SOUTHERN BLUE WHITING SITUATION REPORT

PREPARED FOR THE 4TH MSC SURVEILLANCE AUDIT 2023

Seafood New Zealand
DEEPWATER COUNCIL

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Seafood New Zealand DEEPWATER COUNCIL

SITUATION REPORT FOR THE 4TH MSC SURVEILLANCE AUDIT 2023

NEW ZEALAND SOUTHERN BLUE WHITING TRAWL FISHERIES

PURPOSE OF THIS REPORT

This report is one of three prepared for the combined 4th MSC surveillance audit of New Zealand hake, hoki, ling and southern blue whiting.

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 an update on two Units of Certification (UoC), for southern blue whiting (SBW 6B, SBW 6I) trawl fisheries, and builds on the information previously provided for the 2022 surveillance audit.

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

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 the stock status of the UoC based on the base model runs

Stock	Most recent assessment	Depletion [Year]	P < Target	P < Soft Limit	P <Hard Limit
SBW 6B	2022*	-	40%	-	-
SBW 6I	2020	56% B_0 [2020]	>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, 2022)

SBW 6B:

- For Bounty Plateau (SBW 6B) a management target is set based on a fishing mortality rate calculated from a harvest control rule. B2020 was estimated to be about 56% B0
- 2022 updates to the harvest control rule simulations determined that the stock is likely (> 60%) to be below the target fishing effort threshold (F) and is unlikely to be experiencing overfishing

SBW 6I:

- For Campbell Rise (SBW 6I), B_{2020} was estimated to be about 56% B_0
- Very Likely (> 90%) to be above the management target of 40% B_0 (base case run)

TACC & catch trends (FNZ, 2022)

Table 3: TACC, catch limits, catch and associated balances for the SBW 6I and SBW 6R fishery from 2018-19 to 2022-23. The fishing year relates to the 1 April – 31 March dates.

Stock	TACC	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24 YTD	5 year average (exc. 23/24)
SBW 6B	TACC (t)	3,145	3,145	2,830	2,830	2,264	2,264	
	ACE	3,145	3,460	2,830	3,113	2,264	2,478	
	Catch (t)	1,101	788	1,100	801	125	0.123	783
	Balance (t)	2,045	2,672	1,730	2,312	2,139	2,478	2,179
SBW 6I	TACC (t)	39,200	39,200	39,200	39,200	39,200	39,200	

	ACE	43,531	43,553	43,428	43,428	43,308	43,065	
	Catch (t)	15,147	26,517	11,982	19,514	22,985	44	19,229
	Balance (t)	28,383	17,036	30,302	23,915	20,323	43,021	23,992

Note: "Estimated catch trawl" is derived from at-sea estimates per fishing event and is typically different from "reported catch", which is derived from weighed landings as reported against the TACC and balanced with ACE.

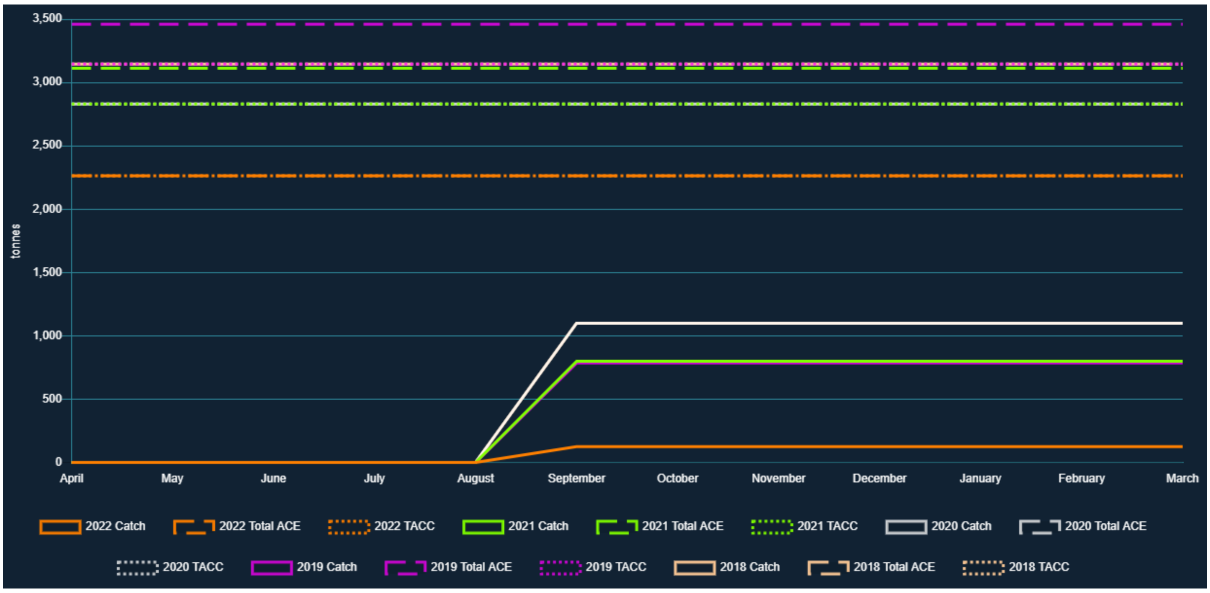


Figure 1: Reported commercial landings, total ACE and TACC for SBW 6B (Bounty Plateau) for fishing years 2018 – 2022. (Source: FishServe KUPE system)

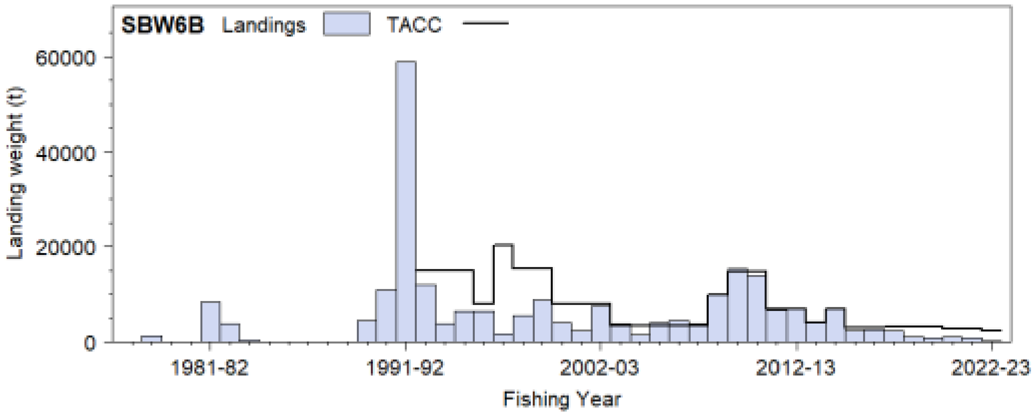


Figure 2: Reported commercial landings and TACC for SBW 6B (Bounty Plateau) (Source: FNZ, 2023)

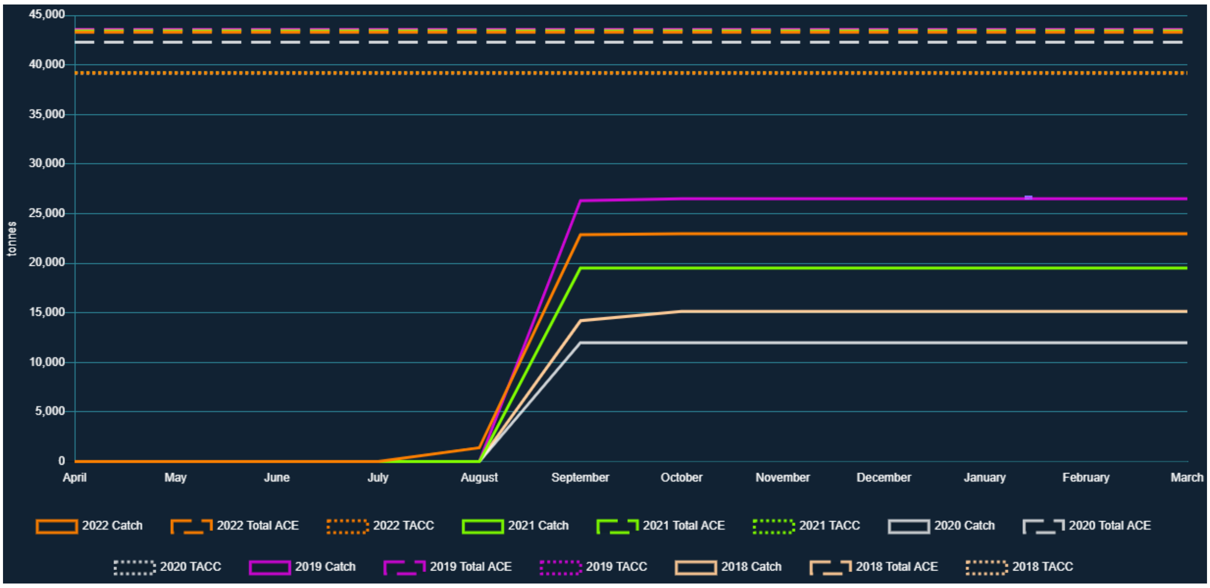


Figure 3: Reported commercial landings, total ACE and TACC for SBW 6B (Bounty Plateau) for fishing years 2018 – 2022. (Source: FishServe KUPE system)

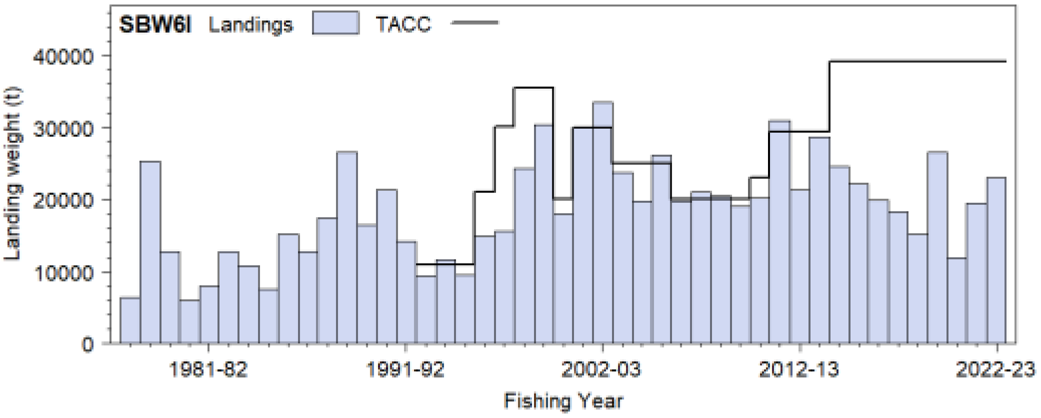


Figure 4: Reported commercial landings and TACC for SBW 6I (Campbell Rise) (Source: FNZ, 2023)

Stock assessment development and structure

SBW 6B

Previous acoustic surveys have been used to determine abundance, most recently in 2017 which showed a slight increase in abundance. Surveys completed annually from 2018 – 2022 were unsuccessful and did not produce indices of abundance.

HCR_{2022} was updated from HCR_{2017} to address the increasing gap years between the acoustic surveys. 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.

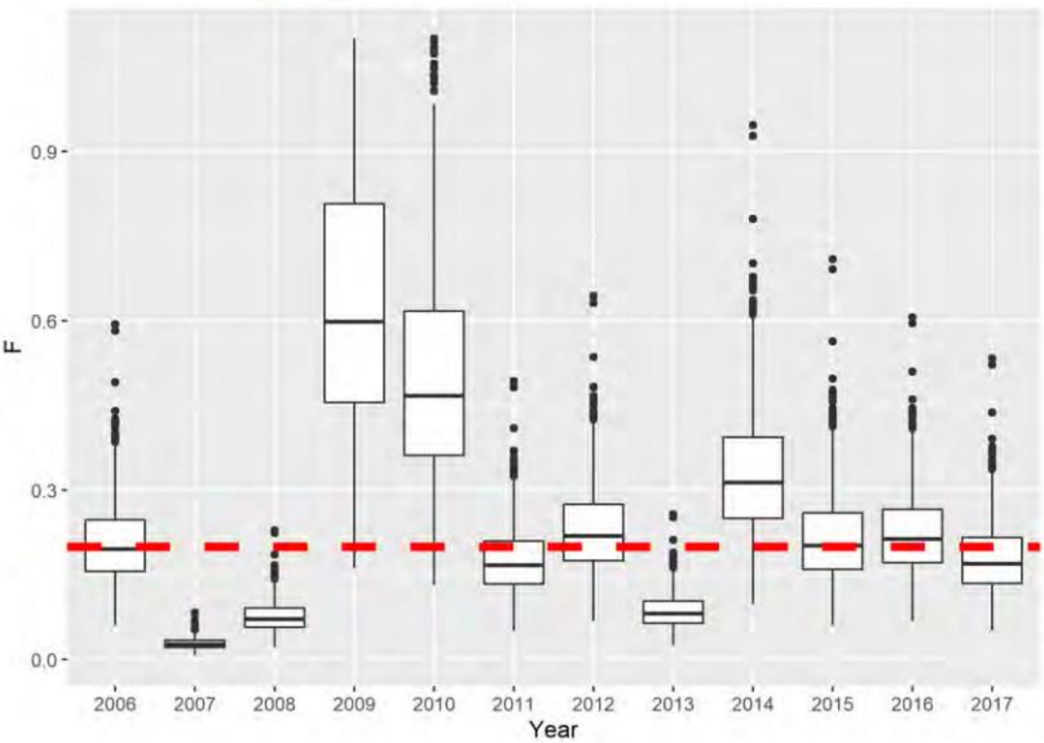


Figure 5: ***F*** **distribution using historical data and the *q*-prior used in the simulations. Dashed red line is at the agreed target of 0.2 (i.e., M) (Source: FNZ, 2023)**

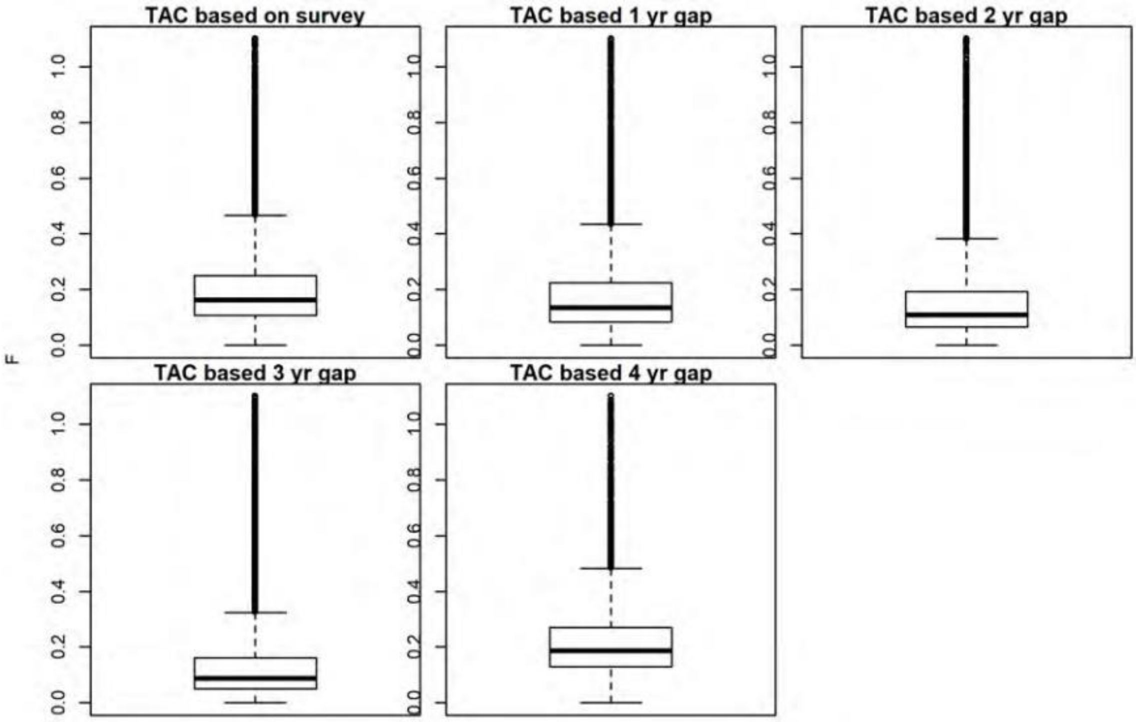


Figure 6: ***F*** **distribution from years 50 to 120, for years that had their TAC determined by a survey the previous year, using the adjustment, for a gap of 1 year, and similarly for 2, 3, and 4-year adjustments**. (**Source: FNZ, 2023)**

SBW 6I

The last fully quantitative stock assessment for Campbell Rise (SBW 6I) was completed in 2020 using an age-structured CASAL model with Bayesian estimation of posterior distributions.

With strong recent recruitment, the biomass has increased well above the management target and B_{2020} was estimated to be at 56% B and overfishing is very unlikely (10%) to be occurring.

Fishing pressure has declined with the increase in stock size. Recent catches have been consistently less than the TACC and there are no indications that the fishery is likely to change in the next few years. At current catches (21 059 t), the biomass will remain above the target (40% B0) until 2022–23 or 2023–24 depending on recruitment. Noting that if catches are at the TACC (39 200 t) the biomass would be expected to decrease over the next 1–5 years (Figure 7 and Figure 8).

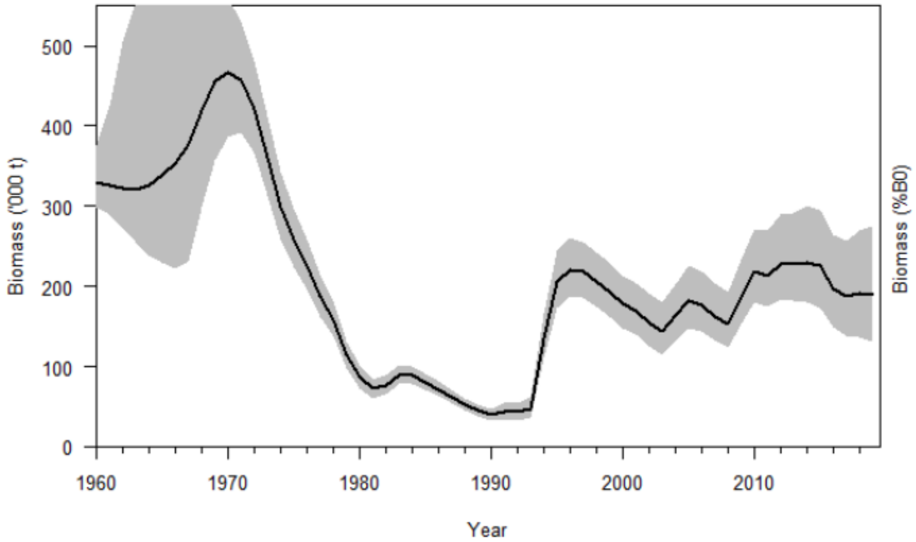


Figure 7: MCMC posterior plots of the trajectories of biomass (Source: FNZ, 2023)

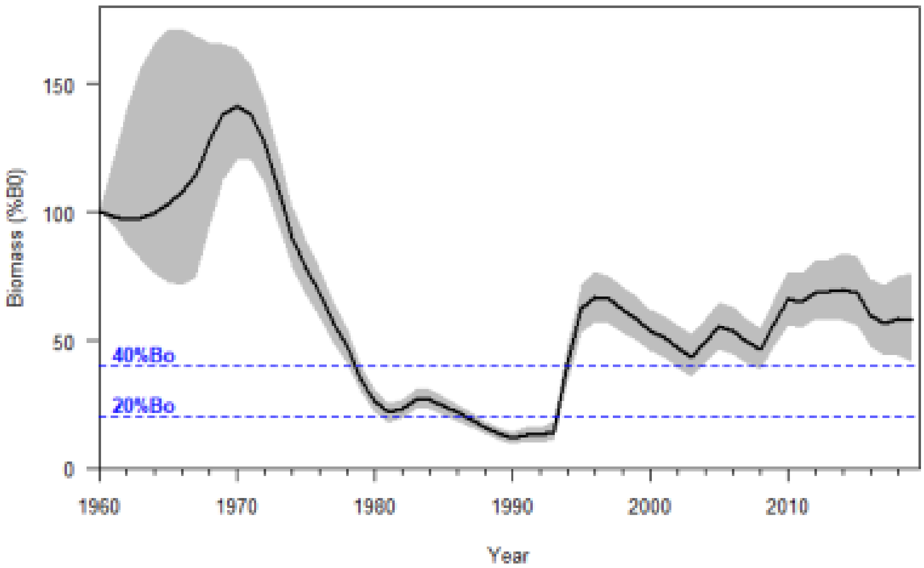


Figure 8: Trajectory over time of spawning biomass (%B0) for the Campbell Rise southern blue whiting stock from the start of the assessment period in 1960 to 2019. The blue horizontal lines show the management target (40% B0) and the soft limit (20% B0). Biomass estimates are based on Base case MCMC results. (Source: FNZ, 2023)

Key P1 references

Doonan, I.J. (2020). Southern blue whiting (Micromesistius australis) stock assessment for the Campbell Island Rise for data up to 2018–19. New Zealand Fisheries Assessment Report 2020/43. 20 p.*https://www.mpi.govt.nz/dmsdocument/43645-FAR-202043-Southern-blue-whiting-Micromesistius-australis-stock-assessment-for-the-Campbell-Island-Rise-for-data-up-to-201819*

FNZ (2023). Fisheries Assessment Plenary May 2023: Stock Assessments and Stock Status, Vol. 2 Horse mussel to Red crab (Southern blue whiting pp.1641-1670). https://www.mpi.govt.nz/dmsdocument/57256-Fisheries-Assessment-Plenary-May-2023-Stock-Assessments-and-Stock-Status-Volume-3-Red-gurnard-to-Yellow-eyed-mullet#page=405

Large, K.; O'Driscoll, R.L.; Datta, S. (2021). 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 2020 season. New Zealand Fisheries Assessment Report 2021/40. 73 p. https://www.mpi.govt.nz/dmsdocument/46327-FAR-202140-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-2020-season

Large, K (2021b) 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 2019 season. New Zealand Fisheries Assessment Report 2021/14. 77 p. https://www.mpi.govt.nz/dmsdocument/44731-FAR-202114-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-2019-season

P2 OVERVIEW OF STOCK STATUS INFORMATION

Observer Programme

Overview

Fisheries New Zealand (FNZ) 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 (DWG, 2014), in the Interim Code of Practice (DWG, 2013), and in the newly developed Operational Procedures (DWG, 2016d).

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 be high-risk to ETP species given operations overlap with sea lions[1].

Table 4 outlines the trend in observer coverage for the relevant stocks of SBW target fisheries for the last five years including the current fishing year. The latest Annual Review Report for Deepwater Fisheries covers the 2020/21 fishing year, meaning the publicly available information on 2021/22 and 2022/23 fishing years is based on the Annual Operating Plans for Deepwater Fisheries.

Table 4: Observer coverage in the southern blue whiting fisheries (SBW 6B and 6I).

Fishery	QMA	2018-19	2019-20	2020-21	2021-22 (planned)	2022-23 (planned)
Southern blue whiting	SBW6B	100%	100%	77%	100%	100%
	SBW 6I	100%	100%		100%	100%

It has been recognised that observer coverage, especially of small vessels, is sometimes inadequate to satisfactorily estimate interactions with a high degree of confidence. This has in part been due to the reprioritisation of observer effort toward foreign charter vessels (FCVs) and some priority coastal fisheries (e.g., SNA1 and to support the Maui Dolphin monitoring strategy. MPI has therefore used a Risk Assessment process to methodically consider risk in a conservative way when data are sparse. However, there have been significant steps to improve the availability of ETP capture information for the fleet of small vessels in the ling longline fleet.

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 5).

[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.

Table 5: Numbers of length frequency samples and otoliths collected by observers during the 2020/21 fishing years for Tier 1 deepwater species by area

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

Retained & bycatch species

Estimates of bycatch for nine Tier-1 species fisheries (SQU, SCI, HAK, HOK, JMA, ORH, OEO, LIN, SBW) were completed as part of *"Bycatch monitoring and quantification of deepwater stocks".* The purpose of this research was to compile a list of all fish and invertebrate bycatch species in New Zealand deepwater fisheries, with estimates of annual catch weights, which could be relatively rapidly produced and regularly updated.

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. Ballara (2015) updated the analysis to cover the fish and invertebrate bycatch in New Zealand deepwater fisheries from 1990-91 until 2012-13.

The most recent report by Finucci et al. (2019) identified:

- 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 9).
- Most common bycatch species by weight (t) were ling (*Genypterus blacodes*, LIN), hake (*Merluccius australis*, HAK), and hoki (HOK) (Figure 10).

Edwards and Mormede (2023) 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 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 for SBW fisheries indicates that the model fits are reasonable, but that to achieve 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. Table 6 shows the model estimates of the average annual catch (tonnes) per gear and per non-target species for the SBW fishery shows that BAR and FRO have the highest average annual catch.

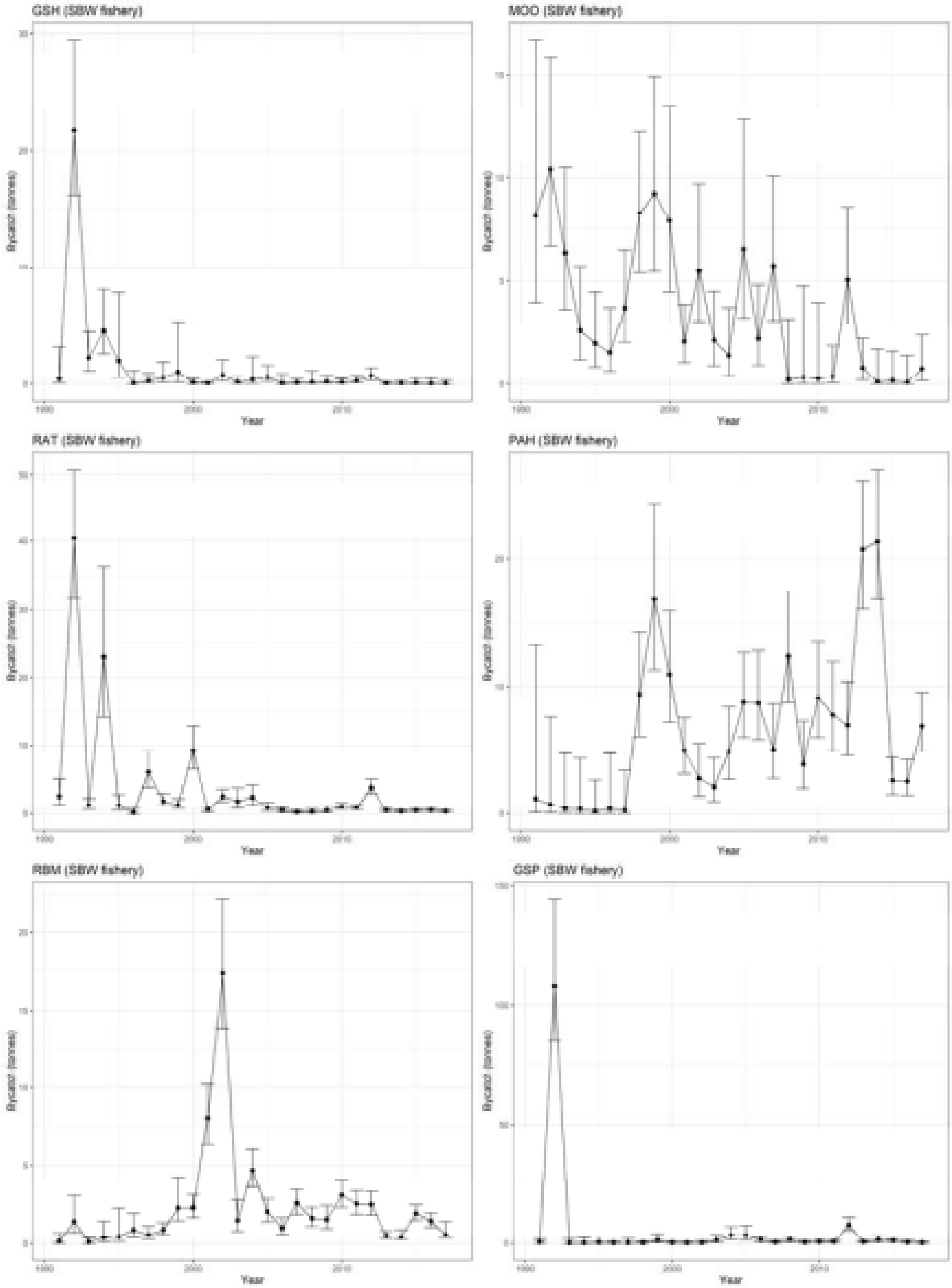


Figure 9: Annual bycatch estimates in the southern blue whiting trawl fishery for the species showing the greatest increases and declines between 1990–91 and 2016–17. See text above for explanation of the species codes. Note: the scale changes on the y-axis between plots (Finucci et al., 2019).

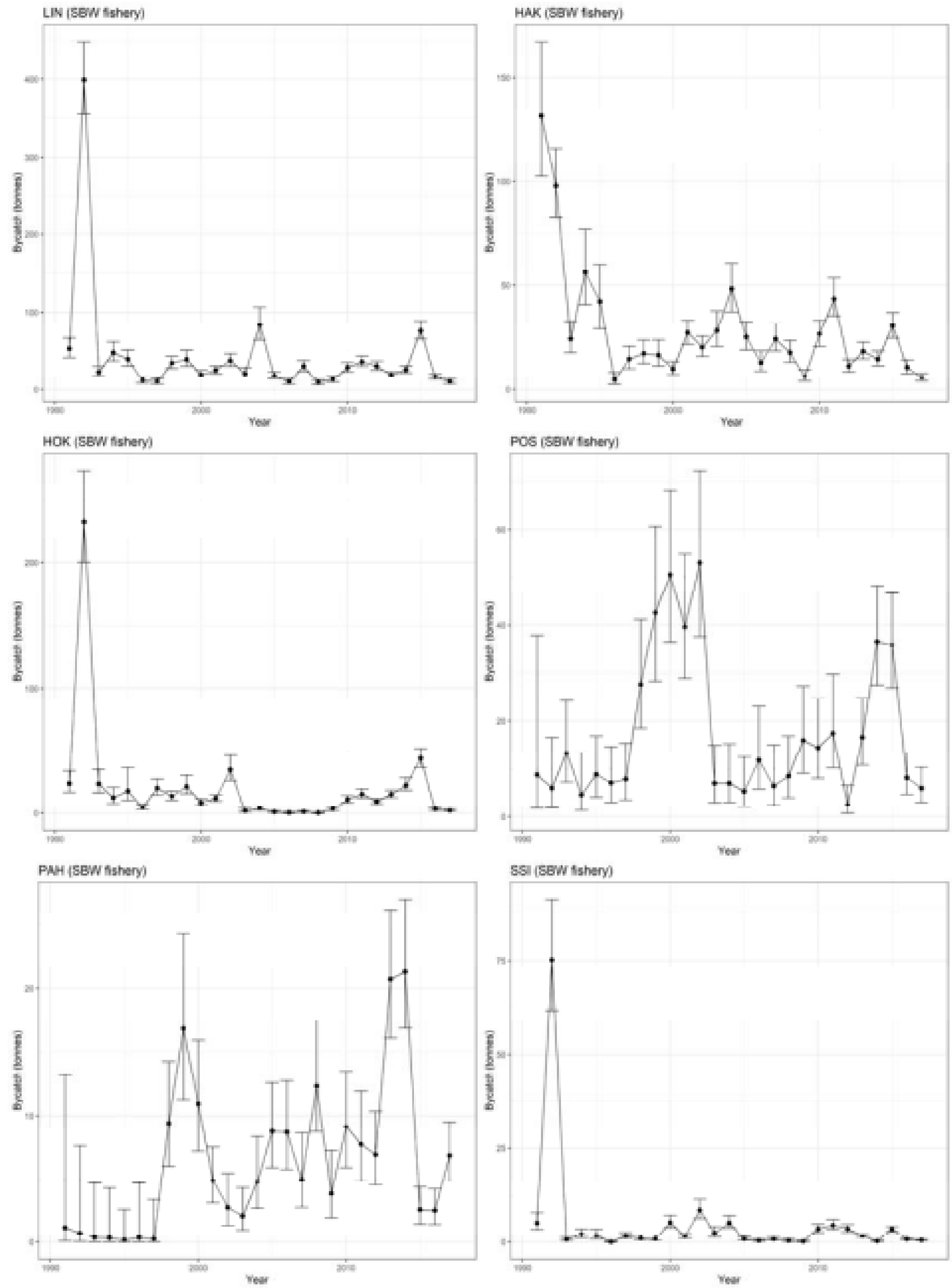


Figure 10: Annual bycatch estimates for the most common southern blue whiting trawl fishery bycatch species by weight between 1990–91 and 2016–17. See http://marlin.niwa.co.nz or Table 10 for species code definitions. Note: the scale changes on the y-axis between plots. HAK had a significant decreasing trend, LIN, HOK, and SSI had non-significant decreasing trends, PAH had an increasing significant trend, and POS had an increasing non-significant trend (Finucci et al., 2019)

Table 6: 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 (Edwards and Mormede, 2023).

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)

ETP species

Southern blue whiting trawlers occasionally interact with marine mammals and seabirds. Information on incidental captures of ETP species reported by the MPI Observer Programme is summarised in a series of annual reports (e.g., Abraham & Thompson, 2015, published on the Dragonfly website (www.dragonfly.co.nz/data/) and, MPI, 2016), which enable the incidental captures of seabirds, marine mammals and turtles by the commercial fisheries to be monitored on an ongoing basis.

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 MPI/Dragonfly)
- Assessments of the risk that the SBW fisheries pose to ETP bird species using the estimation of Annual Potential Fatalities (APFs) and Potential Biological Removals (PBRs) (Richard & Abraham, 2015, 2015a, in prep; Baker & Hamilton, 2016, Edwards et al., 2023)
- Population studies
- Annual Environmental Liaison Officer reports
- Trigger reports (i.e., real time responses to actual incidents)
- The development and testing of tori lines specifically for small vessels (the small vessel tori line project, reported by Pierre & Goad, 2016)
- Review of ETP species monitoring (MPI, 2015).

The National Plan of Action Seabird reports 2018/19 and 2019-20 provide breakdowns of the observed seabird captures by hoki, hake and ling trawlers illustrating that small albatross species (i.e., mollymawks) and petrels & shearwaters are the most abundant groups caught (Table 7), (FNZ, 2020a; FNZ, 2021c). Figure 11 shows the historical capture rate trend showing that the capture rate has continued to decline and is below the SBW baseline level. The capture rate per 100 tows for SBW fisheries was 0.59 during the 2020/21 fishing year with 77% observer coverage achieved (FNZ, 2020b).

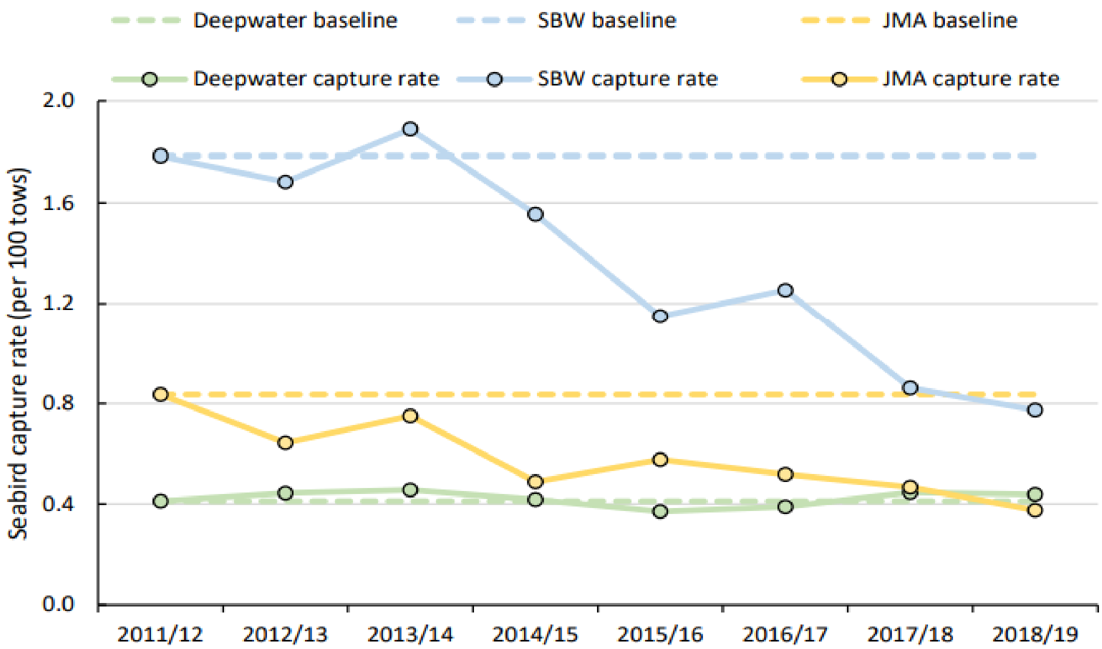


Figure 11:: Estimated seabird capture rates (captures per 100 tows) relative to baseline capture rates, for the deepwater, jack mackerel and southern blue whiting trawl fisheries between the 2011/12 and 2018/19 fishing years. As seabird capture rates are expressed as three-year rolling averages, data for 2018/19 represents the average for the 2017/18, 2018/19, and 2019/20 years. Data taken from the Protected Species Capture webpage.

The latest Spatially Explicit Fisheries Risk Assessment (SEFRA) framework for seabirds in the New Zealand Exclusive Economic Zone was released on 5 July 2023 and attempts to quantify the impact of New Zealand commercial fisheries on New Zealand populations of seventy-one seabird species. The new SEFRA has made significant structural changes to improve seasonal resolution and improve the transparency diagnosis of the capture predictions. The results of the update are noticeably different and are reported to be a result of the updated structural changes.

The results show that only the southern Buller's albatross was estimated to have a risk metric of greater than one, indicating that current captures are higher than what can be sustained by the population over the long term. The results of the annual deaths for the southern blue whiting fishery show that the mean of southern Buller's albatross deaths is zero (Table 7). The associated catchability and vulnerability for the southern blue whiting fishery are shown in Figure 12, Figure 13 and Figure 14.

Table 7: 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]

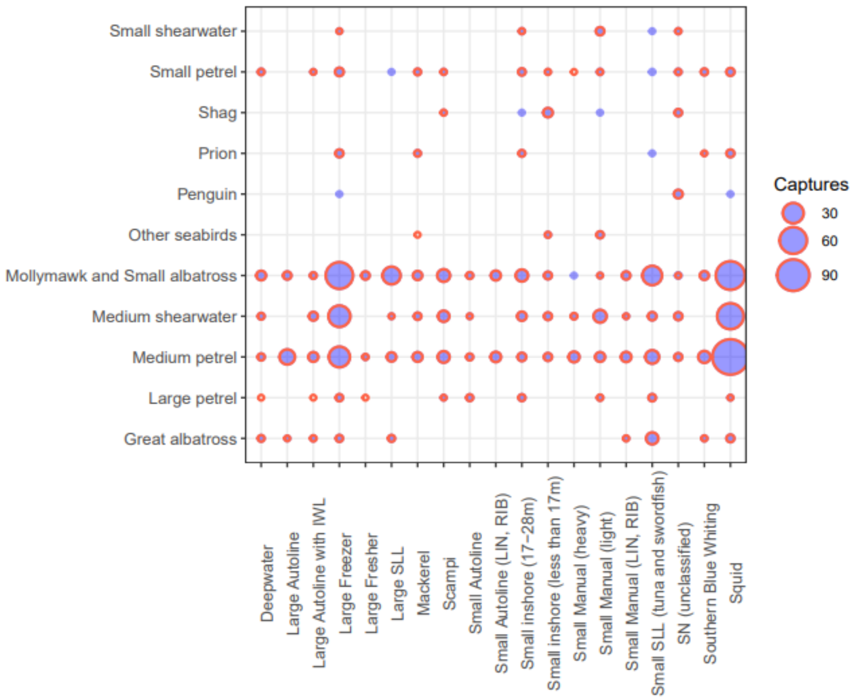


Figure 12: Model fit to observed average annual captures (C 0 f,z) per species and fishery group combination, between 2006/07 and 2019/20. Model predicted values are represented by the posterior median of the sum across species per group and shaded in blue. Empirical values are represented by red circles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

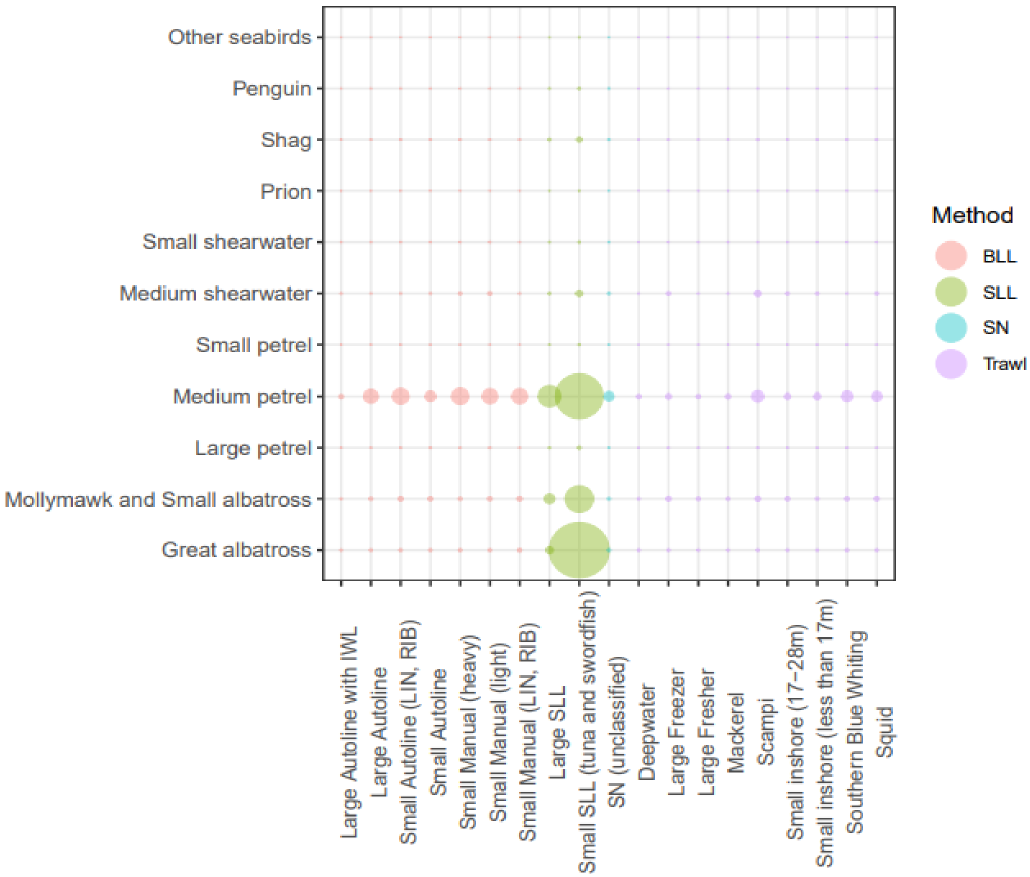


Figure 13: Catchability (qf,z) per species group and fishery group combination. Catchabilities are only comparable between methods and groups that share the same effort units (Source: Edwards et al., 2023).

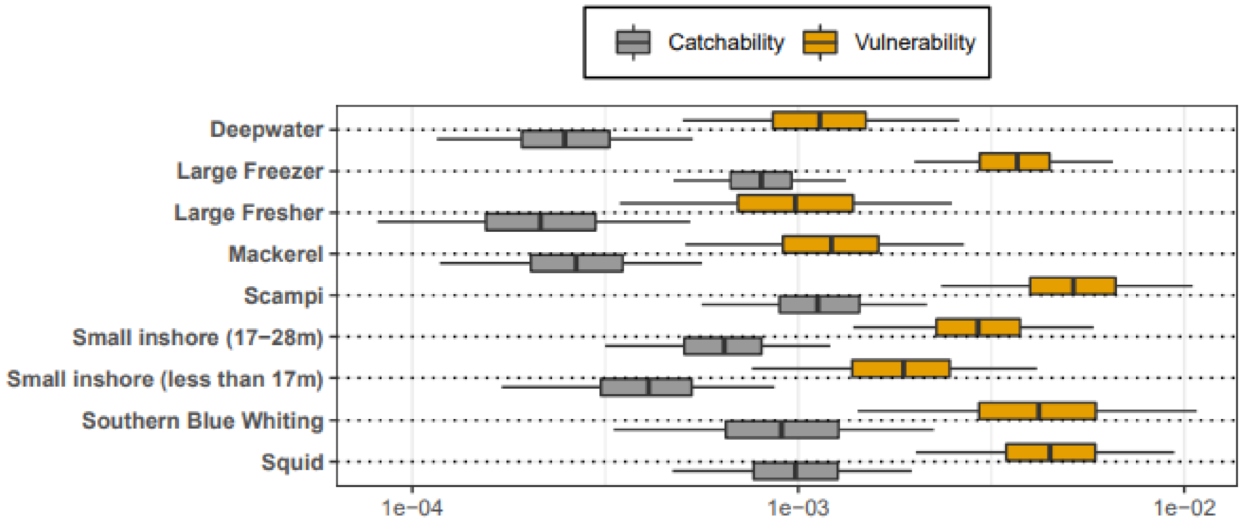


Figure 14: Marginal catchability (qf) and vulnerability (uf) per trawl fishing group assuming a geometric mean across species. Values are given on a log10-scale. Boxplots show the median, and 75% and 95% posterior quantiles (Source: Edwards et al., 2023).

Between 2002–03 and 2019–20, there were 138 observed captures of all birds in southern blue whiting trawl fisheries (Figure 15 and Figure 16). Grey petrel is the species captured most often (accounting for around 56% of captures over the time period (Figure 17).

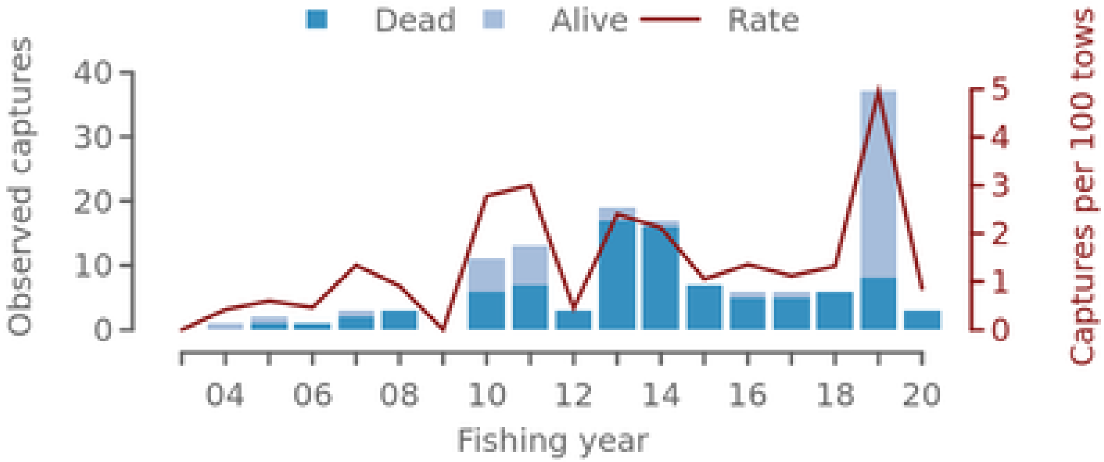


Figure 15: Observed captures and capture rates of all birds by southern blue whiting fisheries 2002-03 to 2019-20.

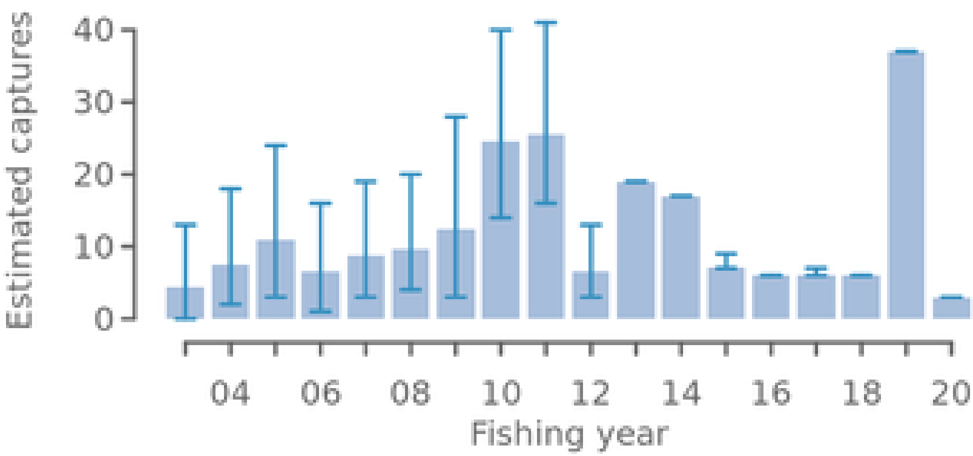


Figure 16: Southern blue whiting trawl fishery estimated total incidental seabird captures (dead and live released) of all birds by southern blue whiting fisheries 2002-03 to 2019-20.

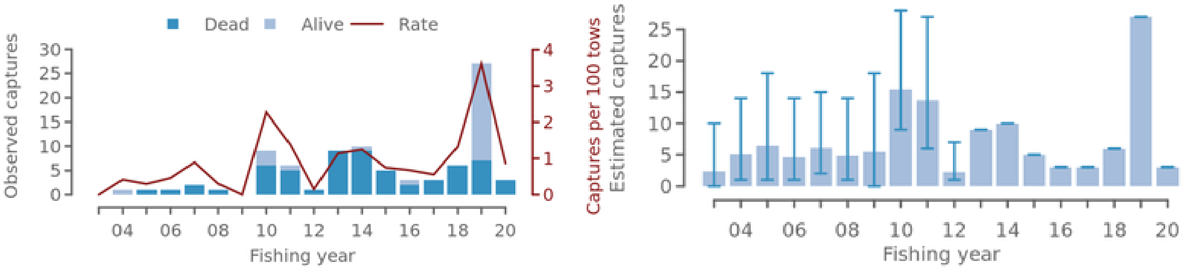


Figure 17: Southern blue whiting trawl fishery interactions with Grey Petrel. Left panel - Observed captures of grey petrel in southern blue whiting trawl fisheries, Right panel - Estimated captures of grey petrel in southern blue whiting trawl fisheries

Marine mammals

New Zealand sea lions

Between 2002–03 and 2019–20, there were 66 observed captures of New Zealand sea lions in southern blue whiting trawl fisheries (Figure 18).

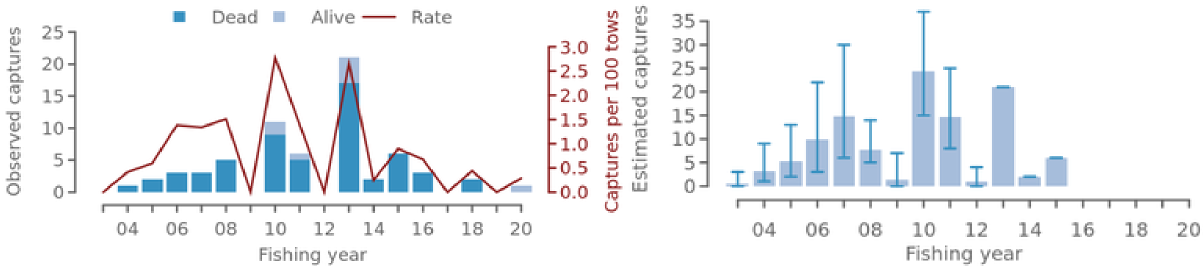


Figure 18: Southern blue whiting trawl fishery interactions with New Zealand sea lion. Left panel - Observed captures and capture rates of New Zealand sea lion by southern blue whiting fisheries 2002-03 to 2019-20, Right panel - Estimated captures of grey petrel in southern blue whiting trawl fisheries.

New Zealand Fur seals

Between 2002–03 and 2019–20, there were 498 observed captures of New Zealand fur seals in southern blue whiting trawl fisheries (Figure 19).

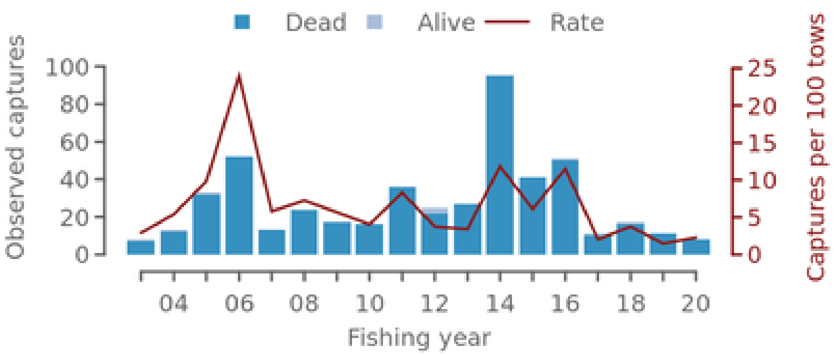


Figure 19: Observed captures and capture rates of New Zealand fur seals by southern blue whiting fisheries from 2002-03 to 2019-20.

Other seals

Between 2002–03 and 2019–20, there was one observed capture of a Leopard seal in southern blue whiting trawl fisheries.

Whales & dolphins

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

Sharks

An active mitigation programme administered by DWG and monitored by MPI has been in place since 2013 to reduce shark captures in deepwater fisheries (DWG, 2014b). For the first time in the history of the southern blue whiting fishery, a basking shark was reported captured in SBW 6B during the 2016 fishing season (Figure 20). The Department of Conservation (DOC) has undertaken a review of basking shark interactions in 2016-17 (Francis, 2017).

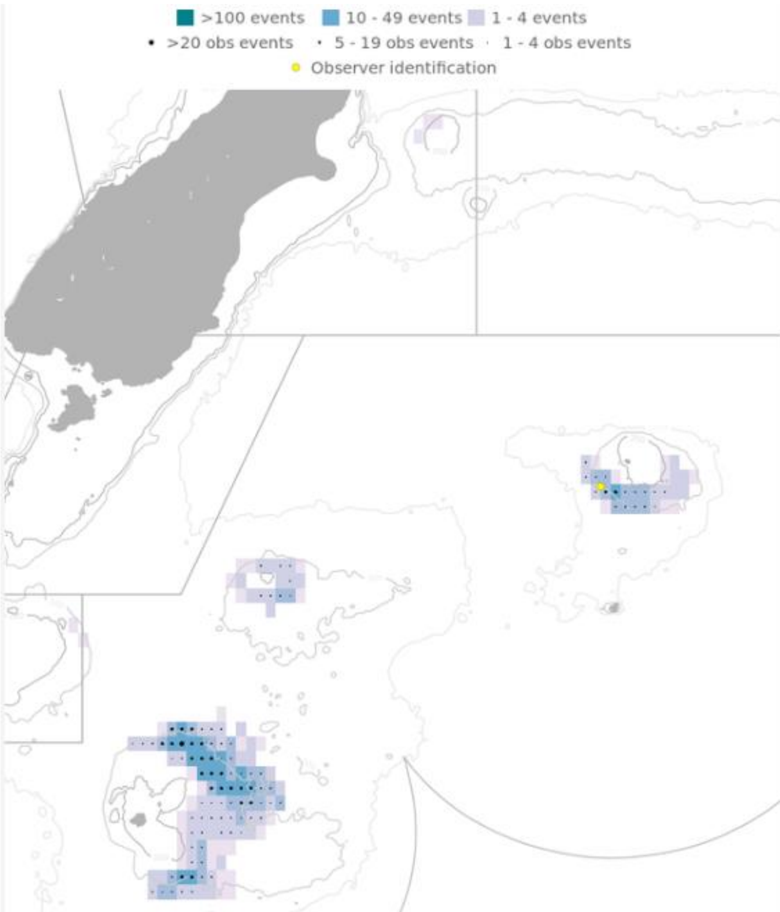


Figure 20: Map of fishing effort and observed captures, 2002–03 to 2019–20. Fishing effort is mapped into 0.2-degree cells, with the colour of each cell being related to the amount of effort. Observed fishing events are indicated by black dots. Fishing is only shown if the effort could be assigned a latitude and longitude, and if there were three or more vessels and three or more companies or persons fishing within a cell. In this case, 98.9% of the effort is shown.

Shark retention policy

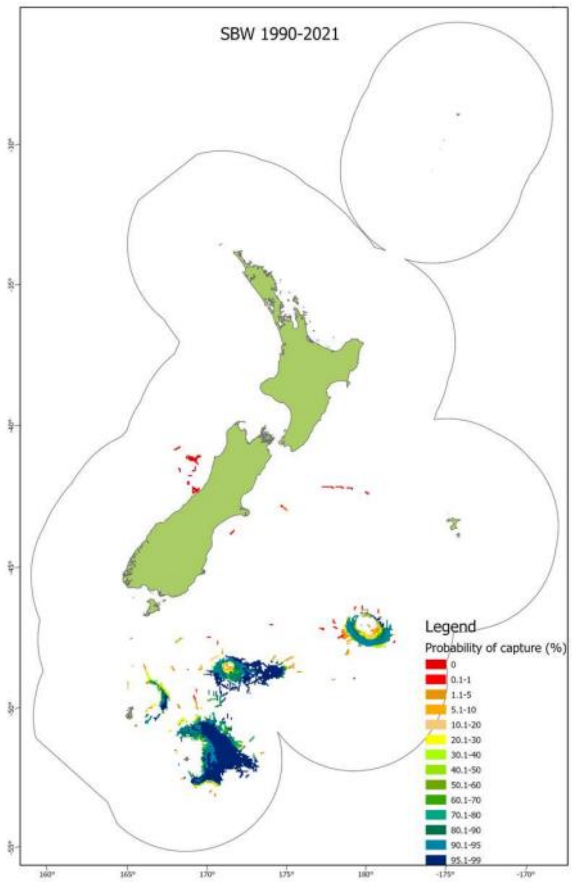
The Fisheries (Commercial Fishing) Regulations 2001 prohibit shark finning and require that any shark fins landed must be naturally attached to the remainder of the shark (or artificially in the case of blue shark). However, an exception to the fins attached requirement is provided for seven QMS species to allow at-sea processing to continue. (https://www.mpi.govt.nz/dmsdocument/3644-Landing-shark-fins-subject-to-a-ratio). The conditions that apply to the different shark species is shown in the table below.

Table 16: Summary of conditions that apply if fishers wish to land shark fins.

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

Benthic interactions

The southern blue whiting fishery footprint is mainly distributed in areas where the probability of occurrence in over 90%. The overlap of the fishery footprint on the southern blue whiting 'preferred habitat' distribution (probability of occurrence) is shown in Figure 21 and Figure 22. This distribution represents the probability of capture (%) of a fish in a standardised trawl and shows that SBW trawls are in areas which is most likely to capture the species (Table 8**Error! Reference source not found.**).



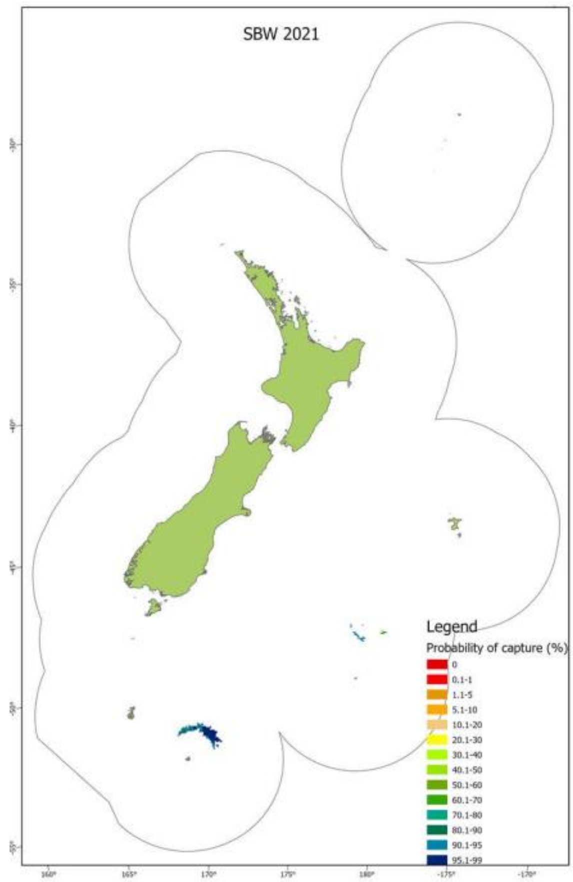


Figure 21: Distribution of the 1990–2021 (left) and the 2021 trawl footprints (right) for southern blue whiting, displayed by 25-km2 contacted cell, relative to the probability of capture for that species (after Leathwick et al. 2006) (MacGibbon & Mules, 2023).

Table 8: 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

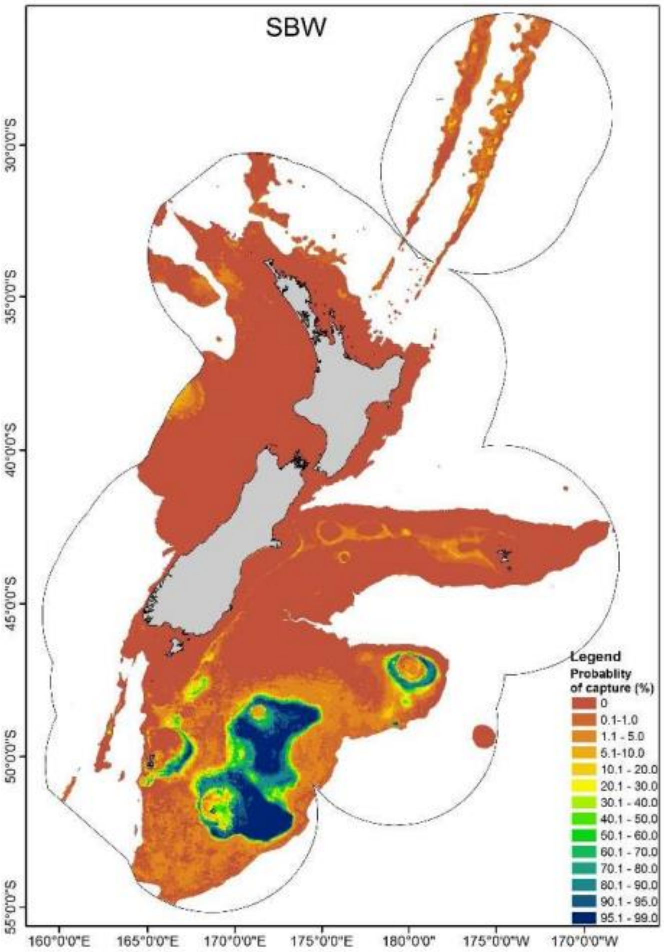


Figure 22 The extent of the predicted distribution of the preferred habitat for southern blue whiting (after Leathwick et al. 2006), where the preferred habitat represents the probability of capture of that species in a standardised trawl in waters down to 1950 m depth (MacGibbon & Mules, 2023).

The indicative bottom contact by depth profile shows that SBW trawls are in the 400- 600m depth profile (Table 9) and when reviewed as a combined figure shows that whilst the majority of SBW is in the 400 – 600 m depth it only represents 0.21% of the total footprint overlap (Table 10).

Table 9: 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 zone (m)	Area (km^2)	Footprint area overlap (%)									
		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

Table 10: 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 zone (m)	Area (km^2)	Footprint area overlap (%)									
		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

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.

Management measures

In 2007, the New Zealand Government, with support of the fishing industry, closed 1.1 million square kilometres of seabed to bottom trawling and dredging – close to a third of New Zealand's entire EEZ (MPI, 2019).

The New Zealand EEZ contains 17 Benthic Protection Areas (BPAs) representatively distributed around the EEZ that close 30% of the EEZ to bottom fishing and include about 52% of all seamounts over 1,500 m elevation and 88% of identified hydrothermal vents (Helson *et al.*, 2010).

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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 Maori 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[2]) 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.

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

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

- 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

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 behavioral 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 deepwater vessel locations at all times. In combination with at-sea and aerial surveillance, supported by the New Zealand joint military forces, the activities of deepwater vessels are fully monitored and verified to ensure compliance with both regulations and with industry-agreed operating 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 to report catches of QMS species. Catches may only be landed at designated ports and sold to Licensed Fish Receivers (LFRs). Reporting requirements for deep water trawl vessels include logging the location, depth, main species caught for each tow, and total landed catch for each trip.

MPI audits commercial vessel catch-effort and landing reports, 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

Observer coverage has been 100% since 2013.

Commercial fishermen 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 fishermen 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 Fisheries relies on the effectiveness of both regulatory and non-regulatory measures to ensure the sustainable management of these fisheries.

As part of DWG's Operational Procedures, DWG 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.

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 11 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 11: 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 12). 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 13).

Table 12: 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 13: 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.

Key P3 references

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