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**Assessment of the west coast South Island and
northern North Island orange roughy fisheries**

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This series documents the scientific basis for stock assessments and fisheries management advice in New Zealand. It addresses the issues of the day in the current legislative context and in the time frames required. The documents it contains are not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

Assessment of the West Coast South Island and Northern North Island
orange roughy fisheries

A significant domestic orange roughy fishery exists on the west coast of the South Island, although relatively small in comparison with the major New Zealand fisheries (Chatham Rise, Challenger Plateau and Ritchie Banks). In addition, there is a small quota and exploratory allowance of orange roughy from Cape Egmont northwards around to Cape Runaway. There has been considerable interest from fishers in this area, but to date no significant concentrations of orange roughy have been found.

Little active fisheries research effort has gone on in these areas in the last year due to other major orange roughy fishery priorities. This paper summarises the current status of each fishery.

WEST COAST SOUTH ISLAND

Introduction

The main commercial activity for orange roughy on the west coast of the South Island centres on the Cook Canyon area.

The domestic areas for this orange roughy fishery are 032, 033 and 034. These form part of the old EEZ Area G and make up Quota Management Area 7B and parts of areas 7A and 5. The present quota in area 7B is

owned by 10 companies (1 508 t) and MAFFish (50 t). The TAC of 1 558 t for this area was set when the fishery developed in 1985.

Review of the Fishery

The fishery developed in May 1985. Highest catches have been recorded in area 033, where most of the commercial fishing activity occurs throughout June and July and in October. A summary of the reported domestic catches of orange roughy from the west coast South Island by fishing year from 1983 to 1987 is presented in Table 1.

Research

Research by FRC on orange roughy on the west coast of the South Island dates back to 1983. Surveys have been carried out by Sealord's F.V. Arrow, FRV James Cook, as well as an exploratory survey by F.V. Cascade and Corsair on a FIDGFAC grant. All research and commercial activity in the area up to July 1985 is summarised in Armstrong and Tracey (1986). More recent research results have been reported in Armstrong and Tracey (1987), in Robertson (1986), and Robertson et al. (1988).

The population of spawning fish around the Cook Canyon appears to be separate from that on the Challenger Plateau. Orange roughy spawn earlier than fish on the Challenger, and the main commercial activity also occurs earlier. Length frequency distributions of orange roughy have been compared between the Cook Canyon and Challenger fisheries. The spawning fish are larger in the Cook Canyon area. A recent

parasitological survey of orange roughy from New Zealand showed that the Cook Canyon and Challenger Plateau fish had distinct parasite faunas (Lester et al., in press).

Research aimed at monitoring commercial catch data and effort has continued and biological data will be collected during the 1988 spawning season to monitor size, age and reproductive parameters.

Yield estimation

The area was surveyed for biomass estimation in July 1986. This gave a mean wingtip value of 15 400 t. These results have been used in computer model simulations to estimate virgin biomass and predict future biomass levels. The simulation model is described in Robertson et al. (1988). Catch history prior to the survey was added (including 30% overrun of reported catches) and virgin biomass (B_0) computed as 17 000 t.

1) Maximum Constant Yield (MCY)

This is derived from the formula:

$$\begin{aligned} \text{MCY} &= 0.25 \times M \times B_0 \\ &= 0.25 \times 0.1 \times 17\ 000 \end{aligned}$$

$$\underline{\text{MCY} = 425 \text{ t}}$$

2) Current Annual Yield (CAY)

This is based on a constant fishing mortality strategy:

$$\text{CAY} = F_{0.1} \times B_{\text{current}}$$

A value of $F_{0.1} = 0.18$ was used in common with Chatham Rise and Ritchie Banks fisheries. Computer model simulations were made to determine expected biomass in 1988/89. Assumptions were made that the 1987/88 catch was 1 558 t (the TAC), with a 30% level of overrun.

$$B_0 = 17\,000\text{ t}$$

$$B(1988/89) = 10\,100\text{ t}$$

$$\underline{\text{CAY (1988/89) = 1\,820 t}}$$

Projected biomass and yield:

$$B(1989/90) = 8\,880\text{ t}$$

$$\text{CAY (1989/90) = 1\,600 t}$$

Management Implications

The CAY predicted by the computer model is greater than the present TAC. However, a level of TAC overrun of 30% can be anticipated, and the TAC needs therefore to be set lower than the CAY. Computer simulations indicate that a constant catch level of 1 500 t is not sustainable, and would cause stock collapse within 10 years. Simulations based on a constant fishing mortality strategy ($F_{0.1}$) result in a long-term yield of 870 t. The fishery is still relatively new, and quotas will need to be progressively reduced as the population declines towards equilibrium.

A further survey (trawl or acoustic) is needed to estimate biomass. The 1986 survey occurred after peak spawning, when fish may have begun

to disperse beyond the survey area. We are also uncertain of the accuracy of values of the growth parameters used in the computer model.

NORTHERN NORTH ISLAND

Cape Egmont-North Cape

Introduction

Orange roughy is distributed throughout the region. There is no established fishery for orange roughy, and commercial exploratory activity is infrequent. The present TAC is 10 t (combined with the area North Cape - Cape Runaway), although up to 750 t has been informally designated for exploratory fishing. At the 1987 Stock Assessment meeting, it was recommended that this exploratory fishing quota be reduced to at most 500 t (Robertson et al. 1988).

Review of the fishery

Soviet trawlers may have fished in this area during the 1960's, but we have no information on catches. Commercial activity in recent years has involved New Zealand vessels, but reported catches have been very small (Table 2).

There was exploratory fishing by a domestic vessel in September 1986 under a programme coordinated by MAFFish, Auckland. Catch rates were low, with a total of 0.01 t from 8 trawls by this vessel.

Research

Several research cruises have occurred over recent years to assess potential of deepwater species, including orange roughy, in the area. In 1981 there were brief surveys by 'James Cook' (McMillan 1981) and 'Kalinovo' (McMillan 1985).

More extensive research was carried out using 'Wanaka' during 1985 and 1986 (Clark & King, in press). This transect trawl survey was not designed for abundance estimation, but biomass indices have been computed.

Yield estimation

A total of 6 390 t of orange roughy (wingtip area swept) was estimated for this area, of which approximately 84% was recruit-sized fish of 25 cm and larger. Commercial catches in the past have been minor, and therefore this estimate is considered that of virgin biomass.

$$B_0 \text{ (of recruited fish)} = 5\,370 \text{ t.}$$

1) Maximum Constant Yield (MCY)

This is based on the formula:

$$\begin{aligned} \text{MCY} &= 0.25 \times M \times B_0 \\ &= 0.25 \times 0.1 \times 5\,370 \text{ t} \end{aligned}$$

$$\underline{\text{MCY}} = 130 \text{ t}$$

No new research has been conducted since 1986, although commercial catches are being monitored. There is no estimate for Current Annual Yield (CAY).

Management Implications

Limited interest in exploratory fishing continues. It seems appropriate to institute a TAC based on 'Wanaka' survey results, and retain a reduced level of exploratory allocation.

NORTH CAPE-CAPE RUNAWAY

Introduction

There is no established fishery for orange roughy on the north-east coast of the North Island, but occasional interest is shown by the industry. The species occurs throughout the region at depths greater than 800 m. The present TAC (combined with Cape Egmont - North Cape) is 10 t, with additional exploratory allocation of up to 750 t, which in 1987 was recommended be reduced to 500 t (Robertson et al. 1988).

Review of the fishery

There were no reports of orange roughy caught by commercial vessels in the area prior to 1982. Recorded catches by domestic boats are given in Table 3. During 1985 there were sporadic catches reported off the Bay of Islands and in the eastern Bay of Plenty.

Exploratory fishing occurred under the MAFFish Auckland programme from July to October 1986. Catches were small, and activity has declined. A total of 103 trawls was carried out by 9 vessels for 4.0 t of orange roughy.

Research

Research history is similar to that on the west coast of the North Island. The most significant survey is that conducted using 'Wanaka' during 1985 and 1986 (Clark & King, in press).

Yield estimation

Biomass estimates derived from wingtip swept-area was approximately 2 640 t, of which 89% was of recruit-sized fish. This makes the virgin biomass of recruited fish 2 350 t.

1) Maximum Constant Yield (MCY)

This is based on the formula:

$$\begin{aligned} \text{MCY} &= 0.25 \times M \times B_0 \\ &= 0.25 \times 0.1 \times 2\,350 \text{ t} \end{aligned}$$

$$\underline{\text{MCY} = 60 \text{ t}}$$

Current Annual Yield (CAY) cannot be estimated, as there has been no new research since the 'Wanaka' survey in 1986. Commercial data are being compiled.

Management Implications

Interest in exploratory fishing has declined since the MAFFish programme in 1986. Catches have been small. The 'Wanaka' survey indicated limited potential in the area, and it seems appropriate to specify a yield based on survey results, and retain limited exploratory quota.

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Table 1. Reported catches (t) of orange roughy from the west coast South Island (1983/84-1985/86) fishing year data from FSU, 1986/87 total catch figures* from QMR, area code 7B).

Fishing Year (Oct-Sep)	Areas			Total
	(032,	033,	034)	
1983-1984		2.0		2.0
1984-1985		220.7	61.5	282.2
1985-1986	11.7	1472.9	278.0	1 762.6
1986-1987				1 691.3*

Table 2. Reported catches of orange roughy (tonnes) from the west coast of the North Island by New Zealand vessels (FSU data).

	1982/83	1983/84	1984/85	1985/86
Central West	0	0.1	<0.1	0.2
Auckland West	<0.1	<0.1	<0.1	0.3
Total	<0.1	0.1	<0.1	0.5

Table 3. Reported catches of orange roughy (tonnes) from the north-east coast of the North Island by New Zealand vessels (FSU data).

	1982/83	1983/84	1984/85	1985/86
Auckland East	0	0	95.6	1.5