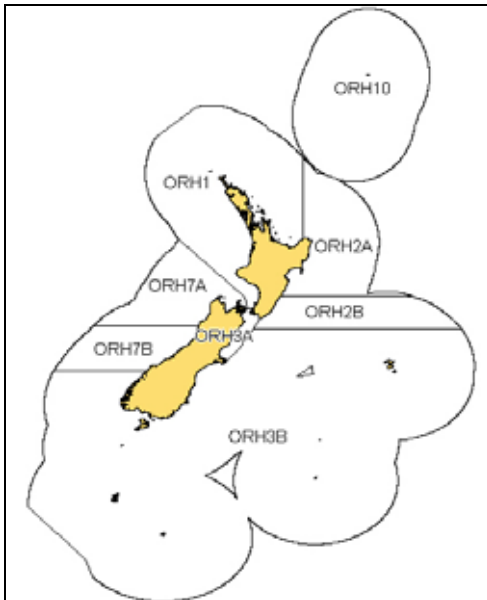
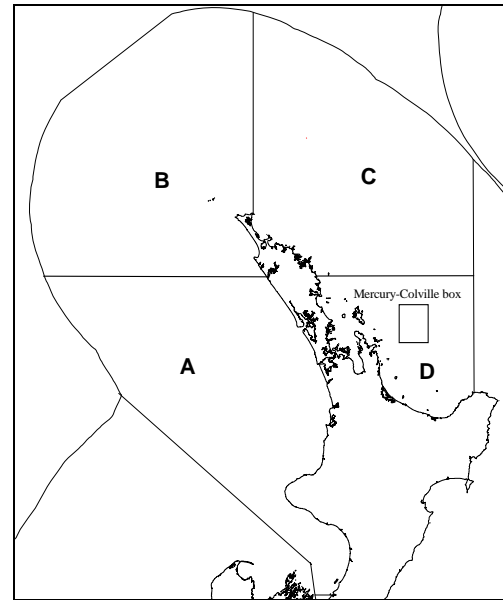


# ORANGE ROUGHY (ORH 1)

**Figure 1.** Orange Roughy QMAs.



**Figure 2.** The ORH 1 Quota Management Area and the four sub-management areas defined for the ORH 1 AMP (labelled A-D). Solid lines enclose the Mercury-Colville ‘box’.



## Executive Summary

- 1 Information on ORH 1 to underpin an assessment of stock status and long-term yield is not available. There is neither an evaluation of stock size in relation to the biomass that can produce the maximum sustainable yield ( $B_{MSY}$ ), nor an indication of the likely trend in stock size under the current Total Allowable Catch (TAC).
- 2 Despite uncertainty, MFish proposes that the Minister set the TAC under section 13(2)(a) to maintain the stock at or above a level that can produce the maximum sustainable yield, having regard to the interdependence of stocks. Given the level of uncertainty, it is also open to the Minister to consider setting the TAC under section 13(2)(b) to restore the stock at or above a level that can produce the maximum sustainable yield.
- 3 MFish proposes three options to manage the orange roughy fishery in ORH 1. All options include a variety of management and sustainability measures that existed under the Adaptive Management Programme (AMP), and currently are implemented through industry agreement. These include: sub-area limits, feature limits, biological sampling, observer coverage, and regular reporting. Their adoption would result in a structured fishing plan to manage risks of localised depletion or sustainability risks to localised stocks that might exist.
- 4 Option 1 (*status quo*) retains the existing TAC, Total Allowable Commercial Catch (TACC), sub-area and feature limits. Option 1 places more weight on short-term utilisation and the existing management approach (catch spreading, *etc.*) as the means to manage risk.

Although retaining the current TAC is not likely to pose a high risk to the stock in the short term, the longer term sustainability risks are unknown. A TAC is set to move the stock to  $B_{MSY}$  over time; a higher TAC increases the risk that the stock will not move to  $B_{MSY}$ . Option 1 proposes a TAC for which there is little risk that there will be stock depletion resulting from catching 1,400 tonnes of roughy this year; this is different from a sustainable catch over the long term, moving the stock towards  $B_{MSY}$ .

- 5 Due to the biological characteristics of orange roughy, the nature of the ORH 1 fishery (relatively small aggregations widely dispersed over a large fishing area), and the sort of information that is being collected on the fishery, evidence of unsustainable harvesting will likely only be available following a major decline in stock size.
- 6 Accordingly, Option 2 adopts a more cautious approach than Option 1 by reducing the TAC by approximately 20% to 1,208 tonnes, and the TACC to 1,150 tonnes. Sub-options 2a and 2b provide different catch limits by sub-areas to effect the TACC reduction. 2a imposes a reduction of approximately 20% to each sub-area, whereas 2b only reduces sub-area C where the limit has never been caught.
- 7 Option 2 (and 2a in particular), places greater weight on the uncertainty of the current information regarding stock status, and the biological characteristics of the species. In the absence of an assessment of stock status relative to the sustainability of current catches and the current TAC, Option 2 seeks to reduce risk to the long-term sustainability of the stock. Given the biological characteristics of this species, the approach under Option 2 recognises the risk that isolated features within ORH 1 are particularly susceptible to over-fishing. A TAC reduction is appropriate under 13(2)(a) if the Minister is satisfied that maintaining the biomass at or above  $B_{MSY}$ , or avoiding a risk that the biomass may decline below that target stock level, is best achieved by a lower fishing mortality.
- 8 Option 3 places the greatest weight of any of the options on the uncertainty of the information, takes the most cautious approach in favour of sustainability, and imposes the greatest short-term economic loss. It is the option that best suits the setting of a TAC if the Minister judges s 13(2)(b) to be the appropriate section. Option 3 would reduce the TAC by 38% to 914 tonnes, and the TACC to 870 tonnes. Requested sub-area limits of 150 t for sub-area A, 380 t for sub-Area B, 190 t for sub-Area C, and 150 t for sub-Area D are calculated by applying a 25% reduction to the average catch by sub-area over the past five years.

## Summary of Options

- 9 MFish proposes three management options; Option 2 has two pathways to reach the proposed TACC, presented as Option 2a and 2b. The Minister may choose other options (alternative TAC levels and sustainability measures) that he considers will best meet his obligations under the Fisheries Act 1996 (the Act).
- 10 MFish reminds submitters that the IPP is not advice for the Minister, but provides stakeholders with the opportunity to comment on, and provide supplemental information to, draft advice. Stakeholder views and information will be considered and incorporated where appropriate into advice to the Minister.
- 11 As the AMP for ORH 1 has completed its full term review, MFish proposes that the catch spreading, sub-QMA limits, monitoring and reporting measures formerly managed under the AMP continue. These measures should be agreed by quota owners and a commitment made to them by signed agreement. MFish requests that quota owners confirm their intent to sign such an agreement in the consultation on this IPP. The Minister must be advised of this intent before Final Advice is provided.
- 12 MFish proposes that the agreement and administration of the package of management measures be formalised under a fisheries plan in place by 1 October 2008.

	<b>Option 1</b>	<b>Option 2</b>		<b>Option 3</b>
		<b>A</b>	<b>B</b>	
TAC	1,470 tonnes	1,208 tonnes	1,208 tonnes	914 tonnes
Allowance for other sources of fishing-related mortality	70 tonnes	58 tonnes	58 tonnes	44 tonnes
Allowance for customary Māori interests	0	0	0	0
Allowance for recreational fishery interests	0	0	0	0
TACC	1,400 tonnes	1,150 tonnes	1,150 tonnes	870 tonnes
Requested sub-area A limit	200 tonnes	175 tonnes	200 tonnes	150 tonnes
Requested feature limit in sub-area A	100 tonnes annual feature limit			
Requested sub-area B limit	500 tonnes	400 tonnes	500 tonnes	380 tonnes
Requested feature limit in sub-area B	150 tonnes annual feature limit			
Requested sub-area C limit	500 tonnes	400 tonnes	250 tonnes	190 tonnes
Requested feature limit in sub-area C	150 tonnes annual feature limit			
Requested sub-area D limit	200 tonnes	175 tonnes	200 tonnes	150 tonnes
Requested feature limit in sub-area D	75 tonnes annual feature limit			
Mercury-Colville 'box' limit	30 tonnes bycatch-only limit			
Requested observer coverage	100% for all ORH 1 fishing trips for June and July in sub-area A, C and D, for October for sub-area B, and all fishing in the Mercury-Colville box			
Reporting	Request that industry continue to submit comprehensive catch reports by feature and sub-area			

## Cost-Benefit Analysis

13 In the *New Zealand Fishing Industry Association Inc v Minister of Fisheries* (CA82/97, 22/7/97) case (known as the 'Snapper 1' case), the Court of Appeal wrote "the Minister would be wise to undertake a careful cost/benefit analysis of a reasonable range of options available to him in moving the fishery towards MSY". Appendix 4 provides a tabular summary of the costs and benefits of each option; the detail of each is provided in the body of the IPP.

- 14 As a simple summary list, the costs and benefits cannot be summed, or the costs netted out against the benefits to derive the superior option. In general, there are unquantified sustainability risks and benefits of the two options, with more known (and to some degree quantifiable) utilisation costs and benefits.

## Recent ORH 1 Management Advice

- 15 ORH 1 was reviewed during the October 2006 sustainability round. The Minister's decision to reduce the TAC and TACC for ORH 1 was challenged, and the Minister elected to withdraw from proceedings. Accordingly, the TAC and TACC remained unchanged.
- 16 When making his decision, the Minister must consider all relevant information, and disregard any irrelevant considerations. MFish considers the concerns expressed by some stakeholders over recent ORH 1 advice and management decisions, court challenges and possible amendments to s 10 of the Act to be irrelevant to sustainability measures decisions by the Minister.
- 17 However, some of the documentation relating to last year's ORH 1 decisions provide relevant information for this year's decision. Such information has been incorporated into this IPP where appropriate. Sources have been footnoted.

## *Past misreporting*

- 18 Previous advice discussed the issue of misreporting in the ORH 1 fishery. Due to the reliance on catch and effort trends as the tool by which the effect of the TAC can be monitored, and feature reporting as a means to manage catch spreading, misreporting of catch and effort between features and sub-areas undermines the value of monitoring and management.
- 19 There have been prosecutions regarding misreporting between features and sub-areas within ORH 1 under the AMP. The prosecutions focused on approximately 180 tonnes of misreported catch. Once the offenders were convicted and sentencing concluded, the relevant forms were re-submitted and analysed for the full term AMP review.
- 20 However, misreporting concerns in ORH 1 are not relevant to decisions on TAC setting under s 13 of the Act. All available steps have been taken to correct and complete the input data in order to improve the credibility of the subsequent analyses. MFish is satisfied that the information considered by the AMP Working Group (AMP WG) is the best available, and is the most credible basis on which to assess and manage ORH 1. This IPP presents the best information currently available, and final advice will incorporate any additional relevant information from stakeholder submissions.

## Rationale for Management Options

- 21 The Plenary report for ORH 1, completed following the full term review of the ORH 1 AMP in May 2007, is attached as Appendix 1; species characteristics of orange roughy are discussed in Appendix 2; the history of the fishery and the management of ORH 1 under the AMP are discussed in Appendix 3.
- 22 There is no formal stock assessment for ORH 1 to provide estimates of current stock size relative to  $B_{MSY}$ . Information from the commercial fishery drives the assessment of stock status by the AMP WG.

### *Results of the full-term AMP review*

- 23 The objectives of the 2001-2006 AMP were to determine stock size, geographical extent, and long term sustainable yield of the ORH 1 fish stock. The AMP spread catch between sub-areas, directed exploratory fishing, and provided scientific observer coverage of around 25-37% of trawl tows (although this is lower than the 50% coverage target). Observers collected information on target species length frequency and sex ratio, and on bycatch. The AMP was able only to obtain information regarding geographical distribution.
- 24 The previous WG report, as presented in the Plenary document, stated that “the current stock size is probably above that which will support the maximum sustainable yield”. That statement dates to 2001 when the AMP was initiated; following an assessment of the five years of data collected, the WG has revised this view to: “it is not known if recent catch levels or current TACCs are sustainable in the long term”. The WG was unable to determine the sustainability of catches, because ORH 1 “probably includes a number of constituent stocks”, and “it is not possible to estimate  $B_{MSY}$  for any of the individual stocks, let alone aggregate up to an estimate for ORH 1 as a whole.”
- 25 Moreover, “a better understanding is not possible in the near future.  $B_{MSY}$  is difficult to estimate in situations involving an unknown number of constituent stocks.” The WG “concluded that no other information can currently be extracted from the existing data that will provide insight into the status of the ORH 1 stocks”. A 2001 assessment of yield for the Mercury-Colville ‘box’ serves as the basis for the proposed orange roughy bycatch limit for that area.
- 26 The report continues: “The amount of fishing in some areas appears to be low, but without any indication of current abundance, there is no way to determine if this level of fishing is in fact sustainable or if current feature limits will avoid overexploitation of localised areas.”
- 27 Unstandardised catch per unit effort (CPUE) of tonnes/tow is the major monitoring tool for ORH1. The fishery has generally operated above the threshold of 2.0 tonnes per tow, although there is considerable variation between sub-areas, and between years in the same sub-area (e.g. in 2006, CPUE was 0.97 t/tow in Area A, and 3.18 t/tow in area C; within Area A, CPUE was 3.96 t/tow in 2005, and 0.97 t/tow the following year).
- 28 The AMP WG agreed that CPUE does not seem to be a measure of abundance or a biomass index. For ORH 1, monitoring CPUE is not likely to provide a signal of stock decline. CPUE has been used in ORH 1 as a management tool: the AMP spread effort in an attempt to reduce fishing pressure on any one sub-area or feature (and Area D in particular).

- 29 ORH 1 is a large area, with roughly spread across a number of areas and features. Much of the area has not been explored, and there may well be other orange roughy populations in the unexplored parts of ORH 1. MFish is investigating the viability and utility of a characterisation study to inform future estimates of roughy in unfished areas of ORH 1. By analogy with other areas, the likely total stock size of roughy in ORH 1 could be approximated. While this may be informative, it would still not lead to any conclusive finding about the sustainability of current harvesting, or the relationship of the stock to  $B_{MSY}$ . Within ORH 1, there are six Seamount Closures and one BPA which are or soon will be closed to bottom trawling, which may include features that are likely to host roughy populations.
- 30 Estimates of stock status and long-term sustainable yield are not expected to be available in the near future. MFish considers that this is a stock where information is inadequate and highly uncertain.
- 31 Obviously a meaningful stock assessment would be desirable to assess stock status and  $B_{MSY}$ , and in determining long-term yields. Given the best available information, MFish considers that it is not possible to assess  $B_{MSY}$  for ORH 1. Nevertheless, s 13 requires the Minister to set or vary the TAC with reference to where the stock is with regards to  $B_{MSY}$ . The best available information is presented in this IPP on ORH 1, and will provide the Minister with a rational basis for his decision.

## Assessment of Management Options

- 32 The Minister must set a TAC under s 13 that maintains the stock at or above, or moves it towards or above, a biomass level that can produce the MSY. The available information for ORH 1 is uncertain and inadequate, and therefore the Minister should be cautious when making his decision. Option 2 and 3 adopt a progressively more cautious approach in favour of sustainability, while still providing for utilisation.
- 33 Under s 13, the Minister may set a TAC that maintains the stock (13(2)(a)), rebuilds the stock (13(2)(b)), or moves the stock from a position where it is above MSY (13(2)(c)), to a biomass level at or above that which can produce the MSY. Given the level of uncertainty of the information on stock status, it is not clear which of (a), (b), or (c) should be applied. MFish proposes that the Minister set the TAC for ORH 1 under section 13(2)(a) to maintain the stock at or above a level that can produce MSY, having regard to the interdependence of stocks. That does not mean that adjustments to catch limits cannot be made, provided those adjustments are considered by the Minister to maintain the stock at or above a biomass that can produce MSY. The Minister may also consider it appropriate to set the TAC under section 13(2)(b), in which case Option 3 is likely to be the most suitable option.
- 34 Options 2 and 3 propose varying the TAC. MFish is of the view that the Minister can have regard to the relevant social, cultural and economic factors for both the options that propose a TAC reduction, and Option 1 which retains the current TAC. To enable a proper comparison between the three options, MFish will advise the Minister of the social, cultural and economic factors so that he may determine their relevance.
- 35 MFish therefore invites submitters to provide additional information with regards to social, cultural and economic factors that may be relevant to setting the TAC.

### *TACC and Allowances*

- 36 The TAC must be apportioned between the relevant sectors and interests set out under the provisions of 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).
- 37 There is no known recreational or Māori customary fishery for ORH 1. MFish proposes that the Minister sets allowances of 0 tonnes for recreational and Māori customary fishing under this option – consistent with the *status quo* that has existed since orange roughy became a QMS species in 1986. MFish proposes that the current allowance for other sources of fishing-related mortality be retained at 5% of the TACC, and is combined with the TACC to make up the TAC.
- 38 Section 21 requires that any mātaimai reserve or closure/restriction under s 186A to facilitate customary fishing be taken into account. There are mātaimai reserves and s 186A measures in ORH 1, but none intersect with the ORH 1 fishery. No area has been closed or fishing method restricted (that affects the fishery within ORH 1) under the customary fishing provisions of the Act. Section 21 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 1.

### *Recommended management measures*

- 39 Each option includes a variety of management and sustainability measures that existed under the AMP program, and currently are applied by industry agreement. Their adoption would result in an industry-led structured fishing plan to manage risks of localised depletion or sustainability risks to localised stocks that might exist. Where the options differ is on the TAC, TACC, and catch limits by sub-area.
- 40 While the overall ORH 1 TAC and TACC are important, a structured fishing plan to spread effort (with good compliance and reporting) most directly influences the sustainability of the stock or stock complexes, and is therefore critical to managing risk. Accordingly, MFish recommends that the general management approach for ORH 1 continue, including sub-area limits, feature limits, biological sampling, observer coverage, and regular reporting.
- 41 MFish recommends that most elements of the structured fishery plan continue to be implemented by industry agreement for the 2007/08 fishing year. These elements are described in the ORH 1 AMP Management & Monitoring Plan (M&MP) and Memorandum of Understanding for the Management of the ORH 1 Fishery between the ORH 1 Exploratory Fishing Company (EFC) Ltd & Owners of ORH 1 Quota (MOU). MFish further recommends that these arrangements be formalised (in their current or modified form) in a fisheries plan approved under s 11A of the Act by 1 October 2008, and that the Management & Monitoring Plan be updated and agreed to by quota holders by 1 October 2008.
- 42 Although there has been no consultation with industry on how these management components would operate under any TACC level, submitters last year supported a

continuation of the AMP, which included each of the elements described below. In requesting a continuation of the current management approach, MFish is seeking to convert the AMP into a structured fishing plan. In their submission last year, EFC stated that they would “undertake to work closely with all ORH 1 Stakeholders to confirm a robust, sustainable and manageable Management and Reporting System ... before the commencement of the new Fishing Year.”<sup>1</sup>

- 43 MFish seeks industry support for this approach in the IPP consultation for both the 2007/08 fishing year and beyond, so that the Minister can be advised accordingly in the FAP. MFish considers that an agreement with the quota owners to a revised Management and Monitoring Plan for the 2007/08 fishing year would provide the necessary assurance that sub-area limits will have integrity.
- 44 If industry is unwilling to agree to a Management and Monitoring Plan, to formalise fine scale management of the fishery and to establish a credible reporting and monitoring system to ensure its integrity, then MFish would need to closely assess whether further sustainability measures, both regulatory and statutory, were necessary to ensure sustainability of ORH 1.
- 45 A summary of the recommended management measures are presented in the table below. A full description is found at Appendix 5.

Catch limits for each sub-area (A, B, C and D), and limits for each of the features	Sub-area limits as proposed in each option. Feature limits per sub-area: A = 100 t, B = 150 t, C = 150 t, D = 75 t, Mercury Colville Box = 30 t.
Mercury-Colville Box	Maintain a 30 t bycatch-only limit (no orange roughly targeting in this area).
Monitoring and reporting	As per the M&MP/MOU with regards to notification, reporting and ACE sales (see Appendix 5 for details).
Directed exploratory fishing programme	Suspend for 2007. To be considered by working group to establish value of continuing following an analysis of results to date. If useful information is likely to be generated, the working group can properly structure the fishing programme in time for the winter 2008 fishery.
Observer coverage	MFish recommends 100% observer coverage for June and July in sub-area A, C and D, for October in sub-area B. Outside these months, the standard observer coverage of approximately 10 to 15% is recommended.
Biological sampling	Standard sampling according to accepted protocols.

<sup>1</sup> Submission from the ORH 1 Exploratory Fishing Company Limited, dated 31 July 2006, Re: Review of Sustainability Measures and Other Management Controls for the 2006/2007 Fishing Year (1 October Stocks).

### *Integrity of management*

- 46 Performance with agreed reporting and monitoring under the AMP was sub-standard, and feature limits were exceeded. There have been concerted efforts to address these problems in the past, but with limited success. MFish considers that the onus is on industry to demonstrate that previous issues under the AMP can be addressed and that industry governance in this fishery can provide credible and robust fisheries management. MFish believes the delivery of monitoring and reporting as described above and in Appendix 4 would demonstrate the ability of industry to meet the standard of professional management that is required.
- 47 An analyst in the MFish Deepwater Team will be responsible for monitoring the ORH 1 fishery, and any failure to adhere to the agreed upon management system will be followed up with EFC, as will any discrepancies that may be detected between reported data, statutory forms, and fishery-independent data (such as VMS).
- 48 MFish advises that fine scale management and reporting is the preferred approach for this fishery, but that its success depends on all relevant groups working together. MFish proposes that the management system initiated under the AMP, and proposed to continue for 2007/08 be modified (as appropriate) and formalised in a Fisheries Plan approved under Section 11A of the Act. This fisheries plan must include be pre-agreed decision rules to manage non-adherence to the terms of the plan.

### *Option 1 - Retain the 1 470 tonne TAC and 1 400 tonne TACC*

- 49 Option 1 retains the current TAC of 1,470 tonnes, the TACC of 1,400 tonnes, and sub-area limits of 200 t for sub-area A, 500 t for sub-Area B, 500 t for sub-Area C, and 200 t for sub-Area D. This option also proposes the continuation of the feature limits by sub-area and other recommended management measures described above and in Appendix 5.
- 50 At the start of the AMP, scientific advice was that the stock was likely to have been above the  $B_{MSY}$  level. The latest scientific advice has confirmed that it is now unknown whether or not the ORH 1 stock remains is at, above, or below  $B_{MSY}$ . MFish considers that continuing the current TAC could enable ORH 1 to be managed at, or above,  $B_{MSY}$ . However, there is increased risk that the TAC under this option will not achieve this target level over the long-term.
- 51 The ORH 1 TACC has not been fully caught since it was set at 1,400 tonnes (70 to 92% caught, mean of 82%). This is not entirely unexpected in a fishery managed by spreading effort into unfished areas; Area C for example, with a limit of 500 t has never been more than 75% caught. Area B now represents the largest ORH 1 fishery (since the decline of Mercury-Colville in Area D), with a relatively stable target catch of about 450 t, close to the 500 t area limit.

### *Option 2 - Reduce the TAC to 1 208 tonnes and the TACC to 1 150 tonnes*

- 52 Option 2 adopts a more cautious approach than Option 1 by reducing the TAC to 1,208 tonnes, the TACC to 1,150 tonnes. This option also proposes the continuation of the feature limits by sub-area and other recommended management measures described above and in Appendix 5.

- 53 Two sub-options are presented with regards to requested sub-area limits. In Option 2a, an approximately 20% reduction across all sub-areas is requested, resulting in sub-area limits to 175 t for sub-area A, 400 t for sub-area B, 400 t for sub-area C, and 175 t for sub-area D.<sup>2</sup> In Option 2b, the entire reduction in TACC is taken from sub-area C, resulting in sub-area limits of 200 t for sub-area A, 500 t for sub-area B, 250 t for sub-area C, and 200 t for sub-area D.
- 54 Option 2 imposes a smaller reduction than the more dramatic cuts proposed last year, for which the short-term utilisation consequences were severe. The proposed reduction to the TAC of 20%, in particular if effected through Option 2a, may provide greater certainty over the longer term that ORH 1 will be managed at or above  $B_{MSY}$ , in light of the uncertainties in the best available information and uncertain stock information. It is, however, not possible to ascertain with any certainty the actual or likely effect of the proposed TAC on the biomass and sustainability of ORH1, and is best characterised as a risk mitigation approach.
- 55 Option 2, and Option 2a in particular, places greater weight on the level of uncertainty generally, and the risk that a sustainability problem might not be detected in advance substantial stock depletion (due largely to the biological nature of the stock, and the use of CPUE analysis as the primary assessment tool). Since stock status is not known, Option 2, and Option 2a in particular, provides greater certainty to the decision maker that sustainability is ensured over the longer term.
- 56 Option 2a would result in an appreciable reduction in fishing mortality, as each sub-area limit is reduced. Since the current limit for sub-area A and B is close to the current catch for those areas, catch would be reduced in A and B. The limit for sub-area C would still be greater than any catch recorded, allowing for some expansion in catch in this area (within the limits of the reduced TACC). The limit for sub-area D would be modestly above the long term average catch for this sub-area, but is lower than the most recent year's catch.
- 57 Option 2b would effect the reduction in the TACC only by reducing the limit in sub-area C. 250 t is just over the 5-year average catch (average is 233.3 tonnes) for this sub-area, although in the most recent year, catch was estimated at 375 tonnes, a 30% increase over the next-highest catch from that sub-area. Option 2b removes the 'headroom' – the difference between actual average catch and the current catch limit.
- 58 In the absence of an assessment of stock size or status or sustainable yield, and therefore no assessment that the current TAC is sustainable, this approach adopts a more cautious catch limit. The cautious approach under Option 2 recognises the specific biological characteristics of this species and the isolated features within ORH 1 that are particularly susceptible to over-fishing.

### *Option 3 - Reduce the TAC to 914 tonnes and the TACC to 870 tonnes*

- 59 Option 3 adopts the most cautious approach with regards to the TACC by reducing the TAC to 914 tonnes, and the TACC to 870 tonnes, and requesting sub-area limits of 150 t for sub-area A, 380 t for sub-area B, 190 t for sub-area C, and 150 t for sub-area D. This option

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<sup>2</sup> Calculations of catch by sub-area for tows targeting ORH are taken from Table 1 from AMP WG 2007/30, Report to SeaFIC on the orange roughy Adaptive Management Programme in ORH 1 by Owen Anderson, dated April 2007. Table 1 from this report was reproduced to show all catch or ORH irrespective of target in personal communication to MFish on 7 June 2007. These sources are used throughout the IPP.

also proposes the continuation of the feature limits by sub-area and other recommended management measures described above and in Appendix 5.

- 60 The Minister may select Option 3 while setting the TAC under s 13(2)(a), if the reduction is considered necessary by the Minister to maintain the stock at or above a biomass that can produce MSY. However, a reduction of this magnitude may be more suited to a determination by the Minister that setting the TAC under s 13(2)(b) is more appropriate, and that a reduction is required to rebuild the stock.
- 61 The TACC under Option 3 is a 38% reduction over the current catch limit. It would be effected by reducing each sub-area limit by 25% from the five-year average landings by sub-area. Option 3 removes all 'headroom' from all sub-areas.
- 62 Option 3 would result in the greatest reduction in fishing mortality across ORH 1, and is a reduction of the same order as those proposed last year. In one respect, Option 3 provides the greatest certainty over the longer term that ORH 1 will be managed at or above  $B_{MSY}$ , in light of the uncertainties in the best available information and uncertain stock information.
- 63 Option 3 places the greatest weight on the level of uncertainty generally, and adopts the most cautious catch limit. Option 3 adopts a TAC that will likely provide for management at or above  $B_{MSY}$  at the ORH 1 stock level, although there remains risk that parts of the stock will be over-exploited.

### *Discussion of TAC options*

- 64 As stated above, sub-area limits are requested, along with various other elements of a structured fishing approach. If Industry is unwilling or unable to commit to such measures under one or more of the TAC and TACC options, then MFish would need to closely assess whether further sustainability measures, both regulatory and statutory, were necessary in the future to ensure sustainability of ORH 1.
- 65 Quota owners have pointed out that there is no evidence that the ORH 1 fishery is under stress, through, for example, declining catch rates.<sup>3</sup> EFC has stated that "the fishery is not sending any signals to the fishers that there needs to be a reduction in the level of catch."<sup>4</sup> Paul Starr, an independent scientist contracted to SeaFIC, stated that "analysis shows that the catch rates in [the sub-areas other than D] are above the 2.0 t/tow threshold specified in the AMP, indicating that the Fishstock is most likely in reasonable health and not affected by strong sustainability concerns."<sup>5</sup>
- 66 The Antons group have characterised this fishery as "steady with potential for expansion" and believe "there is nothing to suggest that the current catch rates cannot be maintained".<sup>6</sup> Moreover, if there was "any evidence of stress then the Submitters, as the majority quota

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<sup>3</sup> Submission to the Primary Production Select Committee on the Fisheries Act 1996 Amendment Bill on behalf of the Antons Group of Companies. Submission dated 16 April 2007.

<sup>4</sup> Submission from the ORH 1 Exploratory Fishing Company Limited, dated 31 July, Re: Review of Sustainability Measures and Other Management Controls for the 2006/2007 Fishing Year (1 October Stocks).

<sup>5</sup> Affidavit of Paul Joseph Starr in support of application for interim relief. Filed in the High Court of New Zealand, 22 September 2006. Paragraph 14.

<sup>6</sup> Submission to the Primary Production Select Committee on the Fisheries Act 1996 Amendment Bill on behalf of the Antons Group of Companies. Submission dated 16 April 2007. Paragraph 64, p.13.

holder, would be prepared to accept any cuts which need to be made in the long term interest of the fishery and their quota holdings”.<sup>7</sup>

- 67 SeaFIC has pointed out in recent communication that a sensible approach to gathering information, such as on stock status, “is to actually do something [i.e. fish at a particular level] and then carefully monitor the effects of that activity and adjust management approaches in response to the information gathered.”<sup>8</sup> This would be, in effect, be looking for the ‘signal’ that the EFC has not yet seen. This is ‘adaptive management’, and has been the approach taken to manage ORH 1 for much of the past decade.
- 68 Due to the biological nature of orange roughy, the characteristics of the ORH 1 fishery (widely dispersed over a large area fishing relatively smaller aggregations), and the sort of information that has been collected on a fishery of those characteristics, evidence of unsustainable harvesting levels and stock decline will likely only be available following a major stock decline.
- 69 Therefore, the updated information currently available on the stock could be considered annually, and each year the risk to the stock for that year could legitimately be judged low, until the stock was overexploited with dismal prospects for recovery. Given the level of uncertainty, the annual short-term risk could equally continue indefinitely with no long-term overexploitation.
- 70 There is no discernable CPUE trend in ORH 1. It is possible that catch rates (t/tow) could remain high, and certainly above the threshold of 2.0 t/tow, until the stock becomes severely depleted. The link between any CPUE level and stock sustainability is at best weak and likely undetectable.
- 71 The use of CPUE, despite its shortcomings, has been employed because of the size of the stock – an investment into better information has not been deemed affordable given the likely return. More costly research, such as acoustic surveys, *may* allow more accurate monitoring, although it is also possible that a substantial investment would not lead to any improved information or reduced uncertainty.
- 72 As SeaFIC has argued, the extent of precautionary measures must be commensurate with the potential risks.<sup>9</sup> As put by the Deepwater Group Limited, there “must be a reasonable balance between the stringency of precautionary measures (with their associated financial or opportunity costs) and the seriousness and irreversibility of the potential threat”.<sup>10</sup> MFish agrees. Information is provided in this IPP both on the potential threat, and on the financial costs; submitters are invited to provide any additional relevant information not otherwise provided in this IPP. The Minister should examine the information in this particular case, and decide upon the weight given them.

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<sup>7</sup> Submission to the Primary Production Select Committee on the Fisheries Act 1996 Amendment Bill on behalf of the Antons Group of Companies. Submission dated 16 April 2007. Paragraph 63, p.13.

<sup>8</sup> The New Zealand Seafood Industry Council Ltd Submission to the Primary Production Select Committee on the Fisheries Act 1996 Amendment Bill. Submission dated 13 April 2007.

<sup>9</sup> The New Zealand Seafood Industry Council Ltd Submission to the Primary Production Select Committee on the Fisheries Act 1996 Amendment Bill. Submission dated 13 April 2007. Paragraph 72, p.18.

<sup>10</sup> Deepwater Group Ltd Submission to the Primary Production Select Committee on the Fisheries Act 1996 Amendment Bill. Submission dated 13 April 2007. Paragraph 11, page 2.

73 MFish agrees with SeaFIC that the “acceptability of uncertainty diminishes as the severity of potential negative effects increases”.<sup>11</sup> Due to the high degree of uncertainty, in deciding between the options the Minister should therefore form a view as to the *possible* severity of the *possible* ORH 1 depletion in determining if the level of uncertainty is acceptable. The greater the consequences of stock depletion, the more certain the Minister should be that the effect of his decisions will avoid this outcome.

## Statutory Considerations

74 When setting sustainability measures, and when making decisions under the authority of the Act, the Minister is required to consider a series of principles and factors.

### *Interdependence of stocks: section 13(2)*

75 This section should be read in conjunction with the fish bycatch section (paragraph 90).

76 Available information about the interdependence of stocks is inadequate to provide guidance on the appropriate level for a TAC. At times there has been significant ORH 1 bycatch to targeted fishing for other deepwater species (such as cardinal fish and alfonsino), and this could have contributed to overcatch of sub-area and feature limits.

77 Between 2001–02 and 2005–06, targeted catches of orange roughy ranged from 872 to 1183 tonnes. Over the same years, the bycatch of orange roughy taken when fishing for cardinal fish ranged between 11 and 122 tonnes per year, and the bycatch of orange roughy taken when fishing for alfonsino ranged from 1 to 102 tonnes per year. In general, the trend in ORH 1 has been a steady decrease in the volumes of orange roughy taken as bycatch; in 2005/06, less than 2% of the orange roughy catch was taken as a bycatch. Almost all bycatch orange roughy last year came from sub-area D as a bycatch in the target cardinal fish fishery.

78 However, as the TACCs for several deepwater stocks are under-caught, catch in these stocks could increase (and therefore ORH 1 bycatch). For example, the TACs for CDL 1, BYX 1, RIB 1, and RBY 1 have been greatly under-caught during the last five years.<sup>12</sup>

79 On balance, MFish advises that bycatch is not a significant consideration in setting a TAC for ORH 1.

80 If s13(2)(b) is considered the appropriate tool to set the TAC, then the Minister must also have regard to the biological characteristics of ORH 1 and any environmental conditions affecting ORH 1.

- a) **Biological characteristics:** orange roughy are late maturing and very long-lived and, which are biological characteristics that render them slow to recover from overfishing. Orange roughy form aggregations both to spawn and outside the spawning period over identifiable features, making them susceptible to overfishing and localised depletion.

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<sup>11</sup> The New Zealand Seafood Industry Council Ltd Submission to the Primary Production Select Committee on the Fisheries Act 1996 Amendment Bill. Submission dated 13 April 2007. Paragraph 72, p.18.

<sup>12</sup> Except BYX1 in 2004/05, in which catch equalled the TACC.

- b) **Environmental conditions:** MFish is not aware of any specific environmental conditions affecting the ORH1 stock. However, environmental factors may have influenced the distribution of orange roughy, contributing to the rapid decline in abundance in the Mercury-Colville Box in the late 1990s.

*Purpose of the Act: section 8*

- 81 The management options presented provide for different levels of utilisation through the setting of catch limits and allowances. The sustainability risk may or may not be greater under Option 1, but Options 2 and 3 are a more cautious approach in that a lower catch, in the absence of information, provides some degree of increased certainty that the harvest is sustainable over the long term.
- 82 The Minister must weigh up providing for the utilisation of orange roughy with ensuring the sustainability of orange roughy – however, ensuring sustainability is the bottom line and the ultimate objective. In this particular case, the decision is confounded by unquantified sustainability risks and benefits of TAC levels, and utilisation risks being more easily quantified. The Minister must be satisfied that his decision will ensure sustainability. This does not require the selection of Option 2 or 3; given the uncertainty of information, the Minister must exercise his judgement, and may determine that Option 1 satisfies his obligation with respect to sustainability. With respect to ORH 1, given the uncertainty of the information and the biological characteristics of the species, MFish considers that all options are reasonable and consistent with the Purpose.
- 83 The Minister is entitled to determine that the protection of orange roughy from over-exploitation warrants more weight being given to the sustainability element over the utilisation element of the Purpose. He is also entitled to determine that the combined effect of his tolerance for sustainability risk with the socio-economic factors mean that a TAC reduction does not best meet the purpose of the Act.

*International obligations and the Treaty of Waitangi (section 5)*

- 84 Decision-makers are required to act in a manner consistent with New Zealand's international obligations relating to fishing, including the Law of the Sea and the Fish Stocks agreement as well as regional fishery management agreements. Decision-makers must also act in a manner consistent with the provisions of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992. MFish considers that the proposed 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.

*Environmental principles (section 9) and Effects on the aquatic environment: section 11(1)(a)*

- 85 The Minister must take into account any effects of fishing on any stock and the aquatic environment. The Minister must also take into account the following principles:
- a) Associated or dependent species should be maintained above a level that ensures their long-term viability;
  - b) Biological diversity of the aquatic environment should be maintained;
  - c) Habitat of particular significance for fisheries management should be protected.

- 86 The specific nature and extent of effects of ORH 1 fishing on any stock and the environment generally are not known. While some bycatch of non-harvested species is known, information is inadequate to determine the impact that fishing for ORH 1 might be having. Bycatch of corals has been raised as an issue in orange roughy fisheries in New Zealand and this is addressed in the area closures within ORH 1 discussed below. No specific concerns have been raised at this time on issues which would affect setting the TAC for ORH 1.
- 87 No habitat of particular significance for fisheries management that should be protected are known currently.

### *Marine mammals*

- 88 The available observer information indicates that incidental captures of marine mammals do not occur in the ORH 1 target fishery. Therefore, the proposed options are likely to have no adverse implications for marine mammals.

### *Seabirds*

- 89 Although trawl fisheries for orange roughy are known to interact with seabirds, the available observer information indicates that incidental captures of seabirds are infrequent in the ORH 1 target fishery (three birds captured over ten years ago, both landed on deck and released unharmed). Therefore, the proposed options are likely to have no adverse implications for seabirds.

### *Fish bycatch*

- 90 Orange roughy is one of several deepwater species that share similar ecological habitats in the area of ORH 1. In the past, there has been significant ORH 1 bycatch in alfonsino (BYX) target tows (100 tonnes in 2001/02); in the four most recent years, this catch has dropped to an average of 4 tonnes per year. There has also been substantial ORH 1 bycatch in the black cardinal fish CDL fishery (average of 82 tonnes over the past 5 years), in particular in sub-area D. For ORH 1 target tows, CDL, rattails (RAT), and sharks and dogfish not otherwise specified (OSD) are the most common bycatch.<sup>13</sup> Given the low level of bycatch of other species in ORH 1 target tows, and the low level of ORH 1 bycatch in tows not targeting either ORH 1 or cardinal fish, the proposed options are likely to have no adverse impacts on fish bycatch.

### *Benthic impacts and coral bycatch*

- 91 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.<sup>14,15</sup> Researchers have reported anecdotal evidence of bycatch of coral species in developing orange roughy fisheries in New Zealand.

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<sup>13</sup> CDL, RAT and OSD each appear as having been landed in volumes greater than 7 tonnes in any one year from all tows targeting ORH 1. A variety of other species have been reported in volumes less than 7 tonnes.

<sup>14</sup> Anderson, O.F. and Clark, M.R. 2003 Analysis of bycatch in the fishery for orange roughy, *Hoplostethus atlanticus*, on the South Tasman Rise. *Marine and Freshwater Research*, 2003, 54: 643-652.

<sup>15</sup> Clark, M.R. and O'Driscoll, R. 2003 Deepwater fisheries and aspects of their impact on seamount habitat in New

- 92 Nineteen seamounts of varying size and depth within New Zealand waters have been closed to trawling, and six of these are within ORH 1. In addition, the Norfolk Deep BPA is within ORH 1. None of the six seamounts closed were fished at the time of closure, and there has been virtually no fishing in the BPA. MFish therefore considers that more than 51,600 km<sup>2</sup> in six different areas of ORH 1 is or will soon be closed to bottom trawling, and has never been trawled. These closures should therefore protect faunas in a variety of habitats from the effects of fishing. In ORH 1, MFish considers that the combined effect of the seamount closures and BPAs avoids, remedies, or mitigates the impacts of fishing on seamounts generally. Research in this area is ongoing, and various policy initiatives such as the Marine Protected Area Policy and the Benthic Impact Strategy, will continue to review benthic impacts.

### *Information principles: section 10*

- 93 MFish considers that the information used to support these proposals (catch data, the opinion of the stock assessment working group for deepwater fisheries and MFish scientists, the known biological characteristics of orange roughy, and socio-economic information provided by stakeholders) is the best available information for ORH 1 stock (s 10(a)). MFish is not aware of any other information related to the status of the stock that could be made available without unreasonable cost, effort, or time.
- 94 The IPP advises on how uncertainty might be considered, and how caution might be exercised (s 10(b) and (c)). In progressing the advice process, no postponement is being made as a result of absent or uncertain information (s 10(d)).

### *Social, cultural and economic factors*

- 95 Retaining the current TAC would enable greater utilisation benefits, at least in the short term. It also provides a greater number of CPUE data points, which is cost-effective data gathering. Reducing the TAC under Option 2 would constrain utilisation, and Option 2a in particular would considerably reduce revenues from the fishery. Option 3 imposes the greatest constraint on utilisation.

### *Economic factors*

- 96 The ORH 1 catch is New Zealand's second largest after ORH 3B, taking about 8% of the total orange roughy landings. ORH 1 fishing is conducted throughout the year, although large catches are taken in the June - July spawning season, and October in sub-area B. Three companies hold 90% of ORH 1 quota; the remainder is settlement quota held by 38 different Maori interests.
- 97 Since 2001/02, between 4 and 7 vessels (from 3 to 7 companies) have recorded ORH 1 catch in excess of 5 tonnes each year. 12 vessels have recorded catch in excess of 5 tonnes at least once over the five-year period. The vessels in the fleet range between 25 and 44 metres, with an average length of approximately 33 metres. The ORH 1 fleet is composed primarily of domestic fresher vessels (no freezing capacity) with only minor participation by foreign charter vessels.

- 98 The ORH 1 fishery is a significant contributor to the \$84.1 million export value (2006) of orange roughy. Of the various export states, 87% by value (or 64% by weight) of orange roughy is either chilled or frozen fillets. It is not possible to determine the percentage of ORH 1 that is exported as fillets (as opposed to a less-processed state), but if it is significant, then there would be substantial shore-based value-added for the ORH 1 catch.
- 99 The catch limit reduction proposed under Option 2 will have a direct economic effect on industry participants. Applying the port price (\$2.99/kg for 2007/08) and average export price (\$11.58/kg in 2006), the TACC reduction under Option 2 (to 1,150 tonnes) provides an expected gross landed value of \$3.44 million and export value of \$13.7 million. This represents a reduction of 18% compared to Option 1 (this presumes the full TACC were caught, and the TACC has been 70 to 92% caught over the past five years).
- 100 If the average of actual catches by sub-area over five years is used, then Option 2b imposes no landed value or export value reductions (as the option reduces the TACC only by eliminating the headroom – or the unused portion of the catch limit – in sub-area C).
- 101 The catch limit reduction proposed under Option 3 will greater direct economic effect on industry participants than would Option 2. Applying the port price, the TACC under Option 3 (700 tonnes) provides an expected gross landed value of \$2.09 million. Again, this presumes the full TACC were caught.
- 102 Information to inform an understanding of the economic consequences of the catch limit reductions last year was produced in response to the IPP of June 2006, and during court proceedings following the Minister’s decision in September 2006. This provides some guidance to the Minister on the possible economic consequences of the options. Last year’s proposed TACC was 800 t, and is therefore moderately less severe than Option 3; Option 2, with a TACC of 1,150 t is in between the current limit and that proposed last year. The following comments were received with regard to an 800 t TACC; such information may need to be updated to reflect any change in the current circumstances of submitters. Since they relate to an 800 t TACC, pending any update, these likely represent the outer boundary of possible economic impacts of the current set of options.

a)

[REDACTED]

MFish notes that the calculated loss of revenue estimated at [REDACTED] was based on a sale price of USD \$4.80/lb, and an exchange rate of \$0.62. MFish estimates that the price for orange roughy fillets has softened, and the exchange rate has increased to about \$0.70. Whether or not this is of any consequence (i.e. affects the economic loss calculation) depends on the nature of the sales arrangements made with US buyers.

[REDACTED]

[REDACTED]

[REDACTED]

103

[REDACTED]

The costs of outside-EEZ fishing is high (due to fuel costs for transit), making it economically less attractive than fishing closer to port. If Option 2 or 3 is selected, it is not apparent that fishing vessels could fish economically outside the EEZ. In addition, the Minister of Fisheries has also recently announced that effective 30 September 2006:

- a) Bottom trawling in the high seas of the South Pacific must not exceed current levels and must not expand into any new areas of the high seas
- b) Current bottom trawling activities may continue only if they can satisfy an independently peer-reviewed process that they will not cause significant adverse effects to vulnerable marine ecosystems such as seamounts, hydrothermal vents, cold water corals and sponge fields.

The effect of this announcement is uncertain, but it at least raises the possibility that high seas bottom trawling options for displaced ORH 1 companies may be reduced.

104

Sanford Limited and Te Ohu Kai Moana, as the other major quota holders, provided submissions opposing the TAC and TACC reduction last year, but did not provide an assessment of its potential economic consequences. Since last year, some quota held by

[REDACTED]

TOKM has been distributed to individual iwi; TOKM remains the owner of 4.2% of ORH 1 quota.

- 105 MFish invites submitters to provide supplementary information to elaborate, update or clarify the existing information on economic factors. From what information is available, MFish notes that although the possible TACC reductions are less than that proposed last year, and therefore the consequences are commensurately lower, a 20% or 38% reduction (Option 2 and 3, respectively) is considerable and could impose significant economic hardship on the majority quota owner. While Sanford is well diversified across other stocks, the reduction will still affect the viability of part of their operation, including the annual catch plan of one of their vessels.
- 106 In general, many of the costs in deepwater fisheries are more or less fixed – vessels, shore-based facilities, overhead, etc. – that are not easily or quickly scaled back to respond to catch decreases. While a TACC drop does mean that some variable costs – such as fuel, some labour, etc. – will be eliminated, the general effect is that the decrease in revenue (from fewer fish) usually well exceeds the decrease in costs. Irrespective of the overall amounts, this means reduced profitability.

#### *Social factors*

- 107 Catch reductions can have social implications when employment opportunities for catching and processing staff are reduced. The information MFish has on the impact on employment that might arise from options 2 and 3 is discussed under Economic Factors.
- 108 There is no known recreational or customary fishing for orange roughy, and no allowance has been provided to non-commercial extractive users. There is a broad social benefit to New Zealand from the supply of orange roughy to the domestic market, and there is a general public benefit from the maintenance of orange roughy populations. Both of these issues are adequately addressed by maintaining a sustainable fishery.

#### *Cultural factors*

- 109 There are no cultural factors relevant to sustainability or management decisions.

#### ***Existing controls that apply to the stock: section 11(1)(b)***

- 110 For ORH 1, 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 1. The effect of the seamount closures and the BPA is discussed at paragraph 92.

#### ***Natural variability of the stock: section 11(1)(c)***

- 111 Best available information is that orange roughy are not highly variable, and therefore the natural variability of orange roughy is not a concern in setting the ORH 1 TAC.

#### ***Resource Management Act 1991: section 11(2)(a)***

- 112 MFish is not aware of any relevant policy statements or (proposed) regional plans, under the Resource Management Act 1991 relevant to ORH 1.

***Conservation Act 1987: section 11(2)(b)***

113 MFish is not aware of any relevant management strategies or plans under the Conservation Act 1987 for ORH 1.

***Hauraki Marine Park Act 2000: 11(2)(c)***

114 Although the ORH 1 quota management area encompasses the waters of the Hauraki Gulf Marine Park, the distribution of orange roughy and the fishery for it do not intersect with the Park boundaries. Therefore MFish considers there are no relevant concerns regarding sections 7 and 8 of the Hauraki Gulf Marine Park Act 2000 in considering the ORH 1 TAC.

***Conservation services, fisheries services and fisheries plans: 11(2A)***

115 MFish does not consider that existing or proposed conservation or fisheries services materially affect the proposed TAC options. There is no approved fisheries plan for ORH 1.

# APPENDIX 1 – 2007 ORH 1 PLENARY REPORT

## ORANGE ROUGHY NORTHERN NORTH ISLAND (ORH 1)

### 1. FISHERY SUMMARY

#### (a) Commercial fisheries

This region extends northwards from west of Wellington around to Cape Runaway. Prior to 1993–94 there was no established fishery, and reported landings were generally small (Table 1). A new fishery developed in winter 1994, when aggregations were fished on two hill complexes in the western Bay of Plenty. In 1996 catches were also taken off the west coast of Northland.

A TACC of 190 t was set from 1989–90. Prior to that there had been a 10 t TAC and various levels of exploratory quota. From 1995–96, ORH 1 became subject to a five year adaptive management programme, and the TACC was increased to 1190 t. A catch limit of 1000 t was applied to an area in the western Bay of Plenty (Mercury-Colville ‘box’), with the former 190 t TACC applicable to the remainder of ORH 1. In 1994 and 1995, research fishing was also carried out under Special Permit (not included in the TACC). For the period June 1996–June 1997, a Special Permit was approved for exploratory fishing. This allowed an additional 800 t (not included in the TACC) to be taken in designated areas, although catches were limited from individual features (hills and seamounts etc).

**Table 1: Reported landings (t) and TACs (t) from 1982–83 to 2005–06. – no TAC. The reported landings do not include catches taken under an exploratory special permit of 699 t in 1998–99 and 704 t in 1999–00.**

Fishing year	West coast	North–east coast	Reported landings	
			Total	TAC
1982–83*	< 0.1	0	< 0.1	–
1983–84*	0.1	0	0.1	–
1984–85*	< 0.1	96	96	–
1985–86*	<1	2	2	–
1986–87*	0	< 0.1	< 0.1	10
1987–88†	0	0	0	10
1988–89†	0	19	19	10
1989–90†	37	49	86	190
1990–91†	0	200	200	190
1991–92†	+	+	112	190
1992–93†	+	+	49	190
1993–94†	0	189	189	190
1994–95†	0	244	244	190
1995–96†	55	910	965	1190
1996–97†	+	+	1021	1190
1997–98†	+	+	511	1190
1998–99†	+	+	845	1190
1999–00†	+	+	771	1190
2000–01†	+	+	858	800
2001–02†	+	+	1294	1400
2002–03†	+	+	1123	1400
2003–04†	+	+	986	1400
2004–05†	+	+	1 151	1400
2005–06†	+	+	1 207	1400

\* FSU data.

† QMS data.

+ Unknown distribution of catch.

Reported catches have varied considerably between years, and the location of the catch in the late 1980s/early 1990s is uncertain, as some may have been taken from outside the EEZ, as well as misreported from other areas. Research fishing carried out under Special Permit in 1994 and 1995 resulted in catches of 45.2 t and 200.7 t, respectively (not included in Table 1).

Based on an evaluation of the results of an Adaptive Management Programme (AMP) for the Mercury-Colville box initiated in 1995, the AMP was concluded and the TACC was reduced to 800 t for the 2000–01 fishing year. Catch limits of 200 t were established in each of four areas in ORH 1, with an individual seamount feature limit of 100 t. From 1 October 2001, ORH 1 was reintroduced into the AMP with different design parameters for five years, and the TACC was increased from 800 to 1400 t.

In recent years the fishery has also developed off the west coast and sizeable catches have been taken off the Tauroa Knoll and West Norfolk Ridge. The current management of the fishery is described in section 4 (Analysis of adaptive management programme) with a 2007 review of the performance of the AMP.

### **2005-06 Fishery (Anderson 2007)**

The pattern of catch and effort in 2005–06 was different to 2004–05 in several areas. While most fishing again took place within the main recognised fishing regions, the distribution of catches amongst and within these regions was quite different. Effort and catches in the Northland fishery were greater than in 2004–05 with several large catches in the southwest of this area. The several good catches reported from North Colville in 2004–05 were not repeated in 2005–06, with almost no effort or catch in this fishery. Catch sizes were also much smaller in Manukau in 2005–06, although they were from approximately the same positions. Elsewhere, in the West Norfolk Ridge and Bay of Plenty fisheries, the pattern of fishing between the two years was much the same. The focus of catch and effort in the West Norfolk Ridge continues to be in the northwest, close to the limits of the EEZ.

Following the exploratory development of the fishing grounds through the mid–late 1990s, large annual catches have been reported regularly from Tauroa Knoll, the West Norfolk Ridge, and the north Colville Ridge. Catches on Tauroa Knoll increased from a relatively low level in 2004–05 to be similar in 2005–06 to the level of the three years prior to 2004–05. Catches and catch rates in the West Norfolk Ridge fishery peaked at about 350 t in 2001–02, and since then have remained steady at a level of 150–250 t. The catch in 2005–06 in this fishery was similar to recent years, but with relatively low effort and a high overall catch rate. Despite double the effort of any previous year, catches were down in the Manukau fishery, and the catch rate fell below 1 t per tow for the first time. Newly developed grounds in the Northland fishery provided a boost to the catches and catch rate in this fishery, the catch of 332 t being more than three times that of any previous year, and the catch rate almost double the previous high of 1.5 t/tow recorded in 1997–98. Effort was relatively low in the North Colville, Mercury-Colville, and Aldermen fisheries, with only 30 orange roughy target tows in total for these areas. Catches in the White Is. fishery have fluctuated over time and the 74 t caught in 2005–06 is slightly below the median level of the nine years of this fishery, although the 3.7 t/tow catch rate is the highest recorded.

The catch limit for the Mercury-Colville Box was reduced to 30 t in 2000–01, and although catches and effort increased in 2001–02, well beyond this catch limit, catches have been closer to this limit since 2002–03. Only in 2003–04 was this 30 t limit not exceeded. Within the Mercury-Colville Box, on Colville Knoll, only about 9 t were caught from 25 tows in 2005–06 (the 13 ORH target tows caught only 50 kg, the remainder being caught as bycatch from cardinalfish fishing). Catch rates were better on Mercury Knoll, where 29 t were caught from 18 tows.

### **(b) Recreational fisheries**

There is no known non-commercial fishery for orange roughy in this area.

(c) **Maori customary fisheries**

No Maori customary fishing for orange roughy is known in this area.

(d) **Illegal catch**

No quantitative information is available on the level of illegal catch in this area.

(e) **Other sources of mortality**

There may be some overrun of reported catch because of fish loss with trawl gear damage and ripped nets. In other orange roughy fisheries, a level of 5% has been estimated.

## 2. STOCKS AND AREAS

Orange roughy are distributed throughout the area. Spawning is known from hills in the western Bay of Plenty. Stock status/affinities within the QMA are unknown. The Mercury-Colville grounds in the Bay of Plenty are about 120 n.miles from fishing grounds at East Cape (ORH 2A North), and spawning occurs at a similar time. Hence, it is likely that these are separate stocks. The Mercury and Colville Knolls in the Bay of Plenty are about 25 miles apart and may form a single stock. Stock affinities with other fishing hills in the southern and central Bay of Plenty are unknown. The Tauroa Knoll and outer Colville Ridge seamounts are distant from other commercial grounds, and these fish may also represent separate stocks.

## 3. STOCK ASSESSMENT

An assessment for the Mercury-Colville box was carried out in 2001 and is repeated here. A deterministic stock reduction technique (*after* Francis 1990) was used to estimate virgin biomass ( $B_0$ ) and current biomass ( $B_{curr}$ ) for the Mercury-Colville orange roughy stock. The model was fitted to the biomass indices using maximum likelihood and assuming normal errors. In common with other orange roughy assessments, the maximum exploitation rate was set at 0.67. The model treats sexes separately, and assumes a Beverton-Holt stock-recruit relationship. Confidence intervals of the biomass estimates were derived from bootstrap analysis (Cordue & Francis 1994).

(a) **Estimates of fishery parameters and abundance**

A series of trawl surveys of the Mercury-Colville box to estimate relative abundance were agreed under an Adaptive Management Programme. The first survey was carried out in June 1995 with a second survey in winter 1998 (Table 2). The biomass index of the latter survey was much lower than 1995, and it was uncertain whether the 1998 results were directly comparable to the 1995 results because of warmer water temperatures. They were not incorporated in the decision rule for the adaptive management programme. A third survey was carried out in June 2000, with the results suggesting that the abundance of orange roughy in the box had decreased considerably and was at low levels. However, these estimates are uncertain because of the suggestion that environmental factors may have influenced the distribution of orange roughy. The abundance indices from trawl survey and commercial catch-effort data used in the assessment are given in Table 2. The trawl survey indices had *c.v.*'s of 0.27, 0.39 and 0.29 for 1995, 1998, and 2000 respectively.

**Table 2: Biomass indices and reported catch used in estimation of  $B_0$ . Values in square brackets are included for completeness; they are not used in the assessment.**

Year	1993-4	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00
Trawl survey	-	76 200	-	-	[2 500]	-	3 800
CPUE	8.3	9.1	5.4	4.2	[0.5]	1.5	(2.0)
Catch (t)	230	440	915	895	295	140	250

The CPUE series is mean catch per tow (sum of catches divided by number of tows, target ORH) from Mercury Knoll in the month of June. This is the only month when adequate data exist from the fishery to compare over time. A *c.v.* of 0.30 was assigned to the CPUE data.

Catch history information is derived from TCEPR records, scaled to the reported total catch for ORH 1. Figures differ slightly from unscaled data summarised by Clark (1999), but this would make little difference to the assessment. Overrun of reported catch (e.g., burst bags, inappropriate conversion factors) was assumed to be zero, as even if there was some, it is likely that it was similar between years. The catch in 1999–00 was assumed to be 250 t.

Assessments were carried out for three alternative sets of biomass indices (Table 3).

**Table 3: Three alternative sets of biomass indices used in the stock assessment.**

Alternative	Trawl survey indices	CPUE indices
1	1995, 2000	All except 1998
2	1995, 2000	None
3	1995, 2000	All except 1998 and 2000

Biological parameters used are those for the Chatham Rise stock, except for specific Bay of Plenty values for the maturity and recruitment ogives (Annala et al., 2000).

### (b) Biomass estimates

The estimated virgin biomass ( $B_0$ ) is very similar for all three alternative assessments (Table 4). With alternative 1 the estimated  $B_0$  is 3200 t, with a current biomass of 15%  $B_0$ . For both alternatives 2 and 3, the estimated  $B_0$  is 3000 t, which is  $B_{min}$ , the minimum stock size which enables the catch history to be taken given a maximum exploitation rate of 0.67.

**Table 4: Biomass estimates (with 95% confidence intervals in parentheses) for stock assessments with the three alternatives of Table 3.  $B_0$  is virgin biomass;  $B_{MSY}$  is interpreted as  $B_{MAY}$ , which is 30% $B_0$ ;  $B_{current}$  is mid-season 1999–00; and  $B_{beg}$  is the biomass at the beginning of the 2000–01 fishing year. Estimates are rounded to the nearest 100 t (for  $B_0$ ), 10 t (for other biomasses), or 1%.**

Biomass	Alternative 1		Alternative 2		Alternative 3	
$B_0$ (t)	3200	(3000, 3600)	3000	(3000, 3500)	3000	(3000, 3300)
$B_{MSY}$ (t)	960	(900, 1080)	900	(900, 1050)	900	(900, 990)
$B_{current}$ (t)	490	(290, 890)	290	(290, 790)	290	(290, 590)
$B_{current}$ (% $B_0$ )	15	(10, 25)	10	(10, 23)	10	(10, 18)
$B_{beg}$ (t)	480	(270, 900)	270	(270, 800)	270	(270, 590)

The model fits the CPUE data reasonably well but estimates a smaller decline than is implied by the two trawl survey indices.

### (c) Estimates of Yield

Yield estimates were determined using the simulation method described by Francis (1992) and the relative estimates of  $MCY$ ,  $E_{CAY}$  and  $MAY$ , as given by Annala et al. (2000).

Yield estimates are all much lower than recent catches (Table 5). Estimates of current yields ( $MCY_{current}$  and  $CAY$ ) lie between 16 t and 35 t; long-term yields ( $MCY_{long-term}$  and  $MAY$ ) lie between 44 t and 67 t.

**Table 5: Yield estimates (t) for stock assessments with the three alternatives of Table 3.**

<b>Yield</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>
MCY <sub>current</sub>	35 (22,53)	22 (22,51)	22 (22,44)
MCY <sub>long-term</sub>	47 (44,53)	44 (44,51)	44 (44,49)
CAY	29 (16,54)	16 (16,48)	16 (16,36)
MAY	67 (58,70)	58 (58,68)	58 (58,64)

CSP for this stock is just under 100 t for any  $B_0$  between 3000 t and 3600 t.

#### 4. ANALYSIS OF ADAPTIVE MANAGEMENT PROGRAMME

The ORH 1 TACC was increased from 800 to 1400 t in October 2001/02 under the Adaptive Management Programme. The objectives of this AMP were to determine stock size, geographical extent, and long-term sustainable yield of the ORH 1 stock. This is a complex AMP, with ORH 1 divided into four sub-areas (see Figure 1), each with total catch and “feature” catch limits (a “feature” was defined as being within a 10 nm radius of the shallowest point).

<b>ORH 1 Subarea</b>	<b>Proposed Catch Limit</b>	<b>Feature Limit (t/fishing year)</b>
	200 t	100 t
Area B	500 t	150 t
Area C	500 t	150 t
Area D	200 t	75 t

Feature limits also serve as limits to the total catch in any area due to the limited number of available productive features. The Mercury-Colville “Box” (located within Area D) has been given a specific limit of 30 t per year to allow for the bycatch of orange roughy when fishing for black cardinalfish. The catch of orange roughy in the Mercury-Colville “Box” is included in the overall limit for Area D.

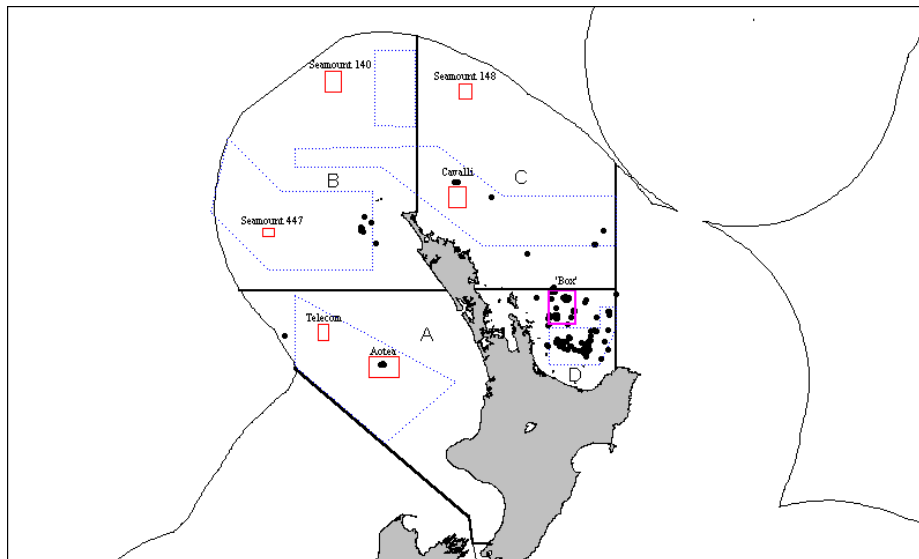


Figure 1. Four sub-management areas for the ORH 1 AMP (labelled A-D). Dotted lines enclose the exploratory fishing areas defined in the special permit issued on 6 July 1998. Solid lines enclose seamount closures and the Mercury-Colville Ohena ‘box’ (labelled at their top). Trawls (dots) where orange roughy were reported as the target species and caught during 1997–98 and 1998–99 are shown. Note that the lines separating Areas A and D from Areas B and C are incorrectly drawn at 36° S latitude rather than 35°30’ S latitude.

## Review of ORH 1 AMP in 2007

In 2007 the AMP FAWG reviewed the performance of the AMP after the full 5-year term.

### *Fishery Characterisation*

- In most years, the total catch has been less than the TACC.
- The area splits into A, B, C and D only occurred in 2001.
- Main fishery is in area B; the fishery in area A only began in 2002.
- Two main goals of the AMP:
  - Reduce fishing in area D, in particular the Mercury-Colville “box”.
  - Look for new fishing areas, distributing effort across the QMA, with feature limits to reduce the possibility of localised overfishing

**Table 6: Estimated target catches by sub-area , reported landings and TACC for ORH 1.**

	Sub-area target catch (t)				Total target catch(t)	Reported landings (t)	TACC (t)
	A	B	C	D			
1997–98	0.5	6	0	491	497	511	1190
1998–99	5	575	165	725	1470	1543	1190
1999–00	1	645	165	598	1408	1476	1190
2000–01	9	166	99	165	439	858	800
2001–02	123	441	266	227	1056	1294	1400
2002–03	197	508	238	72	1015	1123	1400
2003–04	223	422	117	110	872	986	1400
2004–05	277	390	173	174	1014	1151	1400

### *CPUE Analysis*

- Unstandardised CPUE is in kg/tow. The short time series, the nature of the fishery (fishing aggregations spread over a wide area in different seasons) and the impact of catch limits on features and sub-areas prevent any useful relative abundance indices from being developed at this point for ORH 1.
- Where features are less than 10 nm apart, catch is apportioned according to the distance to the feature. Industry in-season reporting is based on the feature closest to the start of the tow.
- Possible problems with the area A observations in 2005-06, as there seem to be more reported tows than expected given the number of vessels operating in the area.

### *Observer Programme*

- 50% observer coverage prior to 1 October 2006 (a high level relative to that for other deepwater stocks, with a large number of samples taken relative to the size of the fishery). From 1 October 2006, 100% coverage was requested by the Minister, but this has not been fully achieved, as some ORH 1 is taken as bycatch on trips that do not predominantly target ORH.
- The size frequency data show high levels of stock variability between fisheries on features or feature groups. Size variation does not seem to be linked to exploitation rate.

### *Environmental Effects*

- Observer data from 2000 to 2003 indicated that incidental captures of seabirds did not occur in the ORH 1 target fishery (Baird 2005). Marine mammal interactions are also not a problem.
- Only 3 non-fish bycatch records have been reported from observed trips (in 1994 and 1995). All were shearwaters that landed on deck and were released alive. It was verified that observers were briefed in the same way as for other MFish trips including recording non-fish bycatch i.e. seabirds and marine mammals. Note that this does not include benthic organisms.

- The overall impact of bottom trawling on seamounts in ORH1 is not known. A number of seamounts have been closed to fishing and the Norfolk Deep BPA is included in the industry accord relating to benthic protection areas within New Zealand's EEZ.

*Sub-area D Directed Adaptive Exploratory Fishing Programme*

- The purpose of this exercise was to establish whether fish populations shift between features in different years in sub-area D.
- Based on the results from the exploratory fishing from 2002 to 2005 it is evident that catches from all features contained a high proportion of ripe or ripe running females and that synchronised spawning occurs on a range of hills during winter.
- In 2006 the AMP Working Group recommended some changes to the design of the exploratory survey; however, this was not achieved during the 2006 survey.

The abbreviated checklist questions for full- and mid-term reviews are:

*1. Is stock abundance adequately monitored?*

The working group concluded that CPUE does not seem to be a proportional measure of abundance for this stock. However, CPUE is used in ORH 1 as a management tool. When CPUE drops on a feature, fishers are meant to move to another feature.

*2. Is logbook coverage sufficient?*

As there are MFish observers on these vessels, fishers are not required to complete detailed logbooks for the AMP. This is the highest level of monitoring of any ORH fishery in New Zealand.

*3. Are additional analyses of current data necessary?*

No. The Working Group concluded that no other information can currently be extracted from the existing data that will provide insight into the status of the ORH 1 stocks. However, a potential problem with the 2005-06 catch records from Area A still needs to be checked.

*4. Based on the biomass index, is current harvest sustainable?*

Unknown. The purpose of the AMP was to spread effort in an attempt to reduce fishing pressure on any one sub-area or feature (and Area D in particular). ORH 1 is a large area, with orange roughly aggregations spread across a number of areas and features. The amount of fishing in some areas appears to be low, but without any indication of current abundance, there is no way to determine if this level of fishing is in fact sustainable, or if current feature limits will avoid overexploitation of localised areas.

*5. Where is stock, based on weight of evidence, in relation to  $B_{MSY}$ ?*

Unknown. In 2001, when the AMP was initiated, the Working Group stated that the stock was likely above  $B_{MSY}$ ; while the information collected since that time has not improved the understanding about the status of the stock, the intent of the AMP design for ORH1 was to spread effort to reduce the likelihood of the biomass declining below  $B_{MSY}$ .

ORH 1 is unlikely to be a single biological stock, and probably includes a number of constituent stocks. The Working Group concluded that it is not possible to estimate  $B_{MSY}$  for any of the individual stocks, let alone aggregate up to an estimate for ORH 1 as a whole. Moreover, a better understanding is not possible in the near future.  $B_{MSY}$  is difficult to estimate in situations involving an unknown number of constituent stocks.

*6. Are the effects of fishing adequately monitored?*

Yes, there is good observer coverage. The Working Group noted that one consequence of deliberately spreading effort was to increase the possible benthic impact.

*7. Are rates of non-fish bycatch acceptable?*

Yes.

*8. Should the AMP be reviewed by the plenary?*

This AMP does not need to be reviewed by the Plenary.

## 5. STATUS OF THE STOCKS

From 1 October 2001, the TACC for ORH 1 was increased to 1400 t within the AMP, with sub-area and feature limits. In most years the total catch has been less than the TACC. However, it is not known if recent catch levels or current TACCs are sustainable in the long term. Except for the small area of the Mercury-Colville box no assessment of stock status is currently available.

An assessment of the Mercury-Colville box in 2001 indicated that biomass had been reduced to 10-15%  $B_0$  (compared to an assumed  $B_{MSY}$  of 30%  $B_0$ ). As the stock was considered to be well below  $B_{MSY}$ , a catch limit of 30 t was set for the box. The assessment indicated that a catch level of about 100 t would probably maintain the stock at the 2000 stock size (assuming deterministic recruitment) and catch levels from 16 to 35 t (consistent with CAY or MCY strategies) might allow the stock to rebuild slowly.

In other areas of ORH 1 the status of the constituent stocks is unknown. The amount of fishing in some areas appears to be low, but without any indication of current abundance, there is no way to determine if this level of fishing is in fact sustainable or if current feature limits will avoid overexploitation of localised areas.

## 6. FOR FURTHER INFORMATION

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## APPENDIX 2 – ORANGE ROUGHY CHARACTERISTICS

- 116 The unique characteristics of orange roughy give rise to fisheries management considerations that differ from many other species. Key biological features and issues for consideration by fisheries managers, especially with regard to managing new fisheries for orange roughy, were summarised by Annala et al. (2005):<sup>24</sup>
- Because of their low productivity, sustainable yields from orange roughy fisheries are estimated to be low, at an annual rate of 1 to 2 percent of the virgin biomass ( $B_0$ ), and 4 to 6 percent of the biomass that will produce the maximum sustainable yield ( $B_{MSY}$ );
  - The aggregating behaviour of orange roughy, particularly on undersea hill features and during spawning seasons, makes it easy to overestimate the unfished biomass;
  - The major scientific challenges have been to obtain reliable estimates of orange roughy life history parameters and stock size in order to estimate the yields appropriate to move the stocks from  $B_0$  to  $B_{MSY}$ ;
  - It is difficult to accurately specify a time stream of future catches and catch limits that will result in an orderly fishing-down phase to achieve target biomass. In New Zealand, these stock assessment difficulties have resulted in stocks falling below  $B_{MSY}$  in 7 of the 9 orange roughy fisheries for which quantitative stock assessments have been conducted, and the subsequent need to rebuild stocks back to  $B_{MSY}$ ;
  - Initial high catch rates lasted only a few years in most fisheries, to be followed by sharp declines, and the serial depletion of hill features has been observed;
  - The challenge is to use information on possible stock size and our knowledge about the low productivity of the species to devise an orderly fish-down strategy that satisfies both the desire for high initial catch levels and the need to ensure that the target biomass level is not exceeded.
- 117 Orange roughy are widely distributed within New Zealand's Exclusive Economic Zone and elsewhere, with a number of genetically distinct stocks. There are likely to be several distinct biological stocks within the area of ORH 1.

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<sup>24</sup> Annala, J., M. Clark, G. Clement, and J. Cornelius 2005. Management of New Zealand orange roughy fisheries – a deep learning curve. In FAO Fisheries Proceedings No. 3/1, Deep Sea 2003: Conference on the Governance and Management of Deep-sea Fisheries. (Ed. R. Shotton). FAO, Rome.

## APPENDIX 3: DEVELOPMENT AND MANAGEMENT OF THE ORH 1 FISHERY

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- 118 The development of the ORH 1 fishery lagged considerably behind that of other New Zealand orange roughy fisheries. ORH 1 was introduced into the quota management system (QMS) in 1986 under a TACC of 10 tonnes, when effort in this area was very low. The TACC was increased to 190 tonnes from 1989–90. Initial orange roughy catches in ORH 1 came from the Bay of Plenty in the mid-1980s. It was not until the mid 1990s that relatively large quantities of orange roughy were found to aggregate around the Mercury-Colville seamount features in the centre of the Bay of Plenty.
- 119 A trawl survey in the winter of 1995 estimated the biomass in the Mercury-Colville area at 78 000 tonnes. In response, a five-year AMP was initiated for ORH 1 as from the 1995–96 year. The AMP framework allows the TAC for low knowledge stocks to be set higher than would otherwise be the case, as long as, on the balance of probabilities, the TAC would move the stock towards the  $B_{MSY}$  level over the duration of the AMP.
- 120 The AMP framework relies on the collection of more information from the fishery than otherwise available, in order to assess and manage risks associated with the increased TAC. The TACC for ORH 1 was set at 1 190 tonnes under an AMP, with a catch limit of 1 000 tonnes applying to the Mercury-Colville ‘box’ area, and the previous TACC of 190 tonnes applying to the remainder of the ORH 1 QMA. In addition, research and exploratory fishing was undertaken under special permits between 1994 and 1997, which allowed up to 800 tonnes catch each fishing year in designated areas of ORH 1 and with feature limits applied.
- 121 The Mercury-Colville knoll fishery persisted near the 1 000 tonne level for two years, after which catches declined. Additional survey work was carried out in the area of the Mercury-Colville knoll in 1998 and 2000; the results indicated a much lower estimate of between 2 500 and 3 800 tonnes. The fishing pressure could not have been sufficient to result in this decline, and it was proposed that the decline could be a result of oceanographic conditions or movement of orange roughy between areas. Based on the available information, the AMP was concluded and the TACC was reduced to 800 tonnes for 2000–01. For that year, the Minister requested industry to implement a structured fishing plan with catch limits of 200 tonnes for each of four sub-areas within ORH 1, and individual feature limits of 100 tonnes to ensure the TAC was sustainable.
- 122 A second ORH 1 AMP was implemented on 1 October 2001, with the objective of determining stock size, geographical extent, and long term sustainable yield, of the various features and sub-areas of the ORH 1 quota management area (QMA). In order to facilitate the objectives of the AMP and encourage fishing over a wide area, the TACC for ORH 1 was increased from 800 to 1 400 tonnes for five years under the AMP framework (as described in the *Revised Framework for the Adaptive Management Program*<sup>25</sup>).
- 123 Criteria for approval of AMPs under the revised framework and stakeholder undertakings of particular relevance are that:

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<sup>25</sup> The *Revised Framework for the Adaptive Management Program* dated March 2004 is available on request from MFish.

- Increased TACs can be agreed where there is reasonable probability that current biomass exceeds the  $B_{MSY}$  level and that the TAC is likely to move the stock towards, or keep it at or above, that level over the five years of the AMP;
- The increased TAC is not for an indefinite period and efforts have to be made to improve the understanding of stock status and yield;
- There is scope to consider ongoing management of a stock at the conclusion of the AMP in the absence of an assessment of stock status and estimation of yield, but such ongoing management would require that stakeholders continue to collect the same level of information (under a longer-term plan) as under the AMP in order to justify retaining the increased TAC – however, this would require that there would be ongoing monitoring of changes in stock status and agreement that the TAC is sustainable;
- There is an ‘onus on industry to either fulfil their commitments or face a reversal of the TACC increase’; and
- Stakeholders accept the responsibility to work cooperatively to meet the AMP criteria, ‘otherwise the Minister of Fisheries will reduce the TACC to a level that he determines will ensure sustainability with no information’.

124 Controls and monitoring measures aimed at ensuring sustainability and encouraging exploration included voluntary catch limits by sub-area and undersea ‘feature’, as well as decision rules relating to progressive reductions of catch limits that would be triggered by reductions in CPUE. A critical element of the AMP was the use of CPUE to monitor relative abundance, both for increasing information on abundance (and distribution) generally, and for managing sustainability risks or risks of localised depletion.

125 Monitoring requirements of the AMP included a high level of scientific observer coverage to collect biological information on ORH as well as the weight and number of all species of fish and invertebrates caught. The AMP also undertakes to complete annual ‘directed exploratory fishing surveys’ in the Bay of Plenty to determine the extent of spawning grounds in the area.

126 In agreeing to the current AMP proposal, the Minister specifically requested that industry develop and implement a compliance and monitoring plan that would be in place before fishing began for the 2001-02 fishing year. The ORH 1 Exploratory Fishing Company subsequently produced the *‘Management and Monitoring Plan’*<sup>26</sup> that set out quota owners’ undertakings in the conduct of the AMP. The company also produced a Memorandum of Understanding (MoU) to bind industry participants to the ‘rules’ under the AMP.

127 Both the AMP WG and the Minister have raised concerns about the operation of the AMP on more than one occasion. Concerns focused on industry governance where agreed sub-area and feature catch limits have been exceeded, and the desired scientific observer coverage levels in 2001–02 and 2002–03 were not achieved. Those matters were of concern because exceeding the agreed sub-area and feature limits increased concerns over unknown sustainability risks, given the uncertainty of information underpinning those management measures. In addition, failing to achieve the desired level of scientific

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<sup>26</sup> The Management and Monitoring Plan and MoU were prepared by the ORH 1 Exploratory Fishing Company, and are available on request from MFish.

observer coverage could reduce the value of biological data collected about orange roughy and about any adverse effects of fishing under the AMP.

- 128 As a result of his concerns at the time, the Minister directed MFish to review the AMP at the end of the 2003–04 fishing year. The Minister noted that he would withdraw the AMP if additional measures were not undertaken by industry to address governance problems and affirm their commitment to adhere to sub-area and feature limits. The Minister required the development and acceptance by stakeholders of an industry MoU designed to address governance problems.
- 129 In March 2004, industry signed the MoU commitment. Since then some sub-area and feature limits have continued to be exceeded. Monthly reporting has generally been reliable, although some reports have been delayed.

## APPENDIX 4 – SUMMARY OF COSTS AND BENEFITS

### Option 1

<b>Costs</b>	<b>Benefits</b>
<ul style="list-style-type: none"> <li>• Greater risk that fishing exploitation leads to stock biomass below <math>B_{MSY}</math> in the future</li> </ul>	<ul style="list-style-type: none"> <li>• Ongoing utilisation at current level: landed value of approximately \$4.2 million, or approximately \$8 million export value, if TACC fully caught</li> </ul>
<ul style="list-style-type: none"> <li>• Possible depletion of individual features</li> </ul>	<ul style="list-style-type: none"> <li>• Continued management under an industry-driven structured fishing plan, although efficacy of this plan not fully tested</li> </ul>
<ul style="list-style-type: none"> <li>• In the case of over-exploitation, forgone future utilisation</li> </ul>	<ul style="list-style-type: none"> <li>• Continued collection of data</li> </ul>

### Option 2

<b>Costs</b>	<b>Benefits</b>
<ul style="list-style-type: none"> <li>• If TACC was fully caught, potential immediate landed value loss of approximately \$750,000, or approximately \$2.9 million export value. Using average catches, Option 2a results in landed value loss of approximately \$435,000, or approximately \$1.7 million export value.</li> </ul>	<ul style="list-style-type: none"> <li>• Lower overall exploitation rate across the stock, which means increased certainty over the long-term sustainability, and long-term sustainable utilisation, of ORH 1 compared to Option 1.</li> </ul>
<ul style="list-style-type: none"> <li>• Possibly the Antons Group will no longer be commercially viable.</li> </ul>	<ul style="list-style-type: none"> <li>• Possible reduced environmental impact should effort be reduced</li> </ul>
<ul style="list-style-type: none"> <li>• Unknown number of vessel and shore-based staff layoffs.</li> </ul>	<ul style="list-style-type: none"> <li>• Continued management under an industry-driven structured fishing plan, although efficacy of this plan not fully tested.</li> </ul>
<ul style="list-style-type: none"> <li>• Possible costs incurred to lay up or sell a vessel.</li> </ul>	<ul style="list-style-type: none"> <li>• Using average catches, Option 2b results in loss in landed value or export value.</li> </ul>
<ul style="list-style-type: none"> <li>• Unknown ability to manage an industry-led fishing plan at a reduced TACC.</li> </ul>	
<ul style="list-style-type: none"> <li>• Possibly less biological information collected.</li> </ul>	

### Option 3

<b>Costs</b>	<b>Benefits</b>
<ul style="list-style-type: none"> <li>• Immediate gross revenue loss greater than Option 2. If TACC was fully caught, potential immediate landed value loss of approximately \$1.6 million, or approximately \$6.1 million export value. Using average catches, Option 3 results in landed value loss of approximately \$840,000, or approximately \$3.3 million export value.</li> </ul>	<ul style="list-style-type: none"> <li>• Lowest overall exploitation rate across the stock, which means the greatest certainty of the three options of the long-term sustainability, and long-term sustainable utilisation, of ORH 1.</li> </ul>
<ul style="list-style-type: none"> <li>• Possibly the Antons Group will no longer be commercially viable.</li> </ul>	<ul style="list-style-type: none"> <li>• Possible reduced environmental impact should effort be reduced</li> </ul>
<ul style="list-style-type: none"> <li>• Unknown number of vessel and shore-based staff layoffs.</li> </ul>	
<ul style="list-style-type: none"> <li>• Possible costs incurred to lay up or sell a vessel.</li> </ul>	
<ul style="list-style-type: none"> <li>• Least certainty over the effectiveness of an industry-led fishing plan.</li> </ul>	
<ul style="list-style-type: none"> <li>• Possibly less biological information collected.</li> </ul>	

## APPENDIX 5 – RECOMMENDED MANAGEMENT MEASURES

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130 A summary of the recommended management measures are provided in the body of the IPP.

### *Sub-area and feature limits*

131 A catch limit should continue to exist for each sub-area (A, B, C and D), and each of the features. Feature limits per sub-area should be: A = 100 t, B = 150 t, C = 150 t, D = 75 t, Mercury Colville Box = 30 t.

### *Mercury-Colville Box*

132 The Mercury-Colville Box has had a 30 tonnes ORH 1 catch limit in place to allow the catch of orange roughy as bycatch to cardinal fish target fishing. However, in some years this limit has been greatly exceeded by combined target and bycatch take of orange roughy (including as part of the directed exploratory fishing programme).

133 An assessment for the Mercury-Colville 'box' in 2001 assessed the stock to be below  $B_{MSY}$ , and that a catch of around 100 tonnes would probably maintain the then-current stock size, while catches between 16 tonnes and 35 tonnes would be consistent with MCY or CAY strategies and could allow the stock to rebuild slowly. Exceeding the 30 t limit in the amounts recorded over the past few years is not likely to be reducing the stock size, although it may also be preventing rebuilding.

134 MFish's advice continues to be that a 30 t bycatch-only limit (no orange roughy targeting in this area) be maintained. MFish expects that industry make all reasonable attempts to ensure that the limit is not exceeded, whether as a result of targeted fishing for cardinal fish or any other species.

### *Monitoring and reporting*

135 The M&MP/MOU contained several monitoring and reporting elements, each of which is repeated:

- a) Fishers will notify the EFC of their intention to fish a sub-area or areas at least 12 hours prior to the each voyage. EFC will provide an update on the current catch level by sub-area and feature, prior to the vessel departing. A full list of such notifications should be furnished to MFish monthly, for auditing against TCEPR and VMS data.
- b) Vessels will report date, time, feature, position, target species, estimated catch and actual catch at the completion of every tow to EFC. At the conclusion of each voyage, vessels will confirm to EFC the actual catch taken by feature and sub-area. EFC will notify ORH 1 ACE holders at least monthly of catch by sub-area and feature, and will immediately notify all operators when sub-area or feature limits are close to being reached, or have been reached. EFC will notify MFish monthly of catch by sub-area and feature, for auditing against TCEPR and VMS data.

- c) Quota owners agree not to sell ORH 1 ACE to any non-shareholder who lands ORH1 who has not agreed to fish according to these terms.
- d) EFC will provide an Annual Report to MFish on the ORH 1 fishery.

#### *Directed Exploratory Fishing Programme*

- 136 The exploratory fishing programme was designed to determine if fish populations shift between features in different years in sub-area D. If this was indeed the case, spawning aggregations would be found on different features from one year to the next.
- 137 EFC undertook a directed exploratory fishing programme in the Bay of Plenty with a suitable vessel and a scientist on-board to manage the programme, between late June and early August (dates varied by year). Generally speaking, tows were conducted on several features in the Bay of Plenty, with biological sampling done and CPUE analysis conducted.
- 138 Evidence to date (from an analysis of four years) is that catch from all features contained spawning fish, and that synchronised spawning occurred on a range of hills during winter. The working group recommended changes to the 2006 programme design, and the survey was completed; however, data from 2006 have not yet been analysed.
- 139 MFish is not convinced of the value of the exploratory fishing programme. MFish wrote to EFC in June 2007 to advise that the winter 2007 programme was not required. MFish recommends that the working group reconsider this programme by March 2008, once the analysis of all data has been completed, to determine if useful information is likely to be generated. If the programme is useful, the working group can properly structure the fishing programme in time for the winter 2008 fishery.

#### *Observer coverage*

- 140 The MOU agreed to 50% observer coverage on all targeted tows. MFish sought to implement 100% observer coverage on all ORH 1 fishing trips for 2007/08. For the 2007/08 fishing year, MFish intends to recommend 100% observer coverage for June and July in sub-area A, C and D, and 100% observer coverage for October in sub-area B. Outside these months, and where ORH 1 is likely to be caught only in small quantities, the standard observer coverage of approximately 10 to 15% is intended to apply.
- 141 The proposed scientific observer coverage is aimed at improving voluntary compliance with sub-area and feature limits, providing verification of fishing activity, and providing opportunities to maximise the collection of biological data relevant to the management of the fishery. This will ensure the greatest reliability of the available monitoring tools for the fishery.
- 142 Decisions concerning the level of observer coverage are made by the Chief Executive under s 224 of the Act. As such, any level of intended observer coverage is not a condition of any TAC or TACC decision by the Minister. MFish will advise the Minister of the Chief Executive's intention to implement, subject to this consultation, a level of observer coverage described above for ORH 1.

*Biological sampling*

143 Sampling of catch will be carried out by MFish observers to the accepted sampling protocols.