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MOP-12-12

SIOFA Fisheries Summary: alfonsino (*Beryx* spp., *B. splendens, B. decadactylus*) 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: alfonsino (*Beryx spp., B. splendens, B. decadactylus*) 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: alfonsino 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** SIOFA Fisheries Summary: alfonsino 2025 and [**task** the Secretariat to] make a public version of it, with confidential information removed, available on the SIOFA website.

SIOFA Fisheries Summary: alfonsino (*Beryx* spp., *B. splendens, B. decadactylus*) 2025

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

Next review date: 2028

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.
- 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.
- 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.

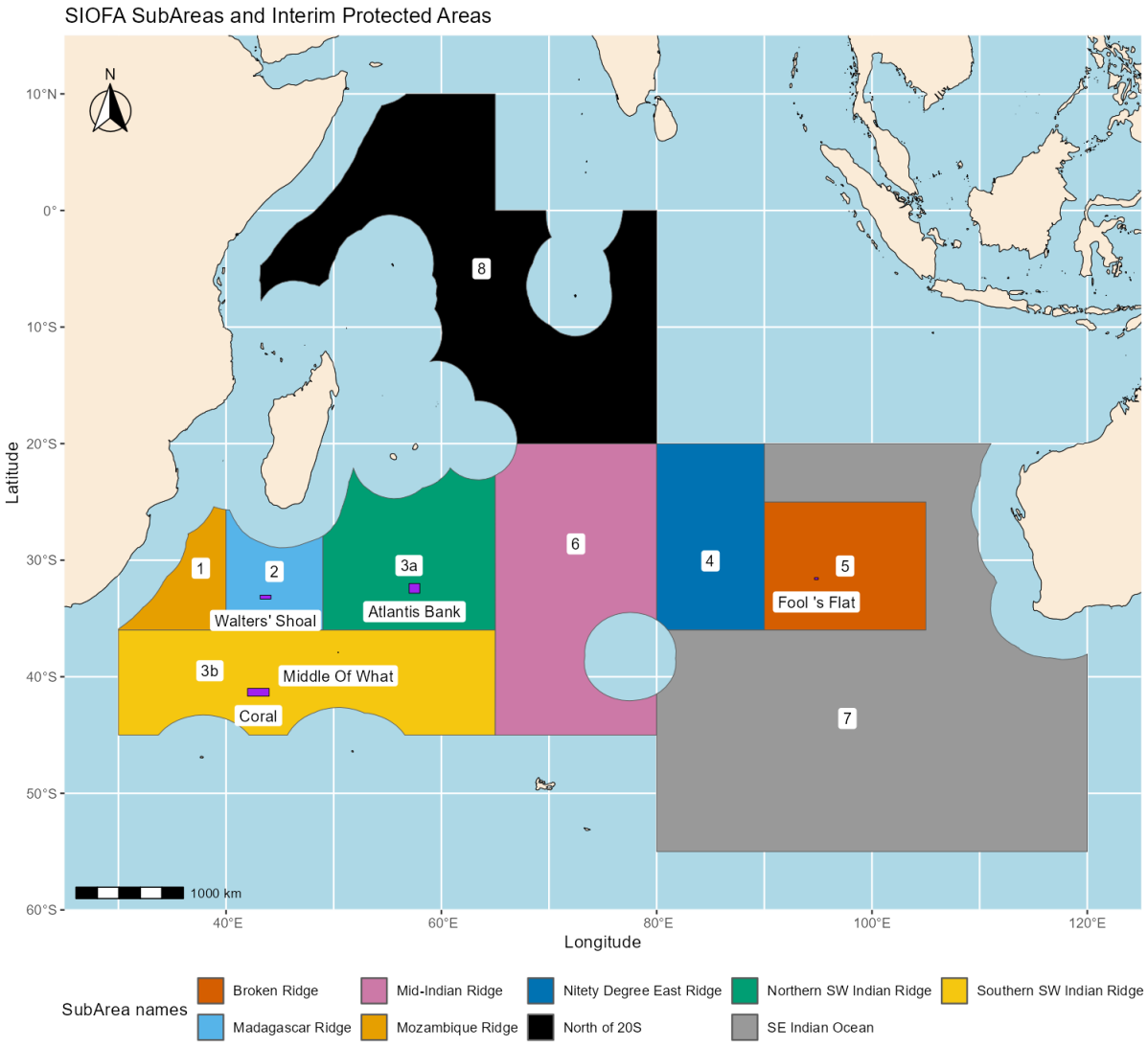

Figure 1 – The SIOFA Area and Subareas (source: SIOFA Spatial database). The Subarea numbers and colour codes are used consistently throughout this summary to identify Subareas. The map highlights SIOFA Interim Protection Areas (in magenta) as defined in CMM 01(2024) (Annex 3). All the interim protection 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	Alfonsino, splendid alfonsino
Scientific name	*Beryx* spp., *Beryx splendens, Beryx decadactylus*
Scientific synonyms	
FAO species code	ALF (*Beryx* spp.), BYS (*Beryx splendens)*, BXD (*Beryx decadactylus)*
Year of this report	2025
Assessment Areas/ Management Units	West (subareas 1, 2, 3a, 3b) and East (subareas 4 and 5)
Assessment method	Standardised CPUE trend analysis
Most recent assessment	2020
Year of next assessment	2025
Harvest strategy	Not defined
Summary of current stock status	For both the East and West alfonsino stocks, there is a high degree of confidence that the stocks are not overfished (i.e. $B>B_{msy}$) and overfishing is not occurring (i.e. $F<F_{msy}$). Stocks are estimated to be healthy at approximately 60% of their pre-exploitation biomass.

This report describes the alfonsino fishery in the SIOFA Area and available biological parameters for alfonsino. Collectively, the name 'alfonsino' includes both the splendid alfonsino (BYS, *Beryx splendens*) and alfonsino (BXD, *Beryx decadactylus*) species, as well as catch not identified to the species level (ALF, *Beryx* spp.). For the remainder of this report 'alfonsinos' and the generic code ALF refer collectively to ALF, BYS, and BXD

Management advice for this species is given in the Report of the Scientific Committee of SIOFA and management decisions are summarised in the Report of the Meeting of Parties of SIOFA.

The SIOFA Scientific Committee has provided interim advice, endorsed by the SIOFA MoP, to put in place an interim catch limit for alfonsino 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 alfonsino in the SIOFA area.

A harvest strategy for the alfonsino stocks in the SIOFA Area has not yet been developed.

Alfonsino is assessed through an age structured production model fitted to standardised CPUE trends, separately for two management units, comprising an 'east' unti and a 'west' unit (see Brandão et al. 2021). The SIOFA Scientific Committee has recommended additional research to better define the stock structure of alfonsino in the SIOFA Area, and standardised data collection to improve estimation of ageing and biological parameters.

4. Biological Summary

The vast majority (99.9%) of the catch of alfonsinos in the SIOFA Area is composed by splendid alfonsino (BYS, *Beryx splendens*), but sometimes catch of another species (alfonsino, BXD, *Beryx decadactylus*) or not identified to the species level (ALF, *Beryx* spp.) are also reported. The data on all alfonsino species has been aggregated, and is presented here, at the highest taxonomical resolution, but is substantially composed by splendid alfonsino.

Alfonsinos are schooling benthopelagic fishes found at a depth range of 25–1300 m, but more commonly at 400–600 m, generally in aggregations over rocky bottoms or underwater features. Alfonsinos have a global distribution in temperate and tropical waters of all oceans (Busakhin 1982).

Alfonsinos are moderately selective feeders that forage primarily in the mesopelagic layers, preying primarily on mesopelagic crustaceans at smaller sizes and on fishes when they are larger (Horn et al. 2010). Adults occur primarily near the ocean floor (but ascending to feed in midwater during the night), and often aggregate around underwater topographic features, particularly during spawning, which occurs in the Austral summer, primarily December – February (Brouwer et al. 2021).
The species is oviparous, spawning in batches. Females are serial spawners and release eggs 10-12 times at intervals of about four days during the spawning season. Females produce 270 000-675 000 eggs per spawning event. Eggs hatch after about 8 days. Eggs, larvae and juveniles are pelagic. Alfonsinos reach maturity at approximately 23-44 cm and 5-6 y of age, and were thought to reach a maximum age of around 20 years (FAO 2016), but research under the SIOFA project SER2022-BYS2 suggested that maximum age could be higher than previously thought.

5. Description of the fishery

5.1 Fleet and gear

Alfonsino are targeted in the SIOFA Area using midwater and benthopelagic trawls near underwater topographic features where the species tend to aggregate. There are effectively two distinct alfonsino fisheries in the SIOFA Area: the first uses benthopelagic trawls that are deployed in association with, but generally not in contact with, the ocean floor, whereas the second uses fully pelagic trawl gear. Fisheries using these distinct gears operate in relatively distinct areas (denoted ‘east’ and ‘west’ in Figure 2 below) with relatively minor levels of overlap. The CCPs that have participated in the alfonsino fishery are summarised in Table 2Table 2 within Section 7 of this Summary.

In the 2019-2023 period, participation in the alfonsino fishery has involved on average 2.8 vessels per year.

5.2 Fishing areas

Alfonsino fisheries occur at subtropical and temperate latitudes across the extent of the SIOFA Area, including SIOFA subareas 1, 2, 3a, 3b, 4, and 5 (Figure 2). The majority of fishing effort and catch have occurred in the West area (subareas 1, 2, 3a and 3b). Fishing occurs near underwater topographic features.

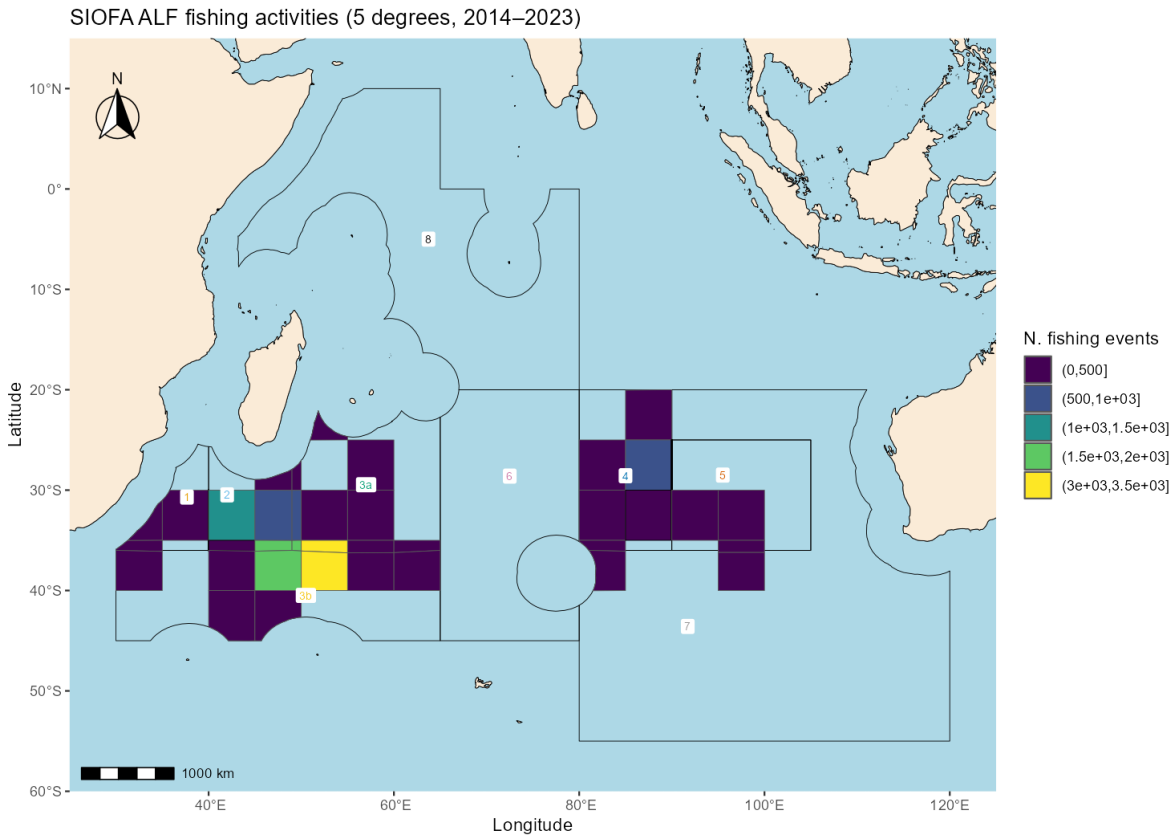

Figure 2 – Spatial distribution of fishing events that caught alfonsino in the SIOFA Area, derived from haul-by-haul level fishing data, aggregated at a 5x5 degrees resolution (source: SIOFA HBHCatchEffort databases 2014–2023). This map represents all fishing events that caught any ALF, BYS or BXD, irrespective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

5.3 Assessment Areas

For the purpose of stock assessment, two management units have been defined: the 'West' fishery and the 'East' fishery; see Figure 3 below (Brandão et al. 2021). Brandão et al. noted that the majority of catches, and all of the catch in recent years, came from the West fishery which includes SIOFA subareas 1, 2, 3a, and 3b; a much lower level of catch has historically come from the East fishery, which includes subareas 4 and 5.

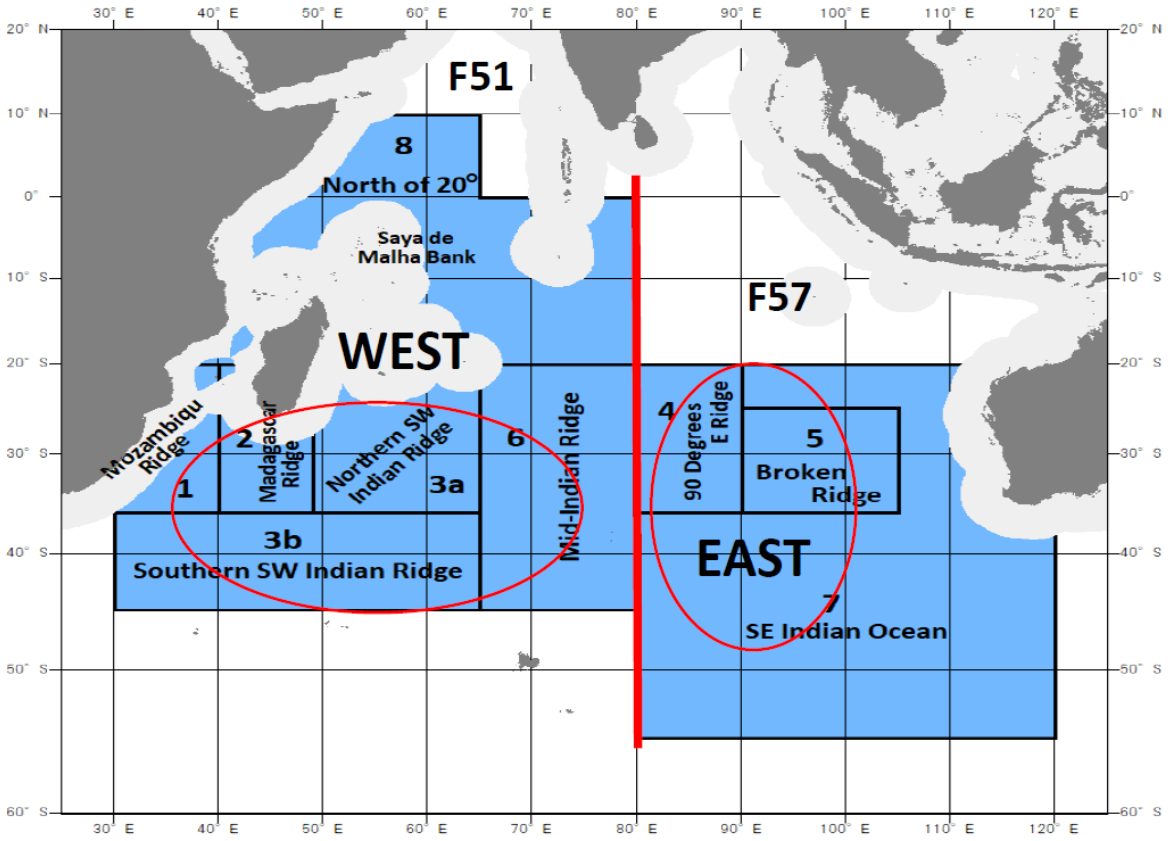

Figure 3 – Map of SIOFA subareas and management units used for assessments for alfonsino (source: Brandão et al. (2021)). Labels indicate names of individual subareas. Red ovals labelled West and East denote the grouping of subareas into two larger management units for purposes of stock assessment.

5.4 Catch and effort

Note that fishing effort and catches reported in this section are intended to represent total catch of alfonsino (including ALF, BYS and BXD), irrespective of whether each particular fishing event had been targeting alfonsino or not. Consequently, CPUE represents the CPUE of all operations that caught alfonsino even as bycatch, so if the share of operations actively targeting alfonsino increases, then CPUE is likely to increase as well. In this context CPUE as depicted here cannot be considered a reliable index of abundance. In contrast, the stock assessment analyses described by Brandão et al. (2021) used CPUE standardisation and separated these data by management unit (West vs East) to derive an index of abundance.

Catches of alfonsino are represented in Figure 4a. The average annual catch of alfonsinos during the recent (2018–2022) period was 3698.2 t. In recent years, up to three vessels participated in the SIOFA alfonsino fishery, so variability in fleet deployment can cause moderate fluctuations in catch and effort.

Alfonsino is mostly caught in the western SIOFA Area, mainly subareas 2, 3a and 3b (Figure 4b).

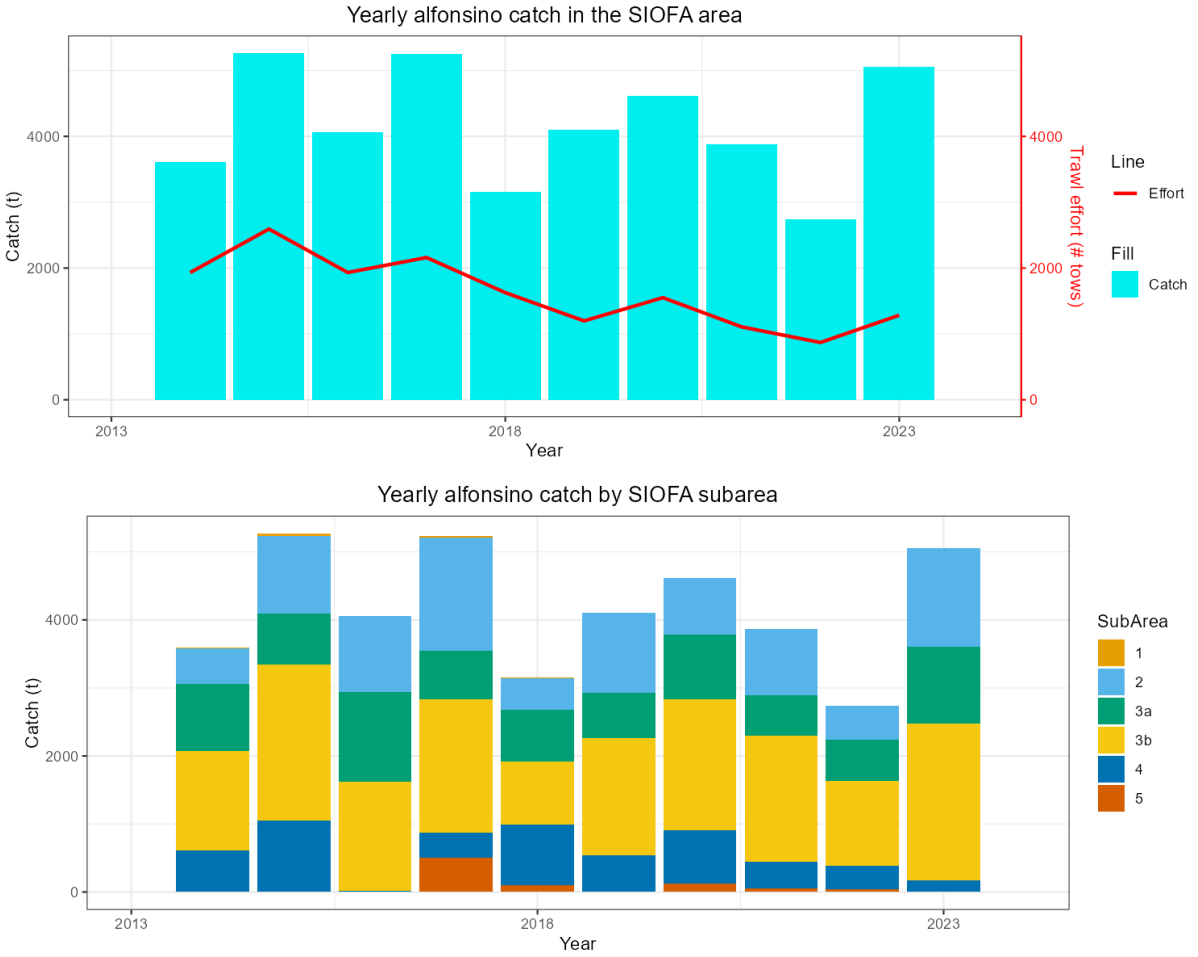

Figure 4a and b – Annual effort (number of alfonsino target tows) and catch of alfonsino (tonnes) and in the SIOFA Area (upper panel, a) and in different SIOFA subareas (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2021).

Effort levels are presented in Figure 4, and unstandardised catch per units of effort (CPUE) are presented in Figure 5. Standardised CPUE indices have been used in the assessments described by Brandão et al. (2021) however these authors caution that problems with data quality will affect the ability of these data to serve as an index of abundance. These authors recommend improved data collection, for example haul by haul rather than daily aggregated catch data, as well as increased biological sampling, to improve the alfonsino stock assessment.

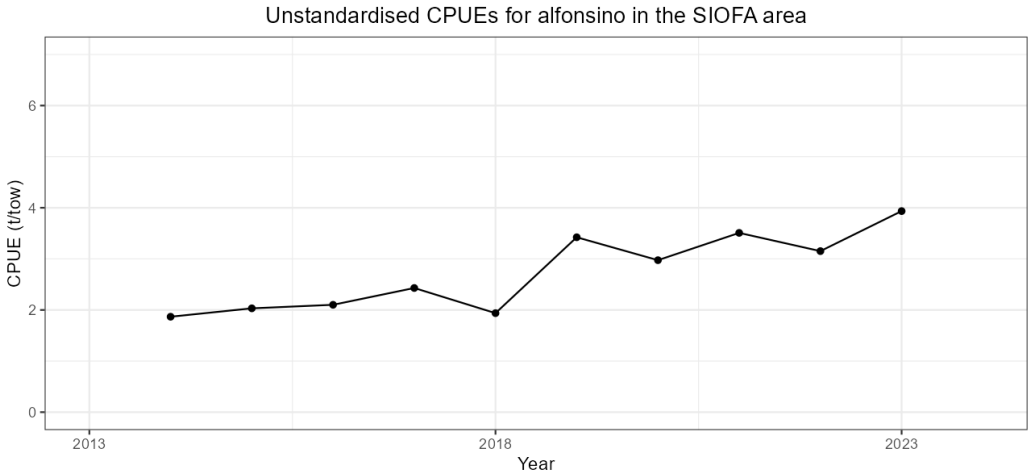

Figure 5 – Unstandardised catch per unit effort (CPUE) of alfonsino in the SIOFA Area (tonnes/tow) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2021), for all fishing events with non-zero catches of alfonsino.

Alfonsino catch and bycatch are further investigated in Section 10.

Table 1 shows the history of alfonsino catches in the different SIOFA assessment areas from 1999-2018 (Brandão et al. 2020). Where reported catches are taken by a single vessel, the data is withheld for reasons of confidentiality.

Table 1 – Yearly catches of alfonsino (in tonnes) estimated to have been taken from the SIOFA Area, disaggregated by fleet for years where such information is available, as compiled by Brandão et al. (2020). Blank cells indicate either lack of information or that the information has been withheld for reasons of confidentiality, but it is not possible to differentiate between these two cases.

Year	West				East			
	S1	S2	S3	Other and non-member	S1	S2	S3	Non-member
1977								522
1978								92
1979								
1980				20.0				
1981				2 524.0				120
1982				921.0				2
1983				852.0				
1984				57.0				
1985				3.0				
1986								
1987				2.0				
1988				16.0				9
1989								
1990								
1991								
1992				314.0				
1993				462.0				

Year	West				East			
	S1	S2	S3	Other and non-member	S1	S2	S3	Non-member
1994				1 534.0				
1995				2 249.0				
1996				3 079.0				
1997				1 031.0				
1998				859.0				
1999			147.9	1 964.0			26.8	
2000			390.2	1 589.0			0.0	
2001		2 986.5	6.4	594.4			1 070.5	
2002		37.3	105.4			248.7	2 871.1	
2003	353.8		3.4		911.5		1 605.9	
2004	141.6		44.7	7.9			824.8	
2005	391.8		32.1	10.1	828.1		182.3	
2006			17.6		164.3		202.6	
2007			96.8	1.2			190.3	
2008			33.1	16.8			173.7	
2009	1 828.5	1 204.2	62.3		368.9		0.0	
2010	2 033.4	977.3	16.2		1 713.9		30.9	
2011	2 672.9	612.3	58.0	147.0	747.2		531.9	
2012	3 101.3	104.5	235.6	561.0	1 244.2	191	46.4	
2013	2 184.0	1 262.8	88.8	718.3	1 127.5	2.1	29.0	
2014	2 405.1	452.1	75.8	1.7	615.4			
2015	2 096.7	2 119.4		0.5	690.7	276.4	59.8	
2016	1 529.6	1 976.9	1.4				12.9	
2017	2 392.7	1 971.8			803.1	80.6		
2018	1 090.4	1 066.3	0.04		692.0	300		
Total	22 221.7	14 771.4	1 415.5	19 535.0	9 906.9	1 098.8	7 858.8	745.0
Grand total	57 943.6				19 609.5			

5.5 Catch limits

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

5.6 Illegal Unreported and Unregulated (IUU) catch

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

5.7 Other sources of fishing mortality

Some mortality associated with escapement from trawl nets is likely to occur, mostly of small fish that escape through the trawl mesh. The level of mortality associated with escapement is unknown.

6. Stock assessment and status

An age structured production model fitted to catch histories and standardised CPUE time series was completed in 2020 (Brandão et al. 2020, 2021).

Due to data limitations, only deterministic models were possible, which assumed no variation in annual recruitment about the predictions from a standard Beverton-Holt stock-recruitment relationship. The models utilised catch data for each fleet for which data were available, with catches beginning in 1977. Relative abundance indices were obtained from standardised CPUE time series; the preferred standardisation used negative binomial models for catch series with few zeroes, and hurdle-negative binomial models for series with large numbers of zeroes.

Stock structure was assumed to correspond to the management units labelled West (subareas 1, 2, 3a and 3b) and East (subareas 4 and 5).

The assessment concluded with high certainty that neither the West nor the East stock was overfished (i.e. $B > B_{msy}$) nor was either stock experiencing overfishing (i.e. $F < F_{msy}$). . Both stocks were estimated to be at about 60% of their pre-exploitation spawning stock biomass levels (i.e. $B / B_o = 0.6$). These results are insensitive to all sensitivities explored, except for changes in the value assumed for natural mortality (M). Modelled relative biomass trajectories are shown in Figure 6.

The base case value of M used was 0.2; sensitivities examined the consequences of M = 0.15 and M = 0.25. In the base case projections, alfonsino biomass remained well above the MSY level even assuming constant catches for 20 years at levels 40% higher than recent high in 2018. However, in the low-productivity sensitivity, projections suggested that biomass could drop below the MSY level within 10 years.

Due to limited data availability, the same selectivity function was used for all of the different fleets (i.e. countries) in in all locations. New data are available to improve this assumption when the stock assessment is updated.

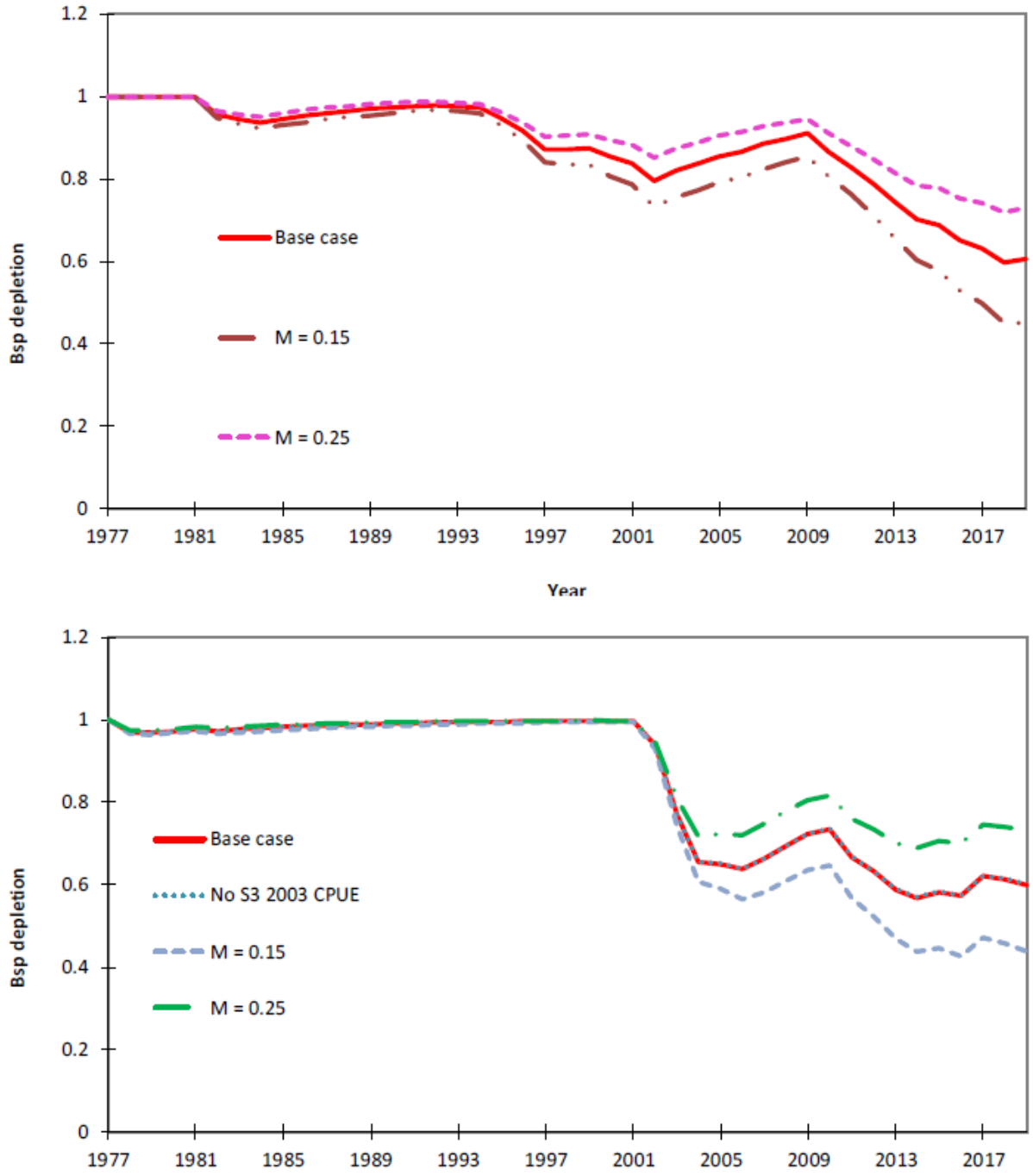

Figure 6 – Spawning biomass depletion estimated for the West (top) and East (bottom) alfonsino stocks, showing base case (M=0.2) and alternate natural mortality sensitivities (source: Brandão et al. (2021)).

6.1 Harvest strategy and reference points

Harvest strategies for alfonsino in the SIOFA Area have not yet been agreed upon.

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 alfonsino (see paragraph 79, MoP10 Report). However, no further management advice has been agreed for alfonsino in the SIOFA area.

For a range of species, Butterworth et al. (2021) discusses the relative merits and drawbacks of adopting either 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 alfonsino, Butterworth et al. (2021) and Brandão et al. (2022) note that approach i) generates stable TACs but may result in some foregone catch levels in the short term because current biomass is thought to be substantially higher than B_{msy}. They note that approach ii) is likely to result in higher inter-annual TAC variability (relative to approach iii), reflecting uncertainty regarding B_o.

7. Data collection

Catch and effort fishery data are collected under CMM 02(2023) and were submitted by the CCPs listed in Table 2.

Table 2 – Alfonsino 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.

Alfonsino catch and effort data submitted by different SIOFA CCPs		
Year	**Country**	**Database**
2014	AUS	HBH
2014	COK	AGG
2014	JPN	AGG
2015	AUS	HBH
2015	COK	AGG
2015	JPN	AGG
2016	AUS	HBH
2016	COK	AGG
2016	JPN	AGG
2016	JPN	HBH
2017	COK	AGG
2017	JPN	AGG
2018	COK	AGG
2018	JPN	AGG
2018	JPN	HBH
2019	COK	AGG
2019	COK	HBH
2019	JPN	HBH
2020	COK	HBH
2020	JPN	HBH
2021	COK	HBH
2021	JPN	HBH
2022	COK	HBH
2022	JPN	HBH
2023	COK	HBH
2023	JPN	HBH

Scientific Observer biological data (i.e., measures and biological samples of alfonsino) are collected as a requirement of CMM 02(2023), and were submitted by the CCPs listed in Table 3.

Table 3 – Alfonsino Scientific Observer biological data collected by different SIOFA CCPs, by year (source: SIOFA Observer database 2014–2023).

Alfonsino observer data submitted by different SIOFA CCPs	
Year	**Country**
2014	AUS
2015	AUS
2016	AUS
2016	JPN
2017	JPN
2018	COK
2018	FR-OT
2018	JPN
2019	AUS
2019	COK
2019	ESP
2019	JPN
2020	AUS
2020	COK
2020	ESP
2020	JPN
2021	AUS
2021	COK
2021	ESP
2021	JPN
2022	COK
2022	ESP
2022	JPN
2023	COK
2023	ESP
2023	JPN

7.1 Biological data summaries

A summary of biological data collected by Scientific Observers, and counts of records by year for selected data fields, are shown in Table 4.

Table 4 – Alfonsino 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).

Alfonsino observer data measurements							
Year	**Length (n)**	**Weight (n)**	**Otoliths collected (n)**	**Sex (n)**	**Maturity (n)**	**Gonad weight (n)**	**Stomachs sampled (n)**
2014	792	792	792	792	757	0	792
2015	500	475	501	500	500	0	501
2016	9 608	279	530	529	523	0	526
2017	39 863	0	0	0	0	0	0
2018	24 014	10 096	9 647	10 098	7 111	9 947	0
2019	32 245	3 121	9 376	11 923	8 486	3 099	8 809
2020	17 934	4 204	3 523	7 666	7 322	0	3 832
2021	14 611	509	377	460	328	0	328
2022	25 100	8 591	6 342	8 515	8 515	0	8 515
Total	164 667	28 067	31 088	40 483	33 542	13 046	23 303

7.2 Tag data

SIOFA does not require or conduct any tagging of alfonsino, and any such tagging program is unlikely to be successful. Tagging of alfonsino is not considered feasible due to high and unquantifiable release mortality of alfonsino captured in trawls.

8. Summaries of abundance indices and other observational data

8.1 Scaled length frequencies

Fish from across the SIOFA Area were sampled for otoliths by the Cook Islands fleet so that a length frequency could be constructed, and growth parameters established (Brouwer et al. 2021). The scaled length frequencies are shown in Figure 7.

8.2 Scaled age frequencies

Fish from across the SIOFA Area were sampled for otoliths by the Cook Islands fleet so that an age frequency could be constructed, and growth parameters established (Brouwer et al. 2021). The scaled age frequencies are shown in Figure 7.

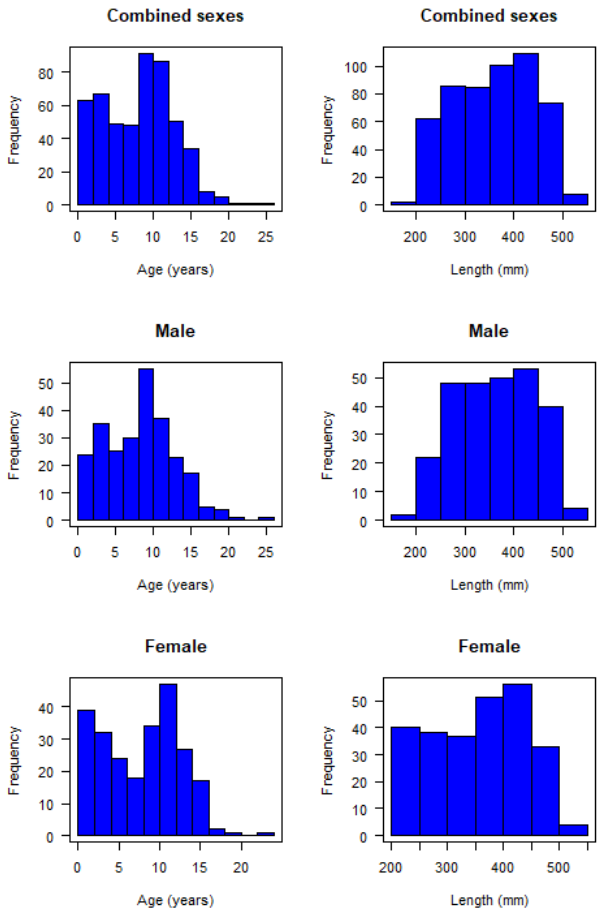

Figure 7 – Age and length sample distribution of alfonsino collected from the Cook Islands trawl fleet (source: Brouwer et al. 2021)

8.3 CPUE indices

Recent years have seen lower levels of effort (hauls) with consistent catches (Figure 3a), so unstandardised catch per unit of effort (CPUE) has been rising slightly (Figure 4).

Standardised CPUE indices developed for the stock assessment described by Brandão et al. (2021) used a negative binomial model for series with few zero catches, and a Hurdle-Negative Binomial for series with a large number of zero catches (Brandão and Butterworth 2020). The utility of the CPUE indices as an index of abundance is limited by the fact that catch data are aggregated on a daily basis rather than reported on a haul-by-haul basis.

8.4 Acoustic biomass indices

The SIOFA Scientific Committee is considering the feasibility of utilising acoustic survey methods to assess alfonsino in the SIOFA Area.

8.5 Trawl survey indices

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

8.6 Tag based abundance estimates

SIOFA does not require or conduct tagging of alfonsino and no alfonsino tagging experiments in the SIOFA Area have been reported to SIOFA, hence tag-based abundance indices of abundance are not available. It is not considered feasible to utilise tag-based methods to assess the status of alfonsino.

9. Biological parameters

Biological parameters including growth and maturity have been estimated for alfonsino in the SIOFA Area by the Brouwer et al. (2021). Other stock assessment parameters have been estimated by Brandao et al. (2020). These are summarised in Table 5.

Table 5 – Biological parameters for alfonsino used in the most recent stock assessment by Brandão et al. (2020) or as subsequently updated by Brouwer et al. (2021).

Relationship	Parameter (units)	Area	Value			References
			Both	Male	Female	
Natural mortality	M (y^{-1})	all	0.2			Brandão et al. (2021)
Von Bertalanffy growth Coefficient	t_0 (y)		-5.114			Brouwer et al. (2021)
	k (y^{-1})		0.068			Brouwer et al. (2021)
	L_∞ (cm)		61.3			Brouwer et al. (2021)
Length-weight	c.v. a ($t.cm^{-1}$) b					
Maturity	a_{50} ($\pm a_{to95}$)		6			Brandão et al. (2021)
Stock recruitment relationship			Beverton-Holt			Brandão et al. (2021)
Stock recruitment steepness	h		0.75			Brandão et al. (2021)
Recruitment variability	σ_R		Stable			
Ageing error type	Normal					
Ageing error parameters	c.v.					

9.1 Natural mortality

The base case of the most recent stock assessment (Brandão et al. 2021) assumes a natural mortality M = 0.2 for alfonsino.

9.2 Growth parameters

Growth parameters have been investigated by Brouwer et al. (2021) and are shown below in Table 6.

Sampling occurred from 2009 -2020, with 45,062 fish being sampled across all months of the year. The samples were collected from a wide area in the south-central Indian Ocean in five broad regions. It was found that there is no difference between the male, female and combined-sex growth curves; for this reason, only the combined sex parameters and figures are shown. Note that these revised growth parameters are slightly different from those used in the most recent stock assessment described in Brandão et al. (2020 and 2021).

The SIOFA Scientific Committee has endorsed the recommendation that these updated values are appropriate for use in future stock assessments. The SC also recommended that CCPs implement stratified otolith sampling protocols to ensure that otoliths continue to be collected across the full size-range of fish.

Table 6 – Growth parameters for alfonsino in the SIOFA Area (source: Brouwer et al. 2021). Note that growth and maturity curves were derived independently for male and female fish but were found to be statistically indistinguishable from the combined sex growth curve. As a consequence, only the combined-sex parameters are shown.

Parameter	Combined sex	Male	Female
L-inf	61.3		
K	.068		
To	-5.114		
L_{50}	38		

9.3 Length/age relationship

The length-age relationship for alfonsino in the SIOFA Area was updated by Brouwer et al. in 2021, using otoliths collected from five regions broadly spread across the SIOFA Area (see Brouwer et al. 2021). This relationship is reproduced in Figure 8.

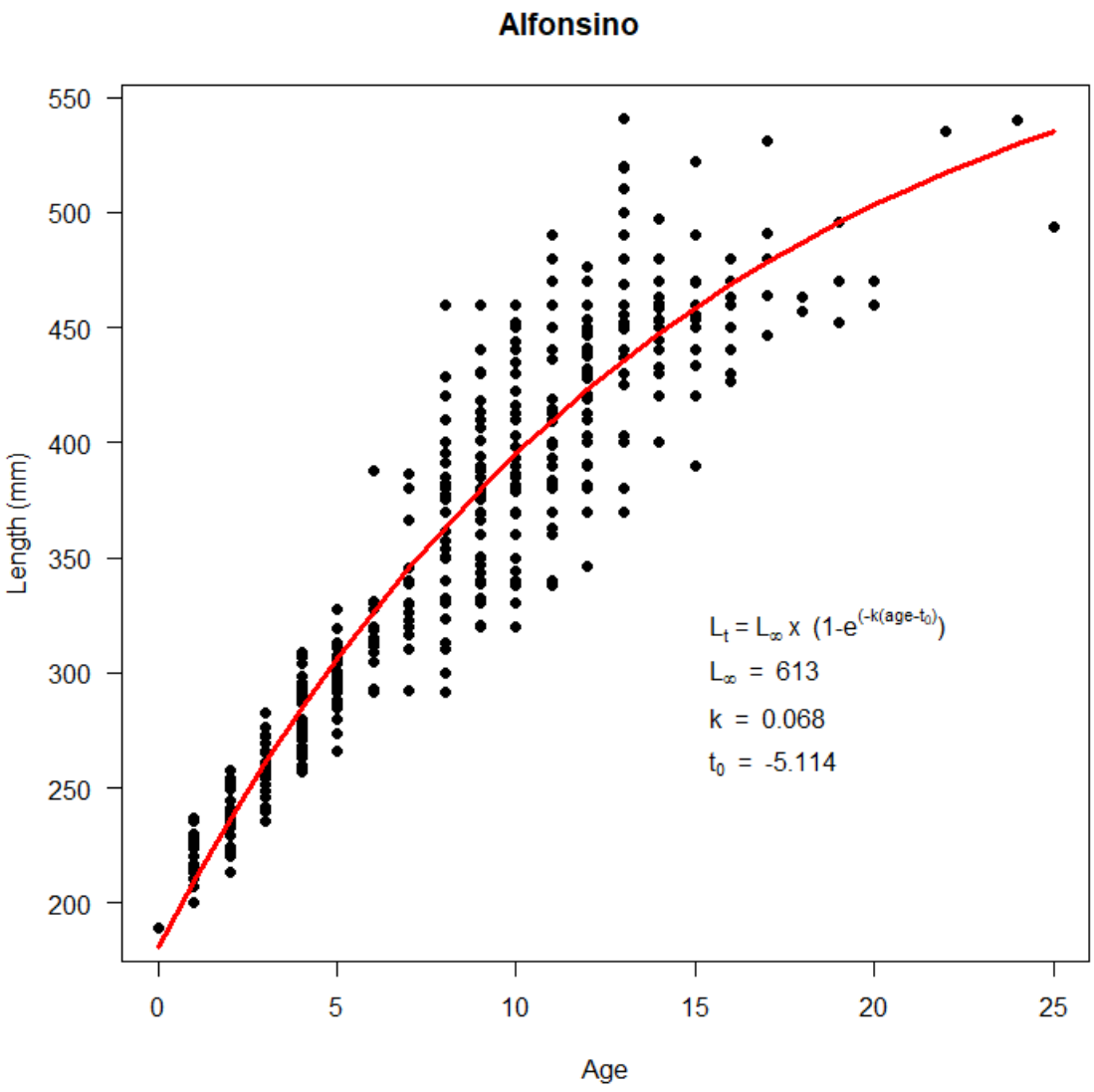

Figure 8 – Length-at-age of alfonsino samples (both sexes combined) in the Indian Ocean showing all samples with readability scores of 1-3 and the fitted von Bertalanffy growth curve, along with the derived growth parameters (source: Brouwer et al. 2021).

9.4 Maturity and spawning

Between 2009 and 2020, 45,062 individual alfonsino were sampled for length and maturity across all months of the year. The samples were collected from across a wide area in the south-central Indian Ocean, and used to estimate updated age, growth, and maturity information for alfonsino (Brouwer et al. 2021).

Gonad mass increases substantially with fish length. The monthly gonadosomatic index (GSI) trends show that alfonsino have a distinct spawning season through the Austral summer with the bulk of spawning taking place from December to February. The estimated L50 size-at-maturity was 38cm for both males and females which coincides with an age of 9 years.

For fish below the size-at-50% maturity the sex ratio is approximately balanced; however, after the onset of maturity the sex ratio becomes skewed in favour of females, which may reflect differential mortality of male and female fish (Brouwer et al. 2021).

9.5 Stock recruitment relationship

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

9.6 Tag parameters

SIOFA does not require or conduct any tagging for alfonsino.

10. Target 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).

While recent data is sufficiently detailed, there is a lack of reported target species for fishing events that caught alfonsino in 2014, 2015, 2017 and 2019. In 2019, only a single operation was declared as targeting alfonsino, but hundreds of tonnes of alfonsino were caught in that year. Hence, it was not possible to determine the target catch/bycatch ratios of all fishing events, based solely on declared targets.

As a practical mean of estimating the target 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 fishing events in which at least 70% of the catch was alfonsino are designated as alfonsino target operations.

10.1 Alfonsino target catch/bycatch

Target catch/bycatch is depicted in Figure 9. Note that the 70% catch threshold rule to define alfonsino 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 most commonly bycaught species in alfonsino target hauls was violet warehou (SEY), as shown in Figure 10.

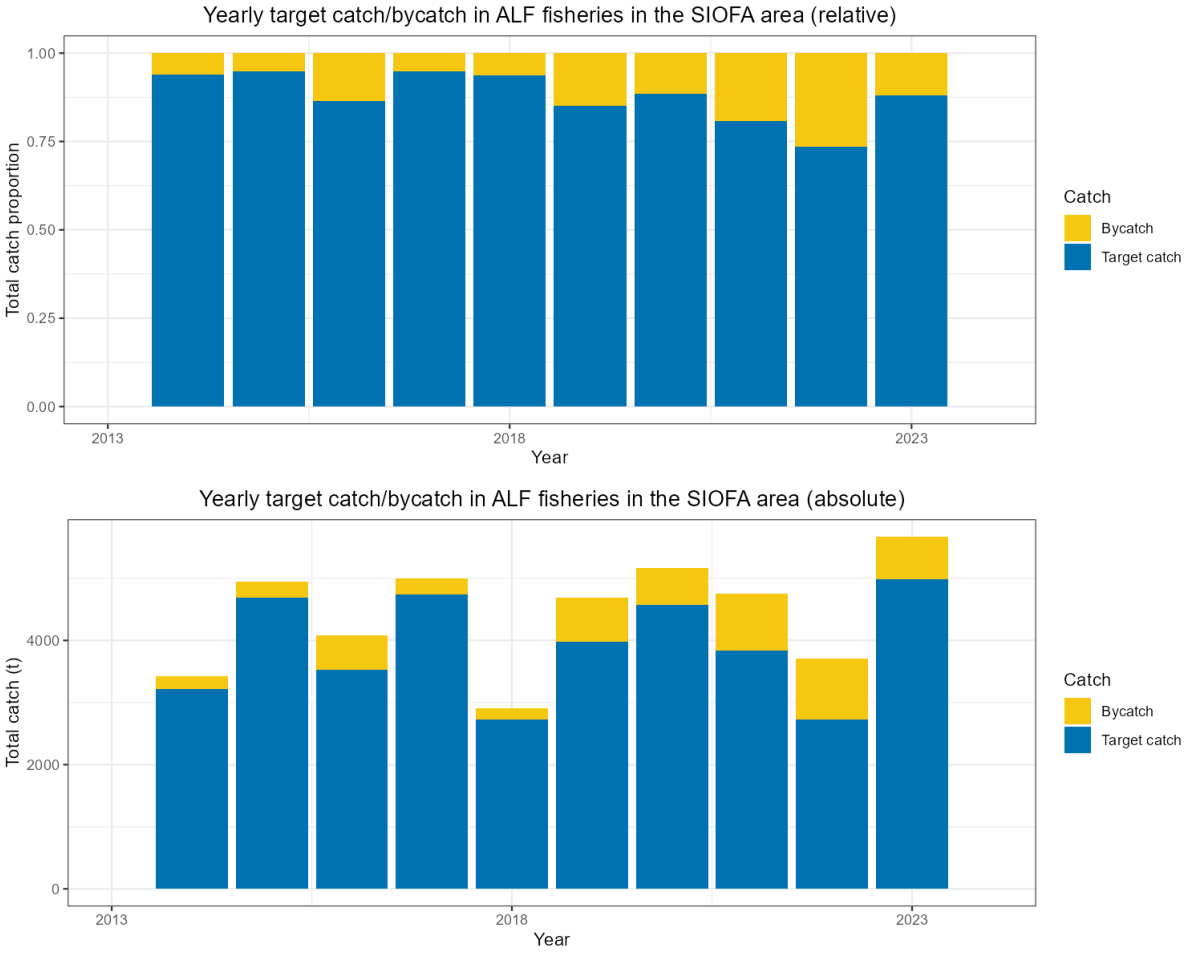

Figure 9a and b – Total catch of alfonsino and other bycatch species in SIOFA fisheries that targeted alfonsino, shown as relative values (upper panel, a) and absolute values (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023).

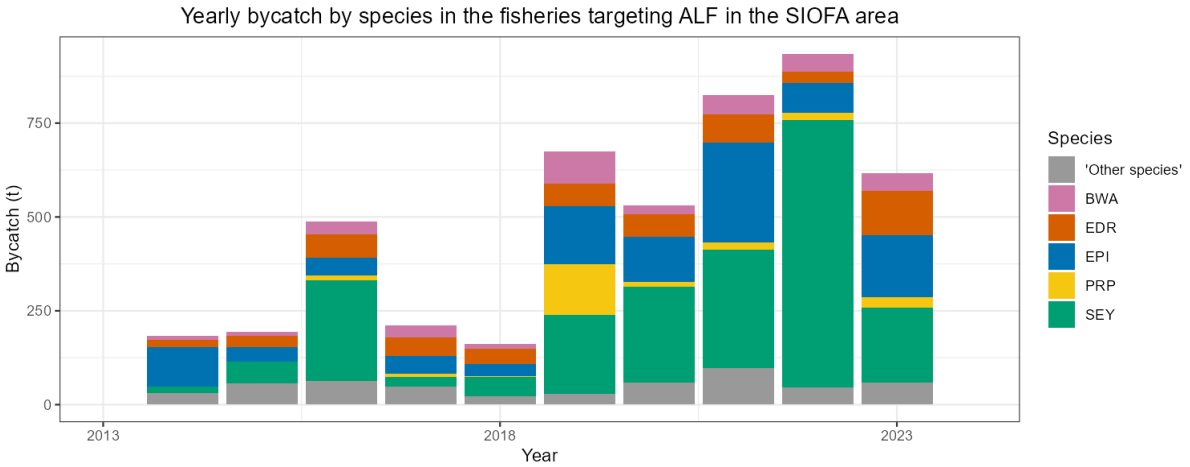

Figure 10 – Yearly catch weights of bycatch species in fisheries targeting alfonsino in the SIOFA Area, by species (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Only the top 5 species by weight (cumulatively in the full database) are shown individually (identified by their 3-letter FAO code). All other species are grouped under 'other species.

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 alfonsino fishery are reported rarely. The most reported bycaught shark species by weight was *Etmopterus compagnoi* (ETE, Figure 11), but reported catches were overall very low.

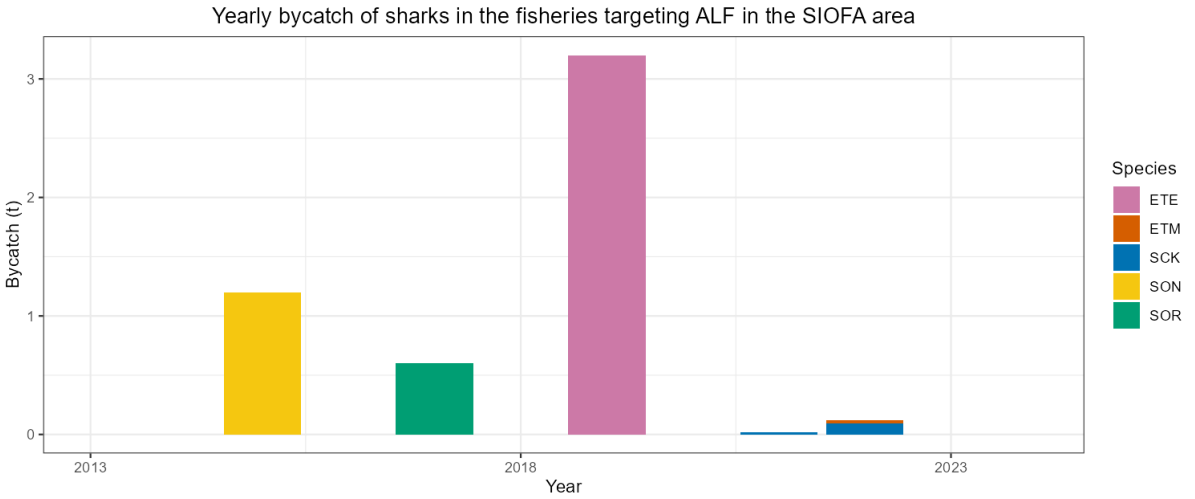

Figure 11 – Reported bycatch of shark species in fisheries targeting alfonsino (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Reported bycatch includes both discarded and retained catches.

10.2 Target catch/bycatch by SIOFA subarea

Target catches and bycatches in fisheries targeting alfonsino in the SIOFA Area were largely concentrated in Subareas 2, 3a and 3b, but some target catches also came from Subarea 4 (Figure 12).

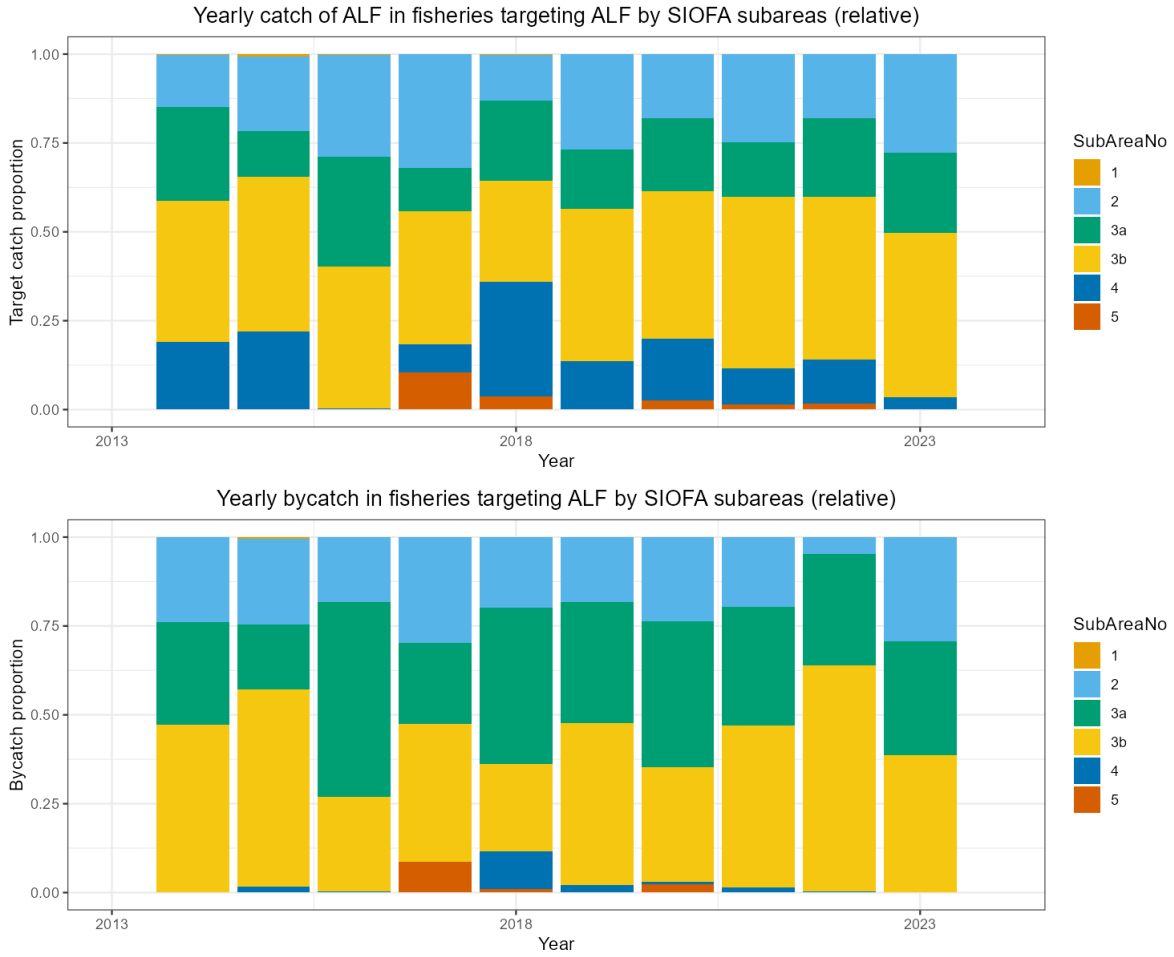

Figure 12a and b – Distribution of target catch (a) and bycatch (b) in fisheries targeting alfonsino in different SIOFA Subareas (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches reported without location information are not included.

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 alfonsino in the SIOFA Area are presented in Figure 13.

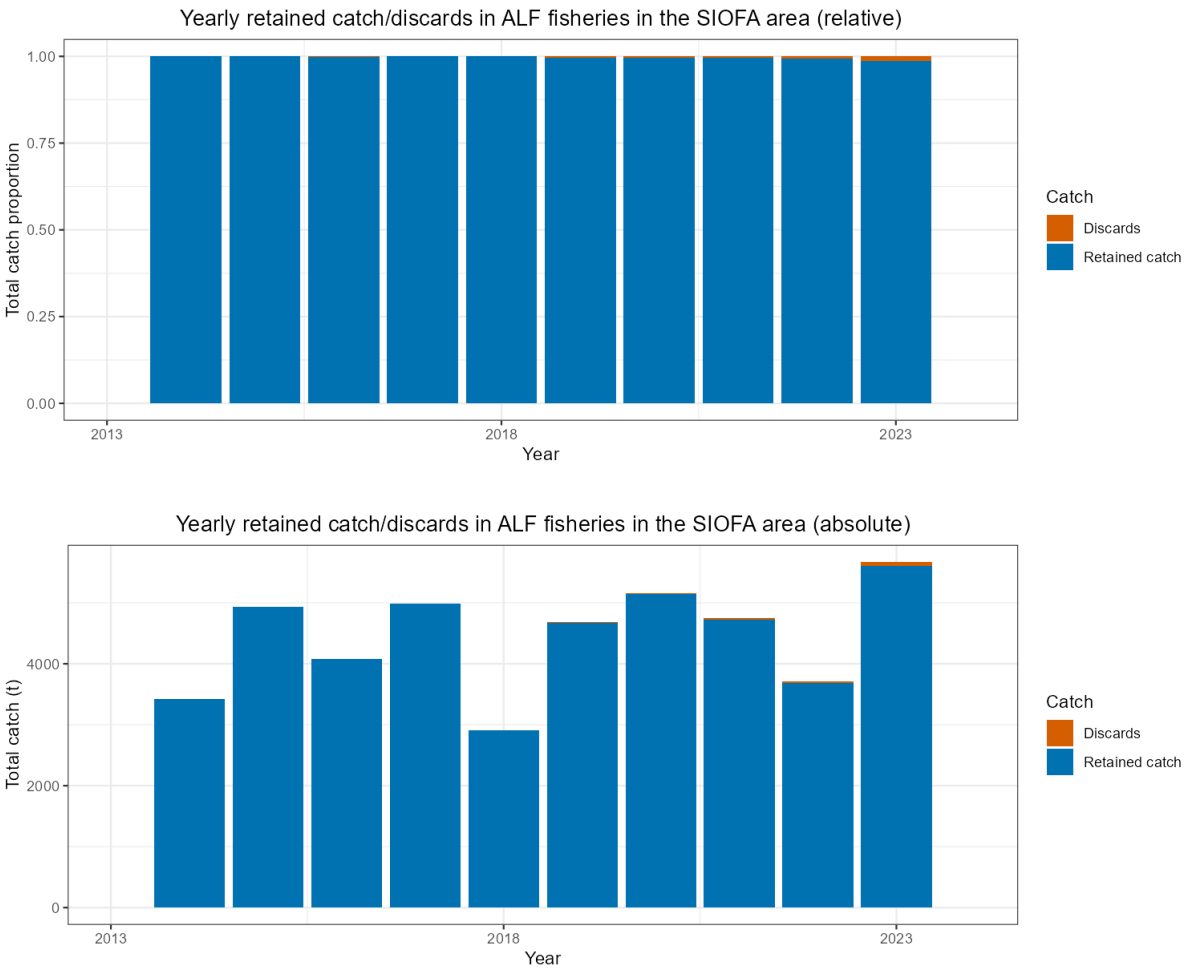

Figure 13a and b – Total retained and discarded catch in SIOFA fisheries that targeted alfonsino, shown as relative values (upper panel, a) and absolute values (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches reported without location information are not included.

Discards composition by species in fisheries targeting alfonsino in the SIOFA Area is presented in Figure 14. Some of the most represented species in discards are the black cardinal fish (*Epigonus telescopus*, EPI) and the spiky oreo (*Neocyttus rhomboidalis,* ONV).

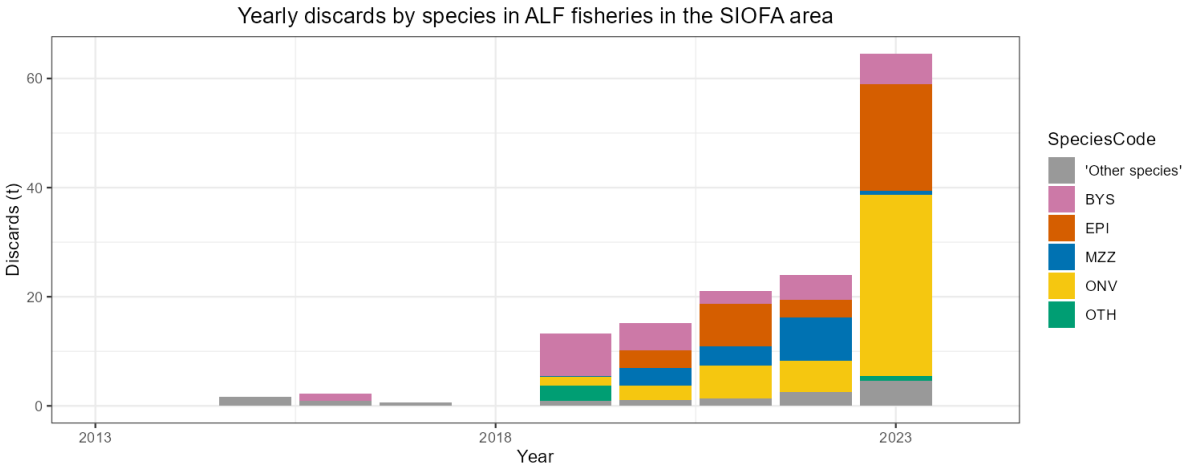

Figure 14 – Reported discards of fish species in fisheries targeting alfonsino (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Only the top five species (by weight) are fully represented, while the other species have been grouped in a single category.

10.4 Target catch/bycatch in assessment units

The East and West assessment units are not formally management units, but for the purpose of stock assessment, two management units have been defined: the 'West' fishery and the 'East' fishery; see Figure 3 (Section 4.3).

As reported by Brandão et al. (2021), the majority of alfonsino catches are from the West assessment unit, including SIOFA Subareas 2, 3a and 3b. A much smaller proportion of alfonsino catches are reported from the East assessment unit, including Subareas 4 and 5 (Figure 15). Orange roughy are occasionally caught as bycatch in trawls targeting alfonsino.

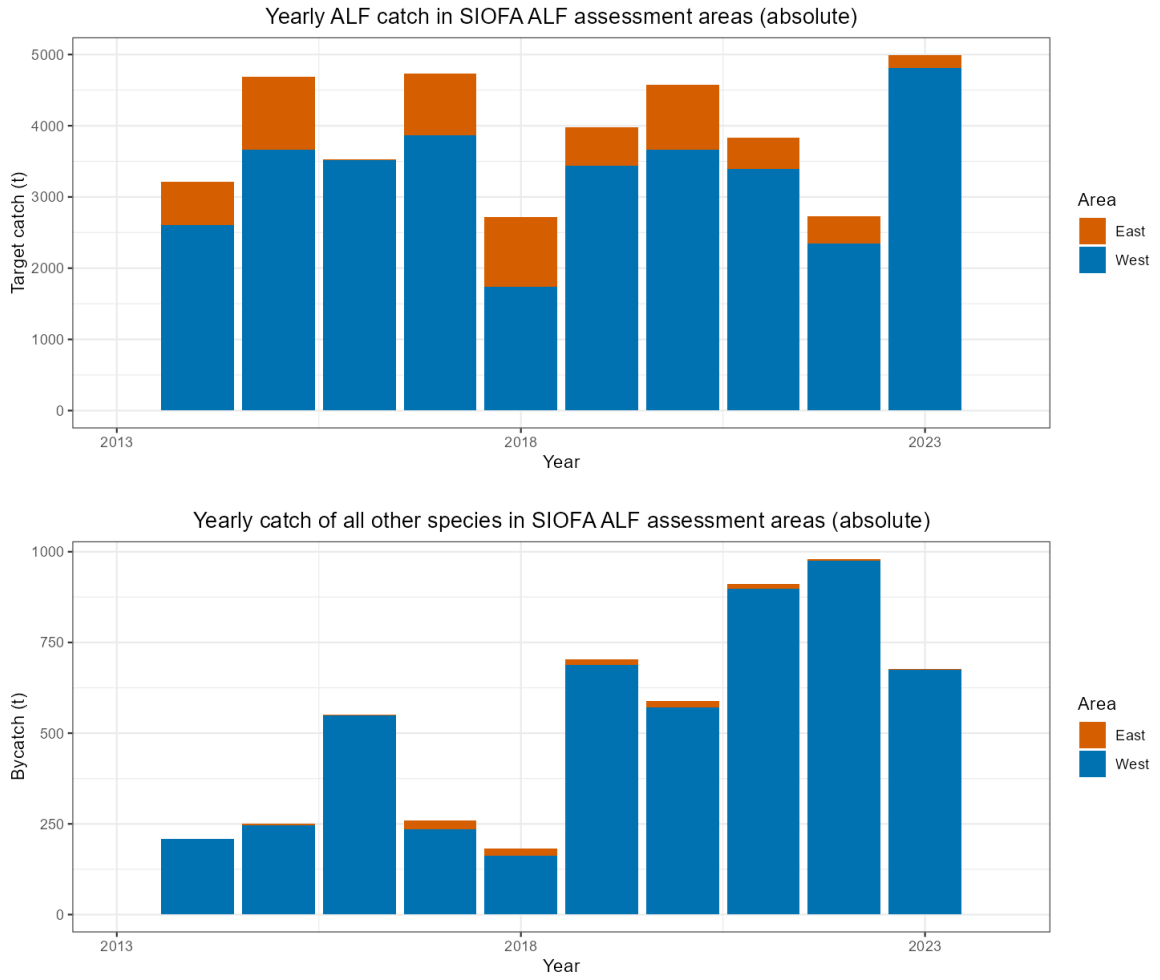

Figure 15a and b – Distribution of target catch and bycatch in fisheries targeting alfonsino in different SIOFA assessment areas (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2014–2023). Catches reported without location information are not included.

10.5 Incidental catch of VME taxa and other invertebrates

Alfonsino are targeted using midwater or pelagic trawls that rarely or never contact the ocean floor. As such, VME incidental capture rare in this fishery (Figure 16), with 2019 being a notable exception.

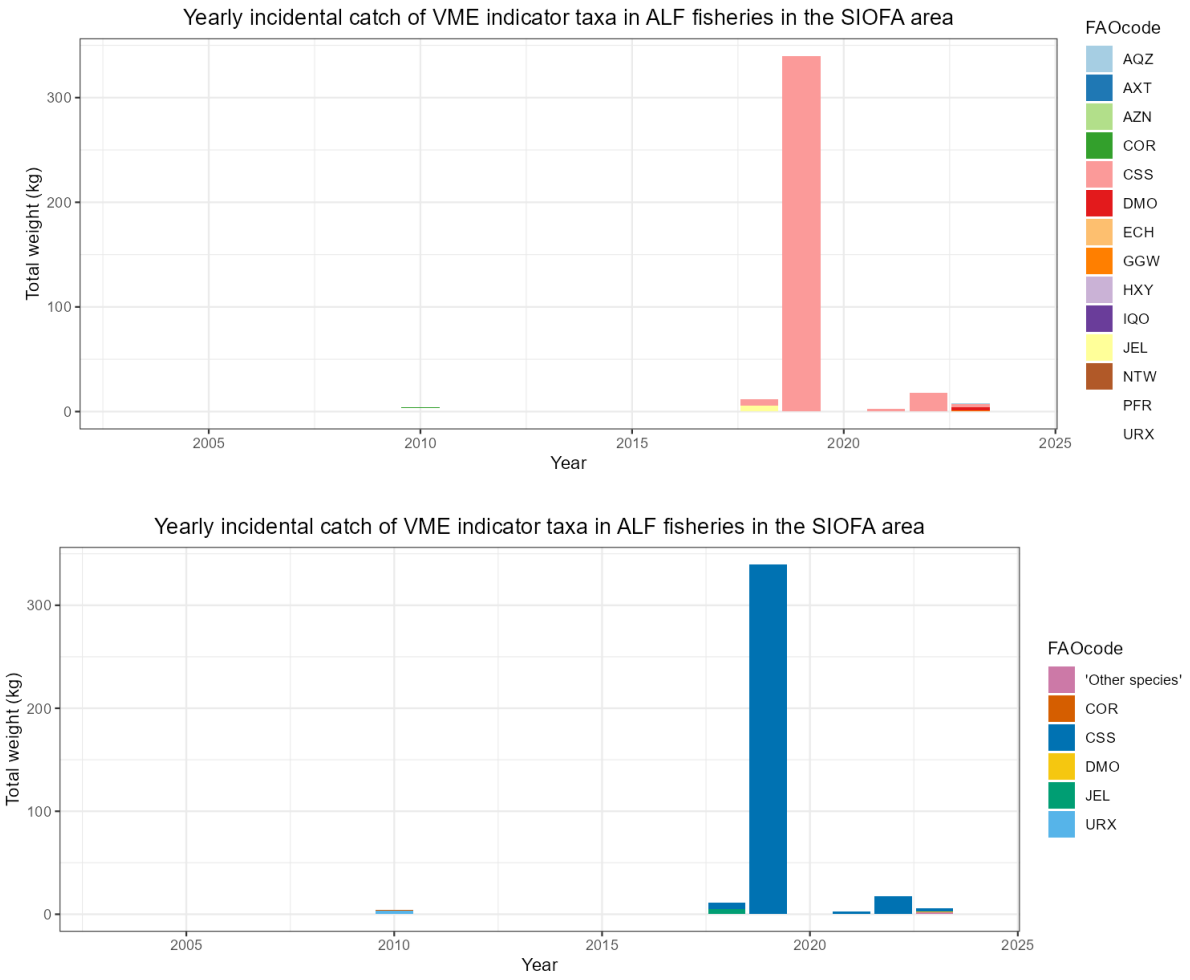

Figure 16a and b – Yearly incidental catch of VME indicator taxa in fisheries targeting ALF within the SIOFA Area, by taxa group (source: SIOFA Observer and HBHCatchEffort databases 2004–2023). Taxa are indicated by their 3-letter FAO code (see Appendix C). Captures were recorded in 2020, but the total weight was negligible and thus difficult to visualise in this figure. Only the top 5 species by weight (cumulatively in the full database) are shown individually (identified by their 3-letter FAO code). All other species are grouped under 'other species.

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 17 shows the reported locations of incidental captures (Figure 17a) and observations (Figure 17b) 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 alfonsino in the SIOFA Area, as recorded by Scientific Observers.

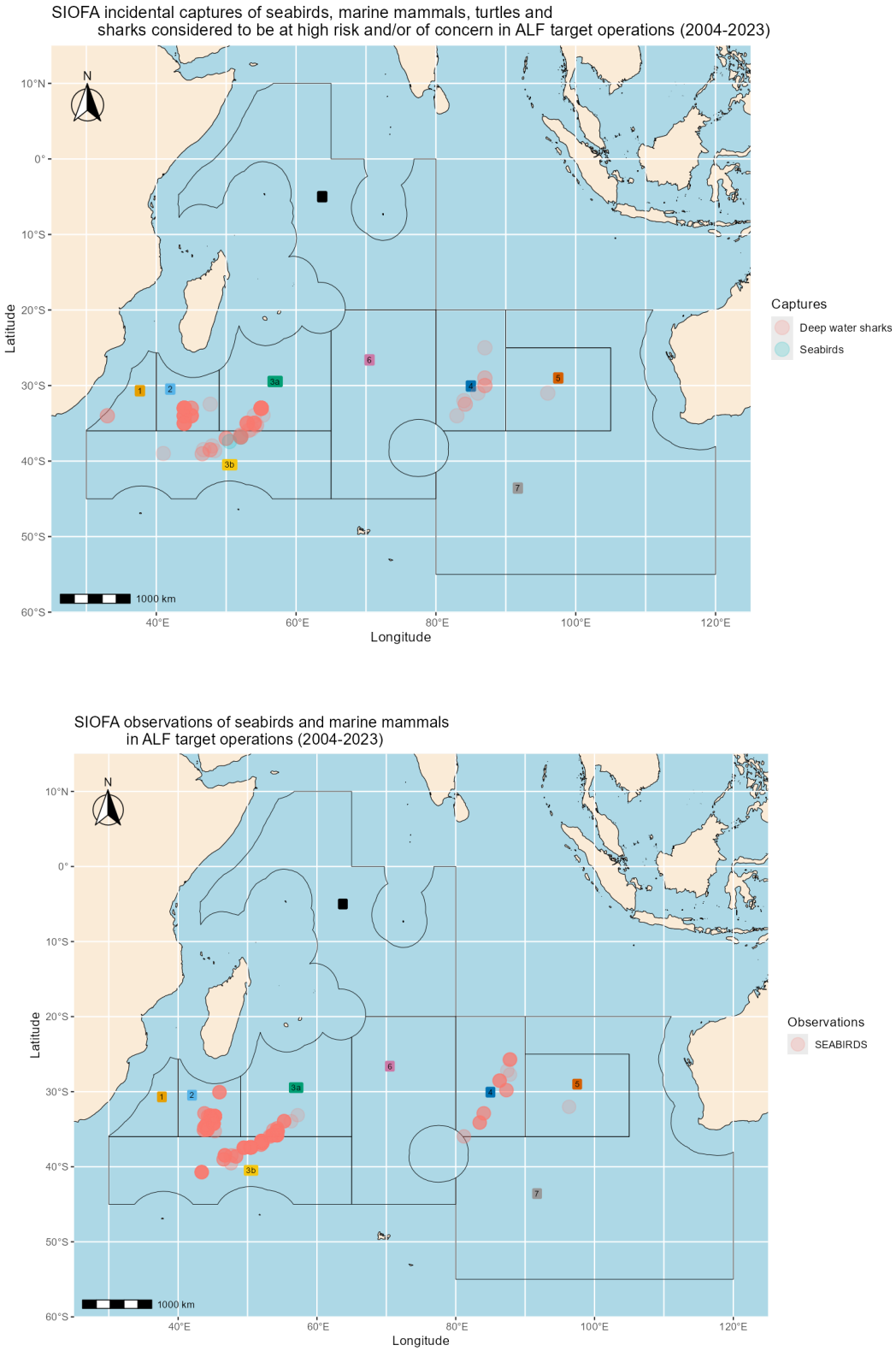

Figure 17a and b – Reported locations of incidental captures (a, upper) and observations (b, lower) of seabirds, cetaceans, and sharks considered to be "at high risk" and/or "of concern", as defined in Annex 1 of CMM 12(2024), captured in fishing operations targeting alfonsino in the SIOFA Area, as recorded by SIOFA Scientific Observers (source: SIOFA Observer database 2004–2023).

11.1 Seabirds interactions

Provisions for the mitigation of accidental capture of seabirds in alfonsino 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

Incidental captures of seabirds in alfonsino fisheries, most of which were reported as fatal, were recorded for at least 3 different species (Table 7).

Table 7 – Number of seabirds captured in fishing operations that targeted alfonsino (source: SIOFA Observer database 2004–2023).

Observed captures of seabirds in SIOFA alfonsino fisheries				
Year	**Common name**	**Scientific name**	**Fishing gear**	**Captures**
2009	Wedge-tailed shearwater	*Puffinus pacificus*	Single boat midwater otter trawls	1
2013	White-chinned petrel	*Procellaria aequinoctialis*	Single boat midwater otter trawls	1
2021	Black-browed albatross	*Thalassarche melanophris*	Midwater trawls (nei)	1

11.1.2 Observations

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

Table 8 – Number of seabirds observed around fishing operations that targeted alfonsino (source: SIOFA Observer database 2004–2023).

Year	Common name	Scientific name	Fishing gear	Abundance
2007	Wandering albatross	*Diomedea exulans*	Single boat bottom otter trawls	6
2007	White-chinned petrel	*Procellaria aequinoctialis*	Single boat bottom otter trawls	65
2008	Albatrosses nei	*Diomedeidae*	Single boat bottom otter trawls	31
2008	Atlant. yellow-nosed albatross	*Thalassarche chlororhynchos*	Single boat bottom otter trawls	5
2008	B/W bellied storm petrels nei	*Fregetta spp*	Single boat bottom otter trawls	1
2008	Black-browed albatross	*Thalassarche melanophris*	Single boat bottom otter trawls	21
2008	Cape petrel	*Daption capense*	Single boat bottom otter trawls	35
2008	Giant petrels nei	*Macronectes spp*	Single boat bottom otter trawls	22
2008	Grey petrel	*Procellaria cinerea*	Single boat bottom otter trawls	4
2008	Light-mantled sooty albatross	*Phoebetria palpebrata*	Single boat bottom otter trawls	2
2008	Shy albatross	*Thalassarche cauta*	Single boat bottom otter trawls	21
2008	Sooty albatross	*Phoebetria fusca*	Single boat bottom otter trawls	1
2008	Wandering albatross	*Diomedea exulans*	Single boat bottom otter trawls	3
2008	White-chinned petrel	*Procellaria aequinoctialis*	Single boat bottom otter trawls	8
2010	Albatrosses nei	*Diomedeidae*	Single boat bottom otter trawls	43
2010	Atlant. yellow-nosed albatross	*Thalassarche chlororhynchos*	Single boat bottom otter trawls	256
2010	Hall's giant petrel	*Macronectes halli*	Single boat bottom otter trawls	8
2010	Petrels nei	*Procellaria spp*	Single boat bottom otter trawls	3693
2010	Wandering albatross	*Diomedea exulans*	Single boat bottom otter trawls	87
2010	White-chinned petrel	*Procellaria aequinoctialis*	Single boat bottom otter trawls	1
2011	Albatrosses nei	*Diomedeidae*	Single boat bottom otter trawls	18
2011	Atlant. yellow-nosed albatross	*Thalassarche chlororhynchos*	Single boat bottom otter trawls	33
2011	Cape petrel	*Daption capense*	Single boat bottom otter trawls	66
2011	Giant petrels nei	*Macronectes spp*	Single boat bottom otter trawls	53
2011	Grey petrel	*Procellaria cinerea*	Single boat bottom otter trawls	2
2011	Shy albatross	*Thalassarche cauta*	Single boat bottom otter trawls	50

Year	Common name	Scientific name	Fishing gear	Abundance
2011	Wandering albatross	*Diomedea exulans*	Single boat bottom otter trawls	66
2011	White-chinned petrel	*Procellaria aequinoctialis*	Single boat bottom otter trawls	257
2011	Wilson's storm petrel	*Oceanites oceanicus*	Single boat bottom otter trawls	2
2020	Seabirds nei	*Trawls (nei)*	1125	
2021	Wandering albatross	*Diomedea exulans*	Single boat bottom otter trawls	11
2021	White-chinned petrel	*Procellaria aequinoctialis*	Single boat bottom otter trawls	66
2022	Cape petrel	*Daption capense*	Trawls (nei)	35
2022	Great-winged petrel	*Pterodroma macroptera*	Trawls (nei)	11
2022	Grey petrel	*Procellaria cinerea*	Trawls (nei)	47
2022	Hall's giant petrel	*Macronectes halli*	Trawls (nei)	109
2022	Indian yellow-nosed albatross	*Thalassarche carteri*	Trawls (nei)	4
2022	Prions nei	*Pachyptila spp*	Trawls (nei)	3
2022	Seabirds nei	*Trawls (nei)*	1085	
2022	Shy albatross	*Thalassarche cauta*	Trawls (nei)	46
2022	Wandering albatross	*Diomedea exulans*	Trawls (nei)	41
2023	Antarctic giant petrel	Macronectes giganteus	Bottom trawls (nei)	20
2023	Antarctic giant petrel	Macronectes giganteus	Midwater trawls (nei)	169
2023	Black-browed albatross	Thalassarche melanophris	Midwater trawls (nei)	39
2023	Cape petrel	Daption capense	Bottom trawls (nei)	6
2023	Cape petrel	Daption capense	Midwater trawls (nei)	97
2023	Giant petrels nei	Macronectes spp	Midwater trawls (nei)	48
2023	Great-winged petrel	Pterodroma macroptera	Bottom trawls (nei)	1
2023	Great-winged petrel	Pterodroma macroptera	Midwater trawls (nei)	309
2023	Grey petrel	Procellaria cinerea	Bottom trawls (nei)	1
2023	Grey petrel	Procellaria cinerea	Midwater trawls (nei)	4
2023	Indian yellow-nosed albatross	Thalassarche carteri	Midwater trawls (nei)	51
2023	Prions nei	Pachyptila spp	Bottom trawls (nei)	1
2023	Prions nei	Pachyptila spp	Midwater trawls (nei)	35
2023	Seabirds nei		Midwater trawls (nei)	10
2023	Shy albatross	Thalassarche cauta	Bottom trawls (nei)	15
2023	Shy albatross	Thalassarche cauta	Midwater trawls (nei)	307
2023	Wandering albatross	Diomedea exulans	Bottom trawls (nei)	2
2023	Wandering albatross	Diomedea exulans	Midwater trawls (nei)	142
2023	White-chinned petrel	Procellaria aequinoctialis	Bottom trawls (nei)	10
2023	White-chinned petrel	Procellaria aequinoctialis	Midwater trawls (nei)	528
2023	Wilson's storm petrel	Oceanites oceanicus	Midwater trawls (nei)	21

11.2 Marine mammals interactions

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 alfonsino fisheries by SIOFA Scientific Observers.

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

Captures of 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 (Sharks)) were reported in the SIOFA Observer database for fisheries that targeted alfonsino between 2018 and 2022 (Table 9).

Table 9 – Number of sharks 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) captured in fisheries that targeted alfonsino (source: SIOFA Observer database 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)	4
2018	Birdbeak dogfish	*Deania calceus*	Midwater trawls (nei)	53
2018	Gulper shark	*Centrophorus granulosus*	Bottom trawls (nei)	6
2018	Gulper shark	*Centrophorus granulosus*	Midwater trawls (nei)	2
2018	Kitefin shark	*Dalatias licha*	Bottom trawls (nei)	11
2018	Kitefin shark	*Dalatias licha*	Midwater trawls (nei)	47
2018	Largespine velvet dogfish	*Scymnodon macracanthus*	Bottom trawls (nei)	7
2018	Largespine velvet dogfish	*Scymnodon macracanthus*	Midwater trawls (nei)	1
2018	Longnose velvet dogfish	*Centroselachus crepidater*	Midwater trawls (nei)	15
2018	Pacific sleeper shark	*Somniosus pacificus*	Midwater trawls (nei)	1
2018	Portuguese dogfish	*Centroscymnus coelolepis*	Bottom trawls (nei)	2
2018	Portuguese dogfish	*Centroscymnus coelolepis*	Midwater trawls (nei)	2
2018	Southern lanternshark(Lucifer)	*Etmopterus granulosus*	Bottom trawls (nei)	196
2018	Southern lanternshark(Lucifer)	*Etmopterus granulosus*	Midwater trawls (nei)	143
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

Year	Common name	Scientific name	Fishing gear	Captures (n)
2019	Southern lanternshark(Lucifer)	*Etmopterus granulosus*	Midwater trawls (nei)	1
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	Southern lanternshark(Lucifer)	*Etmopterus granulosus*	Trawls (nei)	4

12. Effects of the fishery on the ecosystem

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

13. References

Brandão, A., Butterworth, D.S. and Johnston, S. 2020. Age-Structured Production Model (ASPM) assessments of the Alfonsino (*Beryx splendens*) resource in the SIOFA Area of the Southern Indian Ocean. 2nd Meeting of the Stock and Ecological Risk Assessment Working Group (SERAWG2). SERAWG2-02-14, 39pp.

Brandão, Anabela; Butterworth, Doug; Holloway, Susan (2021): ASPM assessments of the Alfonsino resource in the SIOFA Area of the Indian Ocean. University of Cape Town. Presentation. https://doi.org/10.25375/uct.14274497

Brandão, A., Butterworth, D.S., and Johnston, S. (2022). Initial results for comparing three approaches to set TACs for the major fisheries in the SIOFA Area of the Southern Indian Ocean. 4th Meeting of the Stock and Ecological Risk Assessment Working Group (SERAWG4). SERAWG2-04-11, 32pp.

Busakhin, S.V. (1982). Systematics and distribution of the family Berycidae (Osteichthyes) in the World Ocean. Journal of Ichthyology, 22, pp 1-21.

Brouwer, S., Wragg, C., Flanagan and B., Heaphy, C. (2021) Alfonsino growth, length and maturity estimates from fish sampled by Cook Islands trawl vessels in SIOFA. 3rd Meeting of the Stock and Ecological Risk Assessment Working Group (SERAWG3). SERAWG2-03-09rev1, 31pp.

FAO (2016). Global review of alfonsino (*Beryx spp*.), their fisheries, biology and management, by Ross Shotton. FAO Fisheries and Aquaculture Circular No. 1084. Rome, Italy.

Horn, P.L.; Forman, J.; Dunn, M.R. (2010). Feeding habits of alfonsino Beryx splendens. Journal of Fish Biology 76: 2382–2400.