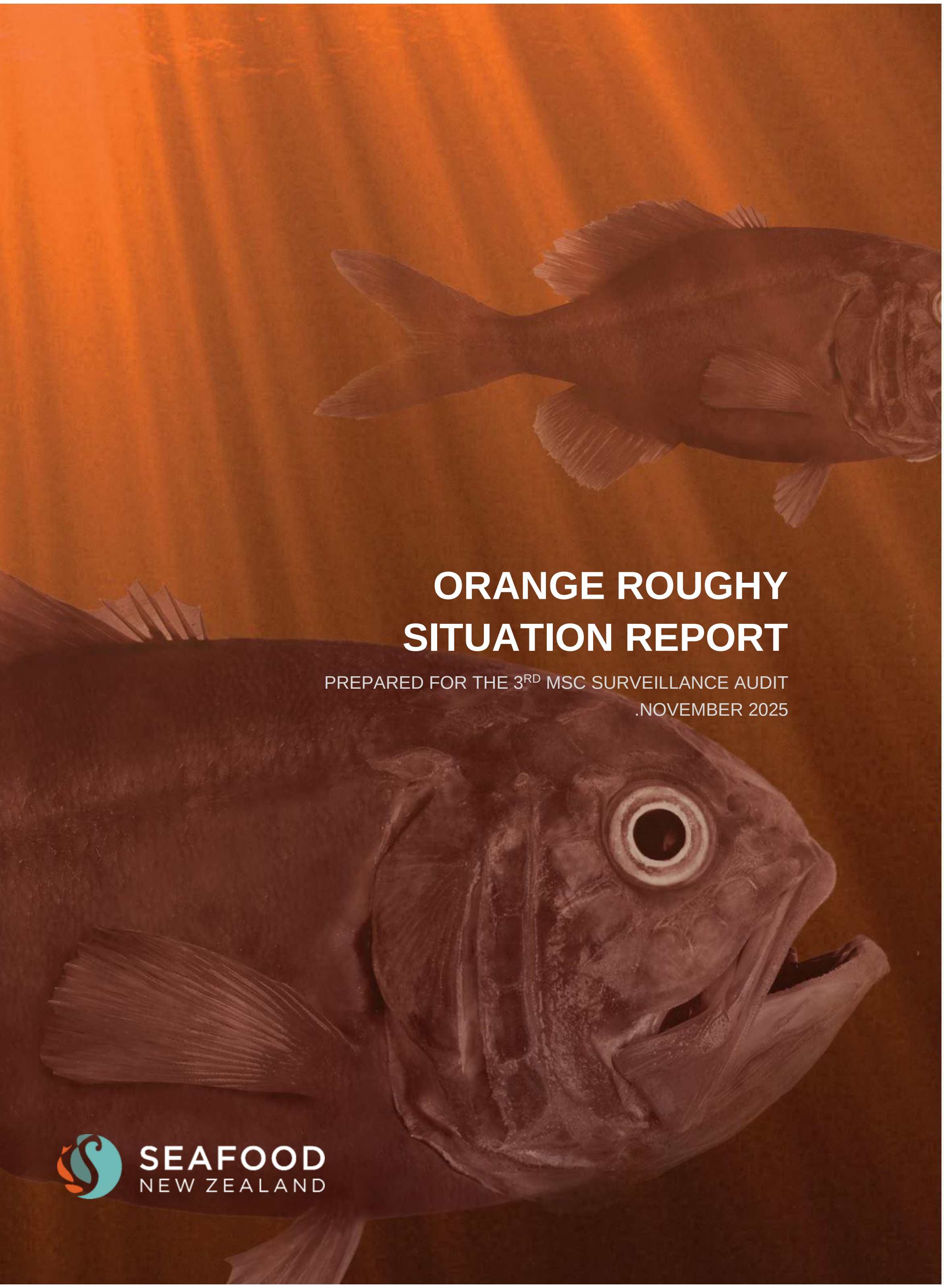

ORANGE ROUGHY SITUATION REPORT

PREPARED FOR THE 3RD MSC SURVEILLANCE AUDIT

.NOVEMBER 2025

SEAFOOD NEW ZEALAND

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SITUATION REPORT FOR THE 3RD MSC SURVEILLANCE AUDIT 2025

NEW ZEALAND ORANGE ROUGHY TRAWL FISHERIES

PURPOSE

This report is prepared for the third annual MSC surveillance audit and re-assessment of two New Zealand orange roughy Units of Certification (**UoC**): ORH3B Northwest Chatham Rise (**ORH3B NWCR; hereafter referred to as NWCR**) and ORH7A Challenger Plateau & Westpac Bank (**ORH 7A-WB; hereafter referred to as ORH7A**) trawl fisheries.

OVERVIEW OF FISHERY MSC CERTIFICATION

Certification Date	2016
Stock Areas	UoC 1: ORH 3B NWCR UoC 2: ORH 7A-WB
Species	*Hoplostethus atlanticus*
Method/Gear	Trawl

P1 OVERVIEW OF STOCK MONITORING, STATUS, AND INFORMATION

Stock Status Summary for the Combined UoC

Table 1. Summary of the stock status of the UoC based on the base model runs

Stock	Most recent assessment	Depletion [Year]	P < Target	P < Soft Limit
NWCR	2025	36 (25–49) [2025]	> 40-60%	< 1%
ORH7A	2024	35 (16-57) [2024]	> 40-60%	< 40%

Orange Roughy Sustainability Management

In 2014, a Management Strategy Evaluation (**MSE**) indicated that surveys and assessments of orange roughy every four years would provide for utilisation while ensuring that stocks are not overfished[1] and scheduled by Fisheries New Zealand's Medium Term Research Plan for Deepwater Fisheries 2020/21 to 2024/25. This plan has been updated for 2024/25 to 2029/30[2].

The MSE underpinned the development of a Harvest Control Rule (**HCR**), which involved testing the performance of a number of potential harvest control rules against simulated stock trajectories over long periods of time to allow for uncertainty in the inputs. The agreed HCR is estimated to have a greater than 97% probability of maintaining the stock above the lower bound of the management target range (30% B_0) under a range of assumptions about stock-recruit relationships and estimates of natural mortality.

The HCR is used to suggest catch limits based on the estimated stock status in relation to the management target range. Where a stock is estimated to be below the midpoint of the target range (F_{mid} = 0.045), recommended catch limits are lower than for a stock near the top of the target range (125% F_{mid}). Likewise, the HCR allows for a higher catch limit for stocks that are above the mid-point of the target range. A review of the HCR in 2019 included revised estimates of natural mortality and stock-recruitment steepness from recent stock assessments but did not recommend any changes to the HCR[3].

The most recent acoustic biomass surveys of NWCR were undertaken in 2021[4] and 2022[5]. Recent stock assessment research (2023–25)[6] focused on improving confidence in model results and addressing uncertainties identified in earlier assessments. Length frequency data were excluded where better age data or simplified assumptions could be used, and selectivity for both the fishery and surveys was aligned with the maturity ogive derived from otolith transition zones. Standardised CPUE indices were set aside due to unrealistic historical declines, and model runs tested alternative assumptions about recruitment and natural mortality with tighter constraints to improve stability. Acoustic biomass estimates from different frequencies were analysed separately but used informed priors on catchability to maintain consistency with previous assessments. These refinements improved model coherence and confidence in the 2025 stock status estimates. This assessment estimated the stock to be in the management target range of 30–50% B_0 (around 34–36% B_0) and

[1] Cordue (2014)
[2] Fisheries New Zealand (2024)
[3] Cordue (2019)
[4] Ryan et al. (2023)
[5] Ryan & Tilney (2023)
[6] Dunn et al. (2025)

projected those catches at the current level spawning stock biomass likely to increase over the next 5 years.

The most recent trawl and acoustic biomass survey of ORH7A was undertaken in 2018[7] and an acoustic biomass survey only was undertaken in 2023[8]. The most recent accepted stock assessment for ORH 7A was completed in 2024.[9] This assessment estimated the stock to be within the management target range of 30–50% B_0 (around 35% B_0) and projected that catches at the current level were likely to maintain the stock within this range during the next 5 years. The next stock assessment is planned for the 2026 research cycle with a plan to reconsider the otolith sampling approach from acoustic surveys to maximise probability that adequate otoliths are obtained from each aggregation and that these are obtained from multiple tows to support the stock assessment.

Stock Status, TACCs, Catch Limits, & Catches

UoC 1 – ORH3B NWCR

Update on stock status	Based on the 2025 evaluation, B_{2025} was estimated to be 34-36% B_0, was As Likely as Not (40–60 %) to be at or above the lower bound of the management target range (30–50% B_0), and Very Unlikely (< 1%) to be below the soft limit. The stock prognosis is that at recent catch levels, the spawning stock is expected to increase[10].
ORH3B TACC 2025-26	2,321 t
ORH3B TACC 2024-25	4,752 t
ORH3B TACC 2023-24	7,967 t
ORH3B TACC 2022-23	7,967 t
ORH3B TACC 2021-22	7,967 t
ORH3B TACC 2020-21	6,772 t
NWCR Catch Limit 2024-25	1,150 t
NWCR Catch Limit 2023-24	1,150 t
NWCR Catch Limit 2022-23	1,150 t
NWCR Catch Limit 2021-22	1,150 t
NWCR Catch Limit 2020-21	1,150 t
UoA share of TACC	100%
UoC share of TACC	95.6%
NWCR Catch 2024-25	288 t
NWCR Catch 2023-24	237 t
NWCR Catch 2022-23	173 t
NWCR Catch 2021-22	198 t
NWCR Catch 2020-21	353 t

[7] Ryan et al. (2021)
[8] Escobar-Flores & Maurice (2024)
[9] Dunn (2024)
[10] Fisheries New Zealand (2025)
[11] The ORH3B TACC figures include all sub-area catch limits.

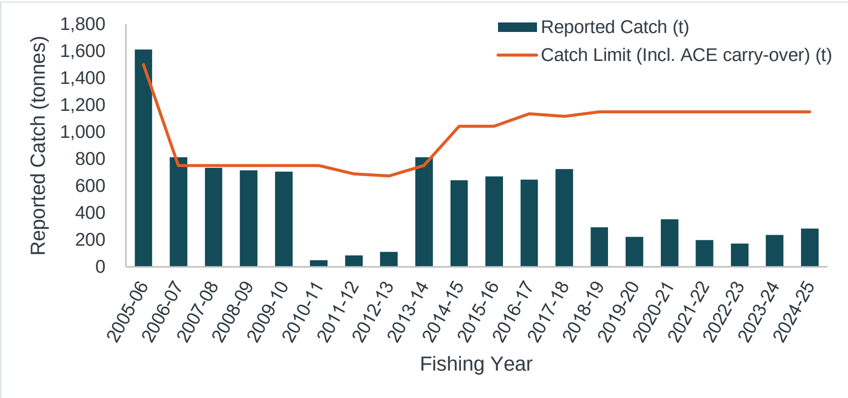

Figure 1. Reported commercial landings and TACC for the ORH3B NWCR fishery from 2005-06 to 2024-25. Voluntary fishery closure from 2010-11 to 2012-13 to promote stock rebuilding; includes research survey catches.

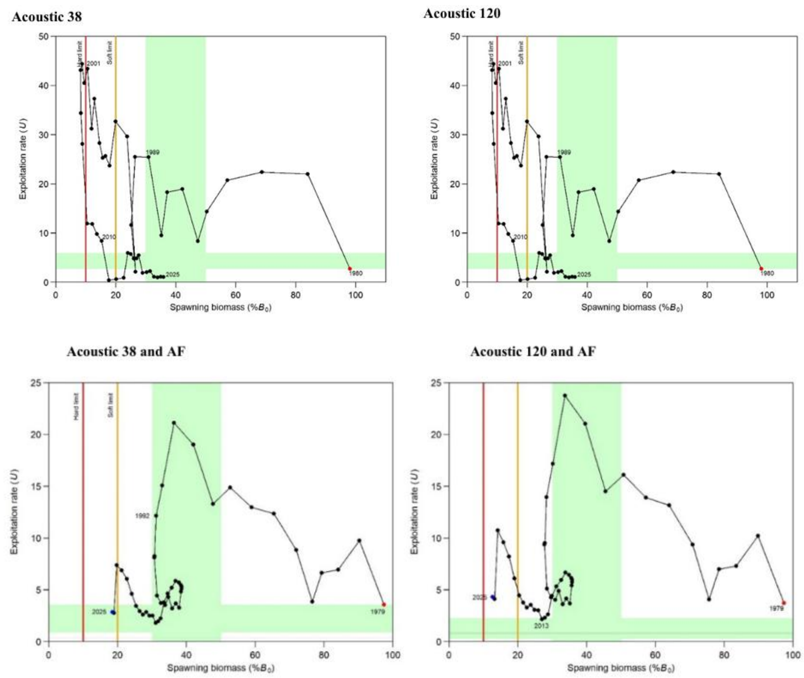

Figure 2. Historical trajectory of spawning biomass (% B_0), median exploitation rate (%), and exploitation rate for the four model runs. The biomass target range of 30–50% B_0 and the corresponding exploitation rate range are marked in green. The soft limit (20% B_0) and the hard limit (10% B_0) are marked in red.[12]

[12] Fisheries New Zealand (2025)

The NWCR fishery

The NWCR catch limit from 2014-15 of 1,250 t, was established prior to development of the HCR. The industry chose a more conservative approach by shelving 207 t annually. Application of the HCR to the 2018 stock assessment resulted in a reduced catch limit of 1,150 t. Catches have been below the catch limit since 2014-15 and the NWCR fishery took 18% of the agreed catch limit in 2023-24. Recently, much of the biomass during the spawn in NWCR resides on the underwater topographical feature Morgue, which is closed to fishing by regulation. Most of the catch is taken outside of the spawning season over flat/undulating grounds in the western part of NWCR.[13]

Biomass projections

Five-year biomass projections were made assuming future catches to be the current agreed catch limit (1,150 t), or the 2023–24 catch (212 t; plus 5% over-run). At the current catch (212 t), spawning stock biomass (**SSB**) is predicted to slowly increase over the next five years, and the probability of the SSB going below the soft limit is less than 1%. At the current agreed catch limit (1,150 t), SSB is predicted to slowly decrease over the next five years, and the probability of the SSB going below the soft limits is 5% or less.[14]

UoC 2 – ORH7A

Update on stock status	Most recent stock assessment was completed in 2024[15]. B_{2024} estimated to be 35% B_0, As Likely As Not (40–60%) to be at or above the lower end of the management target range and Very Unlikely (< 10%) to be at or above the upper end of the management target range. B_{2024} is Unlikely (< 40%) to be below the Soft Limit. The stock prognosis is that biomass is expected to slowly decrease at the TACC of 2,058 t over the next 5 years.[16]
ORH7A TACC 2025-26	885 t
ORH7A TACC 2024-25	885 t
ORH7A TACC 2023-24	2,058 t
ORH7A TACC 2022-23	2,058 t
ORH7A TACC 2021-22	2,058 t
ORH7A TACC 2020-21	2,058 t
UoA share of TACC	100%
UoC share of TACC	95.5%
ORH7A Catch 2024-25	761 t
ORH7A Catch 2023-24	846 t
ORH7A Catch 2022-23	1,771 t
ORH7A Catch 2021-22	2,193 t
ORH7A Catch 2020-21	2,074 t

[13] Fisheries New Zealand (2025)
[14] Fisheries New Zealand (2025)
[15] Dunn (2024)
[16] Fisheries New Zealand (2025a)

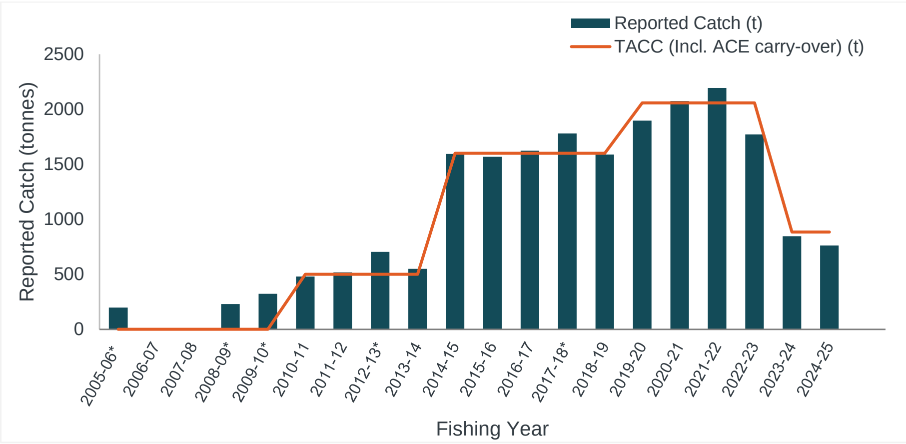

Figure 3. Reported commercial landings and TACC for the ORH 7A fishery from 2005-06 to 2024-25. The fishery was closed to fishing from 2001-02 to 2009-10. Asterisks on the x-axis denote years where biomass survey catches were taken against a special permit.

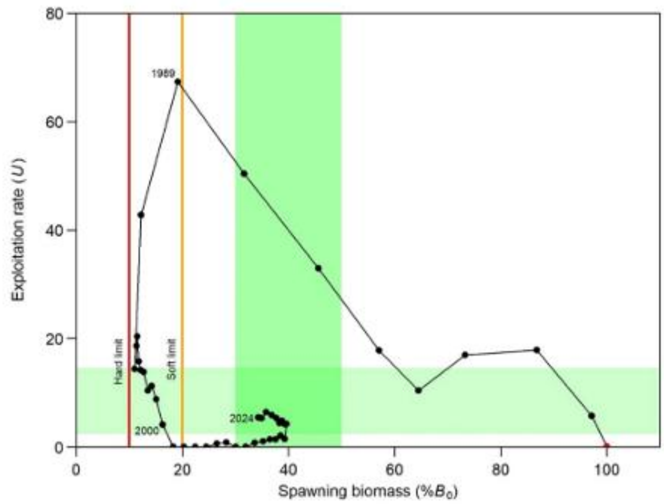

Figure 4. Historical trajectory of spawning biomass (% B_0) and fishing intensity (exploitation rate) for the base model (medians of the marginal posteriors). The biomass target range of 30–50% B_0 and the corresponding exploitation rate (fishing intensity) target range are marked in green. The soft limit (20% B_0) is marked in blue and the hard limit (10% B_0) in red[17].

[17] Fisheries New Zealand (2025a)

The ORH7A fishery

Following a 10-year closure, the fishery was re-opened to commercial fishing on 1 October 2010 with a TACC of 500 t. Following implementation of the HCR in 2014-15 the TACC was increased to 1,600 t. Application of the HCR following the 2019 assessment indicated there was an opportunity to increase the TACC for this stock by up to 833 t. Industry agreed to adopt a precautionary approach by accepting a lower increase of 460 t, which increased the TACC to 2,058 t from 1 October 2019. The TACC was reduced to 885 t in 2024–25.[18]

Biomass projections

Five-year projections were conducted for a constant catch equal to the TACC of 2,058 t, 0.8×TACC, and 0.7×TACC and a 5% catch over-run was assumed. SSB is predicted to decrease slowly over the next five years at all future constant catch levels. The base model projection is anticipated to stay within the target biomass range, with a maximum likelihood of 19% for falling below the soft limit and a maximum of 2% for falling below the hard limit during the next 5 years.[19]

Orange Roughy Harvest Control Rules (HCR) and Tools

Standard Ministry HCR Procedures

The process of setting a Total Allowable Catch (**TAC**) followed by Fisheries New Zealand has a long-established history and must conform to section 13 of the Fisheries Act 1996[20], which states that:

> The Minister shall set a total allowable catch that —
>
> (a) Maintains the stock at or above a level that can produce the maximum sustainable yield, having regard to the interdependence of stocks; or
>
> (b) Enables the level of any stock whose level is below that which can produce the maximum sustainable yield to be altered —
>
> (i) in a way and at a rate that will result in the stock being restored to or above a level that can produce the maximum sustainable yield. Having regard to the interdependence of stocks; and
>
> (ii) within a period appropriate to the stock, having regard to the biological characteristics of the stock and any environmental conditions affecting the stock; or
>
> (c) enables the level of any stock whose current level is above that which can produce the maximum sustainable yield to be altered in a way and at a rate that will result in the stock moving towards or above a level that can produce the maximum sustainable yield, having regard to the interdependence of stocks.

The Harvest Strategy Standard for New Zealand Fisheries (**HSS**)[21] is a policy statement of best practice in relation to the setting of fishery and stock targets and limits for fish stocks in New Zealand's Quota Management System (**QMS**). It outlines the form of the HCR which, by default, is used to inform sustainable harvesting of all New Zealand fisheries. The HSS consists of three core elements:

[18] Fisheries New Zealand (2025a)
[19] Fisheries New Zealand (2025a)
[20] Fisheries Act 1996
[21] Fisheries New Zealand (2008)

- A specified target based upon MSY-compatible reference points (e.g. BMSY and FMSY) or better22, about which a stock should fluctuate with at least a 50% probability of achieving the target.
- Soft limit (default of 50% BMSY or 20% B0, whichever is higher) that triggers a requirement for a formal, time-constrained rebuilding plan when the probability that stock biomass is below this soft limit is greater than 50%.
- Hard limit (default of 25% B_{MSY} or 10% B_0, whichever is higher) below which fisheries should be considered for closure when the probability that stock biomass is below this hard limit is greater than 50%.

The status of fisheries and stocks is characterised according to these reference points (**RP**s):

- If the MSY-compatible fishing mortality rate, F_{MSY} , or an appropriate proxy, is exceeded on average (over 3 to 5 years), overfishing is deemed to have been occurring, as stocks fished at rates exceeding F_{MSY} will ultimately be depleted below B_{MSY} .
- A stock that is determined to be below the soft limit will be designated as depleted and in need of time-constrained rebuilding.
- A stock that is determined to be below the hard limit is designated as collapsed.

The relationship amongst these various RPs and the management actions that should be invoked are illustrated (Figure 5) in the HCR outlined in the Operational Guidelines for New Zealand's HSS[23]. The example is applicable only for high information stocks, such as the orange roughy stocks under assessment, where it is possible to estimate biomass relative to B_{MSY} and fishing mortality relative to F_{MSY} (or some other measure of fishing intensity).

However, Fisheries New Zealand notes that it can also be adapted to other, lower information situations. When biomass is between the target and the soft limit, management actions to reduce catch are to be taken to prevent stocks declining to the level of the soft limit. Besides TACCs, these could consist of measures such as changes in minimum legal sizes of fish caught (through, for example, increases in the minimum allowable mesh size of fishing nets), and closures of areas with high levels of catches of juveniles.

[22] "MSY-compatible reference points or better" refers to benchmarks for fish stock management that align with Maximum Sustainable Yield (MSY) principles, including specific metrics for biomass (B_{MSY}), fishing mortality (F_{MSY}), and catch (MSY), along with their proxies. The phrase "or better" indicates that these reference points should ideally be above B_{MSY}, below F_{MSY}, and/or below MSY, ensuring healthier and more sustainable fish populations.

[23] Fisheries New Zealand (2011)

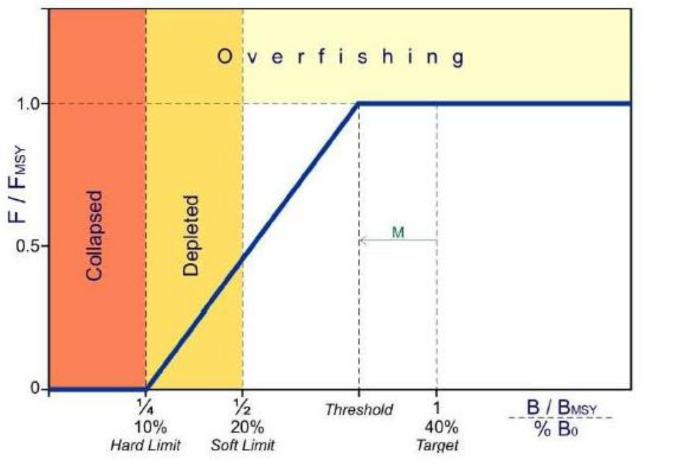

Figure 5. Illustrative example of a harvest strategy control rule that would be in conformance with the Harvest Strategy Standard; M is natural mortality.[24]

The requirements of the HSS are outlined in its Operational Guidelines. These outline the MSY-compatible target and limit RPs as noted above, and the actions to be taken if and when stock biomass declines below the target. The latter include formal rebuilding plans when biomass is below 20% B_0 and actions when current biomass is likely to be above soft and hard limits but below targets.

Rebuilding plans

1. Science Working Groups (**SWG**s) will estimate the probability that current and/or projected biomass is below 50% B_{MSY} or 20% B_0, whichever is higher. If this probability is greater than or equal to 50%, SWGs should calculate T_{min} where T_{min} is the number of years required to rebuild in the absence of fishing.
2. SWGs will work with fisheries managers to define and evaluate alternative rebuilding plans that will rebuild the stock back to the target with a 70% probability within a timeframe ranging from T_{min} to 2 * T_{min}.
3. Fisheries New Zealand will provide advice to the Minister for Oceans and Fisheries (**the Minister**) on a range of rebuilding plans that satisfy the T_{min} to 2 * T_{min} time constraint (or an alternative that can be adequately justified), and the specified probability levels.
4. Once a rebuilding plan has been implemented, SWGs will regularly evaluate and report on the performance of the rebuilding plan.
5. Fisheries New Zealand will provide advice to the Minister on appropriate TACCs to achieve the rebuilding plan.

Actions when current biomass is likely to be above soft and hard limits but below targets (or thresholds):

1. SWGs will provide best estimates and confidence intervals for current biomass and/or fishing mortality (or related biological reference points).
2. If current biomass is estimated to be between the target (or the threshold) and the soft limit, SWGs should work with fisheries managers to define and evaluate the TACC consequences of:

[24] The Operational Guidelines emphasizes that Figure 4 is primarily for illustrative purposes, to provide an example of one type of control rule that is likely to achieve the requirements of the HSS.

- reducing fishing mortality proportionately to the estimated decrease in biomass below the target or threshold (or taking steps to approximate this for low information stocks), in order to avoid breaching either the soft or hard limits, and/or
- reducing catch super-proportionately to the estimated decrease in biomass below the target or threshold (or taking steps to approximate this for low information stocks), in order to avoid breaching either the soft or hard limits.

3. If current biomass is estimated to be above some threshold, SWGs will work with fisheries managers to define and evaluate the TACC consequences of:

- maintaining a constant *F* that will achieve the target biomass on average (or taking steps to approximate this for low information stocks), and/or
- reducing catch proportionately to the estimated decrease in biomass towards the threshold (or taking steps to approximate this for low information stocks), and/or
- increasing catch proportionately to the estimated increase in biomass above the threshold (or taking steps to approximate this for low information stocks).

Stocks will be considered to have been fully rebuilt when it can be demonstrated that there is at least a 70% probability that the target has been achieved and there is at least a 50% probability that the stock is above the soft limit.

In its consideration of TACC options, Fisheries New Zealand follows the HSS.

The HCRs for the orange roughy fisheries seeking MSC re-certification are consistent with the HSS and associated Operational Guidelines and consist of the following:

A stock assessment developed about every 4 years, with peer review provided by the Deepwater Fisheries Assessment Working Group (**DWFAWG**), to estimate the probability of current biomass and/or fishing mortality relative to limit and target reference points or ranges.

Conduct of multi-year projections and to evaluate in a probabilistic manner, where the stock is and will be in future years in relation to the RPs. This is typically done for a base case model and for models which explore the main uncertainties in the assessment.

The decision by the Minister on the setting of the TAC (and associated TACC) is consistent with HSS and informed by DWFAWG and stakeholder engagement; consultation during this step can result in additional projections undertaken by Fisheries New Zealand.

There is monitoring of the fishery and stock performance during projection period to ensure that stock status is not being compromised by the management actions.

Management Strategy Evaluation

The HSS and its associated Operational Guidelines describe the role of MSE in the management system. MSE, rather than focusing solely on biological RPs, seeks to take into account the robustness of alternative management procedures and socio-economic implications of management decisions. MSE attempts to model and simulate the whole management process. It makes projections about the state of the fishery resources and other ecosystem parameters for a number of years into the future under a variety of decision-rule options.

The management measures and rules that achieve the best results in terms of specified objectives can then be selected and applied. This procedure greatly assists in identifying management strategies that are resilient to uncertainties in scientific understanding. The HSS provides minimum performance standards, or minimum performance measures, for MSEs and does not restrict alternative management objectives, or innovative management strategies, or additional performance measures beyond this. It states that MSEs should be designed to ensure that:

- the probability of achieving the MSY-compatible target or better is at least 50%
- the probability of breaching the soft limit does not exceed 10%, and
- the probability of breaching the hard limit does not exceed 2%

The MSE developed by Cordue[25] had higher performance characteristics than those required as a minimum by the HSS, with, for example, a zero probability of breaching the soft limit. This MSE, and the HCR developed at the same time, were reviewed by the DWFAWG[26] and applied from 2016. The MSE and HCR were reviewed and found to still be fit for purpose[27], however, this review has not as yet been peer reviewed.

Application of the HCR

Deepwater Council will continue to apply the HCR to provide guidance on the setting of catch limits for these orange roughy fisheries. The output results from running the HCR will be provided to the Ministry to assist them in formulating the options and advice to the Minister for Oceans and Fisheries (**the Minster**).

Deepwater Council will ensure that, if there is a difference between the HCR recommended catch limits and those selected by the Minister, the lower limit of the two will be implemented and observed as a precautionary measure.

Implementation Tools

The tools to control fishing to achieve the objectives of the harvest strategy have not changed since the previous full certification assessment. To summarise, since 1986, fish stocks harvested by the major commercial fisheries in New Zealand fisheries waters, have been managed through a QMS using individual transferable quotas (**ITQ**s). Each fish stock has 100,000,000 quota shares issued in perpetuity and each quota share is a property right[28]. Within the QMS, fisheries sustainability objectives are achieved by setting an overall annual TAC that is consistent with the productivity of each stock. The TAC is apportioned amongst user groups such as the TACC for the commercial fishery, allocations for the customary and recreational sectors and an allocation to address other fishing-related mortality such as illegal fishing or accidental loss of fish from nets. However, there is no allowance allocated for customary or recreational fisheries for orange roughy.

Regarding other fishing-related mortality, in its consideration of TACC options, Fisheries New Zealand explicitly addresses whether or not illegal catch and misreporting are issues. Determination on whether or not adjustment to the TACC is required is based upon risk analyses undertaken by Fisheries New Zealand as part of its advice to the Minister when he sets the TAC and TACC.

Recommendations

After Recertification

1. *The possibility that orange roughy live to ages greater than observed previously in New Zealand (180 years on the Morgue Sea Mount, Doonan et al., 2018) suggests that future assessments should examine sensitivity to the plus-group age when conducting assessment and an assessment whether the current*

[25] Cordue (2014)
[26] Reeve (2014)
[27] Cordue (2019)
[28] For more information, visit Quota Management System

base-case value of M of 0.45yr-1. Any updated estimate of M should feed into future reviews of the harvest control rule.

2. *The most recent assessment of the ORH 2A (south), 2B and 3A area (not a UoC), suggests a higher age-at-maturity (55 years) than estimated for orange on the Chatham Rise, and hence that spawning fish constitute a smaller proportion of the mature biomass in ORH 2A (south), 2B and 3A area than earlier believed. Future assessments should report the posteriors for the A50 and A95 parameters of the spawning ogive, as well as the data that suggest higher A50 and A95 values, to allow this issue to be explored in more detail.*

After First Annual Audit

3. *Conducting a new assessment for the NWCR sub-area should be a priority. However, given the difficulties with making use of the age-composition data (especially if it is concluded that the differences in age-frequencies among years is due to sampling error), consideration should be given to applying simpler assessment methods (e.g. based on Bayesian surplus production models) that have the ability to fit the primarily data sources (catch and acoustic estimate of biomass) and provide the information needed to apply the harvest strategy (or management procedure).*

4. *Consider collecting age data from the commercial fishery as well as the survey.*

5. *The assessment process did not lead to an accepted assessment in 2023. Management of the fishery would benefit from "back up" approaches for providing advice for TAC setting as the rejection of assessments is not uncommon worldwide (Punt et al., 2020). Management jurisdictions such as the US New England and Mid-Atlantic regions must develop a 'plan B,' along with the proposed assessment in case the proposed assessment is rejected. The 'plan B' assessments are index-based, easy to compute, and theoretically require little review once agreed upon (NEFSC, 2017). This 'plan B' approach was developed to define roles, responsibilities and process in cases when assessment working groups or review panels deem that a stock assessment is insufficient or inappropriate, and empirical approaches are required to provide management advice. The approaches used in the 'plan B' should be MSE-based.*

6. *The probabilities included in the report of the Stock Assessment Plenary were qualitative and reflected both the results of the quantitative stock assessment and expert option. The interpretation of these probabilities would be enhanced by text that more clearly reflects the logic that led to the final probabilities. In addition, reporting probability ranges that better match those referred to in the MSC Standard would enhance the ability to evaluate stock status relative to PI 1.1.1.*

7. *The next full assessment should explore the impact of higher ages at maturity and older plus group ages in the models considered for the assessment.*

8. *The next assessment for ORH 7A should explore the issues that led to the rejection of the assessment of ESCR, in particular whether recent survey estimates of abundance, length-frequencies and age-compositions are consistent with the results of the 2019 assessment. The next assessment for ORH 7A should also analyse (ideally standardise) the CPUE data for the fishery.*

Progress Against Recommendations

1. Exploration of estimates of the appropriate values of natural mortality, *M*, have been on-going over many years. Recently, for example, the 2024 assessment for the ORH7A stock of orange roughy estimated *M* in multiple model runs and reported these estimates between 0.024 and 0.033, all lower than the historic assumption of *M* = 0.045.[29]

[29] Fisheries New Zealand (2025a)

2. The values of A_{50} and A_{95} have been variously reported in recent stock assessments. Estimates of A_{50} for the Old Spawning Plume in the 2025 stock assessment for ORH 3B ESCR were reported across multiple model runs as between 25 to 45 years[30]. Where acoustic abundance data only were used A_{50} at 28.51 and A_{to95} 4.56, derived assuming maturity was equal to the otolith transition zone estimates[31]. In the 2024 assessment for the ORH7A stock of orange roughy, with selectivity assumed equal to maturity, A_{50} was about 34 years in all model runs[32].

3. An assessment for ORH3B NWCR was conducted and accepted by the Deepwater Fisheries Assessment Working Group (**DWFAWG**) and Plenary in 2025[33]. Exploration of simpler models for the ORH3B stocks was also conducted and peer reviewed by the DWFAWG.

4. The DWFAWG has discussed how to develop alternative age frequencies for orange roughy including using otoliths sampled from the commercial fishery. FNZ undertook to review the availability of orange roughy otoliths by year, fishery area, and season/type of fishing (i.e., spawning vs non-spawning). The DWFAWG is awaiting reporting of this review. It was noted that none of these otoliths will have been read for age and reading the numbers needed will require both logistic (reader capacity) and financial issues to be addressed.

5. Development of alternative approaches in the event of further failures to develop full stock assessments for these stocks. This work is on-going.

6. The way Fisheries New Zealand report the probabilities around stock assessments, and its incompatibility with the MSC Standard has been a regular subject of discussion over the years. As this is a formulaic FNZ-approach for all stocks, so far, it has not been possible to get FNZ to change how it reports probabilities in the Plenary document. Fully describing the logic behind the decisions on probabilities has also been explored but requires the agreement of both the DWFAWG and the Plenary meeting to the wording. Seeking to address the description of the logic behind the semi-quantitative probabilities in the Plenary document is on-going. However, this is only really an issue when there is no adequate stock assessment, as a stock assessment FAR will provide full model outputs and should be the preferred, priority source of information used to address the P1 components of an MSC certification or surveillance.

7. Age at maturity estimates for New Zealand orange roughy have been estimated at between 23 and 31.5 years for various stocks from transition zone observations in otoliths[34]. Exploring differences between estimated age at 50% spawning (at 55 years) and age at 50% maturity estimated at 30-35 years was a research recommendation, including collecting biological material, following the ORH MEC assessment in 2022. Plus-groups in assessments have been used at 70 (MEC in 2022), 100 (ECSR in 2025 and ORH 7B in 2020), 120 (Puysegur in 2017). This remains an area explored in assessment as indicated by the available data. Clearly there is further scope to explore higher age plus-groups.

8. All orange roughy assessments have been exploring shared assessment issues but especially those seen in the ESCR assessment attempts in recent years.

Commented [G1]: This text needs a reference to the work by Phil Neubauer (Dragonfly) which is not in the reference list and for which I assume DWC has project report. I have look for but cannot find a Ministry FAR for this work. There are DWWG documents on the work but these are not public.

Commented [G2]: The same reference as for recommendation 3 above.

[30] Fisheries New Zealand (2025).
[31] Fisheries New Zealand (2025).
[32] Fisheries New Zealand (2025a).
[33] Fisheries New Zealand (2025).
[34] Fisheries New Zealand (2025b).

P1 References

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P2 OVERVIEW OF ENVIRONMENTAL INFORMATION

Observer Coverage

Observer coverage of deepwater fisheries is based on biological sampling requirements, international requirements, percentage-level coverage targets and observer programme capacity. Coverage is monitored throughout the year to ensure information is available to support stock assessments and to understand interactions with protected species.

The Ministry for Primary Industries' (**MPI**) Scientific Observer Programme (**SOP**) collects data from fisheries, including Endangered, Threatened and Protected (**ETP**) incidental capture information. The ETP component of observer coverage, under New Zealand law, is administered and funded by the Department of Conservation (**DOC**) through levies recovered from relevant fisheries' quota owners. All observer deployment is managed by the SOP.

The objective of the SOP is to collect data from fisheries for the following purposes:

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

The 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. However, coverage requirements vary across fisheries. Some fisheries, like the Campbell Island southern blue whiting where there may be high-risk ETP species, require 100% coverage, while others, such as the Cook Strait and West Coast South Island hoki fisheries, have targets below 30% due to complementary onshore sampling. Scampi and ling longline fisheries also have lower coverage due to prioritisation of observer days in other fisheries. MPI's planned observer coverage for the ORH3B Chatham Rise and ORH7A deepwater fisheries as specified in the Annual Operational Plan for Deepwater Fisheries 2023/24, is 290 and 120 days respectively, equivalent to 30% and 85% coverage.[35] The latest annual review of performance against targeted observer coverage is provided in the 2022/23 Annual Review Report.[36]

Over the most recent 5-year period, observer coverage in the NWCR (Table 2 and Figure 6) and ORH7A (Table 3 and Figure 7) UoA fishery areas has averaged 37% and 27%, respectively.[37] This level of coverage is considered by MPI to be sufficient given the low level of ETP species captures and high level of overall compliance by orange roughy fisheries.

[35] Fisheries New Zealand (2024)
[36] Fisheries New Zealand (2024a)
[37] Fisheries New Zealand (personal comms.)

Table 2. Numbers of commercial trawl tows and associated observer coverage for tows that targeted ORH in the NWCR trawl fishery from 2020-21 to 2024-25 (Fisheries New Zealand, pers. comm.).

NWCR	2020-21	2021-22	2022-23	2023-24	2024-25	5–year Average
Commercial tows	204	154	124	101	100	137
Observed tows	56	22	61	16	97	50
Observed tows (%)	27	14	49	16	97	37

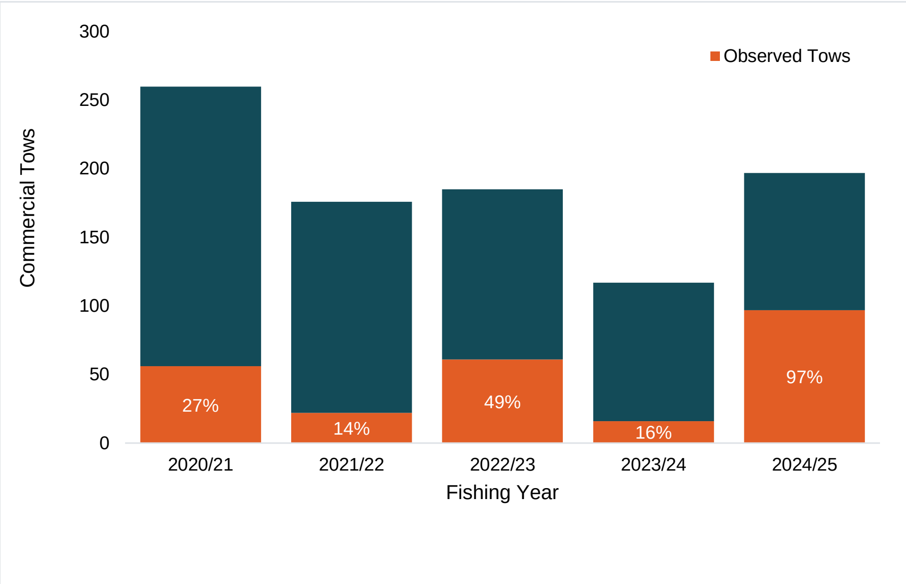

Figure 6. Observer coverage and fishing effort in the orange roughy fishery in NWCR. The most recent fishing year for which data are presented is 2024-25.

Table 3. Numbers of commercial trawl tows and associated observer coverage for tows that targeted ORH in the ORH7A trawl fishery from 2020-21 to 2024-25 (Fisheries New Zealand, pers. comm.).

ORH7A	2020-21	2021-22	2022-23	2023-24	2024-25	5–year Average
Commercial tows	639	669	520	340	168	467
Observed tows	133	100	160	177	58	126
Observed tows (%)	21	15	31	52	35	27

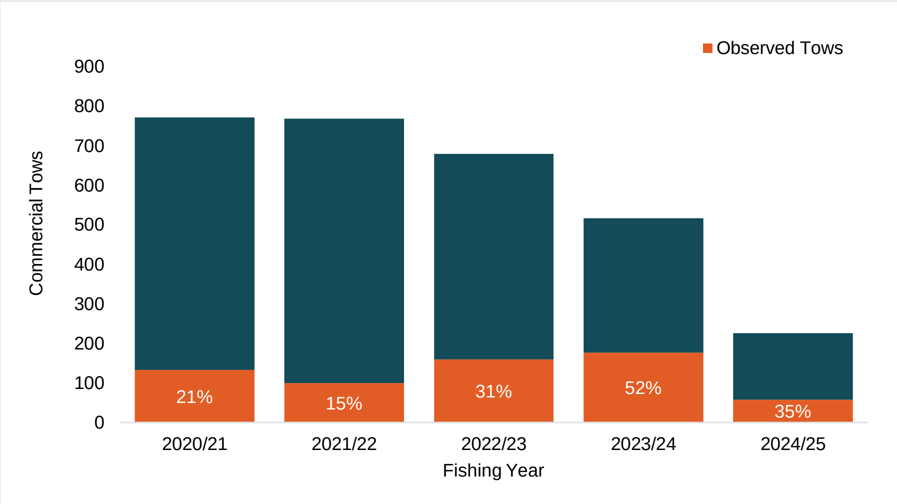

Figure 7. Observer coverage and fishing effort in orange roughy fisheries in ORH 7A. The most recent fishing year for which data are presented is 2024-25.

Retained & Bycatch Species

EEZ Catch Analysis

The most recent available analysis of non-target fish and invertebrate catch by New Zealand orange roughy and oreo trawl fisheries covers the period 2002-03 to 2019-20[38]. 751 non-target species or species groups were identified by observers in the target orange roughy and oreo trawl fisheries and analysis over this period revealed the following:

- Non-target catch varied from year to year, with the lowest median in 2012–13 and highest in 2015–16, but there was no indication of any trend over time.
- Of the main target species, total non-target catches were slightly more associated with orange roughy fishing than for oreo species.

Between 1 October 2015 and 30 September 2020, orange roughy made up around 80% of the total catch from observed tows targeting the species, with minimal discards. The main non-target species by weight were smooth oreo (4.8%), unspecified rattails (1.7%), shovelnose dogfish (1.3%), ribaldo (1%), unspecified slickheads (1%), and Johnson's cod (0.9%). While smooth oreo and ribaldo were rarely discarded, most of the other non-target species (all non-QMS) were discarded. Notable discard levels were also seen for white rattails and various deepwater shark and slickhead species. When grouped by broader taxonomic categories, osteichthyd (bony) fishes accounted for the largest proportion of non-target catch (12.2%), with 23% discarded, followed by sharks and rays (3.5%, with 76% discarded), and rattails and chimaeras. Among invertebrates, squid (0.4%), echinoderms (0.3%), and cnidarians (0.2%) each made up more than 0.1% of the catch, though these were mostly discarded.[39]

[38] Anderson & Finucci (2022)
[39] Anderson & Finucci (2022)

UoA Catch Analysis

Catch composition by weight for each of the two UoAs was determined based on observer sampling data sourced from FNZ for the five-year period 2020-21 to 2024-25. The observer catch estimates are unadjusted.

NWCR

Table 4. NWCR average estimated catch composition of targeted orange roughy tows, in kilograms and percentage, from 2020-21 to 2024-25 based on observer data (FNZ pers. comm.). Species with <0.01% estimated catch have not been included.

Species	QMS/Non-QMS	Observer Estimated Catch (kg)	Observer Estimated Catch (%)
Orange roughy	**QMS**	249,800.0	76.46
Smooth oreo (SSO)	QMS	17,813.8	5.45
Slickhead (SLK)	Non-QMS	11,462.8	3.51
Hoki (HOK)	QMS	9,162.4	2.80
Rattails (RAT)	Non-QMS	9,105.2	2.79
Slender cods (HJO)	Non-QMS	7,969.8	2.44
Morids (MOD)	Non-QMS	5,773.8	1.77
Sharks and dogfish, unspecified (OSD)	Non-QMS	3,020.0	0.92
Javelinfish (JAV)	Non-QMS	1,945.4	0.60
Shovelnose dogfish (SND)	Non-QMS	1,481.4	0.45
Clubhook squid (WSQ)	Non-QMS	1,070.8	0.33
Ghost shark, dark (GSH)	QMS	934.4	0.29
Baxter's lantern dogfish (ETB)	Non-QMS	890.4	0.27
Hake (HAK)	QMS	881.2	0.27
Seal shark (BSH)	Non-QMS	850.6	0.26
Australasian narrow-nosed spookfish (LCH)	Non-QMS	690.0	0.21
Chimaera, wide-nosed (RCH)	Non-QMS	623.2	0.19
Ghost shark, pale (GSP)	QMS	448.0	0.14
Basketwork eel (BEE)	Non-QMS	383.8	0.12
Ribaldo (RIB)	QMS	380.6	0.12
Chimaera, purple (CHP)	Non-QMS	379.6	0.12
Chimaera spp. (CHI)	Non-QMS	178.0	0.05
Deepwater dogfish, unspecified (DWD)	Non-QMS	177.4	0.05
Tam O'Shanter urchin (TAM)	Non-QMS	160.2	0.05
Spiky oreo (SOR)	QMS	151.8	0.05
Longnose velvet dogfish (CYP)	Non-QMS	150.8	0.05
Purple chimaera (CHG)	Non-QMS	119.6	0.04
Starfish (SFI)	Non-QMS	114.8	0.04
Black oreo (BOE)	QMS	72.0	0.02
Longnose deep-sea skate (PSK)	Non-QMS	68.8	0.02

Black cardinal fish (CDL)	QMS	61.8	0.02
Deepwater eel, unspecified (DWE)	Non-QMS	52.0	0.02
Warty oreo (WOE)	QMS	49.4	0.02
Ling (LIN)	QMS	42.5	0.01
Sea perch (SPE)	QMS	30.8	0.01
Small-headed cod (SMC)	Non-QMS	24.6	0.01
Hydrolagus spp. (HYD)	Non-QMS	18.4	0.01
Smooth skate (SSK)	QMS	18.2	0.01
Small-scaled brown slickhead (SSM)	Non-QMS	18.0	0.01
Sea urchin (URO)	Non-QMS	17.0	0.01
Deepwater king crab (KIC)	QMS	16.4	0.01
TOTAL		**326,609.7**	**99.97%**

QMS Species

Targeted orange roughy trawl tows account for 77% of the total estimated catch by weight. The two most abundant QMS bycatch species are smooth oreo (5.45%) and hoki (2.8%), which is MSC-cerified (Table 4).

The OEO4 QMA for smooth oreo overlaps with the NWCR UoA. The latest stock assessment of smooth oreo in OEO4 was updated in 2018. This assessment estimated B_{2018} at 40% B_0 and B_{2018} is About As Likely As Not (40-60%) to be at or above the target. Stock projections indicate there would be little change in biomass over the next five years at annual catches of 2,300–3,000 tonnes[40]. The commercial catch limit for OEO4 is currently 3,600 tonnes, with a five-year average annual catch of smooth oreo of 2,594 t (range 2,327 to 2,781) for the years 2019-20 to 2023-24

The eastern stock of the HOK1 QMA for hoki overlaps with the NWCR UoA. The latest stock assessment of hoki was completed in 2025. This assessment estimated B_{2025} to be 55% B_0 and Very Likely (>90%) to be above the lower end of the target range. Stock projections indicate that the eastern stock would remain within or above the target range over the next five years, with current catches or catch limits.[41] The eastern commercial catch limit for HOK1 is currently 65,000 tonnes. The hoki fishery is unconditionally MSC certified.

Non-QMS species

Of the non-QMS bycatch species, the two species groups with the largest catches are slickheads (3.51%) and rattails (2.79%) (Table 4).

Slickhead bycatch in the NWCR fishery has been variable over the last 5 years, with a low in 2021/22 followed by a sharp increase and sustained higher levels in subsequent years. (Figure 8). Rattail bycatch in the NWCR fishery have annual values that have varied substantially across the five-year period, with peaks in 2020/21 and 2022/23 followed by a steady decline in subsequent years. (Figure 8).

[40] Fisheries New Zealand (2025)
[41] Fisheries New Zealand (2025a)

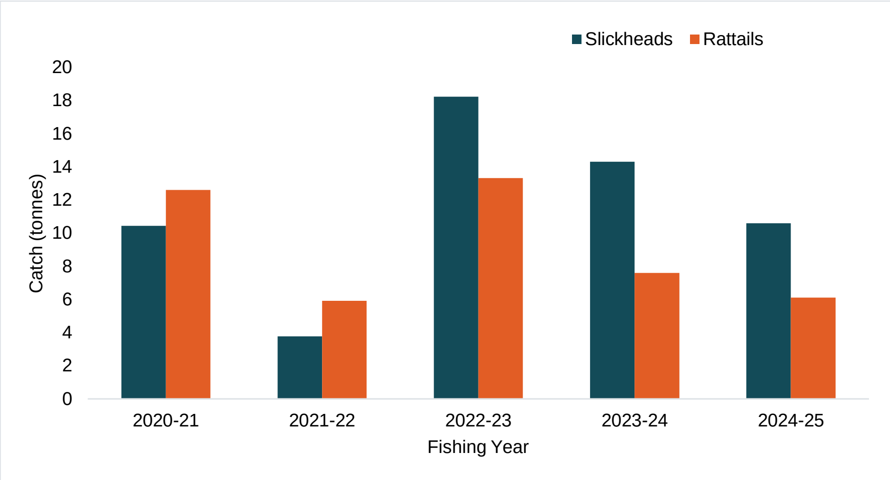

Figure 8. Bycatch of rattail and slickhead species (in tonnes) in the NWCR fishery from 2020-21 to 2024-25.

The New Zealand field guide to common species caught in bottom and mid-water trawling describes 5 species of slick heads and 51 species of rattails[42] and bottom trawl surveys on the Chatham Rise, primarily to estimate the abundance of hoki and middle-depth and deepwater-species, also yield biomass estimates for a range of bycatch species.

The 2024 trawl survey in the Chatham Rise recorded 4 slickhead and 30 rattail species taken during tows to estimate the abundance of hoki and middle-depth and deepwater-species.[43]

On the NWCR, big-scaled brown slickhead was the most widespread slickhead species, occurring throughout the survey area, while small-scaled brown slickhead was more abundant on the southern Rise. with no trend in abundance over the period 2010-2024, when data were available (Figure 9).[44]

[42] McMillan et al (2024)
[43] https://tsip-uat.niwa.co.nz/search
[44] Stevens et al. (2024)

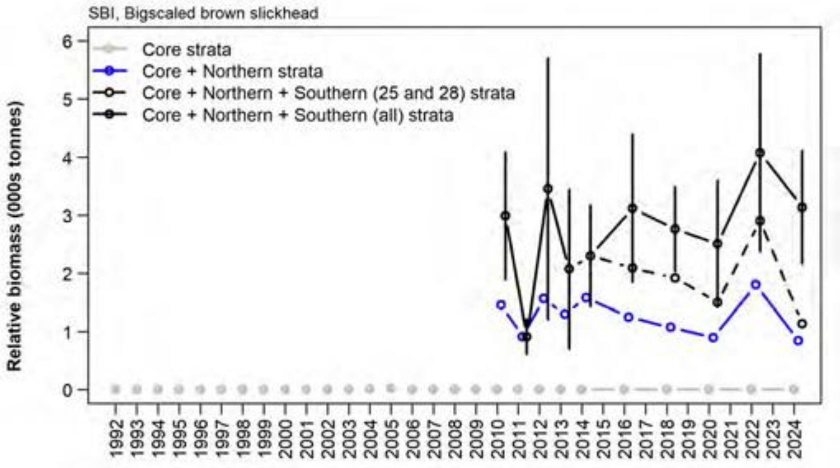

Figure 9. Relative biomass estimates (thousands of tonnes) of bigscaled brown slickheads sampled by bottom trawl surveys of the Chatham Rise from 1992 to 2024. Grey lines show fish from core (200–800 m) strata. Blue lines show fish from core strata plus the northern deep (800–1300 m) strata. Black solid lines show fish from core strata plus the northern and southern deep (800–1300 m) strata, and black dotted lines show fish from core strata plus the northern and southern 25 and 28 deep strata (800–1300 m). Error bars show ± 2 standard errors.

On the NWCR, four-rayed rattail was the most common rattail species, being widespread and relatively abundant across the northern Rise, with no trend in abundance over the period 2010-2024, when data were available (Figure 10).[45]

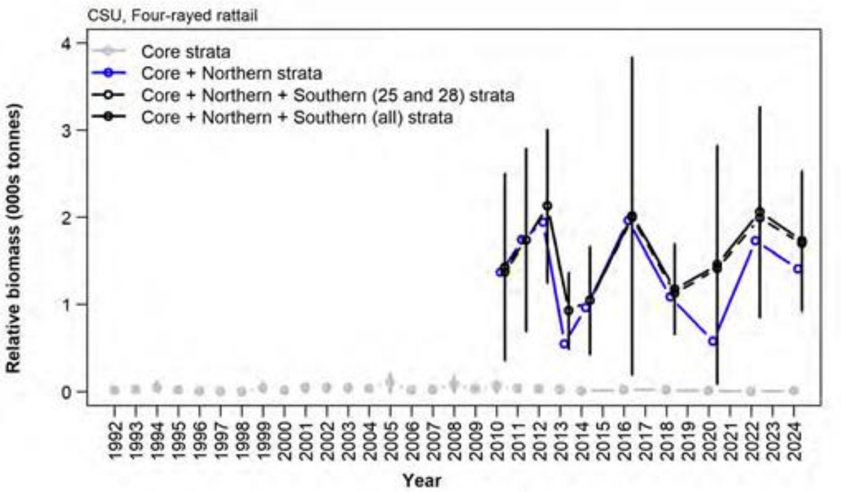

Figure 10. Relative biomass estimates (thousands of tonnes) of four-rayed rattails sampled by trawl surveys of the Chatham Rise from 1992 to 2024. Grey lines show fish from core (200–800 m) strata. Blue

[45] Stevens et al. (2024)

lines show fish from core strata plus the northern deep (800–1300 m) strata. Black solid lines show fish from core strata plus the northern and southern deep (800–1300 m) strata, and black dotted lines show fish from core strata plus the northern and southern 25 and 28 deep strata (800–1300 m). Error bars show ± 2 standard errors.

Table 4 shoes that unidentified deepwater sharks and dogfish make up the largest elasmobranch group catch at 0.92% while the single elasmobranch species with the greatest catch is the shovelnose dogfish at 0.45%.The most abundant chimaerid is the dark ghost shark at 0.29% of the catch. The clubhook squid, at 0.33% of the catch is the most abundant of the invertebrate species. No single species exceeds 5% of the overall catch and none is therefore a minor primary species.

ORH7A

Table 5. ORH7A average estimated catch composition of targeted orange roughy tows, in kilograms and percentage, from 2020-21 to 2024-25 based on observer data (FNZ pers. comm.). Species with <0.01% estimated catch have not been included.

Species	QMS/Non-QMS	Observer Estimated Catch	
		(kg)	(%)
Orange roughy	***QMS***	1,529,000.0	89.49
Rattails (RAT)	Non-QMS	41,918.0	2.45
Ribaldo (RIB)	QMS	35,788.9	2.09
Hake (HAK)	QMS	20,314.6	1.19
Sharks and dogfish, unspecified (OSD)	Non-QMS	13,883.4	0.81
Seal shark (BSH)	Non-QMS	10,819.8	0.63
Shovelnose dogfish (SND)	Non-QMS	6,979.4	0.41
Ghost shark, pale (GSP)	QMS	6,800.8	0.40
Slickhead (SLK)	Non-QMS	5,057.0	0.30
Australasian narrow-nosed spookfish (LCH)	Non-QMS	4,803.7	0.28
Spiky oreo (SOR)	QMS	4,211.9	0.25
Black slickhead (BSL)	Non-QMS	4,183.2	0.24
Hoki (HOK)	QMS	4,178.4	0.24
Unicorn rattail (WHX)	Non-QMS	3,310.2	0.19
Slender cods (HJO)	Non-QMS	3,215.0	0.19
Chimaera, wide-nosed (RCH)	Non-QMS	1,809.9	0.11
Leafscale gulper shark (CSQ)	Non-QMS	1,729.4	0.10
Morrids (MOD)	Non-QMS	1,703.8	0.10
Sea perch (SPE)	QMS	1,555.0	0.09
Baxter's lantern dogfish (ETB)	Non-QMS	1,545.6	0.09
Cardinal fish (CDL)	QMS	1,394.9	0.08
Longnose velvet dogfish (CYP)	Non-QMS	712.1	0.04
Portuguese dogfish (CYL)	Non-QMS	363.8	0.02
Javelinfish (JAV)	Non-QMS	358.4	0.02
Starfish (SFI)	Non-QMS	288.7	0.02
Smooth skin dogfish (CYO)	Non-QMS	262.4	0.02

White warehou (WWA)	QMS	212.0	0.01
Cape scorpionfish (TRS)	Non-QMS	204.9	0.01
Plunket's shark (PLS)	Non-QMS	199.6	0.01
Warty oreo (WOE)	QMS	150.8	0.01
Sea urchin; other (URO)	Non-QMS	136.4	0.01
Lanternfish (LAN)	Non-QMS	123.6	0.01
Deepwater dogfish, unspecified (DWD)	Non-QMS	118.0	0.01
Spinyfin (SFN)	Non-QMS	108.8	0.01
Smooth skate (SSK)	QMS	96.6	0.01
Giant squid (GSQ)	Non-QMS	95.6	0.01
TOTAL		**1,707,634.5**	**99.95**

QMS species

Targeted orange roughy trawl tows account for 89.49% of the total estimated catch by weight and the two QMS bycatch species with the next largest catches are ribaldo (2.09%) and hake (1.19%), (Table 5).

The RIB7 QMA for ribaldo overlaps with the ORH7A UoA. The latest stock assessment of ribaldo in RIB7, RIB8, and RIB9 was = in 2022 where the Working Group agreed that biomass estimates from the West Coast South Island trawl survey are reliable, but only from 2012 onward, when the survey design included deeper areas. In 2022, the data series was considered too short to determine a B_{MSY}-based reference period. The commercial catch limit for RIB7 is currently 330 tonnes, with average annual catches of 232 t (2019-20 to 2023-24).

The HAK7 QMA for hake overlaps with the ORH7A UoA. The latest stock assessment of hake in HAK7 was updated in 2024. This assessment estimated B_{2024} to be 39% B_0 and About As Likely As Not (40–60%) to be at or above the target. Stock projections indicate that biomass is expected to increase under both recent recruitment and long-term recruitment for both the current catches and TACC.[46] The commercial catch limit for HAK7 is currently 2,272 tonnes. The fishery for hake in HAK7 is MSC-certified.

Non-QMS species

Of the non-QMS bycatch species, the two species groups with the largest catches are rattails (2.45%) and unspecified sharks and dogfish (0.81%), (Table 5).

Rattail bycatch in the ORH7A fishery shows a strong declining trend over the five-year period, with a steep decrease after 2021/22 and the most recent year reaching the lowest recorded level (Figure 11). Unspecified shark and dogfish bycatch in the ORH7A fishery show substantial interannual variability, with a peak in 2021/22 followed by a sharp decline, reaching the lowest level in the most recent year (Figure 11). The decline in bycatch reported to group reporting codes for unspecified sharks and dogfish, is likely associated with the drive within the NPOA-Sharks to reduce the use of group codes and increasingly report to species codes.

[46] Fisheries New Zealand (2025b)

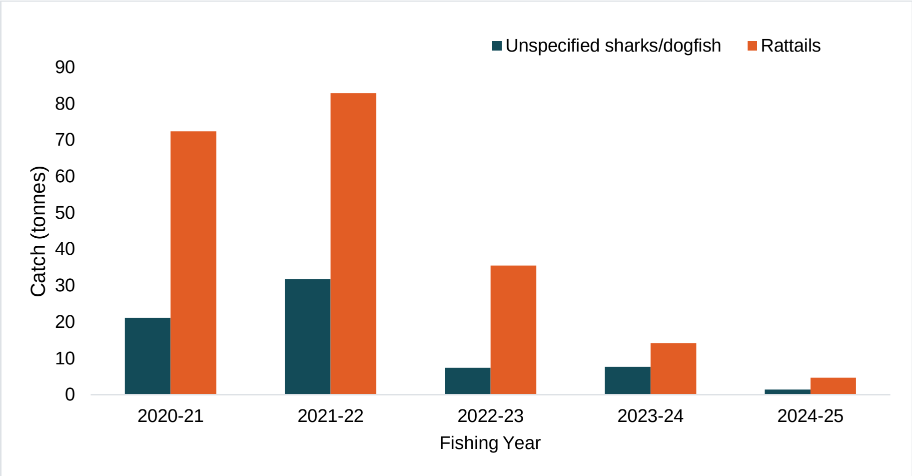

Figure 11. Bycatch of rattail and unspecified sharks and dogfish species in the ORH7A fishery from 2020-21 to 2024-25.

The reason(s) for the decline in bycatch of rattails is not clear. However, comparison with the biomass trend data from the WCSI bottom trawl survey suggest that this not due to a general decline in the abundance of rattails, as the WCSI survey biomass estimates of combined rattails shows no obvious declining trend over the timeseries but a drop in biomass between 2021 and 2024 which might explain the drop in bycatch levels seen in Figure 11 since 2021-22 (Figure 12).

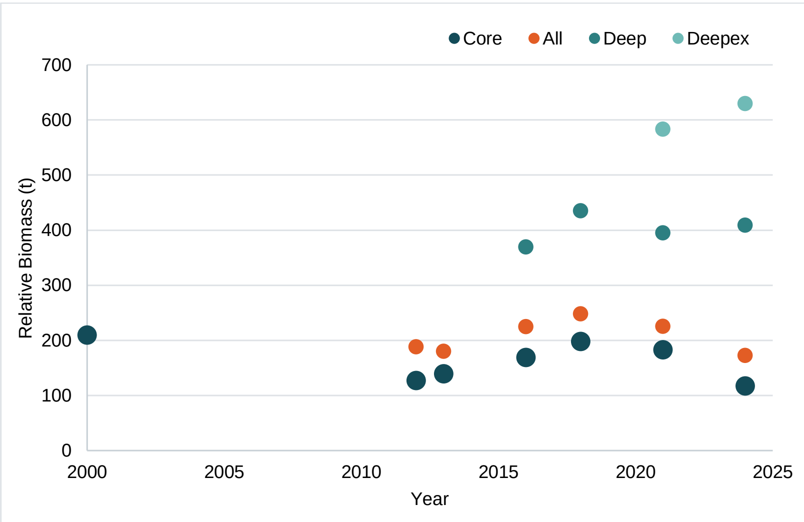

Figure 12. Estimated cumulative relative biomass (t) of 22 species of rattail reported in the Trawl Survey Information Portal for the WCSI bottom trawl survey series.[47]

[47] https://tsip-uat.niwa.co.nz/search

Of the 22 species included in Figure 12, 88% of the estimated biomass across the survey timeseries is for one species, Bollons' rattail (*Coelorinchus bollonsi*), a fairly consistent estimate as the range has been between 73% and 93% over the timeseries. Bollons' rattail unsurprisingly shows a similar pattern of observed biomass in the survey data to the combined species data, of fluctuation without trend but a reduction in biomass from 2021 of about 180 t to about 100 t in 2024; a scale of change that is not inconsistent with the observed decline in bycatch in the fishery (Figure 13).

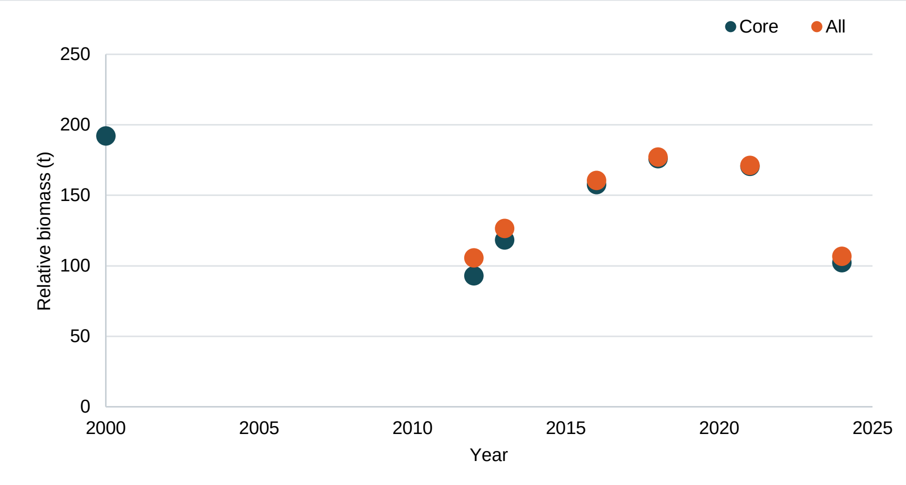

Figure 13. Estimated relative biomass (t) of Bollons' rattail reported in the Trawl Survey Information Portal for the WCSI bottom trawl survey series.[48]

The New Zealand field guide to common species caught in bottom and mid-water trawling describes 51 species of rattails and 58 species of sharks and dogfish[49], and trawl surveys off the West Coast South Island, primarily to estimate the abundance of middle-depth fish species, also yield biomass estimates for a range of bycatch species.

The 2025 trawl survey off the West Coast South Island recorded 19 rattail and 25 shark and dogfish species taken during tows to estimate the abundance of middle-depth fish species.[50]

In the southwest survey area, dark ghost shark was the most commonly recorded shark species (Figure 14).[51]

[48] https://tsip-uat.niwa.co.nz/search
[49] McMillan et al. (2024)
[50] Devine et al. (2025)
[51] Stevens et al. (2024)

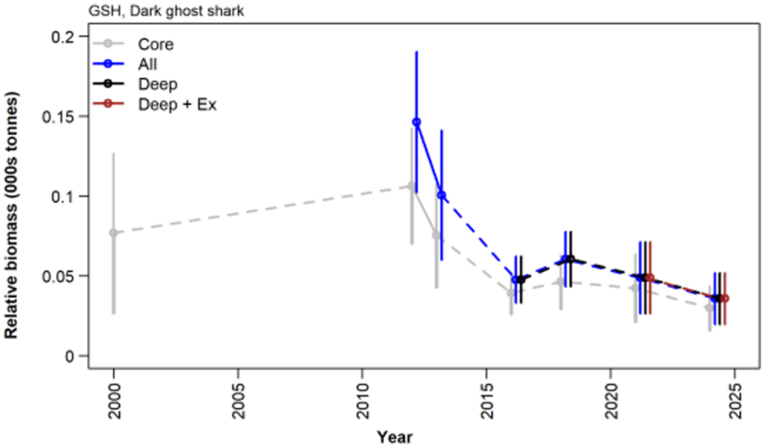

Figure 14. Relative biomass estimates (thousands of tonnes) for dark ghost shark. Grey lines show fish from core (300–650 m) strata, blue lines indicate all strata consistently sampled since 2012 (200–800 m), black solid lines are deep + (200–1000 m) strata, and red lines include the deep exploratory strata. Error bars show ± 2 standard errors.

Table 5 shows that from the target ORH fishery unidentified sharks and dogfish make up the largest elasmobranch catch at 0.81% while the single elasmobranch species with the greatest catch is the seal shark at 0.4%. The chimaerid with the largest catch is the pale ghost shark at 0.19% of the catch. The starfish, at 0.02%, is the largest catch of the invertebrate species. No single species exceeds 5% of the overall catch.

Bycatch Management Strategy

Analyses of bycatch trends for deepwater fisheries are updated every four-to-five years, as well as bi- or triennial bottom trawl surveys. Where there are concerns around persistent observed declines for particular species, FNZ will, in consultation with stakeholders, propose bringing such species into the QMS so that TACCs can be set towards managing catches to sustainable levels.

The Fisheries Act 1996 allows for species to be brought into the QMS in order to effect improved management of species/stocks or to promote improved utilisation. progressive increase in the number of species and stocks incorporated into the QMS over time is testament to the implementation of this management approach.

Section 72A of the Fisheries Act 1996 allows the return of species to the sea if they have an acceptable likelihood of survival if returned or abandoned in the manner specified by the instrument. Shark finning (i.e. retention of fins while returning carcasses to the sea) has been illegal in New Zealand since 2014. The ban requires that any shark fins retained must be landed attached to the shark's body for all non-QMS species and for two QMS species (spiny dogfish and blue shark). In most cases, limited processing is permitted (e.g., removal of the head), but the fins must still be attached to the body by some portion of uncut skin.

Bycatch Information

Vessels routinely report catch estimates for the top five most abundant non-QMS bycatch species on a tow-by-tow basis. FNZ's fishery observers monitor and report total bycatch composition on the same basis. Observer coverage has averaged around 32% in the two UoA fisheries over the past five years (see Tables 2 and 3), ensuring that representative data is being collected regularly to track bycatch trends. Additionally, catch composition data from regular research trawl biomass surveys further contributes to the information base on bycatch abundance. Analyses of bycatch trends in deepwater fisheries are updated every four to five years.

Endangered, Threatened, and Protected Species

All commercial fishing vessels are required by law to report all captures of ETP species to FNZ. Information on incidental captures of ETP species, reported by vessels and by MPI observers, is summarised in the Aquatic Environment and Biodiversity Annual Review.[52]

In addition to MPI's SOP, a range of management measures, including some industry-led, non-regulatory initiatives, are employed to monitor environmental interactions in deep water fisheries and to reduce the risk of any adverse effects on protected species populations. Responsibilities relating to the mitigation and monitoring of ETP species are described in the Deepwater Council's Operational Procedures.

MPI's operational plans additionally prescribe mitigation requirements for application in fisheries at high risk of capturing ETP species. For example, in the squid and southern blue whiting trawl fisheries these include a limit on the number of sea lion mortalities during the fishing season and a requirement for the use of sea lion excluder devices.

Data provided below on ETP species uses observer data obtained from MPI.

Seabirds

New Zealand uses the Spatially Explicit Fisheries Risk Assessment (**SEFRA**) method to evaluate the risk commercial fisheries pose to protected seabird species. SEFRA combines biological data about seabird populations, such as size, growth, and breeding information, with estimates of fishing-related mortality. This approach helps assess the potential impact of fisheries on seabird populations and prioritise interventions to reduce unsustainable fishing-related deaths.

Observed incidental seabird captures are used to model the estimated number of annual captures based on the total number of trawl tows undertaken. The estimated number of captures does not discriminate between birds killed and birds released alive.

Net captures frequently involve birds foraging on top of the net when it's on the surface on hauling and getting their heads or feet tangled in the meshes. Practical solutions are being sought to resolve these net captures. The proportion of birds released alive has increased in recent years as the main type of interaction has shifted from warp strikes (all fatal) to net captures (varying degrees of mortality but rarely less than 30% released alive). There are no data or published study on the survival of seabirds released from trawl nets. To estimate post-release survival, a range of 50% to 100% (a uniform distribution) was used, meaning it's assumed that between half and all the birds survive, though the actual survival rate is unknown.[53]

New Zealand's *National Plan of Action – Seabirds 2020*[54] informs the regulatory requirements for seabird mitigation, applicable to all trawlers 28 metres or greater in length. These include:

- Deployment of at least one type of seabird scaring device during all tows (i.e. bird bafflers, tori lines or warp deflectors)

[52] Aquatic Environment and Biodiversity Annual Review (AEBAR)
[53] Meyer (2023)
[54] Department of Conservation & Fisheries New Zealand (2020)

- 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.

DWG Liaison Programme for ETP seabirds, marine mammals and shark species risk management

DWG employs an Environmental Liaison Officer (**ELO**) who visits factory vessels and fresh fish trawlers involved in all deepwater fisheries to:

- Deliver PowerPoint-assisted training courses to senior crew (and at times vessel managers) on the need for ETP species capture mitigation and on best practice mitigation methods
- Provide training material on best practice environmental operations and procedures and ensure updated versions of all OPs are on each vessel
- Check that VMP's are updated and appropriate for each vessel's fishing operations
- Physically check their seabird mitigation equipment is fit-for-purpose and functional and ensure officers and crew are aware of the need to maintain conformance with offal control and mitigation systems to reduce seabird interactions.
- Be on-call 24/7 for any communications or requests for support, including trigger capture events
- Compare fishery information with that from observers to ensure the best information is available regarding the nature of significant capture events.

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.[55] While all deepwater trawl vessels are visited each year, including orange roughy vessels, the orange roughy fleet is not singled out for any specific attention as it is not associated with a high level of ETP seabird or marine mammal interactions.

In summary, the existing seabird mitigation strategy applied by the orange roughy trawl fisheries has a high probability of ensuring the UoAs neither hinder nor threaten the recovery of any seabird populations.

NWCR

Over the past five years, seabird captures in the NWCR UoA fishery have remained low and stable (Figure 15), with a total of three observed captures. In the most recent fishing year, no seabirds were captured. Of the three recorded captures, two were an unidentified petrel, prion, or shearwater – one alive and uninjured, and one dead. The remaining capture was an unidentified albatross, which was found alive and uninjured.

[55] Cleal (2020, 2021, 2022, 2023, 2024)

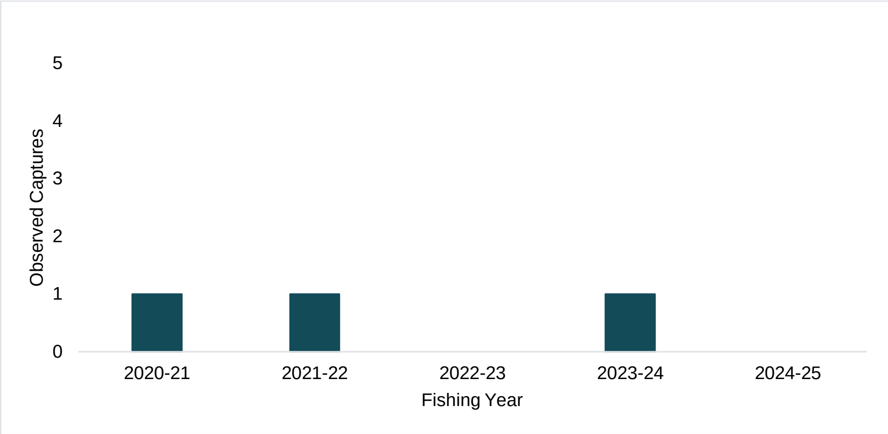

Figure 15. Observed seabird captures in NWCR (Fisheries New Zealand, pers. Comm.).

ORH7A

Over the past five years, seabird captures in the 7A fishery have varied, with a total of six observed captures (Figure 16). In the two most recent fishing years, no seabirds were captured. Of the six recorded captures, two were an unidentified petrel, prion, or shearwater – one alive and uninjured, and one dead. The remaining captures included one white-capped albatross, found alive and uninjured, and two unidentified albatrosses, of which one was alive and uninjured, and one was dead.

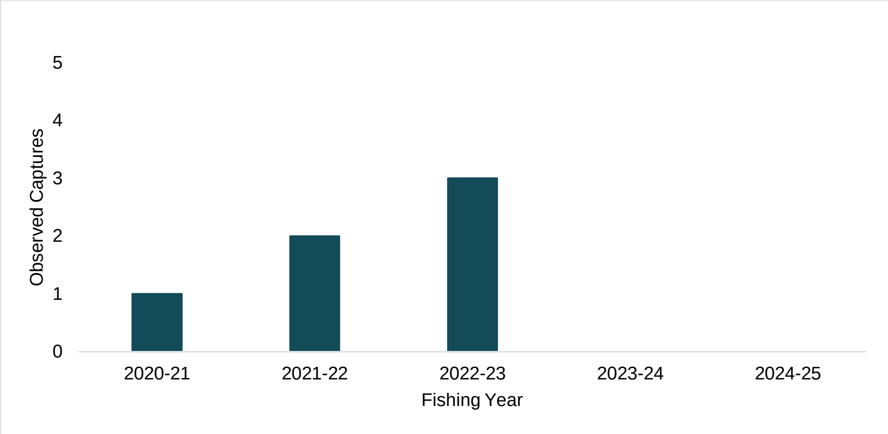

Figure 16. Observed New Zealand seabird captures in the 7A-WB UoA (Fisheries New Zealand, pers. comm.).

New Zealand Fur Seal

NWCR

There have been no observed or reported captures of New Zealand fur seals by trawlers targeting orange roughy in the NWCR UoA fishery.

ORH7A

There have been no observed or reported captures of New Zealand fur seals by trawlers targeting orange roughy in the ORH7A UoA fishery.

New Zealand Sea Lion

NWCR

There have been no observed or reported captures of New Zealand sea lions by trawlers targeting orange roughy in the NWCR UoA fishery.

ORH7A

There have been no observed or reported captures of New Zealand sea lions by trawlers targeting orange roughy in the ORH7A UoA fishery.

Whales & Dolphins

NWCR

There have been no observed or reported captures of whales or dolphins by trawlers targeting orange roughy in the NWCR UoA fishery.

ORH7A

There have been no observed or reported captures of whales or dolphins by trawlers targeting orange roughy in the ORH7A UoA fishery.

Sharks

NWCR

There have been no observed or reported captures of sharks by trawlers targeting orange roughy in the NWCR UoA fishery.

ORH7A

There have been no observed or reported captures of sharks by trawlers targeting orange roughy in the ORH7A UoA fishery.

Turtles

NWCR

There have been no observed or reported captures of turtles by trawlers targeting orange roughy in the NWCR UoA fishery.

ORH7A

There have been no observed or reported captures of turtles by trawlers targeting orange roughy in the ORH7A UoA fishery.

Corals

Distribution of corals and other sessile benthos

Of the approximately 110 species of deep-sea corals in New Zealand waters, around one-third are endemic. Around 85-90% are not habitat forming), occurring in small, patchily distributed, individual colonies throughout the EEZ. Only 10-15%% are reef-forming stony corals, which form beds and reefs (e.g. *Solenosmilia variabilis* and *Madrepora oculata*), which are habitat forming and provide refugia to other organisms. Matrices (i.e. coral beds) of reef-building corals may span depths from 70–2,850m in New Zealand waters occurring both shallower and deeper than the orange roughy fishing grounds.[56]

Most corals in New Zealand waters are protected under the Wildlife Act 1953 and include black, gorgonian, stony, and hydrocorals.

Observer-reported coral catches indicate that encounters by the fisheries are occasional, suggesting that corals are patchily distributed in the fished areas. Note that the catchability of corals by trawl nets has yet to be reliably established and not all coral is retained by trawl nets. Work is ongoing to establish a credible catchability coefficient for trawl nets (e.g. by South Pacific Regional Fisheries Management Organisation (**SPRFMO**).[57]

NWCR

Observed ETP coral catches during the period 2020/21 to 2024/25, based on observer records obtained from MPI, show that the NWCR fishery estimated annual catches range from 0 to 6,002.5 kg, with no apparent trend (Table 6). Review of the reported 6,000 kg coral catch confirmed that the material consisted primarily of mud and dead coral.[58]

Table 6. NWCR observed and estimated coral catch (kg) from fishing years 2020-21 to 2024-25 (Fisheries New Zealand, pers. comm.).

Species	Observer Reported Catch (kg)				
	2020-21	2021-22	2022-23	2023-24	2024-25
Gorgonian coral – Bushy bamboo (ACN)	0.1	0	0	0	0
Hydrocoral – *Bathyalcyon robustum* (ARO)	0	0	0	0.1	0
Black coral – *Bathypathes* spp. (BTP)	0	0.2	0	0	0
Black coral (COB)	0	0	0	0.1	0
True coral (unidentified; COU)	1	0.2	0	0	0
Stony coral – *Desmophyllum dianthus* (DDI)	0	0	0	1.6	0
Black coral – *Dendrobathypathes* spp. (DEN)	0	1	0	0	0
Stony coral – *Goniocorella dumosa* (GDU)	0	0	0	265.2	2.4
Gorgonian coral – Bamboo coral (ISI)	0	0	0	0.8	0
Gorgonian coral – Bamboo Coral – *Isidella* (ISP)	0	0	0	0.2	0
Gorgonian coral - *Lepidisis* spp. (LLE)	0	0	0	0.8	0
Black coral – *Parantipathes* (PTP)	0	0	0	0.1	0
Stony coral (SIA)	340	0	0	0.4	6,000
Stony coral – *Stephanocyathus platypus/spiniger* (STP)	1	0	0	0.4	0.1
TOTAL	**342.1**	**1.4**	**0**	**269.7**	**6,002.5**
Total Tows	204	154	124	101	100
Observed Tows	56	22	61	16	97
Observer Tows (%)	27	14	49	16	97
Estimated Coral Catch (kg)	1246.7	9.8	0.00	1,702.3	6189.2
Estimated Coral Catch/100 Tows (kg)	610.1	6.4	0	1685.4	6189.2

[56] Tracey & Hjorvarsdottir (2019)
[57] Stephenson et al. (2022)
[58] SLR Consulting, pers. comms)

ORH7A

Observed ETP coral catches during the period 2020-21 to 2024-25, based on observer records obtained from MPI, show that the ORH7A fishery estimated annual catches range from 0 to 18.5 kg, with no apparent trend (Table 7).

Table 7. ORH7A observed and estimated coral catch (kg) from fishing years 2020-21 to 2024-25 (Fisheries New Zealand, pers. comm.).

Species	Observer Reported Catch (kg)				
	2020-21	2021-22	2022-23	2023-24	2024-25
Gorgonian coral – Bushy bamboo (ACN)	0	0.1	0	0.1	0
Black coral – *Bathypathes* spp. (BTP)	0	0	0	0.1	0
Black coral (COB)	0	0	0	0	0.4
True coral (unidentified; COU)	0	0.8	0	0	0
Gorgonian coral – Bamboo coral (ISI)	0	0	0	0.51	0
Gorgonian coral – *Lepidisis* spp. (LLE)	0	1	0.1	0	0
Golden coral – *Radicipes* (RAD)	0	1	0	0	0
Stony coral (SIA)	0	0	0	0	0.4
Stony coral – *Stephanocyathus platypus/spiniger* (STP)	0	0	5.6	0.3	0
TOTAL	**0**	**2.9**	**5.7**	**1.01**	**0.8**
Total Tows	639	669	520	340	168
Observed Tows	133	100	160	177	58
Observer Tows (%)	21	15	31	52	35
Estimated Coral Catch (kg)	0	19.4	18.5	1.9	2.3
Estimated Coral Catch/100 Tows (kg)	0	2.9	3.6	0.6	1.4

Vessel-reported Catch

Vessels are required by regulation to report all protected species captures using Non-Fish Protected Species forms, whether or not an observer is on board. Records show that, for the most part, vessels in NWCR and 7A-WB reported more catch than observers, as would be expected given the levels of observer coverage (Table 8).

Table 8: Vessel-reported and observer-reported coral catch (kg) in NWCR and 7A-WB from fishing years 2020-21 to 2024-25 (Fisheries New Zealand, pers. comm.).

Year	NWCR Catch (kg)		7A-WB Catch (kg)	
	Commercially Reported	Observer Reported	Commercially Reported	Observer Reported
2020-21	405.3	342.1	0	0
2021-22	1190.47	1.4	0.86	2.9
2022-23	0	0	1.45	5.7
2023-24	220.98	269.7	1.1	1.01
2024-25	6003.65	6002.5	1.12	0.8

Assessment of Trawling Interactions

A key tool for assessing the probable effects of trawl fishing on ETP coral communities has been to assess the extent of overlap between the fishery footprint and areas where corals are known to occur (i.e. the observed coral distribution).

Bottom trawl records for all tows that targeted ORH over the three-year period 2018-19 to 2020/21 were plotted against observer-reported, vessel-reported, and research coral datasets (the 'observed' coral distribution), using GIS to determine the overlap within the ORH habitat depth range of 800 – 1,600 m.

The method involves coral capture localities being expressed as cells of 1 km x 1 km in extent, which are then overlaid with the recent trawl footprint to provide an indication of probable fishery impact. However, the 'observed' coral dataset is not representative of the overall distribution of corals because the majority of the records originated from the fishing grounds.

The research dataset cannot be assumed to be representative of the distribution, either by area or depth, as it is predominantly based on trawl survey records, which have the objective of assessing the biomass of fished stocks and not the nature and extent of epibenthic fauna.

These are strong reasons not to rely solely on the 'observed' coral distribution as a basis for assessing the impact of UoA fisheries on coral habitat. There is evidence that many of New Zealand's deepwater protected corals occur deeper than the maximum depths currently fished (i.e. ~1,400 m), with maximum depth records as follows:

- Black corals: 2,440 m
- Gorgonian octocorals: ~2,990 m
- Scleractinian stony corals: 2,860 m
- Hydrocorals: ~2,530 m[59]

The observer-reported coral catch composition for the years 2020-21 to 2024-25 showed the following:

NWCR

Stony coral formed the bulk of the coral catch. Small quantities of unidentified true corals, black coral, hydrocoral, and gorgonian coral were recorded (based on Table 6).

ORH7A

Stony coral formed the bulk of the coral catch. Small quantities of unidentified true corals, black coral, gorgonian coral and golden coral were recorded (based on Table 7).

Trawl Footprint ***(Section to be updated pending receival of updated data)***

The distribution of the trawl footprint for ORH shows a significant contraction in 2021 compared to the trawl footprint over the period 1990 – 2021 and now focuses on areas with the highest probability of capture (Figure 17).[60]

[59] Finucci et al. (2019)
[60] MacGibbon & Mules (2023)

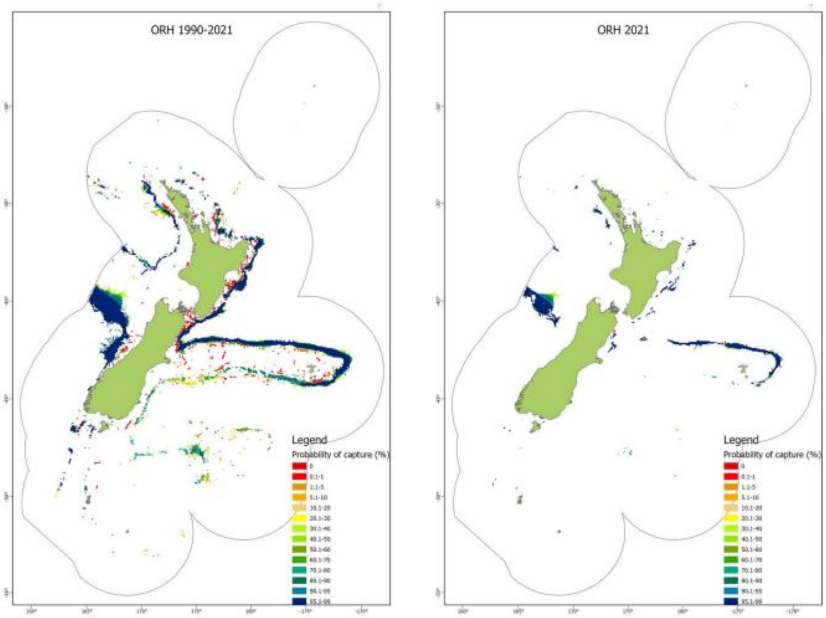

Figure 17. Distribution of the 1990 – 2021 (left) and 2021 trawl footprints (right) for orange roughy displayed by 25 km2 contacted cell, relative to the probability of capture for that species (after Leathwick et al., 2006).

The latest trawl footprint report, released in September 2024, presents a spatial analysis of bottom-contacting trawl effort by commercial trawlers within the EEZ, in waters open to trawling to a maximum depth of 1,600 meters, for different time periods based on the most recent data.

The latest trawl footprint analysis shows that for the deepwater data between 1990 and 2022, the overall footprint contacted was 8.7% of the EEZ and territorial sea, representing 25.8% of the fishable area. From 2006 onwards, the annual overlap has been 1.0 – 1.2% of the EEZ and territorial sea, representing 2.9 – 3.7% of the fishable area.[61] The data show that the numbers of tows by ORH/OEO-targeted fisheries has remained fairly consistent over the period 2016 – 2021[62] (Figure 17).[63]

[61] MacGibbon et al. (2024)

[62] MacGibbon & Mules (2023)

[63] MacGibbon & Mules (2023)

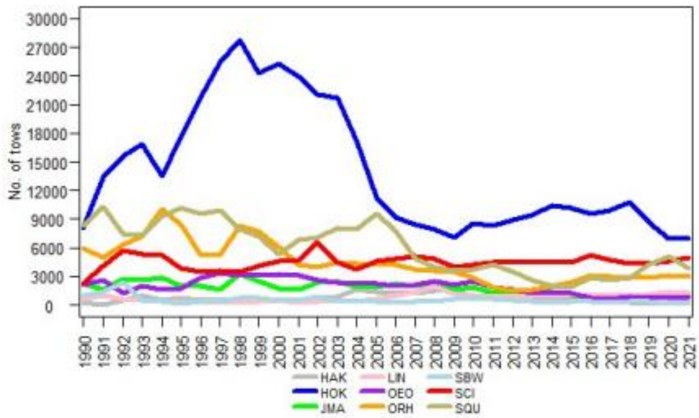

Figure 18. The number of bottom-contacting tows by year for the period 1990 - 2021 for deepwater tier 1 species.

The following key observations were made:

NWCR

For the period 1990 – 2021 the trawl footprint for ORH/OEO-targeted tows in NWCR was 7,057 km^2 and contacted 861 cells.

The trawl footprint remained low from 2011 – 2013 when much of the catch was taken from UTFs. The fishery moved progressively to longer tows on slope habitat from 2014 and then showed a contraction from 2019-17, which broadly corresponds with the reductions in the TACC. The number of 25^{km2} cells contacted showed a similar trend (Figure 19).

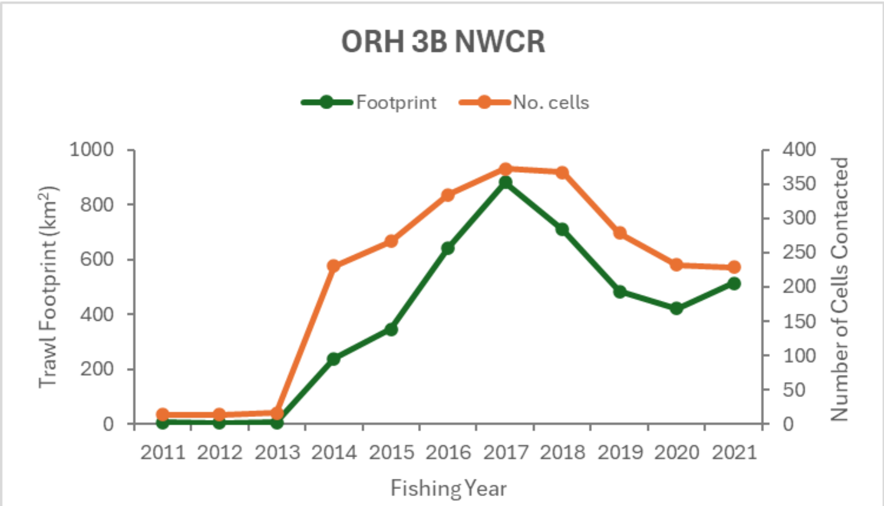

Figure 19. The number of contacted 25^{km2} cells and footprint (km^2) for combined targets ORH/OEO bottom-contacting trawls in NWCR from 2011 – 2021.

ORH7A

For the period 1990 – 2021 the trawl footprint for ORH/OEO-targeted tows in ORH 7A was 11,187 km^2 and contacted 1,568 cells

The trawl footprint remained low for four years from 2011, when the fishery was reopened to commercial fishing, and then showed an increasing trend through to 2021. The number of 25 km^2 cells contacted showed a similar trend. This pattern is also broadly consistent with the changes in the TACC.

Fishing effort in ORH 7A showed an expansion over a wider area in 2020 and 2021 (Figure 20).

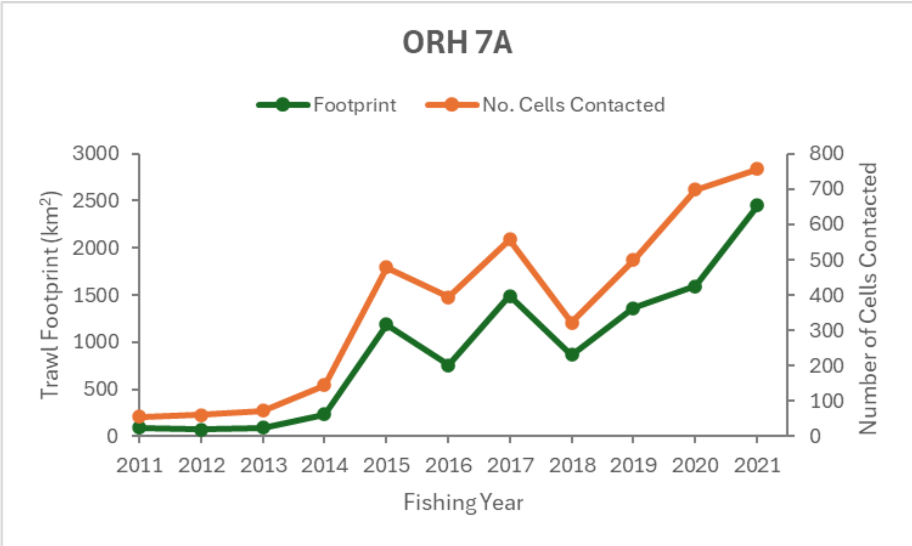

Figure 20. The number of contacted 25 km^2 cells and footprint (km2) for combined targets ORH/OEO bottom-contacting trawls in ORH 7A from 2011 – 2021.

Maps showing the extent of the recent trawl footprints in relation to the orange roughy habitat areas for each of the UoAs are provided in Figure 20 and Figure 21.[64]

In NWCR, most fishing in recent years has occurred on flat habitat to the south and west of the 180˚ hills in recent years and much of the 'new area' traversed has involved in-filling between existing trawl tracks within the traditional fishing grounds, as acknowledged by Baird & Mules (Figure 21).[65]

[64] Deepwater Group (2021)
[65] Baird & Mules (2023)

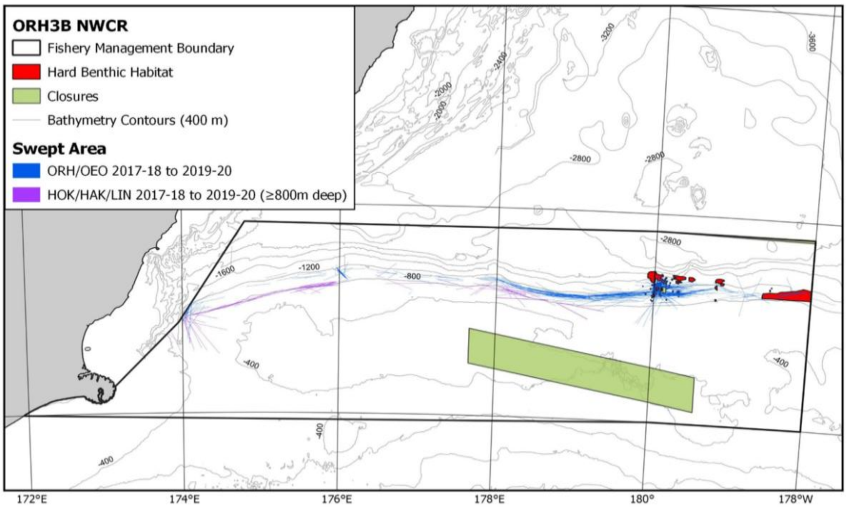

Figure 21. NWCR UoA trawl footprint for ORH/OEO targeted tows and for HAK/HOK/LIN targeted tows with starting depths ≥ 800 m, 2017-18 to 2019-20.

In ORH 7A, there has been an expansion of the fishery towards the south-east, reflective of the fishery increasingly operating outside of the spawn (the spawning area is in the extreme western part of ORH7A) (Figure 22).

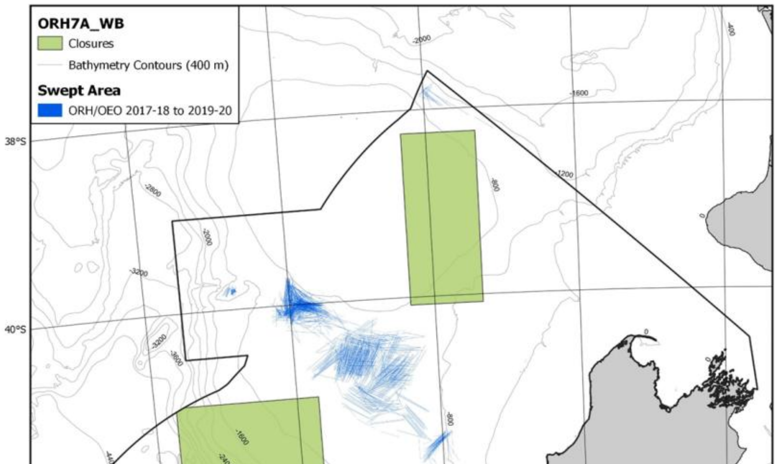

Figure 22. ORH 7A UoA trawl footprint for ORH/OEO targeted tows and for HAK/HOK/LIN targeted tows with starting depths ≥ 800 m, 2017-18 to 2019-20.

Improved Trawl Footprint Methodology ***(Bold to be updated pending receival of updated data)***

An Electronic Reporting System (**ERS**) was introduced for all New Zealand trawlers from 2019. This involved real-time reporting of tow start and tow end positions, and near-real-time reporting of catches by tow, directly to Fisheries New Zealand via satellite. Mandatory Vessel Monitoring Systems (**VMS**) aboard vessels additionally report vessels' geospatial positions automatically to Fisheries New Zealand at a frequency of every 3 – 10 minutes (Geospatial Position Reporting, **GPR**). In calculating trawl footprint, the tow-start and tow-end positions are used as a proxy for the 'probable' bottom contact by trawl gear. However, as trawl tows are often not in a straight-line, it was suspected that this method may under-estimate the 'true' trawl footprint. As a result, in 2023, a method using GPR data was trialled for determining a more accurate trawl footprint. The difference between use of ERS and GPR data is illustrated in Figure 23. The trial showed that, for tows that had corresponding GPR data, the trawl footprint was slightly larger; the GPR:ERS trawl footprint ratio being 1.04 (i.e. 4% larger).[66]

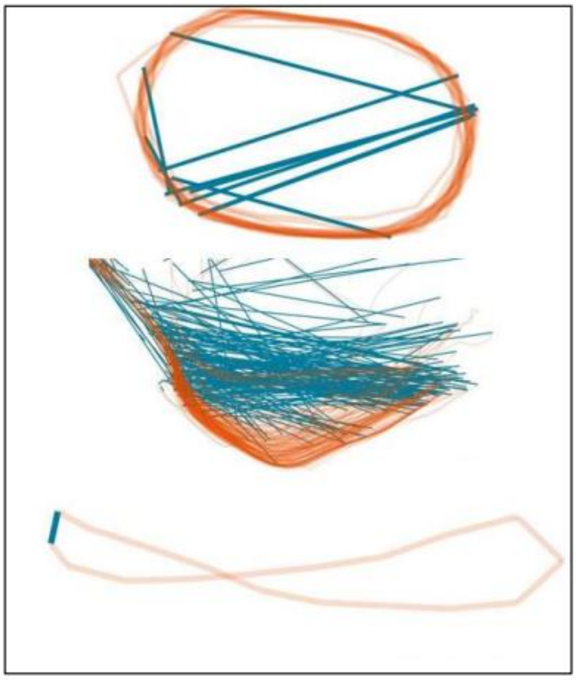

Figure 23. A selection of trawl paths created using GPR data (orange lines) and the corresponding tows created using the 'traditional ERS straight-line' method (green lines).

Assessment of Fishery Impact on Coral Habitat ***(Section to be updated pending receival of updated data)***

In the knowledge of the deficiencies and biases of analyses based on the 'observed' coral distribution for assessing fishery impact, models have been developed to produce predicted coral habitat distributions.[67]

[66] MacGibbon & Mules (2023)
[67] Anderson et al. (2014, 2015, 2019)

For a previous surveillance audit, predicted habitat distributions for protected coral groups[68] were overlayed with the trawl footprint to estimate the potential fishery impact. The audit team determined that the model could not be relied upon as an indicator of true coral distribution and discounted the assessment of trawl footprint against the predicted coral distributions. Outputs from a revised and updated model were presented for the third surveillance audit in 2020, using the model of Anderson et al. (2015), which used slightly different methodology in consideration of real coral absence data, as opposed to 'pseudo absence' data used in the 2014 study, and in interpolating the models to the resolution of the true sea floor topography rather than the modelled sea floor. The trawl footprint for the 2017-18 and 2018-19 fishing years, plotted against the Anderson et al. (2015) predicted coral distributions at the >50th percentile level for each of the four protected coral groups, were suggestive of a very small overlap by the NWCR fishery on the coral distributions, ranging between 0.15% and 1.18% (Table 9).

Table 9. Overlap of the combined 2017-18 and 2018-19 trawl footprint against the updated predicted habitat distribution of Anderson et al. (2015) for black, gorgonian, and stony corals in NWCR. Predicted distribution > 50th percentile occurrence.[69]

Species	Predicted Coral Distribution >50th percentile (km^2)	Overlap Of 2017-19 Footprint with Predicted Coral Distribution (km^2)	Overlap with Predicted Coral Distribution (%)
Black corals – O. Antipatharia	9,620	113	1.18
Gorgonian corals – O. Alcyonacea	7,008	325	0.96%
Stony corals – O. Scleractinia	33,906	11	0.15%

Predicted distribution modelling of benthic biodiversity in the New Zealand EEZ has developed rapidly over recent years. While earlier models used faunal distribution data to predict distributions in unsampled areas, they were deficient in that they used presence-only data from museum and trawl datasets and did not incorporate population density data. For these reasons their predictions were considered uncertain. In more recent modelling a new, merged benthic invertebrate occurrence dataset from five seabed photographic surveys has been used to inform development of improved predictive models at both single taxon levels, using Random Forest (RF) and Boosted Regression Tree (BRT) decision-tree methods, and at community levels, using Gradient Forest (GF) and Regions of Common Profile (RCP) methods.[70] The use of these new, quantitative datasets, incorporating environmental variables at a very fine scale of resolution of 1 km^2, represent a major refinement of the earlier models. The approach used in all of these modelling exercises is essentially to define relationships between point-sampled (i.e. observed) faunal data and environmental gradients to predict how individual benthic taxa and communities vary spatially over large areas (e.g. Chatham Rise).

The accuracy and spatial resolution of these models is dependent on the quality and consistency of fine-scale information on the sediment types and topography of the seabed. This is significant because the distribution of sessile fauna such as corals and other habitat forming fauna is defined by the availability of hard substrata, which is highly patchy.[71] The resolution of both the input data and the predicted outputs from the recent modelling are at a reasonably fine scale of 1 x 1 km cells and the predicted abundances of benthic taxa, for the depth range 300 – 3,000 m, are presented as the number of individuals per 1000 m^2. The relative confidence in the predictions was assessed using a bootstrapping technique, at the scale of individual cells, to produce spatially explicit uncertainty

[68] Anderson et al. (2014)
[69] Black & Easterbrook (2022)
[70] Stephenson et al (2021)
[71] Bowden et al. (2019)

measures. Model uncertainties were calculated as the coefficient of variation (**CV**) of the bootstrap output.[72]

Habitats Impacted by the UoA Fisheries

Orange roughy and oreo are distributed throughout the New Zealand EEZ at depths of between 800 – 1,600 m. The two main habitat types encountered through bottom trawling for orange roughy are flat habitat and Underwater Topographic Features (**UTF**s). In ORH 7A and NWCR, most fishing effort and catch occurs on flat habitat.

The major bottom trawl fishery in New Zealand targets hoki, hake and ling at depths between 250–750 m. A small proportion of tows occur at depths greater than 800 m (i.e., within the ORH/OEO fishery areas). Including the HOK/HAK/LIN trawl fishery footprint in the analyses results in only small increases to the overall trawl footprints within the 800-1,600 m fishable grounds under consideration.

Management of Benthic Effects

Observer monitoring of around 30% of trawl tows in the UoAs provides a good estimation of the impact of the fisheries on vulnerable habitats and mandatory Global Position Reporting by vessels enables the Ministry to monitor vessel compliance with regard to area closures on a 24/7 basis.

Seafood New Zealand – Deepwater's Trawl Benthic Operational Procedures[73], implemented from 1 October 2021, apply to all trawlers over 28 m and ensure that vessels are cognisant of the requirement to accurately measure, record and report all captures of benthic biota to the Ministry and to their shore managers. The objectives of the Benthic OPs are to:

- Ensure correct reporting of benthos, both protected and non-protected
- Enable avoidance or mitigation of catches of benthos.

DWC's Environmental Liaison Officer is at hand to assist in providing response management advice to vessels for implementation in near-real-time.

Reducing our Catches of Corals and Other Epi-benthic Species

Our current benthic habitat management strategies (non-fish by-catch reporting, SCAs, and BPAs) go some way towards protecting assemblages and communities of corals and other epi-benthic species.

In New Zealand's deepwater fisheries, sessile (non-mobile) epi-benthic organisms (e.g., corals, sponges, bryozoans etc.) are vulnerable to bottom trawl gear. Many of these species, which are outlined in the Deepwater Trawl Benthic Operational Procedures[74], create habitats for fish and other mobile animals. However, the defining criteria for VMEs do not provide guidance around the extent to which these organisms are habitat forming.

Because our objective is to reduce our catches of live epi-benthic organisms (e.g., corals) to as near to zero as practicable within these ORH fisheries, we need to implement management procedures that not only meet the requirements of the New Zealand MSC certified orange roughy fisheries, in terms of minimising gear interactions with benthic organisms, but also apply a clear spatial scale or area so that these organisms can be quantified and protected (where required).

In the absence of any explicit scale-component by MSC, the quantification of VME type habitat health and integrity and the demonstration of the effectiveness of management strategies is challenging.

[72] Bowden et al. (2019)
[73] Deepwater Council (2024)
[74] Deepwater Council (2024)

Applying VME habitat requirements in other international organisations, and in other MSC fishery assessments, has yielded VME scales that rely upon significant aggregations of the representative taxa or species with scales of 100s of metres to kilometres, often associated with physical elements such as “seamounts.”

Monitor, Pause, Survey and Assess (MPSA) Management Strategy

This Monitor, Pause, Survey and Assess (**MPSA**) strategy implements our own criteria and terminology to reduce our interactions with “VME” taxa:

- MPSA Management Strategy: This strategy outlines the process by which Vulnerable Benthic Areas (**VBA**s) are identified, surveyed and assessed.
- Benthic Management Areas (**BMA**s): These are areas that contain extensive aggregations or communities of epi-benthic organisms to the extent that they conform to BMA criteria.

The proposed MPSA management strategy is based on a specific set of operational procedures that use current information and infrastructure to manage interactions with epi-benthic habitat areas:

- **Monitor**: Regular reporting of non-fish bycatch by observers and industry.
  - Training key crew members in epi-benthic species identification to differentiate between live and dead coral, and improved use of reporting codes)
  - Trigger-point reporting to DWC if designated VBA indicator taxa reach agreed triggers (e.g., 50 kg of any VBA Indicator species).
  - Annually review each towline to assess if catches of designated VBA indicator taxa reach agreed triggers (e.g., 50kg of any VBA Indicator species).
- **Pause**: Fishing on a towline would be paused if a pre-set trigger point is met or exceeded,
  - DWC will notify the fleet that a trigger was met, provide the coordinates of the towline and will request that fishing ceases along this towline until the VBA characteristics can be assessed.
- **Survey**: The towline and the area adjacent to the paused towline is prioritised for benthic biodiversity survey under the five-year research programme contracted to CSIRO.
- **Assess:** Survey results are assessed to determine any BMA characteristics in the vicinity of the paused towline, consider and implement appropriate management measures (e.g., reopening of the towline, or determining the level of protection including designation as a MBA, should the area conform with the definition of a VBA)

Pause

Move-on rules produce unpredictable changes in effort and impacts overall and may be better considered as secondary to other measures for reducing trawling impacts on sensitive biota75, other commentors have said that nets are poor samplers of epi-benthic taxa, or that move-on rules are two clunky to be used as a benthic management strategy.

For this reason, the MPSA procedures are not a move on rule, but simply a pause in fishing until the epi-benthic habitat area is surveyed and/or assessed for a management response. This enables the MPSA to readily incorporate other benthic management components such as closures, reporting, footprint analysis and benthic predictive modelling – to form a more comprehensive strategy.

A pause phase follows an encounter with a significant epi-benthic habitat area that results in a single tow trigger of ≥50 kg as outlined in Part 3 of the DWC Trawl Benthic Operational Procedures.

While the Deepwater threshold of ≥50 kg as outlined in the OP is higher in comparison with other MSC certified fisheries, it is sufficient as a pause trigger for a single tow encounter. As stipulated in

[75] McConnaughey et al. (2019)

the OP, the inbuilt precaution within the MPSA strategy comes from the annual cumulative towline threshold of ≥50kg and the ability to survey and assess towlines with real-world indicative information against BMA criteria (which define BMAs in terms of a science-based and operationally applicable scale that enables the ability to quantify ecosystem structure and function). This cumulative analysis and subsequent survey/assessment is not a feature in other strategies.

Survey

Owners of deepwater quota have recently completed an agreement to purchase science from CSIRO over the next five years (funded one third by CSIRO and two thirds by industry) to further our understanding of the deepwater benthic biodiversity and fisheries interactions with biogenic habitats. This work will have 2 main themes:

- **Habitat mapping of the benthic biodiversity within selected areas:** Detailed surveying and mapping of the benthic habitats of selected Underwater Topographic Features (UTFs) using CSIRO's underwater towed video system (with real- time connectivity to the survey vessel). Over a five-year period, the plan is to survey the benthic habitats of up to 25 of the key UTFs. The objective is to quantitatively survey and assess the habitat types and the benthic biodiversity on each of these UTFs (e.g., mud, sand, rock, biogenic) and the VME indicator taxa within biogenic habitats encountered (i.e., areas containing corals, sponges and other epibenthic invertebrate communities). The video imagery from these surveys will be analysed by CSIRO using their Artificial Intelligence (AI) capabilities. The survey information will then be analysed in relation to other data, such as trawl paths, enabling assessments of any risks posed by trawling and the extent of areas untouched by trawling.
- **Industry trawl camera systems:** progressively, surveys will employ SMART–cam technology. Deepwater and vessel owners have contracted CSIRO to develop and deploy bespoke SMART–cam technology (Seafloor Monitoring, Automated Recording of Trawls). This robust underwater hardware and software will be routinely deployed during commercial trawling to collect high resolution digital imagery of the seabed along trawl pathways that will be analysed to identify and quantify the benthic habitat types and their biodiversity. We will apply CSIRO's proven solutions for deepwater engineering, automated data download, data management and analyses using their proven AI capabilities in New Zealand waters. This project will deliver a unique seafloor monitoring programme, the results from which will provide a basis for an informed strategy for assessing and managing risks to benthic communities from deepwater trawling.

Under the MPSA Strategy paused tows and towlines will be prioritised for surveying and mapping.

Assess

The best strategy is to have, within any management system, an adaptive process to monitor performance and allow for future refinements.[76] The Assessment phase of the MPSA strategy is both responsive and adaptive to the needs of the ORH fisheries and of the benthic habitat.

During the assessment phase of the strategy, best available information is assessed, including:

- Trawl footprint information
- Trawl tow analysis
- Epi-benthic taxa catch analysis
- Target species catch analysis
- CSIRO underwater towed video survey results

[76] McConnaughey et al. (2019)

- Smart-Cam data

The analysis of this information will enable assessments of any risks posed by trawling and the extent of areas untouched by trawling and will provide valuable information on requisite levels of management and protection, including the designation of BMAs, which will provide localised protection of significant epi-benthic habitat areas, which in turn will integrate with other extant benthic protections such as BPAs and Seamount Closures.

ETP Corals & Habitats Summary ***(To be updated pending receival of updated data)***

The updated information shows that the UoA fisheries have a small footprint relative to the 800–1,600 m habitat and predicted coral distributions. Combined with the extensive protected areas, combined with information from previous surveillance audits (including analyses of coral distribution at depths shallower and deeper than orange roughy fishery depths, the extent of untrawled hard benthic habitat, and the likely connectivity between known coral habitats)[77], it indicates that the fishery has only a minor impact on the overall distribution of protected corals and on habitats of vulnerable sessile benthic fauna.

The fishing-related risk to corals within New Zealand's EEZ is very low. Stony corals and hydrocorals occur over wide depth ranges, most of which are outside of the depth ranges being trawled. **Of the depth range that has been trawled for orange roughy (i.e. 800–1,400 m), 92.6% remains untouched by bottom trawls.** In addition, corals and other benthic organisms are afforded protection provided by the Benthic Protection Areas (**BPA**s) and the Seamount Closure Areas (**SCA**s).

Research Projects

Aquatic environment and biodiversity research initiatives related to the benthic effects of fishing are detailed in the Annual Operational Plan for Deepwater Fisheries. Projects to monitor seabed contact by bottom trawling are ongoing.[78]

These include the following ongoing projects:

- BEN2023-01 Mobile bottom fishing footprint - assessment and development of estimation methods using ER and GPR data
- BEN2022-01 The extent and intensity of seabed contact by mobile bottom fishing in the New Zealand Territorial Sea and Exclusive Economic Zone and development of an interactive bottom fishing footprint website
- BEN2021-03 Taxonomic identification of benthic invertebrate samples.
- BEN2020-07 Extent and intensity of trawl effort on or near underwater topographic features in New Zealand's Exclusive Economic Zone
- BEN2020-01 Extent and intensity of seabed contact by mobile bottom fishing in the New Zealand Territorial Sea and Exclusive Economic Zone.
- BEN2019-05 Towards the development of a spatial decision support tool for managing the impacts of bottom fishing on in-zone, particularly vulnerable or sensitive habitats.
- BEN2019-04 A spatially explicit benthic impact assessment for inshore and deepwater fisheries New Zealand to describe and quantify the likely nature and extent of impacts to benthic taxa or communities by mobile bottom fishing methods.

[77] Deepwater Group (2020, 2020a, 2021); Seafood New Zealand – Deepwater Council. (2024a)
[78] Fisheries New Zealand (2024)

Progress Against Conditions

Condition 1

One condition of certification was proposed against Principle 2:

> *"By the 4th annual audit in 2026 there will be some quantitative evidence that the partial strategy outlined in the Deepwater Council's Benthic Operational Procedures is being implemented successfully in the NWCR and ESCR units of assessment."*

Progress Against the Condition

Seafood New Zealand – Deepwater has developed operational procedures to outline the management measures for identifying, disposing of, and reporting benthic organisms, including protected corals, captured incidentally during fishing.[79] These procedures are approved by the Deepwater Council shareholders and managed by Seafood New Zealand – Deepwater.

The management framework includes 10 Commandments for benthic captures, including specific reporting requirements. Vessels must report to the Deepwater Council if trigger points of ≥50 kg of coral catch or ≥600 kg of sponge catch are reached when fishing on a towline. Reports include photos and any relevant information associated with the trigger-level catch. Fishers are instructed to cease fishing in the area (also referred to as *'paused tows'*) until the nature of the benthic catch is identified. Additionally, vessels are required to avoid areas known to have high amounts of benthos.

Detailed figures and images supporting this section have been provided in a separate, confidential supplement (Appendix 1).

From September 2024 to September 2025, no towlines were paused in the NWCR and ESCR fisheries. A record of trawl tows that yielded trigger-level coral catches is maintained by DWC, along with details on the locality, quantity of coral and the alive/dead status of the coral (Table A1).

Vessels report trigger-level coral catches, as required in terms of the Trawl Benthic Operational Procedures, and email colour photographs of the captured coral to the ELO. The images are forwarded to coral experts for identification and for determination of their alive or dead status. Trigger-level tows with confirmed live coral catch are paused by DWC until further notice.

The 6,000 kg coral capture was confirmed dead coral (Figure A1) and was not paused.

Trigger-level coral tows are mapped using coordinates as reported by vessels and these are distributed to orange roughy quota owners for their reference and management action (Figure A2).

The four towlines paused in ORH 3B NWCR and ESCR during 2022-23 and 2024-25 are illustrated in Figure A3.

[79] Deepwater Council (2024)

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P3 OVERVIEW OF MANAGEMENT INFORMATION

Changes to Management System and Regulations

Electronic reporting and geo-positional reporting for all New Zealand trawlers was phased in during 2019.

A review of ORH3B was completed following the 2025 stock assessment. As a result, the Minister has adjusted catch settings to support long-term management objectives. The TACC for ORH3B has been revised, with the reduction applied to the East and South Chatham Rise (ESCR) sub-area. Catch limits for the NWCR fishery remains unchanged, as recent information indicates these areas continue to perform within management expectations. The new settings are supported by ongoing monitoring and planned research to inform future assessments.[80]

Changes to Personnel Involved in Science or Management

DWC has contracted Dragonfly Ltd to assist in the development of a revised stock assessment approach for orange roughy in ORH 3B ESCR, and potentially for application in NWCR and ORH 7A.

Legal and Customary Framework

New Zealand's fisheries management is centred on the Quota Management System (**QMS**), a system introduced in 1986 to regulate the annual catch limits for commercial, recreational, and customary fishers (also known as the TAC). Under the TAC, commercial fisheries are allocated a specific annual catch limit (**TACC**), and commercial fishers are allowed to purchase Individual Transferable Quotas (**ITQ**).

An ITQ is a tradable property right that entitles the owner to a share of the TACC. At the start of each fishing year, ITQs generate Annual Catch Entitlements (**ACE**), which are also tradable, expressed in weight, and allow the holder to land catch against them. ITQs are also allocated to Māori under the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992[81], which acknowledges the Treaty of Waitangi and guarantees Māori chiefs, tribes, and individuals exclusive and undisturbed possession, as well as te tino rangatiratanga[82] over their fisheries.

The QMS supports the sustainable management of fisheries resources by controlling harvest levels based on the best available science. It is administered by MPI under the Act.

New Zealand has developed one of the most extensive quota-based fisheries management systems in the world, managing over 100 species or species complexes of fish, shellfish, and seaweed within this framework. Today, almost all commercially targeted fish species in New Zealand's waters are managed under the QMS. At the operational level, these fisheries are managed in accordance with the National Fisheries Plans.

The National Fisheries Plan for Deepwater and Middle-depth Fisheries has been revised and implemented as of May 2019.[83] It is a statutory document, approved by the Minister for Oceans and Fisheries, which provides an enabling framework outlining agreed management objectives, timelines,

[80] Minister for Oceans and Fisheries (2025)
[81] New Zealand Legislation (1992)
[82] "Tino rangatiratanga" is defined as self-determination and sovereignty.
[83] Fisheries New Zealand (2019)

performance criteria and review processes. There is a species-specific chapter for orange roughy within this plan.[84]

The National Deepwater Plan consists of three parts:

1. Part 1 outlines the framework and objectives for the management of New Zealand's deepwater fisheries. It is divided into Part 1A and Part 1B.
    A. Part 1A details the overall strategic direction for New Zealand's deepwater fisheries.
    B. Part 1B is comprised of the fishery-specific chapters of the Deepwater Fisheries Plan, which provide management objectives at the fishery level, in line with the management objectives outlined in Part 1A.
2. Part 2 is the Annual Operational Plan (**AOP**) which details the management actions that will be implemented on an annual basis for deepwater fisheries. The AOP includes the required services, delivery mechanisms, and service prioritisation factors that must be considered each financial year. The latest AOP available is for 2023/24[85]:
    - management actions for delivery during 2023/24 (see Table 2 on pp 8–13),
    - research projects (see Tables 6–9 on pp. 23–26)
    - deepwater fisheries observer coverage plan for 2023/24 (see Table 10, pp. 26–28)
3. Part 3 is the Annual Review Report (**ARR**) which assesses the annual performance of deepwater fisheries against the actions specified in the previous Annual Operational Plan and reports on progress towards meeting objectives described in Part 1A. The latest ARR available is for 2022/23.[86]

Collaboration

In 2006, DWC and FNZ, entered into a formal partnership to enable collaboration in the management of New Zealand's deepwater fisheries. This partnership was updated in 2008 and 2010 and has directly facilitated improved management of the orange roughy trawl fisheries through:

- A close working relationship under a shared and agreed vision, objectives and collaborative work plans.
- Real-time, open communication between DWC 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[87] model, which focuses on all elements of the compliance spectrum as follows:

[84] Fisheries New Zealand (2010)
[85] Fisheries New Zealand (2024)
[86] Fisheries New Zealand (2024a)
[87] Fisheries New Zealand (2019a)

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 orange roughy 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 Reporting of catch. 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 deepwater 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 monthly. It is illegal to discard or fail to report QMS species. Catches may only be landed at designated ports and sold to Licensed Fish Receivers (**LFR**s). Orange roughy vessels must report tow location, depth, main species caught, and total landed catch for each trip.

Commercial fishers face prosecution and risk severe penalties, including forfeiture of vessel and quota, if convicted of regulatory breaches. Financial penalties are also imposed in the form of deemed values to discourage fishermen from over-catching their ACE holdings.

The extensive regulations governing these fisheries are complemented by additional industry-agreed non-regulatory measures, known as the New Zealand Deepwater Fisheries Operational Procedures. The Minister relies on the effectiveness of both regulatory and non-regulatory measures to ensure the sustainable management of these fisheries.

As part of DWC's Operational Procedures, DWC has an Environmental Liaison Officer whose role is to liaise with vessel operators, skippers and FNZ to assist with the effective implementation of these Operational Procedures. The latest ELO report available is for the 2023-24 fishing year.[88] DWC personnel and vessel operators meet with MPI's Management and Compliance teams annually to discuss and evaluate any issues that may have arisen. Any identified risks are communicated to the fleet along with proposed remedial action to be undertaken.

Research plans

Research needs for deepwater fisheries are driven by the objectives of the National Fisheries Plan for Deepwater and Middle-depth Fisheries and delivered through the Medium-Term Research Plan for deepwater fisheries (**MTRP**).[89] 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.

[88] Cleal (2025)

[89] Fisheries New Zealand (2024b)

The schedule of stock assessments for the orange roughy UoA fisheries is being adhered to. 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. The 2023/24 AOP[90] outlines the deepwater fisheries research projects that are underway or scheduled to be undertaken during 2023/24.

P3 References

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[90] Fisheries New Zealand (2024)