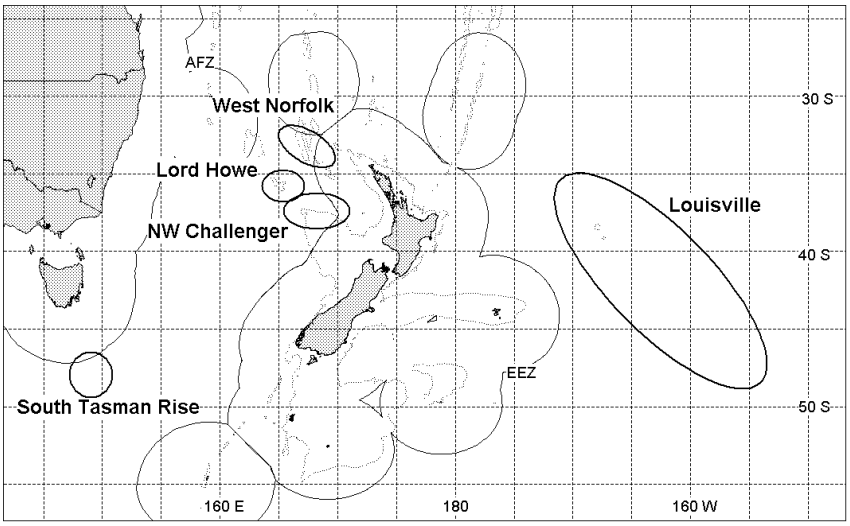
ORANGE ROUGHY OUTSIDE THE EEZ (ORH ET)



1. FISHERY SUMMARY

1.1 Commercial fisheries

Fisheries outside the EEZ in the New Zealand region occur on ridge systems and seamount chains in the Tasman Sea and southwest Pacific Ocean. There are five main fishing areas: Lord Howe Rise, Northwest Challenger Plateau, West Norfolk Ridge, South Tasman Rise, and Louisville Ridge (see figure above).

The first orange roughy fishery outside the EEZ developed on the Westpac Bank close to the main fishing grounds on the southwest Challenger Plateau in the early-mid 1980s. Catches were recorded as part of the straddling stock crossing into ORH 7A, and therefore excluded from this chapter, up until 2007. Further exploration in the region resulted in the development of commercial fisheries on the Lord Howe Rise in 1987–88, Northwest Challenger Plateau in 1988–89, Louisville Ridge in 1993–94, South Tasman Rise in 1997–98, and West Norfolk Ridge in 2001–02. Catches from all these fisheries are tabulated by fishing year up to 2006–07, excluding Westpac Bank catches (Table 1), and by calendar year from 2007 to present (Table 2), as required by the South Pacific Fisheries Management Organisation (SPRFMO).

Table 1: Estimated catches (t) of orange roughy for ORH ET fisheries from 1987–88 to 2006–07. (Data from New Zealand (FSU, QMS), Australia (AFMA), and various sources for other countries. Note that the fishing year for South Tasman Rise is March to February, all others are October to September). See Table 2 for catches from 2007 onwards.

Fishing year	Lord Howe	NW Challenger	Louisville	West Norfolk	South Tasman	Total ET
1987–88	4 000	5	0	0	0	4 005
1988–89	2 430	297	0	0	0	2 727
1989–90	927	425	0	0	0	1 352
1990–01	282	123	0	0	0	405
1991–02	859	620	0	0	0	1 479
1992–03	2 300	2 463	0	0	0	4 763
1993–04	840	1 731	689	0	0	3 260
1994–05	761	1 138	13 252	0	0	15 151
1995–06	5	500	8 816	0	0	9 321
1996–07	139	332	3 209	0	5	3 685
1997–08	26	397	1 404	0	3 930	5 757
1998–09	440	961	3 164	0	705	5 270
1999–00	52	473	1 369	0	4 110	6 004
2000–01	428	1 228	1 598	10	830	4 094
2001–02	120	2 075	1 004	649	170	3 729
2002–03	272	1 010	1 296	94	110	2 782
2003–04	324	654	1 419	90	3	2 490
2004–05	430	464	1 510	277	55	2 736
2005–06	240	201	675	727	12	1 855
2006–07	40	96	323	552	0	1 011

Catch totals include data from New Zealand and Australian vessels available from tow by tow fishing records, with estimated catches added for vessels from Japan, USSR, Korea, Norway, South Africa, and China. Catch statistics are likely to be incomplete.

These fisheries were historically unregulated, with the exception of the South Tasman Rise area, where catches by Australian and New Zealand vessels have at times been restricted by a TAC imposed under a Memorandum of Understanding between the two countries. The South Tasman Rise fishery is currently closed by SPRFMO.

South Pacific Regional Fisheries Management Organisation (SPRFMO) Convention Area

Regulation of these fisheries was implemented following adoption of the SPRFMO interim measures in May 2007, and specific high sea fishing permits for the SPRFMO Area have been issued since 2007–08. Table 3 shows the number of New Zealand vessels that fished and their orange roughy catch by area. From 2007 to 2019, an orange roughy catch limit was applied for New Zealand vessels, being the average annual catch between 2002 and 2006 (1852 t). Australia implemented analogous limits for its vessels, and no other nations fished orange roughy in the SPRFMO area.

From 2019, SPRFMO has implemented orange roughy catch limits that are subsequently allocated to SPRFMO Members who are permitted to fish under SPRFMO Conservation and Management Measures. In 2019 and 2020, catch limits were set for the Tasman Sea (comprises NW Challenger, W. Norfolk Ridge, and Lord Howe Rise), for the Louisville Ridge, and for the Westpac Bank. For 2021, the catch limit in the Tasman Sea was divided to represent the three Tasman Sea stocks.

Table 2: Annual effort and catch (t) data for orange roughy from New Zealand vessels, by area, for the SPRFMO Area (calendar years). Westpac Bank is on the Challenger Plateau but is considered part of the straddling stock ORH 7A so landings from that area are tabulated separately. Australian catches over this period, mostly from the Tasman Sea, ranged from 0 to 148 t, mean 46 t per annum). No other nations fished in this area.

Year	Number of Vessels	Number of tows	Lord Howe	NW Challenger	West Norfolk	Westpac	Louisville	Other	All areas
2007	8	415	34	36	515	–	280	–	866
2008	4	208	380	31	426	–	–	–	837
2009	6	545	403	238	233	23	–	31	928
2010	7	1 170	385	415	79	5	584	6	1 474
2011	7	1 158	1	675	113	5	285	–	1 079
2012	6	652	121	247	49	8	288	8	721
2013	5	760	344	230	19	3	565	3	1 164
2014	5	403	79	57	–	54	754	54	998
2015	5	959	157	530	20	118	462	–	1 287
2016	6	943	208	486	–	234	27	–	954
2017	5	1 423	215	307	22	129	420	–	1 093
2018	6	858	180	399	5	569	81	–	1 232
2019	4	221	38	171	0	111	139	–	460
2020	3	329	2	76	3	88	133	–	301

Table 3: New Zealand catch and catch limits (t) from 2019.

Year	Lord Howe	NW Challenger	West Norfolk	Tasman Sea catch total	Tasman Sea NZ limit	Westpac	Westpac NZ limit	Louisville	Louisville NZ limit	Other	All areas
2019	38	171	0	210	277	111	245	139	1 026	–	460
2020	2	76	3	80	277	88	245	133	1 026		301

The SPRFMO Convention was closed for signature in January 2011 and formally entered into force in August 2012. Since that time, monitoring and assessment of catches and fisheries, including for orange roughy, has been overseen by the SPRFMO Scientific Committee. New Zealand reports annual catch and effort information in an Annual Report available on the SPRFMO website.

South Tasman Rise

Exploratory fishing south of Tasmania located aggregations of orange roughy on the South Tasman Rise just outside the Australian Fishing Zone (AFZ) in late 1997. The fishery rapidly increased in the next four years (Table 4), with Australian and New Zealand vessels working several small hill features on the rise. However, New Zealand vessels have not fished the South Tasman Rise since 2000–01. Effort dropped continuously from 2001–02, and mean catch per tow in 2004–05 was about 1 t/tow.

Note that insufficient numbers of vessels have fished since 2005–06 to enable presentation of catch or effort summaries.

Table 4: Catch and effort data from the South Tasman Rise (combined Australian and New Zealand data).

Fishing year	Number of tows	Total recorded catch (t)	Mean tow length (h)	Mean catch rate (t/tow)	Mean catch rate (t/h)
1996–97	61	4	0.6	0.1	0.5
1997–98	1 132	3 930	0.7	3.5	17.4
1998–99	1 332	1 705	0.6	1.3	10.4
1999–00	1 086	3 360	0.5	3.1	21.1
2000–01	1 155	830	0.4	0.7	6.7
2001–02	201	170	0.8	1.0	3.5
2002–03	164	110	0.5	0.9	7.9
2003–04	67	2	0.3	0.1	0.4
2004–05	47	55	0.3	1.2	14.7

The fishery was formally regulated by a Memorandum of Understanding between Australia and New Zealand from December 1998. A precautionary TAC of 2100 t was applied, increased to 2400 t in 2000–01, and then progressively reduced to 600 t for 2004–05. The fishery was closed to all trawling in 2007. This area is now managed through SPRFMO and has a catch limit of zero tonnes.

1.2 Summary of trends in commercial fisheries

Information presented to the SPRFMO Scientific Committee shows that New Zealand catches of orange roughy have declined since the early 2000s and were relatively stable at about 1000 t between 2006-2018 and have decreased in 2019 and 2020. The distribution of catches between areas has varied substantially by year (Figure 1).

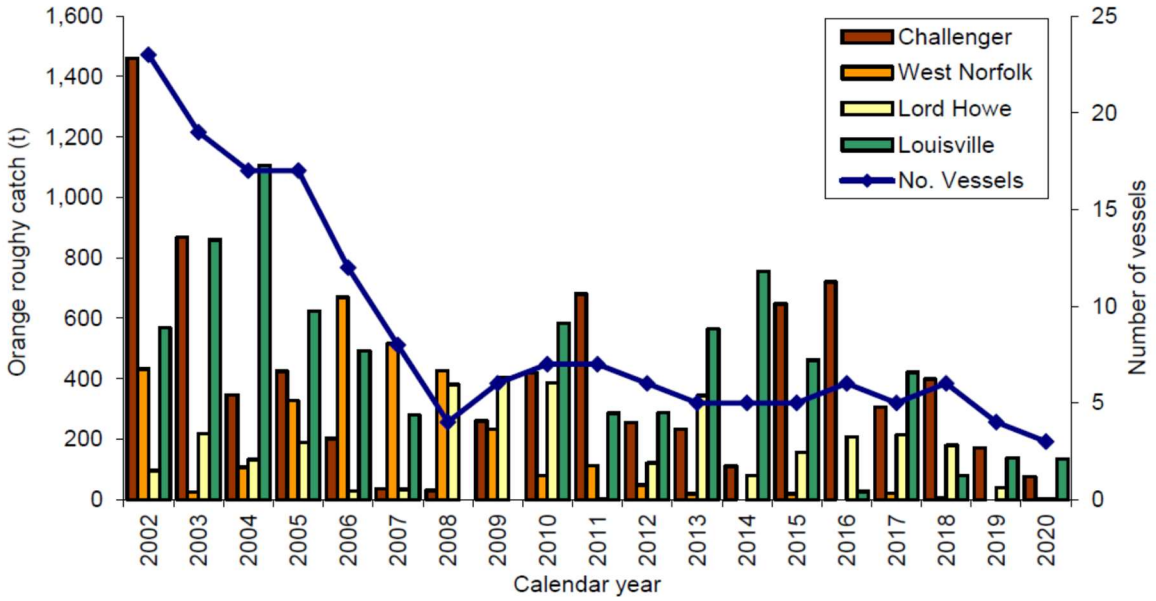


Figure 1: Trends in effort (number of vessels bottom trawling) and total landings of orange roughy (tonnes) for each of the four main areas fished by New Zealand vessels in the SPRFMO area by calendar year from 2002–2020.

Catch rates have varied considerably. Roux & Edwards (2017) developed a spatially-disaggregated CPUE index of stock abundance that corrects for some of the known issues with CPUE for orange roughy (Figure 2). This index shows less variability between years than unstandardised or standard GLM modelled-CPUE, but it is still not known whether it indexes biomass.

1.3 Recreational fisheries

There is no non-commercial fishery for orange roughy in these areas.

1.4 Customary non-commercial fisheries

There is no customary non-commercial fishing for orange roughy in these areas.

1.5 Illegal catch

In most of these areas, there were no regulations regarding limits on catch in international waters before 2007. The South Tasman Rise region has been subject to catch restrictions for Australian and New Zealand vessels under a Memorandum of Understanding between the two countries. In 1999–2000 vessels registered in South Africa and Belize fished the region. The estimated catch of at least 750 t has been included in the catch total for that year. No other information is available on any possible illegal catch on the South Tasman Rise, or the Westpac Bank part of ORH 7A.

1.6 Other sources of mortality

There may be some overrun of reported catch because of fish loss with trawl gear damage, ripped nets, discards, and conversion factor inaccuracies. In a number of other orange roughy fisheries, a current level of 5% has been applied (higher in the past). No corrections are made here because of limited information on the sources which may differ with each fishery.

2. STOCKS AND AREAS

Stock structure is uncertain but Clark et al (2016) analysed multiple data sets and recommended that fishing grounds in the following areas be considered as separate units for the purpose of stock assessment: Lord Howe Rise; NW Challenger; SW Challenger; West Norfolk Ridge; South Tasman Rise; and North, Central, and South Louisville (Figure 2).

Orange roughy on the South Tasman Rise are regarded as a straddling stock with fish inside the AFZ. Those on the Westpac Bank on the SW Challenger Plateau are regarded as a straddling stock with fish inside New Zealand's EEZ and the ORH 7A stock.

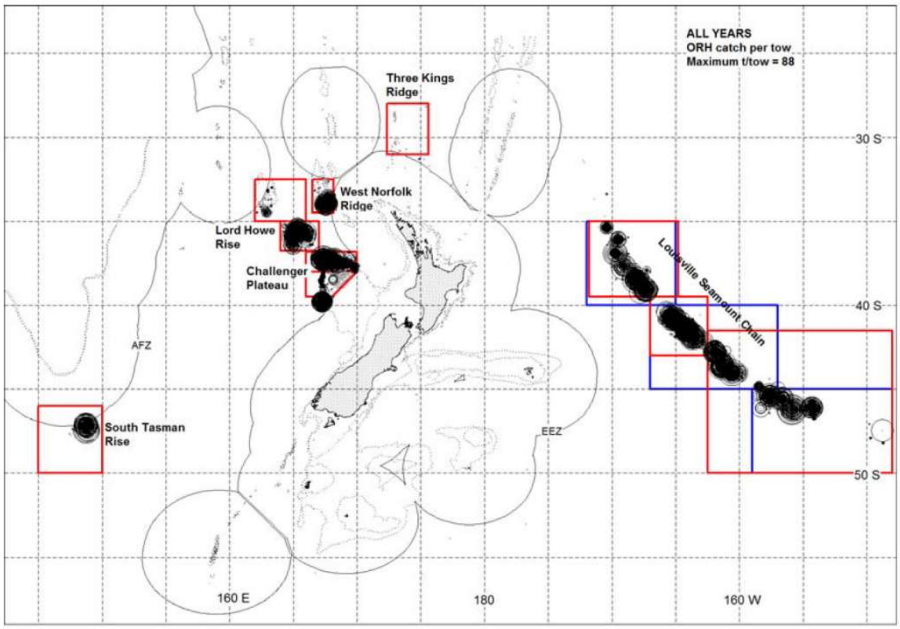


Figure 2: Comparison of new areas assumed for stock assessment purposes (in red) and previous areas (in blue) overlaid on the total distribution of catch rates for orange roughy. Where both areas are coincident, red boxes overlay blue boxes. See Clark et al (2016) for details.

3. STOCK ASSESSMENT

Several low-information stock assessments were presented to the SPRFMO Scientific Committee in 2015 and 2016 but these were not used by the committee to frame advice to the SPRFMO Commission until the 2017 meeting. The following is an extract from the report of the Scientific Committee's meeting in August 2017.

98. Noting the urgent need to collect information to support robust assessments of orange roughy in the SPRFMO Area for sound management advice, the Scientific Committee considered the three approaches to assess SPRFMO orange roughy stocks as detailed in SC5-DW11 to DW14, SC5-INF03, and the Report of the 2nd Deepwater Workshop of the Scientific Committee (Annex 5). Although none of the methods is ideal for the assessment of SPRFMO orange roughy stocks, the SC considered them to be collectively indicative of stock status and potential yields. The development of advice on catch limits for individual stocks was considered but, because of the level of uncertainty in estimates of status and yield by stock, it was considered better to group the stocks for the development of advice.

99. The SC used the lower 95% CIs of estimated stock status to inform the level of precaution that might be appropriate. The group of stocks to the west of New Zealand (in the Tasman Sea) have a greater potential for low stock status than those to the east (Louisville Ridge) and a more precautionary approach was considered appropriate there.

Papers adopted and cited by the Scientific Committee in framing this advice were as follows:

- Roux et al (2017), FAR 2017/01, tabled as paper SC5-DW11: Low information stock assessment of orange roughy in the SPRFMO Area. Available at: http://www.sprfmo.int/assets/SC5-2017/SC5-DW11-NZFAR-2017-01-Orange-roughy-SPRFMO-area.pdf
- Edwards & Roux (2017), tabled as paper SC5-DW12: A simple delay-difference model for assessment of data-poor orange roughy stocks. Available at: http://www.sprfmo.int/assets/SC5-2017/SC5-DW12-Edwards-Roux-Delay-difference-ORY-model.pdf
- Roux & Edwards (2017), tabled as paper SC5-DW13: A data limited approach for assessing small scale fisheries for orange roughy in the SPRFMO Area. Available at: http://www.sprfmo.int/assets/SC5-2017/SC5-DW13-rev1-Roux-Edwards-BDM-method-ORY.pdf
- Cordue (2017a), tabled as paper SC5-DW14: Catch-history based stock assessments of seven SPRFMO orange roughy stocks. Available at: http://www.sprfmo.int/assets/SC5-2017/SC5-DW14-Cordue-catch-history-method-ORY.pdf
- Cordue (2017b), tabled as paper SC5-INF03: A CPUE based stock assessment of the Louisville Central orange roughy stock. Available at: http://www.sprfmo.int/assets/SC5-2017/SC5-INF03-LouisCentralAssess.pdf
- Galvez et al (2017), tabled as paper SC5-Doc08: Report from the Deepwater Workshop in Hobart, May 2017. Available at: http://www.sprfmo.int/assets/SC5-2017/SC5-Doc08-rev1-DWG-Workshop-Report-Final27Sep17.pdf

In 2019, a Bayesian stock assessment model for the Louisville Central orange roughy stock using age and length compositions and constraints on maximum exploitation rates was developed. The biological parameters and year class strengths for Louisville Central were then used to update assessments based on catch history for Louisville North and South. Although stock status remains uncertain, the models suggest that Louisville Central is likely to be above 50% B_0 and Louisville North is likely to be above 30% B_0.

In 2020, a Bayesian stock assessment was presented for the NW Challenger using age frequency data collected in 1993, 2013, and 2018. The maturity parameters and year class strengths estimated for NW Challenger were then used in a catch-history based assessment for Lord Howe Rise. For both stocks, current stock status was estimated to be higher than in the 2017 stock assessment. The addition of the age frequencies has reduced the estimated probability of low B_0 and associated low stock status. There is also qualitative evidence from the fishery that current stock status is not seriously depleted because catch rates have been maintained or slightly increased since a low point in 2005.

Although current stock status for each of the stocks is uncertain, it was considered likely that NW Challenger is above 40% B_0 whereas Lord Howe Rise is likely to be above 30% B_0.

4. STATUS OF THE STOCKS

The status of the stocks in the SPRFMO Convention Area is not well-known. The SPRFMO Scientific Committee has accepted stock assessments for the main stocks (Tables 5 and 6).

Table 5: Summary results for the Louisville Ridge stocks from SC7-DW05 presented in October 2019.

	Bo (000 t)		SS_{2019} (%B_0)		Long term yield (t)			
	Median	**95% CI**	**Median**	**95% CI**	**Median**	**95% CI**	**P(SS19<20% B_0)**	**P(SS19>30% B_0)**
Central	71	34–117	82	61–93	710	340–1 170	0.00	1.00
North	26	8–80	78	32–96	260	82–800	0.00	0.98
South	25	11–55	64	18–86	250	110–550	0.04	0.89

Table 6: Summary results for the Tasman Sea stocks from SC8-DW10.

	Bo (000 t)		SS_{2020} (% *Bo*)		Long-term yield (t)	
	Median	**95% CI**	**Median**	**95% CI**	**Median**	**95% CI**
NW Challenger	33	19–43	68	46–81	396	228–516
Lord Howe Rise	29	11–75	72	29–93	348	132–900
West Norfolk Ridge	9	4–21	63*	19–84*	108	48–252

* 2015 stock status, noting that the yield estimate for West Norfolk Ridge differs from that given in SC5-DW14 based on application of the 1.2% B_0 calculation

5. FOR FURTHER INFORMATION

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