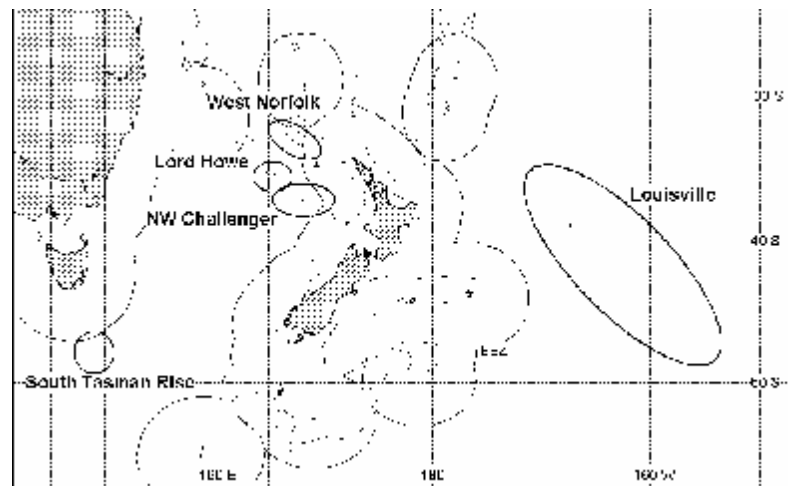


ORANGE ROUGHY OUTSIDE THE EEZ (ORH ET)



1. FISHERY SUMMARY

(a) 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).

Fisheries outside the EEZ developed firstly on the “Westpac Bank” close to the main fishing grounds on the southwest Challenger Plateau Lord Howe Rise in the early-mid 1980s (but is included in the stock area of ORH 7A, and so not covered here). Further exploration in the region resulted in discoveries 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 (Table 1).

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

These fisheries have been 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.

Table 1: Estimated catches (t) of orange roughy for ORH ET fisheries from 1987–88 to 2004–05 (Data from New Zealand (FSU, QMS), Australia (AFMA), and various sources for other countries. Note the fishing year for South Tasman Rise is March to February, all others are October to September).

Fishing year	Lord Howe	NW Challenger	Louisville	West Norfolk	South Tasman	Total ET	NZ QMS
1987–88	4000	5	0	0	0	4005	
1988–89	2430	297	0	0	0	2727	
1989–90	927	425	0	0	0	1352	
1990–01	282	123	0	0	0	405	
1991–02	859	620	0	0	0	1479	
1992–03	2300	2463	0	0	0	4763	
1993–04	840	1731	689	0	0	3260	
1994–05	761	1138	13252	0	0	15151	
1995–06	5	500	8816	0	0	9321	
1996–07	139	332	3209	0	5	3685	
1997–08	26	397	1404	0	3930	5757	
1998–09	440	961	3164	0	705	5270	
1999–00	52	473	1369	0	4110	6004	
2000–01	428	1228	1598	10	830	4094	2514
2001–02	120	2075	1004	360	170	3729	3201
2002–03	272	1010	1296	94	110	2782	2410
2003–04	324	654	1419	90	3	2490	1967
2004–05	430	471	1503	248	55	2707	1696

Lord Howe Rise

Commercial quantities of orange roughy were found by Japanese vessels in winter 1988, and New Zealand vessels joined the fishery the following year. A number of countries fished the Rise in the late 1980s, but since then it has been largely a New Zealand and Australian fishery. Tows were relatively long at the start of the fishery, when most fishing effort was on the flat ground of the broad platforms. However shorter tows have become more common associated with a shift onto rough ground and small hill features in the area. Levels, of catch and effort decreased to low levels in the mid 1990s, but in recent years have tended to increase, along with unstandardised catch rates (Table 2).

Table 2: Catch and effort data from NZ vessels for the Lord Howe Rise.

Fishing year	Number of vessels	Number of tows	Total recorded catch (t)	Mean tow length (h)	Mean catch rate (t/tow)	Mean catch rate (t/h)	Mean catch rate (t/nmile)
1988–89	6	181	766	3.0	4.2	5.2	1.5
1989–90	4	63	127	2.9	2.0	1.0	0.3
1990–91	3	14	52	2.9	3.7	2.0	0.7
1991–92	4	70	479	1.7	6.8	7.6	2.5
1992–93	18	825	1 363	1.3	1.7	3.6	1.2
1993–94	19	1 263	777	0.9	0.6	1.9	0.8
1994–95	8	110	61	1.2	0.6	0.5	0.2
1995–96	3	26	5	0.7	0.2	0.5	0.2
1996–97	5	179	44	0.8	0.2	0.8	0.3
1997–98	4	57	15	0.3	0.3	1.8	0.5
1998–99	16	138	48	1.0	0.3	0.5	0.2
1999–2000	8	121	34	1.1	0.3	1.3	0.5
2000–01	6	136	145	0.7	1.1	2.9	1.0
2001–02	10	191	110	0.7	0.6	2.3	0.7
2002–03	10	280	208	0.5	0.7	4.3	1.3
2003–04	9	207	180	0.7	0.9	4.5	1.5
2004–05	12	219	255	0.6	1.2	5.5	1.8

A reduced data set has been examined for 19 vessels that have fished for several years in the area (Table 3). CPUE peaked in 1991–92, declined rapidly to low levels from 1994–95 to 1998–99, and has increased over the last 4 years. Most fishing now takes place in the period from May to July.

Table 3: Unstandardised CPUE indices for core vessels from Lord Howe Rise.

Fishing year	Number of tows	Catch (t)	t/tow	t/n.mile	% 0 catch
1988–89	65	268	4.1	0.4	9
1989–90	59	126	2.1	0.4	22
1990–91	13	52	4.0	0.7	8
1991–92	70	479	6.8	2.5	17
1992–93	473	994	2.1	1.2	27
1993–94	783	539	0.7	0.8	44
1994–95	98	58	0.6	0.2	59
1995–96	26	5	0.2	0.2	69
1996–97	173	44	0.3	0.3	64
1997–98	57	15	0.3	0.5	44
1998–99	30	2	0.1	0.0	41
1999–2000	45	24	0.5	1.1	36
2000–01	99	90	0.9	1.2	45
2001–02	157	104	0.7	0.8	26
2002–03	264	205	0.8	1.4	35
2003–04	127	114	0.9	1.5	20
2004–05	75	104	1.4	2.4	25

Northwest Challenger Plateau

New Zealand and Norwegian vessels began working the northwestern margins of the Challenger Plateau in the late 1980s. Fishing initially was on relatively flat bottom but from 1990 onwards developed more on small hill and pinnacle features, and mean tow length was relatively short (Table 4). Effort declined during the mid 1990s but increased substantially in 2000–01. Tow length increased also, as the fishery moved eastwards along the northern flanks of the Plateau in towards the EEZ. The hill fishery has decreased. Effort has also extended southwards along the western margins of the Challenger Plateau, although catches there have been small.

Table 4: Catch and effort data from NZ vessels for Northwest Challenger.

Fishing year	Number of vessels	Number of tows	Total recorded catch (t)	Mean tow length (h)	Mean catch rate (t/tow)	Mean catch rate (t/h)	Mean catch rate (t/nmile)
1988–89	3	33	107	3.2	3.3	1.5	0.5
1989–90	4	40	25	2.4	0.6	0.6	0.2
1990–91	1	4	1	0.2	0.3	1.5	0.4
1991–92	2	56	230	0.5	4.1	12.8	3.7
1992–93	19	1 370	2 250	0.8	1.6	3.9	1.2
1993–94	19	1 499	1 394	1.1	0.9	1.4	0.5
1994–95	11	877	1 138	0.8	1.3	5.7	2.0
1995–96	7	270	500	1.0	1.9	10.0	3.4
1996–97	7	385	332	0.8	0.9	3.5	1.2
1997–98	8	215	228	0.7	1.1	6.0	2.0
1998–99	21	707	838	0.8	1.2	4.2	1.4
1999–2000	11	598	335	1.0	0.6	2.6	0.9
2000–01	13	1 002	944	2.6	0.9	1.5	0.5
2001–02 ¹	21	2 431	1 863	3.9	0.8	1.4	0.5
2002–03 ¹	22	1 979	948	3.8	0.5	0.9	0.3
2003–04	16	869	495	3.5	0.6	0.9	0.3
2004–05	18	1 010	452	4.6	0.5	0.7	0.3

¹ Aggregated daily data are included in the vessel, tow, and catch totals, excluded from catch rate.

Unstandardised CPUE for vessels that have fished the area for several years has declined over time (Table 5). Average catch per tow has been less than 1 t since 2000, even though the success of catching orange roughy (expressed as % of 0 catch trawls) has improved.

Table 5: CPUE indices for core vessels from all seasons.

Fishing year	Number of tows	Catch (t)	Unstandardised CPUE		
			t/tow	t/nmile	% 0 catch
1992–93	474	819	1.7	0.9	20
1993–94	1 115	1 343	1.2	0.6	42
1994–95	869	1 136	1.3	2.0	39
1995–96	266	499	1.9	3.5	36
1996–97	379	330	0.9	1.2	41
1997–98	211	227	1.1	2.0	35
1998–99	463	622	1.3	1.3	25
1999–2000	430	190	0.4	0.6	29
2000–01	997	940	0.9	0.5	15
2001–02	2 098	1 633	0.6	0.5	10
2002–03	1 822	896	0.5	0.3	12
2003–04	786	464	0.6	0.3	9
2004–05	828	385	0.5	0.3	7

Catch rates in the hill fishery (winter, tow duration less than 30 mins), has decreased (Table 6). From a peak at around 4 t/tow in the mid 1990s it has dropped to less than 1 t. Effort in June during 2004–05 was low.

Table 6: CPUE indices for cropped data from June only.

Fishing year	Number of tows	Catch (t)	Unstandardised CPUE		
			t/tow	t/nmile	% 0 catch
1992–93	182	385	2.1	1.4	15
1993–94	187	283	1.5	1.3	28
1994–95	105	399	3.8	5.6	32
1995–96	103	426	4.1	8.3	33
1996–97	131	244	1.9	3.1	31
1997–98	80	108	1.4	3.6	26
1998–99	251	367	1.5	1.9	26
1999–2000	101	64	0.6	1.8	33
2000–01	65	49	0.7	1.3	32
2001–02	203	301	1.5	2.7	20
2002–03	174	127	0.7	1.2	26
2003–04	143	123	0.9	1.3	24
2004–05	38	7	0.2	0.5	16

The fishery has for many years now been worked solely by New Zealand and Australian boats, mostly between April and July.

West Norfolk Ridge

This is a recent fishery that followed exploratory fishing inside the EEZ on the West Norfolk Ridge (ORH 1). In 2000–01 and 2001–02 Australian vessels were involved as well as New Zealand boats. Catches quickly increased to almost 300 t, but then dropped substantially the following year (Table 7). After 2 years of small catches, they increased in 2004–05, as new hills along the ridge were fished.

Table 7: Catch and effort data from NZ vessels for the West Norfolk Ridge orange roughy fishery.

Fishing year	Number of vessels	Number of tows	Total recorded catch (t)	Mean tow length (h)	Mean catch rate (t/tow)	Mean catch rate (t/h)	Mean catch rate (t/nmile)
2000–01	1	1	0.2				
2001–02	3	297	586	0.3	2.0	9.0	3.0
2002–03	5	91	35	0.3	0.4	2.4	0.8
2003–04	2	90	88	0.5	1.0	2.3	0.8
2004–05	6	248	274	0.4	1.1	4.4	1.5

Fishing has been spread over the year, although highest catch rates have occurred in June and July (Table 8).

Table 8: Monthly distribution of catch rates (t/tow) by NZ vessels in the West Norfolk Ridge orange roughy fishery. Blanks indicate months when there was no effort.

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
2000–01				0.2								
2001–02	0.1	6.0	7.1	1.6	1.4	1.5	1.1	3.5	2.5	1.9	0.4	
2002–03	0.9	0.5	0.8	0.1			0.2	0.7	0.1	0.1		
2003–04	0.5		0.4				0.2	0.7	1.4	2.8		0.7
2004–05	1.0	0.6		0.2		0.6	2.0	0.8	1.5	1.1		

Louisville Ridge

The Louisville Ridge is a chain of more than 60 seamounts extending for over 4000 km southeast from the Kermadec Ridge. Fishing began in 1993–94 in the central part of the ridge, and spread both northwest and southeast in subsequent years. The fishery has comprised largely New Zealand vessels, although boats from Australia, China, Russia, Ukraine, Korea and Japan are known to have fished the ridge also (mainly in the first few years). The New Zealand catch peaked in the early years at over 11000 t (Table 9), and in recent years has generally been between 1000 and 1500 t. Catch rates have varied, and shown no consistent trend, either overall or broken into subareas (Table 10).

Table 9: Catch and effort data from NZ vessels for the Louisville Ridge.

Fishing year	Number of vessels	Number of tows	Total recorded catch (t)	Mean tow length (h)	Mean catch rate (t/tow)	Mean catch rate (t/h)	Mean catch rate (t/nmile)
1993–94	7	134	189	1.4	1.4	1.5	0.6
1994–95	31	4 294	11 340	0.7	2.6	10.6	4.2
1995–96	26	4 024	8 764	0.7	2.2	7.4	3.0
1996–97	16	1 849	3 209	0.8	1.7	5.3	2.1
1997–98	13	787	1 404	0.5	1.8	14.2	4.8
1998–99	17	1 093	3 025	0.5	2.7	14.2	5.2
1999–2000	12	918	1 369	0.5	1.5	11.4	3.8
2000–01	11	749	1 598	0.5	2.1	18.0	2.3
2001–02	15	889	1 004	0.6	1.1	7.4	2.4
2002–03	11	736	1 296	0.4	1.8	13.8	4.6
2003–04	12	1336	1419	0.4	1.1	8.7	2.8
2004–05	8	742	1 503	0.4	2.0	13.1	4.3

Table 10: Average catch rate (t per tow) of orange roughy by New Zealand vessels from the Louisville Ridge, 1993–94 to 2004–05, and by sub-area. The winter column is for June–August.

	Full Area		North		Central		South	
	All year	Winter	All year	Winter	All year	Winter	All year	Winter
1993–94	1.4	1.9			1.5	1.9		
1994–95	2.6	2.7	1.7	3.9	2.7	2.6	2.3	11.0
1995–96	2.2	3.6	3.0	6.0	1.4	2.1	2.8	3.9
1996–97	1.7	2.1	1.2	1.4	1.8	2.0	3.3	3.5
1997–98	1.8	2.0	1.7	1.9	2.0	2.4	0.7	0.7
1998–99	2.7	2.7	2.0	2.1	3.0	2.9	1.8	1.7
1999–2000	1.5	1.8	1.4	2.1	1.5	1.6	2.3	2.8
2000–01	2.1	2.3	2.4	2.6	1.9	2.0	1.9	1.9
2001–02	1.1	1.3	0.8	0.9	1.9	2.3	2.8	3.9
2002–03	1.7	1.9	1.6	1.7	1.2	1.2	5.3	5.3
2003–04	1.1	1.1	0.7	0.7	1.4	1.4	1.6	1.8
2004–05	2.0	2.1	1.6	1.8	1.6	1.6	2.8	2.9

Individual seamount CPUE, however, has shown variable patterns. The fishery on some seamounts has lasted only a few years, while on others it has continued, or fluctuated over time. Seamounts in the southeastern section of the Ridge have not sustained consistent catches, and some localised depletion has occurred.

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, with Australian and New Zealand vessels working several small hill features on the Rise. Catches peaked in 1997–98 (Table 11).

Table 11: Catch and effort data from the South Tasman Rise (combined Australian and New Zealand data).

Fishing year	Number of vessels	Number of tows	Total recorded catch (t)	Mean tow length (h)	Mean catch rate (t/tow)	Mean catch rate (t/h)
1996–97	2	61	4	0.6	0.1	0.5
1997–98	20	1 132	3 930	0.7	3.5	17.4
1998–99	18	1 332	1 705	0.6	1.3	10.4
1999–2000	16	1 086	3 360	0.5	3.1	21.1
2000–01	15	1 155	830	0.4	0.7	6.7
2001–02	5	201	170	0.8	1.0	3.5
2002–03	6	164	110	0.5	0.9	7.9
2003–04	5	67	2	0.3	0.1	0.4
2004–05	6	47	55	0.3	1.2	14.7

Levels of effort and catch dropped quickly from 2001–02, and mean catch per tow decreased to about or less than 1 t/tow.

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.

Monthly distribution of catch and effort have been affected by the quotas and fishing year, but typically catch rates during winter months, when orange roughy spawn, have been variable and inconsistent (Table 12).

Table 12: Monthly distribution of catch rates (t/tow) in the South Tasman Rise orange roughy fishery (combined NZ and Australian data). Blanks indicate months when there was no effort.

Fishing year	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
1996–97												
1997–98	0		0	0		0	1.9	5.5	1.4		3.6	5.1
1998–99	2.5	0			0	6.6	0	0.2	0.1	0	0	1.3
1999–2000	1.2	3.7	5.1	9.8	0		0	0		0		0
2000–01	0.2	0.1	0.2	1.7	1.4	0.3	0		0	0	0	0
2001–02	0	0	0.1	0	2.7	1.1	0		0.5		0	
2002–03	0		0		1.1	0.4					1.0	0
2003–04	0			0	0	0		0	0.1	0		
2004–05		1.1	1		1.8	0.1	0.9			2.4		0

New Zealand vessels have not fished the South Tasman Rise since 2000–01.

(b) Summary of trends in commercial fisheries

Most fisheries outside the New Zealand EEZ continue to have variable levels of catch and effort between years. Catch levels have decreased for all fisheries since they began, but in recent years the total catch by New Zealand vessels has been consistent at 2000–2500 t. Trends in catch and effort have been difficult to interpret, given changes in the vessel composition over time and the areas fished between years.

Mean catch rates for the Lord Howe Rise have increased in recent years, and the fishery appears more stable now following a period of low catch and effort in the mid 1990s. The orange roughy catch in the Northwest Challenger Plateau fishery has declined substantially in the last few years. Unstandardised CPUE has been at relatively low levels since 2000–01, and associated with a shift

towards long tows on the flat, the winter fishery on the hills declined considerably in 2004–05. The Louisville Ridge fishery has been the largest of those in the New Zealand region, and catch and effort levels are broadly similar to those in recent years, although the patterns on individual seamounts differ, with some appearing stable, while others have declined. The fishery on the South Tasman Rise has decreased to very low levels, and New Zealand vessels have not fished the Rise since 2001. The West Norfolk Ridge fishery developed rapidly in 2001–02, and after an initial decrease in catch and effort, these increased in 2004–05 as new sites were fished.

(c) **Recreational fisheries**

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

(d) **Maori customary fisheries**

No Maori customary fishing for orange roughy is known in these areas.

(e) **Illegal catch**

In most of these areas, there are no regulations regarding limits on catch in international waters. 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 region of ORH 7A.

(f) **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

The five fishing grounds are all regarded as separate stocks.

The Lord Howe Rise and Northwest Challenger Plateau fisheries are based on fish that have a different size structure, different age/size at maturity, similar timing of spawning, and a geographical separation of about 120 n.miles. Their genetics differ from fish on the southwest Challenger Plateau (ORH 7A). Morphometric differences have been shown between orange roughy from Lord Howe and Puysegur Bank areas.

Orange roughy on the South Tasman Rise are regarded as a straddling stock with fish inside the AFZ.

The Louisville Ridge is a long seamount chain, and little is known about stock structure within the area. There are several known spawning sites, and it would seem likely that there could be multiple stocks or sub-populations along the ridge.

3. STOCK ASSESSMENT

There are currently no accepted stock assessments for these ET fisheries. Several have been attempted (for Lord Howe, Northwest Challenger Plateau and Louisville) based on catch per unit effort data, but these have not been accepted as sufficiently robust by the Deepwater Fishery Assessment Working Group. This was generally on account of highly variable levels of effort and catch between years for considerable periods within each of the fisheries, which can make the use of CPUE as an index of abundance uncertain.

4. STATUS OF THE STOCKS

The status of the five ET orange roughy stocks (Lord Howe Rise, Northwest Challenger Plateau, West Norfolk Ridge, South Tasman Rise and Louisville Ridge) is unknown. Unstandardised CPUE has declined in a number of areas. However, it is not known if recent catch levels are sustainable, or whether they will allow the stocks to move towards B_{MSY} .

5. REFERENCES

- Clark, M.R. (2003). Estimation of orange roughy biomass on the Louisville Ridge: application of "Seamount Meta-analysis" results. Final Research Report to the Ministry of Fisheries for ORH2002/03. (Unpublished report held by MFish, Wellington.)
- Clark, M.R. (2004). Descriptive analysis of orange roughy fisheries in the New Zealand region outside the EEZ: Lord Howe Rise, Northwest Challenger Plateau, West Norfolk Ridge, South Tasman Rise, and Louisville Ridge to the end of the 2002-03 fishing year. *New Zealand Fisheries Assessment Report 2004/51*. 36 p.
- Clark, M.R.; Anderson, O.F. (2001). The Louisville Ridge orange roughy fishery: an update of commercial catch-effort data and CPUE analysis of the fishery to the end of the 1999-2000 fishing year. *New Zealand Fisheries Assessment Report 2001/74*. 31 p.
- Clark, M.R.; Anderson, O.F. (2003). The Louisville Ridge orange roughy fishery: an analysis of commercial catch-effort data and stock assessment of the fishery to the end of the 2000-01 fishing year. *New Zealand Fisheries Assessment Report 2003/3*. 26 p.
- Clark, M.R.; O'Driscoll, R.L. (2002). Descriptive analysis of orange roughy fisheries in the Tasman Sea outside the New Zealand EEZ: Lord Howe Rise, Northwest Challenger Plateau, and South Tasman Rise from 1986-87 to the end of the 2000-01 fishing year. *New Zealand Fisheries Assessment Report 2002/59*. 26 p.
- Clark, M.; Tilzey, R. (1996). A summary of stock assessment information for orange roughy fisheries on the Lord Howe Rise: 1996. Bureau of Resource Sciences, Canberra. 23 p. (Available from BRS, P.O. Box E11, Canberra, Australia.)
- Clark, M.; Tilzey, R. (2001). A summary of commercial catch and effort information for the orange roughy (*Hoplostethus atlanticus*) fishery on the South Tasman Rise from 1987 to 1999. *New Zealand Fisheries Assessment Report 2001/3*. 16 p.
- O'Driscoll, R.L. (2001). CPUE analysis of orange roughy fisheries outside the New Zealand EEZ: Lord Howe Rise and Northwest Challenger Plateau, to the end of the 1999-2000 fishing year. *New Zealand Fisheries Assessment Report 2001/36*. 26 p.
- O'Driscoll, R.L. (2003). Catch-per-unit-effort analysis of orange roughy fisheries outside the New Zealand EEZ: Lord Howe Rise and Northwest Challenger Plateau to the end of the 2001-02 fishing year. *New Zealand Fisheries Assessment Report 2003/36*. 38 p.
- Smith P.J., Robertson, S., Horn, P., Bull, B., Anderson O., Stanton, B.R., Oke, C.S. (2002). Multiple techniques for determining stock relationships between orange roughy, *Hoplostethus atlanticus*, fisheries in the eastern Tasman Sea. *Fisheries Research* 58: 119-140.
- Tilzey, R. (2000). South Tasman Rise trawl fishery. In: Caton, A., McLoughlin, K. (eds) Fishery status reports 1999: resource assessments of Australian Commonwealth fisheries. BRS, Canberra.
- Wayte, S., Bax, N., Clark, M.; Tilzey, R. (2003). Analysis of orange roughy catches on the South Tasman Rise, 1997-2002. Report provided to the Orange Roughy Assessment Group. 14 p. (Unpublished report held by CSIRO, Hobart.)