Orange roughy
FISHERIES PLAN

February 2010

Introduction

This chapter of the National Deepwater Plan sets the operational objectives and performance criteria for the orange roughy and key bycatch fisheries. Specifically it addresses the management of the following quota management species:

- Orange roughy (target)
- Black cardinalfish (target)

It also addresses the management of any adverse environmental effects caused by fishing these species.

Oreo species (smooth oreo, black oreo, spiky oreo and warty oreo), which can be a significant bycatch of orange roughy, are not included in this chapter as they constitute significant target fisheries in their own right. A separate oreo chapter will be developed for these species.

This chapter consists of the following sections:

1. Summary of five year management actions
2. Overview of the orange roughy fisheries
3. Overview of non-target interactions
4. Operational objectives for the orange roughy fisheries
5. Measuring performance

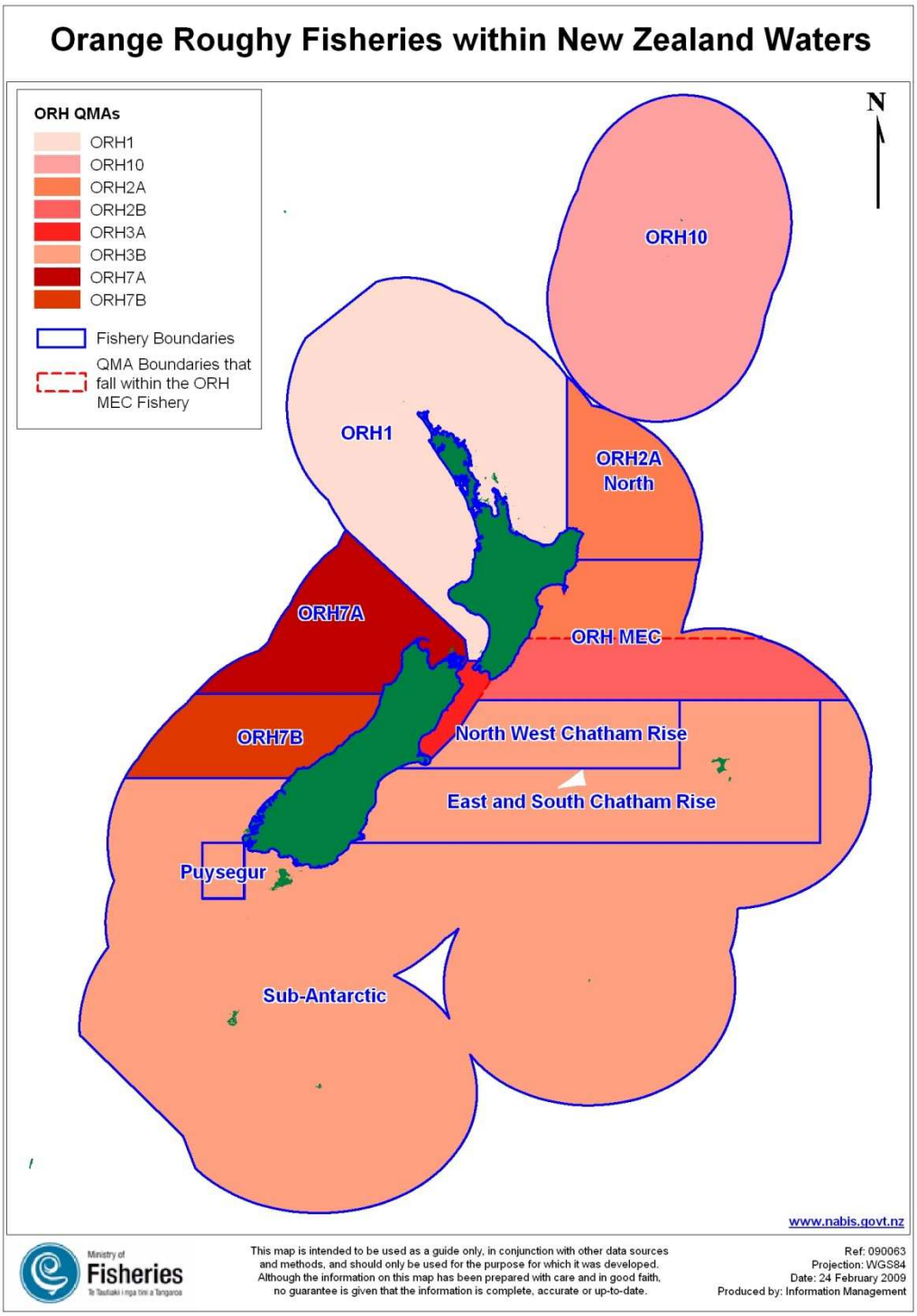
Summary Five year actions for the orange roughy fishery	Single/ Multiple year or Annual delivery	Start	Expected delivery date
Actions to contribute to the Use Outcome: Fisheries resources are used in a manner that provides greatest overall economic, social, and cultural benefit			
1. Develop and implement a programme to maximise economic yield from all orange roughy fisheries	Multiple	2010	2011
2. Develop and implement a cost/benefit evaluation process to assess proposed management interventions in the orange roughy fisheries	Multiple	2010	2011
3. Develop and implement a revised Memorandum of Understanding with the DeepWater Group Ltd (DWG)	Single		2010
4. Produce the Annual Operational Plan & Annual Review Report and publish both documents on the MFish website by July and December respectively each year	Annual	2011	2015
5. Only utilise research to inform the management of orange roughy fisheries that has met the requirements of the Research Standard	Annual	2011	2015
6. Annually assess the performance of orange roughy fisheries against the regulatory regime through a series of compliance benchmarks	Annual	2011	2015
7. Establish an Environmental Advisory Group, in collaboration with environmental stakeholders, to provide for ENGO engagement on the management of deepwater fisheries including orange roughy	Single		2010
8. Increase iwi participation in deepwater fisheries management, including orange roughy, through membership of the DWG (target of 70% of iwi represented by the DWG, either directly or indirectly, from 2013)	Multiple	2010	2014
Actions to contribute to the Environment Outcome: The capacity and integrity of the aquatic environment, habitats and species are sustained at levels that provide for current and future use			
9. Information on the performance of orange roughy fisheries against compliance benchmarks is reported in the Annual Review Report, including details of actions taken when breaches have occurred	Annual	2011	2015
10. Complete and implement harvest strategies across all orange roughy fish stocks	Single	2010	2014
11. Complete and implement a harvest strategy for all cardinalfish fish stocks	Single	2011	2014
12. Produce annual reports documenting the performance of the catch spreading arrangements across the orange roughy fisheries	Annual		2011
13. Annually review the deemed value rates for orange roughy and cardinalfish stocks and amend as necessary	Annual	2011	2015

14. Complete an Ecological Risk Assessment (ERA) for orange roughy and cardinalfish fisheries	Single		2011
15. Develop a policy position on what is meant by "habitats of particular significance for fisheries management purposes" with respect to orange roughy fisheries	Single		2012
16. Assess the extent of existing protection measures in ensuring habitats of particular significance for orange roughy fisheries management are adequately protected	Single		2013
17. Ensure the orange roughy fishery is managed so that it fully meets the requirements of the Seabird Standard and NPOA from 2011*	Multiple	2011	2012
18. Implement a monitoring regime to improve the quality of data on bycatch species (non-QMS) caught in orange roughy fisheries	Single		2011
19. Use the results from the ERA to implement a management programme (regulatory/non-regulatory) to manage any adverse effects of orange roughy fishing on shark species, in line with environmental standards	Annual	2013	2015
20. Use the results from the ERA to implement a management programme (regulatory/non-regulatory) to manage any adverse effects of orange roughy fishing on endangered threatened and protected (ETP) species, in line with environmental standards	Multiple	2012	2013
21. Complete a qualitative risk assessment for the non-QMS bycatch species caught in the orange roughy fishery	Single		2012
22. Produce a map of the extent of the orange roughy trawl grounds annually	Annual	2011	2015
23. Assess the extent of the orange roughy trawl grounds against the revised Benthic Optimised Marine Environment Classification	Single		2011
24. Ensure all orange roughy fisheries are managed so that they fully meet the requirements of the Benthic Impact Standard from 2013*	Multiple	2013	2015

* Dependent on an approved standard being in place by this date

1. Overview of the orange roughy fisheries

Figure 1. Map of the orange roughy fisheries within the New Zealand EEZ *(Note that the Northwest Chatham Rise, East and South Chatham Rise, Puysegur and the Sub-Antarctic fisheries combine to form the ORH 3B Quota Management Area (QMA); and the ORH MEC fishery is made up of the southern part of the ORH 2A QMA and the entire ORH 2B and ORH 3A QMAs.)*



Biology overview

Orange roughy *(Hoplostethus atlanticus)* is widespread in New Zealand waters, occurring in all areas of the upper continental slope at depths between 700 and 1,500m. It reaches a maximum size in New Zealand waters of about 50 cm (standard length) with an average size of around 35 cm.

Orange roughy are a very slow-growing and long-lived species, and are believed to reach an age of 120-130 years. In New Zealand orange roughy is estimated to reach sexual maturity between 23 and 31 years of age, and become vulnerable to fishing at 15-20 years of age.

Spawning occurs once every year, between June and early August in many separate locations within the New Zealand Exclusive Economic Zone (EEZ). The location and timing of spawning demonstrates there are multiple stocks around New Zealand. Spawning fish form dense aggregations at depths of 700-1,000m in areas often associated with bottom features such as hills and canyons. It is likely that individual orange roughy do not spawn every year and fecundity is relatively low.

Additional aggregations form outside the spawning period, presumably for feeding. The main prey includes mid-water and bottom species (prawns, fish and squid).

For more information on the biology of orange roughy see the current Ministry of Fisheries Plenary Report at www.fish.govt.nz

Fisheries management overview

Orange roughy stocks within the New Zealand EEZ are managed under the Quota Management System (QMS). The statutory management target is to maintain stocks at or above the biomass that will support the Maximum Sustainable Yield (B_{MSY}).

Orange roughy are the focus of an important deepwater fishery in New Zealand, and have been fished for over 30 years. The first orange roughy fishery developed on the Chatham Rise in 1979, followed by new grounds being located on the Challenger Plateau, off the east coast (Wairarapa, Kaikoura, Ritchie Banks), and Cook Canyon in the mid 1980s, and Puysegur Bank, East Cape, and Bay of Plenty in the early 1990s.

There are now nine distinct orange roughy fisheries within the New Zealand EEZ (Figure 1). The boundaries of the ORH 1, ORH 7A and ORH 7B fisheries align with Quota Management Area (QMA) boundaries. The ORH 2A North fishery is the northern portion of the ORH 2A QMA, with the southern portion linking with the ORH 2B and ORH 3A QMAs to form ORH Mid-East Coast (MEC). ORH 3B is comprised of fisheries developed on the Chatham Rise (the largest historical fishery, the East and South Rise and the smaller NW Rise fishery) and in the Sub-Antarctic area.

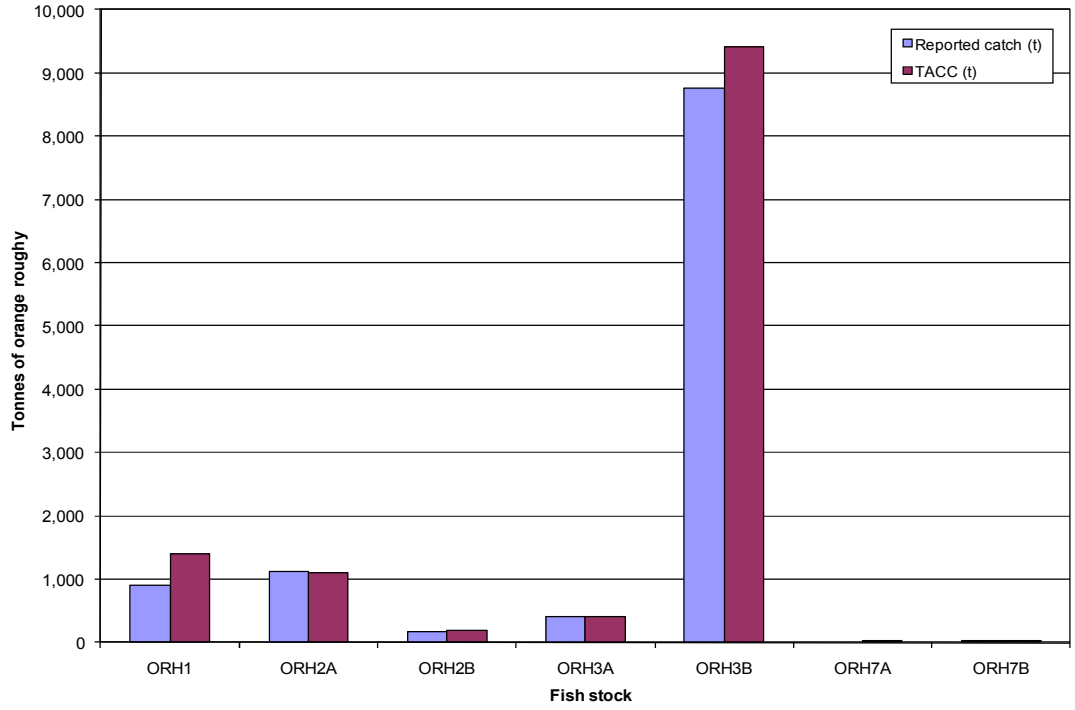
The separate fisheries are managed independently with each having an agreed catch limit. Statutory catch limits in the form of total allowable catches (TACs) and total allowable commercial catches (TACCs) are set for each QMA. Where a fishery boundary aligns with the boundaries of a single QMA the catch limit is the TACC. Catch limits for the other orange roughy fisheries are set by agreement between the industry and Government by splitting TACCs into area limits along the accepted fisheries boundaries within QMAs. Figure 2 shows the reported catch and TACCs for all orange roughy fisheries by QMA for the 2008-09 fishing year.

The deliberate management strategy in the early years of most fisheries managed under the QMS is to reduce the stock down to the most productive size. This level is the biomass that can support the maximum sustainable yield (MSY). During the initial fish-down phase, catches are higher than are

sustainable over the long term. Once the fish-down is complete and the stock size is reduced down to the biomass that will support the MSY (B_{MSY}), a lower annual catch is implemented to maintain the stock size at this level. Generally, as the stock is progressively fished down, catch limits are decreased. In circumstances where the biomass is estimated to have been reduced below B_{MSY}, catches are set at levels below the MSY in order to rebuild the stock.

The size of the total fishery was relatively steady at about 40,000-50,000t during the 1980s but started to decrease in the 1990s with reductions in TACCs as the fishing down phase was completed in the major stocks.

Figure 2. Reported catch and TACC for orange roughy stocks in the 2008-09 fishing year



Orange roughy quota owners are represented through the DeepWater Group Ltd (DWG), the commercial stakeholder organisation responsible for the key EEZ fisheries. In 2006 the Ministry of Fisheries and DWG signed a Memorandum of Understanding (MOU) which set out how both DWG and MFish would work collaboratively to improve the management of deepwater fisheries, including orange roughy. The objectives of this collaborative arrangement include:

1. An improved working relationship with industry (open and collaborative dialogue);
2. Enabling collaborative work to develop better quality policy advice including the development of the National Deepwater Plan;
3. Greater information sharing to ensure optimal solutions are developed for management issues;
4. Improved (informed) compliance; and
5. Improved environmental management and mitigation across key areas such as seabirds.

Environmental overview

Orange roughy fishing activity is known to interact with the wider marine environment including:

1. benthic organisms associated with deepwater features such as hills and canyons as well as a wide variety of substrate types.
2. incidentally captured finfish species
3. incidentally captured shark species

Where these interactions are determined to be adverse, management intervention is required to minimise the severity of the impact. A key focus of this fisheries plan is to ensure that adverse effects are avoided and minimised and that all interactions are monitored and assessed against agreed environmental performance standards.

As yet no formal standards exist and, in their absence, the management focus is on ensuring that once environmental standards are in place, New Zealand's deepwater fisheries, including orange roughy, are operating at a level above that which is required by the standard. Although it is not possible to assess if individual orange roughy fisheries have yet met this aspirational state, efforts are in place to achieve this. These include both mandatory measures (such as seabird mitigation measures and catch limits for certain bycatch fishstocks) and a range of non-regulatory measures implemented by industry and monitored and audited by the Ministry of Fisheries.

Additional information on the extent of environmental interactions in orange roughy target trawl fisheries is discussed later in this chapter.

Economic overview

Commercial orange roughy fishing began in New Zealand on the Chatham Rise in the late 1970s - early 1980s with fisheries in other parts of the New Zealand EEZ typically starting in the mid 1980s. Catches peaked in the late 1980s and have decreased since, largely in response to reductions in catch limits as the biomass of the various stocks has been fished down to target levels.

Three individual companies own approximately 80% of all orange roughy quota. These three companies are the principal operators in the ORH 3B fishery and are also significant quota owners in ORH MEC. Two other companies are dominant in the ORH 1 and ORH 2A North fisheries. The orange roughy fleet predominantly consists of domestic vessels with large factory trawlers predominant in the Chatham Rise and sub-Antarctic fisheries and smaller fresher vessels typically operating in other areas.

Orange roughy quota across all fisheries was estimated to be worth $282m as at 30 September 2009.[1] In 2009, 4,093 tonnes (processed weight) of orange roughy was exported realising a value of $51m. The majority of orange roughy is exported as frozen fillets with 82% of this product exported to the USA and 12% to Australia. In 2009 1,228 tonnes (processed weight) of orange roughy was exported to China for further processing.

Orange roughy has featured unfavourably on "best fish guide' lists produced by environmental NGOs. The stated intent of these lists is to advise consumers on how to make environmentally responsible fish purchases and they have resulted in orange roughy products no longer being stocked by some retailers. The reason for the unfavourable assessment is primarily due to the perception that orange roughy stocks generally are overfished; that bottom trawling fishing methods have an unacceptable impact on the deepsea benthic communities; and that management does not adequately address these issues. The Ministry of Fisheries does not support this perception.

[1] From the Fish Monetary Stock Account, 1996-2009 produced by Statistics New Zealand.

Compliance overview

Orange roughy fisheries are subject to a number of compliance requirements aimed at improving the management of these fisheries – including their effect on bycatch and related species. The following compliance risks have been identified as being of particular relevance to orange roughy fisheries and these are described in more detail below:

1. Area misreporting
2. Misreporting catch
3. Fishing in closed areas

Area misreporting

Area misreporting occurs when catch caught in one quota management area (QMA) is incorrectly reported as caught in another. The primary motive behind this type of offence is to minimise the cost of acquiring Annual Catch Entitlement (ACE) or paying deemed value charges.

Misreported catch

Catch misreporting occurs when incorrect weights, quantities, species, or landed states are reported. As with area misreporting, the primary motive behind this type of offence is to minimise the cost of acquiring ACE or paying deemed value charges.

Fishing in closed areas

Areas are closed to orange roughy fishing by regulation under the benthic protection area (BPA) initiative and the seamount closures.

MFish strives to minimise the opportunity for these and other types of offending to occur through careful risk analysis of the orange roughy fisheries with cooperative input from industry. Information sharing between MFish and industry allows MFish to adapt compliance efforts to current risks and will also help to develop and monitor performance against the compliance standards and benchmarks necessary to achieve many of the goals within this plan.

Social and cultural overview

The Fisheries Act (1996) (the Act) requires that, prior to setting management measures for orange roughy stocks, the Minister of Fisheries shall consult with persons having an interest in the stock or the effects of fishing on the aquatic environment in the area in which the fishery takes place, including Maori, environmental, commercial and recreational interests. In addition the Act requires that in setting a TAC under section 13, the Minister shall have regard to such social, cultural and economic factors that (s)he considers relevant.

Social and cultural factors include those related to the harvesting of orange roughy itself. There is little to consider in this regard as orange roughy is not taken by either recreational or customary fishers and there is no allowance made for recreational or customary take within the orange roughy TACs.

Social and cultural factors also include the non-extractive value of healthy orange roughy and key bycatch stocks and the values associated with an aquatic environment that is not adversely impacted on by orange roughy fishing activity. These intrinsic values must be considered when determining the appropriate management measures for a fishery.

Overview by fishery

The following sections provide a timeline of key developments in each of the individual orange roughy fisheries within the New Zealand EEZ (Figure 1). A graph of catch over time is included for each fishery.

ORH 1

The ORH 1 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. The fishery first 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. From 2000 the QMA was split into four sub-areas and catch is spread across the QMA. The fishery was managed under an Adaptive Management Plan from 1995-2000 and again from 2001 to 2007.

Time line of key developments

1986 TACC of 10 tonnes established with varying levels of additional exploratory catch allowance provided up until 1989.

1989 TACC increased to 190 tonnes but catches remain small.

1994 Fishery developed on two hill complexes in the Western Bay of Plenty. Research fishing undertaken under Special Permit (i.e. additional to TACC).

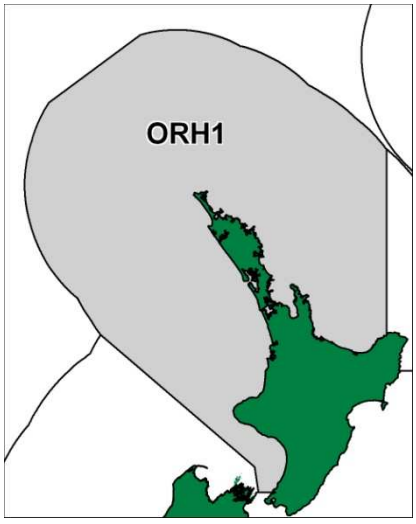
1995 5 year Adaptive Management Programme (AMP)[2] introduced for the area known as the 'Mercury-Colville Box'. TACC increased to 1,190 tonnes, 1,000 tonnes of which was to come from the 'Mercury Colville Box'. Additional research fishing undertaken under Special Permit.

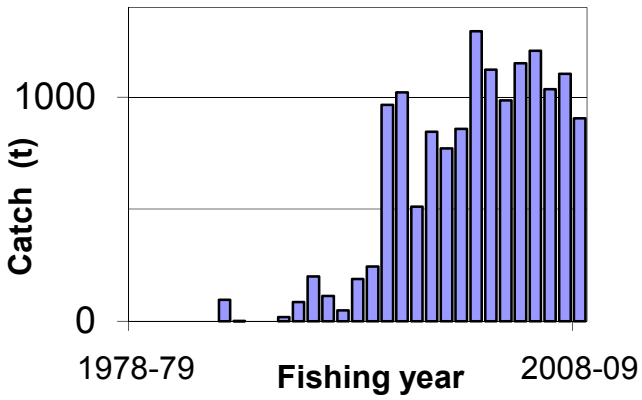
1996 Special Permit granted for exploratory fishing allowing additional 880 tonnes to be taken from designated areas and within designated feature limits.

2000 AMP concluded and TACC reduced to 800 tonnes. QMA split into 4 areas (A-D) and catch limited to 200 tonnes within each area and 100 tonnes from individual features.

2001 New AMP initiated. TACC increased to 1,400 tonnes.

2007 AMP ceased but quota owners agreed to continue to adhere to sub-area and feature limits established under the AMP.





[2] An AMP involves increasing TACCs for a limited period of time to improve the understanding of stock status. Improved understanding comes through obtaining a stronger signal of the effect fishing is having on a stock and also from additional reporting and information gathering requirements that form part of an AMP agreement with industry.

ORH 2A North

ORH 2A North (also known as the 'East Cape') covers the northern portion of the ORH 2A QMA and has been managed and assessed independently from the MEC stock since 1995. Up until 1999-2000 annual landings in the fishery ranged from 1,500 to 3,400 tonnes, with very little of the catch coming from outside the East Cape hills area. The catch limit was decreased sharply from 2,500 to 200 tonnes in 2000-01, restricting landings from this fishery to low levels in recent years.

Time line of key developments

1995 Fishery managed and assessed independently from the remainder of the ORH 2A QMA.

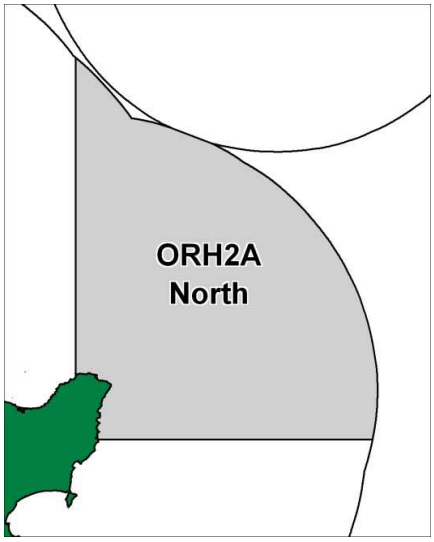
1996 ORH 2A North fishery split by voluntary agreement with quota owners with separate catch limits agreed for the East Cape hills and an exploratory area comprising the remainder of ORH 2A North.

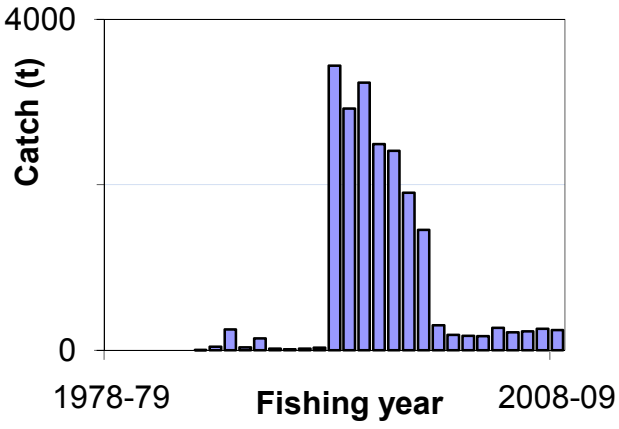
2000 Catch limit decreased from 2,500 to 200 tonnes. Agreement to split catch established in 1996 lapsed, and subsequent landings from the fishery as a whole have been low.

2002 Catch limit for ORH 2A as a whole reduced to 680 tonnes but industry agreed to retain 200 tonne limit for ORH 2A North.

2004 Catch limit for ORH 2A as a whole increased to 1,100 tonnes but industry agreed to retain 200 tonne limit for ORH 2A North.

2004-2009 200 tonne catch limit for ORH 2A North exceeded every year





ORH Mid East Coast (MEC)

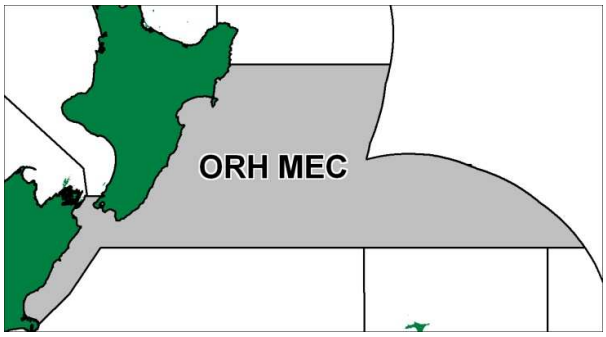
The development of a fishery in the East Cape led to a voluntary agreement to manage the ORH MEC fishery (covering the southern portion of the ORH 2A QMA, the ORH 2B and the ORH 3A QMAs) separately from the ORH 2A North fishery.

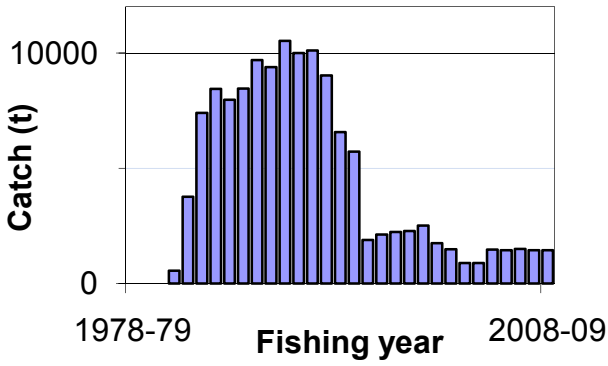
Catch peaked at over 10,000 tonnes in the early 1990s and has been relatively constant since the mid-1990s.

The main spawning area for the fishery is understood to be on the Ritchie Bank with smaller spawning events located in Wairarapa (ORH 2B South) and in Kaikoura (ORH 3A).

Time line of key developments

- *1989* First reported landings with the development of the Wairarapa fishery.
- *1993* A major change took place in the ORH 2A fishery with a shift of effort from the main spawning hill on Ritchie Bank to hills off East Cape.
- *1994* Voluntary agreement to manage the southern portion of ORH 2A in conjunction with ORH 2B and ORH 3A as the Mid-East Coast (MEC) fishery. Catch limit for MEC set at 6,660 tonnes.
- *1995* Catch limit for MEC reduced to 2,100 tonnes
- *2000* Catch limit for MEC reduced to 1,500 tonnes
- *2002* Catch limit for MEC reduced to 800 tonnes
- *2004* Catch limit for MEC increased back to 1,500 tonnes based on new stock assessment information





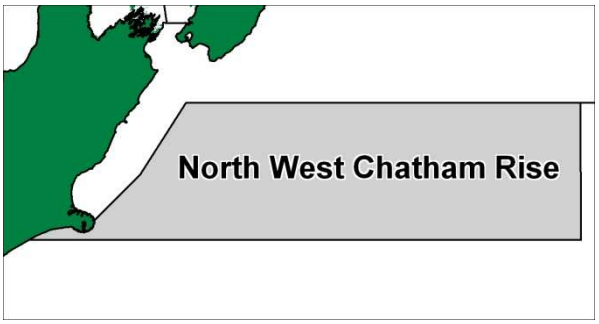
Northwest Chatham Rise

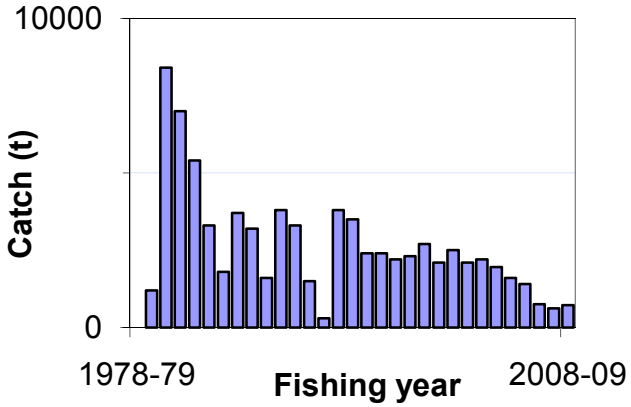
A catch limit specific to the Northwest Rise component of ORH 3B has been in place since 1992 and has been progressively decreased from 3,500 tonnes to its current level of 750 tonnes.

The fishery is focussed on a complex of hills referred to as the Graveyard, located on the 180^{o} longitude line. The Graveyard spawning plume typically forms during mid-late June and dissipates in mid July. Outside the spawning season, orange roughy form aggregations for feeding, but these are less consistent than those formed for spawning. One of the Graveyard Hills (the Morgue) was closed to all fishing as part of a series of seamount closures established in 2001 to protect benthic biodiversity.

Time line of key developments

- *1979* First reported catch from the Northwest Chatham Rise.
- *1980* Annual catch peaked at over 8,400 tonnes.
- *1992* ORH 3B TACC split into voluntary catch limits managed under a voluntary arrangement with the fishing industry, limiting catch to 3,500 tonnes.
- *1995* The fishery now focused on spawning aggregations of orange roughy found on the Graveyard hills complex.
- *2000* Catch limit reduced to 2,000 tonnes
- *2004* Catch limit reduced to 1,500 tonnes
- *2006* Catch limit reduced to 750 tonnes





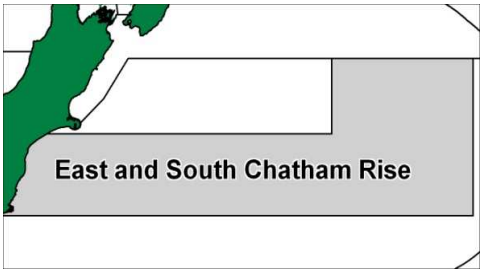
East and South Chatham Rise

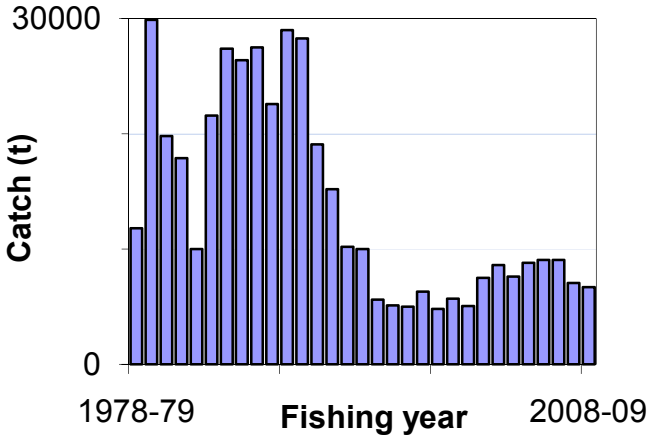
The oldest and largest orange roughy fishery in the world is located on the East and South Chatham Rise (ESCR), a discrete orange roughy stock that is one of several that make up the ORH 3B QMA. Targeted orange roughy fishing on the East and South Chatham Rise occurs year-round on flat ground and on underwater hill features.

Orange roughy on the East and South Chatham Rise spawn in June and July. Spawning is known to occur on many of the hill features located in this area but the dominant spawning aggregations form over a flat area of seafloor to the north of the Chatham Islands. The nature of the seafloor and the overwhelming dominance of orange roughy during the spawning period in this area have allowed successful and repeatable acoustic biomass surveys to be undertaken.

Time line of key developments

1970s	Fishery commenced in the late 1970s.
1988	Annual catch peaked at over 30,000 tonnes.
1992	ORH 3B TACC split into voluntary catch limits managed under a voluntary arrangement with the fishing industry.
1998	Acoustic survey series of the spawning plume started and have been undertaken annually by the same vessel from 2002
2007	Accepted stock structure altered and the Northeast Chatham Rise and the South Chatham Rise combined to form a single management area (East and South Chatham Rise).
2007	Three year phased introduction of an F_{MSY}-based harvest strategy initiated, such that F will equal F_{MSY} [3] for the 2011-12 fishing year
2008	Catch limit reduced to 6,570 tonnes
2009	Catch limit reduced to 5,100 tonnes
2010	Catch limit reduced to 2,960 tonnes





[3] F_{MSY} is the fishing mortality rate that, if applied constantly, would result in an average catch corresponding to the Maximum Sustainable Yield (MSY) and an average biomass of B_{MSY}.

Sub-Antarctic

Stock structure in the Sub-Antarctic region is not known. Fisheries have developed progressively throughout this area as fishers have moved from one fishery to another over the last 20 years.

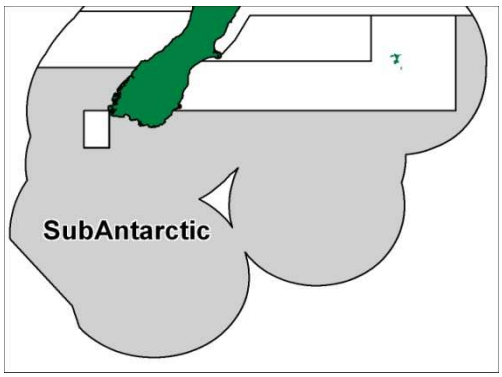
In 1995–96, large catches were reported on the southeast Pukaki Rise, with a catch total of over 3,000 tonnes. However, the catches dropped rapidly, and within a few years the fishery had effectively ceased.

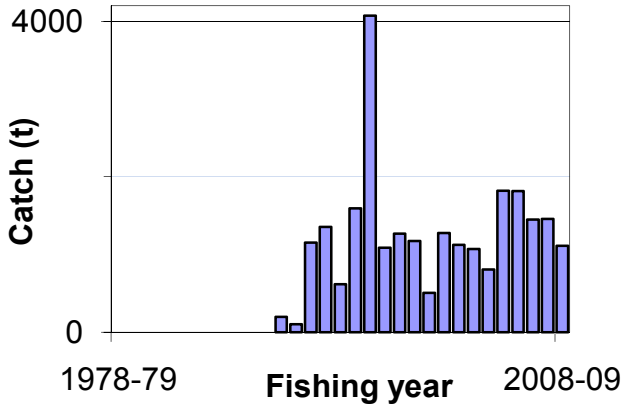
Catches of orange roughy have also been taken off the Bounty Islands (around 200 tonnes per year since 1997–98), off the Snares Islands (up to around 500 tonnes, but infrequently in recent years), areas of the Macquarie Ridge (100–500 tonnes per year since 2000–01), and off Fiordland (around 500 tonnes in 2000–01, but catches then rapidly decreased).

In recent years, a fishery has developed on the northeast Pukaki Rise, and includes the area known as Priceless. This area now dominates the Sub-Antarctic orange roughy catch. Catches are mostly taken at the start of the fishing year, and have reached the feature limit of 500 tonnes for each of the last 5 years.

Time line of key developments

1990	Exploratory fishing undertaken for orange roughy in the Sub-Antarctic
1992	ORH 3B TACC split into voluntary catch limits managed under a voluntary arrangement with the fishing industry
1993	Auckland Islands fishery developed
1994	Catch from the Auckland Islands fishery peaked at around 900 tonnes
1995	SE Pukaki fishery commenced
1999	Catch dropped to less than 200 tonnes and is now infrequent
2001	Fishery developed on NE Pukaki Rise, including the area known as Priceless. Sub-Antarctic catch limit reduced to 1,300 tonnes
2006	Sub-Antarctic catch limit increased to 1,850 tonnes
2010	Catch limit reduced to 500 tonnes



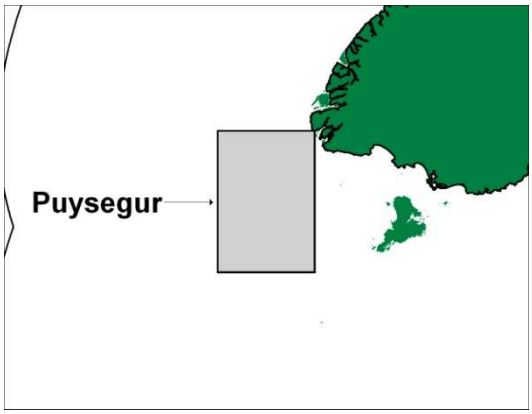


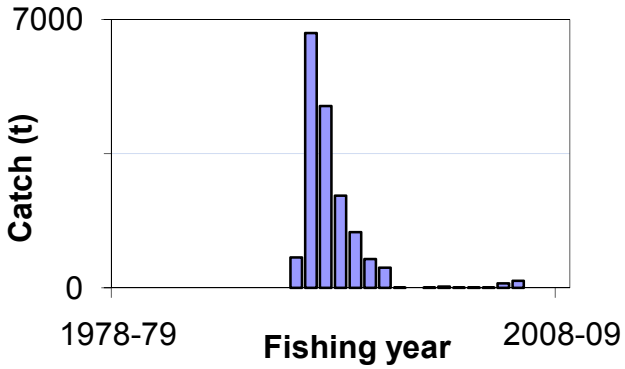
Puysegur

The first fishery to be developed south of the Chatham Rise was on Puysegur Bank in 1990–91. The fishery developed rapidly, but from 1993–94 catch limits were substantially under-caught. Catch limits were subsequently reduced with industry agreeing to a self-imposed closure in the 1997–98 fishing year.

Time line of key developments

- *1990* Exploratory fishing discovered spawning aggregations and rapid development of the Puysegur fishery ensued
- *1992* ORH 3B TACC split into voluntary catch limits managed under a voluntary arrangement with the fishing industry. Catch limit of 5,000 tonnes established for Puysegur
- *1993* Catch limit for Puysegur substantially under-caught
- *1994* Progressive annual reductions in catch limit initiated
- *1997* Fishery closed by industry agreement
- *2004* Industry research survey undertaken
- *2005* Industry research survey undertaken
- *2010* Fishery reopened with catch allowance of 150 tonnes



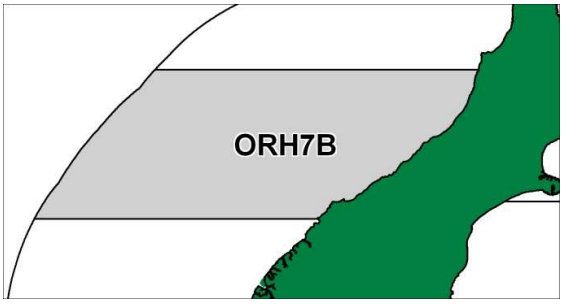


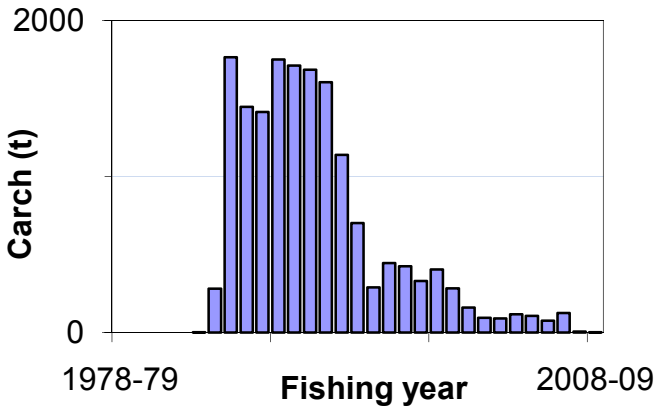
ORH 7B

The fishery was centred on an area near the Cook Canyon, which is a trench running out from the west coast of the South Island in roughly an east-west direction. Fishing also occurred to the south around the Moeraki Canyon.

Time line of key developments

- *1985* Fishery first developed
- *1986* Rapid development when aggregations of spawning orange roughy were targeted in winter.
- *1993* Catches began to decline well below the TACC of 1,708 tonnes.
- *1996* TACC reduced to 430 tonnes.
- *1998* Catches began to decline well below the TACC of 430 tonnes.
- *2001* TACC reduced to 110 tonnes.
- *2007* Fishery closed by Minister of Fisheries (TACC reduced to 1 tonne).





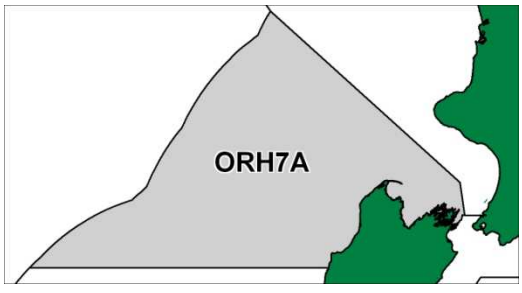
ORH 7A

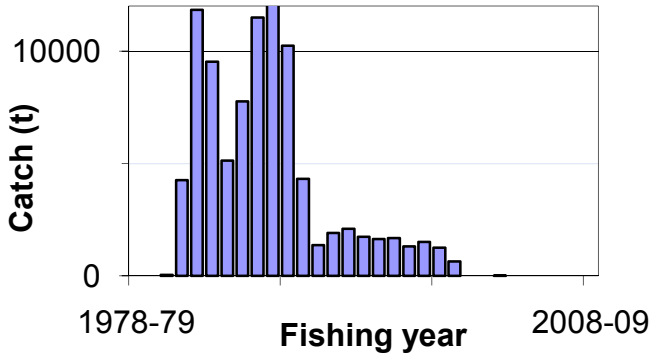
The orange roughy fishery in ORH 7A commenced in the early 1980s in the southwestern region of the Challenger Plateau. Catches increased rapidly in 1982-1983 with the discovery of spawning aggregations. The fishery occurred both within and outside the EEZ and based on scientific evidence it has been managed as a single, straddling stock.

An experimental management approach was adopted in the 1980s to test the productivity of the stock, and to this end, the TAC was progressively increased to a peak of 12,000 tonnes in 1987-88. By 1990-91, stock assessments estimated the stock had been fished down to below B_{MSY} and the TAC was reduced to 1,900 tonnes, a level that was believed would support stock rebuilding. A new stock assessment in 2000, estimated a much lower biomass, and the fishery was closed to fishing from 1 October 2000 (with a TACC of 1 tonne), to promote stock rebuilding.

Time line of key developments

1981	Fishery first developed
1982	Spawning aggregations found and rapid development of the fishery
1984	4,950 tonne TAC established
1987	TAC increased to its maximum level of 12,000 tonnes.
1989	TAC reduced to 2,500 tonnes.
1990	TAC reduced to 1,900 tonnes.
1998	TAC reduced to 1,425 tonnes.
2000	Fishery effectively closed (TACC reduced to 1 tonne)
2004	Industry research survey undertaken
2005	Industry research survey undertaken
2009	Industry research survey undertaken
2010	Industry research survey undertaken
2010	Fishery reopened with a 500 tonne TACC





2. Overview of non-target interactions

This section describes in more detail the relevant non-target bycatch and incidental interactions and captures that occur in orange roughy fisheries (Table 1). The bycatch and incidental captures are categorised as follows:

1. **Key bycatch species:** These are species which, while not specifically targeted by this fishery, are of economic value. They are predominantly QMS species and therefore will be managed through a fisheries plan.

   Key bycatch species do not warrant a chapter of a fisheries plan in their own right, usually because they are taken as bycatch in a more valuable target fishery (e.g. silver warehou in the hoki fishery) or because they are targeted in conjunction with higher value species (e.g. black cardinalfish in the orange roughy fishery).

   In most cases key bycatch species taken in deepwater and middle depth fisheries will be managed under the National Deepwater Plan. However, key bycatch species that are predominantly inshore species will be managed through the relevant inshore fisheries plan.

   As a rule, species that account for at least 1% of the total catch weight in the orange roughy fishery will be managed as a key bycatch species of orange roughy. An exception will be made if catch is less than the 1% threshold but a stock is commercially important and there are valid reasons to include it in the orange roughy chapter.

   The only key bycatch species incorporated into the orange roughy plan is black cardinalfish.

   Note that several QMS species in Table 1 are important target species in their own right and will have their own chapter in the fisheries plan. These species are smooth oreo, black oreo, spiky oreo and warty oreo which will be managed through the oreo fishery specific chapter.

2. **Incidental bycatch species:** These are species with little or no commercial value that are rarely the focus of fishing effort and are usually discarded or rendered to fishmeal. They are typically non-QMS species that account for only a small proportion of the total fish harvested from the orange roughy target fisheries.

   The primary management approach for incidental bycatch species will be to actively monitor catch levels. If the annual catch of an incidental bycatch stock changes significantly, either up or down, then management intervention will be considered.[4]

3. **Incidental interactions with endangered, threatened and protected (ETP) species:** This category relates to the incidental interaction, capture or mortality of protected species such as seabirds and marine mammals.

4. **Benthic interactions:** This category includes benthic invertebrate species that are captured by, or that are known to interact with, orange roughy trawl gear.

Fish and invertebrate species taken as bycatch or incidental catch in the orange roughy fisheries over the last three fishing years are shown in Table 1. This information is derived from observer reports.

[4] The variation in reported catch of all non-QMS stocks is considered annually as part of the process detailed in the paper 'Identification candidate Stocks for QMS introduction – standards and organisational procedures'

The table is colour coded as follows:

- Those species highlighted in blue are **key** bycatch species managed through this chapter of the National Deepwater Plan
- Those species highlighted in orange are **key** bycatch species managed through another chapter of the National Deepwater Plan
- Those species highlighted in yellow are **key** bycatch species managed through another fisheries plan
- Remaining species are **incidental** bycatch species which will be monitored annually as part of the orange roughy chapter of the National Deepwater Plan.

Table 1: Catch weight by species name for the top 50 species caught as bycatch in orange roughy trawls – from Observer records for the period 1 October 2006 to 30 September 2009

	2006/07		2007/08		2008/09	
Common name	**Sum of observed catch (t)**	**% of catch**	**Sum of observed catch (t)**	**% of catch**	**Sum of observed catch (t)**	**% of catch**
Orange roughy	6,349.8	90.8	5,976.9	78.5	5,026.9	74.7
Smooth oreo	236.3	3.4	915.4	12.0	971.8	14.4
Black oreo	22.9	0.3	111.4	1.5	181.5	2.7
Hoki	47.1	0.7	63.4	0.8	78.7	1.2
Rattails	43.3	0.6	62.5	0.8	45.9	0.7
Shovelnose dogfish	46.2	0.7	68.2	0.9	30.1	0.4
Deepwater sharks or dogfish (Unspecified)	18.7	0.3	46.3	0.6	66.7	1.0
Baxter's lantern dogfish	20.1	0.3	38.8	0.5	53.5	0.8
Slickhead	14.2	0.2	43.7	0.6	36.8	0.5
Morids	38.8	0.6	9.2	0.1	28.9	0.4
Johnson's cod	1.5	0.0	50.0	0.7	25.1	0.4
Longnose velvet dogfish	13.9	0.2	27.1	0.4	14.4	0.2
Seal shark	10.3	0.1	21.8	0.3	22.3	0.3
Warty squid	13.4	0.2	11.7	0.2	20.8	0.3
Black cardinalfish	7.5	0.1	10.4	0.1	25.7	0.4
Basketwork eel	9.3	0.1	12.0	0.2	12.6	0.2
Ribaldo	13.7	0.2	9.0	0.1	8.5	0.1
Long-nosed chimaera	3.8	0.1	15.0	0.2	11.7	0.2
Rocks / Stones	13.1	0.2	14.8	0.2	0.1	0.0
Javelinfish	8.6	0.1	14.9	0.2	4.4	0.1
Violet cod	0.2	0.0	14.1	0.2	10.0	0.1
Coral rubble	11.1	0.2	8.1	0.1	-	-
Spiky oreo	3.1	0.0	5.5	0.1	9.6	0.1
Bushy hard coral	7.3	0.1	7.4	0.1	-	-
Hake	2.4	0.0	3.9	0.1	4.4	0.1
Plunket's shark	0.2	0.0	3.9	0.1	5.9	0.1
Scleractinia	-	-	4.4	0.1	5.0	0.1
Pale ghost shark	1.5	0.0	3.2	0.0	2.3	0.0
Unicorn rattail	6.6	0.1	-	-	0.3	0.0
Alfonsino	1.6	0.0	3.1	0.0	1.9	0.0

	2006/07		2007/08		2008/09	
Common name	**Sum of observed catch (t)**	**% of catch**	**Sum of observed catch (t)**	**% of catch**	**Sum of observed catch (t)**	**% of catch**
Leafscale gulper shark	3.5	0.1	0.5	0.0	2.5	0.0
Etmopterus spp.	4.1	0.1	0.8	0.0	0.3	0.0
Smooth skin dogfish	1.5	0.0	2.0	0.0	1.5	0.0
Oreo	-	-	0.1	0.0	4.1	0.1
Caryophyllia spp.	-	-	4.0	0.1	-	-
Crested cup coral	-	-	3.5	0.0	-	-
Ridge scaled rattail	1.1	0.0	1.8	0.0	0.2	0.0
Brodie's king crab	1.1	0.0	0.9	0.0	1.2	0.0
Four-rayed rattail	-	-	-	-	2.8	0.0
Warty oreo	0.9	0.0	0.8	0.0	0.6	0.0
Pacific sleeper shark	-	-	1.0	0.0	1.3	0.0
Longnosed deepsea skate	0.3	0.0	1.6	0.0	0.4	0.0
Sea cucumber (other than *Stichopus mollis*)	0.5	0.0	1.4	0.0	0.3	0.0
Cat shark	0.8	0.0	1.1	0.0	0.3	0.0
Widenosed chimaera	1.4	0.0	0.2	0.0	0.2	0.0
Jellyfish (Unspecified)	0.0	0.0	1.4	0.0	0.3	0.0
Bollons rattail	0.0	0.0	1.5	0.0	0.0	0.0
Coral (Unidentified)	0.3	0.0	1.0	0.0	-	-
Toadfish	0.3	0.0	0.3	0.0	0.7	0.0
Shark (Unspecified)	0.3	0.0	0.0	0.0	0.8	0.0
Others	11.4	0.2	12.8	0.2	8.1	0.1
Totals	6,994.1		7,612.9		6,731.0	

Category 1: Key bycatch species

The following QMS stocks are included in the orange roughy chapter of the National Deepwater Plan:

- Black cardinalfish: CDL 1 - 9

Black cardinalfish do not meet the >1% threshold but as the main fishing areas for this species overlap with that of orange roughy, and black cardinalfish are targeted by vessels that also target orange roughy, it is appropriate to include these stocks within this fisheries plan chapter.

Future management of black cardinalfish will occur through this fisheries plan. A summary of the black cardinalfish fishery is provided below.

BLACK CARDINALFISH (CDL)

Biological Overview

Several species of *Epigonus* are widely distributed in New Zealand waters, but only black cardinalfish (*E. telescopus*) reaches a marketable size and is found in commercial concentrations. It occurs throughout the New Zealand EEZ at depths of 300–1,100 m, mostly in very mobile schools up to 150 m off the bottom over hills and rough ground.

The average size of black cardinalfish landed by the commercial fishery is about 50–60 cm and they reach a maximum length of about 75 cm. Research indicates that this species is relatively slow-growing and long lived.

Fisheries Management Overview

Black cardinalfish has been caught since 1981 by research and commercial vessels, initially as a bycatch of target trawling for other high value species. The preferred depth range of schools (600–900 m) overlaps the upper end of the depth range of orange roughy and the lower end of alfonsino and bluenose. The exploitation of these species from 1986 resulted in the development of the major cardinalfish fishery in QMA 2.

Black cardinalfish is primarily sold domestically due to the short shelf life of frozen fillets. The species has a section of dark flesh under the lateral line that has caused problems with overseas marketing. The fillets can be tainted if this flesh is not removed quickly.

Since 1982 more than 65% of annual black cardinalfish landings have come from the east coast of the North Island (QMA 2). The large increase in landings from this area in 1986–87 was associated with the development of the orange roughy fishery around the Ritchie Banks and Tuaheni High, and an increase in targeted fishing to establish a catch history when it was anticipated to become a quota management species. Landings from the Bay of Plenty (QMA 1) have fluctuated since 1988. The relatively large landings in 1990–91 were a combination of bycatch of the orange roughy fishery and target fishing for black cardinalfish. Between 1991–92 and 2005–06 occasional large catches were taken from outside the EEZ on the northern Challenger Plateau and the Lord Howe Rise.

Black cardinalfish was introduced into the QMS on 1 October 1998 along with a number of other low knowledge species. At that time TACs were set for CDL 2–8 on the basis of reported landings. Setting TACs for CDL 1 and 9 was deferred due to concerns that TACs based on current landings may not have been sustainable. From 1 October 2006, TACs were increased in CDL 4 from 5 to 66 tonnes and in CDL 5 to 22 tonnes. The new TACs were intended to better reflect the then current catch and were

established on the basis that there were no known sustainability concerns for these stocks. They were set at the average of the previous seven years' commercial catch plus an additional 10% to take account of the variability of the quantities harvested as the fishery developed.

The stock structure of black cardinalfish in CDL 2, 3 and 4 was considered in 2009 as part of a new stock assessment for these fisheries. The working group agreed that these three QMAs were likely to comprise a single stock. The stock assessment indicated that the stock had been reduced to low levels and as a result, the Minister decided to reduce the TAC for the CDL 2 (the largest fishery) fishery from 1 October 2009. The first cut of a 3-year staged reduction in TACC was implemented in October 2009 with the second reduction implemented in 2010. A pilot acoustic feasibility study was completed in early 2010. Although the results of survey are inconclusive a further feasibility survey is scheduled for early 2011.

Economic overview

- 65% of black cardinalfish quota in the main CDL 1 and 2 fisheries is held by three companies.
- Quota owners in CDL 1 and 2 are broadly similar to those in the orange roughy fisheries that overlap these QMAs.
- Black cardinalfish quota value was estimated to be $4.2m in 2009.

Category 2: Incidental bycatch species

These are typically species with little or no commercial value, which are not the focus of fishing effort and are frequently discarded. The bycatch discard rate in orange roughy target fisheries is very low with approximately 94% of the greenweight catch in targeted orange roughy tows retained onboard.

A range of deepwater shark species account for a significant portion of the species taken as incidental bycatch in orange roughy fisheries and make up approximately 2% of the total observed catch.

Incidental bycatch species, including deepwater shark species, will continue to be monitored annually through the National Deepwater Plan. If catch levels are deemed to be impacting on the sustainability of a species, or if there are utilisation concerns, then incidental bycatch species will be considered for possible QMS introduction or other management measures may be implemented under section 11, such as catch limits, gear restrictions or closed fishing areas.

Category 3: Incidental captures of ETP species

New Zealand's orange roughy fisheries have low levels of interaction with seabird and marine mammal species. Table 2 below describes the extent of the seabird and marine mammal interactions based on MFish observer data from vessels targeting orange roughy for the period 1 October 2005 to 30 September 2008. All the observed seabird captures occurred in the East and South Chatham Rise fishery and all the marine mammal captures occurred in the Sub-Antarctic fishery.

Table 2: Extent of observed interactions with seabirds and marine mammals from the orange roughy trawl fisheries for the period 1 October 2005 – 30 September 2008.[5]

Fishing year	Seabirds		Marine mammals		Total number of tows	Observed tows	Percentage of tows observed
	Dead	Alive	Dead	Alive			
2007-08	1x Giant petrel	0	0	0	3686	1588	43.08%
2006-07	1x Gibson's albatross	0	1 x fur seal	0	3882	1152	29.68%
2005-06	2 x Buller's albatross	0	0	1 x fur seal	4477	778	17.38%

Seabirds:

Seabirds are infrequently caught during trawling for orange roughy. MFish observers have provided information showing that the seabird mortality rate associated with deepwater trawling is very low, at less than 0.01 seabird captures per tow. Seabirds that are killed or injured by trawl gear are either struck by the trawl warps (typically larger seabirds such as albatross) or caught in the net when it is on the surface during deployment and retrieval (typically smaller seabirds such as shearwaters or petrels). Regulations were passed in 2005 that require trawl vessels to deploy bird mitigation devices, such as tori lines, to scare birds away from the danger zone around the stern of the vessel. These mitigation measures have been successful in reducing the number of warp interactions across the deepwater and middle depth fleet generally.

In addition to the mandatory mitigation measures, industry and the Ministry work collaboratively to ensure all trawlers over 28 metres in length have, and follow, a Vessel Management Plan (VMP). VMPs specify the measures that must be followed onboard the vessel so as to reduce the risk of incidental seabird captures. These measures include storing offal while shooting and hauling fishing gear, and making sure all fish are removed from the net before it is put back in the water. The Ministry monitors vessel performance against these VMPs. If a vessel is not complying with its VMP then the Chief Executive of the Ministry of Fisheries has the option of putting vessel-specific regulations in place to better control offal management practices on individual vessels.

Work is currently underway to develop an environmental standard for seabirds which will apply across all fisheries – inshore, deepwater and highly migratory. Once this standard is in place, the performance of vessels operating in the orange roughy fishery will be assessed annually against the standard. If the extent of orange roughy fishing activity means that the standard is not being met then further management intervention, including increased mitigation, will likely be required.

[5] Abraham, E.R. (2009) Seabird and marine mammal captures in New Zealand deepwater fisheries. Report prepared for the Ministry of Fisheries. 6p.

Marine mammals:

Fur seals are occasionally, but infrequently, captured by vessels targeting orange roughy in the Sub-Antarctic. There have also been a small number of sea lion captures attributable to orange roughy trawlers operating in the vicinity of the Auckland Islands. Both the New Zealand fur seal and sea lion are protected species under the Marine Mammal Protection Act 1978.

As with seabird interactions, industry works to ensure all vessels over 28 metres in length follow a Marine Mammal Operating Procedure (MMOP) which is generic across the deepwater and middle depth fleet. The MMOP specifies measures that must be followed to reduce the risk to marine mammals and procedures to follow if a marine mammal is captured. The Ministry of Fisheries monitors and audits vessel performance against the MMOP.

There is no observer information to suggest interactions occur with other marine mammals such as dolphins or whales in orange roughy fisheries.

Protected shark species:

There are no known interactions with protected shark species.

Protected coral species:

An amendment to the Wildlife Act 1953 in July 2010 means that most hard coral species are now protected under that Act. Over the last three fishing years observers have reported over 50 tonnes of corals being taken in orange roughy target trawls.

Approximately 40% of such corals were reported under generic reporting codes, which means that it is not possible to confirm whether it was a protected species or not. Most of the remainder were hard corals and therefore are now protected under the Wildlife Act. Less than a 100kg of reported coral were species not protected under the Wildlife Act.

Category 4: Benthic interactions

Vessels targeting orange roughy use bottom trawl gear that is typically fished on the seabed. Contact of components of the trawl (doors, ground rope etc.) with the seafloor results in the capture of benthic invertebrates and impacts on both physical and biological components of the benthic habitat.

Table 3 below details the benthic bycatch that has been recorded from observed vessels targeting orange roughy over the past three fishing years. In addition to these invertebrates a total of 28,276 kg of substrate (including rocks, stones, sand and mud) was recorded by observers during this period.

Table 3: Benthic bycatch from orange roughy target tows from Observer records for 2006-07 to 2008-09 fishing year[6]

Phyla	Common name	Total amount recorded (kg)
Cnidaria	Corals (protected species)	32,734
	Corals (not protected species)	84
	Corals (generic reporting codes)	20,792
	Sea anemones	979
	Hydroids	9
	Sea pens	6
Echinodermata	Sea stars, brittle stars and sea urchins	2,258
	Sea cucumbers	2,392
Arthropoda	Crustacea (crabs, lobsters and barnacles)	4,686
Porifera	Sponges	1,394
Mollusca	Octopus	462
	Gastropods and bivalves	70

In recent years the management measures to address the effects of deepwater trawl activity have focused on avoiding these effects. This has been achieved though closing areas to bottom trawling; first with seamounts and then with Benthic Protection Areas (BPAs). The implementation of BPAs in 2007 effectively closed over 30% of the New Zealand EEZ to bottom trawling. It also implemented a monitoring regime to ensure these closures were adhered to. The BPA closures were based on the best available marine classification and over 10% of each environment class was closed.[7]

The BPAs currently in place represent 16% of orange roughy habitat (based on orange roughy depth range), as detailed in Figure 4 below. The current BPAs will be reviewed after 2013 and if research suggests that the existing BPAs are not protecting an adequate and representative section of marine habitats then further closures will be considered.[8]

[6] Phyla with a total observed catch less than 10kg have been excluded

[7] The exception is environment class 55, where only 3% was closed, because a third of this area is included in the Territorial Sea and most bottom trawling in that area is for coastal rather than deepwater species.

[8] Some eNGOs do not consider that the Benthic Protected Area adequately address the benthic interactions that arise from trawling for orange roughy and other deepwater species.

Figure 3: Orange roughy bottom trawl footprint 1989-90 to 2007-2008

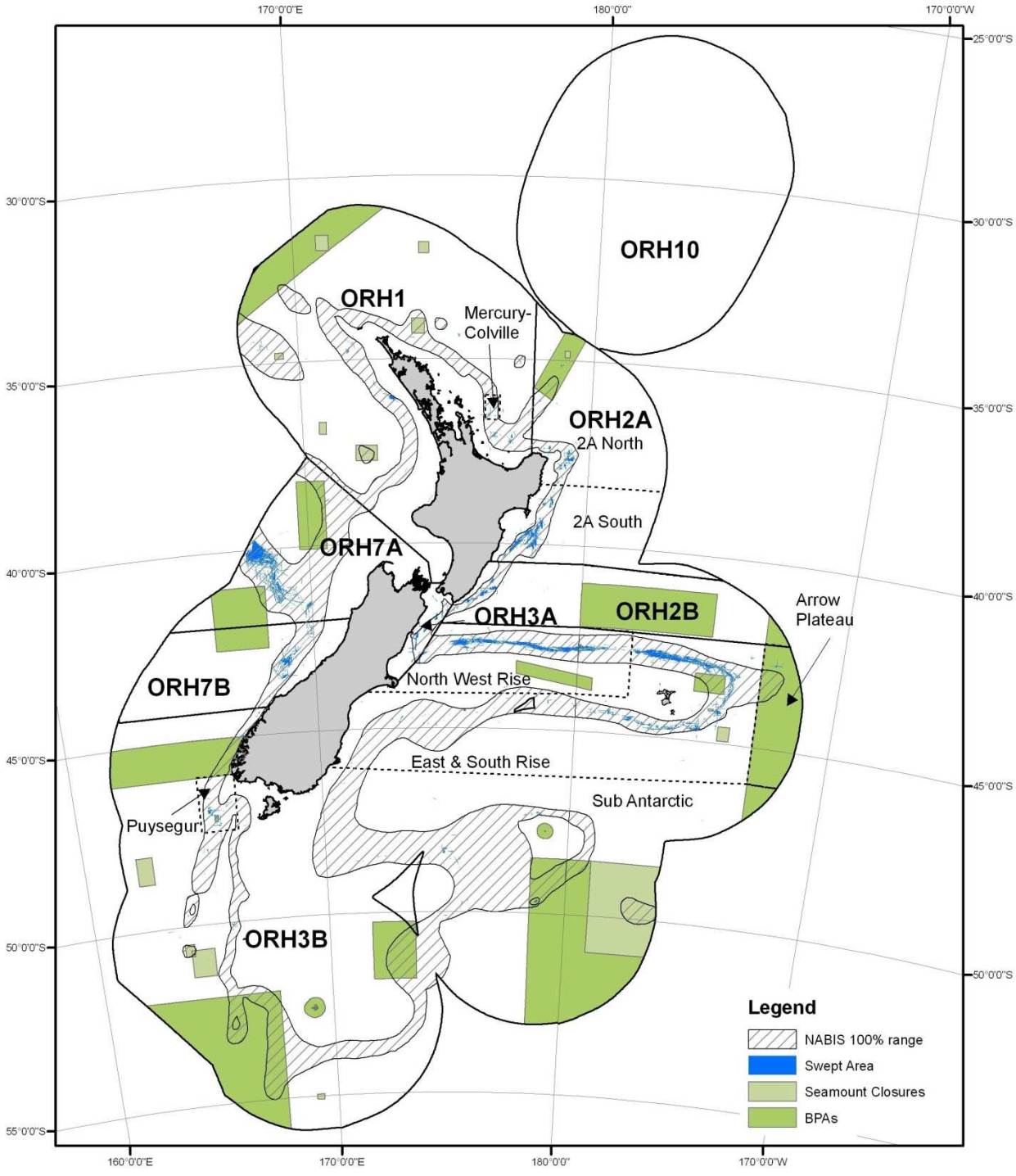
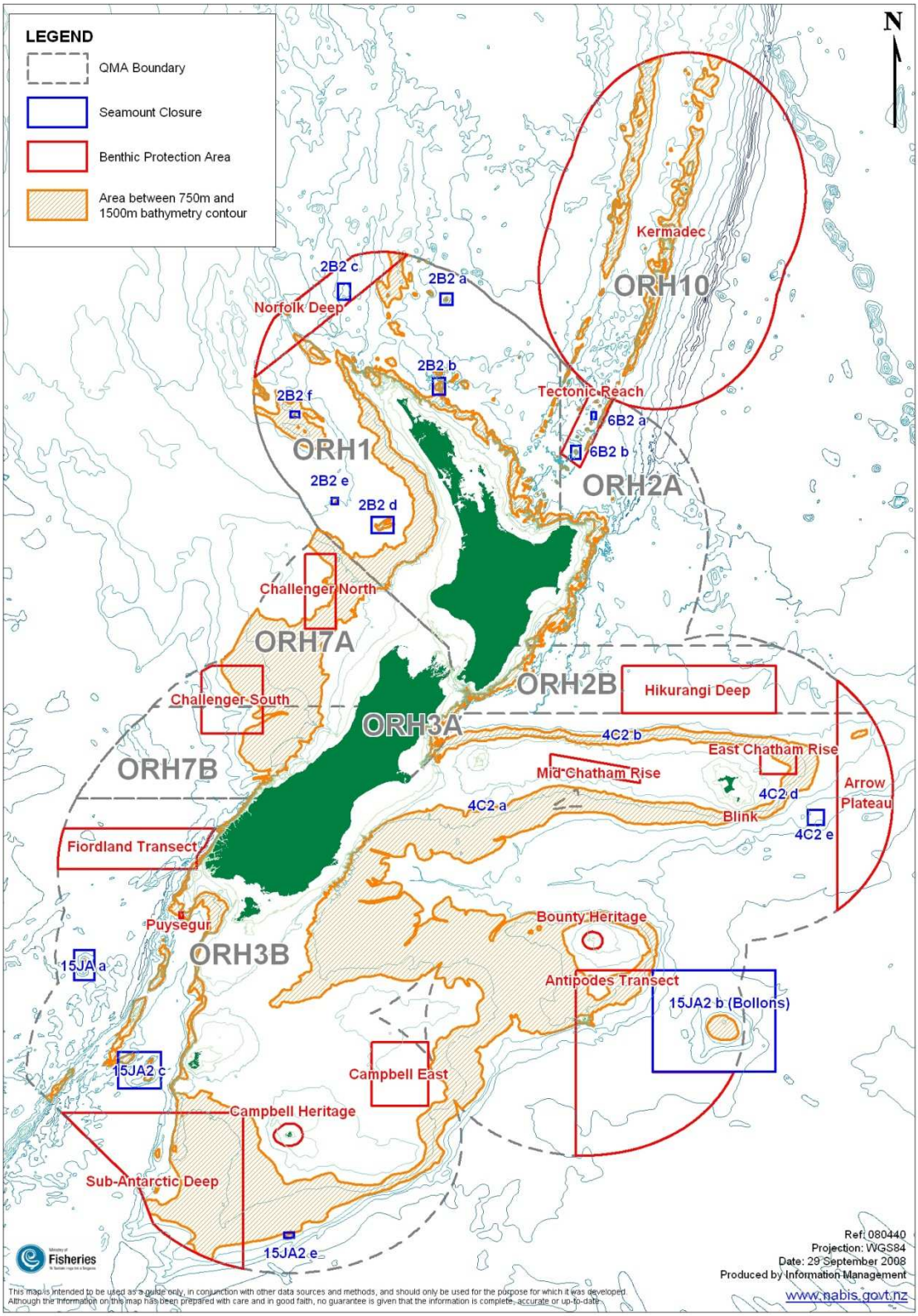


Figure 4. Orange roughy depth range and areas closed to bottom trawling within the New Zealand EEZ



Operational Objectives for orange roughy fisheries

This section describes the operational objectives that have been identified for the orange roughy fisheries. The table below details each operational objective and indicates which management objective(s) it contributes to, recognising that the successful delivery of one operational objective may contribute to the delivery of more than one management objective.

Operational objectives are specific, measurable and time bound and they will drive all management action in the fishery. These operational objectives will be critical in determining the annual management of all orange roughy fisheries for the five years that this iteration of the National Deepwater Plan is in place. The individual tasks that contribute to the delivery of each operational objective will be specified each year in the annual operational plan.

Table 4. Operational objectives (OO) contributing to achieving each of the management objectives

●● Denotes the primary management objective that each operational objective contributes to achieving
● Denotes additional management objectives that each operational objective contributes to achieving

Operational objective	MO 1.1	MO 1.2	MO 1.3	MO 1.4	MO 1.5	MO 1.6	MO 1.7	MO 2.1	MO 2.2	MO 2.3	MO 2.4	MO 2.5	MO 2.6	MO 2.7
OO1.1 Ensure the management of each orange roughy fishery is explicitly linked to agreed management objectives from 2011	●	●●												
OO1.2 Ensure the research and monitoring programme for all orange roughy fisheries is clearly linked to management objectives by 2010	●	●		●●										
OO1.3 Establish an open, transparent and inclusive management environment through: (1) ensuring all management information is available and easily accessible by all; and (2) collaboratively engaging with stakeholders on the management of the fishery, from 2011		●●	●			●								

Operational objective	MO 1.1	MO 1.2	MO 1.3	MO 1.4	MO 1.5	MO 1.6	MO 1.7	MO 2.1	MO 2.2	MO 2.3	MO 2.4	MO 2.5	MO 2.6	MO 2.7
OO1.4 Ensure that all research used to inform management continues to be peer reviewed and meets approved research standards					●●	●								
OO1.5 Ensure that all management settings are peer reviewed and comply with, or exceed, international best practice, progressively from 2011			●		●●	●								
OO1.6 Monitor levels of fisher compliance annually against a set of agreed compliance standards and benchmarks, from 2011	●		●		●●									
OO1.7 Ensure appropriate and transparent action is taken when compliance levels fall below the agreed benchmark from 2011	●		●		●●									
OO1.8 Create an 'information hub' where all information on the management of orange roughy and black cardinalfish is available and easily accessible by all from 2012	●					●●								
OO1.9 Facilitate greater commercial iwi involvement in the management of orange roughy and black cardinalfish through the Deepwater Group Ltd from 2010			●				●●							
OO1.10 Utilise the collaborative relationships currently established between the Ministry of Fisheries and iwi groups to ensure iwi have the opportunity to effectively input and participate in the management of orange roughy and black cardinalfish from 2010			●				●●							
OO1.11 Ensure management measures and controls are assessed in terms of their contribution to the value of the orange roughy fisheries before implementation from 2011	●●						●							

Operational objective	MO 1.1	MO 1.2	MO 1.3	MO 1.4	MO 1.5	MO 1.6	MO 1.7	MO 2.1	MO 2.2	MO 2.3	MO 2.4	MO 2.5	MO 2.6	MO 2.7
OO2.1 Implement an agreed harvest strategy, consistent with the Harvest Strategy Standard, progressively across all major orange roughy stocks from 2010		●				●		●●	●				●	
OO2.2 Implement an agreed harvest strategy, consistent with the Harvest Strategy Standard, progressively across all black cardinalfish stocks from 2012		●				●		●●	●				●	
OO2.3 Ensure that the total harvest of orange roughy and key bycatch species is balanced against ACE and that overcatch of the TACC is minimised		●				●		●	●●				●	
OO2.4 Complete an ecological risk assessment (ERA) on the effects of the orange roughy fisheries on the aquatic environment (including the effects on trophic linkages etc.) by 2011	●			●						●●	●●	●●	●●	●●
OO2.5 Assess if existing protection of habitats of particular significance to the management of orange roughy fisheries is appropriate by 2013			●						●●				●	
OO2.6 Monitor trends in captures of incidental bycatch species (Tier 3 species) in the orange roughy fishery from 2010			●	●●							●●			
OO2.7 Minimise the use of generic reporting codes to record bycatch information in the orange roughy and black cardinalfish fisheries progressively from 2011				●●							●●			
OO2.8 Ensure that interactions with ETP species identified as at risk during the ERA process are managed to avoid or minimise adverse effects to acceptable levels (which may include standards) from 2012			●		●●							●●	●	
OO2.9 Appropriate spatial management measures to address the impact that orange roughy bottom trawl fishing activity has on the benthic habitat are implemented post 2013														●●

Measuring performance

Monitoring and measuring performance is critical to ensure operational objectives are achieving the management objectives, the fisheries goals and in turn the overall strategic vision for the fisheries sector.

This section describes:

- The review criteria that will be used to assess performance against the management objectives in the fishery. These review criteria provide a gap analysis for the management of orange roughy fisheries as they specify the current status of the orange roughy management regime and the expected target status after five years of the National Deepwater Plan driving management.
- The performance indicators that will be used to determine if the operational objectives have been met.

Management Objectives: Review criteria

Review criteria enable measurement of where we are now compared with where we will be in 5 years time, i.e. how the management of orange roughy has improved over the five year term of the National Deepwater Plan. Review criteria allow us to demonstrate that, through the implementation of operational objectives specified in this chapter clear and definite progress has been made towards meeting a management objective.

The nature of some of the management objectives means it may not be feasible to fully meet all of the management objectives within the five-year life span of this iteration of the National Deepwater Plan.

Each of the management objectives is assessed below in terms of its current status with regard to the orange roughy fisheries collectively, and the target status after the National Deepwater Plan has been in place for five years.

Management Objectives - Utilisation

MO 1.1	**Enable economically viable orange roughy fisheries in New Zealand over the long term**
Status at start of plan	○ Current orange roughy quota value is $282m (2009) ○ Current orange roughy export earnings are $51M annually (2009)
Target status at 5 year review	○ The real value of orange roughy quota is increased ○ Management decisions are formally assessed in terms of their value contribution prior to being implemented ○ Information necessary to manage fisheries is obtained on a cost-effective basis
Supporting operational objectives	
OO1.1	Ensure the management of each orange roughy fishery is explicitly linked to agreed management objectives from 2010
OO1.2	Ensure the research and monitoring programme for all orange roughy fisheries is clearly linked to management objectives by 2010
OO1.6	Monitor levels of fisher compliance annually against a set of agreed

	compliance standards and benchmarks, from 2011
OO1.7	Ensure appropriate and transparent action is taken when compliance levels fall below the agreed benchmark, from 2011
OO1.8	Create an 'information hub' where all information on the management of orange roughy and black cardinalfish is available and easily accessible by all from 2012
OO2.4	Complete an ecological risk assessment (ERA) on the effects of the orange roughy fisheries on the aquatic environment (including the effects on trophic linkages etc.) by 2012

MO 1.2	**Ensure there is consistency and certainty of management measures and processes in the orange roughy fisheries**
Status at start of plan	○ All orange roughy fisheries are managed by the Ministry of Fisheries in collaboration with DWG ○ There is currently no fisheries plan in place that sets out the management objectives to guide the management of these fisheries ○ Key management decisions are consulted on widely across all stakeholder groups with an interest in orange roughy ○ Few management decisions are assessed in terms of the value that they contribute to both New Zealand and quota owners ○ Catch is monitored annually against TACCs, voluntary catch limits and voluntary catch spreading arrangements ○ There is limited information available in terms of levels of compliance in the orange roughy fisheries ○ Management measures and processes to address environmental issues have been advanced in recent years but further work may be required in some areas (trophic linkages and ecosystem functioning) ○ There is currently no single information source that can be accessed by people with an interest in the management of the orange roughy fisheries
Target status at 5 year review	○ Wide support and compliance with both regulatory and non-regulatory management measures in place in these fisheries – and this is apparent in the performance of the orange roughy fisheries against compliance benchmarks. ○ Collaborative management relationship continues with greater benefits realised and is extended to other stakeholder groups ○ Regular internal and external consultation and review processes continued ○ Management measures and decisions are documented and are publicly available on the MFish website ○ Management decisions are formally assessed in terms of their value contribution prior to being implemented
Supporting operational objectives	
OO1.1	Ensure the management of each orange roughy fishery is explicitly linked to agreed management objectives from 2011
OO1.2	Ensure the research and monitoring programme for all orange roughy fisheries is clearly linked to management objectives by 2010
OO1.3	Establish an open, transparent and inclusive management environment

	through: (1) ensuring all management information is available and easily accessible by all; and (2) collaboratively engaging with stakeholders on the management of the fishery, from 2011
OO1.11	Ensure management measures and controls are assessed in terms of their contribution to the value of the orange roughy fisheries before implementation from 2011
OO2.1	Implement an agreed harvest strategy, consistent with the Harvest Strategy Standard, progressively across all major orange roughy stocks from 2010
OO2.2	Implement an agreed harvest strategy, consistent with the Harvest Strategy Standard, progressively across all black cardinalfish stocks from 2012
OO2.3	Ensure that the total harvest of orange roughy and key bycatch species is balanced against ACE and that overcatch of the TACC is minimised

MO 1.3	**Ensure the orange roughy fisheries resource is managed so as to provide for the reasonably foreseeable needs of future generations**
Status at start of plan	○ The foreseeable needs of future generations, including intrinsic and bequest values, have not specifically been identified in relation to orange roughy ○ Current management is focussed on meeting agreed catch limits and avoiding, remedying or mitigating the adverse effects of fishing on the aquatic environment
Target status at 5 year review	○ Through the delivery of the National Deepwater Plan there is a greater public awareness and understanding of how orange roughy fisheries are managed ○ There is wider public acknowledgement that orange roughy fisheries are well managed ○ Orange roughy fisheries are managed so that they are capable of achieving third party certification, if required
Supporting operational objectives	
	Note that all operational objectives and management objectives contribute to the delivery of MO1.3

MO 1.4	Ensure the effective management of the orange roughy fisheries is achieved through the availability of appropriate information
Status at start of plan	○ Management of all orange roughy fisheries is supported by a significant research programme but the outputs from this programme are frequently contentious and, in the absence of agreed harvest strategies, may not be clearly linked to management requirements ○ There is insufficient data and information available to assess the status of bycatch stocks or to fully assess the nature and extent of adverse environmental effects ○ Available information is often highly technical and difficult to understand ○ All scientific information used to inform management decisions is peer reviewed
Target status at 5 year review	○ The 10 Year Research Programme is implemented and the data necessary to support the objectives in the National Deepwater Plan is routinely collected in a cost-effective manner ○ All research used to inform management decisions continues to meet MFish standards and peer review requirements
Supporting operational objectives	
OO1.2	Ensure the research and monitoring programme for all orange roughy fisheries is clearly linked to management objectives by 2010
OO2.4	Complete an ecological risk assessment (ERA) on the effects of the orange roughy fisheries on the aquatic environment (including the effects on trophic linkages etc.) by 2011
OO2.6	Monitor trends in captures of incidental bycatch species (Tier 3 species) in the orange roughy fishery from 2010
OO2.7	Minimise the use of generic reporting codes to record bycatch information in the orange roughy and black cardinalfish fisheries progressively from 2011

MO 1.5	Ensure New Zealand's orange roughy fisheries are recognised as being consistent with, or exceeding, national and international best practice
Status at start of plan	Orange roughy is listed at the bottom of several sustainable consumer choice assessments produced by environmental NGOs (although the conclusions reached by these assessments are not supported by the Ministry of Fisheries)
Target status at 5 year review	○ Through the delivery of the National Deepwater Plan there is a greater public awareness and understanding of how the orange roughy fisheries are managed ○ Levels of compliance in the orange roughy fisheries are monitored annually against compliance benchmarks and performance of the fisheries exceeds these benchmarks ○ There is wider public acknowledgement that orange roughy fisheries are well managed and are consistent with or exceeding best practice ○ Orange roughy fisheries are managed so that they are capable of achieving third party certification, if required

Supporting operational objectives	
OO1.4	Ensure that all research used to inform management continues to be peer reviewed and meets approved research standards
OO1.5	Ensure that all management settings are peer reviewed and comply with, or exceed, international best practice, progressively from 2011
OO1.6	Monitor levels of fisher compliance annually against a set of agreed compliance standards and benchmarks, from 2011
OO1.7	Ensure appropriate and transparent action is taken when compliance levels fall below the agreed benchmark from 2011

MO 1.6	**Ensure New Zealand's orange roughy fisheries are transparently managed**
Status at start of plan	○ Information currently available on the management of orange roughy fisheries consists predominantly of scientific and technical reports which are only accessible to a limited audience ○ There is currently no primary information source that can be accessed by all people with an interest in the management of the orange roughy fisheries
Target status at 5 year review	○ The Ministry of Fisheries website is acknowledged as the most comprehensive source of information on the management and performance of the orange roughy fisheries ○ The Annual Operational Plan describes management procedures for orange roughy for the upcoming fishing year. ○ The Annual Review Report describing the performance of the orange roughy fisheries in the previous fishing year is produced and made publicly available ○ There is greater awareness and understanding of how orange roughy fisheries are managed
Supporting operational objectives	
OO1.3	Establish an open, transparent and inclusive management environment through: (1) ensuring all management information is available and easily accessible by all; and (2) collaboratively engaging with stakeholders on the management of the fishery, from 2011
OO1.4	Ensure that all research used to inform management continues to be peer reviewed and meets approved research standards
OO1.5	Ensure that all management settings are peer reviewed and comply with, or exceed, international best practice, progressively from 2011
OO1.8	Create an 'information hub' where all information on the management of orange roughy and black cardinalfish is available and easily accessible by all from 2012
OO2.1	Implement an agreed harvest strategy, consistent with the Harvest Strategy Standard, progressively across all major orange roughy stocks from 2010
OO2.2	Implement an agreed harvest strategy, consistent with the Harvest Strategy Standard, progressively across all black cardinalfish stocks from 2012
OO2.3	Ensure that the total harvest of orange roughy and key bycatch species is balanced against ACE and that overcatch of the TACC is minimised

MO 1.7	Ensure the management of New Zealand's orange roughy fisheries meets the Crown's obligations to Maori under fisheries settlement acts
Status at start of plan	Iwi quota owners are not actively represented in the management of orange roughy fisheries
Target status at 5 year review	○ Iwi with an interest in orange roughy fisheries are actively engaged in the management of these fisheries ○ Iwi membership of the DWG has increased ○ Clear and agreed processes in place to allow TOKM to represent commercial iwi views, where necessary ○ Iwi with an interest in orange roughy fisheries are enjoying the benefits of responsible asset management ○ Mechanism for wider iwi engagement is acknowledged to be through iwi fisheries plans and iwi forums
Supporting operational objectives	
OO1.9	Facilitate greater commercial iwi involvement in the management of orange roughy and black cardinalfish through the DWG from 2010
OO1.10	Utilise the collaborative relationships currently established between the Ministry of Fisheries and iwi groups to ensure iwi have the opportunity to effectively input and participate in the management of orange roughy and black cardinalfish from 2010

Management Objectives - Environment

MO 2.1	Ensure orange roughy and black cardinalfish stocks are managed to an agreed harvest strategy
Status at start of plan	○ Harvest strategies, consistent with the Harvest Strategy Standard, are not yet fully in place for any of the orange roughy or black cardinalfish fisheries ○ An F_{MSY} based harvest strategy focussing on the method of establishing a catch limit when the stock is above the soft limit has been developed for the ESCR and ORH7A fisheries but further work is required to complete and implement the harvest strategy for this stock
Target status at 5 year review	○ Orange roughy and black cardinalfish stocks are managed either at or above agreed target levels or are managed to ensure that stocks are moving towards an agreed target ○ Harvest strategies, consistent with the Harvest Strategy Standard, are established and implemented for all major orange roughy and black cardinalfish stocks ○ The necessary data and information is available to regularly assess performance against agreed biological reference points in all major orange roughy and black cardinalfish stocks
Supporting operational objectives	
OO2.1	Implement an agreed harvest strategy, consistent with the Harvest Strategy Standard, progressively across all major orange roughy stocks from 2010
OO2.2	Implement an agreed harvest strategy, consistent with the Harvest Strategy Standard, progressively across all black cardinalfish stocks from 2012
OO2.3	Ensure that the total harvest of orange roughy and key bycatch species is balanced against ACE and that overcatch of the TACC is minimised

MO 2.2	Maintain the genetic diversity of orange roughy and black cardinalfish stocks
Status at start of plan	○ There is little information available on the genetic diversity within orange roughy or black cardinalfish stocks ○ Information on population structure (sex and size class distribution) for orange roughy and black cardinalfish is available from research surveys and observer data although coverage varies widely between stocks
Target status at 5 year review	○ Information is available (collected as part of the 10 Year Research Programme) on sex and size class structure for all orange roughy and black cardinalfish stocks and processes are in place to monitor trends in this information[9]

[9] Note that achieving the target status for MO 2.1 at 5 year review will make a significant contribution to ensuring the genetic diversity of these species is maintained.

Supporting operational objectives	
OO2.1	Implement an agreed harvest strategy, consistent with the Harvest Strategy Standard, progressively across all major orange roughy stocks from 2010
OO2.2	Implement an agreed harvest strategy, consistent with the Harvest Strategy Standard, progressively across all black cardinalfish stocks from 2012
OO2.3	Ensure that the total harvest of orange roughy and key bycatch species is balanced against ACE and that overcatch of the TACC is minimised
OO1.5	Ensure that all management settings are peer reviewed and comply with, or exceed, international best practice, progressively from 2011

MO 2.3	**Protect habitats of particular significance to fisheries management**
Status at start of plan	○ Habitats of particular significance to the management of orange roughy fisheries have not been defined, although it is recognised that orange roughy are frequently associated with underwater topographic features such as hills and canyons ○ Regulatory closures under the Seamount and BPA initiatives have closed large areas of the New Zealand EEZ to bottom trawling[10]
Target status at 5 year review	○ A policy definition is available which describes what is meant by 'habitats of particular significance to fisheries management' ○ Habitats of particular significance to the management of orange roughy fisheries have been identified ○ Where necessary, management measures to further protect these habitats have been identified and are implemented post 2013
Supporting operational objectives	
OO2.4	Complete a ecological risk assessment (ERA) on the effects of the orange roughy fisheries on the aquatic environment (including the effects on trophic linkages etc.) by 2011
OO2.5	Assess if existing protection of habitats of particular significance to the management of orange roughy fisheries is appropriate by 2013
OO2.9	Appropriate spatial management measures to address the impact that orange roughy bottom trawl fishing activity has on the benthic habitat are implemented post 2013

[10] Sixteen percent of the area of the EEZ within the depth range of 750 to 1500 m is within the Benthic Protection Area closures and the Seamount closures as shown in Figure 5.

MO 2.4	Identify and avoid or minimise adverse effects of orange roughy fishing activity on incidental bycatch species
Status at start of plan	○ Orange roughy fisheries are relatively clean fisheries in terms of bycatch but are known to take a number of finfish and deepwater shark species ○ Approximately 25% of the catch of non-QMS species reported by observers in orange roughy fisheries (Table 1) is reported against generic codes, particularly for rattail and shark species ○ Reported catch of non-QMS species that are reported against individual species codes are monitored under the process detailed in the paper 'Identification of candidate stocks for QMS introduction – standards and organisational procedures'
Target status at 5 year review	○ Incidental bycatch from orange roughy fisheries is monitored annually ○ Results of the ERA process ensure that high risk bycatch socks are identified and harvest trends are assessed annually ○ Action is taken when bycatch levels for a particular species mean that the species sustainability may be compromised or utilisation opportunities may be forgone – action may include QMS entry or other section 11 management measures ○ The use of generic reporting codes used by observers and fishers is reduced to less than 15% of total reported incidental bycatch
Supporting operational objectives	
OO2.4	Complete an ecological risk assessment (ERA) on the effects of the orange roughy fisheries on the aquatic environment (including the effects on trophic linkages etc.) by 2011
OO2.6	Monitor trends in captures of incidental bycatch species (Tier 3 species) in the orange roughy fishery from 2010
OO2.7	Minimise the use of generic reporting codes to record bycatch information in the orange roughy and black cardinalfish fisheries progressively from 2011

MO 2.5	Manage orange roughy fisheries to avoid or minimise adverse effects on the long term viability of protected, endangered and threatened species
Status at start of plan	○ Orange roughy fisheries are known to have a low level of interaction with fur seals, seabirds and protected shark and coral species ○ Seabird interactions are managed through both regulation and non-mandatory measures ○ Interactions with protected shark species are low ○ Marine mammal interactions are infrequent but the small risk of interactions is mitigated through non-mandatory measures (MMOP) ○ There are no management measures in place specific to protected coral species but significant areas of New Zealand EEZ are closed to bottom trawling under the Seamount and BPA initiatives

Target status at 5 year review	○ Robust information is available on actual incidental interactions with ETP species from all vessels targeting orange roughy ○ The ecological risk assessment (ERA) has assessed the nature and extent of the impact of the orange roughy fisheries on ETP species and, where this impact is adverse, management measures are in place to avoid or minimise the impact ○ All ETP species interactions in the orange roughy fisheries are managed to agreed standards
Supporting operational objectives	
OO2.4	Complete an ecological risk assessment (ERA) on the effects of the orange roughy fisheries on the aquatic environment (including the effects on trophic linkages etc.) by 2011
OO2.8	Ensure that interactions with ETP species identified as at risk during the ERA process are managed to avoid or minimise adverse effects to acceptable levels (which may include standards), from 2012

MO 2.6	**Manage orange roughy fisheries to avoid or minimise adverse effects on biological diversity**
Status at start of plan	Research and information on the full extent of adverse interactions on the biological diversity of the aquatic environment, including trophic relationships, due to orange roughy trawl activity is limited
Target status at 5 year review	○ The ERA has identified all adverse effects on biological diversity ○ Management measures are either in place, or under development, to avoid or minimise adverse effects on biological diversity of the aquatic environment
Supporting operational objectives	
OO2.1	Implement an agreed harvest strategy, consistent with the Harvest Strategy Standard, progressively across all major orange roughy stocks from 2010
OO2.2	Implement an agreed harvest strategy, consistent with the Harvest Strategy Standard, progressively across all black cardinalfish stocks from 2012
OO2.3	Ensure that the total harvest of orange roughy and key bycatch species is balanced against ACE and that overcatch of the TACC is minimised
OO2.4	Complete an ecological risk assessment on the effects of the orange roughy fisheries on the aquatic environment (including the effects on trophic linkages etc.) by 2011
OO2.5	Assess if existing protection of habitats of particular significance to the management of orange roughy fisheries is appropriate by 2013
OO2.8	Ensure that interactions with ETP species identified as at risk during the ERA process are managed to avoid or minimise adverse effects to acceptable levels (which may include standards), from 2012

MO 2.7	Manage effects from the impact of orange roughy fishing activity on the benthic habitat using a spatial management approach
Status at start of plan	Benthic Protection Areas and Seamount closures are in place which have closed over 30% of the New Zealand EEZ to bottom trawling activity
Target status at 5 year review	○ Assessment (post 2013) completed of whether existing benthic protection measures are sufficient ○ Variations to existing spatial protection implemented as appropriate on the basis of this assessment
Supporting operational objectives	
OO2.4	Complete an ecological risk assessment (ERA) on the effects of the orange roughy fisheries on the aquatic environment (including the effects on trophic linkages etc.) by 2011
OO2.5	Assess if existing protection of habitats of particular significance to the management of orange roughy fisheries is appropriate by 2013
OO2.9	Appropriate spatial management measures to address the impact that orange roughy bottom trawl fishing activity has on the benthic habitat are implemented post 2013

Operational Objectives: Performance Indicators

A performance indicator provides information (either qualitative or quantitative) on the extent to which an operational or management objective is achieving its outcomes.

Operational objectives should be SMART (specific, measurable, achievable, realistic and timely). The choice of performance indicator should ensure that evaluating progress towards achievement is possible – the outcome should be measurable and it should be possible to make comparisons with a previous point in time.

Individual tasks and actions to support the Operational Objectives will be specified in the Annual Operational Plan. A summary of these actions can be found on the introduction section to this chapter on page 3.

The performance indicators described below are primarily output based which means that progress towards meeting the operational objectives will be assessed through the completion of a suite of tasks and actions or the delivery of agreed services.

These performance indicators provide only an **expectation** of what will be delivered through the fisheries plan rather than **confirmation** that the tasks and actions associated with these operational objectives will be delivered in the time frame proposed. Actual tasks, including required resources and timeframes, will be described in the Annual Operational Plan. These performance indicators will be reported against in the Annual Review Report.

Operational objectives – Utilisation Performance Indicators

MO1.2	**OO1.1**	**Ensure the management of each orange roughy fishery is explicitly linked to agreed management objectives from 2011**
	1	Cost benefit evaluation process developed during 2010-11 for all management decisions relevant to orange roughy
	2	Evaluation process implemented from 2011-12
MO1.4	**OO 1.2**	**Ensure the research and monitoring programme for all orange roughy fisheries is clearly linked to management objectives by 2010**
	1	All orange roughy research is delivered through the 10 Year Research Programme (as described in Part 1A) from 2011
MO1.2	**OO 1.3**	**Establish an open, transparent and inclusive management environment through: (1) ensuring all management information is available and easily accessible by all; and (2) collaboratively engaging with stakeholders on the management of the fishery, from 2011**
	1	Annual Operational Plan published on the MFish website in July each year - starting in 2011
	2	Annual Review Report published on the MFish website in November each year – starting in 2011
	3	Revised MOU in place by December 2010
	4	Environmental Advisory Group established by end of 2010.

MO1.5	**OO 1.4**	**Ensure that all research used to inform management continues to be peer reviewed and meets approved research standards**
	1	All science information used to inform management meets the appropriate research standards and is peer reviewed through MFish processes
MO1.5	**OO 1.5**	**Ensure that all management settings are peer reviewed and comply with, or exceed, international best practice, progressively from 2011**
	1	Measures to achieve this objective are clearly documented in the Annual Operational Plan and performance is assessed against the Annual Review Report from 2011
MO1.5	**OO 1.6**	**Monitor levels of fisher compliance annually against a set of agreed compliance standards and benchmarks, from 2011**
	1	Performance of the orange roughy and key bycatch fisheries are assessed against a comprehensive set of compliance benchmarks from 2011
MO1.5	**OO 1.7**	**Ensure appropriate and transparent action is taken when compliance levels fall below the agreed benchmark from 2011**
	1	MFish Field Operations report annually on actions taken against operators and quota owners engaged in non-compliant activity across all deepwater fisheries. This information and subsequent enforcement actions are summarised in the Annual Review Report from 2011
MO1.6	**OO1.8**	**Create an 'information hub' where all information on the management of orange roughy and black cardinalfish is available and easily accessible by all from 2012**
	1	MFish website is the 'go-to' site for public and media for full information on the management of orange roughy and black cardinalfish stocks from 2012
MO1.7	**OO1.9**	**Facilitate greater commercial iwi involvement in the management of orange roughy and black cardinalfish through the DWG from 2010**
	1	Improved iwi participation in management issues is apparent from increased iwi representation on the DWG
MO1.7	**OO1.10**	**Utilise the collaborative relationships currently established between the Ministry of Fisheries and iwi groups to ensure iwi have the opportunity to effectively input and participate in the management of orange roughy and black cardinalfish from 2011**
	1	Annual Operational Plans and Annual Review Reports are presented to relevant iwi forums to provide for input into the prioritisation of tasks and services to support the delivery of fishery specific objectives in the first instance and, the delivery of objectives specified in Iwi Fish Plans over time

MO1.7	OO1.11	Ensure management measures and controls are assessed in terms of their contribution to the value of the orange roughy fisheries before implementation from 2011
	1	Cost benefit evaluation process developed during 2010-11 for all management decisions relevant to orange roughy
	2	Evaluation process implemented from 2011-12

Operational objectives – Environmental Performance Indicators

MO2.1	**OO 2.1**	**Implement an agreed harvest strategy, consistent with the Harvest Strategy Standard, progressively across all major orange roughy stocks from 2010**
	1	Biological reference points developed and agreed for use across all orange roughy stocks from 2011
	2	Harvest control rules and rebuild strategies developed and agreed for individual stocks from 2011
	3	Monitoring and management of orange roughy fisheries against the harvest strategy[11] agreed by: -2011 for ESCR, -2012 for NWCR, MEC, ORH 7A, ORH 2A North -2013 for Sub-Antarctic, ORH 1, ORH 7B, Puysegur
MO2.1	**OO 2.2**	**Implement an agreed harvest strategy, consistent with the Harvest Strategy Standard, progressively across all black cardinalfish stocks from 2012**
	1	Biological reference points for black cardinalfish stocks developed and agreed by 2011
	2	Harvest control rules and rebuild strategies developed and agreed during 2012
	3	Harvest strategy implemented progressively across all black cardinalfish stocks from 2012
MO2.2	**OO 2.3**	**Ensure that the total harvest of orange roughy and key bycatch species is balanced against ACE and that overcatch of the TACC is minimised**
	1	Performance of the orange roughy fishery and key bycatch species against the TACC is assessed annually
	2	Deemed value rates are reviewed annually and where appropriate are amended so as to provide an incentive to cover catch with ACE
MO2.3 MO2.4 MO2.5 MO2.6 MO2.7	**OO 2.4**	**Complete an ecological risk assessment (ERA) on the effects of orange roughy fisheries on the aquatic environment (including the effects on trophic linkages etc.) by 2011**
	1	ERA completed, with stakeholder participation, by 2012
	2	Final report available on additional management measures required to address environmental impacts from orange roughy fishing by 2012
	3	Description of proposed mitigation approach for implementation and timeframe for these additional measures is available for the start of the 2012- 2013 fishing year

[11] Monitoring strategies will vary between stocks but in all cases will dictate how the status of a stock will be assessed against the biological reference points. Note that for some stocks an agreed monitoring strategy will build on an existing time series of survey data, while in others a new time series will be initiated. In the latter case, information to determine stock status may not be available for several years.

MO2.2	**OO 2.5**	**Assess if existing protection of habitats of particular significance to the management of orange roughy fisheries is appropriate by 2013**
	1	Report produced documenting and mapping habitats of particular significance in the orange roughy fisheries by 2012
	2	Assessment report on extent of existing protection measures in meeting protection requirements for habitats of particular significance for fisheries management available by 2013
	3	Report specifying additional levels of habitat protection required for orange roughy fisheries management purposes available by 2014 for implementation during 2014-2015
MO1.4 MO2.4	**OO 2.6**	**Monitor trends in captures of incidental bycatch species (Tier 3 species) in the orange roughy fishery from 2010**
	1	Report produced annually on extent of captures of incidental bycatch species from observed vessels from 2010
	2	Level 1 Risk Assessment completed for all deepwater and middle-depth incidental bycatch species by end of 2011-2012
MO1.4 MO2.4	**OO 2.7**	**Minimise the use of generic reporting codes to record bycatch information in the orange roughy and black cardinalfish fisheries progressively from 2011**[12]
	1	Up to date species identification guides and reporting codes are available for use on all deepwater trawl vessels from 2011
	2	Annual audit completed on the extent of use of generic reporting codes for ETP and bycatch species starting in 2011
MO1.5 MO2.5	**OO 2.8**	**Ensure that interactions with ETP species identified as at risk during the ERA process are managed to avoid or minimise adverse effects to acceptable levels (which may include standards from 2012**
	1	Report on incidental ETP captures included in Annual Review Report from 2011
	2	Report on performance of orange roughy fishery against available environmental standards produced annually from 2011
	3	Additional management measures to ensure the fishery meets agreed standards are implemented within a time frame consistent with the agreed standard
	4	In the absence of standards a transparent and clearly demonstrated approach of continuous improvement is implemented from October 2011

[12] Generic codes will remain necessary as it will never be possible for all bycatch to be identified to species level. This objective establishes the aim of continual improvement in reporting of bycatch, by both observers and vessels, to species level over the duration of the plan.