ORANGE ROUGHY SITUATION REPORT

PREPARED FOR THE 2nd MSC SURVEILLANCE AUDIT 2024

SEAFOOD NEW ZEALAND

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SITUATION REPORT FOR THE 2ND MSC SURVEILLANCE AUDIT 2024

NEW ZEALAND ORANGE ROUGHY TRAWL FISHERIES

PURPOSE

This report is prepared for the second annual MSC surveillance audit and re-assessment of two New Zealand orange roughy Units of Certification (**UoC**): ORH 3B Northwest Chatham Rise (**ORH 3B NWCR; hereafter referred to as NWCR**) and ORH 7A Challenger Plateau & Westpac Bank (**ORH 7A-WB; hereafter referred to as ORH 7A**) 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	P < Hard Limit
NWCR	2023	54 (41-70) [2023]	> 40-60%	< 40%	< 40%
ORH 7A	2024	35 (16-57) [2024]	> 40-60%	< 40%	< 10%

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 recently 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 (***M***) and stock-recruitment steepness (***h***) from recent stock assessments but did not recommend any changes to the HCR[3].

Research in 2023 raised concerns about the results of the 2018 stock assessment model of NWCR which estimated the stock to be in the target zone of 30-50% B_0. The concerns stemmed from inconsistencies between the stock biomass and trends estimated by the models, and observational data such as local estimates of CPUE and acoustic time series. The last accepted stock assessment for NWCR was in 2017 and has been reevaluated in 2023. The last available stock assessment for 7A was in 2019.[4]

[1] Cordue (2014)
[2] Fisheries New Zealand (2024)
[3] Cordue (2019)
[4] Cordue (2019a)

The most recent acoustic biomass surveys of NWCR were undertaken in 2021[5] and 2022[6]. The most recent trawl and acoustic biomass survey of ORH 7A was undertaken in 2018[7] and an acoustic biomass survey was undertaken in 2024[8].

Stock Status, TACCs, Catch Limits & Catches

UoC 1 – ORH 3B NWCR

Update on stock status	B_{2017} was estimated to be 38% B_0[9]. Based on the 2023 evaluation, B_{2017} was As Likely as Not (40–60 %) to be at or above the lower end of the management target range (30–50% B_0). Based on 2023 evaluation B_{2017} is Unlikely (< 40%) to be below both the soft and hard limits. The stock prognosis is that current catch is low, and the spawning stock is expected to increase[10].
ORH 3B TACC 2024-25	4,752 t
ORH 3B TACC 2023-24	4,752 t
ORH 3B TACC 2022-23	7,967 t
ORH 3B TACC 2021-22	7,967 t
ORH 3B TACC 2020-21	7,967 t
ORH 3B TACC 2019-20	6,772 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
NWCR Catch Limit 2019-20	1,150 t
UoA share of TACC	100%
UoC share of TACC	95.8%
NWCR catch 2023-24	237 t
NWCR catch 2022-23	173 t
NWCR catch 2021-22	198 t
NWCR catch 2020-21	353 t
NWCR catch 2019-20	223 t

[5] Ryan et al. (2023)
[6] Ryan & Tilney (2023)
[7] Ryan et al. (2021)
[8] Escobar-Flores & Maurice (2024)
[9] Dunn & Doonan (2018)
[10] Fisheries New Zealand (2024a)

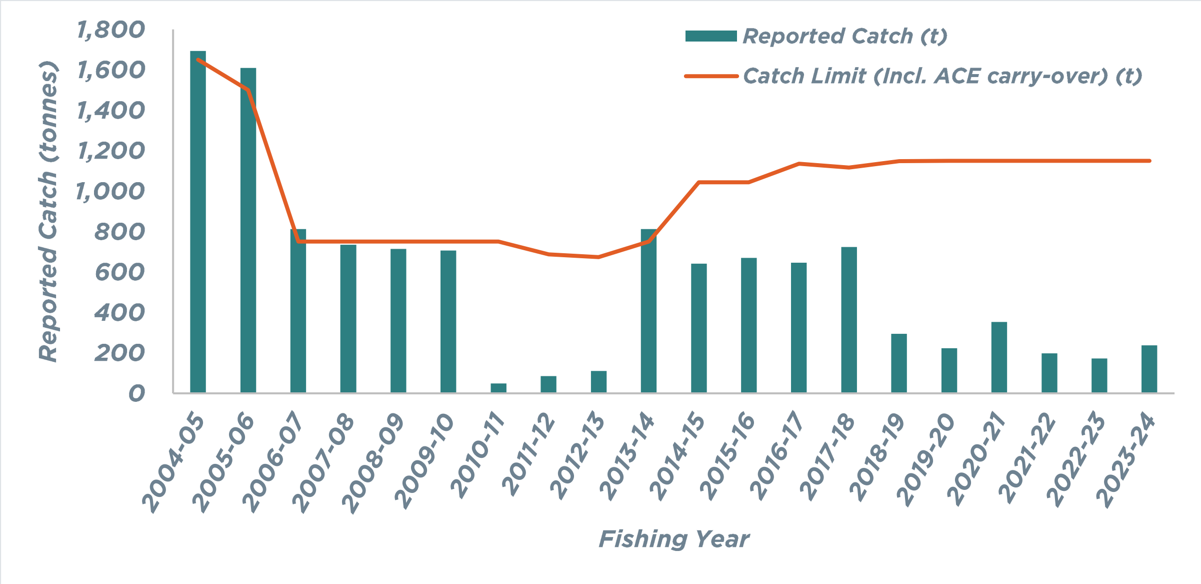

Figure 1: Reported commercial landings and TACC for the NWCR fishery from 2004-05 to 2023-24. Voluntary fishery closure from 2010-11 to 2012-13 to promote stock rebuilding.

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. 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.

Biomass projections

Five-year biomass projections were made for the base model run assuming future catches to be the current Total Allowable Commercial Catch (**TACC**; 1,250 t). For each projection scenario, future recruitment variability was sampled from actual estimates between 1940 and 1979. At the TACC (1,250 t), spawning stock biomass (**SSB**) is predicted to remain stable or slowly increase over the next five years, and the probability of the SSB going below the soft or hard limits is zero.[11]

[11] Fisheries New Zealand (2024a)

UoC 2 – ORH 7A

Update on stock status	Most recent stock assessment was completed in 2024[12]. 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 B_{2024} is Very Unlikely (< 10%) to be below the Hard Limit. Biomass is expected to slowly decrease at the current TACC (2058 t) over the next 5 years.[13]
ORH 7A TACC 2024-25	885 t
ORH 7A TACC 2023-24	2,058 t
ORH 7A TACC 2022-23	2,058 t
ORH 7A TACC 2021-22	2,058 t
ORH 7A TACC 2020-21	2,058 t
ORH 7A TACC 2019-20	2,058 t
UoA share of TACC	100%
UoC share of TACC	93.9%
ORH 7A catch 2023-24	843 t
ORH 7A catch 2022-23	1,771 t
ORH 7A catch 2021-22	2,193 t
ORH 7A catch 2020-21	2,074 t
ORH 7A catch 2019-20	1,897 t

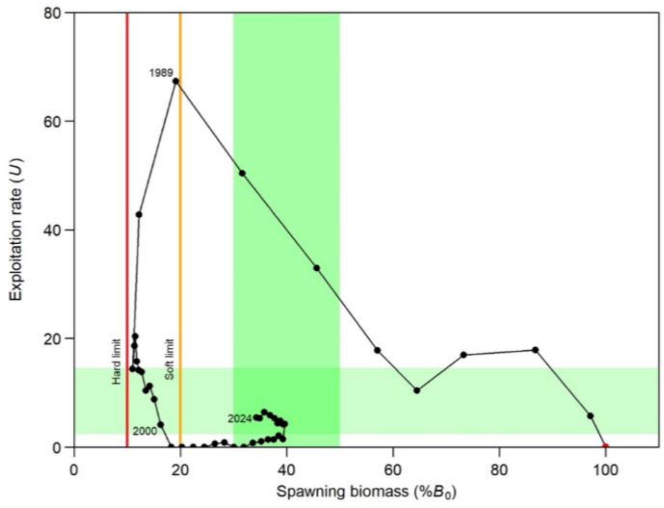

Figure 2: Historical trajectory of spawning biomass (% B0) and fishing intensity (exploitation rate) for the base model (medians of the marginal posteriors). The biomass target range of 30–50% B0 and the corresponding exploitation rate (fishing intensity) target range are marked in green. The soft limit (20% B0)

12 Dunn (2024)
13 Fisheries New Zealand (2024b)

is marked in blue and the hard limit (10% B0) in red14.

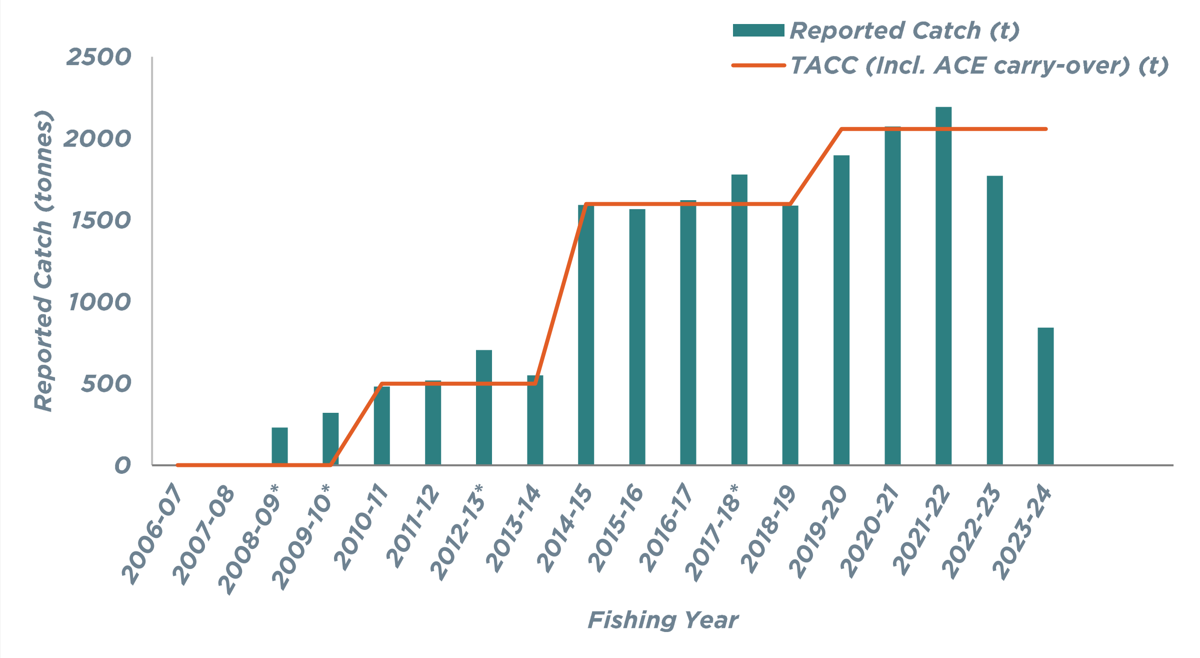

Figure 3: Reported commercial landings and TACC for the ORH 7A fishery from 2006-07 to 2023-24. The fishery was closed to fishing from 2001-02 to 2009-10. Asterisks on the x-axis denote years where biomass survey catches were taken against a special permit.

The ORH 7A 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[15].

Biomass projections

Five-year projections were conducted for a constant catch equal to the current 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[16].

[14] Fisheries New Zealand (2024b)
[15] Fisheries New Zealand (2024b)
[16] Fisheries New Zealand (2024b)

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[17], 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**)[18] 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:

- A specified target based upon MSY-compatible reference points (e.g. B_{MSY} and F_{MSY}) or better[19], about which a stock should fluctuate with at least a 50% probability of achieving the target.
- Soft limit (default of 50% B_{MSY} or 20% B_0, 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.

[17] Fisheries Act 1996

[18] Fisheries New Zealand (2008)

[19] "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.

- The relationship amongst these various RPs and the management actions that should be invoked are illustrated (Figure 4) in the HCR outlined in the Operational Guidelines for New Zealand's HSS[20]. 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.

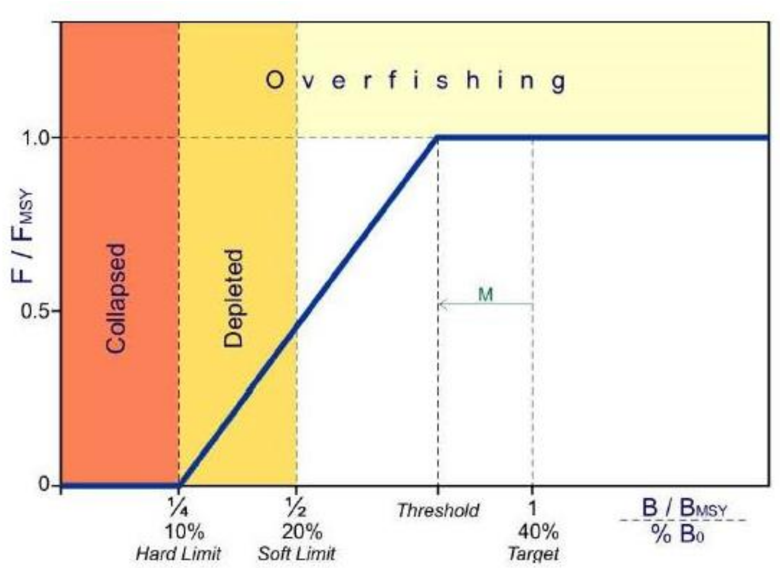

Figure 4: Illustrative example of a harvest strategy control rule that would be in conformance with the Harvest Strategy Standard; M is natural mortality.[21]

The requirements of the HSS are outlined in its Implementation Guidelines (FNZ, 2011). 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:

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.

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} .

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.

[20] Fisheries New Zealand (2011)
[21] 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.

Once a rebuilding plan has been implemented, SWGs will regularly evaluate and report on the performance of the rebuilding plan.

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):

- SWGs will provide best estimates and confidence intervals for current biomass and/or fishing mortality (or related biological reference points).

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:

a. 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

b. 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.

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

a. maintaining a constant *F* that will achieve the target biomass on average (or taking steps to approximate this for low information stocks), and/or

b. reducing catch proportionately to the estimated decrease in biomass towards the threshold (or taking steps to approximate this for low information stocks), and/or

c. 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[22] 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[23] and applied from 2016. The MSE and HCR were reviewed and found to still be fit for purpose[24], 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[25]. 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.

[22] Cordue (2014)
[23] Reeve (2014)
[24] Cordue (2019)
[25] For more information, visit Quota Management System

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:

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

"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:

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).

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

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.

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.

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.

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 analyze (ideally standardize) the CPUE data for the fishery.

Progress Against the Recommendations

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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.[26]

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 ORH 3B Chatham Rise and ORH 7A deepwater fisheries as specified in the Annual Operational Plan for Deepwater Fisheries 2022/23, is 290 and 70 days respectively, equivalent to 30% and 50% coverage.[27] Performance against targeted observer coverage in previous years is reviewed in the 2020-21 Annual Review Report.[28]

Over the most recent 5-year period, observer coverage in the NWCR (Table 2 and Figure 5) and ORH 7A (Table 3 and Figure 6) UoA fishery areas has averaged 28% and 27%, respectively.[29] 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.

[26] Fisheries New Zealand (2022)
[27] Fisheries New Zealand (2022)
[28] Fisheries New Zealand (2022a)
[29] Fisheries New Zealand (personal comms.)

Table 2: Numbers of commercial trawl tows and associated observer coverage for tows that targeted ORH in the NWCR UoA trawl fishery from 2019-20 to 2023-24 (Fisheries New Zealand, pers. comm.).

NWCR UoA	2019-20	2020-21	2021-22	2022-23	2023-24	5-year Average
Commercial tows	178	204	154	124	101	152
Observed tows	61	56	22	61	16	43
Observed tows (%)	34%	27%	14%	49%	16%	28%

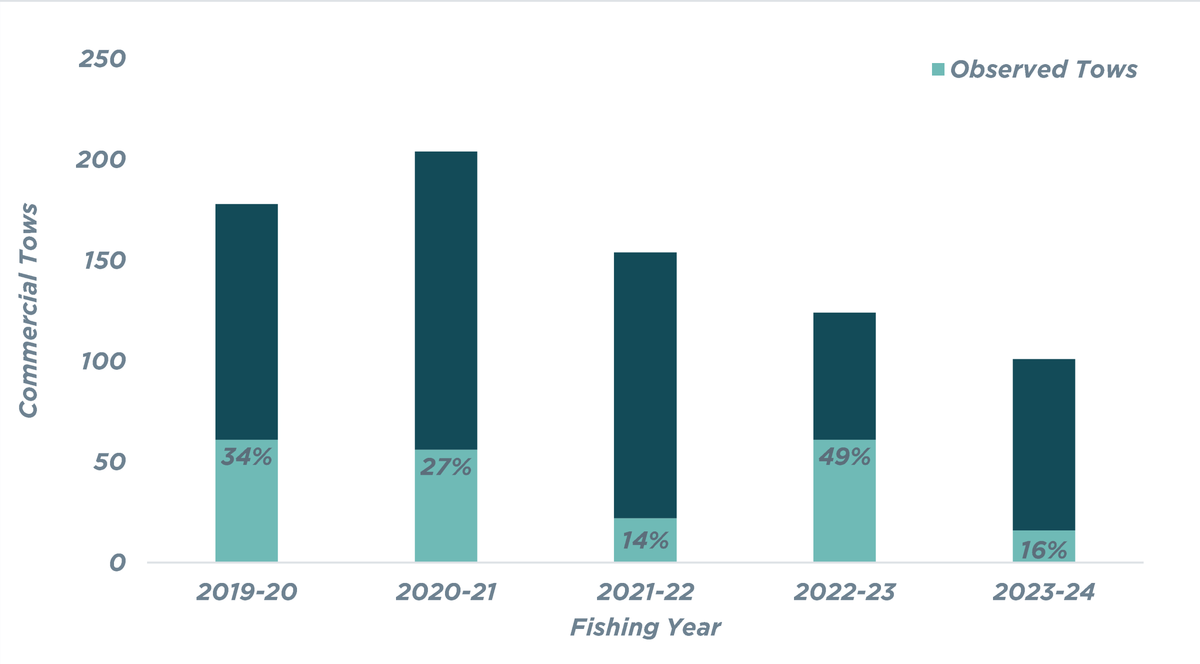

Figure 5: Observer coverage and fishing effort in orange roughy fisheries in NWCR. The most recent fishing year for which data are presented is 2023-24.

Table 3: Numbers of commercial trawl tows and associated observer coverage for tows that targeted ORH in the 7A UoA trawl fishery from 2019-20 to 2023-24 (Fisheries New Zealand, pers. comm.).

7A-WB UoA	2019-20	2020-21	2021-22	2022-23	2023-24	5-year Average
Commercial tows	556	639	669	520	340	545
Observed tows	169	133	100	160	177	148
Observed tows (%)	30%	21%	15%	`31%	52%	27%

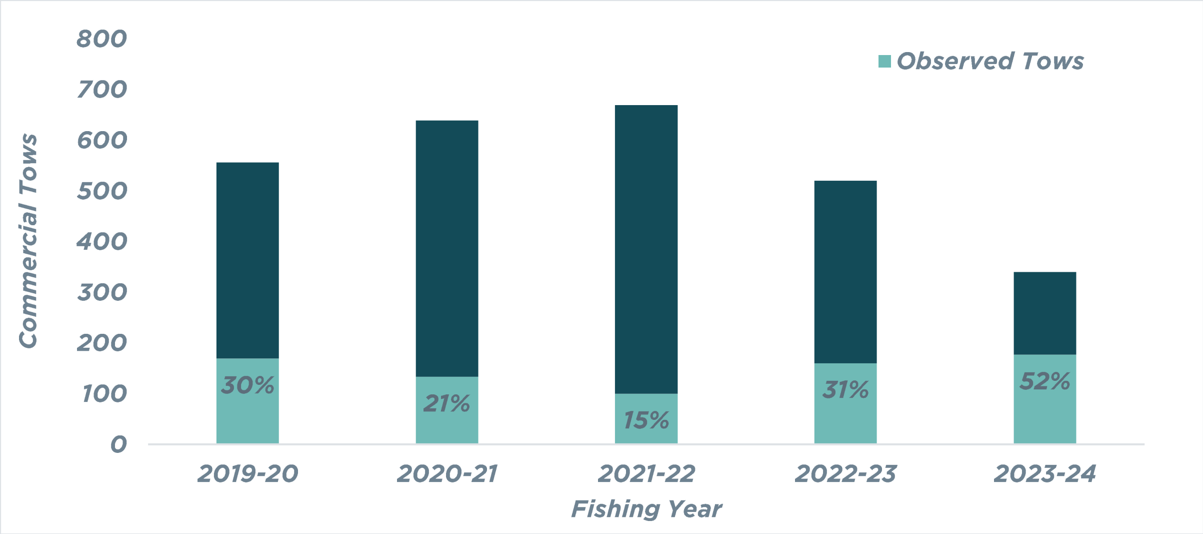

Figure 6: Observer coverage and fishing effort in orange roughy fisheries in ORH 7A. The most recent fishing year for which data are presented is 2023-24.

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 (**OEO**) trawl fisheries covers the period 2002-03 to 2019-20[30]. 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%),

[30] Anderson & Finucci (2022)

and cnidarians (0.2%) each made up more than 0.1% of the catch, though these were mostly discarded.[31]

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 2019-20 to 2023-24. The observer catch estimates are unadjusted.

NWCR UoA

Table 4: NWCR UoA average estimated catch composition of targeted orange roughy tows, in kilograms and percentage, from 2019-20 to 2023-24 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***	***236,800***	***73.00***
Smooth oreo (SSO)	QMS	20,382.6	6.28
Rattails (RAT)	Non-QMS	19,043.0	5.87
Slickhead (SLK)	Non-QMS	9,808.4	3.02
Hoki (HOK)	QMS	9,743.8	3.00
Slender cods (HJO)	Non-QMS	6,895.2	2.13
Morids (MOD)	Non-QMS	5,366.2	1.65
Sharks and dogfish, unspecified (OSD)	Non-QMS	2,541.6	0.78
Javelinfish (JAV)	Non-QMS	2,097.4	0.65
Shovelnose dogfish (SND)	Non-QMS	1,629.2	0.50
Clubhook squid (WSQ)	Non-QMS	1,236.0	0.38
Ghost shark, dark (GSH)	QMS	1,213.6	0.37
Hake (HAK)	QMS	1,041.2	0.32
Seal shark (BSH)	Non-QMS	948.8	0.29
Baxter's lantern dogfish (ETB)	Non-QMS	734.4	0.23
Ribaldo (RIB)	QMS	587.8	0.18
Ghost shark, pale (GSP)	QMS	492.6	0.15
Australasian narrow-nosed spookfish (LCH)	Non-QMS	475.2	0.15
Small-scaled brown slickhead (SSM)	Non-QMS	398.0	0.12
Chimaera, purple (CHP; CHG)	Non-QMS	379.6	0.12
Chimaera, wide-nosed (RCH)	Non-QMS	321.6	0.10
Basketwork eel (BEE)	Non-QMS	301.4	0.09
Spiky oreo (SOR)	QMS	241.2	0.07
Alfonsino (BYX)	QMS	240.0	0.07
Deepwater dogfish, unspecified (DWD)	Non-QMS	218.4	0.07
Tam O'Shanter urchin (TAM)	Non-QMS	160.2	0.05
Longnose velvet dogfish (CYP)	Non-QMS	150.8	0.05
Starfish (SFI)	Non-QMS	129.0	0.04
Chimaera spp. (CHI)	Non-QMS	111.0	0.03
Deepwater eel, unspecified (DWE)	Non-QMS	104.0	0.03
Black cardinal fish (CDL)	QMS	79.0	0.02
Smooth skate (SSK)	QMS	75.0	0.02

[31] Anderson & Finucci (2022)

Black oreo (BOE)	QMS	69.0	0.02
Longnose deep-sea skate (PSK)	Non-QMS	58.6	0.02
Warty oreo (WOE)	QMS	53.2	0.02
Ling (LIN)	QMS	44.9	0.01
Sea perch (SPE)	QMS	31.0	0.01
Deepwater king crab (KIC)	QMS	29.0	0.01
Small-headed cod (SMC)	Non-QMS	24.6	0.01
Hydrolagus spp. (HYD)	QMS	19.2	0.01
	TOTAL	**324,275.7**	**99.96%**

QMS Species

Targeted orange roughy trawl tows account for 73% of the total estimated catch by weight. The two most abundant QMS bycatch species are smooth oreo (6.28%) and hoki (3%), (Table 4). The OEO 4 QMA for smooth oreo overlaps the NWCR UoA. The latest stock assessment of smooth oreo in OEO 4 was updated in 2018. This assessment estimated B_{2018} at 40% B_0 for the base model and B_{2018} is 'about as Likely as Not (40-60%)' to be at or above the target of 40% B_0. Stock projections indicate there would be little change in biomass over the next five years at annual catches of 2,300 – 3,000 tonnes[32]. The catch limit for OEO 4 is currently 3,600 tonnes.

The eastern stock of the HOK 1 QMA for hoki overlaps with the NWCR UoA. The latest stock assessment of hoki was completed in 2024. This assessment estimated B_{2024} to be 51% 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. The eastern catch limit for HOK 1 is currently 65,000 tonnes.[33]

Non-QMS species

Of the non-QMS bycatch species, the two most abundant species are rattails (5.87%) and slickhead (3.02%), (Table 4).

Rattail bycatch in the NWCR fishery has fluctuated over the last 5 years but has a notable peak in the 2019-20 fishing year followed by a steady decline over the next four years (Figure 7). The declining trend in the reported bycatch of rattails under the generic code 'RAT' could be attributed to the increasing use of species-specific reporting codes in recent years, noting that observers now record at least seven rattail species against individual codes.

Unidentified deepwater sharks and dogfish make up the largest elasmobranch catch at 0.78% while the single elasmobranch species with the greatest catch is the shovelnose dogfish at 0.5%. The most abundant chimaerid is the purple chimaera at 0.12% of the catch (Table 4).

The clubhook squid, at 0.38% of the catch (Table 4), 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.

Slickhead bycatch in the NWCR fishery has been variable over the last 5 years, with slightly elevated catches in the 2022-23 and 2023-24 fishing years (Figure 7).

[32] Fisheries New Zealand (2024)
[33] Fisheries New Zealand (2024a)

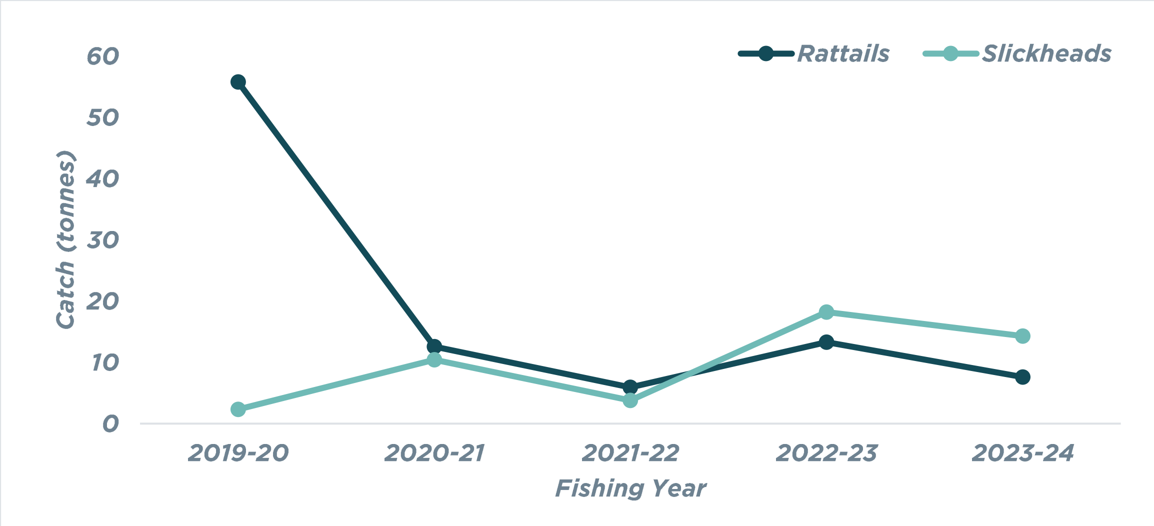

Figure 7: Bycatch of rattail and slickhead species in the NWCR fishery from 2019-20 to 2023-24.

The New Zealand field guide to common species caught in bottom and mid-water trawling describes thirty-nine species of rattails[34] and a 2022 trawl survey in the Chatham Rise recorded 30 rattail species taken during tows to estimate the abundance of hoki and middle-depth and deepwater-species.[35] Biomass estimates for four-rayed rattails, a common species, sampled from trawl biomass surveys on the Chatham Rise have been variable between 2010 and 2022, with no evident trend (Figure 8).

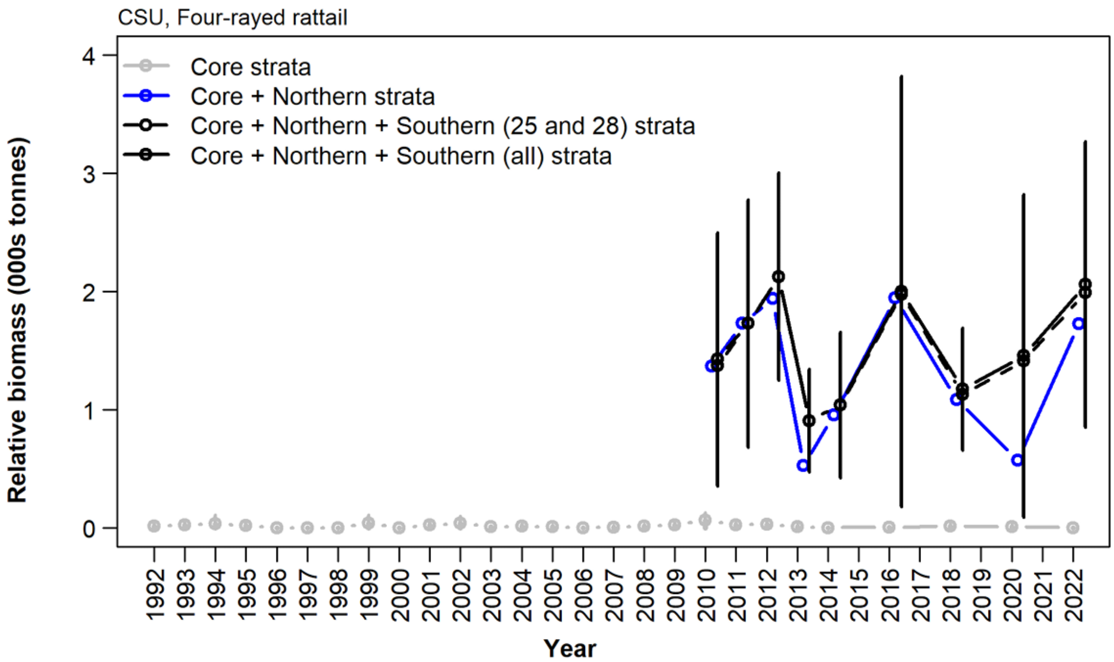

Figure 8: Relative biomass estimates of four-rayed rattails sampled by annual trawl surveys of Chatham Rise, January 1992-2014, 2016, 2018, 2020, and 2022. Grey lines show fish from core (200–800 m) strata. Blue lines show fish from core strata plus the northern deep (800–1300 m) strata. Black solid lines show fish from core strata plus the northern and southern deep (800–1300 m) strata, and black dotted lines show fish from

[34] Large (2014)
[35] Stevens et al. (2023)

core strata plus the northern and southern 25 and 28 deep strata (800–1300 m). Error bars show ± 2 standard errors.[36]

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.[37] Biomass estimates are available for big-scaled and small-scaled brown slickhead between 2010 and 2022. Big-scaled brown slickhead show no evident trend while small-scaled brown slickhead show an increasing trend (Figure 9). Both big-scaled and small-scaled brown slickhead were found primarily in deep strata in 2022.[38]

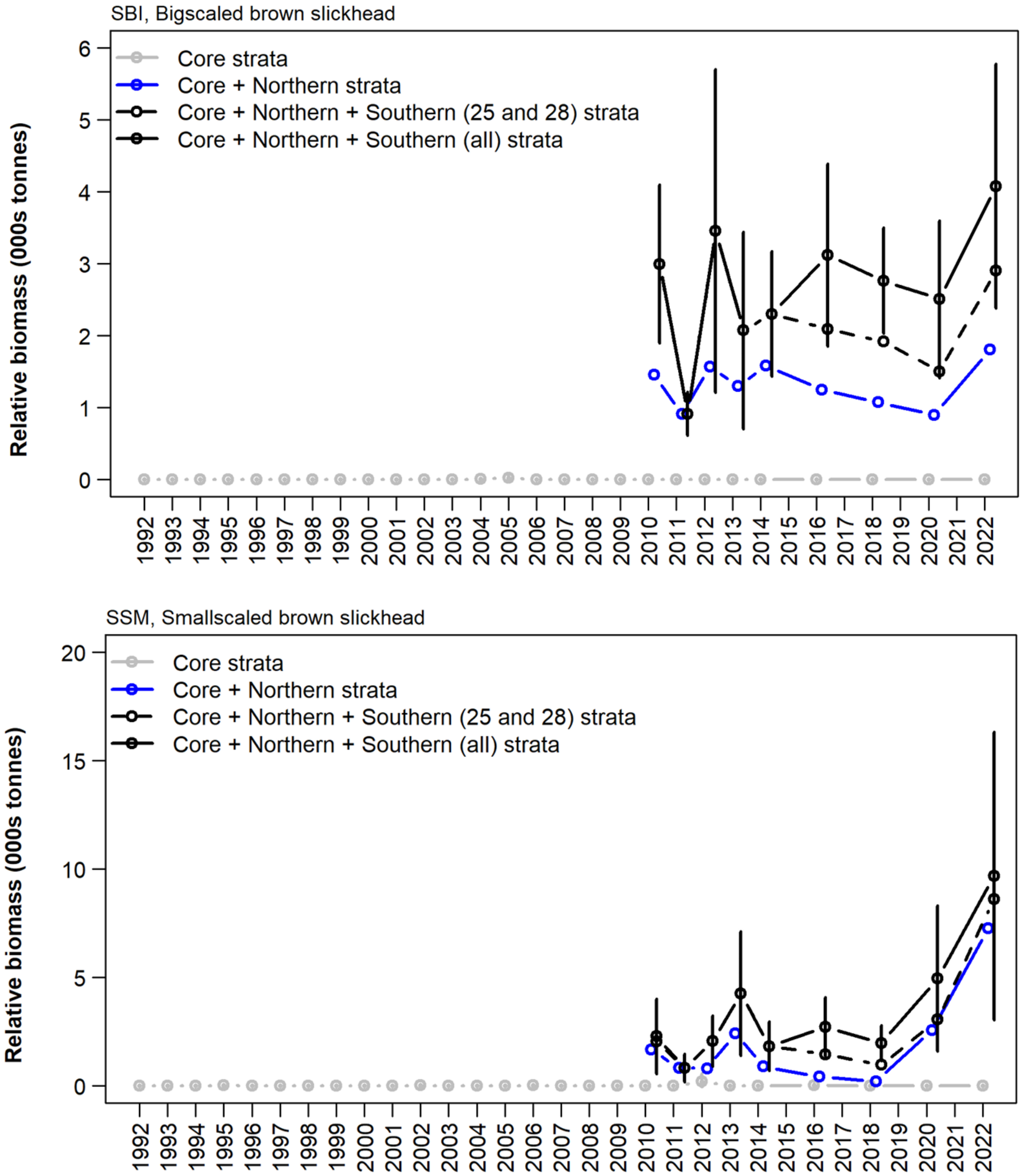

Figure 9: Relative biomass estimates of big-scaled and small-scaled brown slickheads sampled by annual

[36] Stevens et al. (2023)
[37] Stevens et al. (2023)
[38] Stevens et al. (2023)

trawl surveys of Chatham Rise, January 1992-2014, 2016, 2018, 2020, and 2022. 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.[39]

ORH 7A UoA

Table 5: ORH 7A UoA average estimated catch composition of targeted orange roughy tows, in kilograms and percentage, from 2019-20 to 2023-24 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***	1,755,600.0	86.93
Rattails (RAT)	Non-QMS	113,506.0	5.62
Ribaldo (RIB)	QMS	39,520.3	1.96
Hake (HAK)	QMS	22,648.4	1.12
Sharks and dogfish, unspecified (OSD)	Non-QMS	14,569.0	0.72
Seal shark (BSH)	Non-QMS	10,561.9	0.52
Ghost shark, pale (GSP)	QMS	7,786.3	0.39
Shovelnose dogfish (SND)	Non-QMS	7,297.0	0.36
Slickhead (SLK)	Non-QMS	6,250.2	0.31
Australasian narrow-nosed spookfish (LCH)	Non-QMS	5,703.8	0.28
Spiky oreo (SOR)	QMS	5,652.2	0.28
Hoki (HOK)	QMS	4,622.0	0.23
Black slickhead (BSL)	Non-QMS	4,124.2	0.20
Slender cods (HJO)	Non-QMS	3,252.0	0.16
Unicorn rattail (WHX)	Non-QMS	2,693.0	0.13
Baxter's lantern dogfish (ETB)	Non-QMS	2,341.2	0.12
Morrids (MOD)	Non-QMS	2,237.2	0.11
Cardinal fish (CDL)	QMS	1,914.8	0.09
Requiem shark (RSH)	Non-QMS	1,761.4	0.09
Leafscale gulper shark (CSQ)	Non-QMS	1,692.4	0.08
Sea perch (SPE)	QMS	1,419.1	0.07
Longnose velvet dogfish (CYP)	Non-QMS	768.7	0.04
Portuguese dogfish (CYL)	Non-QMS	439.6	0.02
Javelinfish (JAV)	Non-QMS	309.2	0.02
Deepwater dogfish, unspecified (DWD)	Non-QMS	283.8	0.01
Starfish (SFI)	Non-QMS	265.8	0.01
Plunket's shark (PLS)	Non-QMS	253.6	0.01
White warehou (WWA)	QMS	212.0	0.01
Smooth skin dogfish (CYO)	Non-QMS	200.4	0.01
Spinyfin (SFN)	Non-QMS	172.8	0.01
Cape scorpionfish (TRS)	Non-QMS	154.4	0.01
Black oreo (BOE)	QMS	154.0	0.01
Warty oreo (WOE)	QMS	150.8	0.01
Sea urchin; other (URO)	Non-QMS	135.2	0.01

[39] Stevens et al. (2023)

Lanternfish (LAN)	Non-QMS	123.6	0.01
Smooth skate (SSK)	QMS	118.5	0.01
	TOTAL	2,018,894.9	99.96

QMS species

Targeted orange roughy trawl tows account for 86.93% of the total estimated catch by weight (Table 5). The two most abundant QMS bycatch species are ribaldo (1.96%) and hake (1.12%), (Table 5).

Neither of these species exceeded 5% of the overall catch and are therefore not a minor primary species.

Non-QMS species

Of the non-QMS bycatch species, the two most abundant species groups are rattails (5.62%) and unspecified sharks and dogfish (0.72%), (Table 5).

Observer-reported rattail bycatch in the ORH 7A fishery has shown variability. After steady increase from 2019-20 to 2021-22, there was a spike in 2022-23 (Figure 10). This is followed by an equally sharp drop in 2023-24 and this decline in the reported bycatch of rattails under the generic code 'RAT' could be attributed to the increasing use of species-specific reporting codes in recent years.

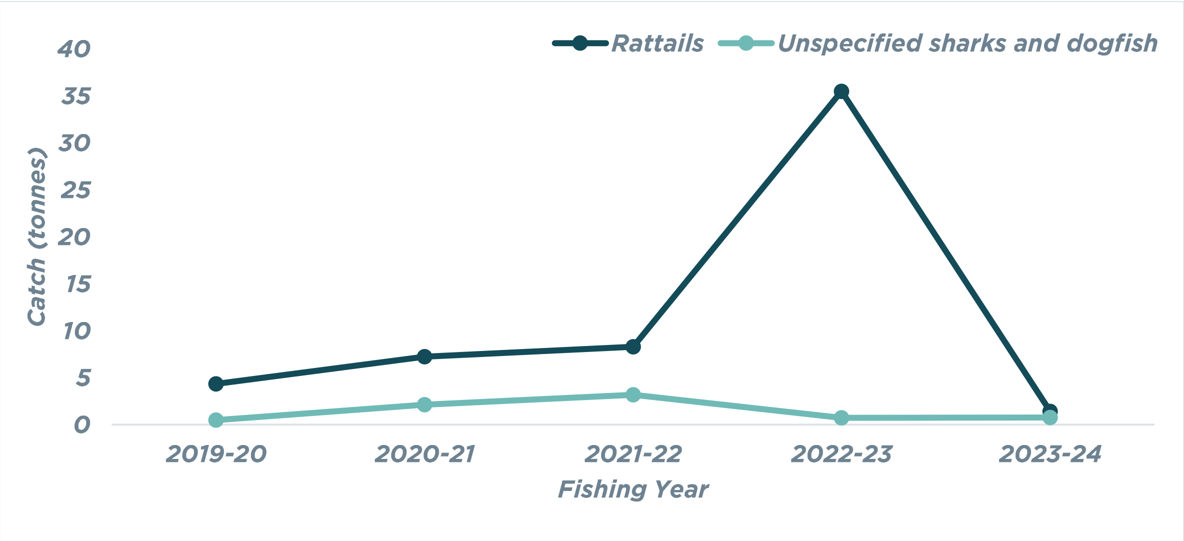

Figure 10: Bycatch of rattail and unspecified sharks and dogfish species in the ORH 7A fishery from 2019-20 to 2023-24.

Catch data for unspecified sharks and dogfish shows a slight increase from 2019-2020 to 2021-2022, indicating a period of growth. However, this is followed by a decline in 2022-2023 and a slight increase in 2023-2024, suggesting a stabilisation at a lower level.

Unidentified sharks and dogfish make up the largest elasmobranch catch at 0.72% while the single elasmobranch species with the greatest catch is the seal shark at 0.52% (Table 5). The starfish, at 0.01% of the catch (Table 5), 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.

Bycatch Management Strategy

Analyses of bycatch trends for deepwater fisheries are updated every four-to-five years. 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 28% 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.[40] Information on incidental captures of ETP species, reported by vessels and by MPI observers, is summarised in the Aquatic Environment and Biodiversity Annual Review[41], and for ETP species other than corals on MPI's Protected Species website[42]. The latter provides open access to multi-year records of ETP species captures by fishery sector and fishing method, based on MPI observer data, and is updated annually through FNZ's Science Working Group process noting, however, that the website has yet to be updated to include the 2021/22 and 2022/23 fishing years.

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 in.

Data provided below on ETP species uses a combination of observer data publicly available on the MPI's Protected Species website (for fishing years 2019/20 and 2020/21) and observer data obtained from MPI.

[40] Fisheries New Zealand (n.d.)
[41] Aquatic Environment and Biodiversity Annual Review (AEBAR)
[42] Protected Species Bycatch in New Zealand Fisheries

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 is 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.[43]

New Zealand's *National Plan of Action – Seabirds 2020*[44] 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)
- 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

[43] Meyer (2023)
[44] Department of Conservation & Fisheries New Zealand (2020)

- 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.[45] 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 UoA

Over the past five years, seabird captures in the NWCR UoA fishery have remained low and stable (Figure 11), with a total of four observed captures. In the most recent fishing year, no seabirds were captured. Of the four captures, one was a storm petrel and one a white-chinned petrel, both of which were found dead. The remaining two captures involved a Salvin's albatross and an unidentified petrel, prion, or shearwater, both of which were alive.

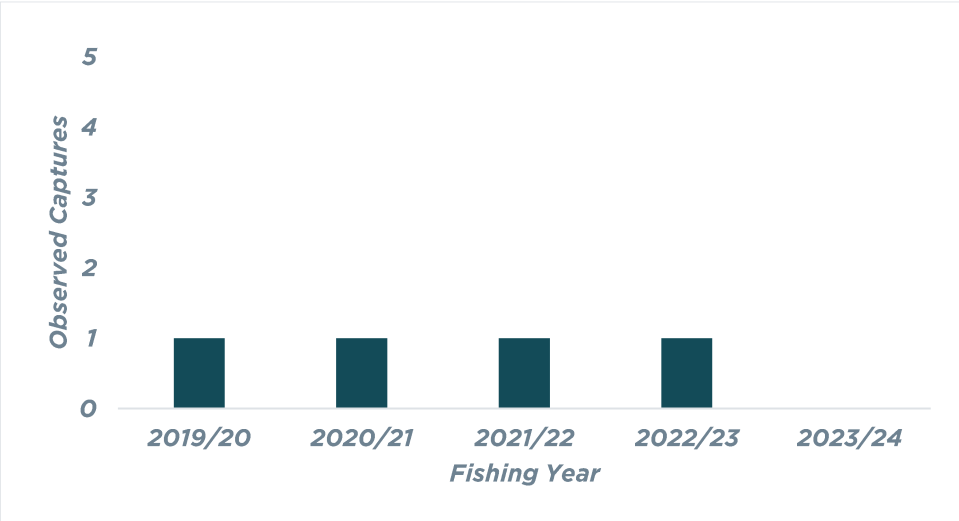

Figure 11: Observed seabird captures in the NWCR UoA (Fisheries New Zealand, pers. Comm.).

7A-WB UoA

Over the past five years, seabird captures in the 7A fishery have varied, with a noticeable increase in captures during 2022/23, followed by a return to zero captures in the most recent fishing year, as

[45] Cleal (2019, 2020, 2021, 2022, 2023, 2024)

shown in the graph (Figure 12). Of the 11 captures, four birds were found dead, including a white-chinned petrel, northern giant petrel, great albatross, and an unspecified pair of antipodean and Gibson's albatross. The remaining captures involved live birds, consisting of a white-capped albatross, two unidentified Procellaria petrels, three unidentified petrels, prions, or shearwaters, and one unidentified albatross.

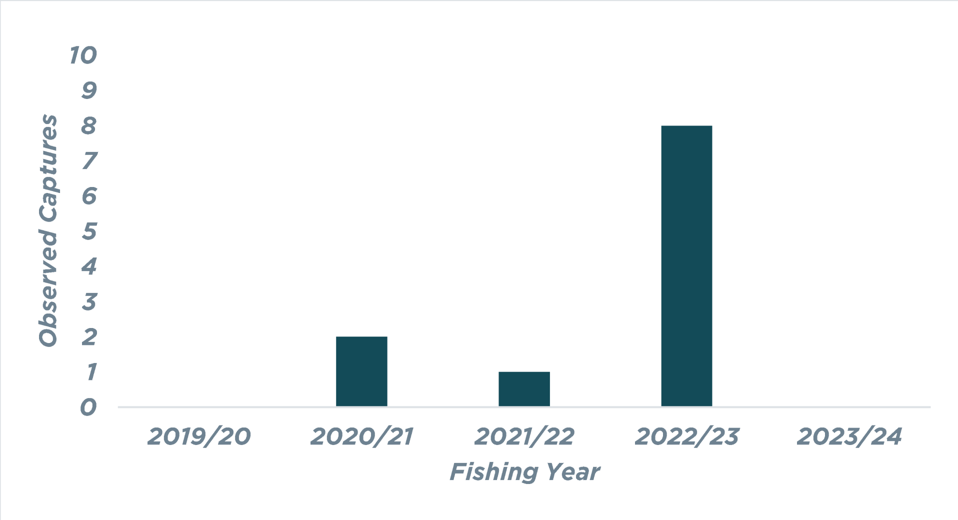

Figure 12: Observed New Zealand seabird captures in the 7A-WB UoA (Fisheries New Zealand, pers. comm.).

New Zealand Fur Seal

NWCR UoA

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

7A-WB UoA

There have been no observed captures of New Zealand fur seals by trawlers targeting orange roughy in the 7A-WB UoA fishery.

New Zealand Sea Lion

NWCR UoA

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

7A-WB UoA

There have been no observed captures of New Zealand sea lions by trawlers targeting orange roughy in the 7A-WB UoA fishery.

Whales & Dolphins

NWCR UoA

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

7A-WB UoA

There have been no observed captures of whales or dolphins by trawlers targeting orange roughy in the 7A-WB UoA fishery.

Sharks

NWCR UoA

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

7A-WB UoA

There have been no observed captures of sharks by trawlers targeting orange roughy in the 7A-WB UoA fishery.

Turtles

NWCR UoA

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

7A-WB UoA

There have been no observed captures of turtles by trawlers targeting orange roughy in the 7A-WB UoA fishery.

Corals

Distribution of corals and other sessile benthos

Of the approximately 420 species of corals in New Zealand waters, the majority are distributed globally and around 25% are endemic[46]. Around 83% are solitary (i.e. not habitat forming), occurring in small, patchily distributed, individual colonies throughout the EEZ[47]. Only 3% are reef-forming stony corals, which form beds and reefs (e.g. *Goniocorella dumosa*, *Solenosmilia variabilis, Enallopsammia rostrata* and *Madrepora oculata*), which are habitat forming and provide refugia to other organisms[48]. Matrices (i.e. coral beds) of reef-building corals may span depths from 70 – 2,850 m in New Zealand waters[49] occurring both shallower and deeper than the orange roughy fishing grounds. In other oceans, these scleractinian stony corals have been found down to depths of over 6,000 m.[50]

Underwater images have demonstrated that corals occur in discrete locations on both flat habitat and on knolls and hills. Most often, corals are seen to be in groups or clumps rather than as contiguous beds or reefs covering large areas.[51]

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

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. The above estimates may be conservative given that some

[46] Consalvey et al. (2006)
[47] Cairns (1995)
[48] Consalvey et al. (2006)
[49] Consalvey et al. (2006)
[50] Cairns (1995)
[51] International Coral Reef Initiative (n.d.)

captured coral is likely to fall through the meshes. Work is ongoing to establish a credible catchability coefficient for trawl nets (e.g. by South Pacific Regional Fisheries Management Organisation (**SPRFMO**).[52]

NWCR UoA

Observed ETP coral catches during the period 2019/20 to 2023/24, based on observer records obtained from MPI, show that the NWCR fishery estimated annual catches range from 0 to 1,697 kg, with no apparent trend (Table 6).

Table 6: NWCR observed and estimated coral catch (kg) from fishing years 2019/20 to 2023/24 (Fisheries New Zealand, pers. comm.).

Species	Observer Reported Catch (kg)				
	2019/20	2020/21	2021/22	2022/23	2023/24
Stony coral - Goniocorella dumosa (GDU)	0	0	0	0	265.2
Stony coral - cup (unspecified; CUP)	2	0	0	0	0
Gorgonian coral - Lepidisis spp. (LLE)	1	0	0	0	0.8
Stony coral - cup Desmophyllum dianthus (DDI)	0	0	0	0	1.6
True coral (unidentified; COU)	0	1	0.2	0	0
Golden corals - Chrysogorgia spp. (CHR)	1	0	0	0	0
Black coral - Dendrobathypathes spp. (DEN)	0	0	1	0	0
Gorgonian coral - Lepidisis spp. (LLE)	0	0	0	0	1
Gorgonian coral - Keratoisis spp. (BOO)	0.3	0	0	0	0
Black coral - Bathypathes spp. (BTP)	0	0	0.2	0	0
Black coral (COB)	0	0	0	0	0.2
Gorgonian coral - Bushy bamboo (ACN)	0	0.1	0	0	0
TOTAL	**4.3**	**1.1**	**1.4**	**0**	**268.8**
Total Tows	178	204	154	124	101
Observed Tows	61	56	22	61	16
Observer Tows (%)	34%	27%	14%	49%	16%
Estimated Coral Catch (kg)	12.55	4.01	9.80	0.00	1696.80
Estimated Coral Catch/100 Tows (kg)	7.05	1.96	6.36	0.00	1680.00

7A-WB UoA

Observed ETP coral catches during the period 2019/20 to 2023/24, based on observer records obtained from MPI, show that the 7A-WB fishery estimated annual catches range from 0 to 1,676 kg, with no apparent trend (Table 7).

Table 7: 7A-WB observed and estimated coral catch (kg) from fishing years 2019/20 to 2023/24 (Fisheries New Zealand, pers. comm.).

Species	Observer Reported Catch (kg)				
	2019/20	2020/21	2021/22	2022/23	2023/24
Stony coral - Goniocorella dumosa (GDU)	0	0	0	0	265.2
Black coral (COB)	2.64	1.62	0	0	0
Gorgonian coral - Lepidisis spp. (LLE)	0.3	0	1	0.1	0
True coral (unidentified; COU)	0	0.8	0	0	0
Gorgonian coral - Bushy bamboo (ACN)	0	0	0.1	0	0.1
Gorgonian coral - Keratoisis spp. (BOO)	0.1	0	0	0	0
Black coral - Bathypathes spp. (BTP)	0	0	0	0	0.1

[52] Stephenson et al. (2022)

TOTAL	**3.04**	**2.42**	**1.1**	**0.1**	**265.4**
Total Tows	178	204	154	124	101
Observed Tows	61	56	22	61	16
Observer Tows (%)	34%	27%	14%	49%	16%
Estimated Coral Catch (kg)	8.87	8.82	7.70	0.20	1675.34
Estimated Coral Catch/100 Tows (kg)	4.98	4.32	5.00	0.16	1658.75

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 2019/20 to 2023/24 (Fisheries New Zealand, pers. comm.).

Year	NWCR Catch (kg)		7A-WB Catch (kg)	
	Commercially Reported	Observer Reported	Commercially Reported	Observer Reported
2019/20	2.02	4.3	9.15	3.04
2020/21	405.3	1.1	1.57	2.42
2021/22	1190.47	1.4	0.86	1.1
2022/23	0	0	1.45	0.1
2023/24	20.98	268.8	0.1	265.4

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[53]

The observer-reported coral catch composition for the years 2019/20 to 2023/24 showed the following:

NWCR

Stony coral formed the bulk of the coral catch. Small quantities of unidentified true corals, coral rubble, black coral, golden gorgonian coral, and gorgonian coral were recorded (Figure 13; based on Table 6).

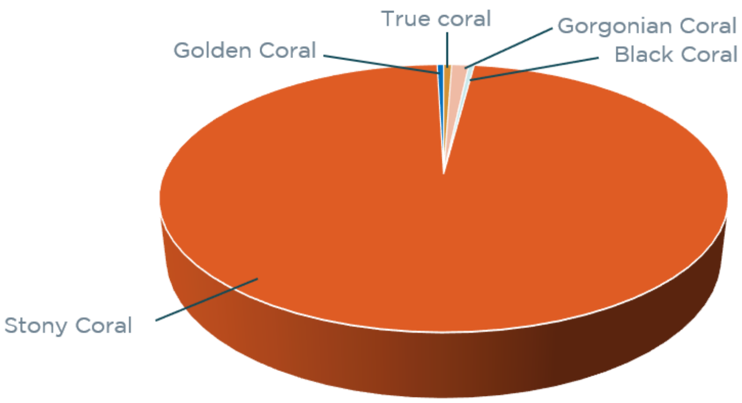

Figure 13: Total observed-reported coral catch composition in the NWCR UoA from 2019/20 to 2023/24 (Fisheries New Zealand, pers. comm.).

7A-WB

Black coral and gorgonian coral formed the bulk of the coral catch. Small quantities of unidentified true corals were recorded (Figure 14; based on Table 7).

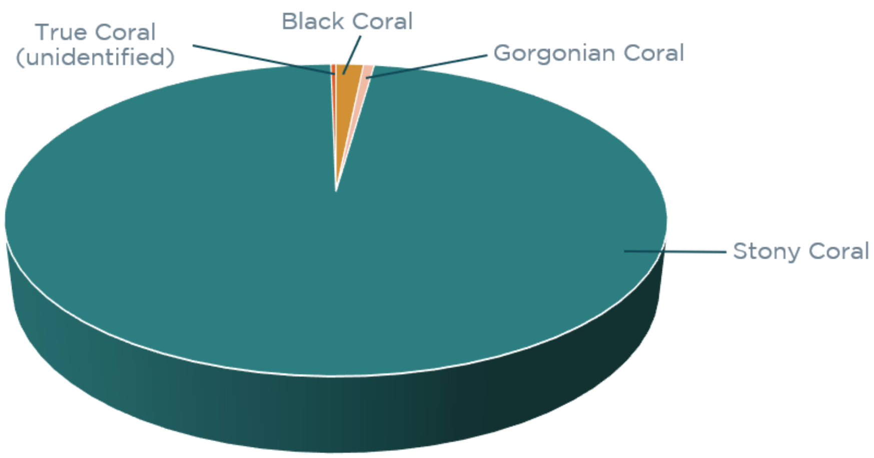

Figure 14: Combined total observed-reported coral catch composition in the 7A-WB UoA from 2019/20 to 2023/24 (Fisheries New Zealand, pers. comm.).

[53] Finucci et al. (2019)

Trawl Footprint

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 15).[54]

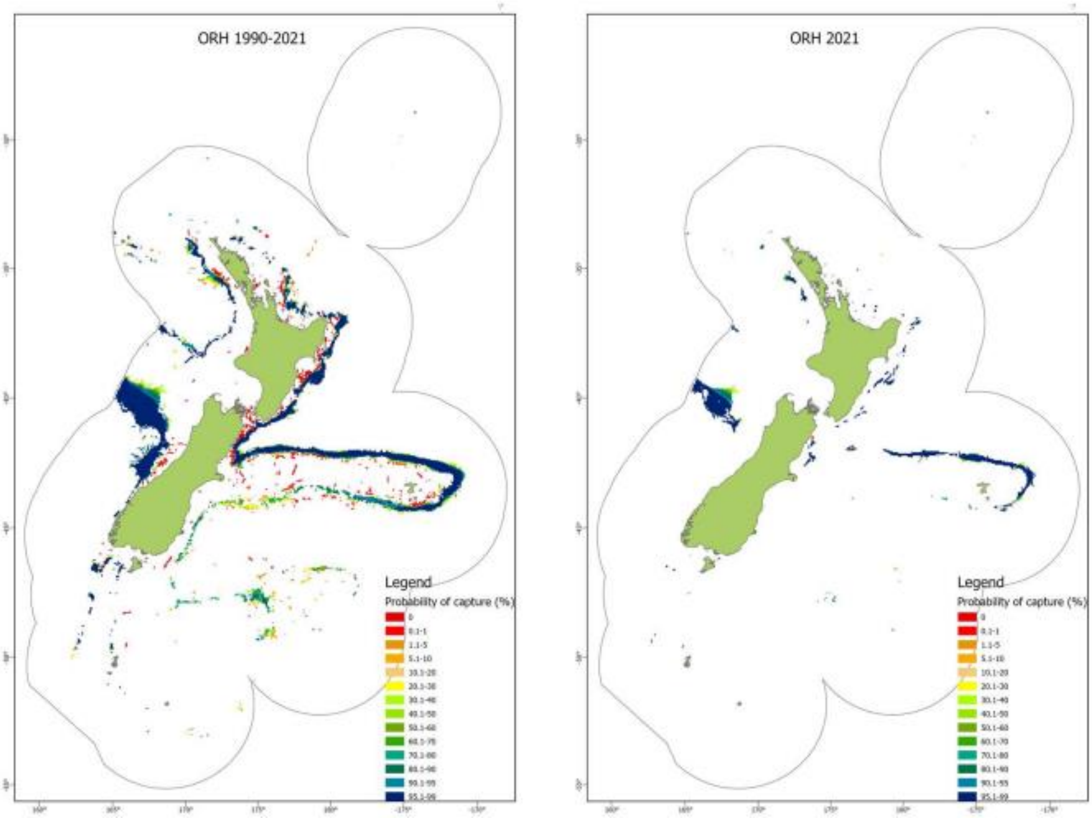

Figure 15: Distribution of the 1990 - 2021 (left) and 2021 trawl footprints (right) for orange roughy displayed by 25 km2 contacted cell, relative to the probability of capture for that species (after Leathwick et al., 2006).

The distribution of the trawl footprint for OEO shows that in 2021 the fishery was focused mainly on the south Chatham Rise, where it overlaps with the southern part of the NWCR UoA (Figure 16).

[54] MacGibbon & Mules (2023)

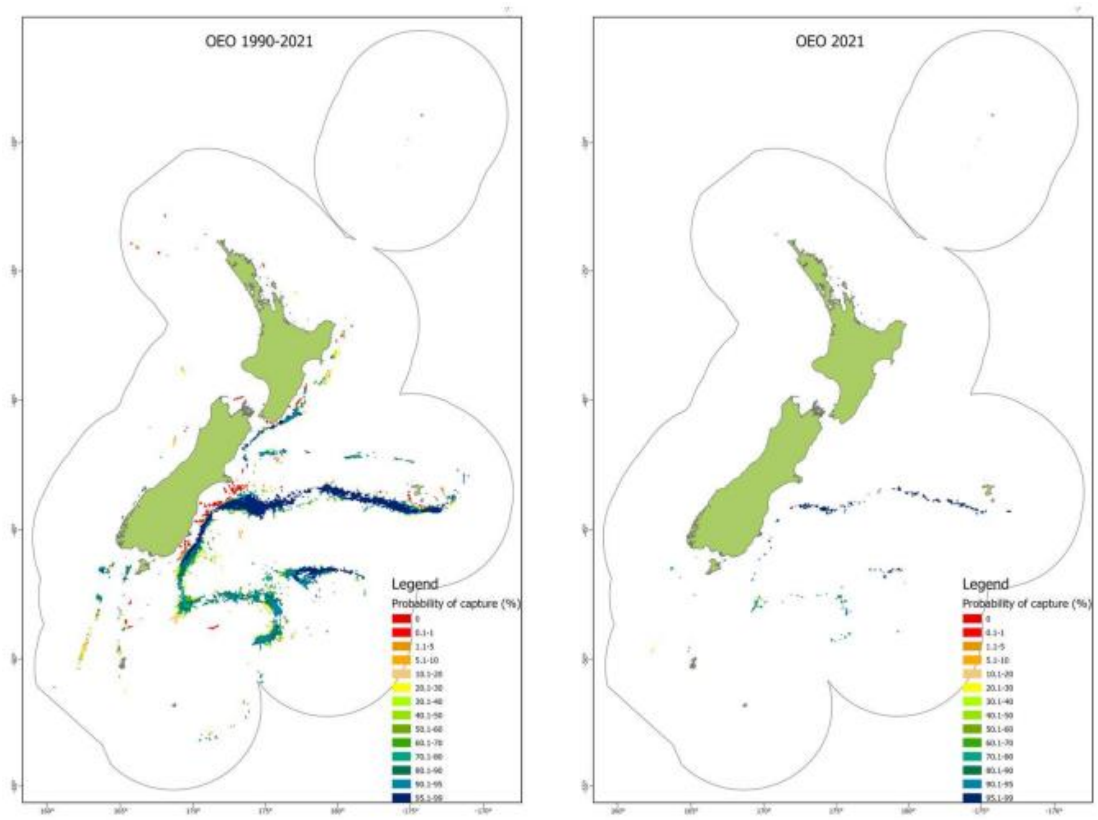

Figure 16: Distribution of the 1990 - 2021 (left) and 2021 trawl footprints (right) for oreo dory species displayed by 25 km2 contacted cell, relative to the probability of capture for these species (after Leathwick et al., 2006).

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.[55] The data show that the numbers of tows by ORH/OEO-targeted fisheries has remained fairly consistent over the period 2016 – 2021[56] (Figure 17).[57]

[55] MacGibbon et al. (2024)

[56] MacGibbon & Mules (2023)

[57] MacGibbon & Mules (2023)

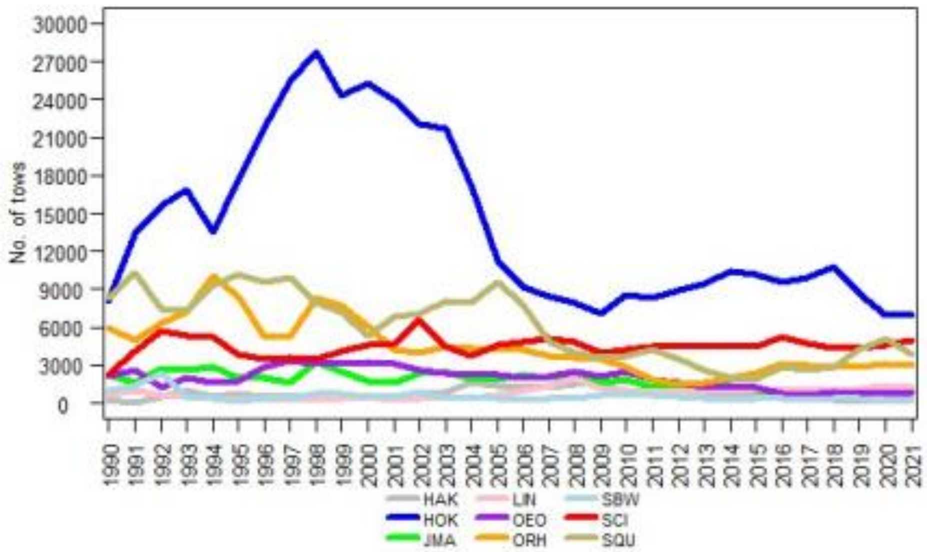

Figure 17: The number of bottom-contacting tows by year for the period 1990 - 2021 for deepwater tier 1 species.

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 - 2021. The number of 25 km^2 cells contacted showed a similar trend (Figure 18).

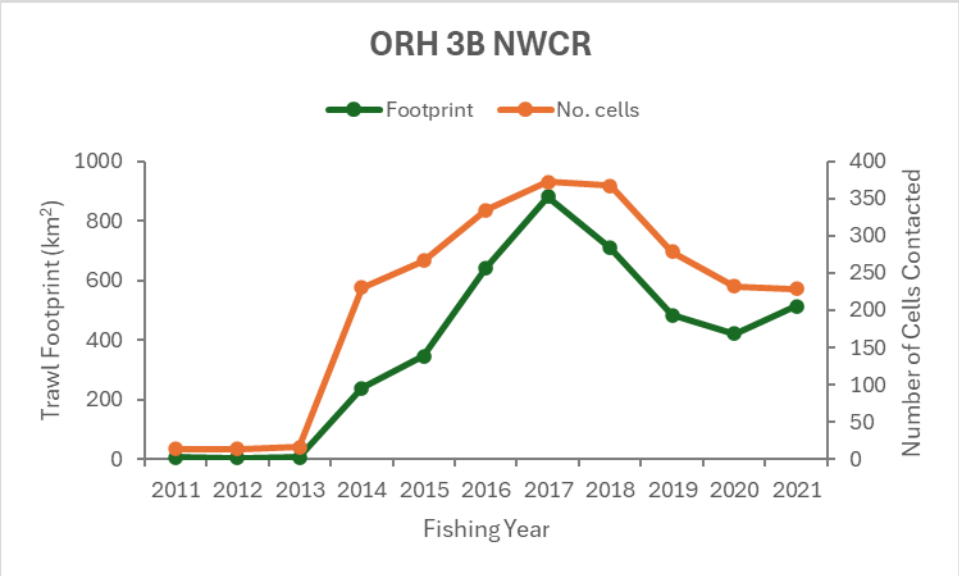

Figure 18: The number of contacted 25 km^2 cells and footprint (km^2) for combined targets ORH/OEO bottom-contacting trawls in NWCR from 2011 – 2021.

7A-WB

- 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

- Fishing effort in ORH 7A showed an expansion over a wider area in 2020 and 2021 (Figure 19).

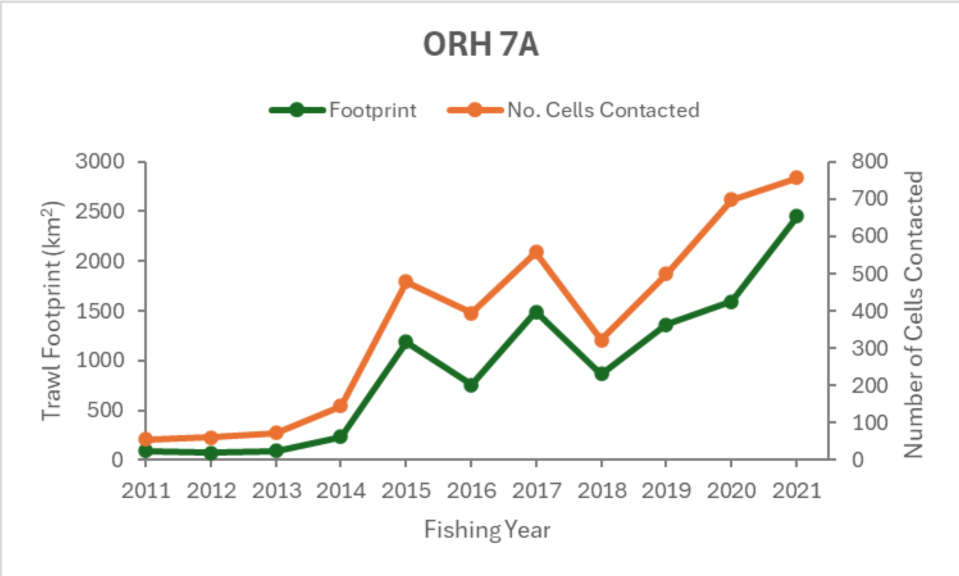

Figure 19: The number of contacted 25 km^2 cells and footprint (km2) for combined targets ORH/OEO bottom-contacting trawls in ORH 7A from 2011 – 2021.

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.[58]

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 20).[59]

[58] Deepwater Group (2021)
[59] Baird & Mules (2023)

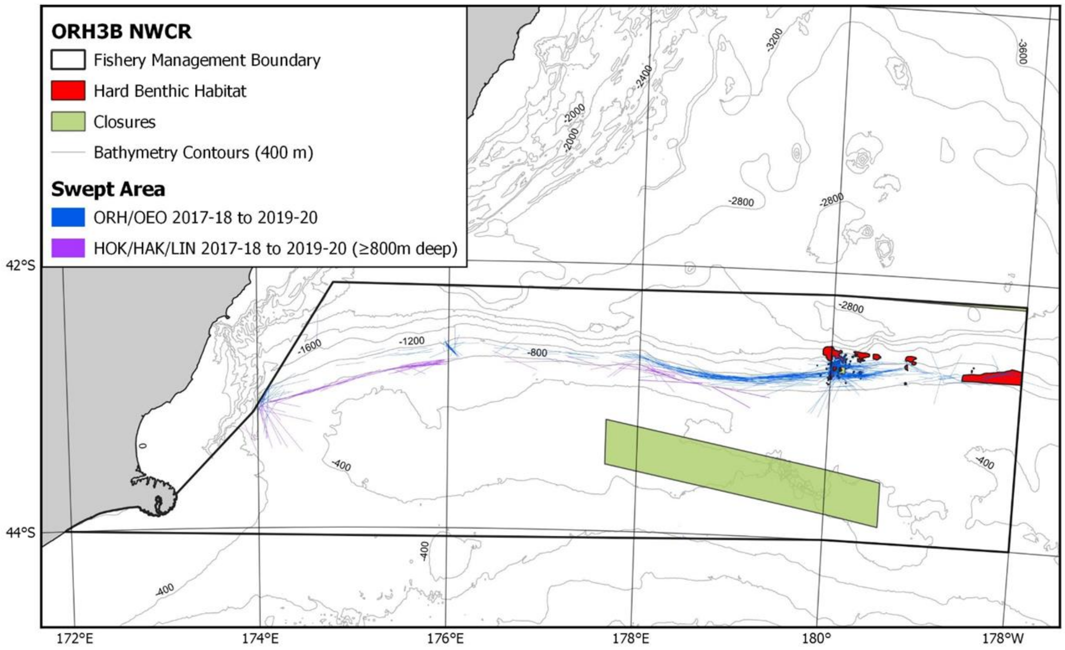

Figure 20: NWCR UoA trawl footprint for ORH/OEO targeted tows and for HAK/HOK/LIN targeted tows with starting depths ≥ 800 m, 2017-18 to 2019-20.

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 28).

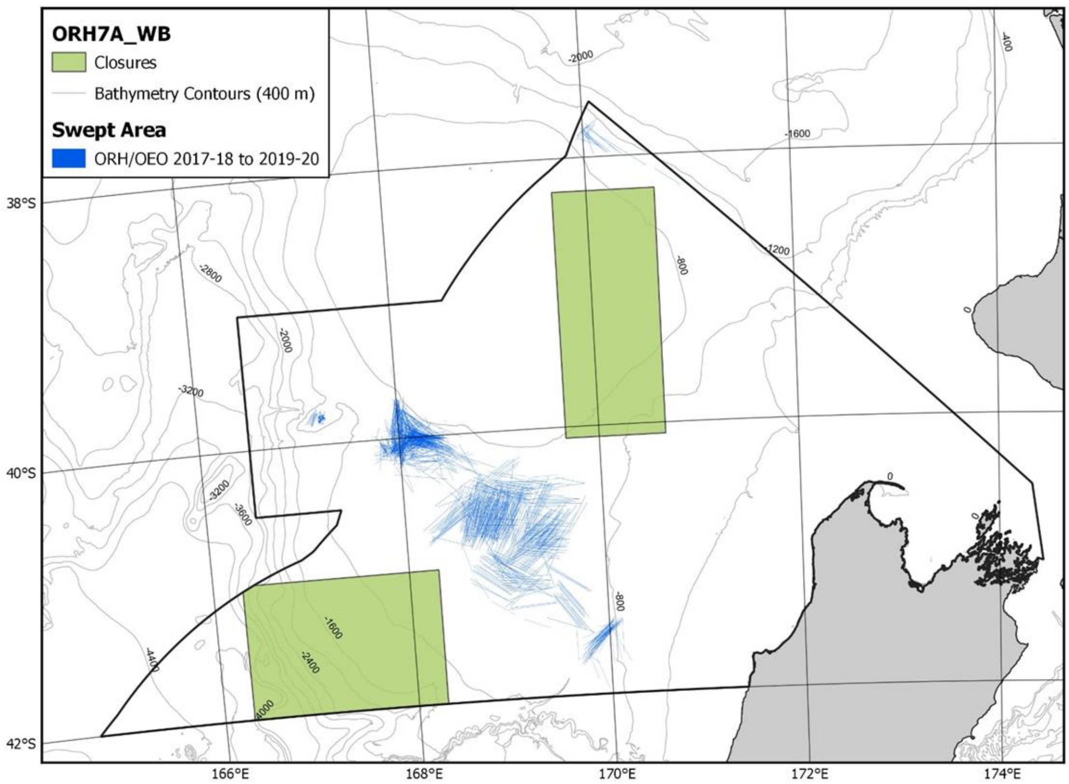

Figure 21: ORH 7A UoA trawl footprint for ORH/OEO targeted tows and for HAK/HOK/LIN targeted tows with starting depths ≥ 800 m, 2017-18 to 2019-20.

Improved Trawl Footprint Methodology

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 22. 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)[60].

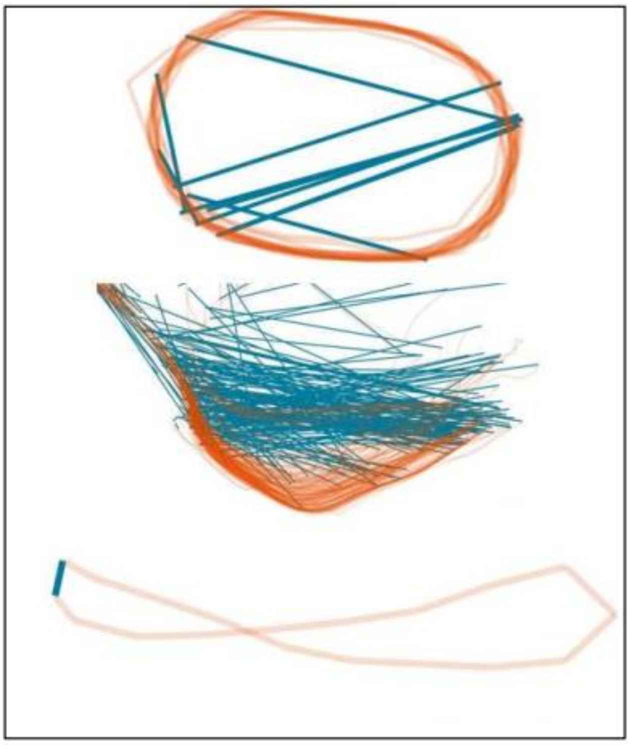

Figure 22: A selection of trawl paths created using GPR data (orange lines) and the corresponding tows created using the 'traditional ERS straight-line' method (green lines).

[60] MacGibbon & Mules (2023)

Assessment of Fishery Impact on Coral Habitat

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.[61]

For a previous surveillance audit, predicted habitat distributions for protected coral groups[62] 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.[63]

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.[64] 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.[65] 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

[61] Anderson et al. (2014, 2015, 2019)
[62] Anderson et al. (2014)
[63] Black & Easterbrook (2022)
[64] Stephenson et al (2021)
[65] Bowden et al. (2019)

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 measures. Model uncertainties were calculated as the coefficient of variation (**CV**) of the bootstrap output.[66]

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.

DWC's Benthic Operational Procedures, implemented from 1 October 2021[67] 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, Seamount Closures, and Benthic Protection Areas) 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[68], 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).

[66] Bowden et al. (2019)
[67] Deepwater Group (2023a, 2023b)
[68] Deepwater Council (2024)

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.

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 (VBAs) are identified, surveyed and assessed (see below).

- 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,
    - 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)

<u>*Pause*</u>

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 biota[69], 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.

[69] McConnaughey et al. (2019)

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 DWC 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 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. DWC 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

McConnaughey et al (2019) noted that the best strategy is to have within any management system, an adaptive process to monitor performance and allow for future refinements. 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
- 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

The updated information provided here on the small footprint by the UoA fisheries in relation to the 800 – 1,600 m habitat area and in relation to the predicted coral distributions, and the extensive protected areas, in combination with the information provided for previous Surveillance Audits (i.e. analyses on the distribution of corals at depths both shallower and deeper than orange roughy fishery depths, the extent of untrawled hard benthic habitat in the NWCR and ESCR UoAs, and on the proximity and likely connectivity between known coral habitats), (DWG, 2020, 2020a, 2021), all point to a minor fishery 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 (BPAs) and the Seamount Closure Areas (SCAs).

DWG is of the view that the above, together with the recently introduced Trawl Benthic Operational Procedures and the MPSA management framework currently under development, in combination meet the requirements of MSC FS v2.01 for ETP corals and Habitats.

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.[70]

These include the following ongoing projects:

- 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.
- 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.
- BEN2020-01 Extent and intensity of seabed contact by mobile bottom fishing in the New Zealand Territorial Sea and Exclusive Economic Zone.
- BEN2020-07 Extent and intensity of trawl effort on or near underwater topographic features in New Zealand's Exclusive Economic Zone
- BEN2021-03 Taxonomic identification of benthic invertebrate samples.
- BEN2022-01 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.
- ENV2020-20 Temporal and spatial distribution on non-target catch, and non-target species, in deepwater fisheries

[70] Fisheries New Zealand (2022)

- ZBD2019-01 Quantifying Benthic Biodiversity Across Environmental Gradients - To expand and develop initiatives to improve confidence in predictive models of seabed fauna and habitat distributions.
- ZBD2020-06 Recovery of biogenic habitats: assessing the recovery potential offered by spatial planning scenarios proposed in the Sea Change Plan.
- ZBD2020-07 Recovery of Seamount Communities.

Progress Against Conditions

<u>*Condition*</u>

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."*

<u>*Progress Against the Condition:*</u>

The Deepwater Council has developed operational procedures to outline the management measures for identifying, disposing of, and reporting benthic organisms, including protected corals, captured incidentally during fishing.[71] These procedures are approved by the Deepwater Council shareholders and managed by Deepwater Council.

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.

From April 2022 to August 2023, a total of 4 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 10).

Table 10: Details of trigger-level towlines and paused towlines (red) in NWCR UoA and in ORH 3B ESCR to date.

Capture Date	Vessel	ORH3B UoA	Stat Area	Coral Catch (kg)	Tow start Lat	Tow start Lon	E/W	Tow end Lat	Tow end Lon	E/W	Target Species	Paused Y/N	Comments
29/11/21	*San Waitaki*	ESCR	412	3,000	44 27.382	174 52.451	W	44 27.522	174 52.250	W	ORH	N	Reported as dead coral rubble - not paused
03/01/22	*Amaltal Explorer*	ESCR	412	270	44 15.122	174 34.494	W	44 15.122	174 34.491	W	ORH	N	Reported as dead coral rubble - not paused
21/01/22	*Amaltal Mariner*	NWCR	404	4,000	42 48.936	179 11.582	W	42 47.780	179 13.113	W	BYX	N	Reported as dead coral rubble - not paused
07/03/22	*Amaltal Mariner*	NWCR	403	600	42 38.492	179 52.984	W	42 38.636	179 52.228	W	ORH	N	Reported as dead coral rubble - not paused
19/03/22	*Otakou*	NWCR	403	450	42 39.410	179 54.353	W	42 39.364	179 54.263	W	ORH	Y	Reported as live coral. Paused on 8/04/22
28/10/22	*San Waitaki*	ESCR	052	80	44 37.04	177 33.82	W	44 38.20	177 32.60	W	SSO	Y	Confirmed live coral. Paused on 3/11/22
25/11/22	*San Waitaki*	ESCR	412	118	44 30.67	174 49.30	W	44 30.70	174 48.35	W	ORH	N	Confirmed dead coral
01/12/22	*Amaltal Explorer*	ESCR	412	800	44 15.25	174 35.05	W	44 15.12	174 34.68	W	ORH	Y	Confirmed live coral. Paused on 5/12/22
19/06/23	*San Waitaki*	ESCR	404	109	42 46.82	177 13.41	W	42 46.84	177 13.09	W	ORH	N	Confirmed dead coral
23/06/23	*Rehua*	ESCR	404	50	42 47.77	177 13.84	W	42 47.738	177 14.273	W	ORH	Y	Confirmed live coral. Paused on 27/06/23
17/09/24	*Tasman Viking*	NWCR	403	200	42 40.518	180 38.22	E	42 40.512	180 38.28	E	ORH	N	Confirmed dead coral

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 DWC's Environmental Liaison Officer. The images are forwarded to coral experts for identification and for determination of their alive

[71] Deepwater Council (2024)

or dead status. Trigger-level tows with confirmed live coral catch are paused by DWC until further notice (Figure 23).

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NOTIFICATION OF TOWLINE PAUSE

Notification date: 8 April 2022

Fishery: Orange Roughy

This notification is further to the ORH Fisheries Specific Benthic Interactions Measures (January 2022), which require towlines that yield coral capture(s) of ≥50 kg to be paused pending further survey and/or assessment in the following MSC-certified ORH fisheries:

- ORH 3B East and South Chatham Rise (ORH 3B ESCR)
- ORH 3B Northwest Chatham Rise (ORH 3B NWCR)
- ORH 7A Quota Management Area (ORH 7A QMA)

Note: ORH 7A Westpac Bank (ORH 7A WB) is excluded from these measures.

Details of Paused Towline

The following towline, having yielded a coral capture event of ≥50 kg is paused.

No further fishing activity is allowed (shooting, towing, or hauling of gear) in the line between the start and end positions.

The paused towline will remain in effect pending review and further notice from Deepwater Group.

Table 1: Details of Paused Towline

PAUSE DATE	QMA	SUB-AREA	STAT. AREA	TOWLINE START POSITION	TOWLINE END POSITION
08/04/2022	ORH 3B	NWCR	403	-42.6614 -179.9098	-42.6601 -179.9073

Details of Current Paused Towlines

To date, the following towlines are currently paused.

Table 2: Details of Paused Towlines to Date

PAUSE DATE	QMA	SUB-AREA	STAT. AREA	TOWLINE START POSITION	TOWLINE END POSITION
08/04/2022	ORH 3B	NWCR	403	-42.6614 -179.9098	-42.6601 -179.9073

S:\Operational Procedures\OP Manual 2021-22\Benthic OP\DWG Notification of Towline Pause (080422).docx

Deepwater Group Ltd Notification of Towline Pause 1 of 1

Figure 23: Notification of Towline Pause as circulated to orange roughy quota owners.

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 24).

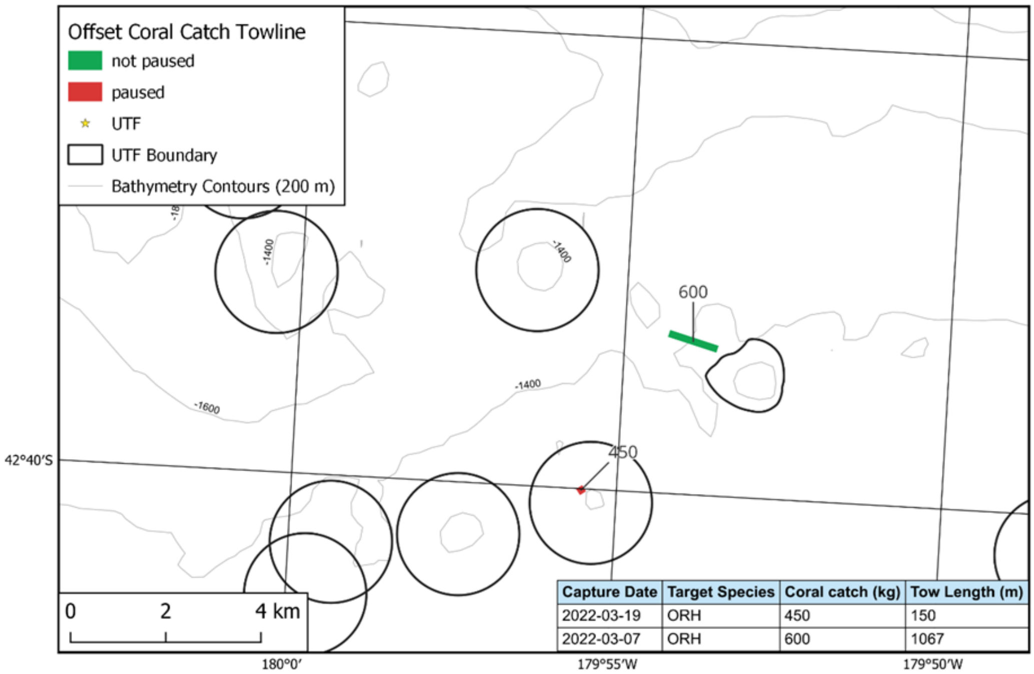

Figure 24: NWCR trawl tows with trigger-level coral catch at the 180° hills complex. A single tow on a UTF caught 450 kg of live coral (paused towline) and a single flats tow caught 600 kg of dead coral rubble (not paused).

The four towlines paused in ORH 3B NWCR and ESCR during 2022-23 and 2023-24 are illustrated in Figure 25.

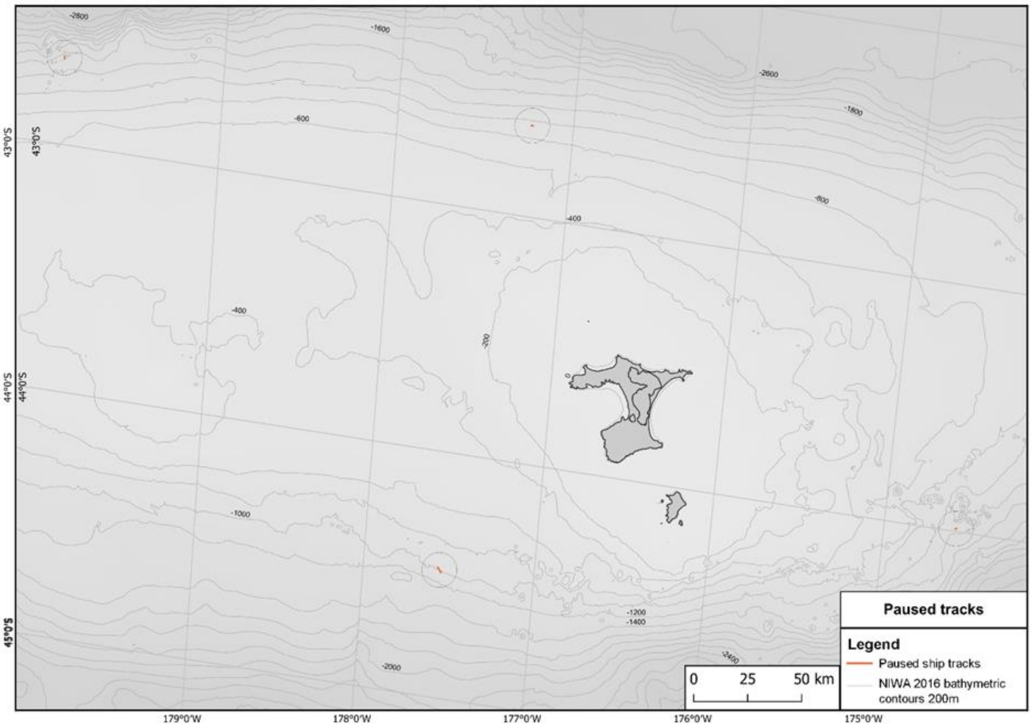

Figure 25: Paused towlines (circled) in ORH 3B NWCR and ESCR during 2022-23 and 2023-24.

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P3 OVERVIEW OF MANAGEMENT INFORMATION

Changes to Management System and Regulations

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

The SPRFMO agreed to a new management measure for bottom fishing in the Convention Area, which includes the Westpac Bank portion of the ORH 7A UoA[72]. The measure defines areas open to bottom trawling and implements requirements for move-on rules should vulnerable species be encountered. A catch limit for the NW Challenger (which includes the Westpac Bank area) was considered by the Commission in February 2021 on the basis of a 2020 stock assessment. The catch limit remained unchanged at 396 tonnes.[73]

Changes to Personnel Involved in Science or Management

Deepwater Group Limited has amalgamated with Fisheries Inshore New Zealand Limited and has been rebranded as Seafood New Zealand Deepwater Council (**DWC**). In July 2024, Lisa Futschek was appointed as the Chief Executive Officer of Seafood New Zealand. DWC appointed Tanayaz Patil as a Senior Policy Advisor in September 2024.

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.

Fisheries New Zealand's Deepwater Management team leader, Tiffany Bock has been appointed to head up Seafood New Zealand's Inshore Council and her role at FNZ has been filled by James Andrew.

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, which acknowledges the Treaty of Waitangi and guarantees Māori chiefs, tribes, and individuals exclusive and undisturbed possession, as well as te tino rangatiratanga[74] 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

[72] South Pacific Regional Fisheries Management Organisation (2021)
[73] South Pacific Regional Fisheries Management Organisation (2022)
[74] "Tino rangatiratanga" is defined as self-determination and sovereignty.

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.[75] It is a statutory document, approved by the Minister for Oceans and Fisheries, which provides an enabling framework outlining agreed management objectives, timelines, performance criteria and review processes. There is a species-specific chapter for orange roughy within this plan.[76]

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 2022/23[77].

    - management actions for delivery during 2022/23 (see Table 2 on pp 8-13),
    - research projects (see Tables 8-12 on pp. 23-26)
    - deepwater fisheries observer plan for 2022/23 (see Table 12, pp. 27-28)

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 draft RRP available is for 2021/22.[78] For example, a comparison of planned and achieved observer coverage in orange roughy fisheries during the 2018-19 fishing year showed that targets were exceeded in ORH 3B Chatham Rise fisheries but were under-delivered in ORH 7A (see Table 7, p. 34).[79]

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.

[75] Fisheries New Zealand (2019)
[76] Fisheries New Zealand (2010)
[77] Fisheries New Zealand (2022)
[78] Fisheries New Zealand (2023)
[79] Fisheries New Zealand (2023)

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[80] model, which focuses on all elements of the compliance spectrum as follows:

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

Since 1994, all vessels over 28 m have been required by law to be part of the Vessel Monitoring System (VMS) which, through satellite telemetry, enables FNZ to monitor all 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 at the end of the month. It is illegal to discard or not to report catches of QMS species. Catches may only be landed at designated ports and sold to Licensed Fish Receivers (**LFR**s). Reporting requirements for orange roughy vessels include logging the location, depth, main species caught for each tow, and total landed catch for each trip.

Commercial fishermen face prosecution and risk severe penalties, which include automatic forfeiture of vessel and quota upon conviction of breaches of the fisheries regulations (unless the court rules otherwise). Financial penalties are also imposed in the form of deemed values to discourage fishermen from over-catching their ACE holdings.

The extensive regulations governing these fisheries are complemented by additional industry-agreed non-regulatory measures, known as 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.[81] DWC personnel and vessel operators meet with MPI's Management and

[80] Fisheries New Zealand (2019a)
[81] Cleal (2024)

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 deep water 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**).[82] 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.

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 AOP provides detail of the research projects relating to deepwater fisheries to be undertaken during 2022/23 and 2023/24.

[82] Fisheries New Zealand (2024)

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