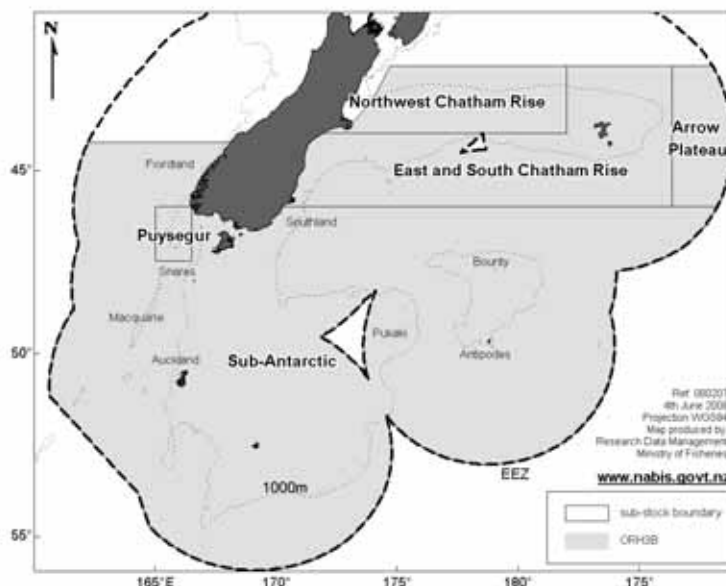


# ORANGE ROUGHY (ORH 3B)

Figure 1: Quota Management Area (QMA) for ORH 3B



## Executive Summary

- 1 ORH 3B is a large and spatially complex fishery, comprised of several biological stocks.<sup>1</sup> A range of sub-Quota Management Area (QMA) catch limits are managed under a voluntary agreement by the Deepwater Group (DWG) which represents 97.95% of the ORH 3B quota owners. Monthly reports on catch by sub-stock and sub-area are provided to MFish.
- 2 The status of the individual sub-stocks that make up ORH 3B are evaluated independently, with the results compiled to determine the status of ORH 3B as a whole. No new stock assessment information was available for the Northwest Chatham Rise, Puysegur or the Sub-Antarctic portion of ORH 3B in 2008.<sup>2</sup> The most recent (2006) assessment of the Northwest Chatham Rise estimated that the biomass was likely to be below the biomass that can produce the maximum sustainable yield ( $B_{MSY}$ ); Puysegur remains voluntarily closed in recognition that it is likely to be below  $B_{MSY}$ ; and there is no information on the status of the remainder of the Sub-Antarctic portion of ORH 3B.
- 3 The 2008 Plenary agreed that the 2004 and 2006 model-based stock assessments for the East and the South Chatham Rise are not reliable. These assessments were set aside and existing survey and fishery information was

<sup>1</sup> To avoid confusion, unless otherwise clarified in the text 'stock' refers to the QMA management unit; 'sub-stock' or 'biological stock' refers to a biologically or geographically distinct orange roughy population; and the term 'sub-area component' is used where it is necessary to consider areas within sub-stock boundaries.

<sup>2</sup> The Arrow Plateau is closed to bottom trawling by regulation under the BPA initiative.

assembled and analysed to evaluate the stock structure and status of the East and South Chatham Rise portion of ORH 3B.

- 4 The Plenary concluded that for the East and South Chatham Rise;
  - The orange roughy found on this part of the Chatham Rise comprise a single biological stock;
  - The unfished biomass ( $B_0$ ) was estimated to be 300,000 t - 450,000 t;
  - $B_{MSY}$  is estimated to be 30%  $B_0$  which equates to 90,000 t - 135,000 t ;
  - Current mature biomass ( $B_{current}$ ) is between 15 and 30%  $B_0$ ;
  - The best estimate of  $B_{current}$  is 98,000 tonnes.
- 5 Based on the best available information the ORH 3B stock as a whole is likely to be below  $B_{MSY}$ . As no new stock assessment information is available for the Northwest Rise or the Sub-Antarctic portion of the QMA, the Ministry of Fisheries (MFish) is not proposing to change the management of these parts of ORH 3B at this time. However a new management strategy is proposed for the East and South Chatham Rise.
- 6 The strategy is based on setting a catch limit based on the fishing mortality (F) that will result in the stock fluctuating around the biomass that will support the maximum sustainable yield ( $F_{MSY}$ ). A research programme is a key component of the management strategy to better inform the estimate of current biomass which is the key input for deriving the  $F_{MSY}$ -based yield. Once established, and fully implemented, the strategy is likely to result in relatively small annual variations to the catch limit on the East and South Chatham Rise. However, on the basis of the best available information, the  $F_{MSY}$ -based yield is 4,410 t. This represents a 3,240 t reduction from the current catch.
- 7 In making his determination on the TAC for ORH 3B, the Minister of Fisheries (the Minister) will be required to consider the way and rate that the ORH 3B stock is rebuilt. As only the East and South Chatham Rise catch limit is being considered at this time the way and rate decision relates to the timeframe over which the East and South Chatham Rise catch limit is reduced to the  $F_{MSY}$ -based yield estimate to initiate a rebuild of this part of the ORH 3B stock.
- 8 MFish does not consider that retaining the status quo is appropriate. Given the low productivity of orange roughy stocks the biomass of the stock is likely to continue to decline further below  $B_{MSY}$  under the existing management settings.
- 9 The Ministry of Fisheries (MFish) considers it appropriate to consider a staged implementation of the new strategy whereby successive annual catch limit reductions would be taken until the  $F_{MSY}$ -based yield is reached. Such a staged approach recognises that the  $F_{MSY}$ -based yield estimate will be refined

over time. The two options proposed are based on reaching a target catch limit of 4,410 tonnes by:

- i) Reducing the catch limit by 1,080 tonnes for each of three years
- ii) Reducing the catch limit by 1,620 tonnes for each of two years

As new information better defines the estimate of current biomass each year, the target catch limit for the East and South Chatham Rise will change. The size of the catch limit reductions in the second and third year of option 1, and the second year of option two, will be altered to accommodate these changes ensuring that the refined catch limit is reached within the specified timeframes.

- 10 MFish does not support an option of reducing the catch limit to 4,410 t in one year. This would impose a significant economic cost to the Industry over a short timeframe. It would also limit the flexibility to incorporate better information used to define the  $F_{MSY}$ -based yield estimate.
- 11 MFish considers it prudent to continue to ensure that the amount of fish taken from the main spawning plume (the Plume)<sup>3</sup> is limited to ensure that fishing pressure does not have a negative impact on spawning success. A catch limit for the Plume set at 50% of the East and South Chatham Rise catch limit is included under all options.

## Background

- 12 The MFish Chief Scientist briefed the Minister in September 2007 on the status of Chatham Rise orange roughy. This briefing described the 2004 and 2006 model-based stock assessments for the East and the South Chatham Rise as “not credible” and concluded that:

*“The Chief Scientist, along with many other members of the FAWG [Deepwater Fisheries Assessment Working Group], believes it is time to abandon the [previous] models for the East Chatham Rise and the South Chatham Rise as the key assessment and management tools, and to instead focus on model-independent analyses of the data at hand”.*

- 13 The Minister, in his decision letter on sustainability measures introduced on 1 October 2007, requested that existing survey and fishery information be assembled and analysed to “provide a more credible evaluation of the status of the East and South Chatham Rise orange roughy stocks”. This work was undertaken and presented to the 2008 Plenary.

## Science Review

### Sub-stock structure

- 14 Prior to reviewing stock status, the sub-stock structure of orange roughy on the Chatham Rise was comprehensively reviewed. The approach evaluated all available data including: catch distribution and catch per unit effort (CPUE)

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<sup>3</sup> While smaller spawning aggregations may occur in a number of localities across the East and South Rise, the Plume is accepted to be the main spawning aggregation. It is located in the area to the north of the Chatham Islands.

patterns; location of spawning and nursery areas; inferred migrations; size, maturity and condition data; genetic studies; and habitat and natural boundaries.

- 15 The Plenary agreed that it is most likely that the Northwest Chatham Rise is a separate biological stock, and that the East and South Chatham Rise is a single biological stock. The previous stock assessment boundaries partitioned the East and South Chatham Rise into four sub-area components: the Spawning Box and Eastern Flats, the Northeast Hills, the Andes, and the South Chatham Rise.

#### *Stock status*

- 16 The status of the Northwest Chatham Rise, Puysegur and Sub-Antarctic components of the ORH 3B stock was not reviewed by either the FAWG or the Plenary in 2008.
- 17 The Plenary Report states that the previous stock assessments for the East and South Chatham Rise are no longer considered reliable for two reasons. First, the accepted stock structure for this part of the Chatham Rise has changed and second, that the rebuild predicted by those assessments was largely driven by model assumptions about incoming recruitment, rather than actual data.
- 18 Analyses of the main observational data were reviewed by the Plenary to draw conclusions on likely stock status. The data considered included: research trawl surveys; acoustic surveys of the Plume and background areas; catch patterns; and standardised CPUE. The main conclusions of the 2008 Plenary regarding the East and South Chatham Rise are:
  - a. The unfished biomass ( $B_0$ ) is estimated to have been between 300,000 t and 450,000 t;
  - b. The spawning stock was likely to have been reduced to 30% of this level by the early 1990s. There is no clear evidence of the stock rebuilding after the early 1990s; instead, there are indications that it may have continued to be reduced in size due to fishing;
  - c. The current total mature biomass ( $B_{\text{current}}$ ) is thought to be between 15% and 30%  $B_0$ ;
  - d. The current estimate of the stock status is most likely below the management target (30%  $B_0$ );
  - e. The best estimate of  $B_{\text{current}}$  is 98,000 tonnes.
- 19 The Plenary Report concludes that the East and South Chatham Rise stock has likely been fished to below  $B_{\text{MSY}}$  and that the current fishing mortality rate ( $F$ ) is continuing to fish down the stock. With the rejection of the existing stock assessment models for the East and South Chatham Rise, a new strategy for managing this fishery is required.

## Proposed management strategy for the East and South Chatham Rise

- 20 The proposed new management strategy is based on setting a catch limit based on the fishing mortality (F) that, if applied constantly, would result in the maximum sustainable yield ( $F_{MSY}$ ). Under an  $F_{MSY}$ -based management strategy, the same proportion of the biomass will be taken from the East and South Chatham Rise stock each year. If the stock is above  $B_{MSY}$ , the amount taken will be higher than if the stock was below  $B_{MSY}$ , resulting in the stock being fished down towards the target level. Conversely, if the stock is below  $B_{MSY}$  the amount taken will be lower, allowing the stock to rebuild.<sup>4</sup>
- 21 The strategy will embed the method of calculating the recommended annual catch limit for the East and South Chatham Rise. This catch limit will be determined by multiplying  $F_{MSY}$  by the best available estimate of  $B_{current}$ .
- 22 The  $F_{MSY}$ -based approach has been discussed with fisheries scientists, Industry and environmental NGO representatives. Feedback to date suggests a broad level of support.
- 23 There are three key components to the  $F_{MSY}$  strategy:
- i) An estimate of  $F_{MSY}$ ;
  - ii) An annual estimate of current biomass ( $B_{current}$ );
  - iii) A research programme to better inform the  $B_{current}$  estimate.

### *Estimating $F_{MSY}$*

- 24 An estimate of  $F_{MSY}$  equal to the level of natural mortality (M) has been used for the implementing the strategy for the East and South Chatham Rise. This approach accords with international best practice and is consistent with the draft Harvest Strategy Standard, which has been consulted on with stakeholders. The level of natural mortality for orange roughy is estimated to be 0.045 (that is, 4.5% of the vulnerable biomass dies naturally every year).
- 25 Therefore, an  $F_{MSY}$  strategy for orange roughy would set a catch limit of 4.5 % of the current biomass.

### *Estimating $B_{current}$*

- 26 Annual estimates of  $B_{current}$  will be determined by the FAWG and presented at the Plenary.
- 27 The best estimate of  $B_{current}$  available is derived by scaling up the estimated spawning biomass ( $B_{spawn}$ ) by the proportion of the mature biomass that joins the spawning aggregations each year (the multiplier).

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<sup>4</sup> This is the case provided that the stock has not been reduced to a level where 'depensatory effects' are evident. Depensatory effects occur when a population level becomes very low, and may include fundamental changes in the biology or behaviour of the species, such as the inability to spawn or the inability of individuals to find mates. This effect inhibits a population from rebuilding back to former levels.

- 28 Spawning is known to occur primarily in the Plume with additional smaller spawning aggregations forming in other localities across the East and South Chatham Rise. An acoustic survey of the Plume is undertaken annually to provide an estimate of spawning biomass on this part of the Chatham Rise. Estimates of spawning biomass in other areas (the Northeast Flats, the Northeast Hills, Mt Muck, the Andes complex and the South Chatham Rise) have been derived from existing survey data. These data have been collected sporadically and the estimates are less well defined at this time.
- 29 There have been a number of studies, both in New Zealand and elsewhere, that have considered the percentage of mature orange roughy that spawn each year. A range for the multiplier has been derived from a review of the available studies.

#### *Research programme to better define $B_{current}$*

- 30 While there is an accepted estimate of spawning biomass in the Plume, there remains considerable uncertainty surrounding the spawning biomass in other parts of the East and South Chatham Rise. There is also uncertainty as to the proportion of mature orange roughy that spawn each year. A research plan designed to reduce key areas of uncertainty in the estimates of spawning biomass and the multiplier is a key component of the management strategy.
- 31 Research proposals will be evaluated and approved by the deepwater Research Planning Group and Research Coordinating Committee.

#### *The management strategy*

- 32 In summary it is now time to put in place a long-term, sustainable management strategy for the East and South Chatham Rise orange roughy fishery. The best estimate of  $B_{current}$  is 98,000 t which is below  $B_{MSY}$ ; and the current fishing mortality rate ( $F_{current}$ ) is above  $F_{MSY}$ . The proposed strategy will progressively reduce  $F_{current}$  to  $F_{MSY}$  over two or three years (dependent on the option chosen).

## Summary of Options

33 The existing management arrangements are summarised in the table below.

ORH 3B Sub-Areas	Existing catch limits (t)
<b>Northwest Chatham Rise</b>	<b>750</b>
<b>East and South Chatham Rise</b>	<b>7650</b>
East Chatham Rise	(Maximum) 6500
<i>Spawning Box (Jun-Aug)</i>	3200
<i>Northeast Chatham Rise</i>	1650
<i>Southeast Chatham Rise</i>	1650
South Chatham Rise	(Maximum) 1750
<b>Puysegur</b>	<b>0</b>
<b>Arrow Plateau (BPA)</b>	<b>0</b>
<b>Sub-Antarctic</b>	<b>1850</b>
Feature limit	500
<b>Research survey allowance</b>	<b>250</b>
<b>TACC</b>	<b>10500</b>
<b>Other sources of fishing related mortality</b>	<b>525</b>
<b>TAC</b>	<b>11025</b>

34 Proposed management options to implement an  $F_{MSY}$ -based strategy are summarised in the table below.

ORH 3B Sub-Areas	Catch limits under option 1 (t)	Catch limits under option 2 (t)
<b>Northwest Chatham Rise</b>	<b>750</b>	<b>750</b>
<b>East and South Chatham Rise</b>	<b>6570</b>	<b>6030</b>
<i>The Plume</i>	3285 (max.)	3015 (max.)
<b>Puysegur</b>	<b>0</b>	<b>0</b>
<b>Arrow Plateau (BPA)</b>	<b>0</b>	<b>0</b>
<b>Sub-Antarctic</b>	<b>1850</b>	<b>1850</b>
Feature limit	500	500
<b>Research survey allowance</b>	<b>250</b>	<b>250</b>
<b>TACC</b>	<b>9420</b>	<b>8880</b>
<b>Other sources of fishing related mortality</b>	<b>470</b>	<b>445</b>
<b>TAC</b>	<b>9890</b>	<b>9325</b>

### *Option 1 – Implementation of an $F_{MSY}$ strategy for the East and South Chatham Rise by 2010*

35 Under this option the catch limit for the East and South Chatham Rise would be reduced by 14%, or 1,080 t. Arrangements under this proposal would be to:

- a) Reduce the TAC for ORH 3B by 10% to 9,890 t for the 2008-09 fishing year, and within the TAC:

- i) Set an allowance of 470 t for other sources of fishing related mortality;
- ii) Retain zero allowances within the TAC for customary Maori and recreational fishing interests;
- iii) Set the TACC at 9,420 t;
- b) Request that Industry implement the following sub-stock catch limits within the TACC:
  - i) East and South Chatham Rise be reduced to 6,570 t;
  - ii) A maximum of 3,285 t be taken from the Plume between 1 June and 31 August;
  - iii) Catch limits for the Northwest Chatham Rise, Arrow Plateau, Puysegur and Sub-Antarctic sub-areas remain unchanged and the 500 t feature limits in the Sub-Antarctic sub-area remain in place;
  - iv) Retain a catch limit of 250 t for Industry research surveys;
- c) Request that Industry continue to spread catch across ORH 3B and continue to monitor catch against voluntary catch limits.

***Option 2 – Implementation of an  $F_{MSY}$  strategy for the East and South Chatham Rise by 2009***

- 36 Under this option the catch limit for the East and South Chatham Rise would be reduced by 21%, or 1,620 t. Arrangements under this proposal would be to:
- a) Reduce the TAC for ORH 3B by 15% to 9,325 t for the 2008-09 fishing year, and within the TAC:
    - i) Set an allowance of 445 t for other sources of fishing related mortality;
    - ii) Retain zero allowances within the TAC for customary Maori and recreational fishing interests;
    - iii) Set the TACC at 8,880 t;
  - b) Request that Industry implement the following sub-stock catch limits within the TACC:
    - i) East and South Chatham Rise be reduced to 6,030 t;
    - ii) A maximum of 3,015 t be taken from the Plume between 1 June and 31 August;
    - iii) Catch limits for the Northwest Chatham Rise, Arrow Plateau, Puysegur and Sub-Antarctic sub-areas remain unchanged and the 500 t feature limits in the Sub-Antarctic sub-area remain in place;
    - iv) Retain a catch limit of 250 t for Industry research surveys;
  - c) Request that Industry continue to spread catch across ORH 3B and continue to monitor catch against voluntary catch limits.

### *Additional considerations common to both options*

- 37 Request that Industry confirm the voluntary agreement on catch limits within ORH 3B and;
- i) continue to submit annual updates and specific DWG annual agreements that pertain to the ORH 3B fishery to MFish;
  - ii) continue to submit monthly monitoring reports pertaining to catch levels by both sub-stock and sub-area to MFish;
  - iii) continue to notify MFish when catch reaches 80% of the sub-stock and sub-area limits, and also notify MFish when any limit has been reached.
- 38 Unless future estimates of  $B_{\text{current}}$  increase substantially, further TAC reductions will be necessary to reduce the catch limit for the East and South Chatham Rise to the  $F_{\text{MSY}}$ -based yield over 3 years under option 1 and 2 years under option 2. The quantum of the necessary catch limit reductions will be informed by new research considered by the FAWG and Plenary processes.

### **Rationale for Management Options**

- 39 The Plenary concluded that the East and South Chatham Rise sub-stock is likely to be below the management target of 30%  $B_0$ , and therefore needs to be rebuilt. Setting the catch limit through the application of an  $F_{\text{MSY}}$  approach (by setting the catch limit equal to  $F_{\text{MSY}}$  multiplied by the current biomass) will effect this rebuild.
- 40 The Plenary agreed that it was appropriate to estimate current biomass ( $B_{\text{current}}$ ) by collating the best available information on the size of the current spawning biomass across the East and South Chatham Rise and scaling this figure up by the ratio of total mature biomass to spawning biomass (the multiplier) considered typical of orange roughy stocks. An appropriate range for the multiplier was derived from a literature search. Although acknowledging uncertainty in both the estimates of current spawning biomass and the multiplier, the Plenary agreed that, based on the best available information,  $B_{\text{current}}$  was likely to be in the range 15 to 30%  $B_0$  with a best estimate of 98,000 t.
- 41 Applying  $F_{\text{MSY}}$  of 0.045 to the best  $B_{\text{current}}$  estimate provides a yield of 4,410 t.
- 42 A research and monitoring programme is being developed to improve estimates of  $B_{\text{current}}$  by reducing uncertainty in both the estimates of spawning biomass and the multiplier. As the results of this programme become available they will be reviewed by the FAWG and the Plenary, enabling better estimation of  $B_{\text{current}}$ , and  $F_{\text{MSY}}$ -based yield in future years. While there remains uncertainty surrounding the level of sustainable catch that this process will ultimately settle on, it will change as new information comes to hand.
- 43 MFish proposes that an appropriate way and rate to move the sub-stock to at or above the level that can produce MSY is to embark on a series of reductions until the  $F_{\text{MSY}}$  level is reached. Under option 1 the catch limit will equal the

$F_{MSY}$ -based yield estimate by 1 October 2010 (i.e. the catch limit will be reduced to the  $F_{MSY}$ -based yield estimate in three steps). Option 2 will result in the catch limit equalling the  $F_{MSY}$ -based yield estimate by 1 October 2009 (i.e. the catch limit will be reduced to the  $F_{MSY}$ -based yield estimate in two steps).

- 44 The proposed reductions in the catch limit under both options are predicated on the  $F_{MSY}$ -based yield remaining at 4,410 t. The yield estimate is likely to change as new information from the research programme comes to hand. The adjustments to the catch limit on the East and South Chatham Rise in years two and three (under the three year option) and year two (under the two year option) will be revised each year to ensure that the catch limit equals the updated  $F_{MSY}$ -based yield at the end of the implementation timeframe.
- 45 MFish does not consider that retaining the status quo is appropriate. Given the low productivity of orange roughy stocks the biomass of the stock is likely to continue to decline further below  $B_{MSY}$  under the existing management settings.
- 46 The catch limit will remain above the  $F_{MSY}$ -based yield until 1 October 2010 under option 1 and until 1 October 2009 under option 2, and the East and South Chatham Rise stock is likely to continue to decline until the  $F_{MSY}$ -based yield is met. MFish does not however support an option of reducing the catch limit to 4,410 t in one year. This would impose a significant economic cost to the Industry over a short timeframe. As the estimate of current biomass is refined, the target catch limit for the East and South Chatham Rise will change. The size of the catch limit reductions in the second and third year of option 1, and the second year of option two, will be altered such that the catch limit equals the refined  $F_{MSY}$ -based yield estimate within the specified timeframe of each option.
- 47 MFish propose that the  $B_{current}$  estimate used in calculating the appropriate catch limit should generally be the average of the three most recent  $B_{current}$  estimates. This will smooth out annual fluctuations and is likely to result in smaller year to year variations to the recommended catch limit on the East and South Chatham Rise.
- 48 Under existing arrangements, there is a voluntary catch limit for the spawning box from June to August. This is the primary spawning area for the East and South Chatham Rise and is estimated to account for 80% of the spawning biomass. MFish proposes removing the definition of the spawning box but retaining a limit for the Plume on the basis that fishing disturbs spawning fish, and may adversely affect spawning success. A catch limit for the Plume set at 50% of the East and South Chatham Rise catch limit is included under all options.

# Assessment of Management Options

## *Considerations at the stock (QMA) level*

### *Total allowable catch*

#### Section 13 (2)

- 49 The ORH 3B stock is managed under section 13 of the Act which requires that the Minister sets a TAC that moves the stock to or above, or maintains the stock at or above, a biomass level that can produce the maximum sustainable yield ( $B_{MSY}$ <sup>5</sup>).
- 50 Stock assessment information reported in the Plenary considers ORH 3B by sub-stock – specifically the Northwest Chatham Rise, the East and South Chatham Rise, and the Sub-Antarctic (Puysegur, Pukaki South and the remaining southern areas). The status of the Northwest Chatham Rise is based on the assessment conducted in 2006. The Plenary noted that this assessment is uncertain because the estimated status of the Northwest Chatham Rise was strongly dependent on the CPUE data for the flat areas and the extent to which these data index the entire sub-stock is unknown. Model runs that included all data estimated that the biomass was below  $B_{MSY}$  at 11% (range 8-16%)  $B_0$ . On the basis of the assessment the catch limit was reduced from 1,500 t to 750 t in 2006 to initiate a rebuild of the sub-stock.
- 51 While no new assessments were available in 2008 the Plenary evaluated the status of the East and South Chatham Rise sub-stock using available data sources. The Plenary concluded that the sub-stock was likely to be below  $B_{MSY}$  and in the range 15-30%  $B_0$ . Puysegur remains voluntarily closed in recognition that it is likely to be below  $B_{MSY}$ . There is no information on the status of the remainder of the Sub-Antarctic portion of ORH 3B.
- 52 Although there is incomplete information as to the status of the sub-stocks that make up ORH 3B, the Chatham Rise is likely to contain the majority of the ORH 3B biomass. As both the Northwest and the East and South Chatham Rise are considered is likely to be below  $B_{MSY}$  it follows that ORH 3B as a whole is likely to be below  $B_{MSY}$ .
- 53 MFish therefore proposes to advise the Minister to set the TAC for ORH 3B under section 13(2)(b) of the Act. Section 13(2)(b) is appropriate in cases where the stock biomass is likely to be below  $B_{MSY}$  and requires a TAC that restores a stock biomass towards a level that is at or above a level that can produce the maximum sustainable yield, having regard to the interdependence of stocks, biological characteristics and environmental conditions.
- 54 MFish does not consider that retaining the status quo is appropriate. Given the low productivity of orange roughy stocks the biomass of the stock is likely to continue to decline further below  $B_{MSY}$  under the existing management settings.

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<sup>5</sup>  $B_{MSY}$  for orange roughy stocks is estimated to be 30%  $B_0$ .

- 55 Both options propose a reduction to the TAC, to be implemented by a reduction in the catch limit on the East and South Chatham Rise stock. The proposed catch limits are the first step in a staged reduction to the current  $F_{MSY}$  yield estimate of 4,410 t. Option 1 would reduce the TAC for ORH 3B by 3,400 t over 3 years while option 2 would achieve this reduction over 2 years.
- 56 As a result of new research the  $F_{MSY}$ -based catch limit for the East and South Chatham Rise will change. MFish proposes that the timeframe for reducing the TAC to incorporate revised  $F_{MSY}$ -based catch limits under each option will remain the same. Ensuring that the appropriate TAC is reached within the stated timeframe will likely necessitate a change to the quantum of TAC reduction in the following years of each option.

### Section 13 (3)

- 57 Section 13 (3) requires that, in considering the way and the rate that the stock may be moved towards a level that can produce MSY under s 13(2)(b), the Minister shall have regard to such social, cultural and economic factors as he or she considers relevant.
- 58 Option 1 proposes a reduction in the TACC of 1,080 t. A conservative estimate of the landed value of 1,080 t of orange roughy derived from the 2006-07 port price in ORH 3B equates to a value of \$3.2 million. The majority of orange roughy is exported so a better estimation of value may be derived from export earnings. On the basis of the export value of the most common product state exported<sup>6</sup>, 1,080 t of orange roughy is worth approximately \$3.9 million.
- 59 Option 2 proposes a reduction in the TACC of 1,620 t. A conservative estimate of the landed value of 1,620 t of orange roughy derived from the 2006-07 port price in ORH 3B equates to a value of \$4.9 million. The majority of orange roughy is exported so a better estimation of value may be derived from export earnings. On the basis of the export value of the most common product state exported<sup>7</sup>, 1,620 t of orange roughy is worth approximately \$5.8 million.
- 60 Without a clear understanding of recruitment it is not possible to determine the rebuild rate of orange roughy stocks, although lower catch limits will initiate a rebuild faster than higher catch limits. The research programme will incorporate annual plume surveys plus additional work to better define the mature orange roughy biomass on the East and South Chatham Rise. The quantum of further reductions to the TAC will be determined annually when the methods for determining current mature biomass have been better developed. MFish considers that a staged approach to reducing the TAC, given uncertainty in available information at the present time, is appropriate having regard to relevant economic factors.

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<sup>6</sup> Based on final FOB export figures for December 2007

<sup>7</sup> Based on final FOB export figures for December 2007

- 61 MFish requests that Industry, through the submission process, provide any additional information on social, cultural and economic factors relevant to this decision.

### *TACC and Allowances*

- 62 The TAC must be apportioned between the relevant sectors and interests set out under the provisions of s 20 and s 21 of the Act. Section 21 prescribes that the Minister shall make allowances for Maori customary non-commercial interests, recreational fishing interests, and for any other sources of fishing-related mortality, before setting the TACC. In determining these allowances, the Minister should consider how the allowances will enable people to provide for their social, economic and cultural wellbeing (as provided for in the purpose of the Act).
- 63 There are no known Maori customary or recreational fisheries for orange roughy. MFish proposes that the Minister sets allowances of zero tonnes for recreational and Māori customary fishing under both options. This is consistent with the approach that has been adopted since orange roughy became a QMS species in 1986.
- 64 Other sources of fishing-related mortality has been previously set at 5% of the TACC to account for lost fish, discards etc. There is no information to support a variation to this figure at this time.

### *Sub-QMA catch spreading arrangements*

- 65 Proposed sub-stock and sub-area voluntary catch limits for the 2008-09 fishing year are discussed below. MFish recommends that these catch limits and reporting requirements continue to be managed by DWG. Under both options MFish will monitor DWG reports and operators' fishing patterns to evaluate the effectiveness of these voluntary catch limits. MFish will ensure that, through joint MFish-DWG communications, operators are fully informed as to the progress of catch taken against sub-stock and sub-area limits.

### *Considerations at the sub-stock level*

#### **Stock boundaries**

- 66 The sub-stock boundaries are defined in Appendix 2.

#### **Sub-stock catch limits**

##### Northwest Chatham Rise

- 67 The catch limit for the Northwest Chatham Rise was decreased in response to sustainability concerns identified in the 2006 stock assessment. MFish considers that the 2006 decisions were appropriate and in the absence of new stock assessment information, does not propose varying the current management arrangements for this sub-stock at this time.

- 68 Both options retain the existing catch limit for the Northwest Chatham Rise.

##### East and South Chatham Rise

69 The Plenary has considered the location of stock assessment and management boundaries on the Chatham Rise and has agreed that the East and South Chatham Rise should be considered as a single sub-stock.

70 Both options reflect the revised stock structure and no distinction is made between the East Chatham Rise and the South Chatham Rise.

#### Arrow Plateau

71 The Arrow Plateau has been closed to bottom trawling by regulation under the Benthic Protected Areas (BPA) initiative and the catch limit for this portion of the stock will remain at zero.

72 Both options retain a zero tonne catch limit for the Arrow Plateau.

#### Puysegur

73 The fishery has been voluntarily closed since 1997-98.

74 Both options retain a zero tonne catch limit for Puysegur.

#### Sub-Antarctic

75 The catch limit for the Sub-Antarctic was increased in 2006 to 1,850 t. MFish considers that the 2006 decisions were appropriate and in the absence of new stock assessment information, does not propose varying the current management arrangements at this time.

76 Both options retain a catch limit of 1,850 t for the Sub-Antarctic.

#### *Considerations at the sub-area component level*

77 The sub-area component boundaries are defined in Appendix 3.

#### **Catch spreading by sub-area component**

##### Sub-Antarctic sub-area limits

78 MFish considers that the 2006 decisions were appropriate and that the voluntary catch spreading and reporting arrangements are working well. In the absence of new stock assessment information MFish does not propose varying the current management arrangements at this time.

79 MFish will monitor DWG reports and operators' fishing patterns to evaluate the effectiveness of these voluntary catch limits. MFish will also ensure that, through joint MFish-DWG communications, operators are fully informed as to the progress of catch taken against the Sub-Antarctic feature limits.

#### East and South Chatham Rise

80 Both options include a limit of 50% of the East and South Chatham Rise catch limit that can be taken from the Plume during the period 1 June to 31 August.

#### *Environmental considerations*

81 MFish is in the process of developing environmental standards – including a seabird standard and a benthic impact standard - to ensure that statutory

obligations to avoid remedy or mitigate the adverse effects of fishing are met. These standards will ultimately be used to inform fisheries plan development.

- 82 Key environmental issues in relation to the ORH 3B fishery and the options proposed in this paper are discussed below.

#### *Finfish bycatch*

- 83 While a number of deepwater species that share similar habitat to orange roughy are taken in the ORH 3B fishery (including black, smooth and spiky oreo, black cardinal fish and alfonsino) targeted orange roughy fishing historically captures over 90% orange roughy (by greenweight).<sup>8</sup> No increase in the orange roughy TAC is contemplated and consequently there should be no additional adverse implications for fish bycatch.

#### *Shark bycatch*

- 84 Some concern has been raised regarding highly vulnerable deepwater sharks, although sharks account for approximately 3% (by greenweight) of the bycatch in target orange roughy fisheries. A specific national plan of action for the conservation and management of sharks is in preparation by MFish.
- 85 MFish considers that the management proposals will have no additional adverse implications for sharks as none of the options should result in an increase in fishing effort.

#### *Marine mammals*

- 86 MFish considers that the management proposal will have no additional adverse implications for fur seals and other marine mammals as none of the options should result in an increase in fishing effort.

#### *Seabirds*

- 87 While trawl fisheries for orange roughy are known to interact with seabirds, and fishing-related mortalities of seabird species are known to occur, orange roughy fisheries are considered to pose relatively low risk to seabirds compared to other fisheries. The few vessels that dominate the catch in ORH 3B apply mitigation measures ranging from on-board meal plants (one vessel), batch discarding (all vessels) and back of the boat mitigation measures (all vessels). Consequently the level of interaction and fishing related mortality is considered to be low for the vessels that fish in ORH 3B.
- 88 It is difficult to quantify the overall impact as knowledge of the population characteristics of seabird species is typically limited. It is known however that the Chatham Rise and Sub-Antarctic regions are areas of vulnerable and threatened sea bird species such as the Chatham Island Albatross and the Chatham Petrel (the International Union for the Conservation of Nature (IUCN) status is critically endangered); the Northern and Southern Royal Albatross (IUCN status is endangered and vulnerable respectively); and the

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<sup>8</sup> Anderson, O.F.; Gilbert, D.J.; Clark, M.R. (2001). Fish discards and non-target catch in the trawl fisheries for orange roughy and hoki in New Zealand waters for the fishing years 1990-91 to 1998-99. *New Zealand Fisheries Assessment Report 2001/16.57* p.

Salvin's Albatross (IUCN status is vulnerable).

- 89 The number of observed seabird captures from the deepwater trawl fisheries generally has been decreasing since 2004-05 with only three recorded in the 2006-07 fishing year. The management proposal should have no additional adverse implications for seabirds as no increase in orange roughy catch entitlements is proposed.

*Benthic impacts and coral bycatch*

- 90 Bottom trawling can affect fragile benthic invertebrate communities but adverse effects may be reduced if vessels repeatedly trawl along the same tows in a fishery. There are cost implications for Industry in terms of lost or damaged gear when fishing in new areas. As a consequence Industry generally follows known trawl tracks on the Chatham Rise.
- 91 Two initiatives are in place to address benthic impacts. In 2001 the Minister regulated a trawl closure covering a selection of 19 seamounts of varying size and depth within New Zealand. Ten of these are within the ORH 3B QMA. In addition 17 further areas have recently been closed to bottom trawling by regulation under the BPA initiative. Twelve of these, including the Arrow Plateau, are within the ORH 3B QMA.

*Compliance implications*

- 92 Key offences that may occur in ORH 3B include misreporting of QMA, species and weights and fishing in closed areas. MFish considers that the proposed management options resulting in a significant reduction in the TAC over time may increase the incentive to offend.
- 93 The ORH 3B fishery is closely managed from an Industry perspective with few boats operating in the fishery and 97.95% of the ORH 3B quota owners represented by the Deepwater Group (DWG). DWG currently monitor adherence to voluntary catch spreading arrangements and provide monthly reports to MFish. DWG notifies MFish when catch reaches 80% of the sub-stock and sub-area limits, and also notifies MFish when any limit has been reached.
- 94 MFish considers that the monitoring arrangements are robust and appropriate. DWG and MFish will continue to closely monitor this fishery to ensure compliance with management arrangements.

# APPENDIX 1

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## Statutory Considerations

95 When setting or varying the TAC and TACC under the Act, the Minister is required to consider a series of principles and factors:

- a) **Section 13(2)** MFish recommends that the TAC is varied pursuant to s 13(2)(b) to enable ORH 3B to be restored to a level at or above  $B_{MSY}$ . Of the sub-stocks that make up ORH 3B: the most recent (2006) assessment of the Northwest Chatham Rise estimated that the biomass was below  $B_{MSY}$  at 11% (range 8-16%)  $B_0$ ; evaluation of the status of the East and South Chatham Rise stock in 2008 concluded that the stock was likely to be below  $B_{MSY}$  and in the range 15-30%  $B_0$ ; and Puysegur remains voluntarily closed in recognition that the stock is likely to be below  $B_{MSY}$ . While there is no information on the stock status of the remainder of the Sub-Antarctic portion of ORH 3B, the Chatham Rise is likely to contain the majority of the ORH 3B biomass. As both the Northwest and the East and South Chatham Rise are considered to be below  $B_{MSY}$  it follows that ORH 3B as a whole is below  $B_{MSY}$ .

The proposed TAC reduction under both options will be implemented by reducing the catch limit on the East and South Chatham Rise. The reduction will reduce the catch limit for this sub-stock towards the yield estimates derived from an  $F_{MSY}$  strategy. Catch limits derived from an  $F_{MSY}$  strategy by definition will rebuild a stock that is below  $B_{MSY}$ . Further research is planned to refine yield estimates and further TAC reductions may be contemplated in future.

The specific considerations set out in s 13(2)(b) include having regard to the interdependence of stocks, the biological characteristics of the stock and any environmental conditions affecting the stock. As such, in considering the proposed TAC options and corresponding proposed periods of rebuild, the Minister must take into account:

- i) The interdependence of stocks for ORH 3B (as required by s 13(2)(b)(i)). There is no information to suggest the interdependence of stocks should affect the level of the TAC for ORH 3B at this time. Given that the fishery primarily targets aggregations of orange roughy, it is relatively clean, and bycatch proportions are low.
- ii) Environmental factors affecting ORH3B (as required under s 13(2)(b)(ii)). No specific environmental conditions affecting the ORH 3B stock have been identified.
- iii) The biological characteristics of ORH3B (as required under s 13(2)(b)(ii)). It is known that orange roughy are very long-lived and late maturing, which are biological characteristics that render them slow to recover from overfishing.

- b) **Section 13(3)** requires that the Minister, in considering the way and rate at which a stock is moved towards  $B_{MSY}$ , have regard to such social, cultural, and economic factors as he considers being relevant when determining the way and rate at which to move the stock biomass toward or above the  $B_{MSY}$  level.

MFish has considered the economic impact of reducing the TAC to the  $F_{MSY}$  yield estimates for the East and South Chatham Rise. MFish proposes a staged approach to reducing the TAC to allow Industry time to rationalise their operations as the TAC decreases. This staged reduction will occur in concert with a research programme to update the yield estimates.

Industry has consolidated the fleet deployed in the ORH 3B fishery and thereby significantly reduced the number of personnel involved in this fishery. While reduction in the TAC will likely reduce the number of days vessels expend in this fishery, the proposed cuts are not anticipated to have a significant social impact.

MFish is not aware of any recreational or customary Māori interest in the fishery and no other cultural factors that MFish considers are relevant to a determination under section 13(3).

- c) **Sections 5(a) and (b)** require the Act to be interpreted consistently with New Zealand's international obligations with respect to fishing and with the provisions of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992. Provisions of general international instruments such as the United Nations Convention on the Law of the Sea (UNCLOS) and the Fish Stocks Agreement have been implemented through the provisions of the Fisheries Act 1996 and given effect here. MFish considers that the options are consistent with both New Zealand's international obligations relating to fishing and the provisions of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992.
- d) **Section 8** of the Act describes the purpose of the Act as being to provide for the utilisation of fisheries resources while ensuring sustainability, and defines the meanings of utilisation and sustainability. The management options presented seek to achieve the purpose of the Act. The proposals ensure sustainability under the respective catch limits via sub-stock management and monitoring measures that address risk as appropriate to the different levels of catch, and take into account the respective costs of management versus the utilisation benefits.
- e) **Sections 9(a) and (b)** require the Minister to take into account that associated or dependent species (those that are not harvested) be maintained at or above a level that ensures their long-term viability, and that the biological diversity of the aquatic environment should be maintained. The specific nature and extent of effects of fishing on any particular sub-stock in ORH 3B and the environment are generally understood to be localised and specific to aggregations of orange roughy at 850-1,200 metre depths. While some bycatch of non-

harvested species is known, the impact that fishing for ORH 3B has on the long term viability and biological diversity of the aquatic environment is of greater concern in regions of steep sloping and highly diverse topographic features. Some features within ORH 3B have been set aside from all trawling, including ten seamounts and the Arrow Plateau, to mitigate the benthic effects of fishing.

The main prey species for orange roughy include mesopelagic and benthopelagic prawns, fish and squid, with other organisms such as mysids, amphipods and euphausiids occasionally being important. MFish has considered the effects on associated and dependent species and biodiversity that would affect the setting of the TAC and determined the impact is addressed under the catch spreading arrangements.

- f) **Section 9(c)** requires the Minister to take into account the principle that habitat of particular importance for fisheries management should be protected.

While trawling can adversely affect fragile benthic invertebrate communities, the commercial bycatch of benthic invertebrates is seldom recorded or examined. Research has revealed marked differences in the bottom fauna of fished and unfished seamounts off New Zealand and Tasmania, and those differences have been ascribed to the impact of bottom trawling. Researchers have reported anecdotal evidence of bycatch of coral species in developing orange roughy fisheries in New Zealand.

Nineteen seamounts of varying size and depth within New Zealand waters have been closed to trawling, and ten of these are within ORH 3B. In addition, 12 BPAs are within ORH 3B. These closures should therefore protect faunas in a variety of habitats from the effects of fishing.

- g) **Section 10** of the Act sets out the information principles, which require that decisions be based on the best available information, taking into account any uncertainty in that information, and applying caution when information is uncertain, unreliable, or inadequate. In accordance with s 10, the absence of information should not be used as a reason to postpone, or fail to take, any measure to achieve the purpose of the Act, including providing for utilisation at levels considered to be sustainable. A thorough review of available information has been undertaken in 2008 and the best available information has been used to derive management options. MFish has endeavoured to set out the relevant uncertainty in, and inadequacy of, that information so that the appropriate caution can be applied in assessing the proposed management options.

- h) **Section 11(1)(a)**: Before varying the TAC for ORH 3B, the Minister must take into account any effects of fishing on any stock and the aquatic environment. No information about any effects of fishing on any stock or on the aquatic environment additional to that discussed elsewhere in the paper is considered relevant to the consideration of

sustainability measures for ORH 3B at this time.

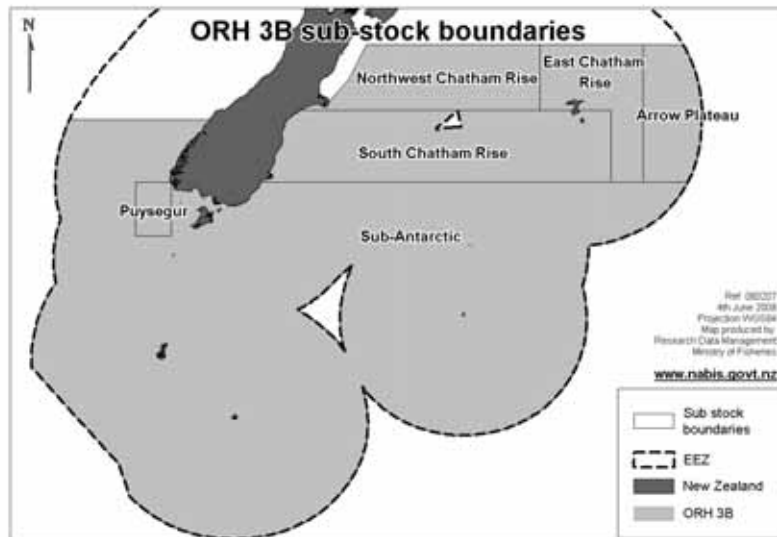
- i) **Section 11(1)(b):** Before varying the TAC for ORH 3B, the Minister must take into account of any existing controls under the Act that apply to the stock or area concerned. For ORH 3B, the measures that apply currently are a TAC, TACC and an allowance for incidental fishing-related mortality. No other controls under the Act apply specifically to ORH 3B. Specific seamount closures are located within ORH 3B.
- j) **Section 11(1)(c):** Before varying the TAC for ORH3B, the Minister must take into account the natural variability of the stock. Orange roughy year-to-year biomass is not known to be highly variable, and therefore the natural variability of orange roughy is not a concern in setting the TAC for ORH 3B.
- k) **Sections 11(2)(a) and (b):** Before varying the TAC for ORH3B, the Minister must have regard to any provisions of any regional policy or plan under the Resource Management Act 1991 and any management strategy or plan under the Conservation Act 1997 that apply to the coastal marine area and you consider relevant. MFish is not aware of any such provisions that should be taken into account for ORH 3B.
- l) **Section 11(2)(c):** Before varying the TAC for ORH3B, the Minister must have regard to sections 7 and 8 of the Hauraki Gulf Marine Park Act 2000 that apply to the coastal marine area and you consider relevant.. The distribution of orange roughy in the ORH 3B QMA does not intersect with the Park boundaries.
- m) **Section 11(2A)(b):** Before varying the TAC for ORH3B, the Minister must take account of any relevant and approved fisheries plans. There is no approved fisheries plan in place for ORH 3B.
- n) **Sections 11(2A)(a) and (c):** Before varying the TAC for ORH3B, the Minister must take into account any conservation or fisheries service, or any decision not to require such services. MFish does not consider that existing or proposed services materially affect the proposals for the ORH 3B stock. No decision has been made to not require a service in this fishery at this time.
- o) **Section 20 and 21** specify a number of matters that must be taken into account when setting or varying a TACC. Section 21 requires the Minister to allow for non-commercial Māori and recreational fishing interests, and other sources of fishing-related mortality when setting or varying the TACC. The nature of the ORH 3B fishery and the interests of recreational and customary fishers have been considered in proposing the TACCs.
- p) **Section 21(4)** also requires that any mātaitai reserve or closure/restriction under s 186A to facilitate customary fishing be taken into account. There is one mātaitai reserve in ORH 3B generally (Te Whaka a Te Wera Maitaitai – located in Patterson Inlet, Stewart Island), but this does not intersect with the ORH 3B fishery. No area has been closed or fishing method restricted (that affects the fishery within ORH 3B) under the customary fishing provisions of the Act.

- q) **Section 21(5)** also requires that any regulations to prohibit fishing made under s 311 be taken into account when setting allowances for recreational interests. No restrictions under s 311 have been placed on fishing in any area within ORH 3B.

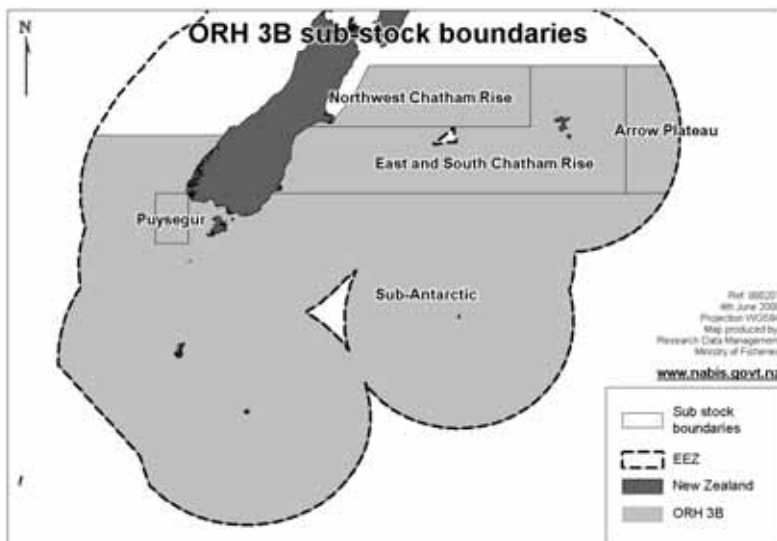
## APPENDIX 2

### Definition of ORH 3B sub-stock boundaries

Note: All positions are given in degrees, minutes and decimal minutes format. Figures in brackets are decimal degrees with western longitudes given as a progression of eastern longitude (for example 179° W is given as 181).



### Existing sub-stock boundaries



### Sub-stock boundaries under proposed options

### ***Northwest Chatham Rise (unchanged)***

The area within the box defined by the points:

42°10.0' S, 174 °42' E	(-42.166667, 174.700000)
42°10.0' S, 178 °00' W	(-42.166667, 182.000000)
44°00.0' S, 178 °00' W	(-44.000000, 182.000000)
44°00.0' S, Coastline	(-44.000000, coastline )
43°44.3' S, 173 °07.5' E	(-43.738333, 173.125000)
43°08' S, 173 °57' E	(-43.133333, 173.950000)

### ***Existing South Chatham Rise***

The area defined by the points:

44°00' S, 171 °55.8' E	(-44.000000, 171.930000)
44°00' S, 175 °00' W	(-44.000000, 185.000000)
46°00' S, 175 °00' W	(-46.000000, 185.000000)
46°00' S, 170 °15.6' E	(-46.000000, 170.260000)

Note that for the area defined above, points 1 and 4 are linked by the coastline. For reporting purposes the following rectangular box that overlaps with the South Island may be used:

44°00' S, 170 °15' E	(-44.000000, 170.256977)
44°00' S, 175 °00' W	(-44.000000, 185.000000)
46°00' S, 175 °00' W	(-46.000000, 185.000000)
46°00' S, 170 °15.6' E	(-46.000000, 170.260000)

### ***Existing East Chatham Rise***

The area within the box defined by the points below:

42°10' S, 178 °00' W	(-42.166667, 182.000000)
42°10' S, 173 °40' W	(-42.166667, 186.333333)
46°00' S, 173 °40' W	(-46.000000, 186.333333)
46°00' S, 175 °00' W	(-46.000000, 185.000000)
44°00' S, 175 °00' W	(-44.000000, 185.000000)
44°00' S, 178 °00' W	(-44.000000, 182.000000)

### ***Proposed East and South Chatham Rise***

The East Chatham Rise and the South Chatham Rise areas defined above combined.

### ***Arrow Plateau (unchanged)***

The area within the box defined by the points:

42°10' S, 173 °40' W	(-42.166667, 186.333333)
42°10' S, 171°00.07' W	(-42.166667, 188.998833)
46°00' S, 171°46.68' W	(-46.000000, 188.222000)
46°00' S, 173 °40' W	(-46.000000, 186.333333)

Note that for the area defined above, points 2 and 3 are linked by the boundary of the EEZ.

***Puysegur (unchanged)***

The area within the rectangular box defined by the points:

46°00' S, 165 °00' E	(-46.000000, 165.000000)
46°00' S, 166 °30' E	(-46.000000, 166.500000)
47°30' S, 166 °30' E	(-47.500000, 166.500000)
47°30' S, 165 °00' E	(-47.500000, 165.000000)

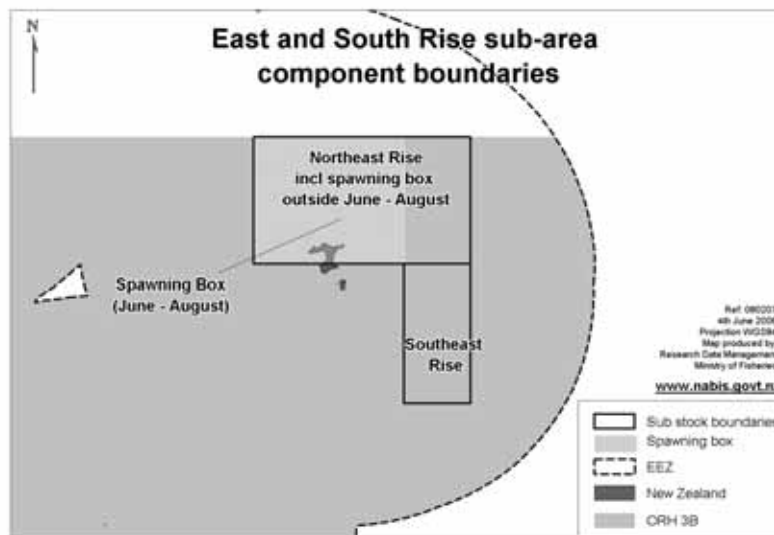
***Sub-Antarctic (unchanged)***

The remaining area within ORH 3B. Specifically the area (excluding Puysegur) within the EEZ and below 46°00' S on the East Coast and 44°15.6' S on the West Coast.

## APPENDIX 3

### Definition of ORH 3B sub-area component boundaries

Note: All positions are given in degrees, minutes and decimal minutes format. Figures in brackets are decimal degrees with western longitudes given as a progression of eastern longitude (for example 179° W is given as 181).



#### Existing East and South Chatham Rise sub-area component boundaries

which are all removed under proposed options

#### *Spawning Box (existing)*

The area within the rectangular box defined by the points:

42°10' S, 178 °00' W	(-42.166667, 182.000000)
42°10' S, 175 °00' W	(-42.166667, 185.000000)
44°00' S, 175 °00' W	(-44.000000, 185.000000)
44°00' S, 178 °00' W	(-44.000000, 182.000000)

During the period June 1 to 31 August.

#### *Northeast Chatham Rise (existing)*

The area within the rectangular box defined by the points:

42°10' S, 178 °00' W	(-42.166667, 182.000000)
42°10' S, 173 °40' W	(-42.166667, 186.333333)
44°00' S, 173 °40' W	(-44.000000, 186.333333)
44°00' S, 178 °00' W	(-44.000000, 182.000000)

### *Southeast Chatham Rise (existing)*

The area within the rectangular box defined by the points:

44°00' S, 175 °00' W	(-44.000000, 185.000000)
44°00' S, 173 °40' W	(-44.000000, 186.333333)
46°00' S, 173 °40' W	(-46.000000, 186.333333)
46°00' S, 175 °00' W	(-46.000000, 185.000000)

### *Sub-Antarctic feature monitoring (unchanged)*

DWG monitors catch on the northern and eastern Pukaki Rise using the 'Feature Monitoring Grid' below. Each grid box is approximately 10nm by 10nm and each can have no more than 500 t of ORH taken from it. Grid cell A13 roughly aligns with the previous Priceless Box and grid cell A18 is the previous 'SE Box'. Catches are also monitored throughout the Sub-Antarctic sub-area. GIS analyses are performed to identify any feature or 10nm x 10nm area where accumulated catches approach the 500 t feature limit.

