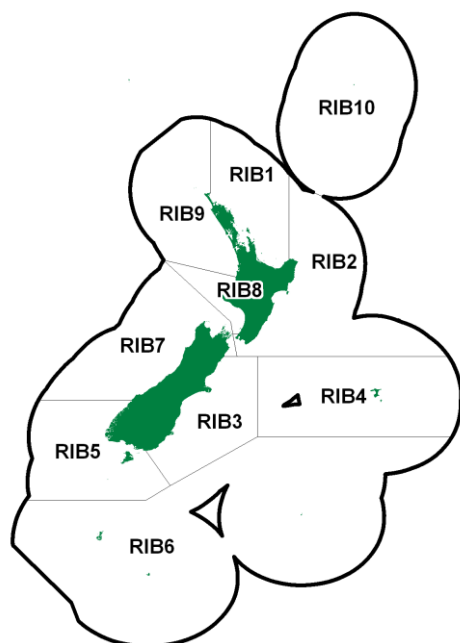


RIBALDO (RIB)*(Mora moro)***1. FISHERY SUMMARY****1.1 Commercial fisheries**

In New Zealand ribaldo is caught mainly on bottom longlines and as a bycatch of trawling. About 4500 t catch was reported in 1977 by Japanese and Korean longline vessels target fishing for ling on the Chatham Rise and east coast of the South Island in the 1970s. Since 1982–83, overall reported catch has been mainly from the Chatham Rise and east coast South Island (QMAs 3 and 4) but has declined somewhat from these areas since being introduced into the QMS in the 1998–99 fishing year. Since entering the QMS, a similar decline in reported ribaldo catch is seen in other QMAs with the exception of RIB 7 where reported catches increased to 2008–09 but then halved. The reasons for these changes in catch levels are not well understood as ribaldo is mainly taken as bycatch. Levels of discarding and unreported catch are likely to have changed with the introduction of ribaldo into the QMS. Ribaldo are caught throughout the New Zealand Exclusive Economic Zone by a variety of fishing methods in different target fisheries but mainly as bycatch in bottom trawls targeting hoki (*Macruronus novaezelandiae*), hake (*Merluccius australis*) and ling (*Genypterus blacodes*) and bottom longlines for ling.

There is no seasonality of catch other than on the west coast South Island where catch is related to target fishing of hoki and hake during the winter spawning season. Catches by Japanese and Korean longliners in the mid 1970s are shown in Table 1. Landings from 1982–83 onwards are shown in Table 2, while Figure 1 shows the landings and TACC values for the main RIB stocks since the introduction of the QMS.

Table 1: Japanese and Korean longline catch (t) of ribaldo (“deep-sea cod¹”) from New Zealand waters, probably mostly Chatham Rise and east coast South island, by calendar year from 1975 to 1977.

Year	1975	1976	1977
Japan	2 417	4 920	4 283
Korea	-	-	286

1. Reported as “cods” but considered to be mainly ribaldo. The Korean fleet began fishing in April 1977.

Ribaldo was introduced into the QMS from 1 October 1998, no customary, recreational or other mortality allowances have been set. Historical catch limits up to the most recent fishing year are shown in Table 2. TACCs were increased from 1 October 2006 in RIB 6 to 231 t and in RIB 7 to 330 t. In these stocks landings were above the TACC for a number of years and the TACCs were

RIBALDO (RIB)

increased to the average of the previous seven years plus an additional 10%. Current levels of reported catch are well below TACCs in most areas.

Table 2: Reported landings (t) of ribaldo by QMA for fishing years 1983–84 to 2015–16 and TACCs (t). QMA 10 has no landings and a TACC of 0. Total includes catches from outside the NZ EEZ.

	RIB 1		RIB 2		RIB 3		RIB 4		RIB 5	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
1982–83	0		8		15		33		111	
1983–84	0		3		24		21		68	
1984–85	0		4		17		61		21	
1985–86	1		1		26		13		35	
1986–87	4		1		44		20		41	
1987–88	19		4		65		31		56	
1988–89	1		2		33		41		6	
1989–90	8		9		23		28		6	
1990–91	15		15		177		119		34	
1991–92	95		40		160		169		73	
1992–93	131		54		217		228		67	
1993–94	87		70		217		186		23	
1994–95	116		136		437		303		68	
1995–96	121		168		286		253		26	
1996–97	114		188		365		843		64	
1997–98	78		122		141		375		80	
1998–99	24	121	55	176	161	394	290	357	71	52
1999–00	22	121	89	176	264	394	347	357	80	52
2000–01	5	121	107	176	269	394	306	357	78	52
2001–02	7	121	53	176	198	394	370	357	62	52
2002–03	12	121	98	176	211	394	183	357	50	52
2003–04	12	121	120	176	175	394	299	357	50	52
2004–05	28	121	127	176	156	394	379	357	44	52
2005–06	49	121	137	176	126	394	202	357	47	52
2006–07	39	121	125	176	149	394	312	357	49	52
2007–08	53	121	135	176	134	394	173	357	43	52
2008–09	45	121	74	176	216	394	216	357	31	52
2009–10	28	121	63	176	213	394	162	357	27	52
2010–11	42	121	67	176	348	394	137	357	30	52
2011–12	29	121	27	176	174	394	304	357	32	52
2012–13	16	121	74	176	182	394	234	357	35	52
2013–14	29	121	80	176	104	394	492	357	41	52
2014–15	35	121	154	176	122	394	341	357	47	52
2015–16	49	121	125	176	163	394	330	357	43	52
	RIB 6		RIB 7		RIB 8		RIB 9		Total	
	Landing	TACC	Landing	TACC	Landing	TACC	Landing	TACC	Landing	TACC
1982–83	0		58		0		0		225	
1983–84	1		25		0		0		142	
1984–85	13		18		0		0		134	
1985–86	2		37		0		0		115	
1986–87	10		6		0		0		126	
1987–88	12		68		0		0		255	
1988–89	6		69		1		10		169	
1989–90	13		21		0		0		108	
1990–91	106		55		0		0		521	
1991–92	98		40		0		0		675	
1992–93	96		106		0		0		899	
1993–94	92		42		1		0		718	
1994–95	122		39		2		6		1 231	
1995–96	109		62		0		0		1 025	
1996–97	158		77		1		0		1 824	
1997–98	262		110		1		1		1 214	
1998–99	223	124	243	55	1	1	0	2	1 081	1 282
1999–00	237	124	300	55	< 1	1	< 1	2	1 359	1 282
2000–01	191	124	275	55	< 1	1	< 1	2	1 242	1 282
2001–02	322	124	254	55	0	1	< 1	2	1 311	1 282
2002–03	172	124	338	55	< 1	1	1	2	1 209	1 282
2003–04	205	124	364	55	< 1	1	2	2	1 302	1 282
2004–05	105	124	307	55	< 1	1	2	2	1 240	1 282
2005–06	62	124	336	55	0	1	4	2	1 018	1 282
2006–07	61	231	404	330	0	1	9	2	1 162	1 664
2007–08	80	231	356	330	< 1	1	14	2	992	1 664
2008–09	63	231	456	330	< 1	1	10	2	1 111	1 664
2009–10	104	231	137	330	< 1	1	21	2	755	1 664
2010–11	67	231	198	330	3	1	20	2	913	1 664
2011–12	76	231	177	330	3	1	12	21	835	1 683
2012–13	66	231	180	330	2	1	10	21	799	1 683
2013–14	133	231	291	330	2	1	22	21	1 194	1 683
2014–15	83	231	434	330	1	1	13	21	1 231	1 683
2015–16	67	231	322	330	<1	1	28	21	1 127	1 683

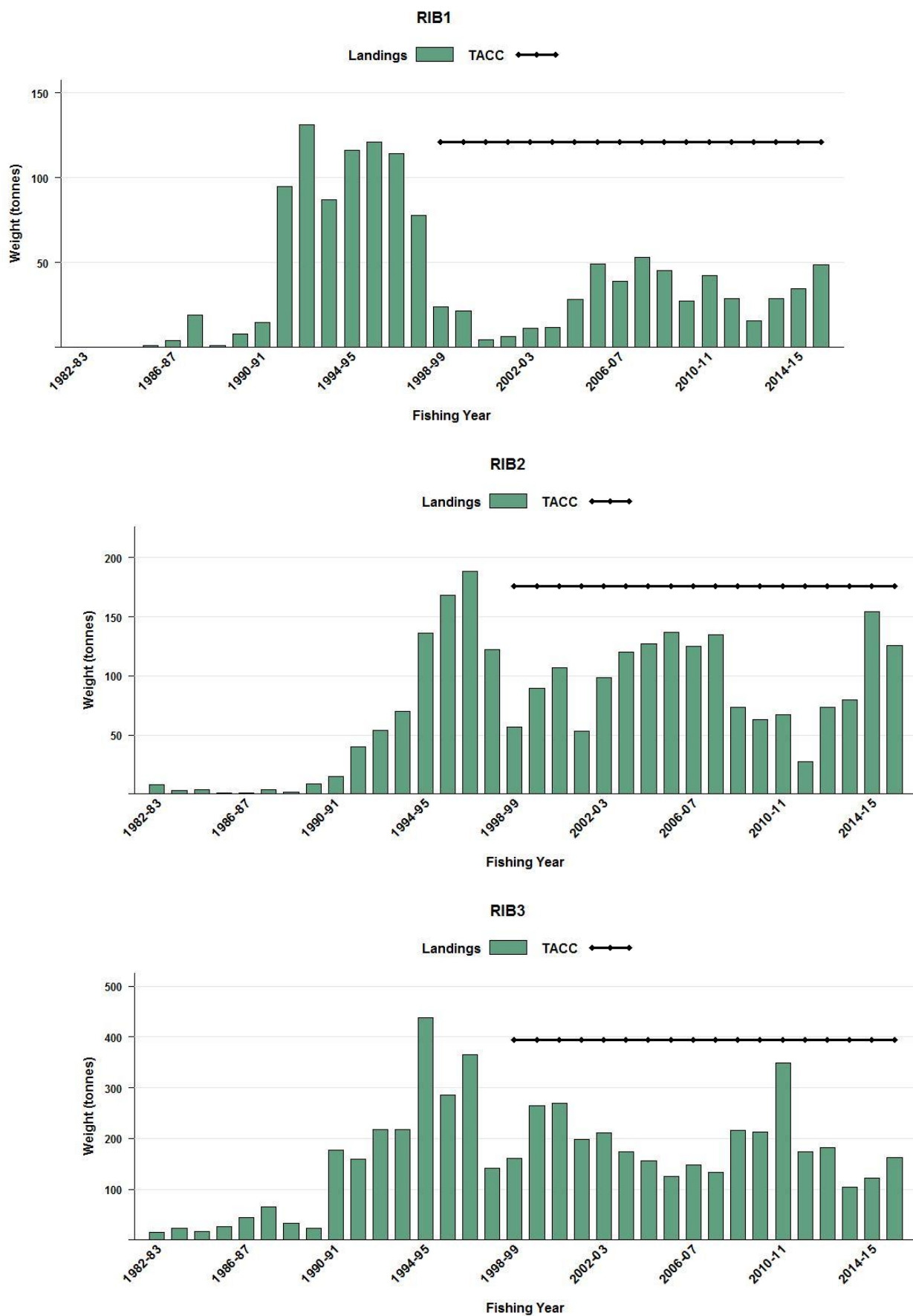


Figure 1: Reported commercial landings and TACC for the seven main RIB stocks. From top to bottom: RIB 1 (Auckland East), RIB 2 (Central East), RIB 3 (South East Coast). [Continued on next page]

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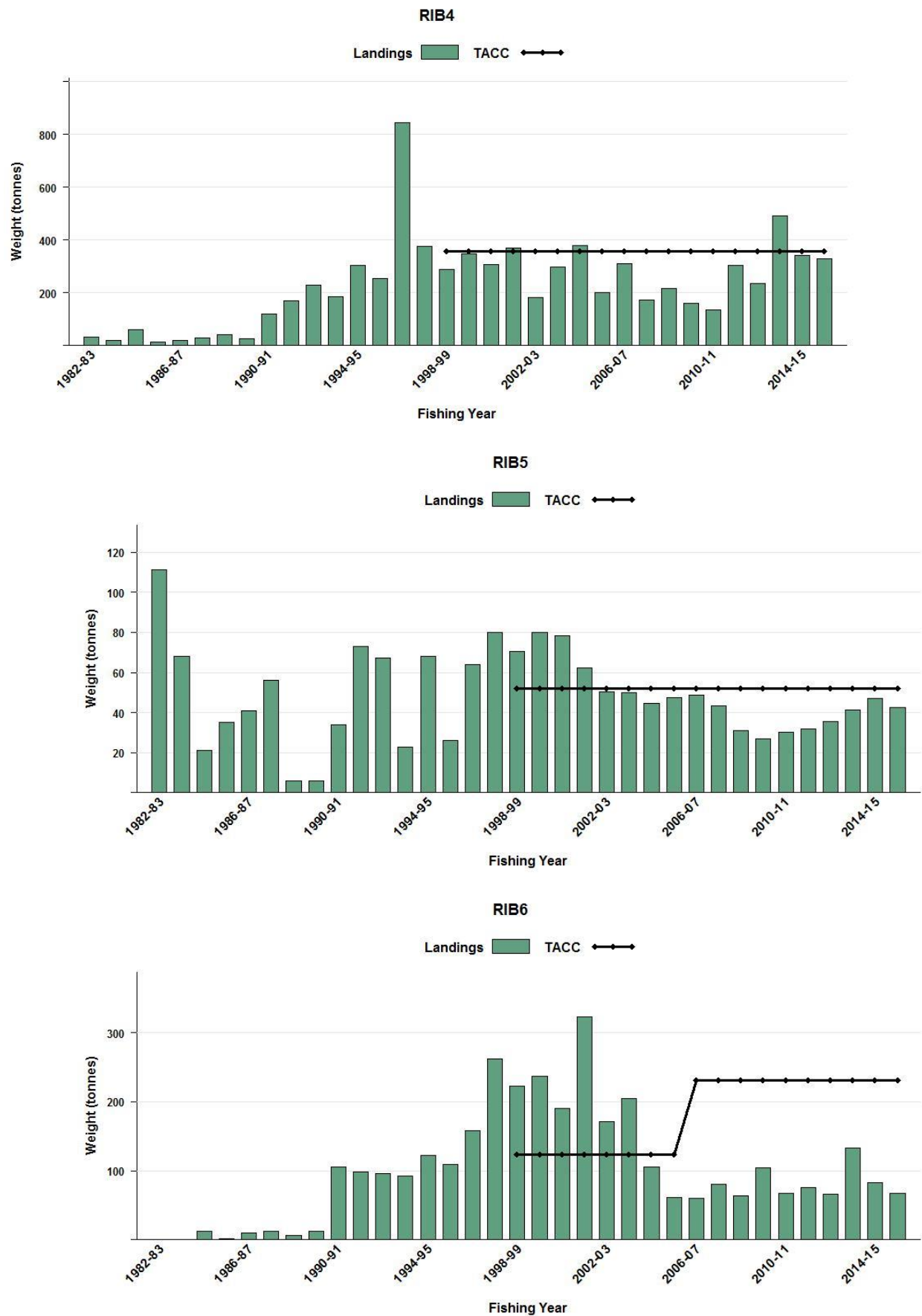


Figure 1: [Continued] Reported commercial landings and TACC for the seven main RIB stocks. From top to bottom: RIB 4 (South East Chatham Rise), RIB 5 (Southland), RIB 6 (Sub-Antarctic). [Continued on next page].

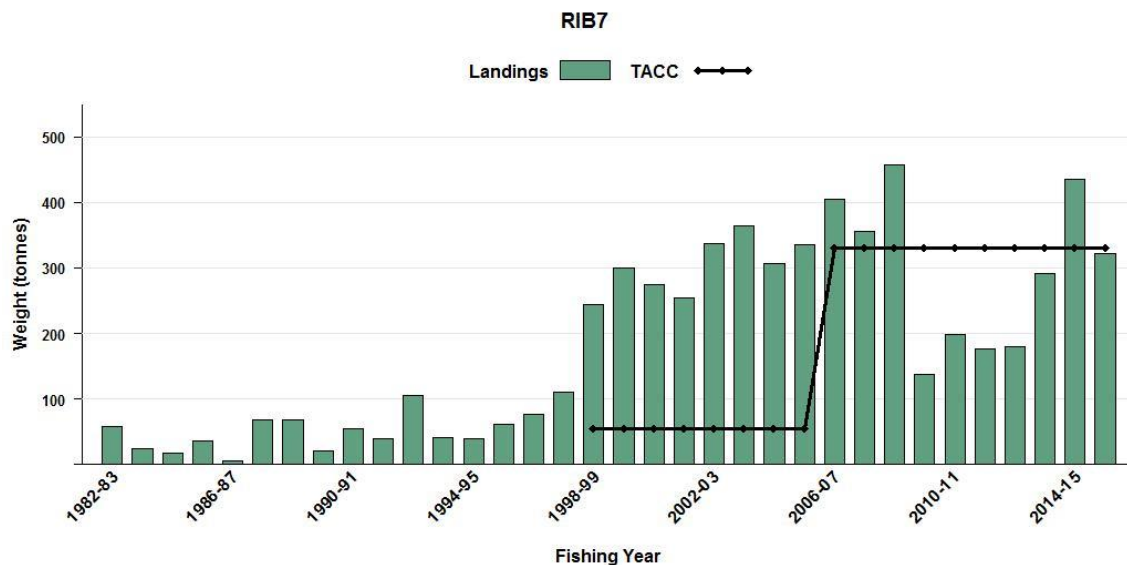


Figure 1 [Continued]: Reported commercial landings and TACC for the seven main RIB stocks. RIB 7 (Challenger).

In RIB 1, ribaldo are taken as bycatch primarily in the ling and to a lesser extent bluenose bottom longline fisheries. There is also some direct targeting of ribaldo by bottom longline. In RIB 2, ribaldo are taken as bycatch primarily in the ling and bluenose bottom longline fisheries and to a lesser extent the hoki and orange roughy bottom trawl fisheries. There is also some direct targeting of ribaldo by bottom longline. In RIB 9 very small amounts of ribaldo are taken as bycatch in orange roughy, cardinal and alfonsino target trawl fisheries and in the ling bottom longline fishery. In all areas, a variety of other fishing methods and target fisheries also report catching ribaldo but only in negligible amounts. The majority of the ribaldo catch is taken in RIB 3–7. Fisheries interactions for these areas are described in the Status of the Stocks tables in Section 5.

1.2 Recreational fisheries

Recreational catches are likely to be negligible given the depth and location of ribaldo.

1.3 Customary non-commercial fisheries

Customary catches are likely to be negligible given the depth and location of ribaldo.

1.4 Illegal catch

Estimates of illegal catch are not available. Given the low value of ribaldo illegal catch is likely to be negligible.

1.5 Other sources of mortality

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

2. BIOLOGY

Ribaldo is known from the North Atlantic Ocean from Iceland to West Africa, the western Mediterranean Sea, the Indian Ocean south of Madagascar and the Pacific Ocean from Australia, New Zealand and Chile. In New Zealand it is widespread and has been caught by research trawl at depths from 200 to 1300 m. It appears to be most common at 500–1000 m. The relatively high catch by bottom longline suggests that it favours rough bottom habitats.

Ribaldo reach maximum fork lengths (FL) of about 75 cm and 65 cm for females and males respectively. Most research trawls have caught fish ranging from 30 to 70 cm FL. The 50% length at sexual maturity has been estimated at 45 cm total length for New Zealand ribaldo (O'Driscoll et al 2003). Analysis of data on female gonad development, collected by the Ministry of Fisheries Observer Programme, indicated a winter/early spring spawning season. Fish do not appear to form

RIBALDO (RIB)

large spawning aggregations. Locations at which spawning fish have been observed are the upper North Island (extending outside the EEZ), north-east and west Chatham Rise, the area between the Snares and Auckland Islands shelves, and the west coast of the South Island. Early life history is largely unknown but a few individuals less than 10 cm FL were captured in plankton nets in the upper 200 m of the water column over bottom depths of about 1000 m at the south west end of Chatham Rise. The distribution of juveniles under 28 cm is similar to that of observed spawning females. Juveniles up to 35 cm have been observed in all fished areas of the EEZ except for the Bounty Islands.

Ageing by zone counts of otoliths has been validated using radiometric techniques (Sutton et al 2010) using ribaldo caught on Chatham Rise trawl surveys by *Tangaroa* from 2001 to 2005. Maximum observed ages were 37 and 39 years for females and males respectively. Von Bertalanffy growth parameters are presented in Table 3, estimates of natural mortality (M) are presented in Table 4 and length-weight parameters in Table 5.

Ribaldo are caught in low numbers both in research trawl surveys and in observed commercial fisheries making tracking of cohorts by length frequencies difficult. Analyses of trawl survey and observer data has shown that the biomass of females is usually greater than that of males on the Chatham Rise although sex ratios by number are about 1:1. In the Sub-Antarctic and west coast South Island the biomass and numbers of females are significantly greater than males, often over 10:1. Sex ratios elsewhere in the EEZ are less clear.

Table 3: Von Bertalanffy growth parameter values for ribaldo. Source: Sutton et al 2010.

Von Bertalanffy growth parameters			
	K	t_0	L_∞
RIB 3 & 4 females	0.135	0.221	67.526
RIB 3 & 4 males	0.072	-5.246	61.444
RIB 3 & 4 combined sexes	0.14	-0.287	60.47

Table 4: Estimates of natural mortality (M). Source: Sutton et al 2010.

	Females	Males
Natural mortality (M)	0.106	0.112

Table 5: Length-weight parameter values for ribaldo.

Fishstock	Estimate				Source
<u>Weight = a(length)^b</u> (Weight in g, length in cm total length)					
	<u>Females</u>		<u>Males</u>		
	a	b	a	b	
RIB 3 & 4	0.0037	3.27	0.0053	3.18	Sutton et al (2010)
RIB 5 & 6	-	-	-	-	
	<u>Sexes combined</u>				
	a	b			
RIB 3 & 4	0.004289	3.237753			Sutton et al (2010)
RIB 5 & 6	0.0039	3.15			Bagley et al (unpublished data)

4. STOCK ASSESSMENT

4.1 Estimates of fishery parameters and abundance

The Middle Depths Working Group agreed in February 2011 that relative biomass estimates of ribaldo from middle depth trawl surveys on the Chatham Rise and the Sub-Antarctic were suitable for monitoring major changes in ribaldo abundance for RIB 3 & 4 and RIB 5 & 6 respectively. The west coast South Island trawl survey on *Tangaroa* may provide an index of abundance but with just three years of data points (2000, 2012, 2013) there is insufficient data with which to draw any conclusions. It is not certain that standardised CPUE indices from the hoki bottom trawl fisheries in RIB 3 & 4, and in RIB 5 & 6 track abundance. Standardised CPUE indices for these two areas are flat and indices from the corresponding trawl surveys are also flat, making it difficult to validate CPUE. CPUE indices from the spawning hoki and hake target fisheries in RIB 7 show a possible steady decline but with just three data points in the corresponding trawl survey and a lack of any other information it is not possible to validate the indices. There are no stock monitoring indices available for RIB 1, 2, 8 or 9.

4.2 Biomass estimates

Estimates of biomass are given in Table 6.

4.3 Yield estimates and projections

MCY cannot be estimated.

CAY cannot be estimated.

4.5 Other yield estimates and stock assessment results

No information is available.

Table 6: Biomass indices (t) and coefficients of variation (CV) of ribaldo from *Tangaroa* trawl surveys (Assumptions: areal availability, vertical availability and vulnerability = 1). NB: estimates are for the core strata only for the respective time series.

Chatham Rise	Vessel	Trip code	Date	Biomass (t)	%CV
	<i>Tangaroa</i>	TAN9106	Dec 91–Feb 92	417	12.2
		TAN9212	Dec 92–Feb 93	336	17.2
		TAN9401	Jan 94	602	10.8
		TAN9501	Jan–Feb 95	406	19.7
		TAN9601	Dec 95–Jan 96	470	18.2
		TAN9701	Jan 97	333	21.3
		TAN9801	Jan 98	510	14.3
		TAN9901	Jan 99	395	18
		TAN0001	Dec 99–Jan 00	387	20.8
		TAN0101	Dec 00–Jan 01	762	18.3
		TAN0201	Dec 01–Jan 02	417	13.2
		TAN0301	Dec 02–Jan 03	455	18.1
		TAN0401	Dec 03–Jan 04	535	15.6
		TAN0501	Dec 04–Jan 05	491	14.2
		TAN0601	Dec 05–Jan 06	313	16.9
		TAN0701	Dec 06–Jan 07	380	15
		TAN0801	Dec 07–Jan 08	479	14.3
		TAN0901	Dec 08–Jan 09	463	12.7
		TAN1001	Jan 10	416	19.9
		TAN1101	Jan 11	396	16.7
		TAN1201	Jan 12	469	14.6
		TAN1301	Jan 13	428	15.7
		TAN1401	Jan 14	477	18
Sub-Antarctic	<i>Tangaroa</i>	TAN9105	Nov–Dec 91	1 035	11.2
		TAN9211	Nov–Dec 92	389	18.6
		TAN9310	Nov–Dec 93	996	12.8
		TAN0012	Nov–Dec 00	873	14
		TAN0118	Nov–Dec 01	1 017	17.2
		TAN0219	Nov–Dec 02	656	17.5
		TAN0317	Nov–Dec 03	653	18.9
		TAN0414	Nov–Dec 04	951	16.5

Table 6 [Continued]

Sub-Antarctic	Vessel <i>Tangaroa</i>	Trip code	Date	Biomass (t)	%CV
		TAN0515	Nov–Dec 05	721	14.6
		TAN0714	Nov–Dec 07	1 062	13.5
		TAN0617	Nov–Dec 06	780	16.4
		TAN0813	Nov–Dec 08	658	18
		TAN0911	Nov–Dec 09	1 056	13.4
		TAN1117	Nov–Dec 11	1 017	17.2
		TAN1215	Nov–Dec 12	787	16.7
		TAN1412	Nov–Dec 14		
		TAN9204	Apr–May 92	768	17.1
		TAN9304	May–Jun 93	1 162	15.1
		TAN9605	Mar–Apr 96	989	16.7
		TAN9805	Apr–May 98	837	14.2

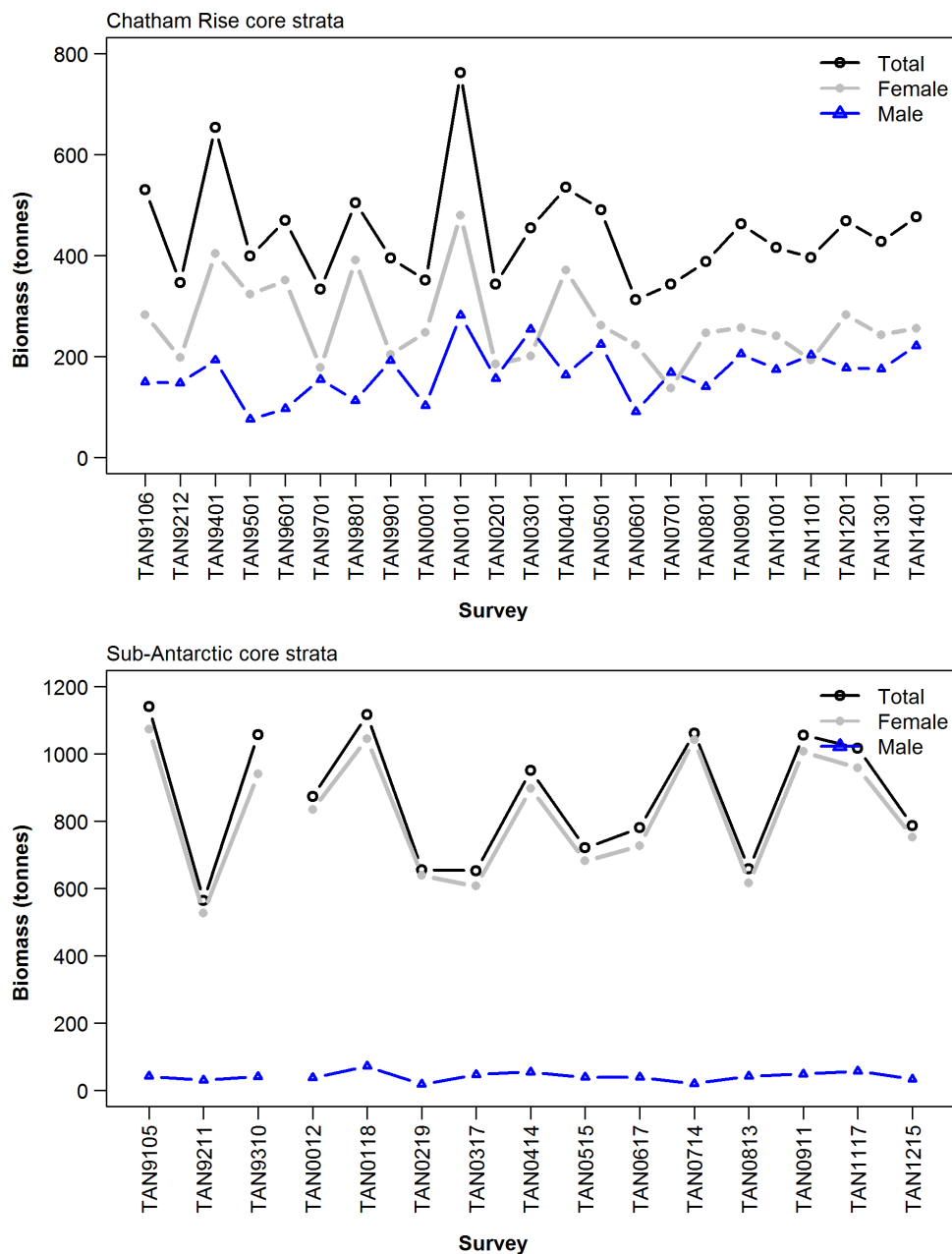


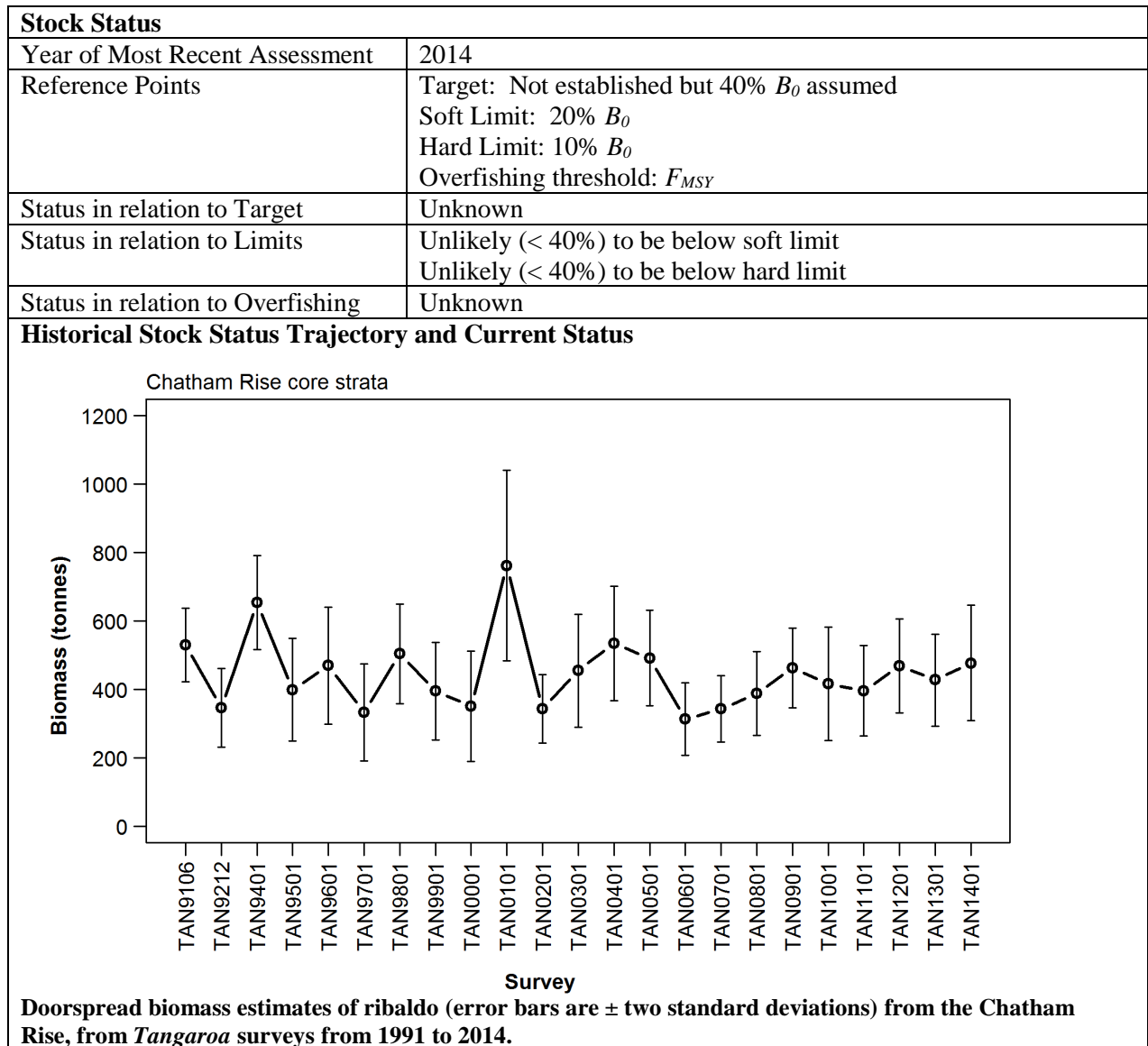
Figure 2: Doorspread biomass estimates of ribaldo by sex from the Chatham Rise 1991 to 2014 (upper) and Sub-Antarctic 1991 to 1993 and 2000 to 2012 (lower), from *Tangaroa* trawl surveys.

5. STATUS OF THE STOCKS

• RIB 1, 2, 7, 8 and 9

There are no accepted stock monitoring indices available for RIB 1, 2, 7, 8 or 9.

• RIB 3 & 4



Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	The relative biomass index of ribaldo from summer middle depth trawl surveys of the Chatham Rise is relatively flat. Precision is generally good in this time series (< 20%). Although numbers of individual ribaldo caught are low the Working Group considered this index to be suitable to monitor major trends in this stock.
Recent Trend in Fishing Mortality or Proxy	-
Other Abundance Indices	-
Trends in Other Relevant Indicators of Variables	-

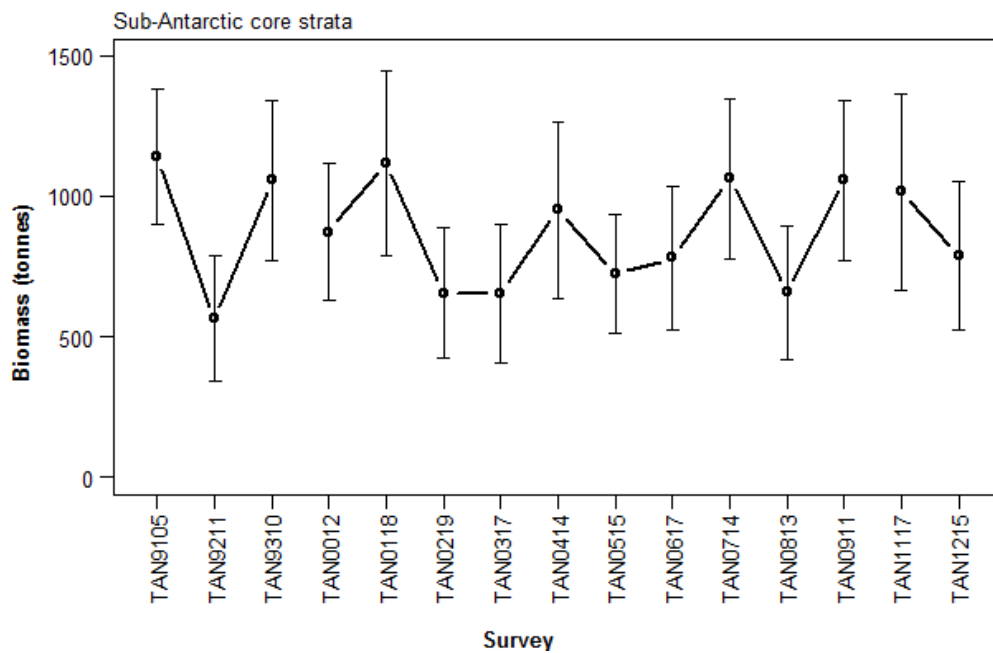
RIBALDO (RIB)

Projections and Prognosis	
Stock Projections or Prognosis	Stock size is Likely ($> 60\%$) to remain near current levels under recent catches, that were well below the current TACC before 2013–14
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft limit: Unlikely ($< 40\%$) for recent catches Hard limit: Unlikely ($< 40\%$) for recent catches
Probability of Current Catch or TACC causing Overfishing to continue or commence	Unknown as catches increased in 2013–14

Assessment Methodology and Evaluation		
Assessment Type	Level 2 - Partial Quantitative Stock Assessment	
Assessment Method	Evaluation of agreed trawl survey indices thought to index RIB 3 & 4 abundance	
Assessment Dates	Latest assessment: 2014	Next assessment: Unknown
Overall assessment quality rank	1 – High Quality	
Main data inputs (rank)	Data collected on trawl surveys	1 – High Quality
Data not used (rank)	N/A	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	- Low numbers of individuals caught on trawl surveys.	
Qualifying Comments		
-		
Fishery Interactions		
In RIB 3 & 4, ribaldo are taken as bycatch primarily in the ling and hoki bottom trawl fisheries and ling bottom longline fishery.		

- **RIB 5 & 6**

Stock Status	
Year of Most Recent Assessment	2014
Reference Points	Target: Not established but $40\% B_0$ assumed Soft Limit: $20\% B_0$ Hard Limit: $10\% B_0$ Overfishing threshold: F_{MSY}
Status in relation to Target	Unknown
Status in relation to Limits	Unlikely ($< 40\%$) to be below Unlikely ($< 40\%$) to be below
Status in relation to Overfishing	Unknown

Historical Stock Status Trajectory and Current Status

Doorspread biomass estimates of ribaldo (error bars are \pm two standard deviations) from the Sub-Antarctic, from *Tangaroa* surveys from 1991 to 1993, and 2000 to 2012.

Fishery and Stock Trends

Recent Trend in Biomass or Proxy	Relative biomass estimates of ribaldo from summer middle depth surveys of the Sub-Antarctic show a relatively flat index. CVs are consistently low in this time series ($< 20\%$). Although numbers of individual ribaldo caught are low the Working Group considered this index to be suitable to monitor major trends in this stock.
Recent Trend in Fishing Mortality or Proxy	Unknown
Other Abundance Indices	-
Trends in Other Relevant Variables of Indicators	-

Projections and Prognosis

Stock Projections or Prognosis	Stock size is Likely ($> 60\%$) to remain near current levels under current catches and TACCs
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft limit: Unlikely ($< 40\%$) Hard limit: Unlikely ($< 40\%$)
Probability of Current Catch or TACC causing Overfishing to continue or commence	Unknown

Assessment Methodology and Evaluation

Assessment Type	Level 2 - Partial quantitative stock assessment	
Assessment Method	Evaluation of agreed trawl survey indices thought to index RIB 5 & 6 abundance	
Assessment Dates	Latest assessment: 2014	Next assessment: 2017
Overall assessment quality rank	1 – High Quality	
Main data inputs (rank)	- Data collected on trawl surveys	1 – High Quality
Data not used (rank)	N/A	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	Low numbers of individuals caught on trawl surveys; and	

RIBALDO (RIB)

	unknown implications of highly skewed sex ratios (females usually make up > 90% of biomass) for stock structure. Observer data also shows skewed sex ratios in favour of females.
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Qualifying Comments

-

Fishery Interactions

In RIB 5 & 6, ribaldo are mainly caught as bycatch in hoki and ling bottom trawl fisheries and ling bottom longline fisheries.

TACCs and reported landings for the 2015–16 fishing year are summarised in Table 7.

Table 7: Summary of TACCs (t) and reported landings (t) of ribaldo for the most recent fishing year.

			2015–16 Actual TACC	2015–16 Estimated landings
Fishstock		QMA		
RIB 1	Auckland (East)	1	121	49
RIB 2	Central (East)	2	176	125
RIB 3	South-east (Coast)	3	394	163
RIB 4	South-east (Chatham)	4	357	330
RIB 5	Southland	5	52	43
RIB 6	Sub-Antarctic	6	231	67
RIB 7	Challenger	7	330	322
RIB 8	Central (West)	8	1	0.1
RIB 9	Auckland (West)	9	21	28
RIB 10	Kermadec	10	0	0
Total			1 683	1 127

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