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Southern Indian Ocean Fisheries Agreement

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

Overview of SIOFA Fisheries 2025

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Prepared by the SIOFA Secretariat

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Contents

Summary of updates in the 2025 version:

- Catch and Effort data is presented for the last 10 years in the series (2014–2023) and Observer data for the last 20 years (2004-20023), previous data will remain available in older reports but is not showcased here.
- Included additional historical data, deriving from a review of the activities of the Spanish fleet in 2001–2017.
- Figures updated to be color-blind friendly, wherever possible, mostly using the Okabe-Ito color scale (Okabe & Ito 2008, "Color Universal Design (CUD): How to Make Figures and Presentations That Are Friendly to Colorblind People." http://jfly.iam.u-tokyo.ac.jp/color/) or other high-contrast color scales.
- Active fleet by gear table (Table 1) updated using the information available in the SIOFA CatchEffort database, rather than the annual reports.
- Main fisheries operating in the SIOFA Area (Table 2) updated using the table that was included in the recently established SIOFA CMM 17(2024).
- Fishing effort by gear (Table 3) updated using the information available in the SIOFA CatchEffort database.
- Flextables used to create auto-updating tables, particularly those nested, where appropriate.
- List of FAO species codes in Appendix A updated, so that it includes overarching species codes (e.g. TOT, ALF etc.), and full list of codes published on GitHub for reference.
- Toothfish Management Areas used instead of Management Units, following more closely the CMM 15 nomenclature.
- A description of the toothfish historical fishing and tagging data in the SIOFA Area by CCAMLR vessels prior to SIOFA included in the corresponding section (confidential).
- Appendix B (list of "sharks" present in the catch record) updated using the available data
- Appendix C (list of sharks at high risk or of concern) revised to align with the updated CMM 12(2024)

1. Purpose of this document

The SIOFA Fisheries Overview is 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 also serves as a description of data available on SIOFA fisheries, which can be used by scientists and consultants alike when evaluating research involving this data.

Fisheries Summaries (e.g., the SIOFA Fisheries Summary: orange roughy (*Hoplostethus atlanticus*) 2023) are being developed for a number of species of interest. Fisheries summaries 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 02(2023), including their FAO codes, is provided in Appendix A. The SIOFA Ecosystem Summary supplements this overview by describing the main areas of work on ecosystems and species conservation within the SIOFA Area.

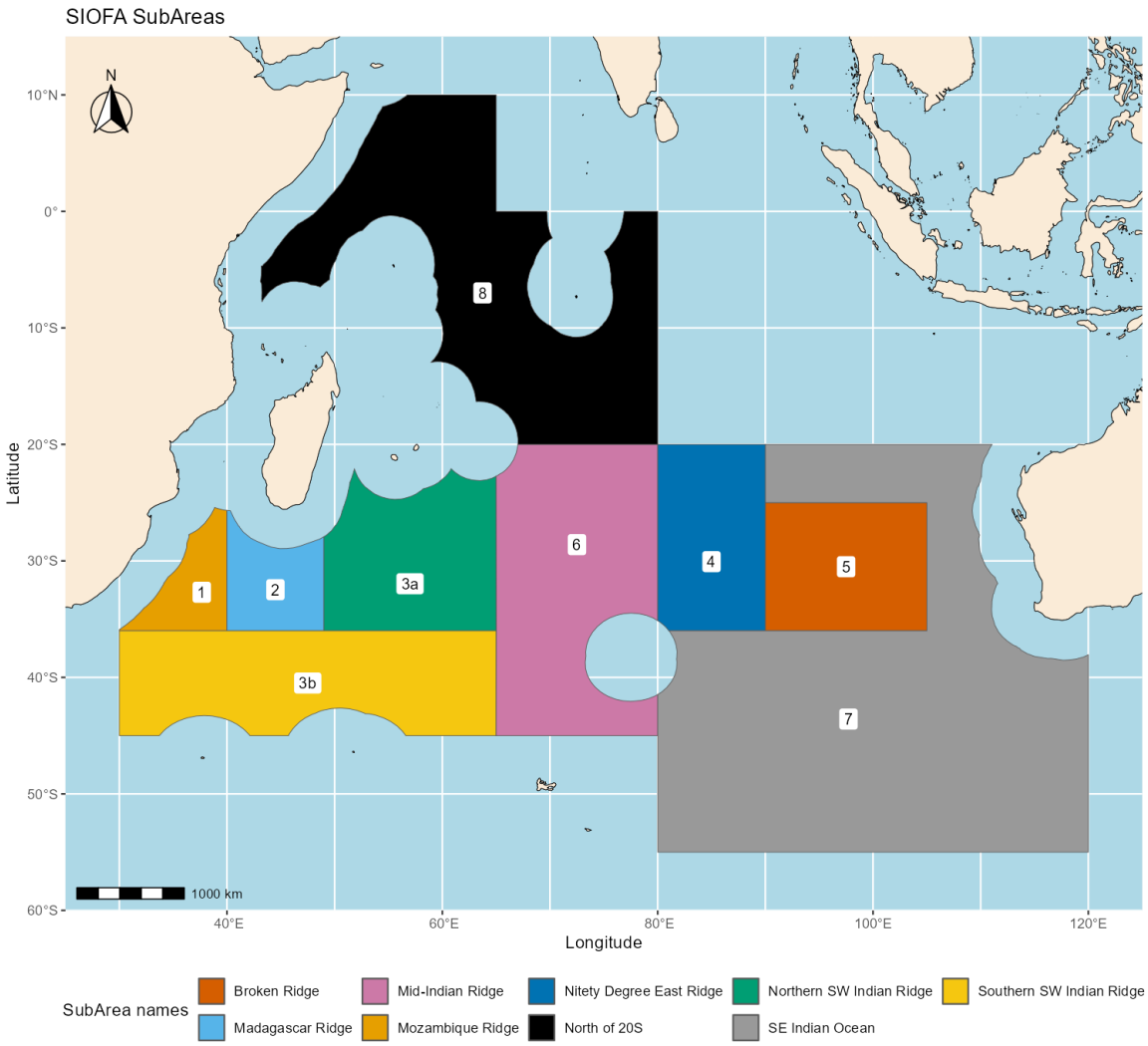

Figure 1 – The SIOFA Area and its Subareas highlighted with different colours (source: SIOFA Spatial database). The Subarea colour code is used consistently to identify Subareas throughout this overview.

2. Data sources and analysis code

2.1 Data availability

There are thirteen CCPs that are members of SIOFA. The SIOFA Secretariat receives data from CCPs pertaining to their fishing activities, biological sampling, and Scientific Observer reports as per CMM 02(2023) (Data Standards). The SIOFA Secretariat acts as custodian for these data on behalf of its members. Request to release or publish these data (e.g., for scientific purposes) are regulated under CMM 03(2016) (Data Confidentiality). Data requests can be made through the SIOFA Secretariat (secretariat@siofa.org).

The main SIOFA databases are:

- 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 2022.
- Observer, which contains Scientific Observer collected biological sampling, observer reported catches, and observed operations data, from 2012 to 2022.

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, Assessment Areas). These have been collected at https://github.com/SIOFASecretariat/SIOFA_SC_Spatial_layers
- Codes, including gear and species codes etc. Some of these have been collected at https://github.com/SIOFASecretariat/FAO-unfied-codes

The main SIOFA databases have been described in the outputs of project SEC2021-05 (see SC-07-08, restricted access), where it was noted that the data was repeated (i.e., overlaps) across the first two databases. A suggestion has been made to further develop the three 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 (2015–2025) that SIOFA CCPs submit to the Scientific Committee every year, which are made publicly available on the SIOFA website (https://siofa.org/meetings/groups/Scientific%20Committee%20Meeting).

2.2 Missing/incomplete/problematic data for the purposes of this report

2024 Catch, Effort and Scientific Observer data are scheduled to be submitted to the Secretariat at the end of May in 2025. Any data more recent than 2023 should be thus considered as draft, potentially incomplete and subject to further revisions, and has therefore been excluded from this report.

Inconsistencies between tows times and positions have been detected in the 2021 and 2022 data from the orange roughy fishery. Similarly, catch weights in the 2023 data from the orange roughy fishery likely contained some errors. Furthermore, small inconsistencies have been identified in the reported trap effort from 2021.

These data were included in this report, but caution should be exercised when interpreting positional data at a fine scale or catches for the most recent year.

While these reports are based on best available data, there might be other data issues that have not been detected and caution is advised when interpreting the results presented.

2.3 Data used in this report

A SIOFA database extract was delivered on 17 September 2024 and used in this report.

The information presented in this report was 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 to data sources have been made in each table/figure caption in the report.

The report is intended to cover the last five years of available data (at a minimum) but note that the data used covers the 2014–2023 period (10 years of data), and that the period covered varies across the different sections as detailed below.

i. Active fleet composition (2014–2023): SIOFA HBHCatchEffort and SIOFA AggregatedCatchEffort databases
ii. Main fisheries (2000–2023): Annex 1 of CMM 17(2024).
iii. Total catches per CCP (2014–2023): SIOFA AggregatedCatchEffort database, combined with SIOFA HBHCatchEffort database.
iv. Catch, Effort (including per Subarea) and discards (2014–2023): SIOFA HBHCatchEffort database, SIOFA AggregatedCatchEffort database and spatial layers (this does not include non-fish catch, see Section 10 for definitions of target catch).
v. VMEs (2004–2023): SIOFA Observer and HBHCatchEffort databases.
vi. Fishing in Interim Protected Areas (2014–2023): SIOFA HBHCatchEffort and Spatial databases
vii. Biological sampling (2014-2023): SIOFA Observer database.
viii. Observer-reported catches (2014-2023): SIOFA Observer database.
ix. Observer coverage (2014-2023): SIOFA Observer database.

2.4 Analysis code

The code that produces all analyses presented in this report is publicly available at https://github.com/SIOFASecretariat/SIOFA_SC_Reports_code

3. Active Fleet Composition

In the SIOFA Area, eight CCPs were fishing over the last three years. Table 1 summarises the number of vessels engaged in fisheries in the SIOFA Area by type of gear employed.

Table 1 – Historical summary of active vessels by CCP and gear in the SIOFA Area (source: SIOFA CatchEffort database 2014–2023). The Thailand fleet was mainly composed of small tonnage vessels. The Chinese Taipei fleet was composed mainly of longliners fishing for tuna and oilfish, but the SIOFA database held no data on the number of active vessels between 2015 and 2017. Korea has had no vessels active in the SIOFA Area since 2014 and Seychelles resumed their fishing in SIOFA in 2023.

Active vessels (number of vessels)											
		Year									
CCP	Gear	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
AUS	Bottom trawls (nei)	1									
AUS	Demersal longlines					1	1			1	
AUS	Dropline					1	1	1			
AUS	Longlines (nei)		1	1							
AUS	Midwater trawls (nei)	1	1	1					1		
AUS	Pots								2		
AUS	Set longlines							2	3		1
CHN	Handlines and hand-operated pole-and-lines										3
CHN	Mechanized lines and pole-and-lines										2
CHN	Midwater trawls (nei)										2
COK	Bottom trawls (nei)							2	2	2	1
COK	Midwater trawls (nei)							2	2	2	1
COK	Trawls (nei)	2	2	2	2	2	2	2			
COM	Handlines and hand-operated pole-and-lines						1	1			
ESP	Gillnets and entangling nets (nei)	1	1								
ESP	Longlines (nei)		1	1	1						
ESP	Set longlines					2	1	1	1	1	1
FR-OT	Longlines (nei)	2	2	1	2		1				
FR-OT	Set longlines							2	1	1	1
FR-OT	Traps (nei)					1					
FR-OT	Vertical lines					1					
FRA	Drifting longlines		1								
FRA	Longlines (nei)	1		1	1						
JPN	Demersal longlines				1						
JPN	Midwater trawls (nei)	1	2	2	2	1	1	1	1	1	1
JPN	Single boat midwater otter trawls			2							
MUS	Handlines and hand-operated pole-and-lines						3	3	2	3	4
MUS	Mechanized lines and pole-and-lines						5	4	2		
SYC	Longlines (nei)										2
TPE	Drifting longlines								48	37	
TPE	Longlines (nei)				44	35	41	40			47
THA	Bottom trawls (nei)										2
THA	Handlines and hand-operated pole-and-lines						2	3	3	2	2
THA	Single boat bottom otter trawls						2	3	3	4	
THA	Traps (nei)		1	1	1						
THA	Trawls (nei)		51	20	12						

4. Main fisheries operating in the SIOFA Area

In the SIOFA Area, only a 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 engaged in the fishery, and the main Subareas where these fisheries were targeted.

Table 2 – Established target species/fisheries in the SIOFA Area, as per Annex 1 of CMM 17(2024) [1]. The table also provides information on gear employed, the CCPs engaged in the fishery, and the main Subareas where these fisheries were targeted.

Targeted [2] species/fisheries	Fishing gear	Participants	Area
Patagonian toothfish	Set longlines, traps	Australia, EU (Spain), France (Overseas Territories), Japan, Korea	Designated fishing footprints of Australia, EU (Spain), Japan, and France (Overseas Territories). SIOFA sub-areas 3b and 7
Orange roughy	Bottom trawl	Australia, Cook Islands, Japan, China, Mauritius	Designated fishing footprints of Australia, Cook Islands, Japan. Underwater topographic features in SIOFA sub-areas 1, 2, 3a, 3b, 4, 5 and 6.
Alfonsino	Midwater trawl	Australia, Cook Islands, Japan, Korea,	Designated fishing footprints of Australia, Cook Islands and Japan. Underwater topographic features in SIOFA sub-areas 1, 2, 3a, 3b, 4, 5 and 6.
Brushtooth lizardfish and scads	Trawl (nei), single boat otter board trawl	Thailand	Designated fishing footprint of Thailand.
Shallow-water (<200m), Carangoides spp., snappers, emperors and groupers	Set longline, hook and line (handlines), bottom trawl, traps	EU (France), Mauritius, Thailand, Comoros	Designated fishing footprint of Thailand. SIOFA sub-area 8 (mainly Saya de Malha Bank)
Deep water (>200m) snappers, lutjanids, hapuka	Set longline, dropline	Australia, China, EU (Spain)	Designated fishing footprints of the EU (Spain) and Australia. SIOFA Subareas 2, 3a, 3b and 4.
Oilfish	Pelagic longline, dropline	Chinese Taipei, Seychelles	Southwest Indian Ocean
Squid	Light Seining, Squid Jigging	China	To be confirmed

[1] Annex 1 may be updated by the Meeting of the Parties upon the advice of the Scientific Committee concerning historical catch data and/or other information submitted by CCPs regarding their targeted fisheries.
[2] As per the endorsed definition adopted by MoP10 (MoP10 Report Para 130).

5. Fishing Effort

Table 3 summarises fishing effort in the SIOFA Area by CCPs. Effort was variable across years and gears, and 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 CatchEffort database 2014–2023). Trawl effort is reported as number of hauls. Longline effort is reported as number of hooks (but note that there is a small proportion of fishing events where number of hooks were not reported). Handlines and mechanized lines effort is reported as number of fishing events/days, because only one CCP reported on the number of fishermen involved in each fishing event. Even though number of pots could have been a more significant measure of effort, these were not available, so trap effort is reported as number of sets.

Trawl effort (number of tows)											
		Year									
CCP	**Gear**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
AUS	Bottom trawls (nei)	30									
AUS	Midwater trawls (nei)	143	25	26					6		
CHN	Midwater trawls (nei)										13
COK	Bottom trawls (nei)							252	262	197	178
COK	Midwater trawls (nei)							868	787	437	909
COK	Trawls (nei)	1 952	2 217	1 355	1 702	1 749	1 537	376			
JPN	Midwater trawls (nei)	211	681	646	734	251	379	198	251	306	303
JPN	Single boat midwater otter trawls			173							
THA	Bottom trawls (nei)										475
THA	Single boat bottom otter trawls						161	462	1 003	982	
THA	Trawls (nei)		4 002	4 515	794						
	Totals	**2 336**	**6 925**	**6 715**	**3 230**	**2 000**	**2 077**	**2 156**	**2 309**	**1 922**	**1 878**

Longlines effort (1000 hooks)											
		Year									
CCP	**Gear**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
AUS	Demersal longlines					24.9	48.3			113.1	
AUS	Dropline					33.7	8.0	5.565			
AUS	Longlines (nei)		1.8	37.8							
AUS	Set longlines							217.200	223.7		31.25
ESP	Longlines (nei)		2 221.2	3 335.8	3 218.9						
ESP	Set longlines					5 431.9	3 477.3	2 509.560	2 772.8	3 864.6	2 837.49
FR-OT	Longlines (nei)	603.5	443.5	1.2	150.8		200.0				
FR-OT	Set longlines							127.800	143.1	216.0	13.50
FR-OT	Vertical lines					30.0					
FRA	Drifting longlines		15.0								
FRA	Longlines (nei)	104.0		492.0	50.0						
JPN	Demersal longlines				60.3						
SYC	Longlines (nei)										391.43
TPE	Drifting longlines								18 876.3	14 773.9	
TPE	Longlines (nei)		8 713.4	21 278.8	25 686.7	19 737.9	22 485.4	17 435.389			19 952.56
	Totals	**707.5**	**11 394.8**	**25 145.6**	**29 166.6**	**25 258.5**	**26 219.0**	**20 295.514**	**22 015.9**	**18 967.7**	**23 226.22**

Hand and mechanized lines effort (fishing events)						
		Year				
CCP	**Gear**	**2019**	**2020**	**2021**	**2022**	**2023**
CHN	Handlines and hand-operated pole-and-lines					3
CHN	Mechanized lines and pole-and-lines					2
COM	Handlines and hand-operated pole-and-lines	16	71			
MUS	Handlines and hand-operated pole-and-lines	259	127	48	187	270
MUS	Mechanized lines and pole-and-lines	150	57	26		
THA	Handlines and hand-operated pole-and-lines	103	134	52	49	80
	Totals	**528**	**389**	**126**	**236**	**355**

Pots and traps effort (sets)						
		Year				
CCP	Gear	2015	2016	2017	2018	2021
AUS	Pots					4
FR-OT	Traps (nei)				4	
THA	Traps (nei)	68	8	10		
	Totals	**68**	**8**	**10**	**4**	**4**

Gillnet effort (km nets)			
		Year	
CCP	Gear	2014	2015
ESP	Gillnets and entangling nets (nei)	4 925	1 109
	Totals	**4 925**	**1 109**

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. A list of species identified by the SIOFA SC as primary and secondary species in SIOFA fisheries, and considered as target species for the purposes of this overview, are listed (along with their FAO species codes) in Appendix A.

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 2a).

The addition of catches from Thailand (THA) (Thailand National report 2015-17) and Chinese Taipei (TPE) is largely responsible for the increase in reported catch in 2015. Thailand catches consisted mostly of scads (*Decapterus spp*.) and lizardfish (*Saurida spp.*) and Chinese Taipei catches consisted of oilfish/escolar from its tuna fishery.

The total catch of high value species (ALF *Beryx* spp., ORY *Hoplostethus atlanticus*, TOT *Dissostichus* spp.), in relation to the total catch of other species is illustrated in Figure 2b.

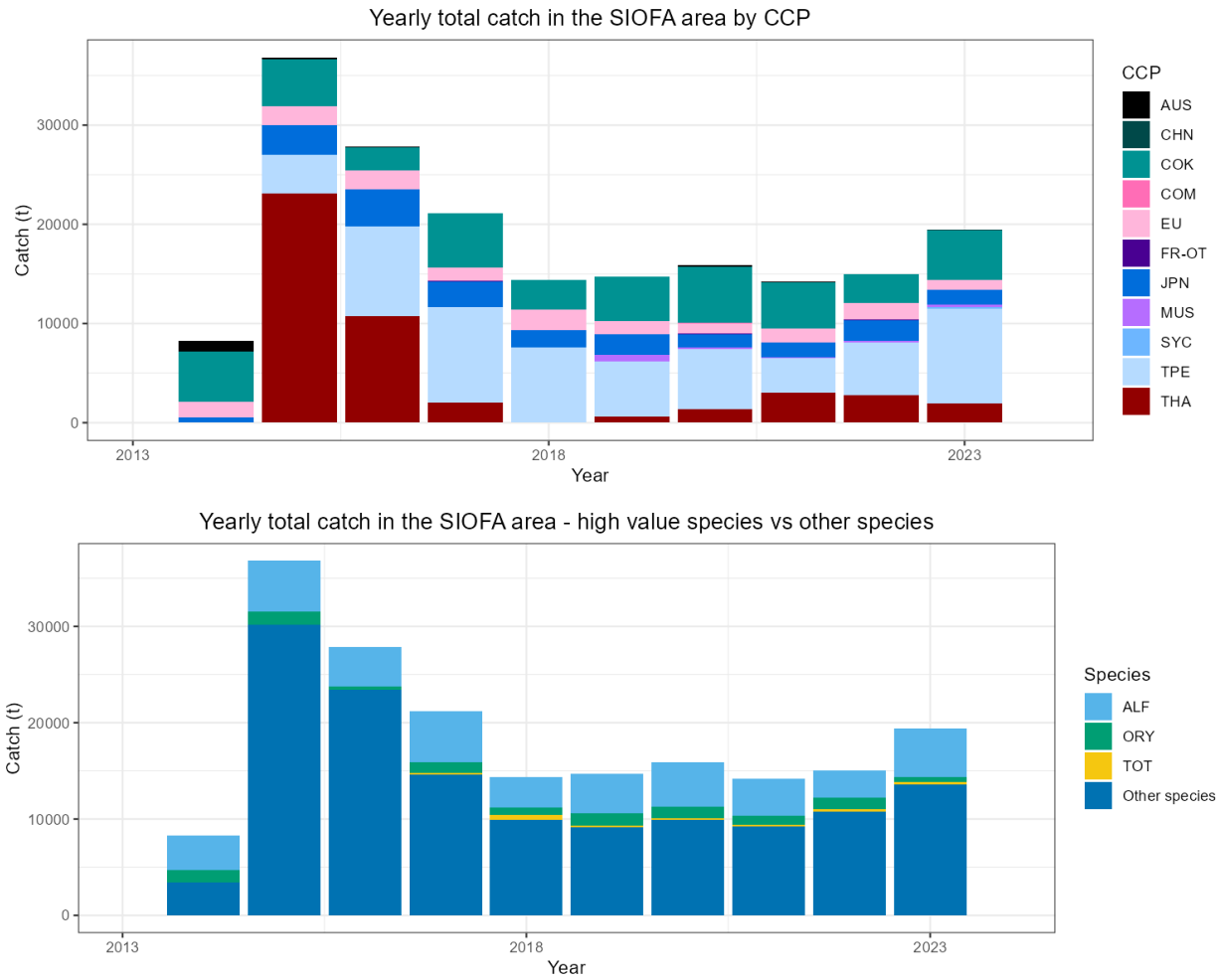

Figure 2a and b – Yearly total catch (t) in the SIOFA Area (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023) by SIOFA CCP (panel a) and by species (panel b) highlighting the primary species as opposed to all other species. All catch included, even without spatial information.

Total catch in 2022 was mostly taken in SIOFA Subareas 1, 2, 3b, and 8, but in 2015-2016 a larger portion of the catch came from Subarea 8 (Figure 3).

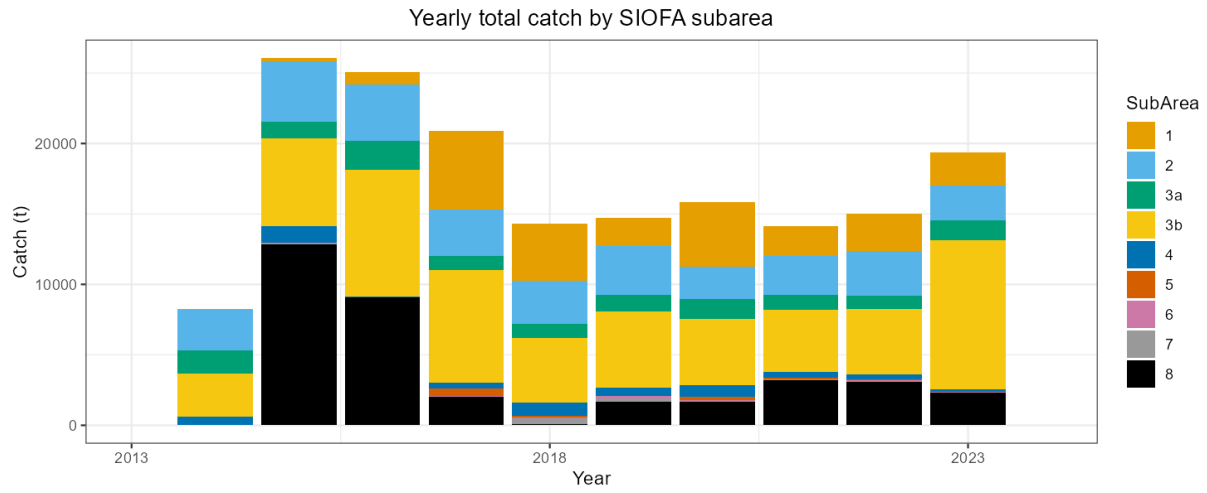

Figure 3 – Total catch reported by SIOFA Subareas (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches without spatial information are not included.

6.2 Fish target catch and bycatch

Fish bycatch commonly refers to the capture of all fish species that were not intended as a target in a given fishing event or, more broadly, in a fishery. All fish species not in the list of species identified by the SIOFA SC as primary and secondary species in SIOFA fisheries, and considered as target species for the purposes of this overview (Appendix A) were considered bycatch.

6.3 Global fish target catch/bycatch

Bycatch constituted a predominant proportion (>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, bycatch was extremely variable across years (Figure 4b).

The figures on bycatch highlight the proportion of “sharks” in the 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 2014–2023 was extracted and used to define “sharks”. The full list of shark taxa captured in SIOFA fisheries is provided in Appendix B.

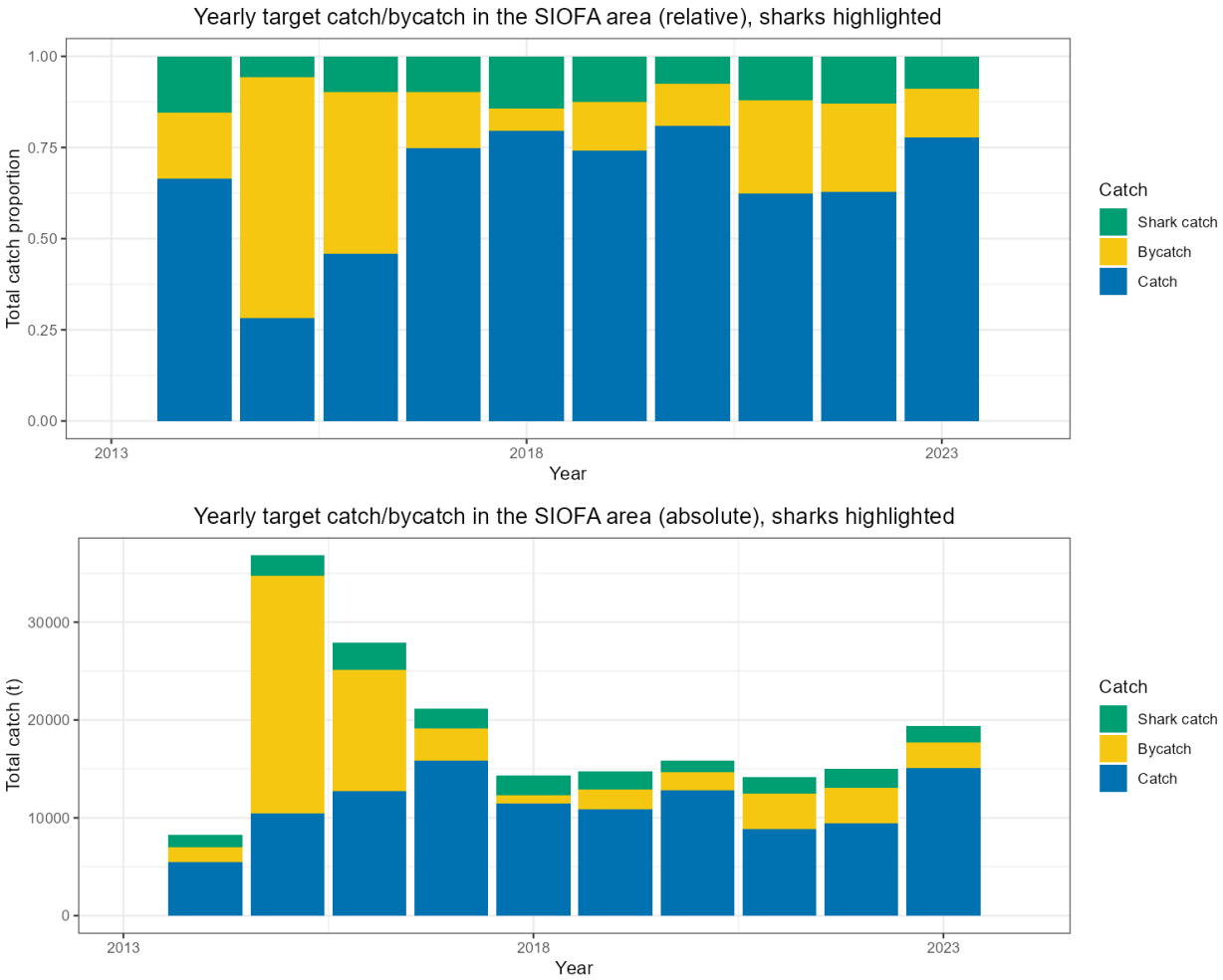

Figure 4a and b – Target catch and bycatch as relative values (upper panel, a) and absolute values (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches without spatial information are not included, and the portion of bycatch composed by sharks (as defined in Appendix B) is highlighted.

6.3.1 Target catch and bycatch in SIOFA Subareas

Catch of target species was taken mainly in SIOFA Subareas 1 and 3b (Figure 5a). Bycatch in 2021 was mostly taken in SIOFA Subareas 8, and 2 (Figure 5b). In 2015-2016 a larger portion of the bycatch came from Subarea 8 (Figure 5b).

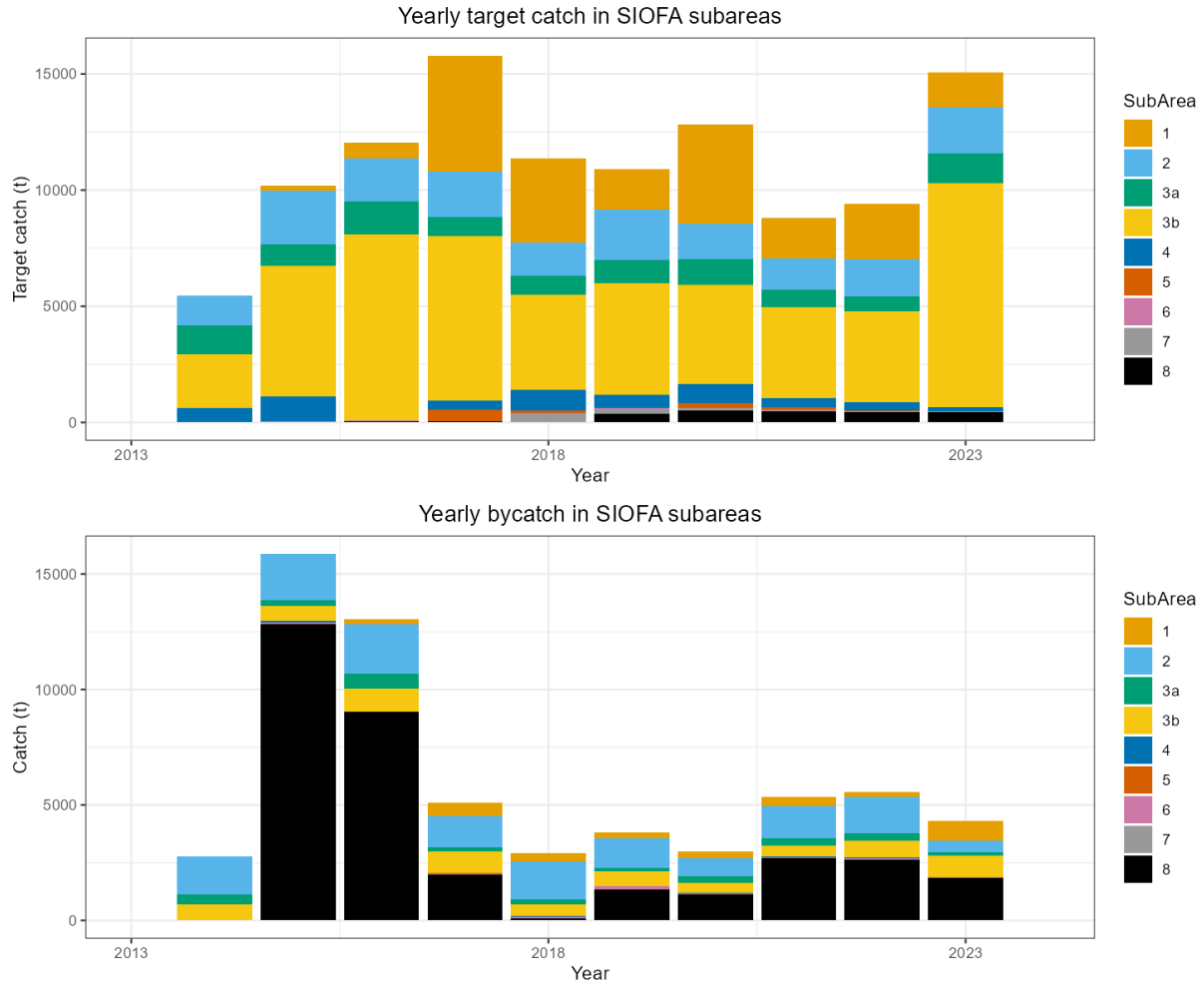

Figure 5a and b – Catch (upper panel, a) and bycatch (lower panel, b) in different SIOFA Subareas (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches without spatial information are not included.

6.3.2 Catch of sharks

This section presents further details on the sharks catches in SIOFA, which were noted 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 simply as catch for the purpose of this Overview.

Catch of sharks (as defined in Appendix B) increased between 2013 and 2016 but has decreased since (Figure 6a, Table 4). Catch of sharks was dominated by Portuguese dogfish (CYO), with a significant presence of kitefin shark (SCK) until 2019 (Figure 6a). Subarea 2 was the origin of most of the shark catches in the SIOFA Area (Figure 6b). Note that most of the shark catches not identified (SKX) come from pelagic longline fishing activities, and thus likely consist of pelagic, rather than deepwater, sharks.

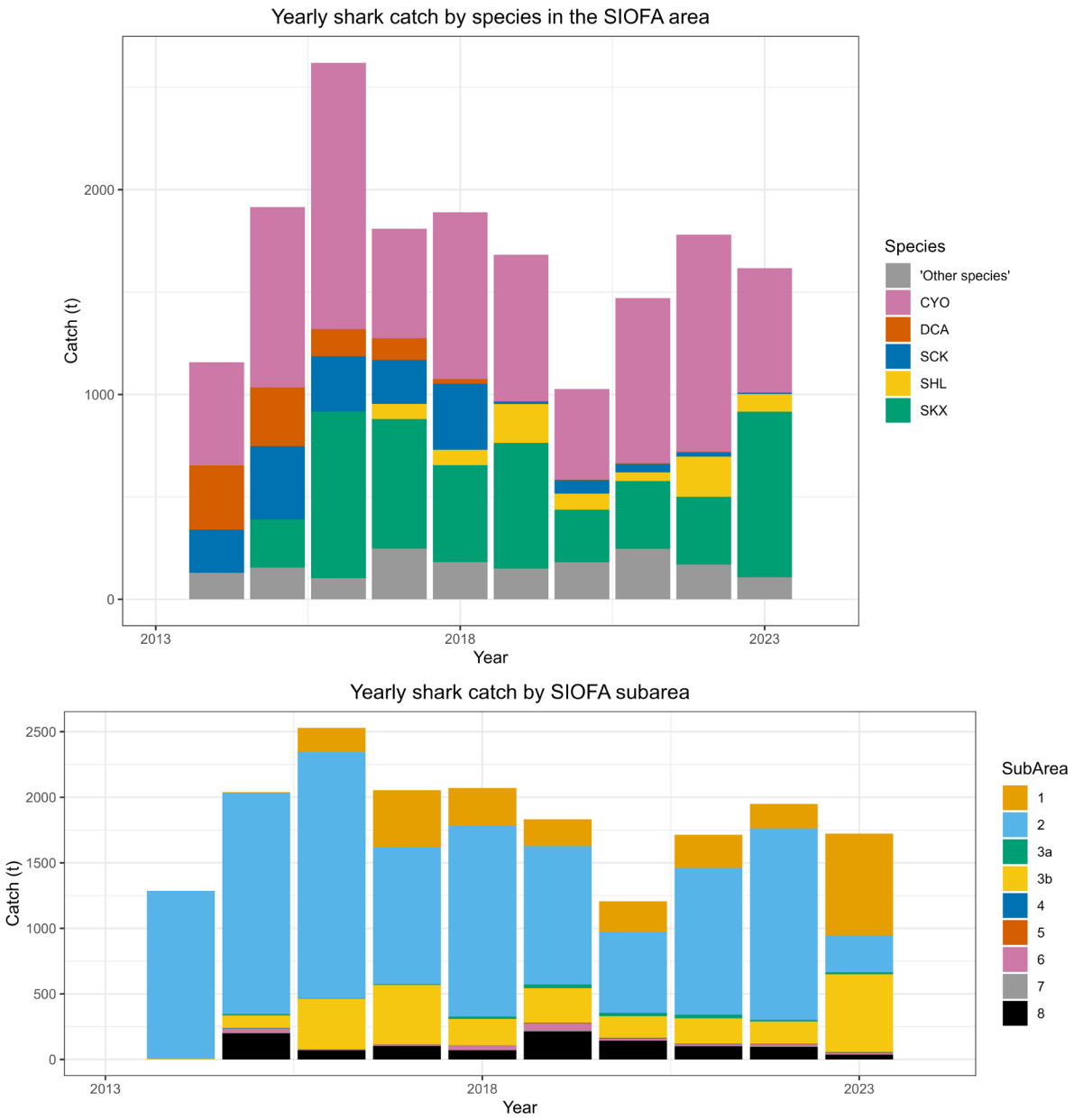

Figure 6a and b – Yearly catch of sharks in the SIOFA Area by species (upper panel, a) and by SIOFA Subarea (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Species are indicated by their 3-letter FAO code, see Appendix B for disambiguation.

Table 4 - Total catch of sharks (in t) per year and Subarea (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Total catch includes both target and bycatch for all species.

Shark catch (t)										
	SIOFA Subarea									
Year	1	2	3a	3b	4	5	6	7	8	Totals
2014	0.0	1 282.9	0.0	3.9	0.0	0.0	0.0	0.0	0.0	**1 286.8**
2015	7.5	1 685.4	10.5	95.7	4.7	0.0	32.2	3.0	200.2	**2 031.7**
2016	184.4	1 878.1	3.2	387.8	1.1	0.0	5.0	0.0	70.4	**2 345.6**
2017	436.1	1 044.1	5.2	453.9	1.4	0.4	9.8	0.0	102.8	**1 617.6**
2018	286.7	1 456.1	18.0	199.9	0.0	0.0	38.2	0.2	71.0	**1 783.4**
2019	204.4	1 055.3	28.0	263.5	1.2	5.0	51.5	9.2	213.9	**1 627.6**
2020	231.9	619.6	23.7	166.0	5.1	1.2	15.1	0.5	143.4	**974.6**
2021	252.5	1 120.0	27.9	193.9	4.4	0.0	14.8	0.4	100.2	**1 461.6**
2022	186.5	1 460.0	13.5	168.8	2.4	2.9	9.5	8.8	96.5	**1 762.4**
2023	776.6	280.8	15.1	593.2	4.4	3.2	11.0	1.3	36.5	**945.5**

A list of deep-sea sharks considered to be at "high risk" and "of concern" is included in Annex 1 of SIOFA CMM 12(2024) (Conservation and Management Measure for Sharks) and was derived from work presented at SC8 (restricted paper SC-08-29). The following figures refer to this subset of sharks as defined in CMM 12(2024), which is reported here in Appendix C for easier reference.

Note that the CMM 2019/12 listed the scientific name of *Somniosus antarcticus* (FAO code RZZ) under the FAO code for *Somniosus pacificus* (SON), but only SON was recorded in the data, and likely represents a nomenclature discrepancy in CMM 2019/12. In CMM 12(2023), the *antarcticus* species code was updated to RZZ. Please be advised that the nomenclature of Plunket's shark (*Centroscymnus plunketi*, CYU) has been officially revised in 2023 to largespine velvet dogfish (*Scymnodon macracanthus*, YSM). This change is reflected in this report, which follows the nomenclature of CMM 12(2024).

Given the recent changes in shark species codes, combined with the changes in the list of species included in SIOFA CMM 12 Annex 1, the Secretariat further noted that there is a risk that some species data could be missed in the analyses, as the database contains obsolete or even contradictory codes. For the purpose of composing the following figures in a comprehensive way, all FAO codes of species included in Annex 1 of CMM 12 through its different iterations were retained but this could create some confusion in reporting. A revision and upgrade of the shark codes between the database and the CMM could solve this issue, and the SIOFA SC would be best placed to set up a consistent framework for this revision.

Catch of sharks at "high risk" and "of concern" (as defined in CMM 12(2024)) are represented in Figure 7a. Catch of sharks at "high risk" and "of concern" was generally dominated by Portuguese dogfish (CYO), with a significant presence of Kitefin shark (SCK) (Figure 7a). Historically. the vast majority of catches of shark at "high risk" and "of concern" in the SIOFA Area came from Subarea 2 (Figure 7b), but this changed in 2023.

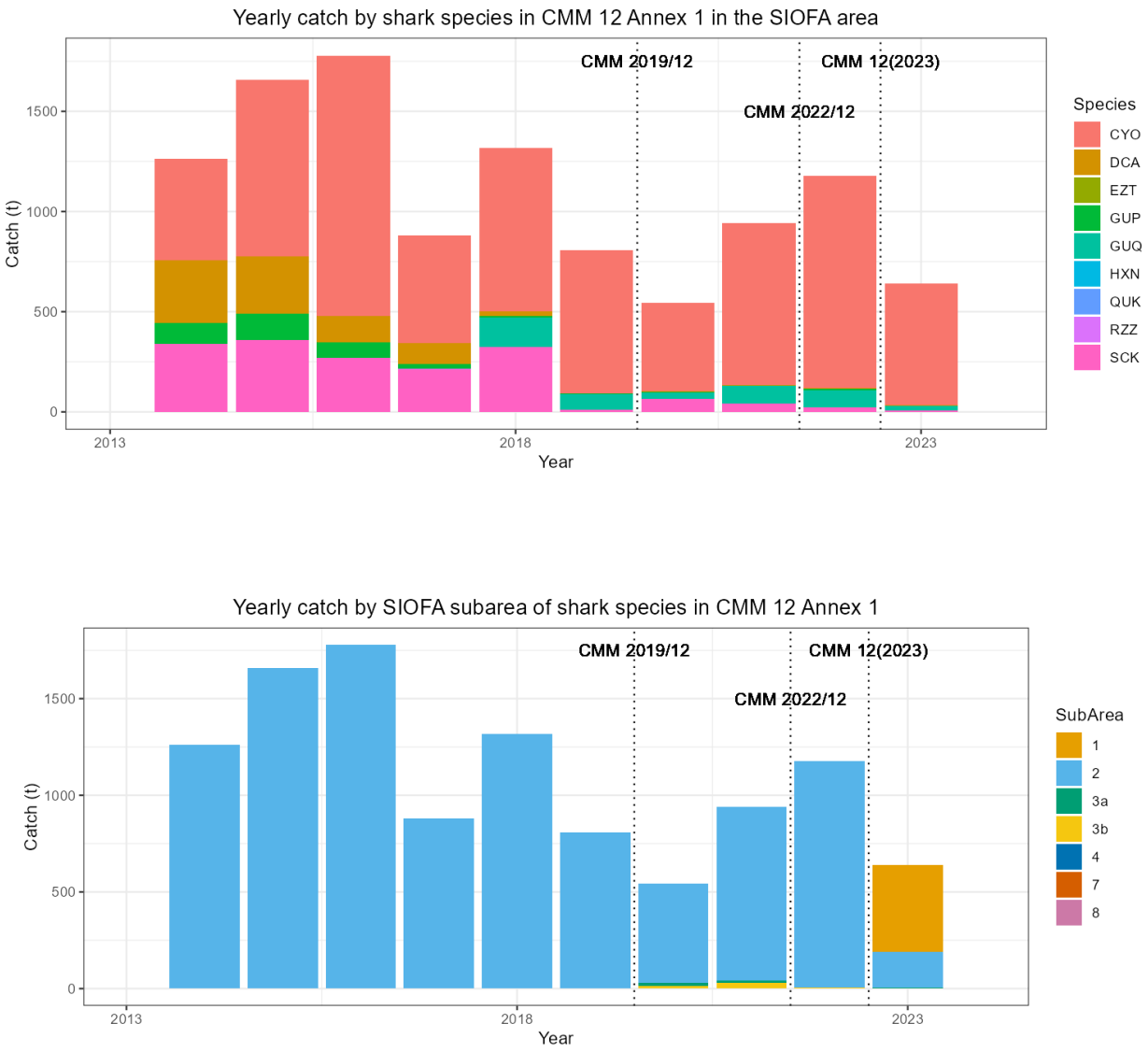

Figure 7a and b – Yearly catch of sharks considered to be at "high risk" and "of concern" as included in Annex 1 of SIOFA CMM 12(2024) (Conservation and Management Measure for Sharks) in the SIOFA Area. Figures by species (upper panel, a) and by SIOFA Subarea (lower panel, b) are presented (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Species are indicated by their FAO species code, see Appendix C for disambiguation.

6.3.3 Catch in SIOFA orange roughy Assessment Areas and toothfish Management Areas

Stock boundaries for orange roughy were defined and used in the first stock assessments conducted in SIOFA (Cordue 2018a, 2018b). These stock assessments assumed that all catch would derive from within these boundaries. These stock boundaries have been historically referred to as "Management Units", even though SIOFA has not yet formally adopted these for orange roughy (Figure 8). Therefore, they should be referred to more appropriately as "Assessment Areas". Note that not all catch of orange roughy was taken inside those Assessment Areas.

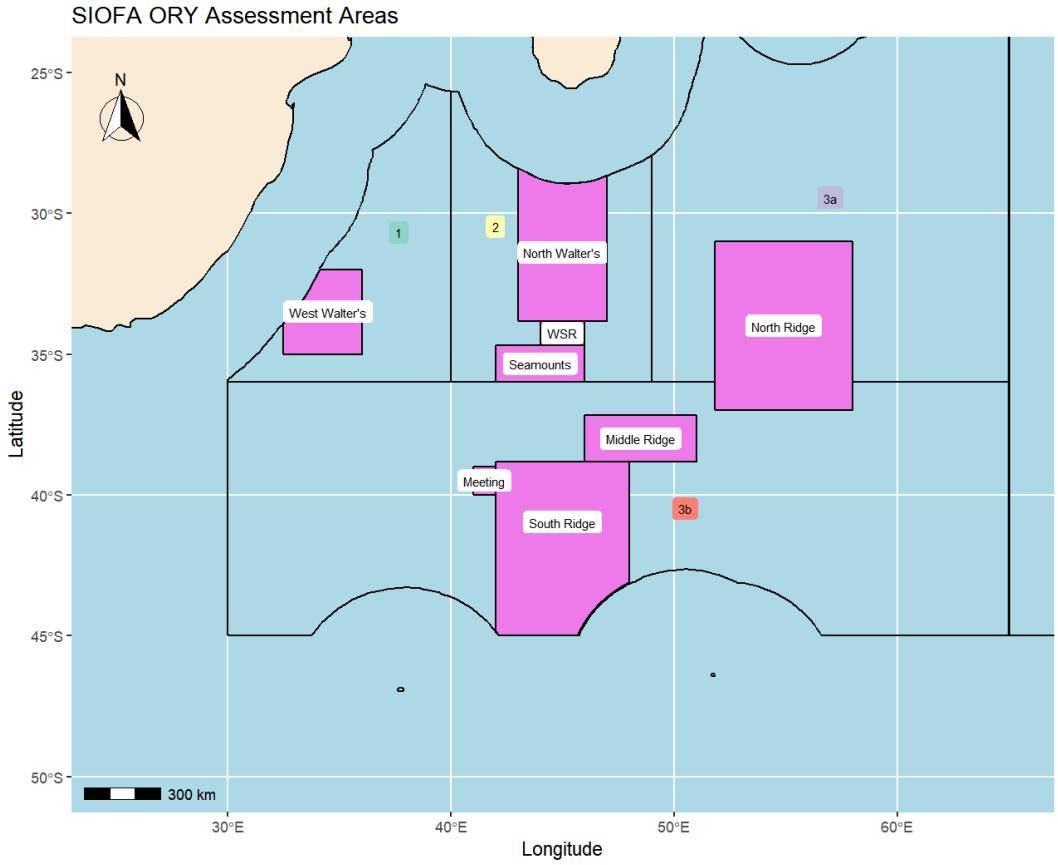

Figure 8 – Map of SIOFA Assessment Areas for orange roughy as defined by Cordue (2018a, 2018b) (source: SIOFA Spatial layers). Labels indicate names of each Assessment Area.

Toothfish Management Areas are defined within CMM 15(2024) (paragraphs 13 and 50, Annex VIII), and include two areas, the Del Cano Rise and Williams Ridge (Figure 9). These can be appropriately termed Management Units, as there are clear management implications for these areas. Note that not all catch of toothfish was taken inside those management areas.

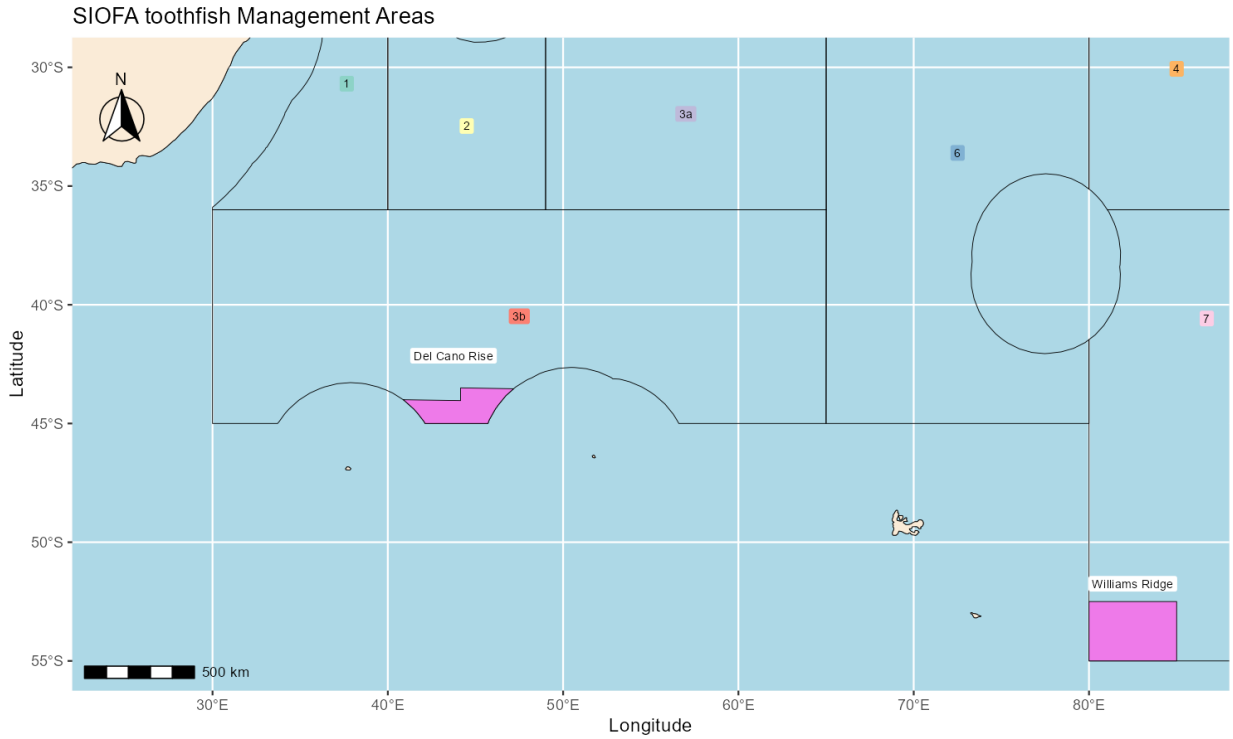

Figure 9 – Map of SIOFA Management Areas for toothfish as defined in Annex VIII of CMM 15(2024) (source: SIOFA Spatial layers). Labels indicate names of each Management Area.

Some specific analyses of catch and effort within Assessment/Management Areas included presentation of confidential data. These have been excluded from the public version.

Within the Assessment Areas for orange roughy, the proportion between target (as defined in Appendix A) and bycatch was relatively stable (around 25% of bycatch) from 2013 onwards (Figure 10a). Total (all species) catch was however variable across years (Figure 10b).

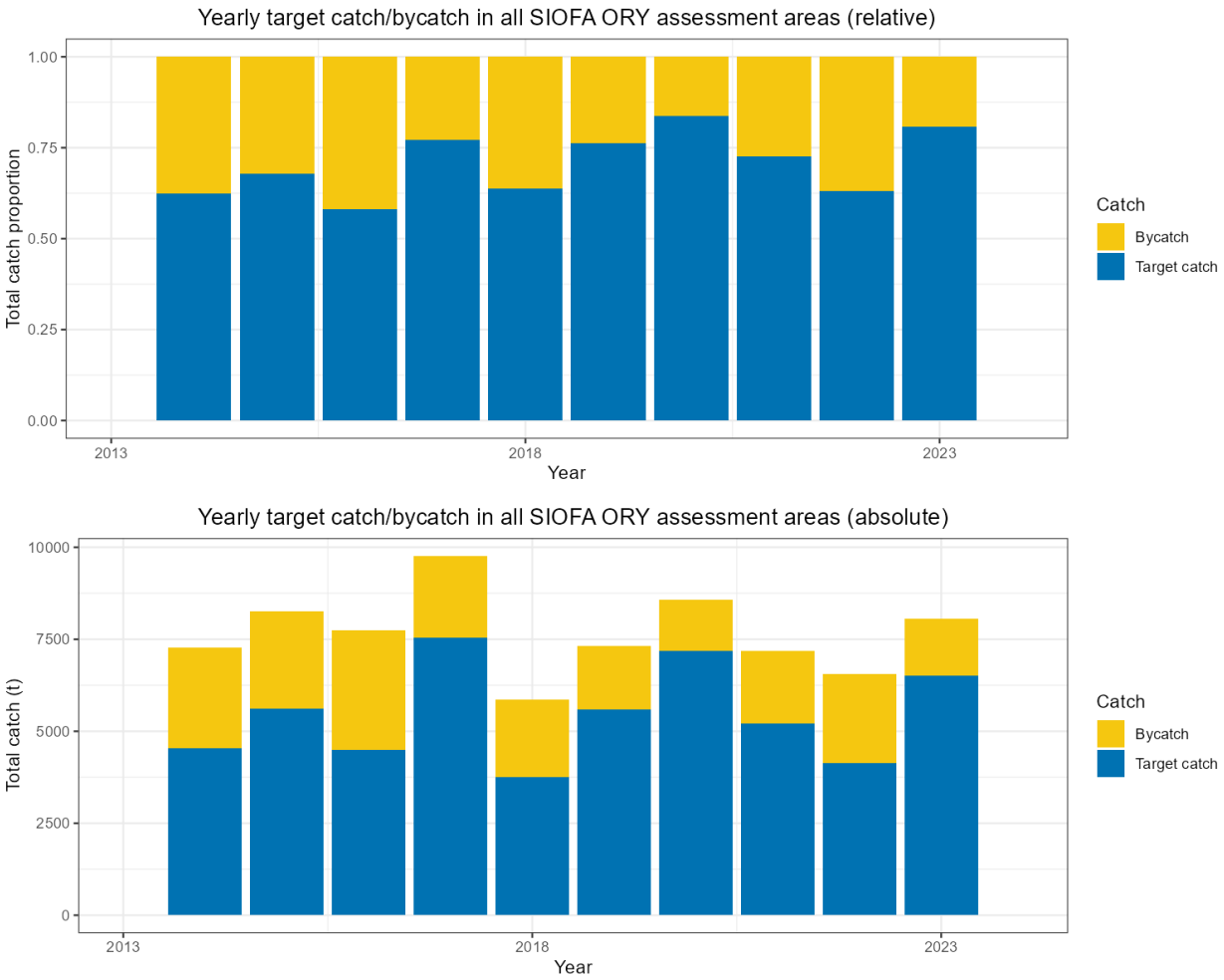

Figure 10a and b – Target catch (as defined in Appendix A) and bycatch as relative values (upper panel, a) and absolute values (lower panel, b) in all SIOFA Assessment Areas for orange roughy (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches without spatial information are not included.

Within the two toothfish Management Areas, the proportion between catch and bycatch was relatively variable, with the proportion of bycatch close to 0.75 until 2015, and below 0.5 afterwards (Figure 11a). Total (all species combined) catch was however relatively variable across years, with a notable peak in 2018 (Figure 11b).

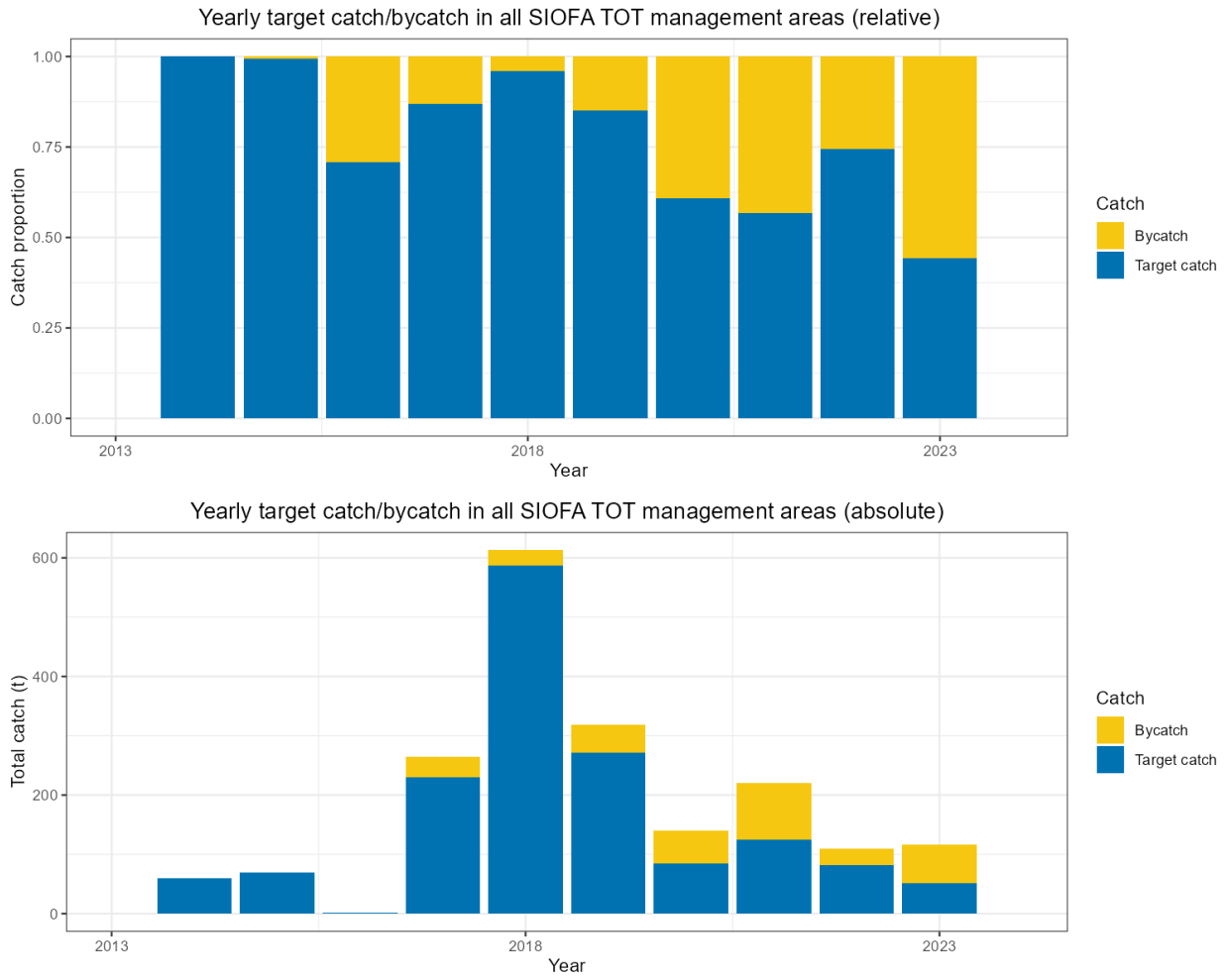

Figure 11a and b – Target catch (as defined in Appendix A) and bycatch as relative values (upper panel, a) and absolute values (lower panel, b) within the two SIOFA Management Areas for toothfish (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches without spatial information are not included.

Catch and bycatch in single Assessment Areas/Management Areas

[this section is not included in the public version of the manuscript, due to confidentiality limitations set out in CMM 03(2016)]

6.3.4 Discards and bycatch

When dealing with bycatch, note that usually most of the bycatch was retained and landed, with only a small proportion of it being discarded at sea and not landed. Discards might also involve target catch (e.g., undersized or damaged fish), but typically to a lesser extent. SIOFA catch and effort databases contain the fate of catch per species, aggregated at different levels, which enables analyses on discards.

Discards have historically been a small proportion of the bycatch (Figure 14a), and consequently an even smaller proportion of the total catch. In absolute terms, they were typically around or below 100 t per year but were much higher in 2015, when they were more than 1500 t (Figure 14b).

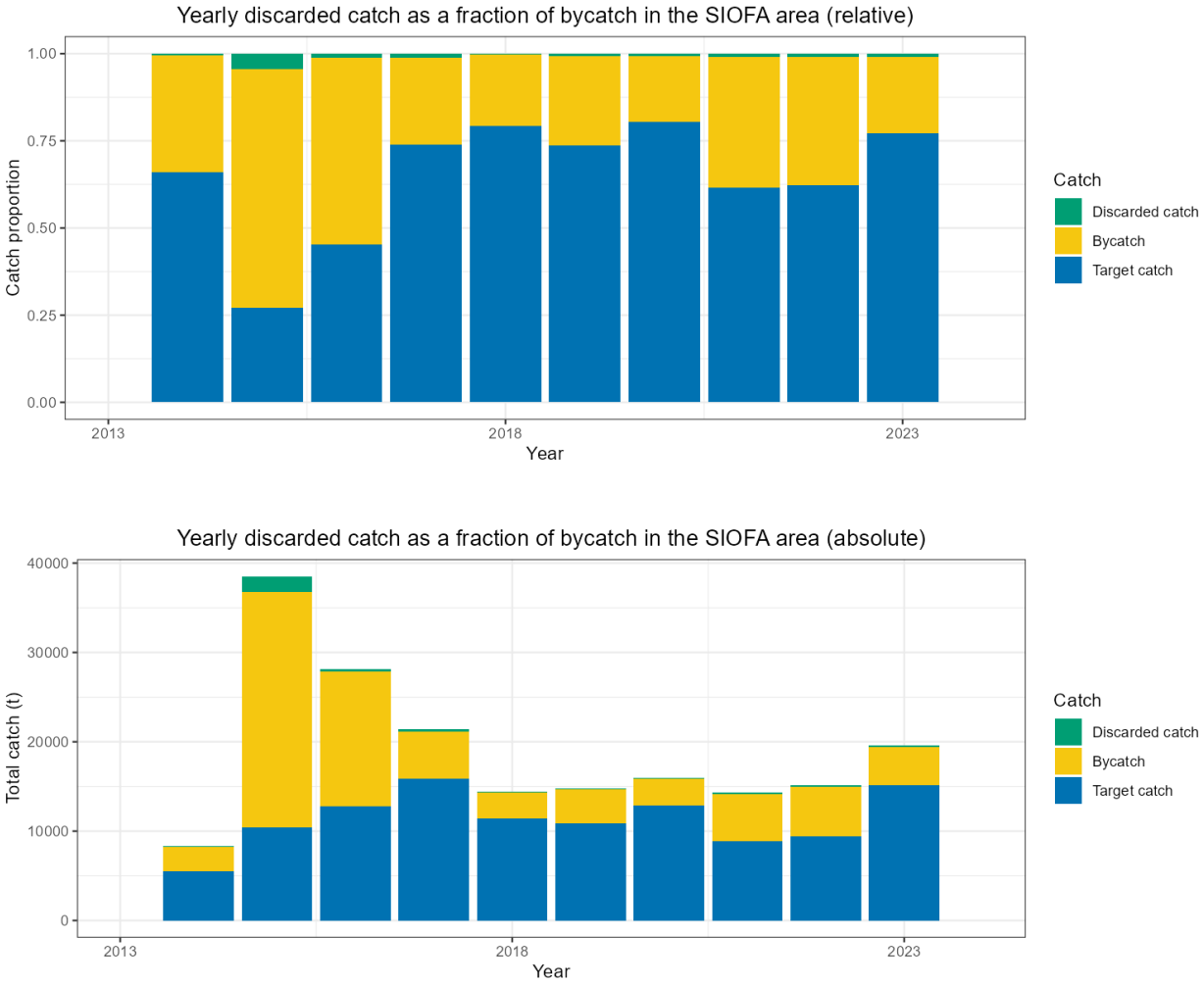

Figure 12a and b –Target catch, bycatch and discards as relative values (upper panel, a) and absolute values (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches without spatial information are not included.

Discards are often considered in the perspective of bycatch, even though also target species (e.g. undersized or damaged) 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 and only the top five species (by weight) are fully displayed. The high discards recorded in 2015 were attributed to unspecified marine species (MZZ) which are still reported up to recent years (Figure 15). Other high contributions to discards (e.g. in 2017) were due to smooth oreo dory (SSO) (Figure 15).

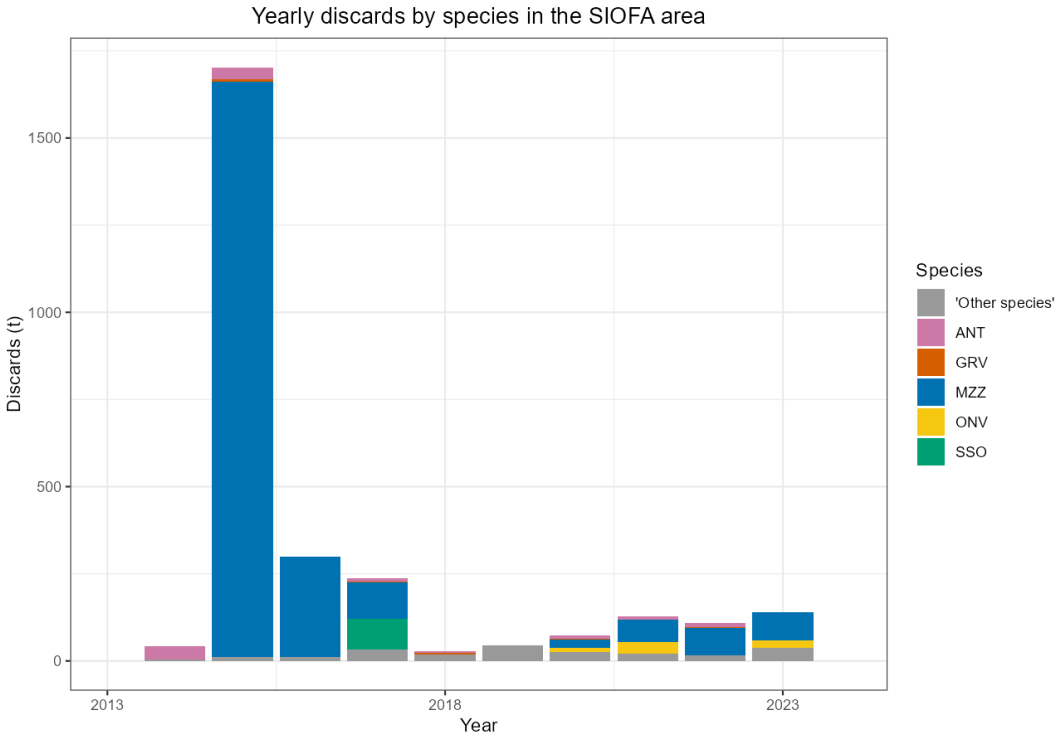

Figure 13 – Yearly discards by species in the SIOFA Area (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Only the top five species (by weight) are fully represented, while the other species have been grouped in a single category. Species are indicated by their 3-letter FAO code.

6.4 Main species catch and effort

The catch of trawl vessels was 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 was 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 05(2016) 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.

6.4.1 Alfonsinos (ALF, *Beryx* spp.)

The most common species of alfonsinos caught in the SIOFA Area was 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.) were 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 are shown in Figure 16a. The average annual catch of alfonsinos during the recent (2018–2022) period was 3698.2 t.

Effort is represented in Figure 16a. Alfonsinos are mostly caught in the western SIOFA Area, mainly Subareas 2, 3a, 3b and 4 (Figure 16b).

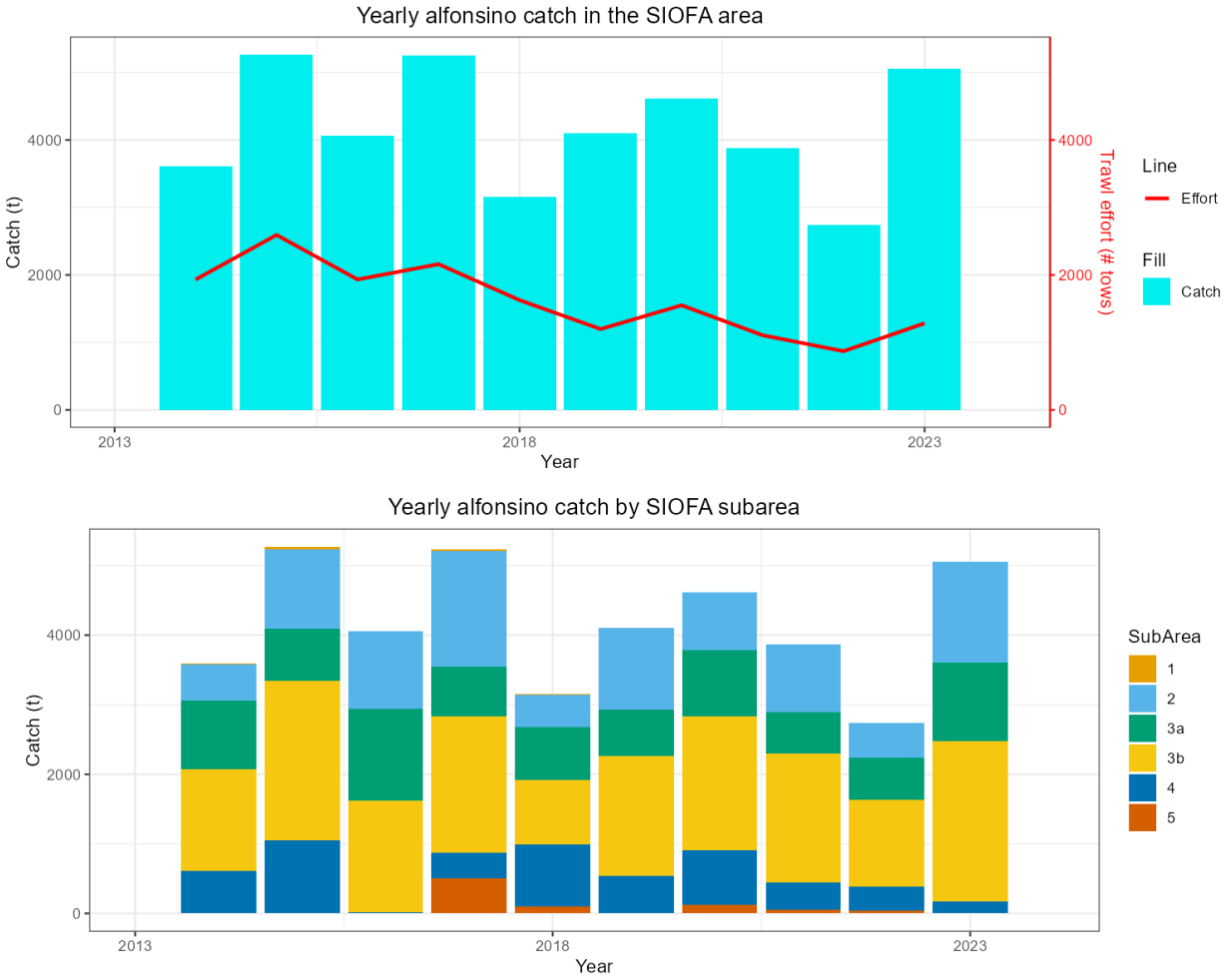

Figure 14a and b – Yearly alfonsino catch (t) and effort (number of trawls) in the SIOFA Area (upper panel, a) and in different SIOFA Subareas (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

Unstandardised catches per units of effort (CPUEs) are represented in Figure 17)

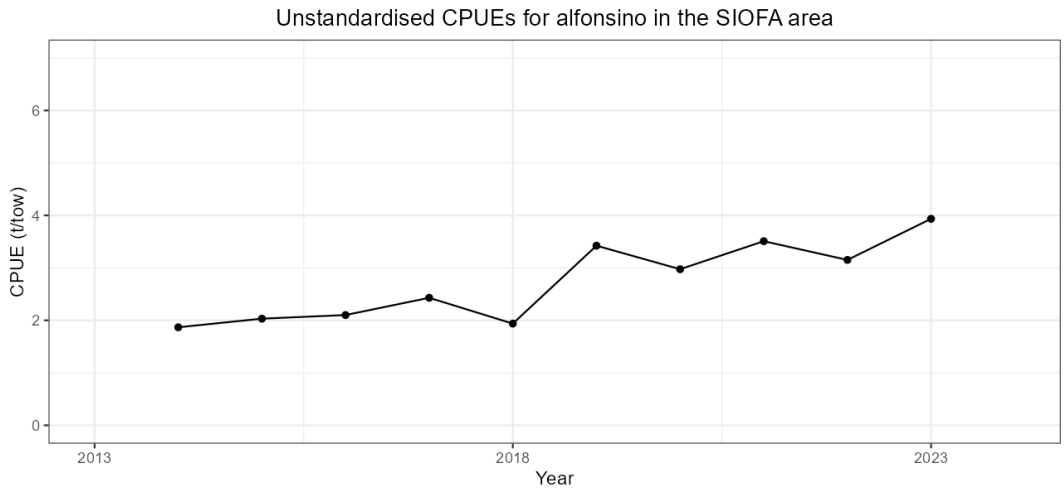

Figure 15 – Unstandardised catches per unit of effort (CPUEs) of alfonsino in the SIOFA Area (t/tow) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

6.4.2 Orange roughy (ORY, *Hoplostethus atlanticus*)

The only species of slimehead caught in the SIOFA Area was the 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 is provided in the SIOFA Fisheries Summary: orange roughy (*Hoplostethus atlanticus*) 2025.

Catches of orange roughy are shown in Figure 18a. The average annual catch of orange roughy during the recent (2018–2022) period was 1075.7 t. However, note that SC7 defined a period of six years instead of 5 years as the recent period for this species, and referred to a specific period: 2015–2020. Using the SC7 criterion, the average annual catch of orange roughy during the recent (2015–2020) period was 1010.7 t.

Effort has decreased in recent years, from higher values in 2015–2018 (Figure 18a). Orange roughy was mostly caught in the western SIOFA Area, mainly Subareas 2 and 3a (Figure 18b).

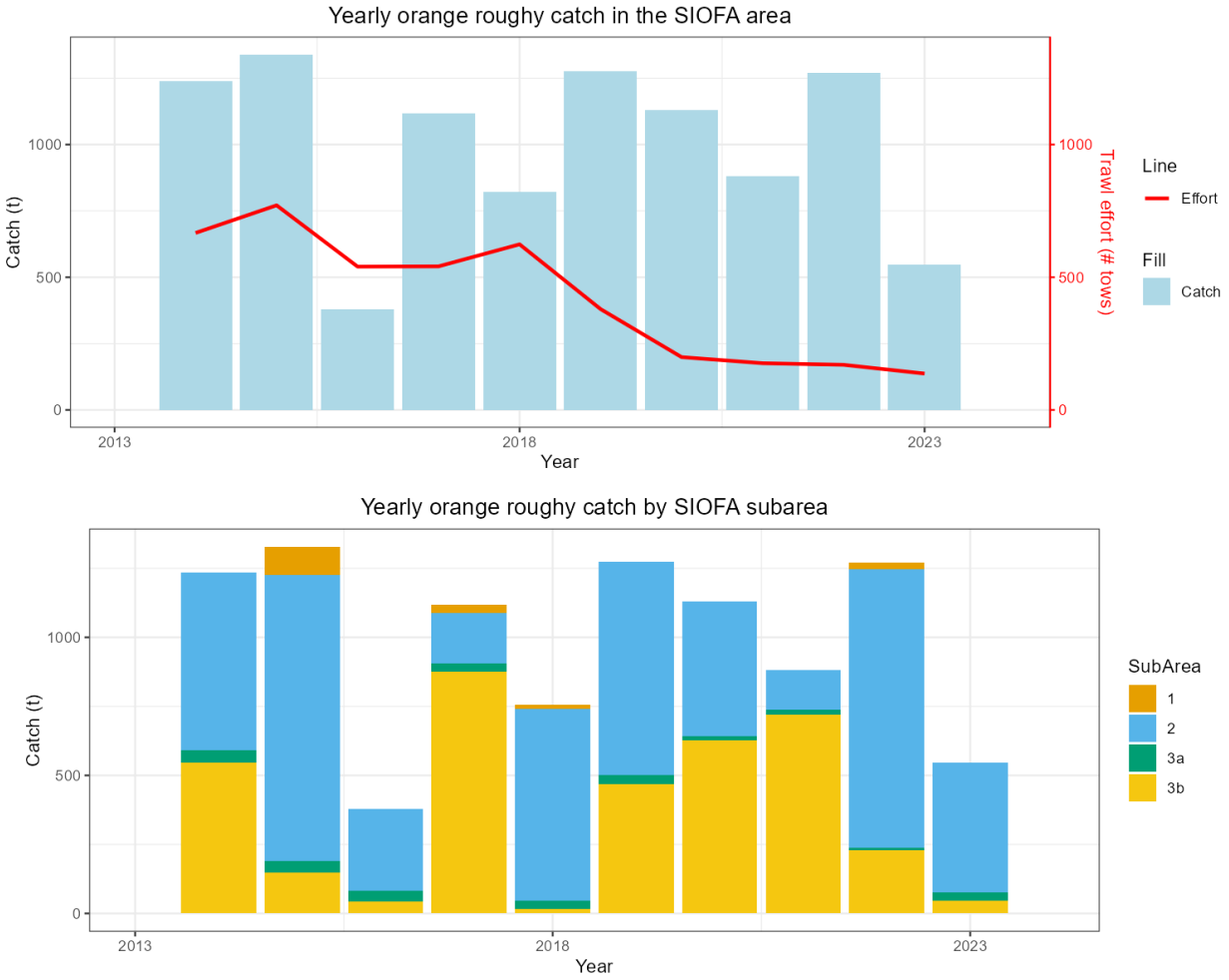

Figure 16a and b – Yearly orange roughy catch (t) and effort (number of trawls) in the SIOFA Area (upper panel, a) and in different SIOFA Subareas (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Values of the figure in panel a are provided in Table A.1 and values of the figure in panel b are provided in Table A.2 (both in Appendix A).

Unstandardised catches per units of effort (CPUEs) are represented in Figure 19.

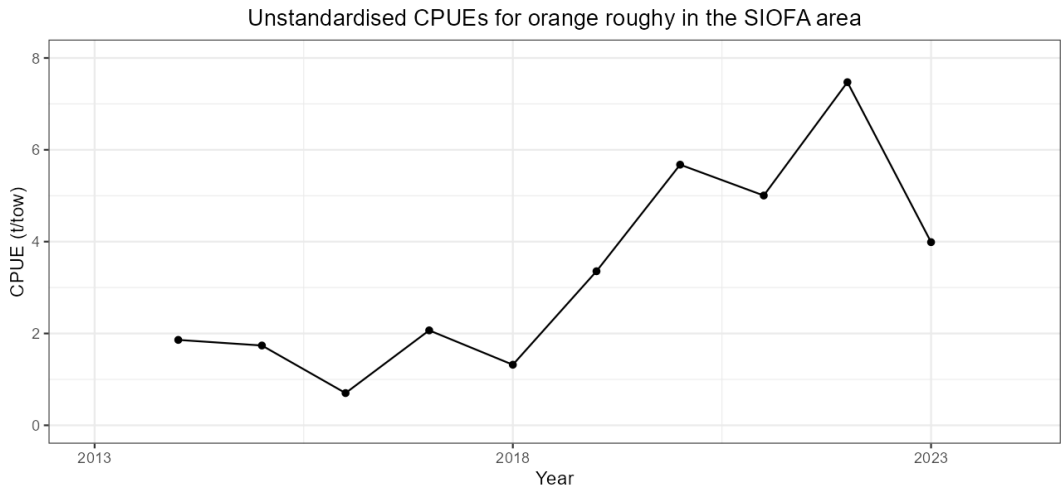

Figure 17 – Unstandardised catches per unit of effort (CPUEs) of orange roughy in the SIOFA Area (t/tow) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

6.4.3 Toothfish (TOT, *Dissostichus eleginoides* and *Dissostichus mawsoni*)

Patagonian toothfish (TOP, *Dissostichus eleginoides*) was the main species of toothfish caught in the SIOFA Area. However, few Antarctic toothfish (TOA, Dissostichus mawsoni) were caught in 2021 and 2022, which could indicate a distribution shift of this species into the SIOFA Area.

Toothfish are long-lived, late-maturing, large demersal fishes 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. Antarctic toothfish is present in waters near the Antarctic, approximately east of New Zealand to southern America.

Catches of toothfish are shown in Figure 20a, catches of Antarctic toothfish are hardly visible in the figure because of their limited amount. The average annual catch of toothfish (both species combined) during the recent (2018–2022) period was 257.2 t.

Catches of Patagonian and Antarctic toothfish come from the southern SIOFA Area, mainly Subareas 7 and 3b (Figure 20b).

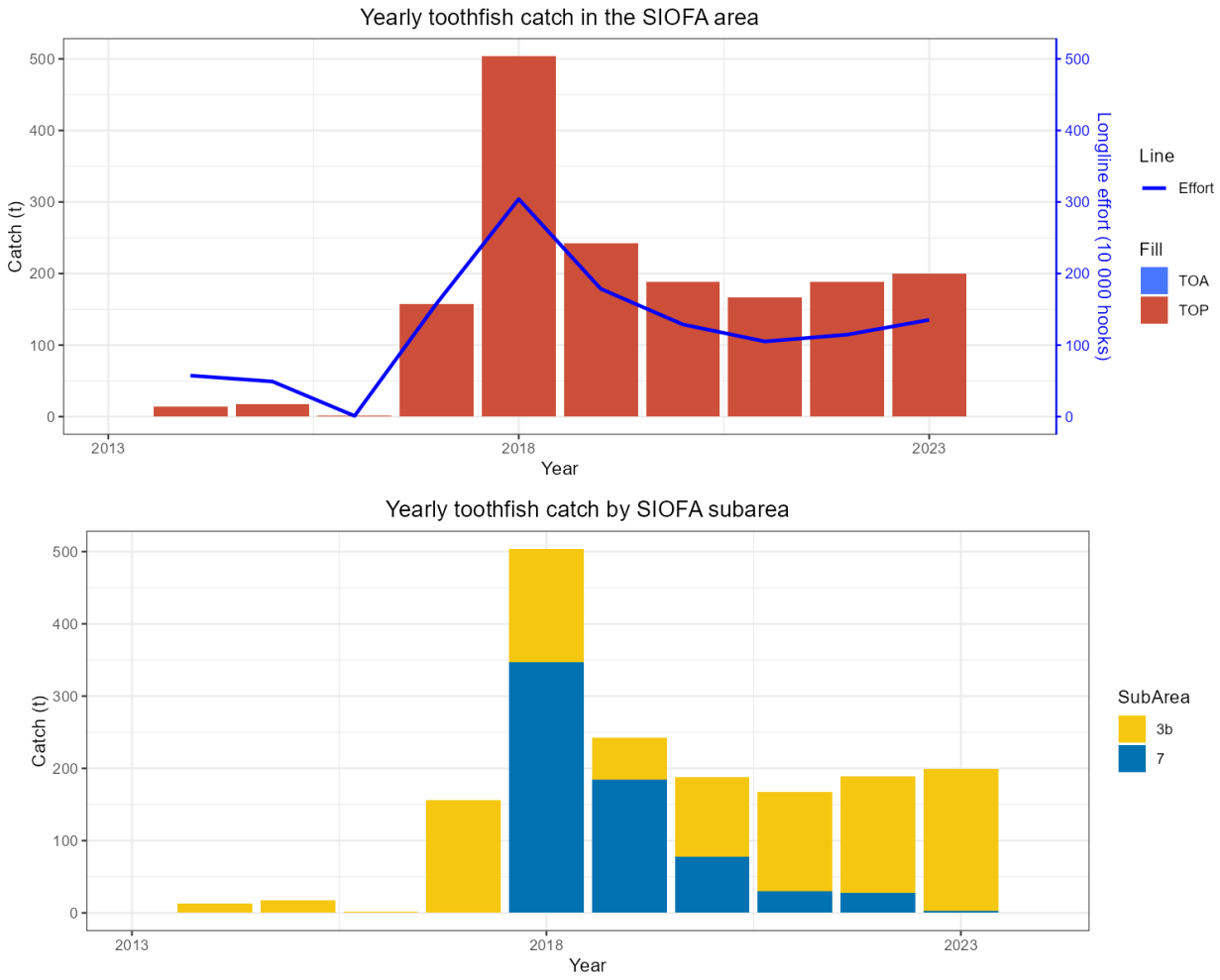

Figure 18a and b – Yearly toothfish catch (t) and effort (10 thousand hooks) in the SIOFA Area (upper panel, a) and in different SIOFA Subareas (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Note that the Subareas are larger than the toothfish Assessment Areas.

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

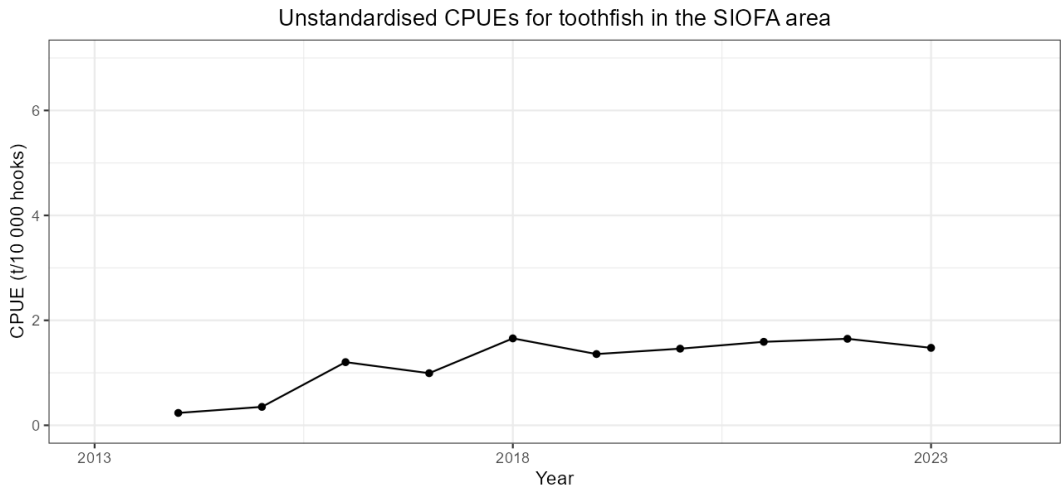

Figure 19 – Unstandardised catches per unit of effort (CPUEs) of toothfish in the SIOFA Area (t/10 thousand hooks) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

6.4.4 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, mostly derived from demersal longline fisheries but occasionally also from benthopelagic midwater trawl fisheries.

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 are shown in Figure 22a. The yearly catch composition was relatively variable, but hapuku wreckfish was the most commonly caught species in the last years (Figure 22a). The average annual catch of hapuka (all species combined) during the recent (2018–2022) period was 82.1 t.

Hapuka are caught in the western SIOFA Area, mainly Subareas 2, 3a and 3b (Figure 22b).

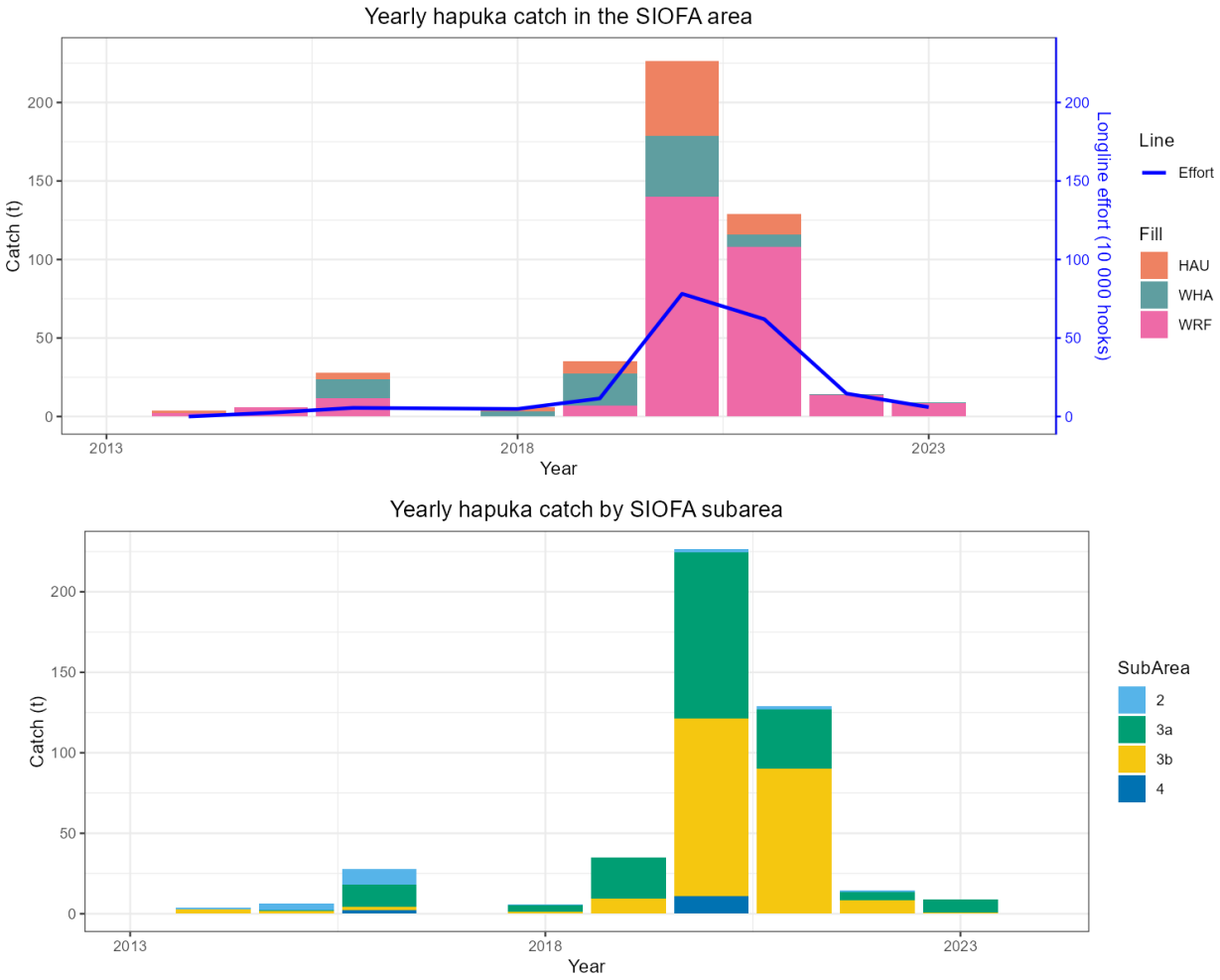

Figure 20a and b – Yearly hapuka catch (t) and effort (10 thousand hooks) in the SIOFA Area (upper panel, a) and in different SIOFA Subareas (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

Unstandardised catches per units of effort (CPUEs) are shown in Figure 23.

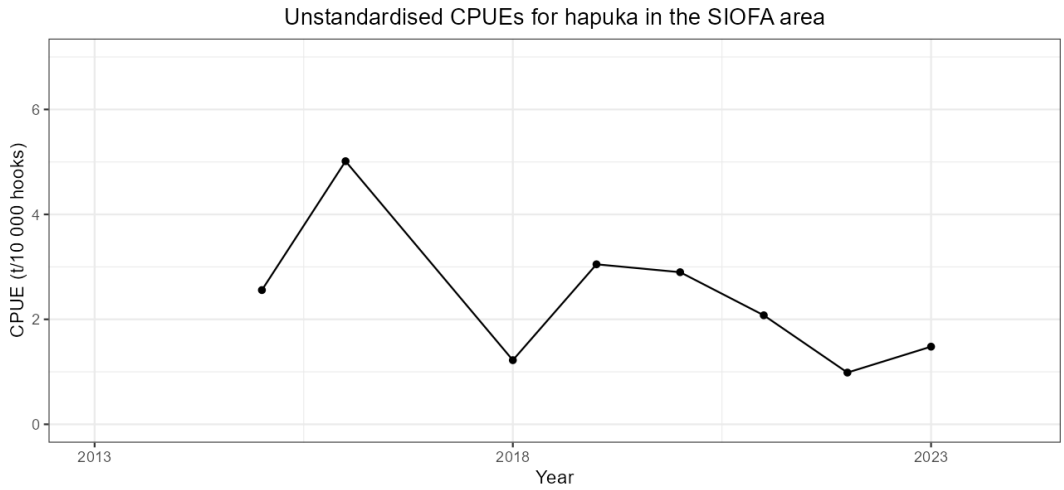

Figure 21 – Unstandardised catches per unit of effort (CPUEs) of hapuka in the SIOFA Area (t/10 thousand hooks) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

6.4.5 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 targeted catch and effort was by Chinese Taipei from its pelagic longline fishery, but a small amount of bycatch was also reported by other CCPs from other gears.

Both oilfish and escolar can grow to over 2 m 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). The average annual catch of oilfish (both oilfish and escolar combined) during the recent (2018–2022) period was 13529.6 t.

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). The SIOFA SC8 and MoP10 noted the significant catch of oilfish in cells that are both in exclusive economic zones (EEZs) and in the SIOFA area and stressed the need to consider this catch information for any future assessment of oilfish in the SIOFA Area.

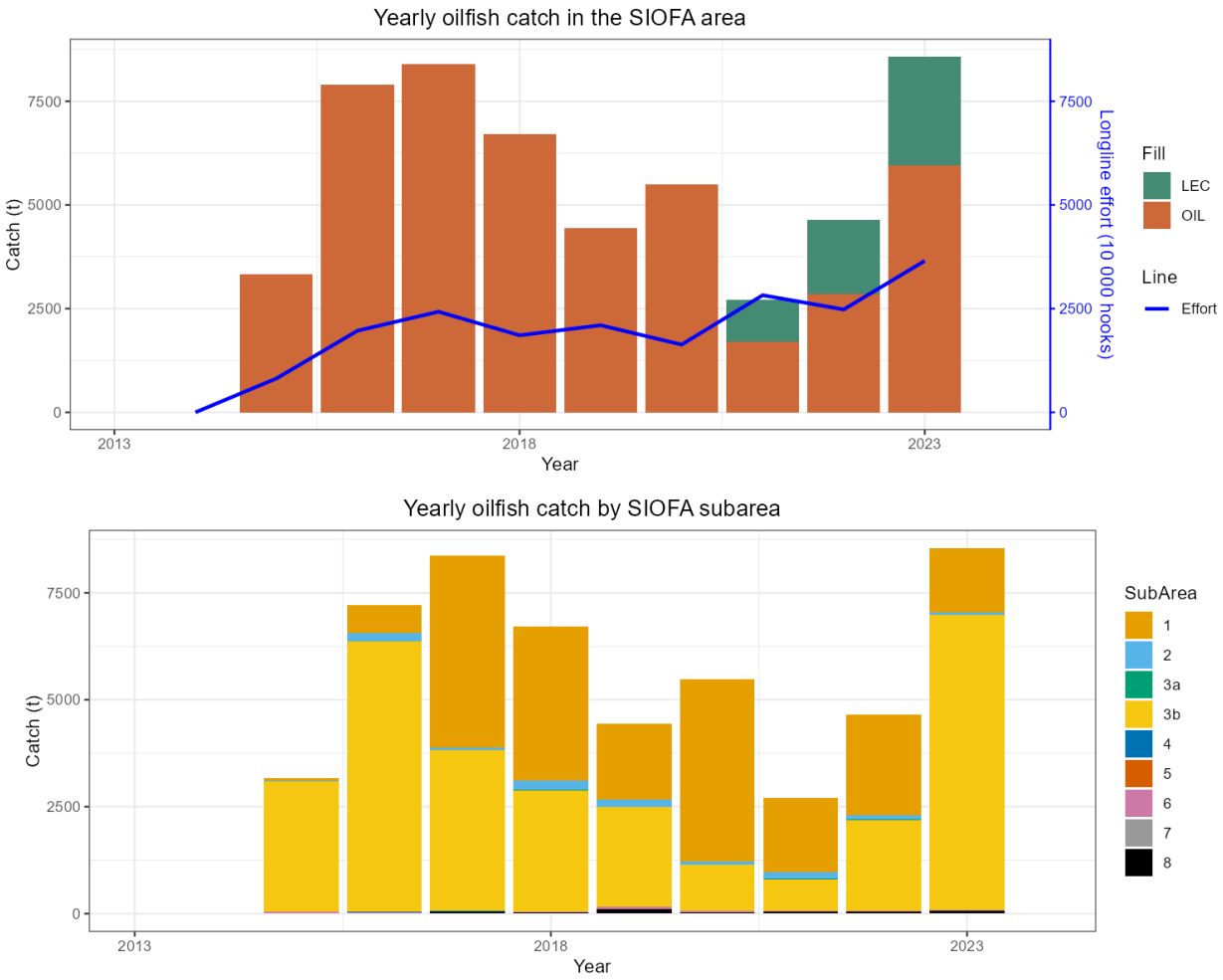

Figure 22a and b – Yearly oilfish catch (t) and effort (10 thousand hooks) in the SIOFA Area (upper panel, a) and in different SIOFA Subareas (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

Effort has been relatively stable in recent years, with slightly declining catches (Figure 24a), such that unstandardised catches per units of effort (CPUE) declined slightly (Figure 25). In 2021 effort increased and catches decreased, leading to a marked decline of CPUE.

Unstandardised CPUEs cannot be considered a reliable index of abundance. Standardised CPUEs have not been produced for these species.

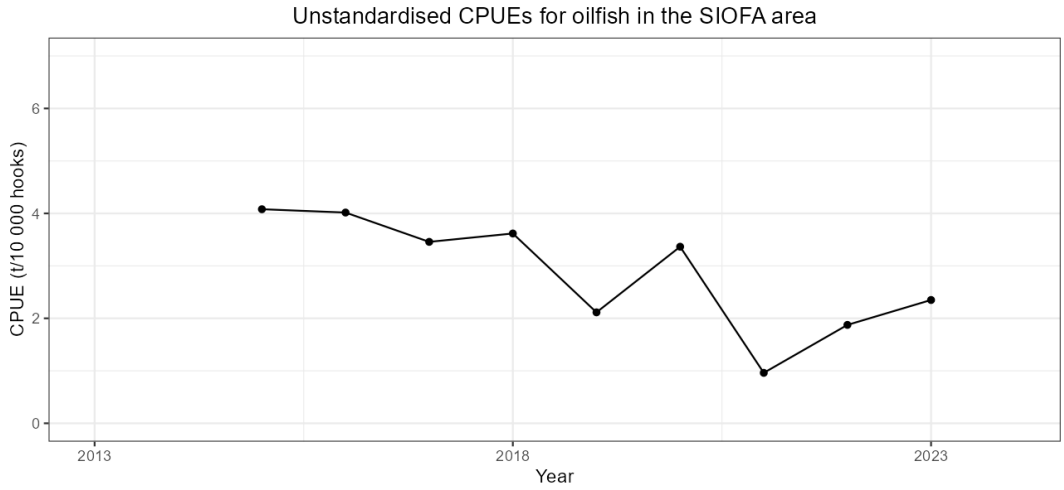

Figure 23 – Unstandardised catches per unit of effort (CPUEs) of oilfish in the SIOFA Area (t/10 thousand hooks) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

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 CMM 01(2024).

Table 5 summarises the thresholds and move-on rules applied by each CCP. No VME encounters were recorded since encounter threshold levels set out in CMM 01 first came into effect in October 2019.

Table 5 – 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 01(2020). 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 01(2020) 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 01(2019). 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 01(2019), 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	

7.2 Benthic invertebrates bycatch summary

Observers are required to report the incidental 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 incidental catches.

Corals and sponges were the most caught (by weight) benthic invertebrates in SIOFA bottom fisheries (Table 6). Note that an exemption was in place for CCPs to have the required Scientific Observer coverage in their bottom fisheries during 2020 and 2021, due to the restrictions imposed by the COVID pandemic.

Table 6 – Invertebrate taxa recorded as incidental captures in SIOFA fisheries, presented in order of decreasing total weight and including the number of occurrences (source: SIOFA Observer and HBHCatchEffort databases, 2004–2023). Highest taxonomic resolution available.

FAO code	Scientific name	Total weight (kg)	Occurrences
COR	Corallium spp	4564.35	66
SPO	Spongiidae	1231.28	112
IQO	Isididae	67.19	111
HXY	Hexactinellida	49.53	52
ADQ	Antipathes dichotoma	32.98	16
AJZ	Alcyonacea	26.75	72
JEL	Rhopilema spp	22.46	35
KQM	Acropora formosa	22.2	4
URX	Echinoidea	18.51	51
OEQ	Euryalida	13.42	62
HQZ	Hydrozoa	13.39	11
STF	Asteroidea	13.17	18
AZN	Anthoathecata	11.58	23
BZN	Bryozoa	9.57	28
INV	Invertebrata	7.63	23
CVD	Cidaridae	5	15
CWD	Crinoidea	4.74	24
HKQ	Heliopora coerulea	4.5	1
SIA	Stolothrissa tanganicae	3	3
ZOT	Zoantharia	2.9	15
QCX	Gorgonocephalus spp	2.83	7
GER	Chaceon spp	2.77	4
SSX	Ascidiacea	2.33	8
BWV	Paragorgiidae	2.31	4
OWP	Ophiuroidea	1.51	3
SZS	Serpulidae	1.14	1
BWJ	Bathybiaster loripes	0.87	4

FAO code	Scientific name	Total weight (kg)	Occurrences
WBX	Holothuria spp	0.4	1
BVH	Brachiopoda	0.28	6
CRU	Crustacea	0.27	13
BWY	Bathylasmatidae	0.22	8
KRH	Cirrhipathes spp	0.1	1
NYZ	Nephtheidae	0.1	1
PWJ	Pycnogonida	0.07	2
QFY	Chrysogorgiidae	0.06	3
GKX	Galatea spp	0.04	1
BHZ	Brisingidae	0.03	1
FXX	Eunice spp	0	1
AQZ	Antipatharia	0	75
ATX	Actiniaria	0	78
AXT	Stylasteridae	0	88
CNI	Cnidaria	0	61
CSS	Scleractinia	0	695
DMO	Demospongiae	0	235
ECH	Echinodermata	0	68
GGW	Gorgoniidae	0	370
KCX	Lithodidae	0	2
NTW	Pennatulacea	0	60
OOY	Ophiurida	0	39
OTH	Animalia	0	3
PFR	Porifera	0	139

8. Fishing activities in Interim Protected Areas (CMM 01(2024))

Annex 3 of SIOFA CMM 01(2024) lists five Interim Protected Areas (IPAs) and their coordinates (Figure 26). These areas were first instituted in 2018 with SIOFA CMM 2018/01, 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 6e of SIOFA CMM 01(2024).

According to SIOFA CMM 01(2024), 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 6d, the Meeting of the Parties shall also review Annex 3 of this CMM, taking into account the advice of the Scientific Committee.

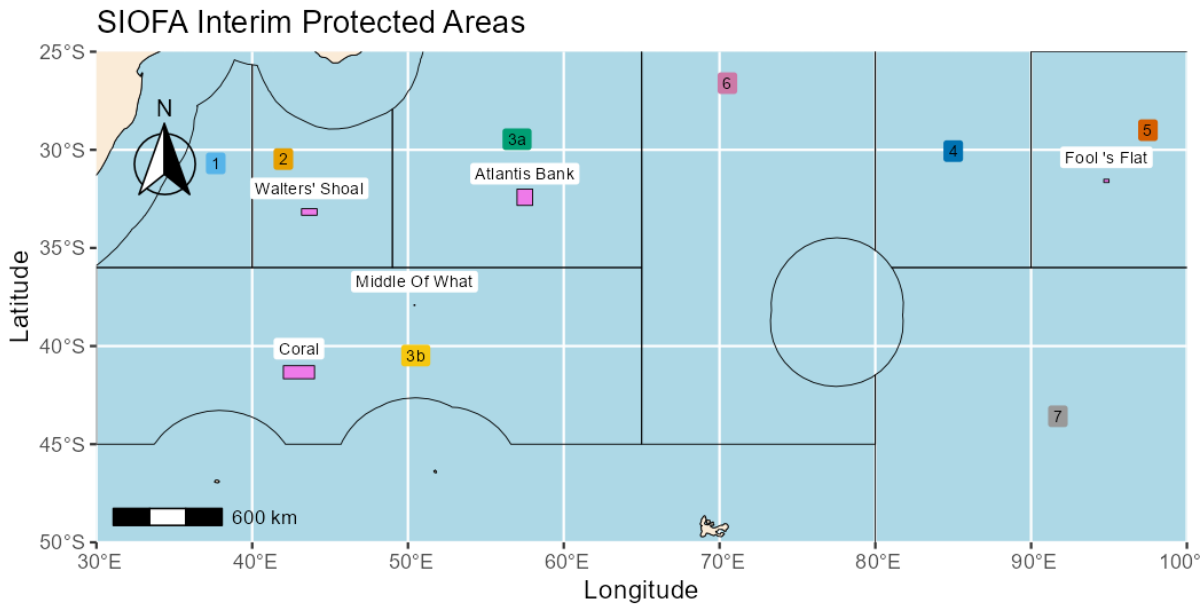

Figure 24 – Map of the SIOFA Interim Protection Areas (in magenta) as defined in CMM 01(2020) (Source: Annex 3 of SIOFA CMM 01(2024)). All the areas have been labelled for easier recognition, as some are barely visible on the map due to their small size.

Current restrictions to fisheries in SIOFA IPAs, detailed in CMM 01(2024), 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. Note that following discussions at CC6 and MoP9, handlines and midwater trawls are also not considered bottom fishing gears albeit this has not been included explicitly in the CMM yet.

A total of 125 fishing events have been recorded to occur in SIOFA IPAs in 2014–2023, but the number of fishing events significantly decreased after the establishment of the SIOFA IPAs in late 2018 (Figure 27). While before the institution of the SIOFA IPAs multiple gear types were used, after 2018 only lines were used, according to restrictions set out in CMM 01, which entered into force for the first time in 2018 (Figure 27).

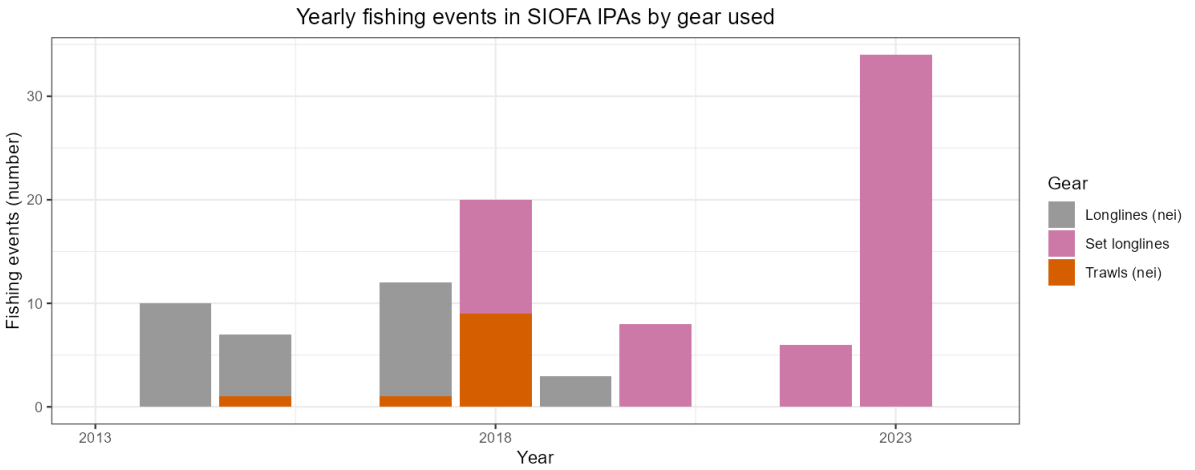

Figure 25 – Number of fishing events by gear in Interim Protected Areas (IPAs) per year (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

Fishing operations in SIOFA IPAs events caught a large number of species, but generally in relatively low amounts (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).

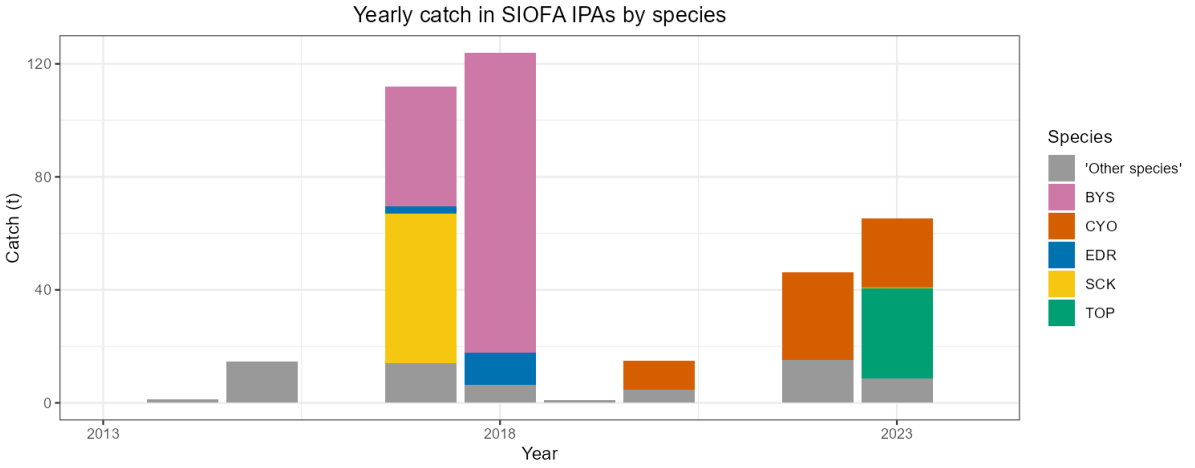

Figure 26 – Total catch (t) by species in Interim Protected Areas (IPAs) per year (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Only the top five species (by weight) are fully represented, while the other species have been grouped in a single category. Catches in 2021 were 0.1 t and thus are not visible in the graph.

9. Scientific Observer and port sampling programmes

CMM 01(2024) requires SIOFA CCPs to implement Scientific Observer programmes. Scientific Observer coverage of trawl fisheries in the SIOFA Area was set at 100% (para. 39a of CMM 01(2024)) and at 20% for any other bottom fishing gear type (para. 39b of CMM 01(2024)).

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

Table 7 provides a summary of the Scientific Observer programs implemented by each SIOFA CCP and information on port sampling.

Table 7 – Summary of Scientific Observer and Ports Sampling programs in 2021 (sources: SIOFA National Reports 2021).

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 02(2021).
	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. The small motorized boats carry out the fishing activities. The main difficulty arises in making observers available for each boat, of which there are 19 today.
Cook Islands	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 01(2020) (interim

Flag	Item	Description
		Bottom Fishing Measures). The Cook Island has in addition, requested an extension of this derogation to March 2022.
	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 are 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 02(2021). 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 16(2016) (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
	Collection	

Flag	Item	Description
		Fisheries Commission (NPFC) CA. The scientific observers collect items listed in Annex B, CMM 02(2017), CMM 02(2018), CMM 02(2019), and CMM 02(2020), 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.
	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	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.
	Collection	
	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

Flag	Item	Description
		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.
	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 2022 National Report

10. Summary of Scientific Observer biological sampling

The SIOFA Scientific 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 key target species

The length of some of the main target species of fisheries in the SIOFA Area (see Appendix A) is measured by Scientific Observers and reported both in the SIOFA Observer database and in national reports. Table 8 summarizes the number of individuals of each species that were measured by the Scientific Observer programmes.

Table 8 – Summary of the number of fish of SIOFA key target species measured by Scientific Observers in 2014–2023 for length (source: SIOFA Observer database 2014–2023).

Number of fish of SIOFA key target species measured by Scientific Observers												
			Year									
FAO code	Common name	Scientific name	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
BXD	Alfonsino	*Beryx decadactylus*	0	0	0	0	1	16	398	178	76	36	**705**
BYS	Splendid alfonsino	*Beryx splendens*	792	500	9 608	39 863	24 013	32 229	17 536	14 433	25 024	28 973	**192 971**
LEC	Escolar	*Lepidocybium flavobrunneum*	0	0	0	0	0	1	0	4 159	7 041	1 496	**12 697**
OIL	Oilfish	*Ruvettus pretiosus*	0	14	10	0	0	3	4	8 240	16 675	2 678	**27 624**
ORY	Orange roughy	*Hoplostethus atlanticus*	283	0	0	0	9 727	9 605	6 799	42	4 312	1 300	**32 068**
TOA	Antarctic toothfish	*Dissostichus mawsoni*	0	0	0	0	0	1	12	17	7	0	**37**
TOP	Patagonian toothfish	*Dissostichus eleginoides*	0	0	0	792	254	4 954	5 552	3 291	4 378	5 389	**24 610**
WHA	Hapuku wreckfish	*Polyprion oxygeneios*	6	0	136	0	10	24	527	281	6	7	**997**
WRF	Wreckfish	*Polyprion americanus*	0	0	96	0	32	111	1 951	585	227	184	**3 186**

Table 9 expresses the percentage (%) of the catch of key target species that was measured for length in each year. Note that not all species caught were also measured, so a ratio could not be calculated for 1 out of 10 species caught due to this (HAU, Hapuka, *Polyprion* spp), but values are present for the single species that form the hapuku wreckfish group.

Table 9 – Share (%) of the total catch of key species that was measured for length by Scientific Observers in each year (source: SIOFA Observer database 2014–2023). The fraction of the catch measured (%, 3 decimals precision) was derived considering the average weight of an individual measured in every given year. "0" marks years/species for which a given measure or ratio was not available. Values above 100% (highlighted in yellow) are due to mismatches between the data recorded in the Observer database and that recorded in the CatchEffort database, particularly when the estimated total weight of the catch does not exactly match the fine scale weights recorded by Scientific Observers.

Percentage of fish of SIOFA key target species measured by Scientific Observers											
			Year								
FAO code	Common name	Scientific name	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
BXD	Alfonsino	*Beryx decadactylus*	0.000	0.000	0.000	0.000	4.323	0.450	0.195	0.145	13.501	33.657
BYS	Splendid alfonsino	*Beryx splendens*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LEC	Escolar	*Lepidocybium flavobrunneum*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.002	0.003
OIL	Oilfish	*Ruvettus pretiosus*	0.000	0.031	0.005	0.000	0.000	0.002	0.013	0.001	0.001	0.002
ORY	Orange roughy	*Hoplostethus atlanticus*	0.001	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.001
TOA	Antarctic toothfish	*Dissostichus mawsoni*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	168.097	486.486	0.000
TOP	Patagonian toothfish	*Dissostichus eleginoides*	0.000	0.000	0.000	0.080	0.010	0.018	0.034	0.019	0.025	0.023
WHA	Hapuku wreckfish	*Polyprion oxygeneios*	0.000	0.000	1.053	0.000	2.592	0.416	0.463	1.156	13.241	19.048
WRF	Wreckfish	*Polyprion americanus*	0.000	0.000	1.075	0.000	247.665	1.777	0.159	0.142	0.995	1.473

10.2 Length measurements of all other species

Table 10 summarises the number of individuals measured for all other species of fish, when at least 40 lengths were recorded in at least one year.

Table 10 – Summary of the number of fish of SIOFA bycatch species measured for length by Scientific Observers (sources: SIOFA Observer database 2014–2023). Only species where at least 40 individuals have been measured in at least one year are included.

FAO code	Common name	Scientific name	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
BWA	Bluenose warehou	*Hyperoglyphe antarctica*	34	0	5	0	1	9	141	215	84	41	530
EDR	Pelagic armourhead	*Pseudopentaceros richardsoni*	56	0	338	1650	13	0	87	63	80	0	2287
EPI	Black cardinal fish	*Epigonus telescopus*	210	0	0	0	0	0	16	0	102	250	578
JAX	Jack and horse mackerels nei	*Trachurus spp*	110	0	50	0	0	0	0	0	6	0	166
ONV	Spiky oreo	*Neocyttus rhomboidalis*	427	0	0	0	0	0	0	12	152	2	593
RIB	Common mora	*Mora moro*	51	0	0	20	8	687	701	907	668	442	3484
RYG	Rubyfish	*Plagiogeneion rubiginosum*	353	0	50	0	0	1	0	0	20	0	424
SCK	Kitefin shark	*Dalatias licha*	2	0	0	0	0	26	275	92	206	31	632
SEY	Violet warehou	*Schedophilus velaini*	560	89	519	0	1	59	160	99	125	0	1612
SSO	Smooth oreo dory	*Pseudocyttus maculatus*	82	0	0	0	0	0	0	0	90	100	272
TAK	Tarakihi	*Nemadactylus macropterus*	4	0	0	0	0	0	19	48	0	0	71
GEP	Snake mackerels, escolars nei	*Gempylidae*	0	0	50	0	0	0	0	0	0	0	50
ANT	Blue antimora	*Antimora rostrata*	0	0	0	316	0	658	1162	1083	563	615	4397
BYR	Kerguelen sandpaper skate	*Bathyraja irrasa*	0	0	0	6	0	22	18	468	37	129	680
GRV	Grenadiers nei	*Macrourus spp*	0	0	0	279	27	12	517	592	298	1	1726
HOL	Chimaeras, etc. nei	*Chimaeriformes*	0	0	0	9	0	42	0	1	19	25	96

FAO code	Common name	Scientific name	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
MCH	Bigeye grenadier	*Macrourus holotrachys*	0	0	0	150	60	1183	1339	776	1073	1851	6432
ROK	Rosefishes nei	*Helicolenus spp*	0	0	0	20	26	1	180	0	0	0	227
SDC	Basketwork eel	*Diastobranchus capensis*	0	0	0	73	0	0	3	1	117	0	194
SHL	Lanternsharks nei	*Etmopterus spp*	0	0	0	180	0	1654	1976	0	536	691	5037
RFA	Whiteleg skate	*Amblyraja taaf*	0	0	0	0	7	542	846	789	539	936	3659
AVR	Green jobfish	*Aprion virescens*	0	0	0	0	0	515	171	65	59	68	878
BAR	Barracudas nei	*Sphyraena spp*	0	0	0	0	0	73	4	26	0	0	103
BAT	Batfishes	*Platax spp*	0	0	0	0	0	44	0	0	0	0	44
BEA	Eaton's skate	*Bathyraja eatonii*	0	0	0	0	0	15	12	42	59	7	135
BIS	Bigeye scad	*Selar crumenophthalmus*	0	0	0	0	0	19	0	1613	675	19	2326
BRF	Blackbelly rosefish	*Helicolenus dactylopterus*	0	0	0	0	0	105	350	45	156	70	726
COX	Conger eels, etc. nei	*Congridae*	0	0	0	0	0	99	0	12	100	139	350
CYO	Portuguese dogfish	*Centroscymnus coelolepis*	0	0	0	0	0	4000	2454	941	2508	1096	10999
DCA	Birdbeak dogfish	*Deania calceus*	0	0	0	0	0	27	292	100	316	35	770
DCC	Shortfin scad	*Decapterus macrosoma*	0	0	0	0	0	3052	1014	6952	5455	4230	20703
DCK	Redtail scad	*Decapterus kurroides*	0	0	0	0	0	606	109	53	67	25	860
EMN	Marbled coralgrouper	*Plectropomus punctatus*	0	0	0	0	0	96	65	128	65	57	411
ETM	Southern lanternshark(Lucifer)	*Etmopterus granulosus*	0	0	0	0	0	2399	0	844	481	794	4518
FIT	Flutemouth	*Fistularia spp*	0	0	0	0	0	202	161	0	0	0	363
GOX	Goatfishes	*Upeneus spp*	0	0	0	0	0	420	0	0	0	0	420
GUP	Gulper shark	*Centrophorus granulosus*	0	0	0	0	0	162	197	13	72	69	513
GUQ	Leafscale gulper shark	*Centrophorus squamosus*	0	0	0	0	0	272	346	241	493	241	1593
HYD	Ratfishes nei	*Hydrolagus spp*	0	0	0	0	0	58	212	1	105	0	376
IWX	Coralgroupers nei	*Plectropomus spp*	0	0	0	0	0	120	52	0	0	0	172

FAO code	Common name	Scientific name	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
KZJ	Delagoa threadfin bream	*Nemipterus bipunctatus*	0	0	0	0	0	5803	8558	11892	12427	4380	43060
LIB	Brushtooth lizardfish	*Saurida undosquamis*	0	0	0	0	0	6056	5327	9720	9690	5096	35889
LJB	Two-spot red snapper	*Lutjanus bohar*	0	0	0	0	0	205	225	32	93	120	675
LJG	Humpback red snapper	*Lutjanus gibbus*	0	0	0	0	0	198	259	6	36	18	517
LUB	Emperor red snapper	*Lutjanus sebae*	0	0	0	0	0	13	105	58	1	50	227
LZX		*Lethrinus spp*	0	0	0	0	0	196	44	85	0	3	328
NGU	Yellowspotted trevally	*Carangoides fulvoguttatus*	0	0	0	0	0	231	3306	200	751	2163	6651
NGX		*Carangoides spp*	0	0	0	0	0	1851	490	0	0	0	2341
QUK	Shortspine spurdog	*Squalus mitsukurii*	0	0	0	0	0	13	65	0	6	7	91
RUS	Indian scad	*Decapterus russelli*	0	0	0	0	0	8457	13511	19751	14582	4400	60701
SKA	Raja rays nei	*Raja spp*	0	0	0	0	0	19	130	0	0	0	149
SVY	Cutthroat eels nei	*Synaphobranchidae*	0	0	0	0	0	90	325	0	0	0	415
SYW	Variegated lizardfish	*Synodus variegatus*	0	0	0	0	0	101	85	0	60	0	246
CGZ	Conger eels nei	*Conger spp*	0	0	0	0	0	0	292	29	3	0	324
DOP	Shortnose spurdog	*Squalus megalops*	0	0	0	0	0	0	81	1	7	0	89
KZY	Sicklefin mullet	*Liza falcipinnis*	0	0	0	0	0	0	45	0	0	0	45
LEN	Smalltooth emperor	*Lethrinus microdon*	0	0	0	0	0	0	110	2	2	2	116
LIX	Lizardfishes nei	*Synodontidae*	0	0	0	0	0	0	15	35	104	0	154
MSD	Mackerel scad	*Decapterus macarellus*	0	0	0	0	0	0	31	225	297	22	575
NGY	Bludger	*Carangoides gymnostethus*	0	0	0	0	0	0	49	53	69	7	178
OPH	Cusk-eels, brotulas nei	*Ophidiidae*	0	0	0	0	0	0	107	5	2	0	114
QMC	Caml grenadier	*Macrourus caml*	0	0	0	0	0	0	63	159	120	5	347
SDU	Arrowhead dogfish	*Deania profundorum*	0	0	0	0	0	0	112	0	0	2	114
WGR	Whitson's grenadier	*Macrourus whitsoni*	0	0	0	0	0	0	159	13	51	9	232
BIL	Marlins,sailfishes,etc. nei	*Istiophoridae*	0	0	0	0	0	0	0	224	295	73	592
PEL	Pelagic fishes nei	*Actinopterygii*	0	0	0	0	0	0	0	376	266	406	1048
PQY	Purple-spotted bigeye	*Priacanthus tayenus*	0	0	0	0	0	0	0	43	0	0	43

FAO code	Common name	Scientific name	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
RAG	Indian mackerel	*Rastrelliger kanagurta*	0	0	0	0	0	0	0	136	0	0	136
SDV	Smooth-hounds nei	*Mustelus spp*	0	0	0	0	0	0	0	64	0	0	64
SDX	Scads nei	*Decapterus spp*	0	0	0	0	0	0	0	178	1	101	280
SKX	Sharks, rays, skates, etc. nei	*Elasmobranchii*	0	0	0	0	0	0	0	795	207	445	1447
TUD	African scad	*Trachurus delagoa*	0	0	0	0	0	0	0	1882	920	373	3175
TUJ	Arabian scad	*Trachurus indicus*	0	0	0	0	0	0	0	640	280	463	1383
TUN	Tunas nei	*Thunnini*	0	0	0	0	0	0	0	8651	2810	10660	22121
UPM	Goldband goatfish	*Upeneus moluccensis*	0	0	0	0	0	0	0	1619	0	0	1619
YRB	Obtuse barracuda	*Sphyraena obtusata*	0	0	0	0	0	0	0	175	0	0	175
CDL	Cardinal fishes nei	*Epigonus spp*	0	0	0	0	0	0	0	0	70	200	270
CRF	Blue trevally	*Carangoides ferdau*	0	0	0	0	0	0	0	0	3	317	320
ETE		*Etmopterus compagnoi*	0	0	0	0	0	0	0	0	70	0	70
OWR	Prickly lanternfish	*Myctophum asperum*	0	0	0	0	0	0	0	0	0	50	50
UBU	Bigeye cigarfish	*Cubiceps pauciradiatus*	0	0	0	0	0	0	0	0	0	258	258
YMO	Purpleback flying squid	*Sthenoteuthis oualaniensis*	0	0	0	0	0	0	0	0	0	305	305

10.3 Other biological sampling of fish species

Besides length, other biological measures are taken in the SIOFA Scientific Observer programme. These include measures of maturity stage, sex and weight. Table 11 displays the number of individuals for which other biological records are available in the dataset.

Table 11 – Number of other fish that have been sampled for maturity, sex or weight by Scientific Observers (source: SIOFA Observer database 2019-2023, with 2023 being largely incomplete). Only species with at least 40 measures (of at least one parameter) are included in the table.

FAO code	Common name	Scientific name	Maturity (n)	Sex (n)	Weight (n)
ANT	Blue antimora	*Antimora rostrata*	11	991	3168
AVR	Green jobfish	*Aprion virescens*	0	0	880
BAT	Batfishes	*Platax spp*	0	0	44
BEA	Eaton's skate	*Bathyraja eatonii*	124	188	188
BIL	Marlins,sailfishes,etc. nei	*Istiophoridae*	0	594	591
BIS	Bigeye scad	*Selar crumenophthalmus*	0	1613	125
BOR	Boarfishes nei	*Caproidae*	50	50	50
BRF	Blackbelly rosefish	*Helicolenus dactylopterus*	0	1	726
BWA	Bluenose warehou	*Hyperoglyphe antarctica*	59	377	520
BXD	Alfonsino	*Beryx decadactylus*	16	199	705
BYR	Kerguelen sandpaper skate	*Bathyraja irrasa*	145	688	688
BYS	Splendid alfonsino	*Beryx splendens*	48021	54847	41961
CDL	Cardinal fishes nei	*Epigonus spp*	200	200	270
CGZ	Conger eels nei	*Conger spp*	0	0	324
COX	Conger eels, etc. nei	*Congridae*	0	1	350
CRF	Blue trevally	*Carangoides ferdau*	0	0	320
CRS	Portunus swimcrabs nei	*Portunus spp*	0	0	55
CYO	Portuguese dogfish	*Centroscymnus coelolepis*	10998	10999	10998
CYP	Longnose velvet dogfish	*Centroselachus crepidater*	44	44	44
DCA	Birdbeak dogfish	*Deania calceus*	769	766	770
DCC	Shortfin scad	*Decapterus macrosoma*	0	6952	22
DCK	Redtail scad	*Decapterus kurroides*	0	53	12
DOP	Shortnose spurdog	*Squalus megalops*	88	89	89
EDR	Pelagic armourhead	*Pseudopentaceros richardsoni*	152	213	330
EML	Blacksaddled coralgrouper	*Plectropomus laevis*	0	0	41
EMN	Marbled coralgrouper	*Plectropomus punctatus*	0	0	411
EMU	Roving coralgrouper	*Plectropomus pessuliferus*	0	0	51
EPI	Black cardinal fish	*Epigonus telescopus*	534	535	578
ETE		*Etmopterus compagnoi*	0	0	70
ETM	Southern lanternshark(Lucifer)	*Etmopterus granulosus*	4504	4519	4519
FIP	Red cornetfish	*Fistularia petimba*	0	0	66
FIT	Flutemouth	*Fistularia spp*	0	0	76

FAO code	Common name	Scientific name	Maturity (n)	Sex (n)	Weight (n)
GEP	Snake mackerels, escolars nei	*Gempylidae*	50	50	25
GLT	Golden trevally	*Gnathanodon speciosus*	0	0	44
GOX	Goatfishes	*Upeneus spp*	0	0	61
GRV	Grenadiers nei	*Macrourus spp*	19	663	807
GUP	Gulper shark	*Centrophorus granulosus*	513	513	513
GUQ	Leafscale gulper shark	*Centrophorus squamosus*	1584	1584	1593
HOL	Chimaeras, etc. nei	*Chimaeriformes*	86	96	96
HXT	Sharpnose sevengill shark	*Heptranchias perlo*	51	51	51
HYD	Ratfishes nei	*Hydrolagus spp*	205	270	376
IWX	Coralgroupers nei	*Plectropomus spp*	0	0	173
JAX	Jack and horse mackerels nei	*Trachurus spp*	158	160	135
JBO	Redaxil emperor	*Lethrinus conchyliatus*	0	0	50
KZJ	Delagoa threadfin bream	*Nemipterus bipunctatus*	0	11892	6
LEC	Escolar	*Lepidocybium flavobrunneum*	0	12725	9797
LEF	Lefteye flounders nei	*Bothidae*	0	0	44
LEN	Smalltooth emperor	*Lethrinus microdon*	0	0	118
LHO	Longface emperor	*Lethrinus olivaceus*	0	0	49
LIB	Brushtooth lizardfish	*Saurida undosquamis*	0	9720	5
LJB	Two-spot red snapper	*Lutjanus bohar*	0	0	675
LJG	Humpback red snapper	*Lutjanus gibbus*	0	0	517
LTQ	Sky emperor	*Lethrinus mahsena*	0	0	70
LUB	Emperor red snapper	*Lutjanus sebae*	0	0	231
LZX		*Lethrinus spp*	0	0	343
MCC	Ridge scaled rattail	*Macrourus carinatus*	44	44	47
MCH	Bigeye grenadier	*Macrourus holotrachys*	476	654	6627
MSD	Mackerel scad	*Decapterus macarellus*	0	225	1
NGU	Yellowspotted trevally	*Carangoides fulvoguttatus*	0	0	6657
NGX		*Carangoides spp*	0	0	2365
NGY	Bludger	*Carangoides gymnostethus*	0	0	178
OIL	Oilfish	*Ruvettus pretiosus*	17	27868	21192
ONV	Spiky oreo	*Neocyttus rhomboidalis*	539	573	593
OPH	Cusk-eels, brotulas nei	*Ophidiidae*	7	7	114
ORY	Orange roughy	*Hoplostethus atlanticus*	28599	32049	22460
OWR	Prickly lanternfish	*Myctophum asperum*	0	0	50
PEL	Pelagic fishes nei	*Actinopterygii*	0	1048	1044
PQY	Purple-spotted bigeye	*Priacanthus tayenus*	0	43	99
PUX	Puffers nei	*Tetraodontidae*	0	0	41
QMC	Caml grenadier	*Macrourus caml*	289	291	347
QUK	Shortspine spurdog	*Squalus mitsukurii*	91	91	91
RAG	Indian mackerel	*Rastrelliger kanagurta*	0	136	61
RFA	Whiteleg skate	*Amblyraja taaf*	1354	3147	3284
RIB	Common mora	*Mora moro*	404	481	3464
ROK	Rosefishes nei	*Helicolenus spp*	0	39	202
RUS	Indian scad	*Decapterus russelli*	0	19751	21
RYG	Rubyfish	*Plagiogeneion rubiginosum*	336	404	399

FAO code	Common name	Scientific name	Maturity (n)	Sex (n)	Weight (n)
SCK	Kitefin shark	*Dalatias licha*	630	629	632
SCO	Scorpionfishes, redfishes nei	*Scorpaenidae*	0	0	51
SDC	Basketwork eel	*Diastobranchus capensis*	2	5	120
SDU	Arrowhead dogfish	*Deania profundorum*	114	114	114
SDV	Smooth-hounds nei	*Mustelus spp*	0	0	80
SDX	Scads nei	*Decapterus spp*	0	178	8
SEY	Violet warehou	*Schedophilus velaini*	1101	1416	1327
SHL	Lanternsharks nei	*Etmopterus spp*	4846	5027	4857
SKA	Raja rays nei	*Raja spp*	0	130	149
SKX	Sharks, rays, skates, etc. nei	*Elasmobranchii*	0	1449	1441
SNA	Snappers nei	*Lutjanus spp*	0	0	56
SSO	Smooth oreo dory	*Pseudocyttus maculatus*	182	182	272
SVY	Cutthroat eels nei	*Synaphobranchidae*	0	0	415
TAK	Tarakihi	*Nemadactylus macropterus*	2	71	57
TOP	Patagonian toothfish	*Dissostichus eleginoides*	23043	24015	22941
TUD	African scad	*Trachurus delagoa*	0	1882	13
TUJ	Arabian scad	*Trachurus indicus*	0	640	8
TUN	Tunas nei	*Thunnini*	0	22135	21992
UAZ	Thorny flathead	*Rogadius pristiger*	0	0	57
UBU	Bigeye cigarfish	*Cubiceps pauciradiatus*	100	100	258
UPM	Goldband goatfish	*Upeneus moluccensis*	0	1619	138
WGR	Whitson's grenadier	*Macrourus whitsoni*	218	227	232
WHA	Hapuku wreckfish	*Polyprion oxygeneios*	260	781	902
WRF	Wreckfish	*Polyprion americanus*	1240	2158	3095
YBS	Bigeye barracuda	*Sphyraena forsteri*	0	0	57
YMO	Purpleback flying squid	*Sthenoteuthis oualaniensis*	8	8	305
YRB	Obtuse barracuda	*Sphyraena obtusata*	0	175	48
YTC	Yellowtail amberjack	*Seriola lalandi*	20	57	50

10.4 Biological sampling of sharks

Other species of fish in the catch are also measured in the Scientific Observer programme. Table 12 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 12 – Summary of the number of sharks measured for length by SIOFA Scientific Observers in 2014–2023 (sources: SIOFA Observer database 2012–2023, with 2023 data being largely incomplete). See Appendix B for a list of sharks, defined for the purpose of this overview.

Number of sharks measured for length by SIOFA Scientific Observers	
Year	**N. of sharks measured**
2014	28
2015	3
2017	195
2018	7
2019	9 243
2020	6 795
2021	4 368
2022	5 595
2023	4 625

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

Table 13 focuses on the number of deep-water sharks at "high risk" and "of concern" (as defined in CMM 12(2024), and reported here in Appendix C for easier reference) that have been sampled by Scientific Observers for maturity, sex, length or weight.

Table 13 – Number of deep-water sharks at "high risk" (in bold) and "of concern" (as defined in CMM 12(2024), and reported here in Appendix C for easier reference) that have been sampled for maturity, sex, length or weight by SIOFA Scientific Observers (source: SIOFA Observer database 2019-2023).

Number of sharks in CMM 12 measured by SIOFA Scientific Observers						
FAO code	**Common name**	**Scientific name**	**Maturity (n)**	**Sex (n)**	**Length (n)**	**Weight (n)**
CYO	Portuguese dogfish	*Centroscymnus coelolepis*	10 998	10 999	10 999	10 998
CYP	Longnose velvet dogfish	*Centroselachus crepidater*	44	44	44	44
DCA	Birdbeak dogfish	*Deania calceus*	769	766	770	770
ETP	Smooth lanternshark	*Etmopterus pusillus*	0	1	1	1
GUP	Gulper shark	*Centrophorus granulosus*	513	513	513	513
GUQ	Leafscale gulper shark	*Centrophorus squamosus*	1 584	1 584	1 593	1 593
QUK	Shortspine spurdog	*Squalus mitsukurii*	91	91	91	91
RZZ	Southern sleeper shark	*Somniosus antarcticus*	9	9	9	9
SCK	Kitefin shark	*Dalatias licha*	630	629	632	632
SDU	Arrowhead dogfish	*Deania profundorum*	114	114	114	114
SSQ	Velvet dogfish	*Zameus squamulosus*	9	9	9	9

10.5 Patagonian toothfish tags releases and recaptures

In 2021 the SIOFA Scientific Committee endorsed the recommendations of a SIOFA/CCAMLR joint workshop regarding exchange of toothfish data, to standardise the process of data exchange between SIOFA and CCAMLR (as described in Annex A and Annex B of CCAMLR and SIOFA SC Chairs (2022)). The Scientific Committee also endorsed the adoption of toothfish tagging methods consistent with toothfish tagging protocols in CCAMLR (as described by the SIOFA Secretariat, 2022).

In 2024, the SIOFA SC tasked the Secretariat to retrieve historical tagging data that might have been available at the CCAMLR Secretariat from fishing activities in the SIOFA Ara prior to the establishment of SIOFA. The SIOFA Data Officer retrieved from Uruguay 60 tag records from the vessel 'Banzare', which conducted fishing activities in the SIOFA Area in 2009, and included these in the SIOFA Observer database. The Data Officer was also able to retrieve catch and effort data from 10 fisheries operations conducted by Ukraine in 2004, and these data were included in the SIOFA CatchEffort database.

The data for the 264 tagged fish which were released between April 2008 to June 2008 by the 'Banzare' were reported to CCAMLR and included in the tag linking algorithm, resulting in one additional linked recapture reported here.

Japan also flagged that they might have some data from the operations of the 'Shinsei Maru No. 3' in 2010 and 2013. These data were not available to SIOFA at the time of this analysis and thus not included in this report.

Two Spanish vessels fished in the SIOFA management area in 2017 and 2018. These vessels recovered eleven tagged Patagonian toothfish (*Dissostichus eleginoides*) in 2017 and 2018, but the release data from one of these toothfish are missing. The time elapsed between the release and recapture was between 3 and 10 years and all fish were small at release (between 75-93 cm). The maximum growth in weight was 5 kg and 26 cm in length. Specimens recaptured travelled (straight line distance) from 6 to ~1800 km, with 6 of 10 individuals showing a long-distance movement (exceeding 1000 km). This information was provided to CCAMLR by Sarralde and Barreiro (2018).

Table 14 summarizes the number of toothfish tagged and released in the SIOFA Area to date, as available in the SIOFA database after the most recent data exchange with CCAMLR. Table 15 summarizes recaptures in the SIOFA Area to date. Most recaptures in the SIOFA Area were of fish originally released in the CCAMLR Area, but 14 individuals were released in the SIOFA Area (Table 15). In 2023, three individuals released in the SIOFA Area were recaptured in the CCAMLR Area (one at a considerable distance from the release point, in CCAMLR Subarea 88.2) and another individual released in the Williams Ridge toothfish management area was recaptured in CCAMLR division 58.5.1 in 2024.

Table 14 – Summary of Patagonian toothfish tag releases in the SIOFA Area, by Subarea and year (source: SIOFA Observer database/CCAMLR database 2009-2023).

Patagonian toothfish tag releases in the SIOFA Area (2009-2023)			
Year	**SIOFA Subarea 7**	**SIOFA Subarea 3b**	**Total**
2009	0	60	60
2020	175	0	175
2021	150	687	837
2022	149	774	923
2023	15	1 043	1 058
Total	489	2 564	3 053

Table 15 – Summary of Patagonian toothfish tag recaptures in the SIOFA Area, by Subarea (source: SIOFA Observer database/CCAMLR database 2019-2023). Numbers of recaptured tags originating from the CCAMLR areas are provided in separate columns.

Patagonian toothfish tag recaptures in the SIOFA Area (2019-2023)				
Year	**All recaptures in SIOFA Subarea 3b**	**All recaptures in SIOFA Subarea 7**	**CCAMLR tags recaptured in SIOFA Subarea 3b**	**CCAMLR tags recaptured in SIOFA Subarea 7**
2019	0	1	0	1
2020	2	1	2	1
2021	5	3	3	3
2022	5	5	1	4
2023	9	2	3	1
Totals	21	12	9	10

Toothfish recapture data were shared with CCAMLR to collect more detailed information on release/recapture locations and fish condition (last update 25/09/2024).

[this section is not included in the public version of the manuscript, due to confidentiality limitations set out in CMM 03(2016)]

11. References

Cordue, P. L. 2018a. Assessments of orange roughy stocks in SIOFA statistical areas 1, 2, 3a, and 3b. SIOFA, Saint-Denis, Reunion.

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.

Sarralde and Barreiro. 2018. Information about tagged Patagonian toothfish (*Dissostichus eleginoides*) tagged in the CCAMLR Convention Area and recovered in the SIOFA management area by two Spanish vessels in 2017/18. CCAMLR paper WG-FSA-18/53 Rev. 1

12. Appendix A – List of species identified by the SIOFA SC as primary and secondary species in SIOFA fisheries and considered as target species for the purposes of this overview

FAO Code	Common name	Scientific name
BYS	Splendid alfonsino	*Beryx splendens*
ORY	Orange roughy	*Hoplostethus atlanticus*
CDL	Cardinal fishes	*Epigonus spp*
OIL	Oilfish	*Ruvettus pretiosus*
HAU	Hapuka	*Polyprion spp.*
LIB	Brushtooth lizardfish	*Saurida undosquamis*
RUS	Indian scad	*Decapterus russelli*
KZJ	Threadfin bream	*Nemipterus bipunctatus*
UPM	Goldfin goatfish	*Upeneus moluccensis*
DCC	Shortfin scad	*Decapterus macrosoma*
LTQ	Sky emperor	*Lethrinus mahsena*
TOP	Toothfish	*Dissostichus eleginoides*
NGU	Yellow spotted trevally	*Carangoides fulvoguttatus*
NGY	Bludger	*Carangoides gymnostethus*
NGX	Carangoides species	*Carangoides spp*
LEC	Escolar	*Lepidocybium flavobrunneum*
BYS	Splendid alfonsino	*Beryx splendens*
SSO	Smooth oreo dory	*Pseudocyttus maculatus*
BIS	Bigeye scad	*Selar crumenophthalmus*
YBS	bigeye barracuda	*Sphyraena forsteri*
EMN	Marbled coral groper	*Plectropomus punctatus*
LTQ	Sky emperor	*Lethrinus mahsena*
LUB	Emperor red snapper	*Lutjanus sebae*
LJB	Two-spot red snapper	*Lutjanus bohar*
BOE	Black oreo	*Allocyttus niger*
ORD	Oreos nei	*Oreosomatidae*
GRV	Macrourids	*Macrourus spp*
ANT	Violet cod	*Antimora rostrata*
BIL	Billfish*	*Istiophoridae*
TUN	Tuna *	*Thunnini*
YFT	Yellowfin tuna	*Thunnus albacares*
ALF	Alfonsinos	*Beryx* spp.
TOT	Toothfish	*Dissostichus* spp.
HAU	Hapuka	*Polyprion* spp.

* These species are managed by, and reported at the species level to, IOTC.

13. 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
AML	Grey reef shark	*Carcharhinus amblyrhynchos*
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	Ghost sharks	*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*

FAO code	FAO common name	Scientific name
RYE	Ornate eagle ray	*Aetomylaeus vespertilio*
RZZ	Southern sleeper shark	*Somniosus antarcticus*
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*

14. Appendix C – List of deep-sea sharks considered to be at "high risk" and "of concern" is included in Annex 1 of SIOFA CMM 12(2024) (Conservation and Management Measure for Sharks)

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

FAO code	English 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**	***Centroselachus crepidater***
DCA	**Birdbeak dogfish**	**Squale savate**	***Deania calceus***
DWG	**Cristina's skate**		***Bathyraja tunae***
ETP	Smooth lanternshark	Sagre nain	*Etmopterus pusillus*
EZT	**Blue-eye lanternshark**		***Etmopterus viator***
EZU	Whitecheek lanternshark		*Etmopterus alphus*
ETB	**Blurred smooth lantern shark**		***Etmopterus bigelowi***
GUP	**Gulper shark**	**Squale-chagrin commun**	***Centrophorus granulosus***
GUQ	**Leafscale gulper shark**	**Squale-chagrin de l'Atlantique**	***Centrophorus squamosus***
CPU	**Little gulper shark**	**Petit squale-chagrin**	***Centrophorus uyato***
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***
QUK	**Shortspine spurdog**	**Aiguillat épinette**	***Squalus mitsukurii***
RFI	**Paddlenose chimaera**		***Rhinochimaera africana***
SDQ	**Longsnout dogfish**	**Squale-savate à long nez**	***Deania quadrispinosa***
SDU	**Arrowhead dogfish**	**Squale-savate lutin**	**Deania profundorum**
SCK	**Kitefin shark**	**Squale liche**	***Dalatias licha***
SSQ	**Velvet dogfish**		***Zameus squamulosus***
RZZ	**Southern sleeper shark**		***Somniosus antarcticus***
YSM	**Largespine velvet dogfish**	**Pailona austral**	***Scymnodon macracanthus***
ZZC	**Dark-mouth chimaera**		***Chimaera buccanigella***
ZZD	**Falkor chimaera**		***Chimaera didierae***
ZZE	**Seafarer's ghost shark**		***Chimaera willwatchi***

15. Appendix D – Data included in figures

Figure 27 – Yearly total catch (t) in the SIOFA Area (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). All catch included, even without spatial information.

Year	Catch (t)
2014	8266.35
2015	36804.19
2016	27865.06
2017	21157.89
2018	14363.94
2019	14733.7
2020	15861.69
2021	14188.14
2022	15001.74
2023	19419.26

Figure 28 – Total catch reported by SIOFA Subareas (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches without spatial information are not included.

Year	SubArea	Catch (t)
2014	1	12.65214
2015	1	244.0379
2016	1	887.5886
2017	1	5542.67
2018	1	4008.41
2019	1	2025.859
2020	1	4550.1
2021	1	2094.522
2022	1	2608.208
2023	1	2360.314
2014	2	2892.567
2015	2	4293.592
2016	2	3994.63
2017	2	3320.614
2018	2	3062.498
2019	2	3449.925
2020	2	2320.855
2021	2	2793.645
2022	2	3177.521
2023	2	2485.646
2014	3a	1678.286
2015	3a	1170.487
2016	3a	2054.513

Year	SubArea	Catch (t)
2017	3a	1006.218
2018	3a	1045.87
2019	3a	1148.544
2020	3a	1396.674
2021	3a	1037.084
2022	3a	965.549
2023	3a	1424.399
2014	3b	3014.457
2015	3b	6254.438
2016	3b	9007.653
2017	3b	8005.051
2018	3b	4575.246
2019	3b	5436.865
2020	3b	4695.987
2021	3b	4412.486
2022	3b	4647.925
2023	3b	10565.56
2014	4	630.4962
2015	4	1134.786
2016	4	34.03907
2017	4	386.9707
2018	4	928.5816
2019	4	559.6967
2020	4	824.4903
2021	4	420.7612
2022	4	355.1876
2023	4	181.339
2017	5	523.0365
2018	5	100.6148
2019	5	7.0368
2020	5	218.7876
2021	5	103.52
2022	5	62.51158
2023	5	5.24964
2015	6	96.964
2016	6	27.71337
2017	6	56.3174
2018	6	96.4996
2019	6	200.7715
2020	6	71.07661
2021	6	43.81253
2022	6	35.91121
2023	6	51.85043
2015	7	20.532
2018	7	362.6302
2019	7	203.2464
2020	7	82.20765
2021	7	35.8114

Year	SubArea	Catch (t)
2022	7	64.17369
2023	7	6.69576
2014	8	7.858
2015	8	12853.35
2016	8	9079.027
2017	8	2028.383
2018	8	105.8707
2019	8	1697.828
2020	8	1650.273

Figure 4a and b – Catch and bycatch as relative values (upper panel, a) and absolute values (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches without spatial information are not included, and the portion of bycatch composed by sharks (as defined in Appendix B) is highlighted.

Figure 5a and b – Target catch (upper panel, a) and bycatch (lower panel, b) in different SIOFA Subareas (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches without spatial information are not included.

Figure 6a and b – Yearly 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 2014–2023). Species are indicated by their 3-letter FAO code, see Appendix B for disambiguation.

Figure 7a and b – Yearly catch of sharks considered to be at "high risk" and "of concern" as included in Annex 1 of SIOFA CMM 12(2024) (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 2014–2023). Species are indicated by their 3-letter FAO code, see Appendix C for disambiguation.

Figure 10a and b – Target catch (as defined in Appendix A) and bycatch as relative values (upper panel, a) and absolute values (lower panel, b) in all SIOFA Assessment Areas for orange roughy (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches without spatial information are not included.

Figure 11a and b – Target catch (as defined in Appendix A) and bycatch as relative values (upper panel, a) and absolute values (lower panel, b) within the two SIOFA Assessment Areas for toothfish (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches without spatial information are not included.

Figure 14a and b –Bycatch and discards as relative values (upper panel, a) and absolute values (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches without spatial information are not included.

Figure 15 – Yearly discards in the SIOFA Area by species (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Only the top five species (by weight) are fully represented, while the other species have been grouped in a single category. Species are indicated by their 3-letter FAO code.

Figure 16a and b – Yearly alfonsino catch (t) 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 2014–2023).

Figure 17 – Unstandardised catches per unit of effort (CPUEs) of alfonsino in the SIOFA Area (t/tow) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

Figure 18a and b – Yearly orange roughy catch (t) 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 2014–2023). Values of the figure in panel a are provided in Table A.1 and values of the figure in panel b are provided in Table A.2 (both in Appendix A).

Figure 19 – Unstandardised catches per unit of effort (CPUEs) of orange roughy in the SIOFA Area (t/tow) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

Figure 20a and b – Yearly toothfish catch (t) 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 2014–2023). Note that the Subareas are larger than the toothfish Assessment Areas.

Year	Total catch (t)	Effort (10 thousand hooks)
2014	13.5	57.4049
2015	17.2	49.1515
2016	1.2	1.0112
2017	157	158.1598
2018	503.7	304.1199
2019	242.5	178.6158
2020	188.1	128.8434
2021	167.2	105.1092
2022	188.9	114.6223
2023	199.6	135.2161

Year	3b	7
2014	13.5	
2015	17.2	
2016	1.2	
2017	156.2	
2018	156.5	347.2
2019	58.1	184.4
2020	110.3	77.8
2021	136.7	30.5
2022	161.6	27.3
2023	196.3	3.3

Figure 21 – Unstandardised catches per unit of effort (CPUEs) of toothfish in the SIOFA Area (t/10 thousand hooks) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

Year	CPUEs
2014	0.235343
2015	0.350716
2016	1.203521
2017	0.992556
2018	1.656293
2019	1.357461
2020	1.459913
2021	1.590524
2022	1.648157
2023	1.475832

Figure 22a and b – Yearly hapuka catch (t) 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 2014–2023).

Figure 23 – Unstandardised catches per unit of effort (CPUEs) of hapuka in the SIOFA Area (t/10 thousand hooks) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

Figure 24a and b – Yearly oilfish catch (t) 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 2014–2023).

Year	Total catch (t)	Effort (10 thousand hooks)
2014	0.2	0
2015	3329.9	816.2505
2016	7901	1967.303
2017	8387.5	2425.898
2018	6716.3	1856.838
2019	4437.4	2098.871
2020	5493.6	1632.57
2021	2713.8	2823.591
2022	4649.4	2479.875
2023	8578.4	3650.94

Figure 25 – Unstandardised catches per unit of effort (CPUEs) of oilfish in the SIOFA Area (t/10 thousand hooks) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

Year	CPUEs
2015	4.079451
2016	4.016178
2017	3.457466
2018	3.617064
2019	2.114175
2020	3.364985
2021	0.961106
2022	1.874847
2023	2.349642

Figure 27 – Number of fishing events by gear in Interim Protected Areas (IPAs) per year (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

Figure 28 – Total catch (t) by species in Interim Protected Areas (IPAs) per year (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Only the top five species (by weight) are fully represented, while the other species have been grouped in a single category.