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Full Assessment
New Zealand Orange Roughy Fisheries

Public Certification Report
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Volume 1: Report; Scoring; Peer Review

Prepared for
Deepwater Group Limited

Prepared by
MRAG Americas, Inc.

Contents

Figures 2
Tables 5
Glossary 1
1 Executive Summary 3
2 Authorship and Peer Reviewers 3
2.1. MRAG Assessment team 3
2.2. Peer reviewers 4
3 Description of the Fishery 6
Unit(s) of Certification and Scope of Certification Sought 6
Overview of the fisheries 7
3.3.1 Background and history 7
3.3.2 Fishing gear and methods 10
Principle One: Target Species Background 12
3.3.1 Outline of the fishery resources 12
3.3.2 Stock structure 14
3.3.3 Life history 18
3.3.4 Stock assessments 19
3.3.5 ORH3B Chatham Rise and Southern New Zealand 22
3.3.6 Management advice 33
Principle Two: Ecosystem Background 42
3.4.1 Retained and bycatch species 42
3.4.2 Protected fishes 61
3.4.3 Seabirds and Marine Mammals 62
4.4.5 Corals 63
3.4.5 Habitat 78
3.3.7 Ecosystem 91
Principle Three: Management System Background 93
3.5.1 Area of operation of the fishery and under which jurisdiction it falls 94
3.5.2 Particulars of the recognised groups with interests in the fishery and individuals or groups granted rights of access 95
3.5.3 Details of consultations leading to the formulation of the management plan .. 96
3.5.4 Arrangements for ongoing consultations and decision-making processes 96
3.5.5 Details of non-fishery users or activities and arrangements for liaison and co-ordination 97
3.5.6 Objectives for the fishery 98
3.5.7 Measures agreed upon for the regulation of fishing 99
3.5.8 Monitoring, control and surveillance and enforcement 100

3.5.9 Jurisdictional category 102
3.5.10 Details of any planned education and training for interest groups. 102
3.5.11 Date of next review and audit of the management plan 102
3.5.12 Description of fishery's research plan. 103
4 Evaluation Procedure 104
4.1. Harmonised Fishery Assessment 104
4.2. Previous assessments 104
4.3. Assessment Methodologies 104
4.4. Evaluation Processes and Techniques 104
4.4.1 Site Visits 104
4.4.2 Evaluation Techniques 105
5 Traceability 107
5.1. Eligibility Date 107
5.2. Traceability within the Fishery 107
5.3. Eligibility to Enter Further Chains of Custody 108
5.4. Eligibility of Inseperable or Practically Inseparable (IPI) stock(s) to Enter Further Chains of Custody 109
6 Evaluation Results 109
6.1. Principle Level Scores 109
6.2. Summary of Scores 110
6.3. Summary of Conditions 113
6.4. Determination, Formal Conclusion and Agreement 113
References 114
Appendices 120
Appendix 1 Scoring and Rationales 120
Appendix 1.1 Performance Indicator Scores and Rationale 120
Principle 1 121
Principle 2 136
Principle 3 181
Appendix 1.2 Conditions 203
Appendix 2 Peer Review Reports 208
Appendix 2.1 Peer Review No. 1 208
Appendix 2.2 Peer Review No. 2 217

Figures

Figure 1 Generic Fishery Management Areas for New Zealand (Source DWG) 8
Figure 2 Orange roughy Quota Management Areas and the Three Units of Assessment for New Zealand (Source DWG) 9

Figure 3 Stylised net construction diagrams for typical bottom trawl nets used in the New Zealand deepwater orange roughy targeted bottom trawl fishery. Two alternate simplified net 11
Figure 4 Orange roughy Mid-East Coast Management Area (QMAs ORH2A South, ORH2B and ORH3A) 16
Figure 5 Designated Sub-Area Boundaries for Orange Roughy in the ORH3B QMA. The Spawning Box is within the western part of the East Chatham Rise (i.e. to the east of 175°W). The sub-Antarctic is all areas below 46°S on the east coast, and 44°16'S on the west coast, except Puysegur. (Source: DWG)..... 17
Figure 6 Priors (in red) and posterior distributions for a selection of acoustic *q*s for the PRB3B ESCR stock. The blue dot is the MPD estimate and R is the ratio of the mean of the posterior to the mean of the prior (Source: MPI 2014b). Three of the priors were updated in an optimistic direction and one in a pessimistic direction in terms of stock abundance..... 22
Figure 7 ORH3B Northwest Chatham Rise base, MCMC estimated spawning-stock biomass trajectory. The box in each year covers 50% of the distribution and the whiskers extend to 95% of the distribution. The hard limit (dotted red line), soft limit (solid red line), and management target range (green) are marked by horizontal lines. 26
Figure 8 Historical trajectory of spawning biomass (%B_0), median exploitation rate (%) and fishing intensity (100-ESD) for the ORH3B Northwest Chatham Rise (base model, medians of the marginal posteriors). The management target range of 30-50 % B_0 and the corresponding exploitation rate range are marked in green. The soft limit (20% B_0) is marked by a solid red line and the hard limit (10% B_0) by a dashed red line. Note that the Y-axis is non-linear. 26
Figure 9 ORH3B ESCR base, MCMC estimated spawning-stock biomass trajectory. The box in each year covers 50% of the distribution and the whiskers extend to 95% of the distribution. The hard limit (dotted red line), soft limit (solid red line), and management target range 30–50% B_0 (green) are marked by horizontal lines. 29
Figure 10 Historical trajectory of spawning biomass (%B_0), median exploitation rate (%) and fishing intensity (100-ESD) (base model, medians of the marginal posteriors) for the ORH3B ESCR. The management target range of 30-50 % B_0 and the corresponding exploitation rate range are marked in green. The soft limit (20% B_0) is marked by a solid red line and the hard limit (10% B_0) by a dashed red line. Note that the Y-axis is non-linear..... 30
Figure 11 ORH7A Challenger, base, MCMC estimated spawning-stock biomass trajectory. The box in each year covers 50% of the distribution and the whiskers extend to 95% of the distribution. The hard limit (dotted red line), soft limit (solid red line), and management target range (green) are marked by horizontal lines. 32
Figure 12 Historical trajectory of spawning biomass (%B_0), median exploitation rate (%) and fishing intensity (100-ESD) (base model, medians of the marginal posteriors) for the ORH7A Challenger stock. The management target range of 30-50% B_0 and the corresponding exploitation rate (fishing intensity) range are marked in green. The soft limit (20% B_0) is marked by a solid red line and the hard limit (10% B_0) by a dashed red line. Note that the Y-axis is non-linear 32
Figure 13 The prior (red line) and posterior (histogram) for steepness from the Beverton-Holt (left panel) and Ricker (right panel) MCMC runs (from Cordue, 2014c). 35
Figure 14 ORH3B East and South Chatham Rise base model: projections under dynamic HCR10 (catch limit: 3,772 t for 2015–2018 inclusive; 4,965 t for 2019–2021 inclusive; 5,768 t for 2022–2024 inclusive; 6,317 t in 2025) (Cordue, 2014c). The box and whiskers plots are of projected mid-season spawning biomass. The medians are shown by the horizontal red lines; the boxes cover the middle 50%; and the whiskers extend to the 95% CI. 37
Figure 15 ORH3B East and South Chatham Rise, "worst case" lowM-highq model: projections under the catch limits from dynamic HCR10 applied to the base model (3,772 t for 2015–2018 inclusive; 4,965 t for 2019–2021 inclusive; 5,768 t for 2022–2024 inclusive; 6,317 t in 2025) (Cordue, 2014c). The box and whiskers plots are for projected mid-season spawning biomass. The medians are shown by the horizontal red lines; the boxes cover the middle 50%; and the whiskers extend to the 95% CI..... 37

Figure 16 An array of functional relationships between estimated stock status and fishing mortality (*F*) under the HCR. The initial relationship is shown where F_{mid} = 0.045. The grey lines show the new relationship should the next assessment provide stock status estimates of 20, 21, 22, … 29 % B_0. The red lines show the updated relationships if the assessment after that has an estimate of 20% B_0 or lower (in which case the relationship is scaled down by 0.9). The blue lines are the new relationship if yet another assessment has stock status at 20% B_0 or lower. The maximum cumulative scaling down is limited by a scalar of 0.3 (solid black line). 40
Figure 17 The scaling function for the fishing mortality used in the control rule. 40
Figure 18 Annual estimates of non-orange roughy catch (called bycatch in this figure, but not the same as the MSC definition of bycatch) in the orange roughy trawl fisheries, calculated for commercial species (COM), non-commercial species (OTH), QMS species, and overall for 1990–91 to 2008–09 (black points). Also shown (grey points) are earlier estimates of bycatch in each category (excluding QMS) calculated for 1990–91 to 2004–05 (Anderson *et al.* 2001, Anderson 2009). Error bars show the 95% confidence intervals. The black line in the bottom panel shows the total annual estimated landings of orange roughy (O. Anderson and M. Dunn (NIWA), unpublished data). (From Figure 6.13, MPI, 2013). 44
Figure 19 Bayesian posterior distribution of mature biomass as a percentage of B_0 for model 3.2 (left) and 5.2 (right). Dashed lines represent the target (40% B_0), soft limit (20% B_0), and hard limit (10% B_0) respectively. 47
Figure 20 Relative biomass estimates (thousands of tonnes) of selected deepwater dogfish sampled by annual trawl surveys of the Chatham Rise, January 1992–2014. Black lines show fish from core (200–800 m) strata. Blue lines show fish from core strata plus the northern deep (800–1,300 m) strata. Error bars show ± 2 standard errors (Stevens *et al.*, 2015). 49
Figure 21 Observed and predicted distributions for coral Orders a) Scleractinia, b) Gorgonacea (previous pages) and c) Antipatharia (above) in relation to the trawl footprint of the orange roughy fishery and the 500-1,600 m depth range in the New Zealand EEZ. 68
Figure 22: Observed and predicted distributions for coral Orders a) Scleractinia, b) Gorgonacea (previous page) and c) Antipatharia (above) in relation to the trawl footprint of the orange roughy fishery and the 500-1,600 m depth range in the ORH7A UoA. 70
Figure 23 Observed and predicted distributions for coral Orders a) Scleractinia (previous page), b) Gorgonacea and c) Antipatharia (above) in relation to the trawl footprint of the orange roughy fishery and the 500-1,600 m depth range in the ORH3B NWCR UoA. 71
Figure 24 Observed and predicted distributions for coral Orders a) Scleractinia, b) Gorgonacea (previous page) and c) Antipatharia (above) in relation to the trawl footprint of the orange roughy fishery and the 500-1,600 m depth range in the ORH3B ESCR UoC. 73
Figure 25 : Hills (red), knolls (green) and seamounts (blue) in the UoAs (ORH7A, ORH3B Northwest Chatham Rise, ORH3B East & South Chatham Rise), the New Zealand EEZ and the Kermadec Bioregion (from Roux *et al.*, 2015). 79
Figure 26 Summary by UoA, New Zealand EEZ, and Kemadec Bioregion, of the numbers of known UTFs, numbers of UTFs target-fished for orange roughy and oreo, and proportion of seamounts fished during the period 2008-09 to 2012-13 80
Figure 27 Current spatial restrictions to bottom trawling within the New Zealand EEZ (DWG, 2015). 85
Figure 28a The extent of the ORH trawl footprint in relation to ORH slope habitat area and closed areas during the period 2008-09 to 2012-13 in the ORH7A UoA (Black *et al.,* 2015). 87
Figure 29 Structure of the management system for New Zealand deepwater fisheries. 94

Tables

Table 1 GIS-based summary of orange roughy UoA catches (1978-79 to 2014-15) (tonnes) 13
Table 2 Number of vessels by length in the three orange roughy UoAs over the past five years (2008-09 to 2012-13) (registered length in metres). Note: The same vessels fish in all three fisheries, but not all vessels fish in all fisheries in all years. 14
Table 3 Recent catches and agreed catch limits (t) for the three units of assessment based on a GIS analysis of catch locality (Source: DWG, 2015). 23
Table 4 Survey estimates of spawning biomass used in the 2014 base model for the ORH3B NWCR (excludes 2002 and 2004). “GY” = Graveyard, “M” = Morgue, “O” = other hills. The CVs are those used in the model and do not include any process error. 25
Table 5 Acoustic estimates of average pluming spawning biomass in the three main spawning areas in ORH3B ESCR as used in the assessment. All estimates were obtained from surveys on *FV San Wataki* from 38 kHz transducers. Each estimate is the average of a number of snapshots as reflected by the estimated CVs. 28
Table 6. Biomass indices used in the stock assessment for the ORH7A Challenger stock. The model CV is the observation error used in the base model. A 20% process error CV was added to the sample CV for the trawl indices. The CV for the combined acoustics and trawl estimates was split between the informed *q*-prior (CV = 21%) and the observation error in the model. 30
Table 7 Summary of the estimates of unfished biomass from the three assessments, along with the estimate of current (2014) biomass relative to B_0. The values in parentheses indicate 95% credibility intervals. 33
Table 8 Summary of stock status of each UoA relative to the hard limit and the management target range (MPI, 2014b, c; Cordue, 2014d) 33
Table 9 Bayesian estimates of B_{MSY} for the base model assuming a Beverton-Holt or a Ricker stock recruitment relationship. The median and 95% CIs are given as a percentage of virgin mid-season mature biomass (B_0). 38
Table 10 Bayesian estimates of the limit reference point for the base model assuming a Beverton-Holt or a Ricker stock-recruitment relationship. The median and 95% CIs are given as a percentage of virgin mid-season mature biomass (B_0). 38
Table 11 The outcomes of the HCR for each of the three stocks and the catch limits agreed by the Minister of Fisheries 41
Table 12 The expected frequency and type (trawl, hull mounted acoustics, multi-frequency acoustic system) of survey for orange roughy relevant to the certification of the ORH 7A, ORH 3B NWCR and ESCR fisheries (Tingley, 2014). 41
Table 13 The expected frequency and timing of stock assessments (Tingley, 2014)..... 41
Table 14 Annual trawl effort (total tows) and observer coverage (% of total tows observed) for each of the three orange roughy management areas (ORH3B ESCR, ORH3B NWCR, and ORH7A) (From DWG Ltd, MPI (2013) as reported in Boyd (2013))..... 43
Table 15 Estimates of Mature biomass for OEO 4 smooth oreo for MCMC model runs 3.2 and 5.2. 47
Table 16 ORH3B NWCR UoA: QMS (retained) species (kg and % represent observer data, and tonnes represents the estimated [scaled up] total catch) (MPI, 2015b)..... 50
Table 17 ORH3B NWCR UoA: non-QMS (bycatch) species (species > 2 tonnes per year. For remainder, see MPI, 2015). (kg and % represent observer data, and tonnes represents the estimated [scaled up] total catch) (MPI, 2015b)..... 51
Table 18 Summary of deepwater dogfish catch in ORH3B NWCR UoA (MPI, 2015b). The data come from Table 17, and show total catch by species or species group scaled up from observer data and the proportion of dogfish catch in NWCR relative to total dogfish catch in FMA 4 and in the EEZ..... 52
Table 19 ORH3B ESCR: QMS (retained) species (kg and % represent observer data, and tonnes represents the estimated [scaled up] total catch) (MPI, 2015b)..... 55

Table 20 ORH3B ESCR UoA: non-QMS (bycatch) species (species > 2 tonnes per year. For remainder, see MPI, 2015). (kg and % represent observer data, and tonnes represents the estimated [scaled up] total catch) (MPI, 2015b)..... 56
Table 21 Summary of deepwater dogfish catch in ORH3B ESCR UoA. (MPI 2015b). The data come from Table 20, and show total catch by species or species group scaled up from observer data and the proportion of dogfish catch in NWCR relative to total dogfish catch in FMA 4 and in the EEZ..... 57
Table 22 ORH7A UoA: QMS (retained) species (kg and % represent observer data, and tonnes represents the estimated [scaled up] total catch) (MPI, 2015b)..... 58
Table 23 ORH7A UoA: Non-QMS (bycatch) species (kg and % represent observer data, and tonnes represents the estimated [scaled up] total catch) (MPI, 2015b)..... 59
Table 24 Total number of observed and estimated captures (n) of seabirds and marine mammals between 2002 and 2012 by orange roughy trawl fisheries in the three UoA areas. Large birds include the albatrosses listed above and small birds include sooty shearwaters (*Puffinus griseus*) and white chinned petrels (*Procellaria aequinoctialis*). Mammals include New Zealand fur seals (*Arctocephalus forsteri*). 62
Table 25 Observed vs predicted coral distribution overlap for ORH UoA areas and the NZ EEZ for the five year period between 2009 and 2013 and total time period (from data presented in NIWA 2015)..... 73
Table 26 Proportional occurrence of protected coral observed and predicted in MPAs in each ORH fishing area and the New Zealand EEZ as a whole (from data presented in NIWA 2015)..... 74
Table 27 Peak catch (t) and fishing year, current catch limit (t), current catch limit as a percentage of the peak catch, projected catch limit (t) at a future date (from the MSE) and projected catch limit as a percentage of the peak catch for each fishery. Peak catches and current catch limits from MPI (2015); projected catch limits from Table 14 of Cordue (2014). 76
Table 28 Overlap of UTFs with ORH/OEO combined trawl footprint and closed or unfished areas (data from Roux *et al.,* 2015 and GNS) 77
Table 29. Marine Reserves in New Zealand to 2014..... 81
Table 30 Summary of orange roughy and oreo targeted trawl footprint analysis for slope habitat in the three UoAs for the most recent five-year period (2008-09 to 2012-13) and for all years for which TCEPR data are available (1989-90 tp 2012-13) (Black *et al.*, 2015)..... 86
Table 31 Management objectives from the National Deepwater Plan (MPI 2013) 99
Table 32 Scoring elements 106
Table 33 Final Principle Scores 109
Table 34 Summary of Conditions..... 113

Glossary

ACE	Annual Catch Entitlement
B_0	Unfished Equilibrium Biomass
AEEF	Assessment of the Enviromental Effects of Fishing
ALC	Automatic Location Communicator
BPA	Benthic Protection Area
CAY	Current Annual Yield
CITES	Convention on International Trade in Endangered Species
CLR	Catch Landing Return
CPUE	Catch Per Unit Effort
DOC	New Zealand Department of Conservation
DWG	Deepwater Group Limited
DFAWG	Deepwater Fisheries Assessment Working Group
ETP	Endangered, Threatened, Protected Species
FARs	Fishery Assessment Reports
FAWGs	Fishery Assessment Working Groups
FCV	Foreign Charter Vessel
HCR	Harvest Control Rule
HSS	Harvest Strategy Standard for New Zealand Fisheries
LFR	Licensed Fish Receiver
LMA	Large Marine Reserve
MFish	Ministry of Fisheries. MFish merged with the Ministry of Agriculture and Forestry (MAF) in July 2011 to become part of the Ministry for Primary Industries (MPI).
MLS	Minimum Legal Size
MPA	Marine Protected Area
MPI	Ministry for Primary Industries (representing the Crown and its statutory obligations to the public). Formery the Ministry of Agriculture and Forestry and before that the Ministry of Fisheries.
MSE	Management Strategy Evaluation
MSY	Maximum Sustainable Yield
nm	Nauticle Mile
NGO	Non-Governmental Organisation
NIWA	National Institute of Water and Atmospheric Research
NPA	National Plan of Actions
NZ	New Zealand
ORH3B	ESCR UoA The UoA within the ORH3B QMA within the designated area known as the East and South Chatham Rise management area east of 179^{o} 30' W on the southern Chatham Rise (see Figure 2)
ORH3B	NWCR UoA The UoA within the ORH3B QMA managed as a separate stock unit within the designated area known as the North West Chatham Rise (see Figure 2)
ORH7A UoA	The UoA including the orange roughy 7A QMA along with that area known as the Westpac Bank immediately adjacent to and outside of the New Zealand EEZ boundary – recognised as a straddling stock under UNCLOS (Figure 2)
QMA	Quota Management Area
QMS	Quota Management System
SPRFMO	South Pacific Regional Fisheries Management Organisation
TAC	Total Allowable Catch
TACC	Total Allowable Commercial Catch
TCEPR	Trawl Catch Effort and Processing Returns

TCER	Trawl Catch Effort Returns
TOKM	Te Ohu Kai Moana
UoA	Unit of Assessment (see **MSC-MSCI Vocabulary** for MSC defined terms)
UoC	Unit of Certification
UTF	Underwater Topographic Features (including hills, knolls, and seamounts)
VMS	Vessel Monitoring System

1 Executive Summary

An assessment team of Robert J. Trumble, André Punt, and Amanda Stern-Pirlot conducted the assessment using MSC Certification Requirements (CR) v1.3. The fishery has three units of assessment: ORH3B East and South Chatham Rise (ESCR) (east of 179° 30' W), ORH3B Northwest Chatham Rise (NWCR), and ORH7A (including Westpac Bank). The assessment team met with scientists, managers, and other stakeholders from New Zealand and Australia from 27 July 2014 to 4 August 2014. The fishery is exceptionally well managed and is characterized by state of the art stock assessments and harvest strategies. All three stocks had dropped well below the current target range of 30-50% B_0 but have increased in abundance since the 1990s or 2000s. The stocks of NWCR and ORH7A are in good condition and within the target range. The stock of ESCR has increased to the bottom of the target range. New zealand implements high levels of control over the fisheries to minimize environmental impacts. However, the fishery occurs in regions with deepwater corals. The overarching legislation and regulation affecting Principle 1 and Principle 2 are highly developed, and applied specifically to the fisheries. On the basis of this re-assessment of the fisheries, the Assessment Team recommends that the New Zealand fishery for orange roughy receive certification. The assessment team identified two performance indicators for ORH3B NWCR and ORH3B ESCR, one performance indicator for ESCR and one performance indicator for all units that scored less than 80 and received conditions:

1.1.1 Stock status: ORH3B ESCR meets scoring issue a of SG80, but not scoring issue b of SG80, so received a score of 70.

2.3.1. ETP species outcome: All three fisheries meet scoring issues a and c of the SG 80 but ORH3B NWCR and ORH3B ESCR only partially meet scoring issue b of the SG80 (all elements except coral meet SG80), so received a score of 75.

2.3.3 ETP species information: All three fisheries meet scoring issues a and c of the SG 80 but ORH3B NWCR and ORH3B ESCR only partially meet scoring issue b of the SG80 (all elements except coral meet SG80), so received a score of 75.

3.2.5: Management system review: All three fisheries meet scoring issue a, but do not meet scoring issue b, so received a score of 70.

Final Principle Scores	Score		
Principle	**3B - NWCR**	**3B - ESCR**	**7A**
Principle 1 – Target Species	86.9	81.9	86.9
Principle 2 – Ecosystem	87.0	86.0	87.7
Principle 3 – Management System	95.3		

MRAG Americas has determined that the three fisheries should be certified.

2 Authorship and Peer Reviewers

2.1. MRAG Assessment team

Dr. Robert J. Trumble serves as team leader. He joined MRAG Americas in 2000 as a senior research scientist and became Vice President in 2005. He has wide-ranging experience in marine fish science and management, fishery habitat protection, and oceanography. Dr. Trumble serves as Certification Manager for MRAG. He has overseen all

MRAG pre-assessments and full assessments. He has received MSC training, including the Risk-based Framework, and has led an RBF on three occasions. Previously, he served as Senior Biologist of the International Pacific Halibut Commission in Seattle, Washington, in various research and management positions at the Washington Department of Fisheries, and with the US Naval Oceanographic Office. Dr. Trumble has extensive experience working with government agencies, commercial and recreational fisheries groups, Indian tribes, and national and international advisory groups. He received appointments to the Scientific and Statistical Committees of the South Atlantic Fishery Management Council and the Pacific Fishery Management Council, the Groundfish Management Team of the North Pacific Fishery Management Council, the affiliate faculty of Fisheries at the University of Washington, and the Advisory Committee of the Washington Sea Grant Program. Dr. Trumble received a Ph.D. in Fisheries from the College of Fisheries, University of Washington.

Dr. André E. Punt is a Professor at the University of Washington and Director of the School of Aquatic and Fisheries Sciences. He is a quantitative scientist with a specialty of providing quantitative scientific advice for fisheries management, focusing on new methods for assessing fish and marine mammal populations; Bayesian assessment and risk analysis methods; and evaluating the performance of existing methods for assessing and managing renewable resource populations. He uses methods for assessing fish and marine mammal populations that are tailored specifically to the situation in question. Current areas of interest are spatial models, individual-based models, and stage-structured models. He has worked as a resource population modeller at the University of Cape Town, a resource modeller at CSIRO in Australia, and at the University of Washington. He has a Ph.D. from the University of Cape Town in South Africa.

Ms. Amanda Stern-Pirlot. Amanda Stern-Pirlot joined MRAG Americas in 2014 as MSC Certification Manager. She has worked together with other scientists, conservationists, fisheries managers and producer groups on international fisheries sustainability issues for the past 10 years. With the Institute for Marine Research (IFM-GEOMAR) in Kiel, Germany, she led a work package on simple indicators for sustainable within the EU-funded international cooperation project INCOFISH, followed by five years within the Standards Department at the Marine Stewardship Council (MSC) in London, developing standards, policies and assessment methods informed by best practices in fisheries management around the globe. Most recently she has worked with the Alaska pollock industry as a resources analyst, within the North Pacific Fisheries Management Council process, focusing on bycatch and ecosystem-based management issues, and managing the day-to-day operations of the offshore pollock cooperative. She has co-authored a dozen publications on fisheries sustainability in the developing world and the functioning of the MSC as an instrument for transforming fisheries to a sustainable basis. Ms. Stern-Pirlot is an M.Sc. graduate of the University of Bremen, Center for Marine Tropical Ecology (ZMT) in marine ecology and fisheries biology.

2.2. Peer reviewers

Dr. Don Bowen is a Ph.D. graduate of the University of British Columbia, Vancouver, British Columbia. He has been a research scientist at the Bedford Institute of Oceanography, Dartmouth and an Adjunct Professor of Biology at Dalhousie University, Halifax, Nova Scotia for more than 25 years. He has studied the ecology, energetics and population dynamics of North Atlantic seals. As Chief Marine Fish Division, he was responsible for fisheries research and stock assessments of commercially harvested fishes on the Scotian Shelf and currently leads the assessments of seals and Atlantic halibut. Interests also include ecological interactions of marine mammals and seabirds with fisheries and ecosystem change. Has published over 220 scientific papers, including 155 journal articles and book

chapters and two books. He has served on the USA recovery team of the Hawaiian monk seal, and as chair of the UK Special Committee on Seals. He has broad national (Natural Science and Engineering Research Council, DFO) and international (National Academy, NSF, NRC, NMFS, NERC, NRPB) experience as a science advisor and served as member of the Board and Editor of Marine Mammal Science for five years. He has considerable experience as an MSC assessor having been involved with a number of groundfish fisheries certifications (e.g., pollock, Pacific cod, flatfishes) in the Bering Sea and Gulf of Alaska and has served as an external reviewer on US West coast trawl groundfish fisheries and Cornish hake. In these assessments, he has evaluated the effects of both bottom and pelagic trawls on shallow and deep benthic habitats, including structure forming groups, such as corals, sponges and sea pen/whips, habitat diversity and the spatial effects of fishing on habitats.

Tom Jagielo has a wide breadth of experience in marine fish science, habitat studies, and oceanography. He formed his own firm in 2008 to provide consulting services in quantitative fisheries science. Previously he served for 24 years with the Washington Department of Fish and Wildlife, and 6 years with the Fisheries Research Institute at the University of Washington in Seattle. He has specialized in groundfish stock assessment and survey design, adapting state of the art tools and methods to assess marine fish populations for sustainable fisheries management. He has produced groundfish stock assessments used by the Pacific Fishery Management Council, including analysis of lingcod, black rockfish, and yelloweye rockfish populations. Tom has experience working with government agencies, commercial and recreational fisheries groups, Native American tribes, community organizations, and both national and international advisory groups. He has received appointments to the Scientific and Statistical Committee of the Pacific Fishery Management Council, the Technical Subcommittee of the US-Canada Groundfish Committee, the Pacific Coast Ocean Observation System, and other workshop panels and review bodies. He has published in peer-reviewed journals and symposium proceedings, and has presented papers at national and international meetings. Tom received a B.S. degree in Biology from the Pennsylvania State University, and a M.S. degree in Fisheries from the University of Washington, where he also conducted post M.S. graduate studies in fisheries population dynamics and parameter estimation. In addition to serving as an MSC Surveillance Team Member/Auditor (P1,P2, and P3 expert) for various stocks in the US and Europe, he has experience in providing MSC Peer Reviews on the West Coast-US (Pacific hake, Limited Entry groundfish, sablefish, Pacific halibut), West Coast-Canada (dogfish shark, sablefish, Pacific halibut), Alaska (sablefish, Pacific halibut, pacific cod, flatfish), and Australia (blue grenadier).

3 Description of the Fishery

Unit(s) of Certification and Scope of Certification Sought

3.1.1 Units of Assessment

The MRAG Americas assessment team has determined that the fishery is within scope for an MSC assessment, without use of poisons or explosives, and without unilateral exemptions. It does not target out of scope species, is not enhanced, and not subject to forced labor investigations or convictions.

The units of assessment proposed for MSC certification consist of:

Species	New Zealand Orange Roughy (*Hoplostethus atlanticus*)
Geographical range of fishing operations	ORH3B ESCR (east of 179° 30' W), ORH3B NWCR, and ORH7A (including Westpac Bank)
Method of capture	Demersal trawl
Stocks	Include ORH catches from each of the three fish stocks within the designated management areas as units of assessment: ORH7A (including the Westpac Bank) ORH3B East and South Chatham Rise (excluding ORH catches from those waters west of 179° 30' W) ORH3B Northwest Chatham Rise. Each of these stocks is assessed in its entirety for P1. The Westpac Bank lies outside of the New Zealand EEZ but the orange roughy stock here is a straddling stock managed as part of the ORH7A stock. The three units of assessment include fishing effort and tows that target orange roughy (ORH), black oreo (BOE), smooth oreo (SSO) and oreo (OEO). The ESCR UoA term used in this report refers to the ESCR east of 179° 30' W. If referring to ESCR Management Area, it means science, monitoring and management are carried out at the scale of the ESCR management area. While the UoA represents 47% of the total ESCR management area, it comprises ~99% of the total catch (based on the past 10 years catch data). The ORH3B ESCR unit of assessment is smaller than the range of the unit stocks, as targeted tows for ORH, BOE, SSO and OEO occur in less than the full range of the managed ESCR stock. Participating vessels must implement an industry Operational Procedure (OP) that requires all skippers to define the target species and to record this on their Trawl Catch Effort and Processing Returns **(**TCEPR) form ***before*** shooting within each of the agreed MSC UoC areas. The implementation of this OP would be independently monitored by MPI Observers to verify compliance.

Management The fisheries are managed by the New Zealand Ministry for Primary Industries in consultation and collaboration with Deepwater Group Limited.

Client group Deepwater Group Limited (DWG)

The three units of assessment represents three of the nine management units of orange roughy in New Zealand, and include all eligible fishermen of New Zealand with authorization from the New Zealand government to fish for orange roughy and are participants with the DWG.

3.1.2 Units of Certification

Units of Certification are the same as the Units of Assessment

3.1.3 Scope of Assessment in Relation to Enhanced Fisheries

The fisheries are not enhanced.

3.1.4 Scope of Assessment in Relation to Introduced Species Based Fisheries

The fisheries do not have introduced species.

3.1.5 Scope of Assessment in Relation to Unilateral Exemptions and Forced Labor

The fisheries have no unilateral exemptions or convictions or charges of forced labor.

Overview of the fisheries

3.3.1 Background and history

New Zealand's deepwater fisheries are those fisheries that occur in offshore waters out to the 200 nm limit of New Zealand's Exclusive Economic Zone (EEZ). The management of New Zealand's deepwater fisheries is a collaborative initiative between the Ministry for Primary Industries (MPI, representing the Crown and its statutory obligations to the public) and Deepwater Group Limited (DWG, representing the owners of deepwater quota).

New Zealand fisheries are managed within Fishery Management Areas (FMA) (Figure 1). FMAs may be combined or subdivided for to account for the different ranges of biological stocks for specific fisheries. For example the boundaries of the Quota Management Areas (QMA) for orange roughy stocks (Figure 2) differ from the default FMA areas. Separate total allowable catch (TACs) and total allowable commercial catch (TACCs) are set for each of these orange roughy QMAs, which in some cases have been further combined or subdivided into Designated Areas to enable discrete management of recognised stocks. Overall, nine orange roughy stocks are managed as separate fisheries within New Zealand's EEZ, of which three are the subject of this assessment. One (ORH7A) is recognised under UNCLOS as a straddling stock with a portion of its management area extending outisde of the New Zealand EEZ into an area known as the Westpac Bank (Figure 2).

MPI and DWG contract a range of science and monitoring programmes to routinely assess the status of orange roughy stocks and to monitor the orange roughy fisheries. Orange roughy quota owners pay the full cost for the majority of science and monitoring on these fisheries, either through a Government cost recovery levy or through direct payment through DWG.

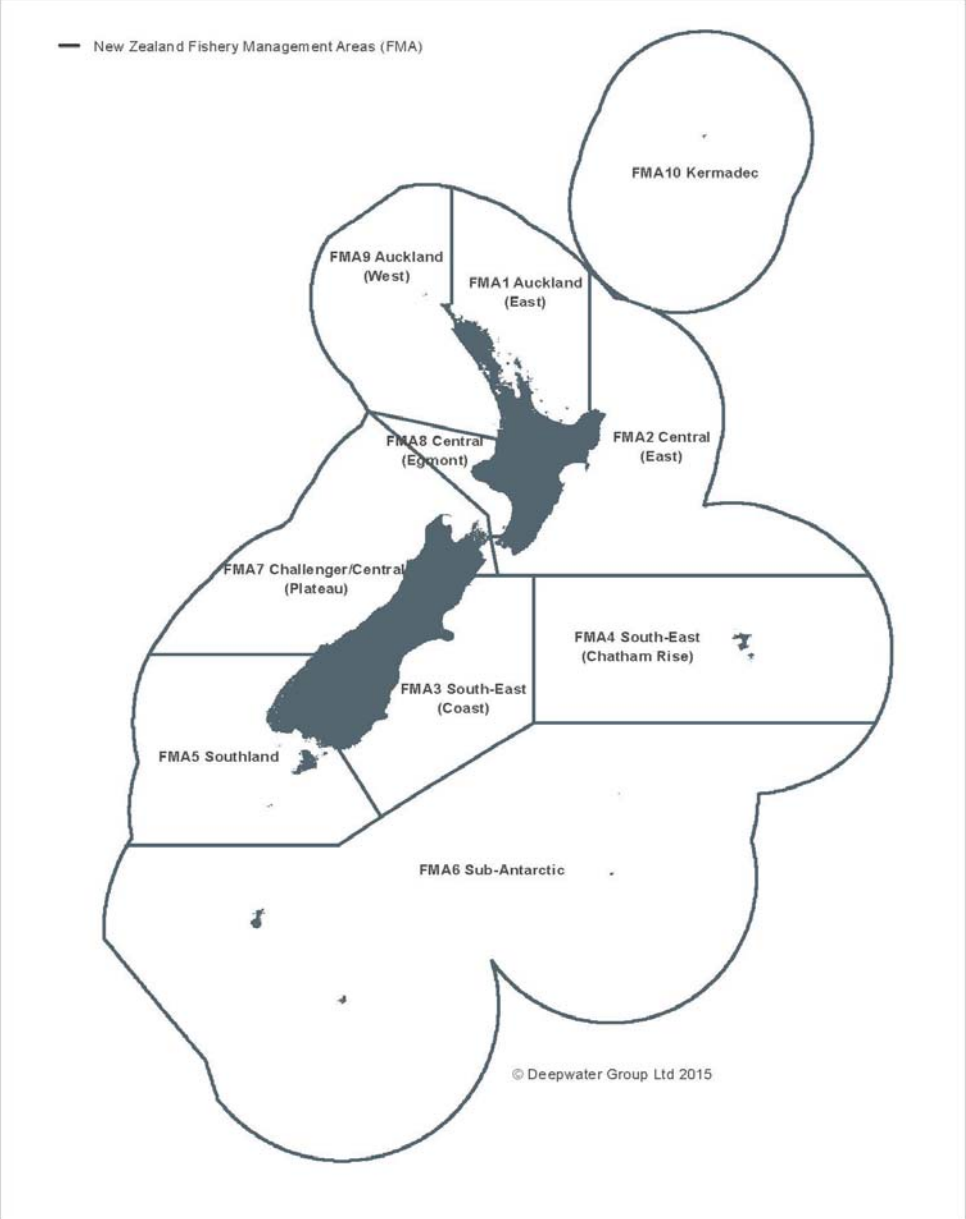

Figure 1 Generic Fishery Management Areas for New Zealand (Source DWG)

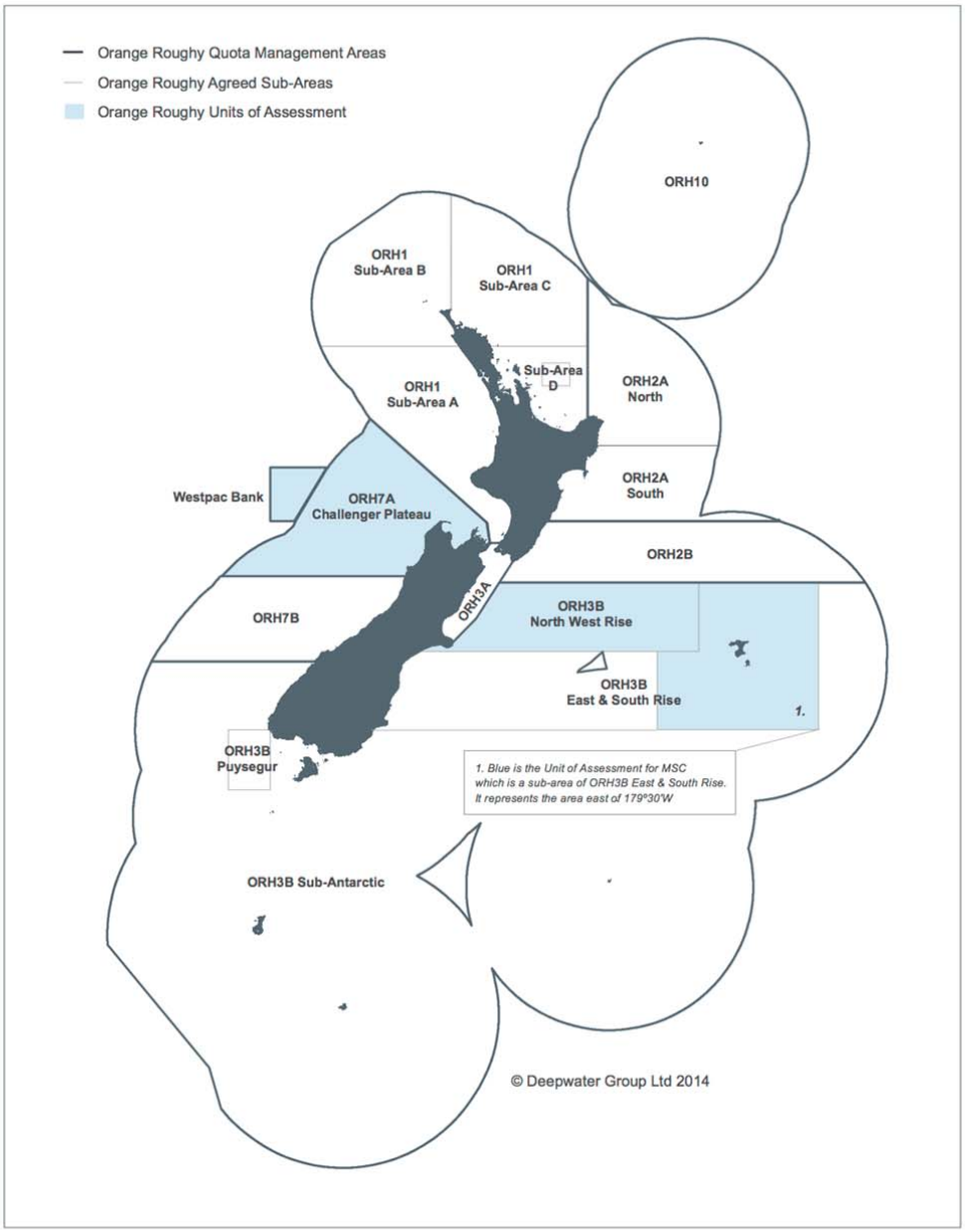

Figure 2 Orange roughy Quota Management Areas and the Three Units of Assessment for New Zealand (Source DWG)

The stock assessment process is open to anyone who elects to participate. The process is managed by MPI and supported by orange roughy quota owners through DWG, a non-profit company established to represent quota owners' interests in fisheries science, management and sustainable utilisation. DWG represents the interests of orange roughy quota owners, who own over 91% of the orange roughy quota within the New Zealand fishing zone.

The first orange roughy fishery began in 1978 with moderate catches (Table 1). New Zealand catches of orange roughy progressively increased during the 1980s as more fishing grounds were discovered and developed. By 1992 it became evident that orange roughy are slower growing, longer lived, and less productive than previously thought. As a result, the stock assessment parameters, estimated sustainable yields and TACCs were adjusted downwards. As stocks were progressively 'fished down' from B_0 towards B_{MSY}, and at times to below B_{MSY}, the management response has been to reduce the TACCs. During the 1990s, catches were subsequently reduced, at times to zero, to promote stock size rebuilding.

The total catch of orange roughy from the three units of assessment, including catches from the Westpac Bank was 4,989 tonnes (Table 1).

3.3.2 Fishing gear and methods[1]

The New Zealand high seas bottom fisheries are well-developed fisheries that have been in operation for about the past two decades. While fishing areas have expanded over time, and fishing methods and gear have been steadily refined and improved, the current fisheries operate in much the same way as they have for the past decade or so. Descriptions and analyses presented in this assessment have been based on data for the period from 1990 onwards, when fishery development started to increase significantly, to 2006/07, with emphasis on the years 2002 - 2006, this being the reference period in the interim measures upon which to base catch and effort management measures.

Bottom Trawling Methods

New Zealand flagged bottom trawling vessels generally target orange roughy, alfonsino, cardinalfish and oreo species using specific deepwater bottom trawl nets and fishing methods developed since the early 2000s, and which are currently used both within and beyond the New Zealand EEZ, to specifically target these species.

Modern deepwater trawling is an aimed method of trawling, usually targeting relatively dense aggregations of fish which are often located and targeted acoustically. This differs from the herding type trawl fishing of, for example, flatfish, hake or cod which are fished using long, nonaimed tows on flat, muddy seabed. To reduce damage to fishing gear on the hard ground typical of areas inhabited by species such as orange roughy, and to enable nets to be rapidly and accurately aimed at fish aggregations, deepwater trawling methods have evolved in various ways towards agile net systems that minimise groundrope length, net size and unnecessary ground contact, particularly by non-fishing gear components such as trawl doors.

Some typical deepwater trawl net designs currently used in these fisheries are shown in Figure 3. Nets are manufactured from braided nylon twines, typically ranging in thickness from 4mm for the wings, to 5mm for the end sections, doubled for areas of the net belly

[1] This section adapted from MFish 2008.

subject to abrasion. Codends attached to these nets are made of heavier rope meshes. Net headropes are equipped with hard floats to provide the buoyancy needed to maintain the net opening during trawling, while the footrope may be equipped with a variety of ground-gear, depending on the seabed type to be trawled. The nets used are designed to provide net mouth openings (groundrope lengths) between wing-tips of 15 - 20 m under optimal towing conditions, with headline heights of 5 m - 6 m above the footrope. Nowadays, nets are also equipped with netsounders and headline sensors to monitor the net opening, to determine position of the net relative to the seabed, and to facilitate accurate targeting of nets at acoustic fish targets.

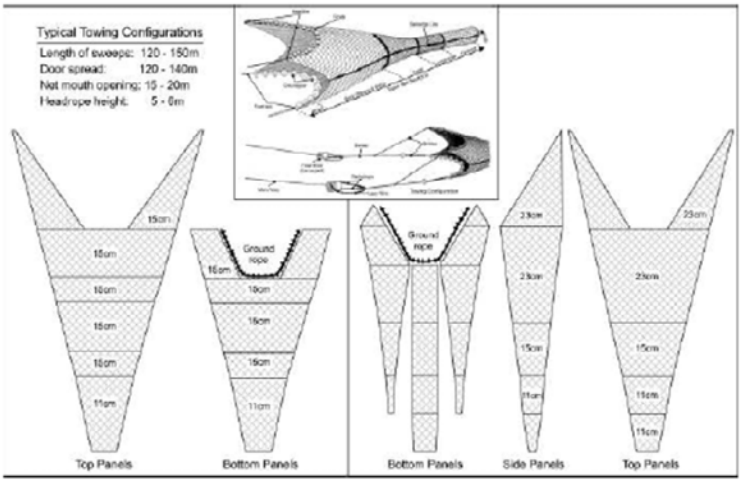

Figure 3 Stylised net construction diagrams for typical bottom trawl nets used in the New Zealand deepwater orange roughy targeted bottom trawl fishery. Two alternate simplified net designs are shown, using different mesh sizes and net wing configurations. Inset shows an illustration of the configuration of a typical bottom trawl net during trawling.

Trawl Doors and Towing Configurations

Trawl doors used in New Zealand deepwater bottom trawl fisheries were initially of the older style ‘vee-door’, to maximise the stability of doors during towing. Vee doors have a low aspect ratio, with their length being greater than their height, which results in greater stability. However, these doors are dependent on bottom contact (ground sheer forces) to create their net spreading force. With the move to better winch systems and increased use of electronics to accurately target fish aggregations, there has been a move to high aspect ratio doors, in which the height is 1.5 to 1.8 times length. These doors do not require bottom contact and depend solely on hydrodynamic forces to generate spread. Efforts to reduce drag and increase control of trawl doors has also resulted in a move to smaller, more efficient doors from producers of high-technology doors, such as Nichimo, Hampidjan and Morgere.

The trawl doors currently used by New Zealand deepwater bottom trawlers typically range from ~1,200kg - 2,000kg in weight, and from ~4m^2 - 8m^2 in size, depending on the vessel engine power and net design. Modern doors are generally designed and rigged to operate off the bottom, being set to minimise the risk of digging in should there be any contact with the seabed. Deepwater trawl nets rigged in this way are ideally ‘flown’ such that the net contacts the seabed only in the area of the aggregateed fish shoals, with the doors themselves preferably not touching the seabed. Lengths of sweeps and bridles (the towing and herding wires connecting the trawl doors and the net opening) are relatively short, to provide better control over the gear and reduced seabed contact. The combination of

sweeps and bridles connecting the doors to the nets on current orange roughy targeted trawls typically range in length from 120m - 140m, the combination of doors and sweep lengths being set to achieve net openings of 15m - 20m between wingtips. Under these configurations, distance achieved between trawl doors during towing (door spread) is maximally 120m - 150m under optimal towing conditions. In areas where operators wish to accurately target fish aggregations and require maximal control of the net, they may even operate with very short bridles and no sweeps.

Ground Gear Configuration

For bottom trawling on hard ground, net footropes are equipped with some form of ground-gear to protect the footrope, and to enable the net to manoeuvre over rough terrain or minor obstacles. Initially, deepwater trawlers used steel bobbins on the groundrope when fishing hard ground, these being standard at the time on Northern Hemisphere cod trawlers. It has been found that these are not necessary and that gear efficiency is improved and bottom contact reduced by incorporating rubber components in the ground rope. Initially, steel bobbins were replaced by smaller 40 cm - 60 cm diameter rubber bobbins. More recently, there has been a shift to the use of 50cm - 80cm rubber discs separated by spacers along the footrope to create 'rockhopper' gear. Whereas bobbins are designed to allow the footrope to roll over rough ground, the groundrope in a rockhopper system is rigged under tension, causing the net to 'hop' over encountered obstacles, rather than attempting to drag through or roll over them.

Bottom Trawling Fishing Depths

New Zealand vessels are required to report seabed depth on catch return forms for each fishing trip, enabling the frequency of trawl tows in different depth ranges to be analysed. For the period over the period 2002-2006, 13,662 of the total reported 13,713 tows reported bottom depth. 11% of these tows were conducted in depths less than 700 m, 6% in depths greater than 1,100 m, with 83% of tows being conducted in the depth range 700 m - 1,100 m. Just over half the tows were conducted over the depth range 800 m - 1,000 m, with a strong mode in the 900 m - 1,000 m depth range. The participants, fishing methods and fishing areas to be fished during 2008 and 2009 have not changed since the 2002 - 2006 reference period, and bottom trawling continues to occur over the same depth ranges.

Principle One: Target Species Background

3.3.1 Outline of the fishery resources

Orange roughy (*Hoplostethus atlanticus*) has an almost worldwide distribution (Branch, 2001). However, the bulk of the world catch of this species has been taken from New Zealand. In New Zealand, orange roughy are assessed and managed in several areas, each of which may contain one or more stocks of orange roughy (Figure 2). Orange roughy are also fished in international waters on WestPac Bank. The fisheries in international waters are managed under the auspices of the South Pacific Regional Fisheries Management Organisation (SPRFMO) of which New Zealand is a member.

The UoAs are the following populations of orange roughy (See Figure 2):

1) ORH3B Northwest Chatham Rise (ORH3B NWCR);
2) ORH3B East and South Chatham Rise (ORH3B ESCR) east of 179^{o} 30' W; and,
3) ORH7A Challenger Plateau, including Westpac Bank (ORH7A).

Table 1 lists the catches for the three UoAs (ORH3B NWCR, ORH3B ESCR, and ORH7A). When collating the catch information MPI noted differences between these data and the summarised orange roughy catches reported in the Plenary Report (e.g. the ORH3B catch reported on Tables 1 and 2 of MPI (2015z)). MPI acknowledges that the Plenary uses estimated catch scaled up to landings, whereas the data in Table 1 are unscaled catches. However, the magnitude of the differences between the catches in the Plenary report and in Table 1, particularly for the ORH3B areas during the 1970s and 1980s, appears too large to be accounted for by this issue alone. MPI has subsequently contracted a review of the catch data as reported in MPI (2015z). Until that review is complete, these data differ somewhat from those in MPI (2015z).

Table 1 GIS-based summary of orange roughy UoA catches (1978-79 to 2014-15) (tonnes)

Fishing Year	ORH3B ESCR			ORH3B NWCR			ORH7A		
	Commercial	Research[1]	Total	Commercial	Research[1]	Total	Commercial	Research[1]	Total
1978-79	10,126		10,126						
1979-80	17,861		17,861	747		747			
1980-81	18,221		18,221	8,333	0	8,333	1		1
1981-82	9,503		9,503	3,825		3,825	3,940		3,940
1982-83	17,159	0.1	17,159	8,670	0	8,670	11,941		11,941
1983-84	20,830	37	20,867	2,971	0	2,971	9,287		9,287
1984-85	24,804		24,804	1,839		1,839	5,077		5,077
1985-86	24,605	0.2	24,605	3,691	3	3,694	7,414		7,414
1986-87	25,851		25,851	3,035		3,035	10,407		10,407
1987-88	12,674	0.7	12,675	737	1	738	10,092		10,092
1988-89	13,878	2	13,880	1,762	0	1,762	5,171		5,171
1989-90	19,104	0.4	19,104	2,524	3	2,527	3,329		3,329
1990-91	16,471	0	16,471	1,529	2	1,531	1,294		1,294
1991-92	14,031	215	14,246	304	14	318	1,898		1,898
1992-93	8,910	55	8,965	3,499	9	3,508	1,973		1,973
1993-94	9,009	297	9,306	3,314	116	3,430	1,634		1,634
1994-95	5,326	275	5,601	2,253	2	2,255	1,679		1,679
1995-96	4,356	61	4,417	2,167	231	2,398	1,772		1,772
1996-97	4,069	0.01	4,069	1,967	16	1,983	1,241		1,241
1997-98	5,619	152	5,771	2,327	-	2,327	1,427		1,427
1998-99	4,638	2	4,640	2,603	115	2,718	1,238		1,238
1999-00	5,569	0.1	5,569	2,296	0	2,296	627		627
2000-01	5,063	0.3	5,063	2,627	0	2,627	2		2
2001-02	7,586	0.1	7,586	2,276	129	2,405	4		4
2002-03	8,428	0.1	8,428	2,351	0	2,351	5		5
2003-04	7,579	7	7,586	2,072	0	2,072			
2004-05	8,031		8,031	1,685	8	1,693	0	158	158
2005-06	8,143	46	8,189	1,610	0	1,610	0	199	199
2006-07	8,048	126	8,174	813	0	813	0		0
2007-08	6,988	200	7,188	734	0	734	2		2 [2]
2008-09	6,019	144	6,163	620	95	715	0	231	231
2009-10	4,706	203	4,909	668	38	706	0	322	322
2010-11	2,694	97	2,791	45 [4]	4	49	136	345	481
2011-12	1,757	650	2,407	19 [4]	67	86	387	132	519
2012-13	1,859	327	2,187	19 [4]	92	111	513	192	705
2013-14	3,039	2	3,041	811	1	812	497	54	551

[1] Catches taken by MPI and/or Industry during ORH biomass surveys and wide area trawl surveys

The assessed orange roughy stocks are fished by New Zealand domestic vessels using demersal trawl gear. Eighteen vessels have caught orange roughy from the UoAs during the period between 2008-09 and 2012-13 (Table 2). These vessels range in size from 26 m to 62 m registered length. Vessel tonnage ranges from 113 t to 2,483 t, with hold capacity ranging from 112 m^3 to 1,000 m^3.

Six of the vessels are 'freshers', in that they store their catch onboard in ice and land this as fresh chilled. These vessels generally do not process catch at sea and land whole fish which may be processed on land or exported whole. The remaining 12 vessels are factory-

freezers, which freeze product on-board and generally remain at sea for longer periods. These vessels either process to the 'dressed' (head, guts and pectoral fins removed) or 'gutted' state at-sea. Nine of the factory vessels also have onboard fishmeal plants, and process most offal and non-commercial bycatch species into fishmeal and fish oil.

Table 2 Number of vessels by length in the three orange roughy UoAs over the past five years (2008-09 to 2012-13) (registered length in metres). Note: The same vessels fish in all three fisheries, but not all vessels fish in all fisheries in all years.

UoA	2008-09			2009-10			2010-11			2011-12			2012-13		
	<30	30-40	>40	<30	30-40	>40	<30	30-40	>40	<30	30-40	>40	<30	30-40	>40
ORH3B NWCR	0	4	2	1	5	6	1	3	4	0	2	5	0	1	6
ORH3B ESCR	0	3	2	0	3	4	1	2	5	0	3	4	0	2	5
ORH7A	0	1	0	0	1	0	1	3	0	0	4	1	0	4	2

All vessels fishing in New Zealand are required to report all fish caught, except those fish under a set Minimum Legal Size (MLS). There are no retained or bycatch species caught in orange roughy fisheries that have set MLS.

Reporting requirements are set out in the Fisheries (Reporting) Regulations 2001, most notably in sections 5 and 6. It is illegal under the Fisheries Act 1996 to discard any species in the Quota Management System (QMS) at-sea unless the species is listed on Schedule 6 (of the Fisheries Act), the return to the sea is recorded, and the specified conditions are met, or an MPI observer on the vessel authorises the discard.

The majority of the vessels involved in the three UoA orange roughy fisheries are trawlers greater than 28 m. These vessels are required to record fishing effort and estimated catch on Trawl Catch Effort and Processing Returns (TCEPRs). Some orange roughy fishing is also carried out by trawlers under 28 m. These smaller vessels are required to record fishing effort on Trawl Catch Effort Returns (TCERs). These forms require reporting of effort statistics as well as estimates of catch for either the top five (TCEPR) or the top eight species (TCER) in the catch. Fishers are required to report landings for a trip on Catch Landing Returns (CLRs) regardless of the type of return (TCEPR or TCER) upon which effort information is reported. CLRs require all fish taken on a trip to be reported, including non-QMS species that were returned to the sea (discarded bycatch).

All fishers are required to furnish accurate monthly returns on locations fished, fishing gear used, catches of main species, information on processing and landing of catches and to reconcile these against Annual Catch Entitlement (ACE).

3.3.2 Stock structure

Allozyme studies have shown that orange roughy from within the Mid-East Coast (MEC) orange roughy fisheries (i.e. QMAs ORH2A (South), ORH2B and ORH3A, Figure 4) cannot be separated, but are distinct from orange roughy on the eastern Chatham Rise (MPI, 2014a). Genetic methods have, however, generally led to equivocal results, with some studies not finding genetic differentiation even over very large distances (e.g., Varela *et al.*, 2012, 2013). Although several genetic and other methods have been applied to examine stock structure in New Zealand, considerable uncertainty regarding stock structure and stock boundaries remain.

Five sub-stocks of orange roughy are recognised for management purposes within the ORH3B QMA (NWCR, ESCR, Arrow Plateau, Puysegur and Sub-Antarctic) (Figure 5). However, only two stocks (Chatham Rise and Puysegur) have been distinguished using genetics (Smith and Benson, 1997). Given the large size of the ORH3B QMA, as well as

discontinuities in the distribution of catches, it is *a priori* likely that there are several stocks of orange roughy in this QMA (MPI, 2014b). The most comprehensive evaluation of the stock structure of orange roughy on the Chatham Rise was conducted during 2008 (Dunn & Devine, 2010). Dunn and Devine (2010) evaluated a variety of sources of information for the ORH3B QMA, including (a) catch distribution and catch-rate patterns, (b) locations of spawning and nursery grounds, (c) inferred migrations, (c) size, maturity and condition data, (d) genetic studies, and (e) habitat and natural boundaries.

Dunn and Devine (2010) found evidence that a separate stock of orange roughy occurs on the Northwest Chatham Rise. The evidence in support of this includes a substantive spawning ground as well as nursery grounds in the Graveyard Hills area on the Northwest Chatham Rise (Figure 5). Other evidence suggesting that orange roughy on the Northwest Chatham Rise and in the Spawning Box on the East Chatham Rise constitute separate stocks include: (a) a gap in the distribution of juveniles between these sub-areas; (b) evidence for a westerly post-spawning migration from the Graveyard Hills area; (c) differences in the median length among sub-areas; and, (d) differences in trends in the size-of-50%-maturity among sub-areas. The only information that suggests that the Northwest Chatham Rise may not be separate from the Spawning Box is an indication from patterns in commercial catch rates that some fish that arrive to spawn in the Spawning Box may come from the west.

In contrast to the situation for the Northwest Chatham Rise and the Spawning Box, Dunn and Devine (2010) found no evidence for separating orange roughy in the Spawning Box from those on the South Chatham Rise. A common stock in these areas was supported by a continuous nursery ground throughout the area, similar trends in the size-at-50%-maturity, inferred post-spawning migrations from the Spawning Box towards the East Rise, and a lack of differences in median lengths. Dunn and Devine (2010) found weak evidence that the area west of and including 'Hegerville' (on the South Chatham Rise) is a separate stock. This evidence included that a median length analysis indicated a split in the area, and an oceanographic front at 177^0W. In contrast, the few catches of orange roughy in the area west of Hegerville and the lack of a nursery ground on the South Chatham Rise supported the hypothesis that orange roughy on the East and South Chatham Rise do not constitute separate stocks. Based on the analyses reported by Dunn & Devine (2010), the Chatham Rise is managed as two separate stocks (ORH3B NWCR; and, ORH3B ESCR) for the purposes of stock assessment and the provision of information on which management advice is based (see Figure 5).

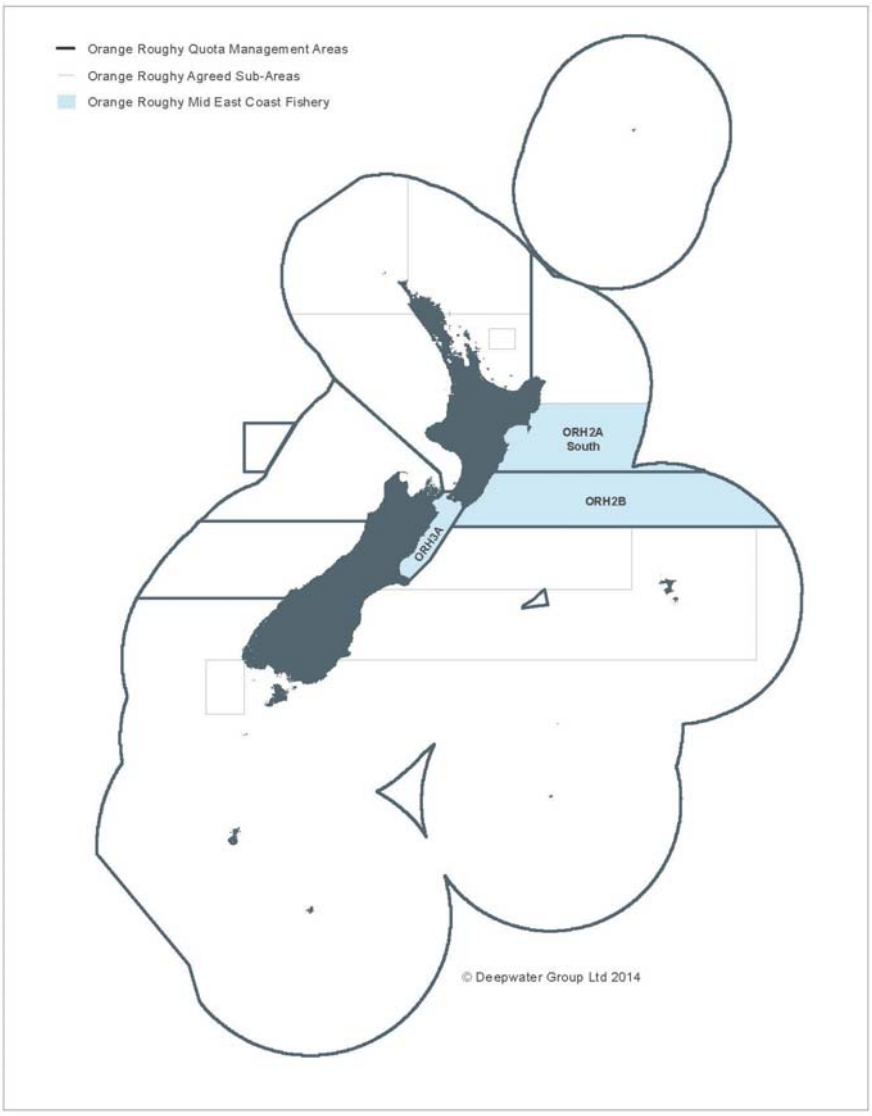

Figure 4 Orange roughy Mid-East Coast Management Area (QMAs ORH2A South, ORH2B and ORH3A)

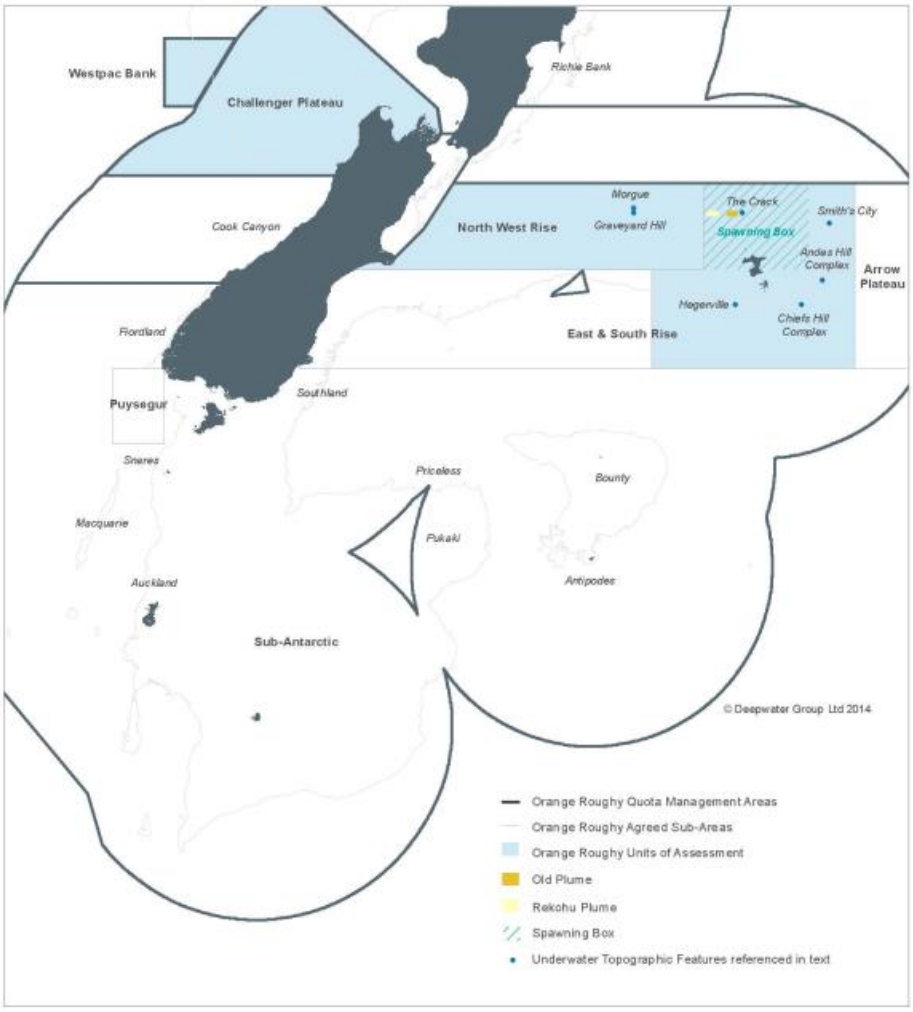

Figure 5 Designated Sub-Area Boundaries for Orange Roughy in the ORH3B QMA. The Spawning Box is within the western part of the East Chatham Rise (i.e. to the east of 175°W). The sub-Antarctic is all areas below 46°S on the east coast, and 44°16'S on the west coast, except Puysegur. (Source: DWG).

Orange roughy in ORH7A are considered to be a straddling stock contiguous with those on the Westpac Bank immediately adjacent to the west and outside of the New Zealand EEZ, and to be separate from those in other areas (MPI, 2014c). Evidence to support this conclusion includes studies on parasite composition, flesh mercury levels, allozyme frequency and mitochondrial DNA that suggest differences among fisheries. In addition,

spawning occurs at a similar time on the Challenger Plateau as on the Chatham Rise, Puysegur Bank, Richie Bank, Cook Canyon and Lord Howe Rise (MPI, 2014c).

3.3.3 Life history[2]

Orange roughy is a deepwater species and is found from 700 to at least 1,500 m (MPI, 2014a). The maximum depths that orange roughy inhabit are unknown (MPI, 2014a). A variety of methods have been applied to age orange roughy. Orange roughy are considered to be long-lived (otolith ring count and radiometric isotope studies suggest that orange roughy may live up to 120-130 years; MPI, 2014a). Although age determination from otolith rings has been validated by length-mode analysis for juveniles up to four years of age in one study (MPI, 2014a), routine ageing of orange roughy has proven difficult. Specifically, biases in reading the numbers of otolith rings between laboratories were identified (Francis, 2006). A new ageing protocol was developed for orange roughy in 2007, associated with an international ageing workshop for this species (Tracey *et al.*, 2007) that largely addressed the biases noted in Francis *op.cit*. Age-frequency data were only used in the 2014 stock assessments if the otoliths had been read using the 2007 ageing protocol, except as indicated below.

Accurate estimation of key biological parameters (growth, natural mortality and maturation) depends on having reliable age estimates. The values for these biological parameters for all orange roughy stocks are based on age estimates from otoliths collected during the 1984 and 1990 trawl surveys of the Spawning Box and the East Chatham Rise, and aged by NIWA because these age estimates are believed not to contain serious biases (MPI, 2014a).

Natural mortality, *M*, has been estimated to be 0.045 yr^{-1} based on otolith data from a 1984 trawl survey of the Chatham Rise. A similar estimate of *M* was obtained in 1998 from a lightly fished population in the Bay of Plenty (MPI, 2014a). The base runs in the assessments use this value for *M*. Some of the sensitivity tests in the stock assessments treat *M* as an estimable parameter, subject to an informative prior, and the posteriors are generally located at lower values (medians 0.041, 0.036, and 0.039 yr^{-1} for the Northern Rise, East and South Rise, and Challenger Plateau, respectively). The implications of *M* differing from 0.045yr^{-1} on stock status are included in the assessment reports, and explicitly accounted for in the Management Strategy Evaluation (MSE) analyses (Cordue, 2014b). Cordue (2014a) notes that it is not clear whether the models are obtaining 'genuine' information on *M*, in particular because the signals are driven by information or the assumption of average recruitment for the cohorts that are poorly represented in the age data. Lower estimates of *M* could consequently be due to above average year strengths, sampling vagaries, errors in selectivity, as well as because *M* is less than 0.045y^{-1}. Given this, and the bias-variation trade-off associated with estimating *M*, Cordue (2014a, b) preferred to fix rather than estimate *M*, at least at present.

Determination of the age of maturation for orange roughy has also proved difficult although it has been inferred that most orange roughy may take more than two decades to reach maturity. Maturation is assigned based on a marked transition zone in otolith banding, which is believed to be associated with the age of first spawning (Francis & Horn, 1997). Estimates of transition zone maturity range from 23 to 31.5 years (Horne *et al.*, 1998). However, the 2014 assessments were based on spawning fish and the age at which 50% of animals are spawning was estimated within the assessment models to range from 32 - 41 years (MPI, 2014a), i.e. substantially later than maturation. Spawning of orange roughy generally occurs between mid-June and mid-August, and orange roughy may form large

[2] The bulk of the information in this section was taken from the report of the 2014 stock assessment plenary.

spawning aggregations that may extend several hundred metres into midwater, providing suitable targets for acoustic surveys and for commercial harvesting.

The larval biology of orange roughy, in common with that for most deepwater marine species, is poorly known.

The relationship between spawning biomass and recruitment for orange roughy is poorly known owing to a lack of data on recruitment strength and, in particular, the long lag between spawning and subsequent recruitment to the fishable stock, although it has been possible to update a prior for the steepness of the stock-recruitment relationship using the results from the assessment of the MEC orange roughy stock (Cordue, 2014c). Assessments of orange roughy have assumed that the stock-recruitment relationship is of the Beverton-Holt form, that the steepness of the stock-recruitment relationship is 0.75, and that the extent of inter-annual variation in recruitment is very high ($\sigma_R = 1.1$) (MPI, 2014a).

The main prey species of orange roughy include mesopelagic and benthopelagic prawns, fish and squid, with other organisms such as mysids, amphipods and euphausiids occasionally being important (Rosecchi *et al.*, 1988). Ontogenetic shifts occur in their feeding preferences, with the smaller fish (up to 20 cm) feeding on crustaceans, and larger fish (31 cm and above) feeding on teleosts and cephalopods (Stevens *et. al.*, 2011). Dunn and Forman (2011) inferred from diet analysis that juveniles feed more on the benthos compared with the benthopelagic foraging of adults. Predators of orange roughy are likely to change with fish size. Larger smooth oreo, black oreo and orange roughy have been observed with healed soft flesh wounds, typically in the dorso-posterior region. Wound shape and size suggest they may be caused by deepwater dogfishes.

3.3.4 Stock assessments

The information needed to assess stock status relative to the limit reference points and the management target range, and to apply the harvest control rule is an estimate of F_{MSY}, an estimate of current fishing mortality, an estimate of recent abundance, $B_{current}$, and an estimate of the unfished biomass B_0. This information is obtained from quantitative stock assessments based on fitting population dynamics models to monitoring data. Assessments of orange roughy stocks based on fitting population dynamics models have been conducted for many years. However, it has proved challenging to conduct assessments that are not subject to considerable uncertainty for a variety of reasons. In 2014, stock assessments based on fitting population dynamics models were approved for the first time in many years for the three areas considered in this assessment (MPI, 2014b, c).

The review of these assessments has been conducted primarily though meetings of the MPI[3] Deepwater Fisheries Assessment Working Group (DFAWG), which consists of scientists from NIWA, MPI, representatives of environmental NGOs, and industry. The 2014 assessments[4] were developed through a series of eight meetings of the DFAWG. The meetings are open to the Public and have Terms of Reference that define working group roles and responsibilities (MPI, 2014d).

The objectives of the MPI Fishery Assessment Working Groups (FAWGs) are to:

a) review any new research information on stock structure, productivity, abundance and related topics for each fish stock under the purview of individual FAWGs;

[3] Reference is made in this document to MPI even though it was the Ministry of Fisheries during the much of period considered in the report.

[4] No assessments were conducted during 2015 (MPI, 2015)

b) estimate appropriate MSY-compatible reference points for selected fish stocks for use as reference points for determining stock status, based on the Harvest Strategy Standard (HSS);
c) conduct stock assessments or evaluations for selected fish stocks to determine the status of the stocks relative to MSY-compatible reference points;
d) explore the potential for using existing data and analyses to draw conclusions about likely future trends in biomass levels and/or fishing mortality (or exploitation) rates if current catches and/or TACs/TACCs are maintained, or if fishers or fisheries managers are considering modifying them in other ways. Where appropriate and practical, to conduct projections of likely future stock status using alternative fishing mortality (or exploitation) rates or catches and other relevant management actions, based on noting the HSS and input from the FAWG, fisheries plan advisers, and fisheries managers;
e) develop alternative rebuilding scenarios based on the HSS and input from the FAWG, fisheries plan advisers, and fisheries managers for stocks that are deemed to be depleted or collapsed; and,
f) review the existing Fisheries Assessment Plenary report text on the "Status of the Stocks" for fish stocks for which new stock assessments are not conducted in the current year, to determine whether the latest reported stock status summary is still relevant; else to revise the evaluations of stock status based on new data or analyses, or other relevant information.

The DFAWG reports are available through annual summaries, with the results of detailed analyses reported in Fishery Assessment Reports (FARs). Past assessments of orange roughy on the Chatham Rise have been reviewed by scientists not normally involved in the New Zealand assessment process. Independent stock assessment scientists from New Zealand (1), Australia (2), USA (1), and Canada (1) familiar with stock assessment of orange roughy participated in MPI's 2014 DFAWG and Plenary meetings that considered and reviewed the orange roughy stock assessments. However, no formal comprehensive external review of the current assessment framework has been undertaken.

A variety of sources of data are available for assessing the current biomass and stock status of orange roughy. These data sources include catch-rates from the commercial fishery (following standardization), acoustic estimates of biomass, trawl survey estimates of biomass, and egg production estimates of biomass. The 2014 assessments did not make use of catch-per-unit-effort (CPUE) data owing to concerns regarding whether CPUE indexes stock-wide abundance (Cordue, 2014a, MPI, 2014a). Estimates of biomass from egg surveys were also not used in the 2014 assessments because it was found that the available estimates were from surveys where the assumptions of the survey design were not met and/or there were major difficulties in analysing the survey data (Francis *et al.*, 1997, MPI, 2014a, Zeldis *et al.*, 1997). Many estimates of abundance have been obtained based on acoustic surveys. However, the 2014 assessments were restricted to estimates based on plumes on the flats surveyed using hull-mounted transducers or towed systems, or for plumes on underwater features surveyed using towed multi-frequency systems (MPI, 2014a). This restriction reduced the impacts of uncertainties related to extrapolation of densities to the acoustic dead-zone and ensured that the acoustic signal recorded was from orange roughy rather than from orange roughy mixed with other species.

In principle, changes in age- and length-composition from the fisheries and surveys provide some information on recruitment trends and these data were included in the 2014 stock assessments.

The 2014 stock assessments were based on the stock assessment package CASAL (Bull *et al.*, 2012). Specifically, orange roughy in each area were represented as a single stock and a single sex was modelled. The population in each area was modelled using an age-structured model in which animals that spawn were modelled separately from those that

have not yet entered the spawning biomass. The spawning biomass will be smaller than the mature biomass (the biomass of fish of the transition age and higher), and the proportion of mature fish that spawn each year will change depending on recruitment strength and fishing intensity.

The assessments for the Northwest Chatham Rise and the Challenger Plateau assumed that fisheries were for spawning fish while the assessment for the East and South Chatham Rise included four fleets (although the selectivity patterns for the four fleets were all very similar, Cordue, 2014b). The assessments were based on conducting model runs by maximizing the posterior density function (MPD estimates) and capturing parameter uncertainty using Bayesian methods. The results based on Bayesian methods formed the basis for the management advice. In general, sensitivity was explored relative to natural mortality, the biomass indices included in the assessment, and the means of the priors for the acoustic catchability coefficients. Analyses were also conducted under the assumption of deterministic dynamics (the basis for the earlier assessments).

In New Zealand, the point estimate from the assessment is the posterior median (rather than posterior mean – which can be substantially higher than the median if the posterior is skewed to the right), while uncertainty for a given model structure is based on posterior percentiles. The posterior median is usually between the posterior mode and the posterior mean for the typically right-skewed posterior distributions (Cordue, 2014b). Consequently, the posterior mode (which is the quantity typically reported for age-structured assessments owing to the speed with which it can be computed) is often lower than the posterior medians. Assessments in New Zealand typically only conduct full Bayesian assessments for a subset of the assessment variants explored.

A key input to any Bayesian assessment is the specification of the prior distributions for the parameters. Prior probability distributions are specified for survey catchability for some of the surveys. The acoustic estimates of abundance are assumed to be relative indices of abundance, with informative prior distributions constructed taking into account uncertainty about target strength (with the best estimate assumed to be unbiased) and the proportion of the spawning biomass available to the acoustic survey (modelled using a beta distribution to reflect that the biomass available to the acoustic survey will be less than the total spawning biomass). Improved estimates of orange roughy target strength have been obtained using multi-frequency acoustic equipment in recent years (Macaulay *et al.,* 2013).

The priors for the catchability coefficients are justified for each survey individually. For example, the distribution for acoustic catchability is centred on 0.8 for surveys that covered “most” of the spawning biomass (e.g. the surveys of the “old plume”, “Rekohu plume” and “the Crack”). Cordue (2014b) argues that a higher fraction than 0.8 is not justified given that orange roughy are known to have minor spawning sites in addition to the sites that are surveyed, and that the estimates are based on the average of the results of several snapshots. He notes that, even in the major spawning sites / aggregations, only the plumes can be reliably surveyed and not all of the spawning biomass is pluming at the same time. The impact of the choice of priors is examined in sensitivity tests, and can be substantial. Across assessments, roughly half of the posteriors for the acoustic catchability coefficients are updated in an optimistic direction in terms of stock status while roughly half are updated in pessimistic direction. Some of the updates to priors are quite substantial (e.g., for recent years for East and South Chatham Rise and Challenger) (Cordue, 2014b) (Figure 6).

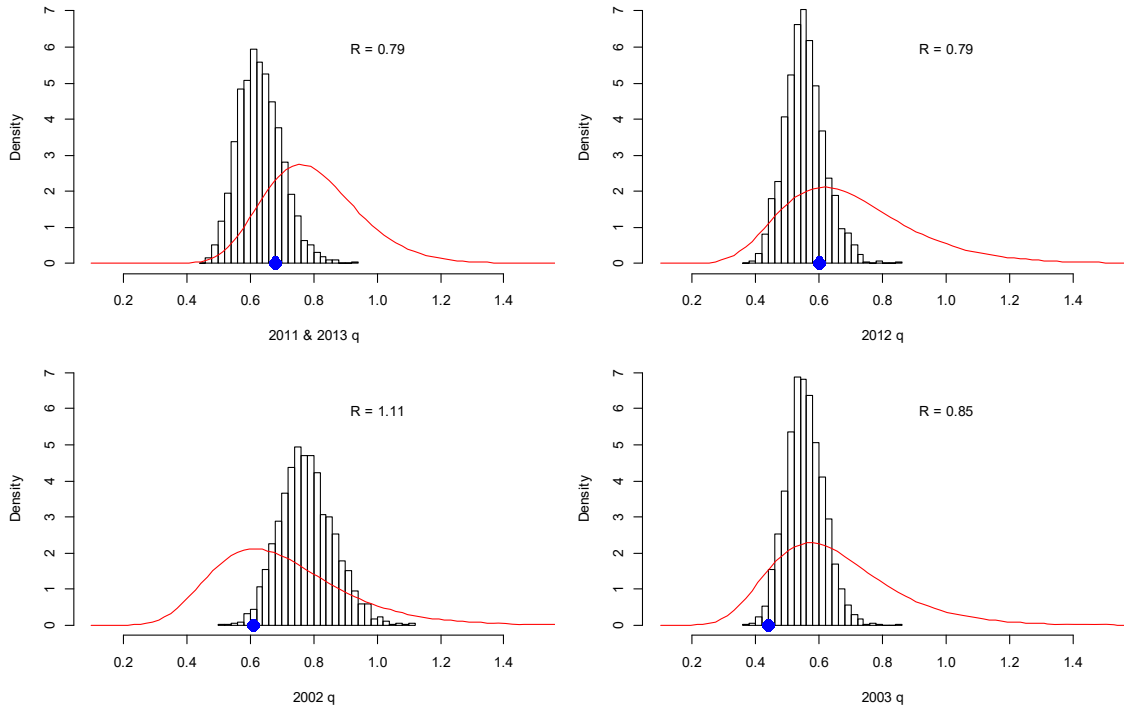

Figure 6 Priors (in red) and posterior distributions for a selection of acoustic *q*s for the PRB3B ESCR stock. The blue dot is the MPD estimate and R is the ratio of the mean of the posterior to the mean of the prior (Source: MPI 2014b). Three of the priors were updated in an optimistic direction and one in a pessimistic direction in terms of stock abundance.

Cordue (2014b) outlines the approach used for data-weighting. In general, and following Francis (2011), the composition data (age and length-frequencies) are down-weighted so that the biomass indices can be the primary source of information on scale and trend.

3.3.5 ORH3B Chatham Rise and Southern New Zealand

The fishery for orange roughy within the ORH3B QMA started on the Chatham Rise in the late 1970s. The bulk of the catches of orange roughy in the early years was taken from the Spawning Box region on the Northeast Chatham Rise, although the fishery quickly expanded to the Northwest and South Chatham Rise areas. Until 1982, most of the catch was taken from areas of relatively flat bottom, between mid-June and late July, when fish form spawning aggregations. The Spawning Box was closed to fishing for the 1992-93 and 1994-95 fishing seasons to facilitate rebuilding, and the fishery moved to the hills, first to Smith's City and adjacent hills (in the north-east Chatham Rise), then to the Andes and Chiefs hill complexes (in the south-east Chatham Rise, Figure 4). The non-spawning fishery contracted to hill complexes, particularly on the south-east Chatham Rise where new fishing locations were found (discovery of new fishing grounds, followed by apparent rapid depletion is a common feature of fisheries for orange roughy worldwide). A full description of the changes in the fishery across the entire ORH3B QMA is given in MPI (2014b) and Dunn *et al.* (2008).

A Total Allowable Commercial Catch (TACC) is set for each of the ORH3B and ORH7A QMAs. TACCs and corresponding catches (as provided by MPI) during the period 2005-06 to 2013-14 for the three UoAs are provided in Table 3.

The spatial distribution of orange roughy catches within the ORH3B QMA is currently managed within four designated sub-areas, each of which is considered to have a separate

fisheries stock and is assessed and managed accordingly. Management of each designated sub-area, including the two UoAs: ORH3B NWCR and ORH3B ESCR, is implemented through catch limit agreements between the Minister of Primary Industries and quota owners. These non-regulatory sub-area catch limits are implemented by MPI and industry. Each quota owner apportions their holdings of ORH3B ACE according to the agreed sub-area catch limits, trades ACE, and manages catches as if each sub-area was a separate QMA.

In instances where catch reductions are required within a designated sub-area, but where government and industry agree that these catch reductions will be implemented by quota owners rather than by TACC reductions, quota owners agree to collectively transfer (or to 'shelve') the requisite quantity of ACE to be held in trust by a neutral third party, Commercial Fisheries Services Ltd (FishServe). At present 207 t of ACE for the designated area ORH3B NWCR is annually shelved. The purpose is to align the ORH3B NWCR limit with the MSE and the Harvest Control Rule (HCR) (refer to sections 3.3.4 and 3.3.5, and Cordue, 2014b). The initial 2014-15 catch limit of 1,250 t was based on five-year forward projections using the 2014 stock assessment results and although consistent with the requirements if the Fisheries Act 1996, this catch limit is not consistent with the agreed HCR.

Catch limits for each of the designated sub-areas, and the corresponding catches (based on MPI's GIS analysis) during the period 2005-06 to 2013-14 for ORH3B ESCR and ORH3B NWCR are provided in Table 3 (a & b).

MPI monitors DWG's catch reports and operators' fishing patterns to audit the agreed catch spreading. Catches have been within the agreed catch limits, which allow for an over-run of not more that 10% in any one year, as is the case for catches against TACCs in the QMS.

Table 3 Recent catches and agreed catch limits (t) for the three units of assessment based on a GIS analysis of catch locality (Source: DWG, 2015).

Table 3a: ORH3B ESCR Unit of Assessment (tonnes)

Fishing Year	Catch Allowance			Catch[1]				% of Total Catch Allowance
	Sub-Area Catch Limit	Research	Total	Commercial	Research	Total	(Under) / Over	
2005-06	8,650	250 [2]	8,900	8,143	46	8,189	(711)	92%
2006-07	8,650	250 [2]	8,900	8,048	126	8,174	(726)	92%
2007-08	7,650	250 [2]	7,900	6,988	200	7,188	(712)	91%
2008-09	6,570	250 [2]	6,820	6,019	144	6,163	(657)	90%
2009-10	5,100	250 [2]	5,350	4,706	203	4,909	(441)	92%
2010-11	2,960	250 [3]	3,210	2,694	97	2,791	(419)	87%
2011-12	1,950	653 [3, 4]	2,603	1,757	650	2,407	(196)	92%
2012-13	1,950	326 [3, 5]	2,276	1,859	327	2,187	(89)	96%
2013-14	3,100		3,100	3,039	2	3,041	(59)	98%

[1] Catches provided by MPI determined using GIS analysis

[2] Research allowance of 250 t applied to all of ORH3B

[3] Research allowance of 250 t applied to ESCR only

[4] Transfer of 403 t of Sub-Antarctic ACE to ESCR

[5] Transfer of 76 t of NWCR ACE to ESCR

Table 3b: ORH3B NWCR Unit of Assessment (tonnes)								
Fishing year	Catch Allowance			Catch				
	NWCR Sub-Area Catch Limit	Research	Total	Commercial	Research[5]	Total	(Under) / Over	Under / Over[2] as % of Total Catch Allowance
2005-06	1,500		1,500	1,610		1,610	110	7%
2006-07	750		750	813		813	63	8%
2007-08	750		750	734		734	(16)	-2%
2008-09	750		750	620	95	715	(35)	-5%
2009-10	750		750	668	38	706	(44)	-6%
2010-11	750		750	45 [4]	4	49	(701)	-93%
2011-12	750		688 [3]	19 [4]	67	86	(602)	-88%
2012-13	750		674 [3]	19 [4]	92	111	(563)	-84%
2013-14	750		750	811	1	812	62	8%

[1] Data analysis by MPI

[2] The Fisheries Act provides for up to 110% of the TACC to be caught in any one year.

[3] 62 & 76 t ACE transferred for research use in ORH3B ESCR in 2011-12 & 2012-13, respectively

[4] Industry agreement to 'rest' fishery to provide rebuild - no target fishing

[5] Catches taken by MPI and/or Industry during ORH biomass surveys and wide area trawl surveys

Table 3c: ORH7A[5] Unit of Assessment (tonnes)								
Fishing Year	Catch Allowance			Catch				Under / Over as % of Total Catch Allowance
	TACC	Research	Total	Commercial	Research	Total	(Under) / Over	
2005-06	1	250	251		199	199	(52)	-21%
2006-07	1		1				(1)	-100%
2007-08	1		1	2		2 [3]	1	100%
2008-09	1	400	401		231	231	(170)	-42%
2009-10	1	400	401		322	322	(79)	-20%
2010-11	500	No Limit[2]	500+	136	345	481	(364)	-43%
2011-12	500	No Limit[2]	500+	387	132	519	(113)	-18%
2012-13	500	No Limit[2]	500+	513	192	705	13	2%
2013-14	500	50	550	497	54	551	1	0.2%

[1] Data provided by MPI

[2] In 2010-11, 2011-12 & 2012-13 an MFish Special Permit provided for unlimited research catch to be taken during trawl and acoustic biomass surveys of ORH7A (including Westpac Bank). Shading illustrates that research catch limit was assumed equal to the survey catch.

[3] Non-targeted bycatch

[4] During the 2010-11 and 2011-12 surveys all research catch was taken against commercial ACE. However, in 2012-13, industry had already caught most of their commercial ACE prior to the survey commencing and so research catch was taken against the Special Permit, additional to the commercial catch.

[5] ORH7A UoA and FMA TACC/ACE is ORH7A QMA plus designated area adjacent known as Westpac Bank (see map)

ORH3B Northwest Chatham Rise

A new stock assessment was undertaken in 2014 (MPI, 2014c). The previous quantitative assessment of orange roughy for ORH3B NWCR was conducted in 2006 (MPI, 2014c). The 2006 assessment was based on a model that assumed that recruitment is related deterministically to spawning biomass according to an assumed stock-recruitment relationship. Assessments based on the assumption of deterministic dynamics are no longer considered an appropriate for orange roughy.

The 2014 assessment was fitted to acoustic-survey estimates of spawning biomass, a trawl-survey estimate of proportion-at-age and proportion-spawning-at-age, and length-frequencies from the commercial fishery. The 2006 assessment made use of standardized

CPUE data and estimates of absolute abundance from an egg survey, but these data sources are no longer considered reliable for assessment of orange roughy. Table 4 lists the abundance estimates used in the 2014 assessment. The prior for the acoustic-survey estimate of abundance for 2013 was assumed to have a mean of 0.3 because only one of the areas considered in the earlier acoustic surveys ("Graveyard") was surveyed (Cordue, 2014b).

Table 4 Survey estimates of spawning biomass used in the 2014 base model for the ORH3B NWCR (excludes 2002 and 2004). "GY" = Graveyard, "M" = Morgue, "O" = other hills. The CVs are those used in the model and do not include any process error.

Year	System	Areas	Estimate (t)	CV (%)	Prior
1999	Towed-body	GY+M+O	8,126	22	1
2012	AOS	GY	5,550	17	1
	AOS	M	9,087	11	1
2013	AOS	GY	7,379	31	2

1 – Normal (mean=0.8; CV=0.19); 2 – Lognormal (mean=0.3; CV=0.19)

Although commercial length-frequency data were available for several individual years, they were pooled over time (data for 1989-97 in a single "1993" length-frequency; data for 1998-2005 in a single "2002" length-frequency). The weights assigned to these data were based on the number of tows that were sampled.

The base model fitted the acoustic estimates of abundance fairly closely. A noteworthy feature of the assessment was that the posterior for the acoustic catchability for the 1999 and 2012 surveys was shifted to a lower value. The estimate of virgin biomass was 66,000 t (95% CI 61 - 76,000t) and the current biomass was estimated to be 37% (95% CI 30 - 46%) of the unfished spawning biomass. The posterior distribution indicated that spawning stock biomass declined from the start of the fishery until the mid-2000s and has rebuilt thereafter (Figure 7). Fishing mortality was estimated to be currently well below those corresponding to the management target range (Figure 8).

The general pattern of decline followed by an increase was robust to changes to the specifications of the assessments. The stock was estimated to be above the lower limit of the management target except when *M* and the mean of the prior for acoustic catchability were simultaneously reduced by 20% (Cordue, 2014b).

The stock was estimated to continue to rebuild under the both the 2013-14 catch limit (750 t) and a catch limit double this, under the base model and the most pessimistic of the sensitivity runs. The sub-area catch limit was increased to 1,250 t for the 2014-15 fishing year although a shelving arrangement subsequently reduced the agreed catch limit to 1,043 t in line with the HCR.

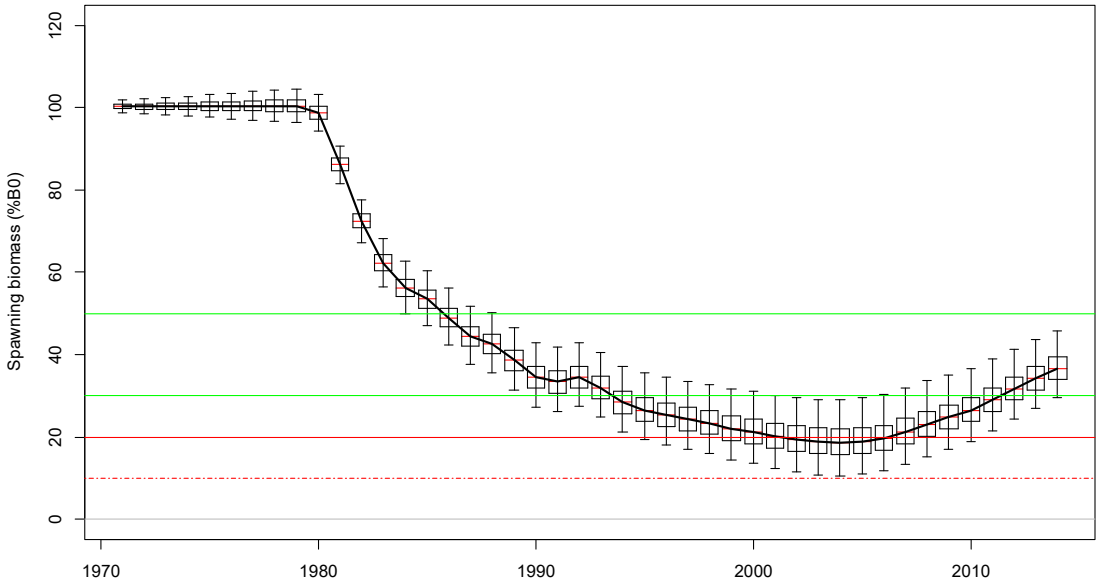

Figure 7 ORH3B Northwest Chatham Rise base, MCMC estimated spawning-stock biomass trajectory. The box in each year covers 50% of the distribution and the whiskers extend to 95% of the distribution. The hard limit (dotted red line), soft limit (solid red line), and management target range (green) are marked by horizontal lines.

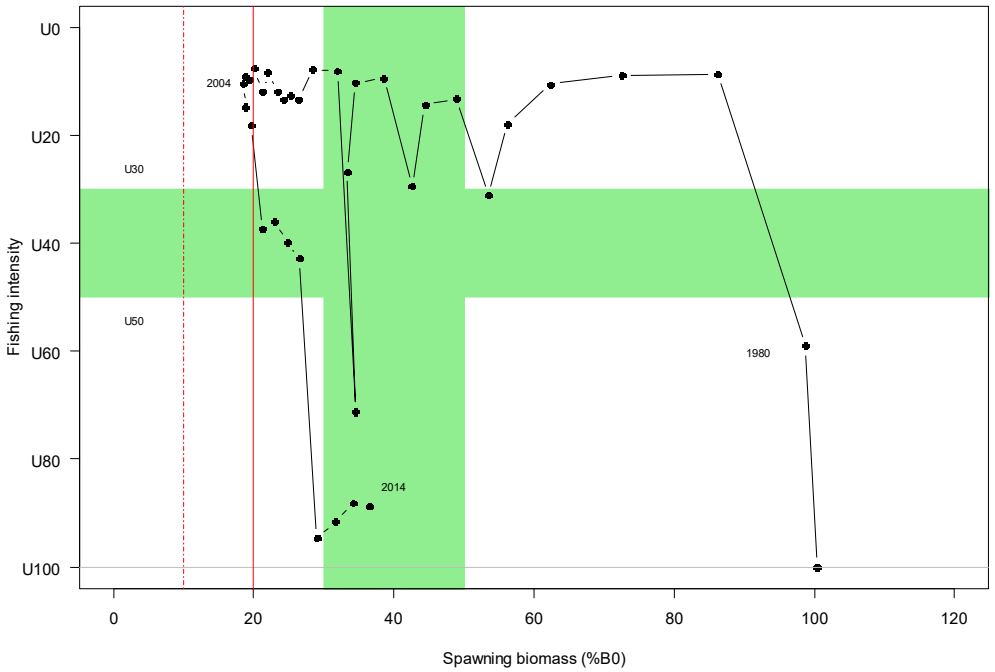

Figure 8 Historical trajectory of spawning biomass (%B_0), median exploitation rate (%) and fishing intensity (100-ESD) for the ORH3B Northwest Chatham Rise (base model, medians of the marginal posteriors). The management target range of 30-50 % B_0 and the corresponding exploitation rate range are marked in green. The soft limit (20% B_0) is

marked by a solid red line and the hard limit (10% B_0) by a dashed red line. Note that the Y-axis is non-linear.

ORH3B East and South Chatham Rise

Several stock assessments based on fitting age- and sex-structured population dynamics models to the available data have been conducted for orange roughy in this area. However, these assessments no longer form the basis for management advice because: (a) the stock structure hypothesis on which previous assessments was based has been modified based on new information; and, (b) all model runs in the previous assessment of the Spawning Box and Eastern Flats stock predicted that stock biomass had been rebuilding since catches were substantially reduced in the early 1990s (MPI, 2014b), but this rebuild was insensitive to observational data (Dunn, 2007a, b).

The 2014 stock assessment was based on four fleets[5]: Box & flats; Eastern Hills; Andes; and, South Rise. However, selectivity for the South Rise fleet was set to that for the Andes. Two versions of the assessment were constructed for 2014. The first treated all orange roughy in the assessed area as a single homogenous stock and the other accounted for spatial structure. The spatial model included four areas (Rekohu, Plume, Crack and "Other"), which were used to allow area-specific data to be fitted. A key uncertainty pertains to when the Rekohu plume was established and the assessment explored several alternative assumptions in this regard. When the Rekohu plume was established has consequences for how the indices of abundance in Table 6 can be used in assessments. Specifically, if the Rekohu plume has always existed (and was not discovered until 2010) then it would be one of three major spawning sites and could be modelled as such, along with the old plume and the Crack. This would imply that the "Plume" (referred to previously as the "spawning plume") time series was tracking a consistent part of the spawning biomass (and its decline over time is therefore an important indicator of stock status). If, on the other hand, the Rekohu plume had been formed very recently, this would imply that the old plume time series was a biomass index only up until the year before the Rekohu plume came into existence.

Several data sources are available for the assessment of ORB3B ESCR (MPI, 2014b). Four time-series of biomass indices based on trawl surveys were available for inclusion in the assessment (Table 5). These indices were assigned uninformative priors. There are acoustic survey estimates of spawning biomass for the old plume, Rekohu and the Crack. The priors for the surveys (Table 5) were selected based on the old plume and Rekohu plume occurring on the "flats". In contrast, the Crack is an area of rough terrain that has been surveyed using towed-body or trawl mounted multi-frequency acoustic gear.

The base model for the 2014 assessment assumed that the old plume time series does not provide a consistent index for any part of the spawning biomass (the age structure of the old plume and the Rekohu plume differ substantially). The means of the priors for the proportions of the population indexed by the old plume were assumed to change linearly from 0.7 for 2002 to 0.3 for 2010 (MPI, 2014b). This reflects that the Rekohu plume did not exist in 2002, only the Crack was missing from the 2002 survey estimate, and the data for 2011 provide the relative proportion of each area in 2010.

The trawl surveys (Table 5) were treated as relative indices of abundance with uninformative priors on catchability.

[5] Defined as the combination of when and where fishing takes place.

The assessment included length-frequencies from all of the trawl surveys and from the commercial fisheries. Age-frequencies were developed for the old plume and the Rekohu plume for 2012 and 2013 and for the Crack in 2013 (MPI, 2014b).

Table 5 Acoustic estimates of average pluming spawning biomass in the three main spawning areas in ORH3B ESCR as used in the assessment. All estimates were obtained from surveys on *FV San Wataki* from 38 kHz transducers. Each estimate is the average of a number of snapshots as reflected by the estimated CVs.

		Estimate (t)	CV (%)	Prior
Acoustic estimates of abundance				
2002	Old plume	63,950	6	1
2003	Old plume	44,316	6	2
2004	Old plume	44,968	8	3
2005	Old plume	43,923	4	4
2006	Old plume	47,450	10	5
2007	Old plume	34,427	5	6
2008	Old plume	31,668	8	7
2009	Old plume	28,199	5	8
2010	Old plume	21,205	7	9
2011	Old plume+Rekohu+Crack	51,329	10	10
2012	Old plume + Rekohu	46,513	7	11
2013	Old plume+Rekohu+Crack	51,673	11	10
Trawl survey data				
1984	Otago Buccaneer	130,000	17	Uninformative
1985	Otago Buccaneer	111,000	15	Uninformative
1986	Otago Buccaneer	77,000	16	Uninformative
1987	Otago Buccaneer	60,000	15	Uninformative
1988	Cordella	73,000	25	Uninformative
1989	Cordella	54,000	18	Uninformative
1990	Cordella	34,000	19	Uninformative
1992	Tangaroa	22,000	34	Uninformative
1994	Tangaroa	61,000	67	Uninformative
2004	*Tangaroa* wide	16,878	10	Uninformative
2007	*Tangaroa* wide	17,000	13	Uninformative

1 – 9: lognormal (mean=0.7-0.3; CV=0.3); 10 – Lognormal(mean=0.8; CV=0.19); 11 – Lognormal(mean=0.7; CV=0.3)

The base model fitted the acoustic estimates of abundance fairly closely. As for the ORH3B NWCR assessment, the posteriors for several of the acoustic catchability parameters were generally shifted to the left of their priors (i.e. towards higher biomasses). The base model estimate of virgin biomass was 320,000 t (95% CI 280 - 350,000 t) and the current biomass was estimated to be 30% (95% CI 25-34%) of the unfished spawning biomass. The posterior distribution for the time-trajectory of spawning stock biomass declines from the start of the fishery until the late-2000s and rebuilds thereafter (

Figure 9). Fishing mortality is estimated to be currently below the corresponding management target range (Figure 10).

The results of the 2014 assessment for ORH3B ESCR are sensitive to the treatment of the Rekohu plume, with substantially larger extents of depletion (less optimistic results) if the assessment is based on the spatially-structured model (although this model was considered implausible by the DFAWG because the prior for acoustic catchability was updated substantially as was the prior for the proportion of spawning biomass being indexed by the three spawning areas combined and because the model estimated that the Rekohu plume would have contained 100,000 t up until the early 1980s). Assuming that the Rekuho plume was established in 2007 leads to a more pessimistic appraisal of stock status as does estimating *M* (a posterior median depletion of 26% of the unfished level).

The results are sensitive to the value assumed for *M* and the mean of the priors for the acoustic surveys, with current stock size close to the soft limit when *M* and the mean of the

prior for acoustic catchability are set to 20% below their base values (Cordue, 2014b). The estimates of current stock size relative to B_0 are less optimistic when the assessment is based on the maximum posterior density (MPD) estimates. However, these are not preferred for providing management advice in New Zealand.

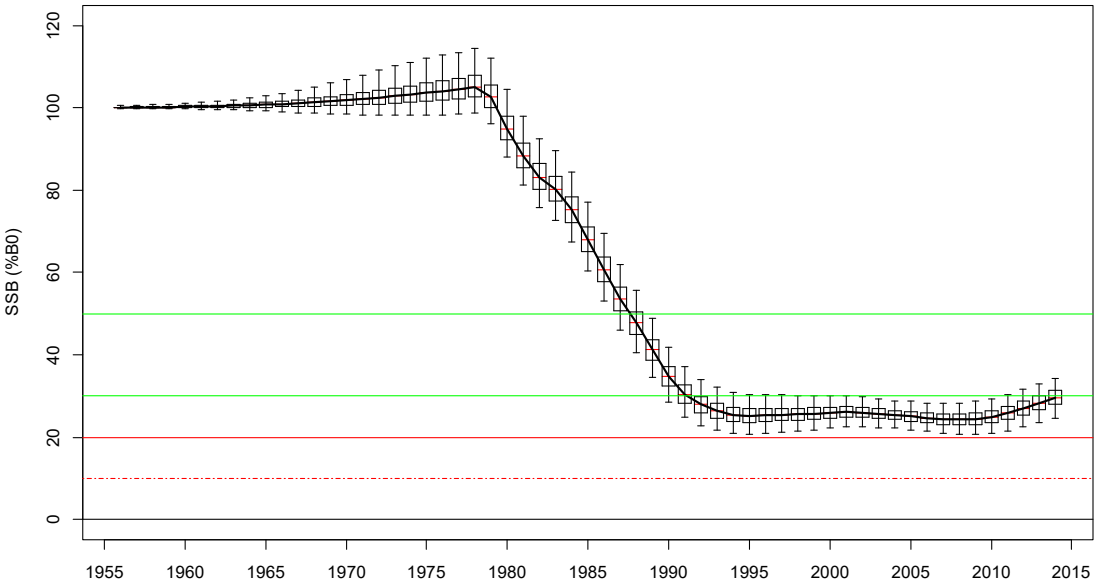

Figure 9 ORH3B ESCR base, MCMC estimated spawning-stock biomass trajectory. The box in each year covers 50% of the distribution and the whiskers extend to 95% of the distribution. The hard limit (dotted red line), soft limit (solid red line), and management target range 30–50% B_0 (green) are marked by horizontal lines.

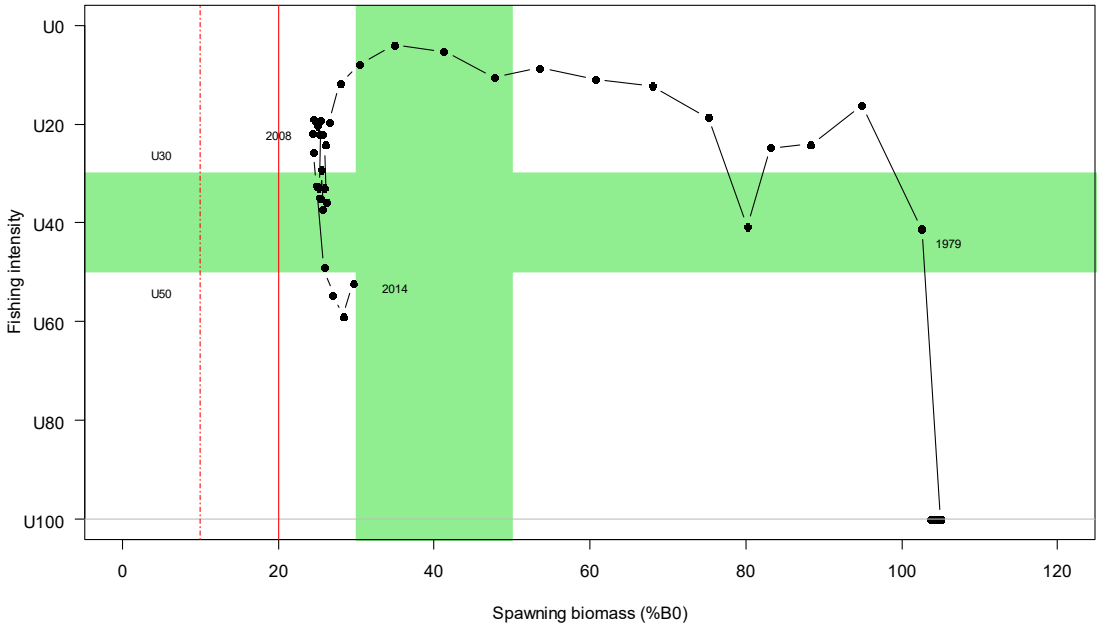

Figure 10 Historical trajectory of spawning biomass (%B_0), median exploitation rate (%) and fishing intensity (100-ESD) (base model, medians of the marginal posteriors) for the ORH3B ESCR. The management target range of 30-50 % B_0 and the corresponding exploitation rate range are marked in green. The soft limit (20% B_0) is marked by a solid red line and the hard limit (10% B_0) by a dashed red line. Note that the Y-axis is non-linear.

The stock was estimated to continue to rebuild under the 2013-14 catch limit (3,100 t) and under a catch limit double this, under the base model and the most pessimistic of the sensitivity runs.

ORH7A Challenger Plateau

The fishery on the Challenger Plateau historically took place on the south-western region of the Plateau, both inside and outside the New Zealand EEZ. The total catch peaked during 1986-87 and 1988-89. The fishery was closed in 2000-01 to facilitate stock rebuilding and reopened in 2010-11 with a TACC of 500 t given the results of surveys that established increased biomass in the stock.

The 2014 assessment was the first formal model-based assessment since 2005 (MPI, 2014c). The data included in the assessment were spawning biomass estimates from combined acoustic and trawl surveys (2006, 2009–2013); an early trawl survey time series of relative spawning biomass (1987–1989); and three age frequencies from the trawl surveys (1987, 2006, and 2009). The biomass indices are listed in Table 6. The acoustic and trawl indices were based on the method of Cordue (2010, 2012). There are some earlier trawl survey estimates of abundance, but these were excluded from the base model owing to lack of comparability.

Table 6. Biomass indices used in the stock assessment for the ORH7A Challenger stock. The model CV is the observation error used in the base model. A 20% process error CV was added to the sample CV for the trawl indices. The CV for the combined acoustics and

trawl estimates was split between the informed *q*-prior (CV = 21%) and the observation error in the model.

Series	Year	Biomass index (t)	CV (%)	Model CV (%)	Q Prior
Trawl surveys					
Amaltal Explorer	1987	75,040	26	33	Uninformative
	1988	28,954	27	34	Uninformative
	1989	11,062	11	23	Uninformative
Thomas Harrison	2006	13,987	27	34	1
	2009	34,864	24	31	1
	2011	18,425	26	33	1
	2012	22,451	18	27	1
	2013	18,993	51	55	1
Acoustics & trawl	2010	14,766	30	21	2
	2013	13,637	35	28	2
Acoustic: two plumes	2009	23,095	25	25	3

1: log-normal(mean=1.27; CV=0.3); 2: log-normal (mean=0.77; CV =0.21); 3: log-normal (mean=0.8; CV=0.19)

The mean of the prior for the catchability coefficient for the *F.V. Thomas Harrison* surveys accounted for the proportion of biomass available to be surveyed (0.8), three excluded survey strata (0.85), and expected vulnerability (1.66) (Cordue, 2014b). The CV for this prior was set to 0.3 to reflect the effects of fish pluming and moving within the area. The mean of prior for the catchability coefficient for the acoustic estimates for 2010 and 2013 accounted for the proportion of the biomass available to be surveyed (0.8) and for three excluded strata (0.85).

The assessment also included age-frequency data from the 1987 *F.V. Amaltal Explorer* survey and 2006 and 2009 *F.V. Thomas Harrison* surveys.

The model fitted the data fairly well, although it failed to fi the high 1987 trawl estimate and the 2009 acoustic survey estimate of abundance (Cordue, 2014b). The priors for the acoustic catchability coefficients for the *F.V. Thomas Harrison* and the 2010 and 2013 acoustic surveys were updated fairly substantially.

The stock was estimated to have been depleted substantially during the 1980s, close to the hard limit (10% B_0). Closure of the fishery from 2000-01, along with new recruitment, is understood to have led to an increase in biomass to above the midpoint of the management target (30-50% B_0) (Figure 11, Figure 12).

The stock is estimated to continue to rebuild under the 2013-14 TACC (500 t), under the base model and the most pessimistic of the sensitivity runs. However, stock size is predicted to decline slightly under a TACC of 2,100 t (the current estimated yield at the target exploitation rate so that spawning biomass is reduced to 35% of the unfished level) under the base model and substantially for the more pessimistic lowM-highq scenario. The 2014-15 TACC was set to 1,600 t based on the HCR.

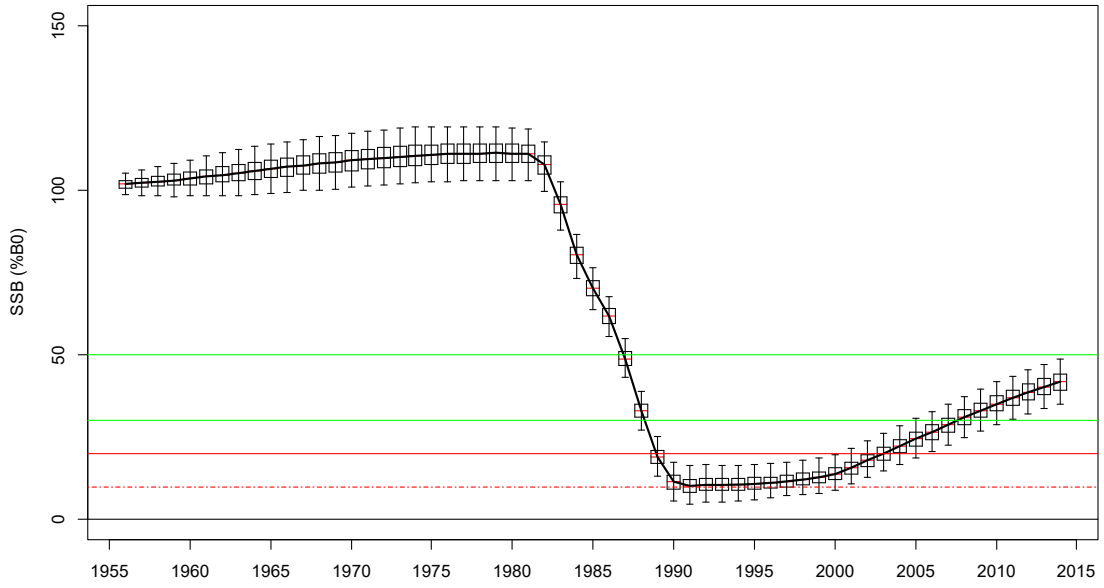

Figure 11 ORH7A Challenger, base, MCMC estimated spawning-stock biomass trajectory. The box in each year covers 50% of the distribution and the whiskers extend to 95% of the distribution. The hard limit (dotted red line), soft limit (solid red line), and management target range (green) are marked by horizontal lines.

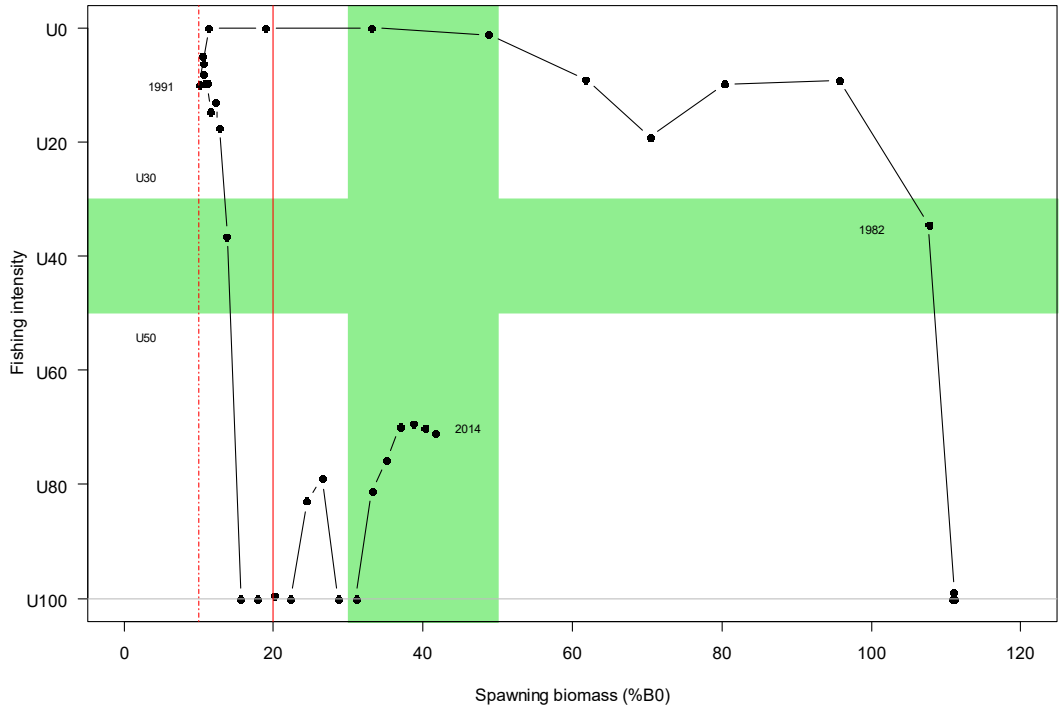

Figure 12 Historical trajectory of spawning biomass (%B_0), median exploitation rate (%) and fishing intensity (100-ESD) (base model, medians of the marginal posteriors) for the ORH7A

Challenger stock. The management target range of 30-50% B_0 and the corresponding exploitation rate (fishing intensity) range are marked in green. The soft limit (20% B_0) is marked by a solid red line and the hard limit (10% B_0) by a dashed red line. Note that the Y-axis is non-linear

Stock status summary

Table 7 provides a summary of the key output statistics from the base models for three assessments.

Table 7 Summary of the estimates of unfished biomass from the three assessments, along with the estimate of current (2014) biomass relative to B_0. The values in parentheses indicate 95% credibility intervals.

Stock	B_0 ('000 t)	B_{2014} (%B_0)
ORH3B NWCR	66 (61-76)	37 (30-46)
ORH3B ESCR	320 (280-350)	30[1] (25-34)
ORH7A	88 (82-96)	42 (35-49)

1: Actually 29.6% (Cordue, 2014d)

Table 8 provides a summary of the estimates of the stock status for each of the three UoAs, as reported by the MPI Stock Assessment Plenary (MPI, 2014b, c) and by Cordue (2014d).

Table 8 Summary of stock status of each UoA relative to the hard limit and the management target range (MPI, 2014b, c; Cordue, 2014d)

	ORH3B NWCR	ORH3B ESCR	ORH7A
Below Hard Limit	Exceptionally unlikely	Very unlikely	Exceptionally unlikely
Below Soft Limit	Very unlikely	Unlikely	Very unlikely
At or above Management Target	Likely above lower limit	As likely as not above lower limit	Considered fully rebuilt
Overfishing	Exceptionally unlikely	Very unlikely	Very unlikely
$P(B_{2014} < 0.2B_0)$	< 0.01	< 0.01	<0.01
$P(B_{2014} < 0.3B_0)$	0.04	0.57	<0.01

Exceptionally unlikely (<1%); Very unlikely (< 10%); Unlikely (<40%), As Likely as Not (40-60%), Very Likely (> 90%)

3.3.6 Management advice

Reference points and harvest strategy

Management advice on setting TACs for orange roughy has to be broadly consistent with the Harvest Strategy Standard for New Zealand Fisheries (HSS). The HSS (MPI, 2008, 2011) aims to:

> *"provide a consistent and transparent framework for setting fishery and stock targets and limits and associated fisheries management measures, so that there is a high probability of achieving targets, a very low probability of breaching limits, and acceptable probabilities of rebuilding stocks that nevertheless become depleted, in a timely manner"*.

The HSS specifies probabilities for each of these outcomes. The HSS is consistent with the 2008 Amendments to the Fisheries Act 1996. The Standard (i.e. not the Fisheries Act) includes the need for a target reference point, a soft limit and a hard limit. Stocks that are

assessed to be depleted to below the soft limit require a formal, time-constrained rebuilding plan, while stocks that are depleted to below the hard limit should be considered for closure. Under the HSS, stocks depleted to below the soft limit should be rebuilt (with an acceptable probability) to at least the target level/range between T_{MIN} and $2XT_{MIN}$ where T_{MIN} is the theoretical minimum number of years required to rebuild a stock to the target level/range in the absence of fishing (MPI, 2008). The HSS was established following extensive consultation and review (including international peer-review of a draft of the standard). The Standard is not, however, a management strategy because it does not specify, for example, the form of the HCR, and the monitoring requirements, although both monitoring and some form of a HCR are needed to implement the HSS.

The TAC is set by the Minister for Primary Industries (who executes the responsibilities of the Minister of Fisheries) through a public process. The Minister, under Section 13 of the Fisheries Act 1996, sets a TAC for a quota management species that:

a) *maintains the stock at or above a level that can produce the maximum sustainable level; or,*
b) *enables the level of any stock whose current level is below that which can produce the maximum sustainable level to be altered:*
    - *in a way and at a rate that will result in the stock being restored to or above a level that can produce the maximum sustainable level and*
    - *within a period appropriate to the stock, having regard to the biological characteristics of the stock and any environmental conditions affecting the stock or*
c) *enables the level of any stock whose current level is above that which can produce maximum sustainable level to be altered in a way and at a rate that will result in the stock moving towards or above a level that can produce the maximum sustainable yield.*

The Fisheries Act 1996 does not refer to harvest strategies or HCRs. However, the HSS refers to both. The process for setting TACs first involves MPI providing a discussion document that outlines a set of options for the TAC (and other management controls including TACCs and other catch limits), and provides the context for the Minister's decision and other relevant background material such as previous management decisions and the results of the stock assessment, including the main uncertainties (e.g. MPI, 2014e, f). The discussion document also outlines for orange roughy how each option is consistent with the Fisheries Act 1996 and with the harvest strategy.

The discussion document is then released for a four to six week public consultation period during which submissions are received from stakeholders, including industry and non-governmental organizations. These submissions are incorporated into a decision document, which forms the basis for the Minister's decision (see MPI, 2014g).

Management Strategy Evaluation

The proposed limit reference point, the management target range, and harvest strategy (HCR) were developed using a MSE framework parameterized for orange roughy of New Zealand (Cordue, 2014c). The MSE framework is based on the assessments conducted during 2014. However, the base models from those assessments were based on pre-specified values for two key parameters, including: steepness; and, natural mortality. In contrast, the MSE analyses allowed for uncertainty in both steepness and natural mortality throughout the analyses.

The steepness of the stock-recruitment relationship and natural mortality are related directly to the fishing mortality rate at which MSY is achieved (Punt *et al.*, 2008). The steepness parameter was consequently treated as uncertain in the projections, with a distribution based on a Bayesian assessment of the MEC stock (i.e. ORH2A South, ORH2B and ORH3A)

based on a prior for steepness for U.S. west coast rockfishes developed by Forrest *et al.* (2010). Figure 13 shows the prior and the posterior for steepness. The posterior mean for steepness (0.6; 95% CI [0.31-0.95]) is less than that assumed in the base models used for assessments (0.75).

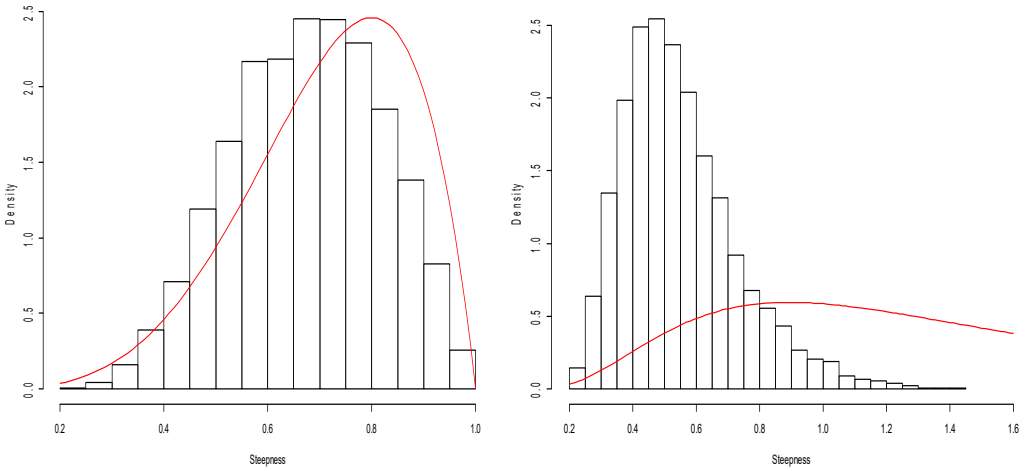

Figure 13 The prior (red line) and posterior (histogram) for steepness from the Beverton-Holt (left panel) and Ricker (right panel) MCMC runs (from Cordue, 2014c).

The posterior distribution for natural mortality was based on combining the estimated distributions for natural mortality from the assessments for four orange stocks (the three included in this report and the MEC). This led to a distribution for natural mortality that was centred on a lower value 0.037 yr^{-1} (95% CI [0.029 – 0.49]) than that used in the base model (0.045 yr^{-1}). This was expected because estimates of natural mortality are less than the value assumed in the base-case models (MPI, 2014a).

The MSE did not simulate the actual assessment method owing to computational limitations. Instead, estimates of stock status (B/B_0) and vulnerable biomass were simulated with error that was highly temporally correlated (ρ=0.95) and subject to annual variation with a coefficient of variation based on the actual assessment. The TAC was updated every third year and set to the TACC plus 5% to allow for estimated incidental catch.

The key uncertainties considered in the MSE were:

- the form of the stock-recruitment relationship (Ricker or Beverton-Holt);
- whether fishing is restricted to spawning fish or independent of maturity status;
- the extent of variation and temporal correlation in recruitment about the assumed stock-recruitment relationship; and,
- bias in the estimates of stock status and vulnerable biomass as well as a higher level of error in the estimates on which the HCR is based.

A concern with orange roughy fisheries is the potential for spawning success to be disrupted by fishing of spawning aggregations. Given the nature of the fishery, it is not possible to directly measure this impact (if it exists) and consequently it is not modelled explicitly in the MSE. However, Cordue (2014d) argues that the posterior distribution for steepness used in the MSE was taken from an assessment of the MEC stock that historically has had substantial fishing on spawning plumes (Dunn, 2011). Consequently, any effect that such

fishing has had would have been passed through to the posterior on steepness, and the distribution would be shifted to the left because of it (i.e., lower values of steepness estimated because of lower spawning success caused by fishing on plumes – if such an effect exists). The most recent estimated year class strength was in 1996 for the stock assessment conducted for the MEC where steepness was estimated. Cordue (2014d) notes that it is probably the last 10 year class strengths estimated that would have the most influence on the estimate of steepness (as they have the lowest stock status of those years for which year class strengths were estimated). Dunn (2011) estimated the spawning season (June-July) catch for the MEC stock. The estimated catch exceeded 1,500 t (with a maximum of 3,000 t) during seven out of the ten fishing years from 1986-87 to 1995-96. Cordue (2014d) notes that this probably represents a much greater level of spawning disruption than could be expected for the regions under assessment in the future under the HCR. This is especially true for Northwest Rise, which has one of the main spawning plumes contained within a closed area (i.e., Morgue).

The performance metrics on which the MSE was based were:

- mean annual mid-season spawning biomass;
- mean annual yield;
- probability of spawning biomass being above the limit reference point; and,
- probability of the mid-season spawning biomass being above the lower bound of the management target range.

Cordue (2014c) recognized that there is a need to re-evaluate the agreed upon HCR every five years given collection of new data that might inform key parameters such as steepness and natural mortality.

The adopted harvest strategy (DWG, 2014b, Reeve, 2014) was applied by Cordue (2014c) as the basis for projections. Future recruitment was sampled from the year-class strengths for the ten most recent cohorts for which recruitment strength can be estimated. The projections took into account when future assessments are likely to be conducted. Projections were undertaken for a base scenario and a “worst case” scenario in which both natural mortality and steepness are less than their base values. Stock size either remains in the management target range or increases towards that range (Figure 14, Figure 15).

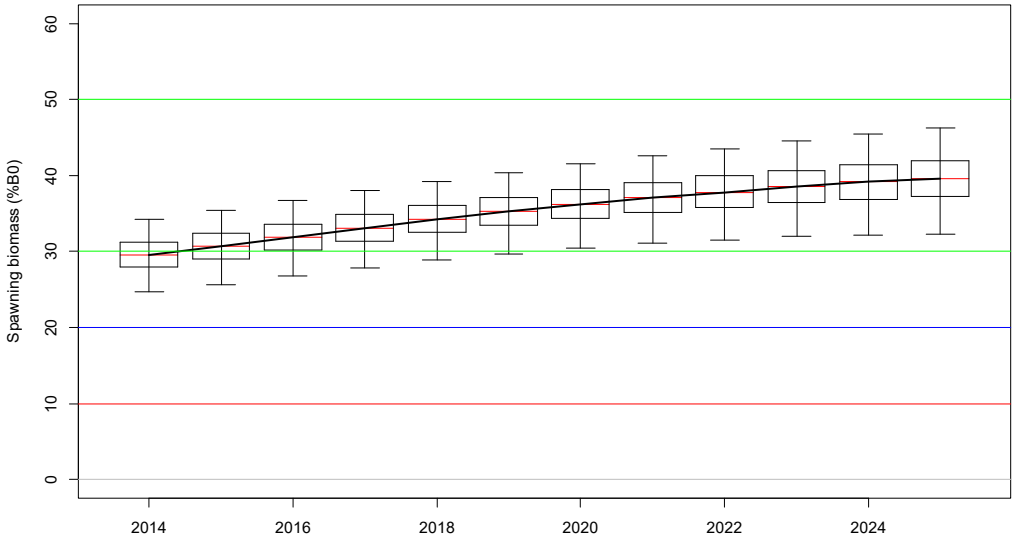

Figure 14 ORH3B East and South Chatham Rise base model: projections under dynamic HCR10 (catch limit: 3,772 t for 2015–2018 inclusive; 4,965 t for 2019–2021 inclusive; 5,768 t for 2022–2024 inclusive; 6,317 t in 2025) (Cordue, 2014c). The box and whiskers plots are of projected mid-season spawning biomass. The medians are shown by the horizontal red lines; the boxes cover the middle 50%; and the whiskers extend to the 95% CI.

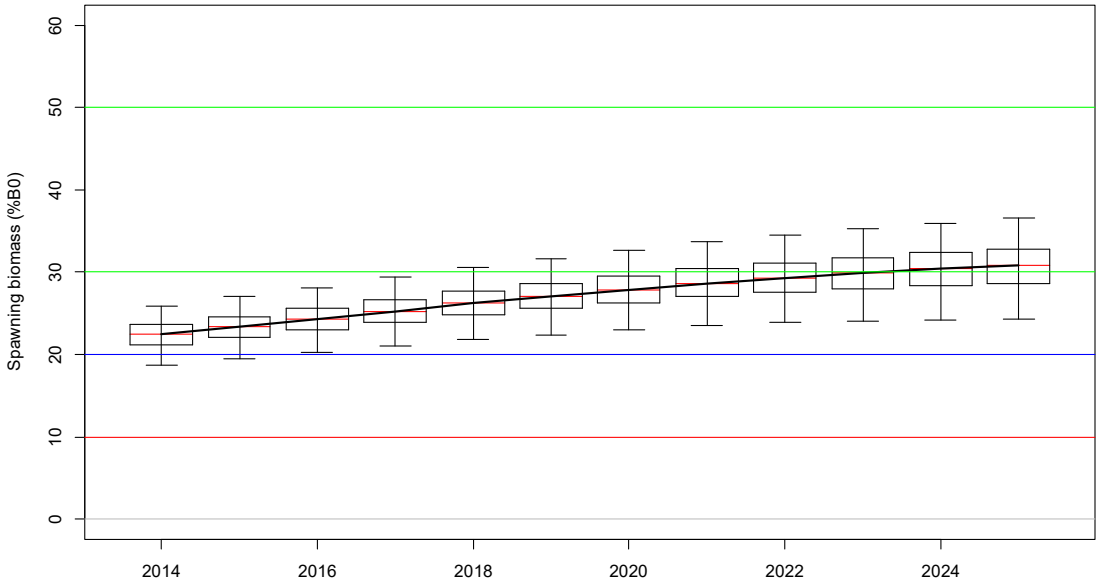

Figure 15 ORH3B East and South Chatham Rise, “worst case” lowM-highq model: projections under the catch limits from dynamic HCR10 applied to the base model (3,772 t for 2015–2018 inclusive; 4,965 t for 2019–2021 inclusive; 5,768 t for 2022–2024 inclusive; 6,317 t in 2025) (Cordue, 2014c). The box and whiskers plots are for projected mid-season

spawning biomass. The medians are shown by the horizontal red lines; the boxes cover the middle 50%; and the whiskers extend to the 95% CI.

Informing B_{MSY} and the limit reference point

A distribution for both B_{MSY} and the limit reference point was constructed from the results of long-term projections. The limit reference point was defined as $0.2B_0$ or $0.5B_{MSY}$ whichever was higher. Values for B_{MSY} and the limit reference point were computed for a grid of values for steepness and natural mortality under the assumption of deterministic recruitment. The value for B_{MSY} was sensitive to the form of the stock-recruitment relationship, steepness and to a lesser extent natural mortality. Table 9 lists Bayesian estimates of B_{MSY} as a fraction of B_0. The management target range is 30-50% of the unfished spawning stock biomass (0.3 – $0.5B_0$). The mid-point of this range balances the low estimate of B_{MSY} from the Beverton-Holt stock-recruitment relationship with the higher estimate based on the Ricker stock-recruitment relationship. Cordue (2014c) notes that the management target range should be broad enough to accommodate the sustained trends in stock status that can occur due to good or poor recruitment and that based on the projections conducted, a range of approximately 20% is appropriate.

Table 9 Bayesian estimates of B_{MSY} for the base model assuming a Beverton-Holt or a Ricker stock recruitment relationship. The median and 95% CIs are given as a percentage of virgin mid-season mature biomass (B_0).

	B_{MSY} (%B_0)	
	Median	95% CI
Beverton-Holt	26	12-39
Ricker	42	37-47
Combined (equal weight)	38	15-47

Table 10 summarises the posterior distributions for the limit reference point. The estimate (posterior median) based on combining results across stock-recruitment relationships and allowing for uncertainty in both steepness and natural mortality is $0.2B_0$. This lower bound for the 90% CIs is $0.2B_0$ because the limit reference point cannot be less than $0.2B_0$.

Table 10 Bayesian estimates of the limit reference point for the base model assuming a Beverton-Holt or a Ricker stock-recruitment relationship. The median and 95% CIs are given as a percentage of virgin mid-season mature biomass (B_0).

	Limit Reference Point (%B_0)	
	Median	95% CI
Beveron-Holt	20	20-20
Ricker	21	20-24
Combined (equal weight)	20	20-23

In summary, the proposed reference points for the two fisheries are a limit reference point of 20% of the spawning stock biomass ($0.2B_0$), while the management target range is 30-50% of the unfished spawning stock biomass. The lower bound of management target range is higher than the estimate of spawning stock biomass corresponding to maximum sustainable yield ($0.26B_0$) computed under the assumption of deterministic dynamics and the stock-recruitment relationship on which the stock assessment is based. Thus, the limit reference point is larger than half of this estimate of B_{MSY}. Given the assumed stock-recruitment relationships, a limit reference point of $0.2B_0$ should be above the point at which recruitment is impaired.

Harvest control rule

The proposed harvest strategy for orange roughy (DWG, 2014b) is given in Figure 16. This HCR sets the fishing mortality to 0.045 yr^{-1} (the value for *M* used in assessments at a stock size of $0.4B_0$), with fishing mortality ranging between 0.034 yr^{-1} and 0.056 yr^{-1} between $0.3B_0$ and $0.5B_0$. The rate over which fishing mortality is reduced for stock sizes below $0.3B_0$ is higher than the rate of change in fishing mortality between $0.3B_0$ and $0.5B_0$. Fishing mortality is set to set to zero at $0.1B_0$ (the Hard Limit in the HSS).

A rescaling procedure is applied if the stock size is estimated to be below $0.3B_0$ or larger than $0.6B_0$ (Figure 17).

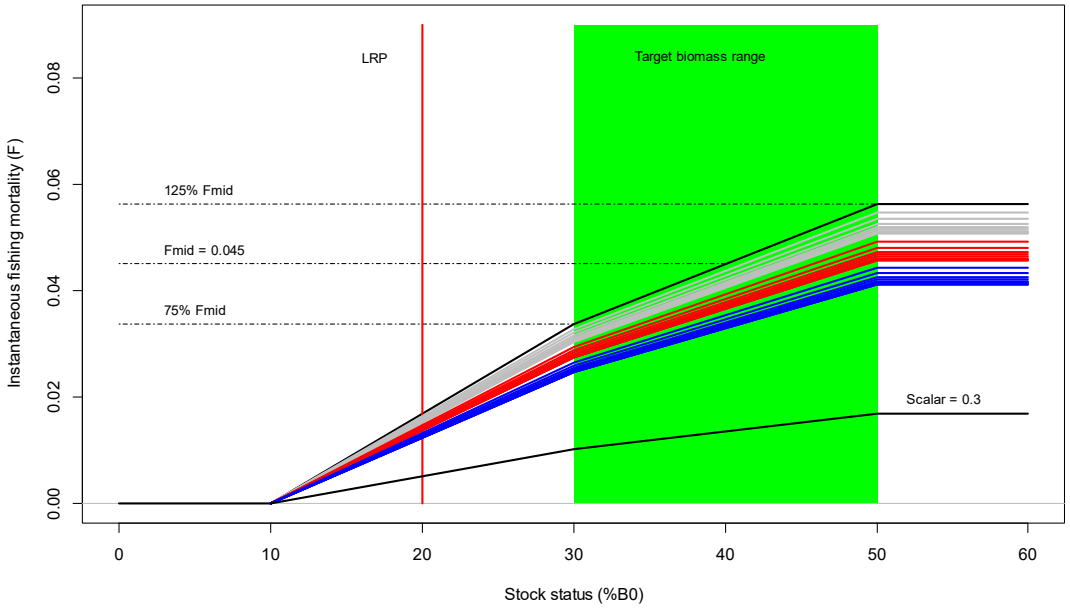

Figure 16 An array of functional relationships between estimated stock status and fishing mortality (F) under the HCR. The initial relationship is shown where F_{mid} = 0.045. The grey lines show the new relationship should the next assessment provide stock status estimates of 20, 21, 22, … 29 % B_0. The red lines show the updated relationships if the assessment after that has an estimate of 20% B_0 or lower (in which case the relationship is scaled down by 0.9). The blue lines are the new relationship if yet another assessment has stock status at 20% B_0 or lower. The maximum cumulative scaling down is limited by a scalar of 0.3 (solid black line).

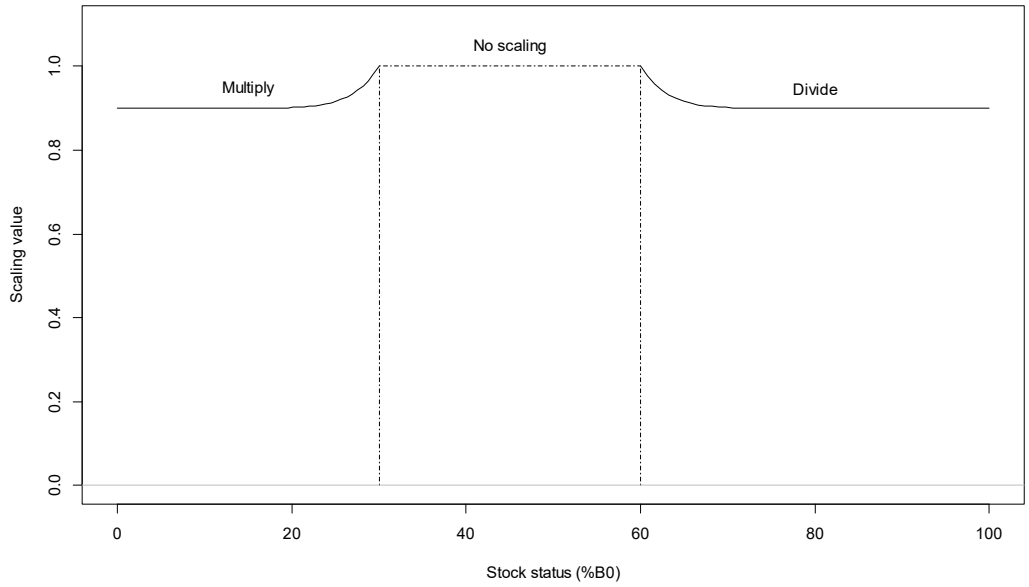

Figure 17 The scaling function for the fishing mortality used in the control rule.

The HCR in Figure 15, combined with the rescaling approach in Figure 17, was tested using the MSE process. In general, the proposed harvest strategy has a high probability of maintaining stocks in the management target range (Cordue, 2014c).

It is proposed that the harvest strategy will be reviewed every 4-5 years (DWG, 2014b). Reeve (2014) notes that the work to finalise and agree the HCR was not complete when the Minister for Primary Industries made his decisions regarding the 2014 catch limits for the ORH3B and ORH7A stocks. Reeve (2014) notes that the 2014 catch limits are broadly consistent with those produced by the HCR, but the catch limit for the ORB3B NCWR stock was set 207 t above that required by the HCR. Consequently, quota owners have collectively agreed to not fish this 207 t ACE until the stock size is assessed to reach $0.4B_0$[6]. The catch limits currently implemented for each of the UoA are at, or below the HCR-generated catch limits.

Reeve (2014) notes that now the HCR has been formally agreed, MPI will in future endeavour to set catch limits for the three orange roughy stocks using the agreed HCR whenever possible. Thus, the HCR are, for all intents and purposes, implemented. However, as Reeve (2014) suggests that following the HCR will occur “whenever

[6] MPI proposed a catch limit of 1,250 t based on five-year catch projections from the 2014 stock assessment before the MSE was completed and the results accepted.

possible", whether catch limits are implemented consistent with the HCR will need to be monitored during annual surveillance reports.

Table 11 The outcomes of the HCR for each of the three stocks and the catch limits agreed by the Minister of Fisheries

Stock	HCR output	2014-15 catch limits (t)
ORH 3B NWCR	1,043	1,250
ORH 3B ESCR	3,772	3,100
ORH 7A	1,748	1,600

MPI has a 10-year plan that identifies a work programme for research and monitoring for orange roughy. This plan is part way through and currently being revised and updated. Table 12 lists the expected frequency and type of survey for orange roughy for the three stocks while Table 13 lists the proposed assessment frequency. Table 12 includes the frequency of assessment for the MEC orange roughy fishery as the assessment for that stock informs steepness, which is a core component of the MSE. Tingley (2014) notes that surveys are planned to occur more frequently than the MSE suggested would be necessary. This choice has also been informed by the relative newness of the modelling approach and the need to be adequately precautionary. The exact timing of individual surveys, and thus stock assessments, may change, but the frequency between surveys is not expected to change prior to the MSE being rerun.

Table 12 The expected frequency and type (trawl, hull mounted acoustics, multi-frequency acoustic system) of survey for orange roughy relevant to the certification of the ORH 7A, ORH 3B NWCR and ESCR fisheries (Tingley, 2014).

Financial year	Challenger ORH7A trawl & acoustic survey	NWCR & Mt Muck ORH3B acoustic survey	ESCR spawning plumes ORH3B acoustic survey
2015-16	July 2015		
2016-17		June-July 2016	June-July 2016
2017-18			
2018-19	July 2018		
2019-20		June-July 2019	June-July 2019
2020-21			
2021-22	July 2021		
2022-23		June-July 2022	June-July 2022
2023-24			
2024-25	July 2024		

Age frequencies and length frequencies by sex will be collected from the surveys. Observer coverage in the fisheries is expected to be about 20%, with age and length frequencies collected from commercial catches from each area. MPI intend to collect data on gonad development by date, which will be used to refine the planning of survey timing.

Table 13 The expected frequency and timing of stock assessments (Tingley, 2014).

Financial year	Challenger (ORH7A)	NWCR (ORH3B)	ESCR (ORH3B)	Mid-East Coast (ORH2a south, 2B, 3A)
2015-16	Assessment			
2016-17		Assessment	Assessment	
2017-18				Assessment
2018-19	Assessment			
2019-20		Assessment	Assessment	
2020-21				Assessment
2021-22	Assessment			
2022-23		Assessment	Assessment	
2023-24				Assessment
2024-25	Assessment			

Principle Two: Ecosystem Background

Orange roughy (*Hoplostethus atlanticus*) occur in deepwater habitats on and below the continental slope. Clark and Anderson (2013) have reviewed and summarised the ecosystem that orange roughy inhabit. While orange roughy are considered demersal, as they are caught on/near the seabed in demersal trawls, their diet indicates they forage into the bentho pelagic and, as a species without a swim bladder, they would appear to be well adapted to this. Juvenile orange roughy occur most frequently on gently sloping areas of the upper continental slope at depths of 850–900 m (Dunn *et al.*, 2009a, b). Adults are found at depths of 850 m to at least 1500 m. Larger orange roughy may aggregate around Underwater Topographic Features (UTFs), such as ridges, hills, knolls, and seamounts as well as canyons for spawning and feeding (Branch, 2001; Dunn and Devine, 2010). Orange roughy fishing in New Zealand takes place over areas of flat seabed on the continental slope and on UTFs. UTFs include seamounts, knolls and hills defined on the elevation measured as the height from base to summit (seamount > 1,000 m; knoll 500 to 1,000 m; hill <500m) (United States National Geospatial-Intelligence Agency, 2015). Compared to UTFs, less is known about the ecosystems of the benthic areas of the upper continental slope. The upper continental slope has lower benthic biomass per unit area compared to UTFs but is not homogenous. Biodiversity and habitats do vary over large spatial scales (Compton *et al.*, 2013) but the primary driver of this variability is likely to be environmental such as depth, substrate and oceanographic conditions (Dunn, 2013).

3.4.1 Retained and bycatch species

Estimation of annual bycatch and discard levels of non-protected species in New Zealand orange roughy fisheries have been undertaken at regular intervals since 1998 (e.g., Anderson *et al.*, 2001, Anderson, 2009, 2011, 2013, Clark *et al.*, 2000). In a New Zealand context, and in most New Zealand publications referred to above, the term 'bycatch' is of all non-target catch and includes both MSC 'retained' and 'bycatch' categories. Target fishing for orange roughy catches a relatively small amount of bycatch, with around 96% of the catch consisting of either orange roughy or other species managed under the QMS, such as oreo (Family Oreosomatidae). All catches of species managed under the QMS are required by law to be accurately recorded, reported and landed with a few prescribed exceptions for landings. Deemed values prevent an incentive for dumping. Deemed values are payable for QMS species caught without balancing ACE. Where deemed values are payable for QMS species taken without balancing ACE, the deemed value is set at a level to remove any financial benefit to industry to catch but at a level that will not incentivise what would be illegal discarding. The penalties for discarding QMS species without authorisation are severe, further reducing the incentives to discard. There is no restriction on discarding non-QMS species. There was a notable decrease in total non-commercial bycatch during 2010-11 and 2011-12 (MPI & DWG, 2013) as a result of a decrease in fishing effort and decreases in catch limits.

There is a Government fisheries observer programme in New Zealand waters and the overall level of observer coverage in the orange roughy fishery (MPI Observer Programme) has generally been more than 20% (in terms of hauls observed) and over 50% in some years (Table 14). The MPI Observer Programme is specifically designed to address the need for accurate species identification (retained, bycatch and ETP species) as well as obtain independent estimates of catch weights or numbers. MPI's Scientific Observer Programme monitors each of the deepwater fisheries, with coverage prioritised based on the needs of each different fishery. Reprioritisation of observer deployment to cover the fleet of foreign charter vessels (FCVs) in relation to monitoring compliance with new labour legislation has resulted in a decline in coverage within the UoAs in recent years. It is

anticipated that this issue will be resolved from 1 May 2016 after which time all vessels fishing within the New Zealand EEZ will be required to be New Zealand flagged.

The observer coverage in the three UoA (ORH7A, ORH3B NWCR and ORH3B ESCR) was relatively high during the period from 2007 to 2014. Observer coverage of 100% in ORH7A from 2008-09 to 2009-10 resulted from observer presence on the commercial vessel undertaking the biomass surveys, which was 100% of the fishing effort as the fishery was a closed during these years.

Table 14 Annual trawl effort (total tows) and observer coverage (% of total tows observed) for each of the three orange roughy management areas (ORH3B ESCR, ORH3B NWCR, and ORH7A) (From DWG Ltd, MPI (2013) as reported in Boyd (2013))

	ORH3B ESCR		ORH3B NWCR		ORH7A	
Year	No. Tows	% obs.	No. tows	% obs.	No. tows	% obs.
2007–08	1,999	47	283	64	0	-
2008–09	2,251	41	186	35	64	100
2009–10	1,659	40	280	31	78	100
2010–11	715	12	11	45	112	65
2011–12	869	17	9	11	106	66
2012–13	818	3	13	69	154	55
2013–14	942	14				

Since 2005–06, orange roughy accounted for about 84% of the total observed catch by weight across all orange roughy fisheries combined, including the three fisheries under assessment (MPI, 2015b). Most of the remainder of the total catch (about 10% of the total) comprised oreo species (Family Oreosomatidae): mainly smooth oreo (*Pseudocyttus maculatus*) and black oreo (*Allocyttus niger*). Rattails (various species) and shovelnose spiny dogfish (*Deania calcea*) were the species with high discard rates (90% discarded). Other fish species frequently caught and usually discarded included deepwater dogfishes (family *Squalidae*), especially *Etmopterus* species, the most common of which is likely to have been Baxter's dogfish (*E. baxteri*), slickheads, morid cods, and especially Johnson's cod (*Halargyreus johnsonii*) (Anderson, 2011, 2013, MPI, 2012).

Although only a few species make up the total catch in the orange roughy fisheries, a large number of species have been observed in low numbers, most being non-commercial species, including invertebrate species. Squid (mostly warty squid, *Onykia* spp.) were the largest component of the invertebrate catch, followed by various groups of coral, echinoderms (mainly starfish) and crustaceans (mainly king crabs, Family *Lithodidae*). Although the catch composition varies among the three orange roughy UoAs, a general trend of declining bycatch and discards has occurred. Total annual catch of other species (i.e. everthing except orange roughy) in all New Zealand orange roughy fisheries since 1990–91 ranged from about 2,300 t to 27,000 t, and has declined over time along with that of the catch and effort in the New Zealand orange roughy fisheries to be less than 4,000 t in each of the last four years (Figure 18). Catch volumes mostly consist of retained species, with non-commercial species accounting for only 5 – 10% by weight of the total non-orange roughy catch from the 2000s. Estimated total annual discards also decreased over time, from about 3,400 t in 1990–91 to about 300 t in 2007–08, and, since about 2000, discards were almost entirely non-commercial non-QMS species, as required by regulations (MPI, 2012).

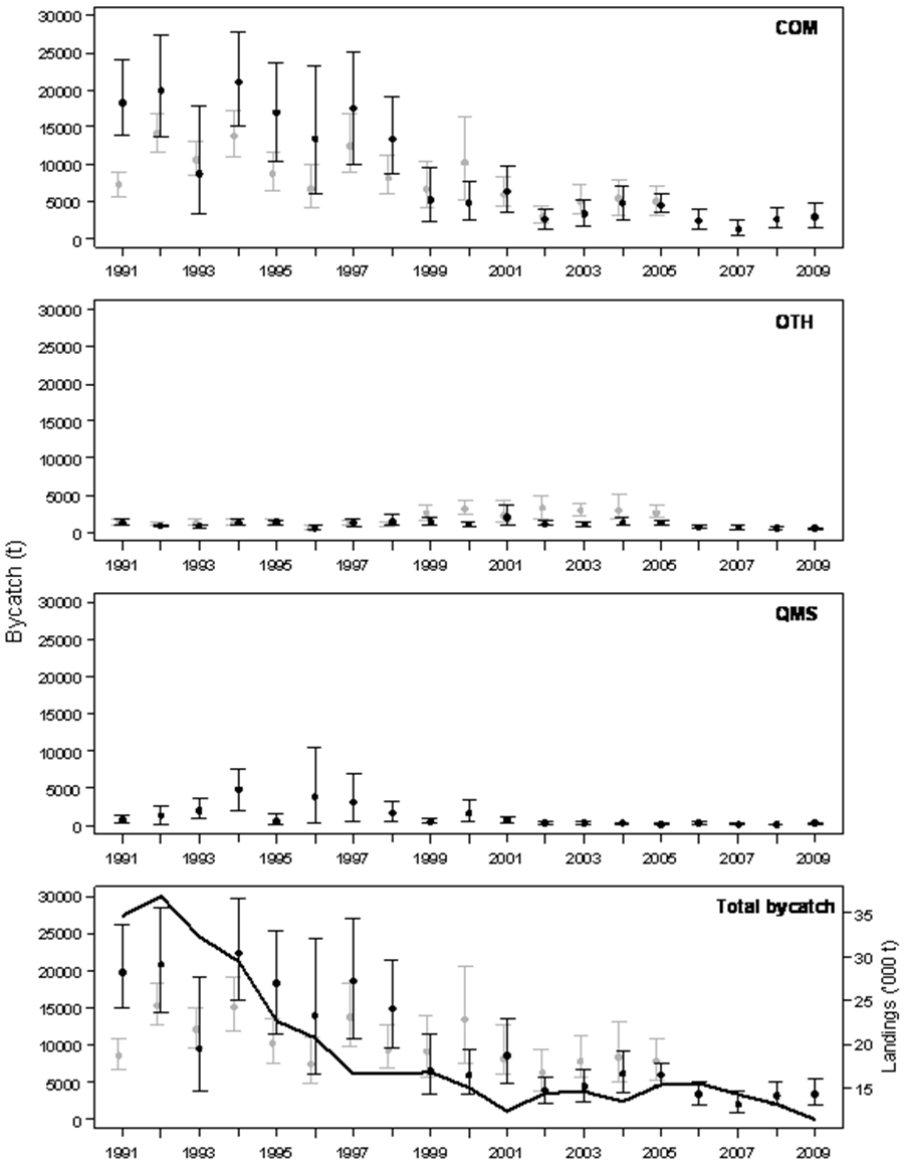

Figure 18 Annual estimates of non-orange roughy catch (called bycatch in this figure, but not the same as the MSC definition of bycatch) in the orange roughy trawl fisheries, calculated for commercial species (COM), non-commercial species (OTH), QMS species, and overall for 1990–91 to 2008–09 (black points). Also shown (grey points) are earlier estimates of bycatch in each category (excluding QMS) calculated for 1990–91 to 2004–05 (Anderson *et al.* 2001, Anderson 2009). Error bars show the 95% confidence intervals. The black line in the bottom panel shows the total annual estimated landings of orange roughy (O. Anderson and M. Dunn (NIWA), unpublished data). (From Figure 6.13, MPI, 2013).

Bycatch (non-retained) species are those with little or no commercial value that are rarely the focus of fishing effort and are usually discarded. They account for only a small proportion of the total catch from the orange roughy target fisheries. The primary management approach for bycatch species, including deepwater shark species, is to actively monitor catch levels through the National Deepwater Plan. If the annual catch or retention of bycatch species changes significantly, either up or down, then management intervention may be considered (MPI, 2010a). If catch levels are deemed to be impacting on the sustainability of a bycatch population then bycatch species may be considered for possible

introduction into the QMS, or other management measures may be implemented, such as catch limits, gear restrictions or closed fishing areas (MPI, 2010a).

The increasing number of species managed under quota within the QMS demonstrates that substantial catches of non-QMS species tends to lead to the establishment of their QMS status, and hence become subject to more formalised monitoring and a requirement for retaining them onboard vessels. Species can be added to the QMS under Section 17B of the Fisheries Act (the Act) and/or the species managed under Section 11 of the Act. Section 17B of the Act requires adding stocks or species to the QMS if the existing management does not ensure sustainability or does not provide for utilization. Under the Act, 'ensuring sustainability' means:

> *'Maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations and avoiding, remedying, or mitigating any adverse effects of fishing on the aquatic environment.'*

while 'utilisation' means:

> *'Conserving, using, enhancing, and developing a fisheries resource to enable people to provide for their social, economic, and cultural wellbeing*'.

A QMS Introduction Process Standard (Mfish, 2008) provides a framework formalising the procedure for moving non-QMS species within the QMS framework, and monitoring 'minor' QMS species status and trends. The management system introduced two species into the QMS in 2010: Patagonian toothfish (MFish, 2010a) and attached bladder kelp (MFish, 2010b). The latter was added to the QMS inter alia because MFish concluded that there was increasing demand for the species. A QMS Introduction Process Standard provides a framework formalising the procedure for moving non-QMS species within the QMS framework, and monitoring lower tier QMS species status and trends.

MPI's 10-year research plan (MPI, 2010b) identifies gaps in the knowledge available for non-QMS species. The research plan calls for directed attention to non-QMS species as the need arises. However, numerous species are monitored with commercial catch records, observer data, and trawl surveys, especially on the Chatham Rise and adjacent areas.

Fishery-specific retained and bycatch

QMS stocks are considered as "Retained species" and non-QMS stocks as "Bycatch species". The assessment team considered main species as those that make up ≥5% of the total catch in a UoA, except for vulnerable species that reach or exceed 2% of the total catch; in an effort to accommodate stakeholder requests, the assessment team made an additional exception for shark species, which are considered main at ≥1% of the total catch).

MPI (2015) compiled detailed information on all catch from the orange roughy fisheries for 2008-09 to 2012-13 for all species. There was no targeted trawling for orange roughy in ORH3B NWCR during 2011-12 as the area was being rested (i.e. there was no commercial fishing). Retained catch includes black cardinalfish (*Epigonus telescopus*), hoki (*Macruronus novaezelandiae*), alfonsino (*Beryx splendens)*, silver warehou (*Seriolella punctata)*, black oreo, smooth oreo, hake (*Merluccius australis)*, and bluenose (*Hyperoglyphe antarctica)* (see Table 16, Table 19, and Table 22). There are significant differences in the levels of retained catch of these species within each of the fisheries under assessment.

Among the non-QMS species making up the bulk of discards, Baxter's lantern dogfish and other deepwater dogfish make up small quantities of the catch, but exceeded 1% of the catch for the ORH3B NWCR and ORH3B ESCR UoA (MPI, 2015b). These dogfish are not

as yet fully managed, but the management system recognizes their vulnerability and the need for explicit management. MPI (2014d) stated the following in regard to these species:

> *Management of shark species in New Zealand is now driven by the National Plan of Action for Sharks (NPOA-Sharks) 2013. Orange roughy fishing is also known to interact with several species of sharks, many reported using generic codes for 'other sharks and dogfish' and 'deepwater dogfish'. It is considered that these species may have life history characteristics that make them vulnerable to overfishing.*
>
> *As part of the implementation of the NPOA-Sharks 2013, a two-stage risk assessment is being completed for all sharks that will guide ongoing management. A preliminary, expert based assessment should be available in late 2014 and a formal quantitative analysis will be available in 2015 to prioritise actions for species estimated to be at higher risk from fishing activities. Any additional catches of deepwater sharks will be taken into account through the risk assessment process.*
>
> *Another work stream within the NPOA-Sharks 2013 is targeted at better identifying all sharks caught and reducing use of generic codes like 'other sharks and dogfish' and 'deepwater dogfish'. Fishery managers are working with observers and the industry to increase species-specific reporting of these shark catches to better inform their management in conjunction with the risk assessment framework.*
>
> *The changes proposed to the ORH3B TAC will result in an increase in fishing effort for orange roughy on the Northwest Chatham Rise. MPI will continue to monitor interactions with sharks in orange roughy fisheries and considers that the planned risk assessment and additional management actions under the NPOA-Sharks 2013 will mitigate any risks posed by increased orange roughy fishing effort.*

Four-rayed rattails and brown slickheads, the predominant species found in trawl surveys (Stevens *et al*. 2015) are not considered as particularly vulnerable, as they generally rated in FishBase as medium resilience with minimum population doubling time 1.4 - 4.4 years and vulnerability of moderate or moderate-high (e.g., http://www.fishbase.org/Summary/speciesSummary.php?ID=8481&AT=four-rayed+rattail; http://www.fishbase.org/Summary/SpeciesSummary.php?ID=16453&AT=brown+slickhead). Ratttails (4.8%) and slickheads (2.9%) are considered as minor species in ORH3B NWCR.

ORH3B Northwest Chatham Rise

Retained For ORH3B NWCR, orange roughy, hoki, smooth oreo, and hake are the only QMS species that individually make up more than 0.5% of the catch, at 73.4%, 8.4% 2.3%, and 0.64%, respectively, during the 2008/09 to 2013/14 fishing years (Table 16). Both hoki and hake are MSC certified as being managed within biologically sustainable limits.

Stock assessments for hoki are undertaken annually, using research time series of abundance indices (trawl and acoustic surveys), proportions at age data from the commercial fisheries and trawl surveys, and estimates of biological parameters (MPI, 2015z). In the 2015 assessment, new information included a trawl survey, two acoustic surveys, and updated catch-at-age data. The general-purpose stock assessment program, CASAL, was used, and the assessment approach, which used Bayesian estimation, was similar to that in the 2013 assessment. The model partitioned the population into two sexes, 17 age groups (1 to 16 and a plus group, 17+), two stocks [east (E) and west (W)], and four areas [Chatham Rise (CR), West Coast South Island (WC), Sub-Antarctic (SA), and Cook Strait (CS)]. It is assumed that the adult fish of the two stocks do not mix: those from the Western stock spawn off the WC and spend the rest of the year in SA; the Eastern stock fish move between their spawning ground, CS, and their home ground, CR.

B_{2015} for the eastern stock of hoki was estimated to be 59% B_0; Virtually Certain (> 99%) to be at or above the lower end of the target range and Likely (> 60%) to be at or above the upper end of the target range. B_{2015} is Exceptionally Unlikely (< 1%) to be below the Soft or Hard Limits. B_{2015} for the western stock of hoki was estimated to be 59% B_0; Virtually Certain (> 99%) to be at or above the lower end of the target range and Likely (> 60%) to be at or above the upper end of the target range. B_{2015} is Exceptionally Unlikely (< 1%) to be below the Soft or Hard Limits.

Smooth oreo is not considered to be a main retained species. The 2014 stock assessment plenary report based on Fu and Doonan (2013) shows that the biomass in OEO4 has trended down since the 1980s (Figure 19). The biomass trend showed a steeper decline in the 1990s compared to more recent years. The Bayesian posterior distribution of mature biomass as a percent of two models (Figure 19) shows the biomass at (model 3.2) or just below (model 5.2) the target of 40% B_0; the Bayesian distribution further demonstrates a small proportion, less than 30%, of the distribution falls below 20% B_0 generating a higher than 70% probability of exceeding the limit reference point. Fu and Doonan (2013) report that the lower 95% confidence interval for mature biomass (Table 15) is 26% B_0 (model 3.2) or 18% B_0 (model 5.2), providing additional evidence that current biomass has a greater than 70% chance of exceeding the limit reference point, and therefore highly likely above the point of recruitment impairment. These results suggest no immediate conservation concern, although the biomass is trending down. The fishery is undergoing a public, industry run fishery improvement project http://deepwatergroup.org/species/oreo/oreo-fisheries-improvement-projects/.

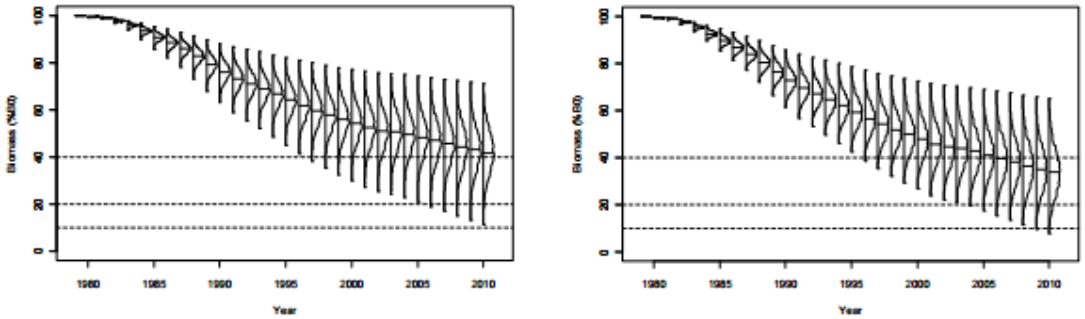

Figure 19 Bayesian posterior distribution of mature biomass as a percentage of B_0 for model 3.2 (left) and 5.2 (right). Dashed lines represent the target (40% B_0), soft limit (20% B_0), and hard limit (10% B_0) respectively.

Table 15 Estimates of Mature biomass for OEO 4 smooth oreo for MCMC model runs 3.2 and 5.2.

	Model 3.2			Model 5.2		
	5%	Median	95%	5%	Median	95%
B_0	132 000	166 000	225 000	118 000	146 000	193 000
$B_{current}$	34 000	67 000	125 000	22 000	48 000	94 000
$B_{current}$ (%B_0)	0.26	0.41	0.55	0.18	0.33	0.49

Hake is not considered to be main retained species. B_{2012} for hake in this area was estimated to be about 47% B_0, and Likely (> 60%) to be at or above the target (MPI, 2015). B_{2012} is Exceptionally Unlikely (< 1%) to be below the Soft or Hard Limits.

Bycatch For ORH3B NWCR, a suite of species make up ≥0.5% of the total catch: rattail (4.8%), slickhead (2.9%), morid cod (1.5%), deepwater dogfish (1.1%), other sharks (0.7%), Baxter's dogfish (0.6%), Johnson's cod (0.6%), and longnose chimaera (0.6%) (Table 17). Baxter's lantern dogfish averaged about 1% of the total catch over the past four years, and slightly more if combined with deepwater and unidentified dogfish; Baxter's lantern dogfish are considered a main bycatch species because they have low productivity and high vulnerability, and reach the 1% threshold set for shark species. No other species reached the main status.

Blackwell (2010) concluded that commercial catch records do not reflect abundance of deepwater sharks. Trawl survey data and observer data are generally of better quality. Observer data are essentially limited to areas where deepwater fisheries operate. Trawl surveys cover areas outside of the fishing grounds and also collect length and maturity stage data for deepwater sharks and other non-QMS species (Stevens *et al.,* 2014). In spite of the low-medium productivity of deepwater sharks (e.g., PSA Productivity score = 2.57 for Baxter's dogfish), Blackwell (2010) reviewed trawl survey data to conclude that deepwater sharks appear to be relatively resilient to the levels of fishing effort associated with the target hoki and orange roughy fisheries on the Chatham Rise.

Blackwell (2010) reviewed research trawl survey estimates for core hoki depths (600-800 m) and deeper waters (750-1,500 m) on the Chatham Rise. Over the course of the 1990s to 2006, Baxter's lantern dogfish ranged in annual estimated abundance from 6,000 to 12,000 t, consisting of 800-2,000 t in the core hoki depth, 200-700 t on the Northwest Chatham Rise, 200-700 t on the Northeast Chatham Rise, and 5,000-10,000 t on the South Chatham rise. Stevens *et al.* (2014, 2015) reported similar amounts in the hoki core depth and the deep zone, excluding the South Chatham Rise. Stevens *et al.* (2015) present figures of trawl estimates of abundance for several deepwater dogfish, including Baxter's dogfish, that show no temporal pattern (Figure 20). Stevens *et al.* (2015) further demonstrate that the length frequency of these dogfish extends up to lengths expected for the adult sizes. For example, Baxter's dogfish reach lengths at and beyond 75 cm, the theoretical expected maximum length for the species. This demonstrates that the adult component has not been fished down. The lower lengths observed, to 20 cm, demonstrate that recruiting year classes are entering the stock.

The ORH3B NWCR fishery averages about 6 t per year of deepwater dogfish and about 13 t of combined dogfish (Table 18). This aggregate catch of dogfish represents about 2.6% of the dogfish catch in FMA 4 (Chatham Rise) and about 1.6% of the dogfish catch in the EEZ (Table 18). The aggregate estimated catch of 13 t represents less than 0.02% of the 6,500-14,000 t biomass of Baxter's lantern dogfish in the Chatham Rise area (Blackwell, 2010) as estimated by trawl surveys.

The orange roughy catch limit has been progressively reduced since the 1990s. For example, the ORH3B catch was reduced from 15,000-20,000 t in the early 1990s to 9,000-12,000 t through the mid-2000s and in the order of 2,500-3,500 t from 2010 (Table 1). The recent catch of orange roughy is a third to a quarter of the catch taken at the peak of the fishery (Blackwell, 2010). Fishing pressure on Baxter's lantern and other deepwater dogfish will have similarly substantially decreased (Blackwell 2010).

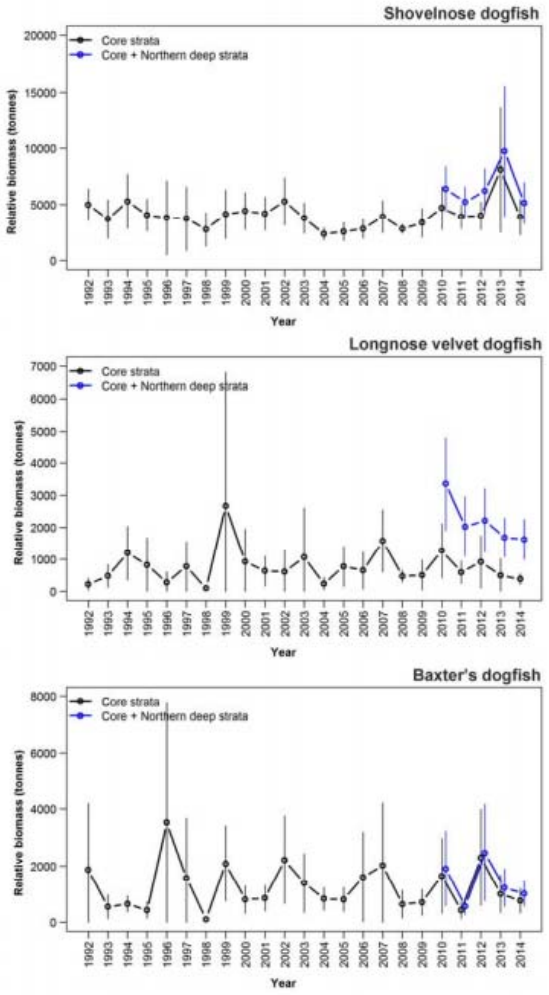

Figure 20 Relative biomass estimates (thousands of tonnes) of selected deepwater dogfish sampled by annual trawl surveys of the Chatham Rise, January 1992–2014. Black lines show fish from core (200–800 m) strata. Blue lines show fish from core strata plus the northern deep (800–1,300 m) strata. Error bars show ± 2 standard errors (Stevens *et al.*, 2015).

Table 16 ORH3B NWCR UoA: QMS (retained) species (kg and % represent observer data, and tonnes represents the estimated [scaled up] total catch) (MPI, 2015b)

Northwest Chatham Rise ORH fishery: QMS (retained) species

All commercial tows		186			280			11			13				
All obs tows		66			87			5			9				
Percentage of tows observed		35.5%			31.1%			45.5%			69.2%				
Species	**2008/09**			**2009/10**			**2010/11**			**2012/13**			**Scaled up total 4 yr catch**	**% total catch**	**Average annual catch**
Unit	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**tonnes**	**%**	**tonnes**
Orange roughy	330,650	80.42	931.8	183,758	61.44	591.4	13,971	92.05	30.7	77,924	97.27	112.6	1,666.5	73.40	416.6
Hoki	21,364	5.20	60.2	40,245	13.46	129.5	8	0.05	0.0	53	0.07	0.1	189.8	8.36	47.5
Smooth oreo	11,863	**2.89**	33.4	5,431	**1.82**	17.5	76	0.50	0.2	586	0.73	0.8	51.9	2.29	13.0
Hake	2,394	**0.58**	6.7	2,382	**0.80**	7.7		0.00	0.0	6	0.01	0.0	14.4	0.64	3.6
Pale ghost shark	254	**0.06**	0.7	777	**0.26**	2.5	6	0.04	0.0		0.00	0.0	3.2	0.14	0.8
Ghost shark	551	**0.13**	1.6	428	**0.14**	1.4		0.00	0.0		0.00	0.0	2.9	0.13	0.7
Ribaldo	414	**0.10**	1.2	157	**0.05**	0.5		0.00	0.0		0.00	0.0	1.7	0.07	0.4
Cardinal fish	92	**0.02**	0.3	120	**0.04**	0.4	43	0.28	0.1	33	0.04	0.0	0.8	0.03	0.2
Black oreo	39	**0.01**	0.1	34	**0.01**	0.1	1	0.01	0.0	191	0.24	0.3	0.5	0.02	0.1
Ling	87	**0.02**	0.2		**0.00**	0.0		0.00	0.0		0.00	0.0	0.2	0.01	0.1
Spiky oreo	56	**0.01**	0.2	10	**0.00**	0.0		0.00	0.0		0.00	0.0	0.2	0.01	0.0
King crab	21	**0.01**	0.1	30	**0.01**	0.1		0.00	0.0		0.00	0.0	0.2	0.01	0.0
Smooth skate		**0.00**	0.0	22	**0.01**	0.1		0.00	0.0		0.00	0.0	0.1	0.00	0.0
Lookdown dory	9	**0.00**	0.0	1	**0.00**	0.0		0.00	0.0		0.00	0.0	0.0	0.00	0.0
Flatfish	5	**0.00**	0.0	2	**0.00**	0.0		0.00	0.0		0.00	0.0	0.0	0.00	0.0
Sea perch	6	**0.00**	0.0		**0.00**	0.0		0.00	0.0		0.00	0.0	0.0	0.00	0.0
Giant stargazer		**0.00**	0.0	5	**0.00**	0.0		0.00	0.0		0.00	0.0	0.0	0.00	0.0
Alfonsino	4	**0.00**	0.0		**0.00**	0.0		0.00	0.0		0.00	0.0	0.0	0.00	0.0
Rough skate	3	**0.00**	0.0		**0.00**	0.0		0.00	0.0		0.00	0.0	0.0	0.00	0.0
Spiny dogfish	2	**0.00**	0.0		**0.00**	0.0		0.00	0.0		0.00	0.0	0.0	0.00	0.0
Arrow squid		**0.00**	0.0	2	**0.00**	0.0		0.00	0.0		0.00	0.0	0.0	0.00	0.0
														0.00	
QMS Species total	**367,814**	**89.46**	**1,036.6**	**233,404**	**78.04**	**751.2**	**14,105**	92.94	**31.0**	**78,793**	98.36	**113.8**	**1,932.6**	85.12	483.1
ALL SPECIES TOTAL	**411,150**	**100.00**	**1,158.7**	**299,080**	**100.00**	**962.6**	**15,177**	**100.00**	**33.4**	**80,108**	**100.00**	**115.7**	**2,270.4**	**100.00**	567.6
	Where 4-year annual %age catch exceeds 5% for the species														

Table 17 ORH3B NWCR UoA: non-QMS (bycatch) species (species ≥ 2 tonnes per year. For remainder, see MPI, 2015). (kg and % represent observer data, and tonnes represents the estimated [scaled up] total catch) (MPI, 2015b)

All commercial tows		186			280			11			13				
All obs tows		66			87			5			9				
Percentage of tows observed		35.5%			31.1%			45.5%			69.2%				
Species	**2008/09**			**2009/10**			**2010/11**			**2012/13**			**Scaled up total 4 yr catch**	**% total catch**	**Average annual catch**
Units	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**tonnes**	**%**	**tonnes**
Rattails	6,124	1.49	17.3	28,112	9.40	90.5	12	0.08	0.0	12	0.01	0.0	107.8	4.75	26.9
Slickhead	10,771	2.62	30.4	10,894	3.64	35.1	1	0.01	0.0		0.00	0.0	65.4	2.88	16.4
Morids	1,580	0.38	4.5	8,971	3.00	28.9	23	0.15	0.1		0.00	0.0	33.4	1.47	8.3
Deepwater dogfish (Unspecified)	4,504	1.10	12.7	3,531	1.18	11.4		0.00	0.0		0.00	0.0	24.1	1.06	6.0
Other Sharks and Dogfish*	2,903	0.71	8.2	2,590	0.87	8.3		0.00	0.0	85	0.11	0.1	16.6	0.73	4.2
Baxter's lantern dogfish	1,713	0.42	4.8	1,550	0.52	5.0	794	5.23	1.7	994	1.24	1.4	13.0	0.57	3.2
Johnson's cod	3,534	0.86	10.0	1,231	0.41	4.0	66	0.43	0.1	33	0.04	0.0	14.1	0.62	3.5
Long-nosed chimaera	2,024	0.49	5.7	2,758	0.92	8.9		0.00	0.0		0.00	0.0	14.6	0.64	3.6
Basketwork eel	2,204	0.54	6.2	906	0.30	2.9	15	0.10	0.0	1	0.00	0.0	9.2	0.40	2.3
Four-rayed rattail	2,733	0.66	7.7	4	0.00	0.0		0.00	0.0		0.00	0.0	7.7	0.34	1.9

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non-QMS species total	**43,336**	**10.54**	**122.1**	**65,676**	**21.96**	**211.4**	**1,072**	**7.06**	**2.4**	**1,315**	**1.64**	**1.9**	**337.8**	**14.88**	**84.4**
ALL SPECIES TOTAL	**411,150**	**100.00**	**1,158.7**	**299,080**	**100.00**	**962.6**	**15,177**	**100.00**	**33.4**	**80,108**	**100.00**	**115.7**	**2,270.4**	**100.00**	**567.6**

* Sharks & Dogfish not otherwise specified in Sch3, Part2 Reporting Regs 2001

Where 4-year annual %age catch exceeds 5% for the species

Where 4-year annual %age catch exceeds 1% for 'shark' species

Table 18 Summary of deepwater dogfish catch in ORH3B NWCR UoA (MPI, 2015b). The data come from Table 17, and show total catch by species or species group scaled up from observer data and the proportion of dogfish catch in NWCR relative to total dogfish catch in FMA 4 and in the EEZ

Species/species group	Scaled up 4 yr catch	% total catch	Average annual catch in certified fishery		Avg annual Scaled FMA 4 catch (all methods)	Avg annual Scaled EEZ catch		% of FMA 4 catch in UoC	% of EEZ catch from UoC
Unit	tonnes	%	tonnes		tonnes	tonnes		%	%
Deepwater dogfish (Unspecified)	24.1	1.1%	6.0		109.7	133.2		5.5%	4.5%
Other sharks and dogfish*	16.6	0.7%	4.2		104.9	239.7		4.0%	1.7%
Baxter's lantern dogfish	13.0	0.6%	3.2		205.2	431.6		1.6%	0.8%
* Sharks & Dogfish not otherwise specified in Sch3, Part2 Reporting Regs 2001									
08/09 to 11/12 FMA 4 scaling									
Total tows on Chatham Rise	23,284								
Observed tows on Chatham Rise	4,884								
Approximate observed %	21%								
08/0 to 11/12 EEZ Scaling									
Total tows by vessels >28m in EEZ	112,470								
Observed tows by vessels >28m in EEZ	29,555								
Approximate observed %	26%								

ORH3B East and South Chatham Rise

Retained For ORH3B ESCR UoA, smooth oreo, orange roughy, and black oreo are the only QMS species that make up more than 1% of the catch, at 62.5%, 27.6%, and 4.7% respectively (Table 19 ORH3B ESCR). Smooth oreo is considered a main retained species, but black oreo is not. Hoki, ribaldo, and cardinal fish made up less than 1% but ≥0.5% of the total catch so are considered minor retained species.

The 2014 stock assessment Plenary report based on Fu and Doonan (2013) shows that the biomass in OEO4 has trended down since the 1980s (Figure 19). The biomass trend showed a steeper decline in the 1990s compared to more recent years. The Bayesian posterior distribution of mature biomass as a percent of two models (Table 15) shows the biomass at (model 3.2) or just below (model 5.2) the target of 40% B_0; the Bayesian distribution further demonstrates a small proportion, less than 30%, of the distribution falls below 20% B_0 generating a higher than 70% probability of exceeding the limit reference point. Fu and Doonan (2013) report that the lower 95% confidence interval for mature biomass is 26% B_0 (model 3.2) or 18% B_0 (model 5.2), providing additional evidence that current biomass has a greater than 70% chance of exceeding the limit reference point, and therefore highly likely above the point of recruitment impairment. These results suggest no immediate conservation concern, although the biomass is trending down. The fishery is undergoing a public, industry run fishery improvement project http://deepwatergroup.org/species/oreo/oreo-fisheries-improvement-projects/.

Bycatch Of non-QMS species from ORH3B ESCR, only Baxter's lantern dogfish make up 0.5% or more of the catch, at 1.0% (Table 20). As a vulnerable species that reaches the 1% threshold set for shark species, Baxter's dogfish is considered as a main bycatch species. As no other species made up ≥0.5% of the catch, no other main or minor species were identified. Catches from the ORH3B ESCR UoA average about 100 t per year of Baxter's lantern dogfish and about 180 t of combined dogfish (Table 20). This aggregate catch of dogfish represents about 50% of the dogfish catch in FMA 4, and about 25% of the dogfish catch in the EEZ.

Blackwell (2010) reviewed the Chatham Rise trawl survey estimates for core hoki depths (600-800 m) and deeper waters (750-1500 m) on the Chatham Rise. Over the course of the 1990s to 2006, Baxter's lantern dogfish ranged in annual estimated abundance from 6,000 to 12,000 t, consisting of 800-2,000 t in the core hoki depth, 200-700 t on the Northwest Chatham Rise, 200-700 t on the Northeast Chatham Rise, and 5,000-10,000 t on the South Chatham rise. Stevens *et al.* (2014, 2015) reported similar amounts in the hoki core depth and the deep zone, excluding the South Chatham Rise. Stevens *et al.* (2015) present figures of trawl estimates of abundance for several deepwater dogfish, including Baxter's dogfish, that show no temporal pattern (Figure 20). Stevens *et al.* (2015) further demonstrated that the length frequency of these dogfish extends up to lenghts expected for the adult sizes. For example, Baxter's dogfish reach lengths beyond 75 cm, the theoretical expected maximum length for the species. This demonstrates that the adult component has not been fished down. The lower lengths observed, to 20 cm, demonstrate that recruiting year classes are entering the stock.

The average recent annual catch of 100 t of Baxter's lantern dogfish makes up 0.8-1.7% of the estimated abundance of 6,000 to 12,000 tonnes. The orange roughy catch has declined substantially since the1990s. For example, the ORH3B catch was reduced from 15,000-20,000 t in the early 1990s to 9,000-12,000 t through the mid 2000s and to 2,500-3,500 t from 2010 (Table 1). The recent catch of orange roughy is less than 20% of the catch taken at the peak of the fishery (Table 1). Fishing pressure on Baxter's lantern dogfish and other deepwater dogfish will have similarly substantially decreased.

ORH 7A (including Westpac Bank)

Retained For the ORH7A UoA, only orange roughy and spiky oreo make up ≥1% of the catch, at 95.2% and 1.4%, respectively (Table 22). Spiky oreo is not vulnerable (productivity score <2.0) and is thus not considered a main retained species.

Bycatch No non-QMS species other than leafscale gulper shark (0.5%) reached 0.5% (Table 23), so there are no main bycatch species in the ORH7A UoA and only leafscale gulper shark as minor.

Table 19 ORH3B ESCR: QMS (retained) species (kg and % represent observer data, and tonnes represents the estimated [scaled up] total catch) (MPI, 2015b)

All commercial tows		2,251			1,659			715			869			942				
All obs tows		920			657			85			145			136				
Percentage of tows observed		40.9%			39.6%			11.9%			16.7%			14.4%				
Species	**2008/09**			**2009/10**			**2010/11**			**2011/12**			**2013/14**			**Scaled up total 5 yr catch**	**% total catch**	**Average annual catch**
Units	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**tonnes**	**%**	**tonnes**
Smooth oreo	2,483,634	54.79	6,076.8	2,320,203	52.08	5,858.8	505,133	70.48	4,249.1	1,024,644	84.04	6,140.8	872,673	62.26	6,044.5	28,370.0	62.51	5,674.0
Orange roughy	1,466,474	32.35	3,588.1	1,412,364	31.70	3,566.4	170,826	0.24	1,436.9	108,945	8.94	652.9	471,983	33.67	3,269.2	12,513.5	27.57	2,502.7
Black oreo	257,535	5.68	630.1	390,194	8.76	985.3	13,373	0.02	112.5	37,628	3.09	225.5	24,505	1.75	169.7	2,123.1	4.68	424.6
Hoki	45,747	1.01	111.9	63,331	1.42	159.9	3,971	0.01	33.4	9,046	0.74	54.2	1,678	0.12	11.6	371.1	0.82	74.2
Ribaldo	510	0.01	1.2	1,074	0.02	2.7	18	0.00	0.2	27	0.00	0.2	6,459	0.46	44.7	49.0	0.11	9.8
Cardinal fish	8,604	0.19	21.1	1,455	0.03	3.7	65	0.00	0.5	232	0.02	1.4	1,818	0.13	12.6	39.3	0.09	7.9
Pale ghost shark	794	0.02	1.9	1,614	0.04	4.1	39	0.00	0.3	86	0.01	0.5	49	0.00	0.3	7.2	0.02	1.4
Hake	143	0.00	0.3	483	0.01	1.2	54	0.00	0.5	51	0.00	0.3	317	0.02	2.2	4.5	0.01	0.9
Alfonsino	554	0.01	1.4	161	0.00	0.4		0.00	0.0	166	0.01	1.0	5	0.00	0.0	2.8	0.01	0.6
Smooth skate	9	0.00	0.0	768	0.02	1.9		0.00	0.0		0.00	0.0	20	0.00	0.1	2.1	0.00	0.4
King crab		0.00	0.0	335	0.01	0.8		0.00	0.0		0.00	0.0	2	0.00	0.0	0.9	0.00	0.2
Sea perch	11	0.00	0.0	233	0.01	0.6	1	0.00	0.0		0.00	0.0	17	0.00	0.1	0.7	0.00	0.1
Moonfish	215	0.00	0.5		0.00	0.0		0.00	0.0	30	0.00	0.2		0.00	0.0	0.7	0.00	0.1
White warehou	15	0.00	0.0	131	0.00	0.3		0.00	0.0		0.00	0.0		0.00	0.0	0.4	0.00	0.1
Spiky oreo		0.00	0.0		0.00	0.0		0.00	0.0	60	0.00	0.4		0.00	0.0	0.4	0.00	0.1
Ghost shark	78	0.00	0.2	11	0.00	0.0		0.00	0.0	10	0.00	0.1		0.00	0.0	0.3	0.00	0.1
Ling	3	0.00	0.0	64	0.00	0.2		0.00	0.0		0.00	0.0	4	0.00	0.0	0.2	0.00	0.0
Silver warehou		0.00	0.0		0.00	0.0		0.00	0.0	28	0.00	0.2		0.00	0.0	0.2	0.00	0.0
Bluenose	13	0.00	0.0	25	0.00	0.1		0.00	0.0	4	0.00	0.0		0.00	0.0	0.1	0.00	0.0
Arrow squid	11	0.00	0.0	28	0.00	0.1		0.00	0.0		0.00	0.0		0.00	0.0	0.1	0.00	0.0
Ray's bream	6	0.00	0.0	7	0.00	0.0	2	0.00	0.0	3	0.00	0.0		0.00	0.0	0.1	0.00	0.0
Rough skate		0.00	0.0	25	0.00	0.1		0.00	0.0		0.00	0.0		0.00	0.0	0.1	0.00	0.0
Lookdown dory	3	0.00	0.0	10	0.00	0.0		0.00	0.0		0.00	0.0		0.00	0.0	0.0	0.00	0.0
Spiny dogfish	13	0.00	0.0		0.00	0.0		0.00	0.0		0.00	0.0		0.00	0.0	0.0	0.00	0.0
Flatfish		0.00	0.0	3	0.00	0.0		0.00	0.0		0.00	0.0		0.00	0.0	0.0	0.00	0.0
NZ Southern arrow squid	3	0.00	0.0		0.00	0.0		0.00	0.0		0.00	0.0		0.00	0.0	0.0	0.00	0.0
		0.00			0.00						0.00							
Grand Total	**4,264,375**	94.08	**10,433.8**	**4,192,519**	94.10	**10,586.6**	**693,482**	**96.76**	**5,833.4**	**1,180,960**	96.86	**7,077.6**	**1,379,537**	**98.42**	**9,555.3**	**43,486.7**	**95.82**	**8,697.3**
ALL SPECIES TOTAL	**4,532,932**	100.00	**11,090.9**	**4,455,394**	100.00	**11,250.4**	**716,671**	**100.00**	**6,028.5**	**1,219,241**	100.00	**7,307.0**	**1,401,708**	**100.00**	**9,708.9**	**45,385.7**	**100.00**	**9,077.1**
x%	=	Where 5-year annual %age catch exceeds 5% for the species.																

Table 20 ORH3B ESCR UoA: non-QMS (bycatch) species (species ≥ 2 tonnes per year. For remainder, see MPI, 2015). (kg and % represent observer data, and tonnes represents the estimated [scaled up] total catch) (MPI, 2015b)

All commercial tows		2,251			1,659			715			869			942					
All obs tows		920			657			85			145			136					
Percentage of tows observed		40.9%			39.6%			11.9%			16.7%			14.4%					
Species	**2008/09**			**2009/10**			**2010/11**			**2011/12**			**2013/14**				**Scaled up total 5 yr catch (t)**	**% total catch**	**Average annual catch (t)**
Units	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**		**tonnes**	**%**	**tonnes**
Baxter's lantern dogfish	60,359	1.33	147.7	56,258	1.26	142.1	4,604	0.64	38.7	15,840	1.30	94.9	2,656	0.19	18.4		441.8	0.97	88.4
Deepwater dogfish (Unspecified)	50,708	1.12	124.1	15,773	0.35	39.8		**0.00**	0.0	2,336	**0.19**	14.0	270	0.02	1.9		179.8	0.40	36.0
Other sharks & dogfish*	570	0.01	1.4	25,642	0.58	64.7	9,900	**1.38**	83.3	1,694	**0.14**	10.2	1,940	0.14	13.4		173.0	0.38	34.6
Slickhead	25,679	0.57	62.8	28,513	0.64	72.0	389	**0.05**	3.3	2,173	**0.18**	13.0	3,025	0.22	21.0		172.1	0.38	34.4
Morids	17,444	0.38	42.7	34,491	0.77	87.1	775	**0.11**	6.5	2,357	**0.19**	14.1	832	0.06	5.8		156.2	0.34	31.2
Rattails	24,927	0.55	61.0	24,290	0.55	61.3	343	**0.05**	2.9	1,537	**0.13**	9.2	1,913	0.14	13.3		147.7	0.33	29.5
Shovelnose dogfish	14,638	0.32	35.8	26,053	0.58	65.8	303	**0.04**	2.5	711	**0.06**	4.3	2,153	0.15	14.9		123.3	0.27	24.7
Seal shark	18,973	0.42	46.4	2,590	0.06	6.5	105	**0.01**	0.9	5,143	**0.42**	30.8	340	0.02	2.4		87.0	0.19	17.4
Johnson's cod	2,099	0.05	5.1	12,135	0.27	30.6	2,929	**0.41**	24.6	1,417	**0.12**	8.5	1,817	0.13	12.6		81.5	0.18	16.3
Warty squid	11,754	0.26	28.8	3,996	0.09	10.1	736	**0.10**	6.2	791	**0.06**	4.7	665	0.05	4.6		54.4	0.12	10.9
Basketwork eel	6,052	0.13	14.8	6,482	0.15	16.4	470	**0.07**	4.0	1,748	**0.14**	10.5	915	0.07	6.3		51.9	0.11	10.4
Spiky oreo	6,866	0.15	16.8	2,121	0.05	5.4	265	**0.04**	2.2	979	**0.08**	5.9	2,068	0.15	14.3		44.6	0.10	8.9
Long-nosed chimaera	4,215	0.09	10.3	8,167	0.18	20.6	8	**0.00**	0.1	150	**0.01**	0.9	199	0.01	1.4		33.3	0.07	6.7
Violet cod	11,297	0.25	27.6	1,448	0.03	3.7	12	**0.00**	0.1	7	**0.00**	0.0	0	0.00	0.0		31.4	0.07	6.3
Longnose velvet dogfish	4,300	0.09	10.5	3,001	0.07	7.6	219	**0.03**	1.8	162	**0.01**	1.0	88	0.01	0.6		21.5	0.05	4.3
Cookiecutter shark		0.00	0.0		0.00	0.0	1,664	**0.23**	14.0		**0.00**	0.0	0	0.00	0.0		14.0	0.03	2.8
Plunket's shark	3,621	0.08	8.9	1,024	0.02	2.6	12	**0.00**	0.1	159	**0.01**	1.0	12	0.00	0.1		12.6	0.03	2.5
Leafscale gulper shark	692	0.02	1.7	998	0.02	2.5	72	**0.01**	0.6	292	**0.02**	1.7	477	0.03	3.3		9.9	0.02	2.0
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non-QMS total	**268,557**	5.92	**657.1**	**262,875**	5.90	**663.8**	**23,189**	**3.24**	**195.1**	**38,281**	**3.14**	**229.4**	**20,375**	1.45	**141.1**		**1,886.5**	4.16	**377.3**
ALL SPECIES TOTAL	**4,532,932**	100.00	**11,090.9**	**4,455,394**	100.00	**11,250.4**	**716,671**	**100.00**	**6,028.5**	**1,219,241**	**100.00**	**7,307.0**	**1,401,708**	**100.00**	**9,708.9**		**45,385.7**	**100.00**	**9,077.1**
x%	=	Where 5-year annual %age catch exceeds 1% for the 'shark' species.																	
* Sharks & Dogfish not otherwise specified in Schedule 3, Part 2 of the Reporting Regulations 2001																			
Table ordered by 5-yr average annual catch																			

Table 21 Summary of deepwater dogfish catch in ORH3B ESCR UoA. (MPI 2015b). The data come from Table 20, and show total catch by species or species group scaled up from observer data and the proportion of dogfish catch in NWCR relative to total dogfish catch in FMA 4 and in the EEZ.

Species	Scaled up 4 yr catch	% total catch in E&S Rise fishery	Avg annual catch in unit of assessment (t)		Avg annual Scaled FMA 4 catch (all methods)	Avg annual Scaled EEZ catch		% of FMA 4 catch in UoA	% of EEZ catch from UoA		% of EEZ catch of combined ETB, DWD, and OSD from UoA
Units	**tonnes**	**%**	**tonnes**		**tonnes**	**tonnes**		**%**	**%**		
Baxter's lantern dogfish	441.8	1.2%	105.8		205.2	431.6		**51.6%**	**24.5%**		23.6%
Deepwater dogfish (Unspecified)	179.8	0.5%	44.5		109.7	133.2		40.6%	33.4%		
Other sharks & dogfish (Unspecified)*	173.0	0.4%	39.9		104.9	239.7		38.0%	16.6%		
* Sharks & Dogfish not otherwise specified in Sch3, Part2 Reporting Regs 2001											
08/09 to 11/12 FMA 4 scaling											
Total tows on CR	23,284										
Obs tows on CR	4,884										
Approximate observed %	21%										
BLL coverage on CR in 10/11	0.065										
08/09-11/12	**ETB is mostly caught by mid-water and DW trawling, and BLL so the overall obs % for those methods has been used**										
Total tows by vessels >28m in EEZ	112,470										
Observed tows by vessels >28m in EEZ	29,555										
Approximate observed %	26%										

Table 22 ORH7A UoA: QMS (retained) species (kg and % represent observer data, and tonnes represents the estimated [scaled up] total catch) (MPI, 2015b)

Total commercial tows		64			78			112			106			154				
Total observed tows		67			80			73			70			84				
% tows observed		104.7%			102.6%			65.2%			66.0%			54.5%				
Species	**2008/09**			**2009/10**			**2010/11**			**2011/12**			**2012/13**			**Scaled up total 5-year catch**	**% of total catch**	**Average annual catch**
Unit	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**tonnes**	**%**	**tonnes**
Orange roughy	229,788	92.89	229.8	332,083	98.63	332.1	320,567	97.37	491.8	238,623	94.61	361.3	281,573	92.68	516.2	1,931.3	95.22	386.3
Spiky oreo	2,248	0.91	2.2	488	0.14	0.5	3,799	1.15	5.8	6,401	2.54	9.7	5,570	1.83	10.2	28.5	1.40	5.7
Ribaldo	838	0.34	0.8	331	0.10	0.3	767	0.23	1.2	821	0.33	1.2	2,134	0.70	3.9	7.5	0.37	1.5
Hake	270	0.11	0.3	261	0.08	0.3	284	0.09	0.4	241	0.10	0.4	418	0.14	0.8	2.1	0.10	0.4
Hoki	99	0.04	0.1	138	0.04	0.1	222	0.07	0.3	325	0.13	0.5	294	0.10	0.5	1.6	0.08	0.3
Cardinal fish		0.00	0.0		0.00	0.0	98	0.03	0.2	163	0.06	0.2	44	0.01	0.1	0.5	0.02	0.1
Pale ghost shark	35	0.01	0.0	16	0.00	0.0	36	0.01	0.1	59	0.02	0.1	111	0.04	0.2	0.4	0.02	0.1
Ray's bream	2	0.00	0.0	1	0.00	0.0	1	0.00	0.0		0.00	0.0	140	0.05	0.3	0.3	0.01	0.1
Sea perch	30	0.01	0.0	17	0.01	0.0	14	0.00	0.0	9	0.00	0.0	69	0.02	0.1	0.2	0.01	0.0
Smooth oreo	27	0.01	0.0	13	0.00	0.0	10	0.00	0.0	16	0.01	0.0	15	0.00	0.0	0.1	0.01	0.0
Silver warehou		0.00	0.0		0.00	0.0	27	0.01	0.0		0.00	0.0	2	0.00	0.0	0.0	0.00	0.0
Ghost shark	2	0.00	0.0		0.00	0.0	1	0.00	0.0	13	0.01	0.0		0.00	0.0	0.0	0.00	0.0
Smooth skate		0.00	0.0	7	0.00	0.0		0.00	0.0		0.00	0.0	6	0.00	0.0	0.0	0.00	0.0
Blue shark		0.00	0.0		0.00	0.0		0.00	0.0	11	0.00	0.0		0.00	0.0	0.0	0.00	0.0
Black oreo		0.00	0.0		0.00	0.0	1	0.00	0.0	1	0.00	0.0	9	0.00	0.0	0.0	0.00	0.0
Alfonsino		0.00	0.0	2	0.00	0.0	2	0.00	0.0		0.00	0.0	3	0.00	0.0	0.0	0.00	0.0
Ling		0.00	0.0	6	0.00	0.0		0.00	0.0		0.00	0.0		0.00	0.0	0.0	0.00	0.0
Spiny dogfish		0.00	0.0		0.00	0.0		0.00	0.0	3	0.00	0.0	2	0.00	0.0	0.0	0.00	0.0
Giant stargazer	2	0.00	0.0		0.00	0.0		0.00	0.0		0.00	0.0	3	0.00	0.0	0.0	0.00	0.0
King crab		0.00	0.0		0.00	0.0		0.00	0.0		0.00	0.0	5	0.00	0.0	0.0	0.00	0.0
Arrow squid		0.00	0.0		0.00	0.0		0.00	0.0		0.00	0.0	5	0.00	0.0	0.0	0.00	0.0
Lookdown dory		0.00	0.0		0.00	0.0		0.00	0.0		0.00	0.0	2	0.00	0.0	0.0	0.00	0.0
Frostfish		0.00	0.0		0.00	0.0		0.00	0.0		0.00	0.0	1	0.00	0.0	0.0	0.00	0.0
NZ Southern arrow squid		0.00	0.0	1	0.00	0.0		0.00	0.0		0.00	0.0		0.00	0.0	0.0	0.00	0.0
Rough skate	1	0.00	0.0		0.00	0.0		0.00	0.0		0.00	0.0		0.00	0.0	0.0	0.00	0.0
Kingfish	1	0.00	0.0		0.00	0.0		0.00	0.0		0.00	0.0		0.00	0.0	0.0	0.00	0.0
		0.00			0.00			0.00			0.00			0.00			0.00	
QMS Total	**233,343**	**94.33**	**233.3**	**333,364**	**99.01**	**333.4**	**325,829**	**98.97**	**499.9**	**246,686**	**97.80**	**373.6**	**290,406**	**95.58**	**532.4**	**1,972.6**	**97.26**	**394.5**
ALL SPECIES	**247,377**	**100.00**	**247.4**	**336,694**	**100.00**	**336.7**	**329,215**	**100.00**	**505.1**	**252,224**	**100.00**	**381.9**	**303,822**	**100.00**	**557.0**	**2,028.1**	**100.00**	**405.6**
	Where 5-year annual percentage catch exceeds 5%																	

Table 23 ORH7A UoA: Non-QMS (bycatch) species (kg and % represent observer data, and tonnes represents the estimated [scaled up] total catch) (MPI, 2015b)

Total commercial ORH target tows		64			78			112			106			154				
Total observed ORH target tows		67			80			73			70			84				
% tows observed		104.7%			102.6%			65.2%			66.0%			54.5%				
Species	**2008/09**			**2009/10**			**2010/11**			**2011/12**			**2012/13**			**Scaled up total 5-year catch**	**% of total catch**	**Average annual catch**
Unit	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**kg**	**%**	**tonnes**	**tonnes**	**%**	**tonnes**
Leafscale gulper shark	1,072	0.4%	1.1	949	0.3%	0.9	1,197	0.4%	1.8	1,441	0.6%	2.2	2,412	0.8%	4.4	10.5	0.5%	2.1
Common roughy		0.0%	0.0		0.0%	0.0		0.0%	0.0		0.0%	0.0	4,959	1.6%	9.1	9.1	0.4%	1.8
Other sharks and dogfish	9,051	3.7%	9.1		0.0%	0.0	8	0.0%	0.0		0.0%	0.0		0.0%	0.0	9.1	0.4%	1.8
Shovelnose dogfish	634	0.3%	0.6	191	0.1%	0.2	411	0.1%	0.6	525	0.2%	0.8	726	0.2%	1.3	3.6	0.2%	0.7
Smooth skin dogfish	581	0.2%	0.6	409	0.1%	0.4	139	0.0%	0.2	527	0.2%	0.8	781	0.3%	1.4	3.4	0.2%	0.7
Johnson's cod	289	0.1%	0.3	185	0.1%	0.2	169	0.1%	0.3	238	0.1%	0.4	892	0.3%	1.6	2.7	0.1%	0.5
Plunket's shark	314	0.1%	0.3		0.0%	0.0	301	0.1%	0.5	494	0.2%	0.7	358	0.1%	0.7	2.2	0.1%	0.4
Unicorn rattail	324	0.1%	0.3	22	0.0%	0.0	195	0.1%	0.3	306	0.1%	0.5	478	0.2%	0.9	2.0	0.1%	0.4
Seal shark	197	0.1%	0.2	134	0.0%	0.1	283	0.1%	0.4	370	0.1%	0.6	172	0.1%	0.3	1.6	0.1%	0.3
Rattails	20	0.0%	0.0	308	0.1%	0.3	134	0.0%	0.2	168	0.1%	0.3	305	0.1%	0.6	1.3	0.1%	0.3
Longnose velvet dogfish	190	0.1%	0.2	244	0.1%	0.2	31	0.0%	0.0	129	0.1%	0.2	197	0.1%	0.4	1.0	0.1%	0.2
Potuguese dogfish	111	0.0%	0.1	16	0.0%	0.0	4	0.0%	0.0	130	0.1%	0.2	325	0.1%	0.6	0.9	0.0%	0.2
Black slickhead	85	0.0%	0.1	70	0.0%	0.1	21	0.0%	0.0	88	0.0%	0.1	281	0.1%	0.5	0.8	0.0%	0.2
Widenosed chimaera	158	0.1%	0.2	241	0.1%	0.2	34	0.0%	0.1	88	0.0%	0.1	126	0.0%	0.2	0.8	0.0%	0.2
Baxter's lantern dogfish	82	0.0%	0.1	62	0.0%	0.1	22	0.0%	0.0	97	0.0%	0.1	210	0.1%	0.4	0.7	0.0%	0.1
Bigscaled brown slickhead	25	0.0%	0.0	85	0.0%	0.1		0.0%	0.0	96	0.0%	0.1	91	0.0%	0.2	0.4	0.0%	0.1
Violet squid	51	0.0%	0.1	29	0.0%	0.0	16	0.0%	0.0	42	0.0%	0.1	69	0.0%	0.1	0.3	0.0%	0.1
Cape scorpionfish	28	0.0%	0.0	29	0.0%	0.0	2	0.0%	0.0	59	0.0%	0.1	75	0.0%	0.1	0.3	0.0%	0.1
NON-QMS TOTAL	**14,034**	**5.7%**	**14.0**	**3,330**	**1.0%**	**3.3**	**3,385**	**1.0%**	**5.2**	**5,534**	**2.2%**	**8.4**	**13,415**	**4.4%**	**24.6**	**55.5**	**2.7%**	**11.1**
ALL SPECIES	**247,377**	**100.0%**	**247.4**	**336,694**	**100.0%**	**336.7**	**329,215**	**100.0%**	**505.1**	**252,224**	**100.0%**	**381.9**	**303,822**	**100.0%**	**557.0**	**2,028.1**	**100.0%**	**405.6**
	Where 5-year annual percentage catch exceeds 5%																	

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Shark finning. The Fisheries (Commercial Fishing) Regulations 2001 prohibit shark finning and require that any shark fins landed must be naturally attached to the remainder of the shark, or artificially in the case of blue shark (MPI 2014 shark). However, an exception to the fins attached requirement is provided for seven QMS species to allow at-sea processing to continue. Since 1 October 2014 for species processed at sea, fishermen must store and land the fins separately by species. Fins must be landed wet to assure that fishermen are not retaining any more shark fins than the trunks they come from.

The ban requires all shark fins to be landed attached to the body of the shark for all non-Quota Management System (QMS) species and two QMS species (spiny dogfish and blue shark). In most cases, limited processing will be allowed (e.g. removal of the head) but the fins will still need to be attached to the body through some portion of uncut skin.

For seven QMS species (elephantfish, ghost shark, mako shark, pale ghost shark, porbeagle shark, rig, and school shark) fishers will be able to land shark fins separately to the body of the shark but only in accordance with a gazetted fin to greenweight ratio. Francis (2014) reported research to develop the ratios of fins to body weight. The ratio means that the weight of fins for a species of shark landed for a trip will be compared to the greenweight (whole weight) of that species of shark landed for that trip. For example, if sharks are landed that weigh a total of 100 kgs and the gazetted ratio is 3.50, the fins of that species landed must not weigh more than 3.5 kgs. There will be a legal requirement that fins are separately stored and landed by species.

Approach	Species
Ratio	Elephantfish Ghost shark Mako shark Pale ghost shark Porbeagle shark Rig School shark
Fins artificially attached	Blue shark
Fins naturally attached	Spiny dogfish All non-QMS species

Fishers may return some QMS sharks, dead or alive to the sea. All are reported and counted against the total allowable catch for the species and against a fisher's annual catch entitlement. This assures receiving good data on shark mortalities.

Endangered, Threatened, and Protected Species
The strategic framework for managing protected species interactions with deepwater fisheries currently includes:

- legislation: the Fisheries Act, Wildlife Act, and Marine Mammals Protection Act;
- the National Plan of Action – Sharks (MPI 2013);
- the National Plan of Action—Seabirds (MPI 2013);
- the Annual Operational Plan for Deepwater Fisheries (MPI 2012);
- the National Fisheries Plan for Deepwater and Middle-depth Fisheries: Part 1B, orange roughy chapter (Ministry of Fisheries 2010); and,
- the Marine Conservation Services Programme (e.g., Annual Plan, DOC 2015).

The Expert Panel for the Assessment of the Enviromental Effects of Fishing (AEEF, Boyd, 2013) assessed the following species or species groups protected under the provisions of the New Zealand Wildlife Act 1953 (note: not all of these groups occur in the UoA):.

1. Protected fishes
    a. Oceanic whitetip shark (*Carcharhinus longimanus*)
    b. Basking shark (*Cetorhinus maximus*)
    c. Deepwater nurse shark (*Odontaspis ferox*)
    d. White pointer shark (*Carcharodon carcharias*)
    e. Whale shark (*Rhincodon typus*)
    f. Manta ray (*Manta birostris*)
    g. Spinetail devil ray (*Mobula japanica*)
    h. Giant grouper (*Epinephelus lanceolatus*)
    i. Black grouper (*Epinephelus daemelii*)
2. Reptiles
3. All seabirds except black backed gull
4. All marine mammals
5. Corals:
    a. Black corals - all species in the order Antipatharia
    b. Gorgonian corals—all species in the order Gorgonacea
    c. Stony corals— all species in the order Scleractinia
    d. Hydrocorals.

A review of CITES Appendix 1 indicated that there are no relevant marine species not included in the current list of New Zealand protected marine species and there are no relevant listed species that are not protected under New Zealand legislation.

When impacts of fishing are such that they are causing an adverse effect on the Marine Environment (Fisheries Act s 2, s8), measures are to be taken pursuant to the Conservation Act 1987 and the Director-General of the Department of Conservation will implement measures, including:

- research relating to those effects on protected species;
- research on measures to mitigate the adverse effects of commercial fishing on protected species; and,
- the development of population management plans under the Wildlife Act 1953 and the Marine Mammals Protection Act 1978.

3.4.2 Protected fishes

There have been no recorded captures of oceanic white tip shark, white pointer shark, whale shark, manta ray, spine tail devil ray, giant grouper or the spotted black grouper in the fisheries being assessed (Anderson, 2011, 2013, Francis & Lyon, 2012, Francis & Smith, 2010, Francis & Sutton, 2012, Ramm, 2010, 2012a, 2012b, Rowe, 2009, 2010). Furthermore, whale shark, manta ray, giant grouper and marine reptiles are tropical/subtropical species and do not occur in the range of the orange roughy management areas under assessment. There are records of deepwater nurse shark catches but there are significant misidentification and therefore misreporting issues for this species and New Zealand catch records are unreliable and almost certainly wrong (Igor Debski, NZ Department of Conservation, *pers. comm*. as reported in Boyd, 2013).

The AEEF Expert Panel identified the basking shark (*Cetorhinus maximus*) as potentially at risk but, following a risk assessment focused on fishing mortality/cryptic impacts and population status, concluded there was no risk or a negligible risk to this species (Boyd, 2013). Most basking shark records came from trawl fisheries mainly by vessels targeting barracouta and hoki off east coast South Island, hoki off west coast South Island, and arrow

squid off Southland-Auckland Islands (MPI, 2013). MPI (2015) does not report any basking sharks caught in the three UoAs from 2008-09 to 2012-13.

The NPOA—sharks contains explicit long-term and short-term objectives for minimizing fisheries related mortality for these ETP species groups and include practical operational measures to support overarching policy objectives. The NPOA also has a built-in system for analysis of data collected through fishery dependent and independent sources on an ongoing basis, and regular review of this analysis designed to feedback to management for further action if necessary (NPOA-Sharks, 2013)

3.4.3 Seabirds and Marine Mammals

Orange roughy fishing vessels in the three orange roughy UoA catch relatively few seabirds and no marine mammal captures have been recorded in the ten year period from 2002 to 2012 (Thompson and Berkenbusch, 2013). All orange roughy fishing vessels >28 m are required to comply with regulations that ban the use of net sonde cables and require the deployment of devices to keep birds away from the fishing gear (MPI, 2013). Industry standards, supported by MPI, require all orange roughy vessels to agree to a Vessel Management Plan that specifies the management of the disposal of fish waste to minimise it as an attractant to seabirds (MPI, 2012, 2013).

Thompson and Berkenbusch (2013) estimated the total number of seabirds and marine mammals that were incidentally captured in New Zealand orange roughy trawl fisheries in the period between 2002 and 2012. During the ten year period, a total of 46 seabird captures were recorded in the three UoAs and no marine mammal captures were recorded. Most of the observed seabird captures (37 captures) occurred on the East and South Chatham Rise and Northwest Chatham Rise (9 captures). Captures included Salvin's (*Thalassarche salvini*), Buller's (*Thalassarche bulleri*), white-capped (*Thalassarche steadi*), Chatham albatrosses (*Thalassarche eremita*) and unidentified large albatross. These observations were extrapolated based on observer rates to estimated mortalities in the three areas (Table 24).

Table 24 Total number of observed and estimated captures (n) of seabirds and marine mammals between 2002 and 2012 by orange roughy trawl fisheries in the three UoA areas. Large birds include the albatrosses listed above and small birds include sooty shearwaters (*Puffinus griseus*) and white chinned petrels (*Procellaria aequinoctialis*). Mammals include New Zealand fur seals (*Arctocephalus forsteri*).

	ORH3B NWCR		ORH3B ESCR		ORH7A	
	Observed captures	Estimated captures	Observed captures	Estimated captures	Observed captures	Estimated captures
Large birds	0	6	20	152	0	1
Small birds	9	13	17	40	0	0
Mammals	0	0	0	0	0	0

Richard and Abraham (2013) provide semi-quantitative estimates of the risk to New Zealand seabird species from all commercial fisheries including the three management areas under assessment.

The AEEF Expert Panel used data from Thompson and Berkenbusch (2013) and Richard and Abraham (2013) assessments to identify Salvin's albatross, Chatham Island albatross, and northern giant petrel as species that could potentially be at risk and therefore should be considered in an assessment of impact in the three orange roughy fisheries (Boyd, 2013).

Boyd (2013) analysis focused on fishing mortality/cryptic impacts and population status. As the estimated captures for the three species in all three FMAs being assessed are negligible to very low they concluded the risks of serious or irreversible harm to Salvin's albatross from orange roughy fishing was low and the same for the other two species of birds.

When compared with the total estimated numbers of fisheries-related mortalities of protected seabirds and mammals, the numbers in the three orange roughy UoA are negligible (Dragonfly, 2013).

The NPOA-Seabirds contains explicit long-term and short-term objectives for minimizing fisheries related mortality for these ETP species groups and include practical operational measures to support overarching policy objectives. The NPOA also has a built-in system for analysis of data collected through fishery dependent and independent sources on an ongoing basis, and regular review of this analysis designed to feedback to management for further action if necessary (NPOA-Seabirds, 2013).

4.4.5 Corals

Collectively, benthic habitats in the New Zealand region contain a rich Scleractinian assemblage – higher in diversity and abundance than those recorded in other ocean basins. Consalvey *et al*., (2006), Baird *et al.* (2012), Tracey *et al.* (2011a) and Tracey *et al.* (2011b) summarised their taxonomic and distributional information. Currently 105 azooxanthellate scleractinians are recorded in the New Zealand region (representing 15% of the known azooxanthellates) with 80% occurring on the upper slope (defined as 200 – 1,000 m) and 39% on the lower slope (defined as 1,000 m to 3,000 m (Cairns, 1995); the % values exceed 100 because some species occur in more than one zone). Cairns (1991) reported 32% of New Zealand scleractinians were estimated to be endemic but care must be taken with the interpretation of this number, as it is likely that these species could be found to be more cosmopolitan with an increased sampling effort (Clarke & Anderson, 2013). Tracey (2011a) pointed out that distribution data of corals from fishing vessels do not adequately reflect the true distribution for the region and are an artefact of limited sampling effort from within fishing grounds which comprise only very small portions of coral habitat ranges. However, the coral collection programme from commercial fishing vessels has provided a diverse and extensive collection of corals and an expanding valuable data source.

Consalvey (2006) summarized the possible effects of coral damage to the ecosystem. This includes: changes to local hydrodynamic and sedimentary conditions and a shift from a diverse reef community to a reduced species/biomass "disturbance" community; and, reduced reproductive output from: (1) a reduction in colony size; (2) an increase in energy resources channelled to repair rather than growth/reproduction; (3) immature colonies being delayed to reach maturity; and, (4) the loss of larger individuals with a disproportionately large contribution to the reproductive output of the entire population.

Coral bycatch from the orange roughy fisheries on the Chatham Rise includes black corals, stony branching and cup corals, and dead coral rubble, with relatively smaller catches of bubblegum coral, precious coral, other gorgonians (such as primniods and plexaurids) and hydrocoral. DWG (2014) summarise ETP coral incidental bycatch data collected by MPI's observer programme over the last five fishing years (2008-09 to 2012-13) to show the relative level of incidental ETP coral bycatch in each of the three individual UoAs. ETP coral incidental bycatch in the orange roughy three UoAs differs substantially by area. During the period 2008-09 to 2012-13, a total of 0.01 t (average 0.00 t) and 0.04 t (average 0.00 t)was observed in ORH7A and ORH3B NWCR, respectively. This is compared to 13 t (average 0.02 t) observed in ORH3B ESCR.

Baird *et al.* (2012) analysed 7,731 records, 58% from research samples and 42% commercial fishing vessels where observers had been present. Of the 7,731 records, 46%

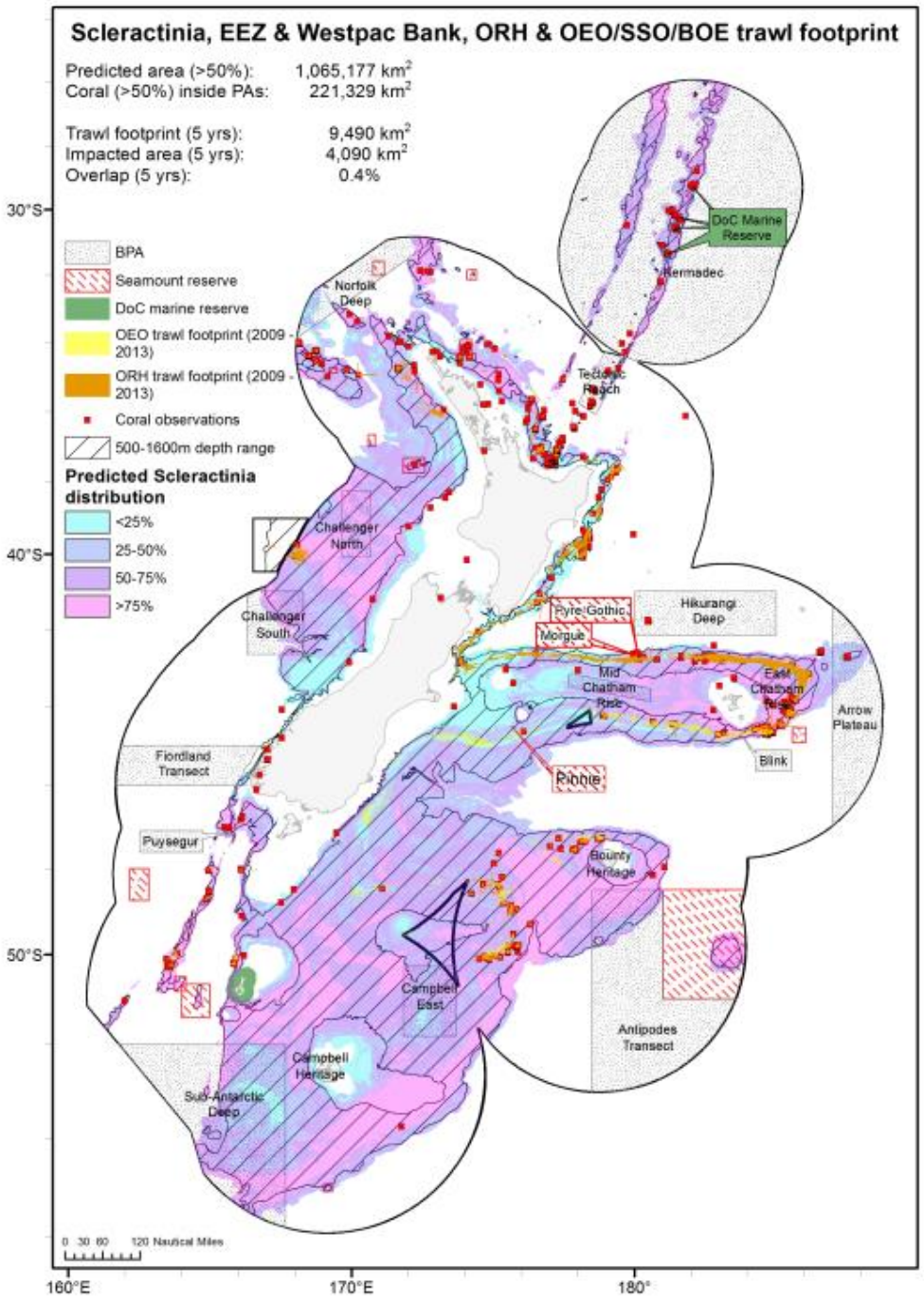
were stony corals (56 genera from 15 families in the Order Scleractinia), 33% were gorgonians (57 general from 8 families in Order Alcyonacea), 11% were hydrocorals (16 genera from one family in Order Anthoathecata), and 10% were black corals (26 families from seven genera in Order Antipatharia). Their analyses indicated coral records from the four orders were distributed throughout the EEZ, though differences by area and depth were evident at the family and genus level, where lower taxonomic detail was available. Baird *et al.* (2012) also modelled the distribution of the corals and predicted the areas likely to have the greatest probability of coral occurrence were outside the main fisheries areas, except for some deepwater fisheries that occurred on areas of steeper relief. This study concluded the fisheries that pose the most risk to protected corals are the deepwater trawl fisheries for species such as orange roughy, oreo species, black cardinalfish, and alfonsino. Tracey (2011a) and Consalvey (2006) concluded that the overlap of coral distribution and the fishing activities, combined with corals low productivity long recovery period, makes deep-sea coral populations especially vulnerable to damage by fishing gear. The fishery areas of highest risk to protected corals are the deepwater fisheries targetting orange roughy and oreo on UTFs, including those on the northern and southern slopes of the Chatham Rise (Tracey, 2011a). This is consistent with a study by Clark et. al. (2015) indicating the potential damage that trawling can have on deep-sea coral communities in fished areas.

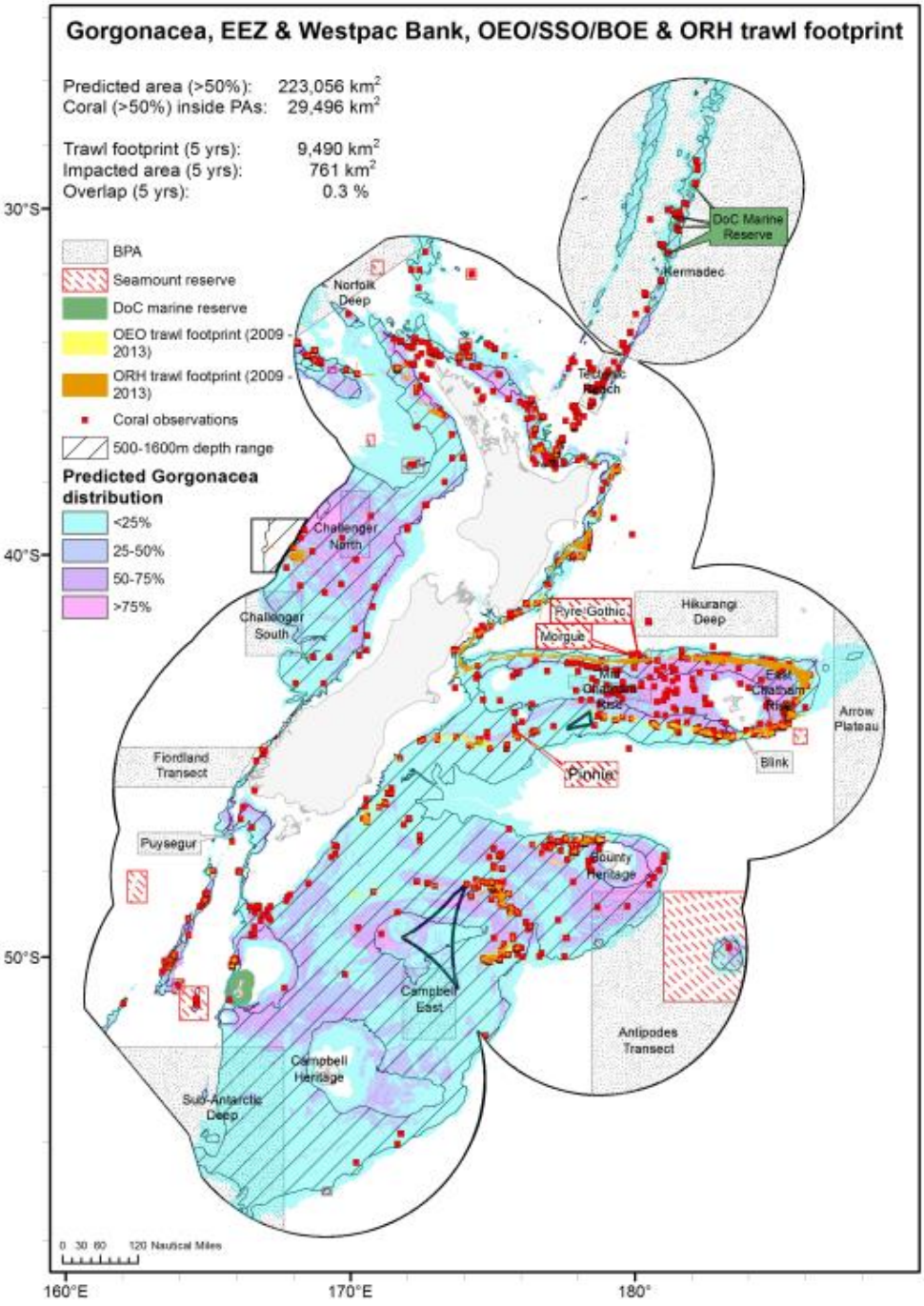
Regarding indirect trawling impacts, MPI's (2015) literature review indicates that trawling has been shown to create a substantial sediment plume, that in low-current deep-sea environments can disperse very slowly, over large distances (Bluhm, 2001, Rolinski *et al.*, 2001). There have been no-specific studies examining sediment mobilization by fishing gear in deep-sea fisheries but sediment plumes generated through trawling over soft substrate have potential impacts on ETP coral species through smothering of small individuals (Glover & Smith, 2003) and preventing settlement of juveniles (Rogers *et al.,* 1999) with deposition of mm to cm depth. Impacts on coral feeding and metabolic function are uncertain, although shallow water stony corals can actively shed sediment (Riegl, 1995) and potentially cope with a sediment plume but deep-sea sponge respiration has been reported as largely shutting down when subjected to heavy sedimentation loads (Tjensvoll *et al.,* 2013). Sediment impacts are likely to be higher on *Goniocorella dumosa* communities as they are distributed over slope habitat of the Chatham Rise dominated by soft sediment interspersed with hard substrate patches. The longer trawl tows on the slope will tend to generate greater sediment clouds than would the shorter tows typical of UTF fishing. Sediment effects will be less on coral assemblages on UTFs where the substratum is typically rocky, with only small patches of interspersed soft-sediment (Clark *et al.,* 2010).

An assessment of the orange roughy and oreo trawl footprint in relation to protected coral species distribution in New Zealand waters in which observed and predicted distributions of protected corals were overlain on the orange roughy trawl footprint has been undertaken (Clark *et al.*, 2015a). Predicted coral distributions are based on "habitat suitability" models, including hydrological and geological variables such as dynamic topography (shape of the seafloor), bottom temperature, and primary productivity, among others. Observed coral distributions are derived largely from fishery-dependent coral presence observations from observer data, and to a lesser extent from fisheries-independent sampling. Fishery-dependent presence observations across all three protected coral Orders accounts for >50% of total presence observations. Because the observed distributions are heavily based on the fishery-dependent presence data, the observed overlap of protected coral distributions with the orange roughy trawl footprint is unsurprisingly higher than the predicted overlap based on habitat suitability (Table 25).

Maps produced by Clark *et al.* (2015) show coral observations, predicted distributions and the most recent (five year) trawl footprints for each of the three ETP coral groups in each of the five areas. In addition, the most recent five-year period was compared with overlap for all years, showing the impact of the reduced fishing effort in recent years on percentage of

overlap (for example, across the entire New Zealand EEZ and Westpac bank, the ORH trawl footprint has a 40.6% overlap with observed distribution of black corals for all years, but a 16.1% overlap for the past five years only (see Figure 21, Figure 22, Figure 23, Figure 24, and Table 25 below). Three percent of the known UTF habitat in the EEZ is estimated to have been trawled and 8.2% of the known UTF habitat within the Bioregion has been trawled (Black *et al.* 2015). Further, 16.1% of the available UTF habitat area within the three UoAs are trawled. For each UTF that has been fished, on average, 51.4% of the area has been trawled.


Scleractinia, EEZ & Westpac Bank, ORH & OEO/SSO/BOE trawl footprint
Predicted area (>50%): 1,065,177 km²
Coral (>50%) inside PAs: 221,329 km²
Trawl footprint (5 yrs): 9,490 km²
Impacted area (5 yrs): 4,090 km²
Overlap (5 yrs): 0.4%
BPA
Seamount reserve
DoC marine reserve
OEO trawl footprint (2009 - 2013)
ORH trawl footprint (2009 - 2013)
Coral observations
500-1600m depth range
Predicted Scleractinia distribution
<25%
25-50%
50-75%
>75%
DoC Marine Reserve
Kermadec
Norfolk Deep
Challenger North
Challenger South
Fyre Gothic
Hikurangi Deep
Morgue
Mid Chatham Rise
East Chatham Rise
Arrow Plateau
Blink
Fiordland Transect
Puysegur
Bounty Heritage
Campbell East
Antipodes Transect
Campbell Heritage
Sub-Antarctic Deep
0 30 60 120 Nautical Miles
30°S
40°S
50°S
160°E
170°E
180°


Gorgonacea, EEZ & Westpac Bank, OEO/SSO/BOE & ORH trawl footprint
Predicted area (>50%): 223,056 km2
Coral (>50%) inside PAs: 29,496 km2
Trawl footprint (5 yrs): 9,490 km2
Impacted area (5 yrs): 761 km2
Overlap (5 yrs): 0.3 %
BPA
Seamount reserve
DoC marine reserve
OEO trawl footprint (2009 - 2013)
ORH trawl footprint (2009 - 2013)
Coral observations
500-1600m depth range
Predicted Gorgonacea distribution
<25%
25-50%
50-75%
>75%
DoC Marine Reserve
Kermadec
Norfolk Deep
Challenger North
Challenger South
Hikurangi Deep
Pyre Gothic
Morgue
Arrow Plateau
Blink
Fiordland Transect
Puysegur
Bounty Heritage
Campbell East
Campbell Heritage
Sub-Antarctic Deep
Antipodes Transect
0 30 60 120 Nautical Miles
30°S
40°S
50°S
160°E
170°E
180°

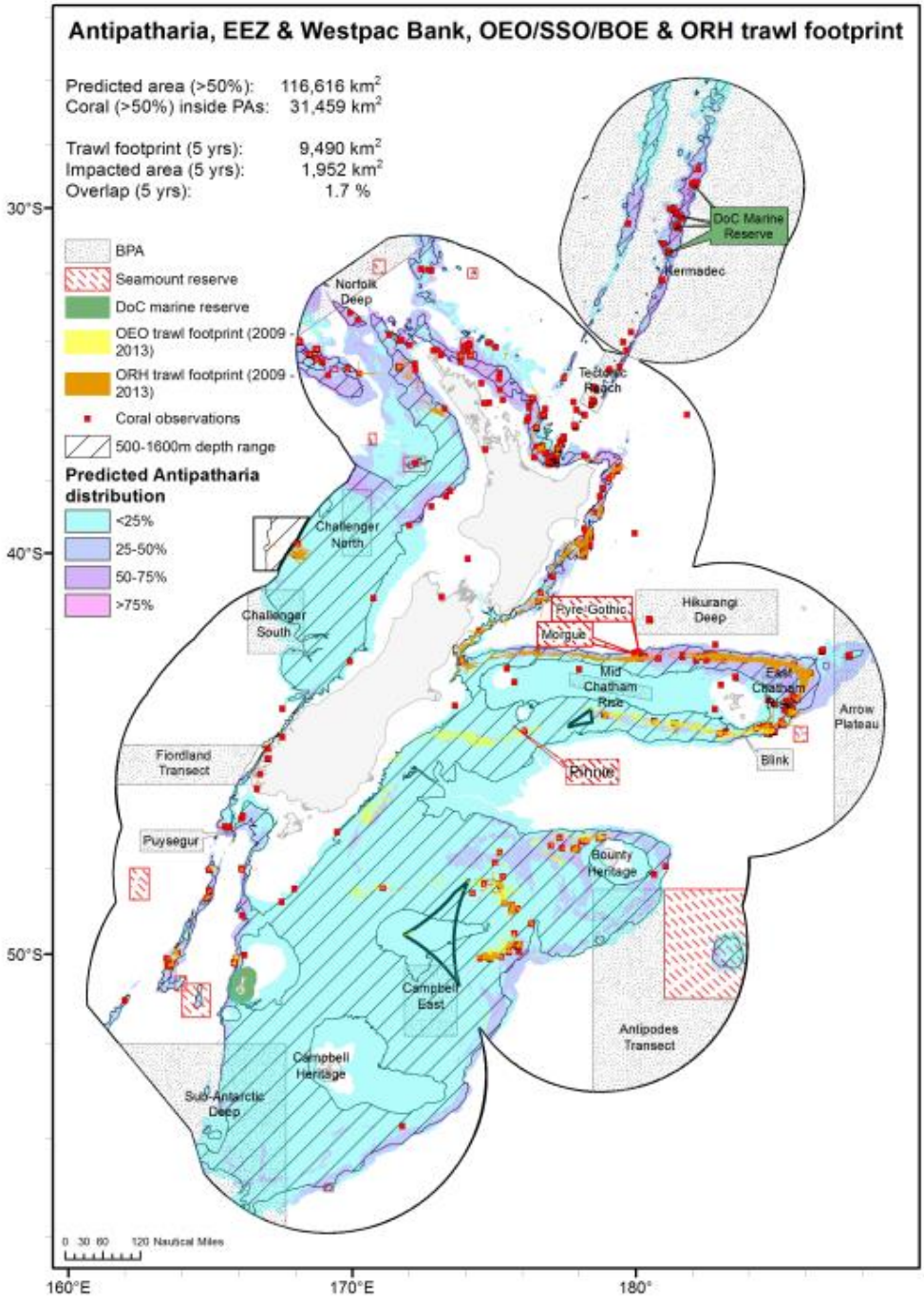
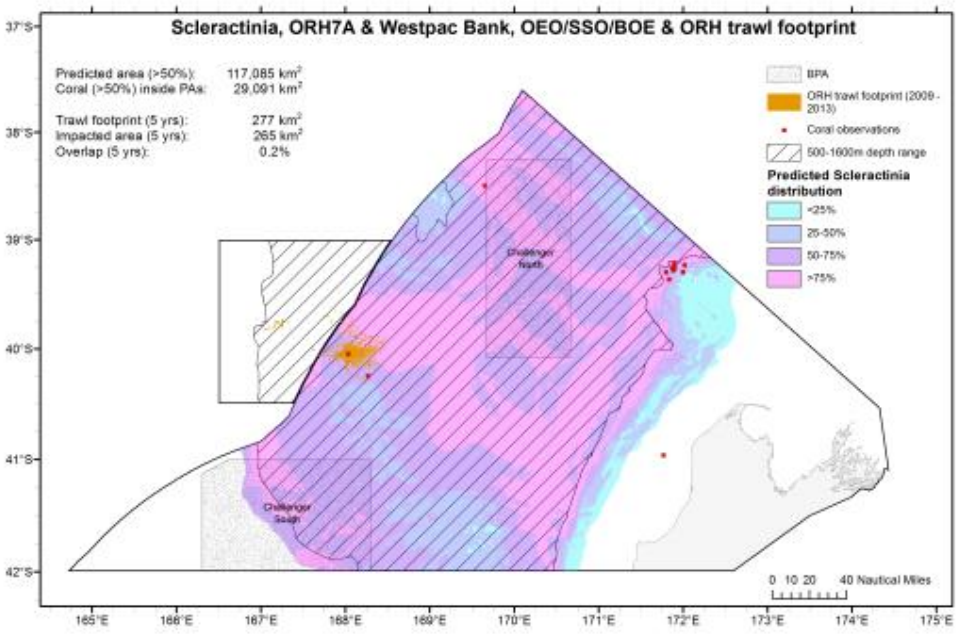
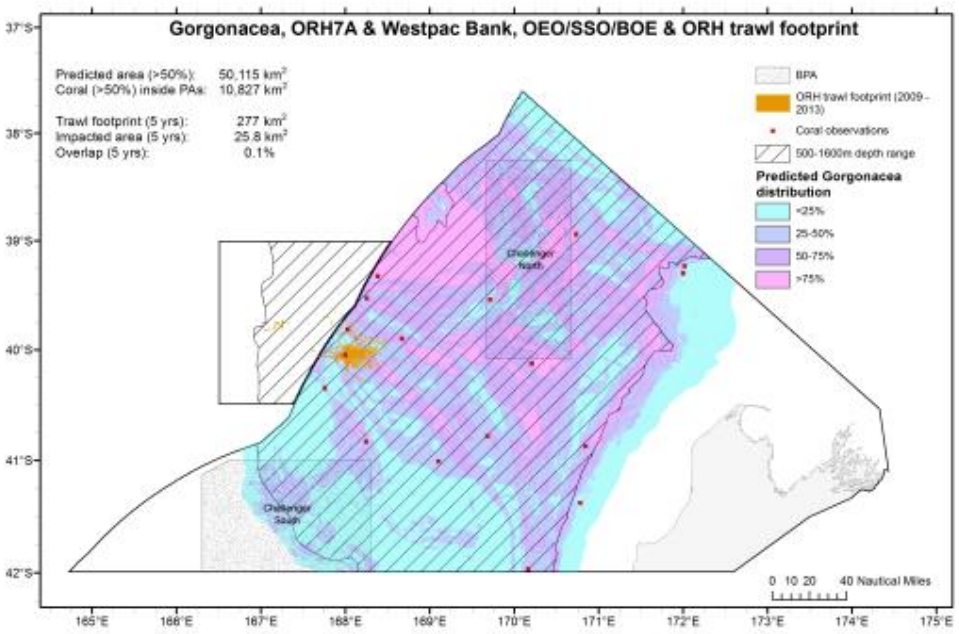


Figure 21 Observed and predicted distributions for coral Orders a) Scleractinia, b) Gorgonacea (previous pages) and c) Antipatharia (above) in relation to the trawl footprint of the orange roughy fishery and the 500-1,600 m depth range in the New Zealand EEZ.


Scleractinia, ORH7A & Westpac Bank, OEO/SSO/BOE & ORH trawl footprint
Predicted area (>50%): 117,085 km²
Coral (>50%) inside PAs: 29,091 km²
Trawl footprint (5 yrs): 277 km²
Impacted area (5 yrs): 265 km²
Overlap (5 yrs): 0.2%
BPA
ORH trawl footprint (2009 - 2013)
Coral observations
500-1600m depth range
Predicted Scleractinia distribution
<25%
25-50%
50-75%
>75%
Challenger North
Challenger South
0 10 20 40 Nautical Miles
37°S
38°S
39°S
40°S
41°S
42°S
165°E
166°E
167°E
168°E
169°E
170°E
171°E
172°E
173°E
174°E
175°E


Gorgonacea, ORH7A & Westpac Bank, OEO/SSO/BOE & ORH trawl footprint
Predicted area (>50%): 50,115 km²
Coral (>50%) inside PAs: 10,827 km²
Trawl footprint (5 yrs): 277 km²
Impacted area (5 yrs): 25.8 km²
Overlap (5 yrs): 0.1%
BPA
ORH trawl footprint (2009 - 2013)
Coral observations
500-1600m depth range
Predicted Gorgonacea distribution
<25%
25-50%
50-75%
>75%
Challenger North
Challenger South
0 10 20 40 Nautical Miles
37°S
38°S
39°S
40°S
41°S
42°S
165°E
166°E
167°E
168°E
169°E
170°E
171°E
172°E
173°E
174°E
175°E

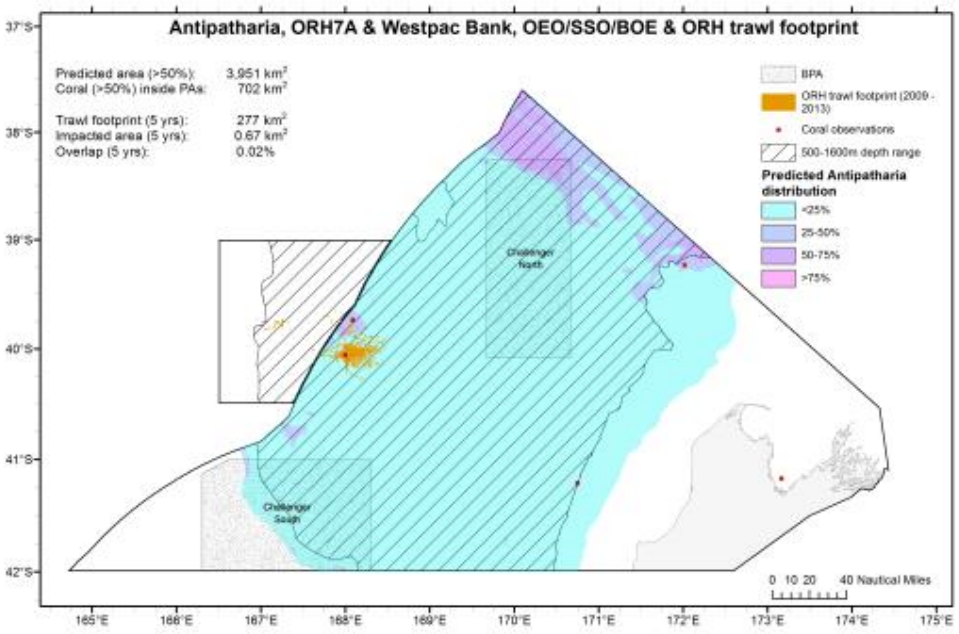
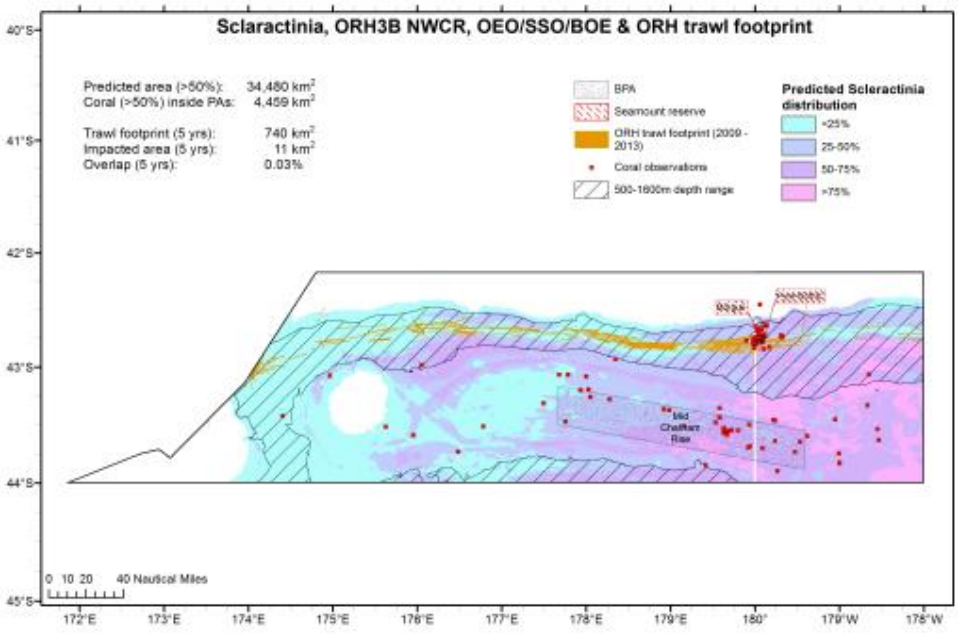
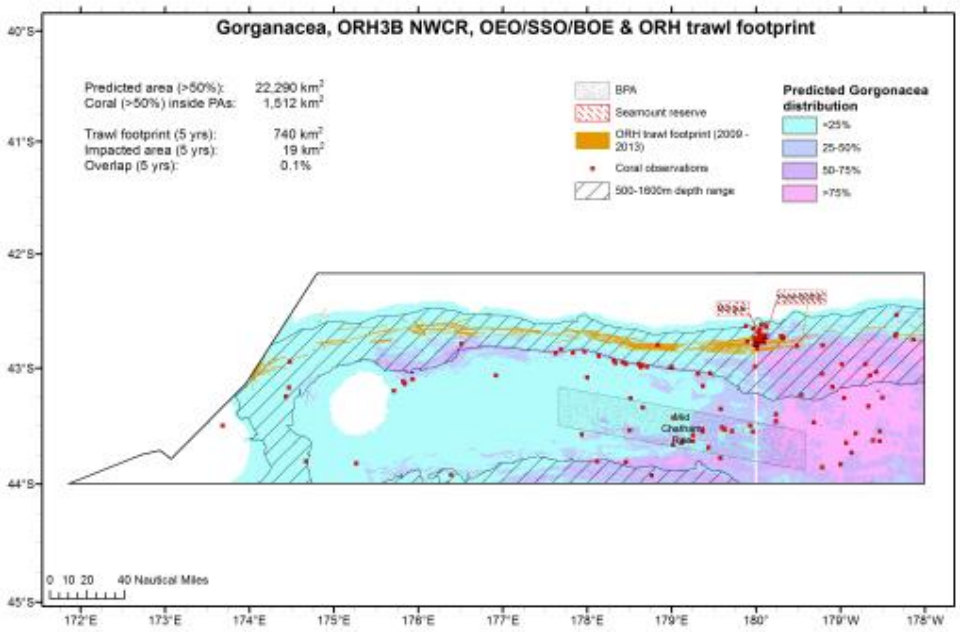


Figure 22: Observed and predicted distributions for coral Orders a) Scleractinia, b) Gorgonacea (previous page) and c) Antipatharia (above) in relation to the trawl footprint of the orange roughy fishery and the 500-1,600 m depth range in the ORH7A UoA.





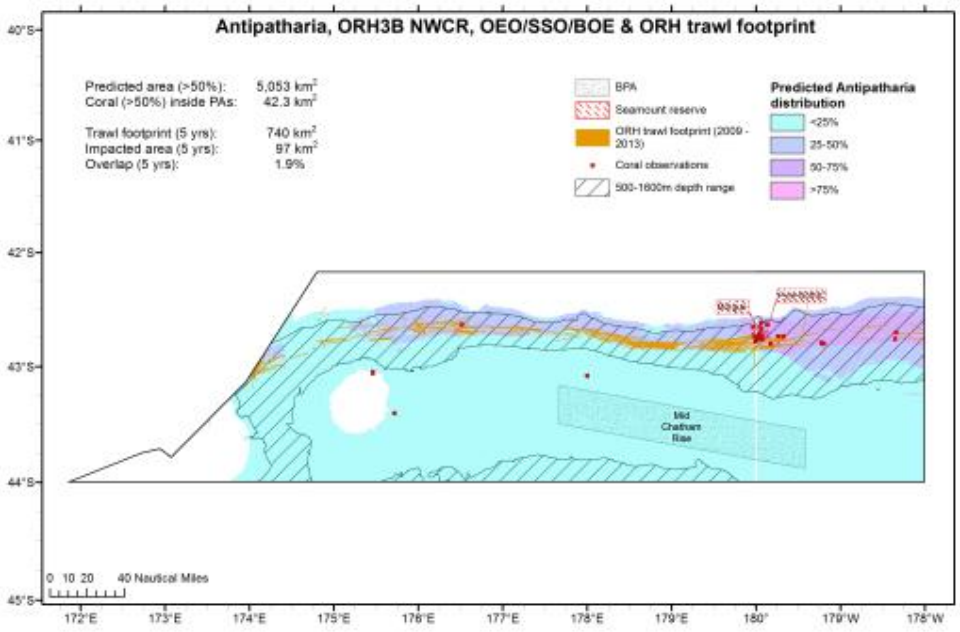
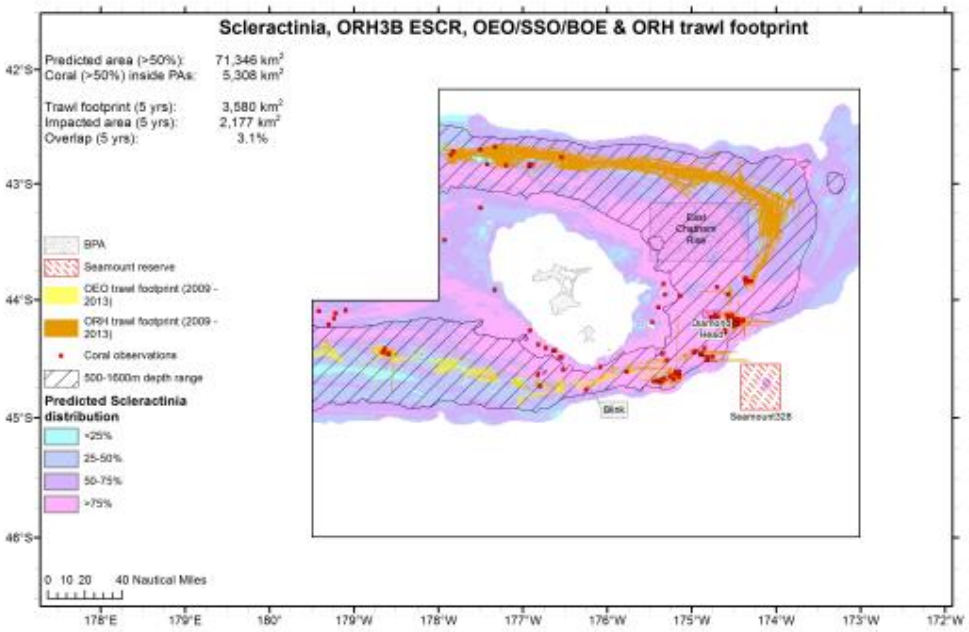
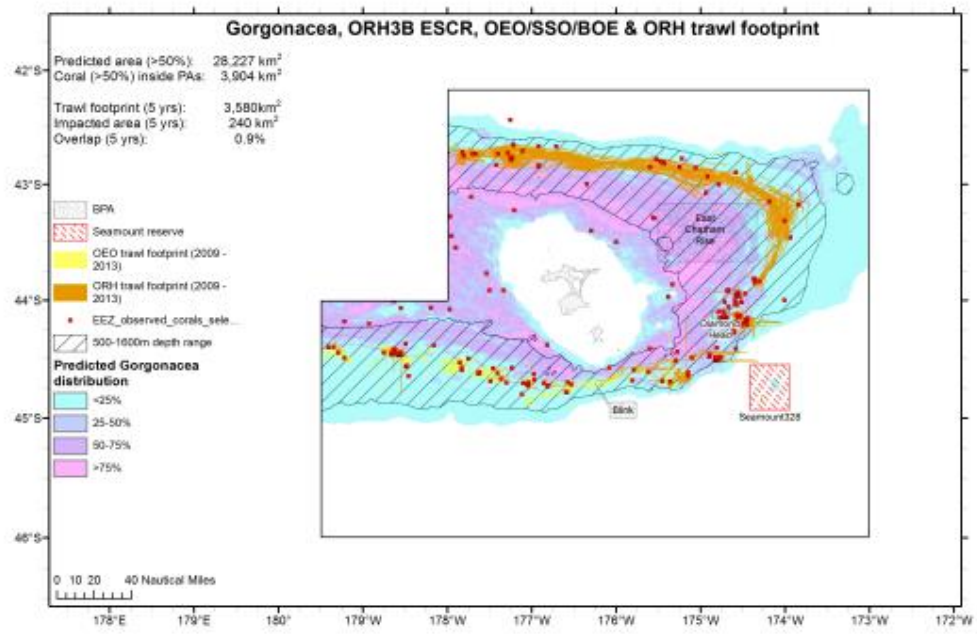


Figure 23 Observed and predicted distributions for coral Orders a) Scleractinia (previous page), b) Gorgonacea and c) Antipatharia (above) in relation to the trawl footprint of the orange roughy fishery and the 500-1,600 m depth range in the ORH3B NWCR UoA.


Scleractinia, ORH3B ESCR, OEO/SSO/BOE & ORH trawl footprint
Predicted area (>50%): 71,346 km²
Coral (>50%) inside PAs: 5,308 km²
Trawl footprint (5 yrs): 3,580 km²
Impacted area (5 yrs): 2,177 km²
Overlap (5 yrs): 3.1%
BPA
Seamount reserve
OEO trawl footprint (2009 - 2013)
ORH trawl footprint (2009 - 2013)
Coral observations
500-1600m depth range
Predicted Scleractinia distribution
<25%
25-50%
50-75%
>75%
0 10 20 40 Nautical Miles
42°S
43°S
44°S
45°S
46°S
178°E
179°E
180°
179°W
178°W
177°W
176°W
175°W
174°W
173°W
172°W


Gorgonacea, ORH3B ESCR, OEO/SSO/BOE & ORH trawl footprint
Predicted area (>50%): 28,227 km²
Coral (>50%) inside PAs: 3,904 km²
Trawl footprint (5 yrs): 3,580km²
Impacted area (5 yrs): 240 km²
Overlap (5 yrs): 0.9%
BPA
Seamount reserve
OEO trawl footprint (2009 - 2013)
ORH trawl footprint (2009 - 2013)
EEZ_observed_corals_sele...
500-1600m depth range
Predicted Gorgonacea distribution
<25%
25-50%
50-75%
>75%
0 10 20 40 Nautical Miles
42°S
43°S
44°S
45°S
46°S
178°E
179°E
180°
179°W
178°W
177°W
176°W
175°W
174°W
173°W
172°W

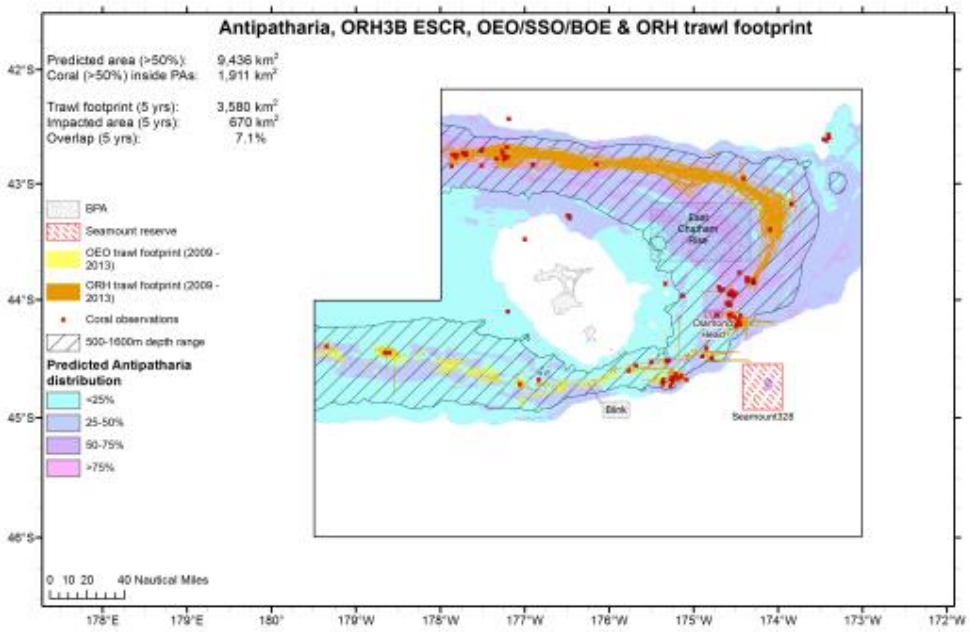


Figure 24 Observed and predicted distributions for coral Orders a) Scleractinia, b) Gorgonacea (previous page) and c) Antipatharia (above) in relation to the trawl footprint of the orange roughy fishery and the 500-1,600 m depth range in the ORH3B ESCR UoC.

Table 25 Observed vs predicted coral distribution overlap for ORH UoA areas and the NZ EEZ for the five year period between 2009 and 2013 and total time period (from data presented in NIWA 2015).

Coral group	ORH UoA	Observed overlap last 5 years	Predicted overlap last 5 years	Observed overlap all years	Predicted overlap all years
Black corals Antipatharia	ORH7A	10%	0.0%	28%	0.7%
Gorgonian corals Alcyonacea		4.4%	0.1%	13.9%	2.1%
Stony corals Scleractinia		6.9%	0.2%	13.1%	4.8%
Black corals Antipatharia	ORH3B NWCR	14.4%	1.9%	60.7%	19.2%
Gorgonian corals Alcyonacea		5.3%	0.1%	26.9%	0.8%
Stony corals Scleractinia		8%	0.0%	38.6%	0.4%
Black corals Antipatharia	ORH3B ESCR	38.8%	7.1%	70.9%	22.1%
Gorgonian corals Alcyonacea		25.4%	0.8%	55.2%	3.7%
Stony corals Scleractinia		36.0%	2.6%	64%	9.1%
Black corals Antipatharia	All NZ EEZ+Westpac	16.1%	1.6%	40.6%	6.0%
Gorgonian corals Alcyonacea		9.0%	0.2%	27.9%	1.4%
Stony corals Scleractinia		11.2%	0.2%	30.0%	1.4%

The Clark *et al.* (2015) study also quantified the proportional occurrence of protected coral observed and predicted in the variety of marine protected areas (MPAs), across the New Zealand EEZ and within each ORH fishing area (Table 26). MPAs include benthic protection areas (BPAs), seamount closures and large marine reserves (LMAs). LMAs include the Territorial Sea area around Auckland Island and around each of the four Kermadec Islands (the latter fall within the Kermadec BPA).

Table 26 Proportional occurrence of protected coral observed and predicted in MPAs in each ORH fishing area and the New Zealand EEZ as a whole (from data presented in NIWA 2015).

Coral group	ORH UoA	Proportional occurrence of protected corals in MPAs-observed	Proportional occurrence of protected corals in MPAs-predicted
Black corals Antipatharia	OR7A	0.0%	17.8%
Gorgonian corals Alcyonacea		5.6%	21.6%
Stony corals Scleractinia		0.0%	24.8%
Black corals Antipatharia	ORH3B NWCR	4.4%	0.8%
Gorgonian corals Alcyonacea		16.4%	6.8%
Stony corals Scleractinia		31.7%	12.9%
Black corals Antipatharia	ORH3B ESCR	1.0%	20.3%
Gorgonian corals Alcyonacea		1.9%	13.8%
Stony corals Scleractinia		2.8%	7.4%
Black corals Antipatharia	All NZ EEZ+Westpac	12.2%	27.0%
Gorgonian corals Alcyonacea		11.1%	13.2%
Stony corals Scleractinia		16.5%	20.8%

A substantial part of the Kermadec Bioregion that supports the ETP coral groups discussed here lies outside of the New Zealand EEZ (Figure 24). There are, therefore, substantial areas of coral habitat and coral abundance outside of the EEZ (e.g. Clark *et al*., 2015). While parts of the area outside of the EEZ have also been fished for orange roughy, as evidenced by the fishery on the Westpac Bank, the fishing is managed by the conservation and management measures (CMMs) set by the non-tuna RFMO, SPRFMO[7], and implemented by its members. The vast majority of the SPRFMO Convention Area (>98%) is not fishable, being deeper than 2,000m (Table 3.1.1.1. Williams et al., 2011). Of the 1.1% of the SPRFMO Convention Area that is shallower than 2,000 m, about 0.5% is deeper than 1,500 m and thus deeper than orange roughy fisheries normally operate, has never been fished

[7] www.sprfmo.int

and is not within any footprint declared to SPFRMO. This means that >99% of the SPRFMO Convention Area is not within any bottom fishing footprint declared to SPRFMO and is closed to bottom trawling.

In addition, Scleractinian corals are found at depths below those at which the orange roughy fisheries operate (see Figure 54 in Clark *et al.*, 2015). For depth distribution of tows see Figure 4 in MFish, 2008. Williams *et al*. (2011) provide estimates of areas by depth zone, with the area in South Pacific Regional Fisheries Management Organisation (SPRFMO) Convention Area between 1,500 m and 2,000 m deep, which has seen very little fishing. Within the SPRFMO Convention Area, the unfished area was estimated at 273,389 km^2 which represents about 43% of the area between 200 m and 2,000 m (Williams *et al*., 2011). This represents a considerable area for coral to exist without disturbance from fishing.

However, according to Clark *et. al.* (2011) connectivity of fauna between UTFs is important for maintaining the productivity of the system. The dispersal capabilities of benthic invertebrates are not well known, but a review of inshore invertebrate taxa indicated most were able to disperse less than 100 km (Kinlan & Gaines 2003). So while it is true that a substantial area of coral habitat within the bioregion as a whole is unimmpacted by fishing, it is possible that fished UTFs isolated by 100 km or more from other UTFs will have slower recolonization that more connected UTFs. The time scale of the recolonization would depend on what recruitment could occur from more distant features and on the amount or coral remaining on the fished UTF. On balance, it is possible that on the scale of the UoAs, due to the large overlap between the orange roughy fishery, particularly on the Chatham Rise, and observed coral distributions, the fisheries could be having an impact on the ability for ETP coral species to recover from disturbance. The assessment team considered this possibility in evaluating fishery impacts on corals.

According to Black *et al.* (2013), there have been no studies investigating whether the current trawling frequencies, as determined for the 5 × 5 km cell grid, have had adverse effects on the structure and function of benthic communities, or on the productivity of the associated fisheries. In the orange roughy fishery on the Chatham Rise, which occurs primarily between depths of 800 - 1,200 m, there is evidence that fishing effort has shifted geographically over time in response to changes in catch rates on individual hills (MPI, 2012). While the fishery has moved into new areas each year, the rate of additional 'new area' subjected to trawling in each successive year has continued to decline throughout the time series (Black *et al.,* 2013). In 2009-10 new area amounted to 3,208 km^2, which is 4% of the 2009-10 trawl footprint of 79,512 km^2 and less than 1% of the cumulative swept area for the period 1989-90 to 2009-10 of 385,032 km^2.

However, UTFs considered to be heavily fished still contain diverse assemblages of corals and other epibenthic fauna and no difference in species numbers or community structures in coral-dominated UTFs within or outside of protected areas (coral dominance indicated no or only light fishing) has been observed (Consalvey, 2006; Clark *et al.*, 2015b). This suggests that coral diversity continues to be maintained on fished UTFs, as most UTFs are fished only on established tow lines, leaving areas of many UTFs unfished because the seabed is too rough or steep to trawl, or where orange roughy do not aggregate. Recent information from trawl surveys supports a conclusion that coral will remain well established on fished UTFs, although not at the density prior to trawling.

Public comments received on the PCDR expressed concerns that future fishing may not continue within the bounds of current tow lines. The following information addresses the likely expansion of the fishery, and the likelihood of fishing beyond existing tow lines. For those parts of the fisheries that operate on UTFs, the fishable 'tow lines' have been long-defined based on trawlable ground. As trawlable ground is unlikely to change, it is also unlikely that fishing will occur outside of these established tow lines. This will be true for

much of the ORH3B NWCR fishery, where a substantial proportion of the catch is taken from UTFs and to a lesser extent for the ORH7A and ORH3B ESCR fisheries, which tend have more of their operation fishing on the slope areas than does the ORH3B NWCR fishery.

Each of the three fisheries mostly target spawning aggregations, which tend to occur in the same places year-after-year. This is particularly true for the largest of the fisheries, where the ORH3B ESCR fishery has taken the majority of its catch from the 'old plume,' which is found on the slope habitat type. Such repeated fishing in the same locations will tend to limit the extent of direct and indirect impacts of fishing on habitat (and ETP corals).

In some areas, spawning plumes do move around somewhat within the same general area (e.g. the fishery in ORH7A, as seen from the trawl and acoustic surveys) but, as in the ORH3B ESCR fishery, these areas are on the slope where corals occur less frequently so localised shifts in fishing location would be of less importance from the perspective of interactions with ETP corals.

The scale of each of these fisheries is now much smaller than in previous years and is effectively limited by the HCR. Current catch limits for the three fisheries range between 12% and 13% of the historic maximum size of these fisheries (as measured by catch). The HCR dictates that the scale of these fisheries will not return to their former levels (Table 27). The ORH3B NWCR and ORH7A fisheries current catch limits are close to their expected long-term average catch limits so have little scope for expansion.

The ORH3B ESCR fishery, at the lower limit of its management target range, has scope to grow somewhat over the next few years. This information is summarised in Table 27, where the relative scale of the three fisheries can be seen together with their scope for increase. Based on catch, the relative size of each fishery at some future date compared to its peak would be 24% for the ORH3B ESCR, 15% for the ORH3B NWCR and 15% for ORH7A (Table 27).

Table 27 Peak catch (t) and fishing year, current catch limit (t), current catch limit as a percentage of the peak catch, projected catch limit (t) at a future date (from the MSE) and projected catch limit as a percentage of the peak catch for each fishery. Peak catches and current catch limits from MPI (2015); projected catch limits from Table 14 of Cordue (2014).

UoA Fishery	Peak Catch (t)	Year of Peak Catch	Current Catch Limit (t)	Current Catch Limit as % Peak Catch	Projected Catch Limit (t) at Year [year]	Projected Catch Limit at Year as % of Peak Catch
ORH3B NWCR	8,670	1982-83	1,043	12%	1,332 [2019]	15%
ORH3B ESCR	25,851	1986-87	3,100	12%	6,317 [2025]	24%
ORH7A	11,941	1982-83	1,600	13%	1,799 [2019]	15%

Because the HCR will limit the catch in each fishery far below the peak catches, and the industry needs to catch the available TAC efficiently, fishing is most likely to stay in previously fished areas where the catching opportunities are understood and can be optimised. The rate of change in the stock size will be slow, limited by the HCR-constrained removals coupled with the naturally slow recruitment to the fishery. The rate of any change in size (i.e. the TACC) of the fisheries will, therefore, also be relatively slow (Cordue, 2014), as well as being signalled in advance though the public process of TACC change; this slow

change allows time to address specific concerns and implement appropriate additional monitoring if necessary. DWG provides annual information on any changes in footprints, which will allow rapid response, if necessary, in management of the impacts on habitat.

Table 28 Overlap of UTFs with ORH/OEO combined trawl footprint and closed or unfished areas (data from Roux *et al.,* 2015 and GNS)

Areas	Total UTFs (500 - 1600 m)	UTFs Fished 2008/09 - 2012/13	% Fished	UTFs Closed	% Closed	UTFs Closed or Unfished	% Closed or Unfished
Bioregion[1]	573	151	26%	188	33%	422	74%
EEZ[2]	451	144	32%	142	31%	307	68%
ORH3B ESCR UoA[3]	85	58	68%	4	5%	27	32%
ORH3B NWCR UoA	26	10	38%	3	12%	16	62%
ORH7A UoA	5	4	80%	0	0%	1	20%

[1] Bioregion includes categories 1) outside EEZ; 2) inside EEZ excl. UoAs; and, 3) UoAs
[2] EEZ includes UoAs
[3] 99 UTFs in whole ESCR and 85 in UoA

The RV *Tangaroa* surveyed six seamounts on the central and southern Louisville Ridge in January 2014 using towed underwater camera and benthic sledge sampling (Clark *et al*., 2015). This survey reported the distributions of different species groups (including taxonomic groups of coral, sponges, crinoids, etc.), as well as reporting the historic level of fishing on each seamount, which varied from relatively light (<200 tows) to relatively heavy (~2000 tows). While not fully analysed[8], this study clearly shows from the distribution of the various taxa, the continued existence of a variety of trawl-sensitive benthic biota (including VME indicator taxa) on seamounts that have documented levels of fishing from light (<200 tows) to heavy (>2000 tows). This information demonstrates that:

(i) coral and fishing can co-exist on UTFs, even when fishing is considered to have been heavy; and,

(ii) the distributions of coral indicator taxa do not appear to be altered by substantially different levels of fishing effort.

Linking this information to the known patterns of fishing on UTFs (where standard tow lines are followed), strongly suggests that there will still be areas of coral and other sensitive benthic organisms on most, if not all, fished UTFs.

South Pacific Regional Management Organization (SPRFMO) management of these areas restricts fishing areas. SPRFMO is an inter-governmental organisation that is committed to the long-term conservation and sustainable use of the fishery resources of the South Pacific Ocean and in so doing safeguarding the marine ecosystems in which the resources occur. The SPRFMO Convention applies to the high seas of the South Pacific, covering about one fourth of the Earth's high seas areas.

[8] Data are still to undergo final checking, including formal identification of specimens, hence the observations presented in Clark et al. (2015) are preliminary

Less than 1% of the SPRFMO Convention Area is within any bottom fishing footprint declared to SPRFMO and open to bottom trawling.

Together, these factors demonstate the limited degree of overlap between the fisheries and geographical, local spatial, and depth distribution of corals within the Kermacec Bioregion.

Cold water corals are fully protected under the Wildlife Act 1953. Interactions with fisheries are monitored through the MPI's Scientific Observer Programme and vessel reporting; however, there is no overall management plan (Boyd 2013). The orange roughy fishery is spatially managed with defined areas where bottom trawling or all trawling is prohibited (e.g., benthic protected areas (BPAs), 'seamount' closures), which provide some protection for corals. Managed areas have closed approximately 31% of UTFs within New Zealand's EEZ while 68% of UTFs in the EEZ and 74% of UTFs within the Kermadec Bioregion have not been trawled in the most recent five-year period (Table 28). The remaining open areas allow for potential expansion of trawling beyond the current footprint of the fishery.

3.4.5 Habitat

Orange roughy fishing in New Zealand takes place over areas of flat seabed on the continental slope and on Underwater Topographic Features (UTFs). UTFs are defined as seamounts, knolls or hills based on the elevation measured as the height from base to summit (i.e., seamount >1,000 m; knoll 500 - 1,000 m; hill <500 m, Black *et al.*, 2015). Compared to UTFs, less is known about the ecosystems of the benthic areas of the upper continental slope. Biodiversity and habitats do vary over large spatial scales (Compton *et al.,* 2013) but the primary drivers of variability at these depths is understood to most likely be environmental factors such as depth, substrate and oceanographic conditions (Dunn, 2013).

UTFs

The NIWA "Seamounts" database holds information on 1,517 known UTFs, with 892 of these inside the New Zealand EEZ and 625 outside the EEZ (Clark, 2013). Pitcher *et al.* (2007), Clark *et al.* (2010) and Rowden and Clark (2010) summarized the ecological role of UTFs. The UTFs are well known as aggregation sites for pelagic, mesopelagic and demersal species and may provided important benthic habitats for fish species (enhanced numbers and/or biomass) and invertebrates. UTF benthic biomass has been reported as four times that of the adjacent slope (Rowden & Clark 2010). The drivers of these differences include: the wide depth ranges offered by UTF elevation; variable substrates that include hard substrates (which provide suitable attachment surfaces for sessile epibenthic invertebrates, such as corals); and stronger current flows around UTFs (that may act to reduced sediment settlelment and to increase/concentrate food supplies).

Black *et al.* (2015) summarized information regarding UTF habitat for orange roughy and associated trawl fisheries for orange roughy and oreo species. This study specifically examined the UoA areas under consideration with respect to trawling for orange roughy and oreo species and trawl footprint overlap with UTFs in each UoA, the unit of management (i.e. the New Zealand EEZ), and the Kermadec bioregion (UNESCO, 2009) within which all three UoAs reside. The UTFs in each UoA, in the New Zealand EEZ, and in the Kermadec Bioregion are shown in Figure 25 (Roux, *et al.*, 2015).

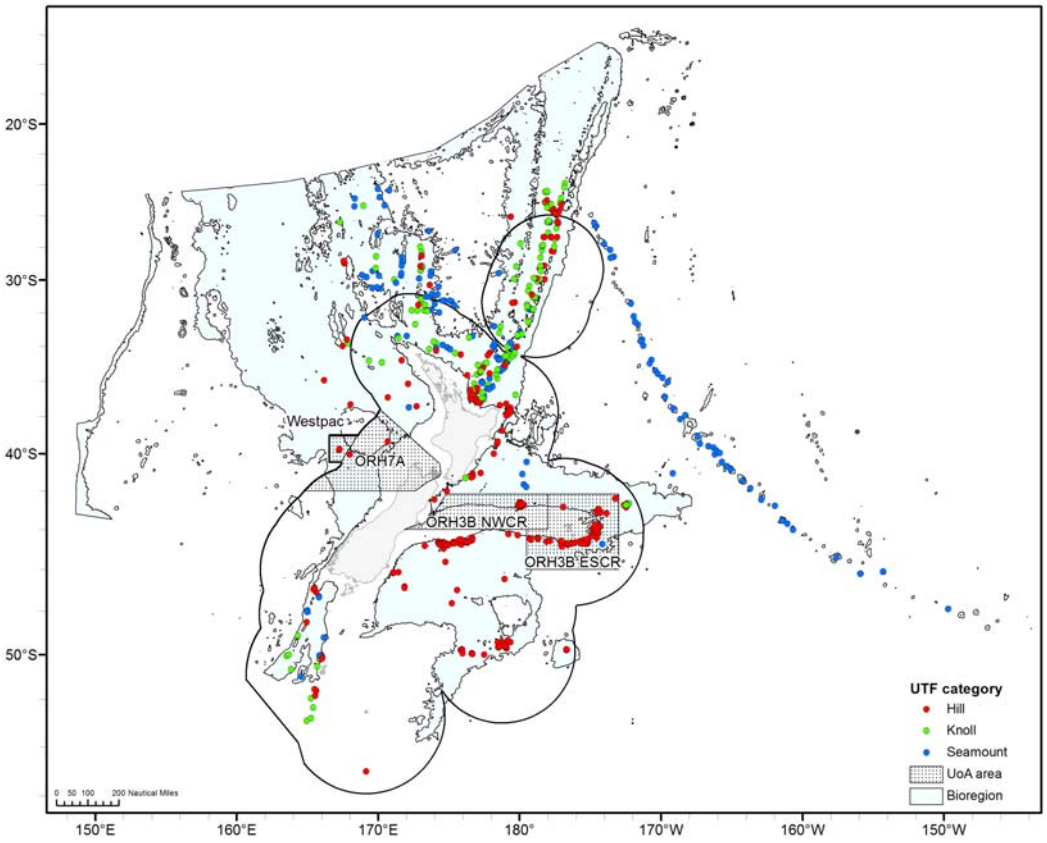


Figure 25 : Hills (red), knolls (green) and seamounts (blue) in the UoAs (ORH7A, ORH3B Northwest Chatham Rise, ORH3B East & South Chatham Rise), the New Zealand EEZ and the Kermadec Bioregion (from Roux *et al.*, 2015)

Key results from the Roux *et al.,* (2015) study are summarised below (and in Figure 26):

- A total of 591 UTFs (318 hills, 136 knolls and 137 seamounts) were identified within the orange roughy distribution range (i.e. 800 - 1 600 m) within the New Zealand EEZ and Kermadec Bioregion. Of these, 451 were in the EEZ and 573 were in the Bioregion. (note: as there is a large overlap between the Bioregion and the EEZ, these UTF numbers are not additive—the 573 does not include the portion of the bioregion also within the EEZ).

- During the period 2009 to 2013 a total of 156 UTFs were fished. Of these, 144 were within the New Zealand EEZ, and 151 were within the Kermadec Bioregion.

- The total number of fished UTFs within the Kermadec bioregion (both within and outside the EEZ) was 151 (124 hills, 12 knolls and 15 seamounts).

- The total number of fished UTFs within the New Zealand EEZ between 2008-09 and 2012-13 was 144 (124 hills, 14 knolls and 6 seamounts), of which half (72) were located within the UoAs.

- Only 12 of the 140 UTFs located in the bioregion outside the EEZ were fished between 2008–09 and 2012–13.

- Coral layers have yet to be developed for regions located outside the EEZ boundaries. Thus, coral presence/absence on UTFs outside the EEZ was not assessed. Note, however, that corals are known to be widespread in areas outside of the New Zealand EEZ but still within the same bioregion, as seen in observer reports from fishing operations (MPI, 2014y) and as reported from scientific studies of seamounts (Clark *et al.* 2015a).

- A total of 85 UTFs (81 hills, 3 knolls and 1 seamount) were located within the ORH3B ESCR UoA. More than half (48) had coral presence and 58 were fished between 2008–09 and 2012–13. Of the 58 UTFs that were fished, 37 had coral records.

- Within the ORH3B NWCR UoA, a total of 26 UTFs (all hills) were identified, among which 19 had coral presence and 10 were fished in the period 2008-09 and 2012-13. Nine of the fished UTFs had coral presence.

- UoA ORH7A had a total of 5 UTFs (all hills), including four that were fished. None had coral presence.

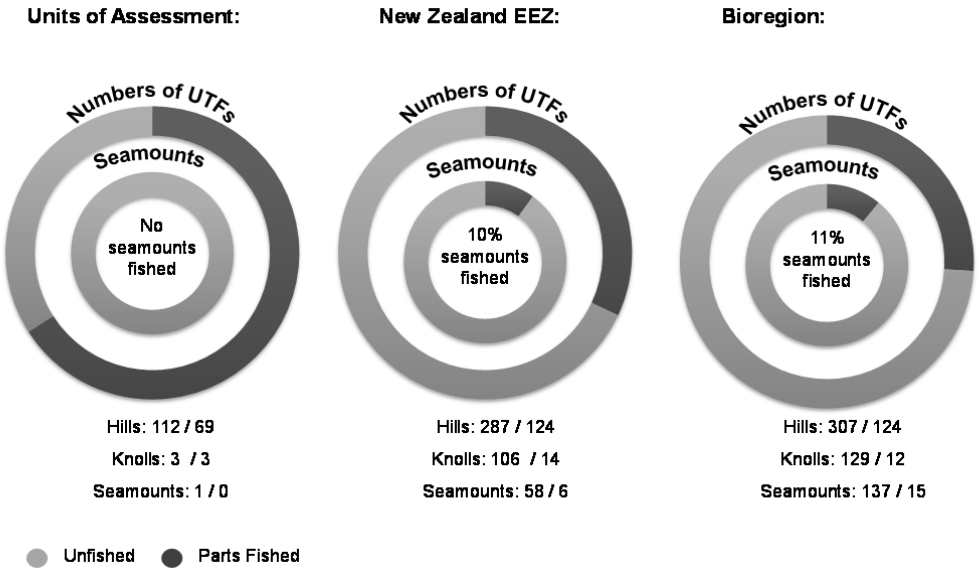


Figure 26 Summary by UoA, New Zealand EEZ, and Kemadec Bioregion, of the numbers of known UTFs, numbers of UTFs target-fished for orange roughy and oreo, and proportion of seamounts fished during the period 2008-09 to 2012-13

In the New Zealand Territorial Sea (TS) and EEZ there are substantial areas closed to bottom fishing, including marine reserves, large MPAs (including BPAs), and the proposed Kermadec Ocean Sanctuary announced by the New Zealand Government for introduction during 2016 (note that this entire area is already a MPA, having been closed to bottom fishing since 2007). Table 29 shows the Marine Reserves in New Zealand established up until 2014, and demonstates active and increasing establishment of these areas over time.

Table 29. Marine Reserves in New Zealand to 2014.

Marine Reserves	Year Established	Area (ha)
Akaroa	2014	512
Hautai	2014	853
Hikurangi	2014	10,416
Kahurangi	2014	8,419
Moutere Hauriri/Bounty Islands	2014	104,626
Moutere Ihupuku/Campbell Island	2014	113,251
Moutere Mahue/Antipodes Island	2014	217,287
Punakaiki	2014	3,520
Tauparikākā	2014	16
Waiau Glacier Coast	2014	4,557
Tawharanui	2011	394
Tapuae	2008	1,404
Taputeranga	2008	854
Horoirangi	2006	904
Parininihi	2006	1,844
Te Paepae Aotea (Volkner Rocks)	2006	1,267
Whāngārei Harbour	2006	25
Hawea (Clio Rocks)	2005	411
Kahukura (Gold Arm)	2005	464
Kutu Pārera (Gaer Arm)	2005	433
Moana Uta (Wet Jacket Arm)	2005	2,007
Taipari Roa (Elizabeth Island)	2005	613
Taumoana (Five Fingers Peninsula)	2005	1,466
Te Hāpua (Sutherland Sound)	2005	449
Te Tapuwae o Hua (Long Sound)	2005	3,672
Ulva Island (Te Wharawhara)	2004	1,075
Auckland Islands	2003	484,000
Te Matuku	2003	690
Pōhatu	1999	215
Te Tapuwae o Rongokako	1999	2,450
Te Angiangi	1997	446
Long Bay–Ōkura	1995	980
Motu Manawa (Pollen Is)	1995	500
Westhaven–Te Tai Tapu	1994	536
Long Is–Kokomohua	1993	619
Piopiotahi (Milford Sound)	1993	690

Marine Reserves	Year Established	Area (ha)
Te Awaatu Channel (The Gut)	1993	93
Tonga Is	1993	1,835
Kapiti	1992	2,167
Te Whanganui-A-Hei (Cathedral Cove)	1992	840
Tūhua (Mayor Is)	1992	1,060
Kermadec*	1990	745,000
Poor Knights Islands	1981	2,400
Cape Rodney–Ōkakari Point	1975	518

All of these measures contribute to protect the marine environment generally and to mitigate and adverse effects from bottom trawling (Figure 27). These MPAs are largely based on the analysis of physical and some biological attributes and in total exclude bottom trawling from around 30% of the New Zealand EEZ to minimize benthic impacts, safeguard habitats, and protect representative marine benthic ecosystems and biodiversity in accordance with s 8(1) of the Fisheries Act 1996 which focuses on avoidance, mitigation or remedy of "*any adverse effects of fishing on the aquatic environment*."

As noted in the section on coral above, the area of the high seas seabed that surrounds New Zealand is largely closed to bottom trawling under the bottom fishing conservation and management measure developed by the South Pacific Regional Fisheries Management Organization (SPRFMO). These areas have been closed to bottom fishing since 2007 (SPRFMO, 2013). A process for assessing the potential for benthic impacts, the **Interim Benthic Assessment Framework**[9], was developed together with a **Process for the Preparation and Evaluation of Benthic Assessments**[10] and adopted in September 2007 at the 4th International Consultation. These documents provided the basis for evaluating the earliest bottom fishery impact assessments.

Continuing progress was made in this area and at the Third Preparatory Conference in February 2012, a **Bottom Fishing Impact Assessment Standard**[11] was adopted.

From its first Commission meeting in 2013, SPRFMO has implemented a number of conservation and management measures (CMMs) that are binding on members and CNCPs. There are currently 15 such CMMs addressing a wide variety of issues such as banning gill nets from the Convention Area, setting catch limits for the jack mackerel fishery, an IUU vessel list, minimisation of seabird by-catch, and bottom fishing controls.

CMM 2.03, Bottom Fishing in the SPRFMO Convention Area[12] was adopted at the 2nd Commission Meeting in early 2014 and was binding from 4th May 2014. This CMM contains the following clauses pertinent to the management of the high seas orange roughy fisheries, including the high seas part of the ORH 7A fishery.

[9] https://www.sprfmo.int/assets/Meetings/Meetings-before-2013/International-Consultations-2006-to-2009/IntCons-4-2007-Noumea-New-Caledonia/SPRFMO4-Report-Annex-C.pdf
[10] https://www.sprfmo.int/assets/Meetings/Meetings-before-2013/International-Consultations-2006-to-2009/IntCons-4-2007-Noumea-New-Caledonia/SPRFMO4-Report-Annex-D.pdf
[11] https://www.sprfmo.int/assets/Meetings/Meetings-before-2013/Scientific-Working-Group/SWG-06-2008/a-Miscellaneous-Documents/SPRFMO-Bottom-Fishing-Impact-Assessment-Standardagreed-Vanuatu-Fri23Sep2011-1140am.pdf
[12] https://www.sprfmo.int/assets/Meetings/Meetings-2013-plus/Commission-Meetings/2nd-Commission-Meeting-2014-Manta-Ecuador/Annex-M-CMM-2.03-CMM-for-Bottom-Fishing.pdf

Objective

1. To promote the sustainable management of bottom fisheries including target fish stocks as well as non-target species taken as bycatch, in these fisheries, and to protect the marine ecosystems in which those resources occur, including *inter alia*, the prevention of significant adverse impacts on vulnerable marine ecosystems.

3. For the purposes of this CMM, the term 'vulnerable marine ecosystem' (VME) means a marine ecosystem that has the characteristics referred to in paragraph 42 and elaborated in the Annex of the FAO International Guidelines for the Management of Deep-Sea Fisheries in the High Seas (FAO, 2009; FAO Deep-sea Fisheries Guidelines).

4. For the purposes of this CMM, the term 'bottom fishing' is defined as fishing using any gear type likely to come in contact with the seafloor or benthic organisms during the normal course of operations.

Management of bottom fishing and fisheries

8 (a) Prepare and submit to the Scientific Committee a bottom fishing footprint as defined in paragraph 6, and a bottom fishing impact assessment, in accordance with paragraphs 10 to 15.

8 (d) Except as provided for in paragraphs 16 to 20 below, restrict bottom fishing to within the bottom fishing footprint of that Member or CNCP established in accordance with sub-paragraph (a).

8 (h) Notwithstanding sub-paragraphs (d) and (g) above, a Member or a CNCP may exclude part of its bottom fishing footprint from the application of sub-paragraph (g) by dividing its footprint into areas open to bottom fishing, areas closed to bottom fishing and areas to which sub-paragraph (g) would apply. These exclusions must have the purpose of preventing significant adverse impacts to VMEs.

Assessment of bottom fishing

10 No Member or CNCP shall authorize their flagged vessels to engage in any bottom fishing within the Convention Area unless they have undertaken an assessment of the impact of their flagged vessels' bottom fishing. Any assessment carried out after 2011 must be done in accordance with the FAO Deep-sea Fisheries Guidelines, and taking into account the SPRFMO BFIAS and areas identified where VMEs are known or suspected to occur in the area to be fished. When preparing assessments, Members and CNCPs will take into account the information provided pursuant to paragraph 23 of this CMM.

12. The Scientific Committee shall:

(a) assess, on the basis of the best available scientific information, whether the proposed bottom fishing would have significant adverse impacts on VMEs and if it is assessed that these activities would have significant adverse impacts, recommend measures to prevent such impacts, or recommend that the proposed bottom fishing should not proceed.

(b) assess, taking into account, inter alia, the cumulative impacts of other fishing occurring in the region where such information is available, whether the proposed activities are consistent with paragraph 1 of this CMM and Article 2 of the Convention.

(c) provide recommendations and advice to the Commission on the assessment.

13. The Commission shall:

a. on the basis of these assessments and taking into account the recommendations and advice of the Scientific Committee, consider whether, and if applicable, the extent to which, bottom fishing in the region of the Convention Area for which the assessment was conducted, can be authorised and which, if any, measures are required, to prevent significant adverse impacts on VMEs.

b. Make their determinations and any Scientific Committee evaluations publicly available.

Fishing outside the footprint or above reference period catch levels

16. Notwithstanding paragraphs 8(c) and (d), a Member or CNCP may apply to the Commission to either:

a. undertake bottom fishing in the Convention Area where they do not have a bottom fishing footprint;

b. undertake bottom fishing in the Convention Area but outside their footprint established in accordance with paragraph 8(a); or

c. exceed the average level of catch for bottom fishing established in accordance with paragraph 8(c).

17. The Member or CNCP shall prepare and submit to the Secretariat for consideration by the Scientific Committee 60 days in advance of a Scientific Committee meeting, an application outlining their proposal to commence bottom fishing or their proposal to fish outside their footprint or above reference year catch levels, in accordance with paragraphs 10 and 11. Such an application will take into account the results of any public consultation conducted by that Member or CNCP.
18. Assessments by Members or CNCPs shall be submitted to the Scientific Committee for review. The Scientific Committee will consider the assessments in accordance with paragraph 12.
19. The Commission shall consider the assessments in accordance with paragraph 13. These assessments shall be made publicly available on the SPRFMO website.
20. Members and CNCPs shall not permit bottom fishing to occur until it has been authorised in accordance with paragraphs 16 to 19.
21. The requirements in paragraphs 16 to 20 are in addition to the requirements in any other measures adopted under Article 22 of the Convention with respect to new and exploratory fisheries.

Vulnerable Marine Ecosystems

22. Subject to paragraph 8(h) of this CMM, in respect of areas where VMEs are known to occur or are likely to occur based on the best available scientific information, the Commission shall close such areas to bottom fishing by a particular gear type or types, drawing on advice from the Scientific Committee provided under paragraph 5, unless, based on an assessment undertaken in accordance with either paragraphs 10 to 15 or paragraphs 16 to 19 above, the Commission determines that such bottom fishing will not have significant adverse impacts on VMEs.

The New Zealand BFIA (*op.cit*.) reported the estimated area of the SPRFMO Convention Area as 49,920,000 km^2 and the New Zealand footprint as 217,463 km^2 (i.e. 0.44% of the SPRFMO Convention Area). In addition, Penney (2013) reported that the average area within each 20' by 20' rectangle of the footprint that was actually subject to bottom contact by fishing gear was between 4% and 5%, thus the percentage of the SPRFMO Area subject to bottom fishing as a result of fishing within the New Zealand footprint is of the order of 0.022%.

From the selected CMM paragraphs, it is clear that bottom fishing can only be conducted by members or CNCPs in areas defined to the Commission as a member or CNCP bottom fishing footprint areas based on fishing activity between the years 2002 and 2006 and that also have submitted an acceptable Bottom Fishing Impact Assessment (BFIA). To date only Australia and New Zealand have both declared footprint and accepted BFIAs, the relevant footprint is included in each BFIA[13]. Thus, the vast majority of the SPRFMO Convention Area is currently closed to bottom fishing.

From the way the negotiations, frameworks, documents and CMMs have developed since 2006, it is also clear that SPRFMO, its members and CNCPs have tried to set up a management framework that fully addresses the UNGA resolutions relating to the management of deepwater, high seas fisheries and the conservation of VMEs and they are also continuing to develop and apply appropriate management measures.

From the same analysis (Table 28, Table 30), it is clear that, within the Kermadec Bioregion, the vast majority of habitat has not been fished and will not be fished under the current management arrangements operated by New Zealand and SPFRMO.

[13] https://www.sprfmo.int/cmms/benthic-impact-assessments/

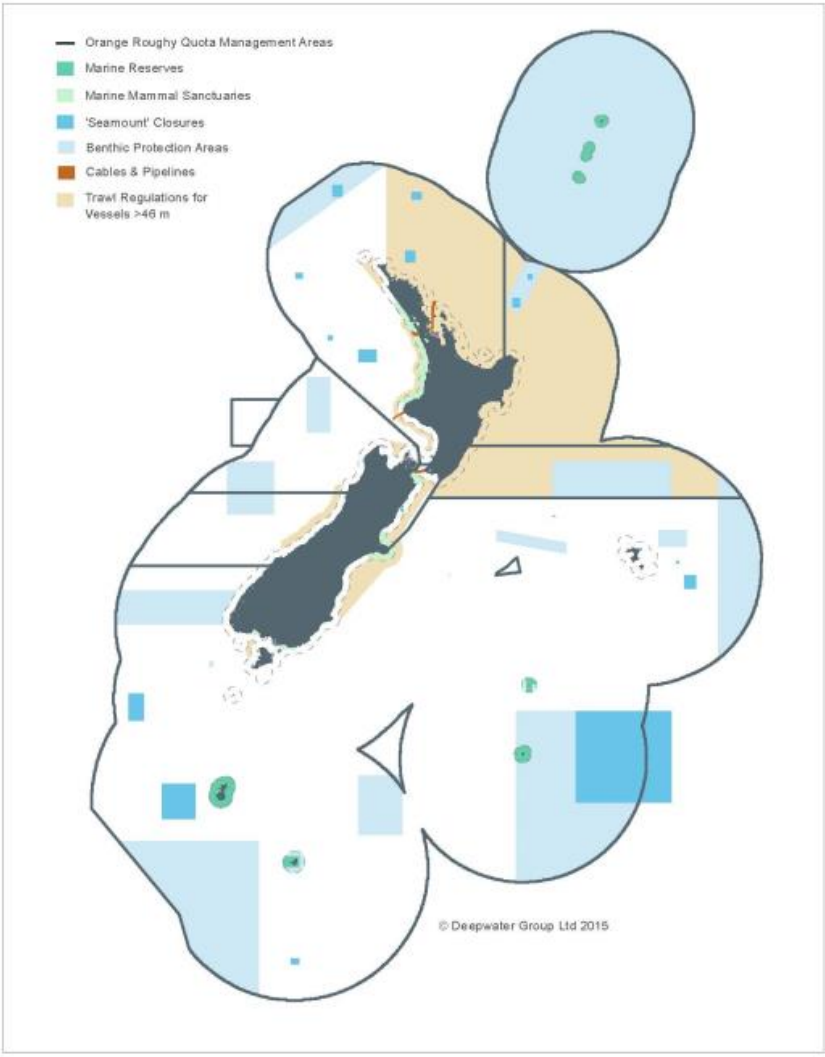


Figure 27 Current spatial restrictions to bottom trawling within the New Zealand EEZ (DWG, 2015).

Slope

Black *et al*. (2015) provide an analysis of the orange roughy and oreo trawl footprint in relation to slope habitat in each of the three UoAs. In this analysis, maps were constructed for the five-year period between 2008-09 and 2012-13 and the total period for which fisheries data were available (1989-90 to 2012-13) to show the spatial relationships between the orange roughy and oreo trawl footprints, the Kermadec Bioregion, the orange roughy habitat

area, and the areas closed to bottom trawling. The conclusions from this analysis are presented below (and in Table 30 below):

- The proportion of the orange roughy habitat area that falls within closed areas ranges between 0.3% (ORH3B NWCR) and 15.1% (ORH7A).
- During the period 2008-09 to 2012-13, the proportions of orange roughy habitat area swept in each UoA were: 0.3% (ORH7A), 4.3% (ORH3B NWCR), and 8.3% (ORH3B ESCR).
- During the period 1989 to 2013, the proportions of orange roughy habitat swept area in each UoA were: 9.1% (ORH7A), 35.1% (ORH3B NWCR), and 24.4% ORH3B ESCR.

Table 30 Summary of orange roughy and oreo targeted trawl footprint analysis for slope habitat in the three UoAs for the most recent five-year period (2008-09 to 2012-13) and for all years for which TCEPR data are available (1989-90 tp 2012-13) (Black *et al.*, 2015)

UoA	ORH3B ESCR	ORH3B NWCR	ORH7A
Closed areas (% of ORH habitat area)	7.5%	0.3%	15.1%
Swept (5 yr 2008-09 to 2012-13)	8.3%	4.3%	0.3%
Swept (All yrs 1989-90 to 2012-13)	24.4%	35.1%	9.1%

The spatial extent of the orange roughy and oreo targeted trawl footprint within the three UoA, the New Zealand EEZ and the Kermadec Bioregion in relation to the orange roughy slope habitat and closed areas is shown in Figure 28 (a-e) below.

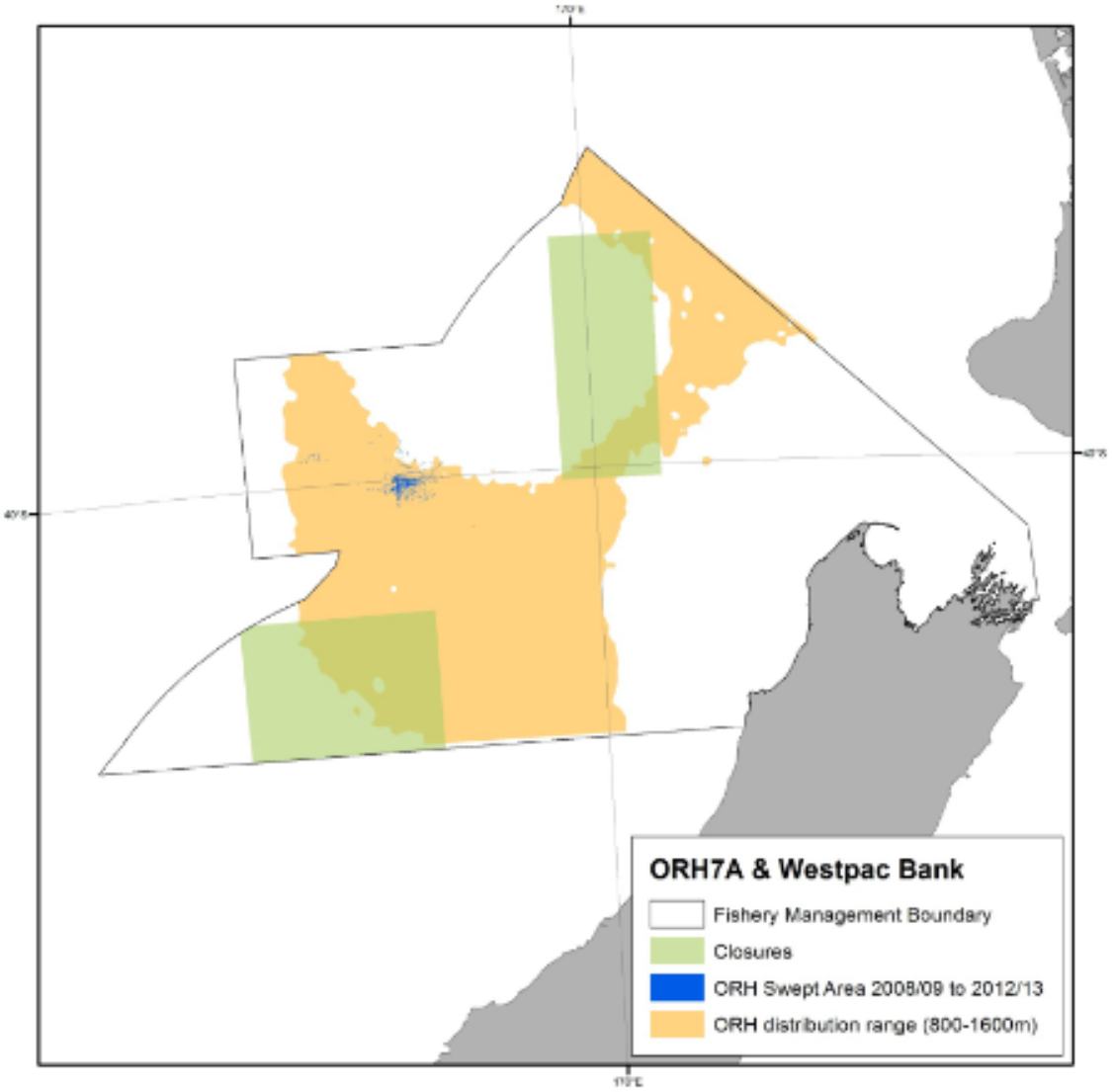


Figure 28a The extent of the ORH trawl footprint in relation to ORH slope habitat area and closed areas during the period 2008-09 to 2012-13 in the ORH7A UoA (Black *et al.,* 2015).

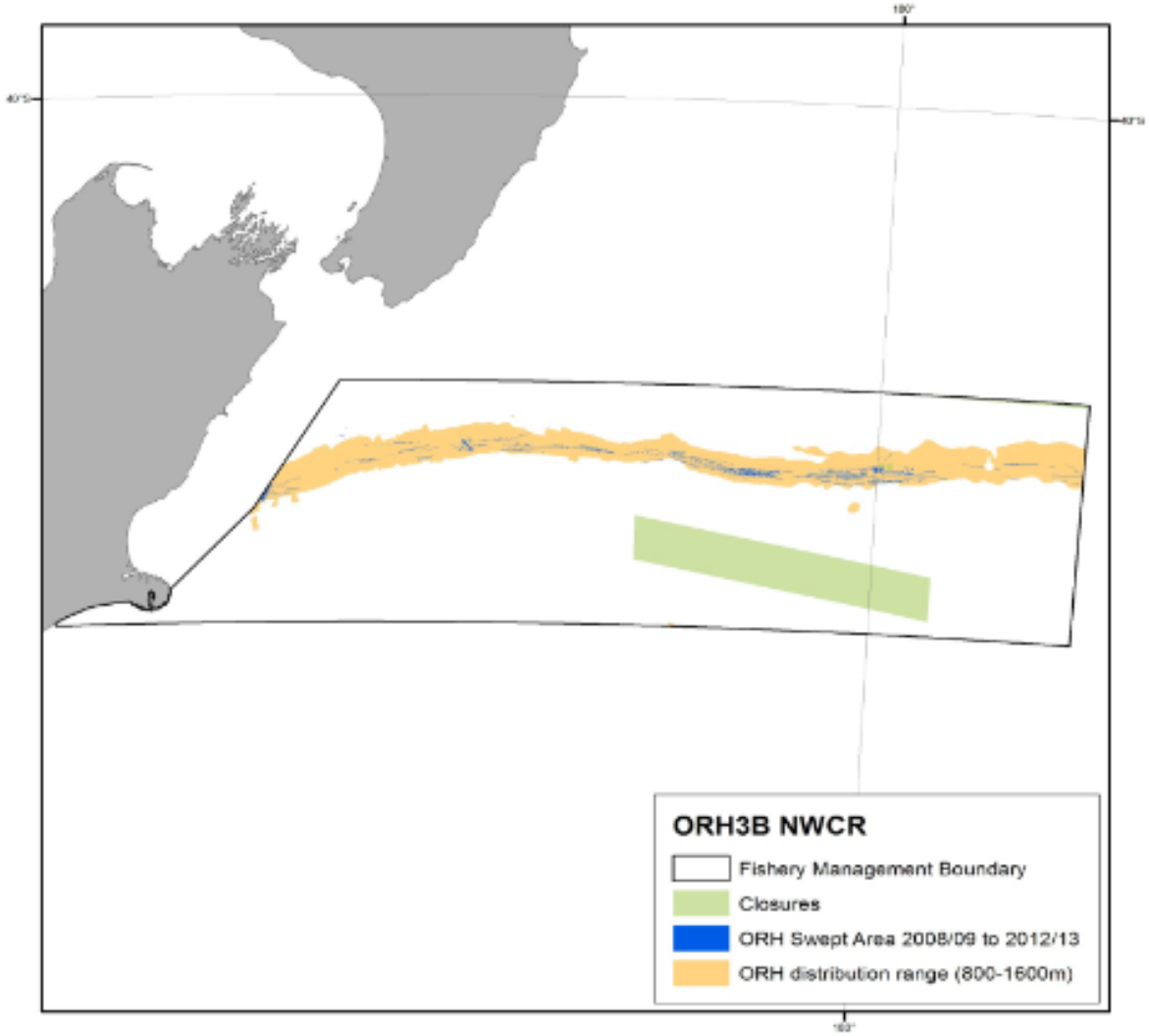


Figure 28b. The extent of the ORH trawl footprint in relation to ORH slope habitat area and closed areas during the period 2008-09 to 2012-13 in the ORH3B NWCR UoA (Black *et al.,* 2015).

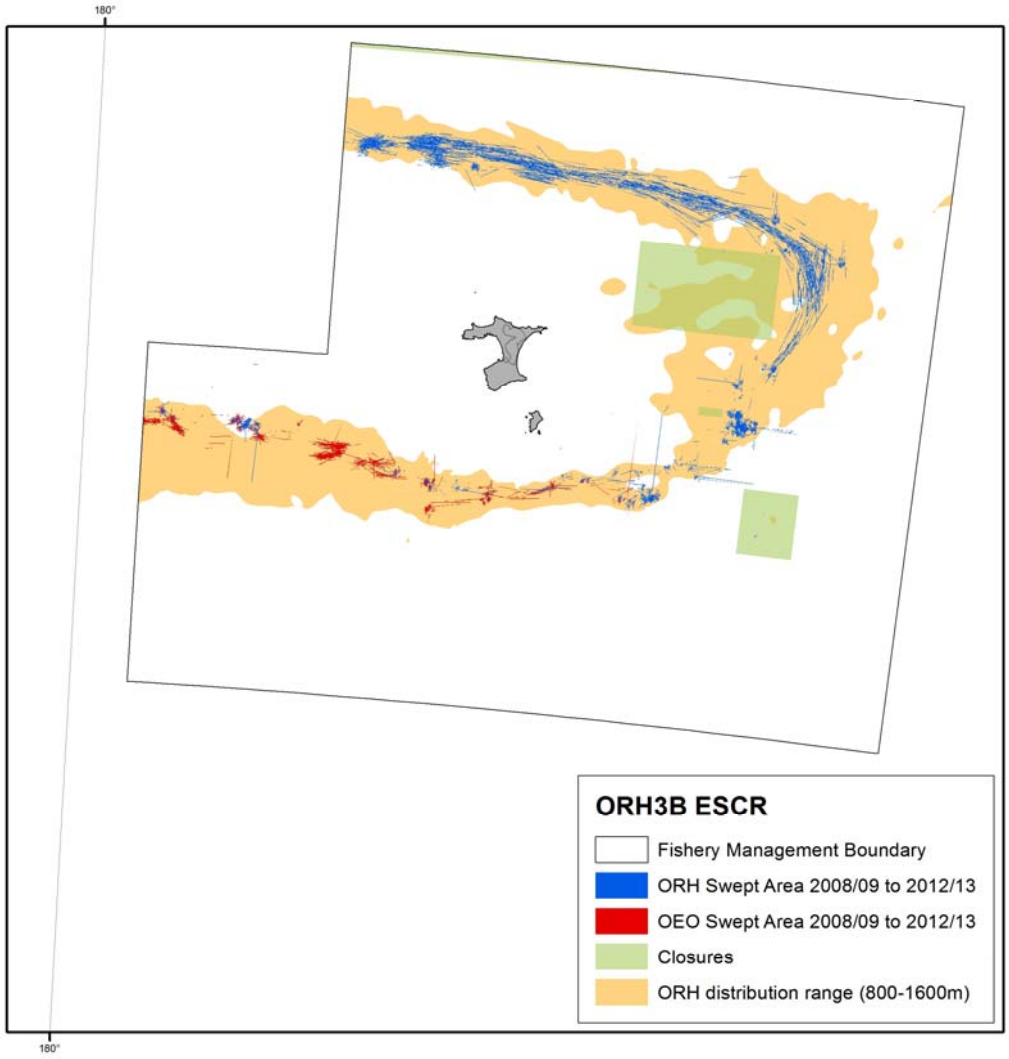


Figure 28c. The extent of the ORH and OEO/BOE/SSO trawl footprint in relation to ORH slope habitat area and closed areas during the period 2008-09 to 2012-13 in the ORH3B ESCR UoA (Black *et al.,* 2015).

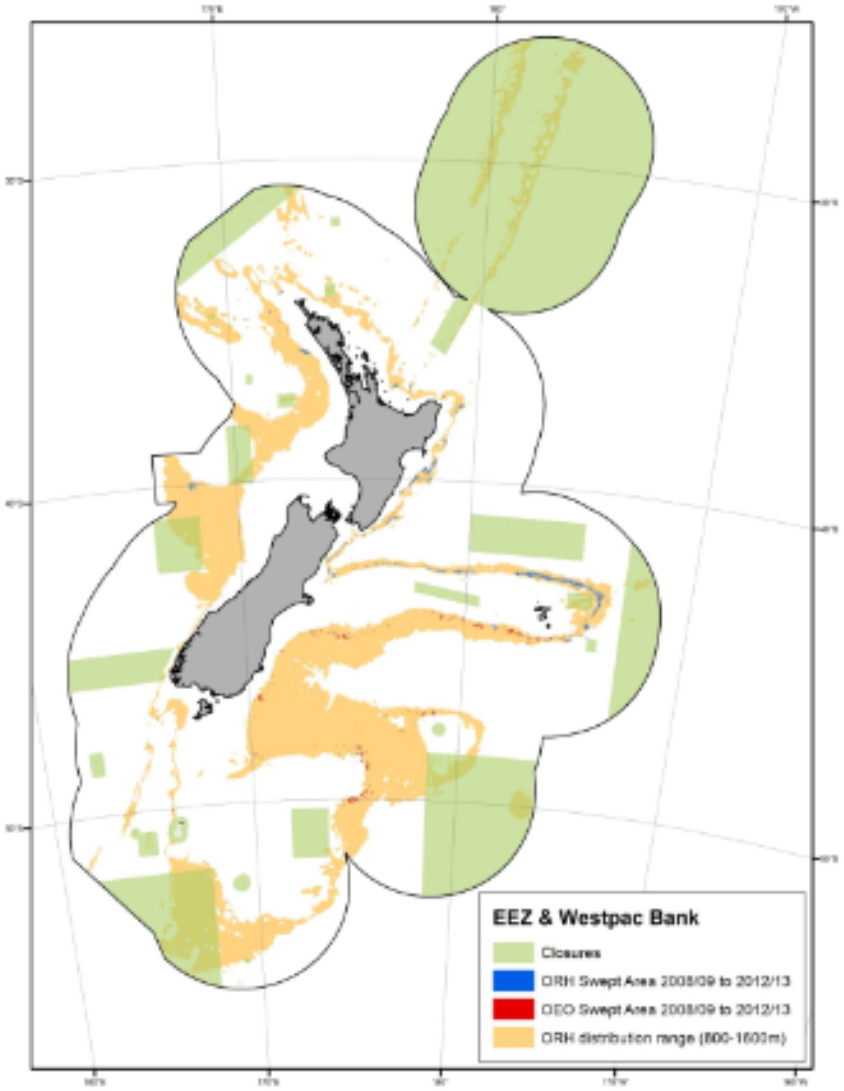


Figure 28d. The extent of the ORH and OEO/BOE/SSO targeted trawl footprint in relation to ORH habitat area and closed areas during the period 2008-09 to 2012-13 in the New Zealand EEZ and Westpac Bank (Black *et al.,* 2015).

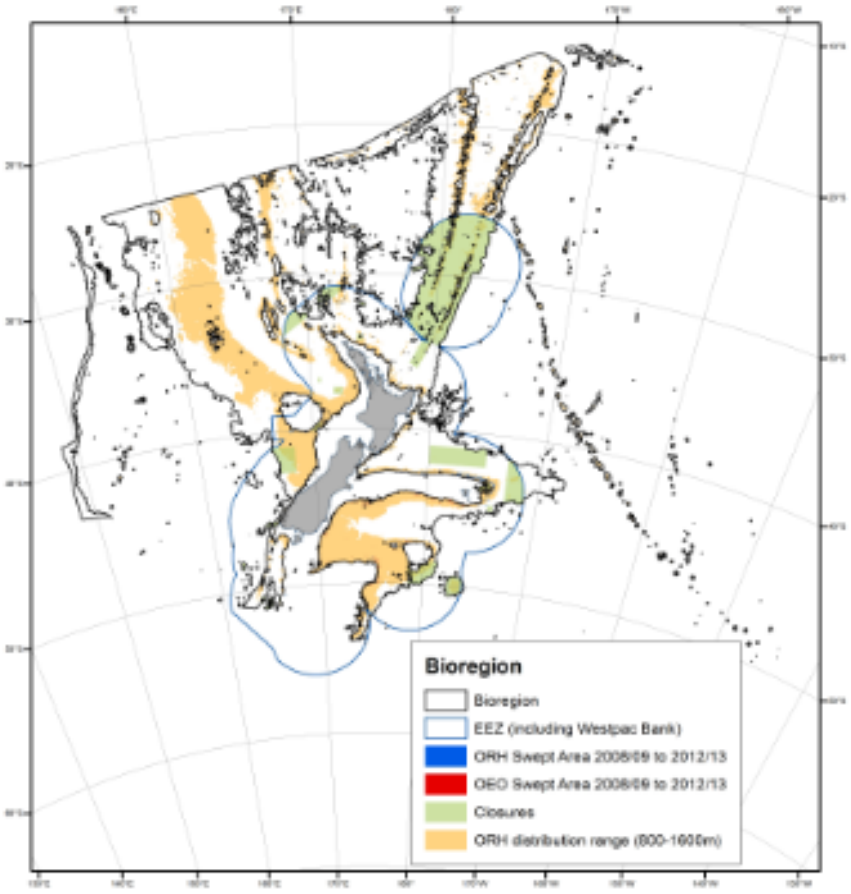


Figure 28e. The extent of the ORH habitat area within the Kermadec Bioregion (i.e. lower bathyal New Zealand-Kermadec province). No swept area data are currently available for the Bioregion outside the NZ EEZ (Black *et al.,* 2015).

3.3.7 Ecosystem

Orange roughy occur in deepwater habitats on the upper continental shelf. Dunn (2013) and Clark and Anderson (2013) have reviewed and summarized the ecosystem that orange roughy inhabit. Although orange roughy are often considered to be demersal species, as they are caught on/near the seabed in demersal trawls, their diet indicates that they forage into the bentho-pelagic and, as a species without a swim bladder, they would appear to be well adapted to live in a bentho-pelagic habitat. Acoustic marks interpreted as ornage roughy ar e otften found up to several hundreds of metres above the seabed.

Juvenile orange roughy occur most frequently on gently sloping areas of the upper continental slope at depths of 850-900 m (Dunn *et al.,* 2009 a, b). Adults are found at depths of 850-1,500 m at least. Larger orange roughy may aggregate around UTFs, such as ridges, hills, knolls, and seamounts as well as canyons for spawning and feeding (Branch, 2001; Dunn & Devine, 2010).

There is a body of research on trophic interactions for orange roughy fisheries generally and trophic models have been developed that include orange roughy. Pinkerton (2008, 2011) presented results of a balanced trophic model of the the chatham Rise. The results showed macrobenthos (benthic invertebrates), macrozooplankton, and mesopelagic fish had high ecological importance. Trophic modelling will continue, including use of stable isotopes for

validation of the model and further development of the model.There is no evidence of loss of functional components or species in the ecosystem or significant changes in the composition of orange roughy prey, predators or competitors based on catch composition in research trawls, fishery-dependant data, and stomach analyses (Dunn 2013). In addition, monitoring of meso-pelagic biomass on the Chatham Rise suggests no significant changes between 2001 and 2010 (O'Driscoll *et al.* 2011). Although these wide area trawl and aocusitc research surveys predominantly sample depths shallower than the main orange roughy fishing grounds, it is likely that the meso-pelagic resources overlap with the orange roughy distribution depth range.

In addition, the low level of bycatch in the fisheries indicates direct ecosystem effects from removals are likely to be small, and the footprint of the orange roughy fishery in the three UoA areas is small relative to the orange roughy distribution area within the bioregion. and there are also areas that are currently fully protected from trawl impacts through the BPA approach.

The New Zealand Fisheries Act 1996 s8 provides for "*the utilisation of fisheries resources while ensuring sustainability*." Ecosystem-based management is achieved through a multi-layered approach that considers fishery management (e.g., QMS), vulnerable species needs (e.g., NPOA-Sharks), ETP management (a host of protected species and related initiatives such as NPOA-Seabirds, NPOA-Sharks, the protection of marine mammals, and habitat considerations e.g. BPAs). Vessel management plans deal specifically with achieving avoidance and mitigation, and Marine Mammal Operational Procedures reduce the risk of interactions with marine mammals.

Legislated protection of areas of sea bottom from fishing activities, coupled with good quality monitoring of all fisheries removals that might impact on trophic structure and function and management of fishery removals (e.g. through TACCs), although not with the explicit objective of maintaining ecosystem structure and function, do represent a partial strategy to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function.

Data from the fishery, including observer data together with fishery independent surveys and other research projects, are taken into account in the management of the fishery, such as for designation of BPAs, setting of TACCs, management of ETP species interactions, etc.

The Fisheries Act 1996 is required to consider the various impacts of fishing, to seek to deliver better management through, for example, the fisheries management objectives of the fisheries management plans, and to seek to reduce the environmental effects of fishing through such tools as monitoring and managing ETP, bycatch, and other fisheries impacts to the ecosystem. In addition, research outcomes are fed back into management, although in the areas of ecosystem structure and function, stronger links could be developed. Where unacceptable impacts are detected, the current framework allows them to be addressed, including through fishery management measures.

Management responses so far have addressed individual ecosystem components (e.g. target or other QMS species stock status, bycatch levels, habitat impacts) rather than broader ecosystem effects. Fishing impacts are increasingly being considered through a risk assessment framework (e.g. seabirds, sharks) that takes into account both direct and indirect impacts on substantive groups of key ecosystem indicator species. While not specifically focused on addressing ecosystem impacts themselves, this effective constitutes a partial strategy that both monitors and evaluates fishing impacts on a broad range if top predators, which are typically used as indicators of ecosystem health. Moreover the framework is also designed to trigger management action should unacceptable impacts of key species be defected. Therefore, management measures work together across a range of

the most important ecosystem components/functions, even though this is not through a specific ecosystem design. .

Strategic and operational measures that are in place are considered likely to work, based on information about the fishery and ecosystem components involved (e.g. target and retained species, some ETP species, habitat). For example, target species stocks have been actively managed, fish species brought under the QMS structure, and seabird bycatch mitigation measures introduced, to address sustainability concerns specifically, while BPAs have been put in place to protect a representative range of deepwater benthic ecosystems.

Annual review of the Annual Operational Plan for Deepwater Fisheries provides a forum for reviewing the effectiveness of measures, and identifying ongoing and new issues (MPI, 2015). Detailed monitoring of many aspects of the fishery (e.g. catches of target, retained species, and bycatch (including coral bycatch) allows such review.

There is specific information about the fishery with regards to the impact of orange roughy fishing on ecosystem structure and function including time series of species/ functional group composition. However, much of the information indicating that this strategy is working is based on theory or comparison with similar fisheries/ecosystems (Clark *et al.* 1989, Heymanns *et al.*, 2011, O'Driscoll et al. 2011).

With particular reference to individual ecosystem components and key indicator groups (seabirds and sharks), there is evidence that the strategy is being implemented successfully.

For example, stock assessments of the target and retained species and monitoring of incidental mortalities of ETP species are ongoing, combined with fishery-independent surveys for many areas. TACCs and other control mechanisms are being monitored and adjusted for the main species where necessary. BPAs are monitored through observer and VMS coverage, and as part of the partial management strategy provide protection for benthic components of the orange roughy ecosystem. There is a high level of compliance with management limits on TACC species, ETP species and bycatch mitigation measures, and BPAs. More data are being collected for data deficient species considered to be high risk (e.g. some species of sharks and seabirds) and risk profiles are being subsequently updated. There is therefore evidence that the approaches are being implemented successfully.

Principle Three: Management System Background

The management system consists of a highly structured public-private partnership consisting of agreements between MPI and DWG, with a high level of stakeholder involvement (Figure 29). This overall structure forms the basis for operation of the fishery in terms of goals and objectives, fishing rights, planning, consultations, decision making, monitoring and enforcement, and regulation.

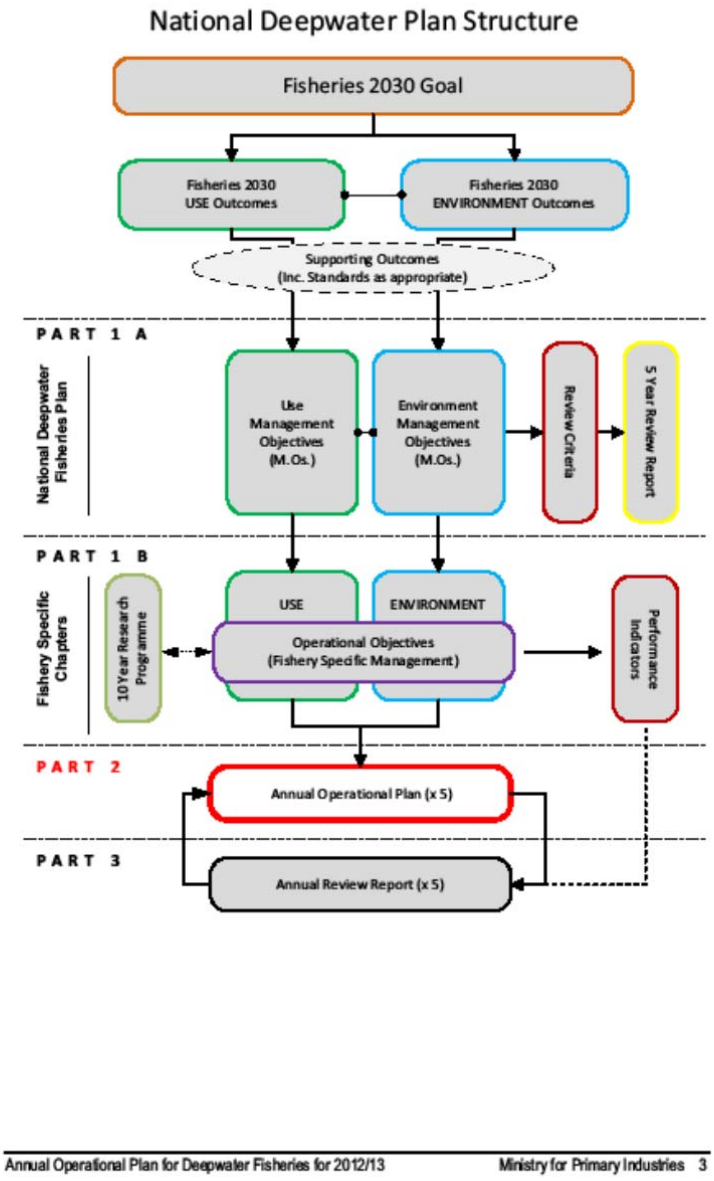


Figure 29 Structure of the management system for New Zealand deepwater fisheries.

3.5.1 Area of operation of the fishery and under which jurisdiction it falls

The three UoAs operate in the Exclusive Economic Zone (EEZ) of New Zealand from within the 12 nautical mile (nm) limit of the territorial sea out to the 200 nm limit of New Zealand's EEZ (MPI, 2012). A small area on the New Zealand west coast in Area ORH7A extends beyond the New Zealand EEZ (Figure 2). No foreign fishing has occurred adjacent to New Zealand in the recent past and none is expected in the foreseeable future. The three UoA fisheries, including the region of ORH7A beyond the New Zealand EEZ, fall under the authority of the New Zealand government. The area beyond the New Zealand EEZ is also subject to management arrangements determined the SPRFMO. The management of New

Zealand's deepwater fisheries is undertaken through a collaborative initiative between the MPI and the owners of orange roughy quota (represented by DWG, DWG-MFish, 2010). This arrangement allows for collaborative Management Objectives to be achieved by drawing on the combined knowledge, experience, capabilities and perspectives of both public and private sectors – through MPI and the seafood industry. MPI is also responsible for administration of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992, which implements the 1992 Fisheries Deed of Settlement under which historical Treaty of Waitangi claims relating to commercial fisheries have been fully and finally settled, and for administraiton of the Maori Fisheries Act 2004, which provides that the Crown allocates 20% of quota for any new quota management stocks brought into the QMS to the Treaty of Waitangi Fisheries Commission.

Between 2008-09 and 2012-13, 18 vessels ranging in size from 26 m to 62 m registered length have caught orange roughy from the UoAs (MPI, 2014) (Table 2). Vessel tonnages range from 113 – 2,483 t and hold capacities range from 112 m^3 to 1,000 m^3. Six of the vessels do not have onboard freezers and store catch on ice until landing. These vessels generally do not process catch at sea and land whole fish which may be processed on land in New Zealand or exported whole. The remaining 12 vessels are factory-freezers, which freeze product onboard and generally remain at sea for longer periods. These vessels either process to the 'dressed' (head, guts and pectoral fins removed) or 'gutted' state at-sea, or land the fish whole. Of the factory vessels, nine of them also have onboard fishmeal plants and will process most offal and non-QMS bycatch species into fishmeal.

3.5.2 Particulars of the recognised groups with interests in the fishery and individuals or groups granted rights of access

The primary groups with direct interest in the fishery are MPI and the deepwater fishing industry (represented by DWG). Both are involved in the fishery through a partnership for management and science-based monitoring. MPI has the responsibility for sustainable harvest under the requirements of the Fisheries Act 1996. Through policy, MPI and DWG work closely together through a Memorandum of Understanding (DWG 2010) with a goal to ensure New Zealand's deepwater fisheries are sustainably managed. The New Zealand Department of Conservation (DoC) Conservation Services Programme (CSP) monitors the impact of commercial fishing on protected species, studies species populations and looks at ways to limit bycatch. Protected marine species include all marine mammals and reptiles; sea birds (except black backed gulls); seven species of fish; all black corals, gorgonian corals, stony corals and hydrocorals (DoC 2015). MPI and DWG coordinate with DoC in management of the fisheries. However, managing the effects of fishing on these species remains the responsibility of MPI.

New Zealand is a member of the South Pacific Regional Fisheries Management Organization (SPRFMO), which has Conservation Management Measures (CMM) binding on members. CMM 2.03 specifically deals with international requirements for bottom fishing in the SPRFMO area.

The terms of the Treaty Settlement for their rights to commercial fisheries have included delivery of commercial quota to Maori (MPI, 2012). The Treaty of Waitangi guarantees the "Chiefs, Tribes and peoples of New Zealand" the "undisturbed possession" of their fisheries until they wished to dispose of them to the Crown. Recognition of their Treaty rights to commercial fisheries was agreed in the early 1990s, resulting in the Crown delivering a comprehensive settlement to Maori in three major components. The first was to purchase 10 percent of the quota shares from the market and to transfer these to the Treaty of Waitangi Fisheries Commission, set up as a transitional trust for the benefit of Maori. The second was a cash settlement that was in part used to buy half of New Zealand's largest

fishing company – Sealord Limited. The third was an undertaking to deliver to Maori 20% of the commercial quota shares for any new species brought into the QMS in future.

Through their purchase of Sealord, Maori gained access to additional deepwater quota, including for orange roughy in the three UoA. Maori have since invested in the seafood industry to increase their commercial stake to a point where they now control or influence more than 30 percent of New Zealand's commercial fisheries. The Treaty of Waitangi Fisheries Commission has reached agreement on the beneficiaries of these settlement assets and accorded each a beneficial interest. The final step in this process was completed in 2004 when Parliament approved the distribution to iwi (tribes) of the fisheries assets and this being implemented by Te Ohu Kai Moana (TOKM), the Maori Fisheries Trust.

Active participation in New Zealand's commercial fisheries by Iwi, TOKM and other Maori interests occurs through several mechanisms, including through membership in DWG and through active engagement with MPI and Ministers.

A number of NGOs participate in consultations on the science and management of orange roughy fisheries. WWF-NZ, WWF-US, WWF-AU, Royal Forest and Bird Protection Society of New Zealand, Greenpeace, and Environment and Conservation Organisations of New Zealand (ECO) are participants. Other organisations may also participate selectively such as the New Zealand Marine Sciences Society and TRAFFIC.

3.5.3 Details of consultations leading to the formulation of the management plan

The 1996 Fisheries Act requires consultation with stakeholders. To affect this, the Minister has established consultation guidelines (MPI, 2009). These guidelines recognize that consultation leading to decisions must occur in accordance with law; in a reasonable manner; and fairly, in accordance with the principles of natural justice. The Minister is the decision maker in fisheries management matters and his decisions are bound by the law, and are therefore open to legal review. The law requires identification of stakeholders "with an interest" in each fishery, and the identification of those who represent stakeholders with an interest. In general, the policy recommends setting a wide range of stakeholders with an interest. The Minister must notify stakeholders in advance of the consultation, and to subsequently inform them of his decisions (See also Section 3.5.4).

The primary non-government stakeholders are the owners of orange roughy quota represented by DWG. DWG-MFish (2010) outlines the consultations undertaken by the industry and MPI. MPI has established open and direct involvement of all stakeholders in their science assessment processes. All of the science Working Groups, including the annual stock assessment Plenary, are open to the public and the papers and meeting records are available to all participants. DWG invites discussions with MSC stakeholders through presentations and participation in conferences (Clement, 2015); through direct meetings; through the public release of all information pertaining to the MSC assessment process online; and, through inviting all participants to attend any meeting between the MSC, CAB and DWG.

3.5.4 Arrangements for ongoing consultations and decision-making processes

A process standard for stakeholder consultation has been developed to set out how MPI meets its obligations to consult with stakeholders before providing advice to the Minister, based on requirements of the of the Fisheries Act 1996 (MPI, 2009). This standard sets out best practice consultation processes to be followed by fisheries managers; minimum performance measures where appropriate; and a nationally consistent approach with reference to relevant legislation and guidelines. Within this process, it is necessary to identify both who has an interest and who are representative of those having an interest.

MPI provides an initial consultation plan and the manner of consultation, including the timeframe for the consultation and the decision. MPI distributes the decision and subsequently reviews the process to assure that their consultation meets all requirements.

When management changes are proposed to meet sustainability requirements (such as a change to a TAC/TACC), MPI prepares a discussion document that provides the Ministry's initial proposals for issues needing decision and a range of management options. In orange roughy fisheries such proposals primarily relate to changes in TACCs/catch limits. The proposals outlined in MPI's discussion document are preliminary and are provided as the basis for consultation with stakeholders. Subsequently, MPI prepares a decision document, which summarises stakeholders' views on their proposals and makes recommendations to the Minister. The decision document and the Minister's letter setting out his final decisions are posted on MPI's website as soon as they become available.

The Fisheries Act 1996 requires a precautionary approach. The 1992 Rio Declaration provides a definition of precautionary as: "where there are threats of serious or irreversible damage, lack of full scientific evidence shall not be used as reason for postponing cost-effective measures to prevent environmental degradation". Section 10 of the Fisheries Act 1996 specifies four information principles, which encompass the precautionary principle, that must be taken into account in relation to the utilisation of fisheries resources or ensuring sustainability:

s10 Information principles

All persons exercising or performing functions, duties, or powers under this Act, in relation to the utilisation of fisheries resources or ensuring sustainability, shall take into account the following information principles:

- decisions should be based on the best available information:
- decision makers should consider any uncertainty in the information available in any case:
- decision makers should be cautious when information is uncertain, unreliable, or inadequate:
- the absence of, or any uncertainty in, any information should not be used as a reason for postponing or failing to take any measure to achieve the purpose of this Act.

A decision to consult or not to consult, and any decision made after consultation, must be made in accordance with the principles of administrative law, and in accordance with Fisheries Act 1996 obligations. These principles require decision-makers to act:

- in accordance with law;
- reasonably; and
- fairly, in accordance with the principles of natural justice.

Decisions that do not follow requirements are open to legal challenge.

3.5.5 Details of non-fishery users or activities and arrangements for liaison and co-ordination

Other deepwater fisheries, primarily those for the targeting smooth oreo and black oreo, occur in the three UoA. The MPI-DWG joint management MOU covers these fisheries and provides liaison and coordination. The relative offshore remoteness of the orange roughy fisheries precludes non-fishery users. However, those stakeholders with potential interest in the fisheries have opportunities to participate through the consultation procedures set by the government and by DWG.

3.5.6 Objectives for the fishery

Fisheries 2030 (PricewaterhouseCoopers 2008), MPI's overarching vision for New Zealand fisheries, states that by 2030, New Zealand's fisheries will be:

- world-leading and recognised for achieving a track record of environmental and commercial leadership and success, both domestically and internationally;
- a sector that New Zealanders are proud of, in that they understand that a precious but limited national resource is being responsibly managed, in the interests of all, for both the present and the future;
- based on healthy and abundant aquatic environments that are ecologically sustainable, about which we have reliable and dynamic information;
- a sector in which there are positive Crown-Maori partnerships, balancing and optimising cultural and commercial value;
- profitable and efficient, with a strong focus on long-term economic value;
- characterised by high trust and high accountability relationships amongst both use and non-extractive use interests and between stake/rights holder entities and Government; and,
- a dynamic system in which transparent and robust decisions about allocation and trading-off are being made by stake/rights holders themselves, within a more enabling legislative and regulatory framework.

Fisheries 2030 specifies an overarching goal for New Zealand's fisheries and two outcomes:

> **Goal**: New Zealanders maximising benefits from the use of fisheries within environmental limits.
>
> **Use Outcome:** Fisheries resources are used in a manner that provides greatest overall economic social and cultural benefit.
>
> **Environment Outcome:** The capacity and integrity of the aquatic environment, habitats and species are sustained at levels that provide for current and future use.

The National Deepwater Plan sets out high level Management Objectives for all of New Zealand's deepwater fisheries (Table 31). This is then supported by a species specific Fisheries Plan that describes Operational Objectives for the orange roughy fisheries in New Zealand.

These Objectives drive annual work plans, which are set out in the Annual Operational Plan for deepwater fisheries. The progress against the actions in the Annual Operational Plan and the objectives is reviewed in the Annual Review Report produced at the end of each year.

The DWG-MPI MOU (DWG-MFish, 2010) further lays out specific objectives for implementing the National Deepwater Plan

Table 31 Management objectives from the National Deepwater Plan (MPI 2013)

Use Outcome	MO1.1	Enable economically viable deepwater and middle-depth fisheries in New Zealand over the long-term
	MO1.2	Ensure there is consistency and certainty of management measures and processes in the deepwater and middle depths fisheries
	MO1.3	Ensure the deepwater and middle-depths fisheries resources are managed so as to provide for the reasonably foreseeable needs of future generations
	MO1.4	Ensure effective management of deepwater and middle-depth fisheries is achieved through the availability of appropriate, accurate and robust information
	MO1.5	Ensure the management of New Zealand's deepwater and middle-depth fisheries are recognised as being consistent with or exceeding national and international best practice
	MO1.6	Ensure New Zealand's deepwater and middle-depth fisheries are transparently managed
	MO1.7	Ensure the management of New Zealand's deepwater and middle-depth fisheries meets the Crown's obligations to Maori
Environment Outcome	MO2.1	Ensure deepwater and middle-depth fish stocks and key bycatch fish stocks are managed to an agreed harvest strategy
	MO2.2	Maintain the genetic diversity of deepwater and middle-depth target and bycatch species
	MO2.3	Protect habitats of particular significance for fisheries management
	MO2.4	Identify and avoid or minimise adverse effects of deepwater and middle-depth fisheries on incidental bycatch species
	MO2.5	Manage deepwater and middle-depth fisheries to avoid or minimise adverse effects on the long-term viability of endangered, threatened and protected species
	MO2.6	Manage deepwater and middle-depth fisheries to avoid or minimise adverse effects on biological diversity
	MO2.7	Identify and avoid or minimise adverse effects of deepwater and middle-depths fishing activity on the benthic habitat

3.5.7 Measures agreed upon for the regulation of fishing

MPI and the DWG work in partnership to agreed stategic outocmes within aligned work plans and operational procedures to ensure New Zealand's deepwater fisheries are managed sustainably. The two parties have developed a single joint-management framework with agreed strategic and operational priorities and work plans and timeframes (DWG-MFish, 2010).

The partnership was formed to:

- advise the Minister of Fisheries on clear and agreed objectives for the deepwater fisheries;
- advise the Minister of Fisheries on management measures to support these objectives;
- define service requirements to support these objectives;
- ensure efficient delivery and value from these services; and
- provide consistent and agreed advice to the Minister wherever possible.

The partnership is focused on determining the maximum economic yield of the deepwater fisheries by setting catch limits that maximise returns over the long-term within the constraints of ecological sustainability. This collaborative approach to fisheries management has an industry-wide impact on the behaviour of seafood companies by way of creating a "self-management" responsibility amongst industry participants.

This co-operation between seafood companies replaces historical competitive behaviours, improves industry-wide management initiatives and subsequent compliance with standards and outcomes set, monitored and audited by government.

3.5.8 Monitoring, control and surveillance and enforcement

The orange roughy management system has documented a comprehensive and effective monitoring, control and surveillance system through:

1. compulsory use of satellite-based Vessel Monitoring System (VMS) with an onboard automatic location communicator (ALC);
2. government observers who may be placed on board to observe fishing, transhipment and transportation to collect any information on orange roughy fisheries resources. This includes information to monitor the effects of orange roughy fishing on the aquatic environment; and,
3. accurate recordkeeping and recording requirements to establish auditable and traceable records to ensure all catches are counted and do not exceed the ACE held by each operator.

New Zealand introduced the VMS in 1994 which requires by law all vessels over 28 metres and all vessels that target orange roughy to carry and operate a registered ALC at all times.

In combination with at-sea and air surveillance supported by the New Zealand joint forces, vessel activities in the three UoAs are monitored and verified to ensure compliance with regulations and with industry-agreed operational procedures.

All vessels fishing in New Zealand are required to report all fish caught except those fish under a set MLS (MPI, 2014). There are no retained or bycatch species caught in orange roughy fisheries that have an MLS in place. Reporting requirements are set out in the Fisheries (Reporting) Regulations 2001, most notably in section 5 and section 6. Note also that it is illegal under the Fisheries Act 1996 to discard any species in the QMS unless the species is listed on Schedule 6 of the Fisheries Act 1996, all returns to the sea are recorded, and the specified conditions are met, or an MPI observer on the vessel authorises the discard. The majority of vessels involved in the three orange roughy UoAs are trawlers greater than 28 m. These vessels are required to record fishing effort and estimated catch on TCEPR. Some orange roughy fishing is also carried out by trawlers under 28m. These smaller vessels are required to record fishing effort on TCER. These returns require reporting of effort statistics as well as estimates of catch for either the top five (TCEPR) or the top eight species (TCER) in the catch. In all of the above cases, fishers are required to

report landings for a trip on CLR form regardless of the type of return (TCEPR or TCER) upon which effort information was reported. These returns require all fish taken on a trip to be reported, including any non-QMS species that were returned to the sea (discarded bycatch).

A comprehensive reporting regime requires catch reports submitted by commercial fishers, including the estimated catch per tow, the location and depth of every tow and the total landed catch for each trip undertaken; landings only to Licensed Fish Receivers (LFRs), who must also report all catch received. MPI verification through auditing and reconciliation analysis across multiple sources ensures all catches are reported and documented correctly. Data collected by onboard MPI Observers greatly assist the catch verification and auditing process. Observer coverage of orange roughy target fishing effort across the Chatham Rise and ORH7A (including Westpac Bank) has ranged widely (Table 14, Table 16, Table 19, Table 20) depending on availability of observers. Additional quayside inspections may also be undertaken by MPI to verify reported landings. Commercial fishers face prosecution and risk severe penalties, including automatic vessel and quota forfeiture, upon conviction of breaches in fisheries regulations. Financial penalties also exist to discourage commercial fishers from over-catching their ACE holdings, in the form of a deemed value regime.

The deepwater fishing industry in New Zealand works closely with government to ensure compliance with all agreed management measures. A co-management approach to New Zealand's deepwater and middle-depth fisheries has been in place since 2006, encouraging open collaboration between quota holders (represented by DWG) and MPI. This collaborative approach to management has enabled the development of shared reporting and monitoring processes that allow both parties to utilise their own operational expertise to ensure ongoing adherence to the non-statutory management measures that are in place. Relevant measures to the orange roughy fisheries include the management of catches within designated sub-QMA catch limits within the overall ORH TACC, where fisheries biology recognises these to be distinct stocks for management purposes. DWG works directly with vessel managers and skippers to administer the reporting and monitoring of catches against the sub-QMA catch limits, while MPI performs an auditing and verification role to ensure that reliable data is being reported by industry vessels. The industry and MPI also hold regular meetings to increase understanding by industry of the agreed requirements.

MPI has the philosophy of informed and assisted compliance: that most fishermen will follow the regulations; that some engage in opportunistic non-compliance unless kept in check; and, that a few will actively seek advantage with illegal fishing.

MPI's compliance strategy is underpinned by the VADE compliance operating model. VADE is focussed on all elements in the compliance spectrum. Enforcement is but one of the tools utilised to ensure compliance, however it is the intervention that sets the conditions and incentives for voluntary compliance. There are four components to the VADE compliance operating model:

1. **Voluntary Compliance:** The voluntary component commences well before the involvement of compliance interventions as part of the regulatory setting process. MPI ensures that the consequence for non–compliance is proportionate to the effect to be achieved. Accordingly, sensible rules and sanctions ensure high voluntary compliance once those who need to comply are aware of their obligations. Within the compliance directorate, outcomes are achieved through education, engagement and communication of expectations and obligations.

2. **Assisted Compliance:** Assisted compliance is that range of activities that re-enforce obligations and give the organisation confidence that the desired purpose of the Fisheries Act 1996 is being achieved. This is heavily reliant on monitoring,

inspection, responding and business intelligence activities. It requires feedback loops and compliments the voluntary component to determine if stakeholders are attempting to comply, are aware of their obligations or indeed choosing not to comply. Determined upon what observations are deduced an appropriate intervention is then considered. Assisted compliance remains heavily focussed on reminding individuals their compliance is being monitored and if no discernible behaviour change formal direction or sanction will occur.

3. **Directed Compliance:** Directed Compliance is that range of tools that Compliance Officers apply to direct a desired behavioural change. It ranges from those powers that allow directed activity such as infringement notices, official sanctions such as warnings and in some cases regulatory or lower threshold prosecutions.

4. **Enforced Compliance:** Enforced compliance is where the full extent of the law is applied. While it can be the decision as a consequence of no noticeable behavioural change despite Voluntary, Assisted and Directed interventions, it is also for those entities or individuals who deliberately choose to break the law and where a lesser intervention is inappropriate. This is for either serious offending or where legislation requires an enforcement action. These cases are formally investigated with a view to prosecution.

The VADE model gives a framework for stakeholders to understand the discretionary powers and approach regardless of sectors. It gives some confidence to compliance officers to apply discretion at the frontline and allows for calibration across sectors for national consistency.

MPI's Compliance Directorate has published a series of compliance information sheets (MPI, 2015b) to bring to the industry's attention matters that are of direct interest and concern to the Ministry.

3.5.9 Jurisdictional category

The orange roughy UoAs fall under single jurisdiction management. Each of these three UoAs occur primarily within the New Zealand EEZ, with a relatively small portion (Westpac Bank adjacent to ORH7A) extending into international waters, under the management jurisdiction of New Zealand and the SPRFMO as a straddling stock.

3.5.10 Details of any planned education and training for interest groups.

DWG and MPI have ongoing outreach and education for vessel captains, fishermen and other interested parties. MPI has the activities of the informed and assisted compliance that assures understanding by industry with regulations and other requirements. DWG has implemented a range of non-regulatory measures and supplementary measures for avoiding or mitigating interactions with ETP species. As part of this, DWG has an Environmental Liaison Officer whose role is to work with fishing vessels to help implement voluntary measures. DWG invites representatives of NGOs to discuss issues important to them and to work on collaborative solutions.

3.5.11 Date of next review and audit of the management plan

The Annual Review Report for Deepwater Fisheries 2013-2015 (MPI 2015) provides a record of the annual reviews of the fisheries, including orange roughy. **Part 1** describes the progress that has been made during the 2012-2013 financial year towards meeting the five

year management priorities set out in the 2013/14 Annual Operational Plan. Achievement of these annual management priorities aims to contribute towards meeting the five year high level Management Objectives and Operational Objectives set out in Part 1 of the National Deepwater Plan.
Part 2 provides detail on MPI work that is relevant to deepwater fisheries management and is planned by financial year (1 July – 30 June). These processes include the planning and contracting of fisheries and conservation research projects, planning observer coverage on the deepwater fleet and the cost recovery regime. Progress made during the 2012/13 financial year is detailed.
Part 3 reports on the combined environmental impacts of deepwater fishing, and on the deepwater fleet's adherence to the non-regulatory management measures that were in place for the 2012-2013 fishing year (1 October 2012 – 30 September 2012).

The annual review report evaluates the development and implementation of the Fisheries Plan framework – National Deepwater Plan with fishery specific chapters and Annual Operational Plan for the fisheries. This review encompasses all parts of the management systemProgress against the objectives in the National Fisheries Plan for Deepwater and the Annual Operational Plan is reviewed annually and reported in the Annual Review Report. MPI conducts an extensive review of performance of the deepwater fisheries (e.g., MPI 2015) that incorporates consultations with industry and other stake holders. Parts of the management system, specifically science and enforcement, undergo external review. Although the internal review is very comprehensive and parties external to MPI participate, there is no explicit separate external review of the management system.

3.5.12 Description of fishery's research plan.

Research in New Zealand must meet the MPI's Research and Science Information Standard for New Zealand Fisheries (the Science Standard) (MFish, 2011). MPI has developed and implemented the Science Standard based on international best practices for science quality assurance, adapted to New Zealand's requirements. This Standard recognizes and ensures that only high-quality scientific information is used to inform policy formulation and decision-making, including the need for independent scientific peer review (MFish 2010n) to ensure the relevance, integrity, objectivity and reliability of information. MPI has established a 10 year research programme for deepwater fisheries that complies with the Science Standard.

MPI's 10 Year Research Programme (MFish 2012c) for deepwater fisheries sets out the research and monitoring approach for ling over the next ten years. Orange roughy stocks will be assessed at a 2-3 year interval using the following information:

- trawl surveys;
- acoustic surveys;
- regular length-frequency sampling by Observers and during trawl surveys; and,
- routine catch-at-age analysis of otoliths collected by Observers and during trawl surveys.

MPI's 10 Year Research Plan also identifies monitoring environmental interactions includingenvironmental monitoring; benthic impacts; ETP species; and, fish bycatch.

The Department of Conservation has an additional research plan to monitor any adverse effects on ETPs and to develop effective programmes to avoid, mitigate or remedy these as and where required (DOC 2011, 2014).

4 Evaluation Procedure

4.1. Harmonised Fishery Assessment

The MRAG assessment team harmonized with P3.1 of the New Zealand certified fisheries for hoki, hake, ling, and southern blue whiting by concurring with the assessment results and accepting the scoring.

4.2. Previous assessments

The fisheries have not been previously assessed.

4.3. Assessment Methodologies

The assessment team used MSC CR V1.3, MSC GCR V1.3, and MSC assessment template V1.3. The team used the default assessment tree without modification. Evaluation Processes and Techniques

4.4. Evaluation Processes and Techniques

4.4.1 Site Visits

The surveillance team of Robert Trumble (Lead Assessor), André Punt, and Amanda Stern-Pirlot met with the staff of: the MPI, MPI Enforcement, the Department of Conservation (DoC), National Institute of water and Atmospheric Research(NIWA), Innovative Solutions, Ltd (ISL), Victoria University, WWF NZ, WWF AU, ECO, and the fishery client (the Deepwater Group) from 27 July to 4 August 2014 in Wellington, Nelson, and Auckland, New Zealand. The team met in person, except for a conference link with Peter Trott, WWF-AU, with those organizations and individuals that requested a meeting. MRAG posted a notice of the site visit on the MSC website and on the IntraFish website, and invited stakeholders to present information and to meet with the team. The DWG requested that all meeting be open to all stakeholders. MRAG offered to have separate meetings with any group that so desired, but the agencies and NGOs agreed to open all meetings. MPI, NIWA, DoC presented information in the public domaine, or information added to the public domaine following the meeting. Two other stakeholder meetings occurred during the site visit: WWF (AU and NZ) and ECO. These organizations primarily addressed BSAI pollock concerns.The table below summarizes the participation, location, and topics of the meetings.

The clients had provided substantial documentation in advance of the site visit, and the DWG and MPI staffs provided additional material to document the information presented at the visits.

Date 2014	Location	Name/Affiliation	Topic
28 July	Wellington	Bob Trumble, André Punt, Amanda Stern-Pirlot – MRAG Assessment Team; George Clement, Aaron Irving – DWG; Vicky Reeve, Tiffany Bock, Geoff Tingley, Kevin Sullivan – MPI; Patrick Cordue, ISL	• Introduction • Data, surveys, AOS results, stock assessment, MSE • Retained and bycatch; shark finning ban • Research plan
29 July	Wellington	Bob Trumble, André Punt, Amanda Stern-Pirlot – MRAG Assessment Team; George	• Habitats, coral • Compliance • Fishing operations, traceability, AOS

Date 2014	Location	Name/Affiliation	Topic
		Clement, Aaron Irving, Andy Smith – DWG; Vicky Reeve, Tiffany Bock, Geoff Tingley – MPI; Gary Orr – MPI Compliance; Rob Tilney, Malcom Clark, Rosemary Hurst, Marie-Julie Roux – NIWA	• Units of Assessment
30 July	Wellington	Bob Trumble, André Punt, Amanda Stern-Pirlot – MRAG Assessment Team; George Clement, Aaron Irving – DWG; Vicky Reeve, Tiffany Bock, Geoff Tingley – MPI	• Threshold levels for retained and bycatch • Ecosystem • ETP • Habitat – hills and slope • Units of Assessment
31 July	Wellington and conference call	Bob Trumble, André Punt, Amanda Stern-Pirlot – MRAG Assessment Team; George Clement, Aaron Irving – DWG; Vicky Reeve, Tiffany Bock, Geoff Tingley – MPI; Barry Weeber – ECO; Peter Hardstaff – WWF NZ; Peter Trott – WWF AU; Matt Dunn – Victoria University	• 2013 stock assessments – GOA • Observer program – GOA focus • Ecosystem considerations • Seabirds • Marine mammal interactions
1 August	Nelson	Bob Trumble, André Punt, Amanda Stern-Pirlot – MRAG Assessment Team; George Clement, Aaron Irving – DWG	• Fishery operations • Traceability • Tour fishing vessels
4 August	Auckland	Bob Trumble, – MRAG Assessment Team; George Clement, Aaron Irving – DWG	• Client meeting

4.4.2 Evaluation Techniques

MRAG published an announcement of the re-assessment of the fishery on IntraFish.com, and the MSC posted the announcement on its re-assessment downloads page. Together, these media presented the announcement to a wide audience representing industry, agencies, and stakeholders.

The assessment team and the clients set up meetings with science, management, and enforcement personnel, and the team set up a meeting with all other stakeholders who requested one.

Scoring followed a consensus process in which the assessment team discussed the information available for evaluating performance indicators to develop a broad opinion of performance of the fishery against each performance indicator. Review of sections 3.2, 3.3, 3.4 and 3.5 by all team members assured that the assessment team was aware of the issues for each performance indicator. Subsequently, the assessment team member responsible for each principle filled in the scoring table and provided a provisional score. The assessment team members reviewed the rationales and scores, and recommended modifications as necessary, including possible changes in scores. The team members agreed on the final scores. This process followed the MSC CR V1.3 section 27.10. The MSC has 31 'performance indicators', seven in Principle 1, 15 in Principle 2, and nine in Principle 3. The performance indicators are grouped in each principle by 'component.'

Principle 1 has two components, Principle 2 has five, and Principle 3 has two. Each performance indicator consists of one or more 'scoring issues;' a scoring issue is a specific topic for evaluation. 'Scoring guideposts' define the requirements for meeting each scoring issue at the SG60 (conditional pass), SG80 (full pass), and SG100 (state of the art) levels.

Note that some scoring issue may not have a scoring guidepost at each of the 60, 80, and 100 levels. The scoring issues and scoring guideposts are cumulative; this means that a performance indicator is scored first at the SG60 levels. If not all of the SG scoring issues meet the 60 requirements, the fishery fails and no further scoring occurs. If all of the SG60 scoring issues are met, the fishery meets the 60 level, and the scoring moves to SG80 scoring issues. If no scoring issues meet the requirements at the SG80 level, the fishery receives a score of 60. As the fishery meets increasing numbers of SG80 scoring issues, the score increases above 60 in proportion to the number of scoring issues met; performance indicator scoring occurs at 5-point intervals. If the fishery meets half the scoring issues at the 80 level, the performance indicator would score 70; if it meets a quarter, then it would score 65; and it would score 75 by meeting three-quarters of the scoring issues. If the fishery meets all of the SG80 scoring issues, the scoring moves to the SG100 level. Scoring at the SG100 level follows the same pattern as for SG80.

Principle scores result from averaging the scores within each component, and then from averaging the component scores within each Principle. If a Principle averages less than 80, the fishery fails.

Table 32 Scoring elements

Component	Scoring elements	Main/not main	Data-deficient or not
P1	Orange roughy NWCR		Not
P1	Orange roughy ESCR		Not
P1	Orange roughy 7A		Not
Retained	Hoki	Main – NWCR; Minor ESCR	Not
Retained	Hake	Minor – NWCR	Not
Retained	Smooth oreo	Main – NWCR; Minor – ESCR	Not
Retained	Black oreo	Minor – ESCR	Not
Retained	Spikey oreo	Minor - Challenger	Not
Bycatch	Deepwater dogfish	Main – NWCR, ESCR	Not
Bycatch	Rattails	Minor - NWCR	Not
Bycatch	Slickheads	Minor - NWCR	Not
Bycatch	Morid cod	Minor - NWCR	Not
Bycatch	Longnose chimera	Minor - NWCR	Not
Bycatch	Leafscale gulper shark	Minor – 7A	Not
ETP	Mammals		Not
ETP	Salvin'salbatross		Not
ETP	Buller's albatross		Not
ETP	Whitecapped albatross		Not
ETP	Chatham albatross		Not
ETP	Unidentified albatross		Not
ETP	Corals		Not
Habitat	UTFs	Main	Not
Habitat	Slope	Main	Not
Ecosystem	Kermadec Bioregion	Main	Not

5 Traceability

5.1. Eligibility Date

The target eligibility date is the date of the PCDR.

The actual eligibility date is the date of the PCDR, 4 February 2016.

5.2. Traceability within the Fishery

Traceability of fishing activity within New Zealand is largely provided by the statutory requirements to record all fishing in logbooks and through federal monitoring and compliance programmes. All vessels in the three UoA are equipped with VMS equipment as well as being subject to monitoring by MPI observers and fisheries enforcement officers. Extensive record keeping is required for reporting landings and processing activity and this information is reported electronically to MPI. Fishing beyond the New Zealand EEZ requires special permitting prior to the activity of fishing and MPI observers on board during fishing operations. All EEZ and high seas fishing activities must be reported to MPI. No transhipment or motherships are used and no change of ownership of any orange roughy (raw or finished product) occurs prior to landing.

Information for each trawl tow is recorded on-board, providing the time, start and finish postions, the depth, and the intended target species. Catch information is recorded on logbooks after each haul. Vessels locations are tracked by VMS at all times. The information specifically contains reference to species caught (estimated catch (kg), time and date of haul, and location). Target and bycatch species are retained (unless prohibited by law) and reported with the same level of detail. Since MPI collects all catch and landing information from all orange roughy harvests, fishery-wide data collection for traceability or reconciliation purposes could be obtained from MPI, if required.

Further traceability is provided by the client's own internal systems that record the date and time of fishing activities against the date and time of packaging (if processed). All of the landed product from the UoA can be traced back to the particular fishing activities. The identification and quantities of catch can be cross-checked by observers at sea and upon landing. Vessels and companies are routinely monitored. Any alleged breaches are investigated and prosecutions for misrepresentation of landing and/or processing data may follow.

The majority of orange roughly landed in New Zealand has been processed at sea by catcher/processor vessels. At-sea processing operations are similar to onshore primary processing operations with an emphasis on IQF products. Product is processed immediately upon catch, frozen, packaged and held in cold storage for the duration of the voyage. Some vessels also produce fish meal from a mix of species and fish meal is not considered as part of the certified fishery. Product labelling information includes pertinent product form and species information and can be traced back to harvest date, fishing period, vessel name and processing characteristics via bar code or lot codes.

Fresh product is also traceable to the same harvesting information and is physically segregated on board (largely for food safety reasons). Physical segregation of fresh fish is inspected for compliance purposes.

If a vessel only fishes from within the UoA area during a single trip, there would be minimal risks to traceability of the product. This is most likely to occur within the smaller fresh fleet due to limitations on holding capacity and reduced trip length (in order to provide fresh

product to markets). Larger vessels may fish inside and outside the UoA during a single trip. VMS will determine if they move outside or between UoA. The unit of certification is determined in part by the target species of a tow, and vessels must record the intended target species in advance of a set. Therefore, no after-the-fact determinations of targets are allowed.

All orange roughy harvested in New Zealand must be landed to a licensed fish receiver. Catches can be inspected by enforcement bodies upon landing. The main ports used by the orange roughy fleets of the UoAs are Nelson and Timaru in the South Island, although landings may occur in Auckland and Gisborne in the North Island. The scope of the fishery certification would end at the point of landing to any LFR within New Zealand and all LFRs would require chain of custody.

There are no major traceability risk factors associated with the broader orange roughy fishery (particularly if the vessels only harvest from within the UoA during the trip). The overall risk to traceability onboard the fishing vessels is also very low. Current systems operating within the fishery and onboard the vessels are sufficient to identify, segregate, and track all certified fish. The fishing vessels do not require CoC. The highest risk factor is species identification at the beginning of production. Proper identification is critically important to ensuring non-orange roughy stocks are not processed as orange roughy. However, the harvest and compliance incentives (including ACE balancing, food safety requirements, observers, etc.) both reduce and detect mistakes in species identification. Once the processed product is packaged, there is no realistic opportunity for non-certified product to mix with the certified product. Equally, once fresh product is sorted, labelled and stored, cross-contamination is likely very low.

5.3. Eligibility to Enter Further Chains of Custody

Because of the detailed traceability within the fishery and onboard vessels, all fish and fish products from the UoA would be eligible to enter into further certified chains of custody and carry the MSC logo. The scope of this certification ends at the point of landing to any LFR within New Zealand, and all LFRs would require chain of custody. Downstream certification of the product would require appropriate certification of storage and handling facilities at these locations.

There are no MSC specific adaptations to traceability within the fleet, by the vessel companies or in the VMPs with DWG. Any fishermen that are not shareholders of DWG would follow the same procedures as DWG members, including all record keeping and product identification requirements. All orange roughy ACE holders with statutory fishing rights fishing within New Zealand's EEZ (whether or not they are shareholders of DWG) would therefore have the same risk profile as described above. Under these requirements, no additional risk accrues from non-members participating in the certification. This means all product harvested within the UoCs would be eligible to be covered by the MSC fisheries certificate and be eligible to sell product into the supply chain as certified (there would be no limitations based on vessel, ownership, membership, etc.).

DWG could elect to charge non-members a fee for maintenance of the certificate, but this would be based on market-incentives and could not be controlled through the MSC fishery certification process.

Many of the companies involved in the orange roughy fishery also participate in the certified hoki fishery and other certified fisheries, and hold MSC CoC certification for that purpose. Adjustments to current traceability systems may be as simple as existing CoC certificate holders expanding their current scope to include orange roughy fisheries.

5.4. Eligibility of Inseperable or Practically Inseparable (IPI) stock(s) to Enter Further Chains of Custody

No IPI stocks will enter further chains of custody.

6 Evaluation Results

6.1. Principle Level Scores

Table 33 Final Principle Scores

Final Principle Scores	Score		
Principle	**3B - NWCR**	**3B - ESCR**	**7A**
Principle 1 – Target Species	86.9	84.4	86.9
Principle 2 – Ecosystem	87.0	85.7	87.7
Principle 3 – Management System	95.3		

6.2. Summary of Scores

Orange Roughy NWCR

Prin-ciple	Wt (L1)	Component	Wt (L2)	PI No.	Performance Indicator (PI)	Wt (L3)	Weight in		Score	Contribution to Principle Score	
						Either		Or		Either	Or
One	1	Outcome	0.5	1.1.1	Stock status	0.5	0.25	0.333	90	22.50	
				1.1.2	Reference points	0.5	0.25	0.333	80	20.00	
				1.1.3	Stock rebuilding			0.333			
		Management	0.5	1.2.1	Harvest strategy	0.25	0.125		85	10.63	
				1.2.	Harvest control rules & tools	0.25	0.125		90	11.25	
				1.2.	Information & monitoring	0.25	0.125		90	11.25	
				1.2.	Assessment of stock status	0.25	0.125		90	11.25	
Two	1	Retained species	0.2	2.1.	Outcome	0.333	0.0667		95	6.33	
				2.1.	Management	0.333	0.0667		95	6.33	
				2.1.	Information	0.333	0.0667		85	5.67	
		Bycatch species	0.2	2.2.	Outcome	0.333	0.0667		80	5.33	
				2.2.	Management	0.333	0.0667		85	5.67	
				2.2.	Information	0.333	0.0667		80	5.33	
		ETP species	0.2	2.3.	Outcome	0.333	0.0667		75	5.00	
				2.3.	Management	0.333	0.0667		90	6.00	
				2.3.	Information	0.333	0.0667		75	5.00	
		Habitats	0.2	2.4.	Outcome	0.333	0.0667		90	6.00	
				2.4.	Management	0.333	0.0667		85	5.67	
				2.4.	Information	0.333	0.0667		95	6.33	
		Ecosystem	0.2	2.5.	Outcome	0.333	0.0667		100	6.67	
				2.5.	Management	0.333	0.0667		90	6.00	
				2.5.	Information	0.333	0.0667		85	5.67	
Three	1	Governance and policy	0.5	3.1.1	Legal & customary framework	0.25	0.125		100	12.50	
				3.1.2	Consultation, roles &	0.25	0.125		100	12.50	
				3.1.3	Long term objectives	0.25	0.125		100	12.50	
				3.1.4	Incentives for sustainable fishing	0.25	0.125		90	11.25	
		Fishery specific management system	0.5	3.2.	Fishery specific objectives	0.2	0.1		100	10.00	
				3.2.	Decision making processes	0.2	0.1		95	9.50	
				3.2.	Compliance & enforcement	0.2	0.1		100	10.00	
				3.2.4	Research plan	0.2	0.1		100	10.00	
				3.2.5	Management performance	0.2	0.1		70	7.00	

Overall weighted Principle-level scores		Either	Or
Principle 1 - Target species	Stock rebuilding PI not scored	86.9	
	Stock rebuilding PI scored		
Principle 2 - Ecosystem		87.0	
Principle 3 - Management		95.3	

Orange Roughy ESCR

Prin-ciple	Wt (L1)	Component	Wt (L2)	PI No.	Performance Indicator (PI)	Wt (L3)	Weight in			Score	Contribution to Principle Score	
						Either		Or			Either	Or
One	1	Outcome	0.5	1.1.1	Stock status	0.5	0.25	0.333	0.1667	70		11.67
				1.1.2	Reference points	0.5	0.25	0.333	0.1667	80		13.33
				1.1.3	Stock rebuilding			0.333	0.1667	90		15.00
		Management	0.5	1.2.1	Harvest strategy	0.25	0.125			85		10.63
				1.2.	Harvest control rules & tools	0.25	0.125			90		11.25
				1.2.	Information & monitoring	0.25	0.125			90		11.25
				1.2.	Assessment of stock status	0.25	0.125			90		11.25
Two	1	Retained species	0.2	2.1.	Outcome	0.333	0.0667			90	6.00	
				2.1.	Management	0.333	0.0667			80	5.33	
				2.1.	Information	0.333	0.0667			85	5.67	
		Bycatch species	0.2	2.2.	Outcome	0.333	0.0667			80	5.33	
				2.2.	Management	0.333	0.0667			85	5.67	
				2.2.	Information	0.333	0.0667			80	5.33	
		ETP species	0.2	2.3.	Outcome	0.333	0.0667			75	5.00	
				2.3.	Management	0.333	0.0667			90	6.00	
				2.3.	Information	0.333	0.0667			75	5.00	
		Habitats	0.2	2.4.	Outcome	0.333	0.0667			90	6.00	
				2.4.	Management	0.333	0.0667			85	5.67	
				2.4.	Information	0.333	0.0667			95	6.33	
		Ecosystem	0.2	2.5.	Outcome	0.333	0.0667			100	6.67	
				2.5.	Management	0.333	0.0667			90	6.00	
				2.5.	Information	0.333	0.0667			85	5.67	
Three	1	Governance and policy	0.5	3.1.1	Legal & customary framework	0.25	0.125			100	12.50	
				3.1.2	Consultation, roles &	0.25	0.125			100	12.50	
				3.1.3	Long term objectives	0.25	0.125			100	12.50	
				3.1.4	Incentives for sustainable fishing	0.25	0.125			90	11.25	
		Fishery specific management system	0.5	3.2.	Fishery specific objectives	0.2	0.1			100	10.00	
				3.2.	Decision making processes	0.2	0.1			95	9.50	
				3.2.	Compliance & enforcement	0.2	0.1			100	10.00	
				3.2.4	Research plan	0.2	0.1			100	10.00	
				3.2.5	Management performance	0.2	0.1			70	7.00	

Overall weighted Principle-level scores		Either	Or
Principle 1 - Target species	Stock rebuilding PI not scored		
	Stock rebuilding PI scored		84.4
Principle 2 - Ecosystem		85.7	
Principle 3 - Management		95.3	

Orange Roughy ORH7A

Prin-ciple	Wt (L1)	Component	Wt (L2)	PI No.	Performance Indicator (PI)	Wt (L3)	Weight in			Score	Contribution to Principle Score	
						Either		Or			Either	Or
One	1	Outcome	0.5	1.1.1	Stock status	0.5	0.25	0.333	0.1667	90	22.50	
				1.1.2	Reference points	0.5	0.25	0.333	0.1667	80	20.00	
				1.1.3	Stock rebuilding			0.333	0.1667			
		Management	0.5	1.2.1	Harvest strategy	0.25	0.125			85	10.63	
				1.2.	Harvest control rules & tools	0.25	0.125			90	11.25	
				1.2.	Information & monitoring	0.25	0.125			90	11.25	
				1.2.	Assessment of stock status	0.25	0.125			90	11.25	
Two	1	Retained species	0.2	2.1.	Outcome	0.333	0.0667			80	5.33	
				2.1.	Management	0.333	0.0667			95	6.33	
				2.1.	Information	0.333	0.0667			85	5.67	
		Bycatch species	0.2	2.2.	Outcome	0.333	0.0667			80	5.33	
				2.2.	Management	0.333	0.0667			85	5.67	
				2.2.	Information	0.333	0.0667			80	5.33	
		ETP species	0.2	2.3.	Outcome	0.333	0.0667			95	6.33	
				2.3.	Management	0.333	0.0667			90	6.00	
				2.3.	Information	0.333	0.0667			80	5.33	
		Habitats	0.2	2.4.	Outcome	0.333	0.0667			90	6.00	
				2.4.	Management	0.333	0.0667			85	5.67	
				2.4.	Information	0.333	0.0667			95	6.33	
		Ecosystem	0.2	2.5.	Outcome	0.333	0.0667			100	6.67	
				2.5.	Management	0.333	0.0667			90	6.00	
				2.5.	Information	0.333	0.0667			85	5.67	
Three	1	Governance and policy	0.5	3.1.1	Legal & customary framework	0.25	0.125			100	12.50	
				3.1.2	responsibilities	0.25	0.125			100	12.50	
				3.1.3	Long term objectives	0.25	0.125			100	12.50	
				3.1.4	Incentives for sustainable fishing	0.25	0.125			90	11.25	
		Fishery specific management system	0.5	3.2.	Fishery specific objectives	0.2	0.1			100	10.00	
				3.2.	Decision making processes	0.2	0.1			95	9.50	
				3.2.	Compliance & enforcement	0.2	0.1			100	10.00	
				3.2.4	Research plan	0.2	0.1			100	10.00	
				3.2.5	Management performance	0.2	0.1			70	7.00	

Overall weighted Principle-level scores		Either	Or
Principle 1 - Target species	Stock rebuilding PI not scored	86.9	
	Stock rebuilding PI scored		
Principle 2 - Ecosystem		87.7	
Principle 3 - Management		95.3	

6.3. Summary of Conditions

Table 34 Summary of Conditions

Condition number	Condition	Performance Indicator	Related to previously raised condition? (Y/N/N/A)
1 (ORH ESCR)	By the end of the certification period, provide evidence that the ESCR stock is at or fluctuating around its target reference point.	**1.1.1b**	**NA**
2 (ORH3B NWCR and ORH3B ESCR)	By the end of the certification period, the direct effects of ORH fishing must be highly unlikely to create unacceptable impacts to ETP coral species.	**2.3.1 SI b**	**NA**
3 (ORH3B NWCR and ORH3B ESCR)	By the end of the certification period, information must be sufficient to determine whether the fishery may be a threat to protection and recovery of ETP coral species.	**2.3.3 SI b**	**NA**
4 (all units)	By the third annual surveillance the fishery-specific management system must undergo occasional external review.	**3.2.5b**	**NA**

6.4. Determination, Formal Conclusion and Agreement

The fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any Indicators. The assessment team has concluded that the New Zealand Orange Roughy fisheries (as defined in this report) should therefore be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

Following this Recommendation of the assessment team, and review by stakeholders and peer-reviewers, a determination is hereby made by the MRAG Americas Certification Decision Making Process to certify the **New Zealand Orange Roughy Fisheries** according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

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Appendices

Appendix 1 Scoring and Rationales

Appendix 1.1 Performance Indicator Scores and Rationale

Principle 1

Evaluation Table for PI 1.1.1

PI 1.1.1		The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	It is likely that the stock is above the point where recruitment would be impaired.	It is highly likely that the stock is above the point where recruitment would be impaired.	There is a high degree of certainty that the stock is above the point where recruitment would be impaired.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) Y
	Justification	The stock assessments for the three stocks estimate spawning biomass relative to reference points. The aim of the limit reference point is that it be set at a level which is at least half of B_{MSY} and is equivalent to the soft limit under the New Zealand Harvest Strategy Standard. The status of the stocks relative to the reference points depends on whether stock status is based on the MPD estimates or the medians of the posterior distributions. In New Zealand, stock status is consistently based on the median of the posterior distribution, with the probability of a stock being above the hard and soft limits based on percentiles of the posterior distribution of spawning biomass relative to the relevant reference points. Under the base case assessments, all three stocks have a less than 1% probability of being below the LRP (< 0.01; Table 8). These probabilities would be higher for sensitivity tests in which the assumptions are more pessimistic than those on which the base model is based and lower for sensitivity tests in which the assumptions are more optimistic than those on which the base model is based. NWCR: < 1% probability of being below the limit reference point; **Table 8** (achieves SG100) ESCR: < 1% probability of being below the limit reference point; **Table 8** (achieves SG 100) ORH7A: < 1% probability of being below the limit reference point; **Table 8** (achieves SG100) Consequently, it can be concluded that all three stocks are above the point at which recruitment is impaired, with a high degree of certainty.		
b	**Guidepost**		The stock is at or fluctuating around its target reference point.	There is a high degree of certainty that the stock has been fluctuating around its target reference point, or has been above its target reference point, over recent years.
	Met?		(Y/N) Y - NWCR; Y - ORH7A N - ESCR	(Y/N) N

PI 1.1.1		The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing
	Justification	The ORH3B NWCR and ORH7A stocks have been in the management target range for several years (Figure 7 and Figure 11; Table 7 and Table 8). Spawning biomass for the ORH7A stock is estimated to be above the midpoint of the management target range, while the spawning biomass for the ORH3B NWCR is below the midpoint of this range. The ORH3B ESCR stock is estimated to be just ($0.004B_0$) below the lower limit of the management target range (Figure 9; Table 7 and Table 8 ; Section 4.3.5). The ORH3B NWCR and ORH7A stocks are above the lower bound of the management target and hence are within the target reference range, thereby meeting the SG80. The ORH3B ESCR stock is, however, estimated to be just below the lower bound of the target management range for the base-case analysis in 2014 ($0.296B_0$; Cordue 2014d). The stock is projected to increase above the lower limit of management target range in 2015 for the base-case analysis (Figure 14) and in 2025 for the "worst case" "lowM-highq analysis (Figure 15). However, given the uncertainty in the estimate, more than one year at or above the lower limit or a lower uncertainty is needed to assure that the stock has reached the harvest range. Hence this stock is not considered to meet the SG80, resulting in a condition. NWCR: < 5% probability of being below the lower limit of the target range; **Table 7 and Table 8** (achieves SG 80) ESCR: 57% probability of being below the lower limit of the target range for the base-case analysis; **Table 7 and Table 8** (achieves SG 60) ORH7A: > 50% probability of being above the midpoint of the target range; Table 7 and Table 8 (achieves SG 80).
References		Cordue. 2014d; MPI, 2014 a,b,c

Stock Status relative to Reference Points			
	Type of reference point	**Value of reference point (1000 mt)**	**Current stock status relative to reference point**
Target reference point	30-50% B_0	ORH3B NWCR 19.8-33.0 ORH3B ESCR 96.0-160.0 ORH7A 26.4-44.0	30-46% 25-34% 35-49%
Limit reference point	20% B_0	NWCR 13.2 ESCR 64.0 ORH7A 17.6	<1% likelihood below LRP

OVERALL PERFORMANCE INDICATOR SCORE:	ORH3B NWCR 90 ORH3B ESCR 70 ORH7A 90
CONDITION NUMBER (if relevant):	**ORH3B ESCR 1**

Evaluation Table for PI 1.1.2

PI 1.1.2		Limit and target reference points are appropriate for the stock		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Generic limit and target reference points are based on justifiable and reasonable practice appropriate for the species category.	Reference points are appropriate for the stock and can be estimated.	
	Met?	(Y/N) Y	(Y/N) Y	
	Justification	Reference points exist for all three orange roughy stocks. These reference points arise from, and are consistent with, the New Zealand Harvest Strategy Standard. Three (biomass) reference points are defined for orange roughy stocks: a hard limit (10% of B_0), a soft limit (20% of B_0) and a management target range (30-50% of B_0). The harvest strategy for orange roughy (DWG, 2014b) specifies that the limit reference point is 20% of B_0 while the management target range is 30-50% of B_0. The reference points are defined specifically for orange roughly and are estimated within the assessment (achieves SG80).		
b	**Guidepost**		The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity.	The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity following consideration of precautionary issues.
	Met?		(Y/N) Y	(Y/N) N
	Justification	The limit reference point was selected based on posterior probabilities for the maximum of 20% B_0 and 0.5B_{MSY}, accounting for uncertainty in the form of the stock-recruitment relationship, steepness and natural mortality, with probabilities assigned to these parameters based on Bayesian analyses (Cordue, 2014c). In general, the posteriors assign higher probability to more pessimistic values of steepness and natural mortality than are assumed for the base models. The estimated proportion of virgin recruitment at the limit reference point is 60% (95% CI 30-90%) (Cordue, 2014c). The limit reference point is the greater of 0.2B_0 and 0.5B_{MSY}, and corresponds to a reduction of 40% in expected recruitment (achieves SG80). However, there is nothing explicitly precautionary about the derivation of the limit reference point apart from specifying that it is higher of the two values. Examples of ways to include precaution in the limit reference point would be to account more explicitly for model uncertainties and the fact that steepness is estimated to be low compared to most other fished teleosts.		
c	**Guidepost**		The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome.	The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome, or a higher level, and takes into account relevant precautionary issues such as the ecological role of the stock with a high degree of certainty.
	Met?		(Y/N) Y	(Y/N) N

PI 1.1.2		Limit and target reference points are appropriate for the stock		
	Justification	The management target range was based on the results of the MSE. The mid-point of this range balances the low estimate of B_{MSY} from the Beverton-Holt stock-recruitment relationship with the higher estimate based on the Ricker stock-recruitment relationship, essentially following an approach similar to that of Clark (1991). Cordue (2014c) notes that the target range should be broad enough to accommodate the sustained trends in stock status that can occur due to good or poor recruitment and that based on the projections conducted, a range of approximately 20% is appropriate. Moreover, the setting of B_{MSY} involved stochastic simulations rather than simply a deterministic calculation. The target reference point is a range based on the estimates of B_{MSY} from two stock-recruitment relationships (achieves SG80). However, the spawner-recruit relationship was borrowed from another stock and uses the less precautionary average of the B_{MSY} rather than the maximum, so does not achieve "high certainty" and does not meet SG100.		
d	Guidepost		For key low trophic level stocks, the target reference point takes into account the ecological role of the stock.	
	Met?		(Y/N/Not relevant) NA	
	Justification	Orange roughy is not a key low trophic level species so scoring issue d does not apply.		
References		Clark 1991; Cordue 2014c; DWG, 2014b		

OVERALL PERFORMANCE INDICATOR SCORE:	ORH3B NWCR 80 ORH3B ESCR 80 ORH7A 80
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 1.1.3

PI 1.1.3		Where the stock is depleted, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Where stocks are depleted rebuilding strategies, which have a reasonable expectation of success, are in place.		Where stocks are depleted, strategies are demonstrated to be rebuilding stocks continuously and there is strong evidence that rebuilding will be complete within the specified timeframe.
	Met?	(Y/N) Y		(Y/N) N
	Justification	The spawning biomass of the ORH3B ESCR stock is at the lower limit of management target range and is thus this stock is considered to be depleted (Figure 9). Consequently, a rebuilding plan needs to be developed for this stock. The rebuilding plan involves managing the stock under the harvest strategy, which has an inherent rebuilding feature. Projections conducted by Cordue (2014c) estimate that, under the base model, the stock will rebuild rapidly into the management target range and that under the more pessimistic "low M-high q" model, rebuilding will occur to the mid-point of the management target range ($0.4B_0$) with 50% probability by 2025 (Figure 14 and Figure 15). The stock is only fractionally below the target range ($0.296B_0$), and even minimal recovery should lead to the stock reaching the lower end of the management target range. The projections from the 2014 stock assessment under the current catch level suggest that this stock size should have achieved a stock size >$0.3B_0$ by 2015. This demonstrates a reasonable demonstration of success. The stock does not reach SG100 because (a) there is no demonstration of rebuilding under the current harvest strategy and (b) there is no formal selection of a timeframe for rebuilding.		
b	**Guidepost**	A rebuilding timeframe is specified for the depleted stock that is the shorter of 30 years or 3 times its generation time. For cases where 3 generations is less than 5 years, the rebuilding timeframe is up to 5 years.	A rebuilding timeframe is specified for the depleted stock that is the shorter of 20 years or 2 times its generation time. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.	The shortest practicable rebuilding timeframe is specified which does not exceed one generation time for the depleted stock.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) Y
	Justification	Orange roughy is a very long-lived species and consequently two generations (~120 years; Cordue, 2014d) is substantially longer than 20 years. The projections indicate that the East and South Chatham Rise stock will rebuild to the lower end of the management target range in less than one generation and less than 20 years. Although the rebuilding timeframe is not explicit as part of the control rule, the management system deliberately set quotas below the acceptable quantity calculated from the MSE to ensure rapid rebuilding, thus predicted to achieve rebuilding in the shortest practicable timeframe (achieves SG60, SG80, and SG100).		

PI 1.1.3		**Where the stock is depleted, there is evidence of stock rebuilding within a specified timeframe**		
c	**Guidepost**	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within a specified timeframe.	There is evidence that they are rebuilding stocks, or it is highly likely based on simulation modelling or previous performance that they will be able to rebuild the stock within a specified timeframe.	
	Met?	(Y/N) Y	(Y/N) Y	
	Justification	Although the rebuilding timeframe is not explicit as part of the control rule, the management system deliberately set quotas below the acceptable quantity calculated from the MSE to ensure rapid rebuilding, thus predicted to achieve rebuilding in the shortest practicable timeframe. The estimated time-trajectory of spawning biomass for the ORH3B ESCR stock (Figure 9) indicates that this stock was increasing under the previous management arrangements (the harvest strategy was only developed and adopted in 2014) and that rebuilding should occur as fast or faster under the recently adopted management arrangements. The simulation model indicates that there is a high probability of rebuilding to the management target range (achieves SG80).		
References		Cordue 2014d.		
OVERALL PERFORMANCE INDICATOR SCORE:				**90**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.2.1

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The harvest strategy is expected to achieve stock management objectives reflected in the target and limit reference points.	The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving management objectives reflected in the target and limit reference points.	The harvest strategy is responsive to the state of the stock and is designed to achieve stock management objectives reflected in the target and limit reference points.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) Y
	Justification	The harvest strategy for orange roughy (DWG, 2014b) is well-defined and is responsive to the state of the stock. It is consistent with the New Zealand Harvest Strategy Standard as well as the Fisheries Act. It was designed using a Management Strategy Evaluation that considered a fairly broad range of uncertainties (Cordue, 2014c) and was adopted by industry and the Ministry for Primary Industry (Reeve, 2014). The final harvest control rule was selected to achieve a desirable trade-off between risk to the resource and catches. The harvest strategy was developed using MSE. As such, the values for the parameters of the control rule were selected accounting for the frequency of assessments, as well the choices for the limit reference point and the management target (achieves SG100).		
b	**Guidepost**	The harvest strategy is likely to work based on prior experience or plausible argument.	The harvest strategy may not have been fully tested but evidence exists that it is achieving its objectives.	The performance of the harvest strategy has been fully evaluated and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) N

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
	Justification	The harvest strategy is unusual because it is effectively an agreement between the fishing industry and Ministry for Primary Industry because the fisheries law in New Zealand does not include a provision for a formal harvest control rule. Reeve (2014) notes that in future, now the HCR has been formally agreed, the Ministry for Primary Industry will endeavour to set catch limits for the three orange roughy stocks using the agreed HCR whenever possible. The harvest strategy as it is now defined has only been applied once and there has been insufficient time to assess that it is achieving its objectives. The MSE provides strong (but indirect) evidence that the harvest strategy is achieving its objectives. Cordue (2014) reports that the probabilities that the spawning biomass will exceed the limit reference point and the lower limit of the management target range both exceed 90% and the mean biomass is 42% for the base-case specifications. This conclusion is robust to the frequency with which assessments are conducted, the form of the stock-recruitment relationship, and the extent of recruitment variability. The probability of being above the lower limit of the management target is less than 90% (78-80%) if biomass is positively biased by 20% and this bias in not reduced over time. The fisheries have had previous conservative management that has led to abundance increases; simulations explored in the MSE support the conclusion that the harvest strategy will continue the increases. It is not possible to formally contrast the previous management strategy and the HCR because the previous management strategy was not fully specified and could not be evaluated using MSE (achieves SG80).		
c	Guidepost	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	(Y/N) Y		
	Justification	The harvest strategy relies on information from catch, surveys, and age compositions – the research plan includes data collection at the level expected given the MSE (achieves SG60).		
d	Guidepost			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			(Y/N) N
	Justification	The previously proposed harvest strategy was revised based on the MSE work undertaken by Cordue (2014c). The harvest strategy includes a provision for review every 4-5 years (DWG, 2014b). To date the harvest strategy has not been reviewed and improved, although the harvest strategy is an improvement on how management advice was provided in the past (does not achieve SG100)		

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
e	Guidepost	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	(Y/N/Not relevant)	(Y/N/Not relevant)	(Y/N/Not relevant)
	Justification	NA – Shark is not a P1 species.		
References		Cordue 2014c; DWG 2014n; Reeve 2014		
OVERALL PERFORMANCE INDICATOR SCORE:				ORH3B NWCR 85 ORH3B ESCR 85 ORH7A 85
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.2.2

PI 1.2.2		There are well defined and effective harvest control rules in place		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Generally understood harvest rules are in place that are consistent with the harvest strategy and which act to reduce the exploitation rate as limit reference points are approached.	Well defined harvest control rules are in place that are consistent with the harvest strategy and ensure that the exploitation rate is reduced as limit reference points are approached.	
	Met?	(Y/N) Y	(Y/N) Y	
	Justification	The New Zealand system is well structured to ensure that catches remain below the catch limits (see also PI 3.2). The harvest control rule (Figure 16 and Figure 17) is fully-specified. The exploitation rate is reduced to zero when stock size is estimated to be below $0.1B_0$. The exploitation rate drops with lower stock sizes between the lower limit of the management target range and $0.1B_0$, as well as within the management target range (albeit it at a different rate). The harvest control rule is based on a default target fishing mortality rate of $0.045yr^{-1}$ (equal to the base model estimate of *M*). However, this fishing mortality can be adjusted over time through the 'scaling' feature of the harvest control rule if productivity is estimated to differ from $0.045yr^{-1}$. The MSE did not explicitly account for the impact of spawning on recruitment success (Cordue, 2014d), but by parameterizing the stock-recruitment relationship using model outputs for a stock (MEC) that was fished substantially during spawning, the posterior for steepness accounts to some extent for this effect (which should be less into the future given lower intended levels of fishing morality). The harvest control rule is in place. It is consistent with the harvest strategy and ensures that the exploitation rate is reduced as limit reference point is approached (achieves SG 80).		
b	**Guidepost**		The selection of the harvest control rules takes into account the main uncertainties.	The design of the harvest control rules takes into account a wide range of uncertainties.
	Met?		(Y/N) Y	(Y/N) N

PI 1.2.2		There are well defined and effective harvest control rules in place		
	Justification	The harvest control rule was developed using Management Strategy Evaluation (Cordue 2014c). The MSE was consistent with how this technique is used elsewhere, with the exception that the assessment (a Bayesian integrated analysis method) had to be approximated given the computational demands of simulation testing such a method and the projection period was longer than is typical. This is not an uncommon practice when applying MSE. The MSE was tailored to the biology of orange roughy, and integrated the impact of uncertainties due to parameter uncertainty, in particular that due to steepness and natural mortality (which are pre-specified in the base model). While it is never possible to account for all uncertainties in an MSE, the MSE for orange roughy considered many of the uncertainties that are known to impact the performance of a harvest control rule, specifically: • the form of the stock-recruitment relationship (Ricker or Beverton-Holt); • whether fishing is restricted to spawning fish or independent of maturity status; • the extent of variation and temporal correlation in recruitment about the assumed stock-recruitment relationship; and, • bias in the estimates of stock status and vulnerable biomass as well as a higher level of error in the estimates on which the HCR is based. The MSE summarized results in terms of performance metrics that evaluate performance in terms of yield as well the probabilities of being below the limit reference point and above the lower bound of the management target range. The harvest control rule was based on MSE. The MSE took several (likely the main) sources of uncertainty into account but did not cover a very wide spectrum of uncertainties. Specifically, the uncertainty associated with the assessment was only approximately accounted for and at least one key uncertainty (stock structure) was not accounted for (so achieves SG 80 but SG100). The evaluation also did not consider the impacts of climate change.		
c	Guidepost	There is some evidence that tools used to implement harvest control rules are appropriate and effective in controlling exploitation.	Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the harvest control rules.	Evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the harvest control rules.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) Y
	Justification	Catches in New Zealand orange roughy fisheries are at or below agreed catch limits. Thus, the evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the control rules (achieves SG100).		
References		Cordue 2014c, d		

OVERALL PERFORMANCE INDICATOR SCORE:	ORH3B NWCR 90 ORH3B ESCR 90 ORH7A 90
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 1.2.3

PI 1.2.3		Relevant information is collected to support the harvest strategy		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Some relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data is available to support the harvest strategy.	A comprehensive range of information (on stock structure, stock productivity, fleet composition, stock abundance, fishery removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) N
	Justification	The data required to support the harvest strategy include information on stock structure, basic population dynamics and removals from the stocks, and information on abundance and age-structure. There is in general a substantial amount of information on the biology of orange roughy (notwithstanding the difficulties associated with conducting biological studies for a species that occurs at considerable depth). Knowledge about the population dynamics of orange roughy is sufficient to the support the harvest strategy, but several sources of uncertainty remain (e.g., fecundity) and stock structure is clearly not fully understood (achieves SG 80).		
b	**Guidepost**	Stock abundance and fishery removals are monitored and at least one indicator is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and fishery removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule.	All information required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) Y

PI 1.2.3		Relevant information is collected to support the harvest strategy		
	Justification	Acoustic surveys of the three stocks are planned to occur on a 3-year schedule, with the survey results feeding into stock assessments that then can be used to apply the harvest control rule (Tingley, 2014; Table 12 and Table 13). The proposed schedule of surveys and assessments is more frequent than was indicated to be necessary from the MSE. In addition to estimates of biomass, age-frequencies will be obtained from surveys (primarily) and commercial catches. Data on gonad development will be collected to help refine the design of the surveys. Reporting requirements are set out in the Fisheries (Reporting) Regulations 2001, most notably in sections 5 and 6. It is illegal under the Fisheries Act 1996 to discard any species in the Quota Management System (QMS) at-sea unless the species is listed on Schedule 6 (of the Fisheries Act), the return to the sea is recorded, and the specified conditions are met, or an MPI observer on the vessel authorises the discard. As orange roughy is a QMS species, all catch of orange roughy is recorded and reported with a high degree of accuracy. The key input to the assessment on which the harvest control rule is based are the survey estimates of abundance, and catch and survey age-structure. These data will be collected at the rate anticipated in the design of the harvest control rule (achieves SG80). Although the surveys are not annual, given the biology of the orange roughy, and the fact that there is regular observer and catch monitoiring, the data collection scheme can be considered to be high frequency. The uncertainties associated with the data are well studied and the assessment considers sensitivity to how the data are included in the assessment (achieves SG100)		
c	Guidepost		There is good information on all other fishery removals from the stock.	
	Met?		(Y/N) Y	
	Justification	As a QMS species, orange roughy removals are monitored and reported across all sectors that take orange roughy – reporting removals is required in the Fisheries (Reporting) Regulations 2001. Therefore, there is good information on all removals (achieves SG80).		
References		Tingley 2014		

OVERALL PERFORMANCE INDICATOR SCORE:	ORH3B NWCR 90 ORH3B ESCR 90 ORH7A 90
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 1.2.4

PI 1.2.4		There is an adequate assessment of the stock status		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**		The assessment is appropriate for the stock and for the harvest control rule.	The assessment is appropriate for the stock and for the harvest control rule and takes into account the major features relevant to the biology of the species and the nature of the fishery.
	Met?		(Y/N) Y	(Y/N) Y
	Justification	The 2014 assessments involved fitting an age-structured population dynamics model to catch and monitoring data. The key biological parameters of the model (natural mortality and growth) were pre-specified based on auxiliary information, while the steepness of the stock-recruitment relationship was set to a default value (0.75). Sensitivity was explored, inter alia, to changing the assumed value for natural mortality and steepness, with a "worst case" scenario defined in terms of lower (more pessimistic) values for these parameters (MPI, 2014a,b,c; Cordue, 2014b). The assessment was based on ageing data, but only ageing data based on the new approach while the set of acoustic and trawl survey estimates used in the assessment was selected based on criteria developed by the DFWAG. A key input for the assessments was the priors for the catchability coefficients for the surveys. Some of these priors were assumed to be uninformative (e.g. for the trawl surveys), but those for the acoustic surveys were informative. The (informative) priors for catchability for the acoustic surveys accounted for uncertainty in target strength as well as in the proportion of the population available to be surveyed. The assessment was configured within the CASAL package to take key specifics, including the biology of the species and the nature of the fishery, into account (achieves SG100).		
b	**Guidepost**	The assessment estimates stock status relative to reference points.		
	Met?	(Y/N) Y		
	Justification	The assessment estimates stock status relative to the reference points included in the harvest control rule as well as those required under the Harvest Strategy Standard (Cordue, 2014b; MPI, 2014a,b,c), meeting the SG60.		
c	**Guidepost**	The assessment identifies major sources of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) Y

PI 1.2.4		There is an adequate assessment of the stock status		
	Justification	As is common in New Zealand, the assessment method is Bayesian and the results are expressed in terms of posterior distributions for quantities of management interest such as current spawning biomass and current spawning biomass relative to B_0. The uncertainty in the assessment is also quantified using sensitivity tests, and some of those sensitivity tests are carried forward to form the basis for projections. The assessments provide the ability to assess stock status in probabilistic terms using Bayesian methods as well as the information needed to apply the harvest control rule for orange roughy. The assessment is Bayesian. Consequently, it takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way (achieves SG100).		
d	Guidepost			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			(Y/N) N
	Justification	The basic assessment method (integrated analysis) is used for many fisheries around the world and simulation studies have led to an understanding of how assessment methods of this type perform. However, no formal evaluations of an assessment method that is identical to that used for orange roughy have been undertaken. In particular, no evaluation of the implications of errors in specifying priors for key parameters has been undertaken. The assessment method (CASAL) has yet to be formally tested using simulations and hence not tested the way it is configured for orange roughy.		
e	Guidepost		The assessment of stock status is subject to peer review.	The assessment has been internally and externally peer reviewed.
	Met?		(Y/N) Y	(Y/N) N
	Justification	The assessment is reviewed by the DFAWG which has a broad range of members, including those from government, industry and NGOs. However, to date the assessment has not been formally reviewed by scientists external to the New Zealand assessment process. The assessment is subject to peer review through the DFAWG process but has not been reviewed externally (achieves SG80).		
References		Cordue, 2014b; MPI, 2014a,b,c		

OVERALL PERFORMANCE INDICATOR SCORE:	ORH3B NWCR 90 ORH3B ESCR 90 ORH7A 90
CONDITION NUMBER (if relevant):	

Principle 2

Evaluation Table for PI 2.1.1

PI 2.1.1		**The fishery does not pose a risk of serious or irreversible harm to the retained species or species groups and does not hinder recovery of depleted retained species or species groups**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Main retained species are likely to be within biologically based limits (if not, go to scoring issue b below).	Main retained species are highly likely to be within biologically based limits (if not, go to scoring issue b below).	There is a high degree of certainty that retained species are within biologically based limits and fluctuating around their target reference points.
	Met?	(Y/N) NWCR – Y ESCR – Y ORH7A – Y	(Y/N) NWCR – Y ESCR – Y ORH7A – Y	(Y/N) NWCR – partial ESCR – N ORH7A – N

PI 2.1.1		The fishery does not pose a risk of serious or irreversible harm to the retained species or species groups and does not hinder recovery of depleted retained species or species groups
	Justification	Retained species are those designated as QMS, which requires full retention and reporting. Main species are those that make up ≥5% of the total catch in the fishery, except for for most of the vulnerable species which are designated as main if they make up ≥ 2% of the catch, and shark species that are designated as main if they make up ≥ 1% of the total catch. The assessment team added the lowert shark threshold to respond to stake holder comments from the site visit regarding concern for deepwater dogfish. The assessment team considered species making up <0.5% as *di minimis*, and not considered further. Estimation of annual bycatch and discard levels of non-protected species in New Zealand orange roughy fisheries have been undertaken at regular intervals since 1998 (Clark *et al.* 2000; Anderson *et al.* 2001; Anderson 2009, 2011, 2013; MPI 2014). In a New Zealand context and in most New Zealand publications referred to above the term bycatch is of all non-target catch and includes both MSC 'retained' and 'bycatch' categories. Target fishing for orange roughy catches a relatively small amount of bycatch, with around 96 percent of the catch consisting of either orange roughy or other species managed under the Quota Management System (QMS), such as oreo (Family Oreosomatidae). **ORH3B NWCR**: In the NWCR, only hoki, smooth oreo, and hake exceed 0.5%. Hoki reaches the 5% threshold as a main species, with smooth oreo and hake as minor species (Table 16). Hoki and hake are MSC certified and therefore highly likely to be within biological limits. B2014 for hoki was estimated to be 60% B0; Virtually Certain (> 99%) to be at or above the lower end of the target range, and has been since 2008 and Very Likely (> 90%) to be at or above the upper end of the target range. B2014 is Exceptionally Unlikely (< 1%) to be below both the soft or hard limits. This provides a high degree of certainty of being within biological limits and fluctuating around the target, that meets the SG100. Fu and Doonan (2013) show that the biomass in OEO4 has trended down since the 1980s (Figure 19). The biomass trend showed a steeper decline in the 1990s compared to more recent years. The Bayesian posterior distribution of mature biomass as a percent of two models (Table 15) shows the biomass at (model 3.2) or just below (model 5.2) the target of 40% B0; the Bayesian distribution further demonstrates a small proportion, less than 30%, of the distribution falls below 20% B0 generating a higher than 70% probability of exceeding the limit reference point. Fu and Doonan (2013) report that the lower 95% confidence interval for mature biomass is 26% B0 (model 3.2) or 18% B0 (model 5.2), providing additional evidence that current biomass has greater than 70% chance of exceeding the limit reference point, and therefore highly likely above the point of recruitment impairment. These results suggest no immediate conservation concern, although the biomass is trending down; therefore smooth oreo defaults to the SG80 level. Hake are considered a minor species. Hake was estimated to be about 50% B_0, and Very Likely (> 90%) to be at or above the target (MPI, 2014h), the abundance has not fallen below the target. B_{2011} is Exceptionally Unlikely (< 1%) to be below both the Soft and Hard Limits, providing a high degree of certainty of being within biological limits and fluctuating around the target, that meets the SG100. **ORH3B East and South Chatham Rise** For ORH3B ESCR, smooth oreo, orange roughy, black oreo, and hoki are the only QMS species that make up more than .5% of the catch, at 62.5%, 27.6%, 4.7%, and 0.8% respectively (**Table 19 ORH3B ESCR**). Smooth oreo is considered a main retained species, but black oreo and hoki do not meet the 5% threshold for main. The assessment of smooth oreo in MSA4 (OEO4) described in this section for ORH3B NRWC applies to the smooth oreo in ORH 3B ESCR.These results suggest no immediate conservation concern, although the biomass is trending down; therefore smooth oreo scores SG80. **ORH 7A:** No main species. Only spiky oreo make up ≥0.5% of the catch, at 1.4%, scoring SG60 and SG80

Species	Main/Minor	Score
Hoki	Main	100
Smooth oreo	Minor	80
Hake	Minor	100

Species	Main/Minor	Score
Smooth oreo	Main	80
Black oreo	Minor	-
Hoki	Minor	-

Species	Main/Minor	Score
Spiky oreo	Minor	-

PI 2.1.1		The fishery does not pose a risk of serious or irreversible harm to the retained species or species groups and does not hinder recovery of depleted retained species or species groups		
b	Guidepost			Target reference points are defined for retained species.
	Met?			(Y/N) NWCR – Y ESCR – Y ORH7A – N
	Justification	Eastern hoki has a target range of 35–50% B0, which applies to hoki caught in NWCR and ESCR. Smooth oreo has a target or 40% B0, which applies to hoki caught in NWCR and ESCR. Black oreo has a target or 40% B0, which applies to hoki caught in NWCR and ESCR. Hake has a target of 40% B0, which applies to hoki caught in NWCR and ESCR. Therefore, NWCR and ESCR meet the SG100. Spiky oreo does not have a target. Therefore ORH7A does not meet SG100.		
c	Guidepost	If main retained species are outside biologically based limits there are mitigation measures in place that are expected to ensure that the fishery does not hinder recovery and rebuilding.	If main retained species are outside biologically based limits there is a partial strategy of demonstrably effective mitigation measures in place such that the fishery does not hinder recovery and rebuilding.	
	Met?	(Y/N)	(Y/N)	
	Justification	ORH3B NWCR – NA ORH3B ESCR – NA ORH7A - NA		
d	Guidepost	If the status is poorly known there are measures or practices in place that are expected to result in the fishery not causing the retained species to be outside biologically based limits or hindering recovery.		
	Met?	(Y/N)		
	Justification	ORH3B NWCR – NA ORH3B ESCR – NA ORH7A - NA		
References		MPI 2014 Stock assessment plenary; Fu and Doonan (2013); Clark *et al.* 2000; Anderson *et al.* 2001; Anderson 2009, 2011, 2013; MPI 2014		

PI 2.1.1	The fishery does not pose a risk of serious or irreversible harm to the retained species or species groups and does not hinder recovery of depleted retained species or species groups
OVERALL PERFORMANCE INDICATOR SCORE:	ORH3B NWCR – 95 ORH3B ESCR – 90 ORH7A – 80
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.1.2

PI 2.1.2		There is a strategy in place for managing retained species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place, if necessary, that are expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a partial strategy in place, if necessary, that is expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a strategy in place for managing retained species.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) Y
	Justification	The QMS requires assessment of all managed species and requires vessels in the QMS to report all catches. As no discards are allowed, catches represent total removals. Based on the assessments, MPI establishes TAC and TACC for each QMS species. MPI tracks landings against the TACC to assure compliance. Observer coverage in the fishery generally exceeds 20% (Table 14), commonly reaches 50%. The minor retained species fall under the same QMS requirements. This requires keeping landings within TACCs, a strategy for maintaining species within biological limits or rebuilding them if necessary. This meets the SG60, SG80, and SG100 levels.		
b	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or species involved.	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or species involved.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) Y
	Justification	It is very clear that the strategy will work as designed. Many fisheries around the world use TAC-based management for assuring reasonable harvest rates that work to keep harvest at levels that keep stocks within biological limits, representing evidence that testing supports high confidence that the strategy will work. MSC certified hoki demonstrates the successful management of QMS species. MPI will add additional species to the QMS if information suggests that those species may need direct management; thereby extending the strategy as necessary. This meets the SG60, SG80, and SG100 levels.		
c	**Guidepost**		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		(Y/N) Y	(Y/N) N

PI 2.1.2		There is a strategy in place for managing retained species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species		
	Justification	The successfully certified hoki fishery provides evidence that the strategy has been implemented successfully. A number of species have been added to the QMS in the past several years. All retained species fall under the requirements of the QMS, but implementation has been uneven,with some species not receiving the same level of attention as others. This meets the SG 80 level.		
d	Guidepost			There is some evidence that the strategy is achieving its overall objective.
	Met?			(Y/N) Y
	Justification	A number of New Zealand deepwater species have been certified under the programme, and others are under improvements with the goal to achieve certification. These results provide evidence that the strategy is obtaining its objective (Akroyd et al., 2012; Akroyd, Pierre & Punt, 2012; Akroyd & Pilling, 2014a;b)		
e	Guidepost	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	(Y/N/Not relevant) Y	(Y/N/Not relevant) Y	(Y/N/Not relevant) NWCR – Y ESCR – N ORH7A – Y

PI 2.1.2		There is a strategy in place for managing retained species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species
	Justification	Several shark species are landed by the orange roughy fisheries (MPI. 2015a). A ban on shark finning requires all shark fins to be landed attached to the body of the shark for all non-Quota Management System (QMS) species and two QMS species (spiny dogfish and blue shark). MPI allows landing of QMS species (elephantfish, ghost shark, mako shark, pale ghost shark, porbeagle shark, rig, and school shark) with a gazetted fin to body weight ratio except blue sharks, which must have fins artificially attached to the body. Observer coverage generally exceeds 20% in all areas except ORH3B ESCR from 2010-11 through 2013-14, and averages well above 20%. The close relationship between DWG and MPI means that the industry has committed to the MPI conservation requirements that prohibit finning. The catch of sharks is small, in the range of tens of tons. The amount of value in shark fins relative to the penalties for violations provides strong disincentives against occurrence of shark finning. The fishery enforcement in New Zealand puts a focus on preventing violations, including monitoring catches, both in person and electronically. The following measures apply to retention of sharks: a. There are regulations in place governing the management of sharks that require naturally or artificially attached fins for some species (MPI 2015b); and b. Some shark fins and carcasses may be landed in compliance with an appropriate ratio (MPI 2015b); c. Ratios for a few species exceeded 5% wet weight; species-specific ratios developed from fishery data for all species justified the ratios above 5% (Francis 2014); and d. There is some onboard observer coverage (Table 14) or other equivalent evidence that shark finning is not taking place. The observer coverage in all areas exceeds the 5% level for 'some' observer coverage at the SG80 level. ESCR falls below the 20% default for 'good' observer coverage. However, the fishery has other elements that add assurance that shark finning does not occur. Under CB3.6.6.2 d. the SG100 requirement states: "There is onboard observer coverage of all operations to provide evidence that shark finning is not taking place. Under GCR V1.3: GCB2.5.4 Percentage onboard observer coverage generally refers to fishing effort, although CABs may accept other expressions of coverage." To accept other expressions of coverage, the team should determine "…whether onboard observer data are representative of the activity of the vessel during a year, and can be relied upon to have detected representative encounters with sharks …." The Guidance gives examples of electronic monitoring and port sampling as examples of alternatives to onboard observers. The fishery has other elements that add assurance that shark finning does not occur. MPI has confirmed that confirming compliance with shark finning regulations, in addition to at-sea monitoring, occurs through in-port inspections, inspections of licensed fish receivers, detailed analysis of data collected through the comprehensive reporting requirements of the QMS, and retrospective analysis across all data sources (see MPI shark fin letter annexed to stakeholder comments). The close relationship between DWG and MPI means that the industry has committed to the MPI conservation requirements. The catch of sharks is small, in the range of tens of tons. The amount of value in shark fins relative to the penalties for violations provides strong disincentives against occurrence of shark finning. The fishery enforcement in New Zealand puts a focus on preventing violations, including monitoring catches, both in person and electronically. The assessment team concluded that for ORH3B NWCR and ORH7A the extra monitoring conducted by MPI raises the default 'good' coverage achieved by exceeding 20% observer coverage to meet the requirement of CB2.5.7.2d "There is onboard observer coverage of all operations to provide evidence that shark finning is not taking place," consistent with GCB2.5.4. The ESCR coverage has fallen below 20% in the past several years of the data series The assessment team concludes that for ORH3B ESCR the extra monitoring conducted by MPI raises the default 'some' coverage from greater than 5% but less than 20% observer coverage as equivalent to the requirement of CB2.5.6.2d "There is some onboard observer coverage or other equivalent evidence that shark finning is not taking place," consistent with GCB2.5.4. The combination of regulations, observer coverage well above default levels in OHR 3B NWCR and ORH 7, on-board record keeping, and monitoring by enforcement agents provide evidence such that the assessment team considers a high degree of certainty that shark finning does not occur on any vessel in OHR 3B NWCR and ORH 7, reaching the SG60, SG80, and SG100. The ORH 3B ESCR fishery reaches SG60 and SG80 but does not reach SG100 because fins are cut on board, but there is only 'some' observer coverage.

PI 2.1.2	**There is a strategy in place for managing retained species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species**	
References	Francis, M.P. 2014. Estimation of fin ratios and dressed weight conversion factors for selected shark species New Zealand. Fisheries Assessment Report 2014/68. https://mpi.govt.nz/document-vault/4734 MPI. 2015a. MPI. 2015b. Eliminating Shark Finning in New Zealand. http://www.fish.govt.nz/en-nz/Environmental/Sharks/Eliminating+shark+finning+in+New+Zealand.htm	
OVERALL PERFORMANCE INDICATOR SCORE:		ORH3B NWCR – 95 ORH3B ESCR – 80 ORH7A – 95
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.1.3

PI 2.1.3		Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Qualitative information is available on the amount of main retained species taken by the fishery.	Qualitative information and some quantitative information are available on the amount of main retained species taken by the fishery.	Accurate and verifiable information is available on the catch of all retained species and the consequences for the status of affected populations.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) N
	Justification	As all QMS species must be retained, with logbook and landings records required, and observer coverage generally exceeding 20%. Therefore, accurate and verifiable information is available for all QMS species. However, the consequences of the catch is not known for all retained species, meeting the SG80 level.		
b	**Guidepost**	Information is adequate to qualitatively assess outcome status with respect to biologically based limits.	Information is sufficient to estimate outcome status with respect to biologically based limits.	Information is sufficient to quantitatively estimate outcome status with a high degree of certainty.
	Met?	(Y/N/Not relevant) Y	(Y/N/Not relevant) Y	(Y/N/Not relevant) N
	Justification	The main species – hoki (NWCR) and smooth oreo (ESCR) – have outcome status estimates with respect to biological limits, as described in Performance Indicator 2.1.1. This meets the SG80 level. Two of the retained species, hoki and hake, have outcome status estimated with a high degree of certainty (see Performance Indicator 2.1.1), but other species do not, thereby not meeting SG100.		
c	**Guidepost**	Information is adequate to support measures to manage main retained species.	Information is adequate to support a partial strategy to manage main retained species.	Information is adequate to support a strategy to manage retained species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) N
	Justification	All QMS species must be retained, so the information requirements for all species is high. All QMS species are monitored against a TACC, which keeps exploitation to a set level. This meets the SG 80 level. However, the TACC is not based on an assessment for all species, leaving a gap in information for evaluating with a high degree of certainty whether the strategy is achieving its objective, thereby not meeting SG100.		

PI 2.1.3		**Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species**		
d	**Guidepost**		Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator score or the operation of the fishery or the effectiveness of the strategy)	Monitoring of retained species is conducted in sufficient detail to assess ongoing mortalities to all retained species.
	Met?		(Y/N) Y	(Y/N) Y
	Justification	The requirement for logbook and landings records, and observer coverage generally exceeding 20%, provides sufficient data to detect risks to the stocks. The annual Plenary reviews all information to recommend changes in management to respond to any detected changes in the level of risk. This level of monitoring provides ongoing estimates of mortalities of all retained species. Thus, the fisheries meet the SG80 and SG100 levels.		
References		MPI 2015a MPI 2014a, b, c		
OVERALL PERFORMANCE INDICATOR SCORE:				**85**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.2.1

PI 2.2.1		The fishery does not pose a risk of serious or irreversible harm to the bycatch species or species groups and does not hinder recovery of depleted bycatch species or species groups		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Main bycatch species are likely to be within biologically based limits (if not, go to scoring issue b below).	Main bycatch species are highly likely to be within biologically based limits (if not, go to scoring issue b below).	There is a high degree of certainty that bycatch species are within biologically based limits.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) N

PI 2.2.1		The fishery does not pose a risk of serious or irreversible harm to the bycatch species or species groups and does not hinder recovery of depleted bycatch species or species groups
	Justification	**Northwest Chatham Rise** For ORH3B NWCR, a suite of species make up ≥0.5% of the total catch: rattail (4.8%), slickhead (2.9%), morid cod (1.5%), deepwater dogfish (1.1%), other sharks (0.7%), Baxter's dogfish (0.6%), Johnson's cod (0.6%), and longnose chimaera (0.6%) (Table 17). Baxter's lantern dogfish averaged about 1% of the total catch over the past four years, and slightly more if combined with deepwater and unidentified dogfish; Baxter's lantern dogfish are considered a main bycatch species because they have low productivity and high vulnerability, and reach the 1% threshold set for shark species (Table 17). Slickheads, rattails, and morid cod are not considered main species (Section 3.4.1). The generic group unidentified dogfish average about 1% of the total catch for the past four years, and more if combined with Baxter's lantern dogfish, and are considered as main species because they also have low productivity. The NWCR averages about 6 tonnes per year of deepwater dogfish and about 13 tonnes of combined dogfish (Table 18). This aggregate catch of dogfish represents about 2.6% of the dogfish catch from FMA 4, and about 1.6% of the dogfish catch in the EEZ. The catch of Baxter's dogfish and other deepwater sharks make up a small proportion (<0.002) of the Baxter's dogfish biomass on Chatham Rise estimated estimated by Blackwell (2010). Stevens *et al.* (2015) present figures of trawl estimates of abundance for several deepwater dogfish, including Baxter's dogfish, that show no temporal pattern (Figure 20). Stevens *et al.* (2015) further demonstrated that the length frequency of these dogfish extends up to lengths expected for the adult sizes. For example, Baxter's dogfish reach lengths at and beyond 75cm, the theoretical expected maximum length for the species. This demonstrates that the adult component has not been fished down. The lower lengths observed, to 20cm, demonstrate that recruiting year classes are entering the stock. This is similar to the conclusions of an expert panel conducting a risk assessment for the orange roughy fisheries (Boyd 2013). The dogfish are highly likely above the point of recruitment impairment, given the preponderance of evidence, and highly likely to be within biologically based limits. This reaches SG60 and SG80, but does not rise to a high degree of certainty.

Species	Main/Minor	Score
Deepwater dogfish/Baxter's dogfish	Main	80
Rattails	Minor	-
Slickheads	Minor	-
Morid cod	Minor	-
Other sharks	Minor	-
Johnson's cod	Minor	-
Longnose chimera	Minor	-

East & South Chatham Rise: only deepwater dogfish/Baxter's lantern dogfish make up more than 1% of the catch, at 1.0% (Table 20), and no other species reached 0.5%. As a vulnerable species, Baxter's dogfish is considered as a main bycatch species. The ESCR averages about 100 tonnes per year of Baxter's lantern dogfish and about 180 tonnes of combined dogfish. This aggregate catch of dogfish represents about 50% of the dogfish catch in fishing management area 4, and about 25% of the dogfish catch in the EEZ.

The catch of Baxter's dogfish and other deepwater sharks make up a small proportion ~0.007-0.017)) of the Baxter's dogfish biomass on Chatham Rise estimated by Blackwell (2010). Stevens *et al.* (2015) present figures of trawl estimates of abundance for several deepwater dogfish, including Baxter's dogfish, that show no temporal pattern (Figure 20). Stevens *et al.* (2015) further demonstrated that the length frequency of these dogfish extends up to maximum theoretical lengths expected for the adult sizes. For example, Baxter's dogfish reach lengths at and beyond 75cm, the expected maximum length for the species. This demonstrates that the adult component has not been fished down. The lower lengths observed, to 20cm, demonstrate that recruiting year classes are entering the stock. Blackwell (2010) noted that the species seemed resistant to the level of exploitation onserved. This is similar to the conclusions of an expert panel conducting a risk assessment for the orange roughy fisheries (Boyd 2013). The dogfish are highly likely above the point of recruitment impairment, given the preponderance of evidence, and highly likely to be within biologically based limits. This reaches SG60 and SG80, but does not rise to a high degree of certainty.

ORH7A. Of non-QMS species, only leafscale gulper shark (0.5.%) reached the 0.5% threshold. No non-QMS species reach the threshold of main species. Therefore, no main bycatch species are identified for this fishery. This reaches SG60 and SG80, but does not rise to a high degree of certainty.

PI 2.2.1		**The fishery does not pose a risk of serious or irreversible harm to the bycatch species or species groups and does not hinder recovery of depleted bycatch species or species groups**		
b	**Guidepost**	If main bycatch species are outside biologically based limits there are mitigation measures in place that are expected to ensure that the fishery does not hinder recovery and rebuilding.	If main bycatch species are outside biologically based limits there is a partial strategy of demonstrably effective mitigation measures in place such that the fishery does not hinder recovery and rebuilding.	
	Met?	(Y/N) NA	(Y/N) NA	
	Justification			
c	**Guidepost**	If the status is poorly known there are measures or practices in place that are expected to result in the fishery not causing the bycatch species to be outside biologically based limits or hindering recovery.		
	Met?	(Y/N) NA		
	Justification			
References		Blackwell 2010 Boyd 2013 DWG. 2014. Shark operational plan. MPI. 2013. National plan of action – Sharks Stevens et al. 2014, 2015		
OVERALL PERFORMANCE INDICATOR SCORE:				**ORH3B NWCR, ORH3B ESCR, ORH7A – 80**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.2.2

PI 2.2.2		There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to bycatch populations		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place, if necessary, that are expected to maintain the main bycatch species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a partial strategy in place, if necessary, that is expected to maintain the main bycatch species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a strategy in place for managing and minimizing bycatch.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) N
	Justification	There is a partial strategy inplace consisting of monitoring non-QMS species with catch, observer, and survey data, and moving them to QMS as necessary. Species can be added to the QMS under Section 17B of the Fisheries Act and/or the species managed under Section 11 of the Act. Section 17B of the Act requires adding stocks or species to the QMS if the existing management does not ensure sustainability or does not provide for utilization. A QMS Introduction Process Standard (Mfish, 2008) provides a framework formalising the procedure for moving non-QMS species within the QMS framework, and monitoring 'minor' QMS species status and trends.The management system introduced two species into the QMS in 2010: Patagonian toothfish (Ministry of Fisheries, 2010a) and attached bladder kelp (Ministry of Fisheries, 2010b). The latter was added to the QMS in part because the Ministry of Fisheries concluded that there was increasing demand for the species. New Zealand has implemented a National Plan of Action – Sharks (MPI 2013) that sets policy for utilization and protection of sharks. The Deepwater Group has produced a shark operational plan (DWG 2014) to implement the NPOA. The NPOA and the shark operational plan focus on protection of protected sharks, prohibition of shark finning, proper release of sharks to maximize survival, and improved identification. There was a notable decrease in non-commercial bycatch in 2010-11 and 2011-12 (MPI & DWG 2013) as a result of a decrease in fishing effort and decreases in catch limits. The low density but widespread distribution of the dogfish make avoiding catch difficult. The fisheries are unlikely to hinder recovery because of the small amounts of dogfish taken annually, on the order of <0.007-0.017 of the estimated abundance only in the areas of fishing. Therefore, the NWCR and ESCR fisheries reach both the SG 60 and SG 80 guideposts. With no main bycatch species, the ORH7A fishery reaches SG80.		
b	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/species).	There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or species involved.	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or species involved.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) N

PI 2.2.2		There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to bycatch populations		
	Justification	Moving non-QMS species to QMS will work to protect species if the monitoring demonstrates ability to detect sustainability or utilisation issues. The fishery has maintained the catch of dogfish at consistently low levels since at least the 2008-2009 fishing year (Table 17, Table 18, Table 20, Table 21, Table 23). MPI will continue to monitor interactions with sharks by the orange roughy fisheries and considers that the planned risk assessment and additional management actions under the NPOA-Sharks 2013 will mitigate any risks posed by increased orange roughy fishing effort. The fact of ongoing transfers to QMS and the observation that abundance of main species remains at safe abundance provide some objective basis that the partial strategy will work, reaching the SG80. There is not high confidence in the strategy due to uncertainty in the non-QMS monitoring, so not reaching the SG100.		
c	Guidepost		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		(Y/N) Y	(Y/N) N
	Justification	MPI clearly monitors many non-QMS species through catch data, observer data, and surveys. The monitoring has led to movement of non-QMS species to QMS as necessary. Available evidence points out that New Zealand has prohibited shark finning and has implemented release protocols of sharks to maximize survival. Even though identification of deepwater dogfish is not completely effective, the DWG operations manual has provided information to vessel operators that improved identification. MPI continues to monitor catches of dogfish and other non-QMS species with a commitment to implement protective measures when and if necessary. This reaches the SG60 and SG80 levels. However, it is not clear that all non-QMS species that may need protection get moved to QMS with adequate management measures due to some uncertainty in the monitoring, thereby not reaching SG100.		
d	Guidepost			There is some evidence that the strategy is achieving its overall objective.
	Met?			(Y/N) Y
	Justification	The overall objective of the bycatch management strategy is to monitor non-QMS species and protect them by moving them to QMS if sustainability or utilisation issues arise. The NPOA-Sharks further sets up protection for shark species. The ongoing monitoring of non-QMS species and movement of non-QMS species to QMS does occur (e.g., Patagonian toothfish and attached bladder kelp). This provides some evidence of meeting the overall objective and preventing non-sustainable interactions. On-going monotoring of a wide range of bycatch species in the large scale trawl surveys, such as that on the Chatham Rise, provides evidence that there is neither any multispecies declines nor declines in key bycatch species. This reaches the SG60, SG80, and SG100.		
References		Blackwell 2010 DWG 2013 Mfish 2008 MPI 2010a MPI 2014d		

PI 2.2.2	**There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to bycatch populations**	
	MPI 2015 (Ministry of Fisheries, 2010a) (Ministry of Fisheries, 2010b	
OVERALL PERFORMANCE INDICATOR SCORE:		**ORH3B NWCR, ORH3B ESCR, ORH7A – 85**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.2.3

PI 2.2.3		Information on the nature and the amount of bycatch is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage bycatch		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Qualitative information is available on the amount of main bycatch species taken by the fishery.	Qualitative information and some quantitative information are available on the amount of main bycatch species taken by the fishery.	Accurate and verifiable information is available on the catch of all bycatch species and the consequences for the status of affected populations.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) N
	Justification	Observer coverage mostly ranging from 20-50% coverage provides quantitative information on all bycatch species. Comprehensive logbooks provide catch records for some but not all bycatch species. Trawl surveys provide data to track abundance of most species or species groups in some fishing areas. This reaches the SG80. However, with misidentification of deepwater dogfish and lack of logbook records for some non-QMSspecies, it is not possible to evaluate the consequences of fishing activities on all bycatch species' populations in each of the areas,so does not reach SG100.		
b	**Guidepost**	Information is adequate to broadly understand outcome status with respect to biologically based limits	Information is sufficient to estimate outcome status with respect to biologically based limits.	Information is sufficient to quantitatively estimate outcome status with respect to biologically based limits with a high degree of certainty.
	Met?	(Y/N/Not relevant) Y	(Y/N/Not relevant) Y	(Y/N/Not relevant) N
	Justification	Most non-QMS species are caught at levels <1% of total catch and not considered as main species. The Baxter's lantern dogfish and other deepwater dogfish, the only species that reach the threshold as Main, have a combination of catch records from observer data and logbooks and estimates of relative abundance from trawl surveys; length frequency from surveys provides information as a biological indicator. This information has been used to estimate outcome status sufficient to conclude that the stocks are sufficiently above the point of recruitment impairment that main species are within biological limts, thus reaching the SG60 and SG80. Non-QMS species are not subject to the Plenary process of evaluating stock status or recommending a basis for quota management. Therefore, determination of stock status is less rigorous than for QMS species. Uncertainty in the data do rise to the level of high degree of certainty, so does not reach SG100.		
c	**Guidepost**	Information is adequate to support measures to manage bycatch.	Information is adequate to support a partial strategy to manage main bycatch species.	Information is adequate to support a strategy to manage retained species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) N

PI 2.2.3		**Information on the nature and the amount of bycatch is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage bycatch**		
	Justification	Available information from observer coverage, comprehensive logbooks, and trawl surveys is sufficient to support the partial strategy of monitoring non-QMS species and moving them to QMS if necessary for sustainability or utilization reasons. While no stocks have moved from non-QMS to QMS based on catches in the orange roughy fisheries, other stocks (e.g., Patagonian toothfish and attached bladder kelp) have been moved. The information further supports the partial strategy of protection of protected sharks, prohibition of shark finning, proper release of sharks to maximize survival, improved identification, and monitoring observered abundance for changes (see also PI 2.2.2), meeting the SG80. Available information suggests that the risk to main bycatch species, Baxter's lantern dogfish and other deepwater dogfish, is fairly low, providing support for maintaining these species as non-QMS. It is not clear with high certainty that the information supports a conclusion that the strategy achieves its objective, given some uncertainty in the assessment of non-QMS status, so does not reach SG100.		
d	**Guidepost**		Sufficient data continue to be collected to detect any increase in risk to main bycatch species (e.g., due to changes in the outcome indicator scores or the operation of the fishery or the effectively of the strategy).	Monitoring of bycatch data is conducted in sufficient detail to assess ongoing mortalities to all bycatch species.
	Met?		(Y/N) Y	(Y/N) N
	Justification	Ongoing observer data and trawl surveys provide for tracking changes in catch, relative abundance, and fisheries operations of all bycatch species. Logbook data collections supplements observer and trawl information for some species. Annual analyses of these data are sufficient to detect changes in risk to the bycatch species (Table 17, Table 18, Table 20, Table 21, Table 23). Unobserved mortality from the trawls is low as the nets do not lose substantial quantities of catch. This reaches the SG60 and SG80. However, with misidentification of deepwater dogfish and lack of logbook records for some non-QMSspecies, this does not reach SG100.		
References		Blackwell 2010 DWG 2013 MPI 2010a MPI 2014d MPI 2015		

OVERALL PERFORMANCE INDICATOR SCORE:	**ORH3B NWCR, ORH3B ESCR, ORH7A – 80**
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 2.3.1

PI 2.3.1		The fishery meets national and international requirements for the protection of ETP species The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Known effects of the fishery are likely to be within limits of national and international requirements for protection of ETP species.	The effects of the fishery are known and are highly likely to be within limits of national and international requirements for protection of ETP species.	There is a high degree of certainty that the effects of the fishery are within limits of national and international requirements for protection of ETP species.
	Met?	Mammals -Y Birds-Y Reptiles-Y Fishes-Y Coral-Y	Mammals -Y Birds-Y Reptiles-Y Fishes-Y Coral-Y	Mammals -Y Birds-Y Reptiles-Y Fishes-Y Coral-Y

PI 2.3.1		The fishery meets national and international requirements for the protection of ETP species The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species		
	Justification	Mammals: there are no indications of fishery-induced mortalities (Thompson and Berkenbusch 2013). Seabirds: despite large numbers of seabirds seen around deepwater vessels, interactions are infrequent in these fisheries. In the period between 2002–03 and 2011–12 a total of 46 seabird captures were recorded in the three fisheries being assessed. Most of the observed seabird captures (36 captures) occurred on the East and South Chatham Rise and Northwest Chatham Rise (9 captures). Captures included Salvin's, Buller's, whitecapped, Chatham albatrosses and unidentified large albatross none of which are classed as endangered within the New Zealand seabird threat classification. The NZ NPOA-Seabirds shows that fishery interactions with these seabird species are at or above the potential biological removals (PBR), and therefore considered at risk. The orange roughy fisheries, however, contribute a negligible proportion of the interactions, thus not hindering the recovery of the seabird species. There are no quantitative limits or defined levels of impact of fishing on seabird populations in New Zealand; the key management objective is to minimize impacts and mortalities. There is a process to undertake semi-quantitative estimates of the risk to New Zealand seabird species from all commercial fisheries. Captures by orange roughy trawl fisheries in the UoC areas of seabirds are very low each year (Thompson and Berkenbusch 2013), particulary when set against overall fisheries interactions with these species in NZ waters (MPI protected species bycatch database 2015) Sharks: Some shark species (e.g., basking shark and great white shark) are prohibited species under the Fisheries Act. None of the protected species interact with the orange roughy fisheries. Benthic organisms: a variety of cold water corals are caught and brought up on deck, or disturbed by bottom trawling. Black corals (all species in the order Antipatharia); Gorgonian corals (all species in the order Gorgonacea); and, Stony corals (all species in the order Scleractinia) are protected under the provisions of the NZ Wildlife Act 1953. MPI (2015) provides a comprehensive analysis of the overlap of the orange roughy fisheries in the three UoC areas with observed and predicted distributions of protected coral species (Table 25). The overlap ranges from 4.4-38.8% of observed coral to 0.0-7.1% of predicted coral distributions for the most recent five years (2009-2013; see Section 3.4.2 and scoring issue B). National legislation does not set numerical limits on coral interactions, but does require minimizing impacts; the orange roughy fisheries tend to fish in previously fished areas on UTFs, which minimizes new damage. New Zealand does not set quantitative limits on the interactions of the orange roughy fisheries, but has strong policies and strategies for minimizing interactions with marine mammals and seabirds. The policies also apply to corals, and measures such as closed areas and limited trawl lines apply to the fisheries. Therefore, the fisheries has a high degree of certainty to be within limits of national and international requirements for all ETP elements.		
b	Guidepost	Known direct effects are unlikely to create unacceptable impacts to ETP species.	Direct effects are highly unlikely to create unacceptable impacts to ETP species.	There is a high degree of confidence that there are no significant detrimental direct effects of the fishery on ETP species.
	Met?	All areas:	All areas:	All areas:

PI 2.3.1		The fishery meets national and international requirements for the protection of ETP species The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species		
		Mammals -Y Birds-Y Reptiles-Y Fishes-Y Coral-Y	Mammals -Y Birds-Y Reptiles-Y Fishes-Y Coral: ORH7A-Y; NWCR and ESCR-N	Mammals-Y Birds-Y Reptiles-Y Fishes-Y Coral-N

PI 2.3.1		The fishery meets national and international requirements for the protection of ETP species The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species
	Justification	The zero to negligible interactions demonstrated in Scoring issue a and section 3.4.2. provide evidence that these fisheries have a high degree of confidence that unacceptable impacts for seabirds and marine mammals do not occur. Clark et. al (2015) presents observed (from observer data) and predicted (from habitat suitability models) overlap of the fisheries with protected corals. Predicted overlap of the fisheries is much lower based on habitat suitability, likely because of the largely fishery-dependant nature of the coral observation data. The assessment team considered the observed overlap unrealisticaly conservative, and the predicted overlap too uncertain to take at face value. Therefore, the team considered both observed and predicted in assessing the overlap.The limited overlap (less than 20% for all coral groups over the past 5 years) of the fishery in the Challenger-Westpac area with corals for both observed and predicted distributions (Table 25) demonstrates that the fishery is at least highly unlikely (≤20%) to create unacceptable impacts, reaching the SG80. The higher overlap in NWCR and ESCR (≤30%) meets only the unlikely to create unacceptable impacts (SG60) level. It is not clear that sufficient analysis has occurred in the NWCR and ESCR areas to demonstrate that the fisheries are highly unlikely to have unacceptable impacts for deep sea corals, due to discrepancies between observed and predicted distribution of protected corals and the overlap with the orange roughy trawl footprint in the three UoC areas. Specifically of concern is high (>60%) observed overlap in NWCR and ESCR of the orange roughy fishery with black corals (MPI 2015), although this overlap has been reduced substantially over the five year period between 2009 and 2014. In the absence of ground-truthing of the predicitive model, and the fact that the trawl fishery does expand to new areas (albeit at a very slow and continually reduced rate), it is not possible to determine that the fishery does not pose a risk of serious or irreversible harm to ETP coral species in these areas with high liklihood as defined by the MSC standard. A substantial part of the Kermadec Bioregion that supports the ETP coral groups discussed here, lies outside of the New Zealand EEZ (Figure 19). There are, therefore, substantial areas of coral habitat and coral abundance outside of the EEZ (e.g. Clark *et al*., 2015). While parts of the area outside of the EEZ have also been fished for orange roughy, as evidenced by the fishery on the Westpac Bank, the fishing is managed by the conservation and management measures (CMMs) set by the non-tuna RFMO, SPRFMO[14], and implemented by its members. The vast majority of the SPRFMO Convention Area (>98%) is not fishable, being deeper than 2,000m (Table 3.1.1.1. Williams et al., 2011). Of the 1.1% of the SPRFMO Convention Area that is shallower than 2,000 m, about 0.5% is deeper than 1,500 m and thus deeper than orange roughy fisheries normally operate, has never been fished and is not within any footprint declared to SPFRMO. This means that >99% of the SPRFMO Convention Area is either outside of the combined Australian and NZ footprint and therefore formally closed to bottom fishing by the binding bottom fishing CMM implemented by SPRFMO, or effectively inaccessible to bottom fishing due to depth.

[14] www.sprfmo.int

PI 2.3.1		**The fishery meets national and international requirements for the protection of ETP species** **The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species**		
		In addition, Scleractinian corals are found at depths below those at which the orange roughy fisheries operate (see Figure 54 in Clark *et al.*, 2015). For depth distribution of tows see Figure 4 in MFish, 2008). Williams *et al*. (2011) provide estimates of areas by depth zone, with the area in South Pacific Regional Fisheries Management Organisation (SPRFMO) Convention Area between 1,500 m and 2,000 m deep, which has seen very little fishing. Within the SPRFMO Convention Area, the unfished area was estimated at 273,389 km^2 which represents about 43% of the area between 200 m and 2,000 m (Williams *et al*., 2011). This represents a considerable area for coral to exist without disturbance from fishing. However, according to Clark *et al.* (2011) connectivity of fauna between UTFs is important for maintaining the productivity of the system. The dispersal capabilities of benthic invertebrates are not well known, but a review of inshore invertebrate taxa indicated most were able to disperse less than 100 km (Kinlan and Gaines 2003). So while it is true that a substantial area of coral habitat within the bioregion as a whole is unimmpacted by fishing, it is possible that fished UTFs isolated by 100 km or more from other UTFs will have slower recolonization that more connected UTFs. The time scale of the recolonization would depend on what recruitment could occur from more distant features and on the amount or coral remaining on the fished UTF. On balance, it is possible that on the scale of the UoAs, due to the large overlap between the orange roughy fishery, particularly on the Chatham Rise, and observed coral distributions, could be having an impact on the ability for ETP coral species to recover from disturbance. Therefore it cannot be said, for NWCR and ESCR, that direct effects of orange roughy fishing are highly unlikely to create unacceptable impacts to ETP species. MSC requires for the SG80 to be met, that “known direct effects of the fishery are highly unikely to hinder recovery or rebuilding of ETP species/stocks.” The assessment team is aware of unanalyzed data from a number of projects that, when analysed, could be a source of reduced uncertainty. However, the assessment team cannot analyse raw data to draw conclusions; only after the analyses can the data inform the conclusion, thus the SG80 level is not met for NWCR and ESCR with regard to ETP coral species.		
c	**Guidepost**		Indirect effects have been considered and are thought to be unlikely to create unacceptable impacts.	There is a high degree of confidence that there are no significant detrimental indirect effects of the fishery on ETP species.
	Met?		All groups and areas-Y	All areas: Mammals –Y Birds-Y Reptiles-Y Fishes-Y Coral-N

PI 2.3.1		**The fishery meets national and international requirements for the protection of ETP species** **The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species**
	Justification	No ETP species have been identified where orange roughy is a significant element of its diet, and the levels of by-catch are low, thus competition between the fishery and ETP species for food is extremely unlikely (Dunn 2013). Regarding corals, studies as reported in MPI (2015) show the possibility of indirect trawl impacts on corals created from the trawl 'sediment plume,' particularly over soft substrates. UTFs considered to be heavily fished still contain diverse assemblages of corals and other epibenthic fauna and no difference in species numbers or community structures in coral-dominated UTFs within or outside of protected areas (coral dominance indicated no or only light fishing) has been observed (Consalvey, 2006; Clark et al., 2015b). This suggests that coral diversity continues to be maintained on fished UTFs, as most UTFs are fished only on established tow lines, leaving areas of many UTFs unfished because the seabed is too rough or steep to trawl, or where orange roughy do not aggregate. Recent information from trawl surveys supports a conclusion that coral will remain well established on fished UTFs, although not at the density prior to trawling. However, as there are no known studies specifically examining sediment mobilization by fishing gear in deep-sea fisheries and its effects, there is not a high degree of confidence that there are no significant detrimental indirect effects of the fisheries on ETP species in the UoCs under assessment.
References		Thompson and Berkenbusch 2013; MPI 2015 Protected species bycatch database 2015 (https://data.dragonfly.co.nz/psc/v20140201/explore/)
OVERALL PERFORMANCE INDICATOR SCORE:		**ORH3B ESCR-75** **ORH3B NWCR-75** **ORH7A-95**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.3.2

PI 2.3.2		The fishery has in place precautionary management strategies designed to: • Meet national and international requirements; • Ensure the fishery does not pose a risk of serious harm to ETP species; • Ensure the fishery does not hinder recovery of ETP species; and • Minimise mortality of ETP species.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place that minimise mortality of ETP species, and are expected to be highly likely to achieve national and international requirements for the protection of ETP species.	There is a strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to be highly likely to achieve national and international requirements for the protection of ETP species.	There is a comprehensive strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to achieve above national and international requirements for the protection of ETP species.
	Met?	All groups-Y	All groups: Y	Mammals, seabirds, sharks: Y Corals-N

PI 2.3.2		**The fishery has in place precautionary management strategies designed to:** • **Meet national and international requirements;** • **Ensure the fishery does not pose a risk of serious harm to ETP species;** • **Ensure the fishery does not hinder recovery of ETP species; and** • **Minimise mortality of ETP species.**		
	Justification	The strategic framework for managing protected species interactions with deepwater fisheries currently includes: • Legislation: the Fisheries Act, Wildlife Act, and Marine Mammals Protection Act • The National Plan of Action – Sharks (MPI 2013) • The Annual Operational Plan for Deepwater Fisheries (MPI 2012) • The National Fisheries Plan for Deepwater and Middle-depth Fisheries (Ministry of Fisheries 2010) • The Marine Conservation Services Programme (e.g., Annual Plan, DOC 2011) • The National Plan of Action—Seabirds (MPI 2013) When impacts of fishing are such that they are causing an adverse effect on the Marine Environment (Fisheries Act s 2, s8), measures are to be taken pursuant to the Conservation Act 1987 and the Director-General of where the Department of Conservation will implement measures, including: • research relating to those effects on protected species: • research on measures to mitigate the adverse effects of commercial fishing on protected species: • the development of population management plans under the Wildlife Act 1953 and the Marine Mammals Protection Act 1978. Cold water corals are fully protected under the Wildlife Act 1953, and Benthic Protection Areas provide areas off limits to bottom trawl fisheries. Interactions between fisheries and ETP species are monitored through the NZ Observer Programme and vessel reporting. Overall, policy frameworks and their implementation through a series of measures explicitly designed to manage the impact of fisheries on ETP species comprise a strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to be highly likely to achieve national and international requirements for the protection of ETP species. Furthermore, with respect to seabirds, mammals and fishes (sharks), the respective NPOAs comprise comprehensive strategies in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to achieve above national and international requirements for the protection of ETP species. This meets the SG100 level for these ETP groups, however no equivalent comprehensive strategy as defined by MSC is available for protected corals, therefore this group does not meet the SG100 level.		
b	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is an objective basis for confidence that the strategy will work, based on information directly about the fishery and/or the species involved.	The strategy is mainly based on information directly about the fishery and/or species involved, and a quantitative analysis supports high confidence that the strategy will work.
	Met?	Y	Y	N

PI 2.3.2		**The fishery has in place precautionary management strategies designed to:** • **Meet national and international requirements;** • **Ensure the fishery does not pose a risk of serious harm to ETP species;** • **Ensure the fishery does not hinder recovery of ETP species; and** • **Minimise mortality of ETP species.**		
	Justification	There is an objective basis of confidence that the above-described strategy will work based on information directly about the fishery and species involved. Interactions between the orange roughy fisheries in the three UoC areas and protected mammals, seabirds, and sharks are minimal, particularly when compared with overall interactions with these species groups across NZ. This is at least in part owing to the strategy above with clear objectives and corresponding operational procedures in place to minimize interactions between the orange roughy fisheries and ETP species. Regarding protected corals, there is an objective basis for confidence that BPAs as a strategy to limit fisheries interactions with these habiats will work, as effectively enforced closed areas to trawling as a means of protecting sensitive habitat is widely known to be an effective strategy. The practice of using the same tow paths on previously fished parts of UTFs reduces the scale of the damage from towing. Maintenance of this practice will keep the fishery impacts within current accepable bounds.		
c	**Guidepost**		There is evidence that the strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Y	Y-mammals, birds, sharks N-corals
	Justification	Good observer and VMS data on fishery interactions with protected species (including avoidance of protected corals inside and outside of BPAs; and the 100% observer coverage and VME-focused move-on rule outside the EEZ), and compliance with vessel operational procedures such as those designed to minimize capture of seabirds, provides clear evience that the strategies described above are being implemented successfully. In addition, monitoring and review components of the strategies contained in the NPOAs for sharks and seabirds ensure the implementation of the strategies remain effective over time. This meets the SG60, SG80, and SG100 for mammals, birds, and sharks. For corals, the MPA policy for benthic habitats is still under development; therefore, the SG100 is not met for corals.		
d	**Guidepost**			There is evidence that the strategy is achieving its objective.
	Met?			Y-all groups but corals N-corals
	Justification	Very limited interaction between the orange roughy fisheries in the three UoC areas and protected mammals, seabirds, and sharks provides evidence that the goal of ensuring fishery impacts on ETP species remain in line with national and international requirements and do not hinder recovery of ETP species where required. In addition, risk assessments and population studies carried out on seabirds, mammals and sharks showing overall declining mortalities and improved mitigation measures over time provide further evidence that the strategies described above are achieving their objectives (MPI protected species bycatch database 2015). For corals, the MPA policy for benthic habitats is still under development; therefore, the SG100 is not met for corals.		
References		Ministry of Fisheries 2010; MPI 2012; MPI 2013; MPI 2015; DOC 2011; Dragonfly, 2013		

PI 2.3.2	**The fishery has in place precautionary management strategies designed to:** • **Meet national and international requirements;** • **Ensure the fishery does not pose a risk of serious harm to ETP species;** • **Ensure the fishery does not hinder recovery of ETP species; and** • **Minimise mortality of ETP species.**	
OVERALL PERFORMANCE INDICATOR SCORE:		**90**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.3.3

PI 2.3.3		**Relevant information is collected to support the management of fishery impacts on ETP species, including:** • **Information for the development of the management strategy;** • **Information to assess the effectiveness of the management strategy; and** • **Information to determine the outcome status of ETP species.**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Information is sufficient to qualitatively estimate the fishery related mortality of ETP species.	Sufficient information is available to allow fishery related mortality and the impact of fishing to be quantitatively estimated for ETP species.	Information is sufficient to quantitatively estimate outcome status of ETP species with a high degree of certainty.
	Met?	Y	Y	N – ORH7A; Not scored – ORH3B ESCR and NWCR
	Justification	Sufficient information is available to allow fishery related mortality and the impact of fishing to be quantitatively estimated for all ETP species groups. This information includes interactions between the fishery and protected species from observer data, VMS tracks (in relation to coral habitat and BPAs), supported by ecological risk assessments pertaining to the likely effects of orange roughy fishing on ETP species (e.g. Boyd 2013). The MPI protected species bycatch database contains good records and anaysis of fisheries interactions by gear, vessel size, and ETP bird, mammal and reptile species across NZ commericial fisheries. In addition, regular analysis and monitoring of the ORH fishery trawl footprint in relation to ETP coral groups is a relevant quantitative proxy for fishery related mortality on these benthic species. However, there is only quantitative estimates of outcomes status for some ETP species and this is not sufficient to reach the SG100 level, which requires a 'high degree of certainty'.		
b	**Guidepost**	Information is adequate to broadly understand the impact of the fishery on ETP species.	Information is sufficient to determine whether the fishery may be a threat to protection and recovery of the ETP species.	Accurate and verifiable information is available on the magnitude of all impacts, mortalities and injuries and the consequences for the status of ETP species.
	Met?	Y	Y-all groups in ORH7A, and all groups except corals in ORH3B ESCR and NWCR N-corals in ORH3B ESCR and NWCR	N – ORH7A; Not scored – ORH3B ESCR and NWCR
	Justification	Information on interactions between the fishery and protected species comes from observer data, VMS tracks (in relation to coral habitat and BPAs), supported by ecological risk assessments (e.g. Boyd 2013) is sufficient for determining the likely effects of orange roughy fishing on ETP species except coral. The MPI protected species bycatch database contains good records and anaysis of fisheries interactions by gear, vessel size, and ETP bird, mammal and reptile species across NZ commericial fisheries. Although there has been a comprehensive analysis on the distribution of corals and its overlap with orange roughy fisheries in the three UoC areas as well as contained within BPAs in these areas (MPI 2015), the large descrepency between observed and predicted occurances of coral and the commensurate large descrepency in observed vs predicted degree of overlap of protected corals with the orange roughy fisheries creates uncertainty in determining whether the fishery may be threat to the protection of these species in the Chatham Rise UOAs. See justification under 2.3.1 scoring issue B for further rationale.		

PI 2.3.3		**Relevant information is collected to support the management of fishery impacts on ETP species, including:** • **Information for the development of the management strategy;** • **Information to assess the effectiveness of the management strategy; and** • **Information to determine the outcome status of ETP species.**		
c	**Guidepost**	Information is adequate to support measures to manage the impacts on ETP species.	Information is sufficient to measure trends and support a full strategy to manage impacts on ETP species.	Information is adequate to support a comprehensive strategy to manage impacts, minimize mortality and injury of ETP species, and evaluate with a high degree of certainty whether a strategy is achieving its objectives.
	Met?	Y	Y	N – ORH7A; Not scored – ORH3B ESCR and NWCR
	Justification	The strategic framework for managing protected species interactions with deepwater fisheries is described under PI 2.3.1. When impacts of fishing are such that they are causing an adverse effect on the Marine Environment (Fisheries Act s2, s8), measures are to be taken pursuant to the Conservation Act 1987 and the Director-General of where the Department of Conservation will implement measures, including: • research relating to those effects on protected species: • research on measures to mitigate the adverse effects of commercial fishing on protected species: • the development of population management plans under the Wildlife Act 1953 and the Marine Mammals Protection Act 1978. Information collected through observers, vessel monitoring systems, research surveys, and other research projects, such as anlyses in MPI (2015) making use of existing datasets to understand fishery interactions with protected species or sensitive habitats is sufficient to measure trends and support the above-described strategy for managing impacts on ETP species. In addition, regarding protected coral species, regular monitoring and reporting of the ORH trawl footprint in relation to coral habitat provides trend data relevant for evalution of the likely impact of the fishery on these protected species.		
References		MPI 2015; Boyd 2013		

OVERALL PERFORMANCE INDICATOR SCORE:	**80-ORH7A** **75-ESCR, NWCR**
CONDITION NUMBER (if relevant):	**3**

Evaluation Table for PI 2.4.1

PI 2.4.1		The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The fishery is unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.	The fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.	There is evidence that the fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.
	Met?	Y	Y	Partial

PI 2.4.1		The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function
	Justification	MSC provides examples of "serious or irreversable harm" to habitats to include the loss (extinction) of habitat types, depletion of key habitat forming species or associated species to the extent that they meet criteria for high risk of extinction, and significant alteration of habitat cover/mosaic that causes major change in the structure or diversity of the associated species assemblages. Further, MSC specifies that if a habitat extends beyond the area fished then the full range of the habitat should be considered when evaluating the effects of the fishery. The 'full range' of a habitat shall include areas that may be spatially disconnected from the area affected by the fishery and may include both pristine areas and areas affected by other fisheries. It is recognized that when demersal trawl gear touches the bottom, damage is done to the benthic environment and the communities that dwell there. Depending on the type of habitat, type of interaction, its duration and frequency; some areas may receive permanent damage while other areas will be able to recover in relatively short time periods. Damage to some habitats in this fishery occurs with minimal trawling and will be long lasting due to the nature of the key benthic organisms and the depth (e.g. biogenic habitat with vertical relief). Damage will, however, be restricted to areas trawled so that, the extent of any damage will be in proportion to the trawl footprint of the fishery. Orange roughy fishing occurs over two distinct habitat types—UTFs, and slope which are considered as separate 'scoring elements' for scoring habitat performance indicators. **UTFs (all UoCs):**The Orange Roughy fishery in all three UoC areas is highly unlikely (no more than 30% probability) to reduce habitat structure and function to a point where there would be serious or irreversible harm as defined above by MSC. In addition, there is some evidence to this effect. The UTF habitat scoring element can be considered to comprise all UTFs within the orange roughy distribution range in the Kermadec bioregion, of which there are 573 in total. Of these 151 (about 25%) were fished within the last 5 years. 116 (about 20%) are located within the combined UoCs, and of these, 72 (62% of those in the UoCs, 48% of those fished within the bioregion, and 13% of total UTFs in the bioregion within the orange roughy distribution range) were fished within the last 5 years (see Table 28). Therefore, over the last 5 years, the maximum amount of structural damage to UTF habitats within the orange roughy distribution range that could be attributed to orange roughy fishing in the UoC areas is 13%, assuming 100% habitat destruction of habitat on the fished UTFs in the UoC areas. According to Black at al. (2013), there have been no studies investigating whether current trawling frequencies have had adverse effects on the structure and function of benthic communities, or on the productivity of the associated fisheries. In the orange roughy fishery on the Chatham Rise, which is prosecuted primarily in the 800–1200 m depth zone, there is evidence that fishing effort has shifted geographically over time in response to changes in catch rates on individual hills (MPI 2012). The fishery expands to new areas each year, but the rate of additional 'new area' subjected to trawling in each successive year has continued to decline throughout the time series (Black *et al.* 2013). In 2009-10 new area amounted to 3,208 km^2, which is 4% of the 2009-10 trawl footprint of 79,512 km^2 and less than 1% of the cumulative swept area for the period 1989-90 to 2009-10 of 385,032 km^2. However, the extent to which this might be linked to impaired benthic ecosystem functioning has yet to be determined. The results of the NIWA study (Roux, 2015) are summarized below: A total of 591 UTFs (318 hills, 136 knolls and 137 seamounts) were identified within the orange roughy distribution range in the New Zealand EEZ and Kermadec bioregion. Of these, 451 were in the EEZ and 573 were in the bioregion (note these numbers are not additive as a portion of the EEZ is within the bioregion—573 UTFs are in the bioregion excluding the overlapping EEZ portion, and 591 UTFs are in the bioregion, including that portion that is within the EEZ, and 451 UTFs are in the EEZ as a whole, including both areas inside and outside the bioregion) The total number of fished UTFs over the last five years was 156. Of these, 144 were in the EEZ, while 151 occurred in the bioregion. The total number of fished UTFs within the Kermadec bioregion (both within and outside the EEZ) was 151 (124 hills, 12 knolls and 15 seamounts). The total number of fished UTFs within the New Zealand EEZ between 2008-09 and 2012-13 was 144 (124 hills, 14 knolls and 6 seamounts), of which half (72) were located within the UoCs. Only twelve of the 140 UTFs located in the bioregion outside the EEZ were fished between 2008–09 and 2012–13. UoC ORH7A&Westpac had a total of 5 UTFs (all hills), including four that were fished. None had coral presence.

PI 2.4.1		The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function
		Reef-building stony corals (*O. Scleractinia*) are the main habitat-forming taxa on UTFs (Clark and Anderson 2013). However, heavily fished UTFs may still contain diverse assemblages, and no difference in species number or community structure in coral-dominated UTFs within or outside of a protected area (coral dominance indicated no or only light fishing) has been observed (Consalvey 2006). There is evidence that coral diversity may be maintained on fished UTFs, as operational procedures and physical environmental attributes tend to localise trawl footprints. Trawling tends to be restricted to specific areas, e.g., following specific trawl paths on UTFs, leaving substantial areas of many UTFs un-impacted. (NIWA 2015b). Thus, there is evidence that complete serious or irreversible habitat destruction even on the 12% of fished UTFs within the UoC areas in the orange roughy distribution area of the bioregion is highly unlikely. Based on the low overlap of the orange roughy fishery in the UoC areas with orange-roughy-associated UTFs on a bioregional basis, and evidence of portions of fished UTFs remaining inaccessible to trawls, and evidence from fishing patterns year over year that fished UTFs remain suitable for orange roughy fishing over time, it is considered highly unlikely that the orange roughy fishery within the UoC areas is reducing structure and function of UTF habitats in the bioregion to the point of serious or irreversible harm. (PI score of 90). <u>Slope habitat (all UoCs)</u> Black et. al (2015) provide an analysis of the orange roughy and oreo trawl footprint in relation to slope habitat in each of the three UoC areas under assessment. The following are the summary conclusions from this analysis: • The proportion of the orange roughy habitat area that falls within closed areas ranges between 0.3% (NWCR) and 15.1% (ORH7A+Westpac Bank) • In the period between 2009 and 2013, the proportion of orange roughy habitat area swept ranges between 0.3% (ORH7A+Westpac Bank) and 7.6% (ORH3B ESCR). Over the full time period, this swept area ranges between 9.1% (ORH7A+Westpac Bank) and 35.1% (ORH3B NWCR). • ORH7A+Westpac Bank has the lowest percentage of newly swept seafloor during the 2009-2013 period (0%), followed by ORH3B NWCR (0.9%) and ORH3B ESCR (2.1%). • Within the EEZ bioregion, the orange roughy habitat swept amounts to 1.3% in the 2009-2013 period, and 7.1% in all years. Although it has been somewhat higher in the past (e.g. 35.1% for ORH3B NWCR over the past 24 years), the very low proportion of orange roughy/oreo slope habitat that has been swept by trawling in the three UoC areas under assessment and within the bioregion where orange roughy are distributed makes it highly unlikely that the fishery is reducing slope habitat structure and function to a point where there would be serious or irreversible harm. Similar to UTF habitats, evidence from fishing patterns year over year that fished areas of slope habitat remain suitable for orange roughy fishing over time provides some evidence that slope habitat structure and function are not being seriously or irreversibly harmed by the fishery. (PI score of 90).
References		NIWA 2014; Black et al 2013; Consalvey 2006; MPI 2012; NIWA 2015b (part II of habatits study); Black et. a. 2015.
OVERALL PERFORMANCE INDICATOR SCORE:		**90**
CONDITION NUMBER (if relevant):		**N/A**

Evaluation Table for PI 2.4.2

PI 2.4.2		There is a strategy in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance.	There is a partial strategy in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above.	There is a strategy in place for managing the impact of the fishery on habitat types.
	Met?	Y	Y	N
	Justification	There are a number of key elements of the approach to managing fisheries impacts on habitat under a range of different legislative tools. These include: ▪ The closing of about one third of the New Zealand EEZ to bottom fishing though the designation of Benthic Protection areas (BPAs). ▪ The designation or Marine Protected Areas (MPAs). ▪ The designation of Marine Reserves. ▪ Monitoring vessel position In the New Zealand Territorial Sea (TS) and EEZ there are substantial areas closed to bottom fishing, including marine reserves, marine protected areas (MPAs) and large Benthic Protected Areas (BPAs) and all contribute to protecting the environment generally and from the impact of trawling (SR 2007/308). These areas are largely based on the analysis of physical and some biological attributes and in total exclude bottom trawling from around 30% of the New Zealand EEZ to minimize benthic impact, safeguard habitats and protect representative marine benthic ecosystems and biodiversity in accordance with s 8(1) of the Fisheries Act 1996 which focuses on avoidance, mitigation or remedy of "*any adverse effects of fishing on the aquatic environment*." Marine reserves are closed to all fishing and BPAs are open only to trawling that does not contact the seabed (any trawling fewer than 100 meters directly above the seabed is prohibited, and trawling above this level has substantial verification requirements including Electronic Net Monitoring Systems; SR 2007/308). Penalties for violating bottom trawl bans in BPAs include fines of up to NZD 100,000 and criminal charges. To qualify as Marine Protected Areas (MPAs), sites must be under a level of protection that allows their habitats and ecosystems to remain at (or recover to) a healthy state. Although protected coral species are considered separately here under the ETP component, their presence within protected areas in both the UoC areas under assessment and within the bioregion as a whole can be used here to substantiate the effectivness of protected areas as part of a strategy to mitigate adverse effects of fishing on UTF habitats. According to Clark et. al. (2015), proportions of protected coral species in protected areas (BPAs or MPAs) within the UoC areas under assessment comprise between 0% (for black corals and stony corals in ORH7A) and 32% (for stony corals in ORH3B NWCR) of observed occurances, and between 1% (for black corals in ORH3B NWCR) and 25% (for stony corals in ORH7A) of predicted occurances. Within the EEZ bioregion as a whole, the observed proportion of protected corals in protected areas is between 9% and 13%, and the predicted proportion is between 18% and 29%. As discussed in the previous section, the differences between observed and predicted occurances of corals in protected areas is likely primarily due to the lack of fishery-dependant observations in areas where there is no fishing.		

PI 2.4.2		There is a strategy in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types		
		Although NZ has been developing a benthic impacts strategy since 2008 in SPRFMO area and 2011 within the EEZ, this strategy is not yet fully implemented. However, there is an MPA framework that is made up of the MPA Policy and the Marine Reserves Act of 1971, and there is evidence of continuing and accelerating establishment of MPAs in New Zealand (Table 29) even in the absence of the implementation of the abovementioned strategy. The network of MPAs and BPAs, the representativeness of habitat they encompass, and the restrictions on bottom trawling they include within the UoC areas and the bioregion as a whole comprise at least a partial strategy that is expected to achieve the Habitat Outcome 80 level of performance or above.		
b	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/habitats).	There is some objective basis for confidence that the partial strategy will work, based on information directly about the fishery and/or habitats involved.	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or habitats involved.
	Met?	Y	Y	N
	Justification	Objective basis for confidence that the partial strategy will work/is working includes evidence that the restrictions on bottom fishing in MPAs and BPAs are effectively enforced. Orange roughy fishing in the UoA areas and elsewhere within the NZ EEZ is fully monitored through VMS and observer coverage and there have been no violations since the implementation of closed areas to bottom trawling by vessels targeting orange roughy (See section 3.4.8). In addition, the quality of UTF and slope habitats, specifically coral composition and density is well mapped, studied and regularly monitored such that the objectives of the Fisheries Act 1996 which focuses on avoidance, mitigation or remedy of "any adverse effects of fishing on the aquatic environment" can be achieved. In addition, there are a series of criteria in development under the habitat protection standard that will be based around an assessment of the risk that fishing poses to each habitat type in question (MPI 2015). The habitat assessment under this standard will take into account: • how sensitive the biological and physical components of each habitat are; • the reversibility of the likely impacts; and • the relative importance of the habitat to ecosystem function. And these criteria will be used on an ongoing basis to identify any new areas that are in need of protection based on research and monitoring results (as evidenced by Table 29). Together, this meets the SG80. However, the partial strategy has not been tested.		
c	**Guidepost**		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Y	Y

PI 2.4.2		**There is a strategy in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types**		
	Justification	Orange roughy fishing in the UoA areas and elsewhere within the NZ EEZ is fully monitored through VMS and observer coverage and there have been no violations since the implementation of closed areas to bottom trawling by vessels targeting orange roughy (See section 3.4.8). In addition, the quality of UTF and slope habitats, specifically coral composition and density is well mapped, studied and regularly monitored such that the objectives of the Fisheries Act 1996 which focuses on avoidance, mitigation or remedy of "any adverse effects of fishing on the aquatic environment" can be achieved. This provides clear evidence of successfully implemtation, and achieves the SG80 and SG100.		
d	**Guidepost**			There is some evidence that the strategy is achieving its objective.
	Met?			N
	Justification	The Annual Review of deepwater fisheries provides metrics for indicators of benthic impacts from deepwater fisheries, including orange roughy (MPI 2015). However, the Annual review has not provided evidence of evaluation of the partial strategy against the objectives to determine the level of success, thereby not meeting the SG100.		
References		MPI (2015c)		
OVERALL PERFORMANCE INDICATOR SCORE:				**85**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.4.3

PI 2.4.3		Information is adequate to determine the risk posed to habitat types by the fishery and the effectiveness of the strategy to manage impacts on habitat types		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There is basic understanding of the types and distribution of main habitats in the area of the fishery.	The nature, distribution and vulnerability of all main habitat types in the fishery are known at a level of detail relevant to the scale and intensity of the fishery.	The distribution of habitat types is known over their range, with particular attention to the occurrence of vulnerable habitat types.
	Met?	Y	Y	Y
	Justification	Within the NZ EEZ and Kermadec Bioregion there is excellent information on the location and features of UTFs available from the Seamounts database managed by NIWA (SEAMOUNT V2 as described by Rowden et al. 2008). In addition, there is excellent information on the distribution of protected coral species within these areas broadly, and in the UoA areas specifically from a NIWA dataset of protected coral captures (both fisheries dependent and independent) that have been used to model observed and predicted coral distributions across fished and unfished areas (Baird et al., 2013; NIWA 2015). Particularly vulerable habitat types such as seamounts and hydrothermal vents are well mapped and monitored. There is also excellent data on the extent of interaction between the orange roughy fisheries in the three UoAs and the bioregion as a whole with slope habitats (Black et. al. 2015). Therefore the distribution of habitat types and vulnerable habitats is known over the range, meeting SG60, SG80, and SG100.		
b	**Guidepost**	Information is adequate to broadly understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear.	Sufficient data are available to allow the nature of the impacts of the fishery on habitat types to be identified and there is reliable information on the spatial extent of interaction, and the timing and location of use of the fishing gear.	The physical impacts of the gear on the habitat types have been quantified fully.
	Met?	Y	Y	N
	Justification	Sufficient data on trawl footprint within the UoA areas under assessment are available to allow the nature of the impacts of the fishery on UTF and slope habitat types to be identified. And there is reliable information on the spatial extent of the interaction when considering the trawl footprint analysis and trawl tow location information (NIWA 2014) in combination with the habitat mapping described above under Scoring Issue A. While the physical impacts of the gear on habitat types have not been fully quantified, there is on-going collection of relevant data from observer, vessel monitoring and research programs providing robust information on trawl footprint and the impact of trawling on slope and UTF habitats for the fisheries. This meets the SG60 and SG80, but not the SG100.		

PI 2.4.3		Information is adequate to determine the risk posed to habitat types by the fishery and the effectiveness of the strategy to manage impacts on habitat types		
c	Guidepost		Sufficient data continue to be collected to detect any increase in risk to habitat (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).	Changes in habitat distributions over time are measured.
	Met?		Y	Y
	Justification	While the physical impacts of the gear on habitat types have not been fully quantified, there is on-going collection of relevant data from observer, vessel monitoring and research programs providing robust information on trawl footprint and the impact of trawling and recovery for the fisheries. Through the implementation of MPIs benthic impacts/habitats strategy, habitat distributions are monitored on a regular basis with specific studies designed to measure the impacts of fishing and identify new areas potentially in need of protecting based on a fixed set of criteria (MPI 2015). This meets the requirements for detecting changes in risk, and changes in habitat distributions, meeting the SG 80 and SG100.		
References		MPI, 2015c; NIWA 2014; NIWA 2015; Rowden et al. 2008; Baird et al. 2013		
OVERALL PERFORMANCE INDICATOR SCORE:				**95**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.5.1

PI 2.5.1		The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The fishery is unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	The fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	There is evidence that the fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.
	Met?	Y	Y	Y
	Justification	According to the MSC, serious or irreversible harm in the ecosystem context should be interpreted in relation to the capacity of the ecosystem to deliver ecosystem services. Examples include trophic cascades, severely truncated size composition of the ecological community, gross changes in species diversity of the ecological community, or changes in genetic diversity of species caused by selective fishing. As with the habitat component, it is reasonable to consider the orange roughy ecosystem as the area over which orange roughy is distributed within the Kemadec bioregion. The orange roughy fisheries in the three UoA areas are highly unlikely (<30% likelihood) to disrupt the key elements underlying ecosystem structure and function to a point where there would be serious or irreversible harm, based on evidence from species composition time series and trophic models. There is a body of research on trophic interactions for orange roughy fisheries generally and trophic models have been developed that include orange roughy, and there is no evidence of loss of functional components or species in the ecosystem or significant changes in the composition of orange roughy prey, predators, or competitors based on catch composition in research trawls, fishery-dependant data, and stomach analyses (Dunn 2013). In addition, monitoring of mesopelagic biomass on the Chatham Rise has suggested no significant change between 2001 and 2010 (O'Driscoll *et al.*, 2011). Although this survey is predominantly at depths shallower than orange roughy, it is likely that the mesopelagic resources overlap with the orange roughy distribution depth range. In addition, the low level of by-catch in the fisheries indicates direct ecosystem effects from removals are likely to be small, and the footprint of the orange roughy fishery in the three UoC areas is small relative to the orange roughy distribution area within the bioregion. Also, benthic impact that may damage ecosystem structure and function are restricted to <20% of the fishery management areas, and there are also areas that are currently fully protected from trawl impacts through the BPA approach. This provides evidence that the fishery is highly unlikely to disrupt structure and function to the point of serious harm, meeting the SG60, SG80, and SG100.		
References		Dunn 2013; O'Driscoll et al 2011		
OVERALL PERFORMANCE INDICATOR SCORE:				**100**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.5.2

PI 2.5.2		There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place, if necessary.	There is a partial strategy in place, if necessary.	There is a strategy that consists of a plan, in place.
	Met?	Y	Y	Y
	Justification	The New Zealand Fisheries Act 1996 s 8 provides for "the utilisation of fisheries resources while ensuring sustainability." Ecosystem-based management is achieved through a multi-layered approach that considers fishery management (e.g., QMS), vulnerable species needs (e.g., NPOA sharks), ETP management (a host of protected species and related initiatives such as NPOA Seabirds, NPOA Sharks, the protection of marine mammals, and habitat considerations (e.g. BPAs)). Vessel management plans deal specifically with achieving how avoidance and mitigation, and Marine Mammal Operational Procedures seek to minimise interactions with marine mammals. Legislated protection of areas of sea bottom to fishing activities, coupled with good quality monitoring of all fisheries removals that might impact on trophic structure and function and management of fishery removals (e.g. through TACCs), and management of impacts to ETP species, although not with the explicit objective of maintaining ecosystem structure and function, work together to accomplish these objectives. Therefore they can be considered as a strategy that consists of a plan that is in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function, meeting the SG 60, SG80, and SG100.		
b	**Guidepost**	The measures take into account potential impacts of the fishery on key elements of the ecosystem.	The partial strategy takes into account available information and is expected to restrain impacts of the fishery on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.	The strategy, which consists of a plan, contains measures to address all main impacts of the fishery on the ecosystem, and at least some of these measures are in place. The plan and measures are based on well-understood functional relationships between the fishery and the Components and elements of the ecosystem. This plan provides for development of a full strategy that restrains impacts on the ecosystem to ensure the fishery does not cause serious or irreversible harm.
	Met?	Y	Y	N

PI 2.5.2		There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function		
	Justification	Data from the fishery, including observer data together with fishery independent surveys and other research projects are taken into account in the management of the fishery, such as for designation of BPAs, setting of TACCs, management of ETP species interactions, etc. The measures listed under PI 2.5.1 either require some consideration of impacts (e.g. the Fisheries Act), take account of them with the intent of delivering better management (e.g. fisheries management objectives), or seek to manage them to reduce the environmental effects of fishing (e.g. ETP bycatch measures). In addition, research outcomes are fed back into management, although in the areas of ecosystem structure and function, stronger links could be developed. Where unacceptable impacts are detected, the current framework allows them to be addressed, including through fishery management measures. However, management responses so far have addressed individual ecosystem components (e.g. target or other QMS species stock status, bycatch levels, habitat impacts) rather than broader ecosystem effects. Therefore, although management measures naturally work together, this is not through a specific ecosystem design; they are currently not developed across ecosystem components/functions to the level required for the SG100 level. A score of 80 is therefore given.		
c	Guidepost	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ecosystems).	The partial strategy is considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ecosystems).	The measures are considered likely to work based on prior experience, plausible argument or information directly from the fishery/ecosystems involved.
	Met?	Y	Y	N
	Justification	Strategic and operational measures that are in place are considered likely to work, based on information about the fishery and ecosystem components involved (e.g. target and retained species, some ETP species, habitat). For example, target species stocks have been actively managed, fish species brought under the QMS structure, and seabird bycatch mitigation measures introduced, to address sustainability concerns specifically, while BPAs have been put in place to protect benthic ecosystems. Annual review of the Annual Operational Plan for Deepwater Fisheries provides a forum for reviewing the effectiveness of measures, and identification of ongoing and new issues. Detailed monitoring of many aspects of the fishery (e.g. catches of target, retained species, and bycatch (including coral bycatch) allows such review. Orange roughy is not a low trophic level species and the stocks under assessment are at or recovering to target biomass reference levels. Therefore, there is plausible argument that the partial strategy will work, meeting SG 60 and SG80. There is information directly about the fishery pertaining to the impact of orange roughy fishing on ecosystem structure and function such as time series of species/ functional group composition, much of the information indicating that this strategy is working is based on theory or comparison with similar fisheries/ecosystems (e.g. Heymanns et. al 2011; Clark et al 1989; O'Driscoll et. al. 2011) to demonstrate that the measures are likely to work and indeed are working to maintain ecosystem structure and function and avoid serious or irreversible harm. Therefore, the SG100 is not met.		

PI 2.5.2		There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function		
d	Guidepost		There is some evidence that the measures comprising the partial strategy are being implemented successfully.	There is evidence that the measures are being implemented successfully.
	Met?		Y	Y
	Justification	With particular reference to individual ecosystem components (rather than functions), there is evidence that the strategy is being implemented successfully. For example, stock assessments of the target and retained species and monitoring of incidental mortalities of ETP species are ongoing, combined with fishery-independent surveys for many areas, while TACCs and other control mechanisms are being monitored and for the main species adjusted where necessary. BPAs are monitored through observer and VMS coverage, and as part of the partial management strategy provide protection for benthic components to the orange roughy ecosystem inside and outside the EEZ. There is a high level of compliance with management limits on TACC species, ETP and bycatch mitigation measures, and BPAs. There is therefore evidence that the approaches are being implemented successfully. This meets the SG 80 and SG100.		
References		Dunn 2013; Heymanns et. al 2011; Clark et al 1989; O'Driscoll et. al. 2011		
OVERALL PERFORMANCE INDICATOR SCORE:				**90**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.5.3

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Information is adequate to identify the key elements of the ecosystem (e.g., trophic structure and function, community composition, productivity pattern and biodiversity).	Information is adequate to broadly understand the key elements of the ecosystem.	
	Met?	Y	Y	
	Justification	Dietary analyses and trophic models provide information to adequately understand the functions of the key elements of the ecosystem (Stevens et al 2011). The lack of significant levels of retained and discarded by-catch, limited ETP interactions, and potentially limited benthic impacts (based on the trawl foot-prints) indicate a limited ecosystem impact. There is information on trawl footprint, and the impact of trawling and the slow recovery for some UTF habitats (e.g. reef-building stony coral habitat). This shows information leading to a broad understanding of key ecosystem elements, meeting SG60 and SG80.		
b	**Guidepost**	Main impacts of the fishery on these key ecosystem elements can be inferred from existing information, and have not been investigated in detail.	Main impacts of the fishery on these key ecosystem elements can be inferred from existing information and some have been investigated in detail.	Main interactions between the fishery and these ecosystem elements can be inferred from existing information, and have been investigated.
	Met?	Y	Y	Y
	Justification	The main impacts of the fishery on the ecosystem elements such as structure and function can be inferred from the stock assessments (for most fished species), QMS catch trends, observer data, and surveys that cover the target species, related species, as well as specific research related to trawl impacts on habitat structure and function. Some of these impacts have been investigated in detail, as summarized by Dunn (2013) and there is ongoing research and data collection aimed at continuing to inform management with the aim of fulfilling the ecosystem objectives stated in the Fisheries Act. This meets the SG 60 and SG80. The trophic model for the Chatham Rise developed Pinkerton (2008, 2011) is direct investigation of the main interactions. All of the main interactions have been investigated, therefore meeting SG100.		
c	**Guidepost**		The main functions of the Components (i.e., target, Bycatch, Retained and ETP species and Habitats) in the ecosystem are known.	The impacts of the fishery on target, Bycatch, Retained and ETP species are identified and the main functions of these Components in the ecosystem are understood.
	Met?		Y	N

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem		
	Justification	The main functions of the components of the ecosystem have been identified and studied (e.g. Rosecchi et all 1998; Dunn and Forman 2011; Stevens et al 2011; Dunn 2013; O'Driscoll *et al.* 2011) to an extent where they can be considered to be known (noting studies and models on the Chatham Rise are more abundant than those west of NZ (ORH7A). The main functions of ecosystem components are known, though not in detail for some species. Diet studies have been integral to the development of this knowledge. The impacts of the fishery on target, bycatch, retained, and ETP species are identified and have been described in background sections of this report as well as under the Performance Indicator justifications for the respective components. These are monitored on an ongoing basis through the fishery management regime, also described previously for individual components. This meets the SG80. However, for some protected benthic species in particular, knowledge of ecosystem functions is minimal and the knowledge of the potential for trawl fisheries to affect the productivity of benthic communities is not well studied, thereby not meeting the SG100.		
d	**Guidepost**		Sufficient information is available on the impacts of the fishery on these Components to allow some of the main consequences for the ecosystem to be inferred.	Sufficient information is available on the impacts of the fishery on the Components and elements to allow the main consequences for the ecosystem to be inferred.
	Met?		Y	N
	Justification	Information provided in the background sections on Principle 2 and in the scoring issue justifications in P2 component performance indicators demonstrates that sufficient information is available on the impacts of the fishery on ecosystem compoents to allow some of the main consequences for the ecosystem to be inferred. This reaches the SG80. However, as there are limited studies on fishery impacts to actual ecosystem elements that comprise structure and function in the MSC context (see rationales above under other ecosystem component PIs), it is not possible to determine that sufficient information is available in the impacts of the fishery on the components AND elements to allow the main consequences for the ecosystem to be inferred, thereby not reaching the SG100.		
e	**Guidepost**		Sufficient data continue to be collected to detect any increase in risk level (e.g., due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).	Information is sufficient to support the development of strategies to manage ecosystem impacts.
	Met?		Y	N

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem	
	Justification	Catch information, observer information, trawl survey information, and VMS information are sufficient to detect increased risks levels, reaching the SG60 and SG80 levels. The footprint of the fishery is well identified, but the distribution of protected coral is sufficiently uncertain that relience on predicted distribution could lead to overestimates of the range, and possibly higher than anticipated impacts. This also leads to some uncertainties in developing a strategy for maintaining structure and function of coral and benthic components of the ecosystem, thereby not meeting SG100.	
References		Rosecchi et all 1998; Dunn and Forman 2011; Stevens et al 2011; Dunn 2013; O'Driscoll et al. 2011	
OVERALL PERFORMANCE INDICATOR SCORE:			**85**
CONDITION NUMBER (if relevant):			

Principle 3

Evaluation Table for PI 3.1.1

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** • **Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and** • **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** • **Incorporates an appropriate dispute resolution framework.**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There is an effective national legal system and a framework for cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2	There is an effective national legal system and organised and effective cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2.	There is an effective national legal system and binding procedures governing cooperation with other parties which delivers management outcomes consistent with MSC Principles 1 and 2.
	Met?	Y	Y	Y

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** • **Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and** • **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** • **Incorporates an appropriate dispute resolution framework.**
	Justification	This section is based on Intertek (2014 a, b, and c), the assessments of New Zealand hoki, hake, and ling. To assure harmonization, the Intertek rationale forms the base for orange roughy scores. MPI is responsible for the utilisation of New Zealand's fisheries resources while ensuring sustainability in accordance with its governing legislation - the Fisheries Act 1996. Under the Fisheries Act, sustainability means: (a) maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations, which addresses P1 and (b) avoiding, remedying, or mitigating any adverse effects of fishing on the aquatic environment, which addresses P2. Utilisation means conserving, using, enhancing, and developing fisheries resources to enable people to provide for their social, economic, and cultural well-being. The Fisheries Act binds the Crown. Decisions made under power given by the Act are judicially reviewable by the Courts in the event of disputes. Procedures and processes that apply to disputes about the effects of fishing on the fishing activities of any person that has a current fishing interest provided for under the Act, are set out under Part 7 of the Fisheries Act. MPI's fisheries management responsibilities extend to the 200 nautical mile limit of the NZ EEZ. MPI provides management, licencing (where applicable) research and compliance and education services for commercial, recreational and customary fishing. MPI assists the Minister of Primary Industries in the administration of the relevant Acts. The Government's commitment to wide consultation and engagement is set out in Section 12 of the Act. MPI is required to consult with those classes of persons having an interest (including, but not limited to, Maori, environmental, commercial and recreational interests) in the stock or the effects of fishing on the aquatic environment in the area concerned. MPI do this in a number of ways eg through regular meeting of working groups. These meetings are open to everyone, and consider fish stocks and the effects of fishing on the aquatic environment. The New Zealand Department of Conservation (DoC) Conservation Services Programme (CSP) monitors the impact of commercial fishing on protected species, studies species populations and looks at ways to limit bycatch. Protected marine species include all marine mammals and reptiles; sea birds (except black backed gulls); seven species of fish; all black corals, gorgonian corals, stony corals and hydrocorals (DoC 2015). MPI and DWG coordinate with DoC in management of the fisheries. New Zealand is a member of the South Pacific Regional Fisheries Management Organization (SPRFMO), which has Conservation Management Measures (CMM) biniding on members. CMM ***2.03*** specifically deals with international requirements for bottom fishing in the SPRFMO area. There is an effective national and international legal system and binding procedures governing cooperation with other parties that delivers management outcomes consistent with MSC Principles 1 and 2. This SI meets SG60, SG80 and SG100.

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** • **Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and** • **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** • **Incorporates an appropriate dispute resolution framework.**		
b	**Guidepost**	The management system incorporates or is subject by law to a mechanism for the resolution of legal disputes arising within the system.	The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes which is considered to be effective in dealing with most issues and that is appropriate to the context of the fishery.	The management system incorporates or subject by law to a transparent mechanism for the resolution of legal disputes that is appropriate to the context of the fishery and has been tested and proven to be effective.
	Met?	Y	Y	Y
	Justification	This section is based on Intertek (2014 a, b, and c), the assessments of New Zealand hoki, hake, and ling. To assure harmonization, the Intertek rationale forms the base for orange roughy scores. The Fisheries Act provides opportunities to negotiate and resolve disputes. The Minister may appoint a Dispute Commissioner and the Minister makes the final determination. The consultation process is an attempt to avoid unresolved disputes by ensuring all interested parties have an opportunity to participate and have an input into decisions. There have been occasions when there has not been a satisfactory outcome and then this has gone to litigation and the Court has made a decision. The Memorandum of Understanding between DWG and MPI has encouraged better working relationships and avoided the need for litigation between the Ministry and the industry. The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes that is appropriate to the context of the fishery and has been tested and proven to be effective. This meets the SG60, SG80, and SG100.		
d	**Guidepost**	The management system has a mechanism to generally respect the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to observe the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to formally commit to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) Y

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** • **Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and** • **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** • **Incorporates an appropriate dispute resolution framework.**
	Justification	This section is based on Intertek (2014 a, b, and c), the assessments of New Zealand hoki, hake, and ling. To assure harmonization, the Intertek rationale forms the base for orange roughy scores. MPI is responsible for the administration of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992, which implements the 1992 Fisheries Deed of Settlement under which historical Treaty of Waitangi claims relating to commercial fisheries have been fully and finally settled. The Ministry is also responsible for the Maori Fisheries Act 2004, which provides that the Crown allocates 20% of quota for any new quota management stocks brought into the QMS to the Treaty of Waitangi Fisheries commission. For non-commercial fisheries, the Kaimoana Customary Fishing Regulations 1998 and the Fisheries (South Island Customary Fishing) Regulations 1998 strengthen some of the rights of Tangata Whenua to manage their fisheries. These regulations let iwi and hapü manage their non-commercial fishing in a way that best fits their local practices, without having a major effect on the fishing rights of others. When the government sets the total catch limits for fisheries each year, it allows for this customary use of fisheries before allocating comercial quotas. The management system therefore has a mechanism to formally commit to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2. This meets the SG60, SG80, and SG100.
References		Fisheries Act 1996 DWG Partnership 2010 Treaty of Waitangi (Fisheries Claims) Settlement Act 1992 Deed of Settlement 1992 Maori Fisheries Act 2004 Customary Fisheries Regulations 1998 MFish 2009a Intertek 2014a, b and c DOC 2015 SPRFMO 2014, 2015.
OVERALL PERFORMANCE INDICATOR SCORE:		**100**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 3.1.2

PI 3.1.2		The management system has effective consultation processes that are open to interested and affected parties. The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are generally understood.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for key areas of responsibility and interaction.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction.
	Met?	Y	Y	Y

PI 3.1.2		**The management system has effective consultation processes that are open to interested and affected parties.** **The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties**		
	Justification	This section is based on Intertek (2014 a, b, and c), the assessments of New Zealand hoki, hake, and ling. To assure harmonization, the Intertek rationale forms the base for orange roughy scores. MPI is the Government agency responsible for the utilisation and sustainable management of the fisheries resources. The role of the MPI, working with other government agencies, is to advise on and implement government policy in the following areas of core responsibility: • ensuring sustainability of fish stocks and the protection of the aquatic environment; • meeting international and Deed of Settlement obligations; • providing for maximum value to be realised; • facilitating sustainable development; and • ensuring integrity of management systems. MPI is charged with consistently monitoring the fishery resource, and making timely and appropriate policy advice on all aspects of fisheries management to the Government. The Ministry is also responsible for carrying out the Government's policies to manage and conserve fisheries, and to actively encourage compliance of fisheries regulations by all fishers. The Department of Conservation (DOC) is the central government organisation charged with conserving the natural and historical heritage of New Zealand. The department is responsible for marine reserves, seabirds, and for marine mammals such as dolphins, whales, sea lions and fur seals. DWG is an amalgamation of EEZ fisheries quota owners in New Zealand. DWG is a nonprofit organisation, and is the commercial stakeholder organisation responsible for the majority of deepwater and middle-depth fisheries. It is working in partnership with the MPI and other interest groups to ensure New Zealand gains the maximum economic yields from its deepwater fisheries resources managed within a long-term, sustainable framework. The vast majority (95%) of orange roughy quota owners are represented through the DWG. The MPI and DWG signed a Memorandum of Understanding (MOU) in 2006 which sets out how DWG and MPI would work collaboratively to improve the management of deepwater fisheries (including orange roughy). eNGOs and other stakeholders have an important role in participating and contributing to management processes. Therefore, organisations and individuals involved in the management process have been identified and their functions, roles and responsibilities are explicitly defined and well understood for key areas of responsibility and interaction. This meets the SG60, SG80, and SG100.		
b	**Guidepost**	The management system includes consultation processes that obtain relevant information from the main affected parties, including local knowledge, to inform the management system.	The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information obtained.	The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information and explains how it is used or not used.
	Met?	Y	Y	Y

PI 3.1.2		**The management system has effective consultation processes that are open to interested and affected parties.** **The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties**
	Justification	This section is based on Intertek (2014 a, b, and c), the assessments of New Zealand hoki, hake, and ling. To assure harmonization, the Intertek rationale forms the base for orange roughy scores. Section 12 of the 1996 Act includes a range of specific consultation requirements. MPI is required to consult with those classes of persons having an interest (including, but not limited to, Maori, environmental, commercial and recreational interests) in the stock or the effects of fishing on the aquatic environment in the area concerned; Section 12 only relates to certain sections of the 1996 Act. However, there are other sections of the 1996 Act that require the Minister or MPI Chief Executive to consult with stakeholders before making a decision. MPI has a well-defined process for stakeholder consultation. The consultation process: • sets out best practice process for how MPI will meet its obligations under Section 12 of the Fisheries Act 1996 and for other decisions requiring consultation with fisheries stakeholders; • helps to ensure a consistent approach across all MPI business groups when consulting with fisheries stakeholders; and • sets out minimum performance measures where appropriate, e.g., a minimum period for stakeholder consultation. The consultation process standard includes the following: • identification of stakeholders “having an “interest” for consultation purposes; • a timeframe for consultation; • notification of decision to stakeholders; and • monitoring, review and oversight. Within this process, it is necessary to identify who has an interest; and who are representative of those having an interest. MPI must provide an initial consultation plan and the manner of consultation, including the timeframe for the consultation and the decision. MPI must distribute the decision, and subsequently review the process to assure that the consultation met all requirements. When management changes are proposed to meet sustainability requirements (such as a change to a TAC/TACC), MPI prepares a discussion document that provides the Ministry’s initial proposals for issues needing decision and a range of management options. In orange roughy fisheries such proposals primarily relate to changes in TACCs/catch limits. These proposals occur on an annual basis. At a more general level, MPI works closely with other government agencies and in partnership with stakeholders in addressing complex resource management issues, including developing and implementing policy settings and regulatory regimes for fisheries, aquaculture and forestry to support increased sustainable resource use, which requires ongoing consultations. A record of all consultations is documented at http://www.mpi.govt.nz/news-and-resources/consultations/, which includes summaries of the basis for decisions, and comments from all participating stakeholders. Information in letters, emails, and in Final Advice papers for management actions demonstrate the consideration of stakeholder input and use or non-use of that information. The letters, emails, and Final Advice address the issues raised by stakeholders. MPI has provided further information on consultation in a letter annexed to stakeholder comments, including planned consultation on the Deepwater Management Plan. Explanations on how information is used or not used are conveyed by letters, emails and in Final Advice papers is evidence that consultation occurs on a regular basis and that information provided by stakeholders is often taken into account. The management system therefore includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information and explains how it is used or not used. This meets the SG60, SG80, and SG100.

PI 3.1.2		**The management system has effective consultation processes that are open to interested and affected parties.** **The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties**		
c	**Guidepost**		The consultation process provides opportunity for all interested and affected parties to be involved.	The consultation process provides opportunity and encouragement for all interested and affected parties to be involved, and facilitates their effective engagement.
	Met?		(Y/N) Y	(Y/N) Y
	Justification	This section is based on Intertek (2014 a, b, and c), the assessments of New Zealand hoki, hake, and ling. To assure harmonization, the Intertek rationale forms the base for orange roughy scores. MPI has a well-defined process for stakeholder consultation. The consultation process: • sets out best practice process for how MPI will meet its obligations under Section 12 of the Fisheries Act 1996 and for other decisions requiring consultation with fisheries stakeholders; • helps to ensure a consistent approach across all MPI business groups when consulting with fisheries stakeholders; and • sets out minimum performance measures where appropriate, e.g., a minimum period for stakeholder consultation. The consultation process standard includes the following: • identification of stakeholders having an “interest” for consultation purposes; • a time frame for consultation; • notification of decision to stakeholders; and • monitoring, review and oversight. There is evidence of the MPI seeking stakeholder views throughout the year using, for example, the Initial Position Paper process, the Working Group, and fisheries planning meetings. As part of the consultation process, stakeholders are given the opportunity to provide feedback on the delivery of the process itself. The feedback is evaluated and used to finetune future consultation processes. Stakeholders are encouraged to be involved. The consultation process provides opportunity and encouragement for all interested and affected parties to be involved, and facilitates their effective engagement. MPI have also set up an Environmental Engagement forum. This meets the SG80 and SG100.		
References		Fisheries Act 1996 DWG 2010 MFish 2010e MFish 2010 l MFish 2011b MFish 2012b MPI 2014 DOC 2012 Intertek 2014a, b and c		
OVERALL PERFORMANCE INDICATOR SCORE:				**100**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 3.1.3

PI 3.1.3		The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Principles and Criteria, and incorporates the precautionary approach		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Long-term objectives to guide decision-making, consistent with the MSC Principles and Criteria and the precautionary approach, are implicit within management policy	Clear long-term objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach are explicit within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach, are explicit within and required by management policy.
	Met?	(Y/N/Partial) Y	(Y/N/Partial) Y	(Y/N/Partial) Y

PI 3.1.3		The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Principles and Criteria, and incorporates the precautionary approach
	Justification	This section is based on Intertek (2014 a, b, and c), the assessments of New Zealand hoki, hake, and ling. To assure harmonization, the Intertek rationale forms the base for orange roughy scores. Long-term fishery and environmental objectives are included within both NZ fisheries and environmental legislation and these guide decision making. In regard to information principles, Section10 of Fisheries Act states: "All persons exercising or performing functions, duties, or powers under this Act, in relation to the utilisation of fisheries resources or ensuring sustainability, shall take into account the following information principles: (a) Decisions should be based on the best available information: (b) Decision makers should consider any uncertainty in the information available in any case: (c) Decision makers should be cautious when information is uncertain, unreliable, or inadequate: (d) The absence of, or any uncertainty in, any information should not be used as a reason for postponing or failing to take any measure to achieve the purpose of this Act." Fisheries 2030 sets the strategic direction for the management and use of New Zealand's fisheries resources. One of the principles guiding Fisheries 2030 is "Precautionary approach: particular care will be taken to ensure environmental sustainability where information is uncertain unreliable or inadequate." The National Fisheries Plan for Deepwater and Middle-depth Fisheries (the National Deepwater Plan) establishes the 5-year enabling framework for the management of New Zealand's deepwater fisheries. It is further divided into two parts – Part 1A and Part 1B. Part 1A details the overall strategic direction for New Zealand's deepwater fisheries. Specifically it describes: (a) the wider strategic context that Fisheries Plans are part of, including Fisheries 2030; (b) the nature and status of the management objectives that will apply across all deepwater fisheries; and (c) how the National Deepwater Plan will be implemented and how stakeholders will be engaged during the implementation phase. Part 1A of the National Deepwater Plan has been approved by the Minister of Fisheries under Section 11A of the Fisheries Act 1996. This means that it must be considered each time the Minister makes decisions or recommendations concerning regulation or control of fishing or any sustainability measures relating to the stocks managed through this plan. Part 1B of the National Deepwater Plan comprises the fishery-specific chapters of the National Deepwater Plan which provide greater detail on how deepwater fisheries will be managed at the fishery level, in line with the management objectives. To date, fisheryspecific chapters have been completed for the hoki, orange roughy, southern blue whiting, and ling fisheries. The fishery specific chapter for hake is in draft form. The fishery-specific chapters describe the operational objectives for each target fishery and their key bycatch species, as well as how performance against both the management and operational objectives will be assessed at the fishery level. These chapters also describe any agreed harvest strategy for the relevant species. On an annual basis the National Deepwater Plan is delivered through the Annual Operational Plan which describes management actions scheduled for delivery during the financial year for which the Operational Plan applies, and the management services required to deliver the management actions. The Annual Operational Plan also clearly demonstrates how these management actions contribute to the long-term objectives in the National Deepwater Plan. The annual review of performance and delivery of objectives is provided in MPI's annual reports Clear long-term objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach, are explicit within and required by management policy. This SI meets the SG60, SG60, and SG100.
References		Fisheries Act MFish 2010d MFish 2010f

PI 3.1.3	The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Principles and Criteria, and incorporates the precautionary approach	
	Pricewaterhouse Coopers 2008 Intertek 2014a, b and c	
OVERALL PERFORMANCE INDICATOR SCORE:		**100**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 3.1.4

PI 3.1.4		The management system provides economic and social incentives for sustainable fishing and does not operate with subsidies that contribute to unsustainable fishing		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2.	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2, and seeks to ensure that perverse incentives do not arise.	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2, and explicitly considers incentives in a regular review of management policy or procedures to ensure they do not contribute to unsustainable fishing practices.
	Met?	(Y/N/Partial) Y	(Y/N/Partial) Y	(Y/N/Partial) P
	Justification	This section is based on Intertek (2014 a, b, and c), the assessments of New Zealand hoki, hake and ling. To assure harmonization, the Intertek rationale forms the base for orange roughy scores. Incentives: The QMS and the use of ITQs provides stability and security for quota owners and hence incentives for sustainable utilisation (Fisheries Act). The management system also includes customary provisions (e.g., Maori Fisheries Act 2004 and Treaty of Waitangi (Fisheries Claims) Settlement Act 1992). Subsidies: There are no subsidies in the New Zealand ling fishery. The management system has explicit mechanisms that facilitate regular review of management policy or procedures (Fisheries Act). Under Section 13 of the Fisheries Act 1996 the Minister of Fisheries needs to take social, cultural and economic factors into account as well as the status of the stocks and all environmental considerations when setting a TAC for a fishery. There are regular reviews of the Quota Management System and MPI management policy and procedures to ensure they contribute to sustainable fishing. Other strategies that contribute to sustainable fishing are also regularly reviewed e.g. deemed values and the harvest strategy. There do not appear to be explicit incentives and encouragement not to catch marine mammals and protected species, i.e. there no positive feedback for those not catching these species. The management system does not explicitly consider incentives in a regular review of management policy or procedures to ensure they not contribute to unsustainable fishing practices. As such, the fishery only partially meets the 100 level of performance		
References		Fisheries Act 1996 Lock et al. 2007 Intertek 20014a, b and c		
OVERALL PERFORMANCE INDICATOR SCORE:				**90**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 3.2.1

PI 3.2.1		The fishery has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Objectives, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are implicit within the fishery's management system	Short and long-term objectives, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery's management system.	Well defined and measurable short and long-term objectives, which are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery's management system.
	Met?	(Y/N/Partial) Y	(Y/N/Partial) Y	(Y/N/Partial) Y
	Justification	Fisheries 2030, National Fishing Plan Deepwater and Middle depths Plan and Annual Operational Plan set out explicit short and long-term objectives. The DWG-MFish Memorandum of Understanding commits the industry to align long-term objectives of the National Deepwater Plan with the specific fishery activities. The management system conducts annual review of objectives. The National Fishing Plan for Deepwater and Middle Depth Fisheries Part 1B-Orange Roughy sets out the specific objectives for the orange roughy fisheries. These are then specified within the annual Operating Plan. These are fishery specific, subject to annual review and are measurable. The National Plans of Action for sharks and seabirds, both revised and published in 2013, provide additional examples of management objectives (relating to some ETP species) that are applicable to the assessed fisheries and consistent with Principle 2. Therefore, well defined and measurable long-term objectives are explicit, reaching the SG100.		
References		PricewaterhouseCoopers 2008 MPI 2013 MPI 2013 MPI 2014 DWG-MFish 2010		
OVERALL PERFORMANCE INDICATOR SCORE:				**100**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 3.2.2

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are some decision-making processes in place that result in measures and strategies to achieve the fishery-specific objectives.	There are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.	
	Met?	(Y/N) Y	(Y/N) Y	
	Justification	The Fisheries Act (specifically Sections 10, 11, and12) clearly lays out the requirements for decision-making, and requires basing all decisions on the best available information (Section 10). The DWG-MFish MOU, the annual operations plans, the Review of Management Controls for Orange Roughy implement the procedures for decision making. The MPI prepares an Initial Position Paper (IPP) that provides the Ministry's initial proposals for issues needing decision. This is used in the orange roughy fisheries primarily relating to catch limits and allowances for orange roughy FMAs (e.g., Review of Management Controls for Orange Roughy). Subsequently, the Ministry will provide a Final Advice Paper (FAP) to the Minister for Primary Industries. The FAP will summarise the Ministry's and stakeholder's views on proposals and make recommendations to the Minister. A copy of the FAP and the Minister's letter setting out his final decisions will be posted on the MPI website as soon as these become available. Altogether, these processes result in measures and strategies to achieve the fishery-specific objectives, reaching the SG60 and SG80.		
b	**Guidepost**	Decision-making processes respond to serious issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions.	Decision-making processes respond to serious and other important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.	Decision-making processes respond to all issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) N

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.		
	Justification	Consultation is a central component of the management decision making process (Fisheries Act Section 12, Stakeholder Consultation Process Standard). The Minister makes the final decision based on advice received from other parties (Section 12 - the Minister shall consult with such persons or organisations as the Minister considers are representative of those classes of persons having an interest in the stock or the effects of fishing on the aquatic environment in the area concerned including Maori, environmental, commercial, and recreational interests). The MPI ensures that the Minister is provided with analysed alternatives for consideration before making any decisions (information is both from within and outside the Ministry (stakeholders, science)). The feedback process is formalised, involving planning, consultation, project development, and scientific enquiry. The IPP/FAP process highlights the extent of consultation, engagement and transparency of the decision making process. Submissions received on the Review of Sustainability Measures and other management Controls for Deepwater Fisheries. Thus, decision-making processes respond to serious and other important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions. This meets the SG60 and SG80. Although management decision-making can be shown to respond to serious and important issues, a very large number of 'issues' are identified during research and monitoring. Management does not respond formally to all of these. However, response may be informal or through discussion at various fora, such as working groups. All issues are addressed through such mechanisms, although this may not be to the satisfaction of all stakeholders. The assessment team does not have full evidence that decision-making processes respond to all issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions. A score of SG100 is not met.		
c	Guidepost		Decision-making processes use the precautionary approach and are based on best available information.	
	Met?		(Y/N) Y	
	Justification	The Fisheries Act requires that MPI must follow the precautionary approach. Section 10 of the Fisheries Act Information principles states: "All persons exercising or performing functions, duties, or powers under this Act, in relation to the utilisation of fisheries resources or ensuring sustainability, shall take into account the following information principles: (a) Decisions should be based on the best available information: (b) Decision makers should consider any uncertainty in the information available in any case: (c) Decision makers should be cautious when information is uncertain, unreliable, or inadequate: (d) The absence of, or any uncertainty in, any information should not be used as a reason for postponing or failing to take any measure to achieve the purpose of this Act. As an example of implementation of the precautionary approach, the orange roughy fishery was closed in Area 7A (Challenger) from 2000 to 2009 to allow rebuilding, and the industry voluntarily refrained from harvesting orange roughy in the NWCR from 2010-11 to 2012-13, even though they had available quota, as part of a plan to increase the rate of abundance growth.This was described in the Review of Sustainability Measures and Other Management Controls for Selected Deepwater Fishstocks 2014.		

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.		
d	**Guidepost**	Some information on fishery performance and management action is generally available on request to stakeholders.	Information on fishery performance and management action is available on request, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.	Formal reporting to all interested stakeholders provides comprehensive information on fishery performance and management actions and describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) Y
	Justification	MPI and DWG provide a wide range of formal reporting that provides comprehensive information to stakeholders. For the purposes of this assessment, the DWG has gathered a wide range of documents with links to the original reports (DWG, 2015) . The documents range from the Fishery Act, to plenary reports, to long and short-term goals and objectives that are publically available (e.g., National Fisheries Plan, Annual Operational Plan, Statements of Intent, Initial Position Papers, press releases and reports). MPI provides formal reports consistent with formalised reporting and consultation processes such as the IPP/FAP process, the Stakeholder Consultation Process Standard or the National Fisheries Plan for Deepwater and Middle-Depth Fisheries and the annual Operating Plan for Deepwater Fisheries that are always provided to stakeholders. This formal reporting meets the SG60, SG80, and SG100.		
e	**Guidepost**	Although the management authority or fishery may be subject to continuing court challenges, it is not indicating a disrespect or defiance of the law by repeatedly violating the same law or regulation necessary for the sustainability for the fishery.	The management system or fishery is attempting to comply in a timely fashion with judicial decisions arising from any legal challenges.	The management system or fishery acts proactively to avoid legal disputes or rapidly implements judicial decisions arising from legal challenges.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) Y

PI 3.2.2		**The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.**
	Justification	Section VII Disputes Resolution of the Fisheries Act states that the section "(a) applies to disputes about the effects of fishing (excluding fish farming) on the fishing activities of any person who has a current fishing interest provided for or authorized by or under this Act; but (b) does not apply to disputes about ensuring sustainability or about the effects of any fishing authorised under Part 9." Section VII further requires that the Minister publicly set out an approved statement of procedure for the resolution of such disputes. The Minister of Fisheries published in 1998 the dispute resolution procedures. The Minister's approved statement of procedure for the resolution of disputes consists of four steps, with each step in turn involving specific actions to be undertaken by the parties to the dispute to give effect to the requirements of Section VII of the Act: • Dispute summary report by the party identifying the report • Production and Distribution of Initial Assessment Report demonstrating the dispute is about the effects of fishing, and does not involve issues associated with ensuring sustainability • Negotiation and attempts at resolution • Prepare an Outcome Report with conclusion of the process including resolution or not of the dispute. The parties to the dispute may make recommendations that involve sustainability or customary fishing that would require action beyond the authority of the Minister. The collaboration between the DWG and MPI works to avoid disputes, as the agreement of common goals and negotiations to achieve them occurs during the normal working relationship between the two parties. The principles in the Fisheries Act require decision-makers to act: • in accordance with law; • reasonably; and • fairly, in accordance with the principles of natural justice. Decisions that do not follow requirements are open to legal challenge. Legal challenges are uncommon in the fisheries, in part because of the collaborative decision making. Therefore, the management system proactively acts to avoid disputes. Lack of judicial decisions does not provide direct evidence of rapid implementation, but the requirements of the Fisheries Act and policies of DWG and MPI strongly suggest this would be the case. The fishery reaches the SG60, SG80, and SG100.
References		Fisheries Act 1996 MFish 1998 DWG-MPI 2010
OVERALL PERFORMANCE INDICATOR SCORE:		**95**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 3.2.3

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Monitoring, control and surveillance mechanisms exist, are implemented in the fishery under assessment and there is a reasonable expectation that they are effective.	A monitoring, control and surveillance system has been implemented in the fishery under assessment and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.	A comprehensive monitoring, control and surveillance system has been implemented in the fishery under assessment and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) Y
	Justification	The orange roughy management system has documented a comprehensive and effective monitoring, control and surveillance system through 1) a compulsory satellite Vessel Monitoring System (VMS) with an on board an automatic location communicator (ALC); 2) government observers who may be placed on board to observe fishing, any transhipment and transportation, and collect any information on orange roughy fisheries resources (including catch and effort information) and the effects of orange roughy fishing on the aquatic environment; and 3) accurate recordkeeping and recording requirements to establish auditable and traceable records to ensure all catches are counted and do not exceed the ACE held by each operator. Other measures include: • fishing permit requirements; • requirement to hold ACE to cover all target and bycatch species caught, or alternatively, to pay deemed values; • fishing permit and fishing vessel registers; • vessel and gear marking requirements; • fishing gear and method restrictions; • vessel inspections; • control of landings (e.g. requirement to land only to licensed fish receivers); • auditing of licensed fish receivers; • control of transhipment; • monitored unloads of fish; • information management and intelligence analysis; • analysis of catch and effort reporting and comparison with VMS, observer, landing and trade data to confirm accuracy; • boarding and inspection by fishery officers at sea; and • aerial and surface surveillance. MPI has a sophisticated fishery outreach programme of informed and assisted compliance, in which Enforcement agents work with the industry in a proactive way to ensure understanding of regulations and to prevent infractions (Gary Orr, MPI Compliance Directorate, pers. comm. 2014). In combination with at-sea and air surveillance supported by the New Zealand joint forces, vessel activity can be monitored and verified to ensure compliance with regulations and with industry-agreed codes of practice. The high level of surveillance ensures that a low numbers of violations results from compliance, and not just from lack of coverage. Therefore, a comprehensive strategy that demonstrates a high capability for enforcement meets the SG60, SG80, and SG100.		

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with		
b	Guidepost	Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, are consistently applied and thought to provide effective deterrence.	Sanctions to deal with non-compliance exist, are consistently applied and demonstrably provide effective deterrence.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) Y
	Justification	Under the Fisheries Act, in proceedings for an offence against this Act it is not necessary for the prosecution to prove that the defendant intended to commit the offence; rather, the defendant must show the contravention was due to the act or default of another person, or to an accident or to some other cause beyond the defendant's control; and the defendant took reasonable precautions and exercised due diligence to avoid the contravention. Upon conviction, the Fisheries Act allows for sanctions that may include prison time, fines from $250 to $500,000, forfeiture of quota, vessels, and other property. As only several major companies own quota, severe sanctions could put them out of business. The industry, with its investment in the fishery through co-management, has a strong incentive to maintain its cooperative role through compliance with legal requirements. MPI uses 'informed and assisted compliance' help minimize infractions. Most fishermen follow the regulations; some engage in opportunistic non-compliance that is usually easily detected by enforcement agents, and a few will actively seek advantage with illegal fishing. Checking and feedback of minor infractions hold the second group in line; but only severe sanctions, up to loss of fishing permits and vessels, will deter the last group. Enforcement personnel report that compliance is high in the orange roughy fishery.		
c	Guidepost	Fishers are generally thought to comply with the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery.	Some evidence exists to demonstrate fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.	There is a high degree of confidence that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) Y
	Justification	The industry complies with reporting requirements, traceable documentation, effective surveillance, landing and reconciliation of catch against ACE, catch documentation audits, and checks against past catch. Kazmierow et al. (2010) surveyed fishermen on compliance decision making, and found generally good compliance. The MPI has devolved responsibility for obtaining scientific information to the orange roughy fishing industry, as demonstrated in the research plan, operations plans, and the industry-ministry MOU. The DWG provides information necessary for the management of the fishery on the premise that better information can reduce uncertainty and lead to more flexibility in management. Together, these actions demonstrate with a high degree of confidence that the fishermen comply with the requirements and provide substantial amounts of information for the management of the fisheries.		
d	Guidepost		There is no evidence of systematic non-compliance.	

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with		
	Met?		(Y/N) Y	
	Justification	The the high level of meeting reporting requirements, the relatively high level of observer coverage, and ongoing monitoring by enforcement agents demonstrates no evidence of systematic non-compliance. This meets the SG80.		
References		Kazmierow et al. (2010) MPI (2015b)		
OVERALL PERFORMANCE INDICATOR SCORE:				100
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 3.2.4

PI 3.2.4		The fishery has a research plan that addresses the information needs of management		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Research is undertaken, as required, to achieve the objectives consistent with MSC's Principles 1 and 2.	A research plan provides the management system with a strategic approach to research and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2.	A comprehensive research plan provides the management system with a coherent and strategic approach to research across P1, P2 and P3, and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) Y
	Justification	Fisheries 2030, the 10 Year Research Programme for Deepwater Fisheries, the National Fishing Plan Deepwater and Middle depth Fisheries Part 1A and 1B, the Conservation Services Programme Annual Plan 2013-14, and the fishery assessment plenaries provide documentation of a comprehensive research plan that provides reliable and timely information. Working groups containing stakeholders contribute to the research plans. The 10-year research plan identifies outstanding research issues for each of the species, including orange roughy, for consideration in the additional research component. The research plan identifies research for benthic environments, ETP species, bycatch and discards, and ecosystem functions and trophic interactions. DOC provides further research on protected species. Therefore, a comprehensive research plan exists with a strategic approach to Principles 1, 2, and 3 that provides reliable and timely information; this meets the SG60, SG80 and SG100.		
b	**Guidepost**	Research results are available to interested parties.	Research results are disseminated to all interested parties in a timely fashion.	Research plan and results are disseminated to all interested parties in a timely fashion and are widely and publicly available.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) Y
	Justification	The public posting of plenaries and annual operations plans demonstrate the wide and timely distribution of information research results. Stakeholders participating in the research planning and review receive results of the research. For the purposes of this assessment, the DWG has gathered a wide range of documents with links to the original reports (DWG, 2015). This meets the SG60, SG80, and SG100.		
References		DOC 2014 DWG 2015		
OVERALL PERFORMANCE INDICATOR SCORE:				**100**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 3.2.5

PI 3.2.5		There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives There is effective and timely review of the fishery-specific management system		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The fishery has in place mechanisms to evaluate some parts of the management system.	The fishery has in place mechanisms to evaluate key parts of the management system	The fishery has in place mechanisms to evaluate all parts of the management system.
	Met?	(Y/N) Y	(Y/N) Y	(Y/N) Y
	Justification	The Annual Review Report for Deepwater Fisheries 2013-2014 (MPI 2015) provides a record of the annual reviews of the fisheries, including orange roughy. **Part 1** describes the progress that has been made during the 2012-2013 financial year towards meeting the five year management priorities set out in the 2013/14 Annual Operational Plan. Achievement of these annual management priorities aims to contribute towards meeting the five year high level Management Objectives and Operational Objectives set out in Part 1 of the National Deepwater Plan. **Part 2** provides detail on MPI work that is relevant to deepwater fisheries management and is planned by financial year (1 July – 30 June). These processes include the planning and contracting of fisheries and conservation research projects, planning observer coverage on the deepwater fleet and the cost recovery regime. Progress made during the 2012/13 financial year is detailed. **Part 3** reports on the combined environmental impacts of deepwater fishing, and on the deepwater fleet's adherence to the non-regulatory management measures that were in place for the 2012-2013 fishing year (1 October 2012 – 30 September 2012). The annual review report evaluates the development and implementation of the Fisheries Plan framework – National Deepwater Plan with fishery specific chapters and Annual Operational Plan for the fisheries. This review encompasses all parts of the management system, therefore reaching the SG60, SG80, and SG100.		
b	**Guidepost**	The fishery-specific management system is subject to occasional internal review.	The fishery-specific management system is subject to regular internal and occasional external review.	The fishery-specific management system is subject to regular internal and external review.
	Met?	(Y/N) Y	(Y/N) N	(Y/N)
	Justification	Progress against the objectives in the National Fisheries Plan for Deepwater and the Annual Operational Plan is reviewed annually and reported in the Annual Review Report. MPI conducts an extensive review of performance of the deepwater fisheries (e.g., MPI 2015) that incorporates consultations with industry and other stake holders. Parts of the management system, specifically science and enforcement, undergo external review. Although the internal review is very comprehensive and parties external to MPI participate, there is no explicit separate external review reported for the management system.		
References		MPI 2015		
OVERALL PERFORMANCE INDICATOR SCORE:				**70**
CONDITION NUMBER (if relevant):				

Appendix 1.2 Conditions

Condition 1 ESCR

Performance Indicator	1.1.1b The stock is at or fluctuating around its target reference point.
Score	70
Rationale	The East and South Chatham Rise stock is estimated to be just below the lower bound of the target management range in 2014 ($0.296B_0$; Cordue 2014d). There is a 57% probability of being below the lower limit of the target range; Table 7 and Table 8**.** The stock is projected to recover to the the lower limit of management target range in 2015 (Figure 14 and Figure 15). However, given the uncertainty in the estimate, more than one year at or above the lower limit or a lower uncertainty is needed to assure that the stock has reached the harvest range. Hence this stock is not considered to meet the SG80, resulting in a condition.
Condition	Provide evidence that the ESCR stock is at or fluctuating around its target reference point.
Milestones	Year 1 to year 3: provide estimates of ESCR stock relative to target reference point. This may result in a score ≥80 if evidence demonstrates the stock is at or fluctuating around the target reference point. Year 4: provide evidence that the ESCR stock is at or fluctuating around the target reference point. This will result in a score ≥80.
Client action plan	Year 1 to Year 3: The client, in collaboration with MPI, will continue to monitor ESCR stock relative to its target reference point. The client will provide documentary evidence of the ESCR stock status. Year 4: Documentary evidence will be supplied to demonstrate that the ESCR stock is at or fluctuating around the target reference point.
Consultation on condition	The Orange Roughy Client Action Plan was drafted by DWG in consultation with MPI. MPI has confirmed its support for the certification of these three orange roughy fisheries and for the implementation of the Action Plan wherever possible. DWG and MPI have demonstrated a partnership in conducting stock assessments that assures the required stock assessments will be undertaken as scheduled, to continue to monitor the stock biomass trajectory.

Condition 2 (ORH3B NWCR and ORH3B ESCR)

Performance Indicator	2.3.1 The fishery meets national and interational requirements for the protection of ETP species. The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species.
Score	75
Rationale	SIb: The zero to negligible interactions demonstrated in Scoring issue a and section 3.4.2. provide evidence that these fisheries have a high degree of confidence that unacceptable impacts for seabirds and marine mammals do not occur. NIWA presents observed (from observer data) and predicted (from habitat suitability models) overlap of the fisheries with protected corals. Predicted overlap of the fisheries is much lower based on habitat suitability, likely because of the largely fishery-dependant nature of the coral observation data. The assessment team considered the observed overlap unrealisticaly conservative, and the predicted overlap too uncertain to take at face value. Therefore, the team considered both observed and predicted in assessing the overlap.The limited overlap of the fishery in the Challenger-Westpac area with corals for both observed and predicted distributions (Table 25) demonstrates that the fishery is at least highly unlikely (≤20%) to create unacceptable impacts, reaching the SG80. The higher overlap in NWCR and ESCR (≤30%) meets only the unlikely

	to create unacceptable impacts (SG60) level. It is not clear that sufficient analysis has occurred in the NWCR and ESCR areas to demonstrate that the fisheries are highly unlikely to have unacceptable impacts for deep sea corals, due to discrepancies between observed and predicted distribution of protected corals and the overlap with the orange roughy trawl footprint in the three UoC areas. Specifically of concern is high (>60%) observed overlap in NWCR and ESCR of the orange roughy fishery with black corals (MPI 2015), although this overlap has been reduced substantially over the five year period between 2009 and 2014. In the absence of ground-truthing of the predicitive model, and the fact that the trawl fishery does expand to new areas (albeit at a very slow and continually reduced rate), it is not possible to determine that the fishery does not pose a risk of serious or irreversible harm to ETP coral species in these areas with high liklihood as defined by the MSC standard. A substantial part of the Kermadec Bioregion that supports the ETP coral groups discussed here, lies outside of the New Zealand EEZ (Figure 19). There are, therefore, substantial areas of coral habitat and coral abundance outside of the EEZ (e.g. Clark *et al*., 2015). While parts of the area outside of the EEZ have also been fished for orange roughy, as evidenced by the fishery on the Westpac Bank, the fishing is managed by the conservation and management measures (CMMs) set by the non-tuna RFMO, SPRFMO[15], and implemented by its members. The vast majority of the SPRFMO Convention Area (>98%) is not fishable, being deeper than 2,000m (Table 3.1.1.1. Williams et al., 2011). Of the 1.1% of the SPRFMO Convention Area that is shallower than 2,000 m, about 0.5% is deeper than 1,500 m and thus deeper than orange roughy fisheries normally operate, has never been fished and is not within any footprint declared to SPFRMO. This means that >99% of the SPRFMO Convention Area is not within any bottom fishing footprint declared to SPRFMO and is closed to bottom trawling. In addition, Scleractinian corals are found at depths below those at which the orange roughy fisheries operate (see Figure 54 in Clark *et al*., 2015). For depth distribution of tows see Figure 4 in MFish, 2008. Williams *et al*. (2011) provide estimates of areas by depth zone, with the area in South Pacific Regional Fisheries Management Organisation (SPRFMO) Convention Area between 1,500 m and 2,000 m deep, which has seen very little fishing. Within the SPRFMO Convention Area, the unfished area was estimated at 273,389 km^2 which represents about 43% of the area between 200 m and 2,000 m (Williams *et al*., 2011). This represents a considerable area for coral to exist without disturbance from fishing. However, according to Clark *et al.* (2011) connectivity of fauna between UTFs is important for maintaining the productivity of the system. The dispersal capabilities of benthic invertebrates are not well known, but a review of inshore invertebrate taxa indicated most were able to disperse less than 100 km (Kinlan and Gaines 2003). So while it is true that a substantial area of coral habitat within the bioregion as a whole is unimmpacted by fishing, it is possible that fished UTFs isolated by 100 km or more from other UTFs will have slower recolonization that more connected UTFs. The time scale of the recolonization would depend on what recruitment could occur from more distant features and on the amount or coral remaining on the fished UTF. On balance, it is possible that on the scale of the UoAs, due to the large overlap between the orange roughy fishery, particularly on the Chatham Rise, and observed coral distributions, could be having an impact on the ability for ETP coral species to recover from disturbance. Therefore it cannot be said, for NWCR and ESCR, that direct effects of orange roughy fishing are highly unlikely to create unacceptable impacts to ETP species. MSC requires for the SG80 to be met,

[15] www.sprfmo.int

	that “known direct effects of the fishery are highly unlikely to hinder recovery or rebuilding of ETP species/stocks,” thus the SG80 level is not met for NWCR and ESCR with regard to ETP coral species.
Condition	For the ORH3B NWCR and ORH3B ESCR, by the end of the certification period, the direct effects of ORH fishing must be highly unlikely to create unacceptable impacts to ETP coral species.
Milestones	Year 1: Present a plan to increase certainty regarding the impact of ORH fishing in the two UoAs on ETP coral groups. Years 2- 3: Carry out the plan developed for the Year 1 milestone. Year 4: Demonstrate that the fishery is highly unlikely to create unacceptable impacts ot ETP coral species in the NWCR and ESCR UoA areas. This will result in a score ≥80.
Client action plan	Year 1: The client will review the outcome status of ETP coral and develop a plan to increase our understanding of the direct effects of fishing on ETP coral so as to reduce uncertainty in relation to the impacts of fishing on ETP coral. Years 2 - 3: The client will develop, conduct and begin reporting on studies to deliver the plan developed in Year 1. Year 4: Using the outputs from the studies conducted during years 2 and 3, plus any additional management actions implemented to protect corals, the client will report with improved certainty the likelihood of unacceptable impacts of the ORH3B NWCR and ORH3B ESCR fisheries on ETP coral such that the SG 80 will be met for each fishery.
Consultation on condition	The Orange Roughy Client Action Plan was drafted by DWG in consultation with MPI. MPI has confirmed its support for the certification of these three orange roughy fisheries and for the implementation of the Action Plan wherever possible.

Condition 3 (ORH3B NWCR and ORH3B ESCR)

Performance Indicator	**2.3.3 Relevant information is collected to support the management of the fishery impacts on ETP species, including: -information for the development of the management strategy;-information to assess the effectiveness of the management strategy; and –information to determine the outcome status of ETP species.**
Score	75
Rationale	SIb: See justification under scoring issue a in relation to all protected groups except corals. Although there has been analysis on the distribution of corals and its overlap with orange roughy fisheries in the three UoC areas as well as contained within BPAs in these areas (MPI 2015), the large descrepency between observed and predicted occurances of coral and the commensurate large descrepency in observed vs predicted degree of overlap of protected corals with the orange roughy fisheries creates uncertainty in determining whether the fishery may be threat to the protection of these species. DWG has identified a series of studies resulting in data that have yet to be fully analysed: 1. Extensive sets of fishery-dependent and fishery-independent presence, absence and abundance data for coral from the observer programme and dedicated benthic research are available. While presence data have been well explored, the absence data have been little used as appropriate modelling frameworks have not been employed and the abundance data have hardly been considered at all. 2. Detailed distribution information of fishing (footprint, trawl pathways, etc.). These data have only been partially utilised. There are more, and more detailed data on the distribution of the fisheries than have been analysed to date. 3. There is substantive information about UTFs, only some of which has been analysed. The spatial distribution of UTFs has only been crudely considered and that not in terms of potential recruitment of coral through reproduction and dispersal.

	4. There is considerable detailed oceanographic information about currents and water movements, especially around the Chatham Rise were two of the relevant fisheries occur. This information has also not been used in terms of looking at the potential dispersal and recruitment of corals. 5. Depth distributional data for corals, noted as important but not analysed. 6. Co-existence of coral on fished UTFs, noted that important but not fully analysed. 7. Spatial extent of fished and unfished UTFs, not fully analysed. DWG has identified unanalyzed data from a number of projects; however, raw data do not constitute useable information. Only after the analyses can the data inform the conclusion. While DWG supplied the best information available at the time of the assessment, it was insufficient to draw the conclusion on status to reach SG80.
Condition	By the end of the certification period information must be sufficient to determine whether the fishery may be a threat to protection and recovery of ETP coral species.
Milestones	Year 1: Present a plan to reduce uncertainty regarding the threat of ORH fishing to the two UoAs on ETP coral groups. Years 2- 3: Carry out the plan developed for the Year 1 milestone. Year 4: Provide information sufficient to determine whether the fishery may be a threat to the protection and recovery of ETP coral species. This will result in a score ≥80.
Client action plan	Year 1: The client will supply a plan that establishes a sequence of analyses of existing data related to reducing uncertainty of the impacts of ORH fishing on ETP coral groups. Years 2 - 3: The client will develop, conduct and begin reporting on analyses to deliver the plan developed in Year 1. Year 4: Using the outputs from the studies conducted during years 2 and 3, plus any additional management actions implemented to protect corals, the client will report with improved certainty the information necessary to determine the likelihood of unacceptable impacts of the ORH3B NWCR and ORH3B ESCR fisheries on ETP coral such that the SG 80 will be met for each fishery.
Consultation on condition	The Orange Roughy Client Action Plan was drafted by DWG in consultation with MPI. MPI has confirmed its support for the certification of these three orange roughy fisheries and for the implementation of the Action Plan wherever possible.

Condition 4 (all units)

Performance Indicator	**3.2.5 The fishery-specific management system is subject to regular internal and occasional external review.**
Score	70
Rationale	SIb: Progress against the objectives in the National Fisheries Plan for Deepwater and the Annual Operational Plan is reviewed annually and reported in the Annual Review Report. MPI conducts an extensive review of performance of the deepwater fisheries (e.g., MPI 2015) that incorporates consultations with industry and other stake holders. Parts of the management system, specifically science and enforcement, undergo external review. Although the internal review is very comprehensive and parties external to MPI participate, there is no explicit separate external review reported for the management system.
Condition	By the third annual surveillance the fishery-specific management system must undergo occasional external review.
Milestones	Year 1: Present a plan to establish occasional external review. Years 2: Carry out the plan developed for the Year 1 milestone. Year 3: Provide information that demonstrates occasional external review. This will result in a score ≥80.
Client action plan	Year 1: The client will supply a plan that establishes occasional external review. Year 2: The client will provide documentary evidence of the status of the plan

	and progress towards its implementation. Year 3: The client will provide documentary evidence that demonstrates occasional external review.
Consultation on condition	MPI has confirmed that it supports the intentions of DWG with regards to the certification of orange roughy fisheries. The Orange Roughy Client Action Plan was drafted by DWG in consultation with MPI. MPI is committed to supporting the implementation of the Action Plan wherever possible.

Appendix 2 Peer Review Reports

Appendix 2.1 Peer Review No. 1
Overall Opinion

Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?	**Yes**	**Conformity Assessment Body Response**
Justification:		

Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe?	**Yes**	**Conformity Assessment Body Response**
Justification: Condition 1 will require annual estimates of the ESCR stock relative to the target reference point. The Team indicates that MPI assures the required stock assessments will be undertaken as scheduled. Condition 2 requires that DWG presents, and causes to have implemented, a plan (including the conducting of studies) to increase certainty regarding the impact of ORH fishing in NWCR and ESCR on ETP coral groups. The Team reports that MPI has confirmed its support for the implementation of the Action Plan wherever possible. The nature and type of studies to be conducted are not specified in the CAP. Condition 3 requires that DWG presents and implements a plan to reduce uncertainty regarding the threat of ORH fishing to the two UoAs on ETP coral groups. The Team reports that MPI has confirmed its support for the implementation of the Action Plan wherever possible. The analyses to be conducted will be on existing data and thus will not require the collection of new data which would add uncertainty to meeting the specified timeframe. Condition 4 requires that a plan is prepared to establish occasional external review, and that occasional external review is demonstrated by the third surveillance. The Team reports that MPI has confirmed its support for the implementation of the Action Plan wherever possible.		MRAG concurs with the Peer Reviewer Summary.

If included:

Do you think the client action plan is sufficient to close the conditions raised?	**Yes**	**Conformity Assessment Body Response**
Justification: The CAP appears to be sufficient to close the conditions raised if the support of MPI is provided as expected (see above). However, it is unclear what the nature and type of studies to be conducted under Condition 2 are going to be, and thus it is difficult to evaluate if they will be sufficient to close that condition.		The assessment team will monitor during surveillance the progress of Condition 2 (and other conditions) and evaluate the nature and type of studies to be conducted. The team has confidence that DWG and MPI will design and implement a

	successful plan.

General Comments on the Assessment Report (optional)

Performance Indicator Review

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.1.1	Yes	Yes	Yes	Relevant information was used and the rationale supports the scoring. As per CR CB2.2.1: scores are justified by the probabilities of stock position relative to the point where recruitment would be impaired (SI a). As per CB2.2.1: time periods used are appropriate (SI b). F-based reference points are not used (CR CB2.2.4).	NA
1.1.2	Yes	Yes		Relevant information was used and the rationale supports the scoring. The TRP is consistent with MSY. The LRP is the greater of $0.2B_0$ and $0.5B_{MSY.}$	NA
1.1.3	Yes	No		SI c requires "…they will be able to rebuild the stock within a specified timeframe". As noted in the justification for SI a,"… there is no formal selection of a timeframe for rebuilding". Thus, the information and rationale do not support scoring at the SG80 level for SI c.	The assessment team modified the scoring justification to further support the scoring decision. No change made to the score.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.2.1	Yes	Yes		Relevant information was used and the rationale supports the scoring. As per CR Annex CB 2.5.1, the HS was "evaluated" and "tested", consistent with the definitions provided.	NA
1.2.2	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA
1.2.3	No	No		SI b requires that fishery removals are monitored (SG60) and the SG 80 level requires they are "…regularly monitored at a level of accuracy and coverage consistent with the harvest control rule…" For SIs b and c, the justifications do not provide or make reference to the evidence needed to support the scoring.	The assessment team modified the scoring justification to further support the scoring decision. No change made to the score.
1.2.4	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA
2.1.1	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.1.2	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA
2.1.3	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA
2.2.1	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA
2.2.2	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA
2.2.3	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA
2.3.1	Yes	Yes	Yes	Relevant information was used and the rationale supports the scoring	NA
2.3.2	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA
2.3.3	Yes	Yes	Yes	Relevant information was used and the rationale supports the scoring	NA

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.4.1	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA
2.4.2	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA
2.4.3	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA
2.5.1	Yes	Yes		Relevant information was used and the rationale supports the scoring. As per CR Annex CB 3.17.5.1, Table CB 18 was used for the probability interpretations for SG60, SG80, and SG100.	NA

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.5.2	No	No		As per CR Annex CB 3.17.2, the justifications do not refer substantively to the key ecosystem elements crucial to the function of the system (cf GCB3.17.2), for example those listed in the justification for 2.5.1 SI a.	The text in 2.5.2 scoring issue B explains the way in which the assessment team applied the guidance in the final paragraph of GCB3.17.2 wherein MSC acknowleges that "harm to ecosystem structure is normally inferred from impacts on populations, species and functrional groups, which can often be measured directly." In this case, the team used evidence of effective management of these components of the ecosystem to determine that overall ecosystem structure is being managed apporpriately, even given the lack of direct measures of "ecosystem elements" such as trophic relationships and ecosystem resiliance. We note as well that a score of 100 was not awarded exactly because of this, as outlined in the final paragraph of the justification under scoring issue B. No change has been made to the text.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.5.3	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA
3.1.1	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA
3.1.2	No	No		SI b does not state the regularity of the consultation processes (cf CR Annex 4.3) (GCB4.3).	The assessment team added a statement noting that consultation occurs when management changes are proposed to meet sustainability requirements, This occurs at least annually for addressing TACCs/catch limits, and regularly for other policy and management matters.
3.1.3	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA
3.1.4	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
3.2.1	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA
3.2.2	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA
3.2.3	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA
3.2.4	Yes	Yes		Relevant information was used and the rationale supports the scoring	NA
3.2.5	Yes	Yes	Yes	Relevant information was used and the rationale supports the scoring	NA

Appendix 2.2 Peer Review No. 2

Peer Review No. 2

Overall Opinion

Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?	**Yes/No Yes**	**Conformity Assessment Body Response**
Justification: The report is well written and the evidence used to support scoring is appropriate and presented clearly.		

Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe?	**Yes/No Yes**	**Conformity Assessment Body Response**
Justification:		

If included:

Do you think the client action plan is sufficient to close the conditions raised?	**Yes/No Partial**	**Conformity Assessment Body Response**
Justification: It is reasonable to expect that the client action plan is sufficient to close conditions 1 and 4. To close conditions 2 and 3, I believe field studies will be needed. Thus the client action plan should be more specific on the types of field studies that will be undertaken, recognizing that in year 1 precise nature of these studies will be determined.		The assessment team will monitor during surveillance the progress of Conditions 2 and 3 (and other conditions) and evaluate the nature and type of studies to be conducted. A substantial amount of research has occurred, including field research, which needs analysis. The team expects that the planning for conditions 2 and 3 will evaluate whether the existing studies will provide sufficient information or if new field studies are needed. The team has confidence that DWG and MPI will design and implement a successful plan.

General Comments on the Assessment Report (optional)

The report is well written and the evidence used to support scoring is appropriate and presented clearly. One area that might be improved concerns reference to the Observer Program. Throughout the report reference is made to an average of 20% observer coverage of the orange roughy fisheries. However, coverage in the largest fishery has been consistently below 20% since 2010. The report does acknowledge is decline but not consistently throughout the scoring of P2 scoring issues.

MRAG response: The assessment team is aware of the decline in observer coverage. The decline resulted from re-prioritization that DWG expects to revert to higher observations for the orange roughy fishery. The assessment team will monitor observer coverage during surveillance and evaluate the coverage against the resolution requirements for estimates.

Performance Indicator Review

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.1.1	Yes	Yes	Yes	Evidence that, by year 4, the stock is at or fluctuating around the target reference point will result in a score ≥80.	
1.1.2	Yes	Yes	NA		
1.1.3	Yes	Yes	NA		
1.2.1	Yes	Yes	NA		
1.2.2	Yes	Yes	NA		
1.2.3	Yes	Yes	NA		
1.2.4	Yes	Yes	NA		
2.1.1	Yes	Yes	NA		

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.1.2	Yes	Yes	NA	A score of SG100 was given to this performance indicator. While I generally accept the CAB's rationale for this score given that reasonable mesures are in place to ensure that shark finning does not oocur, the reduction in observer coverage, in the ORH3B ESCR stock with the largest number of hauls and catches, perhaps should be noted here.	The team noted the decline in observer coverage in ORH3B NWCR, and will re-assess the score if coverage does not increase toward the default value of 20%.
2.1.3	Yes	Yes	NA	Observer coverage in recent years has been consistently below the 20% average in the ORH3B ESCR stock.	The team noted the decline in observer coverage in ORH3B NWCR, and will re-assess the score if coverage does not increase toward the default value of 20%.
2.2.1	Yes	Yes	NA		
2.2.2	Yes	Yes	NA		

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.2.3	Yes	No	NA	In scoring issue a, it was noted that "with misidentification of deepwater dogfish and lack of logbook records for some non-QMSspecies, it is not possible to evaluate the consequences of fishing activities on all bycatch species' populations in each of the areas, so does not reach SG100." Given this situation, it is not clear that scoring issue d should have been scored at the SG100 level, but certainly meets the SG80.	As a result of this comment, the assessment team reconsidered the scoring for scoring issue d, and agreed that it met only the SG80, resulting in an overall score or 80 for 2.2.3.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.3.1	Yes	No	Yes	For scoring issue b, the team regarded ORH7A fishery as being highly unlikely (SG80 level) to create unacceptable impacts on corals, however, it is not clear that the values given in Table 24 for this fishery are that different from those given for the NWCR fishery for the past 5 years which is scored at the SG60 level. Given the imprecise nature of these data (i.e., Table 24) it is perhaps not unexpected that interpretations may differ. Nevertheless, the text to support the different scoring for ORH7A could be strenghtened. Results of the proposed 2-yr research project should provide evidence by year 4 that the fishery is highly unlikely to create unacceptable impacts ot ETP coral species in the NWCR and ESCR UoA areas, resulting in a score $\geq$80, providing that these studies result in new empirical evidence of the nature and extent of impacts.	The information presented in Table 24 shows that over the past 5 years, the observed overlap of the ORH fishery with protected coral groups in the ORH 7A area is less than 20% whereas the observed overlap in the other two areas is up to 70%. Because the observed overlap in each area is thought to be a likely overestimate of actual overlap, and is substantially higher than predicted overlap based on the habitat suitability model, the assessment team concluded that the relatively much lower observed overlap in the 7A area allows for the determination that the fishery in that area is at least highly likely not to create unacceptible impacts, whereas in the other two areas, the relatively higher overlap, without the benefit of corroboration with the predicted overlap, is only likely to not create unacceptabe impacts. This is what led to the differences in scoring between these areas. The assessment team has not revised the scoring of this PI; however, more details have been provided in the scoring rationale to refer back to Table 24.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.3.2	Yes	Yes	NA	In scoring issue a, the rationle for corals not meeting the SG100 level seems missing from the text.	Text has been added to the rationale in scoring issue A to address this comment.
2.3.3	Yes	No	Yes	In scoring issue a, it is not clear from the current text how estimates of coral mortality are derived. Additional information is needed to justify the current score given the reduced observer coverage in recent years. As noted above (2.3.1), it is not clear that ORH7A should be scored differently from the other two stocks in scoring issue b, except that it is a small fishery. Perhaps this could be noted in the rationale here. In scoring issue c, more needs to be said with respect to how information on corals is collected to measure trends and assess impacts. It is not clear that the current text supports a score at the SG80 level. Again the information base for treating ORH7A differently than the other two stocks does not seem that different, but it is a small fishery and perhaps this is the most compelling rationale for the different score. Proposed research in 2.3.1 will also address the condition on this performance indicator.	See response under 2.3.1 regarding the differential scoring for coral impacts in ORH7A relative to the other two areas. Text has been added to the scoring rationale to explain how regular monitoring of the ORH trawl fishery footprint is a relevant metric for measuring trends and assessing potential impacts to coral species.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.4.1	Yes	Yes	NA		
2.4.2	Yes	Yes	NA		
2.4.3	Yes	Yes	NA		
2.5.1	Yes	Yes	NA		
2.5.2	Yes	Yes	NA		
2.5.3	Yes	Yes	NA		
3.1.1	Yes	Yes	NA		NA
3.1.2	Yes	Yes	NA	In scoring issue a, it would be useful to include a statement about the proportion of the orange roughy quota represented by DWG. I'm not clear that the reference to hake is appropriate here.	The reference to hake was a mistake that has been corrected in the text. DWG represents more than 95% of the orange roughy catch.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
3.1.3	Yes	Yes	NA		NA
3.1.4	Yes	Yes	NA		NA
3.2.1	Yes	Yes	NA		NA
3.2.2	Yes	Yes	NA		NA
3.2.3	Yes	Yes	NA	In scoring issue c, it would be useful to state the level of compliance reported in Kazmierow *et al.* (2010). I could not find this in the report.	More information from Kazmierow *et al.* was added to the text and referenced in the scoring table.
3.2.4	Yes	Yes	NA		NA
3.2.5	Yes	Yes	Yes	Provide evidence of an external review of the fishery-specific management system in year 2 will result in a score of ≥ 80 in year 3.	NA

Any Other Comments

Comments	Conformity Assessment Body Response