

## ORANGE ROUGHY WEST COAST SOUTH ISLAND (ORH 7B)

## 1. FISHERY SUMMARY

## 1.1 Commercial fisheries

From 1 October 2007 the TACC for this stock was reduced to 1 t. Previously the fishery was centred on an area near the Cook Canyon in statistical areas 033, 034 and 705. Up until 1996–97 approximately 80% of the catch was taken in winter (June–July) when fish form aggregations for spawning. From 1997–98 onwards about 50% of the catch was taken in winter. Reported domestic landings and TACCs are shown in Table 1, while the historical landings and TACC for ORH 7B are depicted in Figure 1.

**Table 1: Reported landings (t) of orange roughy and TACCs (t) for ORH 7B from 1983–84 to present. QMS data from 1986–present.**

Fishing year	Reported landings	TACC
1983–84*	2	-
1984–85*	282	-
1985–86*	1 763	1 558
1986–87*	1 446	1 558
1987–88	1 413	1 558
1988–89	1 750	1 708
1989–90	1 711	1 708
1990–91	1 683	1 708
1991–92	1 604	1 708
1992–93	1 139	1 708
1993–94	701	1 708
1994–95	290	1 708
1995–96	446	430
1996–97	425	430
1997–98	330	430
1998–99	405	430
1999–00	284	430
2000–01	161	430
2001–02	95	110
2002–03	90	110
2003–04	119	110
2004–05	106	110
2005–06	77	110
2006–07	125	110
2007–08	6.0	1
2008–09	1.4	1
2009–10	< 0.1	1
2010–11	0.1	1
2011–12	< 0.1	1
2012–13	0.3	1
2013–14	0.6	1
2014–15	1.67	1
2015–16	0.274	1

\*FSU data.

Catches in the early-mid 1990s (especially 1994–95) were well below the TACC. The TACC was reduced to 430 t for the 1995–96 fishing year, then was reduced further to 110 t from 1 October 2001, followed by a further reduction to 1 t in the 2007–08 fishing year.

## 1.2 Recreational fisheries

There is no known recreational fishery for orange roughy in this area.

## 1.3 Customary non-commercial fisheries

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

## 1.4 Illegal catch

There is no quantitative information available on illegal catch.

### 1.5 Other sources of mortality

There is no quantitative information available on other sources of mortality in this fishery.

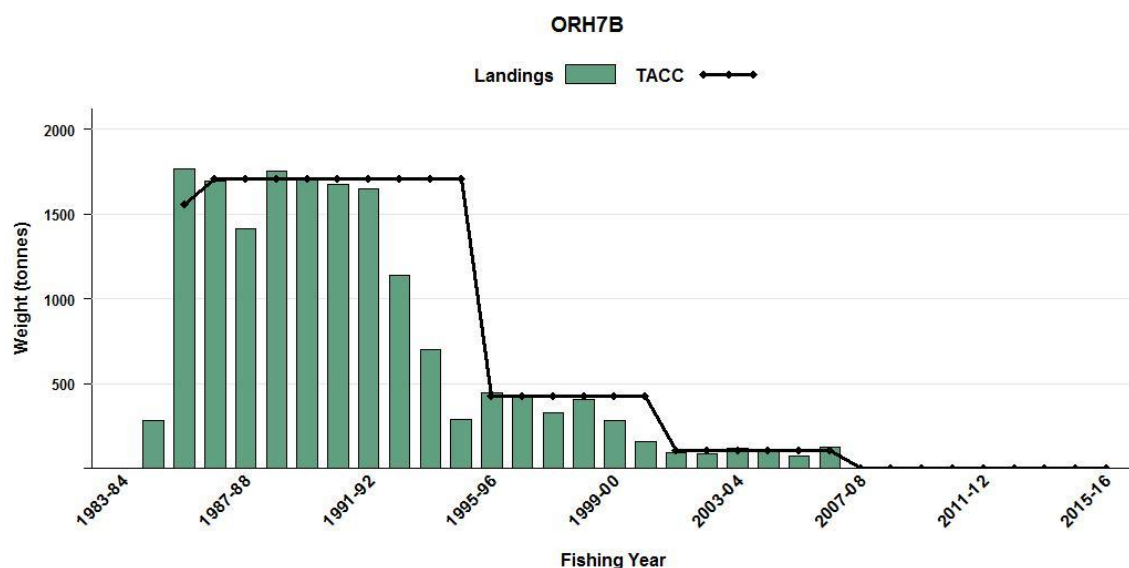


Figure 1: Reported commercial landings and TACC for ORH 7B (Auckland East).

## 2. STOCKS AND AREAS

There is no new information which would alter the stock boundaries given in previous assessment documents.

Orange roughy in this fishery are thought to be a single stock. Genetic studies have shown that samples of Cook Canyon orange roughy are significantly different from Challenger Plateau and Puysegur Bank samples. Moreover, the size structure and parasite composition differ from fish on the Challenger Plateau. Spawning occurs at a similar time to fish on the Challenger Plateau and the Puysegur Bank.

## 3. STOCK ASSESSMENT

The previous assessment for this stock was carried out in 2004 and is summarised in the 2006 Plenary Report. Biomass was estimated to be 17%  $B_0$  (95% confidence interval 14–23%) when CPUE was assumed to be directly proportional to abundance.

An updated assessment was attempted in 2007 with the addition of catch data up to 2005–06 and new standardised CPUE indices. The Working Group rejected the assessment on the basis of the poor fit to the CPUE data. The effect was similar to the result from the 2004 assessment; namely a slow rebuild in recent years, which was not supported by the CPUE data.

### 3.1 Estimates of fishery parameters and abundance

Commercial catch and effort data are available from 1985 and were examined using both an unstandardised and a standardised analysis. Unstandardised catch rates have declined substantially over the course of the fishery but have shown no clear trend in recent years (Table 2).

The standardised CPUE analysis has been divided into two series to address reporting form changes: (i) using TCEPR data from 1985–86 through to 1996–97, and (ii) using CELR data from 1990–91 through to 2005–06. In addition, in order to increase vessel linkage across years, it was decided to use

all months of data not just that from the winter fishery (June–July) as has been done for previous standardisations.

**Table 2: Summary of groomed data from TCEPR and CELR forms.**

Fishing year	Number of vessel days	Number of tows	Total estimated catch (t)	Mean daily catch rate (t/tow)	Mean daily catch rate (t/h)
1985–86	138	357	1 544	4.5	2.9
1986–87	132	405	1 250	4.0	2.7
1987–88	132	420	1 250	3.4	2.3
1988–89	133	368	827	2.5	1.6
1989–90	123	356	1 282	4.5	5.6
1990–91	208	632	1 657	2.8	3.3
1991–92	238	810	1 601	2.0	1.4
1992–93	258	784	1 128	1.5	2.3
1993–94	298	708	660	1.1	0.9
1994–95	162	361	320	0.9	1.6
1995–96	66	150	275	2.2	1.7
1996–97	90	182	244	1.3	7.5
1997–98	96	228	170	0.7	0.3
1998–99	188	566	359	0.6	0.2
1999–00	213	647	259	0.4	0.1
2000–01	149	442	162	0.4	0.1
2001–02	117	282	76	0.3	0.1
2002–03	97	292	112	0.4	0.2
2003–04	90	252	118	0.4	0.2
2004–05	121	393	102	0.3	0.1
2005–06	87	257	73	0.3	0.2

The standardised analysis for the TCEPR data used catch per tow in a linear regression model. Indices from this model (Table 3, Figure 2) show a steep decline after the first two years, followed by a more gradual decline and a slight increase in catch rates in 1995–96 and 1996–97.

**Table 3: Standardised CPUE indices (relative year effect) based on TCEPR data with number of vessel tows from 1985–86 to 1996–97.**

Year	CPUE index	CV	Number of tows	Year	CPUE index	CV	Number of tows
1985–86	1.99	0.20	153	1991–92	0.48	0.23	231
1986–87	2.13	0.23	150	1992–93	0.29	0.23	230
1987–88	1.11	0.26	212	1993–94	0.14	0.25	341
1988–89	0.58	0.22	310	1994–95	0.13	0.27	172
1989–90	0.61	0.22	236	1995–96	0.51	0.33	37
1990–91	0.76	0.23	238	1996–97	0.41	0.26	104

The standardised analysis for the CELR data used daily catch in a linear regression model. Indices from this model (Table 4, Figure 2) show a steep decline for the first four years, followed by an increase to a peak in 1995–96, and subsequent low catch rates after then.

**Table 4: Standardised CPUE indices (relative year effect) based on CELR data with number of days from 1990–91 to 2005–06.**

Year	CPUE index	CV	Number of days	Year	CPUE index	CV	Number of days
1990–1991	2.17	0.27	110	1999–2000	0.34	0.27	131
1991–1992	1.11	0.27	108	2000–2001	0.34	0.28	88
1992–1993	0.74	0.27	126	2001–2002	0.33	0.28	73
1993–1994	0.28	0.28	81	2002–2003	0.61	0.26	67
1994–1995	0.53	0.30	46	2003–2004	0.59	0.25	75
1995–1996	1.16	0.33	29	2004–2005	0.35	0.24	114
1996–1997	0.53	0.38	19	2005–2006	0.36	0.26	80
1997–1998	0.36	0.30	52				
1998–1999	0.39	0.28	112				

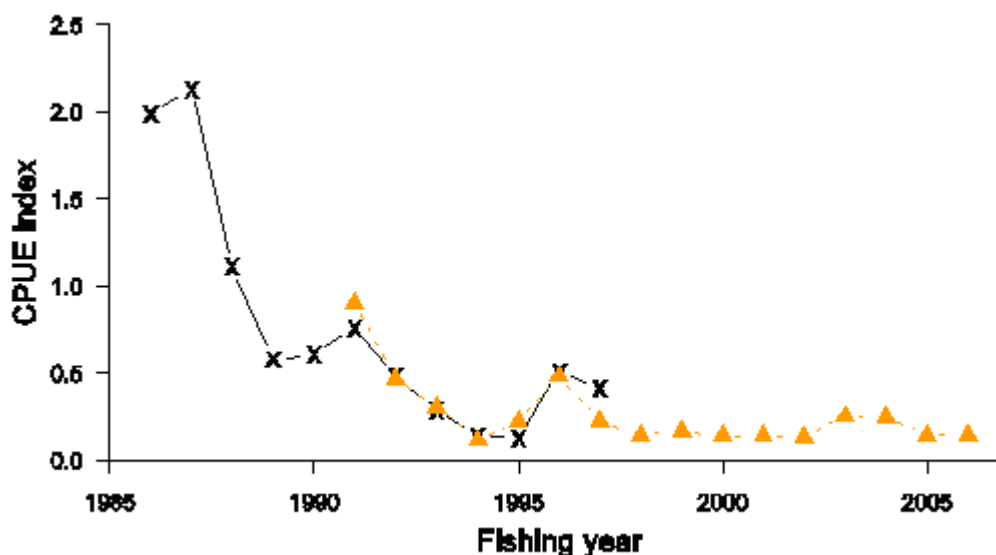


Figure 2: The CPUE indices based on: (i) TCEPR data (solid line and crosses) covering 1985–86 to 1996–97, and (ii) CELR data (triangles and dashed line) covering 1990–91 to 2005–06. The CELR index has been scaled so that it has the same mean value as the TCEPR index in the years that they overlap.

### 3.2 Biomass estimates

No estimates of current biomass are available. Based on previous stock assessments using CPUE data the TACC was cut back severely from about 1700 t in 1994–95 to 110 t in 2000–01. By the late 1990s the stock was believed to be well below  $B_{MSY}$  where it continued until at least 2004 (17%  $B_0$  in the 2004 assessment, Figure 3). Despite the large reduction in annual removals from the stock after 2001–02, catch rates did not increase over the subsequent 5 years.

An updated assessment was attempted in 2007 with the addition of catch data up to 2005–06 and new standardised CPUE indices (Figure 2) based on TCEPR data (1986 to 1997) and a separate CELR series (1991 to 2006). These data were incorporated in a Bayesian stock assessment with deterministic recruitment to estimate stock size. The Working Group rejected the assessment on the basis of the poor fit to the recent CPUE data. The model was insensitive to the recent CPUE data and predicted a rebuild (driven by the recruitment assumptions) that is not supported by any observations in the fishery.

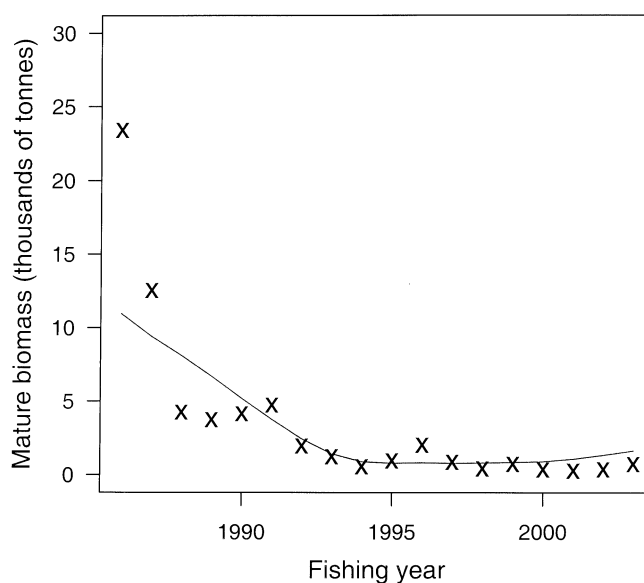


Figure 3: Biomass trajectory derived from Maximum Posterior Density (MPD) estimate of the model parameters (2004 stock assessment). The biomass trajectory is shown by the solid line; crosses denote the CPUE index scaled to biomass.

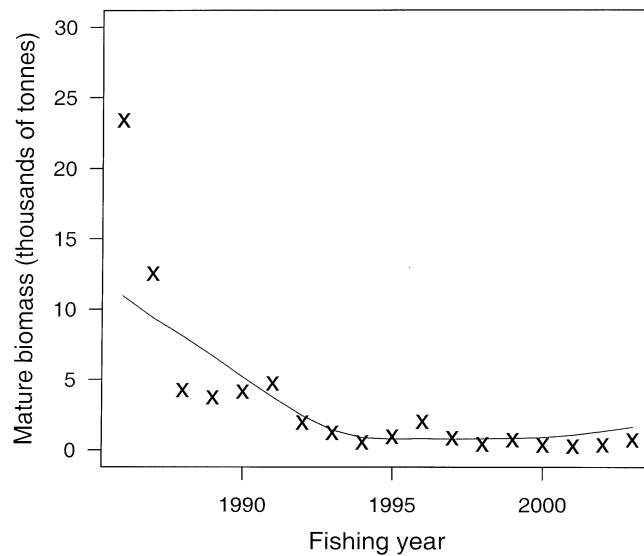
#### 4. STATUS OF THE STOCK

##### Stock Structure Assumptions

The ORH 7B stock has been treated as a single spawning stock located around the Cook Canyon area. It is assessed and managed separately from other stocks and is assumed to be non-mixing with orange roughy stocks outside of the Cook Canyon area.

Stock Status	
Year of Most Recent Assessment	2004
Assessment Runs Presented	One base case
Reference Points	Target: 30% $B_0$ Soft Limit: 20% $B_0$ Hard Limit: 10% $B_0$ Overfishing threshold: -
Status in relation to Target	$B_{2004}$ was estimated to be 17% $B_0$ , Very Unlikely (< 10%) to be at or above the target
Status in relation to Limits	$B_{2004}$ was Likely (> 60%) to be below the Soft Limit and Unlikely (< 40%) to be below the Hard Limit

##### Historical Stock Status Trajectory and Current Status



Biomass trajectory derived from Maximum Posterior Density (2004 stock assessment model)

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	Unknown, but biomass is thought to be very low.
Recent Trend in Fishing Mortality or Proxy	The fishery has been effectively closed since October 2007.
Other Abundance Indices	-
Trends in Other Relevant Indicators or Variables	-

Projections and Prognosis (2004)	
Stock Projections or Prognosis	Stable at current catch level
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Already below the Soft Limit Hard Limit: Very Unlikely (< 10%)

**ORANGE ROUGHY (ORH 7B)**

<b>Assessment Methodology and Evaluation</b>		
Assessment Type	Type 1 - Quantitative stock assessment	
Assessment Method	Age-structured model with Bayesian estimation of posteriors.	
Assessment Dates	Latest assessment: 2004	Next assessment: Unknown
Overall assessment quality rank	-	
Main data inputs (rank)	- Catch history - CPUE indices (1985–2003)	
Data not used (rank)	-	
Changes to Model Structure and Assumptions	- CPUE indices based on mean catch per hour as opposed to previous measure of mean catch per tow	
Major Sources of Uncertainty	- Recruitment assumed to be deterministic - CPUE assumed to be directly proportional to stock biomass in base model	

<b>Qualifying Comments (2010)</b>
A further assessment was attempted in 2007 with updated information; however, this was rejected by the working group as the model was insensitive to the CPUE data. The model indicated that the stock had been rebuilding since the mid 1990s, a trend not supported by any observations in the fishery. The fishery was closed from 1 October 2007 and stock size is expected to increase.

<b>Fishery Interactions</b>
Historically, the main bycatch species were oreos and deepwater dogfish. Bycatch species of concern included deepwater sharks, deepsea skates, seabirds and corals. The fishery is currently closed.

**5. FOR FURTHER INFORMATION**

Annala, J H; Sullivan, K J; O'Brien, C J; Smith, N W McL; Graying, S M (Comps.) (2003) Report from the Fishery Assessment Plenary, May 2003: stock assessments and yield estimates. 616 p. (Unpublished report held in NIWA Greta Point library, Wellington.)

Clark, M R; Tracey, D M (1988) Assessment of the west coast South Island and northern North Island orange roughy fisheries. New Zealand. Fisheries Assessment Research Document 1988/20. 11 p. (Unpublished report held in NIWA library, Wellington.)

Clark, M R; Field, K D (1995) Assessment of the ORH 7B orange roughy fishery for the 1995–96 fishing year. New Zealand Fisheries Assessment Research Document 1995/19. 15 p. (Unpublished report held in NIWA library, Wellington.)

O'Driscoll, R L (2001) Assessment of the west coast South Island orange roughy fishery (ORH 7B) for the 2001–02 fishing year. *New Zealand Fisheries Assessment Report 2001/31*. 29p.