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Southern Indian Ocean Fisheries Agreement
Accord relatif aux Pêches dans le Sud de l'Océan Indien

8th Meeting of the Scientific Committee (SC8)

Tenerife, Spain, 22-31 March 2023

SC-08-19-Rev1

Fishery Summary: oilfish (*Ruvettus pretiosus*) and escolar (*Lepidocybium flavobrunneum*) 2023

The SIOFA Secretariat

Document type	working paper ✔ information paper ☐
Distribution	Public ✔ Restricted [1] ☐ Closed session document [2] ☐

Abstract

This paper presents the SIOFA fishery summary for oilfish (*Ruvettus pretiosus*) and escolar (*Lepidocybium flavobrunneum*) 2023.
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.

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Recommendations

The SIOFA Secretariat recommends that the SC8:

- **notes** the work done by the Secretariat in preparing the SIOFA Fishery Summary for oilfish and escolar 2023.
- **provides** any comments or edits to the SIOFA Fishery Summary for oilfish and escolar 2023 during the SC meeting.
- **endorses** the SIOFA Fishery Summary for oilfish and escolar 2023 and **recommends** that this is further developed for SC9 and before publication.
- **considers** the frequency with which the Secretariat is to update the SIOFA Fishery Summary for oilfish and escolar 2023.

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Fishery Summary: oilfish (*Ruvettus pretiosus*) and escolar (*Lepidocybium flavobrunneum)* 2023

Version 1.0 Date 25.02.2023 | Revised by ~~XX~~SC8 | Endorsed by ~~XX~~SC8

Next review date: ~~20XX~~2024

Prepared by the SIOFA Secretariat

Please cite as: SIOFA Secretariat (2023). Fishery Summary: oilfish (*Ruvettus pretiosus)* and escolar (*Lepidocybium flavobrunneum).* Southern Indian Ocean Fisheries Agreement (SIOFA), 17 pp.

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1. Purpose of this document

The SIOFA Fisheries Summaries are public document that describe specific SIOFA fisheries in the SIOFA Area (Figure 1) and summarizes 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.

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

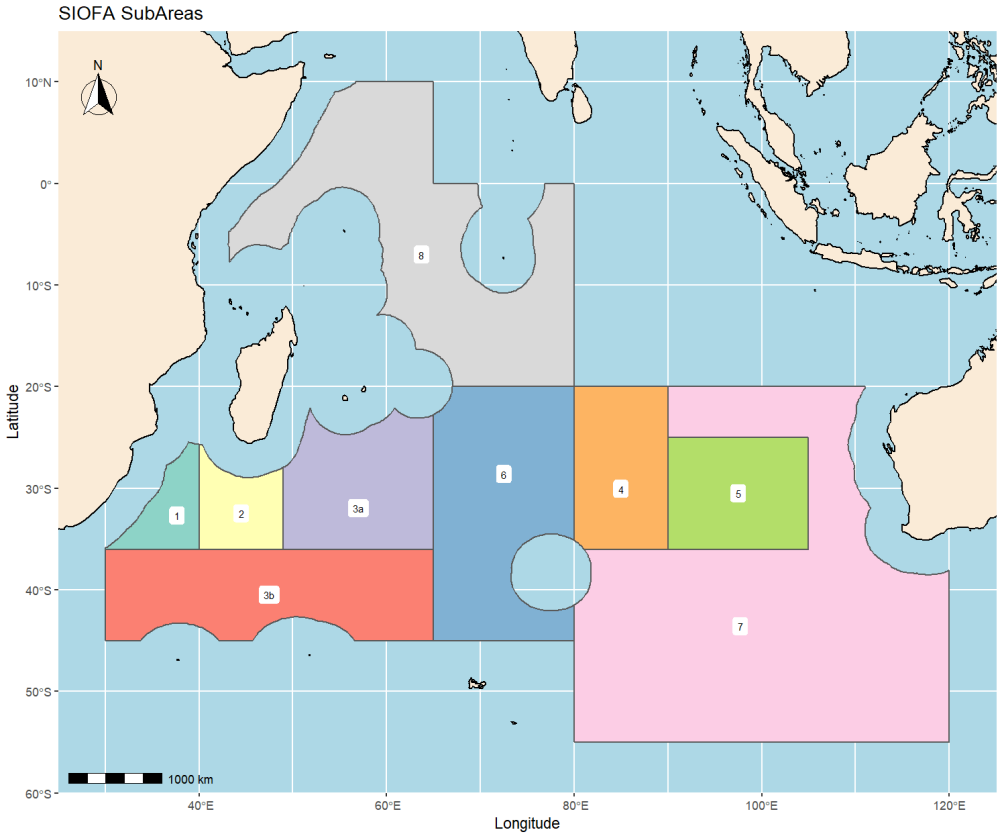

Figure 1 – The SIOFA Area and subareas (source: SIOFA Spatial Database). The subarea numbers and colour codes are used consistently throughout this Summary to identify subareas. ~~*The map highlights SIOFA Interim Protection Areas (in magenta) as defined in Annex 3 of CMM 2020/01. The interim protection areas have been labelled by name for easier recognition.*~~

2. Data sources - Data availability

There are thirteen Contracting Parties, Cooperating non Contracting Parties, and Participating Fisheries Entities of SIOFA (CCPs) that are the members of SIOFA. The SIOFA Secretariat receives data from CCPs pertaining to their fishing activities, biological sampling, and observer reports as per CMM 2021/02 (Conservation and Management Measure for the Collection, Reporting, Verification and Exchange of Data relating to fishing activities in the Agreement Area). The SIOFA Secretariat acts as custodian for these data on behalf of its members. Requests to release or publish these data (e.g., for scientific purposes) is regulated under CMM 2016/03 (Conservation and Management Measure for Data Confidentiality and Procedures for access and use of data). Data requests can be made through the Secretariat (secretariat@siofa.org).

The SIOFA databases are organized as follows:

- AggregatedCatchEffort: this database contains the catch and effort data aggregated at different spatial resolutions, varying from the whole SIOFA Area to 20' squares, for years from 2000 to 2019.
- HBHCatchEffort: this database contains haul-by-haul catch and effort data at recorded at a range of spatial resolutions, varying from degrees to seconds, for the years from 1998 to 2021.
- SIOFA Observer Database: this database contains data from Scientific Observers including biological sampling and operational data, for the years from 2012 to 2021

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

- Spatial data layers (in various formats), including the GIS spatial layers available to the Secretariat (e.g., boundaries of the SIOFA Subareas, Management Unit boundaries, etc.). These are stored at the SIOFA Secretariat
- Codes, including countries, gears and FAO species codes etc. These are stored at FAO.

SIOFA databases and supporting data assets have been described in the reports of project SEC2021-05 (e.g., SC-07-08), where it was noted that some data are repeated in the AggregatedCatchEffort and HBHCatchEffort databases.

Further data (e.g., the number of active vessels) are available from Annual National Reports that SIOFA CCPs submit to the Scientific Committee each year. These are available from the SIOFA website (https://siofa.org/meetings/groups/Scientific%20Committee%20Meeting).

3. Species Summary

Common name	oilfish and escolar
Scientific name	*Ruvettus pretiosus* and *Lepidocybium flavobrunneum*
Scientific synonyms	*Gempylidae* family
FAO species code	OIL and LEC
Year of this report	2023
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 oilfish and escolar fisheries in the SIOFA Area and available biological parameters for oilfish and escolar. For the purposes of this summary, 'oilfish' will be utilised to refer to both oilfish (OIL, *Ruvettus pretiosus*) and escolar (LEC, *Lepidocybium flavobrunneum*), unless otherwise specified.

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

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

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

4. Biological Summary

Oilfish *(Ruvettus pretiosus*) is a species of snake mackerel fish with a cosmopolitan distribution in subtropical and temperate oceans. Oilfish are found at depths of 100-800 m but more commonly 200-400 m. Escolar (*Lepidocybium flavobrunneum)*, another species of fish in the family *Gempylidae,* are found at similar depths (200–885 metres) in tropical to temperate waters around the world (Froese and Pauly 2022).

Oilfish and escolar can grow in excess of 2 m and over 50 kg, though most do not exceed 150 cm and 30 kg. The maximum recorded weight is 63.5 kg. Oilfish are generally encountered solitary or in pairs near the ocean floor. Not much is known about their reproductive biology but they are thought to undertake long seasonal migrations between feeding and spawning areas. They feed on benthopelagic fish, crustaceans, and squid (Vasilakopoulos et al. 2020).

Both species have very high levels of indigestible wax esters in their flesh (Aldsworth 2017), which has led to a ban on sales in some countries like Japan or Italy; nonetheless these species are sought after in several countries and are caught in substantial amounts in the SIOFA area.

5. Description of the fishery

5.1 Fleet and gear

Oilfish are targeted in the SIOFA Area using pelagic longlines. Target fisheries are confined to the western edge of the SIOFA area near the African continental shelf, but oilfish are also caught incidentally at lower levels in pelagic longline fisheries targeting tuna throughout the SIOFA area (Figure 1). The only CCP that participates in the target oilfish fishery is Chinese Taipei., but a very small amount of catch is also reported by other CCPs from midwater trawls and gillnets. In recent years, participation in the fishery has involved XX vessels per year (average of the last 5 years).

5.2 Fishing areas

Catch of oilfish have been reported in pelagic longline fisheries, targeting either oilfish or tuna or without a particular target, all across the SIOFA area (Figure 1). The highest catches of oilfish have been recorded from the western edge of the SIOFA area, near the African continental shelf, primarily in SIOFA subarea 1 and 3b.

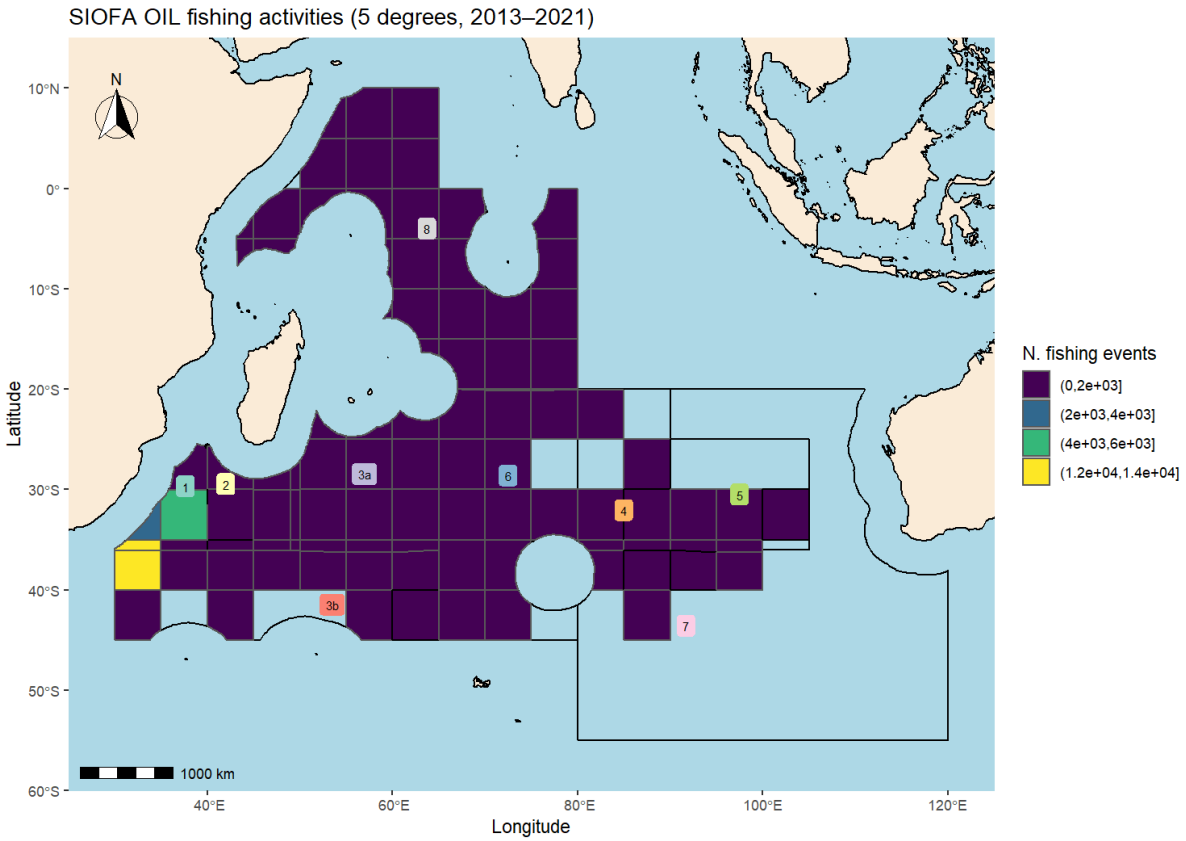

Figure 1: Spatial distribution of oilfish catches in the SIOFA Area, derived from haul-by-haul level fishing data, aggregated at a 5 x5 degree resolution (source: SIOFA HBHCatchEffort databases 2013–2021). This map represents all fishing events that caught any OIL or LEC, irrespective of declared target species.

5.3 Assessment Areas

No management units or areas for purposes of stock assessment have been defined for oilfish.

5.4 Catch and effort

Note that fishing effort and catches reported in this section are intended to represent total catch of OIL and LEC, irrespective of whether each particular fishing event had been targeting these two species or not. Consequently, CPUE represents the CPUE of all operations that caught oilfish even as bycatch, so if the share of operations actively targeting oilfish 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 oilfish in the SIOFA area were first reported in 2013, but at very low levels (Figure 2a). Effort and catches increased starting in 2015, and then stabilized at levels higher than the other main SIOFA species (Figure 2a). Oilfish are mainly caught in the western edge of the SIOFA area, particularly in subareas 1 and 3b (Figure 1).

Effort levels have been relatively stable in recent years, with an increase recorded in 2021. (Figure 2a). Note that the effort figures in Figure 2a include also fishing events that targeted species other than oilfish, so long as that fishing event also caught oilfish, but exclude all effort for which the oilfish catch was zero. For this reason, the unstandardised CPUE shown in Figure 3 cannot be considered an index of abundance. Oilfish is mostly caught in the western edge of the SIOFA area, near the African continental shelf (i.e. mainly subareas 1 and 3b; see Figure 2b).

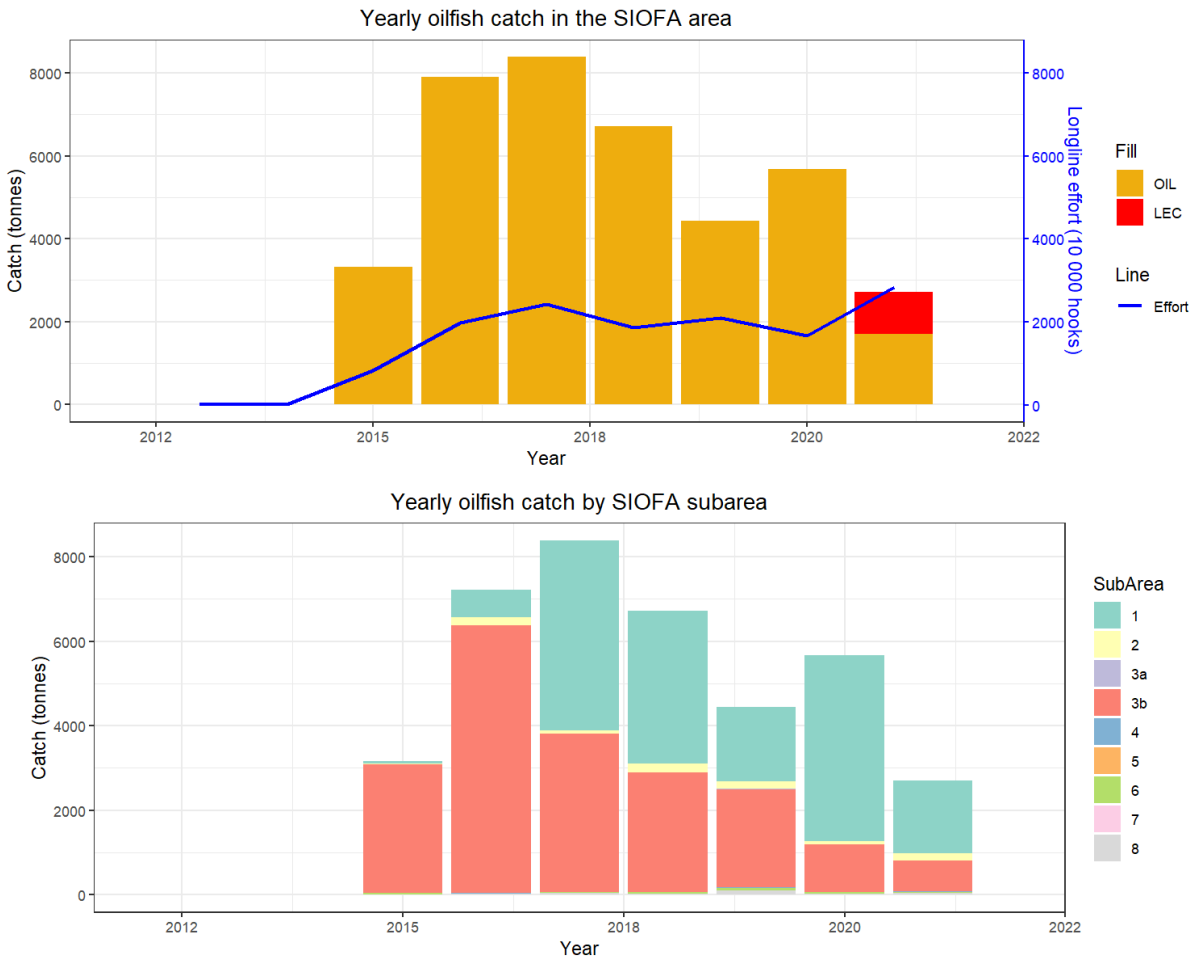

Figure 2a and b — Yearly catch of oilfish (tonnes) and effort (10 thousand hooks) in the SIOFA area (upper panel, a) and in different SIOFA subareas (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2021).

Effort has been relatively stable in recent years, with slightly declining catches (Figure 2), such that unstandardised catches per units of effort (CPUE) are slightly declining (Figure 3).

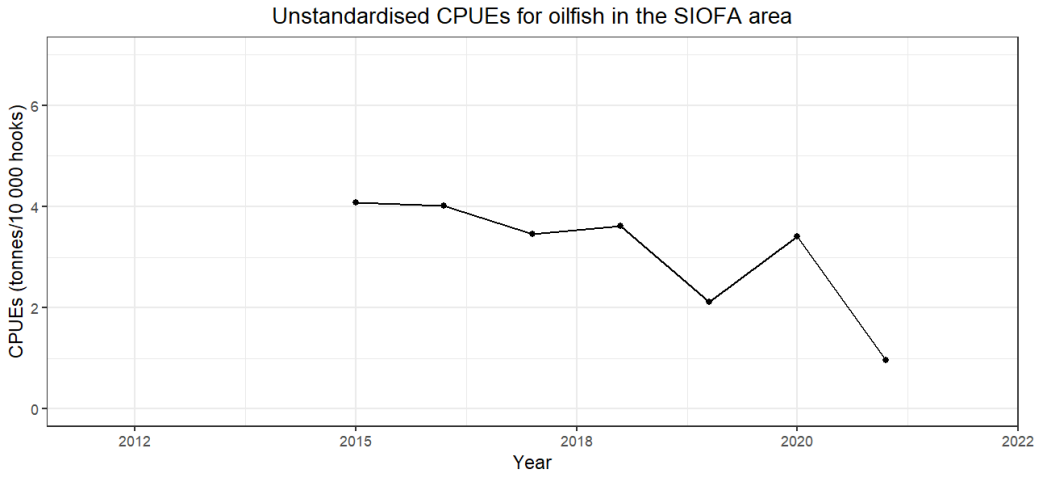

Figure 3 – Unstandardised catch per unit effort (CPUE) of oilfish in the SIOFA area (tonnes/tow) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2021).

The SC8 reviewed the annual catch, nominal CPUE and length frequency distributions of oilfish from the national report of Chinese Taipei and concluded that there was no obvious sign of negative impact from Chinese Taipei pelagic longline fishery on the oilfish stock in SIOFA area. The significant catch decline of 2021 was due to the sharp shrinkage in market demand so that those pelagic longline fishing vessels switched to target tuna species.

The SC8 recommended that the length distribution and the standardised CPUE should be used as oilfish stock indices in the short term, to monitor the oilfish stock in SIOFA area.

The SC8 recommended that Chinese Taipei provide working papers on analyses of the length fluctuation and the standardised CPUE of oilfish to the SC to review the pelagic longline fishery fishing impact on the oilfish stock.

In the following figures 'target catch' has been defined as the catch of oilfish and escolar that were caught in any fishing operation declaring OIL/LEC targets. All other species captured in OIL/LEC targeted fishing operations have been considered as non-target. Note that oilfish catches were first recorded in 2013 (see Figure 2), but oilfish was only recorded as a target species in the SIOFA area beginning in 2017, so these data are limited to the most recent years.

Low levels of incidental catch of oilfish have been reported in longline fisheries all across the SIOFA area (Figure 1) but oilfish target fisheries are confined to the western edge of the SIOFA near the African continent, primarily in subarea 1 and to a lesser extent in subarea 3b (Figure 4). The distribution of non-target catch in oilfish target fisheries was similarly distributed (Figure 5).

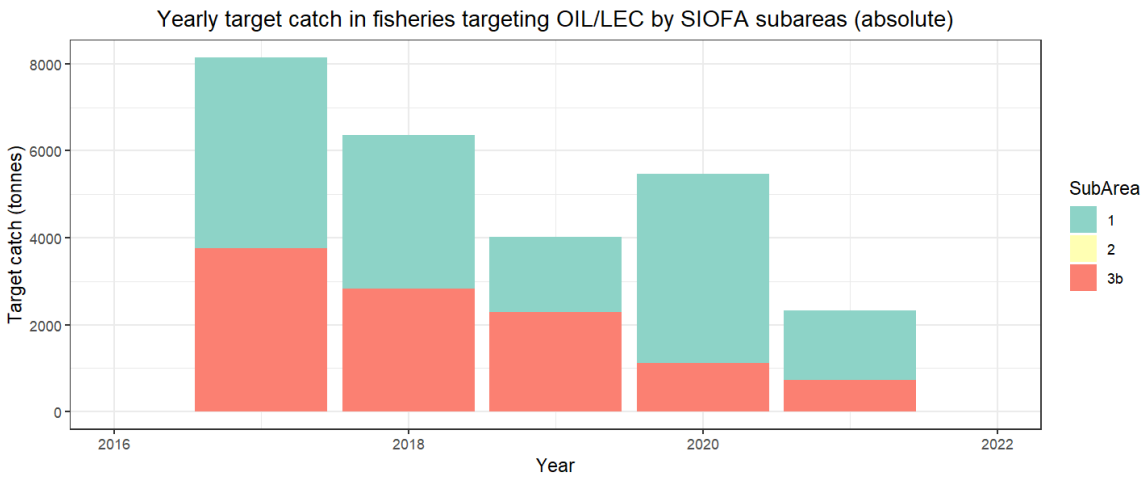

Figure 4 – Oilfish target catch in different SIOFA subareas in relative terms (source: SIOFA AggregatedCatchEffort and HBHCatchEffort database 2013–2021). Catches reported without location information are not included.

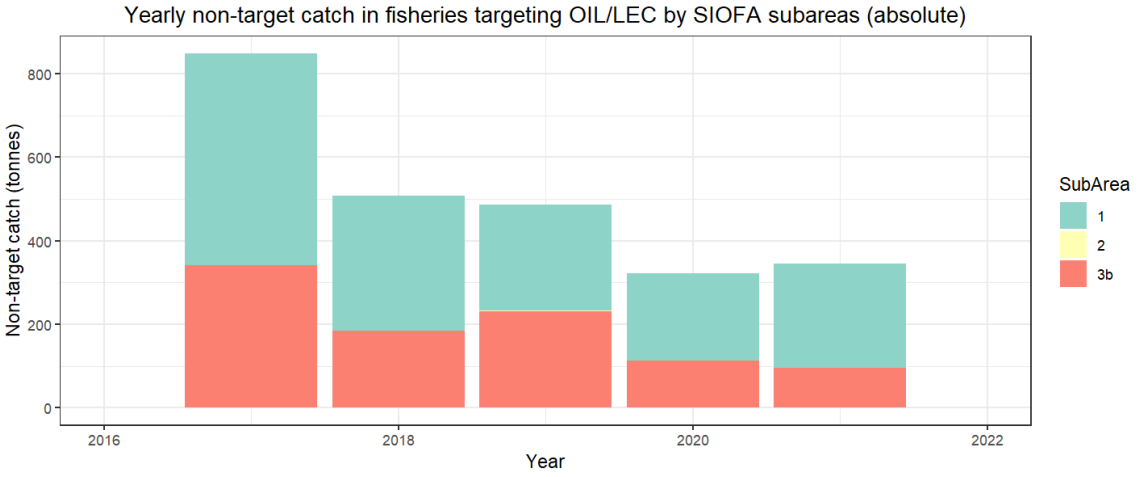

Figure 5 – Catch of all species other than oilfish in oilfish target fisheries, by subarea and year (source: SIOFA AggregatedCatchEffort and HBHCatchEffort database 2013–2021). Catches reported without location information are not included.

5.4.1 Catch limits

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

5.5 Illegal Unreported and Unregulated (IUU) catch

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

5.6 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). Whale depredation is mostly associated with toothfish fisheries; the extent to which whale depredation also affects longline fisheries targeting or catching oilfish is unknown.

6. Stock assessment and status

6.1 Stock assessment and status

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

6.2 Harvest strategy and reference points

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

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 oilfish, Butterworth et al. (2021) noted 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 SAFE methodology; see Zhou et al. 2016).

6.3 Stock structure and status

The stock structure and status of oilfish have not been defined.

7. Data collection

Catch and effort data collected are collected and submitted by the different CCPs participating in the fishery. A summary of these data is not available at this time.

Scientific observer data are collected as a requirement of CMM2021/02, submitted by different CCPs participating in the fishery.

7.1 Biological data summaries

A summary of biological measurements collected by fisheries observers, and the proportion of the catch measured per year, are shown in Table 1.

Table 1 – Summary of the number of oilfish measured by scientific observers in 2013–2021 for length, and their fraction of their total catch (sources: SIOFA Observer database 2013–2021, Cook Island 2020 data, and Chinese Taipei National Report 2020). The fraction of the catch measured (%, 2 decimals precision) was derived considering the average weight of an individual measured in every given year. N/A marks years for which a given measure or ratio was not available.

	Oilfish

Year	N. of individuals measured	% of catch measured
2013	N/A	N/A
2014	N/A	N/A
2015	14	0.01
2016	10	0.00
2017	12558	N/A
2018	87933	N/A
2019	59919	12.56
2020	75990	30.03
2021	12399	2.78

7.2 Tag data

SIOFA does not require or conduct any tagging of oilfish.

8. Summaries of abundance indices and other observational data

8.1 Scaled length frequencies

Scaled length frequency data are not available for oilfish.

8.2 Scaled age frequencies

Scaled age frequency data are not available for oilfish.

8.3 CPUE indices

Effort has been relatively stable in recent years, with slightly declining catches (Figure 2), such that unstandardised catches per units of effort (CPUE) are slightly declining (Figure 3). In 2021 effort increased and catches decreased, leading to a marked decline of unstandardised CPUE.

Unstandardised CPUE cannot be considered a reliable index of abundance. However, standardised CPUE have not been produced for these species.

8.4 Acoustic biomass indices

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

8.5 Trawl survey indices

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

8.6 Tag based abundance estimates

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

9. Biological parameters

Biological parameters have not been estimated for oilfish from data collected specifically from SIOFA fisheries. Globally, very little is known about their growth and reproductive biology (Vasilakopoulos et al. 2011).

Butterworth et al. (2021) propose = 0.11, L_∞ = 90 cm, and maximum age = 42, but note that the maximum size is not consistent with lengths exceeding 2 m from individuals sampled elsewhere.

Table 2: Biological parameters for oilfish are mostly unknown.

Relationship	Parameter (units)	Area	Value			References
			Both	Male	Female	
Natural mortality	M (y^{-1})	all	0.11			Butterworth et al. (2021)
Von Bertalanffy growth coefficient	t_0 (y)					
	k (y^{-1})					

	L_∞ (cm)	90	Butterworth et al. (2021)
	c.v.		
Length-weight	a ($t.cm^{-1}$)		
	b		
Maturity	a_{50} ($\pm a_{to95}$)		
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 oilfish in the SIOFA Area.

Butterworth et al. (2021) proposed a value of M = .11 for oilfish in the SIOFA area.

9.2 Growth parameters

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

Butterworth et al. (2021) proposed the following biological growth parameters for oilfish (Table 3) but note that the L-inf value is not consistent with much larger individuals sampled elsewhere.

Table 3 – Growth parameters for oilfish in the SIOFA Area proposed by Butterworth et al. (2021).

Parameter	Combined sex
L-inf	90 cm
kappa	0.2
Average age at maturity	?
Maximum age	42

9.3 Length/age relationship

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

Von Bertalanffy growth parameters for based on review of oilfish parameters derived elsewhere are shown above in Tables 1 and 2 (from Butterworth et al. 2021).

9.4 Maturity and spawning

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

9.5 Stock recruitment relationship

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

9.6 Tag parameters

SIOFA does not require or conduct any tagging for oilfish.

10. Target/non-target catch and ecosystem impacts

Non-target fish catch commonly refers to the capture of all fish species that were not intended as a target in a given fishing event. All fish caught but not declared as targets (CMM 2021/02) are considered non-target catch for the purpose of this section.

10.1 Oilfish target vs non-target catch

The total/nontarget catch ratio in the oilfish fisheries suffers from a lack of reported targets for fishing events that caught oilfish before 2017, which makes it impossible to unambiguously determine what were the target vs. non-target catches before that date. Target vs. non-target catch is depicted in Figure 6.

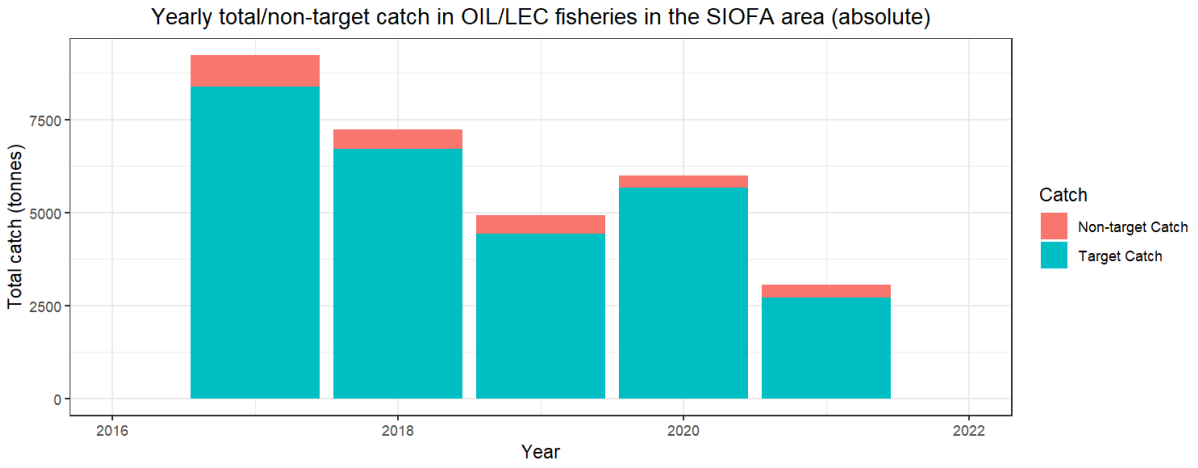

Figure 6a and b – Total catch of oilfish and other non-target species in SIOFA fisheries that targeted oilfish, shown as relative values (upper panel, a) and absolute values (lower panel, b) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2021). Catches reported without location information are not included. Note that catch data for years prior to 2017 did not record oilfish as a target species.

The only species reported as non-target catch in SIOFA fisheries targeting OIL/LEC were pelagic fishes nei (PEL) and elasmobranchs nei (SKX), as shown in Figure 7.

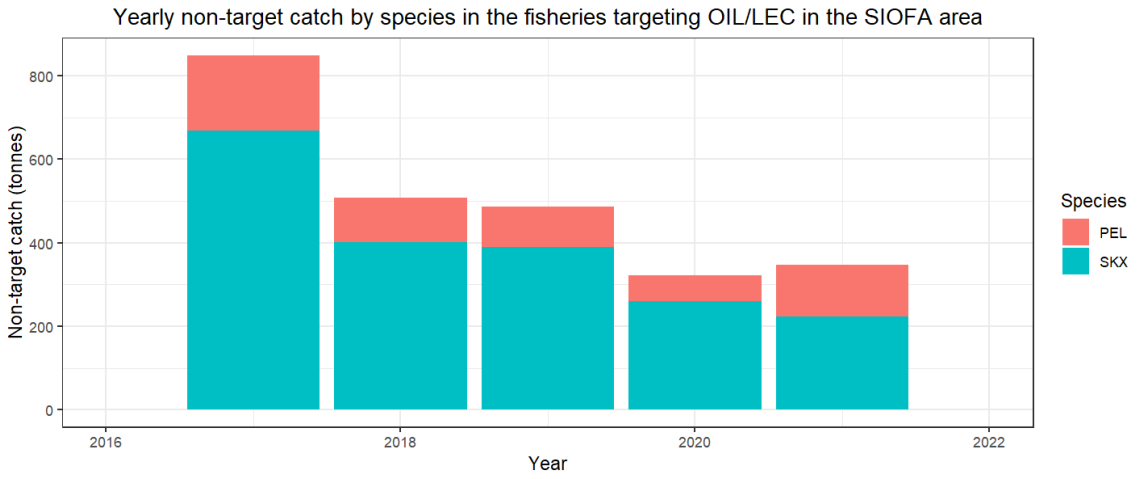

Figure 7 – Yearly non-target catch in fisheries targeting oilfish in the SIOFA area, by species (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2021). Species are identified by their 3-letter FAO code. Note that oilfish as a target species was first recorded in 2017; earlier years should be regarded as missing data, not reported zeroes.

10.1 Target/non-target catch by SIOFA subarea

These ratios are not available broken down by SIOFA subarea at this time, they are partly reported in Section 3.4.

10.2 Target/non-target catch in management units

No management units are designated for oilfish.

10.3 Incidental catch of VME taxa and other invertebrates

Oilfish are targeted using pelagic longlines, and occasionally caught as bycatch using other methods. VME capture data are recorded in longline fisheries but are unavailable broken down by fishery at this time.

11. Interactions with seabirds, mammals, turtles, sharks and other species of concern

Note that, to date, captures of protected species in the SIOFA area have not been characterised on a per-fishery basis. Protected species captures in the whole SIOFA area are characterised in the SIOFA Ecosystem Summary.

11.1 Seabirds

Seabird captures and interactions have not been characterised specifically for oilfish fisheries at this time.

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

11.2 Marine mammals

Marine mammal captures and interactions have not been characterised specifically for oilfish fisheries at this time.

Some interaction may be expected to occur between oilfish 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 oilfish is unknown.

11.3 Turtles

Turtle captures and interactions have not been characterised specifically for oilfish fisheries at this time.

11.4 Sharks

Shark captures and interactions have not been characterised specifically for oilfish fisheries at this time.

12. Effects of the fishery on the ecosystem

The effects of this fishery on the ecosystems are unknown.

13. References

Aldsworth, T. (2017). Chapter 25 – Fish: Escolar and OIlfish. pp. 527-533 in: Foodborne Diseases (Third edition). Academic Press. https://doi.org/10.1016/B978-0-12-385007-2.00025-5

Butterworth, D.S., Brandao, A., and Johnston, S. (2021) Report on the development of Harvest Strategies for key target species in the SIOFA area (Project code SE2020-01). Marine Resource Assessment and Management Group (MARAM). Confidential report to SIOFA.

(Froese, R. and Pauly, D. (2022). FishBase. Word Wide Web electronic publication. www.fishbase.org

Gasco, N., Tixier, P., and Guinet, C (2021). Protocol for documenting marine mammals interaction in deep sea demersal longline fisheries. 3rd Meeting of the Stock and Ecological Risk Assessment Working Group (SERAWG3). SERAWG-03-06, 10pp.

Vasilakopoulos, P., Pavlidis, M., and Tserpes, G. (2011). On the diet and reproduction of the oilfish Ruvettus pretiosus (Perciformes: Gempylidae) in the eastern Mediterranean. Journal of the Marine Biological Association of the United Kingdom, 91(4), 873-881. doi:10.1017/S0025315410001785