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Role	Name	Organisation	Date	File suffix[3]
Authors/ Task Leader	John R. Isaksen	Nofima	05/04/2019	JRI
Author	Andy Thorpe	Univ. of Portsmouth	05/04/2019	AT
Author	Pierre Failler	Univ. of Portsmouth	05/04/2019	PF
Author	Grégoire Touron-Gardic	Univ. of Portsmouth	31/01/2019	GTG
Author	Cindy Cornet	Univ. of Portsmouth	31/01/2019	CC
Author	Øystein Hermansen	Nofima	05/04/2019	ØH
Author	Thong Nguyen	SYNTESA	05/04/2019	TN
Author	Olavur Gregerson	SYNTESA	19/01/2019	OG
Author	Marianne Svorken	Nofima	19/01/2019	MS
WP leader	Petter Olsen	Nofima	10/04/2019	PO
Coordinator	Jónas R. Viðarsson	MATIS	10/04/2019	JRV
Administrative Coordinator	Oddur M. Gunnarsson	MATIS	10/04/2019	OMG

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[2] PU: Public, PP: Restricted to other programme participants (including the Commission Services), RE: Restricted to a group specified by the consortium (including the Commission Services), CO: Confidential, only for members of the consortium (including the Commission Services)
[3] The initials of the revising individual in capital letters

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Deliverable D3.4

Description of value chains and input-output structure of the Case Studies

10/04/2019

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Executive Summary

More than 20% of the European fishing fleets catches are taken from non-European waters. Access to these waters is often based on agreements with coastal states that allow the EU fleet to fish from surplus stocks in return for financial support. These agreements have been subjected to criticism, as these fisheries are sometimes poorly regulated and management decisions are often based on limited knowledge, compliance, and enforcement capabilities. It is also too often the case that trust between stakeholders is lacking. The aim of the FarFish project is to overcome these hurdles.

The FarFish project is designed around six case study areas in which the European fleet is actively engaged in fishing activities, including Cape Verde, Mauritania, Senegal and Seychelles, as well as the international high-seas areas in the southeast and southwest Atlantic. In this context of geographic, economic and cultural diversity, the project will gain insights into the sustainability of commercially important species; such as tuna, hake, mackerel, sardines, octopus, shrimp, etc.

This report provides a generalised mapping and description of the seafood value chains for the six case studies covered by FarFish. The work is based on publicly available data and has primarily been carried out as desktop analyses. One major challenge in this work has been the lack of reliable data, which in fact is a general challenge for these fisheries. The fisheries are conducted by multi-national fleets and different vessel types, ranging from artisanal fisheries to large scale industrial fisheries; and the reporting from these fleets vary a great deal. The available data from within the value chains from processing to consumption does vary considerably as well.

The six FarFish value chains are highly variable, despite having many of the same actors or flag states identified as main operators and much of the raw material is the same. The national configuration of the value chains differs quite substantially, even though much of the seafood products end up in the EU. This is highlighted in this report as each case study value chain are described. This work will feed into other work in the FarFish project. It is to be highlighted that this report is not an in-depth value chain analysis, but merely a generalised description of the value chains. A proper value chain analysis will follow in 2021 when FarFish will publish a “Report on the value chain analysis for EU fisheries in international- and SFPA waters” (D3.9).

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Table of Contents

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Abbreviations

ACOPESCA	National Seafood Safety Authority (Cape Verde)
ACP	African, Carrabin and Pacific (states)
AGAC	Association of Large Tuna Freezers
AIS	Automatic Identification System
AUCFZ	Argentine-Uruguayan Common Fishing Zone
BET	Bigeye tuna
BSH	Blue Shark
CECAF	Central East Atlantic Fisheries Committee
CPUE	Catch Per Unit Effort
CRODT	Oceanographic Research Center Dakar-Thiaroye
CVE	Cape Verdean Escudos
DARO	The Mauritanian Directorate of Ocean Resources Management
DG-Mare	EU's Directorate General for Maritime Affairs and Fisheries
DGRM	National Directorate of Maritime Economy (Cape Verde)
DPI	The Mauritanian Directorate of Industrial Fisheries
EEZ	Exclusive Economic Zone
EUMOFA	European Market Observatory for Fisheries and Aquaculture Products "
FAD	Fish Aggregating Devices
FAO	Food and Agriculture Organization of the United Nations
FICZ	Falkland Islands Inner Conservation Zone
FOCZ	Falkland Islands Outer Conservation Zone
FPA	Fisheries Partnership Agreement
FTE	Full Time Equivalent
GCM	The Mauritanian Coast Guard
GDP	Gross Domestic Product
HACCP	Hazard analysis and critical control points
HDI	Human Development Index
ICCAT	International Commission for the Conservation of Atlantic Tunas
IMP	National Institute of Fisheries Development (Cape Verde)
IMROP	The Mauritanian Institute of Oceanographic Research and Fisheries
INDP	National Institute of Fisheries Development (Cape Verde)
IOT	Indian Ocean Tuna
IOTC	Indian Ocean Tuna Commission
ITQ	Individual Transferable Quota
IUU	Illegal, Unreported and Unregulated
JSC	Joint Scientific Committee
LDAC	EU Long Distance Fleet Advisory Council
MPEM	The Mauritanian Ministry of Fisheries and Maritime Economy
NSO	The Mauritanian Statistical Office
RFMO	Regional Fisheries Management Organisation
SEAFO	South East Atlantic Fisheries Organisation
SFA	Seychelles Fishing Authority
SFPA	Sustainable Fisheries Partnership Agreement
SKJ	Skipjack tuna
SMA	Shortfin mako
STECF	Scientific, Technical and Economic Committee for Fisheries
SWO	Swordfish
TAC	Total Allowable Catch

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TAE	Total Allowable Effort
UNIDO	United Nations Industrial Development Organization
VMS	Vessel Monitoring System
WIO	West Indian Ocean
YFT	Yellowfin tuna

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1 Introduction

This report (deliverable 3.4) is a part of the FarFish work package 3 and completes task 3.2: "Value chain analysis". The purpose is to produce a description of the value chains in question for the six FarFish case studies and for the main target species (Table 1). A premise for the task has been to utilise already publicly available data, supplemented with key informal stakeholder interviews.

The case studies covered by the report and corresponding species are depicted in Table 1.

Table 1 Case studies and species covered in the report

Case Study	Cape Verde	Seychelles	Senegal	Mauritania	SE Atlantic	SW Atlantic
Species	Tuna	Tuna	Tuna, hake	Tuna, black hake, small pelagics, etc.	*- misc.*	*Argentine hake - misc.*

The work on the value chain analyses have been carried out separately for each case study, with dedicated teams within each. For each section authors are stated introductorily.

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2 Cape Verde

Author: **John Isaksen** (Nofima)

Short description on Cape Verde and their fisheries[4]

Cape Verde consists of 10 main islands located 570 km west of West-Africa, of which nine are populated. Population reached 546,000 in 2017, 26% more than in 2000 and 60% above the population in 1990. Since its independence from Portugal in 1975, Cape Verde followed a socialist agenda with central planning and public ownership of productive assets until 1991. Then, a multiparty political system was pursued, which has led to a stable democracy with free elections and alternating parties in power. Its economy boosted in the 1990's and 2000's, following liberalisation and privatisation, a growth driven by tourism. Recent economic annual growth (GDP) has been in the range of 2-4%. The currency – CVE; Cape Verdean Escudo – is fixed against Euro, in a rate of 110.265 CVE = 1 EUR.

The Cape Verdean exports of products, adding up to CVE 6 billion in 2016 (mEUR 54.1), is dominated by canned seafood (43%) and unpreserved seafood (fish, crustaceans and molluscs – 38%). Hence, more than 80% of product export incomes stems from fish. The largest trading partner for all export products is Spain, accounting for 72%, ahead of Portugal (19%). With tourism as the largest currency earning sector in Cape Verde, the export of products fades in comparison to export of services, which in value is 10 times larger (in 2016; CVE 58.8 billion = mEUR 533.7). Cape Verde also have a GSP+ (Generalised System of Preferences) trade preferences towards the EU, allowing zero duty trade with the EU on fisheries products, among other things (Amador et al., 2018).

Cape Verdean climate and soils do not support extensive agriculture, and only 10% of land area is suitable for agriculture. Agriculture is, however, an important industry for many Cape Verdeans and has, according to INE (2017: 194): *"… played a major role for the country, allowing the livelihood of a large number of families whose support and organization of family life are closely linked to the land."* With a land area of only 4,033 km^2, the main resources of Cape Verde are found within its 789,400 km^2 EEZ. Large parts of the Cape Verdean EEZ are however exploited by foreign vessels only (World Bank, 2008).

According to Statistics Cape Verde, the domestic fishing fleet can be divided into artisanal and industrial/semi-industrial fisheries. The former is mainly open vessels in coastal fisheries, while the latter consists of larger, motorized vessels. The Cape Verdean catch in 2016 was divided between artisanal and industrial vessels in a 44/56% distribution. For both vessel groups, tuna is the most important species, with a share of the total catch for artisanal and industrial vessels of 35% and 75%

[4] Sources: The World Bank (www.worldbank.org/en/country/capeverde/overview), and Cape Verde Statistics (www.ine.cv) and INE (2017).

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respectively in 2016. For the artisanal fleet, demersal fish and small pelagics amounted to 29% and 21% of their total catch respectively in 2016, while for industrial vessels, small pelagics and demersal constituted 20% and 4% respectively. Table 2 shows the catches of artisanal and industrial vessels in Cape Verde for the years 2014 and 2016, and Figure 1 shows the total catches of the two vessel groups in the period 2010–2016.

Table 2 Catches (in tonnes) by groups of species in Cape Verdean artisanal and industrial fisheries, 2014 and 2016. Source: INE (2017).

	2014		2016	
	Artisanal	**Industrial**	**Artisanal**	**Industrial**
Tuna	1,548	6,524	1,436	3,985
Small pelagics	935	2,169	869	1,079
Demersal	1,246	973	1,198	204
Various	65	38	619	36
Crustaceans	12	33	12	34
Shark	25	102	22	0
Total	**4,418**	**9,839**	**4,156**	**5,339**

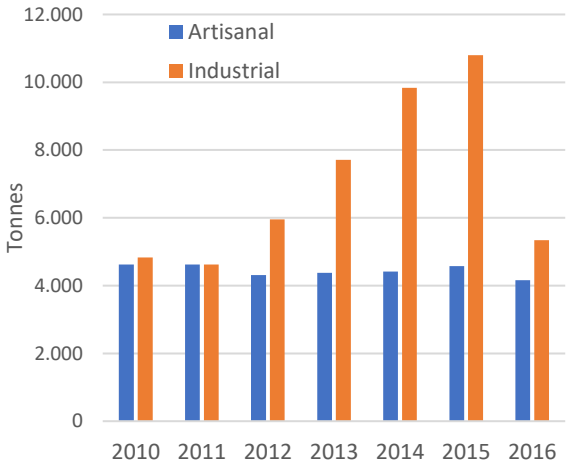

Figure 1 Total catch in Cape Verdean artisanal and industrial fisheries, 2010-2016. Source: INE (2017).

Table 2 shows the relative importance of tuna species for both the artisanal and industrial domestic fleet, while Figure 1 shows how industrial catches fell in 2016 after a considerable 130% increase in the period 2011–2015. Table 3 presents the number of fishing vessels and fishers in the two sectors

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for 2011 and 2016[5]. We see that in 2016 nearly 6,300 fishermen were engaged in domestic fisheries in Cape Verde – 1,500 more than in 2011. According to Erzini *et al.* (2017) roughly 9,500 people, or about 5% of the working population, worked in the fisheries sector in 2011. In addition to 4,800 fishers, there were roughly 3,500 "fish market women", and about 1,100 persons within processing, exports and administration.

Table 3 Number of fishing vessels, fishers and catch (in tons) in Cape Verde artisanal and industrial fishing, 2011 and 2016. Source: Statistical Yearbook Cape Verde 2015/2016 (http://ine.cv/publicacoes/anuario-estatistico-cabo-verde-2015/)

	2011				2016			
	Vessels	**Fishers**	**Fishers/ vessel**	**Catch (t)**	**Vessels**	**Fishers**	**Fishers/ vessel**	**Catch (t)**
Artisanal	1,239	3,717	3.0	4,622.5	1,683	5,078	3.0	4,155.8
Semi-industrial	90	1,092	12.1	4,622.5	122	1,220	10	5,338.6
Total	**1,329**	**4,809**	**3.6**	**9,245.1**	**1,805**	**6,298**	**3.5**	**9,494.4**

Table 3 shows a 36% increase in the number of fishing vessels in both sectors from 2011 to 2016, whereas the number of fishers has not increased to the same degree (+ 31%), due to fewer men per vessel in the semi-industrial sector. Also, we see that the total catch has increased from 2011 to 2016, stemming from semi-industrial catch, while artisanal catch has decreased. Another feature, which can be read from the table, is that catch per vessel is smaller in 2016 than in 2011 in both sectors. However, the catch has fluctuated considerably in the period, especially from the semi-industrial fleet. While artisanal catches have been relatively stable at between 4,200 and 4,600 tons from 2010 to 2016, the semi-industrial catch varied between 4,600 and 10,800 tonnes (in 2015) in the period.

As put forward in Erzini et al. (2017) and Mikkelsen (2018) – FarFish deliverables D2.1 and D4.1, respectively – Cape Verdean tuna fisheries are fairly well-regulated, subjected to ICCAT catch and effort limits, and with well-functioning management organizations like DGRM (National Directorate of Maritime Economy), INDP (National Institute of Fisheries Development), IMP (National Port Institute), Coast Guard and ACOPESCA (National Seafood Safety Authority). Moreover, like the EU, other nations have also negotiated access to Cape Verdean waters, like Japan, China, as well as countries in the African sub-region like Senegal, Mauritania, Gambia, Guinea Conakry and Guinea Bissau (Erzini *et al.*, 2017: 11).

[5] Amador et al. (2018: 19-20) operates with slight different numbers of vessels and fishers in 2016: 1,588 artisanal vessels with 5,078 fishers, and 118 semi-industrial with 1,205 fishers. In addition they add 4 industrial vessels, employing 15 Cape Verdean fishermen: *„...vessels earlier under foreign ownership were previously flagged to Cape Verde, including purse seines operated by EU beneficial owners. The four Cape Verdean vessels listed under the industrial fleet are understood to have now re-registered under other flags (Panama and Belize).*"

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Another feature with Cape Verdean fisheries is that landings to the islands exceed the catch of the national and EU fleet. According to Erzini *et al.* (2017: 9): "*…total tuna landings averaged 17,605 t from 2005 to 2014, with strong increases in 2013 and 2014 (29,149 t and 30,188 t respectively), the EU/SFPA share* [which averaged 2,133 t in the period 2011-2015; our insertion] *is less than 20% of total tuna landings*". In 2014, total tuna landings to Cape Verde was 30,188 tons, of which domestic artisanal and industrial fisheries accounted for 27% (8,072 tons) and EU/SFPA-catches 19,5% (5,893 tons). Hence, other vessels – non-national and vessels not comprised by the EU/SFPA – landed a bit more than half of the tuna to Cape Verde (54% – 16,223 tons) in 2014.

Cape Verde – EU Fisheries agreement

Fisheries agreements between the EU and Cape Verde dates back to 1990. The current 4-year SFPA is a prolongment of the agreement signed in 2007. It came into effect on 23rd December 2014 and expires on 22nd December, 2018. The Cape Verde-agreement is a part of the tuna network fisheries agreements in West Africa, allowing EU-vessels from Spain, Portugal and France (utilizing purse seine, surface longline and pole and line) to fish for tuna (and tuna-like species) in the range 5,000 tonnes on an annual basis.

The annual economic contributions from EU to Cape Verde, in return for EU vessels' opportunity to fish tuna in Cape Verdean waters, was EUR 550,000 the two first years of the agreement (2015-2016), and EUR 500,000 for the latter two. Of this, half is earmarked for promoting sustainable management of Cape Verdean fisheries, which should include reinforcement of control and surveillance capacities, and the support of local fishing communities. Additionally, per vessel advances is collected for participating vessel upon issuing a fishing license (as shown in Table 4), which is the anticipated flat-rate fee per tonnage: 55 EUR per ton the first two years of the agreement and EUR 65 per ton the two latter. Hence, for a seiner paying EUR 5,525 per year (the second period) upon the issuing of a fishing license, it corresponds to a catch of 85 tonnes times the fee per tonne (€ 65). In the first period, the reference catch of tuna seiners is 90 tonnes. The corresponding anticipated catch figures behind the per vessel advances for surface longliners and pole and line vessels (in the table below) is 58 tonnes in the first period and 50 tonnes in the second for surface longliners and 9 tonnes in both periods for pole and line vessels.

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Table 4 Fishing possibilities for EU vessels and annual advances per vessel, SFPA between Cape Verde and the EU. Source: https://ec.europa.eu/fisheries/cfp/international/agreements/cape_verde

Flag state		Tuna seiners	Surface longliners	Pole and line	Total
Spain		16	23	7	46
France		12	-	4	16
Portugal		-	7	2	9
Total		28	30	13	71
Per vessel advances	2015-16	€ 4,950	€ 3,191	€ 450	
	2017-18	€ 5,525	€ 3,250	€ 585	

All in all, over the four year period, Cape Verde will benefit from a monetary transfer from the EU and licenced EU vessels, in the range of mEUR 3.1, of which mEUR 1,05 is a compensation for the access to the resource, similar to the support for the Cape Verde fisheries policy (mEUR 1,05), and mEUR 1,0 is the fees paid by EU vessels upon issuing of fishing licences (given that all numbers of vessels in the table above applies).

The protocol of the Agreement[6] also contains passages regarding the need to hire local Cape Verdean seamen on licensed vessels (from two to six Cape Verdian seamen depending on vessel type), on logbooking, technical measures, landings and transhipments, check points, satellite monitoring systems (VMS) and other clauses. Long liners and tuna seiners must operate more than 18 nautical miles outside the baseline, whereas the operation of pole and line vessels can take place beyond 12 nautical miles from the baseline. Figure 2 shows maps of Cape Verde's baseline (left) and its localisation in relation to West Africa and it's EEZ (right).

[6] See http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22014A1224(01)&from=EN

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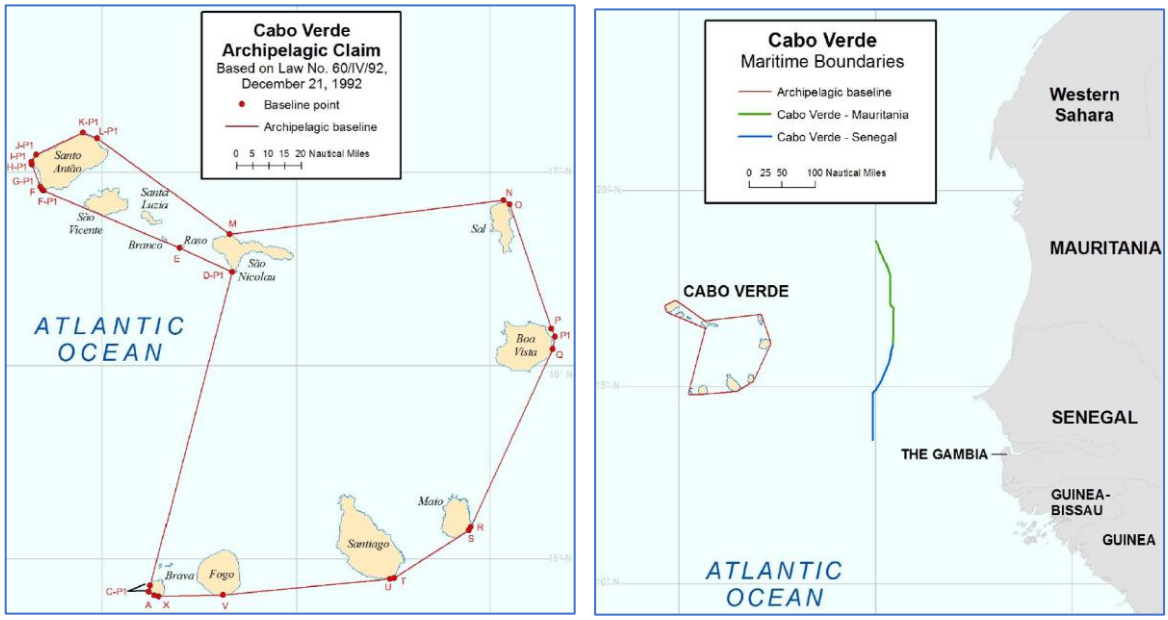

Figure 2 Cape Verde, baseline and EEZ limits towards Mauritania and Senegal in east. Source: US Department of State, Bureau of Oceans and Environmental and Scientific Affairs[7]

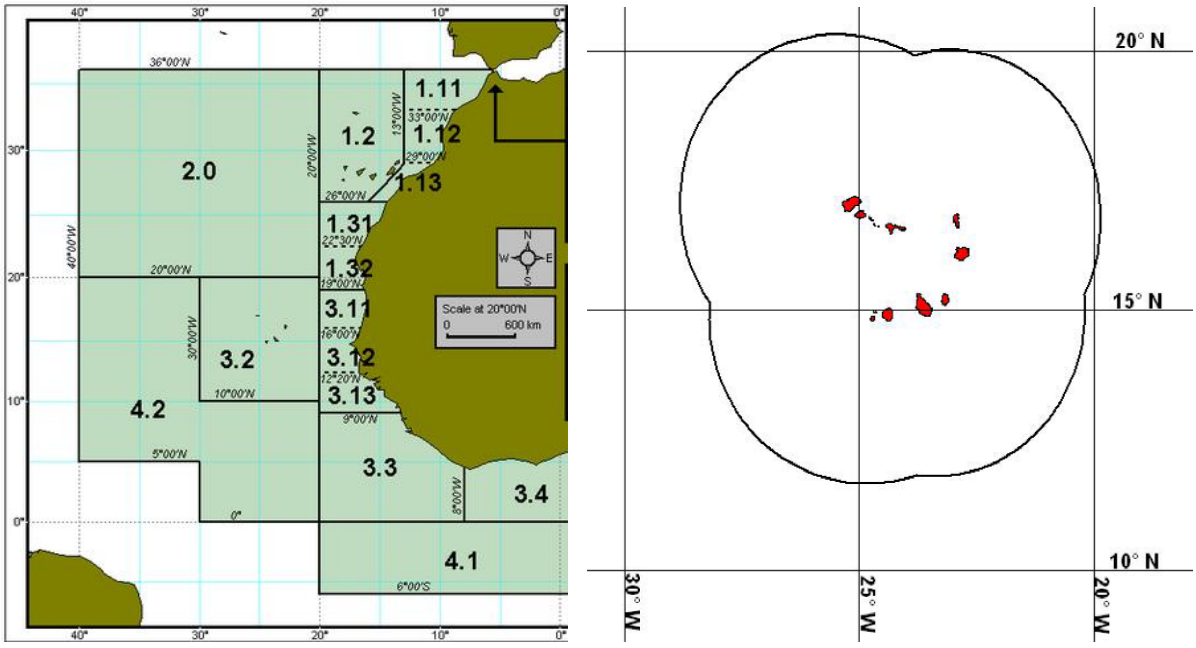

Figure 3 Cape Verde insular area 34.3.2 (as part of FAO area Eastern Central Atlantic) and an approximation of the Cape Verde EEZ-limits. Sources: http://www.fao.org/fishery/area/Area34/ (left) and World Bank (2008) – right

Figure 2 and Figure 3 both demonstrate the geographic location of Cape Verde in the Eastern Central Atlantic, west of the African mainland. The Cape Verde insular area (FAO area 34.3.2) as part of the Southern Coastal area (FAO area code 34.3) cover most of the Cape Verdean EEZ, with some limited areas reaching outside in the eastern and northern outreach. Moreover, the Cape Verdean EEZ covers

[7] See https://www.state.gov/documents/organization/221365.pdf

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roughly 60% of the Cape Verdean Insular area (FAO area 34.3.2). Hence, if fish and catches were distributed relatively equal throughout the FAO area 34.3.2 roughly 60% could belong to the Cape Verdean EEZ. However, such an assumption would be fairly misguiding, since next to all artisanal catch are taken inside the EEZ, and tuna catches are more densely located in the areas to the east and south east of the Cape Verdean zone (not so much north and west of the islands).

2.1 Catches under the SFPA

As noted above, the SFPA for Cape Verde allows up to 71 licensed EU-vessels to fish for tuna and tuna like species within the Cape Verdean EEZ, in the range of 5,000 tonnes annually. A quite recent evaluation (February 2018) of the EU-Cape Verde SFPA, in which DG-Mare has contributed with detailed figures (Amador et al., 2018), demonstrates that the total catch in Cape Verde waters between 2011 and 2015 is estimated to be divided between Cape Verde, EU and Japanese vessels, at an average ratio of 70%/22%/8%. For 2016, domestic catches were considerably reduced, especially for the semi-industrial fleet (8-24m) due to increased steaming distances and lower fixed prices paid by the dominant buyer, leading to a reduced Cape Verde share.

Table 5 shows the total catch under the SFPA by EU member state vessels in the period 2014–2017, as presented by Amador et al. (2018), based on figures from DG Mare. Catch is divided between tuna, sharks and other fish, and also between flag states.

Table 5 Licensed EU vessels' catch in Cape Verdean waters by flag country, in tonnes, 2014-2017. Source: Amador et al., 2018: 55.

	2014	2015	2016	2017	Average 2014-17
Tuna	8,251	2,042	2,392	7,819	5,126
- skipjack	91%	88%	64%	78%	83%
Shark	1,392	2,797	1,977	2,052	2,054
- blue shark	96%	96%	96%	95%	96%
Other	56	127	126	112	105
Total	**9,699**	**4,966**	**4,494**	**9,983**	**7,285**
- Spain	8,246	4,617	3,801	9,791	6,614
- Portugal		98	175	125	133
- France	1,453	251	517	66	572
> Longliners	1,445	2,947	2,119	2,178	2,172
- blue shark	92%	91%	89%	90%	90%
> Purse seine	6,969	659	962	6,477	3,767
- Skipjack tuna	90%	88%	53%	79%	83%
> Pole & line	1,284	1,361	1,414	1,328	1,347
- Skipjack tuna	99%	89%	71%	73%	83%

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Table 5 shows that the catch of licenced EU-vessels under the SFPA varied between 4,500 and 10,000 tonnes in the period. Hence, the catch has (on average) been higher than the stipulated reference level set in the agreement. Tuna accounts for the lion's share of the catch, with 2015 as an exception. Skipjack tuna (*Katsuwonus pelamis*) is the main (if only) targeted tuna species – accounting for more than 80% of total tuna catches (on average) during the period 2014-2017. Skipjack tuna was assessed by ICCAT in 2014 as being within sustainable levels and INDP has estimated the potential tuna resources in Cape Verdean waters to be in an annual range of 25,000–30,000 tonnes (Amador et al., 2018: 17). In the years 2012–2014, the total tuna catches of domestic and EU-vessels in the Cape Verde EEZ was in the range of 24,000–33,000 tonnes. Adding the catch of Japanese (8 longliners), Senegalese (6 vessels; 4 purse seiners and 2 pole and line), and other nations who also have agreements with Cape Verde to fish within their EEZ (op cit; p. 25), the potential tuna catch level might well have been surpassed in the three-year period, and might have contributed to the considerable decline in catches in 2015 and 2016. Some quantities of yellowfin (*Thunnus albacares*) and bigeye (*Thunnus obesus*) tuna are caught, constituting 8% and 9% of EU vessels' tuna catch in the period. The remaining tuna catches consists of relatively small quantities of frigate (*Auxis thazard*) and bullet (*Euthynnus alletteratus*).

The catch of sharks is dominated by blue shark (*Prionace glauca*) constituting 96% of the EU fleet's shark catch in the area, and in 2015 and 2016, roughly 50% of total EU catches in Cape Verdean waters. According to Amador et al. (2018: 17) risk assessments of this species in 2010 and 2012 showed it: "*… capable of sustaining relatively high levels of fishing mortality*". Catches of other shark species includes shortfin mako shark (*Isurus oxyrinchus*) and some small quantities of silky and mako sharks. The latest assessments on shortfin mako sharks have considered it as one of the most vulnerable of all pelagic sharks, due to low productivity (op cit.). According to Amador et al. (2018) Cape Verde authorities have claimed that not all countries exploiting shark resources in the region fully declare their catches. Other marine resources contributing to EU catches in Cape Verde waters ("Other" in Table 5) we find some quantities of swordfish (*Xiphias gladius*), with 360 tonnes in total in the period.

Summed up, the catches under the latest EU – Cape Verde SFPA has been above its reference level in the years 2014–2017. Skipjack tuna and blue shark accounted for 85% of the total EU catches in these waters in the period, where Spanish vessels were dominant, with 91% of catches.

For comparison, the total catch of tuna in the Eastern Central Atlantic constituted about 375,000 tonnes in 2016, while global catches reached nearly 5 million tonnes, according to www.atuna.com. In this global or regional overview, the Cabo Verdean catches, where domestic and SFPA-catches add up to about 7,800 metric tonnes, is small related to the overall catches reported above. Even if we include all landings by foreign vessels in 2016 (26,000 tonnes according to Table 9) the share of Eastern Central Atlantic tuna catches is only 8 %. In the trade flow diagram below we see that in a global

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framework, the supply from/via Cabo Verde, even the Central Eastern Atlantic, is too small to be included. World-wide, the Spanish fleet alone caught on average annually more than 125,000 tonnes of tuna in the Indian Ocean in the period 2011–2015 (Lecomte *et al.*, 2017a) and a total of 326,000 tonnes world-wide in 2014 (Lecomte *et al.*, 2017b). Spain was the fifth largest tuna catching nation in 2014, behind Indonesia, Japan, the Philippines and Taiwan.

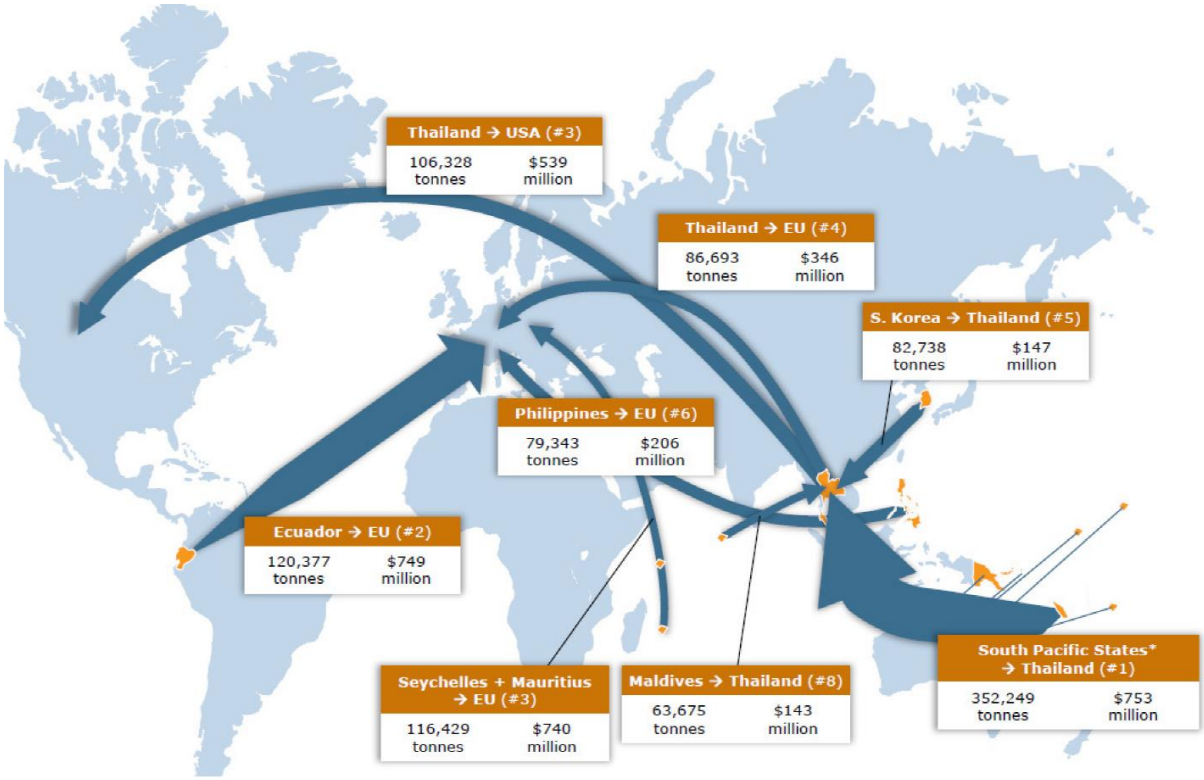

Figure 4 Key global tuna trade flows. Source: Rabobank (2015)

2.1.1 Vessels operating under the SFPA

The SFPA opens for 71 EU vessels to fish for tuna and tuna like (highly migratory) species, at a reference tonnage of 5,000 tonnes per year in the period 2014–2018. The vessels allowance opens for up to 28 purse seiners, 30 surface long liners and 13 pole-and-line vessels. The EU member states accessing these opportunities are Spain, Portugal and France. In Table 6 the allocation of vessel groups to countries according to the protocol, and their utilisation is given.

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Table 6 Total number of EU vessels by gear and country allocated Cape Verde licenses, 2015–2017. PS=purse seine, LL= long liners, PL= pole and line. Source: Amador et al. (2018: 54)

	Protocol Allocation 2014		2015		2016		2017	
			#	Share	#	Share (%)	#	Share (%)
ES	PS	16	12	75%	13	81%	11	69%
	LL	23	7	30%	13	57%	14	61%
	PL	7	7	100%	7	100%	7	100%
	TOT	**46**	**26**	**57%**	**33**	**72%**	**32**	**70%**
FR	PS	12	12	100%	11	92%	10	83%
	PL	4	1	25%	1	25%	1	25%
	TOT	**16**	**13**	**81%**	**12**	**75%**	**12**	**75%**
PT	LL	7	2	29%	2	29%	2	29%
	PL	2		0%	1	50%		0%
	TOT	**9**	**2**	**22%**	**3**	**33%**	**2**	**22%**
TOT		**71**	**41**	**58%**	**48**	**68%**	**46**	**65%**

Given the number of vessels taking part in the fishery over the period (Table 6) the interest in the fishery appears to be only moderate. Only 2/3 of the potential was exploited, with gear and country specific differences however. Despite this under fulfilment in participation we have seen that at least in one of the years in question (2017), the licensed fleet was overfishing its reference catch level (5,000 tonnes). While Spanish pole & line vessels fully exploit their potential, the utilisation from the same vessel type from France and Portugal is between zero and 1/3 in the period. This can be due to the Cape Verdean prohibition against catching live bait within the 12-mile zone, a legal practice in Senegal, as brought forward by Amador et al. (2018). French purse seiners have the second highest utilisation ratio, ahead of purse seiners from Spain, while long liners from Portugal have the most stable participation.

The ratio of participation in the protocol is divided between Spain, France and Portugal in a 65%/23%/12% fashion, not considering the difference in effort between vessel groups. French fulfilment is above its ratio, while Portuguese is below and Spain roughly in line. Without further knowledge of the different vessels operating in the area, we cannot conclude whether or not the same vessels are among the licensed fleet on an annual basis.

In general, purse seiners have a crew of 20-40 persons, longliners in the range of 13-18 and bait boats roughly 20. With no information on the licenced vessels, nor the temporal aspects of when catches take place, we cannot conclude on the total employment in Cape Verdean waters, or the seasonality of the fishery. As Amador et al. (2018) beholds, Cape Verde and Mindelo is a hub for the operation of many vessels operating within the South Atlantic for tuna and other species. Moreover, they (op cit., p. 147) estimate the employment (full-time equivalent (FTE's)) under the licensed vessels' catch

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opportunities in Cape Verde waters. According to their assumptions, a Spanish purse seiner will have a crew of 39 persons (of which 15 are EU citizens, two are Cape Verdean citizens and 22 from other countries), while a French purse seiner will have a crew of 24 persons (with a 9/2/13 distribution of the aforementioned nationalities). Longliners will have a crew of 16 (6/2/8) and pole and liners 20 (4/3/13). Based on the average catch in the Cape Verde EEZ in the 2015-2017 period, relative to that in the rest of the Atlantic Ocean, they find that the opportunities under this SFPA have brought about the employment of 53 FTE's, of which 15 Europeans, 6 Cape Verdeans and 32 from other nations. This employment is distributed with more than half on pole and liners (27), 18 on purse seiners and 7 on longline vessels. Amador et al. (2018) concludes that with 97 Cape Verdeans employed on longliners in 2017, the minimum seamen requirements (13) is exceeded, even though none were employed on purse seiners or pole and liners.

Amador et al. (2018) estimates the license fees paid by shipowners to be in the range of m€ 1.47 for the period 2015-2017, of which k€ 495 (34%) stem from the fixed asset fees, and the rest from the variable. This accrues in addition to the k€ 800 from the EU. Moreover, the overfishing of the reference tonnage in 2017 (and possibly 2018) will increase EU payments, so for the three years (2015–2017) total transfers from EU and shipowners add up to (at least) m€ 2.27, or on average k€ 756 per year. That is equivalent to 9.5% of the estimated turnover the licensed vessel have obtained from the catch in the Cape Verde EEZ under the SFPA (in total m€ 23.76 for the period 2015-2016, according to Amador et al., 2018: 73).

2.1.2 Fishing operations

The fishing area in question under the SFPA covers only the Cape Verdean EEZ, but the richest tuna fishing grounds in the Central Eastern Atlantic have however been outside of that area, as shown in Figure 5.

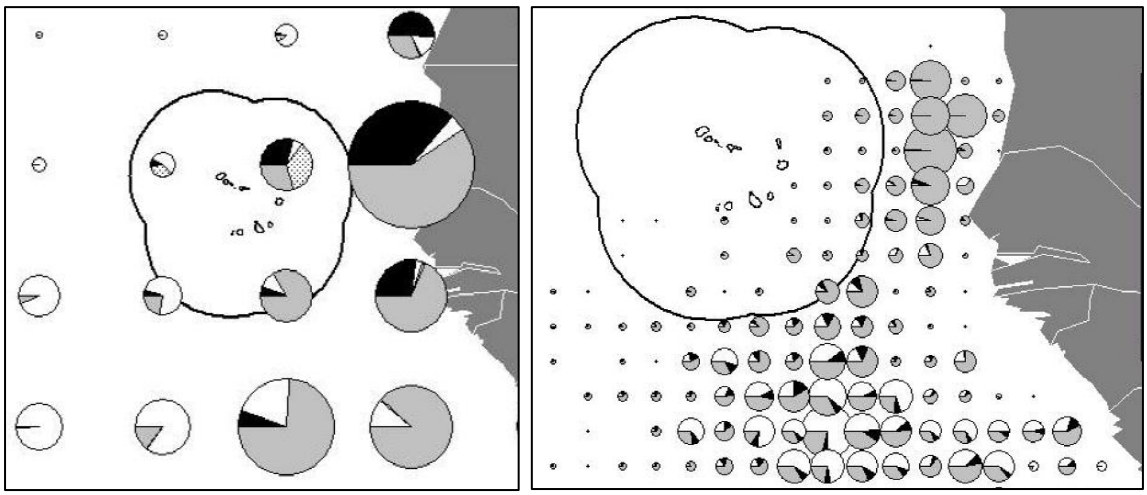

Figure 5 Tuna catches by gear (left) for the period 1993-2003, and Spanish purse seine catches by species (right) for the period 2000–2003. Black=Pole&line/Bigeye; White=Longline/Yellowfin; Grey=Purse seine/Skipjack; Light grey= Other gears. Sources: ICCAT/World Bank (2008:64/65)

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One peculiarity with Cape Verde is the extensive use of hand line in the tuna fishery in the north eastern quadrat in the earlier period (left). We also see from the right-hand side that skipjack tuna has been the favoured target species for Spanish purse seiners in earlier periods.

Maps of the fishery more up to our time, and partly within the timeframe for the present SFPA, can be found from Amador et al. (2018). Figure 6 shows the tuna fisheries for EU purse seiners and pole and line vessels respectively, for the period 2011-2015. Longliners are omitted since tuna is rarely caught with this gear.

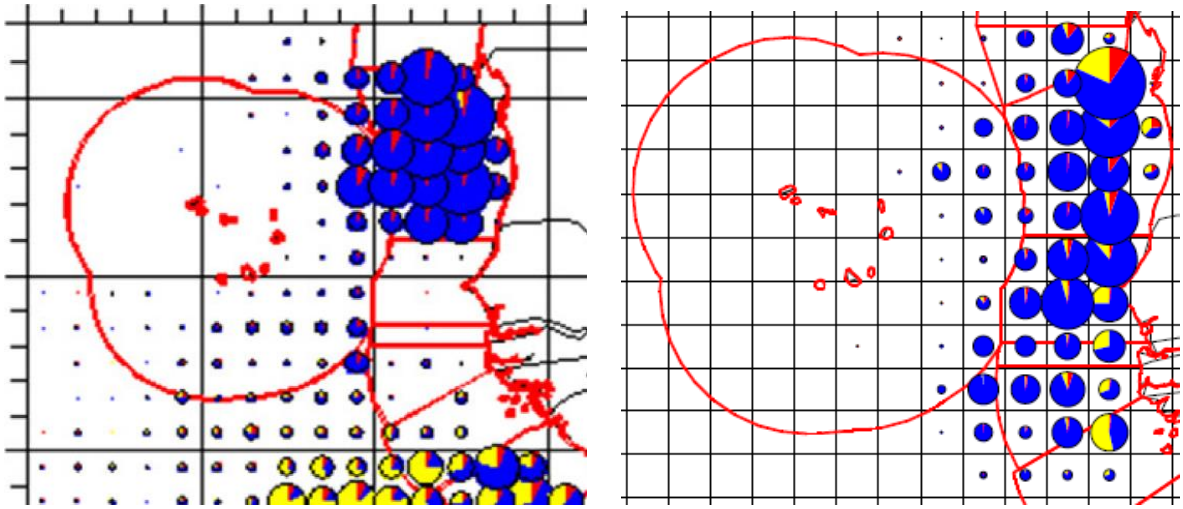

Figure 6 Catch of tuna with purse seiners (left) and bait boats/pole and line (right) from Spain and France, 2011–2015. Blue=Skipjack; Yellow=Yellowfin; Red=Bigeye. Source: ICCAT/Amador et al. (2018:120/130)

Figure 6 clearly shows that a) skipjack tuna is the most common tuna species caught by both purse seiners and pole and line vessels in these areas, and that most of the tuna is caught to the east and northeast of the Cape Verdean EEZ.

Except for the upper left figure (Figure 5), these figures do not take into account all tuna catches, only those of Spanish and French purse seiners and pole and line vessels. We also know from other sources that other nations' vessels operate in these waters. Domestic tuna and other fish catches within the Cape Verde EEZ are mentioned above. In addition, Amador et al. (2018: 25) claims that Cape Verde has an agreement with The Federation of Japanese Cooperatives, allowing eight Japanese purse seiners to its EEZ in 2017. Also, a reciprocal fishing agreement with Senegal exist, which allowed four purse seiners and two pole and line vessels in 2017. In addition, four El Salvadorian, three from Curacao, two from Panama and one purse seiner from Belize were licensed to fish in the Cape Verde EEZ in 2017. This is information obtained from the Port Authorities of Cape Verde. Amador et al. (2018: 25) further claims that: "*High seas reporting, monitoring and surveillance of fishing activity in Cape Verdean waters is* ***currently ineffective****. With regard to the EU vessels the Cape Verdean authorities rely on the EU sharing data from EU vessel logbooks to determine catches. Concerns have been raised with regard to the frequency of landings.*"

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As a mend to this shortcoming we have addressed the online query at the Global Fishing Watch initiative (see: globalfishingwatch.org), to address the fishing effort in Cape Verdean waters. The figures below all stem from Global Fishing watch data and are demonstrated for the purpose of addressing the efforts of fishing vessels within the Cape Verdean EEZ. A disclaimer must be made regarding this data: It is not the result of a thorough investigation, but an illustration of the tool's capabilities and limits[8]. To some degree, we have had the to make an approximation to the Cape Verdean EEZ limits. It also seems as if the algorithms used by Global Fishing Watch, easier identifies the effort of longliners than of purse seiners and other gears. Moreover, the maps, figures and tables are the results of the outcome from using this tool and can be seen as an illustration of the fishing efforts within the Cape Verde EEZ.

Table 7 Number of vessels per flag state fishing in Cape Verde EEZ waters in 2017 and number of fishing days. All and vessels with five fishing days or more. Source: Globalfishingwatch.org

Flag state	Registered vessels		Vessels with more than 5 fishing days	
	Number of vessels	Total fishing days	Number of vessels	Total fishing days
Spain	24	506	11	456
France	2	13	1	9
Portugal	4	47	2	44
Netherlands	2	9	1	7
Belize	1	1	0	0
Panama	2	37	2	37
El Salvador	2	12	1	11
China	6	11	0	0
Japan	28	1,176	23	1,078
Ivory Coast	1	10	1	10
Senegal	1	2	0	0
	73	**1,824**	**42**	**1,652**

Table 7 shows that according to the estimates from Global Fishing Watch, 73 foreign fishing vessels were present in Cape Verdean waters during 2017. Most of the registered effort was Japanese,

[8] To use the disclaimer from Global Fishing Watch itself when producing an overview over fishing vessel within the Cape Verdean EEZ in the second half of 2017: "*Global Fishing Watch analyzes Automatic Identification System (AIS) data collected from vessels that our research has identified as known or possible commercial fishing vessels, and applies a fishing detection algorithm to determine "apparent fishing activity" based on changes in vessel speed and direction. As AIS data varies in completeness, accuracy and quality, it is possible that some fishing activity is not identified as such by Global Fishing Watch; conversely, Global Fishing Watch may show apparent fishing activity where fishing is not actually taking place. For these reasons, Global Fishing Watch qualifies all designations of vessel fishing activity, including synonyms of the term "fishing activity," such as "fishing" or "fishing effort," as "apparent," rather than certain. Any/all Global Fishing Watch information about "apparent fishing activity" should be considered an estimate and must be relied upon solely at your own risk."*

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accounting for roughly 65% of the total, with Spain as the second largest (28%). Other nations fleets' effort was modest in comparison. Excluding vessels with effort below six fishing days does not have great impact, except for three nations falling outside with this scope (Belize, China and Senegal). Adding this information moderates the impression of the fishing activity in the Cape Verde EEZ. Below, we illustrate with figures from Global Fishing Watch the total efforts in the Cape Verde EEZ, distributed on different gear types, underlining the potential under-reporting of purse seiners' effort, seasonality in fishing operation, and a heat map showing where in the EEZ the efforts are the greatest.

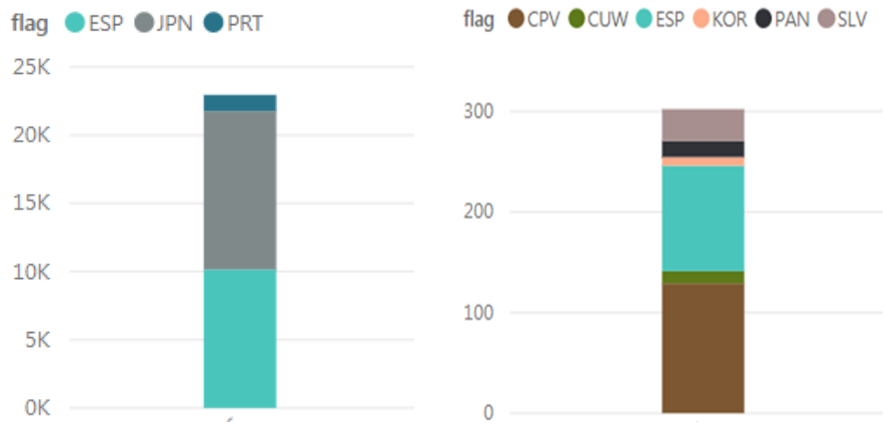

Figure 7 Fishing hours of long liners (left) and purse seiners (right) and flag states (Cape Verde, Curacao, Spain, Korea, Japan, Panama, Portugal, Slovakia) in Cape Verdean EEZ in 2016. (Different scale on y-axis). Source: Global Fishing Watch

Figure 7 shows, like in the table above for 2017, that the most longlining efforts stems from Japanese vessels, a bit ahead of the Spanish. Compared to those, Portuguese vessels had little activity in these waters in 2016. To the right we see that purse seiners are registered with only 300 hours of fishing activity in these waters in 2016, of which Spanish and Cape Verdean vessels cover more than 2/3, with minor efforts from other nations – in some cases of surprising nationality (Slovakia).

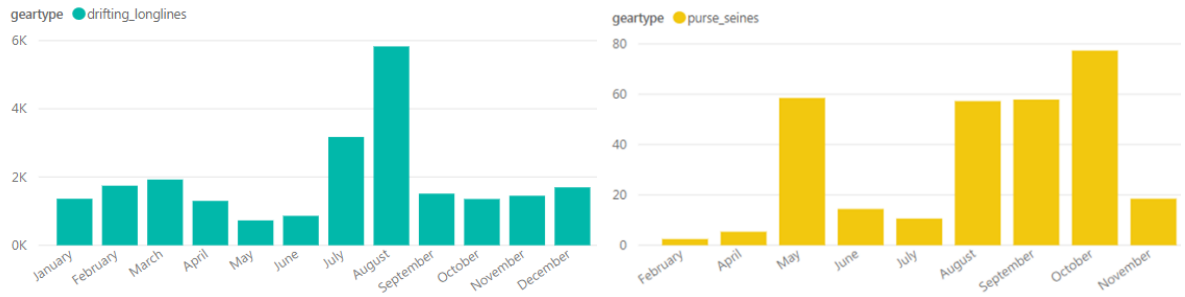

Figure 8 Seasonality (fishing hours by month) for longliners and purse seiners by flag states in 2016. Y-axis scale differences. Source: Global Fishing Watch

We see from Figure 8 that longliners have a peak in their fishing activity at late summer (July/August). For purse seiners, one cannot conclude, even though we find peaks in May and August to October, since the total of roughly 300 hours effort corresponds to nothing more than one vessel fishing every day of the week, for a bit more than a month (five weeks).

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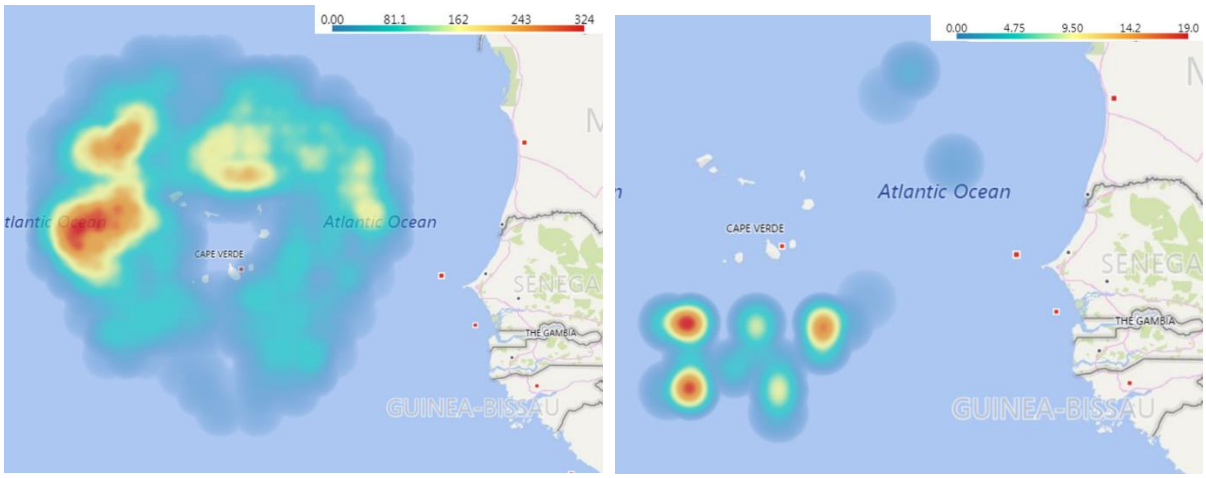

Figure 9 Heat map, longline (left) and purse seine (right) fleet fishing hours in Cape Verde EEZ 2016. Source: Global Fishing Watch

The figures above show that the main area for longliners' fishing is mainly to the west of the islands, whereas purse seiners "mainly" fish in the southern parts of the Cape Verde EEZ. This is also seen when comparing with Figure 6 and Figure 5. Not surprisingly since longliners in general target other species (blue shark) than the purse seiners and pole and line vessels (skipjack tuna).

2.1.3 Landings

Different data sources for landings to Cape Verde have been identified and addressed. First, INDP have produced a detailed spreadsheet for this purpose (INDP, 2018), obtained from the Cape Verde fisheries administration. This report contains landings of tuna and other species, from named EU vessels in Cape Verde for the period 2015–2017 (and first half of 2018). In the table below, total annual landings of tuna and other species (in tonnes) in Cape Verde is given per flag state for the years in questions, together with number of vessels.

Table 8 Landings (in tonnes) from EU-vessels on Cape Verde, 2015-2017 (and first half of 2018). Tuna and other fish, flag state and number of vessels (in brackets, if ≠ 1). Source: INDP (2018)

	2015		**2016**		**2017**		**2018***	
	Tuna	**Other**	**Tuna**	**Other**	**Tuna**	**Other**	**Tuna**	**Other**
Spain (# of vessels)	1,201 (24)	5,997 (22)	239 (19)	3,142 (19)	6,760 (32)	3,107 (24)	*1,898 (27)*	*2,177 (26)*
Portugal (# of vessels)	91 (2)	399 (2)	75	78	99 (2)	188 (2)	*442 (6)*	*32 5 (6)*
Holland			1,474					
UK							*102*	*21*
Total (# of vessels)	**1,292** (26)	**6,395** (24)	**1,787** (21)	**3,220** (20)	**6,859** (34)	**3,296** (26)	***2,442*** *(34)*	***2,523*** *(33)*
Annual total	**7,687**		**5,007**		**10,155**		***4,965***	

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Table 8 shows a varying number of vessels landing catch of tuna and other species in Cape Verde in the period. Vessels are mainly Spanish, but also a few from Portugal, and one vessel from UK and Holland. The latter two indicates that the spreadsheet contains landings, not necessarily catch under the SFPA, since Dutch and British vessels are not favoured under the agreement. Moreover we see that landings vary between years and that Spanish vessels dominate, except in the case of tuna in 2016, when a Dutch vessel sets the tone. From Figure 10 we see that tuna landings increased from 2015 to 2017, while landings of other species were reduced in the same period. The figures from 2018 only cover first half of the year, so the development for this year is inconclusive. However, both tuna landings and participation are greater than in the first two years of this period. Data are, however, not detailed enough to state which gear landings are taken with.

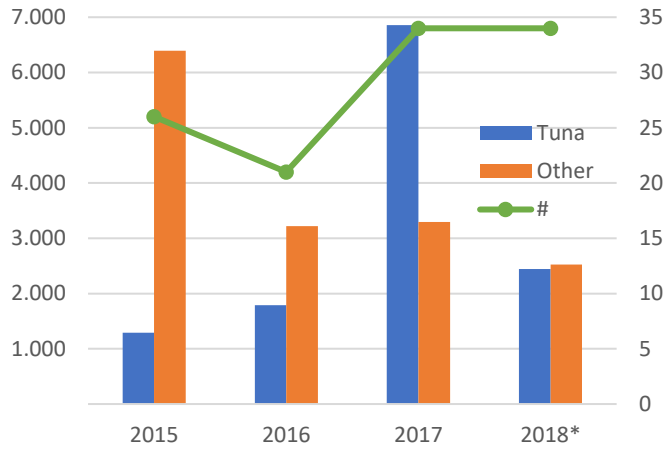

Figure 10 Landings from EU-vessels (tonnes), and number of vessels. Source: INDP (2018)

With named vessels, the pictures below give an impression of which vessels landed the greatest volume of tuna and other species on Cape Verde within the first half of 2018.

Figure 11 Two example vessels (of 34) landing catch on Cape Verde in 1st half 2018. Source/©: MarineTraffic.com/C.A. Peres DaSilva

The two vessels are from Spain (left) and Portugal (right), 40 and 44 meters respectively, built in 2008 and 2006, with roughly 400 and 600 GT. Altogether their landings constituted 11% of total landings from EU vessels in Cape Verde in the 1st half year of 2018.

Another source for landings into Cape Verde is found in Amador et al. (2018), who obtained data from the Cape Verdean Maritime and Ports Authorities. Details on total landings from foreign vessels to Cape Verde in the period 2014 to 2018 is found below in Table 9. Landings from EU vessels are also included in this source and held together with the catch by EU licensed vessels in the period.

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Table 9 Landings into Cape Verde from all foreign vessels and EU vessels, 2014–2017. Source: Amador et al. (2018:26)

Landings into Cape Verde from:	2014	2015	2016	2017	Average
All foreign vessels	8,000	15,630	26,010	Significant decrease	16,550
All EU-vessels (ESP & PRT)	5,474	6,693	11,079	18,468	10,480
Catch under the SFPA	*9,699*	*4,966*	*4,494*	*9,982*	*7,285*

Table 9 shows an increase in foreign vessels' landings to Cape Verde in the period, but with a significant drop in 2017 (not quantified) despite an increase in EU-vessels catch. That is also the case for EU-landings, which increased by 240% in the period. According to Amador et al. (2018) the increase in the period is due to effective actions from a processor in Mindelo to attract Spanish vessels, and the reduction of port charges. Of the EU licensed vessels, only Spanish and Portuguese longliners and Spanish purse seiners land their fish in Cape Verde. The French purse seiners land their catch in Senegal. Landings to Cape Verde also contains fish caught in international waters or in third county EEZ's, and most catch from longliners are loaded into containers at quayside and transhipped to EU. EU licensed vessels accounted for 84% of the volume landed in Cape Verde by EU-vessels in 2017.

When held up against figures of the catch in Cape Verdean EEZ by EU-registered vessels in the same period, we see that landings from EU-vessel exceeds the catch in Cape Verdean water in all years after 2014. Moreover, EU-vessel landings contribute with about 40-70 per cent of total foreign landings in Cape Verde in the years we have figures for. Another, and little disturbing, issue with the numbers in Table 9 is that they do not add up to the landings reported in Table 8. When considering the grand total in the first table, it is pretty close to the reported catch under the SFPA for the years 2016 and 2017 (+2-11%), but for 2015 the discrepancy is 55% (4,966 tonnes versus 7,687 tonnes).

2.1.4 Profitability considerations

The main source for estimating the profitability of vessels operating in these waters is the annual economic report provided by Scientific, Technical and Economic Committee for Fisheries (STECF, 2018). There, the vessels operating in Cape Verde, will naturally enter the national vessel groups for the state flag (Spain, France and Portugal), the designated gear vessel groups (purse seiners – PS, and vessels using hooks – HOK), and the distant water fleet (DWF[9]) fishing in other fishing regions than the European waters (in this case the Eastern Central Atlantic).

According to the STECF (2018), which covers the EU-fleets' profitability and structure for 2016, the EU Distant water fleet consists of 274 vessels. These are large vessels constituting roughly 18% of the

[9] The distant water fleet consists of EU-registered vessels above 24 meters operating outside of EU waters and in areas beyond national jurisdiction (including the EEZs of Canary Island (ESP), Madeira, the Azores (POR), Guyana, Antilles, Reunion and Mayotte (FRA).

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total gross tonnage in the EU-fleet (83,000 vessels and a total of 1.56 mGT in 2016) and employed 5,788 fishers or 7,226 FTEs. Hence, the Cape Verde case, where up to 48 vessels participated (for parts of the year in 2016) and an estimated employment of 53 FTEs, its significance for the fleet is quite modest. This can be seen also from turnover figures. The total turnover for the EU DWF in 2016 was 1,062 m€ in 2016, whereas the value of the catch under the Cape Verde SFPA was estimated by Amador et al. (2018) to be 5.62 m€ - or 0.53% of the total revenue of the EU-distant water fleet.

208 of 274 vessels in the EU-DWF are Spanish (76%). 22 vessels were French and 25 Portuguese in 2016, the remaining 19 from Poland, Lithuania and Italy (STECF, 2018). In total, the DWF achieved a net profit margin of 15% of total revenues in 2016, an 161% improvement from 2015. Portuguese vessels were the most profitable (22.8%), ahead of Spanish (16.8%) and French vessels in 2016.
When contemplating only the fleet operating in the Atlantic Ocean under the ICCAT Convention Area, Spanish (26.5%), French (9.6%) and Portuguese (3.4%) vessels were responsible for almost 40% of total ICCAT catches (Mediterranean excl.) in 2016, with Spain deploying the largest fleet of 127 vessels (purse seiners excluded), ahead of France (10 purse seiners) and Portugal (50 longliners and pole and liners). These three fleets landed around 132,000 tons valued at more than m€ 247 in 2016. In weight, the most important species were (in order) blue shark, skipjack, yellowfin, albacore, swordfish and bigeye, while in value, the order was swordfish, blue shark, yellowfin, albacore, skipjack and bigeye. Spanish vessels were responsible of 55% of the weight and 62% of value, French 37% of landings and 26% of value, while Portuguese vessels were responsible of 7% of the weight but 12% of value. All these fleets produced positive gross profits in 2016, but potential ICCAT management measures for the three tropical tunas (skipjack, yellowfin and bigeye) set due to the poor situation of the bigeye stock, can impact profitability for these fleets on a medium term (STECF, 2018: 105).

Swordfish prices have increased from € 5 to € 6 per kg from 2013 to 2016, while skipjack prices fell from € 1.1 per kg in 2014 to only € 0.4 in 2015, but increased to € 0.95 in 2016. Also, yellowfin tuna has had favourable price increase in recent years (90% since 2011). Below, the figures show the total landings and value of landings for the fleets per species within the whole ICCAT-area.

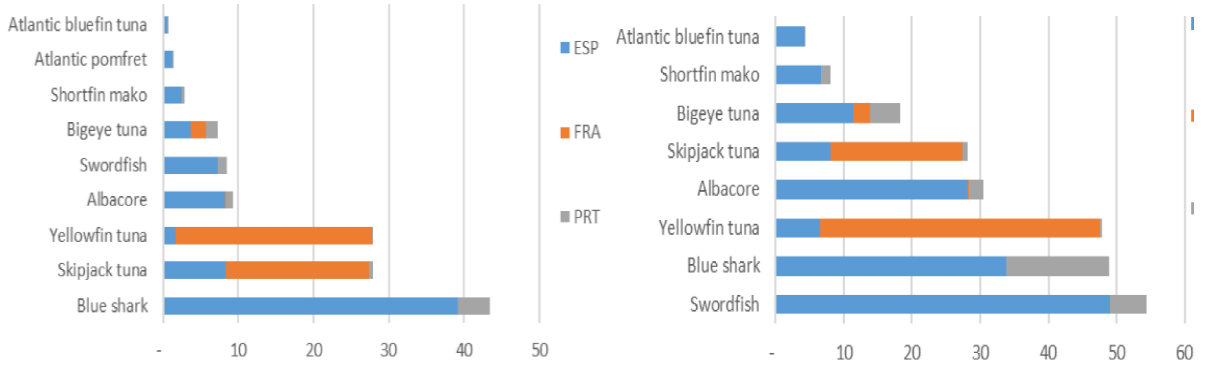

Figure 12 Landings (right) and value of landings for top species by flag state (ESP, FRA, PTG) in ICCAT area 2016. Source: STECF (2018: 235-6)

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Holding these figures up against the catch per flag state in Cape Verdean EEZ in 2016 in Table 5, reveals that the registered catch of the French, Portuguese and Spanish licensed vessels under the SFPA only constitutes between 1% (French) and 5% (Spanish) of their total catch in the ICCAT Convention area. Hence, the contribution to the overall profitability from the Cape Verdean catch is quite limited. For those licensed to this fish in this EEZ, the contribution to profitability can be good, but one should bear in mind that fee costs will accrue.

A general influence on the profitability will of course come from the price development for the species targeted. Amador et al. (2018: 133) reports average prices achieved for the most important species, per vessel group, as seen in Figure 13:

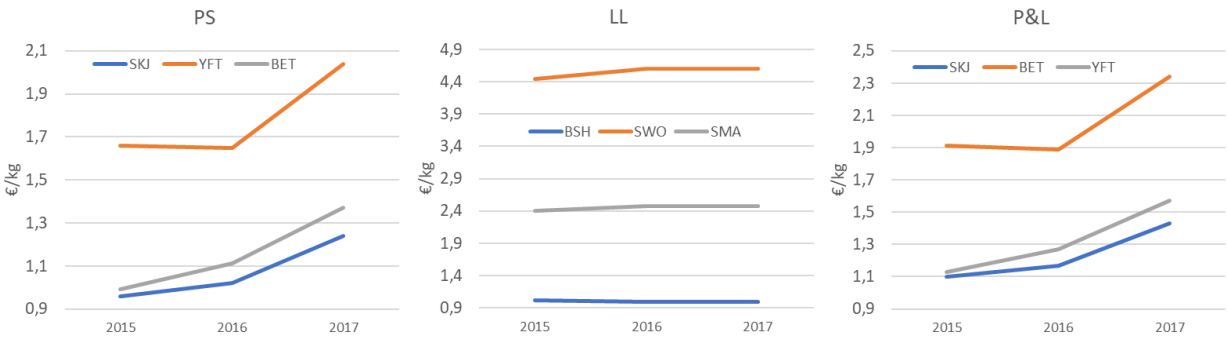

Figure 13 Price development for most important species caught in Cape Verdean EEZ by purse seiners (PS), longliners (LL) and pole and liners (P&L), 2015–2017. Source: Amador (2018)

We see that the price increase noted by STECF (2018) is far less favourable when looking at these. However, the price increase for tuna from 2016-2017 is far more expressed than that the previous year. For longliners, targeting blue shark (BSH), swordfish (SWO) and shortfin mako (SMA), the price development is much less pronounced, and even a slight decrease (- 3%) can be found for blue shark. But as expressed by Amador et al. (2018: 25): "*Cape Verde fishing interests report that vessels are operating at a loss due to increased operating costs (incl. landing fees) and the low fish prices set by the primary buyer.*"

Amador et al. (2018: 73-76) makes, under certain assumptions, some cost benefit analyses on the protocol and finds, among other things, that access fees demand roughly 6% of the turnover for the vessels operating in Cape Verdean EEZ. Moreover, due to purse seiners limited catch in 2015 and 2016, access fees made up 21% and 12%, respectively, of their turnover in the fishery for the two years. They also estimate the gross profit for the vessels and finds it to constitute roughly 15–19% of revenues for longliners and pole liners, while for purse seiners, it turned from a negative gross profit margin in 2015 and 2016 (-15% and -6% respectively) to a positive but still small gross profit margin in 2017, close to break-even (1%).

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Also, regarding the profitability of the national versus the international industrial fleet operating in Cape Verdean EEZ, UNIDO (2016:36-7) claims: "*The highly seasonal nature of surface tuna fishing forces some foreign industrial vessels to fish elsewhere along the African west coast. Year-round industrial fishing for tuna by the local fleet that utilise Cape Verdean EEZ has proven commercially impossibly since tuna stocks are only available to fish during a 3-4 months window* [Sept.–Jan.] *Since the local fleet has been unable to emulate the commercial performance of foreign vessels, expansion appears questionable. The domestic fleet has recently demonstrated that it lacks the infrastructure and management skills to operate as cost-effectively as its foreign counterparts in the region. In the current situation, achieving profitable commercial operations of the local fleet may only be possible through close, long-term commercial linkages with foreign companies that have a proven track-record in regional tuna fisheries."* Hence, one might read from this that the profitability in the tuna fishery in Cape Verde is dependent on additional fishing possibilities in other areas in order to utilize the fishing capacity of highly specialised vessels and to gain scale advantages. Moreover, the blame of the lack of profitability of the domestic industrial fleet is put on biological reasons (seasonality in abundancy) rather than an unhealthy competitive position of the local fleet towards the foreign fleet. In addition, regulations forbid foreign long-liners and purse seine vessels (under the SFPA) to operate any closer than 18 nautical miles to the coast line, which effectively reduces the competition for the artisanal fleet. Nevertheless, in UNIDA (2016:66) the "*Increasing pressure over the purse seine and pole and line local industrial fleet for tuna catches, due to the heavy competition form big foreign purse seiners"* is listed as one of ten threats to the Cabo Verdean fisheries sector in a SWOT-analysis (Strengths, Weaknesses, Opportunities and Threats).

In the most recent SFPA-evaluation (Amador *et al.*, 2018; 25) the following contrast between local and foreign actors is maintained: "*Cabo Verde fishing interests repot that vessels are operation at a loss due to increased operating costs (including landing fees) and the low fish prices set by the primary buyer, Frescomar. By contrast, local consumer prices continue to increase due to a lack of supply, The semi-industrial fleet is in dispute with Frescomar over pricing in the two sales channels (the Frescomar cannery and the local fresh market)."* Hence, the competitive disadvantage of the local fleet can be rooted in first-hand market imperfections when meeting a dominating buyer.

2.2 Processing

Only Portuguese and Spanish vessels land their fish caught under the SFPA in Cape Verde, as French vessels land their catch in Senegal. Dakar (Senegal), together with Abidjan (Ivory Coast), are perhaps the greatest competitors to the Port of Mindelo on Cape Verde in attracting foreign vessels' tuna landings on the West African coast. After 2014, Spanish and Portuguese vessels have landed more in Cape Verde than what is caught under the SFPA (Amador et al., 2018). This is also the case if we compare total landings from EU-vessels in the spreadsheet from INDP (INDP, 2018) with the catch information from Amador et al. (2018), where landings in 2015–2017 exceeds SFPA-catch with

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between 170 and 2,700 tonnes annually. In addition, other fishing nations' catches are landed on Cape Verde, and Amador et al. (2018) claims that total landings from foreign vessels increased from 8,000 tonnes in 2014, to 26,000 tonnes in 2016, but with a significant drop in 2017. In addition, the total raw material base for fish processing on Cape Verde naturally also includes local landings from the artisanal and semi-industrial fleet, which we saw in Figure 1 and Table 2, added up to 12,000 tonnes on average for the years 2012–2016, of which nearly 60% was tuna.

There are 97 landing sites on the nine inhabited Cape Verdean islands, of which 26 sites have been established with support infrastructure (ice machine, chill room, receiving station, warehouses) for landings from the artisanal fleet (UNIDO, 2016), many of which are not in function since most catches are sold fresh in local markets. 45 landing sites are located on Santiago (the largest and most populated island "sotavento", where the capitol Praia is found) and Santo Antão (the north easternmost island). The most important port is Porto Grande Bay in Mindelo (on Sao Vicente island – the second northwesternmost island), ahead of Praia Port – both run by the state-owned ports administration company ENAPOR (Amador et al., 2018). Since 2015, ENAPOR have worked purposeful to strengthen Mindelo's competitive position towards other ports in the region, among other things by erecting cold storage facilities, with a m€ 13 support from the Spanish Government (Amador, 2018). The Baio do Porto Grande at Mindelo is also the regional hub for not only Spanish and Portuguese vessel, but for Chines longline vessels as well (UNIDO, 2016). There vessels can utilise transhipment services, where fish is distributed internationally in refrigerated containers, crew exchange and hiring (also Cape Verdeans), shipyard services (CabeNave) and general supply of inputs, like provision and fuel (UNIDO, 2016). Here is also were we find the two main and dominant processors of fish on Cape Verde. In 1985 there were six canning factories on five of the Cape Verdean islands (Maio, Santiago, Sal, São Nicolau and Boavista, according to UNIDO (2016:50).

It should be noted that, under the SFPA protocol, EU vessels have strong incentives to land their catch in Cape Verde. A discount of €10 per tonne landed, and an additional €10 per tonne for landings for processing, is granted on the licence fees, up to a maximum of 50% of the final catch statements (Amador et al., 2015: 60). Hence, the share of the SFPA-catch landed in Cape Verde, and the share of this quantity processed domestically on Cape Verde should be transparent and obtainable. However, due to lack of data this remains unknown (as it was for Amador et al., 2018). According to the SFPA evaluators (op cit.), EU vessels with licenses in Cape Verdean EEZ gave mixed feed-back regarding the suitability of the Mindelo port for tuna unloading.

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2.2.1 Receivers of raw material[10]

According to the description above, many receivers of fish exist on the islands, but when processing of catch under the SFPA is concerned, mainly two processors are involved, both resided in Mindelo (Sao Vicente island). Some of the fish from the artisanal and semi-industrial fleet landed on other sites and islands is, however, transported to Mindelo for processing. Much goes to the local markets, or even processors dedicated to landings from this fleet. Among these are the cannery Sociedade Ultramarina de Conscervas (SUCLA) at Tarrafal on Sao Nicolao island and up until 2016, the Unidade de Transformacão e Agreacão de Valor (UTAV) on Santiago island. SUCLA employs about 200 people, mostly women. It only sources tuna caught by Cape Verdean vessels and was earlier a supplier for the domestic market. Now it exports to the US, with 35,000 tonnes of canned tuna in 2013, not the EU (UNIDO, 2016). Close to Baio do Porto Grande is Cova de Inglesa, caretaking catch from the semi-industrial Cape Verdean fleet for export, which received funding from the Japanese International Cooperation Agency in 2010 for an extension of the marketing and processing facility.

As mentioned, only Spanish purse seiners and Portuguese and Spanish longliners land their fish in Cape Verde. EU pole and liners do not land in Cape Verde, and shark catches that are landed from the EU longline fleet are exported directly to the EU or to Asian markets.

The main fish processing firms in Cape Verde are **Frescomar** and **Atunlo CV**, both Spanish owned companies located in Baio do Porto Grande in Mindelo on Sao Vicente. There is also a fish meal producer (OJFP, Lda.) caretaking by-products from the tuna and canning industry in Mindelo, who exports their products to other West-African countries (Ivory Coast and Angola), (UNIDO, 2016).

Frescomar was originally a public enterprise for canning of tuna and mackerel, erected in 2000, but was taken over by the multinational Spanish UBAGO Group Mare SL in 2008. Frescomar processed 14,000 tonnes of fish in 2014, employs roughly 800 persons, and has, since 2009, benefitted from tax and customs incentives due to their export production. In 2011, Frescomar alone was responsible for 42 per cent of total Cape Verdean export value of goods (UNIDO, 2016: 24). Frescomar have also benefitted from the use of EU granted tariff quotas of non-originating raw materials, and derogation granted Cape Verde on an annual basis.

Atunlo CV was established in 2015. Atunlo is controlled by Coper – a Spanish alliance of shipowners and processing interests) – and, according to Amador et al. (2018) Atunlo holds the greatest ownership in Atunlo CV (51%), but is also owned by Frescomar/Ubago (33%) and Frigrove (16%). Atunlo receives their raw material from Spanish vessels landing in Cape Verde, but compliments for about half the

[10] Based on Amador *et al.* (2018) and UNIDO (2016).

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year with tuna from the Indian Ocean. Also, Atunlo benefits from tariff quotas of an annual volume of 5,000 tonnes for preserved or prepared tuna derived from non-originating raw materials.

2.2.2 Production

Frescomar under UBAGO have specialised on production of canned fish for Spanish market segments and produces canned tuna and mackerel ("melva" and "cavala" respectively). Other markets are Italy, Germany and Eastern Europe. In recent years, Frescomar's production have relied heavily on imported raw material. According to Amador et al. (2018) roughly 25% of their raw material supply is sourced from Cape Verde (they also operate all official fish landing sites) while imports for the remaining 75% comes from the Seychelles (in the case of tuna), and China and Spain (in the case of small pelagics/mackerel).

Atunlo produces frozen tuna and tuna loins. Frescomar employs in the range of 800 to 1,200 persons (see Amador et al., 2018: 23) while Atunlo has a workforce of 300. Altogether, Amador et al. (2018) estimates these two factories to account for about 1 per cent of the Cape Verdean work force (2,000 FTEs). The two processing firms are responsible for 80% of Cape Verdean export of seafood products[11].

According to Amador et al. (2018), Frescomar and Atunlo buy, process and export most of the tuna landed from national and foreign vessels in Cape Verde, and significant volumes of mackerel sqad (*Decaptarus macarellus*). The quantities supplied account for around half their demand. Since we lack information on the distribution of supplies to Atunlo and Frescomar respectively, and the total raw material volume of tuna and mackerel each to Frescomar, we are unable to stipulate how much the catch under the SFPA constitute with regards to their total raw material demand. What we do know is that its share must be smaller than (or at the best, equal to) the share of the SFPA landings to the total tuna landings in Cape Verde – which we estimated earlier to be in the range of 40-75% for the years 2015–2017, according to the figures brought forward by Amador et al. (2018). However, since Frescomar also buys tuna from the Cape Verdean fleet, but competes over it with SUCLA (Atunlo do not buy from domestic fleet), parts of the local fleet's catch should enter the denominator when calculating the share of raw material from the SFPA catch. Hence the percentage is less than that above. Moreover, since we know that French purse seiners and pole and liners in general do not land in Cape Verde, their share of the SFPA catch should also be subtracted.

[11] Establishing the capacity of the two factory is not easy since information is somewhat „indecisive". Adomar et al. (2018: 24) claims that Atunlo has a capacity of 40,000 metric tons of tuna per year, and that Frescomar is the largest buyer of fish in Cape Verde. UNIDO (2016: 50) claims that Frescomar has an annual production capacity of around 950 tonnes, but processed *14,000* tonnes in 2014 (sic!). Moreover they claim that a new production line for canned tuna loins in June 2015, guaranteeing another 420 jobs, and that 80% and 85% of the raw material was imported. They further claim that Frescomar bought approximately 5,000 tonnes of fish stemming from Cape Verdean EEZ in 2015, while expect to reach 20,000 tonnes raw fish processing in 2016.

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Summing up on processing, it's fair to state that the Cabo Verdean end of the tuna value chain conforms to the description of the global chain, as put forward by Fernandez-Polanco (2016: 64): "*The organization of the canned tuna industry is comprised of complex international trade networks. It is common practice in the European and US industries to locate the first steps of processing in developing countries close to the main landing areas and then export semi-processed products to the facilities in developed countries for completing the process up until final distribution and consumption. These networks involve the trade of a wide variety of product forms across countries, which may vary in their levels of processing. Tuna loins are now the main product in the market.*"

2.3 Distribution channels

Both processors in Cape Verde (Frescomar and Atunlo) that received fish from the SFPA catch produces for the export market. In general, shark landed by the longline fleet is exported frozen to the EU or directly to Asian markets. Moreover; "*[f]or the longliners, Mindelo is an operating base and most catches are transhipped to containers on the quayside for transfer to the EU*" (Amador et al., 2018). This requires container ships to take it to the mainland. When visiting the export statistics of Cape Verde (INE 2016; 2017) we find that in 2017 Spain was the main trading partner, responsible for 71% of the Cape Verdean export value (and 61% of the volume, in total 13,426 tonnes to Spain). The most important items were whole frozen tunas (7,141 tonnes), prepared and preserved tunas (3,329 tonnes) and prepared and preserved mackerel (2,089 tonnes).

2.3.1 To which markets are products sold?

Amador et al. (2018) show that the total Cape Verdean EEZ catch under the SFPA in 2017 was 9,982 tonnes of fish. Of this, we know that French catches and all catches from pole and line vessels (1,382 tonnes) were not landed in Cape Verde. Moreover, all shark catches (2,052 tonnes) are directly exported to EU or Asia, and it is impossible to identify more details on those exports in the export statistics (INE, 2018). With tuna being the only species that can be properly/partially traced through the Cape Verdean value chain, the figures obtained by Amador et al. (2018) reveal a volume of roughly 6,400 tonnes of tuna in 2017, and in 2016, 1,800 tonnes at the most. Considering the size of the EU-markets for canned tuna[12], the total tuna catches in Cape Verdean waters, which were at its greatest in 2014 (8,250 tonnes), would only constitute 9% of the EU imports of frozen whole tuna. For Spain alone, the largest actor in this trade, imports of frozen whole tuna were 54,000 tonnes in 2014,in addition to imports of 6,000 tonnes of frozen tuna fillets and 99,000 tonnes of prepared and preserved tuna (65,000 tonnes of tuna loins and 34,000 tonnes of canned tuna) according to EUMOFA (2017). The largest suppliers of raw materials (whole frozen tuna and frozen tuna loins) to the EU canned tuna

[12] EUMOFA (2017) estimate the apparent market for canned tuna in EU to be one of nearly 810,000 tonnes in 2015, where Italy, Spain, France and Portugal constitute 60%. Spain alone produces 270,000 tonnes of canned tuna, importing 40,000 tonnes and exporting over 100,000 tonnes.

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industry are Guatemala, France, Korea, Ecuador, China, Papa New Guinea, Indonesia, Mauritius, Vietnam, Spain, Philippines and Brazil, representing 58% of total EU import in 2015 (224,000 tonnes). Spanish imports alone to the canning industry in 2015 was 61,000 tonnes of whole frozen tuna and 80,000 tonnes of tuna loins. In 2015, a year when the EU vessels' tuna catches under the SFPA was on low levels (2,000 tonnes), the Cape Verdean exports of whole frozen tuna to Spain, reached 17,255 tonnes. This represented 28% of Spanish imports of whole frozen tuna that year, or 12% of the total volume of imported raw material to the Spanish canning industry in 2015.These figures underline the importance of Cape Verde as a hub port for tuna vessels operating in the Central Atlantic Ocean.

We have no information about the raw material stream from French purse seiners and pole and liners, nor the whereabouts of the shark raw material from longliners (other than being exported directly to Asia or EU). Below we will therefore concentrate on the flow of tuna from the SFPA catch, which are a bit more certain when raw material stream is under scrutiny. Marketing channels

Frescomar and Atunlo are the two major processors on Cape Verde to which we know that at least some shares of the SFPA-catches go. In addition to that, they source raw material from other Spanish vessel, Cape Verdean vessels and foreign vessels operating outside the Cape Verdean EEZ, in addition to importing tuna from China, Seychelles and other nations operating in the Indian Ocean and West African coast (Amador et al., 2018). Frescomar SA is a fully owned subsidiary under the UBAGO Group Mare SL, a Spanish multinational corporation with its main office in Malaga and processing plants in Spain, Morocco, China and Russia, in addition to the one on Cape Verde[13]. Tuna from UBAGO Group is sold in many forms and varieties,mostly under the UBAGO-brand but also under retail chains' private brands. These products are sold through retail chains all over Europe (Mercadona, Alcampo-Auchan, Carrefour, Hipercor, El Corte Inglés, Eroski, Dia and Lidl). Figure 14 shows a UBAGO product stemming from the Frescomar plant in Cape Verde ("Fabricado por FRESCOMAR, SA. Origen: CAPE VERDE"). Note the etiquette on the left bottom corner on top of the packing: "Elaboración Artesanal" (artisanal elaboration).

Figure 14 Tuna product made by Frescomar, Cape Verde. Frigate tuna fillets in olive oil. Source: www.ubagogroup.com

[13] See www.ubagogroup.com

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Atunlo CV, which opened in October 2015[14], is the other large processor of tuna in Mindelo and is also Spanish owned. According to Amador et al. (2018) the majority (51%) is held by Atunlo (which again is owned by equal thirds by the Spanish seafood companies Coper, Inpesca and Pevasa), together with and Frescomar (33%) and Frigrove (16%). Atunlo is a wholesaler of frozen fish, primarily for the canning industry. The factory in Mindelo is partly financed by the EU and operates on 15 years concession granted by Cape Verdean authorities. The Basque companies Inpesca and Pevasa together owns Pevaeche, which operates a fleet of 13 tuna freezer vessels and two merchant ships in the Atlantic and the Indian Ocean. Pevaeche caught about 110,000 tonnes of tune in 2014[15]. Frigrove is a fully owned company under Galician Coper (Vigo), and produces refrigerated cooked tuna loins for the Spanish Canning industry. Coper has its own brand "Ocean King" whereas Pevaeche's products are marketed through Atunlo©. Atunlo has three other processing plants in addition to that in Cape Verde. Hence, Atunlo seems primarily to be the receiver of tuna from Spanish vessels operating in the Atlantic and Indian Ocean, taking care of the first stages of processing on the raw material's way to Spanish canning industry.

2.4 Value chain description

The value chain of fish caught under EU Cape Verdean SFPA can, to the extent that we have been able to identify, be said to be dominated by Spanish actors. Most of the licensed vessels are Spanish, so are the main processors in Cape Verde also. Moreover, the main landings in Cape Verde come from Spanish vessels and the suppliers are of a much larger number than those licensed in Cape Verdean waters, since Mindelo is one of the important logistic hubs for the Spanish distant water fleet in the South Atlantic.

2.4.1 Management

According to stock assessments, the skipjack stock is considered by ICCAT to be within biological limits (assessment done in 2014, referred by Amador et al., 2018), but with associated problems related to FADs (fish aggregation devices) and by-catch of juvenile bigeye and yellowfin (Mikkelsen, 2018). Yellowfin and bigeye stocks are both below sustainable levels (assessed in 2016 and 2015,

[14] See article from the opening of the plant in Mindelo, in the newspaper Atlántico (published in Vigo) from Oct. 30, 2015: http://www.atlantico.net/articulo/economia/atunlo-capital-vigues-inaugura-planta-cape-verde/20151030114838498952.html. Also an article in Undercurrent News, dated Nov. 10, 2015; http://ww.undercurrentnews.com/2015/11/10/spanish-tuna-supplier-opens-new-plant-in-africa-projects-40-turnover-increase/

[15] This information is given under Friends of the Seas (FoS) renewal of Atunlo's certification, from November 20, 2018: http://www.friendofthesea.org/news-doc.asp?CAT=1&ID=863. There, Atunlo is referred to as a: *„Spanish Company commercializing frozen tuna products for the canning, processing and ready meals industries. ATUNLO sources tuna mainly from Pevaeche's fisheries and fleets, which are already Friend of the Sea approved. Such products are commercialised under the ATUNLO brand. ATUNLO owns and operates three plants in Spain and a recently launched new plant in Mindelo, Cape Verde."*

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respectively) but have been marginally targeted in Cape Verdean waters in recent years (Amador et al., 2018). Blue shark stock in the South Atlantic stock is assessed as most likely not overfished or subject to overfishing in the assessment from 2015, while the shortfin mako shark is perhaps one of the most vulnerable of all pelagic sharks, since it has low productivity and susceptible for longline fishery (Amador et al., 2018: 17). INDP have also expressed concerns regarding the catches of different types of sharks in Cape Verdean waters, and especially the need of robust and consistent data over the catch (op. cit.)

Mikkelsen (2018) also draws the attention to the problem of sharks, swordfish and turtles being addressed as by-catch in the SFPA, while shark catches have been greater than total catches for some years. Another point of concern, raised by UNIDO (2016: 38), is the "*…complete absence of scientific research related to the current levels of discards (e.g. catches below minimum sizes, by-catches, etc.) occurring in Cape Verde's EEZ.*" In addition, UNIDO (2016: 43) claims that the aforementioned, together with production of more reliable fisheries statistics, would be one of the most important national upgrades, since it could improve the chances for certification of value chains and products. Amador et al. (2018: 25) also emphasise the ineffectiveness of high seas reporting, monitoring and surveillance in Cape Verde, with only having the sharing of European logbooks as the means to determine catches. Efforts are, however, in commence to reduce this shortcoming.

2.4.2 Sustainability

Establishing the state of sustainability in the EU-Cape Verde fisheries agreement is far beyond the scope of a desktop value chain analysis study as the present. Some aspects have been mentioned above regarding the stock levels of the species targeted in the Cape Verde EEZ, an issue continuously assessed by the ICCAT and national marine research institutes around the Atlantic. The assessment on the sustainable annual harvest conducted by INDP, roughly estimating an uptake of 25,000 tonnes, can from time to time seem overexploited. Moreover, the potential competition for resources between the foreign fleet (incl. EU vessels) and the domestic (both artisanal and semi-industrial) can be an additional issue, involving not only the environmental but also the social sustainability. Reported findings are not unequivocal regarding this relationship. Moreover, the value chain of the production from the domestic sector seems quite different than that of international vessels, even though some small portions of the domestic catches enter the value chain for export. Also, the seafood processing industry, mainly controlled by foreign actors, provides job opportunities to a wide range of Cape Verdeans. At the same time worries are brought forward since that same industry is keeping fixed prices for domestic raw material from semi-industrial vessels so low, that profitability – and with that; catches – fell dramatically in 2017.

Fisheries is an important currency earning sector in Cape Verde and the management and preservation of these resources seems utterly important for this sector to keep its national importance

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continuously into the future. However, with highly migratory species being the main targeted species within the EEZ, the success is not merely up to Cape Verde alone – but needs the coordinated efforts of all ICCAT-member states and distant water fleet – including the European.

As a final branch of the sustainability three, the institutions and legal status surrounding the seafood sector in Cape Verde seems adequate, despite some drawbacks mentioned earlier. This is also underlined by the positive development this civil society have gone through in later decades.

2.4.3 Food security

With most, if not all, of the catches from the EU Cape Verde SFPA being re-exported, either before or after processing, these catches make no contribution to the self-sufficiency ratio on the islands. The seafood products mostly consumed on the islands are derived from the domestic artisanal or semi-industrial fleet (UNIDO, 2016), of which some also goes to a considerable HORECA-sector, considering the tourism sector as the other important currency earning sector on Cape Verde.

Also, according to UNIDO (2016), the regulations surrounding the sector, with emphasis on food safety and animal and plant health standards are not falling behind western standards. HACCP procedures are mandatory and inter-agency agreement with the food safety authorities of Portugal and Senegal exists, regarding veterinary tests. An own independent fish product authority agency (ACOPESCA) was put up by the Government in 2014. Their responsibilities includes: "*…ensuring compliance with SPS standards, inspections, export certification of fish and fisheries products, and compliance with legal requirements aimed at the prevention of illegal, unreported and unregulated (IUU) fishing.*" (UNDP, 2016: 51).

Food security also comprise the ability of a nation to feed its population. For Cabo Verde, the capture fish supply over the period 2013-2015, reaching nearly 40,000 tonnes on an annual basis, is sufficient to supplying the population with fish. However, fish and fish products is exported to provide the nation with foreign exchange earnings. Despite that, annual per capita fish consumption in 2013 was at a level of 11.8 kilograms, (up from 10.2 in 2011) but still 40 % lower than the global mean of 19.8 kilograms[16]. Greater worries, however, are recently over the national agricultural production due to a severe draught which hit the 2017/2018 harvest. As put forward by UNIDA (2016) the fisheries sector of Cabo Verde contributes significantly to the national food security, of which it is the artisanal fisheries that contributes the most, by means of a decentralized fish supply to local communities.

The recent evaluation of the SFPA (Amadores et al, 2018) state no direct reflections regarding the food security issue concerning the agreement. The previous one, however, gives the following notion: Since

[16] See http://www.fao.org/fishery/facp/CPV/en

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EU vessels under the Agreement did not land any fish to the islands they did not contribute to the national supply. Since EU vessels' catch of these migratory species (tuna and some swordfish) took place both within and outside the Cape Verde EEZ, the Agreement was not considered to have any impact on the availability of these resources for the domestic fishery. Moreover, since domestic fishery was mainly artisanal, operating close to shore were EU vessels were not allowed (not closer than 12 nautical miles from the baseline), no direct interaction or competition was registered between domestic and EU fleets. Hence the Agreement had no impacts on the food security situation in Cape Verde. Quite the opposite since support measures for infrastructure measures should improve food security in the future (Megapesca, 2010: 79-80).

2.5 Summary

The EU-Cape-Verde SFPA for tuna and tuna-like species is up for renegotiation and has recently been evaluated by Amador et al. (2018). The fishing industry of Cape Verde is of national importance, with roughly 1,800 vessels (mainly artisanal) and 6,300 fishers in 2016. The national fleet landed roughly 9,500 tonnes in 2016 (of which nearly 60% tuna) – roughly 50% more than the reference catch under the SFPA. Large areas of the Cape Verde EEZ are unexploited by the national fleet, and the SFPA gives purse seiners, longline and pole-and-line vessels from Spain, France and Portugal access to Cape Verdean waters. In the years 2014-2016 the average annual catch under the SFPA was roughly 20% above the reference tonnage (7,285 tonnes), of which skipjack tuna was the most important species (58%) and tuna in total accounted for 70%. Spanish vessels were responsible for 90% of all catch, and purse seiners took roughly 50%. The second most important species was blue shark.

Data from *Global Fishing Watch* show that there are more vessels from other nations than the EU licensed vessels, especially Japanese showing greater efforts than the Spanish fleet, but also Chinese. Landings to Cape Verde also include landings from other nationalities, but most of the catch under the SFPA seems to find its way into Mindelo, even though large shares are transhipped, especially sharks. Foreign vessels' landings to Cape Verde exceed the catch under the SFPA. With Mindelo as the main landing facility, which was supported by the Spanish Government for cold storage facilities, two processors receive the main quantities of fish: Frescomar and Antunlo CV. Both are Spanish owned. Frescomar produces canned tuna and mackerel and employs 800 people. Atunlo CV was established in 2015, produces frozen tuna and tuna loins and employs 300 people. Together they account for 80% of Cape Verde's export of seafood products.

Most of the catch landed in Mindelo goes to export – before or after processing – be it tuna or sharks, which more or less enter the regular value chains for these commodities. Much of the tuna, together with most shark, swordfish and shortfin mako caught within the Cape Verdean EEZ by EU vessels, is landed in Mindelo but exported directly. This is transhipped from Mindelo in big containers, mainly to

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Vigo (Spain), where swordfish is sold to local companies (Fandicosta, Eduardo Vieira, Hermanos Ibañez).

Some issues regarding management practices, sustainability and food security have been noted by scholars. Among these are a growing concern regarding discards and reporting of shark catches. Moreover, criticism has been raised regarding vessel tracking systems governed by the Cape Verdean authorities, whereas food security – in the sense of product edibility and hygienic standards in processing - seems to be under good control.

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3 Seychelles

Author: **Andy Thorpe** (UPortsm.) and Marianne Svorken (Nofima)

Seychelles is the smallest sovereign African state with a population of just under 100,000 inhabitants scattered across 115 islands (only 45 of which are inhabited) and 455 square kilometres[17]. The cornerstone of its economy is tourism, which provided an estimated 22% of GDP (US$358.8 million), 26.2% of employment and 39.1% (US$516.7 million) of foreign exchange in 2016 (WTTC, 2017), and fisheries. In 2014/15 fisheries accounted for an estimated 8% of GDP, 10% of formal employment, with tuna accounting for 22% of exports and fishing licences delivering 3 percent of government revenues (World Bank, 2017). Fish consumption in Seychelles, at 64.3 kg/person/year, is the highest in Africa (and one of the highest in the world) and underpins local dietary needs (UNCTAD, 2017).

The Seychelles fishery is a multi-species fishery and total reported catches have grown exponentially since the 1950s (Figure 15), particularly after the delineation of national EEZs in the early 1980s. The target species of national and international fleets are quite distinct. In the case of the national fleet[18] the main species targeted are jacks and pompanos (*Carangidae*; 26.5%), snappers (*Lutjanidae*; 18.7%), Indian mackerels (*Rastrelliger kanagurta*; 6.4%), emperors (*Lethrinidae*; 6.2%), kawakawa (*Euthynnus affinis*; 4.0%), and groupers (*Serranidae*; 3.5%), with the vast majority (95.5%) of the domestic fleet catch directed to the local market (Le Manach *et al.*, 2014).

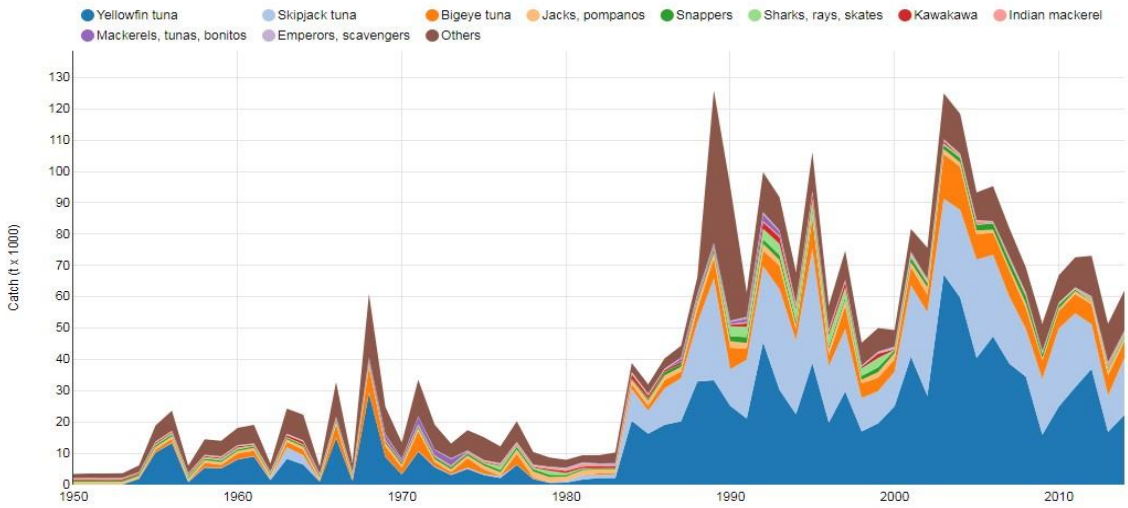

Figure 15 Catches within the waters of Seychelles 1950 – 2014 (by main species). Source: Sea Around Us (2017)

[17] This makes it slightly smaller than the European principality of Andorra (468 km^2) and around one-sixth the size of Luxembourg.

[18] European Parliament (2011:32) suggests the small-scale segment of the national fleet ascends to some 400+ vessels, a number that has remained largely unchanged over the last quarter of a century. The majority employ handlines, are less than 6.5 metres in length, and catches are of the order of 4-5,000 tonnes a year. They are complemented by a semi-industrial fleet of a dozen longliners targeting swordfish (60 per cent of catch) and tuna, which the government has shown an interest in expanding.

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The international fleet operating in Seychelles EEZ consists of both purse seiners and industrial long-liners. The purse seine fishery targets mostly surface-swimming tuna (skipjack and yellowfin), while the longline fishery targets deep-swimming big-eye and yellowfin tuna. As Figure 15 shows, yellowfin and skipjack tuna are by far the most important species, largely harvested by the industrial, foreign–owned fleet. Central to such activity are fleets operating under the flags of Spain and France, whose access to tuna stocks in Seychelles waters is governed by multi-year EU-Seychelles Fisheries agreements (the latest of which covers the period 2014-2020). This chapter therefore covers the Seychelles tuna fishery and its related value-chain, highlighting the role of EU policy, fleets and markets therein.

3.1 Tuna Catches in the Seychelles

3.1.1 Vessels operating in the Seychelles EEZ (under the SFPA)

The Indian Ocean is the second largest global tuna producing area after the Western Pacific region, providing as much as 40% of the total annual tuna catch (800-1,000 thousand tonnes) over the last decade. The majority (65-85%) of the Indian Ocean tuna catch is sourced from the Western Pacific region in which the Seychelles is located. The main industrial fishing gears employed in the region are purse seine (60% of catches) and long-line (31% of catches), with Iranian (20% of catches) and European (22%) dominating (Lecomte *et al.*, 2017a:24).

The longline fishery, which dates from the early 1950s and grew rapidly in the late 1970s, is split between large-scale deep-freezing vessels (which stay at sea for up to six months at a time), and the smaller-scale, fresh tuna fleet (which stay at sea for a month)[19]. Data from the Seychelles Fishing Authority (SFA) (2016) indicates that the number of long-liners fishing in the Western Indian Ocean (WIO) waters and licenced in the Seychelles has dropped sharply since 2005 (Table 10). Although Taiwanese vessels continue to account for just over half the Seychelles licences issued (54%), their numbers plummeted from 178 to 85 over the decade. In contrast, the national fleet has grown by 67 percent over the period to reach 45 vessels in 2015. European long-liners have disappeared from the Seychelles coast, although Seychelles licenced Chinese vessels are still very much active in the WIO region.

[19] The longline fleet is more flexible that the seiner fleet, switching target species (to albacore and swordfish) if catch rates are better, or external factors dictate [i.e.: increased piracy or improved market prices].

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Table 10 Long-liners holding licences to fish in Seychelles waters, 2005-15. Source: SFA (2016:55).

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
National	27	28	27	27	27	27	24	32	32	38	45
Spanish	2	4	4	5	5	1					
Portuguese	1	1	1								
Taiwan	178	147	77	52	33	35	53	111	113	84	85
China (PRC)	16	17	14	7	5			12	16	19	19
Japan	77	74	60	45	36			2	4	4	2
Korea	21	17	3		3						1
Belize	1					1	1				
Oman		1	1		1	1	1	1	1		
Indonesia	1	1									1
Philippines	1	2	2	1	1		1	7	6	1	1
Tanzania								1	1	1	1
Thailand										1	2
Total (All)	**325**	**292**	**189**	**137**	**111**	**65**	**80**	**167**	**174**	**148**	**157**

As Poseidon *et al.* (2014) estimated the total long-line fleet fishing in the WIO to be around 440 vessels in 2012, being dominated by operators from Taiwan (31.4%) and Japan (22.3%), this suggests just over one-third of this total were licenced from Seychelles. This fleet was complemented by a further 1,653 smaller-scale, fresh tuna long-liners flagged to Indonesia (75.2%) and Taiwan (14%). Consequently, the activities and, by extension, the catch made by the WIO longline fleet in the Seychelles EEZ is 'very small compared to the total' (European Parliament, 2011:49).

The purse seine fishery dates from the early 1980s and received a particular boost when Spanish operators introduced FADs into the fishery in the early 1990s. Although the fishery remains essentially a FAD operation, vessels are now limited to deploying 425 (down from 550 in 2015) FADS at any one time, although more may be carried (Poseidon, 2016:2). The number of vessels is much less than in the long-line fishery (Table 11) and; (i) was historically dominated by EU vessels, (ii) while 'the total catch in the Seychelles waters represents a substantial part of the total catch made by purse seiners in the Indian Ocean' (European Parliament, 2011:49). While EU vessel numbers have declined over time due to the threat of piracy in the western part of the region (SFA, 2016:2), this has been offset by a growth in the nationally-flagged fleet after 2013.

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Table 11 Purse Seiners (and Supply Vessels) active in Seychelles waters, 2006-16. Source: SFA (2016:9)

Country	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
National	12(7)	12(7)	12(7)	12(6)	9(7)	8(6)	8(3)	7(4)	11(6)	13(7)	13(7)
Spanish	22(2)	22(2)	22(4)	19(5)	16(4)	14(3)	15(5)	14(6)	15(10)	17(10)	16(10)
French	19	18	17	17	15	8	10	8	13	13	12 (1)
Italian	1	1	1	1	1					1(2)	1 (2)
Total (EU)	42	41	38	37	32	22	25	22	28	31	29
Mauritius								2	2	2	2
Mayotte	1	2	2	3	5	5	5	5			
Korea							1	3	4	5	5
Iran	1										
Thailand			4	4	4						
Total (All)	**56 (9)**	**55 (9)**	**56 (11)**	**56 (11)**	**50 (11)**	**35 (9)**	**39 (8)**	**39 (10)**	**45 (16)**	**51 (19)**	**49 (20)**

Besides the [limited] tuna-fishing activities of the national fleet (see previous sub-section), Seychelles have concluded agreements with various nation states and associations. Current rights and authorisations are laid down in the 2014 Fisheries Act. Six types of licence are granted, though only two types are of relevance to this report; the foreign fishing vessel licence, and the authorisation to fish outside Seychelles waters.

The most historic of agreements are those with the European Union. The first agreement was signed in 1984, and were regularly renewed until 2006, when they were renamed Fisheries Partnership Agreements (FPA). FPAs last for six years, are automatically renewable, and the current one extends until 17th January 2020. The current FPA has a reference tonnage of 50,000 and grants licences to a total of 46 EU fishing vessels (drawn from Spain, France, Italy and Portugal) who can fish for tuna in Seychelles waters (Table 11)[20]. However, the number of licenses that are taken up vary from year to year. For example, while in 2013 (the last year of the previous FPA) 22 licenses were taken out by the EU purse seine fleet in the Seychelles (with none for the long line fleet), FTI (2018:29) notes this rose to 29 in 2016 (16 Spanish, 12 French and 1 Italian), although up to 40 are permitted under the current FPA (Table 12). They were complemented (in 2016) by 13 purse seiners flying the national flag, along with five vessels from South Korea and two from Mauritius[21].

[20] As tuna are a highly migratory species, and as migratory routes vary from one season to the next, FPAs (as an EU fishery access strategy) should be viewed from a regional perspective, with similar agreements with the Comoros, Madagascar and Mozambique being signed to remove/reduce capture uncertainties occasioned by changes in migratory routes.

[21] The purse seiner fleet were supported by 19 supply vessels (7 national, 10 Spanish, and one apiece from France and Korea), who pay licence fees of US$5,000 per vessel.

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Table 12 Number of fishing vessel licences (and type of fishing gear) stipulated in the 2014-20 FPA. Source: EC (2017).

	Spain	France	Italy	Portugal	Total
Purse seiners	22	16	2	-	40
Surface long-liners	2	2	-	2	6
Total	**22**	**18**	**2**	**2**	**46**

Access is not free of charge, and the EU pays therefore an annual fee to the Seychelles, around half of which must be used by the country to promote a responsible and sustainable national fisheries policy. This financial contribution was initially set at 5,530,000 € per year, dropping to 5 million € per annum in the final four years of the agreement. Boats operating under the FPA also pay additional fees ('advances'), as stipulated in the agreement[22], if catches exceed a specified reference tonnage (EU FPA, 2013). Seychelles-flagged purse seiners (2014) are charged US$90,000 for an annual licence, while those licenced under 'private agreements' are charged US$120,000 per vessel. The Republic of the Seychelles also signed a new two-year bilateral fishing agreement with Mauritius in February 2017, allowing 15 purse-seiners (paying US$110,000 p.a.), 20 long-liners (US$17,500 for six months or US$30,000 p.a.) and 7 supply ships (US$5,000 p.a.) to operate in Seychelles waters, with transhipment of catch prohibited (catches must be landed in Victoria).

In addition, the Seychelles government licences internationally-owned, Seychelles-flagged vessels to fish in national waters via a series of independently negotiated 'private' agreements with long-lining fishing associations in Taiwan, China, and Japan[23]. The number of industrial long-liners holding Seychelles licences has dropped from 325 vessels in 2005 to 157 vessels a decade later, as we have earlier indicated (Table 10), with the biggest declines evidenced in the Japanese (down from 77 vessels to just 2) and Taiwanese fleets (down from 178 to 85). Taiwanese access is facilitated by an agreement with the Taiwan Deep Sea and Tuna Longline Boat Owners and Exporters Association which allows any Asian vessel (up to 120) to apply for Seychelles authorisation (providing they are affiliated with the association). Licence fees in 2014 were between US$24,000-35,000 a vessel, depending on country of origin (FTI, 2018:32). However individual payment data by fishing vessel is not publicly available due to the commercial sensitivity of such information (FTI, 2018:60).

Organisationally, the most important player is AGAC, the Association of Large Tuna Freezers (GRT >750 tonnes) and its offshoot OPAGAC (which is a Spanish recognised organisation of frozen tuna owners comprising *Albacora*, *Grupo Nicra 7 S.L.*, and *Compania Europeos de Tunidos* [also members of AGAC],

[22] These range from 38,500-52,500 euros per annum for purse seiners, and 4,950-9,000 euros per annum (depending on GRT) for long-liners.

[23] Although the Seychelles has an agreement with Japan allowing up to 120 vessels to apply for fishing authorisation since 2007 no vessels have taken up this option. Instead authorisation has been obtained under the cloak of the Taiwan agreement.

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and *Canatun* and *Atunera Dularra*), which was established in July 1980. Besides those companies who are also members of OPAGAC, the membership of AGAC includes *Grupo Calvio*, *Grupo Ugavi*, *Tunamol*, *Jealsa* and *Grupo Garavilla* are also active in Seychelles waters.

Box 1: Reliability of Catch Data

Data on catches by the licenced tuna fleet is entirely reliant on reports provided by the fishing vessels to the SFA, as there is very limited independent observer coverage. As highlighted in the SFA Annual Reports (and other technical reports), not all licensed vessels submit complete log-books, although the trend seems to be improving. Reporting by EU vessels is 100% as these submissions are used to finalise invoices for license fee payments. Logbook review is complemented by collection of trans-shipment and landing forms from fish processing companies for the purse seine fishery and the semi-industrial longline fishery, an ongoing activity with a 95-100% coverage for each fleet. On the other hand, as the distant water industrial long-liners rarely land in Port Victoria, monitoring of trans-shipments/landings by these vessels is more problematic (although information on landings in foreign ports is received and processed by the local authorities). Seychelles is also participating in the IOTC regional observer scheme to monitor trans-shipment at sea on support vessels (IOTC, 2015). Consequently, information on catches from the industrial and semi-industrial sector fishing in Seychelles EEZ is unlikely to be entirely reliable, although information on landings is subject to greater oversight, and is likely to be more reliable than data on catches (Standing, 2016).

Manach *et al.* (2014) estimate there are around 1,500 active fishers in Seychelles, with the sector directly or indirectly providing around 10% (5,000-6,000 jobs) of formal employment in the country. Although tuna fishery agreements are economically important to the national Treasury, their contribution to local employment is limited. NFDS, MRAG, COFREPECHE, and Poseidon *et al.* (2014:87) estimate that the EU-Seychelles FPA generated the equivalent of just 120.41 full-time equivalent positions in 2011. Purse seiners operating under international agreements are obliged to take just two Seychelles seamen/trainees each on board and, according to a 2015 SFA report, just 45 Seychellois seamen (19 on Spanish vessels, 26 on French vessels) made one or more trips on board purse seiners in 2014. Instead, the workforce on such vessels was more likely to be sourced internationally, particularly from the Philippines and Indonesia. In addition, industrial tuna purse seiners are obliged to host observers (see Box 1) under the framework of the Seychelles National Scientific Observer Programme, and while there are 78 registered Seychelles Fisheries Observers, just 4 reports were filed in the whole of 2017 [compared to 46-7 in the preceding two years] (2018: 59).

3.1.2 Fishing operations in the Seychelles EEZ

Despite being the smallest sovereign state in Africa, Seychelles has the largest EEZ (Figure 16) in the Western Indian Ocean (1.4 million km^2). The EEZ borders with those of neighbouring Mauritius, Madagascar, the Glorioso Islands (France), Mayotte, the Comoros and Mafia Island (Tanzania).

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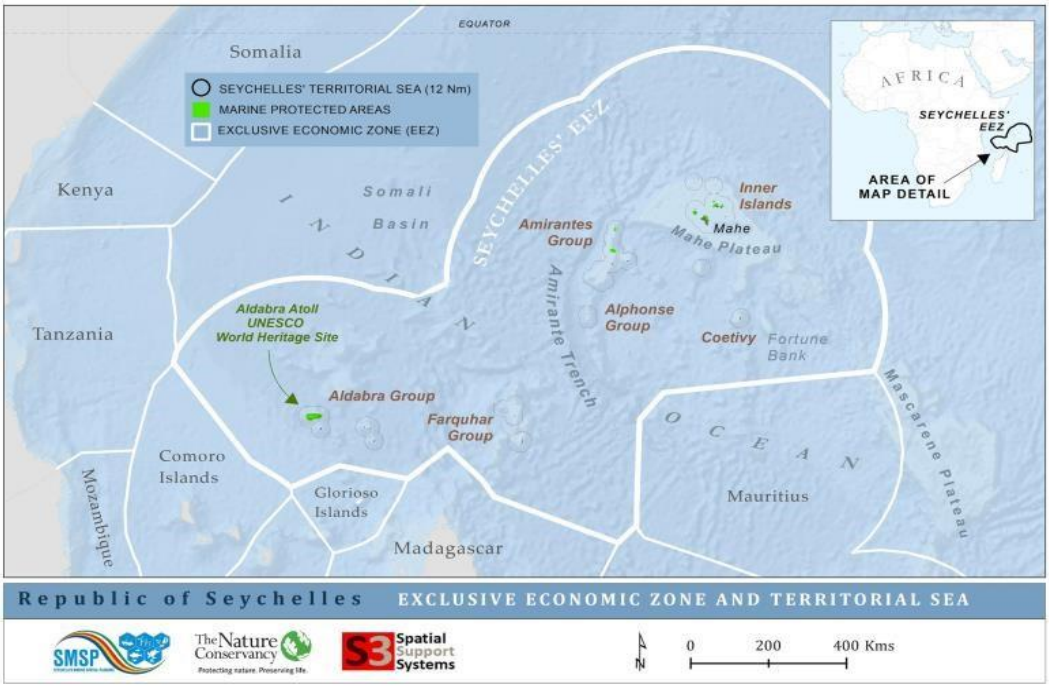

Figure 16 Republic of Seychelles exclusive economic zone and territorial Sea. Source: SMSP (2015)

Primary production rates in the Western Indian Ocean (WIO) region vary considerably, with rates increasing as one moves from the south of the WIO to the north, and from the eastern (offshore) areas to the western (coastal areas). NFDS, MRAG, COFREPECHE, and POSEIDON (2013:87) attribute these differences in ecosystem productivity across the WIO to the fact that productivity reduces as sea temperatures rise, this in turn affecting the high pressure systems and causing more frequent and severe changes in rainfall.

In Seychelles, the shallow bank (generally not more than 50 metres in depth) and the coral reefs surrounding the Mahé Plateau covers some 39,000 km^2 and support the country's main artisanal and various high-value demersal fisheries. High population densities in the Inner Islands grouped around Mahé have translated into increased pressures on local fish resources and coastal development (for tourism, transport and construction purposes), and this has resulted in the deterioration of the surrounding coral reefs and the full/over-exploitation of a number of the Plateau fisheries (Le Manach *et al*., 2014).

In the case of tuna, the fishery is a highly migratory fishery and monthly activities vary from year to year. However, while fishing takes place all year round, most of the catch is generally taken between the months of March and May in the Mozambique Channel (often landing in Diego Suarez), before heading north to fish off Somalia between July and November. Trips can last for 30-40 days, within fishing generally taking place in daylight hours (Poseidon, 2016:3).

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3.1.3 Landings

Long-line catches across the whole WIO have more than halved over the last decade, from 107,928 tonnes in 2007 to 41,247 tonnes in 2017 (IOTC, 2018a). The EU share has been around 10%, with the lion's share of the catch harvested by Taiwanese vessels (45-55%). Although, as noted before, only a small portion of the catch is taken from inside Seychelles waters, the country is a favoured landing site given its central location. Table 13 and Table 14 indicate that Seychelles licenced long-liners source around half their catches from within the Seychelles EEZ. Catches dipped around 40 percent between 2005 and 2006, bottoming out in 2011 at 8,276 tonnes (just 1,343 tonnes taken from local waters), but have since recovered to stand at 20,391 tonnes (10,691 tonnes taken locally) in 2015. Big-eye and yellowfin predominate (70-90 per cent of landings).

Table 13 Longline catches (metric tonnes) in the WIO by vessels licenced to fish in Seychelles waters, 2006-15. Source: SFA (2016:61).

Species	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Yellowfin	6,560	4,161	1.838	881	845	1,372	2,394	1,835	3,333	4,374
Big-Eye	8,625	9,040	6,872	5,113	4,603	4,483	15,886	9,140	9,113	9,618
Swordfish	1,231	1,121	864	695	484	426	1,627	1,305	1,453	2,200
Marlin	373	348	371	238	341	336	1,849	981	1,192	1,993
Shark	228	280	302	420	372	309	818	672	1,143	884
Others	1,089	1,789	1,606	2,880	1,958	1,350	732	2,301	1,767	1,322
Total	**18,105**	**16,739**	**11,853**	**10,227**	**8,603**	**8,276**	**23,306**	**16,234**	**18,001**	**20,391**

Table 14 Long-line catches (tonnes) in the Seychelles EEZ by Seychelles licenced vessels, 2006-15. Source: SFA (2016:67)

Species	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Yellowfin	3,383	2,251	1,203	474	372	401	1,296	973	2,270	2,951
Big-Eye	4,584	4,565	2,942	1,462	1,520	701	6,002	4,642	5,439	5,204
Swordfish	492	457	324	162	95	64	607	465	648	816
Marlin	197	202	158	84	139	78	786	504	624	937
Shark	83	137	238	186	115	68	433	330	667	512
Others	281	342	195	136	141	31	172	163	279	271
Total	**9,020**	**8,054**	**5,060**	**2,504**	**2,382**	**1,343**	**9,296**	**7,077**	**9,927**	**10,691**

Purse seine catches by Seychelles licensed vessels, both within and without the national EEZ, have historically been much higher (Table 15 and Table 16). An estimated total catch of 350,913 tonnes was made in the Western Indian Ocean by Seychelles registered purse seiners in 2016, the highest level since 2006[24]. Between one-fifth and one-quarter of these catches came from within the Seychelles

[24] The total purse seine catch across the whole WIO region rose from 262,086 tonnes in 2007 to 387,494 tonnes in 2017 (IOTC, 2018a).

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EEZ, a further half is taken from the high seas, with Yellowfin (*Thunnus albacares*) and skipjack (*Katsuwonus pelamis*) accounting for around 90%of the total annual catch.

Table 15 Purse seine catches (tonnes) in the WIO by vessels licenced to fish in Seychelles waters, 2006-16. Source: SFA (2016:15)

Species	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Yellowfin	145,596	92,034	112,724	84,821	103,127	110,574	131,057	135,361	126,800	135,797	146,314
Skipjack	224,065	132,238	137,330	150,420	153,782	127,150	82,163	117,053	129,105	128,143	182,516
Big-eye	18,106	20,455	26,951	26,987	22,102	19,864	16,995	24,760	21,236	25,039	21,378
Albacore	1,199	665	1,574	421	187	744	1,206	499	524	537	421
Others	969	278	377	70	46	28	56	206	172	188	284
Total	**389,935**	**245,670**	**278,956**	**262,719**	**279,244**	**258,361**	**231,477**	**277,879**	**277,837**	**289,704**	**350,913**

Table 16 Purse seine catches (tonnes) in Seychelles waters, 2006-16. Source: SFA (2016:21)

Species	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Yellowfin	46,486	38,907	33,027	14,445	27,213	30,503	39,036	18,343	28,717	23,985	41,505
Skipjack	26,251	21,279	15,825	17,688	26,461	23,952	14,580	13,721	22,726	21,348	46,521
Big-eye	5,238	6,071	5,118	4,639	4,678	4,747	3,697	3,698	4,175	3,558	4,278
Albacore	971	212	842	81	42	60	254	161	83	87	127
Others	214	82	20	6	18	0	5	89	93	68	85
Total	**79,160**	**66,550**	**54,831**	**36,859**	**58,412**	**59,261**	**57,572**	**36,013**	**55,794**	**49,046**	**92,515**

SFA (2016:85) also acknowledge that tuna is caught and landed by a handful (between four and eleven) of semi-industrial longline fishing vessels, though total catches for this sub-sector are less than 1,000 tonnes annually. NFDS, MRAG, COFREPECHE, and POSEIDON (2013:73) note that IUU fishing of tuna in the WIO region by unlicensed vessels has been a 'longstanding problem', although underreporting of catch by licensed vessels is less common as the majority of fishing agreements do not stipulate catch quotas/ceilings.

In the case of Seychelles tuna fishery, the majority of the catches in the immediate post-WWII period was taken by Japan, with Korean vessels becoming active in the region in the late 1960s. The delineation of EEZs following UNCLOS in 1982 led to the incursion of French and Spanish fleets, with a sharp increase in landings from under 10,000 tonnes in the 1980s to a peak of 120,0000+ tonnes in the early years of this century (Figure 17). Landings by Seychelles-flagged vessels have increased steadily over the last twenty years due to the insistence on national flagging.

In 2011, EU nations caught 23% (40,545 tonnes) of their total Indian Ocean catch of tunas and associated species in Seychelles waters, utilising 78% of the available reference tonnage under the EU-Seychelles FPA (52,000 tonnes) for that year. NFDS, MRAG, COFREPECHE, and POSEIDON (2013:70) report that the direct income to Seychelles that year from fishing authorisations was almost US$9 million (78% from the EU, 10%from long-line payments). The latest data available (2016) shows a rise

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in revenues of around US$1 million (to 133 million rupees, about US$9.83 million), with almost half the revenues coming from the EU (52%) [FTI, 2018:11].

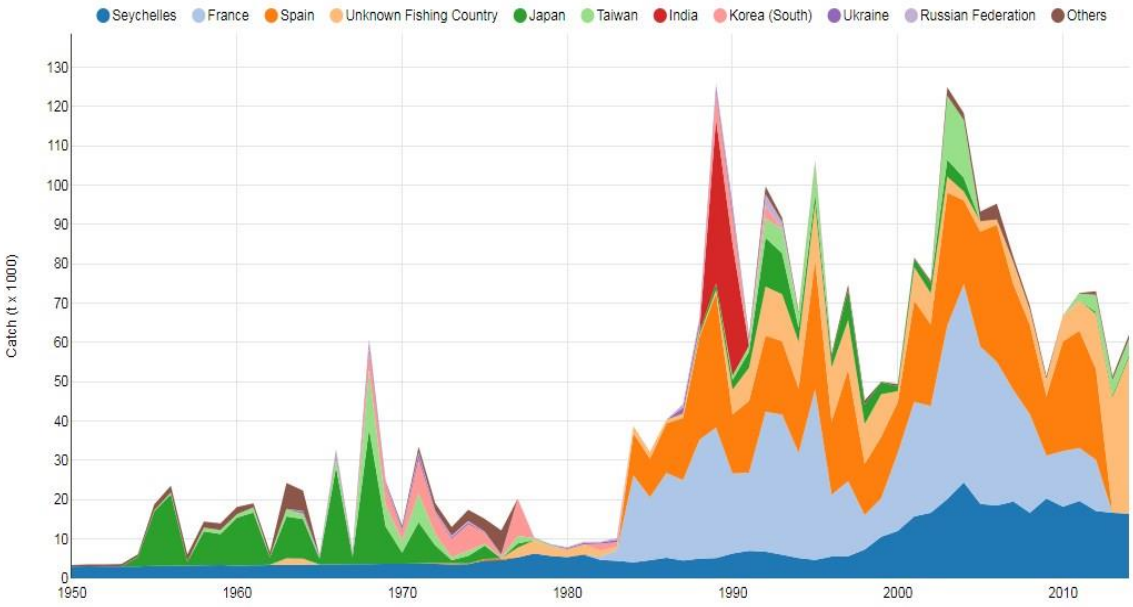

Figure 17 Catches within the waters of Seychelles 1950 – 2014 by main fishing nations. Source: Sea Around Us (2017)

The principal landing point in the Seychelles is Port Victoria on the island of Mahé, which is also the principal hub for tuna landings from purse seiners fishing across the WIO region. The port, according to the IOTC (2015), functions as the home base for the West Indian Ocean purse seine fleet and the Seychelles semi-industrial longline fleet. All catches in Seychelles waters must be landed and/or transhipped through the Port according to local regulations. POSEIDON, MRAG, NFDS and COFREPECHE (2014:74) estimate that around 70-80% of the WIO frozen purse seine catch of 250,000+ tonnes of yellowfin and skipjack (some big-eye) is landed in Port Victoria, either for processing locally, or for transhipment to the *Princes* (canning) or the *Thon des Mascareignes* (canning/loins) factories in Mauritius. Tall (2016:19) estimates that approximately 85% of the purse seiner catch is transhipped, with around 90,000 tonnes being landed for processing in the Seychelles.

In 2013 a total of 233,574 tons of purse seine catches were landed or trans-shipped in Port Victoria in 2013[25], with Spanish flagged vessels accounting for the majority of landing and trans-shipment in Port Victoria (130,802 tonnes, 56%), followed by vessels flagged in the Seychelles (21%) and France (13%). Lesser volumes are landed in Madagascar (10%), Kenya, Thailand, Tunisia and Iran, or sent direct for canning in the EU (Spain and Italy). Three years later, although the volumes landed by Spanish seiners had remained relatively static (122,816 tonnes), the share had dropped to 38%, as

[25] FTI (2018:38) report that around 9,200 tonnes was also transhipped at sea in 2013 (STECF, 2018).

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landings of the national fleet (102,074 tonnes, 38%) and the French fleet (64,891 tonnes, 20%) had risen (SFA, Seychelles Fisheries statistical report, 2016).

Around half of the annual 60,000 tonnes of WIO long-line landings of yellowfin, albacore and big-eye are destined for Port Louis in Mauritius, landings in Port Victoria being of the order of 10%, with smaller volumes sold direct to the sashimi markets in Asia.

3.1.4 Profitability considerations

In 2019, the EU IOTC fleet (excluding Italy and UK) landed 220,000 tonnes valued at over EUR 365 million in the Indian Ocean. The most important species are yellowfin, skipjack, bigeye tuna and blue sharks. The Spanish fleet dominates this fisheries with 65% of the landings in weight and 75% of the value. The overall performance of the fleets covered in the annual economic report provided by the Scientific, Technical and Economic Committee for Fisheries (STECF, 2018) was positive. The most profitable fleet was the Spanish purse seine fleet with average gross profits estimated at around EUR 4.7 million per vessel. Low, stable fuel prices along with a stable market has been positive for the fleet. On the other side, the status for the yellowfin tuna stock is poor and will affect the socio-economic status if continued (ibid). In 2016, around 39% of the total catch of the EU fleet in the West Indian Ocean (WIO) was yellowfin tuna (Figure 18). Together with the skipjack tuna, this is the most targeted species for the EU-fleet in this area, and also the most valued one.

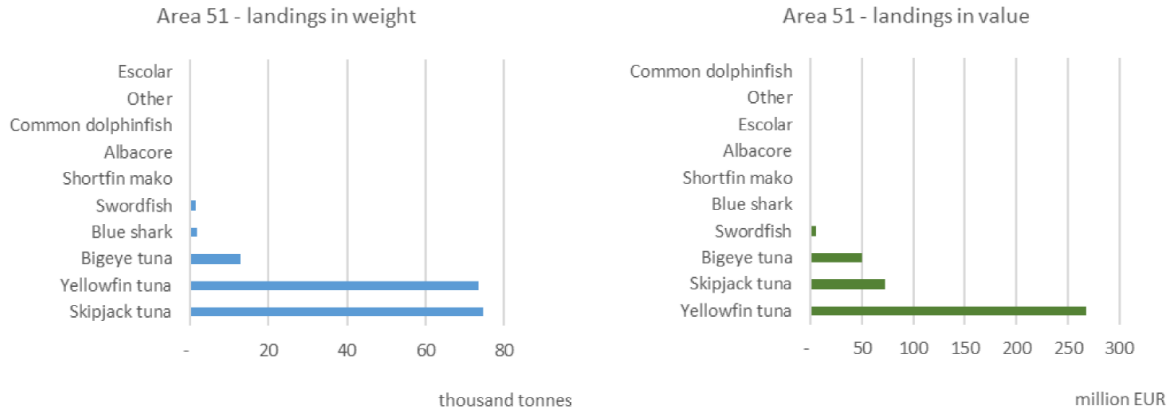

Figure 18 Value and landed weight for ten top species in FAO 51, Western Indian Ocean 2016. Source: STECF (2018: 200)

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3.2 Tuna Processing in the Seychelles

FTi[26] (2018:70) note there is currently no consolidated list of fishing, processing and related companies servicing the fishing sector in the Seychelles available, although the Chamber of Commerce identifies 25 companies active across the sector.

3.2.1 Seychelles tuna processing companies

The most important processing company is the *Indian Ocean Tuna* (IOT) cannery in Port Victoria. IOT is the second largest tuna cannery in the world (after Starkist [Samoa]). It has seven cold stores holding around 25 days supply of fish, and is the single largest employer in the country, employing over 2,500 workers. Set up as a joint venture (*Conserverie de l'Océan Indien*) between the Seychelles government (70%) and two French companies, *Pêcheurs de France* and *Armement Coopératif Finistérien* (who held the remaining 30%) in 1987, Heinz purchased 60%of the company in 1995 (government retained 40%) renaming the company IOT, in order to gain access to the EU market. The decision was subsequently taken (2006) to sell-out to the French *MWBrands Holding of* Paris, ownership then being transferred in October 2010 to *Thai Union Frozen Products Public Co. Ltd.* The factory also owns a fishmeal production company (which uses by-products of the parent company and part of the by-catch of the seiner fleet), and *Ocean Products Seychelles* (which produces fish oil from discarded tuna heads) [POSEIDON, MRAG, NFDS and COFREPECHE, 2014:76]. IOT is currently the largest consumer of electricity and water in the Seychelles, although it pays no taxes or social security contributions as its activities fall within the remit of the local free trade arrangements (European Parliament, 2011:41).

Other local processors include *Amirante Fisheries*, owned by James Lesperance (which processes by-catch such as undersized skipjack, Dorado, bonito, kingfish, barracuda and marlin from EU tuna boats)[27], and two smaller fish processing factories, *Oceana Fisheries Co. Ltd* and *Sea Harvest Pty. Ltd*, who employ seventy staff, and process fresh fish sourced from the artisanal and semi-industrial fleets and frozen by-catch from the seiners for the local and international (pet food and ready to eat) market (Standing, 2016). TRANSTEC (2013:133) report there is no data system on by-catch landings, nor a 'structured market' for tuna by-products at Port Victoria, with rejected skipjack sold as bait to local fishers at around 30 euros a kilogram.[28] Tall (2016:24) reports that two other tuna export processing companies had been forced to redirect their attention to the national market (supplying fish fillets, chilled and frozen fish to the hotel trade) as they were unable to source the investment required to comply with EU hygiene requirements.

[26] Fisheries Transparency Initiative.

[27] The company, with a monthly target turnover of 100 tonnes, was established in 2014 under the Seychelles-EU Fisheries Sectorial Development Programme in Providence, one of three fish processing facilities set up to create value-added from tuna by-products (Seychelles News Agency, July 6 2015).

[28] The same source noted that about 2,000 tonnes of tuna by-products are landed by the purse seiner fleet annually and generally distributed 'freely' by the vessels.

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3.2.2 Production of processed tuna products in the Seychelles

Standing (2016) suggests IOT, the principal tuna processor in the Seychelles, has a production capacity of around 350 tonnes a day[29], but current annual production levels are around 85,000 metric tonnes. Production levels in recent years have been affected by the May 2016 20th IOTC Annual Meeting decision to introduce harvest control measures for skipjack tuna, reduce the number of FADs and supply vessels permitted (see Section 3.1.1) and, to support the recovery of yellowfin stocks, establish a quota allocation system that required a 15% reduction in purse seiner catches. This led the IOT to announce it was considering making 300 staff redundant due to a lack of large yellowfin (10-20 kg) in June 2018 (The Seychelles Nation), although the redundancy threat was subsequently eased by offering 'very attractive prices for yellowfin' (Undercurrent News, July 2018) which enabled IOT to stockpile yellowfin in its cold storage units [up to 500 tonnes per day].

Canned tuna is the dominant fisheries product and has grown significantly since the early 1990s when around 10,000 metric tonnes was produced. Since 2000, output has been of the order of 30-40,000 metric tonnes, with canned tuna accounting for 90-92% of total fisheries production over the last five years (Table 17). In volume terms this accounts for around 1.5 million cans per annum, cans which are produced by a local company *Impress*, who work exclusively for IOT.

Table 17 Seychelles fishery production (tonnes), 2013-16. Source: Seychelles in Figures, NBS (2017)

	2012	2013	2014	2015	2016
Fish	2,503	4,119	3,468	3,348	3,091
Canned tuna	31,946	36,826	32,219	32,068	35,569
Smoked fish	28	41	41	57	50
Total	**34,477**	**40,986**	**35,728**	**35,473**	**38,710**

[29] Around 120,000 metric tonnes a year.

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3.3 Distribution channels

3.3.1 The exportation of tuna products

FAO noted (2015) note that just under half (46%) of the global tuna catch is traded through globalised value chains , with tuna the fourth most traded seafood product (after shrimp, salmon and whitefish). Canned tuna dominates in volume (76%) and value (60%) terms, although the high-value segment of the market is captured by sashimi (14% of volume, 36% value) (Lecomte *et al*., 2017a)[30].

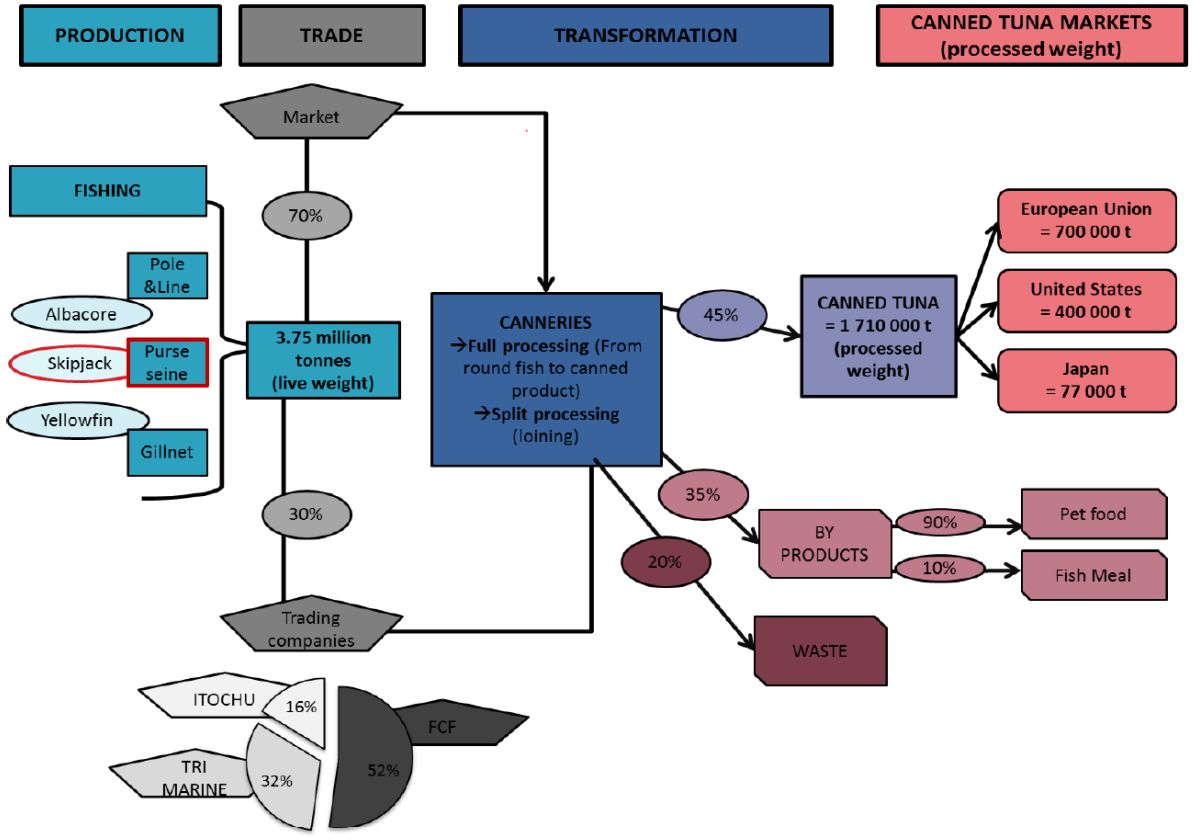

Figure 19 The Global Tuna Supply Chain (Canning). Source: Lecomte et al. (2017a:11).

The Seychelles is the sixth largest global exporter of canned tuna, and this product has generated between 50% and 61% of export trade revenues for the country over the last five years, despite the value of such exports dropping by around 25% since 2014 (Table 18). Exports of other fresh/frozen fish are limited in both volume and value terms.

Table 18 Total exports and fisheries exports, f.o.b. (million R.), 2013-16. Source: Seychelles in figures, NBS (2017)

[30] In the case of long-liners supplying the sashimi market, around 30-40% of the catch is transhipped on the high seas, with the remainder landed in ports such as Port Victoria, before being containerised for export to Japan (Moreno and Herrera, 2013)

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	2012	2013	2014	2015	2016
Total Exports	6,790	6,971	6,879	5,519	6,132
(Of which fisheries)					
Canned tuna	3,411	4,229	4,051	3,032	3,472
Fresh Fish	13	15	15	31	70
Fish Meal	83	102	97	96	102

Historically, as we noted earlier, while much of the Seychelles catch was transhipped (Figure 19)[31], the Seychelles has been heavily dependent on the European market for exports of canned tuna.

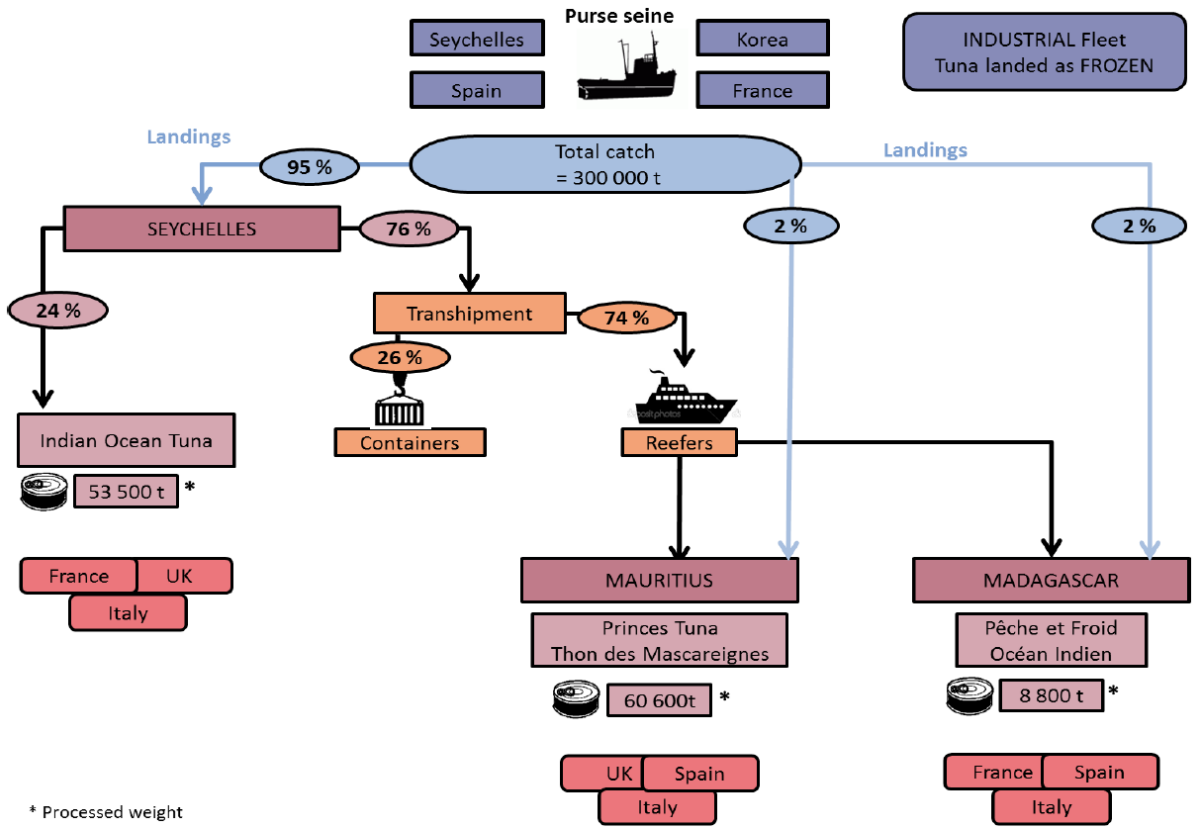

Figure 20 The Western Indian Ocean Cannery Value Chain. Source: Lecomte et al. (2017a:43).

That dependence continues today (Table 19). France takes around 40-45% (by value) of the Seychelles canned tuna, with a further 25-30% destined for the UK market, Lesser volumes are directed to the

[31] Hass (2016:4) notes that if Customs record the transhipment then for foreign-flagged vessels two equivalent transactions are posted ('import' and 'export'). However, in the case of nationally flagged vessels the catch is recorded as 'national production' and the subsequent transhipment is treated as an 'export'.

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Italian (15-20%) and German (4-7%) markets, with the rest being exported to a number of other countries[32].

Table 19 Exports of canned tuna (tonnes and kR), by destination country, 2016 and 2017 (Q1-3). Source: FTI (2018: 74)

	2016	2017 Q1	2017 Q2	2017 Q3
Volume (tonnes)	38,949	7,967	9,304	8,178
Total export Value (kR)	3,471,519	752,682	915,979	839,103
Of which:				
France	1,382,166	321,217	425,737	395,681
Italy	661,231	119,935	157,121	125,964
UK	1,040,982	192,170	239,327	224,635
Germany	135,103	47,969	44,471	41,724
Others	252,038	71,391	49,323	51,099

European preferences for canned tuna is both strong and price-sensitive, with more than 650,000 tonnes imported over the last five years (IEGVu, 2018). As a consequence, the Seychelles share of the EU market is relatively small although, among the ACP countries, it is the EU's main supplier. Preferential tariffs under the Cotonou Agreement with the EU are, nevertheless, crucial to the competitiveness of Seychelles tuna processing sector vis-a-vis local Asian competitors and any change to this tariff agreement would be problematic.

Tuna imports 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 and were responsible for withdrawing export permits for two tuna processing establishments in the current decade (see Section 3.1.1).

3.3.2 Marketing Channels and Brands

Most of the canned tuna products are exported to the EU under the brand names of John West (to the United Kingdom) and Petit Navire (France). Both companies have been owned since 2010 by the Thai Union group who also own the IOT cannery in Port Victoria, and consumers have been able to trace the origins of their purchase since 2011 by inputting the can number into a *Can Tracker* application on the corporate websites[33]. In July 2017, Thai Union and Greenpeace announced an

[32] Spain tranships tuna catches from Seychelles (and other fishing zones) to Spanish canneries for processing. Canned tuna is the most important product of the Spanish canned fish and seafood sector, accounting for 69% (223,033 tonnes) of the volume and 51% (766,781 euros) of its value in 2015. Around 45% of production (98,991 tonnes) was exported to the rest of the EU (EUMOFA, 2017).

[33] In 2015 a Greenpeace investigation into John West showed traceability was limited to just three fishing zones (Seychelles, Ghana and Portugal), and excluded cans originating from canneries in Thailand, the ivory Coast and

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agreement to improve the gate-to-plate tuna supply chain by; cutting FAD usage by its fleet; increasing the volume of FAD-free tuna marketed; introducing a code of conduct for all vessels in the fleet; extending the moratorium on transhipment at sea; ensuring independent observers were on board all vessels; reducing by-catch and long-line caught tuna; and implementing full digital traceability (Undercurrent News, July 11th).

3.4 Value chain description

The value chain of tuna caught within the national EEZ and/or landed in Port Victoria in the Seychelles has multiple actors at the point of harvest. EU activities, primarily involving Spanish and French vessels at present, are governed through the EU-Seychelles FPA, with the current agreement due to terminate in early 2020. They are complemented by a large contingent of Taiwanese vessels, with vessels from the People's Republic of China and craft flying the national flag also active in the fishery. Tuna processing is almost exclusively in the hands of the Indian Ocean Tuna cannery in Port Victoria, a cannery owned by Thai Union Frozen Products Co. Ltd (TUFP). Distribution of final product, principally canned tuna, to Europe and the wider world is through the John West and Petit Navire brands (both also in the hands of TUFP since 2010.

3.4.1 Management

The long-term policy objective 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 (SFA, 2015). In practice these objectives have been operationalised through the Fisheries Act of 1986 and the Fisheries Regulations of 1987, and implemented by the Seychelles Fishing Authority (SFA). In the case of the tuna fishery there is a further IOTC ordinance (Resolution 15/04) requiring the national authorities to maintain a Record of fishing vessels that are larger than 24 metres in length[34] and are authorised to fish for tuna and tuna-like species in the IOTC Area. Equally, the SFA is bound to submit an annual Implementation Report and Compliance Report (see: http://www.iotc.org/compliance/monitoring) to the IOTC documenting; (i) the actions taken to implement the conservation and management measures adopted by the IOTC Commission in its most recent session, and (ii) supplying designated data and information on a variety of aspects related to the fishery. The SFA is also obliged (IOTC Resolution 10/11, superseded by Resolution 16/11) to implement Port State measures to prevent, deter and eliminate illegal, unreported and unregulated (IUU) fishing by preventing transgressing foreign vessels

Papua New Guinea. The 2018 John West website now appears to allow tracking of cans back to all six nation state canneries In the case of the Petit Navire tracker tracing is only available for Ghana, the Seychelles, Portugal and French cans).

[34] The SFA are also obliged, in the case of vessels less than 24m, to maintain records for vessels registered in the country but who operate in waters outside the Seychelles economic exclusive zone.

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from offloading tuna and tuna like species in Port Victoria or calling into the port to use any port services.

The management of EU vessels fishing for tuna in Seychelles waters is managed within the strictures laid down within the EU-Seychelles Fisheries Partnership Agreement (the current six year FPA runs until 1 November 2019) and the associated legal frameworks. Further management measures relating to the tuna fishery can be found in the bilateral reciprocal fishing agreement with Mauritius, and the private agreements made with two Japanese fishing associations whose members own long line vessels (the Japan Agreement), the Taiwanese Deep Sea and Tuna Boat Owners and Exporters Association (the Taiwan Agreement), and the Chinese Company Top Fortune. FAO (2014:34) report "In general fishing regulations are well enforced and compliance is good with regard to the industrial tuna fisheries", although the same source did note instances of under-reporting by licensed fishing vessels, non-compliance by Seychelles flagged foreign vessels, and potential illegal fishing by foreign unlicensed vessels (including transhipment) that warranted attention.

3.4.2 Sustainability

At the species/sub-species level there are concerns about the long-term sustainability of the highly migratory IOTC tuna fishery, especially given the low levels (around 20%) of MSC-certified tuna catches globally. This was best evidenced by the 2017 IOTC decision to reduce the yellow fin catch level by 15% from the 2015 baseline, a precautionary measure to reduce pressure on the Indian Ocean yellow fin tuna stock and allow the species to recover from its overexploited status. On the 31st December 2018, the Nation (see http://www.nation.sc/article.html?id=261797) reported concerns about growing poaching of a number of high-value species (sea cucumbers and lobster) and the continued incursion of vessels fishing illegally in Seychelles water. In 2018 three foreign vessels were intercepted by the Seychelles Coastguard (SCG)[35], though anecdotal evidence suggests these were by no means the sole instances. In a bid to combat such IUU fishing (and also drug related activities in Seychelles waters) the President Danny Faure announced the establishment of a Coastguard base on the Assomption island in 2019 to allow for better surveillance of vessels.

On an equally positive note, in 2018 the IOTC approved a Seychelles co-sponsored resolution to phase out the number of Fish Aggregating Devices (FADS) and the supply vessels that manage them, a decision likely to contribute to making the tuna purse seine industry more sustainable.

[35] The first incident occurred on June 7 when a Sri Lankan fishing vessel was spotted by patrol ship Andromache north-west off Mahé island. The Seychelles Coast Guard (SCG) vessels *PS Topaz* and *PB La Fleche* intercepted two foreign Sri Lankan flagged vessels on November 3 also suspected of illegally fishing in Seychelles' territorial waters.

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3.4.3 Traceability

Tracing the catch at sea to ensure it is fished both legally and sustainably is problematic given the vast size of the national EEZ. Fisheries surveillance is consequently an area that is lacking in terms of both manpower and equipment, although 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 (SFA, 2015). There are presently high hopes resting on a trial project whereby unmanned drones will monitor illegal fishing activities in the country's 1.4 million square kilometres EEZ, with SFA chief executive Ronny Renaud expecting significant improvements in combatting IUU fishing activities, especially in the northern part of the EEZ[36].

Landside, traceability begins with the documentation of catch through logbooks, transhipment and landing forms. Adherence to Port State Measures notwithstanding, catch data is unlikely to be entirely reliable (see Box 1). Processing and export is dominated by the Indian Ocean tuna cannery, a subsidiary of Thai Union Frozen Products Public Co., with canned tuna accounting for 90%+ of aggregate national fisheries production. As little of this production is destined for the domestic market, product traceability levels are high given the exporting requirements that need to be complied with in Port Victoria. From a consumer perspective, the purchaser can be reasonably confident they are eating Seychelles caught/landed tuna given the can tracking applications on the John West and Petit Navarre corporate websites.

3.4.4 Food Security

The Seychelles tuna fishery is export-oriented and so has little direct contribution (except through the domestic processing and consumption of tuna bycatch) to national food security. Tuna exports also have a negligible impact upon food security in the EU, the destination of most Seychelles canned tuna. FAO (2014:17) report that the artisanal and semi-industrial fisheries have traditionally provided the major source of protein for the Seychellois population, with most of the catch consumed fresh in local markets. High value species (such as tuna and red snapper) are generally sold to the main export/processing companies or to the local hotel/restaurant trade.

Indirectly, the tuna fishery contributes to food security by generating taxable revenues, taxes which can be redeployed to support the development of the semi-industrial and artisanal sectors which are more relevant in food security terms. In 2018, for example, the government invested to improve in facilities available to artisanal fishermen, semi-industrial fishing vessels and industrial fishing vessels alike with the opening of the Ile Du Port Handling Services (IPHS) Port and the inauguration of the second phase of the Providence Artisanal Fisheries facility[36].

[36] The Seychelles Nation, «Numerous achievements and challenges in fisheries", newspaper article, 31. Dec. 2018. See: http://www.nation.sc/article.html?id=261797.

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3.5 Summary

The Seychelles tuna fishery is a principal contributor to national GDP, exports and government revenues, although it generates less employment than its semi-industrial and artisanal fisheries counterparts. Its growth coincided with the delineation of national EEZs in the mid-1980s, with the first EU FPA signed about the same time. In the case of the long-line tuna fishery, just over half (54%) of the 157 vessels authorised to fish in Seychelles waters are flagged to Taiwan, while the nationally-flagged contingent has almost doubled over a decade to reach 29%. The purse seine fleet is much smaller (49 vessels), with the fleet split largely between vessels licenced under the FPA (59%, principally Spanish and French) and the nationally-flagged fleet (27%). Licensing would appear to be a lucrative activity, with FTI (2018) suggesting this brought in around US$9.83 million (just over half – 52% - coming from EU sources) in 2016.

Purse seine catches of yellowfin (despite the recent introduction of IOTC quotas) and skipjack dominate, with Port Victoria acting as the major hub not only for vessels seining in Seychelles waters, but also those seining across the whole WIO region. While a large proportion of this catch (Tall [2016] suggests 85%) is directly transhipped, much of the residual is processed by the Indian Ocean Cannery – owned since 2010 by the Thai multinational *Thai Union Frozen Products Co. Ltd* - in Port Victoria. Although the cannery has a peak capacity level of around 350 tonnes a day, current production levels are of the order of 85,000 metric tonnes p.a., as a consequence of the 15% reduction in yellowfin catches mandated by the IOTC in 2017.

The processed product, largely canned tuna, is then primarily exported to the EU. In 2016 canned tuna revenues were around 3,500 million Rupiahs (around US$260 million), and accounted for 55% of the country's total export revenues. The main European markets for Seychelles tuna, which is retailed under the *John West* and *Petit Navire* labels, are France (40-45% of tuna exports by value), the UK (25-30%) and Italy (15-20%). Although the Seychelles share of the total EU tuna market is small, nevertheless, it is the major ACP supplier.

Although there are robust management mechanisms in place to offer oversight of the tuna value chain, and product traceability is high, at the harvesting level there remain concerns about the long-term sustainability of the highly migratory IOTC tuna fishery given the level of IUU fishing. Quotas have, as a consequence, been introduced for Indian Ocean yellowfin. This is, however, likely to have minimal impact upon national food security given the fishery is primarily set up to service the export market.

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4 Senegal

Authors: **Pierre Failler**, **Grégoire Touron-Gardic and Cindy Cornet** (University of Portsmouth)

Senegal has 718 km of coastline[37] located in the far west of the African continent. The peninsula of Cape Verde, which hosts Dakar, the capital, is the westernmost point. The rivers Senegal in the north, Saloum in the center and Casamance in the south flow along the coast.

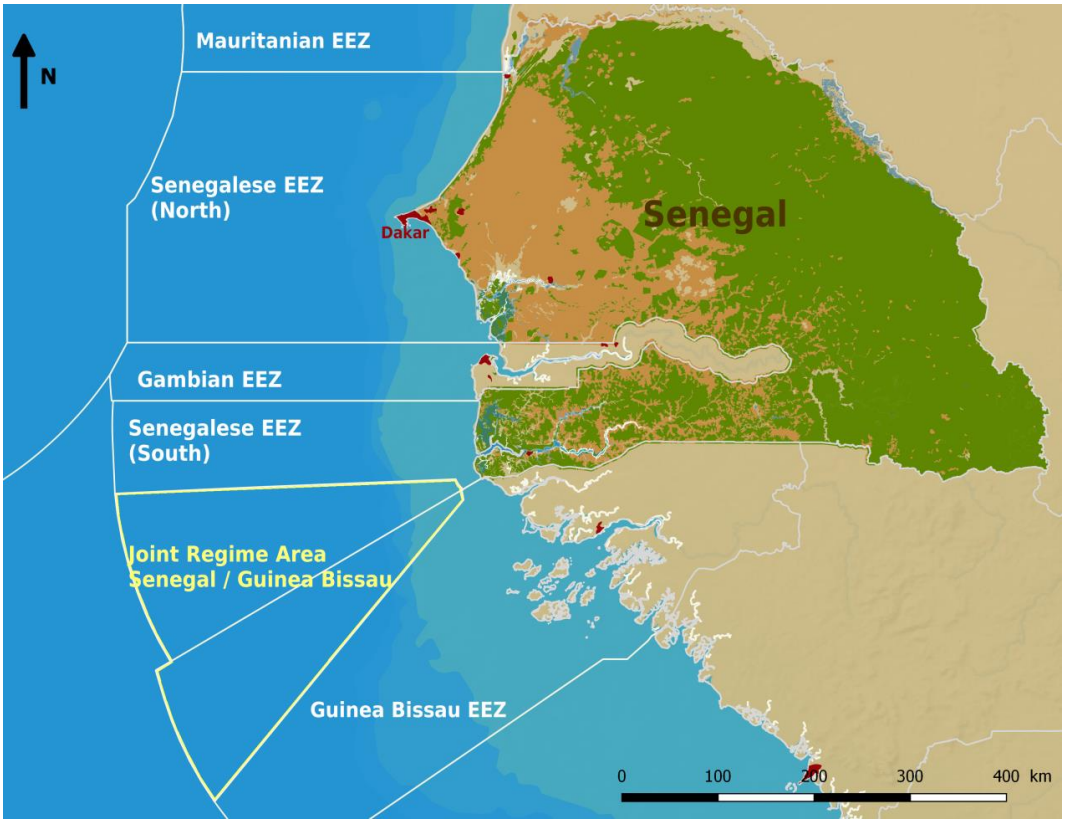

Figure 21 *Map of Senegal and corresponding EEZ. Source: Flanders Marine Institute (2018). Maritime Boundaries Geodatabase: Maritime Boundaries and Exclusive Economic Zones (200NM), version 10*

The continental shelf has canyons and seamounts and is relatively large in the south of the country. The exclusive economic zone (EEZ) of Senegal is approximately 160,000 square kilometres and is divided into three parts: the northern zone, the southern zone and the joint regime area Senegal/Guinea Bissau (shared with part of Guinea Bissau's EEZ). The fishing area benefits from upwelling, which oscillates seasonally between Mauritania in the north and Guinea in the south.

The country's population is approximately 16 million[38] and the gross national income is around US $1,200 per capita[39] , which means that Senegal is a relatively poor country. The country is very

[37] http://www.fao.org/fishery/facp/SEN/en
[38] http://www.fao.org/faostat/en/#data/OA
[39] https://data.worldbank.org/country/senegal

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dependent on the fishing sector to meet the nutritional needs of its inhabitants and to boost its economy (Binet et al., 2012).

In 2016, the total landings of all catches were about 480 000 tonnes with an estimated commercial value of nearly 200 billion CFA francs (Senegal's Ministry of Fishery and maritime Economy, 2016). This trend is slightly growing, because both artisanal and industrial fisheries are on the rise (Figure 22).

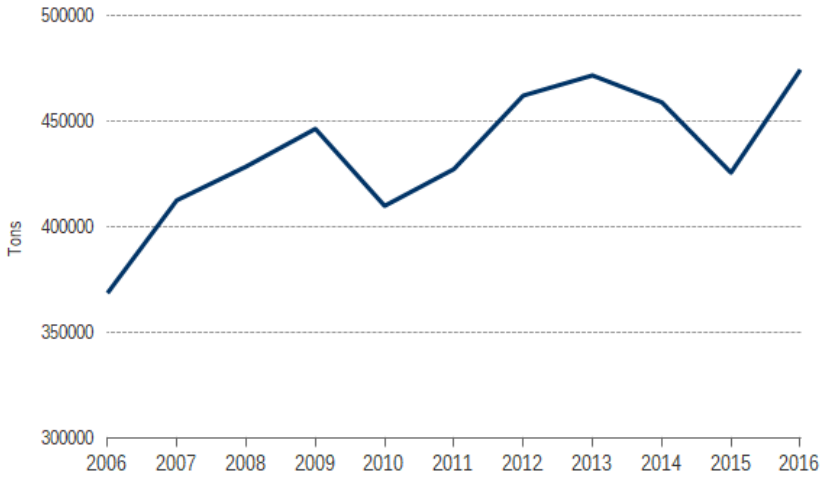

Figure 22 Overall Capture Quantity evolution in Senegal. Source: FAO.org

It should be considered that three-quarters of the catches displayed in this figure are sold on the domestic market, especially the small pelagic species coming from artisanal fisheries. Industrial fisheries (demersal and tunas) are exported in Europe mostly, Asia and USA.

Most of the artisanal production feeds local supply chains and the local wholesalers are a very important step in the process. They buy their stocks directly during landing, in order to transport them and sell on the national markets (about 300,000 tons per year). Another part of artisanal landings (100,000 tons) is destined for traditional processing, which will be transported and sold to local markets, but also to the markets of neighbouring countries (Mali, Guinea, etc.). Industrial production only amounts to around 50,000 tons a year. This production is essentially frozen, in order to be shipped abroad (neighbouring countries, Europe, Asia, Africa). A fraction of the artisanal production (around 40,000 tons) joins the refrigerated supply chain for exports.

4.1 Catch under the SFPA

The current sustainable fisheries' partnership agreement (SFPA) between the European Union and Senegal was signed on the 25th of April 2014 and covers the period from the 20th of November 2014 until 19th of November 2019. It allows EU fishing vessels to catch black hake (*Merluccius senegalensis*

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and *M. polli*) and tuna species (skipjack, albacore, bigeye) as well as associated species (swordfish mainly) in the Senegalese Waters[40] .

Authorisations

For the hake fishery, two trawlers in the European Union targeting the two species of black hake (*Merluccius senegalensis* and *M. polli*) are authorized in the exclusive economic zone (EEZ) of Senegal (see Table 20). The allowed catch tonnage must not exceed 2,000 tonnes per year. These boats are Spanish. The agreement on tuna fishing allows for 28 EU seiner vessels and eight pole-and-line vessels, targeting highly migratory species, to operate in the Senegalese EEZ. The maximum reference level for catches is fixed at 14 000 t per year for the 36 vessels.

Table 20 Current SFPA contribution between EU and Senegal. Source: DG-Mare[41]

Nature of the FPA	Tuna Fishery Agreement with a limited demersal component
Financial contribution	Decreasing: 1 808 000 to 1 668 000 €/year. Including € 750 000 per year to the support of the fisheries sector.
Fee for ship owners	Tuna: increasing: € 55 – 70 per tonne Hake: € 90 per tonne
Advances	Tuna seiners: increasing: € 13 750 – 17 500 per year (reference catch: 250 tonnes) Pole-and-liners: increasing: € 8 250 – 10 500 per year (reference catch: 150 tonnes) Trawlers: € 500 per trimester
Reference tonnage (tuna)	14 000 tonnes per year
Total allowable catch (hake)	2 000 tonnes per year

4.1.1 Vessels operating under the SFPA

Hake Vessels

Since 2015, a freezer ship (Villa de Marin) and a fresh fish vessel (Fuente de Macenlle) have been active in Senegalese waters. In 2017, two other freezer trawlers (Manuel Nores and Ivan Nores) were active in this fishery. All these vessels are Spanish. The maximum number of boats operating at the same time were two trawlers.

[40] https://ec.europa.eu/fisheries/cfp/international/agreements/senegal
[41] https://ec.europa.eu/fisheries/cfp/international/agreements/senegal

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Tuna Vessels

Tuna seiners and pole-and-line boats are Spanish and French (see Table 21).

Table 21 Number of EU tuna vessels by type of fishing in Senegal, 2015–2017. Source: Joint Scientific Committee (2018)

Year	Country	Number of tuna seiners	Number of pole-and-line tuna vessel
2015	France	5	1
	Spain	4	7
	Total	9	8
2016	France	0	1
	Spain	8	7
	Total	8	8
2017	France	1	1
	Spain	9	7
	Total	10	8

In 2017, a total of 18 vessels were fishing for tuna (10 seiners and 8 pole-and-line vessels), landing a catch of around 6,900 tons. The licence utilisation rate is fully utilized for the EU pole-and-line vessels, but is only 36% for the seiners. EU tuna seiners are based in the Ivory Coast due to ship landings and maintenance facilities. The infrastructure in Dakar is not adequate for tuna seiners, unlike Abidjan.

4.1.2 Fishing operations

Hake fishing operations

Regarding the hake fishery, the two EU trawlers (a freezer and a fresh fish trawler) were present in Senegal's fishing zone during 184 days in 2015, 21 days in 2016 and 246 days in 2017 (Table 22).

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Table 22 Monthly fishing effort by Spanish hake trawlers in Senegal between 2015 and 2017 (Source: CSC, 2018 -Joint Scientific Committee Report 2018)

2015-Month		1	2	3	4	5	6	7	8	9	10	11	12	Total
Fresh fisheries	Campaign	-	-	-	4	4	2	-	2	4	4	4	-	24
	Days	-	-	4	20	27	15	-	10	27	28	27	-	158
Frozen fisheries	Campaign	-	-	-	-	-	-	-	-	-	1	1	-	2
	Days	-	-	-	-	-	-	-	-	-	19	7	-	26
Total EU	Campaign	-	-	-	4	4	2	-	2	4	5	5	-	26
	Days	-	-	4	20	27	15	-	10	27	47	34	-	184
2016-Month		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
Fresh fisheries	Campaign	-	-	-	4	-	-	-	-	-	1	1	-	3
	Days	-	-	1	20	-	-	-	-	2	1	3	-	10
Frozen fisheries	Campaign	-	-	-	-	-	-	-	-	-	-	-	1	1
	Days	-	-	-	-	-	-	-	-	-	-	-	11	11
Total EU	Campaign	-	-	-	4	-	-	-	-	-	1	1	1	4
	Days	-	-	1	20	-	-	-	-	2	1	3	11	21
2017-Month		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
Fresh fisheries	Campaign	-	-	-	1	-	-	-	-	-	-	-	-	1
	Days	-	-	3	1	-	-	-	-	-	-	-	-	4
Frozen fisheries	Campaign	1	-	-	-	-	-	1	2	2	2	3	-	11
	Days	23	-	-	-	-	1	26	51	51	49	41	-	242
Total EU	Campaign	1	-	-	1	-	-	1	2	2	2	3	-	12
	Days	23	-	3	1	-	1	26	51	51	49	41	-	246

The capture zone is extended to all Senegalese northern coasts, between the bathymetric lines of 100m and 1000m (see Figure 23).

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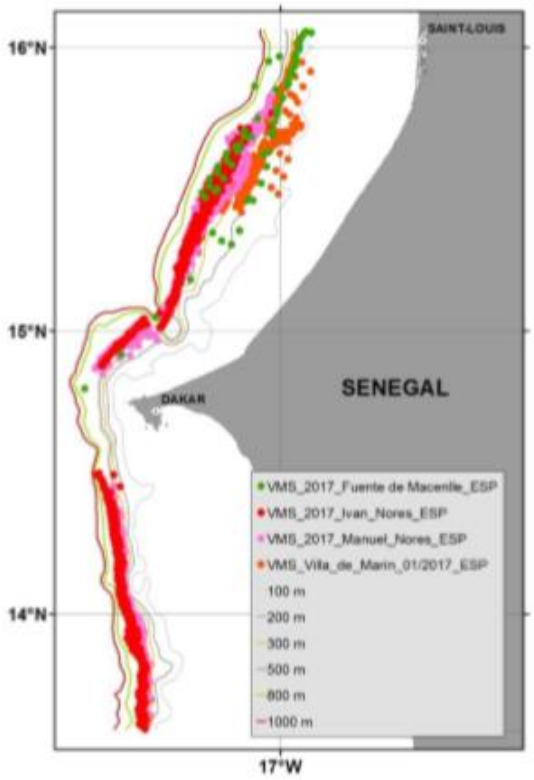

Figure 23 Spatial distribution of EU Hake trawlers in Senegal in 2017. Source : ICCAT 2017. Note: Four vessels registered on the map, but only two were allowed to be in the area at the same time.

Tuna fishing operations

In the Senegalese fishing zone, tropical tunas including albacore tuna (*Thunnus albacares*), bigeye tuna (*Thunnus obesus*) and skipjack tuna (*Katsuwonus pelamis*) are mainly targeted. The pole-and-line boats exploit tuna schools, concentrated in the zone between the latitudes 22°N and 8°N. They are all based in Dakar. Seiners have a much wider range of operation as they operate throughout the East Atlantic. The favourable period for pole-and-line fishing in Senegal is usually from October to June (CSC, 2018) (Association of the pole and line boats of the EU, Dakar Tuna 2013, analysis of catch data 2010 - 2013 in Senegal transmitted by the Spanish fisheries department).

The active fishing time for EU pole-and-line tuna vessels amounted for a total of 428 fishing days in 2017. The monthly effort fluctuated between 2 and 93 days of fishing (peak in December), and the average monthly effort was close to 36 fishing days (see Table 23).

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Table 23 Number of fishing days by month for EU pole-and-line tuna vessels in Senegal in 2017. Source: Joint Scientific Committee (2018)

Month	Fishing Days
1	61
2	2
3	39
4	20
5	37
6	42
7	6
8	5
9	11
10	48
11	64
12	93
Total	428
Mean	36

Tuna seiners are less present since they were responsible for a total of 30 fishing days in 2017, distributed between April and September (see Table 24).

Table 24 Number of fishing days by EU tuna seiners in Senegal in 2017, by month. Source: Joint Scientific Committee (2018)

Month	Fishing Days
4	5
6	1
7	3
8	7
9	14
Total	30
Mean	6

However, EU seiners have developed fishing strategies in this area that are based on the use of drifting fish aggregates (FADs).

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4.1.3 Catches

Hake catches

In 2015, the fresh fish trawler brought to shore 1,236 tons of hake catches from the Senegal fishing zone (1145 tons without accidental fishing) while the freezer trawler landed 256 tons (248 without accidental fishing)Hake catches related to an activity in the fishing zone of Senegal, were in 2015 about 1,236 tons for the fresh fishing trawler (1,145 tons without accidental fishing) and 256 tons (248 without accidental fishing) for the trawler freezer as seen in Figure 24. In 2016 these catches decreased to 64 tons (53.2) and 110 tons (84.7), while these catches were equal to 34 tons (25.7) and 1,871 tons (1,674.5) in 2017 for fresh and frozen fish, respectively, in 2017 (CSC, 2018). Thus, hake corresponds to 80-93% of the total tonnage. Unfortunately, the size structure is difficult to determine because of the lack of data.

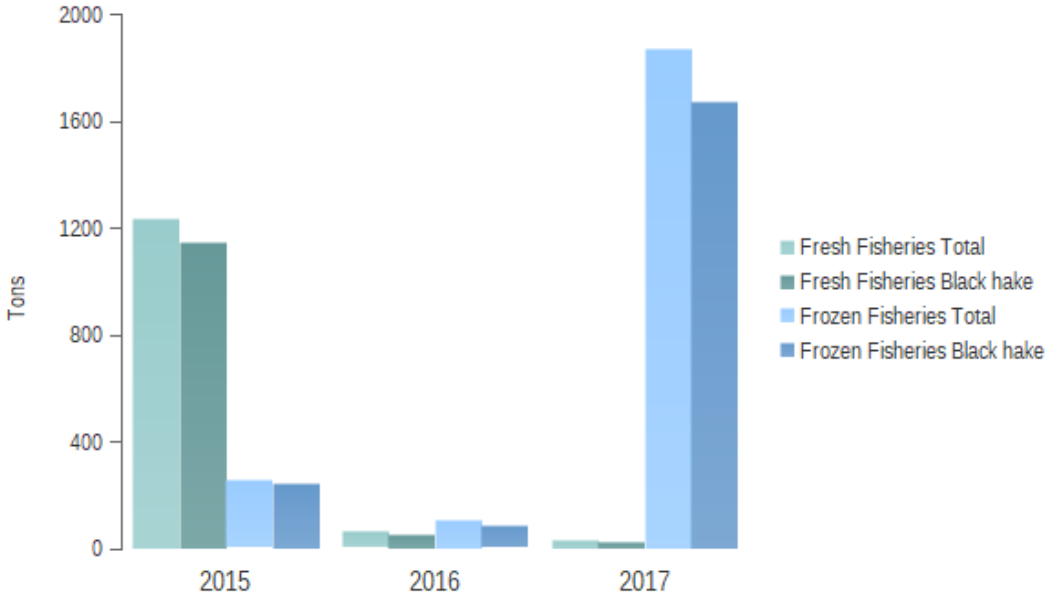

Figure 24 Hake catches (in tons) by EU trawlers in Senegal, including by-catches and hakes exclusively. Source : Joint Scientific Committee (CSC, 2018).

The measurement of black hake catches per unit effort is known for the last three years (see Figure 25). However, details per month have not been measured. Frozen fishing has become important in the last year, while fresh fishing has almost stopped since 2016 and 2017 (CSC, 2018).

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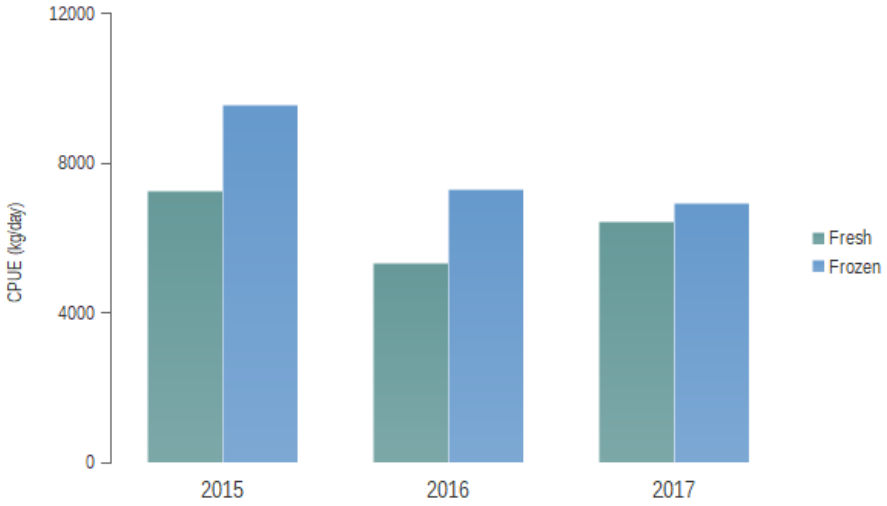

Figure 25 Catch per Unit of Effort (kg per day) for the black hake in Senegal between 2015 and 2017. Source : Joint Scientific Committee (CSC, 2018).

Overall, the EU fleet lowered its catches of black hake by the end of the 20th century. Inversely, local fisheries have increased sharply since 2016, resulting in recent overexploitation of hake in Senegal. This overexploitation is also partly due to accidental hake catches from other types of fisheries.

Tuna catches

In 2017, 42% of the EU pole-and-line vessels' total catch in the Atlantic Ocean (11,229 t) – which means 4,003 t of tuna – was caught in Senegal's fishing zone 2017 (CSC, 2018). The catches are mostly composed of skipjack tuna (3,244 t), followed by yellowfin tuna (590 t), bigeye tuna (91 t), and other species (78 t) (see Figure 26).

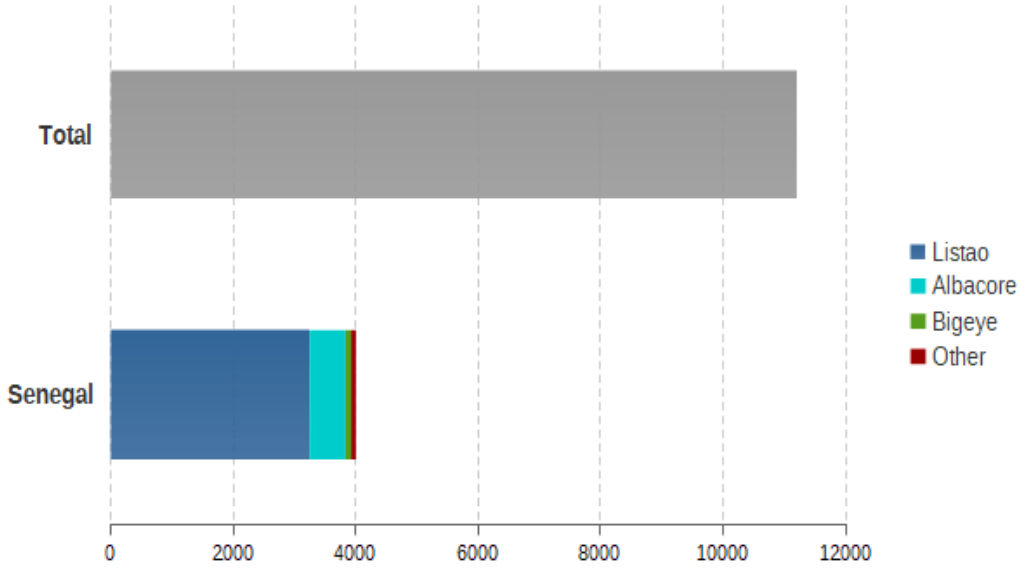

Figure 26 Total pole-and-line tuna vessels' catches in Atlantic Ocean in 2017 by EU (high) and by EU in Senegal (down) in tons. Source: Joint Scientific Committee (2018).

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In 2017, EU pole-and-line tuna vessels were less active during the summer (July-Sept.; see Table 25).

Table 25 Monthly catches by EU pole-and-line vessels in Senegal in 2017 for each species. Source: CRODT (Senegal) 2018 in Joint Scientific Committee (CSC, 2018)

Month	Albacore	Listao	Bigeye	Other	Total Catches
1	229	467	5	52	753
2	280	82.5	3	5.5	371
3	25	768	21	0	813
4	18	330	8	0	356
5	6	223	9	0	237
6	6	416	4	0	426
7	0	38	2	0	39
8	0	0.5	0	0.5	1
9	5	28	4	9	46
10	15	360	2	3	380
11	4	255	17	4	280
12	4	277	16	3	300
Total (tons)	592	3245	91	75	4003

The Catch per unit fishing effort (CPUE) varies greatly depending on the month (see Table 26), which is in large part due to the EU pole-and-line vessels' strategy of favouring quality over quantity. The average fishing effort amounted to a total of 7 tons per day.

Table 26 Catch per unit of effort (CPUE) in tons per day for each species by EU pole-and-line vessels in 2017. Source: Joint Scientific Committee (CSC, 2018).

Month	Albacore	Listao	Bigeye	CPUE Other	Total
1	1.29	3.77	0.09	0.55	5.71
2	7.75	1.55	0.05	0	9.35
3	0.2	11.25	0.32	0	11.77
4	0.4	6.44	0.55	0	7.39
5	0.11	7.97	0.3	0	8.38
6	0.27	9.26	1.13	0	10.66
7	0.03	4.69	0.28	0	5
8	-	-	-	-	-
9	0	4.1	0.15	0	4.25
10	0.25	5.91	0.74	0.02	6.93
11	0.07	7.2	0.12	0.02	7.4
12	0.03	2.4	0.26	0	2.69
Mean (tons per day)	**0.89**	**5.52**	**0.34**	**0.05**	**6.8**

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In 2017, tuna seiners were present in Senegal waters during the period of April to November. The total catch is estimated at 2,899 tonnes, with a peak of 1,437 tonnes in September (Table 27). These seiners are mobile and therefore don't only focus on Senegalese waters. They focused mainly on skipjack/listao tuna (81% of the landings) (CSC, 2018).

Table 27 Monthly Catches by EU tuna seiners in Senegalese EEZ in 2017. Source: Joint Scientific Committee (CSC, 2018).

Month	Quantity (tons)
4	460
5	178
6	195
7	66
8	506
9	1,437
10	33
11	24
Total	**2,899**

The average catches of EU seiners in Senegalese waters were almost 7,000 tons between 1972 and 2002 (COFREPECHE, POSEIDON, MRAG and NFDS, 2013). It then fell, due to a stoppage in the SFPA between 2006 and 2015 and a low stock. Before the break in the agreement, the average annual catch by seiners was less than 2,000 t during the period 2000-2006, instead of 13,500 t during the period 1990-2000. Therefore, compared to landings from previous years, the 3,000 tonnes landed in 2017 are well below the previous agreements.

According to the SFPA Joint Scientific Committee, it was not possible to conduct an analysis about quantities and specific composition of incidental catches and discards resulting from the EU tuna fleet's activity in Senegal.

4.1.4 Landings

Hake landings

The fresh hake is landed in Cadix, before to be processed, distributed and sold. There is only one boat that practices this type of fishing. The landings are marginal, as this vessel is rapidly decreasing its' fishing campaigns, from only three in 2016 down to one in 2017. In 2015, the most landed sizes corresponded to fish between 28 and 52cm for an average weight of 586 grams.

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Currently, there is no further information about the total amount of landings. However, it can be estimated from the total catches: 63.7 tons including 53.2 tons of fresh black hake in 2016; 34 tons including 25.7 tons of fresh black hake in 2017.

Frozen hake is landed in Vigo (and in Las Palmas, Canary Islands, in a less important way). The boats that are practicing this type of fishing went on two fishing trips in 2015, one trip in 2016 and 11 trips in 2017. The total catches were 256.2 tons including 248.4 tons of black hake in 2015, 109.6 tons in total including 84.7 tons of black hake in 2016 and 1,870.6 tons in total including 1674.5 tons of black hake in 2017 (CSC, 2018).

Tuna landings

The tuna landings by EU pole-and-line vessels are made in Dakar. The vessels are all are based in this port. Most of the landings are skipjack (Listao) as they accounted for 81% of the catches. The albacore accounted for 15% and the bigeye for 2%. Total catches were 4,003 tons but there is not any further information about the amount of landings. According to EUMOFA, the landings in 2015 were 7,456 tons with a decrease seen in 2017. Tuna pole-and-line-boat owners are trying to position themselves in profitable markets such as fresh tuna destined for Japan or major European and North American cities whose consumers are increasingly demanding tuna prepared in Japanese fashion. (COFREPECHE, POSEIDON, MRAG and NFDS, 2013). After they have been landed in Dakar, they are shipped by refrigerated boats to these countries, where they are prepared.

Although Dakar is not a usual port for the tuna seiners, the number of vessels that land or tranship tuna in Dakar has been increasing since 2015 (see Table 28). The landings in Dakar were 21,460 tons in 2017 while they were only 4,882 in 2015.

Table 28 Number of EU tuna seiners and landings (including transhipments) in Dakar. Source: Joint Scientific Committee (2018)

Year	Number of EU tuna seiners	Landings (tons)
2015	9	4,882
2016	11	13,708
2017	14	21,460

The EU tuna seiners land mainly in Abidjan (Ivory Coast) and in less quantities in Tema (Ghana). However, the part of the tuna fished by the EU seiners in Senegalese waters is small (only 2,000 tons out of the 190,000) compared to the total quantities of tuna landed every year in Abidjan. A part of the landings in Abidjan (and less importantly, Tema) are then transported as frozen products via containers to Europe. Thus, the catches are either previously stored in the port before being shipped

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to Europe, or they are loaded directly into a container. casein the latter case, it involves direct container loading, which is relatively recent and increasing with the improvement of port facilities, particularly in Abidjan. Alternatively, the catches from the tuna seiners are transhipped directly to freezers on board cargo ships to be subsequently processed in Europe.

4.1.5 Profitability considerations

Hake profitability considerations

Considering that almost all the hake caught in Senegal is found in the Spanish sector, only the analysis related to this sector seems coherent here. As hake is being consumed in large quantities in Spain, the demand is still important. Therefore, the prices are globally stable, especially with regards to the retail prices. The prices for the first sale were more fluctuant until 2009. Since then, the prices have been stable regardless of their origin (see Figure 27).

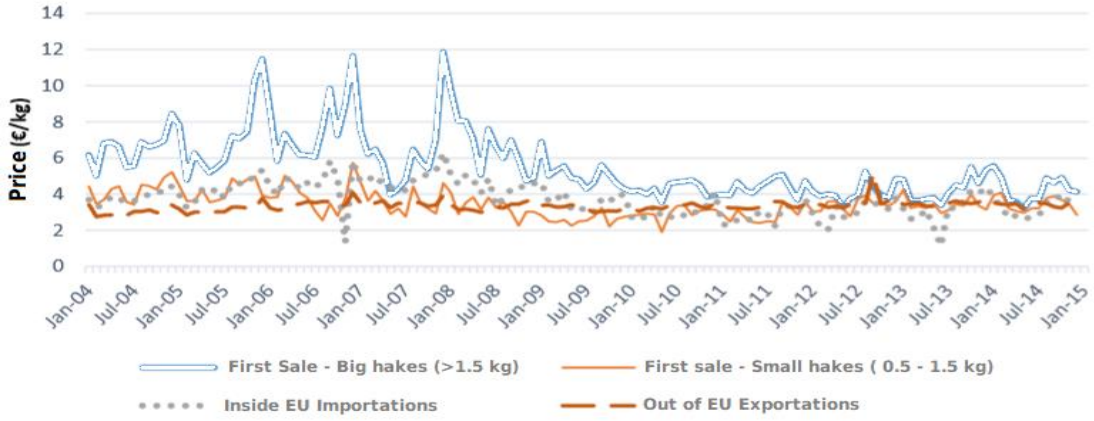

Figure 27 First sale prices for hake in Spain. Source: EUMOFA 2015

Due to the fact that retrospective evaluations of the SFPA are not at hand, it is difficult to comment on financial profitability. Profitability largely depends on the volume of catch, relative to the price of the license. The cost induced by the licenses is important, as well as the total volume of catches in order to mitigate the investment costs.

Tuna profitability considerations

In addition to the influence of the licenses, the price of tuna is correlated with the price of diesel. The price of the three main species of tuna has considerably increased over the past 10 years by a factor of two for albacore and by 2.5 for Listao and bigeye. However, as there are no retrospective SFPA evaluations, it is difficult to analyse profitability.

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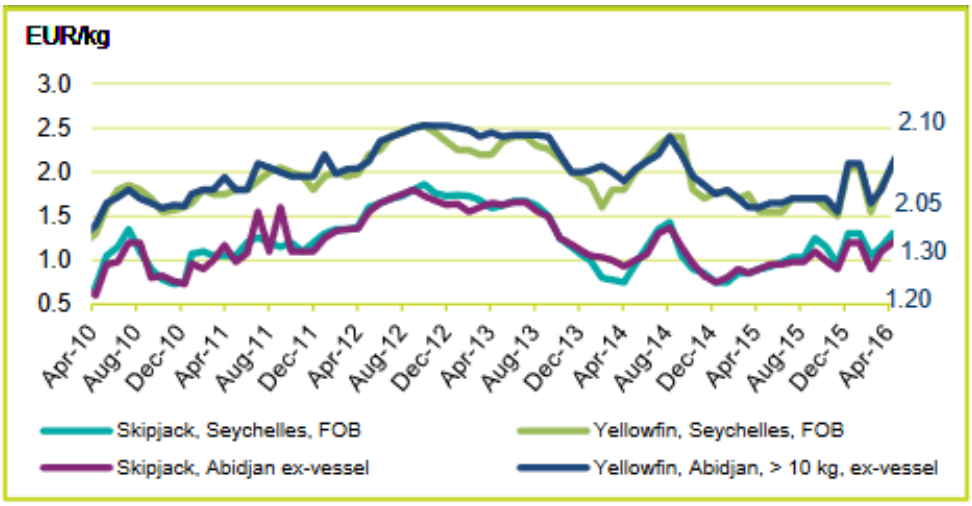

Figure 28 Evolution of tuna prices ready for exportation. Source: DG-Mare (2017)

4.2 Processing

4.2.1 Hake processing

The frozen hake is directly landed in Vigo, Spain, where it is prepared for the market (CSC, 2018). The cleaning/thawing, cutting and gutting, cooking, cleaning, packing, closing and encoding, sterilization and cooling, storage and delivery of the fresh and frozen tunas is mainly done directly in Spain.

The fresh hake is landed in Cadiz (Spain) and directly integrated into the supply chain. The fresh hake, fished in Senegalese waters, represents only a very small percentage of the total annual hake sector in Spain (25 tons out of the total of 150,000 tons).

4.2.2 Tuna processing

Fresh tuna from EU pole-and-lines vessels is landed in Dakar, before being shipped to Asia via refrigerated boats. A part is cut in loins in Dakar, before being exported. However, the data on the proportion of frozen whole tunas vs. tuna loins is not available at this point. Another part of the landings is put in cans in Dakar, where the fish will be processed for sale as canned tuna. Only SCASA (from the Korean group Dongwon) is working at a low rate, supplied by the 8 EU pole-and-line vessels (source : SCASA[42]). Higher quantities of tune were landed or transhipped by EU vessels from Dakar than from the Senegal's Area fisheries and a part of those catches were also hauled outside of Senegalese waters.. In 2015, 4882 tons of tuna were landed or transhipped in Dakar by the EU; 13708 tonnes in 2016 and 21460 tonnes in 2017 (CSC, 2018). The main importer of fresh tuna and loins from Dakar in EU is Spain. In Spain, after preparation, tuna is directed to domestic consumption and export,

[42] https://www.dongwon.com/eng/content/subsidiary/04020114 (SCASA official website)

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mainly in Europe (France, Italy, Portugal) (collected from interviews). However, most of the Senegalese tuna is shipped to Asia, or goes towards the canning process. Additionally, the locals also manage a fair share of trades with fake tuna (small tunas and species derived from tunas, such as *Euthynnus alletteratus*, which are unfit for export and canning).

In Abidjan, where the EU seiners arrive, frozen tuna stocks are mostly directly processed in the canning factories (80,000 tonnes). These canned goods are then exported to Europe. A total of 40,000 tonnes is stored in refrigerated sheds for shipment to Europe. In those cases, the fish will be processed in different sectors of the EU countries, with Spain being the main importer. One third of the tuna is then canned in Europe while the rest is stored and sold as fresh products in retail.

Abidjan is the main tuna port. It brings together a set of maintenance, bunkering, landing and transhipment services that are found nowhere else in West Africa. It is also home to three large canneries. For two of them (SCODI and PFCI), the processing factories are owned by the Lebanese group Thunnus overseas Group, whose head office is in Nanterre (near Paris, France). The last one (CASTELLI) is owned by the Italian group that has the same name. These canneries employ up to 3500 people. More than 130,000 tonnes of tuna are processed each year. The whole sector involves about 30,000 people.

Another important port for the tuna seiners is Tema, which then exports mainly to Asia. The tuna there is treated in two ways. Either as frozen products or canned. Frozen tuna is shipped to Asia, where it will be processed. Four canneries, controlled by foreign capital, are currently operating in Tema: Pioneer Food Company (PFC) is the largest; Ghana Agro-Food Company Ltd (GAFCO); Quality Food Processing (Tonelli) and Myroc Food Processing. Canned tuna is exported to Europe, neighbouring African countries and Asia. In addition, the port of Tema is specialized in the market of false tuna fisheries (by-catch during tuna fishing). These by-catches are intended directly for the African market.

4.2.3 Receivers of raw material/fish

Table 29 summarizes the main flows, locations and main actors in the EU fisheries sector in Senegal. Spain is the leading actor in this agreement, which concerns only hake and tuna. Tuna is much more exploited than hake, but they are not landed in Europe. Transport is always done by the operators.

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Table 29 Summary table of EU fisheries sector in Senegal.

Type of fishing	Number of vessels	Landed quantities (tons, 2017)	Landing location	Ownership	Transport
Fresh Hake	1	25.7	Cadix (Spain)	Spain	Own
Refrigerated Hake	1	1,674.5	Vigo (Spain), Las Palmas (Canarian Islands, Spain)	Spain	Own
Pole-and-line Tuna	8	4,003	Dakar (Senegal)	Spain and France	Own
Seiner Tuna	10	2,899	Abidjan (Ivory Coast), Tema (Ghana)	Spanish and French vessels collaborating with Lebanese, Thai and Italian companies	Own

4.2.4 Production

As previously stated, the contribution of hake fished in Senegalese waters to the whole hake sector in Spain is really low (about 2,000 tons out of 140,000 tons). Distributing channels in Spain are described in the next section.

About 190,000 tons of tuna were landed in Abidjan in 2017. The canneries are able to transform 130,000 tons, employing 2,000 people (3,500 with interim and fixed term contracts). The tuna sector in Ivory coast involves 30,000 people. The ratio is around 6 tons of tuna per worker involved in the sector. In Dakar, only 20,000 tons of tuna are landed or transhipped. The processing into loins doesn't involve a lot of workers, although any information about the price is not available. The same can be said about the cannery, which doesn't employ as much workers as expected (only 400 people including interns and day workers out of 3,000 people expected).

4.3 Distribution channels

Figure 29 shows the main flows. The details are then brought in the following sections (Section 4.3.1 "Hake channels" and Section 4.3.2 "Tuna channels").

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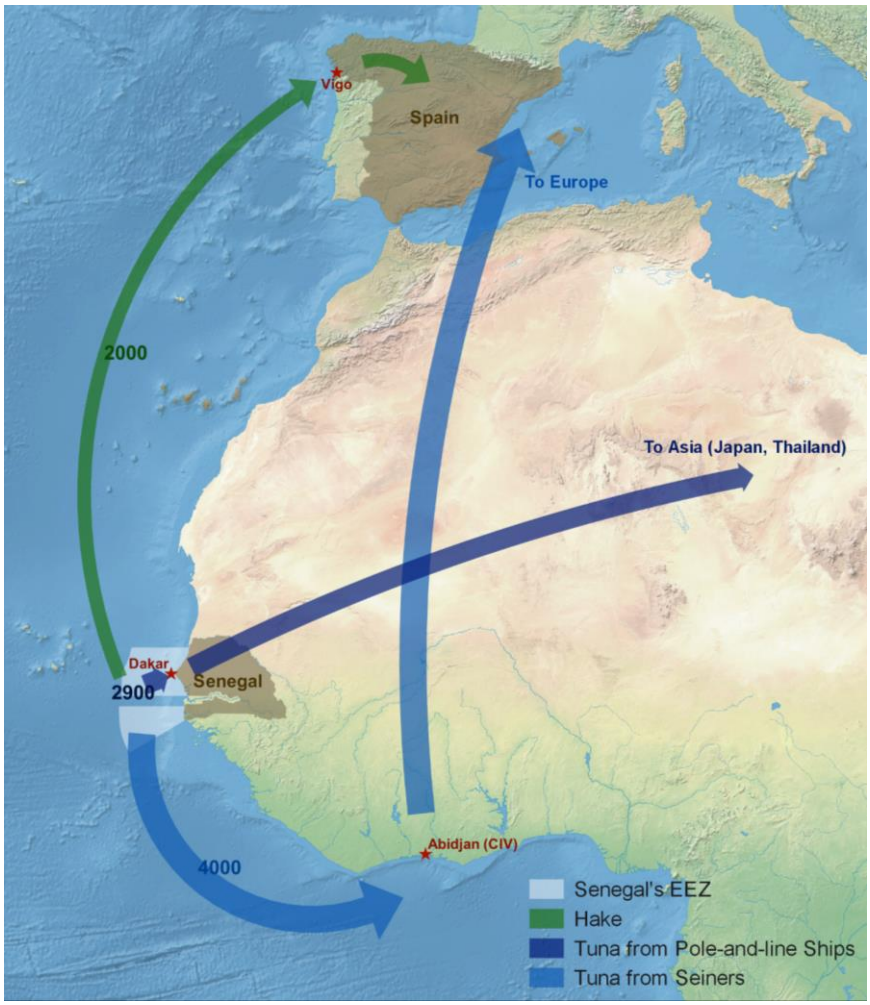

Figure 29 Main Fish channels by EU fleet in Senegal within the SFPA in tons (2017). Source : Own elaboration.

4.3.1 Hake channels

Spain is a big consumer of Hake, which is the most consumed fish species in the country (EUMOFA 2017). Frozen black hake from European boats arrives at the port of Vigo (northern Spain; see Figure 29). The first sale takes place at the port under the port authority. From there, it is supported by the wholesaler fishmongers. Then, the preparation and resale of hake takes place in a relatively short supply chain and goes towards the fish stores, the supermarkets, the sellers in the popular markets and the discounters (cf. Figure 30). Hake fished by EU vessels in Senegalese waters are just a small part of the total (2,000 tons out of 140,000 tons in the whole hake sector in Spain).

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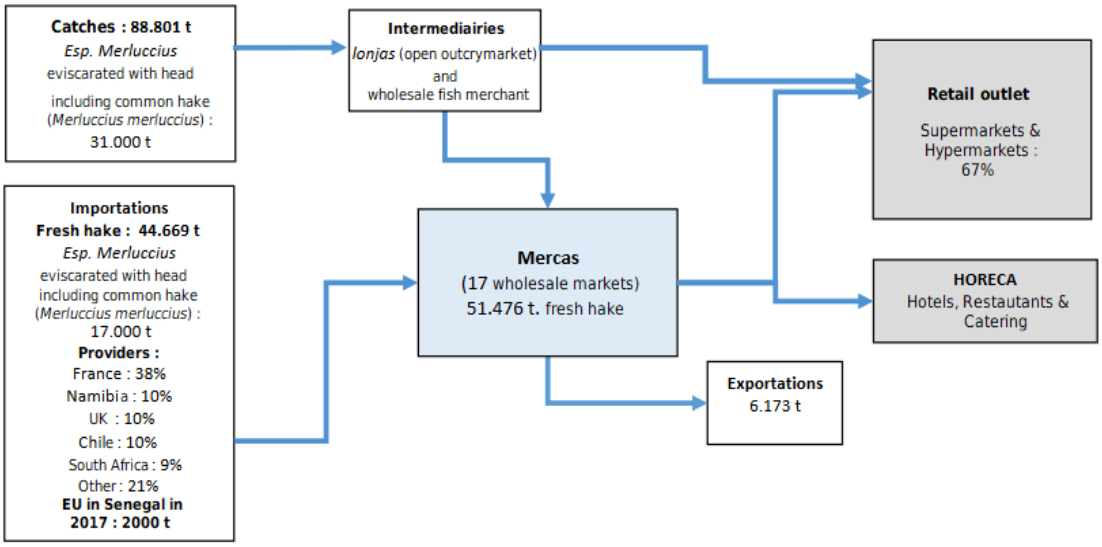

Figure 30 Spanish chain of fresh hake. Source: MAGRAMA, MERCASA, COMEXT and FAO in EUMOFA, 2017

Prices vary greatly from one region to another. Many factors influence what is perceived as a good value: size, cultural tradition and fishing techniques, freshness and origin (local versus non-local species).

Several categories of fishing markets are found in Spain. In Vigo, which is the most important market in Spain for fish caught in west Africa, the port is the authority (EUMOFA 2017). All categories of buyers happen to be present at the first and second sale. While in Tarragona and San Carlos De La Rapita - other important ports - it is Cofradias, brotherhoods of the Catalonia region. The two entities organize not only the first sale but also the second sale. In addition to market infrastructures, they offer the following services: unloading of vessels, marketing (organization of auctions and management of first sale buildings), renting of fish workshops and cold storage rooms, provision of standardized containers and trolleys for their transport, weighing, social services (social security for shipowners and seafarers, insurance, etc).

4.3.2 Tuna channels

Figure 31 summarizes global tuna value chains in West Africa. In the case of Senegal, these are mainly tuna pole-and-line catches that are subsequently shipped to Asia (bottom of the figure). To a lesser extent, the tuna seiners are concerned. These are based in Abidjan and export their processed products from Abidjan to Europe (top of the figure).

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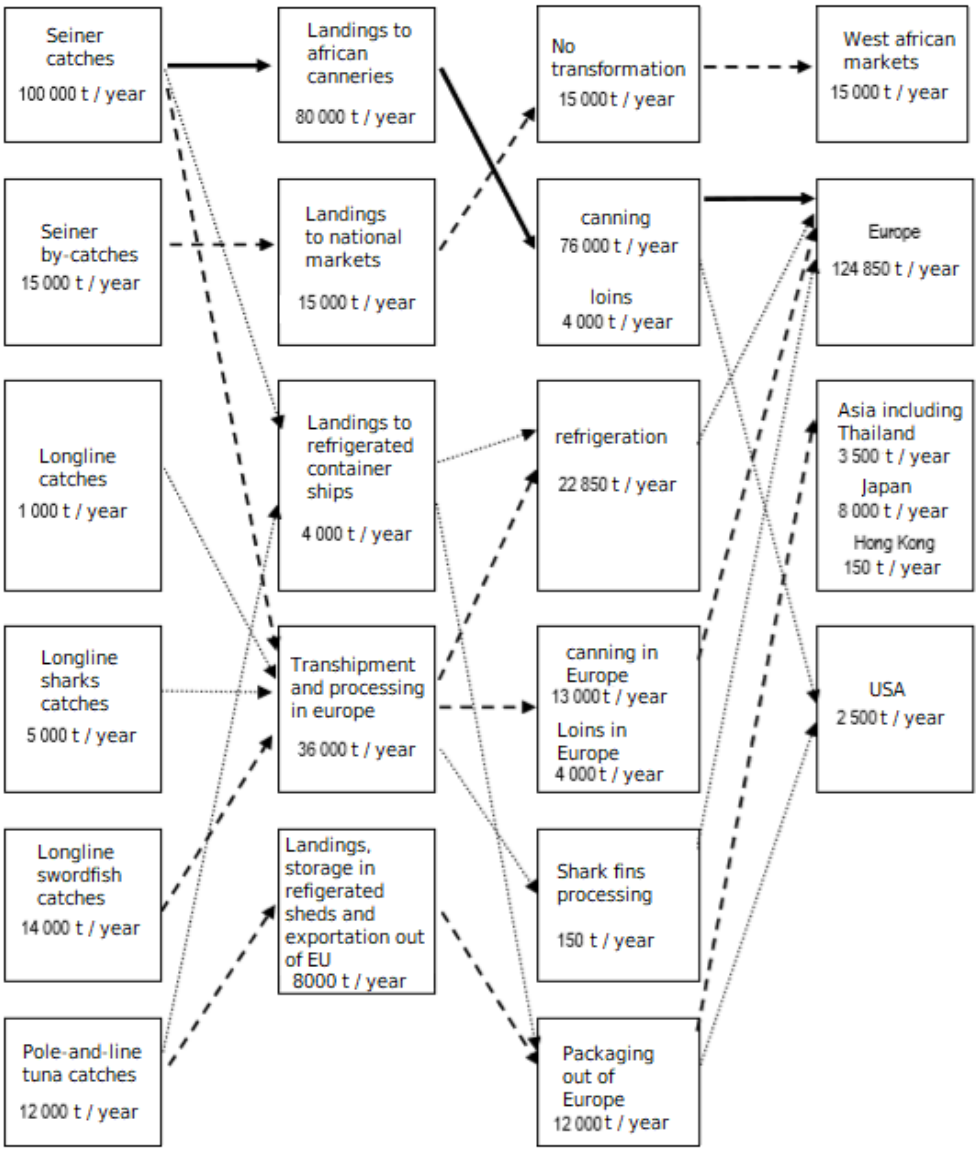

Figure 31 Tuna channels by EU fleet in West Africa (2008-2012 mean flux)

Pole-and-line catches are mainly made in Senegalese and Mauritanian waters. All EU pole-and-line vessels are based in Dakar and landing is occurring in this port. The EU seiners are based in Abidjan, where most of the processing occurs. Finished products are subsequently exported mainly to Europe and Asia (see Figure 29; collected from interviews).

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4.4 Value chain description

4.4.1 Risks

The main risk in the fishery is the diminishing of resources, because of their excessive exploitation. Hake was fished less intensively by EU fleets in the region. Most of the demersal resource stocks in Senegal's fishing zone are regularly assessed by the FAO-affiliated Central East Atlantic Fisheries Committee (CECAF). In the neighbouring Mauritanian fishing zone, where the stock has been continuously exploited in recent years, assessments conducted in 2010 and 2013 concluded that black hake was not fully exploited locally, as well as Senegal, probably because of the decline in EU activity in recent years. However, in 2017 the analyses showed that the stock is fully exploited at the West African scale, and that the overall catch level of 2016 is not sustainable in the short term. This increased pressure (notably the neighbouring fishing zone of Guinea-Bissau) is the consequence of the increasing fishing effort of the local countries on hake, as well as incidental catches caused by other fisheries.

In addition to the stock analysis, the risks related to tuna fishing also include the oil prices. Assuming the increase in the price of oil in the future, this may influence tuna fishery. With regards to the stocks, ICCAT (International Commission for the Conservation of Atlantic Tunas) is the organisation in charge of the monitoring and recommendations. Stock assessment is conducted on a regular basis, which allows the most recent findings, advice and recommendations to be available. Skipjack tuna is currently not in the process of being overexploited (ICCAT, 2016). Albacore tuna, on the other hand, is caught at the limit of its maximum sustainable level, while bigeye tuna is overfished. For associated species, no assessment has been conducted until now according to the ICCAT (International Commission for the Conservation of Atlantic Tunas) which is in particular due to the lack of necessary statistical and biological data.

4.4.2 Management

Fisheries in Senegal are being supervised by the CRODT (Centre de Recherches Océanographiques de Dakar-Thiaroye), which conducts stock evaluations, advices and recommendations on an annual basis. They work closely with SFPA joint scientific committee (JSC). Analyses are also being made in Europe by the national administrations that are involved in the SFPA (France and Spain in that case). However, the fisheries observational staff who are on board of the EU vessels sometimes don’t communicate the information they recorded. JSC recommends that the information should be better transmitted. The ICCAT is also an influential actor, because it is in charge of tuna evaluations and recommendations. One of the most important management measures in recent years is about FAD fishing gear. This technique is managed more strictly now, with spatial and temporal constraints (prohibition of FADs in certain areas, at certain periods).

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4.4.3 Sustainability

CECAF-affiliated working group is conducting stock studies of many marine species in the region. Black hake benefited from a reduction in fishing effort. However, the Senegalese artisanal fishery is contributing to the pressure on overexploitation, as well as the other types of fisheries' by-catches. Current mortality levels are considered unsustainable. In addition, the stock is considered fully exploited in the sub-region: Morocco, Mauritania, Senegal, Gambia (CECAF NORTH 2017). In contrast, studies conducted until 2015 by COPACE and FAO indicate that the stock was not fully exploited (Latouffe 2017). This pressure on the stocks of hake is therefore recent.

Regarding the tunas, ICCAT (International Commission for the Conservation of Atlantic Tunas) is the organisation in charge of the monitoring and recommendations. Stock assessment is conducted on a regular basis, which allow the most recent findings, advice and recommendations to be available. Skipjack tuna is currently not being overexploited (ICCAT 2016). Albacore tuna, on the other hand, is caught at the limit of its maximum sustainable level, while bigeye tuna is overfished.

4.4.4 Traceability

The EU fleets' hake traceability is relatively simple due to a low number of ships (only one fresh trawler, and three refrigerated boats with only two vessels allowed to be present at the same time). The quantities and composition of every catch volume is known for the past three years. The tuna seiners and pole-and-line vessels always bring logbook, which instantly records the catches.

4.4.5 Food Security

SFPA do not contribute at all to the food security of the countries in west Africa. The fishery products included in the SFPA's are almost all exported to Europe, Asia and the USA. Only the employment of local labour on the EU boats generates a marginal revenue.

4.5 Summary

The current agreement started at the end of 2014 and runs until November 2019. It only concerns black hake and tuna fishing. The hake fishery remains of minor importance, since the agreement only allows two trawlers to operate in Senegalese waters at the same time, for a total of 2,000 tonnes maximum per year. These operations took place along the edge of the continental shelf, between the isobaths of 100m and 1000m. Although the fishing pressure from EU vessels on black hake is not very important, the development of the local fishery on this species is causing recent overexploitation. Concerning the black hake, the agreement is fully used by the EU with the Spanish trawlers landing their catch in Spain (Vigo), where hake will join the traditional Spanish sector for local consumption. About tuna fishing, the three species encountered (yellowfin/listao, skipjack/albacore and bigeye) are fished by tuna fishers, but skipjack tunas are the most targeted. There are eight EU pole-and-line

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vessels (7 Spanish and 1 French) fishing for tunas in Senegal, for a total of 4,000 tonnes. The utilization rate of the number of vessels according to the agreement is optimal. They are all based in Dakar, where they land their products. The tuna is stored for a part in refrigerated hangars and then shipped to Asia for processing and consumption. Another part provides the only cannery present in Dakar. EU tuna seiners fishing in Senegalese waters are not based in Senegal and do not focus on this fishing area. In fact, only 3,000 tons were fished by 10 boats, for a utilization rate of about 30-35%. These catches are then landed in Abidjan (Ivory Coast) and more rarely in Tema (Ghana). The tunas are directly prepared and canned in the canning factories of Abidjan, for later shipment to Europe. To finish, the financial annual amount of this agreement is decreasing, with a starting amount of 1.8 million for the first year. The annual amount then drops down to 1.67 million for the last year.

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5 Mauritania

Authors: **Pierre Failler**, Grégoire Touron-Gardic, Cindy Cornet (University of Portsmouth) and Øystein Hermansen (Nofima)

Located in the west-northwest corner of the African continent, Mauritania extends from the 15th to the 21st North parallel over an area of 1.03 million square kilometres. It is bounded by Senegal to the south, Mali to the south and east, Algeria to the northeast and Western Sahara to the north. To the west, the country is exposed to the Atlantic Ocean (see Figure 32) over the span of more than 700 kilometres of coastline. The EEZ claimed by Mauritania covers an area of 234,000 km^2.

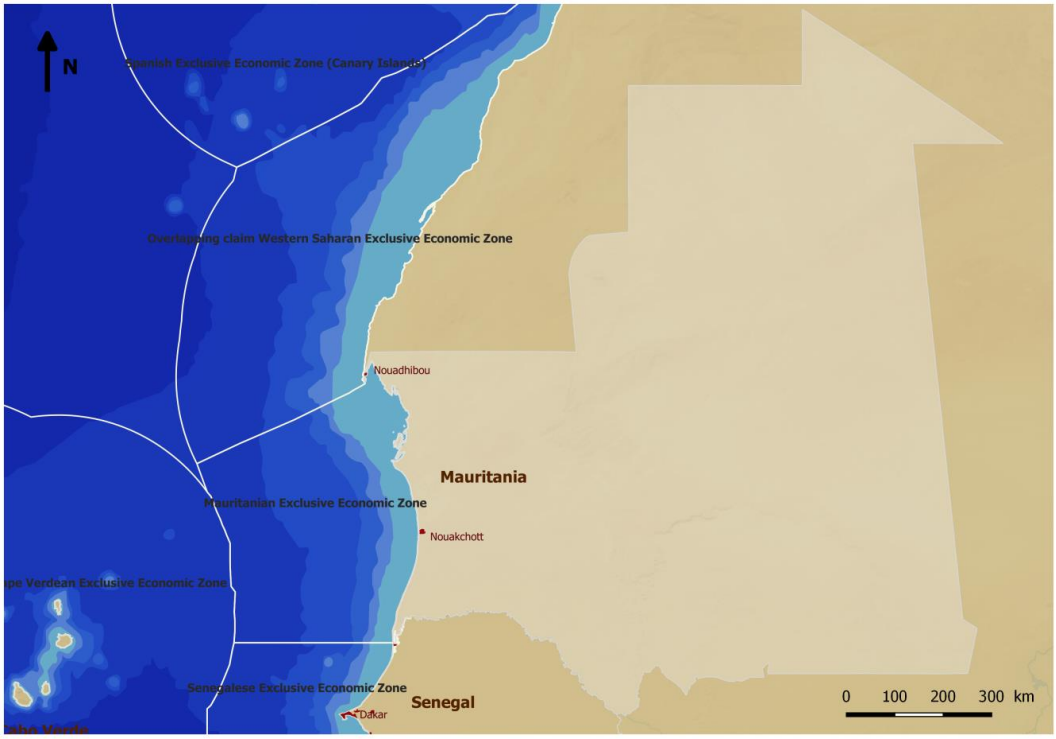

Figure 32 Map of Mauritania and its EEZ. Source (EEZ): Flanders Marine Institute (2018). Maritime Boundaries Geodatabase: Maritime Boundaries and Exclusive Economic Zones (200NM), version 10.

Mauritanian waters are characterized by a very dynamic marine ecosystem, under the effect of a large scale variability of North-West Africa upwelling. The front of the upwelling oscillates with the seasons. It is present all year round in the north of the country, while the rest of the Mauritanian coastal zone benefits only during the period from October to July. In addition to the upwelling, the Mauritanian marine area benefits from an extended continental shelf. Both of these factors result in a high fish productivity. Moreover, given the transitory nature of the Mauritanian maritime area between the southern tropical waters and the northern temperate waters, the Mauritanian zone is characterized by an exceptional biodiversity attested by the juxtaposition of fishery resources with different biogeographic affinities.

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Independent since 1960, the Islamic Republic of Mauritania is part of the ACP Group States. The human development index (HDI) in 2017 was 0.520, ranking the country 159th in the world (UNDP, 2018). The National Income per capita is US$ 1,270 (World Bank), which classifies Mauritania as a poor country. Mauritania's economy is focused on mining and fishing activities, as the development of the oil industry is still in the early stages.

In the context of the fight against poverty and food insecurity, fishing plays a key role. It allows nearly 40,000 workers to work in the sector, and it provides the population with roughly 350,000 tons per year of seafood (mostly small pelagic species, the price of which is affordable to the greatest number). By comparison, the industrial catches from other countries' fleets in Mauritanian waters are more than 700,000 tons per year (CCMLE Working Group 2014). The consumption of fish was restricted to the coastal populations for a long time but recently, it has been developing on a yearly basis by being transported on ice or as frozen products throughout the country.

5.1 Catch under the SFPA

The first fisheries agreement between Mauritania and the EU dates back to 1987. Since then, regular collaboration have been maintained. The current four-year Protocol to the Fisheries Partnership Agreement (SFPA) entered into force on the 16th of November 2015. This 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 sustainable blue growth. It is necessary to keep in mind that there was a suspension between July 2014 and December 2015.

5.1.1 Vessels operating under the SFPA

The agreement includes several categories, divided by type of gear used and marine fauna (Table 30).

Table 30 Categories of fishing included in the SFPA. Source: DG-Mare (ec.europa.eu)

Category Number	Species	Type of fishing gear
1	Crustaceans except spiny lobster and crabs	Trawlers
2	Black hake	Trawlers and longline (fresh)
2Bis	Black hake	Trawlers (frozen)
3	Demersal species other than black hake	Others than trawlers
4	Tuna	Seiners
5	Tuna	Pole-and-line and surface longline
6	Small pelagics	Trawlers (frozen)
7	Small pelagics	Trawlers and seiners (fresh)
8	Cephalopods	No fishing opportunities granted under the current protocol.

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Under the Protocol, the EU fleet is allowed to fish in Mauritanian waters for shrimp, demersal fish, tuna and small pelagic fish, up to a total of 287,050 tonnes a year, under improved operational conditions. In addition to the fees paid by the European fleet (tonnage fees and para-fiscal taxes), the EU provides a financial contribution of 61.625 million euros per year for this partnership, comprising of 57.5 million euros for the access to waters and 4.125 million euros for supporting local fishing communities in Mauritania and improving fisheries' governance.

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.

Table 31 Main features of the SFPA. Source: DG-Mare (ec.europa.eu)

Duration of the agreement	6 years renewable (30.11.2006 - 29.11.2012; 30.11.2012 - 29.11.2018)
Nature of the FPA	Multi-species agreement
Duration of the protocol	4 years (from 16.11.2015 to 15.11.2019)
Financial contribution	61.625 million €/year, of which 4.125 million €/year to support the fisheries sector.
Fishing opportunities and fees for ship-owners	*Category 1*: Fishing vessels specialising in crustaceans other than spiny lobster and crab (maximum 5,000 tonnes/year; maximum 25 vessels). *Fee*: 400 €/t, annual advance fee of 1,000 €/vessel deducted from total fee.
	Category 2: Black hake non-freezer trawlers (maximum 6,000 tonnes/year; and maximum 6 vessels). *Fee*: 90 €/t, annual advance fee of 1 000 €/vessel deducted from total fee. *Category 2 Bis*: Black hake freezer trawlers (main target species: black hake, maximum 3,500 tonnes/year; secondary species: squid maximum 1,450 t/year and cuttlefish, maximum 600 t/year, 25% by-catch allowed for demersal fish other than black hake). *Fees*: Black hake: 70 €/t, squid: 575 €/t, cuttlefish: 250€/t and 90 €/t for by-catches; annual advance fee of 1,000 €/vessel deducted from total fee.
	Category 3: Vessels fishing for demersal species other than black hake with gear other than trawls (maximum 3,000 t; maximum 6 vessels). *Fee*: 105 €/, annual advance fee of 1 000 €/vessel deducted from total fee.
	Category 4: Tuna seiners (reference catch 12,500 tonnes; max. 25 vessels). *Fee*: 60 €/t in the 1st and 2nd years; 65 €/t in the 3rd year; 70 €/t in the 4th year. Annual flat-rate advance fee of 1,750 €/vessel.
	Category 5: Pole-and-line tuna vessels and surface long-liners (reference catch 7,500 tonnes; maximum 15 vessels).

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	Fee: 60 €/t in the 1st and 2nd years; 65 €/t in the 3rd year; 70 €/t in the 4th year. Annual flat-rate advance fee of 2,500 €/pole-and-line vessel and of 3,500 €/surface long-liner.
	Category 6: Pelagic freezer trawlers (maximum 225,000 tonnes; maximum 19 vessels). *Fee*: 123 €/t, annual advance fee of 5,000 €/vessel deducted from total fee.
	Category 7: Non-freezer pelagic vessels (maximum 15,000 tonnes/year, deducted from category 6; maximum 2 vessels). *Fee*: 123 €/t, annual advance fee of 5,000 €/vessel deducted from total fee.
	Category 8: Cephalopods: no fishing opportunities granted under current protocol.

Note: Categories 7 and 8 are not exploited by the EU. There is currently no agreement on category 8. Category 7 is abandoned by EU vessels despite the authorizations. This category (fresh fishing for small pelagic species) would not generate a sufficiently large gross operating surplus.

Vessels operating within the SFPA

The number of vessels that are actually operating within the SFPA are much fewer than the agreement authorises. Some constraints in profitability, logistic and technique limited the EU fleets in Mauritanian waters. Figure 33 shows the number of EU-vessels operating in Mauritanian waters in the period 2002–2016.

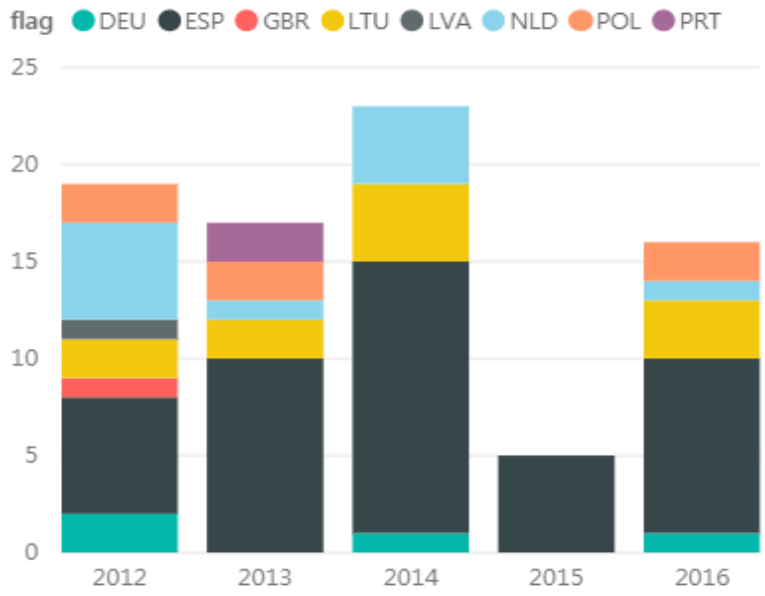

Figure 33 Number of EU vessels fishing in Mauritania classed by nationality. Source: globalfishingwatch.org.

The following estimates of fishing effort are based on a data set downloaded from the Global Fishing Watch website (www.globalfishingwatch.org). Here, AIS data have been gathered and processed to identify when vessels are actually fishing. The methodology is described in Kroodsma et al. (2018).

The data has been filtered for the Mauritanian EEZ. As most of the activity occurs clearly within the EEZ, this does not have a big impact on the results. When all vessels registered in the data are included,

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trawling represents the most fishing hours, followed by drifting longlines and fixed gears. Spanish boats are the most numerous. Nevertheless, as small pelagic trawling is the most important fishery by the EU in Mauritania, it is found that vessels from countries of North-east of EU are well represented. Only Spanish trawlers were active at the end of 2015, because of the agreement suspension. Vessels from Portugal and Great Britain are no longer active, due to new fishing zone restrictions.

Category 1

There were only 13 Spanish vessels that specialised in crustaceans other than spiny lobster and crab (category 1) within the Mauritanian SFPA in 2017 (Figure 34). There has been a significant decline in the number of EU vessels in this fishery since 2011 due to new restrictions in fishing areas.

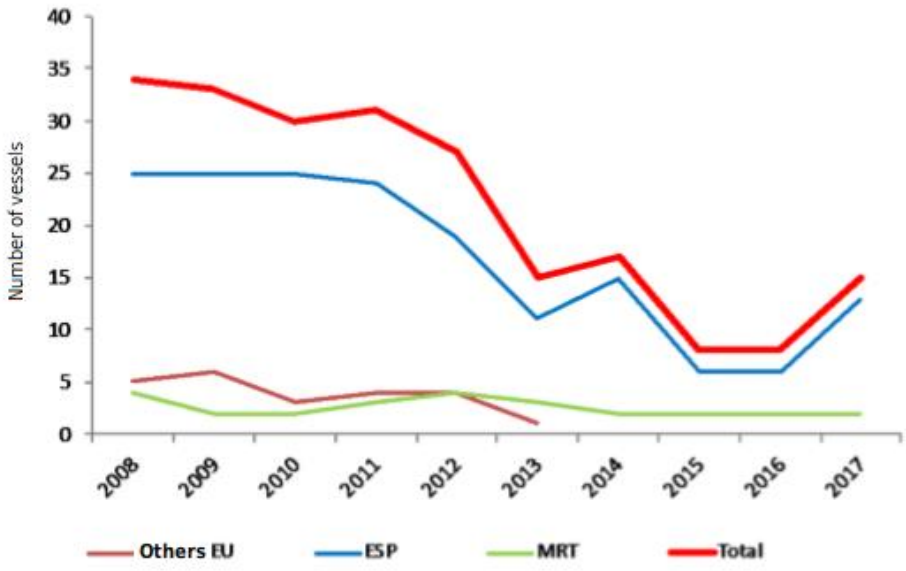

Figure 34 Number of Category 1 EU vessels. Source: Joint Scientific Committee (2018).

The increase in the number of Spanish vessels in 2017, compared to 2016, is linked to the closure of the shrimp fishery in Guinea-Bissau.

Category 2

The number of non-freezer trawlers allowed at the same time to target black hake (category 2)is limited to 6, but during the current Agreement (between December 2015 and 2017) only 3 Spanish trawlers used the authorizations in this category each year. Bottom longline gear has not been used since 2009.

Category 2Bis

Six Spanish black hake freezer trawlers (category 2Bis) were active in 2017, utilizing the entire authorisation of the SFPA.

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Category 3

The SFPA provides access to six EU vessels fishing for demersal species other than black hake with gear other than trawls. In 2015 there tree vessels active in the fishery; five in 2016 and four in 2017. The EU fleet, especially from Spain, fishes exclusively offshore and targets bentho-pelagic species with longlines. The longliners are about 25m long and have an engine power of around 290 hp.

Category 4

EU vessels armed with purse seines, targeting tuna and associated species (category 4) that are authorized in the Mauritanian fishing zone, only operate beyond 30 miles from the baseline. There were a total of 21 vessels licensed in 2017 (Spanish and French), representing a utilization rate of 84% of the number of boats allowed by the agreement.

Category 5

The number of pole-and-line tuna vessels and surface long-liners (category 5) must not exceed 15 units. There were 12 licensed in 2017 (80% use of the agreement) and their flags were Spanish and French. Pole-and-line boats are based in Dakar (seven Spanish and one French). Therefore, only four longliners were active in Mauritanian waters, although a considerable amount of fishing in marine areas beyond the national jurisdiction is being conducted. Among all these longliners, most of them are based in Galicia in the ports of Vigo, Burela or La Guardia, and they are new vessels. Some Portuguese units, based in Nazare, Péniche and Lisboa, complete the Atlantic longline fleet of the EU.

Category 6

Pelagic freezer trawlers (category 6) from Poland, Latvia and Lithuania are the most active and make most of the catches. Dutch and German vessels are also present. It is difficult to assess the actual number of vessels in this category, as they are only occasionally present along the coastline of West-Africa. As these fleets are autonomous and very mobile, they easily change the fishing area according to the fishing possibilities available (in the same year, ships can work in European waters, in the South East Atlantic, and even in the South East Pacific).

Category 7

The SFPA provides two non-freezer pelagic vessels (category 7) access to 15,000 tonnes a year in Mauritanian waters. This category is however not used by the EU fleet, most likely due to a lack of profitability.

Category 8

Fishing opportunities targeting cephalopods (category 8) is suspended in the present SFPA.

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5.1.2 Fishing operations

The cumulative demersal species fishing effort of the EU fleet is much lower now compared to the years of 2008-2012 (see Figure 35). The cessation of fishing for cephalopods (Category 8) has considerably reduced the activity of the European fleet. In addition, the shrimp fishery (Category 1) has weakened. The appearance of the new category (2Bis: frozen hake trawlers) did not result in similar activity levels as seen between the years of 2008–2012.

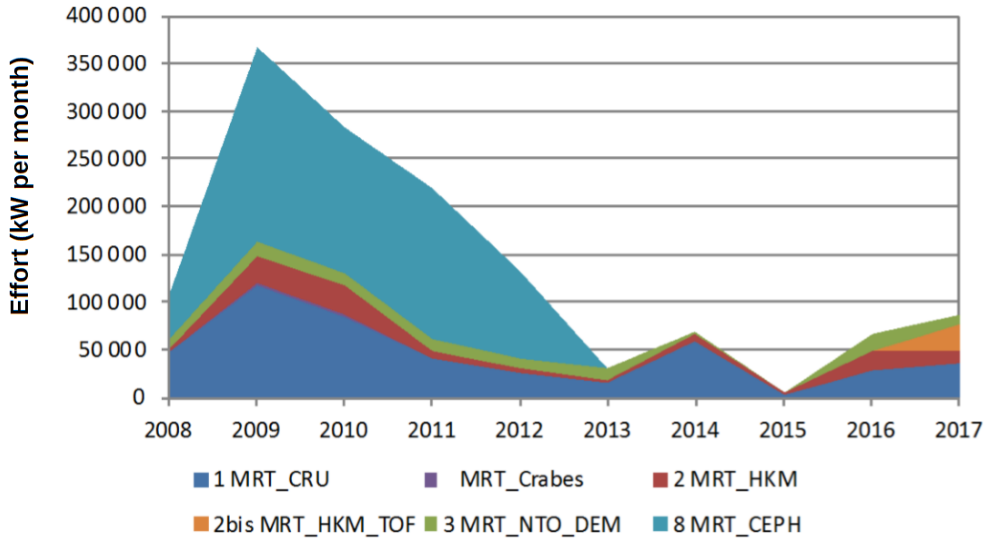

Figure 35 Cumulative fishing effort per month (in kW/month) for demersal species by the EU vessels. Source: Joint Scientific Committee (2018).

The overall effort for pelagic species is growing slightly (except for the year 2015, during which fisheries were suspended for 11 months out of 12; see Figure 36). The fresh small pelagic fishery (Category 6) was the main activity of EU fleet before the suspension of activity in 2015. Now, vessels in Category 4 (tuna seiners) are the most active.

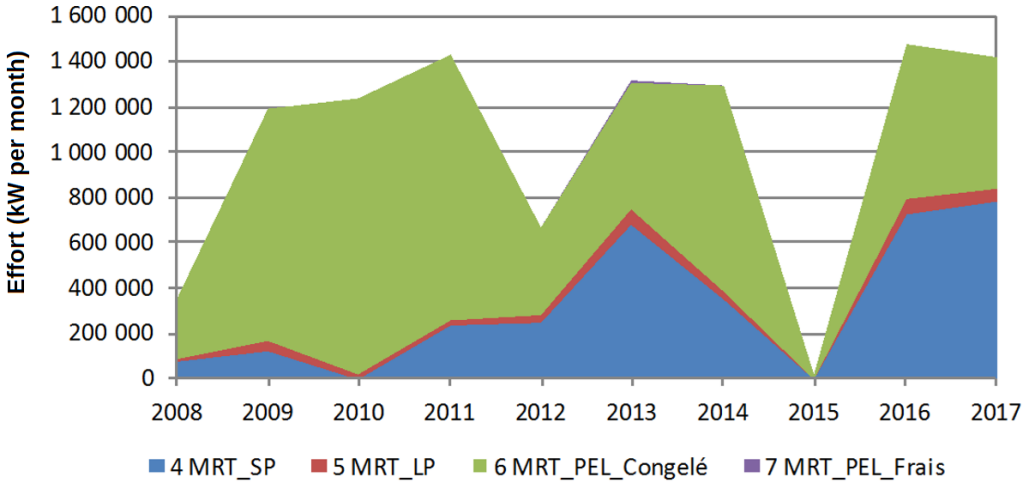

Figure 36 Cumulative fishing effort per month (in kW/month) for pelagics by the EU vessels. Source: Joint Scientific Committee (2018).

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Trawlers represent the most number of EU boats operating within the SFPA (Figure 37). It is also this type of boats that are represented by the most diverse number of countries. Longliners – mainly Spanish – are the most common boats after trawlers. The other types of vessels are much fewer and are for the most part of Spanish origin.

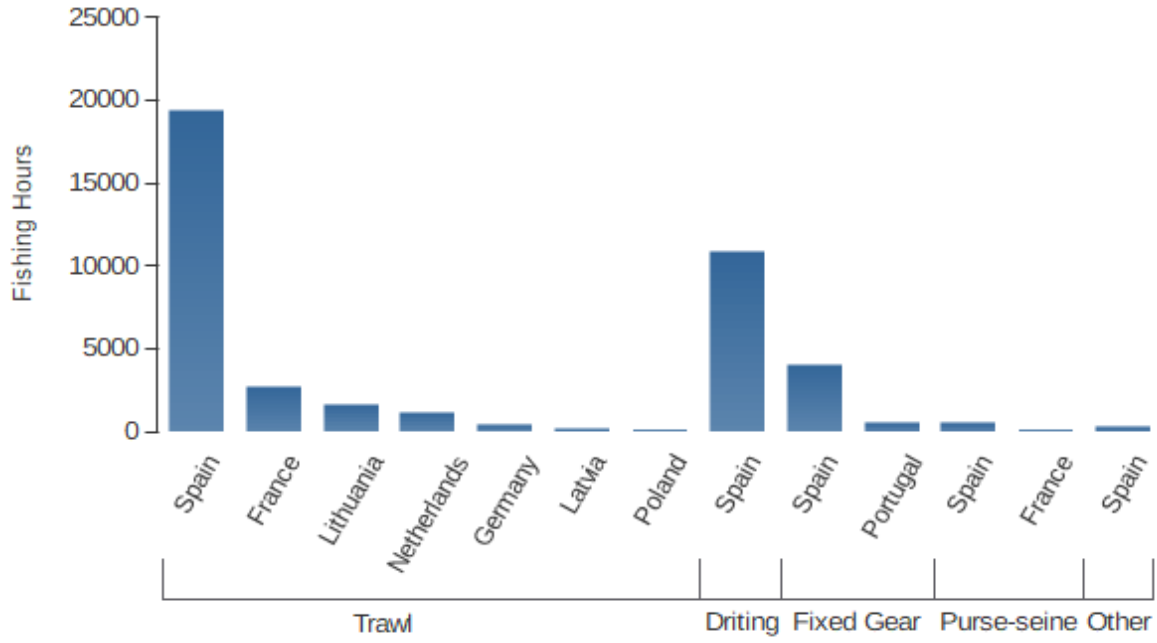

Figure 37 Combined fishing effort by fishing type and by country within EU in 2016. Source: globalfishingwatch.org.

Category 1

EU vessels targeting shrimps in the Mauritanian fishing zone capture all three species encountered at different depths. The first and the most coastal, the langostino (*Penaeus spp*), occurs at depths between 25 and 70 m. The second species, gamba (*Parapenaeus longirostris*), is fished between 100 and 350 m depth. The alistado (*Aristaeomorpha foliacea*), the deepest, is captured at depths of 400 to 950 m. In 2017, Spanish vessels fished mainly between 20°N and the border with Senegal. North of 20°N, fishing was conducted only in deep waters (Figure 38).

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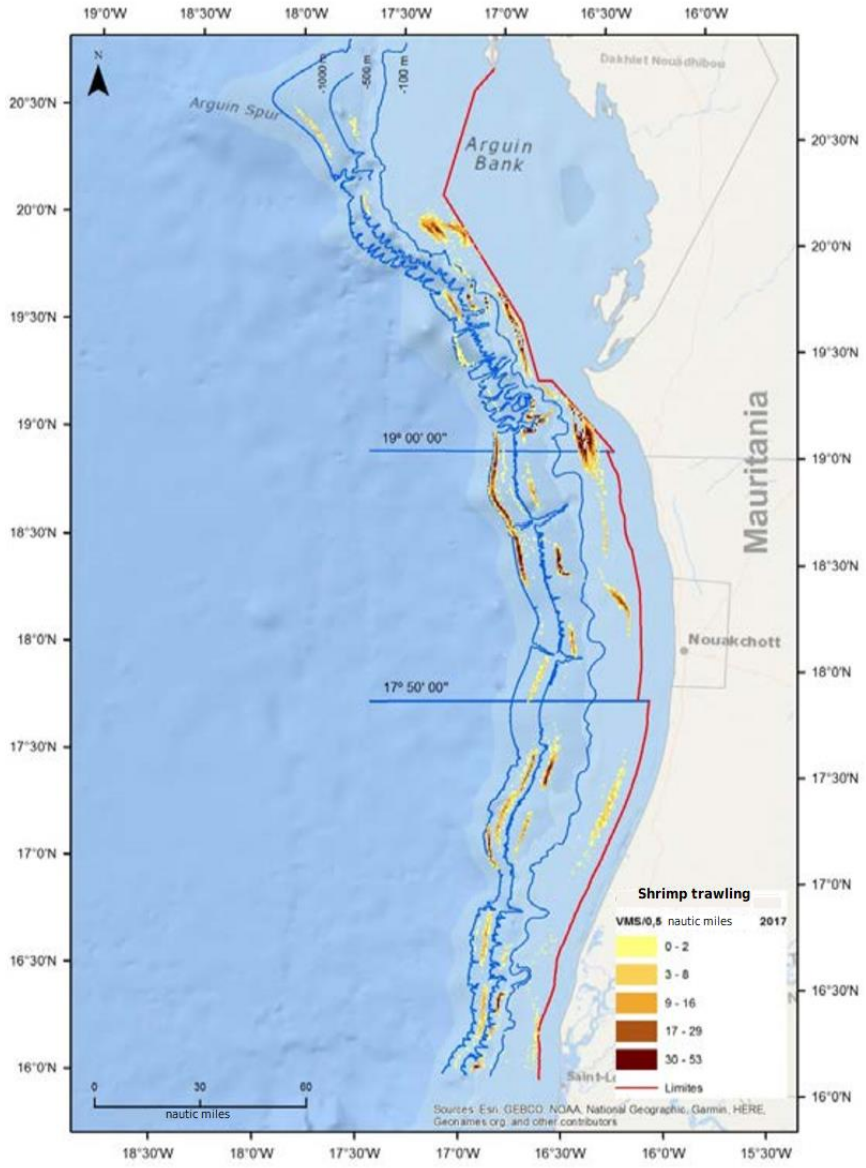

Figure 38 Map of fishing zones for Category 1 vessels. Source: Joint Scientific Committee (2018)

Deep-water shrimp represent the largest portion in a normal year. Demersal fish account for less than 10% of landings. Fishing effort has decreased due to new regulations, which prohibit EU vessels from fishing in shallow waters (<20m). This has resulted in the withdrawal of several vessels (Figure 39).

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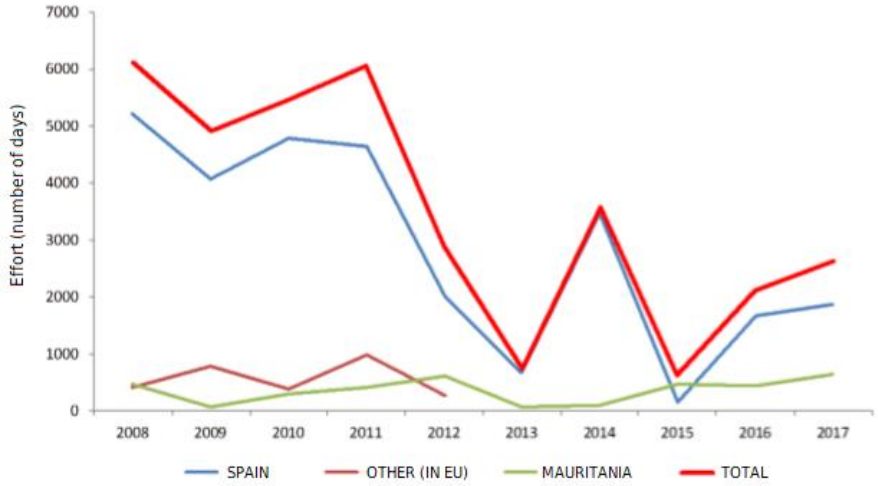

Figure 39 Evolution of fishing effort (days) of EU trawlers targeting shrimp between 2008–2017 in Mauritanian waters. Source: Joint Scientific Committee (2018).

Categories 2 and 2Bis

These fishing categories allow the capture of the two hake species found in Mauritanian waters, *Merluccius senegalensis* and *Merluccius polli*, which have been denominated under the generic name of black hake for more than 60 years.

The fleet of fresh fish trawlers has drastically declined over the past 30 years, from 20-30 to 2-5 boats in the last decade, of which all are Spanish. The effort in fishing days has also decreased (Figure 40), even though the boats now fish all year round, with almost no disruption during landings. The fleet has therefore changed its fishing strategy over all these years, decreasing the length of the campaigns each time for commercial reasons. However, this change has also been promoted by the obligation established in the Fisheries Agreement to land the catches. This gradual decrease in the number of vessels is probably related to the technical and economic conditions adopted in the Protocols during the years concerned, as well as the low prices and low profitability of the black hake fishery.

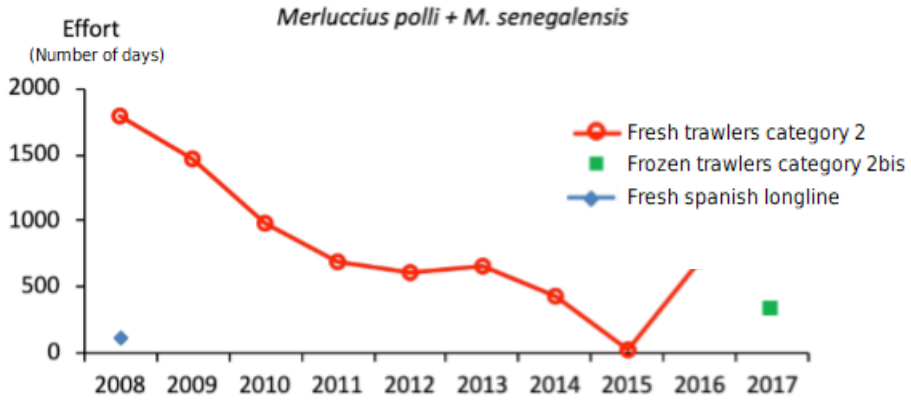

Figure 40 Evolution of fishing effort (days) of EU trawlers and longliners targeting black hakes between 2008–2017 in Mauritanian waters. Source: Joint Scientific Committee (2018)

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The new category of freezer trawlers (Category 2bis) authorizes licenses for 6 boats, which significantly utilized their fishing opportunities during the five and a half months which they were able to fish in 2017. This fleet deployed 322 days of fishing in 2017 as they did not fish during the entire fishing season. Only one boat had a regular activity, while three boats fished for three months, with some stops for landings or fishing in neighbouring countries and two boats fished for only one month in December. Due to the fact that this fishery is only at its initial stages, it is still not viable to analyse the activity and investment efforts in this category.

It should be noted that black hake yields during the current Protocol years (2015-2017), averaging 6,700 kilograms per day, are the highest yields in the entire historical dataset. This is due to a change in strategy (targeting of larger fish) and the arrival of freezer vessels, which have a better performance.

The fishing zone extends to all of Mauritania's EEZ. At the bathymetric level, there are two different fishing zones for the fresh fleet, one less than 500 metres deep, in which more coastal species are generally targeted; the boats are concentrated in an area stretching between Cape Timiris and the latitude of Nouakchott. The other zone, the most used, mainly between 500 and 700 metres, was mainly intended for catching black hake. The freezer trawler fleet (Category 2bis) is generally concentrated mainly in the deepest stratum and in more specific areas in the north, between 19°N and 17°N (Figure 41).

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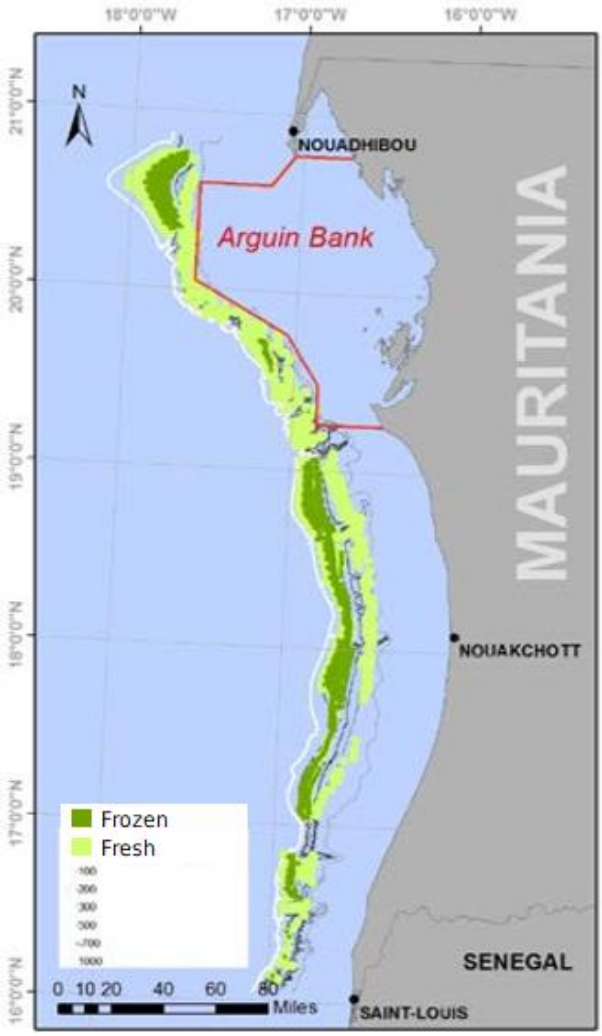

Figure 41 Distribution of the fishing area for EU hake trawlers in Mauritanian waters in 2017. Source: IEO in Joint Scientific Committee (2018).

Category 3

The EU fleet targeting demersal species other than black hake with gear other than trawls (category 3) fishes exclusively offshore with longlines and targets bentho-pelagic species. Only vessels using longline gear, targeting large pomfrets (Brama brama), have operated in this category since late 2015. In addition, demersal fishes are the by-catches of other fisheries (cephalopod, shrimp, hake, pelagic, etc.).

Only recorded data corresponding to the years 2008, and 2014 to 2017 is available in the IEO (Spain) database and shows values reaching 27 days of fishing in 2015 and 945 days in 2016 (Figure 42). This fishing effort has slightly decreased in 2017, where it represents 709 days of fishing. The 2015-2017 average is greater than previous years' efforts.

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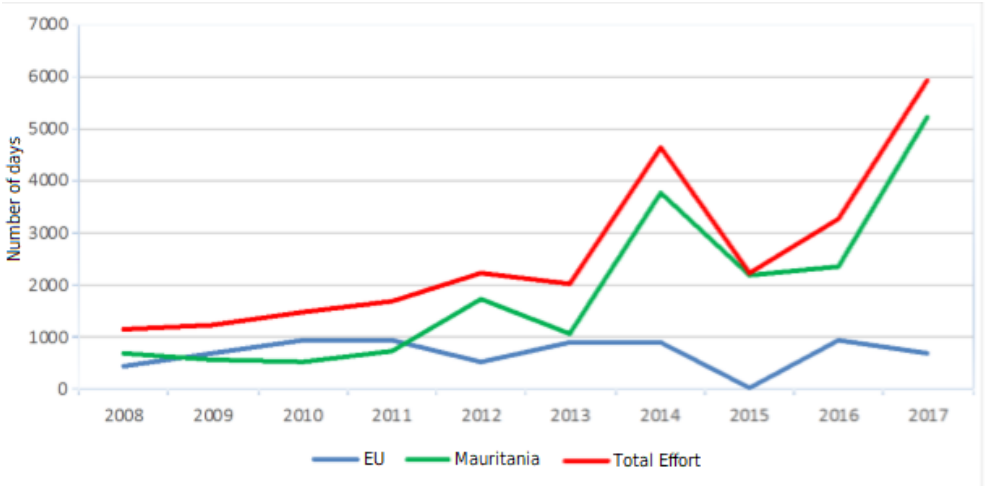

Figure 42 Fishing effort (days) of EU vessels targeting demersal species other than hakes using fishing techniques other than trawling between 2008–2017 in Mauritanian waters. Source: Joint Scientific Committee (2018).

Spanish longliners are the only vessels for which mapped data is currently available for this fishery category. They operate between the Cap Blanc and the parallel 17°N, at depths of 100 m to more than 1,500 m. The largest number of vessels is located at 19°N, at depths greater than 1,000 meters. Nevertheless, the majority of the effort is deployed between 200 and 500 metres depth (Figure 43).

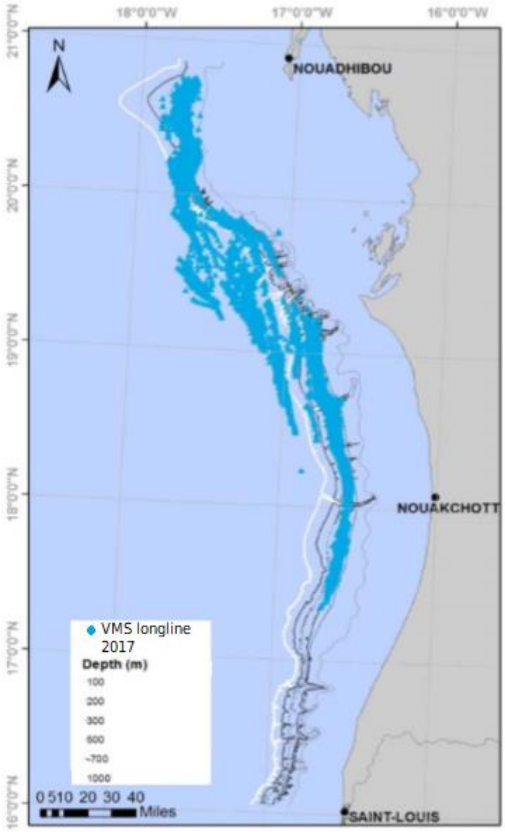

Figure 43 Distribution of fishing areas for EU Category 3 vessels in 2017 in Mauritanian waters. Source: Joint Scientific Committee (2018).

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Category 4

EU seiners, targeting tuna and associated species that are authorized in the Mauritanian fishing zone can only operate beyond 30 miles calculated from the baseline. Peak catches are in July-August. In 2017, EU seiners caught around 11,500 tonnes during the months of July and August (13,778 tonnes throughout the year), of which approximately 80% were Skipjack (*Katsuwonus pelamis*) (Figure 44).

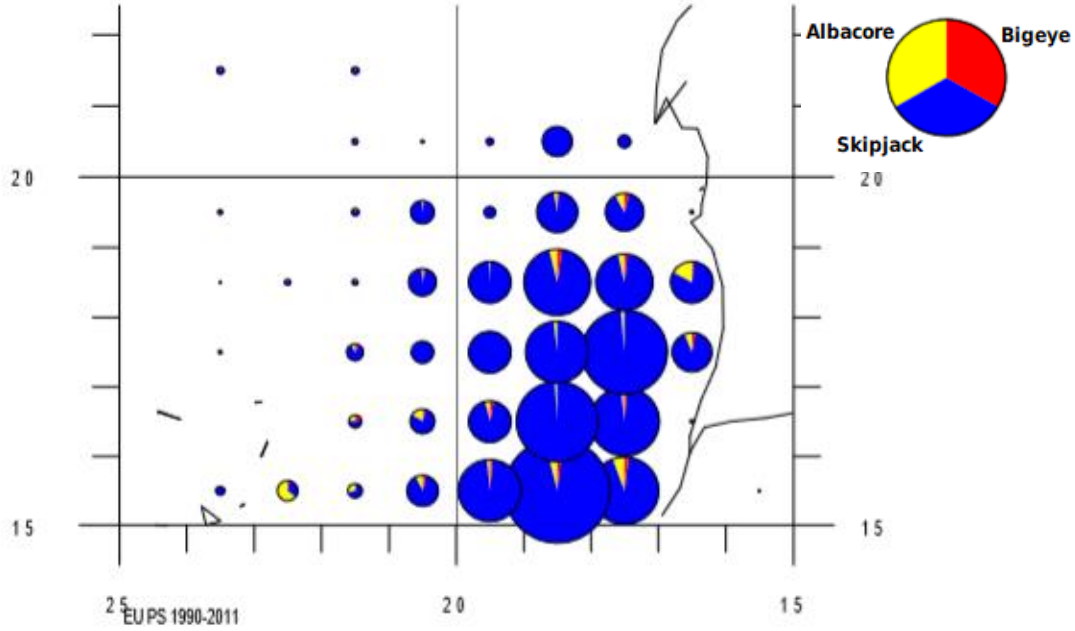

Figure 44 Fishing zones for EU tuna seiners (mean 1990-2012) and landings proportion in Mauritanian waters. Source: ICCAT In Joint Scientific Committee (2018).

Nevertheless, EU seiners have a very wide area of operations that is not limited to Mauritanian areas. They are active in a large zones in the East-Atlantic.

Category 5

EU longline vessels targeting tuna and associated species (category 5) that are authorized in the Mauritanian fishing zone are allowed to operate only beyond 30 miles from the baseline. On the other hand, pole-and-line vessels, also included in category 5, can operate from 15 miles north of latitude 19°21'00''N and from 12 miles south of that latitude.

Peak catches for pole-and-line vessels are recorded in June-September. They are based in Dakar. The pole-and-line boats exploit tuna schools, concentrated in the zone mainly located between Senegal and Mauritania and will then subsequently land their catch in Dakar. The majority of the tuna caught is a skipjack, while albacore and bigeye are found increasingly more often in northern Mauritanian waters (Figure 45).

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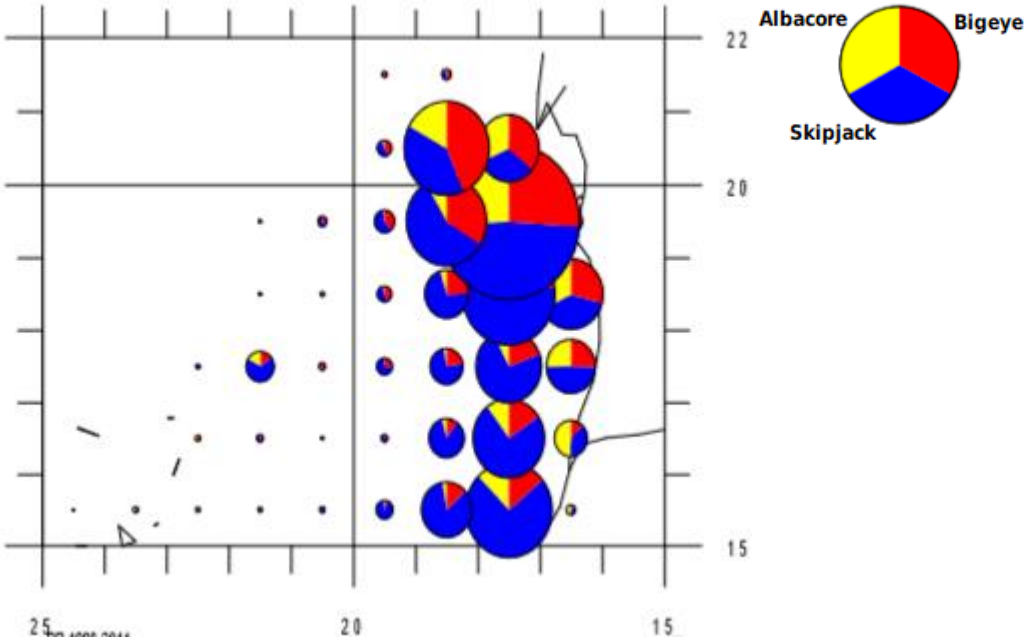

Figure 45 Fishing zones for EU tuna pole-and-line vessels (mean 1990-2012) and landings proportion in Mauritanian waters. Source : ICCAT in Joint Scientific Committee (2018).

Catches reported by the EU longliners to ICCAT consist mainly of swordfish (also sharks, as well as yellowfin and bigeye tuna). The vessels are usually fishing on the high seas outside the EEZs and thus, a large number of EU longliners have ceased to have a flag of a country included in the EU, benefiting from fisheries agreements with the countries of the ACP zone. Longliners therefore free themselves from the constraints related to the access into these waters. In order to operate at their convenience in international waters, they have developed a system of transhipment of catches and supply of vessels from the port of Mindelo to Cape Verde (the ports of Montevideo in Uruguay as well as the European ports of the Canaries and Azores are also used regularly). As swordfish are not among the species for which ICCAT applies management measures, this fishery is not subject to a catch reporting obligation. For that reason, the catch and landing data is sparse and not centralized within any other international institution. The same is true for sharks, which are considered as accidental fisheries in these waters, although some longliners have made them a prime target for their fishing strategies.

Category 6

The fishing operations of EU pelagic freezer trawlers (category 6) are limited by the low abundance of pelagic fish beyond the 20-nautical-mile limit introduced in 2012. In addition, at the beginning of 2017, EU pelagic freezer trawlers faced problems due to large numbers of juvenile mackerel and sardinella that were below legal size. Fishing effort in this category has significantly reduced since 2011, as shown in Figure 46.

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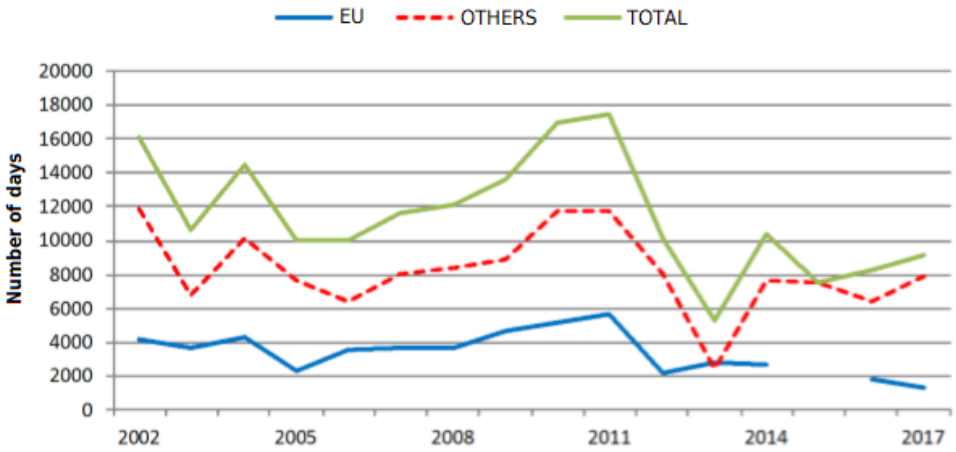

Figure 46 Fishing effort (days) of EU vessels targeting small pelagic species between 2002-2017 in Mauritanian waters. Source : Joint Scientific Committee (2018).

In years prior to 2012, sardinella were at the same level of catches as horse mackerel, before declining in 2013. This is largely due to the withdrawal of Dutch vessels specializing in sardinella fishing. Since 2013, catches of the EU fleet have been dominated by horse mackerel, mackerel and sardines.

With regards to the fishing zones, precise data about small pelagic species is currently not at hand. However, total trawl fishery data for Mauritania is available on Globalfishingwatch.org. As small pelagic trawling fisheries constitute the major part of the EU trawling fishery in Mauritania, information on total trawling effort is still interesting. Figure 47 shows the distribution of total trawl fishing effort of EU vessels within the Mauritanian EEZ.

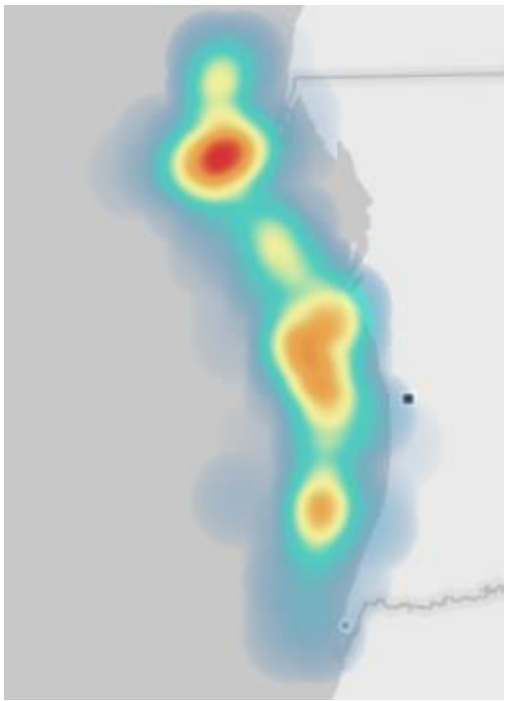

Figure 47 Distribution of total trawl fishing effort of EU vessels (not only trawling pelagic stocks, but these constitute the main part of trawling). Source: globalfishingwatch.org

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The figure above show that the effort is concentrated on areas relatively close to shore and that the main fishing pressure is on fishing grounds in the northern part of the EEZ, close to Nouadhibou.

5.1.3 Catches

The available catch data within Mauritanian waters is to a large extent either missing or unreliable. The EU vessels are though obligated to report catches, but the authors of this report were however only able to find data on CPUE, as well as temporary by-catch percentages.

Category 1

CPUE of EU vessels targeting shrimps in Mauritanian waters have declined in recent years, particularly when looking at gamba (*Parapenaeus longirostris*), but CPUE of langostino (*Penaeus spp*) has been more stable, as shown in Figure 48.

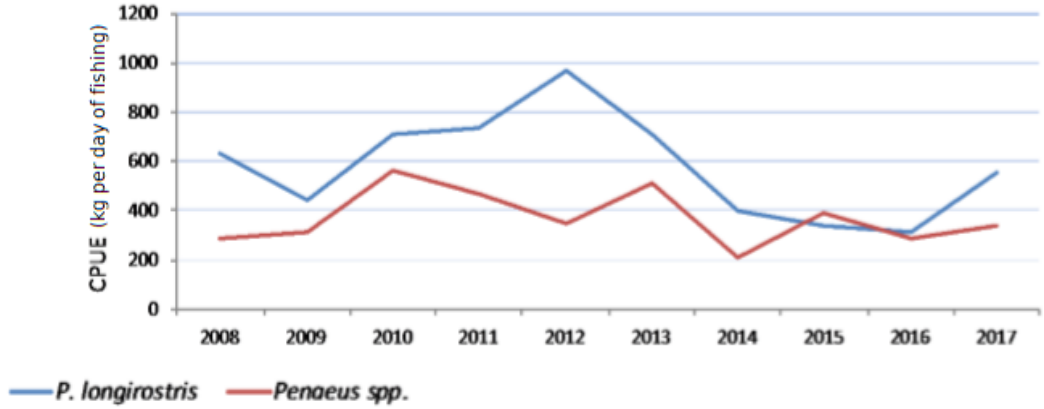

Figure 48 Catch per unit effort (CPUE) of EU vessels targeting P. longirostris (gambas) and Penaeus spp. (langostino) in the fishing zone of Mauritania between 2008–2017. Source: Joint Scientific Committee (2018).

The decline in CPUE of gamba is most likely caused by the restrictions set on fishing areas, as EU vessels have been prohibited to fish for shrimps in waters less than 20 meters in depth.

Category 2 and 2Bis

The landings of the EU fresh fish trawlers targeting black hake (category 2) were 89% black hake in 2016 and 2017; and the catches of freezer trawlers targeting black hake (category 2Bis) consisted of 95% black hake in 2017. Estimates of catches in relation to landings should be revised upwards, because EU vessels are already starting to process larger fish on board (heading, tailing, evisceration, etc.). Analysis made by IEO and OPROMAR show that around 90 % of the catches were *Merluccius polli* and 10 % *Merluccius senegalensis.*

CPUE increased due to an overall decline in fishing effort. Especially as a result of the break between 2014-2015 (Figure 49).

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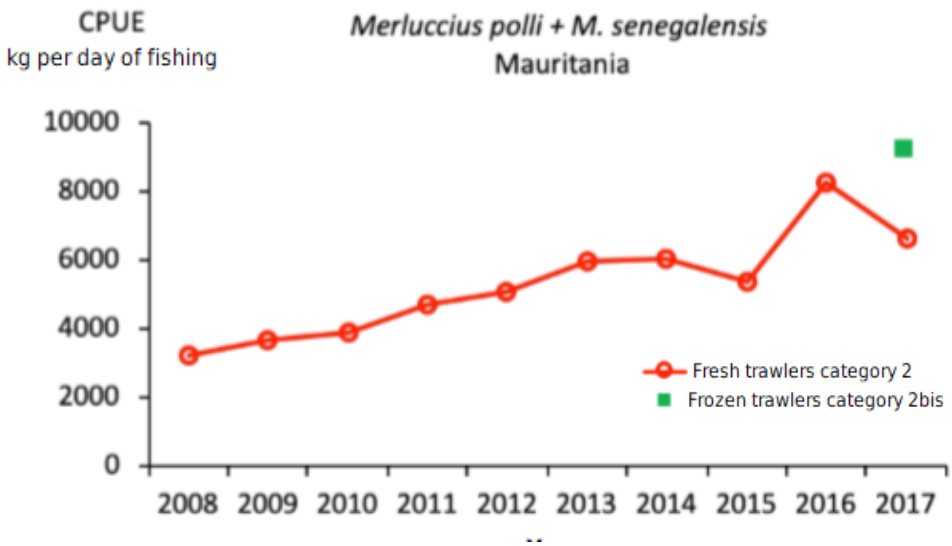

Figure 49 Catch per unit effort (CPUE) of EU vessels targeting hakes in the fishing zone of Mauritania between 2008-2017. Source : Joint Scientific Committee (2018).

The figure suggests that CPUE has increased significantly over the past decade for the fresh fish trawlers. This can largely be explained by an overall reduction of fishing effort.

Category 3

The catches of the EU fleet targeting demersal species other than black hake with gear other than trawls (category 3) consisted predominately (99-100%) of Pomfret (*Brama brama*) during the recent period (2008-2017). The CPUE is variable, with a slight upward trend.

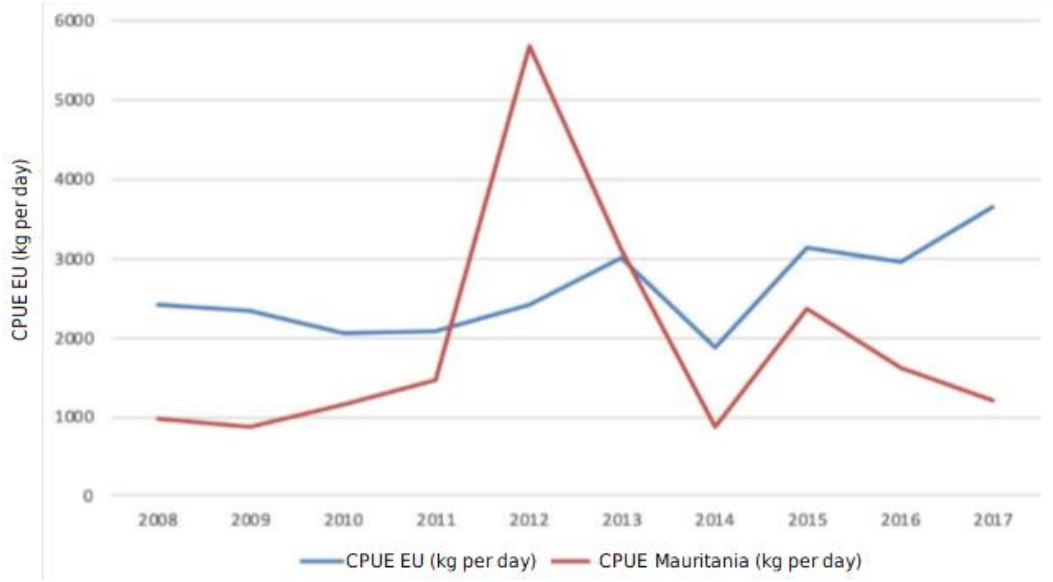

Figure 50 Catch per unit effort (CPUE) of EU vessels targeting demersal species other than hakes and not using trawl in the fishing zone of Mauritania between 2008-2017. Source: Joint Scientific Committee (2018).

In addition, it should be noted that demersal fish is by-catch from other fisheries (cephalopod, shrimp, mackerel, pelagic, etc.).

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Category 4

During the last 4 years, EU tuna seiners were present in Mauritanian waters between May and October, with a peak in July. The authors of this report have not been able to acquire data on total catches of EU vessels operating within this category because the data only focuses on the landings. In addition, the seiners are mobile in the area and don't solely focus on Mauritanian waters. However, total landings in the fishing area were 13,773 tons in 2017. In addition, the trend in CPUE could not be found, as there are data collection problems for this measure (no distinction between tuna vessels using FADs and boats fishing in free banks) (CSC, 2018).

Category 5

Catches and CPUE of EU longline vessels targeting tuna and tuna-like species (category 5) within the Mauritanian EEZ varies greatly depending on the month because EU pole-and-line vessels have a fishing strategy that favours quality over quantity. The average CPUE was about 7 tons per day of fishing in Senegalese waters in 2017, but the authors of this report have however not been able to find such data within Mauritanian waters, because the data only focuses on the landings. Total landings were otherwise 5002 tons in the fishing zone. In addition, the trend in CPUE could not be found, as there are data collection problems for this measure (no distinction between tuna vessels using FADs and boats fishing in free banks).

Longliners' tuna catches are mostly located outside of West African countries' EEZ, and are rarely landed in Mauritania.

Category 6

This is the main category in terms of fishing volumes. The fishing operations of EU pelagic freezer trawlers was still limited by the low abundance of fish beyond the limit of 20 nautical miles from the coast (collected from interviews). In addition, at the beginning of 2017, the fleet was faced with large quantities of mackerel and sardinella juveniles that were below regulatory size; most of the fleet left the Mauritanian area because of this. Although the tolerance rate of juveniles fished was revised and increased in March 2017 (10% instead of the 2% registered in the Mauritanian regulations), the presence of EU pelagic trawlers remains modest. The catches are now mainly composed by horse mackerel and sardine. Sardinella was the main species caught until 2012, but has seen an decline in landings since then.

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5.1.4 Landings

Despite a greater fishing effort, the landings decreased in general in the years 2013 and 2014. Following this, the agreement was suspended, before a new agreement at the end of the year 2015.

Table 32 Landings summary of EU fleet in Mauritanian waters. Source: Joint Scientific Committee (CSC, 2018).

Category	2008*	2009	2010	2011	2012	2013	2014*	2015*	2016	2017
Crustaceans	(1,207)	2,458	3,404	4,512	2,108	378	1,741	86	937	1,342
Fresh Hakes	1,614	3,892	2,678	3,127	3,467	4,303	3,027	246	6,032	6,186
Frozen Hakes	-	-	-	-	-	-	-	-	-	3,392
Demersal (exc. hakes & trawl)	1,112	1,716	2,028	2,331	1,184	2,682	1,592	63	2,788	2,584
Tuna seiners	163	0	0	0	21,665	27,739	11,260	0	5,560	13,773
Tuna (pole-and-line & longline)	2,756	6,264	8,940	10,249	9,781	5,799	2,178	0	3,288	5,002
Small pelagics (frozen)	86,592	296,129	326,765	341,987	127,958	162,003	220,217	2,159	135,967	82,422
Small pelagics (fresh)	1,168	0	5,590	557	0	167	0	0	-	-
Cephalopods	5,413	15,286	10,939	12,870	8,029	0	0	0	-	-

The closure of the EU cephalopods fishery in 2013 has significantly reduced total landing of demersal species by EU vessels, as shown in Figure 51.

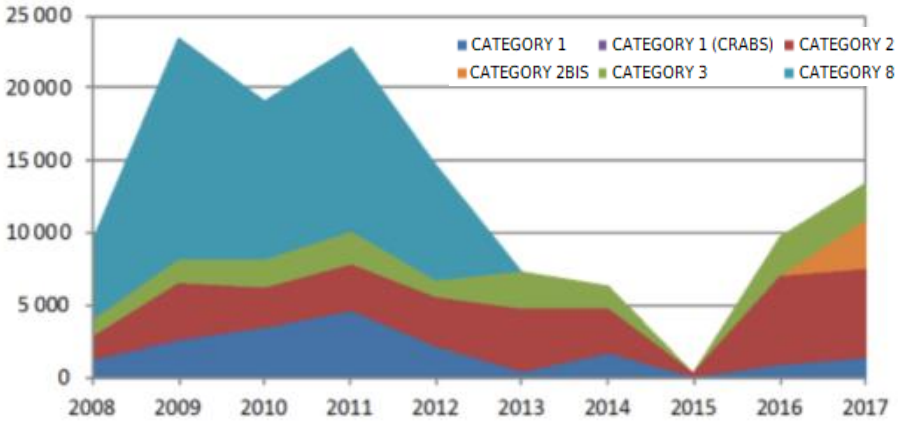

Figure 51 Evolution of landings for demersal fisheries by EU fleet in Mauritanian waters between 2008 and 2017. Source: Joint Scientific Committee (CSC, 2018).

The SFPA was paused between July 2014 and December 2015, which explains the drop in landings during those years. With the introduction of a new category for the new agreement (Category 2Bis),

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the landings have increased. The fishing in Category 2 has also increased since the fishery re-opened in 2016.

Landings of pelagic species caught by the EU fleet within Mauritanian waters is dominated by small pelagics (category 6), as shown in Figure 52.

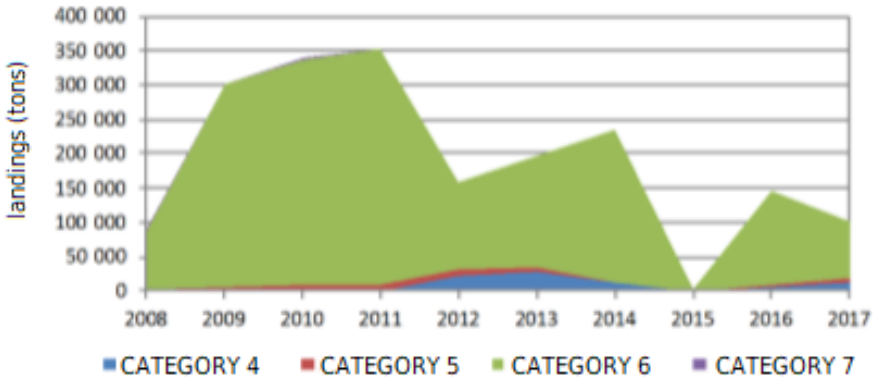

Figure 52 Evolution of landings for pelagic fisheries by EU fleet in Mauritanian waters between 2008 and 2017. Source: Joint Scientific Committee (CSC, 2018).

The average for pelagic landings during the period 2012-2014 is lower than the average for 2008-2011, although the fishing effort was roughly the same. Following the new agreement, the average for 2016-2017 is even lower than in 2012-2014, despite a greater effort.

Category 1

Landings of EU vessels targeting crustaceans other than spiny lobster and crab shrimps in Mauritanian waters (category 1) have drastically declined in recent years; from 4,951 tonnes in 2011 to 1,887 tonnes in 2017 (Figure 53).

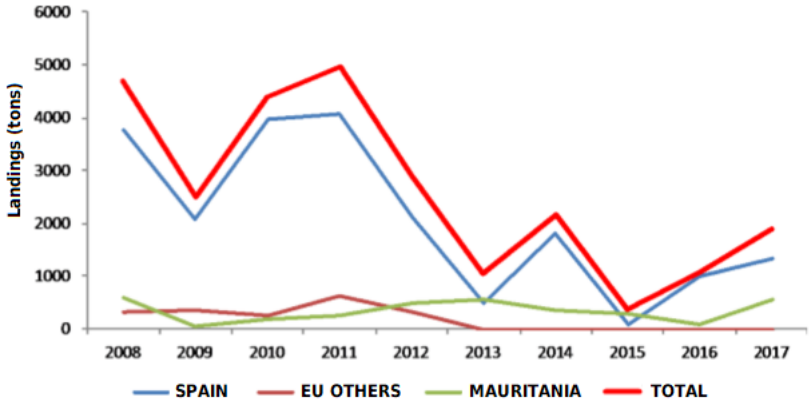

Figure 53 Evolution of shrimps landings fished by EU fleet in Mauritanian waters between 2008 and 2017. Source: Joint Scientific Committee (CSC, 2018).

The increase in landings in 2016 and 2017 is linked to the closure of the EU shrimp fisheries´ in Guinea Bissau. The number of vessels has consequently fallen sharply (see under section 5.1.1). The changes in authorised fishing zones (further from the coast, below 20 meters), combined with a possible

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deterioration in the conditions of economic profitability of the EU fleet, may have led to a decrease in the interest of the shipowners in this fishery. Landings take place in Spain, especially in Huelva; and become a part of other "Spanish" shrimp value chins.

Categories 2 and 2Bis

The EU fresh fish trawlers targeting black hake (category 2) land their catches in Nouadhibou now. Until early 2000's they landed the hakes in Spain, but now it is more profitable to do it in Mauritania. And the present agreement makes it mandatory for this category (2). But most of the freezer trawlers targeting black hake (category 2Bis) land their catches in Las Palmas, where the fish joins the Spanish supply chain (by being shipped to Vigo and Cadix). Landings were slowly decreasing until the beginning of the new SFPA, when landings increased substantially. The recent increase in landings of Spanish fresh fish trawlers and the creation of a new category (Category 2Bis: frozen trawlers) had a significant impact on total landings, as shown in Figure 52.

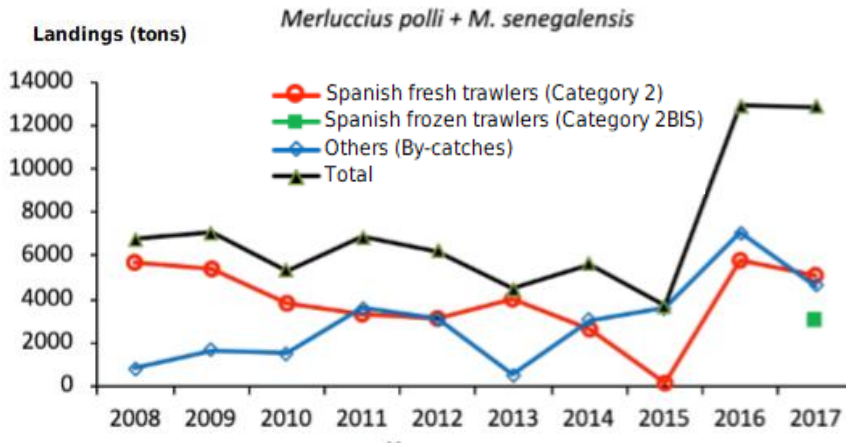

Figure 54 Evolution of hake landings fished by EU fleet in Mauritanian waters between 2008 and 2017 Source : Joint Scientific Committee (CSC, 2018)

By-catches of hake from other types of fishing also impact hake significantly: 3,568 tonnes in 2015, 7,076 tonnes in 2016 and 4,646 tonnes in 2017. The main by-catch comes from offshore pelagic vessels (66%). Thus the total increased strongly since 2016.

When by-catches are removed (see Table 33), the level of landings is close to the maximum level of the agreement (85% for both Category 2 and Category 2Bis; the total of Category 2 exceeds authorisations and Category 2Bis is 97% when incidental fisheries are included).

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Table 33 Evolution of hake landings fished by EU fleet in Mauritanian waters between 2008 and 2017. Source : Joint Scientific Committee (CSC, 2018).

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Fresh hake trawl (cat 2)	5,727	5,429	3,847	3,273	3,135	3,992	2,609	135	5,833	5,082
Frozen hake trawl (cat 2bis)										2,978
Hake longliners	169									

The fresh fish trawlers only operated until the end of July during the year 2014 due to the end of the Fishing Agreement. In 2015, they only operated from the end of December, with the start of the next fisheries agreement. In addition to the recent increase of landings by EU, which follows a decline over the last 10 years. Mauritanian vessels started fishing for black hake in 2016, with help from Namibian companies. The authors were unable to find data on the landings of this Mauritanian fleet.

Category 3

The landings of the EU fleet targeting demersal species other than black hake with gear other than trawls (category 3) have increased slightly since 2008, reaching a maximum of 2,798 tons in 2016, as shown in Figure 55. This represents a utilization rate of 85% of the agreement over the last years.

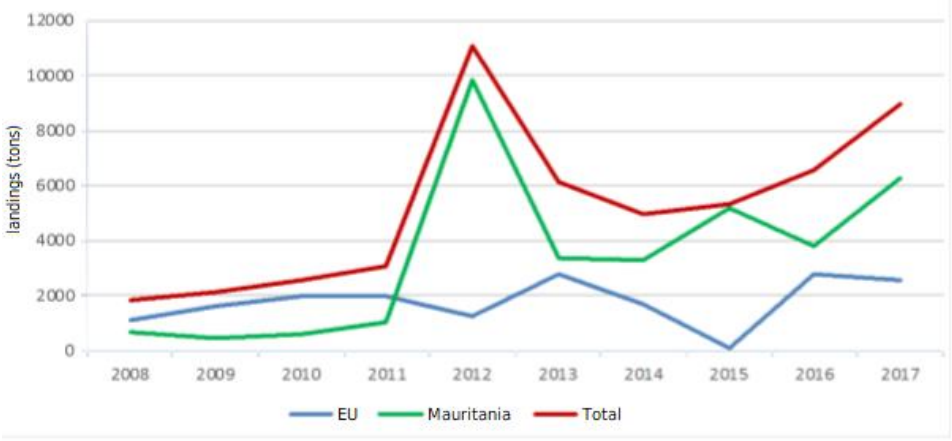

Figure 55 Evolution of demersal landings (other than trawling and hake) by EU fleet coming from Mauritanian waters between 2008 and 2017. Source: Joint Scientific Committee (CSC, 2018).

The landings consist predominately of pomfret (*Brama brama*) and they enter the supply chain of the Spanish market, as they are landed, prepared, distributed, sold and consumed primarily in Spain.

Categories 4 and 5

There are no tuna landings taking place in Mauritania. The pole-and-line landings take place in Dakar. Longline vessels have developed a system of transhipment of catches and supply of vessels from the port of Mindelo in Cape Verde, Montevideo in Uruguay and the European ports of the Canaries and

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Azores, where their catches – mainly swordfish, a little of tuna and shark – are landed. Finally the purse seiners land their catch primarily in Abidjan.

The landings of the EU tuna seiner fleet are estimated to be at 13,773 tons in 2017 (Figure 56), yet the agreement allows for only 12,500 reference tonnage. In 2017, the landings of the European pole-and-line fleet was estimated at 5,002 tons, with a total of 7,500 tons allowed in the agreement.

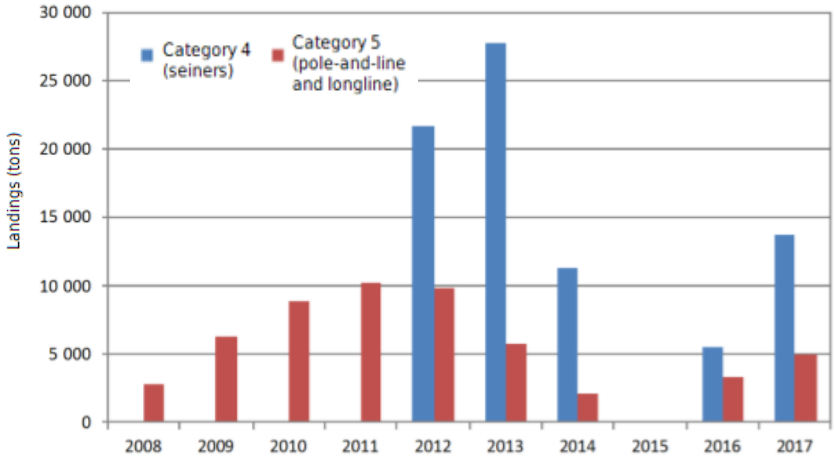

Figure 56 Evolution of landings for tuna caught by EU fleet in Mauritanian waters between 2008 and 2017. Source: Joint Scientific Committee (CSC, 2018).

EU tuna seiners are mainly targeting skipjack, while the pole-and-line vessels are aiming for bigeye and albacore. Longliners focus on other species, mainly swordfish. Figure 57 show the landings of the tuna caught by the EU fleet in Mauritanian waters in 2016 and 2017.

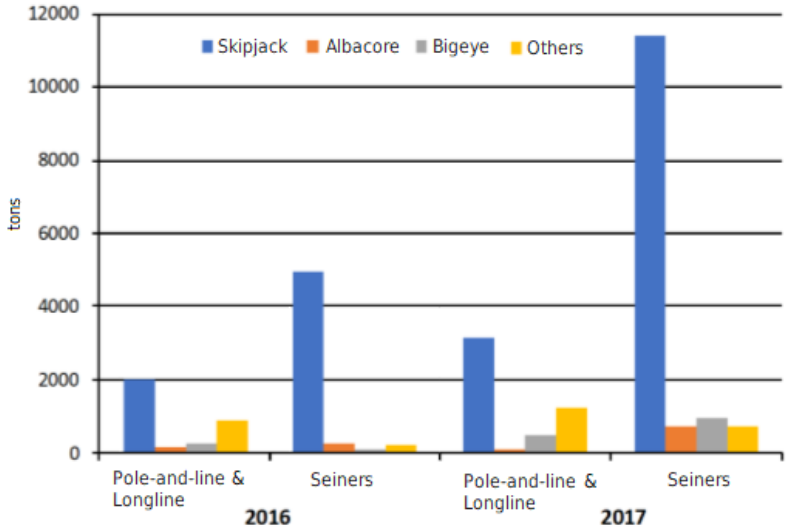

Figure 57 Composition of tuna fisheries by EU fleet in Mauritanian waters in 2016 and 2017. Source: Joint Scientific Committee (CSC, 2018).

Skipjack represents the main landings, which are primarily landed in Abidjan in the Ivory coast.

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Category 6

EU pelagic freezer trawlers (category 6) is the sector that includes most of the landings by the EU fleet (about 100,000 tons per year). However, since 2012 the agreement involves a geographical limit for EU small pelagic fisheries. EU fleets is not allowed to fish within 20 nautical miles of the coast. This has led to a decline in fishing effort and landings. In addition, small pelagic species must be transhipped in the Nouadhibou harbour, according to an agreement since 2012. The catches of small pelagic species in Mauritanian waters, mostly frozen in 20 kg blocks, are sold on external markets where there is a demand for this type of protein source at low prices. These markets exist mainly in the East European countries, the East of Africa and the major consumer countries of West and Central Africa. After transhipment in Nouadhibou Bay, transporters unload small pelagic species in Las Palmas (Canary Islands). Once stored in warehouses, these catches can be sent to countries in the Gulf of Guinea (about 80%) or in the Baltic Sea countries and Russia (about 20%) (COFREPECHE et al. 2014). There was previously a Dutch sector (until 2016), but the Dutch fleet now fishes in the Pacific Ocean (JSC, 2018). Figure 58 shows how the landings of small pelagics caught by the EU fleet have declined since 2011; and how there is a mismatch in the reported landings by EC and IMROP.

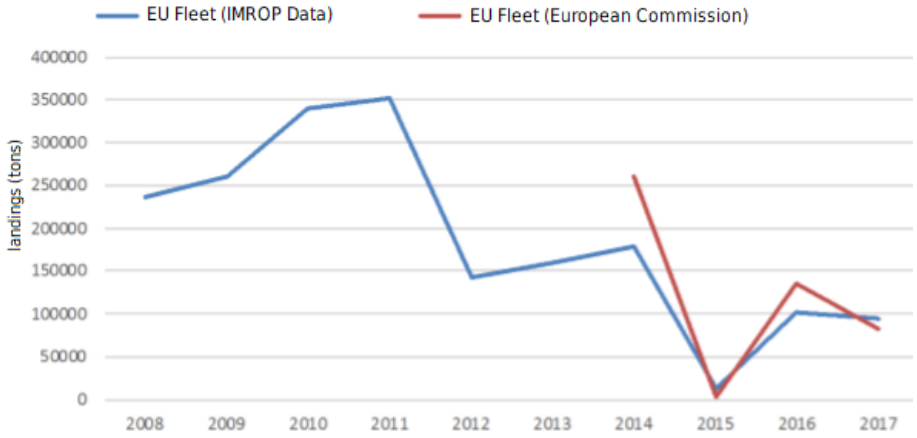

Figure 58 Landings of frozen small pelagic species by EU fleet in Mauritanian waters according to IMROP (Mauritania; between 2008 and 2017) and the European Commission (between 2014 and 2017). Source : CSC, 2018.

EU landings are now mainly composed of horse mackerel and sardines. The total amount of landings has dropped sharply since 2008. Sardinellas and pelagic species other than horse mackerel, sardine and mackerel were targeted more frequently until 2011 (see Figure 59). Modifications in the agreement about the fishing areas had an impact on the mackerel and sardine potentials.

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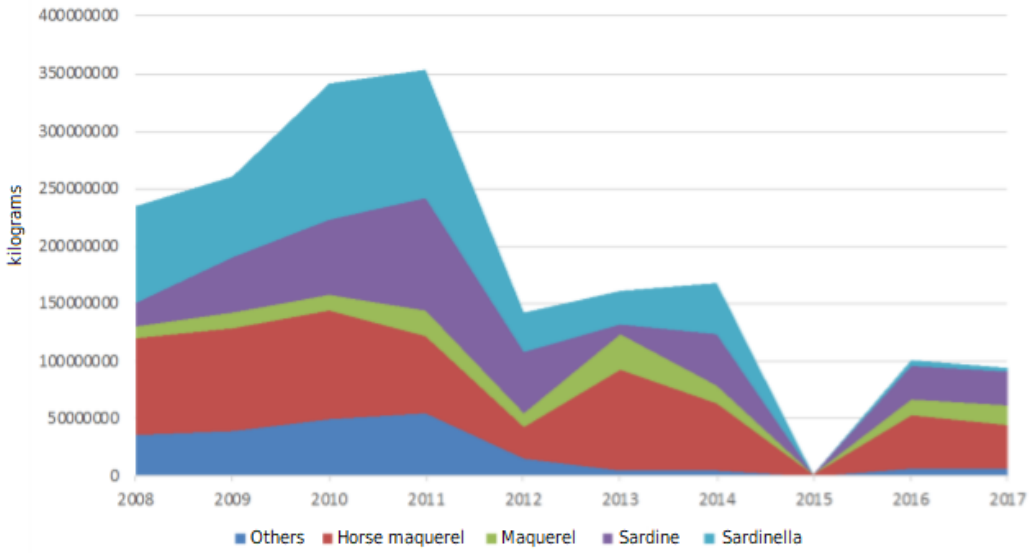

Figure 59 Composition of small pelagic fisheries by EU in Mauritanian waters between 2008 and 2017. Source : Joint Scientific Committee (CSC, 2018).

Figure 59 shows that horse mackerel and sardines represent the mainstay of EU catches within Mauritanian waters.

5.1.5 Profitability considerations

For EU fleets, Mauritania's EEZ is economically interesting. All categories, except the fresh pelagic species (Category 7), have a significant gross operating benefit. The number of jobs created is also significant since the activity of the EU vessels generates more than 550 jobs onboard, including 130 for Mauritanian staff. In addition to this, nearly 970 on shore jobs are created as well, making it a total of 1,500 jobs generated by the agreement (CSC, 2018).

However, some recent conditions included in the agreement lead to lower profitability of fisheries for the EU. These are fishing areas, which are increasingly distant from the coast, leaving areas of high productivity to Mauritanian fleets. The price of licenses also affects shipowners, as these can affect the profitability of their activity. Finally, mandatory transhipments of small pelagic fish in Nouadhibou Bay also have an impact on EU fleet strategies in this category.

Category 1

Shrimp prices have fallen sharply in all landings sites in Spain since 2015 (eumofa.eu). In Huelva, where most of the catch is landed, the price decreased from 13.88 euros per kilo in 2015 to 6.18 euros per kilo in 2018. In addition, the profitability depends on the areas allocated to the EU for fishing. These are gradually moving further away from shallow waters, resulting in lower profitability. The shrimp market consists of several segments defined by size, presentation and preservation, in addition to certification. Data on the first sale shrimp prices for EU catches in Mauritanian waters are not

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available. However, the price of French imports for shrimps (*Penaus sp*.) is known and it has been growing steadily since 2005; as 2015 prices were for example about 60% higher than 2005 prices (EUMOFA 2015).

Category 2

According to SFPA Joint Scientific Committee, the fresh black hake fishery is unprofitable, making it favourable for trawlers to aim for a large number of fishing trips with shorter landing times. Landings are made in Mauritania, according to the agreement. In addition, the price of licenses within the agreement has increased over time. If the ratio of the volumes captured per license price is less interesting, it becomes difficult for the shipowners to cover their investments. In addition, at the regional level (Senegal, Gambia, Morocco included), stocks are in full exploitation and fishing mortality is excessive. This is because of by-catches of black hake in other fisheries. The current high availability of black hake has lowered its price. Prospects for profitability also depend on the fishing area and trawlers must now be at least 30 nautical miles offshore, reducing productivity.

Considering that almost all the black hake caught under the SFPA in Mauritanian waters is caught by Spanish vessels, it seems logical to confine the analysis of the profitability of the fishery to the Spanish sector. The Spanish population consumes a lot of hake and there is a steady demand. The prices have therefore remained stable over the last few years, as shown in Figure 60.

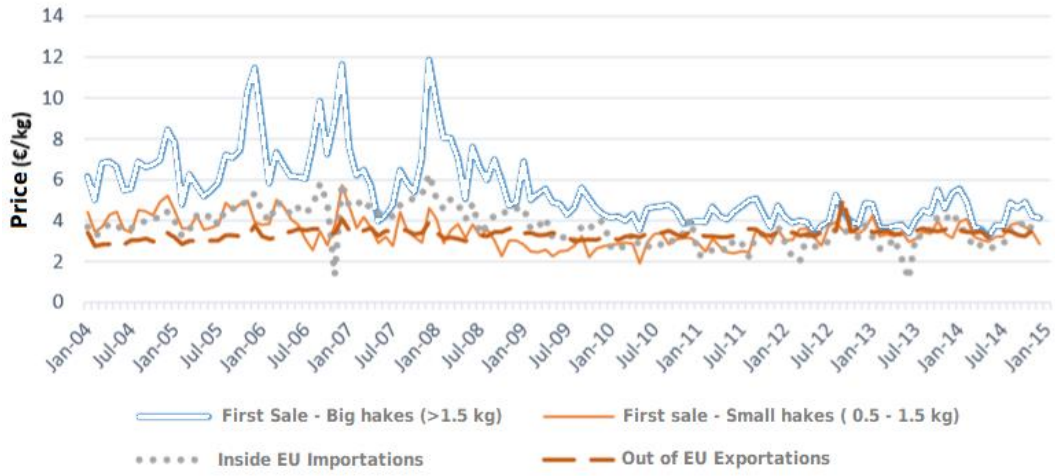

Figure 60 First sale prices for hake in Spain. Source: EUMOFA 2015.

It is however interesting to see that there seem to be some annual fluctuations in hake prices on the Spanish market and that there were major price fluctuations seen in the market prior to 2009 (EUMOFA, 2015).

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Category 2Bis

Profitability of black hake freezer trawlers are also affected by the low price of hake, just as the fresh fish trawlers. The freezer trawlers are however able to make longer fishing trips and land their catches directly in Spain, which has positive effects on their bottom line. The ratio of volume of catch per licence fee still represents a large factor for investors, as can be seen in the previous section.

Category 3

The profitability of EU vessels targeting demersal species other than black hake with gear other than trawls (category 3) is subjected to the same considerations as vessels targeting black hake. The "volumes captured per license price" ratio is important to the investors, as are the fishing zones. In addition, the Mauritanian ports' facilities (Nouadhibou mainly) have an influence on profitability.

Category 4 and 5

Profitability of the EU tuna fleet fishing in Mauritanian waters is affected by the volume of fish captured per licence price as well as fishing zones. In addition, the price of gasoil is determinant for the tuna vessels profitability, especially for the seiners.

The price of the two main species of tuna has increased over the past 10 years, as shown in Figure 61 (DG-MARE, 2017).

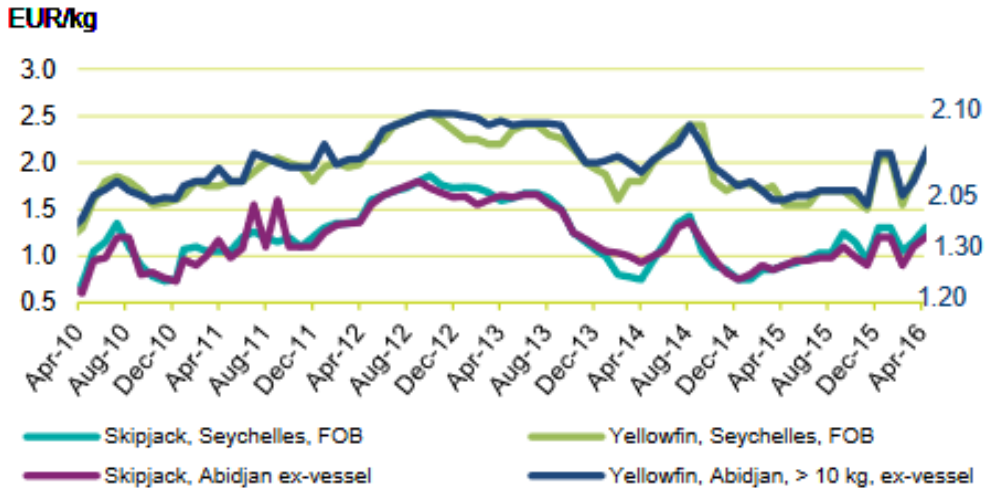

Figure 61 Evolution of tuna prices ready for exportation, from Abidjan and Seychelles. Note: Only tuna price in Abidjan is concerning EU fisheries in Mauritania, as most of seiners' catches are landed there. Source: DG-MARE (2017).

The actual profitability of the sector is however unknown, especially since it is difficult to separate between tuna caught in Mauritanian waters and elsewhere, when they are landed in e.g. Dakar, Mindelo, Montevideo, Canaries, Azores or Abidjan..

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Category 6

About 80% of the small pelagics are transhipped to the countries of the Gulf of Guinea (COFREPECHE et al. 2014), where they are intended for local consumption. The remaining 20% are expedited to factories in the countries along the Baltic sea (Poland, Lithuania and Latvia and Russia). There was previously (since 2016) a Dutch sector, but the Dutch fleet now fishes in the Pacific Ocean. It is complicated to estimate the profitability of EU freezer trawlers targeting small pelagics in Mauritanian waters (category 6); as prices of different species on international markets vary significantly depending on the state of supply and demand. In addition, prices in West African markets vary greatly depending on the proximity of the landing site. Some information on magnitude is presented below (EU/DAI 2015) :

- In Mali (2014), while the small pelagic kilo was sold 2.2 USD/kg, locally caught fish traded between 2.6 and 7.0 USD/kg.
- In Burkina Faso (2008-2009), a kilogram of fresh horse mackerel was sold between 1.0 and 1.3 USD/kg.
- In Nigeria, in 2014, a kilo of herring was worth 1 USD, that of mackerel 1.45 USD and that of horse mackerel 1.70 USD.
- In Ghana (2014), the kilo of sardinella was estimated at 1 USD against 1.9 USD (2015). A kilogram of smoked herring was traded at 1.8 USD.

These prices place small pelagic species among the cheapest sources of protein in West Africa. However, the demand for mackerel has declined sharply in recent years (fao.org) in West Africa. At the same time, supply is still important (eurofish.dk) and prices are falling accordingly. In addition, the mackerel market is moving towards mackerel from the Pacific because they are cheaper (collected from interviews). Prices in the Baltic countries remain relatively stable. A kilo is sold for the first sale about 0.3 euros (eurofish.dk).

Furthermore, small pelagics prices depend on fish biomass, fishing effort and fuel prices. But most importantly, the reduction of the fishing area, further and further from the coast, reduced the profitability of this fishing category during the last agreement.

Category 7

EU shipowners have not shown any interest in fishing for small pelagics to be landed fresh (category 7). The prices of small pelagic species are not high enough to motivate vessel owners to land fresh catches in western African countries. Fresh fisheries for small pelagics require short fishing trips, which means that it is not possible to land the catches in Europe. There have however been large scale investments in fish meal factories in Mauritania in recent years, but the EU fleet has not taken part in supplying those factories.

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5.2 Processing

5.2.1 Receivers of raw material/fish

Table 34 summarizes the main flows, locations and main actors in the EU fisheries sector in Mauritania. Spain and countries of north-eastern EU are the leading actors in this agreement, which concerns mainly small pelagics, hakes and tunas. Most of the catches are transhipped in Nouadhibou bay before being shipped abroad.

Table 34 Active EU fleet summary in Mauritanian waters. Source: Own elaboration

Type of fishing	Number of vessels	Landed quantities in tons (2017)	Landing location	Ownership	Transport
Category 1	6	1,342	Spain (espec. Huelva)	Spain	Own
Category 2	3	6,186	Mauritania (Nouadhibou)	Spain	Freezer ships
Category 2Bis	6	3,392	Las Palmas (Canarian islands, Spain) and then Cadix and Vigo (Spain)	Spain	Own
Category 3	4	2,584	Mauritania (Nouadhibou)	Spain	Freezer ships
Category 4	21	13,773	Abidjan (Ivory Coast), Tema (Ghana)	Spain, France in collaboration with Lebanese, Thai and Italian companies	Own
Category 5 (pole-and-line)	8	5,002	Dakar (Senegal)	Spain, France	Freezer ships
Category 5 (longliners)	4		Mindelo (Cape Verde) Montevideo (Uruguay) EU Ports (Canarian, Azores)	Spain, France	Freezer ships
Category 6	Undeterm.	82,442	Gulf of Guinea countries, Baltic countries, Russia	Lithuania, Latvia, Poland, Germany, (and previously Netherlands)	Freezer ships

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5.2.2 Production

Category 1

EU vessels targeting shrimps in Mauritanian waters freeze their catches onboard and land them in Spain (Huelva in particular), where it joins the Spanish supply chain and is prepared for sale. During the preparation, the shrimp is cooked and then frozen again before being sold.

Category 2

EU fresh fish vessels targeting black hake gut the larger fish onboard. The catch is landed in Mauritania where it is mostly whole frozen. Then it is then transhipped as frozen products to Spain (in Cadix and Vigo), where it enters the Spanish supply chain and is prepared, sold and consumed primarily in Spain.

Category 2Bis

The frozen black hake is for the most parts landed in Las Palmas, from where it is exported to the mainland of Spain (in Vigo and Cadix). There, it is prepared for consumption and the market (Joint Scientific Committee, 2018). The processing is mainly done in Spain.

Category 3

EU vessels targeting demersal species other than black hake with gear other than trawls (category 3) land their catches in Mauritania, where it is frozen before being transhipped to Spain. There, the catch joins the Spanish supply chain, where it is prepared, distributed, sold and consumed.

Categories 4 and 5

Fresh tuna from EU pole-and-lines vessels is primarily landed in Dakar, before being shipped to Asia via refrigerated boats. A part is cut into loins in Dakar, before being exported. However, data on the ratio of loins versus whole tuna is not known. Another part of the landings goes to a canning processing factory in Dakar. Only SCASA (from the Korean group Dongwon) is working at a low rate, supplied by the 8 EU pole-and-line vessels (source: SCASA). A total of 4,882 tons of tuna were landed or transhipped in Dakar by the EU in 2015; this had increased to 13,708 tonnes in 2016 and to 21,460 tonnes in 2017 (EU – Senegal SFPA Joint Scientific Committee, 2018). The main importer of fresh tuna and loins from Dakar in EU is Spain. After processing in Spain, the tuna is directed to domestic consumption and export, mainly in Europe (France, Italy, Portugal). However, most of the Senegalese tunas are shipped to Asia, or is sold as canned products. There is also a trade in fake tuna for local consumption in Senegal (*Euthynnus alletteratus* – not accepted in tuna factories – and by-catches like swordfishes and small tunas).

In Abidjan, where the EU seiners land the mainstay of their catches, frozen tuna stocks are mostly directly processed in the canneries (80,000 tonnes). These canned goods are then exported to Europe.

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40,000 tonnes are stored in refrigerated sheds for shipment to Europe. In this case, they will be transformed in the different sectors of the EU countries. Spain is the main importer. One third of the tuna volume is then canned directly in Europe while the rest is sold as refrigerated parts in retail.

Abidjan is the main tuna port in West Africa. It brings together a set of maintenance, bunkering, landing and transhipment services that are found nowhere else in West Africa. It is also home to three largest canneries. For two of them (SCODI and PFCI), the processing factories are owned by the Lebanese group Thunnus overseas Group, whose head office is in Nanterre (near Paris, France). The last one (CASTELLI) is owned by the Italian group that has the same name. These canneries employ up to 3,500 people. More than 130,000 tonnes of tuna are processed each year in Abidjan. The whole sector involves about 30,000 people.

Another important port for the tuna seiners is Tema, which then exports mainly to Asia. There, the catch in processed either as canned products or frozen. Frozen tuna is shipped to Asia, where it will be processed. Four canneries, controlled by foreign capital, are currently operating in Tema: Pioneer Food Company (PFC) is the largest; Ghana Agro-Food Company Ltd (GAFCO); Quality Food Processing (Tonelli) and Myroc Food Processing. Canned tuna is exported to Europe, neighbouring African countries and Asia. In addition, the port of Tema is specialized in the market of false tuna fisheries (by-catch during tuna fishing). These by-catches are intended directly for the African market.

Regarding longliners, swordfish and tuna are transhipped to Mindelo to be packaged in Europe or Asia later. Sharks transhipped from EU longliners to cargo vessels are transported to Europe where the carcasses are packaged for the European domestic market (mostly Spanish) and the fins are exported to Hong Kong.

Category 6

Small pelagic species are frozen on board. Some of the trawlers from the Baltic countries have factories on board that allow, in addition to freezing, processing of small pelagic fish (heading and canning) and produce fishmeal from waste or whole fish unfit for consumption. For the other vessels, the catches of small pelagic species in Mauritanian waters are mostly frozen in 20 kg blocks. Small pelagic species are then transhipped in the harbour of Nouadhibou and unloaded in Las Palmas (Canary Islands). Once stored in warehouses, 80% are sent to the countries of the Gulf of Guinea by cargo freezers (COFREPECHE et al. 2014), where they are for local consumption, making the transformation simple (smoking and salting) and making the added value minimal. A total of 20% (from Polish and Lithuanian ships) is also shipped to processing factories on the Baltic Sea. Baltic countries (mainly Poland) process significant amounts of pelagic fish, such as mackerel, which are usually frozen and used for smoking, salting and production of marinated fish, salads, and canned

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fish[43]. Lithuania exports also considerable amount of surimi[44]. Latvian ships in Mauritanian waters supply the west African sector instead of Baltic sector[45].

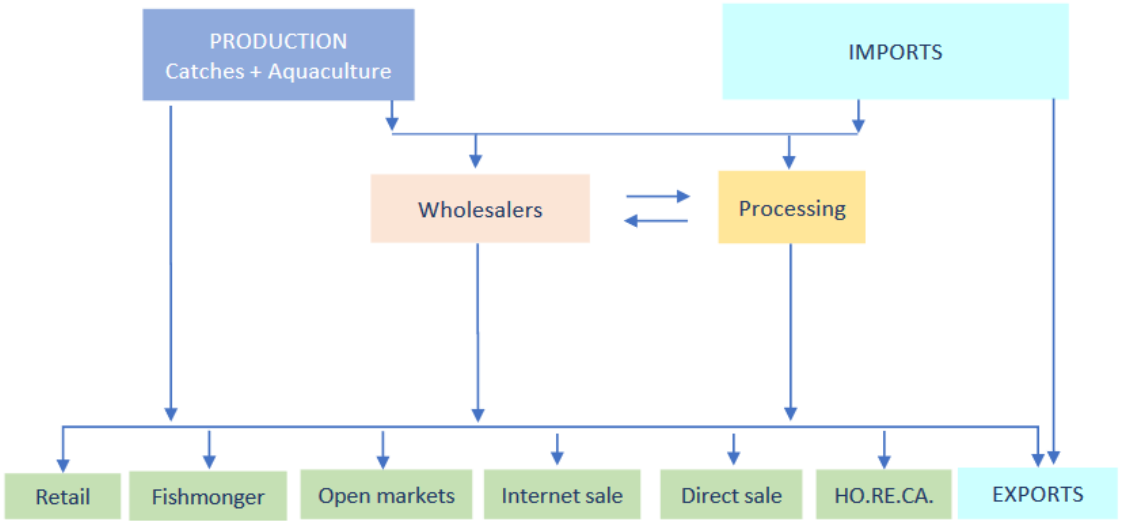

Figure 62 Supply chain of fisheries in Poland and Lithuania. Source: Eurofish.dk/Lithuania and Eurofish.dk/Poland.

In addition to canned mackerel, smoked and salted fish and ready-to-eat fish products like salads and fish in marinades, Baltic countries export also important amount of surimi (from Lithuania). The main market for fish products from Poland and Lithuania is the EU with Germany, France and the Baltic states as the most important destinations[43]. Otherwise, Latvian ships in Mauritanian waters supply the west African sector instead of Baltic sector[45]. Furthermore, Dutch boats were also present until 2016 in Mauritania. However, they have now left this area to fish in the Pacific ocean.

5.2.3 To which markets are products sold?

Figure 63 below summarises the main flows of EU catches in Mauritania within SFPA. Details are then brought in the following sub-sections.

[43] http://www.fao.org/fishery/facp/POL/en and http://www.fao.org/fishery/facp/LTU/en
[44] http://eurofish.dk/lithuania
[45] http://eurofish.dk/latvia

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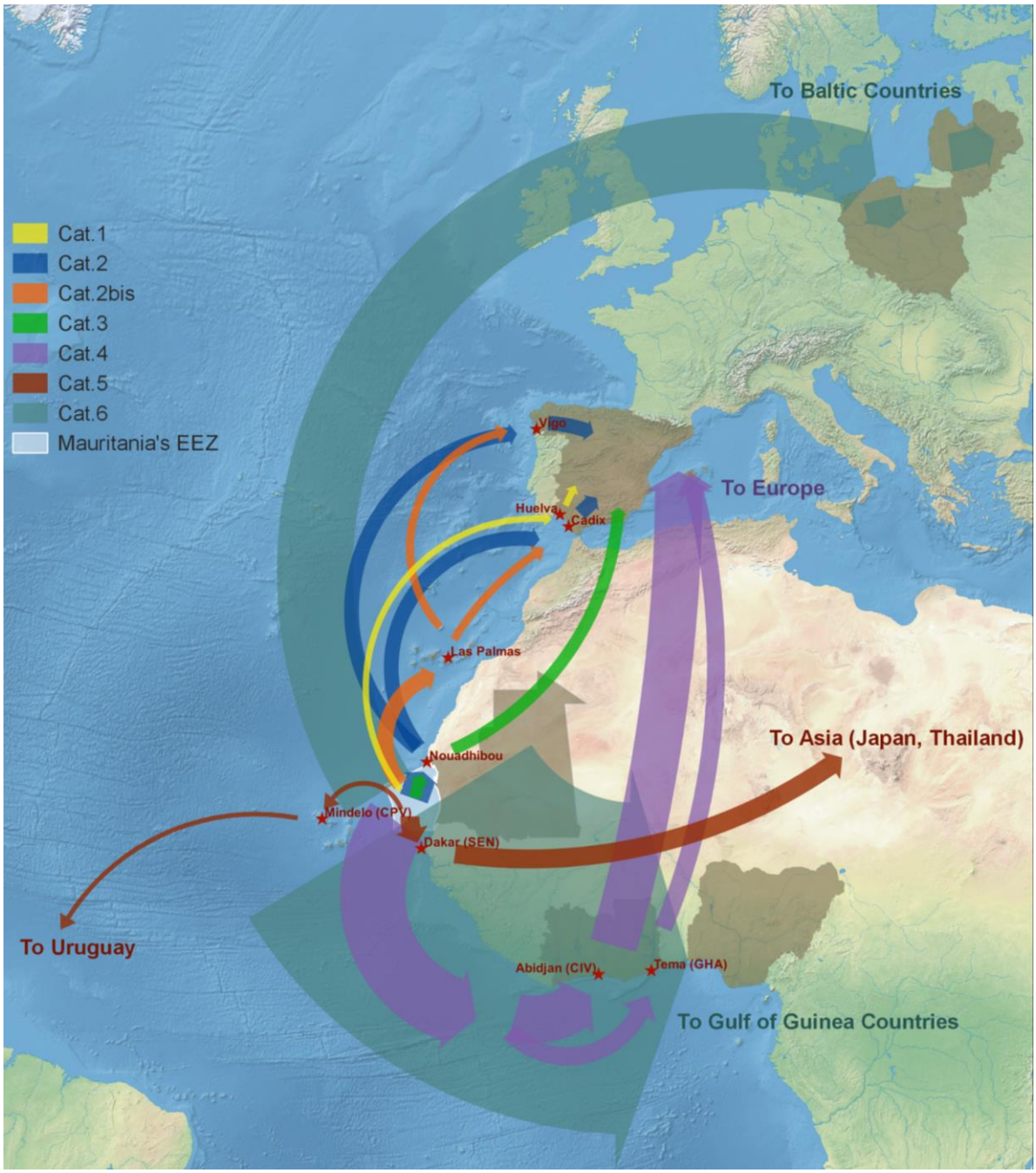

Figure 63 Flow map of the EU catches within the Mauritania-EU SFPA. Source: Own elaboration

Category 1

Frozen shrimps are landed in Huelva (Andalucía, Spain), where they are integrated into the Spanish sector. They are sold to intermediates or wholesale markets, from where they are sent to retail outlets (specialized markets, supermarkets, hypermarkets, etc.).

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Categories 2 and 2Bis

Most of the black hake fished by EU vessels is intended for Spanish consumption (collected from interviews). Even if fresh hake is landed in Mauritania, it is processed as frozen products and then shipped to Cadix and Vigo, Spain.

Spain is a large consumer of hake, which is the most consumed fish species in this country (EUMOFA 2017). Frozen black hake from EU boats mainly arrives at the port of Vigo (northern Spain). The first sale takes place at the port under the port authority, from where it is transferred towards the market for consumers (cf. Figure 30). Hakes fished by EU vessels in Mauritanian waters are just a small part of the total; about 8,000 tons out of 140,000 tons in the whole hake sector in Spain.

Prices vary greatly from one region to another. Many factors influence what is perceived as good value such as size, cultural tradition and fishing techniques, freshness and origin.

Several categories of fish markets are found in Spain. In Vigo, which is the most important market in Spain for fish caught in west Africa, the port is the authority (EUMOFA 2017). All categories of buyers happen to be present at the first and second sale. While in Tarragona and San Carlos De La Rapita - other important ports - it is Cofradias, brotherhoods of the Catalonia region. The two entities organize not only the first sale but also the second sale. In addition to market infrastructures, they offer the following services: unloading of vessels, marketing (organization of auctions and management of first sale buildings), renting of fish workshops and cold storage rooms, provision of standardized containers and trolleys for their transport, weighing, social services (social security for shipowners and seafarers, insurance, etc).

Category 3

Demersal species other than hake follow roughly the same path as the black hake. At first, they are landed in Nouadhibou, before being frozen and shipped to Spain to be integrated into the Spanish supply chain.

Categories 4 and 5

Tuna fished by EU vessels of the shores of West Africa and in the southeast Atlantic follow the channels that are described earlier in the Senegal section, in Figure 31.

Pole-and-line catches are mainly made in Senegalese and Mauritanian waters. All EU pole-and-line vessels are based in Dakar. Tuna is either canned in Dakar, or frozen and exported to Asia. Concerning EU seiners, they are based in Abidjan, where most of the processing occurs. Finished products (cans) are exported mainly to Europe and Asia. Longliners land their catches in Mindelo (Cape Verde), which consist mainly of swordfish, with a few tuna and sharks. The catch is shipped to the EU for processing

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and sale either as canned or frozen products. Following the preparation of sharks in Europe (mainly Spain), the fins are shipped to Hong Kong for consumption.

Category 6

Small pelagic species are transhipped in the harbour of Nouadhibou and 80% is then exported to the Gulf of Guinea countries *via* Las Palmas (Canary Islands). The processing adds little value to the products due to its simplicity. The west African market for small pelagic species is vast and distributed. This makes it difficult to track and quantify flows. Ships from Baltic countries also supply factories located on the Baltic Sea (20%) for local consumption and in neighbouring countries (Russia in particular).

5.3 Value chain description

5.3.1 Risk and Sustainability

The allowable catches depend on an analysis of the stocks (carried out by Secretaría General de Pesca – SGP and Instituto Español de Oceanografía – IEO for Spain, IMROP for Mauritania), the dynamics of the fisheries and the existence of residues left by the Mauritanian fisheries. To these are also added the capacity limits of the authorized fleets (expressed in the number of vessels that can be active at the same time in each category of fishery covered by the Protocol) and the technical conservation measures (fishing zones, types and gear characteristics, catch composition and first catch sizes). The Conjoit Scientific Committee – CSC has completed the series of fishing effort and landings between 2008 and 2017, thanks to the database of the EU's Directorate General for Maritime Affairs and Fisheries (DG-Mare).

The current fisheries agreement has been concluded on the condition that EU fleets catch only species for which Mauritania has a surplus. According to SFPA Joint Scientific Comitee (JSC), this is no longer the case for the main species in the agreement (horse mackerel in particular).

Category 1

The latest analysis of the shrimp stocks was conducted by the FAO/CECAF Working Group on the Assessment of Demersal Resources. A state of non-full exploitation of gamba (*P. longirostris*), and full exploitation for *langostino* (*Penaeus spp*.) were determined (CSC, 2018).

Categories 2 and 2Bis

The two working groups (CECAF 2013 - FAO 2015 and IMROP 2014) estimated a few years ago that the stock of black hake in Mauritanian waters was not fully exploited. Until 2015, annual catches were below 7,000 tonnes, following recommendations from the CSC due to the stock limit. However, there

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has been a significant increase in black hake catches since then, due to the creation of an additional category (Category 2Bis: frozen hake trawlers), the appearance of the Mauritanian fleet, increase in incidental catches and catches within neighbouring countries (Senegal, Gambia and Morocco). The next reports are therefore likely to be more negative.

Category 3

CECAF is the organization that conducts the majority of stock analysis for demersal species in Mauritanian waters. However, no assessment of the stock of pomfret (Brama brama) has been conducted. Nevertheless, the CPUE analysis for this species indicates that the stock has been relatively stable over the past 10 years. In addition, species other than pomfrets that are fished by the local artisanal sector have not shown any signs of overexploitation (CSC 2018).

Categories 4 and 5

The International Commission for the Conservation of Atlantic Tunas (ICCAT) is in charge of the assessment and management of the tuna stocks in the Atlantic Ocean. The latest assessments conducted by ICCAT's Tropical Tuna Working Group in 2016 concluded that the stock biomass of the Atlantic yellowfin tuna (Albacore; YFT) was close to the maximum sustainable level, estimated between 120,000 to 150,000 tons (ICCAT, 2016). The Atlantic bigeye tuna (BET) stock was overexploited and the skipjack stock (SKJ) in the eastern Atlantic was underutilized. There is no swordfish analysis, since this species is considered in the agreements as an incidental fishery.

Category 6

Small pelagic species targeted by pelagic trawlers in Mauritania are among the resources shared by several countries in the sub-region, notably Senegal and Gambia in the south, and Morocco in the north. The assessment of these stocks is carried out by a CECAF working group organized under the supervision of FAO. The most recent report states that sardines are fully exploited. Data on sardinella was insufficient, although it was considered overfished in 2013 (CECAF). In addition, the reduction in size and age shows that fishing mortality has increased over the last ten years. Both species of horse mackerel (*T. trecae* and *T. trachurus*) are overexploited. The mackerel stocks are fully exploited (CECAF 2018 *in* CSC 2018).

5.3.2 Management

The current SFPA has been set up on the condition that EU fleets catch only the surplus left by Mauritania. As this is most likely no longer the case, Mauritania and the EU must take steps to ensure that fishing pressure is reduced as soon as possible, in order to justify continuation of the agreement.

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The Mauritanian authority in charge of fisheries is the Ministry of Fisheries and Maritime Economy (MPEM). The Mauritanian Institute of Oceanographic Research and Fisheries (IMROP) is in charge of scientific monitoring of fishing activities in Mauritanian waters. The Directorate of Industrial Fisheries (DPI) is responsible for granting licenses and monitoring the payment of access rights. The Directorate of Ocean Resources Management (DARO) is responsible for planning, collecting and processing fishery statistics data for transmission to the National Statistical Office (NSO). Finally, the Mauritanian Coast Guard (GCM), under the supervision of the MPEM, is responsible for the sea surveillance. It is supported by the maritime police. The Coast Guard Fisheries Monitoring Center is based in Nouadhibou. In recent years, Mauritania has failed to ensure sufficient coverage of fishing trips by onboard scientific observers (7 missions in 2016 and only 1 mission in 2017).

CECAF plays an important role in analysing the state of fish stocks in the area and advising on management of these resources. ICCAT does as well play a leading role in assessing and managing the tuna stocks. . In 2017, an ICCAT meeting recommended reducing overall catches of bigeye tuna and also reducing the high proportion of catches of small bigeye tuna (mainly related to catches by purse seiners under FADs) (CSC, 2018). Measurements on the use of FAD have also been taken in other areas of the Eastern Atlantic. DG-MARE (EU) has commissioned two studies in 2017 and 2018 to improve knowledge of fish aggregating devices (FADs) (CSC, 2018).

5.3.3 Traceability

Most of the products (Categories 1, 2, 2Bis, 3, 4, 5) are landed in Spain, from where they are sold on auction. The products are tagged with information on catch area, trade name, scientific name of the species, first shipper, production method, product weight, and etc. The west-African market for small pelagic species (Category 6) is vast and diverse with many places and actors in the process. However, EU small pelagic vessels are required to have a logbook, in which they must inform about quantities of fish, type and discards (EU Regulation No 1224/2009).

5.3.4 Food Security

The current agreement has almost no relevance to food security, as the vast majority of EU catches is being landed outside Mauritania. Only landings for categories 2 and 3 (fresh demersal species) can contribute to local food, but these landings are mainly shipped to Europe. However, the transhipments in the bay of Nouadhibou for Category 6 (small pelagics), as well as regular employments of Mauritanian workers (27% of the crews all categories included in 2013) participate in the local animation. In addition, several million euros included in the agreement (4.125 million) are devoted to the development of the fisheries sector in Mauritania. The fact that 80% of the small pelagics are transhipped to the Gulf of Guinea where they become important protein source for other African countries, is also a food security issue for west African countries as whole.

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Otherwise, 80% of the small pelagics are transhipped to the countries of the Gulf of Guinea where they become an important source of proteins at low prices for local population.

5.4 Summary

This agreement follows a suspension of the agreements between July 2014-December 2015. It deals with the period December 2015-2019. This agreement is consequent, since the total financial amount for this period is 61.625 million euros, for annual catches of more than 280 000 tonnes of fish species. This agreement concerns several categories, types of fisheries and species. The main categories are small pelagics frozen on board (cat.6: around 90,000 tons in 2017), tuna seiners (Cat.4: around 14,000 tons) and black hake trawlers (Cat 2b: frozen , about 6,000 tons, Cat 2: fresh, about 3,400 tons). Categories 5 (Tuna pole-and-line vessels and longliners: 5,000 tonnes in 2017), 1 (vessels specialized in crustaceans: 1,300 tons) and 3 (fishing for demersal species: 2,600 tons) are less important. Finally category 7 (small fresh pelagics) is non-existent, despite the authorizations. The exploitation rate of this agreement varies according to the categories. However, it remains low overall (only the hake fishery is at the maximum level). In addition, the fishing effort has globally decreased, except for categories 2 and 3. The reduction of the authorized fishing zone and its limit further and further from the coasts has forced some fleets to give up in this country. In addition, the reduction in stocks for category 6 may be responsible for the decline in catches and fishing effort for this category. The recent increase in fishing pressure on black hakes (with the creation of the new category 2b among other things) results in exploitation that seems unsustainable. For categories 1 and 3, stocks are considered compatible with greater fishing pressure. Finally, yellowfin and bigeye tunas seem overused, while skipjack tunas are underexploited. Finally, catches made by the EU fleet only very rarely end in Mauritania. Most of the catches are integrated in the Gulf of Guinea countries' sectors or in the EU sectors (Spanish and the Baltic countries' in particular).

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6 South East Atlantic international waters (FAO area 47)

Øystein Hermansen (Nofima)

The international waters included in FAO area 47 in the southeast Atlantic represents a vast area of primarily open sea and deep waters. The area is also home to several seamount chains and isolated seamounts, guyots and banks where the fishing in the area takes place. Target species are alfonsino, boarfish, orange roughy, skates, sharks, deep-sea crabs and toothfish.

The fisheries in the area is governed by the South East Atlantic Fisheries Organisation (SEAFO), a RFMO established in 2001. Figure 64 illustrates the SEAFO area, which coincides with the area under investigation with the exception of the top right rectangle which is included in FAO area 37. As mentioned, the area is primarily deep ocean, deeper than 2,000 m. In addition to the relatively small shallow areas marked in yellow, there are multiple several seamounts that clearly stand out marked as black dots. Some areas associated with seamounts have been closed off for fishing as they are considered particularly sensitive.. The three circular white areas within the area 47 are the EEZs around the islands of Ascension, Saint Helena and Tristan da Cunha.

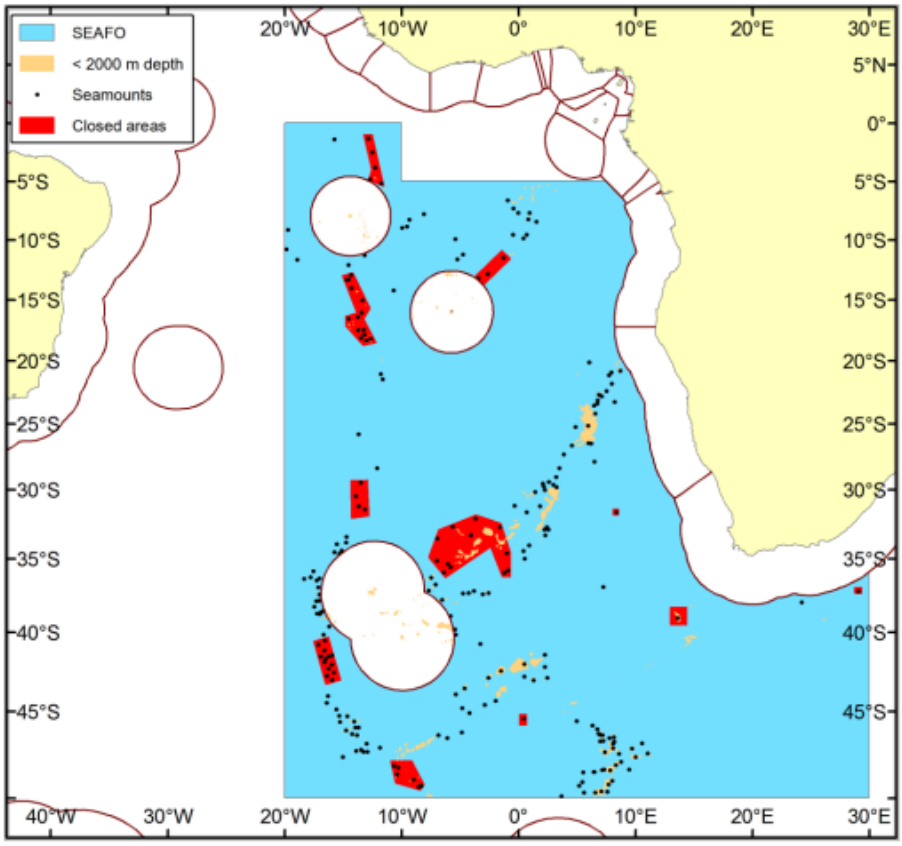

Figure 64 Illustration of the area and potential fishing sites (Source: IMR 2015)

Commercial harvesting is restricted to areas which were fished during a reference period. SEAFO has further closed off 11 areas (illustrated in red) for fishing by SEAFO due to being considered vulnerable

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marine ecosystems. Fishing is further regulated by TACs, gear restrictions and other measures directed at shark conservation. Tuna fisheries are operating in the area under ICCAT and IOTC management.

EU vessels have not been active in the area since 2007, hence sections on landings, processing etc. that are described in the other case studies are not included.

6.1 Catch in South East Atlantic

Apart from the tuna fisheries, catches in the SE-Atlantic (FAO area 47) from both EU and other fleets have been very limited during the last decade. The most important species are described below.

***Orange roughy* (Hoplostethus atlanticus)**

Namibian vessels fished for orange roughy between 1995 and 2005, when a moratorium was enforced. The fishery has not been opened since then (Anon. 2017).

Alfonsino (Beryx splendens)

There has not been a fishery targeting alfonsino in the area since a small-scale Korean trawl fishery in 2010-2012 where two vessels participated. Some IUU fishing has been reported, but the extent is unknown (Anon. 2017)

Pelagic armourhead (Pseudopentaceros richardsoni)

The only recent fishery targeting armourhead was a Korean fishery from 2010 to 2013. Two trawlers participated, but due to depletion of the stock, the fishery stopped in 2014 (Anon. 2017). In 2017, a trawler from Namibia targeted seamount species and also caught armourhead. No reports of IUU fishing has been made to SEAFO the later years.

Deep-sea red crab (Chaceon erytheiae)

Only Namibian, Korean and Japanese vessels have set pots for crab in the area lately, and in relatively small scale. Spanish and Portuguese vessels did some fishing in the first decade of 2000.

EU fleet

Alfonsino was caught by Spanish trawlers in some quantity in 1997 and 1998 and in small quantities by Portuguese bottom trawlers in the period 1999–2003. Since then, no EU vessels have recorded catches. Armourhead was caught in small quantities by Spanish trawlers in 2003–2004, and Cyprus trawlers in 2004. Deep sea crabs were fished in 2003–2004 by Spanish pot vessels and in 2007 by Portuguese vessels. The reported EU catches are illustrated in Figure 65. Quantities are as shown very small. For comparison, total catches and quotas for all fleets are illustrated for 2015 in Figure 65. Only toothfish and crabs were fished, and the quotas were not close to fully utilized, indicating poor economics in the fisheries.

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Figure 65 Recorded EU vessel catches (in tonnes) in FAO47/SEAFO area (Source: SEAFO stock status reports)

Table 35 Total quotas and catches in the area.

	2015	
	Quota	**Catch**
Patagonian toothfish	264	51
Deep sea crab	290	104
Orange roughy	54	N/F
Alfonsino	200	N/F
Armourh./boarfish	143	N/F

6.1.1 Vessels operating in the area

The EU fleet activity in the area is very limited. Table 36 and Table 37 illustrate the vessels registered through AIS data from Global Fishing Watch (as described in Kroodsma *et al.* 2018). In 2015, one Spanish fixed gear vessel is registered with catches of 300 tonnage.

Table 36 Vessel number for EU fleet operating in FAO47 ex. EEZ's (Source: Global Fishing Watch)

Fishing gear	**Country**	**2012**	**2013**	**2014**	**2015**	**2016**
Drifting longline	ESP	27	27	21	24	24
	PRT	6	6	4	3	3
Purse seine	ESP	1	4	5	7	6
	FRA	1	1	1	1	1
Fixed gear	ESP				1	

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Table 37 Vessel tonnage for EU fleet in FAO47 ex. EEZ's (Source: Global Fishing Watch

Fishing gear	Country	2012	2013	2014	2015	2016
Drifting longline	ESP	7,300	7,600	6,600	7,300	7,300
	PRT	2,000	2,100	1,600	1,100	1,100
Purse seine	ESP	900	5,600	7,200	10,600	9,000
	FRA	300	300	2,000	1,700	2,400
Fixed gear	ESP				300	

We assume the drifting longliners and purse seiners are tuna vessels, hence this is the only non-tuna vessel registered fishing in the period 2012-2016. Data for 2017 and 2018 will be available shortly, but catch statistics imply that no vessels have been fishing in 2017 at least.

6.1.2 Fishing operations

We have illustrated the EU fishing operations that took place in 2016 in the area in Figure 66 and Figure 67. Combined with the catch reports from SEAFO, it is clear that there was no non-tuna activity that year. The small fixed gear activity reported took place in the northeaster corner of the area by a single vessel. It is not clear what species were targeted.

Table 38 Estimated fishing hours for EU fleet in FAO47 ex. EEZ's (Source: Global Fishing Watch)

		2012	2013	2014	2015	2016
Drifting longline	ESP	41,800	74,600	63,500	64,100	36,800
	PRT	5,800	8,400	12,300	10,900	1,900
Purse seine	ESP	7	36	128	335	258
	FRA	11	12	11	2	20
Fixed gear	ESP				10	

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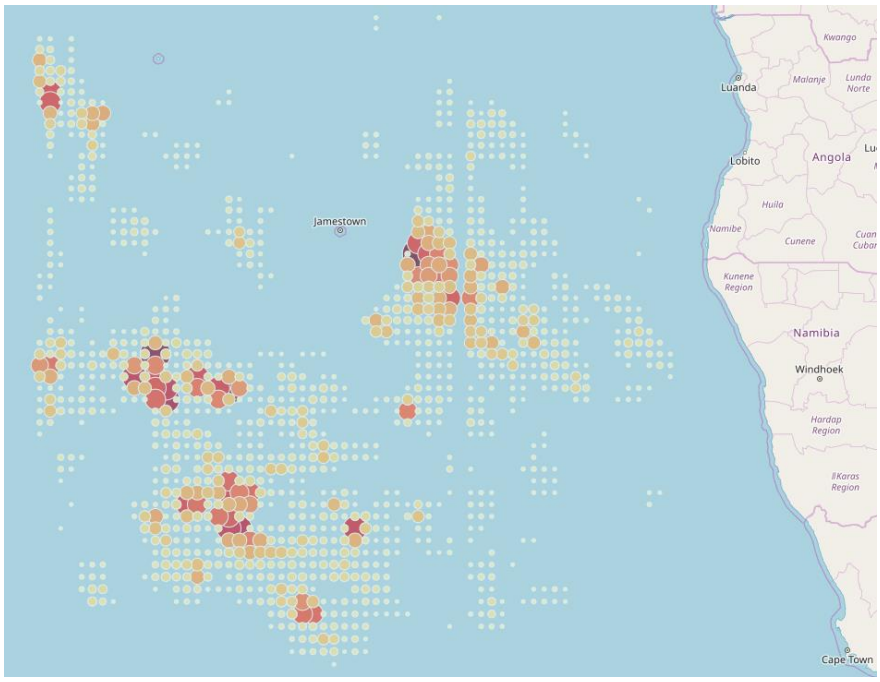

Figure 66: Map of EU drifting longline fishing hours 2016 in FAO47 ex. EEZ's (Source: Global Fishing Watch. Map data: OpenStreetMap contributors CC-BY-SA).

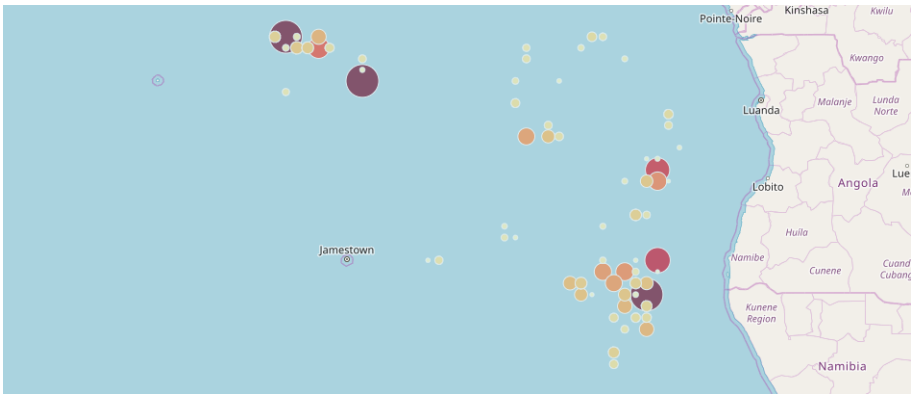

Figure 67 : Map of EU purse seiner fishing hours 2016 in FAO47 ex. EEZ's, (Source: Global Fishing Watch. Map data: OpenStreetMap contributors CC-BY-SA).

6.2 Summary

Although covering a vast area, the non-tuna fisheries in the Southeast Atlantic are very limited. The EU fleet has not reported catches to SEAFO since 2007. From 2000 to 2007 there were sporadic landings of small quantities of armorhead, alfonsino and deep-sea crabs from the EU fleet. Also other countries' fleets have shown little activity in the area lately. Quotas are underutilized, indicating that the available fisheries in the area is of marginal profitability. Hence, the little interest also from the EU fleet. This is supported the little interest shown by vessels from other countries, especially with fewer fishing opportunities and lower crew wages.

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7 South West Atlantic (FAO area 41)

Authors: **Thong Tien Nguyen** and **Olavur Gregersen** (SYNTESA)

The SW Atlantic area (FAO major fishing 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 (Erzini et al., 2017). 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.

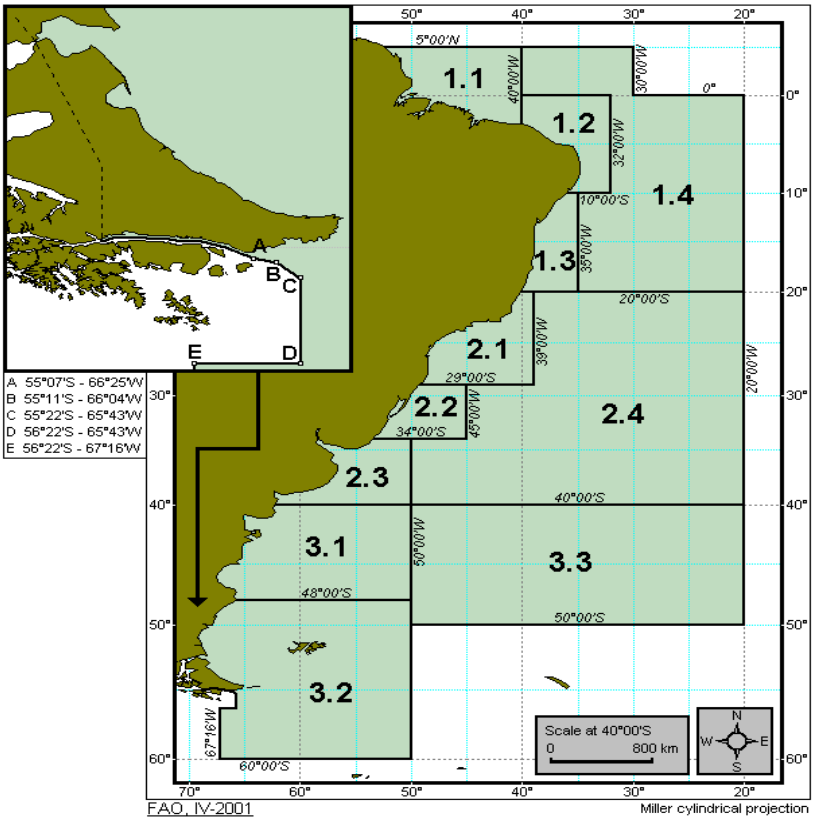

Figure 68 FAO Fishing Area 41 & its Sub-areas

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 68.

The high-seas fisheries in the statistical area 41 is a mixed fishery that is not subjected to any international agreements or governed by any RFMO (Erzini et al., 2017). The target species have primarily been hake, rock-cod, southern cod, red-shrimp and squid caught almost solely by Argentina, Brazil, and Spanish vessels. The total catch volumes have fluctuated between years. For instance, catches in 2014 and 2015 were around 2.5 million tonnes per year, but only about 1.56 million tonnes in 2016. There are fleets from countries such as China, Taiwan and Korea fishing in the area as well.

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Three major species caught in the area consist of Argentine hake (account for 23% of total catch), Argentine red shrimp (11%) and Argentine shortfin squid (9%). Three main fishing countries include Argentina (represent 47% of total catch of all species), Brazil (31%), and Spain (7%) (FishStat J, 2018).

This Chapter will first present an overview of the catch and landing in the SW-Atlantic, with a detail on specific groups of species and fishing countries. The following session will present value chain analysis for Argentine (common) hake (*Merluccius hubbsi*) fisheries which is the most important species in the area and occurs unique in the region. Due to the poor information on the fisheries in the area the value chain analysis covers only analysis of Argentine hake, with as much as possible the information extracted from various sources.

7.1 Catches in the South West Atlantic

Catches in the SW-Atlantic (FAO area 41) have fluctuated significantly from year-to-year, but have though been steadily increasing over the last decades (Figure 69). Total catch in 2014 was around 3.4 million tonnes of multiple fish species and valued at around 5.8 billion USD (SAU, 2018). There was a significant increase in catches in the period 1981-1997, as total catches doubled in volume. A peak volume was reached in 1997, when total catches reached 3.8 million tonnes (SAU, 2018).

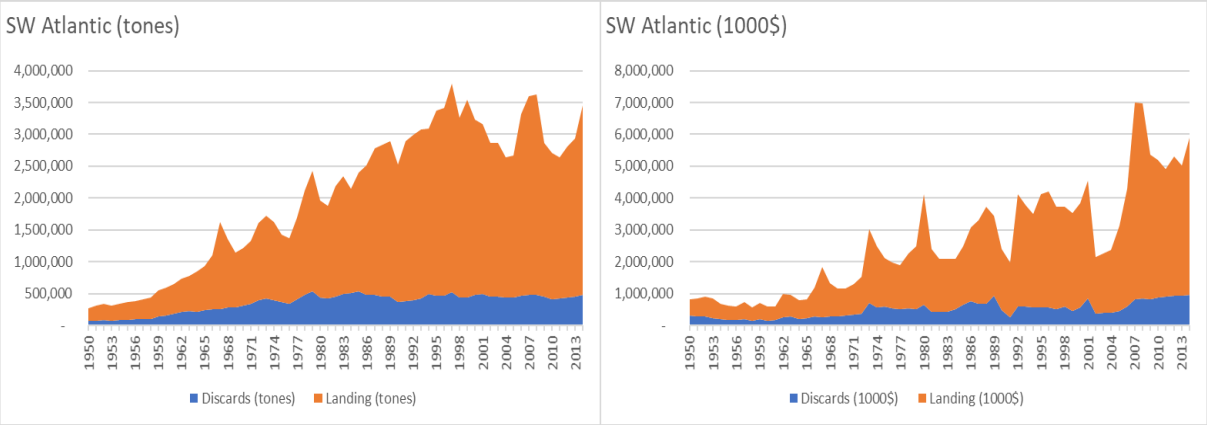

Figure 69 Historical catches and catch values in the SW Atlantic 1950-2014. (Source: SAU, 2018)

The multi-species fisheries in the SW-Atlantic include nearly one hundred fish species. There are however only four functional groups that represent 76% of the total catches, including medium benthopelagic (length of 30-89 cm), medium demersal (30-89 cm), cephalopods and small pelagics (<30cm), as shown in Figure 70.

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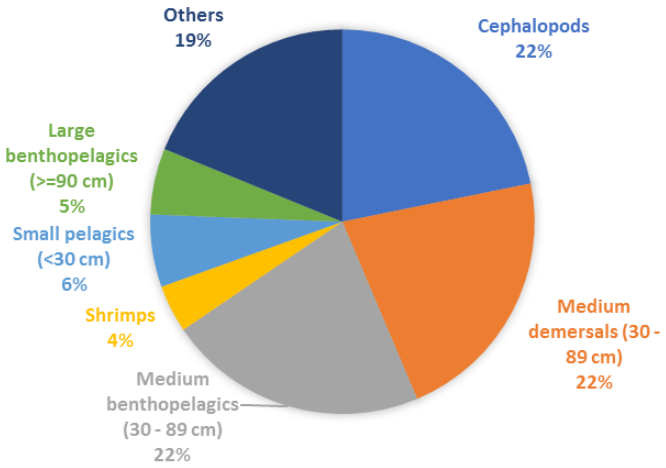

Figure 70 Catch structure (avg. share of catch volume) in the SW Atlantic, 2005-2014. (Source: FishStat J, 2018)

Discarding occurs within the fishery and affects the environment through increased mortality to target and non-target species and through alteration of food webs. It is estimated that discarding represents 15-25% of total catch volumes, giving an average rate of 18% (Figure 71). Perch-like species are the most discarded species, accounting for 40% of total discarding volume; while shark, ray and invertebrate species account for about 30% in total.

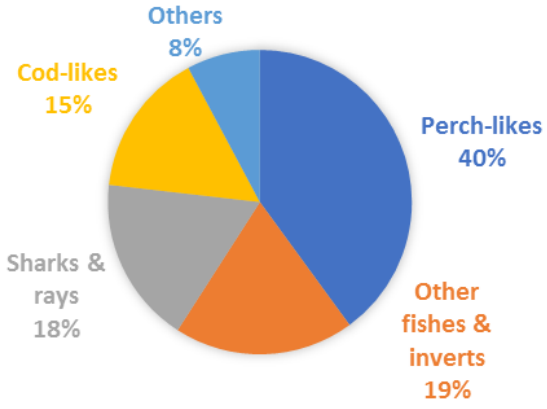

Figure 71 Discard rates in the SW Atlantic by commercial fish groups (Source: FishStat J, 2018)

Table 39 presents details of landing volumes for the SW-Atlantic (area 41). Demersal species, argentine red shrimp and squids are the three main target groups and account for a majority of the landing volume. The non-target species represent about 40% of the total landing volume on average (Fishstat J, 2018).

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Table 39 Landing by species groups in the SW-Atlantic Area (Unit: tonnes)

No	Species group	2012	2013	2014	2015	2016
1	Cods, hakes, haddocks	***426,853***	***453,844***	***435,139***	***430,081***	***442,167***
2	Miscellaneous coastalishes	362,949	306,947	365,102	297,806	276,632
3	Shrimps, prawns	123,768	138,749	165,265	177,445	212,586
4	Squids, cuttlefishes, octopuses	428,241	578,014	975,891	1,091,189	212,461
5	Herrings, sardines, anchovies	144,469	145,625	101,772	94,309	88,436
6	Sharks, rays, chimaeras	73,321	60,345	65,993	66,969	66,405
7	Tunas, bonitos, billfishes	68,882	66,449	65,376	58,628	65,845
8	Miscellaneous demersalishes	69,299	50,723	76,760	53,895	46,293
9	Miscellaneous pelagicishes	56,991	51,781	45,207	52,738	45,669
10	Scallops, pectens	36,820	42,202	33,584	31,628	35,544
11	Marineishes not identified	47,967	38,823	44,427	34,597	34,441
12	Crabs, sea-spiders	12,899	11,786	12,012	10,519	9,942
13	Flounders, halibuts, soles	9,546	7,556	8,703	7,777	7,241
14	Lobsters, spiny-rock lobsters	7,451	6,726	6,787	6,100	6,100
15	Mussels	6,025	5,393	5,401	4,814	4,823
16	Miscellaneous marine molluscs	3,052	1,309	1,948	1,876	2,913
17	King crabs, squat-lobsters	4,522	4,080	3,452	4,169	2,535
18	Clams, cockles, arkshells	1,661	1,495	1,509	1,358	1,355
19	Oysters	1,223	1,104	1,114	1,000	1,000
20	Miscellaneous aquatic invertebrates	254	329	3,280	302	897
21	Miscellaneous marine crustaceans	810	731	737	660	660
22	Abalones, winkles, conchs	113	114	80	12	12
	Total	**1,887,116**	**1,974,125**	**2,419,539**	**2,427,872**	**1,563,957**

Source: FishStat J, 2018

Argentine shortfin squid and Argentine hake are the two main target species caught in the area, with landings per year of each species at 532,631 tonnes and 338,884 tonnes, respectively in the period 2007-2016 (Fishstat J, 2018). These two species represent 26% and 17% of the total landings. Other target fishing species that are important include Argentine red shrimp, Whitemouth croaker, Patagonian grenadier, Brazilian sardinella, Patagonian squid, and Patagonian scallop. The landings per year of each species are between 47-94 thousand tonnes (Figure 72).

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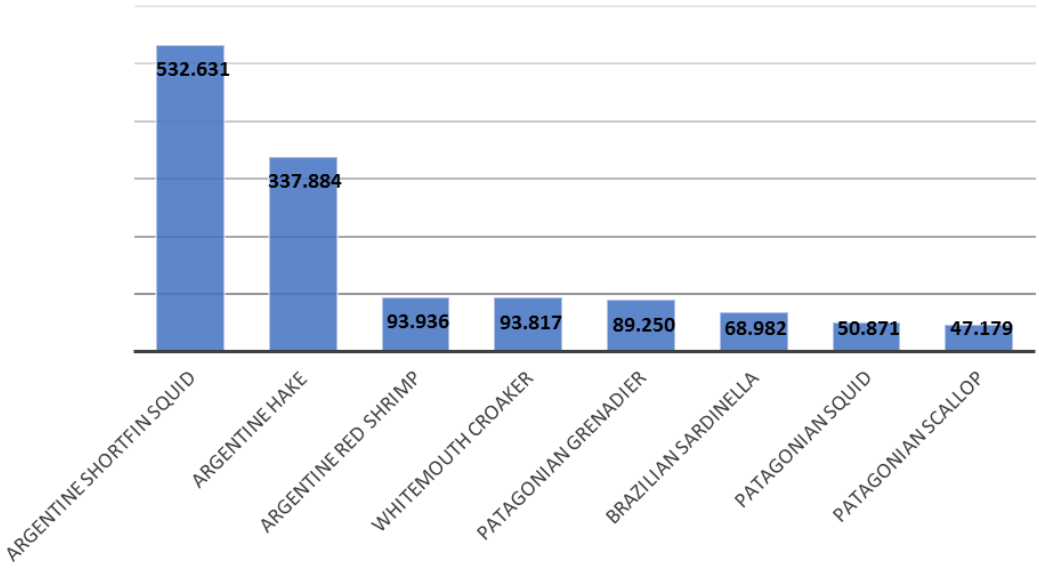

Figure 72 Top landing species (tonnes/year) in the period 2007-2016. (Source: FishStat J, 2018)

Argentina, Brazil and Spain are the three major fishing nations in the SW-Atlantic, and these countries represent over 70% of the reported total landing volume (Table 40). The catch by China and Taiwan fleets is considerable, but these fluctuate significantly between years. Falkland Islands and Uruguay share fishing grounds in the SW-Atlantic, but the catch of each of these countries is around 60-70 thousand tonnes a year. Other countries represent also considerable part of the catches in the region, including South Korea, Portugal and UK. The total catch volumes in the area by main fishing nations are shown in Table 40.

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Table 40 Total catch volume in the SW Atlantic region by country (Unit: tonnes, Source: Fishstat J, 2018)

No	Country	2012	2013	2014	2015	2016
1	Argentina	*723,737*	*858,420*	*815,355*	*795,415*	*736,337*
2	Brazil	*583,560*	*526,733*	*531,499*	*475,000*	*480,000*
3	Spain	*152,421*	*132,275*	*197,987*	*132,453*	*110,088*
4	China	78,999	108,897	337,095	471,519	71,199
5	Falkland Isl.	95,965	69,539	79,434	59,304	60,130
6	Uruguay	74,036	56,556	62,632	55,949	47,993
7	Korea	70,463	87,807	164,332	149,792	27,523
8	Taiwan	89,712	120,888	208,480	266,991	23,161
9	Portugal	3,330	2,240	2,558	2,483	4,460
10	UK	5,714	2,969	4,216	4,282	2,342
11	Belize	1,005	545	424	366	452
12	Japan	1,556	1,351	924	287	196
13	Ukraine	171	233	141	142	125
14	Vanuatu	117	2,427	11,151	13,202	77
15	Chile	209	87	1,728	767	12
	Totals	***1,887,116***	***1,974,125***	***2,419,539***	***2,427,872***	***1,563,957***

Argentina hake, Argentine red shrimp, and Argentine shortfin squid are the main species caught by Argentine fleets. Brazilian sardine, white-mouth croaker are mainly harvested by Brazilian fleets. Argentine hake and longtail southern cod are target species for Spanish vessels. Falkland Island fleet caught mainly Patagonian squid, and Uruguay fleets target white-mouth croaker and Argentina hake. Squid, especially Argentine shortfin squid is target species for Asian vessels, e.g. Korea, Taiwan and China. The landing value of catches from the SW Atlantic by country are shown in Figure 73.

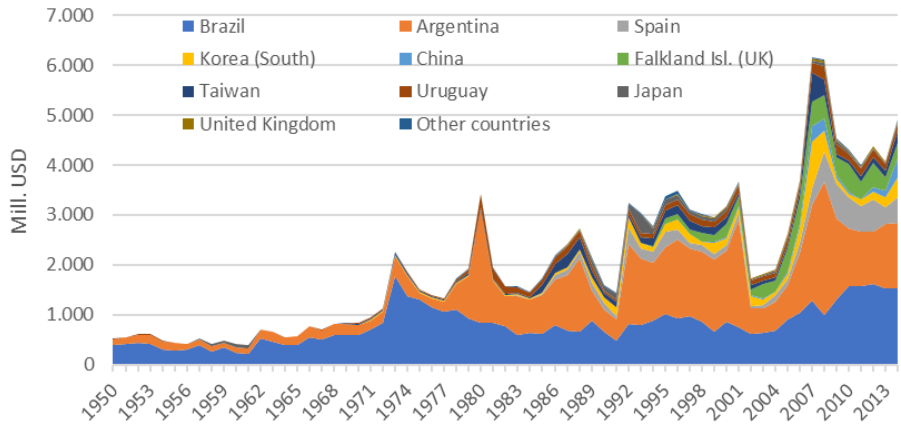

Figure 73 Landing values in SW by fishing countries (Source: SAU, 2018)

Brazil and Argentina are the largest fishing nations in terms of value, with fishing revenues in 2014 of 1.5 $billion USD and 1.3 $billion USD, respectively. The two countries accounted for 57% of total catch

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value in 2014. The countries following in terms of value are Spain (508 $million USD), Korea (414 $million USD), China (358 $million USD), and Falkland Island (325 $million USD).
Demersal species (hake and cod) are the most valuable species in SW-Atlantic fishery (Figure 74).

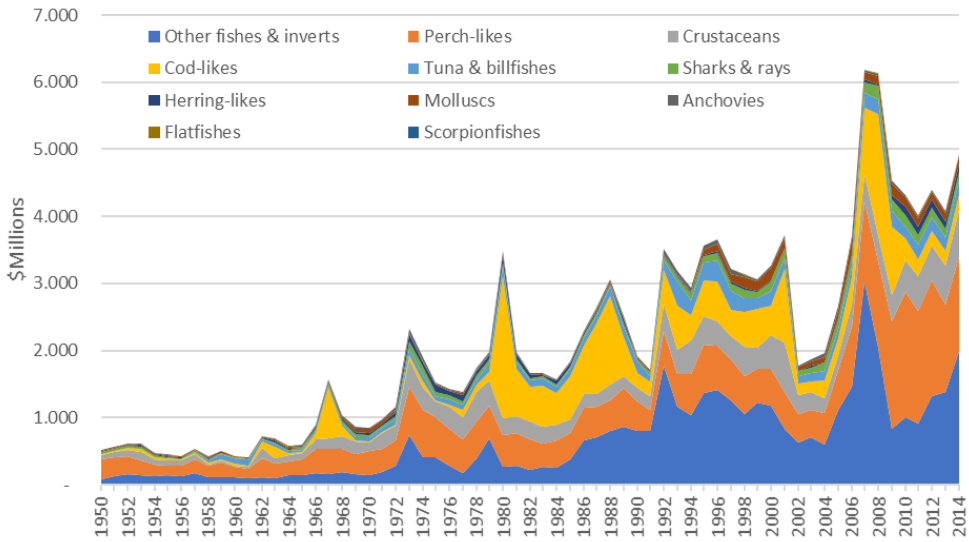

Figure 74 SW Atlantic landing value by species (Source: SAU, 2018)

The highest valued species include perch-like, cod-like, crustaceans' groups

7.1.1 Vessels operating in SW Atlantic

The coastal states fishing in the SW-Atlantic 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 nations are Spain and UK.

The Spanish fleet consists of up to 19 vessels, ranging from 696 to 1,819 GT, with an average of about 1,190 GT. The Spanish long-distance freezer trawler fleet and long liners are based in Galician ports, mainly in Vigo (FarFish D2.1). A list from FAO in 2011 identified 44 vessels with authorization to fish in the SW-Atlantic (FAO, 2011b). Key European stakeholders and operators are LDAC, OPROMAR and ANFACO-COPESCA.

EU fleets operating in SW-Atlantic:

Landings of the EU fleet operating in the SW-Atlantic in 2016 amounted to 116 thousand tonnes (-13% compared to 2015), valued at EUR 173 million (+5.4%). Target species include demersal species, such as Argentine hake, and to a lesser extent, swordfish, blue shark and blue whiting. While swordfish and Patagonian squid are not very important in terms of landed weight, in terms of value, they are almost as important as Argentine hake (Figure 75).

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STECF (2018) reported the main EU fleets operating in the region in terms of landings including:

- Spanish demersal trawlers > 40m; taking 87% of the total landed weight reported for FAO 41 and 66% of the value;
- Spanish pelagic trawlers 24-40m; 5% of the landed weight and 14% of the value;
- Spanish pelagic trawlers >40m; 2% of the landed weight and 8% of the value;
- UK demersal trawlers > 40m; 2% of the landed weight and 6% of the value.

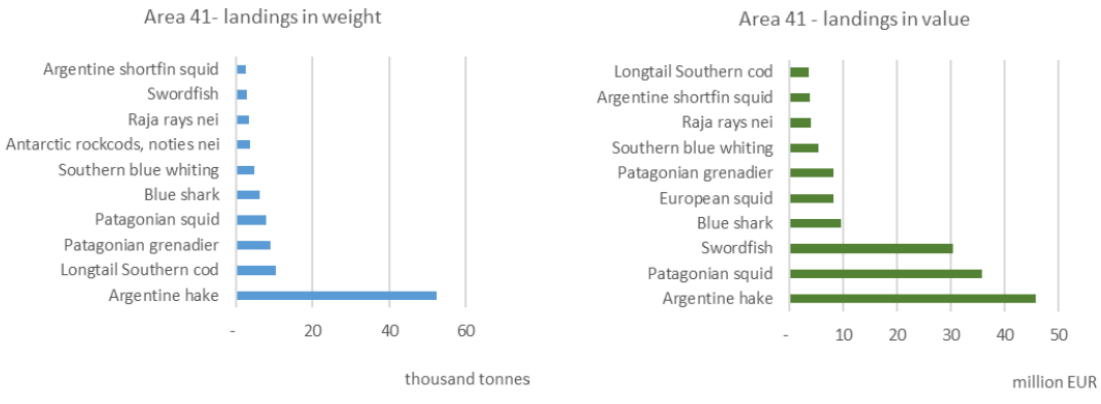

Figure 75 EU fleet's landing volumes and values in the SW Atlantic Ocean (Source: STECF, 2018)

Fishing methods and fishing gear

Fishing methods or gear types used in the SW-Atlantic multi-species fisheries are very diverse. However, classified gears are mainly bottom trawl, lines, shrimp trawl, gillnets, purse seine. Bottom trawl is dominating, representing 21% of the total landing value (Figure 76); followed by longline, shrimp trawl, and small-scale gillnets.

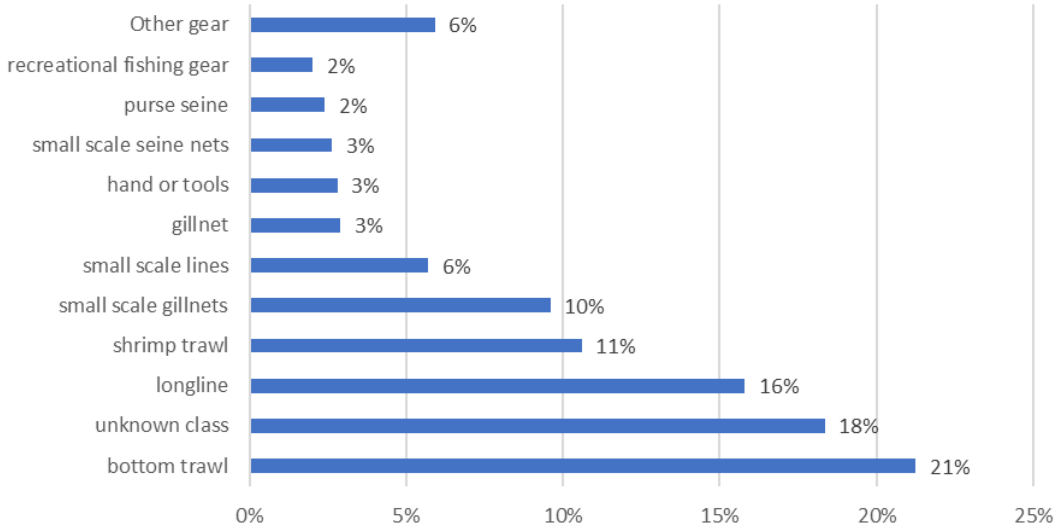

Figure 76 Share of landing value in the SW-Atlantic by fishing gear in 2014 (Source: SAU, 2018)

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Argentine hake (*Merluccius hubbsi*) is the main target species for bottom trawl, accounting for around 46% of total catches by bottom trawl. Patagonian grenadier, Patagonian squid, cod, croaker and blue whiting are also caught by bottom trawl, with shares of landings varying between 4-13%, as shown in Figure 77.

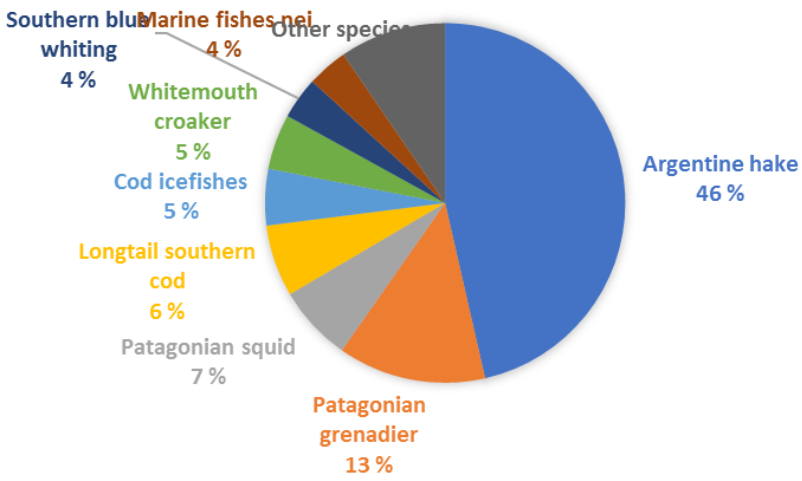

Figure 77 Landing share of major species caught by bottom trawl in the SW-Atlantic in (2005-2014 (Source: FishStat J, 2018)

Fishing gear fraction by major fishing countries

Argentina is the major fishing nation using bottom trawl for hake fishery in the SW-Atlantic (Figure 78). The country represents nearly 90% of total landings of Argentine (common) hake caught by bottom trawl. Uruguay follows, but their landings account for only 6% of the total Argentine hake landings.

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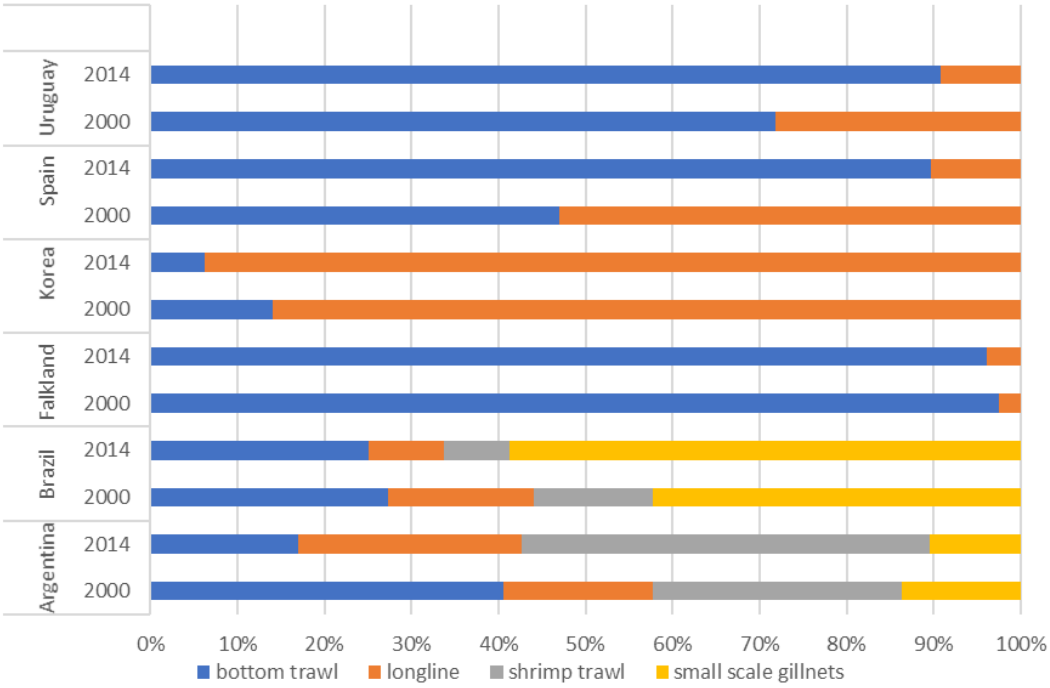

Figure 78 Fishing gear fraction in SW calculated by landing value (Source: SAU, 2018)

Argentinian and Brazilian vessels use four different fishing gears; bottom trawl, longline, shrimp trawl and small-scale gillnets, while other major fishing nations in the area use only bottom trawl and longline. The exception being Korean vessels using mainly longline (for fishing squid) and Falkland Islands vessels use mainly bottom trawl (catching demersal fish). There was a switch of fishing gears between 2000-2014 by some of the fishing nations e.g. Argentine vessels reduced bottom trawling (hake fishery) and increased shrimp trawling, while Spain increased bottom trawling and reduced longline gear and there was an increasing share of small-scale gillnets in Brazilian vessels operating in the region.

7.1.2 Fishing operations

The high-seas fishery in the SW-Atlantic takes mainly place on a shallow bank (<300m) beyond the EEZ of Argentina and outside the Falkland/Malvinas conservation Zones (FICZ and FOCZ). The fleet operates primarily in FAO sub-areas 3.1 and 3.2, shown on Figure 68. The main fishing ground is from Brazilian waters to Argentina-Uruguay Common Fishing Zone, to the around Falkland/Malvinas Islands.

Small pelagic species 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

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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.

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 44°S and 48°S and secondarily in the fishing grounds around 42°S.

Fishing activities by the EU fleet in the SW-Atlantic high-seas areas (Spanish and UK vessels) are mainly carried out in areas 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. 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 (Erzini et al., 2017). 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.

Industrial fisheries dominate the landing value in the area, accounting for nearly 74% of total value. The artisanal fisheries represent 24% of total landing value and is dominated by coastal nations and small-scale vessels from Brazil (67%) Argentina (33%), operating within the EEZ's (Figure 79).

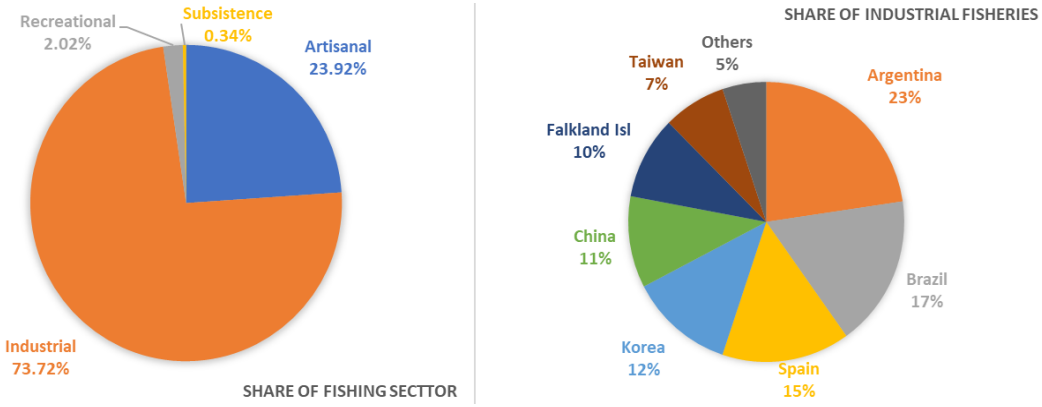

Figure 79 Landing value share 2014 by fisheries sector and industrial fisheries countries (Source: SAU, 2018)

Industrial fisheries in the SW-Atlantic operates around the year, by vessels from Argentina (2%), Brazil (17%), Spain (15%), Korea (12%), China (11%), Falkland (10%).

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7.2 Argentine Hake (*Merluccius hubbsi*)

7.2.1 Biology and Fisheries of Argentine hake (Merluccius hubbsi)

There are 14 species described and recognized in the genus Merluccius (Family *Merlucciidae*) (Maria & Omar, 2015), of which the most important commercial species are Argentine hake, North Pacific hake, Cape hake, European hake, and South Pacific hake. The top five species represent over 95% of total global hake production (Figure 80).

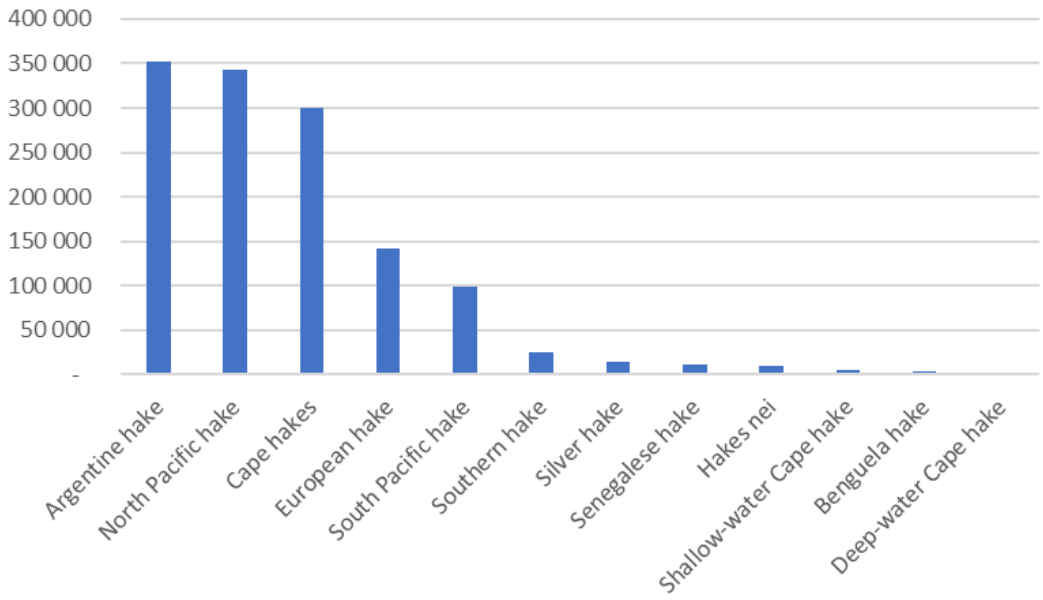

Figure 80 Global production of hake species (genus Merluccius) in 2016, in tonnes (Source: FishStat J, 2018)

Argentine hake is the only hake species distributed in the SW-Atlantic, embracing southern Brazilian, Argentinean and Uruguayan waters. The species lives in a temperature cold Sub-Antarctic water related to Maldinas/Falkland Current system. This area is strongly affected by the confluence of the Brazin (warm and salty) and Maldinas cold current (Maria & Omar, 2015). The shelf where the Argentine hake distributed has a high degree of horizontal and vertical heterogeneity, with oceanographic process affecting column stability and providing favourable environment conditions for spawning and breeding of the fish.

The Argentine hake (*M. hubbsi*) is very similar to the European hake (*Merluccius merluccius*). It can reach a length of 95 cm, and weigh up to 5 kg. It lives popularly at depths from 100 to 200 meters, and feeds on crustaceans, squids and fish (including smaller hakes). It migrates southwards in spring and northwards in autumn (Fishbase, 2018). This species is one of the most abundant fish resources in the Argentine Sea, where its biomass has reached annual values between one and two million metric tons during the early 90´s.

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The Argentine hake and its fishery is one of the most important demersal fisheries in Latin America. Due to its abundance, broad distribution, and the scale of landings, the fishery is a driver of fisheries sector development in Argentina (Arkhipkin et al., 2015). The fishery involves over half of the Argentinean fishing fleet, generates about 12,000 direct jobs, and 40% of fisheries exports in recent years. Argentine hake represents nearly 50% of the total catch and is the most important fisheries in SW-Atlantic area.

The Argentine hake is most abundant between 35°S (ocean in front of Rio de la Plata, Uruguay) and 45°S (Patagonian shelf, Argentina). In Southern Brazil, its abundance is related to cold waters, mainly between 33°S and 35°S (Lorenzo & Defeo, 2015). This hake species performs seasonal migrations relate to trophic behaviour, reproduction and changes in oceanographic conditions. Argentine hake shows a cyclic northward–southward migration accompanied, respectively, by offshore inshore movements. Taking into account sizes, age structure and maturity status of Argentine hakes in various regions of the SW-Atlantic Ocean.

The main regions that the Argentine hake is most abundant in the area are the Argentine-Uruguayan Common Fishing Zone (AUCFZ), Falkland/Malvinas Islands, and Brazilian waters. In AUCFZ, individuals of Argentine hake arrive around May and stay through August, so this area can be considered as a wintering ground. During these months, hake concentrate along the outer shelf and continental slope. By the end of winter (September), a southward movement begins, accompanied by a corresponding inshore migration to shallower waters. The southward migration is associated with a movement towards spawning grounds. Mature females can be found year-round

In Falkland/Malvinas Islands as well as in the entire Southwest Atlantic Ocean, there are two main hake species that represent a significant part of catches, these are the Argentine hake (*Merluccius hubbsi*) and the southern hake (*M. australis)*. The Argentine hake is much more abundant than the southern hake. The proportion of Argentine hake in the total hake catch was 91% in the period 1987–1991, 84% in 1992–1999, 87% in 2000–2006 and 97% in 2007–2012 (Arkhipkin et al., 2015).

The Argentine hake is present in small numbers in the shallowest parts of the high-Seas region and waters around the Falkland Islands in January. The fish migrate first into the western part of the waters around the Falkland Islands in February at depths of about 200 m. In autumn (March-May), the fish is found in large numbers both on the high-Seas and in the northern and western parts of the waters around the Falkland/Malvinas Islands. Argentine hake have their widest distribution in winter. In spring, they disappear first from the south-eastern parts of waters around the Falkland Islands (in September), gradually moving in a north-westerly direction (in October). They disappear from the waters around the Falkland Islands in November and from the high-Seas region in December, presumably moving to their spawning grounds in inshore Argentinean waters (Arkhipkin et al., 2015). Argentine hake in Brazilian waters is a unique species of the genus Merluccius (Vaz-dos-Santos & Schwingel, 2015). The area between 21°S and 34°S comprises the Brazilian territorial sea and EEZ, with a large continental shelf. Young fish are found in shallow waters and in coastal environments close to

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estuaries and bays and above the continental shelf. Adults of Argentine hake are also distributed along the continental shelf and live mainly in the continental slope, where schools in high concentrations are found (Vaz-dos-Santos & Schwingel, 2015).

7.2.2 Landings

Before the late 1970s, the hake fishery in the SW-Atlantic Ocean took place mainly in the northern part of the Patagonian shelf and River Plate basin by both short-range fishing fleets of Argentina and long-range international fishing fleets further offshore (mainly vessels from the former Soviet Union, Spain and Poland). In 1979, the Argentine hake fleet was accompanied by large factory trawlers, which expanded the fishing area further offshore and south into the waters around the Falkland Islands. They harvested there until the international conflict of 1982. Argentine hake became increasingly more important in the mid-1970s, with the development of the fishery, and since the 1990s, more than 90% of the catches obtained in the area has been Argentine hake. The total landing volumes and values, as well as discard volumes and values, for the period 1950-20113 are shown in Figure 81 (SAU, 2018).

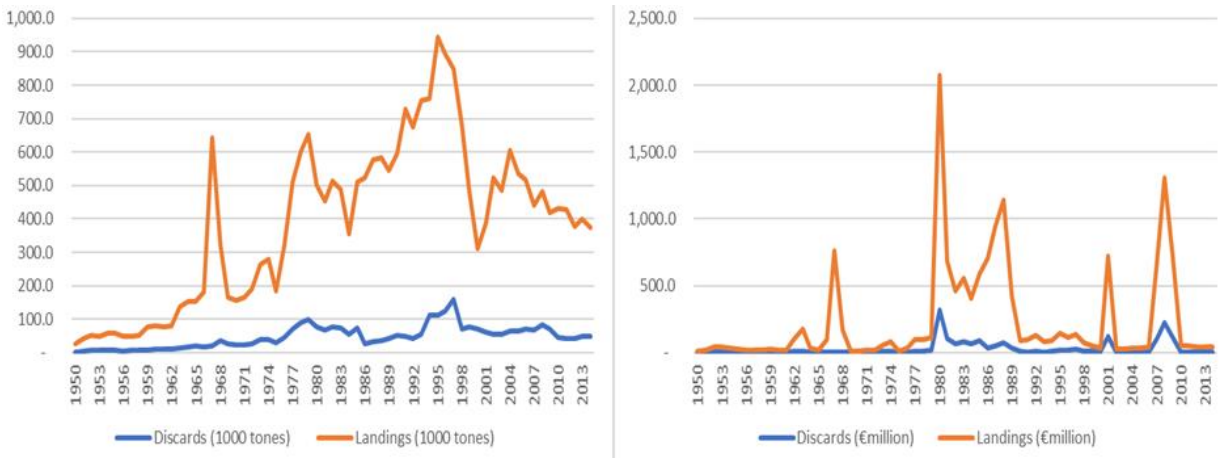

Figure 81 Historical catch of Argentine hake (M. hubbsi) in SW-Atlantic 1950-2014 (Source: SAU, 2018)

FAO data show that total catches of Argentine hake in the SW-Atlantic (area 47) steadily increased from 25,300 tonnes in 1950 (equivalent to 11 $million) to 180,800 tonnes (762,7 $million) in 1966 (Figure 81). Catches were at first all taken by the coastal States, Argentina, Brazil and Uruguay. During the 1960s the Argentine hake began to be exploited by foreign fleets. Following the exceptionally high catches of hake reported in 1995 (942,600 tonnes), catches declined to 311,000 tonnes in 2000. The total catch from this region then increased steadily to 606,800 tonnes in 2004, and then decrease rapidly to 373,300 tonnes in 2014. The discarding of Argentine hake is estimated to be around 11%, consisting mainly of juvenile by-catch.

Before the 1980's, over 80% of total catches of Argentine hake in the SW-Atlantic was by Soviet Union fleets. Since 1990s, the hake has primarily been caught by coastal nations and Spain. The total landings

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of Argentine hake in 2016 was 352,000 tonnes; of which 80% was landed by Argentinian fleets, 15% by Spanish vessels, 3% by Uruguay, only 2% by other national fleets (UK, Falkland Isl., and Brazil) (Figure 82).

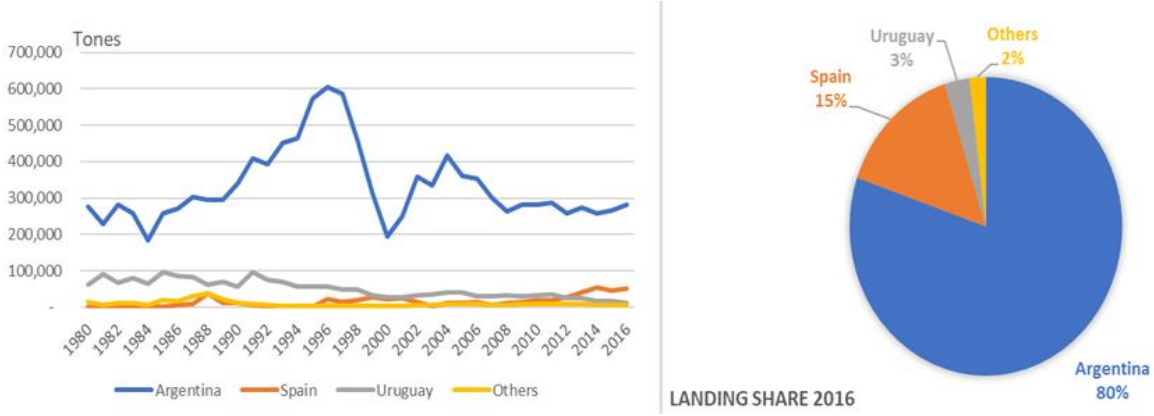

Figure 82 Landing of Argentine hake (M. Hubbsi) by Countries 1980-2016. (Source: FishStat J, 2018)

Nearly 100% of Argentine hake are caught by industrial vessels, as there is no local artisanal fishing fleet in all three main fishing zones, i.e. the Falkland Island, Argentinean–Uruguayan Common Fishing Zone, and Brazilian. In Falkland Island, all vessels fishing for hake and other finfish species prior to 1987 represented foreign long-distance fishing fleets. Before 1998, vessels of many countries fished for hakes and other finfish, with the majority of them flagged in Spain, Poland, Portugal, Japan, Italy and France. Several vessels also belonged to joint ventures between the Falkland/Malvinas Islands and Spain. Since 1999, the number of countries has reduced, and the majority of the fishing fleet was composed of Spanish and Falkland/Malvinas Islands flagged vessels (Arkhipkin et al., 2015).

In the fishing zone around Falkland/Malvinas Islands, all vessels fishing for hake were factory trawlers between 65 and 101 m of length and 1,200–2,700 GRT, with 35–60 men in the crew. The fishing is performed by bottom trawls with horizontal opening of 40–50 m and vertical opening of 35 m. Argentine hake now represents some 15-20% of catches in the finfish fishery (A-license), 5-9% of total finfish caught by vessels with W-license (restricted finfish) and with G-license (restricted finfish and squid), both of which operate over the same area as allowed by the A-licence (Arkhipkin et al., 2015).

According to (Arkhipkin et al., 2015), the number of vessels participating in the hake fisheries was high initially and in 1989–1991 varied between 31 and 72 vessels. In 1992–2004, it was stable and low (8–14 vessels), and gradually increased to 22–28 in 2008–2012 because some other vessels used hake licenses for a short period of time. The number of trawlers fishing with a restricted finfish license (only allows 10% of hake by-catch) ranged from 49–64, in the period 1991–1996, to 24–29, in the period 2007–2012. However, their individual catches of hakes were much lower than those in the hake (A license) fleet. During the early 1990s, the total catch of Argentine hake in the waters around the Falkland/Malvinas Islands quickly decreased from 16,480 tonnes in the year 1989 to 1,414–4,224 tonnes in the period 1992–2005. Since 2006, the catches returned to the 'normal level'; of 8,414–

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13,606 tonnes (Falkland Islands Government, 2011), presumably because of changes in the spawning grounds and post-spawning foraging migration pattern in the bulk of population. Increase in catches in the waters around the Falkland/ Malvinas Island was accompanied by simultaneous decrease in the total catch of the Patagonian stock south of 41°S in the EEZ of Argentina, that is, from 296,000–375,000 tonnes, in the period 2004–2006, to 215,000–271,000 tonnes, in the period 2007–2012 (Arkhipkin et al., 2015).

The Uruguayan fishery of the Argentine hake is developed in the AUCFZ (34°30'–39°30'S), where this fishing resource is shared by Argentina and Uruguay (Lorenzo & Defeo, 2015). However, the distribution of the species extends beyond this area (i.e. up to 55°S), where it is targeted only by the Argentinean fleet under its jurisdiction. Within the AUCFZ, the total landings made by Uruguay and Argentina decreased from an average of 110,000 tonnes in 1980–1990 to 46,000 tonnes during the first decade of the 21st century. The highest landings were recorded in 1991, reaching 195,000 tonnes, decreasing thereafter until reaching 30,000–50,000 tonnes between 2000 and 2010.

In Brazilian waters, four states in Southern and South-eastern Brazil (Rio Grande do Sul, Santa Catarina, São Paulo, and Rio de Janeiro) have harvested the Argentine hake, with landings in the ports of Rio Grande, Itajaí, Santos and Rio de Janeiro, respectively, since the 1980's. From 1986 to 2000, the landings of Argentine hake were relatively small, at a levels less than 300 tonnes. Later, from 2001 to 2003, the fishery increased its mean annual landings to 3,000 tonnes, falling in 2004 to 1,400 tonnes. However, from 2005 to 2011, catches increased to 4,500 tonnes in 2012, which was the highest annual harvest of hake in Brazil (Lorenzo & Defeo, 2015). This increase in landings has been associated to the trawl fleet of Santa Catarina State, which was responsible for 65% of the national catch from 2001 to 2012. Moreover, in the last 12 years, the capture per unit of effort increased continuously, from 2.7 tonnes per trip, in 2001, to 6.0 tonnes per trip from 2009 to 2012.

According to Lorenzo & Defeo (2015), captures were conducted by a fleet of double rig trawlers and single trawlers, which accounted for 70% and 26% of the Santa Catarina State production from 2001 to 2003, respectively. In 2002, a total of 645 landings were registered at the port of Itajaí, and after that, landings fluctuated at about 300 landings/year between 2003 and 2011. From 2004 to 2012, the double rig trawler was responsible for more than 90% of the Argentine hake catches. Monthly hake captures of by double rig trawlers in Santa Catarina, from 2001 to 2012 has shown seasonal variation, with highest values in summer and autumn (February-May), an average of 180 t/month. This falls slightly in the late autumn and winter (June-August) to 140 t/month, decreasing to 65 tonnes/month in spring (September-November). The hake trawl fishery in São Paulo State, similar to those occurred in Santa Catarina State, has been also dominated by double rig trawlers that were responsible for 95% of the landings. In Rio Grande do Sul, bottom gillnet fleet is primarily responsible for Argentine hake landings in this State, representing 60% of the landings in the years between 2001 and 2012, followed by the double rig and pair trawling fleets (Lorenzo & Defeo, 2015).

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7.2.3 Profitability considerations

Due to lacking information on cost and revenues of the fisheries at fishing vessel level, this session presents information regarding to catch per unit effort (CPUE) and status of stock of the fisheries in region, as indicators of the profitability.

It is generally accepted that the hake resource is heavily exploited and in danger of collapsing. There are several indicators of concern: 1) Reliance of the fishery in recent years on the youngest fish indicates the decline of the hake stock; 2) A large percent of the 2 year-old fish is immature;) Lack of older fish in both the population and the catches; 4) Fishing mortality has risen to levels causing growth overfishing, so effectively reducing yield. 5) Qualitative reports of extensive discarding of small 1 and 2 year-old fish owing to present harvesting practices; and 6) Hake is not a species that easily benefits from mesh selectivity control.

The Argentinian fleet accounts for about 80% of total landings of the Argentine hake. Historically, fisheries have however not been particularly important for the Argentinian economy. The development of the Argentinian fishing industry has taken place in the past 35 years. The expanding export market and activities of foreign vessels has increased rabidly since 1990s. Fishing effort of Argentina is estimated to have increased by 83% between 1986-1997. Catch Per Unit of Effort (CPUE) for the area south of 41°S has decreased by approximately 60%. South of the 41°S the CPUE has declined from 2 tons/hour in 1986 to 0.8 tons/hour in 1996 (Word Bank, 1999). In the last few years of 2000s, the fishing industry has been showing signs of declining economic returns due to the decline of the hake stocks and lower export market prices.

Argentine hake now represents some 15-20% of catches in the finfish fishery in Falkland Island, (A-license), 5-9% of total finfish caught by vessels with W-license (restricted finfish) and with G license (restricted finfish + *Illex* squid), both of which operate over the same area as allowed by the A-licence (Arkhipkin et al., 2015). During the early 1990s, the total catch of Argentine hake in the waters around the Falkland/Malvinas Islands quickly decreased from 16,480 tonnes in the year 1989 to 1,414–4,224 tonnes in the period 1992–2005 (Arkhipkin et al., 2015). Since 2006, the catches returned to the "normal level"; of 8,414–13,606 t, presumably because of changes in the spawning grounds and post-spawning foraging migration pattern in the bulk of population. Increase in catches in the waters around the Falkland/Malvinas Island was accompanied by simultaneous decrease in the total catch of the Patagonian stock south of 41°S in the EEZ of Argentina, that is, from 296,000–375,000 t, in the period 2004–2006, to 215,000–271,000 t, in the period 2007–2012 (Arkhipkin et al. 2015).

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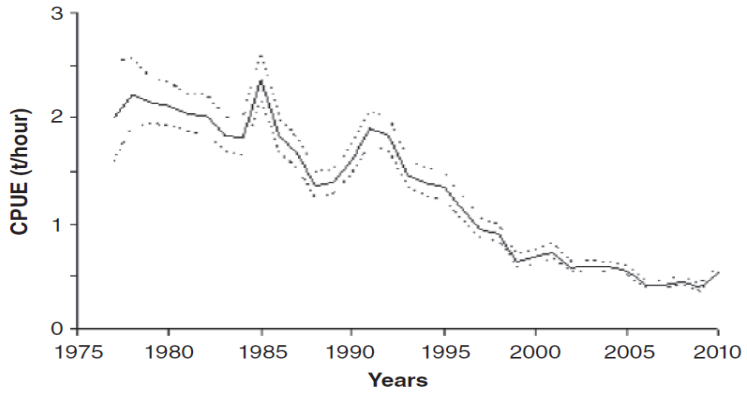

Figure 83 a) Long-term trends in landings (Uruguay, AUCFZ and for the entire Argentine hake (M. hubbsi) distribution in the SW-Atlantic Ocean); (b) CPUE (mean ± 95% confidence interval, dashed lines) estimated only for the Uruguayan fleet. (Source: Lorenzo & Defeo, 2015)

Within the AUCFZ, the total landings by Uruguay and Argentina decreased from an average of 110,000 tonnes in 1980–1990 to 46,000 tonnes during 2000s. The highest landings were recorded in 1991, reaching 195,000 t, decreasing thereafter until reaching 30,000 50,000 tonnes between 2000 and 2010 (reaching approximately 37,000 tonnes in 2011). Long-term trends in CPUE reflected the catch variation through time, decreasing from 1998 kg per hour in 1977 to 558 kg per hour in 2010 (Figure 83). Two concurrent phenomena occurred during this phase: (i) a decreasing trend in catches and fishing yields in the three traditional demersal fishes mentioned previously, and (ii) development of new fisheries on the basis of virgin or under-exploited stocks of high unit value and international demand.

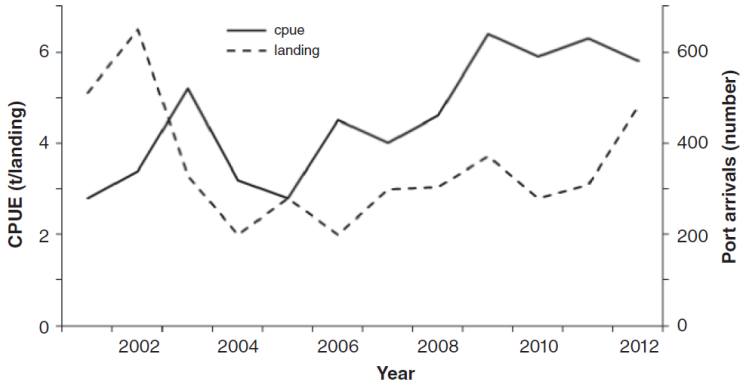

Figure 84: . Capture per unit of effort (CPUE) of Argentine hake (M. hubbsi) and number of landings by double rig trawlers in Santa Catarina State (Brazil) (Source: Vaz-dos-Santos & Schwingel, 2015).

The CPUE in Brazilian waters in the period of 2001-2012 increased continuously, from 2.7 tonnes per trip, in the year 2001, to 6.0 tonnes per trip from 2009 to 2012 (Figure 84) (Vaz-dos-Santos & Schwingel, 2015). Captures were conducted by a fleet of double rig trawlers and single trawlers, which accounted for 70% and 26% of the Santa Catarina State production from 2001 to 2003, respectively.

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7.3 Processing

7.3.1 Receivers of raw material/fish

The Argentinian hake is harvested mainly by Argentina, Uruguay and Spain vessels, As previously mentioned. The Argentinian fleet is dominating in catches, accounting for 80% of total landings. The Argentinian fleet has consisted mainly of fresh fish trawlers (ice trawlers), but in recent years there have been some changes in the fleet composition (Figure 85). The share of fresh fish trawlers has dropped from 62% in 2008 to 46% in 2016, while the share of freezer trawlers has increased from 27% to nearly 50% (Stephanki 2017).

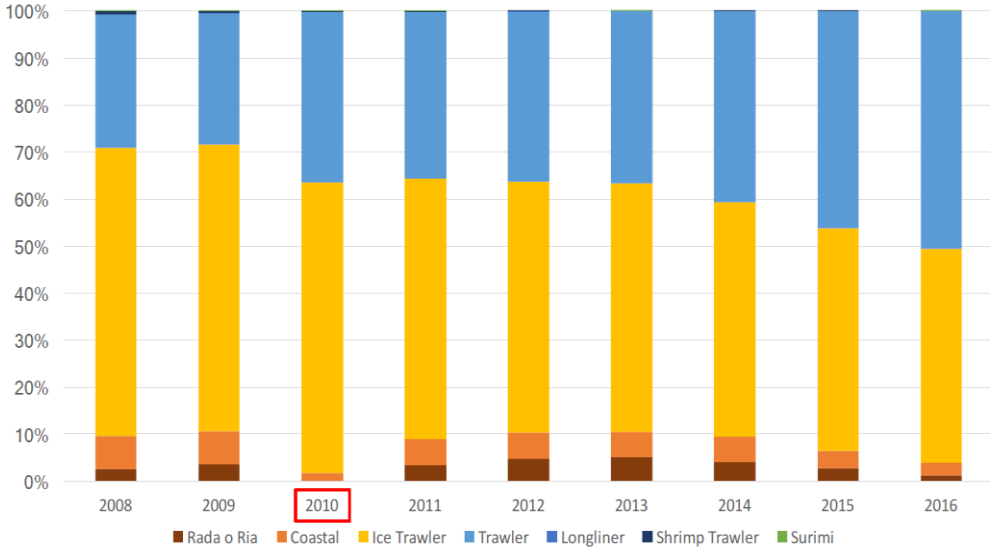

Figure 85: Annual hake landing by type of vessel of Argentina (Source: Stephanki 2017)

Main ports of the Argentinian fleet are Mar del Plata (over 70% of total landings) and Puerto Madryn (10%), as shown in Figure 86.

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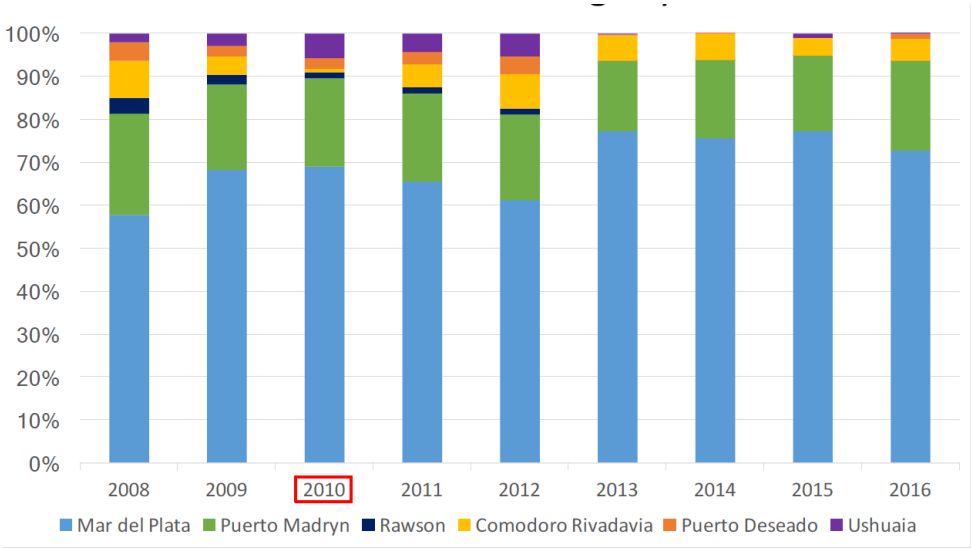

Figure 86: . Hake landing by ports in Argentina (Source: Stephanki 2017

The coastal inshore fleet is technologically more advanced than the artisanal fleet. It consists of boats ranging from 17 to 25 meters in length and possessing larger (18-40 tons) holds with trawlers equipment. Their fishing trips last from 1 to 12 days. Main ports are Mar del Plata and Rawson. The fresh fish trawler (Ice trawler) fleet consists of vessels ranging between 25 to 63 meters in length, with 290 - 1800 HP engines. The fleet provides chilled product to processing plants on land. Fishing trips last from 4 to 15 days. Most of the ice trawlers operate from Mar del Plata and to a lesser extent from Puerto Madryn and Comodoro Rivadavia. The so-called "processing" fleet consists of freezer and factory vessels, jiggers, long liners, surimi boats, scallop boats and shrimp trawlers. The trawler component of the processing fleet varies in size depending on the resource they exploit. The smaller trawlers (30 to 42 meters in length) primarily harvest shrimp, whereas the larger trawlers (up to 70 meters) target squid and hake. Fishing trips of the processing vessels can last up to 60-70 days. Most of the freezer fleet operates are from Puerto Madryn, Puerto Deseado, Punta Quilla, and Mar del Plata. Most of the factory vessels operate however mainly from Ushuaia, Puerto Deseado, and Puerto Madryn.

7.3.2 Production

Hake is an important whitefish species in the seafood market. The global production of this specie in 2016 reached 438,700 tonnes (FishStat J, 2018). Argentina and South Africa dominated with shares of 24% and 20%, respectively, of total global production. Other major production countries include USA, Spain, Namibia and Canada that each represent around 10% of the production (Figure 87, right).

Whole fish frozen and frozen fillet products of hake are the most common. The major product of Cape hake is whole fish frozen (over 80%), while frozen fillet is the main product form for Argentine hake with over 60% of total production (Figure 87, left).

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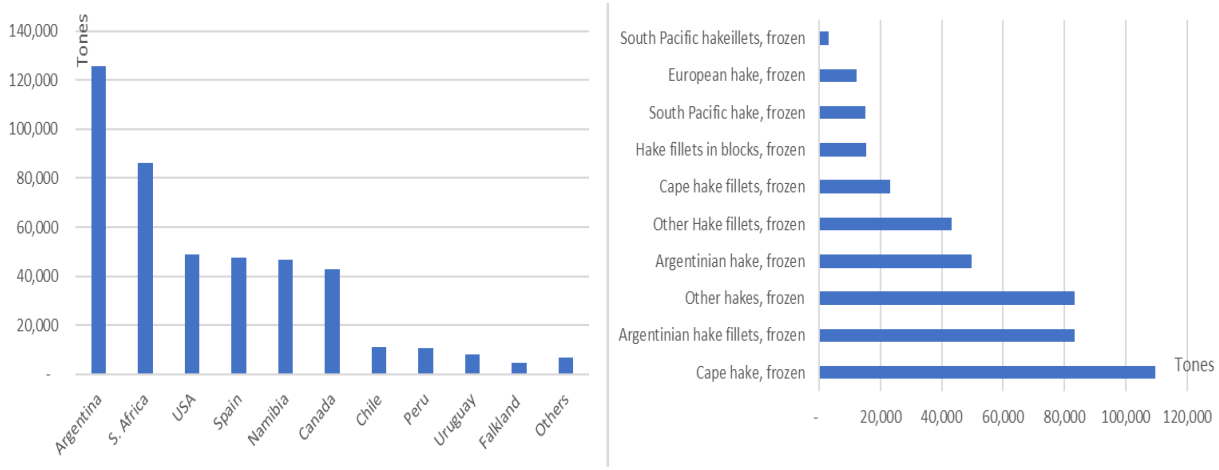

Figure 87: Global production of hake products in 2016 (Data source: FishStat j, 2018)

According to Arkhipkin, Laptikhovsky & Barton (2015), about 95% of the Argentine hake caught in the Falkland/Malvinas waters is processed as HGT (headed, gutted and tailed fish); the rest is being filleted (mostly skinless fillets). Mean conversion factor between green weight and processed weight across the fleet operating in waters around the Falkland/ Malvinas Islands is 1.9 for HGT and 3.3 for skinless fillets. Sub-products such as 'cocochas' (fish throats) are also often frozen due to them being considered a premium product in Spain with high demand and price.

The annual production of Argentine hake in recent years has been between 130,000t-150,000t, of which over 60% is frozen fillets (Figure 88). Argentina dominate the production of this species, with about 93% of total volume.

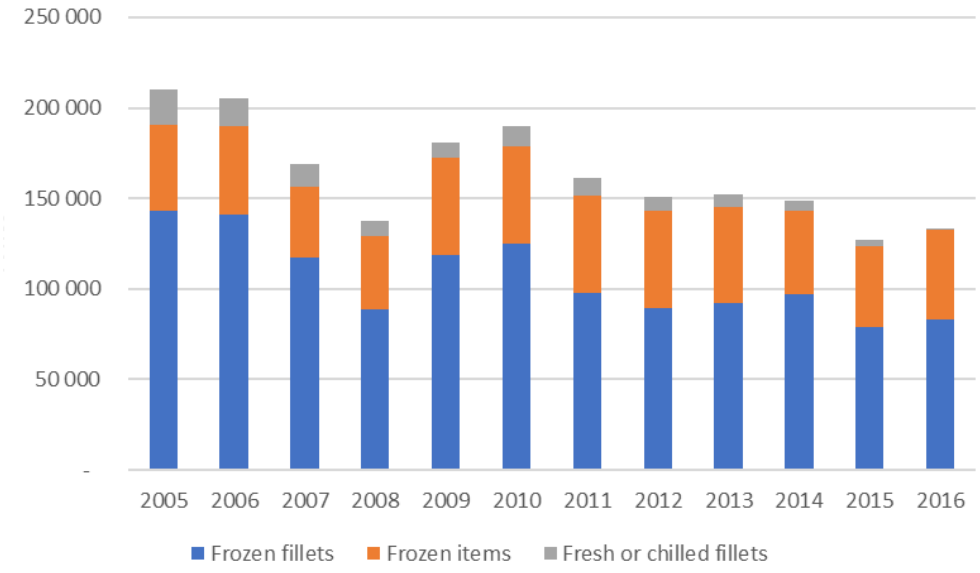

Figure 88: Argentine hake production (Source: FishStat J, 2018)

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EU fleet production in the SW-Atlantic

Total catch by EU fleets (including Russia and other former Soviet-Union countries) in the SW-Atlantic has decreased substantially over the last four decades (Figure 89). The peaked volume has reached at 560 thousand tone in 1988 and thereafter there was a significant decline. The average catch volume in the last decade (2007-2016) has been about 135 tons per year, of which Spain accounts for over 70% of the catch. Argentine hake, longtail southern cod, Antarctic rockcod and Argentine shortfin squid are the major species caught by EU fleets in the SW-Atlantic, accounting for around 63% of total catch over the last decade.

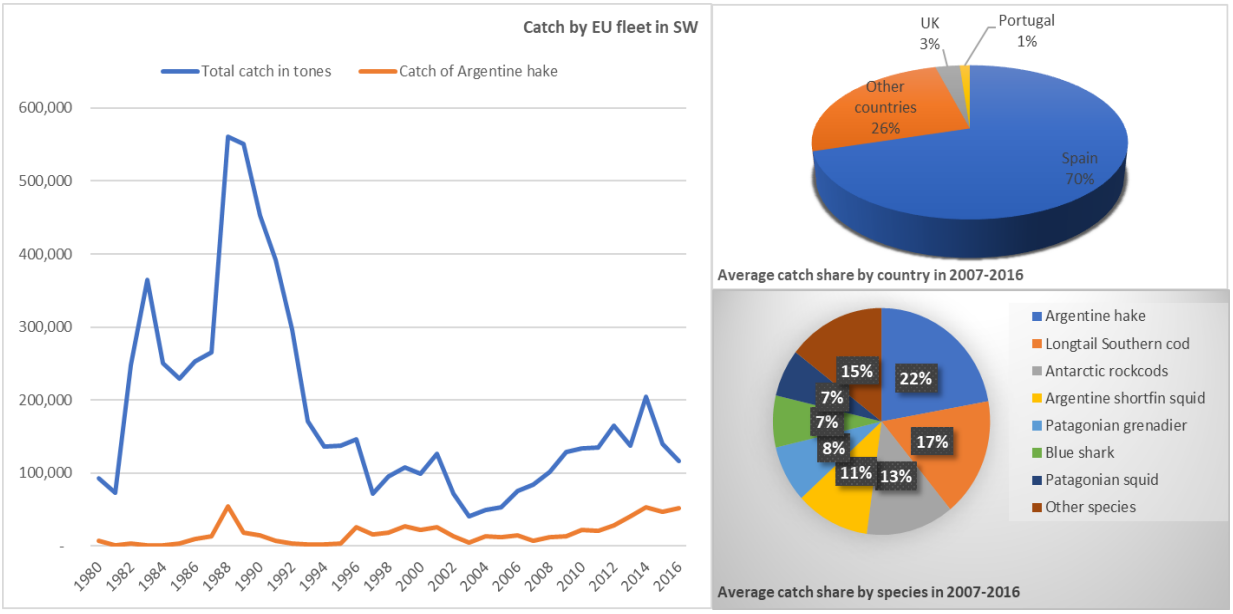

Figure 89: Catch of EU fleet in SW (Source: Fishstat J, 2018)

The catch of Argentine hake by EU fleet has increased significantly since 2010 and reached peak volume at 52,317 tonnes in 2016. Spain is the main EU country harvesting the Argentine hake in the area, representing nearly 100% of total catches of the EU fleet in the SW-Atlantic. Bottom trawl of the Spanish fleet is the only fishing gear used in the fishery.

7.4 Distribution channels

Hake fisheries represent about 5% of the global white fish production (WWF, 2011). Argentina, Uruguay, Peru, and Chile are the major production countries and exported around 47% of their production to the EU market. Spain, Italy, Germany, Cameroon, Brazil, and USA are the main markets for hake products (Figure 90).

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Figure 90: Hake trade flow (Source: WWF, 2011)

Major exporters of hake products in 2017 include Argentina (102,000t), Namibia (68,000t), Spain (59,000t), Canada (49,000t), South Africa (41,000t), and USA (37,000t). The main importers are Spain (130,000t), Ukraine (48,000t), Italy (34,000t), Portugal (32,000t), Brazil (25,000t), and China (20,000t) (Figure 91).

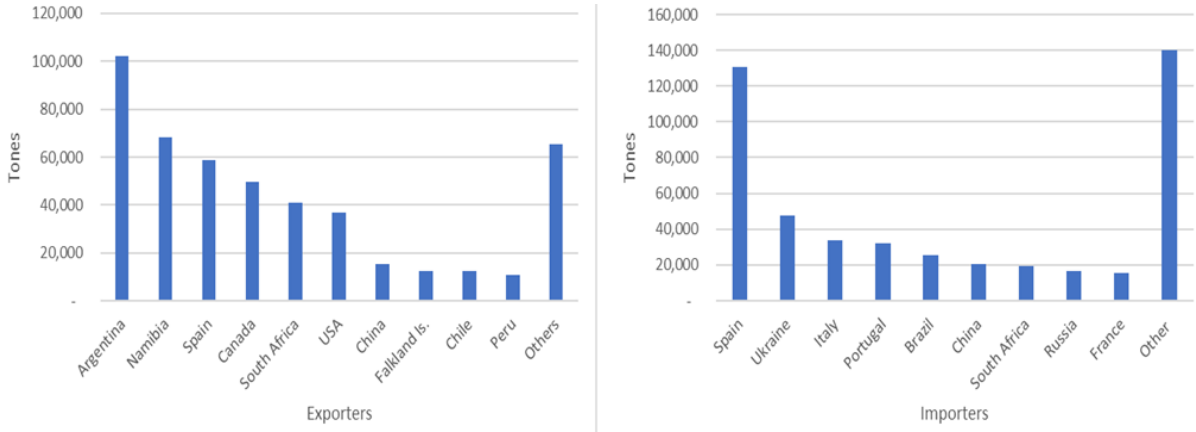

Figure 91: Main importers and exporters of hake products in 2016 (Data source: FishStat J, 2018)

Some countries have high export figures, but they may be net-importers when looking at overall hake trade balance. Figure 92 shows the trade balance of hake products in 2017, revealing the truly important exporters and consuming markets.

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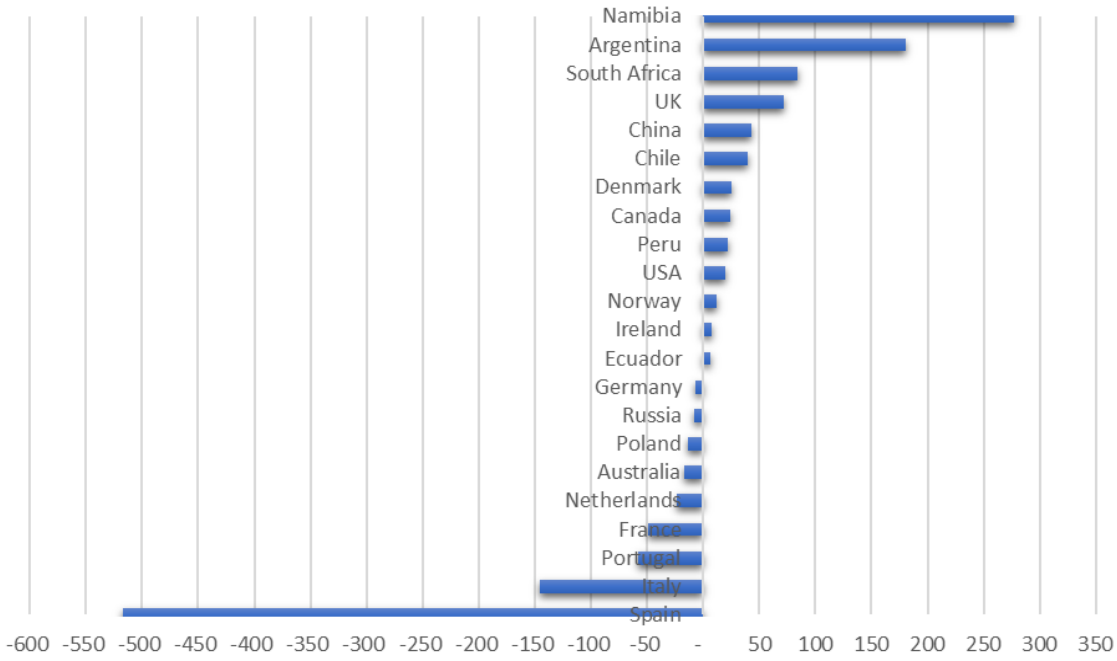

Figure 92: Trade balance of hake products in 2017 ($million USD)) (Source: ITC, 2018)

Countries having high trade deficits of hake in 2017 includes Spain (517 million USD), Italy (145 million USD), Portugal (58 million USD), France (50 million USD), Netherlands (23 million USD). It implies that these countries are the major market for consuming hake products. The countries having high hake surplus consists Namibia (277 million USD), Argentina (181 million USD), South Africa (85 million USD), and UK (72 million USD), China (43 million USD), and Chile (40 million USD).

EU is always the most important market for seafood in general. The high consuming seafood products include tuna (2.8 kg per capita), cod (2.4 kg), salmon (2.2 kg), Alaska pollock (1.6 kg). Hake is in eight place over the most consumed seafood in the EU, with average of 1 kg per capita (Figure 93).

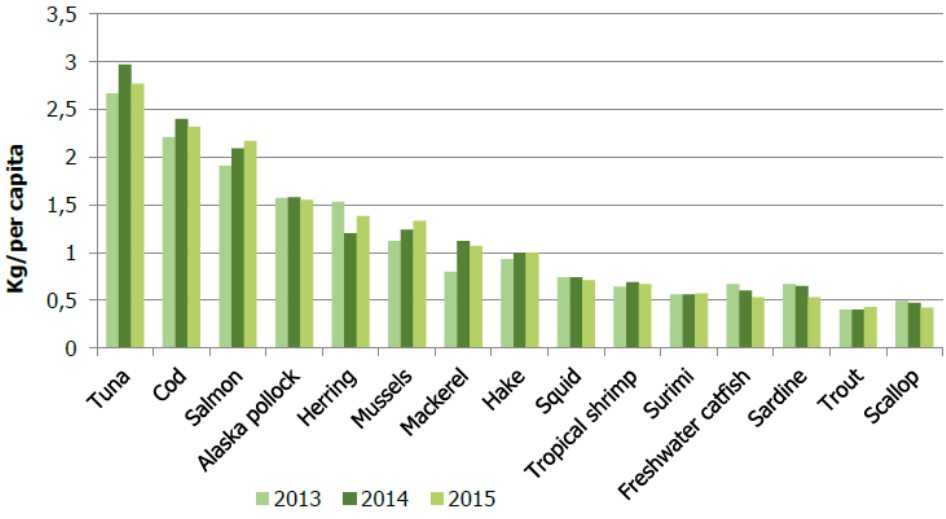

Figure 93: Apparent consumption of important seafood products in EU (Source: EUMOFA, 2017)

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Markets for Argentine hake products

Argentina is the main producer of Argentine hake (*M. hubbsi*) products in the world, with 80% of the production. Although this bottom-trawling fishery is an export-oriented industry, with primary markets in Brazil, Spain, Italy, the US, and Ukraine, domestic market consumes about 60% of the total production (Lorenzo & Defeo, 2015).

The Argentinian export consists mainly of two products, frozen fillets (63%) and whole frozen fish (36%). Fresh or chilled fillets represents less than 1% and is gradually declining. The average export price per kg of whole frozen hake was $1.56 and frozen fillet was $2.99 in 2017 (Figure 94).

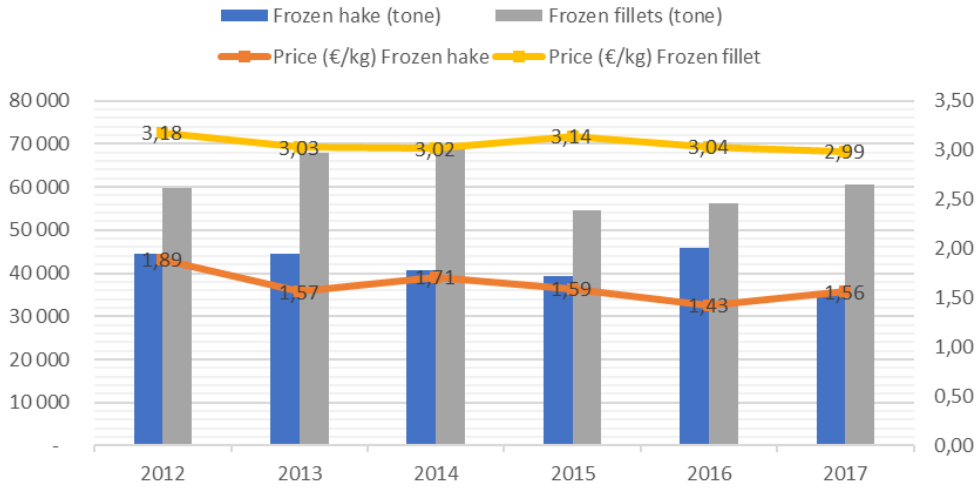

Figure 94: Argentina's export of Argentine hake (M. hubbsi) products 2012-2017 (Source: ITC, 2018)

The most important export market for Argentine hake produced by Argentina is EU, Brazil, and Russia (Figure 95). The retail price of hake products is very seasonal and different among products and among package sizes. In Spain, for example, the HGT prices on Mercabarna frozen market in December 2012 increased from 2.64 USD/kg (~2.00 EUR/kg), for a product of 150–300 g weight, to 4.29 USD/kg (~3.25 EUR/kg) per HGT heavier than 1.5 kg, and earlier in the year were as high as 5.02 USD/kg (~3.80 EUR/kg) per HGT of very large fish (>2 kg). Prices for skinless fillets varied with fish size throughout the year from 3.3 USD/kg (~2.50 EUR/kg) to 5.54 USD/kg (~4.20 EUR/kg). Cocochas are highly valuable product, which in 2011/2012 priced in Spanish markets (Mercabarna, Mercamadrid) between 39.6 USD/kg (~30 EUR/kg) and 50.2 USD/kg (~38 EUR/kg) with no differentiation by hake species (Fish Info and Services, 2012).

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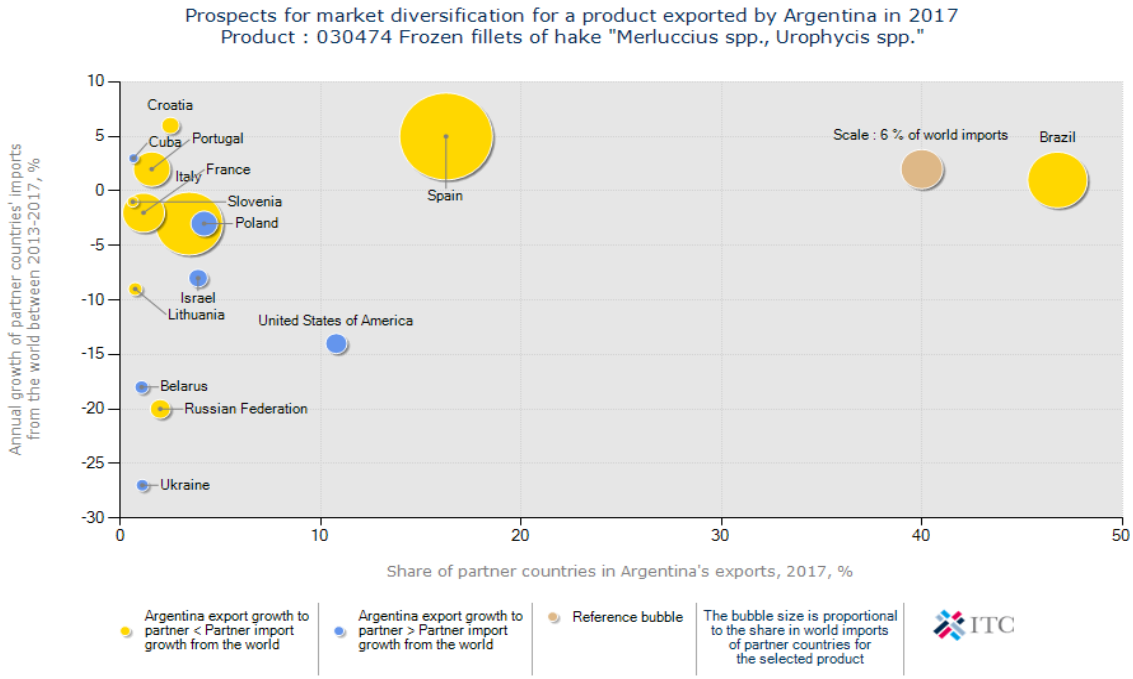

Figure 95: Market diversification for frozen fillets of hake exported by Argentina in 2017 (Source: ITC, 2018)

The Brazilian market for Argentine hake is widely commercialised in frozen form, in packs of 0.5 and 1.0 kg, usually available in the supermarkets. One kilogram of fillets without skin is sold at an average price from US$ 5.00 to US$ 8.00. Fresh fish is rarely sold. National production is insufficient to supply the Brazilian market and imports are common, mainly from Argentina. In 2017, Brazil imported 480 tonnes of whole frozen and 28,208 tonnes of frozen fillet from Argentina (ITC, 2017). Other products of Argentine hake have broad acceptability in the Brazilian market, including nuggets and steaks, many of which are offered with fillings of cheese and tomatoes. A special line of nuggets was developed for children in different shapes (fishes, stars, crabs, etc.). These products are commercialised in packs of 0.3-0.4 kg at a cost of US$ 4.00 per pack.

7.5 Value chain description

Argentina hake (*M. hubbsi*) are abundant in three fishing grounds in the SW-Atlantic that are around Falkland/Malvivas Island, Argentina-Uruguay Common Fishing Zone and Brazilian waters. Below, management and food security issues for these value chains will be addressed.

7.5.1 Management

The supply chain of this species is affected by the regulations and governance structure imposed in these areas, which of course differ. Hence, management issues are addressed for the Falkland Islands Argentine hake fisheries, the Argentina-Uruguay common fisheries zone and the Brazilian waters respectively.

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Management of Argentine hake fisheries in Falkland Islands

To regulate and manage the fish stocks around the Falkland/Malvinas Islands, the Falklands Interim Conservation & Management Zone (FICZ) was established on 29th October 1986 (RSPB, 2017). The establishment of the FICZ was also aimed to regulate the activities of foreign fishing vessels and raise licence revenue. The FICZ extends 150 nm from a point in the centre of the islands. The Falklands Outer Conservation Zone (FOCZ) was established in December 1990 and extends fisheries management jurisdiction to 200 nautical miles from baselines, except where there is overlap with neighbouring jurisdictions. The combined area of the FICZ and FOCZ is around 551,000 km^2. The Falkland Islands Fishery Department (FIFD) was established to manage the FICZ, but following the amalgamation with the agriculture department in October 2009, it is now known as the Directorate of Natural Resources – Fisheries (DNR-F).

In the early years of the conservation zone, the licence structure evolved as more data were acquired. The high catches of Argentine hake in 1988 resulted in the introduction of additional licence types in 1989 to allow for the fishing effort directed at hake to be controlled. An 'unrestricted' or finfish (code A) licence was introduced, which permitted the catching of hake (Arkhipkin, Laptikhovsky & Barton, 2015).

A restricted finfish licence was also introduced from which hake was excluded. The hake fishery (Finfish Licence) has run on the basis of the control of fishing effort, which has some advantage as the fishery often involves some by-catch of other species. The total fishing effort is currently (2013) limited to 29.3 fishing months, and this level of effort has generally been static over the last few years.

In the year 2007, the fishery changed from a system involving relatively short-term licences to a system of long-term fishing rights. The new system involves a version of an Individual Transferable Quota (ITQ) system. In the case of the Falkland/Malvinas Islands hake fishery, the ITQ system continues to operate in terms of effort control, and the fishing limit is expressed in terms of Total Allowable Effort (TAE). ITQ in the finfish fishery, which allows access to hake, has more value than restricted finfish fisheries, which do not allow the targeting of hake. ITQ has been allocated for 25 years and expires in 2031. The TAE is reviewed annually to meet any revised conservation objectives. ITQ may only be held by Falkland/Malvinas Islands fishing companies. The ITQ generates catch entitlement that may be utilised by joint venture companies (minimum 25.1% Falkland/Malvinas shareholding) or chartered fishing vessel (a fishing vessel is chartered by the Falkland ITQ holding company to catch all or some proportion of the catch entitlement); a significant proportion of the hake catch is taken by Falkland/Malvinas fishing vessels (Arkhipkin, Laptikhovsky & Barton, 2015).

The South Atlantic Fisheries Commission (SAFC) involving Argentina, the United Kingdom with Falkland/Malvinas participation operated from 1990 to 2005 and could have provided a mechanism

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for co-ordinated management of hake resources. The SAFC became moribund in 2005 when Argentina suspended participation (Arkhipkin, Laptikhovsky & Barton, 2015).

Argentina-Uruguay Common Fishing Zone

In 1973, Uruguay and Argentina signed the Treaty of Rio de la Plata and its Maritime Front. Since then, Uruguay has been committed to compliance with the treaty and statutes of the Comisión Técnica Mixta del Frente Marítimo (CTMFM; Technical Commission of Rio de la Plata and it Maritime Front Treaty). Argentine hake is assessed, managed and governed according to the guidelines established by the CTMFM. This bi-national commission has been carrying out research during the last 35 years directed to develop, adopt and coordinate management and conservation plans.

The assessments available indicate that, during the 1980's and early 1990's, Argentine hake was fully exploited. However, this soon developed into a state of over-exploitation by the mid-1990s (Lorenzo & Defeo, 2015). Argentina and Uruguay imposed restrictive measures in 1998, which included a reduced Total Allowable Catch (TAC) and extended seasonal and spatial closures to protect juveniles and spawners (Uruguayan Decree 531/990 and Resolution CTMFM 1/93). The extent and magnitude of spatial closures (at least 2, one in autumn and the other in spring) are being monitored regularly by Uruguay and Argentina in the AUCFZ. While recruitment has increased during the last 10 years, the restrictive measures adopted so far do not appear to have reduced fishing pressure sufficiently for a faster long-lasting rebuilding of the stock. Nowadays, the stock is in a rebuilding process, because the adult component has decreased during the last decade.

Resolution 9/00 of the CTMFM (2000) sets an annual Argentine hake quota of 5,000 ton for Argentina and 35,000 ton for Uruguay for the AUCFZ, and an additional volume of 10,000 ton that is being administered by the CTMFM. CTMFM Resolution No. 07/1, approved in July 2011, explicitly includes the creation of a Technical Group for the Development of a Management Plan for hake. This Resolution mainly highlights the implementation of short-term management measures, which include a drastic reduction of the TAC from 2012. A short-term need is the rigorous identification of stocks throughout the species distribution range. Although it has been hypothesised that the Argentine hake could be composed of two or more stocks between 22°S (Brazil) and 55°S (Argentina) (Lorenzo & Defeo, 2015), genetic studies have not been undertaken yet to support this hypothesis. Taking into account the long-term trends observed in Argentine hake, scientific information of the resource throughout its geographic range should be integrated in order to improve its assessment and management. An integrative effort should be made by including information coming not only from national jurisdictions, but also from foreign fleets operating in 'mile 201'. This will certainly improve stock assessment and management procedures.

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Brazilian waters

The Brazilian Federal Government is responsible for the fisheries management in Brazilian waters. It has however not been successful in achieving proper fisheries management, due to problems relating to the agency infrastructure, the adoption of inefficient instruments and policy interests (Vaz-dos-Santos & Schwingel, 2015). Since 2009, fisheries have been managed by both the Brazilian Ministries of Fisheries and Aquaculture and the Environment, although they have passed through various agencies over the last 40 years, a situation that has compromised management efficiency.

Since the 2000's, some programs of the Brazilian ministries (Fisheries and Aquaculture, Agriculture, Environment, and Defence) were implemented tentatively to improve the control and management of fisheries. In the year 2002, the Permanent Committee for the Management of Deep Demersal Fisheries was designated, and its Scientific Subcommittee provided substantial information about fisheries on the Brazilian continental slope, in which Argentine hake is a target fishing resource. In 2006, a satellite vessel monitoring system (VMS) was implemented to attempt to track vessels targeting Argentine hake and other species throughout the continental slope. Since 2010, catch certification has been established for exports to the European Union, and a code for this hake species is included, although it has not been exported (Vaz-dos-Santos & Schwingel, 2015).

Nevertheless, there are no regulations for Argentine hake fisheries and catches in Brazil. In 2004, the Brazilian Ministry of Environment published a resolution designating this species as overexploited, but after that, as a consequence of policy interests, *M. hubbsi* was excluded from this resolution. It must be remembered that *M. hubbsi* is a target fishing resource within a multi-specific fisheries (together with U. mystacea and Z. conchifer).

Traditional fisheries management in Brazil have involved restricted periods and/or areas of fishing, a minimum legal length of capture, and limitations on fishing gear and fishing efforts (Vaz-dos-Santos & Schwingel, 2015), but none of these has been applied to the fishery of Argentine hake. In addition, fishery statistics are fragmented and do not cover landing ports to the same extent. The biological sampling of hake (length distribution, otoliths, gonads, etc.) is not regular, and the scarce collection of available hake information is derived from the individual studies of institutional investigators, mainly from universities, but not from governmental agencies of fisheries.

Historically, the first specific recommendations for managing of Argentine hake in Brazil have involved fishing zones and periods. On the basis of data available through 2006, including information regarding commercial fleet fishing grounds (Vaz-dos-Santos & Schwingel, 2015), a close fishing season was proposed for both stocks of Argentine hake, considering both reproductive and nursery grounds (Vaz-dos-Santos & Schwingel, 2015).

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In the context of the Permanent Committee for the Management of Deep Demersal Fisheries in Brazil some studies related to the South-eastern stock of Argentine hake must be noted. Perez (2007) proposed that bottom-trawl fisheries in the continental slope of the South-eastern and South regions of Brazil should be managed in two strata, that is, by the shelf break (100–250 m) and upper slope (250–500 m). In the year 2006, data of commercial landings from the years 2000 and 2005 were analysed. Estimates of the maximum removal rate of the stock biomass were 9.5% for *U. mystacea*, 10.1% for *M. hubbsi* and 12.5% for *Z. conchifer*, yielding a combined annual catch of 8,257 tonnes. This was proposed as a multi specific management tool together with VMS, observers on board, specific meshes, restrictions applied to by-catch and fishing zone establishments (Perez, 2007). These recommendations have been done in light of the reduction of 50% of the biomass of the species during 2000 and 2005, but they were not adopted by the government (Vaz-dos-Santos & Schwingel, 2015).

According to Vaz-dos-Santos & Schwingel (2015), an integrated approach among Brazil, Uruguay and Argentina appears to be the best way to achieve proper management of the shared southern stock of *M. hubbsi*. This capability was acquired by CARPAS (Regional Fisheries Advisory Commission for Southwest Atlantic) but was abolished in 1997 because of inactivity dating back to 1974.

7.5.2 Food security

SW-Atlantic region is an important seafood source for coastal countries (Argentine, Brazil and Uruguay) and several EU countries (Spain, Portugal & UK). The total catch from SW-Atlantic region is very high, between 1.5 million to 2.5 million tons per year. The three largest fishing nations in the region include Argentina, Brazil and Spain; which have significant catch landing from the SW, in comparison with catch in other regions. In 2016, Argentina, Brazil and Spain landed 736,000, 480,000 and 110,000 tonnes, respectively. The mixed fisheries in SW-Atlantics are export oriented. The three main species (shortfin squid, hake and red shrimp) represent over 70% of total catch. Other species are harvested by small scale fishing and the catch supports the domestic consumption.

Although Argentina is the largest fishing nation in the SW, the national consumption of fish is not very high when compared with consumption in other countries (UNEP, 2003). Cultural factors as well as the high price of fish and fish products in the local market (when compared with other protein sources), has resulted in a historically small domestic market. Nevertheless, there has been a steadily increasing consumption of fish and fish products in recent years. National consumption only accounts for about 10 per cent of the total seafood catch. Hake represents a very high ratio of fish consumed, with about 60 per cent of the local market. The second largest product consumed is Argentine short-fin squid with about 8 per cent of the local market. Most local seafood consumed is either fillet or whole fish. Argentina has a long tradition of local canning and processing industries in the seafood sector. Since the mid-1990s, the emerging pattern is that while seafood that comes from the local market is consumed fresh with little value added, imported fish products are generally processed

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foodstuffs or products of higher value than local fish. The sources vary greatly from product to product. The opening of markets for processed imported products (especially canned) has created a crisis in the processing sector (UNEP, 2003).

7.6 Summary

The SW-Atlantic area (FAO Area 41) focused on in the FarFish project is recognized as high-seas and the EU mixed fishery in the area is not subjected to any international agreements or governed by any RFMO. The total catch volumes in the area have fluctuated significantly year by year, but the peaked volume was reached at 2.43 million tons in 2015. The target species have primarily been hake, rock-cod, southern cod, red-shrimp and squid caught almost solely by Argentina, Brazil, and Spanish vessels. In recent year there have been fleets from countries such as China, Taiwan and Korea fishing in the area as well. The multi-species fisheries in the SW-Atlantic include nearly one hundred fish species. There are however only four functional groups that represent 76% of the total catches, including medium benthopelagic (length of 30-89 cm), medium demersal (30-89 cm), cephalopods and small pelagics (<30cm). Three major species caught in the area consist of Argentine hake, Argentine red shrimp and Argentine shortfin squid. Discarding occurs in this area and is believed to be quite high. It is estimated that discarding represents 15-25% of the total catch volumes, giving an average rate of 18%. Perch-like species are the most discarded species, accounting for 40% of the total discarding volumes; while shark, ray and invertebrate species account for about 30% in total.

The catches of the EU fleets (including Russia and other former Soviet-Union countries) in the SW-Atlantic have decreased substantially over the last four decades. The EU catches reached a peak at 560 thousand tonnes in 1988, but has experienced significant decline thereafter. The average catch volume of the EU fleet in the last decade (2007-2016) have been around 135 tons per year, of which Spain represents over 70% of the catches. Argentine hake, longtail southern cod, Antarctic rockcod and Argentine shortfin squid are the major species caught by EU fleets in the area, accounting for around 63% of total catches over the last decade. Fishing activities by the EU fleet in the SW-Atlantic high-seas areas (Spanish and UK vessels) are mainly carried out in areas 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.

Argentine hake (*M. hubbsi*) is the major fish species harvested in the SW-Atlantic and is only hake species distributed in the area, embracing southern Brazilian, Argentinean and Uruguayan waters. The species lives in a temperature cold Sub-Antarctic water related to Maldinas/Falkland Current system. The main fishing regions that the Argentine hake is most abundant in are the Argentine-Uruguayan Common Fishing Zone (AUCFZ), Falkland/Malvinas Islands, and Brazilian waters.

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Total catches of Argentine hake in the SW-Atlantic (area 41) steadily increased from 25,300 tonnes in 1950 (equivalent to 11 $million) to 180,800 tonnes (762,7 $million) in 1966. Catches were at first all taken by the coastal States, Argentina, Brazil and Uruguay. During the 1960s the Argentine hake began to be exploited by foreign fleets. Following the exceptionally high catches of hake reported in 1995 (942,600 tonnes), catches declined to 311,000 tonnes in 2000. The total catch from this region then increased steadily to 606,800 tonnes in 2004, and then decrease again to 373,300 tonnes in 2014. The discarding of Argentine hake is estimated to be around 11%, consisting mainly of juvenile by-catch.

Before the 1980's, over 80% of total catches of Argentine hake in the SW-Atlantic was by Soviet Union fleets. Since 1990s, the hake has primarily been caught by coastal nations and Spain. The total landings of Argentine hake in 2016 was 352,000 tonnes; of which 80% was landed by Argentinian fleets, 15% by Spanish vessels, 3% by Uruguay, only 2% by other national fleets (UK, Falkland Isl., and Brazil). Nearly 100% of Argentine hake are caught by industrial vessels, as there is no local artisanal fishing fleet in all three main fishing zones, i.e. the Falkland Island, Argentinean–Uruguayan Common Fishing Zone, and Brazilian water. The Argentine hake and its fisheries is one of the most important demersal fisheries in Latin America, especially for the Argentina, which involves over half of fishing fleets and contribute 40% of fisheries export of the country.

Hake fisheries including Argentine hake represent about 5% of the global white fish production. Argentina, Uruguay, Peru, and Chile are the major production countries and exported around 47% of their production to the EU market. Spain, Italy, Germany, Cameroon, Brazil, and USA are the main markets for hake products. Countries having high trade deficits of hake in 2017 include Spain (517 million USD), Italy (145 million USD), Portugal (58 million USD), France (50 million USD), Netherlands (23 million USD). It implies that these countries are the major market for consuming hake products. The countries having high hake surplus consists of Namibia (277 million USD), Argentina (181 million USD), South Africa (85 million USD), and UK (72 million USD), China (43 million USD), and Chile (40 million USD).

It is generally accepted that the hake resource in the SW-Atlantic is heavily exploited and in danger of collapsing. There are several indicators of concern: 1) Reliance of the fishery in recent years on the youngest fish indicates the decline of the hake stock; 2) A large percent of the 2 year-old fish is immature;) Lack of older fish in both the population and the catches; 4) Fishing mortality has risen to levels causing growth overfishing, so effectively reducing yield. 5) Qualitative reports of extensive discarding of small 1 and 2 year-old fish owing to present harvesting practices; and 6) Hake is not a species that easily benefits from mesh-size selectivity control. Argentina hake (*M. hubbsi*) are abundant in three fishing grounds in the SW-Atlantic that are around Falkland/Malvivas Island, Argentina-Uruguay Common Fishing Zone and Brazilian waters. The supply chain of this species is affected by the regulations and governance structure imposed in these areas. It is recommended that

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an integrated approach among Brazil, Uruguay and Argentina appears to be the best way to achieve proper management of the shared southern stock of *M. hubbsi* (Vaz-dos-Santos & Schwingel, 2015).

Although fisheries is a very important sector for coastal countries such as Argentina, Brazil and Uruguay, and the SW is one major fishing zone, the domestic consumption represents only a small proportion of the total catch. For instance, national consumption of fish in Argentina represent only 10% of the total catch and only hake represents over 60% of local market. Most landings of Argentine fisheries are exported.

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