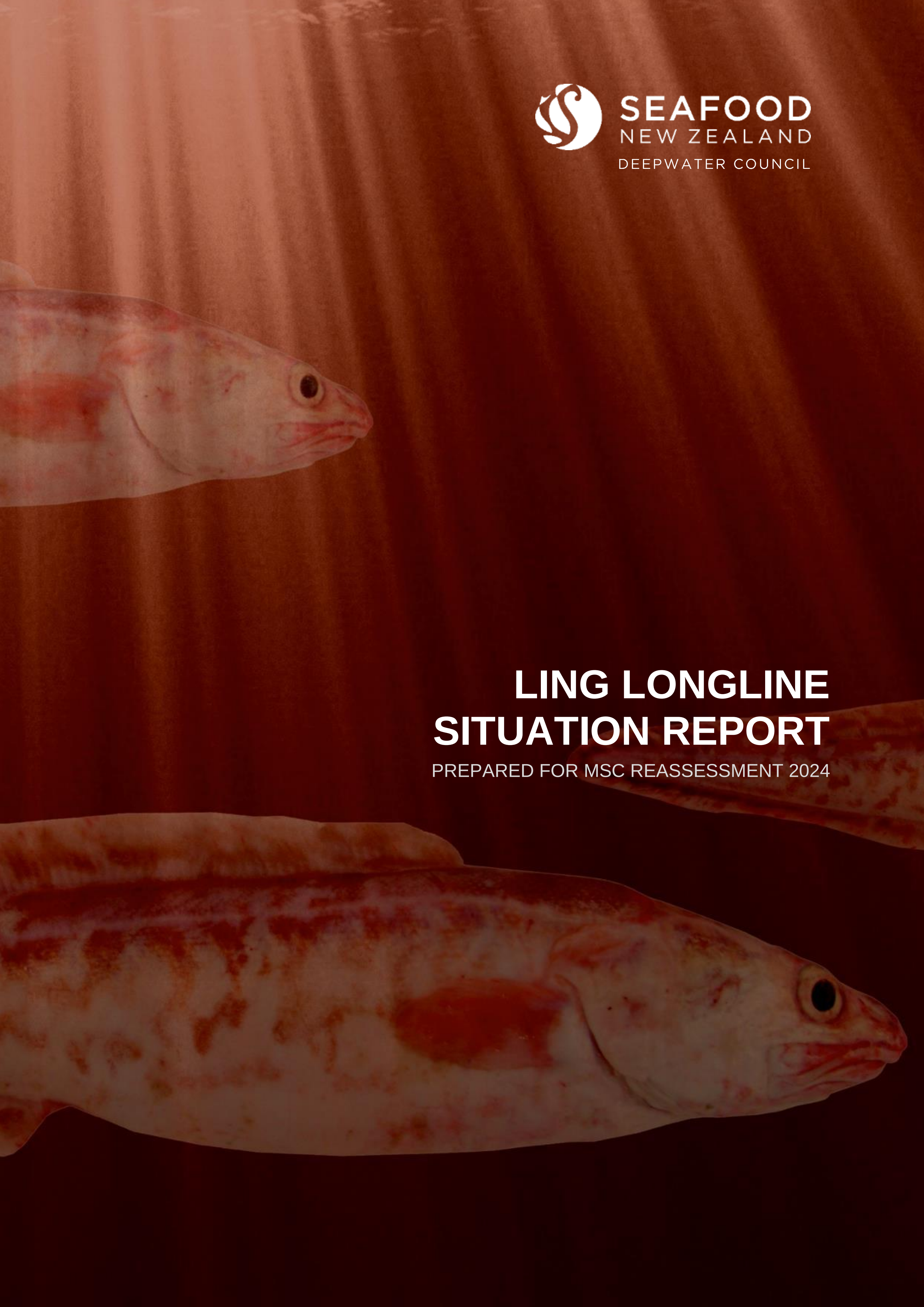

SEAFOOD NEW ZEALAND
DEEPWATER COUNCIL

LING LONGLINE SITUATION REPORT

PREPARED FOR MSC REASSESSMENT 2024

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Updated 27 Sept 2024

SITUATION REPORT FOR MSC REASSESSMENT 2024

NEW ZEALAND LING LONGLINE FISHERIES

PURPOSE OF THIS REPORT

This report is one of three prepared for the New Zealand combined MSC reassessments for 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 five Units of Certification (UoC), for ling (LIN 3, 4, 5, 6 & 7) longline fisheries, and builds on the information provided for previous assessments and surveillance audits.

It is Seafood New Zealand's Deepwater Council (DWG) submission that these five fisheries conform to the MSC Fisheries Standard (FS V3.0) as evidenced in the following information and references.

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

OVERVIEW OF FISHERY MSC CERTIFICATION

Ling longline certification details

Certification date	Initial Certification: September 2014 Recertification: September 2018 (synchronised with Hoki)
Stock areas	UoC 6: LIN 3 UoC 7: LIN 4 UoC 8: LIN 5 UoC 9: LIN 6 UoC 10: LIN 7
Species	*Genypterus blacodes*
Method/gear	Longline

P1 OVERVIEW OF STOCK STATUS INFORMATION

Stock status summary for the combined UoC covered by this report (LIN longline fisheries)

Table 1: Summary of the stock status of the UoCs based on the base model runs

Stock	Most recent assessment	Depletion [Year]	P < Target	P < Soft Limit	P < Hard Limit
LIN 3 & 4	2022	56 (47-66) [2022]	> 90%	< 1%	< 1%
LIN 5 & 6 & 6B	2024	66 (55-78) [2024]	> 99%	<1%	<1%
LIN 7WC	2023	55 (38-64) [2023]	>90%	<10%	<1%

Stock status, TACC & catches by component UoCs

UoC LIN 3, LIN 4, LIN 5, LIN 6 and LIN 7 Bottom Longline

	LIN 3	LIN 4	LIN 5	LIN 6	LIN 7
UoA share of TACC	100 %[1]	100%[3]	100 %[5]	100 %[7]	100 %[9]
UoC share of TACC	93 %[2]	87%[4]	95 %[6]	61 %[8]	73 %[10]

[1] 26% of total LIN catch (based on average estimated longline catch over the last five years)

[2] 24% of total LIN catch (based on average estimated longline catch over the last five years

[3] 57% of total LIN catch (based on average estimated longline catch over the last five years)

[4] 50% of total LIN catch (based on average estimated longline catch over the last five years)

[5] 9% of total LIN catch (based on average estimated longline catch over the last five years)

[6] 8.5% of total LIN catch (based on average estimated longline catch over the last five years

[7] 30% of total LIN catch (based on average estimated longline catch over the last five years)

[8] 18% of total LIN catch (based on average estimated longline catch over the last five years)

[9] 38% of total LIN catch (based on average estimated longline catch over the last five years)

[10] 28% of total LIN catch (based on average estimated longline catch over the last five years)

Update on stock status (FNZ, 2024)

LIN 3 & 4:

- For Chatham Rise (LIN 3 & 4), B_{2022} was estimated to be 56% B_0
- Very Likely (> 90%) to be above the management target of 40% B_0 (base case run)
- B_{2022} is Exceptionally Unlikely (< 1%) to be below the Soft Limit and Hard Limits.
- The stock projection is that the biomass will remain within the target range over the next five years.

LIN 5 & 6 & 6B (i.e. including Bounty Plateau):

- LIN 5 & 6 & 6B (Sub-Antarctic incl. Bounty Plateau): B_{2024} was estimated to be 66% B_0
- Virtually Certain (>99%) to be above the target of 40% B_0

- B_{2024} is Exceptionally Unlikely (< 1%) to be below the Soft and Hard Limits.
- Stock status is unlikely to change over the next 5 years at recent catch levels (9 317 t) and to reduce at the level of the TACC (13 713 t), but remain well above the target.

LIN 7:

- Three alternative model runs were presented, with B_{2023} estimated to be about 55% B_0, Very Likely (>90%) to be at or above the management target of 40%B_0.
- B_{2023} is Very Unlikely (< 10%) to be below the Soft Limit and Exceptionally Unlikely (< 1%) to be below the Hard Limit.
- Stock status is declining but Very Likely (> 90%) to remain above the target over the next 5 years at the current catch levels.

TACC & catch trends (FNZ, 2022)

Table 2: TACC, catch limits, catch and associated balances (tonnes) for the LIN 3, 4, 5, 6 & 7 fisheries from 2018-19 to 2022-23. Catch Total = trawl, BLL and potting; Catch BLL = bottom longline.

Stock	TACC	2018-19	2019-20	2020-21	2021-22	2022-23	5-year average
LIN 3	TACC	2,060	2,060	2,060	2,060	2,060	
	ACE	2,104	2,141	2,252	2,252	2,264	
	Catch Total	2,016	1,685	1,489	1,175	1,366	1,546
	Catch BLL	635	554	400	239	171	400
	Balance	88	456	763	1,077	898	656
LIN 4	TACC	4,200	4,200	4,200	4,200	4,200	
	ACE	4,601	4,591	4,652	4,626	4,619	
	Catch Total	2,044	1,778	2,129	2,604	1,892	2,089
	Catch BLL	1,103	1,048	1,437	1,740	676	1,201
	Balance	2,557	2,813	2,523	2,022	2,727	2,528
LIN 5	TACC	4,735	4,735	4,735	5,208	5,208	
	ACE	4,806	4,944	4,998	5,257	5,416	
	Catch Total	4,596	4,678	4,949	5,049	4,906	4,836
	Catch BLL	335	387	525	450	488	437
	Balance	210	266	49	208	510	249
LIN 6	TACC	8,505	8,505	8,505	8,505	8,505	
	ACE	9,420	9,419	9,399	9,370	9,389	
	Catch Total	3,706	3,972	3,916	3,881	4,780	4,051
	Catch BLL	1,094	1,524	1,319	967	1,134	1,208

	Balance	5,714	5,447	5,483	5,489	4,609	5,348
LIN 7	TACC	3,080	3,387	3,387	3,387	3,387	
	ACE	3,118	3,446	3,616	3,695	3,740	
	Catch Total	3,059	3,216	3,308	3,325	3,540	3,290
	Catch BLL	1,076	1,333	1,408	1,425	1,011	1,251
	Balance	59	230	308	370	200	233

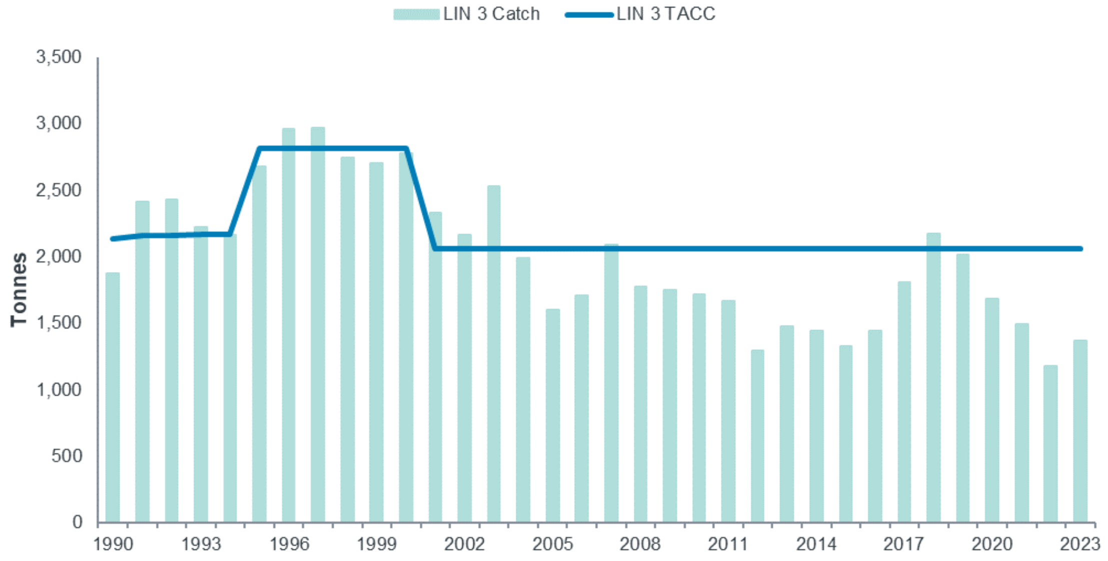

Figure 1: Reported commercial landings and TACC for LIN 3 (all gear types) (Source: FNZ, 2024)

Figure 2: Reported commercial landings, total ACE and TACC for LIN 3 for fishing years 2018 – 2023. (Source: FishServe KUPE system)

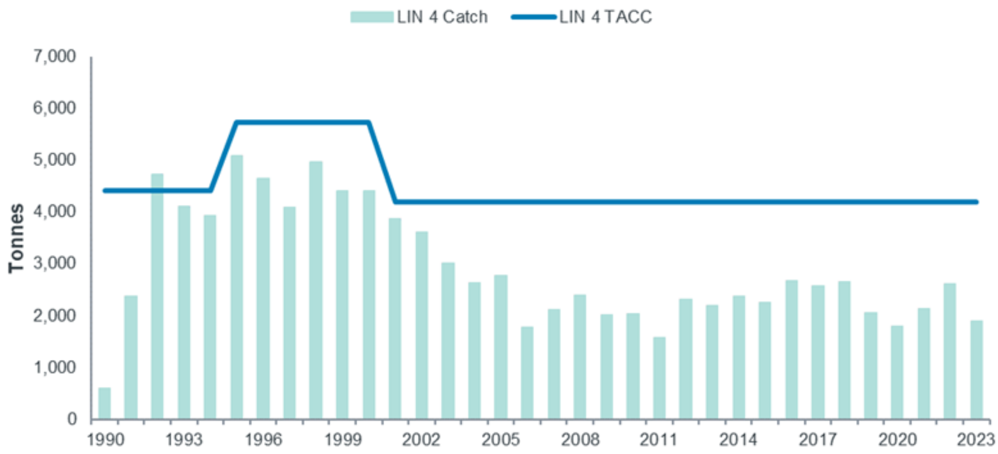

Figure 3: Reported commercial landings and TACC for LIN 4 (all gear types). Note: The LIN 4 trawl catch is largely a bycatch in the much larger eastern hoki trawl fishery and catch trends are therefore subject to forces other than ling abundance (Source: FNZ, 2024).

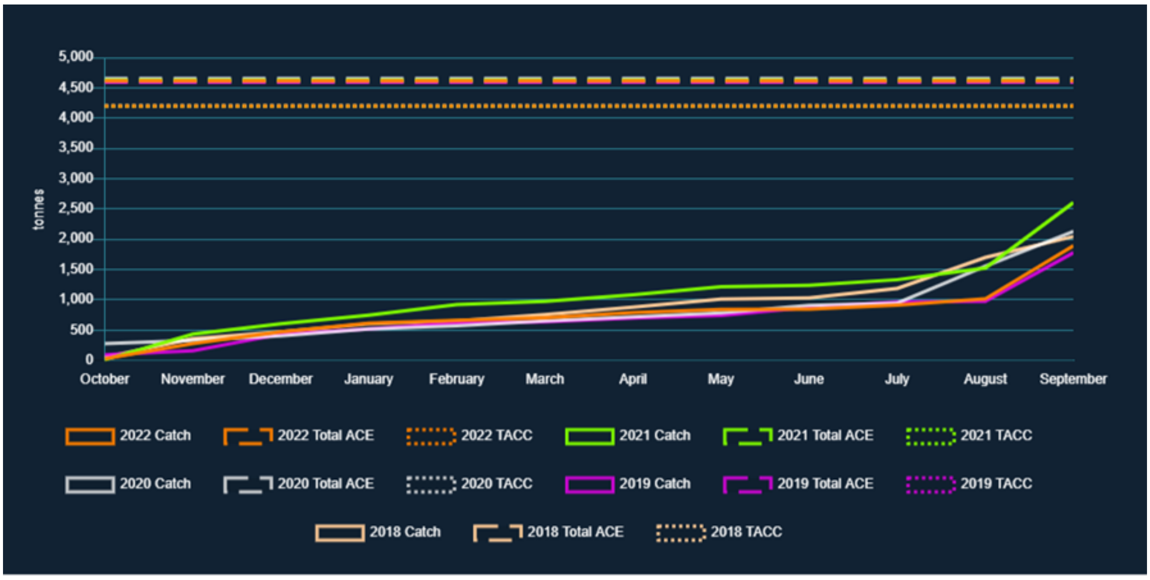

Figure 4: Reported commercial landings, total ACE and TACC for LIN 4 for fishing years 2018 – 2023. (Source: FishServe KUPE system)

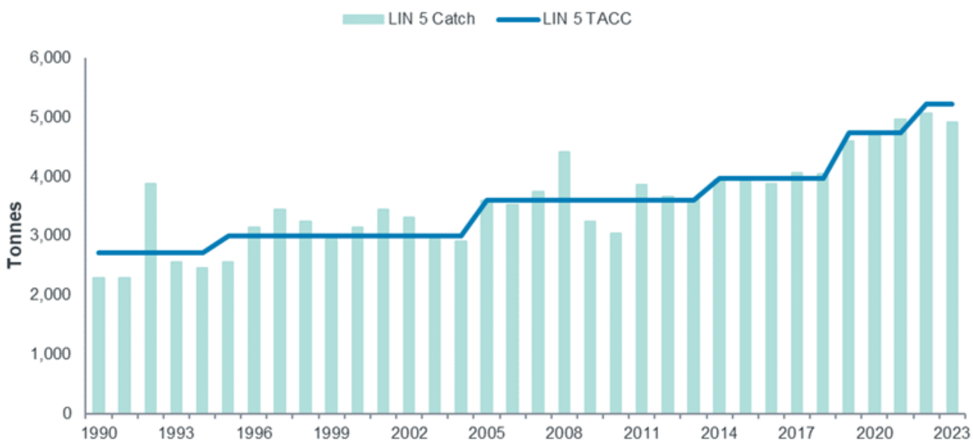

Figure 5: Reported commercial landings and TACC for LIN 5 (all gear types) (Source: FNZ, 2024).

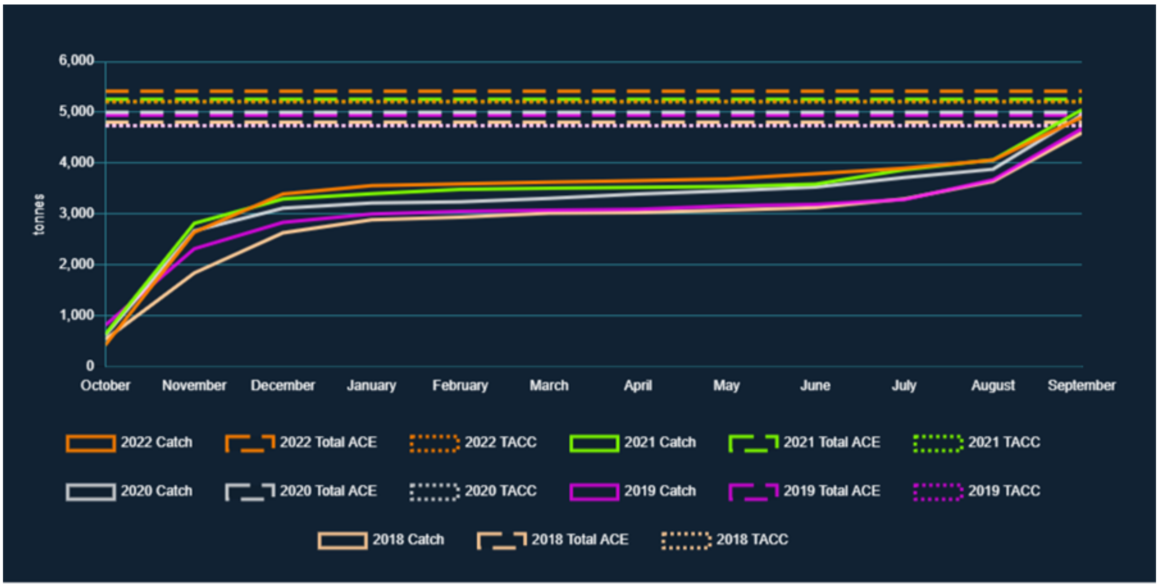

Figure 6: Reported commercial landings, total ACE and TACC for LIN 5 for fishing years 2018 – 2023. (Source: FishServe KUPE system)

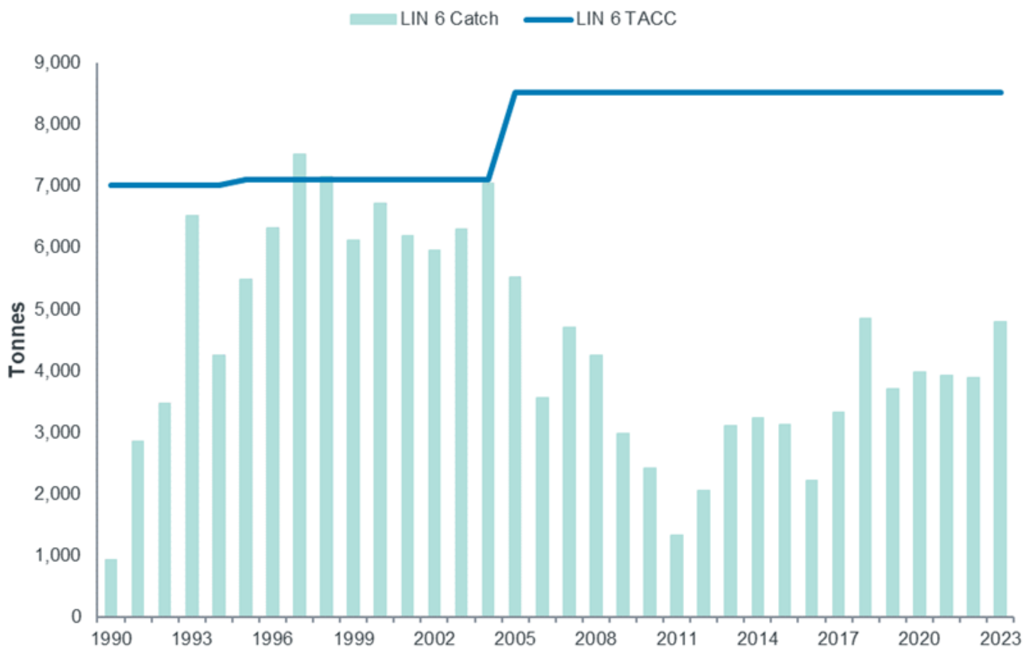

Figure 7: Reported commercial landings and TACC for LIN 6 (all gear types). Note: The LIN 6 trawl catch is largely a bycatch in the much larger western (sub-Antarctic) hoki trawl fishery and catch trends are therefore subject to forces other than ling abundance (Source: FNZ, 2024).

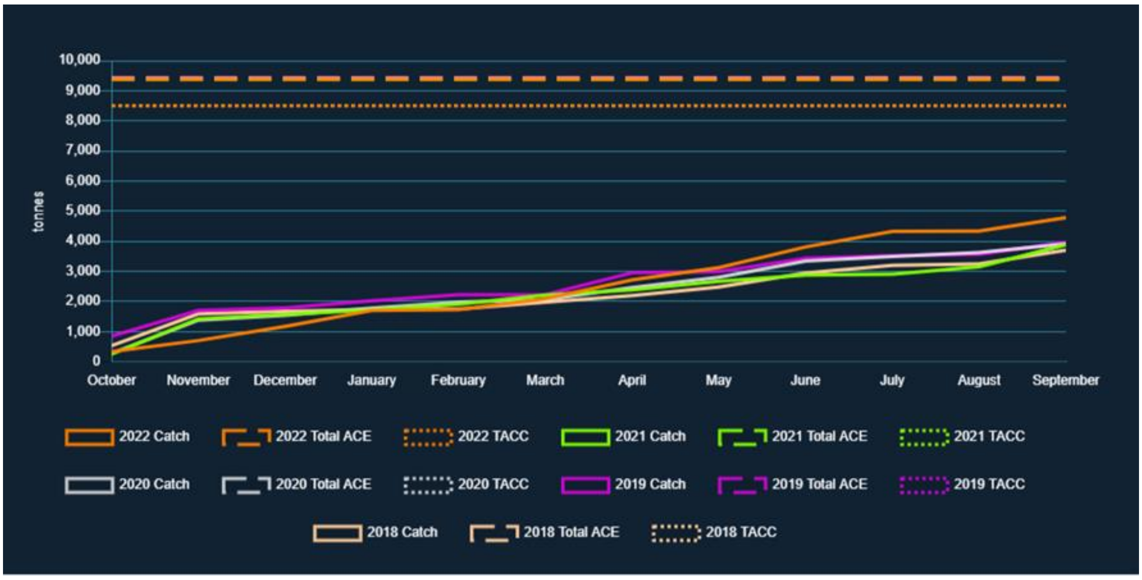

Figure 8: Reported commercial landings, total ACE and TACC for LIN 6 for fishing years 2018 – 2023. (Source: FishServe KUPE system)

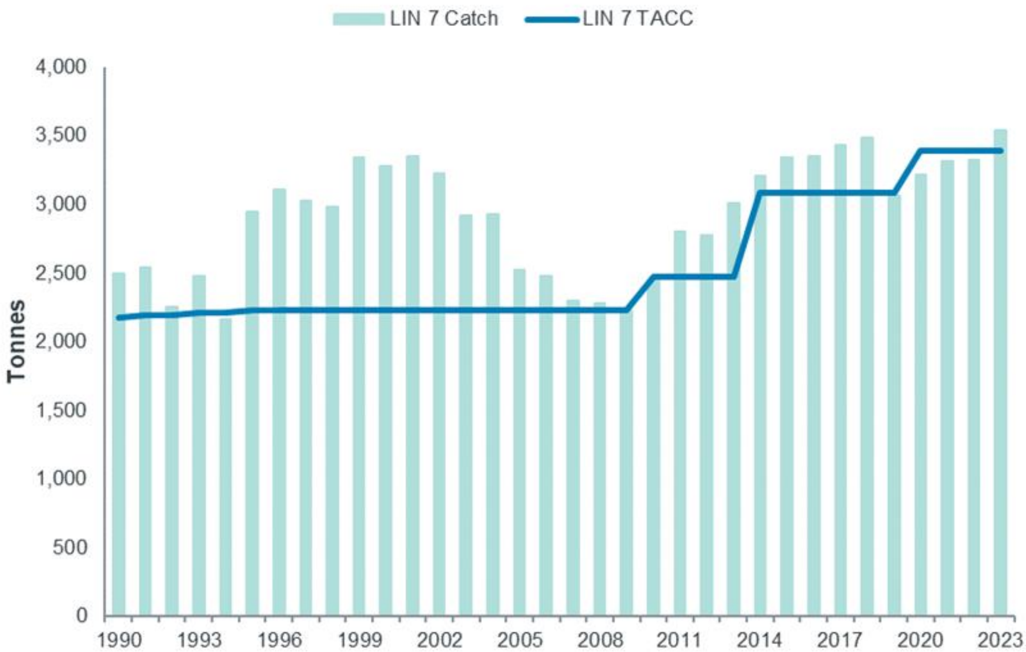

Figure 9: Reported commercial landings and TACC for LIN 7 (all gear types) (Source: FNZ, 2024).

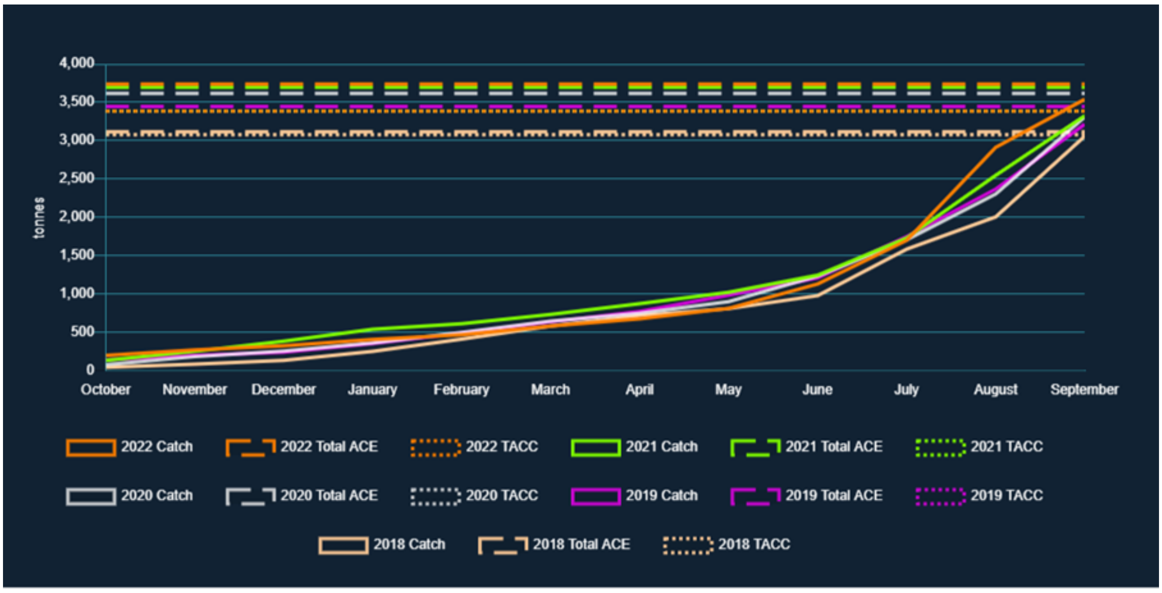

Figure 10: Reported commercial landings, total ACE and TACC for LIN 7 for fishing years 2018 – 2023. (Source: FishServe KUPE system)

Stock assessment development and structure

LIN 3 & 4

The stock assessment for LIN 3 & 4 (Chatham Rise) was updated in 2022. For final runs, the full posterior distribution was sampled using Markov chain Monte Carlo (MCMC) methods, based on the Metropolis-Hastings algorithm. Bounded estimates of spawning stock virgin (B_0) and current (B_{2021}) biomass were obtained.

The model indicated a relatively flat biomass trajectory from about 2009 (Figure 11). Annual landings from the LIN 3&4 stock have been less than 4600 t since 2004, markedly lower than the 6000–8000 t taken annually between 1992 and 2003. Base case estimates indicated that it was unlikely that B_0 was lower than 100 000 t for this stock, or that biomass in 2022 was less than 46% of $B_{0.}$

The sensitivity model based on the longline CPUE estimated lower initial biomass (88 450–96 520 t), with biomass in 2022 estimated between 27 - 41% B_0 (Table 3).

Table 3: LIN 3 & 4: Bayesian median and 95% credible intervals (in parentheses) of B_0 and B_{2022} (in tonnes and as a percentage of B_0) for the Base model run and one sensitivity run, and the probability that B_{2022} is above 40% of B_0 or below 20% of B_0.

Model run	B_0		B_{2022}		B_{2022} (% B_0)		P(>40% B_0)	P(<20% B_0)
Base case model (survey)	110 040	(100 660–129 890)	61 380	(47 400–85 810)	55.8	(46.9–66.3)	1.000	0.000
Sensitivity (CPUE)	92 190	(88 450–96 520)	30 860	(24 720–39 080)	33.5	(27.1–41.2)	0.052	0.000

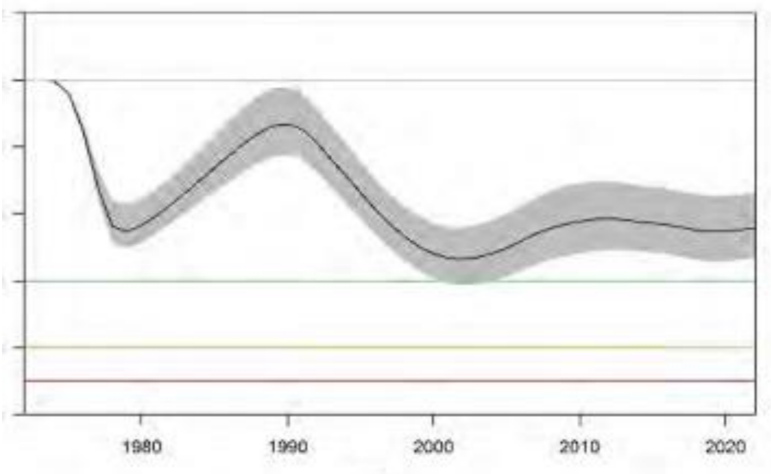

Figure 11: LIN 3 & 4 base model. Estimated median trajectories (with 95% credible intervals shown as grey band) for absolute biomass and biomass as a percentage of B_0. The red horizontal line at 10% B_0 represents the hard limit, the orange line at 20% B_0 is the soft limit, and the green line is the %B_0 target (40% B_0) (Source: FNZ, 2024).

For LIN 3 & 4, using the base case model, stock size is likely to remain about the same or increase by about 5%, assuming future catches equal recent catch levels and year class strengths are consistent with recent (2003–2013) or all year class strengths, respectively, or decrease to around 83–89% of the 2022 biomass by 2027 if catches reach the TACC with the same year class strength assumptions.

The probability of biomass in 2027 being above 40% B_0 is 0.85–1.0 and the probability of being below 20% B_0 is zero for all projection scenarios.

The historical stock status trajectory and current status are illustrated below (Figure 12).

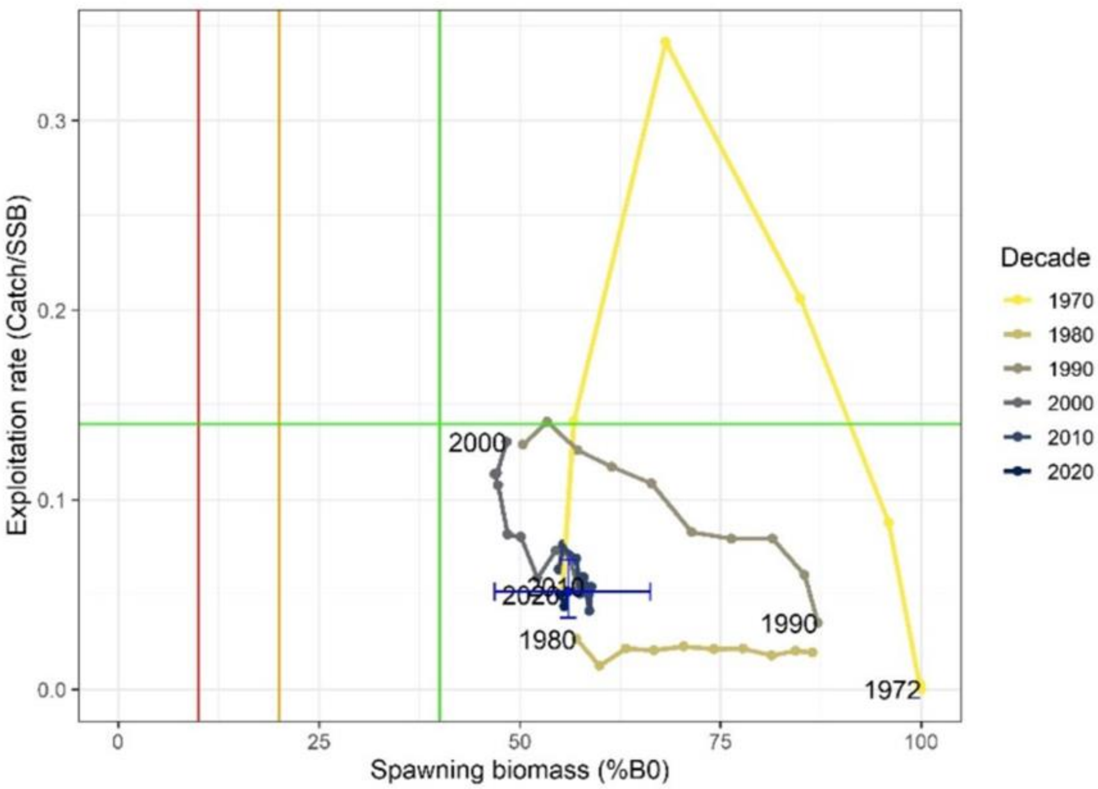

Figure 12: Trajectory over time of exploitation rate (U) and spawning biomass (% B0), for the LIN 3&4 base model from the start of the assessment period in 1972 to 2022. The red vertical line at 10% B0 represents the hard limit, the orange line at 20% B0 is the soft limit, and green lines are the % B0 target (40% B0) and the corresponding exploitation rate (U40 = 0.14 calculated using CASAL CAY function). Biomass and exploitation rate estimates are medians from MCMC posteriors for the base model. The blue cross represents the limits of the 95% confidence intervals of the estimated ratio of the SSB to B0 and exploitation rate in 2022.

Sub-Antarctic, LIN 5 & LIN 6 & LIN 6B (I.e. including Bounty Plateau)

An age-based stock assessment model assuming a Beverton-Holt stock-recruit relationship for LIN 5 & 6 & 6B (Sub-Antarctic) was carried out in 2024 (Mormede et al., in prep). This was the first time LIN 6B was incorporated in the Sub-Antarctic stock model, and the first time the Sub-Antarctic ling stock was assessed using Casal2. LIN 6B was included as a separate fishery in the model, sharing the LIN 5 & 6 bottom longline selectivity and the LIN 5 & 6 biological parameters and recruitment. The age composition data and fisheries CPUE from LIN 6B were deemed to poorly determined to be useful and were omitted. Although potting is becoming an important part of this fishery, there are no age data available for potting in LIN 5 & 6 and potting was assumed to have the same selectivity as bottom longline, as assumed in the other ling stocks that include potting catch.

The 2024 base case model was similar to that of the previous assessment in 2021 (Mormede et al., 2021b). The main changes were:

- The addition of LIN 6B as an additional fishery of the Sub-Antarctic stock
- The removal of the longline CPUE index
- The estimation of catchability parameters (q) as free parameters
- The move from a model year starting in September to starting in January.

Biomass estimates for the stock declined through the 1990s, were stable between the early 2000s and 2016, and have been declining again since (Figure 13). The biomass trajectory from the sensitivity runs was different for those sensitivity runs with either high or low natural mortality only (Table 4).

Table 4: LIN 5 & 6 & 6B, Bayesian median and 95% credible intervals of B_0 (tonnes) and B_{2024} as a percentage of B_0, and the probability that B_{2024} is above 40% and below 20% of B_0 from the Base model and sensitivity runs.

Model run	B_0		B_{2024} (% B_0)		$P(>40\% B_0)$	$P(<20\% B_0)$
Base model	204 628	171 734 – 258 458	66.3	55.3 – 78.3	1.000	0.000
M=0.16	158 380	142 888 – 179 277	52.1	42.3 - 62.3	0.993	0.000
M=0.20	304 797	226 047 – 419 980	76.7	65.1 – 88.3	1.000	0.000
length-based M	205 664	174 120 – 255 506	64.5	53.9 – 75.7	1.000	0.000
Additional catch	208 772	175 345 – 262 784	66.3	55.3 – 78.4	1.000	0.000
Base + CPUE	180 575	157 476 – 215 386	54.3	45.5 – 64.0	0.999	0.000
Base - BLL AF	212 692	175 995 – 275 733	69.3	57.6 - 82.1	1.000	0.000

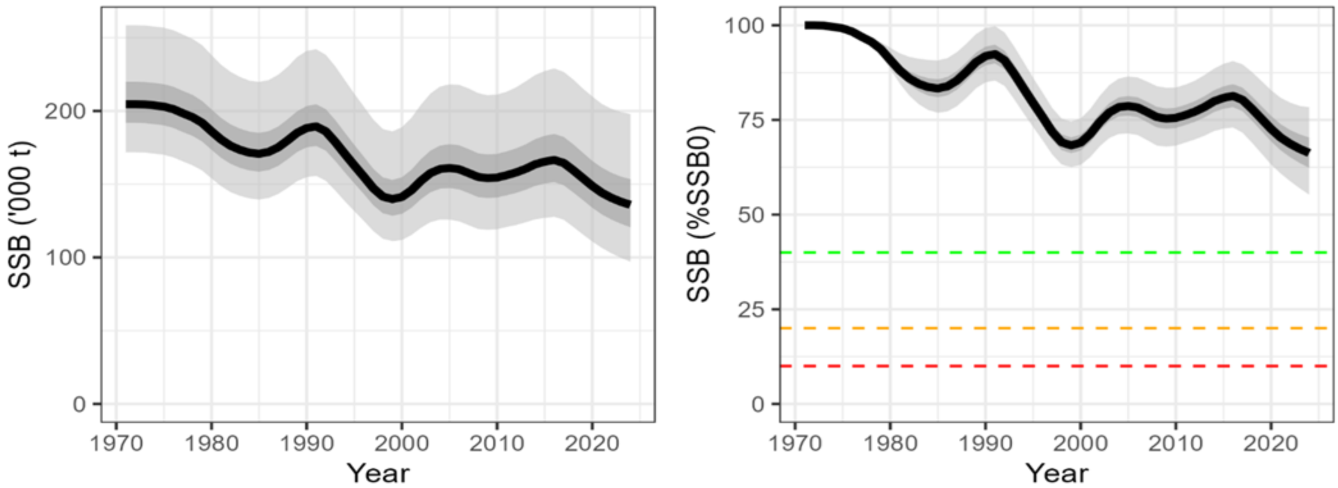

Figure 13: LIN 5 & 6 & 6B base model. Estimated median trajectories (with interquartile range shown as dark grey bands and 95% credible intervals as light grey bands) for absolute biomass and biomass as a percentage of B_0. The red horizontal line at 10% B_0 represents the hard limit, the orange line at 20% B_0 is the soft limit, and the green line is the % B_0 target (40% B_0), (FNZ, 2024).

The historical stock status trajectory and current status are illustrated below (Figure 14).

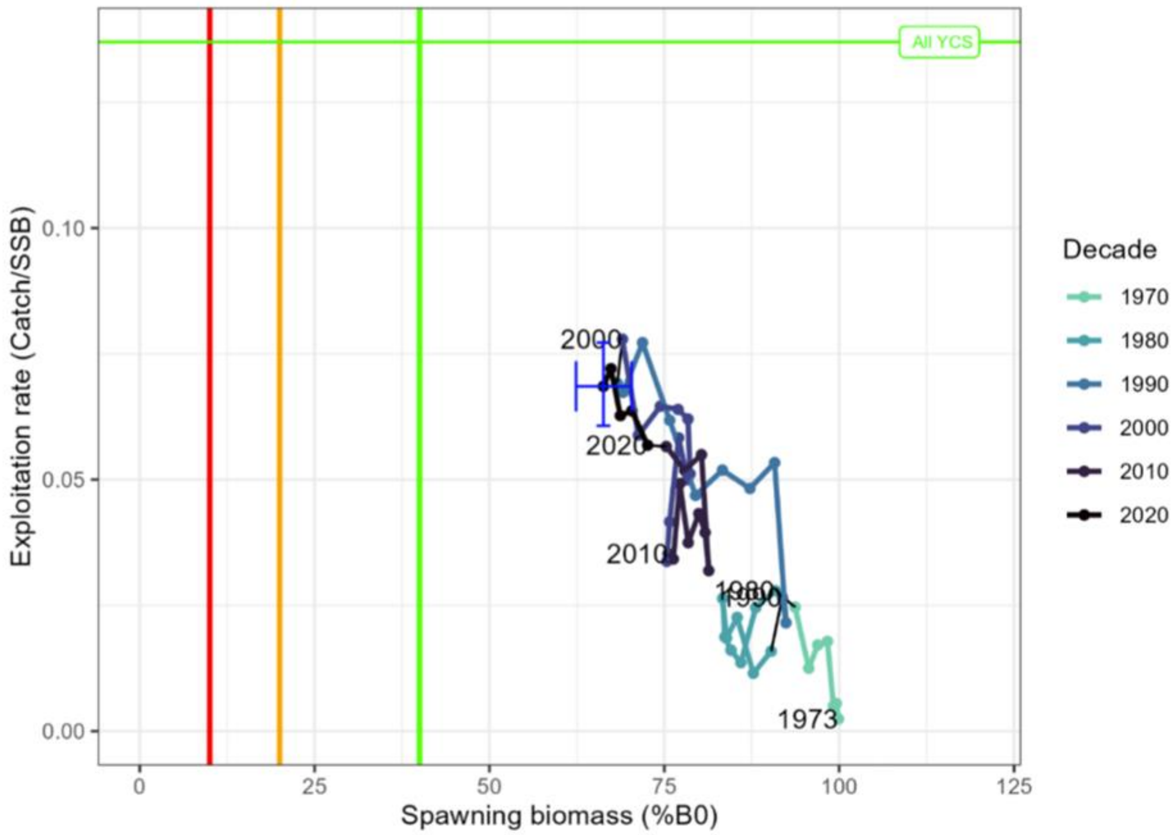

Figure 14: Trajectory over time of exploitation rate (catch / SSB) and spawning biomass (% B0), for the LIN 5&6&6B base model from the start of the assessment period in 1973 to 2024 (in blue). The red vertical line at 10% B0 represents the hard limit, the orange line at 20% B0 is the soft limit, and green lines are the % B0 target (40% B0) and the corresponding exploitation rate (U40 = 0.139). Biomass and exploitation rate estimates are medians from MCMC results. The blue cross represents the limits of the 95% credible intervals of the estimated ratio of the SSB to B0 and exploitation rate in 2024.

LIN 7

West Coast South Island, LIN 7WC

The stock assessment for LIN 7WC (west coast South Island) was updated in 2023 (Mormede et al., in prep.). Population age groups were partitioned into age groups 1 to 28 with a plus group, and sex in the partition. The immature/mature partition in the previous model was removed because the immature selectivity was very poorly estimated. The catch history was updated to include Statistical Area 032 (an area adjacent to the southern boundary of the LIN 7 quota management area), and all fishing methods including potting.

Base case estimates indicated that B_0 was about 62,000 t for this stock and that B_{2023} was about 55%B_0 (Table 5 and Figure 15).

Table 5: LIN 7WC Bayesian median and 95% credible intervals (in parentheses) of B_0 and B_{2023} (in tonnes and as a percentage of B_0), and the probability that B_{2023} is above or below 20% of B_0.

Model run	B_0		B_{2023}		B_{2023} (%B_0)		P(>40% B_0)	P(<20% B_0)
Base case	62 168	(55 007–74 122)	34 265	(25 711–47 751)	55.1	(38.2–63.5)	0.953	0.000
No trawl CPUE (R2)	59 725	(53 183–70 139)	30 970	(23 237–42 440)	51.8	(43.2–61.8)	0.996	0.000
h = 0.6 (R3)	66 716	(59 468–78 689)	34 803	(26 105–48 449)	52.1	(43.5–62.1)	0.998	0.000
M = 0.15 (R4)	58 067	(54 568–62 211)	20 776	(17 255–24 804)	35.8	(31.5–40.0)	0.025	0.000
M = 0.21 (R5)	72 175	(59 611–96 155)	47 907	(34 186–72 670)	66.1	(56.0–77.8)	1.000	0.000

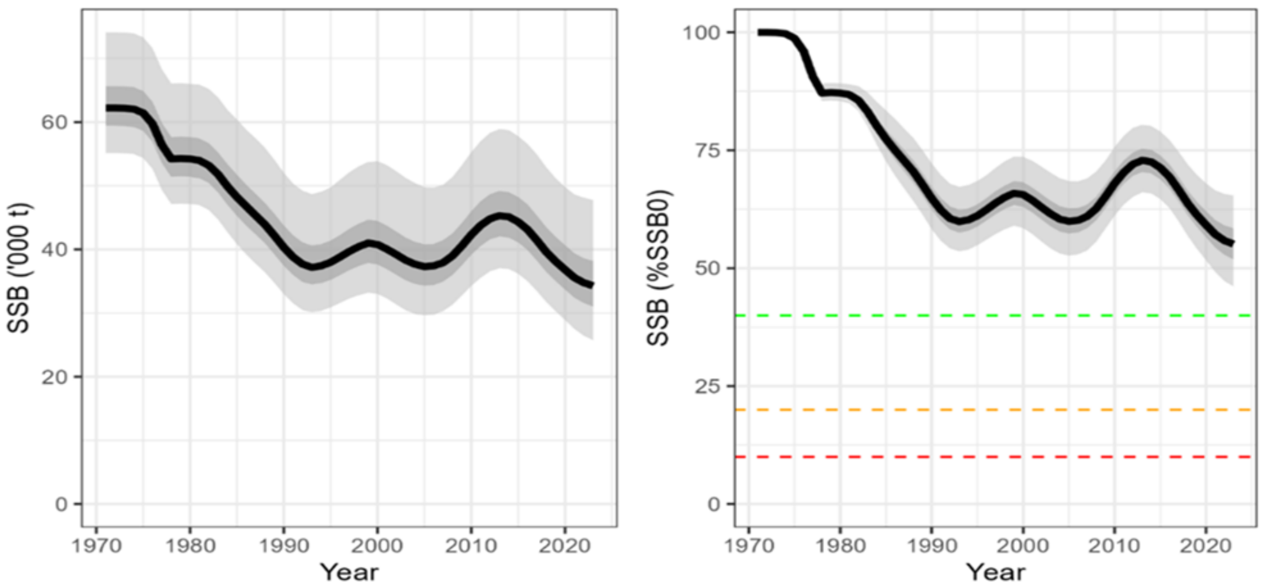

Figure 15: LIN 7WC base case. Estimated posterior distribution of the spawning stock biomass (SSB in tonnes, left) and of the proportion of initial spawning biomass (%SSB_0, right) trajectory and estimated virgin spawning stock biomass reference points (40%, 20%, and 10% B_0) for the base case model. The solid black lines represent the median values, the dark grey shading interquartile range and light shading 95% credible intervals. (FNZ, 2024).

Projections out to 2028 using the base case model indicated that biomass was likely to reduce slightly, to 52%B0, with future catches equal to the average of catch in 2020-2022 (i.e. 3 269 t), which includes Statistical Area 032 and excludes Cook Strait, and YCS resampled over the entire range of the model (Table 6).

Table 6: LIN 7WC, Bayesian median and 95% credible intervals (in parentheses) of projected B_{2028}, B_{2028} and a percentage of B_0, and B_{2028}/B_{2023} (%) for the base case model run. The probability of B_{2028} being above B_0 (p40) and below 20%B_0 (p20) are also reported.

YCS range	Catch range	Future catch (t) Trawl	Line/Pot	B_{2028} (t)		B_{2028} (% B_0)		B_{2028} (% B_{2023})		p_{40}	p_{20}
All	2020–2022	1 511	1 758	32 550	(22 128–48 238)	52	(39–69)	94	(78–117)	0.97	0.00

The historical stock status trajectory and current status are illustrated below (Figure 16).

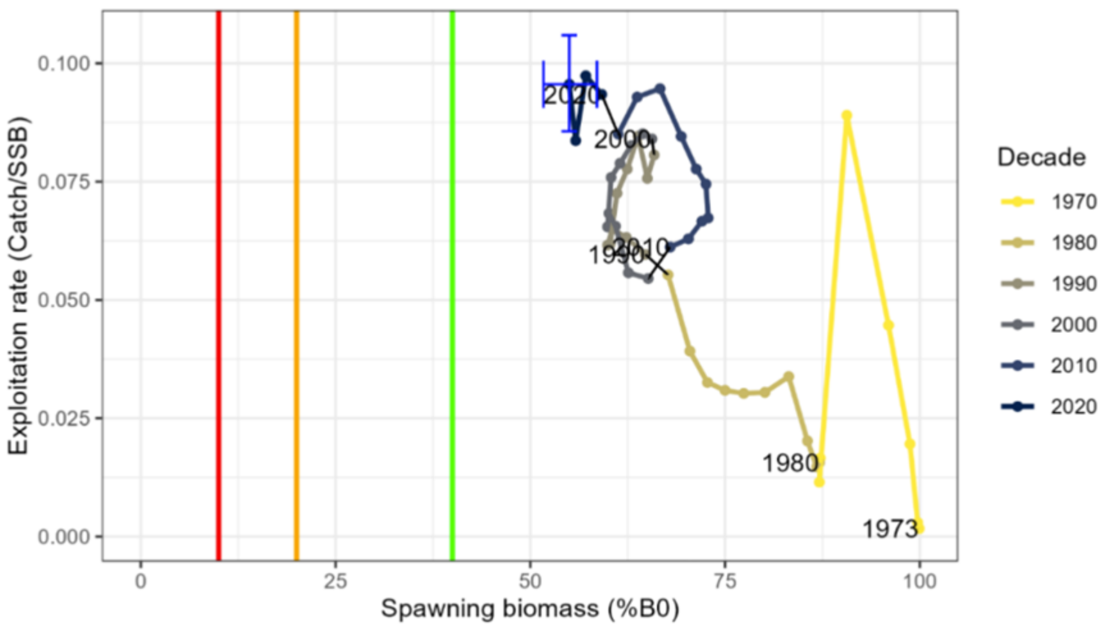

Figure 16: Trajectory over time of exploitation rate (U) and spawning biomass (% B0), for the LIN 7 base model from the start of the assessment period in 1972 to 2023. The red vertical line at 10% B0 represents the hard limit, the orange line at 20% B0 is the soft limit, and green line is the % B0 target (40% B0). Biomass and exploitation rate estimates are medians from MCMC results. The blue cross represents the limits of the 95% confidence intervals of estimated the ratio of the SSB to B0 and exploitation rate in 2023.

Cook Strait, LIN 7CK (sub-components of LIN 7 and LIN 2)

The last stock assessment was completed in 2013 but was not accepted because the model was considered to not accurately represent declines in resource abundance that appeared evident from CPUE values. The 2010 model, the last accepted stock assessment, estimated the stock to be 54% B0 and Likely (> 60%) to be at or above the target. The assessment is driven by the trawl fishery catch-at-age data and tuned by the trawl CPUE. Projections to 2015 were that biomass would increase based on future catch levels remaining equal to previous catch levels (Table 7).

Table 7: LIN 7CK. Probabilities that current (B2010) and projected (B2015) biomass will be less than 40%, 20%, or 10% of B0. Projected biomass probabilities are presented for two scenarios of future annual catch (i.e., 220 t and 420 t).

Biomass	Management reference points 40% B_0	20% B_0	10% B_0
B_{2010}	0.248	0.006	0.000
B_{2015}, 220 t catch	0.179	0.010	0.000
B_{2015}, 420 t catch	0.328	0.094	0.019

Key P1 references

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P2 OVERVIEW OF ENVIRONMENTAL INFORMATION

Observer Programme

Overview

The Ministry for Primary Industries (MPI) fishery observer deployment covers a range of objectives, including monitoring of ETP species interactions, recording of biological data from fish catches for use in stock assessment, monitoring catch composition and discards, and providing a high level of confidence in fishers' at-sea compliance with regulatory and non-regulatory measures.

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 30% coverage is sufficient for most fisheries/sectors but implements high (80-100%) coverage for fisheries where it is considered there may be a high-risk of ETP species capture (e.g., squid and southern blue whiting trawl fisheries where operations overlap with sea lions).

The level of observer coverage is also designed to enable collection of sufficient biological data (i.e. length-frequency measurements and otolith samples) for use in stock assessments (Table 8). The required number of observer days per fish stock is then based on the number of days required to collect the target number of biological samples. The rationale applied is provided in Table 9.

Table 8: Fishery Observer Programme biological sampling requirements for the ling bottom longline UoA fisheries by fishery area and month as planned for the 2022-23 fishing year (FNZ, 2023).

Species	FMA/stock	LF target	Otolith target	Area	Months
Ling	LIN 3/4 (trawl)	100	500	Chatham Rise	October-May
	LIN 3/4 (BLL)	100	500	Chatham Rise	Year-round
	LIN 5/6 (trawl)	100	500	Sub-Ant	September-April
	LIN 5/6 (BLL)	100	500	Sub-Ant	Year-round
	LIN 7	200	500	WCSI	June-October

Table 9: Fishery Observer Programme rationale for determination of observer coverage for LIN BLL UoA fisheries in 2022-23 (FNZ, 2023b).

Fishery complex & stocks covered	Planned days 2022/23	Main objective(s) of observer coverage planning	Rationale and comment
Bottom longline			
Ling bottom longline LIN 3-7	650	Biological sampling of LIN Protected species monitoring	650 days estimated to provide coverage of approx. 30% of effort (all areas). Days to be split by vessel size with 185 days targeted at large (>34 m) vessels and 465 days targeted at small (< 34 m) vessels.

MPI's Annual Operational Plan (MPI, 2022) 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
- Monitoring progress towards sampling targets throughout the year
- Engaging with, and providing feedback to, observers through the observer newsletter and observer catch-up sessions

In summary, observer data are used for the following purposes:

- As an input to monitor key fisheries against harvest strategies
- As an input to monitor bycatch species
- To enable reliable estimations and nature of ETP species interactions and captures
- To enable timely responses to sustainability and environmental impact issues
- To provide a high level of confidence in fishers at sea compliance with regulatory and non-regulatory measures.

The collection of data on incidental catches and mortalities of ETP species, 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, in the Interim Code of Practice, and in the newly developed Operational Procedures.

On-board cameras

During 2022 an initiative to establish camera-based monitoring on small vessels, with the explicit objective of enumerating seabird captures (number and species) was implemented. Trials were undertaken in the snapper-targeted bottom longline fishery around the top of the North Island. Initial trials, using model seabirds provided sufficient information and confidence in the technology to advance to the "proof of concept" stage on a broad scale in that fishery (Middleton and Guard, 2021).

From December 2024 all ling BLL vessels will be required to have cameras onboard to monitor seabird bycatch (FNZ, 2024). DWC's Operational Procedures – Seabirds, and training and instruction from DWC's Environmental Liaison Officer, will ensure operators, skippers and senior crew are adequately prepared (e.g., conducting required sink rate testing, accurate reporting and understanding all other requirements).

Observer coverage

Achieved observer coverage rates for the LIN bottom longline UoAs for the years 2018-19 to 2020-21, and planned observer coverage rates for the years 2021-22 and 2022-23 ranged between 0 – 52% (Table 10), (FNZ, 2022c). The latest Annual Review Report (ARR) (FNZ, 2022a) outlines that the delivery of planned observer coverage in 2020-21 was impacted by:

- Implementation of a number of Ministerial directives requiring high levels of observer coverage in a number of inshore fisheries (e.g. West Coast North Island). These competing priorities have resulted in an ongoing reprioritisation of observer deployments, which has led to challenges in achieving coverage targets in some domestic deepwater fisheries (e.g. ling bottom longline)
- COVID-19 resulted in a shortage of sea day coverage by observers
- Some operational challenges remain with predicting fishing activities and vessel movements. Improvements have been made, with deepwater fishing companies providing quarterly fishing plans, however, fishing activities can be difficult to predict.

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., SNA 1 and to support the Maui Dolphin monitoring strategy). MPI has therefore used a Risk Assessment process to methodically consider risk conservatively 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.

Despite these challenges in the 2020-21 fishing year, 95% of the planned days for LIN 3 – LIN 7 were achieved. In terms of hooks being observed this equated to 7% of the hooks set by vessels < 34m and 3% of those vessels > 34m.

Table 10: Observer coverage in the ling longline fisheries (LIN 3, 4, 5, 6 & 7)

<table>
<tr><th>Fishery</th><th>QMA</th><th>2018-19</th><th>2019-20</th><th>2020-21</th><th>2021-22 (planned)</th><th>2022-23 (planned)</th></tr>
<tr><td rowspan="5">Ling Longline</td><td>LIN 3</td><td>8%</td><td>9%</td><td rowspan="5">3 – 7%*</td><td rowspan="2">25-30%**</td><td rowspan="5">30%</td></tr>
<tr><td>LIN 4</td><td>0%</td><td>0%</td></tr>
<tr><td>LIN 5</td><td>28%</td><td>17%</td><td rowspan="3">10 – 15%+</td></tr>
<tr><td>LIN 6</td><td>34%</td><td>52%</td></tr>
<tr><td>LIN 7</td><td>5%</td><td>10%</td></tr>
</table>

* 7% equates to the % of hooks observed onboard vessels < 34 m for LIN 3 – 7, whilst 3% refers to the % of hooks observed onboard vessels > 34 m for LIN 3 – 7
** the planned % coverage for > 34 m ling bottom longline (LIN 3 – LIN 7)
+ the planned % coverage for < 34 m mixed BLL

For the LIN 3 – 7 fisheries combined over the period 2018-19 to 2022-23, observer coverage ranged between 5.7% and 26.4% per annum, with the 5-year average being 15.9% of hooks observed (Table 11), (G. Lydon, FNZ pers. comm.).

Table 11: Annual observer coverage for the LIN 3 – 7 longline fisheries combined over the period 2018-19 to 2022-23.

October Fishing Year	Target Species Code	Fishing Method Code	Estimated Catch Greenweight (tonnes)	Total Hook Count	Number of Hooks Observed	Hooks Observed (%)
2018-19	LIN	BLL	4,244	20,380,992	2,402,614	11.8%
2019-20	LIN	BLL	4,847	20,875,203	3,401,265	16.3%
2020-21	LIN	BLL	5,088	20,799,036	1,181,698	5.7%
2021-22	LIN	BLL	4,821	22,471,403	4,697,419	20.9%
2022-23	LIN	BLL	3,481	16,501,009	4,356,332	26.4%
		Totals	**22,482**	**101,027,643**	**16,039,328**	**15.9%**

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
- 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, 2022c) the main objective(s) of observer coverage planning is biological sampling of LIN and protected species monitoring. 650 days is estimated to provide coverage of approximately 30% of effort (all areas). Observer days are split by vessel size with 185 days targeted at large (>34 m) vessels and 465 days targeted at small vessels (< 34 m). The 2022-23 draft Annual Operational Plan specifies that 100 length frequencies and 500 otoliths are the targets for each of the LIN BLL fisheries (LIN 3/4, LIN 5/6 and LIN 7), (G. Lydon, FNZ, pers. comm.).

Table 12: Numbers of length frequency samples and otoliths collected by observers during the 2021-22 fishing year for LIN longline fisheries by area.

Species	Area/method	LF target	# of LF samples	# of fish measured	Otolith target	# of otolith pairs collected
Ling Longline	LIN 3 & 4 BLL	100	120	1840	500	757
	LIN 5 & 6 BLL	100	92	2369	500	363
	LIN 7 BLL	200	106	1398	500	968

Observer-reported catch composition (all species) 2018-19 to 2022-23

Catch composition data from the MPI Fishery Observer Services programme from 2018-19 to 2022-23 was used to determine species categories (e.g., in-scope or out-of-scope). While observer data contained ~140 individual species, 20 species comprised 98.2% of the total catch (**Table 13**). 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 13: Catch composition (tonnes) from MPI Fishery Observer Services data for targeted ling longline sets in the LIN 3-7 UoA fisheries. Species comprising the top 98.2% of the observed catch are represented. 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 (G. Lydon, pers. comm.).

Observer coverage (% of hooks)			12%	16%	6%	21%	26%		
Species	**Listing**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**5-yr avg (kg)**	**5-yr avg %**	**MSC Category**
Ling *Genypterus blacodes*		498	874	239	980	682	655	61.34%	
Spiny dogfish *Squalus acanthias*	Chondrichthyes IUCN - VU National legislation - NA CITES II - NA	204	129	21	246	270	174	16.28%	
Ribaldo *Mora moro*	NA	37	36	82	61	75	58	5.45%	
Rough skate *Dipturus nasutus*		3	104	0	14	14	27	2.55%	
Smallscaled cod *Notothenia microlepidota*	NA	12	28	-	42	12	23	2.18%	
Smooth skate *Dipturus innominatus*	Chondrichthyes IUCN - LC National legislation - NA CITES II - NA	31	23	22	28	13	23	2.18%	
Sea perch *Helicolenus* spp.	NA	18	10	4	19	15	13	1.21%	
Shovelnose spiny dogfish *Deania calcea*	Chondrichthyes IUCN - NT National legislation - NA CITES II - NA	15	4	22	14	3	12	1.08%	
School shark *Galeorhinus galeus*		18	12	2	16	4	11	0.99%	
Pale ghost shark *Hydrolagus bemisi*	Chondrichthyes IUCN - LC National legislation - NA CITES II - NA	5	23	1	6	14	10	0.94%	
Hairy conger *Bassanago hirsutus*	NA	11	9	6	10	5	8	0.74%	
Red cod *Pseudophycis bachus*	NA	2	19	0	6	2	6	0.56%	
Swollenhead conger *Bassanago bulbiceps*	NA	5	5	6	6	4	5	0.48%	
Other sharks and dogs	NA	4	2	2	1	15	5	0.46%	
Leafscale gulper shark *Centrophorus squamosus*		1	4	2	6	8	4	0.40%	
Hake *Merluccius australis*	NA	4	5	4	3	2	4	0.35%	
Seal shark *Dalatias licha*		4	5	2	2	2	3	0.29%	
Baxters lantern dogfish *Etmopterus baxteri*	Chondrichthyes IUCN - NA National legislation - NA CITES II - NA	3	1	2	9	1	3	0.28%	
Lucifer dogfish *Etmopterus lucifer*		1	1	0	0	10	3	0.23%	
Bluenose *Hyperoglyphe antarctica*	NA	3	3	0	4	0	2	0.20%	
Other < 0.20% (120 spp.)	NA	21	23	14	21	10	19	1.81%	
Totals		**900**	**1,319**	**431**	**1,496**	**1,161**	**1,067**	**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 four in-scope 'main' species in the UoA catch, all of which are QMS species: spiny dogfish, ribaldo, rough skate and smooth skate (Table 14).

Table 14: Total observed catches (tonnes) of In-scope 'Main' species by the ling longline UoA fisheries and by Fishery Management Area (FMA) during the period 2018-19 to 2022-23.

Species	FMA 3	FMA 4	FMA 5	FMA 6	FMA 7	Total
Spiny dogfish *Squalus acanthias*	35.8	665.8	10.9	128.8	26.1	**867.4**
Ribaldo *Mora moro*	38.4	65.6	2.9	78.7	80.1	**265.6**
Rough skate *Dipturus nasutus*	1.6	2.6	0.1	131.3	0.1	**135.7**
Smooth skate *Dipturus innominatus*	18.3	54.7	6.1	14.5	19.4	**113.0**

Spiny dogfish (*Squalus acanthias*)

Spiny dogfish, a QMS species, are found throughout the southern half of New Zealand, extending to East Cape and Manukau Harbour on the east and west coasts of the North Island respectively. They are most abundant off the east coast of the South Island and the Stewart-Snares shelf and are found on the continental shelf and upper slope down to a depth of at least 500 m. All of the spiny dogfish caught by the ling longline fleet is taken as bycatch, mainly in FMA 4 (Chatham Rise) and in FMA 6 (Sub-Antarctic). Because of their sheer abundance they can at times severely hamper fishing operations for targeted commercial species and they are regarded by many fishers as a major nuisance.

Males mature at 58 cm TL at age 6, and females mature at 73 cm TL at age 10. The maximum ages and lengths in a study of east coast South Island dogfish were 21 years and 90 cm TL for males, and 26 years and 111 cm TL for females. Parturition occurs biennially and the number of young per litter ranges from 1 to 19 (FNZ, 2023).

No specific research on the stock structure of spiny dogfish has been carried out. Based on trawl survey catch rates by area, FNZ deems it appropriate to manage spiny dogfish with the following fishstocks:

- SPD 3: FMA 3
- SPD 4: FMA 4
- SPD 5: FMAs 5 & 6
- SPD 7 and SPD 8: FMAs 7, 8, & 9

No estimates of current or reference biomass are available, but trawl survey estimates of abundance have been calculated for a number of years. Based on a combination of CVs, variability in biomass indices, and the time span of each series, it is concluded that surveys provide reliable indices of spiny dogfish abundance on the Chatham Rise (SPD 4), off the east coast of the South Island (SPD 3), and off the west coast of the South Island (SPD 7), (Figure 17). While a lack of suitable information has precluded estimation of virgin and current biomass for spiny dogfish, most of the necessary biological parameters, relative indices of abundance and data required to estimate fishing selectivity for the larger fisheries are now available. Robust stock assessments will additionally require estimates of historical, unreported discarding and discard mortality so that an accurate history of fishery related removals can be constructed (FNZ, 2023c).

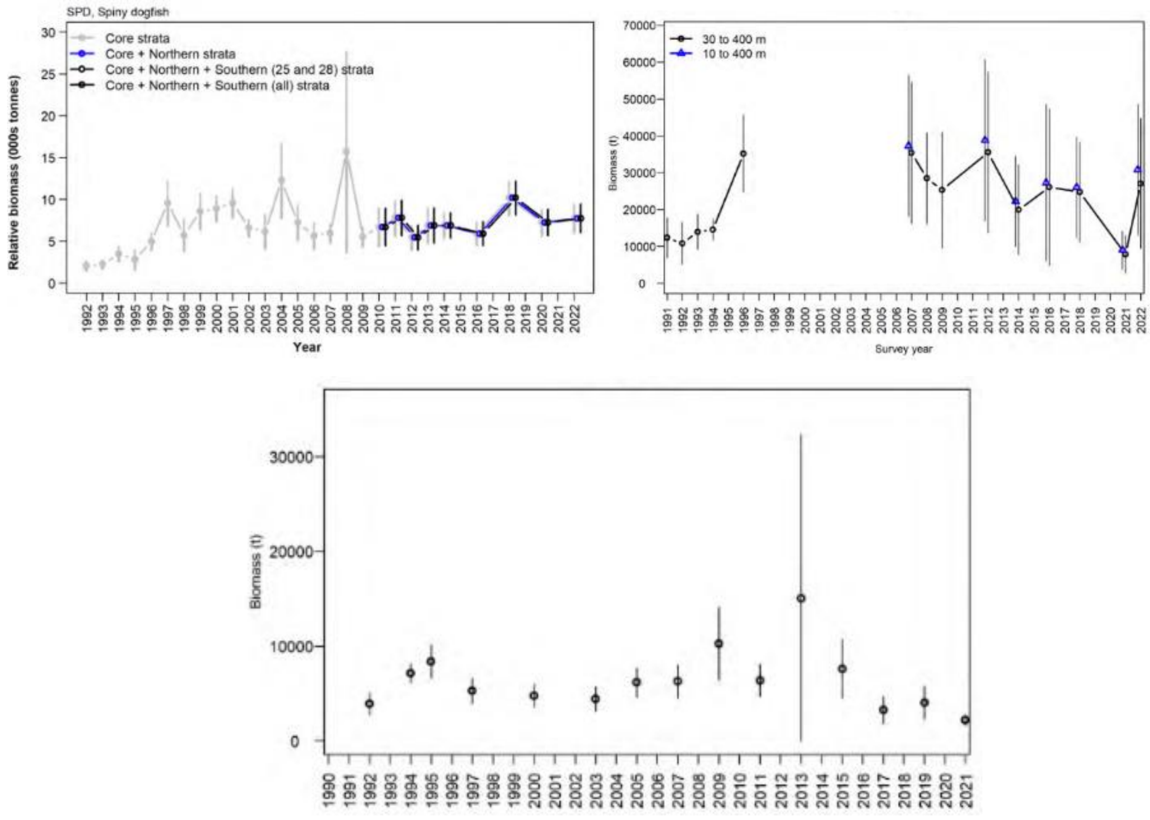

Figure 17: Spiny dogfish biomass for the Chatham Rise (Top left) and East Coast South Island (Top right) and West Coast South Island (Bottom) trawl survey time series (error bars are ± two standard deviations).

Ribaldo (*Mora moro*)

Ribaldo is a QMS species and is common throughout the New Zealand Exclusive Economic Zone. It is caught by a variety of fishing methods in different target fisheries but mainly as bycatch in bottom trawls targeting hoki, hake and ling and bottom longlines for ling. It occurs at depths from 400 - 1 300 m but appears to be most common at 600–700 m. The relatively high catch by bottom longline suggests that it scavenges and may favour rough bottom habitats.

They reach 50% sexual maturity at ~45 cm TL and reach maximum lengths of ~ 75 cm and 65 cm FL and maximum ages of 37 and 39 years for females and males respectively.

Chatham Rise and east coast South Island (RIB 3 & 4)

- Abundance index based on Chatham Rise RV *Tangaroa* research trawl survey
- Interim reference points:
    - Target: B_{MSY} proxy based on arithmetic mean survey index for the period 1995 to 2005
    - Soft Limit: 50% B_{MSY} proxy
    - Hard Limit: 25% B_{MSY} proxy
- About as Likely as not (40-60%) to be at or above the target

- The relative biomass index declined between 2014 and 2020 and then increased substantially in 2022 (FNZ, 2023d).

Sub-Antarctic (RIB 5 & 6)

- Abundance index based on Sub-Antarctic RV *Tangaroa* research trawl survey
- Interim reference points:
    - Target: B_{MSY} proxy based on arithmetic mean survey index for the period 1991 to 2004
    - Soft Limit: 50% B_{MSY} proxy
    - Hard Limit: 25% B_{MSY} proxy
- About as Likely as not (40-60%) to be at or above the target.
- The relative biomass index declined between 2010 and 2016 and then increased to a relatively high level in 2020 (FNZ, 2023e).

West Coast South Island (RIB 7)

- Abundance index based on west coast South Island RV *Tangaroa* research trawl survey
- Reference points:
    - Management Target: 40% B_0
    - Soft Limit: 20% B_0
    - Hard Limit: 10% B_0
- The relative biomass index has been stable since 2013 (FNZ, 2013f).

Rough skate (*Dipturus nasutus*)

Rough skates are QMA species and occur throughout New Zealand but are most abundant around the South Island in depths down to 500 m. Most of the catch is taken as bycatch by bottom trawlers, but skates are also taken by longliners.

Rough skates grow to at least 79 cm pelvic length and females grow larger than males. The greatest reported age is 9 years for a 70 cm pelvic length female. There are no apparent differences in growth rate between the sexes. Males reach 50% maturity at about 52 cm and 4 years, and females at 59 cm and 6 years.

East Coast South Island, Chatham Rise & Sub-Antarctic (RSK 3), (FMAs 3, 4, 5 & 6)

- Abundance index based on ECSI research trawl survey (10– 400 m)
- Reference points:
    - Interim Target: B_{MSY} proxy based on geometric mean survey index for the period 2007 - 2018
    - Soft Limit: 50% B_{MSY} proxy
    - Hard Limit: 25% B_{MSY} proxy
- About as Likely as Not (40–60%) to be at or above the target
- Relative biomass was stable around the target between 2007 and 2018, increased to above the target in 2021 and then returned to the target level in 2022.

West Coast South Island (RSK 7), (FMA 7)

- Abundance index based on research trawl survey
- Reference points:
    - Target: B_{MSY} proxy
    - Soft Limit: 50% B_{MSY} proxy
    - Hard Limit: 25% B_{MSY} proxy

- Status in relation to target unknown
- Relative biomass was stable between 1992 and 2000. Since 2007 abundance estimates have fluctuated and there is no evidence of a long-term trend (FNZ, 2023g).

Smooth skate (*Dipturus innominatus*)

Smooth skates are QMS species and occur throughout New Zealand, but are most abundant around the South Island in depths down to 500 m. Most of the catch is taken as bycatch by bottom trawlers, but skates are also taken by longliners.

The greatest reported age is 28 years for a 155 cm pelvic length female. Females grow larger than males and appear to live longer but there are no apparent differences in growth rate between the sexes. Males reach 50% maturity at about 93 cm and 8 years, and females at 112 cm and 13 years.

East Coast South Island, Chatham Rise & Sub-Antarctic (SSK 3), (FMAs 3, 4, 5 & 6)

- Abundance index based on Chatham Rise RV *Tangaroa* research trawl survey
- Reference points:
    - Target: B_{MSY} proxy
    - Soft Limit: 50% B_{MSY} proxy
    - Hard Limit: 25% B_{MSY} proxy
- Status in relation to target unknown
- Relative biomass rose to its highest recorded level in the early 2000s before declining back to the same level seen in the early 1990s by 2012. After another rise then fall, biomass in 2020 was again at the same level as in the early 1990s.

West Coast South Island (SSK 7), (FMA 7)

- Abundance index based on WCSI RV *Tangaroa* research trawl survey
- Reference points:
    - Interim Target: B_{MSY} proxy based on arithmetic mean survey index for the period 2012 - 2021
    - Soft Limit: 50% B_{MSY} proxy
    - Hard Limit: 25% B_{MSY} proxy
- About as Likely as Not (40-60%) to be at or above the target
- Relative biomass was stable between 2012 and 2021 (FNZ, 2023h).

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).

Smallscaled cod, a non-QMS species, is the only ‘minor’ species that comprises >2% of the total UoA catch (Table 15). The remaining species individually comprise <2% of the total catch and are classified as ‘negligible’ (SA3.5.2.2), with the vast majority (i.e., ~120 species) individually comprising <0.20% of the total catch of the UoA.

Table 15: Total observed catch (tonnes) of In-scope ‘Minor’ species by the ling longline UoA fisheries and by Fishery Management Area (FMA) during the period 2018-19 to 2022-23.

Species	FMA 3	FMA 4	FMA 5	FMA 6	FMA 7	Total
Smallscaled cod *Notothenia microlepidota*				93.2		93.2

Smallscaled cod (*Notothenia microlepidota*)

Notothenia microlepidota, a non-QMS species, have a distribution restricted to southern New Zealand waters. They have been found in depths of a few metres off Campbell Island and have been trawled down to a depth of 1,000 m.

It reaches a length of 70 cm TL. No other biological information is currently available.

Catches have been recorded in FMA 6 (Sub-Antarctic) only and have ranged between zero and 42.2 tonnes during the period 2018-19 to 2022-23 (Table 16). No biomass index or indication of stock status are currently available.

Table 16: Observed catches of smallscaled cod in FMA 6 (Sub-Antarctic) during the period 2018-19 to 2022-23.

Species	2018-19	2019-20	2020-21	2021-22	2022-23	5-Year Avg. (t)
Smallscaled cod *Notothenia microlepidota*	11.6	27.8	0	42.2	11.7	18.7

In-scope species management

The Fisheries Act 1996 provides the legal basis for managing fisheries in New Zealand, including the Minister's responsibilities for setting and varying sustainability measures such as TACCs. The management of New Zealand's deepwater fisheries is a collaborative arrangement between Fisheries New Zealand and the commercial fishing industry, represented by Seafood New Zealand's Deepwater Council (DWC).

The management of deepwater fisheries encompasses all target and bycatch stocks and the environmental effects of fishing. All 28 deepwater species/species groups in the quota management system (QMS), have been categorised into two tiers according to their commercial value and volume of catch. Tier 1 fisheries are high volume and/or high value fisheries and are the targets of dedicated fisheries. Tier 2 fisheries are typically less commercially valuable, may comprise the bycatch component of Tier 1 fisheries, or are only targeted periodically throughout the year (Fisheries New Zealand, 2019b). Tier 3 species are non-QMS and are generally of little or no commercial value (Table 17).

Table 17: Categorisation of commercial deepwater fish stocks by tier.

	Stocks [2]	
Tier 1	Hake: all Hoki : all Jack mackerel: JMA3, JMA7 Ling: LIN3 - LIN7 Orange roughy: all	Oreos: all Scampi: all Southern blue whiting: all Squid: all
Tier 2	Alfonsino: all Barracouta: BAR4, BAR5, BAR7 Black cardinalfish: all Deepwater crabs (CHC/GSC/KIC); all English mackerel: EMA3, EMA7 Frostfish: FRO3-FRO9 Gemfish: SKI3, SKI7 Ghost shark, dark: GSH4-GSH6 Ghost shark, pale: all Lookdown dory: all	Patagonian toothfish: all Prawn killer: all Redbait: all Ribaldo: RIB3-RIB8 Rubyfish: all Sea perch: SPE3-SPE7 Silver warehou: all Spiny dogfish: SPD4, SPD5 White warehou: all
Tier 3	Non-QMS species	

Observer-reported chondrichthyan catch composition

Around 39 chondrichthyan species/species groups have been observed in catches over the most recent five-year period. Spiny dogfish (*Squalus acanthias*) is the most abundant species caught and comprises ~16.6% of the overall total catch. Rough and smooth skate (*Dipturus nasutus* & *D. innominatus*) are the second- and third-most abundant chondrichthyans at 2.6% & 2.2% of the overall catch. All three species are managed under the Quota Management System. All other chondrichthyan species individually comprise <2% of the catch (Table 18).

Table 18: Observed chondrichthyan catch composition (t) by ling longline fisheries. Percentages based on total catch of all species. Green rows are QMS species, white rows are non-QMS species. Data source: FNZ Rep Log 15659.

Species	2018-19	2019-20	2020-21	2021-22	2022-23	5-Year Avg. (t)	5-Year Avg. (%)
Spiny dogfish *Squalus acanthias*	203.5	128.5	21.0	246.0	269.9	173.8	16.58%
Rough skate *Dipturus nasutus*	3.4	104.3	0.0	14.1	14.0	27.2	2.59%
Smooth skate *Dipturus innominatus*	30.6	22.7	22.4	28.2	12.5	23.3	2.22%
Shovelnose spiny dogfish *Deania calcea*	14.7	4.4	21.6	14.1	2.8	11.5	1.10%
School shark *Galeorhinus galeus*	18.3	12.0	2.0	16.2	4.3	10.6	1.01%
Pale ghost shark *Hydrolagus bemisi*	5.3	23.1	1.3	6.4	14.0	10.0	0.96%
Other sharks and dogs	4.4	2.4	1.7	1.0	14.8	4.9	0.46%
Leafscale gulper shark *Centrophorus squamosus*	1.4	4.0	1.6	6.5	7.8	4.3	0.41%
Seal shark *Dalatias licha*	4.2	4.9	2.1	1.9	2.2	3.1	0.29%
Baxters lantern dogfish *Etmopterus baxteri*	2.5	0.9	1.9	8.6	0.9	3.0	0.28%
Lucifer dogfish *Etmopterus lucifer*	1.5	0.6	0.4	0.5	9.5	2.5	0.24%
Ghost shark *Hydrolagus* spp.	2.2	1.8	0.6	2.9	1.1	1.7	0.16%
Plunket's shark *Scymnodon plunketi*	1.3	1.2	1.6	0.7	2.7	1.5	0.14%
Carpet shark *Cephaloscyllium isabellum*	2.1	1.1	2.2	1.3	0.4	1.4	0.14%
Northern spiny dogfish *Squalus griffini*	0.8	1.1	1.0	2.9	0.5	1.2	0.12%
Sixgill shark *Hexanchus griseus*	0.1	0.7	0.6	2.1	0.7	0.8	0.08%
Smooth skin dogfish *Centroscymnus owstoni*	0.1	0.0	0.5	1.8	0.0	0.5	0.05%
Porbeagle shark *Lamna nasus*	1.1	0.4	0.0	0.2	0.3	0.4	0.04%
Longnose velvet dogfish *Centroselachus crepidater*	1.0	0.0	0.1	0.0	0.6	0.3	0.03%
Giant chimaera *Chimeria lignaria*	0.1	0.3	-	0.0	0.9	0.3	0.03%
Blue shark *Prionace glauca*	0.2	0.3	0.3	0.5	0.2	0.3	0.03%
Deepwater dogfish	0.0	0.6	0.2	-	-	0.3	0.03%
Broadnose sevengill shark *Notorynchus cepedianus*	0.1	0.9	0.1	0.1	0.0	0.2	0.02%

Mako shark *Isurus oxyrinchus*	0.1	0.5	0.0	0.1	-	0.2	0.02%
Sharpnose sevengill shark *Heptranchias perlo*	-	0.1	0.1	0.1	0.2	0.1	0.01%
Shark	0.1	-	-	-	-	0.1	0.01%
Slender smooth-hound *Gollum attenuatus*	0.0	0.1	0.1	0.2	0.1	0.1	0.01%
Dawson's catshark *Bythaelurus dawsoni*	0.0	-	-	0.1	0.1	0.1	0.01%
Other (x 11 spp.)	0.1	0.0	0.1	0.1	0.0	0.1	0.01%
Totals	**299.3**	**316.8**	**83.3**	**356.6**	**360.4**	**283.7**	**27.07%**

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 19). 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).

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.

Table 19: 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

Post-release survival of sharks

Post-release survival rates for sharks caught by longline fisheries are thought to be medium-to-high, and with medium-low post-release survival probability (Moore & Finucci, 2024).

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.

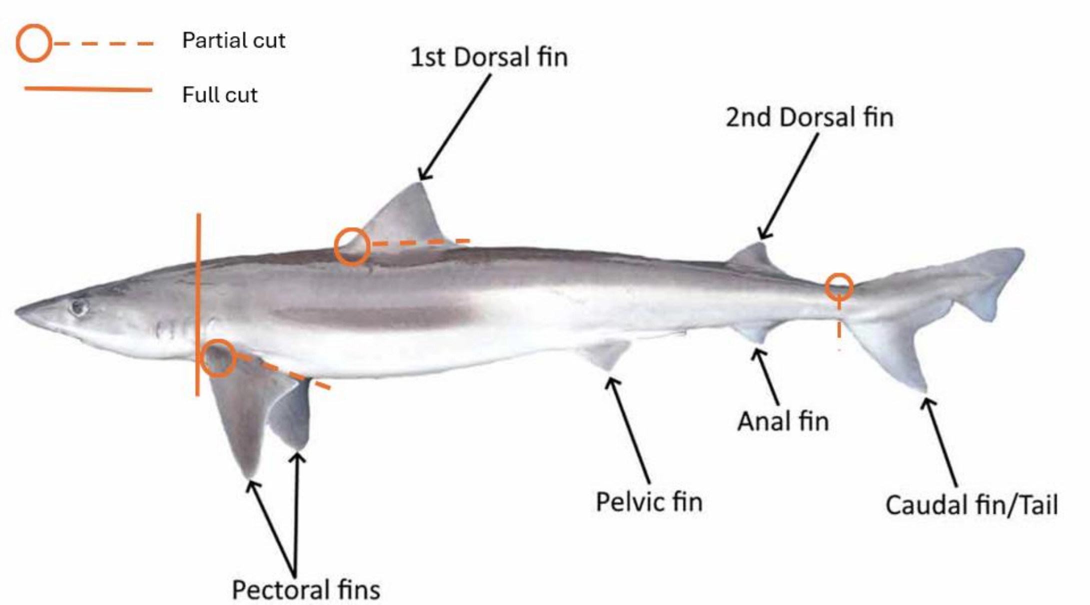

Figure 1: Locations of permitted cuts (this is an indicative guide of permitted cuts under FNA policy, this does not supersede regulatory cuts)

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)

Previous analysis of non-target catch and discards in the ling longline fishery (Anderson 2014) covered the period 1992–93 to 2011–12. The most recent estimates of the level of individual fish and invertebrate species non-target catch in each fishing year from 2002-03 to 2017-28 by Finucci et al. (2020).

Finucci et al. (2020) showed that ling accounted for about 65% of the total estimated catch from all observed bottom longline sets targeting ling between 1 October 2002 and 30 September 2018 (Figure 18).

Finucci et al. (2020) observed that the total annual non-target catch ranged from 1 408–4 724 t between 2002–03 and 2017–18 and that there was no trend over time for the annual estimates of total non-target catch for any of the groups. The average discard fraction of 0.36 was consistent with Anderson's result of 0.3 in 2014 and comparable with recent mean rates in other New Zealand deepwater trawl fisheries.

The total non-target catch is correlated with effort, as may be expected, with effort having generally increased over time. However, there is little correlation between total non-target catch and the total estimated catch of ling from the target fishery, which has remained constant over the time series. Figure 19 plots the observer catch rates and commercial catch-effort forms for the total annual non-target catch.

The annual non-target catch comprised predominantly of QMS species (1 058–3 957 t), with the non-QMS species catch ranging from 600 t to 800 t.

The main nontarget species were spiny dogfish (17% of total estimated catch), ribaldo (3.3%), rough skate (2.7%), black cod (1.7%), smooth skate (1.5%), sea perch (1.4%), and pale ghost shark (1.2%), (Figure 18).

The estimated annual non-target catch ranged from a low of 1,058 t in 2002-03 to a high of 3,957 t in 2016-17 (Figure 19). There are no strong patterns or trends in the amounts of non-target catch of QMS species over time, although some increase in trend was observed since 2014-15 (Figure 20).

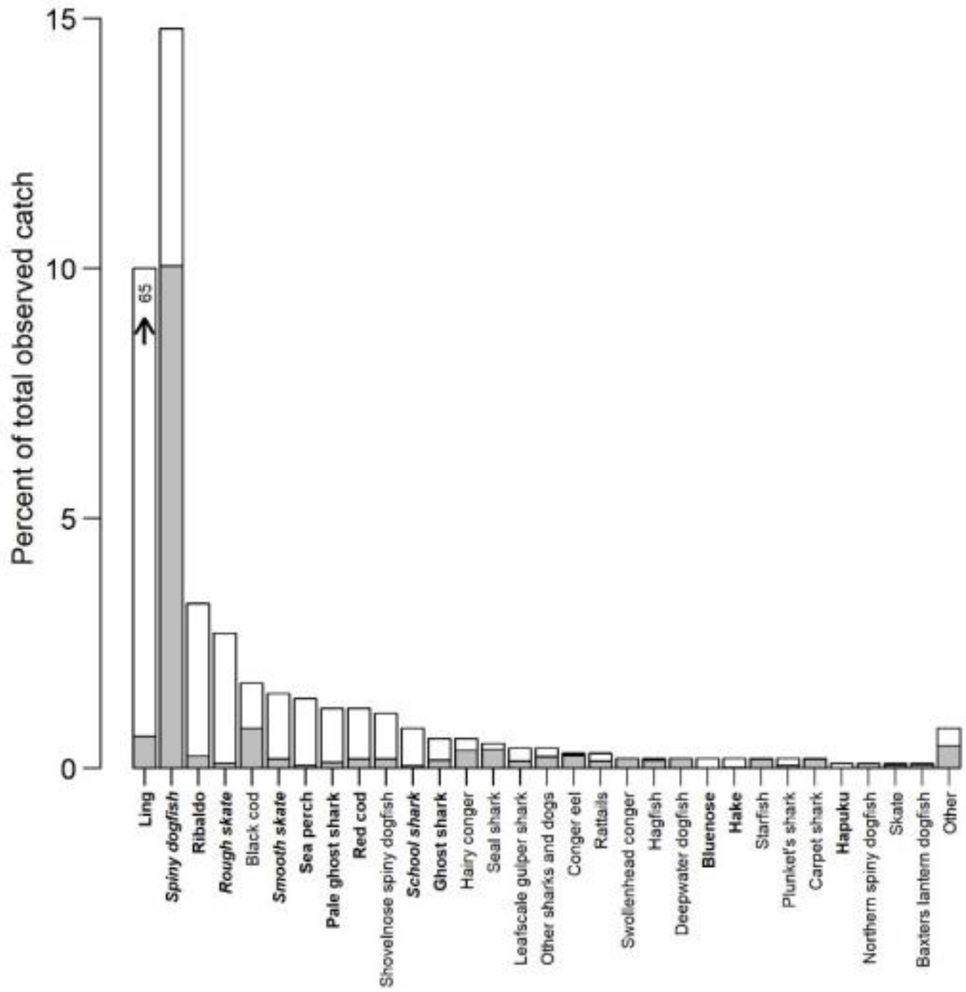

Figure 18: Percentage of the total catch contributed by the main non-target species (those representing 0.02% or more of the total catch) in the observed portion of the ling longline fishery for fishing years 2002-03 to 2017-18 (white bar), and the percentage discarded (grey bar). The Other category is the sum of all non-target species representing less than 0.02% of the total catch. Names in bold are QMS species and names in italics are QMS species that can be legally discarded under Schedule 6 of the Fisheries Act (1996) (since 1996 for spiny dogfish, 2003 for rough and smooth skate, and 2012 for school shark) (Source: Finucci et al., 2020).

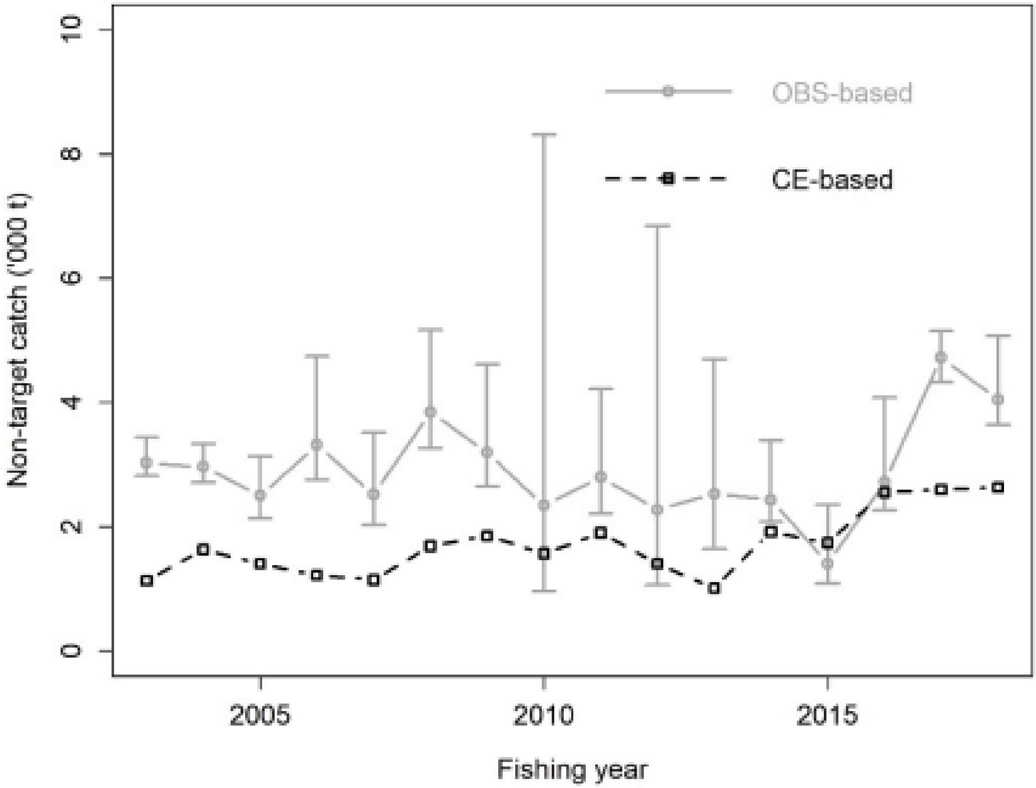

Figure 19: Total annual non-target catch in the ling longline fishery from scaled-up observer catch rates (OBS) and commercial catch-effort (CE) forms (estimated total catch minus any estimated catch of the target species) (Source: Finucci et al., 2020).

Non-QMS fish species

The estimated annual non-target catch of non-QMS species was much lower than that of QMS species, and in most years was 600-800 t, with a low of 120 t in 2012-13. The highest non-QMS catch of 2 163 t occurred in 2002-03, the first year of the time series (the year before spiny dogfish entered the QMS), and as observed with QMS species, levels increased after 2014-15 (Figure 20).

Non-QMS Invertebrate species

Non-QMS invertebrate species non-target catch was at much lower levels than QMS and non-QMS nontarget catch, and apart from estimates of 44 t and 39 t in 2002-03 and 2003-04, respectively, has not exceeded 5 t per year (Figure 20).

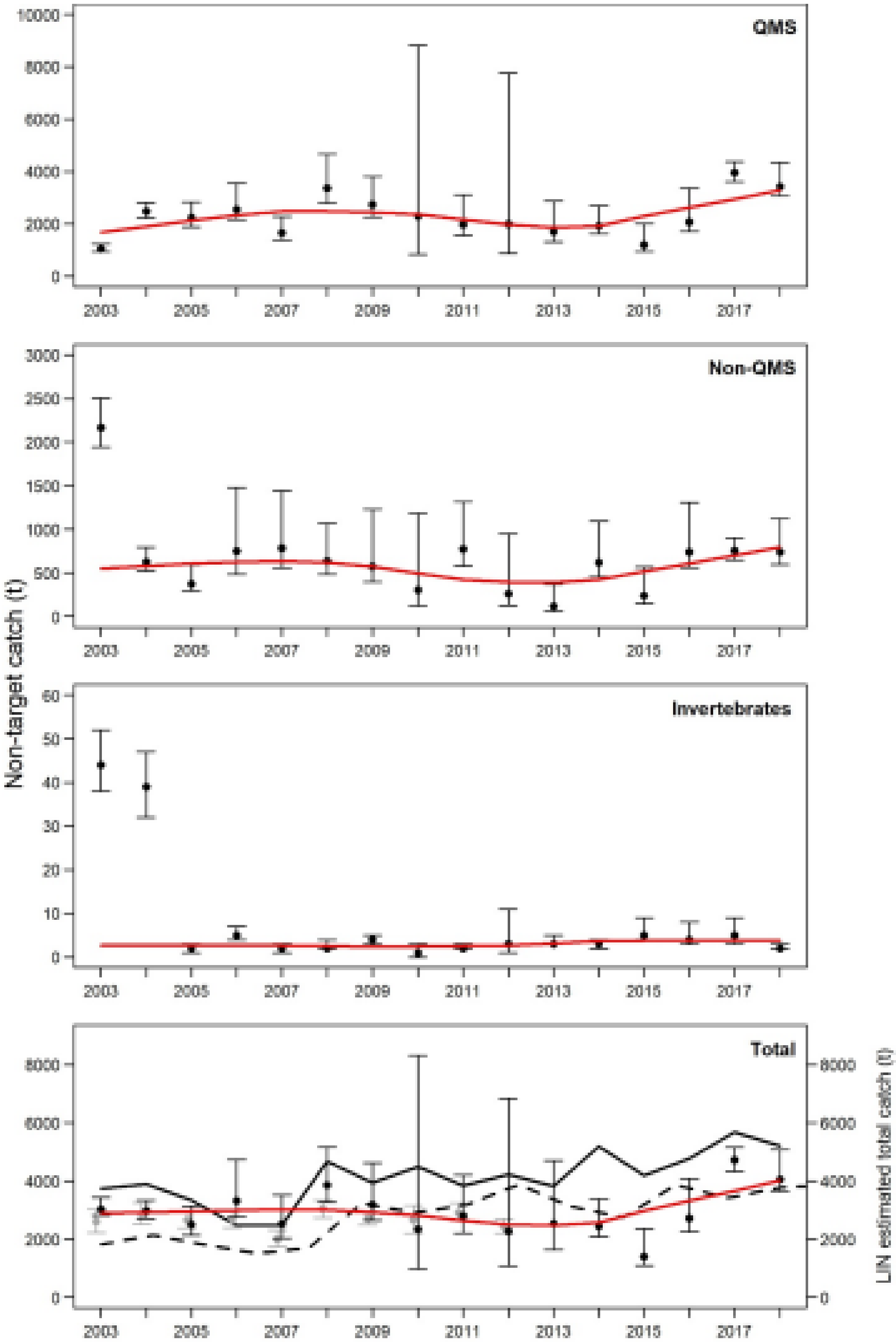

Figure 20: Annual estimates of non-target catch in the target ling longline fishery, by species category, for fishing years 2003 to 2018 (black dots). Error bars indicate 95% confidence intervals. The red lines show the fit of a locally weighted polynomial regression to annual non-target catch. Bottom panel shows estimates (grey dots) of total non-target catch calculated up to 2012 from Anderson (2014), solid black line shows the total annual catch of the target species, and the dashed line shows annual effort (number of sets), scaled to have the mean equal to that of total non-target catch (Source: Finucci et al., 2020).

Discard

Total discard estimates varied from 188 t to 2 442 t annually. The discard fraction (kg of discards per kg of target species catch) showed a declining trend from a peak of 0.98 in 2006–07 to a low of 0.05 in 2012–13, but has since increased (between 0.13 and 0.31) in recent years. The overall discard fraction average was 0.36 across the whole time series, a similar estimate to that previously provided for this fishery. This estimate was low compared with most other fisheries that are monitored, which have ranged between 0.005 (southern blue whiting trawl fishery) and 3.6 (scampi trawl fishery).

Key observations regarding ling bottom longline discards were:

- Discards of ling were variable, but for most years were less than 100 t, with a minimum of 11 t.
- Discards of other QMS species followed a similar pattern to non-target catch, with increased QMS discards since 2013–14.
- Discards of non-QMS fish species discards remaining stable with no trend.
- Discards of non-QMS invertebrate species were low and, for most of the time series, less than 5 t per year.
- The majority of shark catch (63%) was discarded and approximately 10% and 20% of rays and chimaeras were discarded respectively. Some of these species, including spiny dogfish, smooth and rough skate, and school shark, are listed under Schedule 6, allowing for alive individuals to be legally returned to the sea.

Target species

Discarding of ling was generally low, less than 100 t per year in all years except for 2003–04 and 2004–05. Annual levels of discarding have declined over time, with a low of 11 t reported in 2017–18 (Figure 21).

QMS species

Discards of QMS species were in most years greater than discards of other categories but were somewhat variable, ranging from a low of 113 t in 2012–13 to a high of 1 868 t in 2017–18. Overall, QMS species discards have showed an increasing trend since 2013–14 (Figure 21).

Non-QMS fish species

Apart from the first two years of the time series, discards of non-QMS species were generally much lower than those of QMS species, ranging from 2 t in 2012–13 to 1 487 t in 2002–03. Annual discard rates have remained stable without trend since 2006–07 (Figure 21).

Non-QMS Invertebrate species

Annual discards of invertebrates followed a similar pattern to non-target catch (as almost all the catch in this category is discarded) and, apart from the first two years of the time series, remained under 10 t and as low as <1 t (Figure 21).

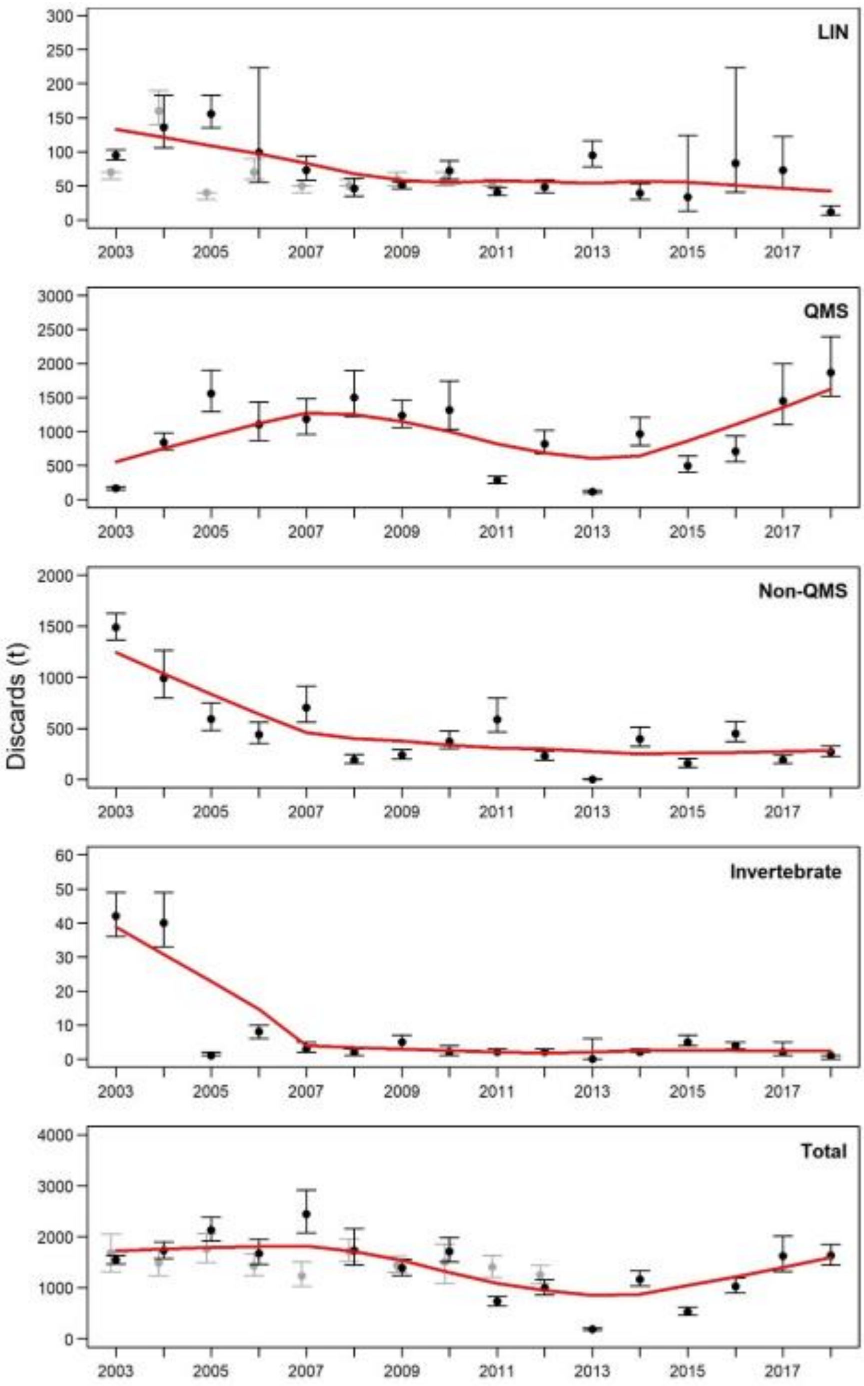

Figure 21: Annual estimates of discards in the target ling longline fishery, by species category, for 2003 to 2018 (black dots). Error bars indicate 95% confidence intervals. The red lines show the fit of a locally-weighted polynomial regression to annual discards. Also shown (grey dots, top and bottom panel) are earlier estimates of target species and total discards calculated for up to 2013 by Anderson (2014). The distribution of observer effort has been fairly representative of total commercial effort across the variables shown in the models to influence rates of non-target catch and discards. The main longline fisheries for ling on the Chatham Rise and sub-Antarctic (Bounty Plateau, Campbell Plateau, and Puysegur Banks) were all well sampled by observers in most years, although overall observer coverage decreased considerably between 2010 and 2013. The smaller vessels in the fishery were poorly sampled compared with the large vessels, and although representative spatial observer coverage has since increased in recent years, it is still mostly absent from around the North Island (where smaller vessels operate) (Source: Finucci et al., 2020).

Bait species and quantities

An analysis of bait use by the LIN 3 – 7 UoA fisheries has been prepared in a separate ‘Ling longline bait use’ report, which can be accessed online here.

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[1] 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.

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.

Fisheries (Commercial Fishing) Regulations 2001[2]

54. Longlines, static fishing gear, and set nets

1. Commercial fishers must not use for fishing, or have on board a fishing vessel, longlines, set nets, or other static fishing gear without surface floats at each end.
2. Each surface float must be clearly, permanently, and legibly marked with the registration number of the fishing vessel from which it was or will be set or is being transported.
3. Despite subclause (1), trot lines, droplines, and dahn lines may be marked at one end only.

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

[2] Fisheries (Commercial Fishing) Regulations 2001 (SR 2001/253) (as at 03 August 2023) 54 Longlines, static fishing gear, and set nets – New Zealand Legislation

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 22). Note: while the example below is for trawl fisheries, the requirement and procedure for reporting of lost gear is similar for longline fisheries.

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.

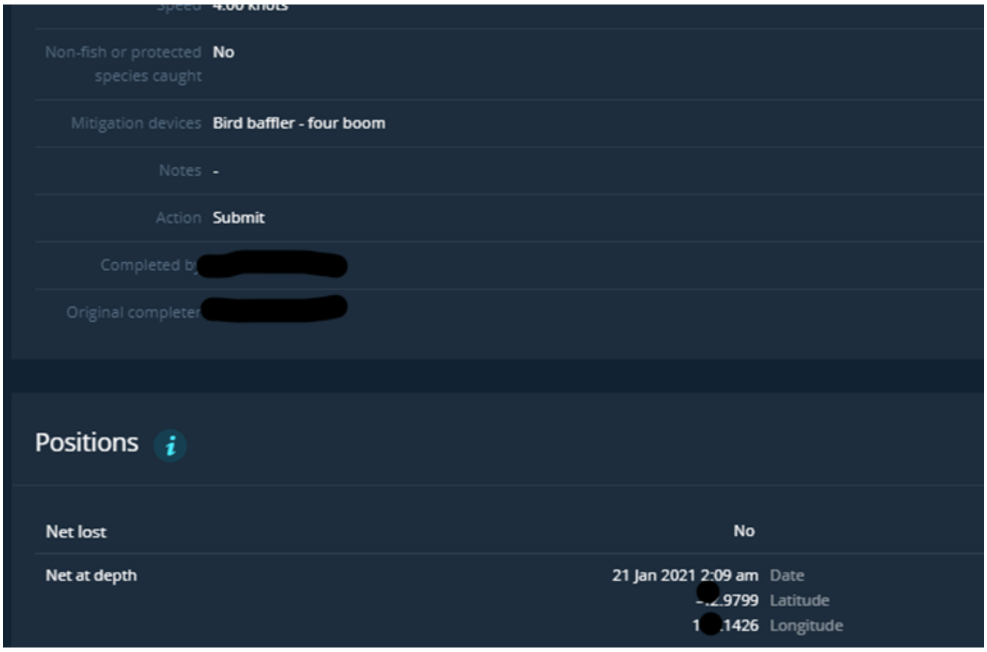

Figure 22: Screenshots from the ERS of the relevant reporting components for the statutory system.

In addition to their statutory requirements vessel operators in the ling bottom longline fisheries have management strategies in place to prevent, mitigate and remediate gear lost or abandoned at sea (Table 20). Discarding gear at sea is prohibited unless under the circumstances noted above.

Table 20: Ghost Fishing Gear Management Strategy for ling bottom longline fisheries.

Prevention	• The ling bottom longline fleet ensure gear is well maintained to avoid gear loss. • The autoline fleet avoid setting on foul ground where gear can get caught up. • Operators maintain a register of gear loss and/or include coordinates of lost gear on the plotter so it can be retrieved. • Bottom longlines must have surface floats attached at two ends, surface floats must be marked with registration number
Mitigation	• Hooks are occasionally lost in the ling bottom longline fishery, however the risk of lost hooks being a risk as ghost fishing gear is considered low. Lost hooks sink to the seafloor, and bait would eventually decompose. These hooks would not be considered ghost fishing.
Remediation	• If sections of line are lost, vessels will plot the location. • Longline vessels also attempt to grapnel for lost sections of line, if equipment is available, or they set another longline across where the gear was lost to try and hook up with it.

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 approximately 22 observed bottom longline sets between 2019-20 to 2021-22 where fishing gear has been reported lost. Most of these involved hooks being lost overboard, but weights, floats and ropes are also occasionally lost. In some cases (when it was rational to do so), the vessels attempted to drag for the gear but were unsuccessful.

Because of the non-fishable characteristics of weights and floats, DWC would not consider this to be ghost fishing gear.

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.

CSP observer focus for LIN 3-7 stocks in 2023-24 was prioritised as follows:

- The focus will be on smaller bottom longline vessels operating on the Chatham Rise
- Monitoring and recording interactions with seabirds including captures and behaviour around vessels.
- Recording information on which mitigation techniques are employed in this fishery (i.e. tori lines; line weighting regimes).
- Monitoring of ETP shark captures.

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 (FNZ, 2021a). 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), (DWG, 2022), which include:

- Ling Bottom Longline OPs
- Marine Mammals OPs
- Reporting OPs
- Seabirds OPs
- Sharks OPs
- Benthic OPs (implemented in 2021-22)
- Ten Commandments for:

- Marine Mammals
- Saving Seabirds

- Ten Golden Rules for Protected Species Reporting.

Auditing compliance with Operational Procedures

During the 2021-22 fishing year, FNZ observers audited the performance of nine vessels against the Ling Bottom Longline (LIN 2-7) Operational Procedures. Along with an objective stating that mandatory measures are understood and complied with, the procedures stipulate the non-regulatory management measures agreed between Seafood New Zealand Deepwater Council (DWC, formerly DWG) shareholders owning LIN 2-7 quota and Fisheries New Zealand to mitigate seabird captures. They are implemented and administered by DWC. Follow-up actions were required after six trips in 2021-22 in relation to fish waste management, seabird scaring devices, trigger points, or sink rate issues.

DWC Liaison Programme for ETP Species Risk Management

During 2018-19, DWC's Environmental Liaison Officer (ELO) visited 34 ling longline vessels. During 2019-20, 24 ling longline vessels were visited. In 2020-21 and 2021-22, the Covid-19 pandemic restricted vessel visits to an extent, and several vessels were tied up. The ELO visited 21 and 20 ling longline vessels in these two years respectively. During 2022-23, around 7 ling longline vessels were still tied up and a total of 19 vessels were visited (Cleal, 2019, 2020, 2021, 2022, 2023).

The purpose of these vessel visits is to:

1. Organise and deliver environmental training resources to senior crew and associated managers.
2. Monitor vessel operator's adherence to the agreed environmental risk Operational Procedures (OPs)
3. Maintain fleet database of vessels, operators, target species, ports, skippers etc.
4. Undertake port call and vessel visits to a minimum of 90% of the fleet
5. Analyse all FNZ audits of Vessel Management Plans (VMPs) and OPs, contacting operators with feedback for each and every audit
6. Maintain strong liaison with government – particularly with FNZ, DOC and DOC's Inshore Liaison Officer Programme
7. Review VMPs, ensuring each vessel has an effective vessel-specific seabird risk management programme.
8. 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.
9. 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 sets (i.e., tori lines)
- Management of fish waste discharge so as not to attract seabirds to risk areas (i.e., no discharge during setting/hauling); mincing and batch-discharge between setting and hauling; installation of mincers/hashers/batching tanks; gratings/trap systems to reduce fish waste discharge through scuppers/sump pumps.

Seabird risk associated with longline sets is minimised by:

- Weighting the line to achieve rapid sink rates (i.e. to 5 m depth while within the area covered by the tori line)
- Seabirds caught alive 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.

In summary, the existing seabird mitigation strategy applied by the ling longline fisheries has a high probability of ensuring the UoCs do not hinder nor threaten the recovery of seabird populations.

All longline vessels 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).

Protected Species Website

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

Seabirds are subject to incidental capture by vessels fishing for ling using bottom-set longlines.

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 ling longline fishery poses 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 Report (DWG, 2021) and MIT2021-02 Liaison Programme Annual Report, 2021-22 Fishing Year (Plencner, 2023).
- 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)
- Assessment of the nature and extent of the seabird interaction in ling longline fisheries (Baker & Hamilton, 2016)
- Review of ETP species monitoring

From December 2024 all ling BLL vessels will be required to have cameras onboard to monitor seabird bycatch (FNZ, 2024). DWC's Operational Procedures – Seabirds, and training and instruction from DWC's Environmental Liaison Officer, will ensure operators, skippers and senior crew are adequately prepared (e.g., conducting required sink rate testing, accurate reporting and understanding all other requirements).

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 ling bottom longline fisheries, a baseline capture rate of 0.022 estimated captures per 1 000 hooks was determined.

The National Plan of Action Seabird reports 2018/19, 2019/20 and 2020/21 provide breakdowns of the observed seabird captures by ling longline vessels, illustrating that small albatross species (i.e. mollymawks), petrels & shearwaters are the most abundant groups caught (FNZ, 2020a; FNZ, 2021b; FNZ, 2022a). Historical capture rates for the ling bottom longline fisheries show that the estimated capture rate has fluctuated above and below the baseline (Figure 23), (FNZ, 2023).

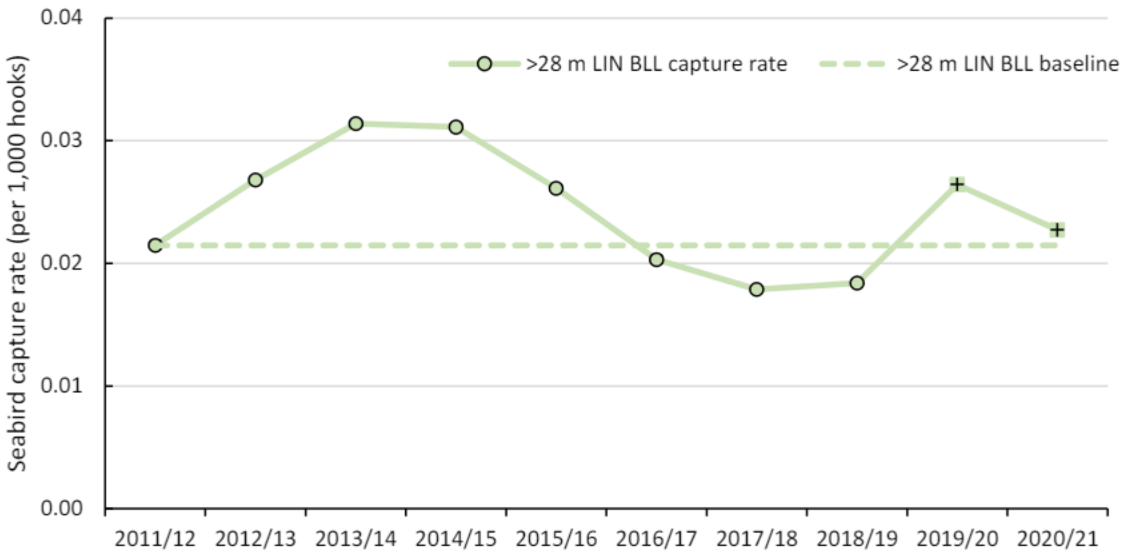

Figure 23: Estimated seabird capture rates (captures per 1000 hooks set) relative to baseline capture rates for the >28 m ling bottom longline (LIN BLL) fishery, since the 2010/11 fishing year. Seabird capture rates are expressed as three-year rolling averages. For example, data for 2018/19 represents 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 (Sharp et al., 2009). 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 21), but noting that the SEFRA considered captures by all trawl, longline and setnet fisheries in the EEZ and did not specifically provide a risk metric for ling bottom longline sets alone. It is noted that bottom longline accounted for only 5% of southern Buller's captures over the study period 2006-07 to 2019-20, (Edwards et al., 2023) and the ling longline UoAs therefore pose a low risk to this species.

Table 21: 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]

The five seabird species with the highest capture numbers by ling longline fisheries are, in order, white-chinned petrel (XWC), Salvin's albatross (XSA), Westland petrel (XWP), New Zealand white-capped albatross (XWM) and Chatham Island albatross (XCI), (Table 22). Their Department of Conservation threat classifications are provided in Table 23.

Table 22: Ling bottom longline fisheries annual deaths for the top thirty at-risk species, ranked in order of highest to lowest median risk (Source: Edwards et al., 2023).

	Large Autoline with IWL		Large Autoline		Small Autoline (LIN, RIB)		Small Manual (LIN, RIB)	
Code	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI
XBM	0	[0–0]	3	[1–10]	0	[0–1]	7	[1–18]
XSA	1	[0–3]	9	[4–17]	33	[20–54]	7	[2–17]
XWM	0	[0–1]	1	[0–5]	0	[0–2]	28	[14–49]
XBP	0	[0–0]	0	[0–0]	0	[0–0]	0	[0–4]
XWP	0	[0–0]	0	[0–3]	0	[0–1]	31	[17–55]
XCI	1	[0–2]	0	[0–2]	25	[13–45]	0	[0–3]
XFS	0	[0–0]	0	[0–0]	0	[0–0]	0	[0–3]
XNB	0	[0–1]	2	[0–6]	1	[0–4]	0	[0–3]
XAU	0	[0–0]	0	[0–1]	0	[0–1]	0	[0–1]
XAN	0	[0–0]	0	[0–1]	0	[0–1]	0	[0–1]
XWC	19	[11–30]	280	[201–390]	154	[101–227]	82	[52–127]
XRA	1	[0–3]	0	[0–3]	0	[0–1]	3	[0–12]
XNP	0	[0–1]	0	[0–0]	0	[0–0]	0	[0–0]
XCM	0	[0–2]	0	[0–1]	0	[0–1]	0	[0–3]
XYP	0	[0–0]	0	[0–0]	0	[0–0]	0	[0–0]
XPP	0	[0–0]	0	[0–0]	0	[0–0]	0	[0–2]
XNR	0	[0–0]	0	[0–1]	0	[0–1]	0	[0–1]
XLM	0	[0–1]	0	[0–1]	0	[0–1]	0	[0–3]
XGM	0	[0–1]	0	[0–1]	0	[0–1]	0	[0–2]
XGP	0	[0–2]	13	[5–25]	7	[2–16]	7	[1–22]
XCA	0	[0–0]	0	[0–0]	0	[0–0]	0	[0–0]
XSI	0	[0–0]	0	[0–0]	0	[0–0]	0	[0–0]
XBS	0	[0–0]	0	[0–1]	0	[0–1]	0	[0–1]
XKS	0	[0–0]	0	[0–0]	0	[0–0]	0	[0–0]
XBC	0	[0–0]	0	[0–0]	0	[0–0]	0	[0–1]
XFC	0	[0–0]	0	[0–0]	0	[0–0]	0	[0–1]
XPS	0	[0–0]	0	[0–0]	0	[0–0]	0	[0–2]
XPV	0	[0–0]	0	[0–1]	0	[0–1]	0	[0–1]
XFX	0	[0–0]	0	[0–0]	0	[0–0]	0	[0–0]
XSH	8	[4–13]	0	[0–2]	0	[0–4]	3	[0–13]

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.

Table 23: DOC threat classifications for the most prevalent incidental seabird captures by ling longline fisheries. Putative 2023 threat classification based on the 2023 SEFRA.

Species (Code)	DOC Threat Classification 2021	Putative Threat Classification 2023	Status change
White-chinned petrel (XWC) *Procellaria aequinoctialis*	Not Threatened	Not Threatened	No change
Salvin's albatross (XSA) *Thalassarche salvini*	Nationally Critical	At Risk - Declining	Better
Westland petrel (XWP) *Procellaria westlandica*	Naturally Uncommon	At Risk - Declining	Worse
NZ white-capped albatross (XWM) *Thalassarche cauta steadi*	At Risk - Declining	At Risk - Declining	No change
Chatham Island albatross (XCI) *Thalassarche eremita*	Naturally uncommon	Naturally Uncommon	No change

Modelling undertaken by the 2023 SEFRA showed that small albatross species, shearwaters and medium-sized petrels are the main groups vulnerable to capture by bottom longliners (Figure 24). The seabird group with the highest catchability by bottom longliners is medium-sized petrels (Figure 25).

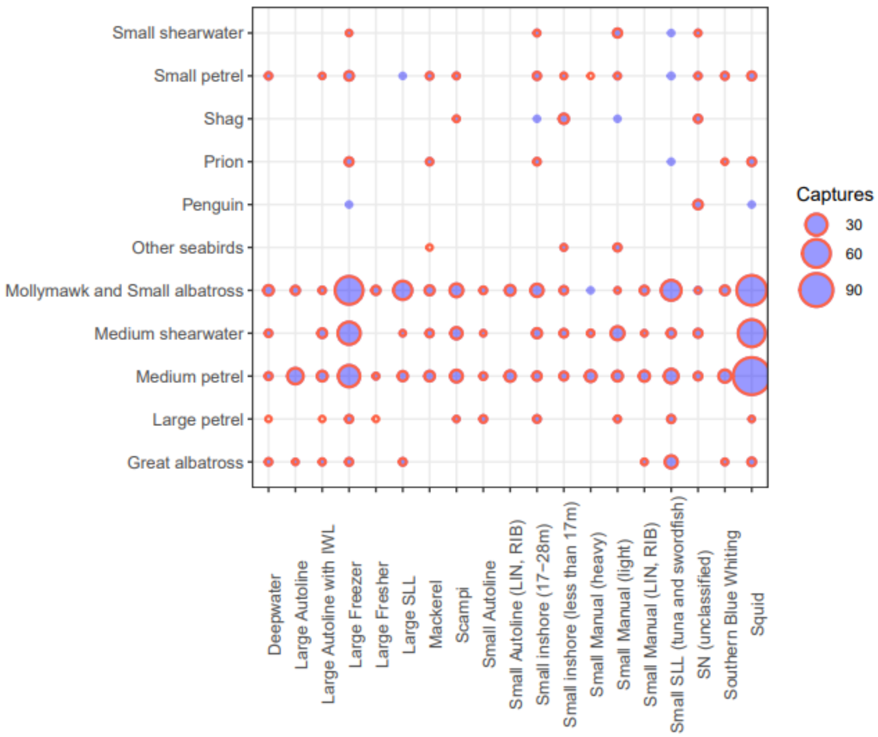

Figure 24: Model fit to observed average annual captures (C 0 f,z) per species and fishery group combination, between 2006/07 and 2019/20. Model predicted values are represented by the posterior median of the sum across species per group and shaded in blue. Empirical values are represented by red circles (Source: Edwards et al., 2023).

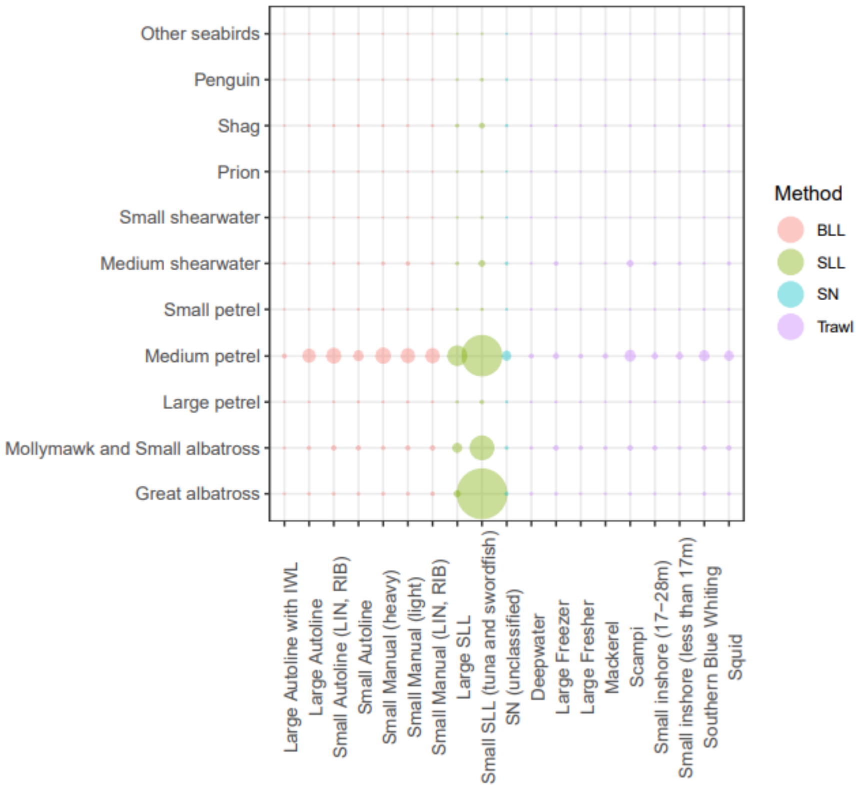

Figure 25: Catchability (qf,z) per species group and fishery group combination. Catchabilities are only comparable between methods and groups that share the same effort units (Source: Edwards et al., 2023). Ling longline UoC vessel categories: Large Autoline with IWL; Large Autoline; Small Autoline (LIN); Small Manual (LIN).

In 2020-21, ling longline-targeted sets resulted in 31 observed seabird captures (x21 white-chinned petrel; x8 Westland petrel; x1 wandering albatross; x1 sooty shearwater) and a modelled estimate of 759 captures (95% c.i. 472 – 1 219). No trend in observed and estimated seabird captures is evident (Figure 26), (FNZ, 2021).

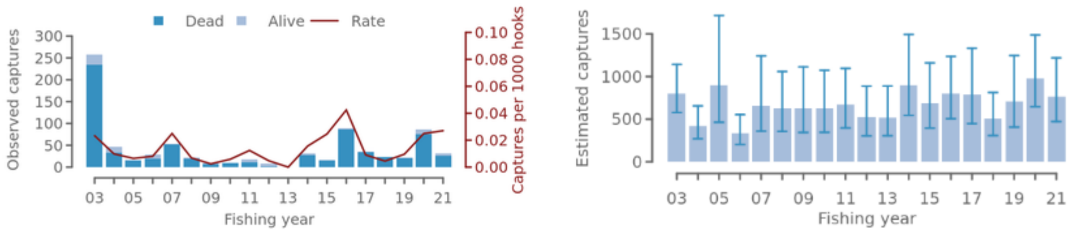

Figure 26: Ling longline observed (Left) and estimated (Right) seabird captures 2002-03 to 2020-21.

Seabird species most at risk

The risk classifications from the Spatially Explicit Fisheries Risk Assessment Framework (SEFRA), (Edwards et al., 2023), for the main species incidentally captured in the ling longline UoA fisheries are provided below (Table 24). The Annual Potential Fatalities (APFs) for these species, for all New Zealand fisheries, are well below the estimated Population Sustainability Thresholds (PSTs), (Richard et al., 2020).

Table 24: Threat and risk classifications, for all New Zealand fisheries combined, as applicable to the most prevalent incidental seabird captures by the ling longline fishery, noting the APFs are for all NZ commercial fisheries combined.

Species	SEFRA Risk Classification (all fisheries combined)	SEFRA Mean APF	SEFRA Mean PST	Risk Ratio
White-chinned petrel	Low	1 638	18 098	0.09 (0.06 – 0.18)
Salvin's albatross	High	1 680	2 551	0.69 (0.35 – 1.69)
Westland petrel	High	135	392	0.38 (0.17 – 0.88)
White-capped albatross	High	2 597	5 367	0.50 (0.29 – 1.07)
Chatham albatross	High	58	225	0.27 (0.13 – 0.68)

The two species incidentally caught by ling longliners that are at highest risk are Salvin's albatross and white-capped albatross, which have total risk ratios at or above 50% of the PST threshold of 1 (Edwards et al., 2023).

White-chinned petrel

White-chinned petrel, the species with the highest number of captures by ling longliners (accounting for around 56% of captures over the last five years) is classified as having 'very low' fisheries risk according to the most recent update of the Spatially Explicit Fisheries Risk Assessment for seabirds (FNZ, 2022a, and Richard and Abraham, 2015 and Edwards, et al., 2023).

White-chinned petrel breeds on Antipodes, Auckland and Campbell Islands in the New Zealand region. Antipodes Island had an estimated 26,400 (95% CI: 22,200–31,600) breeding pairs breeding in December 2022 (Rexer-Huber et al., 2023). The authors note that this figure is smaller but more precise than previous estimates, which ranged from 39,700 (24,200–55,100) to 54,900 (38,400–71,500) pairs (Thompson 2019; Elliott & Walker 2022 in Rexer-Huber et al., 2023), and should not be taken as evidence of a decline. The Auckland Islands support an estimated 153,000 (119,700–195,700) breeding pairs (Rexer-Huber et al. 2017). Campbell Island has an estimated 22,000 breeding pairs (Rexer-Huber et al. 2020).

These birds are capable of swimming down to considerable depths and are adept at accessing baited hooks during longline deployment. They are at increased risk when tori line deployment is sub-optimal (e.g., during periods of strong winds).

Observed captures of white-chinned petrels by ling longline sets over the most recent 5-year period 2016-17 to 2020-21 have ranged between 10 and 57, with an average of 27 birds per annum. Estimated captures ranged between 263 and 546, with an estimated average of 425 per annum (Figure 27).

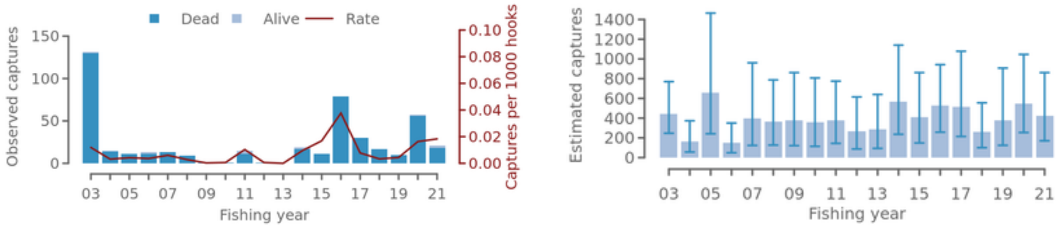

Figure 27: Incidental captures of white-chinned petrel by ling longliners; observed (left) and estimated (right) from 2002-03 to 2020-21.

Salvin's albatross

Aerial censuses of Salvin's albatross at their breeding colonies on Bounty Islands show that the number of breeding pairs increased between 2010 and 2013 and that their raw numbers steadily increased from around 43,000 in 2010 to around 60,000 in 2018 (Table 25), (Baker & Jensz, 2019).

DOC has been reviewing the methodology used to survey Salvin's albatross on the Bounty Islands. Recent ground-based surveys have produced varying results due to differences and inherent uncertainties in the methods applied. This in turn has resulted in difficulties in the assessment of population status (Taylor 2000; Baker et al. 2014; Sagar et al. 2015; Baker & Jensz, 2018; Parker & Rexer-Huber 2020).

Table 25: Censuses of Salvin's albatross at Bounty Islands.

Census Year	Breeding Pairs	Raw Counts	95% CI
2010	31,786	42,826	42,212-43,240
2013	39,995	53,893	53,429-54,357
2018	Not estimated	60,419	59,927-60,911

Observed captures of Salvin's albatross by hoki-targeted trawl tows over the most recent 5-year period 2016-17 to 2020-21 have ranged between 0 and 3, while estimated captures have ranged between 35 and 68, with an estimated average of 49 birds per annum (Figure 28), (FNZ, 2021).

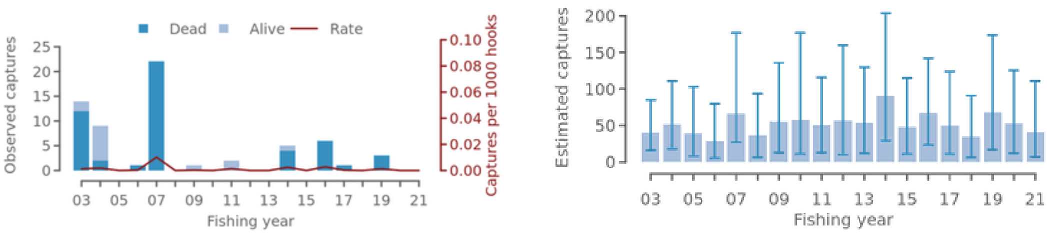

Figure 28: Incidental captures of Salvin's albatross by ling longliners; observed (left) and estimated (right) from 2002-03 to 2020-21.

Westland petrel

Assessment of the number of Westland petrel burrows over a 12-year period provided a baseline population estimate of 6,200 breeding pairs. Burrow density was assessed to have increased by approximately 1% per annum over this period and the population is considered to be stable, although the single nesting area is vulnerable to climate effects (e.g. treefall and landslips), (Waugh et al., 2020).

Observed captures of Westland petrel by ling longline sets over the most recent 5-year period 2016-17 to 2020-21 have ranged between 1 and 8, with an average of 5 birds per annum. (Figure 29), (FNZ, 2021).

Their median Annual Potential Fatality (APF) rate of 180 for all trawl and longline fisheries combined is well below their estimated Population Sustainability Threshold (PST) of 350 (Richard et al., 2020).

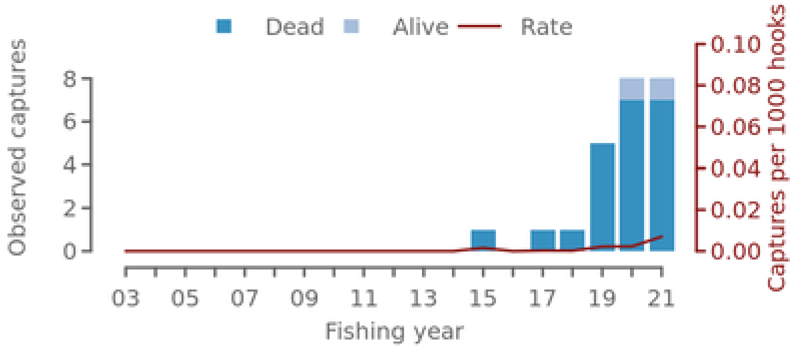

Figure 29: Observed incidental captures of Westland petrel by ling longliners from 2002-03 to 2020-21.

White-capped albatross

Annual population censuses of white-capped albatross at the Auckland Islands over 12 years between 2006 and 2017 produced an estimated mean of 89,846 breeding pairs over this period. A slight negative linear trend was evident but due to high inter-annual variability in counts, was not statistically significant. A reasonable interpretation is that, although impacted by fisheries bycatch, the population of white-capped albatross is stable (Baker er al., 2015; Baker et al., 2023). Current research is focussed on estimating adult survival, documenting a study set up to quantify productivity, and trials to assess the suitability of drones for quantifying the breeding population size.

Observed captures of white-capped albatross by ling longline sets over the most recent 5-year period 2016-17 to 2020-21 have ranged between 0 and 7, with an average of 2 birds per annum. The estimated number of captures ranged between 10 and 35 with an estimated average of 19 per annum but noting that a high proportion are released alive (Figure 30), (FNZ, 2021).

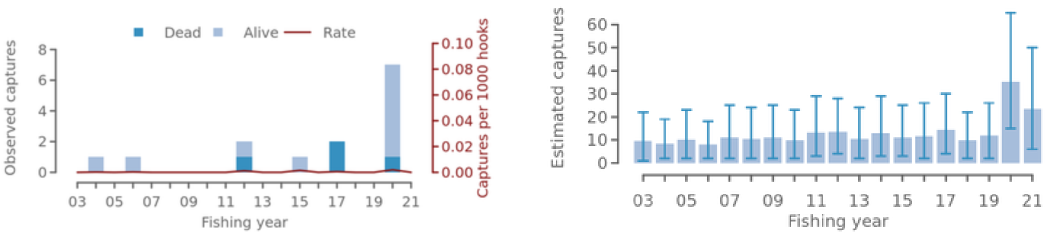

Figure 30: Observed (Left) and estimated (Right) incidental captures of white-capped albatross by ling longliners from 2002-03 to 2020-21.

Chatham Island albatross

Chatham Island albatross have a single breeding population on Te Tara Koi Koia, the southern-most of the Chatham Island group. A 2016 census counted 5 296 nests, which was similar to previous counts from 1999 – 2016, which averaged 5,294 nest sites (Bell et al., 2017). While individual counts have fluctuated from year-to-year, overall the population has been stable (Figure 31).

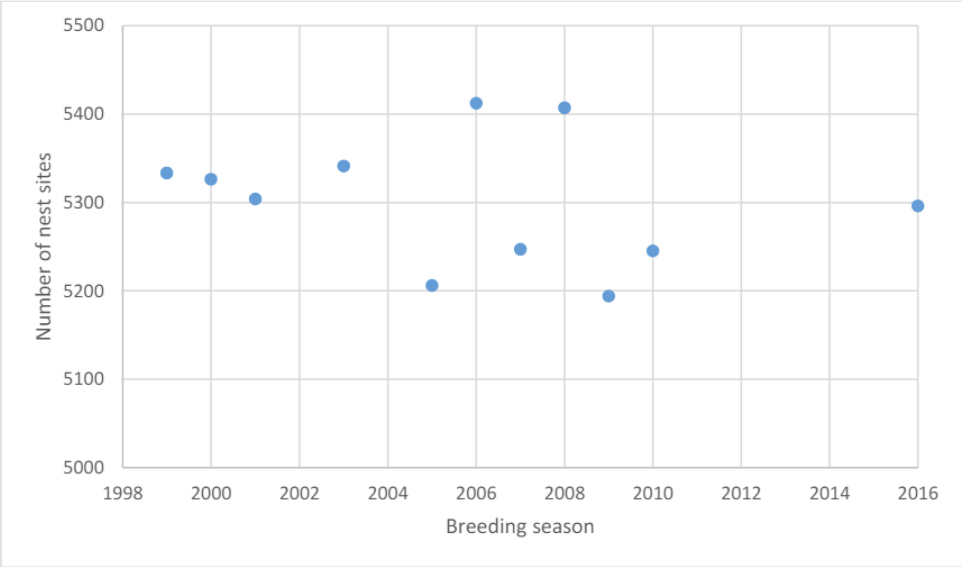

Figure 31: Nest counts of Chatham Island albatross on Te Tara Koi Hoia, 1999 – 2016.

There have only been two observed captures of Chatham Island albatross by ling longline sets over the most recent 5-year period 2016-17 to 2020-21. No estimate of unobserved captures has been determined (Figure 32).

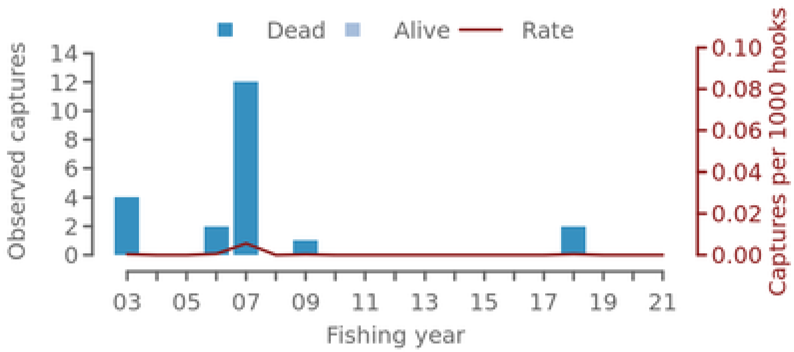

Figure 32: Observed incidental captures of Chatham Island albatross by ling longliners from 2002-03 to 2020-21.

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 ling-targeted longline fisheries with ETP seabirds over the 5-year period 2016-17 to 2020-21 is provided below (Table 26). Data were sourced from the New Zealand Protected Species Database.

Table 26: Summary of observer-recorded interactions of the ling longline UoAs with ETP/OOS seabirds from 2016-17 to 2020-21. Data sourced from FNZ Protected Species Database. Observer coverage averaged x% of hooks set. Rows in orange did not meet the criteria for 'negligible'. Population information was from https://www.iucn.org. Risk ratings are from [1] Edwards, et al., (2023), [2] Richard, et al., (2020), [3] Abraham, et al., (2017).

Common name	ETP Listing	Risk (+ 95% CI)	No. in popn.	2016/17		2017/18		2018/19		2019/20		2020/21		Desig-nation
				Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead	
Campbell black-browed albatross (XCM) *Thalassarche impavida*	Seabird IUCN-VU	0.05 (0.03-0.14)[1]	43,296 mature individuals							2				OOS-negligible Meets SA3.8.2.5
Chatham Island albatross (XCI) *Thalassarche eremita*	Seabird IUCN-VU	0.27 (0.13-0.68)[1]	11,000 mature individuals				2							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
New Zealand white-capped albatross (XWM) *Thalassarche cauta steadi*	Seabird IUCN-NT	0.50 (0.29-1.07)[1]	>200,000 mature individuals		2					6	1			ETP-Assessed Meets SA3.8.2.5
New Zealand white-faced storm petrel (XWF) *Pelagodroma marina*	Seabird IUCN-LC	0.00 (0.00-0.00)[1]	4 million individuals		1									ETP-negligible Meets SA3.8.2.5
Fulmars, petrels, prions, and shearwaters (unid.)	Seabird							1	1					ETP-negligible Meets SA3.8.2.5
Salvin's albatross (XSA) *Thalassarche salvini*	Seabird IUCN-VU	0.69 (0.35-1.69)[1]	79,990 mature individuals		1				3					ETP-negligible Meets SA3.8.2.5
Snares Cape petrel (XCA) *Daption capense*	Seabird IUCN-LC	0.02 (0.00-0.13)[1]	2 million individuals (global Cape petrel)					1						ETP-negligible Meets SA3.8.2.5
Sooty shearwater (XSH) *Ardenna grisea*	Seabird IUCN-NT	0.00 (0.00-0.01)[1]	4.4. million pairs					1			10		1	ETP-Assessed Does not meet 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		1		ETP-negligible Meets SA3.8.2.5
Grey petrel (XGP) *Procellaria cinerea*	Seabird IUCN-NT		53,000 pairs				3				1			ETP-negligible Meets SA3.8.2.5
Westland Petrel (XWP) *Procellaria westlandica*	Seabird IUCN-LC	0.38 (0.17-0.88)[1]	7,900-13,700 mature individuals		1		1		5	1	7	1	6	ETP-negligible Meets SA3.8.2.5
White-chinned petrel (XWC) *Procellaria aequinoctialis*	Seabird IUCN-VU	0.09 (0.06-0.18)[1]	3 million mature individuals		30		17		10	1	55	3	18	ETP-Assessed Does not meet SA3.8.2.5

As FNZ observers are not present on all fishing events, the Protected Species Bycatch in New Zealand Fisheries database (https://protectedspeciescaptures.nz/) also provides mean estimated captures of seabirds based on the total number of hooks deployed, the number of observed hooks, observer coverage (the percentage of hooks that were observed), the number of observed captures (both dead and alive), the capture rate (captures per 1 000 hooks) per fishing year to provide the mean number of estimated total captures (with 95% confidence interval), and the percentage of hooks included in the estimate. While estimated captures are not available by species, the estimates for all seabird species combined for the ling longline sets provide support for the designation of negligible for some bird species (Table 27) based on ratios provided (see Table 26).

Table 27: Observed and estimated seabird interactions by ling longline fisheries. Data sourced from Protected Species Bycatch database (https://protectedspeciescaptures.nz/).

Year	% Hooks observed	No. observed captures	Observed capture rate per 1 000 hooks	Mean estimated captures	Estimated Captures 95% CI
2016-17	14.5%	35	0.009	783	(448 - 1 332)
2017-18	22.9%	23	0.004	502	(307 - 813)
2018-19	9.8%	22	0.010	707	(407 - 1 246)
2019-20	14.9%	87	0.025	975	(645 – 1 488)
2020-21	5.0%	31	0.027	759	(472 – 1 219

Seabird Mitigation Measures

The Fisheries (Seabird Mitigation Measures - Bottom Longlines) Circular (No. 2) 2021 was implemented on 1 October 2021. The primary changes of the Circular involved:

- Setting streamer line requirements based on baiting method and vessel length to more accurately account for fishing effort.
- Introduce an outcome-focused approach to ensure that all vessels setting bottom longlines weight their line so that hooks sink to a depth of 5 metres within the aerial extent of the streamer line.
- Requirement for all BLL vessels active in FMA 6 to use an integrated weighted line (IWL) of 50g per metre.
- Allow bottom longline vessels to discard all live fish and dead fish greater than 30cm on the same side of the vessel as the hauling station if a hauling mitigation device is deployed.

Deepwater Group has responded to the regulatory changes by updating the Ling 2-7 Bottom Longline Operational Procedures (OP), the document which all DWG operators adhere to when targeting ling by bottom longline in these areas. The OP reflects what was changed in the regulations and guides operators on how to meet them. The most significant regulator change was the area-specific line weighting, requiring vessels in FMA 6 to use IWL at all times when bottom longlining. IWL with a lead core of 50g per metre is considered best practice by the Agreement on the Conservation of Albatrosses and Petrels (ACAP).

From December 2024 all ling longliners are required by regulation to have cameras installed for monitoring of fish catch and ETP seabird and marine mammal interactions (FNZ, 2024).

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):

- MIT2022-01 Longline hauling mitigation devices
- MIT2023-06 Underwater line setting devices for bottom longline vessels
- MIT2023-07 Novel seabird bycatch mitigation for floated demersal longline fisheries
- MIT2024-01 Protected species liaison project

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

Two chondrichthyan species are designated as OOS based on the decision tree for species categorisation (Figure SA3). Both have 'negligible' status (Table 28).

Table 28: 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
Leafscale gulper shark *Centrophorus squamosus*	Chondrichthyan IUCN – EN	1.4	4.0	1.6	6.5	7.8	4.3	0.41	ETP/OOS-negligible Meets SA3.8.2.5
School shark *Galeorhinus galeus*	Chondricthyan IUCN - CR	18.3	12.0	2.0	16.2	4.3	10.6	1.01	ETP/OOS-negligible Meets SA3.8.2.5

Shark ETP reporting

No protected sharks have been reported captured by ling longline fisheries over the 5-year period 2016-17 to 2020-21 (https://protectedspeciescaptures.nz/).

Marine mammals

There have been no reported incidental captures of New Zealand sea lions, New Zealand fur seals, whales or dolphins by ling longline fisheries over the period 2016-17 to 2020-21 (https://protectedspeciescaptures.nz/).

ETP coral catches

Landings of corals are reported in the Annual Review Report for Deepwater Fisheries (Fisheries New Zealand, 2022a). 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, FNZ observers also record landing of other benthic bycatch such as anemones, bryozoans, sea pens and sponges.

Observed sessile benthic invertebrate catches by ling longline fisheries show that anemones are the most common group caught, with an average annual catch of around 28 kg. Very small quantities of ETP corals are reported caught (Table 29).

Table 29: Observed incidental catch of sessile benthic invertebrates by ling longline vessels during the period 2018-19 to 2022-23. ETP coral groups are shaded. Percentages calculated in relation to total observed fish and invertebrate catches. (Data source: D. Foster, FNZ, pers. Comm.)

Species/group	2018-19	2019-20	2020-21	2021-22	2022-23	5-Year Avg. (kg)	5-Year Avg. (%)
Warty deepsea anemones	-	-	-	11.50	54.50	13.20	0.0013%
Smooth deepsea anemones	-	-	-	3.00	59.60	12.52	0.0012%
Bivalves (unidentified)	-	-	-	-	13.00	2.60	0.0002%
Anemones	-	10.60	-	-	-	2.12	0.0002%
Coral (Unidentified)	-	-	2.00	-	0.50	0.50	0.0000%
Sponges	-	0.20	0.50	-	1.50	0.44	0.0000%
Bamboo corals	1.00	-	-	-	-	0.20	0.0000%
Deepwater branching coral	1.00	-	-	-	-	0.20	0.0000%
Feathery hydroids	-	-	0.20	-	-	0.04	0.0000%
Sea pens	-	-	0.20	-	-	0.04	0.0000%
Stony corals	-	-	0.20	-	-	0.04	0.0000%
Hydrocorals	-	0.10	-	-	-	0.02	0.0000%
Erect cyclostome bryozoans	-	-	0.10	-	-	0.02	0.0000%
Sea fans	-	0.10	-	-	-	0.02	0.0000%
Primnoidae soft corals	-	-	0.10	-	-	0.02	0.0000%
Totals	**2.00**	**11.00**	**3.30**	**14.50**	**129.10**	**31.98**	**0.0031%**

Incidental catches of non-protected sessile benthic invertebrates (e.g. anemones, bryozoans and sponges) are reported by vessels on Non-Fish Protected Species (NFPS) forms, along with catches of protected seabirds and marine mammals (Table 30). Note: code CSB is sometimes used when mixed catches of unidentified sessile benthics occur.

Table 30: Incidental catches of sessile invertebrates and ETP corals (generic reporting code COU) by ling longline fisheries during the period 2018-19 to 2022-23. ETP coral groups are shaded (Data source: FNZ Non-Fish Protected Species catch forms).

Species Group	Code	2018-19	2019-20	2020-21	2021-22	2022-23
Corals/Sponges/Bryozoans	CSB	-	-	1.3	-	-
Sponges	ONG	-	-	3.2	-	-
True Coral (Unidentified)	COU	-	0.1	0.1	-	-
Totals		**-**	**0.1**	**4.6**	**-**	**-**

Ling bottom longline fisheries clearly have minimal interactions with sessile benthic ETP and non-ETP species.

Habitats

Broad scale habitat maps indicate that sand, mud and gravel are the primary habitat types encountered by fisheries in the UoA areas (Figure 33). Surficial sediment (>40% classes) in the main fishery areas in depth zone 200-800m with sand and carbonate being the dominant sediments across the fishery areas (Table 31).

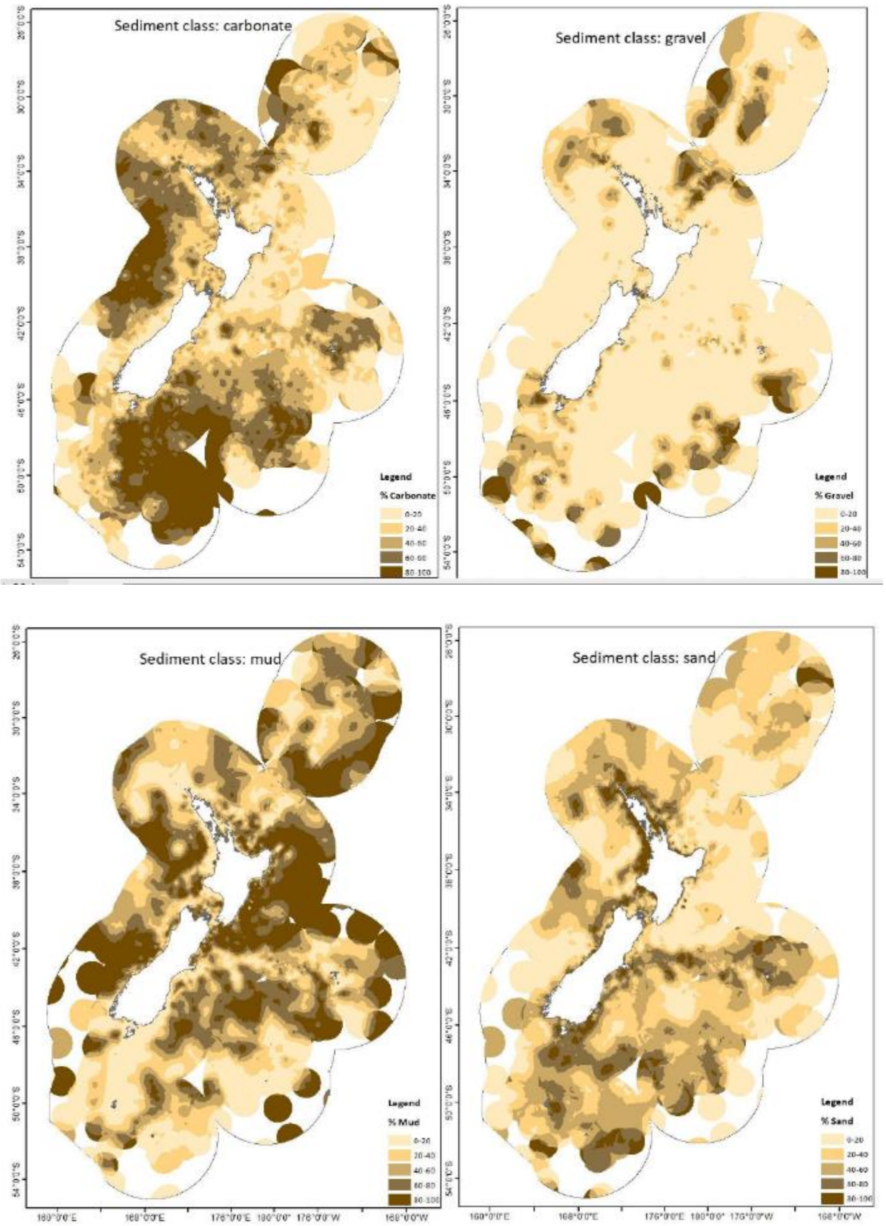

Figure 33: The interpolated distribution (%) of carbonate, gravel, mud, and sand based on the nzSEABED database. Source: (MacGibbon & Mules, 2023).

Table 31: 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 fishing depending on a range of factors, including:

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

Bottom longline is a passive gear considered to have low impact on the benthic environment, particularly compared to mobile gear types such as bottom trawling. Longline gear may, however, impact benthic communities and organisms with complex morphology (e.g. branched cold water corals) and may have the potential to negatively impact sensitive habitats over the long-term. A study in the Azores estimated a single bottom trawl could have a similar impact on a cold-water coral community as between 296 – 1 719 longline sets (Pham et al., 2014).

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.

Benthic Habitat Management

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 fishing 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 on the seabed through BPAs and SCAs, which were implemented to avoid adverse effects of fishing on the benthic environment (Figure 34). 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).

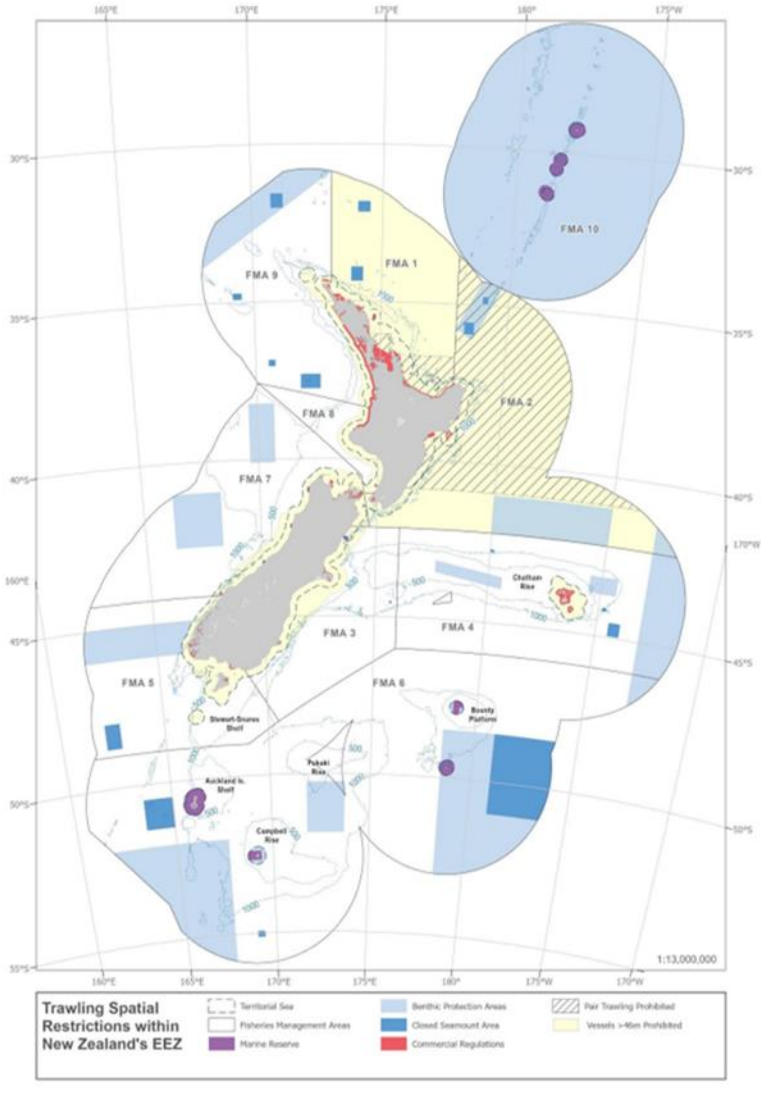

Figure 34: Map of the major spatial restrictions to bottom fishing and the Fisheries Management Areas (FMAs) within the outer boundary of the New Zealand EEZ.

Ecosystem

Hoki are a key biological component of the upper slope (200–800 m) ecosystem and is the species with the highest biomass. Hoki preys on lantern fishes and other midwater fishes, with larger hoki (over 80 cm) consuming proportionately more than smaller hoki. The diet of hoki overlaps with the diets of alfonsino, arrow squid, hake, javelinfish, Ray's bream, and shovelnose dogfish. While hoki is prey for hake, stargazers, smooth skates, several deepwater shark species and ling.

Research into deepwater ecosystems in the New Zealand EEZ is most advanced in the vicinity of Chatham Rise region. Primary production is high in the region due to the convergence of subantarctic and subtropical water and the region supports valuable deepwater fisheries, an unusually rich benthic ecosystem and large seabird populations. Ecosystem modelling of the Chatham Rise food web has been conducted since the mid-2000s (FNZ, 2023a).

Data from the Sub-Antarctic and Chatham Rise trawl surveys were used to develop ecosystem indicators using diversity, fish size, and trophic level. Species-based indicators appeared to identify some changes correlated with fishing intensity with increasing evenness (reducing diversity) but no evidence of species disappearing from the food-web. Some size characteristics of fish in research trawls on the Chatham Rise had changed, with fewer larger or heavier fish, although the median length of the catch did not change (Tuck, et al., 2009).

A balanced trophic model of Chatham Rise, with the focus on the role of demersal fish in the food web including hoki, orange roughy, smooth oreo, black oreo, ling, silver warehou, hake, javelinfish and barracouta and three fish groups: rattails, dogfish and other demersal species, showed that benthic invertebrates, macrozooplankton and mesopelagic fish had particularly high ecological importance in the foodweb (Pinkerton, (2011).

Recent work developing the Chatham Rise Atlantis model (McGregor, et al., 2019, McGregor, et al., 2020), which comprises waters from the shoreline around Chatham Islands to depths of 1,300 m along the Chatham Rise, has shown similar results to fisheries stock assessment models for key fisheries species. The key species groups are orange roughy, hoki, small pelagic fish (primarily myctophids), and spiny dogfish.

Ecosystem monitoring

Three series of scientific trawls in New Zealand waters are particularly valuable for understanding ecosystem dynamics and for monitoring for trophic and ecosystem-level effects at the level of the demersal fish community (Tuck et al. 2009):

- A scientific trawl survey has been carried out on the Chatham Rise region approximately annually since 1992
- A similar scientific trawl survey has been carried out over the Sub-Antarctic plateau over the same period, but less frequently (Bagley & O'Driscoll 2012, Tuck et al. 2009)
- 15 scientific trawl surveys have been carried out in the Hauraki Gulf region between 1980 and 2000.

These surveys used a consistent methodology and were used to investigate change in a series of indicators in the demersal fish community. Data from Chatham Rise trawl surveys between 1992 and 2007 showed evidence of increasing evenness (i.e. reduced diversity), but no evidence that species were being lost from the food web. Some size characteristics of fish had changed, with fewer fish longer than 30 cm or heavier than 750 g being taken by trawl gear, although the median length of the catch did not change (Tuck et al.,2009).

The mean trophic level index (MTI) in the demersal fish community also decreased over the same period, more in the trawl survey data than in the commercial catch data (Pinkerton, 2010). The proportion of piscivorous fish and of true demersal (rather than bentho-pelagic) species also declined over this period (Tuck et al. 2009). Interestingly, threatened species and species defined as 'low-resilience', such as dogfish and rays, increased relative to other species on the Chatham Rise and may have been due to a combination of a lack of incentive to catch these species by the fishing fleet and an increase in offal and discards that benefit demersal scavengers. There were changes in the spatial distribution of fish with 16 out of 47 species showing changes in the proportion of the study area over which 90% of their abundance by weight was caught. Of these, half showed declining range and half showed increasing range. The species showing range contractions were generally the more abundant species whereas the species expanding in spatial range were generally the less abundant species.

Examination of the diets of hoki, hake and ling on the Chatham Rise between 1990 and 2009 showed some marked between-year differences in ling diet but no trends were detected (Dunn et al. 2009; Horn & Dunn 2010). Discards and offal from fisheries were found to be an important part of the diets of deepwater fish and accounted for up to a quarter of the diet of smooth skate (*Raja innominata*), (Dunn et al. 2009, Forman & Dunn 2012).

An estimated 11 000 - 14 000 t per year of non-commercial species and 600 - 2 100 t per year of hoki are discarded by trawl fisheries (Anderson & Smith, 2005), leading to the potential for a significant modification of the diet of scavenging species (Forman & Dunn 2012). Interpreting changes in diet from discards in a way that can inform fisheries management is not straightforward as the changes covered a period of declining hoki spawning biomass (McKenzie 2013) and during a time when evidence of climate variation was noted, namely a shift in the prevalence of Kidson weather types (Kidson 2000) between 1992 and 2007 (Hurst et al. 2012). Disentangling these environmental and fishery drivers of changes to indicators of the demersal fish communities has not yet been attempted in New Zealand.

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. However, for hoki there are known changes in growth rate over time the cause of which is unknown but maybe due to density dependence with hake switching prey in response to low hoki density. There is also a suspected shift in availability of hoki in the Sub-Antarctic, which may be a response to environmental change (Cummings, et al., 2021). However, in the Sub-Antarctic there were changes to several ecosystem components (predators, prey, and competitors of hoki) during anomalously warm and cold years in the 2000s, therefore the links to hoki biomass remain unclear (O'Driscoll et al. 2011). The Chatham Rise Atlantis model has suggested trends in stock abundance (for hoki and other species) which is estimated in stock assessment models to be due to trends in recruitment but may be due to trends in natural mortality rate due to ecosystem changes or species interactions. Overall, based on published literature and expert opinion, the risk of future projected environmental change to hoki and other key Tier 1 stocks was considered low. However, further research is still in progress.

Current climate change research projects include:

- ZBD2018-02 Climate change, fish distribution meta-analysis
- ZBD2018- 03 Climate variability, trends, and fish population parameters
- ZBD2014-09 Climate change risks and opportunities.

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P3 - OVERVIEW OF MANAGEMENT INFORMATION

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.

Legal & customary framework

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 ling fisheries are managed in accordance with the National Fisheries Plan for Deepwater and Middle-depth Fisheries (FNZ,2019b). There is a species-specific chapter for ling within this plan (MPI, 2011).

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

- Fisheries management framework and objectives:
  - Part 1A - strategic direction for deep water fisheries
  - Part 1B - fishery-specific chapters and management objectives at a species level
- Annual Operational Plan (AOP) – detailing the management actions for delivery during the financial year
- Annual Review Report – reporting on progress towards meeting the five-year plan and on the annual performance of the deepwater fisheries against the AOP.

The deepwater fisheries management system undergoes periodic reviews to ensure it is able to deliver on its objectives and to identify opportunities to maximise its effectiveness. The most recent review was conducted in 2018 (IQANZ, 2018).

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 onboard 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, Seafood New Zealand Deepwater Council (DWC, then DWG) and Fisheries New Zealand (FNZ then MPI), entered into a formal partnership to enable collaboration in the management of New Zealand's deep water fisheries. This partnership was updated in 2008 and 2010 (MPI, 2010), and has directly facilitated improved management of the hake/hoki/ling trawl fisheries through:

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

FNZ and the Department of Conservation (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:

3. Voluntary compliance – outcomes are achieved through education, engagement and communicating expectations and obligations
4. Assisted compliance – reinforces obligations and provides confidence that these are being achieved through monitoring, inspection, responsive actions and feedback loops
5. Directed compliance – directs behavioural change and may include official sanctions and warnings
6. 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**

Areas monitored during in-port inspection included one or more of the following:

- Carton weights
- Adherence to state for HGT and DRE product (for HOK, HAK and LIN)
- ER reporting and landing documentation
- Verification of landing
- Compliance checks of mitigation devices for NFPS (e.g., SLEDS and tori lines)
- Inspection of PRB equipment
- Fish to meal.

Some minor non-compliance was detected during in-port inspections in relation to ER reporting including the non-reporting of discards and LIN tail cuts greater than 60mm for dressed product. Other compliance issues such as no fishing permit or certificate of registration onboard the vessel was detected and followed up by Fisheries Officers at the time with the skipper and later with the permit holder if required.

MPI Fishery Officers conducted three at-sea RNZN patrols in 2019. These patrols covered vessels operating on the East Coast of the North Island/Upper East Coast of the South Island and the West Coast South Island Hoki fishery. During these operations a total of 88 vessels were boarded and inspected, observed by RNZN helicopter and/or hailed if boarding was not possible. Of the 88 vessels, twelve had been operating in the HOK, HAK, or LIN fisheries. The Fishery Officers were briefed to examine possible compliance risks in these fisheries including one or more of the checks listed above.

Due to the COVID-19 pandemic all NZ borders and entry ports were closed to non-residents in March 2020. This resulted in fewer in-port and at sea inspections of fishing vessels throughout 2020 due to the tight restrictions of people movement and inspection criteria. In November 2020 one at sea RNZN patrol was conducted in the Northland area. During the patrol one LIN longline vessel was boarded and two trawlers with by-catch of LIN. No compliance issues were identified during these inspections.

FNZ audits commercial vessel catch-effort and landing reports, reconciles these against multiple sources including VMS records, data collected by onboard FNZ observers, and catch landing records from LFRs to ensure that all catches are reported correctly. Areas of compliance risk and/or concern are communicated to deepwater operators annually by MPI Compliance (MPI, 2019, 2020). In addition, MPI's Management and Compliance teams meet with DWG personnel and vessel operators annually to discuss and evaluate any issues of concern (DWG, 2019, 2020). Any identified risks are communicated to the fleet along with proposed remedial action to be undertaken.

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 DWG's Operational Procedures (DWG, 2021). The Minister for Fisheries relies on the effectiveness of both regulatory and non-regulatory measures to ensure the sustainable management of these fisheries.

To facilitate implementation and monitoring of performance of DWG's Operational Procedures, DWG has an Environmental Liaison Officer (ELO) whose role is to train vessel operators and skippers on ETP species mitigation methods, use of mitigation equipment, safe handling and release of incidental captures and prompt reporting of trigger-level captures to DWG and to FNZ. The ELO is on-call 24/7 to respond to any ETP species capture issues and maintains active liaison with both vessel operators and FNZ towards ensuring effective implementation of the Operational Procedures and the National Plans of Action for Seabirds (FNZ, 2020) and Sharks (MPI, 2013a).

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 ling 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 in 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 was 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’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 with 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) 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 which provided a summary of proposed technical amendments to fisheries regulations and why 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.

DWC’s 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 for *New Zealanders to work towards zero fishing-related seabird mortalities*. Its four goals are:

1. Avoiding bycatch — effective bycatch mitigation practices are implemented in New Zealand fisheries.
2. Healthy seabird populations — direct effects of New Zealand fishing do not threaten seabird populations or their recovery.
3. Research and information — information to effectively manage direct fisheries effects on seabirds is continuously improved.
4. 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, 2022a)

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 deep water fisheries are driven by the Objectives of the National Fisheries Plan for Deepwater Fisheries and delivered through Medium-Term Research Plan for deep water fisheries (MTRP), (FNZ, 2020d). The MRTP provides a five-year schedule of science and monitoring projects (e.g. biomass surveys and stock assessments), required to support the sustainable management of deepwater fisheries (Table 34 and

Table **35**).

For LIN the key stocks are assessed on a three-year cycle with the exception of LIN 6B which uses a catch threshold greater than 200 tonnes in two consecutive years to trigger consideration for an assessment. Recent LIN 6B catches meant it was due for an assessment in 2020/21 but was deferred to the 2022/23 financial year. In 2024 assessment of LIN 6B was incorporated into the assessment of the LIN 5/6 stock (Mormede et al., in prep.).

Table 34: Ling assessment schedule

	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
LIN 3/4		Assessment			Assessment	
LIN 5/6	Assessment			Assessment		
LIN 6B	~~Characterisation~~	~~Characterisation~~	Characterisation			
LIN 7			Assessment			Assessment

Table 35: Tier 2 stock research

	2020/21	2021/22	2022/23	2023/24
Barracouta	Update			
Gemfish	CPUE Update			
Ling		~~LIN 6B Update~~	LIN 6B Update	
Silver warehou		Update		
Orange roughy			ORH 1	
Alfonsinos				BYX2 characterisation

All research projects are reviewed by FNZ's Science Working Groups and assessed against FNZ's Research and Science Information Standard for New Zealand Fisheries (MFish, 2011) and the Harvest Strategy Standard (MPI, 2008).

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