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SC-10-15

SIOFA Ecosystem Summary 2025

The SIOFA Secretariat

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	Information paper ☐
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	Restricted [1] ☐
	Closed session document [2] ☐
Abstract	

This paper presents the SIOFA Ecosystem Summary 2025.

The first draft of this document was originally prepared by the SIOFA Secretariat and presented during PAEWG4 and at SC7. SC8 further reviewed and endorsed this document, recommending its publication to MoP10, and the Summary was first published in 2023. An updated version was published in 2024.

This new version of the Ecosystem Summary includes figures with data updated to 2023.

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[1] Restricted documents may contain confidential information. Please do not distribute restricted documents in any form without the explicit permission of the SIOFA Secretariat and the data owner(s)/provider(s).
[2] Documents available only to members invited to closed sessions.

Recommendations

The SIOFA Secretariat recommends that the SC10:

- **notes** the work done by the Secretariat in preparing the SIOFA Ecosystem Summary 2025.
- **identifies** any elements in this summary that are confidential and should therefore be withheld from the published version.
- **provides** any comments or edits to the SIOFA Ecosystem Summary 2025 during the meeting.
- **considers** the frequency with which the Secretariat is to update the SIOFA Ecosystem Summary.
- **endorses** the SIOFA Ecosystem Summary 2025 and **recommends** that the SIOFA MoP tasks the Secretariat to publish it on the SIOFA website.

SIOFA Ecosystem Summary 2025

Version 1.0 Date 31.01.2025 | Revised by the SIOFA SC | Endorsed by SC10

Next review date: 2026

Prepared by the SIOFA Secretariat

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Contents

Summary of updates in this 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. Note that observer coverage data was only available from 2018 onwards.

- 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.

- Estimates of observer coverage (Table 2) updated using the newly linked SIOFA CatchEffort and Observer databases, rather than the unlinked version that was previously used.

- Flextables used to create auto-updating tables, particularly those nested, where appropriate.

- Appendix B (list of "sharks" present in the catch record) updated using the available data

- Table 3 (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 Ecosystem Summary describes the main known effects of SIOFA fisheries on ecosystems and species in the SIOFA Area (Figure 1) and summarizes the available data with an emphasis on the most recent five years. This document is targeted at the general public, institutions, and countries wanting to better understand SIOFA fisheries. It also describes SIOFA data available on SIOFA ecosystems and species that could be used by scientists and consultants for scientific research.

The SIOFA Fisheries Summaries provide more detailed information on target species of SIOFA fisheries, and their biology and ecology. The SIOFA Fisheries Overview further integrates this summary and illustrates broad temporal trends in the main fisheries in the SIOFA Area.
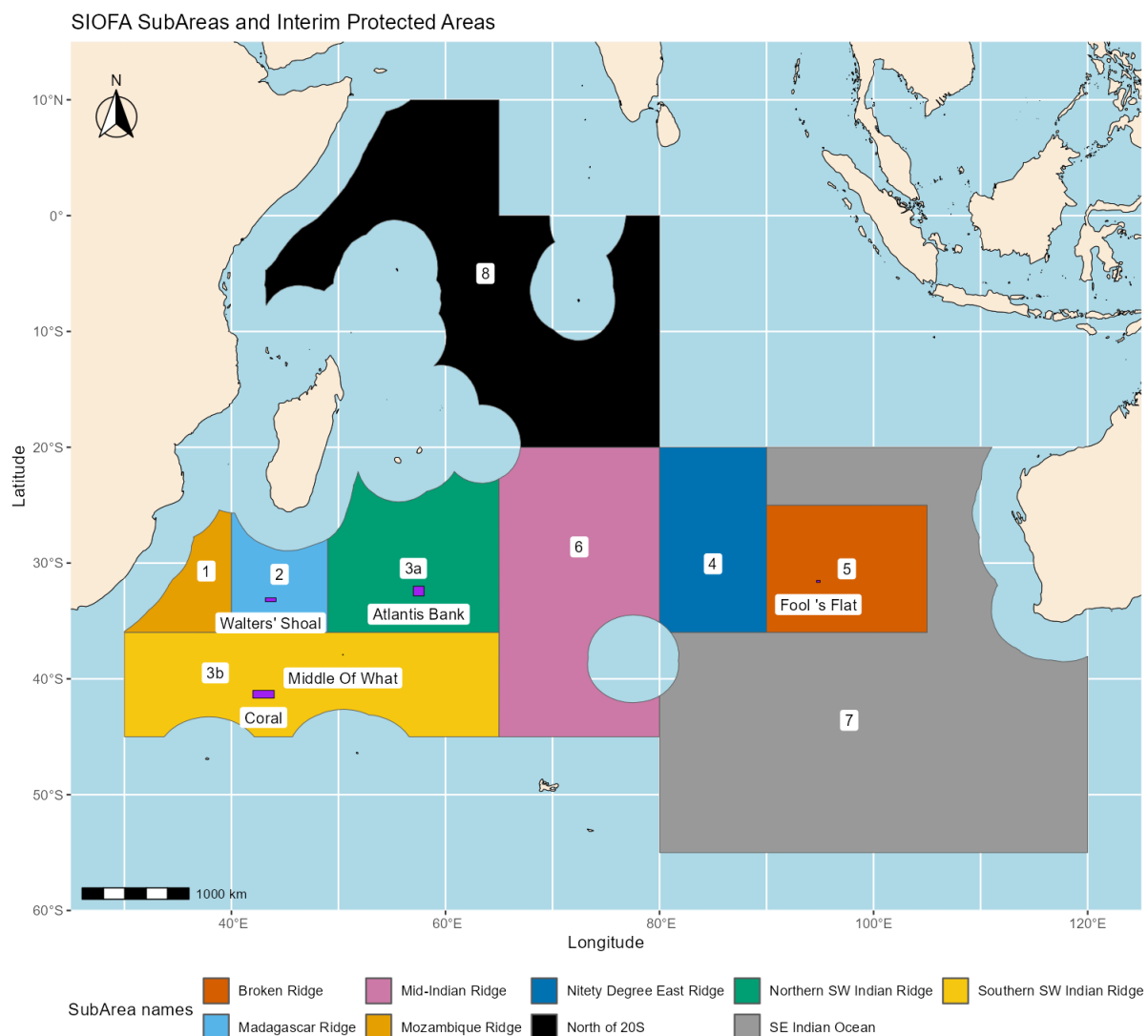

Figure 1 – The SIOFA Area and Subareas (source: SIOFA Spatial database). The Subarea numbers and colour codes are used consistently throughout this summary to identify Subareas. The map highlights SIOFA Interim Protection Areas (in purple) as defined in CMM 01(2024) (Annex 3). All the interim protection areas have been labelled by name for easier recognition.

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 (2015–2024) 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 Sections 6 and 6.2 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 (2017-2023): 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. Ecoregions of the Southern Indian Ocean

The PAE2021-01 project (SIOFA Bioregionalization and VMEs) produced maps of biogeographical regions of the Southern Indian Ocean based on VME indicator taxa using two complementary predictive modelling approaches ("predict first, then group" and "group first, then predict").

This work detected three biogeographical regions at the first hierarchical level, which broadly represented the upper and lower bathyal, the abyssal and the Southern Ocean (Figure 2). At the second hierarchical level, eight nested biogeographical regions were detected, displaying distinct geographical and bathymetric differences across the region (Figure 3).
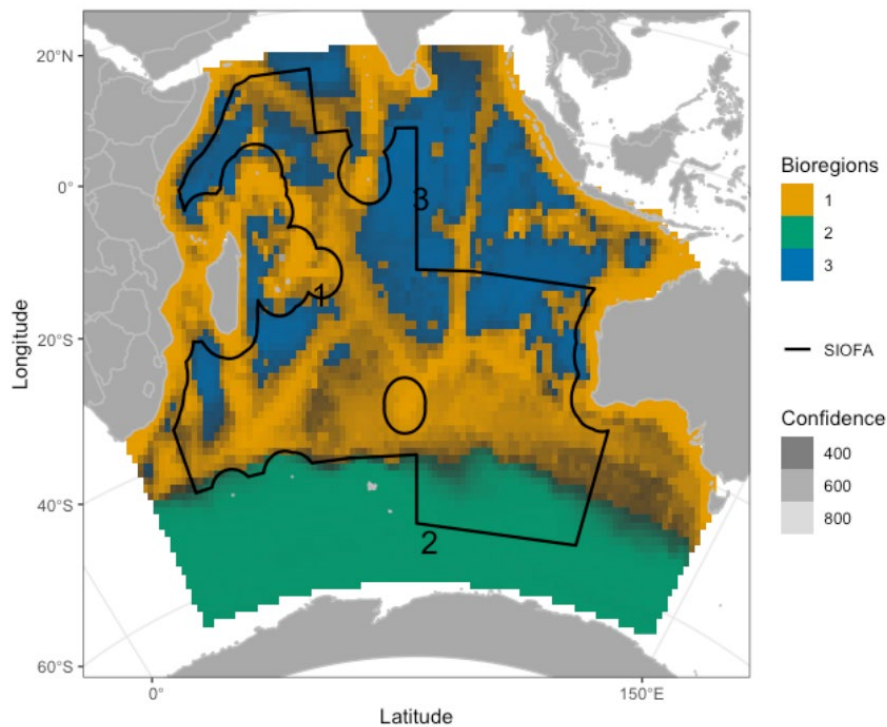
Figure 2 – Predicted biogeographical regions of VME indicator taxa in the Southern Indian Ocean at the first level of the hierarchy. Areas with low confidence in the prediction are shown in darker shades of grey.
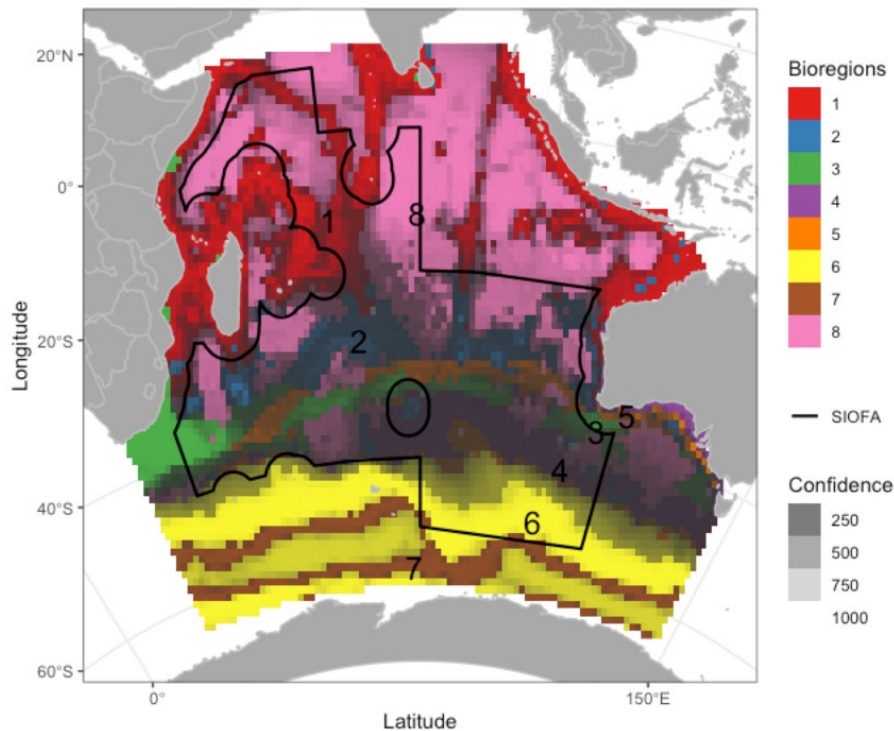
Figure 3 – Predicted biogeographical regions of VME indicator taxa in the Southern Indian Ocean at the second hierarchical level. Areas with low confidence in the prediction are shown in darker shades of grey. Note that, because of the low number of data points, we cannot reliably evaluate these predictions. Bioregion labels: 1: cluster 1.1; 2: cluster 1.2; 3: cluster 1.3; 4: cluster 1.5; 5: cluster 1.7; 6: cluster 2.1; 7: cluster 2.4; 8: cluster 3.1.

Bioregions at the first hierarchical level are the result of taxa distributions spatial clustering, while bioregions at the second hierarchical level reflect limits in dispersal likely driven by the circulation of the water masses in the area. The bioregions, in both predictive approaches, were entirely encompassed within the SIOFA Area. These maps suggest that the SIOFA has a great diversity of bioregions.

4. Main fisheries operating in the SIOFA Area

In the SIOFA Area, a few fisheries account for the majority of the total catch. Table 1 summarises the main SIOFA fisheries by target species and provides information about the fishing method and gear employed, which CCPs engaged in the fishery, and the main Subareas where these fisheries occurred.

Table 1 – Established target species/fisheries in the SIOFA Area, as per Annex 1 of CMM 17(2024) [3]. The table also provides information on gear employed, the CCPs engaged in the fishery, and the main Subareas where these fisheries were targeted.

Targeted[4] 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

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[3] 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.
[4] As per the endorsed definition adopted by MoP10 (MoP10 Report Para 130).

5. Scientific Observer coverage

In 2024, the SIOFA Scientific Committee tasked the Secretariat to attempt to establish linkages between the Observer and CatchEffort databases, which once established would enable more meaningful analyses of observer coverage. This linkage has been partially addressed by the SIOFA Data Officer, who was able to link 86.4% of all events recorded in the Observer database as observed, with a corresponding event of the CatchEffort database.

Data challenges have been identified with aggregated CatchEffort data (up to 2019) not allowing a direct comparison with Observer data reported on a haul-by-haul basis and making it difficult to calculate coherent numbers of fishing events. This includes the Observer data listing more operations observed than those recorded in the CatchEffort data. The linkage with Observer data is unlikely to be fully resolved for the aggregated CatchEffort data.

The SIOFA Data Officer informed that the gear codes discrepancies between the two databases, already noted in the SIOFA Fisheries Overview 2024, could not be addressed at the database level. Gear codes were therefore manually harmonized at the database extract level by the SIOFA Science Officer, to allow for a more meaningful analysis. Estimated observation rates in different SIOFA fisheries are presented in Table 2.

Discrepancies and gear mismatches persist in a number of instances, where unique linkages could not be established across the two databases. This results in an incorrect estimate of observation rate in many different fisheries and across all years, and thus caution should be exercised in interpreting the results presented in Table 2.

Table 2 – Total fishing events recorded in the Observer and CatchEffort databases, and observer coverage in SIOFA fisheries by gear types (source: Observer database 2018–2023). The Scientific Observer coverage is ratio between the number of events observed (Observer database) and the events recorded in the CatchEffort database. Please note that the Observer database does not record the totality of fishing events, and linkages between the Observer and CatchEffort databases could established for about 86.4% of the total observed events. Cells highlighted in red flag instances where no fishing events were recorded in the CatchEffort database for a given gear. Cells highlighted in yellow flag instances where the Observer database reported more observed events than those reported in the CatchEffort database.

Observer coverage in SIOFA fisheries (2018-2023)					
Gear	Year	Observed events	CatchEffort events	Observed events (ratio)	Observed events (%)
Bottom trawls (nei)	2018	356	0		
	2020	201	252	0.8	79.8
	2021	0	262	0.0	0.0
	2022	127	197	0.6	64.5
	2023	695	653	1.1	106.4
Demersal longlines	2018	17	18	0.9	94.4
	2019	54	54	1.0	100.0
	2022	20	20	1.0	100.0
Drifting longlines	2021	405	5 067	0.1	8.0
	2022	274	4 196	0.1	6.5
	2023	15	0		
Dropline	2018	46	32	1.4	143.8
	2019	0	8	0.0	0.0
	2020	0	8	0.0	0.0
Handlines and hand-operated pole-and-lines	2019	0	378	0.0	0.0
	2020	134	332	0.4	40.4
	2021	52	100	0.5	52.0
	2022	49	236	0.2	20.8
	2023	83	353	0.2	23.5
Longlines (nei)	2018	0	5 000	0.0	0.0
	2019	40	6 021	0.0	0.7
	2020	0	4 632	0.0	0.0
	2023	372	5 763	0.1	6.5
Mechanized lines and pole-and-lines	2019	0	150	0.0	0.0
	2020	0	57	0.0	0.0
	2021	0	26	0.0	0.0
	2023	5	2	2.5	250.0
Midwater trawls (nei)	2018	910	251	3.6	362.5
	2019	540	379	1.4	142.5
	2020	377	1 066	0.4	35.4
	2021	287	1 044	0.3	27.5
	2022	579	743	0.8	77.9
	2023	1 403	1 225	1.1	114.5
Pots	2021	19	4	4.8	475.0
Set longlines	2018	15	588	0.0	2.6
	2019	338	356	0.9	94.9
	2020	470	592	0.8	79.4
	2021	330	565	0.6	58.4
	2022	269	379	0.7	71.0
	2023	288	320	0.9	90.0
Single boat bottom otter trawls	2019	144	161	0.9	89.4
	2020	464	462	1.0	100.4
	2021	1 017	1 003	1.0	101.4
	2022	982	982	1.0	100.0
	2023	1	0		
Traps (nei)	2018	0	4	0.0	0.0
Trawls (nei)	2018	2	1 749	0.0	0.1
	2019	1 279	1 537	0.8	83.2
	2020	655	376	1.7	174.2
	2022	61	0		
	2023	29	0		
Vertical lines	2018	0	30	0.0	0.0
	2020	8	0		

6. Target catch and bycatch

A wide variety of fish species are targeted in the SIOFA Area. 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.

Target catch was taken mainly in SIOFA Subareas 1 and 3b (Figure 4a). Bycatch in 2020 was mostly taken in SIOFA Subareas 8 and 2 (Figure 4b). In absolute terms, bycatch is highly variable between years. Bycatch constituted >50% of the total fish catch by weight in 2015 and 2016 (Figure 4a) but has otherwise been around or below 25% of the total catch in other years (Figure 4a). In 2015-2016, when bycatch was highest, the majority of the bycatch came from Subarea 8 (Figure 4b).
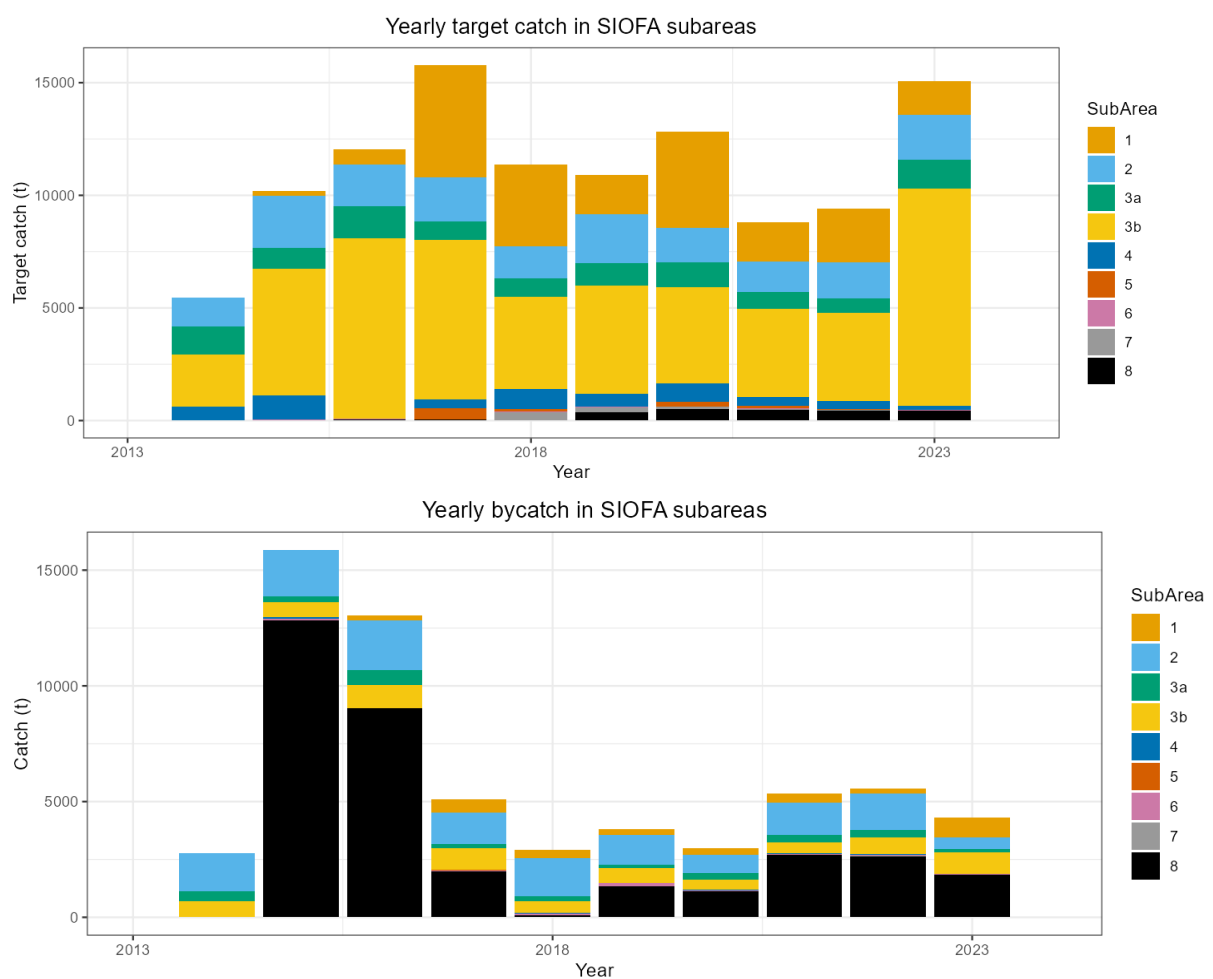
Figure 4a and b – Target catch (upper panel, a) and bycatch (lower panel, b) fish catch by weight in different SIOFA Subareas (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches reported without spatial information are not included. See Table D.2 in Appendix D for the values associates with this figure.

The bycatch figures below (Figure 5) show the proportion of 'sharks' in the reported catch. The broad definition of 'sharks' used here includes Chondrichthyans in general (i.e., including rays and

chimaeras). In this section, a list of all Chondrichthyan 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 reported as captured by SIOFA fisheries is shown in Appendix B.
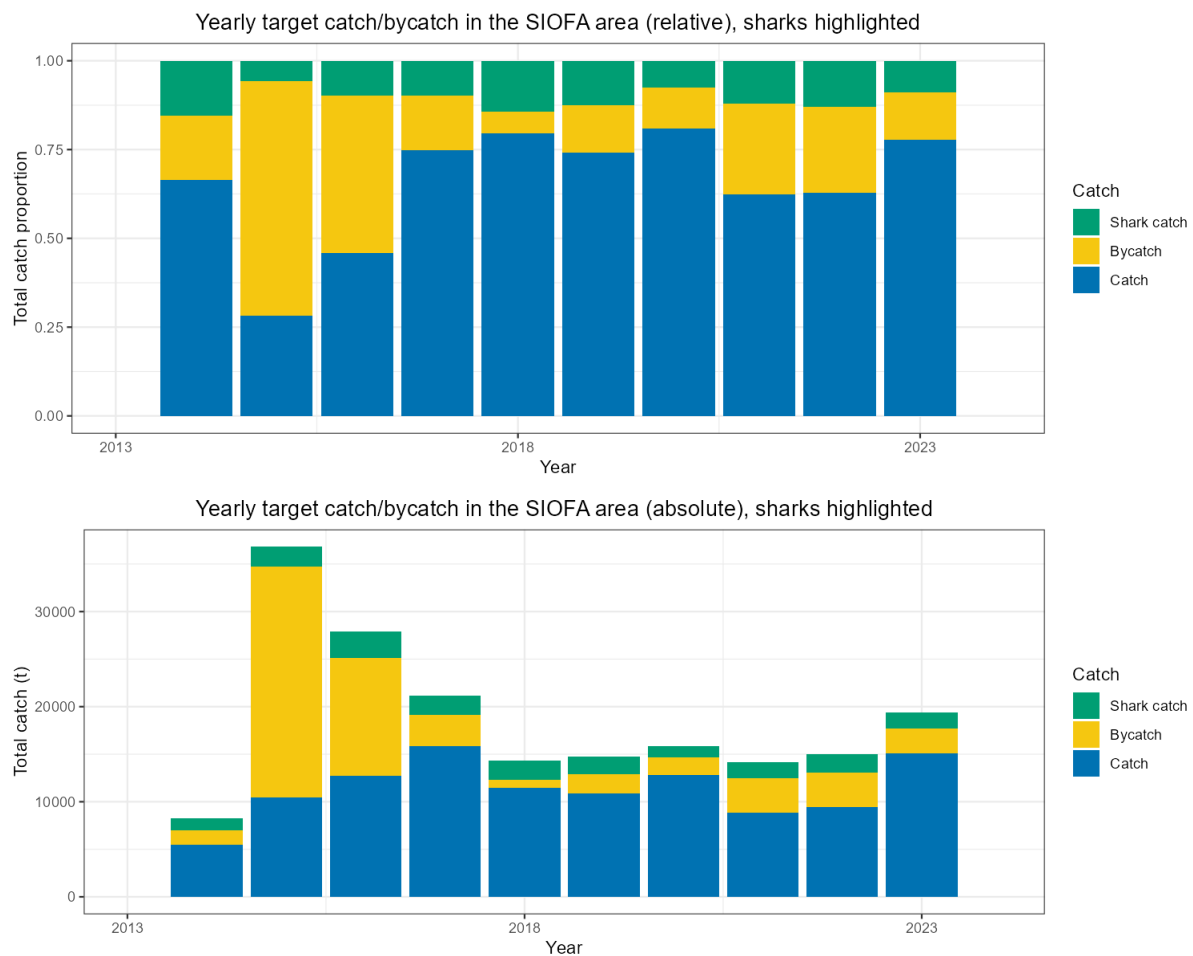
Figure 5a and b – Target catch and bycatch in the SIOFA Area summarised as relative proportions (upper panel, a) and absolute weights (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches reported without spatial information are not included. The portion of catch composed by sharks (as defined in Appendix B) is highlighted. Sharks were targeted in the SIOFA Area until the entry into force of CMM 2019/12 (binding from October 10, 2019), which prohibited targeting any deep-sea shark species listed in its Annex 1. Following the entry into force of CMM 2019/12, all sharks are considered as bycatch for the purpose of this summary. See Table E.1 in Appendix E for the values associates with this figure.

7. Catch of sharks

Sharks were targeted in the SIOFA Area until the introduction of CMM 2019/12, which prohibited targeting the deep-sea shark species listed in its Annex 1 after October 10, 2019. Following the entry into force of CMM 2019/12, all deepwater sharks are considered as bycatch for the purpose of this summary.

Reported catch of sharks (as defined in Appendix B) increased between 2013 and 2016 but has decreased thereafter (Figure 6a). In most years shark catches were dominated by Portuguese dogfish (CYO) and a substantial proportion of unidentified 'other shark species' (including rays, skates, etc.

coded SKX). Other prominent shark catch taxa include kitefin shark (SCK), birdbeak dogfish (DCA) and gulper shark (GUP).

The vast majority of shark catches in the SIOFA Area occurred in Subarea 2 (Figure 6b).

Figure 6 a and b – Yearly catch of sharks in the SIOFA Area by taxon (upper panel, a) and by SIOFA Subarea (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Only the top 5 species by weight (cumulatively in the full database) are shown individually (identified by their FAO species code, see Appendix B). All other species are grouped under 'other species. Table D.5 in Appendix D provides a full list of species caught. See Table D.3 in Appendix D for the values associated with the lower panel figure.

Sharks are caught using several different fishing methods and gears. Historically, a larger proportion of sharks reported captured in SIOFA were caught using gillnets, but in recent years sharks have been mainly caught with longlines (Figure 7).
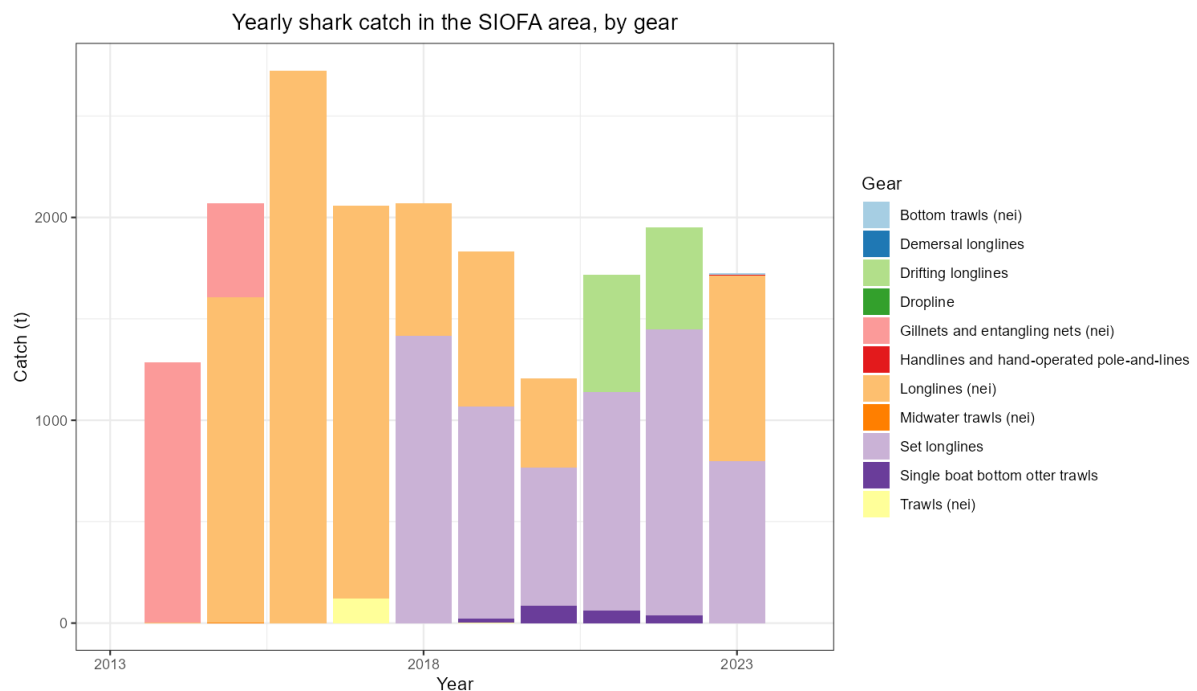
Figure 7 – Yearly catch of sharks in the SIOFA Area by gear type (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

At its 8th annual meeting in 2023, the SIOFA Scientific Committee When reviewing the ecosystem summary, the SC noted that some shark bycatch data appeared to be missing from some of the figures of the Ecosystem Summary 2023 and requested the Secretariat t to resolve this issue when preparing the ecosystem summary for 2024. The Secretariat identified that the issue arose from the non-inclusion of observer-reported catches in the 2022 extract, and therefore also not in the Secretariat reports.

These data were extracted and released to the Science Officer in 2023, and are now included as Figure 8, so as not to lump them with the other types of data. Please note that observer-reported catches might overlap with catches recorded in the Aggregated and HBHCatchEffort databases.

Observer-reported shark (as defined in Appendix B) catches were first recorded in 2013, but were not consistently reported until 2018 (Figure 8a). In most years shark catches were dominated by Portuguese dogfish (CYO), leafscale gulper shark (GUQ), and a substantial proportion of kitefin shark (SCK). The vast majority of observer-reported shark catches in the SIOFA Area occurred in Subarea 2 (Figure 8b).
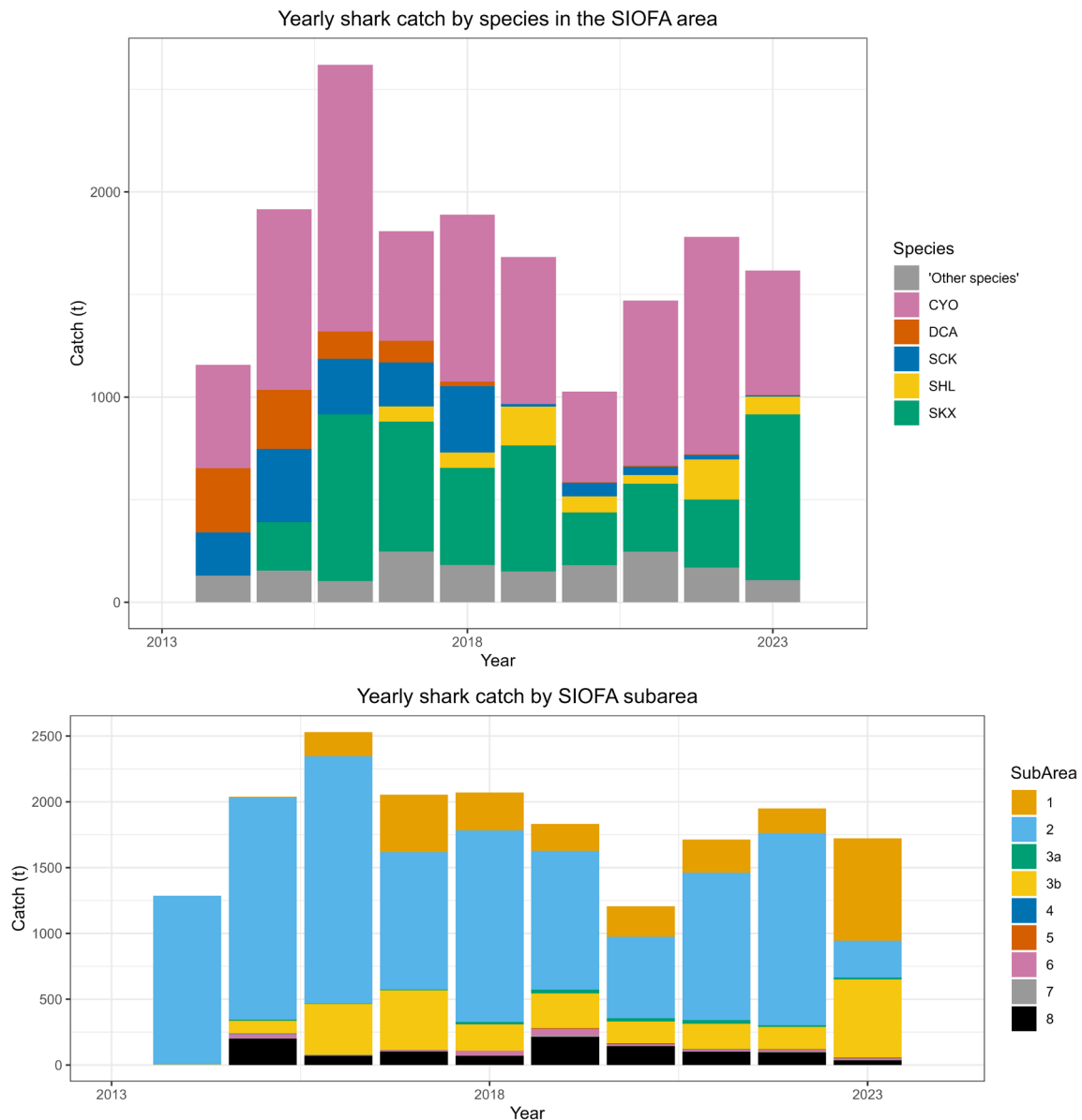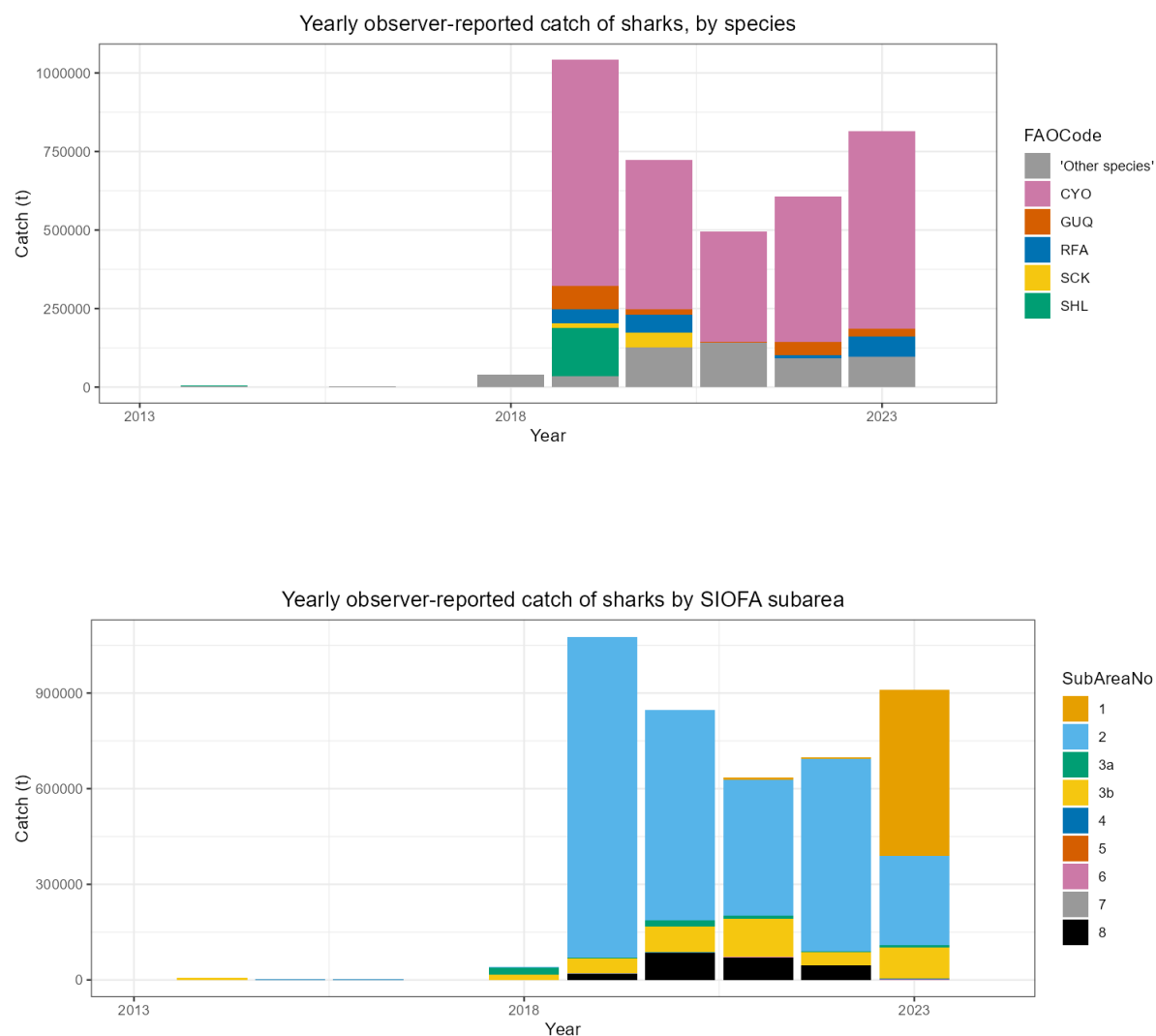
Figure 8a and b – Yearly observer-reported catch of sharks in the SIOFA Area by taxon (upper panel, a) and by SIOFA Subarea (lower panel, b) (source: SIOFA Observer databases 2014–2023). Only the top 5 species by weight (cumulatively in the full database) are shown individually (identified by their FAO species code, see Appendix B). All other species are grouped under 'other species.

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). This list is reproduced below in Table 3.

Table 3– Deep-sea shark taxa considered to be at "high risk" and/or "of concern" , as listed 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***

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 *S. 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 now reflected in the database and this report, as well as in Annex 1 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 (2019, 2022, 2023 and 2024) were retained but this could create some confusion in reporting, thus supplementary figures have also been prepared to illustrate the differences in using the different Annexes of CMM 12. 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 shark species considered to be at "high risk" and/or "of concern" (as defined in CMM 12(2024)) are represented in Figure 9a. In most years Portuguese dogfish (CYO) was the most commonly caught species on this list, with a significant presence of kitefin shark (SCK) until 2019 (Figure 9a). The vast majority of catches of shark at "high risk" and/or "of concern" in the SIOFA Area came from Subarea 2 (Figure 9b) but this changed in 2023.
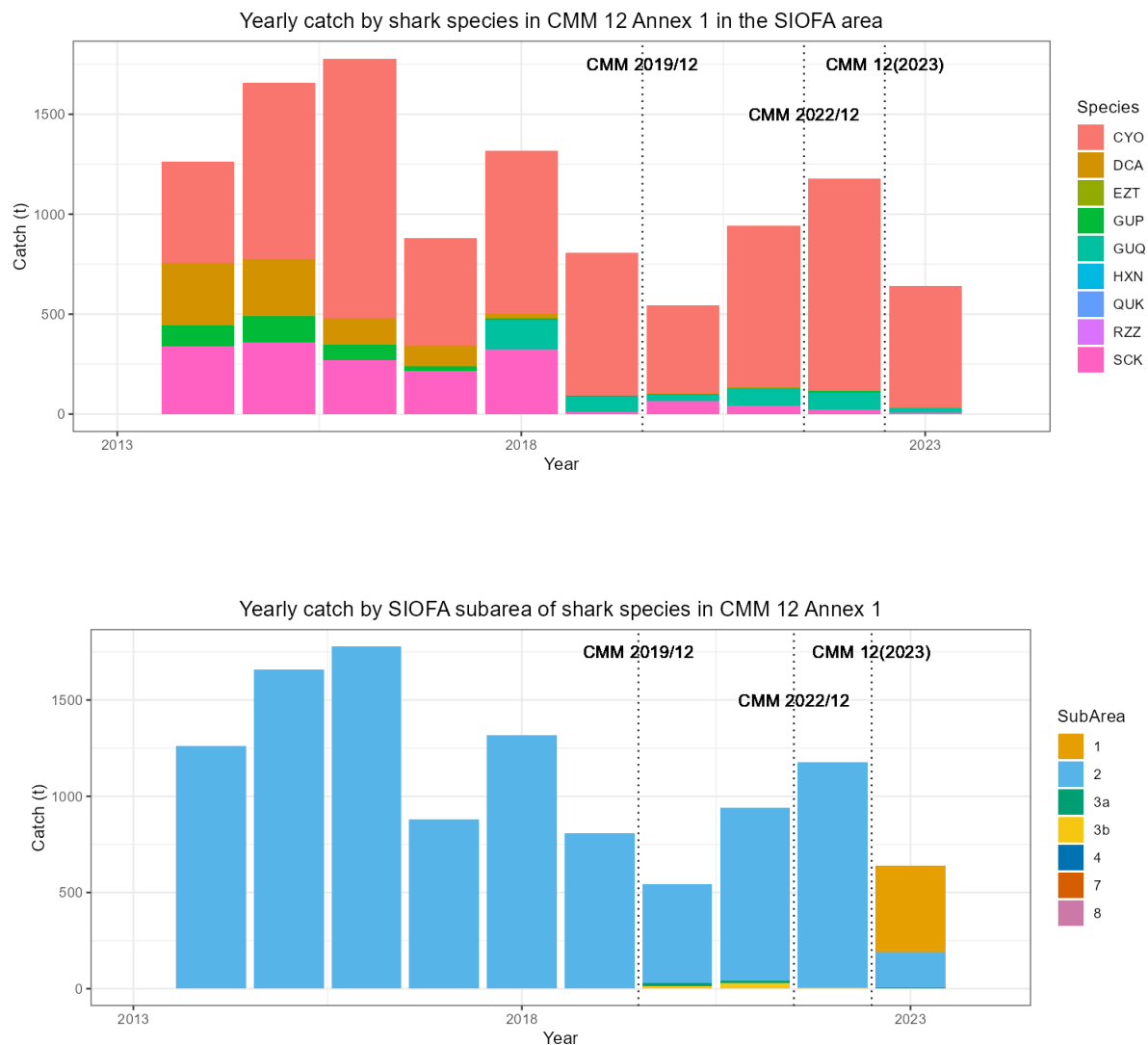
Figure 9a and b – Yearly catch in the SIOFA Area of sharks considered to be at "high risk" and/or "of concern" as included in Annex 1 of SIOFA CMM 12 (Conservation and Management Measure for Sharks). Catches are summarised by species (upper panel, a) and by SIOFA Subarea (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Species are identified by their FAO species

code (see Table 3 for disambiguation). Figures D.1a and b in Appendix D provide information on species caught separating the different versions of the CMM which had different Annex 1 lists.

8. Discards and bycatch

In SIOFA fisheries most of the catch (both target and bycatch) is retained and landed, with small proportion being discarded at sea. The SIOFA CatchEffort database records the fate of catch per species, aggregated at different levels, which enables an analysis of the proportion discarded.

Discards typically involve non-commercial species in the bycatch and undersized or damaged fish in the target catch.

Discards have historically been a very minor proportion of the total bycatch (Figure 10a), and consequently an even smaller proportion of total catch. In absolute terms, only up to around 100 t of catch is discarded per year, but discards were much higher in 2015, when they were more than 1500 t (Figure 10b). Note that, in this figure, discards also include sharks.
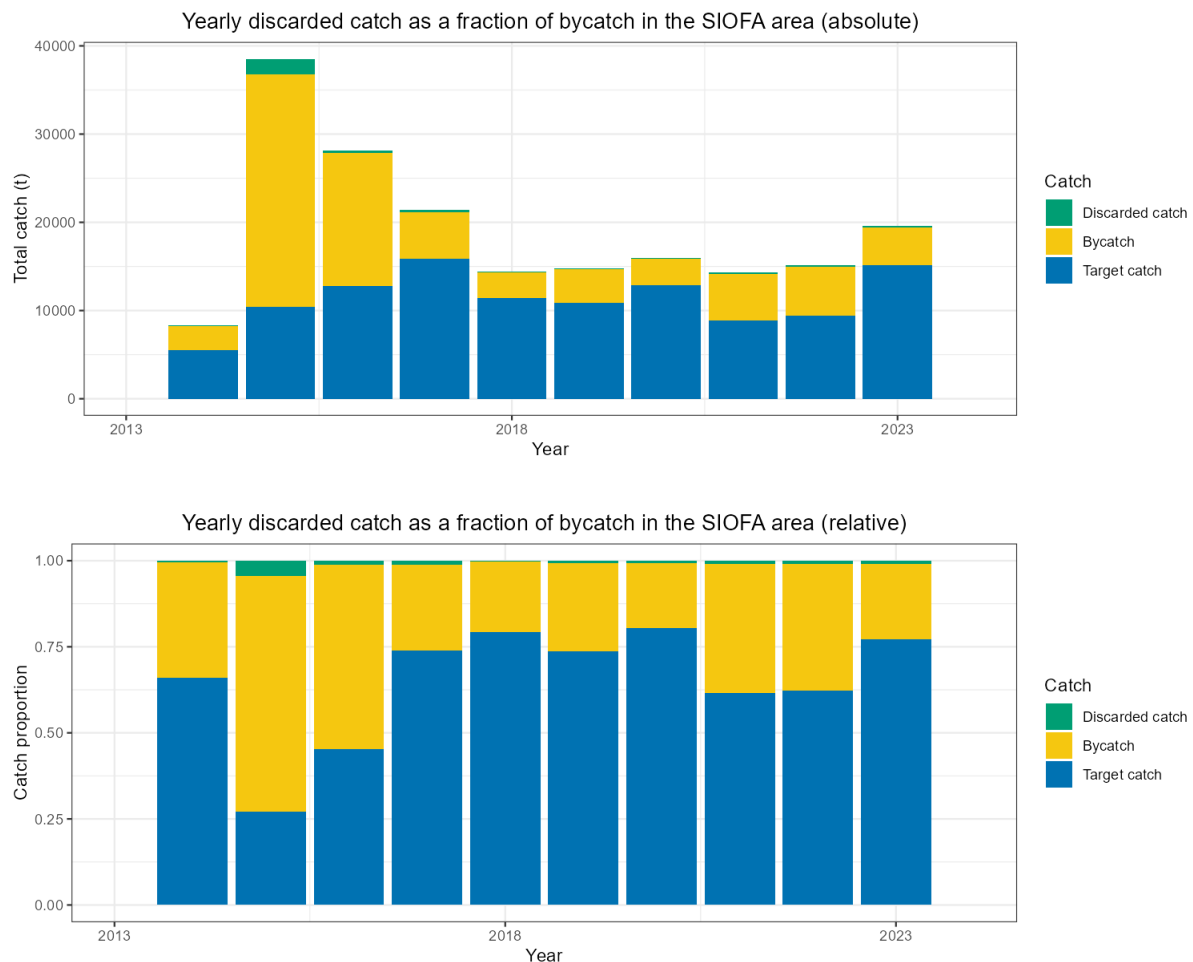
Figure 10a and b – Catch, bycatch and discards (including of sharks) as absolute weights (upper panel, a) and relative proportions (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches reported without spatial information are not included.

Given the high number of species, and imperfect taxonomic reporting, estimates of discards by species was not easy to determine. The high discards recorded in 2015 were recorded as an 'unspecified marine species' (MZZ) which was also reported in 2016 and 2017 (Figure 11). The most heavily discarded species that was identified to species level (in 2017) was little sleeper shark (SOR) (Figure 11).
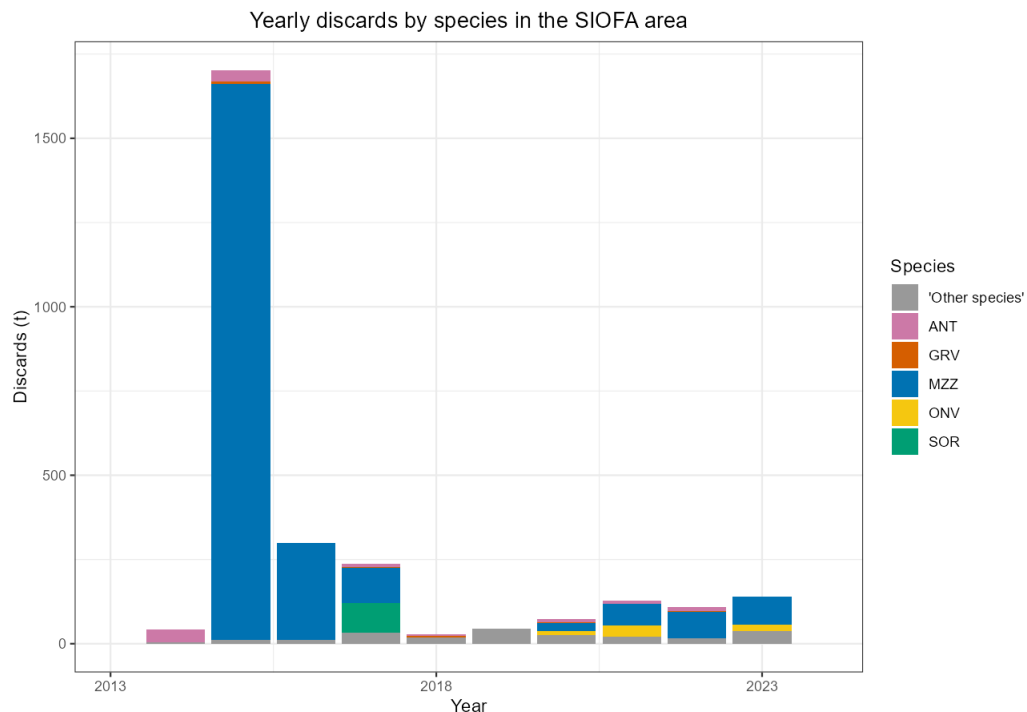
Figure 11 – Yearly discards in the SIOFA Area by species (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020) Only the top 5 species by weight (cumulatively in the full database) are recorded (indicated by their FAO species code, see Appendix B). All other species are grouped and recorded as 'other species'. See Table D.7 in Appendix D for a full account of all discarded species.

9. Interactions with seabirds, marine mammals, turtles, and with sharks considered to be at high risk and/or of concern

Only incidental captures of seabirds, marine mammals, turtles, and sharks considered to be at high risk and/or concern are reported in the SIOFA Scientific Observer database, and the following sections have drawn from this database to explore the number and locations of these interactions.

Incidental captures of other species (e.g., of sharks) are also recorded in the SIOFA CatchEffort database but are not reported here. Note that 8 capture records contained wrong codes, these were excluded from further analysis for the time being, pending clarifications from one of the CCPs.

Figure 12 shows the reported locations of incidental captures (Figure 12a) and observations (Figure 12b) of seabirds, mammals, turtles and sharks considered to be at high risk and/or of concern (i.e., included in SIOFA CMM 12) in the SIOFA Area as recorded by Scientific Observers.
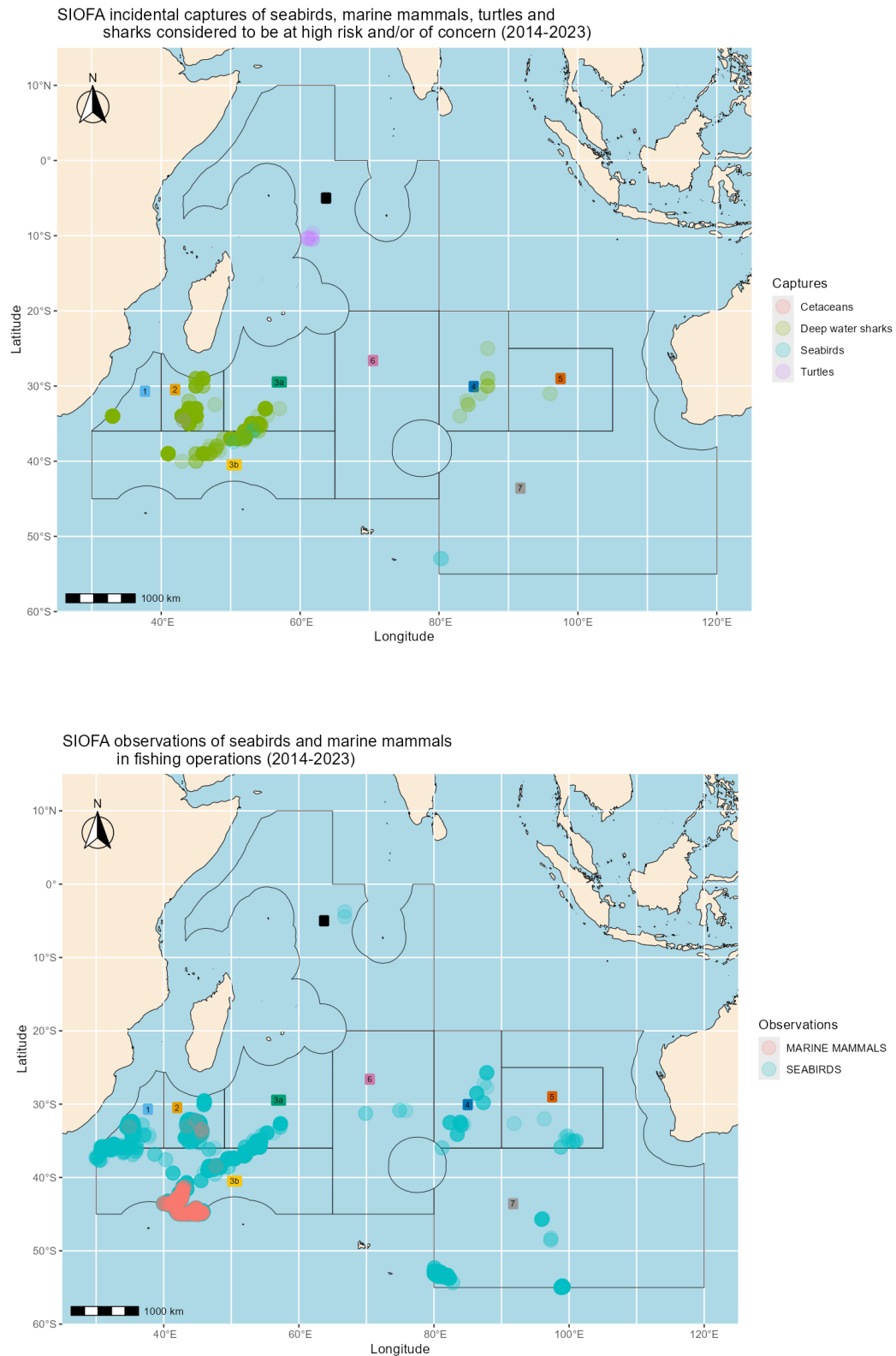
Figure 12a and b – Reported locations of incidental captures (a, upper) and observations (b, lower) of seabirds, mammals, turtles and sharks considered to be "at high risk" and/or "of concern", as defined in Annex 1 of CMM 12(2024), in the SIOFA Area, as recorded by SIOFA Scientific Observers (source: SIOFA Observer database 2014–2023).

9.1   Seabirds

This Summary uses official FAO taxonomic nomenclature (i.e. common and scientific names) for seabirds, but please note that this might not always correspond to the nomenclature used e.g. by ACAP.

9.1.1   Incidental captures

Only a small number of seabird captures have been reported in SIOFA fisheries, these numbers might be different than those submitted in national reports as the capture data has not been fully submitted to the SIOFA Secretariat.

Table 4 summarises seabird incidental captures reported by Scientific Observers in the SIOFA Area.

Table 4 - Incidental captures of seabirds for which interactions have been reported (source: SIOFA Observer database 2004–2023).

Captures of seabirds in SIOFA fisheries (2004-2023)				
Year	Common name	Scientific name	Fishing gear	Captures
2014	White-faced storm petrel	*Pelagodroma marina*	Single boat midwater otter trawls	1
2016	White-chinned petrel	*Procellaria aequinoctialis*	Set longlines	1
2019	Antarctic giant petrel	*Macronectes giganteus*	Set longlines	2
2020	Black-browed albatross	*Thalassarche melanophris*	Set longlines	1
2020	White-chinned petrel	*Procellaria aequinoctialis*	Set longlines	2
2021	Black-browed albatross	*Thalassarche melanophris*	Midwater trawls (nei)	1
2021	White-chinned petrel	*Procellaria aequinoctialis*	Set longlines	4

9.1.2 Abundance observed around fishing operations

The abundance and species of seabirds around fishing operations has been recorded on individual fishing events by Scientific Observers starting from 2007. Table 5 shows the total numbers of seabirds recorded by Scientific Observers, per species, across all fishing events of each year.

Note that there are 2523 records of seabirds observations without any information on species names in the SIOFA Observers database 2019–2023. These represent observations of seabirds around fishing vessel without species identification and are therefore not listed in Table 5. This Summary uses official FAO taxonomic nomenclature (i.e. common and scientific names) for seabirds, but please note that this might not always correspond to the nomenclature used e.g. by ACAP.

Table 5 - Numbers of seabirds observed around fishing operations per species and year (source: SIOFA Observer database 2004–2023). Species nomenclature follows FAO ASFIS codes and might not correspond to other conventions (e.g. ACAP nomenclature).

Year	Common name	Scientific name	Fishing gear	Abundance
2019	Antarctic giant petrel	*Macronectes giganteus*	Set longlines	18570
2019	Black-browed albatross	*Thalassarche melanophris*	Set longlines	1140
2019	Cape petrel	*Daption capense*	Set longlines	15298
2019	Hall's giant petrel	*Macronectes halli*	Set longlines	1155
2019	Indian yellow-nosed albatross	*Thalassarche carteri*	Set longlines	34
2019	Prions nei	*Pachyptila spp*	Set longlines	3
2019	Seabirds nei	-	Set longlines	542
2019	Shy albatross	*Thalassarche cauta*	Set longlines	1956
2019	Southern royal albatross	*Diomedea epomophora*	Set longlines	1
2019	Wandering albatross	*Diomedea exulans*	Set longlines	4992
2019	White-chinned petrel	*Procellaria aequinoctialis*	Set longlines	2050
2019	Wilson's storm petrel	*Oceanites oceanicus*	Set longlines	8
2020	Albatrosses nei	*Diomedeidae*	Set longlines	11
2020	Antarctic giant petrel	*Macronectes giganteus*	Set longlines	3953
2020	Antarctic petrel	*Thalassoica antarctica*	Set longlines	3

Year	Common name	Scientific name	Fishing gear	Abundance
2020	Atlant. yellow-nosed albatross	*Thalassarche chlororhynchos*	Set longlines	2
2020	Black-bellied storm petrel	*Fregetta tropica*	Set longlines	568
2020	Black-browed albatross	*Thalassarche melanophris*	Set longlines	4633
2020	Brown skua	*Stercorarius antarcticus*	Set longlines	2
2020	Buller's albatross	*Thalassarche bulleri*	Vertical lines	4
2020	Cape petrel	*Daption capense*	Set longlines	5686
2020	Giant petrels nei	*Macronectes spp*	Set longlines	365
2020	Great shearwater	*Puffinus gravis*	Set longlines	1
2020	Great skua	*Catharacta skua*	Set longlines	2
2020	Grey petrel	*Procellaria cinerea*	Set longlines	156
2020	Grey-headed albatross	*Thalassarche chrysostoma*	Set longlines	1
2020	Hall's giant petrel	*Macronectes halli*	Set longlines	10295
2020	Indian yellow-nosed albatross	*Thalassarche carteri*	Set longlines	231
2020	Light-mantled sooty albatross	*Phoebetria palpebrata*	Set longlines	29
2020	Prions nei	*Pachyptila spp*	Set longlines	151
2020	Seabirds nei	-	Set longlines	315
2020	Seabirds nei	-	Trawls (nei)	6065
2020	Shy albatross	*Thalassarche cauta*	Set longlines	1893
2020	Sooty albatross	*Phoebetria fusca*	Set longlines	16
2020	Southern fulmar	*Fulmarus glacialoides*	Set longlines	5
2020	Wandering albatross	*Diomedea exulans*	Set longlines	10987
2020	Wandering albatross	*Diomedea exulans*	Vertical lines	9
2020	White-chinned petrel	*Procellaria aequinoctialis*	Set longlines	21429
2020	White-chinned petrel	*Procellaria aequinoctialis*	Vertical lines	19
2020	Wilson's storm petrel	*Oceanites oceanicus*	Set longlines	100
2021	Albatrosses nei	*Diomedeidae*	Set longlines	10
2021	Albatrosses nei	*Diomedeidae*	Single boat bottom otter trawls	13
2021	Amsterdam Island albatross	*Diomedea amsterdamensis*	Set longlines	20

Year	Common name	Scientific name	Fishing gear	Abundance
2021	Antarctic giant petrel	*Macronectes giganteus*	Drifting longlines	64
2021	Antarctic giant petrel	*Macronectes giganteus*	Set longlines	5655
2021	Atlant. yellow-nosed albatross	*Thalassarche chlororhynchos*	Single boat bottom otter trawls	37
2021	Black-browed albatross	*Thalassarche melanophris*	Set longlines	5602
2021	Black-browed albatross	*Thalassarche melanophris*	Single boat bottom otter trawls	26
2021	Blue petrel	*Halobaena caerulea*	Set longlines	16
2021	Buller's albatross	*Thalassarche bulleri*	Set longlines	21
2021	Cape petrel	*Daption capense*	Drifting longlines	382
2021	Cape petrel	*Daption capense*	Set longlines	145
2021	Fairy prion	*Pachyptila turtur*	Set longlines	4
2021	Giant petrels nei	*Macronectes spp*	Set longlines	176
2021	Grey-headed albatross	*Thalassarche chrysostoma*	Set longlines	2
2021	Hall's giant petrel	*Macronectes halli*	Set longlines	2383
2021	Indian yellow-nosed albatross	*Thalassarche carteri*	Drifting longlines	104
2021	Indian yellow-nosed albatross	*Thalassarche carteri*	Set longlines	3321
2021	Light-mantled sooty albatross	*Phoebetria palpebrata*	Drifting longlines	8
2021	Light-mantled sooty albatross	*Phoebetria palpebrata*	Set longlines	3
2021	Parkinson's petrel	*Procellaria parkinsoni*	Set longlines	380
2021	Seabirds nei	-	Set longlines	32
2021	Shy albatross	*Thalassarche cauta*	Set longlines	35
2021	Sooty albatross	*Phoebetria fusca*	Drifting longlines	9
2021	Sooty albatross	*Phoebetria* fusca	Set longlines	1
2021	Sooty shearwater	*Puffinus griseus*	Set longlines	8
2021	Southern royal albatross	*Diomedea epomophora*	Set longlines	1848
2021	Wandering albatross	*Diomedea exulans*	Drifting longlines	22
2021	Wandering albatross	*Diomedea exulans*	Set longlines	16352
2021	Wandering albatross	*Diomedea exulans*	Single boat bottom otter trawls	131
2021	White-chinned petrel	*Procellaria aequinoctialis*	Drifting longlines	180

Year	Common name	Scientific name	Fishing gear	Abundance
2021	White-chinned petrel	*Procellaria aequinoctialis*	Set longlines	25673
2021	White-chinned petrel	*Procellaria aequinoctialis*	Single boat bottom otter trawls	683
2021	Wilson's storm petrel	*Oceanites oceanicus*	Set longlines	1
2022	Antarctic giant petrel	*Macronectes giganteus*	Drifting longlines	5
2022	Antarctic giant petrel	*Macronectes giganteus*	Set longlines	25275
2022	Atlant. yellow-nosed albatross	*Thalassarche chlororhynchos*	Set longlines	1
2022	Black-browed albatross	*Thalassarche melanophris*	Demersal longlines	261
2022	Black-browed albatross	*Thalassarche melanophris*	Drifting longlines	15
2022	Black-browed albatross	*Thalassarche melanophris*	Set longlines	2601
2022	Boobies and gannets nei	*Sulidae*	Drifting longlines	4
2022	Cape petrel	*Daption capense*	Demersal longlines	199
2022	Cape petrel	*Daption capense*	Drifting longlines	343
2022	Cape petrel	*Daption capense*	Set longlines	3679
2022	Cape petrel	*Daption* capense	Trawls (nei)	53
2022	Flesh-footed shearwater	*Puffinus carneipes*	Drifting longlines	12
2022	Giant petrels nei	*Macronectes spp*	Demersal longlines	374
2022	Giant petrels nei	*Macronectes spp*	Set longlines	155
2022	Great-winged petrel	*Pterodroma macroptera*	Trawls (nei)	39
2022	Grey petrel	*Procellaria cinerea*	Set longlines	1
2022	Grey petrel	*Procellaria cinerea*	Trawls (nei)	79
2022	Grey-headed albatross	*Thalassarche chrysostoma*	Demersal longlines	3
2022	Hall's giant petrel	*Macronectes halli*	Set longlines	382
2022	Hall's giant petrel	*Macronectes halli*	Trawls (nei)	226
2022	Indian yellow-nosed albatross	*Thalassarche carteri*	Drifting longlines	718
2022	Indian yellow-nosed albatross	*Thalassarche carteri*	Set longlines	1760
2022	Indian yellow-nosed albatross	*Thalassarche carteri*	Trawls (nei)	4
2022	Leach's storm-petrel	*Oceanodroma leucorhoa*	Drifting longlines	1
2022	Light-mantled sooty albatross	*Phoebetria palpebrata*	Demersal longlines	23

Year	Common name	Scientific name	Fishing gear	Abundance
2022	Parkinson's petrel	*Procellaria parkinsoni*	Set longlines	57
2022	Prions nei	*Pachyptila spp*	Demersal longlines	79
2022	Prions nei	*Pachyptila spp*	Set longlines	77
2022	Prions nei	*Pachyptila spp*	Trawls (nei)	16
2022	Salvin's albatross	*Thalassarche salvini*	Drifting longlines	130
2022	Seabirds nei	-	Demersal longlines	8
2022	Seabirds nei	-	Set longlines	184
2022	Seabirds nei	-	Trawls (nei)	3103
2022	Shearwaters nei	*Puffinus spp*	Set longlines	425
2022	Shy albatross	*Thalassarche cauta*	Set longlines	1750
2022	Shy albatross	*Thalassarche cauta*	Trawls (nei)	130
2022	Sooty albatross	*Phoebetria* fusca	Drifting longlines	1
2022	Southern fulmar	*Fulmarus* glacialoides	Demersal longlines	13
2022	Southern royal albatross	*Diomedea* epomophora	Set longlines	692
2022	Wandering albatross	*Diomedea exulans*	Demersal longlines	112
2022	Wandering albatross	*Diomedea exulans*	Drifting longlines	183
2022	Wandering albatross	*Diomedea exulans*	Set longlines	18182
2022	Wandering albatross	*Diomedea exulans*	Trawls (nei)	168
2022	White-capped albatross	*Thalassarche steadi*	Drifting longlines	6
2022	White-chinned petrel	*Procellaria aequinoctialis*	Demersal longlines	485
2022	White-chinned petrel	*Procellaria aequinoctialis*	Drifting longlines	1441
2022	White-chinned petrel	*Procellaria aequinoctialis*	Set longlines	26675
2023	Amsterdam Island albatross	*Diomedea amsterdamensis*	Set longlines	26
2023	Antarctic giant petrel	*Macronectes giganteus*	Bottom trawls (nei)	157
2023	Antarctic giant petrel	*Macronectes giganteus*	Midwater trawls (nei)	179
2023	Antarctic giant petrel	*Macronectes giganteus*	Set longlines	32074
2023	Black-browed albatross	*Thalassarche melanophris*	Bottom trawls (nei)	24
2023	Black-browed albatross	*Thalassarche melanophris*	Midwater trawls (nei)	44

Year	Common name	Scientific name	Fishing gear	Abundance
2023	Black-browed albatross	*Thalassarche melanophris*	Set longlines	2162
2023	Cape petrel	*Daption* capense	Bottom trawls (nei)	96
2023	Cape petrel	*Daption capense*	Midwater trawls (nei)	106
2023	Cape petrel	*Daption capense*	Set longlines	2514
2023	Giant petrels nei	*Macronectes spp*	Bottom trawls (nei)	141
2023	Giant petrels nei	*Macronectes spp*	Midwater trawls (nei)	48
2023	Giant petrels nei	*Macronectes spp*	Set longlines	38
2023	Great-winged petrel	*Pterodroma macroptera*	Bottom trawls (nei)	264
2023	Great-winged petrel	*Pterodroma macroptera*	Midwater trawls (nei)	328
2023	Great-winged petrel	*Pterodroma macroptera*	Set longlines	492
2023	Grey petrel	*Procellaria cinerea*	Bottom trawls (nei)	14
2023	Grey petrel	*Procellaria cinerea*	Midwater trawls (nei)	7
2023	Indian yellow-nosed albatross	*Thalassarche carteri*	Bottom trawls (nei)	12
2023	Indian yellow-nosed albatross	*Thalassarche carteri*	Midwater trawls (nei)	52
2023	Indian yellow-nosed albatross	*Thalassarche carteri*	Set longlines	4788
2023	Prions nei	*Pachyptila spp*	Bottom trawls (nei)	5
2023	Prions nei	*Pachyptila spp*	Midwater trawls (nei)	35
2023	Seabirds nei	-	Bottom trawls (nei)	30
2023	Seabirds nei	-	Midwater trawls (nei)	10
2023	Seabirds nei	-	Set longlines	25
2023	Shearwaters nei	*Puffinus spp*	Set longlines	30
2023	Shy albatross	*Thalassarche cauta*	Bottom trawls (nei)	160
2023	Shy albatross	*Thalassarche cauta*	Midwater trawls (nei)	330
2023	Shy albatross	*Thalassarche cauta*	Set longlines	3155
2023	Sooty albatross	*Phoebetria fusca*	Set longlines	2
2023	Southern royal albatross	*Diomedea epomophora*	Set longlines	302
2023	Wandering albatross	*Diomedea exulans*	Bottom trawls (nei)	81
2023	Wandering albatross	*Diomedea exulans*	Midwater trawls (nei)	151

Year	Common name	Scientific name	Fishing gear	Abundance
2023	Wandering albatross	*Diomedea exulans*	Set longlines	38984
2023	White-chinned petrel	*Procellaria* aequinoctialis	Bottom trawls (nei)	180
2023	White-chinned petrel	*Procellaria* aequinoctialis	Midwater trawls (nei)	539
2023	White-chinned petrel	*Procellaria* aequinoctialis	Set longlines	58917
2023	Wilson's storm petrel	*Oceanites oceanicus*	Bottom trawls (nei)	10
2023	Wilson's storm petrel	*Oceanites oceanicus*	Midwater trawls (nei)	21

Table 6 summarizes the number of records where observers did not detect birds around fishing operations (0 detection events), grouped by type of fishing gear. Due to the missing linkages between the CatchEffort and the Observer database it is impossible to determine the share of fishing events observed for seabirds presence on the total of fishing events.

Table 6 - Records where observers did not detect birds around fishing operations (0 detection events), by gear (source: SIOFA Observer database 2004–2023).

Observations of seabirds in SIOFA fisheries (2004-2023)				
Year	Fishing gear	Fishing events observed with no seabirds reported	Fishing events observed with seabirds reported	Share of events observed with no seabirds reported (%)
2020	Handlines and hand-operated pole-and-lines	134	0	100.0
2020	Set longlines	88	1 475	5.6
2020	Single boat bottom otter trawls	464	0	100.0
2020	Trawls (nei)	0	294	0.0
2020	Vertical lines	6	6	50.0
2021	Drifting longlines	0	41	0.0
2021	Set longlines	65	852	7.1
2021	Single boat bottom otter trawls	3	28	9.7
2022	Bottom trawls (nei)	984	0	100.0
2022	Demersal longlines	0	125	0.0
2022	Drifting longlines	0	279	0.0
2022	Set longlines	5	951	0.5
2022	Trawls (nei)	2	207	1.0
2023	Bottom trawls (nei)	0	144	0.0
2023	Midwater trawls (nei)	0	250	0.0
2023	Set longlines	0	1 377	0.0

Not all fishing events were observed for seabirds presence, and Table 7 summarizes at least the total number of events that were not observed per each year. Due to the imperfect linkages between the CatchEffort and the Observer database it is challenging to determine the exact share of fishing events observed for seabirds presence on the total of fishing events.

Table 7 - Fishing events that were not observed for bird presence around fishing operations (source: SIOFA Observer database 2004–2023).

Fishing events not observerd for seabirds in SIOFA fisheries (2004-2023)		
Year	**Fishing gear**	**Fishing events not observed for seabirds presence**
2020	Set longlines	68
2021	Set longlines	247
2022	Set longlines	88
2023	Bottom trawls (nei)	17
2023	Midwater trawls (nei)	46

9.2   Marine turtles

Four incidental captures of marine turtles have been reported in SIOFA fisheries, in 2019 and 2020 (Table 8).

Table 8 - Reported Incidental captures of marine turtles (source: SIOFA Observer database 2004–2023).

Captures of marine turtles in SIOFA fisheries (2004-2023)					
Year	Common name	Scientific name	Fishing gear	Captures	Status at release
2019	Hawksbill turtle	*Eretmochelys imbricata*	Handlines and hand-operated pole-and-lines	1	Unknown
2020	Leatherback turtle	*Dermochelys coriacea*	Single boat bottom otter trawls	3	Alive
2021	Leatherback turtle	*Dermochelys coriacea*	Single boat bottom otter trawls	1	Alive
2022	Leatherback turtle	*Dermochelys coriacea*	Bottom trawls (nei)	2	Unknown
2022	Leatherback turtle	*Dermochelys coriacea*	Single boat bottom otter trawls	2	Unknown
2023	Leatherback turtle	*Dermochelys coriacea*	Bottom trawls (nei)	1	Unknown
2023	Leatherback turtle	*Dermochelys coriacea*	Single boat bottom otter trawls	1	Alive

9.3 Marine mammals

9.3.1 Incidental captures

Only a single incidental capture of a marine mammal has been reported in SIOFA fisheries, in 2012 (Table 9).

Table 9 - Reported Incidental captures of marine mammals (source: SIOFA Observer database 2004–2023).

Captures of marine mammals in SIOFA fisheries (2004-2023)					
Year	Common name	Scientific name	Fishing gear	Captures	Status at release
2012	Sperm whale	*Physeter macrocephalus*	Single boat bottom otter trawls	1	Alive

9.3.2 Abundance observed around fishing operations

Marine mammal presence around fishing operations were first recorded in 2021 (Table 10), and a revision of this data in 2025 brought to light more observations than reported in the SIOFA Ecosystem Summary 2024.

Table 10 - Observations of marine mammals around fishing operations (source: SIOFA Observer database 2004–2023).

Observations of marine mammals in SIOFA fisheries (2004-2023)				
Year	Common name	Scientific name	Fishing gear	Maximum abundance
2021	Antarctic minke whale	*Balaenoptera bonaerensis*	Set longlines	3
2021	False killer whale	*Pseudorca crassidens*	Set longlines	10
2021	Killer whale	*Orcinus orca*	Set longlines	205
2021	Sperm whale	*Physeter macrocephalus*	Set longlines	41
2022	Humpback whale	*Megaptera novaeangliae*	Set longlines	21
2022	Long-finned pilot whale	*Globicephala melas*	Set longlines	30
2022	Marine mammals nei	-	Set longlines	2
2022	Sperm whale	*Physeter macrocephalus*	Set longlines	59
2023	False killer whale	*Pseudorca crassidens*	Set longlines	120
2023	Humpback whale	*Megaptera novaeangliae*	Set longlines	1
2023	Killer whale	*Orcinus orca*	Set longlines	149
2023	Long-finned pilot whale	*Globicephala melas*	Set longlines	30
2023	Sperm whale	*Physeter macrocephalus*	Demersal longlines	1
2023	Sperm whale	*Physeter macrocephalus*	Set longlines	123

9.4   Shark captures of species considered to be at high risk and/or of concern

This summary reports captures of sharks considered to be "at high risk" and/or "of concern", as defined in Annex 1 of CMM 12(2024). However, these shark captures have only been occasionally recorded in the SIOFA Observer database, as shark captures were able to be targeted before 10 October 2019 and were reported in the CatchEffort database (summarised in Section 5.2 and Figure 7 above) instead of in the Observer database. For completeness, shark captures recorded in the Observer database are shown in Table 11, but these data cannot be considered a reliable indicator of actual numbers of captures (e.g., see Figure 7).

Note that discussions during the 8th meeting of the SIOFA Scientific Committee suggested the possibility of data from the Secretariat records being incomplete, in particular those of observer reported captures of sharks included in Annex 1 of CMM 12(2024). This issue has been resolved in the SIOFA Ecosystem Summary 2024.

Table 11 - Incidental captures of sharks considered to be "at high risk" and/or "of concern", as defined in Annex 1 of CMM 12(2024) for which interactions have been reported via the Observer database (source: SIOFA Observer database 2004–2023).

Captures of sharks 'at risk' or 'of concern' sharks in SIOFA fisheries (2004-2023)				
Year	Common name	Scientific name	Fishing gear	Captures (n)
2016	Birdbeak dogfish	*Deania calceus*	Midwater trawls (nei)	1
2016	Kitefin shark	*Dalatias licha*	Midwater trawls (nei)	1
2017	Birdbeak dogfish	*Deania calceus*	Midwater trawls (nei)	2
2017	Kitefin shark	*Dalatias licha*	Midwater trawls (nei)	3
2017	Portuguese dogfish	*Centroscymnus coelolepis*	Midwater trawls (nei)	1
2018	Birdbeak dogfish	*Deania calceus*	Bottom trawls (nei)	297
2018	Frilled shark	*Chlamydoselachus anguineus*	Bottom trawls (nei)	1
2018	Goblin shark	*Mitsukurina owstoni*	Bottom trawls (nei)	2
2018	Gulper shark	*Centrophorus granulosus*	Bottom trawls (nei)	67
2018	Kitefin shark	*Dalatias licha*	Bottom trawls (nei)	120
2018	Largespine velvet dogfish	*Scymnodon macracanthus*	Bottom trawls (nei)	76
2018	Longnose velvet dogfish	*Centroselachus crepidater*	Bottom trawls (nei)	217
2018	Pacific longnose chimaera	*Harriotta raleighana*	Bottom trawls (nei)	30
2018	Portuguese dogfish	*Centroscymnus coelolepis*	Bottom trawls (nei)	34
2018	Velvet dogfish	*Zameus squamulosus*	Bottom trawls (nei)	9
2018	Birdbeak dogfish	*Deania calceus*	Midwater trawls (nei)	53
2018	Gulper shark	*Centrophorus granulosus*	Midwater trawls (nei)	2
2018	Kitefin shark	*Dalatias licha*	Midwater trawls (nei)	47
2018	Largespine velvet dogfish	*Scymnodon macracanthus*	Midwater trawls (nei)	1
2018	Longnose velvet dogfish	*Centroselachus crepidater*	Midwater trawls (nei)	15
2018	Portuguese dogfish	*Centroscymnus coelolepis*	Midwater trawls (nei)	2
2018	Velvet dogfish	*Zameus squamulosus*	Midwater trawls (nei)	5
2019	Kitefin shark	*Dalatias licha*	Midwater trawls (nei)	9
2019	Leafscale gulper shark	*Centrophorus squamosus*	Midwater trawls (nei)	1
2019	Smooth lanternshark	*Etmopterus pusillus*	Midwater trawls (nei)	82
2019	Southern sleeper shark	*Somniosus antarcticus*	Midwater trawls (nei)	1
2020	Kitefin shark	*Dalatias licha*	Midwater trawls (nei)	4
2021	Kitefin shark	*Dalatias licha*	Midwater trawls (nei)	4
2021	Leafscale gulper shark	*Centrophorus squamosus*	Midwater trawls (nei)	2
2022	Leafscale gulper shark	*Centrophorus squamosus*	Midwater trawls (nei)	2
2022	Bigeyed sixgill shark	*Hexanchus nakamurai*	Single boat bottom otter trawls	7
2022	Birdbeak dogfish	*Deania calceus*	Trawls (nei)	2
2022	Longnose velvet dogfish	*Centroselachus crepidater*	Trawls (nei)	4

10. Interactions with the seafloor and benthic organisms

A particular focus in the work of the SIOFA Scientific Committee has been the interaction of fisheries with the seafloor and its benthic organisms. This followed a specific mandate included in CMM 01(2024), which required the Scientific Committee to develop and provide advice and recommendations to the Meeting of the Parties to define the maximum extent of an appropriate SIOFA bottom fishing footprint (i.e., a map of the spatial extent of historical bottom fishing in the Agreement Area, for all vessels flagged to all CCPs). Furthermore, VME presence in the SIOFA Area is being investigated, and the SIOFA Scientific Committee is planning to elaborate its scientific advice on management of VMEs for the Meeting of the Parties to consider.

10.1 SIOFA bottom fishing footprint

The 7th meeting of the SIOFA Scientific Committee endorsed a map of the spatial extent of historical bottom fishing in the SIOFA Area, as presented at PAEWG4 (Figure 13, para 180 of the SC7 Report). The footprint shown in this figure includes midwater trawling fishing activities. The Scientific Committee also recommended that further work was needed to clarify whether national data was properly accounted for in the PAEWG4 footprint shown here and that heatmaps of fishing activity be developed.

The 9th Meeting of the Parties of SIOFA (MoP9) noted that there was still outstanding work on the footprint recommended by 7th meeting of the Scientific Committee but recommended that this estimate of the footprint be adopted on an interim basis until the Scientific Committee can update it (para 113 of the MoP9 Report). However, MoP9 also decided that midwater trawling was not to be considered bottom fishing for the purposes of defining the footprint (Annex I of the MoP9 Report).
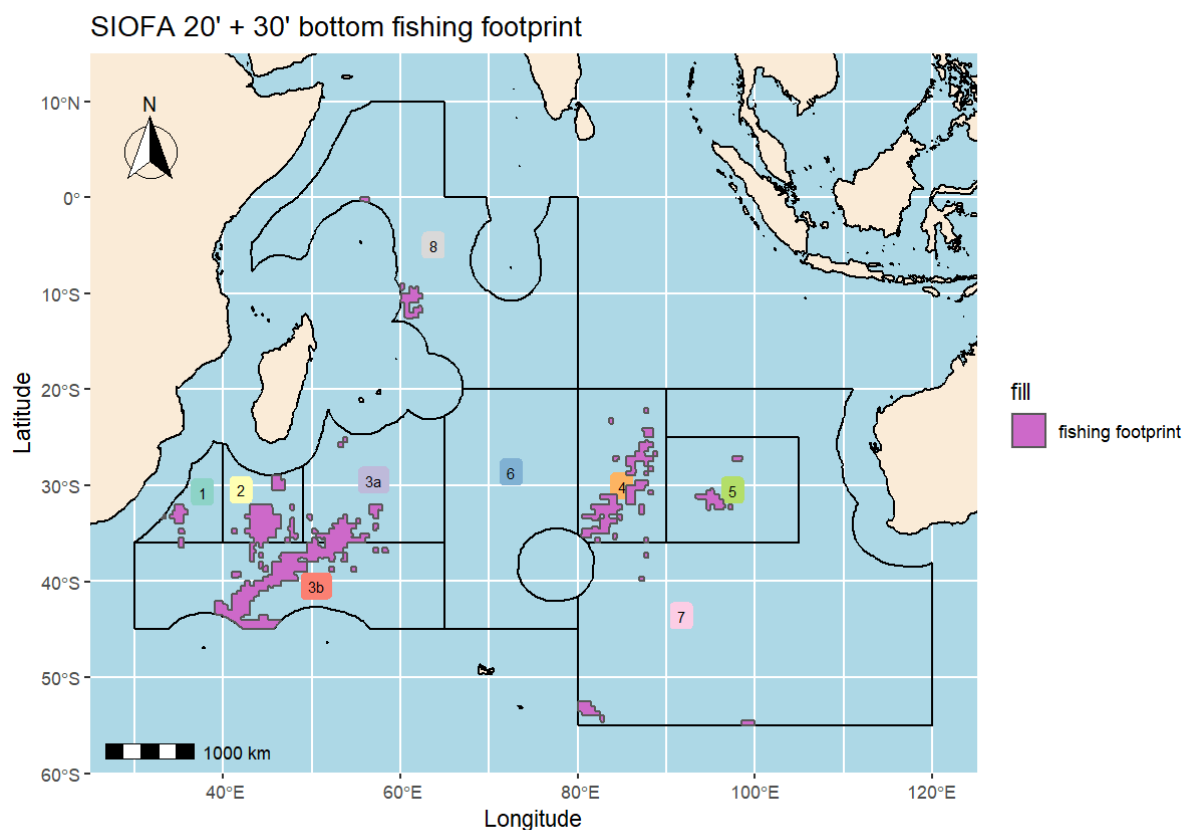

Figure 13 – SIOFA bottom fishing interim footprint map derived from recent (2016–2020) set level and aggregated historical (1998–2015) fishing data, at a hybrid 20' x 30' square resolution (sources: SIOFA HBHCatchEffort 1998–2020, and SIOFA spatial layers, edited from the SC7 final report and PAEWG-04-12 versions

for clarity). Note that because actual fishing events are narrower than the spatial resolution at which the data are summarised, the combined area of the cells will exceed the area of the actual fishery footprint.

After removing midwater trawls, and accounting for the national data provided by SIOFA CCPs for the purpose of updating the mapped footprint, the Interim Footprint map endorsed at MoP9 was revised (Figure 14) and the overall footprint area increased marginally (6%) and shifted in its relative position.
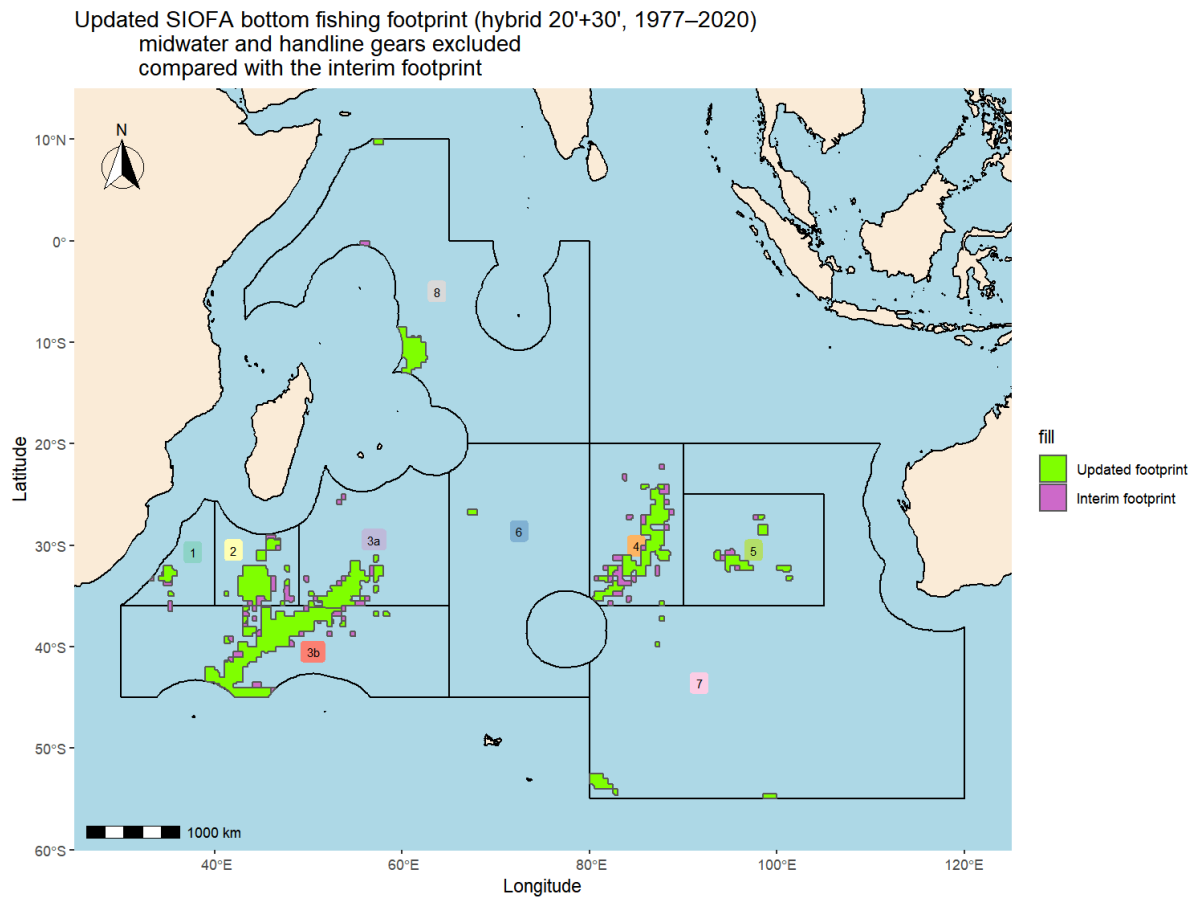

Figure 14 – Revised SIOFA bottom fishing footprint map derived from recent set level and historical fishing data from 1977–2020, at a hybrid 20' x 30' square resolution (sources: SIOFA HBHCatchEffort 1998–2020, national data, and SIOFA spatial layers). The footprint shown in this map does not include midwater trawling or handlining, and includes additional data provided by SIOFA CCPs for the purpose of updating the footprint map. Note that because actual fishing events are narrower than the spatial resolution at which the data are summarised, the combined area of the cells will exceed the area of the actual fishery footprint.

The revised SIOFA Bottom Fishing footprint (Figure 14) was adopted by the SIOFA Meeting of the Parties in 2023 (Para 113-114 MoP10 report) and was made available as a shapefile through the SIOFA GitHub (https://github.com/SIOFASecretariat/SIOFA_SC_Spatial_layers).

The total surface area of the updated footprint is (approximately) 1 131 244 km^2.

The total surface area of the SIOFA area is (approximately) 27 162 002 km^2. Therefore, the updated footprint area is (approximately) 4.16% of the total SIOFA area.

Within the SIOFA area, the total area with depths shallower than 2000m is (approximately) 834 497 km² (3.1% of the total SIOFA area). The updated footprint overlaps with this area for (approximately) 646 236 km² (77.4% of the total area), leaving (approximately) 188 261 km² outside of the footprint (22.6% of the total area).

For the draft heatmap of bottom fishing activities, the number of bottom fishing events (all gears combined) was calculated for each of the 30' cells in the SIOFA Area (Figure 15). WS2022-SUM1 suggested that further developments of this heatmap could consider representing different metrics of fishing effort (e.g., number of hooks or length of trawls), but doing so would require the production of separate maps for different gears, as these measures are not directly comparable.
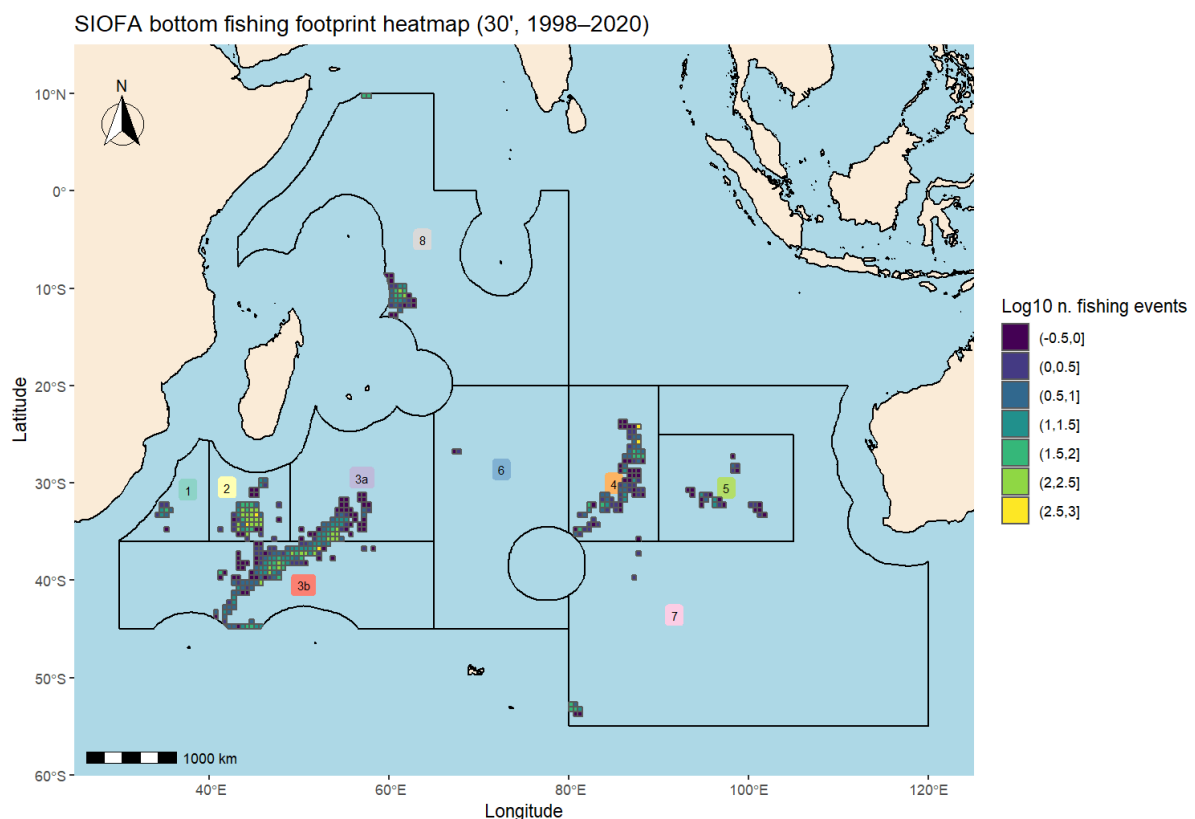

Figure 15 – Heatmap of bottom fishing effort levels in the SIOFA area, derived from recent set level and historical fishing data from 1998–2020, at 30' square resolution (sources: SIOFA HBHCatchEffort 1998–2020, and SIOFA spatial layers). The footprint shown in this map does not include midwater trawling or handlining, and includes additional data provided by SIOFA CCPs for the purpose of updating the footprint map. Note that because actual fishing events are narrower than the spatial resolution at which the data are summarised, the combined area of the cells will exceed the area of the actual fishery footprint.

10.2 Revised bottom fishing footprint by gear

The revised bottom fishing footprint was disaggregated to produce gear-specific maps of bottom fishing effort distribution. Gear-specific maps of bottom fishing effort distribution included longlines (including Demersal longlines, Dropline, Set longlines, and Vertical lines), trawls (including Bottom

trawls (nei), Trawls (nei), and Single boat bottom otter trawls), gillnets and entangling nets (nei), and traps (nei).

These maps are summarised in Figure 16 to Figure 19, shown at a coarser spatial resolution (5 x 5 degree squares) as recommended by WS2022-SUM1.
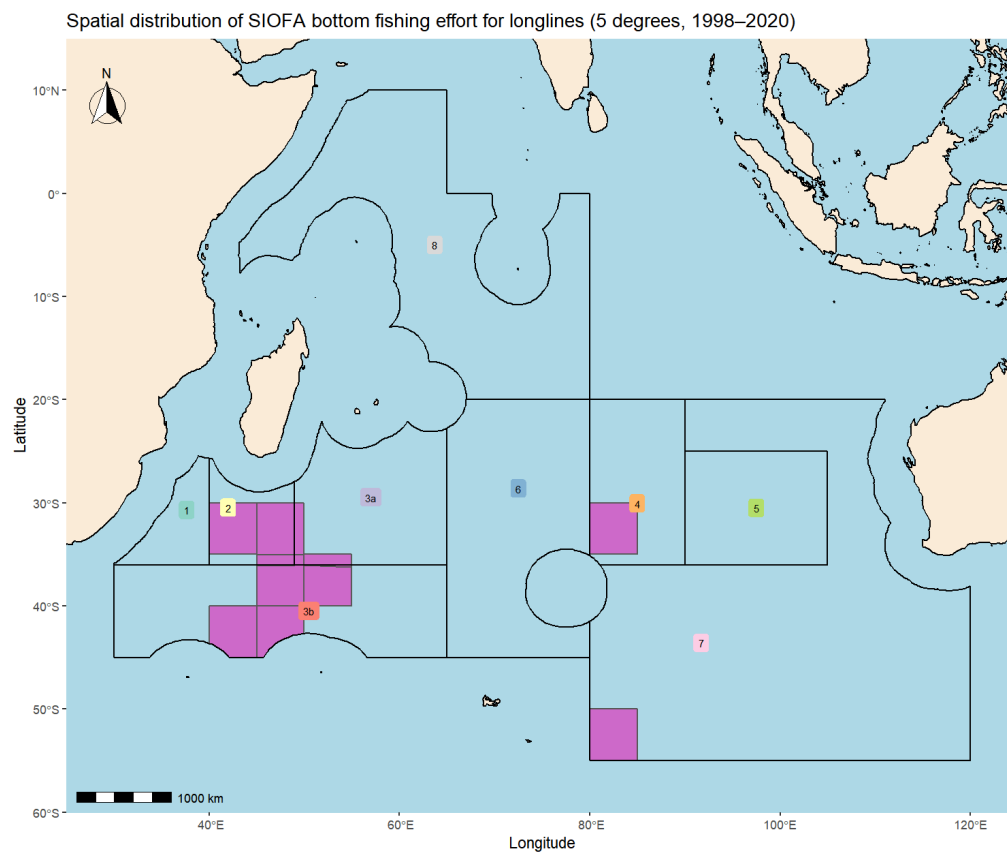
Figure 16 – Spatial distribution of SIOFA bottom fishing effort for longlines (including Demersal longlines, Dropline, Set longlines, and Vertical lines) derived from recent set level and historical fishing data from 1998–2020, at a 5 degrees square resolution (sources: SIOFA HBHCatchEffort 1998–2020, and SIOFA spatial layers). Note that due to the coarse spatial resolution of these data, the area of the non-zero-effort cells will greatly exceed the actual area of the fishing footprint.

Spatial distribution of SIOFA bottom fishing effort for trawls (5 degrees, 1998–2020)

Figure 17 – Spatial distribution of SIOFA bottom fishing effort for trawls (including Bottom trawls (nei), Trawls (nei), and Single boat bottom otter trawls) derived from recent set level and historical fishing data from 1998–2020, at a 5 degrees square resolution (sources: SIOFA HBHCatchEffort 1998–2020, and SIOFA spatial layers). Note that due to the coarse spatial resolution of these data, the area of the non-zero-effort cells will greatly exceed the actual area of the fishing footprint.

Spatial distribution of SIOFA bottom fishing effort for gillnets (5 degrees, 1998–2020)
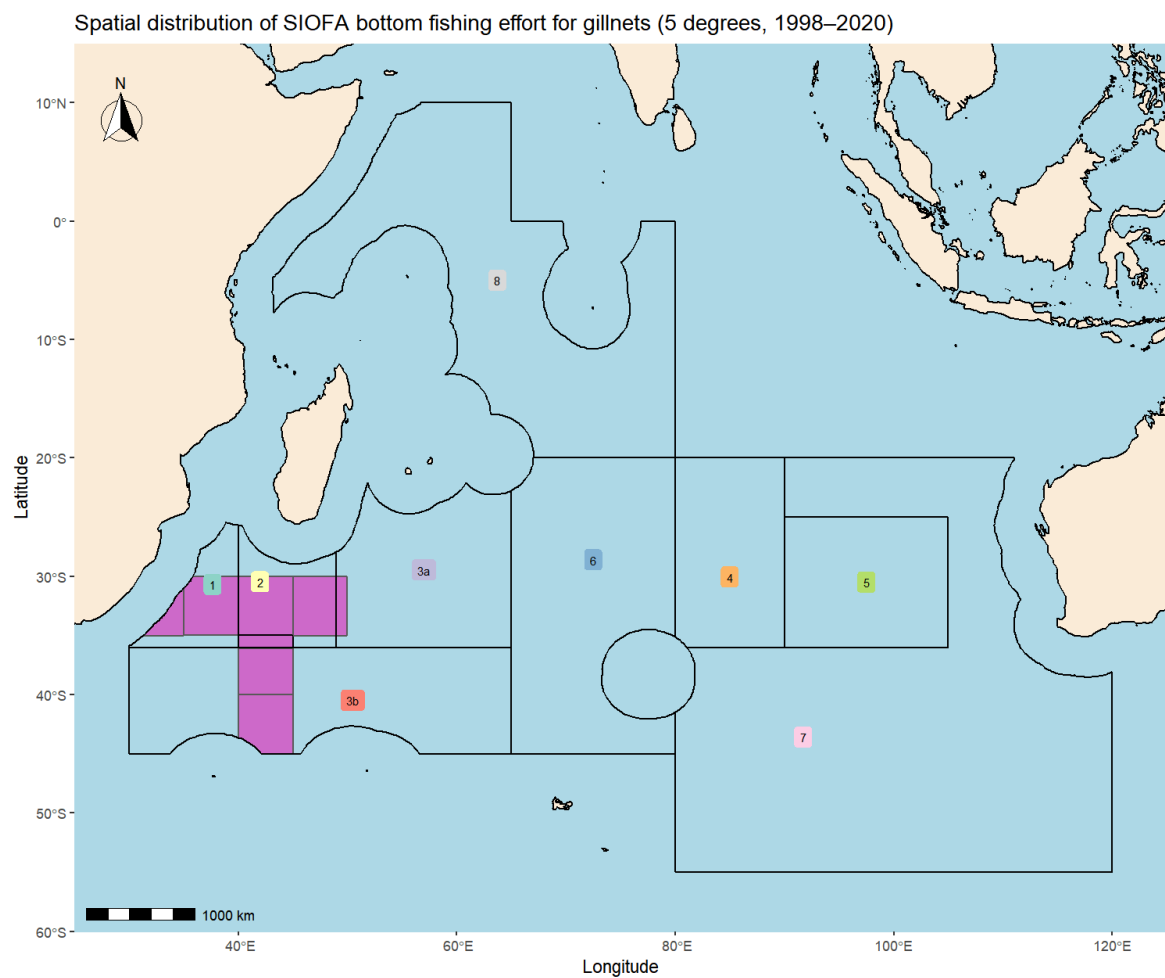
Figure 18 – Spatial distribution of SIOFA bottom fishing effort for gillnets and entangling nets (nei) derived from recent set level and historical fishing data from 1998–2020, at a 5 degrees square resolution (sources: SIOFA HBHCatchEffort 1998–2020, and SIOFA spatial layers). Note that due to the coarse spatial resolution of these data, the area of the non-zero-effort cells will greatly exceed the actual area of the fishing footprint.
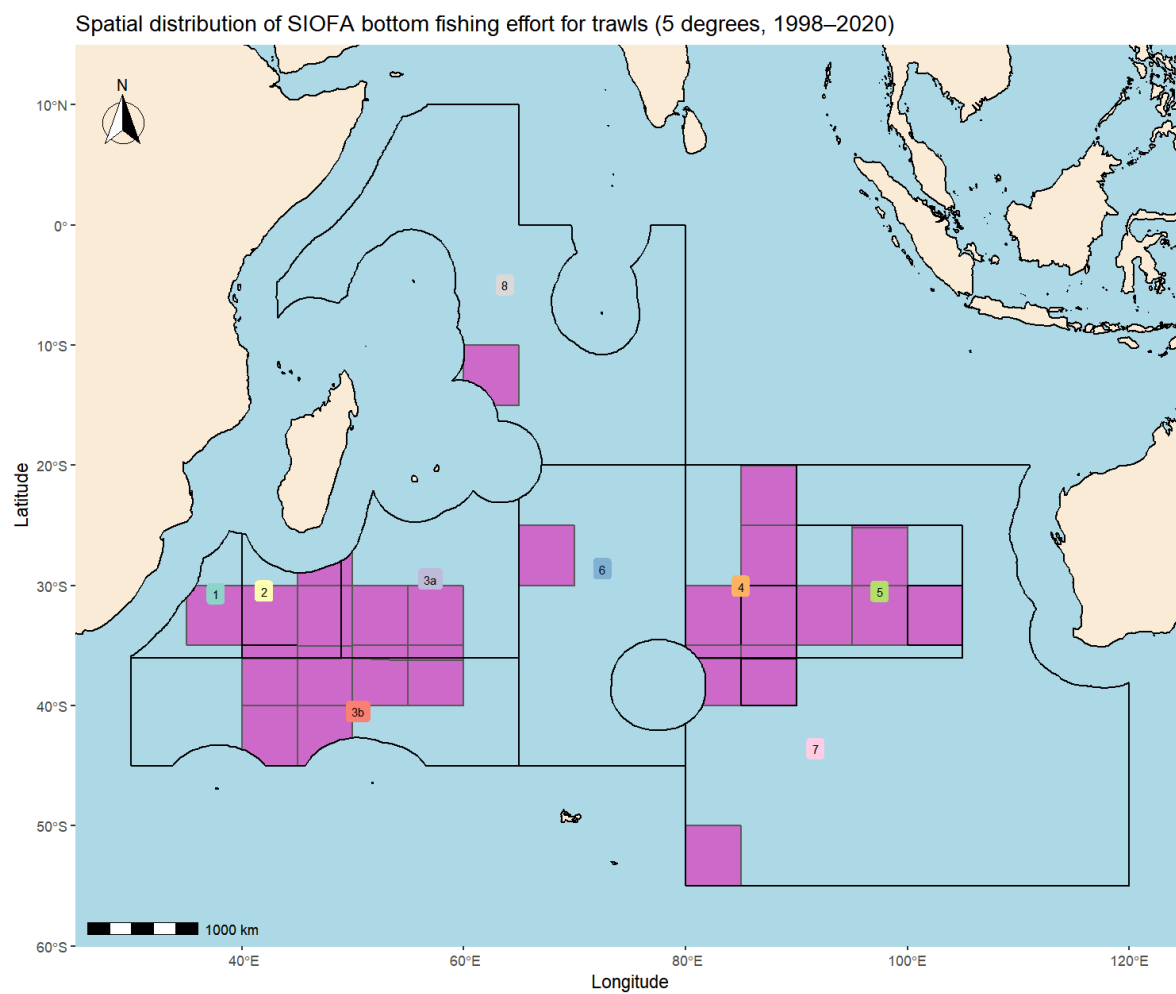
SIOFA bottom fishing footprint traps (5 degrees, 1998–2020)

Figure 19 – Spatial distribution of SIOFA bottom fishing effort for traps (nei) derived from recent set level and historical fishing data from 1998–2020, at a 5 degrees square resolution (sources: SIOFA HBHCatchEffort 1998–2020, and SIOFA spatial layers). Note that due to the coarse spatial resolution of these data, the area of the non-zero-effort cells will greatly exceed the actual area of the fishing footprint.

10.3 Bottom fishing footprint by Subarea
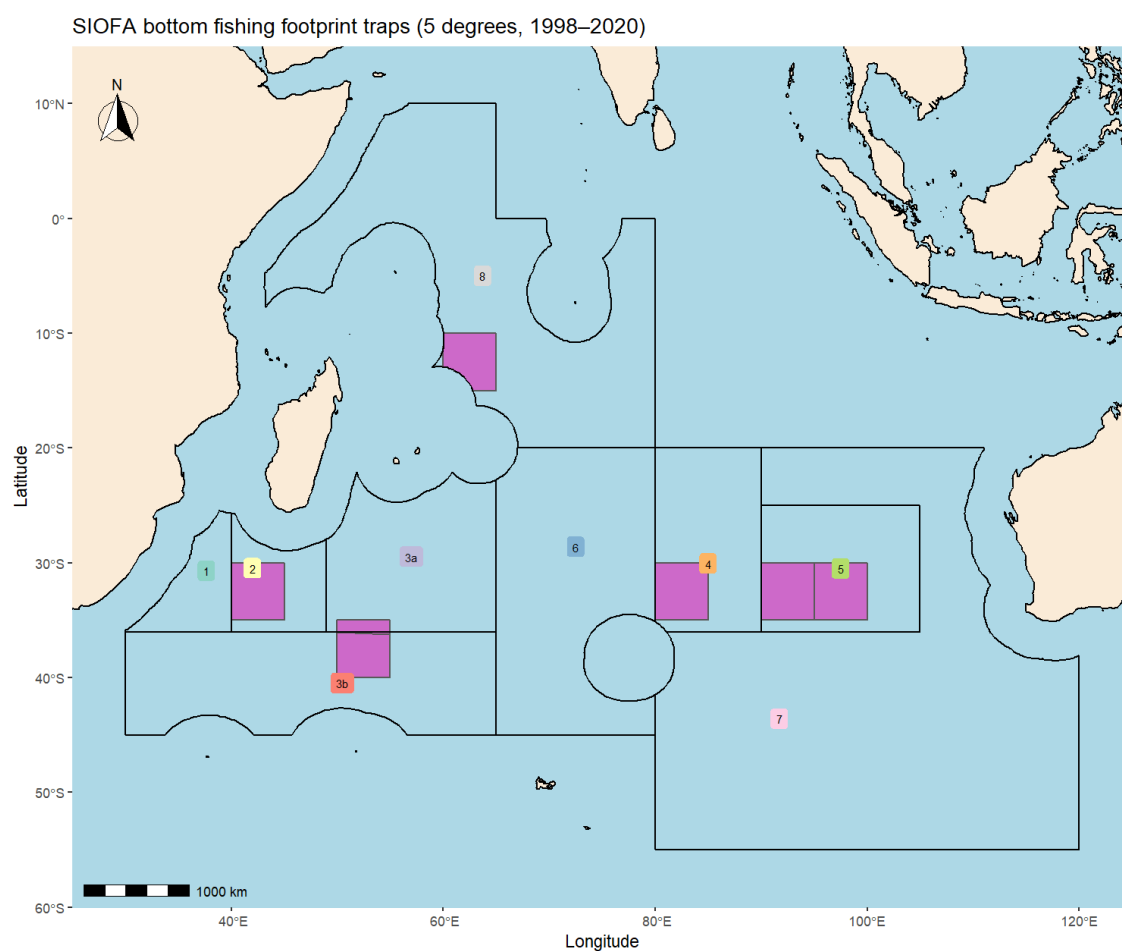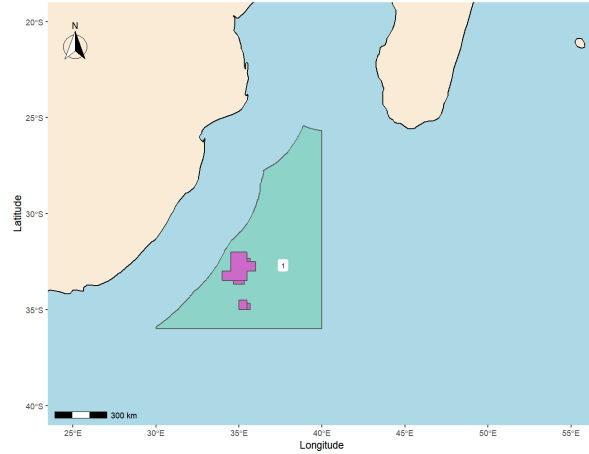
The revised bottom fishing footprint was disaggregated to produce Subarea-specific maps of bottom fishing. Figure 20 details the revised combined-method fisheries footprint (at 20'+30' resolution), for each of the SIOFA Subareas.

SIOFA bottom fishing footprint, subarea 1 (hybrid 20'+30', 1998–2020)

SIOFA bottom fishing footprint, subarea 2 (hybrid 20'+30', 1998–2020)
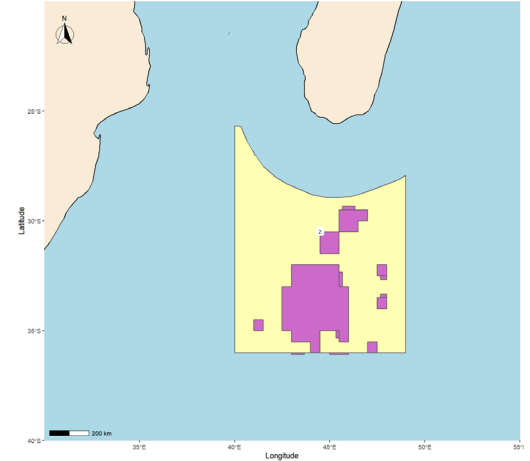
SIOFA bottom fishing footprint, subarea 3a (hybrid 20'+30', 1998–2020)
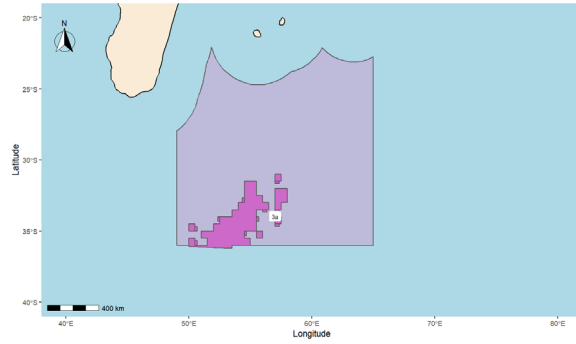
SIOFA bottom fishing footprint, subarea 3b (hybrid 20'+30', 1998–2020)
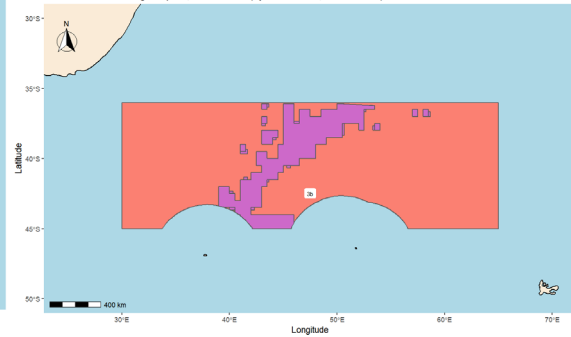
SIOFA bottom fishing footprint, subarea 4 (hybrid 20'+30', 1998–2020)
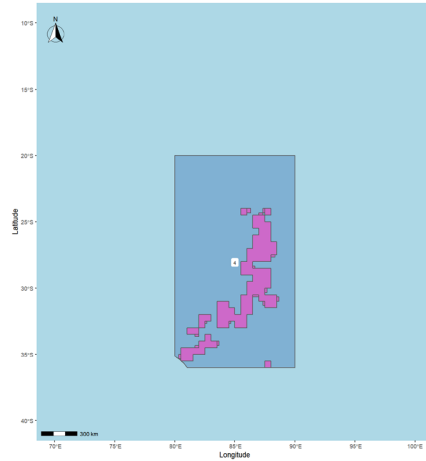
SIOFA bottom fishing footprint, subarea 5 (hybrid 20'+30', 1998–2020)
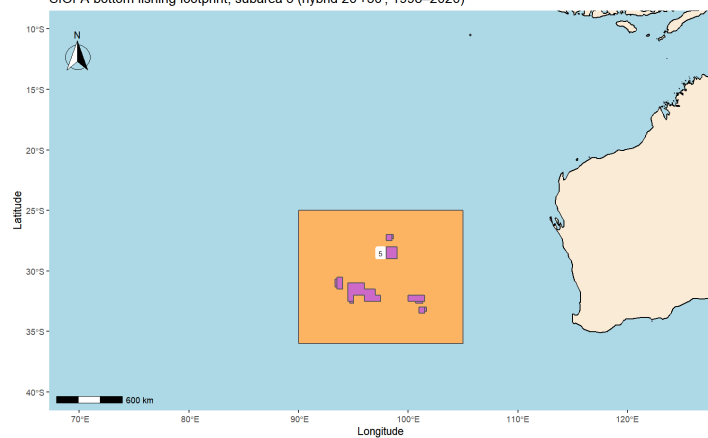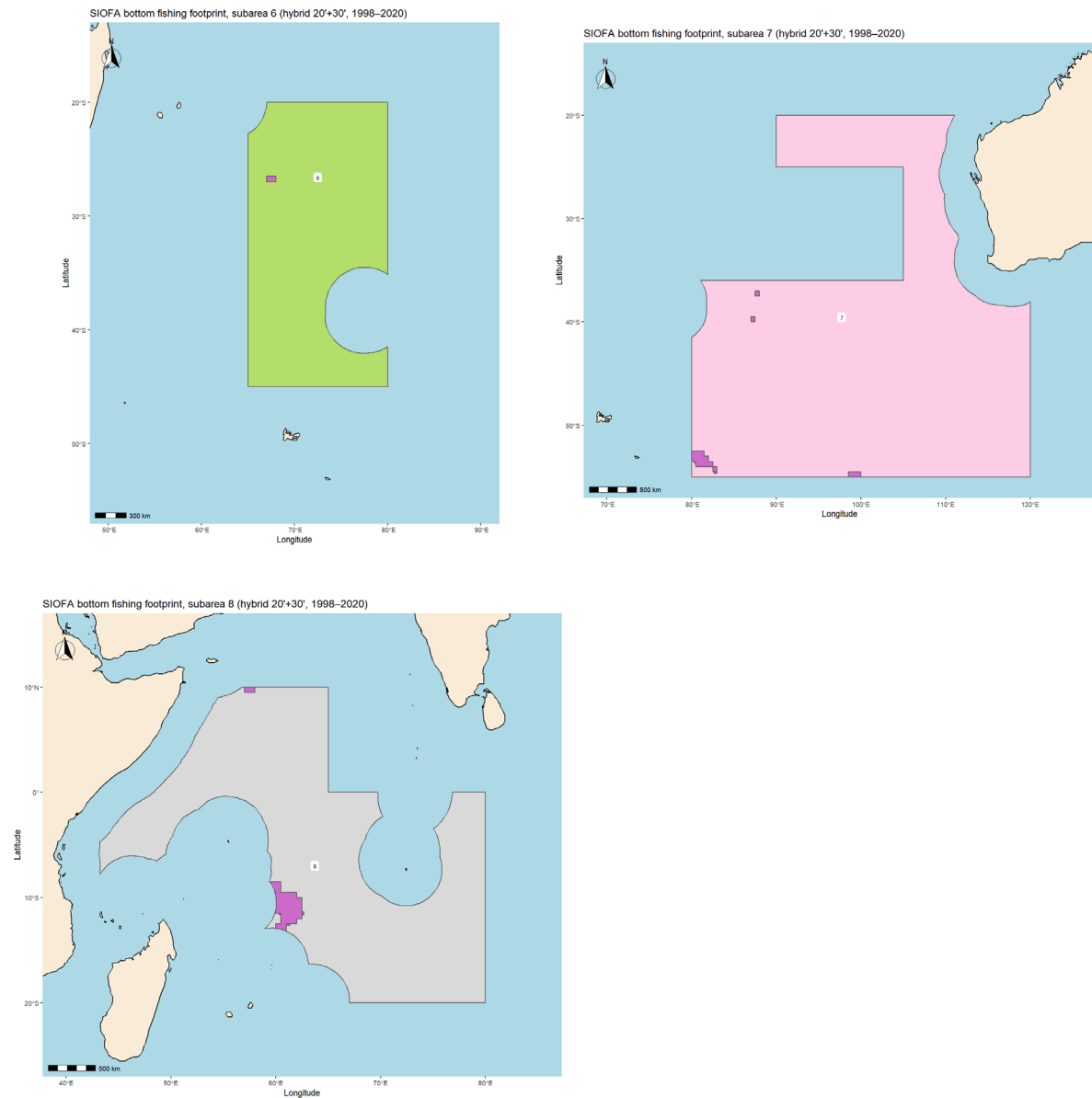
Figure 20 – Bottom fishing footprint by each SIOFA Subarea. These are the same as Figure 14 above (i.e., not including midwater trawling or handlining, and using updated data since adoption of the interim footprint in Figure 13) but represented at the scale of individual SIOFA Subareas. Cell sizes are at a hybrid 20' x 30' square resolution. As for other figures, because actual fishing events are narrower than the spatial resolution at which the data are summarised, the combined area of the cells will exceed the area of the actual fishery footprint.

10.4 Bottom Fishing Impact Assessment

In 2022, SIOFA adopted its first Bottom Fishing Impact Assessment (BFIA) (Mormede 2022), as provided for in its Conservation and Management Measure for the Interim Management of Bottom Fishing in the Agreement Area (CMM 01).

A bottom fishing impact assessment method was developed and applied for trawl and longline gears including all reported effort in 1998–2020 in the SIOFA Area. Summary statistics show the proportion of cells that were fished by at least one fishing event at the designated spatial scale.

To quantify impact and status, a relative benthic status (RBS) method was used, which considered both the actual width of the fished footprint (i.e., the area contacted by fishing gear, independent of

cell size), and the fragility to damage of benthic organisms inside the footprint, and their potential for recovery.

When considering only cells within the fishable area (i.e., to 2000 m depth) at the 0.1° cell resolution, 48% of cells in Subarea 3b and 45% of cells in Subarea 2 have had at least one fishing event (including both trawl and/or longline gears) since 1998). At fishable depths in the 1° cell resolution, 88% of cells in Subarea 8 have been fished at least once. At both scales, the number of fished cells has expanded between 1998 and 2020.

Because the size of cells used in the analysis were larger than the actual width of the fishing events, these 'proportional area fished' summary statistics overestimated the size of the actual fished footprint and were sensitive to the size of the cell used in the calculation. In contrast, impact assessment methods such as RBS estimate proportional impact per cell as a function of actual footprint width and the fragility of the benthic taxa contacted by fishing gear inside the footprint. Because the total area of the footprint and the area of the assessed domain did not depend on cell size, estimates of cumulative impact and VME taxon status under the RBS method were relatively insensitive to the use of different cell sizes.

The final BFIA calculation in Mormede (2022) was carried out at a 0.1° resolution south of 20° S (SIOFA Subareas 1 to 7) and 1° resolution north (SIOFA Subarea 8) for both trawl and bottom longline gears. The analysis estimated that the cumulative bottom fishing impact of trawl and longline gears on stony corals, *Demospongiae* and *Hexactinellida,* and on *Anthiparia* in the assessed area ranged from 0.4% to 1% in different Subareas (i.e., the intact status of each taxon per Subarea ranged 99%-99.6%) in 2020.

The distribution of this impact was not uniform within each Subarea. Summarised per Subarea, mean impact varied from 0.4–1%, but impact in the most heavily impacted cell in each Subarea ranged from 0.7–12.7%. When considering only fishable depths (< 2000 m), mean impact ranged from 0.5–3.5% in the different Subareas, and impact in the most heavily impacted cell per Subarea ranged 1.4–100%.

The Subareas most impacted was Subarea 2 followed by Subareas 3a, 3b and 4 (Figure 21).

Sensitivity analyses showed that in the estimation of relative benthic status (which combined both impact and recovery), biological characteristics of the VME taxa were the most influential parameters (i.e., steepness of the stock-recruit curve and recovery parameters), followed by factors affecting uncertainty about impact (i.e., VME fragility and the width of the bottom impact associated with individual fishing events).
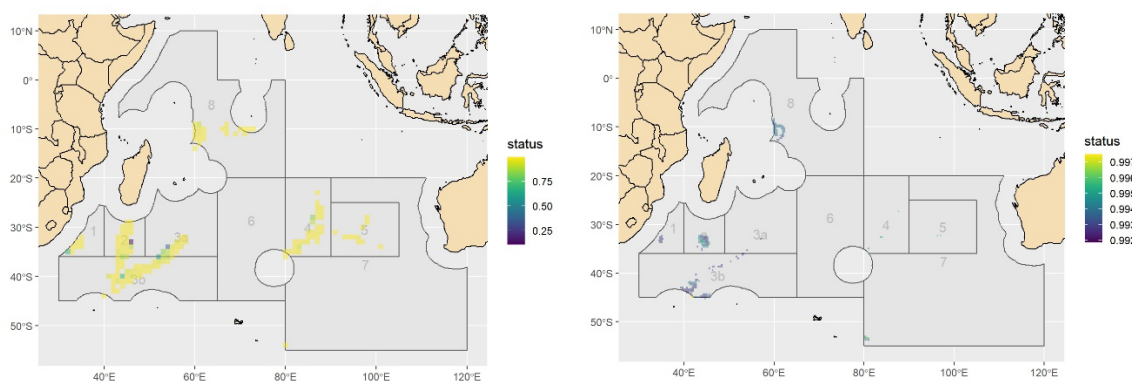
Figure 21 – Relative benthic status as affected by cumulative bottom trawl (left panel) and bottom longline (right panel) impacts within the SIOFA Area. Note unimpacted cells are at 100% status by definition, but these values are not shown. Reproduced from Mormede (2022).

10.5 Bottom fisheries interaction with VME indicator taxa

The incidental capture of VME indicator taxa during fishing operations were recorded by Scientific Observers on board of vessels and reported by SIOFA CCPs in their annual data submissions. Additionally, the Observer database also includes VME taxa captures that have been recorded occasionally in the Catch and Effort database.

While fishing operations and effort have not significantly changed, reporting of incidental captures of VME indicator taxa has been inconsistent over this period, with reports being supplied at the beginning and at the end of the time series but missing from several years in the middle (Figure 22). The species that were most reported (by weight) include precious corals nei (COR), hard corals, madrepores nei (CSS), Demospongiae (DMO), Porifera (PFR) and Spongiidae (SPO).

Figure 22 – Yearly incidental catch of VME indicator taxa in the SIOFA Area by taxa group (source: SIOFA Observer and HBHCatchEffort databases 2004–2023). Only the top 5 taxa by weight (cumulatively in the full database) are represented, indicated by their FAO species code (see Appendix C) and all other taxa are grouped in a separate category. Table D.8 in Appendix D provides a full account of taxa caught.

Incidental captures of VME indicator taxa were reported predominantly in trawls (Figure 23) and especially in bottom trawls, with occasional records being reported for midwater trawls.

Occurrences of captures are reported for line fishing gear, but usually these had small weights compared to those reported in trawls. Table D.4 in Appendix D gives the results by taxon, weight and gear.

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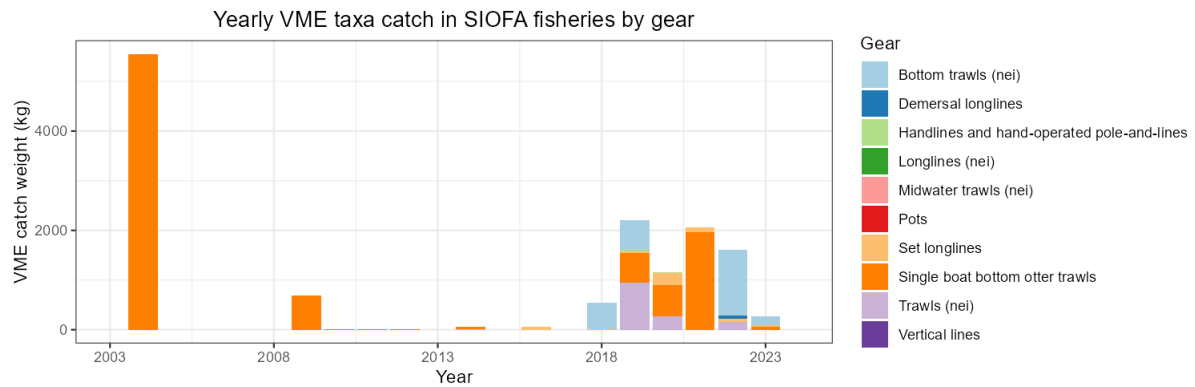
Figure 23 – Yearly incidental catch of VME indicator taxa in the SIOFA Area by fishing method and gear (source: SIOFA Observer and HBHCatchEffort databases 2014–2023).

Hard corals (*Scleractinia*) were commonly caught by fisheries operating at higher latitudes, while sponges *(Porifera)* were caught by fisheries operating throughout the SIOFA Area (Figure 24).
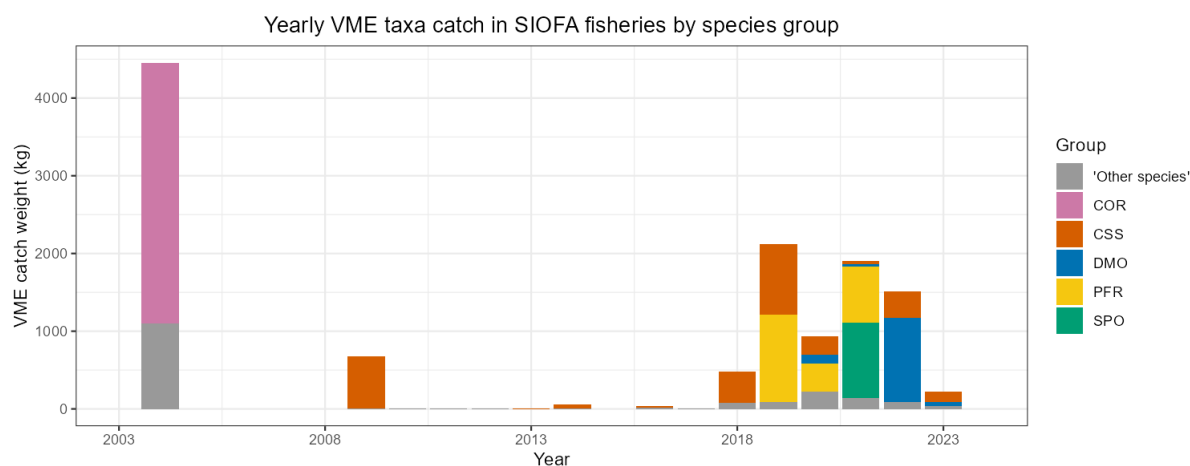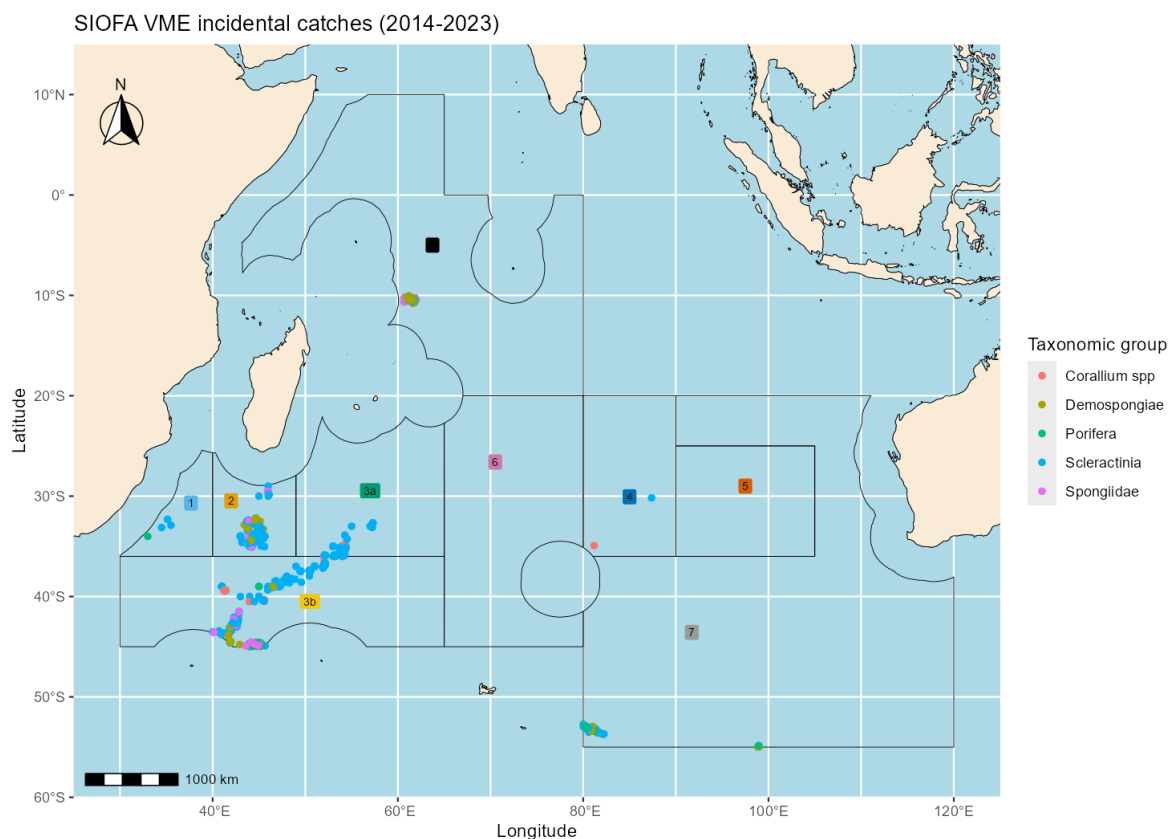

Figure 24 – Reported incidental catch of VME taxa in the SIOFA Area, mapped by taxonomic group (source: SIOFA Observer and HBHCatchEffort databases 2014–2023). Only the top 5 taxa by weight (cumulatively in the full database) are represented in this map. Figure D.2 in Appendix D provides a more detailed map at the highest taxonomic resolution.

11. Habitats of significance

This section has been left empty, pending discussions by the SIOFA Scientific Committee on habitats of significance.

12. 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 25). These areas were first instituted in 2018 through SIOFA CMM 2018/01 and entered into force on 10 August 2018. CCPs are provisionally required to abide by the specified fisheries restrictions to fisheries inside these areas until the adoption of a dedicated research and management plan, referred to in paragraph 6 e, SIOFA CMM 01(2024).

Current restrictions to fisheries in IPAs include a prohibition for CCPs to engage in bottom fishing, exclusion of line and trap fishing, and an obligation to have a Scientific Observer onboard at all times while fishing in those areas.

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 6 d., the Meeting of the Parties shall also review Annex 3 of CMM 01(2024), taking into account advice of the Scientific Committee.
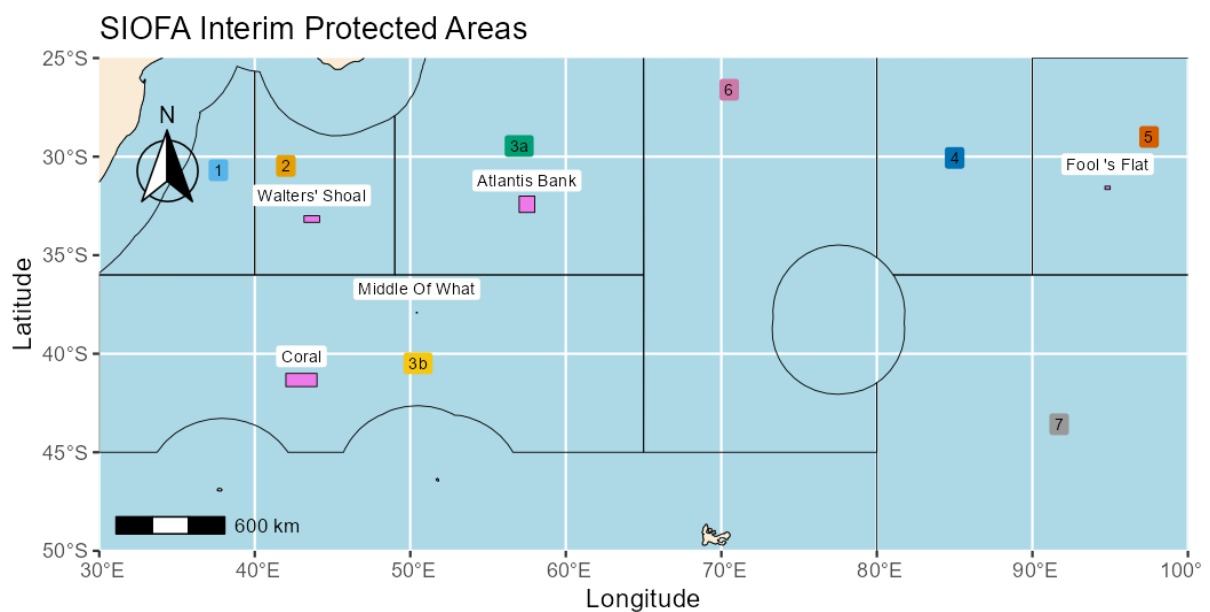
Figure 25 – Map of the SIOFA Interim Protection Areas (in magenta) as defined in CMM 01(2024) (Source: Annex 3 of SIOFA CMM 01(2024)). Each area has been labelled by name for easier recognition, as some are barely visible on a map of this large scale.

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 institution of the IPAs in late 2018 (Figure 26). Before the institution of the IPAs multiple gear types were used, but after adoption of the IPAs in 2018 only lines were used, consistent with the gear restrictions in CMM 01(2024) (Figure 27). No fishing was recorded within IPAs in 2022.
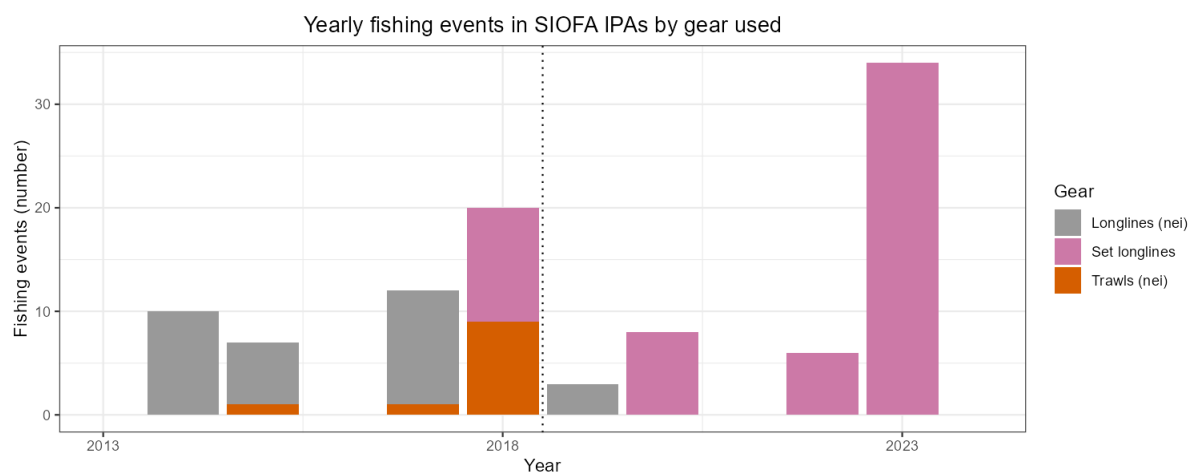
Figure 26 – Number of fishing events by gear in Interim Protected Areas (IPAs) per year (including from years before the IPAs were implemented) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

These events caught a range of species, but total catch weights in these locations have been relatively low (Figure 27). Splendid alfonsino (BYS) and kitefin shark (SCK) were the species that made the largest contribution to total catches in years when catch in IPAs was highest (2013, 2017 and 2018, Figure 27). No fishing was recorded within IPAs in 2021.
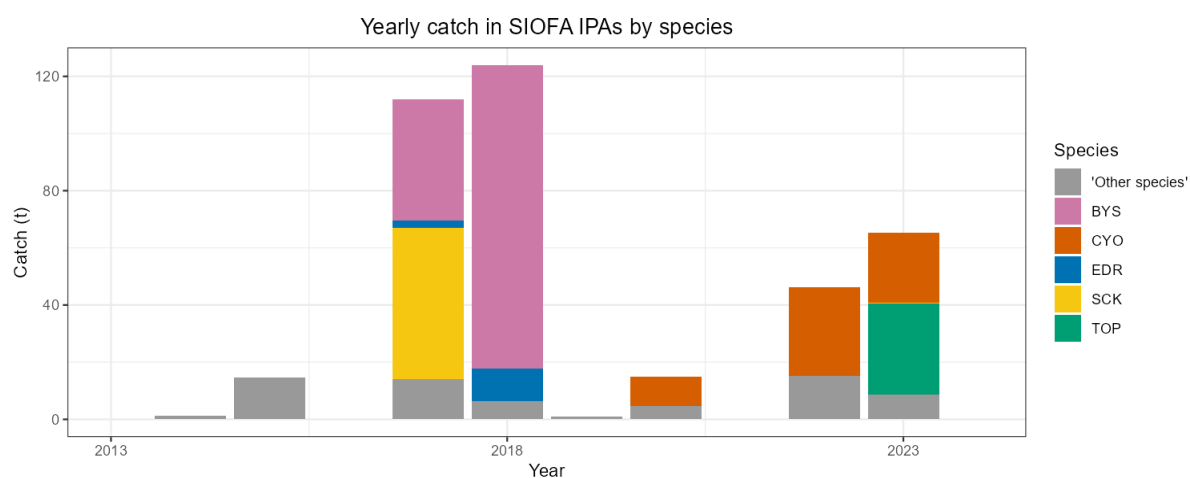
Figure 27 – Total catch (t) by species in Interim Protected Areas (IPAs) per year (including in years before the IPAs were implemented) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Only the top 5 species by weight (cumulatively over the history of the fisheries) are shown, indicated by their FAO species code (see Appendix C); other taxa are grouped and collectively labelled 'other species'. Table D.6 in Appendix D provides a more detailed account of other species caught.

13. Interactions with larger ecosystem processes

13.1 Climate change and environmental variability

No information is currently available on the impacts of climate change or environmental variability on SIOFA fisheries.

13.2 Trophic and ecosystem level effects

No information is currently available on the trophic interactions or other larger ecosystem effects of SIOFA fisheries.

14. References

Mormede, S. 2022. Calculating bottom fishing impact for trawl and longline gears in SIOFA. Pages 1–

22.

15. 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	Thredfin 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*

FAO Code	Common name	*Scientific name*
TUN	Tuna *	*Thunnini*
YFT	Yellowfin tuna	*Thunnus albacares*

16. Appendix B – Common names, FAO species codes, and scientific names of sharks, referred to in this summary

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*

17. Appendix C – Common names, FAO species codes, and scientific names of VME taxa reported as incidental captures in SIOFA fisheries

FAO code	FAO common name	Scientific name
ADQ	Black coral	*Antipathes dichotoma*
AJZ	Soft corals	*Alcyonacea*
AQZ	Black corals and thorny corals	*Antipatharia*
ATX	Sea anemones	*Actiniaria*
AXT	Hydrocorals	*Stylasteridae*
AZN	Hydroids, hydromedusae	*Anthoathecata*
BVH	Brachiopods, lamp shells	*Brachiopoda*
BWV		*Paragorgiidae*
BWY		*Bathylasmatidae*
BZN	Bryozoans	*Bryozoa*
CNI	Cnidarians nei	*Cnidaria*
COR	Precious corals nei	*Corallium spp*
CSS	Hard corals, madrepores nei	*Scleractinia*
CVD	Pencil urchins	*Cidaridae*
CWD	Feather stars and sea lilies	*Crinoidea*
DMO	Siliceous sponges	*Demospongiae*
GGW	Gorgonians	*Gorgoniidae*
HQZ	Hydrozoans	*Hydrozoa*
HXY	Glass sponges	*Hexactinellida*
IQO		*Isididae*
KRH	Wire coral	*Cirrhipathes spp*
NTW	Sea pens	*Pennatulacea*
NYZ	0	*Nephtheidae*
OEQ	Basket stars	*Euryalida*
PFR		*Porifera*
QFY		*Chrysogorgiidae*
SPO	Sponges	*Spongiidae*
SSX	Sea squirts nei	*Ascidiacea*
SZS	Serpulid tube worms	*Serpulidae*
ZOT	Zoanthids	*Zoantharia*

18. Appendix D – Data included in figures and additional figures

Table D.1 – Total annual target and bycatch weight (t) in the SIOFA Area (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023)

Year	Catch (t)	Shark catch (target/non-target, t)	Bycatch (t)
2013	7589.3	1249.9	961.7
2014	5825.6	1286.8	553.1
2015	23014.7	2067.5	11656.8
2016	20913.8	2724	4227.3
2017	17403.6	2134.1	1697.8
2018	11788.7	2071.5	503.7
2019	11993.3	1832.6	902.9
2020	13737.1	1207.2	917.2
2021	10612.3	1717.2	1853.5
2022	11810.4	1949	1240.3

Table D.2 – Total annual target catch weight (t) in the SIOFA Area, by Subarea. (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023)

Year	1	2	3a	3b	4	5	6	7	8
2013	23.8	2898.3	1098.7	2336.1	1178.8				15.5
2014	12.7	1371.4	1356.7	2424.1	630.4				0.4
2015	231.2	2450.9	1036.8	5896.3	1057.7		30.9	3.6	6200
2016	673.2	2051.2	1977	8300.5	29.7		13.2		6003.9
2017	4965.3	2220.7	950.1	7116.7	382.6	500.2	18.1		1093
2018	3634.8	1539.6	952.6	4171.5	914.5	100.6	28.4	347.2	23.4
2019	1758.2	2353.5	1040.5	4837.6	556.4	0.9	62	184.7	1196.4
2020	4269.7	1646.3	1318.6	4325.4	812.8	214.9	29.4	77.8	985.2
2021	1721.4	1549.4	979.5	3968.8	400.8	103.5	23.6	30	1787.4
2022	2376.7	1629.4	929.4	4371.2	343.9	49.4	11.3	31.4	2055.5

Table D.3: Total catch of sharks (t) per year and Subarea (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2021). Total catch includes both target catch and bycatch of all species.

Year	1	2	3a	3b	4	5	6	7	8
2013	61.4	1167.7	0	20.6	0	0	0	0	0.2
2014	0	1282.9	0	3.9	0	0	0	0	0
2015	7.5	1685.4	10.5	95.7	2.7	0	32.2	3	200.2
2016	184.4	1878.1	3.2	387.8	1.1	0	5	0	70.4
2017	436.1	1121.7	5.2	453.9	1.4	0.4	9.8	0	102.8
2018	286.7	1456.1	18	199.9	0	0	38.2	0.2	71
2019	204.4	1055.3	28	263.5	1.2	5	51.5	9.2	213.9
2020	231.9	619.6	23.7	166	5.1	1.2	15.1	0.5	143.4
2021	252.5	1120	27.9	193.9	4.4	0	14.8	0.4	100.1
2022	186.5	1460	13.5	168.3	2.4	2.9	9.5	8.8	96.5

Table D.4 – Total incidental catch (in kg) of VME taxa by fishing method and gear (source: SIOFA Observer and HBHCatchEffort databases 2013–2021).

Taxon	Bottom trawls (nei)	Demersal longlines	Handlines and hand-operated pole-and-lines	Longlines (nei)	Midwater trawls (nei)	Pots	Set longlines	Single boat bottom otter trawls	Trawls (nei)	Vertical lines
Actiniaria	0.84	4.79					26.467	1.45		
Anthoathecatae	9						0.377	1	1	
Antipatharia	3.572						11.515	45.9	7.91	
Antipathes dichotoma	1.3							0.02	31.66	
Asteroidea	0.14							12.66	0.5	
Brisingidae	0.025									
Chrysogorgiidae	0.055									
Cidaridae	4.2	0.76					0.035			
Cirrhipathes spp	0.1									
Cnidaria	5	3.04	22.8				2.64	28.97		
Crinoidea	0.005						4.62			
Demospongiae	1152.32	14.82		0.645			34.476	117	1.08	
Echinodermata	0.4						9.025001			
Gorgoniidae	1.5						103.4083	69.57	13.84	
Hexactinellida	25.63	5.76		0.03			13.53		2.85	
Hydrozoa	10.322							2	0.77	
Isididae	15.57			0.49					51.37	
Nephtheidae	0.1									
Ophiurida	4	2.55					2.211001	1		

Taxon	Bottom trawls (nei)	Demersal longlines	Handlines and hand-operated pole-and-lines	Longlines (nei)	Midwater trawls (nei)	Pots	Set longlines	Single boat bottom otter trawls	Trawls (nei)	Vertical lines
Paragorgiidae	0.09								2.215	
Pennatulacea	3.66	0.66					5.595001	0.05	0.05	
Porifera	625.67	1.8			0.5		5.89	1848.7	6	
Rhopilema spp	1.65				5.2			14.4		
Scleractinia	577.57	14.2		0.15	3.8	0.2	181.239	751.93	1210.537	
Spongiidae	5.5						6.19	1112.35	61.99	
Stylasteridae	3.325			0.41			25.404	7	5	0.6
Bryozoa		3.13					6.44			
Euryalida		3.8		0.155			9.032			
Acropora formosa			22.2							
Heliopora coerulea			4.5							
Alcyonacea				0.041			24.32	1.12	1.005	
Animalia							0.01	1000		
Ascidiacea							2.325			
Bathylasmatidae							0.21			
Brachiopoda							0.28			
Crustacea							0.271			
Echinoidea							0.05	15.31	3.15	
Galatea spp							0.04			
Holothuria spp							0.4			
Invertebrata							6.43			0.9
Lithodidae							1.52			
Pycnogonida							0.07			
Serpulidae							1.14			

Taxon	Bottom trawls (nei)	Demersal longlines	Handlines and hand-operated pole-and-lines	Longlines (nei)	Midwater trawls (nei)	Pots	Set longlines	Single boat bottom otter trawls	Trawls (nei)	Vertical lines
Zoanthidea							2.905			
Corallium spp								5509.35		
Gorgonocephalus spp								2.83		
Ophiuroidea								1.51		

Table D.5 – Total catch of sharks in the SIOFA Area by species (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Species are indicated by their FAO species code (see Appendix B).

Species	Total weight (t)	Species	Total weight (t)	Species	Total weight (t)
ALS	0	HXT	0.3	SOR	120.8
ASK	2	JFB	32.7	SPK	0
BHY	5.2	NTC	1.4	SPN	2
BSH	0	ORZ	2.5	SRX	4.1
BYR	42.3	PTM	0.2	SUN	83.6
CAR	3.1	QUK	1.5	TIG	0.1
CLD	0.3	RAJ	0.2		
CVX	38.1	RBI	0.8		
CWM	0	RBY	1		
CWO	0	RFA	218.4		
CWZ	35.9	RME	0.1		
CYO	7450.2	RMV	0		
CZI	0	RRY	0.9		
DCA	1241.8	RSK	0		
DGX	0.5	RTE	0		
DGZ	0.7	RYE	0.2		
DOP	1.5	RZZ	0.4		
ETE	3.7	SBL	0		
ETF	0.5	SCK	2057.9		
ETM	155.4	SDV	30.1		
GTF	6.6	SHL	654.7		
GUP	486.4	SKA	0.2		
GUQ	427.2	SKH	0.1		
HAG	0	SKX	5121.4		
HCM	0	SMA	0.2		
HOL	1.2	SON	1.1		

Table D.6 – Total discards in the SIOFA Area by species (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Species are indicated by their FAO species code.

Species	Total weight (t)	Species	Total weight (t)	Species	Total weight (t)	Species	Total weight (t)	Species	Total weight (t)	Species	Total weight (t)
ACC	25	CRA	0	GEM	0	LXX	0	RAJ	0	SPN	2
AJH	0	CRU	0	GER	0	MAI	0	RFA	17.9	SPZ	0
AJZ	0	CSF	0	GES	0	MOR	0	RIB	0.1	SRP	0
ANT	172.7	CSS	0	GGW	0	MOX	0	RME	0.1	SRX	0.4
APX	0	CUS	0	GOX	0.4	MRL	0	RMV	0	SSO	0.2
AQZ	0	CVD	0	GRV	53.1	MZZ	2254.7	ROK	0	STF	0
ATX	0	CVY	0	GSS	0	NTC	1.4	RRY	0.9	STT	0.1
AXT	0	CWD	0	GTF	0	NTW	0	RSK	0	SVY	0.1
AYV	0	CWM	0	GUP	0.2	OEO	1	RTE	0	TDO	0
AZN	0	CWO	0	HAG	0	OEQ	0	RYE	0.1	TIG	0.1
BDX	0	CWZ	0	HAU	0	OIL	8.7	RZZ	0.4	TOP	0.1
BHY	5.2	CYO	0	HFR	1.7	ONV	109.4	SBL	0	TRK	0
BOE	0.2	CZI	0	HOL	1.2	OOY	0	SCK	0.1	TTH	0
BRF	1.6	DCA	0	HXN	0	OPH	0.2	SDC	0.1	UPM	0.1
BSF	2.1	DGS	0	HXT	0.3	ORY	24	SDX	14.8	VLO	0
BSH	0	DGX	0.5	HXY	0	OTH	3.7	SFS	2	WBX	0
BWY	0	DGZ	0.4	HYD	0.2	OTPE	0	SHL	0.3	WHA	0
BXD	0.1	DMO	0	HYW	0	PAZ	0	SKA	0.2	XAX	0.4
BYS	21.9	DOP	1.5	JCX	0	PCX	0.2	SKH	0.1	XPX	0
BZN	0	DOT	0	JDX	0	PEL	0	SKX	2.2	YFT	0
CBH	0	EDR	1.5	JEL	0	PFR	1.6	SMA	0.2	ZEX	0.5
CDL	4.3	EMT	0.1	JFB	5.1	PQR	0	SNK	0.1	ZOT	0
CMO	1.7	EPI	19.2	KAW	0.2	PRC	0	SON	1.1		
CNI	0.1	ETF	0.5	KCS	0	PTH	0.1	SOR	120.8		
COE	0	ETM	0	KCU	0	PTM	0.2	SPK	0		
COX	1.2	EZT	0	LEV	0.5	PUX	0.1	SPL	0		

Table D.7 – Total incidental catch of VME taxa in the SIOFA Area by species group (source: SIOFA Observer and HBHCatchEffort databases 2014–2023). Species are indicated by their FAO species code.

Taxon	Total weight (kg)	Taxon	Total weight (kg)
ADQ	32.98	INV	7.33
AJZ	26.49	IQO	67.43
AQZ	68.9	JEL	21.25
ATX	33.55	KCX	1.52
AXT	41.74	KQM	22.2
AZN	11.38	KRH	0.1
BHZ	0.03	NTW	10.02
BVH	0.28	NYZ	0.1
BWV	2.3	OEQ	12.99
BWY	0.21	OOY	9.76
BZN	9.57	OTH	1000.01
CNI	62.45	OWP	1.51
COR	5509.35	PFR	2488.56
CRU	0.27	PWJ	0.07
CSS	2739.63	QCX	2.83
CVD	5	QFY	0.06
CWD	4.62	SPO	1186.03
DMO	1320.34	SSX	2.33
ECH	9.43	STF	13.3
GGW	188.32	SZS	1.14
GKX	0.04	URX	18.51
HKQ	4.5	WBX	0.4
HQZ	13.09	ZOT	2.91
HXY	47.8		

Table D.8 – Total fish catch (t) by species in Interim Protected Areas (IPAs) (including years before the IPAs were implemented) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

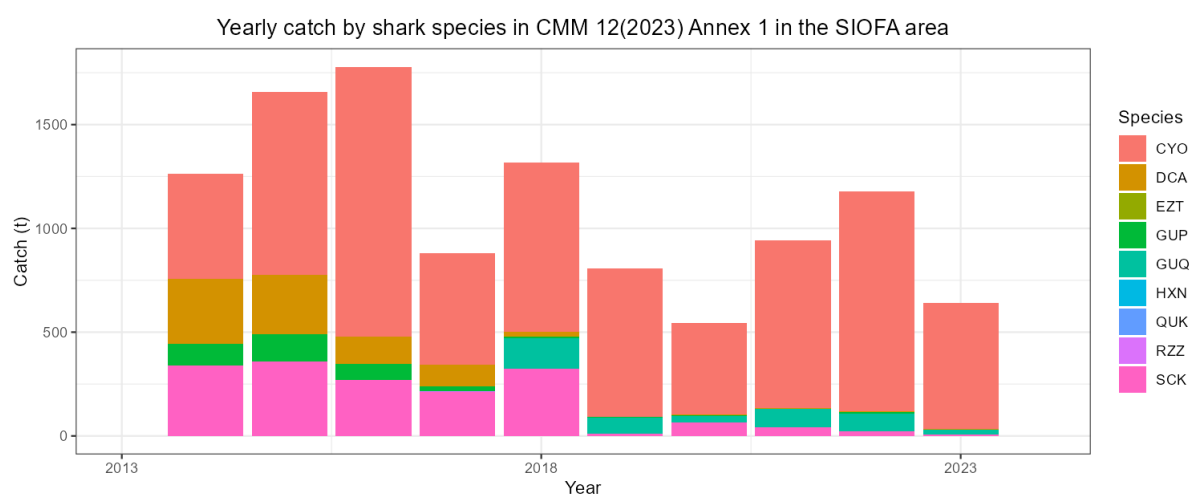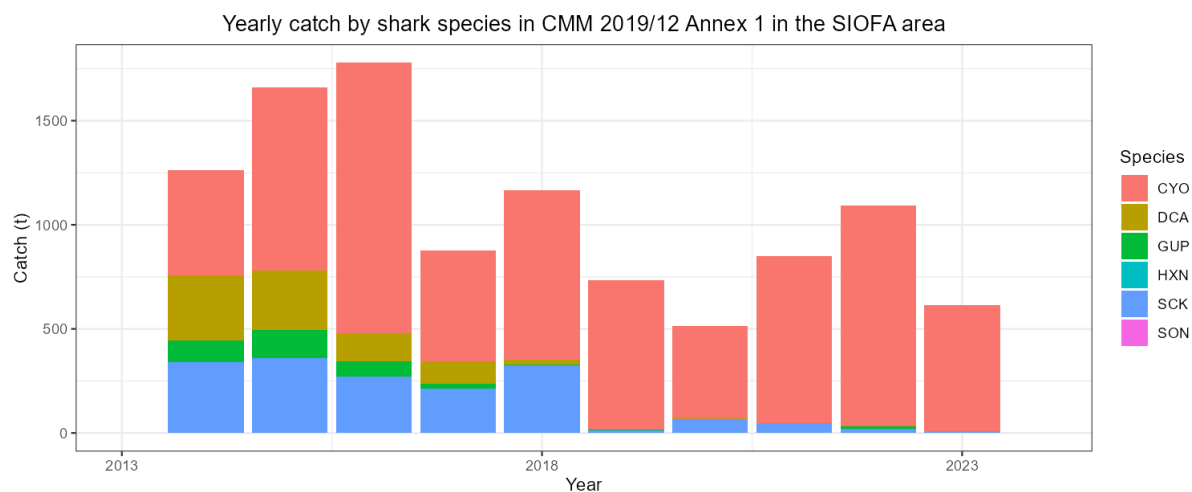| Species	Total weight (t)	Species	Total weight (t)
ANF	1.7	JEL	0
ANT	0.4	KCS	0
AXT	0	KCU	0
BWA	0.1	LEV	0.5
BXD	0	OIL	2.5
BYS	255.3	ORY	0.2
BZN	0	PEL	7.6
COX	0	RFA	0.4
CSS	0	RIB	17
CYO	58.3	ROK	0
DCA	6.6	SCK	71.7
DMO	0	SEY	4.7
EDR	21.1	SHL	3.4
EPI	7.3	SKA	0.1
GGW	0	SKX	5.4
GRV	0.9	SRX	0
GUP	3.4	TOP	12
GUQ	5.8	WRF	2.4
HOL	0.3		

Figure D.1a and b – Yearly catch in the SIOFA Area of sharks considered to be at "high risk" and/or "of concern" as included in Annex 1 of SIOFA CMM 12 (Conservation and Management Measure for Sharks). Catches are summarised by species in different versions of the CMM Annex 1, 2019/2022 (upper panel, a) and 2023 (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Species are identified by their FAO species code (see Table 3 for disambiguation).
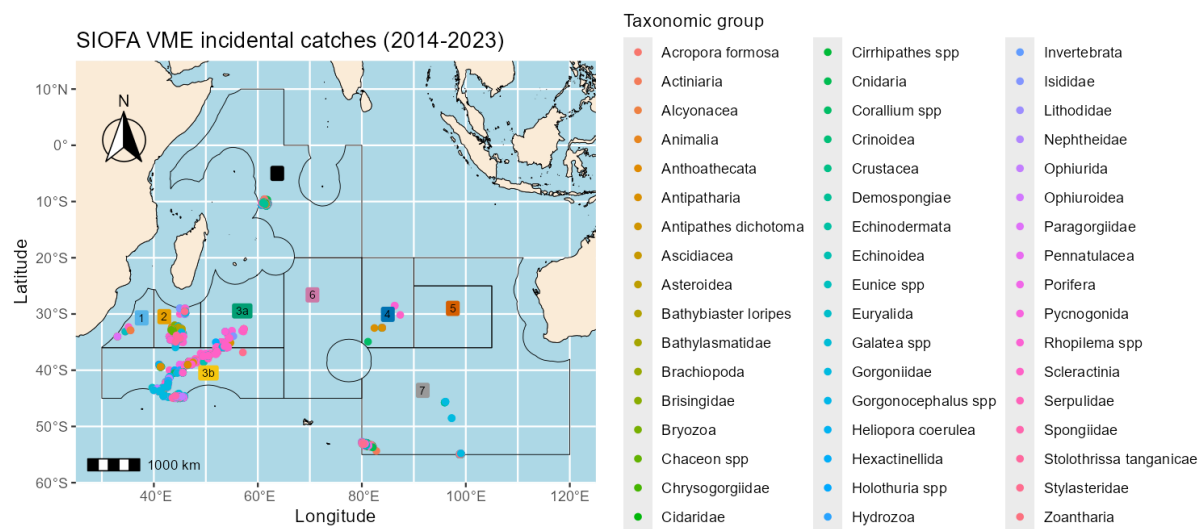
Figure D.2 – Incidental catch of VME taxa reported in the SIOFA Area, mapped by taxonomic group (source: SIOFA Observer and HBHCatchEffort databases 2014–2023).