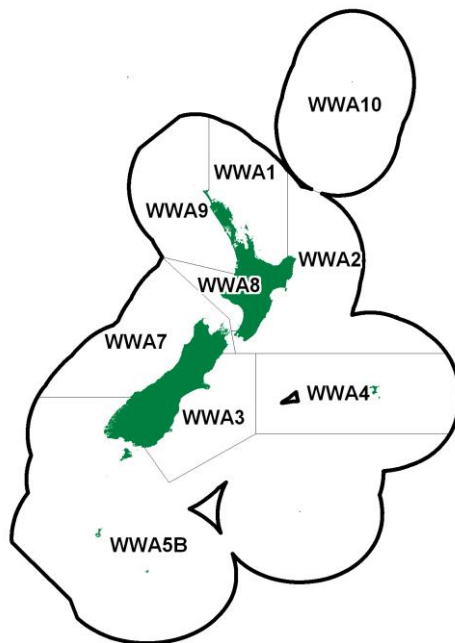


WHITE WAREHOU (WWA)

(*Seriolella caerulea*)
Warehou



1. FISHERY SUMMARY

1.1 Commercial fisheries

White warehou are predominantly taken as bycatch from target trawl fisheries on hoki and silver warehou, and to a lesser extent, hake, ling and scampi. White warehou are mostly caught in 150 to 800 m depth by larger vessels owned or chartered by New Zealand fishing companies.

Prior to the establishment of the EEZ on 1 March 1978, white warehou landings were combined with both silver and blue (or common) warehou as ‘warehouse’. An estimate of total white warehou catches for 1970 to 1977 calendar years has been made (Table 1). From 1978–79 to 1982–83 annual catches of up to 900 t during the fishing year were reported, mainly from Southland and the Chatham Rise (Table 2).

Annual catches of white warehou have been variable (i.e., ranging from 315 t in the 1978–79 fishing year to 3694 t in 1996–97, Tables 2 and 3). The main areas of fishing are the Southland area, with some extension into the Sub-Antarctic area since 1990–91, and the Chatham Rise. The annual catch from other fisheries has been relatively small; the west coast South Island catch is usually less than 100 t and the North Island catch rarely exceeds 50 t. Figure 1 shows the historical landings and TACC values for the main white warehou stocks.

Target fishing on white warehou has been reported from around Mernoo Bank, the Stewart-Snares shelf, Puysegur Bank and on the west coast of the South Island, with the best catch rates recorded in the southern areas. Target fisheries accounted for only 8% of the total white warehou catch for the years from 1988–89 to 1994–95. Most catches are taken from 300–700 m by bottom trawls targeted on hoki, squid, ling and silver warehou (Ballara & Baird 2012)

White warehou was introduced into the QMS on 1 October 1998. The TACCs for each QMA are given in Table 3. A nominal allowance of 1 t was made for both recreational and customary catch in each of WWA 2–7.

WHITE WAREHOU (WWA)

TACCs were increased from 1 October 2006 in WWA 3 to 583 t, in WWA 4 to 330 t, and in WWA 7 to 127 t. In these stocks landings were above the TACC for a number of years and the TACCs have been increased to the average of the previous 7 years plus an additional 10%. Despite this change the catch in WWA 3 in 2006–07 was well above the new TACC, but has been under the TACC since 2007–08. From 1 October 2007 WWA 5 was merged with WWA 6 to create WWA 5B.

Table 1: Estimated catch (t) of white warehou for years 1970 to 1977.

Vessel nationality	1970*	1971*	1972	1973	1974	1975	1976	1977
Japanese	17	25	222	447	234	1 453	1 558	334
Russian	NA	NA	1 300	1 200	1 480	40	440	1 260
Korean	-	-	-	-	-	-	-	400
Total	17	25	1 522	1 647	1 714	1 493	1 998	1 994

* Japanese data only.

Table 2: Reported landings (t) of white warehou by fishing year and area, by foreign licensed and joint venture vessels, 1978–79 to 1983–83. The EEZ areas correspond approximately to the QMAs as indicated. Fishing years are from 1 April to 31 March. The 1983–83 is a six month transitional period from 1 April to 30 September. No data are available for the 1980–81 fishing year.

EEZ area	B	C(M)	C(1)	D	E(B)	E(P)	E(C)	E(A)	F(E)	F(W)	G	H	Total
QMA area	1 & 2		3	4				6		5	7	8 & 9	
1978–79	1	20	10	1	0	5	0	141	86	26	20	6	315
1979–80	2	8	5	230	57	5	4	312	34	97	42	0	795
1980–81	-	-	-	-	-	-	-	-	-	-	-	-	-
1981–82	0	41	2	53	0	2	5	153	27	248	10	1	542
1982–83	0	375	1	88	0	11	0	198	39	137	33	0	882
1983–83	0	167	5	49	0	0	0	12	9	34	24	0	300

Note: The EEZ area E(A) also included part of QMA 5, south of 48°30' S.

Table 3: Reported landings (t) of white warehou by fishstock and fishing year, 1982–83 to 2014–15. The data in this table has been updated from that published in previous Plenary Reports by using the data through 1996–97 in table 44 on p. 296 of the “Review of Sustainability Measures and Other Management Controls for the 1998–99 Fishing Year - Final Advice Paper” dated 6 August 1998. Data since 1997–98 are based on catch and effort returns. There are no landings reported from QMA 10. [Continued on next page].

Fishstock FMA	WWA 1		WWA 2		WWA 3		WWA 4		WWA 5(5B)*	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
1982–83	0	-	35	-	179	-	69	-	248	-
1983–84	0	-	28	-	111	-	33	-	282	-
1984–85	0	-	2	-	123	-	39	-	150	-
1985–86	0	-	5	-	589	-	61	-	277	-
1986–87	0	-	10	-	239	-	29	-	167	-
1987–88	<1	-	9	-	431	-	26	-	113	-
1988–89	6	-	1	-	118	-	43	-	843	-
1989–90	1	-	9	-	484	-	16	-	555	-
1990–91	2	-	12	-	695	-	88	-	568	-
1991–92	6	-	22	-	589	-	113	-	833	-
1992–93	2	-	13	-	281	-	106	-	560	-
1993–94	6	-	34	-	197	-	23	-	1 235	-
1994–95	4	-	41	-	327	-	243	-	1 936	-
1995–96	2	-	68	-	566	-	137	-	1 555	-
1996–97	3	-	89	-	508	-	220	-	2 309	-
1997–98	2	-	31	-	516	-	153	-	1 217	-
1998–99	<1	4	34	73	398	399	120	220	1 269	2 127
1999–00	<1	4	48	73	559	399	277	220	1 112	2 127
2000–01	<1	4	21	73	661	399	303	220	703	2 127
2001–02	0	4	8	73	446	399	262	220	921	2 127
2002–03	<1	4	20	73	852	399	397	220	1 462	2 127
2003–04	<1	4	47	73	458	399	365	220	1 141	2 127
2004–05	<1	4	24	73	347	399	365	220	1 568	2 127
2005–06	<1	4	35	73	589	399	312	220	1 176	2 127
2006–07	<1	4	10	73	733	583	304	330	1 484	2 127
2007–08	<1	4	43	73	345	583	207	330	*1 431	*2 617
2008–09	<1	4	22	73	302	583	85	330	*1 644	*2 617
2009–10	<1	4	7	73	355	583	179	330	*1 106	*2 617
2010–11	<1	4	12	73	391	583	81	330	*787	*2 617
2011–12	<1	4	3	73	204	583	112	330	*978	*2 617
2012–13	<1	4	6	73	174	583	117	330	1 037	2 617
2013–14	<1	4	8	73	302	583	110	330	1 373	2 617
2014–15	<1	4	7	73	225	583	69	330	447	2 617

Table 3 continued:

Fishstock FMA	WWA 6		WWA 7		WWA 8		WWA 9		Total	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
1982-83	7	-	24	-	< 1	-	0	-	562	-
1983-84	24	-	29	-	< 1	-	0	-	510	-
1984-85	12	-	15	-	< 1	-	0	-	342	-
1985-86	43	-	81	-	< 1	-	0	-	1 058	-
1986-87	144	-	15	-	< 1	-	0	-	573	-
1987-88	20	-	28	-	< 1	-	0	-	629	-
1988-89	16	-	10	-	0	-	0	-	1 040	-
1989-90	291	-	83	-	0	-	0	-	1 438	-
1990-91	278	-	69	-	1	-	0	-	1 713	-
1991-92	1 028	-	45	-	0	-	0	-	2 636	-
1992-93	645	-	125	-	2	-	0	-	1 734	-
1993-94	592	-	69	-	0	-	0	-	2 156	-
1994-95	185	-	80	-	0	-	0	-	2 816	-
1995-96	50	-	62	-	0	-	0	-	2 440	-
1996-97	494	-	71	-	0	-	0	-	3 694	-
1997-98	126	-	98	-	< 1	-	< 1	-	2 155	-
1998-99	412	490	73	60	< 1	1	0	0	2 306	3 374
1999-00	211	490	153	60	< 1	1	0	0	2 351	3 374
2000-01	119	490	90	60	< 1	1	0	0	1 897	3 374
2001-02	219	490	85	60	< 1	1	< 1	0	1 941	3 374
2002-03	457	490	158	60	0	1	0	1	3 346	3 374
2003-04	211	490	135	60	0	1	0	1	2 357	3 374
2004-05	436	490	123	60	< 1	1	0	1	2 863	3 374
2005-06	250	490	133	60	0	1	0	1	2 495	3 374
2006-07	563	490	121	127	0	1	0	0	3 215	3 735
2007-08	N/A	N/A	90	127	0	1	< 1	0	2 116	3 735
2008-09	N/A	N/A	110	127	< 1	1	< 1	0	2 164	3 735
2009-10	N/A	N/A	44	127	< 1	1	0	0	1 691	3 735
2010-11	N/A	N/A	52	127	< 1	1	0	0	1 324	3 735
2011-12	N/A	N/A	77	127	< 1	1	< 1	0	1 375	3 735
2012-13	N/A	N/A	118	127	< 1	1	0	0	1 452	3 735
2013-14	N/A	N/A	115	127	< 1	1	< 1	0	1 908	3 735
2014-15	N/A	N/A	98	127	0	1	0	0	845	3 735

* In 2007-08 WWA 5 was merged with WWA 6 to create WWA 5B. The landings and TACC for WWA 5B are presented after 2007-08 in the WWA 5(5B)* column.

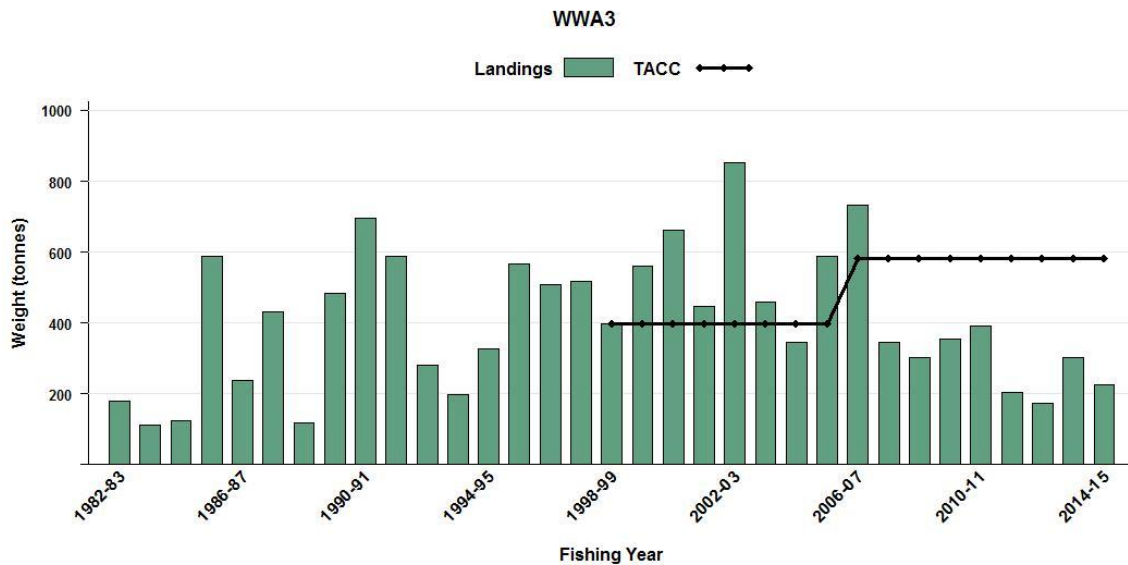


Figure 1 [Continued]: Reported commercial landings and TACC for the four main WWA stocks. WWA 3 (South East Coast). [Continued on next page].

WHITE WAREHOU (WWA)

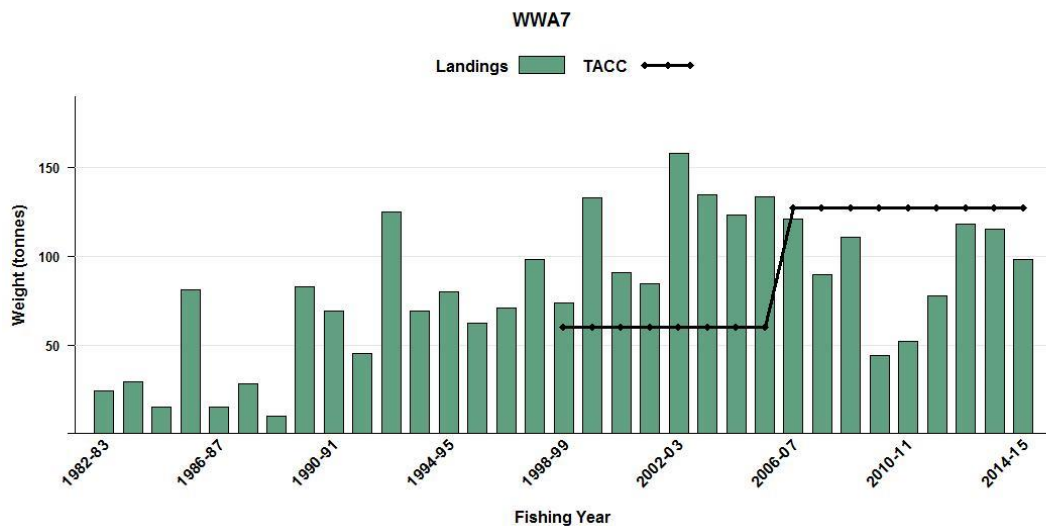
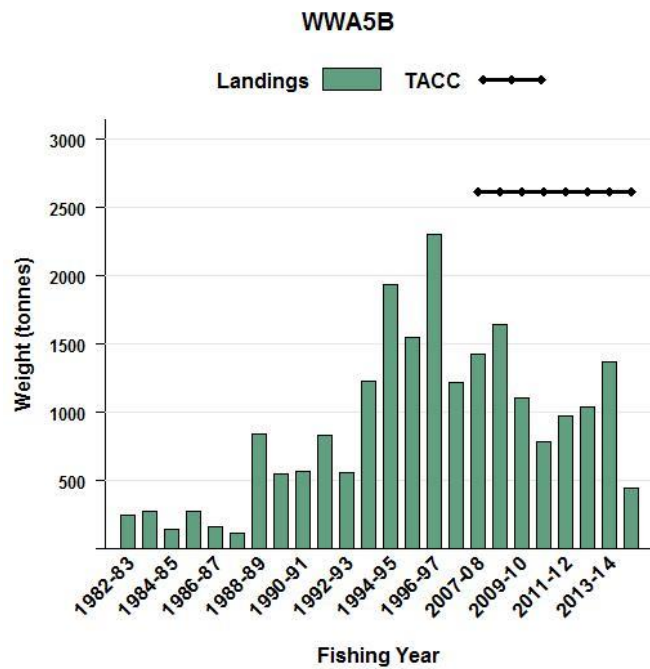
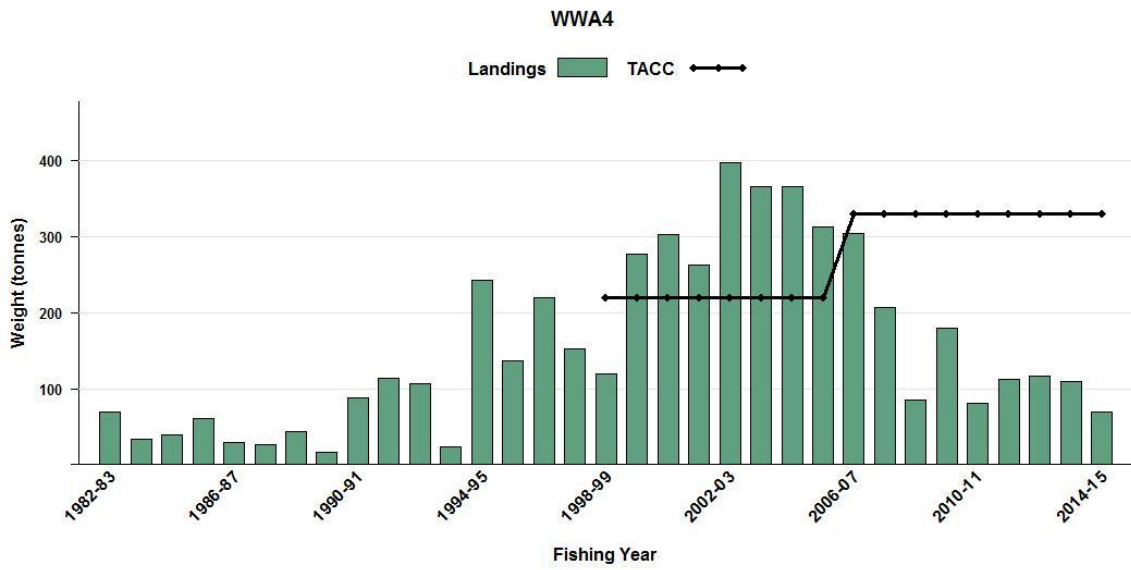


Figure 1 [Continued]: Reported commercial landings and TACC for the four main WWA stocks. WWA 3 (South East Coast), WWA 4 (South East Chatham Rise), WWA 5B* (Southland, Sub-Antarctic), and WWA 7 (Challenger).

1.2 Recreational fisheries

The recreational take of white warehou is likely to be very small given its distribution and depth preferences.

1.3 Customary non-commercial fisheries

No quantitative information is available on the current level of customary non-commercial take.

1.4 Illegal catch

Silver warehou were reported as white warehou when the latter was a non QMS species. Compliance investigations in 1988 successfully proved that substantial quantities of silver warehou were reported as white warehou, but catch statistics were not altered as a result. The true extent of misreporting is unknown and thus the accuracy of annual catch records cannot be determined.

1.5 Other sources of mortality

No information is available on other sources of mortality.

2. BIOLOGY

Adult white warehou range between 40 and 60 cm fork length (FL) and reach a maximum length and weight of 67 cm and 5.7 kg respectively. Sexual maturity is reached at an age of about 3 or 4 years at a length of approximately 38–47 cm. The length at age for the first three years appears to be similar to that described for silver and blue warehou (Gavrilov 1979, Horn & Sutton 1995, 1996).

White warehou were aged by Gavrilov (1979) who gives the maximum age as 12 years. Horn & Sutton (1996) suggested that Gavrilov underestimated the maximum age of silver warehou (as 10–11 years) because he read whole otoliths and scales. They determined a maximum age of 23 years for silver warehou using sectioned otoliths. The maximum age of white warehou is therefore uncertain. Without validated ageing and population age structures it is not possible to estimate mortality for white warehou.

Sex ratio data derived from scaled length frequencies appear to show a slight bias towards males. On the Chatham Rise sex ratios vary from 1.0 : 1 to 1.4 : 1 (males to females). In the southern area, ratios vary from 0.7 : 1 to 4.2 : 1, but sample sizes at either extreme of the range are very small. There are insufficient data to enable detection of any changes in sex ratio with season.

Feeding records from the MPI research database *trawl* show salps as the predominant prey item observed in white warehou stomachs. Occasional records of fish and euphausiids have also been made. Gavrilov & Markina (1979) noted salps (*Iasis*) and the tunicate *Pyrosoma* as major food items.

3. STOCKS AND AREAS

The existence of three possible spawning areas for white warehou, (Mernoo Bank, Puysegur Bank and the west coast of the South Island) at the same time of year, suggests the possibility of three separate stocks. Bagley & Hurst (1997) proposed the following Fishstock areas: WWA 1 (QMAs 1, 2, 3 and 4), WWA 5 (QMAs 5 and 6) and WWA 7 (QMAs 7, 8 and 9) for white warehou. However, TACs were set for each QMA (1–9) in 1998 and each Fishstock is managed separately (note WWA 5 and WWA 6 were merged to form Fishstock WWA 5B in 2007-08).

4. STOCK ASSESSMENT

No assessments are available for any stocks for white warehou, therefore estimates of biomass and yield are not available.

4.1 Estimates of fishery parameters and abundance

No estimates of fishing parameters are available for white warehou.

Several time series of relative abundance estimates are available from trawl surveys, but these estimates are not reliable indicators of relative abundance because of large fluctuations between years and moderate to high CVs. The larger biomass estimates are generally associated with moderate to high CVs (i.e., over 40%), having resulted from one or two large catches. Smaller biomass estimates have lower CVs, but this could be because the survey missed the main white warehou schools.

4.2 Biomass estimates

No biomass estimates are available for white warehou.

4.3 Yield estimates and projections

MCY cannot be determined. Problems with mis-reporting of silver warehou as white warehou and the lack of consistent catch histories make *MCY* estimates based on catch data alone unreliable. Also the amount of effort on white warehou relates very closely to effort on other target species such as hoki and silver warehou. Large fluctuations in the availability of white warehou to the trawl, as indicated by trawl surveys, are also likely to apply to commercial fishing operations. Estimates of *M* need to be determined.

CAY cannot be estimated because of the lack of current biomass estimates.

4.4 Other factors

None

5. STATUS OF THE STOCKS

It is not known whether recent catches are sustainable or if they are at levels that will allow the stock to move towards a size that will support the maximum sustainable yield.

TACCs were increased from 1 October 2006 in WWA 3 to 583 t, in WWA 4 to 330 t, and in WWA 7 to 127 t. In these stocks landings were above the TACC for a number of years and the TACCs have been increased to the average of the previous 7 years plus an additional 10%.

TACCs and reported landings for the 2014–15 fishing year are summarised in Table 4.

Table 4: Summary of TACCs (t), and reported landings (t) of white warehou for the most recent fishing year.

Fishstock		FMA	2014–15	2014–15
			Actual TACC	Reported landings
WWA 1	Auckland (East)	1	4	< 1
WWA 2	Central (East)	2	73	7
WWA 3	South-east (Coast)	3	583	224
WWA 4	South-east (Chatham)	4	330	110
WWA 5B	Southland, Sub-Antarctic	5 & 6	2 617	69
WWA 7	Challenger	7	127	97
WWA 8	Central (West)	8	1	0
WWA 9	Auckland (West)	9	0	0
WWA 10	Kermadec	10	0	0
Total			3 735	845

6. FOR FURTHER INFORMATION

- Bagley, N W; Hurst, R J (1997) A summary of the biology and commercial landings and a stock assessment of white warehou *Seriolella caerulea* Guichenot, 1848 (Stromateoidei: Centrolophidae) in New Zealand waters. New Zealand Fisheries Assessment Research Document 1997/13. 34 p. (Unpublished document held by NIWA library, Wellington.)
- Ballara S.L.; Baird, S.J. (2012). Fishery characterisation and standardised CPUE analyses for white warehou, *Seriolella caerulea*, 1989–90 to 2009–10. *New Zealand Fisheries Assessment Report 2012/49*. 265 p.
- Cousseau, M B; Fortciniti, L; Ubaldi, G (1993) Species of the Genus *Seriolella* in Southwest Atlantic waters. *Japanese Journal of Ichthyology* 40(2): 183–187.
- Gavrilov, G M (1979) *Seriolella* of the New Zealand plateau. Report of the Pacific Ocean Scientific Research Institute of Fisheries and Oceanography (TRINO). (In Russian, English translation held in NIWA, Wellington.)
- Gavrilov, G M; Markina, N P (1979) The feeding ecology of fishes of the genus *Seriolella* (fam. Nomeidae) on the New Zealand plateau. *Journal of Ichthyology* 19(6): 128–135.
- Horn, P L (1999) A validated ageing method and updated stock assessment for white warehou (*Seriolella caerulea*) in New Zealand waters. New Zealand Fisheries Assessment Research Document. 1999/44. (Unpublished document held by NIWA library, Wellington.)
- Horn, P L; Sutton, C P (1995) An ageing methodology, and growth parameters for silver warehou (*Seriolella punctata*) from off the southeast coast of the South Island, New Zealand. New Zealand Fisheries Assessment Research Document 1995/15. 16 p. (Unpublished document held by NIWA library, Wellington.)
- Horn, P L; Sutton, C P (1996) Validated ages, growth, and productivity parameters for silver warehou (*Seriolella punctata*) off the south and east coasts of South Island, New Zealand. *New Zealand Journal of Marine and Freshwater Research* 30: 301–312.
- Hurst, R J; Bagley, N W (1992) Results of a trawl survey of barracouta and associated finfish near the Chatham Islands, New Zealand, December 1985. *New Zealand Fisheries Technical Report* 30. 36 p.
- Kerstan, M; Sahrhage, D (1980) Biological investigation on fish stocks in the waters off New Zealand. *Mitteilungen aus dem Institut für Seefischerei der Bundesforschungsanstalt für Fischerei, Hamburg*: 29. 168 p.
- McDowall, R M (1980) *Seriolella caerulea* Guichenot, 1884 in New Zealand waters (Stromateoidei: Centrolophidae). *Journal of the Royal Society of New Zealand* 10(1): 65–74.
- McDowall, R M (1982) The centrolophid fishes of New Zealand (Pisces: Stromateoidei). *Journal of the Royal Society of New Zealand* 12: 103–142.
- New Zealand Fishing Industry Board (NZFIB) (1996) The New Zealand seafood industry economic review 1994–1996. New Zealand Fishing Industry Board, Wellington. 65 p.
- Sparre, P; Ursin, E; Venema, S C (1989) Introduction to tropical fish stock assessment. Part 1. Manual. *FAO Fisheries Technical Paper* 306. 337 p.