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Southern Indian Ocean Fisheries Agreement

Accord relatif aux Pêches dans le Sud de l'Océan Indien

Overview of SIOFA Fisheries 2022

Prepared by the SIOFA Secretariat

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Contents

1. Aims

The SIOFA Fisheries Overview is intended to be a public document that aims to summarize, at a minimum, the last 5 years of available data, as well as illustrate broad temporal trends in the main fisheries within the SIOFA area (Figure 1). Its target audience is the general public, as well as institutions and countries wanting to better understand SIOFA fisheries. It can also serve as a description of data available on SIOFA fisheries, which could be used by scientists and consultants alike when evaluating research involving this data.

Fisheries Summaries (which are currently being developed for a number of species of interest) integrate this overview by providing further details on single species ecology/biology and their fisheries and are a useful resource for exploring specific knowledge. An interim list of the species declared as a target of fisheries by SIOFA CCPs (Contracting Parties (CP), Cooperating non Contracting Parties (CNCP) and Participating Fishing Entities (PFE)) as per CMM 2021/02, including their FAO codes, is provided in Appendix A for clarity and pending further revisions by the SIOFA Scientific Committee. The SIOFA Ecosystem Summary further integrates this overview by providing in the main areas of work on ecosystems and species conservation within the SIOFA area.

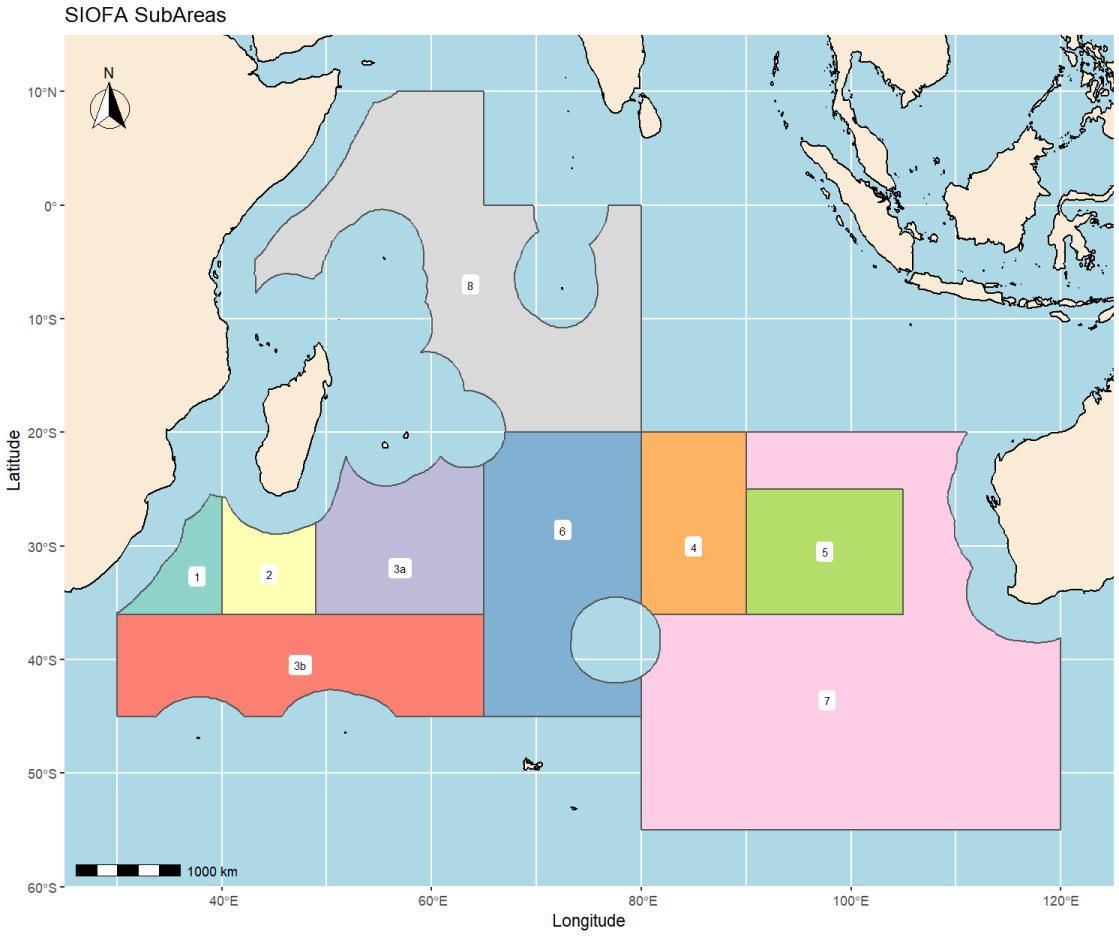

Figure 1 – The SIOFA Agreement area and its subareas highlighted with different colours (source: SIOFA Spatial database). The subarea colour code is used consistently to identify subareas throughout this overview.

2. Data sources

Data availability

The SIOFA Secretariat receives data submissions from CCPs on their fishing activities, biological sampling, observer reports as per CMM 2021/02 (Conservation and Management Measure for the Collection, Reporting, Verification and Exchange of Data relating to fishing activities in the Agreement Area). Thus, the SIOFA Secretariat is a custodian of these data but not their owner, any request to release or publish these data (e.g., for research purposes) is regulated under CMM 2016/03 (Conservation and Management Measure for Data Confidentiality and Procedures for access and use of data).

The SIOFA databases are organized in:

- AggregatedCatchEffort, which contains catch (and sometimes effort) aggregated at different spatial resolutions, varying from the whole SIOFA area to 20' squares, from 2000 to 2019
- HBHCatchEffort, which contains haul-by-haul catch and effort at a spatial accuracy varying from degrees to seconds, from 1998 to 2020
- Observer, which contains observer-collected biological sampling and operational data, from 2012 to 2020

The SIOFA databases are supported by other data assets such as:

- Spatial layers, which contains all the GIS spatial layers available to the Secretariat (e.g. boundaries of SIOFA subareas, Management Units)
- Codes, including countries, gears and species codes etc.

These have been described in the outputs of project SEC2021-05, where it was noted that the data is repeated (i.e., overlaps) across the first two databases. A suggestion has been made to further develop the 3 databases as three 'subject areas' that form part of a single SIOFA Fisheries Database in the future.

Further data (e.g., on active vessels) is available from Annual National Reports (2015–2021) that SIOFA CCPs submit to the Scientific Committee every year and are publicly available.

Missing data for the purposes of this overview

Some of the figures are incomplete as one CCP did not provide a National Report about their fishing activities. In addition, final 2021 catch, effort and observers' data are scheduled to be submitted by 31 May 2022 and were thus only partly available for this overview. Any data from 2021 should be considered as draft and potentially incomplete and subject to further revisions.

Data used in this overview

The information presented in this overview has been extracted from different sources, depending on the type of data required. To minimize the confusion that can arise from having to interpret multiple data sources, explicit references have been made to data sources have been made in each table/figure in the overview.

The Overview was originally meant to cover the last 5 years of available data (at a minimum), but the Secretariat noted that an extraction from SIOFA dataset has been made to cover the 2013–2020 period (8 years of data), and that the timespan covered is variable in different sections (as detailed below). The Secretariat encourages the Scientific Committee to consider this aspect and provide further recommendations as to the timespan to be covered for different sections, with the aim to harmonize it as much as possible and with a consideration to the desired update frequency.

Active fleet composition (2015–2020) and Main fisheries (2000–2019): National Reports submitted to Scientific Committees

Total catches per CCP (2013–2020): SIOFA AggregatedCatchEffort database, combined with SIOFA HBHCatchEffort database

Target and non-target catch, Effort (including per subarea) and discards (2013–2020): SIOFA HBHCatchEffort, SIOFA AggregatedCatchEffort database and spatial layers (this does not include non-fish catch, see Sections 6 and 6.2 for definitions of target/non-target catch)

VMEs (2020): SIOFA Observer database

Fishing in Interim Protected Areas (2013–2020): SIOFA HBHCatchEffort and Spatial databases

Biological sampling (2020): SIOFA Observer database

3. Active Fleet Composition

In the SIOFA area, 8 CCPs were actively fishing over the last 3 years. Table 1 summarises the number of vessels actively engaging in fisheries in the SIOFA area by CCP and type of gear employed.

Table 1 – Historical summary of active vessels by CCP and gear in the SIOFA area (source: Annual National Reports 2015–2021). The Thailand fleet was mainly composed of small tonnage vessels. The Chinese Taipei fleet is composed mainly of longliners fishing for tuna and oilfish. Korea has no vessels active in the SIOFA area since 2014 and Seychelles since 2015.

		Year						
CCP*	**Gear**	2015	2016	2017	2018	2019	2020	2021
AUS	Multipurpose	1	1	0	0	1	1	1
	Longlines	0	0	0	1	0	0	2
	Trawls	0	0	0	0	0	0	0
CHN	Longlines	0	0	0	0	0	0	0
	Seine nets	6	8	5	0	0	0	0
COK	Trawls	2	2	2	2	2	2	2
COM	Handlines	-	-	-	2	1	1	0
EU(France)	Longlines	0	1	1	0	0	0	0
EU(Spain)	Gillnets	1	0	0	0	0	0	0
	Longlines	1	1	1	2	1	1	1
FR-OT	Pots/Traps	0	1	0	1	0	0	0
	Longlines	2	0	2	0	1	2	1
JPN	Longlines	0	0	1	0	0	0	0
	Trawls	2	2	2	1	1	1	1
KOR	Longlines	0	0	0	0	0	0	0
	Trawls	0	0	0	0	0	0	0
MUS		-	-	-	-	-	-	-
SYC		0	0	0	0	0	0	0
TPE	Pel. Longlines	21	40	45	35	42	51	49
THA	Pots/Traps	1	2	0	0	0	0	0
	Multipurpose (trawl/handline)	56	60	13	0	2	3	3

		Year						
CCP*	Gear	2015	2016	2017	2018	2019	2020	2021
	Totals	93	118	72	44	51	62	61

*CCP stands for Contracting Parties, Cooperating Non-Contracting Parties and Participating Fishing Entities
- indicates years where no information provided.

4. Main fisheries operating in the SIOFA area

In the SIOFA area, few fisheries account for the majority of the total catch. Table 2 summarises these fisheries by target species and provides information about the gear employed, the CCPs engaging in the fishery, and the main subareas where these fisheries are targeted.

Table 2 – Target species/fisheries in the SIOFA area. The table also provides information on gear employed, the CCPs engaging in the fishery, and the main subareas where these fisheries are targeted.

Target species/fisheries	Fishing gear	Participants (reported in national reports between 2000 and 2019)	Subareas
Patagonian toothfish	Demersal longline Traps	Australia, EU (Spain), France (Overseas Territories), Japan, Korea	SIOFA subareas 3b, 7
Orange roughy	Demersal trawl	Australia, Cook Islands, China (2000-02)	Underwater topographic features in SIOFA subareas 1, 2, 3a and b
Alfonsino	Midwater trawl	Australia, Cook Islands, Japan, Korea	Underwater topographic features in SIOFA subareas 1, 2, 3a and b
Saurida and scads	Otter board trawl	Thailand	SIOFA subarea 8 (mainly Saya de Malha Bank)
Shallow-water (<200m) snappers, emperors and groupers	Demersal longline, Hook and line Demersal trawl Traps	EU (France), Mauritius, Thailand, Comoros	SIOFA subarea 8 (mainly Saya de Malha Bank)
Deeper water snappers, lutjanids, Hapuka	Demersal longline Dropline	Australia China EU (Spain)	
Oilfish	Pelagic longline	Chinese Taipei	South-west Indian Ocean

5. Fishing Effort

Table 3 summarises fishing effort in the SIOFA area by different CCPs. Effort is variable across years and gears, which different CCPs employ in different fisheries. Note that different gears also have different units of measure for their effort.

Table 3 – Summary of fishing effort by each CCP, main gear and year (source: SIOFA National Reports 2015–2021). 2021 fishing efforts are incomplete as some information has not yet been provided by 2 CCPs. Handline effort is not reported by hooks number but by fishing day.

			Year						
Flag	**Gear**	**Effort unit**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
AUS	Trawl	hours	15	26	0	0	0	0	0
	Longline/Vertical line	x1000 hooks	2	40	0	28	54.2	173	109.7
CHN	Seine net	hours	10000	4000	300	0	0	0	0
	Longline	x1000 hooks	0	0	0	0	0	0	0
COK	Trawl (mid)	shots	2050	1409	1534	897	1026	1549	1084
	Trawl (Bottom)	shots	679	565	451	672	589	381	336
EU-ESP	Gillnet	Km	1200	0	0	0	0	0	
	Longline	x1000 hooks	2300	3200	3200	5432	3435	2551	2691
EU-FRA	Longline	x1000 hooks	0	np	np	0	0	0	0
FR-OT	Longline/Vertical line	sets	66	13	33	30	40	46	54
	Longline	x1000 hooks	443.5	1.2	150.7	2.6	200	127	145
	Pot/Trap	number		40		50	0	0	0
JPN	Trawl	hours	2250	2500	3250	1091	1512	689	-
	Longline	x1000 hooks			64	0	0	0	0
KOR	Longline	hooks	0	0	0	0	0	0	0
	Trawl	hours	0	0	0	0	0	0	0
MUS			-	-	-	-	-	-	-
SYC	*no fishing*		0	0	0	0	0	0	0
CT	Longline	x1000 hooks	11501	22083	26557	20773	23145	21830	19506
THA	Trawl	shots	4090	4552	795	0	176	464	1003
	Handline	days					110	133	52
	Pot/Trap	number	0	8	10	0	0	0	0
COM	Handline	days	-	-	-	-	-	64	0
TOTAL	longline *	hooks (x1000)	14244	25324	29940	26204	26840	24683	22451
	trawl **	shots	9084	9063	6275	1667	1644	464	[2373]
		hours	2265	2526	3250		1512	689	

* does not include potential hooks number from sets

** total trawl effort should consider shots number and hours.

- no information provided to date.

6. Fish catch in the SIOFA area

6.1 Total fish catches

Total fish catches in the SIOFA area are composed by a wide variety of species. The species targeted in the SIOFA area are listed (along with their FAO codes) in Appendix A. The list of target fish species was extracted from CCP declared targets as per CMM 2021/02, and as listed in the SIOFA HBHCatchEffort database, for the purposes of this Overview.

The total fish catch in the SIOFA area sharply increased in 2015 and then decreased to lower levels (but still higher than 2013-2014) in recent years (Figure 2).

The increase in reported catch since 2015 was contributed by the catch from Thailand (THA) (Thailand National report 2015-17) and Chinese Taipei (CT) catches. Thailand catches were mostly made from squads (*Decapterus sp*.) and lizardfish (*Saurida sp.*) and Chinese Taipei catches are oilfish from its tuna fishery.

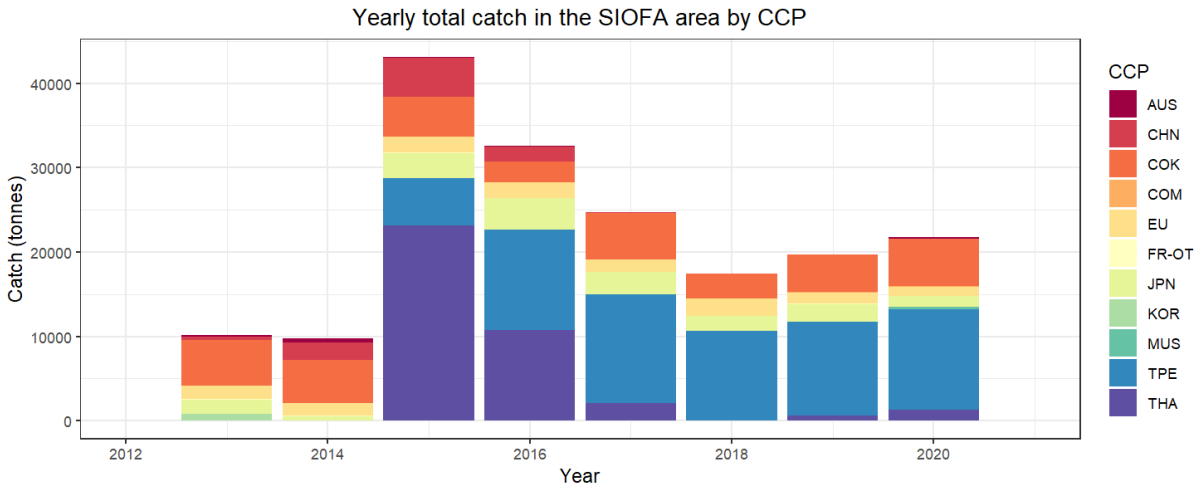

Figure 2 – Yearly t*otal catch (tonnes) in the SIOFA area (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020).* All catch included, even without spatial information.

Total catch in 2020 was mostly taken in SIOFA subareas 3b, 1 and 2, but in 2015-2016 a larger portion of the catch came from subarea 8 (Figure 3).

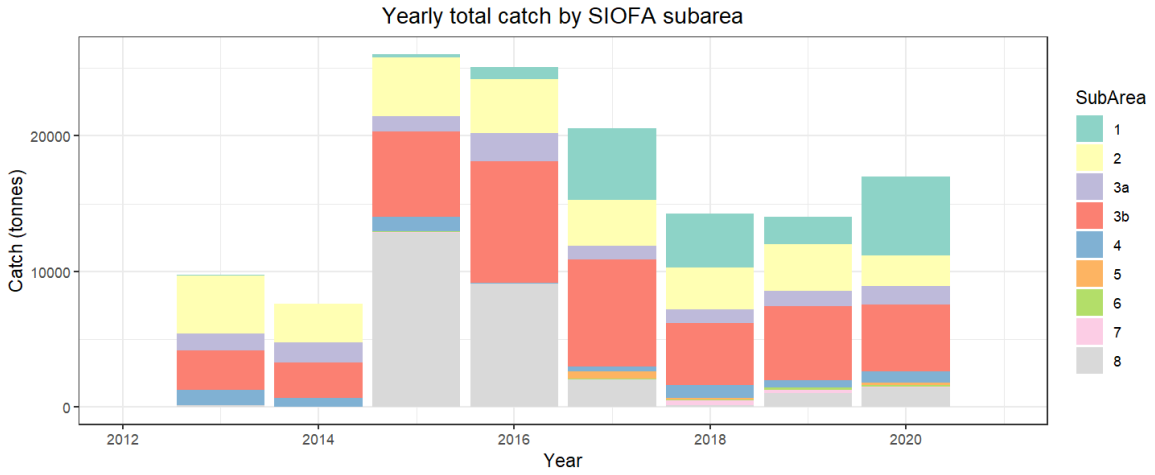

Figure 3 – Total catch reported by SIOFA subareas (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020). Catch without spatial information are not included.

6.2 Target and non-target fish catch

All fish species not declared as targets as per CMM 2021/02 were considered non-target catch.

6.2.1 Global target/non-target fish catch

Non-target catch constituted a predominant fraction (>50%) of the total catch in 2015 and 2016 (Figure 4a) but has otherwise been around or below 25% of the total catch in other years (Figure 4a). In absolute terms, non-target catch was extremely variable across years (Figure 4b).

The figures on non-target catch highlight the portion of “sharks” as non-target catch.

Broad definitions of sharks include Chondrichthyans in general in the “shark” category (e.g. rays and chimaeras). For the purpose of this chapter, a list of all Chondrichthyans taxa captured in SIOFA fisheries and reported in the HBHCatchEffort database 2013–2020 was extracted and used to define “sharks”. The full list of shark taxa captured in SIOFA fisheries is provided in Appendix B.

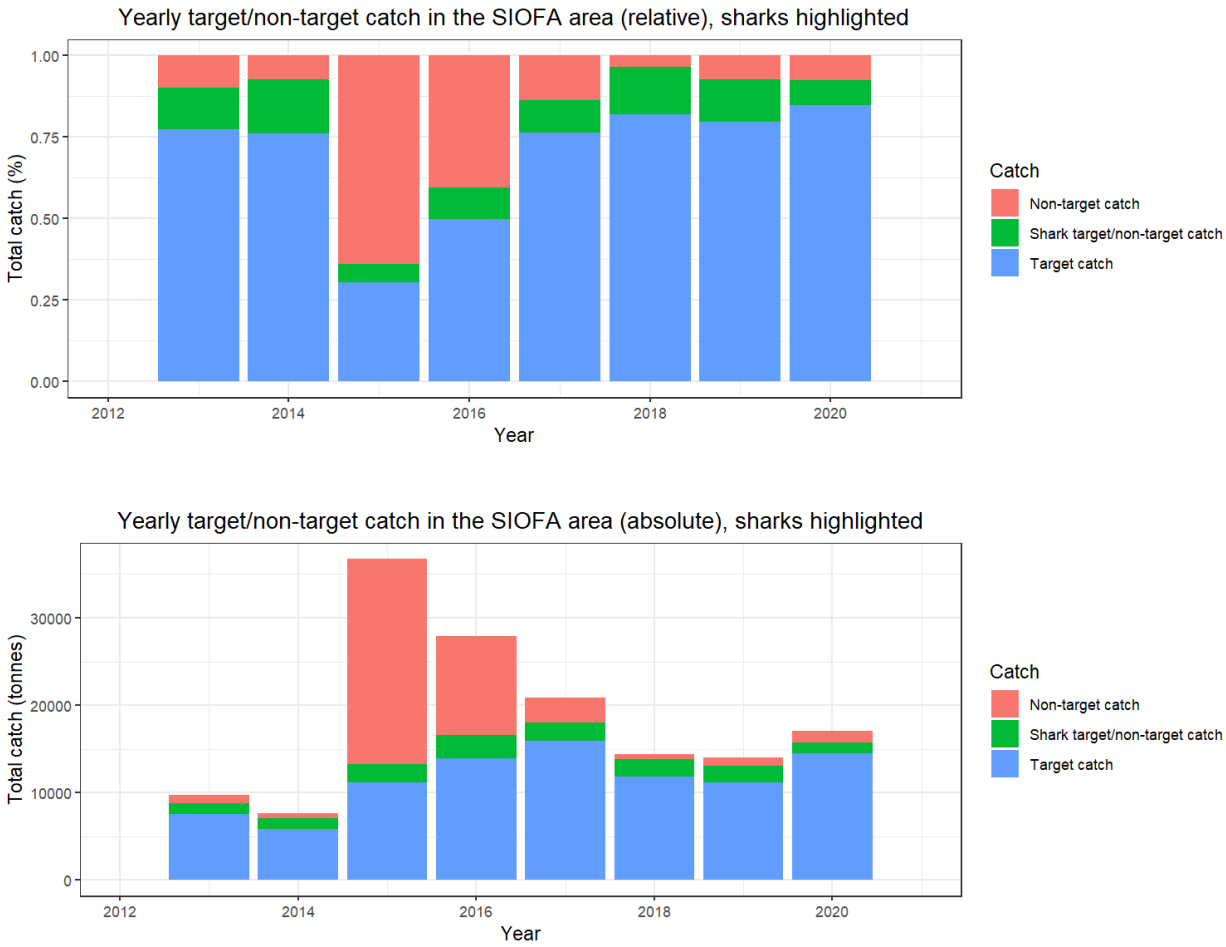

Figure 4a and b – Catch and non-target catch as relative values (upper panel, a) and absolute values (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020). Catch without spatial information are not included, and the portion of non-target catch composed by sharks (as defined in Appendix B) is highlighted.

6.2.2 Target/non-target fish catch in SIOFA subareas

Target catch was taken mainly in SIOFA subareas 1 and 3b (Figure 5a). Non-target catch in 2020 was mostly taken in SIOFA subareas 8, and 2 (Figure 5b). In 2015-2016 a larger portion of the non-target catch came from subarea 8 (Figure 5b).

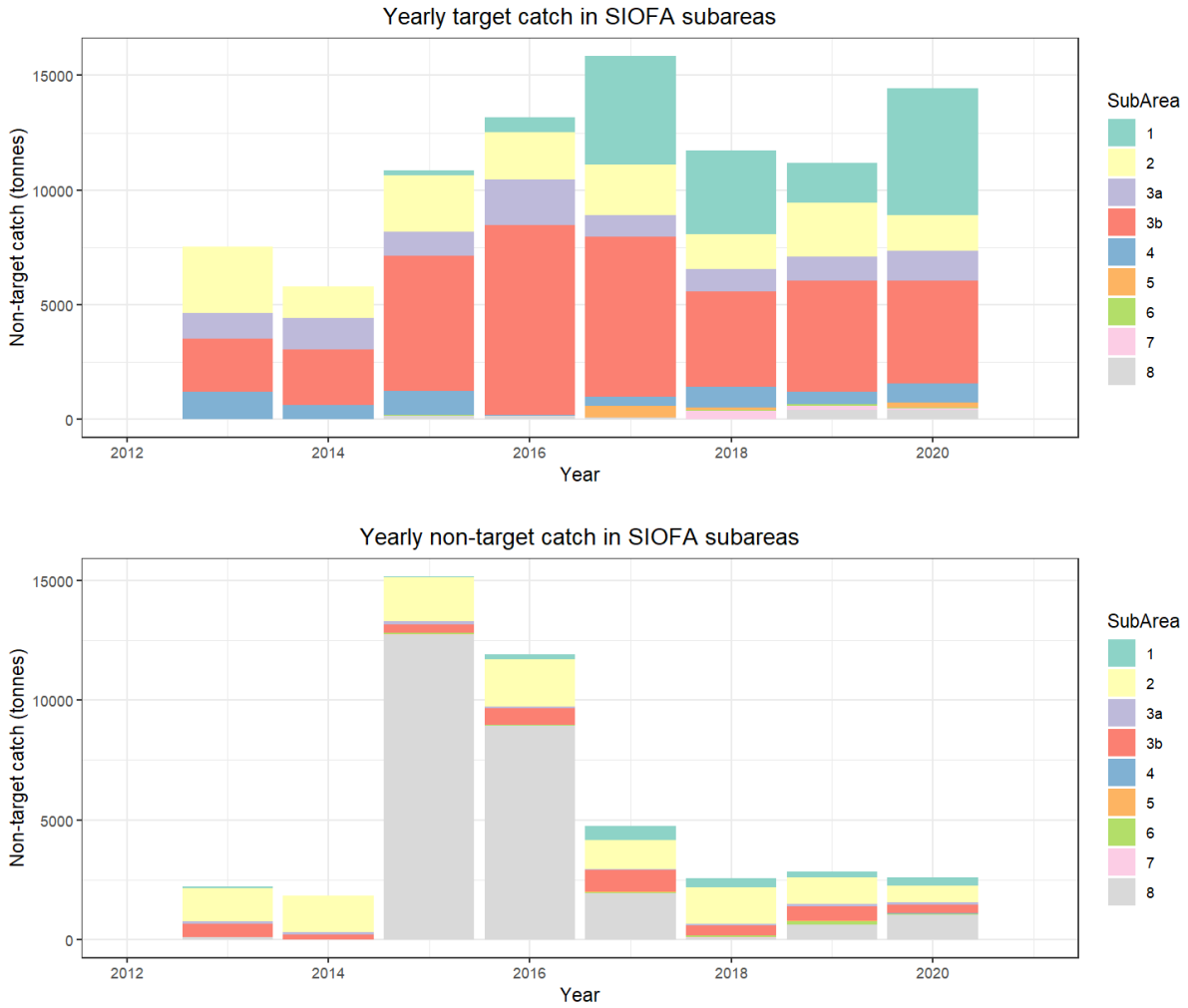

Figure 5a and b – Target (upper panel, a) and non-target (lower panel, b) in different SIOFA subareas (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020). Catches without spatial information are not included

6.2.3 Target/non-target sharks catch

This section presents further details on the sharks catches in SIOFA, which were highlighted in section 6.2.1. Sharks are caught with different gears, in the past they were caught with both gillnets and longlines, but in recent years they are mainly caught with longlines.

Sharks were targeted in the SIOFA area until the entry into force of CMM 2019/12 (binding from October 10, 2019), which prohibited targeting any deep-sea shark species listed in its Annex 1. Following the entry into force of CMM 2019/12, all sharks are considered as non-target catch for the purpose of this Overview.

Target and non-target catch of sharks (as defined in Appendix B) increased between 2013 and 2016 but has been decreasing since (Figure 6a). Target and non-target catch of sharks is dominated by Portuguese dogfish (CYO), with a significant presence of kitefin shark (SCK) until 2019 (Figure 6a). Subarea 2 was the origin of the vast majority of shark catches in the SIOFA area (Figure 6b).

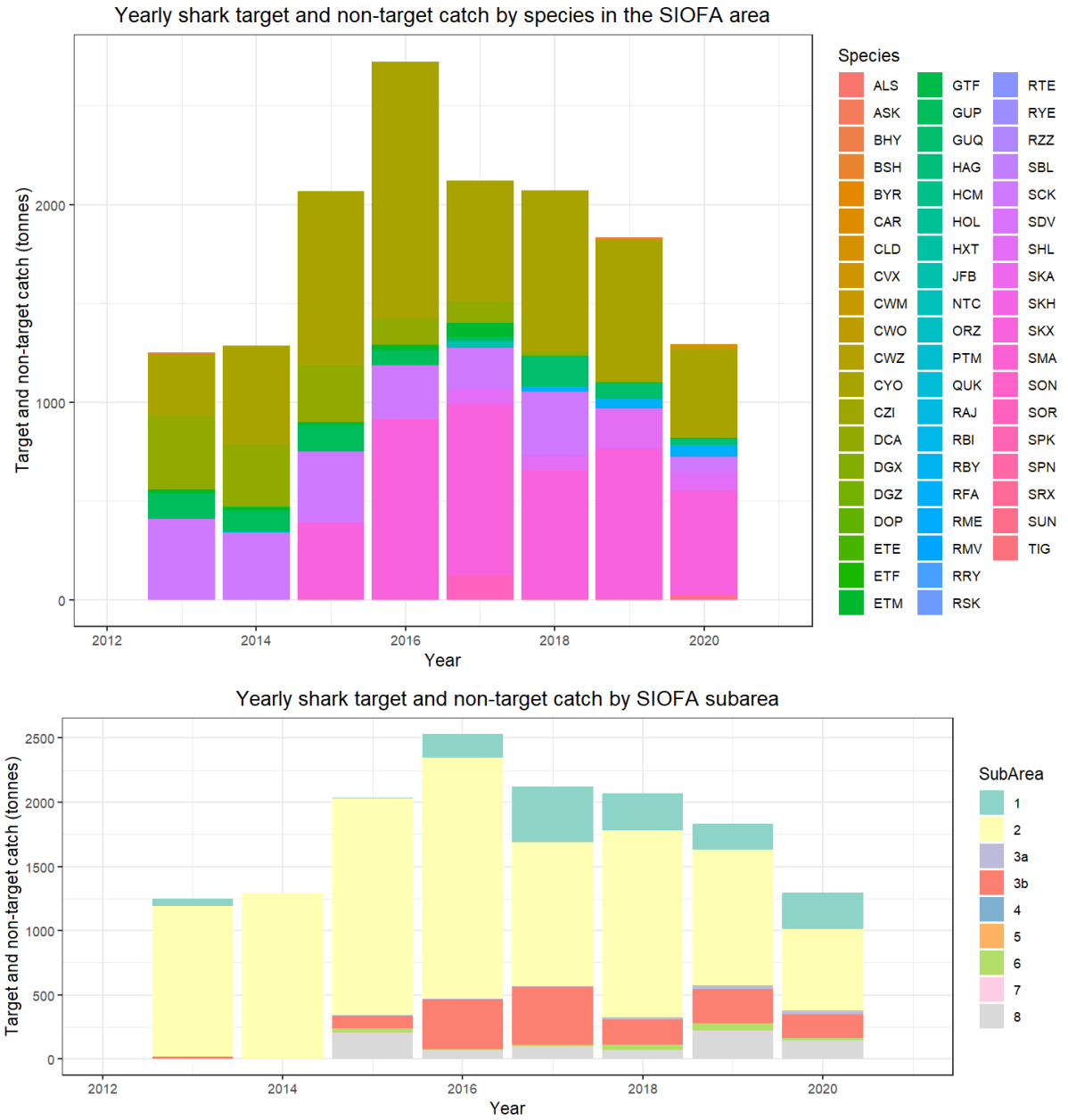

Figure 6a and b – Yearly target and non-target catch of sharks in the SIOFA area by species (upper panel, a) and by SIOFA subarea (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020). Species are indicated by their 3-letter FAO code, see Appendix B for disambiguation.

A list of deep sea sharks considered to be at "high risk" and "of concern" is included in Annex 1 of SIOFA CMM 2019/12 (Conservation and Management Measure for Sharks). The following figures refer to this subset of sharks as defined in CMM 2019/12, which is reported here in Appendix C for easier reference.

Target and non-target catch of sharks at "high risk" and "of concern" (as defined in CMM 2019/12) increased between 2013 and 2016 but has been decreasing since (Figure 7a). Target and non-target catch of sharks at "high risk" and "of concern" is dominated by Portuguese dogfish (CYO), with a significant presence of Kitefin shark (SCK) until 2019 (Figure 7a). The vast majority of catches of shark at "high risk" and "of concern" in the SIOFA area came from Subarea 2 (Figure 7b).

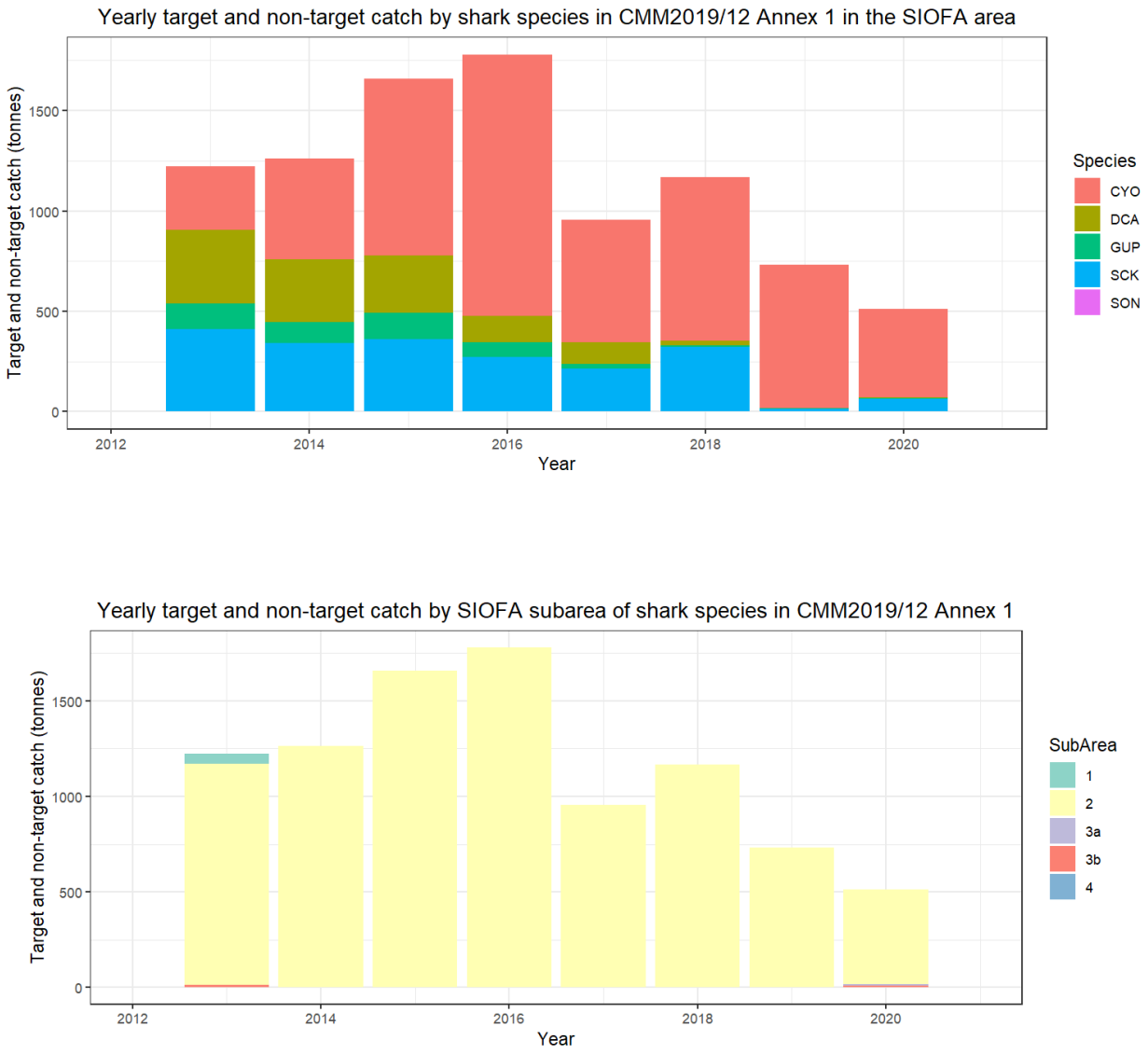

Figure 7a and b – Yearly target and non-target catch of sharks considered to be at "high risk" and "of concern" as included in Annex 1 of SIOFA CMM 2019/12 (Conservation and Management Measure for Sharks) in the SIOFA area. Figures by species (upper panel, a) and by SIOFA subarea (lower panel, b) are presented (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020). Species are indicated by their 3-letter FAO code, see Appendix C for disambiguation.

6.2.4 Target/non-target fish catch in SIOFA Management Units (MUs) for orange roughy and toothfish

Stock boundaries for orange roughy were defined by Graham Patchell of Sealord Group and used in the relative stock assessments (Cordue 2018a, 2018b), assuming that all catch would derive from within these boundaries. These stock boundaries have been historically referred to as "Management Units" or MUs, even though SIOFA has not yet formally adopted management measures for orange roughy (Figure 8). Note that not all catch of orange roughy is taken inside those MUs.

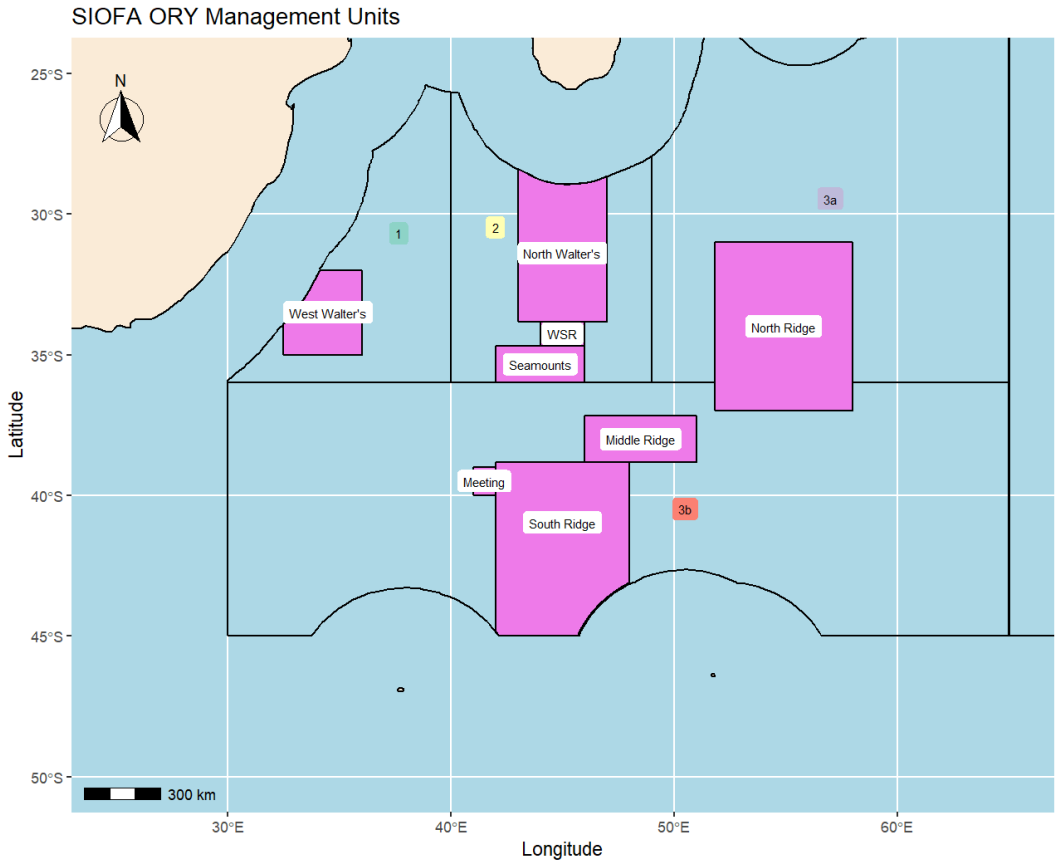

Figure 8 – Map of SIOFA Management Units (MUs, in magenta) for orange roughy as defined by Cordue (2018a, 2018b) (source: SIOFA Spatial layers). Labels indicate names of each management unit.

Toothfish MUs are defined within CMM2021/15 (paragraphs 13 and 50), and include two areas: the Del Cano Rise and the Williams Ridge (Figure 9). Note that not all catch of toothfish is taken inside those MUs.

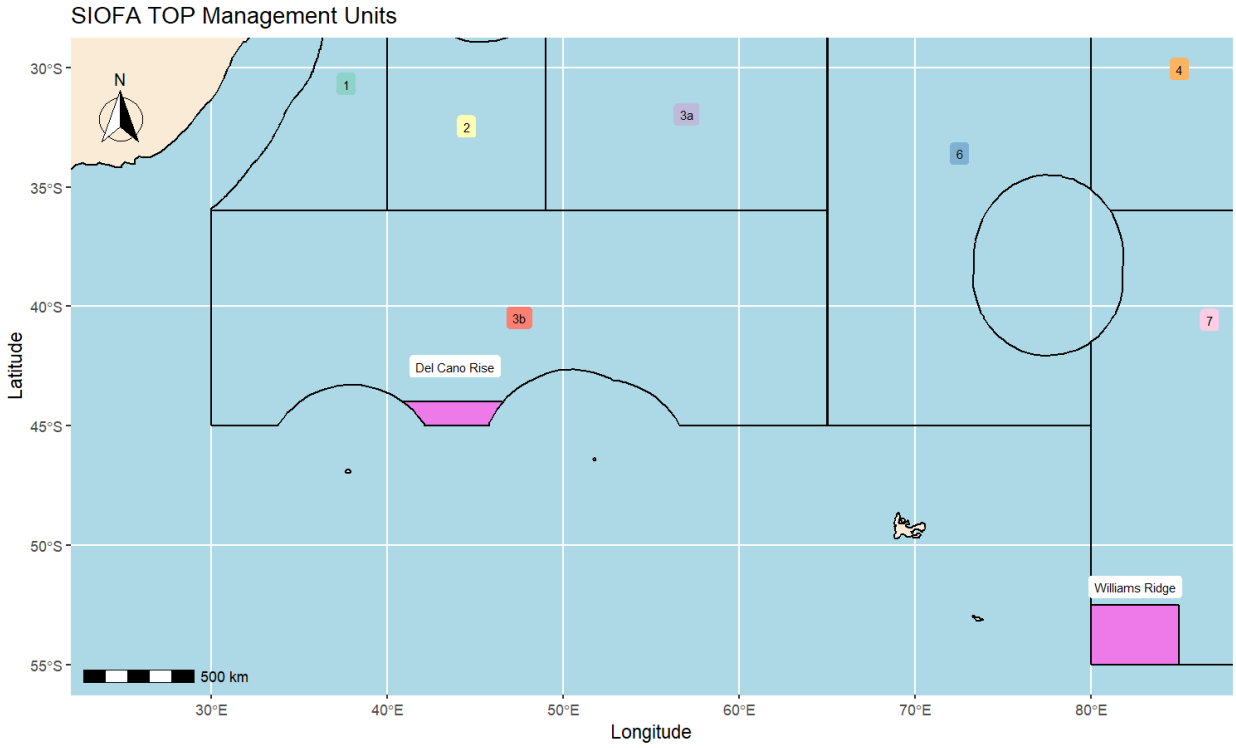

Figure 9 – Map of SIOFA Management Units (MUs, in magenta) for toothfish as defined in CMM15 (source: SIOFA Spatial layers). Labels indicate names of each management unit.

The SIOFA Scientific Committee required a specific analysis of target/non-target catch within MUs, highlighting that, were this to produce outputs considered confidential, a separate restricted version of the Fisheries Overview would have to be created. The following paragraphs and figures are therefore not presented in the public version.

Within management units for orange roughy, the ratio between target and non-target catch was relatively stable (around 25% of non-target catch) from 2013 onwards (Figure 10a). Total (target and non-target) catch was however relatively variable across years (Figure 10b).

Figure 10a and b – Target and non-target catch as relative values (upper panel, a) and absolute values (lower panel, b) in all SIOFA Management Units for orange roughy (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020). Catch without spatial information are not included.

Within the two management units for toothfish, the ratio between target and non-target catch was relatively variable, with values of non-target catch close to 75% until 2015, and below 50% afterwards (Figure 11a). Total (target and non-target) catch was however relatively variable across years, with a notable peak in 2018 (Figure 11b).

Figure 11a and b – Target and non-target catch as relative values (upper panel, a) and absolute values (lower panel, b) within the two SIOFA Management Units for toothfish (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020). Catch without spatial information are not included.

Target and non-target catch in single Management Units (MUs)

[this section is not included in the public version of the manuscript, due to confidentiality limitations set out in CMM2016/03]

Figure 12a and b – Target (upper panel, a) and non-target (lower panel, b) in different SIOFA Management Units for orange roughy (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020). Catch without spatial information are not included.

Figure 13a and b – Target (upper panel, a) and non-target (lower panel, b) within the two SIOFA Management Units for toothfish (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020). Catch without spatial information are not included.

6.2.5 Non-target fish catch and discards

When dealing with non-target catch, it is important to note that usually most of the non-target catch is retained and landed, with only a fraction of it being discarded at sea and not landed. SIOFA catch and effort databases contain the fate of catch per species, aggregated at different levels, which enables an analysis on discards.

Discards have historically been a minor fraction of the non-target catch (Figure 14a), and consequently an even smaller fraction of total catch. In absolute terms, they are typically around or below 100 tonnes per year but were much higher in 2015, when they reached more than 1500 tonnes (Figure 14b).

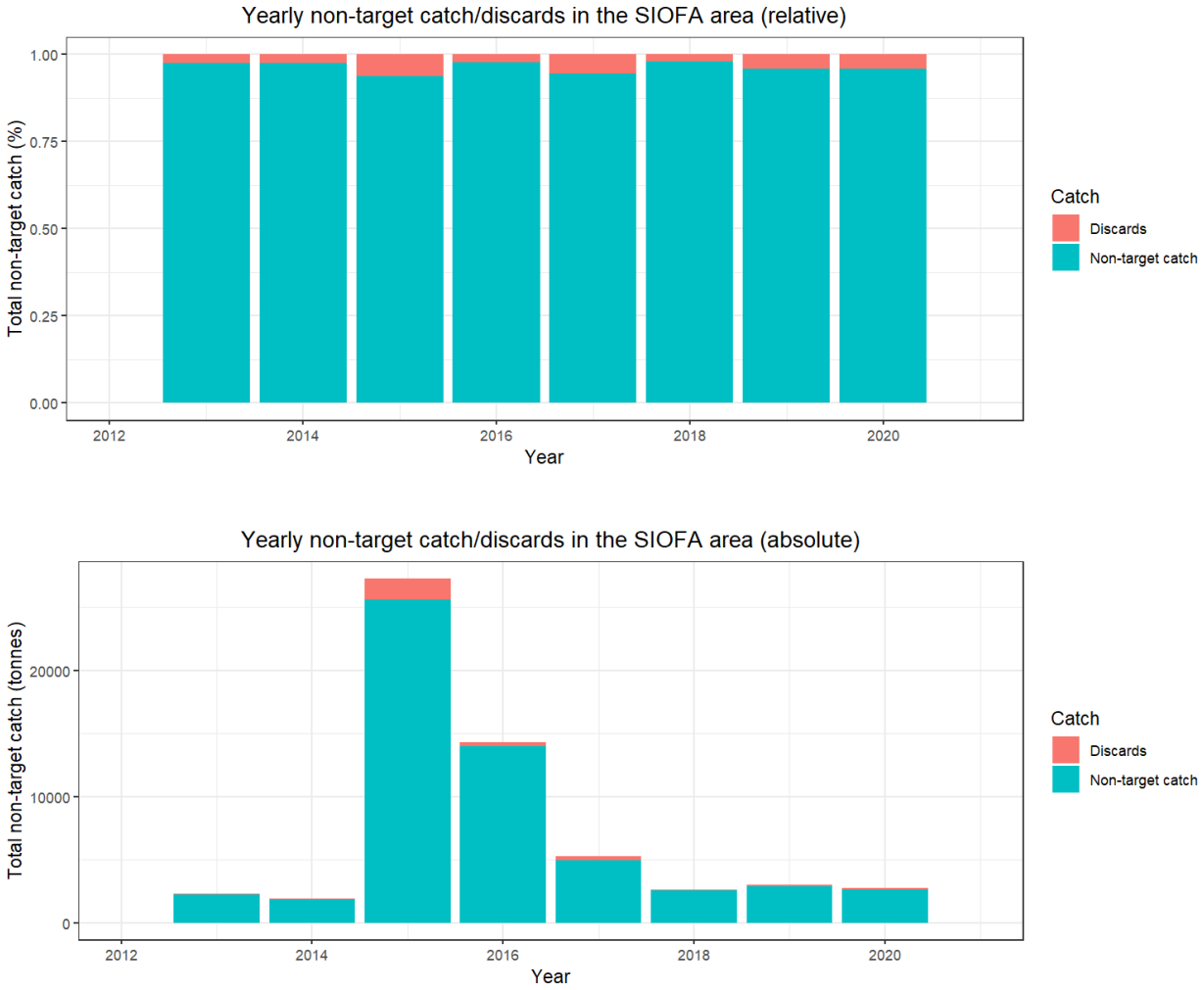

Figure 14a and b –Non-target catch and discards as relative values (upper panel, a) and absolute values (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020). Catch without spatial information are not included.

Discards are often considered in the perspective of non-target catch, even though also target species (e.g. undersized or damaged) target species are also discarded. A total of 113 different species/taxa were discarded in SIOFA fisheries.

Given the high number of species, figures on discards by species are not easy to interpret. The high discards recorded in 2015 were attributed to unspecified marine species (MZZ) which are still reported also in following years (Figure 15). Other high contributions to discards (e.g. in 2017) were due to unspecified tuna species (TUN) (Figure 15).

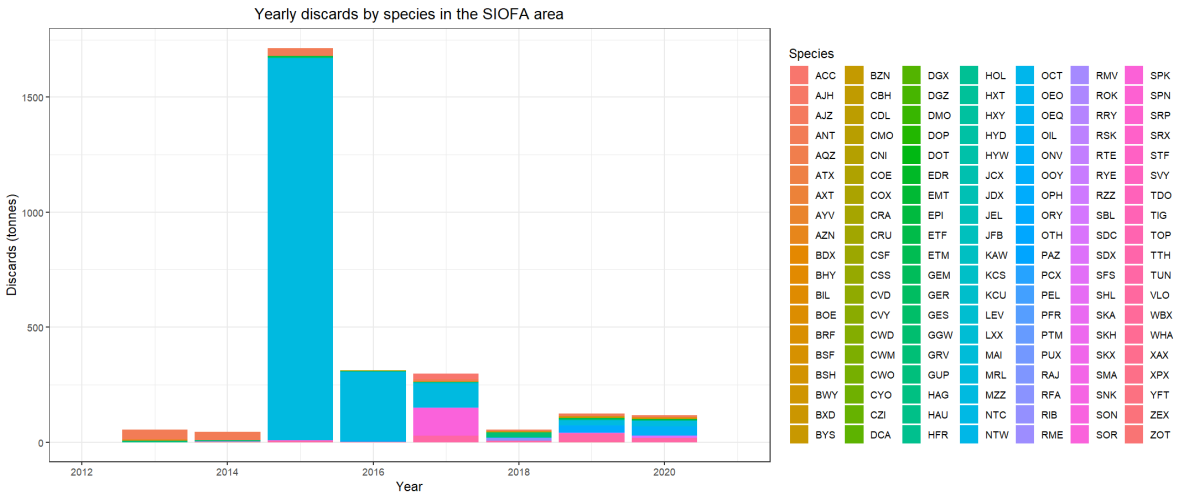

Figure 15 – Yearly discards in the SIOFA area by species (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020). Species are indicated by their 3-letter FAO code.

6.3 Main species catch and effort

The catch of trawl vessels is predominantly alfonsino (6.3.1) and orange roughy (6.3.2). Species also caught by trawling include pelagic armourhead, bluenose warehou, violet warehou, ocean blue-eye trevalla and oreo dories, cardinal fish, hapuku wreckfish.

The addition of Thailand's fishery added Lizardfish and scads as a major catch from small trawlers since 2015.

The catch of longline vessels differs between three groups. There are longline vessels (reported by EU, Japan, Korea and France Overseas Territories) that catch Patagonian toothfish (6.3.3) and associated species, such as blue antimora. The second group catch hapuka (6.3.4), ocean blue-eye trevalla, pelagic armourhead, rubyfish, common mora and, historically, deep-water sharks. The third group is the Chinese Taipei tuna longline fleet that catch oilfish (6.3.5).

The catch of the historical gillnet fisheries was predominantly deep-water sharks (see 6.2.2). Large-scale pelagic driftnets and deepwater gillnets use in the SIOFA area has been prohibited since October 2016, when CMM 2016/05 entered into force.

China's light seining fishery targeted mackerel and *Brama* species (such as *Brama japonica*) and its bottom longline fishery targeted ruby snapper and other species in the Lutjanid family.

6.3.1 Alfonsinos (ALF, *Beryx* spp.)

The most common species of alfonsinos caught in the SIOFA area is splendid alfonsino (BYS, *Beryx splendens*), but sometimes catch of another species (alfonsino, BXD, *Beryx decadactylus*) or not identified to the species level (ALF, *Beryx* spp.) are also reported. The data on all alfonsinos has been aggregated, and is presented here, at the highest taxonomical resolution.

Alfonsinos are long-lived, late-maturing, benthopelagic fishes found at a depth range of 25–1300 m, but more commonly at 400–600 m. Alfonsinos have a global distribution, excluding the north-eastern Pacific and the Mediterranean, and are often aggregating around underwater topographic features (particularly during spawning). Further information on alfonsinos and their fishery in the SIOFA area are provided in a relative Fisheries Summary.

Catches of alfonsino have been increasing over the last years but are overall within the historical average (Figure 16a). Effort has decreased in recent years, from higher values in 2013–2017 (Figure 16a). Alfonsinos are mostly caught in the western SIOFA area, mainly subareas 2, 3a, 3b and 4 (Figure 16b).

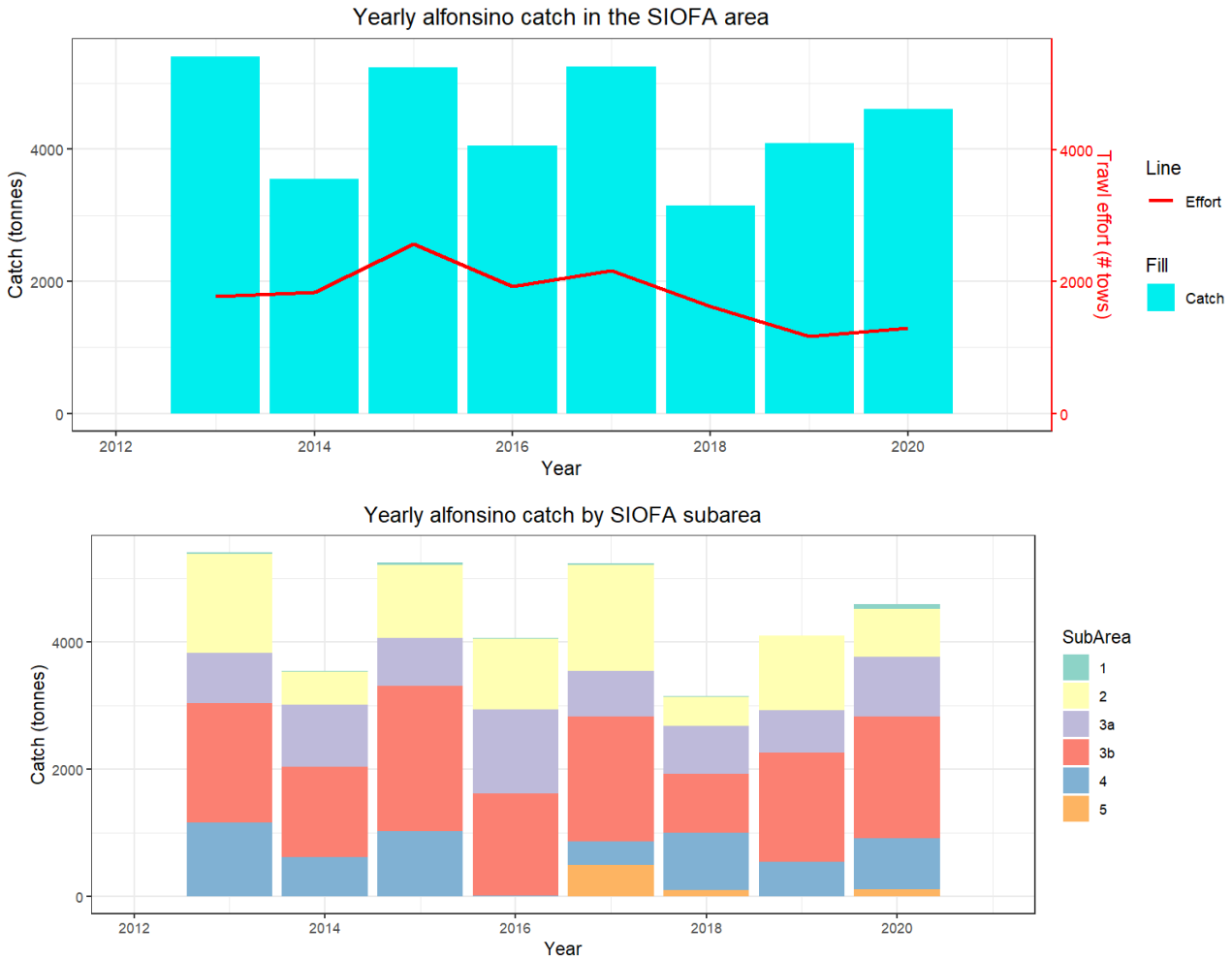

Figure 16a and b – Yearly catch of alfonsinos (tonnes) and effort (number of trawls) in the SIOFA area (upper panel, a) and in different SIOFA subareas (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020).

Recent years have seen lower levels of effort with higher catches (Figure 16a), so unstandardised catches per units of effort (CPUEs) have been rising correspondingly (Figure 17).

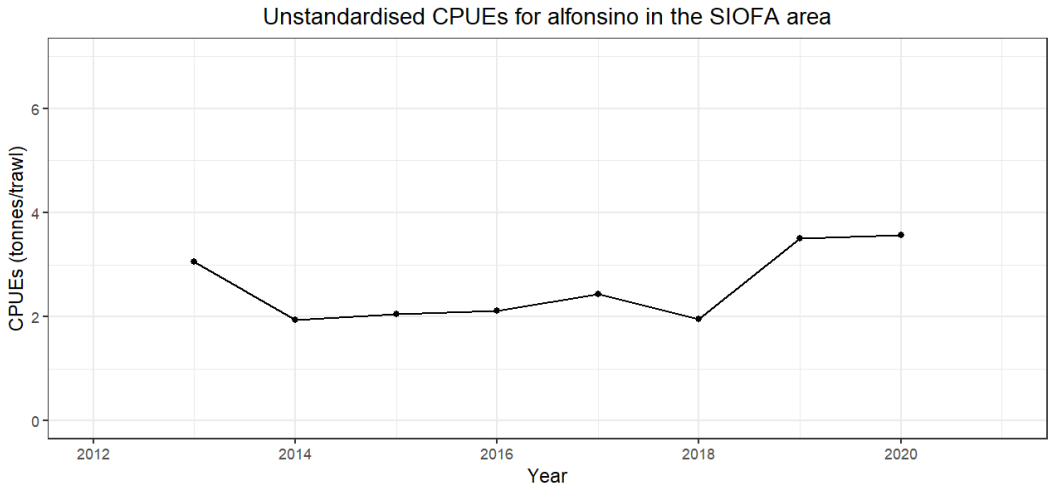

Figure 17 – Unstandardised catches per unit of effort (CPUEs) of alfonsino in the SIOFA area (tonnes/trawl) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020).

6.3.2 Orange roughy (ORY, *Hoplostethus atlanticus*)

The only species of slimehead caught in the SIOFA area is orange roughy (ORY, *Hoplostethus atlanticus*).

Orange roughy is a long-lived, late-maturing, bathypelagic species found at a depth range of 180–1809 m, but more commonly at 400–900 m. Orange roughy is present in all oceans, and is often found both around underwater topographic features and plateaus. Spawning and non-spawning aggregations are known. Further information on orange roughy and its fishery in the SIOFA area are provided in a relative Fisheries Summary.

Catches of orange roughy have been increasing over the last years, but are overall within the historical average (Figure 18a). Effort has decreased in recent years, from higher values in 2015–2018 (Figure 18a). Orange roughy is mostly caught in the western SIOFA area, mainly subareas 2 and 3a (Figure 18b).

Figure 18a and b – Yearly catch of orange roughy (tonnes) and effort (number of trawls) in the SIOFA area (upper panel, a) and in different SIOFA subareas (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020).

Recent years have seen lower levels of effort with higher catches (Figure 18a), so unstandardised catches per units of effort (CPUEs) have been rising correspondingly (Figure 19).

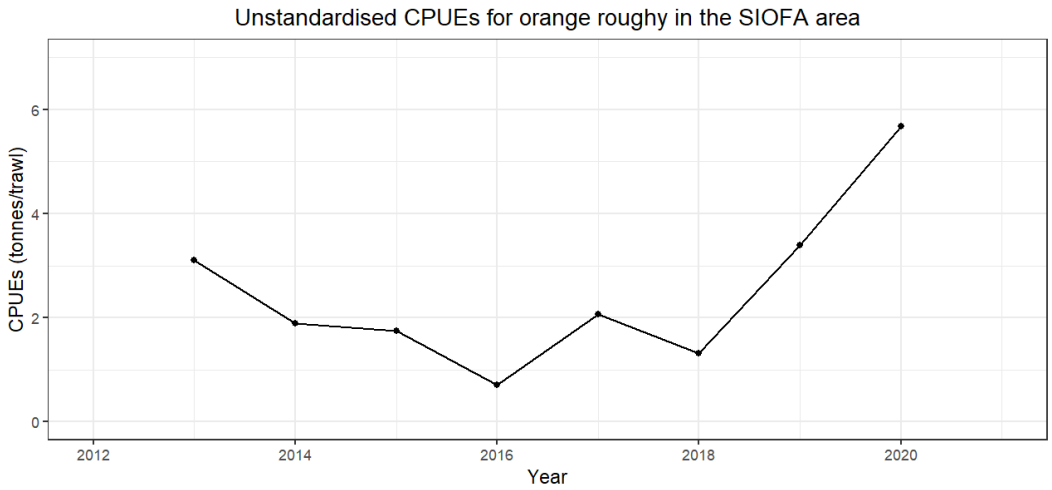

Figure 19 – Unstandardised catches per unit of effort (CPUEs) of alfonsino in the SIOFA area (tonnes/trawl) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020).

6.3.3 Patagonian toothfish (TOP, *Dissostichus eleginoides*)

Patagonian toothfish (TOP, *Dissostichus eleginoides*) is the only species of toothfish caught in the SIOFA area.

Patagonian toothfish is a long-lived, late-maturing, large demersal fish often found at depths greater than 1000 m. Patagonian toothfish is present in waters near the Antarctic, approximately east of southern America to New Zealand. Further information on Patagonian toothfish and its fishery in the SIOFA area are provided in a relative Fisheries Summary.

Catches of Patagonian toothfish have been decreasing over the last years, and effort has also decreased in recent years, from higher values in 2018 (Figure 20a). Patagonian toothfish is caught in the southern SIOFA area, mainly subareas 7 and 3b (Figure 20b).

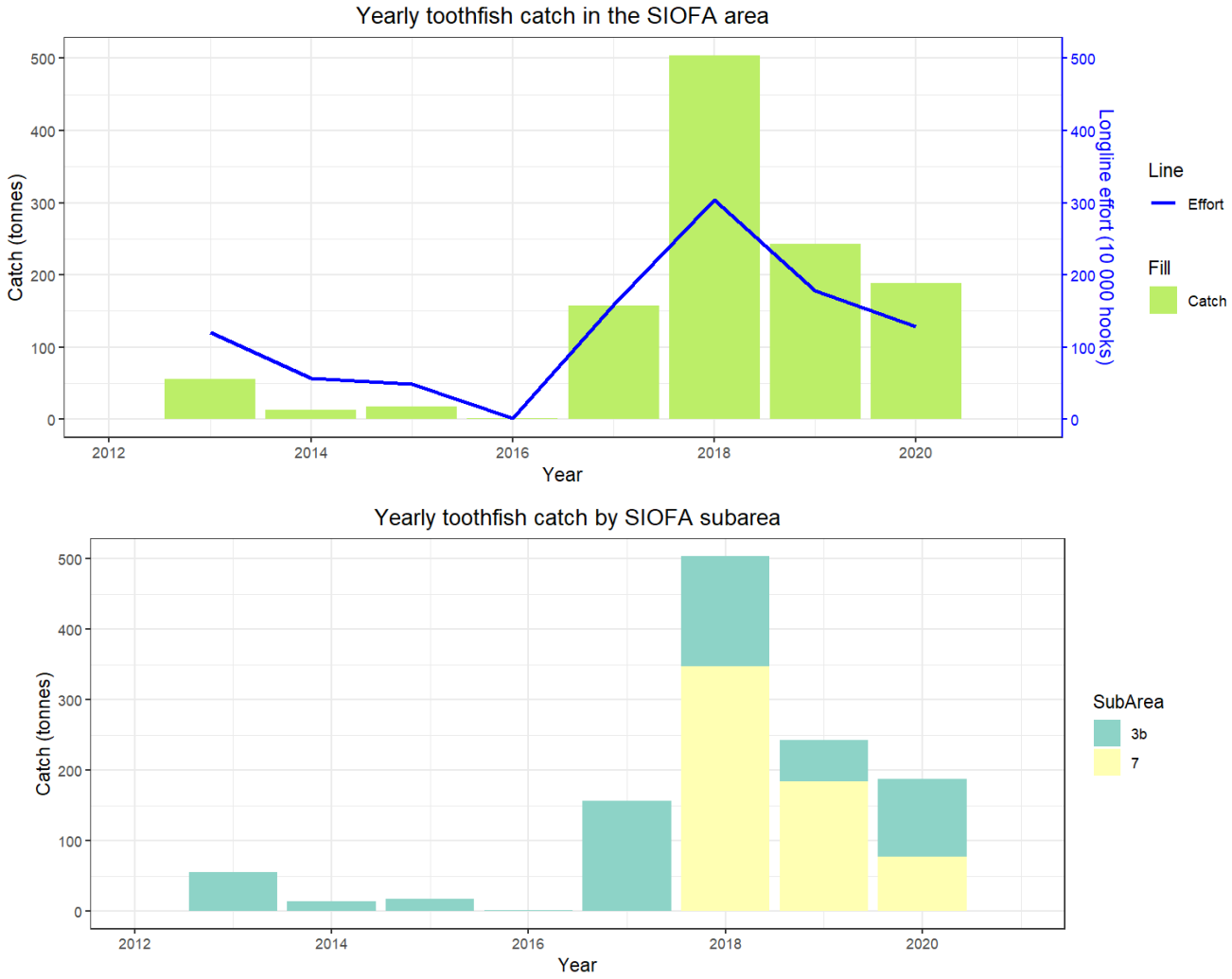

Figure 20a and b – Yearly catch of Patagonian toothfish (tonnes) and effort (10 thousand hooks) in the SIOFA area (upper panel, a) and in different SIOFA subareas (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020). Note that the subareas are larger than the toothfish management units.

Unstandardised catches per units of effort (CPUEs) have been slightly rising in recent years (Figure 21).

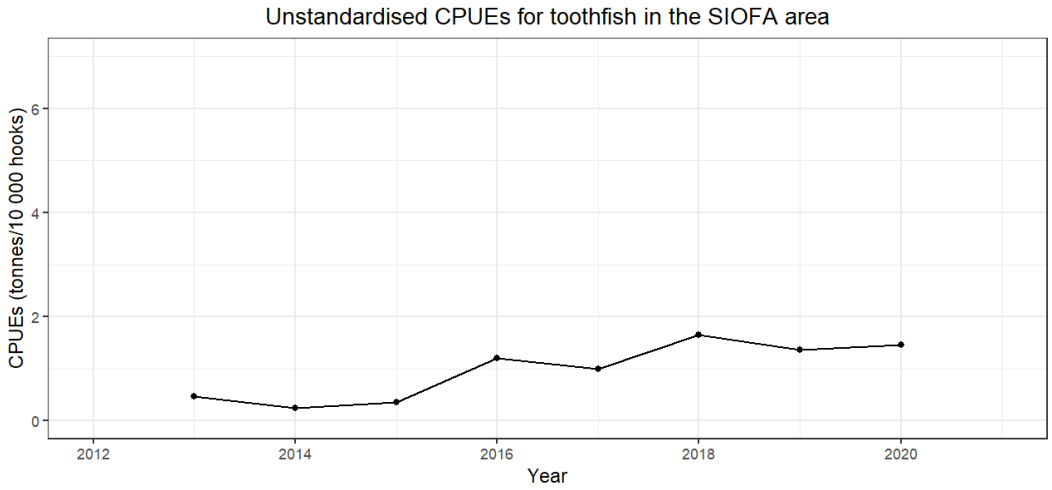

Figure 21 – Unstandardised catches per unit of effort (CPUEs) of Patagonian toothfish in the SIOFA area (tonnes/10 thousand hooks) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020).

6.3.4 Hapuka (HAU, *Polyprion* spp.)

Hapuka is a taxa of groupers that includes both the hapuku wreckfish (WHA, *Polyprion oxygeneios*) and wreckfish (WRF, *Polyprion americanus*) species, as well as catch not identified to the species level (HAU, *Polyprion* spp.). All three taxa have been recorded in catches from the SIOFA area.

Hapuka are large, long-lived, late-maturing, demersal groupers often found at depths of 50–854 m. Hapuka are found on rough grounds and seamounts off the shelf, with a circumglobal distribution in southern oceans. Further information on hapuka and their fishery in the SIOFA area are provided in a relative Fisheries Summary.

Catches of hapuka have significantly increased in 2019 and especially 2020, and effort has also correspondingly increased (Figure 19a). The yearly catch composition was relatively variable, but hapuku wreckfish was the most commonly caught species in 2020 (Figure 22a). Hapuka are caught in the western SIOFA area, mainly subareas 2, 3a and 3b (Figure 22b).

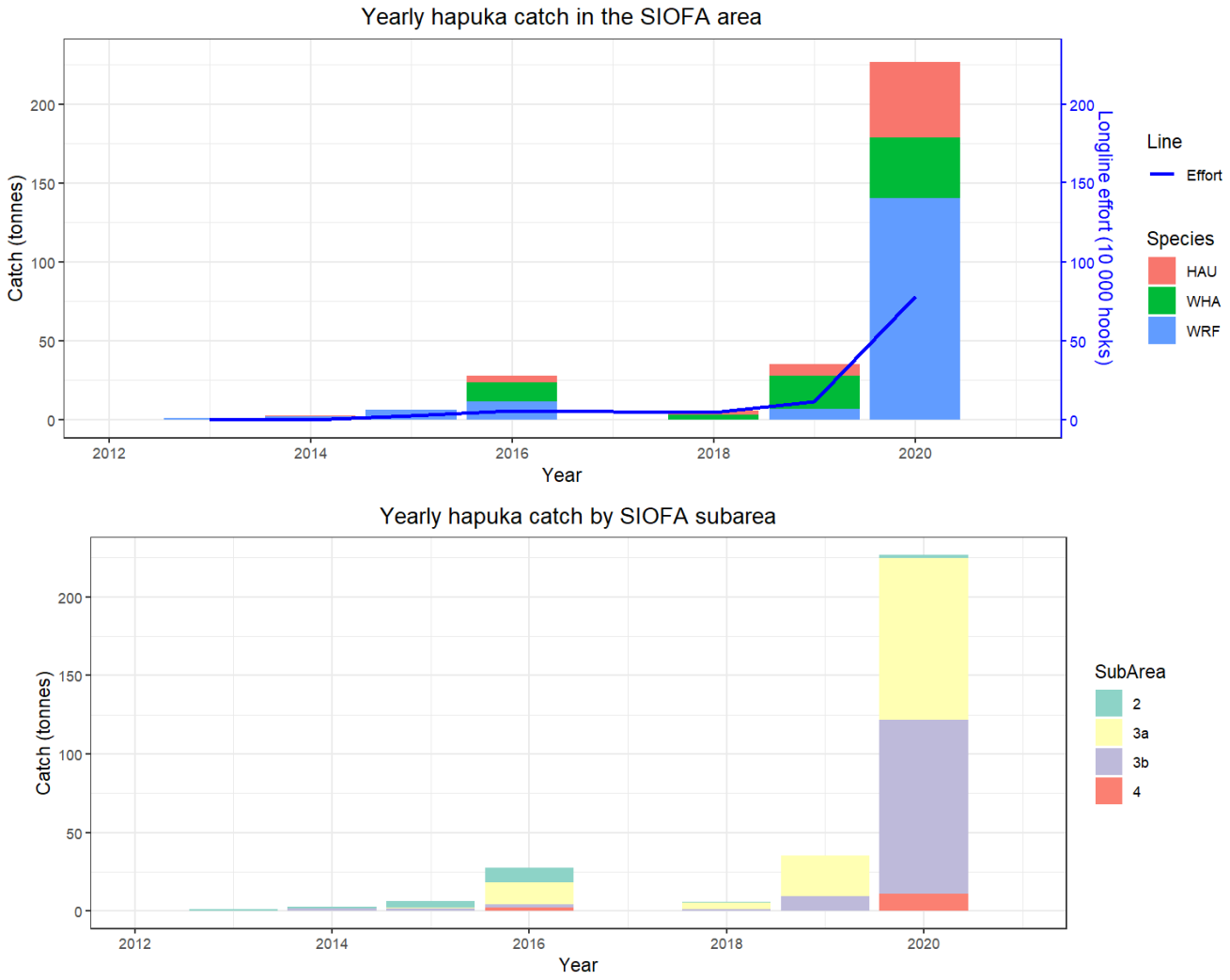

Figure 22a and b – Yearly catch of hapuka (tonnes) and effort (10 thousand hooks) in the SIOFA area (upper panel, a) and in different SIOFA subareas (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020).

Recent years have seen higher levels of effort with higher catches (Figure 22a), with unstandardised catches per units of effort (CPUEs) remaining relatively stable (Figure 23).

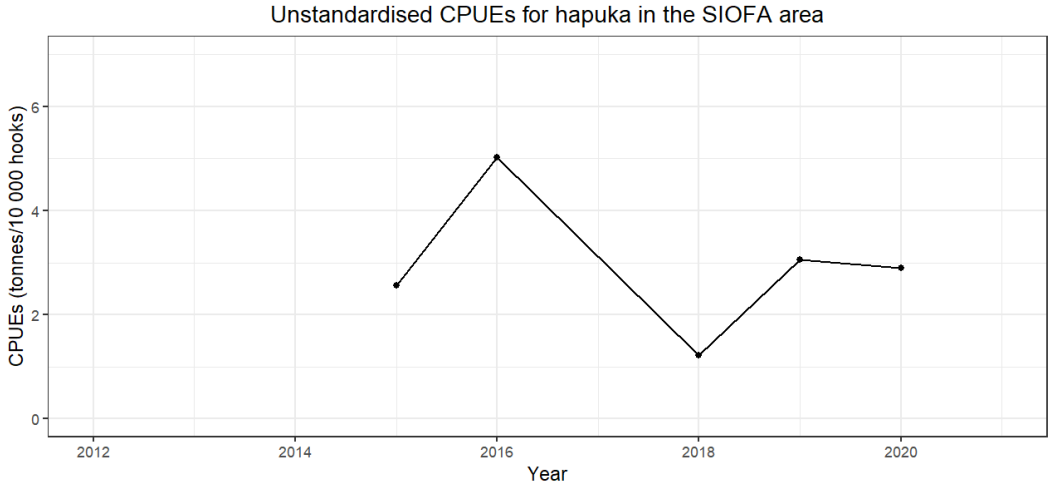

Figure 23 – Unstandardised catches per unit of effort (CPUEs) of hapuka in the SIOFA area (tonnes/10 thousand hooks) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020).

6.3.5 Oilfish (OIL, *Ruvettus pretiosus* and LEC, *Lepidocybium flavobrunneum*)

Oilfish include both oilfish (OIL, *Ruvettus pretiosus*) and escolar (LEC, *Lepidocybium flavobrunneum*) two species of the Gempylidae family.

Oilfish are benthopelagic, found at a depth range of 100– 800 m in subtropical waters of all oceans, and mainly fished with longlines. Note that almost all catch and effort is produced by Chinese Taipei from its pelagic longline fishery, but a small amount of bycatch is also reported by other CCPs from other gears.

Both oilfish and escolar can grow to over 2 metres in length and over 50 kg, but average sizes measured in the SIOFA area are around 27 kg (see section 10). Despite having very high levels of indigestible wax esters in their flesh (which is likely at the root of the ban on sales in countries like Japan or Italy), these species are sought after in several countries and fished in relatively significant amounts in the SIOFA area. Further information on oilfish and their fishery in the SIOFA area are provided in a relative Fisheries Summary.

Catches of oilfish in the SIOFA area were first reported in 2013, but at very low levels (Figure 24a). Effort was only reported starting in 2015, and has progressively increased since, with catches increasing and then stabilizing at levels higher than the other main SIOFA species (Figure 24a). Oilfish are mainly caught in the western SIOFA area, particularly in subareas 1 and 3b (Figure 24b).

Figure 24a and b – Yearly catch of hapuka (tonnes) and effort (10 thousand hooks) in the SIOFA area (upper panel, a) and in different SIOFA subareas (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020).

Even if catches are variable, effort has remained relatively stable in recent years (Figure 24a), unstandardised catches per units of effort (CPUEs) have thus also remained relatively stable (Figure 25).

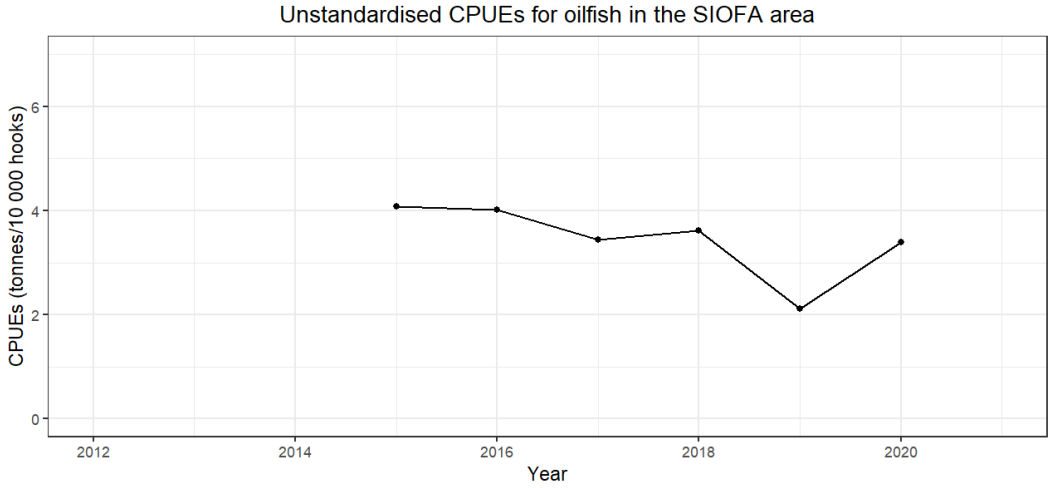

Figure 25 – Unstandardised catches per unit of effort (CPUEs) of oilfish in the SIOFA area (tonnes/10 thousand hooks) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020).

7. Vulnerable Marine Ecosystems (VMEs)

Vulnerable Marine Ecosystems (VMEs) are marine ecosystems corresponding to the characteristics referred to in paragraph 42 of the Annex of the FAO International Guidelines for the Management of Deep-Sea Fisheries in the High Seas (FAO 2009).

These characteristics are:

i. Uniqueness or rarity – an area or ecosystem that is unique or that contains rare species whose loss could not be compensated for by similar areas or ecosystems. These include:
   - habitats that contain endemic species;
   - habitats of rare, threatened or endangered species that occur only in discrete areas; or
   - nurseries or discrete feeding, breeding, or spawning areas.

ii. Functional significance of the habitat – discrete areas or habitats that are necessary for the survival, function, spawning/reproduction or recovery of fish stocks, particular life- 10 history stages (e.g. nursery grounds or rearing areas), or of rare, threatened or endangered marine species.

iii. Fragility – an ecosystem that is highly susceptible to degradation by anthropogenic activities.

iv. Life-history traits of component species that make recovery difficult – ecosystems that are characterized by populations or assemblages of species with one or more of the following characteristics:
   - slow growth rates;
   - late age of maturity;
   - low or unpredictable recruitment; or
   - long-lived.

v. Structural complexity – an ecosystem that is characterized by complex physical structures created by significant concentrations of biotic and abiotic features. In these ecosystems, ecological processes are usually highly dependent on these structured systems. Further, such ecosystems often have high diversity, which is dependent on the structuring organisms.

VMEs have not been fully identified in the SIOFA area, but scientific work is currently ongoing to identify and locate potential VMEs. In the interim, VME management measures are in place and invertebrate taxa bycatch is monitored and assessed on a regular basis.

7.1 Interim VME management measures

One of the management tools SIOFA implements to manage fishing impacts on Vulnerable Marine Ecosystems (VME) is the application of move-on rules. Move-on rules require the fishing vessel to move away a certain distance from the set area when quantities of VME indicator taxa exceeding set thresholds are hauled on board of a vessel. These measures are described in full in CMM2020/01.

Table 4 summarises the thresholds and move-on rules applied by each CCP. No VME encounters were recorded in 2021, as reported in the last column of the table.

Table 4 – Summary of thresholds used to define VME encounters, and management responses to be used in case of an encounter (source: SIOFA National Reports 2021). The last column details whether any encounters were recorded in 2021.

CCP	Thresholds	Management response	Encounter
AUS	Australian-flagged vessels observe the thresholds and move-on rules specified in CMM 2020/01. Australian-flagged vessels are required to record any evidence of a Vulnerable Marine Ecosystem (VME) such as coral or sponges encountered in a fishing shot in logbooks.	Australian-flagged vessels observe the thresholds and move-on rules specified in CMM 2019/01. Australian-flagged vessels are required to record any evidence of a Vulnerable Marine Ecosystem (VME) such as coral or sponges encountered in a fishing shot in logbooks.	No thresholds were triggered by any Australian-flagged vessels in 2021.
COK	In 2021, flagged vessels adhered to the VME encounter threshold established in CMM 20/01 Interim Bottom Fishing Measures section 12(b)	In 2021, flagged vessels adhered to the VME encounter threshold established in CMM 20/01 Interim Bottom Fishing Measures section 12(b)	No shots breached the VME threshold in 2021
EU	From 2019, the EU bottom longline fleet is applying the protocols adopted by SIOFA in the CMM 2019-01. Previously the fishing vessels followed the rules adopted by the Fishing Administration, similar to those applied in SEAFO and CCAMLR in the definition of the VME encounter and thresholds (see SC-06-21 for details).	From 2019, the EU bottom longline fleet is applying the protocols adopted by SIOFA in the CMM 2019-01.	The threshold of 10 or more VME indicator units by segment has never been reached
JPN	From the middle of 2019 fishing season, Japanese fishing vessels have applied Article 12, CMM 2019/01, which establishes thresholds for bycatches of VME indicator species and move-on-rule in the encounter protocol, i.e., for trawl fisheries, 60 kg of live corals and 300 kg of sponges and for bottom longline fisheries, 10 or more VME-indicator units.	If by-catch amount of VME indicator species reach the threshold level, Japanese fishing vessels will follow the protocols stipulated in Article 12 to 19, CMM 2019/01, i.e. fishing vessels move away 2 and 1 nm for trawl and longline fisheries respectively then report it to the Secretariat.	No VME bycatch in 2021
FR-OT	Crew must collect and retain all benthic organisms for each segment in numbered buckets, those buckets will be made available for observers. The observers record benthic organisms' composition and abundance for each set. This information is also recorded in a digital logbook and transferred to the MNHN fishing database "PECHEKER".	No VME indicator thresholds were triggered for the period 2011-2021. The move-on protocol didn't need to be applied.	No interactions with threatened, endangered and protected species were reported in 2021.
KOR	Korea established a procedure to protect Vulnerable Marine Ecosystems from bottom fishing in the high seas, in accordance with UNGA Resolution 61/105, adopted in 2006, and 64/72, adopted in 2009. Korean domestic laws request all Korean bottom fishing vessels clearly mark the start and end of each haul on each fishery, and monitor all hauls to record the quantity of VME indicator organisms recovered during that haul. The fishing vessel, during its operation, shall submit the information with regard to its operation (e.g. position, date) to NIFS if it was confirmed that the vessel encountered VMEs. The threshold of the encounter of VMEs is over 60kg of coral per set or over 800kg of sponges per set.	If the amount of VME that exceeds the weight specified in the criteria, the vessel shall apply a 2 nmiles move-on rule to resume its fishing operation. Furthermore, the vessel shall relocate its fishing position until it reaches a point where no VMEs are confirmed.	no fishing in 2021

CCP	Thresholds	Management response	Encounter
MUS	no information provided	no information provided	no information provided
SEY	no fishing in SIOFA area		no fishing in SIOFA area
TPE	no bottom fishing in SIOFA area		no bottom fishing in SIOFA area
THA	Trawls corals > 60 kg sponges > 300 kg Longlines corals or sponges > 10 units per 1,000 hooks or per mainline of 1,200 meters, whichever is the shorter Traps corals or sponges > more than thresholds to be assigned by SIOFA secretariat Other bottom fishing gears corals or sponges > more than thresholds to be assigned by SIOFA secretariat	Trawls: move at least 2 nautical miles area . Longlines: move at least 1 nautical mile. Traps: move at least 1 nautical mile. Other bottom fishing gears: move at least 1 nautical mile	

1.1 Benthic invertebrates bycatch summary

Observers are required to report the non-target catch of benthic invertebrates in bottom fisheries, and the corresponding data is submitted to the Observer database at the SIOFA Secretariat. The HBHCatchEffort database also contains information on benthic invertebrate taxa non-target catches.

In 2020, sponges and corals were the most important (by weight) benthic invertebrate taxa caught in SIOFA bottom fisheries (Table 4). Note that an exemption was in place for CCPs to have the required observer coverage in their bottom fisheries during 2020, due to the restrictions imposed by the COVID pandemic.

Table 5 – Total weight (kg) of benthic bycatch reported, 2020 (source: SIOFA Observer database and HBHCatchEffort 2020). Note that some CCPs did not have a full observer coverage of their trawl fisheries during 2020, due to the restrictions imposed by the COVID pandemic.

		Weight (Kg)								
Code	Scientific Name	AUS	COK*	COM	EU-ES	FR-OT	JPN	MUS	THA	Totals
ADQ	Antipathes dichotoma								0.02	0.02
AJZ	Alcyonacea				1.01	0.84				1.85
AQZ	Antipatharia	0.8			5.64	0.01				6.45
ATX	Actiniaria	8.19			2.33	0.02				10.54
AXT	Stylasteridae	6.46			4.27	0.11				10.84
AZN	Anthoathecatae				0.147					0.147
BVH	Brachiopoda				0.28					0.28
BWY	Bathylasmatidae				0.06					0.06
BZN	Bryozoa				1.305					1.305
CNI	Cnidaria					0.1				0.1
CRU	Crustacea				0.27					0.27
CSS	Scleractinia	50.96			19.82					70.78
CWD	Crinoidea	2.24			0.12	0.09				2.45
DMO	Demospongiae	14.67			2.815				83	100.485
GGW	Gorgoniidae	14.13			24.37	4.54				43.04
HXY	Hexactinellida	0.13			2.44					2.57
INV	Invertebrata	7.63								7.63
KQM	Acropora formosa								10	10
NTW	Pennatulacea				0.53	0.13				0.66
OEQ	Euryalida	3.57			3.16					6.73
OOY	Ophiurida					1.28				1.28
PFR	Porifera	2.31			0.01	0.3			240	242.62
SSX	Ascidiacea	0.5				0.1				0.6
WBX	Holothuria spp				0.4					0.4
ZOT	Zoanthidea				1.005					1.005
	Total	**111**			**70**	**7.5**			**333**	**522**

* Cook Islands observer data from 2020 are not fully processed

8. Fishing activities in Interim Protected Areas (CMM 2020/01)

Annex 3 of SIOFA CMM 2020/01 lists five Interim Protected Areas (IPAs) and their coordinates (Figure 26). These areas were first instituted in 2018 with SIOFA CMM2018/01, which entered into force on the 10th of August 2018, and CCPs are provisionally required to apply the some restrictions

to fisheries until the adoption of a dedicated research and management plan, referred to in paragraph 6 e of SIOFA CMM 2020/01.

According to SIOFA CMM 2020/01, When the Meeting of the Parties adopts a revised SIOFA protocol for protected area designation after advice from the Scientific Committee arising from its review referred to in paragraph 6 d., the Meeting of the Parties shall also review Annex 3 of this CMM, taking into account advice of the Scientific Committee.

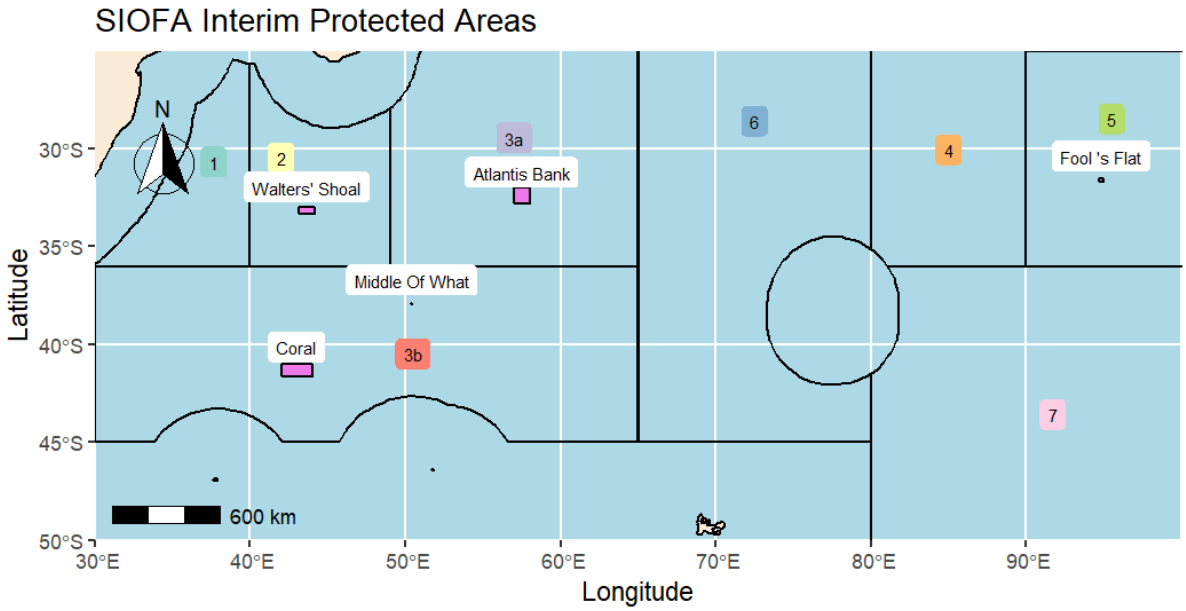

Figure 26 – Map of the SIOFA Interim Protection Areas (in magenta) as defined in CMM 2020/01 (Source: Annex 3 of SIOFA CMM 2020/01). All the areas have been labelled for easier recognition, as some are barely visible on the map due to their small size.

Current restrictions to fisheries in IPAs include a prohibition for CCPs to engage in bottom fishing, excluding line and trap methods, and an obligation to have a scientific observer onboard at all times while fishing inside those areas.

A total of 123 fishing events have been recorded to occur in SIOFA IPAs in 2013–2020, but the number of fishing events significantly decreased after the institution of the IPAs in late 2018 (Figure 27). While before the institution of the IPAs multiple gear types were used, after 2018 only lines were used, as per the CMM restrictions (Figure 27).

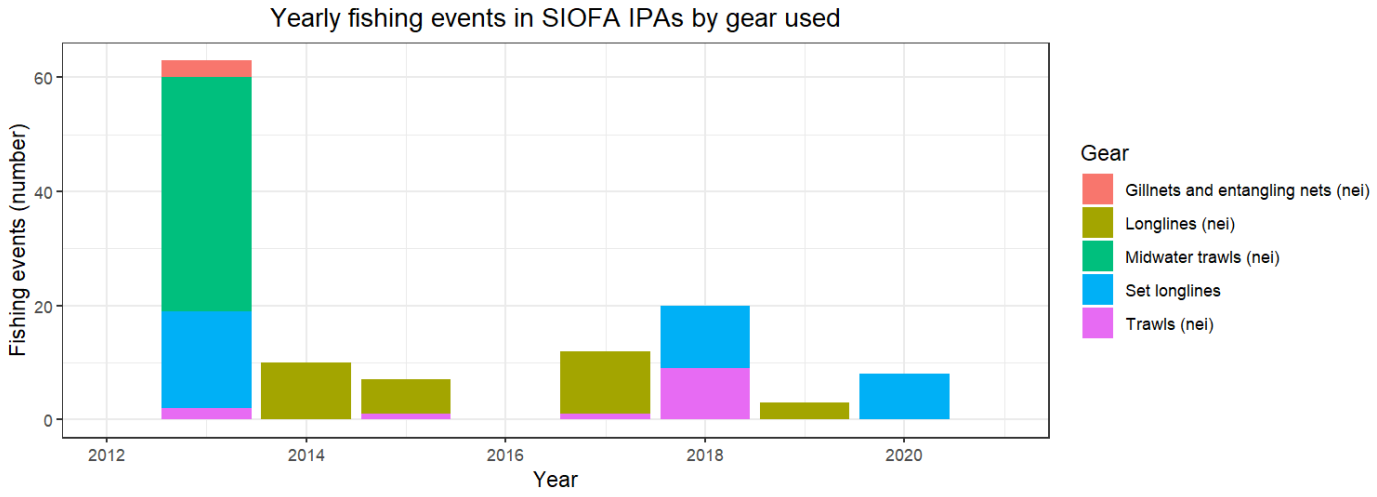

Figure 27 – Number of fishing events by gear in Interim Protected Areas (IPAs) per year (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020).

These events caught a large number of species, even if with a relatively low tonnage (Figure 28). Splendid alfonsino (BYS) and kitefin shark (SCK) had a significant contribution to total catches in years when catch in IPAs was highest (2013, 2017 and 2018, Figure 28).

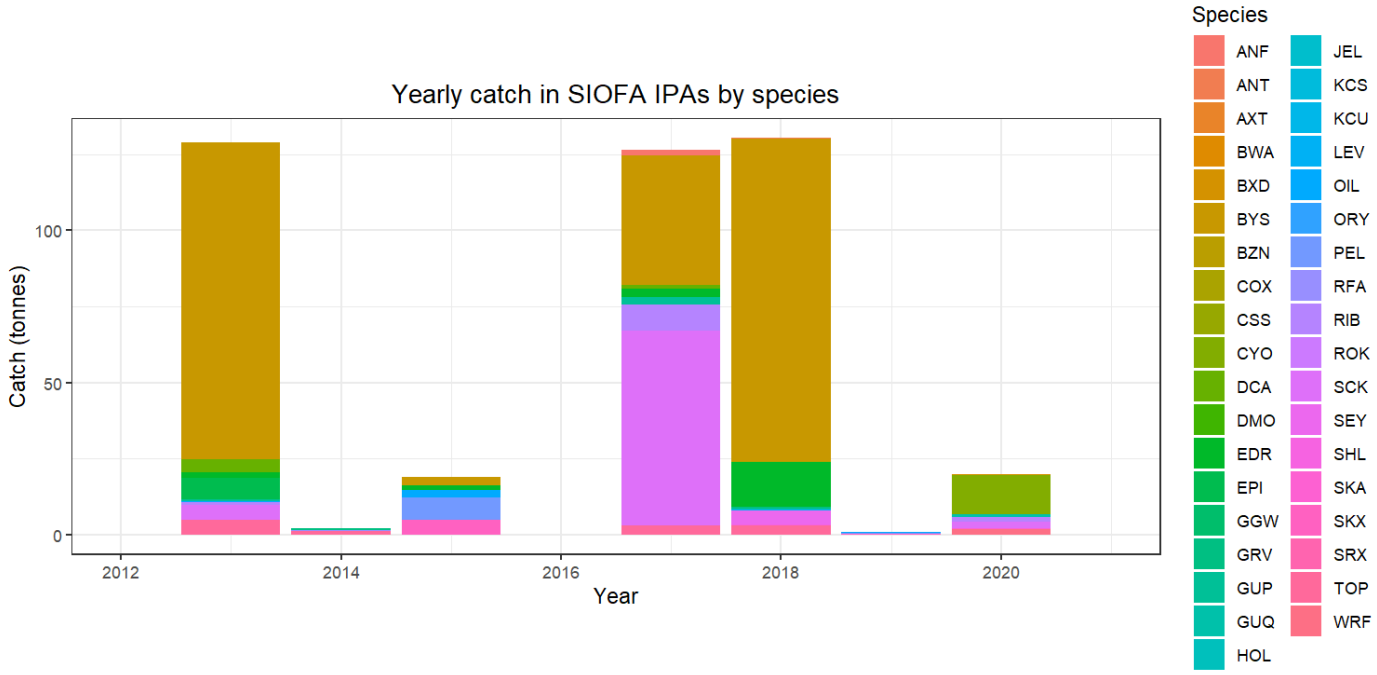

Figure 28 – Total catch (tonnes) by species in Interim Protected Areas (IPAs) per year (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020).

9. Observer and port sampling programmes

CMM2020/01 requires SIOFA CCPs to implement scientific observer programmes. Observer coverage of trawl fisheries in the SIOFA area is set at 100% (art. 39a of CMM2020/01) and at 20% for any other bottom fishing gear type (art. 39b of CMM2020/01).

In 2020, AUS, JPN, THA reported a 100% observer coverage of their hauls. The EU and FR-OT reported 69.2% and 80.4% observer coverage of their hauls, respectively. Note that an exemption was in place for CCPs to have the required observer coverage in their bottom fisheries during 2020, due to the restrictions imposed by the COVID pandemic.

Table 6 provides a summary of the observer programs implemented by each SIOFA CCP and information on port sampling.

Table 6 – Summary of Observers and Ports Sampling programs in 2020 (sources: SIOFA National Reports 2020).

Flag	Item	Description
Australia	Coverage	Since 2010, Australian permit conditions for bottom fishing in the SIOFA area have required 100% observer coverage on all vessels permitted to use trawl gear, with this coverage being expressed as the percentage of hauls observed. A target of 20% observer coverage is required for vessels using non-trawl fishing methods, with this coverage being expressed as the number of hooks observed. Observer coverage requirements were met in 2021.
	Training	AFMA recruits and trains the observers. Observers have a scientific background and/or experience in the fishing industry or other maritime industries and must demonstrate skills in collecting biological data at sea, fisheries research methodologies and collection of associated scientific data. Observers also hold a sea safety certificate and medical certificate and have completed an AFMA observer training course. Some observers hold a marine radio operator certificate of proficiency (or similar qualifications).
	Collection	Observers collect a range of data on vessel characteristics, fishing activity, catch composition, discarding and bycatch. Observer data are provided to the SIOFA Secretariat in accordance with CMM 2021/02.
	Port sampling	Australia does not have a port sampling program for vessels that fish in the SIOFA area. The landings are monitored through catch disposal records where the catch is verified by an AFMA-approved fish receiver.
China	Coverage	China did not conduct an observer program for demersal trawling from 2000 to 2002 in the Indian Ocean. Neither did China for Light seining fishery from 2014 to 2017. Since 2005 China has been conducting an observer program for bottom longlining.
	Training	
	Collection	
	Port sampling	China does not have a regular port sampling program for the vessels operating in the Indian Ocean except for tuna fishing. However, from 2015 to 2019, China has sampled the catch by light seining.
Comoros *		Since the Diego Star 2 is a mother boat, it is difficult to take an observer on board and to find reliable data therefore it is the small motorized boats which carry out the fishing activities. The main difficulty arises in making observers available for each boat, of which there are 19 today.
Cook is.	Coverage	In 2021, The Cook Islands National Observer Programme (CINOP) experienced issues and restrictions caused by COVID -19. As a result of the COVID-19 outbreak, CINOP was unable to maintain 100% observer trip coverage. and we continued to request an extension of the derogation of paragraph 39(A) of CMM 2020/01 (interim Bottom Fishing Measures). The Cook Island has in addition, requested an extension of this derogation to March 2022.

Flag	Item	Description
	Training	In 2019 MMR had trained two additional Observers from the Pacific Islands Regional Fisheries Observers (PIRFO) Programme to carry out placements on Cook Island vessels.
	Collection	
	Port sampling	Cook Islands vessels unload in either Cape Town or Port Louis. Entry and unloading at port is governed by the relevant Port State authorities under their domestic legislation. The Cook Islands does not have a port sampling programme as sampling is conducted onboard the vessel by the observer.
EU France	Coverage	*No fishing in 2021*
	Training	
	Collection	
	Port sampling	The EU has no port sampling program for vessels fishing within the SIOFA CA.
EU Spain	Coverage	In 2021 a total of two trips out of three have been covered by an on-board observer corresponding 100% of the TOP targeted fishing days and 43% of the fishing days targeting other species from a total of 307 fishing days.
	Training	The scientific observers (Biologist or Marine Science degree) are trained at the Instituto Español de Oceanografía, specific training is also adapted for all fleets that are monitored.
	Collection	
	Port sampling	The EU has no port sampling program for vessels fishing within the SIOFA CA.
France Oversea Territories	Coverage	100% trip coverage (100% coverage within hauls, 25% coverage for birds)
	Training	The FR-OT observer program is described in info-paper (WHSOP1-INFO-06-French-Observer-program.pdf). This document describes the French observer program, current update is October 2021 according to the SIOFA's CMM. This report includes summary sections covering observer training, program design and coverage, and type of data collected. During the previous calendar year, no problems are encountered in the of the observer program implementation report. All the data collecting by the observer program are provide to the secretariat following the CMM 2021-02. Biological sampling and length composition of catches is provided to the secretariat through the annual data submission. No specific analyse is conduct in this report. The observation programme follows the guidelines in Annex 4, on 'Function and tasks of the scientific observer' and Annex 5, on 'Protocol for documenting whale interaction in deep-sea demersal longline fisheries.
	Collection	
	Port sampling	In order to keep track of the catch: species and area where the fish were caught are reported on every single box containing the fish to be landed for commercial purposes. An independent company of experts based in La Réunion island is tasked to weigh a second time (the first time being on the factory of the ship at sea) all the fish boxes and report the exact weight for each combination of area, species and product. Those data are then used to correct the weights collected at sea. For Patagonian toothfish, an official DCD (*Dissostichus* Catch Document) from CCAMLR is produced at the scale of each trip and contains all needed information on species, products and areas including SIOFA.
Japan	Training	In accordance with Article 30, CMM 2016/01 (SIOFA interim observer program), Japan started the observer program from January 2017 (for details, see National Report of Japan in 2017, SIOFA-2017-SC02-04 (05)). This program is based on the Japanese scientific observer program for bottom trawl fisheries in North Pacific Fisheries Commission (NPFC) CA. The scientific observers collect items listed in Annex B, CMM2017/02, CMM2018/02, CMM2019/02, and CMM 2021/02, i.e., catch by species, effort, biological data, bycatch information by species including VME indicator species, non-target species (sharks, seabird, marine mammals, reptiles and other species of concern) and other requested information.
	Collection	

Flag	Item	Description
	Coverage	The observers are deployed to all operating vessels, and they cover all activities in fishing operations (100% coverage) since 2017.
	Port sampling	There are no port sampling programs in Japan.
Korea*	Training	Korean scientific observer program for distant water fisheries started in 2002. National Institute of Fisheries Science (NIFS) is responsible for implementing and developing the observer program. The qualification for a person to be an observer is: a person who is a college graduate whose major field is nature science, or else, a fisheries high school graduate who accompanies at least 2-year experience on board having a certificate of qualification to deck officer. Candidates for observer who have passed the paper review (including medical check-up) and oral interview have to take training programs for 3 weeks. Observer training programs include basic safety training for seafaring, operations of navigation devices, biological information training for target and non-target species and data collection method for fishing activities. During the training program they have two types of tests. One is the test on a technical term of fisheries and biology, and the other is the test on species identification. The person who scored above 70 in both tests and attended 100% of the course timetable can be qualified and deployed on board as a scientific observer. NIFS trains observers again before dispatching them to each RFMO area. The training includes the conservation and management measure of each RFMO, how to collect the data and sample, specific task needs to be done and more.
	Coverage	No fishing in 2021
Mauritius		*no information provided*
Seychelles		*no fishing*
Chinese Taipei	Training Collection	For purposes of collecting fisheries data and bycatch data, Taiwan launched the pilot observer program in 2001 and deployed observers on vessels fishing in the Indian Ocean commenced in 2002. Our observer program had received interim authorization in 2009 and received full authorization after auditing in November 2011 and October 2017, respectively. The forms used in our observer program are fully conformed to the standards set by WCPFC which include the fishing activities, catch number and weight, species identification, bycatch species and status. In addition, length frequency of major species and the sighting and incidental catch of ecological species were recorded, and biological samplings were collected for biological research. To fulfil the obligation of distant waters fishing state, the observer data has been provided to t-RFMOs, including CCSBT, IATTC, ICCAT and WCPFC, per their requirements, and the trip reports of individual observer of the Indian Ocean has been submitted to IOTC per its resolution on regional observer program.
	Coverage	In 2021, there were 6,921 fishing day observed by 43 observers dispatched to Taiwanese tuna longline vessels operating in the Indian Ocean. The observer coverage rate of Taiwanese oilfish longline fishery from 2017 to 2021 were summarised in Table 6 which ranges between 5.94% to 15.49% and it should be noted that the observer coverage rate of 2021 is still in preliminary.
	Port sampling	A port sampling program has conducted in domestic ports to collect the size data of tuna and tuna-like species.
Thailand	Training	The training course for observer contained 11 modules of essential fisheries observer principle based on the FAO Guidelines for Developing an at Sea Fisheries Observer Program. These included the Basic Training of Seaman, Fisheries Management, Legal and Policy Framework, Health and Safety, Code of Conduct for Observers, Fishing Vessels and Gears, Data Collection, Recording Forms and Documents, Navigation, Radio Communication and Shipboard Training.

Flag	Item	Description
	Coverage	- Vessels using trawl gear must have onboard observer coverage for the entire duration of the trip (100% coverage). - Vessels using any other bottom fishing gear types must have onboard observer for 20% of operation in any calendar year. - 100% transhipment observer coverage.
	Collection	Duties of observer: - Observe and collect biological information, including catch composition sampling of the transhipped aquatic animal, and other activities such as sorting, processing, or observe several parts onboard the vessel, fish hold, wheelhouse and technology of fishing gears. - Record biological information or data related to the conduct of the conservation and management measures in the format defined by the Department of Fisheries, composition, number of bycatch or discard, type of fishing gear, mesh size, fishing logbook, transhipment, etc. as well as co-signing in the transhipment report by observer, fishing vessel and transhipment vessel
	Port sampling	Port inspector will inspect the documentation and physical checks on board for port in –port out permission and the video recorded by the EM will be inspected by port inspector prior to authorize to unloading. Besides, the Thai authorities will also carry out the catch landing inspection when porting in for reliability and accuracy of information on landed fish before entering the supply chain. During this process, catch weight is verified with landing declaration documents, such as fishing logbook, fishing gears and Marine Catch Transhipment Document (MCTD) in the case of transhipments.

*Sourced from the 2020 National Report

10. Summary of observer biological sampling

The SIOFA Observer programme aims to cover as much of the fisheries operations as feasible under the operational and financial constraints of fishing in the high seas.

10.1 Length measurements for main target species

The length of some of the main target species of fisheries in the SIOFA area (see Appendix A) is measured by observers and reported both in the SIOFA Observer database and in national reports. Table 7 summarizes the number of individuals of each species that were measured by the observer programmes.

In order to provide an estimate of the fraction (%) of the catch that was measured in each year by the programme, average individual weights were calculated for each species where data was available. Total catch was then divided by this average weight to estimate the total number of individuals caught per each species. Finally, the fraction of the catch measured was obtained as the ratio of the number of measured individuals and the total number individuals caught.

Table 7 – Summary of the number of fish of SIOFA main target species measured by scientific observers in 2013–2020 for length, and their fraction of their total catch (sources: SIOFA Observer database 2013–2020,

Cook Island 2020 data, and Chinese Taipei National Report 2020). The fraction of the catch measured (%, 2 decimals precision) was derived considering the average weight of an individual measured in every given year. N/A marks years/species for which a given measure or ratio was not available.

	Alfonsinos		Oilfish		Orange roughy		Patagonian toothfish	
Year	N. of individuals measured	% of catch measured	N. of individuals measured	% of catch measured	N. of individuals measured	% of catch measured	N. of individuals measured	% of catch measured
2013	990	0.02	N/A	N/A	32	0.00	N/A	N/A
2014	792	0.03	N/A	N/A	283	0.07	N/A	N/A
2015	500	0.02	14	0.01	N/A	N/A	N/A	N/A
2016	9608	0.33	10	0.00	N/A	N/A	N/A	N/A
2017	39863	N/A	12558	N/A	N/A	N/A	792	6.07
2018	24014	1.40	87933	N/A	9727	3.22	254	0.37
2019	32245	1.24	59919	12.56	9605	N/A	4955	15.06
2020	22923	0.80	75990	30.03	11626	N/A	5564	25.92

10.2 Length measurements of non-target species

Table 8 summarises the number of individuals measured for other non-target species of fish, when at least 40 measures had been recorded.

Table 8 – Summary of the number of fish of SIOFA non-target target species measured for length by scientific observers in 2013–2020. Only species where at least 40 individuals have been measured are included (sources: SIOFA Observer database 2013–2020, Chinese Taipei and Cook Islands National Reports 2020).

Species Code	English Name	Scientific Name	2013	2014	2015	2016	2017	2018	2019	2020	Total
ALL	Warty dory	*Allocyttus verrucosus*								12	80
ANT	Blue antimora	*Antimora rostrata*					316		658	1162	2648
AVR	Green jobfish	*Aprion virescens*							515	171	686
BAR	Barracudas nei	*Sphyraena spp*							73	4	77
BRF	Blackbelly rosefish	*Helicolenus dactylopterus*							105	350	455
BWA	Bluenose warehou	*Hyperoglyphe antarctica*	61	34		5		1	9	141	299
BYR	Kerguelen sandpaper skate	*Bathyraja irrasa*					6		22	18	468
CDL	Cardinal fishes nei	*Epigonus spp*									148
CGZ	Conger eels nei	*Conger spp*								292	292
COX	Conger eels, etc. nei	*Congridae*							99		111
CVY	Grenadiers, whiptails nei	*Coryphaenoides spp*							1	37	612
DCC	Shortfin scad	*Decapterus macrosoma*							3052	1014	4066
DCK	Redtail scad	*Decapterus kurroides*							606	109	715
DOP	Shortnose spurdog	*Squalus megalops*								81	81
EDR	Pelagic armourhead	*Pseudopentaceros richardsoni*	42	56		338	1650	13		87	2923
EMN	Marbled coralgrouper	*Plectropomus punctatus*							96	65	161
EMT	Bonnetmouths, rubyfishes nei	*Emmelichthyidae*								4	59
EPI	Black cardinal fish	*Epigonus telescopus*	68	210						16	666
FIT	Flutemouth	*Fistularia spp*							202	161	363
GEP	Snake mackerels, escolars nei	*Gempylidae*				50					50
GES	Snake mackerel	*Gempylus serpens*									522
GOX	Goatfishes	*Upeneus spp*							420		420
GRV	Grenadiers nei	*Macrourus spp*					279	27	12	517	1005
GUQ	Leafscale gulper shark	*Centrophorus squamosus*							272	346	795
HYD	Ratfishes nei	*Hydrolagus spp*							58	212	270

Species Code	English Name	Scientific Name	2013	2014	2015	2016	2017	2018	2019	2020	Total
IWX	Coralgroupers nei	*Plectropomus spp*							120	52	172
JAX	Jack and horse mackerels nei	*Trachurus spp*		110		50					160
KZJ	Delagoa threadfin bream	*Nemipterus bipunctatus*							5803	8558	14361
LEN	Smalltooth emperor	*Lethrinus microdon*								110	110
LIB	Brushtooth lizardfish	*Saurida undosquamis*							6056	5327	11383
LJB	Two-spot red snapper	*Lutjanus bohar*							205	225	430
LJG	Humpback red snapper	*Lutjanus gibbus*							198	259	457
LUB	Emperor red snapper	*Lutjanus sebae*							13	105	118
LZX	(blank)	*Lethrinus spp*							196	44	240
MAX	Mackerels nei	*Scombridae*									66
MCH	Bigeye grenadier	*Macrourus holotrachys*					150	60	1183	1339	3263
MOR	Moras nei	*Moridae*								6	67
MSN	Bathypelagic rattail	*Mesobius antipodum*									54
NGU	Yellowspotted trevally	*Carangoides fulvoguttatus*							231	3306	3537
NGX	(blank)	*Carangoides spp*							1851	490	2341
ONV	Spiky oreo	*Neocyttus rhomboidalis*	43	427							990
OPH	Cusk-eels, brotulas nei	*Ophidiidae*								107	111
QMC	Caml grenadier	*Macrourus caml*								63	63
QUK	Shortspine spurdog	*Squalus mitsukurii*							13	65	78
RIB	Common mora	*Mora moro*		51			20	8	687	701	2501
ROK	Rosefishes nei	*Helicolenus spp*					20	26	1	180	259
RUS	Indian scad	*Decapterus russelli*							8457	13511	21968
RYG	Rubyfish	*Plagiogeneion rubiginosum*	20	353		50			1		908
SDC	Basketwork eel	*Diastobranchus capensis*					73			3	91
SDU	Arrowhead dogfish	*Deania profundorum*								112	112
SEY	Violet warehou	*Schedophilus velaini*	616	560	89	519		1	59	160	2721
SFS	Silver scabbardfish	*Lepidopus caudatus*									126
SSO	Smooth oreo dory	*Pseudocyttus maculatus*		82							149

Species Code	English Name	Scientific Name	2013	2014	2015	2016	2017	2018	2019	2020	Total
SVY	Cutthroat eels nei	*Synaphobranchidae*							90	325	415
SYW	Variegated lizardfish	*Synodus variegatus*							101	85	186
TBE	Terebellum conch	*Terebellum terebellum*									68
WGR	Whitson's grenadier	*Macrourus whitsoni*								159	159
WHA	Hapuku wreckfish	*Polyprion oxygeneios*	10	6		136		10	24	527	820
WRF	Wreckfish	*Polyprion americanus*	1			96		32	111	1951	2195
YTC	Yellowtail amberjack	*Seriola lalandi*	8			20				23	66

10.3 Biological sampling of sharks

Non-target species of fish in the catch are also measured in the observer programme. Table 9 provides a summary of the number of sharks (as defined in Appendix B for the purpose of this overview) individuals measured in recent years.

In the case of sharks, given the differences in body size across the different species measures within this broad category, it was not possible to reasonably estimate the fraction of total catch that was measured for length.

Table 9 – Summary of the number of fish of SIOFA sharks measured for length by scientific observers in 2013–2020 (sources: SIOFA Observer database 2012–2020, Cook Island 2020 data, and Chinese Taipei National Report 2020). See Appendix B for a list of sharks, defined for the purpose of this overview.

Year	N. of sharks measured
2013	12
2014	11
2015	
2016	
2017	189
2018	7
2019	8882
2020	6214

10.3.1 Biological sampling of deep-water sharks species at high risk and of concern

Table 10 focuses on the number of deep-water sharks at "high risk" and "of concern" (as defined in CMM 2019/12, and reported here in Appendix C for easier reference) that have been sampled in 2019 and 2020.

Table 10 – Number of deep-water sharks at "high risk" (in bold) and "of concern" (as defined in CMM 2019/12, and reported here in Appendix C for easier reference) that have been sampled by scientific observers in 2019 (top) and in 2020 (bottom) (source: SIOFA Observer database 2019-2020).

2019					
FAO code	English Name	Scientific Name	Maturity (n)	Sex (n)	Weight (n)
CYO	Portuguese dogfish	*Centroscymnus coelolepis*	4000	4000	3999
CYP	**Longnose velvet dogfish**	***Centroscymnus crepidater***	8	8	8
CYU	**Plunket shark**	***Centroscymnus plunketi***	1	1	1
DCA	**Birdbeak dogfish**	***Deania calcea***	27	27	27
ETM	Southern lanternshark (Lucifer)	*Etmopterus granulosus*	2399	2399	2399
GUP	Gulper shark	*Centrophorus granulosus*	162	162	162
HOL	Chimaeras, etc. nei	*Chimaeriformes*	42	42	42
RFA	Whiteleg skate	*Amblyraja taaf*	56	95	505
SCK	**Kitefin shark**	***Dalatias licha***	26	26	26

2019					
FAO code	**English Name**	**Scientific Name**	**Maturity (n)**	**Sex (n)**	**Weight (n)**
SHL	Lanternsharks nei	*Etmopterus spp*	1653	1654	1654
SKA	Raja rays nei	*Raja spp*			19
SSQ	Velvet dogfish	*Scymnodon squamulosus*	2	2	2
2020					
FAO code	**English Name**	**Scientific Name**	**Maturity (n)**	**Sex (n)**	**Weight (n)**
CYO	Portuguese dogfish	*Centroscymnus coelolepis*	2453	2454	2454
CYP	**Longnose velvet dogfish**	***Centroscymnus crepidater***	36	36	36
DCA	**Birdbeak dogfish**	***Deania calcea***	292	292	292
ETP	Smooth lanternshark	*Etmopterus pusillus*		1	1
GUP	Gulper shark	*Centrophorus granulosus*	197	197	197
RFA	Whiteleg skate	*Amblyraja taaf*		846	650
SCK	**Kitefin shark**	***Dalatias licha***	275	275	275
SHL	Lanternsharks nei	*Etmopterus spp*	1976	1976	1976
SKA	Raja rays nei	*Raja spp*		130	130
SOR	Little sleeper shark	*Somniosus rostratus*	5	5	5
SSQ	Velvet dogfish	*Scymnodon squamulosus*	2	2	2

10.4 Biological samplings performed in 2020

Besides length, other biological measures are taken in the SIOFA observer programme. These include measures of maturity stage, sex and weight. Table 11 displays the number of individuals for which other biological records were conducted in 2020.

Table 11 – Summary of the number of fish that have been sampled for maturity, sex, and weight by scientific observers in 2020 (source SIOFA Observer database 2020). Other 95 species have been sampled but accounted for less than 10 individuals in total and thus were not reported in this table.

FAO code	Common Name	Scientific Name	Maturity (n)	Sex (n)	Weight (n)
ALL	Warty dory	*Allocyttus verrucosus*			12
ANT	Blue antimora	*Antimora rostrata*	5	285	763
API	Deep-water catsharks	*Apristurus spp*	14	14	16
AVR	Green jobfish	*Aprion virescens*			171
BEA	Eaton's skate	*Bathyraja eatonii*	4	12	12
BGX	(blank)	*Pomadasys spp*			21
BIG	Bigeyes nei	*Priacanthus spp*			21
BIS	Bigeye scad	*Selar crumenophthalmus*			88
BRF	Blackbelly rosefish	*Helicolenus dactylopterus*			350
BWA	Bluenose warehou	*Hyperoglyphe antarctica*		94	131
BXD	Alfonsino	*Beryx decadactylus*	16	60	398
BYR	Kerguelen sandpaper skate	*Bathyraja irrasa*	13	18	18
CGZ	Conger eels nei	*Conger spp*			292
CLD	Sliteye shark	*Loxodon macrorhinus*			22
COE	European conger	*Conger conger*			16
CRS	Portunus swimcrabs nei	*Portunus spp*			40
CVY	Grenadiers, whiptails nei	*Coryphaenoides spp*	6	22	22
CWZ	Carcharhinus sharks nei	*Carcharhinus spp*	8	9	14
CYO	Portuguese dogfish	*Centroscymnus coelolepis*	2453	2454	2454
CYP	Longnose velvet dogfish	*Centroscymnus crepidater*	36	36	36
CZL	(blank)	*Coryphaenoides lecointei*	12	12	12
DCA	Birdbeak dogfish	*Deania calcea*	292	292	292
DGZ	Dogfishes nei	*Squalus spp*	26	26	26

FAO code	Common Name	Scientific Name	Maturity (n)	Sex (n)	Weight (n)
DOP	Shortnose spurdog	*Squalus megalops*	81	81	81
EDR	Pelagic armourhead	*Pseudopentaceros richardsoni*		10	87
EMN	Marbled coralgrouper	*Plectropomus punctatus*			65
EMU	Roving coralgrouper	*Plectropomus pessuliferus*			12
ENE	Cape armourhead	*Pentaceros capensis*			19
EPI	Black cardinal fish	*Epigonus telescopus*			16
FIP	Red cornetfish	*Fistularia petimba*			23
FIT	Flutemouth	*Fistularia spp*			59
GER	Chaceon geryons nei	*Chaceon spp*		14	14
GOX	Goatfishes	*Upeneus spp*			49
GRV	Grenadiers nei	*Macrourus spp*	5	356	143
GUP	Gulper shark	*Centrophorus granulosus*	197	197	197
GUQ	Leafscale gulper shark	*Centrophorus squamosus*	346	346	346
GUX	Gurnards, searobins nei	*Triglidae*			16
HXT	Sharpnose sevengill shark	*Heptranchias perlo*	39	39	39
HYD	Ratfishes nei	*Hydrolagus spp*	188	212	212
IAX	Cuttlefishes nei	*Sepia spp*			17
IWX	Coralgroupers nei	*Plectropomus spp*			52
KCZ	King crabs nei	*Lithodes spp*	5	17	17
LEF	Lefteye flounders nei	*Bothidae*			31
LEN	Smalltooth emperor	*Lethrinus microdon*			112
LFX	(blank)	*Lagocephalus spp*			10
LHO	Longface emperor	*Lethrinus olivaceus*			23
LJB	Two-spot red snapper	*Lutjanus bohar*			225
LJG	Humpback red snapper	*Lutjanus gibbus*			259
LLV	Lunartail puffer	*Lagocephalus lunaris*			10
LUB	Emperor red snapper	*Lutjanus sebae*			108
LZX	(blank)	*Lethrinus spp*			54
MCH	Bigeye grenadier	*Macrourus holotrachys*	110	110	1339
NGU	Yellowspotted trevally	*Carangoides fulvoguttatus*			3309
NGX	(blank)	*Carangoides spp*			514
NGY	Bludger	*Carangoides gymnostethus*			49
OPH	Cusk-eels, brotulas nei	*Ophidiidae*			107
PQY	Purple-spotted bigeye	*Priacanthus tayenus*			68
PRP	Roudi escolar	*Promethichthys prometheus*			12
PUX	Puffers nei	*Tetraodontidae*			23
QMC	Caml grenadier	*Macrourus caml*	63	63	63
QUK	Shortspine spurdog	*Squalus mitsukurii*	65	65	65
RAG	Indian mackerel	*Rastrelliger kanagurta*			51
RFA	Whiteleg skate	*Amblyraja taaf*		846	650
RIB	Common mora	*Mora moro*			701
ROK	Rosefishes nei	*Helicolenus spp*		13	180
RUS	Indian scad	*Decapterus russelli*			19
SCK	Kitefin shark	*Dalatias licha*	275	275	275
SCO	Scorpionfishes nei	*Scorpaenidae*			15
SDU	Arrowhead dogfish	*Deania profundorum*	112	112	112
SEY	Violet warehou	*Schedophilus velaini*		89	125
SHL	Lanternsharks nei	*Etmopterus spp*	1976	1976	1976
SKA	Raja rays nei	*Raja spp*		130	130
SQZ	Inshore squids nei	*Loliginidae*			11
SVY	Cutthroat eels nei	*Synaphobranchidae*			325
TOA	Antarctic toothfish	*Dissostichus mawsoni*	12	12	12
TOP	Patagonian toothfish	*Dissostichus eleginoides*	5422	5430	5307
UAZ	Thorny flathead	*Rogadius pristiger*			28
UPM	Goldband goatfish	*Upeneus moluccensis*			72
URA	Stargazers	*Uranoscopus spp*			27
VRL	Yellow-edged lyretail	*Variola louti*			11
WGR	Whitson's grenadier	*Macrourus whitsoni*	159	159	159
WHA	Hapuku wreckfish	*Polyprion oxygeneios*	94	321	435

FAO code	Common Name	Scientific Name	Maturity (n)	Sex (n)	Weight (n)
WRF	Wreckfish	*Polyprion americanus*	777	1226	1865
YBS	Bigeye barracuda	*Sphyraena forsteri*			33
YRB	Obtuse barracuda	*Sphyraena obtusata*			46
YTC	Yellowtail amberjack	*Seriola lalandi*		20	13

10.5 Patagonian toothfish tags releases and recaptures

Observers also record the number of toothfish tags released and recovered in the Patagonian toothfish fishery (Table 12).

Table 12 – Summary of Patagonian toothfish tag releases and recaptures in the SIOFA area (source: SIOFA Observer database 2019-2021). Data for 2021 is still preliminary.

Subarea	Year					
	2019		**2020**		**2021**	
	Released	**Recaptured**	**Released**	**Recaptured**	**Released**	**Recaptured**
Subarea 3b	-	-	-	3	79	1
Subarea 7	-	1	175	1	4	-

11. References

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Cordue, P. L. 2018b. Stock assessment of orange roughy in the Walter's Shoal Region. SIOFA, Saint-Denis, Reunion.

FAO. 2009. International Guidelines for the Management of Deep-sea Fisheries in the High Seas. Page 90. Rome, Italy.

Appendix A – List of species reported as targets in SIOFA fisheries and considered as target species for the purposes of this overview

FAO Code	Common name	Scientific name
BWA	Bluenose warehou	*Hyperoglyphe antarctica*
BYS	Splendid alfonsino	*Beryx splendens*
CDL	Cardinal fishes nei	*Epigonus spp*
DPX	Demersal percomorphs nei	*Perciformes*
EDR	Pelagic armourhead	*Pseudopentaceros richardsoni*
EMP	Emperors(=Scavengers) nei	*Lethrinidae*
EPI	Black cardinal fish	*Epigonus telescopus*
GPX	Groupers nei	*Epinephelus spp*
GRO	Groundfishes nei	*Actinopterygii*
HAU	Hapuka	*Polyprion spp*
LEC	Escolar	*Lepidocybium flavobrunneum*
LHN	Spangled emperor	*Lethrinus nebulosus*
NGX		*Carangoides spp*
OIL	Oilfish	*Ruvettus pretiosus*
ORY	Orange roughy	*Hoplostethus atlanticus*
RYG	Rubyfish	*Plagiogeneion rubiginosum*
SEY	Violet warehou	*Schedophilus velaini*
SNA	Snappers nei	*Lutjanus spp*
SSO	Smooth oreo dory	*Pseudocyttus maculatus*
TOP	Patagonian toothfish	*Dissostichus eleginoides*
TUN	Tunas nei	*Thunnini*
WRF	Wreckfish	*Polyprion americanus*

Appendix B – Common names, FAO species codes, and scientific names of sharks, defined for the purpose of this overview

FAO code	FAO common name	Scientific name
ALS	Silvertip shark	*Carcharhinus albimarginatus*
ASK	Angelsharks, sand devils nei	*Squatinidae*
BHY	Bathyraja rays nei	*Bathyraja spp*
BSH	Blue shark	*Prionace glauca*
BYR	Kerguelen sandpaper skate	*Bathyraja irrasa*
CAR	Cartilaginous fishes nei	*Chondrichthyes*
CLD	Sliteye shark	*Loxodon macrorhinus*
CVX	Ground sharks	*Carcharhiniformes*
CWM		*Chimaera spp*
CWO	Gulper sharks nei	*Centrophorus spp*
CWZ	Carcharhinus sharks nei	*Carcharhinus spp*
CYO	Portuguese dogfish	*Centroscymnus coelolepis*
CZI		*Centroscymnus spp*
DCA	Birdbeak dogfish	*Deania calcea*
DGX	Dogfish sharks nei	*Squalidae*
DGZ	Dogfishes nei	*Squalus spp*
DOP	Shortnose spurdog	*Squalus megalops*
ETE		*Etmopterus compagnoi*
ETF	Blackbelly lanternshark	*Etmopterus lucifer*
ETM	Southern lanternshark(Lucifer)	*Etmopterus granulosus*
GTF	Guitarfishes, etc. nei	*Rhinobatidae*
GUP	Gulper shark	*Centrophorus granulosus*
GUQ	Leafscale gulper shark	*Centrophorus squamosus*
HAG	Mud catshark	*Halaelurus lutarius*
HCM	Hooktooth shark	*Chaenogaleus macrostoma*
HOL	Chimaeras, etc. nei	*Chimaeriformes*
HXT	Sharpnose sevengill shark	*Heptranchias perlo*
JFB	Bigmouth skate	*Raja robertsi*
NTC	Broadnose sevengill shark	*Notorynchus cepedianus*
ORZ	Tawny nurse shark	*Nebrius ferrugineus*
PTM	False catshark	*Pseudotriakis microdon*
QUK	Shortspine spurdog	*Squalus mitsukurii*
RAJ	Rays and skates nei	*Rajidae*
RBI		*Rhinobatos irvinei*
RBY	Butterfly rays nei	*Gymnura spp*
RFA	Whiteleg skate	*Amblyraja taaf*
RME	Longhorned mobula	*Mobula eregoodootenkee*
RMV	Mobula nei	*Mobula spp*
RRY	Bowmouth guitarfish	*Rhina ancylostoma*
RSK	Requiem sharks nei	*Carcharhinidae*
RTE	Round ribbontail ray	*Taeniura meyeni*
RYE	Ornate eagle ray	*Aetomylaeus vespertilio*
RZZ	Southern sleeper shark	*Somniosus antarcticus*

FAO code	FAO common name	Scientific name
SBL	Bluntnose sixgill shark	*Hexanchus griseus*
SCK	Kitefin shark	*Dalatias licha*
SDV	Smooth-hounds nei	*Mustelus spp*
SHL	Lanternsharks nei	*Etmopterus spp*
SKA	Raja rays nei	*Raja spp*
SKH	Various sharks nei	*Selachimorpha (Pleurotremata)*
SKX	Sharks, rays, skates, etc. nei	*Elasmobranchii*
SMA	Shortfin mako	*Isurus oxyrinchus*
SON	Pacific sleeper shark	*Somniosus pacificus*
SOR	Little sleeper shark	*Somniosus rostratus*
SPK	Great hammerhead	*Sphyrna mokarran*
SPN	Hammerhead sharks nei	*Sphyrna spp*
SRX	Rays, stingrays, mantas nei	*Rajiformes*
SUN	Ocellated angelshark	*Squatina tergocellatoides*
TIG	Tiger shark	*Galeocerdo cuvier*

Appendix C – List of deep-sea sharks considered to be at "high risk" and "of concern" is included in Annex 1 of SIOFA CMM 2019/12 (Conservation and Management Measure for Sharks)

Species considered to be at "high risk" are highlighted in bold. Note that

FAO code	Common name	French common name	Scientific name
APD	Smallbelly catshark	Holbiche artouca	*Apristurus indicus*
BZL	Narrowhead catshark		*Bythaelurus tenuicephalus*
BZO	Bach's catshark		*Bythaelurus bachi*
CYO	Portuguese dogfish	Pailona commun	*Centroscymnus coelolepis*
CYP	**Longnose velvet dogfish**	**Pailona à long nez**	***Centroscymnus crepidater***
CYU	**Plunket shark**	**Pailona austral**	***Centroscymnus plunketi***
DCA	**Birdbeak dogfish**	**Squale savate**	***Deania calcea***
ETP	Smooth lanternshark	Sagre nain	*Etmopterus pusillus*
EZU	Whitecheek lanternshark		*Etmopterus alphus*
GUP	Gulper shark	Squale-chagrin commun	*Centrophorus granulosus*
HCR	Pacific longnose chimaera	Chimère à nez rigide	*Harriotta raleighana*
HXC	Frilled shark	Requin lézard	*Chlamydoselachus anguineus*
HXN	Bigeyed sixgill shark	Requin-vache	*Hexanchus nakamurai*
LMO	Goblin shark	Requin lutin	*Mitsukurina owstoni*
SCK	**Kitefin shark**	**Squale liche**	***Dalatias licha***
SON	Pacific sleeper shark	Laimargue dormeur	*Somniosus pacificus*
SSQ	**Velvet dogfish**		***Zameus squamulosus***
ZZC	Dark-mouth chimaera		*Chimaera buccanigella*
ZZD	Falkor chimaera		*Chimaera didierae*
ZZE	Seafarer's ghost shark		*Chimaera willwatchi*