



Review of sustainability measures for orange roughy (ORH 3B) for 2023/24

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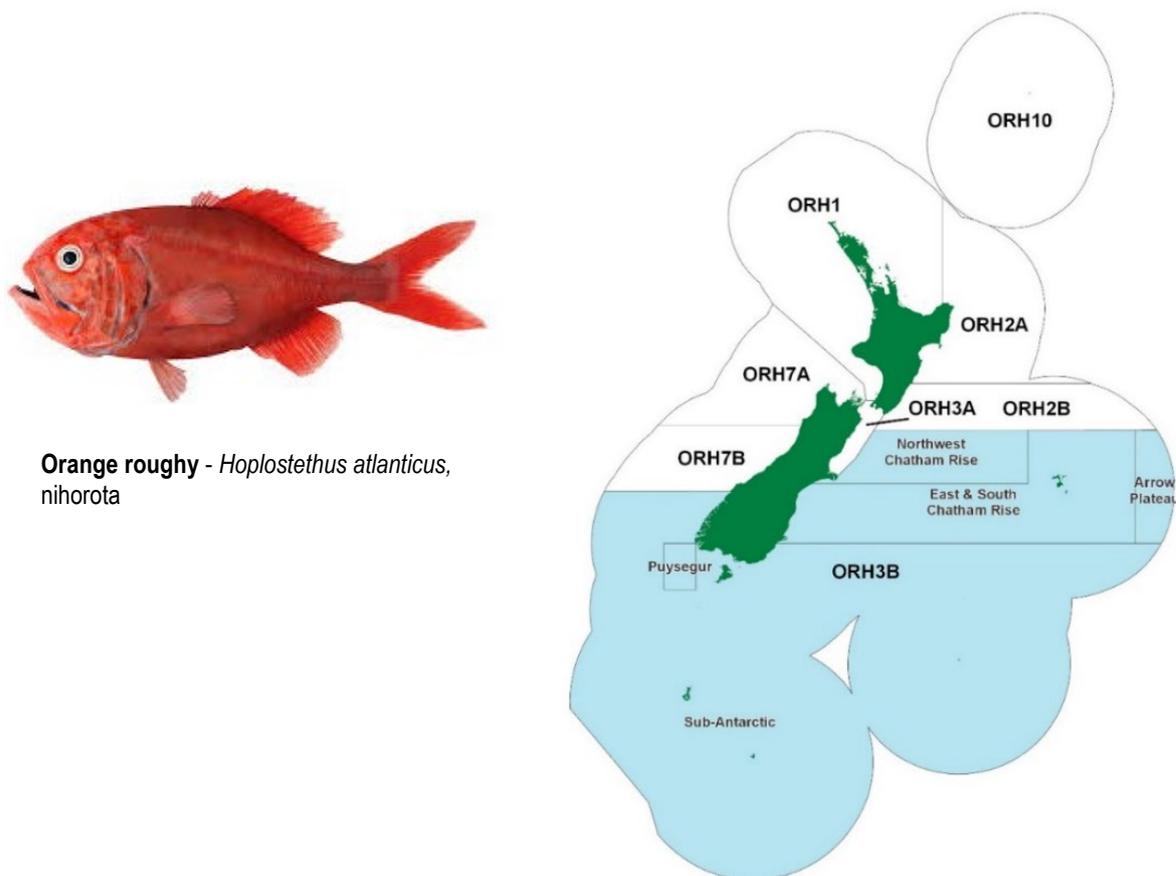
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Stock being reviewed

Orange roughy - ORH 3B – Chatham Rise and southern New Zealand



Orange roughy - *Hoplostethus atlanticus*,
nihorota

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

1 Why are we proposing a review?

1. Fisheries New Zealand (FNZ) is reviewing sustainability measures for orange roughy (*Hoplostethus atlanticus*) in Quota Management Area (QMA) ORH 3B (Figure 1) for the 1 October 2023 fishing year.
2. The Minister sets the TAC and TACC for the ORH 3B stock as a whole. ORH 3B quota owners, through the Deepwater Council Ltd (DWC), which represents owners of approximately 98% of ORH 3B quota, agree each year to adhere to catch limits at a sub-area level for individual sub-stocks. These are non-regulatory catch limits and are monitored by FNZ. The sub-areas are shown in Figure 1.
3. The current TAC is 8,355 tonnes, made up of a TACC of 7,967 tonnes, a customary Māori allowance of five tonnes, a zero allowance for recreational fishing and an allowance for all other mortality caused by fishing of 383 tonnes (equivalent to 5% of the TACC).
4. 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, acoustic and trawl survey, and observer data) was undertaken,

¹ The Deepwater Working Group is a Stock Assessment Working Group for deepwater species. Based on scientific information the Stock Assessment Working Groups assess the current status of fish stocks or species relative to the maximum sustainable yield (MSY)-compatible reference points and other relevant indicators of stock status, conduct projections of stock size and status under alternative management scenarios, and review results from relevant research projects.

but there is no ORH 3B stock assessment. Additionally, past stock assessments were re-evaluated.

5. The characterisation noted flat or declining patterns and recent historical lows in unstandardised catch per unit of effort (CPUE)² across most fished areas in the ESCR, that are not consistent with recent stock assessments of the fishery in that area.
6. For the NWCR, there is a large divergence between catch and sub-area limit with only 17% of the voluntary sub-area catch limit being caught in the 2021/22 fishing year.
7. A re-evaluation of the 2020 ESCR stock assessment identified significant concerns with some of the model parameters and assumptions. The 2023 Fisheries Assessment Plenary (the **Plenary**)³ concluded that the previously accepted assessment of the ESCR can no longer be considered to accurately reflect stock status, and the previous assessment was rejected. A new stock assessment 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.
8. Flat or declining trends in estimated spawning biomass from the acoustic survey series and unstandardised CPUE across many areas give rise to a sustainability concern for ORH 3B. FNZ is consulting on options to reduce the TAC under section 13 (2A) of the *Fisheries Act 1996* (the **Act**), because the status of the sub-stock forming a significant part of the overall fishery is now considered unknown and there is no reliable estimate of biomass that can produce the maximum sustainable yield (MSY).⁴
9. This will be the fourth TAC adjustment since 2018/19. Phased increases to the TAC after 2018/19 were implemented based on favourable stock assessments. Given the significant change and increased uncertainty in our understanding of abundance of ORH 3B, FNZ is proposing a cautious response by proposing reductions to catch limits and allowances.

2 Summary of proposed options

10. FNZ is proposing three options to reduce the TAC, TACC, and allowance for other sources of mortality caused by fishing for this stock. The options would see reductions to the TAC of approximately 15%, 35%, or 40% respectively, with associated reductions in the sub-area catch limit for the ESCR. FNZ considers these options respond to sustainability concerns with various levels of caution. The status quo is not proposed as an option as it is inconsistent with the purpose of the Act for the Minister to act to ensure sustainability when information is uncertain.

Table 1: Proposed management options (in tonnes) for ORH 3B from 1 October 2023.

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 (↓ 2,870 t)	5	0	268 (↓ 115 t)
Option 3	4,995 (↓ 3,360 t)	4,752 (↓ 3,215 t)	5	0	238 (↓ 145 t)

11. FNZ welcomes feedback and submissions on the options proposed, or any alternatives.

² Unstandardised or raw CPUE does not take into account changes in vessel and gear characteristics and fishing patterns over time e.g., start/finish positions, tow speed, net depth, bottom depth, wingspread, duration, and headline height for each fishing day for a vessel.

³ The May 2023 Fisheries Assessment Plenary is accessible at: <https://www.mpi.govt.nz/science/fisheries-research-and-science/about-our-fisheries-research/>.

⁴ Maximum sustainable yield is the largest long-term average catch or yield that can be taken from a stock under prevailing ecological and environmental conditions, and the current selectivity patterns exhibited by fisheries. It is the maximum amount of fishing that a stock can sustain without impairing its renewability through natural growth and reproduction.

3 About the stock

3.1 Fishery characteristics

12. 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). Orange roughy in ORH 3B is understood to be caught exclusively by commercial fishers, with most fish taken as target catch in this high-value fishery. While the ORH 3B QMA includes a large proportion of the New Zealand EEZ, most commercial fishing for orange roughy is concentrated on the Chatham Rise.
13. Vessels target orange roughy fishery with bottom trawl configurations with heavy ground gear (bobbers, rollers, and rock hopper gear) at depths greater than 750 m. Since this set up requires powerful engines, orange roughy vessels are typically medium- to large-sized deepwater vessels with significant freezer capacity and crew accommodation with the ability to operate for several weeks at sea. Three vessels have dominated the catch since 2000/01, with four more vessels contributing since 2019/20.
14. Operators historically targeted spawning aggregations of orange roughy over topographic features in the months of June and July, often towing for as little as 15 minutes per tow. In recent years, more effort has been applied to flat areas with longer tows than previously, and throughout the year. This change in fishing behaviour is partly in response to the demand for better quality fish obtained from smaller catches to supply the Chinese export market, which is predominantly for whole fish, although this market has declined in recent years.
15. The ESCR and NWCR parts of ORH 3B are certified by the Marine Stewardship Council (**MSC**) and were re-certified in 2022.⁵ ORH 3B (in total) earned around \$49M in FOB⁶ 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 by greenweight, using publicly available conversion factors.^{7,8}

3.2 Biology

16. Orange roughy are widespread in New Zealand waters, occurring in the upper continental slope, particularly at depths between 700 and 1,500 m over the Chatham Rise and West Coast South Island.
17. Orange roughy are a very slow-growing and long-lived species, reaching a maximum age of 120 to 130 years and a maximum size of about 50 cm (standard length⁹), 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 become vulnerable to fishing at 15 to 20 years of age (around 23 to 25 cm in length).
18. 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.
19. Spawning orange roughy form dense aggregations at depths of 700 to 1,000 m in areas often associated with bottom features such as hills and canyons. It is likely that individual orange roughy do not spawn every year and fecundity (the potential to produce offspring) is relatively low. Additional aggregations form outside the spawning period, presumably for feeding.

⁵ For more information about the MSC go to <https://www.msc.org/en-au/about-the-msc/marine-stewardship-council>

⁶ 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.

⁷ From <https://www.seafood.co.nz/detail-2/export-stats-december-2022-provisional>

⁸ To calculate the greenweight of processed fish, the processed weight is multiplied by the conversion factor for the correct species and product state.

⁹ Standard length is the length of a fish measured from the tip of the snout to the base of the caudal (tail) fin.

20. Orange roughy mainly prey upon mid-water and bottom species such as prawns, fish, and squid. More detailed information on the biology of orange roughy can be found in the 2023 Plenary Report.

3.3 Management background

21. Orange roughy entered the Quota Management System (**QMS**) in 1986 with eight QMAs and an October fishing year.¹⁰ In most cases, the QMAs for orange roughy do not align with biological stocks.
22. Genetics, geographical separation, and the distribution of orange roughy indicate that there are multiple biological sub-stocks within ORH 3B – NWCR, ESCR, Sub-Antarctic, Puysegur, and the remaining parts of ORH 3B including the Arrow Plateau sub-area (Figure 1).
23. The Minister sets the TAC and TACC for the ORH 3B stock as a whole. ORH 3B quota owners, through the DWC, agree each year to adhere to catch limits at a sub-area level for the individual sub-stocks. These are non-regulatory catch limits. The sub-areas that make up ORH 3B are shown in Figure 1.
24. Adherence to the sub-area catch limits is monitored by FNZ and reported annually in the FNZ Deepwater Fisheries Annual Review Report.¹¹ There have been very high levels of adherence to the sub-area catch limits.
25. The most recent adjustments to the TAC and TACC were implemented over three years from the 2018/19 fishing year. This included recommending 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.
26. The phased increases were guided by the application of a management procedure incorporating a Harvest Control Rule (**HCR**). This involved 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 to suggest sub-area catch limits based on the estimated sub-area stock status in relation to the management target range.
27. 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 a HCR showed a TACC increase could provide for a utilisation opportunity. The TACC was therefore increased to 8,355 tonnes.
28. Because the HCR requires a stock assessment, and the stock status is currently unknown, the HCR cannot be used to inform a TAC and TACC for 2023/24.

4 Status of the stock

4.1 2023 stock assessment development

29. Attempts at a stock assessment of orange roughy in the NWCR and ESCR 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 (e.g., commercial, acoustic and trawl survey, and observer data) was undertaken. Additionally, recent stock assessments were re-evaluated.

East and South Chatham Rise

30. The 2023 characterisation of the ESCR sub-stock revealed information from the commercial fishery and estimates of spawning biomass from acoustic surveys that are inconsistent with

¹⁰ For more information about the QMS go to <https://www.mpi.govt.nz/law-and-policy/legal-overviews/fisheries/quota-management-system/>.

¹¹ <https://www.mpi.govt.nz/dmsdocument/51895-Annual-review-report-for-deepwater-fisheries-202021>

biomass and trends estimated by the recent (2020) stock assessment model for the ESCR sub-area.

31. The 2020 assessment for the ESCR area indicated the stock to be in the target zone of 30–50% of the virgin biomass and increasing. However, declining trends in, and recent historical lows in, unstandardised CPUE across most fished areas in the ESCR are not consistent with these recent stock assessment outputs. While caution should be used drawing conclusions from unstandardised CPUE at a stock level, it may reflect local abundance. Unstandardised CPUE has generally been flat or slowly declining since 2010/11 and was at historical lows within the last two years for non-spawning fisheries (Figure 3).
32. Additionally, acoustic survey results in 2022 indicated that the spawning stock biomass (**SSB**)¹² of the ESCR sub-stock had been flat or declining since 2011, which was inconsistent with previous stock assessment outputs. Estimates of spawning biomass indicate differing trends by area (Figure 2). The individual ESCR estimates are flat or declining across different areas while the combined index is flat.
33. The re-evaluation of the 2020 ESCR stock assessment and investigation into Australian orange roughy assessments identified further issues with the previous assessments, including:
 - a scarcity of data on which to base the models.
 - stock productivity - Australian orange roughy stock assessments suggest that orange roughy is less productive than has been assumed in New Zealand; using similar assumptions leads to a much poorer stock status.
 - over-parameterisation, i.e., trying to estimate more variables (particularly year class strengths) than the data supports may result in spurious model fits.
34. The Plenary concluded that the previously accepted 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 was not able to be completed, and the current status of the ESCR sub-stock is unknown. The stock status table for the ESCR has been removed from the Plenary report.
35. Information from the commercial fishery shows that since 2015/16, fishing effort in the ESCR has changed from 65–90% of all orange roughy landings caught in short tows of less than one hour duration on underwater features outside of the spawning season, to 50–60% caught in long tows of over two hours' duration, and about 90% taken during the spawning season. The duration of the tows has increased substantially since about 2018. Industry advise that declining catch rates are not matched by declining fishing effort to the same extent, at least partly because fishers are aiming for individual trawl tows to catch smaller quantities of fish in better condition to supply the Chinese market for whole fish.

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

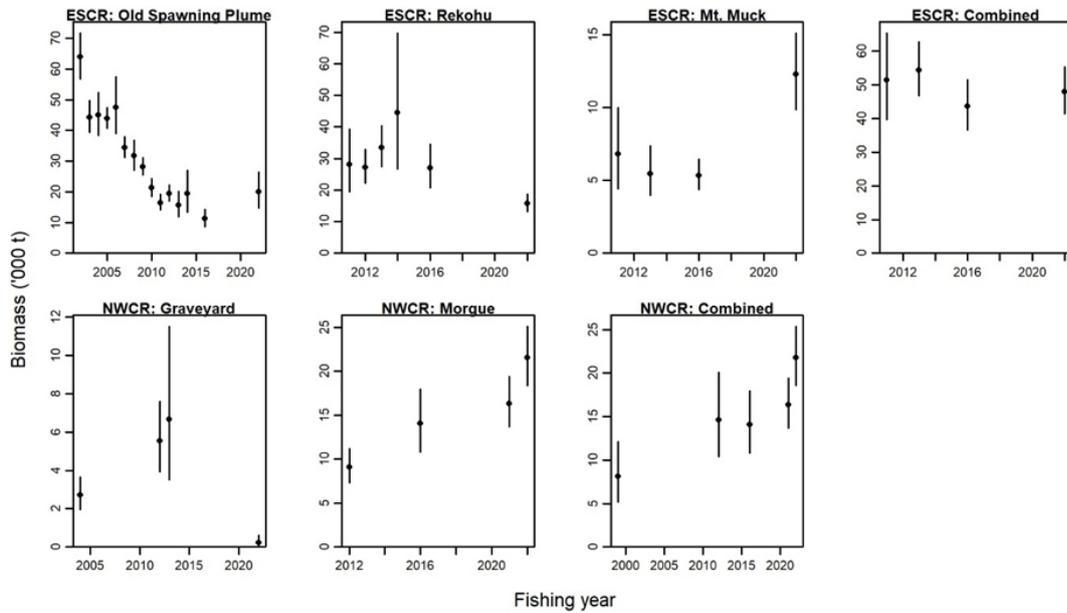


Figure 2: ORH 3B Spawning Stock Biomass estimates from acoustic surveys in ESCR and NWCR sub-areas. Vertical lines indicate 95% confidence intervals (CIs).

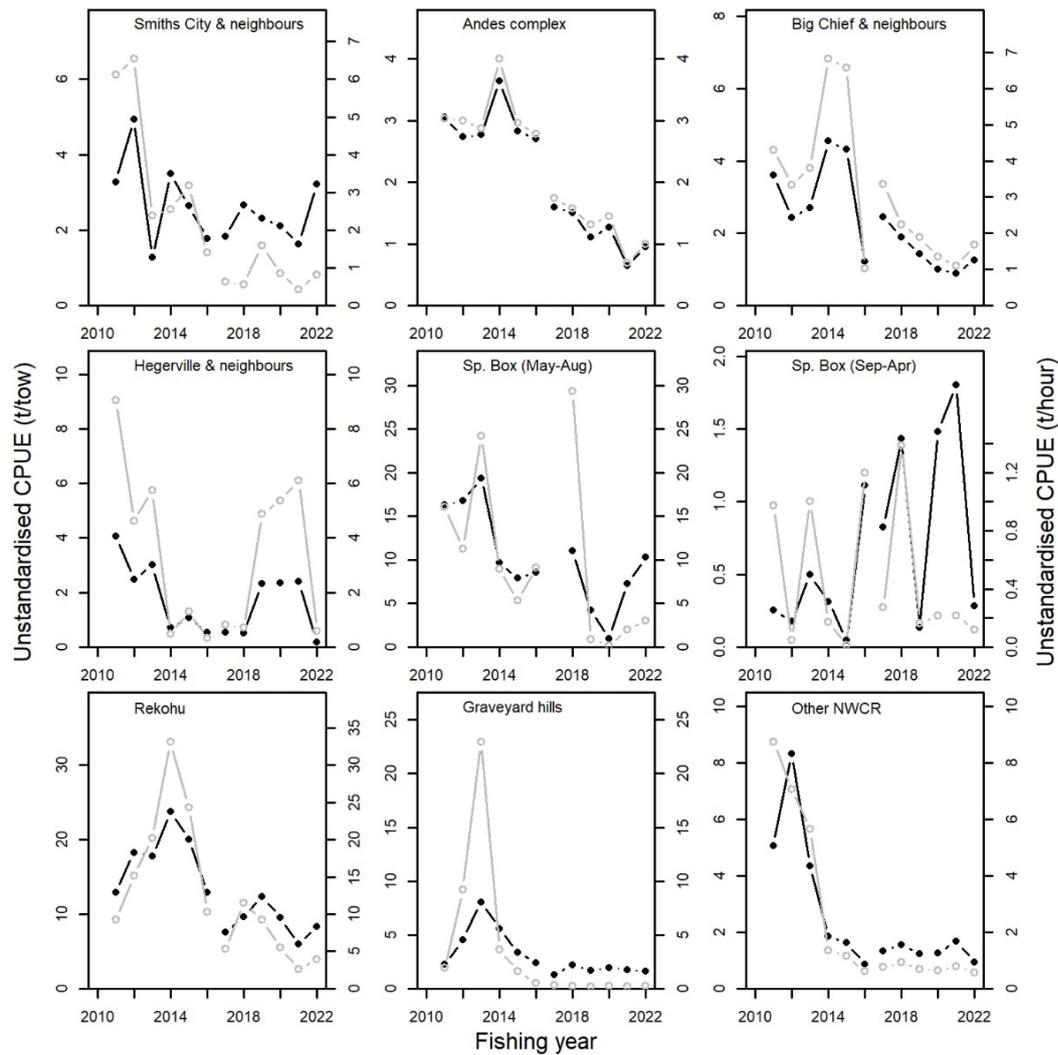


Figure 3: ORH 3B fishery sub-areas and annual unstandardised CPUE for the periods 2009/10 to 2015/16 (period of lower catches and TAC); 2016/17 to 2021/22 (recent years within which fishery characteristics have changed: see text). Black lines and points, t/tow (left y-axis); Grey lines and points, t/hour (right y-axis).

Northwest Chatham Rise

36. For the NWCR, there is a large divergence between catch and sub-area limit with only 17% of the voluntary sub-area catch limit being caught in the 2021/22 fishing year. The duration of the trawl tows has also increased substantially since about 2018 and there have been more tows over flat ground rather than over pinnacles and other topographic features.
37. The re-evaluation of the 2018 NWCR assessment was not completed to the same extent as for the ESCR, so the previous assessment has been retained with some qualifying statements. These include noting that analyses to date provide reasons to consider the 2018 stock assessment to be more uncertain than originally thought, and that further research to inform stock assessments is required.
38. The NWCR combined acoustic index of spawning stock biomass is increasing - although this is driven by the estimated spawning biomass on the Morgue (a spawning aggregation area just north of the Graveyard spawning area, Figure 4) 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 (Figure 2).
39. The Plenary review 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 were re-evaluated. New status interpretations include that the sub-stock is *“Unlikely to be below the Soft and Hard Limits based on the 2022 acoustic survey results.”*

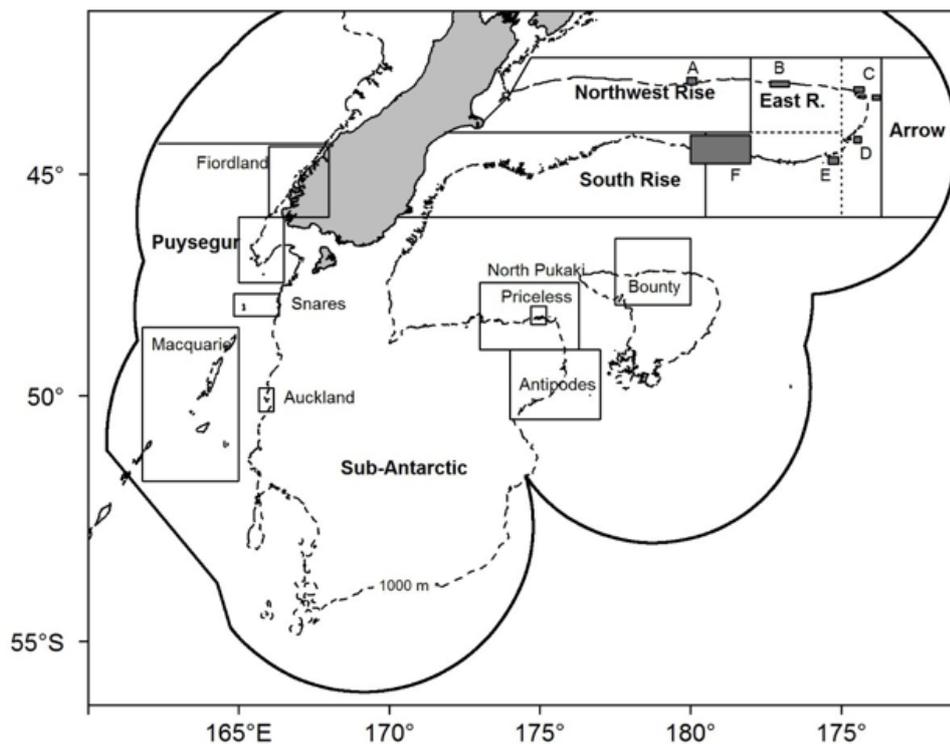


Figure 4. ORH 3B fishery sub-areas and the approximate position of other orange roughy fisheries. The recognised stocks are indicated by bold text. The rectangles mark the main fishing grounds, with those on Chatham Rise shaded: A, Graveyard (180) hills; B, Spawning Box; C, Smith's City NE hills; D, Andes; E, Chiefs; F, South Rise (Mt. Kiso & Hegerville).

Further stock assessment work

40. It was agreed by both the DWWG and the Plenary that further work is required to resolve the issues and to finalise a stock assessment. Recommended further work includes significant work to be done in ageing, surveys, and assessments.

41. Updates to stock assessments and application of a HCR as recently as 2020 suggested the ESCR sub-stock was healthy and increasing, prompting FNZ to recommend the then Minister agree to TAC and TACC increases for ORH 3B in 2018/19, 2019/20, and 2020/21. These recommended increases were based on the best available science information at the time, but the reliability of these stock assessments has been cast into doubt following further research. As a result of the 2023 investigation, FNZ proposes a precautionary approach to the ORH 3B fishery to provide for sustainable utilisation while additional work is completed to inform the status of the ESCR and NWCR sub-stocks.

5 Catch information and current settings within the TAC

5.1 Commercial

42. 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.

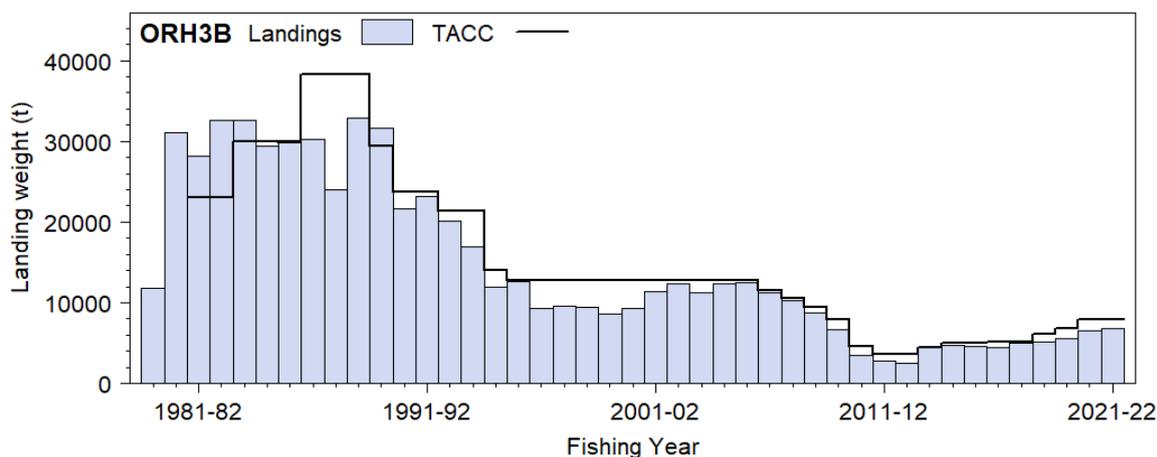


Figure 5. Orange roughy ORH 3B TACCs and landings, 1979/80 to 2021/22.

5.2 Customary Māori

43. 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 pātaka 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.
44. FNZ welcomes input from tangata whenua to inform advice on the proposed retention of this allowance.

5.3 Recreational

45. Due to the depths and locations at which orange roughy is found, the recreational take of orange roughy is either negligible or non-existent, and FNZ holds no records of any orange roughy caught by recreational fishers in ORH 3B. FNZ proposes retaining a recreational allowance of zero tonnes under all options.

5.4 Other sources of mortality caused by fishing

46. The allowance for other sources of mortality caused by fishing is an allowance intended to provide for 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.
47. FNZ proposes to maintain the allowance for other sources of mortality caused by fishing at an amount that equates to around 5% of the TACC under each of the options, because we do not have any specific information to suggest it should change. This allowance is to account for unknown amounts of orange roughly caught but not landed, for example fish that exit trawl net mesh, or burst trawl nets, where the orange roughly subsequently die.

6 Treaty of Waitangi obligations

48. Section 5 of the *Fisheries Act 1996* requires that the Act be interpreted and people making decisions under the Act to do so in a manner that is consistent with the *Treaty of Waitangi (Fisheries Claims) Settlement Act 1992 (the Settlement Act)*. The Settlement Act provides that non-commercial customary fishing rights continue to be subject to the Principles of the Treaty of Waitangi and give rise to Treaty obligations on the Crown.
49. Section 10 of the Settlement Act requires the Minister to develop policies and programmes to give effect to the use and management practices of tangata whenua. Consistent with section 10, FNZ has worked with iwi to develop engagement processes that enable iwi to work together to reach a consensus where possible. Through these engagement processes, tangata whenua are able to inform FNZ on how they wish to exercise kaitiakitanga¹³ regarding fish stocks in which they share rights and interests, and how those rights and interests may be affected by sustainability measures proposed by FNZ.

6.1 Input and participation of tangata whenua

50. Section 12 (1)(b) of the *Fisheries Act 1996* requires that before undertaking any sustainability process the Minister 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, the Minister is required to have particular regard to kaitiakitanga.
51. Input and participation of tangata whenua into the sustainability decision-making process is provided mainly through Iwi Fisheries Forums (**IFFs**), which have been established for that purpose. Each IFF 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.¹⁴
52. 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 Ratō, Ngāti Kōata, Ngāti Kuia, Ngāti Rarua, Ngāti Tama, Ngāti Tōarangatira, Rangitāne ō Wairau, Te Ati Awa and Ngai Tahu.
53. 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 made regarding ORH 3B. FNZ will undertake further engagement with Forums during consultation to seek input on the options

¹³ The Fisheries 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.

¹⁴ However, FNZ also engages directly with Iwi (outside of Forums) on matters that affect their fisheries interests in their takiwa and consults with any affected Mandated Iwi Organisations and Iwi Governance Entities where needed.

outlined in this proposal. FNZ welcomes any input and submissions from tangata whenua on these options.

6.2 Kaitiakitanga

54. Information provided by forums, and iwi views on the management of fisheries resources and fish stocks, as set out in Iwi Fisheries Plans, are ways that tangata whenua can exercise kaitiakitanga in respect of fish stocks.
55. Orange roughy (nihorota) 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.
56. 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:
 - **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.
57. Imi (Moriori) and iwi (Ngāti Mutunga of Chatham Islands (Rēkohu/Wharekauri) have listed pātohe orange roughy as a taonga species in their CIFF@44^o (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^o 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.
58. FNZ considers that the proposed TAC and TACC decreases under all options contributes towards Te Waipounamu Iwi Fisheries Plan and Chatham Island Fisheries Forum plan objectives 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.
59. At the same time, the mauri and wairua of fisheries is likely to be maintained or enhanced under any of these options because the sustainability of orange roughy in ORH 3B should improve. Environmental impacts are reduced by existing regulatory and non-regulatory arrangements, combined with reduced fishing effort.
60. FNZ is seeking input from tangata whenua on how the proposed options for ORH 3B may or may not provide for kaitiakitanga as exercised by tangata whenua, and how tangata whenua consider the proposal may affect their rights and interests in this stock.

6.3 Mātaihai reserves and other customary management tools

61. There are no customary fisheries management tools such as mātaihai, taiāpure, or section 186B temporary closures relevant to this review.

7 Environmental principles – Section 9 of the Act

62. The environmental principles that must be taken into account when considering sustainability measures for the ORH 3B stock, 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.

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

7.1.1 Protected species interactions

63. Associated or dependent species include various protected species that are sometimes accidentally caught through commercial bottom trawling activity. Commercial fishers must file daily reports about what they have caught. FNZ is now releasing these reports quarterly (from the 2019/20 fishing year onwards) on our [webpage](#).
64. Observed capture information is available on the [protected species capture website](#) up to the 2019/20 fishing year. This is the best available independently verified information on protected species interactions. Observer coverage in ORH 3B has averaged 35% percent in the past five fishing years. In the 2021/22 fishing year, observer coverage in ORH 3B was 25% of NWCR tows, and 63% of ESCR tows.
65. FNZ considers the risk of incidental protected species captures is unlikely to increase under the options proposed in this paper given that the amount of fishing effort is likely to be reduced in response to a decreased TAC and TACC. FNZ will continue to closely monitor protected species captures in these fisheries.

Marine mammals

66. The ORH 3B target fishery rarely interacts with marine mammals and 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 one observed New Zealand fur seal capture from tows targeting orange roughy. New Zealand fur seals have a New Zealand Threat Classification of 'Not Threatened.' 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.
67. The DWC Marine Mammal Operational Procedures¹⁵ 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

68. 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 overall risk to seabirds (Richards et al. 2020).
69. Regulations requiring the use of seabird scaring devices by the deepwater trawl fleet have been in place since 2006. Trawlers over 28 m in length are required to deploy seabird mitigation devices when fishing (streamer (tori) lines, bird bafflers and offal management).¹⁶
70. Additionally, a range of non-regulatory measures have been in place for a similar time period. 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. FNZ monitors and

¹⁵ <https://deepwatergroup.org/wp-content/uploads/2018/11/MMOP-Version-9-2.pdf>

¹⁶ <https://www.mpi.govt.nz/dmsdocument/20321-Seabird-Scaring-Devices-Circular-2010-No.-F517>

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.¹⁷

71. 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 0.285 birds per 100 tows. Over this period, the average annual observer coverage was 25%. In comparison, the seabird capture rate in scampi target fisheries over the same period was 4.43 birds per 100 tows.

Fish and invertebrate bycatch

72. Anderson and 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 and smooth oreo, rattails, shovelnose dogfish, and ribaldo. Total estimated annual discards of non-target QMS species were very low. Invertebrate species were caught in low numbers.
73. Finucci et al. (2019) analysed bycatch trends in deepwater fisheries from 1990/91 until 2016/17. They found that the most common bycatch species by weight were smooth oreo, black oreo, and unspecified sharks. Assuming that a reduction in the ORH 3B TACC results in less fishing effort, we would expect that fishing pressure on these species would also decrease.
74. Management of shark species in New Zealand is driven by the National Plan of Action for Sharks (**NPOA-Sharks 2023**). 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 in the ORH 3B TACC would likely reduce the incidental capture of deepwater sharks, all other things being equal.
75. 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

76. 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). A recent study analysed the 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. Bottom trawling for orange roughy accounted for 56% of the protected coral catch weight during this period. Protected coral captures within FMAs 4, 5, and 6 (which approximately align with ORH 3B) account for 86% of the total weight of protected coral captures within the Territorial Sea and EEZ (Meyer, 2023).
77. 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. FNZ and the Department of Conservation are now assessing these recommendations as part of advice to Ministers on the next steps to improve the management of the effects of bottom trawling in the EEZ.
78. 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).

¹⁷ Seabird Annual Reports are available [here](#) and deepwater fisheries Annual Review Reports are available [here](#)

79. FNZ considers that fishing effort, and therefore the trawl footprint, is unlikely to increase under any of the proposed options in the short term. In the longer term, fishers may choose to trawl on new areas as they apply more effort to flat areas with longer trawl tows, as discussed in paragraph 14.

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

80. 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).
81. 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](#).
82. Management measures to address the effects of trawl activity have focused on avoiding benthic impacts. 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 (Clark et al, 2019). Five of the Seamount Closures are within the ESCR and NWCR ORH 3B sub-areas – Pinnie, Morgue, the Pyre/Gothic group, Diamond Head, and Seamount 328). Three of the BPAs are within the ESCR and NWCR ORH 3B sub-areas – Mid Chatham Rise, East Chatham Rise, and Blink.
83. 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, 2021).
84. The trawl footprint in ORH 3B between 1990 and 2019 was estimated to be 11,209 km² of the seabed in the ESCR sub-area, and 6,882 km² of the seabed in the NWCR sub-area at depths of 800 m to 1,600 m. For the 2018/19 fishing year, 3,135 orange roughy bottom trawl tows had an estimated footprint of 3,008 km² which represented coverage of <0.1% of the EEZ and Territorial Sea and 0.2% of the fishable area. 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.
85. FNZ therefore considers that the trawl footprint is unlikely to increase under any of the options proposed in this paper in the short term. In the longer term, fishers may choose to trawl on new areas as they apply more effort to flat areas with longer tows as discussed in paragraph 13. The impact of trawling on flat areas on biodiversity is unknown, as there is little information regarding the biodiversity of these areas.

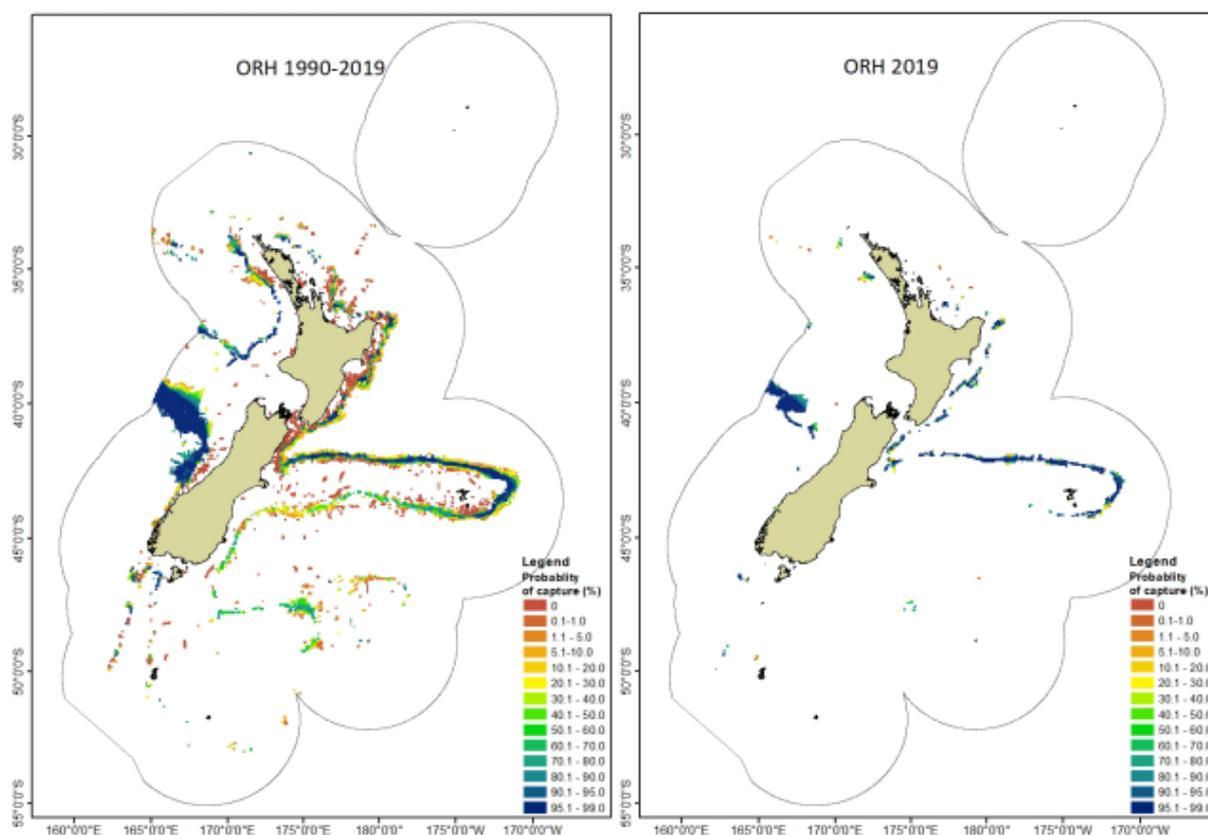


Figure 6: Distribution of the 1990-2019 (left) and the 2019 trawl footprint (right) for orange roughy (Baird and Mules, 2021)

86. The trawl footprint of the orange roughy fishery will continue to be mapped and monitored annually.

7.3 Habitats of particular significance for fisheries management – section 9(c) of the Act

87. ‘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. Alongside this, FNZ consulted on operational proposals to support the consideration of habitats of particular significance protection, when making fisheries management decisions. FNZ considers ‘protect’ in this context means taking measures that would avoid, remedy, or mitigate the adverse effect of a decision that could undermine the function the habitat provides for fisheries.

88. There are no specific habitats of particular significance identified for ORH 3B at this time. What is known is discussed in Table 2 below.

Table 2: Summary of information on potential habitats 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 bottom bathymetric 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.

Fish stock	Orange roughy (ORH 3B)
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. NIWA Technical Report 119. 377 p.
Confidence	High – A body of empirical work exists that orange roughy spawning is associated with bottom features, particularly depths between 700 m and 1,000 m. There is uncertainty in whether there are direct linkages between spawning and biogenic habitats found on these seabed features.

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

89. Section 11 of the *Fisheries Act 1996* sets out various matters that the Minister must take into account or have regard to when setting or varying sustainability measures (such as the TAC change proposed as part of this paper). These include:

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

- any relevant planning instruments, strategies, or services.¹⁸

8.1 Effects of fishing on any stock and the aquatic environment

90. In setting or varying a sustainability measure the Minister must take into account any effects of fishing on any stock and the aquatic environment.
91. “Effect” is defined widely in the Act.¹⁹ The broader effects of removing orange roughy from the ecosystem as well as the more direct effects of trawling must be taken into account.
92. Effects of orange roughy fishing are described in section 7.1 (associated and dependent species), section 7.2 (biological diversity) and section 7.3 (habitats of particular significance for fisheries management), above.
93. The most affected QMS stocks caught as bycatch in the orange roughy target fishery are smooth oreo, black oreo, hoki, and ribaldo. There are no immediate sustainability concerns for any of these stocks, and in any event, a reduction in orange roughy target fishing would result in a reduction of bycatch of these affected stocks, all other things being equal.

8.2 Existing controls that apply to the stock or area

94. In setting or varying a sustainability measure the Minister must take into account any existing controls under the *Fisheries Act 1996* (including rules and regulations made under the Act (s 2(1A)) that apply to the stock when setting or varying the TAC.
95. Spatial restrictions set under the Act can be put in place to ensure sustainable utilisation or to protect habitats of particular significance for fisheries management. There are several spatial restrictions currently in place that apply to ORH 3B, as discussed in section 7.2 of this paper.

8.3 The natural variability of the stock

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

8.4 Relevant statements, plans, strategies, provisions, and documents - section 11(2) of the Act

98. In setting or varying the TAC of this stock, the Minister must have regard to relevant statements, plans, strategies, provisions, and planning documents under section 11(2) of the Act, that apply to the coastal marine area. The following plans and strategies apply to ORH 3B.

8.4.1 Harvest Strategy Standard

99. 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 a mandatory relevant consideration that the Minister must have regard to when setting a TAC under section 13 of the Act.

¹⁸ Sections 11 (2) and (2A).

¹⁹ 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.

100. 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.
101. The HSS outlines the FNZ's approach to relevant sections of the Act and forms a core input to the FNZ's advice to the Minister 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.

8.5 Relevant services or fisheries plans – section 11(2A) of the Act.

102. Before setting or varying any sustainability measure (such as the TAC), the Minister must take into account any conservation or fisheries services, and any relevant fisheries plans approved under section 11(2A) of the Act.

8.5.1 National Fisheries Plan for Deepwater and Middle-depth Fisheries

103. The National Fisheries Plan for Deepwater and Middle-depth Fisheries (**National Deepwater Plan**)²⁰ 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.
104. All orange roughy stocks are managed as Tier 1 stocks within the National Deepwater Plan – Part 1A. Tier 1 stocks are high volume and/or high value target fisheries. A species-specific chapter of the National Deepwater Plan for orange roughy (Part 1B) 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.
105. The National Deepwater Plan is a formally approved section 11A plan which the Minister 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.
106. There are no other plans, strategies, or statements relevant to orange roughy or ORH 3B.

8.6 Other plans and strategies

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

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

108. 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.²¹ 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:

²⁰ <https://www.mpi.govt.nz/dmsdocument/18779-National-Fisheries-Plan-for-Deepwater-and-Middle-depth-Fisheries-Part-1A>

²¹ <https://www.doc.govt.nz/nature/biodiversity/aotearoa-new-zealand-biodiversity-strategy/>

- **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.

109. For Objective 4, FNZ is working with science providers to review and evaluate the data that feed into the stock assessment model (for example, reading more otoliths 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 section above).

8.6.2 Deepwater Council (DWC) Operational Procedures

110. The DWC [Orange Roughy and Oreo Operational Procedures \(OPs\)](#) outline management measures for the fishing industry that are additional to requirements under the Act, intended to ensure the sustainable utilisation of orange roughy and oreo.
111. The OPs establish the agreed sub-area catch limits as well as how operators report to the DWC, who monitor catch in each of the sub-areas to ensure that the voluntary catch limits are not exceeded.
112. The OPs are an agreement between orange roughy (and oreo) quota owners, ACE owners, and FNZ, that is entirely administered by industry. Since sub-area catch limits that apply to ORH 3B are entirely voluntary, industry support, promotion, and monitoring are critical. This has historically worked very well, with sub-area catch limits seldom exceeded.
113. The DWC [Deepwater Trawl Benthic Operational Procedures 2022-23](#) help to mitigate benthic interactions. This document outlines procedures to avoid catching corals, how to respond if corals are accidentally caught, and lists reporting requirements.

8.7 Section 13 – Total Allowable Catch

114. FNZ proposes a precautionary approach in setting the TAC under section 13(2A) because the overall status of the ORH 3B stock is unknown and the MSY is unknown. FNZ also notes the importance of orange roughy as a commercial species, and the concerns for localised depletion.
115. As outlined above under section 4 (status of the stock) above, the best available information on the status of the ORH 3B includes:
- A full characterisation of available data for the ORH 3B stock and fishery (i.e., acoustic survey and observer data).
 - A previous stock assessment for the NWCR sub-stock which has been retained for 2023 with some qualifications and re-considered outputs.
 - The current stock status of ORH 3B in the ESCR is unknown because the 2020 ESCR stock assessment was re-evaluated and rejected by the DWWG.
116. The information available suggests that the performance of the fishery is relatively poor, particularly for the NWCR where there is a large divergence between catch and agreed sub-area catch limit, with only 17% of the catch limit for the NWCR being caught in the 2021/22 fishing year. Additionally, acoustic survey information for the ESCR is flat and declining in some areas, which is inconsistent with previous assessments.
117. Based on the new information, FNZ considers that the ORH 3B TAC has been set too high since 2014/15, which implies a precautionary TAC reduction is justified for the 2023/24 fishing year.

118. The status of the ORH 3B stock in relation to MSY is unable to be reliably estimated using the best available information (outlined above), and as such, section 13 (2A) of the Act is the provision relevant to setting the TAC of the stock. In deciding to set or vary the TAC under this provision, the Minister 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.
119. FNZ is proposing three options to decrease the TAC of ORH 3B for the 2023/24 fishing year. All options are considered precautionary and should help to move the stock towards a level that can produce MSY, consistent with section 13(2A). The range of options provides different levels of precaution toward recovery and future sustainability of the stock. Some options propose larger decreases in fishing pressure and are therefore more precautionary towards ensuring the sustainability of the stock. Larger reductions will provide for lower levels of utilisation in the short term.
120. Feedback is sought on these options, or alternatives within this range.

8.7.1 Biological characteristics

121. Biological characteristics of orange roughy that the Minister must have regard to when setting a TAC under section 13(2A) of the Act are discussed under section 3.2 above. The biological characteristics of orange roughy (longevity and low fecundity) mean that orange roughy populations are not resilient under high fishing pressure. This indicates that a conservative TAC setting is warranted. FNZ considers that all three options proposed in this paper are precautionary. It should be noted that the options under which greater TAC reductions are proposed, the Minister will have greater regard to the biological characteristics of ORH 3B.

8.7.2 Interdependence of stocks

122. There is little information available regarding predator/prey interdependency for orange roughy. As noted in the Plenary report, larger orange roughy have been observed with healed flesh wounds, that may be caused by deepwater dogfish. Giant squid and sperm whales are also thought to prey on orange roughy. 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, it would be reasonable to assume that there would be no adverse effects on interdependent species.
123. It is unlikely that any reduction to the TAC would impact targeting 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 black oreo, smooth oreo, hoki, and ribaldo. There are no sustainability concerns for these stocks. Bycatch of these species is expected to decline as a result of less effort applied to orange roughy fishing under all proposed options.

8.7.3 Environmental conditions affecting the stock

124. Environmental conditions affecting the stock are considered in section 7.3 (Habitats of particular significance for fisheries management), above. FNZ is not aware of any specific environmental conditions adversely affecting ORH 3B that the Minister should have regard to in deciding on an appropriate TAC.

9 Options and analysis

125. The ORH 3B stock assessment model requires further work to resolve the disparity between the model and the characterisation of the fisheries, particularly for the ESCR. There is currently a limited amount of data available, however the information available suggests that caution is needed as stock status is highly uncertain. Furthermore, the management actions for the NWCR and the ESCR may need to be different, especially given the large discrepancy between the catch and the agreed catch limit for the NWCR, noting that there is a lower level of uncertainty for the NWCR sub-area than for the ESCR.
126. The options proposed are shown in Table 4. All three options are associated with reductions to the ESCR voluntary non-regulatory sub-area catch limit. These options would rely upon co-operation of quota holders, through the DWC, to implement any changes. Changes to sub-area limits through this non-regulatory arrangement have in the past been well adhered to and FNZ closely monitors compliance.

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

		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%)
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	-

127. Following the 2023 ORH 3B DWWG meetings, the DWC proposed in a letter to FNZ dated 31 May 2023 to reduce the ESCR catch limit from the current 5,670 tonnes to the previous limit of 4,775 tonnes, by way of shelving ACE. Shelving is a formal agreement among quota owners of a stock to forgo harvesting a specified proportion of the TACC by each transferring an agreed proportion of their ACE to a non-fishing entity, usually FishServe. Shelving is not legislated in the Act and FNZ do not consider shelving a substitute for a properly set TAC and TACC. FNZ notes that ACE shelving has been considered when setting a TAC in other fisheries (E.g. PAU 4 in 2019), but in this instance, a change to the TAC and TACC is needed given the information available about ORH 3B.
128. Options 1 and 2 are reversals of previous phased increases in the TAC. Option 3 is based on an alternative method of estimating yield for the ESCR sub-area.

9.1 Current settings

TAC 8,355 t	TACC: 7,967 t	Customary: 5 t	Recreational: 0 t	Other mortality: 383 t
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129. The status quo is not proposed as an option as it is inconsistent with the requirement under the Act for the Minister to act to ensure sustainability when information is uncertain. Retaining the

current catch settings would not align with the Minister's obligation under the Act to set a TAC in accordance with the conditions set by section 13 (2A) as outlined in section 8.7 above.

9.2 Option 1

TAC 7,116 t (↓1,239)	TACC: 6,772 t (↓ 1,195)	Customary: 5 t –	Recreational: 0 t –	Other mortality: 295 t (↓ 44)
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9.2.1 TAC

130. Option 1 is to 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 in TAC based on a previously optimistic assessment of the ESCR sub-stock.

9.2.2 Allowances

131. Option 1 is to return allowances to the 2019/20 settings. The customary and recreational allowances would therefore remain unchanged, at 5 tonnes and 0 tonnes, respectively, and the allowance for other sources of fishing related mortality would remain around 5% of the TAC.

9.2.3 TACC

132. 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.

9.2.4 Discussion

133. For this option to be effective, industry would need to both support and promote the sub-area catch limit arrangement to give the Minister confidence that this option is viable, since sub-area catch limits that apply to ORH 3B are voluntary. The reduction to the ESCR sub-area limit proposed under option 1 is the same reduction as proposed to FNZ by DWC as discussed in paragraph 127.
134. Option 1 would provide an opportunity for industry to demonstrate stewardship, by continuing to implement non-regulatory measures, that, in recent years, have maintained catch below the sub-area limits.
135. Under option 1, FNZ proposes a cautious decrease with respect to utilisation, allowing FNZ and industry to monitor performance of the fishery whilst acknowledging concerns about the performance of the fishery.
136. Under option 1 the Minister would be taking into account the sustainability concern associated with the 2023 characterisation of the ESCR fishery and the conclusion by the stock assessment Plenary that the status of the sub-stock is now unknown. FNZ considers this option represents the minimal appropriate reduction until more science information about the status of the stock becomes available.
137. The main risk of option 1 is that the proposed TAC reduction may not be significant enough to effectively support sustainability in the immediate term, and further reductions may be necessary as more information becomes available. FNZ is prioritising research to support development of a new stock assessment as soon as possible.

9.3 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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9.3.1 TAC

138. Option 2 is for a more substantial reduction to the TAC. It proposes to return the TAC to the setting that applied before the first phased increase in the 2018/19 fishing year i.e., 5,470 tonnes. This represents a 35% decrease to the current 8,355-tonne TAC.

9.3.2 Allowances

139. Allowances for customary Māori and recreational fishers would remain unchanged, at 5 tonnes and 0 tonnes, respectively. The allowance for other sources of fishing related mortality would be returned to the 2017/18 allowance of 268 tonnes, which as a proportion of the TAC is unchanged from the current setting.

9.3.3 TACC

140. Option 2 is to return the TACC to the setting that applied before the first phased increase in the 2018/19 fishing year i.e., 5,197 tonnes. This is a 35% decrease from the current 7,967-tonne TACC.

141. The voluntary sub-area catch limits would also revert to the 2018/19 values as shown in Table 5, with all of the reduction accruing to the ESCR. The catch limits for the other sub-areas would remain unchanged.

9.3.4 Discussion

142. Option 2 places greater weight on the sustainability concerns associated with 2023 research and is a pragmatic approach to restore the catch limits and settings to the level they were prior to the phased increase in 2018/19. Increases since then to the TACC were based on an assessment that has been rejected by the Fisheries Assessment Plenary as not reflecting stock status. This reduction in the TAC and TACC and the associated reduction in the ESCR sub-area catch limit represents a compromise between acting when information is highly uncertain; concerns about the reduction in performance of the fishery; and enabling the fishery to continue to operate.

143. The benefit of this approach is that catch limits are reduced significantly (supporting sustainability) but are simultaneously sufficiently high enough to enable utilisation. Catch limits at pre 2018/19 levels are expected to support an economically viable fishery.

144. This option would give greater certainty that overfishing is not occurring. It also relies less on the potential to re-evaluate catch settings when more information is available.

9.4 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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9.4.1 TAC

145. Option 3 is based on a calculation of yield for the ESCR sub-stock using methods described in Doonan et al. (2015), and retains the other existing sub-area catch limits to derive a TACC.

9.4.2 Allowances

146. The customary and recreational allowances would remain the same under option 3 at 5 tonnes and 0 tonnes respectively, and the allowance for all other mortality caused by fishing would remain around 5% of the TAC.

9.4.3 TACC

147. This approach uses the most recent acoustic biomass estimate for the ESCR, which is 48,981 tonnes. It has been assumed that there is some spawning stock elsewhere and only 80% of the biomass was observed in the main spawning aggregations.
148. This acoustic biomass estimate can be scaled up using the $F=M$ rule,²² where M is applied to the spawning biomass estimate to calculate the sub-area limit (i.e., M is used as an exploitation rate) as follows:

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

9.4.4 Discussion

149. This method is based upon acoustic survey data that is considered robust. The methodology has been peer-reviewed in scientific journals (see Doonan et al. 2015).²³ This method is frequently used when there is a lack of information, which is the case for ORH 3B.
150. As recently as 2010, estimates of mature biomass have been used to estimate orange roughy yield in the absence of survey data. Now, we understand more about the frequency of orange roughy spawning, so applying a more conservative factor (spawning biomass) is preferred over mature biomass, since this is the proportion of the orange roughy population that is actually contributing to an increase in recruitment in a given year.
151. The 40% reduction in TAC is consistent with addressing sustainability concerns in a responsive way, prioritising the long-term sustainability of the stock above potential negative socio-economic impacts in the short term. It is the option most likely to increase abundance for ORH 3B at the fastest rate.
152. The major disadvantage of this option is that the sub-area catch limit for the ESCR (down 54%) would cause major forgone economic opportunities in the short term, noting that the TACC reduction under option 3 is the largest reduction proposed.

10 Economic considerations

153. Most orange roughy is exported, with little consumed domestically. In the 2022 calendar year, 3,073 tonnes (of processed weight, which converts to 7,029 tonnes green weight) of orange roughy 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.
154. 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 in 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 would be close to zero.
155. 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

²² 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).

²³ <https://www.sciencedirect.com/science/article/abs/pii/S0967063714002234>

\$12.4 million in export earnings, based on 2022 FOB export prices, assuming export prices and the product mix remain the same.

156. 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.
157. 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.
158. 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% of quota was owned by 4 entities, and the remaining 10% of quota was owned by 58 entities.
159. Of the 62 entities that own quota, 57 own Settlement Quota, which accounts for 8.1% of total ORH 3B quota.
160. 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.
161. For the 2021/22 fishing year, there were six licensed fish receivers (**LFRs**) receiving ORH 3B, with eight entities landing to these LFRs.

11 Deemed values

162. Deemed values are the price paid by fishers for each kilogram of unprocessed fish landed in excess of a fisher's Annual Catch Entitlement (**ACE**) holdings. The purpose of the deemed values regime is to provide incentives for individual fishers to acquire or maintain sufficient ACE to cover catch taken over the course of the year, while allowing flexibility in the timing of balancing, promoting efficiency, and encouraging accurate catch reporting.
163. The [Deemed Value Guidelines](#) set out the operational policy FNZ uses to inform the development of advice to the Minister on the setting of deemed values.
164. The deemed value rates for ORH 3B are shown in Table 6 below while Figure 7 shows trends in the port price, average annual ACE transfer price, and annual deemed value rate for ORH 3B since 2014/15 and compares the lowest annual deemed value rate to the average ACE price and port price for the stock. No deemed values have been incurred for ORH 3B for the last three fishing years.

Table 6: Current deemed value rates for ORH 3B.

Stock	Interim deemed value rate (\$/kg)	Special annual differential rates (\$/kg) for excess catch (% of ACE)	
		100-110%	>110%
ORH 3B	4.50	5.00	6.25

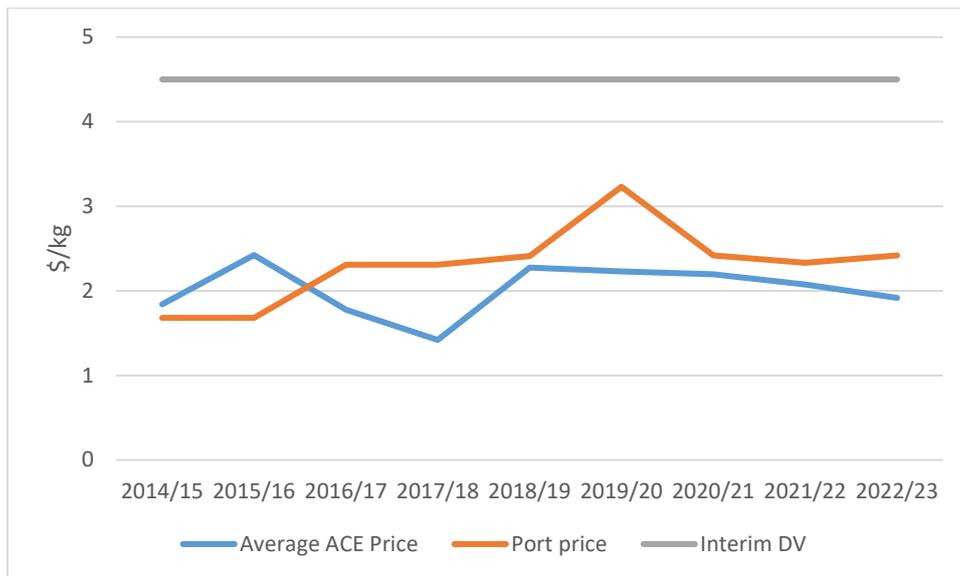


Figure 7: Port price, average ACE price, and interim deemed value rate information for ORH 3B since 2014/15. Note that the average ACE transfer price for 2022/23 is based on a smaller sample size given that the fishing year is not yet complete.

165. FNZ is satisfied that since the basic annual deemed value rate lies well above the average ACE price, it is consistent with requirement in section 75(2)(a) of the Act to provide an incentive for fishers to balance their catch with ACE (rather than paying the relevant deemed value).
166. Although the deemed value rate is much higher than the port price, it is not so high as to incentivise dumping or misreporting, since it is less than the average export price per kg of fish (around \$7-\$9/kg greenweight equivalent in 2022). FNZ is therefore not proposing any changes to deemed value rates for ORH 3B at this time. Nevertheless, FNZ welcomes any feedback on these deemed value settings.

12 Questions for submitters

- Which option do you support for revising the TAC and allowances? Why?
 - If you do not support any of the options listed, what alternative(s) should be considered? Why?
 - Are the allowances for customary Māori, recreational and other sources of mortality appropriate? Why?
 - Do you think these options adequately provide for social, economic, and cultural wellbeing?
 - Do you have any concerns about potential impacts of the proposed options on the aquatic environment?
167. We welcome your views on these proposals. Please provide detailed information and sources to support your views where possible.

13 How to get more information and have your say

168. FNZ invites you to make a submission on the proposals set out in this discussion document. Consultation closes at 5pm on 24 July 2023.
169. Please see the FNZ sustainability consultation webpage (<https://www.mpi.govt.nz/consultations/review-of-sustainability-measures-for-fisheries-october-2023-round/>) for related information, a helpful submissions template, and information on how to submit your feedback. If you cannot access to the webpage or require hard copies of documents or any other information, please email FMSubmissions@mpi.govt.nz.

14 Legal basis for managing fisheries in New Zealand

170. The *Fisheries Act 1996* provides the legal basis for managing fisheries in New Zealand, including the Minister's responsibilities for setting and varying sustainability measures. See the separate document *Overview of legislative requirements and other considerations* at <https://www.mpi.govt.nz/dmsdocument/57112> for more information.

15 Referenced reports

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