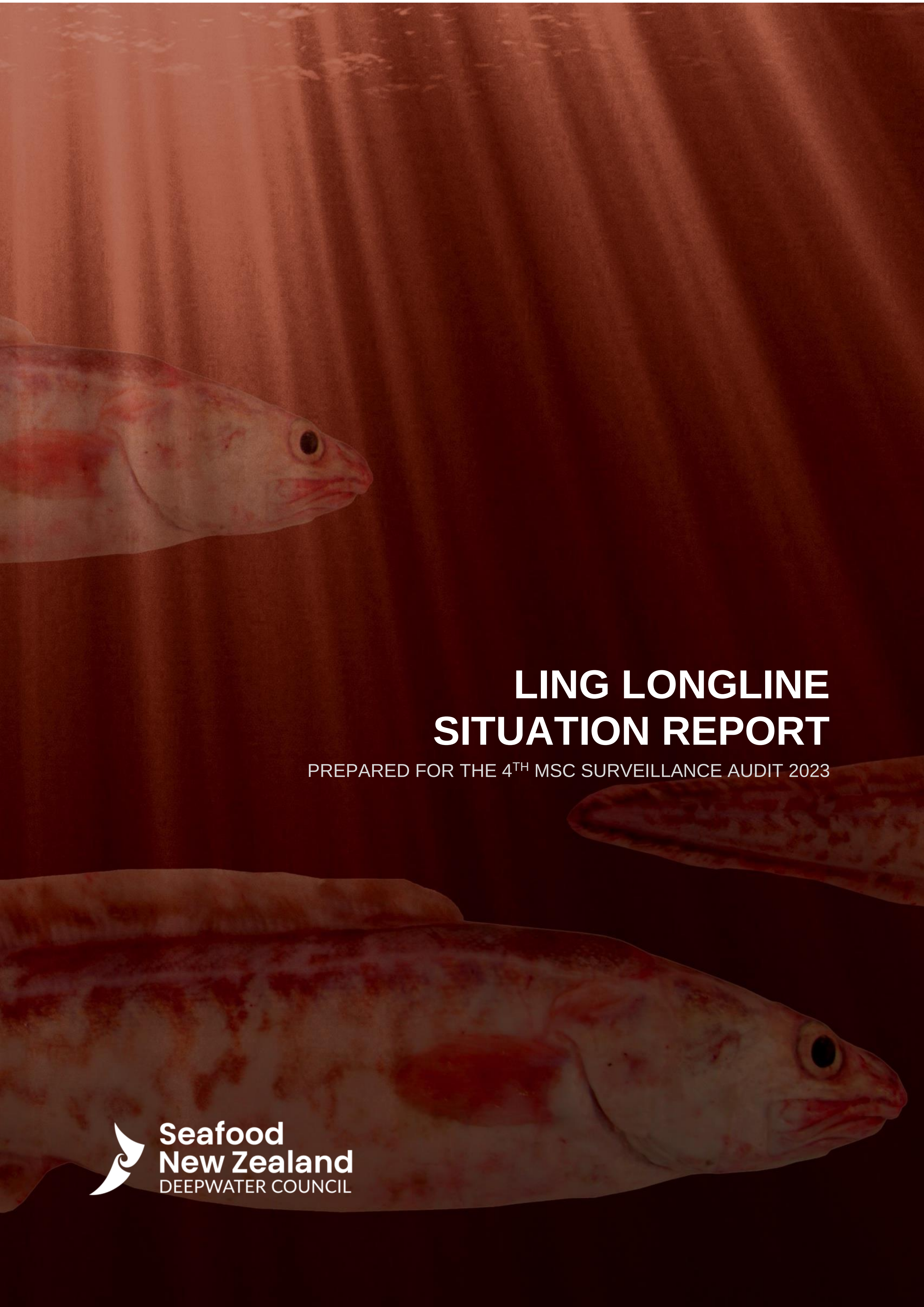

LING LONGLINE SITUATION REPORT

PREPARED FOR THE 4TH MSC SURVEILLANCE AUDIT 2023

Seafood New Zealand
DEEPWATER COUNCIL

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SITUATION REPORT FOR THE 4TH MSC SURVEILLANCE AUDIT 2023

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 previously provided for the 2022 surveillance audit.

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

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 UoC based on the base model runs

Stock	Most recent assessment	Depletion [Year]	P < Target	P < Soft Limit	P < Hard Limit
LIN 3 & 4	2022	55.8 (46.9-66.3) [2022]	> 90%	< 1%	< 1%
LIN 5 & 6	2021	70.8 (63.1-79.3) [2021]	> 99%	<1%	<1%
LIN 7WC	2023	51.1 (38.2-63.5) [2023]	>90%	<10%	<1%

Stock status, TACC & catches by component UoCs

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

	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]	[4]	95 %[6]	61 %[8]	73 %[10]

[1] 44% of total LIN catch (based on average estimated trawl catch over the last two years)

[2] 40% of total LIN catch (based on average estimated trawl catch over the last two years

[3] 32% of total LIN catch (based on average estimated trawl catch over the last two years)

[4] 30% of total LIN catch (based on average estimated trawl catch over the last two years)

[5] 90% of total LIN catch (based on average estimated trawl catch over the last two years)

[6] 85% of total LIN catch (based on average estimated trawl catch over the last two years

[7] 61% of total LIN catch (based on average estimated trawl catch over the last two years)

[8] 57% of total LIN catch (based on average estimated trawl catch over the last two years)

[9] 50% of total LIN catch (based on average estimated trawl catch over the last two years)

[10] 46% of total LIN catch (based on average estimated trawl catch over the last two years)

Update on stock status (FNZ, 2022)

LIN 3 & 4:

- For Chatham Rise (LIN 3 & 4), B_{2022} was estimated to be about 56% B_0
- Very Likely (> 90%) to be above the management target of 40% B_0 (base case run)

LIN 5 & 6:

- LIN 5 & 6 (Sub-Antarctic excl. Bounty Plateau): B_{2021} was estimated to be between 71% B_0;
- Virtually Certain (>99%) to be at or above the target (40% B_0).
- For the Bounty Plateau stock, fished only by longline (LIN 6B part of LIN 6), B_{2006} was estimated to be 61% B_0; Very Likely (> 90%) to be at or above the management target of 40% B_0.

LIN 7:

- Three alternative model runs were presented, with B_{2020} estimated to be about 47% B_0, Likely (>60%) to be at or above the management target

TACC & catch trends (FNZ, 2022)

Table 2 TACC, catch limits, catch and associated balances (all in tonnes [t]) for the LIN 3, 4, 5, 6 & 7 fisheries from 2018-19 to 2022-23.

Stock	TACC	2018-19	2019-20	2020-21	2021-22	2022-23 YTD	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	2,016	1,685	1,489	1,175	868	1,447
	Balance	88	456	764	1,078	1,397	757
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	2,044	1,778	2,129	2,604	845	2,044
	Balance	2,558	2,812	2,523	2,023	3,774	2,558
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	4,596	4,678	4,950	5,049	3,790	4,613
	Balance	210	266	49	208	1,625	472
LIN 6	TACC	8,505	8,505	8,505	8,505	8,505	
	ACE	9,420	9,418	9,399	9,370	9,389	
	Catch	3,706	3,972	3,916	3,881	3,811	3,857
	Balance	5,714	5,447	5,482	5,490	5,577	5,542
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	3,059	3,216	3,308	3,325	1,130	2,808
	Balance	59	230	308	370	2,609	715

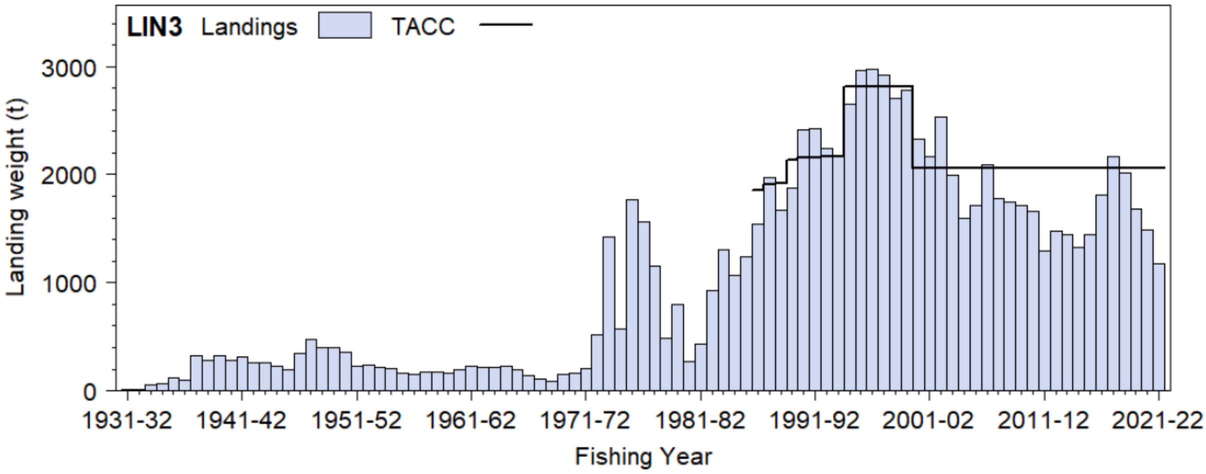

Figure 1: Reported commercial landings and TACC for LIN 3 (all gear types) (Source: FNZ, 2023)

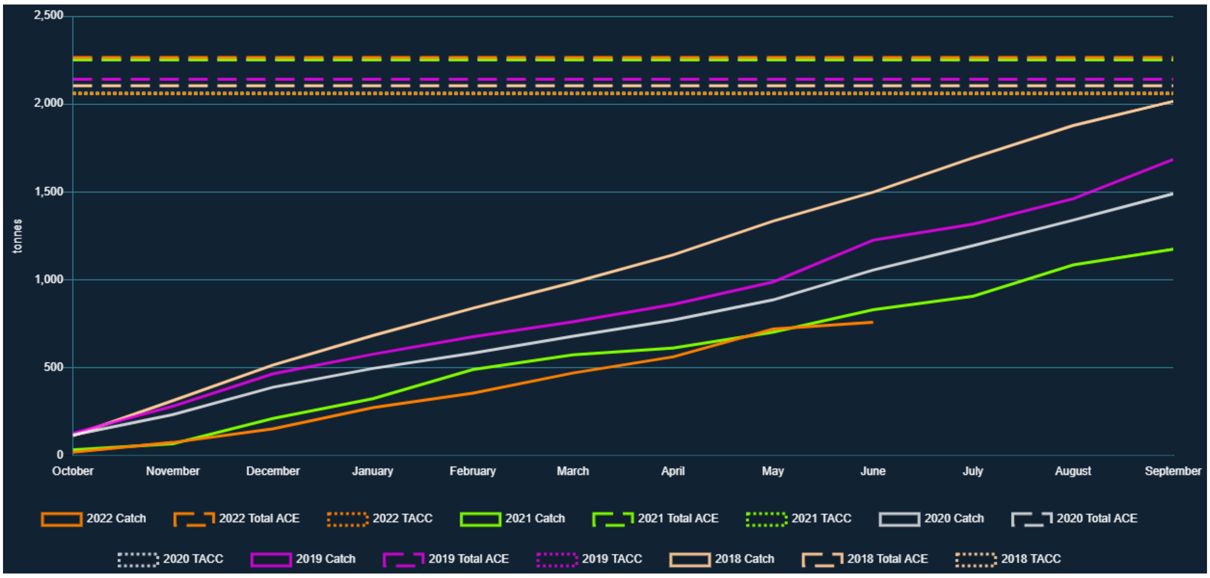

Figure 2: Reported commercial landings, total ACE and TACC for LIN 3 for fishing years 2018 – 2022. (Source: FishServe KUPE system)

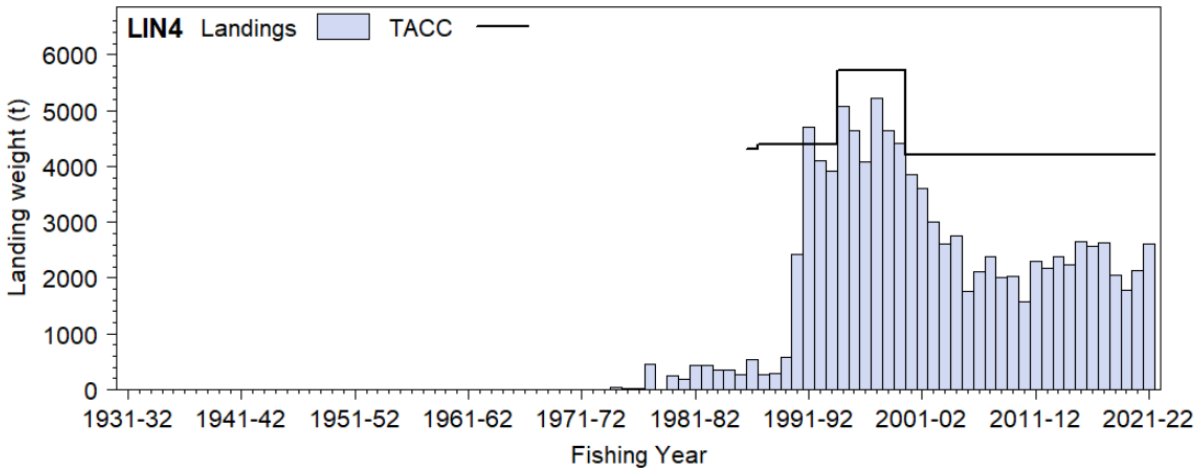

Figure 3: Reported commercial landings and TACC for LIN 4 (all gear types). Note: The LIN 4 trawl catch is largely a bycatch in the much larger eastern hoki trawl fishery and catch trends are therefore subject to forces other than ling abundance (Source: FNZ, 2023).

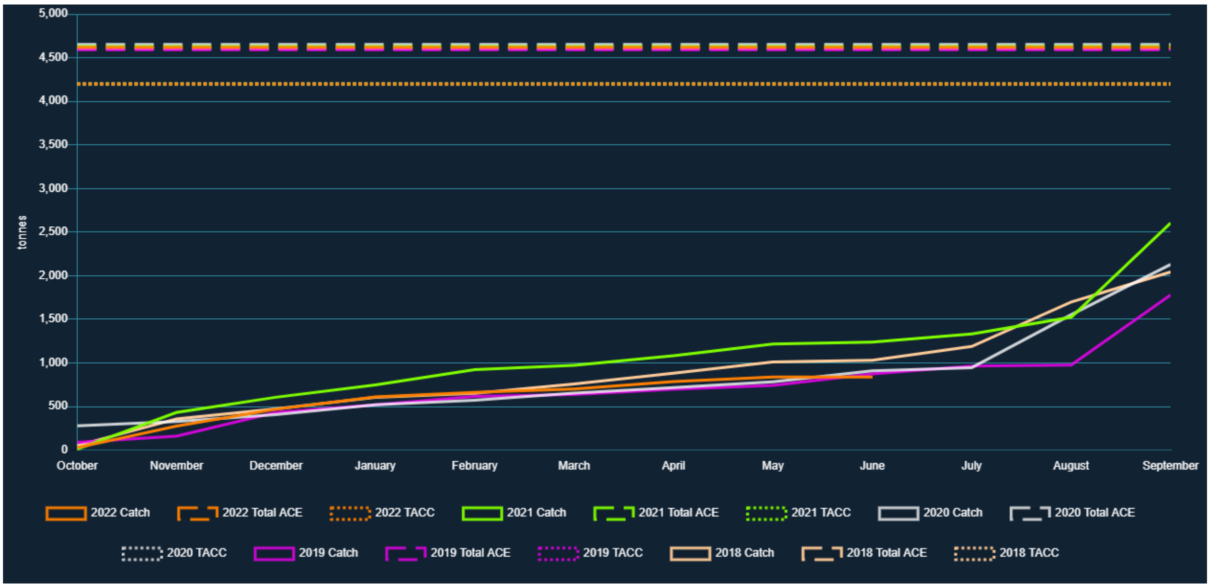

Figure 4: Reported commercial landings, total ACE and TACC for LIN 4 for fishing years 2018 – 2022. (Source: FishServe KUPE system)

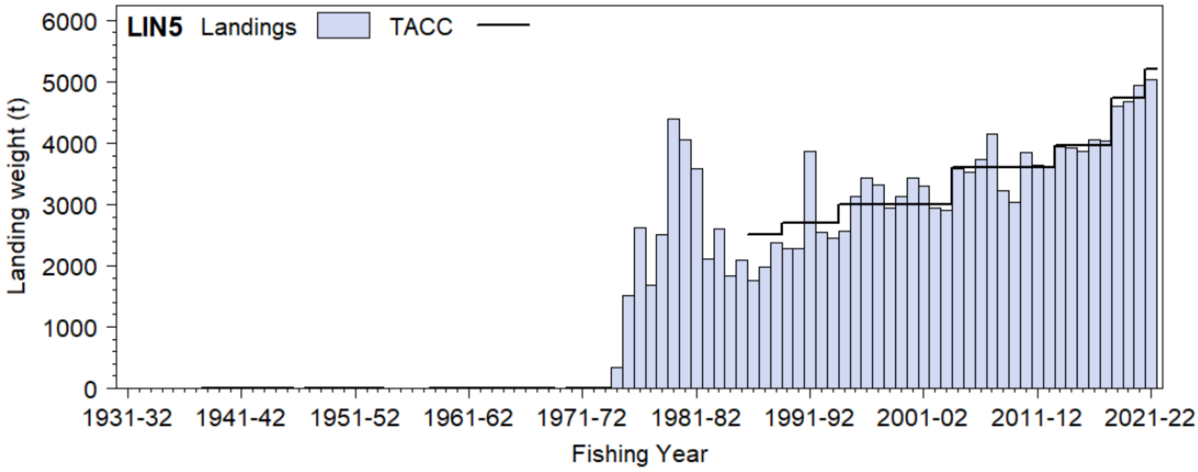

Figure 5: Reported commercial landings and TACC for LIN 5 (all gear types) (Source: FNZ, 2023).

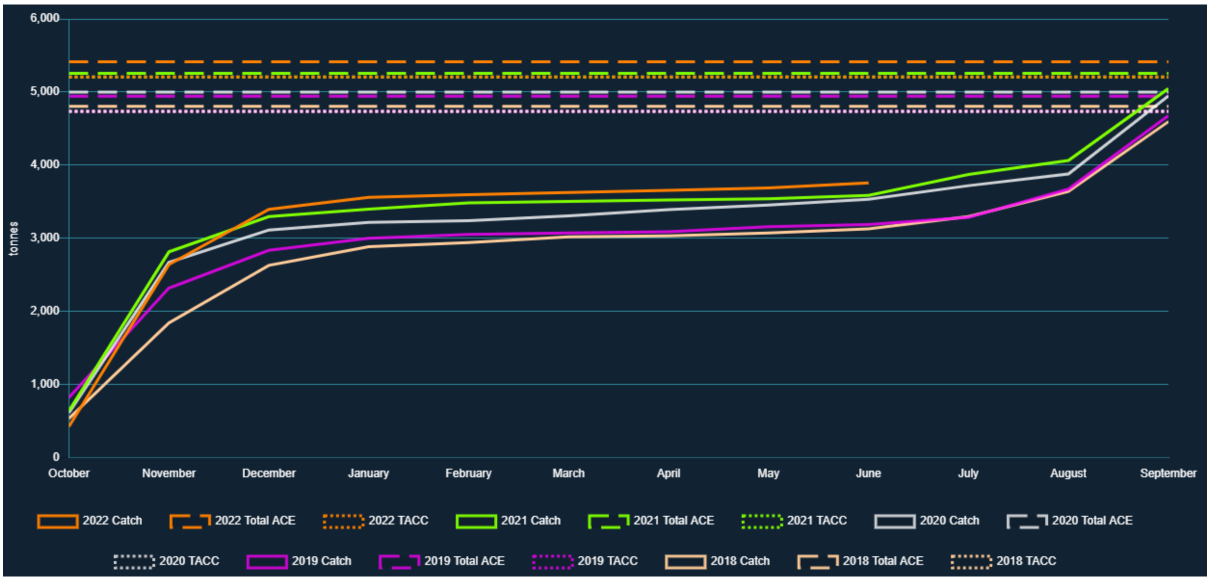

Figure 6: Reported commercial landings, total ACE and TACC for LIN 5 for fishing years 2018 – 2022. (Source: FishServe KUPE system)

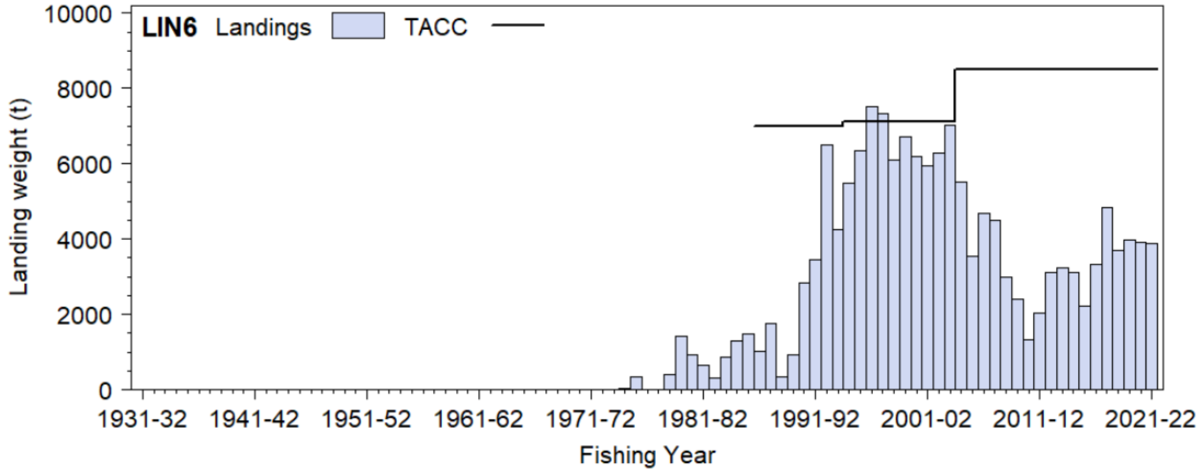

Figure 7: Reported commercial landings and TACC for LIN 6 (all gear types). Note: The LIN 6 trawl catch is largely a bycatch in the much larger western (sub-Antarctic) hoki trawl fishery and catch trends are therefore subject to forces other than ling abundance (Source: FNZ, 2023).

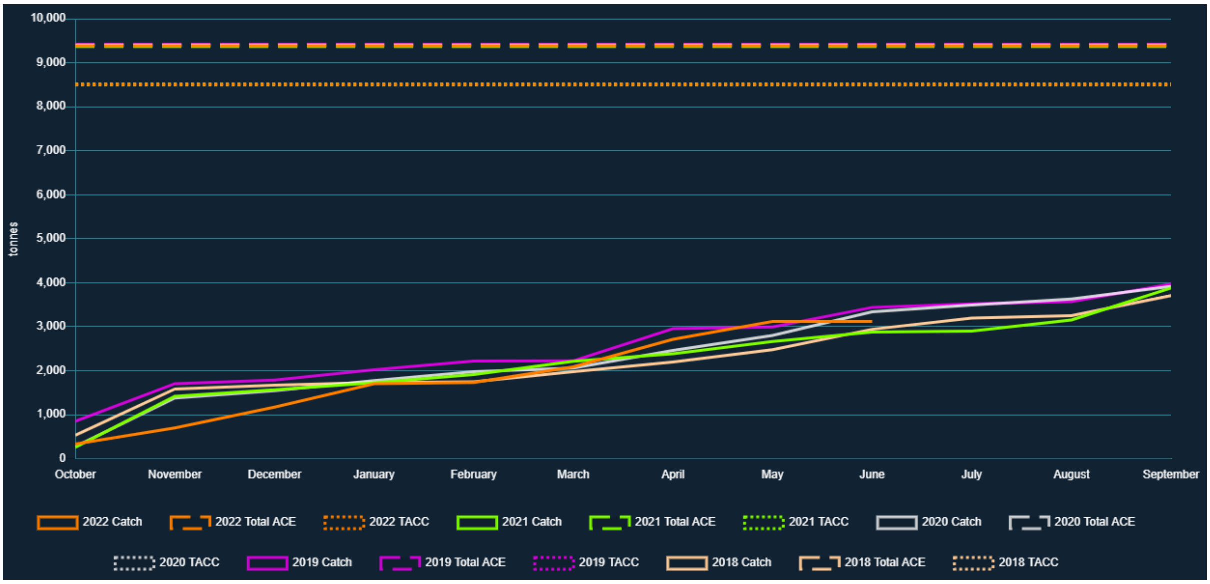

Figure 8: Reported commercial landings, total ACE and TACC for LIN 6 for fishing years 2018 – 2022.(Source: FishServe KUPE system)

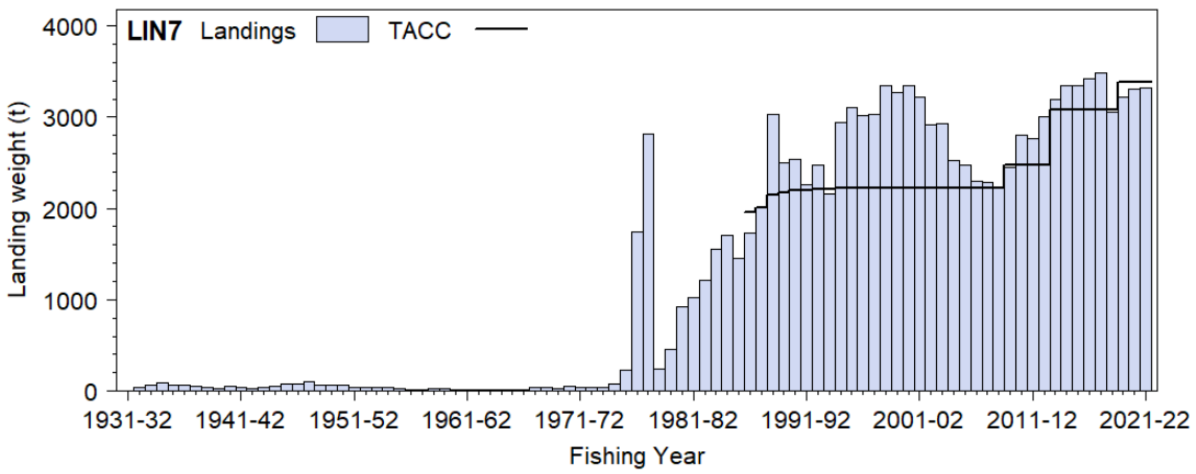

Figure 9: Reported commercial landings and TACC for LIN 7 (all gear types) (Source: FNZ, 2023).

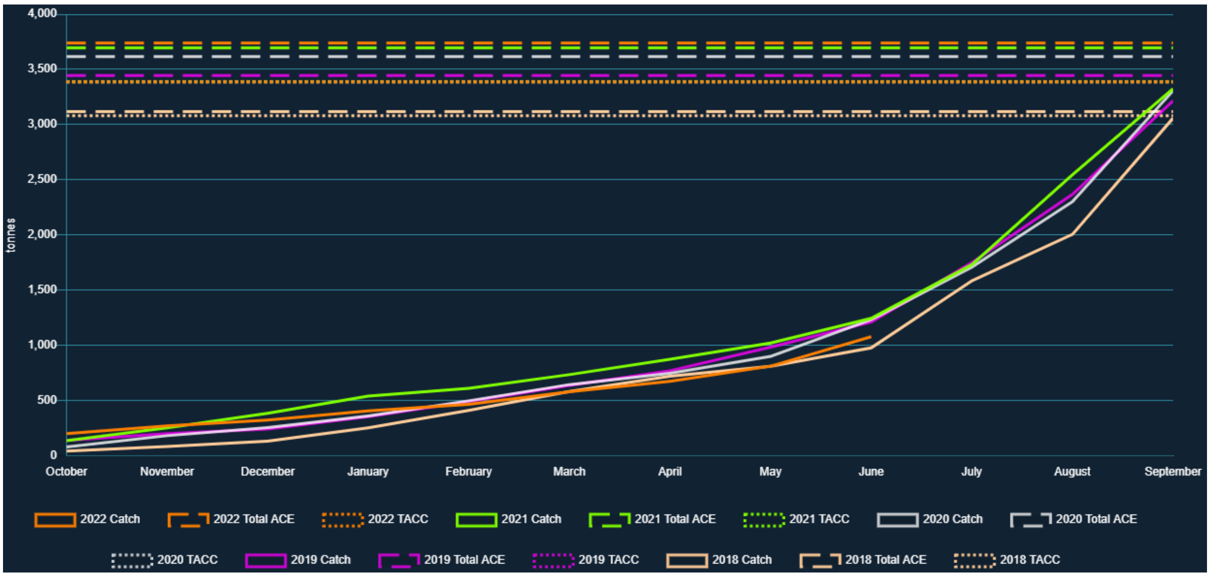

Figure 10: Reported commercial landings, total ACE and TACC for LIN 7 for fishing years 2018 – 2022. (Source: FishServe KUPE system)

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 4). 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 (Table 12, Figure 4). Annual exploitation rates (catch over vulnerable biomass) were estimated to be lower than 0.15 (often much lower) since 1979 (Figure 5). The sensitivity model based on the longline CPUE estimated lower initial biomass (88 450–96 520 t), with biomass in 2022 estimated between 27 and 41% B_0

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.

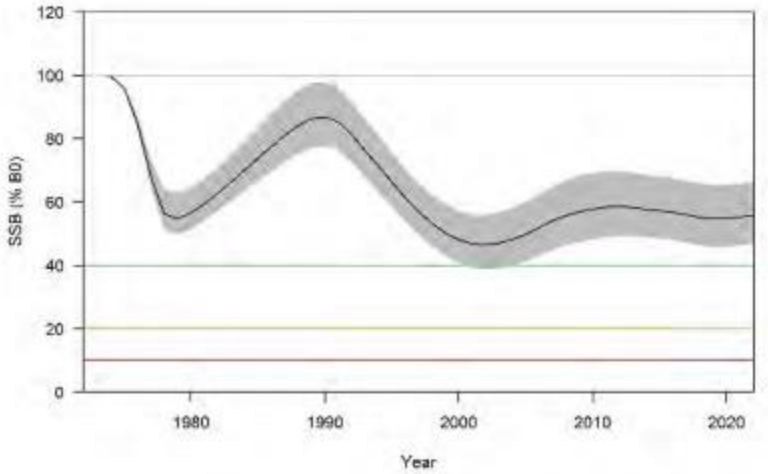

Figure 11: LIN 3 & 4 base model. Estimated median trajectories (with 95% credible intervals shown as grey band) for absolute biomass and biomass as a percentage of B_0. The red horizontal line at 10% B_0 represents the hard limit, the orange line at 20% B_0 is the soft limit, and the green line is the %B_0 target (40% B_0) (Source: FNZ, 2023).

Sub-Antarctic, LIN 5 & LIN 6 (excluding Bounty Plateau)

An age-based total catch history stock assessment model assuming a Beverton-Holt stock-recruit relationship for LIN 5 & 6 (Sub-Antarctic) was updated in 2021 (Mormede et al 2021b). 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 new 2021 base case model differs from the 2018 model in that it has two fisheries (and associated updated annual cycle), a fixed natural mortality of 0.18 y-1, nuisance survey q parameters, fixed the right-hand limb trawl selectivity parameters, and included the longline standardised CPUE index. The 2018 model uses three fisheries, estimated natural mortality, a revised annual cycle for the spawning and non-spawning longline fisheries, free survey q parameters, and excluded the longline CPUE index.

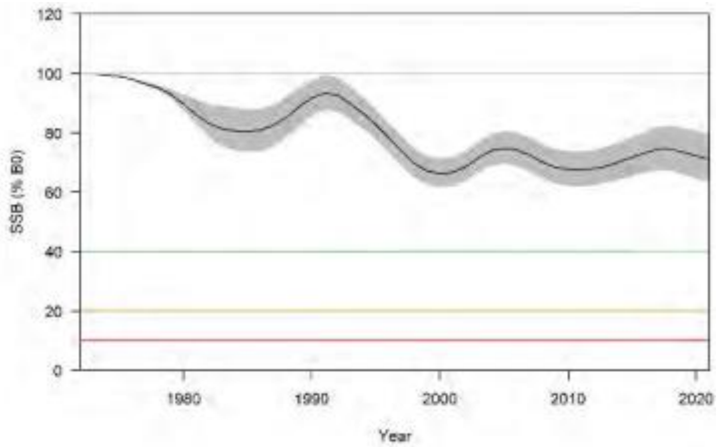

Figure 12: LIN 5 & 6 base model. Estimated median trajectories (with 95% credible intervals shown as grey band) for absolute biomass and biomass as a percentage of B_0. The red horizontal line at 10% B_0 represents the hard limit, the orange line at 20% B_0 is the soft limit, and the green line is the % B_0 target (40% B_0) (Source: FNZ, 2023).

Bounty Plateau, LIN 6B (Bounty Plateau only)

The stock assessment for the Bounty Plateau stock (part of LIN 6) was updated in 2007. Only a base case model run was completed. Final runs for the base case model used a 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.

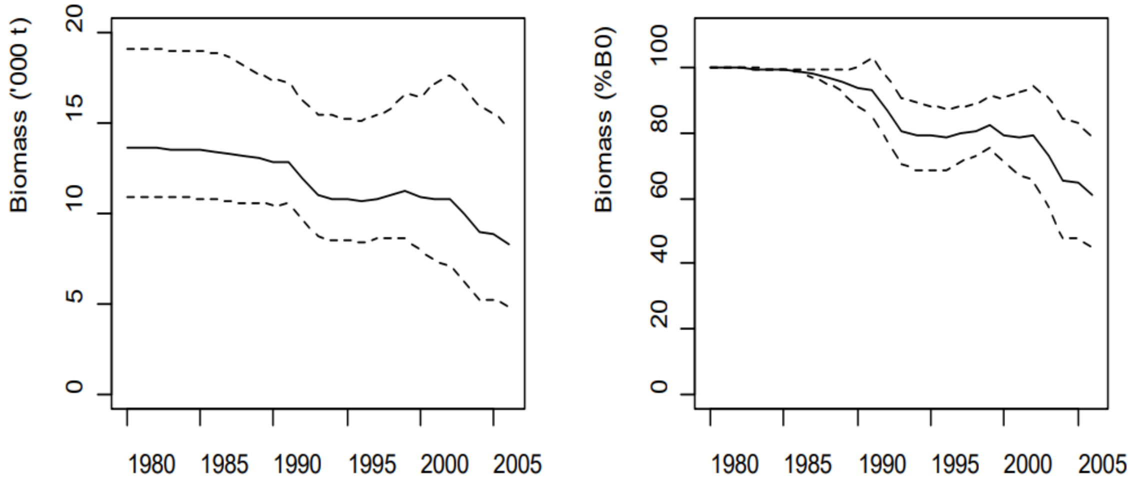

Figure 13: Trajectory over time of spawning biomass (absolute, and % B_0, with 95% credible intervals shown as broken lines) for the Bounty Plateau ling stock from the start of the assessment period in 1980 to the most recent assessment in 2006. Years on the x-axis are fishing years with "1995" representing the 1994–95 fishing year. Biomass estimates are based on MCMC results (Source: FNZ, 2023).

LIN 7

West Coast South Island, LIN 7WC

An age-based total catch history stock assessment was updated in 2020. SSB has declined to approximately 50% of its virgin biomass by 2020 with all the sensitives showing that the model is not sensitive to alternative indices of abundances. Stock projections from the model show that based on average catches biomass was expected to remain stable – noting that these projections were out to 2022 (Table 3 and Figure 14).

Table 3: LIN 7WC Bayesian median and 95% credible intervals (in parentheses) of B_0 and B_{2020} (in tonnes) and B_{2020} as a percentage of B_0 for all model runs (Source: FNZ, 2023).

Model run		B_0		B_{2020}		B_{2020} (% B_0)
Base case	54 546	(50 463–59 833)	25 556	(17 877–35 527)	47	(35–60)
Adding CPUE index of abundance (model 2)	56 159	(51 964–61 580)	28 393	(21 034–38 047)	50	(40–62)

Model run	$P(B_{2020} > 0.4B_0)$	$P(B_{2020} < 0.2B_0)$	$P(B_{2020} < 0.1B_0)$
Base case	87	0	0
Adding CPUE index of abundance (model 2)	97	0	0

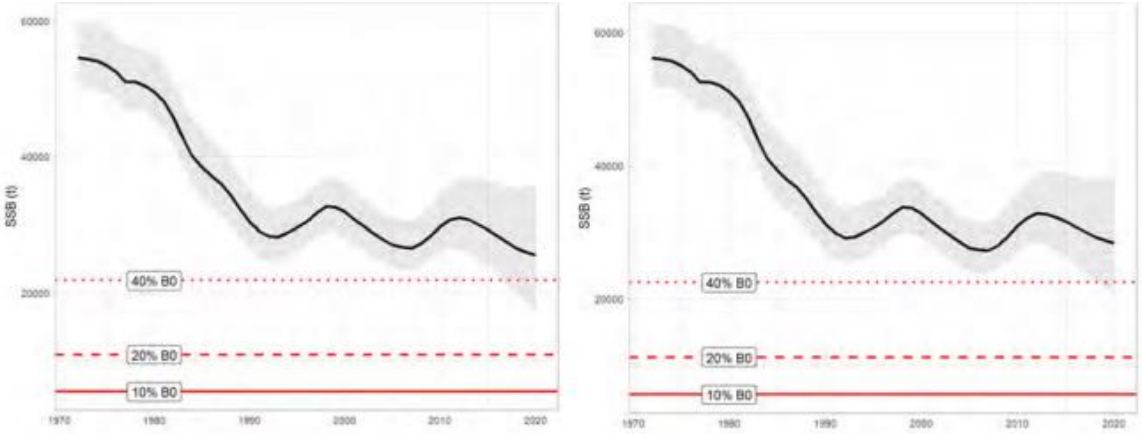

Figure 14: LIN 7WC. Estimated posterior distribution of the spawning stock biomass (SSB in tonnes) trajectory and estimated virgin spawning stock biomass reference points (40%, 20%, and 10% B_0) for the base case model (left panel) and model 2 (right panel). The solid black line represents the median values and the shaded areas the 95% confidence intervals (Source: FNZ, 2023).

Cook Strait, LIN 7CK

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 appear evident from CPUE values. The 2010 model, the last accepted stock assessment, showed that stock status was 54% B_0 but the estimate had large confidence intervals. 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.

Key P1 references

FNZ (2023). Fisheries Assessment Plenary, May 2023: Stock Assessments and Stock Status, Vol. 2 Horse Mussel to Red Crab (Ling pp.795-842) Compiled by the Fisheries Science Team, Fisheries New Zealand, Wellington, New Zealand. 1904 p. https://www.mpi.govt.nz/dmsdocument/57253-Fisheries-Assessment-Plenary-May-2023-Stock-Assessments-and-Stock-Status-Volume-2-Horse-mussel-to-Red-crab#page=155

Horn, P.L. (2022). A synopsis of the biology of ling (*Genypterus blacodes*) and a history of its fishery and assessment in New Zealand. New Zealand Fisheries Assessment Report 2022/27. 78 p. https://fs.fish.govt.nz/Doc/25193/FAR-2022-27-Ling-Biology-Fishery-And-Assessment-In-New-Zealand-4264.pdf.ashx

Mormede, S.; Dunn, A; Webber, D.N. (2021). Stock assessment of ling (*Genypterus blacodes*) in the Sub-Antarctic (LIN5&6) for the 2020–21 fishing year. New Zealand Fisheries Assessment Report 2021/64. 36 p. https://fs.fish.govt.nz/Doc/24983/FAR-2021-64-Sub-Antarctic-Ling-Stock-Assessment-2020-21-4224.pdf.ashx

Mormede, S.; Dunn, A.; Webber, D.N. (2022). Descriptive analysis of ling (*Genypterus blacodes*) on the Chatham Rise (LIN 3&4) up to 2020–21 and inputs for the 2022 stock assessment. New Zealand Fisheries Assessment Report 2022/64. 81 p. https://fs.fish.govt.nz/Doc/25329/FAR-2022-64-Ling-Descriptive-Analyses-To-202021-And-Inputs-For-2022-Assessment-Chatham-Rise-4334.pdf.ashx

Mormede, S.; Dunn, A.; Webber, D.N. (2023). Spatial-temporal standardisation of commercial longline and trawl survey catches of ling on the Chatham Rise (LIN 3&4) up to 2020–21. New Zealand Fisheries Assessment Report 2023/13. 10 p. https://www.mpi.govt.nz/dmsdocument/55858/direct

Mormede, S.; Dunn, A.; Webber, D.N. (2023). Stock assessment of ling (*Genypterus blacodes*) on the Chatham Rise (LIN3&4) for the 2021–22 fishing year. New Zealand Fisheries Assessment Report 2023/14. 39 p. https://www.mpi.govt.nz/dmsdocument/55876/direct

Saunders, R.J.; Ballara, S.; Hart, A.; Sutton, C.P. (2022). Catch-at-age for hake (*Merluccius australis*) and ling (*Genypterus blacodes*) for the 2019–20 fishing year and from a research trawl survey in 2020, and a summary of the available data sets from the New Zealand EEZ. New Zealand Fisheries Assessment Report 2022/09. 95 p. https://fs.fish.govt.nz/Doc/25134/FAR-2022-09-Hake-And-Ling-Catch-At-Age-2019-2020-4269.pdf.ashx

P2 OVERVIEW OF STOCK STATUS INFORMATION

Observer Programme

Overview

Fisheries New Zealand (FNZ) observers are deployed on commercial fishing vessels to carry out biological sampling, monitor environmental interactions, and observe and record compliance with a range of regulatory and non-regulatory management measures.

MPI's Annual Operational Plan (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

Data collected by the observer programme are used:

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

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

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

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

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

Coverage

Observer coverage of deepwater fisheries is planned by financial year and is based on biological information requirements, international requirements, percentage-level coverage targets and observer programme capacity.

The level of observer coverage for the different fisheries/sectors is tailored to suit the data and information requirements, including for stock assessment, compliance monitoring and ETP species captures. FNZ considers that 30% coverage is sufficient for most fisheries/sectors but implements high (80-100%) coverage for fisheries where there may be what are deemed by management to be high-risk ETP species (e.g., squid and southern blue whiting trawl fisheries where operations overlap with sea lions[1]).

Table 1 outlines the trend in observer coverage for the relevant stocks of LIN target fisheries for the last five years including the current fishing year. The latest Annual Review Report (ARR) (FNZ, 2022) outlined that the delivery of planned observer coverage 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 for the 2020/21 financial year. In terms of hooks being observed this equates to 7% of the hooks set by vessels <34m and 3% of those vessels >34m.

Table 4: 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>Ling</td><td>LIN 3</td><td>8%</td><td>9%</td><td rowspan="5">3 – 7%*</td><td rowspan="3">25-30%**</td><td rowspan="5">30%</td></tr>
<tr><td></td><td>LIN 4</td><td>0%</td><td>0%</td></tr>
<tr><td></td><td>LIN 5</td><td>28%</td><td>17%</td></tr>
<tr><td></td><td>LIN 6</td><td>34%</td><td>52%</td><td rowspan="2">10 – 15%+</td></tr>
<tr><td></td><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 he % 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

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

Biological sampling

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

- The number of length frequency (LF) samples and otoliths collected by observers for each fisheries complex during the 2017/18, 2018/19 and 2019/20 years;
- The number of observer days delivered for the 2017/18, 2018/19 and 2019/20 years; and
- An estimate of the number of biological samples collected by observers per fishing day (specific to each fishery complex).

As outlined in MPI's Annual Operational Plan 2022/23 (MPI, 2022) the main objective(s) of observer coverage planning is biological sampling of LIN and 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.

The 2022/23 Annual Operational Plan identifies that 100 length frequencies and 500 otoliths are the targets for each of the LIN BLL fisheries (LIN 3/4 and LIN 5/6).

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

Species	Area/method	LF target	# of LF samples	# of fish measured	Otolith target	# of otolith pairs collected
Ling	LIN 3 & 4 BLL	-	110	1197	1100*	534
	LIN 5 & 6 BLL	-	-	-	1100**	-

*** For 3 & 4 trawl and BLL combined**
**** For 5 & 6 trawl and BLL combined**

Retained & bycatch 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 sets targeting ling between 1 October 2002 and 30 September 2018.

Finucci et al. (2020) observed that the total annual non-target catch ranged from 1408–4724 t between 2002–03 and 2017–18. Finucci et al (2020) show that there has been no trend over time for the annual estimates of total non-target catch or any of the groups. The average discard fraction is recorded as 0.36, this is consistent with Anderson's result of 0.3 in 2014. 0.36 is 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 16 plots the observer catch rates and commercial catch-effort forms for the total annual non-target catch. The trend lines have a 48% correlation with catch effort records lower than the observer-based model.

QMS species

The annual non-target catch comprised predominantly of QMS species (1058–3957 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%)

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 16). 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 17).

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. Maximum non-target catch occurred in the first year of the time series (2002-03, 2,163 t) (the year before spiny dogfish entered the QMS), and as observed with QMS species, levels increased after 2014-15 (Figure 17).

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 17).

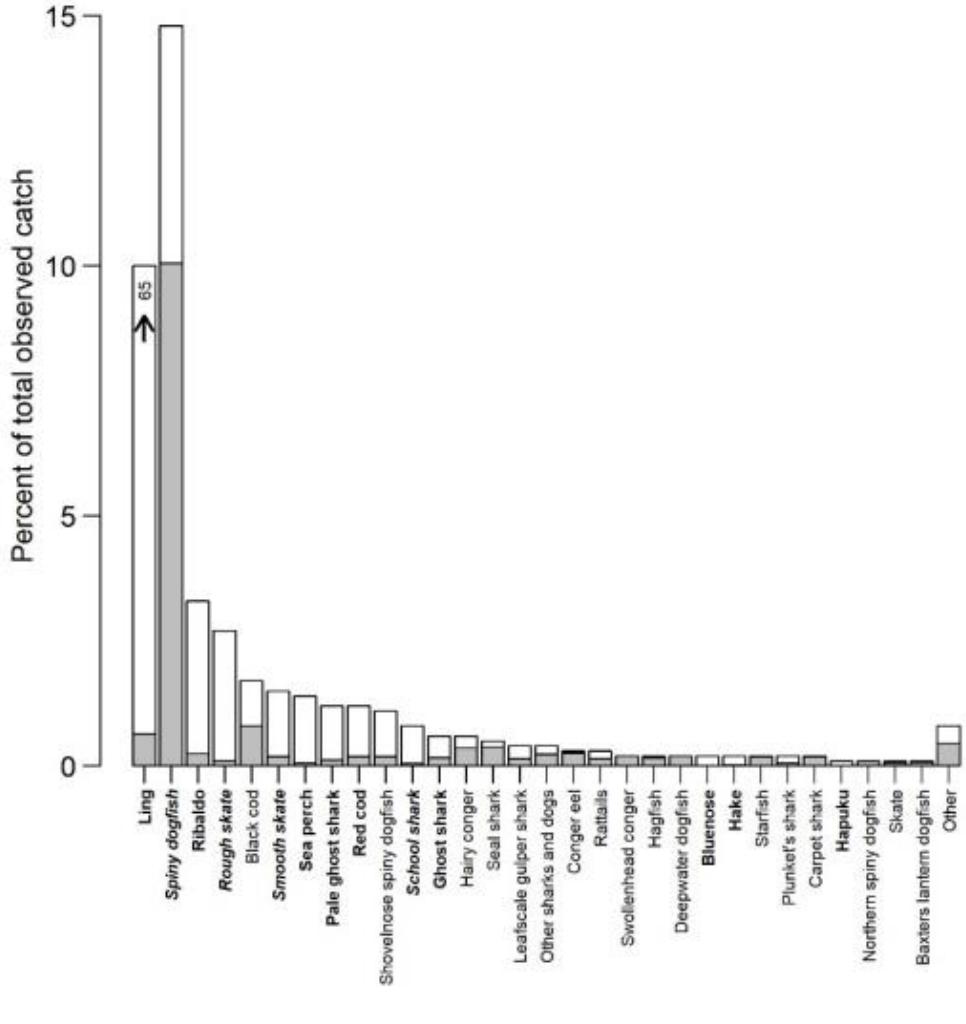

Figure 15: Percentage of the total catch contributed by the main non-target species (those representing 0.02% or more of the total catch) in the observed portion of the ling longline fishery for fishing years 2002-03 to 2017-18 (white bar), and the percentage discarded (grey bar). The Other category 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).

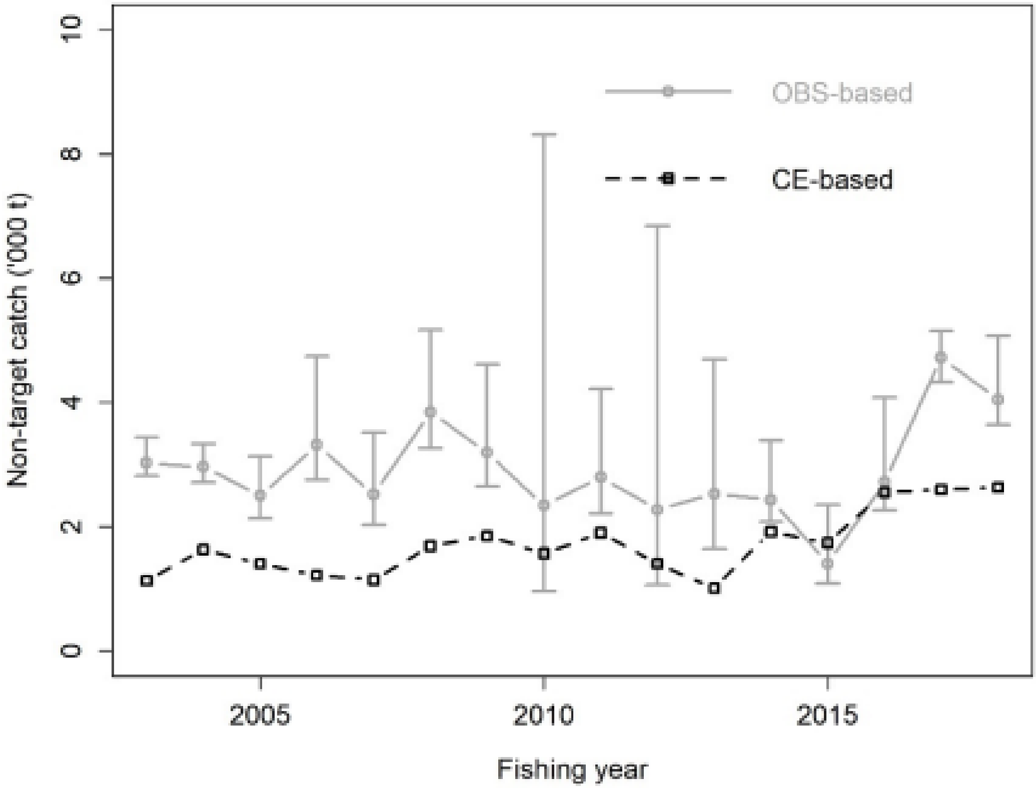

Figure 16: Total annual non-target catch in the ling longline fishery from scaled-up observer catch rates (OBS) and commercial catch-effort (CE) forms (estimated total catch minus any estimated catch of the target species) (Source: Finucci et al., 2020).

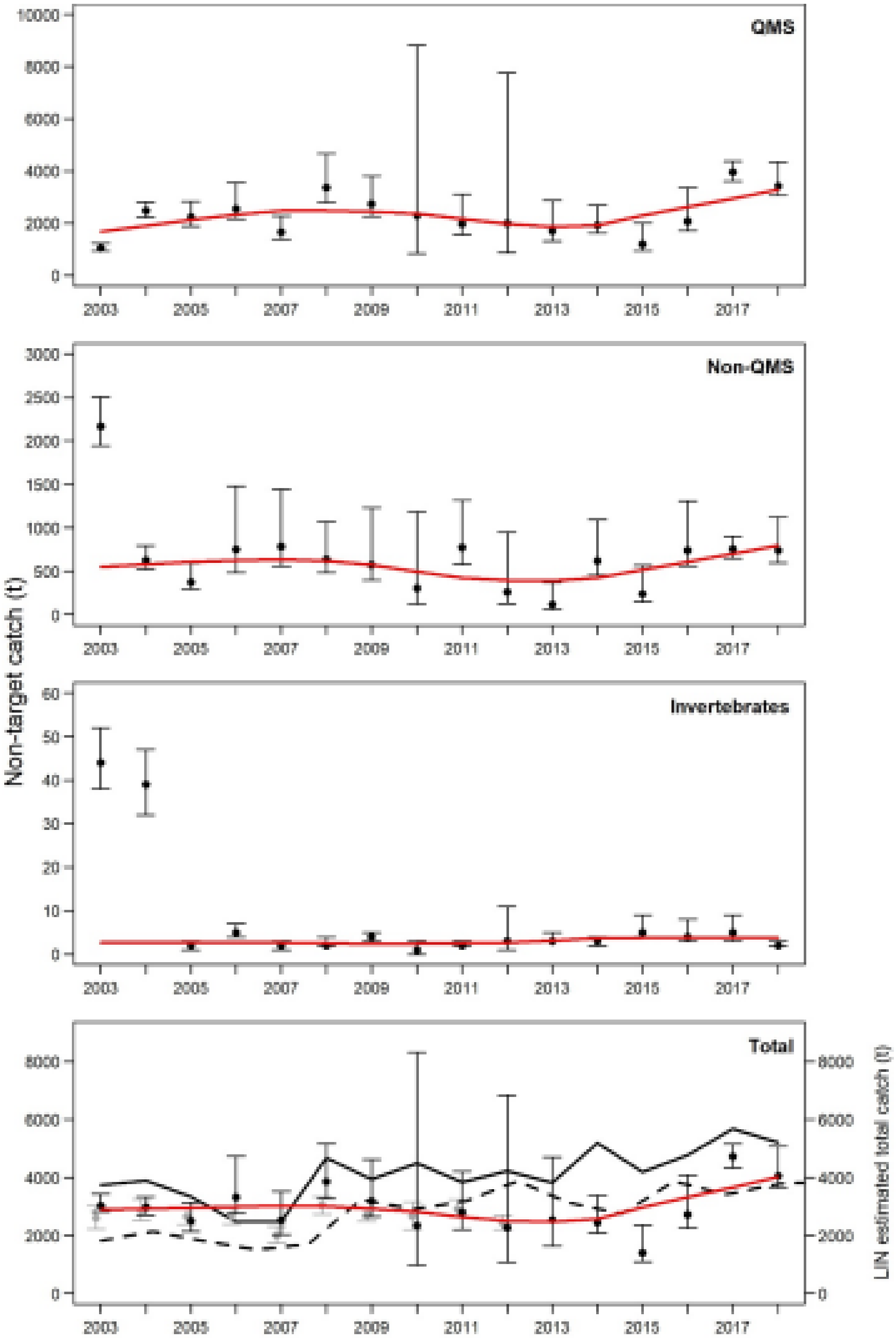

Figure 17: Annual estimates of non-target catch in the target ling longline fishery, by species category, for fishing years 2003 to 2018 (black dots). Error bars indicate 95% confidence intervals. The red lines show the fit of a locally weighted polynomial regression to annual non-target catch. Bottom 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 2442 t annually. The discard fraction (kilogram of discards/kilogram 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 catch of 11 t.
- Discards of 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 18).

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 1868 t in 2017–18. Overall, QMS species discards have showed an increasing trend since 2013–14 (Figure 18).

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 1487 t in 2002–03. Annual discard rates have remained stable without trend since 2006–07 (Figure 18).

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 18).

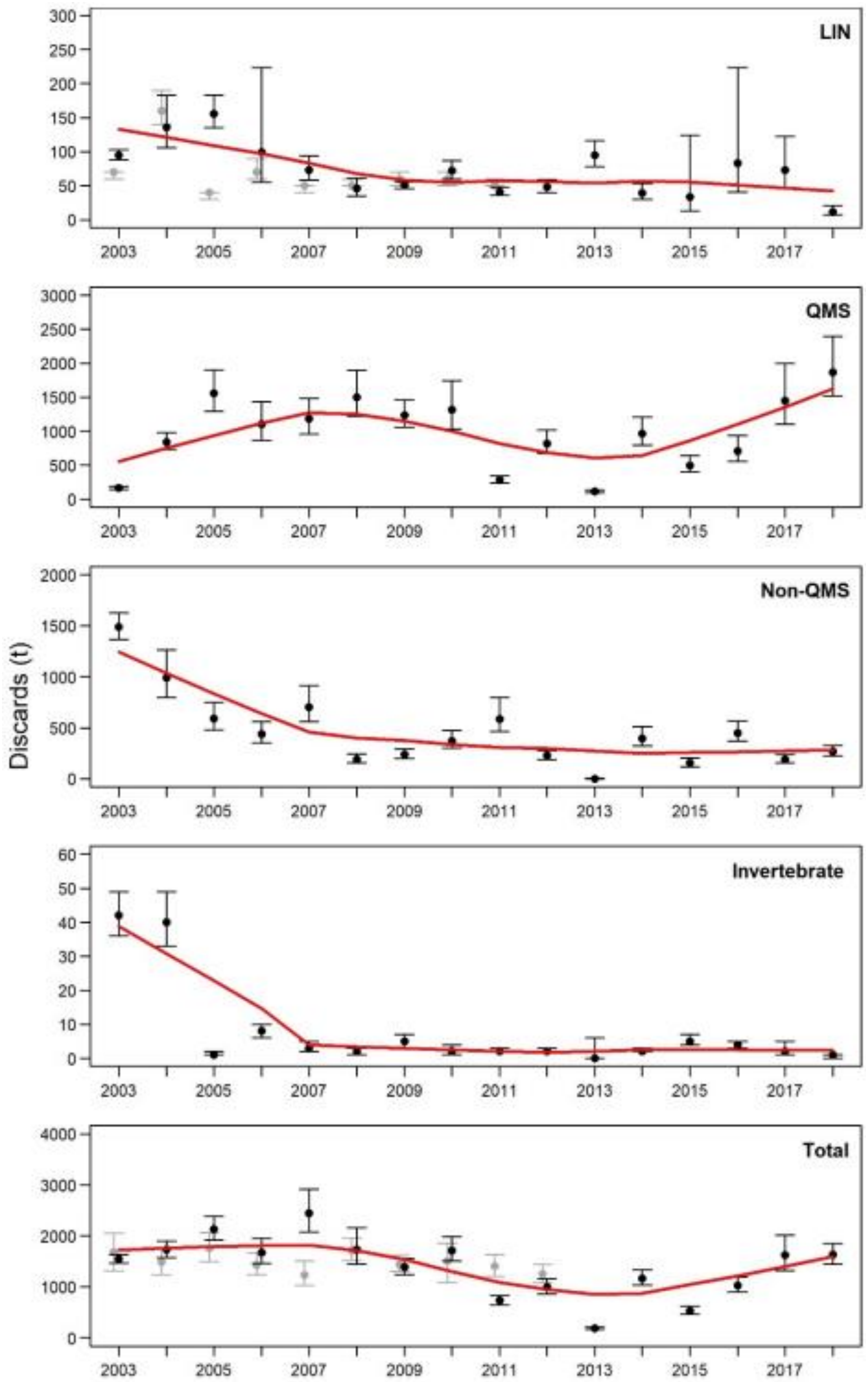

Figure 18: Annual estimates of discards in the target ling longline fishery, by species category, for 2003 to 2018 (black dots). Error bars indicate 95% confidence intervals. The red lines show the fit of a locally-weighted polynomial regression to annual discards. Also shown (grey dots, top and bottom 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).

ETP species

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.

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

The results show that only the southern Buller's albatross was estimated to have a risk metric of greater than one, indicating that current captures are higher than what can be sustained by the population over the long term. The results of the annual deaths from the LIN longline fisheries are shown in

Table 6**.**

The associated catchability and vulnerability for the LIN longline fisheries are shown in Figure 19, Figure 20, and Figure 21.

Reviewing the latest risk assessment results and the previous comparison between the 2017 and 2020 risk assessments indicates a continued reduction in risk indicating that ongoing operational mitigation is resulting in beneficial outcomes.

Table 6: LIN 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]

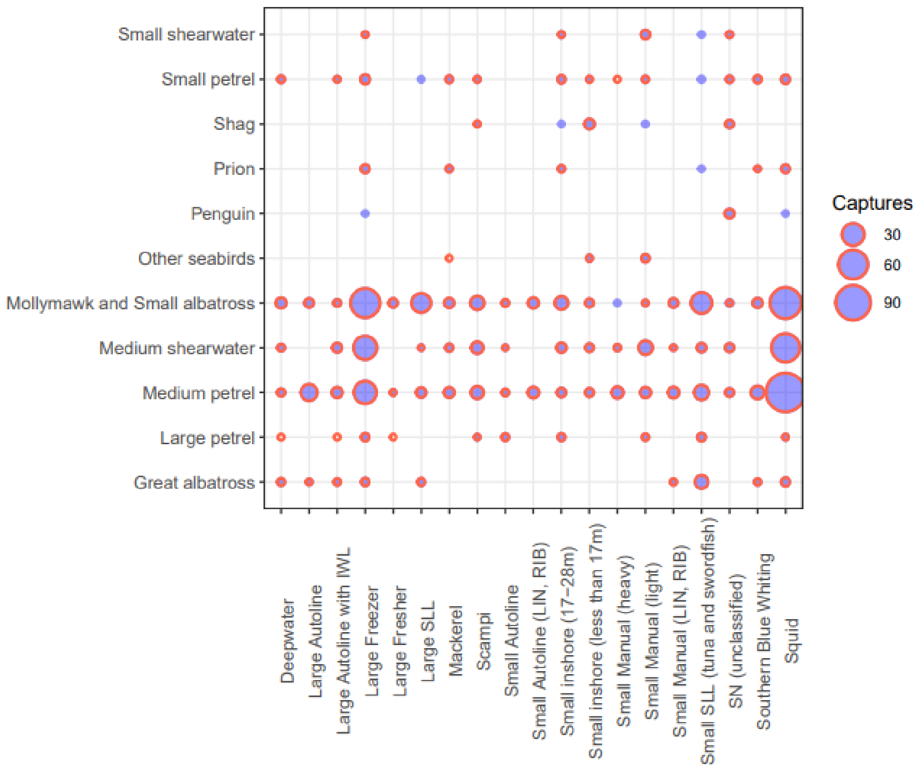

Figure 19: Model fit to observed average annual captures (C 0 f,z) per species and fishery group combination, between 2006/07 and 2019/20. Model predicted values are represented by the posterior median of the sum across species per group and shaded in blue. Empirical values are represented by red circles (Source: Edwards et al., 2023).

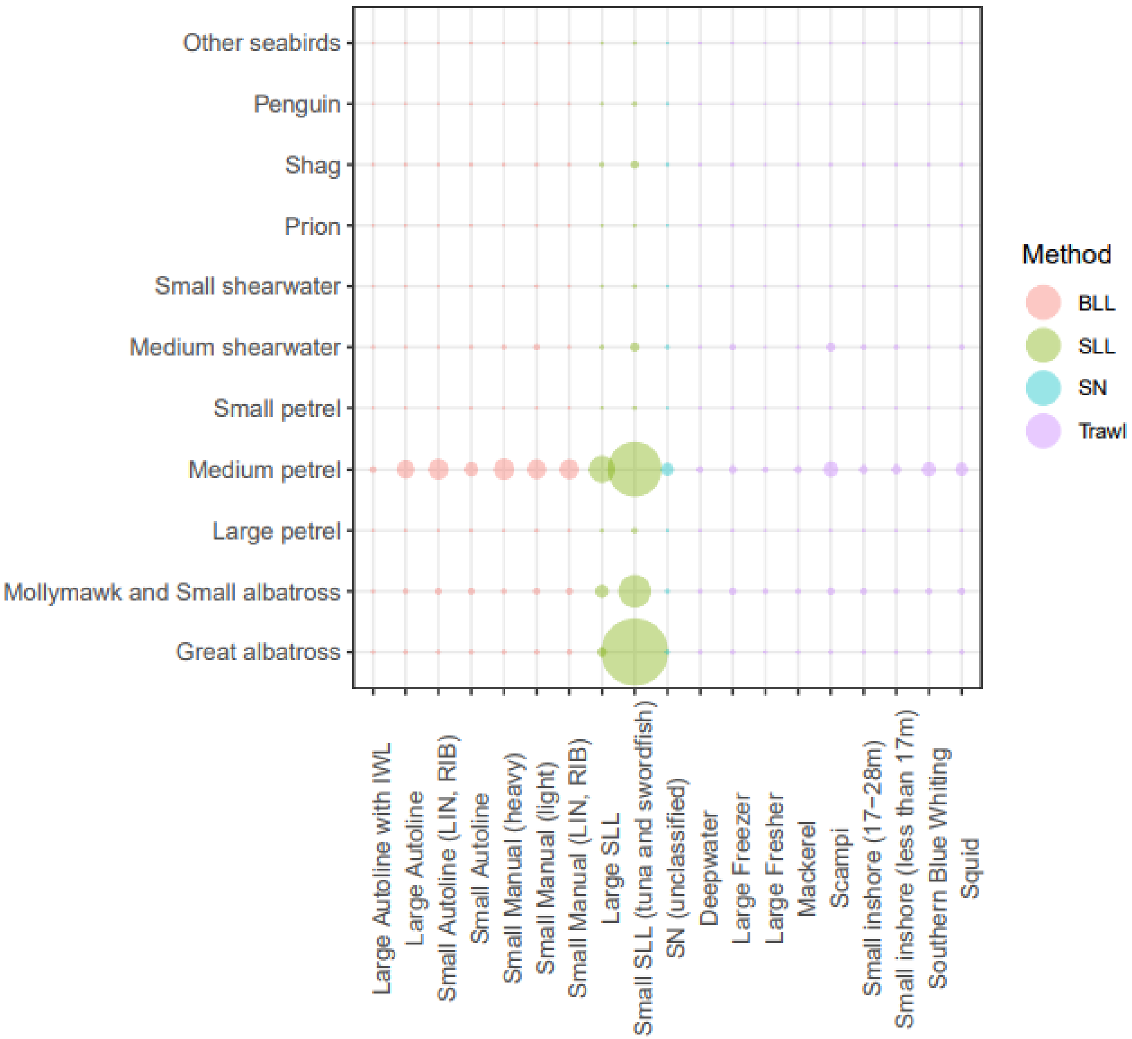

Figure 20: Catchability (qf,z) per species group and fishery group combination. Catchabilities are only comparable between methods and groups that share the same effort units (Source: Edwards et al., 2023).

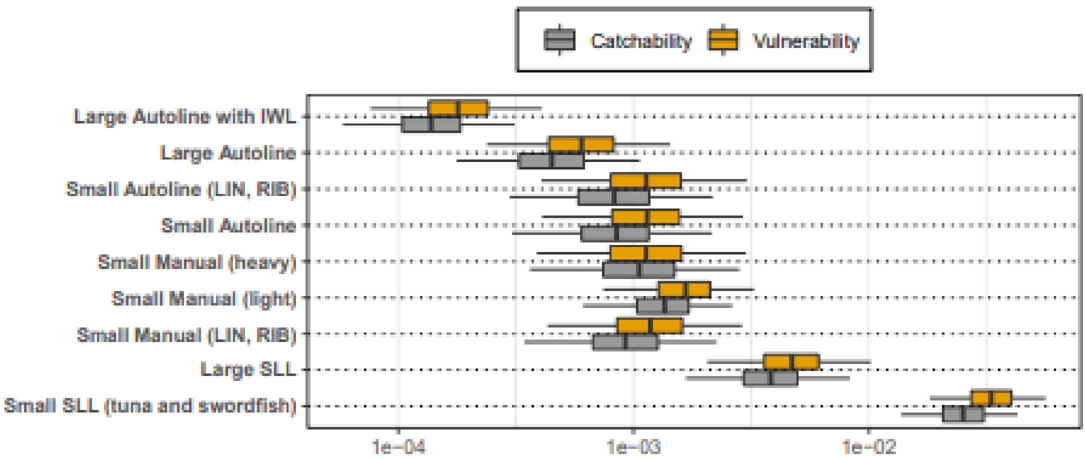

Figure 21: Marginal catchability (qf) and vulnerability (uf) per longline fishing group assuming a geometric mean across species. Values are given on a log10-scale. Boxplots show the median, and 75% and 95% posterior quantiles (Source: Edwards et al., 2023).

Between 2010-11 and 2014-15, there were 77 observed captures of seabirds in ling longline fisheries (LIN 3-7) with many released alive.

White-chinned petrel is the species captured most often (accounting for around 56% of captures over the last five years) and 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). 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 when there are strong winds).

DOC has projects in train related to the risks posed by ling longliners to seabirds including Chatham Island albatross seabird research that continues to monitor adult survival and will help improve data available to the risk assessment process (Bell, 2017).

DWG, in collaboration with MPI, have developed a strategy for managing risks to seabirds from small (<34 m) ling longline vessels.

Marine mammals

There have been no reported incidental captures of New Zealand sea lions, New Zealand fur seals, whales or dolphins in the ling longline fisheries.

Sharks

Sharks are caught primarily as bycatch and do not form a large proportion of the overall catch. QMS shark species most often captured in deepwater fisheries include spiny dogfish, ghost sharks, rough and smooth skates and school sharks (FNZ, 2022a and Ford, 2018). Eighty-seven percent of QMS sharks by weight excluding spiny dogfish were either retained or released alive between the 2013/14 and 2019/20 fishing years, with the remainder being discarded under the sixth schedule of the Fisheries Act13 (FNZ, 2022a).

Benthic interactions

Bottom longline fishing has minimal interactions with the benthic habitat. Tingley (2017) summarises New Zealand's strategy for managing the benthic effects of fishing.

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

Ongoing research

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

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

- INT2019-04: Identification and storage of cold-water coral bycatch.
- INT2019-05: Coral biodiversity in deep water fisheries bycatch.

Key P2 references

Abraham E. R., Thompson F. N. (2015). Captures of all birds in ling longline fisheries, in the New Zealand Exclusive Economic Zone, during the 2014–15 fishing year. Retrieved from https://psc.dragonfly.co.nz/2016v1/released/birds/ling-longline/all-vessels/eez/2014-15/, July, 2023.

Anderson, O.F. (2014). Fish and invertebrate bycatch and discards in New Zealand ling longline fisheries from 1992-93 until 2011-12. New Zealand Aquatic Environment and Biodiversity Report No. 138. 68 p. https://www.mpi.govt.nz/dmsdocument/4720/direct

Ballara, S.L. (2015). Fish and invertebrate bycatch in New Zealand fisheries from 1990–91 until 2012–13. New Zealand Aquatic Environment and Biodiversity Report No. 158. https://www.mpi.govt.nz/dmsdocument/9701-AEBR-158-Fish-and-invertebrate-bycatch-in-New-Zealand-deepwater-fisheries-from-199091-until-201213

Bell, M. (2017). Chatham Island seabird research 2016-17. DOC CSP Report. 25 p. https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/pre-2019-annual-plans/pop2016-01-chatham-islands-aerial-survey-final-report.pdf

DWG (2021) Deepwater Group Environmental Liaison Officer (ELO) Report for 2020-21 Fishing Year (https://deepwatergroup.org/wp-content/uploads/2022/06/Cleal-2021-Environmental-Liaison-Officer-Report-prepared-for-Deepwater-Group-December-2021.pdf)

Edwards, C.T.T.; Peatman, T.; Goad D.; Webber, D.N. (2023). Update to the risk assessment for New Zealand seabirds. New Zealand Aquatic Environment and Biodiversity Report No. 314. 66 p. https://www.mpi.govt.nz/dmsdocument/57181/direct

Finucci, B.; Anderson, O.F.; Edwards, C.T.T. (2020). Non-target fish and invertebrate catch and discards in New Zealand ling longline fisheries from 2002–03 to 2017–18. New Zealand Aquatic Environment and Biodiversity Report No. 241. 83 p. https://www.mpi.govt.nz/dmsdocument/40757-AEBR-241-Non-target-fish-and-invertebrate-catch-and-discards-in-New-Zealand-ling-longline-fisheries-from-200203-to-201718

FNZ (2022a). Aquatic Environment and Biodiversity Annual Review 2021. Compiled by the Aquatic Environment Team, Fisheries Science and Information, Fisheries New Zealand, Wellington New Zealand. 779 p. https://www.mpi.govt.nz/dmsdocument/51472-Aquatic-Environment-and-Biodiversity-Annual-Review-AEBAR-2021-A-summary-of-environmental-interactions-between-the-seafood-sector-and-the-aquatic-environment

FNZ, (2022b) National Plan of Action for the Conservation and Management of Sharks 2022 Draft for Consultation. Fisheries New Zealand, July 2022 (https://www.mpi.govt.nz/dmsdocument/52438-Draft-National-Plan-of-Action-for-the-Conservation-and-Management-of-Sharks-2022)

FNZ (2022c) Annual Operational Plan for Deepwater Fisheries 2022/23. Fisheries New Zealand Technical Paper No: 2022/01 https://www.mpi.govt.nz/dmsdocument/51892-Annual-Operational-Plan-for-Deepwater-Fisheries-202223

Ford, R.B.; Francis, M.P.; Holland, L.; Clark, M.R.; Duffy, C.A.J.; Dunn, M.R.; Jones, E.; Wells, R. (2018). Qualitative (Level 1) risk assessment of the impact of commercial fishing on New Zealand chondrichthyans: an update for 2017. New Zealand Aquatic Environment and Biodiversity Report No. 201. 103 p https://www.mpi.govt.nz/dmsdocument/29807-aebr-2018201-qualitative-level-1-risk-assessment-of-the-impact-of-commercial-fishing-on-new-zealand-chondrichthyans-an-update-for-2017

Baker, B. & Hamilton (2010). Assessment of the impact of incidental fisheries mortality on the Campbell Island New Zealand sea lion *Phocarctos hookeri* population using the Potential Biological Removal technique. https://deepwatergroup.org/wp-content/uploads/2013/09/Baker-Hamilton-2012-Assessment-of-the-impact-of-incidental-fisheries-mortality-on-the-Campbell-Island-NZSL-using-PBR.pdf

Helson, J., Leslie, S., Clement, G., Wells, R. and Wood, R. (2010). Private rights, public benefits: Industry-driven seabed protection. Marine Policy 34, 557–566. https://deepwatergroup.org/wp-content/uploads/2021/11/Helson-et-al-2010-Private-Rights-Public-Benefits-Industry-driven-seabed-protection.pdf

Middleton, D.A.J., and Guard, D. (2021) Summary and evaluation of the electronic monitoring programmes in the SNA 1 trawl and bottom longline fisheries. New Zealand Fisheries Assessment Report 2021/37. ISSN 1179-5352 (online) https://www.mpi.govt.nz/dmsdocument/45928-FAR-202137-Summary-and-evaluation-of-the-electronic-monitoring-programmes-in-the-SNA-1-trawl-and-bottom-longline-fisheries

MPI (2013). National Plan of Action – 2013 to reduce the incidental catch of seabirds in New Zealand Fisheries. 63 p. https://www.mpi.govt.nz/dmsdocument/3962-national-plan-of-action-2013-to-reduce-the-incidental-catch-of-seabirds-in-new-zealand-fisheries

Pierre, J.P. & Goad, D.W. (2016). Improving tori line performance in small-vessel longline fisheries. *Conservation Services Programme Project MIT2014-02.* DOC: Wellington https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/pre-2019-annual-plans/mit2014-02-toriline.pdf

Plencner, T. 2023. CSP Liaison Programme Annual Report 2021-22. Final Report for MIT2021-01, Department of Conservation. 44 p. https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202122-annual-plan/mit2021-01-protected-species-liaison-project-annual-report-2021-22.pdf

Richard, Y. & Abraham, E.R. (2015). Assessment of the risk of commercial fisheries to New Zealand seabirds, 2006-07 to 2012-13. New Zealand Aquatic Environment and Biodiversity Report 162. 85 p. https://www.mpi.govt.nz/dmsdocument/10523

Richard, Y. & Abraham, E.R. (2015a). Assessment of the risk of commercial fisheries to New Zealand seabirds, 2006-07 to 2012-13: Supplementary information. New Zealand Aquatic Environment and Biodiversity Report 162. https://fs.fish.govt.nz/Doc/23980/AEBR-162-risk-supplement.pdf.ashx

Richard, Y.; Abraham, E.; Berkenbusch, K. (2020). Assessment of the risk of commercial fisheries to New Zealand seabirds, 2006–07 to 2016–17. New Zealand Aquatic Environment and Biodiversity Report 237. 57 p. https://www.mpi.govt.nz/dmsdocument/39407-aebr-237-assessment-of-the-risk-of-commercial-fisheries-to-new-zealand-seabirds-200607-to-201617

Tingley, G.A. (2017). Managing the impacts of fishing on benthic habitat in New Zealand. Report prepared for Deepwater Group. 3 p. https://deepwatergroup.org/wp-content/uploads/2017/06/Managing-the-Impacts-of-Fishing-on-Benthic-Habitat-in-New-Zealand.pdf

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

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

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

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

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

At an operational level, the 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 collectively consists of three parts:

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

Fisheries Change Programme

The programme has 3 parts:

- Introducing mandatory electronic catch and position reporting to improve the collection and reliability of fisheries information
- Changing fishing rules and policies to make them simpler, fairer and more responsive, while also incentivising better fishing practice
- Improving monitoring and verification capabilities, including the use of 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, DWG and MPI entered into a formal partnership to enable collaboration in the management of New Zealand's deepwater fisheries. This partnership was updated in 2008 and 2010 and has directly facilitated improved management of the ling fisheries through:

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

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

Compliance & enforcement

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

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

Since 1994, all vessels over 28 m have been required by law to be part of the Vessel Monitoring System (VMS) which, through satellite telemetry, enables MPI to monitor all deepwater vessel locations at all times. In combination with at-sea and aerial surveillance, supported by the New Zealand joint military forces, the activities of deepwater vessels are fully monitored and verified to ensure compliance with both regulations and with industry-agreed operating procedures.

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

MPI audits commercial vessel catch-effort and landing reports 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 Fisheries relies on the effectiveness of both regulatory and non-regulatory measures to ensure the sustainable management of these fisheries.

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

Fisheries plans

The National Fisheries Plan for Deepwater and Middle-depth Fisheries is a statutory document approved by the Minister of Fisheries. This Plan provides an enabling framework outlining agreed management objectives, timelines, performance criteria and review processes. There is a fisheries-specific chapter for the 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 7 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 and Summary of proposed technical amendments to fisheries regulations that an administrative change was needed to reduce the resource-intensive and time-consuming nature of extending or changing the species covered by the fins artificially attached approach.

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

2. NPOA-Seabirds

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

The NPOA Seabirds 2020's vision is 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 7: 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 Deepwater Plan and delivered through the research programme for deep water fisheries.

MPI's medium-term research plan for deep water fisheries provides a five-year outlook on planned research to support sustainable management of deepwater fisheries (Table 8 and Table 9). All research projects are reviewed by MPI's Science Working Groups and assessed against MPI's Research and Science Information Standard for New Zealand Fisheries.

According to this research plan, if the catch from LIN 6B exceeds 200 tonnes in 2 consecutive years, an assessment will be considered. Catch from LIN 6B has been over 200 tonnes every year since 2015/16 and a characterisation (and possible stock assessment) was scheduled for 2020/21. Due to competing priorities, this characterisation was deferred to the 2022/23 financial year.

Table 8: 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 9: 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

Key P3 references

DWG (2018a) Deepwater Trawl - Reporting Operational Procedures Version 3.0 https://deepwatergroup.org/wp-content/uploads/2018/10/Reporting-OP-Version-3.pdf

DWG (2018b) Deepwater Trawl Seabirds Operational Procedures Version 6.0 https://deepwatergroup.org/wp-content/uploads/2018/12/Seabirds-OP-V6.pdf

DWG (2018c) Deepwater Trawl Marine Mammals Operational Procedures Version 9.0 https://deepwatergroup.org/wp-content/uploads/2018/11/MMOP-Version-9-2.pdf

DWG (2020) Deepwater Trawl Sharks Operational Procedures Version 3.0 https://deepwatergroup.org/wp-content/uploads/2020/10/Sharks-OP-V3.pdf

DWG (2022) Deepwater Trawl Benthic Operational Procedures 2022-23 https://deepwatergroup.org/wp-content/uploads/2022/09/Benthic-OP-version-2022-23.pdf

DWG (2023) Ling Bottom Longline LIN 2 - 7 Operational Procedures Version 4.0 https://deepwatergroup.org/wp-content/uploads/2023/03/BLL-OP-V4.0-Feb-2023.pdf

FNZ (2019a) National Fisheries Plan for Deepwater and Middle-depth Fisheries 2019. Fisheries New Zealand Technical Paper No: 2019/03. ISBN No: 978-1-77665-816-9 (online) https://www.mpi.govt.nz/dmsdocument/3967-National-Fisheries-Plan-for-Deepwater-and-Middle-depth-Fisheries-2019

FNZ (2019b) Review of the National Plan of Action - Seabirds (2013). . ISBN No: 978-1-99-001705-6 (online) https://www.mpi.govt.nz/dmsdocument/38057-National-Plan-of-Action-Seabirds-2013-review-document

FNZ (2020a) National Plan of Action – Seabirds 2020 Reducing the incidental mortality of seabirds in fisheries. ISBN No: 978-1-99-001762-9 (online) https://www.mpi.govt.nz/dmsdocument/40652-National-Plan-Of-Action-Seabirds-2020-Report

FNZ (2020a) National Plan of Action – Seabirds 2020 Supporting document ISBN No: 978-1-98-859485-9 (online) https://www.mpi.govt.nz/dmsdocument/38054-National-Plan-of-Action-Seabirds-2020-supporting-document

FNZ (2021) Medium Term Research Plan for Deepwater Fisheries 2021/22 – 2025/26 Fisheries New Zealand Information Paper No: 2021/16 ISBN No: 978-1-99-100999-9 (online). https://www.mpi.govt.nz/dmsdocument/21746-Medium-Term-Research-Plan-for-Deepwater-Fisheries-Report

FNZ (2022a) National Plan of Action for the Conservation and Management of Sharks 2022 Draft for Consultation https://www.mpi.govt.nz/dmsdocument/52438-Draft-National-Plan-of-Action-for-the-Conservation-and-Management-of-Sharks-2022

FNZ (2022b) Review of NPOA Sharks 2013: Progress against Objectives and Actions https://www.mpi.govt.nz/dmsdocument/52441-Review-of-National-Plan-of-Action-Sharks-2013

FNZ (2022c) Annual Operational Plan for Deepwater Fisheries 2022/23. Fisheries New Zealand Technical Paper No: 2022/01. ISBN No: 978-1-99-102697-2 (online) https://www.mpi.govt.nz/dmsdocument/51892-Annual-Operational-Plan-for-Deepwater-Fisheries-202223

FNZ (2022d) Annual Review Report for Deepwater Fisheries 2020/21 Fisheries New Zealand Technical Paper No: 2022/02. ISBN No: 978-1-99-103941-5 (online) https://www.mpi.govt.nz/dmsdocument/51895/direct

FNZ (2022e) Summary of proposed amendments to fisheries regulations https://www.mpi.govt.nz/dmsdocument/49297/direct

Ministry of Fisheries (2009). Fisheries 2030: New Zealanders maximising the benefits from the use of fisheries within environmental limits. https://www.mpi.govt.nz/dmsdocument/5032/direct

Ministry of Fisheries. (2017). National Fisheries Plan for Deepwater and Middle-depth Fisheries – Part 1A. MPI Discussion Paper No: 2017/26 https://www.mpi.govt.nz/dmsdocument/18779/direct

MPI (2011) Ling – Fisheries Plan Chapter September 2011 ISBN No: 978-0-478-42015-9 (online) https://www.mpi.govt.nz/dmsdocument/3973-National-Fisheries-Plan-for-Deepwater-and-Middle-depth-Fisheries-Part-1B-Ling-chapter