SEAFOOD
NEW ZEALAND
DEEPWATER COUNCIL

SOUTHERN BLUE WHITING SITUATION REPORT

PREPARED FOR MSC REASSESSMENT 2024

TABLE OF CONTENTS

https://seafoodnz.sharepoint.com/sites/Deepwater/Projects/Projects_2023-24/2590_1_2_3_HHLS_MSC_Recertification/Reports/2024 Situation Reports/Situation Report for New Zealand Southern Blue Whiting Trawl Fisheries 2024 240225 v3.docx
Updated 27 September 2024
Missing/broken links updated 25 Feb 2025

SITUATION REPORT FOR MSC REASSESSMENT 2024

NEW ZEALAND SOUTHERN BLUE WHITING TRAWL FISHERIES

PURPOSE OF THIS REPORT

This report is one of three prepared for the combined MSC reassessment of New Zealand hake, hoki, ling and southern blue whiting under FS v3.0.

1. Situation Report for New Zealand Hoki, Hake & Ling Trawl Fisheries
2. Situation Report for New Zealand Ling Longline Fishery
3. **Situation Report for New Zealand Southern Blue Whiting Trawl Fisheries**

This report provides information on two Units of Certification (UoC), the southern blue whiting trawl fisheries in Quota Management Areas SBW 6B (Bounty Plateau) and SBW 6I (Campbell Island Rise). The report builds on information previously provided for surveillance audits under FS v1.3.

It is Seafood New Zealand Ltd – Deepwater Council's (DWC) submission that these two fisheries conform to the MSC Fisheries Standard (v3.0) as evidenced in the following information and references.

All cited references are available here: https://tinyurl.com/SBWhiting

OVERVIEW OF FISHERY MSC CERTIFICATION

Southern blue whiting trawl certification details

Certification date	Initial Certification: September 2013 Recertification: September 2018 (synchronised with Hoki)
Stock areas	UoC 1: Bounty Platform (SBW 6B) UoC 2: Campbell Island Rise (SBW 6I)
Species	*Micromesistius australis*
Method/gear	Mid-water and bottom trawling

P1 OVERVIEW OF STOCK STATUS INFORMATION

Stock status summary for the combined UoC covered by this report (SBW trawl fisheries)

Table 1: Summary of UoC stock status from Base model runs

Stock	Most recent assessment	Depletion [Year]	P > Target	P < Soft Limit	P < Hard Limit
SBW 6B	2023*	-	< 60%	-	-
SBW 6I	2023	64% B_0 [2022]	>90%	< 1%	< 1%

* Harvest control rule simulations

Stock status, TACC & catches by component UoCs

UoC 1 - 2 – SBW 6B, SBW 6I

Table 2: Summary of UoA and UoC share of TACC

	SBW 6B	SBW 6I
UoA share of TACC	100%	100%
UoC share of TACC	87%	87%

Update on stock status (FNZ, 2024)

SBW 6B:

- For Bounty Plateau (SBW 6B) a management target is set based on a fishing mortality rate calculated from a Harvest Control Rule
- 2023 updates to the Harvest Control Rule simulations determined that the stock is Likely (> 60%) to be below the target fishing effort threshold F, but that overfishing is Unlikely (< 40%) to occur at the TACC, which is set in line with the HCR_{2022} results.

SBW 6I:

- For Campbell Rise (SBW 6I), B_{2022} was estimated to be 64% B_0.
- Very Likely (> 90%) to be at or above the management target of 40% B_0 (base case run) and Exceptionally Unlikely (< 1%) to be below the soft or hard limits.
- The biomass is expected to decrease over the next 1 – 5 years if catches are at the TACC of 39 200 t. The biomass is expected to remain above the target (40% B_0) until 2027 at current catches (18 200 t).

TACC & catch trends (FishServe, 2024)

Table 3: TACC, catch limits, catch and associated balances for the SBW 6B and SBW 6I fisheries from 2019-20 to 2023-24. The fishing year relates to the 1 April – 31 March.

Stock	TACC	2019-20	2020-21	2021-22	2022-23	2023-24	5-year average
SBW 6B	TACC (t)	3,145	2,830	2,830	2,264	2,264	

	ACE	3,460	2,830	3,113	2,264	2,478	
	Catch (t)	788	1,100	801	125	2,010	965
	Balance (t)	2,672	1,730	2,312	2,139	468	1,864
SBW 6I	TACC (t)	39,200	39,200	39,200	39,200	39,200	
	ACE	43,553	43,428	43,428	43,308	43,065	
	Catch (t)	26,517	11,982	19,514	22,985	21,583	20,516
	Balance (t)	17,036	30,302	23,915	20,323	21,482	22,611

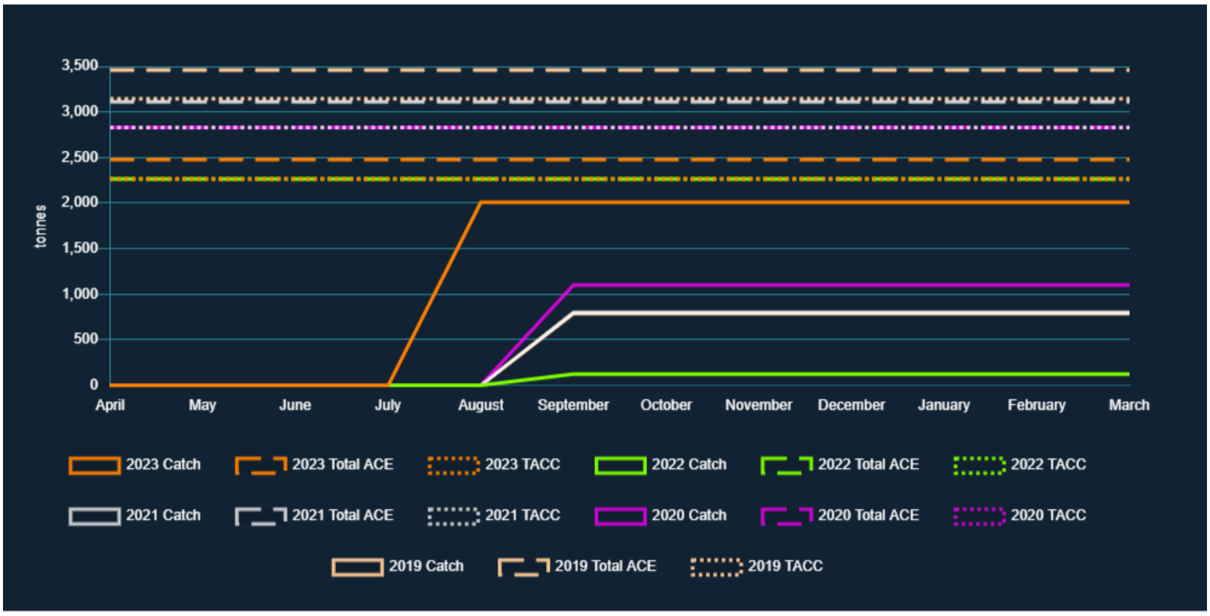

Figure 1: Reported commercial landings, total ACE and TACC for SBW 6B (Bounty Plateau) for fishing years 2019-20 – 2023-24. (Source: FishServe KUPE system)

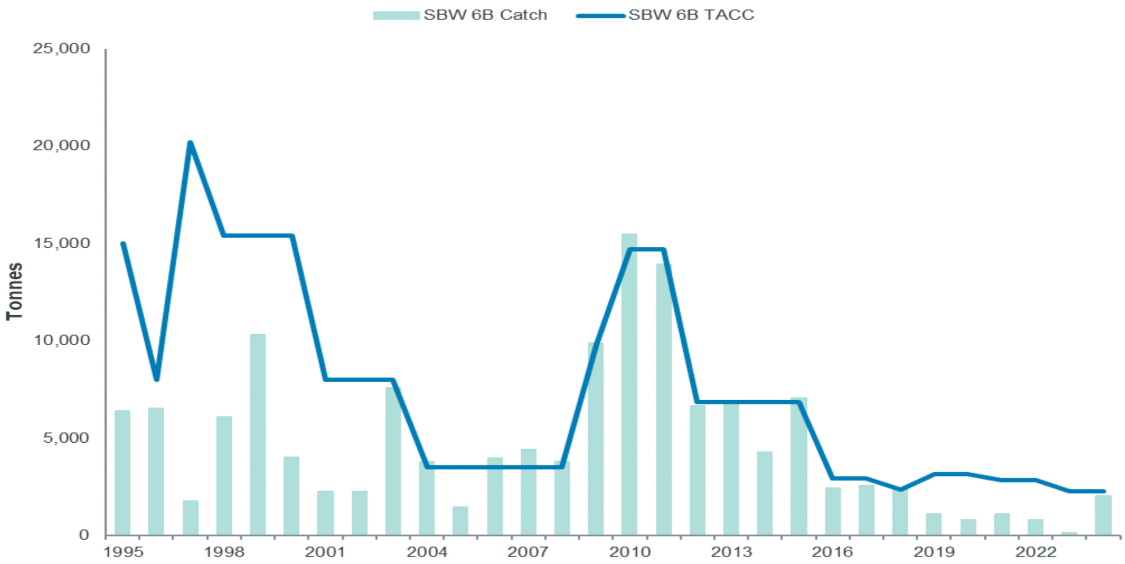

Figure 2: Reported commercial landings and TACC for SBW 6B (Bounty Plateau)

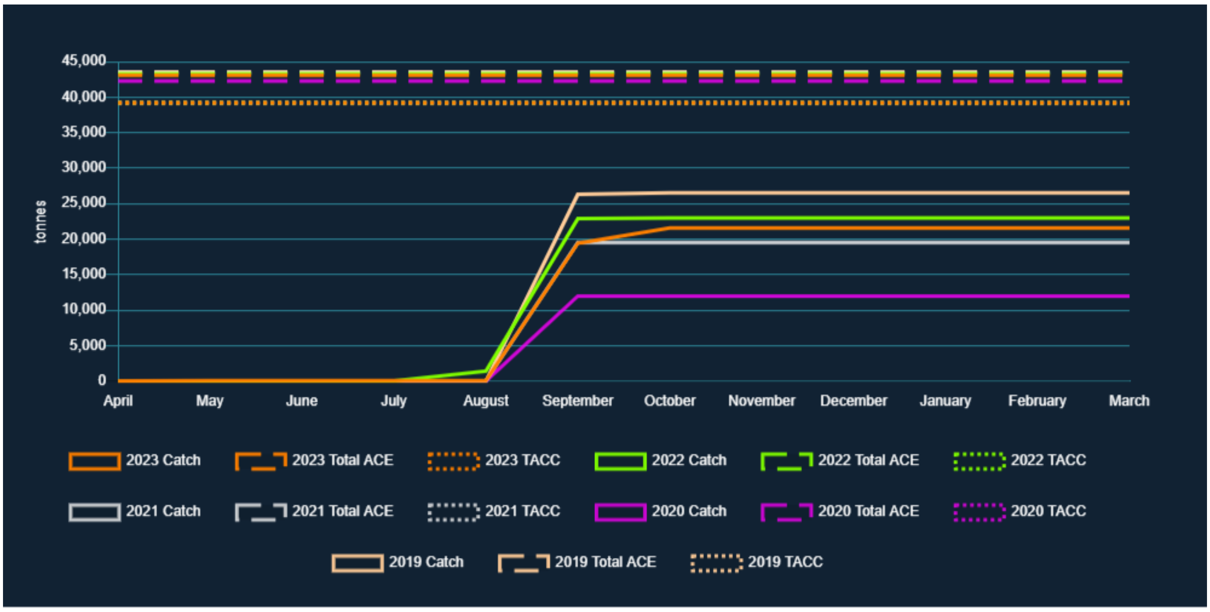

Figure 3: Reported commercial landings, total ACE and TACC for SBW 6I (Campbell Island Rise) for fishing years 2019-20 – 2023-24. (Source: FishServe KUPE system)

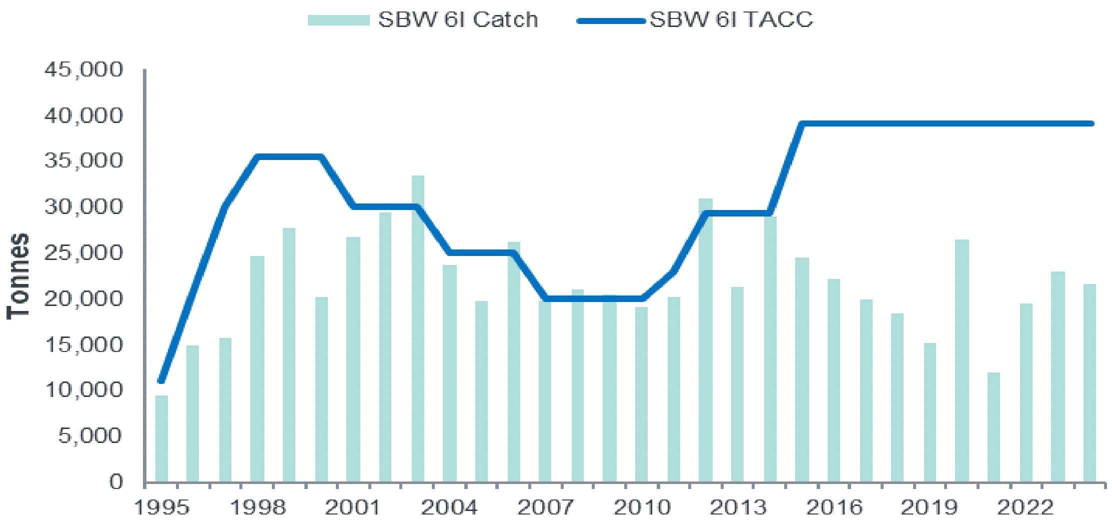

Figure 4: Reported commercial landings and TACC for SBW 6I (Campbell Island Rise)

Stock assessment development and structure

SBW 6B

Quantitative stock assessments were discontinued after 2014 when model runs failed to adequately fit both the high local-area aggregation acoustic biomass estimates observed in 2007-2008 and the lower biomass estimates observed since 2009. Subsequent focus has been on the development of a Harvest Control Rule that would lead to a low risk of the stock falling below the soft limit reference point. The HCR assumes that the most recent acoustic abundance index is an absolute measure of abundance (Doonan, 2017). Risk is defined as the probability of the spawning stock biomass (*SSB*) being below the soft limit (20% SSB_0).

Surveys in 2018, 2019, 2020, 2021 and 2022 were unsuccessful and in 2022 the HCR_{2017} was updated to take account of gaps in surveys and simulations were undertaken to maintain the risk at its target level as the number of years between surveys increased (Doonan, 2023). Table 4 illustrates how the TAC would be adjusted based on the gap between biomass surveys.

Table 4: An example of HCR_{2022} in use over the gap 2018 to 2022, using the 2018 TAC of 3 209 t as the starting point. Note: the TACC is adjusted down from the TAC to account for bycatch in non-target fisheries.

Year	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Gap size at calculation time		1	2	3	4	5
TAC (t)	3 209	2 792	2 401	1 993	1 654	1 373
D_i		0.87	0.86	0.83	0.83	0.83

A partial quantitative stock assessment was used to develop harvest control rules based on simulations of an age-structured model. These results of the HCR were used to calculate F thresholds to be used for setting management targets (Figure 5 and Figure 6),

The biomass of the Bounty Plateau is expected to stay at the target threshold based on the TACCs being updated in line with the results of HCR_{2022} and F is expected to remain relatively stable.

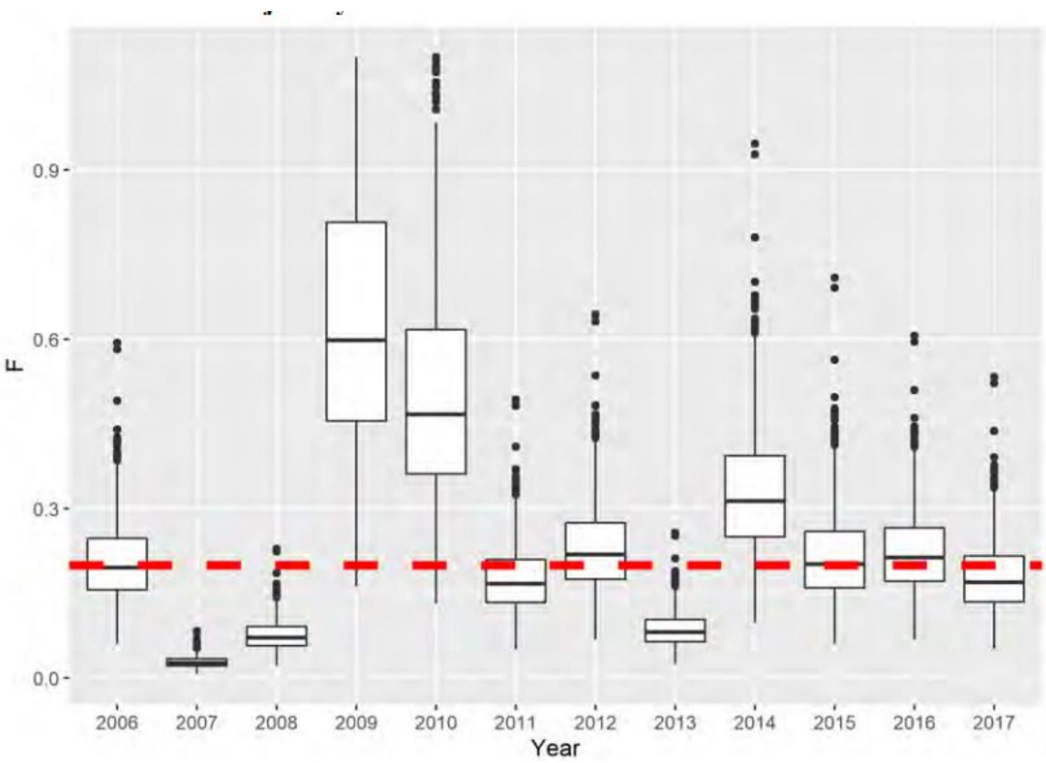

Figure 5: *F* distribution using historical data and the *q*-prior used in the simulations. Dashed red line is at the agreed target of 0.2 (i.e., M) (Source: FNZ, 2023)

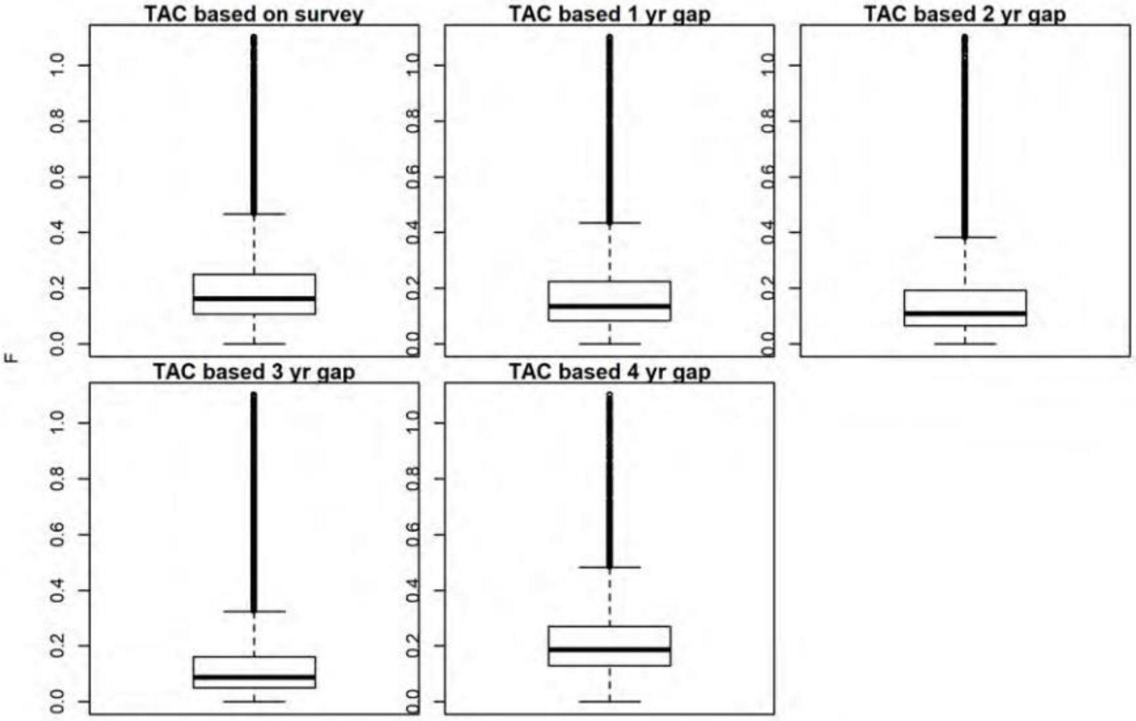

Figure 6: *F* distribution from years 50 to 120, for years that had their TAC determined by a survey the previous year, using the adjustment, for a gap of 1 year, and similarly for 2, 3, and 4-year adjustments. (Source: FNZ, 2023)

Following a successful biomass survey in August 2023, application of the HCR indicated that a TAC of 4 988 t would be appropriate (i.e. an increase of 2 679 t), (Doonan, 2023a). In addition, ageing of fish from the 2023 survey confirmed there has been strong recruitment into the fishery from the 2018 year-class. On 1 April 2024 the Minister for Oceans and Fisheries approved an increase in the TACC from 2 264 t to 4 888 t for the 2024-25 fishing year (FNZ, 2024).

SBW 6I

An updated stock assessment for Campbell Rise (SBW 6I) was completed in 2023 (Doonan et al., in press), using a two-sex, single stock and area Bayesian statistical catch-at-age model using the stock assessment programme CASAL2. The model was fitted to a single time series of acoustic biomass estimates (Escobar-Flores et al., 2023) and the catch-at-age data from the fishery (Holmes et al., 2023).

With strong recent recruitment the biomass has increased well above the management target and B_{2022} was estimated to be 64% B_0. Overfishing is Very Unlikely (< 10%) to be occurring. The biomass would be expected to decrease over the next 1 – 5 years if catches are at the TACC (39 200 t). At current catches (~22 000 t), the biomass will remain above the target of 40 % B_0 until 2027 (Figure 7), (FNZ, 2024).

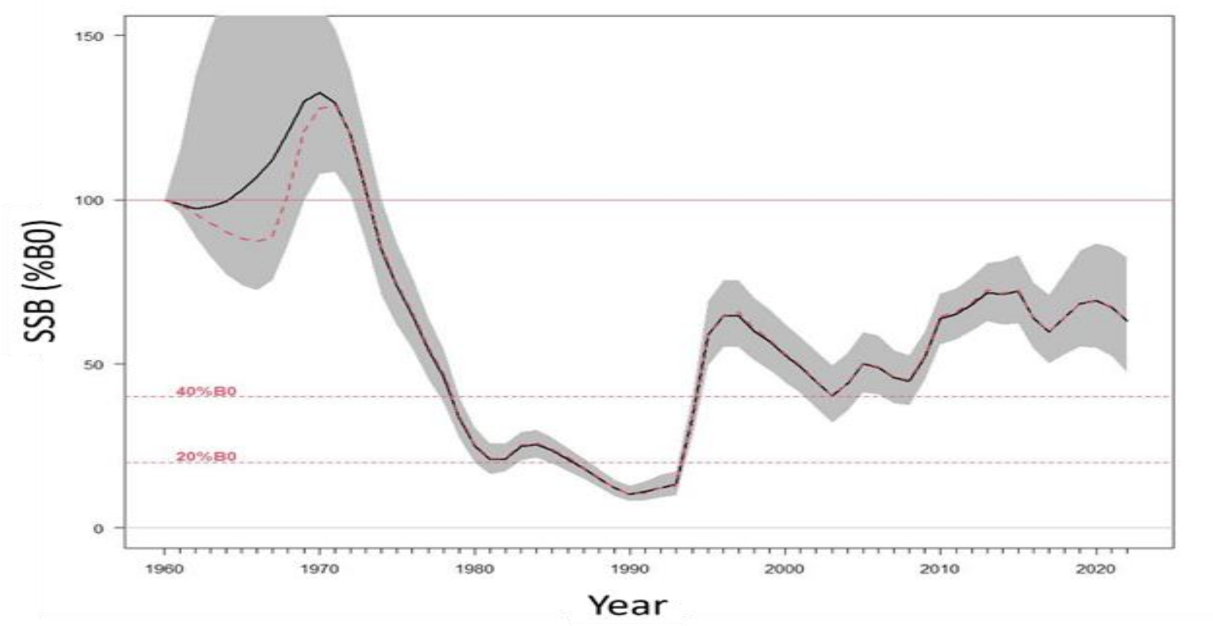

Figure 7: Trajectory over time of spawning biomass (%B_0) for the Campbell Island Rise southern blue whiting stock from the start of the assessment period in 1960 to 2022. The red horizontal lines show the management target (40% B_0) and the soft limit (20% B_0). Biomass estimates are based on Base case MCMC results. (Source: FNZ, 2024)

Key P1 references

Doonan, I.J. (2017). Evaluation of a simple harvest control rule for the Bounty southern blue whiting management area (SBW6B). New Zealand Fisheries Assessment Report 2017/52. 14 p. https://fs.fish.govt.nz/Doc/24495/FAR-2017-52-SBW_harvest_control.pdf.ashx.

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Escobar-Flores, P.C., Ladroit, Y. & Holmes, S. (2023). Acoustic estimates of southern blue whiting from the Campbell Island Rise, August-September 2022 (TAN2210). https://fs.fish.govt.nz/Doc/25553/FAR-2023-37-Southern-Blue-Whiting-Acoustic-Estimates-SWB6I-Aug-Sep-2022-TAN2210-4385.pdf.ashx.

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FNZ (2024a). Minister's Decision Letter, Sustainability Measures 1 April 2024. https://www.mpi.govt.nz/dmsdocument/61321-The-decision-letter-Minister-for-Oceans-and-Fisheries

Holmes, S. J., Bian, R. & Doonan, I.J. (2023). Review and summary of the time series of input data available for the assessment of southern blue whiting (*Micromesistius australis*) stocks up to and including the 2022 season. New Zealand Fisheries Assessment Report 2023/63. 75 p. https://www.mpi.govt.nz/dmsdocument/60409/direct

Wieczorek, A. M., Escobar-Flores, P. C., Datta, S. & O'Driscoll R. L. (2024 (vice 2023)). Acoustic biomass estimates of southern blue whiting on the Bounty Plateau (SBW 6B) in 2023. https://fs.fish.govt.nz/Doc/25795/FAR-2024-61-Acoustic-biomass-estimates-of-southern-blue-whiting-on-the-Bounty-Plateau-SBW6B-in-2023.pdf.ashx

P2 OVERVIEW OF ENVIRONMENTAL INFORMATION

Observer Programme

Overview

Ministry for Primary Industries (MPI) observers are deployed on commercial fishing vessels to carry out biological sampling, monitor environmental interactions, and observe and record compliance with a range of regulatory and non-regulatory management measures.

MPI's Annual Operational Plan 2022/23 provides the Deepwater Observer Coverage Plan for 2022-23. This includes:

- Participating in the training of new observers
- Briefing (where required) and debriefing observers placed on board deepwater vessels
- Planning the 2022/23 observer coverage requirements for deepwater fisheries (the 2021/22 deepwater observer coverage plan is set out below)
- Contributing towards the ongoing redesign of observer forms
- Updating biological sampling targets and observer tasking (the current biological sampling requirements for deepwater fisheries are set out in Table 5)
- Monitoring progress towards sampling targets throughout the year
- Engaging with, and providing feedback to, observers through the observer newsletter and observer catch-up sessions

Data collected by the observer programme are used:

- As an input to monitor key fisheries against harvest strategies, including through various approaches to stock assessment
- As an input to monitor biomass trends for target and bycatch species
- To assess fishery performance against environmental benchmarks as available
- To enable more timely responses to sustainability and environmental impact issues
- To evaluate certain compliance issues.

An important function is to collect data on incidental catches and mortalities of endangered, threatened and protected (ETP) species. This ETP component, under New Zealand law, is administered and funded by the Department of Conservation (DOC) through levies recovered from relevant fisheries sectors. Personnel and observer deployment are managed by MPI

In addition to MPI's Observer Programme, a range of management measures, including some industry-led non-regulatory initiatives, are employed to monitor environmental interactions in deep water fisheries and to reduce the risk of any adverse effects on protected species populations. Measures relating to the monitoring of seabirds are described in the Vessel Management Plans and in the Operational Procedures (DWC, 2024).

DWC has been closely following progress of an initiative to establish camera-based monitoring on small vessels, with the explicit objective of enumerating seabird captures (number and species). This complex and expensive development is currently being trialled in the snapper-targeted bottom longline fishery around the top of the North Island. Initial trials, using model seabirds have provided sufficient information and confidence in the technology to advance to the next, "proof of concept" stage on a broad scale in that fishery (Middleton & Guard, 2021).

The use of electronic monitoring (EM) is being incorporated into the Integrated Electronic Monitoring and Reporting System (IEMRS) that is currently under development by MPI.

Coverage

Observer coverage of deepwater fisheries is planned by financial year and is based on biological information requirements, international requirements, percentage-level coverage targets and observer programme capacity. The level of observer coverage for the different fisheries/sectors is tailored to suit the data and information requirements, including for stock assessment, compliance monitoring and ETP species captures. FNZ considers that 80-100% is required for the SBW fishery as it is deemed by management to pose a high-risk to the protected New Zealand sea lion[1].

Observer coverage in the SBW 6B and SBW 6I fisheries over the last five years has averaged 96.2% (Table 5).

Table 5: Observer coverage in the UoC southern blue whiting fisheries (D. Foster, FNZ, pers. comm.).

	2018/19			2019/20			2020/21			2021/22			2022/23		
Target species	Total tows	Observed tows	Observed tows (%)	Total tows	Observed tows	Observed tows (%)	Total tows	Observed tows	Observed tows (%)	Total tows	Observed tows	Observed tows (%)	Total tows	Observed tows	Observed tows (%)
SBW	749	748	**99.90%**	348	348	**100%**	441	340	**77.10%**	512	512	**100%**	617	617	**100%**

Biological sampling

Biological sampling requirements (numbers of length frequency samples and otoliths) were determined based primarily on the Medium-Term Research Plan for Deepwater Fisheries 2021/22 to 2025/26 for all Tier 1 and selected Tier 2 middle depth and deepwater species. The number of observer days necessary to achieve the biological sampling requirements was based on:

- The number of length frequency (LF) samples and otoliths collected by observers for each fisheries complex during the 2017/18, 2018/19 and 2019/20 years;
- The number of observer days delivered for the 2017/18, 2018/19 and 2019/20 years; and
- An estimate of the number of biological samples collected by observers per fishing day (specific to each fishery complex).
- As outlined in MPI's Annual Operational Plan 2022/23 (MPI, 2022) the main objective(s) of observer coverage planning is biological sampling of SBW and protected species monitoring (Table 6).

Table 6: Target numbers of SBW length frequency and otolith samples for collection by observers during the 2022/23 fishing year (FNZ, 2022).

Species	FMA/stock	LF target	Otolith target	Area	Months	Obs plan 'Fishery complex'
Southern blue whiting	SBW 6B	50	600	Bounties	August-September	Sub-Ant Mid-depths / SBW
	SBW 6I	100	900	Campbell Island	August-September	Southern blue whiting

Observer-reported catch composition (all species) by SBW target fisheries 2018-19 to 2022-23

Catch composition data from the MPI Fishery Observer Services programme between 2018-19 and 2022-23 was used to determine species categories (e.g. in-scope or out-of-scope). While observer data contained 134 individual species, southern blue whiting comprised 99% of the total catch (Table

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[1] Note: The levels of interactions with NZ sea lions are very low. However, as sea lions are considered 'high risk' from a political perspective, high observer coverage is essential to ensure good capture-rate estimations are available.

7). All chondrichthyan species in the observer data were cross-checked against CITES, CMS, ICUN red list and NZ national legislation to determine their designation.

Table 7: Catch composition (t) from MPI Fishery Observer Services data for targeted tows in the southern blue whiting fishery. Green rows are QMS species, white rows are non-QMS species. Observer coverage: 2018/19 to 2020/21 from Protected Species website; 2021/22 & 2022/23 from FNZ (D. Foster, pers. comm.).

Observer coverage (% of tows observed)	**100%**	**100%**	**77%**	**100%**	**100%**		**95%**
Species	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**5-year avg. (kg)**	**5-year avg. (%)**
Southern blue whiting *Micromesistius australis*	28,740	13,185	14,998	22,050	23,234	20,441	99.34%
Southern boarfish *Pentaceros richardsoni*	33	45		65	50	48	0.24%
Hoki *Macruronus novaezelandiae*	14	7	2	73	57	31	0.15%
Ling *Genypterus blacodes*	16	10	6	7	29	13	0.06%
Porbeagle shark *Lamna nasus*	10	6	8	9	20	11	0.05%
Hake *Merluccius australis*	7	8	11	6	21	11	0.05%
Javelin fish *Lepidorhynchus denticulatus*	1	12	2	3	6	5	0.02%
Rattails *Macrouridae*	<1	2	<1	<1	19	4	0.02%
Red cod *Pseudophycis bachus*	<1	2	1	5	6	3	0.01%
Arrow squid *Nototodarus gouldi, N. sloanii*	2	2	1	<1	2	2	0.01%
Silverside *Argentina elongata*	2	2	1	<1	3	2	0.01%
Spiny dogfish *Squalus acanthias*	1	2	1	<1	4	2	0.01%
Other (122 spp <0.01%)	9	4	3	4	11	6	0.03%
Totals	**28,835**	**13,286**	**15,035**	**22,224**	**23,462**	**20,580**	**100.00%**

In-scope main species

Species are considered ‘main’ if:

a. Catch of a species by the UoA comprises 5% or more by weight of the total catch of all species by the UoA, or

b. The species is classified as 'less resilient' and the catch of the species by the UoA comprises 2% or more by weight of the total catch of all species by the UoA, with less resilient species classified as species whose productivity indicates that it has intrinsically low resilience, and/or
    - Its intrinsic resilience is high and existing knowledge of the species indicates that its resilience has been lowered because of anthropogenic or natural changes to its life history.
    - The species is a shark and the fishery trades in shark fins (SA3.5.2.1).

Therefore, there are no in-scope 'main' species in the UoA catch.

In-scope minor species

All in-scope species that are not considered 'main' according to the criteria listed above are considered 'minor' species (SA3.5.2.3). In addition, 'minor' species that make up < 2% of total UoA catch are considered 'negligible', except in cases where SA3.5.2.2 applies (i.e. if the total catch by the UoA is exceptionally large, such that even small catch proportions of a P2 species significantly impact the affected stocks/populations).

There are no 'minor' species that comprise >2% of the total UoA catch (Table 7) and all are classified as 'negligible' (SA3.5.2.2), with the vast majority (i.e. 131 species) individually comprising <0.10% of the total catch of the UoA.

Observer-reported chondrichthyan catch composition

Around 21 chondrichthyan species/species groups have been observed in catches over the most recent five-year period and are caught in negligible quantities. Porbeagle (*Lamna nasus*) is the most abundant species caught, averaging 11 t per annum and comprising only 0.05% of the overall total catch. Catches of spiny dogfish (*Squalus acanthias),* the second-most abundant chondrichthyan, average less than 2 t per annum and contribute less than 0.01% of the overall catch. Both these species are managed under the Quota Management System. The other 19 chondrichthyan species observed caught occur in very negligible quantities (Table 8).

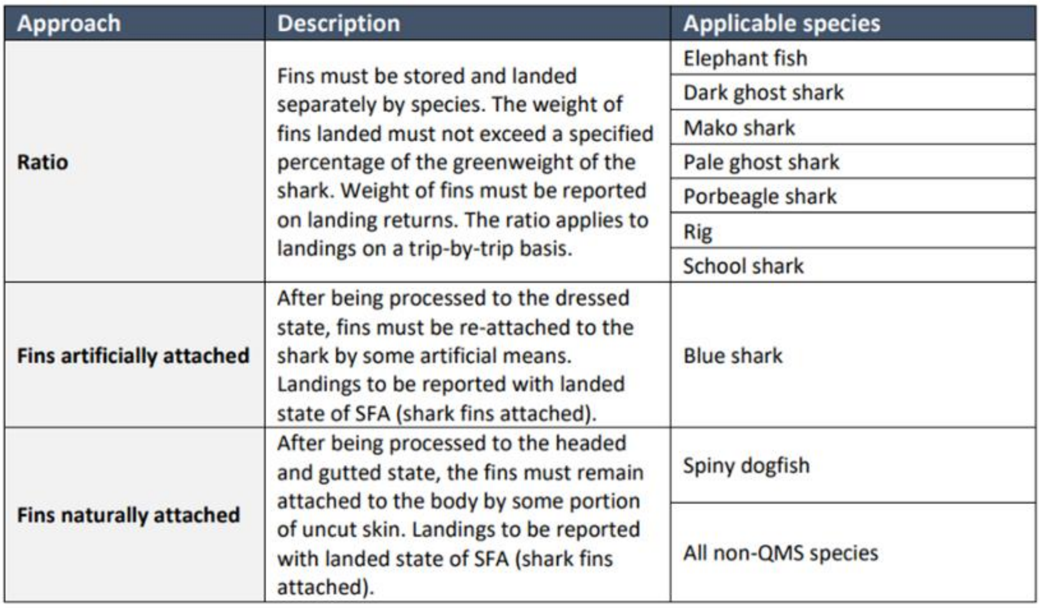
Table 8: Observed chondrichthyan catch composition (tonnes) by southern blue whiting targeted tows 2018-19 to 2022-23. Percentages based on total catch of all fish and invertebrate species. Green rows are QMS species, white rows are non-QMS species. (FNZ Research Database Rep Log 15659)

Species	2018/19	2019/20	2020/21	2021/22	2022/23	5-Year Average (t)	5-Year Average (%)
Porbeagle shark *Lamna nasus*	9.93	6.29	7.70	9.38	20.31	10.72	0.052%
Spiny dogfish *Squalus acanthias*	1.01	1.61	0.93	0.33	4.05	1.58	0.008%
Mako shark *Isurus oxyrinchus*	0.23	0.29	0.11	0.10	1.38	0.42	0.002%
Pale ghost shark *Hydrolagus bemisi*	0.13	0.34	0.42	0.16	0.49	0.31	0.001%
Long-nosed chimaera *Harriotta raleighana*	0.10	0.12	0.06	0.03	0.30	0.12	0.001%
School shark *Galeorhinus galeus*	0.00	0.20	0.00	0.00	0.03	0.05	0.000%
Blue shark *Prionace glauca*	0.00	0.00	0.05	0.07	0.00	0.02	0.000%
Rough skate *Dipturus nasutus*	0.02	0.01	0.00	0.07	0.02	0.02	0.000%
Ghost shark *Hydrolagus* spp.	0.02	0.00	0.05	0.00	0.03	0.02	0.000%

Smooth skate *Dipturus innominatus*	0.01	0.00	0.00	0.00	0.08	0.02	0.000%
Widenosed chimaera *Rhinochimaera pacifica*	0.08	0.00	0.00	0.00	0.00	0.02	0.000%
Shark other	0.03	0.00	0.00	0.00	0.00	0.01	0.000%
Leafscale gulper shark *Centrophorus squamosus*	0.00	0.00	0.03	0.00	0.00	0.01	0.000%
Seal shark *Dalatias licha*	0.01	0.00	0.00	0.00	0.00	0.00	0.000%
Deepwater dogfish *Etmopterus* spp.	0.00	0.00	0.00	0.00	0.00	0.00	0.000%
Longnosed velvet dogfish *Centroselachius crepidater*	0.00	0.00	0.00	0.00	0.00	0.00	0.000%
Chimaera spp.	0.00	0.00	0.00	0.00	0.00	0.00	0.000%
Other sharks and dogs	0.00	0.00	0.00	0.00	0.00	0.00	0.000%
Dawson's catshark *Bythaelurus dawsoni*	0.00	0.00	0.00	0.00	0.00	0.00	0.000%
Lucifer dogfish *Etmopterus lucifer*	0.00	0.00	0.00	0.00	0.00	0.00	0.000%
Skate other	0.00	0.00	0.00	0.00	0.00	0.00	0.000%
Total	**11.56**	**8.86**	**9.35**	**10.15**	**26.68**	**13.32**	**0.065%**

The Fisheries (Commercial Fishing) Regulations 2001 prohibit shark finning and require that any shark fins landed must be naturally attached to the remainder of the shark. However, an exception to the fins attached requirement is provided for seven QMS species to allow at-sea processing to continue (Table 9). In contrast the MSC standard requires a fins naturally attached (FNA) policy to be in place for all retained sharks (GSA2.4.3-2.4.4) with no exceptions. The fishery can partially cut the fins, for the purpose of storage, freezing and draining carcasses, and fold them around the carcasses. However, fins should be attached to a substantial part of the shark, not just some vertebrae, allowing the shark to be easily identified to the species level. If fins are removed and then artificially attached to the carcass via ropes or wire or placed into a bag that contains that carcass and fins, this would not constitute FNA (GSA2.4.3-2.4.4). The MSC standard v3.0 specifies that a FNA must apply to all Chondrichthyan species within the Selachimorpha and Rhinopristiphormes (SA2.4.3.1). However, SA2.4.3.1a states if the UoA is part of a management agency whose definition of “shark” includes additional species, the management agency’s definition shall apply. In New Zealand, under Fisheries (commercial) fishing regulations 2001, shark is defined as a fish of the class Chondrichthyes but excludes Batoidea which is much broader than MSC definition (i.e. it includes Chimaerids).

Table 9: New Zealand conditions for landing shark fins (FNZ AOP, 2022).



Approach	Description	Applicable species
Ratio	Fins must be stored and landed separately by species. The weight of fins landed must not exceed a specified percentage of the greenweight of the shark. Weight of fins must be reported on landing returns. The ratio applies to landings on a trip-by-trip basis.	Elephant fish
		Dark ghost shark
		Mako shark
		Pale ghost shark
		Porbeagle shark
		Rig
		School shark
Fins artificially attached	After being processed to the dressed state, fins must be re-attached to the shark by some artificial means. Landings to be reported with landed state of SFA (shark fins attached).	Blue shark
Fins naturally attached	After being processed to the headed and gutted state, the fins must remain attached to the body by some portion of uncut skin. Landings to be reported with landed state of SFA (shark fins attached).	Spiny dogfish
		All non-QMS species

All QMS shark species must be landed if taken. However, Schedule 6 provides for exceptions to this rule by listing QMS species which may be returned to the sea (FNZ, 2022), as follows:

- Rig (SPO) and School shark (SCH) – may be returned alive only
- Blue shark (BWS), mako shark (MAK) and porbeagle shark (POS) – may be returned alive or dead and if dead, balanced against ACE
- Spiny dogfish (SPD) – may be returned alive or dead and must always be balanced against ACE regardless of life status.

FNA – TBC!

Shark fins naturally attached (FNA) policy

MSC Fisheries Standard v3.0 MSC specifies that retained sharks should have their fins naturally attached, as per SA2.4.3.1.

The Standard defines sharks as selachimorpha (true sharks) and rhinopristiformes (e.g. shovel nose rays, guitar fishes). However, if the fishery operates within a jurisdiction that defines additional species such as skates or chimaeras, the assessment must consider those additional species.

In New Zealand two shark definitions are used:

1) The Fisheries (Commercial Fishing) Regulations 2001 defines sharks as 'a fish of the class *Chondrichthyes*, but excludes *Batoidea'.*
2) New Zealand's NPOA Sharks uses the term 'sharks' generally to include all species in the class Chondrichthyes (sharks, rays, skates and chimaeras).

SA2.4.3.1(a) identifies MSC is happy to use management agency definitions. Recognising the difference in shark definitions within New Zealand for different purposes it is expected that the definition to be used is the regulatory definition.

DWC is in consultation with MSC to amend the requirement to use management agency definitions, thereby removing the requirement to land chimaeras with fins naturally attached (FNA).

The MSC Standard outlines that:

> '*Where reference is made to the requirement for FNA, in order to facilitate freezing and storage, the fishery could partially cut the fins, including for the purposes of draining blood to avoid ammonisation, and fold them around the carcasses. However, fins should be attached to a*

> *substantial part of the shark, not just some vertebrae, allowing the shark to be easily identified to the species level. If fins are removed and then artificially attached to the carcass via ropes or wire or placed into a bag that contains that carcass and fins, this would not constitute FNA'*

The Evidence Requirements Framework is used to support the scoring of the shark finning Scoring Issues. The following information is provided to demonstrate the implementation of FNA or non-retention policy.

1. DWC Sharks Fins Naturally Attached Operational Procedures - operational changes around shark finning for the southern blue whiting UoAs (DWC, 2024).
2. A fleet-wide code-of conduct for deepwater vessels.

Additionally, to ensure the FNA policy is adhered to by vessels:

1. FNZ's observer protocols have been updated to specifically require observers to look for any instances of shark finning, including for sharks that go into the meal plant.

- Where a shark is landed, observers record the species and determine its disposal code. The disposal code is cross-checked against DWC's Sharks Operational Procedures to check they are landed in accordance with DWC's operational documentation.

2. FNZ's observer reports include a section reporting on any observation of shark finning.

DWC Sharks Fins Naturally Attached Operational Procedures for MSC certified fisheries

Purpose of these procedures

These operational procedures have been established to ensure vessels targeting MSC certified fisheries (hoki, hake, ling and southern blue whiting) meet the Fins Naturally Attached (FNA) policy in the new MSC standard and enable verification of shark processing.

Background

The new FNA policy has been developed by MSC as a way to address shark finning globally and ensure it does not occur in MSC certified fisheries. New Zealand has strict regulations to prohibit shark finning in national waters. (**https://legislation.govt.nz/regulation/public/2001/0253/latest/DLM6279825.html)**. Despite this, MSC does not accept artificially attached fins or ratio approach which is allowable under regulations. The result of this is that some processed shark states will no longer be acceptable when targeting hoki, hake, ling and southern blue whiting. Operators will need to land sharks with their fins naturally attached or return to the sea non-QMS or QMS species in alignment with regulations.

Responsibilities of vessel owners, operators and managers:

All vessel owners, operators and managers must:

- Ensure key crew (including captain and factory manager) of vessels targeting hoki, hake, ling and southern blue whiting know what processing states of sharks are allowable under the FNA Policy, and which cuts are not permitted.
- Be responsible for corrective action if requirements are not met.

Responsibility of captain

All captains and senior crew must:

- Be aware of the requirements
- Ensure factory managers comply with the FNA policy.

Sharks FNA Policy

All sharks landed from hoki, hake, ling and southern blue whiting target fishing events must have their fins naturally attached to the body. Processed states which remove the fins from the body will not be allowed. Mealed sharks are acceptable so long as the species is identified, quantified and reported accurately (if there is an observer on board, this will be verified).

Species included in the FNA policy

For the purpose of these requirements "shark" is defined as all *Chondrichthyes* except *rays, skates (Batoidea) or chimaera*.

The following QMS and non-QMS species are the most frequently caught in deepwater fisheries. **Note, this does not include all sharks.**

Species included in FNA Policy

- School shark
- Spiny dogfish
- Rig
- Shovelnose dogfish
- Baxter's lantern dogfish
- Leafscale gulper shark
- Lucifer dogfish
- Seal shark
- Longnose velvet dogfish

Species excluded from FNA policy (process as normal)

- Elephantfish
- Pale ghost shark
- Dark ghost shark
- Long-nosed chimaera
- Smooth skates
- Rough skates

Processing of sharks

QMS and non-QMS shark species are permitted to be:

1. landed GRE
2. landed mealed
3. landed in another official process state which meets FNA policy
4. returned to the sea as discards (if non-QMS) or returned to the sea under landings and discard exemption notice or by observer authorized discards (if QMS species)

Partial cuts

In order to facilitate freezing and storage, vessels are able to partially cut the fins, including for the purposes of draining blood to avoid ammonisation, and fold them around the carcasses.

However, fins should remain attached to a substantial part of the shark, allowing the shark to be easily identified to the species level.

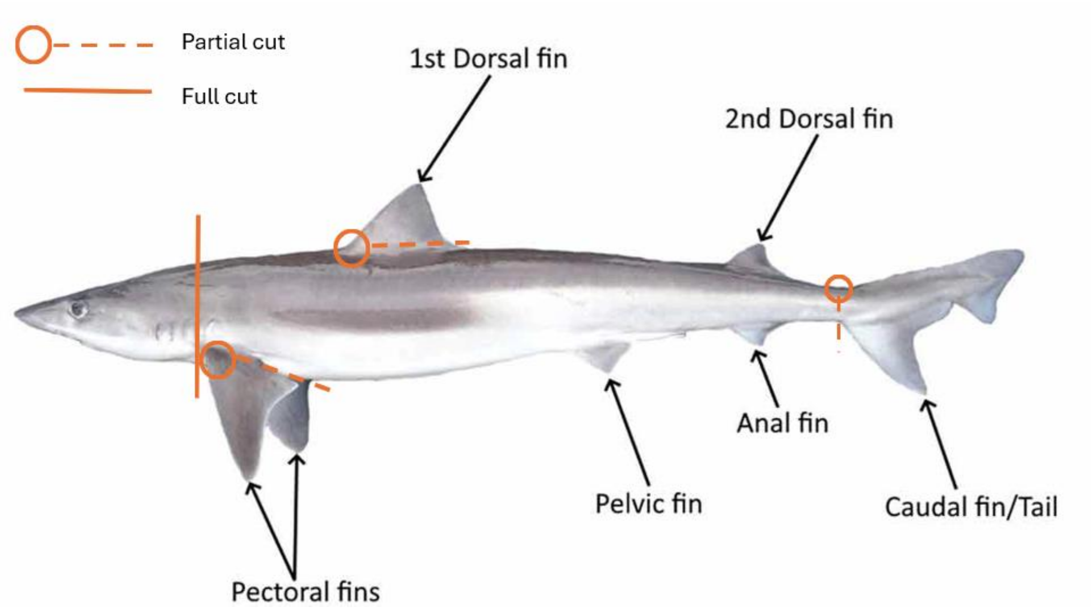


Figure 1: Locations of permitted cuts (this is an indicative guide of permitted cuts under FNA policy, this does not supersede regulatory cuts)

Reporting and verification

There are no changes to vessel reporting requirements under the FNA policy. FNZ observers may be required to verify that sharks being put to meal are not having fins removed before mealing occurs.

Contact

If you have any questions about these procedures, please get in contact with Ben Steele-Mortimer at DWC (bensm@southswell.co.nz or admin@deepwatergroup.org).

Trends in retained & bycatch species (In-scope species) by SBW target fisheries

The southern blue whiting fishery is characterised as a “clean” fishery with minimal fish bycatch (Anderson, 2017). Anderson showed SBW accounted for more than 99% of the total estimated catch from all observed trawls targeting southern blue whiting between 1 April 2002 and 31 March 2007. Analysis of trends in bycatch abundance in southern blue whiting target fisheries, by species, have been regularly undertaken (Anderson, 2014; Anderson, 2017). The most recent analysis identified the following for SBW target fisheries (Finucci et al., 2019):

- Of the 109 bycatch species examined, 33 showed a decrease in catch over time and six were significant; ten showed an increase and one was significant
- Species showing the greatest decline were moonfish (*Lampris guttatus*, MOO), unspecified rattails (RAT), and dark ghost shark (*Hydrolagus novaezealandiae*, GSH) (Figure 8)
- Species showing the greatest increase were opah (*Lampris immaculatus*, PAH), ray’s bream (*Brama brama*, RBM*), pale ghost shark (*Hydrolagus bemisi*, GSP*) (Figure 8)
- Most common bycatch species by weight (t) were the Quota Management Species (QMS) ling (*Genypterus blacodes*, LIN), hake (*Merluccius australis*, HAK), and hoki (HOK) (Figure 9).

It is noted that southern boarfish (*Pentaceros richardsoni*), a non-QMS species, has become more common in catches in recent years (Table 7).

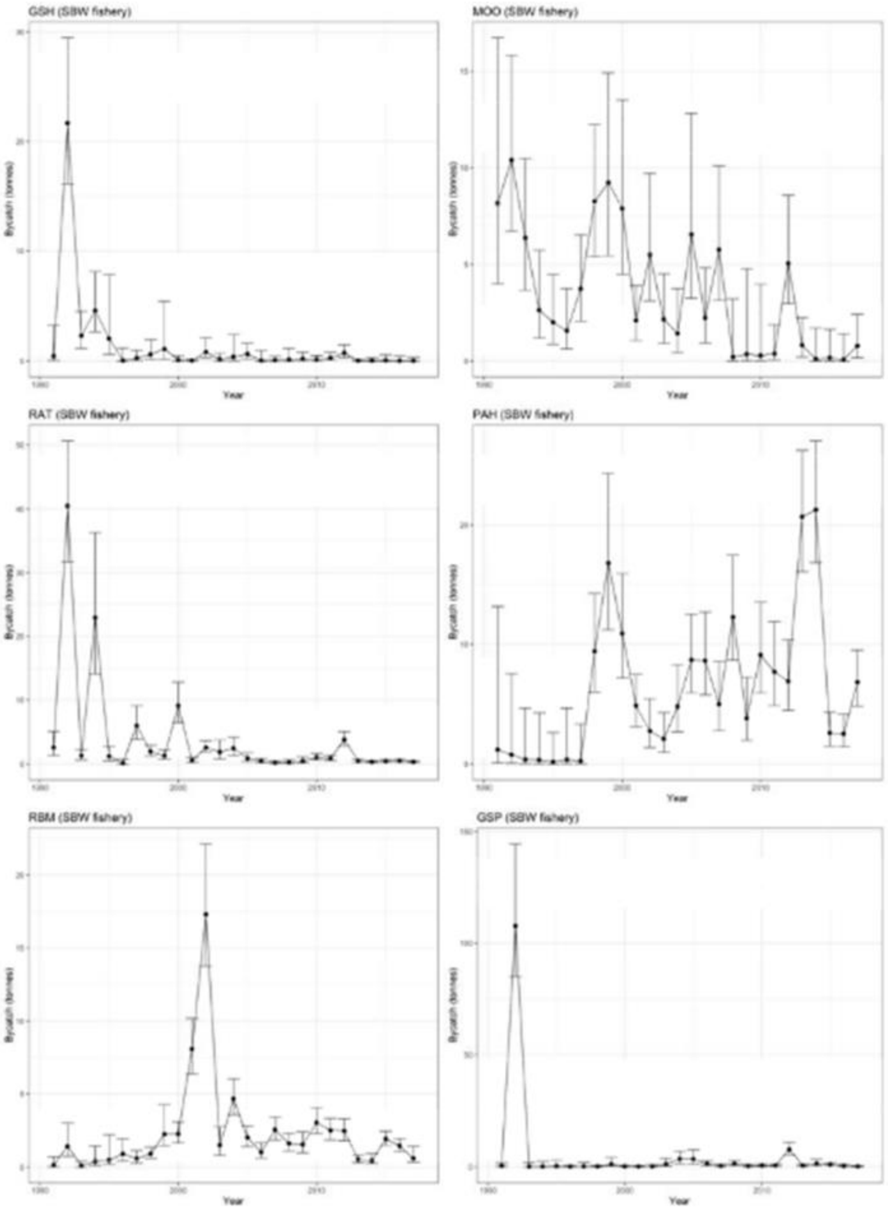


Figure 8: Annual bycatch estimates in the southern blue whiting trawl fishery for the species showing the greatest increases and declines between 1990–91 and 2016–17. See text above for explanation of the species codes. Note: the scale changes on the y-axis between plots (Finucci et al., 2019).

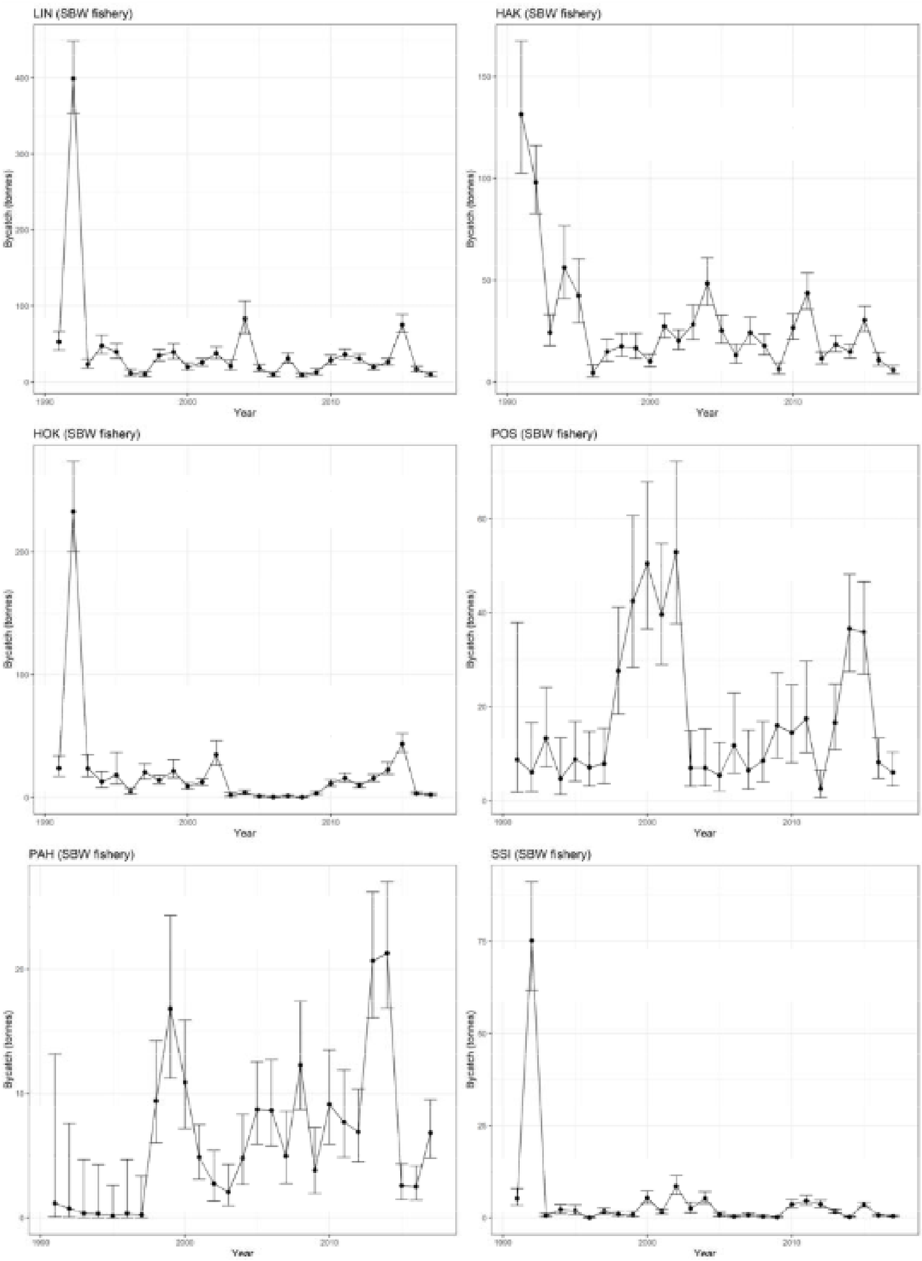


Figure 9: Annual bycatch estimates for the most common southern blue whiting trawl fishery bycatch species by weight between 1990–91 and 2016–17. Note scale changes on the y-axis between plots. HAK had a significant decreasing trend, LIN, HOK, and SSI had non-significant decreasing trends, PAH had an increasing significant trend, and POS had an increasing non-significant trend. Species codes: POS = porbeagle shark; PAH = opah; SSI = silverside (Finucci et al., 2019).

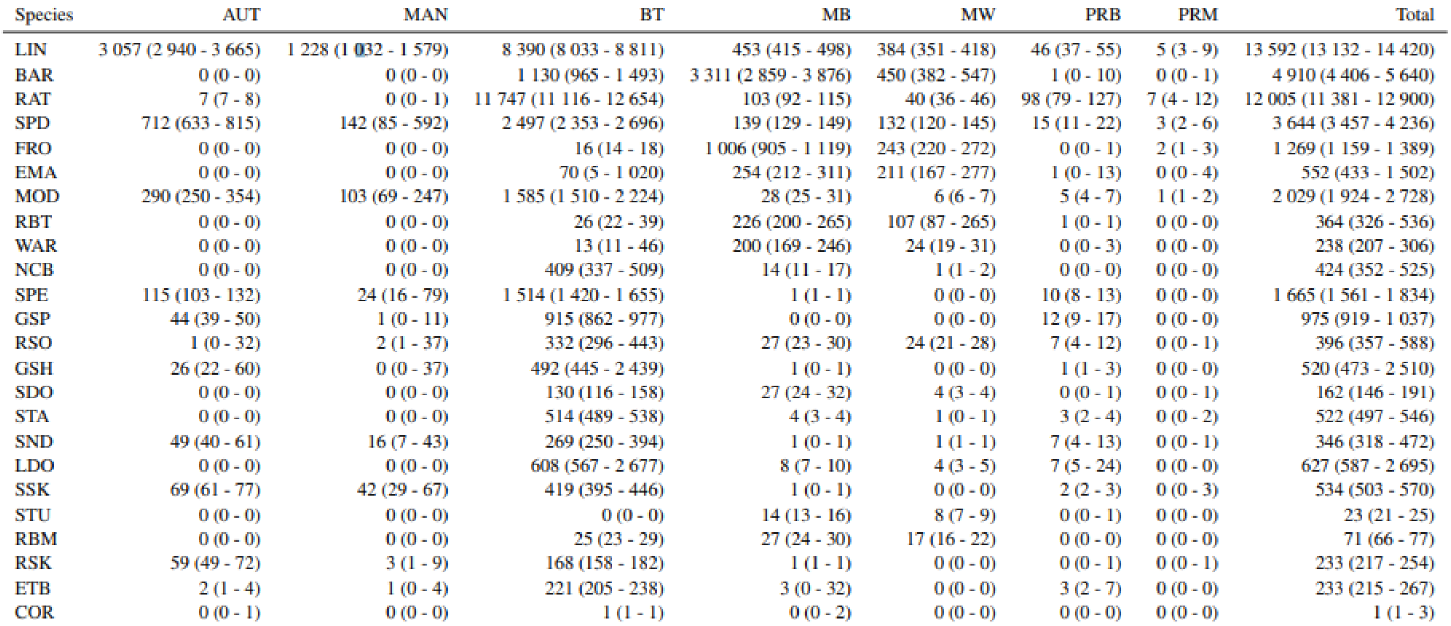
Bycatch and discard estimation in New Zealand deepwater fisheries

Edwards and Mormede (2023; 2023a) have developed a framework for application on a species-specific basis that is able to integrate across fishing effort and sampling data from multiple fisheries, operating in different locations in the EEZ and with different gear types. This is believed to advance the bycatch estimation associated with deepwater fisheries. Edwards and Mormede (2023) state the use of the modelling approach represents a step towards estimation of a spatially resolved exploitation rate for data-poor bycatch fisheries.

Results indicate that the model fits are reasonable, but that an accurate prediction of the catches is dependent on the representativeness of the observer data and the extent to which the statistical structure of the model is able to describe the properties of the data.

The model estimates of the average annual catch (tonnes) per gear and per non-target species, for gear relevant to the SBW fishery (i.e. midwater trawl within 5 m of the bottom - MB & midwater trawl - MW), suggests that barracouta (BAR) and frostfish (FRO), species managed under the Quota Management System, are estimated to be the highest average annual catches (Table 10). Note, however, that this analysis will be skewed by MB tows targeting in other fisheries and targeting other species, e.g. the hoki-targeted fishery on the Chatham Rise.

Table 10: Model estimates of the average annual catch (tonnes) by the offshore Tier 1 fisheries, per gear, per non-target species, excluding the TAN and KAH trawl surveys. Posterior median values are given, with the 95% equal-tailed credibility intervals in brackets. Estimates for LIN are included for purposes of validation. Columns relevant to SBW fisheries include: MB (mid-water trawl within 5 m of the bottom); MW (mid-water trawl), (Edwards and Mormede, 2023a).



Species	AUT	MAN	BT	MB	MW	PRB	PRM	Total
LIN	3 057 (2 940 - 3 665)	1 228 (1 032 - 1 579)	8 390 (8 033 - 8 811)	453 (415 - 498)	384 (351 - 418)	46 (37 - 55)	5 (3 - 9)	13 592 (13 132 - 14 420)
BAR	0 (0 - 0)	0 (0 - 0)	1 130 (965 - 1 493)	3 311 (2 859 - 3 876)	450 (382 - 547)	1 (0 - 10)	0 (0 - 1)	4 910 (4 406 - 5 640)
RAT	7 (7 - 8)	0 (0 - 1)	11 747 (11 116 - 12 654)	103 (92 - 115)	40 (36 - 46)	98 (79 - 127)	7 (4 - 12)	12 005 (11 381 - 12 900)
SPD	712 (633 - 815)	142 (85 - 592)	2 497 (2 353 - 2 696)	139 (129 - 149)	132 (120 - 145)	15 (11 - 22)	3 (2 - 6)	3 644 (3 457 - 4 236)
FRO	0 (0 - 0)	0 (0 - 0)	16 (14 - 18)	1 006 (905 - 1 119)	243 (220 - 272)	0 (0 - 1)	2 (1 - 3)	1 269 (1 159 - 1 389)
EMA	0 (0 - 0)	0 (0 - 0)	70 (5 - 1 020)	254 (212 - 311)	211 (167 - 277)	1 (0 - 13)	0 (0 - 4)	552 (433 - 1 502)
MOD	290 (250 - 354)	103 (69 - 247)	1 585 (1 510 - 2 224)	28 (25 - 31)	6 (6 - 7)	5 (4 - 7)	1 (1 - 2)	2 029 (1 924 - 2 728)
RBT	0 (0 - 0)	0 (0 - 0)	26 (22 - 39)	226 (200 - 265)	107 (87 - 265)	1 (0 - 1)	0 (0 - 0)	364 (326 - 536)
WAR	0 (0 - 0)	0 (0 - 0)	13 (11 - 46)	200 (169 - 246)	24 (19 - 31)	0 (0 - 3)	0 (0 - 0)	238 (207 - 306)
NCB	0 (0 - 0)	0 (0 - 0)	409 (337 - 509)	14 (11 - 17)	1 (1 - 2)	0 (0 - 0)	0 (0 - 0)	424 (352 - 525)
SPE	115 (103 - 132)	24 (16 - 79)	1 514 (1 420 - 1 655)	1 (1 - 1)	0 (0 - 0)	10 (8 - 13)	0 (0 - 0)	1 665 (1 561 - 1 834)
GSP	44 (39 - 50)	1 (0 - 11)	915 (862 - 977)	0 (0 - 0)	0 (0 - 0)	12 (9 - 17)	0 (0 - 0)	975 (919 - 1 037)
RSO	1 (0 - 32)	2 (1 - 37)	332 (296 - 443)	27 (23 - 30)	24 (21 - 28)	7 (4 - 12)	0 (0 - 1)	396 (357 - 588)
GSH	26 (22 - 60)	0 (0 - 37)	492 (445 - 2 439)	1 (0 - 1)	0 (0 - 0)	1 (1 - 3)	0 (0 - 0)	520 (473 - 2 510)
SDO	0 (0 - 0)	0 (0 - 0)	130 (116 - 158)	27 (24 - 32)	4 (3 - 4)	0 (0 - 1)	0 (0 - 1)	162 (146 - 191)
STA	0 (0 - 0)	0 (0 - 0)	514 (489 - 538)	4 (3 - 4)	1 (0 - 1)	3 (2 - 4)	0 (0 - 2)	522 (497 - 546)
SND	49 (40 - 61)	16 (7 - 43)	269 (250 - 394)	1 (0 - 1)	1 (1 - 1)	7 (4 - 13)	0 (0 - 1)	346 (318 - 472)
LDO	0 (0 - 0)	0 (0 - 0)	608 (567 - 2 677)	8 (7 - 10)	4 (3 - 5)	7 (5 - 24)	0 (0 - 0)	627 (587 - 2 695)
SSK	69 (61 - 77)	42 (29 - 67)	419 (395 - 446)	1 (0 - 1)	0 (0 - 0)	2 (2 - 3)	0 (0 - 3)	534 (503 - 570)
STU	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	14 (13 - 16)	8 (7 - 9)	0 (0 - 1)	0 (0 - 0)	23 (21 - 25)
RBM	0 (0 - 0)	0 (0 - 0)	25 (23 - 29)	27 (24 - 30)	17 (16 - 22)	0 (0 - 0)	0 (0 - 0)	71 (66 - 77)
RSK	59 (49 - 72)	3 (1 - 9)	168 (158 - 182)	1 (1 - 1)	0 (0 - 0)	0 (0 - 1)	0 (0 - 1)	233 (217 - 254)
ETB	2 (1 - 4)	1 (0 - 4)	221 (205 - 238)	3 (0 - 32)	0 (0 - 0)	3 (2 - 7)	0 (0 - 0)	233 (215 - 267)
COR	0 (0 - 1)	0 (0 - 0)	1 (1 - 1)	0 (0 - 2)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	1 (1 - 3)

Ghost gear

MSC Fisheries Standard Version 3.0 requires fisheries to have effective measures in place to minimise gear loss and to mitigate the impact of any losses. Fisheries must implement management strategies to minimise gear loss and manage any impacts of lost gear. This could include measures to monitor lost gear, marking and retrieval programs and gear modifications, such as biodegradable locks on pots.

Regulatory framework related to ghost fishing gear

New Zealand maintains stringent regulations to ensure garbage lost at sea from vessels is minimised. The regulations primarily fall under the Maritime Protection Rules[2] but there are also components of the Fisheries Act (1996) which reduces risk of gear being lost.

Vessels are also required by law to report lost gear to authorities as shown in the extracts below.

---

[2] Part 170 - Consolidated - Marine Protection Rules Part 199 Prevention of Air Pollution from Ships Various Amendments 2022 (maritimenz.govt.nz)

Maritime Protection Rules

170.3 General prohibition on discharge of garbage into the sea:

1. Garbage is a harmful substance for the purposes of section 225 of the Act.
2. The discharge of garbage [including fishing gear] into the sea from a ship is prohibited, except as provided in this Part or the Act.

170.4 General exceptions to prohibition:

Nothing in this Part prohibits or restricts any person from discharging garbage from a ship if –

c) the discharge is an accidental loss of fishing gear from a ship and all reasonable precautions have been taken to prevent such loss; or
d) the discharge is a discharge of fishing gear from a ship for the protection of the marine environment or for the safety of that ship or its crew.

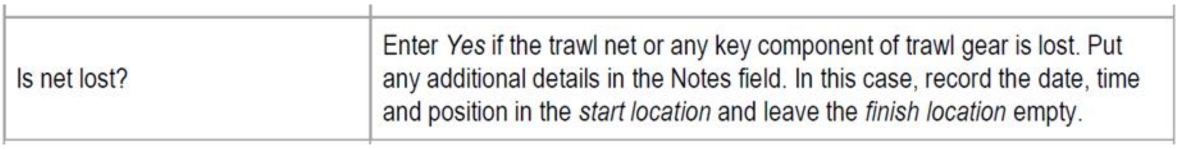
170.21 Reporting accidental loss or discharge of fishing gear:

In the event of an accidental loss or discharge of fishing gear referred to in 170.4(c) or (d) that poses a significant threat to the marine environment or navigation, the owner and the master of a ship to which this rule applies must report the accidental loss or discharge:

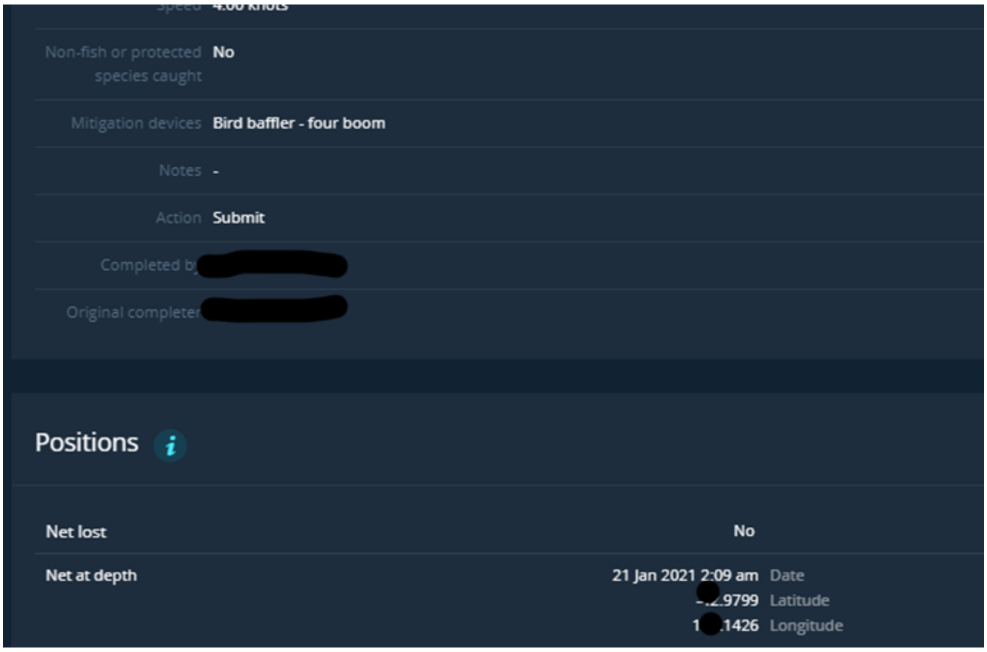
a) to the Director; and
b) if the accidental loss or discharge occurs within waters subject to the jurisdiction of a coastal State, to the appropriate authority in that coastal State.

DWC Management Strategy for lost gear

All vessels are required by law to report lost gear. This is done via Electronic Reporting System (ERS), (Figure 10).



Is net lost?	Enter *Yes* if the trawl net or any key component of trawl gear is lost. Put any additional details in the Notes field. In this case, record the date, time and position in the *start location* and leave the *finish location* empty.



Non-fish or protected species caught No
Mitigation devices Bird baffler - four boom
Notes -
Action Submit
Completed b[redacted]
Original complete[redacted]

Positions

Net lost No
Net at depth 21 Jan 2021 2:09 am Date
-[redacted].9799 Latitude
1[redacted].1426 Longitude

Figure 10: Screenshots from the ERS of the relevant reporting components for the statutory system.

In addition to their statutory requirements vessel operators in the southern blue whiting trawl fisheries have management strategies in place to prevent, mitigate and remediate gear lost or abandoned at sea (Table 11). Discarding gear at sea is prohibited unless under the circumstances noted above.

Table 11: Ghost Fishing Gear Management Strategy for southern blue whiting and HAK/HOK/LIN trawl fisheries.

Prevention	• There is inherently very low risk of losing trawl fishing gear in the HOK/HAK/LIN fisheries. The gear is firmly attached to the vessel throughout fishing operations. Losing this type of gear is incredibly costly to the operator and so all precautions are taken to ensure gear is not lost. • Vessel managers and skippers ensure that gear is well maintained before, during and after use. E.g. o nets are covered when not in use to avoid UV damage o warps are kept appropriately greased to prevent abrasion o gear maintenance is conducted when the gear is on board the vessel o old or damaged gear is replaced. • In the Coastal Hoki Operational Procedures, vessels are required to have 'windows' in trawl net panels as a safety precaution if a high volume of fish in the net is a risk to crew and gear failure. • Most components of fishing gear are marked for identification
Mitigation	• The nature of trawl fishing requires waterflow through the net to herd and funnel fish into the codend of the net. A trawl net without drag and lift will collapse and won't have the ability to catch fish. If a whole trawl were to be lost, the heavy ground gear and doors would pull the gear to the seafloor. If meshing alone were to be lost as sea, it may remain in the water column and move depending on current flows. However, due to the configuration of trawl nets, losing a single piece of meshing is highly unlikely. • Trawl doors, ground ropes or floats lost at sea do not have the characteristics that would result in ghost fishing. E.g. trawl doors would remain on the seabed, and while they may attract marine communities, they would not be classed as 'ghost fishing'.
Remediation	• Trawl gear in these fisheries cost hundreds of thousands of dollars with expensive sensors and other electronics attached. There is significant economic incentive to retrieve gear if lost. • If in the unlikely event a trawl is lost or abandoned at sea, the catch sensors in the codend and net sonde on the headline will emit a signal for up to a week after it is lost. Vessel acoustic systems can pick up the signal and locate the lost gear. • The skipper is also required to record lost fishing gear in ERS, including the specific location of where it was lost. Some vessel operators also maintain a register of garbage (fishing gear) lost at sea. Some do not as it is such an infrequent occurrence. • Sophisticated geo-position sensors on gear during fishing also helps with locating gear. • Once the gear is located, vessels have grapnels onboard to retrieve the gear. • Garbage, including other fishing gear is occasionally trawled up by vessels. Operators will always return this rubbish to shore instead of putting back overboard.

Available data sources

- FishServe has all events where gear was reported ‘lost’
- Observers record events where gear has been lost
- Some operators have a register of lost gear.

There have been three lost gear events recorded through ERS between 2019-20 to 2021-22 for the southern blue whiting and HOK/HAK/LIN trawl fisheries combined. For one of these events the trawl was retrieved using grapnels. It is not clear what the situation was for the other two events i.e. what the specific gear was and whether it was retrieved or not.

DWC is of the view that effects of ghost fishing gear are demonstrably absent or negligible in these fisheries.

ETP and OOS species observer programme

The Conservation Services Programme (CSP), administered by the Department of Conservation, has as its aim to avoid, remedy or mitigate the adverse effects of commercial fisheries on protected species. The CSP Annual Plan outlines the conservation services projects required to be delivered each year and forms the basis for levying the commercial fishing industry to cover these costs under the Fisheries Act 1996. The CSP objectives are as follows (DOC, 2023):

- Objective A: Proven mitigation strategies are in place to avoid or minimise the adverse effects of commercial fishing on protected species across the range of fisheries with known interactions
- Objective B: The nature of direct adverse effects of commercial fishing on protected species is described
- Objective C: The extent of known direct adverse effects of commercial fishing on protected species is adequately understood
- Objective D: The nature and extent of indirect adverse effects of commercial fishing are identified and described for protected species that are at particular risk to such effects
- Objective E: Adequate information on population level and susceptibility to fisheries effects exists for protected species populations identified as at medium or higher risk from fisheries.

The CSP planning for middle-depth and deepwater fisheries considers and works in parallel with other relevant planning and management processes such as those prescribed in the following:

- National Plan of Action (NPOA) for seabirds
- National Plan of Action for sharks
- Threat Management Plan (TMP) for the New Zealand sea lion

The planning process is iterative and inclusive and ensures that gaps are identified and research synergies are maximised. Observer coverage is planned and prioritised based on specific monitoring objectives for protected species interactions with fisheries and achieving adequate coverage levels for high-risk fisheries to allow detection of changes in bycatch over time. Coverage is aimed at reducing uncertainly around the risks to protected species and assessing mitigation options for identified interactions. The allocation of observer coverage across fisheries is guided by factors including data needs for protected species and fisheries management, compliance, and international obligations, with particular consideration of:

- Independently verifying protected species captures
- Fishing effort
- Past observer coverage
- Monitoring of high value stocks or fisheries where there may be a sustainability risk
- Current level of information, especially for recently protected species

- The status of threatened protected species
- Historic mortality of protected species and risk assessment work which has been undertaken
- Requirements under the NPOAs and any relevant TMPs or Strategies
- Planned and ongoing research priorities/projects for DOC and FNZ
- Ministerial directives.

The CSP concedes that observer placements and coverage rates typically have high spatial and temporal variation, as well as multiple competing priorities for information collection, which can result in inconsistent data collection and may hamper efforts to interpret and extrapolate bycatch rates by fishery, location, or other variables. Data accuracy and reliability can be affected by inter-observer variability and weather conditions, while precision is affected by the observer sampling design. In addition, as it is not always possible to place observers on vessels randomly or representatively, data quality may also be biased by the opportunistic allocation of observers to vessels. Nevertheless, it is considered that the use of fisheries observers is currently the most reliable and flexible means of acquiring data on protected species interactions (DOC, 2023).

Observers working in the offshore deepwater and middle-depth trawl fisheries have multiple priorities including stock assessment data collection, compliance monitoring, protected species research and benthic interaction monitoring. As these fisheries have had historically high and consistent levels of observer coverage over the last ten years, they are well characterised. CSP-focused observer days in these fisheries is therefore less than that allocated to monitoring of commercial fishing and recording of associated biological data, but still deemed sufficient for monitoring of ETP species interactions and compliance with mitigation requirements.

For the 2023-24 fishing year, CSP observer focus in the sub-Antarctic SBW 6B and SBW 6I fisheries is to:

- Monitor and record interactions with, and behaviours of, fur seals and sea lions
- Monitor seabird interactions and behaviour, due to the close location of the UoA fisheries to many seabird breeding islands
- Monitor ETP coral captures
- Record information on mitigation techniques employed on vessels towards an improved understanding of interactions between fishing gear and capture of ETP species, including offal and discard management

It is intended that all vessels operating in the southern blue whiting fishery will be observed (DOC, 2023).

ETP and OOS species capture mitigation

ETP species capture information, as reported by vessels and by MPI observers, is summarised in the Aquatic Environment and Biodiversity Annual Review report (FNZ, 2022), and on the Protected Species Capture webpage. The database provides open access to multi-year records of ETP species captures by fishery sector and fishing method, based on MPI observer data, and is updated annually through FNZ's Science Working Group process.

A range of management measures, including industry-led, non-regulatory initiatives, are employed to monitor environmental interactions in deep water fisheries and to reduce the risk of any adverse effects on protected species populations. Measures relating to the deepwater industry's monitoring of ETP species are described in DWG's Operational Procedures (OPs) and Vessel Management Plans (VMPs), (DWC, 2024), which include:

- Hoki OPs
- Hoki OPs Coastal Trawl Fisheries
- Marine Mammals OPs
- Reporting OPs

- Seabirds OPs
- Sharks OPs
- Benthic OPs (implemented in 2021-22)
- Deepwater Trawl VMP (template)
- Trawl Vessel Protected Species Risk Management Plan (template)
- Ten Commandments for:
  - Fresh Fish Hoki
  - Marine Mammals
  - Saving Seabirds
- Ten Golden Rules for Protected Species Reporting.

DWC Liaison Programme for ETP Species Risk Management

During 2018-19, DWC's Environmental Liaison Officer (ELO) visited 28 factory vessels. During 2019-20, the Covid-19 pandemic restricted vessel visits to an extent and the ELO visited 24 factory vessels. During 2020-21, 25 factory vessels were visited. During 2021-22, 26 factory vessels were visited. During 2022-23, 25 factory vessels were visited (Cleal, 2019, 2020, 2021, 2022, 2023).

The purpose of these vessel visits is to:

- Prior to the SBW season, ensure the full fleet adheres to the Sea Lion Excluder Device (SLED) audit programme:
  - Maintain an updated database of all SLEDs
  - Provide FNZ with a summary of all SLED certifications
  - Monitor in-season SLED damage, repairs, and re-certification
- Organise and deliver environmental training resources to senior crew and associated managers.
- Monitor vessel operator's adherence to the agreed environmental risk Operational Procedures (OPs)
- Maintain fleet database of vessels, operators, target species, ports, skippers etc.
- Undertake port call and vessel visits to a minimum of 90% of the fleet
- Analyse all FNZ audits of Vessel Management Plans (VMPs) and OPs, contacting operators with feedback for each and every audit
- Provide expert advice on vessel-specific options for fish waste management and warp mitigation systems and ensure this is documented
- Maintain strong liaison with government – particularly with FNZ, DOC and DOC's Inshore Liaison Officer Programme
- Review VMPs, ensuring each vessel has an effective vessel-specific seabird risk management programme.
- Provide full induction into DWC programmes to new skippers and/or vessel operators who have moved to new fisheries or have started on new vessels.
- Produce an end-of-year summary report to DWC, FNZ and DOC.

The ELO additionally visits any vessel that has reported trigger-point captures in order to assess the possible reasons for the captures, whether they could have been prevented, and to educate the skipper on how to reduce the risk of such events re-occurring. The ELO is on-call 24/7 for any communications or requests for support, including for trigger capture events (Cleal, 2019, 2020, 2021, 2022, 2023).

Regulatory requirements for seabird mitigation, for application by all vessels 28 metres or greater in length, include:

- Deployment of at least one type of seabird scaring device during all tows (i.e., bird bafflers, tori lines or warp deflectors)
- Management of fish waste discharge so as not to attract seabirds to risk areas (i.e., no discharge during shooting/hauling; mincing and batch-discharge while towing; installation of mincers/hashers/batching tanks/meal plants; gratings/trap systems to reduce fish waste discharge through scuppers/sump pumps).

Seabird risk associated with trawl nets is minimised by:

- Removal of stickers before shooting
- Minimising the time fishing gear remains at/near the surface
- Seabirds caught alive in/on the net are correctly handled and released to ensure maximum chance of survival.

Seabird risk associated with deck landings and vessel impacts is minimised by:

- Ensuring deck lighting does not attract/disorientate seabirds
- Prompt removal of fish waste from the deck
- Seabirds that land on the deck or impact with the vessel are correctly handled and released to ensure maximum chance of survival.

All trawl vessels >28 m are required to notify DWC should they capture more than a given number of seabirds or marine mammals within a defined time period. These are known as trigger point notifications and are required to be reported to DWC within 24 hours. DWG's Environmental Liaison Officer (ELO) then contacts the vessel to determine the cause (e.g. mitigation measure failure, mechanical breakdown or weather conditions) and then determines what additional mitigation measures the vessel should take (if any).

In summary, the existing mitigation strategies applied by the southern blue whiting trawl fisheries has a high probability of ensuring the UoCs do not hinder nor threaten the recovery of any ETP species populations.

Protected Species Website

Information and data on incidental captures of ETP species reported by the MPI Observer Programme is published on Fisheries New Zealand's Protected Species Bycatch website, which enables captures of protected seabirds, marine mammals, sharks and turtles by the commercial fisheries to be interrogated by species, fishery type, vessel type, area and fishing year (FNZ 2021).

Seabirds

The following information is available for use in assessing the nature and extent of ETP seabird interactions with these fisheries:

- Seabird interactions recorded by MPI Observers (as reported by FNZ)
- Assessments of the risk posed to ETP bird species using the estimation of Annual Potential Fatalities (APFs) and Potential Biological Removals (PBRs) (Richard & Abraham, 2015; Baker & Hamilton, 2012; Edwards et al., 2023)
- Population studies
- Annual Environmental Liaison Officer reports
- Trigger reports (i.e. real time responses to actual incidents)
- Review of ETP species monitoring.

Seabird capture rate reduction targets were established under the NPOA Seabirds for use in comparing them to baseline capture rates. The latter were defined as the average estimated capture rates across the three-year block leading up to the implementation of the NPOA Seabirds 2013 (i.e.

the 2010/11 to 2012/13 fishing years), with at least 10% observer coverage and an estimated seabird capture rate coefficient of variation (CV) of less than 0.30.

For vessels >28 m length in the middle depth trawl fisheries, the agreed capture rate reduction target was 2.3 estimated captures per 100 tows (i.e. a 15% reduction compared to the baseline of 2.7 estimated captures per 100 tow).

The National Plan of Action Seabird reports 2018-19, 2020-21 and 2022-23 provide breakdowns of the observed seabird captures by southern blue whiting trawlers illustrating that small albatross species (i.e., mollymawks) and petrels & shearwaters are the most abundant groups caught (FNZ, 2020a; FNZ 2022; FNZ 2023).

Capture rate reduction targets were established for fisheries based on baseline capture rates, which were defined as the average estimated capture rates across the three-year block leading up to the implementation of the NPOA Seabirds 2013. For the SBW fisheries, the capture rate per 100 tows was 0.59 during the 2020/21 fishing year with 77% observer coverage achieved (FNZ, 2020b). The historical capture rate trend shows that the capture rate continues to decline and is well below the baseline level for SBW fisheries (Figure 11).

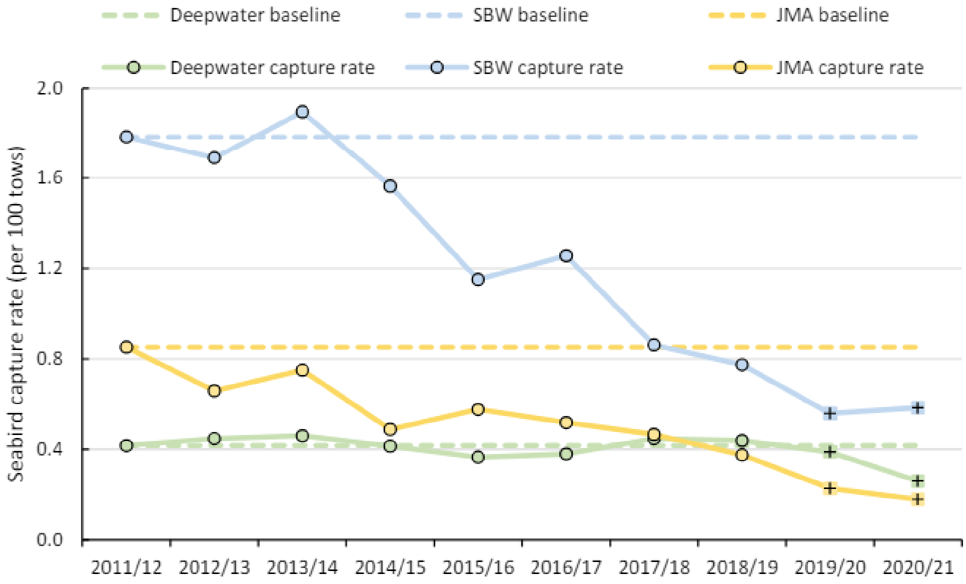


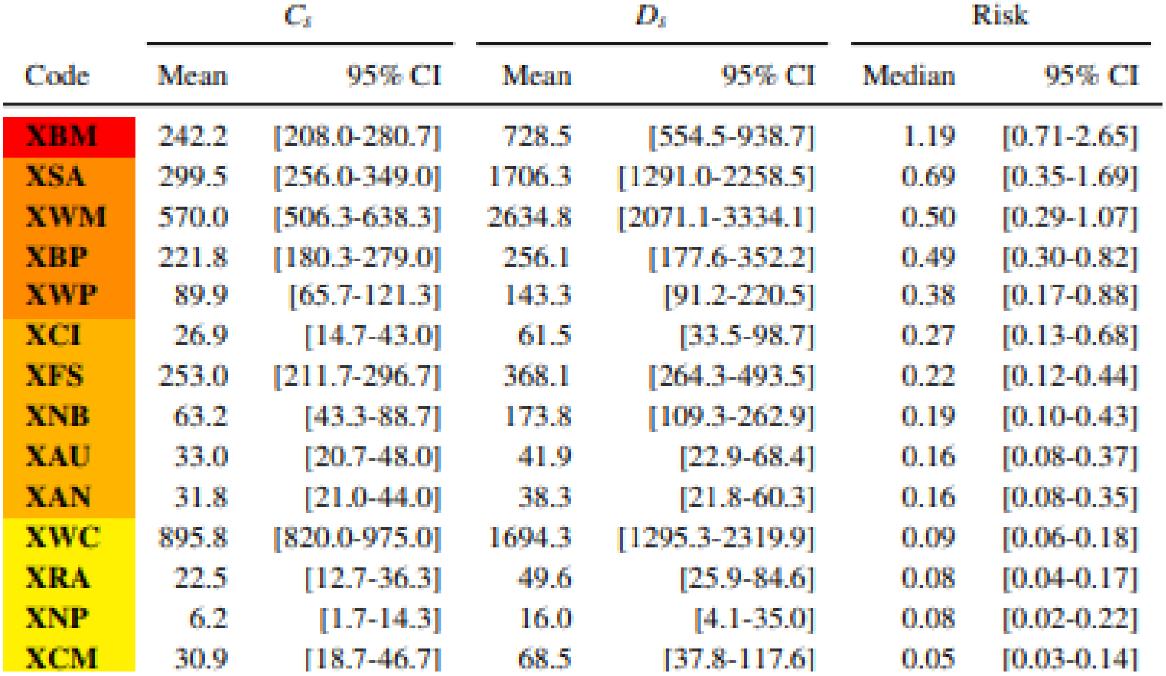
Figure 11: Estimated seabird capture rates (captures per 100 tows) relative to baseline capture rates, for the deepwater, southern blue whiting (SBW), and jack mackerel (JMA) fisheries since the 2010/11 fishing year. Seabird capture rates are expressed as three-year rolling averages. For example, data for 2018/19 represents the average for the 2017/18, 2018/19, and 2019/20 years. Data taken from the Protected Species Capture webpage except for the 2020/21 and 2021/22 fishing years (indicated with a '+').

Seabird Risk Assessments

A Spatially Explicit Fisheries Risk Assessment (SEFRA) method, as developed for non-target species in trawl fisheries, estimates the encounter rate between such species and fishing effort as a function of the overlap (in space and time) between mapped species distributions and mapped fishing effort distributions. The SEFRA framework for seabirds in the New Zealand Exclusive Economic Zone, covering captures by all trawl, longline and setnet fisheries, attempts to quantify the impact of commercial fisheries on New Zealand populations of 71 seabird species (Sharp et al., 2011; Edwards et al., 2023). The 2023 SEFRA has made significant structural changes in order to improve seasonal resolution and improve the transparency diagnosis of the capture predictions and some of the species risk ratios produced by this update are noticeably different from those of the 2017 and 2020 seabird risk assessments (Richard et al., 2017; Richard et al., 2020), reported to be a result of the structural changes to the model.

The results from the 2023 SEFRA show that only southern Buller's albatross (code XBM) was estimated to have a risk metric of greater than one, indicating that current captures are higher than can be sustained by the population over the long term (Table 12), noting that the SEFRA considered captures by all trawl, longline and setnet fisheries in the EEZ and did not specifically include a category for hoki, hake and ling targeted tows. It is assumed that the bulk of captures by the UoA would have been accounted for within the category ‘Large Freezer’, which accounted for only 27% of all southern Buller’s captures over the period 2006-07 to 2019-20 (Edwards et al., 2023).

Table 12: Annual observable captures, deaths and risk per species, ranked from highest to lowest median risk for the top 14 species. Red: risk ratio with a median over 1 or upper 95% credible limit (u.c.l.) over 2; dark orange: median over 0.3 or u.c.l. over 1; light orange: median over 0.1 or u.c.l. over 0.3; yellow: u.c.l. over 0.1.



	C_s		D_s		Risk	
Code	Mean	95% CI	Mean	95% CI	Median	95% CI
XBM	242.2	[208.0-280.7]	728.5	[554.5-938.7]	1.19	[0.71-2.65]
XSA	299.5	[256.0-349.0]	1706.3	[1291.0-2258.5]	0.69	[0.35-1.69]
XWM	570.0	[506.3-638.3]	2634.8	[2071.1-3334.1]	0.50	[0.29-1.07]
XBP	221.8	[180.3-279.0]	256.1	[177.6-352.2]	0.49	[0.30-0.82]
XWP	89.9	[65.7-121.3]	143.3	[91.2-220.5]	0.38	[0.17-0.88]
XCI	26.9	[14.7-43.0]	61.5	[33.5-98.7]	0.27	[0.13-0.68]
XFS	253.0	[211.7-296.7]	368.1	[264.3-493.5]	0.22	[0.12-0.44]
XNB	63.2	[43.3-88.7]	173.8	[109.3-262.9]	0.19	[0.10-0.43]
XAU	33.0	[20.7-48.0]	41.9	[22.9-68.4]	0.16	[0.08-0.37]
XAN	31.8	[21.0-44.0]	38.3	[21.8-60.3]	0.16	[0.08-0.35]
XWC	895.8	[820.0-975.0]	1694.3	[1295.3-2319.9]	0.09	[0.06-0.18]
XRA	22.5	[12.7-36.3]	49.6	[25.9-84.6]	0.08	[0.04-0.17]
XNP	6.2	[1.7-14.3]	16.0	[4.1-35.0]	0.08	[0.02-0.22]
XCM	30.9	[18.7-46.7]	68.5	[37.8-117.6]	0.05	[0.03-0.14]

Species codes:

XBM southern Buller’s albatross; XSA Salvin’s albatross; XWM New Zealand white-capped albatross; XBP black petrel; XWP Westland petrel; XCI Chatham Island albatross; XFS flesh-footed shearwater; XNB northern Buller’s albatross; XAU Gibson’s albatross; XAN Antipodean albatross; XWC white-chinned petrel; XRA southern royal albatross; XNP northern giant petrel; XCM Campbell black-browed albatross.

Reviewing the 2017, 2020 and 2023 risk assessment results indicates, overall, a continued reduction in risk, indicating that ongoing operational mitigation is resulting in beneficial outcomes.

DOC’s conservation status classifications (Robertson et al., 2013; 2017; 2021), and putative 2023 classifications, are provided below (Table 13) for the main species incidentally captured by New Zealand fisheries.

Table 13. Change in DOC threat classifications for the most prevalent incidental seabird captures in all trawl fisheries.

Species	DOC Threat Classification 2012[1]	DOC Threat Classification 2016[2]	DOC Threat Classification 2021[3]	DOC Threat Classification 2023	**Status change**
Southern Buller’s albatross	Naturally Uncommon	Naturally Uncommon	At Risk - Declining	Nationally Critical	Worse

Species	[DOC Threat Classification 2012[1]]	[DOC Threat Classification 2016[2]]	[DOC Threat Classification 2021[3]]	[DOC Threat Classification 2023]	Status change
Salvin's albatross	Nationally Critical	Nationally Critical	Nationally Critical	At Risk - Declining	Better
White-capped albatross	At Risk - Declining	At Risk - Declining	At Risk - Declining	At Risk - Declining	No change
Black (Parkinson's) petrel	Nationally Vulnerable	Nationally Vulnerable	Nationally Vulnerable	Nationally Vulnerable	No change
Westland petrel	Naturally Uncommon	Naturally Uncommon	Naturally Uncommon	Naturally Uncommon	No change

The median risk ratios of the top 5 most at risk seabird species from the 2015, 2017, 2020 and the 2023 Spatially Explicit Fisheries Risk Assessment (SEFRA) are provided below (Table 14). Species with a median risk ratio <1 are not expected to hinder the achievement of population management (Richard et al., 2020). While the risk ratio for southern Buller's albatross is currently assessed to be >1, it is clear that estimates for this species have been highly variable over the last four risk assessments, and it is important to note that these risk assessments consider impacts by all fisheries in New Zealand waters, not just the UoA fisheries

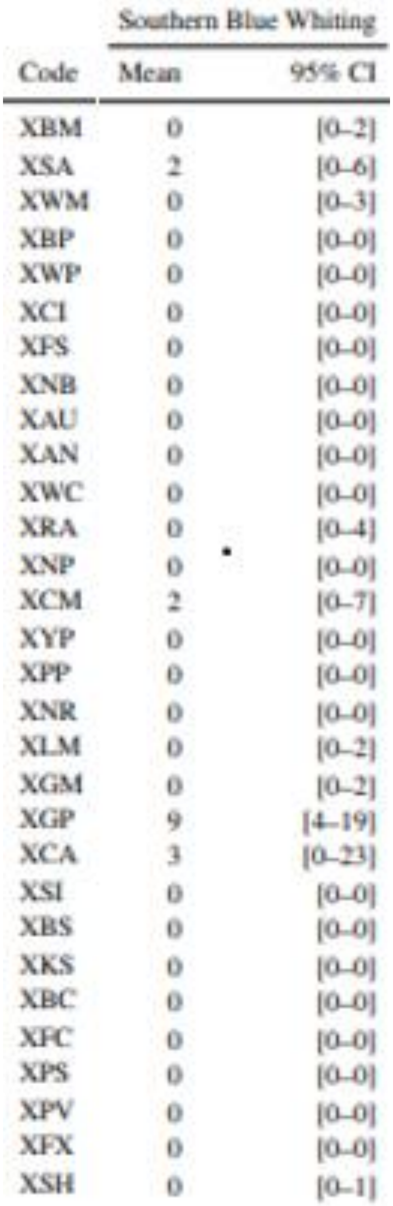
The 2020 risk assessment (FNZ, 2020c), noted an overall decline in seabird interactions consistent with the declining effort in all trawl fisheries over the study period. The risk ratios post-2015 have for the most part shown very great improvements (Table 14).

Table 14: Median risk ratios (and 95% CIs) and SEFRA risk classifications for captures of the top 5 seabird species across all trawl, longline and setnet fisheries in New Zealand waters.

Species	2015 risk ratio (data to 2012-13)	2017 risk ratio (data to 2014-15)	2020 risk ratio (data to 2016-17)	2023 risk ratio (data to 2019-20)	2023 SEFRA Risk Classification (all fisheries combined)	Risk Ratio Trend
Southern Buller's albatross	1.82 (0.97-3.67)	0.4 (0.22-0.69)	0.37 (0.21-0.6)	1.19 (0.71-2.65)	Very high	Variable
Salvin's albatross	3.44 (1.82-6.50)	0.79 (0.52-1.12)	0.65 (0.42-0.94)	0.69 (0.35-1.69)	High	Steady
White-capped albatross	1.10 (0.59-1.97)	0.38 (0.22-0.62)	0.29 (0.18-0.46)	0.50 (0.29-1.07)	High	Variable
Black petrel	11.34 (6.85-19.81)	1.15 (0.51-2.03)	1.23 (0.55-2.11)	0.49 (0.30-0.82)	High	Decreasing
Westland petrel	0.53 (0.21-1.38)	0.55 (0.21-1.28)	0.54 (0.26-1.12)	0.38 (0.17-0.88)	High	Steady

Analysis of the annual deaths attributed to southern blue whiting fisheries shows that the mean number of southern Buller’s albatross (XBM) deaths is zero and that the fishery has very low numbers of seabird encounters overall (Table 15), (see Table 12 for species code descriptions). The associated seabird catchability and vulnerability to SBW fisheries are shown in Figure 12, Figure 13 and Figure 14.

Table 15: Southern blue whiting trawl fishery annual deaths for the top thirty at-risk species, ranked in order of highest to lowest median risk (Source: Edwards et al., 2023).



	Southern Blue Whiting	
Code	Mean	95% CI
XBM	0	[0–2]
XSA	2	[0–6]
XWM	0	[0–3]
XBP	0	[0–0]
XWP	0	[0–0]
XCI	0	[0–0]
XFS	0	[0–0]
XNB	0	[0–0]
XAU	0	[0–0]
XAN	0	[0–0]
XWC	0	[0–0]
XRA	0	[0–4]
XNP	0	[0–0]
XCM	2	[0–7]
XYP	0	[0–0]
XPP	0	[0–0]
XNR	0	[0–0]
XLM	0	[0–2]
XGM	0	[0–2]
XGP	9	[4–19]
XCA	3	[0–23]
XSI	0	[0–0]
XBS	0	[0–0]
XKS	0	[0–0]
XBC	0	[0–0]
XFC	0	[0–0]
XPS	0	[0–0]
XPV	0	[0–0]
XFX	0	[0–0]
XSH	0	[0–1]

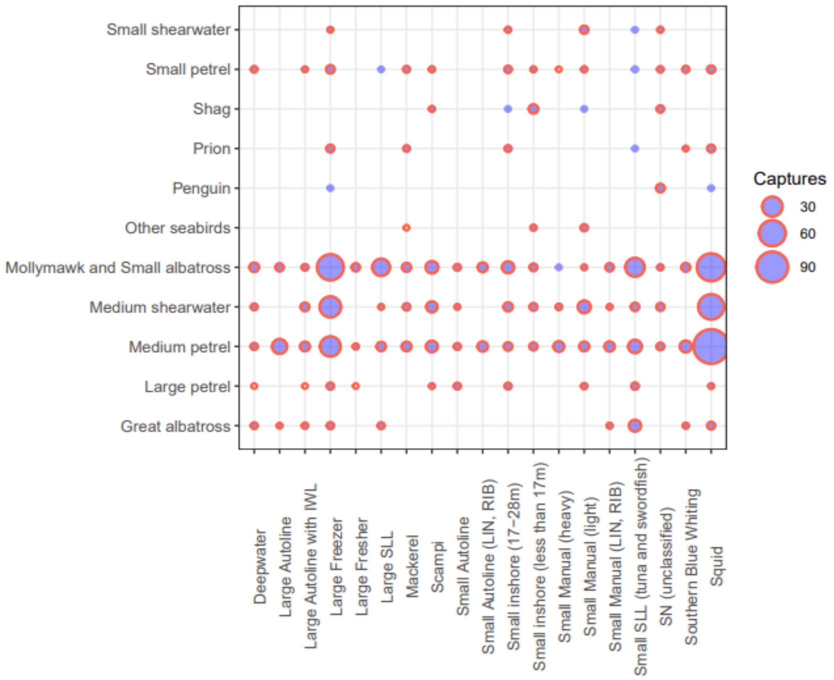


Figure 12: Model fit to observed average annual captures (C 0 f,z) per species and fishery group combination, between 2006/07 and 2019/20. Model predicted values are represented by the posterior median of the sum across species per group and shaded in blue. Empirical values are represented by red circles (Source: Edwards et al., 2023).

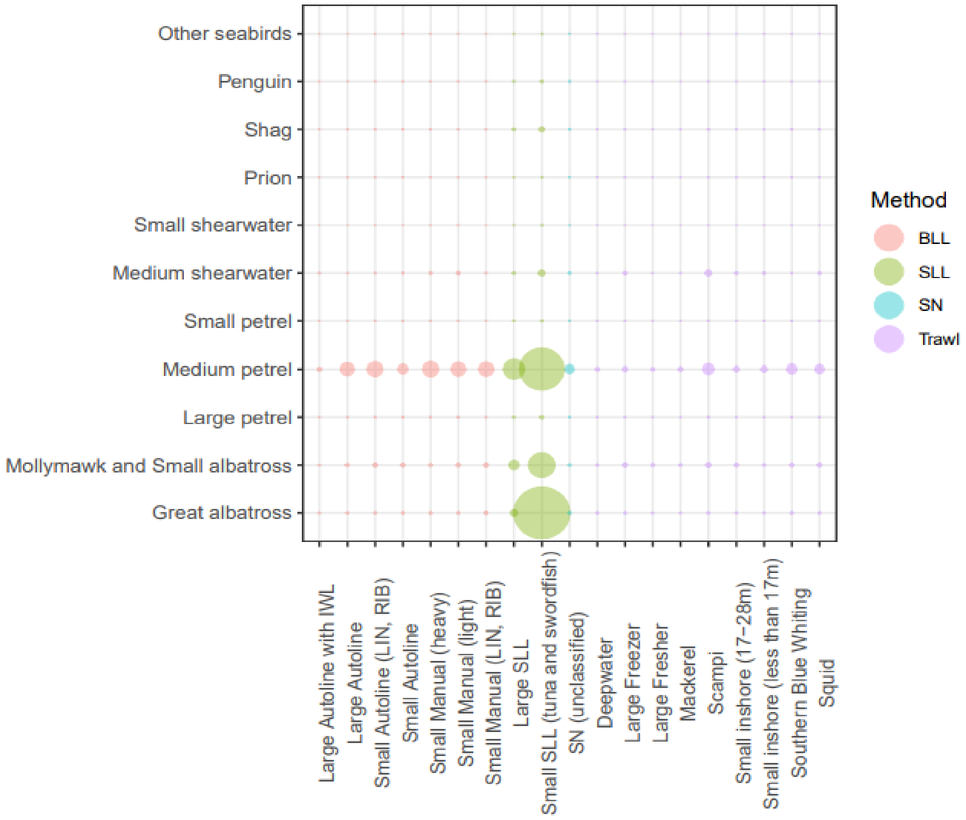


Figure 13: Catchability (qf,z) per species group and fishery group combination. Catchabilities are only comparable between methods and groups that share the same effort units (Source: Edwards et al., 2023).

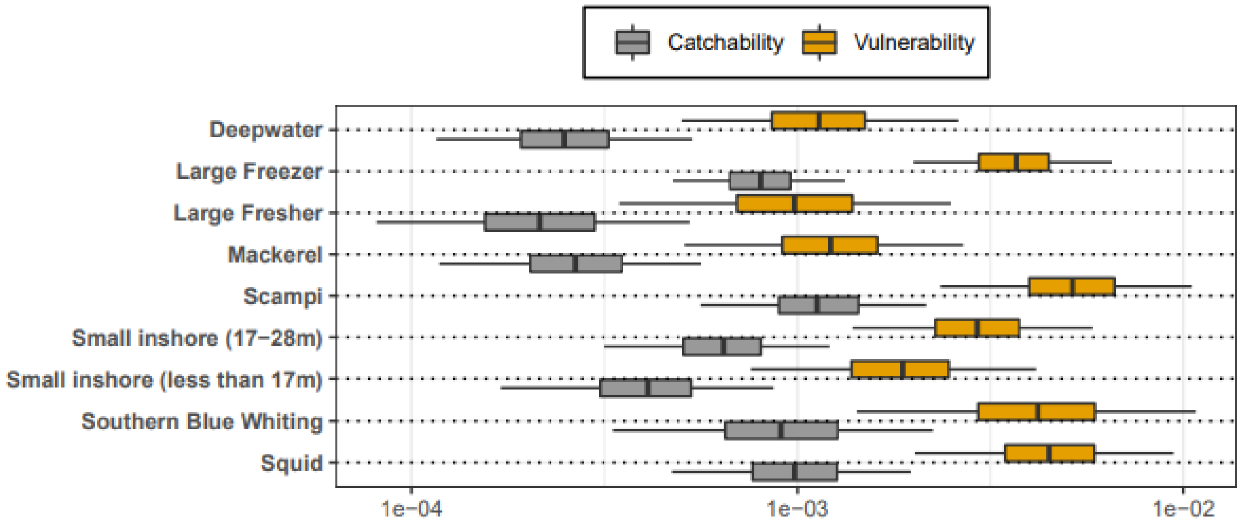


Figure 14: Marginal catchability (qf) and vulnerability (υf) per trawl fishing group assuming a geometric mean across species. Values are given on a log10-scale. Boxplots show the median, and 75% and 95% posterior quantiles (Source: Edwards et al., 2023).

Between 2002–03 and 2020–21 (i.e. 19 years), there were 140 observed captures of all seabirds in southern blue whiting trawl fisheries (Figure 15 and Figure 16). Grey petrel is the species encountered most often, accounting for around 56% of captures. In 2018-19 there was an unexplained spike in petrel captures (grey petrel (x27), Snares Cape petrel (x4), Cape petrel (x3), fairy prion (x1, grey-backed storm petrel (x1) and New Zealand white-capped albatross (x1)), most of which were released alive (Figure 17).

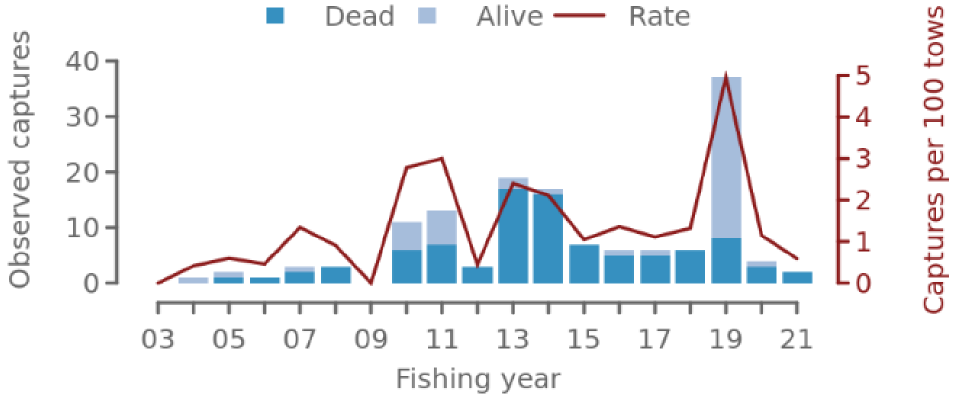


Figure 15: Observed captures, capture rate and release status of all birds in southern blue whiting fisheries 2002-03 to 2020-21.

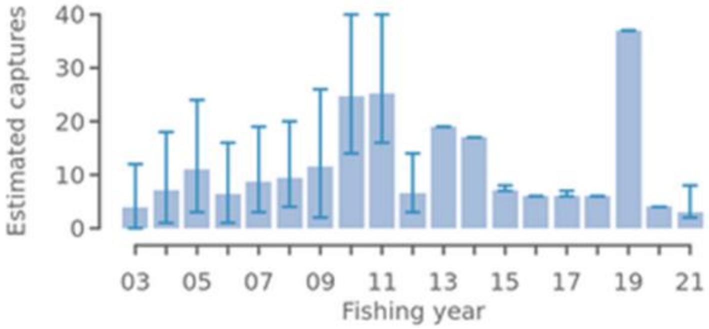


Figure 16: Estimated total incidental seabird captures (dead and live released) by southern blue whiting fisheries 2002-03 to 2019-20.

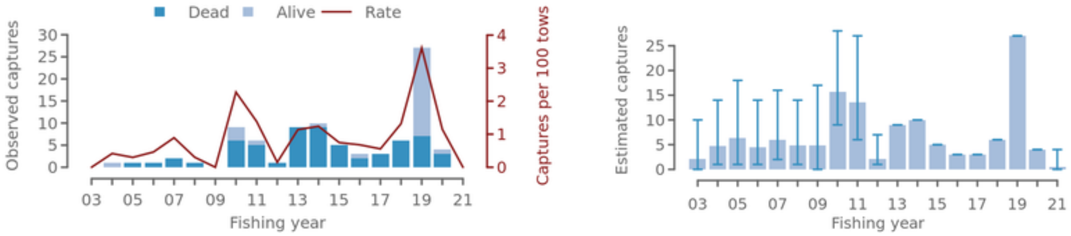


Figure 17: Southern blue whiting trawl fishery interactions with grey petrel. Left: Observed captures and capture rates. Right: Estimated captures.

All seabird and marine mammal species in New Zealand are protected and all interactions/mortalities are required to be reported. A summary of observed interactions of southern blue whiting-targeted tows with ETP seabirds over the 5-year period 2016-17 to 2020-21 is provided below (**Table 16**). Data were sourced from the New Zealand Protected Species Database.

Table 16: Summary of observer-recorded interactions of southern blue whiting fisheries with ETP/OOS seabirds from 2016-17 to 2020-21. Data sourced from FNZ Protected Species Database. Observer coverage averaged 95% of tows for southern blue whiting. Rows in orange did not meet the criteria for 'negligible'. Population information was from the New Zealand Protected Species Captures (PSC) database. Risk ratings are from [1] Edwards, et al., (2023), [2] Richard, et al., (2020), [3] Abraham, et al., (2017).

			No. individuals in population	**2016/17**		**2017/18**		**2018/19**		**2019/20**		**2020/21**		**Designation**
Common name	**ETP Listing**	**Risk (+ 95% CI)**		**Alive**	**Dead**	**Alive**	**Dead**	**Alive**	**Dead**	**Alive**	**Dead**	**Alive**	**Dead**	
Southern black-browed albatross *Thalassarche melanophris*	Seabird IUCN-LC	0.05 (0.03-0.14)[1]	1,4 million mature individuals		1									ETP-negligible Meets SA3.8.2.5
Fairy prion (XFP) *Pachyptila turtur*	Seabird IUCN-LC	0.00 (0.00-0.00)[1]	5 million individuals						1					ETP-negligible Meets SA3.8.2.5
Grey-backed storm petrel *Garrodia nereis*	Seabird IUCN-LC		>200,000 individuals					1						ETP-negligible Meets SA3.8.2.5

				2016/17		2017/18		2018/19		2019/20		2020/21		
Common name	**ETP Listing**	**Risk (+ 95% CI)**	**No. individuals in population**	**Alive**	**Dead**	**Alive**	**Dead**	**Alive**	**Dead**	**Alive**	**Dead**	**Alive**	**Dead**	**Designation**
New Zealand white-capped albatross (XWM) *Thalassarche cauta steadi*	Seabird IUCN-NT	0.50 (0.29-1.07)[1]	>200,000 mature individuals					1						ETP-negligible Meets SA3.8.2.5
Snares Cape petrel (XCA) *Daption capense australe*	Seabird IUCN-LC	0.02 (0.00-0.13)[1]	2 million individuals (global Cape petrel)	1				6						ETP-negligible Meets SA3.8.2.5
Southern royal albatross (XRA) *Diomedea epomophora*	Seabird IUCN-VU	0.08 (0.04-0.17)[1]	27,200 mature individuals		1								2	ETP-negligible Meets SA3.8.2.5
Grey Petrel (XGP) *Procellaria cinerea*	Seabird IUCN-NT	0.02 (0.01-0.05)[1]	151,500 mature individuals		3		6	20	7	1	3			ETP-Assessed Does not meet SA3.8.2.5

As FNZ observers are present on a very high percentage of southern blue whiting fishing events, averaging 95% coverage for the period 2016-17 to 2020-21, the observed and mean estimated numbers of captures presented in the Protected Species Bycatch in New Zealand Fisheries database (https://protectedspeciescaptures.nz/) are very similar. The PSC website provides mean estimated captures of seabirds based on the total number of tows, the number of observed tows, observer coverage (the percentage of tows that were observed), the number of observed captures (both dead and alive), the capture rate (captures per hundred tows) per fishing year to provide the mean number of estimated total captures (with 95% confidence interval), and the percentage of tows included in the estimate. While estimated captures are not available by species, the estimates for all seabird species combined for southern blue whiting-targeted tows (Table 17) provide support for the designation of negligible for some bird species (see Table 16) based on ratios provided.

Table 17: Observed and estimated seabird interactions by the southern blue whiting fishery. Data sourced from the Protected Species Bycatch database (https://protectedspeciescaptures.nz/)

Year	% Tows observed	No. observed captures	Observed capture rate	Mean estimated captures	95% CI
2016/17	100.0	6	1.1	6	6-7
2017/18	100.0	6	1.3	6	6-6
2018/19	99.9	37	5.0	37	37-37
2019/20	100.0	4	1.2	4	4-4
2020/21	77.1	2	0.6	3	2-8

Seabird species most at risk

The seabird species most at risk from SBW fisheries is the grey petrel (*Procellaria cinerea*).

Grey petrel has a circum-polar distribution in the southern hemisphere and breeds on sub-Antarctic islands governed by South Africa, France, New Zealand and Britain. It has an estimated mature population size of ~152 000 birds. In the New Zealand region it breeds on the sub-Antarctic Antipodes and Campbell Islands and has an estimated 53,000 breeding pairs on Antipodes Island, the largest known breeding colony globally (Bell, 2002; Parker et al., 2017; Rexer-Huber & Parker, 2021).

ETP seabird research

A research plan outlining seabird risk assessment, monitoring and mitigation projects to be undertaken from 2020 to 2024 is provided in the NPOA Seabirds 2020 Implementation Plan (FNZ, 2023).

On-going and proposed new seabird population research projects include the following (DOC, 2024):

- POP2022-01 Black petrel population monitoring
- POP2022-08 Auckland Islands seabird research: Gibson’s and white-capped albatross
- POP2022-10 Antipodes Island seabird research: Antipodean albatross and white chinned petrel
- POP2023-02 Southern Buller’s population study
- POP2023-04 Campbell Island seabird research
- POP 2024-01 Flesh-footed shearwater population monitoring

On-going and proposed seabird mitigation projects include the following (DOC, 2024):

- MIT2023-06 Underwater line setting devices for bottom longline vessels
- MIT2024-01 Protected species liaison project
- MIT2024-06 Efficacy of seabird mitigation in large vessel trawl

Post-release survival assessment of seabirds

- INT2019-06 Investigation of options for assessing the post-release survival of seabirds that interact with commercial fisheries in New Zealand.

Sharks

A total of five fish species, all of them chondrichthyans, are designated as OOS, based on the decision tree for species categorisation (Figure SA3). All have ‘negligible’ status (Table 18).

Table 18: Fish species designated as Out Of Scope based on the decision tree for species categorisation. Observed catches in tonnes; catch percentages based on overall observed catch composition. Data from MPI observed catch composition. Data source: FNZ Rep Log 15659.

Species	ETP/OOS Designation	2018/19	2019/20	2020/21	2021/22	2022/23	5-yr average (t)	5-yr average (%)	Designation
Porbeagle *Lamna nasus*	Chondrichthyan CITES Appendix II IUCN - VU Does not meet modification criteria	10	6	8	9	20	11	0.05	ETP/OOS-negligible Meets SA3.8.2.5
Leafscale gulper shark *Centrophorus squamosus*	Chondrichthyan IUCN – EN	0	0	0	0	0	0	<0.01	ETP/OOS-negligible Meets SA3.8.2.5
School shark *Galeorhinus galeus*	Chondricthyan IUCN - CR	0	0	0	0	0	0	<0.01	ETP/OOS-negligible Meets SA3.8.2.5
Short finned mako* *Isurus oxyrinchus*	Chondrichthyan IUCN – EN	0	0	0	0	1	0	<0.01	ETP/OOS-negligible Meets SA3.8.2.5
Blue shark	Chondrichthyan	0	0	0	0.2	0.2	0	<0.01	OOS- negligible

Prionace glauca	CITES-CMS IUCN-NT Does not meet modification criteria								Meets SA3.8.2.5

*Note: while short finned mako is listed as a CITES II species, trade of catch taken in New Zealand waters is subject to a non-detrimental finding (NDF) and is permissible, (Robertson & McIntyre, 2020).

Application of Modification Criteria

Porbeagle

Productivity

Productivity		
Scoring element (species)	Porbeagle Biological characteristics from fish base	
Attribute	Justification	Score
Average age at maturity	8-11 years males 15-18 years females	2
Average maximum age	65	3
Fecundity	4 pups per year	3
Average maximum size Not scored for invertebrates	200cm	2
Average size at maturity Not scored for invertebrates	186.5cm	3
Reproductive strategy	viviparous	3
Trophic level	4.6	3
Productivity score from RBF	2.71	

Management status

The porbeagle is managed as part of the QMS, there are some specific provisions for the species, regarding the removal of fins and returning individuals to the water (i.e., Schedule 6). However, there are no other management measures in place and the species is not managed using LRP or TRP (or equivalent) therefore the species does not meet the modification criteria for management status (SA3.1.4.3b).

Stock status

The stock structure of porbeagle sharks in the Southern Hemisphere is unknown (Fisheries New Zealand, 2019c) however, it seems likely that sharks in the south-west Pacific comprise a single stock. The stock status of porbeagle sharks from the entire Southern Hemisphere range of the species was assessed in 2017 (Hoyle, et al, 2017). The assessment noted that although the stock status of the species is currently unknown the results of the assessment show that fishing mortality on the Southern Hemisphere stock is very low, and that it decreases eastward from the waters off South Africa to the waters off New Zealand. although the stock status of the species is currently unknown there is a very low risk that the Southern Hemisphere porbeagle shark is subject to overfishing anywhere within its range. A qualitative risk assessment was completed on all chondrichthyans (sharks, skates, rays and chimaeras) at the New Zealand scale in 2017 (Ford et al, 2018). Porbeagle sharks had a risk score of 15 and were ranked second equal lowest risk of the eleven QMS chondrichthyan species.

Porbeagle does not meet any of the three modification criteria and therefore is classified as ETP/OOS in accordance with SA3.1.4.3.

Blue shark

Productivity

Productivity		
Scoring element (species)	Blue shark Biological characteristics from fish base	
Attribute	Justification	Score
Average age at maturity	4 years	1
Average maximum age	20 years	2
Fecundity	4-63 young in a litter, gestation 9-12 months	3
Average maximum size Not scored for invertebrates	400cm	3
Average size at maturity Not scored for invertebrates	199 (range 170 – 221)	3
Reproductive strategy	viviparous	3
Trophic level	4.4 ±0.2 se; based on diet studies	3
Productivity score from RBF	2.57	

Management Status

Blue shark is a QMS, Schedule 6 species and be returned to the water alive or dead and if dead, balanced against ACE. Blue shark was introduced into the QMS on 1 October 2004 under a single QMA, BWS 1, with allowances, TACC (1 860t), and TAC (2 080t) however, it is unclear what information these metrics were based on. There are no other management measures in place and the species is not managed using LRP or TRP (or equivalent) therefore the species does not meet the modification criteria for management status (SA3.1.4.3b)

Stock status

Blue shark in the southwest Pacific is considered a single stock (Neubauer et al., 2021). A recent stock assessment found that 90% of model runs indicated that fishing mortality at the end of the assessment period was below F_{MSY} and 96% of model runs show that the biomass is above SB_{MSY} (Neubauer et al., 2021). Fishing mortality had declined over the last decade and is currently relatively low, as blue sharks are not retained by most longline fleets. Neubauer, et al., (2021) concluded that the stock on average does not appear to be overfished and overfishing is not occurring. Therefore, the stock assessment criteria are met in accordance with SA3.1.4.3c.

Blue shark does not meet at least two of the modification criteria and is therefore assessed as ETP/OOS in accordance with SA3.1.4.3.

Post-release survival of sharks

Post-release survival rates for the pelagic mako and blue sharks caught by longline fisheries are thought to be medium-to-high, and medium-low post-release survival probability. There is very little information on post-release survival rates from trawl fisheries, but they are thought to be low (Moore & Finucci, 2024). This is likely to be particularly the case on factory trawlers where the catch may be transported below-decks prior to release and where it may not be possible to release large sized sharks timeously via the discharge chute.

Marine mammals

New Zealand sea lions

The indigenous New Zealand sea lion (*Phocarctos hookeri*) has a population size of approximately 12,000 and has four known breeding sites, the largest being at the Auckland Islands. Other sites are Campbell Island, Stewart Island and the southern tip of South Island (Figure 18).

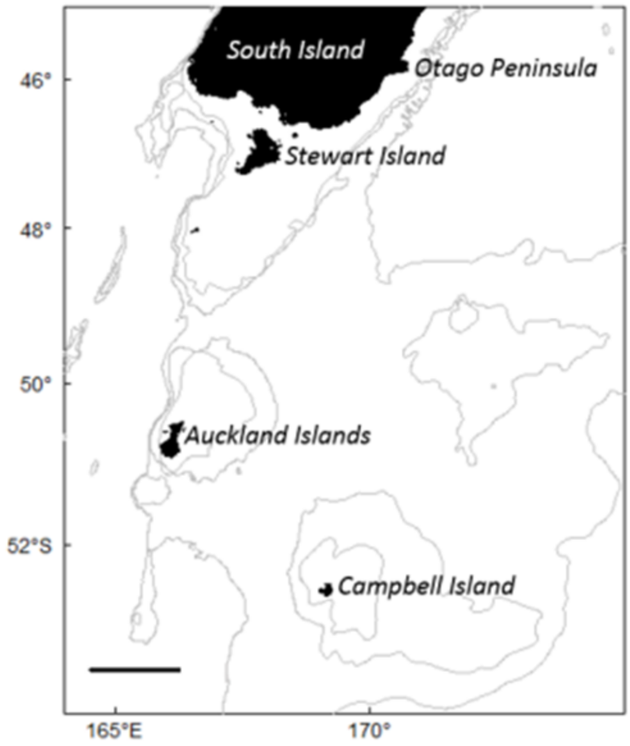


Figure 18: Location of New Zealand sea lion breeding populations on Auckland Islands, Campbell Island, Stewart Island and the southern tip of South Island (after Roberts & Doonan, 2016).

Annual pup counts at the Auckland Islands are used to index trends in the sea lion population. Pup counts halved between 1998 and 2009, prompting a risk assessment to be undertaken (Roberts et al., 2016) and the development and implementation of a New Zealand Sea Lion/rāpoka Threat Management Plan in 2017 (DOC, 2017) with a vision to “promote recovery and ensure the long-term viability of New Zealand sea lions”.

While their conservation threat status is ‘Nationally Vulnerable’ (Baker et al., 2019; FNZ, 2022c), the mandatory use of Sea Lion Exclusion Devices (SLEDs) under the squid fishery and southern blue whiting Operational Plans and agreed Operational Procedures followed by vessels, has arrested captures. The estimated number of annual fishing-related deaths has declined from around 160 in the mid-1990s to an average of three over the last decade. Annual pup production has been relatively stable over the 13-year period 2008-09 to 2021-22, although large, unexplained inter-annual fluctuations continue to feature (Young & Manno, 2022). Pup production declined by 24% in 2022-23 (Figure 19), which has triggering a review of the New Zealand sea lion Threat Management Plan (DOC & MPI 2017) and the Squid 6T Operational Plan (FNZ, 2019). No estimate of pup production was obtained in 2020-21 due to Covid-19-related cancellation of the field season.

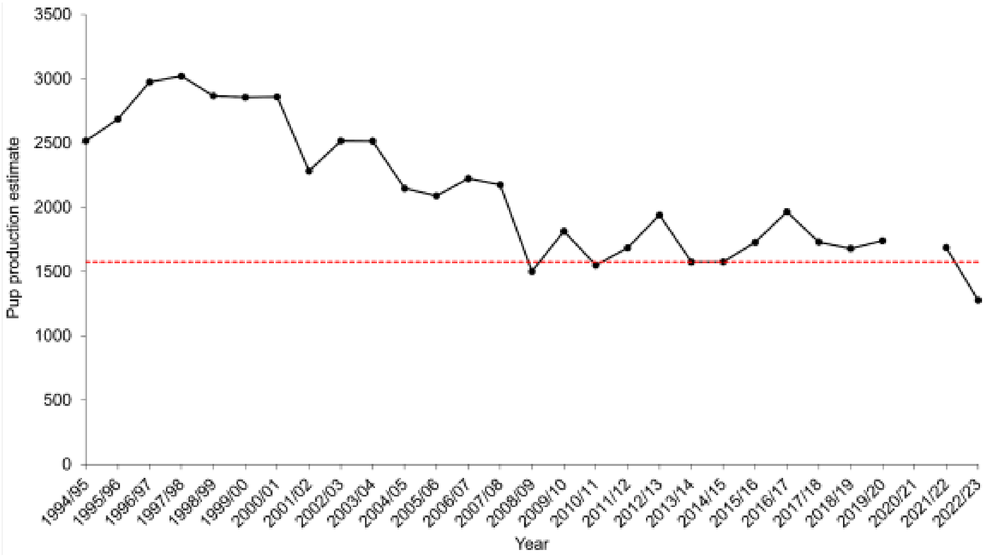


Figure 19: Total estimated sea lion pup production at the Auckland Islands colonies 1994-95 to 2022-23. The dashed line represents the minimum count of 1 575 pups set to trigger reviews of the New Zealand sea lion Threat Management Plan (DOC & MPI, 2017) and Squid 6T Operational Plan (FNZ, 2019).

The risk of sea lion captures is highest in the Squid 6T trawl fishery, which is prosecuted in New Zealand's sub-Antarctic waters (i.e. areas within the EEZ south of 49°S), and which has a very high level of observer coverage, approximating 100%. Under the SQU6T Operational Plan the annual Fishing-Related Mortality Limit (FRML) is 52, estimated by adjusting the observed number of captures by a cryptic multiplier of 1.3 (FNZ, 2019). The observed number of captures has averaged 4 per annum by squid trawl fisheries over the 5-year period 2016-17 to 2020-21 and 1.4 per annum by southern blue whiting fisheries (Figure 20). These captures are well below the annual FRML. Due to the ongoing low capture rate, the sea lion FRML was rescinded in April 2024.

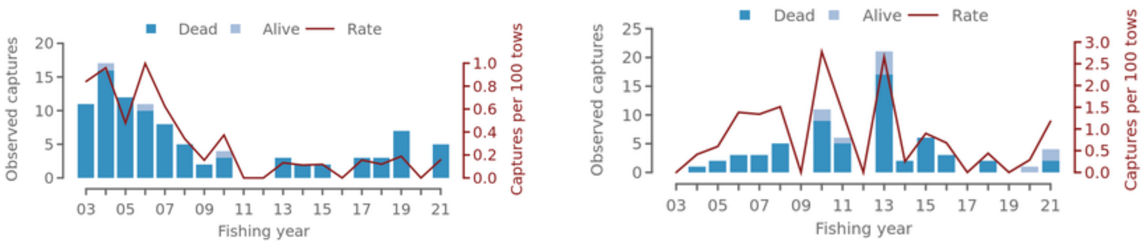


Figure 20: Observed captures and capture rates of New Zealand sea lion by squid (Left) and southern blue whiting (Right) fisheries 2002-03 to 2020-21.

New Zealand Fur seals

The New Zealand fur seal is found in both New Zealand and Australia. It is abundant and classified as 'least concern' by DOC, while their threat classification status is 'Not Threatened'. The New Zealand population is estimated to be around 127,000 and numbers are increasing (Baker et al., 2019). A 2017 marine mammal risk assessment estimated a Population Sustainability Threshold (PST) of 3,400 animals and a median risk ratio of 0.2 for New Zealand fur seals (Figure 21), (Abraham et al., 2017).

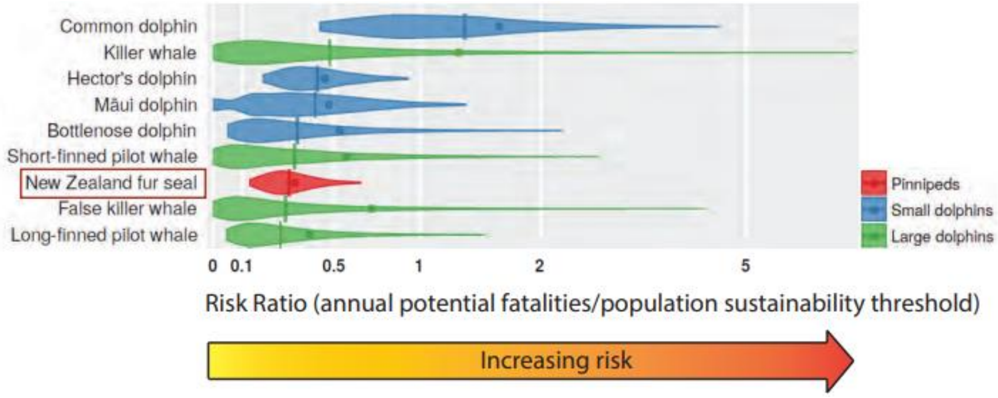


Figure 21: New Zealand fur seal risk ratio as calculated by the 2017 Assessment of the risk to New Zealand marine mammals from commercial fisheries (Abraham et al, 2017).

Over the recent 5-year period 2016-17 to 2020-21 the fur seal capture rate by southern blue whiting fisheries has reduced to a low level, averaging 10 per annum at a capture rate of 2.1 per 100 tows. The very high observer coverage, averaging 95%, provides a high level of confidence in the results(Figure 22).

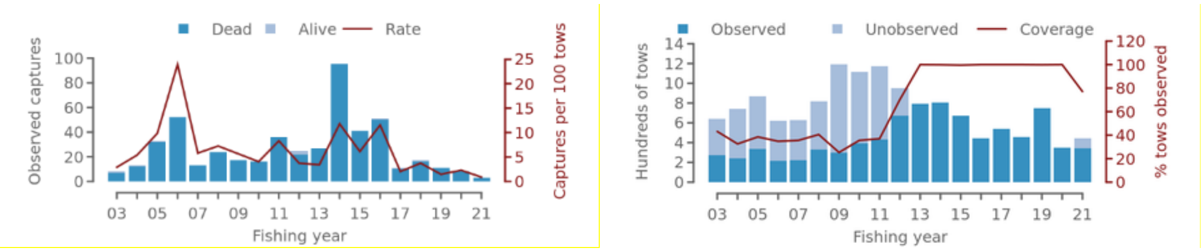


Figure 22: Observed captures and capture rates (Left) and fishing effort and observer coverage (Right) of New Zealand fur seal by southern blue whiting fisheries from 2002-03 to 2020-21.

Fur seal bycatch research

Recent research on NZ fur seal bycatch has focused on:

- The utility of using drones for aerial surveys to quantify fur seals populations sizes at the Bounty Islands, to investigate the effects of bycatch by the southern blue whiting trawl fishery (Rexer-Huber & Carter, 2020)
- Analysis of marine mammal bycatch rates by New Zealand's commercial fisheries as a basis for evaluating the efficacy and effectiveness of the different mitigation measures employed (Tremblay-Boyer & Berkenbusch, 2022)

Other seals

Between 2002–03 and 2020-21, there has been one observed capture of a Leopard seal in southern blue whiting trawl fisheries (Figure 23).

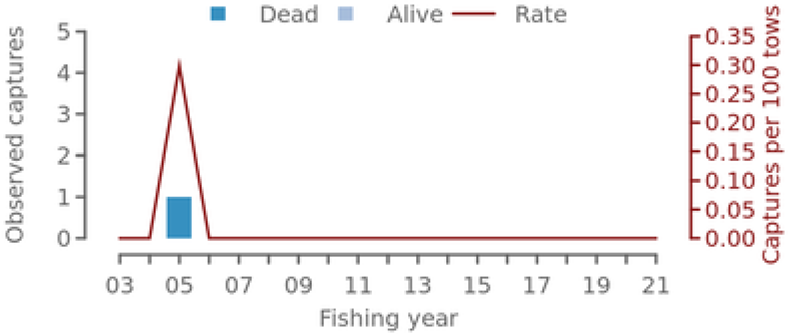


Figure 23: Observed incidental leopard seal captures by southern blue whiting fisheries, 2002-03 to 2020-21.

Whales & dolphins

There have been no reported whale or dolphin captures in the southern blue whiting fisheries.

All marine mammal species in New Zealand are protected and all interactions/mortalities are required to be reported. A summary of observed interactions of southern blue whiting-targeted tows with ETP marine mammals over the 5-year period 2016-17 to 2020-21 is provided below (Table 19). Data were sourced from the New Zealand Protected Species Database.

Table 19: Summary of observer-recorded interactions of the southern blue whiting fisheries with ETP/OOS marine mammals from 2016-17 to 2020-21. Observed captures in numbers of individuals. Data sourced from FNZ Protected Species Database. Observer coverage averaged 95% of tows. Rows in orange did not meet the criteria for 'negligible'. Population information sourced from Abraham, et al., (2017).

			No. individuals in population	**2016/17**		**2017/18**		**2018/19**		**2019/20**		**2020/21**		**Desig-nation**
Common name	**ETP Listing**	**Risk (+ 95%CI)**		**Alive**	**Dead**	**Alive**	**Dead**	**Alive**	**Dead**	**Alive**	**Dead**	**Alive**	**Dead**	
New Zealand sea lion *Phocarctos hookeri*	Mammal IUCN-EN	0.10 (0.05-0.19)	11,650 individuals				2			1		2	2	ETP-negligible Meets SA3.8.2.5
New Zealand fur seal *Arctocephalus forster*	Mammal IUCN-LC	0.31 (0.13–0.64)	100,000 mature individuals	1	10	1	16		11		8		3	ETP-Assessed Does not meet SA3.8.2.5

Sessile benthic species

All landings of protected corals must be returned to the water immediately, and commercial fishers must report their capture on NFPS catch returns. Although not protected, catches of other benthic bycatch such as anemones, bryozoans, sea pens and sponges are also recorded by FNZ observers.

Protected corals are rarely encountered by southern blue whiting trawlers, which operate primarily using mid-water trawl gear and which is occasionally in contact with the seabed. There has been no observed coral bycatch by these fisheries over the 5-year period 2018-19 to 2022-23 (Table 20). Less than 1 kg of coral was reported captured on Non-Fish Protected Species forms by vessels (Table 21). It is clear that the impact of the southern blue whiting UoA fisheries on ETP corals is negligible.

The most commonly captured non-protected sessile benthic species group is sponges, which are taken in small quantities. Deepsea anemones are occasionally encountered in very small quantities. Catches reported independently by observers and by vessels show that sponges are the main benthic bycatch species encountered (Table 20 and Table 21).

Table 20: Observed incidental capture of sessile benthic invertebrates (kg) by southern blue whiting target tows, 2018-19 to 2022-23. Percentages calculated against total observed catch of all fish and invertebrate species (data source: FNZ COD database).

Common name	2018/19	2019/20	2020/21	2021/22	2022/23	5-Year Avg. (kg)	5-Year Avg. (%)
Sponges	80	340			67	162	0.001%
Floppy tubular sponge	169	10	100	1	164	89	0.000%
Grey fibrous massive sponge					30	30	0.000%
Anemones				7		7	0.000%
Deepsea anemone		2			0	1	0.000%
Totals	**249**	**352**	**100**	**8**	**261**	**289**	**0.001%**

Table 21: Vessel-reported incidental catches (kg) of sessile benthic species by southern blue whiting trawl fisheries. (Data source: FNZ Non-Fish Protected Species catch forms).

Common name	Species Code	2018-19	2019-20	2020-21	2021-22	2022-23	5-Year Avg. (kg)	5-Year Avg. (%)
Sponges	ONG	155	373	-	1	252	156	0.001%
True Coral (Unid.)	COU			-		0	0	0.000%
Totals		**155**	**373**	**-**	**1**	**252**	**156**	**0.001%**

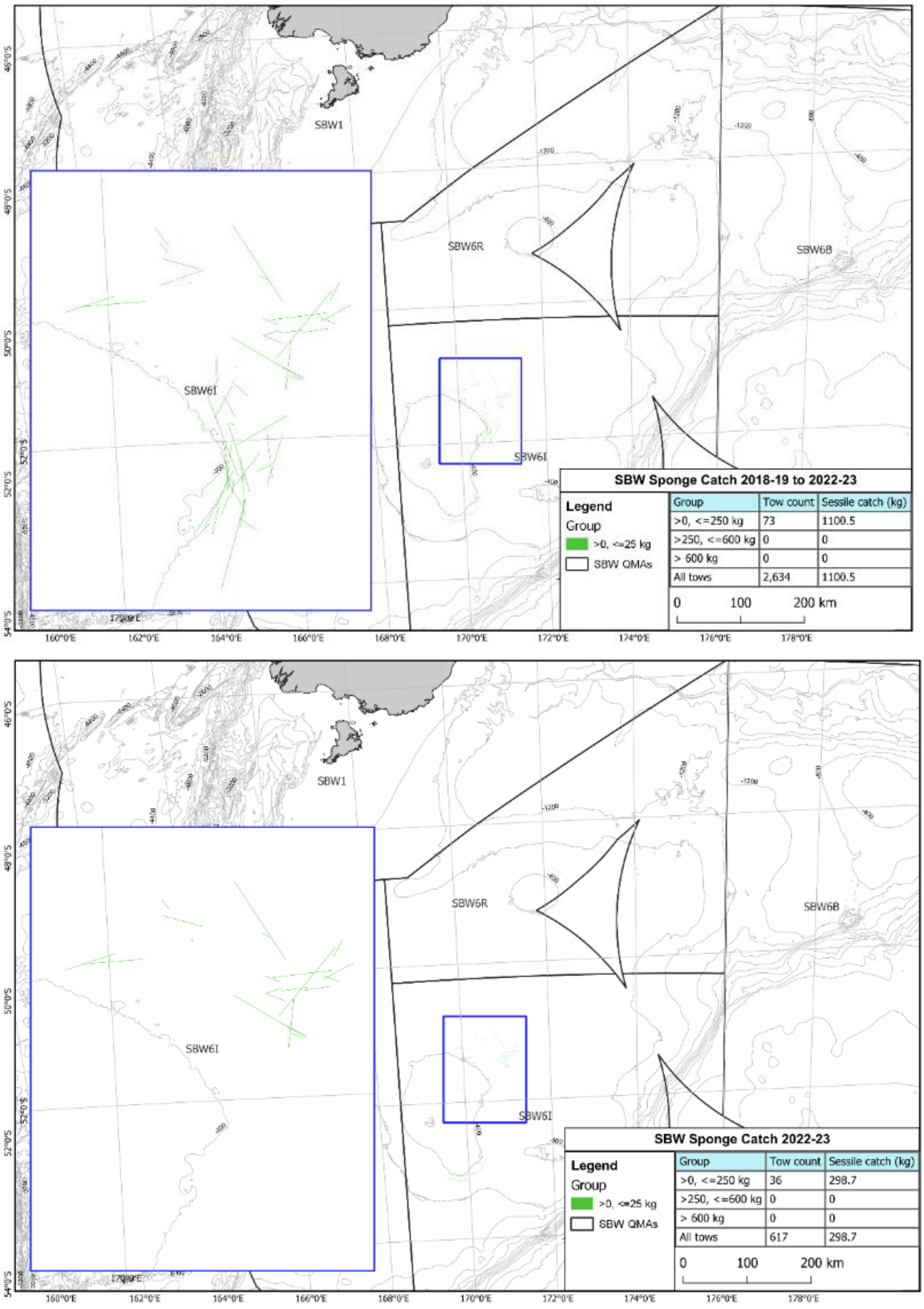
Fishery interaction with sessile benthic taxa

Analysis of incidental catches of sessile benthic invertebrate taxa during the period 1989-90 to 2022-23 and in 2022-23, showed that corals and bryozoans were not impacted by the southern blue whiting UoAs and that anemones were encountered by a very minor percentage of tows and in minor quantities. Sponges were similarly encountered by a small proportion of tows but involved slightly greater quantities (noting that catch weights were likely over-estimated due to water retention), (Table 22).

Table 22: Incidental capture of sessile benthic invertebrate taxa by the southern blue whiting UoAs during the period 1989-90 to 2022-23 and in 2022-23.

	1989-90 to 2022-23				2022-23			
Benthic Taxa	No. tows	No. tows with captures	% tows with captures	Capture weight (kg)	No. tows	No. tows with captures	% tows with captures	Capture weight (kg)
Corals	-	-	-	-	-	-	-	-
Bryozoans	-	-	-	-	-	-	-	-
Sponges	2,634	73	2.8%	1,100.5	617	36	5.8%	298.7
Anemones	2,634	2	0.1%	2.2	617	1	0.2%	0.2

Encounters with sponges were patchy and occurred over an area north-east of Campbell Island (Figure 24). Rare encounters of anemones occurred in the same general area (Figure 25).



SBW Sponge Catch 2018-19 to 2022-23

Group	Tow count	Sessile catch (kg)
>0, <=250 kg	73	1100.5
>250, <=600 kg	0	0
> 600 kg	0	0
All tows	2,634	1100.5

SBW Sponge Catch 2022-23

Group	Tow count	Sessile catch (kg)
>0, <=250 kg	36	298.7
>250, <=600 kg	0	0
> 600 kg	0	0
All tows	617	298.7

Figure 24: Incidental catches of sponges by the southern blue whiting UoAs for the period 1989-90 to 2022-23 (Top) and during 2022-23 (Bottom). Data source: FNZ. (L. Easterbrook-Clarke, GNS Science, pers. Comm.)

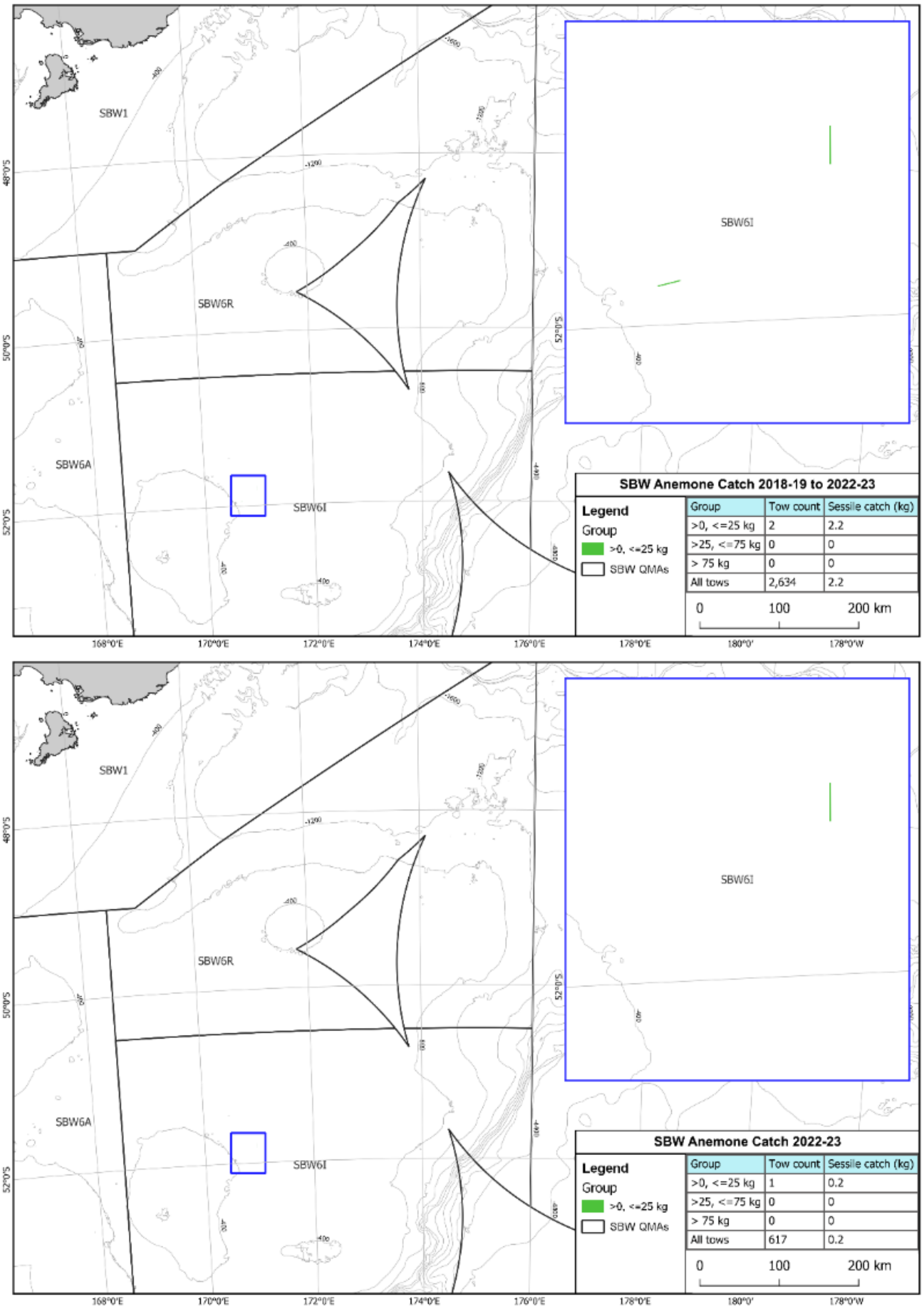
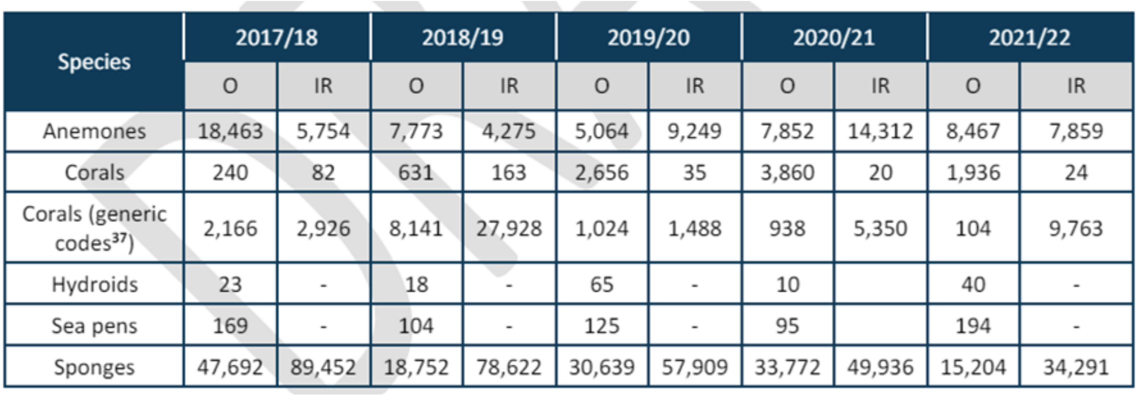


Figure 25: Incidental catches of anemones by the southern blue whiting UoAs for the period 1989-90 to 2022-23 (Top) and during 2022-23 (Bottom). Data source: FNZ. (L. Easterbrook-Clarke, GNS Science, pers. Comm.)

Information trueness

A summary of the observer and industry-reported catches of ETP and non-ETP benthic species as published in the Annual Review Report for the core deepwater trawl fisheries, of which southern blue whiting is a component, indicates that reported catches from these two independent sources align reasonably well (FNZ, 2022), (Table 23).

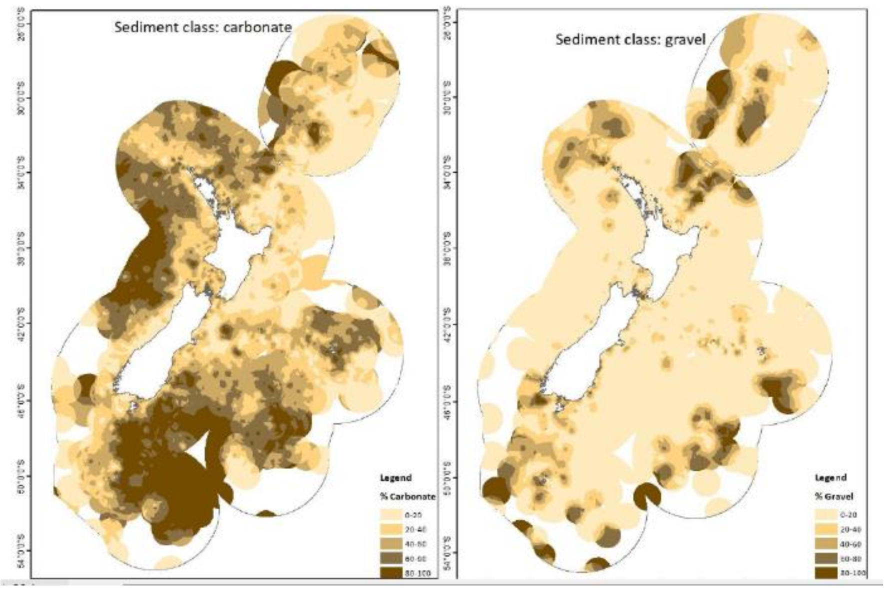
Table 23: Observed (O) and industry reported (IR) catch of benthic species (kg) by the core deepwater fleet for fishing years 2017/18 to 2021/22 (FNZ, 2022).



Species	2017/18		2018/19		2019/20		2020/21		2021/22	
	O	IR	O	IR	O	IR	O	IR	O	IR
Anemones	18,463	5,754	7,773	4,275	5,064	9,249	7,852	14,312	8,467	7,859
Corals	240	82	631	163	2,656	35	3,860	20	1,936	24
Corals (generic codes[37])	2,166	2,926	8,141	27,928	1,024	1,488	938	5,350	104	9,763
Hydroids	23	-	18	-	65	-	10		40	-
Sea pens	169	-	104	-	125	-	95		194	-
Sponges	47,692	89,452	18,752	78,622	30,639	57,909	33,772	49,936	15,204	34,291

Habitats

Broad scale habitat maps indicate that sand, mud and gravel are the primary habitat types encountered by southern blue whiting fisheries (Figure 26). Surficial sediment (>40% classes) in the main fishery areas in depth zone 200-800m show that sand and carbonate are the dominant sediments across the fishery areas (Table 24).



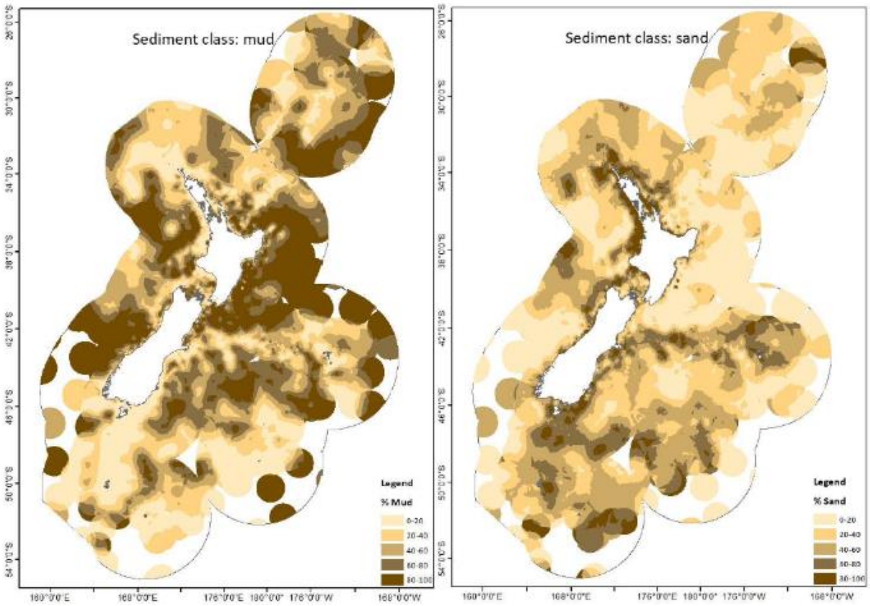


Figure 26: The interpolated distribution (%) of carbonate, gravel, mud, and sand based on the nzSEABED database. Source: (MacGibbon & Mules, 2023).

Table 24: Percentage overlap of the seafloor area of the substrate classes by the fishable area 1990–2021 and 2021 for all Tier 1 stocks. For gravel, mud, and sand, the percentage classes total 100% of the fishable area, while for carbonate the percentage represents the proportion that is carbonate versus noncarbonate. Source: (MacGibbon & Mules, 2023).

Substrate	Class (%)	Class area within fishable area (km^2)	1990–2021 overlap (%)	2021 overlap (%)
Carbonate	0–20	138 252.7	63.5	14.9
Carbonate	20–40	282 469.8	48.4	9.0
Carbonate	40–60	275 070.0	33.6	4.3
Carbonate	60–80	288 732.7	22.8	3.0
Carbonate	80–100	369 402.8	21.2	2.2
Gravel	0–20	1 037 250.7	35.0	5.9
Gravel	20–40	188 550.0	37.4	5.7
Gravel	40–60	77 886.4	25.8	2.6
Gravel	60–80	26 682.0	22.1	0.7
Gravel	80–100	14 188.5	11.0	2.9
Mud	0–20	387 549.1	38.8	6.1
Mud	20–40	323 852.0	34.8	5.2
Mud	40–60	299 719.3	34.8	6.3
Mud	60–80	233 123.9	27.9	4.7
Mud	80–100	109 712.9	26.3	3.9
Sand	0–20	142 639.8	28.9	4.5
Sand	20–40	348 482.0	26.5	4.3
Sand	40–60	482 383.1	34.6	5.4
Sand	60–80	303 832.8	40.3	6.3
Sand	80–100	77 166.5	49.3	10.5

Benthic habitats and communities are impacted to varying extents by the impact of trawling depending on a range of factors, including:

- the type of gear used (design and weight) and the towing speed,
- features of seafloor habitats, including their natural disturbance regimes,
- the species present, and
- the frequency and intensity of fishing.

Previous studies show that recovery rates are slowest in stable, muddy or structurally complex habitats compared to sandy sediment communities that show little change after two to three bottom trawl passes per year (Kaiser, et al., 2006). Hiddink, et al., (2017) found that trawl gears removed 6–41% of faunal biomass per pass (average 15.5%), and that recovery times post-trawling were 1.9–6.4 years depending on the fisheries and environmental context. Of the trawl gears examined, otter trawls caused the least depletion, removing 6% of biota per pass and penetrating the seabed on average down to 2.4 cm (Hiddink, et al., 2017). Pitcher, et al., (2022) also estimated trawl depletion rates of benthic communities in mud, sand, and gravel habitats for a range of trawl gear types, average depletion rates ranged from 0.047 to 0.261 depending on gear and habitat. Otter trawls caused the lowest depletion followed by beam trawls and towed dredges and depletion rates were lower in sand than in gravel and mud (Pitcher, et al., 2022). Some habitat-creating organisms require substantial periods to recover after trawling (e.g., > 8 years for some sponges, >10 years for corals, see Kaiser, et al., 2006)

More Sensitive Habitats

All black, gorgonian, stony, and hydrocorals are protected under the Wildlife Act 1953. However, SA3.1.2.2 requires that all benthic species should be assessed under habitats. Therefore, benthic species including protected corals are assessed under habitats and considered more sensitive habitats.

For the purpose of this assessment, less sensitive habitats are considered to be gravel, mud, and sand, upper and mid-slope, with more sensitive habitats designated as sand covered hard substrate with emergent fauna (i.e., sponges, bryozoans, corals) in line with FAO guidelines.

A Benthic Optimised Marine Environment Classification (BOMEC) was developed to identify ecologically distinct New Zealand bioregions (i.e., broad scale delineation of spatial patterns) (Figure 27), (Leathwick, et al., 2012). BOMEC is restricted to depths <3000 m depth and was developed using benthic community and environmental data, including sediment type. A BOMEC comprised of 15 bioregions across the NZ EEZ was used to assess the potential impact of bottom trawling on these bioregions. However, the modelled BOMEC regions are theoretical, have yet to be ground-truthed, and their efficacy for managing impacts of bottom trawling has yet to be determined.

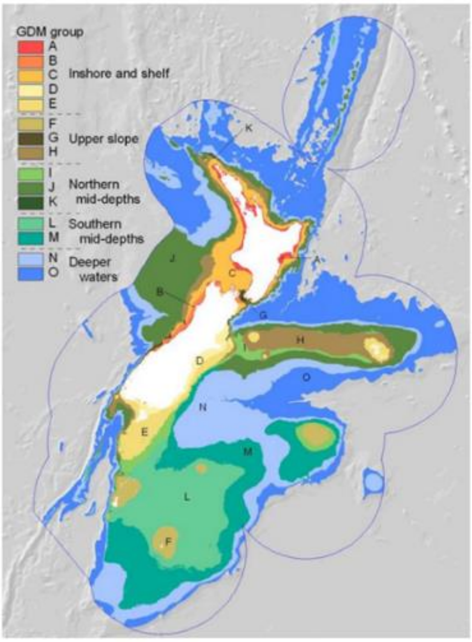
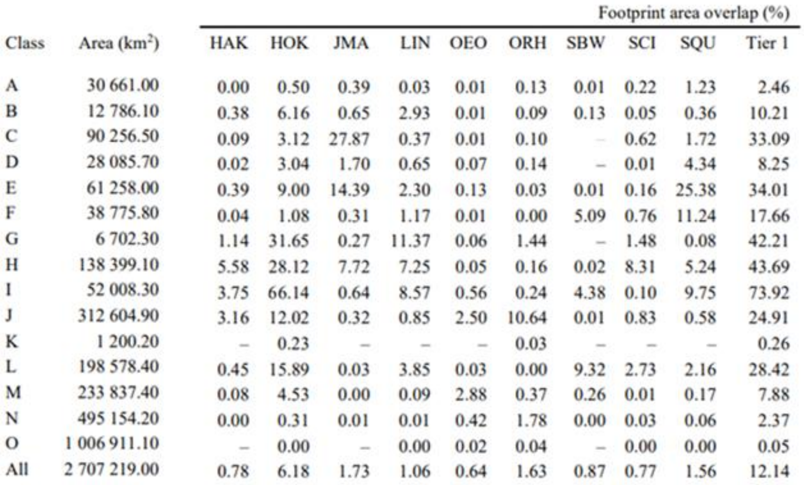


Figure 27: Map of the distribution of 15-class Benthic-Optimised Marine Environment Classification (BOMEC) classes. Source: Leathwick, et al., (2012).

Overlaying the footprint of the southern blue whiting fisheries on the BOMEC classes shows that these fisheries are primarily contacting benthos in classes: L (9.32%), F (5.09%) and I (4.38%) and that their footprint is minor (Table 25).

Table 25: The total area of each BOMEC class within the EEZ+TS and the percentage of each area covered by the 1990-2021 footprint of Tier 1 deepwater species. Note: – indicates no overlap. Source: (MacGibbon & Mules, 2023).



		Footprint area overlap (%)									
Class	Area (km²)	HAK	HOK	JMA	LIN	OEO	ORH	SBW	SCI	SQU	Tier 1
A	30 661.00	0.00	0.50	0.39	0.03	0.01	0.13	0.01	0.22	1.23	2.46
B	12 786.10	0.38	6.16	0.65	2.93	0.01	0.09	0.13	0.05	0.36	10.21
C	90 256.50	0.09	3.12	27.87	0.37	0.01	0.10	–	0.62	1.72	33.09
D	28 085.70	0.02	3.04	1.70	0.65	0.07	0.14	–	0.01	4.34	8.25
E	61 258.00	0.39	9.00	14.39	2.30	0.13	0.03	0.01	0.16	25.38	34.01
F	38 775.80	0.04	1.08	0.31	1.17	0.01	0.00	5.09	0.76	11.24	17.66
G	6 702.30	1.14	31.65	0.27	11.37	0.06	1.44	–	1.48	0.08	42.21
H	138 399.10	5.58	28.12	7.72	7.25	0.05	0.16	0.02	8.31	5.24	43.69
I	52 008.30	3.75	66.14	0.64	8.57	0.56	0.24	4.38	0.10	9.75	73.92
J	312 604.90	3.16	12.02	0.32	0.85	2.50	10.64	0.01	0.83	0.58	24.91
K	1 200.20	–	0.23	–	–	–	0.03	–	–	–	0.26
L	198 578.40	0.45	15.89	0.03	3.85	0.03	0.00	9.32	2.73	2.16	28.42
M	233 837.40	0.08	4.53	0.00	0.09	2.88	0.37	0.26	0.01	0.17	7.88
N	495 154.20	0.00	0.31	0.01	0.01	0.42	1.78	0.00	0.03	0.06	2.37
O	1 006 911.10	–	0.00	–	0.00	0.02	0.04	–	0.00	0.00	0.05
All	2 707 219.00	0.78	6.18	1.73	1.06	0.64	1.63	0.87	0.77	1.56	12.14

Trawl footprint

Geospatial position reporting (GPR) devices, for position reporting, are required to be installed and operational on all commercial fishing vessels. Data are therefore available to monitor the trawl footprint of the southern blue whiting fisheries.

The trawl footprint of New Zealand's trawl fisheries is assessed annually to monitor the scale and intensity of their interactions with the benthic habitat. The latest trawl footprint report released in July 2023 presents the spatial analysis of bottom-contacting trawl effort by commercial trawlers within the New Zealand 200 nm Exclusive Economic Zone and Territorial Sea (EEZ+TS), in waters open to trawling down to 1,600 m depth (the 'fishable area'), for different time periods.

MacGibbon & Mules (2023) analysed data from 1989-90 to 2021 to examine the extent of bottom contact by commercial trawling. Hoki data accounted for the majority of the annual tow data, with 447,248 tows for the time period and more than 20,000 tows in each year between 1996 and 2003. The data show there has been a major reduction in the overall footprint from the early 2000s, driven mainly by the reduced hoki TACC following completion of the fish-down period. The number of bottom-contacting trawl tows by the southern blue whiting fisheries has been consistently low over the entire period (Figure 28).

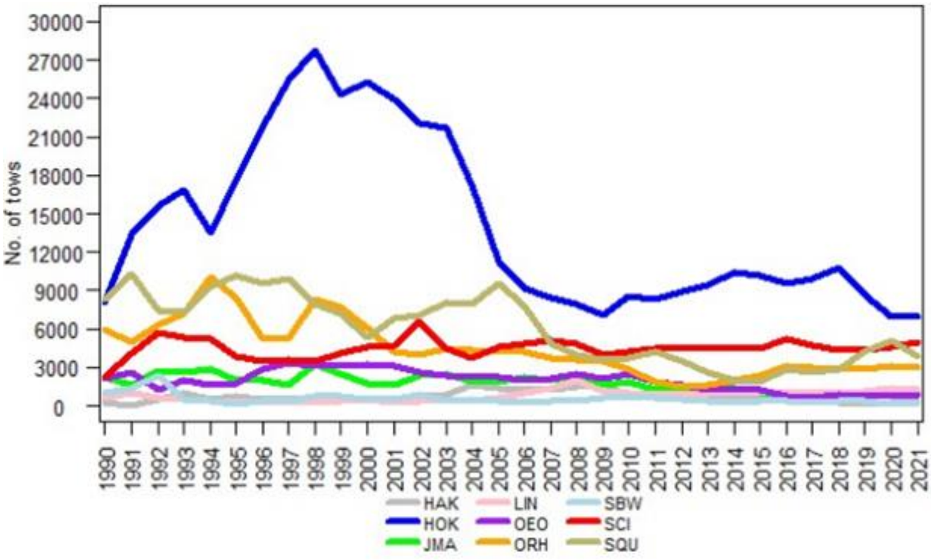
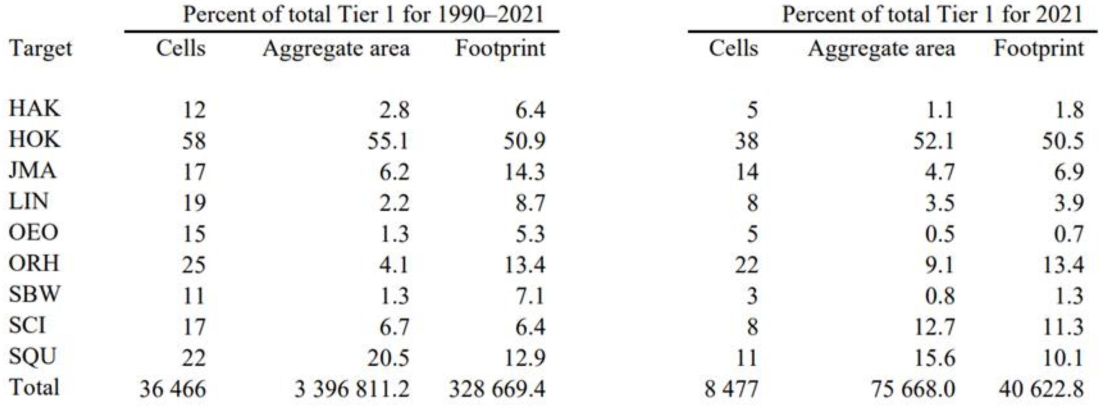


Figure 28: The number of bottom-contacting tows by year for the Deepwater Tier 1 species (MacGibbon and Mules, 2023).

MacGibbon & Mules, (2023) examined the aggregate number of 25 km^2 cells in the fishable area contacted by Tier 1 species as an indicator of fishery footprint, with southern blue whiting contacting 11% of the fished cells over all years and 3% in 2020-21 (Table 26).

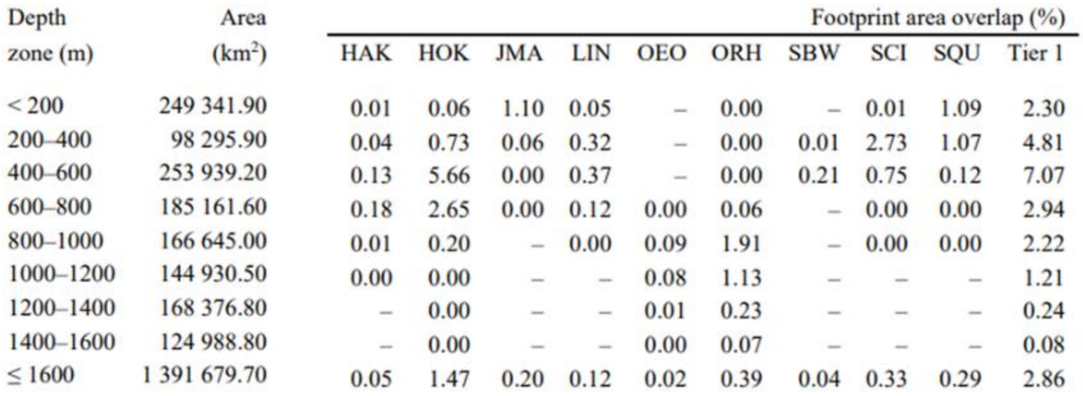
Table 26: **Percentages of the total number of cells contacted, aggregate area (km^2) and footprint (km^2) for Tier 1 targets 1990-2021 (left) and for 2021 (right). Note: the footprint of some target species overlap. Source:** (MacGibbon & Mules, 2023)



	Percent of total Tier 1 for 1990–2021			Percent of total Tier 1 for 2021		
Target	Cells	Aggregate area	Footprint	Cells	Aggregate area	Footprint
HAK	12	2.8	6.4	5	1.1	1.8
HOK	58	55.1	50.9	38	52.1	50.5
JMA	17	6.2	14.3	14	4.7	6.9
LIN	19	2.2	8.7	8	3.5	3.9
OEO	15	1.3	5.3	5	0.5	0.7
ORH	25	4.1	13.4	22	9.1	13.4
SBW	11	1.3	7.1	3	0.8	1.3
SCI	17	6.7	6.4	8	12.7	11.3
SQU	22	20.5	12.9	11	15.6	10.1
Total	36 466	3 396 811.2	328 669.4	8 477	75 668.0	40 622.8

The indicative bottom contact by depth profile shows that SBW trawls are primarily in the 400 - 600m depth zone and that the trawl footprint overlap in this depth zone is only 0.21% of the area (Table 27). Analysis of trawl tow data showed that the median fishing depth for bottom-contacting tows was 430 m for the period 1989-90 to 2022-23 and was 460 m for the most recent year i.e. 2022-23 (L. Easterbrook-Clark, GNS Science, pers. comm.).

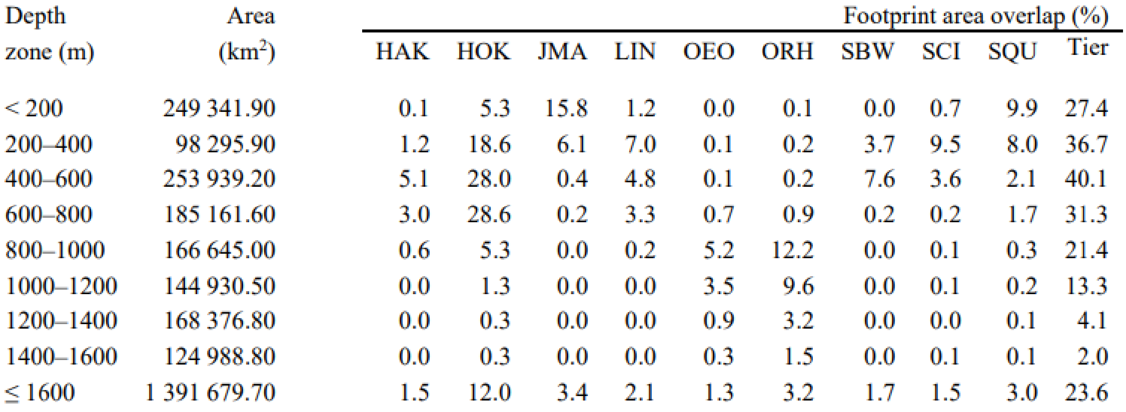
Table 27: The total area of the seafloor in each depth zone within 'fishable' waters, all depth zones ≤ 1600 m combined, and the percentage of each depth zone covered by the 2021 trawl footprint for each Tier 1 target species and for the Tier 1 targets combined. – indicates no overlap (MacGibbon & Mules, 2023).



Depth	Area	Footprint area overlap (%)									
zone (m)	(km^2)	HAK	HOK	JMA	LIN	OEO	ORH	SBW	SCI	SQU	Tier 1
< 200	249 341.90	0.01	0.06	1.10	0.05	–	0.00	–	0.01	1.09	2.30
200–400	98 295.90	0.04	0.73	0.06	0.32	–	0.00	0.01	2.73	1.07	4.81
400–600	253 939.20	0.13	5.66	0.00	0.37	–	0.00	0.21	0.75	0.12	7.07
600–800	185 161.60	0.18	2.65	0.00	0.12	0.00	0.06	–	0.00	0.00	2.94
800–1000	166 645.00	0.01	0.20	–	0.00	0.09	1.91	–	0.00	0.00	2.22
1000–1200	144 930.50	0.00	0.00	–	–	0.08	1.13	–	–	–	1.21
1200–1400	168 376.80	–	0.00	–	–	0.01	0.23	–	–	–	0.24
1400–1600	124 988.80	–	0.00	–	–	0.00	0.07	–	–	–	0.08
≤ 1600	1 391 679.70	0.05	1.47	0.20	0.12	0.02	0.39	0.04	0.33	0.29	2.86

The fishable area in the New Zealand EEZ (i.e. waters <1 600 m depth) is 1,391,680 km^2, of which the southern blue whiting fisheries have contacted 23,467 km^2 over the period 1989-90 to 2020-21 (i.e. 1.7%), (Table 28). In 2020-21, the most recent year of the analysis, southern blue whiting fisheries contacted only 547 km^2 (i.e. 0.04% of the fishable area), showing that a considerably reduced area of the seabed is now being contacted.

Table 28: The total seafloor area in each depth zone within 'fishable' depth zones ≤ 1600 m, and the percentage of each depth zone contacted by the 1990–2021 Tier 1 footprint (MacGibbon & Mules, 2023).



Depth	Area	Footprint area overlap (%)									
zone (m)	(km^2)	HAK	HOK	JMA	LIN	OEO	ORH	SBW	SCI	SQU	Tier
< 200	249 341.90	0.1	5.3	15.8	1.2	0.0	0.1	0.0	0.7	9.9	27.4
200–400	98 295.90	1.2	18.6	6.1	7.0	0.1	0.2	3.7	9.5	8.0	36.7
400–600	253 939.20	5.1	28.0	0.4	4.8	0.1	0.2	7.6	3.6	2.1	40.1
600–800	185 161.60	3.0	28.6	0.2	3.3	0.7	0.9	0.2	0.2	1.7	31.3
800–1000	166 645.00	0.6	5.3	0.0	0.2	5.2	12.2	0.0	0.1	0.3	21.4
1000–1200	144 930.50	0.0	1.3	0.0	0.0	3.5	9.6	0.0	0.1	0.2	13.3
1200–1400	168 376.80	0.0	0.3	0.0	0.0	0.9	3.2	0.0	0.0	0.1	4.1
1400–1600	124 988.80	0.0	0.3	0.0	0.0	0.3	1.5	0.0	0.1	0.1	2.0
≤ 1600	1 391 679.70	1.5	12.0	3.4	2.1	1.3	3.2	1.7	1.5	3.0	23.6

Benthic interactions

Figure 29 illustrates the probability of capture distribution for southern blue whiting, based on the probability of capture (%) of a fish in a standardised trawl.

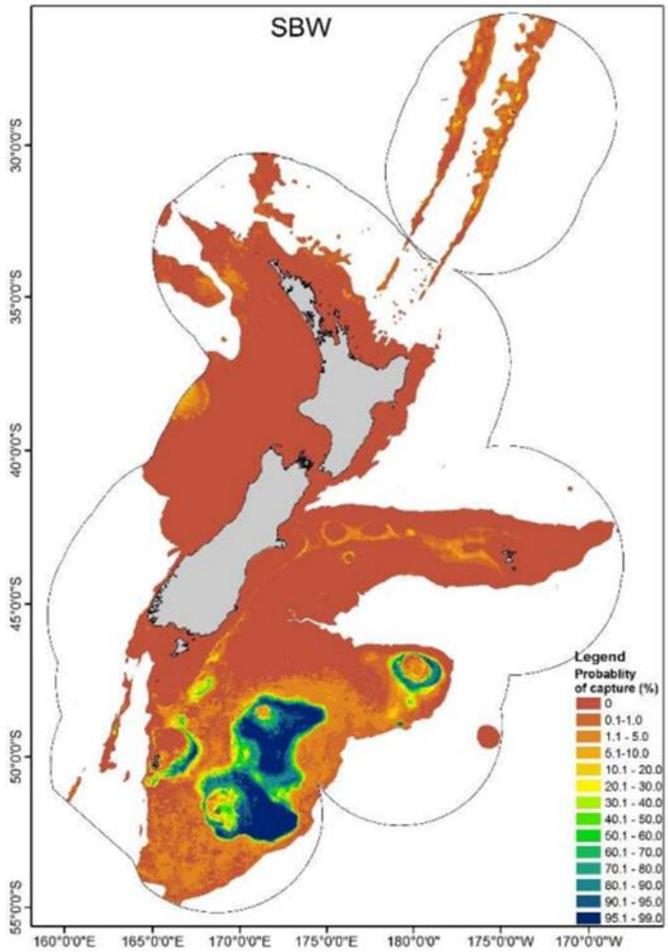


Figure 29: The extent of the predicted distribution of the preferred habitat for southern blue whiting (after Leathwick et al. 2006), where the preferred habitat represents the probability of capture of that species in a standardised trawl in waters down to 1950 m depth (MacGibbon & Mules, 2023).

The overlap of the southern blue whiting fishery footprint on the preferred habitat distribution shows that SBW trawls occur predominantly in areas where the species is most likely to be captured (i.e. in the 70% - 95% probability of occurrence areas), (Figure 30; Table 29).).

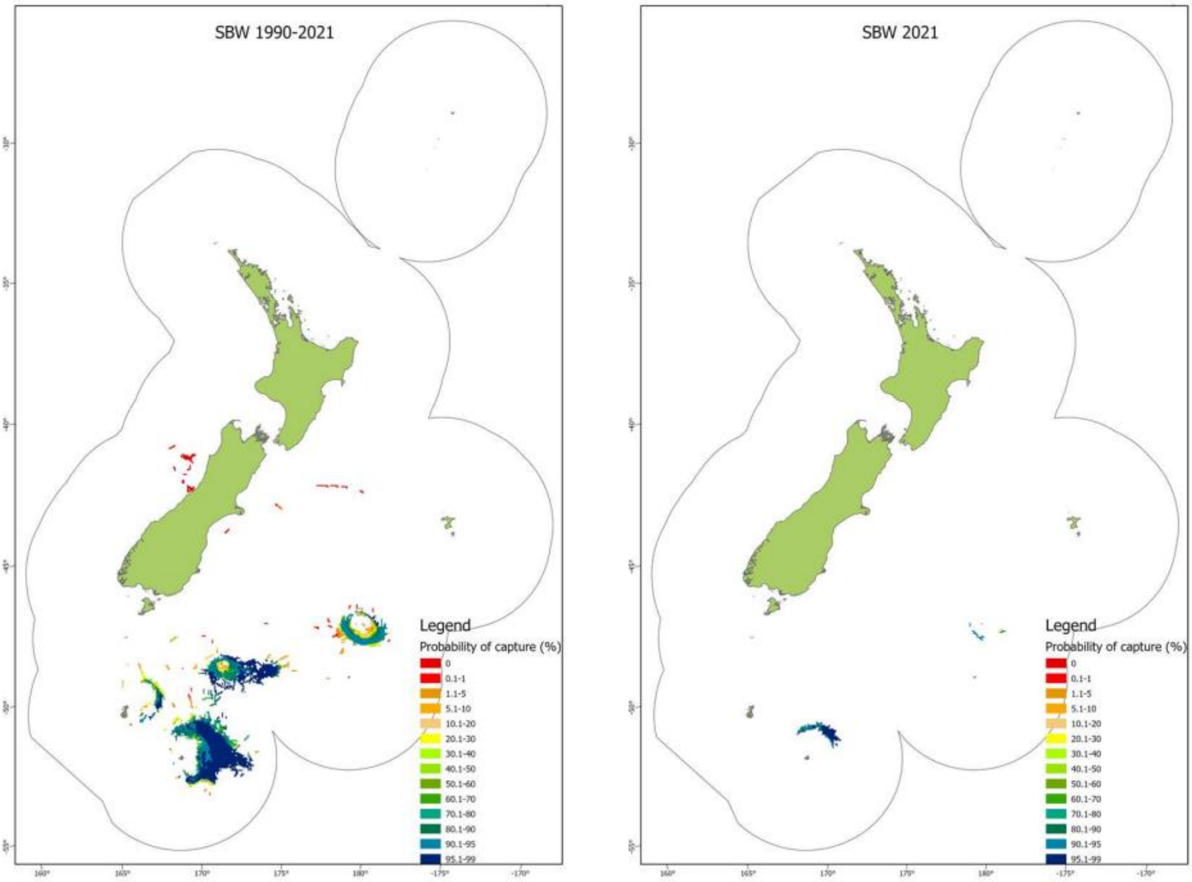


Figure 30: Distribution of the 1990–2021 (left) and the 2021 trawl footprints (right) for southern blue whiting, displayed by 25-km^2 contacted cell, relative to the probability of capture for that species (after Leathwick et al. 2006) (MacGibbon & Mules, 2023).

Table 29: The total area of each 'preferred habitat' (probability of capture) and the percentage of each species 'preferred habitat' (probability of capture) area for SBW covered by the 1990–2021 and 2021 bottom-contact trawl footprint. – indicates no data. (MacGibbon & Mules, 2023).

Preferred habitat (%)	SBW Area (km^2)	SBW Footprint overlap (%)	
		1990–2021	2021
0	931 718.1	0.01	-
0.1–1.0	122 249.7	0.08	-
1.1–5.0	140 341.1	0.27	-
5.1–10.0	23 088.7	1.52	-
10.1–20.0	18 499.5	2.71	<0.01
20.1–30.0	13 156.5	3.28	<0.01
30.1–40.0	11 096.7	3.44	0.01
40.1–50.0	9 764.8	3.63	<0.01
50.1–60.0	8 856.4	6.14	0.01
60.1–70.0	8 626.1	8.74	0.03
70.1–80.0	11 355.4	12.02	0.07
80.1–90.0	21 664.4	17.54	0.74
90.1–95.0	20 464.7	26.49	0.91
95.1–99.0	50 797.8	17.67	0.37
0.0–99.0	1 391 679.7	1.69	0.04

The trawl footprints for southern blue whiting fisheries over the period 1989-90 to 2022-23, and for the 2022-23 fishing year alone, show that the current annual benthic impact is, by comparison, very minor (Figure 31).

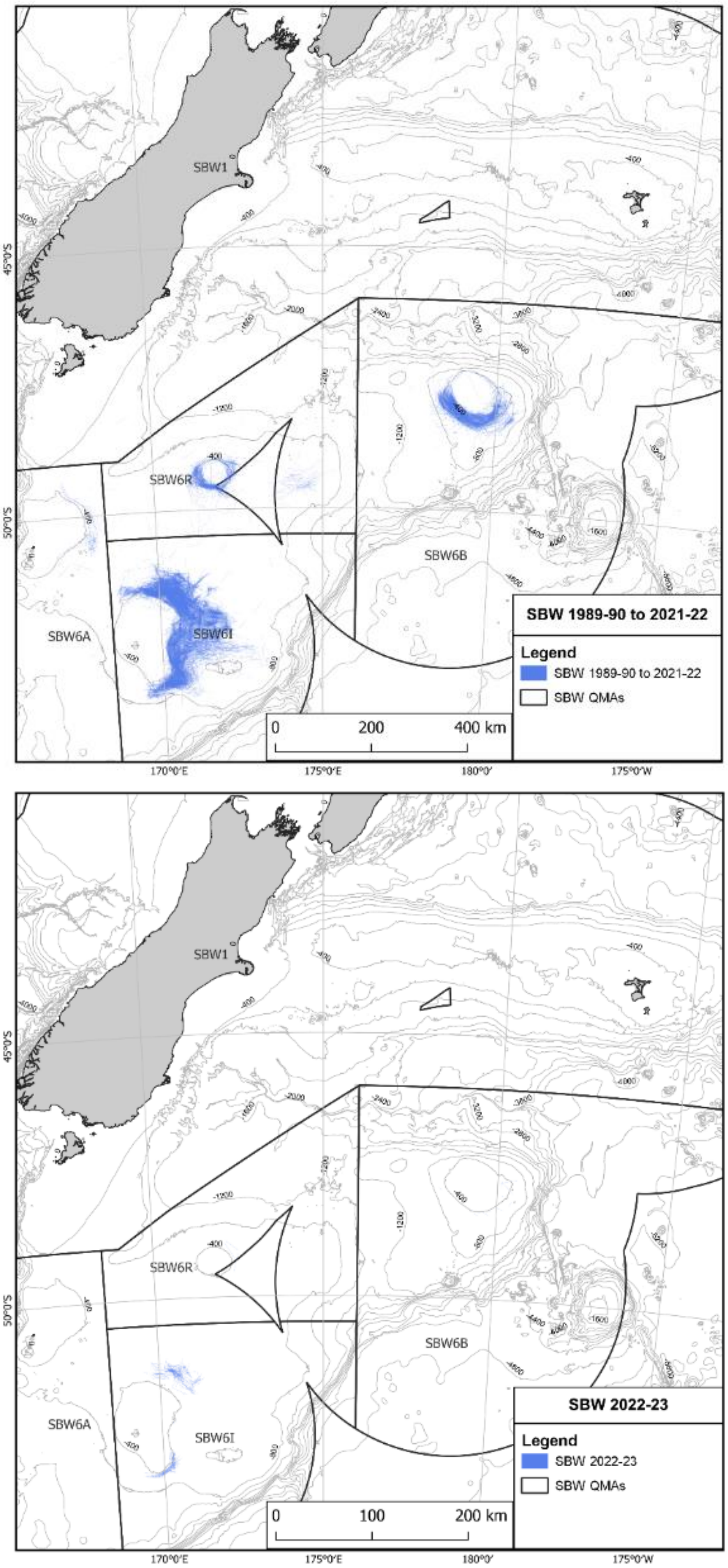


Figure 31: Southern blue whiting trawl footprint for the period 1989-90 to 2022-23 (Top) and for the 2022-23 fishing season (Bottom). Data source: FNZ Rep Log 15702).

Benthic Habitat Management Strategy

The National Fisheries Plan for Deepwater and Middle Depth Fisheries has an environmental outcome to manage deepwater and middle-depth fisheries to avoid, remedy or mitigate the adverse effects of these fisheries on benthic habitats (Fisheries New Zealand, 2019b).

Approximately 34% of the New Zealand EEZ is considered 'fishable', meaning seabed areas shallower than 1,600 metres and open to fishing (i.e., not within a Benthic Protection Area (BPA) or a Seamount Closure Area (SCA)). Since 2007, management measures to address the effects of trawl activity have focused on avoiding benthic impacts through the implementation of spatial closures. More than 30% of the NZ EEZ is protected from the fishing impacts of bottom trawl, through BPAs and SCAs which were implemented to avoid adverse effects of fishing on the benthic environment (Figure 32). There are a total of 17 Benthic Protection Areas (BPAs), representatively distributed around the EEZ, and 17 ‘seamount’ closures, which collectively close 30% of the EEZ to bottom fishing (Helson et al., 2010). The area closures protect:

- 28 percent of underwater topographic features (including seamounts)
- 52 percent of seamounts over 1000 metres in height
- 88 percent of known active hydrothermal vents.

Impacts of fishing on benthic habitats are monitored through annual reporting of the trawl footprint and the capture of benthic organisms (see Fisheries New Zealand, 2022a).

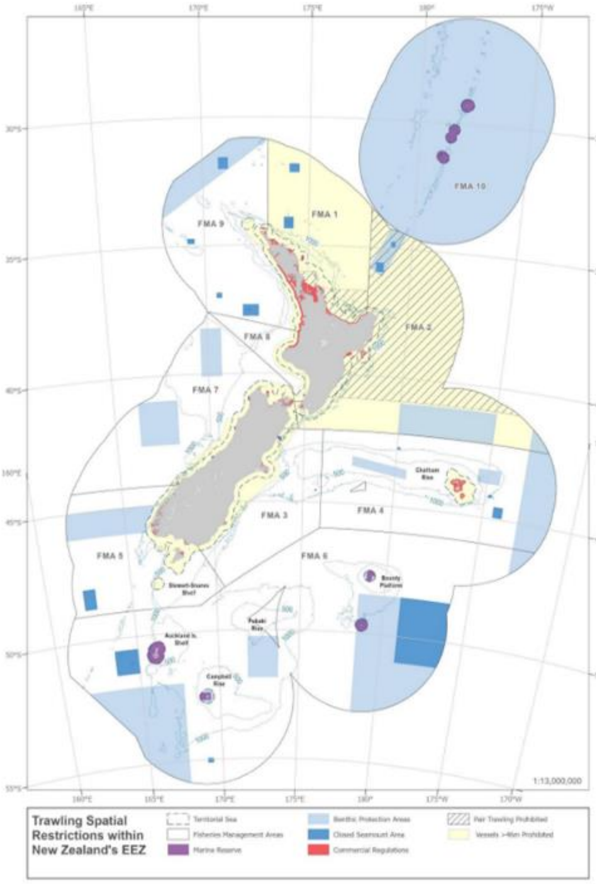


Figure 32: Map of the major spatial restrictions to trawling and Fisheries Management Areas (FMAs) within the outer boundary of the New Zealand EEZ.

Trawl footprint overlap with modelled predictive distributions

Habitat suitability models have been developed to produce predicted habitat distributions for sessile benthic taxa in the New Zealand EEZ (e.g. Anderson et al., 2014, 2015, 2019; Bowden et al., 2019, 2019a; Georgian et al., 2019).

The approach used in all of these modelling exercises is essentially to define relationships between point-sampled (i.e. observed) faunal data and environmental gradients to predict how individual benthic taxa and communities vary spatially over large areas (e.g. Chatham Rise). Recent modelling has used a merged benthic invertebrate occurrence dataset from five seabed photographic surveys to inform development of improved predictive models at both single taxon levels, using Random Forest RF) and Boosted Regression Tree (BRT) decision-tree methods, and at community levels, using Gradient Forest (GF) and Regions of Common Profile (RCP) methods (Bowden et al., 2019). The use of these quantitative datasets with true absences and resolution at a finer scale, represent major refinements on the earlier models.

The accuracy and spatial resolution of these models is dependent on the quality and consistency of fine-scale information on the sediment types and topography of the seabed. This is significant because the distribution of sessile fauna such as corals and other habitat-forming fauna is defined by the availability of hard substrata, which is highly patchy (Bowden et al., op cit.). The resolution of both the input data and the predicted outputs from the recent modelling are at a reasonably fine scale of 1 x 1 km cells and the predicted abundances of benthic taxa are presented as the number of individuals per 1000 m^{-2}. The relative confidence in the predictions is assessed using a bootstrapping technique, at the scale of individual cells, to produce spatially explicit uncertainty measures. Model uncertainties are calculated as the coefficient of variation (CV) of the bootstrap output (Bowden et al., op cit.).

As a basis for estimating the impact of the southern blue whiting fisheries on sensitive benthic habitats, the recent trawl footprint for the period 2018-19 to 2022-23 fishing years was plotted against predicted coral distributions for protected corals, bryozoans, sponges and anemones at the >50th percentile level. The analysis suggests that the southern blue whiting UoA trawl fisheries may have a very minor impact on these sensitive benthic habitats (Table 30).

Table 30: Southern blue whiting UoAs trawl footprint overlap with predicted distributions of benthic habitat-forming taxa. Data source: FNZ. Analysis: L. Easterbrook-Clark, GNS Science (pers. comm.)

Taxa	Parameters	Metrics
ETP Corals	Predicted distribution (km^2) within UoAs	160,165
	Trawl footprint in predicted area (km^2)	15.3
	Percentage of predicted area towed	**0.01%**
Bryozoans	Predicted distribution (km^2) within UoAs	17,243
	Trawl footprint in predicted area (km^2)	0
	Percentage of predicted area towed	**0%**
Sponges	Predicted distribution (km^2) within UoAs	189,425
	Trawl footprint in predicted area (km^2)	3,226
	Percentage of predicted area towed	**1.7%**
Anemones	Predicted distribution (km^2) within UoAs	97,745
	Trawl footprint in predicted area (km^2)	3,005
	Percentage of predicted area towed	**3.1%**

Information

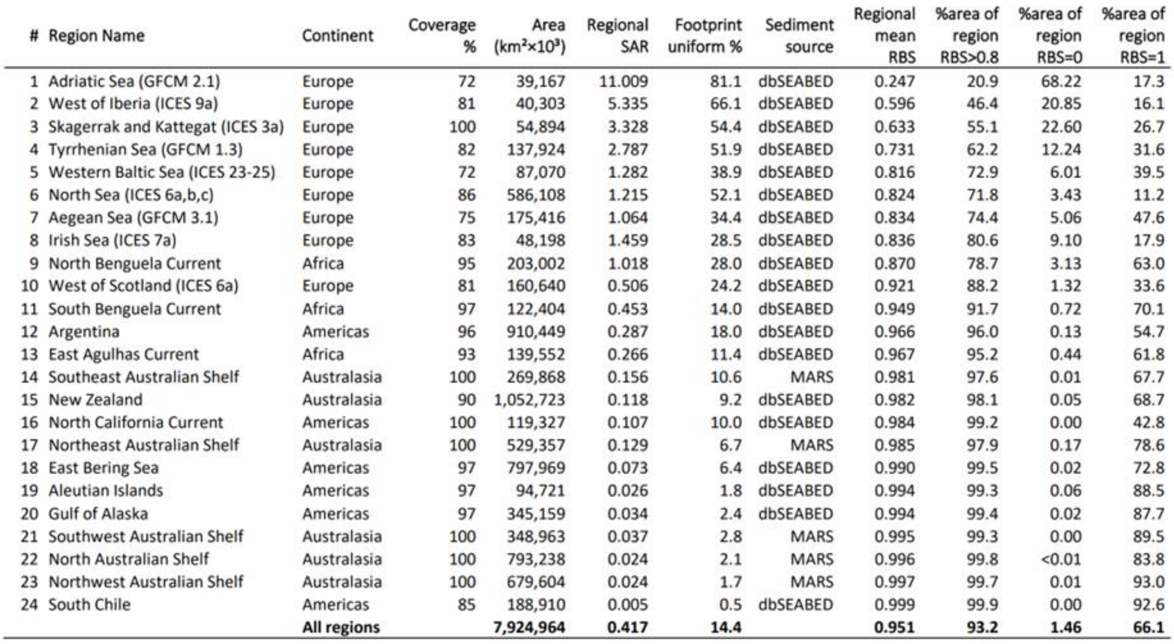
All vessels have GPR systems installed, and the trawl footprint of New Zealand's trawl fisheries is assessed annually to monitor interactions with benthic habitats. The trawl footprint has been determined for each year commencing in 1989-90 for all the main deep water target fisheries (Seafood New Zealand, 2023a).

Several research initiatives related to the benthic effects of fishing are detailed in the Annual Operational Plan for Deepwater Fisheries (Fisheries New Zealand, 2021a) and include the following projects:

- BEN2020-01 Extent and intensity of seabed contact by mobile bottom fishing in the New Zealand Territorial Sea and Exclusive Economic Zone (trawl footprint)
- BEN2020-07 Extent and intensity of trawl effort on or near underwater topographic features in New Zealand's Exclusive Economic Zone
- BEN2019-05 Towards the development of a spatial decision support tool for managing the impacts of bottom fishing on in-zone, particularly vulnerable or sensitive habitats
- INT2021-02 Characterisation of protected coral interactions (Proteus).

In addition, Pitcher, et al., (2022) developed a quantitative model of the Relative Benthic Status (RBS) of the seabed in 24 regions of the world to provide an indication of broad scale patterns. The mean regional RBS for New Zealand, was high (0.982), with 68.7% of the region untrawled (i.e. RBS = 1). Although 98.1% of the New Zealand region has an RBS >0.8, indicating that in most of the region the abundance of biota is at 80% or greater of pre-trawling levels (Table 31), 0.05% of the region is depleted (i.e. RBS=0).

Table 31: Regional Swept Area Ratio (SAR) and Relative Benthic Status (RBS) for 24 regions worldwide from (Pitcher, et al., 2022).



#	Region Name	Continent	Coverage %	Area (km²×10³)	Regional SAR	Footprint uniform %	Sediment source	Regional mean RBS	%area of region RBS>0.8	%area of region RBS=0	%area of region RBS=1
1	Adriatic Sea (GFCM 2.1)	Europe	72	39,167	11.009	81.1	dbSEABED	0.247	20.9	68.22	17.3
2	West of Iberia (ICES 9a)	Europe	81	40,303	5.335	66.1	dbSEABED	0.596	46.4	20.85	16.1
3	Skagerrak and Kattegat (ICES 3a)	Europe	100	54,894	3.328	54.4	dbSEABED	0.633	55.1	22.60	26.7
4	Tyrrhenian Sea (GFCM 1.3)	Europe	82	137,924	2.787	51.9	dbSEABED	0.731	62.2	12.24	31.6
5	Western Baltic Sea (ICES 23-25)	Europe	72	87,070	1.282	38.9	dbSEABED	0.816	72.9	6.01	39.5
6	North Sea (ICES 6a,b,c)	Europe	86	586,108	1.215	52.1	dbSEABED	0.824	71.8	3.43	11.2
7	Aegean Sea (GFCM 3.1)	Europe	75	175,416	1.064	34.4	dbSEABED	0.834	74.4	5.06	47.6
8	Irish Sea (ICES 7a)	Europe	83	48,198	1.459	28.5	dbSEABED	0.836	80.6	9.10	17.9
9	North Benguela Current	Africa	95	203,002	1.018	28.0	dbSEABED	0.870	78.7	3.13	63.0
10	West of Scotland (ICES 6a)	Europe	81	160,640	0.506	24.2	dbSEABED	0.921	88.2	1.32	33.6
11	South Benguela Current	Africa	97	122,404	0.453	14.0	dbSEABED	0.949	91.7	0.72	70.1
12	Argentina	Americas	96	910,449	0.287	18.0	dbSEABED	0.966	96.0	0.13	54.7
13	East Agulhas Current	Africa	93	139,552	0.266	11.4	dbSEABED	0.967	95.2	0.44	61.8
14	Southeast Australian Shelf	Australasia	100	269,868	0.156	10.6	MARS	0.981	97.6	0.01	67.7
15	New Zealand	Australasia	90	1,052,723	0.118	9.2	dbSEABED	0.982	98.1	0.05	68.7
16	North California Current	Americas	100	119,327	0.107	10.0	dbSEABED	0.984	99.2	0.00	42.8
17	Northeast Australian Shelf	Australasia	100	529,357	0.129	6.7	MARS	0.985	97.9	0.17	78.6
18	East Bering Sea	Americas	97	797,969	0.073	6.4	dbSEABED	0.990	99.5	0.02	72.8
19	Aleutian Islands	Americas	97	94,721	0.026	1.8	dbSEABED	0.994	99.3	0.06	88.5
20	Gulf of Alaska	Americas	97	345,159	0.034	2.4	dbSEABED	0.994	99.4	0.02	87.7
21	Southwest Australian Shelf	Australasia	100	348,963	0.037	2.8	MARS	0.995	99.3	0.00	89.5
22	North Australian Shelf	Australasia	100	793,238	0.024	2.1	MARS	0.996	99.8	<0.01	83.8
23	Northwest Australian Shelf	Australasia	100	679,604	0.024	1.7	MARS	0.997	99.7	0.01	93.0
24	South Chile	Americas	85	188,910	0.005	0.5	dbSEABED	0.999	99.9	0.00	92.6
		All regions		**7,924,964**	**0.417**	**14.4**		**0.951**	**93.2**	**1.46**	**66.1**

Pitcher, et al., (2022) also suggest that if an acceptable threshold is set at RBS > 0.8 for >80% (see dotted lines on Figure 33), 15 regions, including New Zealand, have <2.5% probability of not meeting the >80% objective. Therefore, evidence from Pitcher, et al., (2022) indicates that the UoA is highly unlikely to reduce structure and function of the commonly encountered habitats (less sensitive) with moderate sensitivity to a point where there would be serious or irreversible harm (i.e. where the reduction in habitat structure, biological diversity, abundance and function is such that the habitat would be unable to recover to at least 80% of its unimpacted structure and function within 20 years if fishing were to cease entirely).

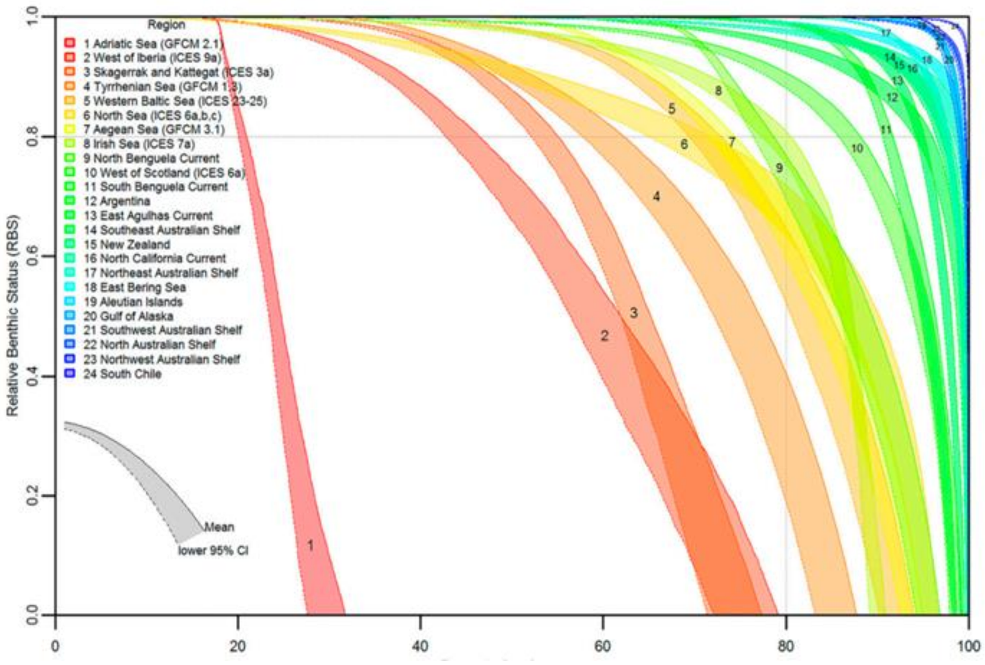


Figure 33: Regional RBS for 24 regions worldwide, for additional explanation see figure caption above. Source: Pitcher, et al., (2022). Note: Northeast Australia (Region 17) is the region in which the UoA operates.

Similarly, Pitcher, et al., (2022) calculated the percentage of each region where trawl Swept Area Ratio (SAR) exceeded an estimated local extinction threshold for highly sensitive biota (i.e., SAR > 0.35). In New Zealand, the percentage of the area where the SAR exceeded >0.35 was <20% (Figure 34). Pitcher, et al., (2022) also calculated the percentage of each region with a trawl SAR of <0.07, which would allow highly sensitive biota to maintain their status at >0.8. Values ranged from 20 – 95%, with New Zealand at ~80% (Figure 34). Therefore, the UoA is unlikely to reduce structure and function of VMEs to a point where there would be serious or irreversible harm (Pitcher, et al., 2022).

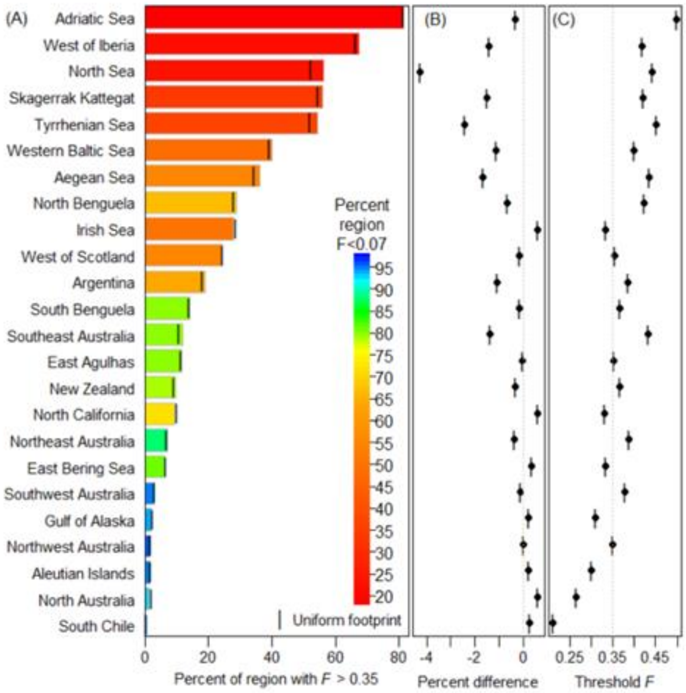


Figure 34: Results for highly sensitive biota types for 24 regions worldwide, for additional explanation see Figure 64 caption above. Source: Pitcher, et al., (2022).

Ongoing research

Ongoing research is conducted by DOC and FNZ to advance the knowledge of coral distributions, bycatch in commercial fisheries and estimate the overlap between commercial fishing and corals under present and future climate conditions, and thus the potential vulnerability of these protected species.

Anderson et al. (2019) has developed a model to predict the present and future spatial extent of corals (POP2018-01). Anderson extends previous coral habitat suitability modelling studies by utilising updated modelling techniques, incorporating additional coral presence records, and by mainly using regional environmental predictor layers for the current and future climate conditions based on the New Zealand Earth System Model (NZESM). This work is indicative, and the model is based on available data which is primarily from commercial fisheries and there are limited samples. Overlaying the regions of greatest habitat suitability with the most highly fished regions (using arbitrary habitat suitability and fishing intensity thresholds) revealed considerable variability in vulnerability among taxa, both in degree and location. Anderson et al. (2019) identified that the greatest overlaps were seen for hydrocorals and the shallower scleractinian species, whereas the deeper scleractinians, gorgonians, and black corals were less vulnerable. Little change in overlap at the end of the century was predicted for many of the modelled taxa.

There are available recent reports that advance the understanding of benthic interactions

- BCBC2020-26: Octocoral bycatch diversity on the Chatham Rise, which focuses on the diversity of octocorals in the family Primnoidae that have been collected through research trawl or bycatch on the Chatham Rise.
- INT2019-04: Identification and storage of cold-water coral bycatch.
- INT2019-05: Coral biodiversity in deep water fisheries bycatch.

Ecosystem

Southern blue whiting is one of the dominant (in terms of biomass) middle depth fish species found on the Campbell Plateau (SBW 6I) and Bounty Plateau (SBW 6B) at depths between 250–600 m. Its distribution is centred on about 500 m depth and latitude 51° S. During August and September, southern blue whiting form large dense spawning aggregations on the Campbell Rise and Bounty Plateau and, to a lesser extent, on the Pukaki Rise and near the Auckland Islands. The species is also found in much lower numbers on the Stewart-Snares shelf and Chatham Rise.

The stocks are characterised by highly variable year-class strengths, with strong year classes growing at a significantly lower rate than others (i.e. showing signs of density dependent growth). Their substantial abundance suggests that southern blue whiting are probably an important part of the Campbell Rise and Bounty Plateau ecosystems, but their variability suggests that these systems may function differently at different times. Very large changes have been observed in abundance on the Bounty Plateau, with a 7-fold increase between 2005 and 2007 followed by a 4-fold decrease to 2009 (Dunn & Hanchet 2011). The large increase was due to the very strong 2002 year-class recruiting to the fishery, but the rapid decline is not easily explained. Whatever the reason, there are likely to be implications for the role of the southern blue whiting population in the ecosystem during such events.

Predation by marine mammals and large teleosts is probably the main source of mortality for adults, while juveniles are frequently taken by seabirds. Large hake and ling taken as bycatch in the fishery have usually been feeding on southern blue whiting, and large hoki caught during Sub-Antarctic trawl surveys have occasionally been feeding on juvenile southern blue whiting. Juvenile (90–130 mm FL) southern blue whiting were found to be the main prey item of black-browed albatross at Campbell Island during the chick rearing period and are also regularly taken by grey-headed albatross and rockhopper penguins breeding at Campbell Island (Cherel et al 1999).

Crustaceans are the dominant prey groups for southern blue whiting in the Sub-Antarctic with crustaceans occurring in 70% of stomachs, mainly euphausiids (37%), natant decapods (24%), and amphipods (11%). Teleosts occur in 32% of stomachs, mainly myctophids (10%). Salps (7%) and cephalopods (2%) were of lesser importance (Stevens et al., 2011).

Data from the Sub-Antarctic trawl survey series were used to derive fish-based ecosystem indicators using diversity, fish size, and trophic level. There were generally increasing trends in the proportion of threatened fish species and those with low resilience, while indices of fish diversity often showed positive trends. The proportion of piscivorous and demersal species and the mean trophic level generally declined over the time-period, especially in areas where southern blue whiting are more common. It was postulated that the highly variable recruitment of dominant species like southern blue whiting may strongly influence such trends Tuck et al (2009).

Since the launch of NZ’s Biodiversity Strategy 2000, Fisheries New Zealand has run a Marine Biodiversity Research Programme with 67 projects to date, addressing biodiversity knowledge gaps. Research projects pertinent to the deepwater environment include:

- ZBD2020-07 Recovery of Seamount Communities
- ZBD2020-06 Recovery of biogenic habitats
- ZBD2019-11 Development of Electronic Automated Reporting System (EARS) to improve seabird bycatch monitoring
- ZBD2019-01 Quantifying benthic habitats
- ZBD2019-04 Plastics and marine debris across the ocean floor in New Zealand waters
- BD2018-01 5-year continuous plankton survey (Phase 3)
- ZBD2018-05 Ecosystem function and regime shifts in the Subantarctic
- ZBD2016-11 Quantifying benthic biodiversity across natural gradients
- ZBD2016-04 Organic Carbon Recycling in Deepwater
- ZBD2014-03 Sublethal effects of environmental change on fish populations.

Climate change

Cummings et al., (2021) reviewed the biological and ecological characteristics of 32 commercial fisheries species or species groups and evaluated their potential to be impacted by climate related changes. For offshore species information was sparse. Predicting the effects of climate variations on fisheries is limited by the understanding of how large-scale climate patterns affect the oceanography of New Zealand waters, how environmental variability affects species and how species interact in an ecosystem. However, the authors concluded that for offshore fish (e.g. southern blue whiting), a variety of interacting factors, including temperature, circulation and stratification, made it difficult to draw direct linkages between environmental variables and stock performance.

Current climate change research projects include:

- ZBD2018-02 Climate change, fish distribution meta-analysis
- ZBD2018- 03 Climate variability, trends, and fish population parameters
- ZBD2018-05 Ecosystem function and regime shifts in the Sub-Antarctic.

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P3 OVERVIEW OF MANAGEMENT INFORMATION

Legal & customary framework

New Zealand’s fisheries management is centred on the Quota Management System (QMS), a system introduced in 1986 based on Individual Transferrable Quota (quota), Total Allowable Catch (TAC) limits and Total Allowable Commercial Catch (TACC) limits.

Quota provides a property right to access commercial fisheries and has been allocated to Māori as part of the Treaty of Waitangi Settlements that acknowledge the Treaty guaranteed Māori *“full exclusive and undisturbed possession of their…fisheries.”*

Quota is a tradable property right that entitles the owner to a share of the TACC. At the commencement of each fishing year, quota gives rise to Annual Catch Entitlements (ACE) which are tradable, expressed in weight, and entitle the holder to land catch against them. The QMS enables sustainable utilisation of fisheries resources through the direct control of harvest levels based on the best available science. The QMS is administered by MPI through the Fisheries Act 1996.

New Zealand has implemented one of the most extensive quota-based fisheries management systems in the world, with over 100 species or species-complexes of fish, shellfish and seaweed now being managed within this framework. Almost all commercially targeted fish species within New Zealand’s waters are now managed within the QMS.

At an operational level, the southern blue whiting fisheries are managed in accordance with the National Fisheries Plan for Deepwater and Middle-depth Fisheries (Ministry of Fisheries, 2010, and MPI, 2016a). There is a species-specific chapter for southern blue whiting within this plan (MPI, 2011).

The National Deepwater Plan was developed to align with Fisheries 2030 (Ministry of Fisheries, 2009) and collectively consists of three parts:

- Five-year plan – divided into two sections, Part1A (of which an updated draft is currently being publicly consulted on[3]) and Part1B. Part 1A sets the strategic direction for deep water fisheries. Part 1B comprises fishery-specific chapters and how the Management Objectives will be applied at a species level.
- Annual Operational Plan (AOP) – this details the management actions for delivery during the financial year.
- Annual Review Report – which reports progress towards meeting the five-year plan and annual performance of the deepwater fisheries against the AOP.

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[3] Refer https://www.mpi.govt.nz/news-and-resources/consultations/national-fisheries-plans-for-highly-migratory-species-and-deepwater-fisheries/

Fisheries Change Programme

The programme has 3 parts:

- Introducing mandatory electronic catch and position reporting to improve the collection and reliability of fisheries information
- Changing fishing rules and policies to make them simpler, fairer and more responsive, while also incentivising better fishing practice
- Improving monitoring and verification capabilities, including the use of on-board cameras, to better observe fishing practice. (https://www.mpi.govt.nz/fishing-aquaculture/commercial-fishing/fisheries-change-programme/)

The Fisheries Amendment Act has been passed into law with the vision that it will encourage better fishing practices, and modernise and strengthen New Zealand's fisheries management system by:

- strengthening the commercial fishing rules relating to the landing and discarding of fish
- introducing new graduated offences and penalties, including enabling the creation of an infringement regime for less serious offences and a system of demerit points
- enabling the further use of on-board cameras
- creating a new defence to help save marine mammals and protected sharks and rays
- streamlining the adjustment of recreational management controls.

Collaboration

In 2006, DWG and MPI entered into a formal partnership to enable collaboration in the management of New Zealand's deepwater fisheries. This partnership was updated in 2008 and 2010 and has directly facilitated improved management of the southern blue whiting fisheries in almost all respects through:

- A close working relationship under a shared and agreed vision, objectives, and collaborative work plans.
- Real-time, open communication between DWG and MPI on information relevant to management measures, particularly from the MPI Observer Programme and commercial catching operations.

MPI and DOC actively consult with interested parties to inform management decisions through their open scientific working groups and public consultation processes.

Compliance & enforcement

The Ministry for Primary Industries (MPI) maintains a comprehensive compliance programme, which includes both encouraging compliance through support and creating effective deterrents. This strategy is underpinned by the VADE model, which focuses on all elements of the compliance spectrum as follows:

1. Voluntary compliance – outcomes are achieved through education, engagement and communicating expectations and obligations
2. Assisted compliance – reinforces obligations and provides confidence that these are being achieved through monitoring, inspection, responsive actions and feedback loops
3. Directed compliance – directs behavioural change and may include official sanctions and warnings
4. Enforced compliance – uses the full extent of the law and recognises that some individuals may deliberately choose to break the law and require formal investigation and prosecution.

Since 1994, all vessels over 28 m have been required by law to be part of the Vessel Monitoring System (VMS) which, through satellite telemetry, enables MPI to monitor all ling bottom longline vessel locations at all times. Paper-based catch reporting was also required by all fishing vessels operating in NZ's EEZ. These systems have now been replaced by near-real-time Geospatial Position Reporting and daily Electronic Catch Reporting. FNZ still combines this functionality with at-sea and aerial surveillance, supported by the New Zealand Defence Force. This independently provides surveillance of activities of deep-water vessels through inspection and visual capability to ensure these vessels are fully monitored and verified to ensure compliance with both regulations and with industry-agreed Operational Procedures.

All commercial catches from QMS stocks must be reported and balanced against ACE at the end of the month. It is illegal to discard or not report catches of QMS species. Catches may only be landed at designated ports and sold to Licensed Fish Receivers (LFRs). Reporting requirements for ling longline vessels include logging the location, depth, main species caught for each set, and total landed catch for each trip.

MPI audits commercial vessel catch-effort and landing reports and reconciles these against multiple sources including VMS records, data collected by onboard MPI observers, and catch landing records from LFRs to ensure that all catches are reported correctly.

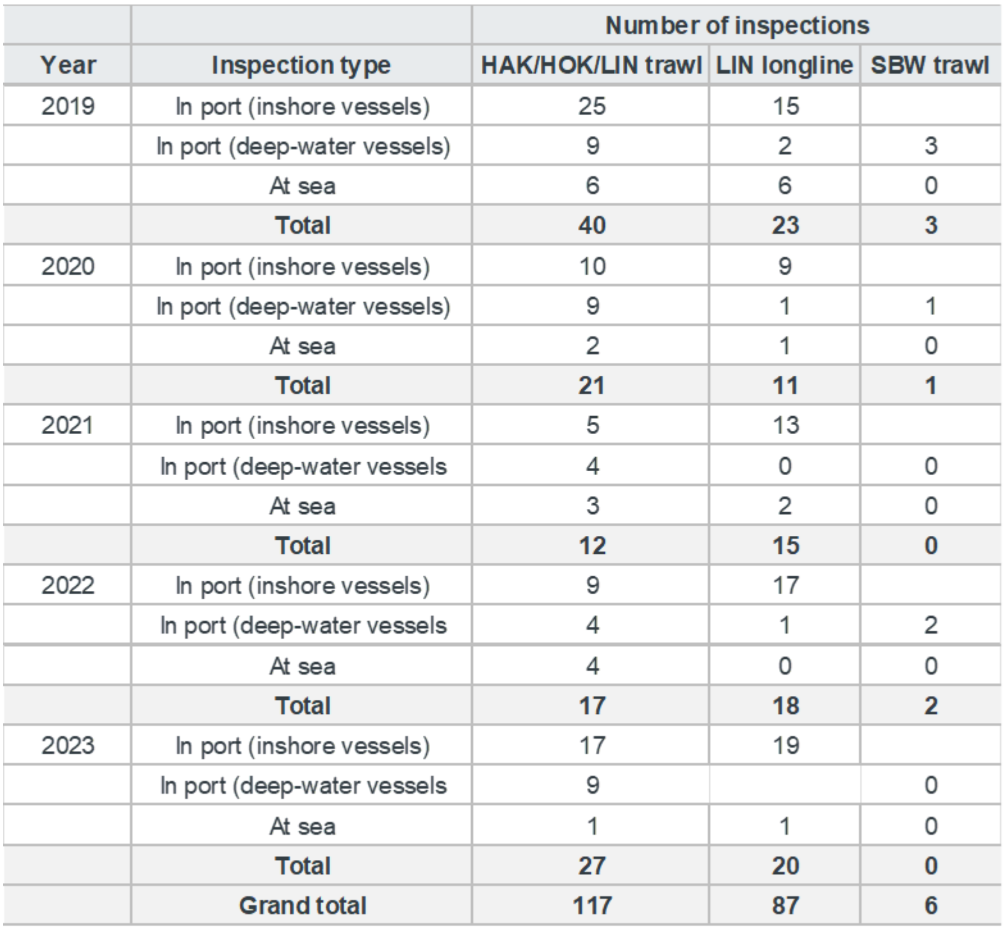
Commercial fishers face prosecution and risk severe penalties, which include automatic forfeiture of vessel and quota upon conviction of breaches of the fisheries regulations (unless the court rules otherwise). Financial penalties are also imposed in the form of deemed values to discourage fishers from over-catching their ACE holdings.

The extensive regulations governing these fisheries are complemented by additional industry-agreed non-regulatory measures, known as the New Zealand Deepwater Fisheries Operational Procedures. The Minister for Oceans & Fisheries relies on the effectiveness of both regulatory and non-regulatory measures to ensure the sustainable management of these fisheries.

As part of DWC's Operational Procedures, DWC has an Environmental Liaison Officer whose role is to liaise with vessel operators, skippers and MPI to assist with the effective implementation of these Operational Procedures.

MPI Fishery Officers carried out a total of 210 in-port and at-sea inspections for the period 1 January 2019 to 31 December 2023. These inspections relate to both inshore and deep-water vessels that were engaged in the HOK, HAK, LIN and SBW trawl fisheries and the LIN longline fishery. Inspections during 2020 and 2021 were lower than usual due to restricted access to vessels during the Covid epidemic (Table 32) (G. Lydon FNZ, pers. comm.).

Table 32: In-port and at-sea compliance inspections of hake, hoki and ling fishing vessels by MPI Fishery officers during the period 1 January 2019 to 31 December 2023.



		Number of inspections		
Year	Inspection type	HAK/HOK/LIN trawl	LIN longline	SBW trawl
2019	In port (inshore vessels)	25	15	
	In port (deep-water vessels)	9	2	3
	At sea	6	6	0
	Total	**40**	**23**	**3**
2020	In port (inshore vessels)	10	9	
	In port (deep-water vessels)	9	1	1
	At sea	2	1	0
	Total	**21**	**11**	**1**
2021	In port (inshore vessels)	5	13	
	In port (deep-water vessels	4	0	0
	At sea	3	2	0
	Total	**12**	**15**	**0**
2022	In port (inshore vessels)	9	17	
	In port (deep-water vessels	4	1	2
	At sea	4	0	0
	Total	**17**	**18**	**2**
2023	In port (inshore vessels)	17	19	
	In port (deep-water vessels	9		0
	At sea	1	1	0
	Total	**27**	**20**	**0**
	Grand total	**117**	**87**	**6**

Fisheries plans

The National Fisheries Plan for Deepwater and Middle-depth fisheries is a statutory document approved by the Minister of Fisheries. This Plan provides an enabling framework outlining agreed management objectives, timelines, performance criteria and review processes. There is a fisheries-specific chapter for the southern blue whiting fisheries within this Plan.

The actual management measures and delivery outcomes in the Plan are specified in MPI's Annual Operational Plan (AOP), which is reviewed and updated annually. In addition, an Annual Review Report assesses performance against the AOP and is publicly available.

National Plans of Action (NPOAs)

New Zealand has a responsibility to act in accordance with the objective of International Plans of Action for Seabirds and Sharks. The two NPOAs applicable to deepwater fisheries are:

1. NPOA-Sharks 2022

New Zealand's first NPOA-Sharks was in 2008 and the most recent one was NPOA-Sharks 2013. The 2013 NPOA has been reviewed and the NPOA-Sharks 2022 has been consulted on and a draft NPOA circulated. The final NPOA-Sharks 2022 is imminent.

The review of NPOA-Sharks 2013 identified that overall, there has been good progress was made on implementing the NPOA-Sharks 2013. A major achievement since the release of the NPOA was the elimination of shark finning – the removal of fins from the shark and returning the carcass to the sea (either dead or alive). Since 2014, it has been illegal for fishers to remove fins from sharks and then discard the bodies into the sea.

The specific feedback on Objective 2.4 Eliminate shark finning in New Zealand fisheries by 1 October 2015, with one exception shows that the combined approach of; (a) fins-attached approach, whereby fins must be naturally or artificially attached to the body of the shark; and (b) a ratio approach, whereby retained shark fin weight must be within a specified percentage of shark greenweight, has provided the best balance between eliminating shark finning and minimising disruptions on fishing operations.

The review identified that this pragmatic approach is providing an effective deterrent to shark finning. Prior to the ban, the highest volume of QMS sharks caught and retained were spiny dogfish, school shark, blue shark, elephant fish and rig. Since the ban, there are substantial decreases in retained catch for these species as reported on Monthly Harvest Returns that fishers provide to Fisheries New Zealand (FNZ, 2022b). FNZ's view is that the ban has resulted in stopping the landings of fins alone for rig and school shark, with one or two exceptions across all fisheries that have been identified and addressed).

The NPOA-Sharks 2022 sets out the desired future state for shark conservation and management in New Zealand. Underpinning this, goals have been developed for a range of areas where improvements in current management arrangements can be achieved, and objectives are aligned to each of the goals.

Table 33 outlines the Management categories and species for New Zealand shark species. Notably a consultation in 2022 sought to amend aspects of shark fin management measures ('fins artificially attached' approach) in order to allow changes to the species subject to this approach to be implemented via circular rather than regulation. This was a recognition in the Discussion document: Proposed technical amendments to fisheries regulations and Summary of proposed technical amendments to fisheries regulations that an administrative change was needed to reduce the resource intensive and time-consuming nature of extending or changing the species covered by the fins artificially attached approach.

The Deepwater Group's (DWG) Sharks Operational Procedures provide the deepwater fleet with guidance on processes to minimise harm to protected shark species and maximise their chance of survival on return to the sea.

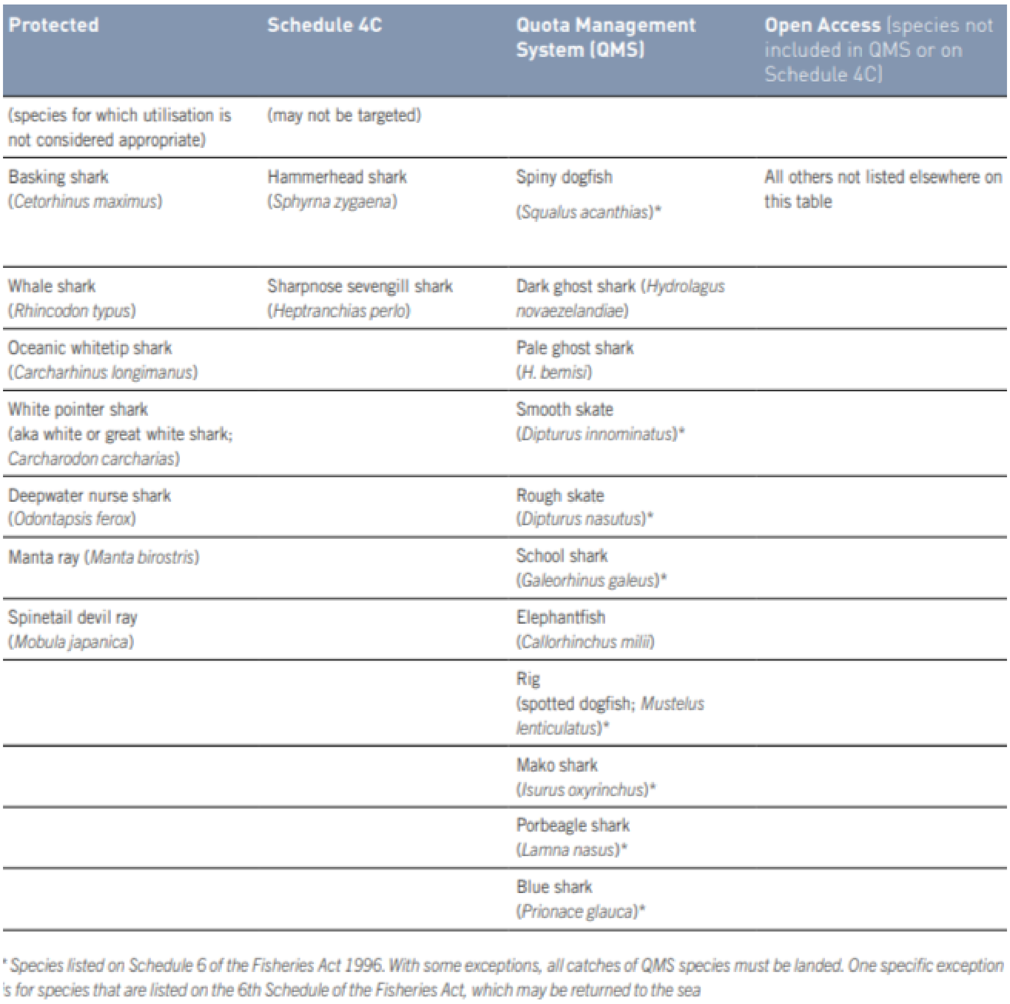
2. NPOA-Seabirds

New Zealand's first NPOA was published in 2004 and a revised NPOA-Seabirds published in 2013. The NPOA Seabirds 2020 is New Zealand's third iteration of a national plan of action

The NPOA Seabirds 2020's vision is *New Zealanders work towards zero fishing-related seabird mortalities*. Its four goals are:

- Avoiding bycatch — effective bycatch mitigation practices are implemented in New Zealand fisheries.
- Healthy seabird populations — direct effects of New Zealand fishing do not threaten seabird populations or their recovery.
- Research and information — information to effectively manage direct fisheries effects on seabirds is continuously improved.
- International engagement — New Zealand actively engages internationally to promote measures and practices that reduce impacts on New Zealand seabirds.

Table 33: Management categories and species in each category (including species listed on Schedule 6 of the Fisheries Act) (FNZ, 2022)



Protected	**Schedule 4C**	**Quota Management System (QMS)**	**Open Access** (species not included in QMS or on Schedule 4C)
(species for which utilisation is not considered appropriate)	(may not be targeted)		
Basking shark (*Cetorhinus maximus*)	Hammerhead shark (*Sphyrna zygaena*)	Spiny dogfish (*Squalus acanthias*)*	All others not listed elsewhere on this table
Whale shark (*Rhincodon typus*)	Sharpnose sevengill shark (*Heptranchias perlo*)	Dark ghost shark (*Hydrolagus novaezelandiae*)	
Oceanic whitetip shark (*Carcharhinus longimanus*)		Pale ghost shark (*H. bemisi*)	
White pointer shark (aka white or great white shark; *Carcharodon carcharias*)		Smooth skate (*Dipturus innominatus*)*	
Deepwater nurse shark (*Odontapsis ferox*)		Rough skate (*Dipturus nasutus*)*	
Manta ray (*Manta birostris*)		School shark (*Galeorhinus galeus*)*	
Spinetail devil ray (*Mobula japanica*)		Elephantfish (*Callorhinchus milii*)	
		Rig (spotted dogfish; *Mustelus lenticulatus*)*	
		Mako shark (*Isurus oxyrinchus*)*	
		Porbeagle shark (*Lamna nasus*)*	
		Blue shark (*Prionace glauca*)*	

** Species listed on Schedule 6 of the Fisheries Act 1996. With some exceptions, all catches of QMS species must be landed. One specific exception is for species that are listed on the 6th Schedule of the Fisheries Act, which may be returned to the sea*

Research plans

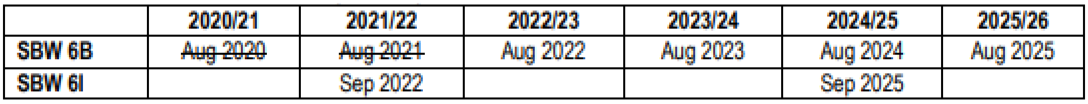
Research needs for deepwater fisheries are driven by the Objectives of the National Deepwater Plan and delivered through the research programme for deepwater fisheries

MPI's medium-term research plan for deepwater fisheries provides a five-year outlook on planned research to support the sustainable management of deepwater fisheries. All research projects are reviewed by MPI's Science Working Groups and assessed against MPI's Research and Science Information Standard for New Zealand Fisheries

Southern blue whiting exhibit highly variable year class strength and are characterised by episodic recruitment events. Stocks are therefore surveyed (and assessed) regularly, both to allow for the utilisation of significant recruitment events, but also to respond when large year classes leave the fishery or fish abundance declines suddenly. The survey for SBW 6B is planned to be completed annually whilst the survey for SBW 6I is scheduled to be completed every third year using the RV Tangaroa (Table 34). The survey schedule is used to align with SBW 6I stock assessments.

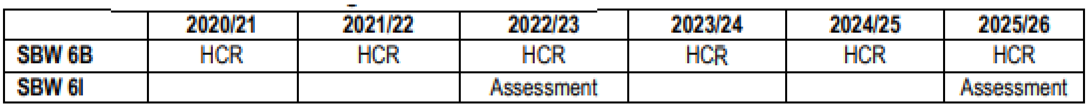
For SBW 6B it is currently managed using a harvest control rule (HCR) that provides guidance on an appropriate level of fishing mortality to be applied based on biomass estimates from the annual acoustic survey (Table 35).

Table 34: Southern blue whiting survey schedule



	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
SBW 6B	~~Aug 2020~~	~~Aug 2021~~	Aug 2022	Aug 2023	Aug 2024	Aug 2025
SBW 6I		Sep 2022			Sep 2025	

Table 35: Southern blue whiting assessment schedule



	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
SBW 6B	HCR	HCR	HCR	HCR	HCR	HCR
SBW 6I			Assessment			Assessment

MPI's medium-term research plan highlights that future research for SBW should consider determining how to best represent mean weights at age for Campbell Island Rise southern blue whiting given the negative relationship between year class strength and growth in the model. Monitoring SBW 6B is also an area of potential future research.

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