

## Deepwater Fisheries Resources

OEO2009-02	Estimation of the abundance of black oreo and smooth oreo in selected areas
ORH2008-02	Orange roughy stock assessment
ORH2009-04	Estimating the non-spawning proportion of mature orange roughy
ORH2009-06	Stock assessment of orange roughy fisheries outside the New Zealand EEZ

**Project:** Estimation of the abundance of black oreo and smooth oreo in selected areas

**Project Code:** OEO2009-02

**Start Date:** 1 September 2009

**Completion Date:** 31 December 2010

**Vessel Use:** Subject to tender, November 2009

**Overall Objectives:**

1. To estimate the abundance of black oreo (*Allocyttus niger*) and smooth oreo (*Psuedocyttus maculatus*) in selected areas.

**Specific Objectives:**

1. To estimate the abundance, with a target coefficient of variation (c.v.) of the estimate of 20-30% for smooth oreo in OEO 4 on the Chatham Rise.

**Reporting Requirements:**

**Research Reporting**

Objective 1

1. To submit to MFish a Voyage Programme as specified in Research Reporting form 2 one month before the beginning of the survey.
2. To submit to MFish a Voyage Report as specified in Research Reporting form 3 one month after the completion of the survey.
3. To present the results to the Deepwater Working Group at meetings in Wellington in June-July 2010 as required.
4. To submit to the Chief Scientist MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 30 November 2010.

**Project Update Reports**

No Project Update Reporting is required for this project.

**Work In Progress Reports**

Monthly Work In Progress Reporting is required for this project in accordance with the Conducting Research with the Ministry document.

## **Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 31 December 2010.

## **Rationale:**

### *General*

The smooth oreo fishery in OEO 4 currently produces landings of almost 6000 t annually. Based on the current stock assessments for the various oreo Fishstocks, smooth oreo in OEO 4 have the largest estimates of current biomass, the largest estimates of sustainable yield, and the largest stock size in relation to virgin biomass (and conversely the lowest level of depletion) of any of the oreo Fishstocks. Therefore, it appears that this fishery has the potential to produce the largest sustainable yield over the long term of any of the oreo Fishstocks.

The OEO 4 smooth oreo stock assessment was updated in 2007, and is reported in the 2008 Plenary report:

“The model estimates of mid-year mature biomass in 2005–06 was 57% (51–62) of mature  $B_0$  and suggests that there is not an immediate sustainability issue with this stock. However, there are considerable uncertainties associated with this assessment described in section 4.3.6 above. The main uncertainty is that substantial proportions of the abundance in each acoustic survey are attributed to layer marks which are generally not fished by the commercial fishery. Also, standardised CPUE in the larger east fishery has declined in recent years.”

The MFish Deepwater Medium Term Research Plan has a programme of updating the biomass indices for each of the main oreo fisheries in the New Zealand EEZ every 3 to 5 years. Three acoustic surveys have been carried out for smooth oreo in OEO 4 – in 1998, 2001 and 2005. Therefore, it is proposed to obtain an acoustic biomass estimate for smooth oreo in OEO 4 in 2009 (4 years after the previous survey).

The following is a summary of the acoustic surveys that have provided estimates of abundance of black and smooth oreos and that have been used as inputs into the stock assessments for these species:

- 1997 – black oreo and smooth oreo in OEO 3A and 4
- 1998 – black oreo and smooth oreo in OEO 4
- 2001 – smooth oreo in OEO 4
- 2002 – black oreo in OEO 3A
- 2005 – smooth oreo in OEO 4
- 2006 – black oreo in OEO 3A

### *Objective 1*

It is proposed to estimate the abundance, with a target coefficient of variation (c.v.) of the estimate of 20-30% for smooth oreo in OEO 4 using acoustic survey.

### *Weighting of Objectives:*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 1.0

**Project:** Orange roughy stock assessment

**Project Code:** ORH2008-02

**Start Date:** 1 September 2009

**Completion Date:** 30 September 2010

**Vessel Use:** None

**Overall Objectives:**

1. To carry out a stock assessment of orange roughy (*Hoplostethus atlanticus*), including estimating biomass and sustainable yields.

**Specific Objectives:**

1. To update the descriptive analysis of the commercial catch and effort data from selected orange roughy fisheries with the inclusion of data up to the end of the 2007/08 fishing year. These fisheries include ORH 1, ORH 2A (North and South), ORH 2B, ORH 3A, ORH 3B (Chatham Rise and other areas).
2. To update the unstandardised and standardised catch per unit effort analyses with the inclusion of data up to the end of the 2007/08 fishing year for the following area:
  - ORH 1
  - East Cape
  - MEC
3. To analyse length frequency, sex ratio, and reproductive data for orange roughy collected by the Observer Programme and from other sources during the 2007/08 fishing year for input into stock assessment models. The target number of samples that will be collected by the Observer Programme for each fishery in 2007/08 is specified below in the Rationale.
4. To update the stock assessment, including reviewing and summarising the historical biological data collected by the MFish Observer Programme and other sources, and estimating biomass and sustainable yields for the following area:
  - MEC

**Reporting Requirements:**

**Research Reporting**

Objectives 1 to 4

5. To present the results to the Deepwater Working Group at meetings in Wellington in March 2010 as required.

6. To submit to the Chief Scientist MFish a draft Working Group Report as specified in Research Reporting form 8 by 20 March 2010.
7. To submit to the Chief Scientist MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 30 September 2010.

### **Project Update Reports**

No Project Update Reporting is required for this project.

### **Work In Progress Reports**

Monthly Work In Progress Reporting is required for this project in accordance with the Conducting Research with the Ministry document.

### **Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 30 September 2010.

### **Rationale:**

#### *General*

Orange roughy is the most important of the deepwater species in New Zealand with current annual landings of about 15,500 t. There is a need to carry out regular monitoring programs and stock assessments to determine stock status and estimate sustainable yields for all orange roughy fisheries. The fisheries included in this project were selected on the basis of the schedule of updates for CPUE set out in the medium term research plan. The results of these analyses will be used in future to update the stock assessments for these stocks.

This research project is considered high priority because:

#### *Objectives 1 & 2*

In order to update the stock assessment for each fishery, commercial catch and effort data should be monitored and the descriptive analysis of the commercial catch and effort data should be updated on an annual basis.

In addition standardised CPUE analyses will be updated with the inclusion of data for the 2007/08 year for the following areas:

- ORH 1
- East Cape
- MEC

Note: in 2006 the Deepwater WG did not consider the CPUE data from the East Cape fishery were indices of abundance because of recent changes in the fishery.

### *Objective 3*

The current stock assessments for all fisheries incorporate information on fish length, sex ratios, length-weight data, and reproductive information of orange roughy from both commercial at-sea sampling and research surveys.

It is proposed to estimate biological parameters for input into the stock assessments by analysing length frequency and sex ratio data collected by the Observer Programme and from other sources during the 2007/08 fishing year.

A total of about 530 observer days are expected from these fisheries as follows:

- ORH 3B
  - Chatham Rise 430 days
  - South of 46° S and Arrow Plateau 40 days
- ORH 2A (South) 40 days
- ORH 1 20 days

### *Objective 4*

An update of the stock assessment for MEC was attempted in 2007, where the standardised CPUE analysis was split into an early series (1983-96) and a late series (1996-2004). The assessment was not finalised as the model gave poor fits to the recent CPUE data, predicting less rebuild in the model than the CPUE indices of abundance. This problem is seen in many stocks where the predicted rebuild is a function of the recruitment assumption in the model rather than the fishery data. In this case the WG considered that the stock was likely to be increasing under recent catch levels.

#### *Weighting of Objectives:*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.2, 0.2, 0.1 and 0.5.

**Project:** Estimating the non-spawning proportion of mature orange roughy

**Project Code:** ORH2009-04

**Start Date:** 1 October 2009

**Completion Date:** 31 December 2010

**Vessel Use:** Subject to tender

**Overall Objectives:**

1. To estimate the annual non-spawning proportion of mature orange roughy.

**Specific Objectives:**

1. Review and refine the methodology for estimating the proportion of non-spawning female orange roughy.
2. Investigate the potential for estimating the non-spawning proportion of male orange roughy.

**Reporting Requirements:**

**Research Reporting**

Objective 1

1. To present the results to the Deepwater Working Group at meetings in Wellington in June-July 2010 as required.
2. To submit to the Chief Scientist MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 30 November 2010.

**Project Update Reports**

No Project Update Reporting is required for this project.

**Work In Progress Reports**

Monthly Work In Progress Reporting is required for this project in accordance with the Conducting Research with the Ministry document.

**Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 31 December 2010.

## **Rationale:**

### *General*

The estimate of the non-spawning proportion is critical to the management approach currently being used to manage ORH 3B, where future yield is determined as a fixed proportion of mature biomass.

The literature on the proportion of orange roughy that spawn each year was reviewed by Dunn & Dunn (draft report presented to the Plenary 2008). This project aims to revisit the assumptions of the method and make methodological improvements where possible, examine the possibility of making an estimate for males, and then apply the technique, for the first time, to the east and south Chatham Rise.

### *Objective 1*

Previous applications have estimated the non-spawning proportion as the number of female orange roughy at maturity stage 3 (maturing, will definitely spawn that year) or above, divided by the number of orange roughy above the mean length of first maturity. Biases might arise from the (usually macroscopic) determination of maturity stage: this is of particular interest for fish in the length range expected to be maturing (e.g., 15–30 cm SL), the calculation of the mean length at maturity (which could be affected by the size of fish which migrate to spawn), and the measurement of relative density. Historical data to investigate the assumptions would be available for the MEC stock.

### *Objective 2*

It is currently assumed that there are both non-spawning females and also males, and that the proportion of non-spawning males will be the same as females. However, possible differences in the energetic costs of spawning and migration to spawning grounds mean that the non-spawning proportion of males may be different. There have been histological studies of maturation of males in other species, but as far as we know not yet in orange roughy. This objective would be expected to consist of the evaluation of macroscopic staging following analyses of histological samples, and then, if possible, the estimation of the non-spawning proportion of males.

### *Weighting of Objectives:*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.7, 0.3

**Project:** Stock assessment of orange roughy fisheries outside the New Zealand EEZ

**Project Code:** ORH2009-06

**Start Date:** 1 December 2009

**Completion Date:** 30 September 2012

**Vessel Use:** None

**Overall Objectives:**

1. To monitor orange roughy (*Hoplostethus atlanticus*) fisheries in the New Zealand region outside the EEZ.

**Specific Objectives (to 30 September 2010):**

1. To update descriptive analyses of commercial catch and effort data from orange roughy fisheries in the mid Tasman Sea (Lord Howe Rise and Northwest Challenger), Louisville Ridge and Norfolk Ridge and any other areas outside the EEZ with the inclusion of data up to the end of the 2008/09 fishing year.
2. To analyse length frequency, sex ratio, and reproductive data for orange roughy from fisheries outside the New Zealand EEZ collected by the Observer Programme and from other sources during the 2008/09 fishing year for input into stock assessment models.

**Note:**

It is proposed to contract this project for 3 years with annual updates of the specific objectives, subject to review each year.

**Reporting Requirements (to 30 September 2010):**

**Research Reporting**

Objectives 1 and 2

1. To submit to the Chief Scientist MFish a draft Working Group Report as specified in Research Reporting form 8 by 20 March 2010.
2. To submit to the Chief Scientist MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 30 September 2010.

**Project Update Reports**

No Project Update Reporting is required for this project.

## **Work In Progress Reports**

Monthly Work In Progress Reporting is required for this project in accordance with the Conducting Research with the Ministry document.

## **Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 30 September 2010.

## **Rationale:**

### *General*

Fisheries for orange roughy occur in waters outside the EEZ, in distant waters (South east Indian Ocean) and within the general New Zealand region (e.g. Lord Howe Rise, Northwest Challenger, Louisville Ridge, and Norfolk Ridge). The fishery in the mid Tasman Sea (Lord Howe Rise and Northwest Challenger) began in the mid to late 1980s, on the Louisville Ridge, east of the Chatham Rise, in 1994, and on the South Tasman Rise in 1997. The fisheries in the former two areas currently are not subject to any management measures. The fishery on the South Tasman Rise was managed through an Arrangement between the Australian and New Zealand governments, which includes a catch limit, but there has been little participation by New Zealand vessels in recent years.

New Zealand has an ongoing obligation to monitor the status of its fisheries in international waters.

### *Objective 1*

In order to assess the status of these fisheries, commercial catch and effort data should be monitored and the descriptive analysis of the commercial catch and effort data should be updated on an annual basis.

### *Objective 2*

The current stock assessments for all fisheries incorporate information on fish length, sex ratios, length-weight data, and reproductive information of orange roughy from both commercial at-sea sampling and research surveys. It is proposed to estimate biological parameters for input into the stock assessments by analysing length frequency and sex ratio data collected by the Observer Programme and from other sources during the 2008/09 fishing year.

### *Weighting of Objectives:*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 1.0