



Fisheries New Zealand

Tini a Tangaroa

Appendix One:

Review of sustainability measures for orange roughy for 2023/24

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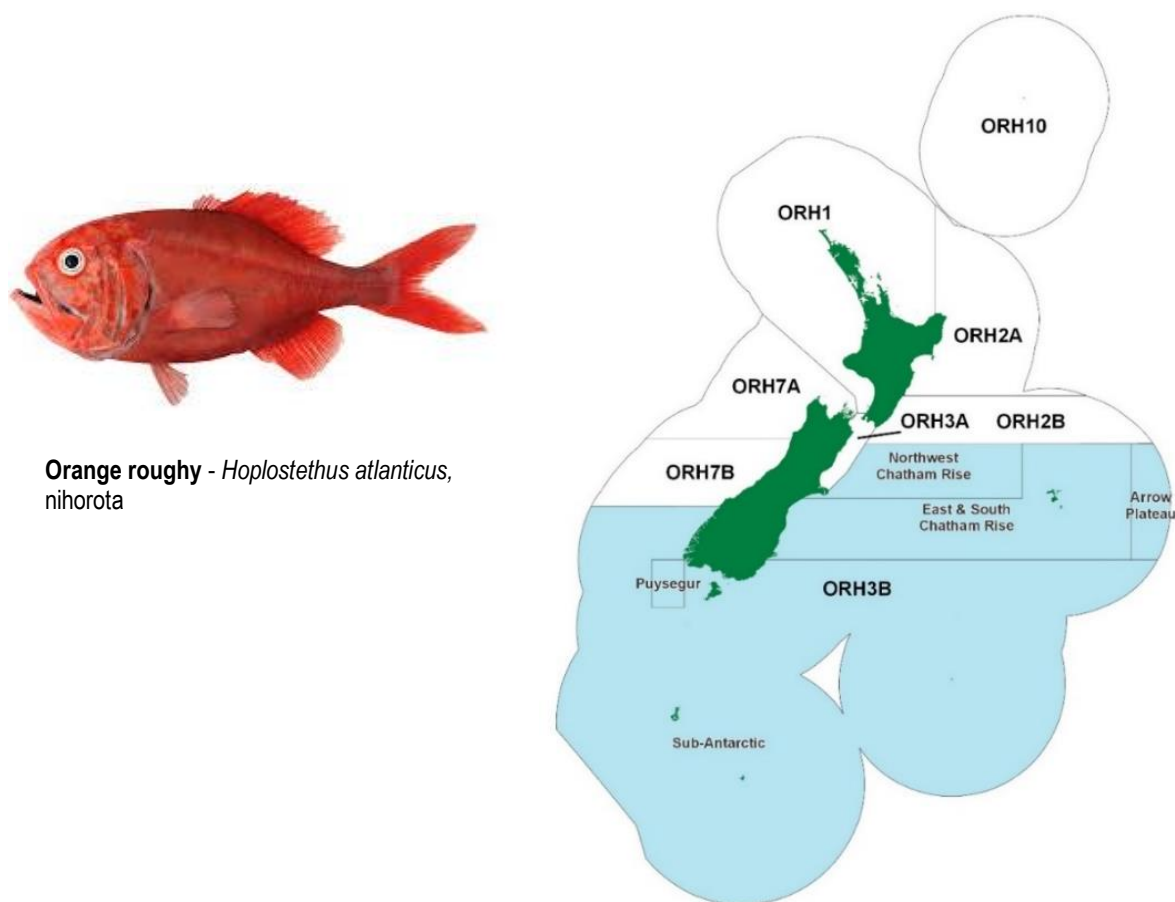


Figure 1: Quota Management Areas (QMAs) for orange roughy, with ORH 3B and sub-areas highlighted.

1 Why are we proposing a review?

1. Stock assessments of orange roughy in the Northwest Chatham Rise (**NWCR**) and the East and South Chatham Rise (**ESCR**) sub-areas within ORH 3B were considered by the Deepwater Working Group (**DWWG**)¹ in April and May 2023. As part of that work, a full characterisation of available data (i.e., commercial, observer, acoustic and trawl survey) was undertaken. A new stock assessment for ESCR was not able to be completed, and current ESCR stock status is unknown. The ESCR sub-stock forms a significant part of the overall ORH 3B fishery. For the NWCR, the previous stock assessment from 2018 has been retained as the best available information, noting that analyses in 2023 suggest the 2018 stock assessment is less robust than originally thought.
2. Increased uncertainty in our understanding of abundance of ORH 3B, and the flat or declining trends in spawning stock biomass estimates from acoustic surveys in the ESCR sub-area indicate a sustainability concern. Fisheries New Zealand (**FNZ**) considers that the current level of the stock cannot be reliably estimated and has concerns that the stocks is below a level that can produce the Maximum Sustainable Yield (**MSY**). Consequently, FNZ is advising you on options to reduce the Total Allowable Catch (**TAC**) of ORH 3B under section 13(2A) of the Fisheries Act 1996 (**the Act**), and within this, to reduce the allowance for other sources of mortality caused by fishing and the Total Allowable Commercial Catch (**TACC**) of the stock.

¹ The DWWG is a Stock Assessment Working Group for deepwater species, convened by FNZ and includes industry and other non-governmental scientists and representatives. Based on scientific information the DWWG assesses the status of deepwater fish stocks or species relative to the maximum sustainable yield (**MSY**)-compatible reference points and other relevant indicators of stock status, conducts projections of stock size and status under alternative management scenarios, and reviews results from relevant research projects.

- These options represent a cautious response with respect to sustainability. Within the proposed TACC reduction, FNZ recommends that you express your expectation that the commercial fishing industry apply the reduction to the ESCR sub-area, since this is the area of both the largest catch and most sustainability concern. The *status quo* is not proposed as an option for your catch limit decision, and was not put forward as an option in the consultation.

1.1 Summary of proposed options

Table 1: Summary of options proposed for ORH 3B from 1 October 2023. Figures are all in tonnes. The preferred option of FNZ is highlighted in blue.

Option	TAC	TACC	Allowances		
			Customary Māori	Recreational	All other mortality caused by fishing
Current settings	8,355	7,967	5	0	383
Option 1	7,116 (↓ 1,239 t)	6,772 (↓ 1,195 t)	5	0	339 (↓ 44 t)
Option 2	5,470 (↓ 2,885 t)	5,197 (↓ 2,770 t)	5	0	268 (↓ 115 t)
Option 3	4,995 (↓ 3,360 t)	4,752 (↓ 3,215 t)	5	0	238 (↓ 145 t)

In total, 31 submissions were received on the proposed options.

2 About the stock

2.1 Biology²

- Orange roughy are widespread in New Zealand waters, occurring in the upper continental slope, particularly at depths between 700 and 1,500 m. Orange roughy are mostly found on the Chatham Rise, off the West Coast South Island and on the Challenger Plateau.
- Orange roughy are a very slow-growing and long-lived species, known to live 120-130 years, reaching a maximum age of 230 years³ and a maximum size of about 50 cm (standard length⁴), with an average size of around 35 cm. New Zealand orange roughy are estimated to reach sexual maturity between 32 and 41 years of age, and recruit⁵ into the fishery at 15 to 20 years of age (around 23 to 25 cm in length).
- Spawning occurs once a year between June and early August, in many separate locations within the New Zealand Exclusive Economic Zone (EEZ), from the Bay of Plenty in the north to the Auckland Islands in the south.
- Spawning orange roughy form dense aggregations at depths of 700 to 1,000 m in areas often associated with underwater topographical features such as hills and canyons. It is now thought likely that individual orange roughy do not spawn every year and that fecundity (the potential to produce offspring) is relatively low. Small aggregations form outside the spawning period, presumably for feeding. Orange roughy mainly prey upon mid-water and bottom species such as prawns, fish, and squid. Historically, orange roughy has been particularly prone to hyperstability, that is, catch rates remain high even as the stock is rapidly depleted, due to targeting spawning aggregations at specific areas and times.
- Genetically, two main stocks are recognised within ORH 3B - Chatham Rise and Puysegur; (Smith & Benson, 1997) and these are considered to be distinct from stocks in adjacent areas

² Information in this section references the [FNZ Fisheries Assessment Plenary 2023](#).

³ Age estimates from the central Louisville Seamount Chain in 1995 and 2013–2015 ranged from 21 to 230 years. The latter value is believed to be the oldest age estimate for an orange roughy determined anywhere. Fish aged greater than 200 years comprised 0.5% of the sample (Horn & Maolagáin, 2019).

⁴ Standard length is the length of a fish measured from the tip of the snout to the base of the caudal (tail) fin.

⁵ That is, become vulnerable to harvest.

(Cook Canyon and Ritchie Bank).⁶ However, because of their geographical separation and the discontinuities in the distribution of orange roughy, it is likely that concentrations of spawning fish on the Arrow Plateau, near the Auckland Islands, and west of the Antipodes Islands also form separate stocks (see Figure 2). These data also suggest multiple stocks within the Chatham Rise, but do not indicate clear stock boundaries.

9. There is evidence that a separate stock exists on the Northwest Chatham Rise, which contains a large spawning ground on the Graveyard Hills (Figure 2). There are also nursery grounds around, and primarily to the west of, the Graveyard Hills. There is weak evidence that the area of the South Chatham Rise west of and including Hegerville is a separate stock.
10. The South Chatham Rise could provide feeding habitat for the stock, which is estimated to have had an initial biomass of over 300,000 tonnes, an amount that was probably too large to inhabit only the East Chatham Rise. The present hypothesis is that the area to the west of the current convergence zone between the East Rise and South Rise is relatively marginal habitat where larger juvenile, maturing, and adult orange roughy were once predominant, and that little spawning occurs; and there are few juveniles present because the water is relatively cold.

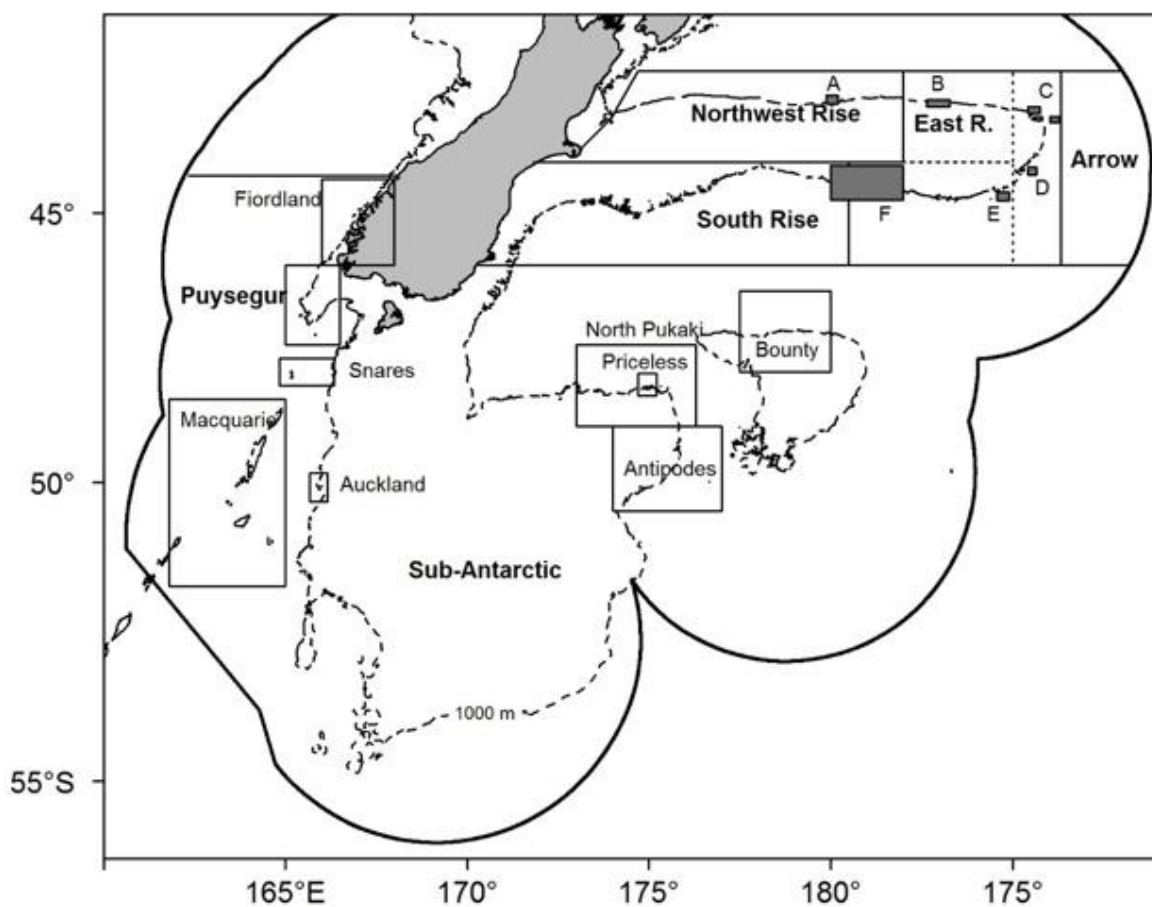


Figure 2. ORH 3B fishery sub-areas and the approximate position of other named orange roughy fisheries. The recognised stocks are indicated by bold text. The rectangles mark the main fishing grounds, with those on Chatham Rise shaded: A, Graveyard (Including Morgue (closed to fishing) and Graveyard hills); B, Spawning Box; C, Smith's City NE hills (includes Cameron's); D, Andes; E, Chiefs; F, South Rise (Mt. Kiso & Hegerville). The Old Spawning Plume, Rehoku, and Mt Muck are all within the Spawning Box (B).

⁶ Cook Canyon lies off the West Coast, South Island; and Ritchie Bank lies off the East Coast, North Island.

2.2 Fishery characteristics

11. The ORH 3B QMA encompasses Fisheries Management Area (**FMA**) 3 (South east coast), FMA 4 (South east), FMA 5 (Southland), and FMA 6 (sub-Antarctic) (Figure 1). Orange roughy in ORH 3B is understood to be caught exclusively by commercial fishers, with most fish taken as target catch. While the ORH 3B QMA covers over half of the New Zealand EEZ, most commercial fishing for orange roughy is concentrated on the East and South Chatham Rise (**ESCR**) sub-area, and the Northwest Chatham Rise (**NWCR**) to a lesser extent.
12. Vessels target orange roughy using bottom trawl net configurations with heavy ground gear (bobbers, rollers, and rock hopper gear) at depths greater than 750 m. Since this ground gear requires powerful engines, orange roughy vessels are typically medium to large-sized deepwater vessels with significant freezer capacity and the ability to operate for several weeks at sea. Seven vessels have been operating in the ORH 3B fishery since 2019/20.
13. Operators historically targeted spawning aggregations of orange roughy over topographic features (such as hills and seamounts), often tows for as little as 15 minutes per tow. In recent years, more effort has been applied to flat sandy areas of the seafloor with longer tows conducted and smaller catches in each tow caught than previous years. Operators suggest this change in fishing behaviour has been partly in response to the demand for better quality whole fish (rather than fish being processed into fillets) obtained from smaller catches of non-spawning fish to supply the Chinese export market, although this market has declined in recent years.

2.3 Management background

14. Orange roughy entered the Quota Management System (**QMS**) in 1986 with eight QMAs and an October fishing year. In most cases, the QMAs for orange roughy are administrative and do not align with biological stocks.
15. While the TAC and TACC apply to the ORH 3B stock as a whole, sub-areas within ORH 3B are subject to voluntary catch limits. ORH 3B quota owners, through the Seafood New Zealand Deepwater Council (**DWC**, formerly called the Deepwater Group), agree each year to adhere to catch limits at a sub-area level for the individual sub-stocks of ESCR, NWCR, Sub-Antarctic and Puysegur. These are non-regulatory catch limits.
16. These measures apportion the TACC to areas within the QMA that are more in-line with the biological stocks at which sub-stock status is evaluated. Historically, industry has adhered to the voluntary sub-area catch limit arrangement and has expressed a commitment to do the same in the future. In previous sustainability decisions, Ministers have expressed their expectation that industry would adhere to these voluntary sub-area catch limits.
17. The most recent adjustments to the TAC and TACC were implemented over three years from the 2018/19 fishing year, based on a favourable stock assessment that showed the ESCR sub-stock to be in the management target range and increasing. The Minister's decision included a small decrease of 100 tonnes to the NWCR sub-area limit in the first year, and an increase to the ESCR sub-area limit spread over three years based on voluntary arrangements. The phased increases were guided by the application of a management procedure incorporating a Harvest Control Rule (**HCR**).⁷
18. In the final year of these increases, a 2020 update to the 2018 stock assessment showed a continued increase in biomass and the application of the HCR showed a TACC increase could provide for a utilisation opportunity. The TAC was therefore increased from 7,116 to 8,355 tonnes.

⁷ A Harvest Control Rule (HCR) is a way of setting catch limits dependent on the estimated stock status in relation to the management target range. For orange roughy, the management target range is 30-50% of unfished biomass (B_0). A management procedure involves testing the performance of several potential HCRs against simulated stock trajectories over long periods of time to allow for uncertainty in the inputs. The HCR was used at that time to suggest sub-area catch limits based on the estimated sub-area stock status in relation to the management target range.

19. The DWC Deepwater Trawl Orange Roughy & Oreo Operational Procedures (**OPs**), which came into effect in 2011, stipulate the management measures agreed upon between orange roughy and oreo quota owners, ACE owners, and FNZ.⁸ The OPs describe the sub-areas within ORH 3B that were established in 1992 to enable fine-scale management of the ORH 3B fishery. All orange roughy and oreo shareholders, ACE owners and owners or operators of vessels in the orange roughy and oreo fisheries agree to adhere to these operational procedures. Currently, members of DWC own 96% of the quota for ORH 3B.
20. Adherence to the sub-area catch limits is monitored by FNZ and reported annually in the FNZ Deepwater Fisheries Annual Review Report.⁹ There have been very high levels of adherence to the sub-area catch limits since they were first agreed to by industry in 1992.¹⁰

3 Status of the stock

21. Genetics, geographical separation, and the distribution of orange roughy indicate that there are multiple biological sub-stocks within ORH 3B (see '*Biology*' above). Stock status for ORH 3B is evaluated for each of these sub-stocks independently – ESCR, NWCR, Puysegur, and the remaining parts of ORH 3B including the Sub-Antarctic and Arrow Plateau (Figure 2).
22. The provisional stock assessments of orange roughy in the ESCR and NWCR sub-areas within ORH 3B were considered by the DWWG in April and May 2023. As part of this work, a full characterisation of available data was undertaken for both sub-stocks. Additionally, the previous stock assessments were re-evaluated in the context of the new characterisations with a focus on the ESCR because that is the stock with the largest catch.

3.1 East and South Chatham Rise

23. As part of the stock assessment process, the 2023 characterisation of the ESCR sub-stock revealed information from the commercial fishery and estimates of spawning biomass from acoustic surveys that were inconsistent with biomass and trends estimated by the previous (2020) stock assessment model for the ESCR sub-area. Assessment outputs should be consistent with data inputs to give managers confidence that they are reflecting real-world trends in orange roughy stock abundance. However, the 2020 stock assessment for the ESCR area indicated the stock to be in the target zone of 30–50% of the unfished biomass (B_0) and increasing, which did not reflect catch per unit effort (**CPUE**) trends or acoustic survey results.
24. Declining trends and recent historical lows in unstandardised¹¹ CPUE across most fished areas in the ESCR in 2023 are not consistent with the 2020 stock assessment model outputs. While caution should be used drawing conclusions from an unstandardised CPUE index at a stock level, it may reflect local abundance. Unstandardised CPUE for the ESCR has generally been flat or slowly declining since 2010/11 and was at historical lows within the last two years for non-spawning fisheries at Andes complex, Big Chief & neighbours, and Hegerville & neighbours, (Figure 3). This suggests local abundance may be declining within the ESCR.
25. Additionally, acoustic survey results in 2022 indicated that the combined area spawning stock biomass series (**SSB**)¹² of the ESCR sub-stock had been flat since 2011, which is also inconsistent with previous stock assessment outputs. Estimates of spawning biomass indicate differing trends by area (Figure 3). Biomass at the Old Spawning Plume, which has been surveyed regularly since 2001, declined significantly since 2001 until about 2010 and has remained flat since. Mt. Muck SSB has increased more than twofold, while Rekohu SSB has declined.

⁸ The [Deepwater Trawl Orange Roughy & Oreo Operational Procedures](#) can be found on the DWC website.

⁹ <https://www.mpi.govt.nz/dmsdocument/51895-Annual-review-report-for-deepwater-fisheries-202021>.

¹⁰ On occasion the voluntary sub-area catch limits may be slightly exceeded, if for example, a fisher attempts to catch their full allowance under the voluntary agreement, but lands a bigger catch than intended. Since under section 72 of the Act fishers are required to land QMS species, they could inadvertently catch and land more than the voluntary agreement stipulates.

¹¹ Unstandardised CPUE does not make an allowance for factors such as different fishing behaviour between and among fishers over time, vessels, and market demand, which can affect catch rates independent of variation in fish abundance.

¹² The total weight of sexually mature fish in a stock that spawn in a given year.

26. The re-evaluation of the 2020 ESCR stock assessment identified further issues with the previous stock assessments for ORH 3B; these are discussed further under ‘*Information principles: Uncertainties and unknowns - section 10 of Act*’ below. In light of the assessment re-evaluation, the DWWG concluded that the previously accepted 2020 stock assessment of the ESCR sub-stock can no longer be considered to accurately reflect stock status. The Plenary consequently rejected the previous stock assessment. A new stock assessment in 2023 was commissioned but not able to be completed due to issues with the assumptions that underpin the model used to provide a stock assessment, described in greater detail on pages 917-921 in the Plenary report (FNZ-Fisheries Assessment Plenary, 2023). Consequently, the current status of the ESCR sub-stock is unknown. The stock status table¹³ for the ESCR has been removed from the Plenary report.

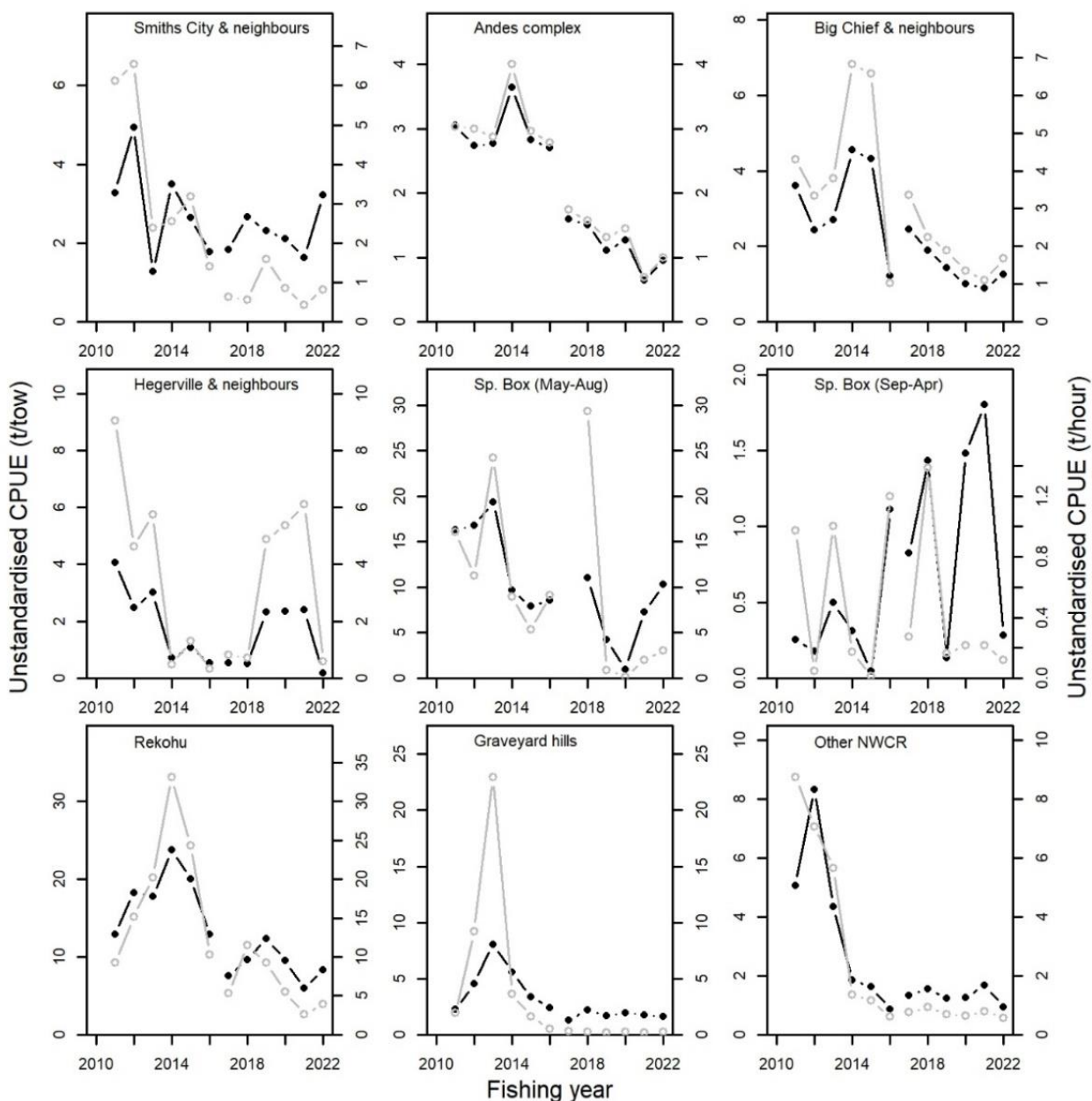


Figure 3: ORH 3B fishery sub-areas and annual unstandardised CPUE for the periods 2009/10 to 2021/22. Black lines and points, tonnes per tow (left y-axis); Grey lines and points, tonnes per hour (right y-axis). The NWCR is represented by the ‘Graveyard hills’ and ‘Other NWCR’, and the remainder are areas within the ESCR.

¹³ The stock status tables within the Fisheries Assessment Plenary report provide summarised details on the status of each stock in relation to management targets and limits, as well as trends in biomass, the assessment methodology used, data inputs and quality used to inform the assessment, fishery interactions with other stocks and protected species, and projections for the stock.

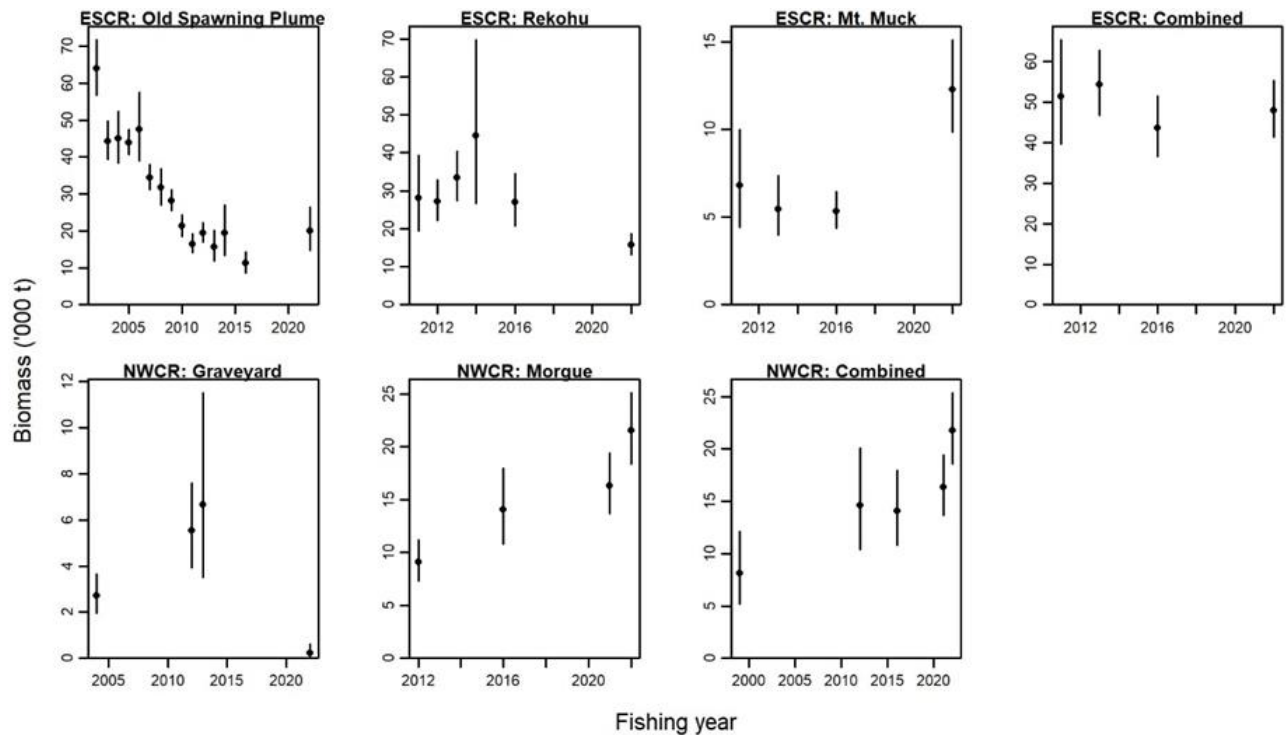


Figure 4: ORH 3B Spawning Stock Biomass (SSB) estimates from acoustic surveys in the ESCR (top) and NWCR (bottom) sub-areas. Vertical lines indicate 95% confidence intervals (CIs).

27. Fishing effort in the ESCR has changed substantially since 2015/16. In 2015/16, 65–90% of all orange roughy landings from the ESCR were caught in short tows of less than one hour duration on underwater features outside of the spawning season. Conversely, in recent years 50–60% of orange roughy landings were caught in long tows of over two hours' duration, and about 90% of catch has been taken during the spawning season (historically less catch was taken during the spawning season). The duration of the tows has increased substantially since about 2018.

3.2 Northwest Chatham Rise

28. For the NWCR sub-area, there is a large divergence between catch and the sub-area limit with only 17% of this voluntary sub-area catch limit being caught in the 2021/22 fishing year. Similar to the ESCR, the duration of the trawl tows in the NWCR has also increased substantially since 2018, but is more pronounced, and there have also been more tows over flat ground rather than over topographic features.
29. The re-evaluation of the 2018 NWCR stock assessment was not completed to the same extent as for the ESCR, so the previous stock assessment from 2018 has been retained as the best available information, with some qualifying statements. These include noting that analyses in 2023 provide reasons to consider the 2018 stock assessment to be less robust than originally thought, and that further research to inform the NWCR stock assessment is required.
30. The NWCR combined acoustic index of spawning stock biomass is increasing (Figure 4) but this is driven by the estimated SSB on the Morgue (a spawning aggregation area just north of the Graveyard spawning area, Figure 2) which has been closed to commercial fishing since 2001. In contrast, the most recent spawning stock biomass on the Graveyard spawning area, which is open to fishing, is at its lowest point in the time series (Figure 4).
31. The Plenary review of the NWCR stock assessment on 12 June 2023 concluded that in the absence of sufficient new information (because the stock assessment investigations focussed on the ESCR), the most recent NWCR stock assessment (2018) remains the best available information - although the likelihoods of stock status in relation to management targets were re-evaluated. New status interpretations include that the sub-stock as a whole is *“Unlikely to be below the Soft and Hard Limits based on the 2022 acoustic survey results.”*

3.3 Other ORH 3B sub-areas: Arrow Plateau, Sub-Antarctic, and Puysegur

32. The remaining part of ORH 3B is comprised of the Arrow Plateau, Sub-Antarctic and Puysegur sub-areas. Less than 1,000 tonnes of orange roughy was caught in these smaller fisheries in each of the last 10 fishing years, with the Puysegur sub-area being the largest, and no fishing occurring on the Arrow Plateau.
33. In 2006 the DWWG examined the data on orange roughy catch and effort from the Arrow Plateau and sub-Antarctic, and agreed that there was insufficient data to carry out standardised CPUE analyses for any of these areas. It was believed that unstandardised CPUE did not provide a suitable index of relative abundance. Therefore, a stock assessment could not be carried out. Since the Arrow Plateau has been a Benthic Protection Area (**BPA**) since 2007, no bottom trawling is permitted. We can therefore be confident that no overfishing of orange roughy is occurring. The stock status for the sub-Antarctic sub-area is unknown.
34. A stock assessment for the Puysegur sub-stock was most recently conducted in 2017 using similar methods to those used in the 2014 stock assessments of the ESCR and the NWCR. The biomass was estimated to be 49% of B_0 and determined to be Very Likely (>90%) to be at or above the target management range of 30-50% B_0 , and Exceptionally Unlikely (<1%) to be below the soft (20% B_0) or hard (10% B_0) limits. Overfishing is Exceptionally Unlikely (<1%) to be occurring in the Puysegur sub-area.

4 Catch information and current settings within the TAC

4.1 Commercial

35. Reported landings and TACCs for ORH 3B are shown in Figure 5. Annual reported orange roughy landings in ORH 3B ranged from 24,000 to 33,000 tonnes in the 1980s, progressively decreased from 1989/90 to 1995/96 following a series of TACC reductions, were stable over the mid-1990s to mid-2000s, and decreased further from 2005/06 as TACCs were further reduced until 2012/13 to 3,600 tonnes. Since then, the TACC has increased to 7,967 tonnes following a number of TAC increases.
36. The ESCR and NWCR fisheries within ORH 3B are certified by the Marine Stewardship Council (**MSC**)¹⁴ and were re-certified in 2022. Orange roughy from all QMAs earned around \$49 million in FOB¹⁵ exports in the 2022 calendar year. Half of orange roughy exports by volume, and nearly three-quarters of exports by value are in the frozen fillet product state. The United States is the single biggest orange roughy export market, making up more than two-thirds of export revenue in 2022, although fish sold in the whole fish product state to China are worth more per greenweight kilogram, using publicly available export data and conversion factors.^{16,17}

¹⁴ See 'Marine Stewardship Council (MSC) certification' for more detail.

¹⁵ FOB - Free on board. The value of export goods, including raw material, processing, packaging, storage, and transportation up to the point where the goods are about to leave the country as exports. FOB does not include storage, export transport, or insurance cost to get the goods to the export market.

¹⁶ Figures obtained from Seafood NZ - *Exports of Seafood Products by Selected Species. Prepared by Seafood New Zealand from official export figures collected by NZ Customs and supplied by Statistics New Zealand.* These figures apply to the calendar year ending in December 2022.

¹⁷ To calculate the greenweight of processed fish, the processed weight is multiplied by the conversion factor for the correct species and product state.

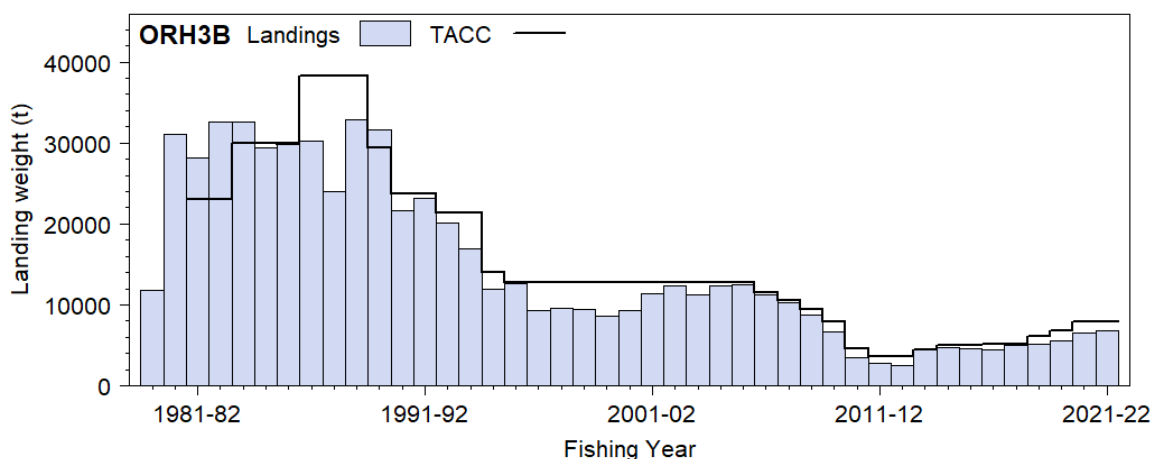


Figure 5. Orange roughy ORH 3B TACC and landings, 1979/80 to 2021/22.

4.2 Customary Māori

37. Due to the depths and locations at which orange roughy is found, it is unlikely that orange roughy is caught by customary fishers. There are no reported customary authorisations for orange roughy, although some iwi have expressed interest in taking orange roughy under customary permit by commercial vessels for pātaka¹⁸ purposes. There are no mātaihai reserves, closures, or restrictions under section 186A of the Act that impact orange roughy fishing in ORH 3B. Therefore, FNZ proposes retaining the allowance for customary Māori take under all options at five tonnes.

4.3 Recreational

38. Due to the depths and locations at which orange roughy is found, the recreational take of orange roughy is either negligible or non-existent. There are no reporting requirements for recreational fishers, but FNZ notes that orange roughy has not been reported in National Panel Surveys of Marine Recreational Fishers (Wynne-Jones *et al.*, 2014; Wynne-Jones *et al.*, 2019) and FNZ has no knowledge of any orange roughy caught by recreational fishers in ORH 3B. FNZ therefore proposes retaining a recreational allowance of zero tonnes under all options.

4.4 Other sources of mortality caused by fishing

39. The allowance for other sources of mortality caused by fishing is an allowance intended to provide for generally unrecorded mortality of fish associated with fishing activity. This includes fish that escape through trawl net mesh and subsequently die from injuries, accidental loss from lost or ripped trawl net cod-ends, predation, and misreporting.

40. In the absence of specific information, the approach that is often taken for deepwater stocks is to set the allowance at a level that equates to a specified percentage of the TAC (the specified level generally takes into account the method of fishing and uncertainty in other mortality occurring in the fishery). For other species taken by the deepwater trawl fleet, such as hoki, hake, and ling, the allowance, where set, is set at a level that equates to one or two percent of the TAC. This allowance is set slightly higher for ORH 3B, at a level that equates to around five percent of the TAC, due to the history of lost fish, discards, and reporting errors on the Chatham Rise in the 1980s.

¹⁸ Traditionally a pātaka was a small wooden structure mounted on piles used to store preserved food. In a modern-day context a pātaka refers to storing fish caught by commercial operators at a licenced fish receiver (LFR) under section 192(7) of the Act. Note there is nothing to stop kaitiaki from issuing customary authorisations to commercial vessels to catch fish for customary purposes, provided the fish is not stored at a licenced fish receiver premises, outside a pātaka arrangement.

41. For species that are primarily taken by the deepwater trawl fleet, this allowance typically equates to a smaller proportion of the TAC than for inshore species. One of the reasons for this is that there is greater certainty that catch reporting in the deepwater fleet is accurate due to the relatively high levels of observer coverage. During the five fishing years between 2016/17 and 2021/22, an average 28% of fishing events in which orange roughy (across all stocks) was caught were conducted while an observer was on board.¹⁹
42. FNZ proposes to maintain the allowance for other sources of mortality caused by fishing at a level that equates to around 5% of the TAC under all options.

5 Treaty of Waitangi obligations as set in the legislation

5.1 Input and participation of tangata whenua

43. Section 12(1)(b) of the Act requires that before undertaking any sustainability process you shall provide for the input and participation of tangata whenua who have a non-commercial interest in the stock or an interest in the effects of fishing on the aquatic environment in the area concerned. In considering the views of tangata whenua, you are required to have particular regard to kaitiakitanga.²⁰
44. Input and participation of tangata whenua into the sustainability decision-making process is provided mainly through Iwi Fisheries Forums, which have been established for that purpose. Each Iwi Fisheries Forum can develop an Iwi Fisheries Forum Plan that describes how the iwi in the Forum exercise kaitiakitanga over the fisheries of importance to them, and their objectives for the management of their interest in fisheries. Iwi Fisheries Forums may also be used as entities to consult iwi with an interest in fisheries.²¹
45. ORH 3B covers the rohe of the Te Waka a Māui me Ōna Toka Iwi Fisheries Forum and Chatham Islands Fisheries Forum (**CIFF**). Te Waka ā Maui me Ōna Toka Iwi Fisheries Forum is the Te Wai Pounamu (South Island) Iwi Fisheries Forum, including all nine tangata whenua iwi: Ngāti Apa ki Ra Tō, Ngāti Kōata, Ngāti Kuia, Ngāti Rarua, Ngāti Tama ki Te Waipounamu, Ngāti Tōa Rangatira, Rangitāne ō Wairau, Te Atiawa o Te Waka a Māui and Ngāi Tahu.
46. At a Te Waka ā Maui Forum hui in March 2023, FNZ presented a list of potential stocks for review in the October 2023 sustainability round, including ORH 3B, for any initial input and feedback from Forum members. No comments were received at the Forum. The ORH 3B consultation paper was made available after the Forum met and no comments were received.

5.2 Kaitiakitanga

47. Information provided by forums, and iwi views on the management of fisheries resources and fish stocks, as set out in Iwi Fisheries Plans, are among the ways that tangata whenua can exercise kaitiakitanga in respect of fish stocks.
48. Orange roughy (nīhorota) is listed as a taonga species in Te Waipounamu (all of South Island) Iwi Fisheries Plan. Te Waka a Māui me Ōna Toka Iwi Forum consider all fish species taonga.
49. Te Waipounamu Iwi Fisheries Plan contains objectives to support and provide for the interests of South Island iwi, and contains two objectives which are relevant to the management options proposed for ORH 3B:

¹⁹ This coverage is calculated based on fishing events (individual tows, sets, or shots) in which the fish stock was recorded as caught and an observer was on board. This metric does not reflect the overall level of monitoring in the fishery.

²⁰ The Act defines kaitiakitanga to mean “the exercise of guardianship; and, in relation to any fisheries resources, includes the ethic of stewardship based on the nature of the resources, as exercised by the appropriate tangata whenua in accordance with tikanga Māori”, where tikanga Māori refers to Māori customary values and practices.

²¹ However, FNZ also engages directly with iwi (outside of Forums) on matters that affect their fisheries interests in their takiwa (district) and consults with any affected Mandated Iwi Organisations and Iwi Governance Entities where needed.

- **Management Objective 3:** to develop environmentally responsible, productive, sustainable, and culturally appropriate commercial fisheries that create long-term commercial benefits and economic development opportunities for South Island iwi.
 - **Management Objective 5:** to restore, maintain and enhance the mauri and wairua of fisheries throughout the South Island.
50. Imi (Moriori) and iwi (Ngāti Mutunga of Chatham Islands (Rēkohu/Wharekauri)) have listed pātohe orange roughy as a taonga species in their CIFF@44° (Chatham Island Fisheries Forum plan, which includes Rangihau/Rangiauria-Pitt Island). Imi and iwi regard all fish as taonga. Three management objectives of CIFF@44° which are particularly relevant to the management options proposed for ORH 3B are:
- **Management Objective 2:** Kaitiakitanga is fundamental to the management of all fisheries resources.
 - **Management Objective 5:** Thriving Fisheries. Thriving sustainable fisheries that are enduring for present and future generations.
 - **Management Objective 6:** Traditional Fisheries. Fisheries and fisheries areas of cultural significance are protected, maintained, and enhanced.
51. FNZ considers that the proposed TAC and TACC decreases under all options are broadly consistent with the objectives of Te Waipounamu Iwi Fisheries Plan and Chatham Island Fisheries Forum plan described above. This is based on the potential to improve sustainability of the fishery, which will help ensure both long-term commercial activity and economic development opportunities for South Island iwi and Chatham Islands iwi and imi quota holders. However, we note that FNZ has not engaged with the Chatham Islands Fisheries Forum on the proposed ORH 3B options (the forum is not currently meeting), and so cannot confirm whether the iwi and imi of the Chatham Islands agree with our view noted above. Given this uncertainty, we emphasise the need for caution in using this information in your decision making for ORH 3B.

5.3 Mātaimai reserves and other customary management tools

52. Section 21(4) of the Act requires that, when allowing for Māori customary non-commercial interests, you must take into account -
- a) any mātaimai reserve in ORH 3B that is declared by notice in the Gazette under regulations made for the purpose under section 186;
 - b) any area closure or any fishing method restriction or prohibition in ORH 3B that is imposed under section 186A or 186B.²²
53. There are no customary fisheries management tools such as mātaimai, taiāpure, or section 186B temporary closures relevant to this review.

6 Environmental and sustainability considerations under the Act

6.1 Overview

54. You are being asked to make a decision under section 13 of the Act, to set the TAC for orange roughy in ORH 3B. This is a sustainability measure. Before setting or varying a sustainability measure, you must adhere to section 11 of the Act. When making your decision you must also act consistently with the requirements in section 5, and sections 8-10 (Purpose and Principles of the Act).
55. The requirements and details of each of these sections are set out below, in the following order:

²² Section 21(4) does not refer to section 186B, but this is the provision used for temporary closures or fishing method restrictions or prohibitions in South Island fisheries waters.

- a) Section 5 (Application of international obligations and Treaty of Waitangi (Fisheries Claims) Settlement Act 1992);
- b) Section 8 (Purpose);
- c) Section 9 (Environmental principles);
- d) Section 11 (Sustainability measures);
- e) Section 10 (Information principles); and
- f) Section 13 (Setting a Total Allowable Catch).

6.2 Application of international obligations and the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992 – section 5 of the Act

56. You must act in a manner consistent with the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992. This is discussed in more detail under Heading 2.2.1 of the *Introduction and Legal Overview* chapter within the main sustainability round advice paper that we have provided you separately (titled '*Review of sustainability measures for the 2023 October round*'). You must also act in a manner consistent with New Zealand's international obligations relating to fishing. Discussion of these relevant obligations is provided under Heading 2.2.2 in the *Introduction and Legal Overview* chapter. There are no specific matters relating to the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992, and FNZ does not consider there are any specific matters that require separate consideration, that might apply to ORH 3B.

6.3 Purpose of the Act – section 8 of the Act

57. The Act's purpose is to "provide for the utilisation of fisheries resources while ensuring sustainability." Guidance for you on the meaning of section 8 and how it should be applied for decision making (for all the stocks being reviewed as part of this round) is provided under Heading 2.2.3 in the *Introduction and Legal Overview* chapter.

6.4 Environmental principles – section 9 of the Act

58. The environmental principles, which must be taken into account when considering sustainability measures for ORH 3B, are as follows:
- Associated or dependent species should be maintained above a level that ensures their long-term viability.
 - Biological diversity of the aquatic environment should be maintained; and
 - Habitats of particular significance for fisheries management should be protected.

6.4.1 Associated or dependent species – section 9(a) of the Act

59. Associated or dependent species include any non-harvested species taken or otherwise affected by the taking of any harvested species. They include marine mammals, seabirds, fish, and invertebrate species caught as bycatch in the orange roughy fishery.
60. The options presented in this chapter are unlikely to increase fishing effort given that they entail a reduction to the TAC, meaning risks of impacts on associated and dependent species such as marine mammals, seabirds, fish, and invertebrates will likely decrease proportionally, or remain the same. In the circumstances, FNZ does not consider any of the options presented pose a significant risk to the long-term viability of associated and dependent species.

Marine mammals

61. The deepwater trawl fleet targeting orange roughy in ORH 3B rarely interacts with marine mammals. As such, the capture rate of marine mammals in ORH 3B target tows is low. In the ten years between the 2011/12 and 2021/22 fishing years, there was only one observed New

Zealand fur seal capture from tows targeting orange roughy.²³ New Zealand fur seals have a New Zealand Threat Classification of 'Not Threatened,' and the fur seal population is considered to be increasing in both abundance and distribution (FNZ – AEBAR, 2021). There were no other fisher-reported marine mammal captures in the orange roughy fishery in this period. Based on observed mammal capture rates, the risk to marine mammals in orange roughy fisheries is very low relative to other deepwater trawl fisheries.

62. The DWC's voluntary *Marine Mammal Operational Procedures* guide risk management and reporting procedures for vessels to reduce the risk of incidental capture as well as ensure safe handling and proper data collection regarding marine mammal captures.

Seabirds

63. Management of seabird interactions with New Zealand's commercial fisheries is guided by the National Plan of Action to Reduce the Incidental Captures of Seabirds (**NPOA-Seabirds 2020**). The NPOA-Seabirds 2020 establishes a risk-based approach to managing fishing interactions with seabirds, targeting management actions at the species most at risk as a priority but also aiming to minimise captures of all species. Deepwater trawl fisheries contribute 2% of the overall risk to seabirds (Richards *et al.*, 2020).
64. Regulations requiring the use of seabird scaring devices by the deepwater trawl fleet (vessels greater than 28 metres in length) have been in place for over 15 years. Mandatory requirements are set out in the Seabird Scaring Devices Circular 2010 No. F517, which is issued pursuant to regulation 58A of the Fisheries (Commercial Fishing) Regulations 2001.
65. Additionally, a range of non-regulatory measures have been in place for a similar period of time. The measures are set out in vessel-specific Protected Species Risk Management Plans (**PSRMPs**) and include measures such as fish waste management practices and the deployment of additional seabird scaring devices at times of heightened risk. All deepwater trawl vessels have had a PSRMP for over 15 years. FNZ monitors and audits performance against these plans. Information on adherence to PSRMPs by all vessels is reported in FNZ Seabird Annual Reports and, for the deepwater fleet, in FNZ Annual Review Reports.²⁴
66. The orange roughy trawl fleet rarely interacts with seabirds. Based on observed seabird capture rates, the risk to seabirds in orange roughy fisheries is very low relative to other fisheries. In the ten years between the 2010/11 and 2019/20 fishing years, a total 16 birds were captured from 6,276 observed tows, which equates to a capture rate of 0.25 birds per 100 tows. Over this period, the average annual observer coverage was 25%.

Fish and invertebrate bycatch

67. Anderson & Finucci (2022) summarised the bycatch of orange roughy trawl fisheries from 2002/03 to 2019/20. Orange roughy accounted for approximately 80% of the total observed catch and the remainder comprised mainly black oreo, smooth oreo, rattails, shovelnose dogfish, and ribaldo. There are no sustainability concerns for any of these stocks. Assuming that a reduction to the ORH 3B TACC results in less fishing effort, we would expect that fishing pressure on these species would also decrease, and would result in a reduction of bycatch of these affected stocks, all other things being equal. Anderson & Finucci (2022) also found that total estimated annual discards of non-target QMS species were very low, and that invertebrate species were caught in low numbers.
68. Management of shark species in New Zealand is guided by the National Plan of Action for Sharks (**NPOA-Sharks 2013**).²⁵ FNZ will continue to monitor interactions with deepwater sharks in orange roughy fisheries and consider management action if impacts are found to pose a sustainability risk to any deepwater shark species. A reduction to the ORH 3B TACC would likely reduce the incidental capture of deepwater sharks, all other things being equal.

²³ However, FNZ notes that in that period the average annual observer coverage level for ORH 3B was about 25%. Given this, there is some uncertainty associated with estimates of environmental interactions in the fishery.

²⁴ Seabird Annual Reports and deepwater fisheries Annual Review Reports are available on [FNZ's website](#).

²⁵ The revised plan, *National Plan of Action for the Conservation and Management of Sharks 2023 (NPOA – Sharks 2023)*, is expected to be published in September 2023.

69. In the ten years between the 2010/11 and 2019/20 fishing years, there were two reported basking shark captures in orange roughy fisheries, one of which was observed and released alive.

Protected corals

70. Benthic faunal communities on deep-water seamount features are commonly characterised by extensive growth of branching stony corals, which are protected. Bottom trawling for orange roughy can have an impact on these coral groups as well as other fragile invertebrate fauna (Anderson & Finucci, 2022).
71. A recent study assessing the risk of commercial fishing on corals analysed the presence-absence of protected coral bycatch from different fisheries within New Zealand's Territorial Sea, EEZ, and surrounding high seas areas for the 2007/08 – 2019/20 fishing years. This study found that fisheries targeting orange roughy, particularly those on the high seas, have the highest interaction with corals (fishing events in which the presence of coral captures is reported). Within the EEZ, FMA 4 (which corresponds to the Chatham Rise, and therefore includes the ESCR and the NWCR) is the FMA with the highest catch rate of coral per 100 tows (Meyer, 2023).
72. There is evidence that recolonisation and regrowth of deep-sea corals on previously heavily trawled deep-sea features can take place but that the process of recovery is slow, with the first detectable signs of coral recruitment and regrowth occurring approximately two decades after the cessation of trawling (Clark *et al.*, 2022).
73. FNZ considers that fishing effort, and therefore the trawl footprint, is likely to decrease under any of the proposed options in the short term. In the longer term, fishers may choose to trawl on different areas as they apply more effort to flat areas with longer trawl tows, as discussed under the '*Fishery characteristics*' heading, but these are sandy areas that generally have lower biodiversity than areas dominated by hard substrates, such as pinnacles and other underwater topographical features.

6.4.2 Biological diversity of the aquatic environment – section 9(b) of the Act

74. Bottom trawling effort for orange roughy interacts with the seabed and the associated benthic environment. This may lead to the disturbance or loss of some benthic habitat and in turn a reduction in biodiversity. The nature and extent of those impacts depends on a range of factors such as seafloor type (e.g., mud, sand, or rock), gear type, types of organisms encountered, and oceanographic characteristics. Contact of the trawl gear with the seabed can lead to bycatch of benthic organisms including corals, sponges, and sea anemones. About 10% of observed orange roughy target tows in FMAs 4 and 6 from 2002/03 to 2019/20 included coral bycatch (Anderson & Finucci, 2022).
75. The environmental impacts of fishing are summarised annually by FNZ in the Annual Review Report for Deepwater Fisheries as well as the Aquatic Environment and Biodiversity Annual Review 2021.
76. The impact of tows on the benthic environment (the trawl footprint) is mitigated by the spatial concentration of the fishery where vessels typically trawl along previously trawled tow lines. FNZ monitors and maps the trawl footprint and the cumulative fishable area contacted by trawl fishing (Baird & Mules, 2023).
77. The trawl footprint in ORH 3B between 1990 and 2021 was estimated to be 10,389 km² of the seabed in the ESCR sub-area, and 7,056 km² of the seabed in the NWCR sub-area, at depths of 800 m to 1,600 m. Although most orange roughy fishing occurs within areas that have been fished for a number of years, and it is estimated that there is very little 'new' area trawled each year, MacGibbon & Mules (2023) note the trawl footprint of 2,025 km² is the second highest footprint in the time series, behind 2,849 km² in 1990.
78. There is little information on biodiversity on flat soft sediment areas and as a result the effect of trawling these areas on biodiversity is unknown. The impact of trawling is likely to be less on

soft sediment environments found on flat areas than on rocky features. Flat areas are inhabited by more, short-lived burrowing organisms that are more resilient to trawl impact than hard substrate environments, where organisms are longer lived and more fragile.

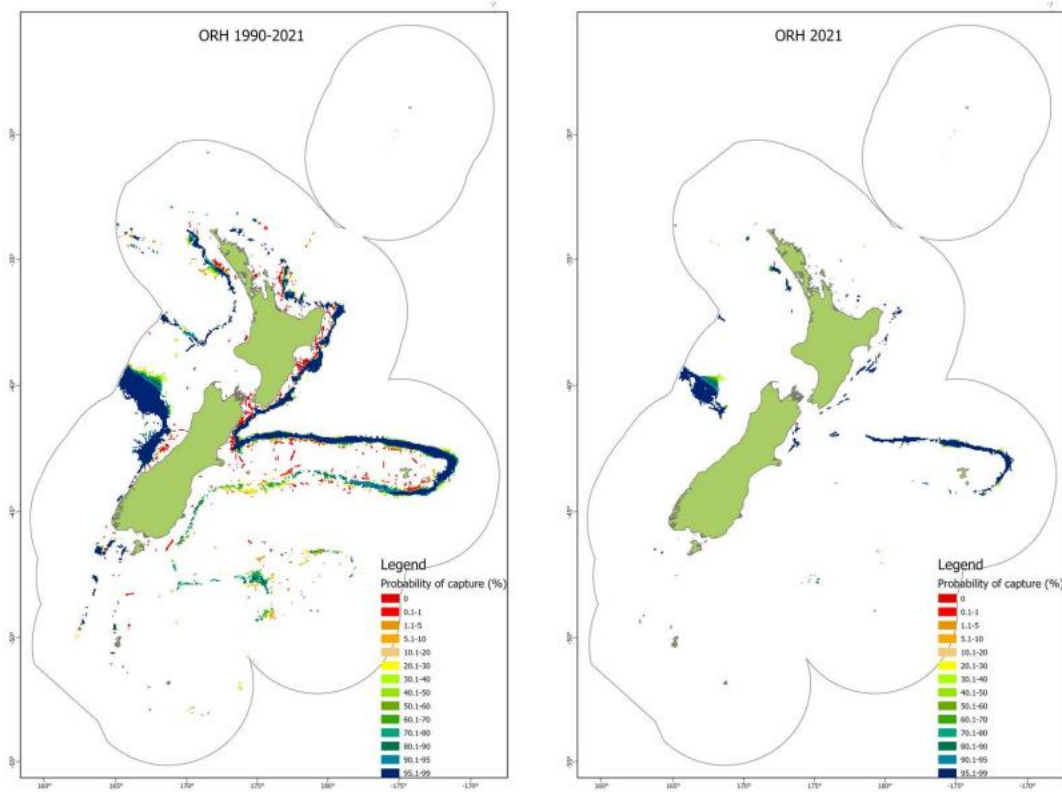


Figure 6: Distribution of the 1990-2021 (left) and the 2021 trawl footprint (right) for orange roughy (Baird & Mules, 2023)

79. The annual trawl footprint of the orange roughy fishery will continue to be mapped and monitored by FNZ.

6.4.3 Habitat of particular significance for fisheries management – section 9(c) of the Act

80. Habitat of particular significance for fisheries management is not defined in the Act. FNZ recently consulted on draft guidelines for identification of habitats of particular significance for fisheries management and the operational proposals to support its application. In this context, protection means taking measures that would avoid, remedy, or mitigate the adverse effect of a decision that could undermine the function the habitat provides for the fisheries resource and ecosystem.
81. There is no specific habitat of particular significance identified within ORH 3B at this time. Information that may inform our understanding of potential habitat of particular significance for ORH 3B is discussed in Table 2 below.
82. While no habitat of particular significance has been identified for ORH 3B, FNZ notes that the TAC options proposed are unlikely to result in any increase in adverse effects on any significant habitat in ORH 3B, since all options are TAC decreases, and fishing effort is therefore expected to decline or remain the same.

Table 2: Summary of information on potential habitat of particular significance for fisheries management for ORH 3B.

Fish stock	Orange roughy (ORH 3B)
Potential habitat of particular significance	<ul style="list-style-type: none"> Spawning grounds above seamounts, knolls, and hills, particularly depths between 700 m and 1,000 m and associated with underwater topographic features– pinnacles and canyons. Mace et al. (1990) identified one area of high abundance for juvenile orange roughy at 800–900 m depth about 150 km east of the main spawning ground on the north Chatham Rise. Larger juveniles are widespread.
Attributes of habitat	<ul style="list-style-type: none"> Continental shelf and slope, seamounts, dense spawning aggregations between June and early August Dunn et al. (2009) note that juvenile orange roughy are generally found close to the seabed, and in shallower water than the adults, from depths of around 850–900 m and spreading to deeper water, and over a wider depth range, as they grow. Dunn and Forman (2011) note that seamounts and other topographic features tend to be dominated by the largest orange roughy. It is not known if there are any direct linkages between the congregation of orange roughy around features and the corals found on those features.
Reasons for particular significance	<ul style="list-style-type: none"> Spawning is critically important in supporting the productivity and recruitment of orange roughy.
Risks/threats	<ul style="list-style-type: none"> Long term ocean current and circulation patterns could be impacted by climate change (sea surface temperature change and changes to wind patterns). Bottom trawling for orange roughy has the potential to affect features of the biogenic habitat that have potential to be habitat of particular significance to fisheries management.
Existing protection measures	<ul style="list-style-type: none"> Management measures have focused on avoiding interactions with the seabed and benthic environment through closing areas to bottom trawling, starting with five seamount closures in 2001 within the ESCR and NWCR ORH 3B sub-areas – Pinnie, the Morgue and Pyre/Gothic group, Diamond Head, and Seamount 328. The implementation of Benthic Protection Areas (BPAs) in 2007 closed some areas to bottom trawling. Three of the BPAs are within the ESCR and NWCR ORH 3B sub-areas – Mid Chatham Rise, East Chatham Rise, and Blink.
Evidence	<ul style="list-style-type: none"> Mace, P; Fenaughty, J; Coburn, R; & Doonan, I. (1990) Growth and productivity of orange roughy (<i>Hoplostethus atlanticus</i>) on the north Chatham Rise. <i>New Zealand Journal of Marine and Freshwater Research</i> 24: 105–119 Dunn, M; Rickard, G; Sutton, P; & Doonan, I. (2009) Nursery grounds of the orange roughy around New Zealand. <i>ICES Journal of Marine Science</i> 66: 871–885. Dunn, M; & Forman, J. (2011) Hypotheses of spatial stock structure in orange roughy <i>Hoplostethus atlanticus</i> inferred from diet, feeding, condition, and reproductive activity. <i>PLoS ONE</i> 6(11): e26704. O’Driscoll, R; Booth, J; Bagley, N; Anderson, O; Griggs, L; Stevenson, M; & Francis, M. (2003) Areas of importance for spawning, pupping or egg-laying, and juveniles of New Zealand deepwater fish, pelagic fish, and invertebrates. <i>NIWA Technical Report 119</i>. 377 p.

6.5 Considerations for setting sustainability measures under section 11 of the Act

83. Section 11 of the Act sets out various matters that you must take into account or have regard to when setting or varying sustainability measures (such as the TAC changes proposed as part of this review). These include:

- a) any effects of fishing on any stock and the aquatic environment; and
- b) any existing controls under the Act that apply to the stock or area concerned; and

- c) the natural variability of the stock concerned; and
- d) any relevant planning instruments, strategies, or services.²⁶

6.5.1 Effects of fishing on any stock and the aquatic environment – section 11(1)(a)

- 84. You must take into account any effects of fishing on any stock and the aquatic environment when making your decision about the ORH 3B TAC.
- 85. “Effect” is defined widely in the Act.²⁷ The broader effects of removing orange roughy from the ecosystem as well as the more direct effects of trawling must be taken into account.
- 86. There is scope for you to consider non-regulatory industry arrangements with regards to the effects of fishing on the ORH 3B stock and the environment. This includes the existing sub-areas catch split arrangement as discussed under ‘*Management background*’.
- 87. FNZ considers that voluntary sub-area catch limits are not a substitute for a properly set TAC and TACC. However, when making your decision, you may take into account the effect that any voluntary sub-area catch limits are expected to have on the level of biomass. This includes whether the resulting reduction in the level of orange roughy being removed from ORH 3B, in line with those voluntary sub-area catch limits, will contribute to the biomass being restored to a level that will produce the MSY. FNZ notes that the expectation that the commercial fishing industry will adhere to voluntary measures has been considered when reviewing a TAC in other fisheries (e.g. HOK 1 in 2022, and PAU 4 in 2019).
- 88. Effects of orange roughy fishing on any stock and the aquatic environment are discussed above under ‘*Environmental principles*’, and below under ‘*Total Allowable Catch - section 13 of the Act*’ and ‘*Options and analysis*’.

6.5.2 Existing controls that apply to the stock or area – section 11(1)(b)

- 89. In setting or varying a sustainability measure you must take into account any existing controls under the Act (including rules and regulations made under the Act (section 2(1A)) that apply to the stock when setting or varying the TAC.
- 90. Spatial restrictions set under the Act can be put in place to ensure sustainable utilisation or to protect habitat of particular significance for fisheries management. There are several spatial restrictions currently in place that apply to ORH 3B. These management measures address the effects of trawl activity and focus on avoiding benthic impacts.
- 91. Areas closed to trawling consist of the 19 Seamount Closures implemented in 2001 (including seamounts, knolls, and hills) and the 17 Benthic Protection Areas (BPAs) established in 2007 to avoid adverse effects of fishing on the benthic environment (Figure 7). Five of the Seamount Closures are within the ESCR and NWCR sub-areas. Three of the BPAs are within the ESCR and NWCR sub-areas.

²⁶ Sections 11(2) and (2A).

²⁷ Section 2(1) of the Act defines “effect” to mean the direct or indirect effect of fishing, and includes any positive, adverse, temporary, permanent, past, present, or future effect. It also includes any cumulative effect, regardless of the scale, intensity, duration, or frequency of the effect, and includes potential effects.

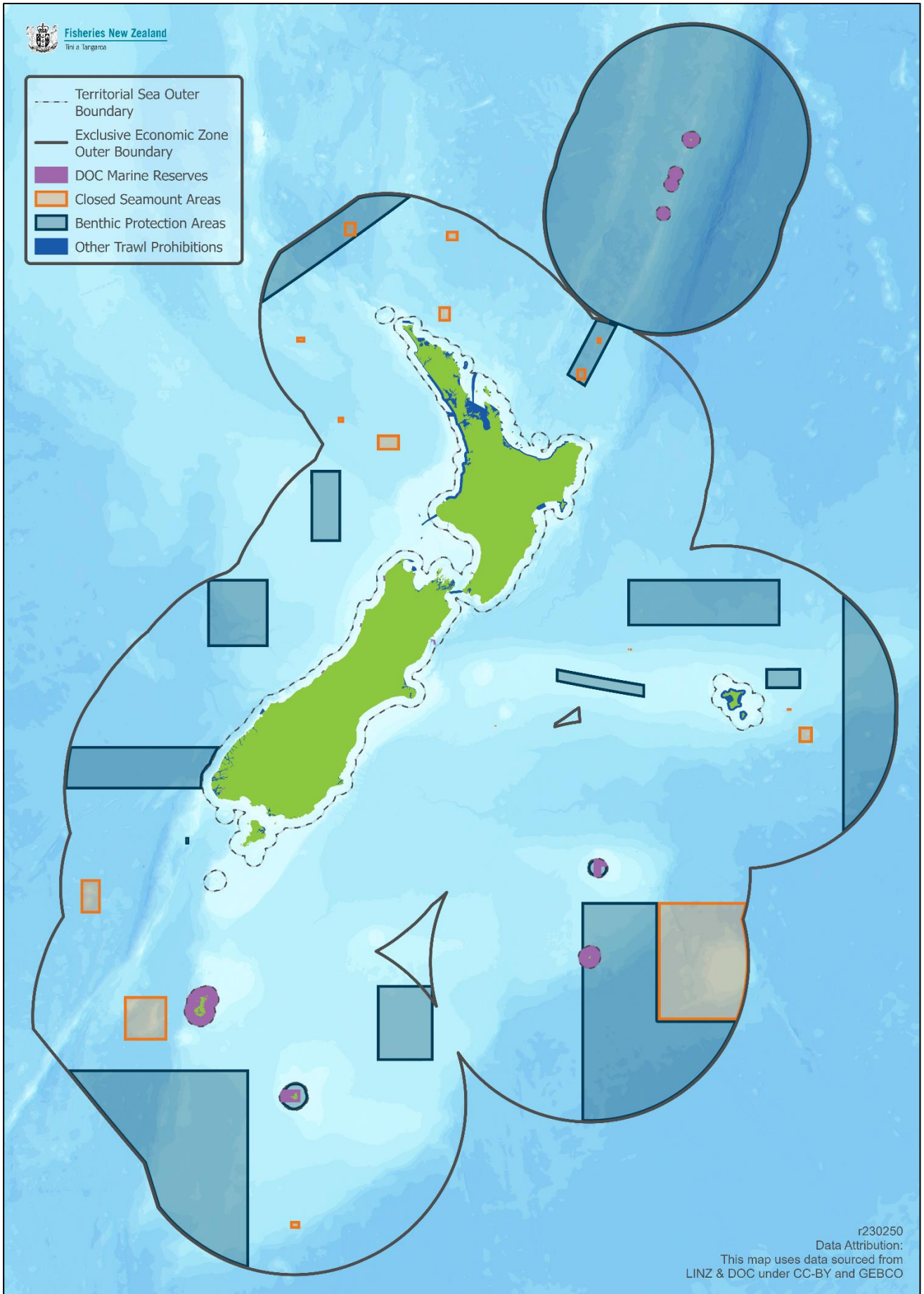


Figure 7: Location of Benthic Protected Areas (BPAs) within New Zealand's EEZ.

6.5.3 The natural variability of the stock – section 11(1)(c)

92. In setting or varying a sustainability measure you must take into account the natural variability of the stock.
93. Due to their low natural mortality rate, relatively low fecundity and hyperstability, orange roughy populations show relatively low natural variability. As a consequence, orange roughy are particularly susceptible to overfishing, and orange roughy fisheries have collapsed in the past, hence justifying caution when setting catch limits.

6.5.4 Relevant statements, plans, strategies, provisions, and documents - section 11(2)

94. In setting or varying the TAC of this stock, you must have regard to the following statements, plans, strategies, provisions, and planning documents under section 11(2) of the Act, that apply to the coastal marine area and that you consider to be relevant.
95. Four Regional Councils have coastlines within the boundaries of ORH 3B: Canterbury, Otago, Southland, and Chatham Islands. Each region has policy statements and plans to manage the coastal and freshwater environments, including terrestrial and coastal linkages, ecosystems, and habitats.
96. FNZ has reviewed these documents and the provisions that might be considered relevant are provided in Table A1 of Addendum 1 of the *Introduction and Legal Overview* chapter within the 'Review of sustainability measures for the 2023 October round' document. FNZ considers that the management options proposed for ORH 3B are consistent with the objectives of these relevant regional plans, which generally relate to the maintenance of healthy and sustainable ecosystems to provide for the needs of current and future generations.

6.5.5 Relevant services or fisheries plans – section 11(2A)

97. Under section 11(2A) of the Act, before setting or varying any sustainability measure or making any decision or recommendation under the Act to regulate or control fishing, you must take into account -
 - a) any conservation services or fisheries services; and
 - b) any relevant fisheries plan approved under this Part; and
 - c) any decisions not to require conservation services or fisheries services.
98. Fisheries services of relevance to the options in this paper include the research used to monitor the fishery and tools used to enforce compliance of management controls in the fishery. The research used to monitor this fishery has been discussed in detail above under 'Management background' and 'Status of the stock'. Compliance with controls in the ORH 3B fishery is monitored by on-board observers and followed up by Fisheries Compliance if needed. The observer coverage relevant to the ORH 3B fishery is described above under the 'Other sources of mortality caused by fishing' and 'Environmental principles – section 9 of the Act'.
99. There are no applicable conservation services that specifically relate to ORH 3B, or any decisions not to require conservation services or fisheries services.

National Fisheries Plan for Deepwater and Middle-depth Fisheries

100. The National Fisheries Plan for Deepwater and Middle-depth Fisheries (**National Deepwater Plan**)²⁸ provides an integrated, transparent way of defining management objectives, actions, and services required to meet relevant legislative obligations and strategic directions for managing New Zealand's deepwater fisheries, including orange roughy. The National Deepwater Plan also provides a reporting mechanism to measure progress towards meeting objectives.

²⁸ <https://www.mpi.govt.nz/dmsdocument/18779-National-Fisheries-Plan-for-Deepwater-and-Middle-depth-Fisheries-Part-1A>

101. All orange roughy stocks are managed as Tier 1 stocks within the National Deepwater Plan. Tier 1 stocks are high volume and/or high value target fisheries. A species-specific chapter of the National Deepwater Plan for orange roughy was completed in 2012. The National Deepwater Plan sets out a series of Management Objectives for deepwater fisheries, the most relevant to ORH 3B being:
- **Management Objective 1:** Ensure the deepwater and middle-depth fisheries resources are managed so as to provide for the needs of future generations.
 - **Management Objective 4:** Ensure deepwater and middle-depth fish stocks and key bycatch fish stocks are managed to an agreed harvest strategy or reference points.
102. The National Deepwater Plan is a formally approved section 11A plan that you must take into account when making sustainability decisions. The proposed options for ORH 3B are consistent with the Management Objectives in the plan, including those outlined above.

6.5.6 Other plans and strategies

103. The following plans and strategies are not mandatory considerations under section 11 of the Act, but they may be considered relevant to this review.

Te Mana o te Taiao (Aotearoa New Zealand Biodiversity Strategy)

104. Te Mana o te Taiao, the Aotearoa New Zealand Biodiversity Strategy, sets a strategic direction for the protection, restoration and sustainable use of biodiversity, particularly indigenous biodiversity, in Aotearoa New Zealand.²⁹ The Strategy sets a number of objectives across three timeframes. The most relevant to setting sustainability measures for ORH 3B are objectives 4, 10, and 12:
- **Objective 4:** Improved systems for knowledge, science, data, and innovation inform our work
 - **Objective 10:** Ecosystems and species are protected, restored, resilient and connected from mountain tops to ocean depths.
 - **Objective 12:** Natural resources are managed sustainably.
105. For Objective 4, FNZ is working with science providers to review and evaluate the data that feeds into the stock assessment model (for example, reading more otoliths³⁰ to enhance the age-length database, and re-examining the variables that inform the stock assessment model). For Objectives 10 and 12, FNZ is progressing to a more integrated ecosystem-based approach to managing oceans and fisheries. In that context, this review contains information on biodiversity impacts, ecosystem function, and habitat protection associated with adjustments to sustainability measures (see '*Environmental principles*' above).

DWC Orange Roughy and Oreo Operational Procedures

106. The fishing industry, through the DWC, has developed Orange Roughy and Oreo Operational Plans that outline voluntary management measures, including voluntary sub-area catch limits as well as how operators report to the DWC. Further detail on the OPs is outlined above in '*Management background*').
107. The DWC Deepwater Trawl Benthic Operational Procedures 2022-23 help to mitigate benthic interactions. This document outlines voluntary procedures to avoid catching corals, how industry respond if corals are accidentally caught, and lists reporting requirements.

²⁹ <https://www.doc.govt.nz/nature/biodiversity/aotearoa-new-zealand-biodiversity-strategy/>

³⁰ The 'ear bones' of fish. Otoliths develop annual growth rings that can be counted to estimate the fish's age.

6.6 Information principles: Uncertainties and unknowns - section 10 of Act

108. Under section 10 of the Act, decision-makers are required to take into account four information principles:
- a) decisions should be based on the best available information.³¹
 - b) decision makers should consider any uncertainty in the information available in any case;
 - c) decision makers should be cautious when information is uncertain, unreliable, or inadequate;
 - d) the absence of, or any uncertainty in, any information should not be used as a reason for postponing or failing to take any measure to achieve the purpose of this Act.
109. FNZ considers that the information presented in this paper represents the best available information. In various parts of this paper, FNZ has pointed out where information is uncertain and warrants caution for your decision making, in line with the principles above.
110. While the status of the NWCR and Puysegur relative to *MSY* has been estimated, the status of the much larger ESCR sub-stock fishery relative to *MSY*, is unknown. Uncertainties in the information regarding the status of the stock are noted under the '*Status of the stock*' heading.
111. In addition, further work is required to resolve several issues and to finalise a stock assessment. Recommended further work includes significant work to be done in ageing of orange roughy otoliths, acoustic surveys, and stock assessment methodology.
112. The 2023 characterisation of the ESCR orange roughy sub-stock revealed information from the commercial fishery, including unstandardised CPUE, and estimates of spawning biomass from acoustic surveys that are inconsistent with biomass and trends estimated by the recent (2020) stock assessment model for the ESCR sub-area.
113. You should therefore be cautious in light of this uncertainty. However, it is important to note that (as emphasised in section 10(d) of the Act) uncertainty should not be used as a reason for postponing or failing to take any measure to achieve the purpose of the Act. FNZ considers that a decision is required to increase the size of the stock, given the uncertainty in the available information, and the options presented below are consistent with this.

6.7 Total Allowable Catch - section 13 of the Act

114. As outlined above under '*Status of the stock*' above, the best available information on the status of ORH 3B includes:
- A full characterisation of available data for the ORH 3B ESCR and NWCR sub-stocks (spawning biomass estimates from acoustic surveys, unstandardised CPUE and catch-effort information).
 - A stock assessment for the NWCR sub-stock from 2018, which has been retained for 2023 with some qualifications and re-considered status.
 - For the NWCR where there is a large divergence between catch and agreed sub-area catch limit, only 17% of the sub-area catch limit was caught in the 2021/22 fishing year.
 - Recent acoustic survey information for the ESCR indicates biomass is flat or declining in some areas, which is inconsistent with previous stock assessments.
115. The status of ORH 3B in relation to the *MSY* is unable to be reliably estimated using the best available information outlined above. This means section 13(2A) is the relevant provision when setting a TAC for ORH 3B. The best available information indicates a sustainability concern for some areas of ORH 3B, and because of the increased uncertainty in our understanding of ORH 3B, we are recommending a more cautious TAC setting than the current setting. This is reinforced by the need to have regard to the biological characteristics of the stock including

³¹ Section 2(1) of the Act defines "best available information" to mean "the best information that, in the particular circumstances, is available without unreasonable costs, effort, or time."

longevity and low productivity (discussed below under '*Biological characteristics*' and above in '*Biology*') hence the large catch limit reductions being proposed under section 13(2A) of the Act.

116. For the purpose of setting TACs under section 13(2A), if you consider that the current level of the stock, or the level of the stock that can produce the *MSY* is not able to be estimated reliably using the best available information, you must—
- (a) not use the absence of, or any uncertainty in, that information as a reason for postponing or failing to set a total allowable catch for the stock; and
 - (b) have regard to the interdependence of stocks, the biological characteristics of the stock, and any environmental conditions affecting the stock; and
 - (c) set a total allowable catch—
 - (i) using the best available information; and
 - (ii) that is not inconsistent with the objective of maintaining the stock at or above, or moving the stock towards or above, a level that can produce the maximum sustainable yield.
117. FNZ has concerns the ORH 3B stock may be below the level that can produce the *MSY*, but it is uncertain what the B_{MSY} level is and where the stock is relative to this. Your obligation is to set a TAC that is not inconsistent with the objective of moving the stock towards or above a level that can produce the *MSY*. Consequently, the greater the TAC reduction, the greater the certainty and the faster the rate of moving the stock towards a level that can produce *MSY*.
118. Section 13(3) requires you to have regard to such social, cultural, and economic factors you consider relevant when considering the way in which and rate at which a stock is moved towards or above a level that can produce the *MSY*. The best available information to assist your assessment of the social, cultural, and economic factors under section 13(3), when considering 'way and rate', is provided under the '*Way and rate at which a stock is moved towards a level that can produce the MSY*' subheading below, and further under '*Options and analysis*'.

6.7.1 Biological characteristics

119. Biological characteristics of orange roughy that you must have regard to when setting a TAC under section 13(2A) of the Act are discussed under '*Biology*' above. The biological characteristics of orange roughy (longevity and low fecundity, as well as hyperstability) mean that orange roughy populations are particularly vulnerable to high fishing pressure.

6.7.2 Interdependence of stocks

120. There is little information available regarding predator/prey interdependencies for orange roughy. Larger orange roughy have been observed with healed flesh wounds that may be caused by deepwater dogfish, and giant squid and sperm whales are also thought to prey on orange roughy (FNZ – Fisheries Assessment Plenary, 2023). It is unlikely that any of these species are dependent on orange roughy as a food source, however. Since all three options proposed involve reductions in the TAC designed to increase the size of the stock, it would be reasonable to assume that there would be no increase in adverse effects on interdependent predating species. The impact of increased orange roughy abundance on their prey species is unknown.
121. It is unlikely that any reduction to the orange roughy TAC would negatively impact bycatch of other associated species in the deepwater trawl fishery. The main QMS species other than orange roughy that are taken in the orange roughy target fishery are listed under '*Fish and invertebrate bycatch*' above. There are no sustainability concerns for these species. Bycatch of these species is expected to decline as a result of less effort applied to orange roughy fishing under all proposed options.

6.7.3 Environmental conditions affecting the stock

122. Environmental conditions affecting the stock are considered above under '*Habitats of particular significance for fisheries management*'. FNZ is not aware of any specific environmental conditions adversely affecting ORH 3B that you should have regard to in deciding on an appropriate TAC.

6.7.4 Harvest Strategy Standard

123. Section 13 of the Act provides for the setting of a TAC, and guidance is provided by the Harvest Strategy Standard (**HSS**). The High Court has held that the HSS is an implied mandatory relevant consideration that you must have regard to when setting a TAC under section 13 of the Act.³²
124. The HSS 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 QMS. It is intended to provide guidance on how fisheries law will be applied in practice, by establishing a consistent and transparent framework for decision-making to achieve the objective of providing for utilisation of New Zealand's QMS species while ensuring sustainability.
125. The HSS outlines FNZ's approach to relevant sections of the Act and forms a core input to FNZ's advice to you on the management of fisheries. The HSS defines a hard limit as a biomass limit below which fisheries should be considered for closure and a soft limit as a biomass limit below which the requirement for a formal time-constrained rebuilding plan is triggered.
126. In keeping with the HSS, a harvest control rule (**HCR**) for ORH 3B was developed, based on the management strategy evaluation (**MSE**) which was reviewed and accepted by the FNZ stock assessment working group as a basis for setting the TAC and TACC. The MSE recommends a management target range for orange roughy of 30-50% of B_0 , a soft limit of 20% of B_0 , and a hard limit of 10% B_0 .
127. The rejection of the stock assessment modelling in 2023 calls into question the MSE underpinning the HCR. Further, because the stock status of the ESCR is unknown, the status of ORH 3B relative to B_{MSY} and therefore its status with respect to the soft limit and hard limit is also unknown due to the lack of an assessment. Therefore, there is limited relevance in the context of reference points specified under the HSS.
128. However, the HSS notes that for new or developing fisheries that may have little information about the size of the stock or stock status - a characteristic shared with ORH 3B – the fishery should be managed cautiously. The HSS further notes that the fishing mortality rate should not exceed F_{MSY} and should probably be lower. Where F_{MSY} (that is, the level of fishing mortality that will achieve maximum sustainable yield) is unknown (as is the case with ORH 3B) it may be approximated by assuming that F_{MSY} is equivalent to M , natural mortality. This approach is the basis for Option 3.

6.7.5 Way and rate at which a stock is moved towards a level that can produce the MSY

129. Section 13(3) states "*In considering the way in which and rate at which a stock is moved towards or above a level that can produce maximum sustainable yield under subsection (2)(b) or (c), or (2A) (if applicable), the Minister shall have regard to such social, cultural, and economic factors as he or she considers relevant.*"
130. FNZ views that a consideration of the way and rate at which the stock is moved towards or above a level that can produce the MSY is applicable in your decision to set the TAC under section 13(2A) of the Act. Given the unknown stock status, FNZ does not have the available information to advise on an appropriate way and rate. As noted in '*Options and analysis*',

³² *Fisheries Inshore New Zealand Ltd v Royal Forest and Bird Protection Society of New Zealand Incorporated* [2023] NZCA 359.

Option 3 is likely to help move the stock towards a level that can produce the *MSY* (the 'way') at faster rate than Option 1 and Option 2.

131. In your consideration of the way and rate, you also shall have regard to social, cultural, and economic factors you consider relevant, but noting that the priority is to set a TAC that is consistent with moving the biomass of the stock towards a level that can produce the *MSY*. Social and cultural factors to have regard to include the objectives of Te Waipounamu Iwi Fisheries Plan and Chatham Island Fisheries Forum plan, described above in '*Kaitiakitanga*'. The TAC reduction proposed under each option has the potential to improve sustainability of the fishery, which will likely help ensure both long-term commercial activity and economic development opportunities for South Island iwi and Chatham Islands iwi and imi quota holders.
132. Relevant economic factors to have regard to include the potential loss in annual export earnings following a reduction to the TAC setting, discussed in more detail below under '*Economic considerations*'. The impact of the reduced TACC on employment (both directly in the fishery and indirectly related to the fishery) is not quantified but is likely to be negative. Offsetting this forgone revenue, any orange roughy catch not taken in the short to medium term would likely be available to catch when stock abundance increases sufficiently, given its low natural mortality. In addition, the long-term economic benefits associated with a rebuilt stock include the ability to harvest at sustainable levels and to provide assurance for customers that the stock is being managed sustainably.

7 Submissions

133. In total, 31 submissions and responses were received. No submissions supporting Option 1 or Option 2 were received. Nine submitters supported Option 3, and three submitters did not support any proposed option or provide an alternative option. Two eNGOs supported the alternative option proposed by Environment & Conservation Organisations of NZ (**ECO**), and 16 submissions from industry supported an alternative option proposed by DWC. One submitter (**ELI**) recommended an emergency closure for ORH 3B. Table 3 summarises the submissions received.
134. Submitters' and respondents' comments on the proposed options are addressed under the '*Options and analysis*' below.

Table 3: Written submissions and responses received for ORH 3B.

Submitter	Option supported				
	1	2	3	Other	Notes
Royal New Zealand Society for the Prevention of Cruelty to Animals (RNZSPCA)			✓		
J. Goldsack			✓		
J. van Rens			✓		
J. Brown			✓		
K. Taylor			✓		
M. Ward			✓		
R. L. Schiff			✓		
S. Fitzjohn			✓		
W. Begley			✓		
Deepsea Conservation Coalition (DSCC)				-	No options supported. DSCC supports the closure of any areas in ORH 3B for which there are no reliable stock assessments.
Environment & Conservation Organisations of NZ (ECO)				✓	Use $F=M$ approach as per Option 3, but use $M = 0.030$
Environmental Defence Society				✓	Set TAC at 2012/13 level of 3,600 tonnes

Submitter	Option supported				
	1	2	3	Other	Notes
Environmental Law Initiative (ELI)				✓	ELI's view is that you should seek advice on immediate emergency closure of the ORH 3B fishery pending further investigation
Forest & Bird				✓	Use $F=M$ approach but use $M = 0.030$
Greenpeace				-	Endorses DSCC's submission
M. Nissan				-	No options supported. No alternative provided.
Maruehi Fisheries Ltd				✓	Reduce TAC by 27% (average catch 2010/11- 2021/22)
New Zealand Federation of Commercial Fishermen (NZFCF)				✓	Reduce TAC by 27% (average catch 2010/11- 2021/22)
Ngāruahine Fisheries Ltd				✓	Reduce TAC by 27% (average catch 2010/11- 2021/22)
Ngāti Mutunga o Wharekauri Asset Holding Co Ltd (Ngāti Mutunga)				✓	Reduce TAC by 27% (average catch 2010/11- 2021/22)
Ngāti Tama ki te Waipounamu Trust (Ngāti Tama)				✓	Reduce TAC by 27% (average catch 2010/11- 2021/22)
Ngātiwai Trust Board				✓	Reduce TAC by 27% (average catch 2010/11- 2021/22)
R. Wilson				✓	There should be a ten-year moratorium on ORH fishing.
Raukawa Asset Holding Company Limited (RAHC)				✓	Reduce TAC by 27% (average catch 2010/11- 2021/22)
Seafood New Zealand Deepwater Council (DWC)				✓	Reduce TAC by 27% (average catch 2010/11- 2021/22)
Sealord Group Ltd				✓	Reduce TAC by 27% (average catch 2010/11- 2021/22)
Talley's Group Ltd				✓	Reduce TAC by 27% (average catch 2010/11- 2021/22)
Taranaki Iwi Fisheries Ltd (TIFL)				✓	Reduce TAC by 27% (average catch 2010/11- 2021/22)
Te Ohu Kaimoana				✓	Reduce TAC by 27% (average catch 2010/11- 2021/22)
Te Pataka o Tangaroa				✓	Reduce TAC by 27% (average catch 2010/11- 2021/22)
Te Runanga a Rangitāne o Wairau (Rangitāne)				✓	Reduce TAC by 27% (average catch 2010/11- 2021/22)

8 Options and analysis

135. The current settings are presented below, as well as the three options consulted on to reduce the TAC of ORH 3B under section 13(2A) of the Act. Within each of these options to reduce the TAC, it is proposed that the allowance for other sources of mortality and the TACC are decreased.

Management of biological sub-stocks within ORH 3B

136. A long-standing voluntary sub-area catch limit arrangement is in place for ORH 3B to manage the biological sub-stocks within the TACC (described above in '*Management background*' and '*Other plans and strategies*'). Some environmental stakeholders have raised concerns about the use of non-regulatory measures to give effect to a catch splitting arrangement.

137. Currently, there is no way for you as part of setting a TAC to compel any kind of sub-area catch limit within the existing ORH 3B boundaries, because the TAC applies to all of ORH 3B. In the past, the commercial fishing industry has both supported and promoted the voluntary sub-area catch limit arrangement and has expressed a commitment to do the same in the future. In previous sustainability decisions, Ministers have expressed their expectation that industry would adhere to the voluntary sub-area catch limits, and industry has generally done so. You may take into account the effect that the voluntary sub-area catch limits are expected to have on the level of biomass (see '*Effects of fishing on any stock and the aquatic environment*' above).

138. None of the proposed options address the feedback from some stakeholders that some sub-areas within ORH 3B, particularly the NWCR, should also be adjusted at this time. The most

recent NWCR stock assessment (2018) remains the best available information, but the stock status has been reinterpreted to be “*Unlikely to be below the Soft and Hard Limits based on the 2022 acoustic survey results*” (refer ‘*Status of the Stocks*’). However, results from spawning stock biomass estimates from the 2022 acoustic survey show that abundance in one area surveyed (the Graveyard) is at a very low level, highlighting the issue of localised depletion within these sub-areas. Additionally, the concentration of fishing effort in the ESCR suggests any change specific to these other areas would be unlikely to reduce actual fishing effort in these areas.

139. Since a TAC applies to a whole QMA, it is not the best tool for addressing issues of localised depletion (i.e., at the sub-area level or other scale). Other medium-term measures you could consider (i.e., after varying the TAC in this sustainability round) include area closures under section 11 of the Act to close areas of very low abundance (e.g., the Graveyard area) to commercial fishing, and splitting the QMA under section 25A or 25B of the Act, which would allow you to set separate regulatory catch limits for the multiple biological stocks within ORH 3B that are at various levels of abundance. The use of these other measures would benefit the sustainability of sub-stocks in areas of significantly reduced abundance, while providing for utilisation in areas with higher abundance. FNZ recommends that you seek further advice on potential methods to manage the ORH 3B stock at the sub-stock level in the future.

Calculation of proposed options and methodology used

140. Some stakeholders raised concerns about the basis and methods used to calculate the options that were consulted on.
141. FNZ notes that the high uncertainty of the status of ORH 3B and the lack of a stock assessment make development of robust options difficult. A range of approaches used to develop options are unavailable in this instance, including projections of stock status under different catch scenarios using a stock assessment model, or more complex HCRs that use a stock assessment model, as has been used in the past for ORH 3B (refer to ‘*Harvest Strategy Standard*’ above).
142. Some submitters also raise concerns with the calculation used to inform Option 3 and the assumptions used. A range of assumptions can inform the calculation, and feedback varied on these and the relative level of precaution built in. This issue is explored more under the *Option 3* heading below.
143. FNZ notes that, regardless of the methodology and calculation used to inform each option, your decision to set a TAC must not be inconsistent with moving the stock towards or above a level that can produce the *MSY*, and you must consider a range of additional matters in your decision, as outlined in earlier sections of this paper.

8.1 Current settings

TAC 8,355 t	TACC: 7,967 t	Customary: 5 t	Recreational: 0 t	Other mortality: 383 t
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144. The *status quo* is not proposed as an option and was not put forward as an option in the consultation. This is because FNZ considers that retaining the current catch settings would not align with your obligation under the Act to set a TAC in accordance with the conditions set by section 13(2A) as outlined in ‘*Total Allowable Catch - section 13 of the Act*’ above. No submissions received supported retaining the current settings.

8.2 Summary of proposed options, including voluntary sub-area catch limits

Table 4: Proposed ORH 3B TACs, allowances, TACCs, and voluntary sub-area catch limits (in tonnes) from 1 October 2023.

		Option 1		Option 2		Option 3	
TAC		7,116	↓ 1,239 (15%)	5,470	↓ 2,885 (35%)	4,995	↓ 3,360 (40%)
Allowances	Customary Māori	5	-	5	-	5	-
	Recreational	0	-	0	-	0	-
	All other mortality caused by fishing	339	↓ 44 (11%)	268	↓ 115 (30%)	238	↓ 145 (30%)
TACC		6,772	↓ 1,195 (15%)	5,197	↓ 2,770 (35%)	4,752	↓ 3,215 (40%)
Voluntary sub-area catch limits	NWCR	1,150	-	1,150	-	1,150	-
	ESCR	4,775	↓ 1,195 (20%)	3,200	↓ 2,770 (46%)	2,755	↓ 3,215 (53%)
	Puysegur	347	-	347	-	347	-
	Arrow Plateau	0	-	0	-	0	-
	Sub-Antarctic	500	-	500	-	500	-

8.3 Option 1

TAC 7,116 t (↓1,239)	TACC: 6,772 t (↓ 1,195)	Customary: 5 t	Recreational: 0 t	Other mortality: 339 t (↓ 44)
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145. Option 1 provides for a modest decrease (15%) in the TAC. This option is the smallest of the proposed catch reductions.
146. Option 1 is to return allowances to the 2019/20 settings. The customary and recreational allowances would therefore remain unchanged, at five tonnes and zero tonnes, respectively. The allowance for other sources of mortality caused by fishing would be set at a level that equates to approximately 5% of the TAC.
147. Option 1 is to return the TACC to match the setting that applied in the 2019/20 fishing year, i.e., 6,772 tonnes. This is a 15% decrease from the current 7,967-tonne TACC. The 1,195-tonne reduction would apply to the ESCR, with the voluntary limits for the other sub-areas unchanged.

8.3.1 Discussion

148. Option 1 would return the TAC to the setting that applied in the 2019/20 fishing year (7,116 tonnes), reversing the third of a three-phase increase to the TAC based on a previously optimistic assessment of the ESCR sub-stock.
149. This is the smallest reduction proposed, recognising that the combined spawning stock biomass estimates from the acoustic survey for ESCR areas have been flat over the past ten years, and that the voluntary ESCR catch-limit has been taken in full in recent years.
150. Option 1 has lower levels of expected biomass increase compared with Options 2 and 3 but comes with lower socio-economic impacts that would occur from a larger TAC reduction. The predicted biomass increases under this option are expected to be less than the other options below and over a longer unknown timeframe.
151. All options have differing degrees of probability that they would help move the stock towards a level that can produce the *MSY* as required under section 13(2A)(c)(ii) of the Act.
152. No submissions were received in support of Option 1. Option 1 was presented during consultation, but FNZ considers that Option 1 is the least precautionary of the three options consulted on with regards to sustainability, and therefore has the highest risk of the three options that it will not move the biomass towards a level that will achieve the *MSY*. This includes

consideration of the available information that stock status is unknown, and that the TAC setting in 2019/20 (which is equivalent to this option) and large increases in the preceding two years were based on flawed methodology. This stock assessment methodology was first developed in 2014 for the ESCR sub-area, and FNZ has concerns around the reliability of these assessments, which informed increases from the 2018/19 fishing year.

153. Although FNZ is prioritising research to support development of a new stock assessment as soon as possible, Option 1 is not recommended at this time as a stock assessment may not be available until 2025.

8.4 Option 2

TAC: 5,470 t (↓2,885)	TACC: 5,197 t (↓2,770)	Customary: 5 t	Recreational: 0 t	Other mortality: 268 t (↓115)
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154. Option 2 proposes a 35% decrease from the current 8,355-tonne TAC. Given that the stock status of ORH 3B is unknown, FNZ considers Option 2 is not inconsistent with moving the stock toward a level that can sustain the *MSY* as required under section 13(2A)(c)(ii) of the Act.
155. Allowances for customary Māori and recreational fishing would remain unchanged, at five tonnes and zero tonnes, respectively. The allowance for other sources of mortality caused by fishing would be returned to the 2017/18 allowance of 268 tonnes, which as a proportion of the TAC is unchanged from the current setting.
156. Option 2 would return the TACC to the setting that applied before the first of three phased TAC increases took place in the 2018/19 fishing year i.e., a TACC of 5,197 tonnes. This is a 35% decrease from the current 7,967-tonne TACC.

8.4.1 Discussion

157. Option 2 returns the TAC to the setting that applied in 2017/18, prior to the first of three phased increases to the TAC that commenced in the 2018/19 fishing year, i.e., a TAC of 5,470 tonnes.
158. Option 2 places greater weight on the sustainability concerns that were evident in the available information, and the need to act cautiously when information is uncertain. While there is high uncertainty in the status of ORH 3B, the greater reduction under Option 2 would be expected to increase biomass to a higher level with more certainty than under Option 1. Consequently, it provides more certainty in moving the stock towards or above, a level that can produce the *MSY*, and at a faster rate than Option 1, but not as quickly as Option 3.
159. Moderate socio-economic impacts are expected under this option. A relevant economic factor to consider is the potential loss in annual export earnings of around \$12.4 million in the short-medium term (discussed in more detail below under '*Economic considerations*'). The impact of the reduced TACC on employment (fishers, process workers etc) is not quantified, but is expected to be negative. Offsetting this forgone short-term revenue, the biological characteristics of orange roughy mean that catch not taken in the short term would likely be available to catch when stock abundance increases sufficiently. In addition, the long-term economic benefits associated with a higher stock biomass include the ability to harvest at sustainable levels and assure consumers that the stock is being managed sustainably.
160. Social and cultural factors to have regard to include the objectives of Te Waipounamu Iwi Fisheries Plan and Chatham Island Fisheries Forum plan, described under '*Kaitiakitanga*' above. The TAC reduction proposed under Option 2 is more likely to improve sustainability of the fishery than Option 1, but less likely than Option 3, to help ensure both long-term commercial activity and economic development opportunities for South Island iwi and Chatham Islands iwi and imi quota holders.
161. No submissions were received in support of Option 2.

162. The settings under Option 2 are largely equivalent to those in place from 2013/14 - 2017/18, predating the three phased increases based on the flawed assessment.³³ Spawning stock biomass estimates from the acoustic survey results since the implementation of these increases suggest variable results for individual areas across the ESCR, but a flat trend across the combined area.

8.5 Option 3

TAC: 4,995 t (↓3,360)	TACC: 4,752 t (↓3,215)	Customary: 5 t	Recreational: 0 t	Other mortality: 238 t (↓145)
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163. Option 3 is to reduce the TAC to 4,995 tonnes. This represents a 40% decrease from the current 8,355-tonne TAC. Given that the stock status of ORH 3B is unknown, FNZ considers Option 3 is not inconsistent with moving the stock toward a level that can produce the *MSY* as required under section 13(2A)(c)(ii) of the Act.
164. The customary and recreational allowances would remain the same under Option 3 at five tonnes and zero tonnes respectively, and the allowance for all other sources of mortality related to fishing would be set at a level that equates to 5% of the TAC.
165. An $F=M$ based approach was used to inform the settings under this option. An $F=M$ approach was used to inform changes to the TAC and allowances as recently as 2013/14, prior to the development of the now not accepted, stock assessment model.
166. $F=M$ is a simple HCR which calculates proposed catch limits by assuming that the fishing mortality (F) needed to achieve maximum sustainable yield (F_{MSY}) equals natural mortality (M). This calculation is based on a proportion of the estimated stock size and making an allowance for unobserved biomass. The $F=M$ approach can be used as a low information proxy in the absence of projections of stock status under different catch scenarios using a stock assessment model. In this approach, F is the fishing mortality rate - the rate of removal of fish from a population by fishing, and M is the natural mortality rate - the rate at which fish die by means other than fishing (old age or predation). As noted at paragraph 128, this approach is consistent with the HSS.
167. The $F=M$ approach to determine the TACC under this option used the most recent acoustic biomass estimate for the ESCR, which is 48,981 tonnes, to update the calculation used in 2013/14. It has been assumed that there is some spawning stock elsewhere and that only 80% of the biomass was observed in the main spawning aggregations. This acoustic biomass estimate can be scaled up using the calculation as set out below.

Table 5: Calculation using the $F=M$ rule for the East and South Chatham Rise sub-stock.

Calculation step	Weight in tonnes
Mean estimate of spawning biomass (Source: 2023 Plenary)	48,981
Divide by 0.8 to account for unobserved biomass	61,226
Multiply by 0.045 (F) to obtain the ESCR sub-area limit	2,755

8.5.1 Discussion

168. Option 3 is the largest proposed reduction to the TAC, so has the highest probability, of the three options consulted on, of helping to move the stock towards or above a level that can produce the *MSY*, but also the largest forgone economic opportunity in the short term.
169. The 40% reduction to the TAC is consistent with addressing sustainability concerns in a responsive way, prioritising the long-term sustainability of the stock above potential negative

³³ Except for a small 220-tonne increase to the TAC based on new information from the Puysegur fishery in the 2017/18 fishing year.

socio-economic impacts in the short term. It is the option most likely to increase abundance for ORH 3B at the fastest rate.

170. The major disadvantage of Option 3 is that the decrease to the TACC, being the largest reduction proposed, would cause a larger forgone economic opportunity in the short term. The counter argument is that because orange roughy have such a low natural mortality, most fish that are not caught this year will still be available to take in future years.
171. Some submitters supported Option 3 on the basis it was founded upon robust and peer-reviewed scientific methods (J. Brown, M. Ward) and provides a precautionary approach, resulting in the lowest risk to orange roughy, other animals, and their habitats (RNZSPCA).
172. Some submitters expressed a preference for Option 3 as the 'least worst' of the three options consulted on with respect to sustainability concerns (K. Taylor), but would prefer that the TAC was set even lower (EDS) or that the ORH 3B fishery be closed (S. Fitzjohn). ECO does not support any of the options consulted on, but notes that their preference is closest to Option 3 (discussed further under '*Other options proposed by submitters*' below).
173. Option 3 places greater weight on sustainability concerns than forgone utilisation concerns, since it proposes the largest TAC reduction of the three options consulted on. In practice though, there is a small difference between the TAC reductions proposed under Option 2 (35% reduction) and Option 3 (40% reduction), with this difference equating to a difference of approximately \$3.4 million in export earnings. Option 3 gives slightly more certainty that the stock would move to a level that will achieve the *MSY*, but at a greater cost in terms of forgone revenue than Option 2.
174. The $F=M$ method used to determine the TACC under this option is based on acoustic survey data that is considered reliable and may be used where there is a lack of more complete information, which is the case for ORH 3B.
175. When presenting Option 3 for consultation, FNZ referred to calculations of yield for the ESCR sub-stock using methods described in Doonan *et al.* (2015). The application of $F=M$ in this instance differs to those rules tested in Doonan *et al.* (2015) by using estimates of spawning biomass rather than mature biomass. However, the Doonan *et al.* paper suggests that an improvement on the methodology used then would be to operate an HCR on the spawning plume biomass estimates (i.e., *SSB*) directly (as has been done in this instance), thereby making stock–recruit relationship redundant,³⁴ as well as removing allowance for unobserved, spawning fish.
176. The $F=M$ approach has been used in this calculation in the absence of a full stock assessment. While not ideal, this proxy of F has been approved by the DWWG in the past and is being used in this instance as an interim measure while stock assessment issues are being resolved in order to inform precautionary management of this stock. This approach is also consistent with the HSS (refer to earlier *Harvest Strategy Standard* section).
177. Submissions from ECO and DWC show that a number of assumptions can be made in the $F=M$ calculation, with different values of M and appropriate acoustic survey components resulting in large differences in the resulting catch setting. While the value of M used to deduce Option 3 has previously been considered and accepted by the DWWG, going forward, the appropriate value of M will be re-investigated as part of the research to inform a new stock assessment.
178. Regardless of the calculation used to determine the settings under this option, FNZ recommends you focus your evaluation of this option on its relative strength of moving the stock towards or above, a level that can produce the *MSY*, and consideration of relevant social, cultural, and economic factors.

³⁴ The stock–recruitment relationship describes the relationship between the parent fish stock (spawning biomass) and the resulting recruitment (the number of juveniles produced that survive to fishable age).

8.6 Economic considerations

179. Most orange roughy is exported, with little consumed domestically. In the 2022 calendar year, 3,073 tonnes of processed orange roughy (which converts to 7,029 tonnes green weight) were exported with a FOB value of \$NZ 49 million. The United States is the largest market, with frozen orange roughy fillets worth \$NZ 35.7 million the most important export product by value. China provides a significant market for frozen whole orange roughy, worth \$NZ 12.6 million in 2022.
180. Option 1: The reduction of 1,195 tonnes is a loss of unrealised potential earnings, as the ORH 3B catch has not reached the TACC in over 20 years. The proposed reduction to the TACC to 6,772 tonnes would bring TACC almost in line with 2021/22 landings (6,781 tonnes), therefore reduction in export revenue under this option may be close to zero.
181. Option 2: Based on catch levels from the 2021/22 fishing year (6,781 tonnes), Option 2 (5,197 tonnes) represents a reduction of 1,584 tonnes. This equates to a reduction of around \$12.4 million in export earnings, based on 2022 FOB export prices, assuming export prices and the product mix remain the same.
182. Option 3: Based on catch levels from the 2021/22 fishing year (6,781 tonnes), Option 3 (4,752 tonnes) represents a reduction of 2,029 tonnes, which equates to a reduction of around \$15.8 million in export earnings, assuming export prices and the product mix remain the same.
183. Short-term economic losses are expected under Options 2 and 3. In the medium-term, due to the longevity of the species, any foregone orange roughy catch would likely be available to catch when stock abundance increases sufficiently. There are long-term economic benefits associated with a rebuilt stock that is harvested at sustainable levels, including assuring consumers that the stock is being managed sustainably.
184. The ORH 3B fishery supports a number of people, including quota holders, commercial fishers, licensed fish receivers, and seafood processing facilities. To give a sense of scale and distribution, based on the 2021/22 October fishing year, 62 entities owned quota. Of this, 90% was owned by four entities, and the remaining 10% of quota was owned by 58 entities.
185. Of the 62 entities that own quota, 57 own Settlement Quota, which accounts for 8.1% of total ORH 3B quota.
186. As at the end of the 2021/22 fishing year, there were six commercial entities holding ACE: 96% of ACE was held by four entities, and the remaining 4% of ACE was held by two entities. For the 2021/22 fishing year, there were six licensed fish receivers (LFRs) receiving ORH 3B, with eight entities landing to these LFRs.

8.7 Other options proposed by submitters

Table 6: ORH 3B TACs, allowances, TACCs, and sub-area catch limits (in tonnes) proposed by submitters during consultation.

		Deepwater Council (DWC)		Environment & Conservation Organisations (ECO)		Environmental Defence Society (EDS)	
TAC		6,085	↓ 2,270 (27%)	4,032	↓ 4,323 (48%)	3,600	↓ 4,755 (57%)
Allowances	Customary Māori	5	-	5	-	5	-
	Recreational	0	-	0	-	0	-
	All other mortality caused by fishing	113	↓ 270 (30%)	193	↓ 190 (50%)	180	↓ 203 (53%)
TACC		5,967	↓ 2,000 (25%)	3,834	↓ 4,133 (48%)	3,415	↓ 4,552 (43%)
Voluntary sub-area catch limits	NWCR	1,150	-				
	ESCR	3,700	↓ 2,270 (38%)				
	Puysegur	347	-				
	Arrow Plateau	0	-				
	Sub-Antarctic	500	-				

8.7.1 DWC alternative option

187. DWC considers that the acoustic biomass estimates are the best available scientific information on which to base catch settings. Acoustic survey estimates of *SSB* for three spawning aggregation areas in the ESCR (Old Spawning Plume, Rekohu, and Mt Muck, plus the three sites combined) have been relatively stable. This implies that significant catch limit reductions to ensure sustainability are not required. Further, DWC suggest that significant TAC reductions are not consistent with section 13(2A) of the Act.
188. Therefore, DWC proposes an alternative option based upon the average catch from the ESCR since the 2010/11 fishing year. They note that this option is consistent with the aim of setting an interim TAC until an estimate of stock status is achieved that will ensure that the biomass is at or above a level that can produce the *MSY*.
189. DWC supports a TACC based on average ESCR catches over the last 12 years, corroborated by a re-calculation of $F=M$ which provides a figure of 3,700 tonnes (rounded to the nearest 100 tonnes). DWC considers that using the average catch from a longer time series is more appropriate than a shorter time series when setting the TAC because it includes a longer range of sustainable catch settings. DWC suggests that a TAC setting of 6,085 tonnes, based on an annual catch limit for the ESCR of 3,700 tonnes, is both sustainable and precautionary.
190. DWC further notes that their alternative option would be accompanied by a research programme to expedite acceptable stock assessments for both the ESCR and the NWCR.
191. DWC's proposed alternative is supported by Te Ohu Kaimoana, all Mandated Iwi Organisations who responded to the proposals, Sealord Group Ltd, and Talley's Group Ltd.
192. FNZ notes that while DWC's approach is relatively simple for stakeholders to understand and is more conservative with respect to sustainability than Option 1, it is less conservative than either Option 2 or Option 3.
193. FNZ further notes that historically, orange roughy has been particularly prone to hyperstability. That is, catch rates remain high even as the stock is rapidly depleted, due to targeting spawning aggregations at specific areas and times. Therefore, FNZ does not support basing a catch limit on current or average catches if there is a risk that these are not likely to be sustainable in the long term.

8.7.2 ECO modified Option 3

194. Although ECO supports the reduction of catch limits for all orange roughy sub-areas within ORH 3B, they propose an alternative option for the ESCR, which is a modification of Option 3 using an adjusted $F=M$ rule. As noted under 'Option 3' above, the proposed sub-area catch limit for the ESCR under Option 3 is calculated by scaling up the spawning biomass estimate to include unobserved biomass, then multiplying by the natural mortality rate (Table 5).
195. ECO suggests that there are uncertainties in the correct value of M to use in these calculations and proposes a lower value of M , noting that globally, reported orange roughy M values are as low as 0.02 in Australia and 0.25 in the Northeast Atlantic (Tingley & Dunn, 2018). Within New Zealand, models in 2014 used M values ranging from 0.032 to 0.041 (Tingley & Dunn, 2018). The modified Option 3 proposed by ECO replaces the value FNZ used for M (0.045) with 0.030 to derive a recommended ESCR catch limit of 1,837 tonnes.
196. ECO suggests that a precautionary approach is warranted when applying M values given their uncertainty.
197. FNZ notes the value of $M = 0.045$ has been accepted by the DWWG as appropriate for orange roughy. It was noted recently by the DWWG, however, that Australian orange roughy fisheries managers use a lower M , and the appropriate value of M to be used in the New Zealand context may be revisited in future stock assessment work.

8.7.3 Environmental Defence Society (EDS) alternative option

198. EDS suggests that the TAC may have been set too high since models were used to inform TAC setting starting in 2014/15. They therefore propose setting the TAC at the level that applied in the 2012/13 fishing year (3,600 tonnes). This setting is more precautionary than any of the three options consulted on.
199. The impact that this adjustment would have on the ORH 3B catch settings is shown in Table 6. To align catch settings and allowances as closely as possible to the 2012/13 levels, adjustment to both ESCR and NWCR voluntary catch limits would be required. As mentioned under the 'Status of the stock' heading, FNZ notes that the NWCR assessment of stock status was retained by the Plenary and there is currently no information on which to base new settings for any of the other sub-areas in ORH 3B.
200. In 2012/13 there was a research allowance for the ESCR of 250 tonnes. Essentially reallocating this ESCR research allowance to the ESCR voluntary catch limit for 2023/24 would be consistent with a TAC of 3,600 tonnes, if the EDS option were adopted.
201. There was a customary Māori allowance of zero tonnes in 2012/13. The five-tonne allowance that has been set subsequently would be deducted from the TACC via the ESCR voluntary catch limit.

8.7.4 Environmental Law Initiative (ELI) alternative option

202. ELI suggests that any decision you make based on the advice in the consultation paper would be open to judicial review, and that you should seek advice on an emergency closure of ORH 3B.
203. ELI notes that although there may have been a lack of reliable information on which to base the TAC since 2014/15, and that the 2014/15 assessment may itself also be unreliable, there were no options consulted on for the ESCR sub-area catch limit to be set below 2014/15 levels.
204. ELI notes that the reductions proposed under each of the three options all relate to the ESCR, with no reductions proposed for the NWCR or the other sub-areas within ORH 3B.
205. ELI suggests that, in short, "...it may be that Ministers have been without reliable information on ORH 3B stocks for almost a decade, with significant possibility for declines in the stock's abundance or reproductive potential over that period."

206. Under section 16 of the Act, you could close the fishery for a period of three months, followed by an extension of nine months, if you are satisfied there is or has been a serious decline in the abundance or reproductive potential of one or more stocks or species.
207. While the abundance of ORH in the ESCR and NWCR has declined since the beginning of the fishery, catch volumes from the ESCR remain at the voluntary catch limit, FNZ notes that unstandardised CPUEs are flat or slowly declining (discussed above under '*East and South Chatham Rise*') and orange roughy may be prone to hyperstability (as discussed under the '*DWC alternative option*' heading above). Additionally, the largest catches in the ESCR and the NWCR occur around the spawn, typically during June and July. As the spawning season has now concluded, an emergency closure imposed now would have limited practical effect on catch levels. On balance, FNZ considers that an emergency closure is not warranted at this time. However, additional measures could be considered to address areas of lower abundance as discussed under the earlier heading '*Management of biological sub-stocks within ORH 3B*'.
208. Emergency closure provisions have been used on two previous occasions, for the recent Coromandel scallop closure (SCA CS) and the closure of part of the pāua fishery in PAU 3A and PAU 7 following the 2016 Kaikoura earthquake.

8.8 Other matters raised

8.8.1 Calculation of $F=M$ and assumptions used

209. Some submitters raised concerns about the calculation of $F=M$ and the assumptions used.
210. DWC notes that while this option uses the best available scientific information from the recent acoustic surveys, they disagree with the calculations used. First, they argue there is no estimate for spawning biomass that has been observed at other areas (including spawning aggregations found at Smith's City, Cameron's, or the Andes; see Figure 2); and second, there is no variable built into the calculation that incorporates non-spawning biomass.
211. DWC notes that acoustic estimates using $F=M$ yield calculations reported in 2012 and 2013 Plenary reports and used in 2013 to inform changes to the TACC and allowances for the 2013/14 fishing year included an allowance for spawning in other areas. DWC contends that by not including non-surveyed areas where orange roughy are known to spawn in the calculations, the resulting yield estimates are too low, and the estimated total spawning biomass is 54,981 tonnes, not 48,981 tonnes as used in the calculation for Option 3.
212. DWC questions the use of a correction divisor of 0.8 (i.e. a multiplier of 1.25) to account for unobserved biomass, and suggests there is no explanation of how this divisor was derived. In contrast, DWC notes that Doonan *et al.* (2015) used a multiplier of 1.5 (i.e. a divisor of 0.66), and how this value was derived is clearly described in Doonan *et al.* (2015).

Table 7: DWC calculation using a modified $F=M$ rule for the East and South Chatham Rise sub-stock

Calculation step	Weight in tonnes
Mean estimate of mature biomass (Source: 2012 and 2013 Plenary)	54,981
Divide by 0.66 to account for unobserved biomass	82,472
Multiply by 0.045 (F) to obtain the ESCR sub-area limit	3,711

213. FNZ notes the calculation used to develop Option 3 does contain an estimate for spawning biomass that has been observed at other areas – this is the divisor (0.8) shown in Table 5.
214. FNZ notes that the calculation does not include a variable to incorporate non-spawning mature biomass, but that spawning stock biomass (SSB) is the DWWG-accepted metric to use, not mature stock biomass. This reflects the fact that estimates of non-spawning mature biomass are speculative. In previous years $F=M$ calculations were based upon mature biomass rather than spawning biomass, but the approach applied in this instance is in response to better

understanding of orange roughy biology, including understanding that mature orange roughy are known to not necessarily spawn every year.

8.8.2 Other sub-area catch limits

215. Submissions from DSCC, ECO, ELI, and Greenpeace commented on the concentration of catch limit reductions on the ESCR, noting the issues identified in the stock assessment model apply to the other sub-areas within the fishery. Notwithstanding concerns about voluntary catch limits, DSCC and Greenpeace support reviews of catch limits for all sub-areas within ORH 3B, and support closure of these areas until a reliable stock assessment can be completed.
216. Due to the problems identified in the stock assessment models, the science process providing updated stock status information that is used to inform management decision making was delayed this year. To avoid exacerbating sustainability concerns by delaying management action, a sustainability review was conducted using the available information.
217. The ESCR is the largest sub-area fishery within ORH 3B and the largest orange roughy fishery in New Zealand. Little is known about the other sub-areas within ORH 3B as they are rarely fished to the same extent as the ESCR. Current fishing effort trends show that catches in these areas are negligible and have been taken from fewer than three fishing vessels. Additionally, as discussed above in '*Status of the Stocks*', the status of the NWCR and Puysegur have been previously estimated and remain as the best available information for these areas.

8.8.3 Bottom trawling

218. Responses from various submitters including eNGOs, the RNZSPCA, and some individual submitters, raised concerns regarding the use of bottom trawling to fish for orange roughy and other deepwater species.
219. The RNZSPCA raised broader concerns around animal welfare, environmental impacts, and potential protected species interactions associated with bulk harvest methods such as bottom trawling. Refer to Heading 6 of the *Introduction and Legal Overview* chapter within the '*Review of sustainability measures for the 2023 October round*' document for FNZ's response to these concerns.
220. EDS voiced concerns over the changing fishing effort in the orange roughy fishery and advocated for bottom trawling to be restricted to its current footprint until the environmental impact of longer tows on the flats has been assessed. Similarly, DSCC argue in their submission (endorsed by Greenpeace) that all seamounts 'and similar biodiverse features in NZ waters' are habitats of particular significance for fisheries management and should therefore be closed to trawling.
221. Management measures in place to address the impact of bottom trawling on the benthic environment are discussed under '*Existing controls that apply to the stock or area*' above. A multi-stakeholder forum consisting of members from environmental NGOs, the fishing industry, and the National Iwi Chairs Forum, met throughout 2022 to discuss and make recommendations on further measures to manage the effects of bottom trawling within the EEZ. The forum concluded in 2022 when members submitted separate recommendations for further measures. You recently considered advice on next steps for this work and agreed for FNZ and the Department of Conservation to draft a consultation package that is informed by further engagement.

8.8.4 Marine Stewardship Council (MSC) certification

222. DSCC and Greenpeace requested in their responses that the MSC be informed regarding the issues identified with the stock assessment models and the now unknown nature of the ORH 3B stock status. They go on to say the MSC certification should no longer apply to ORH 3B.
223. The MSC is an independent third-party non-profit organisation and is internationally recognised as meeting high sustainability and environmental standards. The commercial fishing industry is

responsible for obtaining and maintaining MSC certification. Where sought, FNZ provides various fishery data to support this.

9 Deemed values

224. FNZ is satisfied that the current deemed value rates for ORH 3B are consistent with section 75(2)(a) of the Act in that they provide sufficient incentive for fishers to balance their catch with ACE. FNZ therefore did not propose any deemed value rate changes as part of this review. None of the submissions received commented on the ORH 3B deemed value rates.

10 Conclusions and recommendations

225. The longevity of orange roughy, and potential for extended gaps in recruitment, make estimation of unfished biomass (B_0) problematic. This is because both the fishery and scientific monitoring may not have existed long enough to estimate average productivity.
226. Given the current concerns about orange roughy abundance and increased uncertainty of whether ORH 3B biomass is at a level that can ensure its sustainability, FNZ considers a precautionary approach should be adopted, and considers that either Option 2 or Option 3 would achieve this. In determining the difference between these options there is a trade-off between extent and speed of increase in biomass, and cost in terms of reduced utilisation opportunities.
227. Additional work is currently being contracted by FNZ to inform an updated stock assessment and management strategy, and is scheduled to be completed by 2025. A programme of additional work to address issues in the model and data inputs to better inform an assessment has been developed, with the intention of providing a more certain assessment of stock status. In the meantime, FNZ will closely monitor any changes, including the performance of the fishery and the results of acoustic surveys, as they become available.
228. The TAC applies to the whole ORH 3B QMA and is not the best tool for addressing issues of localised depletion (i.e., at the sub-area level or other scale). While the non-regulatory catch split arrangement is in place, FNZ recommends you seek further advice on the use of management approaches (such as area closures or splitting the QMA to reflect the biological orange roughy stocks) available under the Act.
229. Nonetheless, you must make your decision regarding the TAC setting with the information that is available to you now. On balance, FNZ recommends Option 3. This option acknowledges the need to act cautiously, given the lack of information, the high degree of uncertainty in the status of the stock, and the biological characteristics of orange roughy (longevity, low fecundity and hyperstability). It is the option, of those consulted on, most likely to increase abundance for ORH 3B at the fastest rate, and it is not inconsistent with moving the stock towards or above a level that can produce the *MSY*.

11 Decision for ORH 3B

Option 1

Agree to set the ORH 3B TAC at 7,116 tonnes and, within the TAC, to:

- i. Retain the allowance for Māori customary non-commercial fishing interests at 5 tonnes;
- ii. Retain the allowance for recreational fishing interests at 0 tonnes;
- iii. Decrease the allowance for all other sources of mortality to the stock caused by fishing from 383 to 339 tonnes;
- iv. Decrease the ORH 3B TACC from 7,967 to 6,772 tonnes.

Agreed / Agreed as Amended / Not Agreed

AND

Note Fisheries New Zealand expects that quota owners will implement the following voluntary sub-area catch limit arrangements within the TACC of 6,772 tonnes and will monitor to ensure the arrangements are adhered to:

- a) Northwest Chatham Rise catch limit of 1,150 tonnes;
- b) East and South Chatham Rise catch limit of 4,775 tonnes;
- c) Puysegur catch limit of 347 tonnes;
- d) Arrow Plateau catch limit of 0 tonnes; and
- e) Sub-Antarctic catch limit of 500 tonnes.

OR

Option 2

Agree to set the ORH 3B TAC at 5,470 tonnes and, within the TAC, to:

- i. Retain the allowance for Māori customary non-commercial fishing interests at 5 tonnes;
- ii. Retain the allowance for recreational fishing interests at 0 tonnes;
- iii. Decrease the allowance for all other sources of mortality to the stock caused by fishing from 383 to 268 tonnes;
- iv. Decrease the ORH 3B TACC from 7,967 to 5,197 tonnes.

Agreed / Agreed as Amended / Not Agreed

AND

Note Fisheries New Zealand expects that quota owners will implement the following voluntary sub-area catch limit arrangements within the TACC of 5,197 tonnes and will monitor to ensure the arrangement are adhered to:

- a) Northwest Chatham Rise catch limit of 1,150 tonnes;
- b) East and South Chatham Rise catch limit of 3,200 tonnes;
- c) Puysegur catch limit of 347 tonnes;
- d) Arrow Plateau catch limit of 0 tonnes; and
- e) Sub-Antarctic catch limit of 500 tonnes

OR

Option 3 (*Fisheries New Zealand preferred option*)

Agree to set the ORH 3B TAC at 4,995 tonnes and, within the TAC, to:

- i. Retain the allowance for Māori customary non-commercial fishing interests at 5 tonnes;
- ii. Retain the allowance for recreational fishing interests at 0 tonnes;
- iii. Decrease the allowance for all other sources of mortality to the stock caused by fishing from 383 to 238 tonnes;
- iv. Decrease the ORH 3B TACC from 7,967 to 4,752 tonnes.

Agreed / Agreed as Amended / Not Agreed

AND

Note Fisheries New Zealand expects that quota owners will implement the following voluntary sub-area catch limit arrangements within the TACC of 4,752 tonnes and will monitor to ensure the arrangement are adhered to:

- a) Northwest Chatham Rise catch limit of 1,150 tonnes;
- b) East and South Chatham Rise catch limit of 2,755 tonnes;
- c) Puysegur catch limit of 347 tonnes;
- d) Arrow Plateau catch limit of 0 tonnes; and
- e) Sub-Antarctic catch limit of 500 tonnes.



Hon Rachel Brooking
Minister for Oceans and Fisheries

4 / 9 / 2023

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