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SC-08-21<u>-Rev1</u>

Fishery Summary: hapuka (*Polyprion spp*.), hapuku wreckfish (*Polyprion oxygeneios*), wreckfish (*Polyprion americanus*) 2023

The SIOFA Secretariat

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Abstract					
This paper presents the SIOFA fishery summary for hapuka (<i>Polyprion spp</i> .), hapuku wreckfish (<i>Polyprion oxygeneios</i>), wreckfish (<i>Polyprion americanus</i>) 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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² Documents available only to members invited to closed sessions.



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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 hapuka, hapuku wreckfish and wreckfish 2023.
- **provides** any comments or edits to the SIOFA Fishery Summary for hapuka, hapuku wreckfish and wreckfish 2023 during the SC meeting.
- **endorses** the SIOFA Fishery Summary for hapuka, hapuku wreckfish and wreckfish 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 hapuka, hapuku wreckfish and wreckfish 2023.



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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 <u>CMM 2021/02</u> (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 <u>CMM 2016/03</u> (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 (<u>https://siofa.org/meetings/groups/Scientific%20Committee%20Meeting</u>).

3. Species Summary

Common name	Hapuka, hapuku wreckfish, wreckfish
Scientific name	Polyprion spp., Polyprion oxygeneios, Polyprion americanus,
Scientific synonyms	Polyprion spp.
FAO species code	HAU, WHA, WRF
Year of this report	2023
Assessment Areas/	Not defined
Management Units	
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 remainder of this Summary 'hapuka' and the generic code HAU will be used to refer collectively to WHA, WRF, and HAU, unless otherwise specified.

No 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.

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 (Figures 1 and 3). The CCPs that have participated in the hapuka fishery (2000–2021) are Australia, China, the EU (Spain), and Korea. In recent years, participation in the fishery has involved XX 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 1).



Figure 1 – Spatial distribution of fishing activities that caught hapuka in the SIOFA Area, derived from haul-byhaul 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 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 in the SIOFA area were first reported in 2013, but at very low levels. Catches of hapuka have significantly increased since 2019 and especially in 2020, and effort has also correspondingly increased. The yearly catch composition is variable, but wreckfish (WRF, *Polyprion americanus*) was the most commonly caught species in 2020 and 2021 (Figure 2a).



Figure 2a and b — Yearly catch of hapuka (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).

Because HAU as a target species was only recorded beginning in 2018, the effort figures in Figure 2a include also fishing events that targeted species other than hapuka or had no target reported, so long as that fishing event also caught hapuka, but exclude all effort for which the hapuka catch was zero. For this reason, the unstandardised CPUE shown in Figure 4 cannot be considered a reliable index of abundance. Hapuka is mostly caught in the western SIOFA area (subareas 3a and 3b) in association with underwater features.



Figure 3 – Unstandardised catch per unit effort (CPUE) of hapuka in the SIOFA area (tonnes/tow) (source: SIOFA AggregatedCatchEffort and HBHCatchEffort databases 2013–2020).

For this section 'target catch' has been defined as catch of HAU, WHA, or WRF in fisheries that declared either of these taxa as a target. All other species have been considered non-target. Note that hapuka was only recorded as a target species in the SIOFA area beginning in 2018, so these data are limited to the most recent years. Actual catches of hapuka in SIOFA fisheries were reported also in earlier years (i.e. see Figure 3) but prior to 2018, target species were not recorded in these longline fisheries.

Hapuka are captured in longline fisheries primarily in the western SIOFA area (subareas 2, 3a, and 3b). and to a much lesser extent in a small portion of subarea 4 (Figure 1) but hapuka are only recorded as a target species in the western subareas (Figure 4).



Figure 4 – Hapuka 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.

In fisheries targeting hapuka, non-target species catches were distributed similarly to the target catches across subareas (Figure 5).



Figure 5 – Catch of all species other than hapuka in hapuka 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 hapuka in the SIOFA area.

5.5 Illegal Unreported and Unregulated (IUU) catch

No claims of Illegal Unreported and Unregulated (IUU) catches of hapuka 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). 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

6.1 Stock assessment

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

6.2 Harvest strategy and reference points

Harvest strategies for hapuka 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 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).

6.3 Stock structure and status

The stock structure and status of hapuka 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. A summary of these data is not available at this time.

7.1 Biological data summaries

Data from the biological sampling of target species are collected and submitted by the different CCPs participating in the fishery. A summary of these data is not available at this time.

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) have been relatively stable in recent years. However because target species was only consistently recorded since 2019, such that effort totals include other longline targets, and catch totals include hapuka caught as bycatch, unstandardised CPUE cannot be considered a reliable index of abundance. 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 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 1.

Relationship	Parameter	Area		Value		References
	(units)		Both	Male	Female	
Natural mortality	<i>M</i> (y⁻¹)	all	0.09			Wakefield
						et al. (2010)
Von Bertalanffy	<i>t</i> o (y)		-0.63	-0.47	-0.20	Wakefield
growth coefficient			(-0.84 – 0.71)	(-1.48 - 0.55)	(-1.48 – 1.08)	et al. (2010)
	<i>k</i> (y ⁻¹)		0.24	0.22	0.23	Wakefield
			(0.20 – 0.27)	(0.18 – 0.26)	(0.18-0.29)	et al. (2010)
	<i>L</i> ∞ (cm)		890	877	90.5	Wakefield
			(880 – 900)	(864-890)	(88.7 – 92.2)	et al. (2010)
	C.V.					
Length-weight	a (t.cm⁻¹)					
	b					
Maturity	a ₅₀ (±a _{to95})			6.8	7.1	Wakefield
				(+10.1)	(+9.5)	et al. (2010)
	L50 (±to95)			70.2	76.0	Wakefield
				(+77.4)	(+85.1)	et al. (2010)
Stock recruitment relationship						
Stock recruitment	h					
Recruitment	σ R					
Ageing error type	Normal					
Ageing error parameters	C.V.					

Table 1: Biological parameters for hapuka (P. oxygeneios) as estimated by Wakefield et al. (2010).

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 are shown below in Table 2.

Table 2 – 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 1 (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. 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 (<u>CMM 2021/02</u>) are considered non-target catch for the purpose of this section.

10.1 Hapuka target vs non-target catch

The total/nontarget catch ratio in the hapuka fisheries suffers from a lack of reported targets for fishing events that caught hapuka before 2018, which makes it impossible to unambiguously determine what were the target vs. non-target catches before that date. Target vs. non-target catch is illustrated in Figure 6.





Figure 6a and b – Total catch of hapuka and other non-target 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 2013–2021). Catches reported without location information are not included. Note that catch data for years prior to 2018 did not record hapuka as a target species.

The species identity of non-target catches is shown in Figure 8. The most commonly reported nontarget fish species reported caught in hapuka target fisheries are: yellowtail amberjack, bluenose warehou, terakihi, and alfonsino.



Figure 8 – Yearly catch weights of non-target species in fisheries targeting hapuka 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 hapuka as a target species was first recorded in 2018; earlier years should be regarded as missing data, not reported zeroes.

10.2 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.

10.3 Target/non-target catch in management units

No management units are designated for hapuka.

10.4 Incidental catch of VME taxa and other invertebrates

Hapuka are targeted using bottom longlines and droplines. VME capture data are recorded in longline fisheries, but data are broken down by fishery are unavailable 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 Ecosystems summary.

11.1 Seabirds

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

Provisions for the mitigation of accidental capture of seabirds in hapuka fisheries are in <u>CMM</u> <u>2022/13</u> (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 hapuka fisheries at this time.

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.

11.3 Turtles

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

11.4 Sharks

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

12. Effects of the fishery on the ecosystem

The effects of this fishery on the ecosystems are unknown.

13. References

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