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[1] Document will be a draft until it was approved by the coordinator
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[3] The initials of the revising individual in capital letters

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Deliverable D2.1

Case study characterization

14/04/2019

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Executive Summary

This report contains basic description of the six case studies (CS) in the FarFish project. Four of the CS have Sustainable Fisheries Partnership Agreements (SFPA) with the EU and two are within international waters. The CSs cover the Cape Verde tuna fishery (SFPA), the Senegal tuna and hake fishery (SFPA), the Mauritanian mixed fishery (SFPA), Seychelles tuna fishery (SFPA), the high-seas mixed fishery in the South West Atlantic (FAO Major Fishing Area 41) and the mixed fishery in the international waters of South East Atlantic (FAO Major Fishing Area 47). The information presented is primarily based on a review of the available literature and the data that will feed other FarFish work packages (WPs).

This case study characterizations includes descriptions of geography, oceanography, ecosystem characteristics, fisheries activity and production in the area. It also includes description of the existing management procedures and overall their objectives, stock assessment methods used; as well as identification of the main relevant authorities, operators and other stakeholders. The governance within the fisheries is also discussed, as well as issues related to compliance and transparency. The main findings in the evaluation of the SFPA or the high-seas fishery is presented; and the supply-/value chain is studied. The CS characterizations also include overviews of how FarFish will address the gaps and challenges identified, as well as links to the most relevant literature and data.

The case studies cover a range of fisheries of different complexity, from largely single (or a few) tuna fisheries to multi-species demersal fisheries. The management regimes do also range from essentially no management in the case of the high-seas mixed fishery in the South West Atlantic (FAO Major Fishing Area 41), to management at the national and Regional Fisheries Management Organisation (RFMO) levels. While each case study is in general unique, they all face similar problems and challenges. These include overcapacity, overexploitation, threats to food security, inadequate monitoring of catches and fishing effort, lack of compliance and enforcement, inadequate data for stock assessment and for evaluating the effects of fishing (e.g. gear selectivity), lack of expertise and training in fisheries biology, stock assessment and management, lack of data and analysis for evaluation and understanding of variability in abundance, competition between national and foreign fleets, and insufficient or inadequate value chain infrastructure. FarFish aims to contribute to improved data collection, monitoring and compliance in the CSs, as well the development of Management Recommendations (MR) through participatory processes will likely address the problems of lack of knowledge and unsustainable harvest.

It should be kept in mind when reading this report that it is only intended to be an initial basic description of the six FarFish CSs in the beginning of the project, as it has been published in the 3rd month of the project. More detailed, in-depth, descriptions of various components of the CSs will follow as the project progresses.

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List of abbreviations

ABNJ - Areas Beyond National Jurisdiction
ACOPESCA - Competent Authority for Fishery Products
ACP – African, Caribbean and Pacific Group of States
AIS - Automatic Identification System
AMSSI - Association of Members of the Seychelles Sea Cucumber Industry
ANA - National Agency for aquaculture
ANAM - National Agency of Maritime Affairs
ANFACO-CECOPESCA - National Association of Manufacturers of Canned Fish and Shellfish
ASFA - Artisanal Shark Fishers Association
ATLAFCO - Ministerial Conference on Fisheries Cooperation among African States bordering the Atlantic Ocean
BCC – Benguela Current Commission
BCLME - Benguela Current Large Marine Ecosystem
B_{msy} - Maximum Sustainable Yield Biomass
BSFC - British/Seychelles Fisheries Commission
BSP - Bayesian Surplus Production
CA – Convention Area
CAOPA - African Confederation of Artisanal Fisheries Professional, Organizations
CC – Compliance Committee
CCS - Catch Certificate Scheme
CCSBT - Commission for the Conservation of Southern Bluefin Tuna
CECAF – Fisheries Committee for the Central Eastern Atlantic
CEP - Studies and planning directorate
CFA - Frank of the French Community of Africa
CFL - Consolidated Fisheries Limited
CILSS - Interstate Committee to Fight against Drought in the Sahel
CLPA - Local Councils for Artisanal Fisheries
CMM - Conservation and Management Measures
CNAL - National fishing licensing board
CNCPM - National Advisory Council of Maritime Fisheries
CNFTPA - National Training Centre on Fisheries and Aquaculture
CNPS - National Collective of Artisanal Fishermen
COMAHFAT - Ministerial Conference on Fisheries Cooperation
COMESA - Common Market for Eastern and Southern Africa
CONIPAS - National Inter-professional Council of Artisanal Fishermen
COPAM - Mauritania Artisanal Fisheries Cooperative
COSMAR - Operations Center for Maritime Safety
CRODT - Oceanographic Research Centre of Dakar-Thiaroye
CSC - Joint Scientific Committee
CSRP - Sub-Regional Fisheries Commission
DGEFM - Direction for the management and exploitation of seabed
DGRM - Directorate National Directorate of the Maritime Economy
DITP - Management of fishery product processing industries
DNEM - Directorate National of Maritime Economy
DPC - Inland fisheries management
DPM - Direction des Pêches Maritimes
DPSP - Directorate for the Protection and Monitoring of Fisheries in Senegal
EBA – Everything But Arms

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ECOWAS - Economic Community of West African States
EEZ – Exclusive Economic Zone
ENAPOR – National Cape-Verdean Port Company Association
ENFM - National School on Marine Training
EPA – Economic Partnership Agreement
EU - European Union
FAD - Fish Aggregating Device
FAO - Food and Agriculture Organization of the United Nations
FBOA - Fishing Boat Owners Association
FENAGIE-PECHE - National Federation of Economic Interest Groups of Fishermen
FENAMS - National Federation of Economic Interest Groups of Fish Traders (
FENATRAMS - National Federation of Women Processors
FICZ - Falkland Islands Interim Conservation and Management Zone
FMC - Fisheries Monitoring Centre
FMM - Mauritanian Federation of Fishmongers
FOCZ - Falkland Islands Outer Conservation Zone
FPA – Fisheries Partnership agreement
FPAOI - Indian Ocean Federation of Artisanal Fishermen
GAIPES - Ship-owners and industrial fishing group in Senegal
GCM - Mauritanian Coast guard/Garde Côtes Mauritanienne
GDP - Gross Domestic Product
HSBFC - High seas bottom fishery closure
HSBG - High seas bottom gear
ICCAT - International Commission for the Conservation of Atlantic Tunas
ICSEAF - International Commission for South East Atlantic Fisheries
IDDRI - Institute for Sustainable Development and International Relations
IEO - Instituto Español de Oceanografía
IFAN/CAD - Laboratory of marine biology / Institut Fondamental d'Afrique Noire
IHO - International Hydrographic Bureau
IMROP - Mauritanian Oceanographic and Fishery Research Institute
INDP - National Institute for Fisheries Development
INDS - National Fisheries Institute
INE - Instituto Nacional de Estatística
IO - Indian Ocean
IOC - Indian Ocean Commission
IOT - Indian Ocean Tuna
IOTC - Indian Ocean Tuna Commission
IRD - Institute of Research for Development
IUCN - International Union for Conservation of Nature
IUPA - University Institute on Fisheries and Aquaculture
IUU - Illegal Unreported and Unregulated
LCA - Length based cohort analysis
LDAC - Long Distance Fleet Advisory Council
LDC - Least Developed Countries
LPS - Sectoral Policy Letter
MCS - Monitoring, Control and Surveillance
MOU - Memorandum of Understanding
MPEM - Ministry of Fisheries and Maritime Economy
MSY - Maximum Sustainability Yield
NAFO – North Atlantic Fisheries Organization

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NAMMCO - North Atlantic Marine Mammal Commission
NAO - North Atlantic Oscillation
NEAFC – North East Atlantic Fisheries Commission
NEPAD - New Partnership for Africa's Development
NFMP - National Fleet Maintenance Program
NGO - Non-Governmental Organization
OMVG - Organization for the Development of the Gambia River
OMVS - Organization for the Development of the Senegal River
OPROMAR - Organization of Fresh Fish Producers of the Port and Ría de Marín, Spain
PGRP - Cape Verde Fisheries Management Plan (Plano de Gestão dos Recursos da Pesca
PRSP - Poverty Reduction Strategy Papers
PSE - Plan Senegal Emergent
RBM – Results based management
RFMO - Regional Fisheries Management Organization
RFMS – Responsive fisheries management system
RFO - Regional Fisheries Organizations
SADC – South African Development Committee
SAFC - South Atlantic Fisheries Commission
SC – Scientific Committee
SCAF - Standing Committee on Administration and Finance
SEAFO – South East Atlantic Fisheries Organization
SFA - Seychelles Fishing Authority
SFPA - Sustainable Fisheries Partnership Agreement
SIDS - Small island developing state
SIOFA - South Indian Ocean Fisheries Agreement
SMCP - Mauritanian Fish Marketing Corporation
SOTN - Seychelles Ocean Temperature Network
SS – Stock Synthesis
TAC – Total Allowable Catch
UEMOA - West African Economic and Monetary Union
UNAGIEMS - National Union of Economic Interest Groups of Wholesalers
UNFSA - United Nations Fish Stocks Agreement
UNGA – United Nations General Assembly
VME - Vulnerable Marine Ecosystems
VMS – Vessel Monitoring System
WIO - Western Indian Ocean
WPTT - Working Party on Tropical Tunas
WTO - World Trade Organization
YPR - Yield-per-Recruit

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1 Introduction

Approximately 20% of EU catches are taken from the high-seas or from within the waters of non-EU countries to which access is gained through bilateral agreements (EC, Bilateral agreements with countries outside the EU, 2017). These agreements include the so called Sustainable Fisheries Partnership Agreements (SFPAs), where the EU negotiates on access to underexploited fish stocks. The governance of most of the high-seas fisheries is through Regional Fisheries Management Organisations (RFMOs), while national authorities are responsible for SFPA fisheries. In many cases these fisheries involving EU fleets suffer from inadequate governance and management, with overexploitation of stocks and less than optimal utilization of the biological resources.

The EU is obliged to ensure sustainable utilization of the fisheries' resources to which EU fleets have access to in the high-seas or through bilateral agreements, by cooperating with the RFMOs and national authorities in partnership countries to improve knowledge and make management more effective. In this light, the overall objective of FarFish, which is to "***improve knowledge on EU fleet fisheries and their management outside of Europe, while ensuring sustainability and long-term profitability***." Is highly relevant for ensuring that the long-term interests of the EU and the partner countries is safeguarded.

FarFish focuses on six case studies of varying complexity: two high-seas mixed fisheries in international waters fished by EU fleets i.e. South West Atlantic (FAO Major Fishing Area 41) and South East Atlantic (FAO Area 47), and four SPFAs i.e. the Cape Verde tuna fishery, the Senegal tuna and hake fishery, the Mauritanian mixed fishery and the Seychelles tuna fishery.

This report is a product of work package 2 (WP2), but the aims of WP2 (Advancing biological knowledge and evaluation of current stock assessment models) are related to the first Specific Objective (SO1) of FarFish, which is "*To advance knowledge and collate data related to biological characteristics of the main fish stocks in selected fisheries outside EU waters that are important for the EU fleet, and to evaluate the relevance and applicability of appropriate stock assessment models for these fisheries*." In this light, the objective of Task 2.1 (Case study characterization) is to generate case study characterizations based on a review of the available literature and data that will feed other FarFish WPs.

The case study characterizations, which will be updated as the project progresses, include descriptions of geography, oceanography, ecosystem characteristics, fisheries activity and production in the area, existing management procedures and overall objectives, stock assessment methods used, the main relevant authorities, operators and other stakeholders, governance, compliance and transparency, main findings in the evaluation of the SFPA or fishery, and the supply- and value chain. The CS characterizations also include overviews of how FarFish will address the gaps and challenges identified, as well as links to the most relevant literature and data.

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2 Cape Verde Tuna Fishery

The Cape Verde tuna fishery is a fairly well-regulated fishery subjected to ICCAT catch and effort limits. The SFPA provides access to 71 EU pole, line and seine vessels from Spain, France and Portugal to a total reference catch of 5,000 tons per year. EU companies are also heavily involved in processing on the islands.

2.1 Geographical and biological boundaries

The Cape Verde Archipelago, with a total land area of 4,033 km^2, is situated about 650 km west off the coast of Senegal and is comprised of ten major islands and various small islets of volcanic origin rising from depths of at least 3,000 meters. There are two groups of islands located in the north (Barlavento: windward) and south (Sotavento: leeward), as shown in Figure 1 (Stobberup, 2005). The continental shelves are narrow and irregular, with a total area of 5,394 km^2. The continental shelf is more extensive on the eastern side of the archipelago (Sal, Boavista, and Maio islands). The EEZ of Cape Verde covers an area of 789,400 km^2, much of which is exploited by foreign fishing fleets only.

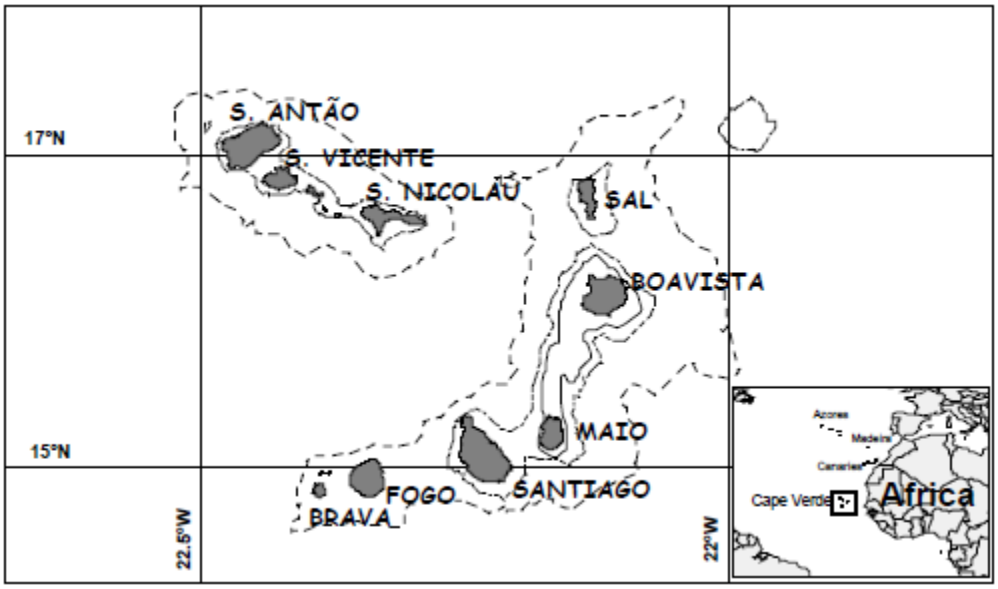

Figure 1: Map of the Cape Verde Archipelago including bathymetric lines corresponding to depths of 200, 1000, and 3000 metres. Source: Stobberup (2005).

The climate of Cape Verde is characterised by warm, relatively even temperatures (22º - 27ºC) and very low and variable precipitation (about 400 mm per year).

The Cape Verde Archipelago is situated in the tropics, isolated from the African mainland and separated by great depths. The Cape Verde marine habitats and ecosystem are generally different from those along the West African coast, which are highly productive upwelling areas. The Canary Current and the equatorial currents (North Equatorial Counter Current – NECC / North Equatorial Current – NEC) have a strong influence on productivity, biodiversity, immigration and colonisation. The mean sea surface topography and main current systems around Cape Verde archipelago are shown in Figure 2 (Fernandes, Marcal, Azevedo, Santos, & Peliz, 2000). In biogeographical terms, the Cape Verde archipelago is a transition zone with a component of species of northern origin (Atlanto-

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Mediterranean) and others of meridional origin (Equato-Guinean). It is considered a "branch" of the Equato-Guinean province, with some connection to the Madeira District (the Canaries and Madeira Islands primarily). Following Longhurst (2007), the Cape Verde Islands are classified as part of the North Atlantic Tropical Gyral Province (NATR), with a consistently low and uniform surface chlorophyll field with a seasonal cycle of small magnitude.

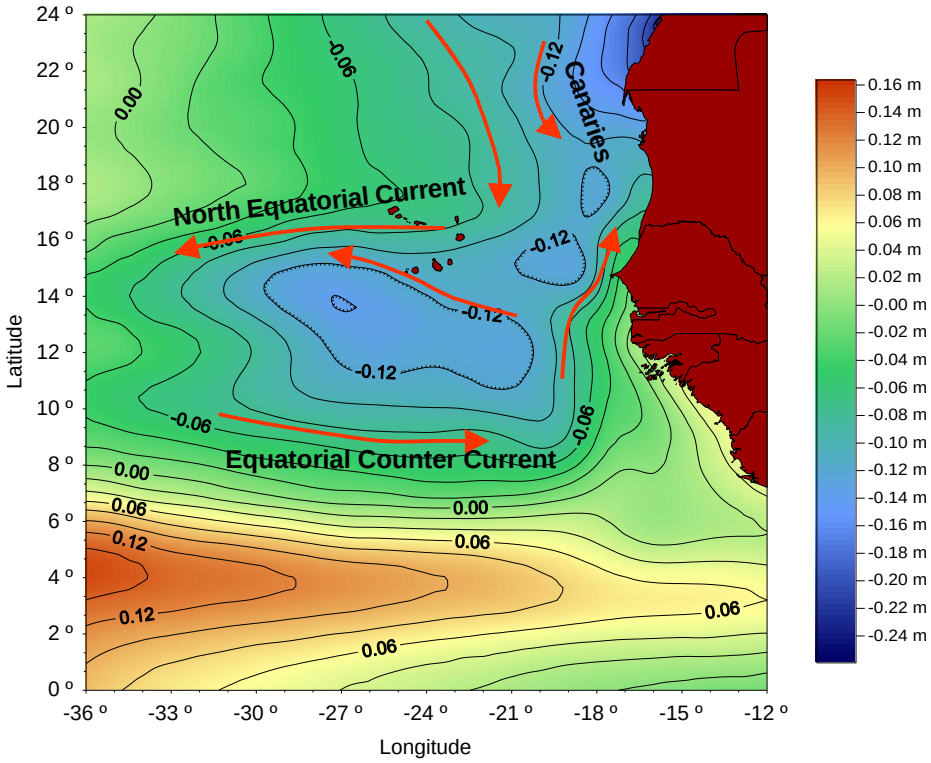

Figure 2: Mean sea surface topography and main current system around Cape Verde archipelago. Source: Fernandes et al. (2000).

Oceanographic conditions vary seasonally as a result of the displacement of the Azores and Santa Helena anticyclones. During the cold season from December to June, northerly winds intensify and the whole Cape Verde Archipelago is under stronger influence from the Canary Current, with generally colder (≤ 23° C) water, transporting nutrients from the upwelling areas in northern Africa and creating more favourable conditions for primary production around the islands. This is especially relevant for the northern group (Barlavento). The warm season from July to November corresponds to a weakening of the St. Helena anticyclone along with intensification and shift to the north (to about 5ºN) of the Azores anticyclone. This results in the southern islands (Sotavento) coming under the influence of the North Equatorial Current (NEC) and North Equatorial Counter Current (NECC), with warmer waters (24° - 27°C) creating ideal conditions for pelagic fish such as tuna, particularly skipjack tuna. The northern and southern areas therefore differ in terms of oceanographic characteristics during the second half of the year.

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2.2 Commercial species, catch statistics, volume and value

In 2013 the Cape Verde semi-industrial and industrial tuna fleet was composed of 3 small purse seiners, 72 multi-gear boats and 2 large purse seiners targeting mainly yellowfin (*Thunnus albacares*), bigeye tuna (*Thunnus obesus*) and skipjack (*Katsuwonus pelamis*). In addition, certain artisanal fisheries (especially the hand line) and sport fishing boats also caught tunas, wahoo and billfishes (marlin and swordfish). Total tuna landings averaged 3,536 t from 1995 to 2004 and 17,605 t from 2005 to 2014, with strong increases in 2013 and 2014 (29,149 and 30,188 t, respectively). The most important species is the skipjack tuna, followed by the yellowfin and the bigeye. In addition to the national fleet, an international fleet consisting of EU vessels licensed to fish under the framework of the EU-Cape Verde fishing agreement as well as vessels from Asian countries are also landing tuna. However, according to the ICCAT Report of the Standing Committee on Research and Statistics (SCRS) of October 2014, the EU vessels are mainly targeting sharks and swordfish. National landings of sharks, caught largely as by-catch, do not exceed 0.3% of the total landings.

2.3 Relevant authorities

The **Direcção Geral dos Recursos Marinhos** (**DGRM**) (Directorate National Directorate of the Maritime Economy) is the fisheries administration body, responsible for implementing the Cape Verde Fisheries Management Plan (**Plano de Gestão dos Recursos da Pesca (PGRP)**, as well as being responsible for control, inspection and certification of fisheries products.

The **Instituto Nacional de Desenvolvimento das Pescas** (**INDP**; www.indp.cv) (National Institute for Fisheries Development) is the main organization responsible for data collection, compilation of fisheries statistics, research and stock assessment.

Until recently, fisheries monitoring and control involved the **DGRM**, the **Instituto Marítimo Portuário** (Maritime Port Institute), the **Coast Guard**, the **Maritime Police** and the **National Police**. The Competent authorities for fisheries production, **Autoridade Competente para os Produtos da Pesca (ACOPESCA)**, created in 2014, has taken over the control and inspection role of DGRM, and is also responsible for control, inspection and certification of fisheries products.

The **Coast Guard** is the component of the Armed Forces responsible for the defense and protection of the marine economic interests of the country and for air and naval support to terrestrial and amphibious operations. **COSMAR** (Operations Center for Maritime Safety) is under the command of the Coast Guard. Fisheries monitoring and control involved the Maritime Police, the National Police, and the Maritime Port Institute.

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2.4 Operators and other stakeholders

There are a number of fisher organizations / associations distributed among the different islands as well as other stakeholders, they include:

Fisher organizations / associations

- **São Vicente**

  Associação Nova Geração de Pescadores de S. Pedro
  Responsável – Celestino Oliveira
  Telefax: 231 09 62/ 996 04 84/ 996 65 63

  Associação de Pescadores de Salamansa
  Responsável – Alfredo Bandeira
  Telef: 231 5755

  Associação Amigos do Calhau
  Responsável – Jorge Melo
  Telef: 232 82 00 / 991 58 73

  Associação de Pescadores de Mindelo
  Responsável: Sr. Francisco Gomes
  Telef: 232 1711

- **Santo Antão**

  Associação Pontinha de Janela
  Responsável – Merinho Rocha
  Telef: 223 18 41/ 223 16 15/ 998 85 69

  Associação Comunitária Nova Experiência Marítima da Cruzinha
  Responsável: Sr. António (Tininho)
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  Vice-Presidente: Sr. Benvindo
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Responsável: Danielson Melo
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Risiane: 9821492

Associação de Pescadores de Ponta do Sol
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Associação de Pescadores de Porto Novo
Responsável: Atelmiro Correia Neves
Telef: 222 2006/ 982 5360

- **São Nicolau**

Associação de Pescadores – Cagarra (Tarrafal)
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Telef: 236 12 87 / 996 61 94

Associação de Pescadores Porto Lapa - Preguiça
Responsável – Elvis Tomas
Telef: 235 22 52/ 235 1583/ 235 21 22

Associação Desenvolvimento Comunitário do Carriçal
Responsável – Ilídio Faria Almeida
Telef: 235 16 93

- **Sal**

Associação de Pescadores da Palmeira
Responsável – Domingos Gomes
Telef: 241 22 36/ 992 38 66

Associação de pescadores de Pedra de Lume
Responsável: Paulo Santos Soares
Telef. 241 12 09/ 9965229 (João Ricardo)

- **Boa Vista**

Associação de Pescadores da Boa Vista
Presidente: João Henrique Cruz
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- **Maio**

Associação de Pescadores do Maio
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- **Santiago**

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  Associação Comunitária Porto Mosquito
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- **Fogo**

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  Brava

  Associação Comunitária de Furna
  Responsável: João Monteiro
  Telef.9836477

  Associação Comunitária Desenvolvimento de Fajã D´Água
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  Telef: 2851473

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Big Game Sport Fishing

Big game sport fishing is increasingly important in Cape Verde. Apart from bill fishes (marlin, spearfish), wahoo and dolphin fish, several tuna species are targeted.

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Berno Niebuhr
IGFA Representative – IGFA Certified Captain
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The following is a list of big game charter contacts:

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Capt. Marty Bates — La Onda; fishing-capeverde.com
Capt. Clay Hensley — Hooker ; worldwidesportfishing@gmail.com
Capt. James Roberts — Hooker; jcrchuy@gmail.com
Capt. Brad Philipps — Hooker; brad@guatbilladv.com
Capt. Migual Gamito — Dona Pi ; fishing-cape-verde.com
Capt. Berno Niebuhr — Happy Hooker ; capeverde-fishing.com
Capt. Matthias Henningsen — Smoker ; atlanticfishingcharter.com

NGOs

"Overseas Fishery Cooperation Foundation", a Japanese non-governmental organization

FAO

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Researchers/Scientists from academia

Other important players, particularly in research are Universidade de Cabo Verde and the Campus do Mar.

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2.5 Supply- and value chain

The catches of foreign fleets within the waters of Cape Verde has fluctuated considerably between years, as can be seen in Table 1 (DNEM, 2017).

Table 1: Catches (tonnes) of the foreign fleet in Cape Verde waters 2011-2015. Source: DNEM (2017).

	2011	2012	2013	2014	2015
Tunas	314	1,119	3,574	5,334	326
Swordfish	142	160	124	21	53
Sharks	1,216	1,317	1,056	519	996
Others	69	54	46	19	0
Total	**1,741**	**2,650**	**4,800**	**5,893**	**1,375**

The catches comprise primarily of tunas, sharks and swordfish, but other species are relatively insignificant.

Given that total tuna landings averaged 17,605 t from 2005 to 2014, with strong increases in 2013 and 2014 (29,149 and 30,188 t respectively), the EU/SFPA share is less than 20% of the total tuna landings. The main landing site is the port of Mindelo and most of the fish for the domestic market is landed fresh and sold in the municipal markets by approximately 3,500 women, mostly wives and relatives of the fishermen. The fish is generally sold without any ice or refrigeration system. However, on some of the islands, a part of the landed fish is sold in supermarkets.

Exports consist of frozen whole and processed fish and invertebrates. In 2014, whole frozen fish accounted for 44.5% of the total value of all exports while processed marine products accounted for 40%. 78.8% of the exports were to Europe, with Spain and Portugal receiving 63.8% and 15.0%, respectively.

ENAPOR (National Cape-Verdean Port Company Association) currently manages and operates all port facilities in the country. The fish is unloaded or transported frozen, at the commercial wharf of Mindelo (São Vicente Island), through the company Atunlo, SA, which also manages the refrigeration facility of Mindelo.

The fisheries sector is responsible for more than 80% of the total exports of Cape Verde, with frozen fish, crustaceans and molluscs accounting for approximately 45% and processed fish 38% of total exports. Official statistics on exports of fisheries products from the Instituto Nacional de Estatística (INE) show that 13,764 t, with a value of approximately 70 million euros, were exported in 2011. For the 5-year period from 2007 to 2011, exports averaged 14,169 t per year. However, it should be noted that these exports include catches from outside the Cape Verde EEZ by vessels with Cape Verde flags.

Historically, the first fisheries agreement between the EU and Cape Verde dates back to 1990. There was another agreement in 20.3.2007 for a period of 5 years. It was then renewed for the period 29.03.2012 to 29.03.2017. The agreement allows EU vessels from Spain, Portugal and France to fish in Cape Verdean waters and is part of the tuna network fisheries agreements in West Africa. Following

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the expiration of the 2011-2014 Protocol on 31.08.2014, a new Protocol to the agreement was signed and entered into provisional application on 23.12.2014. The new agreement will cover a period of 5 years renewable (30.3.2007-29.3.2012-29.3.2017), and the new Protocol will cover a period of 4 years (23.12.2014-22.12.2018). It offers 71 EU vessels fishing opportunities for tuna and tuna-like species in Cape Verdean waters, as follows:

- Tuna purse seiners: Spain (16), France (12)
- Surface longline: Spain (23), Portugal (7)
- Pole and line: Spain (7), France (4), Portugal (2)

In return, the EU will pay Cape Verde a financial contribution of 550,000 € per year in the first two years of application of the Protocol and 500,000 € per year in the last two years. Half of this yearly contribution will be earmarked to promote the sustainable management of fisheries in Cape Verde, including reinforcement of control and surveillance capacities, and to support the local fishing communities.

The majority of the crew is EU. Nevertheless, as stipulated in the fisheries agreement the owners of tuna vessels and surface longlines shall employ African, Caribbean and Pacific group of States (ACP) nationals, including Cape Verde nationals, subject to certain conditions and limits.

2.6 Existing management plan, procedures and objectives

The objective of the Management Plan for Fisheries Resources (Plano de Gestão dos Recurso Pesqueiros – PGRP) 2004-2014, prepared within the framework of the National Action Plan for the Environment, is to ensure that the fisheries of Cape Verde contribute to increase national production, food safety, quality of fishery products, employment, and to decrease the balance of payments deficit.

The PGRP proposes a set of measures for the rational exploitation of fisheries resources and the development of the fisheries sector in a sustainable way. The plan considers three industrial fisheries: 1) tuna pole and line fishery, 2) small pelagic purse seine and 3) deep water lobster traps, as well as five artisanal fisheries: 1) demersal and tuna hand line, 2) small pelagics purse seine, 3) small pelagics with gillnet, 4) small pelagics with beach seine and 5) coastal diving for lobsters. This plan also contemplates shark fishing, fishing by foreign vessels and recreational or subsistence (non-professional) fishing. The PGRP is implemented by means of Biannual Executive Plans, published in the Boletim Oficial da República de Cabo Verde, detailing the regulations and management measures.

2.7 International agreements, RFMO and EU SFPA

The Protocol to the current fisheries partnership agreement between the EU and Cape Verde was signed and entered into provisional application on 23.12.2014, covering a period of 4 years (2014-2018) with fishing opportunities (5,000 ton per year) for 71 EU vessels for tuna and tuna-like species (EC, Bilateral agreements with countries outside the EU, 2017). Cape Verde received a financial contribution of 550 000 € per year in the first two years and will receive 500 000 € per year in the last two years. In addition, vessel owners must pay 55 € and 65 € per tonne in each period, respectively, as

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well as advances ranging from 450 € to 5,525 € per vessel. Half of the yearly EU contribution is intended to be used for promoting the sustainable management of fisheries in Cape Verde and for supporting the local fishing communities.

Cape Verde is one of 48 contracting parties to The International Commission for the Conservation of Atlantic Tunas ("ICCAT" or the "Commission"), a regional fisheries management organization ("RFMO") established by the Convention for the Conservation of Atlantic Tunas (the "Convention"), prepared and adopted at a Conference of Plenipotentiaries in Rio de Janeiro, Brazil in 1966. The Convention entered into force in 1969. ICCAT, an intergovernmental organization, is responsible for the conservation of tunas and tuna-like species in the Atlantic Ocean and adjacent waters, and is tasked with overseeing and coordinating research and stock assessment on approximately 30 species of tuna and other species such as swordfish. Most of the data collection and scientific work is done by the contracting parties, with ICCAT serving as the focal point for data collation/assimilation and coordinating access by scientists to the common databases.

2.8 Governance, compliance and transparency

According to the Agreement, all vessels authorized to fish in Cape Verde waters shall be obliged to report their catches to the Ministry responsible for fisheries in Cape Verde so that it can check the quantities caught and the competent scientific institutes can validate them. All the data is reported to the DNEM (Directorate National of Maritime Economy) and to INDP (National Institute for Fisheries Development). The catch report shall include the catches made by the vessel during each trip. The original of the declarations shall be transmitted on a physical medium to the Ministry responsible for fisheries in Cape Verde within 30 days following the end of the last trip made during the period. Copies shall be sent at the same time by electronic means or by fax to the flag Member State and the Ministry responsible for fisheries in Cape Verde.
In addition to the EU fleet there are a number of other countries that have negotiated access to the Cape Verde waters, including Japan, China and countries of the sub-region i.e. Senegal, Mauritania, Gambia, Guinee Conakry, Guinee Bissau, etc.

Physical inspections are done on regular basis where observers go onboard vessels to confirm that registration and fishing operations are in accordance with the agreements and national legislations. In 2016 a total of 70 vessels were inspected, as shown in Table 2.

Table 2: Number of control operations and inspections of foreign vessels at port. Source: DNEM (2017).

Year	Total operations	Total vessels	Number of inspections
2016	149	70	69
2017 (Jan-June)	80	44	47

Monitoring, Control and Surveillance (MCS) involves several institutions. The activities are organized in actions and tools such as monitoring by the Automatic Identification System (AIS) and the Vessel Monitoring System (VMS), inspections of vessels at landing, maritime patrol operations, and certification of catches. The Coast Guard has four patrol vessels: Guardião (offshore patrol vessel),

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Espadarte class (PeterMk4 11.5 patrol), Vigilante (patrol boat) and Tainha (PRC- 27m). Air patrol operations are also carried out. In terms of capacity, the Coast Guard has around 200 personnel, and the Department for control, inspection and certification of fisheries products in the Directorate National of Maritime Economy has 20 fisheries inspectors.

2.9 Main findings in the evaluation of the fishery and the SFPA

The main problems identified in the PGRP are non-compliance by the foreign vessels, insufficient control and monitoring and competition with the national commercial fleet(s). The NFMP recommends measures to improve monitoring and inspection, including training of inspectors and fisheries observers, studies on the impact of the foreign fleet (e.g. by-catches, sea bird mortality), scientific research on the main species and training programmes for improved management.

For the national "Industrial" pole and line (*salto e vara*) tuna fishery, the national fisheries management plan identifies the following problems: overexploitation, insufficient monitoring and control of the fishery, insufficient management measures, competition with the foreign fleet, low productivity of the fleet due to dependence on live bait, cost/availability of support facilities on land, poor state of the fishing vessels, reduced financial capacity and lack of organization of vessel owners, marketing/economic difficulties (low sale prices, transport to markets).
The plan recommends a number of measures, including: a minimum landing weight of 3.2 kg for albacore, requiring fishing vessels to provide fisheries data, research and improved stock assessment, socio-economic studies, studies on the bait fishery/species, observer programs and improved licensing, control and monitoring.

The artisanal handline fishery for tunas and other large pelagics (and demersal species) has the same problems as the pole and line fishery, but in addition, the vessels are restricted to near shore fishing grounds due to their small size. Thus, specific recommendations include the implementation of an exclusive 3 nautical mile area around the islands to eliminate competition/interaction with larger vessels and other gears. Furthermore, a sampling/data collection along with educational and dissemination programs to inform and educate fishers with regard fisheries legislation and management are also recommended.

The recreational, subsistence and non-professional fishery involves a wide variety of gears and methods, including handline and trolling for large pelagics, including tunas. There is little information available on this generally unregulated fishery, which is the cause of conflict with commercial fisheries. Data collection and scientific studies are recommended.

2.10 Data collection and stock assessment

For the commercial tuna fishery, catch and effort data, supplemented with data from other sources (Customs, Directorate of Marine Resources, fish processing factories) are collected by the National Fisheries Institute (INDS). Sport fishing is increasingly important economically, socially and politically but there is no data available on this fishery.

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Biological data on the three main tuna species is available for the Atlantic Ocean and is summarized in the ICCAT stock assessment reports (www.iccat.int/en/Assess.htm). Most of the biological data is not from studies carried out in Cape Verde waters. However, since these are highly migratory and transboundary species, studies from different parts of the Atlantic are used in the stock assessments.

The three main large tuna species caught in Cape Verde waters and assessed by ICCAT are skipjack, yellowfin and bigeye:

Skipjack tuna (*Katsuwonus pelamis*)
ICCAT considers a single stock for the Eastern North Atlantic. Assessment is based on catch-only (Martell and Froese approach) and catch and effort data (Bayesian Surplus Production (BSP) model). However, it should be noted that this is a difficult species to assess because most of the biomass is due to annual recruitment and also because of the increasing use of fish-aggregating devices (FADs).

Yellowfin tuna (*Thunnus albacares*)
ICCAT uses both an age-structured model and a non-equilibrium production model for assessment. The most recent analysis in 2010 indicates overfishing but annual catches in 2012-2014 were below the estimated MSY. Nevertheless, there is concern with regards to FAD- related mortality of small yellowfin tuna.

Bigeye tuna (*Thunnus obesus*)
The latest ICCAT assessment was in 2015 using a variety of models, including non-equilibrium production models, Virtual Population Analysis and integrated statistical assessment models. The Atlantic bigeye tuna is considered overfished and there are concerns about the usage of FADs.

Socio-economic data on the fisheries are compiled by the Instituto Nacional de Estatística (INE) and are partly available at www.ine.cv. Approximately 9,500 people, corresponding to 5% of the working population, are employed in the fisheries sector. These include approximately 3,800 in the artisanal fisheries, 1,100 in the industrial fisheries, 3,500 fish market women, and the remainder in fish processing, exports and administration. There are 97 ports or landing sites located on nine islands. In 2011 there were 1,239 artisanal fleet vessels and 90 Industrial/semi-industrial fleet vessels.

2.11 How FarFish will address the challenges

Application of RBM principles and the RFMS framework to the Cape Verde tuna fishery will contribute to addressing the challenges and problems identified in the PGRP. The involvement of stakeholders through participatory processes will contribute to improved data collection, monitoring and compliance as well as lead to the development of a management plan that effectively addresses problems such as competition between different fleets and gears.

In collaboration with INDP, FarFish will contribute to improved capacity building that will be achieved through training in data analysis and stock assessment, development and implementation of biological sampling and data collection programmes, and thesis supervision (MSc and PhD).

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Specific studies will fill gaps in the science necessary for proper assessment and management. Examples include the following:

1) The influence of FADs on the tuna resources and their assessment needs to be urgently investigated,
2) Studies on the biology, ecology and population dynamics as well as stock assessment of the small pelagics that are an important part of the diet of tunas, are fished commercially and used as live bait are needed if an Ecosystem Based Approach is to be implemented, as proposed in the PGRP,
3) Studies on by-catch and discards of the tuna fisheries, with particular emphasis on sea birds, sharks and turtles.

2.12 Relevant literature

ICCAT Stock Assessments (www.iccat.int/en/Assess.htm)

INDP. 2013. BOLETIM ESTATÍSTICO Nº 21. Dados Sobre Pesca Artesanal, Pesca Industrial, Conservas e Exportações. Ano de 2012.

Instituto Nacional de Estatística (INE; www.ine.cv).

Ministério do Ambiente, Agricultura e Pescas. 2003. Plano de Gestão dos Recursos da Pesca. 216 p.

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3 Senegal tuna and hake fishery

Senegal is a Sahelian country with a land area of 200,000 km² and a vast maritime area of 198,000 km². Open to the Atlantic Ocean, Senegal is situated at the southern part of Senegalese-Mauritanian sedimentary basin. Between the shore and the 200m depth contour, its continental shelf is very rough and covers an area of 23,600 km² (12% of the area under national jurisdiction), unevenly distributed regarding the depth: 15% between 0-10 meters; 49% between 10-50 meters and 36% between 50-200 meters. The 718 km long Senegalese coast is included in the area of the Fishery Committee of the Eastern Central Atlantic (CECAF/FAO).

3.1 Geographical and biological boundaries

The Senegalese coast extends between 16°04'N (St. Louis, northern border with Mauritania) and 12°20'N (Cap Roxo, southern border with Guinea-Bissau) that encloses Gambian waters (13°05'N-13°36'N) as shown in Figure 3.

Figure 3a): Map of Senegal. Source: Magellan Geographix (1992); b) bathymetry (Mhammdi et al. 2014).

The **North Zone**, also called "Grande Côte" or North Coast, stretches from Saint-Louis (16°04N) north to the Almadies (14°36N) in Dakar region. It is a series of dunes and beach ridges the greater part of which belongs to the "Langue de Barbarie". Its continental shelf is crossed over its entire width by a submarine canyon, the Kayar pit (15°00N) in front of the village of the same name which is the largest fishing area of this zone. Soft bottom (sand, mud, and a mixture of both) are dominated by bedrock within 10 km of the shore. An important mudflat (> 75% of lutites), located on either side of the mouth of the Senegal River (15°15N - 16°30N) is reported between 20 and 80 m depth. This is a habitat of

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coastal shrimp (*Penaeus notialis)*, supplied with juveniles from the river. The 200-meter isobath narrows from north (43 km off St. Louis) to the south (3 km at the Almadies in Dakar region).

The **Centre Zone** lies between Dakar (14°36N) and the northern maritime border of the Gambia (13°36N). It includes the "Petite Côte" - between Dakar and Joal - and the Sine and Saloum, which are drained by rivers of the same names. The main fishing centres are Mbour and Joal. It has two underwater cliffs: the first is shorter, located at approximately 70 meters, and is limited to the southwest of Dakar, while the second is between 35 meters and 45 meters. There are also minor ledges and large cliffs, located near the coast from Dakar to Joal. While this rocky bottom habitat is largely not trawlable, there are other soft bottom areas from the coastal zone to depths of 40m, and the "Flêche de Sangomar" (towards the Saloum River), the Casamance River, to the south. Different spawning grounds and nursery areas are reported there. The fishery resources of this zone are abundant and varied, and landings make it the most productive area of the country.

The **South Zone**, from 13°04N to 12°20N, corresponds to the Casamance region. The continental shelf is at its widest here, almost 87 km. Rocky bottoms are located offshore, mainly on the shelf edge. This area hosts the largest mud flat bottom, from south of the Casamance River's estuary to the Bijagos Islands (11°35N) between 25 and 50m. It is rich in shrimp whose juveniles recruit from the Casamance River and the Rio Cacheu (Guinea - Bissau). This area is facing illegal, unreported and unregulated fishing practices (IUU), which is considered a serious threat affecting the sustainable management of fisheries resources.

Circulation on the continental shelf is influenced by two systems of large currents with very different characteristics:

- The cold, permanent, Canary Current branches off from the north and west at the latitude of Cap Blanc (Mauritania) to form the North Equatorial Current. In the cold season, a branch of this current follows the Mauritanian coast and transports cold water to southern Senegal. Under this coastal current is a backward flow headed north along the continental slope, between Cap Vert and Cap Blanc;
- The equatorial backward flow from the west that brings warm and salty waters onto the continental shelf. It bends to the southeast to form the Guinea Current. In the cold season, it reaches the south of Senegal. In the hot season when it presents its maximum intensity and northern extension, it forms a flow to the north, with the separation initiated off Cap Roxo.

The continental shelf is characterized by the existence of two seasons (hot and cold) that each consist of two sub-seasons:

- A cold sub-season with low intensity of upwelling (November to January). It corresponds to the installation of the trade winds that are still weak and irregular. During this sub-season, the northern continental shelf is always colder than the southern;
- A cold sub-season with intense upwelling (February to May), with strong, stable winds (5 to 7 m/s) towards the north, gradually veering to northwest. Two distinct cold areas are noted, separated by a convergence zone around Kayar. To the south of Cap Vert peninsula, the maximum upwelling area is located on the slope;
- A warm sub-season with relatively stable water (June-August) characterized by arrival of a warm and salty layer of water to the continental shelf, transported by the equatorial backward flow;

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- A warm sub-season with unstable bodies of water (September-October) during which a southward flowing current develops along the entire north coast of Senegal. On the south coast, the situation is more complex. Indeed, there is a north flowing current in the coastal zone while further out the general circulation is oriented to the south as well as along the north coast. This results in very unstable conditions and the existence of these two opposite circulation patterns gives rise to a thermal ridge along the continental slope.

The major mechanism of nutrient enrichment is the coastal upwelling induced by trade winds (strong and cool winds from the northwest sector and related to the Azores). This phenomenon of up-welling of cold, nutrient rich deep water is conditioned in its spatial and temporal fluctuations by the topography of the continental shelf, and the direction and intensity of winds. The upwelling starts on the continental shelf with the trade wind system between November and January. On the north coast, it is very coastal and its intensity is highest between February and April. On the south coast, it moves away from the coast and the maximum upwelling is in March-April. To the south of the Cap Vert peninsula, the upwelling is strong from February to May and up-welling is from 70 to 100m depths. In periods of strong trade winds, Goree Bay becomes the coldest area of the continental shelf. During strong upwelling, phosphate levels are higher on the southern coast. Surface waters off Dakar have higher concentrations of nitrate. Furthermore, the Senegambian coast receives runoff from three rivers (Gambia and Casamance rivers and the Sine Saloum complex) whose soil deposits are another source of enrichment.

Upwelling is the main source of nutrients, followed by river discharge and remineralization of dissolved organic matter. The importance of primary production is linked to seasonal and intra annual fluctuations of these sources. The peaks of maximum chlorophyll production correspond to the end of the upwelling period (May) for the whole coast and also to the end of the rainy season (October) for the area south of Dakar. The phytoplankton production varies with latitude. The existence of coastal currents leads to an accumulation of phytoplankton biomass in shallow coastal waters, with estuarine areas secondarily enriched with inputs from rivers. In warmer months, two major chlorophyll concentrations are noted at the surface of the Saloum and Casamance rivers' estuaries. In the cold season, these concentrations are located on the outskirts of the main zones of upwelling. Studies on secondary production in the area around the Cap Vert peninsula indicate a strong relationship between zooplankton abundance and intensity of upwelling.

3.2 Commercial species, catch statistics, volume and value

Fishery resources are exploited by artisanal and industrial fisheries. The main artisanal fishing gears are purse seines, gillnets, longlines, handlines, while the industrial fleet consists of trawlers, tuna baitboats and tuna and sardine purse seiners.

Offshore pelagic resources

The three main tropical tuna species are yellowfin (*Thunnus albacares)*, skipjack (*Katsuwonus pelamis)* and bigeye tuna (*Thunnus obesus)*. Other tuna species are little tunny (*Euthynnus alletteratus)*, bonito *(Sarda sarda)*, Spanish mackerel (*Acanthocybium solandri)* and Atlantic sailfish (*Istiophorus platypterus)*. They are mainly caught as by-catch by industrial units, although some artisanal fleets are

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showing a growing interest in these species. The blue marlin (*Makaira nigricans)*, Atlantic sailfish and swordfish (*Xiphias gladius)* are targeted by big game sport fishing.

Coastal pelagic resources

Coastal pelagics represent nearly 71% of the catches in the Senegalese Exclusive Economic Zone (EEZ). These resources consist mainly of Clupeidae: round sardinella (*Sardinella aurita*) and flat sardinella (*Sardinella maderensis*), Shad razor (*Ilisha africana*), Bonga (*Ethmalosa fimbriata*), Engraulidae (the European anchovy (*Engraulis encrasicolus*)), Carangidae (black horse mackerel (*Trachurus trecae*), Atlantic horse mackerel (*Trachurus trachurus*) and scad (*Caranx rhonchus*)) and Scombridae (chub mackerel (*Scomber japonicus*), mackerel (*Scomber scomberus*)). They are exploited by artisanal and industrial fleets. Other species that are caught include: *Brachydeuterus auritus, Chloroscombrus chrysurus, Trichiurus lepturus, Lepidotus caudatus, Pomadasys jubelini*, and *Pomadasys perrotteti*.

Coastal demersal resources

The coastal demersal resources, located from surface to a deep of 200 meters, include fish (groupers, soles, croakers, mullet, sea breams), cephalopods (octopus, cuttlefish, squid) and crustaceans (white shrimp, tiger prawn, coastal shrimp, lobster, and crabs). They are exploited by a variety of artisanal and industrial fishing gears. The main targeted crustaceans are the white shrimp (*Penaeus notialis*) and the green spiny lobster (*Panilurus regius*). The common octopus (Octopus vulgaris) and cuttlefish (*Sepia officinalis hierreda*) dominate the cephalopod catches. Given their high market value, coastal demersal species are mainly exported. Indeed, they account for 65% and 90% of the exports in volume and in value, respectively.

Deepwater demersal resources

Deepwater demersal resources, found between 150 and 1000 meters, and mainly caught by Senegalese and Spanish trawlers, include deep-water rose shrimp (*Parapenaeus longirostris*) and striped red shrimp (*Aristeus varidens*), and fish (hake, scorpion fish, sharks, rays and monkfish). The deep-water pink lobster *Palinurus mauritanicus* and deep red crab Geryon (*Chaeton maritae*) are also caught in shrimp trawlers in significant quantities.

Estimated total catches within the Senegalese EEZ were 425 thousand tonnes in 2014, as shown in Table 3. The artisanal fleet accounted for 88% of the catches and the industrial fleet for the rest.

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Table 3: Volume and value of the landings of different fleets operating in Senegalese waters in 2014. Source: CRODT.

	National		Foreign	
	Catch volume (ton)	Value (x1000 F CFA)	Catches in Senegalese EEZ (ton)	Landings in Senegal (ton)
Artisanal fisheries	**372,548**	**93,574,514**		
Industrial fisheries	**52,454**	**41,380,320**		
- *Trawlers*	*46,650*	*38,694,381*		
- *Sardina fisheries*	*1,605*	*146,032*		
- *Tuna fisheries*	*4,445*	*2,539,907*	*7,611*	*32,803*
TOTAL	**425,002**	**134,954,834**	**7,611**	**32,803**

Interestingly, the foreign fleets landed almost 33 thousand tonnes of tuna in Senegal in 2014, of which less than 8 thousand tonnes were caught within Senegalese waters. This highlights the fact that Senegal is a logistics and processing hub for tuna caught along the coast of west-Africa.

3.3 Relevant authorities

The Senegalese fisheries sector is governed by the Ministry of Fisheries and Maritime Economy (MPEM) through a number of governmental institutions, such as:

- Maritime Fisheries Directorate (DPM)
- Management of fishery product processing industries (DITP)
- Direction for the management and exploitation of seabed (DGEFM)
- Directorate for protection and control of fisheries (DPSP)
- Inland fisheries management (DPC)
- Studies and planning directorate (CEP)
- National Agency of Maritime Affairs (ANAM**)**
- National Agency for aquaculture (ANA)

Fisheries related research and training are conducted in the following institutions:

- Oceanographic Research Centre of Dakar-Thiaroye (CRODT)
- National Training Centre on Fisheries and Aquaculture (CNFTPA)
- National School on Marine Training (ENFM)
- University Institute on Fisheries and Aquaculture (IUPA)
- Laboratory of marine biology / Institut Fondamental d'Afrique Noire (IFAN/CAD)
- Research Institute for Development (IRD/France)

The Senegalese fisheries administration is involved in international cooperation, both regionally with neighboring countries and at the international level. These include:

- Sub-regional fisheries commission (CSRP)
- Committee for the Eastern Central Atlantic Fisheries (CECAF)
- International Committee for the Conservation of Atlantic Tuna (ICCAT)
- Ministerial Conference on Fisheries Cooperation (COMAHFAT)
- United Nations Organization for Food and Agriculture (FAO)
- West African Economic and Monetary Union (UEMOA)

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- Economic Community of West African States (ECOWAS)
- New partnership for Africa Development (NEPAD)
- European Union (EU)
- World Trade Organization (WTO)
- Interstate Committee to Fight against Drought in the Sahel (CILSS)
- Organization for the Development of the Senegal River (OMVS)
- Organization for the Development of the Gambia River (OMVG)

3.4 Operators and other stakeholders

Operators are included at the administration level in the work of the National Advisory Council of Maritime Fisheries (CNCPM) and the National fishing licensing board (CNAL). This ensures that the voice of the operators is heard within these institutions.

Fishermen, processors and other stakeholders within the seafood supply chains do have strong associations and other organisations, which represent them when needed. These include:

- Ship-owners and industrial fishing group in Senegal (GAIPES)
- National Federation of Economic Interest Groups of Fishermen (FENAGIE-PECHE)
- National Federation of Economic Interest Groups of Fish Traders (FENAMS)
- National Collective of Artisanal Fishermen (CNPS)
- National Union of Economic Interest Groups of Wholesalers (UNAGIEMS)
- National Federation of Women Processors (FENATRAMS)
- National Inter-Professional Council of Artisanal Fishermen (CONIPAS)
- Local Councils for Artisanal Fisheries (CLPA)

In addition, there are some local Non-Governmental Organizations (NGOs), cooperatives and groups that take part in the discussion on fisheries related matters and represent different interest groups.

3.5 Supply- and value chain

More than 85% of landings are from artisanal fisheries. These are mainly for fresh consumption (17%), fish trade (65%) and processing (17% (salted, dried, smoked)). Industrial catches are from trawlers (90%), tuna vessels (7%) and sardine boats (3%). In 2014, exports consisted of frozen (88%), fresh (4%), processed (5%) and canned (3%) products. The breakdown of industrial exports by continent shows that since the policy of upgrading established by the European Union, Africa remains the main destination for exports. In recent years, exports to Asia have increased, with Asia now ranking second after Africa. Refrigerated and frozen products are landed in Dakar and other markets and exported to the EU, Asia and the USA. Processing plants are owned by Senegalese nationals working alone or with partners, mostly from the EU.

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3.6 Existing management plan, procedures and objectives

The Fisheries Code aims to achieve good management of fisheries resources and to ensure their sustainable development. It was revised in 2015 to incorporate new provisions on illegal, unreported and unregulated (IUU) fishing, co-management, management plans for fisheries, and implementation of participatory approaches. Other important documents include: Plan Senegal Emergent, Sector Policy Letter, Management Plans for specific fisheries.

3.7 International agreements, RFMO and EU SFPA

The current fisheries partnership agreement between the EU and Senegal was signed in 2014 and covers the period 20 November, 2014 to 19 November, 2019. It is a tuna fishery agreement with a limited demersal component (hake). This fisheries agreement allows EU vessels (28 tuna seiners, 8 pole-and-liners, 2 trawlers) to fish 14,000 t/year of tuna and 2,000 t/year of hake in Senegalese waters. The financial contribution is 1,668,000 to 1,808,000 €/year, including 750,000 €/year to support the fisheries sector.

In 2015, 6 purse seiners, 8 pole-and-line vessels and 2 hake trawlers caught a total of 7,884 tons worth 320,125,182 F CFA, corresponding to 476,457 €. In 2016 two more purse seiners joined the fishery resulting in total catches of 6,168 tons with a value of 248,131,663 F CFA, corresponding to 369,716 €.

Senegal is home to the headquarters of the CSRP, which is a member of ICCAT, CECAF, Ministerial Conference on Fisheries Cooperation among African States bordering the Atlantic Ocean (ATLAFCO), NEPAD, and it has bilateral fisheries agreements with certain countries such as Mauritania and Guinea Bissau.

3.8 Governance, compliance and transparency

The Sectoral Policy Letter (LPS) is the reference framework of the MPEM. It covers management of fisheries resources and their habitats, adjustment of fishing effort, valorization of fisheries products, licensing, improvement of infrastructure and provision of advice to the artisanal sector and training. Guidelines for an ambitious new development model for Senegal are outlined in the Emerging Senegal Plan (AllAfrica, 2015). The principal risk factors for the success of the PSE are institutional instability, resistance to change, weak ownership, inadequate resource mobilization, lack of the necessary human resources to conduct the reforms and projects, delays in the investment climate reforms and the modernization of public administration, unexpected social spending, climatic shocks (flooding, drought), limited absorptive capacity, and insufficient monitoring and evaluation.

The operational fisheries monitoring and protection system is aiming at verifying compliance of the activities of industrial fishing vessels. The Monitoring, Control and Surveillance (MCS) activities are organized around the following actions and tools:

- The Vessel Monitoring System (VMS);
- Inspections of vessels at landing;
- Maritime patrol operations;

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- Air patrol operations;
- Observer embarkation on board;
- Certification of catches for the European Union (EU) market;

Summaries of fishing vessel control operations at sea and in the port (2013-2016) are given in tables 4 and 5. As can be seen, there has been a steady increase in the number of control operations over this time period. Regionally there is cooperation in terms of control and monitoring within the framework of the Sub-Regional Fisheries Commission (CSRP), which includes Mauritania, Senegal, Cape Verde, The Gambia, Guinea Bissau, Guinea and Sierra Leone, with projects financing joint monitoring over time.

Table 4: Summary of fishing vessel control operations at sea in Senegalese waters 2013-2016 . Source: CRODT.

	Year			
	2013	**2014**	**2015**	**2016***
Days at sea	442	368	416	182
Fishing vessels controlled	453	448	951	487

Table 5: Summary of fishing vessel control operations at port in Senegal 2013-2016. Source: CRODT.

	Year			
	2013	**2014**	**2015**	**2016**
Fishing vessels controlled	695	783	720	850

Requests / practices for reporting presence in the EEZ, the physical control at the port (landing and trans-shipment) and procedures for declaring catches in the EEZ are also the responsibility of DPSP, MPEM.

The main challenges facing Senegalese fisheries include management of fishing over limits, overexploitation of stocks (coastal demersal species in particular, but also, increasingly, coastal pelagic stocks), threats to food security, bad fishing practices, and lack of law enforcement. Other concerns include coastal erosion, climate change, pollution, and ecosystems degradation.

3.9 Main findings in the evaluation of the fishery and the SFPA

The scientific work on the offshore pelagic resources is mainly carried out under the International Commission for the Conservation of Atlantic Tunas (ICCAT). However, CRODT is involved in the collection and analysis of statistical and biological data. The assessments of the pelagic stocks in the North-West African region are carried out by CECAF / FAO working groups. The assessments of demersal resources of the EEZ of Senegal are conducted in the framework of the FAO working group, using production models implemented in Excel. The production models were also used to evaluate the

* 1st semester

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stock status of black hake and deep-water rose shrimp. The main results are presented in the Table 6 (CRODT, 2017).

Table 6: Summary of the stock assessment for the key fisheries resources and management recommendation. Source: CRODT.

Species	Maximum Sustainable Yield (MSY)	Exploitation Status	Management Recommendations
Offshore pelagic stocks			
Yellowfin Thunnus *albacores*	147 200-161 300 t in 2003 in East Atlantic	Fully exploited or overexploited	Maintain effort at the 1992 level Minimum weight capture set to 3, 2 kg Closing FAD fishing from 1st November 1st January 31st in the moratorium area
Skipjack *Katsuwonus pelamis*		Moderately exploited	Closing FAD fishing from 1st November to January 31st in the moratorium area
Bigeye *Thunnus obesus*	93 000 - 114 000 t in East Atlantic	Fully exploited or overexploited	Catch limits to 90 000 t Minimum weight capture set to 3, 2 kg Closure of the fishing season from November 1st to January 31st in the moratorium area
Yellowfin+ Skipjack+ Bigeye	In the Senegal area, the potential of catch of the three species was estimated between 25 000 and 30 000 t		
Coastal pelagic stocks			
Sardinella *Sardinella spp.* (round and flat Sardinella)	435 000 from south Morocco to Senegal	Signs of overexploitation of the round sardinella	Avoid any increase in catches beyond 400 000 t
Horse mackerel *Trachurus spp*.	417 000 t from south Morocco to Senegal	Moderately exploited	Maintain annual catches at the average of 220 000 t
Coastal demersal stocks			
Red pandora *Pagelllus bellottii*	10 360 t	Overexploited	Reduce fishing effort by 10%
Catfish *Arius spp.*	6 529 t	Danger of overexploitation	As a precaution, do not increase the catch of these species until more accurate assessments
West African croakers *Pseudotolithus spp*	4 781 t	Risk of overexploitation	Reduce fishing effort
Thiof *Epinephelus aeneus*	1 471t (Mauritania + Senegal + Gambia)	Risk of extinction	Prohibit fishing for this species

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West African goatfish *Pseudupeneus prayensis*	1 700 - 1 920 t	Fully exploited	Increase of the production can be envisaged
Bluespotted seabream *Pagrus caeruleostictus*	3 144 t	Overexploited	Reduce fishing effort by at least 20%
Lesser African threadfin *Galeoides decadactylus*	4 300 - 4 500 t	Overexploited	Reduce industrial fishing effort
Large-eye dentex *Dentex macrophthalmus*	3 050 t	Fully exploited	By precautionary measure, do not increase the current fishing effort
Cuttlefish *Sepia officinalis*	3 851 t	Overexploited	Reduce fishing mortality by the control of catches and fishing effort
Octopus *Octopus vulgaris*	12 886 t	Overexploited	Reduce fishing mortality by the control of catches and fishing effort
Southern pink shrimp *Penaeus notialis*	3 518 t	Overexploited	Reduce the current fishing effort by 25%
Deepwater demersal stocks			
Hakes *Merluccius polli, M. senegalensis*	1 657 t	Moderately exploited	Do not increase the fishing effort pending data refresh
Deep-water rose shrimp *Parapenaeus longirostris*	2 560 t	Fully exploited	Do not increase the fishing effort until an understanding of the observed fluctuations

Alarmingly, many of the stocks being assessed are fully exploited or overexploited, which suggests that fishing pressure needs to be reduced and that there may not be much “excess fish” for the EU to negotiate on.

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3.10 Data collection and stock assessment

Sampling data on fishing effort and catches are regularly collected by the Oceanographic Research Centre of Dakar Thiaroye (CRODT) both for artisanal and industrial fisheries. National census data on fleets and fisheries infrastructures are also available.
Biological data on stocks and the major species is available, mainly regarding reproduction and growth. Information is also available on fisheries potential and exploitation status of key species.

Coastal demersal, deep demersal and coastal stocks surveys are conducted. CRODT has its own research vessel (Itaf DEME, since 2001), which replaced Louis SAUGER (1995-2001) and Luarent AMARO (1968-1995). Stock assessment is mainly based on Production models (CECAF, ICCAT or internal working groups).

The fishing sector is the first export sector with revenues of more than CFA 150 billion per year. It accounts for about 15% of the active labour force in Senegal. More than 400,000 tonnes are landed every year. About 60% of people take 40% of the animal protein consumed annually; the average consumption is estimated at 28 kg per capita per year. Total direct employment in the fishing sector is estimated at 650 000 persons, mainly in artisanal fisheries, particularly small-scale processing; 1/6 Senegalese working in the fisheries sector. Data on socio-economic issues like these are available to appoint in Senegal.

3.11 How FarFish will address the challenges identified above

The main challenges within the Senegalese fishery involve overfishing. FarFish will help to address this and improve fisheries management by increasing knowledge on stocks by data collection and analysis, stocks assessment, using up-to-date models and management tools, developing networks, working groups, and knowledge transfer. FarFish will also contribute to a better understanding of the value chains and the development of new markets.

3.12 Relevant literature

Etat d'exploitation des ressources halieutiques sénégalaises et possibilités de pêche. Centre de Recherches Océanographiques de Dakar-Thiaroye

Résultats Généraux de la Pêche Maritime. Direction des Pêches Maritimes (DPM)

Rapports annuels 2013 à 2016. Direction de la Protection et de la Surveillance des Pêches au Sénégal (DPSP)

Vue générale du secteur des pêches de la République du Sénégal. FAO/FID/CP/SEN

www.gouv.sn

http://ec.europa.eu/fisheries/cfp/international/agreements/senegal/index_en.htm

Giron-Nava et al. (2018). Managing at Maximum Sustainable Yield does not ensure economic well-being for artisanal fishers. *Fish and Fisheries* https://doi.org/10.1111/faf.12332

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D. Thiao, J. Leport, B. Ndiaye and A. Mbaye. (2018). Need for adaptive solutions to food vulnerability induced by fish scarcity and unaffordability in Senegal. *Aquat. Living Resour.* https://doi.org/10.1051/alr/2018009

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4 Mauritania Mixed Fishery

Fishing is an economically important sector in Mauritania, accounting for 20% of budget revenues and 45% of foreign currency earnings of the country in 2016 (CIA World Factbook, 2017). After a partnership agreement signed between Mauritania and the EU in 1989, several other agreements have been signed (EC, Bilateral agreements with countries outside the EU, 2017). The last agreement was entered into force for a period of 4 years starting from 2015. It concerns mixed fisheries such as tuna, crustaceans, demersal round fish and pelagic species. The total landings of fisheries are dependent on fishing agreements, reaching a peak of 1,200,000 tonnes in 2010. Management of such a diverse fishery as Mauritania is complex and involves a variety of vessel types and fleets from multiple EU countries. The SFPA allows access to 98 EU vessels.

4.1 Geographical and biological boundaries

Mauritania is the southernmost country of the Maghreb on the north-western coast of Africa, with a land area of 1,030,700 km^2 and 754 km of Atlantic coast. It borders Senegal (813 km), Morocco (1,561 km), Mali (2,237 km) and Algeria (463 km), as shown on Figure 4.

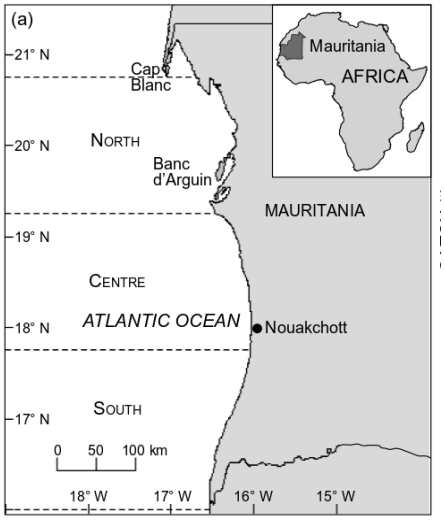

Figure 4: Map of Mauritania. Source: IMROP

Two main climatic zones are present in Mauritania. Most of the landscape is part of the Sahara arid region with little rain and vegetation. However, the southern part of the country has a Sahelian climate with one rainy season from July to September and variable interannual precipitation dependent on the latitudinal position of the inter Tropical Convergence Zone. The coastal fringe is heavily influenced by the trade winds, producing a humid but temperate climate. Finally, the Senegal River Valley is a narrow belt of land that extends north of the Senegal River with more vegetation coverage than the rest of the country and yearly precipitation of up to 600 mm. Severe droughts during recent decades have reduced the area of this climatic region. Figure 5 shows clearly how the precipitation differs between the north and south parts of Mauritania, based on average yearly rainfall (MRDE, 2003).

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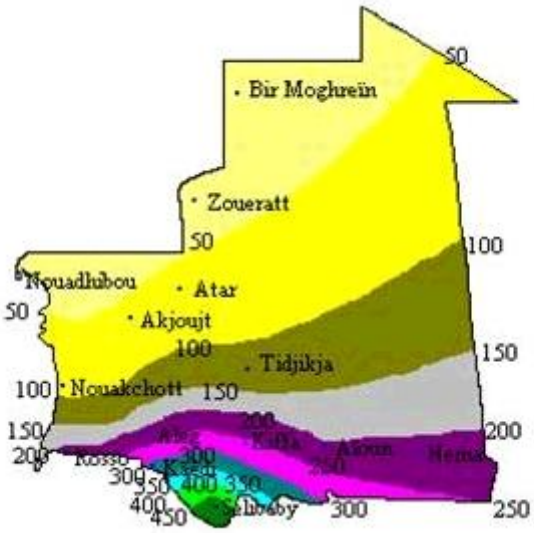

Figure 5: Isohyet map (mm) based on the average rainfall in Mauritania for the period 1961-1990 . Source: Ministry of Rural Development and Environment, in Soule (2003).

Mauritania's EEZ is included in the Canary current large marine ecosystem, which is the eastern - southward flowing component of the North Atlantic Subtropical Gyre, as shown in Figure 6. It is one of the world's major coastal upwelling regions. It is characterized by high values of primary productivity that subsequently flows through the food web, providing the basis for high fish biomass (especially small pelagic species) and significant fisheries resources, with variability highly connected to the physical environment, in particular to upwelling strength which is the main driver of the regional biological processes.

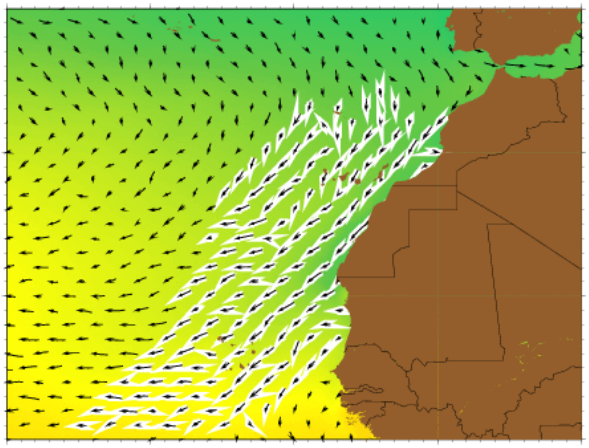

Figure 6: The Canary current marked in white within the context of the north-Atlantic Eastern Boundary Current . Source: Gyory et al. (n.d.)

The upwelling intensity in north-west Africa varies in latitude. Mauritania is affected by permanent upwelling only in the northernmost part of the EEZ, while seasonal upwelling occurs along most of the coast, as shown in Figure 7.

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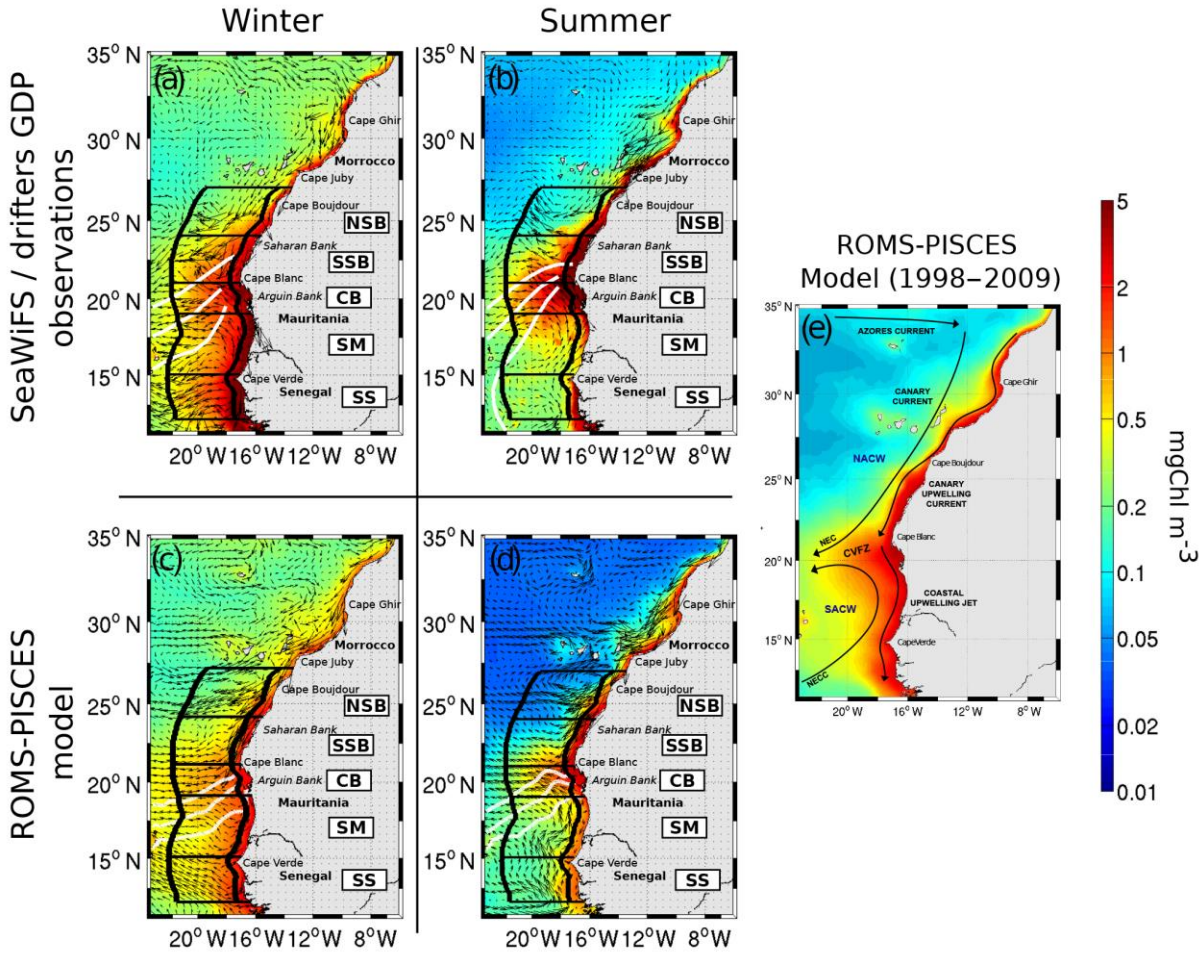

Figure 7: Seasonal sea surface chlorophyll (red = highest concentrations) in the north-west Africa upwelling region. Source: Auger et al. (2016).

The intensity of seasonal upwelling seems to be highly influenced by the North-Atlantic Oscillation (NAO). The NAO controls the magnitude of non-summer upwelling and inter-annual variability, especially in winter. The upwelling index shows a phase of moderate to low upwelling from 1995 to 2005 that followed an intense upwelling period from 1970 to 1995, shown in Figure 8 (Cropper, Hanna, & Bigg, 2014).

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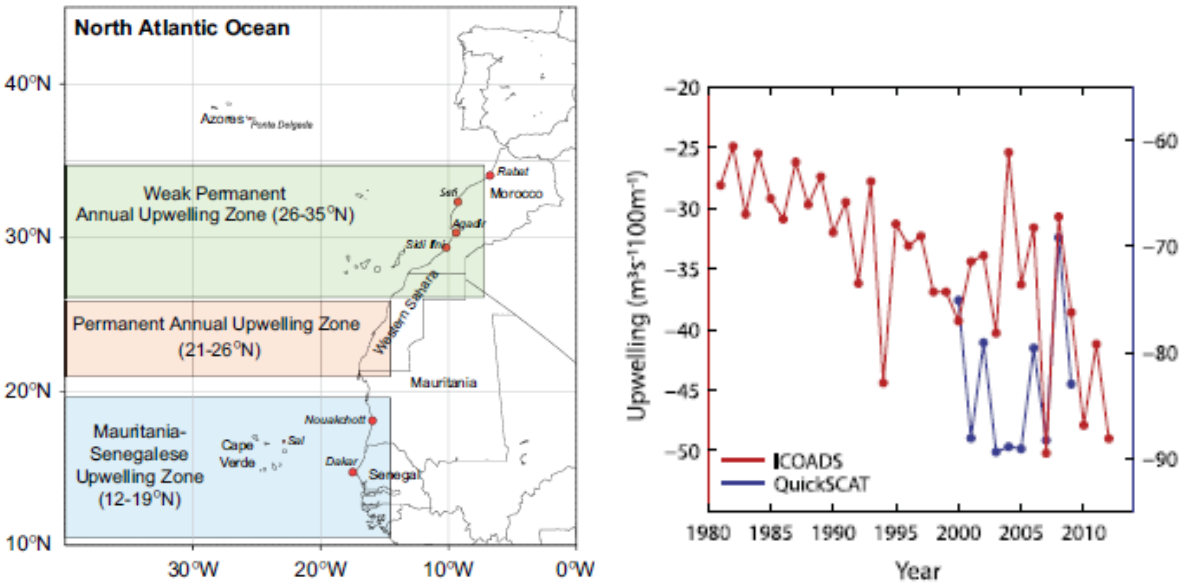

Figure 8: The NW African upwelling region with the three upwelling zones (left Figure), and the Inter-annual variability of the Mauritania-Senegalese summer (June-July-August) upwelling intensity (right Figure). Source: Cropper et al. (2014).

The seasonal intensity of the upwelling has been reduced since 2005. Presently, there is an intense scientific debate on the impact that climate change will have on this upwelling system, including the possibility that this may explain the change of the distribution of species in Mauritanian waters.

4.2 Commercial species, catch statistics, volume and value

There is a great variability of commercial species in Mauritanian waters, but the most important once for the EU fleet are small pelagic, hake, shrimp and tuna, which are all included in the current SFPA agreement (EC, Bilateral agreements with countries outside the EU, 2017). The following discussions on these species is a taken from the report of the seventh meeting of the joint scientific committee (RIM-EU, 2014) and the 2010 annual IMROP report.

4.2.1 Small pelagics fishery

The exploitation of the small pelagic species is carried out with different sizes of boats, ranging from 10 meters to oceanic fishing vessels of 140 meters. Three major types of fishing fleets: artisanal, coastal and industrial, compete for the exploitation of these resources. Clupeidae (pilchard, round sardinella) are the main targets for artisanal and coastal fishing fleets. Trawl fishing by foreign countries in the area is focused on horse mackerel and mackerel, but also sardine and sardinellas since 1996. Industrial fishing belongs exclusively to several foreign nationalities i.e. Eastern Europe; Western and Mediterranean, Far East, North America and some African countries. It consists of units of tonnage with great autonomy, from one to several months. During the last twenty years, the fleets from 25 different nationalities were operating in the Mauritanian zone with a clear dominance of countries like Russia, Ukraine, the Netherlands and more recently Belize.

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The catches of the small pelagic artisanal- and coastal fleets consist mainly of sardines (flat and round) and bonga. It has been increasing from 2006 with 300,000 tonnes in 2013 and 200,000 tonnes in 2012. The catches of sardines account for approximately 79% of the total small pelagic catches in the period between 2006 and 2013. Other species concerned are mainly croakers, mullets and bluefish.

Catches of small pelagics reported by industrial fleets were approximately one million tons in 2010 and 2011, an increase of 30% in relation to 2009. This represents more than 95% of the catches reported by the entire industrial segment. In 2012 and 2013, the decline in fishing effort compared to 2011 was respectively 42% to 48%, but the catch was 39 % in 2012 and 58% in 2013. Horse mackerel is the main target species of the pelagic fishing industry, representing 40% of the catches on average in recent years, whilst the while sardines follow closely accounting for 38% of the catches. The catches of small pelagics by the industrial fleet, by main species, during the period 1990-2009 are shown in Figure 9.

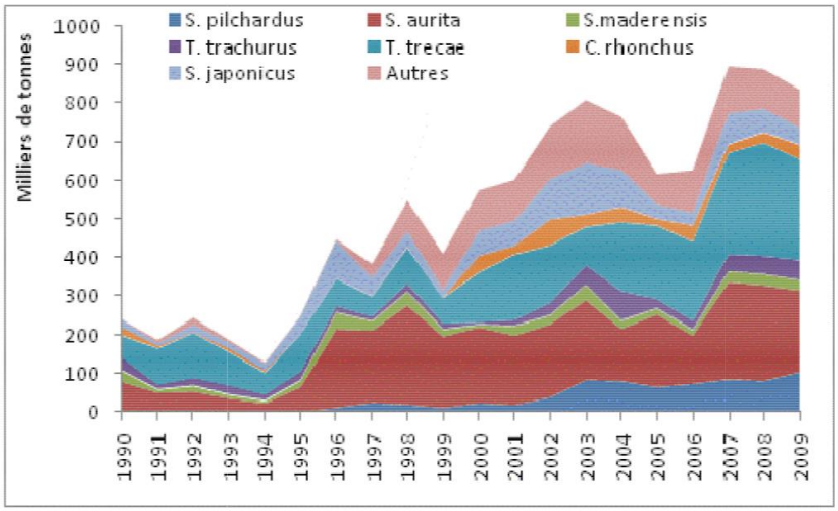

Figure 9: Small pelagic catches of the industrial fleet 1990 to 2009 by main species. Source: IMROP and COPACE.

The figure shows how the catches have risen over the past two decades, making the fishery highly profitable and attracting attention from fishing companies all around the world.

4.2.2 Demersal fishery

Demersal fisheries are considerable in Mauritanian waters, which octopus and hake representing the most important species. These demersal catches are particularly important for the national fleet, but foreign vessels are also utilising these stocks.

Cephalopods

Octopus are the most important demersal species in Mauritania. It is considered a key species because of its socio-economic importance. Given the multi-species nature of the fishery, the management of demersal resources is based on regulatory measures for octopus. The exploitation of octopus began in the late 60´s in northern Mauritania. Its high commercial value and its relative ease of exploitation by the artisanal segment is causing a rapid industrial development of foreign and domestic fleets.

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The artisanal catches peaked in 2009 at 17,800 tonnes, but have reduced slightly since then and in 2013 the catches amounted to 10,000 tons.

Catches of Cephalopods by the industrial fleet 1990 – 2016 are shown in Figure 10. It shows how catches peaked around the year 2000 when catches of all of the three most important species were particularly high.

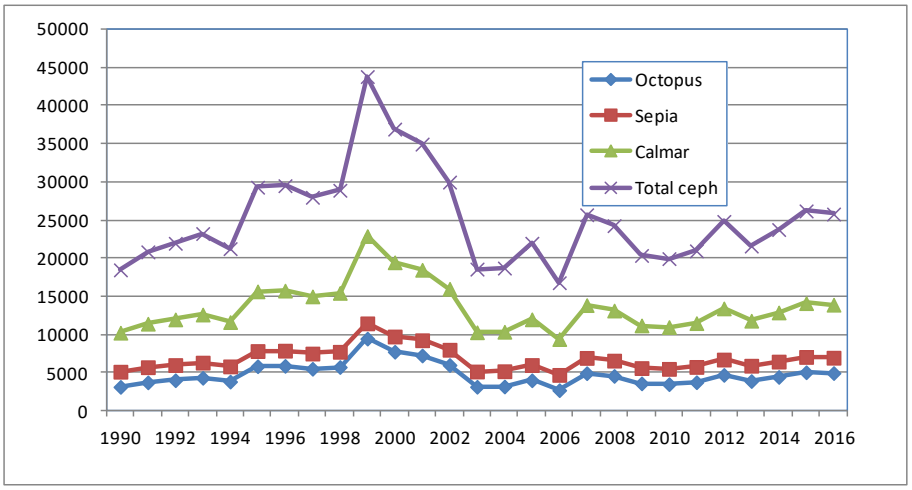

Figure 10: Estimated cephalopod industrial catches, in tonnes, by species from 1990 to 2016; squid (green), cuttlefish (red), octopus (blue), and total (purple). Source: IMROP and CECAF.

The catches have been relatively stable over the past decade, with squid accounting for about half of the catches. About 25% of the cephalopod catches are taken by the EU fleet, but as of 2013 the octopus catches have been taken only by national vessels, distributed almost equally between the industrial and artisanal segment (56% and 44%).

Black hake

This resource consists of two species, *Merluccius senegalensis* and *Merluccius polli*, that are marketed as one under the generic name of black hake. Since the new protocol in 2012, the average rate of utilization of fishing opportunities has been weak in terms of number of vessels, but high in terms of catches. According to figures provided by the Commission, catches reached 3,467 tonnes in 2012 and 4,300 tonnes in 2013, as shown in Figure 11.

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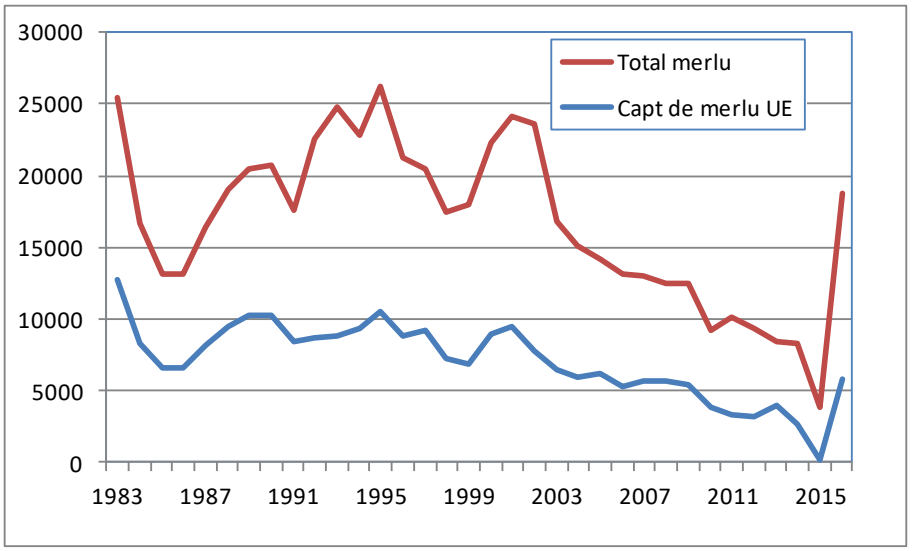

Figure 11: Catches of black hake, in tonnes, within Mauritanian waters 1983-2016. Source: IMROP and CECAF

The EU fleets catches in 2011 and 2012 represented 87% and 107% of the volume stipulated in the agreement at that time (4,000 tonnes). The catches dropped down after that, but arose again with a new protocol in 2015, when reference catches were also increased to 6,000 tonnes.

The black hake catches in Mauritanian waters are mainly carried out by European trawlers and longliners, as well as Mauritanian flagged vessels. Mauritanian vessels began to exploit this resource in 1997, with a peak production (1,595 tonnes) in 2000. Since then, the domestic production of hake has been in sharp decline, with zero catches since 2007.

4.2.3 Shrimp fishery

Two main groups of shrimps are commercially important within Mauritanian waters i.e. the coastal shrimp, including prawn *Farfantepenaeus notialis* (Langostino), and deep-sea rose shrimp *Parapenaeus longirostris* (Gamba) which is the most important fishery. Other shrimp species are also caught incidentally: *Melicertus kerathurus, Aristeus varidens, Plesionika heterocarpus* and *Aristaeopsis edwardsiana.* A maximum of 5,000 tons was granted to the EU by the agreement for the years 2012-2014 for a total of 36 fishing vessels. According to data from the EU, the utilization rate is low (7.6%) with reported catch of 378 tonnes in 2013.

Catches of deep-water rose shrimp (*P. longirostris*) are subject to significant variability interannually, with a general upward trend over the period of 1993-2007, as shown in Figure 12. The largest annual production was recorded in 2007, with 5,984 tons of landed catches. After this production peak, landings of this species fell sharply to around 1,394 tonnes in 2009. Improved production was observed for the next two years in 2010 and 2011, followed by a new decline in 2012 and 2013 associated with a decrease in effort of the European fleet, which withdrew from the area between August 2012 and November 2013. The production of rose shrimp (gamba), over the past three years, is mainly carried out by the Spanish fleet with marginal contribution (less than 4 %) of other fleets.

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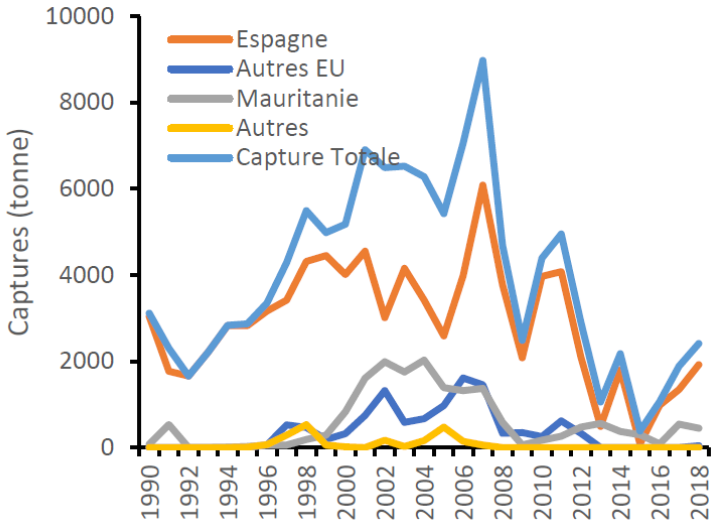

Figure 12: Catches of deep-sea rose shrimp by fleet sections 1990 to 2018. Source: IMROP (2019).

Catch of prawn (*F. notialis*) for the same period shows a maximum in 2006 (3,700 tonnes). Permanent fluctuations from 1999 to 2013 marked the annual production of this species with a great decrease in 2012 and 2013 (less than 500 tonnes) associated with the decrease in effort of the European fleet which stopped their activity in August 2012 and then resumed only in November 2013. Since 2008, landings for the langostino are mainly by European shrimping fleets, particularly Spanish fishing vessels.

4.2.4 Tuna fishery

Fishing for deep-sea tuna species in the Mauritanian EEZ is carried out by a foreign fleet operating under a regime of free licenses, or as part of fisheries agreements. These fleets are from the European Union, Japan and Senegal, and do not land in Mauritania. A 3-year fishing agreement with Japan expired in December 2013. To date it has not been renewed. For offshore tuna, Mauritania does not have any national fleet capacity. However, catches of the artisanal fisheries are currently around 500 tonnes of tuna, mainly of small tunas. Industrial fishing targeting small pelagics (mainly sardines) and tuna (16,000 ton in 2011, 5,000 ton in 2012, mainly small tunas).

4.3 Relevant authorities

Mauritanian Institute for Oceanographic Research and Fisheries (IMROP) is the main scientific organization, responsible for assessing the state of resources, monitoring of operating systems, the study of management mechanisms, the approval of licenses and fishing vessels, control of the safety of fishery products and conservation of the marine environment through the fight against pollution (http://www.imrop.mr/index.html).

The management of industrial fishing (**direction de la pêche industrielle, DPI**), is responsible for granting licenses and monitoring of access rights payments.

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Comité Scientifique Conjoint RIM-UE (CSC) is responsible of providing scientific advice from 2012 to 2014 with scientist members from UE and from Mauritania.

Fishery Committee for the Eastern Central Atlantic (CECAF, COPACE)- FAO is responsible for scientific assessment (http://www.fao.org/fishery/rfb/cecaf/en).

Ministère des Pêches et de l'Économie Maritime (MPEM) (Department of Fisheries and Maritime Economy) is the fisheries administration body responsible for the implementation of the national management plan. http://www.peches.gov.mr/IMG/pdf/strategie_mpem_fr.pdf

Garde Côtes Mauritanienne (GCM, Coast guard), under the supervision of **MPEM**, is responsible for maritime patrolling. The fisheries monitoring centre of the coast guard is Nouadhibou.

Délégation à la surveillance des pêches et au contrôle en mer, is responsible for the application of surveillance operations of fisheries regulations at sea and ship control operations activities including illegal fishing and flags of convenience.

Port of Nouadhibou: Infrastructure landing and assistance with the services necessary for the fishing activity, with a status of autonomous economic administration under supervision.

4.4 Operators and other stakeholders

The Mauritanian fishing sector is represented by a large number of entities, which include the industry, civil society, governmental institutions, fishers and fisher organisations and more.

Industry

The SMCP (Societe Mauritanienne De Commercialisation De Poissons). WWW.SMCP.MR
E-mail=info@smcp.mr

Civil society

Nature Mauritanie. Email: nature.mauritanie@natmau.mr

Organisation mauritanienne pour le Développement Durable. Email: omdd@omdd.mr

ECODEV Mauritanie. Email: sidiml.khalifou@ecodev.mr

Association Nafore. Email: gaonadio@yahoo.fr

Association pour le developpement local et l'environnement – ANNAJAH.
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4.5 Supply and value chain

Fishing accounted for 3.4% of national GDP in 2013 and 17% of the GDP for the primary sector (agriculture, forestry and logging, breeding, fisheries). It is important to stress the importance of artisanal and coastal fisheries in the contribution to the fisheries sector in the GDP. Overall, with the contribution of manufacturing fisheries, the fisheries sector's contribution increased by an average absolute value of 13.6% over the period 2008 to 2012. The contribution of the fisheries sector accounts

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for an average of 4.5% of the GDP not counting fishing related trade (fuel, fish trade, fishing equipment). It does not take into account the revenue relating to fisheries agreements.

The fisheries sector contributes greatly to the state budget, in particular through the provision of financial compensation under fisheries agreements (RIM-EU) paid to the public treasury. From 2010 to 2013, revenues from the fishing sector increased from 42 billion to 65 billion MRO (1 MRO equals 0.0025 Euro) in 2013. However, the relative contribution of the sector tends to decline steadily since the exploitation of new oil and mineral deposits (gold and copper).
According to data from the balance of payments provided by the Central Bank of Mauritania, the sector's export value is estimated to average 342.6 million US dollars per year between 2008 and 2013. The fishing sector exports represented on average 15.8% of total export revenues registering a steady decline. This relative decline in the share of fisheries sector exports is the result of the diversification of other export products, such as iron, copper, gold and oil.

Today, the fisheries sector employs about 69,000 people including 40,000 fishermen (80% of jobs comes from artisanal fisheries), and 19,000 indirect jobs. If we consider that each job in the fisheries sector supports between 4 and 5 people, we see that fishing supports more than 265,000 people, about 11% of the total population.
The Last survey on the consumption of fish in Mauritania is from 2002. It provides an estimate of 4.3 kg yearly consumption per capita. To achieve the objective of an average consumption of 15 kg per year (PRSP objective III), it would require an increase in yearly national consumption, from 54,000 tonnes to 70,000 tonnes by 2020. This assumes an annual population growth of 2.5%.

In general, the Mauritanian fisheries products are sold in raw form, often in the form of fresh products on the local market or exported (mostly as frozen products). Local processing or transformation is limited to the freezing of whole products, various methods of preparation, traditional processing methods (drying, salting - drying, etc.) and processed industrial products (mainly fishmeal and fish oils). Canned products are marginal. Almost all production of Mauritanian fisheries is exported (90%). The marketing of unprocessed frozen products is done through the channel of the Société Mauritanienne De Commercialisation De Poissons (SMCP). Fresh and processed products are exported through the common system of customs procedures.

The number of fish processing plants in Mauritania from 50 to 94 in the period between 2006 to 2014. Almost all of the processing plants (97%) are now eligible for exporting to EU markets. There has been a particular increase in the number of fishmeal and fish-oil processing in recent years. About 70% of the processing plants are located in Nouadhibou.

Many processing plants are facing difficulties with storing their products, because of unstable and high-priced electricity, problems with getting credit on stocked products, lack of proper training on storage of seafood products etc. In addition, the development towards fully utilizing fishery resources has been facing problems because of the challenged arising with hygiene at production sites and a lack of organization. Demersal resources, including the sector of frozen cephalopods, are facing problems of low productivity (technical and economic) and there are significant levels of post catch losses due to breaks in the cold chain process. The main issues of the development of demersal resources recovery

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processes are related to the improvement of sanitary conditions, the establishment of quality procedures within existing businesses, enhancing of traceability and development of labels (e.g. certification).

The success of the fishmeal industry in recent years is one of the highlights of the recent history of the fisheries sector in Mauritania. In 2015, there were 29 fishmeal plants with theoretical processing capacity of one million tonnes, and there are additional 11 plants being planned. The annual volume of small pelagics, processed by the fishmeal industry currently exceeds 300,000 tonnes. However, in relation to the pelagic fishery within national jurisdiction, several problems are raised. The resource value is poorly distributed between the local and foreign sectors where the locals only receive 30%. The impact in terms of creating jobs for nationals is also quite limited. The rapid growth of the fishmeal plants also causes problems with the environment along with the occupation of the maritime public domain.

In relation to the fish distribution chain, several initiatives have been encouraged to facilitate the supply of the domestic market. In particular, there is the obligation of landing a fish quota in the context of access to pelagic resources regimes (e.g. Fisheries agreement with Senegal, royalties in kind introduced for industrial pelagic fishing), fish distribution channels developed by the Société Nationale de Distribution du Poisson (SNDP) created in October 2013 as part of the food security policy. All these efforts led to a significant change in the average consumption of fish per capita and real changes in eating behaviour within the Mauritanian population. The sustainability of this system should depend on the ability of SNDP to develop public - private partnerships.

4.6 Existing management plan, procedures and objectives

The main objective of the National Fisheries Management Plan (Ministry of Fisheries and Maritime Economy, 2015) is to "Harness the fishing heritage of the country, in a sustainable way, the maximum benefit for the people of Mauritania, and participate more actively in efforts to develop an inclusive blue economy source of wealth and employment ". In this perspective, the management strategy and responsible development that underlies this goal will focus on the following six areas:

1. Improve knowledge of fisheries resources and their environment
2. Optimize the management of the exploitation of fishery resources
3. Strengthen integration of the fisheries sector to the national economy
4. Develop maritime business
5. Promote the development of continental fishing and aquaculture
6. Strengthen good governance of fisheries

4.7 International agreements, RFMO and EU SFPA

On 10 July 2015, the European Union and the Islamic Republic of Mauritania initialled a new, 4-year Protocol to the Fisheries Partnership Agreement (FPA). The new protocol confirms several decades of cooperation in the field of fisheries, a key sector for the development of Mauritania and one of the pillars of the European strategy for blue growth. Under the Protocol, the EU fleet will be allowed to

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fish in Mauritanian waters for shrimp, demersal fish, tuna and small pelagic fish, up to a total of 281,500 tonnes a year, under improved operational conditions. In addition to catches paid for by the European fleet, the EU will pay a financial contribution of € 59.125 million per year to the partnership, out of which € 4.125 million will be used to support local fishing communities in Mauritania. In line with the EU's fisheries policy, the protocol contributes to responsible fishing and the sustainable management of fisheries resources, including enhanced transparency measures. It seeks to minimise fishing impacts on marine ecosystems and respects the activities of the Mauritanian coastal and artisanal fleets. The Protocol was signed and entered into provisional application on 16 November 2015. It will enter into force when the necessary procedures for its conclusion have been completed, including the consent of the European Parliament. The agreement is for 6 years and is renewable (30.11.2006 - 29.11.2012; 30.11.2012 - 29.11.2018), but the protocol is for 4 years (from 16.11.2015 to 15.11.2019).

4.8 Main findings in the evaluation of the fishery and the SFPA

The assessment made on the small pelagic stocks by the FAO Working Group in 2014 shows a level of very high uncertainty, because of the rapid change of the operating system, the lack of international and national scientific research (stock assessment research has not been carried out as needed in Senegal since 2009, and since 2013 in Mauritania), widely varying levels of recruitment, and the weakness of the expertise available**.**

For sardines, the working group made no new assessment, and simply took the results of the evaluation in 2011, concluding that the stock is not fully exploited. For round sardinella, the working group used for the first time length based cohort analysis (LCA). The results show that the stock is overexploited in the sub region. Due to recurring sampling problems, particularly in the Senegalese area, the size frequencies do not give a very accurate estimate of the structure of the stock population throughout its range. The diagnostics obtained are very uncertain. However, and as a precautionary measure, the working group recommends a reduction of effort for all of sardine fisheries operating in the sub-region. Regarding horse mackerel (*Trachurus trecae)*, the working group concluded that despite reduced catches in 2012 and 2013 this species remains in a state of overexploitation. Given the multi-specific nature of these fisheries, and despite the other species of horse mackerel (*T. trachurus*) not considered overfished, the working group recommended not to exceed the effort of the year 2011, and limit catches of both species in 2014 to 260,000 tonnes in the sub-region. For chub mackerel (*Scomber japonicus*), the working group concluded that this species is still overfished. A slight reduction in catches of this species is recommended at the sub-regional level (257,000 tonnes in 2014 instead of 278,000 tonnes in 2013).

The results of the latest assessments suggest that the two species of black hake targeted in Mauritanian waters are not fully exploited, with current biomass greater than the maximum sustainable yield biomass (B_{msy}) and the target biomass $B_{0.1}$. The current fishing effort is below the F_{msy} effort and target efforts $F_{0.1.}$ The CECAF working group recommended not to increase effort by more than 10%, as the rebuilding of the stock is not confirmed. In the absence of additional information, the CSC supports this recommendation and considers that the recommended catch level is consistent with the fishing opportunities currently granted in the protocol.

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The latest assessment of the shrimp stocks was conducted by the working group of CECAF, in November 2013 in Spain. The results of these evaluations show a state of under-exploitation of the Gamba with low levels of fishing mortality. For coastal shrimp (Langostino), the stock is fully exploited (B / B MSY = 101 %) but with low fishing mortality (F / F_{MSY} ~ 26%). Shrimp fishing is concerned with both biological rest periods, in spring (May-June) and autumn (October -November). IEO scientists presented an analysis showing that these closures do not correspond to shrimp recruitment periods (July-August for Gamba). This analysis concludes that the current closure is not effective in protecting shrimp.

In 2012, the diagnosis of ICCAT was a slight overfishing of yellowfin tuna, exploitation close to the maximum sustainable yield level for bigeye tuna (i.e. full exploitation), and an exploitation rate slightly below the sustainable level for the skipjack.

For all of the above species and stocks the general scientific advices as follows:

- Due to high variability in the activities of industrial fishing vessels, both European and non-European, it is necessary to improve monitoring of catches, fishing effort and catch sizes;
- Establishing a program on trawl selectivity is needed to estimate the size of first capture of hake and to test more selective gear to reduce the impact of this gear on demersal communities;
- There is a need to carry out further analyses on the influence of the environment on the abundance of these resources in the sub-region;
- It is imperative to Increase the participation of international experts, to support scientific work in this domain.

4.9 Data collection and stock assessment

Sampling of biological parameters in Mauritanian waters, including length and weight, is primarily carried out during scientific surveys organised IMROP. During these surveys, all species of groundfish, shrimp and cephalopods are sampled. Detailed biological data for small pelagics are available from the FAO Working Group on the assessment of Small Pelagic Fish off Northwest Africa (FAO, 2011a). Detailed biological data for demersal, shrimps and cephalopods are available from FAO/CECAF Working Group on the Assessment of Demersal Resources – Subgroup North (FAO/ECAF, 2017). There are also some biology aspects summarized by the FIRMS (Fisheries and Resources Monitoring System) project as fact sheets by species.

There is data available for catches and effort for all the stocks included within the SFPA protocol and they are provided by IMROP. Table 7 gives a summary of oceanographic/fisheries surveys conducted by IMROP, in number of days from 1998 to 2003. As part of its regular monitoring of the state of fishery resources, IMROP usually conducts annual surveys.

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Table 7: IMROP oceanographic and fisheries surveys from 1998-2003 (numbers of days). Source: IMROP.

Year	RV Al-Awam	RV Arrigue	Other vessels	Total
1998	104	70	24	198
1999	109	71	25	205
2000	124	146	103	373
2001	129	77	18	224
2002	94	106	21	221
2003	85	57	90	232
Average	**108**	**88**	**47**	**243**

The CECAF pelagic trawler fisheries (Germany, Poland, the Netherlands, Lithuania and Latvia) agreed to implement a common sampling programme from 2012 to 2015. The multilateral agreement includes an allocation key for sharing the costs of this programme. Sampling is based on an observer programme and is carried out by IMROP (the Mauritanian Oceanographic and Fishery Research Institute) staff.

The stock assessment approaches differ depending on species, as follows:

Small pelagics

Assessment of small pelagics is provided by the FAO Working Group on the Small Pelagic Fish off Northwest Africa. The main model used by the Working Group is the dynamic version of the Schaefer model. To assess the current state of the stocks and estimate the model parameters, an Excel spreadsheet implementation of the dynamic version of this model, with an observation error estimator, is used. The model is fitted to the data using the non-linear optimiser built into Excel, Solver. This model is applied to sardine, sardinella, horse mackerel and chub mackerel. For some stocks (Sardinella, Bonga and Anchovy), a Length-based Cohort Analysis is applied in order to estimate the current F-level and the relative exploitation pattern on the fishery over the last few years. A length-based Yield-per-Recruit (YPR) Analysis is then run on these estimates, to estimate the Biological Reference Points F_{Max} and $F_{0.1}$. Both the LCA and the YPR Analysis are implemented as Excel spreadsheets. For the mackerel stock, catch-at-age data from the Russian fleet, that covers most of the reported catches, is available. The results of the analysis are considered acceptable and the Working Group decided to proceed with applying age-based methods, XSA and ICA as well as the dynamic production model. Other methods/approaches have also been tested, such as:

- Length-Based Mortality Estimates
- Non-equilibrium Production Model
- Calibrated Virtual Population Analysis
- Statistical Catch at Age

Demersal fish, crustaceans and cephalopods

Assessment of demersal species, including crustaceans and cephalopods, is provided by FAO/CECAF Working Group on the Assessment of Demersal Resources – Subgroup North. For certain stocks, it is possible to use length-based methods. Analysis of cohorts based on length frequencies (length-based cohort analysis) is used to estimate the current level of F(mortality rate by fishery), as well as the

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exploitation pattern by fishery over the last years. A length-based YPR Analysis was then run on these estimates, to calculate the Biological Reference Points F_{Max} and $F_{0.1}$. Both the LCA and the Yield - per - Recruit analysis is implemented on Excel spreadsheets. Projections and assessment for the state of the stock are done using the Schaefer dynamic production model adjusted to the time series data. Medium term projections of future yields and the development of the state of the stocks are carried out using a spreadsheet.

4.10 How FarFish will address the challenges identified above

The RFMS approach will engage stakeholders in the process for the formulation of a management plan that effectively addresses problems such as the high variability in the activities of fishing vessels. Management tools will make it easier to understand the outcomes from models to authorities and stakeholders, improving communication and transforming scientific advice into decisions for a more profitable and sustainable fishery. Compilation and production of information regarding the interaction between the environment and life cycles will improve the current models. Giving a socioeconomic dimension to current assessment models will facilitate balanced decisions between profitability and sustainability. Training of scientist and stakeholders will provide new tools for the RFMOs.

4.11 Relevant literature

THE ASSESSMENT OF FISHING CAPACITY IN MAURITANIA - Chérif Ould Touileb
http://www.fao.org/docrep/006/y4849e/y4849e0d.htm

STRATEGIE NATIONALE DE GESTION RESPONSAB LE POUR UN DEVELOPPEMENT DURABLE DES PECHES ET DE L'ECONOMIE MARITIME 2015 - 2019
http://www.peches.gov.mr/IMG/pdf/strategie_mpem_fr.pdf

RECONSTRUCTED CATCHES IN THE MAURITANIAN EEZ. Didier Gascuel, Dirk Zeller, Mahfoud O. Taleb Sidi and Daniel Pauly http://halieutique.agrocampus-ouest.fr/pdf/3486.pdf

IMROP 2014. Rapport: Huitième Groupe de Travail sur L'Evaluation des Ressources et l'Aménagement des Pêcheries Mauritaniennes et la Gestion de leur Environnement
http://www.imrop.mr/Synthese%20du%20rapport%20%20GT%202014.pdf

IMROP. 2019. Rapport de synthèse. 9ème edition du groupe de travail scientifique de l'IMROP sous le theme de: " Amenagement des ressources halieutiques et gestion de la biodivsersité au service du developpement durable", Nouadhibou, du 11 à 14 de février 2019. 51p.

Rapport de la septième réunion du Comité Scientifique Conjoint RIM-UE - Madrid, 25-27 juin 2014 - http://ec.europa.eu/fisheries/documentation/studies/joint-scientific-committee-eu-mauritania-2014/report-jsc-2014_fr.pdf

Giron-Nava et al. (2018). Managing at Maximum Sustainable Yield does not ensure economic well-being for artisanal fishers. *Fish and Fisheries* https://doi.org/10.1111/faf.12332

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5 Republic of Seychelles tuna fishery

The Seychelles is a middle-income, small island developing state (SIDS). Given that the Seychelles has a limited land resource base and is remote from major markets, its surrounding EEZ is highly important to the small population of 89,700 people for marine resources and related food and income. It is one of the most fisheries dependent countries in the world. Tourism, which also largely relies on the coastal environment itself, and associated biodiversity, is the other economic pillar of the islands. Per capita fish consumption is also very high, i.e. fish is a vital source of protein for the local population. Fish accounts for 35 – 40 % of the total protein consumed by the islands' population (NFDS, MRAG, COFREPECHE, & POSEIDON, 2013).

The countries' tuna industry is extremely important for the islands, and the EU has considerable interest in this fishery – both through its SFPA, and also processing. The tuna fishery is subjected to IOTC catch and effort limits. Industrial tuna fishing remains one of the most important sources of foreign currency earnings in the economy of Seychelles. Gross income from the sector is derived mainly from foreign fishing vessels' expenditure on goods and services in Port Victoria, as well as through payments for licenses and financial compensation (SFA, 2013 annual report, 2015).

Fisheries account for 8 % of GDP; 7 % of employment and 35 % of export earnings. In 2011, revenue from the industrial tuna fish totalled SCR 1.45 billion (EUR 85.7 million) based on vessel expenditure on goods and services in Port Victoria, and payments for fishing authorisation and the financial contribution made by the EU. This equates to 33 % of government revenue, surpassing the tourism sector and highlighting the importance of the fisheries sector (NFDS, MRAG, COFREPECHE, & POSEIDON, 2013). Artisanal and semi-industrial fisheries, contributed 1.1% of GDP in 2013. The contribution of other fisheries related activities brings it up to the above figure (SFA, 2015).

With between 5,000–6,000 direct and indirect jobs, i.e., 15% of the total of formal jobs in the Seychelles, the fisheries sector is the main pillar of the national economy, along with the tourism industry. This estimate also includes people employed in fish processing, export activities, net repairs, ship chandelling, stevedoring, etc, however, around half of these 5,000–6,000 jobs happen to be at the national cannery, while approximately 1,500 of them consist of active fishers (Le Manach, Bach, Boistol, Robinson, & Pauly, 2014).

The Indian Ocean Tuna (IOT) canning factory is by far the largest single employer in the Seychelles, with a workforce of over 2,500 workers of which over 60% were foreign nationals. The number of full and part-time commercial fishers vary between 1,300 and 1,400 primarily due to seasonal mobility associated with the sector. In 2013, a total of 143 people were directly employed in the sea cucumber fishery as divers, skippers and apprentices. SFA employs in addition around 150 people. During 2013, a maximum of 45 Seychellois seamen made at least one trip on board purse seiners (19 aboard Spanish vessels and 26 aboard French vessels) (SFA, 2015).

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5.1 Geographical and biological boundaries

The Seychelles is located in the South Western Indian Ocean, and lies between 4º S and 10º S and 46º E and 54º E. It comprises 115 islands. It is the second-smallest country in Africa, has an area of 455 km^2, of which Mahé, the principal island, comprises 144 km^2. The Seychelles has the largest EEZ in the Western Indian Ocean. The EEZ borders with those of neighbouring Mauritius, Madagascar, Glorioso Islands (France), Mayotte, the Comoros and Mafia Island (Tanzania). The total sea surface area is 1.3 million km², while the length of the continental coastline is 600 km and the shelf area is 50,000 km^2).

5.2 Ecosystem characteristics

The Seychelles are located at the centre of the migration path of tuna stocks in the Western Indian Ocean (WIO). The WIO is characterised by a seasonally reversing monsoon wind system that dominates the ocean climate north of 25º south, and results in strong northwards and southwards winds and currents at different times of the year. These meso-scale processes bring an increased nutrient supply to the surface and result in biological productivity that is the forage base for the stocks of tuna that occur throughout the WIO. Primary production rates in the region vary considerably, with a general increase from the south of the WIO to the north, and from the eastern offshore areas to the western coastal areas. Another characteristic of the WIO is a relatively shallow thermocline, usually at 50-100 metres, which favours the concentration of fish in a habitat within reach of the fishing fleets (POSEDON, MRAG, NFDS, & COFREPECHE, 2014).

Coral reefs are well developed around the main group of granitic islands located on the Mahé plateau, as well as around the satellite coral islands, with a total cover of 1,700 km^{2+} (Le Manach, Bach, Boistol, Robinson, & Pauly, 2014). The Mahe Plateau is the centre of artisanal and various high-commodity value fisheries. This shallow (generally not more than 50 meters in depth) bank of some 39,000 km^2 supports important demersal fisheries.

Due to the high population density and reliance on the coastal environment for development, tourism, transport and fisheries, coral reefs around the main granitic islands are under high pressure, whereas those farther from these heavily populated areas are relatively well preserved. Consequently, remote stocks appear to be under-exploited, while inshore fisheries around the main islands and some Mahé Plateau fisheries are fully exploited or over-exploited (Le Manach, Bach, Boistol, Robinson, & Pauly, 2014).

5.3 Commercial species, catch statistics, volume and value

Total reported catches within the waters of Seychelles have fluctuated from 40 – 120 thousand tons a year since the mid 80's. Close to 80% of the catches consist of tuna and billfishes; and the rest is perch-like species, sharks, rays and other fishes, as show on Figure 13 (Sea around us, 2017)

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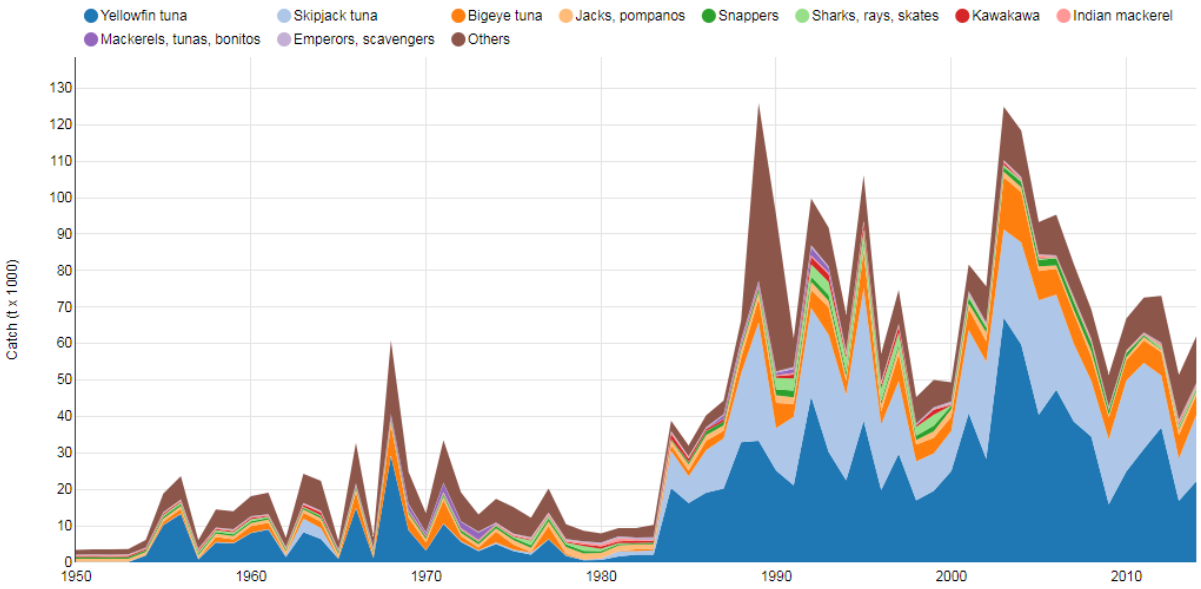

Figure 13: Catches within the waters of Seychelles 1950 – 2014 by main species. Source: Sea around us (2017).

Yellowfin and skipjack tuna are by far the most important species, whilst the other species represent a rather low proportion of the total catches.

The catches of the domestic fleet (excluding the foreign-owned, but Seychelles-flagged vessels) for the period 1950–2010 amounted in total to almost 290,000 tonnes, which is less than 5 thousand tonnes a year on average. The domestic catches have though increased significantly since the latter part of the 90's and are now around 20 thousand tonnes a year, as shown in Figure 14 (Sea around us, 2017).

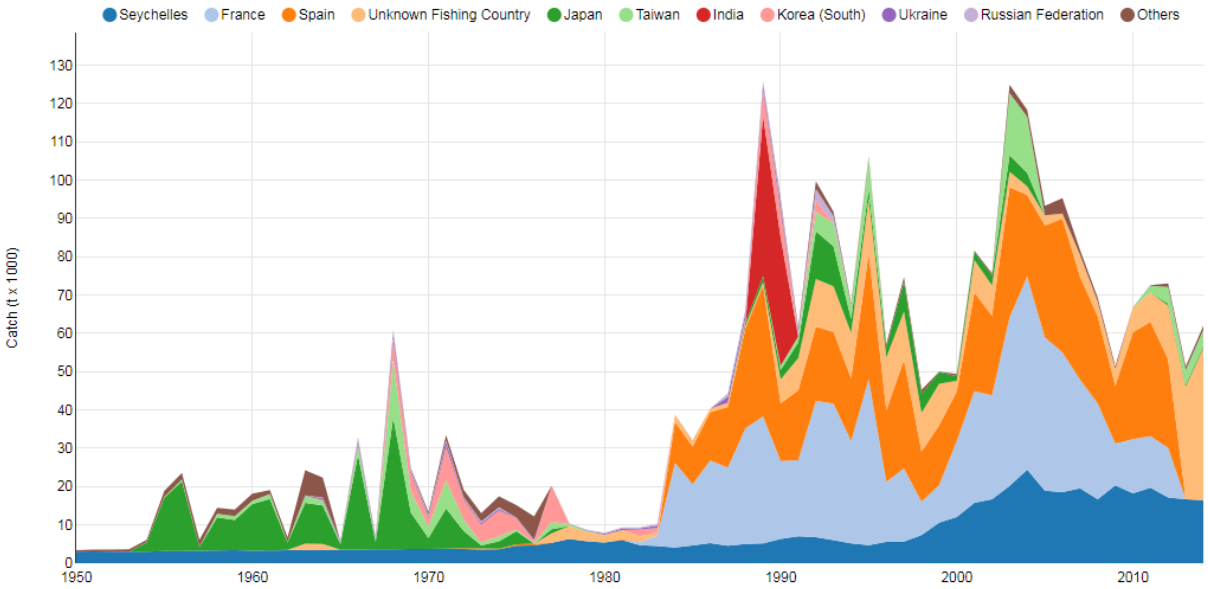

Figure 14: Catches within the waters of Seychelles 1950 – 2014 by main fishing nations. Source: Sea around us (2017).

Major proportions in catches of the national fleet are jacks and pompanos (Carangidae; 26.5%), snappers (Lutjanidae; 18.7%), Indian mackerels (*Rastrelliger kanagurta*; 6.4%), emperors (Lethrinidae;

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6.2%), kawakawa (*Euthynnus affinis*; 4.0%), and groupers (Serranidae; 3.5%). The artisanal sector accounts for the vast majority (95.5%) of the domestic catches (Le Manach, Bach, Boistol, Robinson, & Pauly, 2014). Trevallies (Carangoides and Caranx species), mackerel (*Rastrelliger* species) and jobfish dominated the artisanal catch for 2013 accounting for 33%, 13% and 12% of the total (SFA, 2013 annual report, 2015).

The Indian Ocean is the second largest global tuna producing area and the most significant region for the EU fleet. The legal purse seine fleet fishing in the Indian Ocean in 2011 consisted of 13 vessels flagged to Spain and the remainder to France (8), Seychelles (5), French overseas territories, Iran (1) and Korea (1). The associated catches by EU fleets in the Indian Ocean have remained relatively stable at around 250,000 tonnes since 2007. Fleet activity has concentrated more on the central and southern distributions of tuna, particularly in the Seychelles EEZ. There are also at least 420 known longline vessels operating in the West Indian Ocean; these are mainly from the Asian fleets (NFDS, MRAG, COFREPECHE, & POSEIDON, 2013). The purse seine fishery (mainly French and Spanish vessels under the EU agreement) targets mostly surface-swimming tuna (skipjack and yellowfin), and the longline fishery (mainly Taiwanese and Japanese vessels) targets deep-swimming big-eye and yellowfin tuna. Table 8 shows tuna catches in the whole of the western Indian Ocean (including Seychelles EEZ) in 2012 and 2013 according to where the vessels are registered. Much of these catches are caught outside the Seychelles EEZ, but are though landed in the islands (SFA, 2013 annual report, 2015).

Table 8: Tuna catches in the western Indian Ocean in 2012 and 2013 by country. Source: SFA (2015).

	2012			2013		
Country	**Catch (Mt)**	**Effort**	**CPUE**	**Catch (Mt)**	**Effort**	**CPUE**
Spain	111,644	4,112	27.15	146,983	4,224	34.80
France	37,155	1,944	19.11	39,862	2,291	17.40
Seychelles	50,938	2,133	23.88	57,324	1,809	31.69
Others*	31,740	1506	21.08	33,710	1860	18.12
Total	**231,477**	**9,696**	**23.87**	**277,879**	**10,184**	**27.29**

***Others represent other countries and include Korea (2012-2013), Mayotte (2012-2013) and Mauritius (2013)**

The Spanish fleet accounts about 50% of the catches, but other nations with significant catches are France, Seychelles (including foreign owned vessels that are registered in the islands), Korea, Mayotte and Mauritius.

Catches are from all across the west Indian Ocean are landed for processing or trans-shipment in the Seychelles, as shown in Table 9 (SFA, 2013 annual report, 2015). Canned tuna represents the largest processing sector, but the majority of what is landed is exported fresh or frozen, twithought much value adding in the Seychelles.

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Table 9: Total production of fish and fish products in the Seychelles 2009-2013. Source: SFA (2015).

(MT)	2009	2010	2011	2012	2013	% change 2012 – 2013
Artisanal Catch	3,019.10	2,595.00	2,875.00	2,502.00	4,143.00	65.59%
Semi-Industrial Catch	329.00	295.00	237.70	270.80	262.20	-3.18%
Canned Tuna	30,824.00	30,338.00	30,152.00	31,400.00	36,826.00	17.28%
Smoked Fish	28.40	29.60	29.40	27.69	40.10	44.82%
Others	60.20	70.00	110.00	68.00	48.80	-28.24%
Total Domestic Production	**34,260.70**	**33,327.60**	**33,404.10**	**34,268.49**	**41,320.10**	**20.58%**
Purse Seine Catch*	68,339.40	75,786.60	63,211.60	50,938.00	55,516.00	8.99%
Longliner Catch*	8,323.10	6,659.00	7,565.80	12,164.00	10,565.00**	n/a
Subtotal (2)	**76,662.50**	**82,445.60**	**70,777.40**	**63,102.00**	**66,081.00**	**4.72%****
Fish Meal	5,168.00	7,663.00	6,986.00	6,597.00	7,337.00	11.22%
Fish Oil	826.00	915.00	767.00	871.00	691.00	-20.67%
Subtotal (3)	**5,994.00**	**8,578.00**	**7,753.00**	**7,468.00**	**8,028.00**	7.50%
Grand Total	**116,967.20**	**124,351.20**	**111,934.50**	**104,838.49**	**115,429.10**	10.10%

*sey flagged vessels only

**provisional figures

Much of the domestic processing is owned by foreign companies, some of which are processing catches of their own vessels.

5.4 Relevant authorities

The authorities most relevant for the management of the fisheries within the waters of Seychelles are ministries responsible for natural resources and trade; the Seychelles Fishing Authority and IOTC.

The ministries directly involved are:

- Ministry of Fisheries and Agriculture
- Ministry of Finance, Trade and the Blue Economy
- Ministry of Natural Resources

Seychelles Fishing Authority (SFA) works in close collaboration with the Ministry of Natural Resources, Ministry of Environment and Energy, Seychelles Coastguard, Seychelles Port Authority, fishermen and boat owner organisations. NGOs, and overseas partners. It holds stakeholder meetings on a regular basis regarding the development of the sector. The SFA is responsible for policy development and planning, human resource needs (training needs), fisheries research, management, infrastructure development, and MCS. Also tasked with negotiations, with regard to fishing or fisheries and the establishment or operation of fishing industries, whether at a national or international level, on behalf of the Republic (SFA, 2013 annual report, 2015).

The Indian Ocean Tuna Commission (IOTC) is an RFMO that promotes cooperation among the Contracting Parties (Members) and Cooperating Non-Contracting Parties of the IOTC. Its main objective is to ensure, through appropriate management, the conservation and optimum utilisation of stocks covered by the organisation's establishing Agreement and encouraging sustainable development of fisheries based on the tuna stocks in the Indian Ocean. IOTC makes resolutions and

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recommendations related to scientific processes (e.g. data provision); monitoring, control, and surveillance (e.g. authorized vessels, trade documentation, port state controls and observer programmes); implementation of an ecosystems approach to fisheries (including bycatch-mitigating measures, protection of vulnerable species); and conservation and management measures (e.g. control of fishing capacity, time-area closures). The IOTC has the power to take decisions and adopt conservation and management measures (CMM) that are legally binding on its Contracting Parties (POSEDON, MRAG, NFDS, & COFREPECHE, 2014).

5.5 Operators and other stakeholders

The Seychelles fishery sector has three main components i.e. artisanal fisheries, semi-industrial fisheries and industrial fisheries:

- **Artisanal fisheries** are carried out by local fishers, with small, motorized boats. The artisanal fishery (handlines and traps mostly) targets demersal resources. The target species are snappers, jobfishes, groupers, threadfins, emperors (mainly *Lethrinus variegatus*), rabbitfishes, various species of crustaceans and medium pelagics such as jacks and small tunas. A fishery for live reef food fish trialled in 1998 and 1999, after which it was closed and later prohibited by law (in 2005) due to concerns of over-exploitation and lack of technical means to carry out this fishery properly (Le Manach, Bach, Boistol, Robinson, & Pauly, 2014). The total landings for the artisanal fishery have remained fairly constant for the last 20 years, with approximately 4 000 tonnes of fish landed annually. In addition to these 'regular' reef and medium pelagics components of the artisanal fleet, there are two distinct sub-fisheries: A spiny lobster fishery, and a small holothurian (bêche-de-mer) fishery. Both of these fisheries have shown signs of overexploitation.
- The **Semi-industrial** fleet consists of locally-owned long-liners targeting pelagic species (mainly tuna and swordfish). This fleet was created in 1995, with the aim to target large pelagics. It is the only industrial sector in the Seychelles that is truly domestic. The number of active vessels increased from two in 1995 to ten in 2001. The number of vessels then dropped to four in 2004, increased again to reach ten by 2009–10, and decreased to four in 2011 and seven in 2012. These longliners target tuna and swordfish around the Mahé plateau and in the north-eastern part of the EEZ, and usually catch between 200 and 300 tonnes annually. Noteworthy, it is reported that there is a high depredation by false killer whales and sharks in this fishery (Le Manach, Bach, Boistol, Robinson, & Pauly, 2014).
- The **Industrial** fleet consists of vessels from an array of countries that target tuna (yellow fin and skipjack).

There are a number of fishermen organisations that are established in the Seychelles i.e.

- **Fishing Boat Owners Association** (FBOA) – Seychelles Hook and Line Fishermen. NGO representing traditional and semi-industrial fishers. Safeguarding interests of fishermen, oldest organisation doing so, located in Victoria. Seychelles Hook and Line Fishermen Label (Seafood label show-cased 2016).
- **Association of Members of the Seychelles Sea Cucumber Industry** (AMSSI).
- **Artisanal Shark Fishers Association** (ASFA)

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- **Indian Ocean Federation of Artisanal Fishermen** (FPAOI) [the Fédération des Pêcheurs Artisans de l'Océan Indien (FPAOI) (headed by Seychelles head of FBOA)

5.6 Supply and value chain

EU boats fishing under SFPAs are mainly fishing skipjack and yellowfin tuna. In 2016, French vessels fishing within the Seychelles EEZ caught 16,004 tons of yellowfin and 13,541 tons of skipjack, while the Spanish fleet caught 10,717 ton of yellowfin tuna and 15,567 ton of skipjack (SFA, 2016).

As per the EU SFPA protocol there are allowances for 46 tuna seiners and longliners from Spain, France, Italy, and Portugal (Spain: 22 seiners, 2 longliners; France: 16 seiners, 2 longliners; Italy: 2 seiners; Portugal: 2 longliners). However, the number of licenses that are taken up varies from year to year. For example, in 2013 only 22 licenses were applied for by the EU purse seine fleet in the Seychelles, with none for the long line fleet. This figure rose to 26 in 2016, with only one Italian flagged boat in operation in Seychelles waters (SFA, 2016).

An estimated total catch of 277,879 tons was made in the Western Indian Ocean by purse seiners licensed to fish in Seychelles EEZ in 2013. Yellowfin (*Thunnus albacares*) and skipjack (*Katsuwonus pelamis*) tuna accounted for 49% and 42% of the total purse seine catch respectively. The Spanish and French fleets landed 146,983 tons and 39,862 tons (SFA, 2015). A total of 233,574 tons of purse seine catches were landed or trans-shipped in Port Victoria in 2013. Spanish flagged vessels accounted for the majority of landing and trans-shipment in Port Victoria (56%), followed by vessels flagged in Seychelles (21%), France (13%).
Catches by purse seiners in the west Indian Ocean in 2016 were dominated by the Spanish fleet that accounted for 39% of the total catches whilst the Seychelles and French fleet accounted for 31% and 19%. During the previous year the Spanish, Seychelles and French fleet accounted for 42%, 31% and 19% of the total purse seine catches in the west Indian Ocean (SFA, 2016).

Vessels fishing under the EC agreement reported a total catch of 60,347 tonnes or 65% of the total reported catch inside the Seychelles EEZ. Reported total purse seine tuna catches inside EEZ for 2016 stood at 92,515 tonnes. The French and the Spanish fleet dominated the total catch inside the Seychelles EEZ accounting for 34% and 30% respectively whilst the Seychelles fleet represented 23% of the total catch.

The Seychelles is a hub for commercial fish trade in the western Indian Ocean, with regular trans-shipments of fish by industrial fishing vessels, as well as landings by purse seine vessels, with about 90% of (total) tuna caught by the purse seine fleet in the Indian Ocean (about 250,000 tonnes in recent years) passing through the Seychelles (Standing, 2016). All catches of the Industrial fleet that are landed in the Seychelles, are landed in Port Victoria on the island of Mahé. Port Victoria is the home base for the West Indian Ocean purse seine fleet and the Seychelles semi-industrial longline fleet (IOTC, 2015).Essentially most of the tuna that is caught by seiners fishing in and around the Seychelles EEZ is landed, or trans-shipped in the Seychelles. Analysis of catch landed/trans-shipped in port Victoria by fleet shows that historically, the Spanish fleet dominated tuna unloading in Port Victoria. In 2016 the

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Spanish fleet landed and trans-shipped a total of 122,816 tonnes of tuna in port Victoria, representing 38% of the total catch unloaded in Port Victoria during that year, whilst the French and Seychelles fleet accounted for 20% (or 64,891 tonnes) and 31% (or 102,074 tonnes) (SFA, Seychelles fisheries statistical report, 2016).

EU vessels land the majority of their catches in the Seychelles (92 % for Spanish and 82 % French), and part of this supplies a strong national processing sector with raw material; both for canning and processing of frozen products (NFDS, MRAG, COFREPECHE, & POSEIDON, 2013). Landings are mainly processed by the Indian Ocean Tuna Canning factory. The EU fleet also supplies relatively small quantities of by-catch species to local Seychelles processors. The processing sector is though dominated by the tuna canning industry, which produces about 35,000 ton of canned tuna a year, which is mainly exported to the EU (Standing, 2016).

Of the tuna caught by the EU fleet within the Seychelles EEZ an estimated 20% is canned in the Seychelles and the remainder is trans-shipped elsewhere, of which an estimated 12.5% (of the remainder) goes directly to the EU for processing or retail trade (NFDS, MRAG, COFREPECHE, & POSEIDON, 2013). Furthermore, the vast majority of the tuna that is landed and processed in the Seychelles, is then re-exported as canned tuna to the EU (Standing, 2016).

The Seychelles are heavily dependent on the European market for exports of canned tuna. The main importers are the United Kingdom and France, followed by Italy and Germany. Most of the products are exported to the EU under the brand names of John West (to the United Kingdom), Petit Navire (to France) and Mareblu (to Italy). Although the Seychelles share of the EU market is fairly small compared to the canned tuna trade as a whole, it is the EU's main supplier among the ACP countries (EU, Fisheries in the Seychelles and Fisheries Agreements with the EU, 2011).

Almost of all of the tuna caught by the industrial sector is therefore sold abroad, either through direct landings in other countries or through canned tuna exports. In recent years there has been a policy to encourage more landings of by-catch from the purse seine and long line boats to be made available for local consumption and processing, although data on this is not comprehensive and requires further work to obtain by the government (Standing, 2016).

Exports of fish and fish products constitute a vital source of foreign currency earnings for the country. In addition, processing of fish into exportable products generates a significant amount of employment and income and contributes positively to the national trade balance. In 2013 a total of 45,000 Mt of fish and fish products, with a corresponding value of SR 4.447 billion was exported, compared to 39,154 Mt, valued at SR 3.600 billion, exported in 2012 (SFA, 2015).

Canned tuna is the main good exported by the Seychelles, although there are also substantial exports of fish meal/oil, as well as dried holothurians and shark fins to Asia (Le Manach, Bach, Boistol, Robinson, & Pauly, 2014). Total output of canned tuna was 36,826 tonnes, at a value of SR 4.228 billion in 2013. Dried sea cucumber and shark fins production stood at 48.8 tonnes, whilst production of smoked fish stood at 40.1 tonnes, 45% more than the 27.7 tonnes produced in 2012. Fish meal, a by-

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product produced from the tuna factory trimmings – SR 101.8 million worth of fish meal exported in 2013. Fish oil, another by-product, exports were worth SR 48.9 million in 2013 (SFA, 2015).

Preferential tariffs under the Cotonou Agreement with the EU are crucial to the competitiveness of the Seychelles tuna processing sector, in comparison with Asia. Any change in this tariff agreement would be problematic.

Tuna imported to the EU from the Seychelles must comply with national standards laid down in the Seychelles' Export of Fishery Products Act (1996) and the Export of Fishery Sanitary Regulations (2006). These are modelled on EU health and sanitary requirements and the FAO Codex Alimentarius. During a mission in March 2011, the Food and Veterinary Office of the EU Directorate General 'SANCO' (DG SANCO) concluded that there were no concerns about the Seychelles sanitary conditions for ensuring the quality of fishery products exported to the EU (NFDS, MRAG, COFREPECHE, & POSEIDON, 2013).

The largest processing facility in the Seychelles is the Indian Ocean Tuna Limited Company (IOT). The IOT was previously owned by the French MWBrands Group, however, it is currently majority owned by Thai Union. IOT has a capacity of 350 tonnes of tuna per day and which mainly supplies the export market. Indian Ocean Tuna is currently the world's largest canning company after Starkist Samoa. It is the largest in the Indian Ocean (Standing, 2016). The IOT factory was opened in 1987 in the fishing port of Victoria, under the name 'Conserverie de l'Océan Indien'. Initially the Seychelles government was the largest shareholder (70%). The remaining 30% belonged to two French companies, Pêcheurs de France and Armement Coopératif Finistérien (ACF), which operated purse seiners in Seychelles waters. Conserverie de l'Océan Indien was a leading economic player right from the start, both due to the jobs created and the volume of its exports. The production capacity has increased to 350 tonnes per day and the cannery directly employs 2,400 people, some 1,300 of whom are Seychellois citizens. With this capacity, IOT can process around 30% of the catch passing through Victoria. IOT has the only frozen product storage facilities in the Seychelles, the capacity of which allows for 25 days of production. IOT also has a fishmeal production factory, which uses the cannery's by-products and certain by-catches of the fleet. There is also a company called Ocean Products Seychelles, which is owned by IOT and extracts oil from the tuna heads (EU, Fisheries in the Seychelles and Fisheries Agreements with the EU, 2011).

Other local processors include Amirante Fisheries, owned by James Lesperance (processing bycatch from EU boats) and two smaller fish processing factories (small scale fleet catch) owned by Oceana and Sea Harvest (Standing, 2016).

Seiners operating under the SFPA are required to take on at least two Seychelles seamen/trainees each (whether this actually happens is another thing). According to the Commission, on average only 30 Seychellois crewmembers are employed. As the SFPA vessels are largely Spanish and French, the nationality of the crew on board is likely to be from many countries, including countries such as the Philippines and Indonesia.

During 2013, there was an increase in both the volume and value of fish and fish products imported into the country. The main product, frozen tuna, was destined for the IOT canning factory for canning

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and fish-meal production. The other commodities imported were supplies for the hotel and local market and bait for the domestic fishing industry (SFA, 2015).

5.7 Existing management plan, procedures and objectives

The long-term policy objectives of the Government of Seychelles for the fishing industry is promoting sustainable management to ensure the long-term viability of the industry, and maximising employment, revenue from fisheries and foreign exchange earnings: ***Develop the fishing industry to its fullest potential and to safeguard the resource base for sustainable development*** (SFA, 2015).

Primary legislation being the Fisheries Act of 1986, and Regulations of 1987, of the Ministry of Investment, Natural Resources and Industry which are implemented by the Seychelles Fishing Authority (SFA). The Seychelles Fisheries Monitoring Centre (FMC) makes annual vessel compliance inspections, checks vessel logbooks, receives obligatory vessel monitoring systems (VMS) tracking data and conducts sea patrols. The FMC also implements the EU Catch Certificate Scheme (CCS), which ensures that products exported from Seychelles to the EU are not tainted by IUU fishing activity (NFDS, MRAG, COFREPECHE, & POSEIDON, 2013).

In an effort to preserve marine habitats and resources from degradation and overexploitation, the Government of the Seychelles adopted a number of precautionary fisheries management measures in the early stages of fisheries development. **Licenses are required for all vessels longer than seven meters** and for smaller vessels with engines or those that target sensitive species such as holothurians. Also, **demersal trawling and spearfishing are forbidden in the entire EEZ**, and there are **limits on the total number of licenses allocated every year for the holothurian and lobster fisheries.** Seychelles-flagged and foreign industrial fleets are excluded from the shallow banks and reefs, and exploitation of all species except large pelagics is reserved for nationals. Last but not least, there was a network of 17 **marine protected areas** as of 2008. Open and closed seasons are operated for the lobster fishery.

Inshore fisheries management strategy. Licensing of vessels is by far the most used regulatory measure, for almost all fisheries in Seychelles. Precautionary approach is frequently adopted to ensure the sustainability of resources since the **baseline data on the status of certain stocks is lacking.** SFA is also gradually adopting the co-management approach to inshore fisheries management.

However, other than the above, there seems to be a lack of a more comprehensive management plan for coastal fisheries. The SFA in partnership with UNDP has therefore recently embarked on formulating a fisheries management plan for the Island of Praslin. This is considered to be a pilot study that will lead to a more comprehensive approach to monitoring and managing coastal fisheries off Mahé and other islands. The pilot case study is reported to have been approached with active participation by artisanal fishers and fish processing firms, and it is paving the way for new forms of community co-management arrangement.

SFA have a number of projects ongoing where management plans, procedures and objectives are being researched and developed, such as:

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- Lobster project – monitoring and assessing lobster stock on the Mahe plateau, aim is to establish stock and minimum first capture size. Also tagging.
- Sea cucumber project – enhance management of the fishery
- The Seychelles National Plan of Action for the conservation and management of sharks was approved in May 2007
- Seychelles Ocean Temperature Network (SOTN)
- Eaf-Nansen project – ecosystem approach/ co-management initiative (NORAD), focusing on the demersal hand-line fishery.
- National observer programme for tuna fishery, as per IOTC resolution – must meet 5% coverage.

5.8 International agreements, RFMO and EU SFPA

The Republic of the Seychelles is a member of the Indian Ocean Tuna Commission (IOTC) and is also a member of or party to:

- Southwest Indian Ocean Commission (SWIOFC)
- South Indian Ocean Fisheries Agreement (SIOFA)
- Indian Ocean Commission (IOC)
- New Partnership for African Development (NEPAD)
- South African Development Committee (SADC)
- Common Market for Eastern and Southern Africa (COMESA)
- Agreement on Port State Measures
- Party to the Convention on Migratory Species, the Indian Ocean Southeast Asian Sea Turtle Agreement and the Migratory Sharks Memorandum of Understanding.
- British/Seychelles Fisheries Commission (BSFC) – established in 1995 to promote, facilitate and coordinate conservation and scientific research
- Party to the Cotonou Agreement with EU (EU-ACP countries agreement
- Also has an Economic Partnership Agreement (EPA) also with the EU
- Non-LDC APC country status. Thus, not afforded EBA status.
- Only became a WTO member in 2014
- African Growth and Opportunity Act 111
- The entire Seychelles EEZ falls within the Indian Ocean Whale Sanctuary.

The Republic of the Seychelles has an existing SFPA with EU, and has been signing these since 1987. The current protocol runs from 2014-2020. It is a tuna agreement and has a reference tonnage of 50,000 tonnes. The current protocol allows for a total of 46 EU fishing vessels, from Spain, France, Italy and Portugal, as shown in Table 10 (EC, Bilateral agreements with countries outside the EU, 2017).

Table 10: Number of fishing vessels and type of fishing gear stipulated in the current SFPA. Source: EC (2017).

	Spain	France	Italy	Portugal	Total
Tuna seiners	22	16	2	-	40
Surface longliners	2	2	-	2	6
Total	**22**	**18**	**2**	**2**	**46**

For the 1st and 2nd year, the compensation is 5,530,000 € per year, of which 2,600,000 € is dedicated to the support of the fisheries sector of Seychelles. From the 3rd to 6th year: 5,000,000 € per year, of

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which 2,500,000 € is dedicated to the support of the fisheries sector of Seychelles. Boats operating under the SFPA also pay some additional fees, as stipulated in the protocol.
The SFPA is also committed to sectorial support, namely through development and implementation of Fisheries and Aquaculture management plans, fisheries infrastructure development for artisanal and industrial sectors, and capacity building.

The Republic of Seychelles has another agreement with EU, allowing a number of Seychelles flagged boats to fish in Mayotte. Additionally, a bilateral fishing agreement with Mauritius is in place as well as agreements with other countries are often signed (i.e. Taiwan, Japan, China).

The Seychelles has in addition twelve active 'private agreements' for purse seiners; seven of these cover Seychelles-flagged, but European-owned vessels, paying an access fee of EUR 71,429 per year/vessel; and five agreements cover non-Seychelles, non-EU vessels (of which one is Korean and four from Mayotte) paying EUR 95,238 per year per vessel for access. As comparison, the EU fleet operating under the FPA pays EUR 61,000 per year per vessel. The Seychelles has an active fisheries agreement for longline vessels with a Taiwanese Association and 'private agreements' for locally flagged vessels. In 2012, a total of 137 longline vessels were authorised to fish under these agreements (NFDS, MRAG, COFREPECHE, & POSEIDON, 2013).

So, in addition the European fleet operating in the Seychelles EEZ, the foreign fleet consists of vessels from Japan, Taiwan, China, Korea, Mauritius, Mayotte and US. There are also a number of foreign operations functioning under the Seychelles flag.

5.9 Governance, compliance and transparency

The SFPA protocol stipulates that European Union vessels shall notify the Seychelles authorities at least six hours in advance of their intention to enter or leave Seychelles' waters and every three days during their fishing activities in Seychelles' waters of their catches during this period. When notifying entry/leaving, vessels shall also communicate their position at the time of communication and the volume and species in catches kept on board. These communications shall be made in specific format sent by fax or e-mail to the relevant authorities. The Seychelles authorities may exempt surface longliners not fitted with the appropriate communication equipment from the obligation to report in this format and allow them to report via radio communication. European Union fishing vessels found to be fishing without having informed the competent authorities of Seychelles shall be deemed as vessels without a fishing authorisation.

A logbook system for collecting catch and effort and other relevant data, such as bycatch, environmental data etc. exists for fisheries targeting tuna and tuna like species. It has been in place for the industrial longline from the early 80's to 2012 (<70% annual coverage with 89% more recent years), and from 1984 to date (95 – 100% annual coverage) for industrial seiners (IOTC, 2015).

In terms of the reliability of published information, data on catches by the industrial sector provided by the SFA is entirely reliant on reports sent by the fishing vessels, as there is very limited independent

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observer coverage. As indicated in the Seychelles annual reports and other technical reports, not all licensed vessels submit complete log-books, although the trend seems to be improving and reporting by EU vessels is 100% as these reports are used to finalise invoices for license fee payments. Nevertheless, information on catches by the industrial sector fishing in its EEZ compiled by the SFA is unlikely to be entirely reliable. Information on landings, including from both the industrial and semi-industrial fisheries sector is subject to greater oversight and is likely to be more reliable than data on catches (Standing, 2016).

There are some obvious gaps in information as control at sea seems to be largely restricted to the national fleet. At sea, deployment of observers on industrial tuna purse seiners under the framework of the Seychelles National Scientific Observer Programme continued in 2014. A total of 18 deployments were completed on Seychelles Purse seiners in 2014 covering a total of 744 observation days. SFA is currently undergoing verification of all data compiled to be submitted to the IOTC secretariat along with observer reports by December this year. In 2014, a total of 45 observers were trained under the National Observer Programme by SFA. Training of more observers for expansion of the programme was anticipated in 2015 (IOTC, 2015).

Collection of trans-shipment and landing forms from fish processing companies for the purse seine fishery and the semi-industrial longline fishery is an ongoing activity with a 95 -100% coverage for each fleet. On the other hand, the distant water industrial longliners rarely land in port Victoria, making monitoring of trans-shipments/ landing difficult. However, information on landing in foreign ports is received. Seychelles is also participating in the IOTC regional observer scheme to monitor trans-shipment at sea on carrier vessels (IOTC, 2015).

Many longliners do not land domestically, which makes it difficult to obtain good logbook coverage, trans-shipment/ landings as well as size frequency data. The Seychelles are however participating in the regional Observer Scheme to monitor trans-shipment at sea (IOTC, 2015).

The MCS section of the SFA is made up of two divisions – The Monitoring and Control Unit; composed of the Fisheries Monitoring Centre (FMC) and the Fisheries Control Unit, and The Enforcement Unit, which carries out all inspection duties with respect to port state inspections, land inspections as well as sea and air surveillance. Fisheries Surveillance is an area that is lacking in both manpower and equipment, but there have been some improvements in terms of sea patrol and port state control. Compliance observer training and port state inspections have been identified as areas for further training, and improvement. Table 11 shows the number of vessels inspected in the Port of Victoria in 2013 (SFA, 2015).

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Table 11: Number of fishing vessels by country and type inspected in Port Victoria in 2013. Source: SFA (2015).

Flag	Purse seiner	Longliner	Supply Vessel
China			
France	75		
Italy			
Japan			
Korea	7		
Seychelles	43	2	12
Spain	106		17
Taiwan		5	
Iran			
Mayotte			
Dominica			
Phillipines			
Mauritius			
Total	**231**	**7**	**29**

As of 2013 The Seychelles Coast Guard had two long range patrol vessels, the 'PV Andromache' and 'PV Topaz'. The Seychelles Coast Guard received and commissioned into service a Type 62 patrol boat Etoile from the Chinese in 2014. Topaz has just undergone upgrading.

The current SFPA provides for a strengthening of economic, financial, technical and scientific cooperation on fishing to ensure the conservation and sustainable use of fishery resources (EU, Fisheries in the Seychelles and Fisheries Agreements with the EU, 2011). However, certain aspects of the agreement, such as the boarding of Seychelles observers and crew, are not always easy to implement. The difficult budgetary situation in the Seychelles has led to some complexity with regard to the part of the financial contribution intended for a specific purpose. The level of this cooperation on a practical level is not clear.

At the regional level, the **Regional Fisheries Surveillance Project (RFSP**) is financed in part by the EU, while **SmartFish** is one of the largest regional Programmes for fisheries in Africa covering 20 beneficiary countries in the Eastern, Southern Africa and the Indian Ocean (ESA-IO) region. Funded by the European Union and implemented by the Indian Ocean Commission (IOC) jointly with the Food and Agricultural Organization of the United Nations (FAO).

5.10 Main findings in the evaluation of the fishery and the SFPA

The review of the SFPA has highlighted the following issues (NFDS, MRAG, COFREPECHE, & POSEIDON, 2013)

- In 2011, the EU caught 23 % (40,545 ton) of their total Indian Ocean catch of tunas and associated species and utilised 78 % of the available reference tonnage under the protocol

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(52,000 ton) in Seychelles waters. In the same year, the estimated total value added by the Protocol was EUR 41.49 million, of which 74.6 % went to the EU.

- FPAs are economically important to the Seychelles, and have played a role in the development of the domestic fisheries sector – as indicated, the industrial tuna sector is the highest gross earning sector in the economy, and the FPA itself contributes to a sizeable proportion of this. Sectoral support is an important aspect of the domestic fisheries development programme.
- For the Protocol to be coherent with the CFP it must be coherent with the IOTC management measures. This is the case, for example through managing fishing capacity and effort, and controlling catches and minimising by-catch. In terms of regional policy there is coherence between the FPA and key SADC (Southern African Development Community) fisheries instruments on issues such as VMS, observers, local employment and the promotion of RFMOs (IOTC). However, the application of these, and especially the sharing of information is not as coherent as it could be, nor is the promotion of regional harmonisation a condition for access.
- Any future Protocol should firmly align EU sector support with the Seychelles development and sector policy through the multi-annual plan - including strengthening fishery support infrastructure, the local fishing industry, private sector engagement and the development of Victoria into a major regional fisheries hub. Decoupling the sector support from the compensation paid for access, in line with the March 2012 Council Conclusions on the External Dimension of the CFP may assist this.
- The Protocol provisions for embarking fishermen should be reviewed to reflect the Seychelles policy on employment; contracting arrangements for embarking fishermen need to be addressed in Seychelles legislation. Seychellois at-sea observers should be placed on EU purse seiners at the earliest possible opportunity to comply with the provisions of the current Protocol.
- Joint Committee identified that there are three main priorities for development under the sectoral support fund: financing for artisanal infrastructure projects for the districts, facilities for processing and value addition (mainly for the semi-industrial sector), and finance for the completion of processing units at Providence Fisheries Facilities. Other priorities include improving fisheries management and industrial fisheries, and capacity building (SFA, 2015).

Evaluation of the domestic fishery has highlighted to following issues (SFA, 2015):

- There is an overfishing of the Mahé plateau resources.
- The impact of semi-industrial long-line fleet on heavily depleted shark fishery is a concern.
- Management of demersal resources remains a challenge.
- The potential for recruitment overfishing of the Emperor red snapper fishery has been identified for some years. Concerns over dramatic increase in yields, due to increased targeting. Indication of intensive and unsustainable targeting of spawning aggregations
- Ongoing degradation of habitats through anthropogenic stressors including climate change remain an issue for concerns.
- Historical and ongoing fishing down of the food web which has extirpated (crocodile and seals) or likely rendered ecologically extinct (turtles and various shark species) various key species with unknown ramifications for the stability and overall production of the system.

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- Difficulty in importing swordfish into the EU due to applied standards is a challenge – seen as impeding semi-industrial fisheries development.

Evaluation of the industrial fleet that is flagged in the Seychelles, but owned by foreign companies has highlighted to following issues (SFA, 2015):

- The expansion of industrial fishing raises considerable concern about sustainable use of pelagic resources in the (Western) Indian Ocean.
- The reduction of mega fauna (whales, pinnipeds, turtles, sharks etc...) can reasonably be expected to have significant cascade effects through the food chain and on overall productivity.
- By-catch issues (e.g. with regard to sharks and marine turtles) are an ongoing concern as are other potential secondary fishery effects – such as the impact on sea bird feeding success caused by reduced tuna standing stocks.
- Limited information hindering informed management of current industrial fisheries.
- Concerns in relation to transparency of some agreements/operations (confidentiality of Asia agreements for example).
- Data on catches by the industrial sector provided by the SFA is entirely reliant on reports sent by the fishing vessels, as there is very limited independent observer coverage. However, not all licensed vessels submit complete log-books, although the trend seems to be improving and reporting by EU vessels is 100% as these reports are used to finalise invoices for license fee payments. Nevertheless, information on catches by the industrial sector fishing in its EEZ compiled by the SFA is unlikely to be entirely reliable. Information on landings, including from both the industrial and semi-industrial fisheries sector is subject to greater oversight and is likely to be more reliable than data on catches.

In general, IUU fishing is a concern, as in most such fisheries, and includes Illegal activities (trans-shipment at sea, fishing without licenses and landing of forbidden species), unreported catch (in African market) or effort, unregulated fleets (Indian Ocean driftnets). ICCAT and IOTC evaluated that undeclared (illegal) catch could have reached up to 10% of the catch in these oceans and LDAC has concluded that half of the catches in the Indian Ocean are insufficiently reported (Michael, 2014).

The main challenges that the fishery within Seychelles waters are:

- Overexploitation of resources on the Mahe Plateau; which requires further research.
- Lack of data for informed management of (industrial) pelagics.
- Control of vast EEZ is a major problem, as limited or no control/monitoring of industrial longliners (comprised mainly of Asian Vessels) exists.
- Lack of data for effective shark stock management
- SFA office and human capacity constraints.
- Effective enforcement, given large size of EEZ, remains a constant challenge. Fisheries surveillance remains lacking (despite improvements) in manpower and equipment. Land based monitoring remains an area that needs to be reviewed, as well as the type of inspection. Under the regional fisheries surveillance programme, SFA inspectors have had training in inspection

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at sea, radio telecommunication, and procedures for safety at sea. Compliance observer training and port state inspections are areas identified for future training.

- The implementation of observer coverage on its industrial fleet; and the domestication of the approved IOTC resolution.
- There is some concern in Seychelles about the conditions of employment for Seychellois onboard semi-industrial and industrial fishing boats.
- Transparency of use of sectoral development funds have been highlighted by stakeholders.

5.11 Data collection and stock assessment

SFA collect log-book and VMS data on catches, effort, length frequency, which are then used for stock assessments. The SFA also collaborates on data with the French Institute of Research for Development (IRD) and the Spanish Institute of Oceanography (IEO). Catch assessment surveys by SFA have been conducted since 1980s. However, SFA noted in its 2012 report that lower catch data might result from a lack of coverage of landing sites (SFA, 2015). SFA dose also collect data through its Port sampling programme and through an information Network for Africa. They are also working with IFREMER to develop a new data collection and management system for the Artisanal Fishery.

Project between SFA and the AMSSI have a data collection programme in place, using logs and a database. Fishery independent survey of this fishery also conducted. Also, tendered MRAG for an assessment on sea cucumber, however, the available data collected on the fishery was not reliable enough to parameterise models sufficient to provide robust estimates of yield in order to establish a sustainable catch level or Total Allowable Catch (TACs). However, MRAG provided in its final report a set of recommendations guiding management of the fishery, as well as to improve the quality and reliability of the data being collected via the logbook system in order to achieve more comprehensive stock assessment in the future (SFA, 2015).

Lobster is being monitored and assessed on the Mahé Plateau using a multidisciplinary approach. This is a fisheries independent survey through which fishers collaborate with SFA researchers to monitor lobster stocks during closed seasons (measures and tags).

Acoustic telemetry and tagging is being used to provide key information on the ecology of grey reef shark. The SFA has also worked with the ASFA to gather catch and size data of sharks at various landing sites. A digital database is being compiled. The catch data will improve the estimation of shark catches by the artisanal fishery sector. Furthermore, the size data will be used to develop models which will allow species identification as well as size estimates based on measurement(s) taken from dressed carcases.

Baseline biological data is lacking for certain inshore stocks, which are known to be overexploited due to concentration of fishing effort. There are also concerns regarding the status of some shark stocks, as targeting of sharks has increased in recent years, but reliable data is though lacking.

The tuna species in the west Indian Ocean are in variable condition, as shown on Figure 15 (IOTC, 2015) . Where yellowfin is overfished, but the other species are in a relatively good state.

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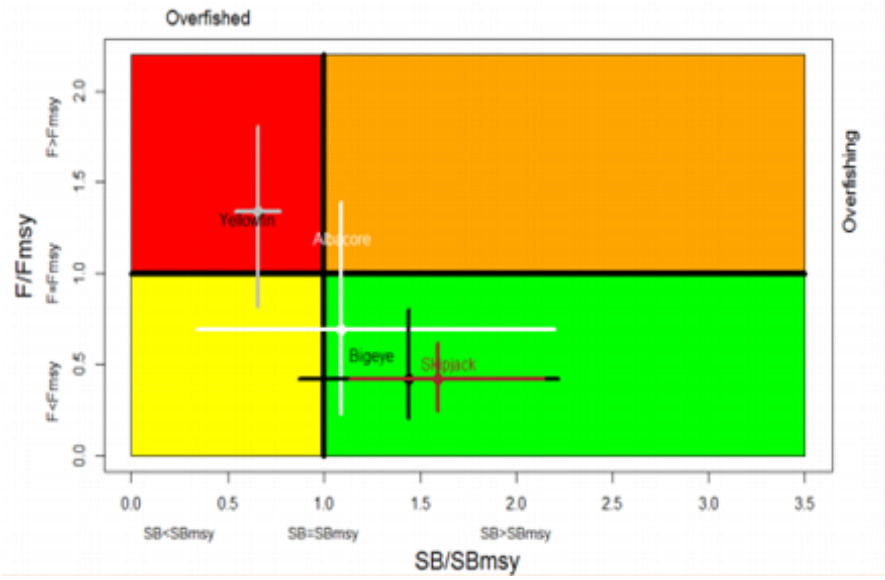

Figure 15: Status of tuna and tuna-like species in the western Indian Ocean: combined Kobe plot for yellowfin tuna, albacore, bigeye and skipjack. Source: IOTC (2015).

The status of a number of species (mostly non-target species, but some that are targeted), for example sharks, marlins and sailfish, is not well researched or understood, in part because lack of reported data from the fisheries especially for species not directly under the mandate of IOTC.
The most recent analysis has indicated that striped marlin is overfished and subject to overfishing.
Longline vessels also target sharks and catch them as an associated species; the IOTC uses the International Union for Conservation of Nature (IUCN) assessments for the threat status of pelagic sharks. There is a lack of information on the status of the stocks of associated species that are caught by the purse seine fleet, particularly in association with fish aggregating devices (FADs) (NFDS, MRAG, COFREPECHE, & POSEIDON, 2013).

Stock assessment methods and models vary depending on species:

Yellowfin tuna (IOTC)

Prior to 2008, Indian Ocean yellowfin tuna was assessed using methods such as VPA and production models (Nishida & Shono, 2005; 2007). In 2008, a preliminary stock assessment of Indian Ocean yellowfin tuna was conducted using MULTIFAN-CL (Kleiber et al. 2003; Langley et al., 2008) enabling the integration of the tag release/recovery data collected from the large-scale tagging programme conducted in the Indian Ocean in the preceding years (Langley et al. 2008). The MULTIFAN-CL assessment was revised and updated in the following years (Langley et al. 2009, 2010 and 2011, Langley 2012). For the 17th WPTT meeting, the IOTC specified that the yellowfin stock assessment be conducted using the Stock Synthesis (SS) modelling platform. Conceptually, the SS modelling framework is very similar to MFCL including the facility to integrate tag release/recovery data. Previously, preliminary trials comparing the application of the two platforms to the modelling of spatially structured tuna populations have yielded similar results. For the 17th WPTT meeting, the IOTC also requested that a range of model sensitivities be conducted to investigate a range of structural assumptions, specifically natural mortality, growth, selectivity, steepness and spatial structure.

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A Fox-form Bayesian biomass dynamics model was developed to assess the stock status of yellowfin tuna (*Thunnus albacares*) in the Indian Ocean (1950-2014) with pessimistic results. Alternative models used are integrated age-structured models.

Skipjack

Recognized as a difficult species to assess, because the population dynamics are very rapid, spawning may be continuous, the selectivity is generally uninformative about year-class strength, and relative abundance indices derived from pole and line and purse seine fisheries are generally considered to be less reliable than those derived from longline fisheries. Recent models seem to have used stock synthesis.

Albacore

Stock synthesis model is being applied for the Albacore, where the assessment incorporates projections for 10 years and provides a Kobe II Strategy Matrix decision table. The preliminary stock status using a reference base case assessment contradicts results obtained in 2012, indicating that the stocks is in a healthy status and is not experiencing overfishing. The only scenario that contradicts this conclusion is a low steepness value, with a very low natural mortality rate that is highly unlikely given the life history of Albacore.

Bigeye

Recent assessments of the Indian Ocean bigeye tuna stock have been conducted using Stock Synthesis (Kolody et al. 2010 and Shono et al. 2009) and ASPM (Nishida & Rademeyer 2011) software. The two most recent assessments (2010 SS3 and ASPM 2011) form the basis for the current management advice for bigeye tuna.

5.12 How FarFish will address the challenges identified above

FarFish will contribute to improvements in the sector by building on co-management efforts and expanding capacity relevant to stock assessments. The project will increase management of overstressed stocks and ensure long term viability of inshore sector. It will also provide Capacity building through training of different stakeholders. The processing sector will hopefully also benefit the FarFish, where current value chains will be analysed and opportunities for improvements identified.

5.13 Relevant literature

Current SFPA documents available at:
http://ec.europa.eu/fisheries/cfp/international/agreements/seychelles/index_en.htm

NFDS, MRAG, COFREPECHE and POSEIDON (2013). Ex post evaluation of the current Protocol to the Fisheries Partnership Agreement between the European Union and the Republic of Seychelles and ex ante evaluation including an analysis of the impacts of the future Protocol on sustainability (Framework contract MARE/2011/01 – Lot 3, specific contract 4). Brussels, 157 p, available at:
http://ec.europa.eu/fisheries/documentation/studies/seychelles_2013/seychelles_2013_en.pdf

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POSEIDON, MRAG, NFDS and COFREPECHE (2014). Review of tuna fisheries in the western Indian Ocean (Framework contract MARE/2011/01 – Lot 3, specific contract 7). Brussels, 165 p, available at: http://ec.europa.eu/fisheries/documentation/studies/tuna-western-indian-ocean/report-tuna-fisheries-western-indian-ocean_en.pdf

Le Manach, F., Bach, P., Boistol, L., Robinson, J., & Pauly, D. (2014) ARTISANAL FISHERIES IN THE WORLD'S SECOND LARGEST TUNA FISHING GROUND—RECONSTRUCTION OF THE SEYCHELLES' MARINE FISHERIES CATCH, 1950–2010. *Fisheries Centre Research Reports. University of British Columbia, Vancouver (Canada)*, available at: http://www.seaaroundus.org/doc/publications/chapters/2015/Le-Manach-et-al-Seychelles.pdf

SFA (2013) Annual Report, available at: http://www.sfa.sc/Downloads/Publications/AnnualReport/SFA%20Annual%20Report%202013.pdf

IOTC stock assessments available at: http://aww.iotc.org/sites/default/files/documents/science/species_summaries/english/Summary%20of%20Stock%20Status%202015%20%5BE%5D.pdf

file:///C:/Users/55120633/Downloads/Summary%20of%20Stock%20Status%202015%20[E].pdf

Seychelles 2015 Report to IOTC: file:///C:/Users/HP/Downloads/IOTC-2015-SC18-NR23_-_Seychelles.pdf

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6 Mixed Fishery in the international waters of the South West Atlantic (FAO Area 41)

The high-seas fisheries in the statistical area 41 is a mixed fishing region that is not subjected to any international agreements or governed by any RFMO. The target species have primarily been hake, rock-cod, southern cod and squid caught almost solely by Spanish vessels amounting to 200.000 reference tons per year. There are as well fleets from countries such as China, Taiwan and Korea fishing in the area, but catch statistics from them are lacking. The fishery is conducted in the high-seas but there are coastal states that have interest in the fishery, particularly Brazil and Argentina.

6.1 Geographical and biological boundaries

The Statistical Area 41 covers a total area of 17.65 million km^2 off the eastern South American coast, from northern Brazil to southern Argentina and includes a total shelf area of 1.96 million km^2. In the northern area (along Brazil) the continental shelf is rather narrow, rocky and coralline and mostly unsuitable for trawling. Closer to the southern extent of Area 41, it widens and becomes more suitable for trawling. The best and largest trawling areas are found in the River Plate area and over the Patagonian shelf and the Falkland/Malvinas area, where the shelf extends well beyond the 200-nm limit (more than 370 km) off the continental coastline, turning this into the largest shelf area in the southern hemisphere.

The outer waters of the Falkland Islands are 1700 meters in depth. Southerly currents often bring small icebergs from the outer reaches of Antarctica making fishing conditions relatively difficult. A variety of whales - including sperm and killer whales – and flocks of albatross, petrels and terns surround the vessels throughout the year necessitating close attention to environmentally friendly fishing practices.

The high-seas fishing mainly takes place on a shallow bank (<300m) beyond the EEZ of Argentina and outside the Falkland/Malvinas conservation Zones (FICZ and FOCZ). The fleet operating in the SW Atlantic mainly works in FAO sub-areas 3.1 and 3.2, shown on Figure 16.

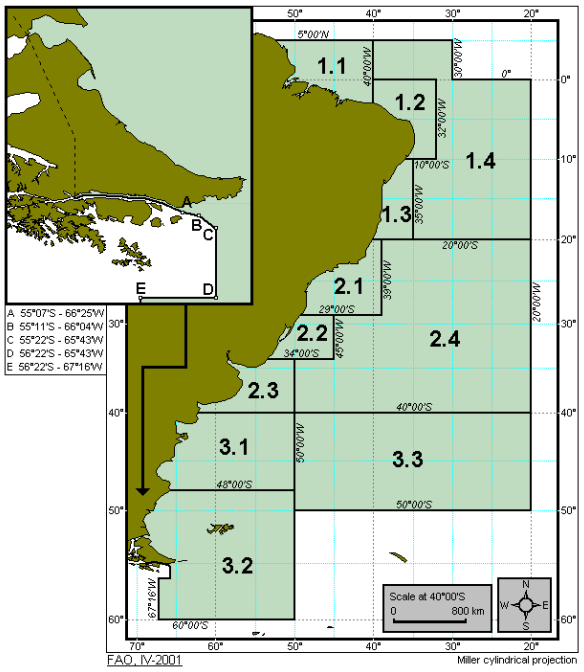

Figure 16: FAO major fishing area 41 and sub-areas. Source: http://www.fao.org/fishery/area/Area41/en

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The type of fisheries and the variety and abundance of exploited fishery resources within this area are determined by the topography and other physical characteristics, including the differences in environmental conditions, which range from typically tropical in the north to sub-Antarctic in the south. Shrimps and lobsters, and to a lesser extent reef fishes and other tropical demersal species, tend to be of particular relevance towards the northern part of the area.
Further south, the marine environment is dominated by the warmer southward-flowing Brazil Current and then by the colder northward-flowing Falkland Current (Malvinas Current). These currents merge into an offshore flow of subtropical convergence just off the Plate River. This is a region where there is also a large flow of freshwater into the coastal ecosystems.

Small pelagics sustain an important fishery in nutrient-rich coastal areas where water masses mix off central Brazil and are abundant in the River Plate area. Coastal demersal species are particularly important off southern Brazil and in the River Plate area, while mid- and deep-water demersal species tend to dominate the scene over most of the River Plate, the Patagonian and Falklands-Malvinas shelf area, where there is also an important squid fishery. Large pelagic species are mostly caught off central Brazil and the River Plate area (FAO, 2011b).

The area of high-seas covers part of the Patagonian shelf and slope that extends beyond the EEZ and the Falkland Islands conservation areas (FICZ and FOCZ). In that area, the fishing activities of Spanish trawlers take place mainly between parallels 44º S and 48º S and secondarily in the fishing grounds around parallel 42º S.

VMS data obtained has confirmed that fishing activities by the EU HSBG fleets in the SW Atlantic high-seas areas (Spanish and UK vessels) are mainly carried out on area of the continental slope that extends onto the High-seas between the Argentinean EEZ, the Falkland Islands Outer Conservation Zone (FOCZ) and the 300-meter depth contour, an area without evidence of seamounts or VMEs (EC, 2008). This is possibly due to past fishing activities of distant water fleets from the USSR, German Democratic Republic, Spain, Poland, Japan, etc.). Some VMEs have been reported at depths greater than 500 meters. If fishing activities were to start expanding into deeper waters, there would be an increased risk of interaction with VMEs. During the course of the study it was not possible to obtain detailed information on fishing locations prosecuted in the SE Atlantic, although a large number of seamounts exist in the area. However, overall EU fishing efforts in this region are relatively small compared to fishing efforts in the north Atlantic and the pressure on VMEs should be small.

6.2 Commercial species, catch statistics, volume and value

The main commercial species caught in the area by EU vessels are hake, squid and southern cod. Spain is the dominant actor, with catches of 200,000 tons in 2014. Portugal and Estonia have had a limited fishery in this area, as has France. Catches have increased considerably, from 123,000 tons in 2013, and 90,0000 tons in 2010 and 18,000 tons in 2008. The current catches in the South West Atlantic amount to 2.6% of the total EU catches (Eurostat).

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SW Atlantic Spanish high-seas bottom gear (HSBG) effort has historically occurred in a relatively concentrated area, as shown in Figure 17 (Otero).

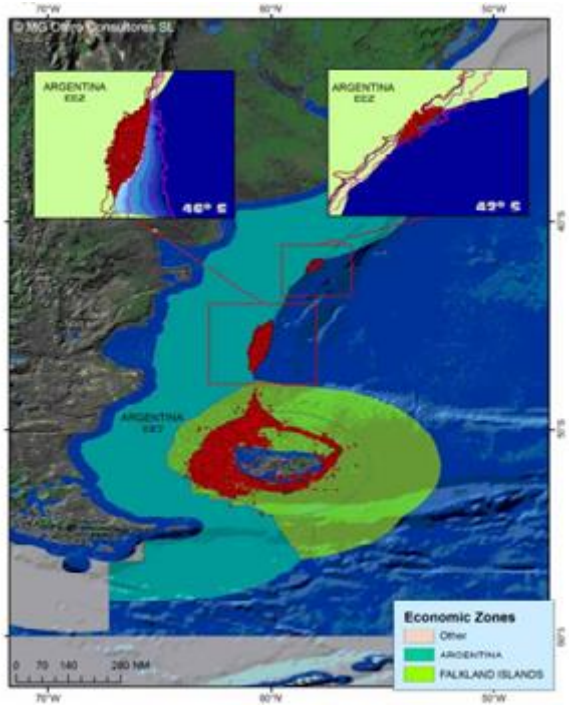

Figure 17: Location of Spanish fishing effort in the SW Atlantic. Source: Otero (n.d.)

The main target species are hakes (Argentine Hake *Merluccius hubbsi* and Australian hake *M. australis*), cephalopods/squid (Argentin shortfin squid *Illex argentinus* and *Loligo gahi*) hoki (*Macruronus magellanicus*), red cod (*Salilota australis*), southern blue whiting (*Micromesistius australis*), kingclip (*Genypterus blacodes*), and skates (*Raja* spp). Some negligible quantities of toothfish (*Dissostichus eleginoides*) are also taken, representing less than 1% of the total catch. The majority of the species caught in this fishery (with the exception of toothfish and grenadier) are not considered 'deep-sea' species (i.e. long-lived species, with low reproduction rate).

Fishing effort declined dramatically after 1992 when Argentina expanded its EEZ several nautical miles eastwards, with the subsequent reduction of the area available for fishing. Thus, the main fishery area for this fleet is located between 44º and 48º S, where the majority of fishing effort (99.85%) registered by scientific observers between 1989 and 2004 was made in waters of less than 300 meters depth. No changes in the fishing strategy have been reported during last few years, this fleet fishing in the same area and depths as in the 1990s and targeting the same species, with the exception of rockcod (*Patagonotothen* spp.), a species previously discarded at sea, that has seen an increase in profitability (EC, 2008).

6.3 Relevant authorities

There are no RFMOs in place in this ocean region with the legal competence to regulate demersal or deep-water fisheries. Several of the target species on the high-seas, most importantly the Argentinian hake and Ilex squid, are shared stocks, occurring in Argentinian and Falkland Island waters and on the

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high sea. The area falls under the convention areas of ICCAT (International Commission for the Conservation of Atlantic Tunas) and CCSBT (Commission for the Conservation of Southern Bluefin Tuna), but there are no reports of tuna catches, only a very small amount of Patagonian toothfish. EU/Spanish, Argentina and Falkland Islands fishing authorities are involved in the fisheries of this region.

6.4 Operators and other stakeholders

The coastal states fishing in the area are Argentina, Brazil and Uruguay. The main non-EU distant water fishing nations fishing in the area are Taiwan and Korea, while the main EU distant water fishing nation is Spain. The Spanish fleet fishing on the SW Atlantic high-seas consists of up to 19 Spanish vessels, ranging from 696 to 1,819 GT, with an average of about 1190 GT (FAO, 2011b). The Spanish long-distance freezer trawler fleet and long liners are based in Galician ports (mainly in Vigo). A list from FAO in 2011 lists 44 vessels with authorization to fish in the NW Atlantic (FAO, 2011b). Key European stakeholders and operators are LDAC, OPROMAR and ANFACO-COPESCA.

LDAC - The Long-Distance Fleet Advisory Council (LDAC) was constituted in May 2007 and is an EU fisheries body representing stakeholders of both the fishing sector (including catching, processing and marketing sectors, and trade unions), and other groups of interest (environmental NGOs, consumers and civil society). It is currently composed by more than 50 members from 12 EU coastal Member States. Its mission is to provide advice to the European Institutions (Commission, Council and Parliament) and EU Member States on matters related to Fisheries Agreements with Third Countries, relations with Regional Fisheries Organizations (RFOs) in which the EU is a signing party, or with international organizations in whose waters the Community Fleet is operating, as well as on business relations and the international market for fishing products.

ANFACO-CECOPESCA is Spanish independent business organisation whose work is focused on the representation and defence of the interests of more than 245 companies belonging to all the levels of the sea-industry complex. Therefore, it forms a real cluster in the marine sector. The global turnover of its associates reaches almost € 7 billion. It employs more than 25,000 workers and is an international sector that serves as a good example to the world economy globalisation by marketing its products in more than 115 countries over five continents.

6.5 Supply and value chain

Deep sea fish species caught by HSBG vessels are mainly landed in Spain (Vigo) if possible, though other ports, such as Montevideo, are sometimes used for landing or trans-shipment of catches for vessels fishing in the SW Atlantic. Spanish HSBG vessels land almost exclusively in Galician ports, either by freezing catches at sea and returning to port at the end of a fishing trip or transshipping catches to be landed directly in Vigo by reefer vessels in more distant fishing grounds (EC 2008).

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6.6 Existing management plan, procedures and objectives

Spain is today the only State known to conduct significant bottom fishing activities in the high-seas of the South-West Atlantic. In the absence of a RFMO for this region, Spain closed nine areas to bottom fishing in July 2011, pursuant to a EU regulation that implemented the UNGA resolutions. Noting that the absence of a competent fisheries body does not exempt states from their obligation to adopt measures for the conservation of marine biodiversity in Areas beyond national jurisdiction (ABNJ), the EU passed a regulation in 2008, requiring states to identify VMEs in high-seas regions where their fishing vessels operate and implement fisheries closures with respect to their vessels. It was envisaged that this regulation would mainly apply to the South West Atlantic. The EU initially intended to review this regulation in 2012, but to date such a review has not been carried out. Between 2007-2009, Spain's Oceanographic Institute (IEO) conducted a series of 11 multidisciplinary research cruises with the aim of identifying VMEs on the high-seas of the South West Atlantic and making a preliminary assessment of how fishing activity was impacting these areas (Portela, o.fl., 2012). The research found the incidence of vulnerable species to be low or negligible at the depths where bottom trawling activities take place and that other fishing activity, mostly for cephalopod species of the Patagonian Shelf, probably has a small adverse impact on VMEs. The IEO proposed closing nine areas containing VMEs. Beginning in July 2011, these areas were closed for bottom fishing for a period of six months. Spain also restricted its bottom fishing footprint to two areas, assuming that these areas would not still contain VMEs which could be damaged by bottom fishing (IDDRI, 2014).

Only vessels from one Member State, Spain, fell under the scope of the Regulation and were fishing in the South West Atlantic in international waters in two areas within FAO fishing area 41: subdivision 3.1. - These vessels had to be in possession of a special fishing permit for the duration of their activities which specified the zones where bottom fishing activities could be carried out, the authorised species, the fishing gear and the depths at which it could be deployed.

Most of the species caught in these fisheries were considered to be high or medium productivity species of mainly squid and hake. Spain restricted the area where bottom fishing activities could be carried out by their vessels to two specified areas in the South West Atlantic where such activities had been carried out for more than two years. An observer scheme was obligatory for all vessels. Fishing vessels were not authorised to carry out bottom fishing activities in unassessed areas. No fishing activities were registered in closed areas. The indicators used to signal unforeseen encounters with vulnerable marine ecosystems were the same as those previously utilized by NEAFC and NAFO i.e. This included for example a total of 100 kg of live Corals and 1000 kg of live sponges per fishing haul. However, a more restrictive encounter protocol was used which obliged the vessel to resume operations at a minimum distance of 5 nautical miles from the site of an encounter. No unforeseen encounters with vulnerable marine ecosystems were registered and thus, no remedial measures were necessary. No serious infringements were detected and consequently no sanctions were implemented. Spain restricted its bottom fishing footprint in the South-West Atlantic to two areas which have been fished for the last 25 years (the northern area: 41 ° 50 'S and 42 ° 30' S and the 500-meter isobath while the southern area: latitude 44 ° 45 'S and 47 ° 20' S and the 500-meter isobath) since it assumed that it would be improbable that these areas still contained VMEs which could be damaged by bottom fishing. Furthermore, to prevent authorized fishing activities in those two areas from impacting on any

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possible existing VMES, Spanish fishing licenses contained a "compulsory encounters and moving-on Protocol", monitored by the observer on board each of the authorized vessels. The Commission considered that the implementation of aspects of the said Regulation should be improved, particularly with respect to the differentiation of areas within the two fished areas which could possibly still contain VMEs as requested in the FAO Guidelines. The Commission is consulting with Spain to achieve this. Spain has made the scientific outcome of the Atlantis project that mapped an area of 59,105 km^2 available, including both within the existing footprint fishing area as well as the adjacent seabed, as previously mentioned in this report. Based on the scientific advice, the Spanish government is closing 9 areas, with a total extent of 41,300 km^2 to bottom fishing. This includes two located in the footprint area where, due to seafloor type, sensitive habitats may be able to recover. In addition, the latest information provided by Member States in April 2011, established that one vessel from a second EU Member State, Estonia, also fished in the waters of the South-west Atlantic in 2010. From the information provided, this vessel submitted a fishing plan prior to the granting of a special fishing permit which foresaw that bottom trawls would be used to target mainly hake species in two areas within FAO fishing area 41 subdivision 3.1 in the same areas fished by Spanish vessels. A special fishing permit valid until 31.12.2010 was issued to this vessel listing the authorized species, and the conditions for the use of the fishing gear as well as the area where the vessel was authorized to carry out bottom fishing activities. Once more, a footprint approach 7 was used, based on the assumption that it would be unlikely that, after several years of fishing activities, these two boxes would contain VMEs in danger of being damaged by bottom trawls, particularly at the depths (70-300 meter) trawled. No unforeseen encounters with VMEs using the thresholds previously utilised by NEAFC and NAFO were registered in either the master's or observer reports. The European Commission will also undertake consultations with this Member State to improve its implementation of the Regulation (IDDRI, 2014).

6.7 International agreements, RFMO and EU SFPA

There is no RFMO for the SW Atlantic high sea area. During the period 1990 – 2005, the South Atlantic Fisheries Commission (SAFC) contributed to a constructive bilateral arrangement between Argentina and Britain, together with Falkland Iceland/Malvinas. The SAFC facilitated the exchange of fisheries data, joint research cruises, joint scientific analysis, and recommended coordinated conservation advice to respective governments. Argentina withdrew from the cooperation in 2005.

6.8 Data collection and Stock assessment

In the absence of an RFMO or any other kind of competent authority, the data collection and assessment of the stocks have been seriously lacking. It is primarily the EU fleet that makes available reliable data, which is though not sufficient to do scientific advice or reliable stock assessment. There was a study on the hake stocks conducted in 2002, which provided some information on the stocks during that time (Portela, o.fl., 2002)

Since 2008, the Atlantis project (Spain) has been using the same methodology set-up used in the northeast Atlantic in the southwest Atlantic (Division FAO 41), to map and identify sensitive habitats and possible interactions with fisheries in the defined area between 42 º S and 48 º S latitude, and

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longitudinally between the western boundary 60 ° 55 ' W and the eastern boundary of 57 º 20 'W. This is an area where Spanish ships have been undertaking bottom trawl fisheries. 13 campaigns of multidisciplinary research were carried out between 2007 and 2010, by Spanish scientists led by the Spanish Institute of Oceanography, aboard the research vessel "Miguel Oliver". Major tasks accomplished during the campaign were: seabed mapping, description of types of seabed and benthic fauna, obtaining rates of biomass and abundance of species of commercial interest, and finally, localization and characterization of sensitive habitats. An area of 59,105 km^2 was mapped and a total of 91,905 km^2 of profile surveying were carried out, in an area of approximately 41,300 km^2 to locate and describe sensitive habitats. These works were carried out with multibeam echo sounders, using the existing protocols of the International Hydrographic Bureau (IHO-S44). In pursuance of the UNGA Resolutions and Council Regulation (EC) 734/2008, from January 1, 2009 and to date, the restriction of fishing to the area defined by the historical footprint of the fishery was established as a mitigating factor. To this end, Spain has adopted a comprehensive set of measures and standards which are binding on the shipping company (vessel owner), including the mandatory presence on board of an observer. A similar encounter protocol to that established in the two North Atlantic RFMOs is also in place (EU, 2010).

6.9 How FarFish will address the challenges identified above

Application of RBM principles and the RFMS framework to the high-seas fishery in statistical area 41 will contribute to addressing some of the challenges and problems related to the lack of a management regime in this region. The involvement of fishermen/operators through participatory processes will contribute to improved data collection, monitoring and compliance as well as lead to the development of a management plan that effectively addresses problems of lack of knowledge and unsustainable harvest.

6.10 Relevant literature

FAO 2011. Review of the state of world marine fishery resources, FAO FISHERIES AND AQUACULTURE TECHNICAL PAPER 569, Marine and Inland Fisheries Service Fisheries and Aquaculture Resources Use and Conservation Division FAO Fisheries and Aquaculture Department, Rome 2011

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7 Mixed fishery in the international waters of South East Atlantic (FAO Area 47)

The high-seas fisheries in the statistical area 47 fishery is governed by the South East Atlantic Fisheries Organisation (SEAFO). This is a non-tuna RFMO established in April 2001. The SEAFO Convention Area (CA) beyond national jurisdictions is a deep, large area with several seamount chains, isolated seamounts, guyots and banks. All fishing in SEAFO occurs on or around seamounts. The target species in the SEAFO Convention Area (CA) include alfonsino, boarfish/pelagic armourhead, orange roughy, skates, sharks, deep-sea crab, and toothfish.

The coastal states that border the SEAFO area are Angola, Namibia and South Africa. They established the Benguela Current Commission in 2013 as an inter-governmental organization. The intention is to conserve and manage the Benguela Current Large Marine Ecosystem (BCLME) jointly, for the benefit of present and future generations.

7.1 Geographical and biological boundaries

Statistical Area 47 covers a total area of 18.3 million km^2 off the South West African coast, from the northern border of Angola to the east coast of South Africa. The area in the FAO global grid of Major Fishing Areas is delimited in the north at 6°S as shown in Figure 18. However, division 47.A.2 in SEAFO covers the rectangle bounded by 10°W to 20°W and 6°S north to 0° (Equator). This area (rectangle) is included in the SEAFO Convention Area but in the FAO Fishing Areas it belongs to Area 34 and not to Area 47. Catch statistics reported for this division are included by FAO under those for Major Fishing Area 34.

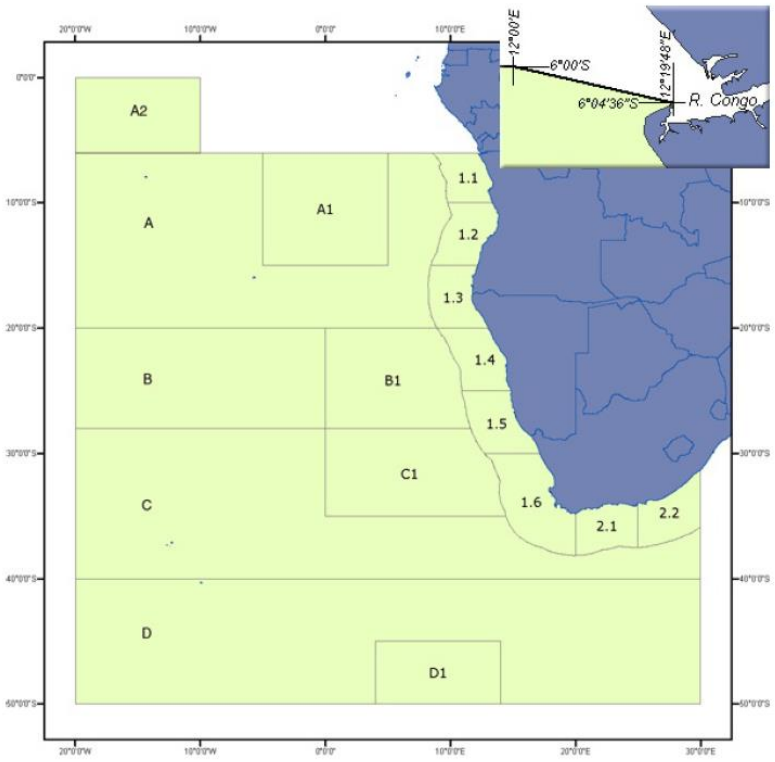

Figure 18: FAO major fishing area 47, as agreed with SEAFO. Source: (FAO, 2017).

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Most of the SEAFO conservation area (CA) is deep ocean (i.e. deeper than 2000 meters) and the seamounts are small, relatively shallow sites protruding from a vast deep ocean floor. The high-seas fishing in SEAFO occurs on or around the seamounts, shown on Figure 19 (IMR, 2015).

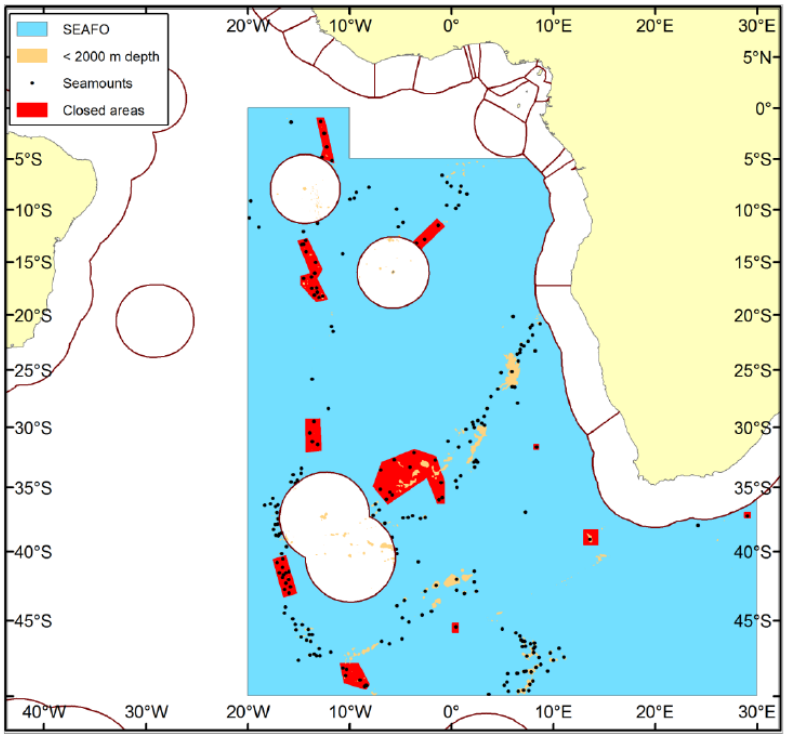

Figure 19: The SEAFO Convention Area (blue) showing seamounts and subareas shallower than 2000m (black dots & orange areas) and the subareas closed to fishing (red polygons) at the time of the "Nansen cruise" in January – February 2015. (Source: CRUISE REPORT "DR. FRIDTJOF NANSEN" EAF – N/2015/2)

Multibeam echosounder mapping in 2015 has shown that several seamounts are considerably deeper than suggested by previous authoritative sources. In most areas, the potential fishing areas are thus smaller than estimated earlier. In 2013, the combined fished area was approximately 0.27% of the total convention area.

In Valdivia, which is a large area <2000m compared with all the other seamounts (probably the largest of the 'existing fishing areas' in SEAFO), potential fishing areas are restricted, because only minor subareas are shallower than 500-1000m and suitable for the target fish resources alfonsino, armourhead and orange roughy. The fishing area for crab is much larger, however, because crabs are distributed across a more extensive depth range than the fishes.

Most of the SEAFO Convention area is deep ocean with numerous seamounts. To the east it is bordering the BCLME. The BCLME extends from east of the Cape of Good Hope, northwards to Cabinda Province in Angola. It is a major coastal upwelling ecosystem and an important centre of marine biodiversity and marine food production. It is the only major upwelling system bound at both northern and southern ends by warm water systems, producing complex horizontal gradients or fronts. The principal upwelling centre of the Benguela Current, situated near Luderitz in southern Namibia, is regarded as the most intense upwelling area in the world. Figure 20 shows the main currents and upwelling areas (left) and the fishing footprints, black dots (right)

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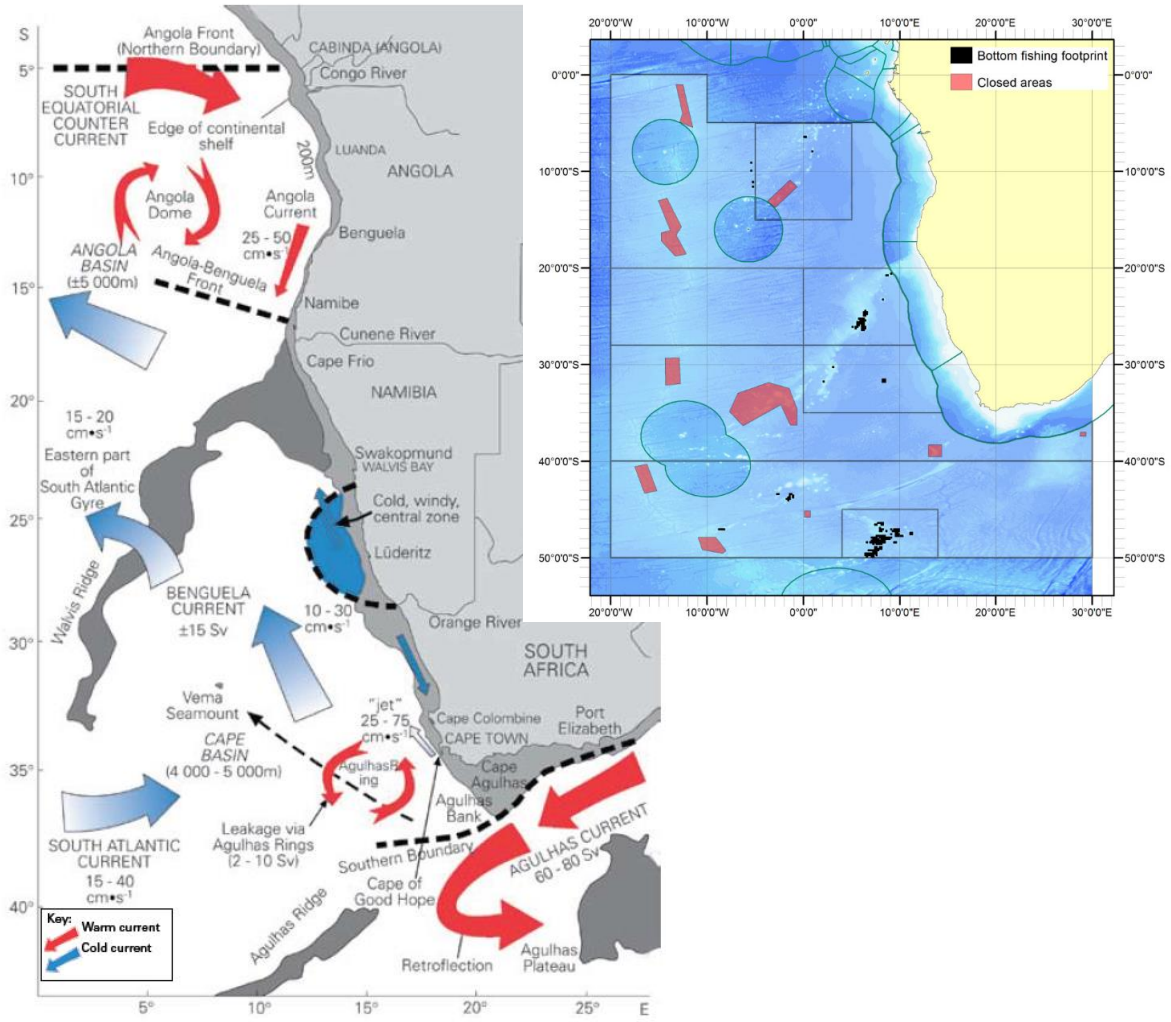

Figure 20: The BCLME and some of its major physical dynamics illustrating the complexity of its system (left figure). The SEAFO Convention Area blue showing fishing footprints i.e. black dots (right figure). Source: BCC STATE OF THE MARINE ENVIRONMENT REPORT 2014, page 5. (left figure). SEAFO. THE CONVENTION. http://www.seafo.org/Documents/TheCommission (right figure).

The Benguela is particularly productive in terms of fisheries resources, but top predators such as seabirds and marine mammals are also abundant. Commercial fisheries and the extraction of non-living natural resources such as oil, gas, diamonds and other minerals, are the focus of industrial activities in the region. In the Convention Area, the fishing activities are very limited.

7.2 Commercial species, catch statistics, volume and value

The commercial fishery is based on only five species, Patagonian toothfish (*Dissostichus eleginoides*), Orange roughy (*Hoplostethus atlanticus),* Alfonsino (*Beryx splendens),* Deep-sea Crab (*Chaceon erytheiae)* and Pelagic armourhead (*Pseudopentaceros richardsoni).* The current TACs and corresponding annual catches are given in Table 12 (SAEFO, Conservation Measure 32/16: on Total

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Allowable Catches and related conditions for Patagonian Toothfish, Deep-Sea Red Crab, Alfonsino, Orange Roughy and Pelagic Armourhead for 2017 and 2018 in the SEAFO Convention Area, 2017).

Table 12: The current TACs and corresponding annual catches. Source: SAEFO (2017).

STOCK	TAC 2016 (Tonnes)	Remaining TAC	Vessels	Date last updated
Patagonian toothfish - Sub-area D	266	253	1	11/07/2017
Orange roughy - outside Division B1	50	50	0	01/01/2017
Alfonsino - Division B1	132	132	0	01/01/2017
Alfonsino - SEAFO CA (includes B1 catches)	200	200	0	01/01/2017
Deep-Sea Red Crab - Division B1	180	30	2	01/01/2017
Deep-Sea Red Crab - remainder of the CA	200	200	0	01/01/2017
Southern Boarfish/Pelagic Armourhead	135	135	0	01/01/2017

Patagonian toothfish

Annual catches of Patagonian toothfish have varied between a minimum of 18 tonnes (2002) and maximum of 413 tonnes (2007). Of EU countries only Spain has been active, to varying degrees in the years 2002, 2003, 2004, 2006 and 2010. Since 2013, only Japan has been active in this fishery, with annual catches (retained) of 61, 79 and 59 tonnes.

IUU fishing activity in the SEAFO CA was last reported to the Secretariat in 2012, but the extent of IUU fishing is at present unknown.

In the SEAFO CA the stock structure of the species is unknown. The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) Scientific Committee in 2009 noted that in most years (since 2003) the main species caught in CCAMLR sub-area 48.6 (adjacent to and directly south of SEAFO Division D) is *D. eleginoides*. The distribution of the species appears to be driven by the sub-Antarctic front which extends into the SEAFO CA. Figure 21 shows the geographical distribution of the Patagonian toothfish in the SAEFO convention area.

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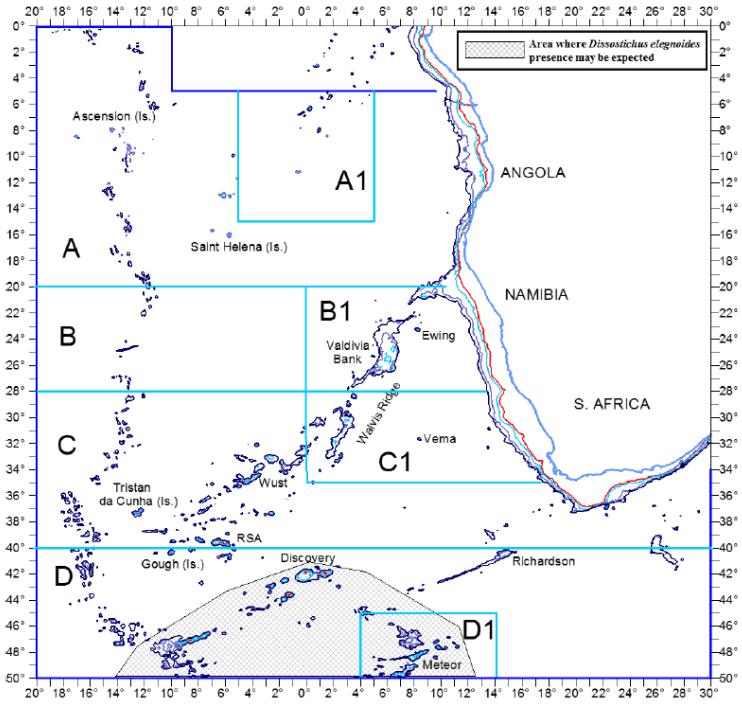

Figure 21: Geographical distribution of the Patagonian toothfish in the SEAFO CA. Source: SEAFO. REPORT OF THE 12th SEAFO SCIENTIFIC COMMITTEE, page 81: Figure 3.

The Scientific Committee of SEAFO notes that in both 2015 and 2016 about 22% of the TAC was taken (incl. the experimental fishery), hence the fishery is not constrained by the TAC.

Orange roughy

No catches or orang roughy have been recorded since 2005 (when Namibia had a catch of 18 tonnes). The 2016 management measure pertaining to orange roughy in the SEAFO CA (CM 31/15) has zero tonnes (moratorium on directed fishery) and a 4 tonnes bycatch allowance in Division B1, and 50 tonnes in the remainder of the SEAFO CA. A moratorium for 2017 and 2018 on directed fishery in Division B1 and allowance for bycatch limit as a proportion (10%) of the average of landings from the last five years with positive catches (i.e. 2001-2005), equivalent to 4 tonnes. The scientific committee did not consider the allowance of a 50 tonnes TAC in the remainder of the area and cannot review the current status quo, due to a lack of new information. A harvest control rule shall be developed for orange roughy in the future as data becomes available.

Alfonsino

No catches have been recorded for Alfonsino since 2013. A few countries had fishing activities in the late 1970s, and in the mid- and late 1990s. Since then South-Korea fished with mid-water trawl for 4 years from 2010 to 2013, with catches of 198 tonnes, 196 tonnes, 172 tonnes and 1.6 tonnes, respectively. Historically the highest catches of fish were recorded by Russia with 2,972 and 2,800 tonnes in 1977 and 1997, respectively, Poland 1,964 tonnes in 1995, and Norway 1,066 tonnes in 1998 in the SEAFO CA.

Alfonsino is a seamount-associated species that form aggregations, and the experience worldwide is that serial depletion of aggregations at different seamounts can happen. In the recent fisheries for the

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species in SEAFO the fishery was concentrated on a single seamount summit, the Valdivia Bank, where it was mainly a bycatch in the target fishery for pelagic armourhead. The only information available from 2015 is the limited observations from the RV Dr Fridtjof Nansen survey noting that only scattered specimens of the species occurred in the main fishing area.
It is also recognized that the last three year's interruption in the exploitation has provided potential for recovery of the resource in the main fishing area on Valdivia Bank. There is however not enough information from any source to determine with certainty whether recovery has happened or not happened (SAEFO, 2016).

Deep-sea crab

There was no fishing attempted for Deep-Sea Crab in the SAEFO CA in 2016, and in 2015 only one Korean vessel reported landings of 104 tonnes. Japan had an active fishery in the period 2005 – 2010, and Namibia had active fishery up until 2014, with catches in the years 2011 to 2014 respectively of 175 t, 198 t, 196 t and 135 t. Spanish and Portuguese vessels fished for crab in the SEAFO CA sporadically during the period 2003 to 2007, with catches of 5 tonnes (2003), 24 tonnes (2004) and 35 tonnes (2007).

Pelagic armourhead, Southern boarfish

There was no fishing for the pelagic armourhead and the southern boarfish in 2014, 2015 and 2016. Korea had a targeted trawl fishery for pelagic armourhead from 2010 to 2013 with two vessels, with catches respectively of 688 tonnes, 135 tonnes, 152 tonnes and 13 tonnes. This fishery stopped in 2014 due to the depletion of the pelagic armourhead stock. Previously, there was fishing by Russia in the late 1970s, and in the mid-1990s by Russia, Ukraine, Namibia and South Africa. The highest annual catches were recorded by Russia with 1,273 and 1,000 tonnes in 1977 and 1993, respectively, and by Korea with 688 tonnes in 2010.

The total fishery in Area 47 has been fairly stable (Table 13).

Table 13: Marine capture production in tonnes in Area 47, as reported by FAO. Source: FAO Yearbook. Fishery and Aquaculture Statistics 2014. FAO Global Capture Production database updated to 2015. Summary information. Note: National figures might also include catches in the high seas.

AREA	2008	2009	2010	2011	2012	2013	2014	2015
Total Area 47	1.358	1.205	1.363	1328	1655	1381	1564	1681
- Angola	306	272	310	342	374	406	442	
- Namibia	373	379	382	414	470	486	444	
- South Africa	645	512	628	533	703	418	596	
Residual (High Seas ?)	*34*	*42*	*43*	*39*	*108*	*71*	*82*	

7.3 Relevant authorities

SEAFO is comprised of the Commission, the Scientific Committee (SC), the Compliance Committee (CC) and the Standing Committee on Administration and Finance (SCAF), and the Secretariat. The Commission has an oversight responsibility of the Organisation. The Scientific Committee provides

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scientific advice on the status of marine resource and on harvesting. The CC provides the Commission with information, advice and recommendations on the implementation of, and compliance with, conservation and management measures. The Standing Committee on Administration and Finance is responsible for advising the Commission on budgetary and administrative matters of the Organization. The SEAFO Secretariat is based in Swakopmund, Namibia and is considered the administrative headquarters of the organization.
Contracting parties are: Angola, European Union, Japan, Republic of Korea, Namibia, Norway and South Africa.

7.4 Operators: fishers, fisher organizations and other stakeholders

All vessels intending to fish in the SEAFO CA must register and there are currently only 18 vessels that have an authorisation from SEAFO to fish in the CA. The vessels are shown in Table 14 (www.saefo.org).

Table 14: SEAFO Authorized Vessel List. Source: SEAFO Vessel List 2017, http://www.seafo.org/

	Vessel Name	Flag State	Radio Call Sign	IMO	Gear	Length(m)	Gross Tonnage
1	Shinsei Maru No.3	Japan	JAAL	8520094	LL	47.2	495
2	Seiryo Maru No.1	Japan	JNNI	8203828	LL, Pot	37.06	221
3	Crab Queen 1	Republic of Namibia	V5XD	8909628	LL, Pot	49.61	619
4	JCS 1	Republic of Namibia	V5HL	7511541	-	44.71	770
5	Sunfish	Republic of Namibia	V5ZU	9060431	OTM	96.7	4407
6	Carapau 1	Republic of Namibia	V5NU	8843044	OTM	96.7	4407
7	Namibian Star	Republic of Namibia	V5NT	8721258	OTM	96.7	4407
8	Argos Marine	Republic of Namibia	V5OW	8113035	OTM	56.62	1093
9	Noordburg Kalapuse	Republic of Namibia	V5W0	7121736	LL, Pot	48.9	789
10	Aquatic Pioneer.King Kauluma 1	Republic of Namibia	V5PI	7930010	LL. Pot	44.48	607.84
11	Jupiter 1	Republic of Namibia	V5NW	1002713	OTM	11.22	7765
12	Koryo Maru 11	Republic of South Africa	ZR7955	8603896	LL	10.4	336
13	Meridian No. 8	Republic of South Korea	DTBX5	9230646	LL, Pot	46.50	495
14	Tronio	Spain	ECJF	9361603	LL	47.60	569.26
15	Viking Bay	Spain	EAWJ	9221516	LL	43.5	280
16	Faro De Burela	Spain	EALI	9344916	OTM	27.5	149
17	Adexe Primero	Spain	EACQ	8834823	Pot	47.92	749.58
18	Yanque	Spain	ECAP	9297993	LL	38.50	411.81

Stakeholders are the national authorities of the contracting parties to the SEAFO, as well as the organisations and bodies representing the fishing sector and civil society in the contracting parties.

7.5 Supply and value chain

The commercial fishery in SEAFO CA is very limited, and there is no specific information related to the supply and value chain for these catches.

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7.6 Existing management plan, procedures and objectives

The Contracting Parties to this Convention, are committed to ensuring the long-term conservation and sustainable use of all living marine resources in the South East Atlantic Ocean, and to safeguarding the environment and marine ecosystems in which the resources occur.
SEAFO has developed a comprehensive strategy to monitor, survey and control the fisheries. All vessels are required to:

- be formally authorised to fish;
- report catches on a 5-day interval;
- report VMS positions on a 2-hourly interval;
- have an independent scientific observer onboard;
- comply with port inspection procedures; and
- not make transhipments in the SEAFO CA.

SEAFO employs an ecosystem and precautionary approach to fisheries management when deciding on management and conservation measures. The Commission adopts resolutions and recommendations based on scientific advice from the Scientific Committee; and monitoring, control and surveillance (MCS) advice from the CC.
It is the responsibility of each SEAFO Contracting Party to ensure that regulations are being adhered to by vessels of their flag State Contracting Party. Contracting Parties have the obligation to ensure that legal proceedings are being undertaken to mitigate infringements of SEAFOs conservation and enforcement regulations.
SEAFO has adopted several measures to combat illegal, unregulated and unreported fisheries (IUU) fishing. The Commission has banned at-sea transhipments in the SEAFO CA, implemented an authorized vessel list, and established an IUU vessel list that incorporates vessels found on NEAFC, NAFO and CCAMLR IUU lists.

The Commission has also implemented management measures for the protection of deep-sea sharks by banning sharks as a directed species. Vessels are also expected to report all catches of sharks, have full utilization and retention (not including gut, skin and head), and not retain fins that total more than 5% of the weight of sharks onboard. Management measures have also been put in place to reduce incidental bycatch of seabirds in the SEAFO Convention Area, and to improve reporting of bycatch of sea turtles with the intent of reducing mortality due to fishing operations. SEAFO has also recommended a ban on all use of gillnets in the Convention Area, and has adopted stringent protocol for retrieval and reporting of lost gear.

The panel of the 2nd Performance Review (2016) was pleased that most of the recommendations from the first review report from 2010 had been addressed by SEAFO and as appropriate changes made to procedures and operations. The Review Panel noted that generally, this small Commission is very well run and is well structured to deal with current and potential fishing activities in its waters.

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7.7 International agreements, RFMO and SFPA

The South East Atlantic Fisheries Organisation (SEAFO) is a regional fisheries management organisation in the South East Atlantic Ocean, established in line with the provisions of the United Nations Law of the Sea (Article 118) and United Nations Fish Stocks Agreement (UNFSA). The objective of its Convention (The Convention on the Conservation and Management of Fisheries Resources in the South East Atlantic Ocean) is to ensure the long-term conservation and sustainable use of the fishery resources in the Convention Area through the effective implementation of the Convention.

The SEAFO Convention Area excludes exclusive economic zones of the three coastal states in the region. These states cooperate on fisheries management through the Benguela Current Commission (BCC).

The BCC is a multi-sectoral inter-governmental commission established by Angola, Namibia and South Africa. It promotes the vision of the BCLME sustaining human and ecosystem well-being for generation after generation.

The BCLME is richly endowed with both living and non-living resources – from large oil and gas reserves to abundant fisheries and unrivalled natural beauty. The BCC provides a vehicle for the countries of the region to introduce an "ecosystem approach to ocean governance". This means that the three countries work together to manage the marine environment.

The BCC was first established in January 2007 through an Interim Agreement. In March 2013 the governments of Angola, Namibia and South Africa signed the Benguela Current Convention, a unique environmental treaty establishing the Benguela Current Commission as a permanent inter-governmental organization.
The BCC is an observer to the SEAFO, and several RFMOs are also observers: Northwest Atlantic Fisheries Organization (NAFO), North Atlantic Marine Mammal Commission (NAMMCO), Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), North East Atlantic Fisheries Commission (NEAFC), International Commission for the Conservation of Atlantic Tunas (ICCAT), and South Indian Ocean Fisheries Agreement (SIOFA).
At the Annual Meeting at the end of 2016 the Commission approved the request from CCAMLR to enter into a formal Memorandum of Understanding (MOU) between the two Organisations. Also, the United States of America is an observer.

The following recommendation is made in the report of the Second Performance Review Panel from October 2016 (SAEFO, 2016):
"*The Panel suggests that SEAFO continues to pressure the UK to join the Commission as it has territories in the Convention Area and has obligations under 116-119 of the UNCLOS. The recent BREXIT vote and the exit of the UK from the EU may encourage UK interest in RFMOs*."

The European Union is a Contracting Party to SEAFO, but there is no SFPA with any of the three coastal states in the area.

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The history of fisheries in this area gives some background to this situation. The International Commission for South East Atlantic Fisheries (ICSEAF) was established in 1971, with the Secretariat located in Madrid. The organization was responsible for the management of the fisheries in the region, both in the exclusive economic zones of Angola, Namibia and South Africa and in the adjacent water of the high-seas. It failed its mandate largely because Contracting Parties did not comply with the adopted conservation and management measures and because the Commission lacked effective compliance and enforcement mechanisms. Fishing efforts by Distant Water Fishing Nations increased rapidly during the 1960s and throughout the 1970s and 1980s on targeted species such as hake, horse mackerel and pilchards off Namibia and horse mackerels (*Trachurus capensis* and *T. trecae*) and sardinellas (*Sardinella aurita* and S. *maderensis*) in southern Angolan waters.

It should be noted that the establishment of ICSEAF was before the adoption of UNCLOS and the establishment of EEZs. Also, Angola only achieved independence from Portugal in 1975, and Namibia became independent in 1990. Before that Namibia was "ruled" by South Africa under a mandate established under the League of Nations in 1920. This mandate was declared terminated in 1966 by the UNGA, and subsequently confirmed by the Court of Justice in 1971. South Africa declared a 200 nm EEZ for Namibia in 1981, but the zone did not receive international recognition and could not be enforced because of the illegal nature of South Africa's authority over Namibia. The result was that the off-shore fishery outside Namibia was an open access fishery.

Hake is the most important Namibian commercial fishery. The fishery for hake developed rapidly from 1964, by trawlers from Spain and USSR, with a catch of 47600 ton Vessels from many Distant Water Fishing Nations joined, and the highest hake catch ever recorded for Namibian waters was in 1972 with 815.000 tonnes. At the time of Namibian independence, the hake stock had been depleted, as shown in Figure 22 (Manning, 2005).

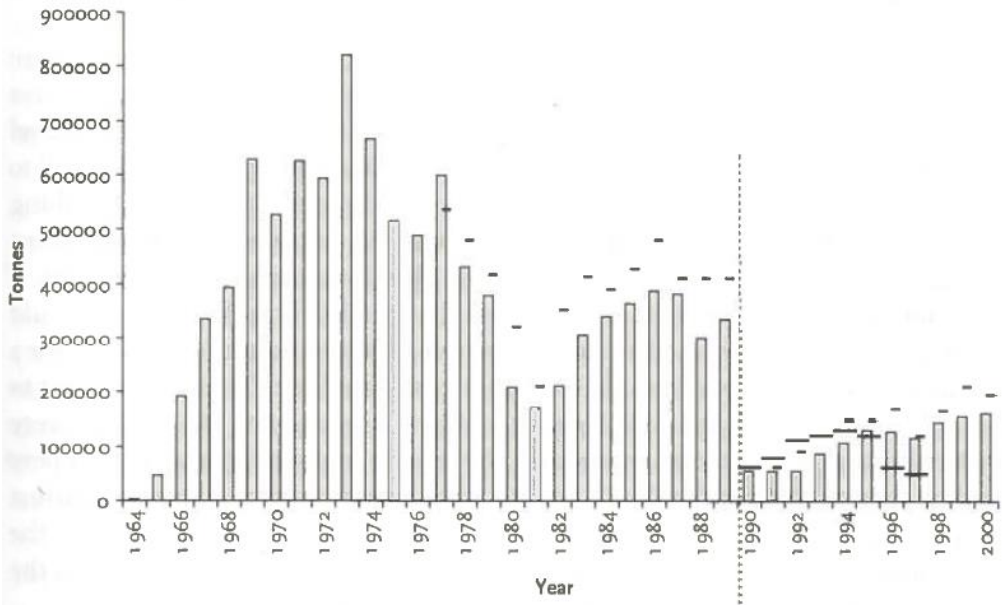

Figure 22: Catch of hake in the area of the present Namibian EEZ. Source: Manning (2005).

The dots on the graph show recommended TACs, indicating that the overfishing was not due to overshooting of TACs, but rather an overestimation of the stock size.

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7.8 Data collection and stock assessment

Each Party to the SAEFO convention is entitled to be represented by one representative in the Scientific Committee meeting who may be accompanied by alternate representatives and advisors. The first meeting of the Scientific Committee took place in September 2005 in Windhoek, Namibia.

In performing its functions, the Scientific Committee shall conduct such activities as the Commission may direct and shall consult, cooperate and encourage the collection, study and exchange of information relevant to the living marine resources of the Convention Area, establish criteria and methods to be used in determining conservation and management measures, assess the status and trends of relevant populations of living marine resources, analyse data on the direct and indirect effects of fishing and other human activities on populations of fishery resources, assess the potential effects of proposed changes in the methods or levels of fishing and of proposed conservation and management measures, and transmit reports and recommendations to the Commission as directed, or on its own initiative, regarding conservation and management measures and research.
In carrying out its functions, the Scientific Committee shall seek to take into consideration the work of other fisheries management organizations, as well as other technical and scientific bodies.

7.9 How FarFish will address the challenges identified above

In relation to the relatively low fishing effort in the SEAFO area, FarFish will explore how to best deal with such a data-poor situation when there is a need to maintain an international framework for both future use and protection. FarFish will focus the work to advance biological knowledge, and improve monitoring, compliance and enforcement in the SEAFO area.
By improving the quality of logbook data from the area and its submission, and by exploring the feasibility for a self-sampling programme, FarFish will seek to improve data quality and quantity.

7.10 Relevant literature

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