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Stock assessment and catch limit proposals for Westpac Bank orange roughy

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Stock assessment and catch limit proposals for Westpac Bank orange roughy

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1. Purpose of paper

This paper summarises the results from New Zealand's updated stock assessment of the Southwest Challenger Plateau orange roughy stock which includes the ORH 7A quota management area within New Zealand's EEZ and the Westpac Bank in the SPRFMO Area. It provides discussion points for the Scientific Committee to consider in providing its scientific advice and recommendation to the Commission on the setting of a sustainable catch limit for the Westpac Bank Area to apply from 2020.

This paper should be read in conjunction with "*A 2019 stock assessment of ORH7A including Westpac Bank*" (Cordue 2019, provided as SC-07-DW-06).

2. Southwest Challenger Plateau stock description

The orange roughy stock on the southwest Challenger Plateau straddles the New Zealand Exclusive Economic Zone (EEZ) and the Westpac Bank Management Area in the SPRFMO Convention Area (Smith et al 2002, Clark et al 2016). The portion of the stock within the New Zealand EEZ is referred to as ORH 7A.

The orange roughy fishery on the southwest Challenger Plateau developed in the early 1980s. The fishery was initially promulgated within the New Zealand EEZ, but extended to the Westpac Bank area in the late 1980s.

Catch from the Westpac Bank area peaked in 1989 at an estimated 3,500 tonnes¹ and declined substantially afterwards. From 1990 to 2000 the average catch was around 240 tonnes per year. The fishery was essentially closed in 2000 but, between 2000 and 2010, a total of 65 tonnes was taken from the Westpac Bank part of the fishery during biomass surveys to monitor stock abundance.

Catch from the Westpac Bank area increased again from 2010 when the fishery was reopened, although the maximum catch in any given year between 2010 and 2014 was 8 tonnes. Since 2014, when New Zealand set a catch limit of 1,600 tonnes for the entire stock (based on application of the harvest control rule which generated a maximum sustainable catch limit of 1,764 tonnes), catch has averaged around 220 tonnes per year.

Based on historical information (See Annex I), it is currently estimated that 10–15% of the southwest Challenger Plateau orange roughy stock is resident in the Westpac Bank Area. This was recognised by the SPRFMO Commission last year in the setting of the Westpac Bank Management Area catch limit at 12.5% of the overall catch limit for the stock.

¹ Higher reported catches on the Westpac Bank in the early 1980s are considered to be unreliable and much of that catch is thought to have been taken within New Zealand's EEZ

3. New Information

2018 Trawl/Acoustic Survey

The southwest Challenger Plateau stock was surveyed using a combined trawl and acoustic survey in June/July 2018. This is the eighth time that the southwest Challenger Plateau stock has been surveyed.

The acoustic survey consisted of acoustic biomass estimates using a net-attached Acoustic Optical System (AOS) and a hull-mounted echosounder. Five acoustic snapshots were completed using the AOS, three on the in-zone portion of the stock, and two on a key feature in the Westpac Bank area. In addition, nine acoustic snapshots were completed using the hull-mounted acoustic system, five in the in-zone portion of the stock and two each on the primary features in the Westpac Bank area.

Biomass estimates from the acoustic survey were similar to previous years, although slightly lower than the most recent estimates for both the in-zone area and the key feature in the Westpac Bank area.

The random stratified trawl survey only encompasses the in-zone portion of the stock as it is a region of relatively featureless terrain and fish are often spread more widely. Terrain in the Westpac Bank area is much rougher and less suitable for trawl surveys. The survey was of a two-stage stratified random design (*sensu* Francis 1984) consisting of 47 planned Phase 1 tows apportioned across two core strata and four bounding guard strata, with capacity for up to 6 Phase 2 tows to be completed to reduce CVs as required.

The biomass estimate from the trawl survey was significantly higher than comparable estimates from 2006 – 2018, but had a relatively high CV.

2019 Stock Assessment

The 2019 stock assessment of the southwest Challenger Plateau orange roughy stock (Cordue 2019) used very similar methods to those used in 2014 (Cordue 2014a, [SC6-INF02](#)). In the development of the updated assessment, all data inputs were reviewed, and new data were incorporated into the model.

The model is an age-structured population model run in CASAL (Bull et al. 2012) with Bayesian estimation of posterior distributions. Natural mortality ($M = 0.045$), steepness (Beverton-Holt $h=0.75$), weight at length, and the von Bertalanffy growth curve were all fixed in the model.

The main data inputs to the model are:

- Acoustic survey indices between 2005 and 2018 (not all areas in each year) for West, East, and Volcano aggregations;
- Two trawl survey time series: 1987-1989 and 2006, 2009-2012;
- Age frequencies from the trawl surveys in 1987, 2006, 2009, and 2018;
- Age frequencies from Volcano in 2014 and 2018.

The stock assessment did not use commercial Catch-Per-Unit-Effort data. Acoustic data that did not meet quality selection criteria, and earlier trawl surveys that did not cover the same areas as the surveys identified above were also not used.

Since 2014, the key changes to the model structure and assumptions included adjustment of acoustic biomass estimates using a combined correction for vessel motion and the bubble layer, and the model assumed two fisheries, one inside the New Zealand EEZ and the other in the Westpac Bank Management Area in the SPRFMO Convention Area.

The main uncertainty in the model is the proportion of the stock that is indexed by the acoustic and trawl surveys.

Outputs

The base case stock assessment estimated a virgin biomass of 94,000 tonnes (95% c.i. 86,000 – 104,000 tonnes) and current stock status to be 47% B_0 (Figure 1). Fishing intensity was estimated to be at the lower bound of the management target range used in New Zealand.

The estimated status of the stock was only moderately sensitive to the four main sensitivity runs: removing informed priors; estimating M within the model; and simultaneously changing the assumed M and the informed q priors in directions that were expected to first reduce estimated stock status and then increase estimated stock status. Over these four sensitivity runs, the estimated stock status varied between 37 and 57% B_0 .

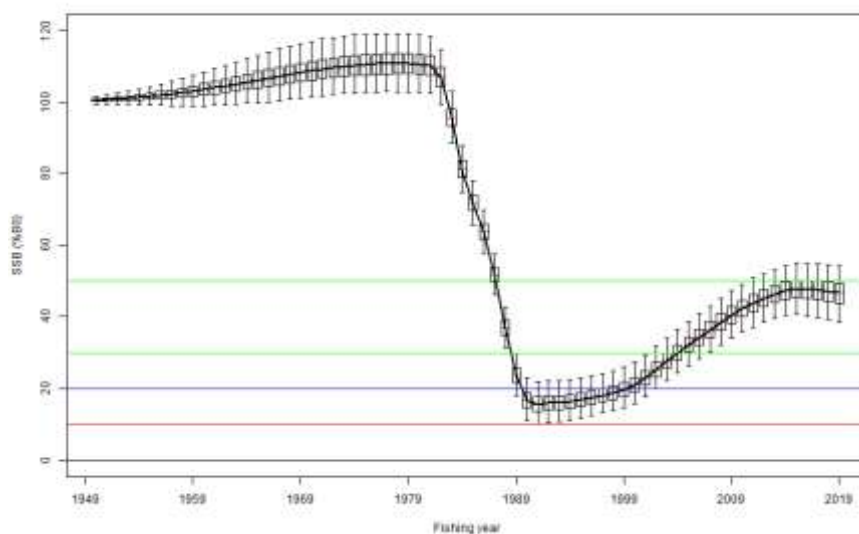


Figure 1 (Figure 11 of Cordue 2019): Base, MCMC estimated spawning-stock biomass trajectory. The box in each year covers 50% of the distribution and the whiskers extend to 95% of the distribution. The reference points used in New Zealand are shown as horizontal lines: hard limit 10% B_0 (red), soft limit 20% B_0 (blue), and biomass target range 30–50% B_0 (green).

Projections

Catch at current levels is expected to result in a slow decrease in the stock status, but for the stock biomass to remain above the midpoint of the management target range (40% B_0) that New Zealand manages to in the EEZ ORH7A fishery over the next five years.

4. Management Advice

New Zealand's management approach

New Zealand has historically managed the southwest Challenger Plateau orange roughy as a single straddling stock, setting a total allowable commercial catch limit that applied to the New Zealand fleet across the whole range of the stock.

New Zealand has required New Zealand vessels to count catch from the Westpac Bank Area against their Annual Catch Entitlement for ORH 7A, and therefore that catch is accounted for within the total allowable commercial catch limit set by the New Zealand Minister of Fisheries. This catch is also accounted for within New Zealand's SPRFMO catch limit allocation for the Westpac Bank Management Area.

New Zealand manages key orange roughy stocks, including the southwest Challenger Plateau, to fluctuate within a management target range of 30-50% B_0 . This target range is based on a management strategy evaluation (Cordue 2014b) with an objective of maintaining the stock above the biomass that can provide the maximum sustainable yield (B_{MSY}) in the long term, with surveys, assessments, and catch limit reviews at 4-year intervals.

Management settings are informed by a harvest control rule that generates appropriate catch limits that, in the long term, will maintain the stock within the management target range 99% of the time. The harvest control rule uses the point estimate of the current stock status to calculate an exploitation rate to be applied to the next year's beginning-of-year vulnerable biomass (spawning stock biomass in this case) to generate suggested sustainable catch limits. The harvest control rule is designed to provide for higher catch when the stock is assessed to be above the mid-point of the target range, and potentially more significant catch limit reductions when the stock is assessed to be in the lower half of the management target range.

New Zealand's orange roughy fisheries are managed on a fishing year that runs from 1 October to 30 September. The total allowable catch limit is set by the Minister of Fisheries based on the best available scientific information and following a public consultation process. Advice has been provided to the New Zealand Minister of Fisheries for the upcoming fishing year beginning 1 October 2019.

2019 management advice for ORH 7A

The harvest control rule (Cordue 2014b, SC7-INF01) was applied to the 2019 stock assessment of southwest Challenger Plateau orange roughy (Cordue 2019, SC-07-DW-06) generating a maximum sustainable catch of 2,448 tonnes. Projections of future stock status were also run for two additional potential catch limits to provide additional options for setting a total catch limit. These additional options allow decision-makers to consider future variability of catch limits, and understand the potential risk associated with each option.

Based on the new information and submissions received during public consultation (see <https://www.fisheries.govt.nz/news-and-resources/consultations/review-of-sustainability-measures-for-1-october-2019/>), New Zealand provided advice to its Minister of Fisheries on

a range of four options for the New Zealand total allowable commercial catch for the southwest Challenger Plateau stock as follows:

Table 3: Options for varying TAC, TACC and allowances

Option	Total Allowable Catch (tonnes)	Total Allowable Commercial Catch (tonnes)	Allowances		
			Customary Māori (tonnes)	Recreational (tonnes)	All other mortality to the stock caused by fishing (tonnes)
Option 1 (Status quo)	1680	1600	0	0	80
Option 2	2163 ↑ (29%)	2060 ↑ (29%)	0	0	103 ↑ (29%)
Option 3	2310 ↑ (38%)	2200 ↑ (38%)	0	0	110 ↑ (38%)
Option 4	2555 ↑ (52%)	2433 ↑ (52%)	0	0	122 ↑ (52%)

Since the deadline for papers to SC-07, New Zealand’s Minister of Fisheries [decided](#) on 27 September 2019 that the New Zealand Total Allowable Commercial Catch for ORH7A would be increased from 1600 tonnes to 2058 tonnes. This is essentially Option 2, the most conservative increase offered in the above advice.

2019 management advice for the Westpac Bank

As a starting point for discussions, four options for catch limits for the Westpac Bank Area have been calculated based on the assumption that 12.5% of the total stock is resident in the Westpac Bank Area. These options are analogous to the options provided to the New Zealand Minister of Fisheries, recognising that the Scientific Committee is free to develop its own advice for Commission that is independent of the reference points and harvest control rule that are used by New Zealand.

Option 1: Maintain Westpac Bank catch limit at 200 tonnes

- This would retain the status quo for catch taken from the Westpac Bank. Projections of stock status assuming catch at current levels indicate the stock will slowly decline from 47% to 45% B_0 in four years (2023).
- Projections of the ‘worst case’ scenario assuming catch at current levels estimate the stock will decline from 37% to 35% B_0 in four years (2023).

Option 2: Increase Westpac Bank catch limit to 258 tonnes

- This would increase the Westpac Bank catch limit commensurate with an overall catch limit of 2,060 tonnes. Projections of stock status with total catch of 2,060 tonnes estimate the stock status would be 43% B_0 in 4 years (2023).
- Projections of the ‘worst case’ scenario assuming catch increased to 2,060 tonnes per year estimate the stock will decline from 37% to 33% B_0 in four years (2023).

Option 3: Increase Westpac Bank catch limit to 275 tonnes

- This would increase the Westpac Bank catch limit commensurate with an overall catch limit of 2,200 tonnes. Projections of stock status with total catch of 2,200 tonnes estimate the stock status would be 43% B_0 in 4 years (2023).
- Projections of the 'worst case' scenario assuming catch increased to 2,200 tonnes per year estimate the stock will decline from 37% to 32% B_0 in four years (2023). Projections and re-application of the harvest control rule to estimated stock status in 2023 indicate that the catch limit would need to be reduced to around 255 tonnes from 2023.

Option 4: Increase Westpac Bank catch limit to 306 tonnes

- This would increase the Westpac Bank catch limit commensurate with an overall catch limit of 2,448 tonnes. Projections of stock status with total catch of 2,448 tonnes estimate the stock status would be 42% B_0 in 4 years (2023).
- Projections of the 'worst case' scenario assuming catch increased to 2,448 tonnes per year suggest that the stock will decline from 37% to 32% B_0 in four years (2023). Projections and re-application of the harvest control rule to estimated stock status in 2023 indicate that the catch limit would need to be reduced to around 245 tonnes from 2023.

Recommendations

It is recommended that the Scientific Committee:

- **Notes** that New Zealand has completed a stock assessment for the biological stock of orange roughy on the southwest Challenger Plateau including the Westpac Bank in the SPRFMO Area, this is provided as SC-07-DW-06;
- **Notes** the four options for changes to catch limits proposed to New-Zealand's Minister of Fisheries for domestic management purposes;
- Develops and **Recommends** appropriate catch limits for the Westpac Bank portion of the stock to the Commission.

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APPENDIX 1: 2018 DOCUMENT ENTITLED ESTIMATING A SUSTAINABLE YIELD FOR ORANGE ROUGHY ON THE WESTPAC BANK

Background

The 2014 stock assessment for ORH7A, including that portion of the stock on and around the Westpac Bank outside New Zealand's EEZ (Cordue 2014), was provided as an information paper to 6th meeting of SPRFMO's Scientific Committee (SC6-INF02) to assure the SC of the quality and credibility of the assessment. New Zealand reminded members that the paper was available and offered to answer questions or provide additional information. Australia asked for a refresher on the findings of the assessment which was duly provided and noted by the committee. DSCC asked about information available in the stock assessment to support setting a catch limit for the Westpac portion of the stock. This is considered important because of SPRFMO's mandate to ensure the sustainability of catches from the high seas portion of the stock. New Zealand clarified that there is no spatial aspect to the current stock assessment that allows for a clear estimation of that proportion of the stock, but that there are other methods by which a catch limit for that area could be calculated.

After considering SC6-INF02, the Scientific Committee:

- **Noted** that New Zealand's 2014 assessment of the biological orange roughy stock that includes the Westpac Bank was reviewed by New Zealand's working groups and is appropriate to support management.
- **Noted** that the stock assessment estimated the biomass of the stock to be 42% B_0 , estimated an annual yield of 1,764 tonnes to maintain the biomass of the stock at or above 35% B_0 , and that the current total allowable commercial catch limit for the entire area applied by New Zealand is 1,600 tonnes.

The 2014 assessment is complex and comprises an age-structured population model fitted to combined acoustic and trawl-survey estimates of spawning biomass, two trawl-survey time series of spawning biomass, and three trawl-survey age frequencies (Cordue 2014). Given this complexity, extracting estimates of biomass for the portions of the stock inside and outside New Zealand's EEZ directly from the model is not straightforward and may not be feasible.

Two alternative approaches to estimating the proportions were therefore considered:

Trawl surveys that included the portions of the stock inside and outside New Zealand's EEZ were examined to estimate the relative biomass in strata inside and outside New Zealand's EEZ.

- The key assumptions of this approach are that: the stock was equally depleted inside and outside the EEZ by the time the surveys were conducted; trawling is an appropriate approach to estimating relative biomass throughout the range of conditions in the stock; and catchability is constant spatially (or, at least, is not different on average inside and outside the EEZ).

Catch histories from inside and outside New Zealand's EEZ were examined to estimate the total catch taken from each sub-area before the fishery was effectively closed in 2000.

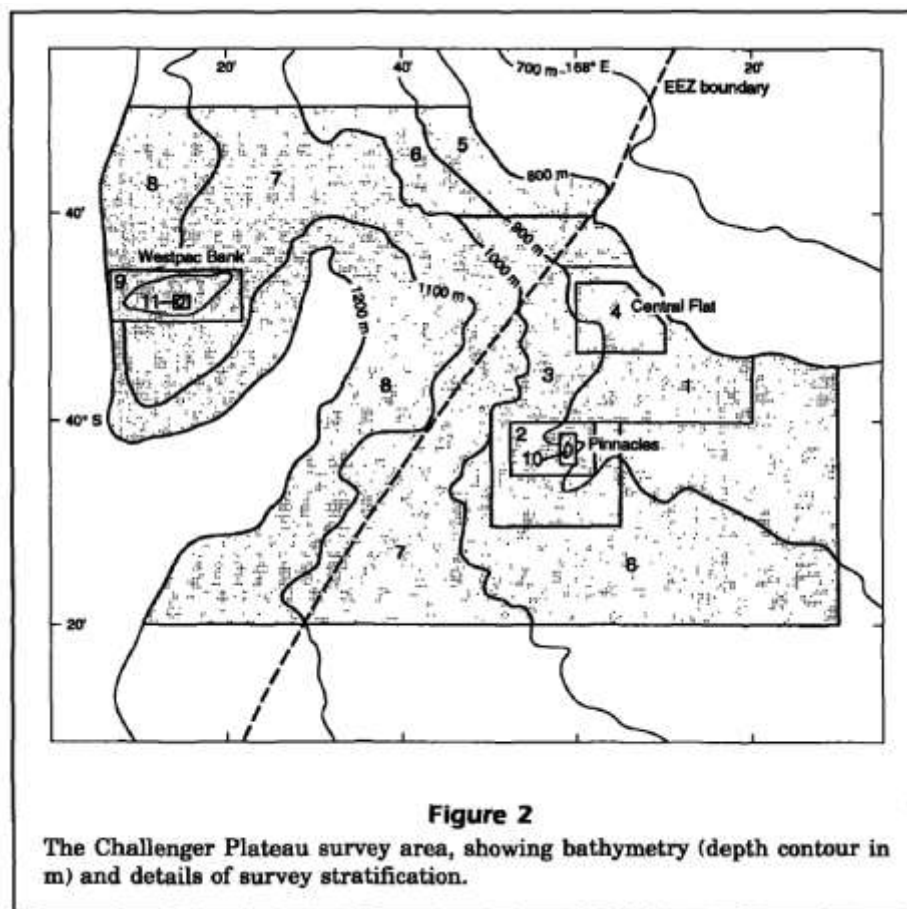
- The key assumptions of this approach are that catch is faithfully reported by area, that there is little large-scale movement of fish across the EEZ boundary,

and that depletion of the stock was spatially homogenous when fishing was curtailed.

These are clearly strong assumptions, so both approaches should be considered approximate.

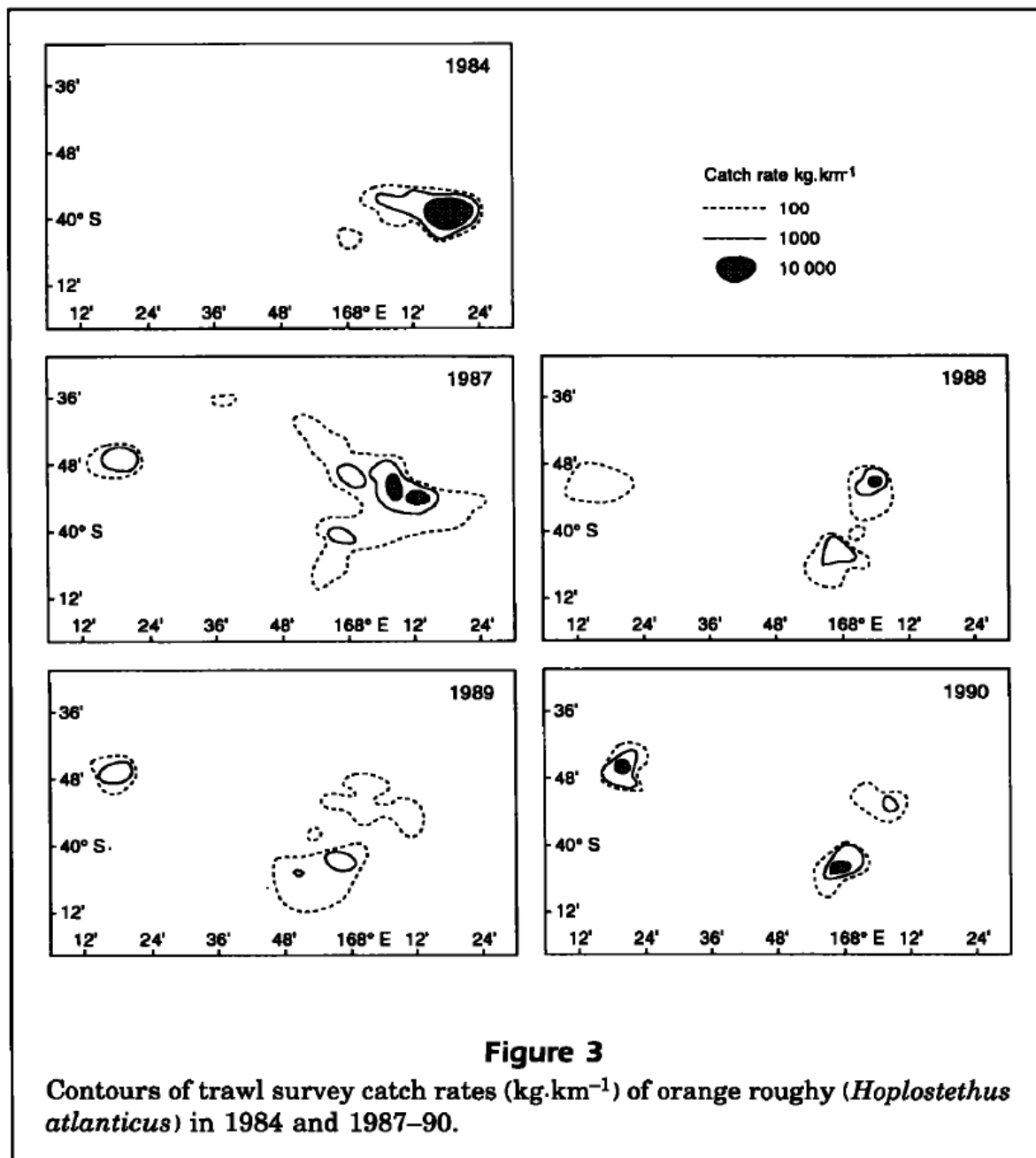
Using trawl surveys

Clark & Tracey (1994) summarised the results of trawl surveys throughout the range of the ORH7A biological stock (their Figure 2) in 1987, 1988, 1989, and 1990. Their Table 5 (shown below) suggests that the proportion of orange roughy outside the EEZ and on the two main high-density strata (9 and 11) on the Westpac Bank was fairly consistent and in the range 4.5–5.8% (mean 5.2%).



Region	1987		1988		1989		1990	
	Biomass (t)	%	Biomass (t)	%	Biomass (t)	%	Biomass (t)	%
Central Flat	56,636	72.0	21,051	68.0	3,275	27.9	4,228	30.8
Pinnacles	7,794	9.9	5,215	16.9	2,821	24.0	5,508	40.1
Surrounding background	10,717	13.6	2,878	9.3	5,088	43.3	3,208	23.3
Westpac Bank	3,514	4.5	1,802	5.8	563	4.8	794	5.8
Total	78,661	100.0	30,946	100.0	11,747	100.0	13,738	100.0

This approach will probably underestimate the proportion of orange roughly outside the EEZ because the summary table does not include fish in those parts of the “background” strata (especially strata 5–8) outside the EEZ. The background strata collectively contained 9–43% (mean 22.4%) of the total estimated biomass across these four surveys. If half of that background biomass was outside the EEZ, then the proportion of all fish outside the EEZ (Westpac strata plus background) would have been about 16%. About half of the area of the survey strata appears to be outside the EEZ, but the density plots shown by Clark and Tracey (1994, their Figure 3) suggest more of the background biomass was probably to the eastern side of the survey area and within the EEZ. This means that 16% is probably an overestimate of the biomass outside the EEZ for this approach, and it may be quite an extreme estimate.



These trawl surveys were replaced with combined trawl-acoustic surveys starting in 2005 (Clark et al. 2005) given the issues identified with trawl surveys (e.g., Dunn et al. 2010). In Cordue’s (2014) stock assessment, strata 9–11 were excluded from the input time series “as they covered hills and/or very rough terrain (i.e., were not included because orange roughy are probably not equally vulnerable to the trawl on the hills and on the flat)”. This suggests quite a serious problem for the use of trawl survey indices given that the proportion of biomass likely to be on hills or very rough terrain appears to be very different inside and outside the EEZ. Reasonably reliable estimates of catchability on rough terrain and on flat bottoms would be needed to “correct” the survey estimates of proportions summarised by Clark & Tracey (1994). Another problem for the use of the early trawl surveys described by Clark & Tracey (1994) is that the distribution of orange roughy has changed substantially since (at least within the EEZ) and the spawning area appear to have shifted well to the east. Thus, an estimated proportion of biomass outside of the EEZ for the late 1980’s may not be appropriate for the current distribution of fish.

Using catch histories

Historically, the fishery mainly occurred in the south-western region of the Challenger Plateau, both inside and outside the EEZ. Fish were caught throughout the year, with most effort in winter when the orange roughy form aggregations for spawning (Fisheries New Zealand, 2018). Total reported catches (tabulated below) peaked at 10 000–12 000 t annually from 1986–87 to 1988–89 but were less than 2 100 t annually from 1990–91 until the closure in 2000–01 when the TACC was reduced to 1 t.

Reported catches and Total Allowable Commercial Catches (TACCs) of orange roughy in ORH7A from chapter 18 (ORH7A) of FNZ 2018. QMS data from 1986 onward, † FSU data, * minimum value, because of unreported catches by foreign vessels fishing outside the EEZ, + Distribution of catch inside and outside the EEZ not reported in FNZ 2018. Research catches of 1581 t between 1982 and 1988 not included.

Fishing year	Inside EEZ	Outside EEZ	Total catch	TACC
1980–81†	1	32	33	-
1981–82†	3,539	709	4,248	-
1982–83†	4,535	7,304	11,839	-
1983–84†	6,332	3,195	9,527	-
1984–85†	5,043	74	5,117	-
1985–86†	7,711	42	7,753	-
1986–87†	10,555	937	11,492	10,000
1987–88	10,086	2,095	12,181	12,000
1988–89	6,791	3,450	10,241	12,000
1989–90	3,709	600	*4,309	2,500
1990–91	1,340	17	1,357	1,900
1991–92	1,894	17	1,911	1,900
1992–93	1,412	675	2,087	1,900
1993–94	1,594	138	1,732	1,900
1994–95	1,554	82	1,636	1,900
1995–96	1,206	463	1,669	1,900
1996–97	1,055	253	1,308	1,900
1997–98	+	+	1,502	1,900
1998–99	+	+	1,249	1,425
1999–00	+	+	629	1,425
2000–01	+	+	<1	1

In previous stock assessments, catch overruns for orange roughy from various sources (including lost and/or discarded fish, use of nominal tray weights and low conversion factors) have been estimated as: 1980–81 to 1987–88, 30%; 1988–89, 25%; 1989–90, 20%; 1990–91, 15%; 1991–92 to 1992–93, 10%; 1993–94 onwards, 5% (Fisheries New Zealand 2018). To avoid bias in the estimated proportions inside and outside the EEZ associated with inconsistent trends in catch over time, the reported landings by area were scaled to account for these over-runs. No correction has been made for the 1581 tonnes of research catch taken between 1982 and 1988 reported by Clark (1991) which appears not to be included in the reported landings.

Estimated catches of orange roughy (t) for ORH7A inside and outside New Zealand’s EEZ, corrected to include estimated overruns. *, proportions inside and outside the EEZ estimated from estimated catches per trawl on statutory reporting forms in 1998 to 2000. Research catches of 1581 t between 1982 and 1988 not included.

Year	EEZ	Westpac	Proportion outside EEZ
1981	1	42	0.970
1982	4,600	922	0.167
1983	5,896	9,495	0.617
1984	8,232	4,153	0.335
1985	6,556	96	0.014
1986	10,024	55	0.005
1987	13,722	1,218	0.082
1988	13,112	2,723	0.172
1989	8,489	4,312	0.337
1990	4,451	720	0.139
1991	1,541	20	0.013
1992	2,083	19	0.009
1993	1,553	743	0.323
1994	1,674	145	0.080
1995	1,632	86	0.050
1996	1,266	486	0.277
1997	1,107	266	0.193
1998*	1,342	235	0.149
1999*	1,122	189	0.144
2000*	554	106	0.160
Total	88,958	26,030	0.226
1985 onwards	70,229	11,418	0.140
1986 onwards	63,673	11,322	0.151

If it is assumed that the biological stock was homogeneously depleted when it was closed in 2000, the summed catch histories inside and outside the EEZ can be interpreted as indices of the initial biomasses inside and outside the EEZ (recruitment of new fish contributing little compared with the initial accumulated biomass). There is circumstantial evidence that the stock was relatively homogeneously depleted by 2000 in that the much-reduced TACC was not caught, at least in part because fishers were unable to locate dense aggregations of fish. This approach also assumes that there is no substantial movement of fish across the EEZ boundary or, if movement did occur, that “Westpac Bank fish” were caught predominantly on the

Westpac Bank and “EEZ fish” were caught predominantly within the EEZ. These catch histories suggest 89,000 tonnes of orange roughy was taken within the EEZ and 26,000 tonnes outside the EEZ on the Westpac Bank; i.e. roughly 23% was taken outside the EEZ.

However, there is good evidence (M. Clark, NIWA pers. comm.) that there was substantial mis-reporting of the location of catches, especially in the early 1980s, such that much catch reported from the Westpac Bank or elsewhere outside the EEZ was probably taken within the EEZ. Observer coverage, which might have been used to verify the location of catches, did not start until the late 1980s. Excluding these early years reduces the estimated proportion taken outside the EEZ to 14–15%, with some sensitivity to the choice of years to exclude. As with the trawl surveys, these estimates are based largely on the initial distribution of orange roughy and may not be reliable if there has been a major shift of the distribution fish with respect to the EEZ boundary.

Choice of a catch limit for the Westpac Bank

New Zealand and SPRFMO’s Scientific Committee have both adopted Cordue’s (2014) stock assessment as appropriate to support management of the biological stock that straddles New Zealand’s EEZ boundary on the Challenger Plateau. Based on that assessment, New Zealand has imposed a catch limit of 1,600 tonnes on that biological stock, including on the Westpac Bank, since 2014. Establishing a sustainable catch limit within that 1,600 tonnes for the Westpac Bank portion of the biological stock is not straightforward and all estimates of the proportion of biomass (and, therefore, available yield) are necessarily approximate, given the available information.

Trawl surveys from the late 1980s suggest that about 5 to (at most) 16% of the biomass could be on the Westpac Bank. However, there is reasonable evidence that such surveys do not work well for hills and rough terrain, and 5% is probably an underestimate for fish outside the EEZ because only Westpac Bank itself was included in Clarke & Tracey’s (1994) published summary. Catch histories using more recent (and more reliable) records suggest that 14 to 15% of the initial biomass could have been outside the EEZ. Because there were probably incentives to mis-report some in-zone catch as having been taken outside the EEZ, even in the more recent records, this is more likely to be an overestimate than an underestimate. Cordue’s (2014) assessment excluded trawl survey strata from hills inside and outside the EEZ, and he estimated those areas to include 15% of the total biomass. This suggests that something less than 15% of the total biomass lay outside the EEZ at the time. Based on these approximate methods using published summaries, a range of 10–15% of the biomass in the ORH7A biological stock being outside the EEZ seems reasonable. Using the midpoint of that range, a catch limit of $12.5\% * 1,600 = 200$ tonnes on the Westpac Bank may be appropriate in the short term until a new stock assessment and more definitive analyses can be conducted. Survey work to support a new stock assessment has been completed and a stock assessment is expected to be available in 2019.

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