



Review of Management Controls for Orange Roughy 3B

MPI Discussion Paper No: 2014/19

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INTRODUCTION

- 1 This Discussion Paper provides the Ministry for Primary Industries' (MPI's) initial proposals relating to catch limits and allowances for ORH 3B. Any changes to the current management settings would apply from 1 October 2014.
- 2 MPI has developed this paper for the purpose of consultation as required under the Fisheries Act 1996 (the Act). The proposals outlined in the paper are preliminary and are provided as the basis for consultation with stakeholders.
- 3 In July 2014, MPI intends to provide a Final Advice Paper (FAP) to the Minister for Primary Industries. The FAP will summarise MPI's position and make recommendations to the Minister that incorporate the views of stakeholders resulting from the consultation. A copy of the FAP and the Minister's letter setting out his final decisions will be posted on the MPI website as soon as these become available.

DEADLINE FOR SUBMISSIONS

- 4 MPI welcomes written submissions on the proposals contained in the Discussion Paper. All written submissions must be received by MPI no later than 5pm on **Wednesday, 25 June 2014**.

Written submissions should be sent directly to:

Deepwater Fisheries Management
Ministry for Primary Industries
P O Box 2526
Wellington 6011

or emailed to fmsubmissions@mpi.govt.nz

Official Information Act 1982

- 5 All submissions are subject to the Official Information Act and can be released (along with the personal details of the submitter) under the Act. If you have specific reasons for wanting to have your submission or personal details withheld, please set out your reasons in the submission. MPI will consider those reasons when making any assessment for the release of submissions if requested under the Official Information Act.

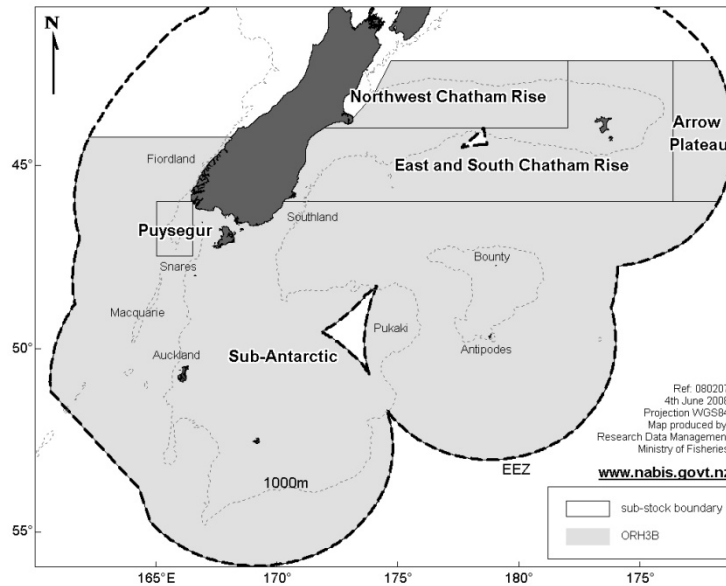


Figure 1: Sub-stock boundaries for the ORH 3B Quota Management Area.

EXECUTIVE SUMMARY

- 6 The Ministry for Primary Industries (MPI) is seeking tangata whenua and stakeholder input to inform a review of catch limits and other management controls for ORH 3B.
- 7 ORH 3B is a large and spatially complex area that comprises at least four individual sub-stocks (Figure 1). The Minister for Primary Industries (the Minister) sets the total allowable catch (TAC) for the ORH 3B stock as a whole. The Deepwater Group Ltd (DWG), which represents approximately 98.0% of the ORH 3B quota owners, agrees each year to adhere to catch limits at a sub-Quota Management Area (QMA) level for the individual sub-stocks (catch limits).
- 8 Stock assessments were completed in 2014 for the two largest sub-stocks in ORH 3B: Northwest Chatham Rise and East and South Chatham Rise.
- 9 The 2014 stock assessment of the Northwest Chatham Rise sub-stock estimates the sub-stock to be at 37% of the unfished orange roughy biomass (B_0) and increasing. This result places the stock's status near the upper bound of the management target range (30-40% B_0) and indicates additional utilisation opportunities may be available. MPI is therefore proposing management options to amend the catch limit for the Northwest Chatham Rise sub-stock (Table 1). The options presented are consistent with the agreed harvest strategy for orange roughy, and would not prevent stock biomass increasing further in the short-term.

Table 1: Current and proposed catch limits for Northwest Chatham Rise sub-stock (tonnes) and the overall TAC for ORH 3B

	Option 1 (status quo)	Option 2	Option 3
Northwest Chatham Rise catch limit	750	900	1250
Overall 3B TAC	4,725	4,883	5,250

10 The 2014 stock assessment of the East and South Chatham Rise sub-stock estimates that the sub-stock is at 30% B_0 , which is at the lower bound of the management target range (30-40% B_0).

11 Stock biomass is projected to continue increasing above 40% B_0 at the current catch level. Stock biomass is also projected to increase, but at a slower rate, if a greater volume of catch was taken from the stock each year. MPI considers that the status of this should increase further into the current management target range before the harvest level is increased.

12 MPI is not proposing any changes to the catch limit for the East and South Chatham Rise sub-stock.

13 MPI has reviewed annual, interim and differential deemed value rates for ORH 3B and is not proposing changes to the current rates for the 2014/15 fishing year.

CONTEXT

Biological characteristics

14 Orange roughy is a slow-growing, long-lived fish that inhabits depths between 700 and 1,500 m within the New Zealand EEZ. On the basis of otolith ring counts, it is estimated that orange roughy may live up to 120-130 years, and are thought to spawn at around 32-41 years of age.

Commercial fishery

15 ORH 3B is a spatially complex area and comprises several biological sub-stocks.¹ The status of each biological sub-stock is assessed independently. The two largest sub-stocks are located on the Chatham Rise. Catches from these stocks represent around 90% of the total orange roughy catch from ORH 3B.

Table 2: Current TAC, TACC and sub-area catch limits for ORH 3B (tonnes)

Sub-stock	2013/14 Catch limit
Northwest Chatham Rise	750
East and South Chatham Rise	3,100
Puysegur	150
Arrow Plateau (protected by BPA)	0
Sub-Antarctic	500
TACC	4,500
Other sources of fishing-related mortality (5% of TACC)	225
TAC	4,725

¹ Unless otherwise clarified in the text “stock” refers to the QMA management unit ORH 3B (per the definition of “stock” in section 2 of the Fisheries Act 1996) and “sub-stock” refers to a biologically or geographically distinct orange roughy population within ORH3B.

16 The catch limit for the Northwest Chatham Rise sub-stock was reduced from 1,500 tonnes to 750 tonnes in 2006. Very little catch has come from this sub-stock since 2010 when quota owners gave a commitment not to fish this sub-stock for the 2010/11, 2011/12 and 2012/13 fishing years. Based on the preliminary results of the 2014 stock assessment showing the sub-stock was likely to be within the target range, the 750 tonne catch limit is being fished in the remainder of the 2013/14 fishing year.

Recreational and Māori Customary

17 Recreational and customary fishers do not target or catch orange roughy due to the depths it is found. The current recreational and Māori customary allowance for all orange roughy stocks is zero (0) tonnes. MPI is proposing to retain this allowance.

18 The Minister must give particular regard to kaitiakitanga and take any relevant Iwi or Forum Fishplans into account when setting or varying the TAC for a stock. In respect to ORH 3B, the input and participation of tangata whenua is effected through MPI's relationship with Te Waka a Māui me ōna Toka Iwi Forum and and CIFF@44 (Chatham Islands) Forum. Orange roughy is identified as a taonga species in both Forums' Fisheries Plans.

Other Sources of Fishing Related Mortality

19 MPI proposes to retain the current allowance for other sources of fishing-related mortality, set at 5% of the TACC. This allowance accounts for unreported orange roughy mortality, such as loss due to burst nets, or discarding of damaged orange roughy.

Previous Review

20 The most recent TAC and catch limit review for ORH 3B was in 2013 when the overall TACC for ORH 3B was increased from 3,600 tonnes to 4,500 tonnes with the increase being allocated entirely to the East and South Rise catch limit. The East and South Chatham Rise catch limit was increased from 1,950 tonnes to 3,100 tonnes in response to a stock assessment including information from surveys on a newly discovered orange roughy plume (the Rekohu plume).

21 The 2013 assessment estimated the stock status to be 25% B_0 . The catch limit was increased in accordance with the F-based harvest strategy in place informed by biomass estimates from 2012 and 2013 surveys. The increased catch limit absorbed the 250 tonne research allowance which had previously been allocated to the East and South Chatham Rise stock.

22 The most recent review of the catch limit for Northwest Rise was in 2006 when the catch limit was reduced from 1,500 tonnes to 750 tonnes. The reduction was based on a stock assessment that estimated the stock status to be below 20% B_0 . The catch limit was then set at 750 under the rationale that it was half of the previous years' catch limit. The high uncertainty in this stock assessment was acknowledged. The model used has since been discredited.

2014 Stock Assessments

23 The following sections present the best available scientific information on the status of the sub-stocks of orange roughy within ORH 3B.

Northwest Chatham Rise

24 The 2014 Plenary agreed that the stock assessment of the Northwest Chatham Rise was of high quality and met New Zealand's Science and Research Information Standard.² The results from the assessment can therefore confidently be accorded a high weight in fisheries management decisions.

25 The Plenary agreed on a base model which assumed natural mortality (M) at 0.045 and was single-sex and age-structured. The model included all catch history data, commercial length frequencies, age data from wide-area trawl surveys, and acoustic biomass estimates from Acoustic Optical System and towed body surveys from 1999 and 2012 and the 2013 biomass estimate from the Graveyard feature only.³

26 The base model estimates current biomass to be at 37% B_0 . The Plenary considered the stock status as Very Likely (> 90% probability) to be at or above the lower bound of the management target range (30-40% B_0). It is also considered Very Unlikely (< 10% probability) to be below the Soft Limit (20% B_0) and Exceptionally Unlikely (< 1% probability) to be below the Hard Limit (10% B_0).

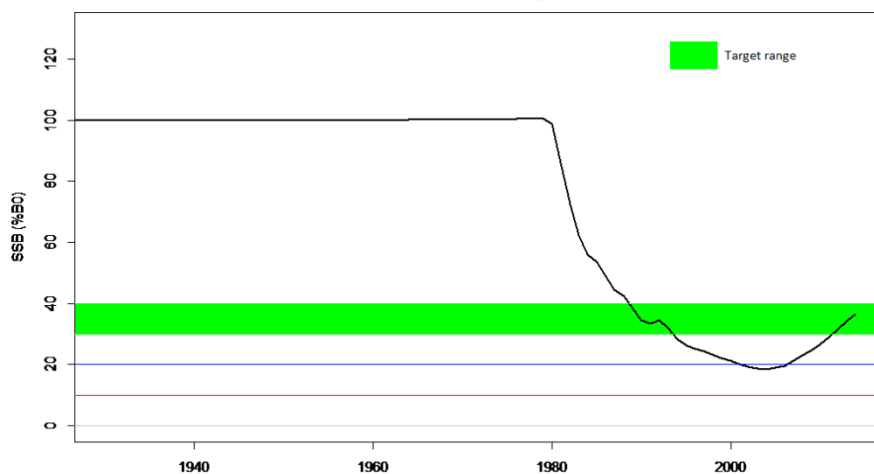


Figure 2: Estimated biomass trajectory for ORH 3B Northwest Chatham Rise

27 Stock status is estimated to have been increasing slowly over the last 10 years (Figure 2). Stock biomass is projected to continue increasing at the current catch level and if catches from the stock were increased as proposed.

28 The main uncertainties in the Northwest Chatham Rise stock assessment include the proportion of the spawning stock that is indexed by the acoustic survey in each year, that the patterns in year class strength are based on only one year of age composition data, and

² Available at: <http://www.fish.govt.nz/en-nz/Publications/Research+and+Science+Information+Standard.htm>

³ Biomass estimates from the Morgue seamount were not included because of the uncertainty around the species mix of acoustic marks surveyed.

that the time series of abundance indices is short and restricted to the period when stock status has been low.

29 Additional model runs investigated the sensitivity of the model to assumptions regarding M and the treatment of acoustic biomass estimates in the model. None of the additional model runs was considered to be more appropriate than the base case for informing fisheries management decisions.

East and South Chatham Rise

30 The 2014 Plenary agreed that the stock assessment of the East and South Chatham Rise was of high quality and met New Zealand's Science and Research Information Standard. The results from the assessments can therefore confidently be accorded a high weight in fisheries management decisions.

31 The 2014 Plenary agreed on a base model which assumed natural mortality (M) at 0.045 and was single-sex and age-structured. The model included four main data inputs: biomass indices from historical research trawl surveys; acoustic biomass indices from research surveys of spawning plumes; age frequencies from the spawning plumes in 2012 and 2013 and; length frequencies from commercial fisheries. Additional data were available that was not used in the model as it was not considered to meet the data quality threshold.

32 The assessment estimates current biomass to be at 30% B_0 . The Plenary considered the stock status to be About as Likely as Not (40-60% probability) to be at or above the lower bound of the management target range (30-40% B_0). It is also considered Unlikely (< 40% probability) to be below the Soft Limit (20% B_0) and Very Unlikely (< 10% probability) to be below the Hard Limit (10% B_0).

33 Stock status is estimated to have been flat since the mid-1990's with a slight increase in the last three years and is projected to continue increasing at the current catch level. Stock biomass would also increase, but at a slower rate, if catch from the stock was increased.

34 The main uncertainties in the East and South Chatham Rise stock assessment are the proportion of the spawning stock that is indexed by the acoustic survey in each year, that patterns in year class strengths are based on only two years of age composition data, and that the stock status is dependent on the timing of the appearance of the Rekohu spawning plume.⁴

35 Additional model runs were used to investigate the sensitivity of the model to a variety of parameters including changes in M , assumptions regarding the priors on the 'availability' of fish to the surveys, and assumptions about the timing of the formation of the Rekohu spawning plume. None of the additional model runs were considered to be more appropriate than the base run to inform fisheries management decisions.

⁴ The Rekohu plume refers to a spawning plume first seen in 2010 and first surveyed in 2011 to the west of the main "Old" plume.

Other 3B sub-stocks

36 The biomass of the remaining sub-stocks in ORH 3B is uncertain. No new information was presented to the Working Group or the Plenary in 2014 regarding the status of the Puysegur or sub-Antarctic sub-stocks.

37 The most recent assessment of the Puysegur sub-stock was reported in 1998 and estimated that the sub-stock was below B_{MSY} . In response, industry voluntarily ceased target orange roughy fishing in the area and the catch limit was set at zero tonnes. In 2010, the catch limit was increased to 150 tonnes specifically intended to be used for research proposed to monitor the status of the stock.

38 There is no new information on the status of any other ORH 3B stock. The low current catch limits and limited fishing effort are considered likely to be sustainable.

Management Approach

39 Orange roughy stocks are managed under section 13 of the Act, with TAC setting also guided by the agreed orange roughy harvest strategy. The harvest strategy sets a management target of 30-40% B_0 , within which stocks are required to fluctuate with high probability. The target is set above the estimate of deterministic B_{MSY} for orange roughy (22-23% B_0)⁵ to provide greater certainty that orange roughy stocks will remain at or above B_{MSY} and can sustain the fishery in the long-term. The Soft and Hard Limit reference points in the harvest strategy are set at 20% and 10% B_0 , respectively.

40 MPI is working with industry to further investigate the appropriateness of the agreed management target range. This work will not be available in time to inform TAC decisions for 1 October 2014, but any changes made to the management target range will be considered in future TAC reviews.

41 The status of the Northwest Chatham Rise indicates the stock is near the upper bound of the management target range. Five-year projections for the Northwest Chatham Rise stock indicate that the stock status will continue to increase at catches up to 1,400 tonnes and will remain within or above the management target range. This status in relation to the management reference points suggests that alternative management settings could be appropriate. The proposed management response for this stock is discussed in the following section.

42 The status of the East and South Chatham Rise indicates the sub-stock is About as Likely as Not to be above the lower bound of the management target range. Five-year projections for the East and South Chatham Rise stock indicate that stock status will increase at the current catch level and also, at a slower rate, if the catch taken was increased to 4,400 tonnes.

⁵ It is important to note that deterministic estimates of B_{MSY} are not considered to be appropriate as management targets as they rely on perfect information, which is unrealistic

PROPOSED RESPONSE

43 In response to the updated science information for the Northwest Chatham Rise stock, MPI is consulting on the following management options for setting the overall TAC for ORH 3B. Within this TAC, changes are proposed for the sub-area catch limit for the Northwest Chatham Rise sub-stock only. No changes are proposed for any of the catch limits for the remaining sub-areas within ORH 3B.

44 Given the current stock status of the East and South Chatham rise stock and the requirement of the harvest strategy that the stock fluctuates within the target range, MPI is of the view that the current catch limit for the East and South Chatham Rise stock is sustainable and should not be increased further at this point. The intention is that the stock should rebuild further into the management target range before MPI considers increasing the harvest level.

Table 3: Expected median status of Northwest Chatham Rise sub-stock and probabilities of being at or above reference points in 2019

	Catch limit	Projected stock status in 2019	Probability of being above 30% B_0	Probability of being above 40% B_0
Option 1 (status quo)	750	43% B_0	100%	72%
Option 2	900	42% B_0	100%	61%
Option 3	1250	40% B_0	95%	48%
Information only	1400	39% B_0	93%	43%

45 MPI considers that all three options are consistent with the orange roughy harvest strategy and will maintain the stocks at or above B_{MSY} and within the management target range with a high probability, in the short term.

Option 1 (Status Quo)

46 Under this option the overall ORH 3B TAC, Total Allowable Commercial Catch (TACC) and all sub-stock catch limits would remain at the current levels.

47 This option is consistent with the harvest strategy for orange roughy fisheries but MPI is of the view that this option does not sufficiently allow for the utilisation opportunity that the stock assessment indicates is available from the Northwest Chatham Rise sub-stock.

48 This option is the most conservative response to the stock assessment outputs, which show that the stock is likely to sustain greater removals while maintaining a low risk of declining below the management target range. However, this option recognises that there are uncertainties in the modelling that present incentives to respond more conservatively to the assessment results.

Option 2

49 Option 2 proposes:

- To increase the TAC for ORH 3B from 4,725 tonnes to 4,883 tonnes and the TACC from 4,500 tonnes to 4,650 tonnes

- To increase the Northwest Chatham Rise catch limit from 750 tonnes to 900 tonnes
- No change to the catch limit for any other sub-stock in ORH 3B
- To increase the allowance for other sources of fishing related mortality from 225 tonnes to 233 tonnes (maintaining it at 5% of the TACC)
- No change to customary or recreational allowances.

50 This option provides a relatively small increase compared to the scale of the increase that the stock assessment indicates is sustainable for this stock. This option acknowledges that there is uncertainty associated with the stock assessment and takes this into account by proposing a lower catch level than the assessment indicates should be acceptable.

51 Projections show that catch at this level would allow the stock to continue to increase over the next five years to a point above the current management target range.

52 Based on export figures from 2013 of \$4.31/kg greenweight, a 150 tonne increase in the TACC may result in an additional \$0.6 m in revenue.⁶

Option 3

53 Option 3 proposes:

- To increase the TAC for ORH 3A from 4,725 tonnes to 5,250 tonnes and the TACC from 4,500 tonnes to 5,000 tonnes
- To increase the Northwest Chatham Rise catch limit from 750 tonnes to 1,250 tonnes.
- No change to the catch limit for any other sub-stock in ORH 3B
- To increase the allowance for other sources of fishing related mortality from 225 tonnes to 250 tonnes (maintaining it at 5% of the TACC)
- No change to customary or recreational allowances.

54 This option would set the catch limit at the long term yield estimate for the stock that would cause the stock to remain within the management target range in the long term. The five year projections indicate that the stock will continue to increase under this catch level, estimating a 48% probability of the stock increasing above the upper bound of the management target range by 2019. This catch level is below the maximum the stock assessment indicated would be sustainable.

55 However, the estimates of long term yield from the stock incorporate certain assumptions about future recruitment, which may or may not eventuate in the real world. This option therefore places more confidence in the long term recruitment assumptions used in the modelling being correct and is less conservative than Option 2. The higher catch level also presents a higher risk of the sub-stock declining in the future.

⁶ Based on export figures for 2013 calendar year of \$4.31 / kg greenweight. This uses frozen fillets to estimate the greenweight export price as this product form accounted for 85% of export earnings and 72% of export volume for orange roughy in the 2013 calendar year. Precise value is difficult to estimate and is influenced by factors such as commodity prices, exchange rate, catching costs and export state.

56 In addition, there is ongoing work to determine the most appropriate target reference point for orange roughy. This work may result in the target range being increased, which would require the stock to attain a higher biomass.

57 A further aspect to take into account is the inability to access the portion of the stock within the 'Morgue' Seamount Closure and the risk of localised depletion in the rest of the stock. Catches from the Morgue area made up around 20% of the Northwest Chatham Rise catches between 1990-91 and 1998-99.

58 Based on export figures from 2013 of \$4.31/kg greenweight, a 500 tonne increase in the TACC may result in an additional \$2.2 m in revenue.

Other Key Considerations

59 When making a decision concerning the TAC for a stock, the Minister for Primary Industries⁷ (the Minister) must have regard to interdependence of stocks. Interdependent stocks and key environmental issues associated with the ORH 3B fishery and how they will be affected by the proposal to decrease the catch limit and TACs are discussed below.

Interdependence of stocks

60 A number of deepwater species that share similar habitat to orange roughy are taken in the ORH 3B fisheries including oreos, black cardinalfish, and alfonsino. However, between 75-80% of the catch from orange roughy target trawls between 2008-09 and 2011-12 was orange roughy. The species caught in conjunction with orange roughy are largely QMS species that are actively managed.

61 Management⁷ of shark species in New Zealand is now driven by the National Plan of Action for Sharks (NPOA-Sharks) 2013. Orange roughy fishing is also known to interact with several species of sharks, many reported using generic codes for 'other sharks and dogfish' and 'deepwater dogfish'. It is considered that these species may have life history characteristics that make them vulnerable to overfishing.

62 As part of the implementation of the NPOA-Sharks 2013, a two-stage risk assessment is being completed for all sharks that will guide ongoing management. A preliminary, expert-based assessment should be available in late 2014 and a formal quantitative analysis will be available in 2015 to prioritise actions for species estimated to be at higher risk from fishing activities. Any additional catches of deepwater sharks will be taken into account through the risk assessment process.

63 Another work stream within the NPOA-Sharks 2013 is targeted at better identifying all sharks caught and reducing use of generic codes like 'other sharks and dogfish' and 'deepwater dogfish'. Fishery managers are working with observers and the industry to

⁷ The Minister for Primary Industries now exercises the powers and responsibilities of the Minister of Fisheries under the Fisheries Act 1996.

increase species-specific reporting of these shark catches to better inform their management in conjunction with the risk assessment framework.

64 The changes proposed to the ORH 3B TAC will result in an increase in fishing effort for orange roughy on the Northwest Chatham Rise. MPI will continue to monitor interactions with sharks in orange roughy fisheries and considers that the planned risk assessment and additional management actions under the NPOA-Sharks 2013 will mitigate any risks posed by increased orange roughy fishing effort.

Protected species interactions

65 Orange roughy trawl fisheries rarely interact with marine mammals (Table 4). MPI considers that the management proposal is unlikely to have any substantive additional effects on New Zealand fur seals, New Zealand sea lions, or any other marine mammals. However, MPI will continue ongoing monitoring of marine mammal interactions in all deepwater fisheries.

66 Management of seabird interactions with New Zealand’s commercial fisheries is now being driven through the 2013 National Plan of Action to reduce the incidental capture of seabirds in New Zealand fisheries (NPOA-Seabirds). The NPOA-Seabirds has established a risk-based approach to managing fishing interactions with seabirds, targeting management actions at the species most at risk.

Table 4: Observed and estimated total captures of seabirds and NZ fur seals in orange roughy trawl fisheries

	Seabirds		NZ fur seals		Total # of tows	Observed tows	% of tows observed
	Observed captures	Estimated total captures	Observed captures	Estimated total captures			
2011-12	0	6	0	0	1,588	437	27.5
2010-11	2	10	0	0	1,889	795	26.2
2009-10	13	27	0	0	2,922	1,139	39.0
2008-09	6	16	0	1	3,544	1,435	40.5
2007-08	2	12	0	0	3,689	1,618	43.9

67 The risk based approach that underpins the NPOA-Seabirds has identified the level of risk to individual seabird species, generated by different vessel classes within the commercial fishing fleet, via a comprehensive and hierarchical risk assessment and risk screening approach.

68 Orange roughy fishing effort generally contributes a very low proportion of the total risk score for those seabird species that have been found to be at high or very high risk and this will not be materially affected by the increased fishing effort inherent in the options proposed here.

69 MPI will continue to work with industry stakeholders to further reduce the risk to key seabird species across all deepwater fisheries. A range of measures are currently in place or are under development. Mandatory seabird mitigation measures include the requirement that all trawlers

over 28 m in length deploy bird mitigation devices during fishing. Research projects are currently underway that aim to improve the efficacy of these mitigation devices.⁸

70 Non-regulatory measures are also used to reduce the risk of seabird interactions with the orange roughy fleet including use of mitigation devices and offal management procedures. MPI monitors seabird captures and works with the Deepwater Group Ltd. (DWG) where necessary to minimise and mitigate captures. These practices will continue during 2014/15.

71 Proposed Options 2 and 3 would both result in increased orange roughy fishing effort on the Northwest Chatham Rise. MPI is satisfied that existing regulatory and non-regulatory measures are appropriate and that the management proposal should have little additional effect on seabirds.

Benthic impacts

72 Bottom trawling can affect fragile benthic invertebrate communities but adverse effects may be reduced if vessels repeatedly trawl along the same towlines in a fishery. There are cost implications for the industry in terms of lost or damaged gear when fishing in new areas and as a result, fishing effort is likely to continue in areas previously fished.

73 Management measures to address the effects of deepwater trawl activity have focused on 'avoiding' these effects. This has been achieved through closing areas to bottom trawling; first with seamount closures in 2001 (ten of these closures are within the ORH 3B QMA) and then with Benthic Protection Areas (12 of these are within the ORH 3B QMA). In particular, 15 square kilometres in the Northwest Chatham Rise sub-area is closed around the Morgue seamount. The implementation of BPAs in 2007 effectively closed approximately 30% of the New Zealand EEZ to bottom trawling. Seamount closures and BPAs combined result in the closure of 15% of the recognised depth range of ORH in the ORH 3B QMA to bottom trawling. A monitoring regime to ensure these closures are adhered to is in place.

Other Management Measures

74 Where two or more biological stocks exist in a single QMA, catch spreading arrangements ensure fishing effort is not concentrated in one or two areas which would increase fishing pressure on those biological stocks. To achieve this, catch limits for each sub-stock are put in place to reduce fishing pressure on individual biological stocks. These limits are monitored by MPI and DWG. MPI continues to support the following catch spreading in the ORH 3B fishery that requires DWG to:

- a) Submit monthly monitoring reports to MPI regarding catch levels in all ORH 3B sub-stocks
- b) To notify MPI when catch reaches 80% of the catch limit for any sub-stock and also notify MPI when any limit has been reached.

⁸ More information on these projects can be found at the Department of Conservation's Conservation Services Programme website: www.doc.govt.nz/csp

75 MPI undertakes to continue to monitor DWG reports and operators' fishing patterns to evaluate the effectiveness of these sub-stock catch limits. MPI will ensure that, through joint MPI-DWG communications, operators are fully informed as to the progress of catch taken against sub-stock limits.

76 MPI is proposing the the current interim and annual deemed values for ORH 3B, 2B and 3A of \$2.50 and \$5.00 respectively, be retained.

FUTURE CONSIDERATIONS

77 MPI will work with the DWG to plan future biomass surveys and stock assessments to monitor ongoing stock status and the impacts of increased fishing activity on the Northwest Chatham Rise stock.

78 MPI will also continue to work with DWG to further investigate the appropriateness of the current agreed management target for orange roughy (30-40% B_0).

CONCLUSION

79 The status of the Northwest Chatham Rise sub-stock of the ORH 3B QMA has been estimated to be at the upper end of the management target range. The stock is likely to support an increase in catch while remaining above B_{MSY} and within or above the management target range.

80 In response to the estimated stock status of the Northwest Chatham Rise, MPI is proposing two options for increasing the ORH 3B TAC and the sub-area catch limit on the Northwest Chatham Rise. Both options are projected to maintain the stock above B_{MSY} and the lower bound of the management target range.

81 The status of the East and South Chatham Rise stock has been estimated to be at the lower bound of the management target range. This stock status, when considered in conjunction with the level of uncertainty in the model and the objective that stocks fluctuate within the management target range, has led MPI to retain the current catch limit for the East and South Chatham Rise stock at this time. The current catch limit will allow the stock to increase further into the management target range, at which point MPI will consider a review.