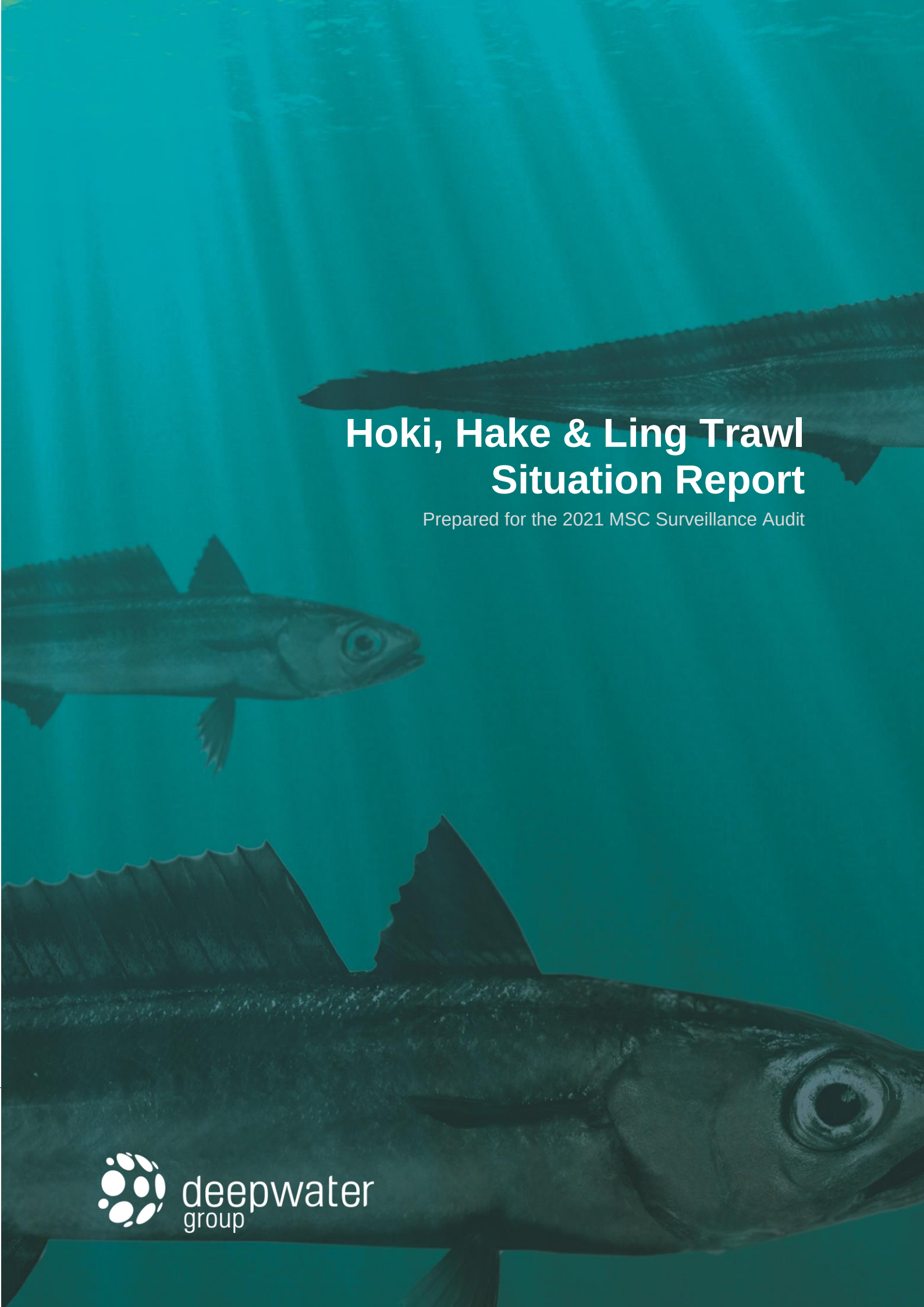

Hoki, Hake & Ling Trawl Situation Report

Prepared for the 2021 MSC Surveillance Audit

deepwater group

Table of Contents

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 2019 surveillance audit. This combined UoC is described as the hoki mixed-species trawl fishery.

It is Deepwater Group Limited's (DWG) submission that these nine fisheries 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Stock areas	UoC 3: HAK 1 (Sub-Antarctic) UoC 4: HAK 4 (Chatham Rise) UoC 5: HAK 7 (West Coast South Island) - WITHDRAWN
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

Update on stock status (McKenzie, 2019)	HOK 1 East: B_{2019} was estimated to be 64% or 66% B_0; Virtually Certain (> 99%) to be at or above the lower end of the target range of 35-50% B_0 and Likely (> 60%) to be at or above the upper end of the target range. Provisional B_{2021} estimates (22 April) are 48 – 49% B_0.) HOK 1 West: B_{2019} was estimated to be 56% B_0 or 29% B_0; About as Likely as Not (40-60%) to be at or above the lower end of the target range of 35-50% B_0. Provisional B_{2021} estimates (22 April) are 32 – 35% B_0. Revised stock assessments for HOK 1 have been developed in 2021and DWG can provide a verbal update on this work.
TACC 2020-21 TACC 2019-20 TACC 2018-19 TACC 2017-18	95,000 t (catch limits: East 50,000 t; West 45,000 t)[1] 115,000 t (catch limits: East 60,000 t; West 55,000 t) 130,000 t (catch limits: East 60,000 t; West 70,000 t)[2] 150,000 t (catch limits: East 60,000 t; West 90,000 t)
UoA share of TACC UoC share of TACC	100% 93%
HOK 1 catch 2019-20 HOK 1 catch 2018-19 HOK 1 catch 2017-18	107,709 t (HOK 1 East 55,070 t, HOK 1 West 53,030 t) 122,460 t (HOK 1 East 63,524 t, HOK 1 West 56,953 t) 135,418 t (HOK 1 East 59,668 t, HOK 1 West 73,736 t)[3]

1 During the 2020-21 fishing year quota owners have 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.

2 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).

3 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.

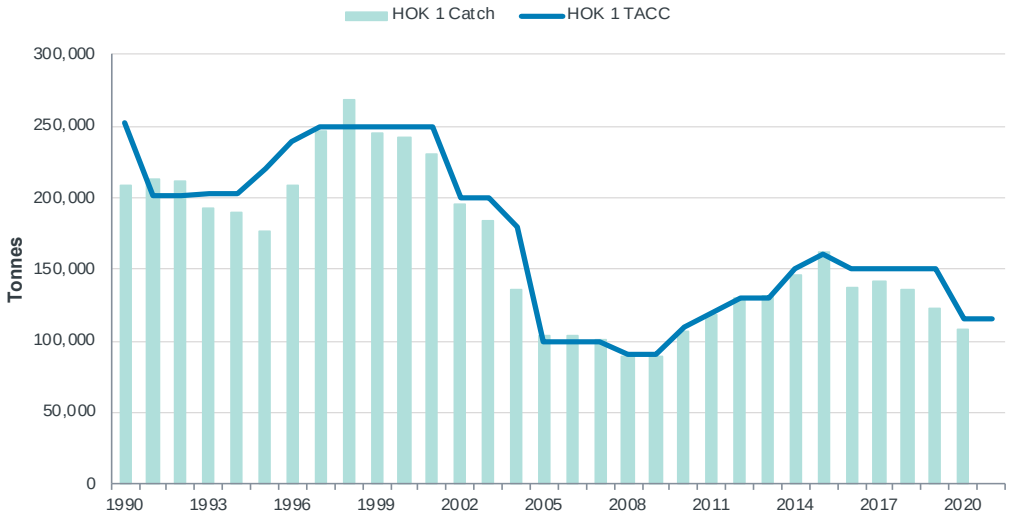

Figure 1: Total Allowable Commercial Catches and reported catches for HOK 1 (East & West combined).

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, HOK1 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 HOK1 W catch limit by 20,000 t from 90,000 t to 70,000 t and to leave the HOK1 E catch limit at 60,000 t, providing a HOK1 catch limit of 130,000 t. This was given effect to by collectively setting aside 30,144 t ACE from HOK1 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 HOK1 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 HOK1 W – thereby reducing the western catch limit from 70,000 t to 55,000 t and with the catch limit for HOK1 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 HOK1 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 – In 2020, given continued concerns over the performance of the hoki fishery, quota owners agreed to again reduce the HOK1 catch limit . The 2020-21 HOK1 catch limit is set at 95,000 t, lower than the TACC of 115,000 t, achieved by setting aside ~20,000 t. The agreed catch limit for HOK1 E has been reduced by 10,000 t (from 60,000 t to 50,000 t) and for HOK1 W by 10,000 t (from 55,000 t to 45,000 t). These catch management measures will be reviewed in May 2021 after the results of the 2021 hoki stock assessment are available.

Stock assessment review

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.

A suite of exploratory models was developed and tested 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. Provisional results from MPD runs for the base model and multiple sensitivities produced estimates of B_{2021}/B_0 ranging between 34-49% for the east stock, 26-38% for the west stock and 27-42% for the east and west stocks combined.

Three models selected for MCMC runs produced provisional estimates of B_{2021}/B_0 between 48-49% B_0 for the East stock, 32-35% B_0 for the West stock and 38-42% B_0 for the East and West stocks combined (22 April). FNZ advise that a Plenary Report for HOK 1 will be available for review by mid-May 2021. DWG expect the Final Advice Report on the 2020-21 stock assessment will be available later during 2021.

Genetic analysis

In 2020, DWG contracted a genetic study to investigate the stock structure of hoki in the New Zealand region. The provisional results from a genomic approach showed that within New Zealand, hoki across a wide range of sampling sites (Fig. 2) are genetically very similar, while hoki in Australia are distinct from hoki in New Zealand (Fig. 3) (Wellenreuther et al., 2021). This work is ongoing.

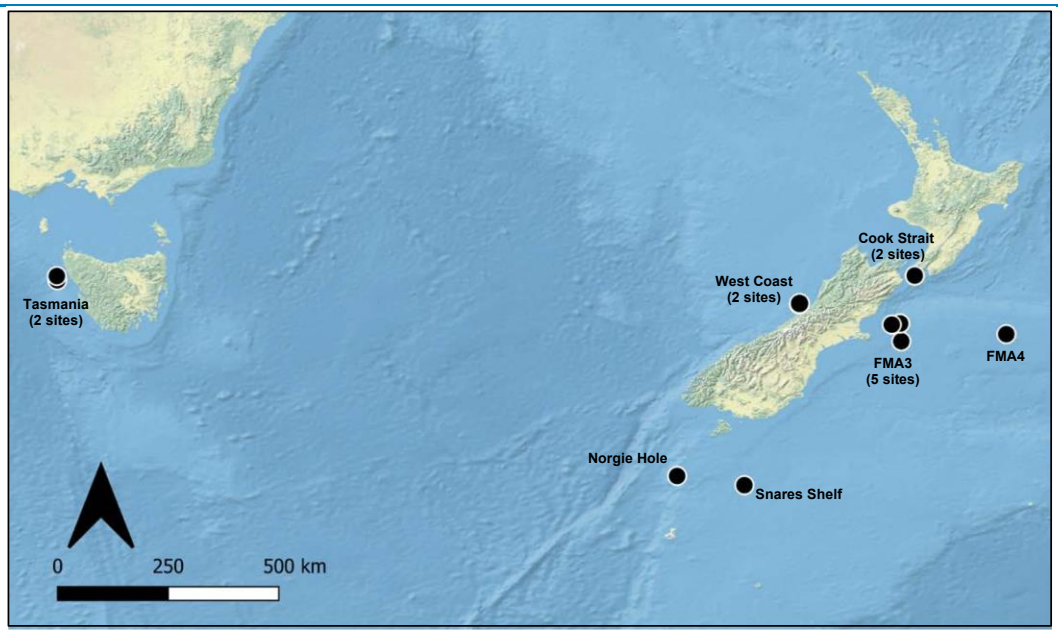

Figure 2: Sampling sites for collection of hoki material for genetic analysis.

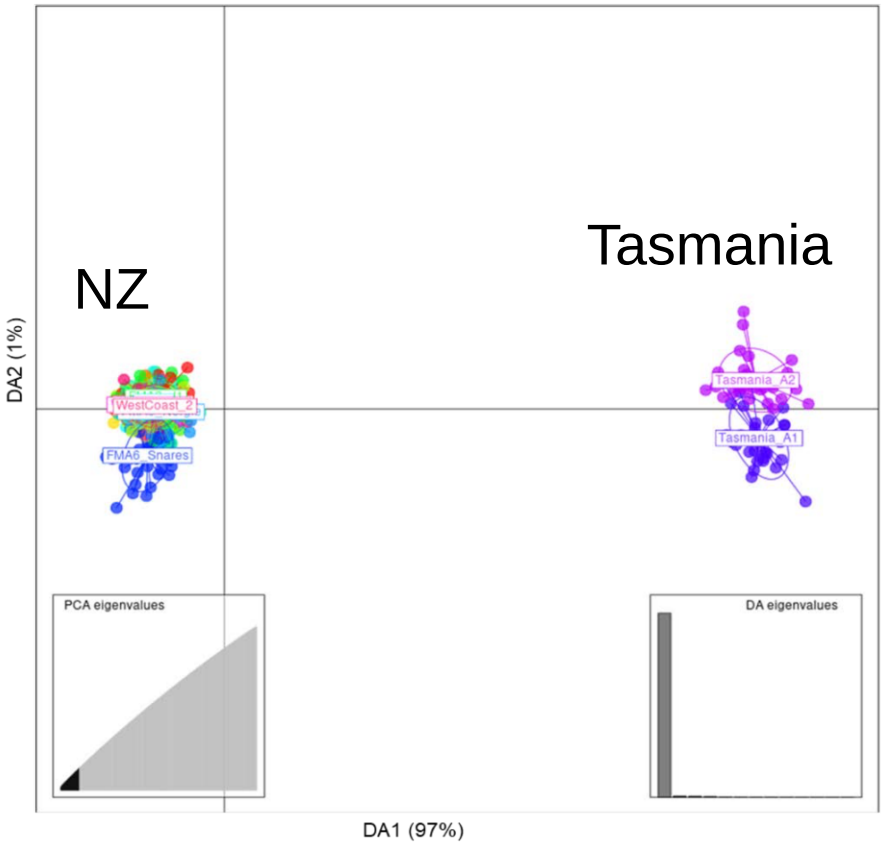

Figure 3: Cluster and discriminant analyses of SNPs for New Zealand and Tasmanian hoki.

Biomass surveys

Hoki trawl and acoustic biomass surveys in recent years have produced lower than average biomass indices, supporting quota owners' contention that recent stock assessments have been out of synch with true stock abundance.

Cook Strait – the acoustic abundance index in 2019 was 11% lower than the equivalent index from the 2017 survey and the lowest since 2008 (O'Driscoll & Escobar-Flores, 2020).

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

Chatham Rise - the trawl abundance index in January 2018 showed an increase of 6% from 2016 and was about average for the period 2013 – 2018, although the biomass of recruited hoki declined by 26% from that in 2016 (Stevens et al., 2018).

Sub-Antarctic - the trawl abundance index in December 2018 was down 18% from 2016 but similar to that in 2014 (MacGibbon et al., 2019).

UoC 3 – HAK 1

Update on stock status (Dunn, 2019)	HAK 1 (sub-Antarctic): B_{2018} was estimated at 49% B_0; Likely (> 60%) to be at or above the target of 40% B_0. Note: This stock assessment is currently being updated.
TACC 2020-21	3,701 t
TACC 2019-20	3,701 t
TACC 2018-19	3,701 t
TACC 2017-18	3,701 t
UoA share of TACC	100%
UoC share of TACC	94%
HAK 1 catch 2019-20	1,062 t
HAK 1 catch 2018-19	896 t
HAK 1 catch 2017-18	1,350 t
HAK 1 catch 2016-17	1,175 t

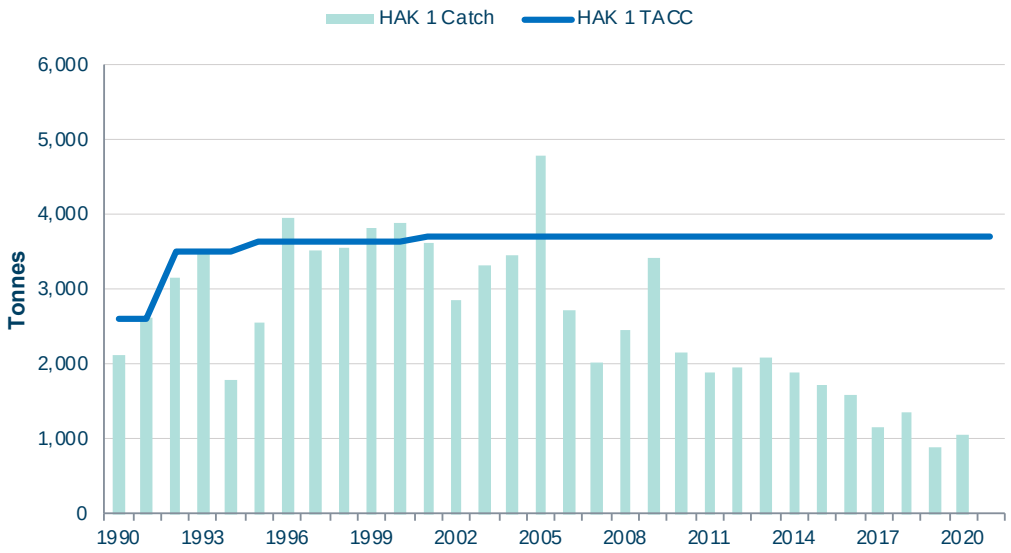

Figure 3 :Total Allowable Commercial Catches and reported catches for HAK 1.

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, In prep., in FNZ, 2020)	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.
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

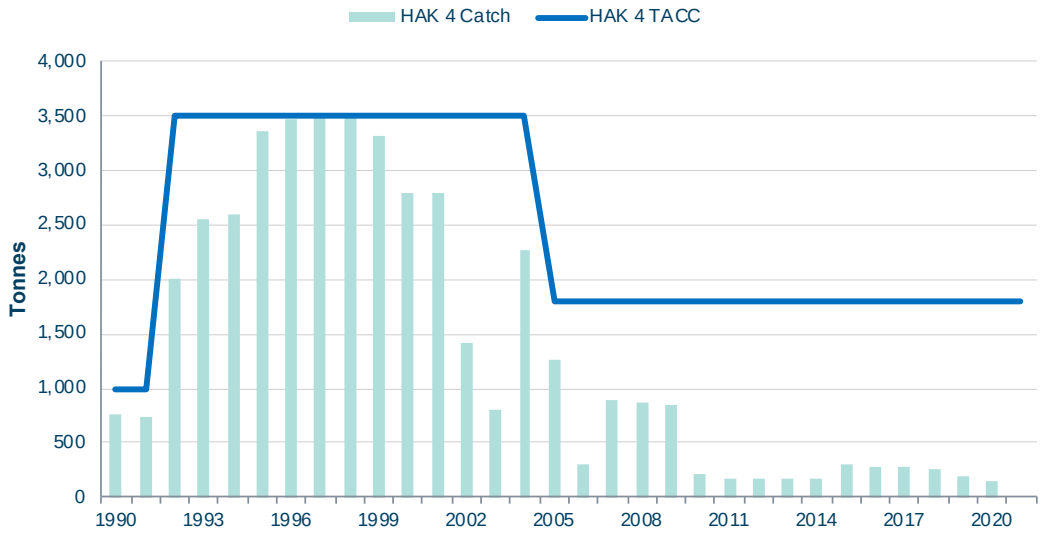

Figure 4: Total Allowable Commercial Catches and reported catches for HAK 4.

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

Withdrawn from certification

UoC 6 – LIN 3

Update on stock status (Holmes, 2019)	For Chatham Rise (LIN 3 & 4), B_{2019} was estimated to be about 57% B_0; Very Likely (> 90%) to be above the management target of 40% B_0 (base case run).
TACC 2020-21 TACC 2019-20 TACC 2018-19 TACC 2017-18	2,060 t 2,060 t 2,060 t 2,060 t
UoA share of TACC and total LIN catch UoC share of TACC and total LIN catch	100% of TACC and 59% of total LIN catch (based on average estimated trawl catch over the last two years) 93% of TACC and 54% of total LIN catch (based on average estimated trawl catch over the last two years)
LIN 3 catch 2019-20	1,684 t (Total reported catch) 912 t (Estimated catch trawl)

LIN 3 catch 2018-19	554 t (Estimated catch bottom longline) 218 t (Estimated catch other methods) 2,016 t (Total reported catch) 1,255 t (Estimated catch trawl) 634 t (Estimated catch bottom longline) 127 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.

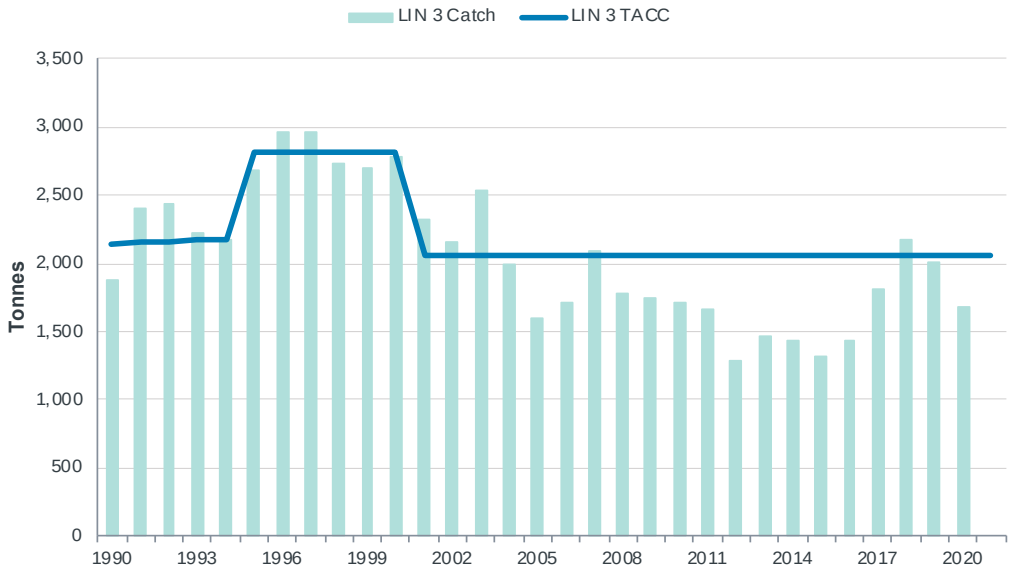

Figure 7: TACCs and reported catches for LIN 3 (all gear types).

UoC 7 – LIN 4

Update on stock status (Holmes, 2019)	For the Chatham Rise stock (LIN 3 & 4), B_{2019} was estimated to be about 57% B_0; Very Likely (> 90%) to be above the management target (base case run).
TACC 2020-21 TACC 2019-20 TACC 2018-19 TACC 2017-18	4,200 t 4,200 t 4,200 t 4,200 t
UoA 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)

UoC share of TACC and total LIN catch	94% of TACC and 30% of total LIN catch (based on average estimated trawl catch over the last two years)
LIN 4 catch 2019-20	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).
LIN 4 catch 2018-19	2,044 t (Total reported catch) 677 t (Estimated catch for all target trawl) 1,106 t (Estimated catch for bottom longline) 271 t (Estimated catch other methods).

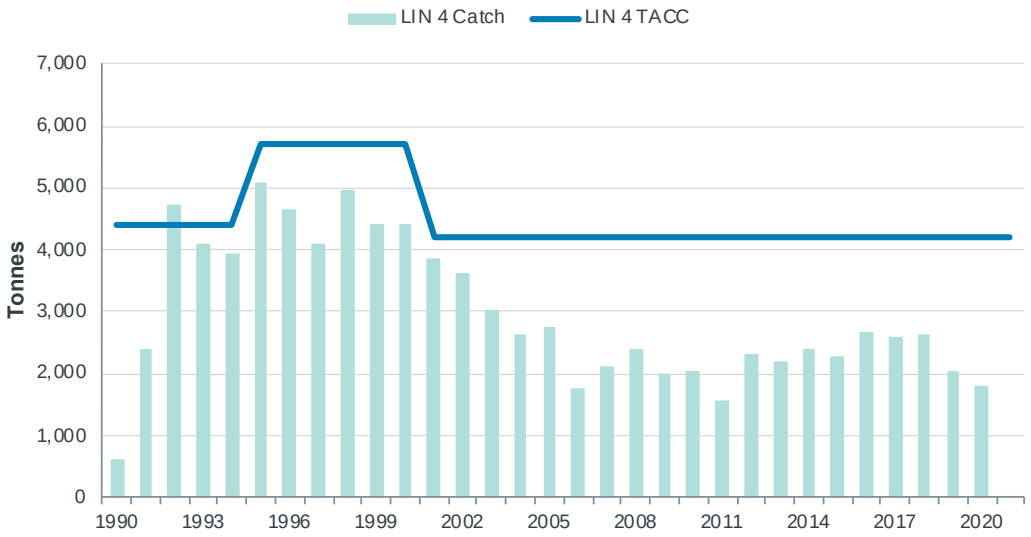

Figure 8: Total Allowable Commercial Catches and reported catches for LIN 4 (all gear types).

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 (Masi, 2019)	LIN 5&6 (Sub-Antarctic excl. Bounty Plateau): B_{2018} was estimated to be between 75% and 101% B_0; Virtually Certain (>99%) to be at or above the target (40% B_0). Note: This stock assessment is currently being updated.
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 UoC share of TACC and total LIN catch	100% of TACC and 92% of total LIN catch (based on average estimated trawl catch over the last two years) 95% of TACC and 87% of total LIN catch (based on average estimated trawl catch over the last two years)
LIN 5 catch 2019-20 LIN 5 catch 2018-19 	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) 4,596 t (Total reported catch) 4,228 t (Estimated catch trawl) 336 t (Estimated catch bottom longline) 32 t (Estimated catch other methods)

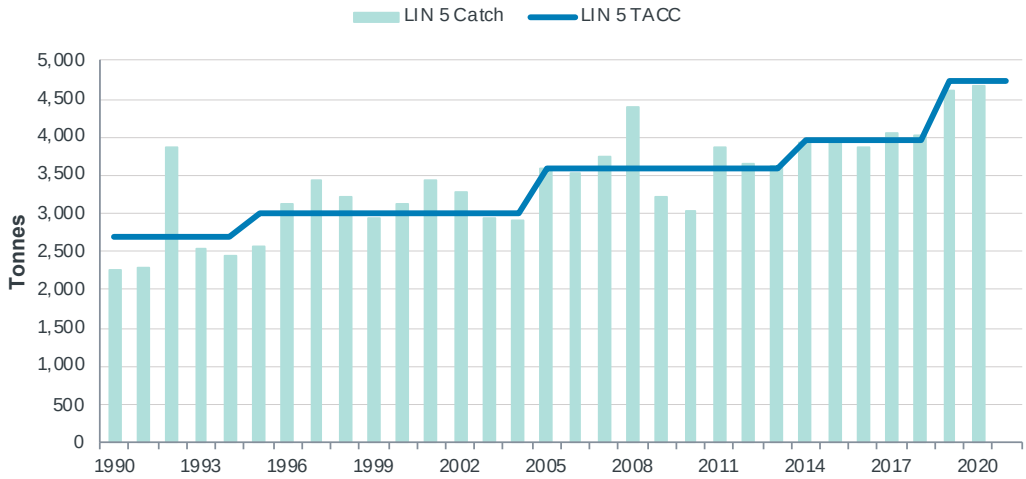

Figure 9: Total Allowable Commercial Catches and reported catches for LIN 5 (all gear types).

UoC 9 – LIN 6

Update on stock status LIN 5 & 6 (Masi, 2019)	For the Sub-Antarctic stock (LIN 5 & 6, excluding the Bounty Plateau, LIN 6B), B_{2018} was estimated to be between 75% and 101% B_0; Virtually Certain (> 99%) to be above the management target. Note: This stock assessment is currently being updated.
TACC 2020-21 TACC 2019-20 TACC 2018-19 TACC 2017-18	8,505 t 8,505 t 8,505 t 8,505 t

UoA share of TACC and total LIN catch	100% of TACC and 60% 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 56% of total LIN catch (based on average estimated trawl catch over the last two years)
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)
LIN 6 catch 2018-19	3,706 t (Total reported catch) 2,372 t (Estimated catch trawl) 1,334 t (Estimated catch bottom longline) 0 t (Estimated catch other methods) 200 t (Estimated catch for LIN 6B bottom longline)

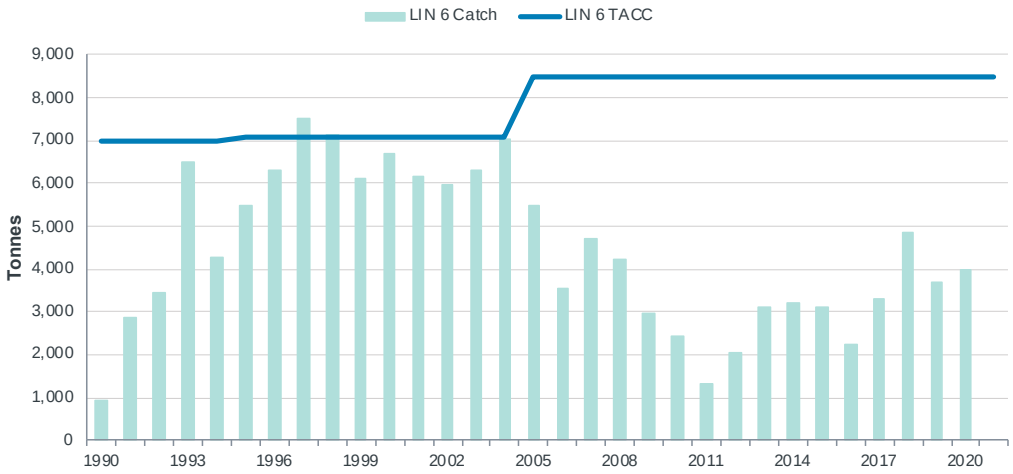

Figure 10: Total Allowable Commercial Catches and reported catches for LIN 6 (all gear types).

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.

UoC 10 – LIN 7

Update on stock status (Dunn & Ballara, 2019)	Three alternative model runs were presented, with B_{2017} estimated to be 79%, 66% and 54% B_0, Very Likely (>90%) to be at or above the management target for all model runs.
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 62% 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 45% of total LIN catch (based on average estimated trawl catch over the last two years)
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)
LIN 7 catch 2018-19	3,059 t (Total reported catch) 2,015 t (Estimated catch trawl) 1,044 t (Estimated catch bottom longline) 0 t (Estimated catch other methods)

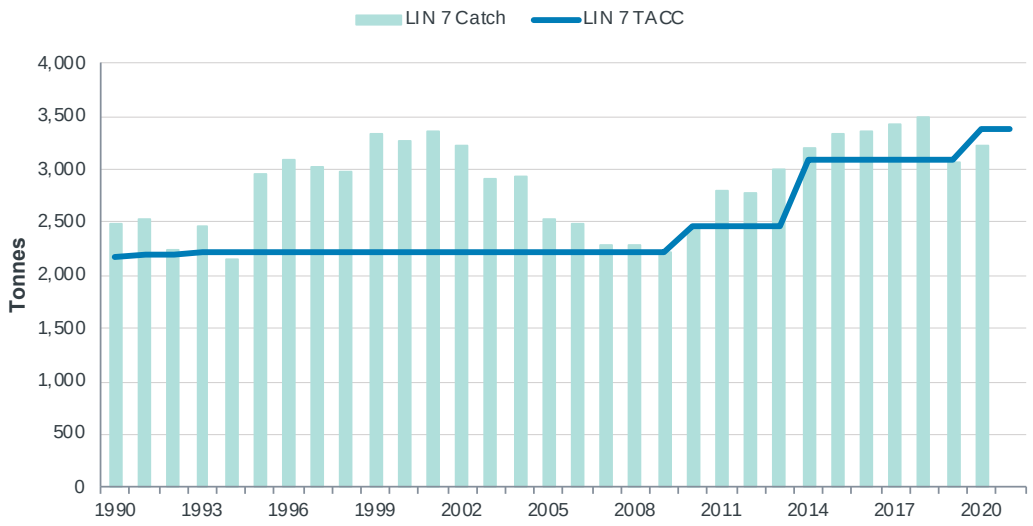

Figure 11: Total Allowable Commercial Catches and reported catches for LIN 7 (all gear types).

Key P1 references

Ballara, S.L. (2019). A descriptive analysis of all ling (*Genypterus blacodes*) fisheries, and CPUE for ling fisheries in LIN 5&6, from 1990 to 2017. New Zealand Fisheries Assessment Report 2019/49. 88 p. https://fs.fish.govt.nz/Doc/24752/FAR-2019-49-Ling-5-6-Characterisation.pdf.ashx

Ballara, S.L. & O'Driscoll, R.L. (2019). Catches, size, and age structure of the 2017–18 hoki fishery, and a summary of input data used for the 2019 stock assessment. New Zealand Fisheries Assessment Report 2019/48. 140 p. https://fs.fish.govt.nz/Doc/24751/FAR-2019-48-Hoki-fishery-and-input-to-2019-stock-assessment.pdf.ashx

Dunn, M.R. & Langley, A. (2018). A review of the hoki stock assessment in 2018. New Zealand Fisheries Assessment Report 2018/42. 55 p. https://fs.fish.govt.nz/Doc/24640/FAR-2018-42-Hoki-stock-assessment-review.pdf.ashx

Dunn, M.R. (2019). Stock assessment of Sub-Antarctic hake (part of HAK 1) for 2018. New Zealand Fisheries Assessment Report 2019/52. 29 p. https://fs.fish.govt.nz/Doc/24755/FAR-2019-52-Sub-Antarctic-Hake-Stock-Assessment.pdf.ashx

Dunn, M.R & Ballara, S.L. (2019). Fishery description and stock assessment for ling off the West Coast South Island (LIN 7) to the 2015–16 fishing year. New Zealand Fisheries Assessment Report 2019/40. 112 p. https://fs.fish.govt.nz/Doc/24737/FAR-2019-40-Stock-Assessment-LIN7.pdf.ashx

Dutilloy, A. (2019). A descriptive analysis of all ling (Genypterus blacodes) fisheries, and CPUE for ling longline fisheries in LIN 3&4 from 1990 to 2018. New Zealand Fisheries Assessment Report 2019/53. 73 p. https://www.mpi.govt.nz/dmsdocument/37359-FAR-201953-A-descriptive-analysis-of-all-ling-Genypterus-blacodes-fisheries-and-CPUE-for-ling-longline-fisheries-in-LIN-34-from-1990-to-2018

Dutilloy, A. (2021). Fishery description and CPUE for ling (*Genypterus blacodes*) off the west coast South Island (LIN 7WC), 1986–87 to 2018–19. New Zealand Fisheries Assessment Report 2021/12. 102 p. https://www.mpi.govt.nz/dmsdocument/44725-FAR-202112-Fishery-description-and-CPUE-for-ling-Genypterus-blacodes-off-the-west-coast-South-Island-LIN-7WC-198687-to-201819

FNZ (2019). Review of Sustainability Measures for Hoki (HOK 1) for 2019/20. Fisheries New Zealand Discussion Paper No: 2019:06. 8 p. https://www.fisheries.govt.nz/dmsdocument/35163-review-of-sustainability-measures-for-hoki-hok-1-for-201920

FNZ (2019a). October 2019 Sustainability Round Decisions. Fisheries New Zealand Document Number: B19-0373, 30 August, 2019. https://www.mpi.govt.nz/dmsdocument/37170-B19-0373-October-2019-Sustainability-Round-Decisions.pdf

FNZ (2020). Fisheries Assessment Plenary May 2020: Stock Assessments and Stock Status, Vol. 1 Introductory Section and Alfonsino to Hake (Hake pp. 534-577). https://www.mpi.govt.nz/dmsdocument/40781-Fisheries-Assessment-Plenary-May-2020-Stock-Assessments-and-Stock-Status-Volume-1-Introductory-section-and-Alfonsino-to-Hake

FNZ (2020a). Fisheries Assessment Plenary May 2020: Stock Assessments and Stock Status, Vol. 2 Hoki to Redbait (Hoki pp.579-622; Ling pp.757-798). https://www.mpi.govt.nz/dmsdocument/40784-Fisheries-Assessment-Plenary-May-2020-Volume-2-Hoki-to-Redbait

Holmes, S. (2019). Stock assessment of ling (*Genypterus blacodes*) on the Chatham Rise (LIN 3&4) for the 2018-19 fishing year. New Zealand Fisheries Assessment Report 2019/70. 45 p. https://www.mpi.govt.nz/dmsdocument/38825-FAR-201970-Stock-assessment-of-ling-Genypterus-blacodes-on-the-Chatham-Rise-LIN-34-for-the-2018-19-fishing-year

Holmes, S.J. (In prep.). Stock assessment of hake (*Merluccius australis*) on the Chatham Rise (HAK 4) for the 2019-20 fishing year. New Zealand Fisheries Assessment Report 20XX/XX.

Langley, A.D. (2020). Review of the 2019 hoki stock assessment. New Zealand Fisheries Assessment Report 2020/28. 52 p. https://www.mpi.govt.nz/dmsdocument/42282-FAR-202028-Review-of-the-2019-hoki-stock-assessment

MacGibbon, D.J., Ballara, S.L., Schimel, A.C.G. and O'Driscoll, R.L. (2019). Trawl survey of hoki and middle-depth species in the Southland and Sub-Antarctic areas, November–December 2018 (TAN1811). New Zealand Fisheries Assessment Report 2019/71. 96 p. https://www.mpi.govt.nz/dmsdocument/38828-FAR-201971-Trawl-survey-of-hoki-and-middle-depth-species-in-the-Southland-and-Sub-Antarctic-NovemberDecember-2018-TAN1811

Masi, M. (2019). Stock assessment of ling (*Genypterus blacodes*) in the Sub-Antarctic (LIN 5&6) for the 2017–18 fishing year. New Zealand Fisheries Assessment Report 2019/30: 31 p. https://www.mpi.govt.nz/dmsdocument/36387-far-201930-stock-assessment-of-ling-genypterus-blacodes-in-the-sub-antarctic-lin-5-and-6-for-the-201718-fishing-year

McGregor, V. (In prep.). Hoki population modelling. Presentation to Deep Water Working Group 30 February, 2021. DWWG 2021-53.

McGregor, V. (In prep.). Hoki population modelling. Presentation to Deep Water Working Group 8 April 2021. DWWG 2021-56.

McKenzie, A. (2019).Assessment of hoki (Macruronus novaezelandiae) in 2019. New Zealand Fisheries Assessment Report 2019/68. 99 p. https://www.mpi.govt.nz/dmsdocument/37820-FAR-201968-Assessment-of-hoki-Macruronus-novaezelandiae-in-2019

O'Driscoll, R.L. and Ballara, S.L. (2019). Trawl and acoustic survey of hoki and middle depth fish abundance on the west coast South Island, July–August 2018 (TAN1807). New Zealand Fisheries Assessment Report 2019/19. 120 p. https://www.mpi.govt.nz/dmsdocument/35526-FAR-201919-Trawl-and-acoustic-survey-of-hoki-and-middle-depth-fish-abundance-on-the-west-coast-South-Island-JulyAugust-2018-TAN1807

O'Driscoll, R. L. & Escobar-Flores, P. (2020). Acoustic survey of spawning hoki in Cook Strait and off the east coast South Island during winter 2019. New Zealand Fisheries Assessment Report 2020/21. 39 p. https://fs.fish.govt.nz/Doc/24810/FAR2020-21-Acoustic-Survey-Hoki-Cook-Strait-ECSI-Winter-2019-4060.pdf.ashx

Saunders, R.J., Hart, Al, Horn, P.L. and Sutton, C.P. (2021). Catch-at-age for hake (*Merluccius australis*) and ling (*Genypterus blacodes*) for the 2018–19 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 2021/15. 97 p. https://www.mpi.govt.nz/dmsdocument/44803-FAR-202115-Catch-at-age-for-hake-Merluccius-australis-and-ling-Genypterus-blacodes-for-the-201819-fishing-year-and-from-a-research-trawl-survey-in-2020-and-a-summary-of-the-available-data-sets-from-the-New-Zealand-EEZ

Stevens, D. W., O'Driscoll, R. L., Ballara, S. L. & Schimel A.C.G (2018). Trawl survey of hoki and middle-depth species on the Chatham Rise, January 2018 (TAN1801). New Zealand Fisheries Assessment Report 2018/41. 111 p. https://fs.fish.govt.nz/Doc/24639/FAR-2018-41-Trawl-Survey-TAN1801.pdf.ashx

Wellenreuther, M., Koot, E., Hilario, E., Ruza, I., Storey, R., Wu, C. and Cagne, D. (2021). Investigating Hoki Stock Structure Using Genomics. PowerPoint presentation, Plant & Food Research. https://deepwatergroup.org/wp-content/uploads/2021/04/Wellenreuther-et-al-2021-Investigating-hoki-stock-structure-using-genomics.pdf

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[4]).

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

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

FNZ's observer coverage plans for deepwater fisheries in 2020-21 are provided in the Annual Operational Plan, with a total of 5,740 observer days planned. The allocation for the hoki mixed-species fisheries is 2,255 days (FNZ, 2020, Table 12, p. 35),

Retained & bycatch species

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

[4] 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.

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, 2020a), and on the Protected Species Capture webpage, previously maintained under contract by Dragonfly Ltd (Dragonfly, 2019). 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.

Note that FNZ have recently contracted a new service provider and the ETP database is currently being revised and is temporarily inaccessible. Summaries of ETP species captures for 2018-19 and 2019-20 have been provided by FNZ's Deepwater Management Team and are provided below. However, none of the capture trends could be updated and those below were previously provided for the first surveillance audit.

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 and Vessel Management Plans (DWG, 2021), which include:

- Hoki OP
- Hoki OP Coastal Trawl Fisheries
- Marine Mammals OP
- Reporting OP
- Seabirds OP
- Sharks OP
- Deepwater Trawl Vessel Management Plan (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.

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). There were seven trigger point activations for seabird captures during 2018/19, most of which were a result of net captures (FNZ, 2020b).

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, 2020a).

The National Plan of Action Seabirds 2018/19 Report (FNZ, 2020c) provides a breakdown of the observed seabird captures by hoki, hake and ling trawlers during 2018-19 (Table 2). Note that FNZ's Annual Review Report 2018/19 provides a lower figure of 72 observed captures (FNZ, 2020d)

Table 2: Summary of observed incidental seabird captures in the hoki, hake and ling trawl fisheries in 2018-19.

Fishery	Observed Captures	Capture Rate per 100 Tows	Observer Coverage	Large Albatross	Small Albatross	Unid. Albatross	Petrels & Shearwaters	Other
Hoki, hake, ling trawl	122	2.74	37%	2	61	6	49	4

The capture rate during 2018-19 of 2.74 per 100 tows by hake, hoki and ling 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.

There were 87 observed seabird mortalities by hoki-targeted tows during 2017-18, dominated by white-chinned petrels. Other prominent species included 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. The estimated number of all seabird mortalities by hoki-targeted tows in 2017-18 was ~350 (Fig. 12).

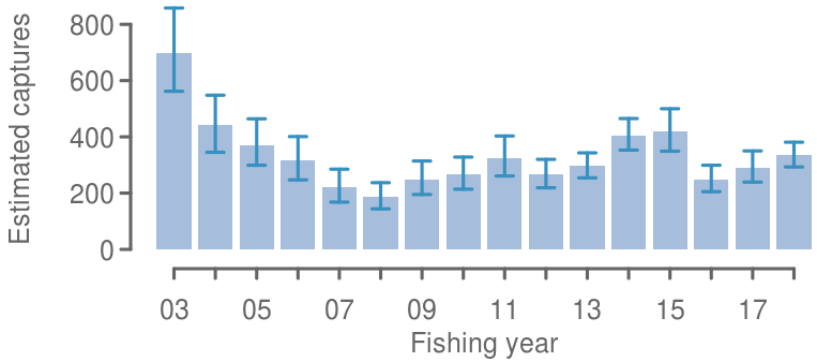

Figure 12: Hoki trawl fishery estimated total incidental seabird captures (dead and live-released) 2002-03 to 2017-18.

Only two seabirds were observed caught by hake trawlers in 2017-18 and the estimated number captured was <5 (Fig. 13).

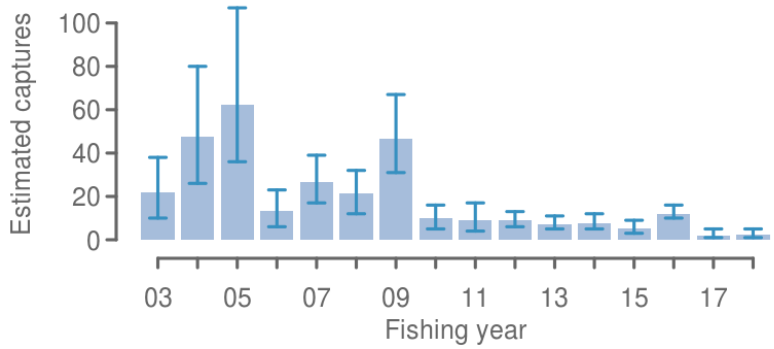

Figure 13: Hake trawl fishery estimated incidental seabird captures 2002-03 to 2017-18.

The 14 observed seabird mortalities by ling-targeted tows in 2017-18 comprised mostly white-capped albatross, but also white-chinned petrel, wandering albatross and sooty shearwater. Around 50 seabirds were estimated captured by ling trawlers in 2017-18 (Fig. 14).

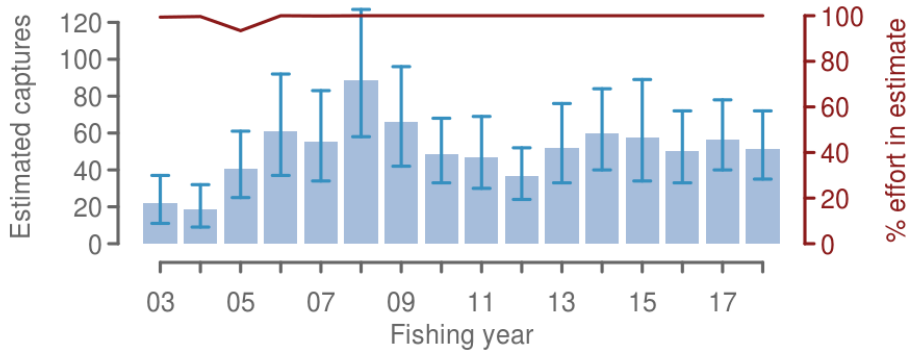

Figure 14: Ling trawl fishery estimated incidental seabird captures 2002-03 to 2017-18.

In the absence of estimated ETP captures post-2017-18, a summary of industry-reported protected species captures by hoki, hake and ling trawlers during 2018-19 and 2019-20 is provided below. Totals of 196 and 158 seabird captures were reported during 2018-19 and 2019-20 respectively (Table 3), (FNZ, pers. comm.).

Table 3: Industry-reported incidental captures of ETP species by hake, hoki and ling targeted tows during 2018-19 and 2019-20.

	2018-19				2019-20			
Target fishery	**Seabirds**	**Sea lions**	**Fur seals**	**Dolphins/ whales**	**Seabirds**	**Sea lions**	**Fur seals**	**Dolphins/ whales**
HAK	0	0	2	0	1	0	0	1
HOK	173	0	60	2	138	0	77	3
LIN	23	1	1	0	19	0	2	0

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., 2017), 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)

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

Estimated incidental captures of Salvin's albatross in middle-depth and deep water trawl fisheries over the 5-year period from 2013-14 to 2017-18 have ranged between 82 and 128, with an average of 103 birds per annum. The rate of capture in hoki-targeted tows (hake- and ling-targeted tows have negligible captures), has reduced by 45% since a peak in 2014-15. (Dragonfly, 2019), (Fig. 16).

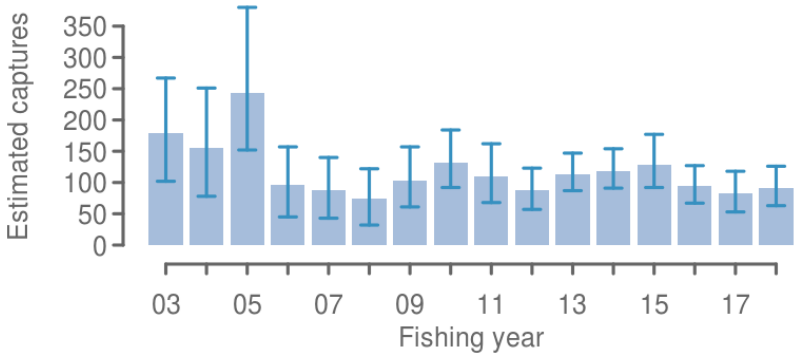

Figure 16: Estimated incidental captures of Salvin's albatross by all middle-depth and deep water trawl fisheries 2002-03 to 2017-18.

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).

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., 2017). The hoki/hake/ling trawl fisheries' share of the overall risk to Westland petrel, at an average of three captures per annum over the last five years (Fig. 17), and at an average observer coverage rate of 33% of tows (Table 1), is illustrative of a low threat level to Westland petrel by these fisheries.

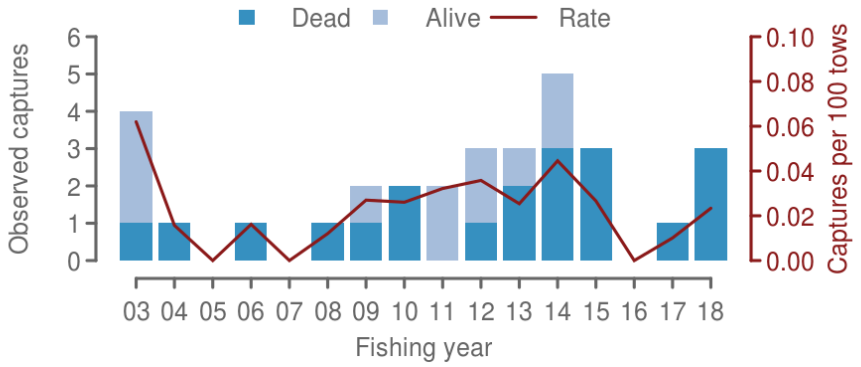

Figure 17: Observed incidental captures of Westland petrel by all trawlers > 28 m from 2002-03 to 2017-18.

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, 2020e).

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 10 seasonal hoki trawlers (< 28 m). 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).

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 around 40 observed and 290 estimated incidental captures of New Zealand (NZ) fur seals per year in the hoki trawl fishery, with a small fraction being released alive (Fig. 18). NZ fur seal captures by the hake and ling trawl fisheries are negligible by comparison. During 2018-19 and 2019-20 there were 63 and 79 fur seal captures reported by vessels (Table 2), considerably lower than the modelled estimate of 290 for 2017-18. The DOC threat classification status for fur seals is 'Not Threatened' and their population size is believed to be increasing (Baker et al., 2019).

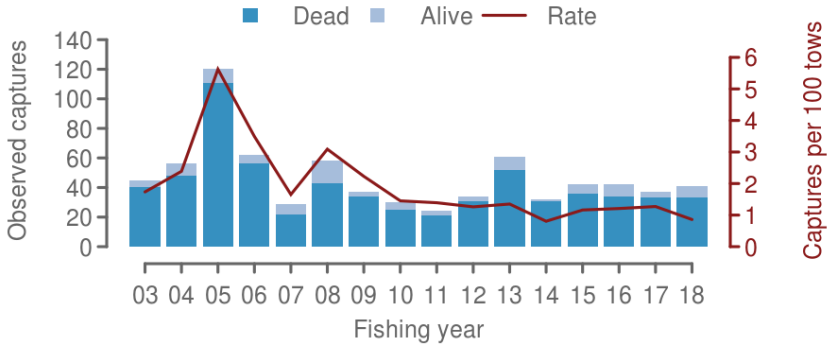

Figure 18: New Zealand observed fur seal captures by the hoki trawl fishery 2002-03 to 2017-18.

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".

There was one reported incidental capture of a New Zealand (NZ) sea lion in the hoki/hake/ling trawl fisheries in the five-year period from 2013-14 to 2017-18 (Dragonfly, 2019). One sea lion was captured in 2018-19, while none were captured in 2019-20 (Table 3). 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 12-year period 2008-09 to 2019-20 (Melidonis & Childerhouse, 2020), (Fig. 19).

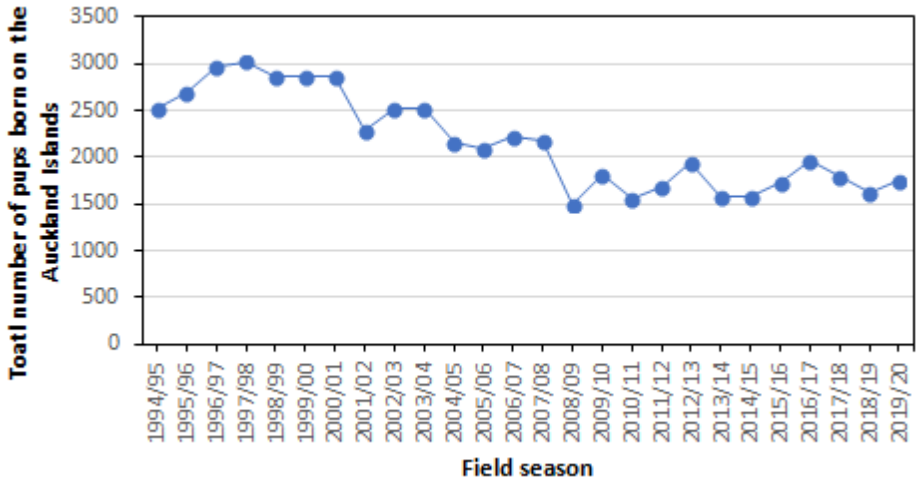

Figure 19. Total estimated sea lion pup production at the Auckland Islands (all colonies combined) 1994-95 to 2019-20.

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 (FNZ, pers. comm.). No white pointer (great white) sharks have been reported captured in these fisheries (Table 5). DWG's Sharks OP provides guidelines for returning protected sharks to the sea unharmed wherever possible (DWG, 2021).

Table 5: 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	
	BSK	WPS	BSK	WPS
HAK	1	0	0	0
HOK	1	0	2	0
LIN	0	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 (Table 3), (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.).

Coral

Corals are rarely encountered by hoki, hake and ling trawlers. Observed coral bycatch in these fisheries averaged 173 kg/year over the 5-year period 2013-14 to 2017-18 (Table 6). Reported coral captures in 2018-19 and 2019-20 amounted to 16 kg and 3 kg respectively (FNZ, pers. comm.). The impact of these fisheries on corals is negligible.

Table 6: 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	Average
Coral catch (kg)	65.4	465.4	190.4	63	78.5	172.54
No. tows with coral	68	96	67	105	79	83
No. observed tows	5,252	4,921	4,282	3,902	5,524	4,776
% tows with coral	1.3%	2.0%	1.6%	2.7%	1.4%	1.7%
Catch rate (kg/tow)	0.01	0.09	0.04	0.02	0.01	0.04

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 7), (Baird & Mules, 2020).

Table 7: 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, 2020), and include the following:

- 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).

Key P2 references

Baird, S.J. and Mules, R. (2020). Extent of bottom contact by commercial trawling and dredging in New Zealand waters, 1989–90 to 2018–19. Draft New Zealand Aquatic Environment and Biodiversity Report No.XX. 157 p. https://deepwatergroup.org/wp-content/uploads/2021/04/Baird-Mules-2020-Trawl-Footprint-1990-2019-Draft-FAR.pdf

Baker, B., Jensz, K. (2019). 2018 aerial survey of Salvin's albatross at the Bounty Islands. Final report to the Conservation Services Programme, Department of Conservation. Latitude 42, Australia. 11 p. https://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/201819/salvins-albatross-bounty-islands-population-project/

Baker, C.S., Boren, L., Childerhouse, S., Constantine, R., van Helden, A., Lundquist, D., Rayment W., Rolfe,J.R. (2019). Conservation status of New Zealand marine mammals, 2019. New Zealand Threat Classification Series 29. 18 p. https://www.doc.govt.nz/globalassets/documents/science-and-technical/nztcs29entire.pdf

Cleal, J. (2019). Deepwater Group Environmental Liaison Officer (ELO) Report 2018/19. 10 p. https://deepwatergroup.org/wp-content/uploads/2021/04/Cleal-2019-ELO-Report-2018-19.pdf

Cleal, J. (2020). Deepwater Group Environmental Liaison Officer (ELO) Report for the 2019-20 Fishing Year. 7 p. https://deepwatergroup.org/wp-content/uploads/2021/04/Cleal-2020-ELO-Report-2019-20.pdf

DOC (2017). New Zealand sea lion/rāpoka Threat Management Plan 2017 – 2022. 17 p. https://www.doc.govt.nz/globalassets/documents/conservation/native-animals/marine-mammals/nz-sea-lion-tmp/nz-sea-lion-threat-management-plan.pdf

DOC (2020). Conservation Services Programme Annual Plan 2020/21. DOC: Wellington. 61 p. https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/plans/final-csp-annual-plan-2020-21.pdf

Dragonfly (2019). Protected species bycatch 2002-03 to 2017-18. https://psc.dragonfly.co.nz/2019v1/released/

DWG (2021). Operational Procedures. https://deepwatergroup.org/newsresources/op-manual/

Finucci, B., Edwards, C.T.t., Anderson, O.F. and Ballara, S.L. (2019). Fish and invertebrate bycatch in New Zealand deepwater fisheries from 1990-91 to 2016-17. New Zealand Aquatic Environment and Biodiversity report No. 210. 77 p. https://www.mpi.govt.nz/dmsdocument/34323-AEBR-210-Fish-and-invertebrate-bycatch-in-New-Zealand-deepwater-fisheries-from-199091-until-201617

FNZ (2019). Protected Fish Species Reporting Requirements for Non-Fish/Protected Species. Fisheries Management Fact Sheet 5. 3 p. https://www.mpi.govt.nz/dmsdocument/7245/direct

FNZ (2020). Annual Operational Plan for Deepwater Fisheries 2020/21. Fisheries New Zealand Technical Paper No: 2020/04. 47 p. https://www.mpi.govt.nz/dmsdocument/41334-Annual-Operational-Plan-for-Deepwater-Fisheries-202021

FNZ (2020a). Aquatic Environment and Biodiversity Annual Review 2019-20. Compiled by the Aquatic Environment Team, Fisheries Science Information, Fisheries New Zealand,

Wellington, New Zealand. 765 p. https://www.mpi.govt.nz/dmsdocument/40980-Aquatic-Environment-and-Biodiversity-Annual-Review-201920

FNZ (2020b). National Plan of Action – Seabirds 2020. Supporting Document. 49 p. https://www.mpi.govt.nz/dmsdocument/40658-National-Plan-Of-Action-Seabirds-2020-supporting-document

FNZ (2020c). National Plan of Action – Seabirds 2020. 2018/19 Report. Fisheries New Zealand Information Paper No: 2020/08. 67 p.https://www.mpi.govt.nz/dmsdocument/42622-National-Plan-of-Action-Seabirds-2020-201819-report

FNZ (2020d). Annual Review Report for Deepwater Fisheries 2018/19. Fisheries New Zealand Discussion Paper No: 2020/01. 95 + 19 p. https://www.mpi.govt.nz/dmsdocument/39770/direct

FNZ (2020e). National Plan of Action – Seabirds 2020. Implementation Plan v2. 14 p. https://www.mpi.govt.nz/dmsdocument/40655-National-Plan-Of-Action-Seabirds-2020-Implementation-Plan

Francis, M. (2017). Review of commercial fishery interactions and population information for New Zealand basking shark. Prepared for Department of Conservation. 44 p. http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2016-17/updated-basking-shark-bycatch-review-2016-17/

Melidonis, M.C. & Childerhouse, S. (2020). New Zealand Sea Lion (Rāpoka) Monitoring on the Auckland Islands for the 2019/20 Season: Field Research Report. Prepared for the Department of Conservation (DOC). 23p. https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/nz-sea-lions/fieldwork-reports/report2020-nzsl-pop-auckland-island.pdf

Richard, Y., Abraham, E. R., & Berkenbusch, K. (2017). Assessment of the risk of commercial fisheries to New Zealand seabirds, 2006–07 to 2014–15. New Zealand Aquatic Environment and Biodiversity Report No. 191. 133 p. https://files.dragonfly.co.nz/publications/pdf/Richardetal_2017_AEBR191.pdf

Robertson, H. A.; Dowding, J. E.; Elliott, G. P.; Hitchmough, R. A.; Miskelly, C. M.; O'Donnell, C. F. J.; Powlesland, R. G.; Sagar, P. M.; Scofield, R. P.; Taylor, G. A. (2013). Conservation status of New Zealand birds, 2012. NZ Threat Classification Series 4. Department of Conservation. Wellington. https://www.doc.govt.nz/Documents/science-and-technical/nztcs4entire.pdf

Waugh, S.M.; Bartle J.A. 2013. Westland petrel. *In*: Miskelly, C.M. (ed.) *New Zealand Birds Online*. www.nzbirdsonline.org.nz

P3 Overview of management information

Legal & customary framework

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

Quota provides a property right to access commercial fisheries and has been allocated to Maori as part of the Treaty of Waitangi Settlements that acknowledge the Treaty guaranteed Maori *"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 99 in port/at sea inspections for the period 1 January 2019 to 31 December 2020. 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. A breakdown of this is provided in the table below.

		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**
	Grand total	**61**	**34**	**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, MPI, 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, 2019a; DWG, 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, 2013).

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, 2020b).

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, 2020c). 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).

Tables 8-11 and 16 of FNZ's Annual Operational Plan for Deepwater Fisheries 2020/21 provide FNZ and DoC research projects to be undertaken during 2020-21 that relate to deep water species (FNZ, 2020a).

Key P3 references

DWG (2019). FNZ-Deepwater Operator's Meeting Summary and Action Points Dec19. 2 p. https://deepwatergroup.org/wp-content/uploads/2021/04/DWG-2020a-FNZ-Deepwater-Operators-Meeting-Summary-and-action-points-Jun20.pdf

DWG (2020). FNZ-Deepwater Operator's Meeting Agenda Jun20. 1 p. https://deepwatergroup.org/wp-content/uploads/2021/04/DWG-2020-FNZ-Deepwater-Operators-Meeting-Agenda-June-2020.pdf

DWG (2021). Operational Procedures. https://deepwatergroup.org/newsresources/op-manual/

FNZ (2019). National Fisheries Plan for Deepwater and Middle-depth Fisheries 2019. Fisheries New Zealand Technical Paper No: 2019/03. 34 p. https://www.mpi.govt.nz/dmsdocument/3967-National-Fisheries-Plan-for-Deepwater-and-Middle-depth-Fisheries-2019

FNZ (2019a). Protected Fish Species Reporting Requirements for Non-Fish/Protected Species. Fisheries Management Fact Sheet 5. 3 p. https://www.mpi.govt.nz/dmsdocument/7245/direct

FNZ (2020). National Plan of Action – Seabirds 2020. Reducing the incidental mortality of seabirds in fisheries. 21 p. https://www.mpi.govt.nz/dmsdocument/40652-National-Plan-Of-Action-Seabirds-2020-Report

FNZ (2020a). Annual Operational Plan for Deepwater Fisheries 2020/21. Fisheries New Zealand Technical Paper No: 2020/04. 47 p. https://www.mpi.govt.nz/dmsdocument/41334-Annual-Operational-Plan-for-Deepwater-Fisheries-202021

FNZ (2020b). Annual Review Report for Deepwater Fisheries 2018/19. Fisheries New Zealand Discussion Paper No: 2020/01. 95 + 19 p. https://www.mpi.govt.nz/dmsdocument/39770/direct

FNZ (2020c). Aquatic Environment and Biodiversity Annual Review 2019-20. Compiled by the Aquatic Environment Team, Fisheries Science Information, Fisheries New Zealand, Wellington, New Zealand. 765 p. https://www.mpi.govt.nz/dmsdocument/40980-Aquatic-Environment-and-Biodiversity-Annual-Review-201920

FNZ (2020d). Medium Term Research Plan for Deepwater Fisheries 2020/21 – 2024/25. Fisheries New Zealand Information Paper No: 2020/01. 21 p. https://www.mpi.govt.nz/dmsdocument/21746-medium-term-research-plan-for-deepwater-fisheries

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://www.deepdyve.com/lp/elsevier/private-rights-public-benefits-industry-driven-seabed-protection-Nf1WqeBzZv

IQANZ (2018). Deepwater Fisheries Management Independent Quality Assurance Review Report. Prepared for Ministry for Primary Industries by Independent Quality Assurance New Zealand (IQANZ). 13 p. https://www.mpi.govt.nz/dmsdocument/27609-Ministry-for-Primary-Industries-Deepwater-Fisheries-Management-Independent-Quality-Assurance-review-report-31-January-2018-signed

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

MFish (2011). Research and Science Information Standard for New Zealand Fisheries. Ministry of Fisheries, April 2011. 31 p. https://fs.fish.govt.nz/NR/rdonlyres/D1158D67-505F-4B9D-9A87-13E5DE0A3ABC/0/ResearchandScienceInformationStandard2011.pdf

MPI (2008). Harvest Strategy Standard for New Zealand Fisheries. Ministry for Primary Industries. 25 p. https://fs.fish.govt.nz/Doc/16543/harveststrategyfinal.pdf.ashx

MPI (2010). Memorandum of Understanding: Continuing a partnership between the Ministry of Fisheries and the deepwater fishing industry for the management of New Zealand's deepwater fisheries. 12 p. https://www.mpi.govt.nz/dmsdocument/19715-memorandum-of-understanding-2010

MPI (2010a). Hoki Fisheries Plan Chapter: National Fisheries Plan for Deepwater and Middle-depth Fisheries Part 1B. 51 p. https://www.mpi.govt.nz/dmsdocument/3974-national-fisheries-plan-for-deepwater-and-middle-depth-fisheries-part-1b-hoki-fishery-chapter

MPI (2011). Ling Fisheries Plan Chapter: National Fisheries Plan for Deepwater and Middle-depth Fisheries Part 1B. 50 p. https://www.mpi.govt.nz/dmsdocument/3973-national-fisheries-plan-for-deepwater-and-middle-depth-fisheries-part-1b-ling-chapter

MPI (2013). Hake Fisheries Plan Chapter: National Fisheries Plan for Deepwater and Middle-depth Fisheries Part 1B. 29 p. https://www.mpi.govt.nz/dmsdocument/3972-national-fisheries-plan-for-deepwater-and-middle-depth-fisheries-part-1b-hake-chapter

MPI (2013). National Plan of Action for the Conservation and Management of Sharks. 32 p. https://www.mpi.govt.nz/dmsdocument/1138-National-Plan-of-Action-for-the-Conservation-and-Management-of-Sharks-2013

MPI (2019). Fisheries Compliance: DW Operators Meeting – Nelson 5th March 2019. PowerPoint presentation prepared by Ministry for Primary Industries. https://deepwatergroup.org/wp-content/uploads/2019/10/MPI-2019-Compliance-Overview-Commercial-Operators-5-March.pdf

MPI (2019a). Risk Management and Compliance HOK and SBW. Ministry for Primary Industries memo to deepwater operators, June 2019. 2 p.https://deepwatergroup.org/wp-content/uploads/2021/04/MPI-2019-Risk-Management-and-Compliance-HOK-and-SBW-Memo.pdf

MPI (2020). Risk Management and Compliance HOK and SBW. Ministry for Primary Industries memo to deepwater operators, June 2020. 2 p. https://deepwatergroup.org/wp-content/uploads/2021/04/MPI-2020-Risk-Management-and-Compliance-HOK-and-SBW-Memo.pdf