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MOP-12-15

SIOFA Fisheries Summary: hapuka (*Polyprion* spp., hapuku wreckfish *P. oxygeneios*, wreckfish *P. americanus*) 2025

The SIOFA Secretariat

Meeting	Compliance Committee ☐ Meeting of the Parties ✔
Document type	Working paper ✔ Information paper ☐
Distribution	Public ✔ Restricted [1] ☐ Closed session document [2] ☐

Abstract

This paper presents the SIOFA Fisheries Summary: hapuka (*Polyprion* spp., hapuku wreckfish *P. oxygeneios*, wreckfish *P. americanus*) 2025.
A template of the Fishery Summary type of document was first presented to and approved by SERAWG4 and SC7 in 2022, and it was adapted to this species as requested by SC7. The creation of this summary was recommended by the SC7, and a first draft was considered at SC8 but was not deemed yet ready for publication. This Summary was first endorsed by SC9 and MoP11 and published in 2024.
The 2025 version of the SIOFA Fisheries Summary: hapuka includes updated figures using data up to 2023.

[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 Scientific Committee recommended that the MoP:

- **endorse** the SIOFA Fisheries Summary: hapuka (*Polyprion* spp., hapuku wreckfish *P. oxygeneios*, wreckfish *P. americanus*) 2025 and **task** the Secretariat to make a public version of it, with confidential information removed, available on the SIOFA website.

SIOFA Fisheries Summary: hapuka (*Polyprion* spp., hapuku wreckfish *P. oxygeneios*, wreckfish *P. americanus*) 2025

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

Next review date: 2028

Prepared by the SIOFA Secretariat

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Contents

Summary of updates in this version:

- Includes additional historical data, deriving from a review of the activities of the Spanish fleet in 2001–2017.
- Figures have been updated to be color-blind friendly, where possible, 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/).
- Data is presented for the last 10 years in the data series (2014–2023), previous data (2013) will remain available in older reports but is not showcased here.
- Observer data on biological measurements (see Section 7.1) split into the two different species, as requested by SC9.
- Flextables used to create auto-updating nested tables.
- Added an analysis of discards in the fishery (see Section 10.3)

1. Purpose of this document

The SIOFA Fisheries Summaries describe specific SIOFA fisheries in the SIOFA Area (Figure 1) and summarize the available information for each species, and their biology and ecology. This document is targeted at the general public and institutions and countries wanting to better understand SIOFA fisheries. It also describes SIOFA data available on SIOFA individual fisheries that could be used by scientists and consultants for scientific research.

The SIOFA Ecosystem Summary provides more detailed information on effects of SIOFA fisheries on ecosystems and species in the SIOFA Area. The SIOFA Fisheries Overview integrates these documents and describes general trends for the main fisheries in the SIOFA Area.

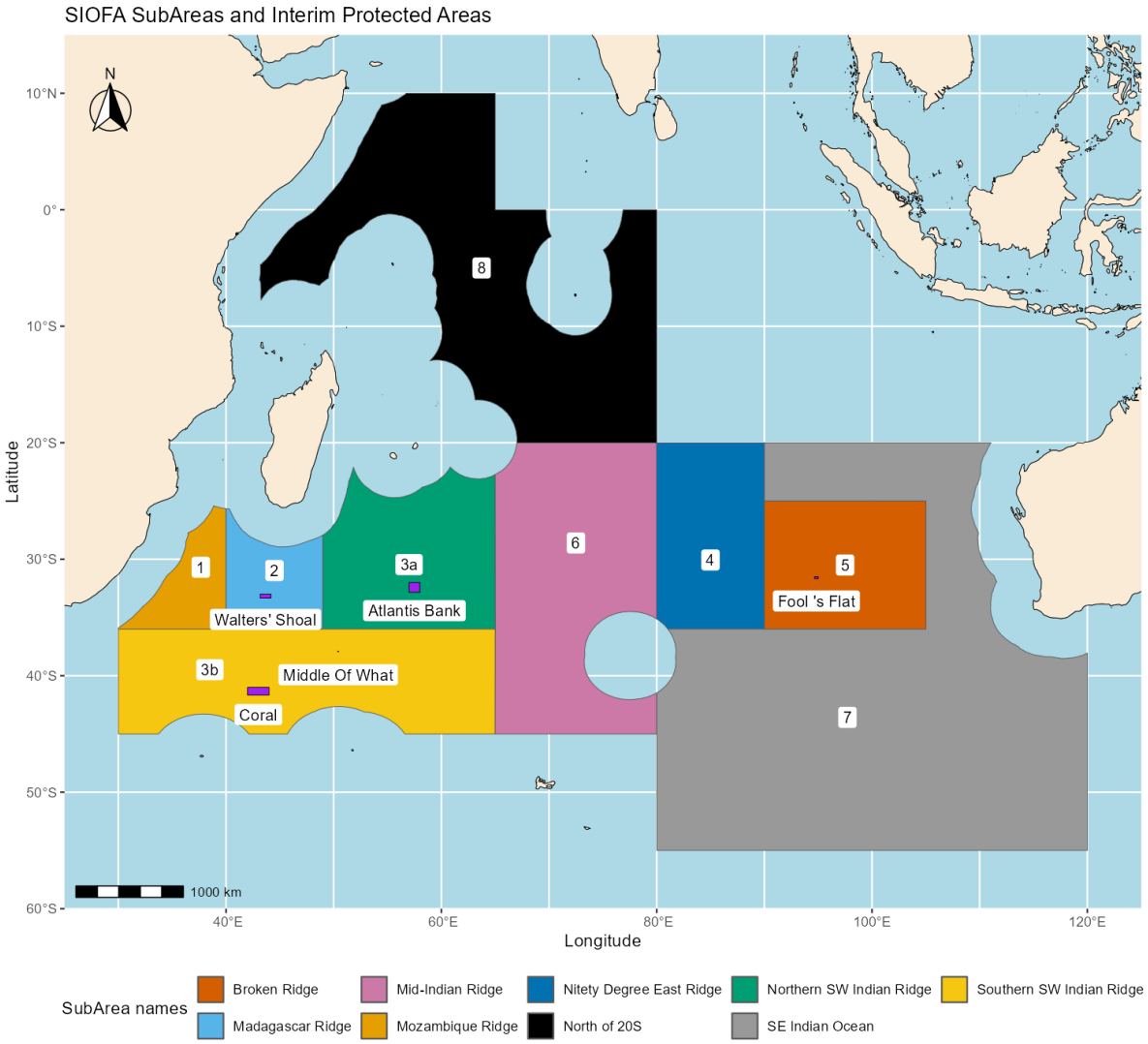

Figure 1 – The SIOFA Area and Subareas (source: SIOFA Spatial database). The Subarea numbers and colour codes are used consistently throughout this summary to identify Subareas. The map highlights SIOFA Interim Protection Areas (in magenta) as defined in CMM 01(2024) (Annex 3). All the interim protection 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 (2015–2025) that SIOFA CCPs submit to the Scientific Committee every year, which are made publicly available on the SIOFA website (https://siofa.org/meetings/groups/Scientific%20Committee%20Meeting).

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

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

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

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

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

2.3 Data used in this report

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

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

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

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

2.4 Analysis code

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

3. Species Summary

Common name	Hapuka, hapuku wreckfish, wreckfish
Scientific name	*Polyprion spp.* (Hapuka)*, Polyprion oxygeneios* (hapuku wreckfish)*, Polyprion americanus* (wreckfish)
Scientific synonyms	
FAO species code	HAU (Hapuka), WHA (hapuku wreckfish), WRF (wreckfish)
Year of this report	2025
Assessment Areas/ Management Units	Not defined
Assessment method	None
Most recent assessment	None
Year of next assessment	Not specified
Harvest strategy	Not defined
Summary of current stock status	Unknown

This report describes the hapuka fisheries in the SIOFA Area and available biological parameters for the species in the genus *Polyprion*. Collectively, hapuka includes both the hapuku wreckfish (WHA, *Polyprion oxygeneios*) and wreckfish (WRF, *Polyprion americanus*) species, as well as catch not identified to the species level (HAU, *Polyprion* spp.). For the purposes of this Summary, 'hapuka' and the generic code HAU will be used to refer collectively to WHA, WRF, and HAU, unless otherwise specified.

The SIOFA Scientific Committee has provided interim advice, endorsed by the SIOFA MoP, to put in place an interim catch limit for hapuka corresponding to the average annual catch in the last 5 years (see paragraph 79, MoP10 Report). However, no further management advice has been agreed for hapuka in the SIOFA area.

A harvest strategy for the hapuka stocks in the SIOFA area has not yet been developed.

No stock assessment is available for hapuka stocks in the SIOFA area.

No management advice has been agreed for hapuka in the SIOFA area.

4. Biological Summary

Hapuka, also known as groper or wreckfish, are large, long-lived, late-maturing, demersal groupers with a circumglobal distribution in southern oceans. They inhabit temperate and subtropical waters of the southern Indian Ocean and Pacific Ocean, and in coastal areas around Chile, Australia, New Zealand and the west coast of Africa. They may be found living in cracks, caverns, or caves when in shallow waters, but adults occur generally over rough ground from the central shelf (about 100 m) to the shelf edge and down to the upper slope, or in association with seamounts or other deepwater features to depths of roughly 800 m. In contrast juveniles are found in surface waters and are thought to be pelagic, perhaps schooling in association with drifting weed, and switching to a demersal habit when they are around 50 cm long. (Beentjes and Francis 1999, Wakefield et al. 2010).

Hapuka reach sexual maturity at roughly 10-13 years age and 88 cm length, and can live to 60 years. They have an average adult length of 80–100 cm and 25 kg, but can grow up to 180 cm in length and 100 kg weight (Wakefield et al. 2010).

Hapuka are voracious generalist predators, feeding on a wide range of fish species including barracouta, pilchards and various demersal fish species, as well as invertebrates and crustaceans. Hapuka are in turn preyed upon by sperm whales (Froes and Pauly 2022).

5. Description of the fishery

5.1 Fleet and gear

Hapuka are targeted and caught in the SIOFA Area using demersal longlines, set longlines or droplines. Hapuka are caught in the western SIOFA area, mainly subareas 2, 3a and 3b (Figure 2). The CCPs that have participated in the hapuka fishery are summarised in Table 1 within Section 7 of this Summary.

In the 2019-2023 period, participation in the hapuka fishery has involved on average 1.6 vessels per year.

5.2 Fishing areas

Hapuka are caught on or in association with underwater features primarily in the western portion of the SIOFA area (subareas 2, 3a, and 3b) and to a much lesser extent in the eastern side, in subarea 4 (Figure 2).

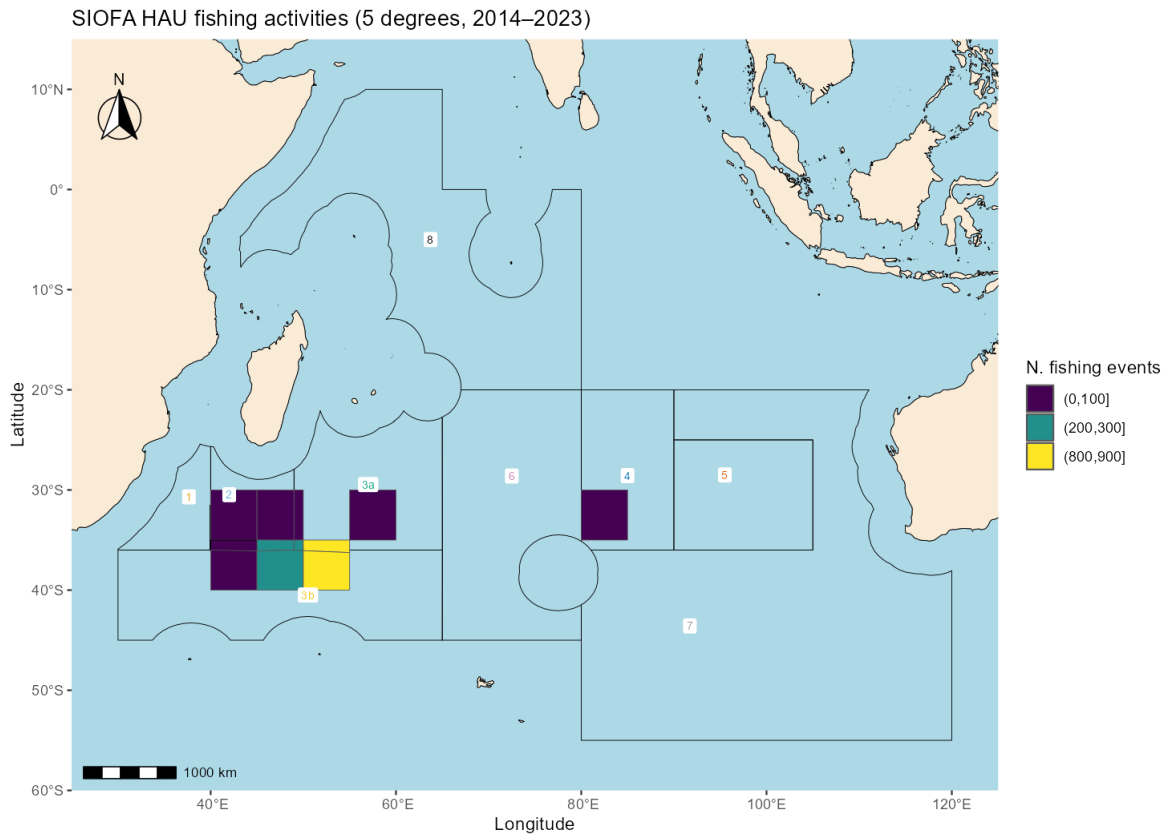

Figure 2 – Spatial distribution of fishing events that caught hapuka in the SIOFA Area, derived from haul-by-haul level fishing data, aggregated at a 5x5 degrees resolution (source: SIOFA HBHCatchEffort databases 2014–2023). This map represents all fishing events that caught any HAU, WHA or WRF, irrespective of declared target species.

5.3 Assessment Areas

No management units or areas for the purpose of stock assessment have been defined for hapuka.

5.4 Catch and effort

Note that fishing effort and catches reported in this section are intended to represent total catch of hapuka, irrespective of whether each particular fishing event had been targeting these species or not. Consequently, CPUE represents the CPUE of all operations that caught hapuka even as bycatch, so if the share of operations actively targeting hapuka increases, then CPUE is likely to increase as well. In this context, CPUE as depicted here cannot be considered a reliable index of abundance.

Catches of hapuka significantly increased in 2020, and effort has also correspondingly increased (Figure 3a). From 2020, both catches and effort have decreased substantially. The yearly catch composition was relatively variable, but wreckfish (WRF) was the most commonly caught species in the last years (Figure 3a). The average annual catch of hapuka (all species combined) during the recent (2018–2022) period was 82.1 t.

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

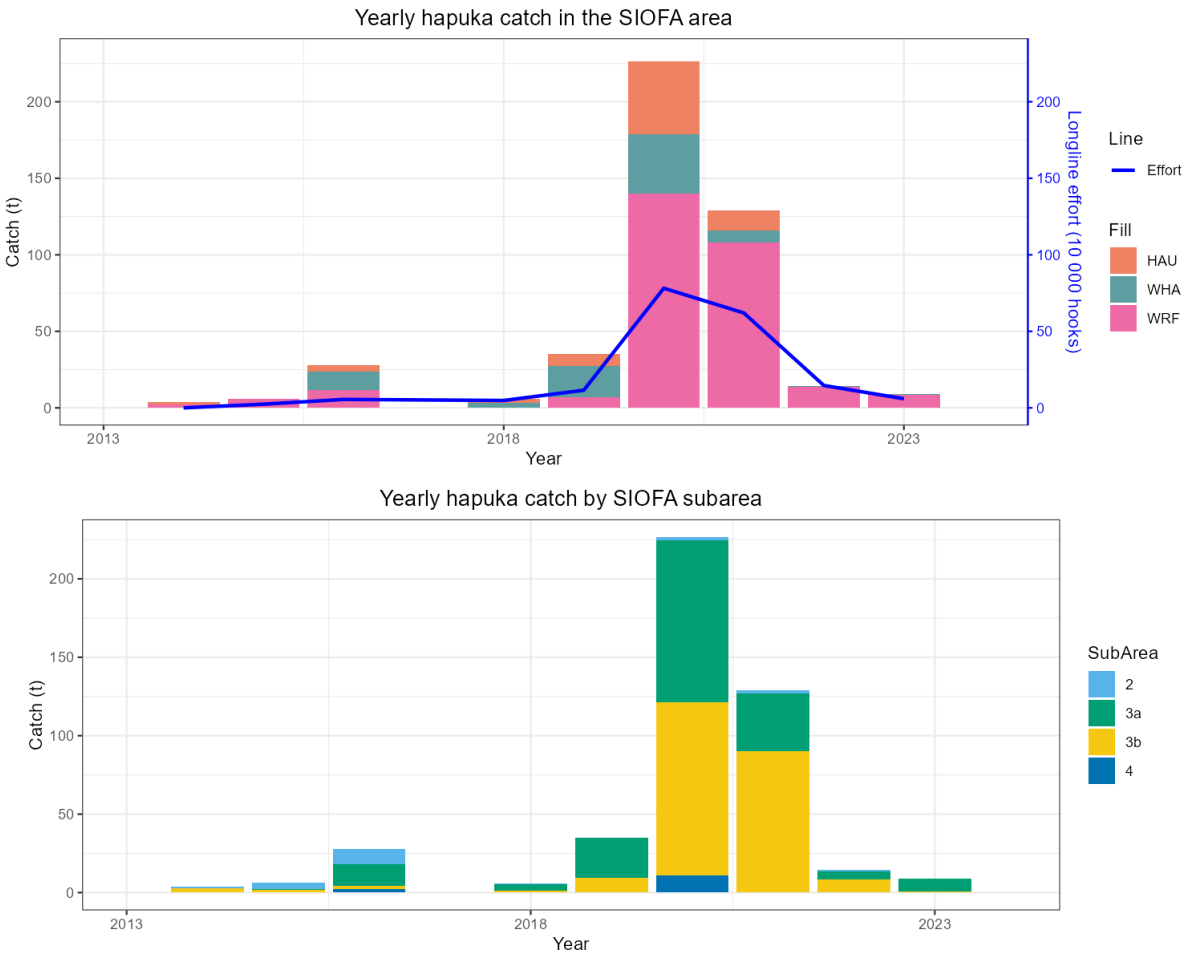

Figure 3a and b – Yearly hapuka catch (t) and effort (10 thousand hooks) in the SIOFA Area (upper panel, a) and in different SIOFA Subareas (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

Recent years have seen higher levels of effort with higher catches (Figure 3a), with unstandardised catches per units of effort (CPUEs) remaining relatively stable (Figure 4).

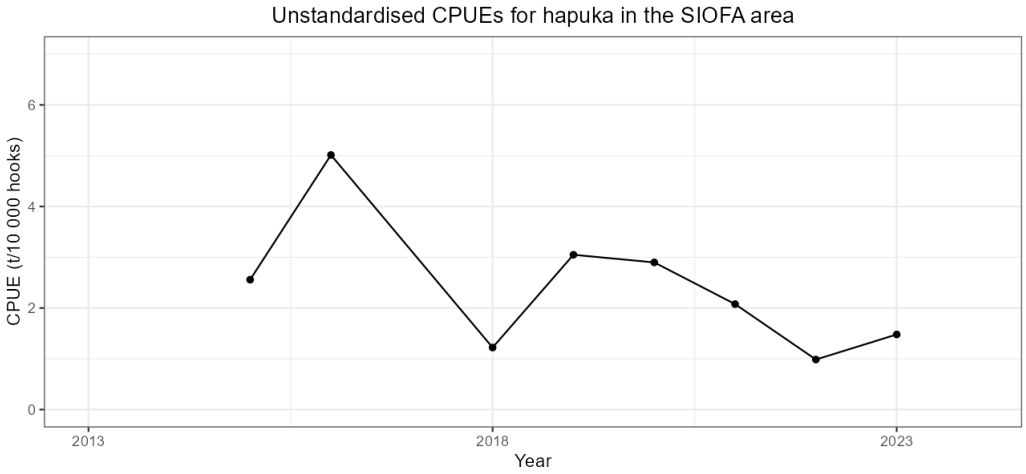

Figure 4 – Unstandardised catches per unit of effort (CPUEs) of hapuka in the SIOFA Area (t/10 thousand hooks) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

5.5 Catch limits

There are currently no catch limits for hapuka in the SIOFA area.

5.6 Illegal Unreported and Unregulated (IUU) catch

No claims of Illegal Unreported and Unregulated (IUU) catches of hapuka have been reported to SIOFA.

5.7 Other sources of fishing mortality

Some unaccounted mortality may be expected to occur arising from whale depredation, whereby killer whales and/or sperm whales are known to remove fish from longlines during hauling (Gasco et al. 2021). However, whale depredation is mostly associated with toothfish fisheries; the extent to which whale depredation also affects longline or dropline fisheries targeting or catching hapuka is unknown.

6. Stock assessment and status

No stock assessment has been completed for hapuka in the SIOFA area.

6.1 Harvest strategy and reference points

Harvest strategies for hapuka have not been decided upon within SIOFA.

The SIOFA Scientific Committee has provided interim advice, endorsed by the SIOFA MoP, to put in place Harvest Control Rules for interim management, notably to maintain catches at present levels

(unless there is evidence of a marked downward trend in the resource) until sufficient further informative data becomes available for meaningful improvements to the existing assessments. Where not previously defined for specific stocks, the SC recommended the present level be defined as the average (mean) of the 5 year period 2018–2022 for hapuka (see paragraph 79, MoP10 Report). However, no further management advice has been agreed for hapuka in the SIOFA area.

For a range of species, Butterworth et al. (2021) discusses the relative merits and drawbacks of adopting a harvest strategy based on either i) a constant catch consistent with recent 'status quo' catch levels; or ii) a simple harvest strategy based on an estimate of B_{msy} and thus F_{msy}, or iii) a constant fisheries mortality (F) consistent with recent 'status quo' F values.

Specifically for hapuka, Butterworth et al. (2021) note that this is a data poor species in the SIOFA area, such that only the first approach is viable at this time (i.e. setting a TAC based on recent average catch levels) until more data are available, augmented by one or more precautionary provisions (e.g. applying the PSA or SAFE methodology; see Zhou et al. 2016).

7. Data collection

Catch and effort fishery data are collected under CMM 02(2023) and were submitted by the CCPs listed in Table 1.

Table 1 – Hapuka catch and effort data submitted by different SIOFA CCPs, by year (source: SIOFA AggregatedCatchEffort and HBHCatchEffort database 2014–2023). HBH= haul-by-haul level data; AGG= aggregated data at different levels.

Hapuka catch and effort data submitted by different SIOFA CCPs		
Year	**Country**	**Database**
2014	JPN	AGG
2015	JPN	AGG
2016	AUS	HBH
2016	JPN	AGG
2018	AUS	HBH
2018	ESP	HBH
2018	FR-OT	HBH
2019	AUS	HBH
2019	ESP	HBH
2020	AUS	HBH
2020	ESP	HBH
2021	AUS	HBH
2021	ESP	HBH
2022	ESP	HBH
2023	ESP	HBH

Scientific Observer biological data (i.e., measures and biological samples of hapuka) are collected as a requirement of CMM 02(2023), and were submitted by the CCPs listed in Table 2.

Table 2 – Hapuka Scientific Observer biological data collected by different SIOFA CCPs, by year (source: SIOFA Observer database 2004–2023).

Hapuka observer data submitted by different SIOFA CCPs	
Year	**Country**
2012	AUS
2013	AUS
2014	AUS
2016	AUS
2018	AUS
2018	FR-OT
2019	AUS
2019	ESP
2019	FR-OT
2020	AUS
2020	ESP
2021	AUS
2021	ESP
2022	ESP
2023	ESP

7.1 Biological data summaries

A summary of hapuku wreckfish and wreckfish biological data collected by Scientific Observers, and counts of records by year for selected data fields, are shown in Table 3 and Table 4, respectively. No data for hapuka (at the genus level) was recorded in 2014–2023.

Table 3 – Hapuku wreckfish biological data collection by Scientific Observers, by year. Numbers of records per year are summarised for the following: length, weight, otoliths collected, sex determination, and gonad maturity stage, gonad weight, and stomachs sampled (source: SIOFA Observer database 2014–2023).

Hapuku wreckfish observer data measurements							
Year	**Length (n)**	**Weight (n)**	**Otoliths collected (n)**	**Sex (n)**	**Maturity (n)**	**Gonad weight (n)**	**Stomachs sampled (n)**
2014	6	6	6	6	1	0	6
2016	136	136	136	136	136	0	0
2018	10	7	7	10	7	0	0
2019	24	24	24	23	8	0	0
2020	527	435	205	321	94	0	0
2021	281	281	6	281	10	0	6
2022	6	6	6	4	4	0	0
2023	7	7	0	0	0	0	0
Total	997	902	390	781	260	0	12

Table 4 – Wreckfish biological data collection by Scientific Observers, by year. Numbers of records per year are summarised for the following: length, weight, otoliths collected, sex determination, and gonad maturity stage, gonad weight, and stomachs sampled (source: SIOFA Observer database 2014–2023).

Wreckfish observer data measurements							
Year	**Length (n)**	**Weight (n)**	**Otoliths collected (n)**	**Sex (n)**	**Maturity (n)**	**Gonad weight (n)**	**Stomachs sampled (n)**
2016	96	96	96	96	96	0	0
2018	32	27	9	32	9	0	0
2019	111	111	5	6	1	0	0
2020	1 951	1 865	222	1 226	777	0	0
2021	585	585	138	581	140	0	2
2022	227	227	227	152	152	0	0
2023	184	184	0	65	65	0	0
Total	3 186	3 095	697	2 158	1 240	0	2

7.2 Tag data

SIOFA does not require or conduct any tagging of hapuka.

8. Summaries of abundance indices and other observational data

8.1 Scaled length frequencies

Scaled length frequency data are not available for hapuka.

8.2 Scaled age frequencies

Scaled age frequency data are not available for hapuka.

8.3 CPUE indices

Both longline effort and hapuka catch levels (Figure 3 and Figure 4) fluctuated around a peak in 2020. However, because target species were only consistently recorded since 2019, such that effort totals include other longline targets, and catch totals include hapuka caught as bycatch in other target fisheries, unstandardised CPUE cannot be considered a reliable index of abundance. Standardised CPUE have not been produced for this species.

8.4 Acoustic biomass indices

It is considered infeasible to utilise acoustic survey methods to assess hapuka in the SIOFA area.

8.5 Trawl survey indices

No trawl surveys have been undertaken for hapuka in the SIOFA Area.

8.6 Tag based abundance estimates

SIOFA does not require or conduct tagging of hapuka and no hapuka tagging experiments in the SIOFA Area have been reported to SIOFA.

9. Biological parameters

Biological parameters have not been estimated for hapuka from data collected specifically from SIOFA fisheries. As a useful proxy, Wakefield et al. (2010) estimated growth and maturity parameters from 1352 *P. oxygeneios* individuals collected in the eastern Indian Ocean (along the south coast of Western Australia). Growth and reproductive parameters estimated from this study are summarised in Table 5. There are no biological parameters estimates currently available for *P. americanus*.

Table 5 – Biological parameters for hapuka (P. oxygeneios) as estimated by Wakefield et al. (2010).

Relationship	Parameter (units)	Area	Value			References
			Both	Male	Female	
Natural mortality	M (y^{-1})	all	0.09			Wakefield et al. (2010)
Von Bertalanffy growth coefficient	t_0 (y)		-0.63 (-0.84 – 0.71)	-0.47 (-1.48 - 0.55)	-0.20 (-1.48 – 1.08)	Wakefield et al. (2010)
	k (y^{-1})		0.24 (0.20 – 0.27)	0.22 (0.18 – 0.26)	0.23 (0.18-0.29)	Wakefield et al. (2010)
	L_∞ (cm)		890 (880 – 900)	877 (864-890)	90.5 (88.7 – 92.2)	Wakefield et al. (2010)
	c.v.					
Length-weight	a ($t.cm^{-1}$)					
	b					
Maturity	a_{50} ($\pm a_{to95}$)			6.8 (+10.1)	7.1 (+9.5)	Wakefield et al. (2010)
	L_{50} ($\pm_{to95}$)			70.2 (+77.4)	76.0 (+85.1)	Wakefield et al. (2010)
Stock recruitment relationship						
Stock recruitment steepness	h					
Recruitment variability	σ_R					
Ageing error type	Normal					
Ageing error parameters	c.v.					

9.1 Natural mortality

Natural mortality has not been estimated specifically for hapuka in the SIOFA Area.

Wakefield et al. (2010) estimated natural mortality M = 0.09 for hapuka sampled in the eastern Indian Ocean near Western Australia.

9.2 Growth parameters

Growth parameters have not been estimated for hapuka specifically in the SIOFA Area.

Maximum age and length parameters from the scientific literature are shown below in Table 6.

Table 6 – Growth parameters for hapuka in the eastern Indian Ocean near Western Australia (from Wakefield et al. 2010).

Parameter	Combined sex	Male	Female
L-inf (cm)		100.4	111.4
kappa		0.22	0.23
Average age at maturity		6.8	7.1
Maximum age		51.8	35.1

9.3 Length/age relationship

No length-age relationship is available for hapuka sampled specifically in the SIOFA area.

Von Bertalanffy growth parameters for hapuka sampled in the eastern Indian Ocean near Western Australia are shown above in Table 6 (from Wakefield et al. 2010).

9.4 Maturity and spawning

No maturity analysis is available derived from hapuka sampled specifically in the SIOFA area.

Wakefield et al. (2010), for fish sampled in the eastern Indian Ocean, estimated maturity at length L_{50} = 76.0 cm and maturity at age A50 = 7.1 years for females; and L_{50} = 70.2 cm and A50 = 6.8 years for males.

The lengths and ages at which 50% of female and male *P. americanus* attain maturity in Brazil were similar, at 779 mm TL and 10.4 years for females and 749 mm TL and 9 years for males (Peres and Klippel, 2003)

9.5 Stock recruitment relationship

The stock-recruitment relationship for hapuka has not yet been investigated in the SIOFA area.

9.6 Tag parameters

SIOFA does not require or conduct any tagging for hapuka.

10. Catch/bycatch and ecosystem impacts

Bycatch commonly refers to the capture of all fish species that were not intended as a target in a given fishing event.

Bycatch was defined by the SIOFA SC as "*Fishery resources that are not target nor targeted typically in the taxonomic classes Chondrichthyes and Actinopterygii and infraphylum Agnatha and class*

Cephalopoda and Crustacea, that are part of the catch which is not the target" (paragraph 207c of the SC8 report).

The ratio of catch and bycatch in the hapuka fisheries suffers from a lack of reported target species for fishing events that caught hapuka in 2013–2016 and 2018–2021. Hence, it was not possible to determine catch/bycatch ratios in these events based on declared targets.

As a practical mean of estimating the catch/bycatch ratio in fishing events where targets were not declared, the Workshop on the development of ecosystem and fisheries summaries (WS2022-SUM1) suggested using a catch threshold whereby hauls in which at least a certain percentage of the catch was hapuka, to be designated as hapuka target hauls. This section uses a 20% target catch threshold (a typical average threshold for declared events).

Note that a number of hapuka were caught in fishing events targeting other species, and that these events are excluded from this analysis, unless hapuka was part of the declared targets (e.g., in multitarget fisheries). This explains the lack of 2022 catches in Figure 5, and the discrepancy with Figure 3.

10.1 Hapuka target catch /bycatch

Catch/bycatch is depicted in Figure 5. Note that the 20% catch threshold rule to define hapuka target hauls was applied only to fishing effort for which targets were not declared, and that the ratios might not be strictly comparable to the data where targets were declared in this figure. Future work should consider harmonizing this time series.

The species identity of these bycatches in hapuka target hauls is shown in Figure 6.

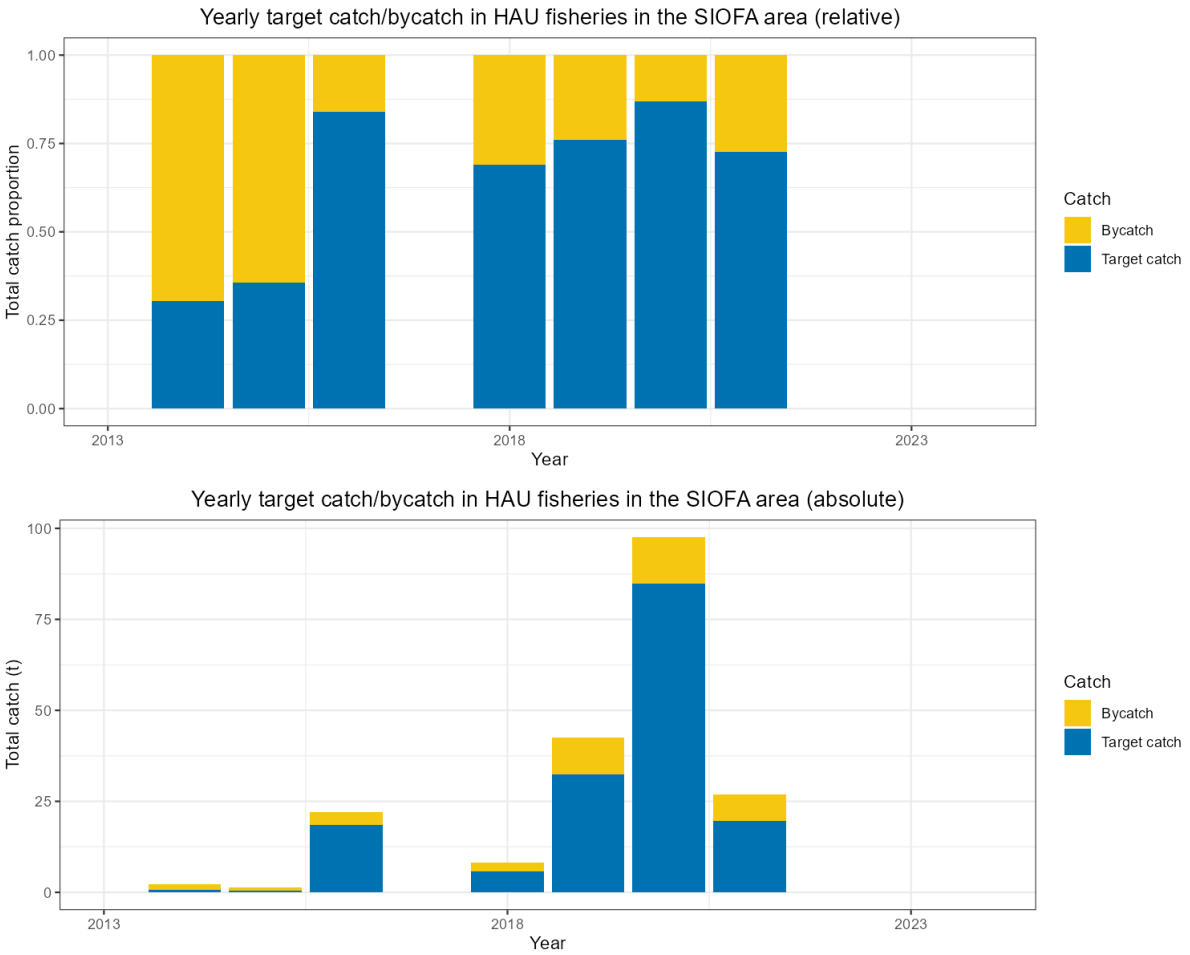

Figure 5a and b – Total catch of hapuka and other bycatch species in SIOFA fisheries that targeted hapuka, shown as relative values (upper panel, a) and absolute values (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches reported without location information are not included.

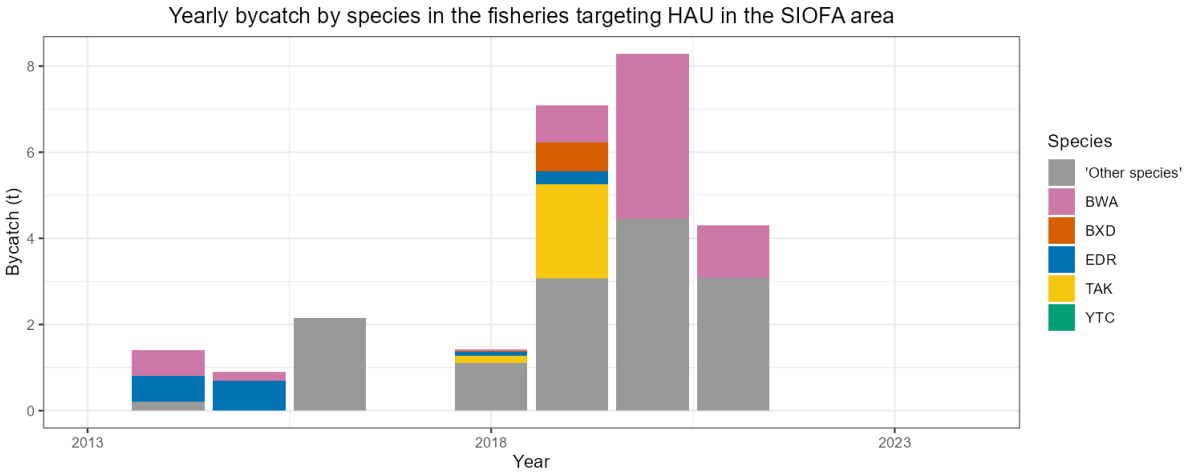

Figure 6– Yearly catch weights of bycatch species in fisheries targeting hapuka in the SIOFA area, by species (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Species are identified by their 3-letter FAO code. Catches reported without location information are not included.

Sharks is used in this report as a broad term to include all Chondrichthyans (see Appendix B of the Overview of SIOFA Fisheries for a full list of taxa), unless otherwise specified.

Catches of sharks in the hapuka fishery were relatively rare. The most bycaught shark species by weight was broadnose sevengill shark (NTC, *Notorynchus cepedianus*), followed by shortnose spurdog (DOP, *Squalus megalops*), but with relatively low overall weights (Figure 7).

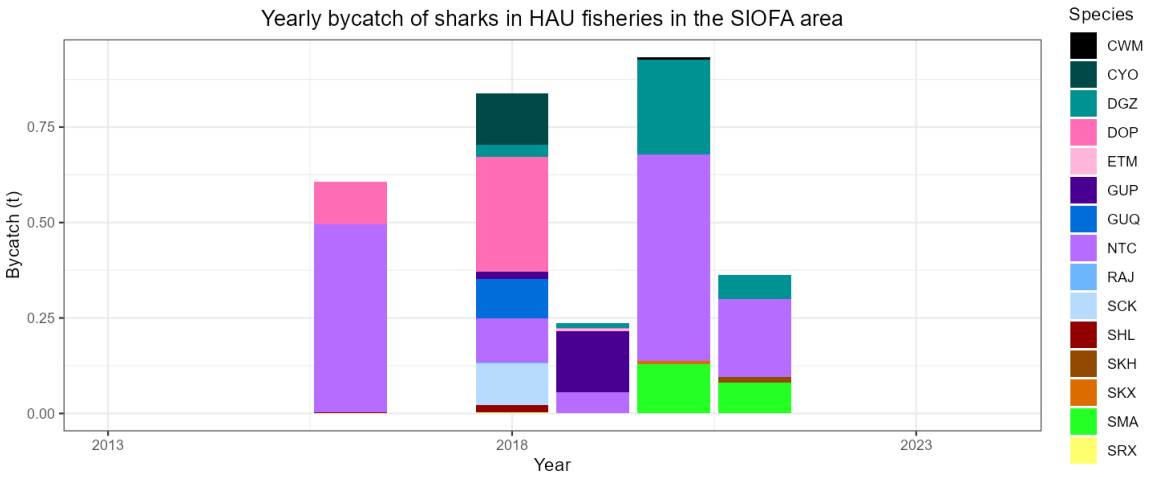

Figure 7 – Reported bycatch of shark species in fisheries targeting hapuka (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches reported without location information are not included.

10.2 Target catch/bycatch by SIOFA subarea

Catches and bycatches in fisheries targeting hapuka in the SIOFA Area were largely concentrated in Subarea 3b, but some target catches also came from Subarea 2 (Figure 8).

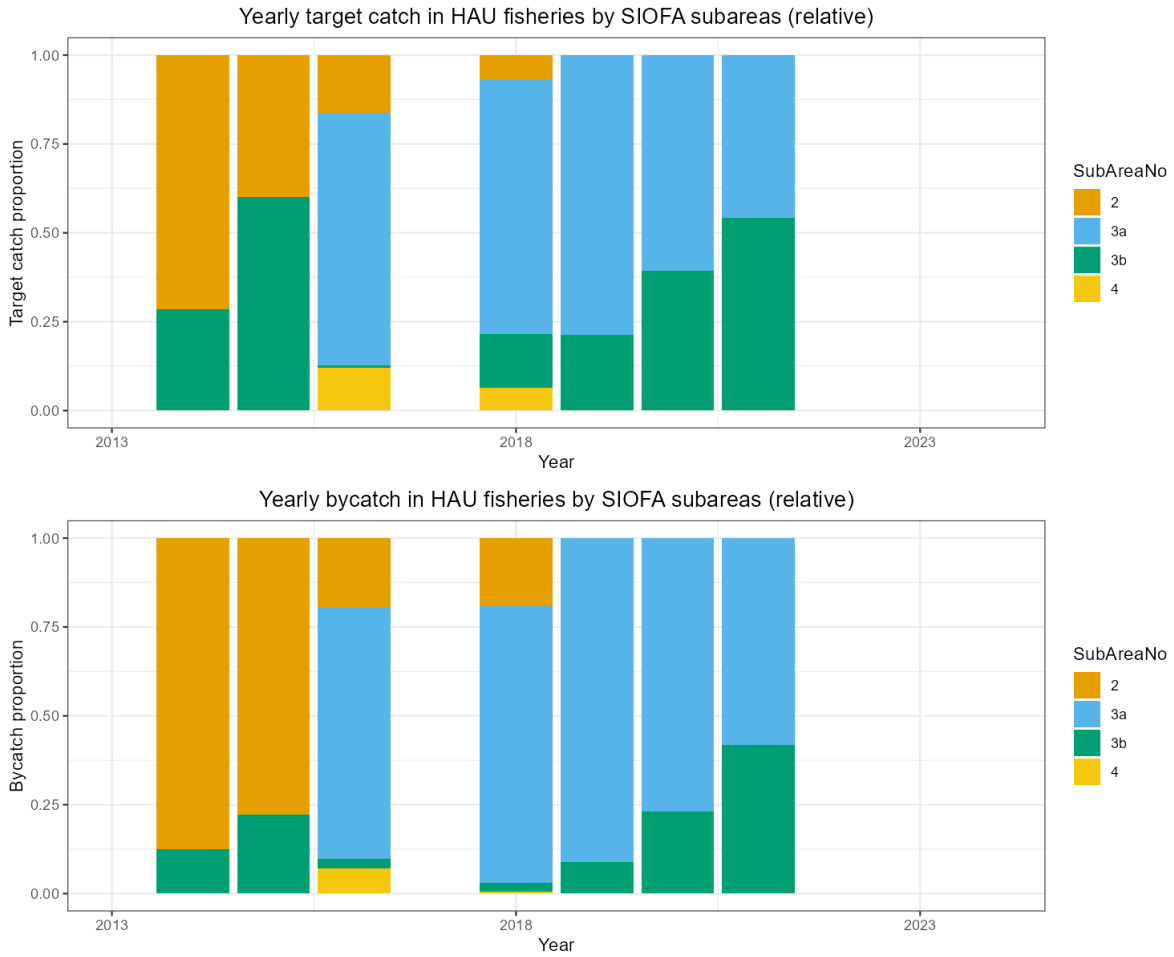

Figure 8a and b – Distribution of target catch (a) and bycatch (b) in fisheries targeting hapuka in different SIOFA Subareas (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches reported without location information are not included. Values of the figure panels are provided in Table A.3 (Appendix A).

10.3 Discards

A specific field is included in SIOFA CatchEffort databases to indicate the fate of the catch, including retained, discarded and "other" categories.

Discard rates of fisheries targeting hapuka in the SIOFA Area are presented in Figure 9.

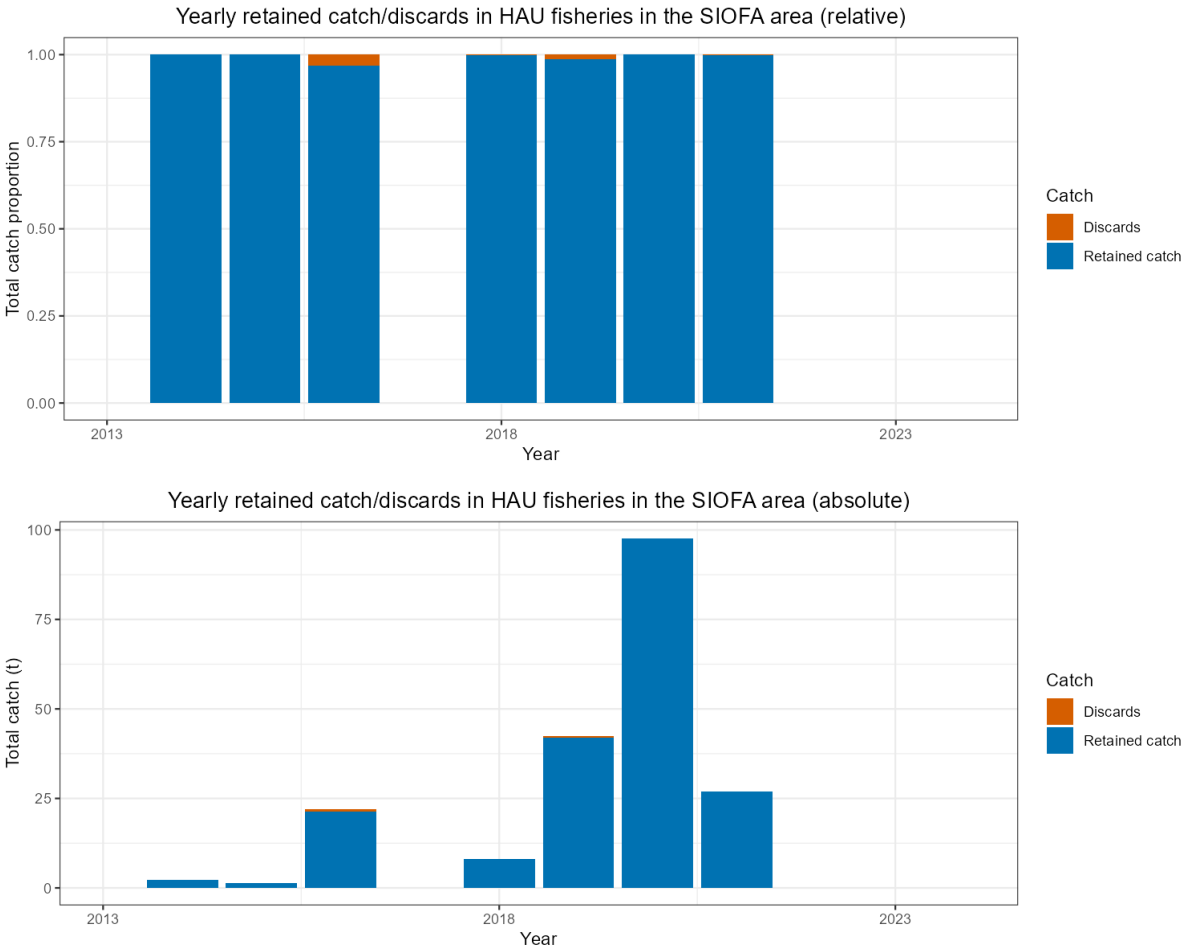

Figure 9a and b – Total retained and discarded catch in SIOFA fisheries that targeted hapuka, shown as relative values (upper panel, a) and absolute values (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches reported without location information are not included.

Discards composition by species in fisheries targeting hapuka in the SIOFA Area is presented in Figure 10. Some of the most represented species in discards are the blackbelly rosefish (*Helicolenus dactylopterus*, BRF) and the broadnose sevengill shark (*Notorynchus cepedianus*, NTC).

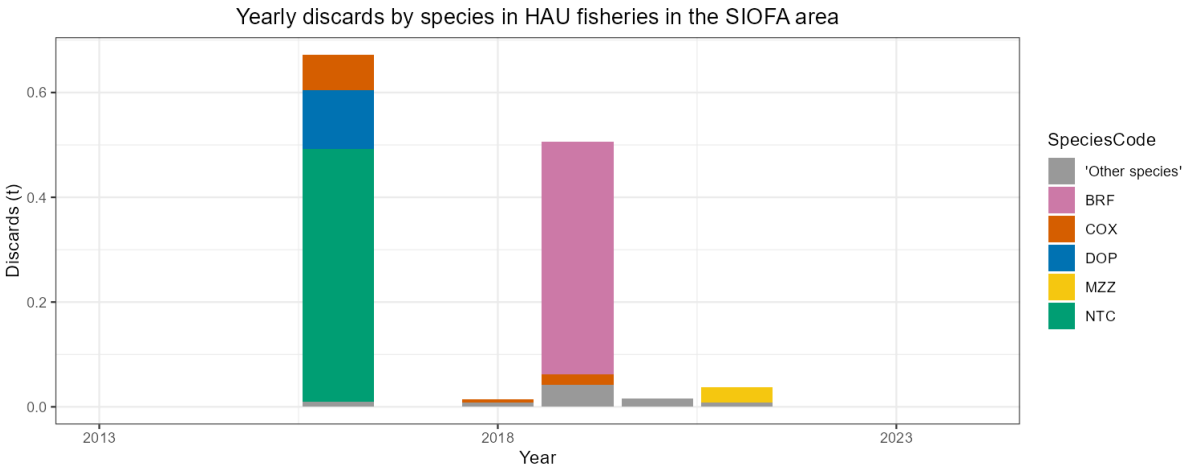

Figure 10 – Reported discards of fish species in fisheries targeting hapuka (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Only the top five species (by weight) are fully represented, while the other species have been grouped in a single category.

10.4 Target catch/bycatch in management units

No management units or stock assessment areas have been defined for hapuka.

10.5 Incidental catch of VME taxa and other invertebrates

SIOFA Scientific Observers recorded the incidental catch of VME indicator taxa in fishing operations targeting hapuka starting in 2016. While early years saw no incidental captures, these have been much more important in recent years (> 50 kg in 2020, Figure 11). While cumulative annual weights can be high, typical weights for single fishing operations are relatively small. A wide diversity of VME indicator taxa can be observed in incidental catches.

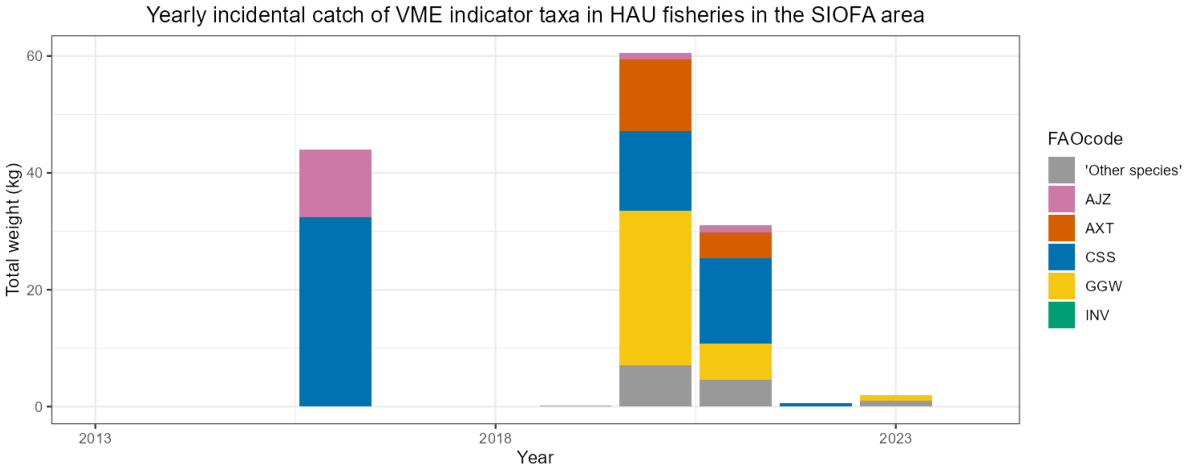

Figure 11 – Yearly incidental catch of VME indicator taxa in fisheries targeting HAU within the SIOFA Area, by taxa group (source: SIOFA Observer and HBHCatchEffort databases 2014–2023). Only the top five species (by weight) are fully represented, while the other species have been grouped in a single category. Taxa are indicated by their 3-letter FAO code (see Appendix C of the SIOFA Ecosystem Summary for disambiguation). Figure A.1 in Appendix A presents a full list of taxa.

11. Interactions with seabirds, mammals, turtles, sharks and other species 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 (see Section 10.1 instead).

Figure 12 shows the reported locations of incidental captures (Figure 12a) and observations (Figure 12b) of seabirds, mammals, and sharks considered to be at high risk and/or concern (i.e., included in SIOFA CMM 12) captured in fishing operations targeting hapuka in the SIOFA Area, as recorded by Scientific Observers. Note that only seabirds were captured and observed in hapuka fisheries.

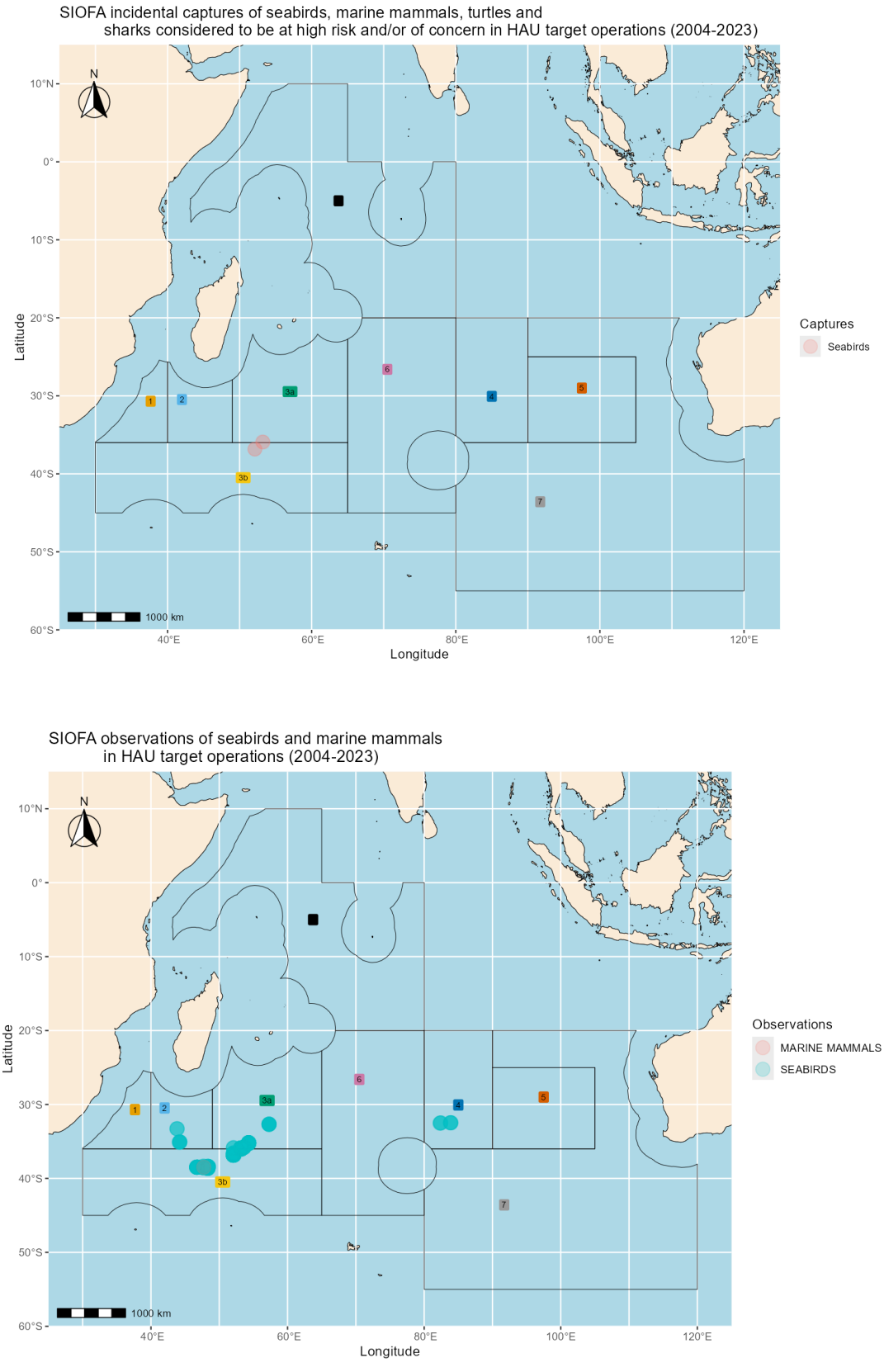

Figure 12a and b – Reported locations of incidental captures (a, upper) and observations (b, lower) of seabirds, cetaceans, and sharks considered to be "at high risk" and/or "of concern", as defined in Annex 1 of CMM 12(2024), captured in fishing operations targeting hapuka in the SIOFA Area, as recorded by SIOFA Scientific Observers (source: SIOFA Observer database 2012–2022). Note that only seabirds were captured and observed in hapuka fisheries.

11.1 Seabirds interactions

Provisions for the mitigation of accidental capture of seabirds in hapuka fisheries are in CMM 13(2022) (Conservation and Management Measure on mitigation of seabirds bycatch in demersal longlines and other demersal fishing gears fisheries(Mitigation of Seabirds Bycatch)).

11.1.1 Captures

A total of 7 incidental capture event were reported by SIOFA Scientific Observers in hapuka fisheries: in 2016–2021. All captures were of white-chinned petrel (*Procellaria aequinoctialis*) and only the individual captured in 2016 was released (status unknown) (Table 7).

Table 7 – Number of incidental captures of seabirds in fishing operations that targeted hapuka between 2016 and 2022 (source: SIOFA Observer database 2010–2022).

Observed captures of seabirds in SIOFA hapuka fisheries				
Year	**Common name**	**Scientific name**	**Fishing gear**	**Captures**
2016	White-chinned petrel	*Procellaria aequinoctialis*	Set longlines	1
2020	White-chinned petrel	*Procellaria aequinoctialis*	Set longlines	2
2021	White-chinned petrel	*Procellaria aequinoctialis*	Set longlines	4

11.1.2 Observations

The presence of several different seabirds was recorded by Scientific Observers around fishing operations that targeted hapuka in the SIOFA Area (Table 8).

Table 8 – Number of seabirds observed around fishing operations that targeted hapuka between 2019 and 2022 (source: SIOFA Observer database 2012–2022).

Year	Common name	Scientific name	Fishing gear	Abundance
2019	Antarctic giant petrel	Macronectes giganteus	Set longlines	335
2019	Cape petrel	Daption capense	Set longlines	330
2019	Shy albatross	Thalassarche cauta	Set longlines	100
2019	Wandering albatross	Diomedea exulans	Set longlines	215
2020	Antarctic giant petrel	Macronectes giganteus	Set longlines	1
2020	Antarctic petrel	Thalassoica antarctica	Set longlines	3
2020	Black-bellied storm petrel	Fregetta tropica	Set longlines	297
2020	Black-browed albatross	Thalassarche melanophris	Set longlines	18
2020	Brown skua	Stercorarius antarcticus	Set longlines	1
2020	Cape petrel	Daption capense	Set longlines	1057
2020	Great skua	Catharacta skua	Set longlines	2
2020	Grey petrel	Procellaria cinerea	Set longlines	142
2020	Hall's giant petrel	Macronectes halli	Set longlines	1357
2020	Indian yellow-nosed albatross	Thalassarche carteri	Set longlines	161
2020	Light-mantled sooty albatross	Phoebetria palpebrata	Set longlines	23
2020	Prions nei	Pachyptila spp	Set longlines	2

Year	Common name	Scientific name	Fishing gear	Abundance
2020	Seabirds nei		Set longlines	147
2020	Shy albatross	Thalassarche cauta	Set longlines	875
2020	Sooty albatross	Phoebetria fusca	Set longlines	14
2020	Southern fulmar	Fulmarus glacialoides	Set longlines	2
2020	Wandering albatross	Diomedea exulans	Set longlines	1841
2020	White-chinned petrel	Procellaria aequinoctialis	Set longlines	4171
2021	Amsterdam Island albatross	Diomedea amsterdamensis	Set longlines	18
2021	Black-browed albatross	Thalassarche melanophris	Set longlines	121
2021	Buller's albatross	Thalassarche bulleri	Set longlines	21
2021	Cape petrel	Daption capense	Set longlines	20
2021	Fairy prion	Pachyptila turtur	Set longlines	4
2021	Hall's giant petrel	Macronectes halli	Set longlines	33
2021	Indian yellow-nosed albatross	Thalassarche carteri	Set longlines	26
2021	Parkinson's petrel	Procellaria parkinsoni	Set longlines	380
2021	Sooty albatross	Phoebetria fusca	Set longlines	1
2021	Sooty shearwater	Puffinus griseus	Set longlines	8
2021	Southern royal albatross	Diomedea epomophora	Set longlines	240
2021	Wandering albatross	Diomedea exulans	Set longlines	249
2021	White-chinned petrel	Procellaria aequinoctialis	Set longlines	2102
2021	Wilson's storm petrel	Oceanites oceanicus	Set longlines	1
2022	Antarctic giant petrel	Macronectes giganteus	Set longlines	415
2022	Cape petrel	Daption capense	Set longlines	473
2022	Parkinson's petrel	Procellaria parkinsoni	Set longlines	35
2022	Shy albatross	Thalassarche cauta	Set longlines	110
2022	Wandering albatross	Diomedea exulans	Set longlines	295
2022	White-chinned petrel	Procellaria aequinoctialis	Set longlines	20
2023	Antarctic giant petrel	Macronectes giganteus	Set longlines	113
2023	Cape petrel	Daption capense	Set longlines	10
2023	Indian yellow-nosed albatross	Thalassarche carteri	Set longlines	575
2023	Long-finned pilot whale	Globicephala melas	Set longlines	30
2023	Shearwaters nei	Puffinus spp	Set longlines	30
2023	Shy albatross	Thalassarche cauta	Set longlines	648
2023	Wandering albatross	Diomedea exulans	Set longlines	195
2023	White-chinned petrel	Procellaria aequinoctialis	Set longlines	795

11.2 Marine mammals interactions

Some interaction may be expected to occur between hapuka fisheries and killer whales engaged in longline depredation. Whale depredation is mostly associated with toothfish fisheries (Gasco et al. 2021); the extent to which whale depredation also affects longline fisheries targeting or catching hapuka is unknown.

11.2.1 Captures

No incidental captures of mammals were recorded in hapuka fisheries at this time.

11.2.2 Observations

No observations of mammals were reported in hapuka fisheries at this time.

11.3 Turtles interactions

No turtles captures or observations have been recorded in hapuka fisheries by SIOFA Scientific Observers.

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

No captures of sharks species considered to be at high risk and/or of concern have been recorded in hapuka fisheries by SIOFA Scientific Observers.

12. Effects of the fishery on the ecosystem

The effects of this fishery on the ecosystems have not yet been investigated.

13. References

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14. Appendix A – Data included in figures

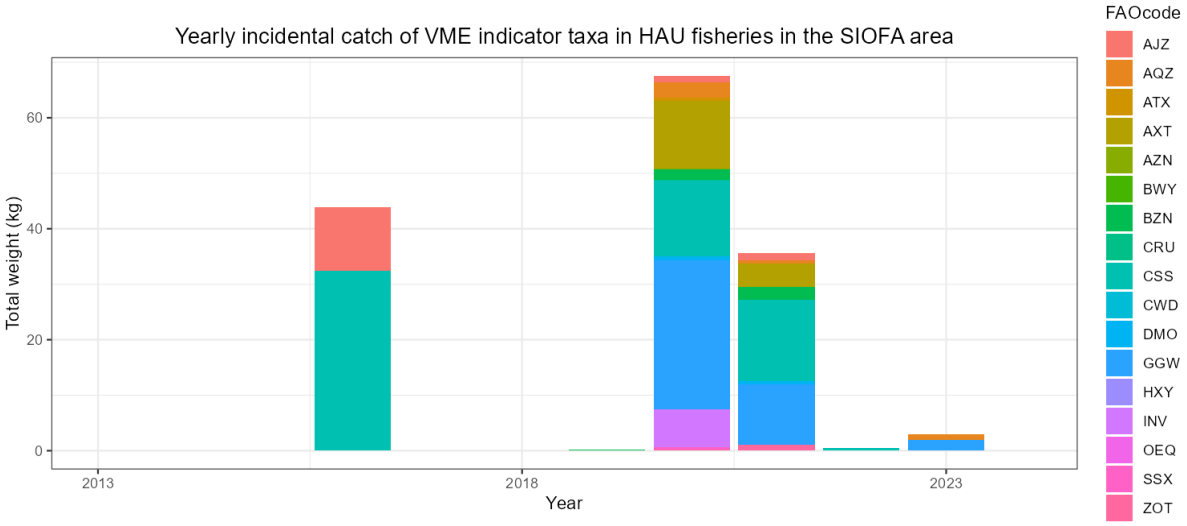

Figure A.1 – Yearly incidental catch of VME indicator taxa in fisheries targeting HAU within the SIOFA Area, by taxa group (source: SIOFA Observer and HBHCatchEffort databases 2014–2023). Taxa are indicated by their 3-letter FAO code (see Appendix C of the SIOFA Ecosystem Summary for disambiguation).