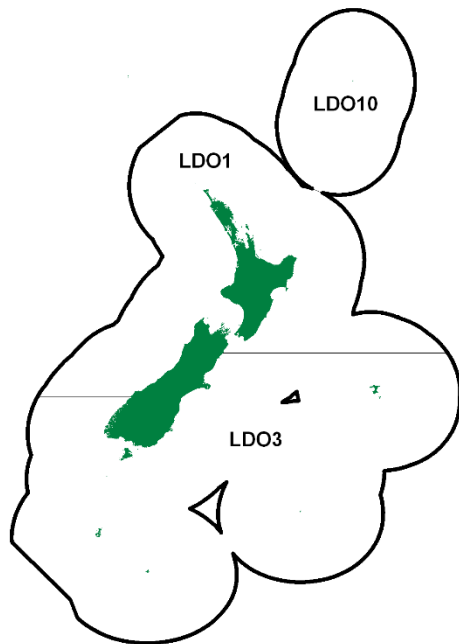


LOOKDOWN DORY (LDO)

(*Cyttus traversi*)



1. FISHERY SUMMARY

Lookdown dory was introduced into the Quota Management System (QMS) on 1 October 2004 with the allowances, TACs and TACCs in Table 1. It is currently managed as three stocks: LDO 1 which comprises FMAs 1–2 and 7–9; LDO 3 which comprises FMAs 3–6; and LDO 10 (Kermadec region).

Table 1: Recreational and customary non-commercial allowances, TACCs and TACs, by Fishstock, for lookdown dory.

Fishstock	Recreational allowance	Customary non-commercial allowance	Other sources of mortality	TACC	TAC
LDO 1	0	0	0	168	168
LDO 3	0	0	0	614	614
LDO 10	0	0	0	1	1

1.1 Commercial fisheries

Reliable landings data are available from 1989–90 onwards, after the introduction of Catch Landing Returns (CLRs) in the previous year (Table 2). Annual landings are also available from Licensed Fish Receiver Returns (LFRRs), and these agree well with CLR figures in most years (within 10%), but differ by 20–27% in 4 of the 12 years with comparable data (Table 2). Total landings (CLR) increased steadily from 127 t in 1989–90 to 760 t in 2001–02. Estimated catch as a percentage of recorded landings were moderate in the early 1990s at 60–70%, but subsequently declined to around 30%. Lookdown dory will often not be included within the top five species in a trawl haul, but the reason for the declining percentage of landings recorded as catch is unknown.

Since entering the QMS, landings in LDO 1 slightly exceeded the TACC in 2005–06 and 2007–08; by an average of 30 t in 2012–13 to 2014–15; by 76 t in 2017–18 and by 7 t in 2022–23 (Table 3, Figure 1). The TACC in LDO 3 has never been caught, with landings fluctuating around 300 t until 2022–23, increasing to 453 t in 2023–24. This probably reflects the reduction in the size of the trawl fishery on the Chatham Rise where the greatest proportion of lookdown dory has been taken as bycatch. No landings have been reported from LDO 10.

There is a seasonal pattern of catch of lookdown dory on the west coast South Island in relation to target fishing for spawning hoki and hake in winter. Catches elsewhere are also dependent on fishing activity in target fisheries but, other than a slight decline in winter months in relation to the shift in area of operation of the hoki fleet, they tend to be less seasonal.

Table 2: Reported landings and estimated catch (t) of lockdown dory by fishing year from 1989–90 to 2001–02. Also, percentage of landings recorded as catch in the catch effort databases.

Year	Landings (CLR)	Landings (LFRR)	Estimated catch (t)	% of CLR landings recorded as estimated catch
1989–90	127	161	80	63
1990–91	164	182	105	64
1991–92	249	216	177	71
1992–93	275	264	159	58
1993–94	188	226	117	62
1994–95	283	277	125	44
1995–96	260	276	107	41
1996–97	354	426	173	49
1997–98	564	557	265	47
1998–99	625	640	228	36
1999–00	637	605	215	34
2000–01	694	504	157	23
2001–02	760	-	254	33

-, data not available

Table 3: Reported domestic landings (t) of lockdown dory by Fishstock and TACC from 2004–05 to present.

Fishstock FMA	LDO 1 1,2,7,8&9		LDO 3 3,4,5&6		LDO 10 10		Total	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
2004–05	110	168	272	614	0	1	382	783
2005–06	180	168	290	614	0	1	470	783
2006–07	147	168	284	614	0	1	431	783
2007–08	174	168	256	614	0	1	430	783
2008–09	144	168	315	614	0	1	459	783
2009–10	161	168	274	614	0	1	435	783
2010–11	165	168	216	614	0	1	380	783
2011–12	153	168	229	614	0	1	382	783
2012–13	185	168	309	614	0	1	494	783
2013–14	204	168	256	614	0	1	460	783
2014–15	207	168	357	614	0	1	564	783
2015–16	166	168	342	614	0	1	507	783
2016–17	160	168	339	614	0	1	499	783
2017–18	244	168	320	614	0	1	564	783
2018–19	133	168	288	614	0	1	421	783
2019–20	122	168	277	614	0	1	399	783
2020–21	141	168	316	614	0	1	457	783
2021–22	133	168	344	614	0	1	477	783
2022–23	175	168	312	614	0	1	487	783
2023–24	112	168	453	614	0	1	566	783

Lookdown dory is generally caught by bottom trawling in depths of 200 to 800 m mainly as bycatch in the hoki fishery, but also in a variety of other target fisheries such as barracouta, hake, ling, scampi, squid and jack mackerel. A small amount of target fishing is reported from FMA 7. Most of the landings have historically come from FMA 3 (east coast South Island), FMA 4 (Chatham Rise), and FMA 7 (west coast South Island) (Table 4). Landings from around the North Island have been restricted mostly to a few tonnes each year from FMAs 1, 2, 8 and 9. In FMA 5 (Southland) and FMA 6 (Sub-Antarctic) landings averaged 28 t and 25 t respectively in 1999–00 to 2003–04. 123 kg of lockdown dory were reported to have been caught from outside the New Zealand EEZ in the 2012–13 fishing year.

Table 4: Reported historic landings (rounded to nearest tonne) of lockdown dory by FMA and fishing year 1989–90 to 2003–04.

Year	FMA 1	FMA 2	FMA 3	FMA 4	FMA 5	FMA 6	FMA 7	FMA 8	FMA 9	FMA 10
1989–90	2	1	40	20	12	2	51	-	-	-
1990–91	3	4	46	59	10	11	33	< 1	-	-
1991–92	1	2	96	75	17	3	55	-	-	-
1992–93	1	4	63	112	10	2	83	-	-	-
1993–94	< 1	2	62	50	4	3	67	-	< 1	-
1994–95	1	6	73	108	7	3	85	-	< 1	-
1995–96	2	4	99	78	11	3	62	-	< 1	-
1996–97	7	10	108	110	11	7	100	< 1	< 1	-
1997–98	5	8	159	272	11	25	82	-	< 1	-
1998–99	3	3	161	295	21	17	124	< 1	10	-
1999–00	3	5	161	295	21	17	124	< 1	10	-
2000–01	2	6	203	318	24	25	111	< 1	4	-
2001–02	10	10	181	331	26	28	170	3	2	-
2002–03	8	8	261	365	48	32	167	1	2	-
2003–04	13	8	135	210	22	24	113	3	1	-

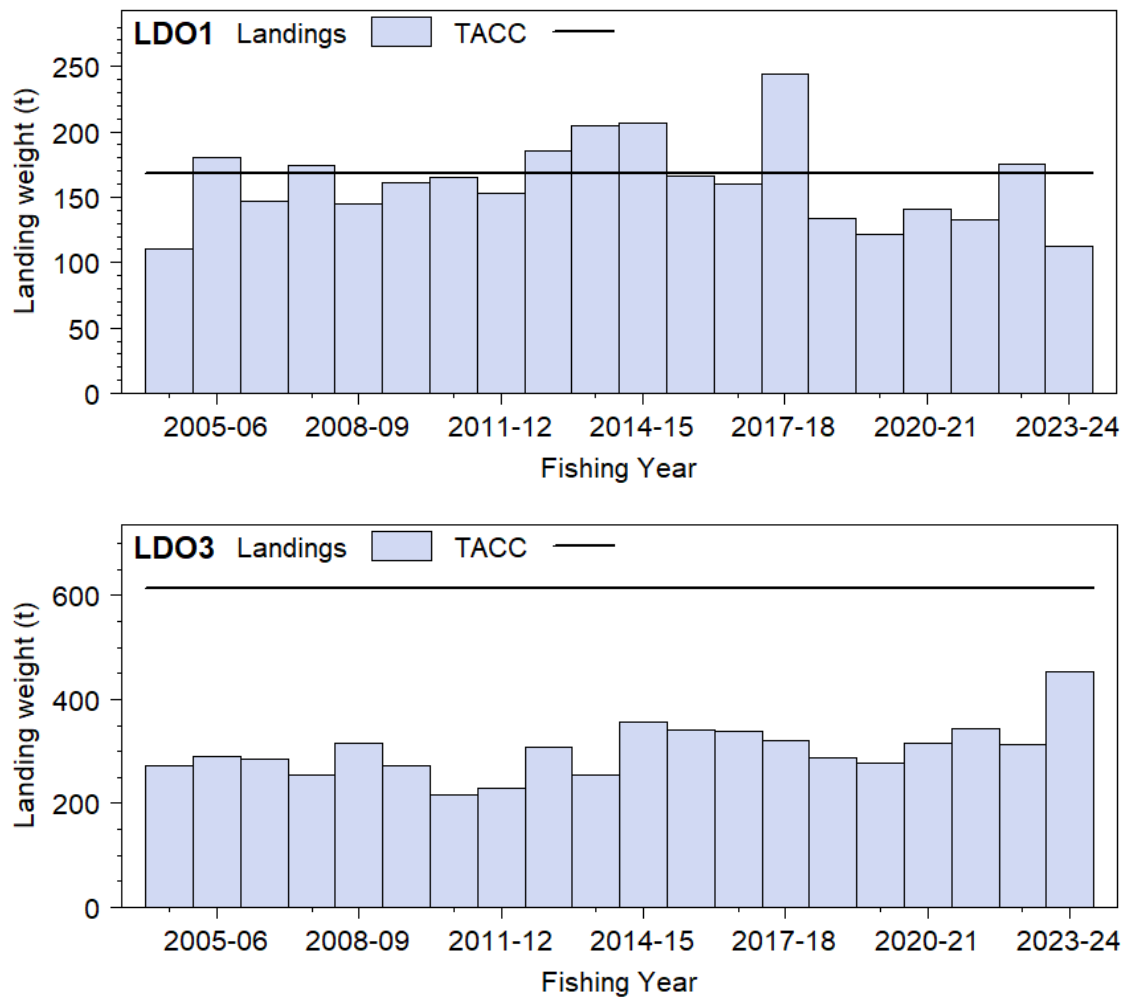


Figure 1: Reported commercial landings and TACC for the two main LDO stocks. Top to bottom: LDO 1 (Challenger, Central, Auckland), and LDO 3 (South East Chatham Rise, South East Coast, Sub Antarctic, Southland). Note that this figure does not show data prior to entry into the QMS.

1.2 Recreational fisheries

There is no quantitative information on recreational harvest levels of lockdown dory. Due to the offshore location and depth distribution of lockdown dory recreational catch is thought to be negligible.

1.3 Customary non-commercial fisheries

An estimate of current catch is not available but given the offshore location and depth distribution of lockdown dory customary non-commercial catch is thought to be negligible.

1.4 Illegal catch

Estimates of illegal catch are not available.

2.5 Other sources of mortality

There is no quantitative information on the level of other sources of mortality.

2. BIOLOGY

Lookdown dory (*Cyttus traversi*) belongs to the family Zeidae. This family includes 13 species in seven genera distributed among the Atlantic and Pacific Oceans and the Mediterranean Sea. Lookdown dory also occurs in Australian waters, mostly east and south of Tasmania (where it is known as king dory), and also in South Africa. It is widely distributed throughout New Zealand waters with most records from the Chatham Rise.

It is one of the less abundant members of a loosely associated group of about 23 common species, which together form the upper slope fish assemblage of New Zealand's continental shelf (Francis et al 2002). The main species in this group are hoki, javelin fish, ling, pale ghostshark, sea perch, hake, and longnose spookfish (chimaerid). It was identified as a key species characterising the demersal fish community 350–550 m on the Chatham Rise (Bull et al 2001).

Juveniles are found in surface waters up to a length of approximately 12 cm (May & Maxwell 1986), at which stage a metamorphosis occurs associated with the transition from a pelagic to a demersal habitat (James 1976). Adults are most common between 400 to 600 m, but have a wide depth range, from 50 to 1200 m (Anderson et al 1998). The main prey of lookdown dory are natant decapod crustaceans, followed by 892uphausiid, mysid, galatheid, and nephropsid crustaceans, and fish (Clark & King 1989, Forman & Dunn, 2010). Lookdown dory is likely to be prey of larger fish and have occasionally been recorded in the stomachs of large ling.

Trawl survey catch distribution across the Chatham Rise is fairly even, with females ranging from 10 to 55 cm total length, and males ranging from 10 to 45 cm. Lookdown dory show early signs of ripening to spawn in the January surveys (Livingston et al 2002). Catch distribution across the Sub-Antarctic is patchier than across the Chatham Rise, particularly during autumn surveys (O'Driscoll & Bagley 2001). Lookdown dory appear to grow larger in the Sub-Antarctic than on the Chatham Rise with females ranging from 12 to 60 cm total length, and males ranging from 12 to 45 cm.

There are no known aggregations or migrations associated with spawning lookdown dory. Around the North Island, female lookdown dory were reported to mature at about 35 cm (May & Maxwell 1986). Tracey et al (2007) estimated mean length at first maturity to be 18.3 cm and 5.2 years for males and 21.6 cm and 6.3 years for females, based on macroscopic maturity estimates of fish caught in Chatham Rise surveys. Ripe specimens are usually seen in autumn and winter but have also been observed in summer (Clark & King 1989). Livingston et al (2002) reported early signs of ripening in January Chatham Rise trawl surveys. Observer records from the east coast South Island and Chatham Rise show that ripe females are more common in summer months and spent females are more common in winter (MacGibbon et al 2012). Females on the west coast South Island are mostly resting, immature or spent in winter. Although most spawning takes place in autumn and winter it is likely that it is not a discrete event but occurs over much of the year. Research data from other areas are sparse, but show the presence of fish in spawning condition in most months of the year.

Although there are no published studies of validated age and growth of lookdown dory, preliminary work in Australia suggests that this species may live to over 30 years (Stewart & Smith 1992). Tracey et al (2007) attempted to use lead-radium techniques to validate ageing by zone counts of otoliths but were unsuccessful. Based on unvalidated zone counts, they observed maximum ages of 38 and 35 years for males and females respectively for New Zealand lookdown dory from the Chatham Rise. Initial fish growth was rapid for both sexes, and females approached a substantially larger mean asymptotic maximum size than males. Length at maximum observed age for females was approximately 50 cm. Tracey et al (2007) estimated total mortality Z using three methods; 1) age reached by 5% of the population (after Hoenig 1983), 2) mean age above recruitment (after Chapman and Robson 1960) and 3) slope of the right hand limb of the relationship between age and the natural logarithm of the frequency of fish in that age class (after Ricker 1975). Results ranged from 0.12 to 0.17 and could be considered an upper limit for natural mortality M . Von Bertalanffy growth parameters and natural mortality M values are given in Table 5 and length-weight parameters are given in Table 6.

Table 5 : Summary of von Bertalanffy growth parameters and natural mortality M values for Chatham Rise lookdown dory. Source : Tracey et al 2007. NB : Ageing in this study used unvalidated methods.

1. von Bertalanffy growth parameters										
Sex	N	L_{∞}	SE	95% CI	K	SE	95% CI	t_0	SE	95% CI
All	382	50.72	2.53	(45.75, 55.68)	0.058	0.007	(0.044, 0.073)	-3.53	0.67	(-4.84, -2.21)
Males	191	38.78	1.68	(35.49, 42.06)	0.074	0.011	(0.053, 0.095)	-4.28	0.87	(-5.97, -2.57)
Females	191	69.94	5.71	(58.75, 81.13)	0.039	0.006	(0.027, 0.051)	-3.90	0.72	(-5.31, -2.49)
2. natural mortality M										
Sex	M									
Combined	0.10 to 0.15									

Table 6: Length-weight parameters for Chatham Rise and Sub-Antarctic lockdown dory.

Fishstock	Estimate				Source
1.Weight = a(length)^b (Weight in g, length in cm total length)					
FMA 3 & 4	Females		Males		Tracey et al (2007)
	a	b	a	b	
	0.022	2.98	0.025	2.96	
FMA 5 & 6	Sexes combined				Bagley et al (unpublished data)
	a	b			
	0.022		3.02		

3. STOCKS AND AREAS

A catch-effort characterisation carried out in 2010 (MacGibbon et al 2012) identified three main fishing areas where lockdown dory are caught. These are the east coast South Island (FMA 3), Chatham Rise (FMA 4), and west coast South Island (FMA 7). It was found that these are still the main relevant fishing areas when this work was updated in 2012 (Ballara 2014).

There is little information on stock structure, recruitment patterns, or other biological characteristics on which to base any biological fishstock boundaries. MacGibbon et al (2012) found that both sexes grow to a larger size in the Sub-Antarctic compared with the Chatham Rise suggesting the possibility of different stocks. There is also a difference in abundance between males and females in both areas with females nearly always outnumbering males (Figure 2).

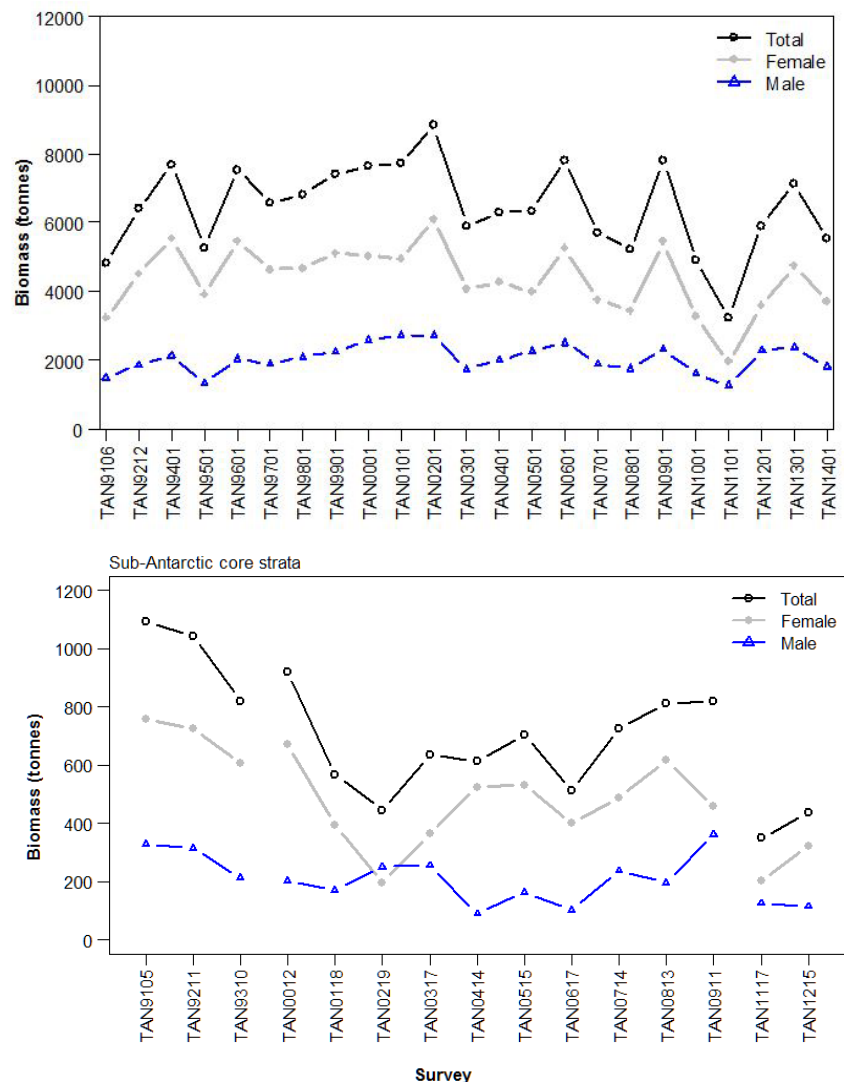


Figure 2: Doorspread biomass estimates of lockdown dory by sex from the Chatham Rise 1991 to 2014 (upper) and Sub-Antarctic 1991 to 1993 and 2000 to 2012 (lower), from *Tangaroa* surveys.

4. STOCK ASSESSMENT

In December 2013 the Middle Depths Working Group agreed that for the west coast South Island (FMA 7, which accounts for the vast majority of the LDO 1 catch), acceptable methods of monitoring abundance are relative biomass estimates from the west coast South Island winter trawl survey carried out by R.V. *Tangaroa*. Catch-per-unit-effort indices from daily processed commercial catches and from the scientific observer programme were also accepted as indices of abundance for the west coast of the South Island.

The Middle Depths Working Group agreed in February 2011 that relative biomass estimates of lockdown dory from middle depth trawl surveys on the Chatham Rise and the Sub-Antarctic were suitable for monitoring major changes in lockdown dory abundance for LDO 3. Standardised CPUE indices from a mixed target species trawl fishery on the ECSI and Chatham Rise area were not accepted by the Working Group.

4.1 Estimates of fishery parameters and abundance

West coast South Island, west and east coast North Island (LDO 1)

Biomass indices from the west coast South Island *Tangaroa* surveys are considerably lower than those for the Chatham Rise and Sub-Antarctic but are still thought to be potentially reliable measures of abundance (Table 7). In 2021 new strata were added to the west of existing WCSI *Tangaroa* survey strata. The estimated biomass including the new strata was 18% higher than if they were excluded, 463 t as opposed to 391 t. Further surveys are needed to confirm which strata are needed to track abundance in the FMA 7 region. There are only 6 years of length frequency data available. The distributions suggest distinct modes can be identified (Figure 3) but they are not tracking cohorts if growth of lockdown dory west of the South Island is as estimated by Tracey et al, (2007) for Chatham Rise lockdown dory.

CPUE indices for lockdown dory on the WCSI were developed using the daily processed catch data and a smaller subset of observed vessels in the hoki and hake target fisheries (Ballara 2014). Both series showed a similar trend, flat since 1995 (Figures 4 and 5).

Chatham Rise & Sub-Antarctic (LDO 3)

Lockdown dory biomass is usually in the top 10 species on Chatham Rise and CVs are relatively precise (usually less than 15%) (Table 7). Females have consistently comprised more of the biomass than males (Figure 2). Biomass indices on the Sub-Antarctic have higher but still acceptable CVs (generally less than 30%). Catches of lockdown dory are very low in the east coast South Island inshore *Kaharoa* survey with often high CVs and lockdown dory are only caught occasionally in the west coast South Island inshore *Kaharoa* survey (Table 7). These surveys can not provide reliable measures of abundance.

Length frequency distributions of Chatham Rise lockdown dory suggest that recruitment is variable (MacGibbon et al, 2012, Ballara, 2014). Generally, when a strongly recruiting year class is present, the male length frequencies are often bimodal and females show two or three modes (Figure 6). Length frequency plots show that females are usually more numerous than males with a mean ratio for the time series (to 2014) of 1.15 females to every male (range 0.98–1.52). Males don't grow as large as females, with few males growing larger than 40 cm. Females have been measured at 50 cm and above in all years.

Length frequency distributions from the summer Sub-Antarctic series are less informative and no tracking of cohorts is possible. Overall, scaled population numbers are much lower for both sexes here than on Chatham Rise but, again, females are more numerous than males with a mean ratio for the time series (to 2014) of 1.8 females for every male (range 0.55–3.9). Females also grow to a larger size than males and both sexes grow to a larger size on the Sub-Antarctic than on Chatham Rise, which suggests that it may be a separate biological stock. This could also potentially be due to differences in fishing pressure.

Table 7: Biomass indices (t) and coefficients of variation (CV) for lockdown dory from trawl surveys (Assumptions: areal availability, vertical availability and vulnerability = 1). Trip codes starting ‘KAH’: *Kaharoa* surveys; trip codes starting ‘TAN’: *Tangaroa* surveys. [Continued on next page]

Trip code	Depth range (m)	Date	Biomass (t)	% CV
QMA 1				
WCSI (inshore)				
KAH9204	20–400	Mar–Apr 1992	2	64.1
KAH9404	20–400	Mar–Apr 1994	1	87.2
KAH9504	20–400	Mar–Apr 1995	18	94.4
KAH9701	20–400	Mar–Apr 1997	5	57.4
KAH0004	20–400	Mar–Apr 2000	16	87.4
KAH0304	20–400	Mar–Apr 2003	3	78.3
KAH0503	20–400	Mar–Apr 2005	6	61.8
KAH0704	20–400	Mar–Apr 2007	0	100
KAH0904	20–400	Mar–Apr 2009	-	-
KAH1104	20–400	Mar–Apr 2011	-	-
KAH1305	20–400	Mar–Apr 2013	-	-
KAH1503	20–400	Mar–Apr 2015	-	-
KAH1703	10–400	Mar–Apr 2017	-	-
KAH1902	10–400	Mar–Apr 2019	6	100
KAH2103	10–400	Mar–Apr 2021	0	100
WCSI (offshore) core				
TAN0007	300–650	Jul–Aug 2000	169	14.4
TAN1210	300–650	Jul–Aug 2012	155	11.9
TAN1308	300–650	Aug 2013	205	11.1
TAN1609	300–650	Aug 2016	210	12.2
TAN1807	300–650	Jul–Aug 2018	271	21.7
TAN2107	300–650	Aug 2021	374	15.6
WCSI all				
TAN1210	200–800	Jul–Aug 2012	181	10.6
TAN1308	200–800	Aug 2013	236	11.6
TAN1609	200–1000	Aug 2016	230	11.4
TAN1807	200–1000	Jul–Aug 2018	292	20.2
TAN2107	200–1000	Aug 2021	391	15.0
WCSI deep + EX				
TAN2107	200–1050	Aug 2021	463	16.2
QMA 3				
ECSI				
KAH9205	30–400	May–Jun 1992	6	60.7
KAH9306	30–400	May–Jun 1993	5	54.0
KAH9406	30–400	May–Jun 1994	16	49.5
KAH9606	30–400	May–Jun 1996	11	100
KAH0705	30–400	May–Jun 2007	23	65.2
KAH0806	30–400	May–Jun 2008	30	29.9
KAH0905	30–400	May–Jun 2009	31	37.1
KAH1207	30–400	Apr–Jun 2012	27	61.4
KAH1402	30–400	Apr–Jun 2014	19	33.0
KAH1605	30–400	Apr–Jun 2016	46	73.9
KAH1803	30–400	Apr–Jun 2018	37	94.3
KAH2104	30–400	Apr–Jun 2021	9	56.3
Chatham Rise				
TAN9106	200–800	Dec 1991–Feb 1992	4 819	5.6
TAN9212	200–800	Dec 1992–Feb 1993	6 401	5.2
TAN9401	200–800	Jan 1994	7 703	7.2
TAN9501	200–800	Jan–Feb 1995	5 284	6.6
TAN9601	200–800	Dec 1995–Jan 1996	7 540	8.0
TAN9701	200–800	Jan 1997	6 568	7.6
TAN9801	200–800	Jan 1998	7 019	6.0
TAN9901	200–800	Jan 1999	7 417	8.2
TAN0001	200–800	Dec 1999–Jan 2000	7 651	7.0
TAN0101	200–800	Dec 2000–Jan 2001	7 713	6.5
TAN0201	200–800	Dec 2001–Jan 2002	8 821	11.1
TAN0301	200–800	Dec 2002–Jan 2003	5 904	7.0

Table 7 [Continued]:

Trip code	Depth range (m)	Date	Biomass (t)	% CV
TAN0401	200–800	Dec 2003–Jan 2004	6 746	7.7
TAN0501	200–800	Dec 2004–Jan 2005	6 351	9.3
TAN0601	200–800	Dec 2005–Jan 2006	7 818	8.5
TAN0701	200–800	Dec 2006–Jan 2007	5 710	7.7
TAN0801	200–800	Dec 2007–Jan 2008	5 225	9.3
TAN0901	200–800	Dec 2008–Jan 2009	7 789	8.7
TAN1001	200–800	Jan 2010	4 896	9.7
TAN1101	200–800	Jan 2011	3 257	21.4
TAN1201	200–800	Jan 2012	5 913	13.2
TAN1301	200–800	Jan 2013	7 141	11.0
TAN1401	200–800	Jan 2014	5 560	6.9
TAN1601	200–800	Jan 2016	6 494	8.8
TAN1801	200–800	Jan 2018	9 535	27.2
TAN2001	200–800	Jan 2020	6 352	9.1
TAN2201	200–800	Jan 2022	6 354	11.0
Sub-Antarctic				
TAN9105	300–1000	Nov–Dec 1991	1 095	12.8
TAN9211	300–1000	Nov–Dec 1992	1 048	11.1
TAN9310	300–1000	Nov–Dec 1993	821	13.2
TAN0012	300–1000	Nov–Dec 2000	921	15.2
TAN0118	300–1000	Nov–Dec 2001	566	19.7
TAN0219	300–1000	Nov–Dec 2002	446	22.1
TAN0317	300–1000	Nov–Dec 2003	636	23.7
TAN0414	300–1000	Nov–Dec 2004	614	27.9
TAN0515	300–1000	Nov–Dec 2005	703	19.1
TAN0617	300–1000	Nov–Dec 2006	513	35.1
TAN0714	300–1000	Nov–Dec 2007	725	20.0
TAN0813	300–1000	Nov–Dec 2008	811	24.7
TAN0911	300–1000	Nov–Dec 2009	820	25.1
TAN1117	300–1000	Nov–Dec 2011	349	33.0
TAN1215	300–1000	Nov–Dec 2012	436	29.1
TAN1412	300–1000	Nov–Dec 2014	352	28.3
TAN16	300–1000	Nov–Dec 2016	675	24.0
TAN1811	300–1000	Nov–Dec 2018	358	28.2
TAN2014	300–1000	Nov–Dec 2020	753	18.3

4.4 Other yield estimates and stock assessment results

No information is available.

4.5 Future research considerations

Catch-per-unit-effort indices from daily processed commercial catches and from the scientific observer programme were accepted as indices of abundance for the west coast of the South Island, but the indices were last updated for data up to the 2011–2012 fishing year.

Ageing by reading possible annual zones on otoliths has yet to be validated (an initial attempt using radiometric techniques was unsuccessful). Otolith sampling and development of catch-at-age for Chatham Rise would increase its usefulness for monitoring and aid in interpretation of trends. Tracey *et al.* (2007) suggested that the use of whole otoliths in radiometric testing could provide a validation method. Validation would provide the opportunity to develop catch-at-age and length-at-age series.

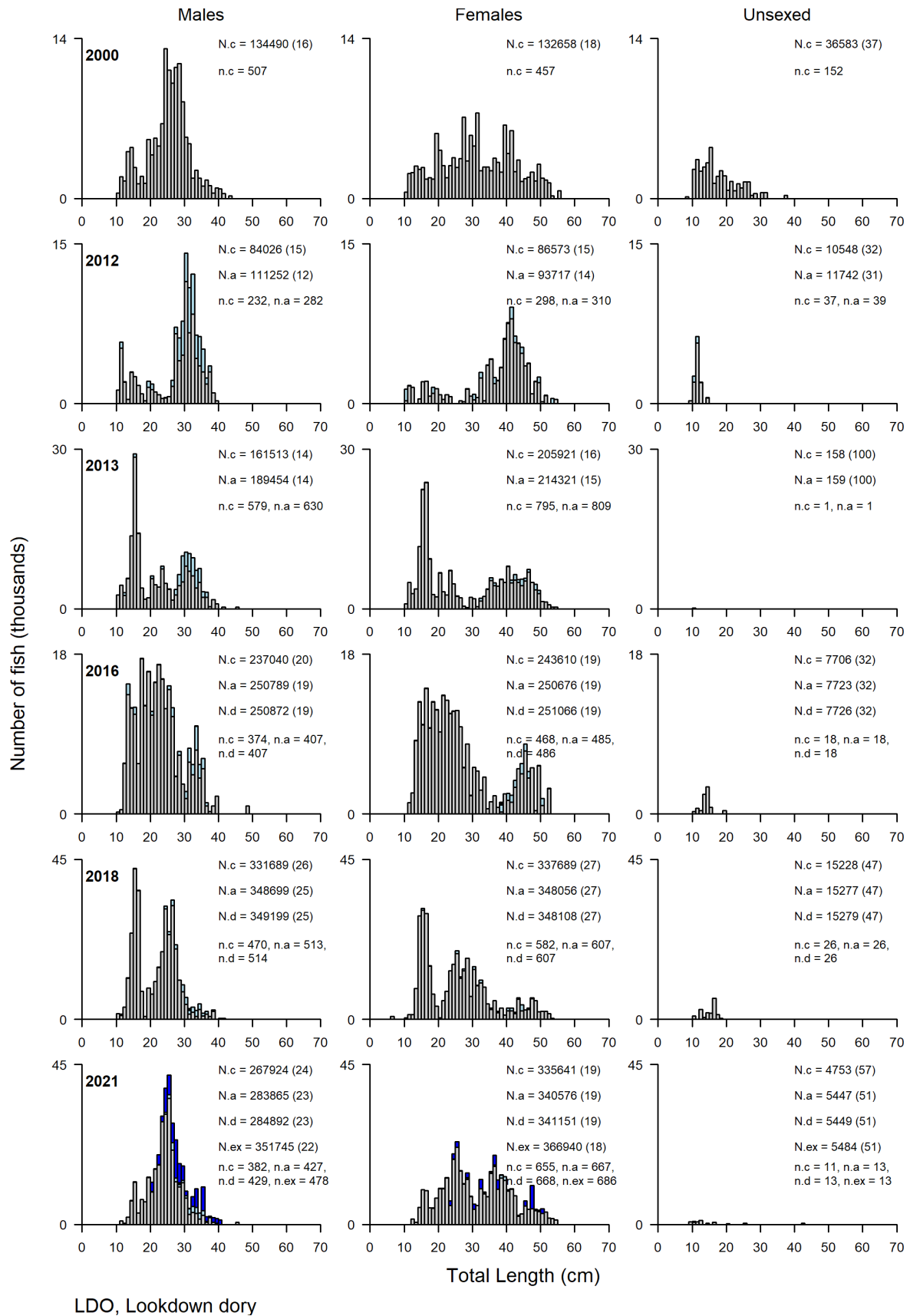


Figure 3: Lookdown dory length frequencies from west coast Soth Island *Tangaroa* surveys. Blue shaded bars in the year 2021 show additional numbers at length caught in the new strata introduced in the 2021 survey.

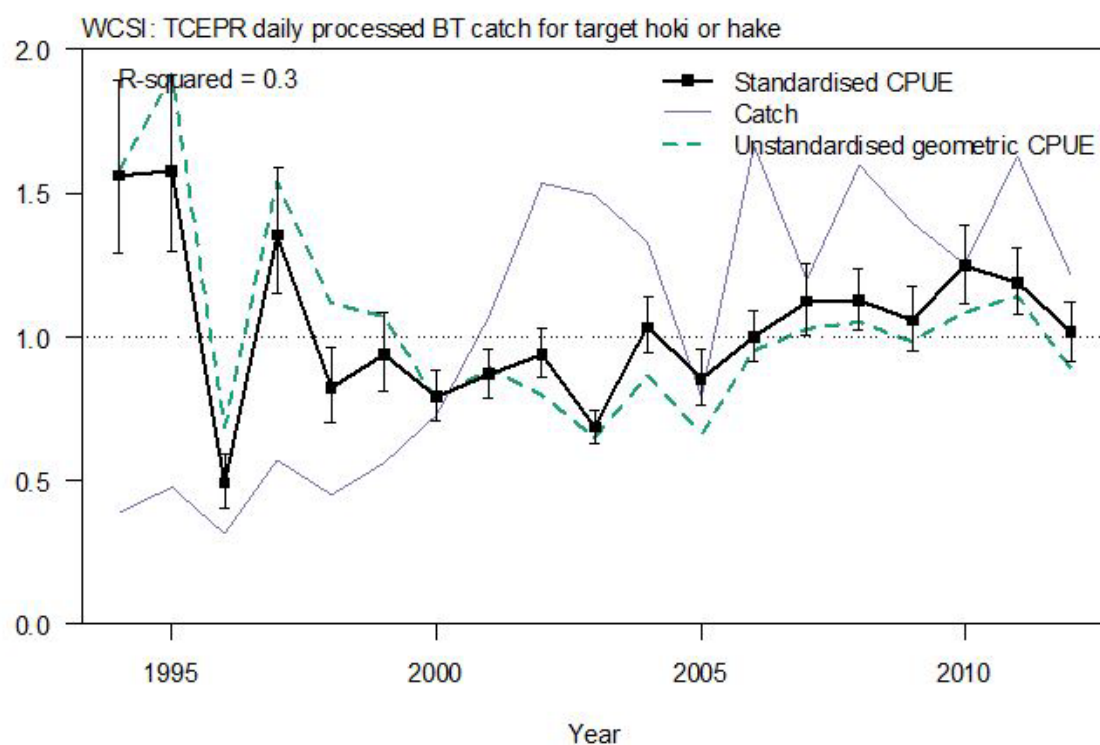


Figure 4: Log normal CPUE indices for WCSI daily processed catch, bottom trawl target hoki or hake, showing catches (scaled to same mean as indices), and lognormal standardised and un-standardised indices. Bars indicate 95% confidence intervals. Year defined as June–September.

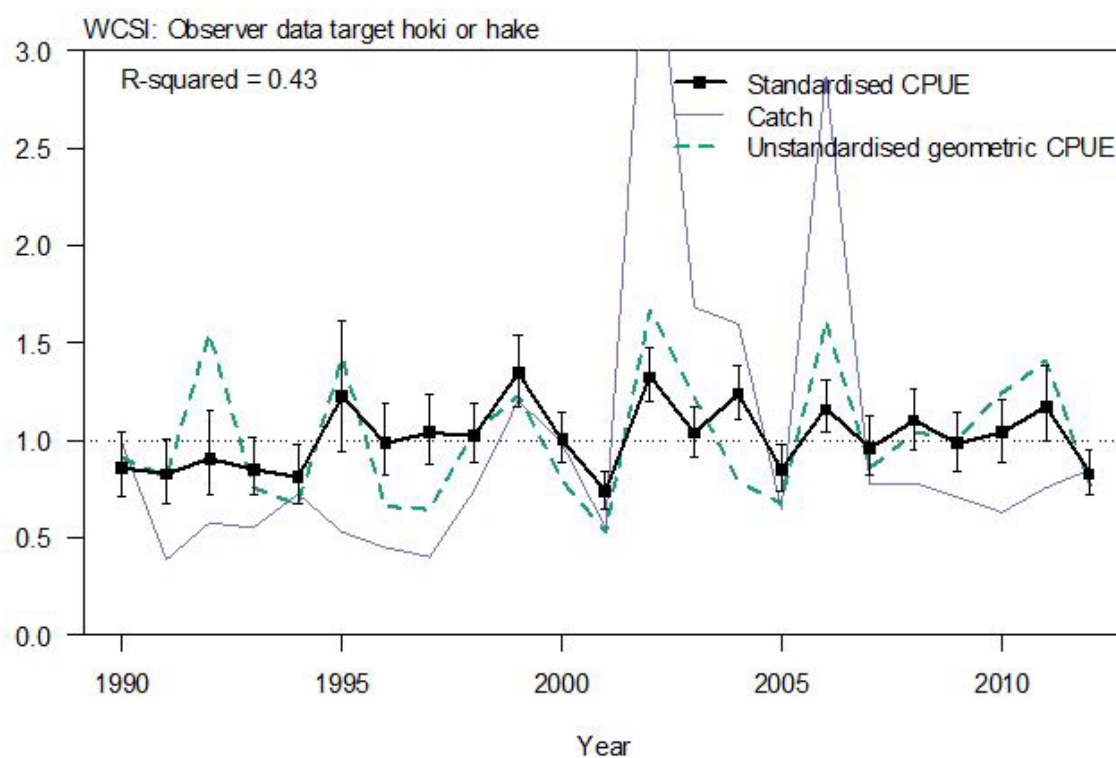


Figure 5: CPUE lognormal indices for WCSI observer programme data, target hoki or hake, bottom and midwater trawl, showing catches (scaled to same mean as indices), and lognormal standardised and un-standardised indices. Bars indicate 95% confidence intervals. Year defined as June–September.

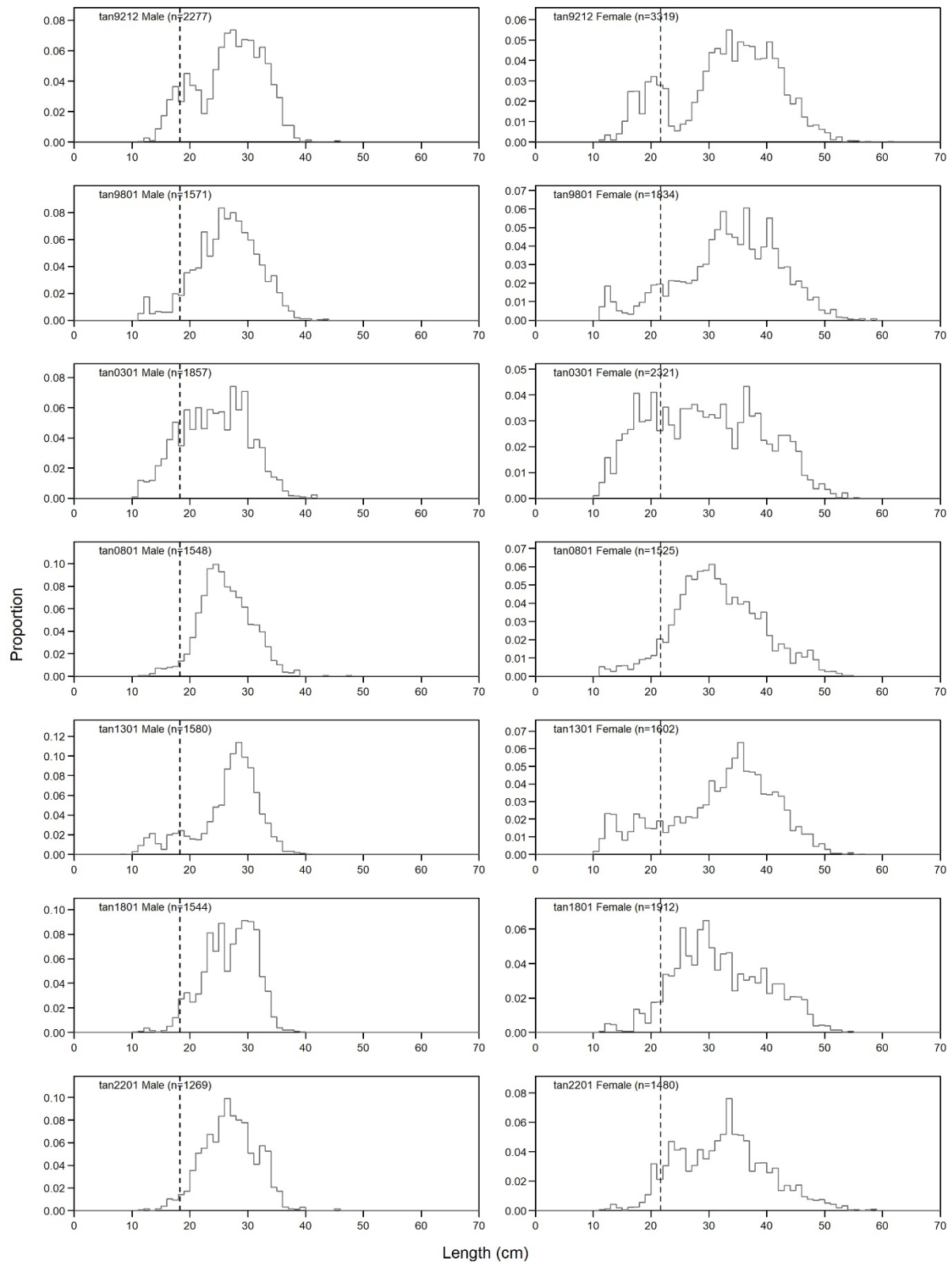


Figure 6: Lookdown dory length frequencies from Chatham Rise *Tangaroa* surveys. Length frequencies are shown from 1993, to show bi-modal length distributions found in some years, then from 1998, 2003, 2008, 2013, 2018 and 2022. Vertical line is at 18.3 cm for males and 21.6 cm for females (length at 50% maturity given by Tracey et al 2007).

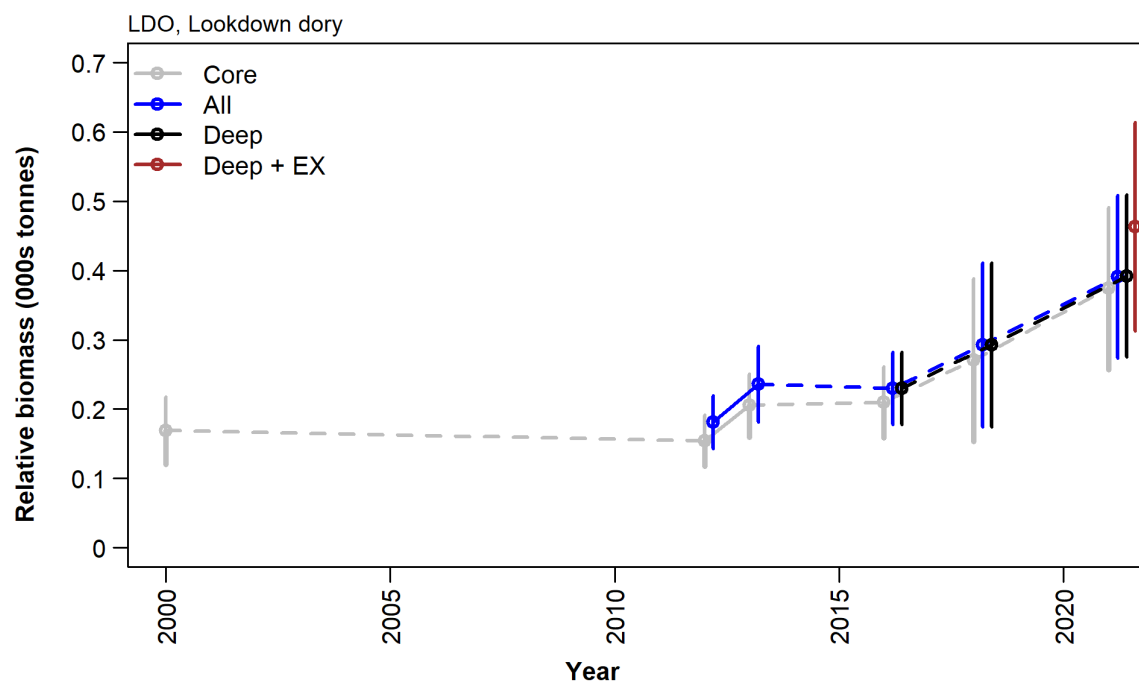
5. STATUS OF THE STOCKS

There are no known sustainability concerns in the lockdown dory fishery. For LDO 1, the area which accounts for the vast majority of the lockdown dory, catch is thought to be well monitored by trawl surveys which are currently too short to suggest any pattern, but CPUE indices (conducted on data to 2012) suggested that abundance had been stable since the mid-1990s. For LDO 3, trawl surveys on the Chatham Rise and Sub-Antarctic indicate abundance has fluctuated without long term trend in both areas. Although LDO 3 includes both Chatham Rise and the Sub-Antarctic, separate status of the stock tables are presented on the basis these areas may contain sub-stocks.

• LDO 1 (west coast South Island, west and east coast North Island)

Stock Status		
Most Recent Assessment Plenary Publication Year	2023	
Intrinsic Productivity Level	Low	
Catch in most recent year of assessment	Year: 2021–22	Catch: 133 t
Assessment runs presented	-	
Reference Points	Target: Not established but 40% B_0 assumed Soft Limit: 20% B_0 Hard Limit: 10% B_0 Overfishing threshold: -	
Status in relation to Target	Unknown	
Status in relation to Limits	Unknown for Soft limit Unlikely (< 40%) to be below the Hard Limit	
Status in relation to Overfishing	-	

Historical Stock Status Trajectory and Current Status



Doorspread biomass estimates for lockdown dory (error bars are $\pm$ two standard deviations) from the winter WCSI *Tangaroa* surveys 2000, and 2012, 2013, 2016, 2018, and 2021.

Fishery and Stock Trends

Recent Trend in Biomass or Proxy

Within LDO 1, FMA 7 biomass indices from the trawl survey time series are similar for 2000 and 2012 (core strata), with an

	increase from 2012 to 2021. This time series is thought to cover an appropriate depth and geographical range for lockdown dory.
Recent Trend in Fishing Mortality or Proxy	Unknown
Other Abundance Indices	-
Trends in Other Relevant Indicators or Variables	-

Projections and Prognosis	
Stock Projections or Prognosis	Stock size is Unlikely (< 40%) to change much at current catch levels in FMA 7.
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Unknown Hard Limit: Unlikely (< 40%)
Probability of Current Catch or TACC causing Overfishing to continue or to commence	-

Assessment Methodology		
Assessment Type	Level 2 - Partial Quantitative Stock Assessment	
Assessment Method	Evaluation of agreed CPUE indices and trawl survey indices thought to index abundance within FMA 7 of LDO 1. The vast majority of the LDO 1 catch is taken in FMA 7, catches in other areas of LDO 1 are minor.	
Assessment dates	Latest assessment Plenary publication year: 2023	Next assessment: Unknown
Overall assessment quality rank	-	
Main data inputs (rank)	-	
Data not used (rank)	-	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	-	

Qualifying Comments
-

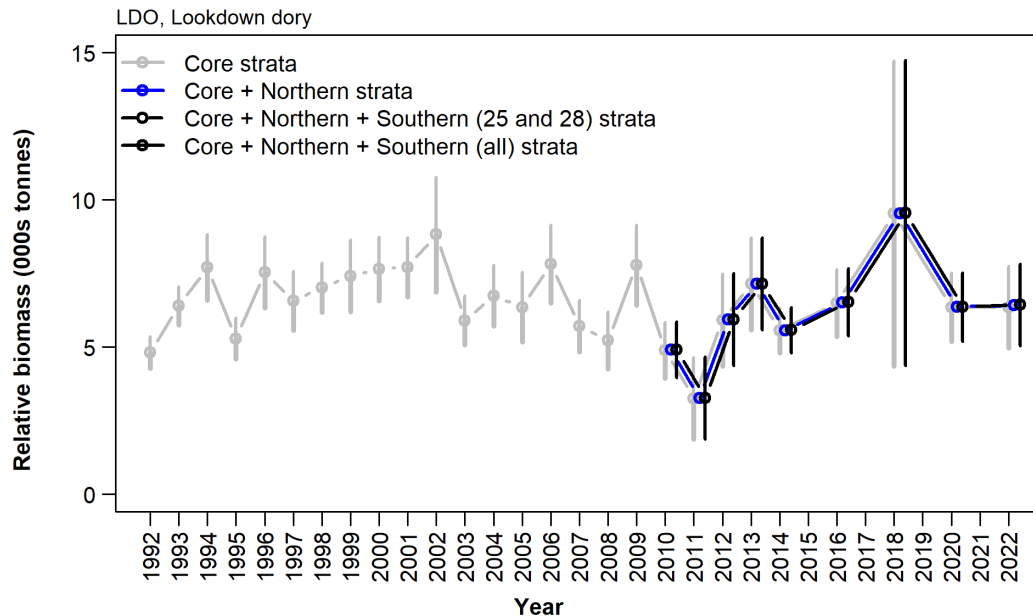
Fishery Interactions
In LDO 1, lockdown dory are taken primarily as bycatch in the bottom trawl west coast South Island hoki and hake target fisheries. Smaller catches are reported by midwater trawl. Interactions are the same as those for the hoki fishery. The east coast North Island scampi fishery also catches lockdown dory. A variety of other target fisheries also report catching lockdown dory but in very small amounts. A small amount of lockdown dory is targeted on the west coast of the South Island by smaller trawlers.

LDO 3 (Chatham Rise)

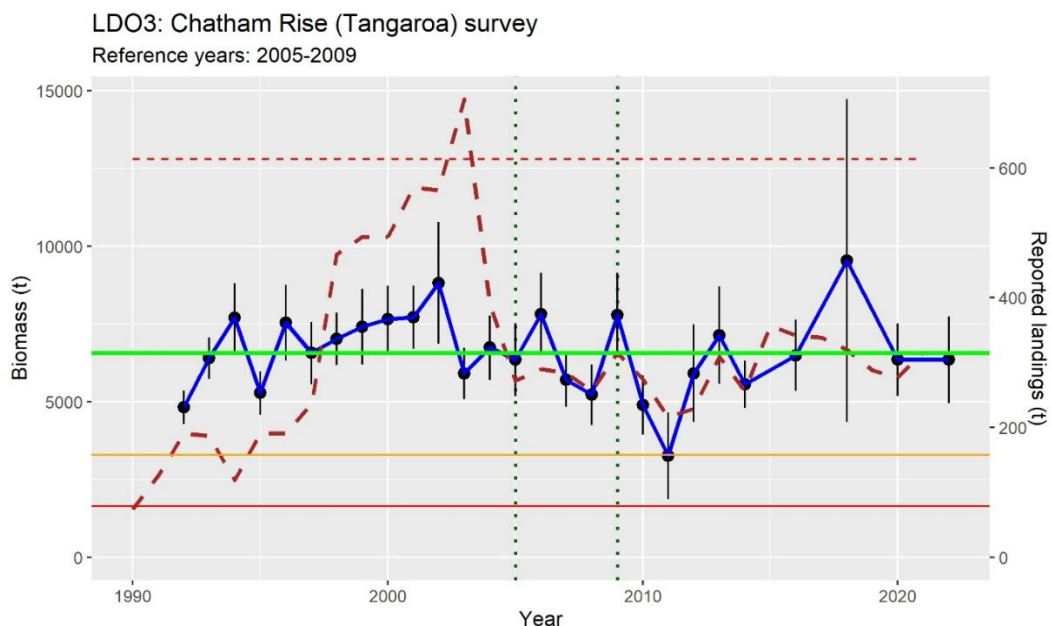
Stock Status		
Most Recent Assessment Plenary Publication Year	2023	
Intrinsic productivity level	Low	
Catch in most recent year of assessment	Year: 2021–21	Catch: Unknown
Reference Points	Target: Not established but 40% B_0 assumed Soft Limit: 20% B_0 Hard Limit: 10% B_0 Overfishing threshold: -	

Status in relation to Target	Unknown
Status in relation to Limits	Unknown for Soft limit Unlikely (< 40%) to be below the Hard Limit
Status in relation to Overfishing	-

Historical Stock Status Trajectory and Current Status



Doorspread biomass estimates of lockdown dory (error bars are $\pm$ two standard deviations) from the Chatham Rise, from *Tangaroa* surveys from 1991 to 2014 and 2016, 2018, 2020, 2022.



Relative biomass from Chatham Rise *Tangaroa* trawl survey: blue line plus vertical lines showing ± 2 s.d. (left axis); dashed line, reported QMR/MHR landings (right axis); red dotted line, TACC for LDO 3 (right axis). Horizontal green line marks the target (calculated as arithmetic mean over reference period), horizontal orange line the soft limit, and horizontal red line the hard limit. Vertical broken green lines bound the reference period.

Fishery and Stock Trends

Recent Trend in Biomass or Proxy	Within LDO 3, FMAs 3 & 4 biomass indices have been fairly flat throughout the time series of Chatham Rise trawl surveys with the exception of 2010 and 2011 which show a decline.
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Recent Trend in Fishing Intensity or Proxy	Unknown
Other Abundance Indices	-
Trends in other Relevant Indicators or Variables	-

Projections and Prognosis	
Stock Projections or Prognosis	Stock size is Unlikely (< 40%) to change much at current catch levels in FMAs 3 & 4.
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Unknown Hard Limit: Unlikely (< 40%)
Probability of Current Catch or TACC causing Overfishing to continue or to commence	-

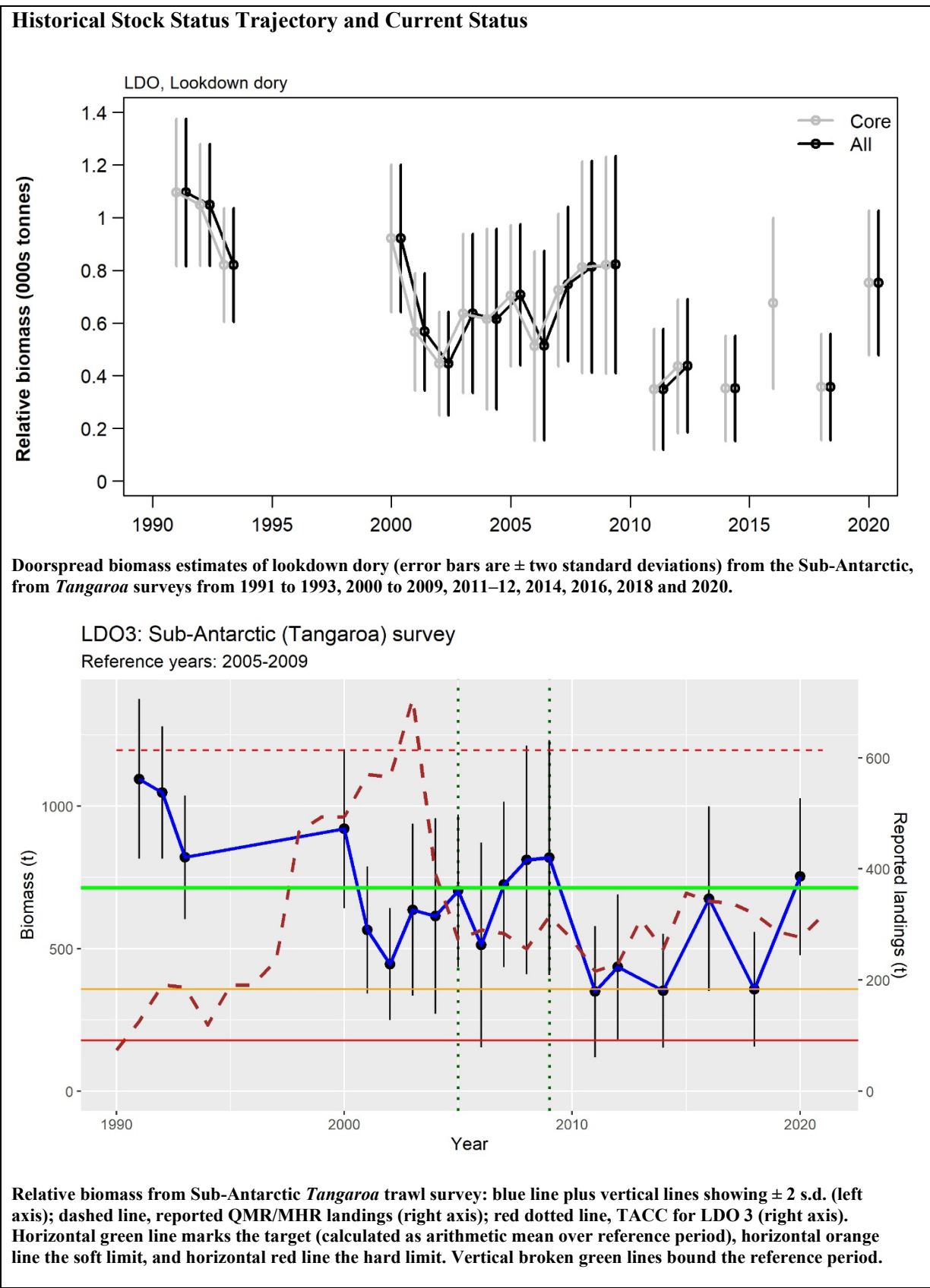
Assessment Methodology		
Assessment Type	Level 2 - Partial quantitative stock assessment	
Assessment Method	Evaluation of agreed trawl survey indices thought to index FMA 3 & 4 abundance	
Assessment Dates	Latest assessment Plenary publication year: 2023	Next assessment: unknown
Overall assessment quality rank	-	
Main data inputs (rank)	-	
Data not used (rank)	-	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	-	

Qualifying Comments
There is some indication that lockdown dory on the Chatham Rise may be a different stock to the Sub-Antarctic (i.e. different maximum sizes, evidence of some spawning activity in the Sub-Antarctic, as well as more extensively on the Chatham Rise)

Fishery Interactions
In LDO 3 lockdown dory are mainly caught as bycatch in the hoki target bottom trawl fishery but also in many other middle depth fisheries. Interactions are the same as those for the hoki fishery.

LDO 3 (Sub-Antarctic)

Stock Status		
Most Recent Assessment Plenary Publication Year	2023	
Intrinsic Productivity Level	Low	
Catch in most recent year of assessment	Year: 2021–22	Catch: Unknown
Reference Points	Target: Not established but 40% B_0 assumed Soft Limit: 20% B_0 Hard Limit: 10% B_0 Overfishing threshold: -	
Status in relation to Target	Unknown	
Status in relation to Limits	Unknown for Soft limit Unlikely (< 40%) to be below the Hard Limit	
Status in relation to Overfishing	-	



Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	Within LDO 3, FMAs 5 & 6 biomass indices from the Sub-Antarctic series declined to 2002, then increased again until 2009. The four lowest biomass estimates of the series have come from surveys since 2011 but the estimate in 2020 is in the range seen between 2000 and 2009.

Recent Trend in Fishing Intensity or Proxy	Unknown
Other Abundance Indices	-
Trends in other Relevant Indicators or Variables	-

Projections and Prognosis	
Stock Projections or Prognosis	Stock size is Unlikely (< 40%) to change much at current catch levels in FMAs 5 & 6.
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Unknown Hard Limit: Unlikely (< 40%)
Probability of Current Catch or TACC causing Overfishing to continue or to commence	-

Assessment Methodology		
Assessment Type	Level 2 - Partial quantitative stock assessment	
Assessment Method	Evaluation of agreed trawl survey indices thought to index FMA 5 & 6 abundance	
Assessment Dates	Latest assessment Plenary publication year: 2023	Next assessment: unknown
Overall assessment quality rank	-	
Main data inputs (rank)	-	
Data not used (rank)	-	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	-	

Qualifying Comments
There is some indication that lockdown dory on the Chatham Rise may be a different stock to the Sub-Antarctic (i.e. different maximum sizes, evidence of some spawning activity in the Sub-Antarctic, as well as more extensively on the Chatham Rise).

Fishery Interactions
In LDO 3 lockdown dory are mainly caught as bycatch in the hoki target bottom trawl fishery but also in many other middle depth fisheries. Interactions are the same as those for the hoki fishery.

6. FOR FURTHER INFORMATION

- Anderson, O F; Bagley, N W; Hurst, R J; Francis, M P; Clark, M R; McMillan, P J (1998) Atlas of New Zealand fish and squid distribution from research bottom trawls. *NIWA Technical Report 42*. 303 p.
- Anderson, O F; Gilbert, D J; Clark, M R (2001) Fish discards and non-target catch in the trawl fisheries for orange roughy and hoki in New Zealand waters for the fishing years 1990–91 to 1998–99. *New Zealand Fisheries Assessment Report 2001/16*. 57 p.
- Bagley, N W; O'Driscoll, R L (2012) Trawl survey of middle depth species in the Southland and Sub-Antarctic areas, November–December 2009 (TAN0911). *New Zealand Fisheries Assessment Report 2012/05*. 70 p.
- Ballara, S L (2014) Fishery characterisation and standardised CPUE analyses for lockdown dory, *Cyttus traversi* (Hutton, 1872) (Zeidae), 1989–90 to 2011–12. *New Zealand Fisheries Assessment Report 2014/62*.
- Bull, B; Livingston, M E; Hurst, R J; Bagley, N (2001) Upper-slope fish communities on the Chatham Rise, New Zealand, 1992–99. *New Zealand Journal of Marine and Freshwater Research 35* (3): 795–815.
- Clark, M R; King, K J (1989) Deepwater fish resources off the North Island, New Zealand: results of a trawl survey, May 1985 to June 1986. *New Zealand Fisheries Technical Report 11*. 56 p.
- Forman, J S; Dunn, M R (2010) The influence of ontogeny and environment on the diet of lockdown dory, *Cyttus traversi*. *New Zealand Journal of Marine and Freshwater Research*. 44: 329–42.
- Francis, M P; Hurst, R J; McArdle, B; Bagley, N W; Anderson, O F (2002) New Zealand demersal fish assemblages. *Environmental Biology of Fishes 62*(2): 215–234.
- Hurst, R J; Bagley, N W; Anderson, O F; Francis, M P; Griggs, L H; Clark, M R; Paul, L J; Taylor, P R (2000) Atlas of juvenile and adult fish and squid distributions from bottom and midwater trawls and tuna longlines in New Zealand waters. *NIWA Technical Report 84*. 162 p.
- James, G D (1976) *Cyttus traversi* Hutton: Juvenile form of *C. ventralis* Barnard and Davies (Pisces: Zeidae). *Journal of the Royal Society of New Zealand 6*(4): 493–498.

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- Livingston, M E; Bull, B; Stevens, D W; Bagley, N W (2002) A review of hoki and middle depth trawl surveys of the Chatham Rise, January 1992–2001. *NIWA Technical Report 113*. 146 p.
- Livingston, M E; Clark, M; Baird, S J (2003) Trends in incidental catch of major fisheries on the Chatham Rise for fishing years 1989–90 to 1998–99. *New Zealand Fisheries Assessment Report 2003/52*. 74 p.
- Livingston, M E; Stevens, D W (2005) Trawl survey of hoki and middle depth species on the Chatham Rise, January 2004 (TAN0401). *New Zealand Fisheries Assessment Report 2005/21*. 62 p.
- MacGibbon, D J; McGregor, V; Hurst, R J (2012) Fishery characterisation and standardised CPUE analyses for lookdown dory, *Cyttus traversi* (Hutton, 1872) (Zeidae), 1989–90 to 2008–09. *New Zealand Fisheries Assessment Report 2012/07*. 143 p.
- May, J L; Maxwell, J G H (1986) Trawl fish from temperate waters of Australia. CSIRO Division of Fisheries Research, Tasmania. 492 p.
- Nelson, J S (1994) *Fishes of the world*. Third edition. J. Wiley, New York. 600 p.
- O'Driscoll, R L; Bagley, N W (2001) Review of summer and autumn trawl survey time series from the Southland and Sub-Antarctic area 1991–98. *NIWA Technical Report 102*. 115 p.
- O'Driscoll, R L; Booth, J D; Bagley, N W; Anderson, O F; Griggs, L H; Stevenson, M L; Francis, M P (2003) Areas of importance for spawning, pupping or egg-laying, and juveniles of New Zealand deepwater fish, pelagic fish, and invertebrates. *NIWA Technical Report 119*. 377 p.
- Stevens, D W; O'Driscoll, R L; Ladroit, Y; Ballara, S L; MacGibbon, D J; Horn, P L (2015) Trawl survey of hoki and middle depth species on the Chatham Rise, January 2014 (TAN1401). *New Zealand Fisheries Assessment Report 2015/19*. 119 p.
- Stewart, B D; Smith, D (1992) Development of methods to age commercially important dories and oreos. *Newsletter of the Australian Society for Fish Biology* 22 (2): 53–54.
- Tracey, D M; Horn, P L; Andrews, A H; Marriott, P M; Dunn, M R (2007) Age and growth, and an investigation of age validation of lookdown dory (*Cyttus traversi*). Final Research Report for Ministry of Fisheries Project LDO2004-01 Objective 1. 36 p. (Unpublished report held by Fisheries New Zealand, Wellington.)F