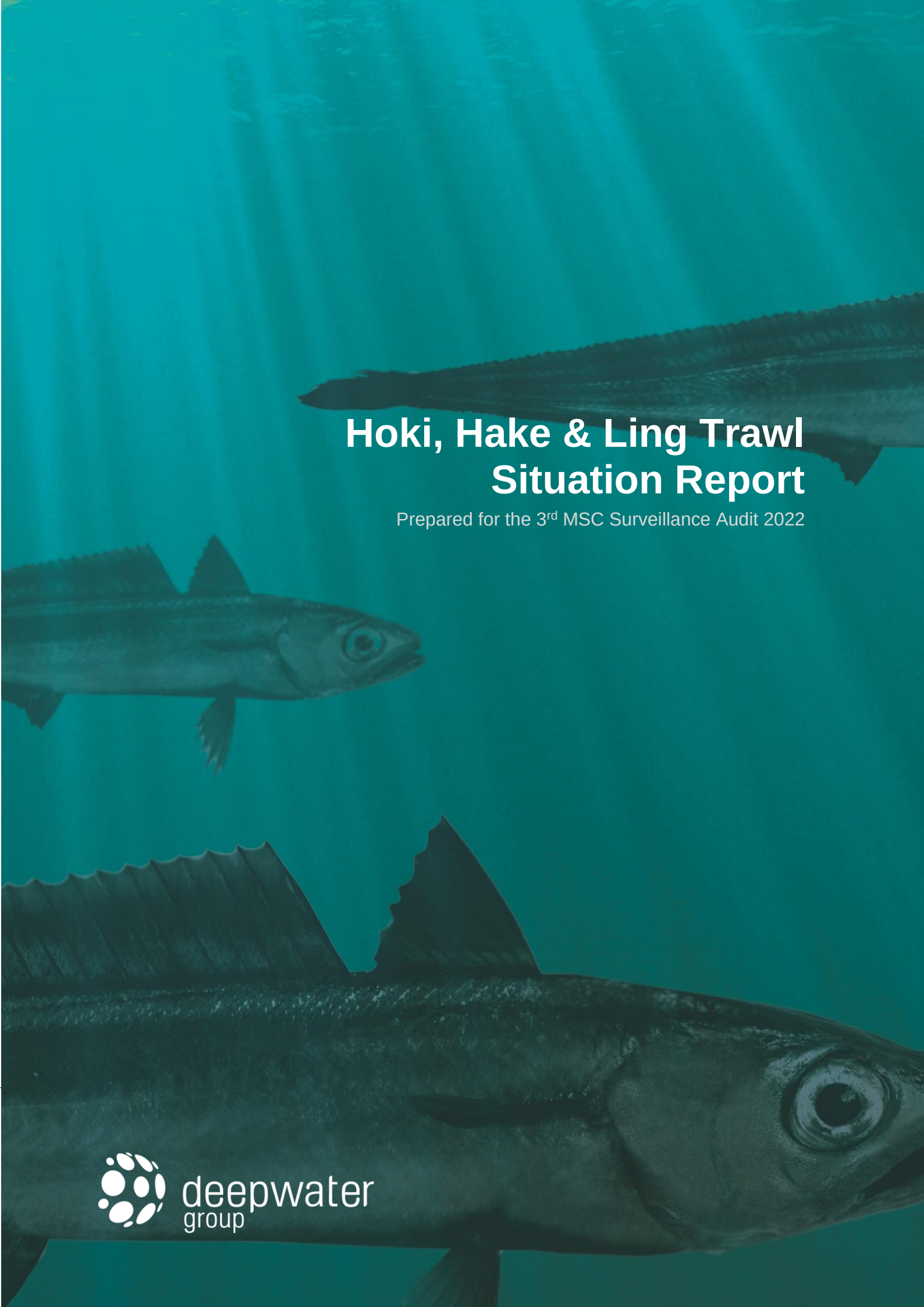

Hoki, Hake & Ling Trawl Situation Report

Prepared for the 3rd MSC Surveillance Audit 2022

deepwater group

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New Zealand Hoki, Hake & Ling Trawl Fisheries

Purpose of this report

This report provides an update on nine Units of Certification (UoC), for hake (HAK 1 & 4), hoki (HOK 1 East & West) and ling (LIN 3, 4, 5, 6 & 7) trawl fisheries, and builds on the information previously provided for the 2021 surveillance audit. This combined UoC is described as the hoki mixed-species trawl fishery.

It is Deepwater Group Limited's (DWG) submission that these ten fisheries, including HAK 7, continue to conform to the MSC Fisheries Standard (FCR V1.3) as evidenced in the following updated information and references.

Overview of fishery MSC certification

Hoki trawl certification details

Certification date	Initial Certification: March 2001 First Recertification: October 2007 Second Recertification: September 2012 Third Recertification: September 2018
Stock areas	UoC 1: HOK 1 (East) UoC 2: HOK 1 (West)
Species	*Macruronus novaezealandiae*
Method/gear	Trawl

Hake trawl certification details

Certification date	Initial Certification: September 2014 Recertification: September 2018 (synchronised with Hoki)
Stock areas	UoC 3: HAK 1 (Sub-Antarctic) UoC 4: HAK 4 (Chatham Rise) UoC 5: HAK 7 (West Coast South Island) – renewed assessment in 2022
Species	*Merluccius australis*
Method/gear	Trawl

Ling trawl 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	Trawl

P1 Overview of stock status information

Stock status, TACC & catches

UoC 1 & UoC 2 – HOK 1 East & HOK 1 West

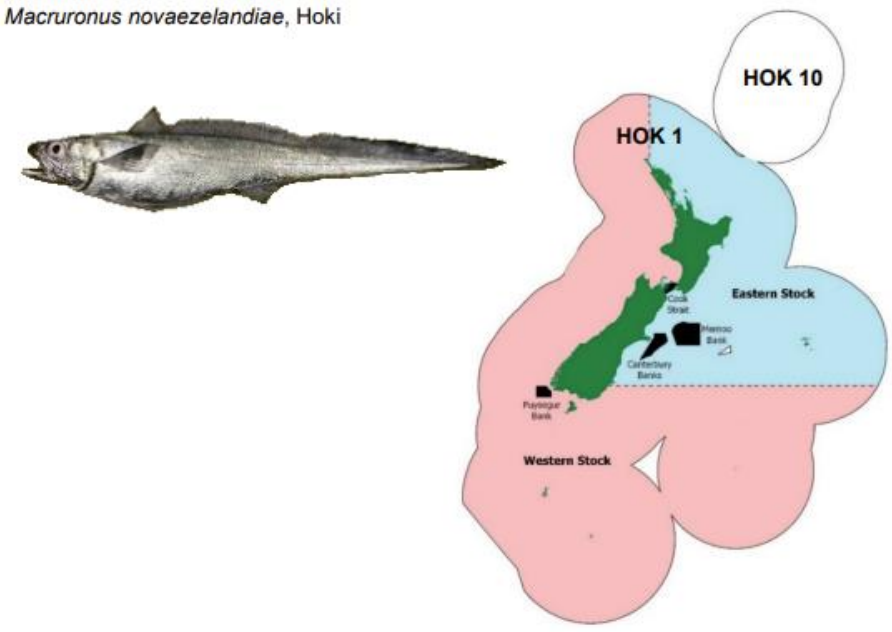


Figure 1: The HOK 1 quota management area showing the Western (pink) and Eastern (blue) stock sub-areas and four hoki management areas (black).

Update on stock status (FNZ, 2022)	HOK 1 East: B_{2022} was estimated to be 51% $B_{0;}$ Very Likely (> 90%) to be at or above the lower end of the target range of 35-50% B_0 and about as Likely as Not (40- 60%) to be at or above the upper end of the target range. HOK 1 West: B_{2022} was estimated to be 28% $B_{0,}$ Unlikely (< 40%) to be at or above the lower end of the target range of 35-50% B_0 and Exceptionally Unlikely (< 1%) to be above the upper end of the target range. Revised stock assessments for HOK 1 were developed in 2021and applied in 2022.
TACC 2021-22	100,000 (catch limits: East 55,000 t; West 45,000 t)[1]
TACC 2020-21	95,000 t (catch limits: East 50,000 t; West 45,000 t)[2]
TACC 2019-20	115,000 t (catch limits: East 60,000 t; West 55,000 t)
TACC 2018-19	130,000 t (catch limits: East 60,000 t; West 70,000 t)[3]
TACC 2017-18	150,000 t (catch limits: East 60,000 t; West 90,000 t)
UoA share of TACC	100%
UoC share of TACC	93%
HOK 1 catch 2020-21	101,319 t (HOK 1 East 54,981 t, HOK 1 West 46,338 t)
HOK 1 catch 2019-20	107,709 t (HOK 1 East 55,070 t, HOK 1 West 53,030 t)
HOK 1 catch 2018-19	122,460 t (HOK 1 East 63,524 t, HOK 1 West 56,953 t)
HOK 1 catch 2017-18	135,418 t (HOK 1 East 59,668 t, HOK 1 West 73,736 t)[4]

1 During the 2021-22 fishing year quota owners have agreed to an overall catch of 100,000 t with catch limits of 55,000 t for East and 45,000 t for West – delivered through shelving of ACE.

2 During the 2020-21 fishing year quota owners agreed to an overall catch of 95,000 t with catch limits of 50,000 t for East and 45,000 t for West – delivered through shelving of ACE.

3 During the 2018-19 fishing year, quota owners agreed to an overall catch of 130,000 t with catch limits of 60,000 t for East and 70,000 t for West – delivered through shelving of 30,144 t of ACE (i.e. including under-catch from 2017-18).

4 The sum of the HOK East & West sub-area catches from FishServe amounts to slightly less than the total hoki catch because operators who balance with HOK ACE less than 275 t are not required to report by sub-area.

Figure 2: Total Allowable Commercial Catches and reported catches for HOK 1 (East & West combined).

Catch management

The harvest strategy for hoki is to manage the stock within the target range of 35-50% B0. The management response is to reduce or increase catches to maintain stock size within the target range.

Over the past five or so years, many in the hoki fishery have expressed concerns with aspects of fishery performance, with no agreement on the causes and a general preference to rely upon the science and the stock assessment results. During 2018, HOK 1 quota owners reached agreement that there was a problem, particularly with the lack of abundance of hoki in the West Coast South Island fishery outside the 25 nm line, and that management intervention was required.

2018-19 fishing year - quota owners agreed to reduce the HOK 1 W catch limit by 20,000 t from 90,000 t to 70,000 t and to leave the HOK 1 E catch limit at 60,000 t, providing a HOK 1 catch limit of 130,000 t. This was given effect to by collectively setting aside 30,144 t ACE from HOK 1 W during 2018-19 (noting that, unless there is a TACC reduction, there will be ACE carried forward from under-catch in the previous year. To account for some of the 14,730 ACE carried forward from 2017-18, an additional 10,144 t ACE was set aside – see table below). In addition, some companies elected to change their fishing strategies during 2018-19 to further reduce their HOK 1 catch.

2019-20 fishing year - FNZ advised their options of a TACC reduction of either 20,000 t or 30,000 t. Industry did not support either of these options. Instead, we asked for a 35,000 t catch reduction, to be implemented by shelving 35,000 t ACE (plus any carry forward) from HOK 1 W – thereby reducing the western catch limit from 70,000 t to 55,000 t and with the catch limit for HOK 1 E being retained at 60,000 t and the total catch limit set at 115,000 t. In the event, the Minister did not agree with either FNZ or with quota owners' proposals and reduced the TACC by 35,000 t to 115,000 t. Again, some companies elected to change their fishing strategies to further reduce their HOK 1 catch. Hoki is a low value species and fishing companies operate to maximise their returns, not their catches, and will deploy their vessels where the returns are highest. During 2020, many vessels that would have otherwise fished for hoki elected to stay on in the squid fishery, given the favourable catch rates and market prices for squid. In addition, during the hoki spawning season three fillet boats were deployed into the Australian blue grenadier fishery. Sealord's CEO publicly announced at the time that they had a deliberate strategy to further reduce the pressure on New Zealand hoki resources. Overall during 2019-20, the deepwater trawl fishery undertook 21,500 tows, compared with ~25,000 tows in previous

years, and there will be an increased number of squid tows and a reduced number of hoki tows in that lower figure.

2020-21 fishing year – Given continued concerns over the performance of the hoki fishery, quota owners agreed to reduce the HOK 1 catch limit to 95,000 t, lower than the TACC of 115,000 t, achieved by setting aside ~20,000 t. The agreed catch limit for HOK 1 E was reduced by 10,000 t (from 60,000 t to 50,000 t) and for HOK 1 W by 10,000 t (from 55,000 t to 45,000 t). These catch management measures were reviewed based on the 2021 hoki stock assessment and quota owners' views on the state of the fisheries.

2021-22 fishing year – The HOK 1 TACC was reduced by 5,000 t to 110,000 t (FNZ, 2021, 2021a). Quota owners agreed to set a catch limit of 100,000 t, achieved by setting aside 10,000 t of HOK 1 E ACE (DWG, 2021).

Stock assessment

In response to concerns from quota owners regarding the conflict between the high stock status estimated by the stock assessment model and the low catch rates observed by the commercial fleet in recent years, a review of the 2019 stock assessment model was undertaken during 2020 (Langley, 2020), and no stock assessment was undertaken during 2020.

The most recent stock assessment was completed in 2022. The 2022 assessment updated the 2021 assessment which followed a review of input data and model assumptions completed between 2018 and 2020 (Dunn & Langley 2018, Langley 2020). There was no assessment completed in 2020. The 2021 assessment differed substantially from 2019 in having different assumptions for natural mortality, maturation, and migrations, and spatially restructured fisheries dependent data with revised selectivity assumptions (FNZ, 2022).

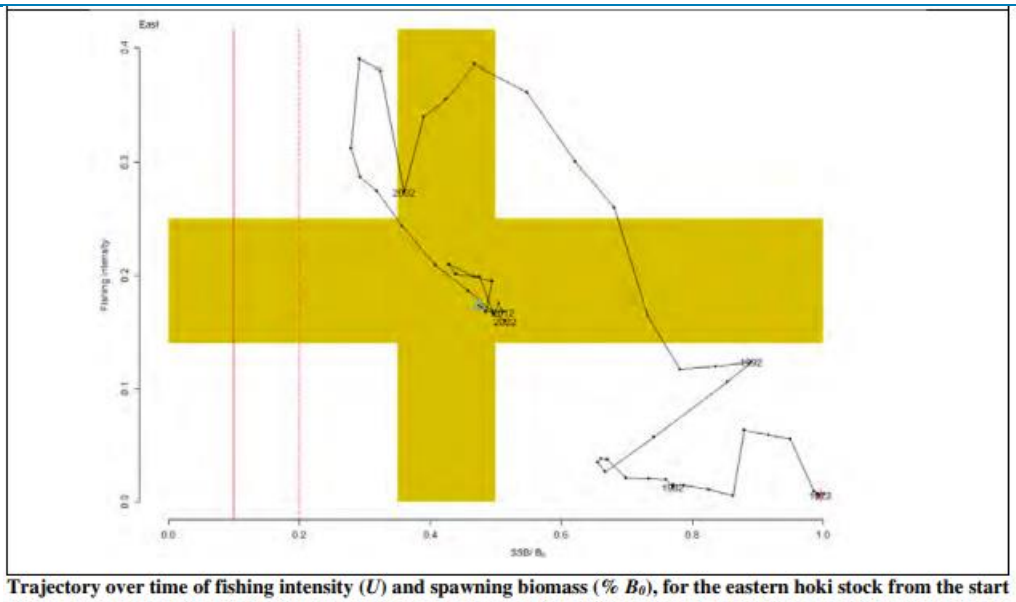
A suite of exploratory models was developed and tested during 2020 incorporating:

- Changes in fishery configuration
- Relaxed model constraints associated with trawl survey selectivity functions
- Constant rates of M for male and female hoki
- Alternative parameterisations for the distribution and migration of fish between the Chatham Rise and the Sub-Antarctic regions.

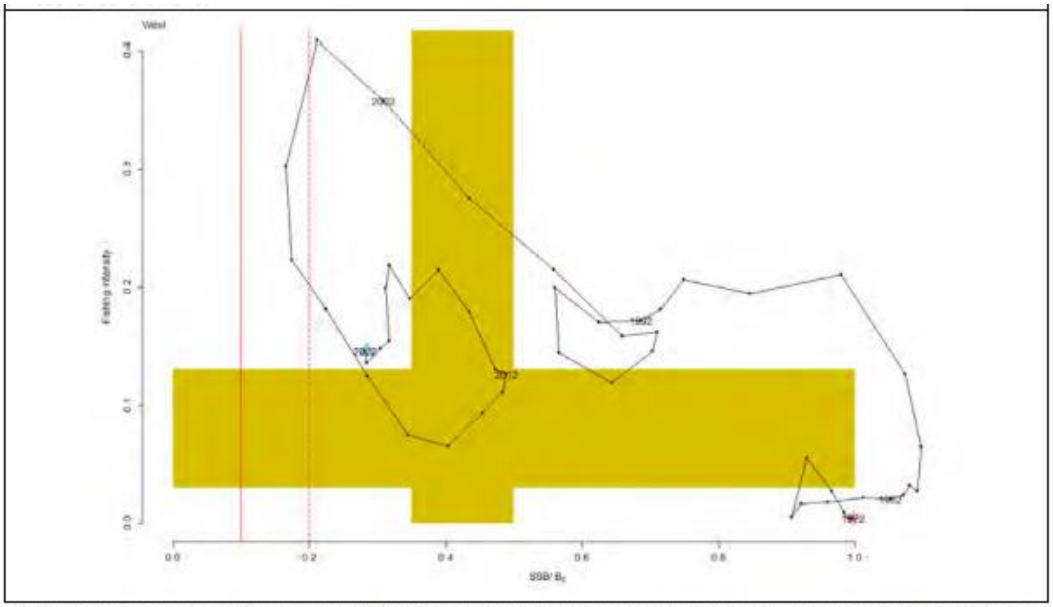
The exploratory models provided improved fits to the individual data sets, yielded estimates of stock status that were more consistent between the eastern and western stock components and identified some persistent discrepancies that required further investigation. Further development of the model during 2020 and 2021 resulted in a number of changes and improvements to model fits.

2022 stock assessment

The assessed trajectories of fishing intensity and spawning biomass from 1972 to 2022 are illustrated below for the East stock (top) and West stock (FNZ, 2022).



Trajectory over time of fishing intensity (U) and spawning biomass (% B_0), for the eastern hoki stock from the start of the assessment period in 1972 (represented by a red asterisk) to 2022 (blue triangle). The red solid vertical line at 10% B_0 represents the hard limit, the red dashed line at 20% B_0 is the soft limit, and the shaded area represents the management target ranges in biomass and fishing intensity, with fishing intensity estimated using recent recruitment. Biomass and fishing intensity estimates are medians from MCMC results.



Trajectories over time of fishing intensity (U) and spawning biomass (% B_0), for the western hoki stock from the start of the assessment period in 1972 (represented by a red asterisk) to 2022 (blue triangle). The red solid vertical line at 10% B_0 represents the hard limit, the red dashed line at 20% B_0 is the soft limit, and the shaded area represents the management target ranges in biomass and fishing intensity, with fishing intensity estimated using recent recruitment. Biomass and fishing intensity estimates are medians from MCMC results.

Biomass surveys

Cook Strait – the acoustic abundance index in 2021 was 75% higher than the equivalent index from the 2019 survey (O'Driscoll & Escobar-Flores, 2020), reversing the decreasing trend observed in the time series since 2015 (FNZ, 2022).

West Coast South Island – the trawl and acoustic abundance index in 2018 was the lowest in the time series, down 47% on 2013 (O'Driscoll & Ballara, 2019).

Chatham Rise - the trawl abundance index in January 2022 was 9% higher than that in 2020, relative biomass of recruited hoki (ages 3+ years and older) increased (by 8%) from that in 2020 and there was also an above average estimate for 2+ hoki (2019 year class), (FNZ, 2022).

Sub-Antarctic - the trawl abundance index in December 2018 was down 18% from 2016 but similar to that in 2014 (MacGibbon et al., 2019). The most recent trawl survey estimate in November-December 2020 was higher than that in 2018 and similar to that in 2016 (FNZ, 2022).

UoC 3 – HAK 1

Update on stock status (FNZ, 2022)	HAK 1 (Sub-Antarctic): B_{2021} was estimated at 62% B_0; Very Likely (> 90%) to be at or above the target of 40% B_0. B_{2021} is Exceptionally Unlikely (< 1%) to be below the Soft Limit of 20% B_0.
TACC 2020-21 TACC 2019-20 TACC 2018-19 TACC 2017-18	3,701 t 3,701 t 3,701 t 3,701 t
UoA share of TACC UoC share of TACC	100% 94%
HAK 1 catch 2019-20 HAK 1 catch 2018-19 HAK 1 catch 2017-18 HAK 1 catch 2016-17	1,062 t 896 t 1,350 t 1,175 t

Figure 3: Total Allowable Commercial Catches and reported catches for HAK 1.

Note: The HAK 1 catch is taken largely as bycatch in the western hoki trawl fishery and catch trends are therefore subject to forces other than hake abundance.

UoC 4 – HAK 4

Update on stock status (Holmes, 2021)	For the Chatham Rise stock (HAK 4 plus HAK 1 north of the Otago Peninsula), B_{2020} was estimated to be about 55% B_0; Very Likely (> 90%) to be at or above the target of 40% B_0 and Exceptionally Unlikely (< 1%) to be below the Soft Limit of 20% B_0.
TACC 2020-21 TACC 2019-20 TACC 2018-19 TACC 2017-18	1,800 t 1,800 t 1,800 t 1,800 t
UoA share of TACC UoC share of TACC	100% 94%
HAK 4 catch 2019-20 HAK 4 catch 2018-19 HAK 4 catch 2017-18 HAK 4 catch 2016-17	137 t 183 t 267 t 268 t

Figure 4: Total Allowable Commercial Catches and reported catches for HAK 4.

Note: The HAK 4 catch is taken largely as bycatch in the eastern hoki trawl fishery and catch trends are therefore subject to forces other than hake abundance.

UoC 5 – HAK 7

Update on stock status (Dunn et al., in prep. (FNZ, 2022)	For the West Coast South Island stock, B_{2022} was estimated to be about 39% B_0; As Likely as Not (40-60%) to be at or above the target of 40% B_0, and Unlikely (< 40%) to be below the soft limit of 20% B_0.
TACC 2021-22 TACC 2020-21 TACC 2019-20 TACC 2018-19 TACC 2017-18	2,272 t 2,272 t 2,272 t 5,064 t 5,064 t
UoA share of TACC UoC share of TACC	100% 94%
HAK 7 catch 2020-21 HAK 7 catch 2019-20 HAK 7 catch 2018-19 HAK 7 catch 2017-18 HAK 7 catch 2016-17	1,368 t 2,063 t 1,563 t 3,086 t 4,701 t

Figure 5: Total Allowable Commercial Catches and reported catches for HAK 7.

Note: The HAK 7 catch is taken largely as bycatch in the western hoki trawl fishery and catch trends are therefore subject to forces other than hake abundance.

Stock assessment

The 2022 assessment used statistical area boundaries as stock boundaries, a very minor but sensible change. Observed maturation was seen in fish between 6 and 10 years old. A two sex, single area model was developed, with a model period of 1975 to 2022. Inclusion of commercial CPUE was considered but found to be unreliable as an abundance index and was not used in the assessment. The abundance index used was the 'core' strata of the WCSI trawl survey from 2000 – 2021, a major change from the 2018 assessment which had included a larger area and greater depth zones but could not incorporate the 2000 survey, likely a major factor in the outcome.

The stock was binned into three size classes: resident juveniles <65cm, adults >75cm, and subadults 65-75cm (likely to be 3 to 5 year-olds). Small fish were observed shallow and deep, with large fish in the middle depths.

Abundance indices: there has been lots of work done over the years on CPUE for the HAK 7 fishery. This was mostly due to a survey with a short run of abundance estimates. The 2022 assessment had a further survey datapoint. This extended the time series and also enabled better comparison between the different survey time periods, and enabled the use of the core strata to be used enabling the earlier 2000 survey to be included. The pattern of the CPUE has been consistently inconsistent with the index from the survey. CPUE was examined but rejected on as being unlikely to be estimating abundance due to the impacts of some management changes but more so due to operational reasons. For example, it was reported that individual and groups of vessels would, on some occasions, be targeting hake and at others be avoiding hake, largely depending on the progress of the hoki fishery and available ACE for hake in HAK 7. The assessment used data from the timeseries of WCSI trawl surveys conducted in 2000, 2012, 2013, 2016, 2018 and 2021.

A new spatio-temporal analyses of the fishery provided some useful albeit incomplete insights.

The model converged well and gave consistent estimates of virgin biomass, B0, across all model runs of 75,000- 85,000 t; with the full range of stock status between 17% – 47% B0, with stock status consistently showing recent improvement across all runs. The base case model run accepted by the DWWG and the Plenary gave an estimated stock status in 2019 of 23% B0, not radically different to the estimate from the 2019 assessment estimate of 17% B0.

Low recruitment was estimated to have occurred from the late 1990sand is consistent with population effects seen on other wildlife populations seen on the WCSI.

The trajectory of stock status (Figure 1), shows the stock to have declined to close to the soft limit in about 2018-19. The stock has been increasing for the last two years, driven by both reduced fishing mortality and better recruitment, with B2022 at 38.6% B0, and set to increase to at or above the target over the next five years.

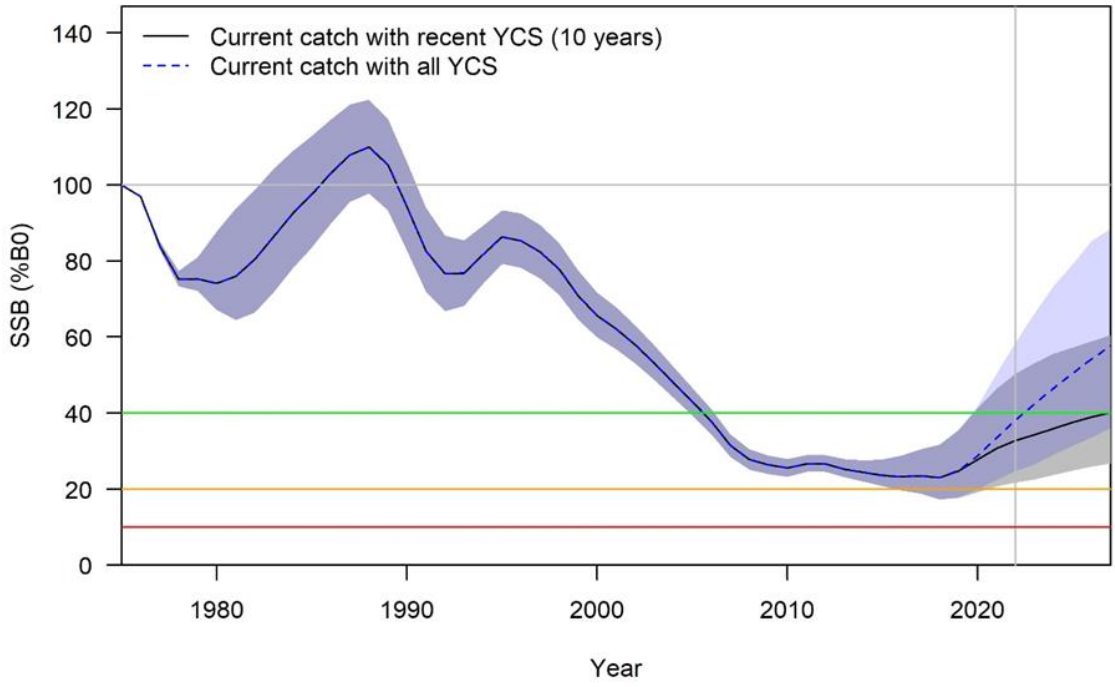


Figure 6: Stock status - spawning stock biomass (SSB) as a percentage of B0 trajectories, including projections from 2023 to 2027 from the base model. All projections with an annual catch of 1,664 t, and with YCS sampled from all years (solid line, grey 95% CI)

In summary, the 2022 stock assessment provided a somewhat more optimistic perspective of the stock trajectory, driven largely by the longer abundance timeseries but the overall pattern was similar. The current stock status is good, lying just below the target reference point, has been increasing for the last two years and at recent catches of the TACC is projected to continue to increase. The next assessment is scheduled for 2025.

UoC 6 – LIN 3

Update on stock status (FNZ, 2022a; Mormede et al., in prep. a, b, c),	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).
TACC 2021-22	2,060 t
TACC 2020-21	2,060 t
TACC 2019-20	2,060 t
TACC 2018-19	2,060 t
TACC 2017-18	2,060 t
UoA share of TACC and total LIN catch	100% of TACC and 44% of total LIN catch (based on average estimated trawl catch over the last two years)
UoC share of TACC and total LIN catch	93% of TACC and 40% of total LIN catch (based on average estimated trawl catch over the last two years)
LIN 3 catch 2020-21	1,489 t (Total reported catch) 489 t (Estimated catch trawl) 406 t (Estimated catch bottom longline) 594 t (Estimated catch other methods)[5]
LIN 3 catch 2019-20	1,684 t (Total reported catch) 912 t (Estimated catch trawl) 554 t (Estimated catch bottom longline) 218 t (Estimated catch other methods)

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

[5] ‘Other’ methods include potting, setnet, dahn line, Danish seine and fish traps.

Figure 7: TACCs and reported catches for LIN 3 (all gear types).

UoC 7 – LIN 4

Update on stock status (FNZ, 2022a; Mormede et al., in prep. a, b, c), (updating Holmes, 2019)	For the Chatham Rise stock (LIN 3 & 4), B_{2022} was estimated to be about 56% B_0; Very Likely (> 90%) to be above the management target (base case run).
TACC 2021-22 TACC 2020-21 TACC 2019-20 TACC 2018-19 TACC 2017-18	4,200 t 4,200 t 4,200 t 4,200 t 4,200 t
UoA share of TACC and total LIN catch UoC share of TACC and total LIN catch	100% of TACC and 32% of total LIN catch (based on average estimated trawl catch over the last two years) 94% of TACC and 30% of total LIN catch (based on average estimated trawl catch over the last two years)
LIN 4 catch 2020-21 LIN 4 catch 2019-20	2,103 t (Total reported catch) 656 t (Estimated catch for all target trawl) 1,447 t (Estimated catch for bottom longline) 0 t (Estimated catch other methods). 1,778 t (Total reported catch)

	571 t (Estimated catch for all target trawl) 1,048 t (Estimated catch for bottom longline) 159 t (Estimated catch other methods).

Figure 8: Total Allowable Commercial Catches and reported catches 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.

UoC 8 – LIN 5

Update on stock status (Mormede et al., 2021, 2021a)	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).
TACC 2021-22	5,208 t
TACC 2020-21	4,735 t
TACC 2019-20	4,735 t
TACC 2018-19	4,735 t
TACC 2017-18	3,955 t
UoA share of TACC and total LIN catch	100% of TACC and 90% of total LIN catch (based on average estimated trawl catch over the last two years)
UoC share of TACC and total LIN catch	95% of TACC and 85% of total LIN catch (based on average estimated trawl catch over the last two years)
LIN 5 catch 2020-21	4,950 t (Total reported catch)

LIN 5 catch 2019-20	4,380 t (Estimated catch trawl) 567 t (Estimated catch bottom longline) 3 t (Estimated catch other methods) 4,662 t (Total reported catch) 4,264 t (Estimated catch for all target trawl) 387 t (Estimated catch for bottom longline) 11 t (Estimated catch for other methods)

Figure 9: Total Allowable Commercial Catches and reported catches for LIN 5 (all gear types).

UoC 9 – LIN 6

Update on stock status: LIN 5 & 6 (Mormede et al., 2021, 2021a) LIN 6B (Horn, 2007)	For the Sub-Antarctic stock (LIN 5 & 6, excluding the Bounty Plateau, LIN 6B), B_{2021} was estimated to be between 71% B_0; Virtually Certain (> 99%) to be above the management target. 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.
TACC 2021-22	8,505 t
TACC 2020-21	8,505 t
TACC 2019-20	8,505 t
TACC 2018-19	8,505 t
TACC 2017-18	8,505 t

UoA share of TACC and total LIN catch	100% of TACC and 61% of total LIN catch (based on average estimated trawl catch over the last two years)
UoC share of TACC and total LIN catch	61% of TACC and 57% of total LIN catch (based on average estimated trawl catch over the last two years)
LIN 6 catch 2020-21	3,916 t (Total reported catch) 2,567 t (Estimated catch trawl) 1,349 t (Estimated catch bottom longline)[6] 0 t (Estimated catch other methods)
LIN 6 catch 2019-20	3,967 t (Total reported catch) 2,234 t (Estimated catch trawl) 1,733 t (Estimated catch bottom longline) 0 t (Estimated catch other methods. 209 t (Estimated catch LIN 6B bottom longline)

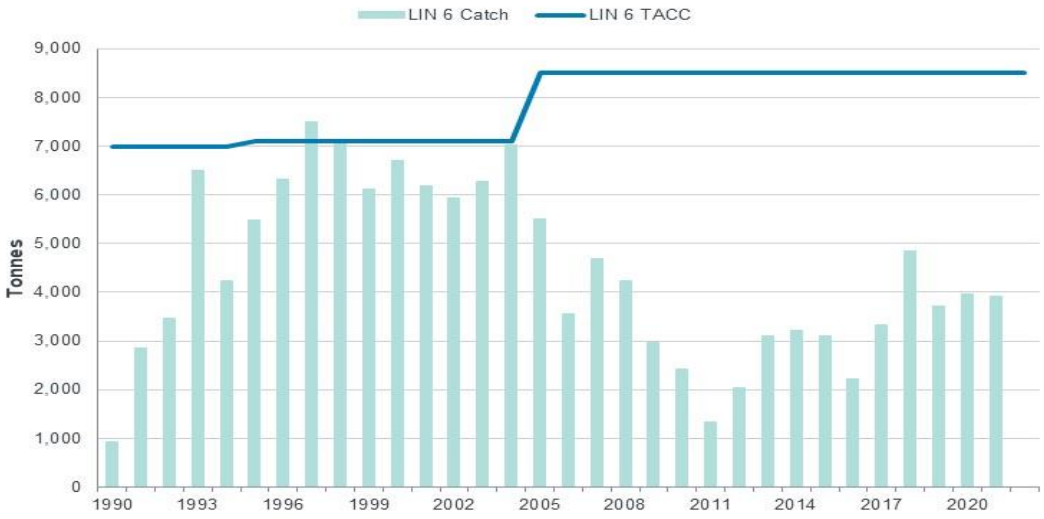


Figure 10: Total Allowable Commercial Catches and reported catches for LIN 6 (all gear types).

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.

[6] Including LIN 6B catch

UoC 10 – LIN 7

Update on stock status (Kienzle, 2021)	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 2021-22	3,387 t
TACC 2020-21	3,387 t
TACC 2019-20	3,387 t
TACC 2018-19	3,080 t
TACC 2017-18	3,080 t
UoA share of TACC and total LIN catch	100% of TACC and 50% of total LIN catch (based on average estimated trawl catch over the last two years)
UoC share of TACC and total LIN catch	73% of TACC and 46% of total LIN catch (based on average estimated trawl catch over the last two years)
LIN 7 catch 2020-21	3,308 t (Total reported catch) 1,414 t (Estimated catch trawl) 1,780 t (Estimated catch bottom longline) 114 t (Estimated catch other methods)
LIN 7 catch 2019-20	3,215 t (Total reported catch) 1,877 t (Estimated catch trawl) 1,313 t (Estimated catch bottom longline) 25 t (Estimated catch other methods)

Figure 11: Total Allowable Commercial Catches and reported catches for LIN 7 (all gear types).

Key P1 references

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P2 Overview of environmental information

Observer Coverage

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. An important function is to collect data on incidental catches and mortalities of endangered, threatened and protected (ETP) species. The monitoring of ETP captures is administered and funded by the Department of Conservation (DOC) through levies recovered from quota owners. 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.

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[7]).

Table 1: Observer coverage in the hoki mixed-species trawl fisheries. Coverage is presented as the percentage of tows observed (G. Lydon FNZ, pers. comm.).

	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
HOK, HAK, LIN	28%	26%	37%	29%	44%	48%

[7] Note: The levels of interactions with NZ sea lions is 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.

FNZ's observer coverage plans for middle-depth, mixed species fisheries in 2021-22 are provided in the Annual Operational Plan, with a total of 2,255 observer days planned and observer coverage rates as follows (FNZ, 2021, Table 12, p. 32),:

- Chatham Rise – 30-40%
- Sub-Antarctic – 20-30%
- West Coast South Island – 50%

Retained & bycatch species

The most recent available information on catch composition was summarised and provided for the second audit and is repeated below.

Hoki, hake and ling have accounted for, on average, 91% of the total estimated catch weight recorded by observers in these target fisheries. The remainder of the observed catch has principally comprised two other QMS species, silver warehou (1.4% of the total catch) and spiny dogfish (0.9%), and two non-QMS species/groups javelin fish (1.4% of the total catch) and rattails (1.1%). Invertebrate species make up only a very small fraction of the overall catch, with squid (arrow and warty), comprising 0.1% of the total catch, being the main species group caught.

Eight of the top ten bycatch species by weight are managed within the QMS and therefore catches are well monitored and direct controls exist to limit their overall catch.

The two most abundant bycatch species are the non-QMS species/groups, javelin fish and rattail species, which have respectively averaged 3,200 t and 2,400 t per annum over the most recent 5-year period (2012-13 to 2016-17), followed by QMS species spiny dogfish (790 t), silver warehou (657 t), pale ghost shark (529 t) and ribaldo (336 t). The main species discarded have been javelin fish, rattails, spiny dogfish, giant stargazer and shovelnose dogfish (Finucci et al., 2019).

While spiny dogfish is a QMS species, it has been listed as a Schedule 6 species under the Fisheries Act 1996 and can be legally returned to the sea (dead or alive) provided the catch is reported and balanced against ACE.

ETP 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, 2021b). 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:

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

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

ETP species captures

Industry-reported protected species captures by hoki, hake and ling trawlers during the period 2018-19 - 2020-21 show that seabird captures have decreased year on year. While captures of fur seals and dolphins/whales have increased, captures are at very low levels (Table 2), (G. Lydon FNZ, pers. comm.).

Table 2: Industry-reported incidental captures of ETP species by hake, hoki and ling targeted tows during the period 2018-19 - 2020-21.

Target fishery	Seabirds	Sea lions	Fur seals	Dolphins Whales
2018-19				
HAK	0	0	2	0
HOK	173	0	60	2
LIN	23	1	1	0
Totals	**196**	**1**	**63**	**2**
2019-20				
HAK	1	0	0	1
HOK	138	0	77	3
LIN	19	0	2	0
Totals	**158**	**0**	**79**	**4**
2020-21				
HAK	0	0	0	0
HOK	74	0	83	7
LIN	60	0	1	1
Totals	**134**	**0**	**84**	**8**

Seabirds

All trawl vessels >28 m are required to notify DWG 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 DWG 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).

Between 2014-15 and 2018-19, approximately 88% of observed seabird captures on deepwater trawl vessels were classed as 'net captures', of which 37% were released alive. Smaller seabirds (e.g. petrels or shearwaters) may get trapped inside the net when they dive into its mouth, while other species (e.g. albatrosses) tend to get tangled in the net mesh from the outside when they try to seize fish (FNZ, 2021c).

The National Plan of Action Seabird reports 2018/19 and 2019-20 provide breakdowns of the observed seabird captures by hoki, hake and ling trawlers illustrating that small albatross species (i.e. mollymawks) and petrels & shearwaters are the most abundant groups caught (Table 3), (FNZ, 2020a; FNZ, 2021c).

Table 3: Summary of observed seabird captures in the hoki, hake and ling trawl fisheries in 2018-19 and 2019-20.

Year	Observed Captures	Capture Rate per 100 Tows	Observer Coverage	Alb. Large	Alb. Small	Alb. Unid.	Petrel & Shearwater	Other
2018-19	122	2.74	37%	2	61	6	49	4
2019-20	147	2.71	52%	2	71	5	68	1

The capture rates of ~2.7 per 100 tows by these fisheries trawl fisheries is close to the 'capture rate reduction target' of 2.3 per 100 tows as specified in the Supporting Document of the NPOA Seabirds (FNZ, 2020b.

The observed seabird mortalities by hoki-targeted tows are dominated by white-chinned petrels. Other prominent species include white-capped albatross, Salvin's albatross, southern Buller's albatross and sooty shearwater. A total of 83 observed seabird captures were live-released, dominated by white-chinned petrels and white-capped albatross.

Hoki-targeted trawl tows resulted in 113 observed captures of all seabirds in 2019-20, dominated by Salvin's albatross (40), white-chinned petrel (27) and sooty shearwater (22), southern Buller's albatross (8) and New Zealand white-capped albatross (8). The total estimated number of birds caught was 239 (FNZ, 2021b).

The estimated number of all seabird mortalities by hoki-targeted tows from 2017-18 to 2019-20 has shown a declining trend (Figure 12).

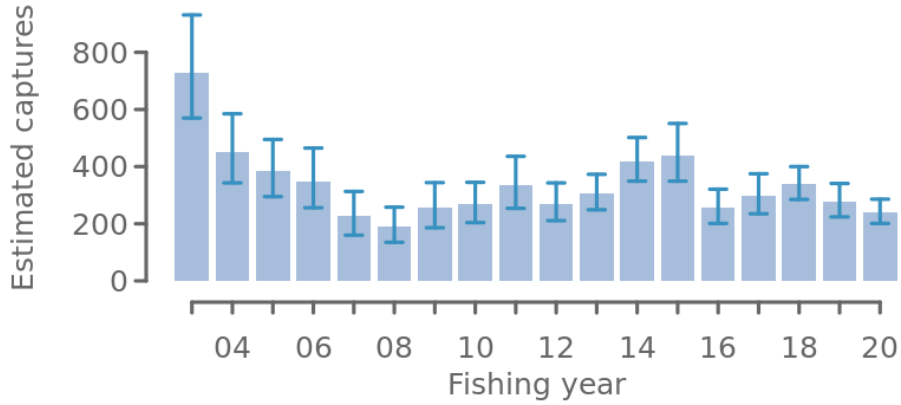

Figure 12: Hoki trawl fishery estimated total incidental seabird captures (dead and live-released) 2002-03 to 2019-20.

Hake-targeted trawl tows have produced very few seabird captures in recent years, estimated at less than 5 per annum over the most recent four-year period (Figure 13), (FNZ, 2021b).

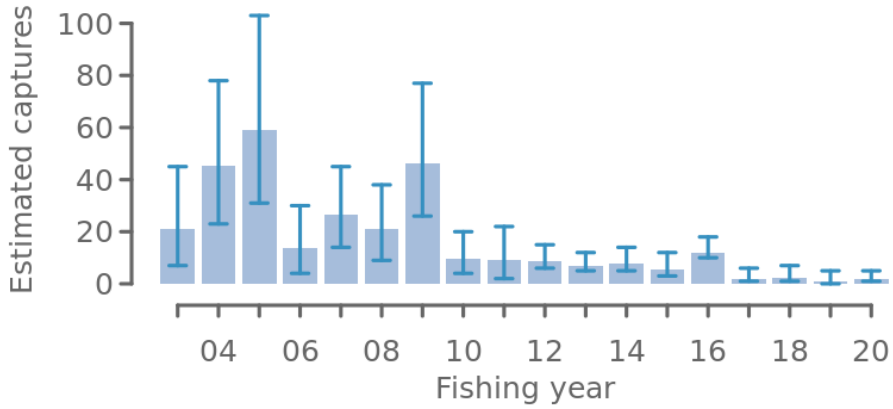

Figure 13: Hake trawl fishery estimated incidental seabird captures 2002-03 to 2019-20.

Ling-targeted trawl tows resulted in 11 observed captures of all seabirds in 2019-20, comprising white-chinned petrel (4), New Zealand white-capped albatross (3), Salvin's albatross (2), sooty shearwater (1) and broad-billed prion (1). Around 45 seabirds were estimated captured in 2019-20 and there has been a slight decreasing trend in captures since 2013-14 (Figure 14), (FNZ, 2021b).

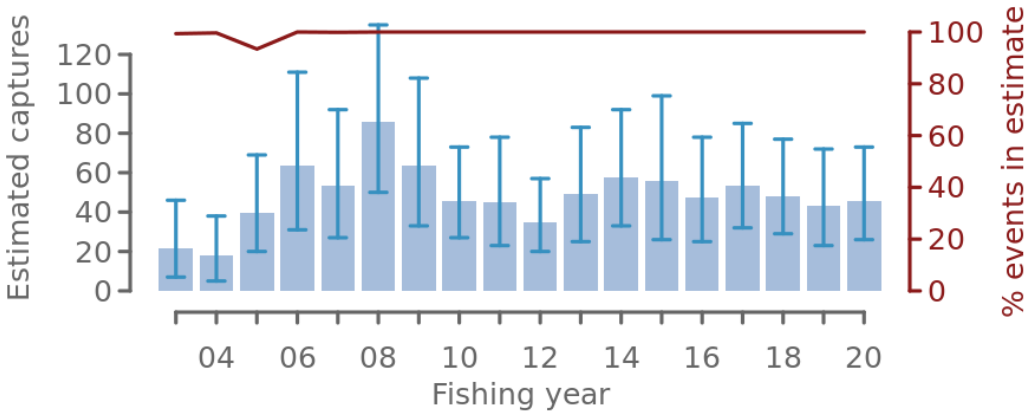

Figure 14: Ling trawl fishery estimated incidental seabird captures 2002-03 to 2019-20.

DOC's conservation status classification (Robertson et al., 2013), for the main species incidentally captured in the hoki trawl fisheries, and the risk categories emanating from the Spatially Explicit Fisheries Risk Assessment Framework (SEFRA), (Richard et al., 2020), are provided below. The risk assessment noted a decline in interactions consistent with the declining effort in all trawl fisheries over the study period. Species with a median risk ratio <1 are not expected to hinder the achievement of population management targets. Only Salvin's albatross and Westland petrel have total risk ratios near or above 50% of the PST threshold of 1 (Table 4).

Table 4: Threat and risk classifications for the most prevalent incidental seabird captures in the hoki/hake/ling trawl fisheries.

Species	DOC Threat Classification	SEFRA Risk Classification (all fisheries combined)	Risk Ratio
White-chinned petrel	At Risk	Low	0.05 (0.03-0.09)
White-capped albatross	At Risk	High	0.35 (0.21-0.58)
Salvin's albatross	Nationally Critical	High	0.78 (0.51-1.09)
Southern Buller's albatross	Naturally Uncommon	High	0.39 (0.22-0.66)
Sooty shearwater	At Risk	Low	0.00 (0.00-0.01)
Westland petrel	Naturally Uncommon	High	0.48 (0.18-1.19)

Between 2017 and 2020, the risk ratios (i.e. the risks to populations from fishing) decreased for the two seabirds most at risk from the mixed-species trawl fisheries, namely Salvin's albatross and Southern Buller's albatross, suggestive of ongoing improvement in mitigation (Figure 15), (FNZ, 2021c).

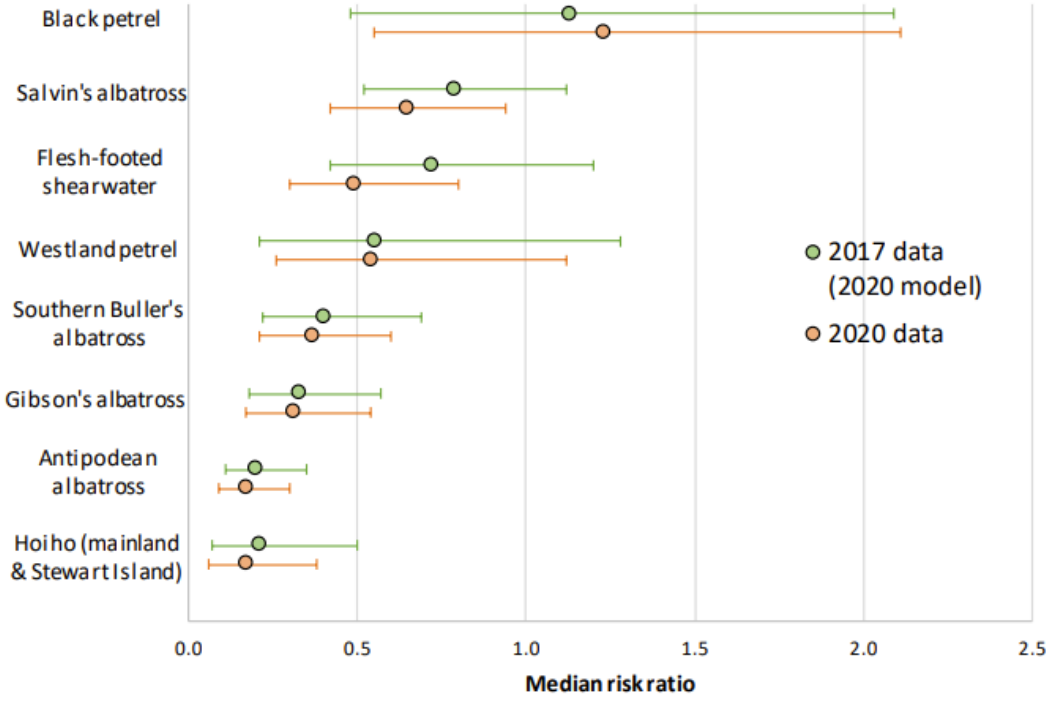

Figure 15: Comparison of median risk ratios for seabird populations of particular concern between 2017 and 2020 risk assessments. Error bars represent 95% confidence intervals.

Censuses undertaken 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 have steadily increased from around 43,000 in 2010 to around 60,000 in 2018 (Table 5), (Baker & Jensz, 2019).

Table 5: 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 2015-16 to 2019-20 have ranged between 12 and 40, with an average of ~20 birds per annum. The rate of capture in hoki-targeted tows spiked in 2019-20 for reasons unknown (Figure 16), (FNZ, 2021b). Hake- and ling-targeted tows have negligible captures., has reduced by 45% since a peak in 2013-14. (FNZ, 2021b), (Figure 16).

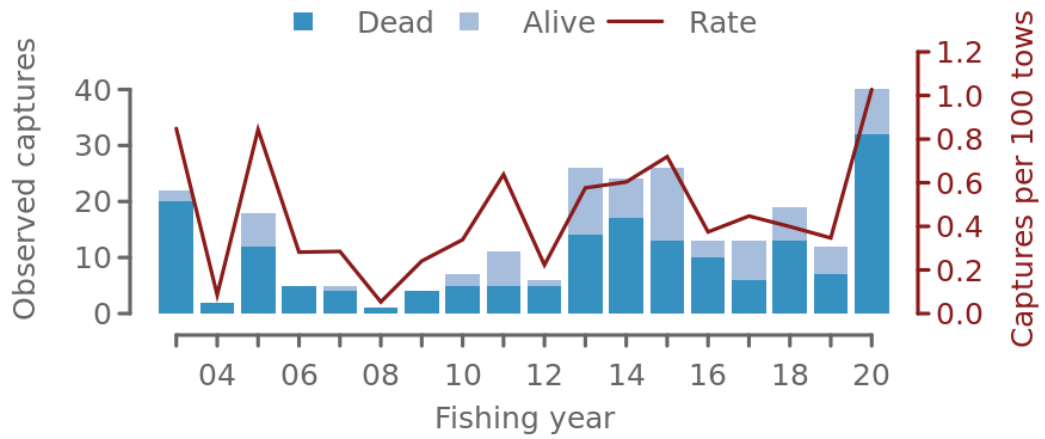

Figure 16: Observed captures and capture rates of Salvin's albatross by hoki trawl fisheries 2002-03 to 2019-20.

The estimated number of Salvin's albatross captured by hoki-targeted tows has ranged between approximately 60 to 80 per annum over the recent 5-year period (Figure 17), (FNZ, 2021b).

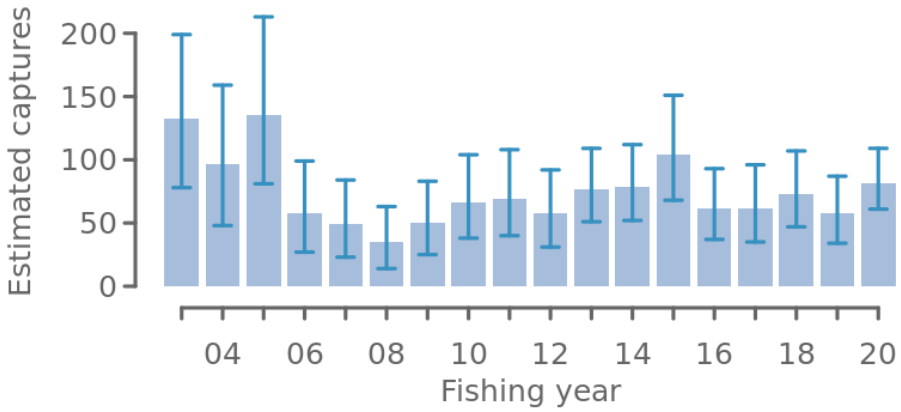

Figure 17: Estimated incidental captures of Salvin's albatross by hoki trawl fisheries 2002-03 to 2019-20.

The Westland petrel population is considered to be stable at around 4,000 breeding pairs (Waugh & Bartle, 2013), and the population is estimated to be stable or slightly increasing, based on demographic studies at the largest colony (Waugh et al., 2015).

The hoki/hake/ling mixed-trawl fisheries' captured on average three Westland petrels per annum (observed captures) over the seven year period 2013-14 to 2019-20 (Figure 18),(six captures in 2018-19 and one in 2019-20). At an average observer coverage rate of 33% (Table 1), this is illustrative of a low threat level to Westland petrel by these fisheries. 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).

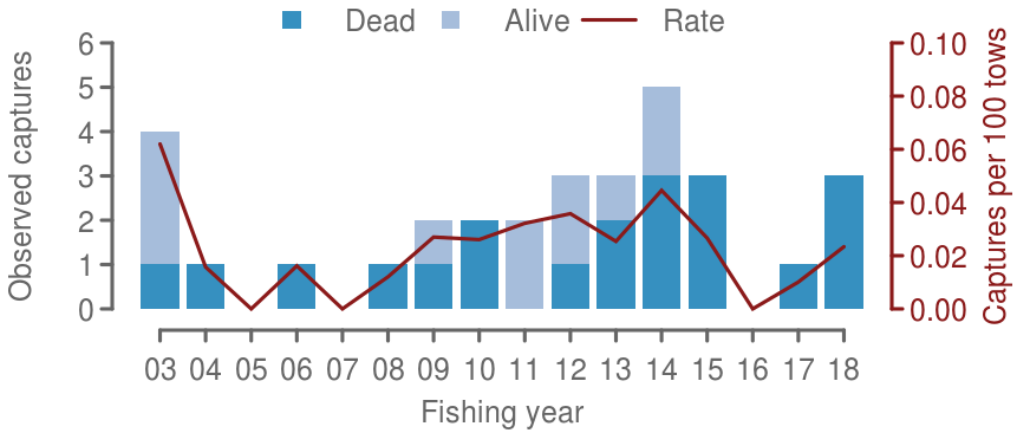

Figure 18: Observed incidental captures of Westland petrel by all trawlers > 28 m from 2002-03 to 2017-18.

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, 2020b).

DWG Liaison Programme for ETP Species Risk Management

During 2018-19, DWG's Environmental Liaison Officer (ELO) visited 28 factory vessels, five fresh fish trawlers (> 28 m) and 14 seasonal hoki trawlers (< 28 m). During 2019-20, the Covid-19 pandemic restricted vessel visits to an extent and the ELO visited 24 factory vessels, five fresh fish trawlers (> 28 m) and 12 seasonal hoki trawlers (< 28 m). During 2020-21, 25 factory vessels, five fresh fish trawlers (> 28 m) and 10 seasonal hoki trawlers (< 28 m) were visited (Cleal, 2019, 2020, 2021).

The purpose of these vessel visits is to:

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

- Provide full induction into DWG programmes to new skippers and/or vessel operators who have moved to new fisheries or have started on new vessels.
- Produce an end-of-year summary report to DWG, 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).

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

- Deployment of at least one type of seabird scaring device during all tows (i.e. bird bafflers, tori lines or warp deflectors)
- Management of fish waste discharge so as not to attract seabirds to risk areas (i.e. no discharge during shooting/hauling; mincing and batch-discharge while towing; installation of mincers/hashers/batching tanks/meal plants; gratings/trap systems to reduce fish waste discharge through scuppers/sump pumps)
- Seabird risk associated with trawl nets is minimised by:
  - Removal of stickers before shooting
  - Minimising the time fishing gear remains at/near the surface
  - Seabirds caught alive in/on the net are correctly handled and released to ensure maximum chance of survival.
- Seabird risk associated with deck landings and vessel impacts is minimised by:
  - Ensuring deck lighting does not attract/disorientate seabirds
  - Prompt removal of fish waste from the deck
  - Seabirds that land on the deck or impact with the vessel are correctly handled and released to ensure maximum chance of survival.

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

New Zealand fur seal

On average over the last five years, there have been on average around 30 observed captures of New Zealand (NZ) fur seals per year in the hoki trawl fishery, with a small fraction being released alive (Figure 19). NZ fur seal captures by the hake and ling trawl fisheries are negligible by comparison.

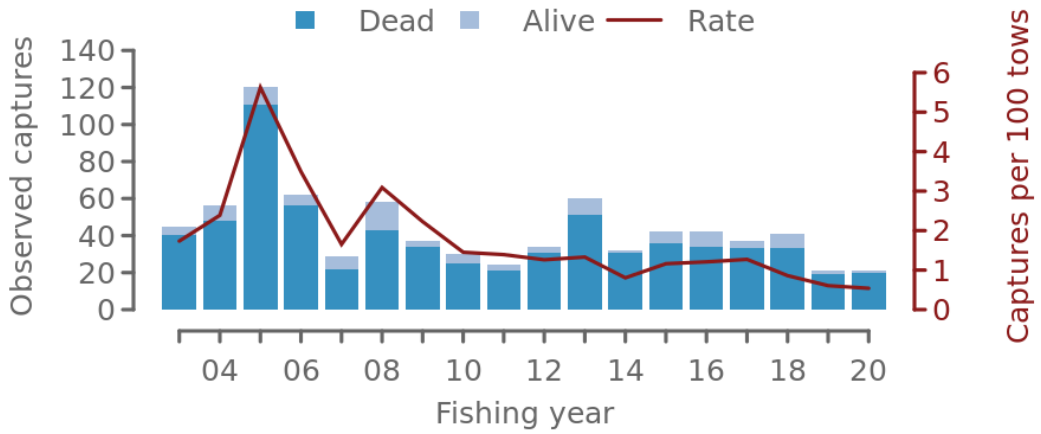

Figure 19: New Zealand observed fur seal captures by the hoki trawl fishery 2002-03 to 2019-20.

During 2018-19 and 2019-20 an average of 75 fur seal captures were reported by vessels annually (see Table 2). The DOC threat classification status for fur seals is 'Not Threatened' and their population size is believed to be increasing (Baker et al., 2019).

New Zealand sea lion

The New Zealand sea lion is listed as 'Threatened – Nationally Vulnerable' (Baker et al., 2019). A New Zealand Sea Lion Threat Management Plan (TMP) was finalised in 2017 (DOC, 2017) with a vision to "promote recovery and ensure the long-term viability of New Zealand sea lions".

No observed captures of New Zealand (NZ) sea lion have been reported in the hoki/hake/ling trawl fisheries in the most recent 5-year period from 2015-16 to 2019-20 (FNZ, 2021b). One sea lion was reported captured by a ling trawler in 2018-19 (see Table 2). Sea lion captures by these fisheries were incorporated into the TMP and were not considered to pose a threat to the sea lion population (DOC, 2017).

Following an unexplained decline in pup counts between 2007-08 and 2008-09, annual pup production has been relatively stable over the 13-year period 2008-09 to 2021-22 (Young & Manno, 2022), (Figure 20). Note that no estimates of pup production were obtained in 2020-21 due to Covid-19-related cancellation of the field season.

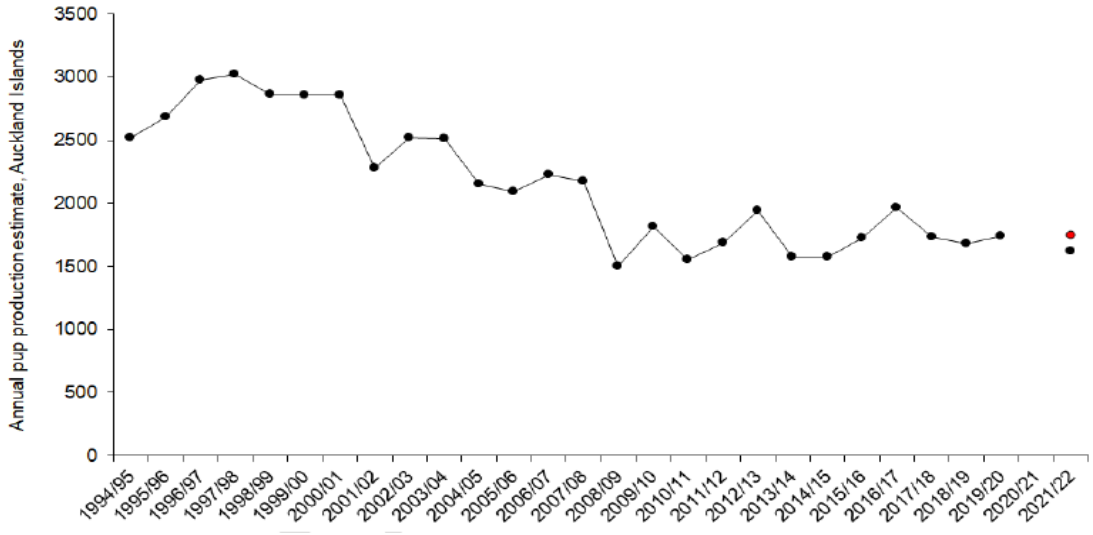

Figure 20: Total estimated sea lion pup production at the Auckland Islands (all colonies combined) 1994-95 to 2021-22. Two estimates are presented for 2021-22: a minimum estimate based on direct counts and mark-recapture (black) and an adjusted estimate based on direct counts and mark-recapture (red).

Sharks

Very few protected sharks have been reported captured by hake, hoki and ling trawl fisheries; a single basking shark (*Cetorhinus maximus*) capture was reported in 2014-15, while two were reported in each of 2018-19 and 2019-20 and three in 2020-21 (G. Lydon FNZ, pers. comm.). No white pointer (great white) sharks have been reported captured in these fisheries (Table 6). DWG's Sharks OP provides guidelines for returning protected sharks to the sea unharmed wherever possible (DWG, 2022).

Table 6: Industry-reported protected shark species captures in the hake, hoki and ling trawl fisheries in 2018-19 and 2019-20.

Fishery	2018-19		2019-20		2020-21	
	BSK	WPS	BSK	WPS	BSK	WPS
HAK	1	0	0	0	1	0
HOK	1	0	2	0	1	0
LIN	0	0	1	0	1	0

A review of basking shark interactions in New Zealand found that while captures were greater for tows deeper than 400 m and for net headline heights that exceeded 4 m, there was no clear understanding of when/where encounters were likely to occur. Basking sharks may undergo very extensive migrations, both within ocean basins and trans-equatorially (Francis, 2017).

Whales & dolphins

There were three reported incidental captures of common dolphin (*Delphis delphis*), and one of a long-finned pilot whale (*Glopicephala melas*) in the hoki mixed species trawl fishery in the five-year period 2013-14 to 2017-18, (Dragonfly, 2019). The pilot whale was in a state of

decomposition when caught, indicating it may have died of natural causes (R. Wells, DWG, pers. comm.). In 2018-19 there were two common dolphin captures involving a single incident, while in 2019-20 there were two common dolphin captures, one dusky dolphin (*Lagenorhynchus obscurus*) capture and one pilot whale capture (see Table 2), (G. Lydon FNZ, pers. comm.). The pilot whale was a retention of a previously dead animal as there was evidence of significant flesh loss to the head region (J. Cleal, ELO, pers. comm.). In 2020-21 there were seven dolphin captures by hoki target trawls and one by a ling target trawl (G. Lydon FNZ, pers. comm.).

Coral

Corals are rarely encountered by hoki, hake and ling trawlers. Observed coral bycatch in these fisheries averaged 155 kg/year over the 6-year period 2013-14 to 2017-18 and 2020-21 (Table 7). Observed coral captures in 2018-19 and 2019-20 amounted to 16 kg and 3 kg respectively (G. Lydon FNZ, pers. comm.). The impact of these fisheries on corals is negligible.

Table 7: Catch of all corals from observed tows, the number of observed tows and the average catch of coral per tow by hoki /hake/ling trawl fisheries).

	2013-14	2014-15	2015-16	2016-17	2017-18	2020-21	Average
Coral catch (kg)	65.4	465.4	190.4	63	78.5	69.4	155.2
No. tows with coral	68	96	67	105	79	10	71
No. observed tows	5,252	4,921	4,282	3,902	5,524	4,059	4,657
% tows with coral	1.3%	2.0%	1.6%	2.7%	1.4%	0.2%	1.5%
Catch rate (kg/tow)	0.01	0.09	0.04	0.02	0.01	0.02	0.03

Benthic interactions

The trawl footprint of New Zealand's trawl fisheries is assessed annually to monitor their interactions with the benthic habitat. The trawl footprint has been determined for each year commencing in 1989-90 for all the main deep water target fisheries.

For the 2017-18 and 2018-19 fishing years, hake-targeted tows contacted less than 0.1% of the seabed in the fishable area (i.e. depths < 1,600 m) in the Territorial Sea and EEZ. For hoki-targeted tows the trawl footprint was 1.5 – 1.8% of the fishable area and for ling-targeted tows, 0.1% of the fishable area. The fishing grounds are well-established and very little new ground is traversed each year (

Table 8), (Baird & Mules, 2021).

Table 8: Trawl footprint and percentage of fishable area trawled by hake, hoki and ling trawl fisheries in 2017-18 and 2018-19.

Fishery	2017-18			2018-19		
	Trawl footprint (km^2)	% Fishable Area (0-1600 m)	New Area Trawled (km^2)	Trawl footprint (km^2)	% Fishable Area (0-1600 m)	New Area Trawled (km^2)
HAK	599	0.04%	1.2	374	0.02%	2.0
HOK	29,084	1.8%	12.9	24,392	1.5%	21.3
LIN	1,422	0.1%	50.7	1,645	0.1%	19.4

New Zealand's strategy to guard against adverse impacts on the benthic environment includes multiple area closures in the EEZ. A total of 17 Benthic Protection Areas (BPAs), representatively distributed around the EEZ, and 17 'seamount' closures, 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.

Aquatic environment and biodiversity research initiatives related to the benthic effects of fishing are detailed in the Annual Operational Plan for Deepwater Fisheries (FNZ, 2021) and the Aquatic Environment and Biodiversity Annual Review report (FNZ, 2022), and include the following in-progress projects:

- The extent and intensity of seabed contact by mobile bottom fishing in the New Zealand Territorial Sea and Exclusive Economic Zone (trawl footprint), (Project BEN2020-01)
- The extent and intensity of trawl effort on or near underwater topographic features in New Zealand's Exclusive Economic Zone (Project BEN2020-07)
- Quantitative photographic surveys of benthic invertebrate communitgies on features in the Graveyard knolls complex (Project ZBD2020-07)
- Spatial decision support tool development for managing the impacts of bottom fishing on vulnerable or sensitive habitats (Project BEN2019-05).

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P3 Overview of management information

Legal & customary framework

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

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

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

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

At an operational level, these fisheries are managed in accordance with the National Fisheries Plan for Deepwater Fisheries (FNZ, 2019). There are species-specific chapters for hake, hoki and ling within this plan (MPI, 2010a; MPI, 2011; MPI, 2013).

The National Deepwater Plan 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 the fishery 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 deep water 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).

Collaboration

In 2006, DWG and 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 DOC actively consult with interested parties to inform management decisions through their open scientific working groups and public consultation processes.

Compliance & enforcement

FNZ 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 FNZ to monitor all hake/hoki/ling/southern blue whiting 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 to report catches of QMS species. Catches may only be landed at designated ports and sold to Licensed Fish Receivers (LFRs). Reporting requirements for hake/hoki/ling trawl vessels include logging the location, depth, main species caught for each tow, and total landed catch for each trip.

MPI Fishery Officers carried out a total of 122 in-port and at-sea inspections for the period 1 January 2019 to 31 December 2021. 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 9), (G. Lydon FNZ, pers. comm.).

Table 9: 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 2021.

		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	0
	In port (deep-water vessels	4	0	0
	At sea	3	2	0
	Total	**12**	**15**	**0**
	Grand total	**73**	**49**	**4**

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 of the National Plans of Action for Seabirds (FNZ, 2020) and Sharks (MPI, 2013a).

Fisheries plans

The National Fisheries Plan for Deepwater Fisheries (FNZ, 2019) 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 are fisheries-specific chapters for the hake, hoki and ling fisheries within this Plan (MPI, 2010a; MPI, 2011; MPI, 2013).

The actual management measures and delivery outcomes in the Plan are specified in FNZ's Annual Operational Plan (AOP), (FNZ, 2020a), which is reviewed and updated annually. In addition, Annual Review Reports assesses performance against the AOP and are publicly available (FNZ, 2021a).

Research plans

Research needs for deep water fisheries are driven by the objectives of the National Fisheries Plan for Deepwater Fisheries and delivered through the Medium-Term Research Plan for deep water fisheries (MTRP), (FNZ, 2020d). The MTRP 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.

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).

FNZ's Annual Operational Plan for Deepwater Fisheries 2021/22 (Tables 8-11 and 16) provides FNZ and DOC research projects to be undertaken during 2020-21 that relate to deep water species (FNZ, 2021). FNZ's NPOA Seabirds 2020 – Implementation Plan outlines the seabird risk assessment, monitoring and mitigation projects to be undertaken from 2020 to 2024 (FNZ, 2020b).

A comprehensive review of progress achieved against aquatic environment-related research projects and environmental objectives is undertaken by FNZ annually (FNZ, 2022).

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