Ministry for Primary Industries
Manatū Ahu Matua

Fishery characterisation and standardised CPUE analyses for ribaldo, *Mora moro*, (Risso, 1810) (Moridae), 1989–90 to 2012–13

New Zealand Fisheries Assessment Report 2015/31.

D.J. MacGibbon

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EXECUTIVE SUMMARY

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Records of ribaldo exploitation in New Zealand waters go back as far as the mid 1970s when Japanese and Korean longliners reported catching "deep sea cod". This period marks the highest recorded landings of ribaldo with between 2417 and 4920 tonnes (t) landed. Since 1991, annual landings averaged 1040 t and ranged between 500 and 1810 t (peaking in 1997). Actual catches were probably higher than this as ribaldo is primarily a low-value bycatch species that was sometimes discarded or made into fish meal.

Ribaldo entered the QMS on 1 October 1998 and reported landings from some areas (e.g. west coast South Island) have since increased. The initial TACC of 1282 t was increased to 1664 t from 1 October 2006 in response to frequent over-catches in QMAs 6 & 7 where ribaldo is taken in target fisheries for hoki and hake. Catches in other QMAs were nearly always within the TACC limits.

This project covered ribaldo quota management areas RIB 3–8, which included three main fishing areas: the eastern fishery (east coast South Island and Chatham Rise), the southern fishery (lower east coast South Island, Southland, and Sub-Antarctic), and the west coast of the South Island. Within each area there is little seasonality of ribaldo catch, other than on the west coast South Island where nearly all the catch is taken during the hake (and to a lesser extent hoki) spawning season from June to September.

Ribaldo are mainly a bycatch species caught in bottom trawls for hoki, hake, and ling and by bottom longline fishing for ling, although the species is also caught in a wide range of other target fisheries using a variety of fishing methods. There was a small amount of targeting of ribaldo by bottom longline on the Chatham Rise and off the east coast of the South Island.

Ribaldo biology is poorly understood in New Zealand waters and elsewhere. Age estimates of New Zealand fish were made by counting growth zones in sectioned otoliths and the estimates were validated using radiometric analysis. Samples from an exploited fishery had maximum age estimates of 37 and 39 years for females and males respectively and natural mortality (M) was estimated at about $0.1y^{-1}$ for both sexes. Length at maturity for ribaldo was estimated as 45 cm.

The species is widespread but not abundant and stock structure is unknown. There are no known spawning migrations and ripe and running ripe fish were reported from the main fishery areas around New Zealand (RIB 3–7), mostly in winter/early spring. The smallest juveniles (under 27 cm) are also widespread. These observations are not inconsistent with the current management approach which is based on the 10 generic fisheries management areas (FMAs), i.e., the division of the main fishing areas into smaller management units will help minimise any impact of localised fishing pressure. However, the unusual occurrence of significant differences in sex ratios in RIB 3–7 indicates that stock structure and distributional patterns are poorly understood and need further investigation.

Monitoring of ribaldo stocks will require more data from research and commercial sources. Middle depth trawl surveys of the Chatham Rise and SubAntarctic are ongoing time series that record ribaldo abundance and length frequencies, but abundance estimates and sample sizes are low (less than 250 per survey). Precision is relatively good with coefficients of variation (CV) usually less than 20%. The surveys did not cover the full depth range of the species up to 2009; however, the Chatham Rise survey was extended to 1300 m in 2010 and now covers a more appropriate depth range. Now that ageing has been validated, otolith collection from this survey should be considered, although even with slightly increased sample sizes, the possible large age range and low sample numbers may be problematic.

Increased observer coverage and collection of otoliths to develop time series of length frequencies and catch-at-age is required from the three main fisheries covered in this study. Length data on their own are insufficient for monitoring as modal progressions cannot be determined. Sampling should preferably be annual for at least the first three years to determine the age structure of the populations, the sample sizes required, and if patterns in strong and weak year classes can be tracked. Collection of data on reproductive condition could also inform analyses of stock structure which is currently uncertain.

CPUE analyses were carried out in the three fishing areas covered by this study and found a generally flat trend in all areas. Validation of CPUE abundance indices compared with trawl survey abundance indices from corresponding areas was difficult to assess for the eastern fishery but CPUE and survey indices from the southern fishery appeared to track each other well. There are insufficient data points from the west coast South Island middle depth trawl survey to determine whether CPUE can be validated this way. New Zealand ribaldo are known to have a wide range of ages and while there appears to be no truncation of ribaldo lengths over time there is no information on whether there was a change in the age structure over time. However, in the absence of a full, quantitative stock assessment, we should note that there is no evidence of depletion.

1. INTRODUCTION

Many of New Zealand's fish species caught in middle depth fisheries, other than those for hoki, hake, ling, and southern blue whiting, are not routinely monitored or assessed despite their moderate size and value. Eighteen such species were selected under the 10 year Research Programme for Deepwater Fisheries (Ministry of Fisheries 2010a) to be assessed under a 3 to 4 year rotating schedule. There were five species selected for characterisation in 2013–14: black cardinal fish (*Epigonus telescopus*), gemfish (*Rexea solandri*), lookdown dory (*Cyttus traversi*), prawn killer (*Ibacus alticrenatus*), and ribaldo (*Mora moro*).

McMillan & Hart (1998) summarised the biology and commercial landings of ribaldo in New Zealand waters for the fishing years 1978–79 to 1995–96 and carried out an unstandardised CPUE analysis of commercial trawl caught ribaldo based on catch (kg) per tow for the period 1982 to 1989. They concluded that this was not very informative as reported catch was much likely to be lower than actual, with most of it having been discarded or made into fishmeal during this period. None of the catch from this time was reported as target trawling for ribaldo. Dunn (2006) also carried out a characterisation of ribaldo in New Zealand waters from 1977–78 to 2002–03, and also found that CPUE was not informative for the southern and eastern fisheries. Dunn was unable to account for very high or very low catch rates, and changes in the fishery meant that assumptions of the standardised analysis were likely to be violated. Changes in the ribaldo fishery were thought to be most likely to be due to changes in the target fisheries in which ribaldo was caught as bycatch. MacGibbon & Hurst (2011) carried out a ribaldo characterisation and standardised CPUE analysis for the 1989–90 to 2008–09 fishing years and also found that CPUE was not very informative, mainly due to low or sporadic catches. They found that research trawl surveys of the Chatham Rise and Sub-Antarctic provided a reasonable index of abundance with relatively precise coefficients of variation (CV) although sample sizes were low and modal progression could not be tracked in the survey series of length frequency distributions. Few scientific data are available to describe stock numbers or boundaries in the New Zealand fishery and currently the ribaldo Quota Management Areas (QMAs) are based on Fishery Management Areas (FMAs). There is minimal scientific information on age, growth and natural mortality although Sutton et al. (2010) carried out the first validated age and growth study for ribaldo for the Ministry of Fisheries under project RIB200702.

Ribaldo are caught in small quantities on research trawl surveys of middle depth species such as hoki, hake, and ling on the Chatham Rise and Sub-Antarctic. While McMillan & Hart (1998) noted that these surveys do not fully cover the depth range of ribaldo, they do cover the majority of that range. They are also taken in small quantities in acoustic mark identification and trawl survey tows for deepwater species such as orange roughy and oreos.

This report summarises the analyses carried out under Ministry of Fisheries (now Ministry for Primary Industries) Project DEE201007RIB, Objectives 1–6: To characterise the New Zealand ribaldo fisheries in RIB 3–8 by analysis of commercial catch and effort data up to 2011–12 including:

- Characterise the fisheries by analysis of commercial catch and effort data up to 2011–12.
- Carry out standardised CPUE analyses for the major fisheries (Fishstocks) where appropriate.
- Review the indices from CPUE analyses, trawl surveys and Observer logbooks to determine trends.
- Review stock structure using data accessed above and any other relevant biological or fishery information.
- Assess availability and utility of developing a series of age frequency distributions from otoliths.
- To make recommendations on future data requirements and methods for monitoring the stocks

The project was to cover up to the 2011–12 fishing years, but commercial catch and effort data for the 2012–13 fishing year was available and so was included. This report updates the work of MacGibbon & Hurst (2011) although RIB 1, 2 & 9 were not included here as they are outside the project mandate.

The report contains sections of text and tables that can be transferred to the Ministry for Primary Industries Plenary Report as appropriate. Tables and figures are provided in four appendices: A, fishery-independent research survey data; B, Ministry for Primary Industries' observer programme data; C, commercial fishery characterisation; and D, catch-per-unit-effort analyses.

2. FISHERY SUMMARY

2.1 Commercial fisheries

Ribaldo is a morid cod, also known as deepsea cod, of the family Moridae. They are reported at depths of 450–2500 m from the northeast of the Atlantic Ocean, the Mediterranean Sea, off West Africa, the Indian Ocean, and the Pacific Ocean off Chile, Australia and all around New Zealand (Cohen et al., 1990). They are widespread around New Zealand at depths of 200–1300 m but not considered abundant at any depth (Paul 2000, Annala et al. 2004). They are mainly caught as bycatch in the hoki, hake, and orange roughy trawl fisheries and in the ling bottom longline fishery. A small amount of ribaldo is targeted around the North Island by bottom longline and on the Chatham Rise and east coast of the South Island. The fishery is currently managed as 10 separate Fishstocks, based on the ten FMAs (Figure 1). An administrative stock was established for the Kermadec area (RIB l0), but aside from 2 t in 1995 no catch of ribaldo was recorded from that area. Japanese and Korean longliners reported catching “deep-sea cod” in New Zealand waters in the mid-1970s with 2417–4920 t landed annually during that time (Table 1a). Foreign licensed and joint venture vessels reported catching 1–222 t between 1978 and 1983 (Table 1b). Records by current QMAs are available from the 1982–83 fishing year. Annual catches peaked in 1996–97 at 1824 t. Most landings were from RIB 4, followed by RIB 3 and RIB 7 with a total of 6418, 4999, and 4877 t since the 1989–90 fishing year. Ribaldo entered the Quota Management System (QMS) on 1 October 1998 and since then annual catches have ranged from 755 to 1359 t (Table 2).

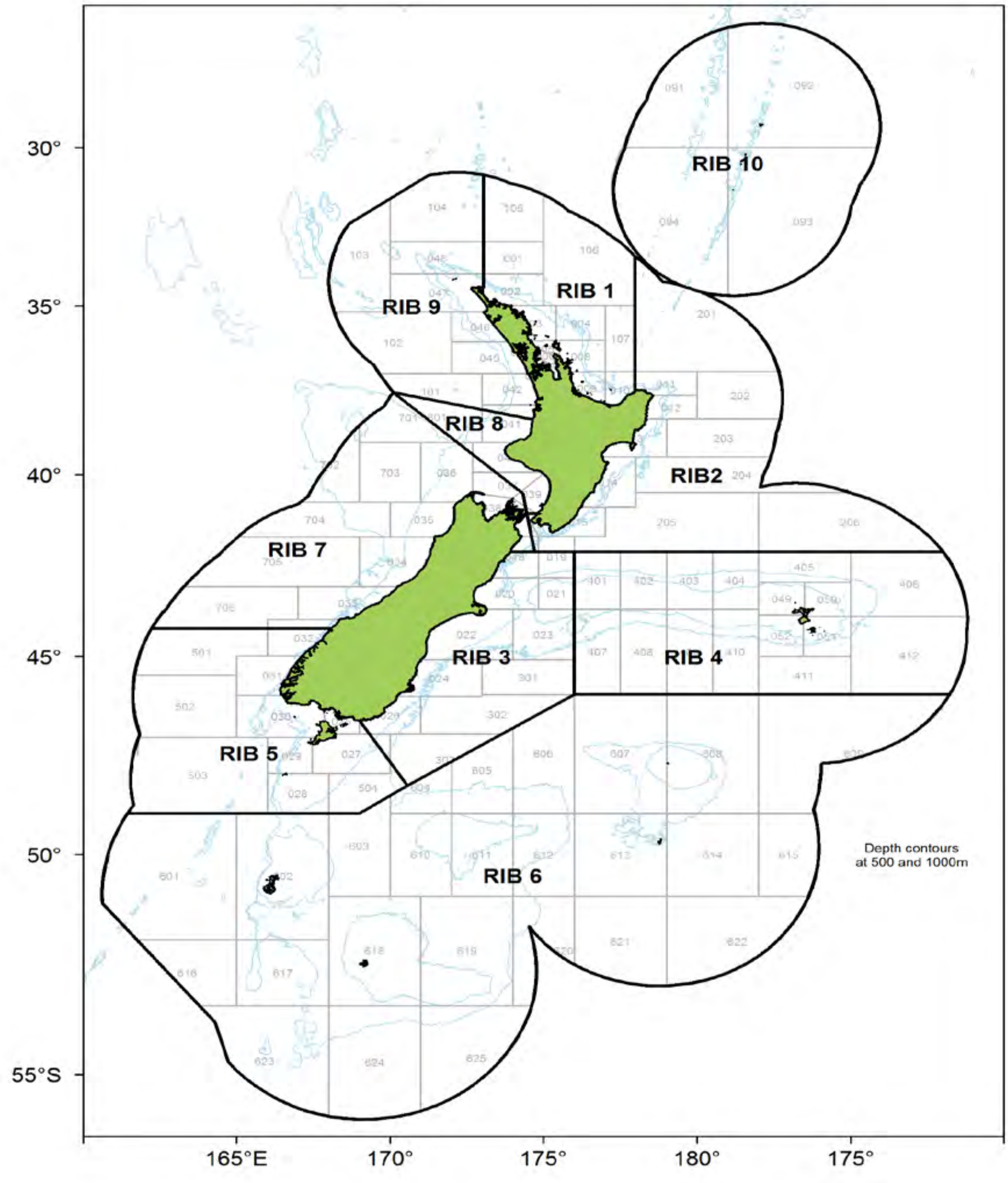

Figure 1: Map showing the Quota Management Areas (QMAs) for RIB 1–10, including statistical areas, and the 500 m and 1000 m depth contours.

The TACCs have remained constant since the introduction of ribaldo into the QMS, with the exception of increases in 2007 for QMAs 6 and 7 where much of the ribaldo catch is taken as bycatch in the hoki and hake fisheries, and there was also an increase in the RIB 9 TACC in 2012 from 2 to 21 t.

Previous characterisations of New Zealand ribaldo fisheries were carried out from 1978–79 to 1995–96 by McMillan & Hart (1998), from 1978–79 to 2002–03 by Dunn (2006), and from 1990–2009 by

MacGibbon & Hurst (2011). McMillan & Hart (1998) proposed that ribaldo could be divided into four main fishing stocks based on catch distribution and natural boundaries: North Island (QMAs 1, 2, 8 & 9), east coast South Island (ECSI) and Chatham Rise (Eastern fishery, QMAs 3 & 4), Southern fishery (QMAs 5 & 6) and the WCSI (QMA 7). This suggested division was also used by MacGibbon & Hurst (2011) and appears to still be largely appropriate from initial data summaries in this study. These divisions were followed in this report (Figure 2) with the exception that Statistical Areas 026, 302, and 303 were included in the Southern fishery rather than the Eastern fishery, based on continuity of catches. RIB 1, 2, 9 and 10 are outside the mandate of this project and are not continuous with the fishery areas identified in this study so are not considered further. Despite being within the mandate of the project, only a brief summary is given for RIB 8 as catches are very low (less than 1 t in most years) and are not continuous with the major fisheries.

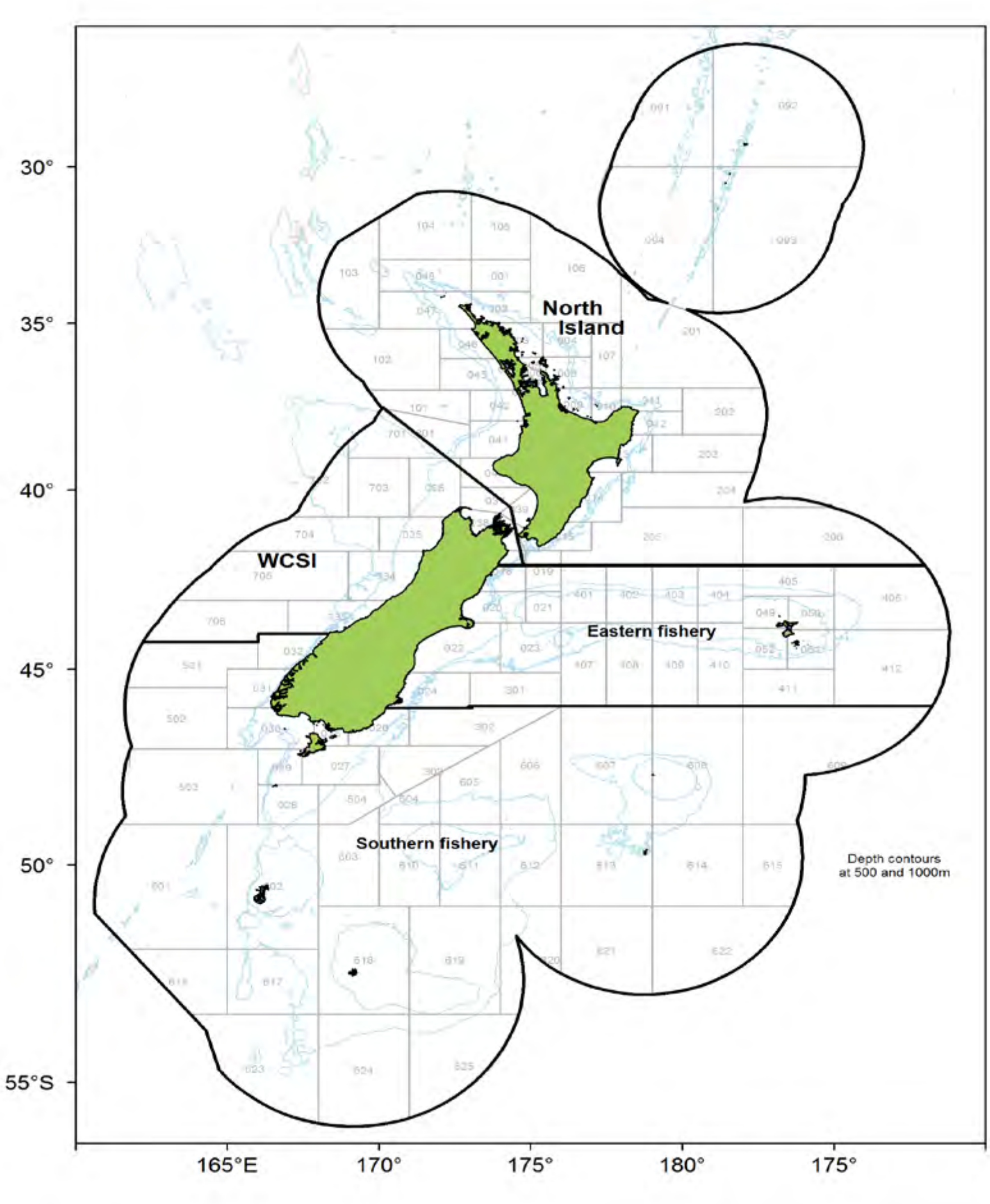

Figure 2: Map showing the New Zealand EEZ, including statistical areas, the 500 m and 1000 m depth contours, and the fishery areas used in this analysis: North Island; Eastern; Southern; WCSI (west coast South Island).

Table 1a: Japanese and Korean longline catch (t) of ribaldo ("deep-sea cod") from New Zealand waters, most likely from Chatham Rise and east coast South Island, by calendar year from 1975–77. Source: Ministry of Fisheries (2010b). There was no reported ribaldo catch by domestic vessels during this time. – no data

Year	1975	1976	1977
Japan	2 417	4 920	4 283
Korea	–	–	286
New Zealand	–	–	–

Table 1b: Reported trawl landings (t) of ribaldo for fishing year (1 April to 31 March) and by EEZ area by foreign licensed and joint venture vessels from 1978–79 to 1983–83. 1983–83 was from 1 April to 30 September to accommodate the change to a 1 October to 30 September fishing year. The EEZ areas correspond approximately to the QMA areas listed (see figure 2 of Baird & McKoy (1988)). – means no data available. (Source: McMillan & Hart 1998).

EEZ area	C(M)	C(-)	D	E(A)	F(E)	F(W)	G	H	Total
QMA		3	4	6		5	7	8 & 9	
1978–79	0	0	0	0	0	0	0	0	0
1979–80	0	0	0	0	0	0	1	0	1
1980–81	–	–	–	–	–	–	–	–	–
1981–82	0	0	10	1	2	2	50	0	65
1982–83	4	0	21	8	1	10	29	0	72
1983–83	11	3	36	3	7	98	60	3	222

Commercial fishing for ribaldo was recorded from the 1970s by Japanese and Korean longliners with up to 4920 t taken annually (Table 1a). After the introduction of the New Zealand 200 mile Exclusive Economic Zone (EEZ), reported catches were low (Table 1b). Since 1982–83, catch summaries are by QMA and fishing year (Table 2). Catches increased during the 1980s and 1990s, peaking at 1824 t in 1996–97 (Table 2). Note that this includes catch from outside the EEZ. Reported catches inside the EEZ subsequently fluctuated from 755 to 1359 t. All subsequent references to fishing years are for 1 October to 30 September years only and refer to the last year, i.e., 1996–97 becomes 1997.

Ribaldo is widespread but not abundant and is very rarely targeted. Dunn (2006) described the fishery up to the 2003 fishing year and found that interpreting CPUE data was difficult as it was nearly always caught as bycatch in other fisheries and changes in ribaldo catch are more likely to be due to changes in those target fisheries rather than in ribaldo abundance. MacGibbon & Hurst (2011) found similar problems with a CPUE analysis of the west coast South Island fishery (trawl bycatch of hoki and hake winter spawning fisheries). What little targeting there is of ribaldo is done almost entirely by bottom longline as well as a drop/dahn lines, and set net.

Ribaldo is caught all around mainland New Zealand in all QMAs but regularly exceeds 100 t per year only in QMAs 2–4, 6, and 7 (Table 2). Highest catches since entering the QMS in the 1999 fishing year have been in QMA 7 where it is trawl bycatch in the hake and hoki spawning fisheries in statistical areas 034 and 035 between June and September. Throughout the New Zealand EEZ ribaldo is also a common bycatch species in the ling longline fishery. Since entering the QMS, the overall TACC for all QMAs combined has been exceeded by 77 t (6%) in 2000, 29 t in 2002 (2%), and 20 t in 2004 (1.6%). Overall reported catches have declined since 2008 to below 1000 t per year usually. Landings from RIB 5–6 in particular have declined in recent years.

Table 2: Reported landings (t) of ribaldo and TACC by QMA for fishing years 1982–83 to 2012–13. Source: Ministry for Primary Industries extract 9414. Fishing year was from 1 October to 30 September. –, no data.

	QMA 1		QMA 2		QMA 3		QMA 4		QMA 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

	QMA 6		QMA 7		QMA 8		QMA 9		Total	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	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	–	1 229	–
1995–96	109	–	62	–	0	–	0	–	1 025	–
1996–97	158	–	77	–	1	–	0	–	1 810	–
1997–98	262	–	110	–	1	–	1	–	1 170	–
1998–99	223	124	243	55	1	1	0	2	1 068	1 282
1999–00	237	124	300	55	< 1	1	< 1	2	1 339	1 282
2000–01	191	124	275	55	< 1	1	< 1	2	1 231	1 282
2001–02	322	124	254	55	0	1	< 1	2	1 266	1 282
2002–03	172	124	338	55	< 1	1	1	2	1 065	1 282
2003–04	205	124	364	55	< 1	1	2	2	1 227	1 282
2004–05	105	124	307	55	< 1	1	2	2	1 148	1 282
2005–06	62	124	336	55	0	1	4	2	963	1 282
2006–07	61	231	404	330	0	1	9	2	1 148	1 664
2007–08	80	231	356	330	< 1	1	14	2	988	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

In RIB 3, catches were mainly bycatch in the ling longline fishery and hoki trawl fishery although a small amount of targeted ribaldo by bottom longline and set net occurred in statistical areas 018, 020, and 021.

In recent years however set netting catches declined. A similar bycatch pattern was seen in RIB 4. Ribaldo catches were fairly consistent for both RIB 3 and 4 throughout most of the year but declined from August to October, possibly as vessels targeting hoki moved to spawning areas in Cook Strait and the west coast of the South Island. Small amounts of ribaldo were also caught in hake and orange roughy target fisheries in RIB 4. Small amounts of ribaldo target bottom longline fishing occurred throughout the study period, most notably in the 2011–2013 fishing years. Since entering the QMS the TACC was never fully caught in RIB 3 and was only slightly over-caught in RIB 4 in 2002 and 2005.

In RIB 5 and 6, ribaldo was again mainly caught as bycatch in the ling bottom longline and hoki bottom trawl fisheries. Small amounts were also taken in the squid trawl fishery. In RIB 5, ribaldo was also caught as bycatch in the orange roughy fishery. In RIB 5, the Snares Shelf and Puysegur Trench are the most important areas. In RIB 6, the main area is just off the Snares Shelf, with some catch around the Auckland Islands and on the Campbell Rise. As in RIB 3 and 4, ribaldo catches decreased slightly during the hoki spawning season from June to September. In RIB 5, the TACC was regularly over-caught until 2003 and the reduced hoki quota is the most likely reason for reduced ribaldo catch there. In RIB 6, the TACC was also over-caught every year until 2005 and then declined, most likely for the same reason. Although the TACC for RIB 6 was increased to 231 t in 2007, current landings were below the original TACC of 124 t every year since. Landings from both QMAs declined dramatically in recent years, particularly in RIB 6.

In RIB 7, nearly all ribaldo was caught by bottom trawl from June to September during the target hoki and hake spawning season. Small amounts were also taken by midwater trawl. When caught by midwater trawl, the net is usually fished on or near (up to about 5 m above) the seafloor. Since 2003, landings of ribaldo from RIB 7 were higher than in any other QMA. The TACC for RIB 7 was increased in 2007 from 55 t to 330 t as the TACC was significantly over-caught every year since 1999 (when ribaldo entered the QMS). Ribaldo continued to be over-caught until 2010 then landings decreased by around half. They were also caught as bycatch in other target fisheries in RIB 7, but only in very small amounts.

RIB 8 catches of ribaldo were negligible with 3 t being the largest reported landings in 2011 and 2012. The TACC is only 1 t and in some years there were no reported landings. Very small amounts were caught as bycatch in bluenose and snapper bottom trawl fisheries and the bottom longline snapper fishery. Bottom longline targeting of bass and ling also accounted for some of the ribaldo bycatch in RIB 8. Reported landings of ribaldo from RIB 8 appear to be rounded up to the nearest whole tonne because reported landings are 1 t in most years, despite the groomed and merged data (see Section 6) from this study finding a mean of 410 kg of ribaldo landed per year.

2.2 Recreational fisheries

There are no known recreational fisheries for ribaldo.

2.3 Maori customary fisheries

There are no known customary fisheries for ribaldo.

2.4 Illegal and misreported catch

There is no quantitative information on the current level of illegal and misreported catch for ribaldo.

2.5 Other sources of mortality

There is no quantitative information of non-fishing sources of mortality of ribaldo.

2.6 Regulations affecting the fishery

Current and historical limits on catch and effort in ribaldo fisheries are described in Section 2.1. Trawl codend minimum mesh-size regulations that currently apply are 60 mm for Sub-Antarctic (FMA 6) fisheries and FMA 5 south of 48° S; and 100 mm elsewhere. From 1 October 1977, the trawl codend mesh-size change took effect at the boundary between the Snares and Auckland Islands fisheries (the old EEZ area F/E boundary), which was at 48° 30'S. The management area boundary was changed on 1 October 1983 to 49° S (now the FMA5/6 boundary) but the codend mesh size change was at latitude 48° S to allow for targeting of squid around the Snares Islands (Hurst 1988).

Protection of bycatch species in multi-species fisheries is mainly through the QMS. Catch of protected species such as seabirds and fur seals is monitored through the Ministry for Primary Industries observer programme and all trawl vessels have been required to deploy seabird mitigation devices to minimise interactions with trawl warps since April 2006 (Ministry of Fisheries 2009). Bottom longline vessels 7 m or more in length must use streamer lines to deter seabirds when setting lines and no vessel may discharge offal while setting lines. When hauling lines, offal may only be discharged from the opposite side of the vessel from which the line is being hauled.

3. BIOLOGY

3.1 Distribution

Ribaldo were recorded in research bottom trawls in 173–1400 m depth but most often 450–1200 m (Anderson et al. 1998, McMillan & Hart 1998). They are distributed all around New Zealand waters but occur most often (although never abundantly) in deeper areas of the north and south Chatham Rise, Puysegur Trench, Campbell Plateau, and Challenger Plateau. This distribution does not appear to change with season. There is no clear evidence of spawning migration or aggregation (McMillan & Hart 1998) although this study did find that the highest catch rates of ribaldo were during winter in the hake target fishery off the west coast of the South Island at a time when ribaldo are known to be spawning. Unfortunately there is little information outside of this time period with which to draw a comparison. The evidence does not suggest that if aggregations do exist, that they are particularly dense. There appears to be little difference in abundance between the autumn, spring, and summer Sub-Antarctic series for which there are comparable years (See Section 5.1), suggesting minimal movement into or out of the area between these seasons.

3.2 Spawning

The 50% length at sexual maturity was estimated at 45 cm total length (TL) for New Zealand ribaldo (O'Driscoll et al. 2003). In the Mediterranean Sea, fish maturity was estimated at 32–34 cm TL and spawning is believed to take place in winter and early spring (Cohen 1986). Records of female gonad stages from research and observer data indicate ripe and running ripe fish on the Chatham Rise, WCSI, Campbell Plateau, and Puysegur, and spent fish in these areas, as well as the southeast coast of the North Island and Southland/Sub-Antarctic (O'Driscoll et al. 2003, Appendix Figure B7).

Analysis of observer records (see Section 6.1) indicates winter spawning in all areas. Main months appear to be: Eastern fishery, May–August; Southern fishery, June–September (although sampling was low in July–August); WCSI, June–September (Appendix B16–17).

Juvenile fish of less than 10 cm were reported in plankton nets in the upper 200 m of the water column over depths of 1000 m at the southwest end of the Chatham Rise (Annala et al. 2004). The distribution of juveniles under 28 cm (Group I defined by O'Driscoll et al. 2003) is similar to that of ripe and running ripe females described above, but there are also records from around the North Island. Juveniles up to 35 cm (Group II) are widely distributed in all fished areas of the EEZ, except the Bounty Plateau. From *Tangaroa* surveys, highest catch rates of juveniles occurred on the north Chatham Rise, off East Cape, WCSI, and on the western Challenger Plateau. These observations are consistent with the widespread spawning events described above.

3.3 Stocks and spatial distribution

McMillan & Hart (1998) proposed four stocks based on the main fishing areas: North Island (QMAs 1, 2, 8 & 9), Chatham Rise & east coast South Island (QMAs 3 & 4), Southland & Sub-Antarctic (QMAs 5 & 6) and the west coast South Island (QMA 7). These are still the main fishing areas in which ribaldo were caught. McMillan & Hart (1998) suggested that it is possible that separate stocks exist based on natural boundaries such as the New Zealand land mass (west and east coast stocks).

MacGibbon & Hurst (2011) noted that the location and timing of spawning activity supports the suggestion of at least 4 stocks but provides no strong basis to move from the current 10 management areas. They also examined scaled population length frequencies from a series of research trawl surveys and observer sampling up to 2009 which suggested significant differences in sex ratios by area, and differences in abundance by sex between areas. This appears to still be the case (see Sections 5 and 6). Further analyses of length frequencies from trawl surveys of the west coast South Island in winter showed lower minimum lengths of both sexes and a lower maximum length for males compared with other areas surveyed, which may indicate that the west coast South Island is a separate stock.

There were no tagging studies of ribaldo in New Zealand waters and given the depths at which they are most commonly found and their apparent low abundance this is not a practical option.

3.4 Ageing

Talman et al. (2002) carried out some limited ageing work on ribaldo from the northeastern Atlantic and estimated ages of between 3 and 34 years for fish between 29 and 65 cm fork length (FL), although they acknowledged that interpreting the central zones of otoliths was difficult and their ageing methodology was not validated.

Age estimates for New Zealand ribaldo were made by counting growth zones in sectioned otoliths and the estimates were validated using radiometric analysis by Sutton et al. (2010). They analysed randomly selected otoliths from summer middle-depth trawl surveys carried out from 2001 to 2005 on the Chatham Rise on *Tangaroa*. They used radiometric methods involving lead-210 and radium-226 and found that the activity ratios of both chemicals increased with age as expected. Comparison of ages estimated by counting otolith zones and by radiometric analysis showed a close match. Maximum age estimates were 37 and 39 years for females and males respectively.

3.5 Growth curves

Von Bertalanffy parameters were derived for Chatham Rise ribaldo for each sex by Sutton et al. (2010) (Table 3). Growth appears to be quite rapid for both male and female fish in the first 10 years, then slows and is negligible for both sexes after 25 years of age. They also found that females are consistently larger than males at corresponding ages but the differences in L_∞ were not statistically significant at the 95% level.

3.6 Natural mortality (*M*)

Estimates of M for New Zealand ribaldo by Sutton et al. (2010) were 0.106 y^{-1} and 0.112 y^{-1} for males and females, using maximum observed ages of 37 and 39 years for females and males respectively based on Hoenig's (1983) formula:

$$\log_e M = 1.46 - 1.01[\log_e(t_{\max})]$$

where t_{max} is the maximum age reached by 1% of the population. Sutton et al. (2010) used the maximum *observed* age as a proxy for the maximum age reached by 1% of the population, which is unknown.

3.7 Length-weight relationship

Length-weight relationships reported by Sutton at al. (2010) for ribaldo from Chatham Rise are given in Table 3.

Table 3: Estimates of biological parameters for ribaldo from Chatham Rise. Source: Sutton et al. (2010).

1. Natural mortality y^{-1} (M)

	Females	Males
	0.106	0.112

2. Weight (grams) = αL^β L= total length in cm.

	Females		Males		Sexes combined	
	α	β	α	β	α	β
Chatham Rise	0.0037	3.27	0.0053	3.18	0.004289	3.237753

3. Von Bertalanffy growth parameters

	K	t_0	L_∞
Chatham Rise females	0.135	0.221	67.526
Chatham Rise males	0.072	-5.246	61.444
Chatham Rise combined	0.14	-0.287	60.47

3.8 Feeding and trophic status

Adult ribaldo are known to feed on a variety of fishes, crustaceans, molluscs and other invertebrates (Cohen et al. 1990). No work was carried out specifically on the feeding habits of ribaldo in New Zealand waters and ribaldo stomachs are usually everted when brought to the surface in research trawls.

4. CURRENT AND ASSOCIATED RESEARCH PROGRAMMES

Ministry for Primary Industries

Recent or ongoing research on or relevant to ribaldo includes: research trawl surveys by *Tangaroa* on the Chatham Rise, Sub-Antarctic, and west coast South Island (since 1991, see Section 5); age validation (see Section 3.4), and fishery characterisation planned every three years under the Ministry of Fisheries 10-year Research Plan for Deepwater Fisheries (Ministry of Fisheries 2010a).

5. FISHERY INDEPENDENT OBSERVATIONS

5.1 Research survey abundance indices and length frequencies

There were no surveys designed specifically to estimate ribaldo abundance. The Chatham Rise and Sub-Antarctic *Tangaroa* random bottom trawl survey time series, started in 1991, are the only ongoing surveys that have consistently caught and measured ribaldo (note that for the Sub-Antarctic, the summer series was not carried out from 1995 to 1999 and the autumn time series ended in 1998). Since MacGibbon & Hurst (2011) last characterised ribaldo in New Zealand there have also been two winter surveys of the west coast South Island on *Tangaroa*. These surveys were primarily aimed at surveying hoki, hake and ling as well as a variety of other middle depth species and did not cover the full depth range of ribaldo. The Chatham Rise survey was extended to 1300 m depth in 2010 as a pilot survey of deeper waters and now covers the full ribaldo depth range. Ribaldo abundance was usually relatively low but coefficients of variation (CVs) were relatively precise, usually under 20%. Trends in abundance and length frequencies from these surveys are presented in Appendix A (Table A1–3, Figures A1–A22).

When targeted in the commercial fishery, ribaldo is caught almost entirely by bottom longline and it was suggested that as well as being susceptible to this method they might also favour rough ground (McMillan & Hart 1998). If so, the use of bottom trawl surveys to measure ribaldo requires assumptions about constant proportions of the abundance outside the survey area or over untrawlable ground. Length frequency distributions may also not be representative of the population if there are differences in length between ribaldo over foul ground and trawlable ground. Differences in observer length frequencies between fish caught by trawl and bottom longline were investigated in this study but were inconclusive (see Section 6.1.2).

The distribution of catch by latitude, longitude, and depth for trawl surveys relevant to ribaldo is shown in Figure A1.

In the Sub-Antarctic summer time series there are two distinct latitudinal peaks at around 47 and 49 degrees. Longitudinally they are most abundant at around 166 to 168 degrees. They are most common at around 650 m in depth. 43% of tows from the summer survey time series contained ribaldo with a mean catch of 3.8 kg per tow (Table A2). The same was seen for the autumn Sub-Antarctic time series but with a slightly higher mean catch per tow of 4.8 kg. 32% of tows from the spring Sub-Antarctic survey caught ribaldo with a mean catch of 1.6 kg per tow. The distribution of ribaldo catch by latitude, longitude, and depth for the spring survey was similar to the summer and autumn surveys.

For the Southland surveys, peak ribaldo catches are at about 47 degrees of latitude, 170 degrees longitude, and 550 m in depth. Just 6% of tows from the Southland time series contained ribaldo with a mean catch of 0.4 kg per tow.

On the Chatham Rise they were most common at around 43 degrees latitude (northern Chatham Rise) and 174 degrees longitude (western Chatham Rise), and around 500 m in depth. 33% of tows from this time series have contained ribaldo with a mean catch of 2.2 kg per tow.

On the west coast South Island ribaldo were found at around 41 to 42 degrees. They were mainly found from 170 to 171 degrees longitude. 40% of tows contained ribaldo with a mean catch of 3.2 kg per tow.

In all survey areas, ribaldo were most common from 500–700 m depth. (Note: the Southland time series did not sample deeper than 650 m).

The largest fish were found around the edges of the deeper parts of the southern Chatham Rise and Campbell Plateau (Figure A2). Small fish (30–40 cm) were most common on the west coast of the South Island.

Relative biomass estimates for the Chatham Rise series were relatively flat, ranging from 313 to 762 t, with CVs of 10–23% (Figure A3). Female biomass was higher than males in most years, with slight exceptions in 2003, 2007, and 2011. More biomass came from the 600–800 m strata than any other, followed by the 400–600 m strata, and almost no ribaldo was recorded from the 200–400 m strata. In 2010, deepwater strata were added (800–1000 and 1000–1300 m) to the Chatham Rise survey time series. These strata contained a similar biomass to the 400–600 m strata. Numbers of ribaldo measured were 73–228 per survey. Most male fish were 40–60 cm and females tended to be larger, at 40–70 cm (Figure A5). Sutton et al. (2010) also found that females tended to be larger than males at corresponding ages on the Chatham Rise. Within each sex there tended to be little difference in length between 400–600 and the 600–800 m strata but deeper than 800 m there were few males less than 40 cm or females less than 50 cm (Figures A8). Males tended to outnumber females at depths greater than 800 m (Figure A8). There was no clear evidence of length class (age) modal progression at any depth. Survey otolith collection was very limited and was only carried out for the study by Sutton et al. (2010). There are insufficient age data to develop a catch-at-age series for ribaldo for this survey series to date.

For the summer Sub-Antarctic surveys, relative biomass estimates were 564–1140 t and CVs were 11–20% (Figure A7). Biomass indices are relatively flat for the time series. Females usually comprised over 90% of the total biomass and most of the biomass was in the 600–800 m strata with little from the 300–600 m strata (Figure A8). In 2000, strata in the depth range 800–1000 m were added to the survey, but little ribaldo biomass was found at this depth compared with the core (300–800 m) strata. Numbers of fish measured were 144–410 per survey. Length frequency sample sizes were low but showed a similar size range to Chatham Rise samples with females growing larger than males (Figure A9). There were fewer smaller fish deeper than 800 m, which is consistent with the Chatham Rise surveys series. Females significantly outnumbered males, often at least 10-fold for scaled up population estimates for the core strata. (Figure A10).

On the autumn Sub-Antarctic time series, relative biomass estimates ranged from 574–1162 t and CVs from 14–21% (Figure A11). The biomass trajectory was relatively flat and only consists of four surveys. Biomass indices were in a similar range to the summer time series, and females comprised the vast majority of the biomass. The 300–600 m strata and 600–800 m strata contribute relatively equal proportions of the biomass whereas the 800–1000 m strata contribute much less (Figure A12). Numbers of fish were 36–269. A similar pattern was seen for length frequencies in the autumn time series as was seen for the summer time series and females outnumbered males, often at least 10-fold for scaled up population estimates (Figures A13 and 14).

The relative biomass estimate of 367 t for the spring Sub-Antarctic survey was lower than any seen in the summer or autumn time series for this area (Figure A15). It is not possible to say whether this represents a seasonal difference in biomass (due possibly, say, to migration) as only one survey was carried out at this time of year. Females were the vast majority of the biomass for this region. A similar length range was also seen for each sex and depth (Figure A16). For these reasons it is unlikely that the low biomass represented a seasonal difference and was probably due to chance.

Four surveys were carried out for the Southland region during autumn. Relative biomass estimates were 23–41 t and had CVs 28–74% (Figure A17). As in the Sub-Antarctic time series, biomass was dominated by females (and was entirely female in 1993 and 1996). Length frequency analysis is of little use because so few fish were caught, although the size range caught was similar to other regions (Figure A18).

Three relative biomass estimates are available for ribaldo from the west coast South Island winter time series (Figure A19). The biomass estimate for the 2000 survey was much higher than for the 2012 and 2013 surveys. As in all areas, female biomass was much greater than male biomass, at a similar ratio to that seen for the Sub-Antarctic and Southland surveys. There were more fish of both sexes less than 30 cm compared with other survey areas and unlike other areas there were almost no males longer than 50 cm (Figure A20).

Gonad development for ribaldo of both sexes by month is shown in Table A3 and Figure A21. In most areas the majority were resting or immature at any time of year. Note however that not all months have examined ribaldo gonad stages (e.g. all months outside of June to August for WCSI, May in all areas). Spawning condition fish were restricted almost entirely to winter months with some recorded in autumn and spring, which is consistent with Cohen (1986). Figure A22 shows evidence of spawning along the northern Chatham Rise, off the west coast South Island around the Hokitika Canyon, and also on the edge of the Challenger Plateau.

No otoliths were collected from ribaldo, apart from four surveys on the Chatham Rise. Therefore it is not possible to develop a catch-at-age series for ribaldo from trawl surveys.

6. FISHERY DEPENDENT OBSERVATIONS

6.1 Observer data

Length and age sampling

The Ministry for Primary Industries observer programme have collected ribaldo length, sex, weight, and female gonad stage from various fisheries since 1990. All tables and figures relating to observer data collected from ribaldo catches are contained in Appendix B (Tables B1–16, Figures B1–17). The “Other” fishery category presented in Appendix B includes all observer data for ribaldo samples from outside the Eastern, Southern or West Coast South Island fisheries defined in Section 2.1 (Figure 2), i.e., RIB 8 (which is of little significance for ribaldo catches) and RIB 1–2, and 9, which are outside the mandate of this study and therefore not discussed in the text below.

6.1.1 Trawl fishery

The total number of trawl tows sampled for ribaldo in decreasing order for each of the focal areas in this study since 1990 was as follows: Eastern fishery (12 518), Southern fishery (8452), and the west coast South Island (6244) (Table B1a). Total observed catch weights of ribaldo for the respective areas are 636, 530, and 797 t (Table B1b). Of tows observed, 676 tows measured ribaldo for length frequency from the Eastern fishery, 373 from the Southern fishery, and 290 from the west coast South Island (Table B2). Overall more tows measured ribaldo for length frequency in the winter months of May, June and July, and the least in the summer months of January and February (Table B3). Sampling before the 1999 fishing year (when ribaldo entered the QMS) was very small in all areas.

Within the Eastern fishery, there was little seasonality in sampling but surprisingly most length frequency samples (fish were measured and sexed) were taken in May and June, when the hoki target fishery had largely moved out of this region and into Cook Strait for the spawning fishery (Table B4a). Most of the observer sampling was actually from target orange roughy fishing which used to include a major winter spawning fishery (late June to early August) on the Chatham Rise. There was also little seasonality in the

Southern fishery, but most length frequency samples were taken in April and May and the least in July and August (Table B4b). Sampling was sporadic by month. For the west coast South Island, virtually all length frequency sampling was from June to September during the main winter spawning period for hoki and hake (Table B4c). No length frequency samples were taken from December to April.

Most fish were measured from the Eastern fishery with a total of 5793 fish, followed by the Southern fishery (4024 fish), and the west coast South Island fishery (3397 fish) (Table B5). Predictably, the numbers of fish measured for each month and area followed a similar pattern to the number of length samples (Tables B6a–c).

Most female ribaldo were examined for gonad stage from the Southern fishery despite fewer length frequency samples and less overall coverage (3624 fish), followed by the west coast South Island fishery (2378 fish), then the Eastern fishery which had the highest number of length frequency samples and individual fish measured (1989 fish) (Table B7). By month, female gonad sampling for each area followed a similar coverage pattern to length frequency sampling (Table B8a–c).

The representativeness of observer sampling of trawl-caught ribaldo was evaluated by plotting the total daily processed catch for each year and area as circles, and overlaying this with the total observed catch for those same cells as crosses (Figure B1, upper plot). If crosses and circles are aligned, then relative to the total amount of observer coverage in a given year, the level of coverage in that cell was correct. However, if over- or under-sampling occurred, the crosses are either larger or smaller than the circles. Overall, all fishery areas were well sampled relative to each other in most years with some slight under-sampling in some years (e.g. Eastern fishery 1993, west coast South Island fishery in 2007) and slight over-sampling in other years (e.g. Southern fishery in 2000, 2009).

Similarly, the representativeness of observed catches sampled for length frequencies was evaluated by plotting the total observer ribaldo catches as circles and overlaying this with the observed catch measured for length frequencies as crosses (Figure B1, lower plot). Overall, length frequency coverage for each fishery area was reasonably good relative to the other areas, although the west coast South Island was slightly oversampled and there were virtually no length frequency measurements taken prior to 1998.

The bubble plots described in the previous two paragraphs were repeated for each fishery area, by year and month to look for seasonality in observer coverage.

Observer coverage by month in the Eastern trawl fishery was patchy over the years with all months receiving years of over- and under-sampling (Figure B2, upper plot). Since entering the QMS in the 1999 fishing year though, overall coverage has been even across most months, with winter months (particularly June and July) being slightly over-sampled relative to the rest of the year. Length frequency sampling by month was also patchy and inconsistent (Figure B2, lower plot). The observed commercial catch was often over-sampled in the winter months, and so was the observed catch sampled for length frequencies.

Observer coverage of the Southern trawl fishery was relatively consistent across months for most years, particularly since 1999, although February was often under-sampled (Figure B3, upper plot). Length frequency sampling of the observed ribaldo catch was patchy (Figure B3, lower plot). Most months in most years were not sampled for length frequency at all. Months that were sampled were often those where the observed catches were small relative to other months in that year, resulting in over-sampling.

On the west coast of the South Island almost all ribaldo was caught in the winter months during the hake and hoki spawning season and consequently this was when almost all of the observer sampling occurred (Figure B4, upper plot). Coverage was reasonably spread across months although June, which appears to be slightly more important than other months for ribaldo catches, was often under-sampled relative to other months. May, while not as important in terms of catch as other months, was often under-sampled. Length frequency sampling of the observed catch was fairly consistent across months since 1999 (Figure B4, lower plot).

Length frequencies

Scaled length frequencies were determined using the ‘catch.at.age’ software (Bull 2002) which scales the length frequency from each catch up to the tow catch, sums over catches in each stratum, scales up to the total stratum catch, and then sums across the strata to yield overall length frequencies. Numbers of ribaldo were estimated from catch weights using the length-weight relationship given in Table 3. Length frequencies for the trawl fishery are plotted in Figures B5–B7.

In the Eastern trawl fishery, the size of fish caught by commercial vessels was similar to that caught in the Chatham Rise summer time series with most males being 40–60 cm and most females being slightly larger at 40–70 cm (Figure B5). Length frequencies were often patchy or unimodal and it is not possible to track length/age cohorts through time. Scaled population numbers were dominated by males in contrast to the trawl surveys where the sex ratio varied across years. This may be due to the species targeted in the tows sampled by observers. In the observer data from the Eastern trawl fishery, almost all of the observed ribaldo catch was taken in the hoki and orange roughy bottom trawl fisheries (171 t and 173 t respectively). The mean observed depth fished in the hoki fishery was 580 m and 858 m in the orange roughy fishery. Trawl survey length frequencies of the Chatham Rise by depth showed that males heavily outnumber females deeper than 800 m (see Section 5.1). Observers measured 1280 male and 1483 female ribaldo from the hoki target fishery and 2482 males and 449 females from the orange roughy target fishery.

Ribaldo from the Southern trawl fishery were of a similar size to those from the Eastern fishery (and from the trawl surveys from the Southland and Sub-Antarctic area) with males 40–60 cm and females 40–70 cm (Figure B6). Scaled population numbers, length frequencies and biomass were dominated by females for the trawl fishery. Observer length frequency sampling was patchy, particularly for males, and it is not possible to track any cohorts through time.

In the west coast South Island fishery, there were more females than males, although the difference was less extreme than for the Southern fishery (Figure B7). The small males (under 30 cm) seen in the trawl survey from this area were not in the observed commercial catch, possibly due to differing selectivity of codend mesh sizes (60 mm in *Tangaroa* trawl surveys, 100 mm for commercial fisheries). Males over 50 cm were relatively common in the observed length frequency distribution but the trawl survey caught virtually no males over 50 cm. The observed length frequency distributions also appear to sample larger females than the trawl surveys with fish over 70 cm being relatively common. As in other areas, length frequency distributions are often patchy, particularly for males, and it is not possible to track any cohorts through time.

6.1.2 Bottom longline fishery

The total number of bottom longline sets sampled for ribaldo in decreasing order for each of the fishery areas since 1990 was: Southern fishery (2237), Eastern fishery (1622), and the west coast South Island (29) (Table B9a). Total observed catch weights of ribaldo for the respective areas were 233, 372, and 1 t. Of sets observed for ribaldo, 112 sets measured ribaldo for length frequency from the Eastern fishery, 327 from the Southern fishery, and none from the west coast South Island (Table B10). Overall more sets measured ribaldo for length frequency in the spring months of October and November, and the least in the months of January to April (Table B11). There was no sampling before 1997 and sampling in 2013 was completely non-existent in all areas. Consequently the bottom longline fishery from the west coast South Island is not discussed any further.

The Eastern fishery showed little seasonality in sampling but most length frequency samples were taken from June to November (Table B12a). No length frequency samples were taken at all in the months of February to April. Although there was little seasonality in the Southern fishery, most length frequency samples were taken in October and November (72% of all sets), Table B12b.

Most fish were measured from the Southern fishery (3208), followed by the Eastern fishery (2016) (Table B13). The numbers of fish measured for each month and area follows a similar pattern to the number of length frequency samples (Tables B14a–b).

More female ribaldo were examined for gonad stage from the Southern fishery (2884) than from the Eastern fishery (697).

The representativeness of observer sampling of ribaldo caught by bottom longline was evaluated by plotting the commercial catch for each year and area as circles, and overlaying this with the observed catch for those same cells as crosses (Figure B8, upper plot). If crosses and circles are aligned, then relative to the total amount of observer coverage in a given year, the level of coverage in that cell was correct. However, if over- or under-sampling occurred, the crosses are either larger or smaller than the circles. The Eastern and Southern fishery areas were well sampled relative to each other but the Southern fishery was often oversampled compared to all fisheries when considering the category ‘Other’ which at times took reasonable catches of ribaldo, including some actual ribaldo targeting, particularly in the mid-1990s (MacGibbon & Hurst 2011). In some years the Eastern fishery was under-sampled or not sampled at all (e.g. 1990–1992, 2000–2001, 2012).

In the same way the representativeness of observed catches sampled for length frequency was evaluated by plotting the total observer ribaldo catches as circles and overlaying this with the observed catch measured for length frequency as crosses (Figure B8, lower plot). The Southern fishery was typically slightly over-sampled for length frequency and the Eastern fishery slightly under-sampled. Length frequency samples were not taken from any region in the 2013 fishing year.

The bubble plots described in the previous two paragraphs were repeated for each fishery area, by year and month to look for seasonality in observer coverage.

Observer coverage by month in the Eastern bottom longline fishery was patchy and inconsistent over the years with sampling in all months ranging from no sampling at all to over sampling relative to other months in a given year. (Figure B9, upper plot). Length frequency sampling by month was also patchy and inconsistent, with none in most months in most years (Figure B9, lower plot).

Observer coverage of the Southern bottom longline fishery was patchy and inconsistent over the years with sampling in all months ranging from no sampling at all to over-sampling relative to other months in a given year. (Figure B10, upper plot). Length frequency sampling was even patchier than overall observation of the ribaldo catch (Figure B10, lower plot). Most months in most years were not sampled for length frequency at all. The months of October and November were heavily sampled from the early to mid-2000s and then barely sampled at all.

Length frequency distributions

Scaled length frequency distributions were determined using the 'catch.at.age' software (Bull 2002), as described earlier for the observed bottom trawl fishery. Numbers of ribaldo were estimated from catch weights using the length-weight relationship given in Table 3. Length frequency distributions for the bottom longline fishery are plotted in Figures B12–B13.

Length frequency plots for the Eastern bottom longline fishery are patchy and inconsistent and it is not possible to track any cohorts through time (Figure B12). Most male ribaldo were 30–50 cm in length and females 40–60 cm, but up to 70 cm in some years.

Length frequency plots for the Southern bottom longline fishery are patchy and no cohorts can be tracked through time. Scaled population numbers were dominated by females just as they were in commercial and research bottom trawls (Figure B13). Females were mainly 40–60 cm, with few larger fish.

Comparison of length frequency distributions between bottom trawl and bottom longline

Observer length frequencies of trawl-caught ribaldo were overlaid with bottom longline-caught ribaldo to investigate any differences in length between methods. The patchy nature of the length frequency distributions from both methods (but particularly for bottom longline) make plots difficult to interpret. In the Eastern fishery fewer small fish were caught by bottom longline compared with bottom trawl although this was not the case every year (Figure B14). This could be due to a number of factors including location but could be due to selectivity of bottom longline hooks e.g. small fish cannot take the larger hooks that bigger fish can. A similar process may have occurred in the Southern fishery although it is even less clear (Figure B15).

Female maturity

Female maturity by month for all years combined is shown in Figure B16 for both bottom trawl and bottom longline combined. The data is comparable to the trawl survey data in that spawning fish are found mainly in the cooler winter months (May to September), in particular June and July.

The location of spawning fish by month for all years combined for both bottom longline and bottom trawl is shown in Figure B17. Location and timing is similar to that for trawl surveys and also demonstrates simultaneous spawning in discrete locations, supporting the hypothesis of four stocks in the New Zealand EEZ and supporting the previous findings of McMillan & Hart (1998) and MacGibbon & Hurst (2011).

6.2 Catch and effort data sources

Catch and effort data were requested from the Ministry for Primary Industries catch-effort database "warehou" as extract 9384. The data consist of all fishing and landing events associated with a set of fishing trips that reported a positive landing of ribaldo in RIB 1–9 (despite the project covering only RIB 3–8) between 1 October 1989 and 30 September 2013. Fishing year is labelled as the most recent year (i.e., the 1998–1999 fishing year is referred to as 1999). The fields from the database tables requested are listed in Table C1.

The estimated catches associated with the fishing events were mainly reported on the general Catch Effort Landing Returns (CELR)and the more detailed Trawl Catch Effort and Processing Return (TCEPR). The green weights associated with landing events were reported on the bottom part of the CELR forms, or where fishing was reported on the TCEPR, on the associated Catch Landing Return

(CLR). From 2004 the Line Catch Effort Return (LCER) form was introduced and most line caught ribaldo was reported on this form. TCEPR forms record tow-by-tow data and summarise the estimated catch for the top five species (by weight) for individual tows. CELR forms summarise daily catches, which are further stratified by statistical area, method of capture, and target species. Trawl vessels less than 28 m in length can use either CELR or TCEPR forms; trawl vessels over 28 m use TCEPR forms. From 1 October 2007, the Trawl Catch Effort Return (TCER) forms replaced the CELR forms for trawlers, and they summarise daily estimated catches for up to the top eight species.

Information on total harvest levels is provided in the plenary report at the resolution of Quota Management Area. The TCEPR forms report catches at the level of individual fishing events, but the fishers are only required to report the top five species in their catch. This led to concerns (e.g., Phillips 2001) that bycatch species such as ribaldo may not be well reported at the fishing event level. The daily processed part of the TCEPR contains information regarding the catch (of all quota species) that were processed that day, and these data are generally believed to provide a more accurate account of low and zero catch observations. However, daily processed catch data suffer from the inability to assign processed catch to a specific day or amount of effort because catch is not always processed on the day it was caught and can be split between days.

In this study, the estimated catch of trawl-caught ribaldo was not well represented in the landings data, but was a significant component of total ribaldo landings (around 63% of landings in the three main fishery areas examined in this study). Most of this was from trawl vessels reporting on TCEPR forms and so daily processed catch was used for this trawl-caught ribaldo. However, around 35 % of the catch in the three fisheries examined here was taken by bottom longline vessels reporting on CELR forms up to 2004 and LCER forms thereafter (50% in the Eastern fishery, which reported the largest ribaldo landings since 1990). For bottom longline, the estimated catch was used as there was a close match with landings by bottom longline vessels. Doing this allows for the fishery to be examined at a finer and more detailed resolution for this method. This necessitated the use of separate grooming algorithms to create groomed data sets for trawl-caught and bottom longline-caught ribaldo. The two grooming processes are discussed below.

6.2.1 Grooming processes for trawl-caught ribaldo

The daily processed catch associated with the fishing events were reported on the Trawl Catch Effort and Processing Return (TCEPR) forms. The greenweights associated with landings were reported on the associated Catch Landing Return (CLR). TCEPR forms record tow-by-tow data and for each day record the catch for all species processed on that day. In some instances the fish processed on a given day was not necessarily caught on that day. For example, target and high value species are likely to be given processing priority which may result in bycatch species such as ribaldo not being processed until the following day. Also, minor bycatch species may not be caught in sufficient numbers to warrant processing them until there is enough to make up whatever units a vessel produces (e.g., box of fillets, head and gut block). There is no way to correct for this, so for the purposes of this study daily processed records were treated as caught on the day of processing. Information on total harvest levels are provided via the QMR/MHR system, but by QMA.

The extracted data were groomed and restratified to derive the datasets required for the characterisation and CPUE analyses using a variation of Starr’s (2003, 2007) data processing method as implemented by Manning et al. (2004), with refinements by Blackwell et al. (2005), and Manning (2007), and further modified for this study to make use of daily processed catch data in place of estimated catch data. The procedure was developed for monitoring bycatch species in the AMP, and was comprehensively described by Manning et al. (2004) and Starr (2007). The major steps used were.

Step 1: The fishing effort, processed catch, and landings data were groomed separately. Outlier values in key variables that failed a range check were corrected using median imputation. This involved replacing missing or outlier values with a median value calculated over some subset of the data. Where grooming failed to find a replacement, all fishing and landing events associated with the trip were excluded.

Step 2: The fishing effort data were collapsed to one record per unique end date and vessel key. For each record, the fields were populated as follows:

FIELD	METHOD
Form type	All TCEPR forms where daily processed data exists.
Trip ID	Most common.
Midday longitude and latitude	Most common.
Start stats area code	If all fishing events for a vessel occur in the same statistical area use that statistical area, otherwise use the most common area.
Target species	Dominant species *(If there is a species targeted for more than 50% of trawl shots in a day, use this species, otherwise leave as 'Mixed').*
Primary method	Dominant method (*If one method is used for more than 50% of trawl shots in a day use that method, otherwise use 'BT+MW'*).
Fishing duration	Sum
Effort depth	Mean
Effort speed	Mean
Effort height	Mean
Effort width	Mean
Bottom depth	Mean
Effort num (defaults to one per tow for TCEPR data)	Sum
Fishing distance	Sum
RIB catch	The daily processed catch for RIB, matched by end date/vessel key in the fishing effort data with processed date/vessel key in the processed catch data. Where a trip lands from more than one QMA, the proportion landed for each is calculated and the RIB catch is multiplied accordingly to get the values for each QMA.

Step 3: The greenweight landings for each fish stock for each trip were allocated to the effort data. The greenweight landings were mapped using the fish stock code and trip ID.

Step 4: The greenweight landings were allocated to the effort data using total processed catch for each date/vessel key as a proportion of the total processed catch for the trip.

6.2.2 Grooming processes for bottom longline-caught ribaldo

The extracted data were groomed and restratified to derive the datasets required for the characterisation and CPUE analyses using a variation of Starr's (2007) data processing method as implemented by Manning et al. (2004), with refinements by Blackwell et al. (2005), and Manning (2007) and further modified for this study. The method allows catch-effort and landings data collected using different form types that record data with different spatial and temporal resolutions to be combined. It also overcomes the main limitation of the CELR and TCEPR reporting systems (frequent non-reporting of species that make up only a minor component of the catch). The procedure was comprehensively described by Manning et al. (2004) and Starr (2007). The major steps are:

Step1: The fishing effort and landings data were first groomed separately. Outlier values in key variables that failed a range check were corrected using median imputation. This involved replacing missing or outlier values with a median value calculated over some subset of the data. Where grooming failed to find a replacement, all fishing and landing events associated with the trip were excluded.

Step 2: The fishing effort within each valid trip was restratified by statistical area, method, and target species.

Step 3: The greenweight landings for each fish stock for each trip were allocated to the effort strata. The greenweight landings were mapped to the effort strata using the relationship between the statistical area for each effort stratum and the statistical areas contained within each fish stock.

Step 4: The greenweight landings were allocated to the effort strata using the total estimated catch in each effort stratum as a proportion of the total estimated catch for the trip. If estimated catches were not recorded for the trip although a landing was recorded for the trip, then the total fishing effort in each effort stratum as a proportion of the total fishing effort for the trip was used to allocate the greenweight landings.

The original intent of the merging process was to allow trip level landings data to be mapped to CELR effort strata. However, many species are captured in fisheries reporting using a combination of form types, and some may use TCEPR forms almost exclusively. The grooming and merging process also allows an evaluation of the amount of catch and effort that is not captured using TCEPR forms at the fishing event level. If significant (as is the case for trawl-caught ribaldo), the best characterisation dataset is likely to be the merged trip level data. But if the amount of lost catch and effort is predictable, minor, and stable over time and area, the estimated catch at the level of the fishing event provides a much more detailed dataset for characterisation and CPUE analysis. In this study daily processed catch data was used for trawl-caught ribaldo (see Section 6.2.1) and was used as the preferred option for this method as it allows for characterization and CPUE analyses to be done at a finer scale than merged data (i.e. day-by-day rather than trip-by-trip). However, bottom longline-caught ribaldo was characterised using fishing event-level data, as estimated catches by this method are well represented and allow for this method (which accounts for significant ribaldo catches) to be analysed for characterisation and CPUE at the finest resolution.

7 DESCRIPTIVE ANALYSIS OF CATCH

Catches by year for the main fishery areas, month, method, and target species are shown in Figure 3. There are four main areas in which ribaldo were caught, with the Eastern fishery being the most important. Overall, catches by month were spread relatively evenly throughout the year with slightly more taken in the winter months, particularly June and July when almost all of the west coast South Island catch was taken (during the hoki and hake spawning season). The vast majority was caught by bottom trawl and bottom longline. Small amounts were also taken by midwater trawl and set net, as well as occasionally by a variety of other methods such as dahn line but in negligible amounts. The species was most often taken in the ling (*Genypterus blacodes*) bottom longline fishery, and the hoki (*Macruronus novaezelandiae*), hake (*Merluccius australis*), and orange roughy (*Hoplostethus atlanticus*) bottom trawl fisheries. Small amounts were also taken in midwater trawls in the hoki and hake fisheries but only when the net was fished on or near the bottom. Targeted fishing of ribaldo was almost entirely by bottom longline with a much smaller amount by set net. Ribaldo may occur in greatest numbers over foul ground, given the prevalence of bottom longline as the main target method. There were also a few records of targeted dahn line fishing for ribaldo.

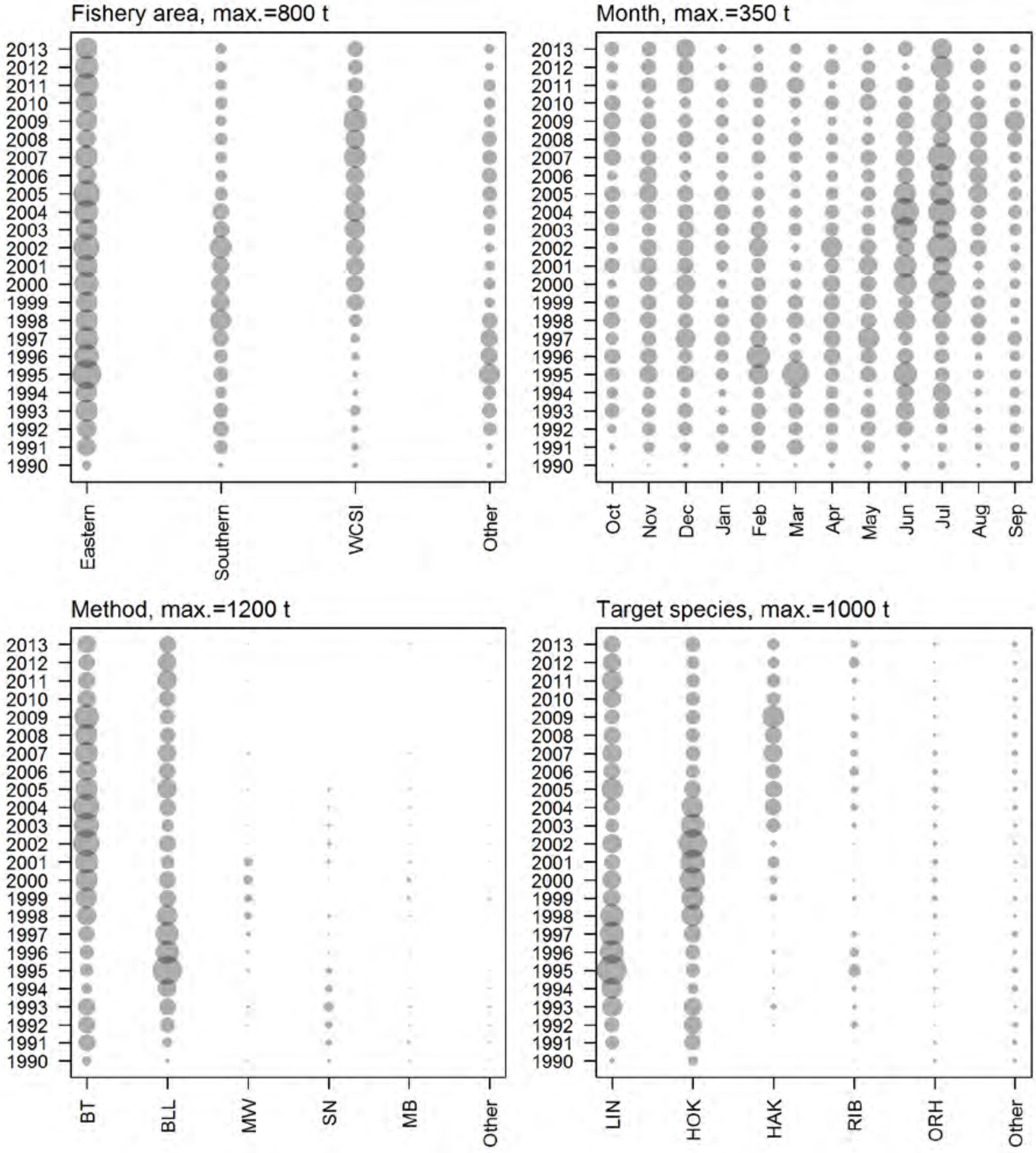

Figure 3: Ribaldo catches (from groomed catch-effort data) by year for the fishery areas identified in this study, month, method, and target species. BT, bottom trawl; BLL, bottom longline; MW, midwater trawl; SN, set net; MB, midwater trawl on the bottom (within 5 m of the sea bed). Circle size is proportional to maximum catch within each panel. See Table C21 for species codes.

7.1 Summary of catches

All tables and figures relating to characterisation of ribaldo fisheries are contained in Appendix C (Tables C1–21, Figures C1–55). Table C21 contains a list of species codes used in this report and includes common and scientific names.

The reported plenary landings, catch-effort landings (un-groomed), and TACCs for RIB 3–8, from 1983–84 to 2012–13, are shown in Figure C1. The ungroomed catch-effort landings in the raw dataset are similar to the reported plenary landings for most years in most QMAs. TACC over runs are usually minor aside from in RIB 6 where over runs of more than 100 t were common before a TACC increase in 2007. With reduced catches, the TACC has not been exceeded since. Major TACC over runs (often more than 200 t) in RIB 7 were also common, even after a TACC increase from 55 to 330 t. Landings have dropped markedly since the 2010 fishing year, however, and have been within limits. Aside from the odd discrepancy in some years, ungroomed and plenary reported landings are similar, or differences are minimal after the grooming process (see Figure C2). One exception to this is in RIB 8. Groomed annual landings here are very low (often less than 250 kg) yet the reported plenary landings are 1 t in most years. This is thought to be due to reported landings being rounded up to the nearest whole tonne, which can appear as a large discrepancy in Figures C1 and C2.

The landings data provide a verified greenweight landed for a fish stock on a trip basis. However, landings data include all final landing events – where a vessel offloads catch to a Licensed Fish Receiver (LFR), and interim landing events, where catch is transferred or retained, and may therefore appear subsequently as a final landing event (SeaFIC 2007). Starr's procedure separates final and interim landings based on the landing destination code, and only landings with destination codes which indicate a final landing are retained (see Table 2 in Starr (2007)).

Table C2 summarises the number of landing events for the major destination codes in the dataset. The weight, number of records, and description of each destination code is given in Table C3. For RIB 3–8 (QMAs covered by this study) the vast majority of ribaldo by individual landing events every year is landed in New Zealand to LFRs (recorded as "L") for both CLR and CELR landing forms. Not surprisingly this code also accounts for the vast majority of greenweight landings in each QMA (Table C3). Greenweight landings coded as "L" account for between 86% and 95% of the total. The second most common landing code for RIB 3–8 is 'R" (retained on board) but along with the other landings codes is minor in comparison to "L" landing events. (Landing events defined as "interim" ("B"; stored as bait, "Q"; holding receptacle on land, and "R"; retained on board,) by Starr (2007) were dropped from the analysis.

The most common processed state for ribaldo in RIB 3–7 is "Dressed" (includes "Dressed", "Headed and Gutted", and "Trunked"), and "Green" in RIB 8 (Figure C3). Some of the larger factory vessels also produce skin-on and skin-off fillets in RIB 3–7, although this is a minor amount compared with dressed. Other processed states are in negligible amounts. The conversion factors for ribaldo have been static since its introduction to the QMS except for changes to skin-on fillets, skin-off fillets, and fish meal. This means that different amounts of greenweight catch are associated with the same amount of processed catch for these three product forms throughout the dataset. Therefore the greenweights were standardised using the most recent conversion factor for those processed states for which there have been changes in conversion factor (skin-on and skin-off fillets and fish meal). This assumes that the changes in conversion factors reflect improving estimates of the actual conversion when processing ribaldo, rather than real changes in processing methodology across the fleet.

The retained landings adjusted for the change of conversion factors were allocated to the effort strata using the relationship between the statistical area for each effort stratum and the statistical areas contained within each fish stock. Difficulties arise with effort strata associated with statistical areas that straddle stock management area boundaries (e.g., Statistical Areas 018, 019, and 027), as the proportion of catches to be allocated to each QMA cannot be determined. This is more of a problem for species such as ribaldo with 10 QMAs and the resulting number of boundary lines that increase the likelihood that a statistical area will straddle QMAs. For example, in RIB 8 every statistical area apart from area 801 straddles the RIB 8 boundaries with RIB 7 and RIB 9. The straddle approach when applied to RIB 8 would result in every statistical area apart from 801 being dropped from the analysis leaving little data. There are two options to address this problem. The first assumes the catches of the straddling statistical area had been taken from a single fish stock if the trip had only reported to that stock, and to exclude all the fishing and landing events from that trip if it had reported to multiple fish stocks ("straddle" method). This may not be ideal if trips often straddle fishstock boundaries. The second option allocates statistical areas to ribaldo fish stocks based on the location of the centroid of each area ("centroid" method). This method was used here and resulted in a closer relationship between reported plenary landings, merged landings, estimated catch, and processed catch in all areas. Details of the retained landings in unmerged and merged datasets and estimated catches in the groomed and merged datasets, by QMA, are given in Table C4.

The reported landings, retained landings in the unmerged and merged datasets, estimated catch, and daily processed trawl catch combined with estimated bottom longline catch are shown in Figure C5. In most QMAs in most years the retained landings, merged landings, and combined daily processed trawl catch and estimated bottom longline catch track each other and the reported QMR landings closely. Estimated catches on their own are frequently significantly lower than the reported QMR landings. This disparity is less severe in RIB 7. The reporting rate, defined to be the annual estimated catch as a proportion of the retained landings in the groomed and merged dataset, was also calculated (Figure C6). The reporting rate is often much lower than one (perfect reporting), and in RIB 3, 5 and 6 is often less than 0.5. The reporting rate in RIB 7 is much better, usually over 0.7, especially since the 1999 fishing year.

Annual estimated catches poorly reflect the harvest reported in the 2012 Plenary. Ribaldo is rarely targeted and almost never on vessels using TCEPR forms, and is caught in relatively small quantities. As such it will rarely feature on the top five species caught on any fishing event. Estimated ribaldo catches in RIB 3–8 capture between 0% (RIB 8) and 100% of the reported plenary landings in any year (Table C4). Within these QMAs overall estimated catch best reflects the reported plenary landings in RIB 4 (64%) and RIB 7 (67%). Slightly more than half the catch in RIB 4 is taken as bycatch in bottom longlines for ling and this accounts for most of the estimated catch. Ribaldo is the second most frequently recorded QMS bycatch species in the ling bottom longline fishery (Anderson, 2014). The reasonably high proportion of estimated catch in the landings for RIB 7 is surprising as ribaldo here is caught almost entirely by bottom trawl and estimated catches of trawl-caught ribaldo in other QMAs are much lower than landings. However, in RIB 7 nearly all of the catch is taken during the hoki and hake winter spawning season. Survey and observer data indicate that ribaldo are also spawning at this time, including at this location (see Sections 5.1 and 6.1). Raw CPUE (see Section 7.2.3) shows that catch rates of more than 300 kg per tow are common here in the hake target fishery whereas in most other target trawl fisheries catch rates are less than 50 kg per tow. This suggests that ribaldo may be aggregated at this time and able to be caught in larger quantities, and hence make it into the top five species recorded in a haul on TCEPR forms more often than in other fishery areas.

Table C5 and Figure C7a–f shows for RIB 3–8 for each fishing year the total number of trips, trips that reported zero estimated catch, and the proportion of trips reporting zero estimated catch, for trips that landed ribaldo for the top three form types. Since the introduction of Lining Catch Effort Return (LCE) forms in the 2004 fishing year, this form type has consistently reported the lowest proportion of trips with no estimated ribaldo catch. No trips reporting on LCE forms have reported zero estimated ribaldo catch in RIB 5 or 6. These proportions are often low for Catch Effort Landings Return (CELR) forms, mainly because these are the same bottom longline vessels targeting ling that switched to LCE forms when they were introduced. Little of the catch on CELR forms was by trawlers under 28 m in length (which reported on this form type until the introduction of Trawl Catch Effort Return forms in the 2008 fishing year). This is indicated by the lack of CELR trips from 2004 (when bottom longline vessels switched to LCE forms). Trawl Catch Effort Processing Return (TCEPR) forms often reported zero estimated catch in a trip, particularly in RIB 3 and RIB 4, and in a number of QMAs prior to the species' introduction into the QMS in the 1999 fishing year (often more than 30% of trips). However, in all QMAs, trips reporting zero processed catch from TCEPR forms is much lower, usually lower than 10% and often less than 5%.

Catches and retained landings by form type for each fishstock are shown in Figures C8a–f. For RIB 3–6 catches are mainly reported on TCEPR forms throughout the study period, and CEL forms until 2003 giving way to LCE forms from 2004. The landings were correspondingly reported on Catch Landing Return (CLR) forms for TCEPR forms, and when introduced LCE catch forms reported landings on CLR forms as well. In RIB 7 most catches are reported on TCEPR forms and corresponding landings on CLR forms, with other form types being minor in comparison. Patchy catches and landings in RIB 8 are mainly reported on CEL forms.

Catches for each statistical area summed for the study period are shown in Figure C9 and to more precise locations (summed to 0.2 degree spatial squares) are shown in Figure C10. For the Eastern fishery, Statistical Area 020 has been the most important, followed by areas 401–403 along the north of the western Chatham Rise, with minor catches widespread across the northern and southern parts of the rest of the region. In the Southern fishery Statistical Area 603 has been the most important, in the central Campbell Plateau in between the Auckland Islands and the Pukaki Rise, followed by area 602 (Auckland Islands) with minor catches along the edges of the Snares Shelf and Campbell Rise. Statistical Area 034 has been the most important area for the west coast South Island fishery around the Hokitika Canyon, and slightly further north in area 035. Minor catches from this region are also taken around the Cook Canyon and along the edge of the Challenger Plateau.

7.2. Fishery summary

Ribaldo catches for the four main fishery areas within the New Zealand EEZ; Eastern, Southern, west coast South Island, and “Other” are given in Table C6a, and for the three main fishery areas identified in this study in Table C6b and Figure C11. Almost half of the catch (45%) has come from the Eastern fishery for the study period of 1990–2013. This has been the most important area in most years since 1990 although in some years the west coast South Island has been of greater importance (e.g. 2008 and 2009). Overall, the west coast South Island has been the second most important area with 21% of the catch for the study period. Catches here were generally a small proportion of the catch prior to the species’ inclusion in the QMS (sometimes less than 10%) but increased after this (most likely due to the requirement to report catches from the 1999 fishing year). Catches from the Southern fishery are the lowest of the three main fishery areas looked at in detail in this study, and have been declining since the mid-2000s. Catches from areas outside the scope of this study have fluctuated from 5% of the total to 29% each year, or 15% of the total catch. When considering the total catch of just the three main fishery areas examined in this study, slightly more than half (53%) has come from the Eastern fishery, and 25% from the west coast South Island, and 23% from the Southern fishery. These are similar to the catches from the entire EEZ as the majority of the catch is taken from these areas (about 85% of the groomed and merged data).

Catches are spread relatively evenly through most of the year (Table C6c, Figure C11, top right plot) with a noticeable increase in June and July, and to a lesser extent in August and September. This is due to the seasonal nature of the west coast South Island fishery where nearly all of the catch is taken in these months.

Throughout the study period the majority of the catch within the main areas examined has been taken by bottom trawl and bottom longline (Table C6d, Figure C11, bottom left plot) with each overall accounting for 59% and 35% respectively. Small amounts have at times been taken by midwater trawling close to or on the sea bed (typically within 5 m) (4% of the catch). Set nets also caught ribaldo in small amounts during the early to mid-1990s and early to mid-2000s with 3% of the total catch from the study period but since 2007 none has been reported from this method. Other fishing methods account for less than 1% of the total ribaldo catch.

Throughout the study period hoki and ling have been the most important target species (Table C6e, Figure C11, bottom right plot) with 41 and 37% of the total catch in the three main areas respectively. The amount of catch taken in the hake target fishery has increased markedly since the 1999 fishing year, at times being the most important target fishery catching ribaldo (e.g. 2007–2009), but catches have declined in the last four years. The hake target fishery has accounted for 17% of the ribaldo catch since 1990. Small amounts are also taken as bycatch in orange roughy target fisheries (2%). Active ribaldo targeting (by bottom longline, 1% of the total) has occurred in some years.

The proportions of ribaldo catches each year by flag nationality are given in Table C7 for RIB 1–9. The majority of the catch is landed by vessels with 'Unknown' flag (but are presumably New Zealand vessels) with 73% of the total for the study period. This is followed by New Zealand flagged vessels with 17%, Korean flagged vessels with 8%, with the remaining 2% being caught by a variety of other foreign flagged vessels. Table C8 and Figure C12 (upper left plot) give the proportion of catches each year by flag nationality for RIB 3–8 only. The proportions are barely different to RIB 1–9 with overall proportions 72%, 15%, 10%, and 2% for Unknown, New Zealand, Korean, and Other flag nationalities respectively. Prior to the species' inclusion in the QMS almost all of the catch was reported by vessels of unknown flag. While the majority still is, the proportion of the catch unknown flag accounted for dropped from 1997 as more New Zealand flagged vessels reported catching ribaldo, perhaps in anticipation of its upcoming inclusion in the QMS. Prior to this New Zealand flagged vessels only reported around 1% of the catch. This was followed soon after by Korean flagged vessels reporting ribaldo catches when previously they reported none (aside from 2% of the catch in 1990).

A wide range of engine power is seen for vessels catching ribaldo (Figure C12, upper right plot). Vessels less than 300 kilowatts (kW) have accounted for a large proportion of the catch throughout the study period with a slight decrease in the late 1990s to the mid-2000s. Vessels of between 300–900 kW were important until the early-2000s but have decreased significantly since then. A large proportion of the catch has been taken by vessels of between 1500 and 2700 kW throughout the period, especially since the late-1990s. Reasonable amounts are taken by vessels between 2700 and 3900 kW. Vessels in excess of 3900 kW report little of the ribaldo catch.

The vast majority of the ribaldo catch has been taken by vessels of between 35 and 65 metres overall length, particularly between 45 and 65 m (Figure C12, bottom left plot). Vessels under 25 m and over 65 m report little of the catch by comparison.

Vessels under 250 gross tonnage (GT) are the single largest tonnage category reporting ribaldo catches (Figure C12, bottom right plot). The bulk of the rest of the catch is by vessels 250–2250 GT. Vessels larger than this catch little ribaldo by comparison, especially since 2007.

7.2.1 Eastern Fishery

By form type, ribaldo in the Eastern fishery were reported mainly on CEL forms before being superseded by LCE forms (Figure C13a). Estimated catches on TCEPR forms appear reasonable until the mid-2000s before decreasing substantially. The daily processed catches from the same form type are generally better than estimated catches as would be expected for what is usually a minor bycatch species in trawl fisheries. While these too decrease in the mid-2000s they are larger than estimated catches, presumably because catches tend to be under- rather than over-estimated.

By method, bottom trawl catches slightly more ribaldo than bottom longline with 50% and 45% respectively (Table C9, Figure C13b lower left plot). However, since 2010 there appears to have been an increase in the proportion taken by bottom longline and a decrease by bottom trawl, with overall catches reasonably steady. While 5% is reported by set net, none has been reported by this method since the 2007 fishing year. Other fishing methods account for less than 1% of the catch.

Catches are made throughout the year for all fishing methods (Figure C13b, upper left plot, Table C10a) with no obvious seasonality. Catches are lowest in August and September (possibly due to vessels targeting hoki moving to spawning grounds at this time) and highest in December, February, June and July. There is also little seasonality in catches when examining bottom trawling only, with similar monthly proportions to the all fishing methods combined (Table C10b, Figure C13c upper left plot). Catches are also made throughout the year for the bottom longline fishery but appear to be highest from May to July (Table C10c, Figure C13d upper left plot). Data from trawl surveys and the Ministry for Primary Industries' observer programme indicate that this is when ribaldo spawn, which may explain higher catch rates for bottom longline vessels at this time of year. The catches of ribaldo by bottom trawl on the Chatham Rise in June and July (when the large hoki fleet is operating elsewhere) may possibly be due to spawning orange roughy target fisheries in the area at that time of year when ribaldo are also spawning.

Catches by statistical area for all fishing methods are given in Figure C13b (upper right plot) and in Table C11a. Catches are widespread across the Eastern fishery but highest in Statistical Areas 020 and 402 with 21 and 19% of the catch respectively. This has been consistent throughout the study period. These areas are continuous with Statistical Areas 021 and 401–403 which are also important areas for ribaldo. Statistical Areas 020 and 402 are also the most important statistical areas when examining bottom trawl data and bottom longline data separately (Tables C11b, C11c, Figure C13c–d upper right plots), as are areas 021 and 401–403. Combined with trawl survey data from the Chatham Rise summer time series (see Section 5.1) this suggests that the north-western Chatham Rise is where ribaldo are most abundant in the Eastern fishery.

Bottom trawl caught ribaldo in this study are reported entirely on TCEPR forms as the daily processed catch had to be used to get sufficient fishing effort data for this method (Figure C13c, middle left plot). For bottom longline data almost all catches were reported on CELR forms until they were superseded by the LCER form (Figure C13d). Very minor bottom longline catches are reported on LTC forms.

Ling and hoki are the two dominant target species for the Eastern fishery when looking at all fishing methods with 52 and 40% of the total catch respectively (Table C12a, Figure C13b, lower right plot). This is followed by orange roughy, ribaldo, and hake (2% each) with the remaining 2% caught in a variety of target species. For bottom trawl-caught ribaldo hoki is the main target species with 89% for the study period, followed by orange roughy (6%) and hake (3%), and the remaining 2% comprising a variety of target species (Table C12b, Figure C13c, middle left plot). For bottom longline caught-ribaldo nearly all of the catch is taken in the ling target fishery (100% in some years) (Table C12c Figure C13d, middle left plot). This has been consistent throughout the study period. At times there has been some active ribaldo targeting by bottom longline with noticeable amounts in 2012 (31%) and 2013 (18%) with 4% of the catch for the total study period being reported as active targeting. The majority of this catch is being taken by just one vessel. A closer examination of this vessel’s fishing practices suggests that this is real targeting of ribaldo rather than targeting of another species for which the vessel has no quota. This vessel had much higher estimated catch of ribaldo when ribaldo was the stated target (mainly 250–1000 kg per set) compared with other target species (usually less than 100 kg). The location of sets where ribaldo was the stated target was usually different to sets were other target species were targeted, and these locations were usually deeper at mainly between 450 and 700 m (never less than 350 m) compared to mainly between 150 and 500 m for other target species. Other vessels that have reported targeting ribaldo have never done so in more than one year of the study period (the only exception being a vessel that reported targeting ribaldo in two separate years). Estimated catches from these other vessels are usually just a few hundred kilograms. Other target species account for just 1% of the total ribaldo catch for bottom longlining.

Catches for the main target species for each year by month and method are shown in Figure C14. Throughout the study period ribaldo catches in the hake target bottom trawl fishery have been patchy with no obvious seasonality. Catches in the hoki target bottom trawl fishery have been spread throughout the year throughout the study period with no real seasonality other than a slight decline in August and September. Catches are also made throughout the year in the orange roughy target bottom trawl fishery but have often been highest in June and July when orange roughy (and ribaldo) are spawning. Catches in the ling target bottom longline fishery are made fairly evenly throughout the year with slightly more taken in June and July, which may be due to possible spawning aggregations of ribaldo at this time. Catches in the ribaldo target bottom longline fishery are patchy and in most years there are no data.

Catches for the main target species for each year by depth and method are shown in Figure C15. In the hake target bottom trawl fishery most catches are made from 350–550 m. Almost all catches in the hoki target bottom trawl fishery occur from 350–750 m, particularly from 450–550 m. Catches in the orange roughy target bottom trawl fishery are mainly made from 750–1050 m, deeper than any other target fishery. For the ling target bottom longline fishery most of the catch is taken between 400 and 600 m, similar to the hoki target bottom trawl fishery (which accounts for most of the ribaldo catch after the ling target bottom longline fishery). Data are not available prior to 2004 as depth information was not recorded on CELR forms (but was from 2004 when bottom longlining started being reported on LCER forms). For what little catch there is for the ribaldo target bottom longline fishery catches are mainly made in depths of 500 to 700 m, more so from 500–600 m.

The proportion of days in which no ribaldo was processed for bottom trawl vessels is shown in Figure C16 (upper plot). For the main target species there has been a relatively flat trend until 1999 followed by a gradually declining trend. The lowest proportion has always been in in the hoki target fishery (apart from in 2011) and is under 0.3 in most years since 1999. The proportion of zero tows is highest in the orange roughy fishery which shows a gradually declining trend, which doesn't drop below 0.6. The trend in the hake target fishery has fluctuated over the study period but is declining overall and has often been under 0.5 since 2000.

The proportion of bottom longline sets reporting no estimated ribaldo catch is shown in Figure C16 (lower plot). From 1992 the proportion of bottom longline sets targeting ling that report no ribaldo bycatch has been relatively steady, usually around 0.5 to 0.6 with a peak of around 0.8 in 2003. Almost no bottom longline sets targeting ribaldo have failed to catch ribaldo.

Unstandardised catch rates of ribaldo for the main target species for bottom trawl are shown in Figure C17. After 1999 the number of tows reporting ribaldo in the hoki target fishery has increased and with it the catch per tow which is usually around 40–50 kg. This increase is most likely to be as a result of improved reporting rather than increased tows resulting in higher ribaldo catch rates. For the orange roughy target fishery, ribaldo catch rates are lower than for hoki. While fluctuating, they are generally between 5 and 15 kg per tow. For the hake target fishery catch per tow has been variable but is usually under 40 kg per tow.

Unstandardised catch rates of ribaldo for the main target species for bottom longline are shown in Figure C18. Catch rates are relatively stable in the ling target fishery throughout the study period and are usually around 0.04–0.06 kg per hook. Catch rates are generally higher in the ribaldo target fishery (up to around 0.2 kg per hook) but are fluctuating.

Daily fishing duration for the main bottom trawl target species catching ribaldo for each year is shown in Figure C19. For hoki tows catching ribaldo, daily fishing duration has been consistent with around 12–18 hours per day spent fishing. For the orange roughy target fishery fishing duration is more variable but generally lower than in the hoki fishery with most fishing duration in most years being around 4–15 hours. For the hake target fishery, daily fishing duration is around 12–20 hours.

Mean daily effort depth for the main bottom trawl target species catching ribaldo for each year is shown in Figure C20. For hoki tows catching ribaldo effort depth has been consistent throughout the period at around 500 m in most years throughout the study. For the orange roughy target fishery, most tows are between 800 and 1000 m in depth. For hake, the depth range is much narrower than is seen for either hoki or orange roughy with most tows being between 400 and 450 m.

Figure C21 shows various other fishing effort variables for the main bottom trawl target species catching ribaldo. Effort width for vessels targeting hoki is mainly 30–40 m, around 18–25 m for vessels targeting orange roughy, and around 35–50 m for vessels targeting hake. Effort height is around 3–4 m for the hoki and hake target fisheries, and 4–6 m for orange roughy. The fastest towing speeds are seen in the hoki target fishery at around 4–4.5 knots, lowest for the orange roughy target fishery at around 3–3.5 knots, and in between for the hake fishery at around 3.8–4.1 knots. Vessels targeting hoki tow for around 75–125 km each day, orange roughy around 10–60 km each day, and hake around 30–125 km each day. Most vessels targeting hoki are around 2000–2500 GT, around 800 to just under 2000 GT for orange roughy vessels, and under 1000 GT for vessels targeting hake, For overall length, most vessels targeting hoki are around 60–65 m, around 40–60 m for orange roughy, and 55–65 m for vessels targeting hake.

Fishing duration for the ling target bottom longline fishery is mainly around 10–24 hours per set (Figure C22). Information for fishing duration for the ribaldo target fishery is only available for 2002 and 2011 where it is usually less than 10 hours for the former and just over 20 hours for the latter.

Effort depth is consistent across years for the ling target fishery at around 400–500 m since 2004 when depth information became available (Figure C23). For the ribaldo target fishery effort depth is slightly deeper with most sets being between 450 and 600 m.

Figure C24 shows various other fishing effort variables for the main bottom longline target species catching ribaldo. Most bottom longline sets have between 4000 and 5000 hooks when targeting ling, and around 3000–4000 hooks when targeting ribaldo. Vessels targeting ling are mainly between 200–600 GT, and around 200 GT for vessels targeting ribaldo. Vessels targeting ling are mainly 35–42 m in length overall, and under 25 m for vessels targeting ribaldo.

There is little change in the location of trawl-caught ribaldo catch within the Eastern fishery since 1990, as recorded on TCEPR forms (Figure C25). Catches are widespread across the northern and southern Chatham Rise but are highest on the north-western Chatham Rise between the 500 and 1000 m contour, and in some years between the Mernoo Bank and the 500 m contour off the east coast of the South Island. Reasonable catches are also made in some years on the north-eastern Chatham Rise.

The location of bottom longline-caught ribaldo in the Eastern fishery is similar to the trawl fishery though not quite as widespread (Figure C26). Highest catches for bottom longline-caught ribaldo are also mainly along the north-western Chatham Rise between the 500 and 1000 m contour and between the Mernoo Bank and the 500 m contour off the east coast of the South Island. There have been some years however where catches have been reasonable on the southern Chatham Rise e.g. the 1995–96 and 2003–04 to 2004–05 fishing years.

Figure C27 shows the location of targeted ribaldo catches (grey squares) and ribaldo bycatch (black squares) for the main target species for bottom trawling and bottom longlining for all years combined. There has been no targeting of ribaldo by trawling in the Eastern fishery. When caught as bycatch of bottom trawling, they are caught over most of the Chatham Rise. When taken as bycatch of hoki, little is taken north east of the Chatham Islands. They are taken from Kaikoura and all along the northern Chatham Rise and around the Chatham Islands when targeting orange roughy, and mainly along the northern Chatham Rise when targeting hake, with some caught west of the Mernoo Bank. When targeted by bottom longline they are mainly caught from the east coast of the South Island from Kaikoura to Mernoo Bank and along the north western Chatham Rise. As bycatch of the ling bottom longline fishery they are caught from Kaikoura across to the Mernoo Bank and virtually the entire Chatham Rise.

7.2.2 Southern fishery

Ribaldo in the Southern fishery are reported mainly on TCEPR forms (Figure C28a). Estimated catches from this form type are similar to daily processed catches, with the latter being slightly higher in some years. Most of the catch reported on CELR forms is bottom longline data rather than from trawling or other methods. As in the Eastern fishery, CELR forms ceased to be used after 2003 and LCER forms were used in their place from 2004 on. A reasonable amount of the catch was reported on CELR forms from the mid-1990s to the early 2000s and then declined and the LCER catches from 2004 are lower than the CELR catches were at this time.

By method, bottom trawl catches more ribaldo than bottom longlining with 66% and 34% respectively (Table C13, Figure C28b lower left plot). The proportion caught by each method has been variable through time however and during the mid- to late-1990s more was caught by bottom longline (up to 82% of the total) than bottom trawl. There has been a declining catch by bottom longline since the early 2000s, and just 2% was taken using this method in 2013. Other fishing methods account for less than 1% of the catch.

Catches are made throughout the year by all fishing methods (Figure C28b, upper left plot, Table C14a) with no obvious seasonality. Months with the highest catch rates are July, November, and December and the lowest in August and September. There is also little seasonality in catches when examining bottom trawling only, with similar monthly proportions to all fishing methods combined (Table C14b, Figure C28c upper left plot). Catches are lowest in August and September, quite likely due to vessels targeting hoki moving out of the area to spawning grounds on the west coast of the South Island and Cook Strait. Catches are also made throughout the year for the bottom longline fishery but are quite patchy with no obvious trend (Table C14c, Figure C28d upper left plot). It does appear though that more is caught in July than any other month with 23% of the total for the study period, with a maximum of 81% in 1993. Data from trawl surveys and the Ministry for Primary Industries observer programme indicate that this is when ribaldo spawn, which may explain higher catch rates for bottom longline vessels at this time of year.

Catches by statistical area for all fishing methods are given in Figure C28b (upper right plot) and in Table C15a. Highest catches in the Southern fishery are located north east of the Auckland Islands, and in some years in the Puysegur trench, and along the Stewart/Snares Shelf. Throughout the study period Statistical Areas 602 and 603 are the most important with 24 and 27% of the catch respectively. Statistical Areas 602 and 603 are also the most important statistical areas when examining bottom trawl data separately (Table C15b, Figure C28c upper right plot). When examining bottom longline data alone there are fewer areas of statistical importance compared with bottom trawling. Statistical Area 030 (Puysegur Trench) is the most important with 25% of the catch for the study period, followed by areas 602–603 and 610 (the area in between the shelf of Auckland Island and the Pukaki Rise). Trawl surveys in this area by *Tangaroa* also indicate that ribaldo are likely to be caught in this area (see Section 5.1 and Appendix A, Figure A1).

Bottom trawl caught ribaldo in this study are reported almost entirely on TCEPR forms (Figure C28c, middle left plot). Catches by trawl vessels reporting on CELR and TCER forms are negligible. For bottom longline data almost all catches were reported on CELR forms until they were superseded by the LCER form (Figure C28d). Very minor bottom longline catches are reported on Lining Trip Catch Effort Return (LTC) forms (a reporting form for vessels under 28 metres in length using lining methods).

Hoki and ling are the two dominant target species for the Southern fishery when looking at all fishing methods with 56 and 41% of the total catch respectively (Table C16a, Figure C28b, lower right plot). The proportion of each has varied somewhat throughout the study period and is related to changes in fishing method (i.e. more is taken as bycatch of hoki when there is more bottom trawling, and more as bycatch of ling when bottom longlining is more common). Only around 3% of the ribaldo catch is taken in other target fisheries. For bottom trawl-caught ribaldo, hoki is the main target species with 85% for the study period, followed by ling (10%) and a variety of other species (5%) (Table C16b, Figure C28c, middle right plot). For bottom longline caught ribaldo, virtually all of the catch is taken in the ling target fishery with other target species accounting for less than 1% of the total ribaldo bottom longline catch (Table C16c, Figure C28d, middle right plot).

Catches for the main target species for each year by month and method are shown in Figure C29. Throughout the study period ribaldo catches in the hoki target bottom trawl fishery have been fairly even throughout the year with a slight decline in August and September. Catches in the ling target bottom trawl fishery have been fairly patchy but appear to start building during July–October and then peak in November and December, declining in January–February. Very little is taken from March to June. Catches in the ling target bottom longline fishery have been patchy and inconsistent throughout the study period, but it appears that catches are slightly higher in July compared with other months.

Catches for the main target species for each year by depth and method are shown in Figure C30. The majority of the catch in the hoki bottom trawl fishery is taken between 450 and 750 m, with 550–650 m being the most important depth within that range. Similarly, in the ling bottom trawl fishery most of the ribaldo catch is taken between 450 and 650 m. For the ling target bottom longline fishery most of the catch is taken between 400 and 700 m, with 500–600 m being the most important within this range. Bottom longline depth data are not available prior to 2004 as depth information was not recorded on CELR forms (but it was from 2004 when bottom longlining started being reported on LCER forms).

The proportion of days in which no ribaldo was processed is shown in Figure C31 (upper plot) for bottom trawl vessels. For the hoki target bottom trawl the proportion declined from 1990 –1998 and has since been relatively flat at around 0.2 in most years. For the ling target bottom trawl fishery the proportion has been more variable but has also declined overall and has been at around 0.2–0.4 since 2006.

The proportion of bottom longline sets reporting no estimated ribaldo catch is shown in Figure C31 (lower plot). Although fluctuating, there has been an overall slightly declining trend in the number of sets targeting ling reporting zero estimated ribaldo catch.

Unstandardised catch rates of ribaldo for the main target species for bottom trawl are shown in Figure C32. For the hoki target bottom trawl fishery the catch per tow of ribaldo has fluctuated but since 1999 has been mainly within 40–80 kg per tow. The number of tows targeting hoki has dropped markedly since the mid-2000s. For the ling target bottom trawl fishery catch rates have also fluctuated but have been relatively stable from 2006 at around 40–60 kg per tow. The number of tows targeting ling has increased since the mid-2000s.

Unstandardised catch rates of ribaldo in the ling target bottom longline fishery are shown in Figure C33. Catch per hook declined slightly during the 1990s but is now relatively stable at about 0.01 kg per hook.

Daily fishing duration for the main bottom trawl target species catching ribaldo for each year are shown in Figure C34. For hoki tows catching ribaldo, daily fishing duration has been consistent with around 12–18 hours per day spent fishing. For the ling target fishery fishing duration has been more variable but generally lower than in the hoki fishery with most fishing duration in most years being around 10–17 hours.

Mean daily effort depth for the main bottom trawl target species catching ribaldo for each year is shown in Figure C35. For hoki tows catching ribaldo effort depth has been consistent throughout the period at around 550 to just over 700 m in most years throughout the study, slightly deeper than is seen for hoki in the Eastern fishery. For the ling target fishery, most tows are between 400 and 600 m in depth, shallower than the hoki target fishery.

Figure C36 shows various other fishing effort variables for the main bottom trawl target species catching ribaldo. For vessels targeting hoki and ling, effort width is mainly 30–40 m, around 3.5–4 m for effort height, and about 4–4.5 knots for effort speed. The similarity in values between the two target species is quite likely due to vessels using the same gear for both species. Distance towed is usually longer for hoki however at about 60–120 km per day compared with 25–90 km per day for ling. Most vessels targeting hoki are around 2000–2500 GT, and those targeting ling 300–2000 GT. Most vessels are around 60–65 m for both target species.

Fishing duration for the ling target bottom longline fishery is mainly around 12–20 hours per set throughout the time period for years where there is available information (Figure C37).

Effort depth is usually around 500–600 m, though some years 400–600 m for the ling target bottom longline fishery (Figure C38). Depth data has only been available since 2004.

Figure C39 shows various other fishing effort variables for the ling target bottom longline fishery for sets catching ribaldo. Most bottom longline sets have between 5000 and 8000 hooks when targeting ling. Vessels are mainly between 500–1000 GT, and are mostly 35–45 m in length overall.

There is little change in the location of trawl-caught ribaldo catch within the Southern fishery since 1990, as recorded on TCEPR forms (Figure C40). Catches are made in the Puysegur Trench, along the Stewart/Snares Shelf, north east of the Auckland Islands (where catches are highest), and at times on the edges of the Campbell and Pukaki Rise.

The location of bottom longline-caught ribaldo in the Eastern fishery is similar to the trawl fishery although not quite as widespread (Figure C41). Puysegur Trench is more important for bottom longlining than it is for trawling, as is the area south east of the Auckland Islands.

Figure C42 shows the location of targeted ribaldo catches (grey squares) and ribaldo bycatch (black squares) for the main target species for bottom trawling and bottom longlining for all years combined. Aside from two successive processing days by one vessel claiming ribaldo as the target there has been no targeting of ribaldo by trawling in the Southern fishery. It is not possible to state whether this would have been real targeting or not but given that it is just two days by one vessel, it is possibly an error. Ribaldo bycatches of hoki targeting by bottom trawling are fairly widespread with concentrations in Puysegur Trench and around the Campbell Plateau. When bycatch of the ling bottom trawl fishery the Puysegur Trench is important but overall catches are not as widespread as for the hoki target fishery, with catches mainly around the Stewart/Snares Shelf and north of the Auckland Islands. There has been no reported targeting of ribaldo by bottom longline in the Southern fishery. Ribaldo bycatches of the ling target bottom longline fishery are widespread across the area.

7.2.3 West coast South Island

Ribaldo in the west coast South Island (WCSI) fishery are reported mainly on TCEPR forms (Figure C43a). Estimated catches from this form type are similar to daily processed catches, with the latter being slightly higher in some years and vice versa. Little catch is reported on CELR forms.

By method, bottom trawl catches the majority of ribaldo in the WCSI fishery with 84% of the total for the study period (Table C17, Figure C43b lower left plot). Midwater trawl has taken 10% of the catch for the study period, but none for the last six fishing years, but at times has accounted for a relatively large proportion, particularly from the mid-1990s to the early-2000s (56% in 1998). Midwater trawling on the bottom (defined as being within 5 m of the sea bed) has accounted for 4% of the catch. Other fishing methods account for just 2% of the catch for the WCSI fishery. Unlike other fishery areas, the bottom longline catch is not significant here.

For all trawling methods, almost all of the catch is taken during the winter to early spring hoki and hake spawning seasons from June to October (94% for the total study period) (Figure C43b, upper left plot, Table C18). This has been consistent through time.

Catches by statistical area for all fishing methods are given in Figure C43b (upper right plot) and in Table C19. Highest catch have consistently been in area 034, followed by area 035 with 76 and 19% of the total respectively.

During the 1990s hoki was the dominant target species for ribaldo catches. Since the early-2000s however, hake has been the dominant target species (more than 90% of the total catch in some years), with hoki in some years accounting for less than 10% of the total, and with 30% for the entire study period. At the time that proportion of the catch from the hake target fishery increased, so did total ribaldo landings. It is quite likely that ribaldo catch rates in the hake target fishery have always been greater than in the hoki fishery, and improved reporting due to the inclusion of the species in the QMS made this apparent. Around 3% of the catch is taken in the orange roughy target fishery (with the proportion declining over time). A variety of other target fisheries comprise the remaining 3% of the ribaldo catch.

Catches for the main target species for each year by month and method are shown in Figure C43c. Catches are almost entirely made from June to October for the hake target fishery. A similar pattern is seen for the hoki target fishery although June and October are less important. Catches in the orange roughy target fishery are made year round in small quantities but with a slight increase in winter months, possibly due to increased effort when orange roughy are spawning, as well as possible increased aggregation of ribaldo due to spawning.

Catches for the main target species by statistical area are shown in Figure C43d. Area 034 is the most important for ribaldo catches for both the hake and hoki target fisheries, followed by area 035. Area 033 is of little importance to these two but is for the orange roughy target fishery, as well as 034.

Catches for the main target species for each year by depth and method are shown in Figure C43e.The majority of the catch in the hake target bottom trawl fishery is taken between 500 and 800 m. In some years, more is taken from 600–700 m than 700–800 m, and vice versa. For the hoki target bottom trawl fishery most ribaldo is taken slightly shallower with most being caught between 400 and 700 m. Ribaldo catches in the orange roughy target bottom trawl fishery are predictably made deeper than in the hake or hoki target fisheries, with most of the catch being made between 800 and 900 m, and at times 900–1000 m.

The proportion of days in which no ribaldo was processed for bottom trawl vessels is shown in Figure C44. For the hake target fishery the proportion is highly variable until 1999 and then fluctuates between 0.2 and 0.5. It has been relatively stable at around 0.2 since 2008. For the hoki target fishery the proportion has been relatively flat throughout the study period, usually around 0.6. The proportion has also been relatively flat in the orange roughy target fishery, usually around 0.1 to 0.2 in most years.

Unstandardised catch rates of ribaldo for the main target species for bottom trawl are shown in Figure C45. For the hake target bottom trawl fishery the catch per tow of ribaldo has fluctuated throughout much of the study period but has been relatively stable since 2006 at around 300–350 kg per tow, the highest catch rate for any target species in any of the areas examined in the study. For the hoki target fishery the catch per tow has also been variable at anywhere between 10 and 100 kg, but is usually around 40–60 kg. For the orange roughy target fishery the catch per tow is again variable but is usually between 10 and 30 kg.

Daily fishing duration for bottom trawl caught ribaldo for the main target species is shown in Figure C46. More time was spent fishing each day before 2007 when targeting hake, with most vessels spending around 17–22 hours per day in most years. From 2007 there appears to be a drop in time spent fishing with most vessels spending around 12–20 hours per day. Most vessels targeting hoki spent less time fishing each day compared with the hake target fishery, usually 12–18 hours until 2007. At this time there was a decrease (also similar to the hake target fishery) to around 6–16 hours per day for most vessels. This may be due to vessels spending less time fishing in order to focus on higher quality product than in the past. Daily fishing duration for the orange roughy target fishery is highly variable; under 5 hours in some years (e.g. 1993), and over 12–20 hours in others (e.g. 1997).

Mean daily effort depth for the main bottom trawl target species catching ribaldo for each year is shown in Figure C47. Most tows for hake are between 600 and 700 m but are sometime more (e.g. over 800 m in 2002). Most hoki tows catching ribaldo are in depths of 450–550 m, with greater depths in the early 1990s (often over 600 m). The depth ranges for the orange roughy target fishery are narrower than seen for hake or hoki, usually around 800–900 m.

Figure C48 shows various other fishing effort variables for the main bottom trawl target species catching ribaldo. Effort width is usually around 40–45 m for vessels targeting hake, 30–45 m for hoki, and around 15–20 m for orange roughy. Effort height is similar for all target species at around 4–5 m. Effort speed is usually slightly under 4 knots when targeting hake, around 4–4.5 knots for hoki, and is slowest for orange roughy at around 2.8–3 knots. Distance towed was greatest for vessels targeting hake with most vessels towing around 40–140 km per day, around 50–120 km per day for hoki, and lowest for orange roughy with 30–75 km per day. Most vessels targeting hake are around 300–800 GT and just under 60 m length overall, 500–2000 GT for hoki and around 60–70 m length overall, and mostly under 500 GT for orange roughy and around 30–40 m length overall.

There is little change in the location of trawl-caught ribaldo catch within the WCSI fishery since 1990, as recorded on TCEPR forms (Figure C49). Catches are concentrated of the west coast of the South Island in a small geographic area, particularly in Cook Canyon.

Figure C50 shows the location of targeted ribaldo catches (grey squares) and ribaldo bycatch (black squares) for the main target species for bottom trawling for all years combined. There are just four recorded instances of ribaldo targeting for the fishery over four successive days by one vessel. This is the same vessel that reported targeting ribaldo in the Southern fishery (see Section 7.2.2) and is also the same trip. Ribaldo bycatches of hake and hoki targeting by bottom trawling are made mainly just outside the 500 m contour, mainly within Statistical Areas 034 and 035, extending further north for hoki into area 036. For the orange roughy target fishery catches are further from land (deeper) than hake or hoki and extend from Statistical Area 033 to 034 and then out to the west along the edge of the Challenger Plateau

Summary

A summary of the main features of each of the focal ribaldo fishery areas from this study is given in Table 4.

Ribaldo is caught throughout most New Zealand waters throughout the year. Within the focal areas of this study almost all (99%) catch is taken as bycatch. When targeted, ribaldo is taken almost exclusively by bottom longline. Targeted fishing of ribaldo by trawl has been restricted to just a handful of tows in 2006 in the WCSI and Southern fisheries. There is no distinct 'ribaldo season' in which the species is targeted. The only area that has a distinct seasonality was the west coast South Island fishery where ribaldo is taken as bycatch in the hake and hoki spawning fisheries from May to September. Outside this period, very little ribaldo is caught on the west coast South Island. Ribaldo catches decline slightly in the Eastern and Southern fisheries during the hoki spawning season as the vessels targeting hoki move out of the area to target spawning hoki on the west coast of the South Island and in Cook Strait.

Most of the ribaldo catch has been taken by bottom trawl (59% for the entire study period) followed by bottom longline (35%). Catches by other methods are minor in comparison. Much of the bottom trawl-caught catch was thought to have been discarded or made into fish meal in the earlier days of the fishery. Hoki and ling have been the most important target species although catches in the hake target fishery have increased dramatically in the last 10 years when previously little or no catch of ribald was reported.

Fishing is spread widely over most of the Eastern fishery but catches are larger in the deeper regions and in the north west of the Chatham Rise. In the southern fishery ribaldo is caught mainly in the deeper areas of the Campbell Plateau region but also in the Puysegur Trench. The WCSI fishery is very localised, mainly in Statistical Areas 034 and 035.

Catches appear to have increased during the early 1990s in the focal areas, remained steady until the early 2000s and have since declined slightly in the Eastern and west coast South Island fisheries, and particularly in the Southern fishery. Bycatch trends are difficult to interpret and CPUE indices need to be standardised. The best candidates for standardised analyses, in terms of catch levels, consistency of effort and areas fished, are identified in Section 8.

Table 4: Summary of features of the main ribaldo fisheries. BLL; bottom longline, BT; bottom trawl. Area definitions are given in Figure 2; species codes in Table C21.

Area	Eastern	Southern	West coast South Island
FMA	3 & 4	5 & 6	7
General characteristics			
Key fishery areas	NW Chatham Rise	NE Auckland Islands	Hokitika Canyon
	East Coast South Island	Puysegur Trench	Cook Canyon
		Snares Shelf	
Key Statistical Areas	020, 402	602, 603	034, 035
Secondary Statistical Areas	021, 401-403	030, 610, 028	033
Season	Year round	Year round	Jun-Oct
Gear type	BT, BLL	BT, BLL	BT
Target species			
Key target species	HOK, LIN	HOK, LIN	HAK, HOK
Secondary target species	ORH, RIB, HAK	ORH	ORH
Target RIB as % of total RIB catch	2	<1	<1

8. CPUE ANALYSES

Table 5: Summary of datasets used in CPUE analyses for the eastern, southern, and west coast South Island bottom trawl ribaldo fisheries (see Appendix D for details, Table C21 for species codes).

Area	Statistical Areas used	Target species	Months	Years
Eastern Model 1	018–023, 052, 401–405, 407–410	HOK (daily processed catch)	Oct–Sep	1999–2013
Southern Model 1	026–028, 030, 504, 602–603, 618	HOK (daily processed catch)	Oct–Sep	1999–2013
WCSI Model 1	034, 035	HAK (daily processed catch)	Jun-Sep	2003–2013
WCSI Model 2	034, 035	HAK (estimated catch)	Jun–Sep	2003–2013

All tables and figures relating to CPUE analyses of the ribaldo are contained in Appendix D (Tables D1–12, Figures D1–39). Species codes are given in Table C21.

The recent standardised CPUE analyses for silver warehou (Parker & Fu 2011) arrow squid, (Hurst et al. 2012), and alfonsino (MacGibbon 2013) considered only TCEPR (tow by tow) data because CELR data were minor. Using tow by tow data allows for the trend in catch rates to be modelled using smaller spatial and temporal scales, and also enables additional factors influencing CPUE to be included (such as tow distance or bottom depth). The previous ribaldo CPUE on ribaldo by MacGibbon & Hurst (2011) carried out on the west coast South Island fishery also considered only tow by tow data but in this study a further analysis has been done on daily processed data as well for this area. Daily processed CPUE analyses have also been done for the eastern and southern hoki target fisheries as ribaldo are rarely recorded in the top five species on TCEPR forms in these areas. Using daily processed catch in a CPUE analyses means that some variables normally available for tow-by-tow analyses can only be used by summing over the day or taking a daily mean, as described in Section 6.2. This is the same approach as was used for the CPUE analyses of lookdown dory by MacGibbon et al. (2012) and pale ghost shark MacGibbon & Fu (2013).

The eastern fishery was considered for standardised CPUE analyses as there were reasonable amounts of ribaldo caught with a mean of 178 tonnes per annum since the 1999 fishing year. The southern fishery was also selected for having reasonable catches each year although they are lower in comparison to the eastern fishery with a mean of 103 tonnes per annum. Also selected was the west coast South Island fishery which has had a mean catch of 126 t since 2003. Years prior to 1999 were not considered as reporting had been somewhat erratic before the species was included in the QMS.

One model was run for each of the eastern and southern fisheries on the bottom trawl hoki target fisheries in each area, all year round. Other divisions of the data set (e.g. other target species or methods) resulted in very small amounts of ribaldo catch. An attempt was made to do a bottom longline, ling target CPUE for the eastern fishery but resulted in just one core vessel for final analyses and so this analysis was abandoned. The bottom longline catch in the southern fishery was too minor to be contemplated, particularly in recent years. Two models were run on the west coast South Island bottom trawl, hake target fishery. Model 1 was run on daily processed data, and model 2 was run on estimated catch data allowing for potentially smaller spatial and temporal scales to be modelled. A summary of the data sets for the various models is given in Table 5.

Estimates of relative year effects in each CPUE model were obtained from a stepwise multiple regression method in which the data were modelled using a lognormal generalised linear model following Dunn (2002). A forward stepwise multiple-regression fitting algorithm (Chambers & Hastie 1991) implemented in the R statistical programming language (R Development Core Team 2013) was used to fit all models. The algorithm generates a final regression model iteratively and used the *fishing year* term as the initial or base model in all cases. The reduction in residual deviance relative to the null deviance, R^2, is calculated for each single term added to the base model. The term that results in the greatest reduction in residual deviance is added to the base model if this would result in an improvement in the residual deviance of more than 1%. The algorithm then repeats this process, updating the model, until no new terms can be added. A stopping rule of 1% change in residual deviance was used as this results in a relatively parsimonious model with moderate explanatory power (Parker & Fu 2011). Alternative stopping rules or error structures were not investigated. Note that while R^2 values are reported they do not necessarily assist in helping choose between the various models.

Variables offered to the eastern and southern models, and model 1 of the west coast South Island were: fishing year, vessel key, month, an indicator variable whether the day's fishing had been done with twin trawl or not, whether the vessel was a twin trawler or not, and statistical area. Also offered to the model as third order polynomials were fishing duration, depth of fishing effort, effort width, effort height, and distance towed. For model 2 of the west coast South Island the variables offered were: fishing year, vessel key, month, and as third order polynomials fishing duration, depth of effort, fishing distance, start latitude, start longitude, and start time. No known twin trawling events made it into the final data set for model 2 so no variables related to twin trawling were offered to the model. In all models, the variable fishing year was forced to be in the model as the relative year effects calculated from the regression coefficients represent the change in CPUE over time. Year indices were standardised to the mean and were presented in canonical form (Francis 1999).

Vessel effects were incorporated into the CPUE standardisations to allow for possible differences in fishing power between vessels. A set of core vessels was defined based on vessels that had at least four years in the fisheries examined and collectively reported about 90% of the catch.

The dependent variable in all models was the log-transformed daily processed catch apart from model 2 of the west coast South Island which used the log-transformed estimated catch as the dependent variable. Model fits were investigated using standard regression diagnostic plots. For each model, a plot of residuals against fitted values and a plot of residuals against quantiles of the standard normal distribution were produced to check for departures from the regression assumptions of homoscedasticity and normality of errors in log-space (i.e., log-normal errors). Influence plots of predictor variables retained by each model were also examined.

8.1 Eastern fishery Model 1

The number of records, proportion of zeros, catch, effort and unstandardised CPUE for the eastern fishery Model 1 are listed in Table D1. Standardised model results are shown in Tables D2–3 and Figures D1–10.

A total of 53 unique vessels (range 17–35 vessels each year) using bottom tows caught 2670 t of ribaldo since 1999, from 24 624 processing days (Table D1). The percentage of zero days was reasonably low, ranging between 14 and 34%. Seventeen core vessels (range 8–16 per year) caught 2399 t of ribaldo, representing 90% of the total catch for the dataset. Ribaldo catches for core vessels ranged from 95–251 t annually, totalling 20 754 processing days with an average of 1384 days per year (Table D1). A number of the core vessels have been present throughout the time period examined and many appear to have similar catches of ribaldo to each other (Figure D1–2).

The variable 'fishing year' is forced into the model as explained in Section 8 above and accounted for less than 0.95% of the residual deviance (Table D2). Five other variables were retained: statistical area, effort depth, month, vessel, and fishing duration, with a total R^2 value of 33.6% for the model.

The CPUE series from the model is presented in Table D3 and Figure D3. The indices are essentially flat throughout the time period. The unstandardised geometric and arithmetic CPUE indices follow each other fairly closely, and are close to the standardised index. A comparison of the standardised CPUE indices with abundance indices from the Chatham Rise trawl surveys (standardised to the mean) is made in Figure D4. Both are relatively flat but the slight increases and decreases in each index do not follow each other very closely and the large spike in the trawl survey index in 2001 is not reflected in the CPUE.

The effects of the selected variables on the expected catch rates of ribaldo for the model are shown in Figures D5–9.

Some statistical areas are predicted to have higher catches than others (Figure D5). Figure D5 also shows that statistical area has had both a positive and negative influence on CPUE throughout the time period although not greatly so, never exceeding 0.1 in any year.

Expected catch rates and influence for effort depth are shown in Figure D6. Expected catch rates follow a bell curve with highest catches expected to come from around 600–800 m. The majority of the effort has been in 475–575 m. Effort depth has had both a positive and negative influence on CPUE throughout the time period although not greatly so, never exceeding 0.1 in any year.

Expected catch rates and influence for month are shown in Figure D7. Expected catch rates are highest in the summer and autumn months and lowest in winter. Effort is spread fairly uniformly throughout the year apart from a decrease from July to September. Month has also had both a positive and negative influence on CPUE throughout the time period although not greatly so, never exceeding 0.1 in any year.

Expected catch rates and influence for vessel are shown in Figure D8. Effort has been fairly uniform for much of the fleet, with a few vessels putting in less effort than others. A few vessels have higher expected catch rates than others but are similar overall. The overall influence of vessel on CPUE has not been particularly strong.

Expected catch rates and influence for fishing duration are shown in Figure D9. Longer fishing durations are associated with higher expected catch rates. The overall influence of fishing duration on CPUE has not been particularly strong.

The diagnostics plots for the model are satisfactory (Figure D10).

8.2 Southern fishery Model 1

The number of records, proportion of zeros, catch, effort and unstandardised CPUE for the southern fishery Model 1 are listed in Table D4. Standardised model results are shown in Table D5–6 and Figures D11–19.

A total of 42 unique vessels (range 8–27 vessels each year) using bottom tows caught 1547 t of ribaldo since 1999, from 9990 processing days (Table D4). The percentage of zero days was reasonably low, ranging between 12 and 26%. Ten core vessels (range 3–10 per year) caught 1386 t of ribaldo, representing 90% of the total catch for the dataset. Ribaldo catches for core vessels ranged from 24–246 t annually, totalling 7887 processing days with an average of 526 days per year (Table D4). A number of the core vessels have been present throughout much of the time period examined and many appear to have similar catches of ribaldo to each other (Figure D11–12).

The variable 'fishing year' is forced into the model as explained in Section 8 above and accounted for less than 2.7% of the residual deviance (Table D5). Four other variables were retained: effort depth, month, statistical area, and vessel, with a total R^2 value of 29.4% for the model.

The CPUE series from the model is presented in Table D6 and Figure D13. The indices are relatively flat throughout the time period. The unstandardised geometric and arithmetic CPUE indices follow each other closely, and are close to the standardised index. A comparison of the standardised CPUE indices with abundance indices from the summer Sub-Antarctic trawl survey (standardised to the mean) is made in Figure D14. Both are relatively flat and follow a similar pattern to one another.

The effects of the selected variables on the expected catch rates of ribaldo for the model are shown in Figures D15–18.

Ribaldo catch is predicted to increase with depth up to around 800 m after which it declines (Figure D15). The influence of depth on the model has been both positive (1999–2002) and negative (from 2004). The negative influence was particularly strong from 2006–2009 when there was a decline in fishing effort in the 650–690 m depth range.

Expected catch rates and influence for month are shown in Figure D16. As was seen for month in the eastern model expected catch rates are highest in the summer and autumn months and lowest in winter, and effort is spread fairly uniformly throughout the year apart from a decrease from July to September. The influence of month on the model was strong in 2006 and 2007 when there was an increase in fishing effort in months that are predicted to have lower catches of ribaldo.

Expected catch rates and influence for statistical area are shown in Figure D17. Expected catch rates are relatively similar between statistical areas but is lowest for area 026 and highest for area 030. The influence of statistical area on the model has been both positive and negative throughout the time period but never exceeds 0.1 in any year.

Expected catch rates and influence for vessel are shown in Figure D18. Some vessels are predicted to have higher catch rates of ribaldo than others but not greatly so. The effect of vessel on the model has been both positive and negative throughout the time period, but not strongly. The diagnostics plots for the model are satisfactory (Figure D19).

8.3 West coast South Island fishery Model 1

The number of records, proportion of zeros, catch, effort and unstandardised CPUE for the west coast South Island fishery Model 1 are listed in Table D7. Standardised model results are shown in Table D8–9 and Figures D20–28.

A total of 28 unique vessels (range 9–19 vessels each year) using bottom tows caught 1383 t of ribaldo since 2003, from 2415 processing days (Table D7). The percentage of zero days was reasonably low, ranging between 2 and 9%. Nine core vessels (range 6–9 per year) caught 1231 t of ribaldo, representing 89% of the total catch for the dataset. Ribaldo catches for core vessels ranged from 35–250 t annually, totalling 1961 processing days with an average of 178 days per year (Table D7). A number of vessels appear to catch more than others and a number of the core vessels have been present throughout much of the time period examined (Figure D20–21).

The variable 'fishing year' is forced into the model as explained in Section 8 above and accounted for less than 0.01% of the residual deviance (Table D8). Four other variables were retained: effort depth, vessel, month, and distance towed, with a total R^2 value of 38.7% for the model.

The CPUE series from the model is presented in Table D9 and Figure D22. The indices are relatively flat throughout the time period though possibly declining slightly. The unstandardised geometric and arithmetic CPUE indices follow each other closely, and are similar to the standardised index. A comparison of the standardised CPUE indices with abundance indices from the west coast South Island middle depth trawl survey (standardised to the mean) is made in Figure D23. There are only two indices from the trawl survey that fall within the period covered by the model so it is not possible to use this trawl survey to validate the CPUE model.

The effects of the selected variables on the expected catch rates of ribaldo for the model are shown in Figures D24–27.

Ribaldo catch is predicted to increase with depth up to around 750 m after which it declines (Figure D24). The influence of depth on the model was strongly positive from 2003–2009 when there was more effort in depths greater than 700 m. After this, the influence of depth on the model was relatively negative when there was a shift to more effort at shallower depths which are predicted to have lower catch rates.

Three vessels in particular are expected to have higher catch rates than the other six core vessels, which are similar to one another (Figure D25). The influence of vessel on the model is strong in 2003 and 2004 when there was less effort on the part of the vessels predicted to have highest catch rates and more by those predicted to have lower catch rates. For most of the rest of the period the influence of vessel on the model has been less than 0.1.

Expected catch rates and influence for month are shown in Figure D26. Catch rates are expected to be highest in June and September, and lowest in July and August. The effect of month on the model has not been very influential during the period examined, never exceeding 0.1.

Expected catch rates of ribaldo increase slowly with distance towed up to around 130 nautical miles after which they decrease slowly (Figure D27). The influence of distance towed on the model has not been very strong, never exceeding 0.1.

The diagnostics plots for the model are satisfactory (Figure D28).

8.4 West coast South Island fishery Model 2

The number of records, proportion of zeros, catch, effort and unstandardised CPUE for the west coast South Island fishery Model 2 are listed in Table D10. Standardised model results are shown in Table D11–12 and Figures D29–38.

A total of 29 unique vessels (range 11–20 vessels each year) using bottom tows caught an estimated 1298 t of ribaldo since 2003, from 6674 individual tows (Table D10). The percentage of zero tows was relatively high, ranging between 31 and 55%. Ten core vessels (range 7–10 per year) caught an estimated 1097 t of ribaldo, representing 85% of the total catch for the dataset. Ribaldo catches for core vessels ranged from 47–170 t annually, totalling 4642 individual tows with an average of 422 tows per year (Table D10). A number of vessels appear to catch more than others and a number of the core vessels have been present throughout much of the time period examined (Figure D29–30).

The variable ‘fishing year’ is forced into the model as explained in Section 8 above and accounted for less than 0.01% of the residual deviance (Table D11). Five other variables were retained: vessel, effort depth, fishing duration, month, and effort width, with a total R^2 value of 37.9% for the model.

The CPUE series from the model is presented in Table D12 and Figure D31. The indices are relatively flat throughout the time period though there is a possible slight decline in the last few years. The unstandardised geometric and arithmetic CPUE indices follow each other closely, and are similar to the standardised index. A comparison of the standardised CPUE indices with abundance indices from the west coast South Island middle depth trawl survey (standardised to the mean) is made in Figure D32. There are only two indices from the trawl survey that fall within the period covered by the model so it is not possible to use this trawl survey to validate the CPUE model.

The effects of the selected variables on the expected catch rates of ribaldo for the model are shown in Figures D33–37.

A number of vessels are predicted to have higher catch rates of ribaldo than others (Figure D33). The influence vessel has had on the model was strongly negative in the first four years (particularly in 2005).

Ribaldo catch is predicted to increase with depth up to around 850 m (Figure D34). The influence of depth on the model was strongly positive from 2003–2005 when there was more effort in depths greater than 730 m. After this, the influence of depth on the model was not strong.

Expected catch rates of ribaldo increase slowly with fishing duration (Figure D35). The influence of fishing duration on the model was relatively strong (negatively) in 2003 but became less negative through time until becoming weakly positive from 2008 as longer fishing durations became more common. After 2003, the influence of fishing duration on the model has never exceeded 0.1.

Expected catch rates and influence for month are shown in Figure D36 and show the same expected pattern as they did in model 1 of the west coast South Island. Catch rates are expected to be highest in June and September, and lowest in July and August. The effect of month on the model has not been very influential during the period examined, never exceeding 0.1.

The expected catch rates of effort width are shown in Figure D37 and are expected to decrease with increasing effort width. The influence of effort width on the model was strongly positive in 2005 and weakly negative since 2010.

The diagnostics plots for the model are satisfactory (Figure D38).

Comparison of west coast South Island CPUE models

A comparison of CPUE models 1 and 2 for the west coast South Island is made in Figure D39. There is some agreement between the models with both tracking each other for some years (e.g. 2003–2008) after which there is less agreement. However, overall both indices are generally rather flat though there is a possible slight decline since 2008.

9. SUMMARY AND RECOMMENDATIONS

9.1 Commercial and research data

Known commercial harvesting of ribaldo has been occurring since the 1970s. Catches are at low levels compared with many other middle depth species such as hoki, hake, and ling, the three target species in which ribaldo is most commonly caught as bycatch. Target fishing of ribaldo is rare although some does occur in the Eastern fishery using bottom longlines. No research surveys have been optimised to survey ribaldo and observer sampling from the commercial fishery is low and variable. No otoliths have been collected by observers, although this is proposed triennially under the Ministry of Fisheries 10 year Research Plan for Deepwater Fisheries. Nevertheless, observer samples have indicated that there are major differences in sex ratios and length frequencies by area that may be relevant to stock structure and need further investigation on an EEZ-wide basis. Increased sampling by observers is required on both bottom longliners and trawlers to determine relative selectivity.

Most aspects of ribaldo biology are poorly understood both in New Zealand and worldwide. The ageing validation work by Sutton et al. (2010) provides a basis for further ageing work if fish can be sampled in sufficient numbers in each fishery area to develop a catch-at-age series. MacGibbon & Hurst (2011) recommended that sampling of otoliths should be annual until a time series is established and the ability to monitor year class strength is determined. This recommendation has not been implemented as yet.

The stock structure of ribaldo remains uncertain. This characterisation of RIB 3–8 and the characterisation of the four main fishery areas by MacGibbon & Hurst followed the approach suggested by McMillan & Hart (1998). However there is no evidence to suggest that the current ten management areas are inappropriate for management of ribaldo. It is widely distributed throughout New Zealand waters and evidence of spawning has been found in all of the key fishery areas.

9.2 Observer Programme sampling

Ribaldo sampling by observers in the focal areas is relatively low. Just 6 % of catch in the Eastern fishery has been observed, 12 % of the Southern fishery catch, and 17% of the WCSI catch. Sampling has been highly variable across years. Most of these observations have been of the catch and have not investigated individual fish for biological data such as sex, length, gonad maturity etc.

9.3 Status of the stocks

The status of the stocks is not known. Chatham Rise and Sub-Antarctic middle-depth surveys carried out by *Tangaroa* since 1991 suggest that biomass trends in these areas have been relatively flat as do the corresponding CPUE models for these areas. The west coast South Island CPUE models are both relatively flat as well, and there is not enough of a time series from the corresponding survey to use as validation for this model. One of the main shortcomings of the CPUE models is that the indices in all models are essentially flat (as are the trawl survey indices). There are no age data for any of these fisheries that would enable monitoring of year class strength. Observed differences in sex ratios are difficult to interpret in relation to stock structure. Length frequency data from the three focal areas from trawl surveys and the Ministry for Primary Industries observer programme show no evidence of a truncation in length.

There are currently insufficient data with which to develop stock assessment models but this may be possible in the future with increased sampling by observers, collection of otoliths to develop a catch-at-age history, and more detailed data collection of ribaldo on trawl surveys. However, it does not appear that there is any reason for any immediate concern over the status of the stocks.

9.4 Future data needs and research requirements

It is possible that CPUE may provide an index of abundance, as do Chatham Rise and Sub-Antarctic bottom trawl surveys carried out in summer. However more data are required in order to develop a quantitative stock assessment in the future; the data collection needs for ribaldo are as follows:

1. Increased observer coverage and more detailed data collection to improve knowledge of ribaldo biology from the key fishery areas.
2. Continuation of middle depth west coast South Island trawl surveys in order to expand knowledge of ribaldo biology from this area, as well as the Chatham Rise and Sub-Antarctic trawl surveys.
3. Optimised length and otolith sampling and development of catch-at-age for key fishing areas to enhance knowledge of recruitment and age structure of the fishery. Ribaldo ageing has been validated, making it possible to develop a catch-at-age time series. More information on spawning areas and seasons and sex ratios will also be helpful to better determine stock structure.

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APPENDIX A: TRAWL SURVEY SUMMARIES

Table A1: Biomass indices (t) and coefficients of variation (CV) of ribaldo from *Tangaroa* trawl surveys (Assumptions: areal availability, vertical availability and vulnerability = 1).

	Trip code	Date	Biomass (t)	% CV
Chatham Rise				
	TAN9106	Dec 91–Feb 92	476	11
	TAN9212	Dec 92–Feb 93	346	17
	TAN9401	Jan 94	654	10
	TAN9501	Jan–Feb 95	399	19
	TAN9601	Dec 95–Jan 96	470	18
	TAN9701	Jan–Jan 97	333	21
	TAN9801	Jan–Jan 98	505	14
	TAN9901	Jan–Jan 99	395	18
	TAN0001	Dec 99–Jan 00	351	23
	TAN0101	Dec 00–Jan 01	762	18
	TAN0201	Dec 01–Jan 02	343	15
	TAN0301	Dec 02–Jan 03	455	18
	TAN0401	Dec 03–Jan 04	535	16
	TAN0501	Dec 04–Jan 05	491	14
	TAN0601	Dec 05–Jan 06	313	17
	TAN0701	Dec 06–Jan 07	343	14
	TAN0801	Dec 07–Jan 08	388	16
	TAN0901	Dec 08–Jan 09	463	13
	TAN1001	Jan 10	416	20
	TAN1101	Jan 11	396	17
	TAN1201	Jan 12	469	15
	TAN1301	Jan 13	428	16
	TAN1401	Jan 14	477	18

Table A1 continued

	Trip code	Date	Biomass (t)	% CV
Sub-Antarctic (summer)				
	TAN9105	Nov–Dec 91	1140	11
	TAN9211	Nov–Dec 92	564	20
	TAN9310	Nov–Dec 93	1057	14
	TAN0012	Nov–Dec 00	873	14
	TAN0118	Nov–Dec 01	1117	15
	TAN0219	Nov–Dec 02	656	18
	TAN0317	Nov–Dec 03	653	19
	TAN0414	Nov–Dec 04	951	16
	TAN0515	Nov–Dec 05	721	15
	TAN0617	Nov–Dec 06	780	16
	TAN0714	Nov–Dec 07	1062	14
	TAN0813	Nov–Dec 08	658	18
	TAN0911	Nov–Dec 09	1056	13
	TAN1117	Nov–Dec 11	1017	17
	TAN1215	Nov–Dec 12	787	17
Sub-Antarctic (autumn)				
	TAN9204	Apr–May 92	574	21
	TAN9304	May–Jun 93	1162	15
	TAN9605	Mar–Apr 96	989	17
	TAN9805	Apr–May 98	837	14
Sub-Antarctic (spring)				
	TAN9209	Sep–Oct 92	367	16
Southland (autumn)				
	TAN9301	Feb–Mar 93	24	38

TAN9402	Feb–Mar 94	41	28

Table A1 continued

Trip code	Date	Biomass (t)	% CV
TAN9502	Feb–Mar 95	23	32
TAN9604	Feb–Mar 96	29	74
West Coast South Island			
TAN0007	Jun–Aug 00	104	26
TAN1210	Jul–Aug 12	140	22
TAN1308	Jul–Aug 13	57	26

Table A2: Trawl survey summaries for ribaldo. Catch values are in kilograms.

Survey	Min catch	Median catch	Mean catch	Max catch	No. of tows	No. of tows with RIB	% tows with RIB
Chatham Rise (summer)							
TAN9106	0	0	3	46.7	184	80	44
TAN9212	0	0	1.5	41.3	194	50	26
TAN9401	0	0	3.1	24.9	165	58	35
TAN9501	0	0	1.7	21.1	122	40	33
TAN9601	0	0	1.9	18.8	89	29	33
TAN9701	0	0	1.7	30.1	103	25	24
TAN9801	0	0	2	21.3	87	29	33
TAN9901	0	0	1.6	16.3	100	28	28
TAN0001	0	0	1.2	19.8	128	29	23
TAN0101	0	0	2.9	27.6	119	43	36
TAN0201	0	0	1.8	18.9	107	35	33
TAN0301	0	0	1.8	16.3	115	33	29
TAN0401	0	0	2.3	29.2	110	40	36
TAN0501	0	0	2.5	34.4	106	33	31
TAN0601	0	0	1.5	18.3	96	24	25
TAN0701	0	0	1.8	18	101	28	28
TAN0801	0	0	1.8	19.3	101	34	34
TAN0901	0	0	2.4	31.3	108	43	40
TAN1001	0	0	2.5	48.2	91	28	31
TAN1101	0	0	2.5	26.2	90	30	33
TAN1201	0	0	2.5	37.9	100	38	38
TAN1301	0	0	2.8	30.7	94	33	35
TAN1401	0	0	2.9	38.4	90	35	39
All	0	0	2.2	48.2	2600	845	33

Table A2 continued

Survey	Min catch	Median catch	Mean catch	Max catch	No. of tows	No. of tows with RIB	% tows with RIB
Sub-Antarctic (summer)							
TAN9105	0	0	3.9	44.2	154	71	46
TAN9211	0	0	2.7	43	155	49	32
TAN9310	0	0	5.3	77.3	134	61	46
TAN0012	0	0.25	3.4	18.7	84	42	50
TAN0118	0	0	4.9	51	85	37	44
TAN0219	0	0	3.1	39.4	85	33	39
TAN0317	0	0	2.6	22.6	69	28	41
TAN0414	0	0	3.9	35	78	32	41
TAN0515	0	0	4.7	40.9	77	35	46
TAN0617	0	1.1	3.7	29.9	75	40	53
TAN0714	0	0	3.3	20.5	80	33	41
TAN0813	0	0	3.1	21.2	75	31	41
TAN0911	0	0	4.3	34.4	74	36	49
TAN1117	0	0	3.7	29.4	80	35	44
TAN1215	0	0	3.7	43.1	80	38	48
All	0	0	3.8	77.3	1385	601	43
Sub-Antarctic (autumn)							
TAN9204	0	0	3.9	130.9	90	34	38
TAN9304	0	0	3.8	40.8	100	42	42
TAN9605	0	0	6.4	190	79	34	43
TAN9805	0	0.4	5.9	94.4	58	29	50
All	0	0	4.8	190	327	139	43
Sub-Antarctic (spring)							
TAN9209	0	0	1.6	31.6	101	32	32
All	0	0	1.6	31.6	101	32	32
Southland (autumn)							
TAN9301	0	0	0.4	15.4	113	8	7
TAN9402	0	0	0.6	17.1	129	11	9
TAN9502	0	0	0.3	8.1	150	10	7
TAN9604	0	0	0.3	23.1	124	4	3
All	0	0	0.4	23.1	516	33	6
West Coast South Island (winter)							
TAN0007	0	0	7.1	47.6	47	23	49
TAN1210	0	0	2	18.7	51	16	31
TAN1308	0	0	1	10.9	54	22	41
All	0	0	3.2	47.6	152	61	40

Table A3: Number and proportions of male and female ribaldo gonad stages by month for all areas from all trawl surveys in *trawl db* with ribaldo gonad stage data. –, no data.

	Month											
Stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Male (number observed)												
1	279	1	100	64	–	91	114	100	2	3	34	384
2	50	–	14	14	–	155	281	6	–	–	4	54
3	1	–	1	–	–	31	194	42	–	–	1	1
4	–	–	–	–	–	–	85	25	–	–	–	–
5	5	–	–	–	–	–	5	38	–	–	1	25
Male (proportion observed)												
1	0.83	1.00	0.87	0.82	–	0.33	0.17	0.47	1.00	1.00	0.85	0.83
2	0.15	–	0.12	0.18	–	0.56	0.41	0.03	–	–	0.10	0.12
3	<0.01	–	0.01	–	–	0.11	0.29	0.20	–	–	0.03	0.00
4	–	–	–	–	–	–	0.13	0.12	–	–	–	–
5	0.01	–	–	–	–	–	0.01	0.18	–	–	0.03	0.05
Female (number observed)												
1	206	9	44	120	–	126	149	310	6	19	179	1217
2	2	–	49	89	–	48	88	11	–	–	5	10
3	–	–	–	1	–	4	22	–	–	–	–	1
4	–	–	1	–	–	–	16	4	–	–	–	–
5	43	2	3	5	–	11	35	211	–	–	13	99
Female (proportion observed)												
1	0.82	0.82	0.45	0.56	–	0.67	0.48	0.58	1.00	1.00	0.91	0.92
2	0.01	–	0.51	0.41	–	0.25	0.28	0.02	–	–	0.03	0.01
3	–	–	–	0.00	–	0.02	0.07	–	–	–	–	0.00
4	–	–	0.01	–	–	–	0.05	0.01	–	–	–	–
5	0.17	0.18	0.03	0.02	–	0.06	0.11	0.39	–	–	0.07	0.07

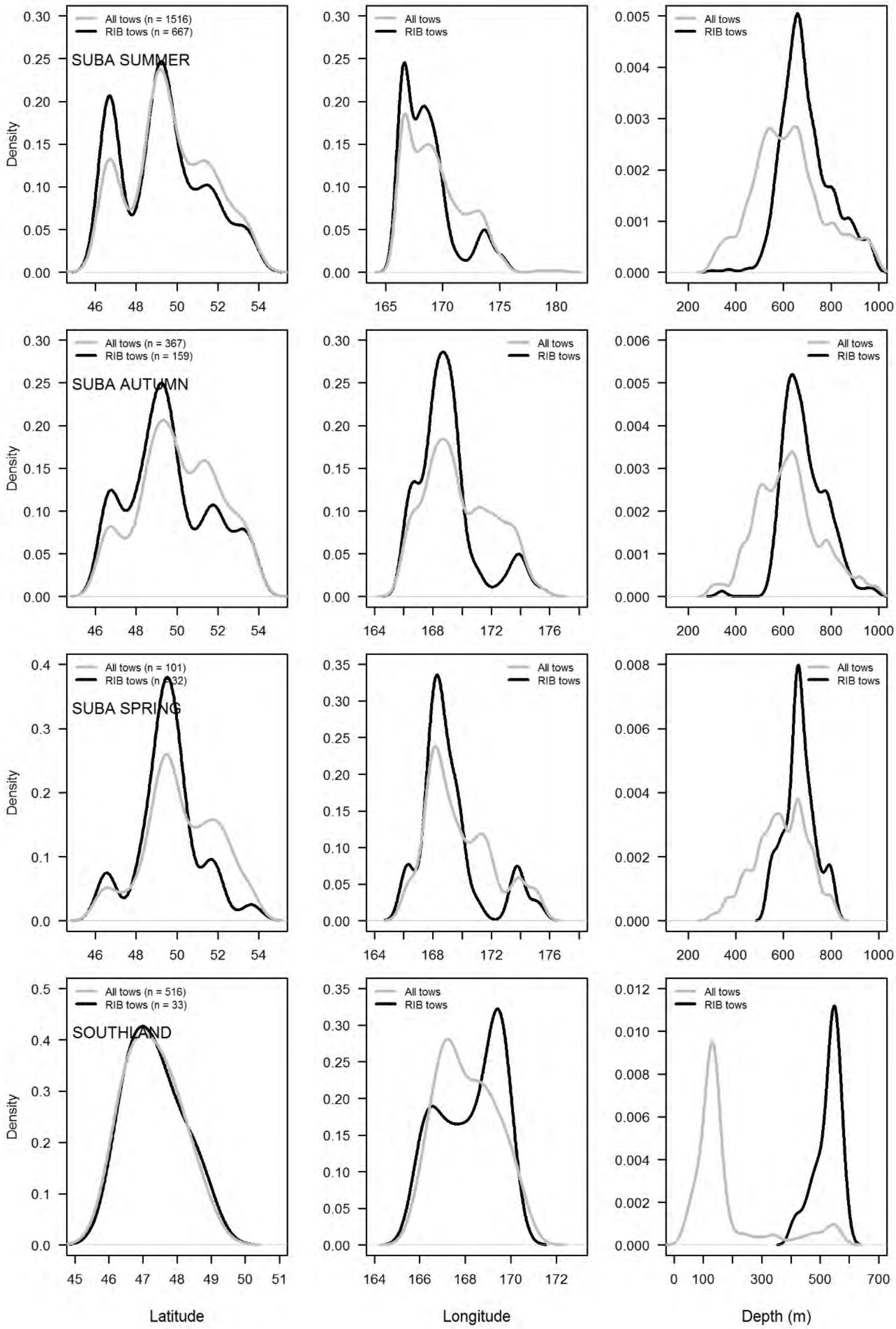


Figure A1: Distribution of *Tangaroa* trawl survey tows with catches of ribaldo, for the Sub-Antarctic summer surveys (SUBA), and Southland (SOUTHLAND) late summer surveys, by latitude, longitude, and maximum depth of tow.

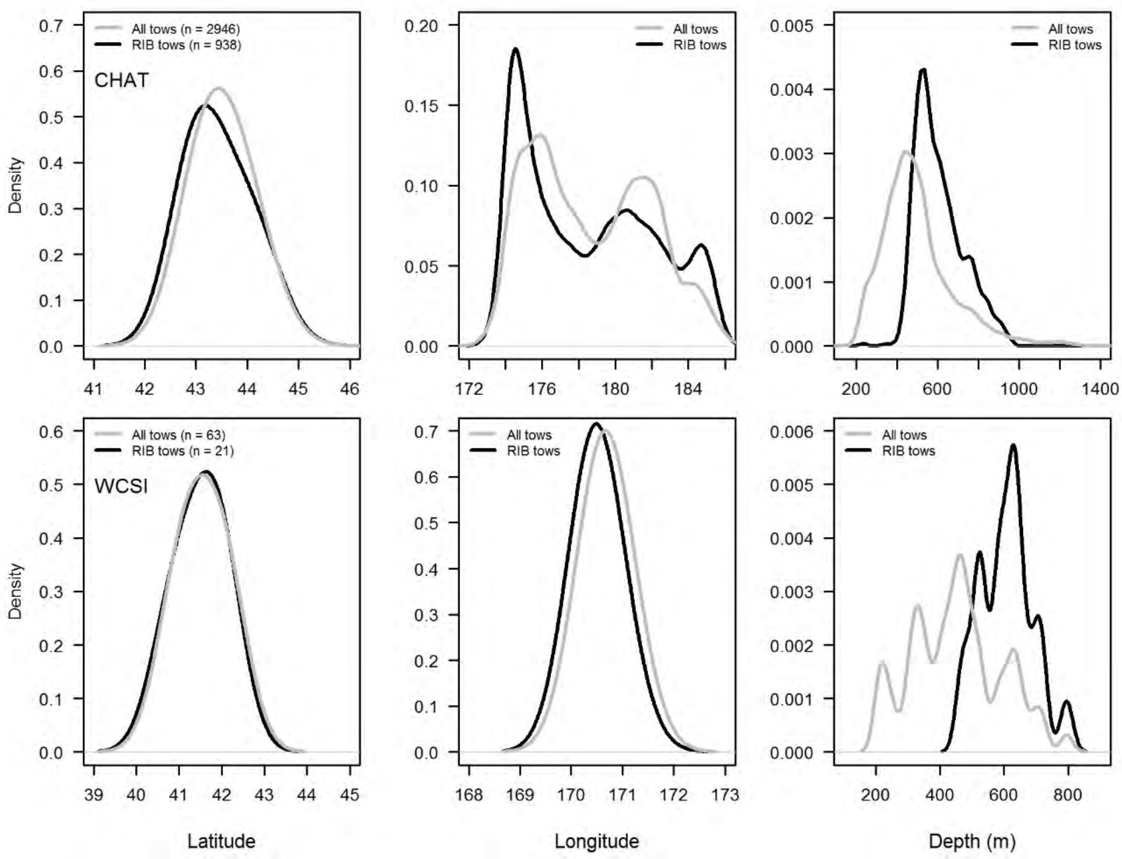


Figure A1 ctd.: Distribution of *Tangaroa* trawl survey tows with catches of ribaldo, for the Chatham Rise summer surveys (CHAT), and WCSI (WCSI) surveys, by latitude, longitude, and maximum depth of tow.

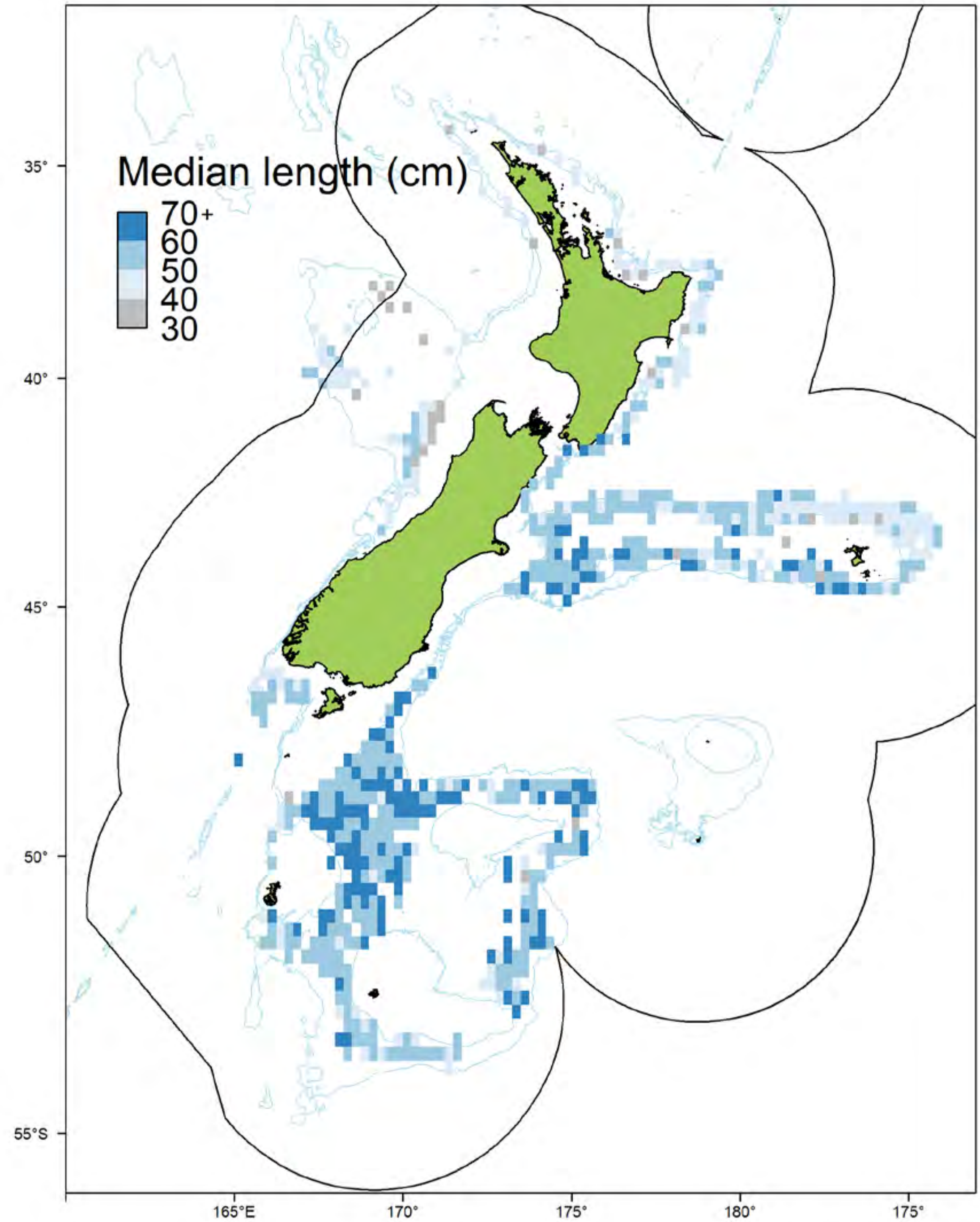


Figure A2: Distribution of length records (median per 0.2° latitude × longitude cell) from 22 784 ribaldo caught during trawl surveys completed between 1979 and 2014.

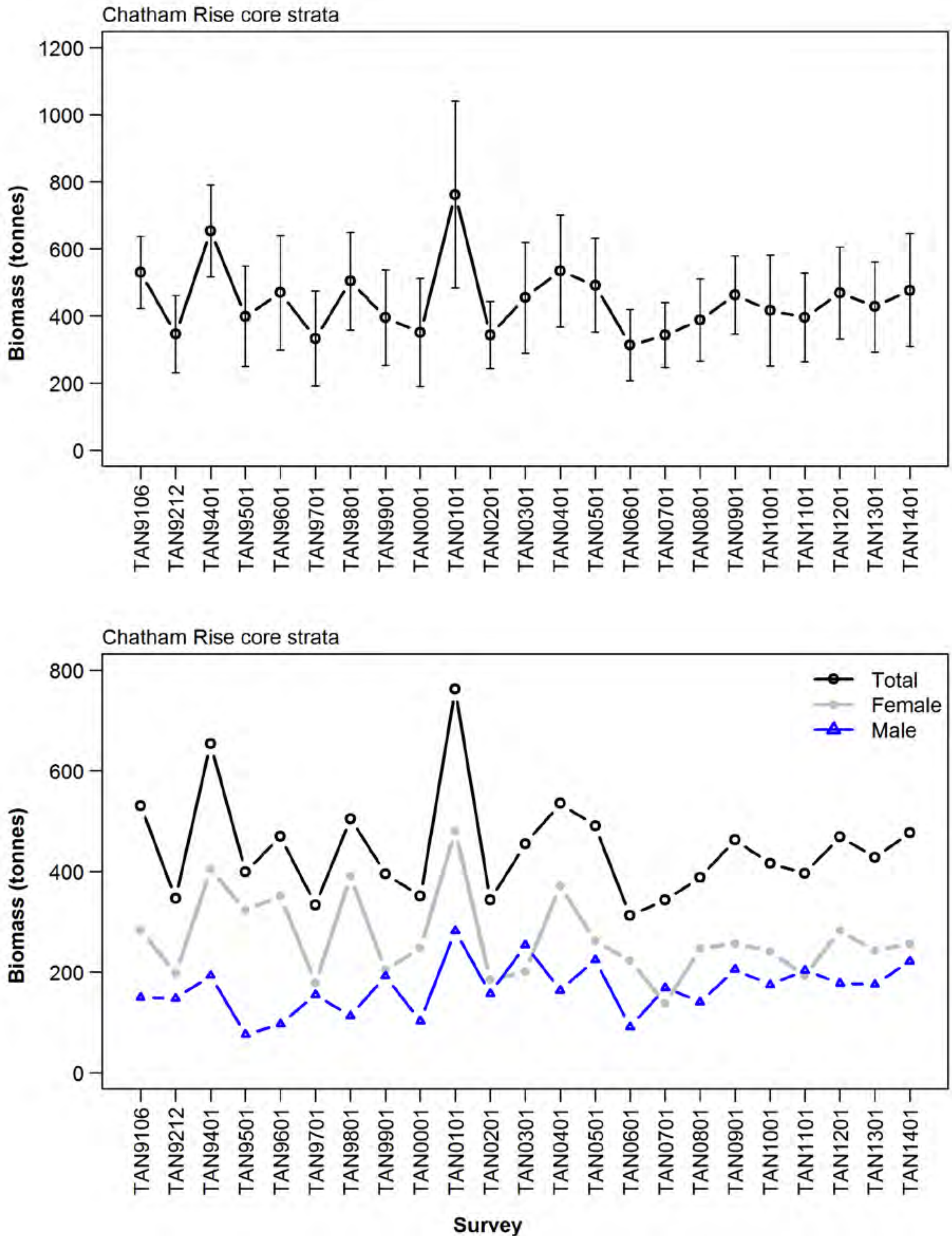


Figure A3: Doorspread biomass estimates for all ribaldo (top plot, error bars are ± two standard deviations) and by sex (bottom panel), from the summer Chatham Rise *Tangaroa* surveys from 1991 to 2014. Biomass estimates are for the core strata only (200–800 m).

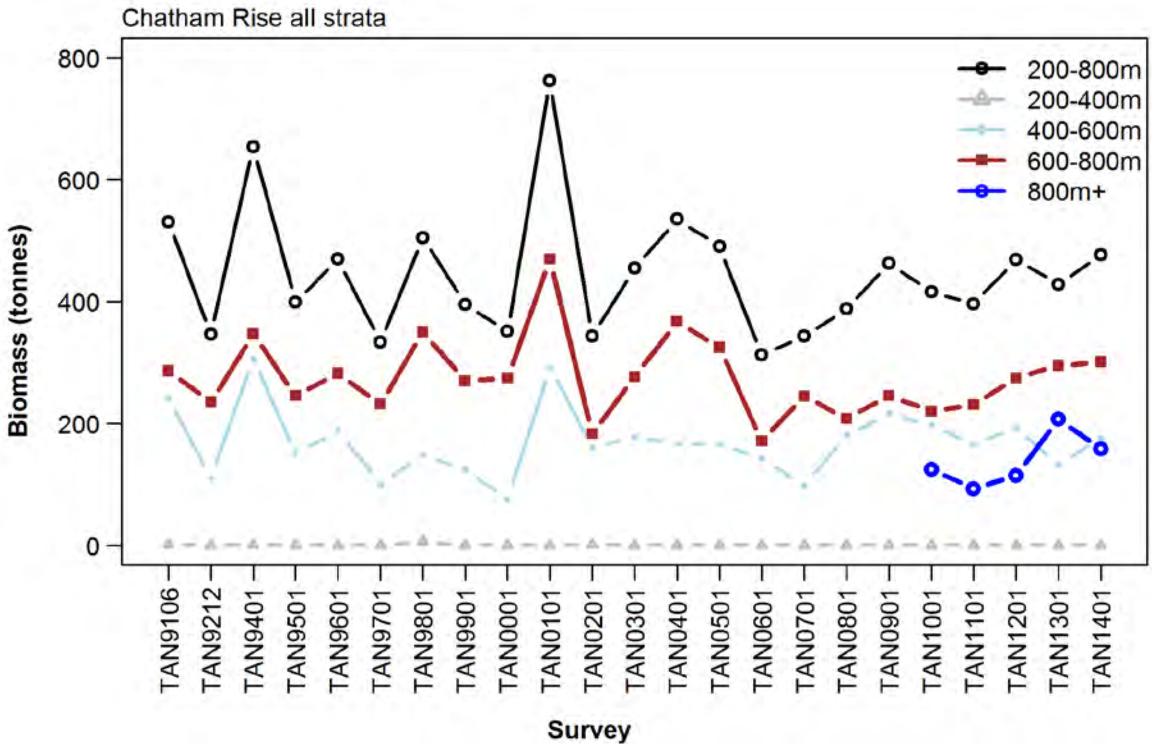


Figure A4: Doorspread biomass estimates for ribaldo from all strata surveyed on the summer Chatham Rise *Tangaroa* time series by stratum depth from 1991 to 2014. Strata greater than 800 m were not surveyed prior to 2010.

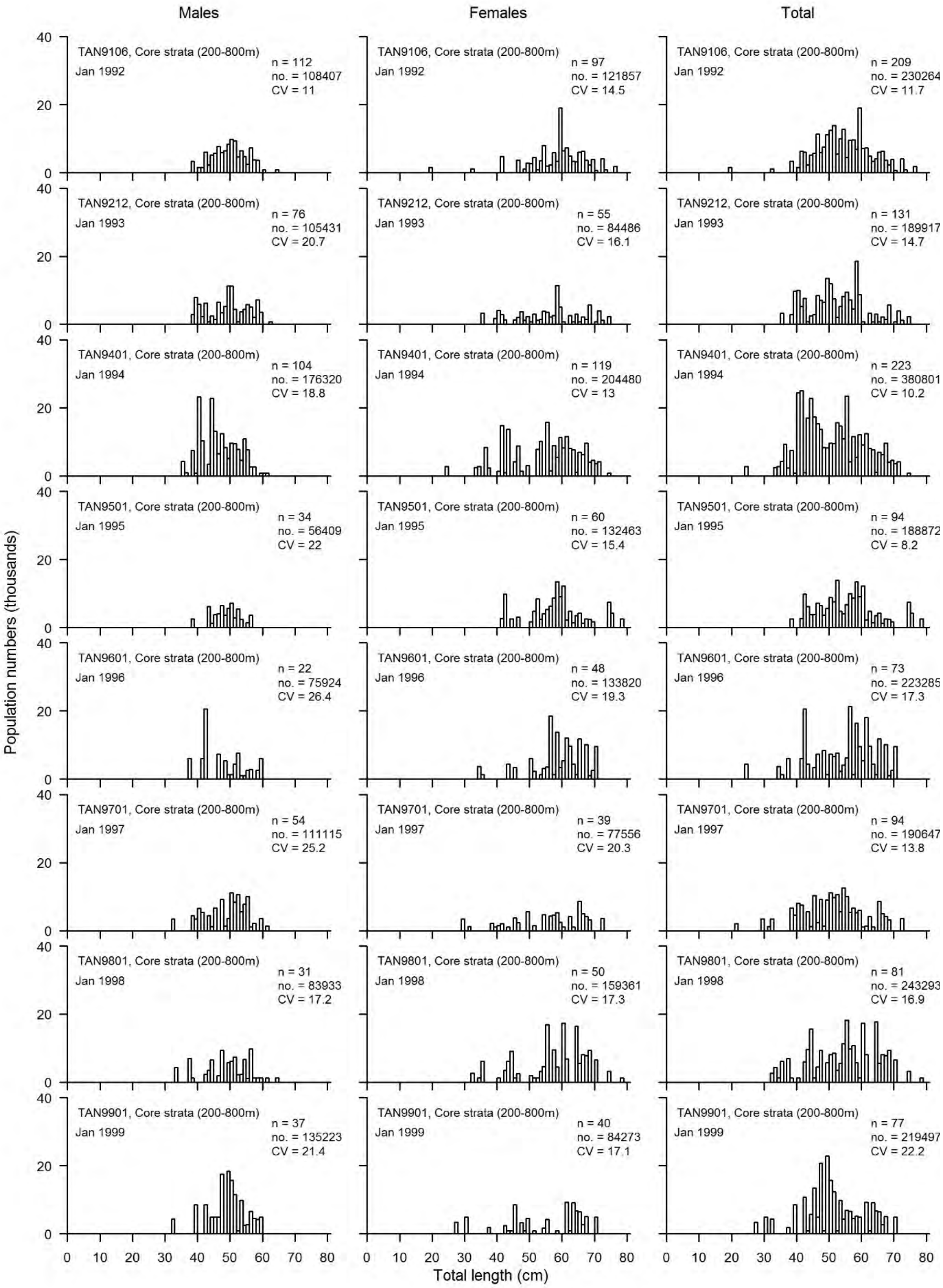


Figure A5: Scaled population length frequencies of ribaldo from the summer Chatham Rise time series carried out by *Tangaroa* from 1991 to 1999 for core strata (200–800 m). n = number of fish measured; no. = scaled population number; CV = coefficient of variation.

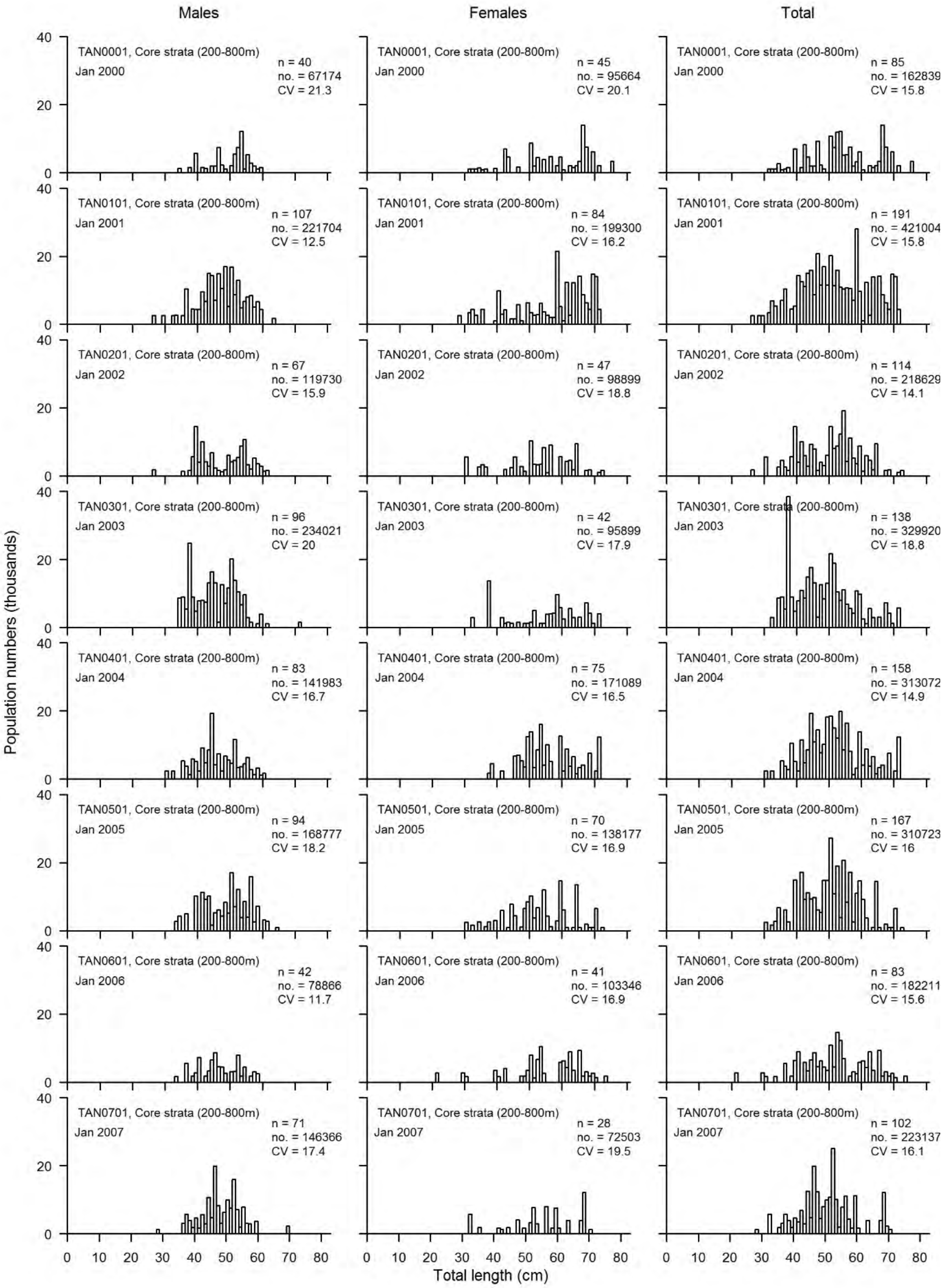


Figure A5 continued: Scaled population length frequencies of ribaldo from the summer Chatham Rise time series carried out by *Tangaroa* from 2000 to 2007 for core strata (200–800 m). n = number of fish measured; no. = scaled population number; CV = coefficient of variation.

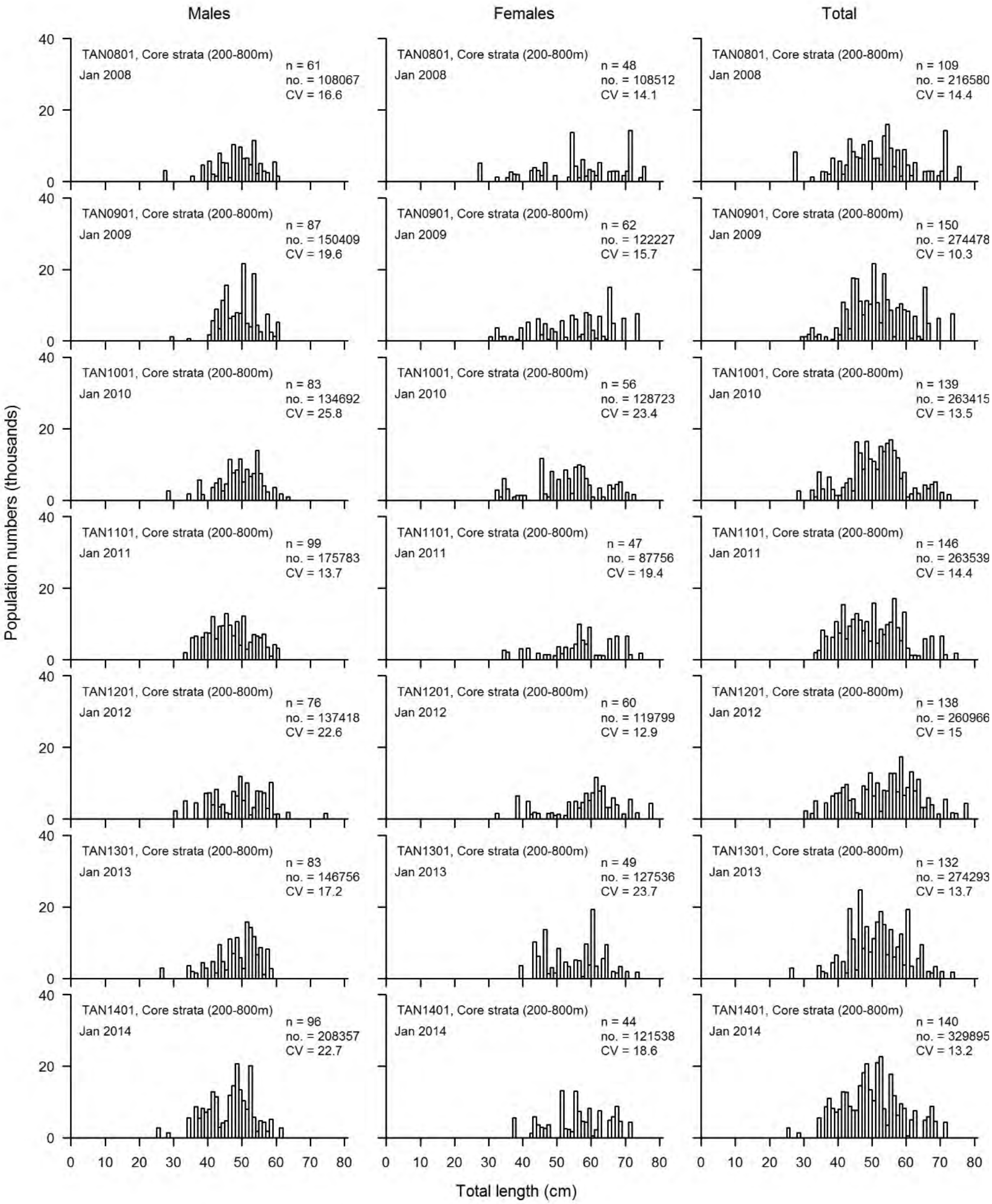


Figure A5 continued: Scaled population length frequencies of ribaldo from the summer Chatham Rise time series carried out by *Tangaroa* from 2008 to 2014 for core strata (200–800 m). n = number of fish measured; no. = scaled population number; CV = coefficient of variation.

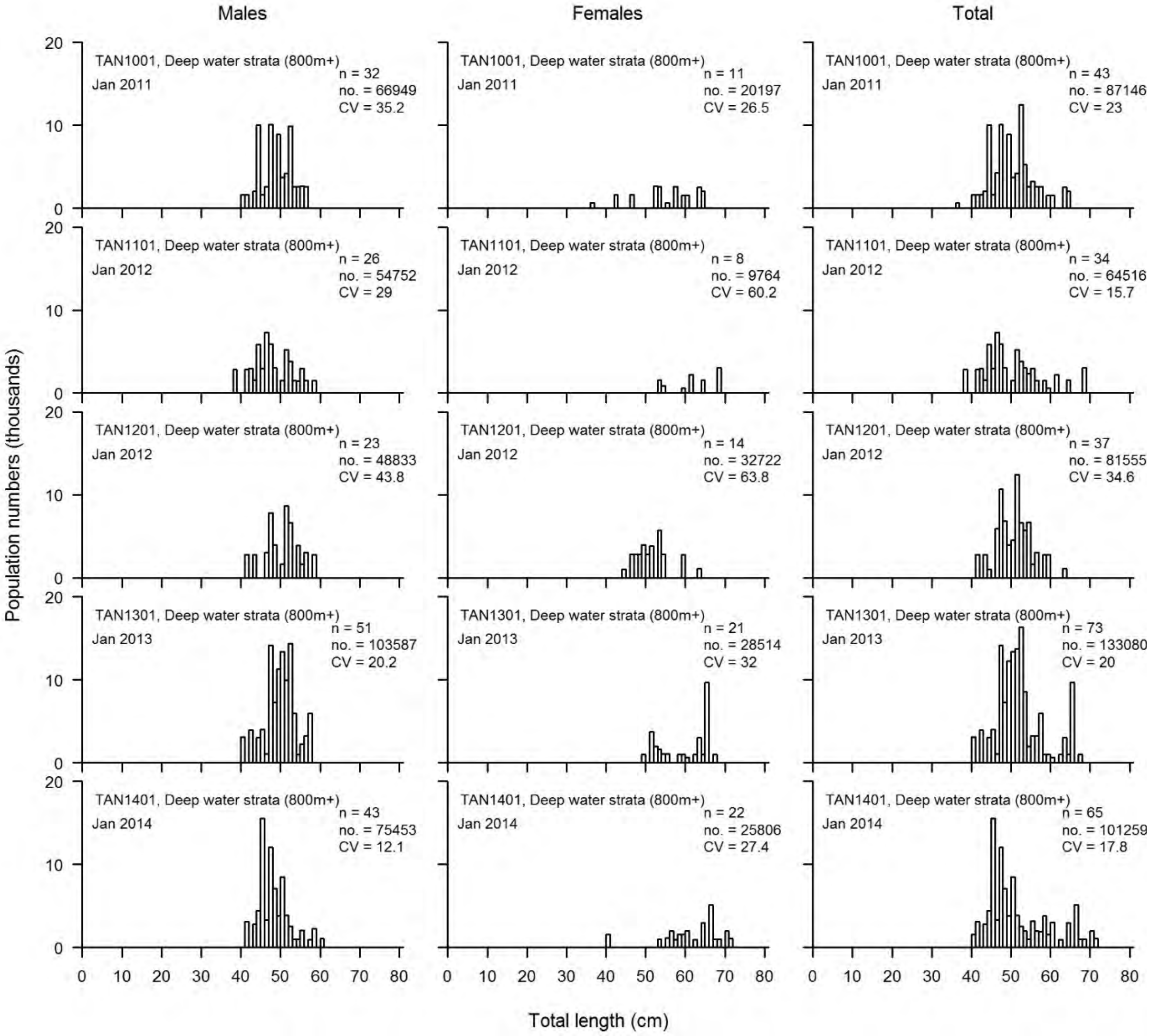


Figure A6: Scaled population length frequencies of ribaldo from the summer Chatham Rise time series carried out by *Tangaroa* from 2010 to 2014 for 800–1300 m strata. n = number of fish measured; no. = scaled population number; CV = coefficient of variation.

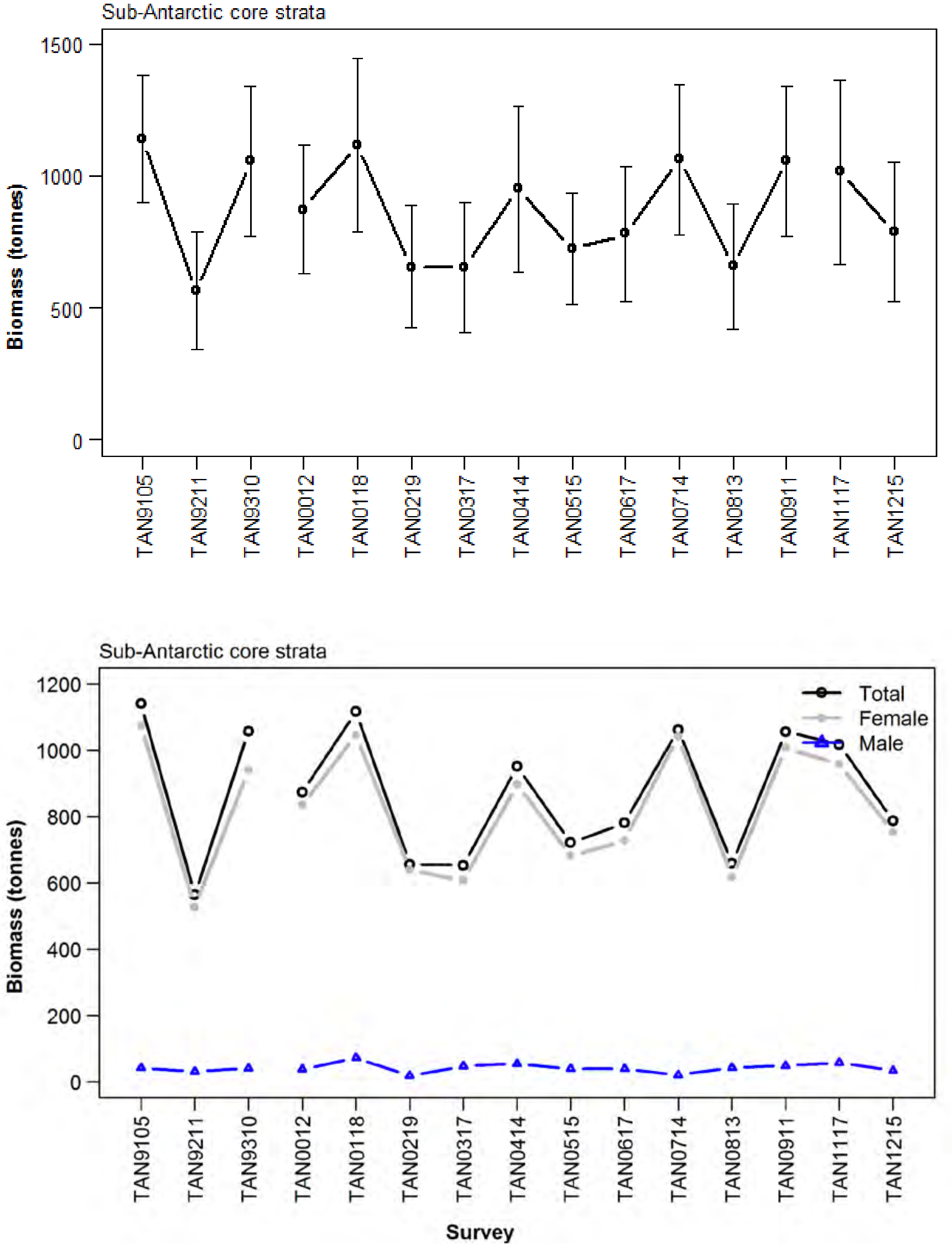


Figure A7: Doorspread biomass estimates for all ribaldo (top plot, error bars are ± two standard deviations) and by sex (bottom panel), from the summer Sub-Antarctic *Tangaroa* surveys from 1991 to 1993, and 2000–2012. Biomass estimates are for the core strata only (300–800 m).

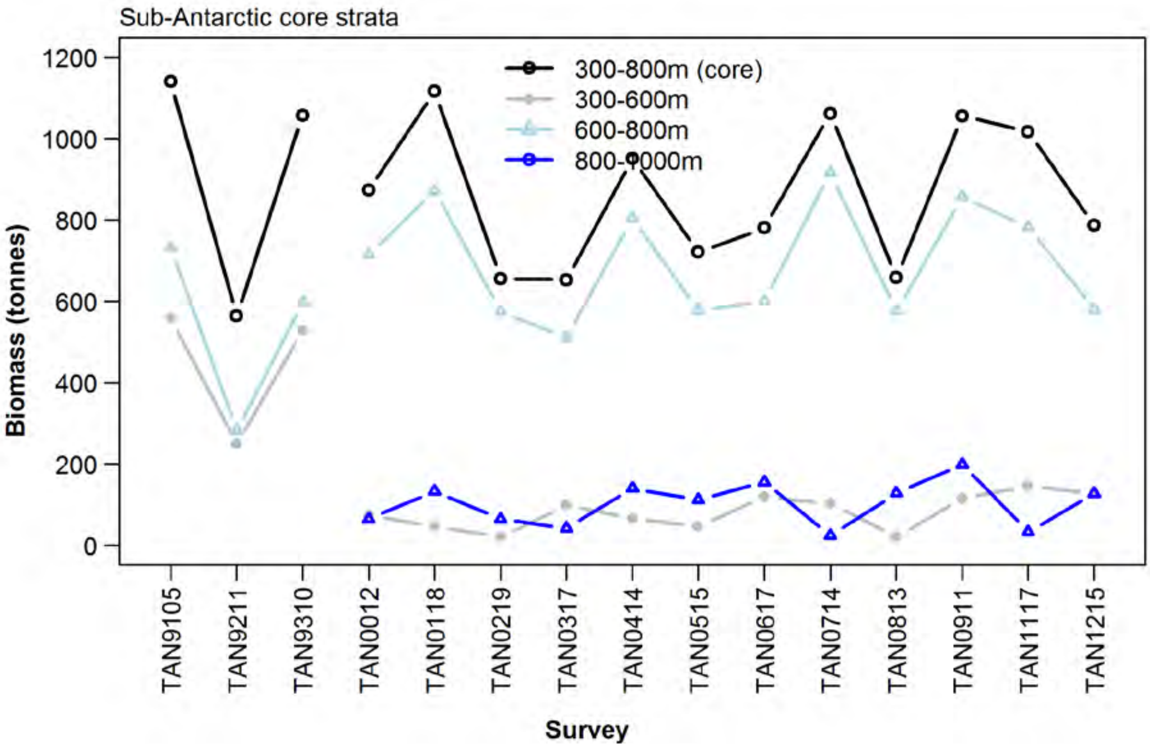


Figure A8: Doorspread biomass estimates for all ribaldo by stratum depth for 300–600, 600–800, all core strata (300–800 m) and deepwater strata (800–1000 m) from the summer Sub-Antarctic *Tangaroa* surveys from 1991 to 1993, and 2000–2012.

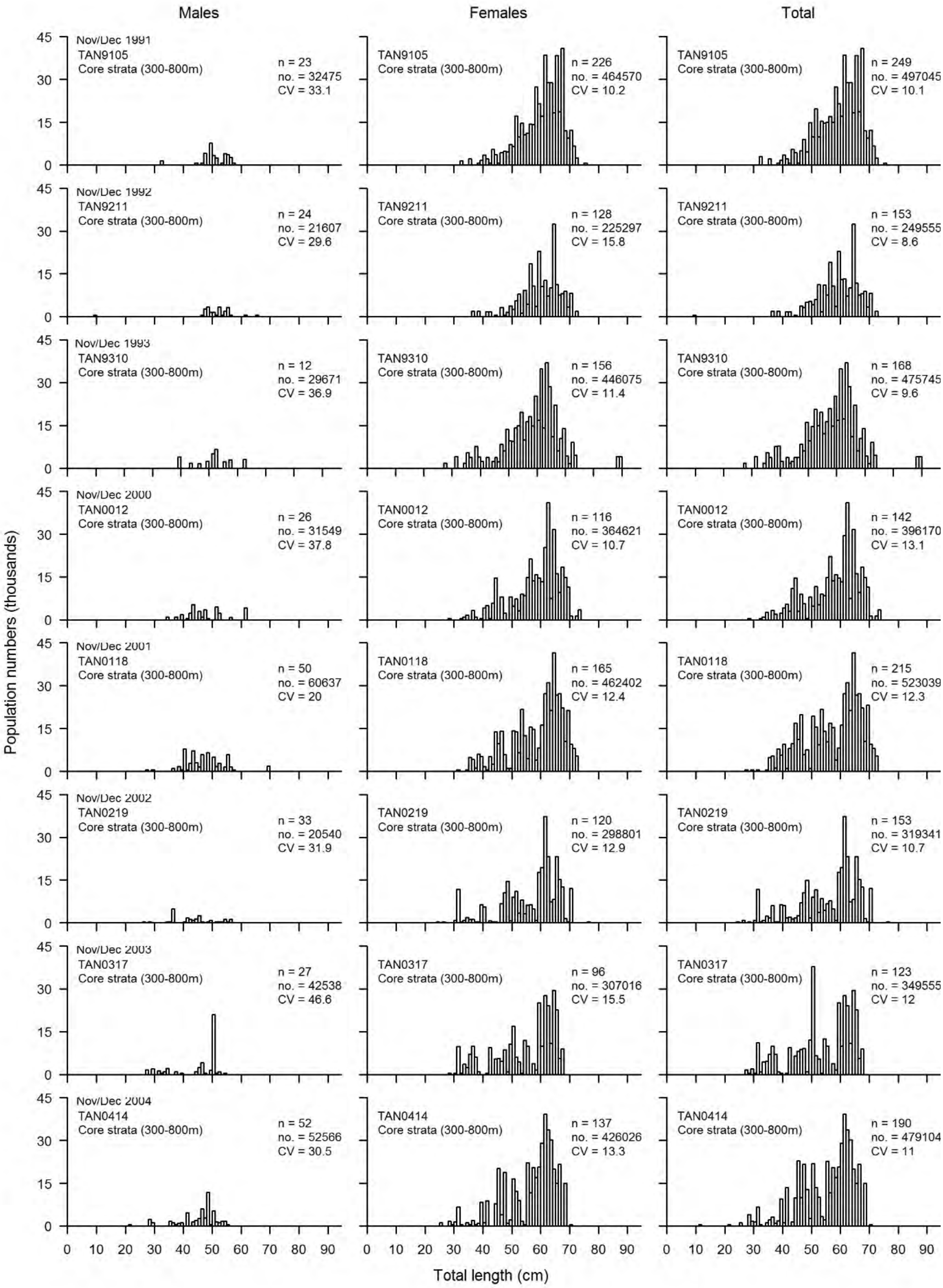


Figure A9: Scaled population length frequencies of ribaldo from the summer Sub-Antarctic time series carried out by *Tangaroa* from 1991 to 1993, and 2000 to 2004 for all core strata (300–800 m). n = number of fish measured; no. = scaled population number; CV = coefficient of variation.

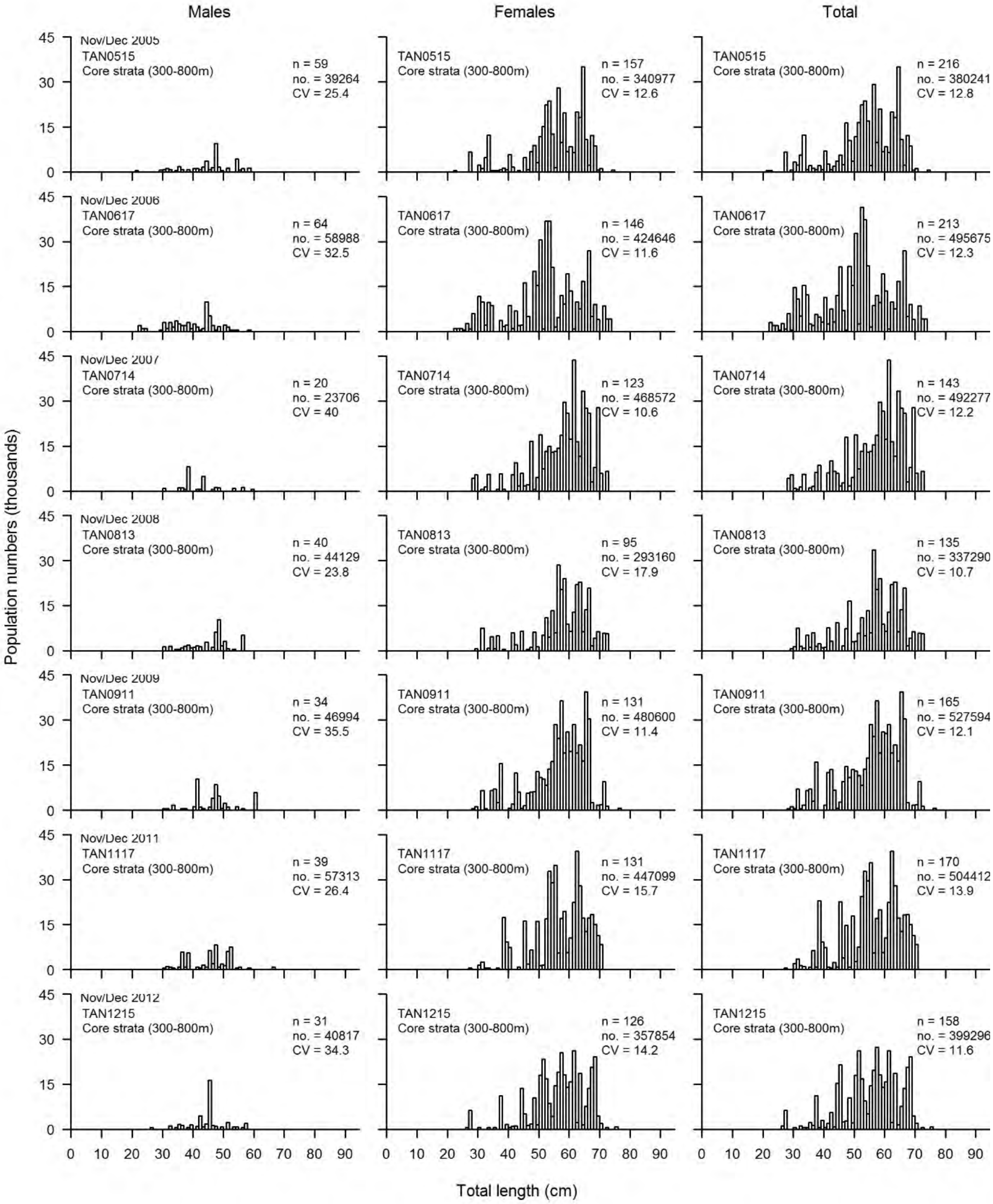


Figure A9 continued: Scaled population length frequencies of ribaldo from the summer Sub-Antarctic time series carried out by *Tangaroa* from 2005 to 2012 for all core strata (300–800 m). n = number of fish measured; no. = scaled population number; CV = coefficient of variation.

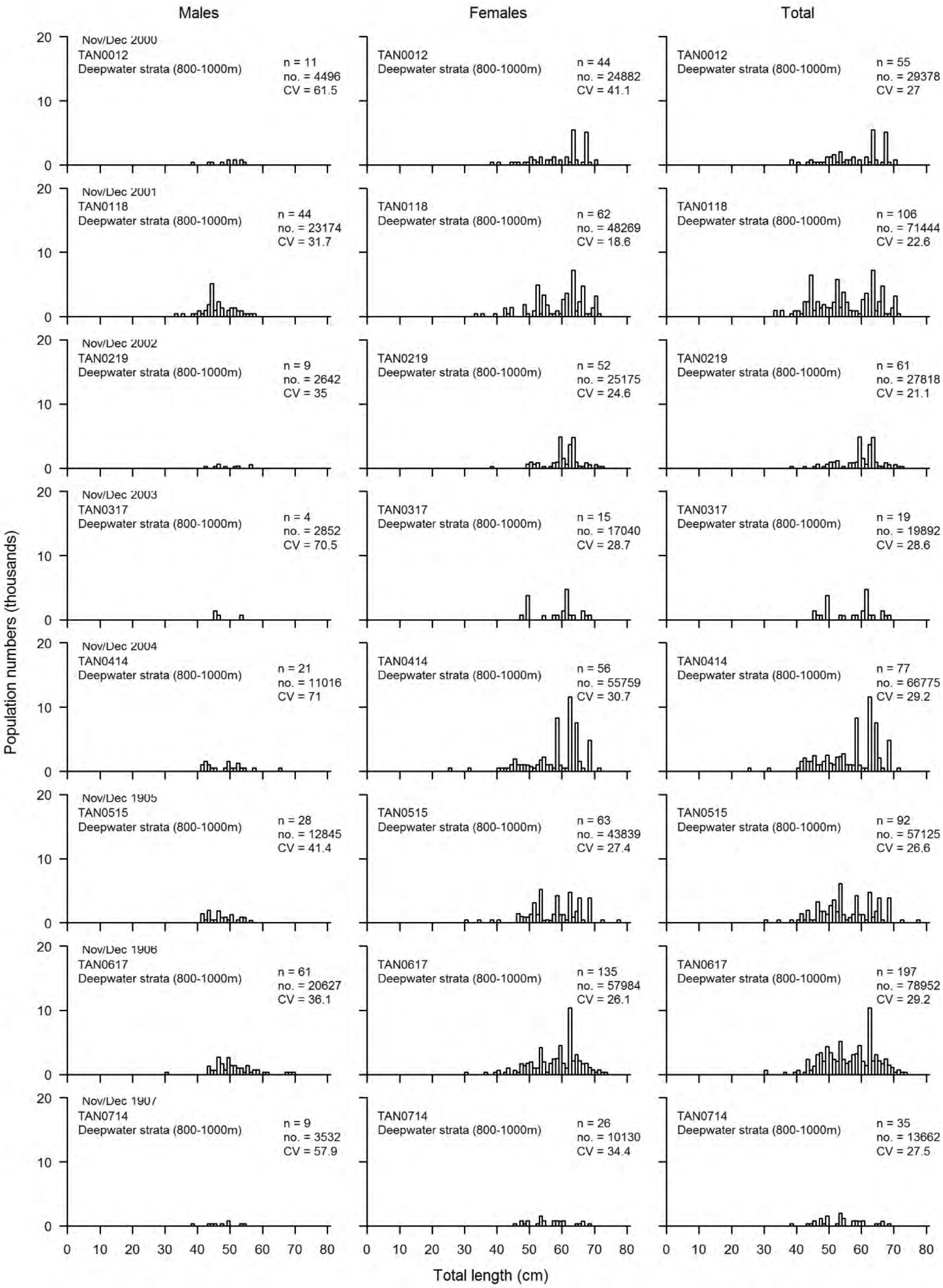


Figure A10: Scaled population length frequencies of ribaldo from the summer Sub-Antarctic time series carried out by *Tangaroa* from 2000 to 2007, for the 800–1000 m strata. n = number of fish measured; no. = scaled population number; CV = coefficient of variation.

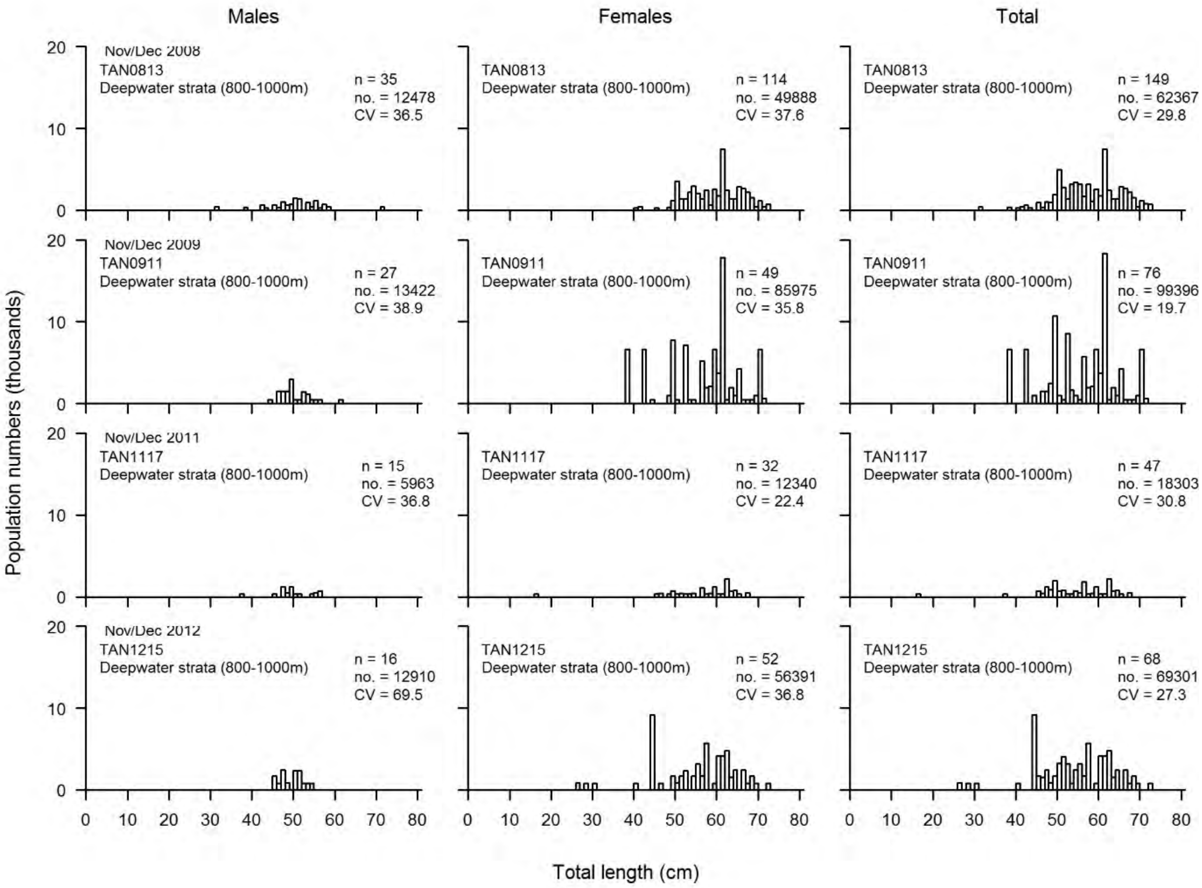


Figure A10 continued: Scaled population length frequencies of ribaldo from the summer Sub-Antarctic time series carried out by *Tangaroa* from 2008 to 2012, for the 800–1000 m strata. n = number of fish measured; no. = scaled population number; CV = coefficient of variation.

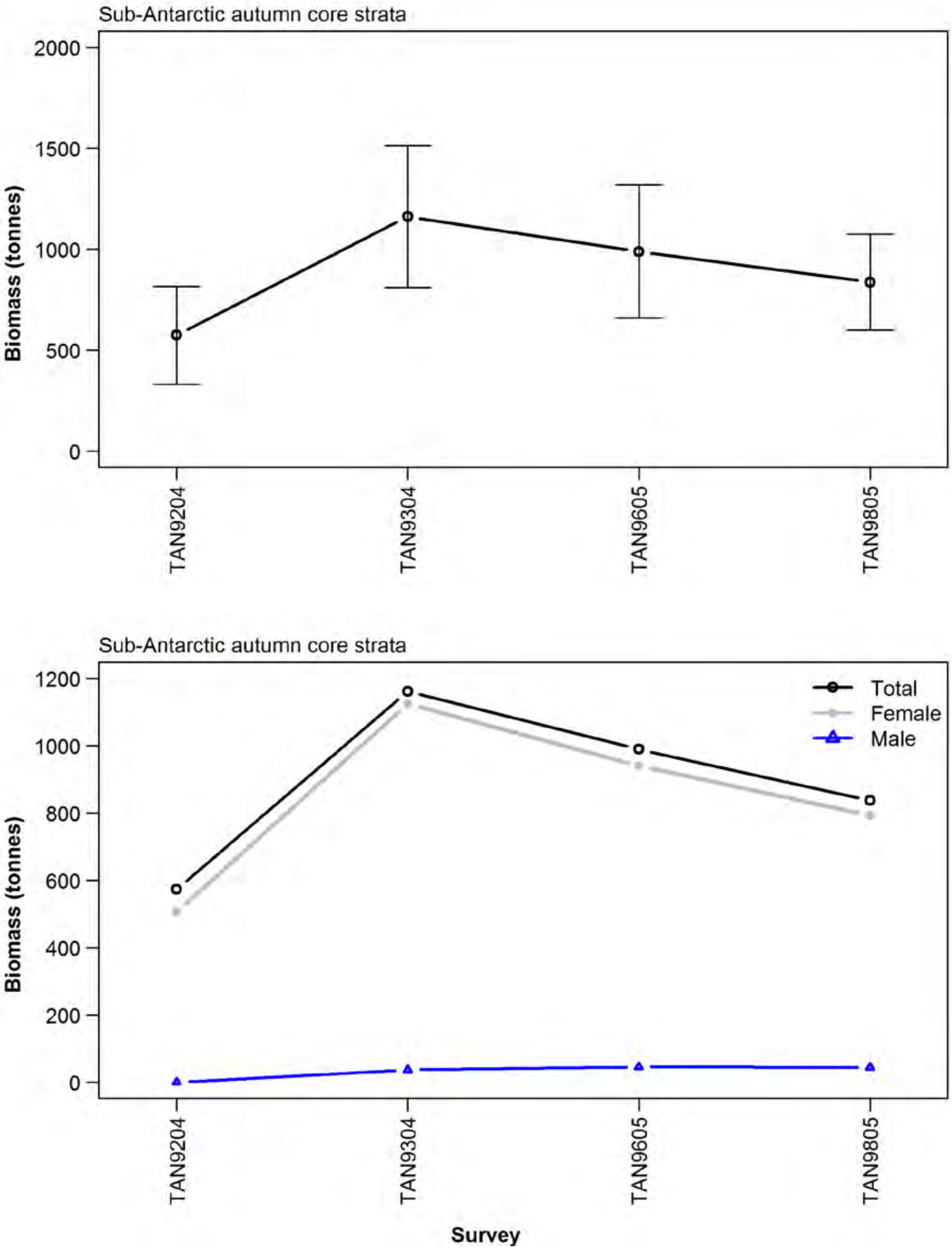


Figure A11: Doorspread biomass estimates for all ribaldo (top plot, error bars are ± two standard deviations) and by sex (bottom panel), from the autumn Sub-Antarctic *Tangaroa* surveys from 1992 to 1993, 1996, and 1998. Biomass estimates are for the core strata only (300–800 m).

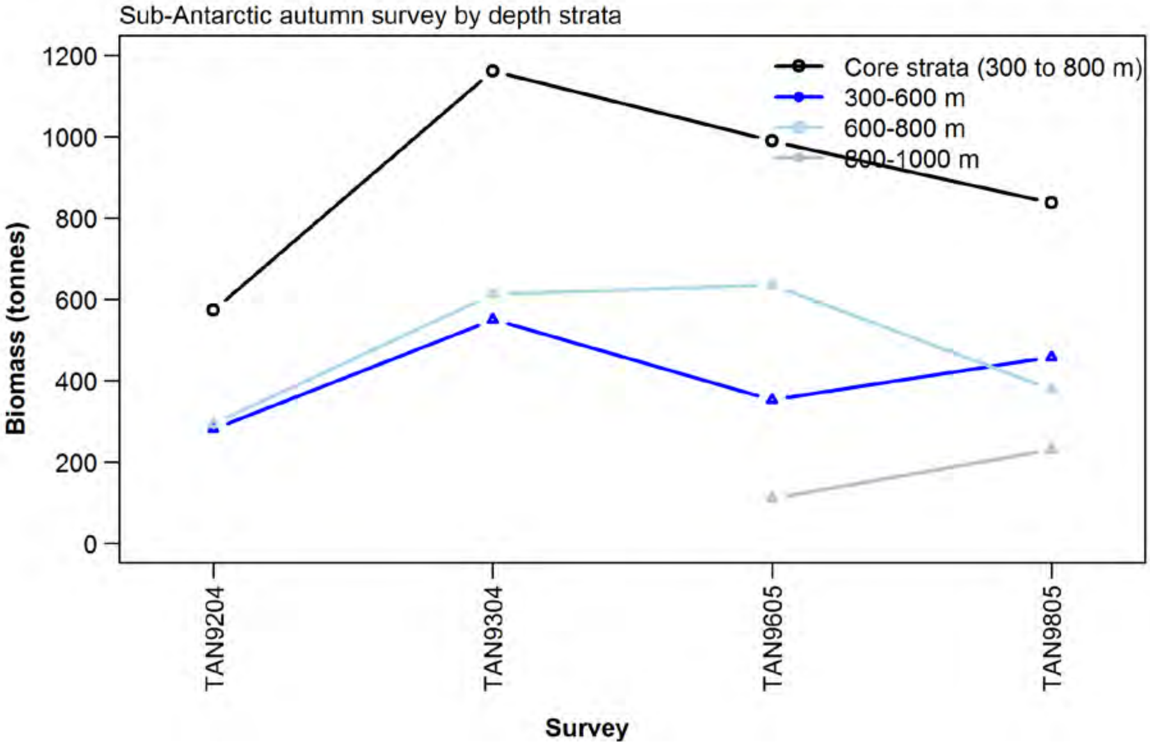


Figure A12: Doorspread biomass estimates for all ribaldo by stratum depth from the autumn Sub-Antarctic *Tangaroa* surveys from 1992 to 1993, 1996, and 1998. 800–1000 m strata were not sampled before 1996.

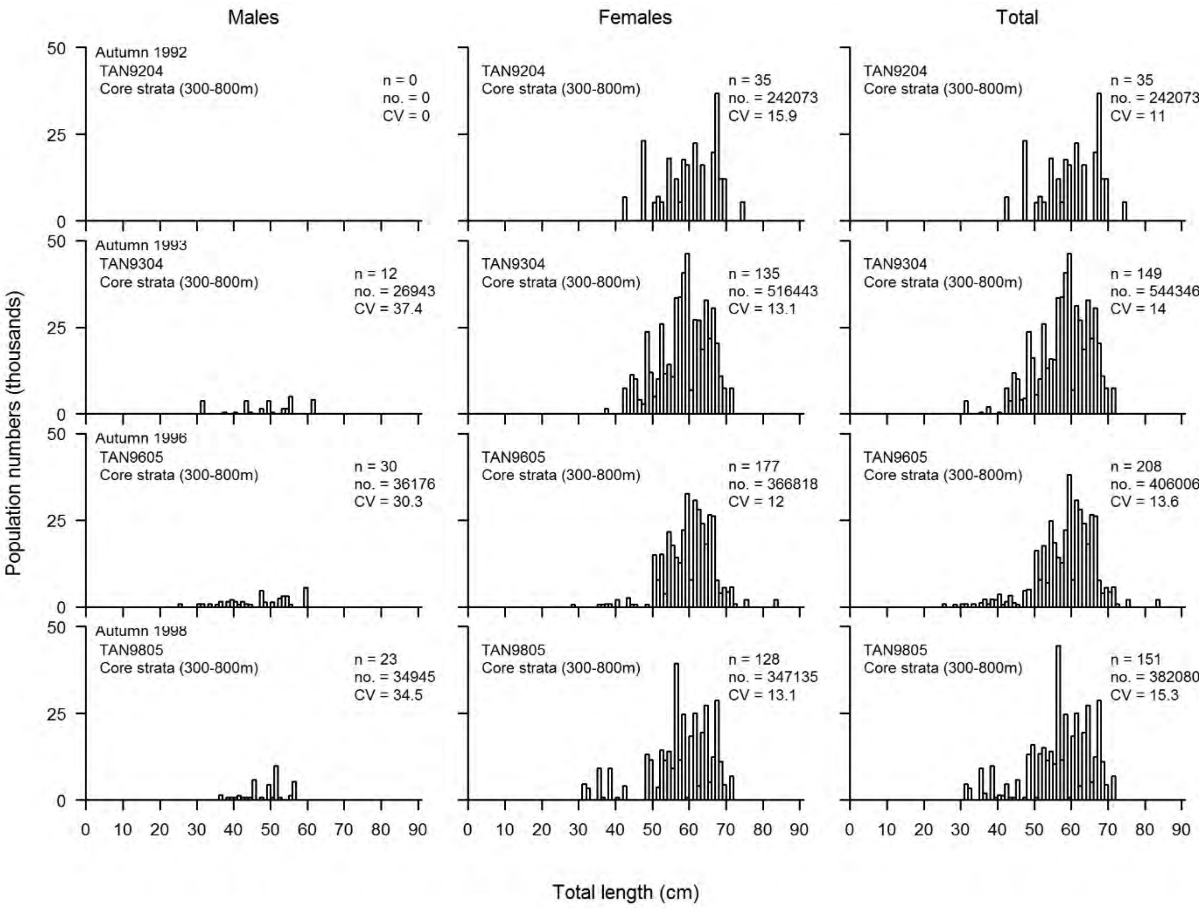


Figure A13: Scaled population length frequencies of ribaldo from the autumn Sub-Antarctic time series carried out by *Tangaroa* from 1992 to 1993, 1996, and 1998 for core strata. n = number of fish measured; no. = scaled population number; CV = coefficient of variation.

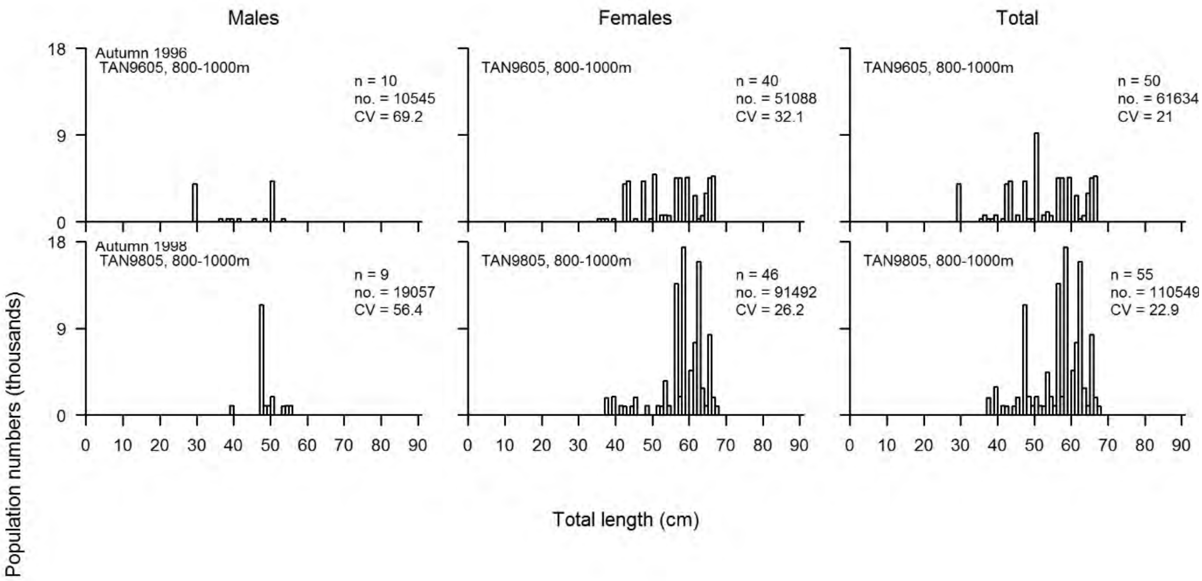
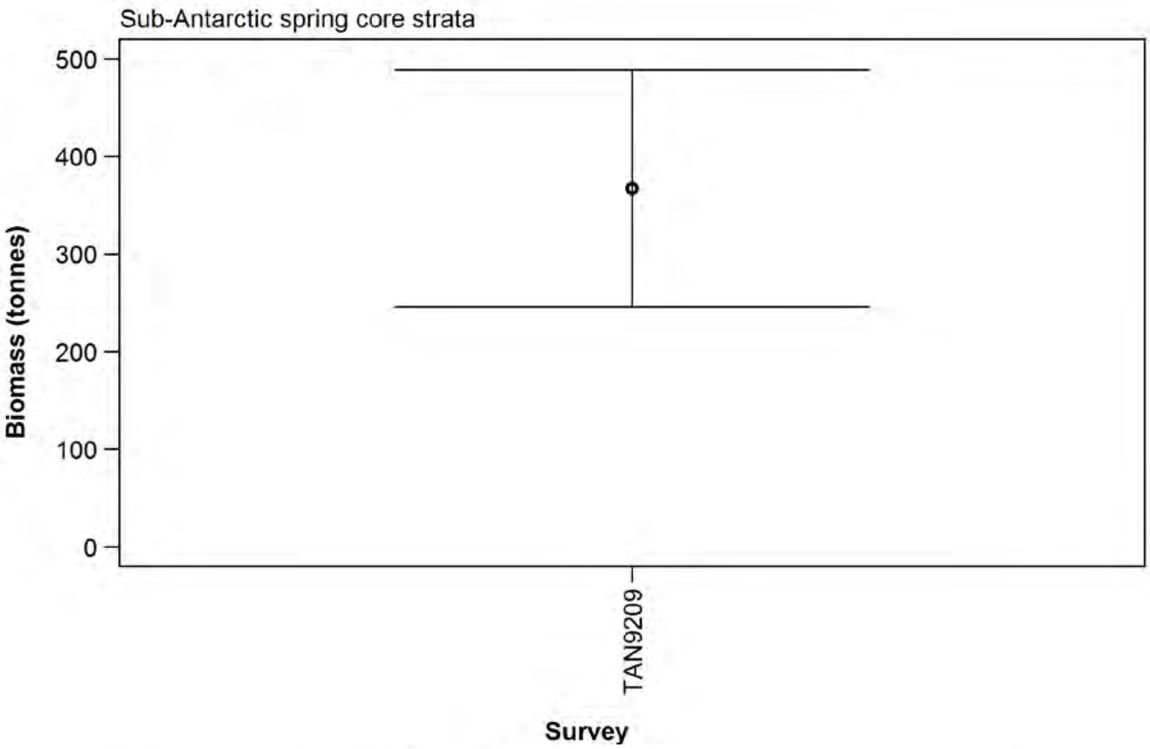


Figure A14: Scaled population length frequencies of ribaldo from the autumn Sub-Antarctic time series carried out by *Tangaroa* from 1992 to 1993, 1996, and 1998 for the 800–1000 m strata. n = number of fish measured; no. = scaled population number; CV = coefficient of variation.



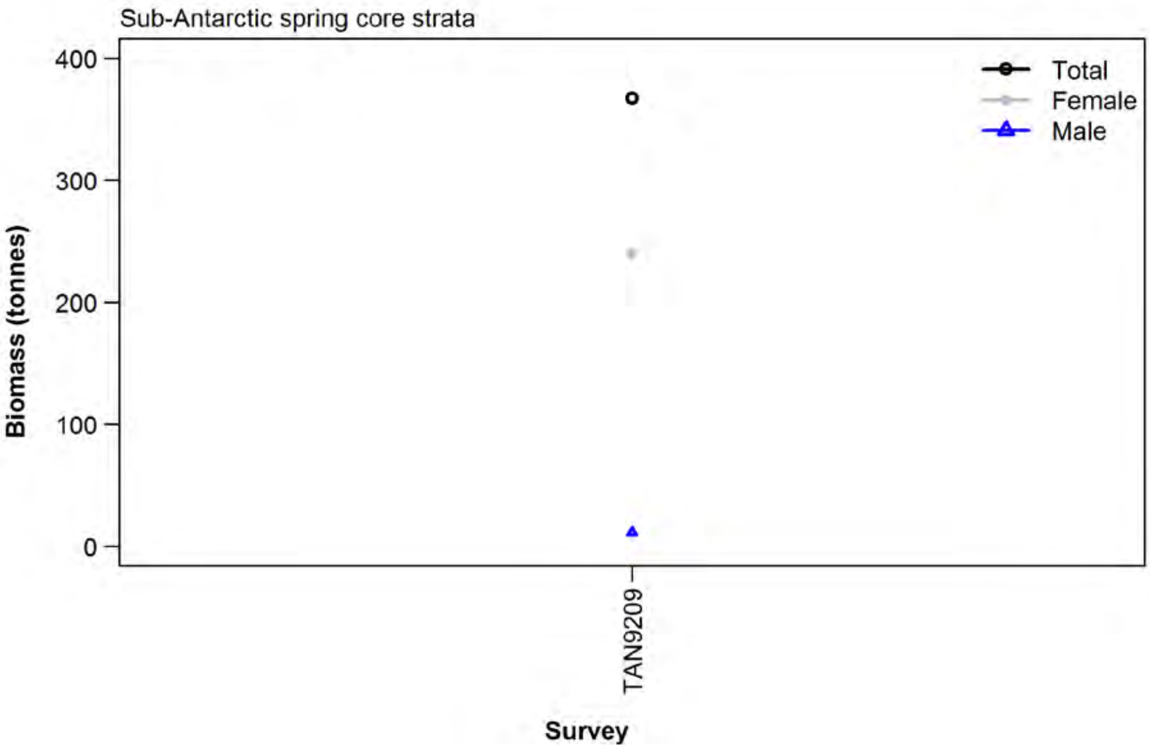


Figure A15: Doorspread biomass estimates for all ribaldo (top plot, error bars are ± two standard deviations) and by sex (bottom panel), from the spring Sub-Antarctic *Tangaroa* survey in 1992.

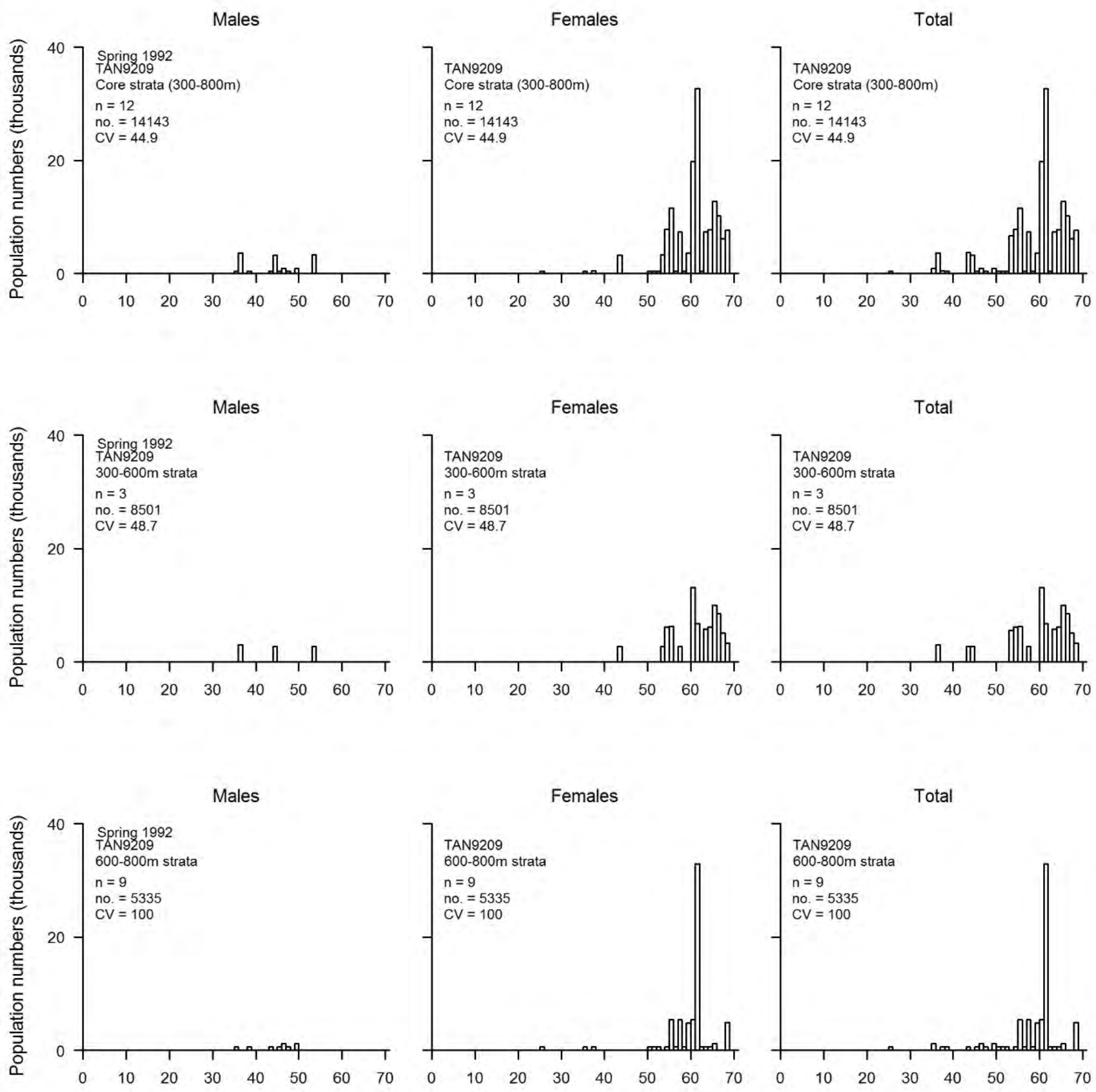


Figure A16: Scaled population length frequencies of ribaldo from the Sub-Antarctic spring survey on *Tangaroa* 1992 for the core strata (300–800 m, top plot), 300–600 m strata (middle plot), and 600–800 m strata (bottom plot). n = number of fish measured, no. = population number, CV = coefficient of variation.

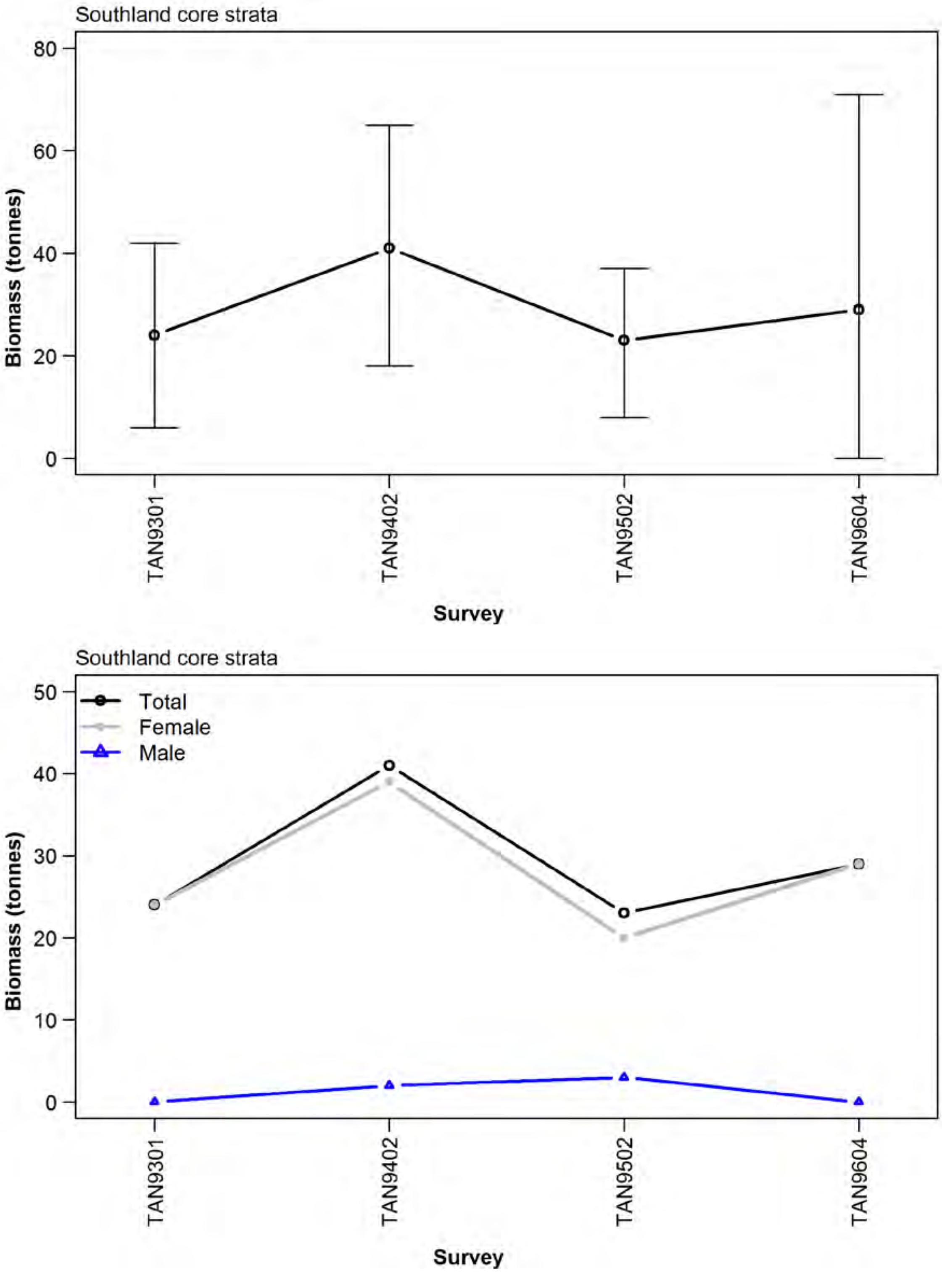


Figure A17: Doorspread biomass estimates, for all ribaldo (top plot, error bars are ± two standard deviations) and by sex (bottom panel), from the Southland autumn *Tangaroa* surveys from 1993–96. Estimates are for the core strata only.

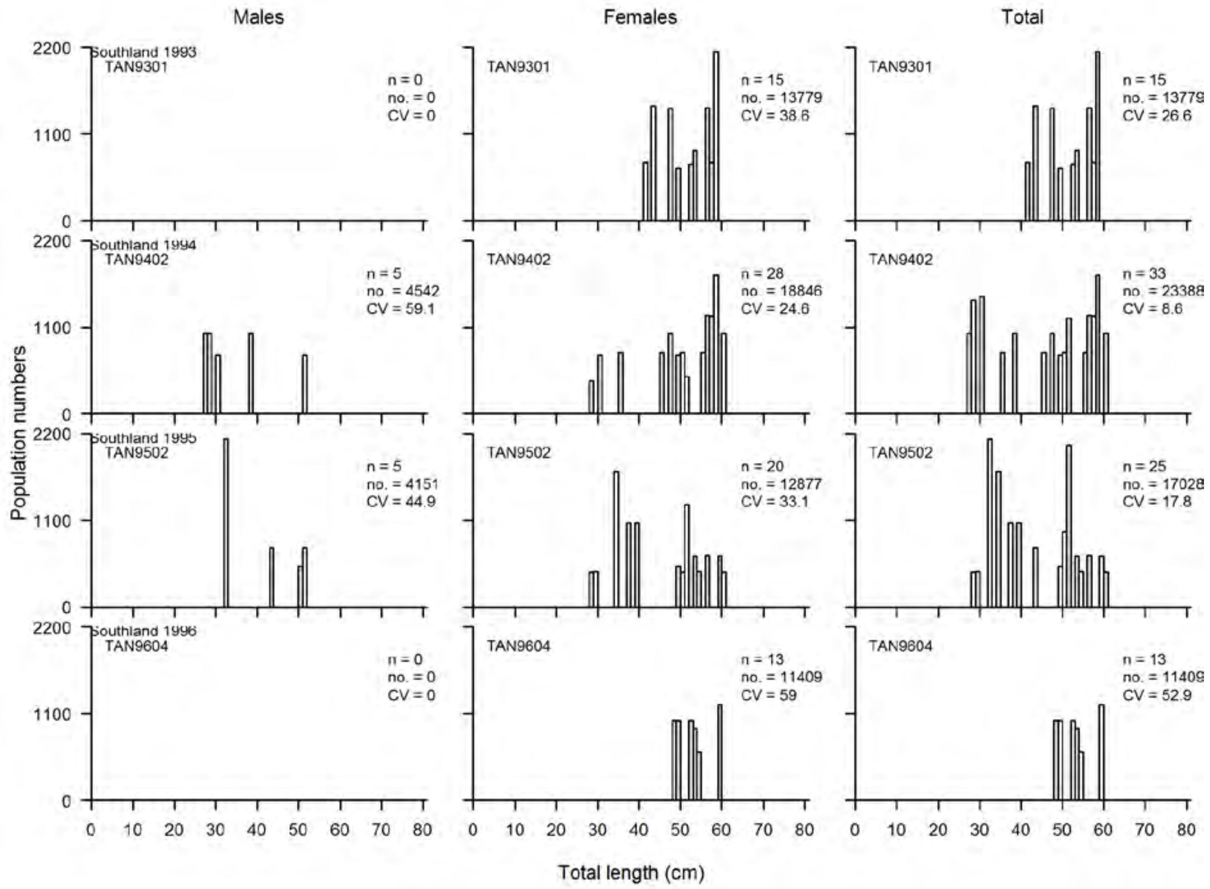


Figure A18: Scaled population length frequencies of ribaldo from the Southland autumn *Tangaroa* surveys from 1993–96. n = number of fish measured, no. = population number, CV = coefficient of variation. Length frequencies are for the core strata only.

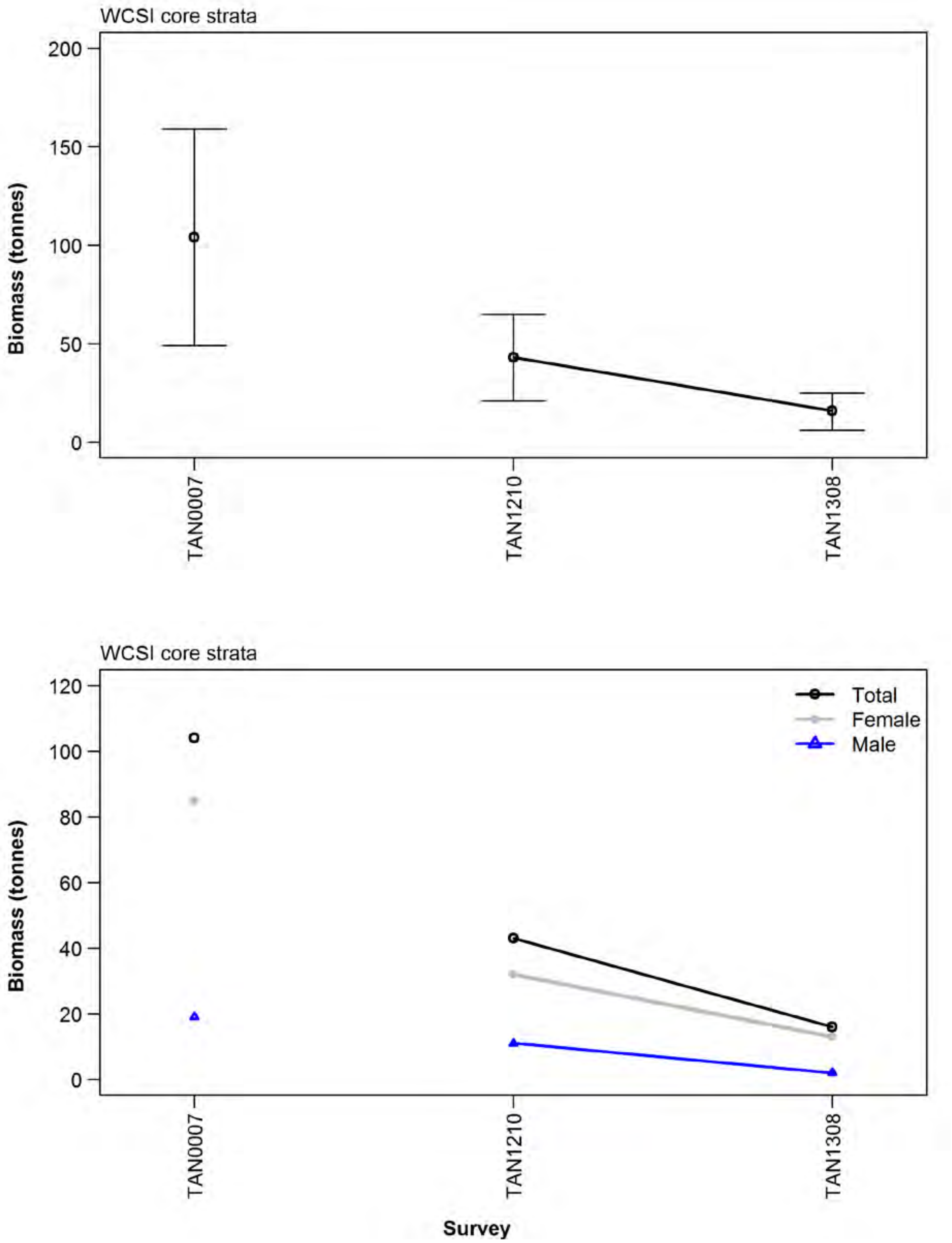


Figure A19: Doorspread biomass estimates, for all ribaldo (top plot, error bars are ± two standard deviations) and by sex (bottom panel), from the winter west coast South Island *Tangaroa* surveys from 2000, and 2012–13. Estimates are for the core strata only.

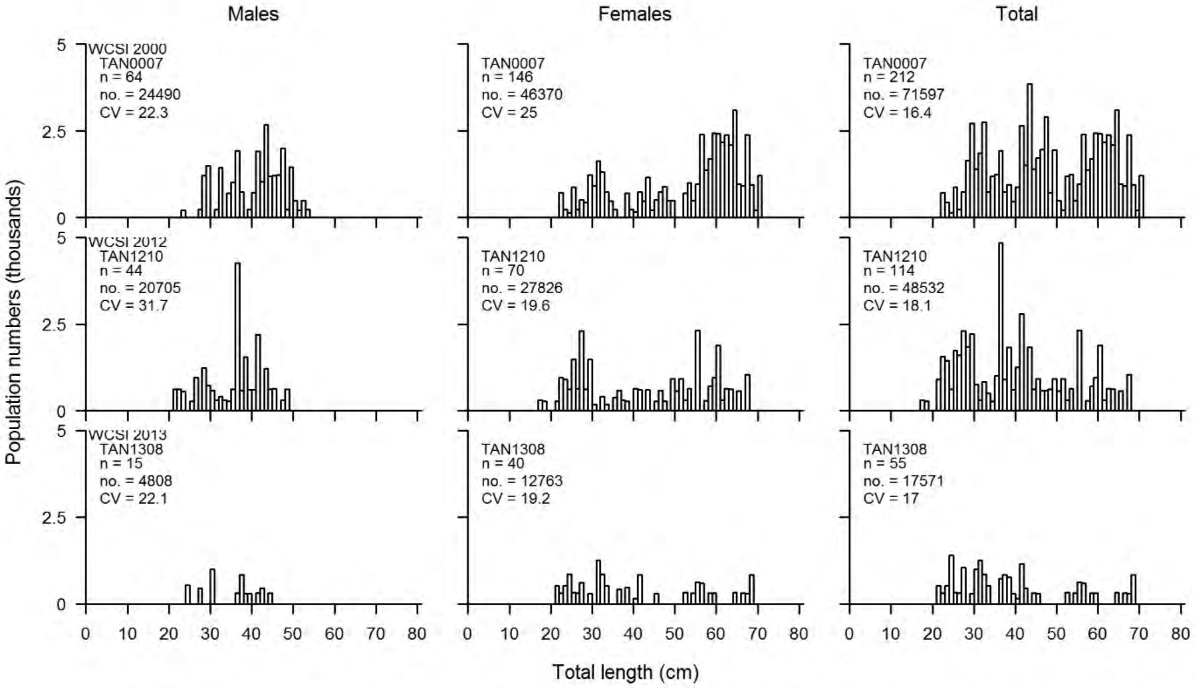


Figure A20: Scaled population length frequencies of ribaldo from the winter west coast South Island *Tangaroa* surveys from 2000, and 2012–13. n = number of fish measured, no. = population number, CV = coefficient of variation. Length frequencies are for the core strata only.

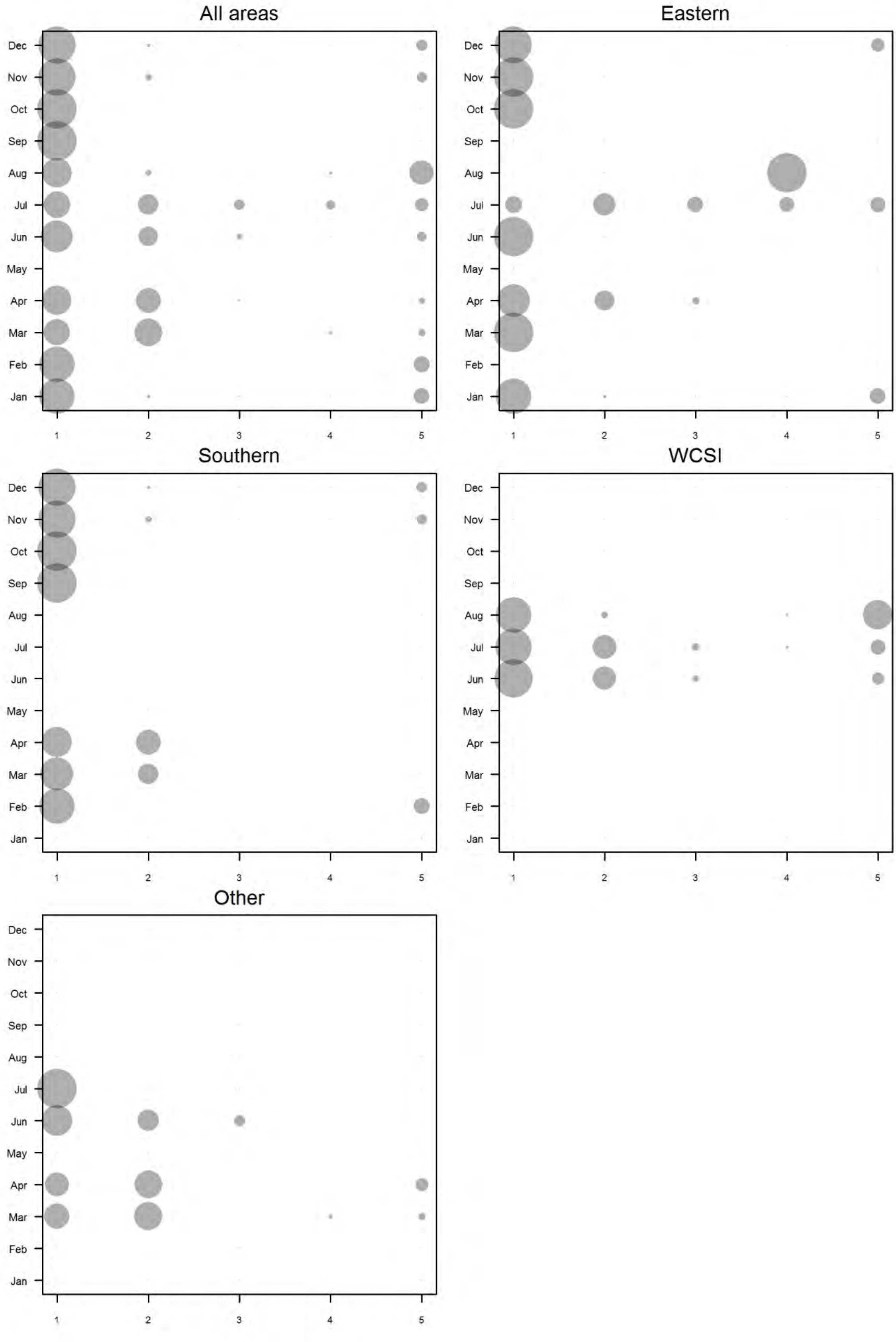


Figure A21: Relative proportions of female ribaldo reproductive stage data from trawl surveys in *trawldb* with ribaldo gonad stage data, by month for each area. 1= immature/resting; 2 = maturing; 3 = ripening; 4 = running ripe; 5 = spent.

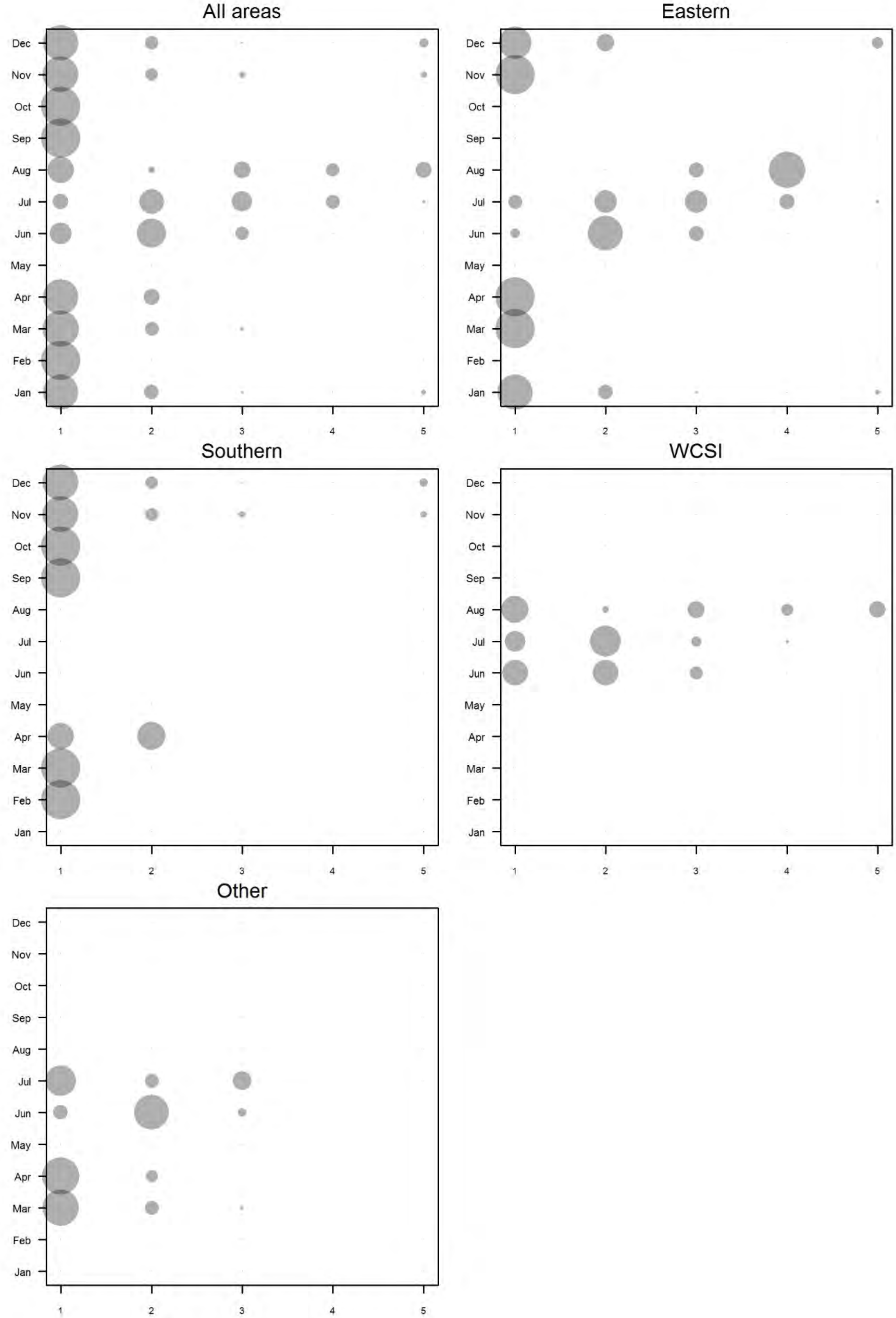


Figure A21: continued: Relative proportions of male ribaldo reproductive stage data from trawl surveys in *trawldb* with ribaldo gonad stage data, by month for each area. 1= resting/immature; 2 = maturing; 3 = ripe; 4 = running ripe; 5 = spent.

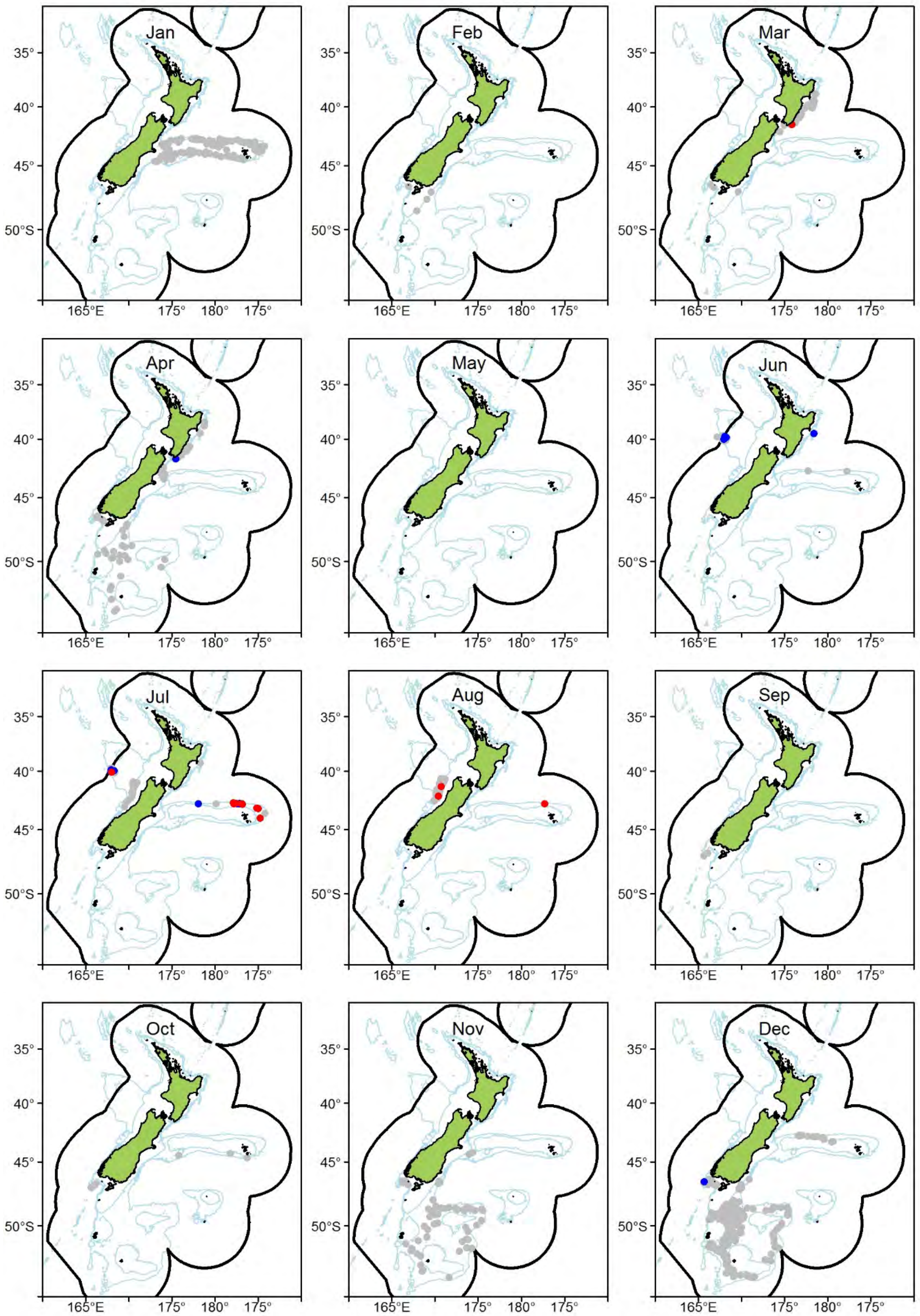


Figure A22: Distribution of female ribaldo reproductive stage data from trawl surveys, by month. Grey = immature/resting, maturing or spent; Blue = ripe; and Red = running ripe.

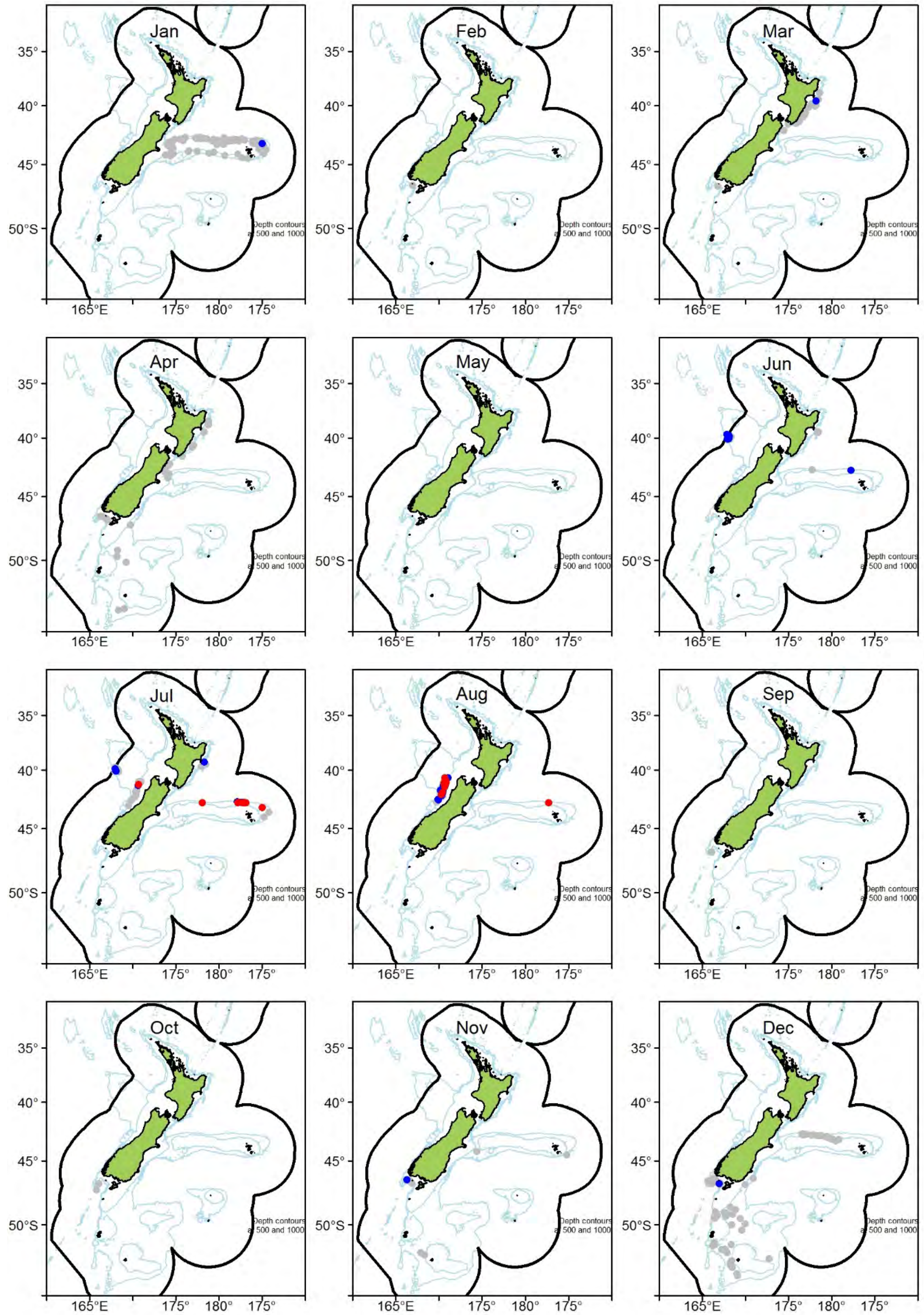


Figure A22 continued: Distribution of male ribaldo reproductive stage data from trawl surveys, by month. Grey = immature, resting, maturing or spent; Blue = ripe; and Red = running ripe.

APPENDIX B. OBSERVER DATA FROM COMMERCIAL TRAWL AND LONGLINE

Table B1: Total number of observed tows (a) and catches in tonnes (b) sampled for ribaldo, by area, for fishing years 1990 to 2013. Areas are defined in Section 2.1 and Figure 2. Other includes all records that do not fall into Eastern, Southern, or west coast South Island (WCSI).

(a) Tows

Fishing year	Eastern	Southern	WCSI	Other	Total
1990	182	134	395	63	774
1991	657	445	164	12	1 278
1992	399	532	180	107	1 218
1993	133	366	242	1 186	1 927
1994	528	195	141	395	1 259
1995	297	149	153	216	815
1996	195	126	112	63	496
1997	205	29	146	44	424
1998	707	199	222	67	1 195
1999	724	617	342	214	1 897
2000	445	792	222	379	1 838
2001	585	411	124	122	1 242
2002	820	600	460	299	2 179
2003	527	341	245	261	1 374
2004	450	187	291	188	1 116
2005	709	135	195	74	1 113
2006	622	209	401	234	1 466
2007	636	308	141	279	1 364
2008	744	435	311	338	1 828
2009	492	450	225	470	1 637
2010	499	444	230	595	1 768
2011	513	304	269	657	1 743
2012	590	344	201	403	1 538
2013	859	700	832	394	2 785
Total	12 518	8 452	6 244	7 060	34 274

Table B1 ctd.

(b) Catches (t)

Fishing year	Eastern	Southern	WCSI	Other	Total
1990	10	17	23	3	54
1991	60	47	3	0	111
1992	22	42	8	9	80
1993	14	15	33	117	179
1994	17	6	7	12	42
1995	23	7	7	5	41
1996	10	4	6	2	21
1997	9	4	5	0	19
1998	46	22	15	1	84
1999	32	50	24	6	113
2000	26	47	26	7	106
2001	32	22	7	2	62
2002	39	42	88	4	174
2003	24	17	18	4	62
2004	22	8	28	2	60
2005	31	10	12	1	54
2006	27	10	59	11	107
2007	38	13	17	4	72
2008	35	32	136	8	211
2009	28	26	56	11	121
2010	20	31	32	24	107
2011	18	9	47	37	110
2012	19	19	34	11	84
2013	37	28	107	10	182
Total	636	530	797	291	2 254

Table B2: Total number of observed tows sampled for ribaldo length and sex, by area for fishing years 1990 to 2013. Numbers of tows sampled in the table are higher than values on the length frequency plots because the table includes tows where fewer than three fish were sampled. See Table B1 for fishing year and area descriptions.

Fishing year	Eastern	Southern	WCSI	Other	Total
1990	1	0	0	0	1
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	5	1	0	0	6
1996	1	0	0	0	1
1997	0	0	0	0	0
1998	4	3	2	0	9
1999	21	48	18	10	97
2000	16	65	12	8	101
2001	43	31	7	1	82
2002	74	76	39	45	234
2003	23	20	20	72	135
2004	64	33	14	46	157
2005	112	22	20	5	159
2006	66	5	62	24	157
2007	59	13	9	39	120
2008	45	13	24	7	89
2009	45	6	14	5	70
2010	39	17	14	18	88
2011	29	6	8	47	90
2012	17	6	6	0	29
2013	12	8	21	4	45
Total	676	373	290	331	1670

Table B3: Number of observed tows sampled for ribaldo length frequency, by month for all fishery areas for fishing years 1990 to 2013.

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	1	0	0	0	0	0	1
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	1	5	0	0	0	0	0	0	0	0	0	0	6
1996	0	0	0	0	0	0	0	0	1	0	0	0	1
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	4	2	0	3	0	0	0	9
1999	0	11	7	3	34	3	6	10	0	11	12	0	97
2000	9	8	0	14	28	9	16	0	0	13	4	0	101
2001	1	3	1	4	19	1	4	2	4	4	18	21	82
2002	7	5	17	37	30	24	42	11	0	25	17	19	234
2003	0	4	0	0	11	67	36	5	3	5	0	4	135
2004	10	0	6	8	9	13	12	27	18	32	11	11	157
2005	19	11	10	8	3	57	16	3	4	6	19	3	159
2006	2	3	5	0	25	45	31	23	7	8	4	4	157
2007	7	7	7	1	21	22	14	4	1	28	7	1	120
2008	1	7	2	3	12	3	7	4	20	7	22	1	89
2009	0	0	11	4	0	6	26	3	12	4	1	3	70
2010	9	3	11	2	4	14	14	13	2	3	1	12	88
2011	4	13	15	1	8	33	13	1	0	0	1	1	90
2012	0	0	3	0	1	1	7	2	4	2	3	6	29
2013	3	0	0	0	3	14	5	1	11	0	4	4	45
Total	73	80	95	85	208	316	252	109	90	148	124	90	1 670

Table B4: Number of observed tows in each fishery area sampled for ribaldo length frequency, by month for fishing years 1990 to 2013. See Table B1 for fishing year and area descriptions.

(a) Eastern fishery

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	1	0	0	0	0	0	1
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	5	0	0	0	0	0	0	0	0	0	0	5
1996	0	0	0	0	0	0	0	0	1	0	0	0	1
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	4	0	0	0	0	0	0	4
1999	0	1	0	0	2	0	0	0	0	6	12	0	21
2000	1	2	0	0	3	0	0	0	0	10	0	0	16
2001	1	0	0	1	0	0	0	0	2	4	14	21	43
2002	5	2	0	9	20	14	0	0	0	7	9	8	74
2003	0	0	0	0	1	15	0	0	3	2	0	2	23
2004	2	0	0	6	4	0	3	21	13	3	6	6	64
2005	19	11	10	0	2	57	2	1	0	2	5	3	112
2006	2	3	0	0	17	24	11	0	0	4	2	3	66
2007	7	7	7	1	13	22	1	0	0	0	0	1	59
2008	1	7	0	3	12	2	2	0	0	4	13	1	45
2009	0	0	11	4	0	5	25	0	0	0	0	0	45
2010	9	0	0	0	3	7	7	0	0	0	1	12	39
2011	0	13	15	0	0	0	0	0	0	0	1	0	29
2012	0	0	3	0	1	0	6	0	0	0	3	4	17
2013	3	0	0	0	2	2	0	0	1	0	0	4	12
Total	50	51	46	24	80	152	58	22	20	42	66	65	676

Table B4 ctd.
(b) Southern fishery

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	1	0	0	0	0	0	0	0	0	0	0	0	1
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	3	0	0	0	3
1999	0	10	2	3	32	0	0	0	0	1	0	0	48
2000	8	6	0	14	25	9	3	0	0	0	0	0	65
2001	0	3	0	3	18	1	0	0	2	0	4	0	31
2002	0	0	0	28	10	1	0	0	0	18	8	11	76
2003	0	0	0	0	7	12	0	0	0	1	0	0	20
2004	8	0	0	0	0	1	0	0	0	17	2	5	33
2005	0	0	0	7	0	0	0	0	0	1	14	0	22
2006	0	0	1	0	0	1	0	0	0	2	0	1	5
2007	0	0	0	0	0	0	0	2	1	6	4	0	13
2008	0	0	2	0	0	0	0	0	1	2	8	0	13
2009	0	0	0	0	0	0	0	0	3	0	0	3	6
2010	0	2	11	2	0	1	0	0	0	1	0	0	17
2011	4	0	0	0	1	0	0	0	0	0	0	1	6
2012	0	0	0	0	0	0	1	0	1	2	0	2	6
2013	0	0	0	0	1	0	3	0	0	0	4	0	8
Total	21	21	16	57	94	26	7	2	11	51	44	23	373

Table B4 ctd.
(c) West coast South Island fishery

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	2	0	0	0	0	0	2
1999	0	0	0	0	0	2	6	10	0	0	0	0	18
2000	0	0	0	0	0	0	12	0	0	0	0	0	12
2001	0	0	0	0	1	0	4	2	0	0	0	0	7
2002	0	0	0	0	0	2	32	5	0	0	0	0	39
2003	0	0	0	0	0	2	13	5	0	0	0	0	20
2004	0	0	0	0	0	0	3	6	5	0	0	0	14
2005	0	0	0	0	0	0	14	2	4	0	0	0	20
2006	0	0	0	0	0	14	17	22	7	0	2	0	62
2007	0	0	0	0	0	0	7	2	0	0	0	0	9
2008	0	0	0	0	0	0	1	4	19	0	0	0	24
2009	0	0	0	0	0	0	0	3	9	2	0	0	14
2010	0	0	0	0	0	0	0	10	2	2	0	0	14
2011	0	0	0	0	0	8	0	0	0	0	0	0	8
2012	0	0	0	0	0	1	0	2	3	0	0	0	6
2013	0	0	0	0	0	8	2	1	10	0	0	0	21
Total	0	0	0	0	1	37	113	74	59	4	2	0	290

Table B4 ctd.
(d) Other fisheries

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	5	0	0	1	0	0	0	4	0	0	10
2000	0	0	0	0	0	0	1	0	0	3	4	0	8
2001	0	0	1	0	0	0	0	0	0	0	0	0	1
2002	2	3	17	0	0	7	10	6	0	0	0	0	45
2003	0	4	0	0	3	38	23	0	0	2	0	2	72
2004	0	0	6	2	5	12	6	0	0	12	3	0	46
2005	0	0	0	1	1	0	0	0	0	3	0	0	5
2006	0	0	4	0	8	6	3	1	0	2	0	0	24
2007	0	0	0	0	8	0	6	0	0	22	3	0	39
2008	0	0	0	0	0	1	4	0	0	1	1	0	7
2009	0	0	0	0	0	1	1	0	0	2	1	0	5
2010	0	1	0	0	1	6	7	3	0	0	0	0	18
2011	0	0	0	1	7	25	13	1	0	0	0	0	47
2012	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	4	0	0	0	0	0	0	4
Total	2	8	33	4	33	101	74	11	0	51	12	2	331

Table B5: Total number of ribaldo measured by fishing year and area by the observer programme for the trawl fishery, for fishing years 1990 to 2013. Numbers of fish in the table may differ from those on the length frequency plots for some years because the plots only included tows where more than five fish were measured. See Table B1 for fishing year and area descriptions.

Fishing year	Eastern	Southern	WCSI	Other	Total
1990	20	0	0	0	20
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	30	11	0	0	41
1996	11	0	0	0	11
1997	0	0	0	0	0
1998	24	34	16	0	74
1999	193	897	98	83	1 271
2000	93	471	146	65	775
2001	228	449	36	35	748
2002	477	754	401	262	1 894
2003	203	145	113	295	756
2004	457	224	76	192	949
2005	864	160	150	32	1 206
2006	632	30	688	202	1 552
2007	351	63	75	216	705
2008	484	179	398	76	1 137
2009	776	46	250	48	1 120
2010	362	255	339	295	1 251
2011	191	41	160	697	1 089
2012	195	161	124	0	480
2013	202	104	327	60	693
Total	5 793	4 024	3 397	2 558	15 772

Table B6: Total number of ribaldo measured by month and fishing year for each fishery area, by the observer programme for the trawl fishery, for fishing years 1990 to 2013. Numbers of fish in the table may differ from those on the length frequency plots for some years because the plots only included tows where more than five fish were measured. See Table B1 for fishing year and area descriptions.

(a) Eastern fishery

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	20	0	0	0	0	0	20
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	30	0	0	0	0	0	0	0	0	0	0	30
1996	0	0	0	0	0	0	0	0	11	0	0	0	11
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	24	0	0	0	0	0	0	24
1999	0	25	0	0	24	0	0	0	0	65	79	0	193
2000	1	2	0	0	20	0	0	0	0	70	0	0	93
2001	1	0	0	18	0	0	0	0	3	13	42	151	228
2002	7	3	0	32	114	122	0	0	0	47	71	81	477
2003	0	0	0	0	5	170	0	0	14	12	0	2	203
2004	17	0	0	35	54	0	14	151	69	31	30	56	457
2005	111	46	29	0	3	586	13	1	0	27	38	10	864
2006	2	22	0	0	273	198	101	0	0	18	14	4	632
2007	19	17	28	18	96	153	11	0	0	0	0	9	351
2008	20	90	0	40	117	36	23	0	0	46	99	13	484
2009	0	0	85	74	0	76	541	0	0	0	0	0	776
2010	27	0	0	0	53	105	133	0	0	0	5	39	362
2011	0	80	91	0	0	0	0	0	0	0	20	0	191
2012	0	0	50	0	40	0	82	0	0	0	8	15	195
2013	68	0	0	0	40	21	0	0	20	0	0	53	202
Total	273	315	283	217	839	1 491	938	152	117	329	406	433	5 793

Table B6: continued.

(b) Southern fishery

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	11	0	0	0	0	0	0	0	0	0	0	0	11
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	34	0	0	0	34
1999	0	357	79	30	423	0	0	0	0	8	0	0	897
2000	51	30	0	122	172	89	7	0	0	0	0	0	471
2001	0	49	0	60	319	5	0	0	8	0	8	0	449
2002	0	0	0	215	61	1	0	0	0	312	73	92	754
2003	0	0	0	0	43	101	0	0	0	1	0	0	145
2004	89	0	0	0	0	7	0	0	0	110	9	9	224
2005	0	0	0	70	0	0	0	0	0	6	84	0	160
2006	0	0	8	0	0	15	0	0	0	6	0	1	30
2007	0	0	0	0	0	0	0	8	5	39	11	0	63
2008	0	0	25	0	0	0	0	0	20	21	113	0	179
2009	0	0	0	0	0	0	0	0	20	0	0	26	46
2010	0	37	172	27	0	10	0	0	0	9	0	0	255
2011	23	0	0	0	15	0	0	0	0	0	0	3	41
2012	0	0	0	0	0	0	28	0	25	40	0	68	161
2013	0	0	0	0	9	0	45	0	0	0	50	0	104
Total	174	473	284	524	1 042	228	80	8	112	552	348	199	4 024

Table B6: continued.

(c) west coast South Island fishery

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	16	0	0	0	0	0	16
1999	0	0	0	0	0	33	21	44	0	0	0	0	98
2000	0	0	0	0	0	0	146	0	0	0	0	0	146
2001	0	0	0	0	9	0	15	12	0	0	0	0	36
2002	0	0	0	0	0	28	353	20	0	0	0	0	401
2003	0	0	0	0	0	11	65	37	0	0	0	0	113
2004	0	0	0	0	0	0	19	28	29	0	0	0	76
2005	0	0	0	0	0	0	104	9	37	0	0	0	150
2006	0	0	0	0	0	153	166	267	68	0	34	0	688
2007	0	0	0	0	0	0	45	30	0	0	0	0	75
2008	0	0	0	0	0	0	20	74	304	0	0	0	398
2009	0	0	0	0	0	0	0	50	170	30	0	0	250
2010	0	0	0	0	0	0	0	204	40	95	0	0	339
2011	0	0	0	0	0	160	0	0	0	0	0	0	160
2012	0	0	0	0	0	20	0	40	64	0	0	0	124
2013	0	0	0	0	0	100	14	21	192	0	0	0	327
Total	0	0	0	0	9	505	984	836	904	125	34	0	3 397

Table B6: continued.

(d) Other fisheries

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	34	0	0	15	0	0	0	34	0	0	83
2000	0	0	0	0	0	0	1	0	0	29	35	0	65
2001	0	0	35	0	0	0	0	0	0	0	0	0	35
2002	2	10	96	0	0	25	59	70	0	0	0	0	262
2003	0	23	0	0	13	180	71	0	0	2	0	6	295
2004	0	0	45	2	14	67	25	0	0	33	6	0	192
2005	0	0	0	20	1	0	0	0	0	11	0	0	32
2006	0	0	10	0	36	100	23	15	0	18	0	0	202
2007	0	0	0	0	20	0	30	0	0	135	31	0	216
2008	0	0	0	0	0	5	62	0	0	8	1	0	76
2009	0	0	0	0	0	30	1	0	0	9	8	0	48
2010	0	20	0	0	20	102	103	50	0	0	0	0	295
2011	0	0	0	20	122	320	215	20	0	0	0	0	697
2012	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	60	0	0	0	0	0	0	60
Total	2	53	220	42	226	904	590	155	0	279	81	6	2 558

Table B7: Number of female ribaldo gonads staged by fishing year sampled from each area by the observer programme from the trawl fishery for the 1990 to 2013 fishing years. See Table B1 for fishing year and area descriptions.

Fishing year	Eastern	Southern	WCSI	Other	Total
1990	3	0	0	0	3
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	21	10	0	0	31
1996	9	0	0	0	9
1997	0	0	0	0	0
1998	4	31	12	0	47
1999	137	839	50	46	1 072
2000	26	430	108	43	607
2001	146	398	28	6	578
2002	167	699	305	64	1 235
2003	42	110	65	136	353
2004	263	189	64	116	632
2005	270	147	105	13	535
2006	181	26	531	68	806
2007	108	53	58	157	376
2008	147	166	232	44	589
2009	132	44	158	6	340
2010	104	247	262	95	708
2011	105	38	104	220	467
2012	43	134	79	0	256
2013	81	63	217	14	375
Total	1 989	3 624	2 378	1 028	9 019

Table B8: Number of female ribaldo gonads staged by fishing year and month sampled from each area by the observer programme for the trawl fishery for the 1990 to 2013 fishing years. See Table B1 for fishing year and area descriptions.

(a) Eastern fishery

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	3	0	0	0	0	0	3
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	21	0	0	0	0	0	0	0	0	0	0	21
1996	0	0	0	0	0	0	0	0	9	0	0	0	9
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	4	0	0	0	0	0	0	4
1999	0	6	0	0	18	0	0	0	0	45	68	0	137
2000	1	2	0	0	8	0	0	0	0	15	0	0	26
2001	0	0	0	16	0	0	0	0	1	1	30	98	146
2002	5	0	0	20	65	17	0	0	0	13	14	33	167
2003	0	0	0	0	3	16	0	0	11	10	0	2	42
2004	14	0	0	24	1	0	3	101	41	22	20	37	263
2005	86	23	16	0	2	102	6	1	0	10	14	10	270
2006	2	8	0	0	33	61	53	0	0	11	10	3	181
2007	6	6	13	7	30	40	0	0	0	0	0	6	108
2008	5	17	0	13	54	4	3	0	0	23	27	1	147
2009	0	0	30	36	0	11	55	0	0	0	0	0	132
2010	21	0	0	0	9	22	15	0	0	0	5	32	104
2011	0	34	60	0	0	0	0	0	0	0	11	0	105
2012	0	0	14	0	2	0	9	0	0	0	8	10	43
2013	33	0	0	0	12	14	0	0	2	0	0	20	81
Total	173	117	133	116	237	291	147	102	64	150	207	252	1 989

Table B8 continued.

(b) Southern fishery

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	10	0	0	0	0	0	0	0	0	0	0	0	10
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	31	0	0	0	31
1999	0	339	76	26	391	0	0	0	0	7	0	0	839
2000	50	26	0	113	153	83	5	0	0	0	0	0	430
2001	0	42	0	54	284	5	0	0	6	0	7	0	398
2002	0	0	0	199	56	0	0	0	0	282	70	92	699
2003	0	0	0	0	35	74	0	0	0	1	0	0	110
2004	80	0	0	0	0	7	0	0	0	91	3	8	189
2005	0	0	0	66	0	0	0	0	0	5	76	0	147
2006	0	0	7	0	0	12	0	0	0	6	0	1	26
2007	0	0	0	0	0	0	0	5	2	35	11	0	53
2008	0	0	22	0	0	0	0	0	20	21	103	0	166
2009	0	0	0	0	0	0	0	0	20	0	0	24	44
2010	0	37	171	26	0	7	0	0	0	6	0	0	247
2011	22	0	0	0	13	0	0	0	0	0	0	3	38
2012	0	0	0	0	0	0	17	0	24	36	0	57	134
2013	0	0	0	0	5	0	9	0	0	0	49	0	63
Total	162	444	276	484	937	188	31	5	103	490	319	185	3 624

Table B8 continued.
(c) West coast South Island fishery

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	12	0	0	0	0	0	12
1999	0	0	0	0	0	4	15	31	0	0	0	0	50
2000	0	0	0	0	0	0	108	0	0	0	0	0	108
2001	0	0	0	0	7	0	12	9	0	0	0	0	28
2002	0	0	0	0	0	21	269	15	0	0	0	0	305
2003	0	0	0	0	0	10	35	20	0	0	0	0	65
2004	0	0	0	0	0	0	17	25	22	0	0	0	64
2005	0	0	0	0	0	0	76	7	22	0	0	0	105
2006	0	0	0	0	0	119	115	231	50	0	16	0	531
2007	0	0	0	0	0	0	35	23	0	0	0	0	58
2008	0	0	0	0	0	0	11	53	168	0	0	0	232
2009	0	0	0	0	0	0	0	43	96	19	0	0	158
2010	0	0	0	0	0	0	0	160	36	66	0	0	262
2011	0	0	0	0	0	104	0	0	0	0	0	0	104
2012	0	0	0	0	0	0	0	29	50	0	0	0	79
2013	0	0	0	0	0	72	11	14	120	0	0	0	217
Total	0	0	0	0	7	330	716	660	564	85	16	0	2 378

Table B8 continued.

(d) Other fisheries

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	28	0	0	5	0	0	0	13	0	0	46
2000	0	0	0	0	0	0	1	0	0	9	33	0	43
2001	0	0	6	0	0	0	0	0	0	0	0	0	6
2002	2	4	26	0	0	9	8	15	0	0	0	0	64
2003	0	16	0	0	9	82	21	0	0	2	0	6	136
2004	0	0	32	1	8	42	12	0	0	20	1	0	116
2005	0	0	0	6	1	0	0	0	0	6	0	0	13
2006	0	0	8	0	10	18	3	14	0	15	0	0	68
2007	0	0	0	0	15	0	21	0	0	105	16	0	157
2008	0	0	0	0	0	0	37	0	0	6	1	0	44
2009	0	0	0	0	0	1	0	0	0	5	0	0	6
2010	0	9	0	0	7	37	37	5	0	0	0	0	95
2011	0	0	0	7	34	98	81	0	0	0	0	0	220
2012	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	14	0	0	0	0	0	0	14
Total	2	29	100	14	84	306	221	34	0	181	51	6	1 028

Table B9: Total number of observed bottom longline sets (a) and catches in tonnes (b) sampled for ribaldo, by area for fishing years 1990 to 2013. See Table B1 for fishing year and area descriptions.

(a) Sets

Fishing year	Eastern	Southern	WCSI	Other	Total
1990	0	0	0	0	0
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	71	0	0	39	110
1994	0	62	0	6	68
1995	146	6	0	0	152
1996	21	142	0	0	163
1997	161	13	0	0	174
1998	32	25	0	2	59
1999	78	111	0	26	215
2000	14	167	0	0	181
2001	18	317	0	38	373
2002	303	154	0	0	457
2003	178	258	0	31	467
2004	82	177	6	0	265
2005	26	100	0	1	127
2006	98	170	0	161	429
2007	34	90	0	132	256
2008	145	23	0	12	180
2009	71	47	0	3	121
2010	0	172	0	0	172
2011	142	61	0	0	203
2012	0	142	23	0	165
2013	2	0	0	0	2
Total	1 622	2 237	29	451	4 339

Table B9 Continued.
(b) Catches (t)

Fishing year	Eastern	Southern	WCSI	Other	Total
1990	0	0	0	0	0
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	13	0	0	8	21
1994	0	4	0	0	4
1995	40	0	0	0	40
1996	4	9	0	0	13
1997	96	0	0	0	96
1998	3	1	0	0	4
1999	18	10	0	3	31
2000	2	27	0	0	30
2001	6	24	0	3	33
2002	55	9	0	0	64
2003	17	17	0	6	39
2004	11	17	0	0	29
2005	0	6	0	0	6
2006	30	9	0	53	91
2007	6	9	0	8	23
2008	19	5	0	0	23
2009	9	15	0	0	24
2010	0	48	0	0	48
2011	44	8	0	0	51
2012	0	16	1	0	17
2013	0	0	0	0	0
Total	372	233	1	81	687

Table B10: Total number of observed bottom longline sets sampled for ribaldo length frequency, by area for fishing years 1990 to 2013. Numbers of tows sampled in the table may be higher than values on the length frequency plots because this table includes sets where fewer than five fish were sampled. See Table B1 for fishing year and area descriptions.

Fishing year	Eastern	Southern	WCSI	Other	Total
1990	0	0	0	0	0
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	0	0	0	0	0
1996	0	0	0	0	0
1997	14	0	0	0	14
1998	0	0	0	0	0
1999	0	0	0	3	3
2000	0	1	0	0	1
2001	1	4	0	3	8
2002	3	14	0	0	17
2003	29	84	0	3	116
2004	23	63	0	0	86
2005	4	14	0	0	18
2006	6	50	0	33	89
2007	3	26	0	17	46
2008	6	1	0	3	10
2009	5	11	0	1	17
2010	0	21	0	0	21
2011	18	11	0	0	29
2012	0	27	0	0	27
2013	<1	0	0	0	0
Total	112	327	0	63	502

Table B11: Number of observed bottom longline sets sampled for ribaldo length frequency, by month for fishing years 1990 to 2013.

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	3	11	0	0	0	0	0	0	14
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	3	0	0	0	0	0	3
2000	0	0	0	0	0	0	0	0	0	0	0	1	1
2001	0	0	0	0	3	3	0	0	0	1	1	0	8
2002	0	0	0	0	0	0	0	0	3	1	13	0	17
2003	0	4	0	0	0	3	21	3	9	35	28	13	116
2004	0	0	0	0	0	0	0	2	12	49	23	0	86
2005	0	0	0	0	0	0	0	0	4	0	14	0	18
2006	2	0	0	7	20	7	0	0	1	23	29	0	89
2007	0	0	0	4	0	7	7	2	0	26	0	0	46
2008	0	0	0	0	5	4	0	0	0	1	0	0	10
2009	0	0	0	0	11	0	0	6	0	0	0	0	17
2010	0	0	0	0	0	14	5	0	0	0	2	0	21
2011	0	7	4	0	0	0	0	0	0	0	13	5	29
2012	0	0	5	1	0	17	4	0	0	0	0	0	27
2013	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2	11	9	12	42	66	40	13	29	136	123	19	502

Table B12: Number of observed bottom longline sets in each fishery area sampled for ribaldo length frequency, by month for fishing years 1990 to 2013. See Table B1 for fishing year and area descriptions.

(a) Eastern fishery

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	3	11	0	0	0	0	0	0	14
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	1	0	0	0	0	0	0	0	1
2002	0	0	0	0	0	0	0	0	3	0	0	0	3
2003	0	0	0	0	0	0	20	3	6	0	0	0	29
2004	0	0	0	0	0	0	0	2	12	9	0	0	23
2005	0	0	0	0	0	0	0	0	4	0	0	0	4
2006	2	0	0	0	1	1	0	0	1	1	0	0	6
2007	0	0	0	0	0	3	0	0	0	0	0	0	3
2008	0	0	0	0	4	2	0	0	0	0	0	0	6
2009	0	0	0	0	0	0	0	5	0	0	0	0	5
2010	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	13	5	18
2012	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2	0	0	0	9	17	20	10	26	10	13	5	112

Table B12 continued.
(b) Southern fishery

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	1	1
2001	0	0	0	0	2	0	0	0	0	1	1	0	4
2002	0	0	0	0	0	0	0	0	0	1	13	0	14
2003	0	4	0	0	0	3	1	0	0	35	28	13	84
2004	0	0	0	0	0	0	0	0	0	40	23	0	63
2005	0	0	0	0	0	0	0	0	0	0	14	0	14
2006	0	0	0	0	0	0	0	0	0	22	28	0	50
2007	0	0	0	0	0	0	0	0	0	26	0	0	26
2008	0	0	0	0	0	0	0	0	0	1	0	0	1
2009	0	0	0	0	11	0	0	0	0	0	0	0	11
2010	0	0	0	0	0	14	5	0	0	0	2	0	21
2011	0	7	4	0	0	0	0	0	0	0	0	0	11
2012	0	0	5	1	0	17	4	0	0	0	0	0	27
2013	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	11	9	1	13	34	10	0	0	126	109	14	327

(c) West coast South Island fishery – No data

Table B12 Continued.
(d) Other fisheries

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	3	0	0	0	0	0	3
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	3	0	0	0	0	0	0	3
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	3	0	0	0	3
2004	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	7	19	6	0	0	0	0	1	0	33
2007	0	0	0	4	0	4	7	2	0	0	0	0	17
2008	0	0	0	0	1	2	0	0	0	0	0	0	3
2009	0	0	0	0	0	0	0	1	0	0	0	0	1
2010	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	11	20	15	10	3	3	0	1	0	63

Table B13: Total number of ribaldo measured by fishing year and area by the observer programme for the bottom longline fishery, for fishing years 1990 to 2013. Numbers measured may differ from those on the length frequency plots for some years as length frequency plots only included tows where more than five individual fish were measured. See Table B1 for fishing year and area descriptions.

Fishing year	Eastern	Southern	WCSI	Other	Total
1990	0	0	0	0	0
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	0	0	0	0	0
1996	0	0	0	0	0
1997	970	0	0	0	970
1998	0	0	0	0	0
1999	0	0	0	7	7
2000	0	39	0	0	39
2001	19	100	0	66	185
2002	19	137	0	0	156
2003	216	740	0	25	981
2004	120	596	0	0	716
2005	4	100	0	0	104
2006	71	288	0	290	649
2007	39	183	0	214	436
2008	151	20	0	32	203
2009	57	198	0	9	264
2010	0	300	0	0	300
2011	350	203	0	0	553
2012	0	304	0	0	304
2013	0	0	0	0	0
Total	2016	3208	0	643	5867

Table B14: Total number of ribaldo measured by month and fishing year for each fishery area, by the observer programme for the bottom longline fishery, for fishing years 1990 to 2013. Numbers measured in the table may differ from those on length frequency plots for some years as length frequency plots only included tows where more than five individual fish were measured. See Table B1 for fishing year and area descriptions.

(a) Eastern fishery

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	117	853	0	0	0	0	0	0	970
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	19	0	0	0	0	0	0	0	19
2002	0	0	0	0	0	0	0	0	19	0	0	0	19
2003	0	0	0	0	0	0	175	7	34	0	0	0	216
2004	0	0	0	0	0	0	0	5	22	93	0	0	120
2005	0	0	0	0	0	0	0	0	4	0	0	0	4
2006	40	0	0	0	10	10	0	0	10	1	0	0	71
2007	0	0	0	0	0	39	0	0	0	0	0	0	39
2008	0	0	0	0	111	40	0	0	0	0	0	0	151
2009	0	0	0	0	0	0	0	57	0	0	0	0	57
2010	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	250	100	350
2012	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	40	0	0	0	257	942	175	69	89	94	250	100	2 016

Table B14: continued.

(b) Southern fishery

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	39	39
2001	0	0	0	0	27	0	0	0	0	8	65	0	100
2002	0	0	0	0	0	0	0	0	0	10	127	0	137
2003	0	20	0	0	0	29	80	0	0	392	175	44	740
2004	0	0	0	0	0	0	0	0	0	362	234	0	596
2005	0	0	0	0	0	0	0	0	0	0	100	0	100
2006	0	0	0	0	0	0	0	0	0	124	164	0	288
2007	0	0	0	0	0	0	0	0	0	183	0	0	183
2008	0	0	0	0	0	0	0	0	0	20	0	0	20
2009	0	0	0	0	198	0	0	0	0	0	0	0	198
2010	0	0	0	0	0	215	60	0	0	0	25	0	300
2011	0	123	80	0	0	0	0	0	0	0	0	0	203
2012	0	0	58	4	0	198	44	0	0	0	0	0	304
2013	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	143	138	4	225	442	184	0	0	1 099	890	83	3 208

Table B14: continued.

(c) West coast South Island fishery – No data

(d) Other fisheries

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	7	0	0	0	0	0	7
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	66	0	0	0	0	0	0	66
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	25	0	0	0	25
2004	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	61	185	39	0	0	0	0	5	0	290
2007	0	0	0	28	0	67	105	14	0	0	0	0	214
2008	0	0	0	0	20	12	0	0	0	0	0	0	32
2009	0	0	0	0	0	0	0	9	0	0	0	0	9
2010	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	89	205	184	112	23	25	0	5	0	643

Table B15: Number of female ribaldo gonads staged by fishing year sampled from each area by the observer programme for the bottom longline fishery for the 1990 to 2013 fishing years. See Table B1 for fishing year and area descriptions.

Fishing year	Eastern	Southern	WCSI	Other	Total
1990	0	0	0	0	0
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	0	0	0	0	0
1996	0	0	0	0	0
1997	198	0	0	0	198
1998	0	0	0	0	0
1999	0	0	0	5	5
2000	0	33	0	0	33
2001	12	95	0	59	166
2002	14	116	0	0	130
2003	160	642	0	23	825
2004	53	502	0	0	555
2005	4	85	0	0	89
2006	39	271	0	234	544
2007	32	131	0	160	323
2008	44	20	0	0	64
2009	0	194	0	0	194
2010	0	295	0	0	295
2011	141	200	0	0	341
2012	0	300	0	0	300
2013	0	0	0	0	0
Total	697	2884	0	481	4 062

Table B16: Number of female ribaldo gonads staged by fishing year and month sampled from each area by the observer programme for the bottom longline fishery for the 1990 to 2013 fishing years. See Table B1 for fishing year and area descriptions.

(a) Eastern fishery

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	31	167	0	0	0	0	0	0	198
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	12	0	0	0	0	0	0	0	12
2002	0	0	0	0	0	0	0	0	14	0	0	0	14
2003	0	0	0	0	0	0	129	6	25	0	0	0	160
2004	0	0	0	0	0	0	0	5	19	29	0	0	53
2005	0	0	0	0	0	0	0	0	4	0	0	0	4
2006	11	0	0	0	8	10	0	0	10	0	0	0	39
2007	0	0	0	0	0	32	0	0	0	0	0	0	32
2008	0	0	0	0	7	37	0	0	0	0	0	0	44
2009	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	101	40	141
2012	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	11	0	0	0	58	246	129	11	72	29	101	40	697

Table B16 continued.

(b) Southern fishery

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	33	33
2001	0	0	0	0	25	0	0	0	0	7	63	0	95
2002	0	0	0	0	0	0	0	0	0	8	108	0	116
2003	0	20	0	0	0	29	55	0	0	335	162	41	642
2004	0	0	0	0	0	0	0	0	0	302	200	0	502
2005	0	0	0	0	0	0	0	0	0	0	85	0	85
2006	0	0	0	0	0	0	0	0	0	112	159	0	271
2007	0	0	0	0	0	0	0	0	0	131	0	0	131
2008	0	0	0	0	0	0	0	0	0	20	0	0	20
2009	0	0	0	0	194	0	0	0	0	0	0	0	194
2010	0	0	0	0	0	211	59	0	0	0	25	0	295
2011	0	120	80	0	0	0	0	0	0	0	0	0	200
2012	0	0	57	4	0	195	44	0	0	0	0	0	300
2013	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	140	137	4	219	435	158	0	0	915	802	74	2 884

(c) West coast South Island fishery – No data

Table B16 continued.
(d) Other fisheries

Fishing year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	5	0	0	0	0	0	5
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	59	0	0	0	0	0	0	59
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	23	0	0	0	23
2004	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	41	156	32	0	0	0	0	5	0	234
2007	0	0	0	15	0	49	92	4	0	0	0	0	160
2008	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	56	156	140	97	4	23	0	5	0	481

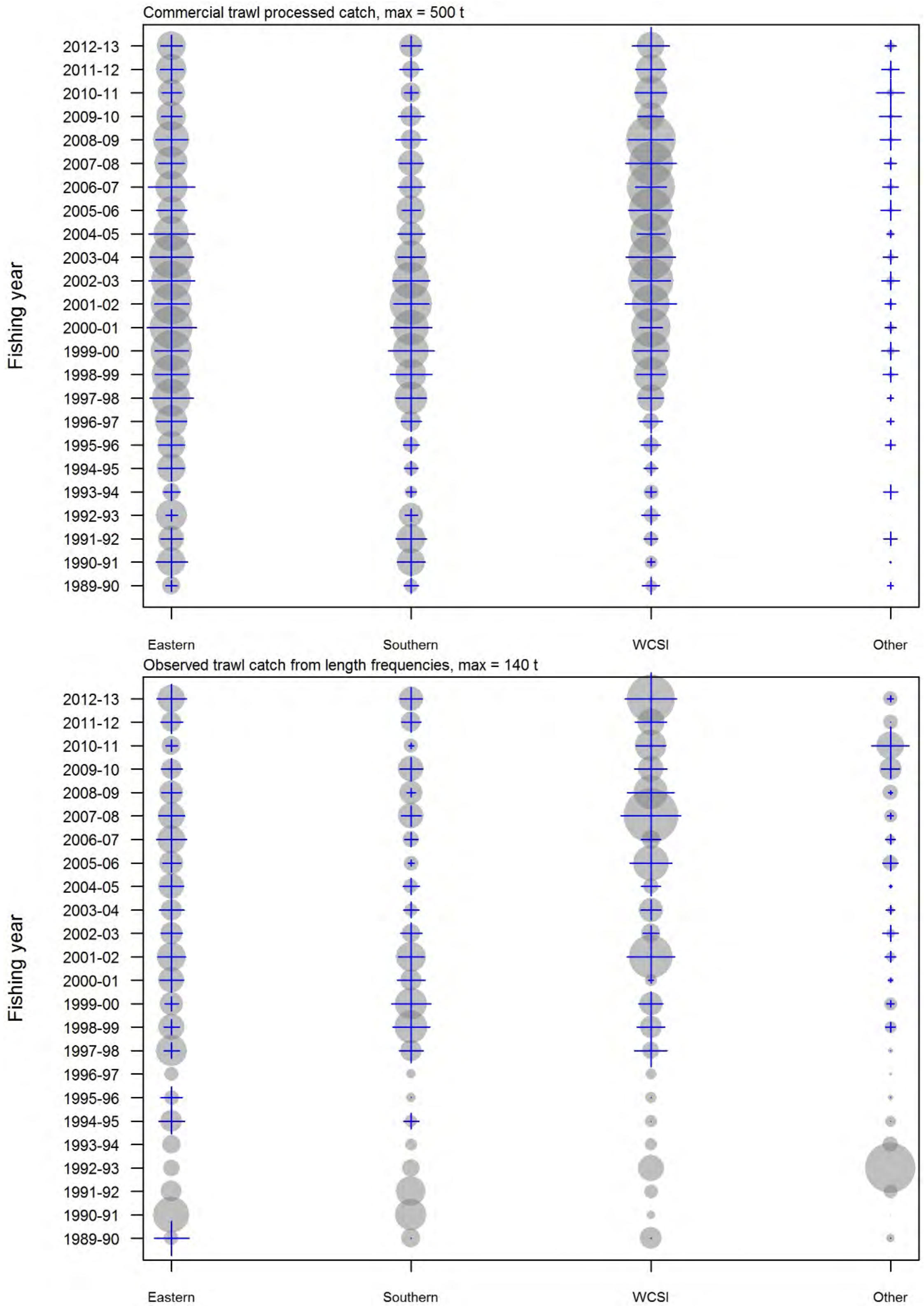


Figure B1: Representativeness of observer sampling of ribaldo catch by fishing year and area for the trawl fishery. Top plot: circles show the processed ribaldo catch by area within a year; crosses show the observed ribaldo catch for the same cells. Representation is demonstrated by how closely the crosses match the circle diameter. Bottom plot: circles show the total observed trawl catch by area within a year; crosses show the observed ribaldo catch sampled for length frequency for the same cells. See Table B1 for area descriptions.

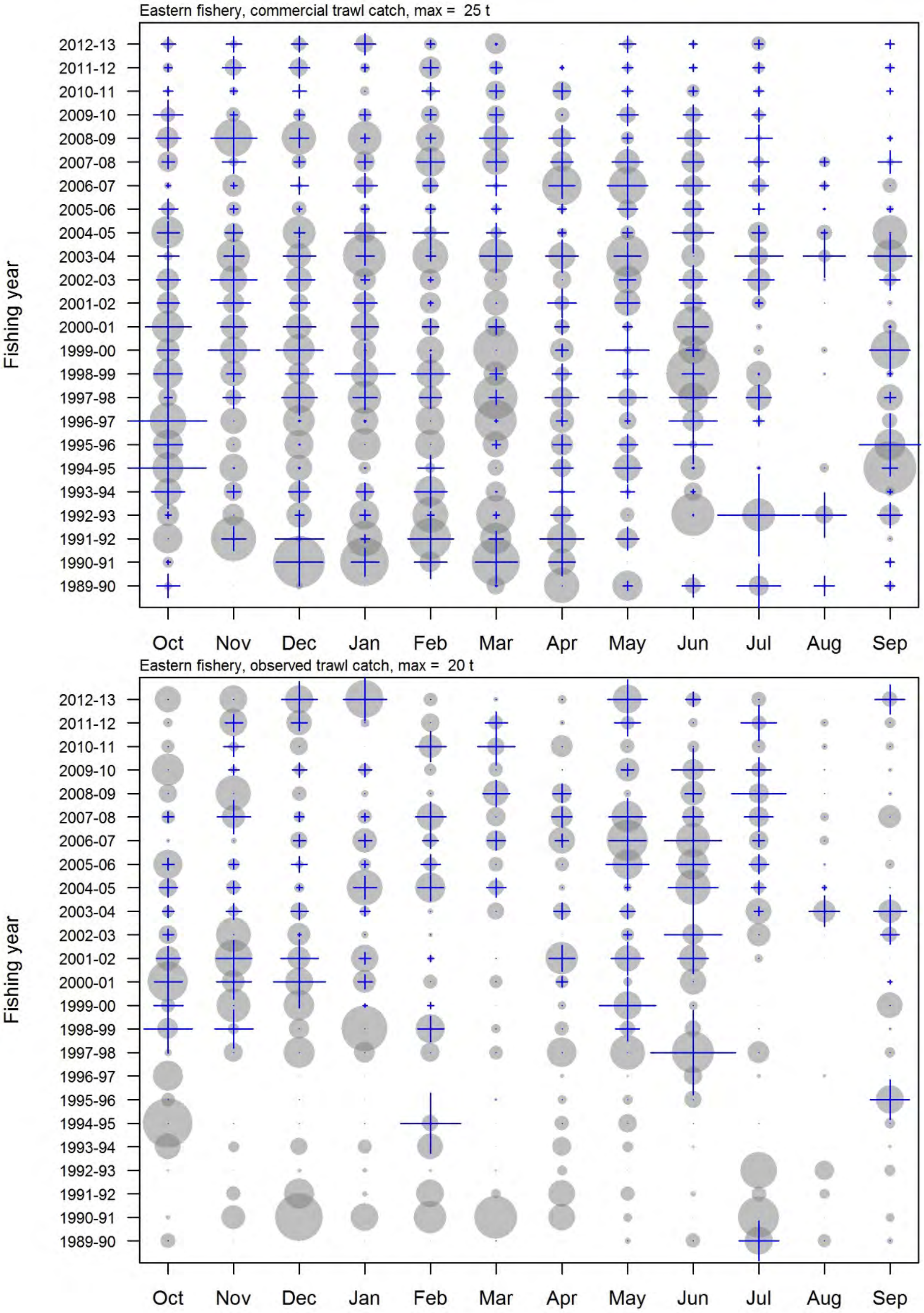


Figure B2: Representativeness of observer sampling of ribaldo catch by fishing year and month for the eastern trawl fishery. Top plot: circles show the processed ribaldo catch by month and year; crosses show the observed ribaldo catch for the same cells. Representation is demonstrated by how closely the crosses match the circle diameter. Bottom plot: circles show the total observed trawl catch for the eastern fishery by month and year; crosses show the observed ribaldo catch sampled for length frequency for the same cells. See Table B1 for area descriptions.

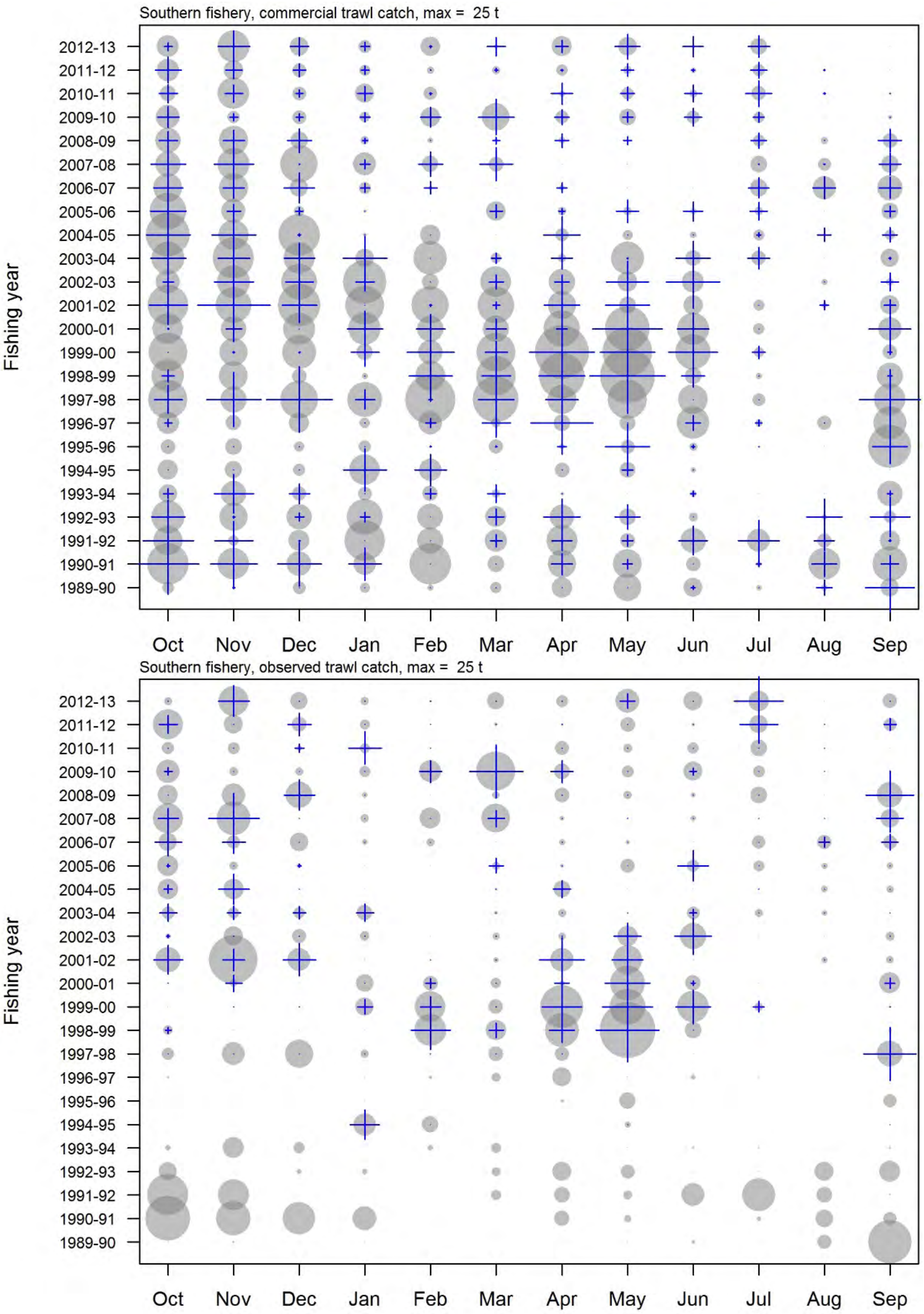


Figure B3: Representativeness of observer sampling of ribaldo catch by fishing year and month for the southern trawl fishery. Top plot: circles show the processed ribaldo catch by month and year; crosses show the observed ribaldo catch for the same cells. Representation is demonstrated by how closely the crosses match the circle diameter. Bottom plot: circles show the total observed trawl catch for the southern fishery by month and year; crosses show the observed ribaldo catch sampled for length frequency for the same cells. See Table B1 for area descriptions.

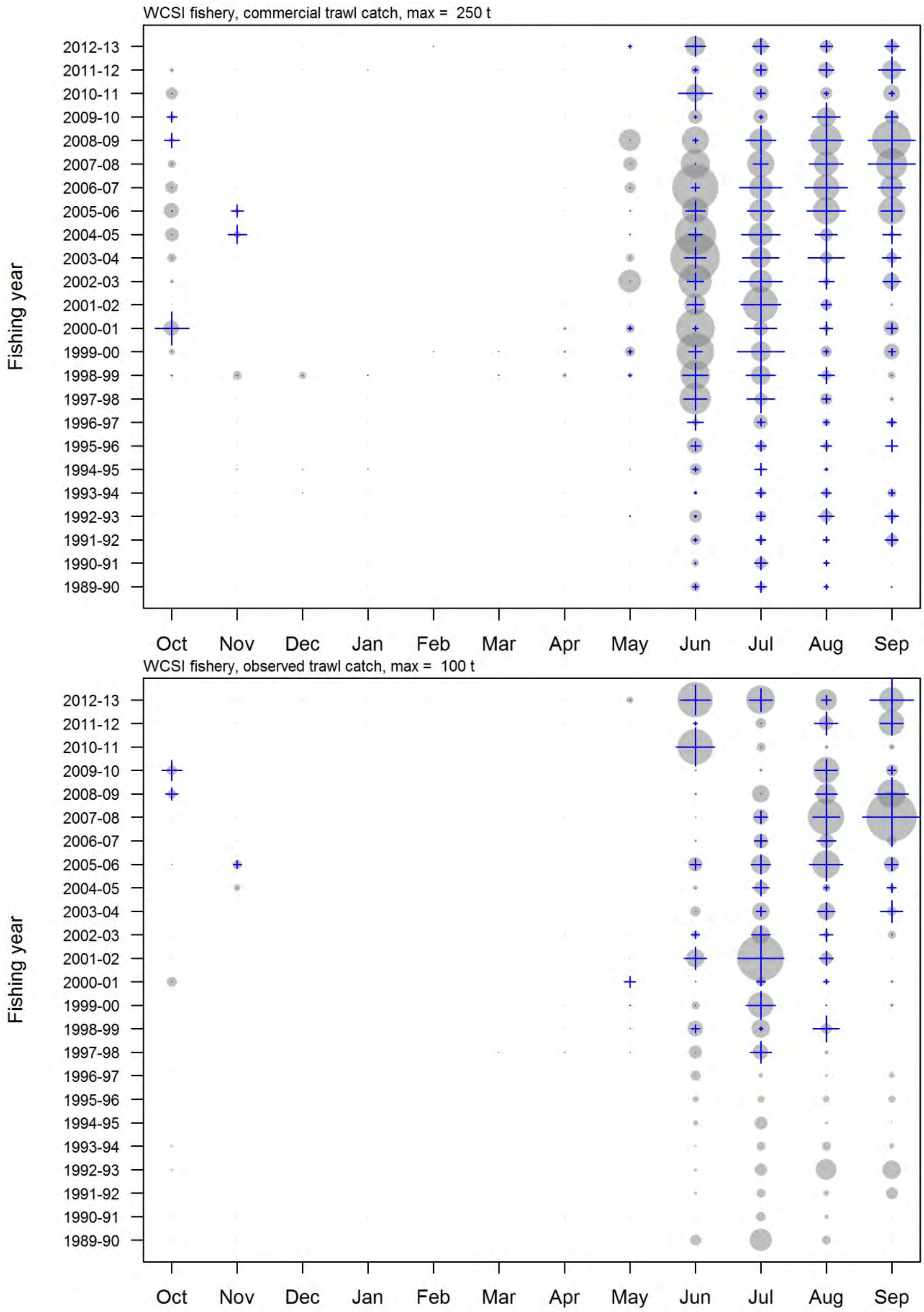


Figure B4: Representativeness of observer sampling of ribaldo catch by fishing year and month for the west coast South Island trawl fishery. Top plot: circles show the processed ribaldo catch by month and year; crosses show the observed ribaldo catch for the same cells. Representation is demonstrated by how closely the crosses match the circle diameter. Bottom plot: circles show the total observed trawl catch for the west coast South Island fishery by month and year; crosses show the observed ribaldo catch sampled for length frequency for the same cells. See Table B1 for area descriptions.

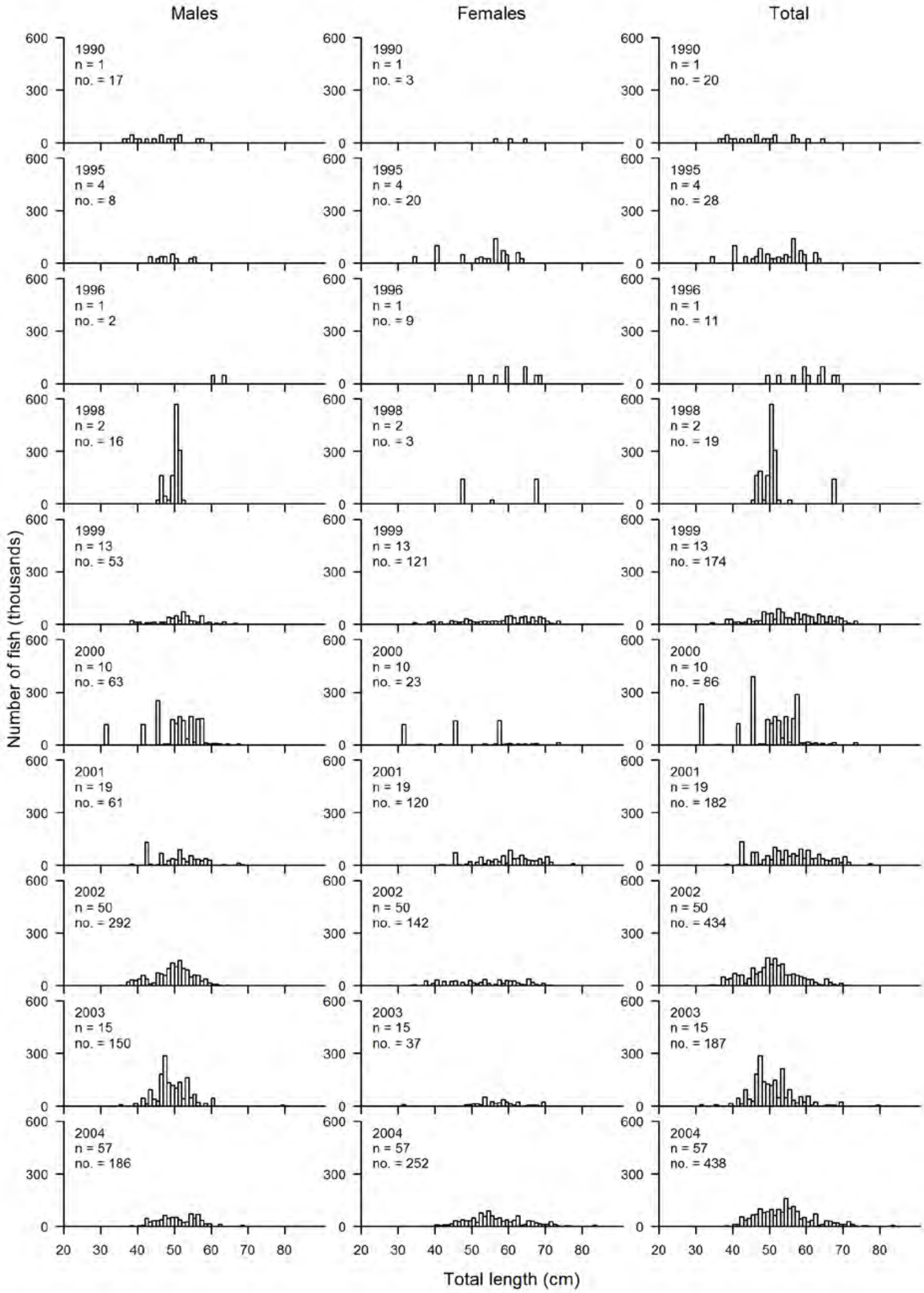


Figure B5: Scaled population length frequency of ribaldo sampled by observers from commercial trawl catches from the eastern fishery, where there were more than 3 ribaldo per tow, for fishing years with available data between the 1990 and 2013 fishing years. n, number of tows sampled with more than 3 individual ribaldo per tow; no., number of ribaldo sampled. See Table B1 for area descriptions.

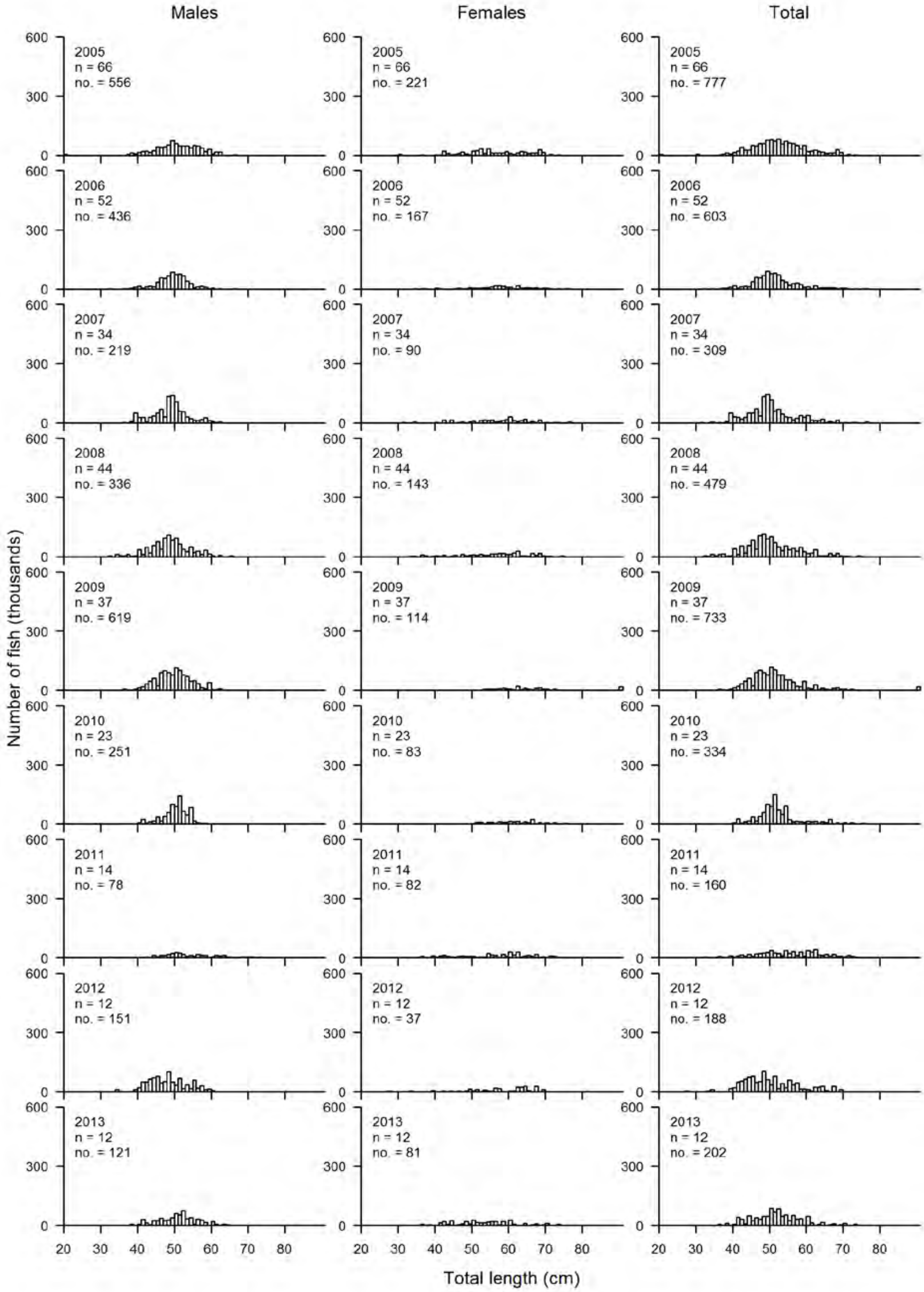


Figure B5 continued: Scaled population length frequency of ribaldo sampled by observers from commercial trawl catches from the eastern fishery, where there were more than 3 ribaldo per tow, for fishing years with available data between the 1990 and 2013 fishing years. n, number of tows sampled with more than 3 individual ribaldo per tow; no., number of ribaldo sampled.

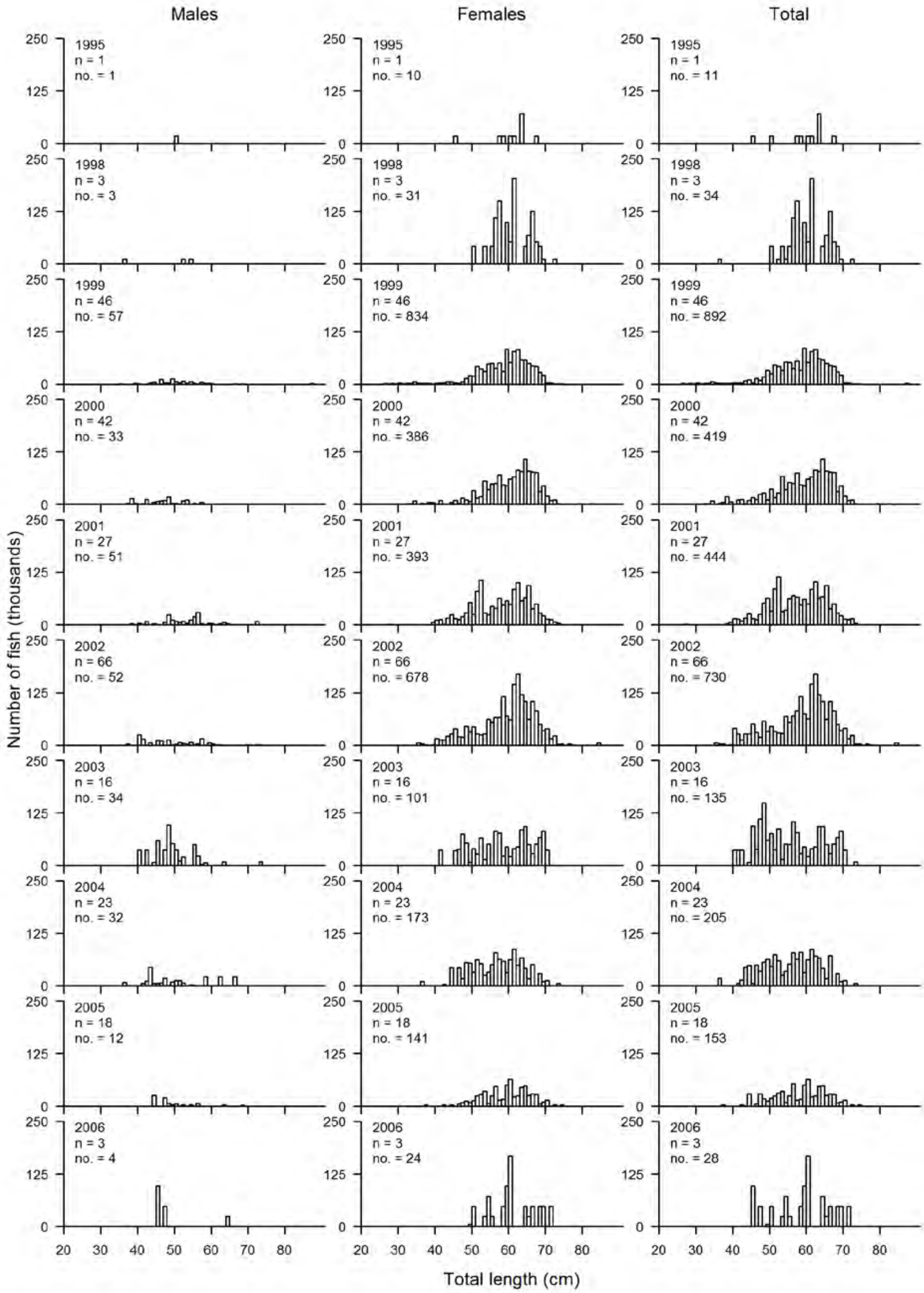


Figure B6: Scaled population length frequency of ribaldo sampled by observers from commercial trawl catches from the southern fishery, where there were more than 3 ribaldo per tow, for fishing years with available data between the 1990 and 2013 fishing years. n, number of tows sampled with more than 3 individual ribaldo per tow; no., number of ribaldo sampled. See Table B1 for area descriptions.

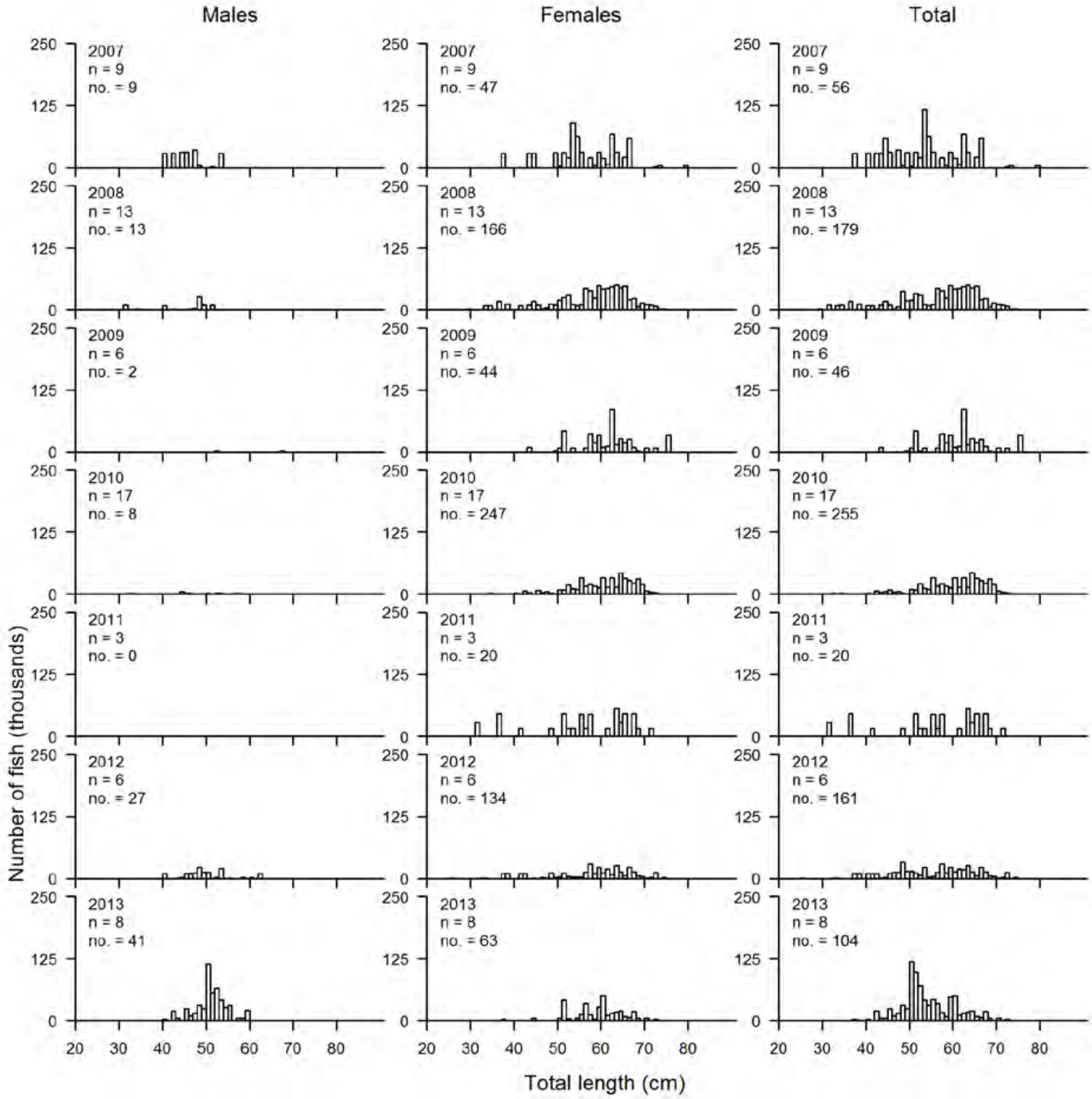


Figure B6 continued: Scaled population length frequency of ribaldo sampled by observers from commercial trawl catches from the southern fishery, where there were more than 3 ribaldo per tow, for fishing years with available data between the 1990 and 2013 fishing years. n, number of tows sampled with more than 3 individual ribaldo per tow; no., number of ribaldo sampled.

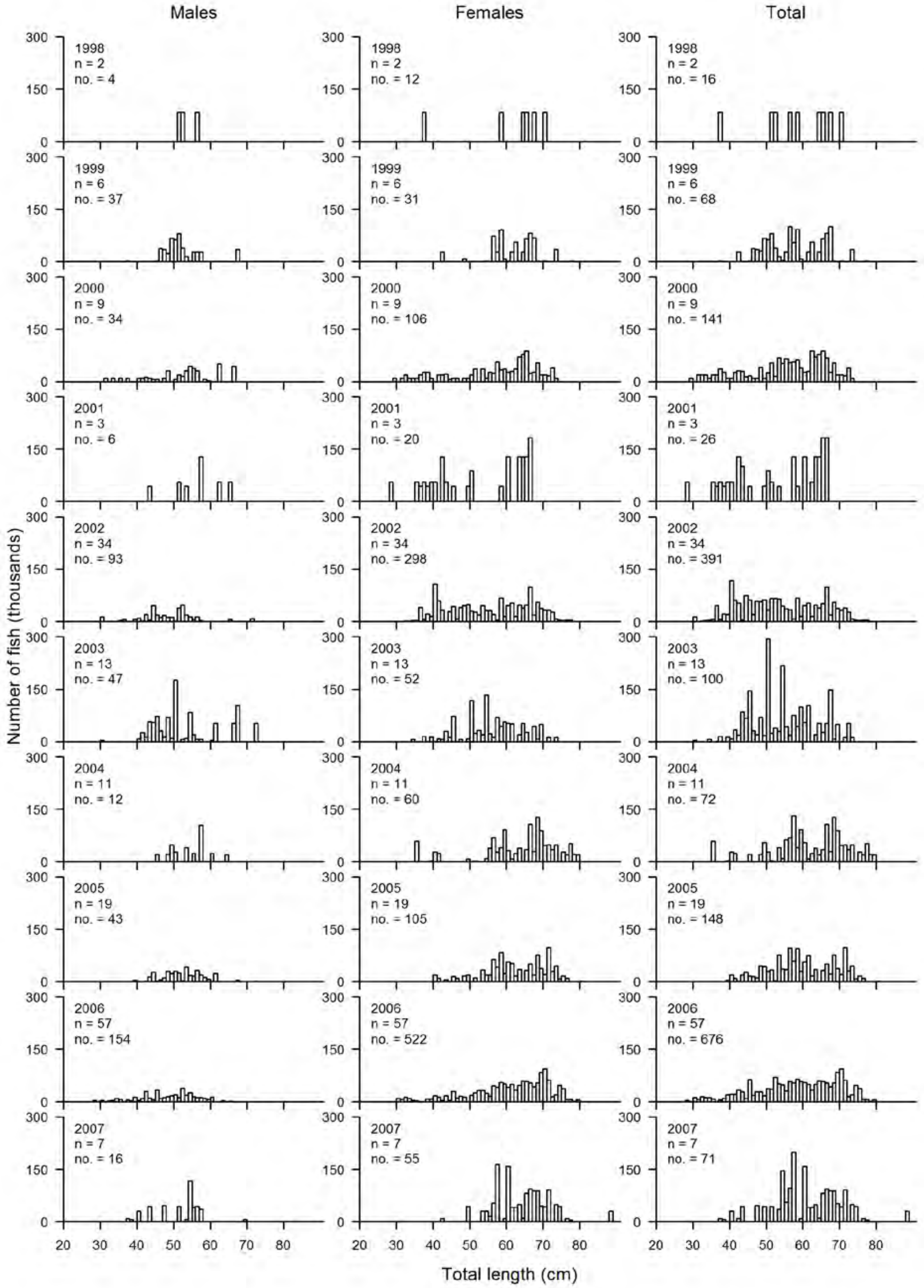


Figure B7: Scaled population length frequency of ribaldo sampled by observers from commercial trawl catches from the west coast South Island fishery, where there were more than 3 ribaldo per tow, for fishing years with available data between the 1990 and 2013 fishing years. n, number of tows sampled with more than 3 individual ribaldo per tow; no., number of ribaldo sampled. See Table B1 for area descriptions.

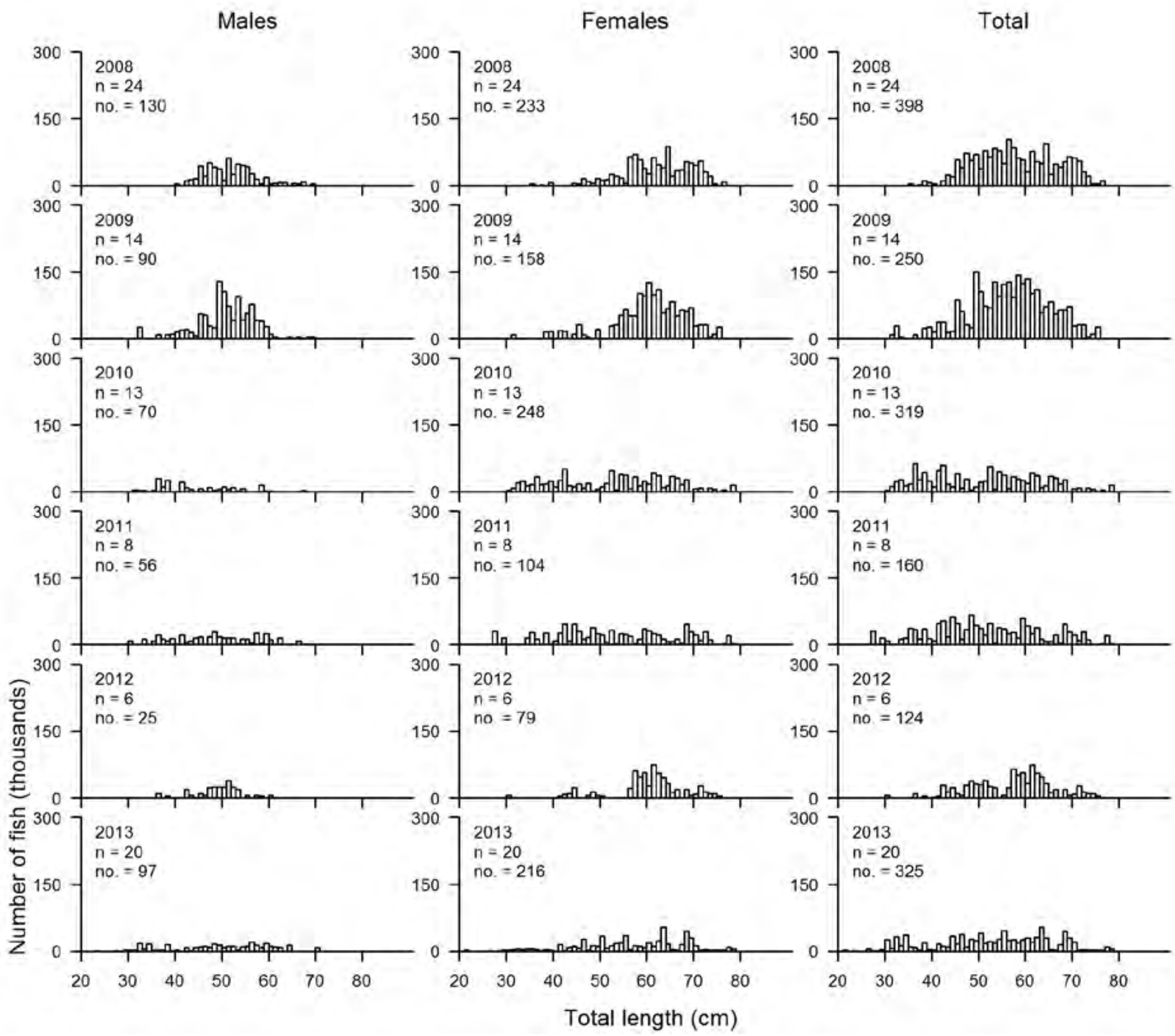


Figure B7 continued: Scaled population length frequency of ribaldo sampled by observers from commercial trawl catches from the west coast South Island fishery, where there were more than 3 ribaldo per tow, for fishing years with available data between the 1990 and 2013 fishing years. n, number of tows sampled with more than 3 individual ribaldo per tow; no., number of ribaldo sampled.

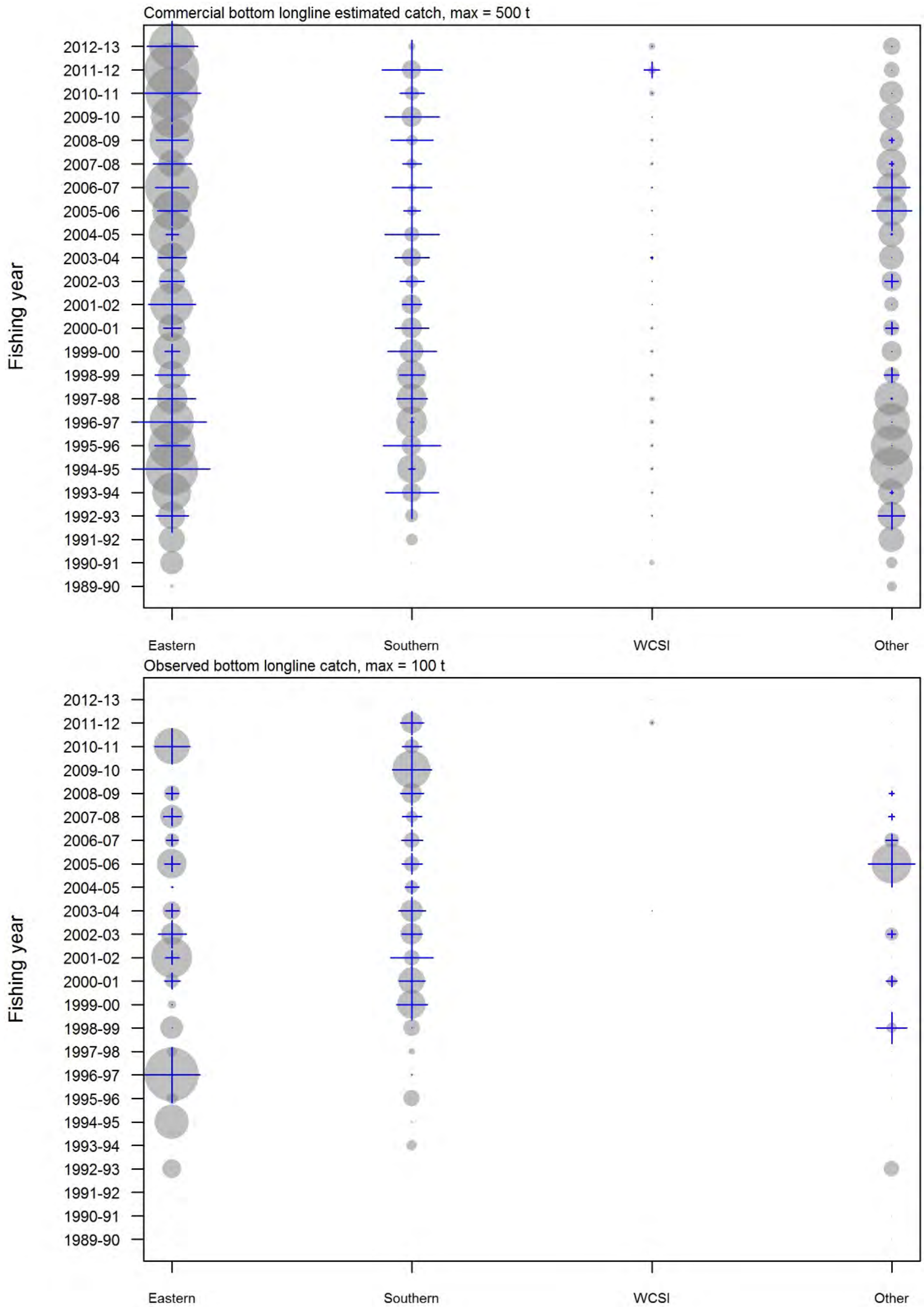


Figure B8: Representativeness of observer sampling of ribaldo catch by fishing year and area for the bottom longline fishery. Top plot: circles show the estimated ribaldo catch by area within a year; crosses show the observed ribaldo catch for the same cells. Representation is demonstrated by how closely the crosses match the circle diameter. Bottom plot: circles show the total observed bottom longline catch by area within a year; crosses show the observed ribaldo catch sampled for length frequency for the same cells. See Table B1 for area descriptions.

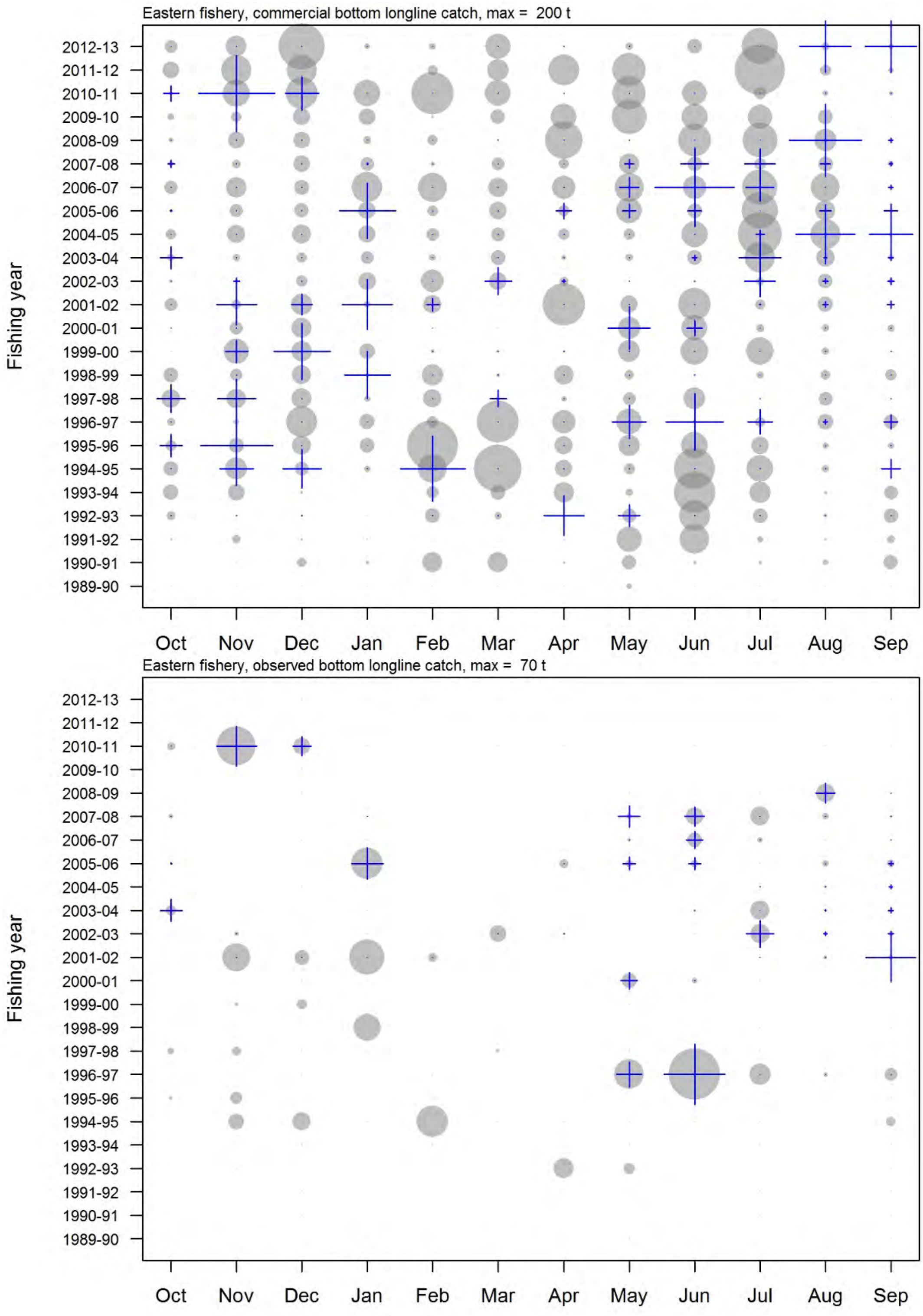


Figure B9: Representativeness of observer sampling of ribaldo catch by fishing year and month for the eastern bottom longline fishery. Top plot: circles show the estimated ribaldo catch by month and year; crosses show the observed ribaldo catch for the same cells. Representation is demonstrated by how closely the crosses match the circle diameter. Bottom plot: circles show the total observed bottom longline catch for the eastern fishery by month and year; crosses show the observed ribaldo catch sampled for length frequency for the same cells. See Table B1 for area descriptions.

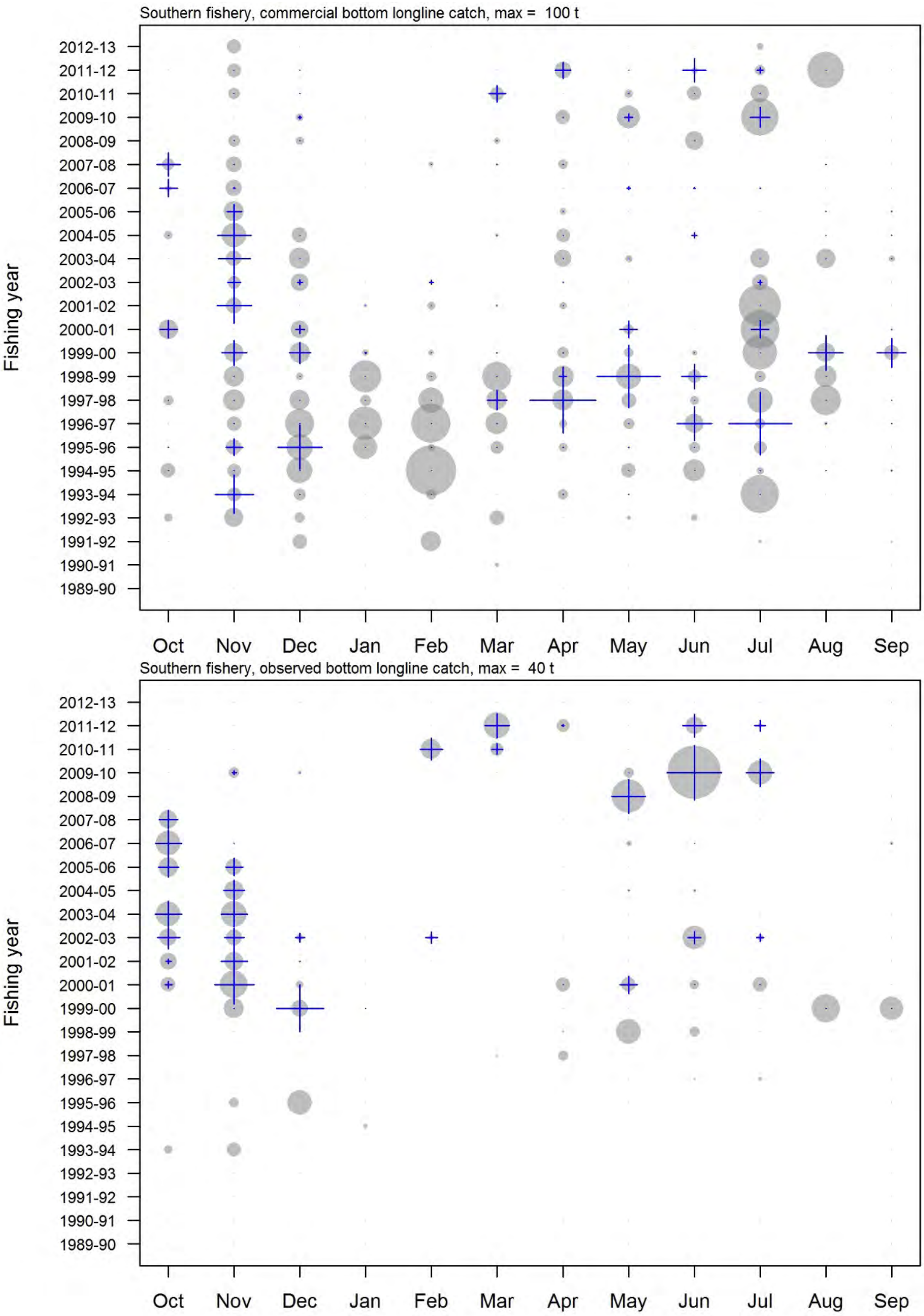


Figure B10: Representativeness of observer sampling of ribaldo catch by fishing year and month for the southern bottom longline fishery. Top plot: circles show the estimated ribaldo catch by month and year; crosses show the observed ribaldo catch for the same cells. Representation is demonstrated by how closely the crosses match the circle diameter. Bottom plot: circles show the total observed bottom longline catch for the southern fishery by month and year; crosses show the observed ribaldo catch sampled for length frequency for the same cells. See Table B1 for area descriptions.

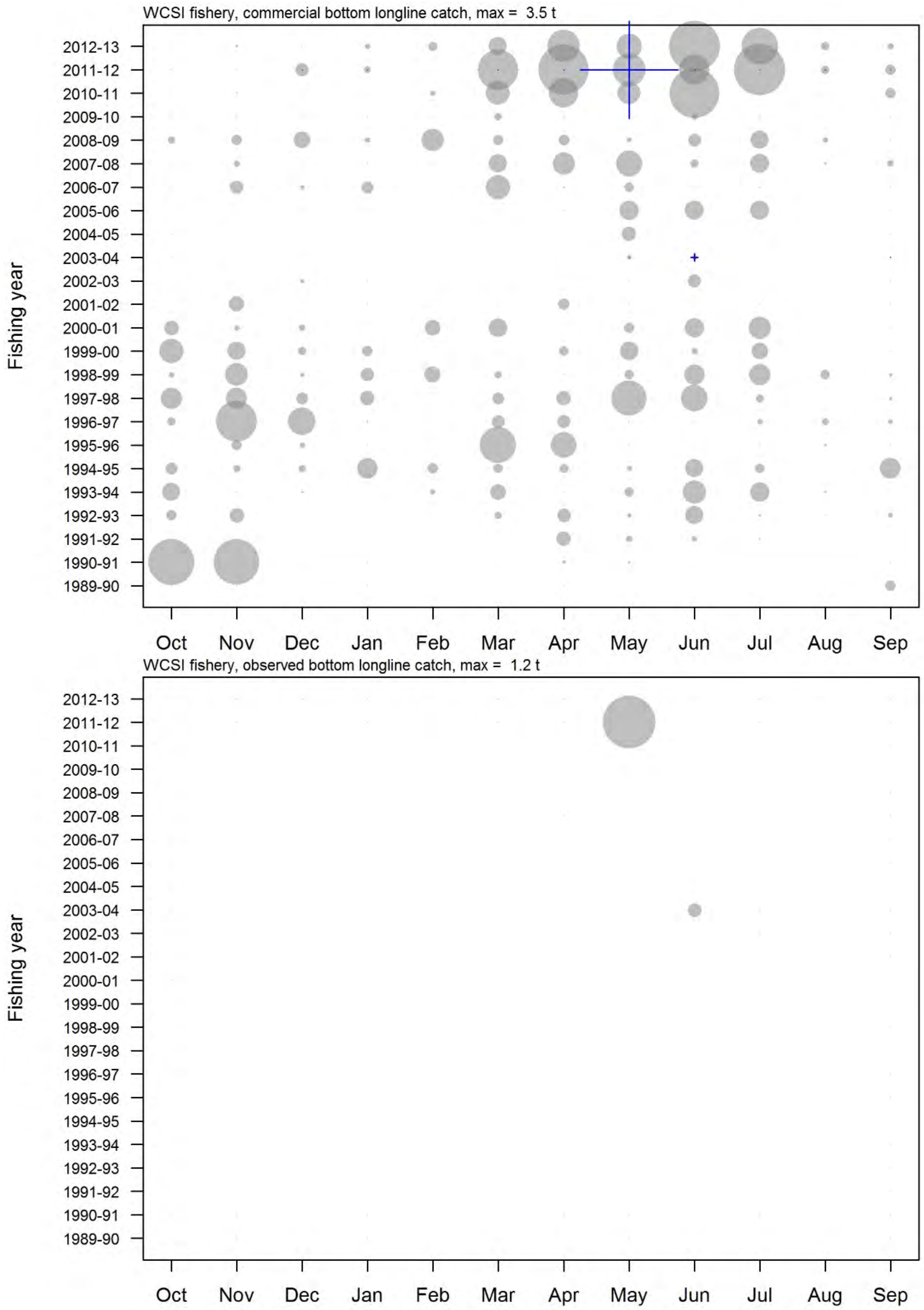


Figure B11: Representativeness of observer sampling of ribaldo catch by fishing year and month for the west coast South Island bottom longline fishery. Top plot: circles show the estimated ribaldo catch by month and year; crosses show the observed ribaldo catch for the same cells. Representation is demonstrated by how closely the crosses match the circle diameter. Bottom plot: circles show the total observed bottom longline catch for the west coast South Island fishery by month and year; crosses show the observed ribaldo catch sampled for length frequency for the same cells. There was almost no observer coverage of the west coast South Island bottom longline fishery and no ribaldo were measured for length frequency by the observer programme. See Table B1 for area descriptions.

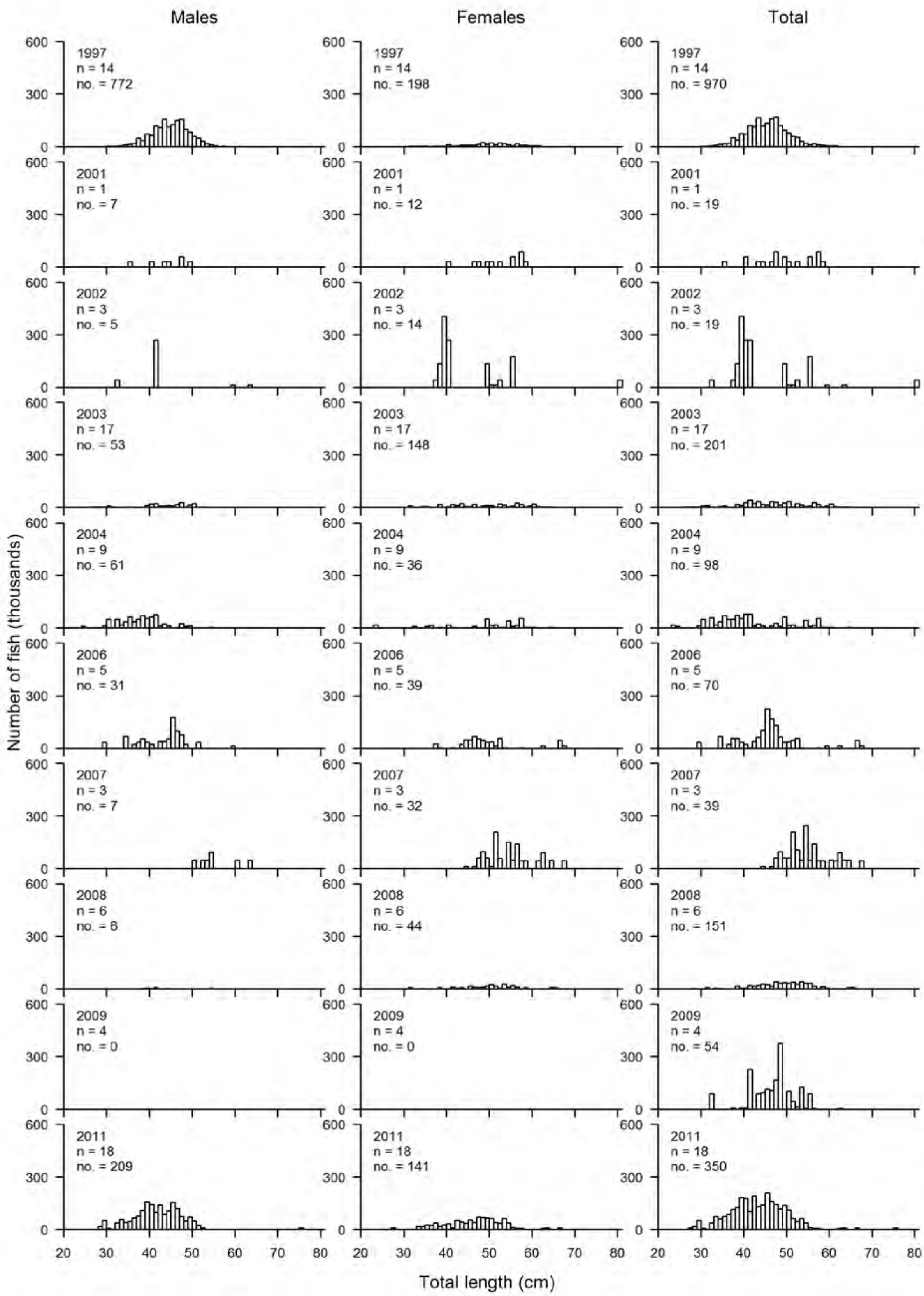


Figure B12: Scaled population length frequency of ribaldo sampled by observers from commercial bottom longline catches from the eastern fishery, where there were more than 3 ribaldo per set, for fishing years with available data between the 1990 and 2013 fishing years. n, number of sets sampled with more than 3 individual ribaldo per set; no., number of ribaldo sampled. See Table B1 for area descriptions.

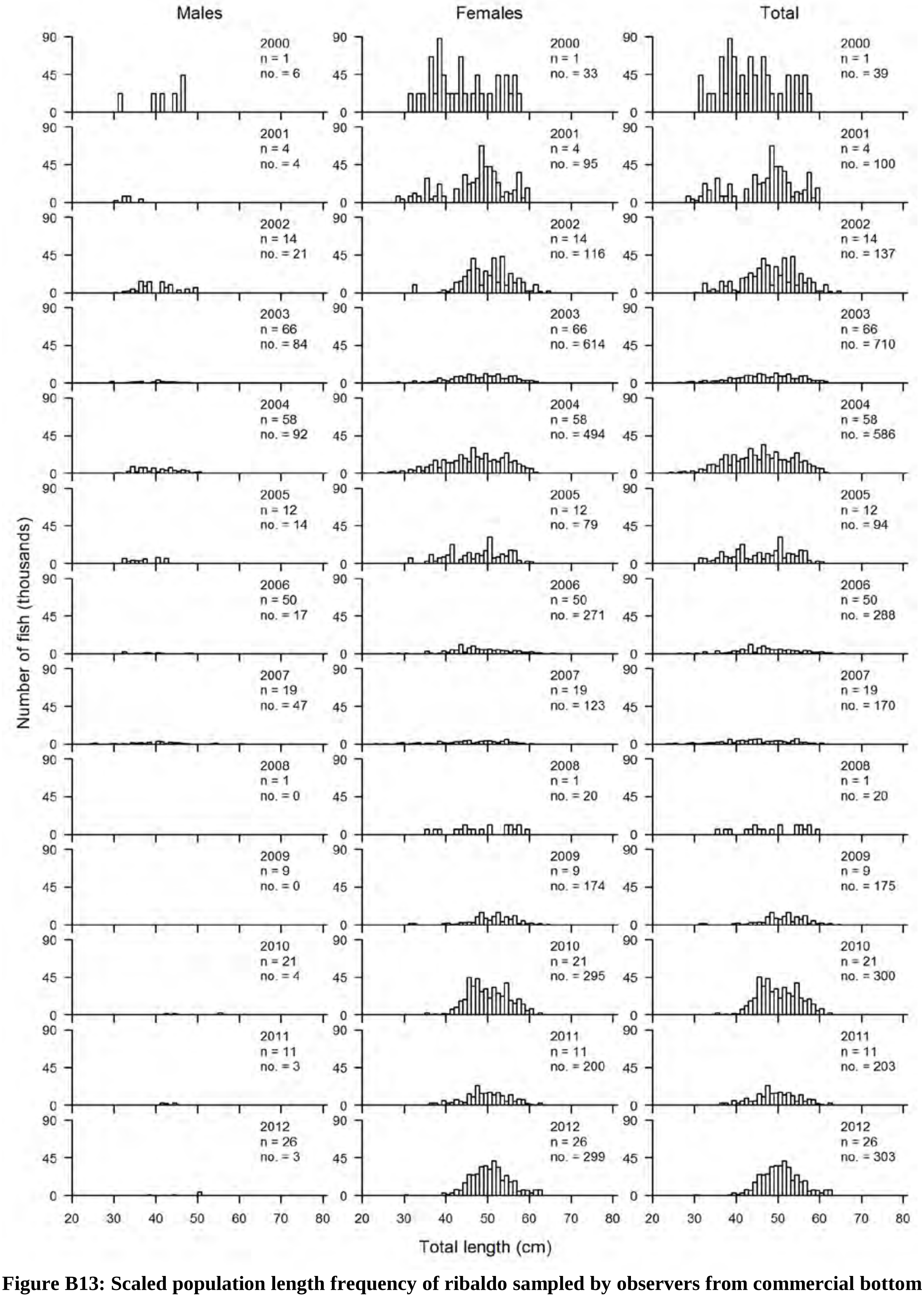


Figure B13: Scaled population length frequency of ribaldo sampled by observers from commercial bottom longline catches from the southern fishery, where there were more than 3 ribaldo per set, for fishing years with available data between the 1990 and 2013 fishing years. n, number of sets sampled with more than 3 individual ribaldo per set; no., number of ribaldo sampled. See Table B1 for area descriptions.

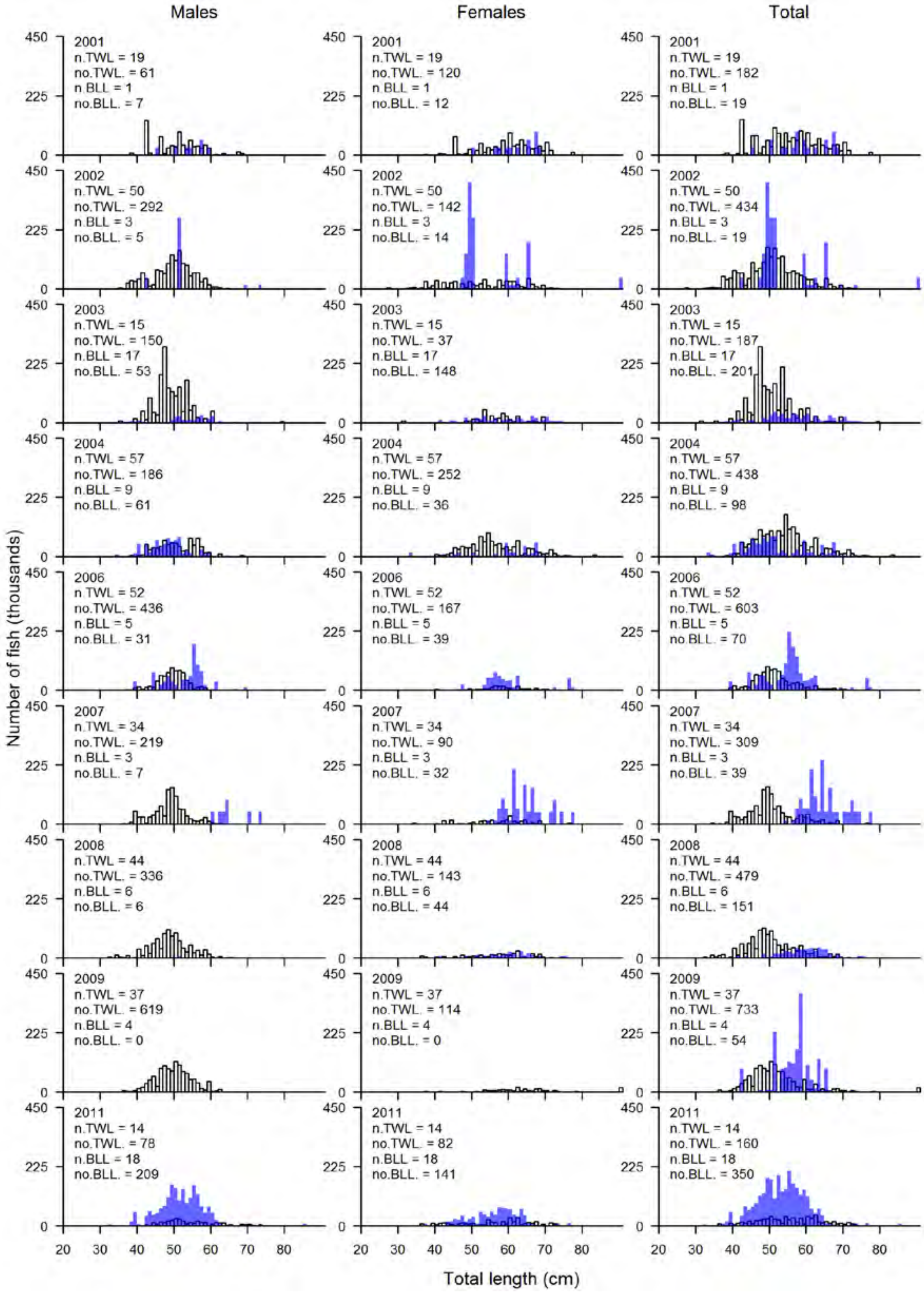


Figure B14: Scaled population length frequency of ribaldo sampled by observers from commercial catches by trawl (white bars) and bottom longline (transparent blue bars) from the eastern fishery, where there were more than 3 ribaldo per tow, for fishing years with available data between the 1990 and 2013 fishing years. n.TWL, number of trawl tows sampled with more than 3 individual ribaldo per tow; no.TWL., number of ribaldo sampled from trawl tows. n.BLL, number of bottom longline sets sampled with more than 3 individual ribaldo per set; no.BLL, number of ribaldo sampled from bottom longline sets. Only years where there are data for both trawl and bottom longline methods are shown. See Table B1 for area descriptions.

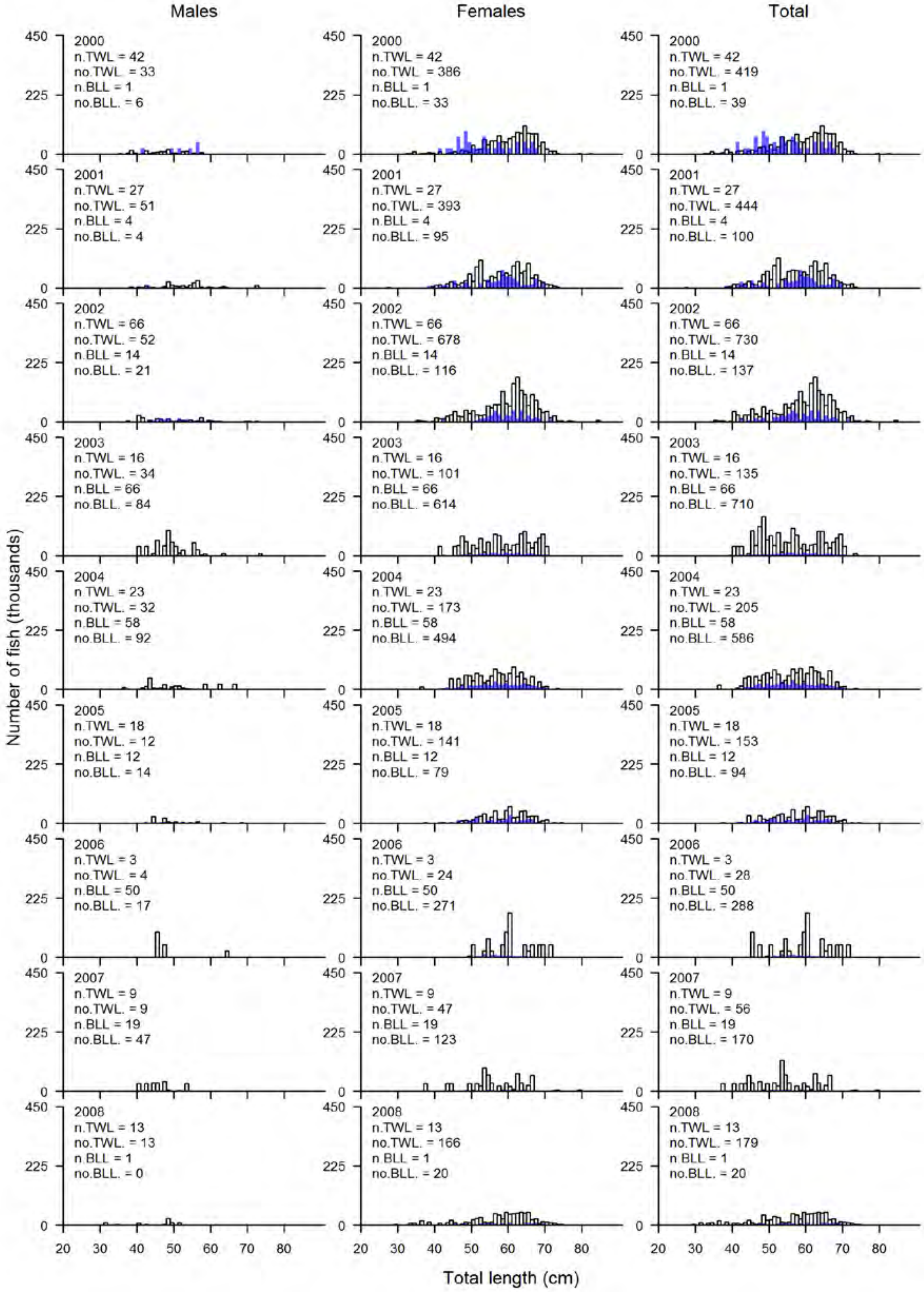


Figure B15: Scaled population length frequency of ribaldo sampled by observers from commercial catches by trawl (white bars) and bottom longline (transparent blue bars) from the southern fishery, where there were more than 3 ribaldo per tow, for fishing years with available data between the 1990 and 2013 fishing years. n.TWL, number of trawl tows sampled with more than 3 individual ribaldo per tow; no.TWL, number of ribaldo sampled from trawl tows. n.BLL, number of bottom longline sets sampled with more than 3 individual ribaldo per set; no.BLL., number of ribaldo sampled from bottom longline sets. Only years where there are data for both trawl and bottom longline methods are shown. See Table B1 for area descriptions.

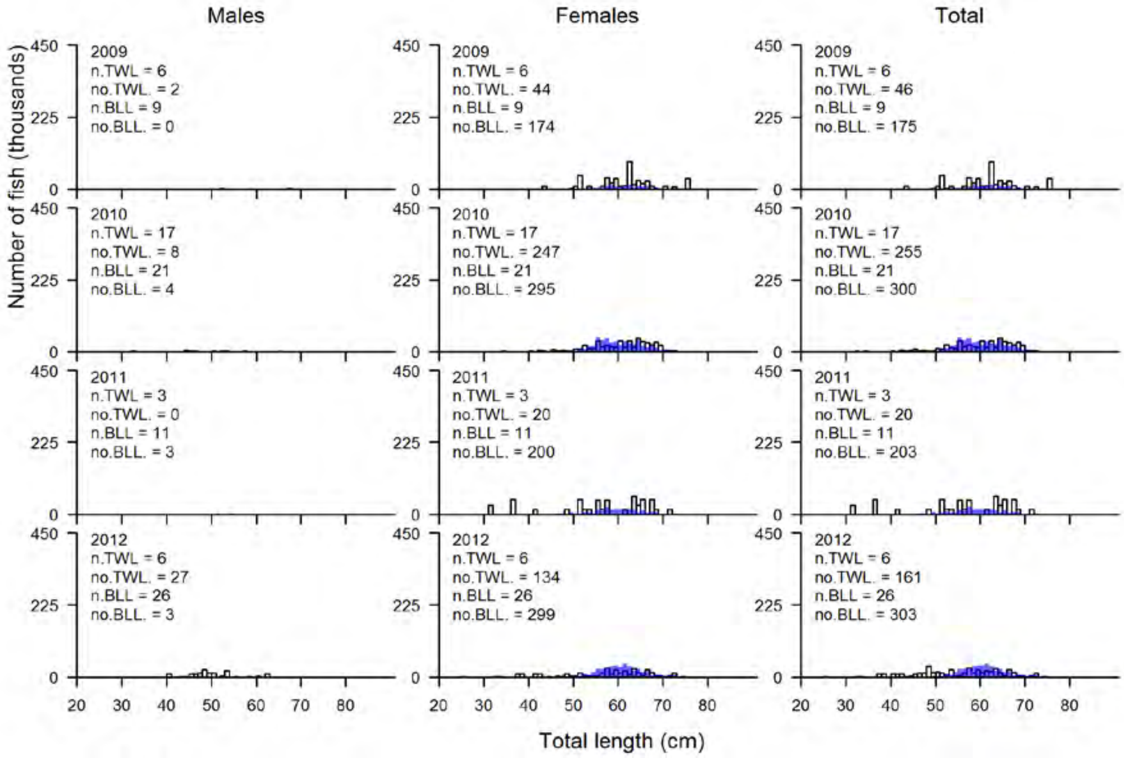


Figure B15 continued: Scaled population length frequency of ribaldo sampled by observers from commercial catches by trawl (white bars) and bottom longline (transparent blue bars) from the southern fishery, where there were more than 3 ribaldo per tow, for fishing years with available data between the 1990 and 2013 fishing years. n.TWL, number of trawl tows sampled with more than 3 individual ribaldo per tow; no.TWL., number of ribaldo sampled from trawl tows. n.BLL, number of bottom longline sets sampled with more than 3 individual ribaldo per set; no.BLL., number of ribaldo sampled from bottom longline sets. Only years where there are data for both trawl and bottom longline methods are shown.

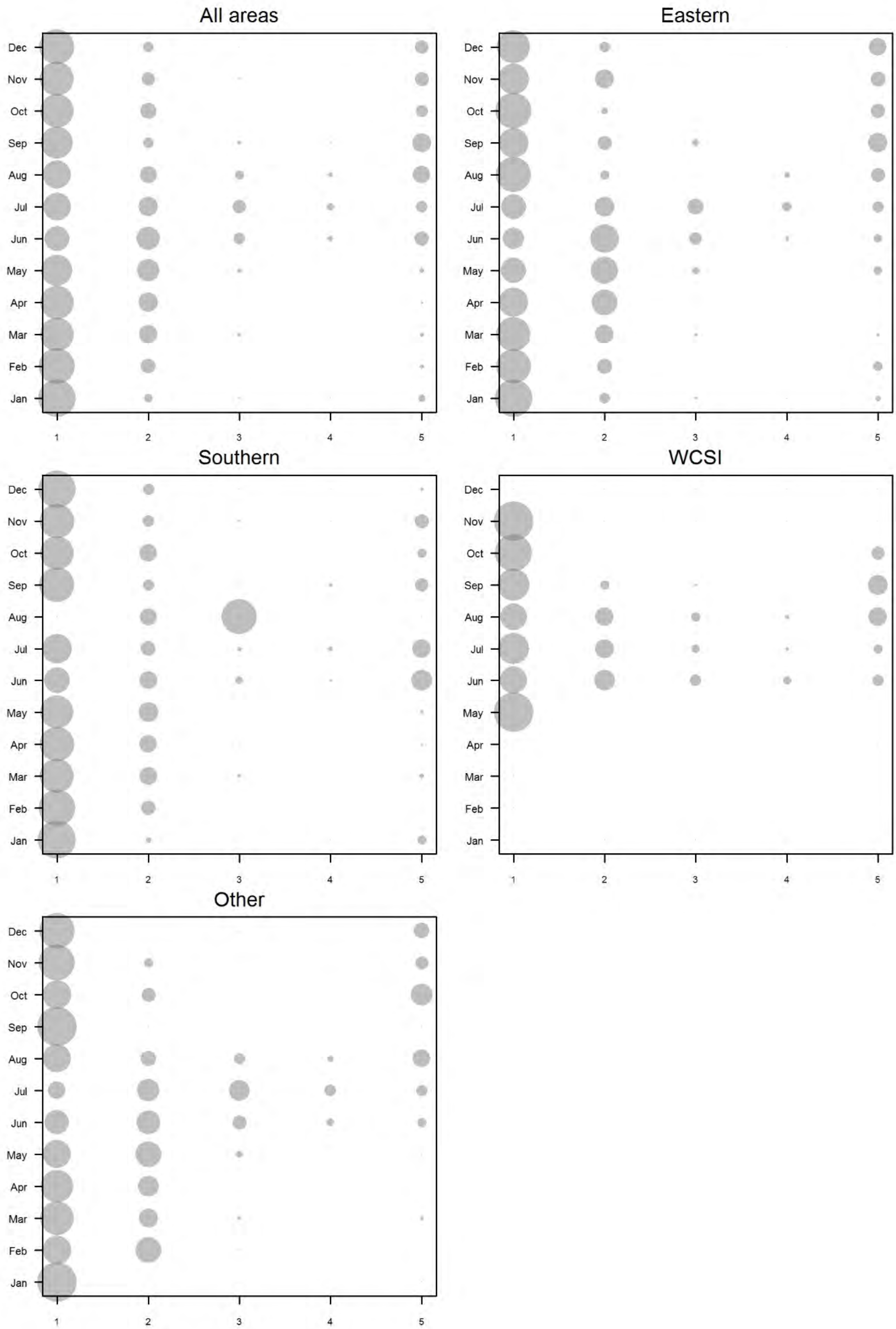


Figure B16: Gonad stages of female ribaldo taken in commercial catches, by month and area, sampled by the observer programme for all fishing methods. Female stages (from the Observer Manual) are: 1, immature/resting/; 2, maturing; 3, ripening; 4; running ripe; 5, spent. See Table B1 for area descriptions.

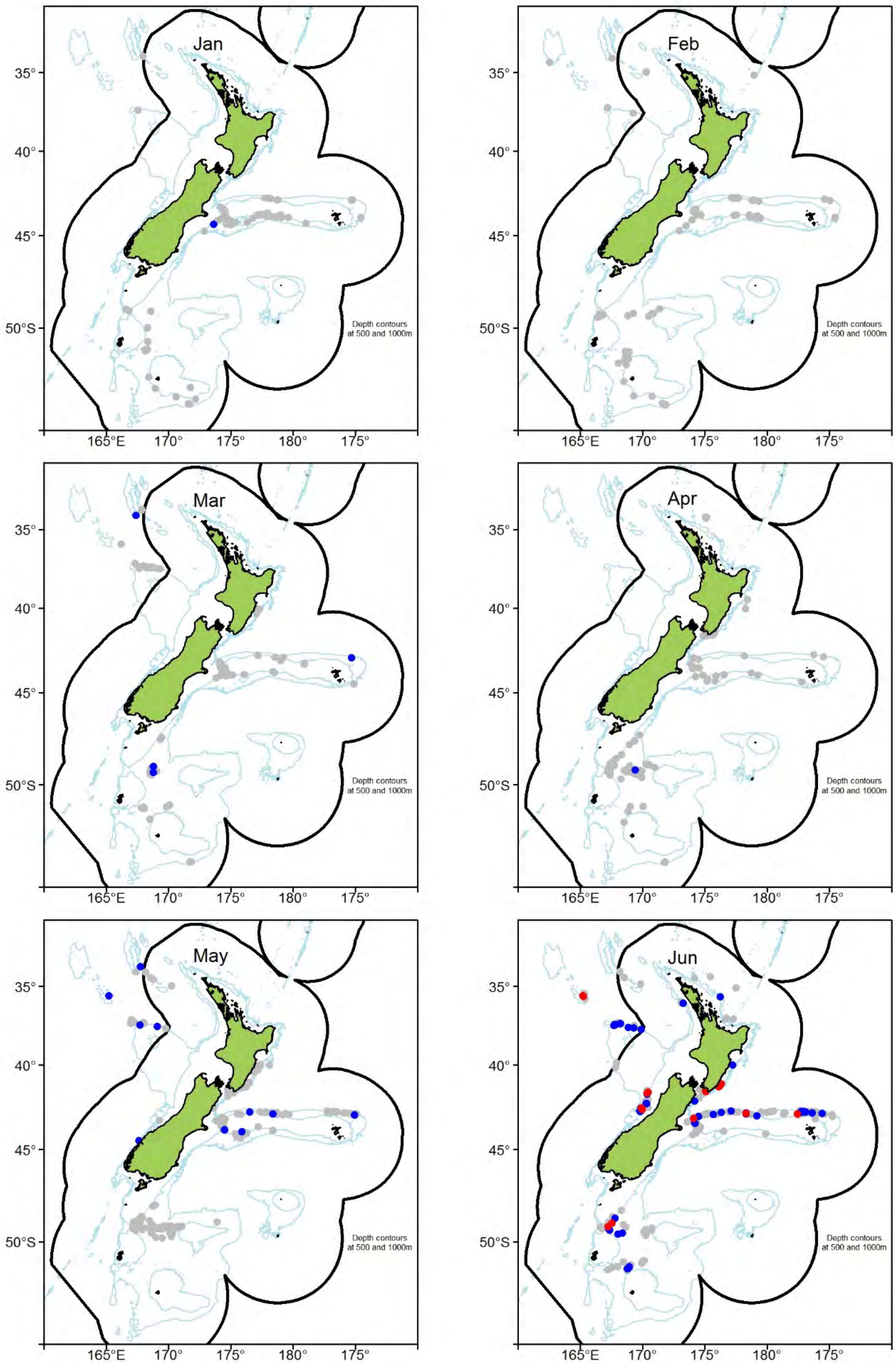


Figure B17: Location of female ribaldo gonad stages sampled by the observer programme for the months of January to June for all fishing methods. Grey = stage 1 (immature), stage 2 (maturing), and stage 5 (spent); blue = stage 3 (ripening), red = stage 4 (running ripe).

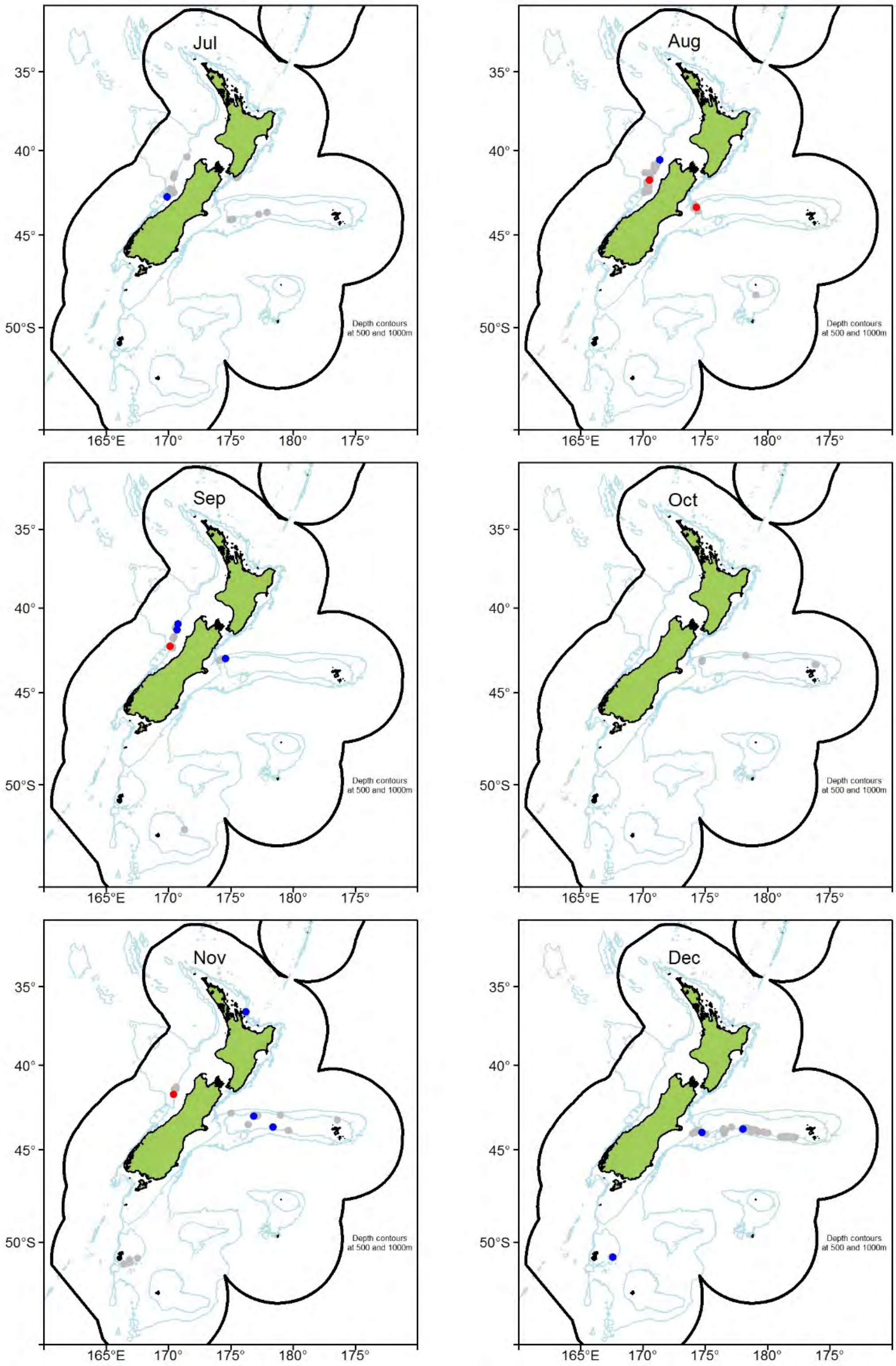


Figure B17 continued: Location of female ribaldo gonad stages sampled by the observer programme for the months of January to June for all fishing methods. Grey = stage 1 (immature), stage 2 (maturing), and stage 5 (spent); blue = stage 3 (ripening), red = stage 4 (running ripe).

APPENDIX C: CHARACTERISATION

Table C1. List of tables and fields requested in the MPI extract 9384.

Fishing_events table

Event_Key
Version_seqno
DCF_key
Start_datetime
End_datetime
Primary_method
Target_species
Fishing_duration
Catch_weight
Effort_depth
Effort_height
Effort_num
Effort_num_2
Effort_seqno

Effort_total_num
Effort_width
Effort_speed
Total_net_length
Total_hook_num
Set_end_datetime
Haul_start_datetime
Start_latitude (full accuracy)
Start_longitude (full accuracy)
End_latitude (full accuracy)
End_longitude (full accuracy)
Pair_trawl_yn
Bottom_depth

Column_a
Column_b
Column_c
Column_d
Display_fishyear
Start_stats_area_code
Vessel_key
Form_type
Trip
Literal_yn
Interp_yn
Resrch_yn

Landing_events table

Event_Key
Version_seqno
DCF_key
Landing_datetime
Landing_name
Species_code
Species_name
Fishstock_code (ALL fish stocks)
State_code

Destination_type
Unit_type
Unit_num
Unit_weight
Conv_factor
Green_weight
Green_weight_type
Processed_weight
Processed_weight_type
Form_type

Trip_key
Trip_start_datetime
Trip_end_datetime
Vessel_key
Form_type
Literal_yn
Interp_yn
Resrch_yn

Estimated subcatch table

Event_Key
Version_seqno
DCF_key

Species_code (ALL species for each fishing event)
Catch_weight

Literal_yn
Interp_yn
Resrch_yn

Process data table

Event_Key
Version_seqno
DCF_key
Spec_prod_action_type
Processed_datatime
Species_code
State_code

Unit_type
Unit_num
Unit_weight
Conv_factor
Green_weight
Green_weight_type
Processed_weight

Processed_weight_type
Vessel_key
Form_type
Trip_key
Literal_yn
Interp_yn
Resrch_yn

Vessel_history table

Vessel_key
Flag_nationality_code
Built_year
Engine_kilowatts
Gross_tonnes
Overall_length_metres
History_start_datetime
History_end_datetime

Table C2: Number of landing events by major destination code and form type for RIB 3 for the 1990 to 2013 fishing years. L: landed to NZ; R: retained on board; T: transferred to another vessel; O: conveyed outside New Zealand; U: used as bait.

RIB 3						CLR form			CEL form			NCE form	Total
Fishing year	L	R	T	O	U	Other	L	R	Other	L	R	Other	
1990	27	4	18	2	-	-	264	-	1	-	-	-	316
1991	60	1	10	6	-	1	568	-	1	-	-	-	647
1992	70	14	13	4	-	-	577	-	-	-	-	-	678
1993	72	13	17	2	-	-	602	-	-	-	-	-	706
1994	101	15	11	1	-	-	569	-	-	-	-	-	697
1995	67	6	5	-	-	-	535	-	-	-	-	-	613
1996	98	8	2	1	-	-	333	-	4	-	-	-	446
1997	137	21	1	2	-	3	308	-	4	-	-	-	476
1998	162	18	1	-	-	5	442	-	2	-	-	-	630
1999	196	13	-	-	-	1	293	-	1	-	-	-	504
2000	234	26	-	-	-	4	386	1	-	-	-	-	651
2001	254	21	-	-	-	5	432	-	-	-	-	-	712
2002	219	23	-	-	-	1	398	-	2	-	-	-	643
2003	264	35	-	-	-	1	370	-	-	-	-	-	670
2004	230	46	3	-	-	4	310	-	-	-	-	-	593
2005	176	14	-	-	-	1	346	-	13	-	-	-	550
2006	152	10	-	-	-	3	231	-	11	-	-	-	407
2007	182	17	-	-	-	10	73	-	4	132	-	-	418
2008	206	22	-	-	-	8	50	1	1	141	-	-	429
2009	207	19	-	-	-	26	57	3	3	105	20	26	466
2010	180	7	-	-	5	24	27	1	3	99	4	46	396
2011	182	12	-	-	9	27	41	-	13	82	-	35	401
2012	162	14	-	-	2	14	17	-	8	18	-	6	241
2013	171	9	-	-	-	25	20	-	10	15	-	3	253
Total	3809	388	81	18	16	163	7249	6	81	592	24	116	12543

Table C2 continued: Number of landing events by major destination code and form type for RIB 4 for the 1990 to 2013 fishing years. L: landed to NZ; R: retained on board; T: transferred to another vessel; D: discarded; A: accidental loss.

RIB 4						CLR form						CEL form	Total
Fishing year	L	R	T	D	A	Other	L	R	T	D	A	Other	
1990	11	2	8	3	-	-	3	-	-	-	-	-	27
1991	21	3	10	1	-	1	24	-	-	-	-	-	60
1992	18	10	15	-	-	4	25	-	-	1	-	-	73
1993	20	6	11	-	-	1	32	-	-	1	-	1	72
1994	19	4	4	-	-	1	36	-	-	1	-	-	65
1995	47	9	4	-	-	-	39	2	-	-	-	-	101
1996	31	1	-	-	-	2	42	-	-	2	-	1	79
1997	68	10	-	1	-	1	55	7	-	1	-	-	143
1998	76	13	1	4	-	3	42	4	-	4	-	-	147
1999	137	11	1	1	-	2	27	-	-	-	1	-	180
2000	145	13	-	1	1	1	32	2	-	-	-	-	195
2001	185	8	-	-	1	2	26	1	-	-	1	-	224
2002	159	14	-	-	1	3	35	3	-	3	7	1	226
2003	201	13	-	-	1	2	21	4	-	2	6	-	250
2004	215	19	4	1	5	8	8	1	-	-	2	-	263
2005	205	9	-	-	9	14	3	-	-	-	-	-	240
2006	143	7	-	-	3	4	3	-	-	-	-	-	160
2007	156	9	-	1	2	11	9	-	-	-	-	-	188
2008	168	10	-	-	3	12	-	-	-	-	-	-	193
2009	125	3	-	-	-	28	-	-	-	-	-	-	156
2010	145	7	-	-	5	20	-	-	-	-	-	-	177
2011	139	7	-	-	10	20	-	-	-	-	-	-	176
2012	123	3	-	-	3	20	-	-	-	-	-	-	149
2013	136	12	-	-	5	14	-	-	-	-	-	-	167
Total	2693	203	58	13	49	174	462	24	0	15	17	3	3711

Table C2 continued: Number of landing events by major destination code and form type for RIB 5 for the 1990 to 2013 fishing years. L: landed to NZ; R: retained on board; T: transferred to another vessel; A: accidental loss; O: conveyed outside New Zealand.

RIB 5						CLR form				CEL form	Total
Fishing year	L	R	T	A	O	Other	L	R	A	Other	
1990	9	1	20	-	-	-	2	-	-	-	32
1991	39	6	9	-	-	-	2	-	-	-	56
1992	48	14	11	-	4	-	6	-	-	-	83
1993	33	6	10	-	1	-	7	-	-	-	57
1994	15	-	3	-	-	-	12	-	-	-	30
1995	23	-	1	-	-	-	6	1	-	2	33
1996	19	3	-	-	-	-	9	-	-	5	36
1997	36	7	-	-	-	3	17	-	-	-	63
1998	39	4	-	-	-	1	18	-	-	-	62
1999	63	5	-	-	-	-	16	-	-	-	84
2000	92	10	-	-	-	1	10	-	-	-	113
2001	110	11	-	-	1	2	13	-	-	-	137
2002	116	12	-	-	-	2	11	-	2	-	143
2003	95	1	-	-	1	2	10	-	2	-	111
2004	79	3	-	2	1	2	7	-	2	1	97
2005	78	10	-	5	1	4	9	-	1	-	108
2006	73	16	-	6	-	1	17	-	-	-	113
2007	87	10	-	5	-	5	2	-	-	-	109
2008	69	4	-	3	-	6	-	-	-	-	82
2009	58	5	-	6	-	8	-	-	-	-	77
2010	53	4	-	4	-	7	-	-	-	-	68
2011	75	2	-	8	-	11	-	-	-	-	96
2012	62	4	-	6	-	5	-	-	-	-	77
2013	60	2	-	12	-	9	-	-	-	-	83
Total	1431	140	54	57	9	69	174	1	7	8	1950

Table C2 continued: Number of landing events by major destination code and form type for RIB 6 for the 1990 to 2013 fishing years. L: landed to NZ; R: retained on board; A: accidental loss; T: transferred to another vessel; D: discarded.

RIB 6						CLR form					CEL form	Total
Fishing year	L	R	A	T	D	Other	L	R	A	D	Other	
1990	-	-	-	5	-	-	-	-	-	-	-	5
1991	29	1	-	2	-	-	-	-	-	-	-	32
1992	42	-	-	2	3	1	5	-	-	-	-	53
1993	27	-	-	-	4	-	9	-	-	-	-	40
1994	13	1	-	-	-	-	8	-	-	-	-	22
1995	21	2	-	-	2	-	10	-	-	-	-	35
1996	22	4	-	-	-	-	15	-	-	-	-	41
1997	23	3	-	-	3	1	18	-	-	-	-	48
1998	51	6	-	-	1	-	20	-	-	-	2	80
1999	62	12	-	-	-	-	26	-	-	-	-	100
2000	96	6	-	-	-	1	17	-	2	-	-	122
2001	95	8	-	1	-	2	8	1	2	1	-	118
2002	108	11	-	-	-	1	11	-	3	-	1	135
2003	103	9	-	-	-	3	5	-	2	1	-	123
2004	120	8	5	-	-	5	3	-	1	-	-	142
2005	89	3	4	-	-	2	-	-	-	-	-	98
2006	60	15	2	-	-	1	-	-	-	-	-	78
2007	84	13	-	-	-	7	-	-	-	-	-	104
2008	81	5	1	-	-	9	-	-	-	-	-	96
2009	58	6	3	-	-	5	-	-	-	-	-	72
2010	58	7	5	-	-	1	-	-	-	-	-	71
2011	52	2	6	-	-	3	-	-	-	-	-	63
2012	46	4	8	-	-	6	-	-	-	-	-	64
2013	58	9	5	-	-	1	-	-	-	-	-	73
Total	1398	135	39	10	13	49	155	1	10	2	3	1815

Table C2 continued: Number of landing events by major destination code and form type for RIB 7 for the 1990 to 2013 fishing years. L: landed to NZ; R: retained on board; T: transferred to another vessel; O: conveyed outside New Zealand; D: discarded.

RIB 7						CLR form			CEL form	Total
Fishing year	L	R	T	O	D	Other	L	T	Other	
1990	17	45	13	8	2	-	32	-	-	117
1991	41	21	7	8	-	-	60	-	-	137
1992	38	17	9	5	-	-	60	-	-	129
1993	44	19	15	2	1	-	37	-	1	119
1994	35	18	5	-	2	-	57	-	1	118
1995	47	-	8	-	-	-	36	-	1	92
1996	43	5	4	-	2	-	40	-	1	95
1997	59	8	3	-	-	-	54	-	-	124
1998	59	9	9	-	16	-	78	-	-	171
1999	126	15	8	-	5	3	75	-	-	232
2000	124	16	-	-	-	11	74	1	-	226
2001	130	18	5	-	-	6	38	-	-	197
2002	139	5	-	-	2	8	25	-	-	179
2003	126	17	-	-	3	12	32	-	-	190
2004	132	10	-	-	3	11	30	-	-	186
2005	96	9	-	-	1	13	41	-	-	160
2006	98	15	-	-	-	21	38	1	-	173
2007	112	7	-	-	-	19	32	-	2	172
2008	110	10	-	-	-	22	-	1	-	143
2009	136	9	-	-	-	27	1	-	-	173
2010	77	3	-	-	-	27	-	-	-	107
2011	117	3	-	-	-	27	1	-	-	148
2012	120	9	-	-	-	41	-	-	-	170
2013	159	5	-	-	-	37	-	-	-	201
Total	2185	293	86	23	37	285	841	3	6	3759

Table C2 continued: Number of landing events by major destination code and form type for RIB 8 for the 1990 to 2013 fishing years. L: landed to NZ; U: used as bait; T: transferred to another vessel; A: accidental loss; R: retained on board.

RIB 8						CLR form		CEL form		NCE form	Total
Fishing year	L	U	T	A	R	Other	L	U	T	L	
1990	-	-	-	-	-	-	2	-	-	-	2
1991	-	-	1	-	-	-	6	-	-	-	7
1992	-	-	-	-	-	-	1	-	-	-	1
1993	-	-	-	-	-	-	3	-	-	-	3
1994	-	-	-	-	-	-	6	1	-	-	7
1995	-	-	-	-	-	-	5	3	-	-	8
1996	-	-	-	-	-	-	10	2	-	-	12
1997	1	-	-	-	-	-	5	1	-	-	7
1998	-	-	-	-	-	-	9	3	-	-	12
1999	1	-	-	-	-	-	8	-	-	-	9
2000	1	-	-	-	-	-	1	-	-	-	2
2001	-	-	-	-	-	-	5	-	-	-	5
2002	-	-	-	-	-	-	-	-	-	-	0
2003	-	-	-	-	1	-	3	-	-	-	4
2004	-	-	-	-	-	-	2	-	1	-	3
2005	1	-	-	-	-	-	1	-	2	-	4
2006	-	-	-	-	-	-	-	-	-	-	0
2007	-	-	-	-	-	-	-	-	1	-	1
2008	4	-	-	-	-	-	1	-	-	-	5
2009	3	-	-	-	-	-	-	-	-	-	3
2010	2	-	-	-	-	-	1	-	-	1	4
2011	10	1	-	-	1	1	-	-	-	-	13
2012	6	1	-	2	-	-	-	-	-	-	9
2013	12	-	-	-	-	-	-	-	-	-	12
Total	41	2	1	2	2	1	69	10	4	1	133

Table C3: Destination codes, total landing weight, number of landings and if the records were kept or discarded for all ribaldo catch for the 1990 to 2013 fishing years for RIB 3–5.

RIB 3

Destination code	Greenweight (t)	No. records	Description	Action
L	5020.87	11650	Landed in New Zealand to a Licensed Fish Receiver	Keep
T	116.17	81	Transferred to another vessel	Keep
O	19.81	18	Conveyed outside New Zealand	Keep
U	6.41	16	Used as bait	Keep
D	5.19	15	Discarded	Keep
A	3.72	63	Accidental loss	Keep
E	1.29	96	Eaten	Keep
F	0.02	6	Recreational catch	Keep
W	<0.01	11	Sold at wharf	Keep
R	241.21	418	Retained on board	Drop
Q	2.92	145	Holding receptacle on land	Drop
Null	2.05	10	Missing destination type code	Drop
B	1.79	14	Stored as bait	Drop

RIB 4

Destination code	Greenweight (t)	No. records	Description	Action
L	5819.10	3155	Landed in New Zealand to a Licensed Fish Receiver	Keep
T	187.72	58	Transferred to another vessel	Keep
D	28.52	28	Discarded	Keep
A	15.81	66	Accidental loss	Keep
C	6.39	2	Disposed to the Crown	Keep
O	5.42	9	Conveyed outside New Zealand	Keep
E	3.26	115	Eaten	Keep
U	2.61	20	Used as bait	Keep
S	0.48	2	Seized by the Crown	Keep
W	0.04	6	Sold at wharf	Keep
R	237.37	227	Retained on board	Drop
B	1.14	21	Stored as bait	Drop
Q	0.61	1	Holding receptacle on land	Drop
Null	0.15	1	Missing destination type code	Drop

RIB 5

Destination code	Greenweight (t)	No. records	Description	Action
L	1109.23	1605	Landed in New Zealand to a Licensed Fish Receiver	Keep
T	57.46	54	Transferred to another vessel	Keep
A	13.60	64	Accidental loss	Keep
O	3.88	9	Conveyed outside New Zealand	Keep
E	0.61	64	Eaten	Keep
D	0.22	5	Discarded	Keep
U	<0.01	7	Used as bait	Keep
R	59.71	141	Retained on board	Drop
B	0.03	1	Stored as bait	Drop

Table C3 continued: Destination codes, total landing weight, number of landings and if the records were kept or discarded for all ribaldo catch for the 1990 to 2013 fishing years for RIB 6–8.

RIB 6

Destination code	Greenweight (t)	No. records	Description	Action
L	3076.33	1553	Landed in New Zealand to a Licensed Fish Receiver	Keep
A	28.93	49	Accidental loss	Keep
T	23.20	10	Transferred to another vessel	Keep
D	8.04	15	Discarded	Keep
E	0.85	48	Eaten	Keep
O	0.48	3	Conveyed outside New Zealand	Keep
R	91.54	136	Retained on board	Drop
B	0.05	1	Stored as bait	Drop

RIB 7

Destination code	Greenweight (t)	No. records	Description	Action
L	4590.00	3026	Landed in New Zealand to a Licensed Fish Receiver	Keep
T	189.69	89	Transferred to another vessel	Keep
O	24.94	23	Conveyed outside New Zealand	Keep
D	16.22	37	Discarded	Keep
E	9.58	232	Eaten	Keep
S	6.30	2	Seized by the Crown	Keep
A	6.29	50	Accidental loss	Keep
U	0.39	6	Used as bait	Keep
R	413.26	293	Retained on board	Drop
B	<0.01	1	Stored as bait	Drop

RIB 8

Destination code	Greenweight (t)	No. records	Description	Action
L	13.63	111	Landed in New Zealand to a Licensed Fish Receiver	Keep
U	1.06	12	Used as bait	Keep
T	1.06	5	Transferred to another vessel	Keep
A	0.14	2	Accidental loss	Keep
E	<0.01	1	Eaten	Keep
R	0.02	2	Retained on board	Drop

Table C4: The reported MHR, annual retained landings in the groomed and unmerged dataset, and retained landings in the groomed and merged dataset, estimated catch, and percentage of estimated catch in the MHR landings for RIB 3–4 for the 1990 to 2013 fishing years.

					RIB 3
				Merged estimated	
Year	MHR	Un-merged landings	Merged landings	Catch	% MHR
1990	23	48	48	23	100
1991	177	171	189	98	55
1992	160	154	159	89	56
1993	217	202	210	107	49
1994	217	206	208	129	59
1995	437	429	432	299	68
1996	286	274	296	168	59
1997	365	282	329	185	51
1998	141	122	123	46	33
1999	161	111	111	37	23
2000	264	188	193	71	27
2001	269	198	198	86	32
2002	198	209	209	66	33
2003	211	205	206	88	42
2004	175	171	175	60	34
2005	156	168	176	78	50
2006	126	119	119	49	39
2007	149	160	160	78	52
2008	134	125	125	57	43
2009	216	206	206	87	40
2010	213	217	217	138	65
2011	348	363	363	290	83
2012	174	181	181	149	86
2013	182	181	181	118	65

					RIB 4
				Merged estimated	
Year	MHR	Un-merged landings	Merged landings	Catch	% MHR
1990	41	37	37	19	46
1991	28	111	117	50	179
1992	119	168	177	97	82
1993	169	222	223	136	80
1994	228	185	185	123	54
1995	186	281	281	134	72
1996	303	231	248	170	56
1997	253	301	309	178	70
1998	843	337	343	167	20
1999	375	277	279	144	38
2000	290	300	301	165	57
2001	347	237	237	91	26
2002	306	367	368	211	69
2003	370	176	177	51	14
2004	183	289	312	141	77
2005	299	383	421	259	87
2006	379	187	187	145	38
2007	202	281	281	227	112
2008	312	171	171	83	27
2009	173	176	176	153	88
2010	216	162	162	93	43
2011	162	115	115	52	32
2012	137	288	288	177	129
2013	304	230	230	139	46

Table C4 continued: The reported MHR, annual retained landings in the groomed and unmerged dataset, and retained landings in the groomed and merged dataset, estimated catch, and percentage of estimated catch in the MHR landings for RIB 5–6 for the 1990 to 2013 fishing years.

RIB 5

Year	MHR	Un-merged landings	Merged landings	Merged estimated Catch	Merged estimated % MHR
1990	6	24	24	16	267
1991	34	27	31	12	35
1992	73	70	86	31	42
1993	67	56	66	30	45
1994	23	23	23	18	78
1995	68	62	62	44	65
1996	26	24	26	17	65
1997	64	64	74	53	83
1998	80	82	87	55	69
1999	71	71	75	45	63
2000	80	72	72	34	43
2001	78	77	78	38	49
2002	62	59	63	24	39
2003	50	48	51	20	40
2004	50	43	48	25	50
2005	44	39	43	25	57
2006	47	50	50	22	47
2007	49	44	44	22	45
2008	43	43	43	23	53
2009	31	30	30	13	42
2010	27	28	28	7	26
2011	30	27	27	10	33
2012	32	28	28	16	50
2013	35	29	29	13	37

RIB 6

Year	MHR	Un-merged landings	Merged landings	Merged estimated Catch	Merged estimated % MHR
1990	13	1	1	1	8
1991	106	107	121	51	48
1992	98	95	129	42	43
1993	96	89	116	48	50
1994	92	91	91	59	64
1995	122	122	122	88	72
1996	109	104	126	39	36
1997	158	158	162	115	73
1998	262	270	277	191	73
1999	223	224	224	151	68
2000	237	238	240	157	66
2001	191	185	185	91	48
2002	322	318	333	137	43
2003	172	170	171	63	37
2004	205	189	202	77	38
2005	105	99	105	50	48
2006	62	54	54	18	29
2007	61	60	60	18	30
2008	80	77	77	30	38
2009	63	95	95	27	43
2010	104	89	89	91	88
2011	67	61	61	35	52
2012	76	62	62	63	83
2013	66	66	66	18	27

Table C4 continued: The reported MHR, annual retained landings in the groomed and unmerged dataset, and retained landings in the groomed and merged dataset, estimated catch, and percentage of estimated catch in the MHR landings for RIB 7–8 for the 1990 to 2013 fishing years.

				RIB 7							RIB 8
				Merged estimated						Merged estimated	
Year	MHR	Un-merged landings	Merged landings	Catch	% MHR	Year	MHR	Un-merged landings	Merged landings	Catch	% MHR
1990	21	32	32	14	67	1990	-	-	-	-	-
1991	55	43	47	26	47	1991	-	-	-	-	-
1992	40	40	45	20	50	1992	-	-	-	-	-
1993	106	78	88	49	46	1993	-	-	-	-	-
1994	42	38	38	14	33	1994	1	1	1	-	-
1995	39	35	35	24	62	1995	2	2	2	1	50
1996	62	54	54	42	68	1996	-	-	-	-	-
1997	77	72	72	40	52	1997	1	1	1	1	100
1998	110	123	123	118	107	1998	1	1	1	1	100
1999	243	221	221	146	60	1999	1	1	1	-	-
2000	300	262	262	199	66	2000	1	-	-	-	-
2001	275	278	278	213	77	2001	1	1	1	-	-
2002	254	258	259	169	67	2002	-	-	-	-	-
2003	338	323	325	219	65	2003	1	-	-	-	-
2004	364	352	356	288	79	2004	1	-	-	-	-
2005	307	297	297	238	78	2005	1	1	1	-	-
2006	336	278	278	211	63	2006	-	-	-	-	-
2007	404	415	415	366	91	2007	-	-	-	-	-
2008	356	314	314	281	79	2008	1	-	-	-	-
2009	456	452	452	380	83	2009	1	-	-	-	-
2010	137	190	190	140	102	2010	1	-	-	-	-
2011	198	191	191	106	54	2011	3	1	1	1	33
2012	177	162	162	87	49	2012	3	-	-	-	-
2013	180	194	194	129	72	2013	2	1	1	-	-

Table C5: Total number of trips, number of trips with zero estimated or daily processed catch, and proportion of trips with zero estimated or daily processed catch, by form type for RIB 3 for the 1990 to 2013 fishing years.

RIB 3	CELR form			TCEPR form			LCER form			TCEPR daily processed		
Fishing year	Total	Zero	Proportion	Total	Zero	Proportion	Total	Zero	Proportion	Total	Zero	Proportion
1990	260	108	0.42	44	23	0.52	0	0	-	32	6	0.19
1991	555	189	0.34	65	30	0.46	0	0	-	36	7	0.19
1992	567	174	0.31	78	41	0.53	0	0	-	35	3	0.09
1993	596	135	0.23	79	42	0.53	0	0	-	44	7	0.16
1994	557	151	0.27	102	56	0.55	0	0	-	40	19	0.48
1995	510	203	0.40	55	22	0.40	0	0	-	38	12	0.32
1996	325	147	0.45	88	25	0.28	0	0	-	79	26	0.33
1997	301	130	0.43	124	43	0.35	0	0	-	92	18	0.20
1998	430	196	0.46	144	49	0.34	0	0	-	127	20	0.16
1999	286	181	0.63	156	56	0.36	0	0	-	141	20	0.14
2000	367	232	0.63	150	49	0.33	0	0	-	149	10	0.07
2001	423	215	0.51	156	46	0.29	0	0	-	144	10	0.07
2002	395	136	0.34	143	41	0.29	0	0	-	126	9	0.07
2003	369	131	0.36	158	49	0.31	0	0	-	150	4	0.03
2004	309	152	0.49	140	50	0.36	5	0	0.00	122	7	0.06
2005	290	90	0.31	95	23	0.24	10	0	0.00	87	4	0.05
2006	190	85	0.45	89	29	0.33	11	1	0.09	87	3	0.03
2007	61	32	0.52	93	27	0.29	41	4	0.10	92	4	0.04
2008	42	16	0.38	101	32	0.32	21	3	0.14	103	7	0.07
2009	34	9	0.26	99	38	0.38	20	2	0.10	89	6	0.07
2010	21	14	0.67	82	34	0.41	16	0	0.00	80	5	0.06
2011	34	11	0.32	91	44	0.48	16	0	0.00	90	2	0.02
2012	10	6	0.60	81	38	0.47	15	0	0.00	86	5	0.06
2013	16	7	0.44	95	53	0.56	9	0	0.00	84	3	0.04

Table C5 continued: Total number of trips, number of trips with zero estimated or daily processed catch, and proportion of trips with zero estimated or daily processed catch, by form type for RIB 4 for the 1990 to 2013 fishing years.

RIB 4	CELR form			TCEPR form			LCER form			TCEPR daily processed		
Fishing year	Total	Zero	Proportion	Total	Zero	Proportion	Total	Zero	Proportion	Total	Zero	Proportion
1990	3	0	0.00	20	5	0.25	0	0	-	16	0	0.00
1991	16	4	0.25	28	11	0.39	0	0	-	22	2	0.09
1992	19	3	0.16	34	10	0.29	0	0	-	30	2	0.07
1993	25	2	0.08	31	10	0.32	0	0	-	28	2	0.07
1994	24	4	0.17	21	6	0.29	0	0	-	18	0	0.00
1995	29	4	0.14	41	15	0.37	0	0	-	44	3	0.07
1996	35	2	0.06	29	12	0.41	0	0	-	24	1	0.04
1997	35	7	0.20	53	18	0.34	0	0	-	49	2	0.04
1998	28	7	0.25	69	25	0.36	0	0	-	69	0	0.00
1999	17	2	0.12	104	40	0.38	0	0	-	90	6	0.07
2000	15	6	0.40	96	34	0.35	0	0	-	88	8	0.09
2001	19	4	0.21	116	45	0.39	0	0	-	97	9	0.09
2002	30	3	0.10	102	42	0.41	0	0	-	93	8	0.09
2003	20	5	0.25	126	44	0.35	0	0	-	123	14	0.11
2004	5	1	0.20	125	42	0.34	19	1	0.05	124	12	0.10
2005	3	2	0.67	104	31	0.30	36	1	0.03	94	13	0.14
2006	3	3	1.00	87	39	0.45	19	2	0.11	84	16	0.19
2007	9	3	0.33	94	45	0.48	30	3	0.10	94	10	0.11
2008	0	0	-	86	39	0.45	40	6	0.15	85	8	0.09
2009	0	0	-	75	38	0.51	24	1	0.04	71	4	0.06
2010	0	0	-	73	35	0.48	35	0	0.00	73	6	0.08
2011	0	0	-	71	35	0.49	32	1	0.03	70	2	0.03
2012	0	0	-	60	28	0.47	29	3	0.10	57	0	0.00
2013	0	0	-	66	29	0.44	22	1	0.05	63	3	0.05

Table C5 continued: Total number of trips, number of trips with zero estimated or daily processed catch, and proportion of trips with zero estimated or daily processed catch, by form type for RIB 5 for the 1990 to 2013 fishing years.

RIB 5	CELR form			TCEPR form			LCER form			TCEPR daily processed		
Fishing year	Total	Zero	Proportion	Total	Zero	Proportion	Total	Zero	Proportion	Total	Zero	Proportion
1990	2	2	1.00	21	8	0.38	0	0	-	16	1	0.06
1991	2	0	0.00	40	16	0.40	0	0	-	27	1	0.04
1992	4	0	0.00	59	28	0.47	0	0	-	41	3	0.07
1993	5	1	0.20	39	13	0.33	0	0	-	28	1	0.04
1994	4	0	0.00	18	5	0.28	0	0	-	17	2	0.12
1995	6	0	0.00	21	3	0.14	0	0	-	17	1	0.06
1996	6	1	0.17	18	7	0.39	0	0	-	19	1	0.05
1997	15	3	0.20	33	7	0.21	0	0	-	30	2	0.07
1998	15	3	0.20	36	4	0.11	0	0	-	38	1	0.03
1999	14	2	0.14	45	11	0.24	0	0	-	43	3	0.07
2000	8	0	0.00	53	9	0.17	0	0	-	55	1	0.02
2001	9	2	0.22	80	15	0.19	0	0	-	79	3	0.04
2002	7	1	0.14	76	16	0.21	0	0	-	74	2	0.03
2003	5	0	0.00	64	16	0.25	0	0	-	62	2	0.03
2004	4	0	0.00	46	13	0.28	2	0	0.00	44	0	0.00
2005	9	0	0.00	48	12	0.25	4	0	0.00	52	3	0.06
2006	17	2	0.12	45	13	0.29	2	0	0.00	47	4	0.09
2007	2	2	1.00	58	13	0.22	3	0	0.00	57	1	0.02
2008	0	0	-	46	12	0.26	3	0	0.00	41	2	0.05
2009	0	0	-	40	17	0.42	3	0	0.00	40	0	0.00
2010	0	0	-	35	14	0.40	1	0	0.00	36	1	0.03
2011	0	0	-	43	23	0.53	1	0	0.00	39	3	0.08
2012	0	0	-	31	9	0.29	1	0	0.00	34	1	0.03
2013	0	0	-	45	21	0.47	0	0	-	42	0	0.00

Table C5 continued: Total number of trips, number of trips with zero estimated or daily processed catch, and proportion of trips with zero estimated or daily processed catch, by form type for RIB 6 for the 1990 to 2013 fishing years.

RIB 6	CELR form			TCEPR form			LCER form			TCEPR daily processed		
Fishing year	Total	Zero	Proportion	Total	Zero	Proportion	Total	Zero	Proportion	Total	Zero	Proportion
1990	0	0	-	4	0	0.00	0	0	-	5	0	0.00
1991	0	0	-	24	5	0.21	0	0	-	26	1	0.04
1992	3	0	0.00	35	10	0.29	0	0	-	34	1	0.03
1993	6	0	0.00	24	4	0.17	0	0	-	22	0	0.00
1994	3	0	0.00	10	0	0.00	0	0	-	11	0	0.00
1995	9	0	0.00	18	3	0.17	0	0	-	15	2	0.13
1996	12	1	0.08	18	7	0.39	0	0	-	18	0	0.00
1997	13	0	0.00	25	5	0.20	0	0	-	25	2	0.08
1998	16	0	0.00	41	7	0.17	0	0	-	38	0	0.00
1999	20	3	0.15	42	4	0.10	0	0	-	40	1	0.02
2000	14	2	0.14	51	5	0.10	0	0	-	45	2	0.04
2001	6	0	0.00	60	16	0.27	0	0	-	53	3	0.06
2002	7	0	0.00	62	10	0.16	0	0	-	60	1	0.02
2003	4	0	0.00	64	14	0.22	0	0	-	61	1	0.02
2004	2	0	0.00	49	16	0.33	6	0	0.00	47	3	0.06
2005	0	0	-	42	12	0.29	3	0	0.00	43	4	0.09
2006	0	0	-	40	8	0.20	1	0	0.00	39	7	0.18
2007	0	0	-	55	12	0.22	0	0	-	55	4	0.07
2008	0	0	-	51	20	0.39	8	0	0.00	42	0	0.00
2009	0	0	-	29	8	0.28	4	0	0.00	30	3	0.10
2010	0	0	-	33	12	0.36	3	0	0.00	33	3	0.09
2011	0	0	-	27	10	0.37	4	0	0.00	26	3	0.12
2012	0	0	-	25	3	0.12	4	0	0.00	24	1	0.04
2013	0	0	-	36	15	0.42	1	0	0.00	32	3	0.09

Table C5 continued: Total number of trips, number of trips with zero estimated or daily processed catch, and proportion of trips with zero estimated or daily processed catch, by form type for RIB 7 for the 1990 to 2013 fishing years.

RIB 7	CELR form			TCEPR form			LCER form			TCEPR daily processed		
Fishing year	Total	Zero	Proportion	Total	Zero	Proportion	Total	Zero	Proportion	Total	Zero	Proportion
1990	30	12	0.40	34	20	0.59	-	-	-	27	9	0.33
1991	60	26	0.43	46	24	0.52	-	-	-	18	2	0.11
1992	58	35	0.60	46	29	0.63	-	-	-	22	4	0.18
1993	37	18	0.49	41	21	0.51	-	-	-	28	11	0.39
1994	55	29	0.53	39	19	0.49	-	-	-	29	8	0.28
1995	37	15	0.41	49	19	0.39	-	-	-	31	12	0.39
1996	38	16	0.42	35	11	0.31	-	-	-	25	2	0.08
1997	48	17	0.35	52	16	0.31	-	-	-	41	8	0.20
1998	73	24	0.33	67	28	0.42	-	-	-	59	0	0.00
1999	70	21	0.30	110	46	0.42	-	-	-	93	6	0.06
2000	69	21	0.30	97	36	0.37	-	-	-	90	6	0.07
2001	37	7	0.19	97	27	0.28	-	-	-	83	0	0.00
2002	25	8	0.32	93	24	0.26	-	-	-	76	2	0.03
2003	29	7	0.24	84	22	0.26	-	-	-	84	1	0.01
2004	30	9	0.30	91	28	0.31	-	-	-	76	2	0.03
2005	39	5	0.13	64	16	0.25	-	-	-	59	1	0.02
2006	38	8	0.21	72	16	0.22	-	-	-	77	2	0.03
2007	34	11	0.32	73	21	0.29	-	-	-	64	0	0.00
2008	1	0	0.00	54	16	0.30	-	-	-	47	1	0.02
2009	2	1	0.50	58	14	0.24	-	-	-	49	1	0.02
2010	0	0	-	52	12	0.23	-	-	-	46	3	0.07
2011	1	0	0.00	48	21	0.44	-	-	-	46	1	0.02
2012	0	0	-	55	13	0.24	-	-	-	54	2	0.04
2013	0	0	-	63	30	0.48	-	-	-	59	2	0.03

Table C5 continued: Total number of trips, number of trips with zero estimated or daily processed catch, and proportion of trips with zero estimated or daily processed catch, by form type for RIB 8 for the 1990 to 2013 fishing years.

RIB 8	CELR form			TCEPR form			LCER form			TCEPR daily processed		
Fishing year	Total	Zero	Proportion	Total	Zero	Proportion	Total	Zero	Proportion	Total	Zero	Proportion
1990	2	0	0.00	-	-	-	-	-	-	-	-	-
1991	6	0	0.00	-	-	-	-	-	-	-	-	-
1992	1	0	0.00	-	-	-	-	-	-	-	-	-
1993	3	0	0.00	-	-	-	-	-	-	-	-	-
1994	5	0	0.00	-	-	-	-	-	-	-	-	-
1995	7	0	0.00	-	-	-	-	-	-	-	-	-
1996	11	3	0.27	-	-	-	-	-	-	-	-	-
1997	5	0	0.00	-	-	-	-	-	-	-	-	-
1998	9	1	0.11	-	-	-	-	-	-	-	-	-
1999	8	3	0.38	-	-	-	-	-	-	-	-	-
2000	1	0	0.00	-	-	-	-	-	-	-	-	-
2001	5	2	0.40	-	-	-	-	-	-	-	-	-
2002	0	0	-	-	-	-	-	-	-	-	-	-
2003	2	1	0.50	-	-	-	-	-	-	-	-	-
2004	3	1	0.33	-	-	-	-	-	-	-	-	-
2005	3	2	0.67	-	-	-	-	-	-	-	-	-
2006	0	0	-	-	-	-	-	-	-	-	-	-
2007	1	0	0.00	-	-	-	-	-	-	-	-	-
2008	1	0	0.00	-	-	-	-	-	-	-	-	-
2009	0	0	-	-	-	-	-	-	-	-	-	-
2010	0	0	-	-	-	-	-	-	-	-	-	-
2011	0	0	-	-	-	-	-	-	-	-	-	-
2012	0	0	-	-	-	-	-	-	-	-	-	-
2013	0	0	-	-	-	-	-	-	-	-	-	-

Table C6a: Proportion of total catch for each region from groomed and merged data for the 1990 to 2013 fishing years.

Fishing year	Eastern	Southern	WCSI	Other	Total (t)
1990	0.46	0.16	0.20	0.18	158
1991	0.56	0.29	0.09	0.06	524
1992	0.44	0.30	0.06	0.20	704
1993	0.48	0.20	0.10	0.21	874
1994	0.55	0.17	0.06	0.22	670
1995	0.54	0.14	0.03	0.29	1 302
1996	0.51	0.15	0.06	0.28	978
1997	0.45	0.22	0.07	0.26	1 040
1998	0.39	0.33	0.11	0.18	1 112
1999	0.39	0.30	0.22	0.09	990
2000	0.42	0.26	0.22	0.09	1 160
2001	0.41	0.25	0.26	0.07	1 049
2002	0.44	0.31	0.20	0.05	1 295
2003	0.37	0.21	0.31	0.10	1 033
2004	0.40	0.20	0.29	0.11	1 230
2005	0.49	0.12	0.25	0.14	1 199
2006	0.35	0.12	0.32	0.21	872
2007	0.39	0.09	0.37	0.15	1 121
2008	0.32	0.13	0.35	0.20	910
2009	0.37	0.09	0.44	0.11	1 030
2010	0.48	0.15	0.24	0.13	780
2011	0.54	0.10	0.22	0.14	877
2012	0.60	0.11	0.21	0.08	781
2013	0.53	0.12	0.25	0.10	774
Total	0.45	0.19	0.21	0.15	22 459

Table C6b: Proportion of total catch for each of the three main fishery areas from groomed and merged data for the 1990 to 2013 fishing years.

Fishing year	Eastern	Southern	WCSI	Total
1990	0.56	0.19	0.24	129
1991	0.60	0.31	0.09	492
1992	0.55	0.37	0.08	565
1993	0.61	0.26	0.13	688
1994	0.71	0.22	0.07	521
1995	0.76	0.20	0.04	923
1996	0.71	0.21	0.08	705
1997	0.60	0.30	0.09	771
1998	0.47	0.40	0.13	913
1999	0.43	0.33	0.24	904
2000	0.46	0.29	0.25	1 052
2001	0.44	0.27	0.29	970
2002	0.47	0.32	0.21	1 230
2003	0.41	0.24	0.35	927
2004	0.45	0.23	0.32	1 092
2005	0.57	0.14	0.29	1 036
2006	0.45	0.15	0.40	688
2007	0.46	0.11	0.43	957
2008	0.40	0.16	0.43	728
2009	0.41	0.10	0.49	920
2010	0.55	0.17	0.28	680
2011	0.63	0.12	0.25	755
2012	0.65	0.12	0.22	718
2013	0.59	0.13	0.28	696
Total	0.53	0.23	0.25	19 058

Table C6c: Proportion of total catch by month for the Eastern, Southern and west coast South Island fishery areas combined from groomed and merged data for the 1990 to 2013 fishing years.

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (t)
1990	0.02	0.01	0.06	0.02	0.02	0.03	0.10	0.15	0.20	0.17	0.04	0.17	129
1991	0.03	0.08	0.08	0.11	0.13	0.18	0.10	0.10	0.04	0.05	0.03	0.06	492
1992	0.05	0.10	0.11	0.05	0.12	0.10	0.08	0.11	0.16	0.06	0.03	0.03	565
1993	0.08	0.07	0.11	0.04	0.12	0.10	0.08	0.07	0.14	0.13	0.01	0.06	688
1994	0.07	0.08	0.05	0.03	0.08	0.09	0.08	0.03	0.19	0.23	0.02	0.05	521
1995	0.06	0.08	0.09	0.02	0.14	0.24	0.04	0.05	0.18	0.07	0.01	0.01	923
1996	0.07	0.07	0.05	0.06	0.25	0.04	0.13	0.09	0.10	0.09	0.02	0.02	705
1997	0.05	0.06	0.16	0.08	0.13	0.05	0.11	0.11	0.06	0.07	0.07	0.06	771
1998	0.08	0.08	0.07	0.07	0.09	0.08	0.10	0.07	0.12	0.14	0.08	0.02	913
1999	0.07	0.08	0.09	0.05	0.09	0.08	0.10	0.11	0.07	0.16	0.06	0.03	904
2000	0.03	0.09	0.12	0.03	0.06	0.03	0.10	0.07	0.17	0.23	0.04	0.03	1 052
2001	0.07	0.09	0.09	0.04	0.08	0.03	0.07	0.13	0.18	0.13	0.03	0.05	970
2002	0.03	0.08	0.09	0.05	0.11	0.02	0.13	0.08	0.10	0.23	0.07	0.02	1 230
2003	0.06	0.05	0.09	0.06	0.10	0.06	0.07	0.07	0.22	0.13	0.06	0.04	927
2004	0.05	0.07	0.06	0.07	0.04	0.04	0.05	0.05	0.22	0.23	0.06	0.05	1 092
2005	0.07	0.10	0.08	0.07	0.04	0.04	0.04	0.03	0.17	0.19	0.12	0.05	1 036
2006	0.04	0.13	0.05	0.05	0.03	0.05	0.05	0.06	0.09	0.23	0.16	0.06	688
2007	0.09	0.07	0.04	0.05	0.05	0.05	0.04	0.06	0.13	0.26	0.12	0.04	957
2008	0.11	0.05	0.09	0.06	0.05	0.07	0.04	0.07	0.12	0.15	0.12	0.09	728
2009	0.10	0.09	0.06	0.06	0.05	0.03	0.02	0.02	0.11	0.17	0.13	0.16	920
2010	0.12	0.05	0.06	0.06	0.04	0.06	0.08	0.13	0.08	0.18	0.08	0.06	680
2011	0.04	0.08	0.13	0.08	0.14	0.11	0.02	0.09	0.11	0.09	0.05	0.06	755
2012	0.05	0.09	0.12	0.03	0.04	0.06	0.10	0.08	0.02	0.25	0.10	0.06	718
2013	0.09	0.09	0.18	0.05	0.04	0.06	0.04	0.05	0.09	0.21	0.05	0.05	696
Total	0.06	0.08	0.09	0.05	0.09	0.07	0.07	0.07	0.13	0.16	0.07	0.05	19 058

Table C6d: Proportion of total catch by method for the Eastern, Southern and west coast South Island fishery areas combined from groomed and merged data for the 1990 to 2013 fishing years. BLL; bottom long line, BT; bottom trawl, MW; midwater trawl, SN; set net, MB; midwater trawl on the bottom (within 5 m of the sea bed).

Fishing year	BT	BLL	MW	SN	MB	Other	Total
1990	0.75	0.03	0.04	0.12	0.06	0.01	129
1991	0.66	0.19	0.01	0.10	0.04	-	492
1992	0.63	0.22	0.02	0.11	0.02	0.01	565
1993	0.53	0.26	0.02	0.16	0.03	-	688
1994	0.24	0.63	0	0.12	0.01	-	521
1995	0.19	0.73	0.02	0.05	0.01	-	923
1996	0.28	0.66	0.03	0.01	0.01	-	705
1997	0.38	0.57	0.03	0.01	0.01	-	771
1998	0.49	0.41	0.07	0.02	0.01	-	913
1999	0.57	0.32	0.08	-	0.02	-	904
2000	0.57	0.29	0.1	-	0.03	-	1 052
2001	0.69	0.17	0.11	0.03	0.02	-	970
2002	0.70	0.27	0	0.02	0	-	1 230
2003	0.84	0.11	0.01	0.03	0.01	-	927
2004	0.78	0.20	0	0.01	0.01	-	1 092
2005	0.62	0.35	0.01	0.01	0.01	-	1 036
2006	0.71	0.28	0	-	0	-	688
2007	0.67	0.30	0.02	-	0.01	-	957
2008	0.81	0.18	0	-	0	-	728
2009	0.81	0.19	0	-	0	-	920
2010	0.60	0.40	0	-	0	-	680
2011	0.48	0.51	0	-	0	-	755
2012	0.43	0.57	0	-	0	-	718
2013	0.60	0.39	0	-	0	-	696
Total	0.59	0.35	0.03	0.03	0.01	<0.01	19 058

Table C6e: Proportion of total catch by target species for the Eastern, Southern and west coast South Island fishery areas combined from groomed and merged data for the 1990 to 2013 fishing years.

Fishing year	HOK	LIN	HAK	ORH	RIB	Other	Total
1990	0.63	0.17	0.02	0.12	-	0.06	129
1991	0.60	0.34	-	0.02	-	0.03	492
1992	0.62	0.30	0.01	0.01	-	0.05	565
1993	0.51	0.41	0.06	0.01	-	0.01	688
1994	0.22	0.70	0.02	0.01	0.02	0.03	521
1995	0.20	0.77	0.01	0.01	-	0.01	923
1996	0.28	0.66	0.03	0.01	-	0.01	705
1997	0.39	0.56	-	0.02	-	0.03	771
1998	0.54	0.43	-	0.02	-	0.01	913
1999	0.56	0.33	0.06	0.03	-	0.01	904
2000	0.60	0.30	0.07	0.03	-	-	1 052
2001	0.64	0.19	0.14	0.03	-	0.01	970
2002	0.65	0.29	0.03	0.02	-	0.01	1 230
2003	0.62	0.14	0.21	0.02	-	0.01	927
2004	0.46	0.21	0.27	0.03	-	0.02	1 092
2005	0.30	0.37	0.26	0.04	0.01	0.02	1 036
2006	0.28	0.33	0.32	0.04	-	0.02	688
2007	0.22	0.33	0.39	0.03	-	0.03	957
2008	0.27	0.24	0.44	0.02	-	0.03	728
2009	0.22	0.21	0.54	0.02	-	0.02	920
2010	0.27	0.42	0.27	0.02	-	0.02	680
2011	0.22	0.49	0.23	0.01	0.02	0.02	755
2012	0.22	0.43	0.17	0.01	0.15	0.02	718
2013	0.31	0.38	0.19	0.02	0.07	0.03	696
Total	0.41	0.37	0.17	0.02	0.01	0.02	19 058

Table C7: Proportion of total catch by flag nationality from groomed and merged data for the 1990 to 2013 fishing years for all fishery areas.

Fishing year	Unknown	NZ	Korea	Other	Total (t)
1990	0.96	0.02	0.02	-	158
1991	0.98	0.02	-	-	524
1992	0.98	0.02	-	-	704
1993	0.92	0.07	-	-	874
1994	0.92	0.08	-	-	670
1995	0.95	0.05	-	-	1 302
1996	0.94	0.06	-	-	978
1997	0.88	0.11	-	0.01	1 040
1998	0.79	0.15	0.01	0.06	1 112
1999	0.72	0.18	0.07	0.03	990
2000	0.71	0.17	0.08	0.04	1 160
2001	0.69	0.15	0.09	0.08	1 049
2002	0.74	0.14	0.09	0.04	1 295
2003	0.66	0.17	0.12	0.05	1 033
2004	0.59	0.24	0.13	0.05	1 230
2005	0.64	0.20	0.12	0.04	1 199
2006	0.70	0.18	0.11	0.02	872
2007	0.64	0.19	0.17	-	1 121
2008	0.61	0.23	0.16	-	910
2009	0.54	0.20	0.26	-	1 030
2010	0.61	0.25	0.13	-	780
2011	0.61	0.29	0.10	-	877
2012	0.51	0.38	0.11	-	781
2013	0.42	0.43	0.15	-	774
Total	0.73	0.17	0.08	0.02	22 459

Table C8: Proportion of total catch by flag nationality from groomed and merged data for the 1990 to 2013 fishing years for RIB3–8.

Fishing year	Unknown	NZ	Korea	Other	Total (t)
1990	0.96	0.01	0.02	-	129
1991	0.99	0.01	-	-	492
1992	1.00	-	-	-	565
1993	0.99	0.01	-	-	688
1994	0.98	0.01	-	-	521
1995	0.99	0.01	-	-	923
1996	0.98	0.01	-	-	705
1997	0.92	0.06	-	0.01	771
1998	0.76	0.16	0.01	0.07	913
1999	0.72	0.17	0.08	0.03	904
2000	0.71	0.16	0.08	0.05	1 052
2001	0.68	0.15	0.09	0.08	970
2002	0.73	0.14	0.09	0.04	1 230
2003	0.65	0.17	0.13	0.05	927
2004	0.55	0.25	0.15	0.06	1 092
2005	0.60	0.21	0.14	0.05	1 036
2006	0.64	0.20	0.14	0.02	688
2007	0.61	0.19	0.20	-	957
2008	0.59	0.21	0.20	-	728
2009	0.58	0.13	0.29	-	920
2010	0.67	0.18	0.15	-	680
2011	0.67	0.21	0.11	-	755
2012	0.52	0.36	0.12	-	718
2013	0.44	0.40	0.16	-	696
Total	0.72	0.15	0.10	0.02	19 058

Table C9: Proportion of ribaldo catch reported by gear type from the Eastern fishery area for the 1990 to 2013 fishing years.

Fishing year	BLL	BT	SN	Other	Total
1990	0.02	0.75	0.22	0.02	73
1991	0.29	0.50	0.16	0.05	296
1992	0.33	0.45	0.20	0.02	310
1993	0.32	0.41	0.27	-	422
1994	0.63	0.20	0.17	-	370
1995	0.74	0.18	0.06	0.01	704
1996	0.67	0.30	0.02	-	500
1997	0.55	0.42	0.01	0.02	467
1998	0.40	0.55	0.04	0.01	432
1999	0.36	0.62	0.01	0.01	385
2000	0.42	0.57	0.01	-	487
2001	0.23	0.71	0.06	-	430
2002	0.44	0.51	0.04	-	575
2003	0.21	0.72	0.06	0.01	382
2004	0.28	0.68	0.03	0.01	487
2005	0.55	0.42	0.02	0.01	592
2006	0.55	0.44	0.01	0.01	306
2007	0.63	0.36	-	-	440
2008	0.39	0.60	-	-	294
2009	0.41	0.59	-	-	379
2010	0.62	0.38	-	0.01	374
2011	0.75	0.24	-	0.01	476
2012	0.75	0.25	-	-	467
2013	0.64	0.35	-	0.01	409
Total	0.50	0.45	0.05	0.01	10 055

Table C10a: Proportion of ribaldo catch reported each month from the Eastern fishery area for the 1990 to 2013 fishing years for all fishing methods.

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (t)
1990	0.03	0.01	0.07	0.01	0.03	0.05	0.16	0.24	0.18	0.12	0.02	0.08	73
1991	0.01	0.01	0.04	0.09	0.21	0.28	0.13	0.13	0.04	0.02	0.01	0.04	296
1992	0.01	0.09	0.12	0.05	0.09	0.10	0.11	0.16	0.23	0.02	0.01	0.02	310
1993	0.04	0.05	0.10	0.04	0.12	0.10	0.13	0.08	0.18	0.15	0.01	0.02	422
1994	0.09	0.08	0.05	0.02	0.09	0.12	0.11	0.04	0.26	0.09	0.01	0.04	370
1995	0.05	0.08	0.07	0.02	0.08	0.32	0.05	0.04	0.20	0.08	0.01	0.01	704
1996	0.09	0.08	0.04	0.05	0.34	0.04	0.04	0.12	0.11	0.06	0.01	0.01	500
1997	0.05	0.08	0.20	0.06	0.08	0.06	0.11	0.15	0.04	0.05	0.05	0.07	467
1998	0.11	0.10	0.10	0.09	0.09	0.05	0.15	0.08	0.06	0.14	0.02	0.02	432
1999	0.11	0.08	0.15	0.05	0.19	0.07	0.15	0.07	0.02	0.07	0.01	0.03	385
2000	0.01	0.15	0.19	0.05	0.09	0.05	0.13	0.07	0.16	0.09	0.01	0.01	487
2001	0.10	0.10	0.16	0.02	0.14	0.05	0.13	0.13	0.10	0.03	0.01	0.04	430
2002	0.04	0.08	0.11	0.04	0.13	0.03	0.19	0.08	0.21	0.04	0.03	0.01	575
2003	0.11	0.05	0.12	0.06	0.16	0.11	0.13	0.07	0.09	0.05	0.03	0.02	382
2004	0.07	0.05	0.07	0.10	0.07	0.07	0.08	0.08	0.10	0.21	0.06	0.05	487
2005	0.07	0.10	0.09	0.08	0.07	0.05	0.05	0.03	0.10	0.18	0.15	0.04	592
2006	0.04	0.06	0.11	0.10	0.07	0.11	0.06	0.10	0.07	0.21	0.06	-	306
2007	0.02	0.07	0.05	0.09	0.10	0.10	0.09	0.12	0.17	0.11	0.08	0.01	440
2008	0.04	0.04	0.10	0.10	0.10	0.12	0.08	0.16	0.10	0.06	0.07	0.03	294
2009	0.06	0.14	0.11	0.10	0.12	0.06	0.05	0.03	0.13	0.13	0.06	-	379
2010	0.03	0.04	0.10	0.09	0.08	0.10	0.09	0.21	0.10	0.14	0.03	-	374
2011	0.01	0.08	0.18	0.12	0.19	0.16	0.03	0.11	0.07	0.03	-	-	476
2012	0.03	0.10	0.17	0.05	0.05	0.07	0.13	0.10	0.02	0.26	0.02	0.01	467
2013	0.05	0.09	0.28	0.07	0.06	0.10	0.03	0.03	0.07	0.20	0.01	0.01	409
Total	0.05	0.08	0.12	0.06	0.12	0.10	0.10	0.09	0.12	0.11	0.03	0.02	10 055

Table C10b: Proportion of ribaldo catch reported each month from the Eastern fishery area for the 1990 to 2013 fishing years for bottom trawling only.

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (t)
1990	-	-	0.09	-	0.04	0.03	0.13	0.26	0.21	0.14	0.01	0.09	54
1991	0.01	0.02	0.01	0.16	0.21	0.33	0.16	0.03	0.02	-	-	0.03	146
1992	0.01	0.12	0.22	0.05	0.15	0.15	0.15	0.07	0.05	0.01	-	-	140
1993	0.03	0.05	0.18	0.04	0.09	0.11	0.18	0.04	0.06	0.20	-	0.02	173
1994	0.16	0.09	0.21	0.06	0.21	0.10	0.08	0.01	0.01	0.06	-	-	74
1995	0.07	0.10	0.25	0.04	0.08	0.01	0.08	0.14	0.09	0.13	0.01	0.02	130
1996	0.22	0.08	0.03	0.08	0.19	0.12	0.06	0.12	0.05	0.05	0.01	0.01	151
1997	0.08	0.16	0.13	0.05	0.11	0.13	0.15	0.05	0.07	0.05	-	0.02	196
1998	0.04	0.06	0.04	0.13	0.05	0.07	0.25	0.07	0.01	0.25	-	0.03	237
1999	0.10	0.08	0.11	0.08	0.16	0.11	0.17	0.06	0.03	0.10	-	-	241
2000	0.02	0.13	0.21	0.02	0.15	0.08	0.23	0.04	0.06	0.05	0.01	0.01	276
2001	0.13	0.11	0.15	0.03	0.19	0.05	0.16	0.05	0.07	0.02	0.01	0.03	305
2002	0.04	0.13	0.11	0.06	0.15	0.05	0.14	0.09	0.15	0.07	-	0.01	294
2003	0.14	0.05	0.12	0.04	0.14	0.07	0.12	0.09	0.13	0.06	0.02	0.01	275
2004	0.08	0.05	0.09	0.12	0.09	0.06	0.10	0.10	0.11	0.11	0.01	0.07	331
2005	0.14	0.17	0.11	0.08	0.11	0.04	0.05	0.05	0.04	0.09	0.02	0.10	250
2006	0.09	0.08	0.16	0.08	0.08	0.08	0.07	0.09	0.09	0.14	0.03	-	134
2007	0.01	0.04	0.09	0.07	0.11	0.10	0.10	0.14	0.19	0.07	0.04	0.03	160
2008	0.06	0.04	0.03	0.10	0.15	0.17	0.08	0.15	0.12	0.05	0.04	0.02	178
2009	0.09	0.18	0.09	0.16	0.16	0.10	0.03	0.06	0.05	0.05	0.02	-	224
2010	0.07	0.06	0.12	0.08	0.19	0.14	0.06	0.10	0.07	0.09	-	0.01	141
2011	0.04	0.10	0.09	0.08	0.10	0.22	0.11	0.13	0.06	0.06	-	-	114
2012	0.02	0.11	0.19	0.19	0.15	0.13	0.06	0.05	0.06	0.03	-	-	115
2013	0.04	0.07	0.08	0.18	0.14	0.11	0.09	0.06	0.10	0.09	0.01	0.01	142
Total	0.07	0.09	0.12	0.08	0.13	0.10	0.13	0.08	0.08	0.08	0.01	0.02	4481

Table C10c: Proportion of ribaldo catch reported each month from the Eastern fishery area for the 1990 to 2013 fishing years for bottom long lining only.

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (t)
1990	-	-	-	-	-	0.03	-	0.82	0.15	-	-	-	1
1991	-	-	0.11	0.01	0.27	0.32	0.01	0.16	0.01	0.01	0.02	0.08	87
1992	0.01	0.06	-	0.01	-	-	-	0.29	0.56	0.04	0.01	0.03	101
1993	0.04	-	-	-	0.18	0.02	0.01	0.12	0.42	0.18	0.01	0.03	136
1994	0.08	0.07	-	-	0.05	0.12	0.09	0.02	0.38	0.12	0.01	0.06	234
1995	0.04	0.07	0.03	0.01	0.07	0.41	0.04	0.01	0.24	0.07	0.01	-	524
1996	0.03	0.07	0.04	0.04	0.42	-	0.03	0.13	0.14	0.07	0.01	0.01	337
1997	0.03	0.01	0.25	0.06	0.05	-	0.09	0.24	0.01	0.04	0.09	0.11	255
1998	0.20	0.14	0.17	0.04	0.14	0.01	0.01	0.09	0.14	-	0.06	-	175
1999	0.13	0.08	0.23	0.01	0.23	-	0.13	0.08	0.01	0.02	0.02	0.07	140
2000	-	0.17	0.17	0.08	0.01	-	-	0.11	0.29	0.14	0.02	-	205
2001	-	0.10	0.20	-	-	-	-	0.35	0.24	0.04	0.03	0.04	99
2002	0.03	0.01	0.12	0.01	0.13	-	0.26	0.06	0.29	0.02	0.06	-	254
2003	0.02	0.01	0.12	0.14	0.22	0.21	0.11	-	0.01	0.05	0.08	0.04	79
2004	0.03	0.03	0.03	0.05	0.03	0.07	0.01	0.01	0.08	0.45	0.18	0.02	138
2005	0.02	0.05	0.08	0.08	0.03	0.05	0.03	0.01	0.14	0.25	0.26	0.01	324
2006	-	0.04	0.06	0.12	0.06	0.13	0.05	0.11	0.05	0.27	0.09	-	169
2007	0.03	0.08	0.04	0.10	0.10	0.10	0.08	0.11	0.15	0.13	0.10	-	279
2008	0.02	0.05	0.19	0.10	0.02	0.05	0.07	0.17	0.08	0.08	0.12	0.04	115
2009	0.01	0.07	0.14	0.03	0.05	-	0.08	-	0.25	0.25	0.11	-	154
2010	0.01	0.03	0.09	0.09	-	0.07	0.11	0.27	0.12	0.17	0.04	-	231
2011	-	0.08	0.20	0.13	0.22	0.14	-	0.11	0.08	0.02	0.01	-	357
2012	0.04	0.10	0.16	-	0.02	0.05	0.15	0.12	-	0.33	0.03	0.01	351
2013	0.05	0.10	0.38	0.01	0.01	0.09	-	0.02	0.05	0.26	0.01	0.01	263
Total	0.04	0.07	0.12	0.05	0.10	0.10	0.06	0.10	0.16	0.14	0.06	0.02	5009

Table C11a: Proportion of ribaldo catch reported for each statistical area from the Eastern fishery area for 1990 to 2013 fishing years for all methods.

Fishing year	018	019	020	021	023	401	402	403	404	407	408	409	410	Other	Total (t)
1990	0.23	0.05	0.07	0.03	0.11	0.04	0.25	0.04	-	-	-	-	0.02	0.15	73
1991	0.18	0.19	0.08	0.14	0.02	0.10	0.22	0.01	0.01	-	0.01	0.01	-	0.02	296
1992	0.21	0.01	0.11	0.04	0.09	0.16	0.22	-	-	0.02	0.04	0.03	0.02	0.05	310
1993	0.29	0.03	0.07	0.05	0.04	0.08	0.25	0.03	0.04	0.01	0.01	-	0.02	0.11	422
1994	0.21	0.01	0.08	0.10	0.10	0.09	0.08	0.01	0.10	0.09	0.02	-	0.01	0.10	370
1995	0.07	0.01	0.31	0.04	0.17	0.05	0.10	0.02	0.01	0.10	0.05	0.02	0.03	0.03	704
1996	0.06	-	0.23	0.07	0.18	0.10	0.04	0.08	0.05	0.02	0.02	0.05	0.02	0.09	500
1997	0.06	0.02	0.15	0.05	0.04	0.22	0.19	0.03	0.01	0.06	0.03	0.04	0.04	0.04	467
1998	0.05	0.01	0.09	0.02	0.05	0.19	0.30	0.01	0.02	0.04	0.02	0.08	0.05	0.08	432
1999	0.03	-	0.12	0.03	0.07	0.14	0.24	0.06	0.02	0.05	0.03	0.04	0.08	0.09	385
2000	0.03	0.03	0.19	0.04	0.07	0.09	0.26	0.18	0.01	0.02	0.02	0.01	0.01	0.04	487
2001	0.07	0.06	0.20	0.04	0.04	0.18	0.20	0.04	0.01	0.02	0.01	0.01	-	0.11	430
2002	0.05	0.05	0.16	0.04	0.06	0.08	0.23	0.12	0.07	0.04	0.03	0.03	0.02	0.04	575
2003	0.08	0.02	0.27	0.06	0.10	0.10	0.16	0.04	0.01	0.03	0.02	0.03	0.01	0.07	382
2004	0.04	0.03	0.17	0.03	0.07	0.08	0.31	0.09	0.03	0.01	0.01	0.03	0.01	0.09	487
2005	0.04	0.04	0.11	0.02	0.08	0.13	0.33	0.10	0.02	0.02	0.02	0.03	0.01	0.06	592
2006	0.03	0.04	0.20	0.03	0.07	0.07	0.29	0.09	0.01	0.06	0.03	0.02	0.01	0.06	306
2007	0.03	-	0.18	0.05	0.08	0.20	0.23	0.07	0.01	0.01	0.02	0.01	0.01	0.09	440
2008	0.05	-	0.25	0.05	0.05	0.09	0.14	0.04	0.06	0.01	0.02	0.01	0.05	0.18	294
2009	0.03	-	0.39	0.03	0.06	0.10	0.20	0.06	0.01	0.01	0.02	0.01	0.01	0.07	379
2010	0.01	0.06	0.29	0.12	0.08	0.13	0.11	0.04	0.03	-	0.02	0.02	0.02	0.06	374
2011	0.02	0.02	0.56	0.12	0.03	0.04	0.09	0.05	-	-	0.01	0.01	-	0.05	476
2012	0.02	0.02	0.26	0.04	0.03	0.14	0.09	0.17	0.13	0.01	0.02	0.01	0.02	0.03	467
2013	0.02	0.01	0.27	0.07	0.06	0.07	0.13	0.11	0.09	0.01	0.02	0.03	0.02	0.09	409
Total	0.07	0.03	0.21	0.05	0.08	0.11	0.19	0.07	0.03	0.03	0.02	0.02	0.02	0.07	10 055

Table C11b: Proportion of ribaldo catch reported for each statistical area from the Eastern fishery area for 1990 to 2013 fishing years for bottom trawling only.

Fishing year	018	019	020	021	022	023	401	402	403	405	408	409	410	Other	Total (t)
1990	-	0.06	0.10	0.03	0.03	0.15	0.05	0.33	0.06	0.15	-	-	0.02	0.01	54
1991	0.01	0.38	0.12	0.12	0.03	0.04	0.14	0.13	0.01	-	0.01	0.01	-	-	146
1992	0.01	0.02	0.12	0.03	0.03	0.19	0.13	0.23	-	0.01	0.09	0.05	0.03	0.06	140
1993	0.02	0.06	0.09	0.03	0.02	0.10	0.12	0.45	-	-	0.02	-	0.04	0.03	173
1994	0.17	0.02	0.21	0.10	0.04	0.12	0.05	0.12	-	-	0.03	0.02	0.06	0.05	74
1995	0.03	0.04	0.14	0.07	0.02	0.07	0.12	0.14	0.02	-	0.12	0.03	0.09	0.11	130
1996	0.09	-	0.40	0.03	0.02	0.14	0.09	0.09	0.01	0.03	0.02	0.01	0.01	0.04	151
1997	0.07	0.05	0.25	0.10	0.03	0.10	0.09	0.12	0.06	-	0.03	0.02	0.03	0.04	196
1998	0.02	0.01	0.13	0.03	0.04	0.08	0.16	0.37	0.01	0.02	0.03	0.03	0.04	0.04	237
1999	0.02	0.01	0.14	0.04	0.03	0.11	0.11	0.22	0.02	-	0.05	0.04	0.09	0.13	241
2000	0.03	0.03	0.22	0.04	0.03	0.08	0.15	0.25	0.05	0.01	0.03	0.02	0.01	0.07	276
2001	0.02	0.09	0.15	0.05	0.02	0.06	0.16	0.24	0.04	0.01	0.01	0.02	0.01	0.12	305
2002	0.01	0.10	0.20	0.06	0.01	0.09	0.08	0.22	0.03	0.02	0.04	0.04	0.02	0.07	294
2003	0.02	0.03	0.23	0.05	0.01	0.10	0.13	0.21	0.05	0.03	0.02	0.04	0.02	0.08	275
2004	0.02	0.05	0.20	0.04	0.02	0.05	0.08	0.28	0.08	0.02	0.02	0.04	0.01	0.10	331
2005	0.02	0.09	0.20	0.03	0.02	0.07	0.07	0.19	0.05	0.05	0.04	0.05	0.01	0.11	250
2006	0.03	0.08	0.24	0.05	0.04	0.15	0.04	0.15	0.01	0.07	0.05	0.04	0.01	0.04	134
2007	0.02	-	0.19	0.02	0.02	0.19	0.01	0.19	0.05	0.12	0.05	0.02	0.03	0.08	160
2008	0.06	-	0.27	0.01	0.03	0.08	0.07	0.13	0.06	0.06	0.03	0.02	0.07	0.13	178
2009	0.04	-	0.50	0.01	0.03	0.09	0.05	0.11	0.02	0.05	0.03	0.01	0.01	0.03	224
2010	0.02	-	0.26	0.01	0.02	0.19	0.10	0.09	0.02	0.07	0.05	0.05	0.06	0.07	141
2011	0.02	0.01	0.22	0.04	0.05	0.13	0.09	0.20	0.05	0.05	0.02	0.03	0.02	0.07	114
2012	0.02	-	0.18	0.03	0.02	0.12	0.12	0.21	0.01	0.03	0.08	0.05	0.08	0.06	115
2013	0.03	0.01	0.11	0.01	0.03	0.18	0.10	0.17	0.01	0.09	0.06	0.07	0.04	0.09	142
Total	0.03	0.05	0.21	0.04	0.03	0.10	0.10	0.21	0.03	0.03	0.04	0.03	0.03	0.07	4 481

Table C11c: Proportion of ribaldo catch reported for each statistical area from the Eastern fishery area for 1990 to 2013 fishing years for bottom long lining only.

Fishing year	018	019	020	021	023	052	401	402	403	404	407	409	410	Other	Total (t)
1990	0.20	0.04	-	0.40	-	-	0.14	0.10	0.03	-	-	-	-	0.09	1
1991	0.06	-	0.07	0.27	-	-	0.10	0.42	0.01	0.03	-	0.02	-	0.01	87
1992	0.01	-	0.15	0.07	-	0.08	0.30	0.35	-	-	0.01	0.01	0.01	-	101
1993	0.04	-	0.08	0.11	-	0.12	0.09	0.19	0.08	0.10	0.01	-	0.01	0.17	136
1994	0.01	0.01	0.07	0.12	0.13	0.07	0.12	0.08	0.01	0.16	0.14	-	-	0.09	234
1995	-	0.01	0.38	0.03	0.21	-	0.04	0.10	0.02	-	0.12	0.02	0.01	0.04	524
1996	0.01	-	0.16	0.09	0.20	0.06	0.11	0.02	0.11	0.07	0.02	0.06	0.02	0.05	337
1997	0.04	-	0.08	0.02	-	0.02	0.34	0.25	0.01	0.01	0.09	0.06	0.04	0.04	255
1998	0.01	-	0.05	-	-	0.04	0.25	0.24	0.02	0.05	0.08	0.15	0.07	0.03	175
1999	0.02	-	0.08	0.02	-	-	0.19	0.27	0.14	0.05	0.05	0.05	0.06	0.06	140
2000	0.01	0.04	0.16	0.04	0.06	-	0.03	0.28	0.36	0.01	-	-	0.01	0.01	205
2001	-	-	0.39	-	-	-	0.31	0.12	0.06	-	0.02	-	-	0.11	99
2002	-	-	0.11	0.02	0.02	0.01	0.08	0.26	0.23	0.14	0.06	0.02	0.01	0.05	254
2003	0.01	-	0.47	0.11	0.17	0.02	0.04	0.07	0.01	0.01	0.05	-	-	0.03	79
2004	0.01	-	0.12	-	0.10	0.04	0.08	0.41	0.12	-	0.01	0.01	-	0.08	138
2005	0.01	-	0.04	-	0.09	-	0.18	0.45	0.15	0.01	0.02	0.02	0.01	0.03	324
2006	0.02	0.01	0.16	0.02	0.01	-	0.09	0.39	0.16	0.01	0.09	-	-	0.03	169
2007	0.03	-	0.16	0.08	0.02	-	0.30	0.25	0.08	-	0.01	0.01	-	0.04	279
2008	0.03	-	0.22	0.10	0.01	0.07	0.14	0.16	0.01	0.06	0.01	-	0.02	0.16	115
2009	0.01	0.01	0.25	0.06	-	0.03	0.18	0.32	0.12	-	0.01	-	-	0.01	154
2010	-	0.09	0.30	0.19	0.01	0.01	0.16	0.13	0.06	0.04	-	-	-	0.01	231
2011	0.01	0.02	0.67	0.14	-	-	0.03	0.06	0.05	-	-	-	-	0.01	357
2012	0.02	0.03	0.29	0.04	-	-	0.15	0.05	0.23	0.18	-	-	-	-	351
2013	-	0.02	0.35	0.10	-	0.02	0.05	0.11	0.17	0.14	0.01	-	0.01	0.02	263
Total	0.01	0.01	0.23	0.07	0.06	0.02	0.14	0.19	0.10	0.05	0.04	0.02	0.01	0.04	5 009

Table C12a: Proportion of ribaldo catch reported by target species from the Eastern fishery area for the 1990 to 2013 fishing years for all fishing methods.

Fishing year	LIN	HOK	ORH	RIB	HAK	Other	Total (t)
1990	0.23	0.51	0.18	0.01	-	0.07	73
1991	0.46	0.51	-	-	-	0.02	296
1992	0.47	0.44	0.01	-	-	0.08	310
1993	0.57	0.40	0.01	-	0.01	0.01	422
1994	0.73	0.20	0.01	0.02	-	0.04	370
1995	0.79	0.18	0.01	-	-	0.01	704
1996	0.68	0.29	0.01	-	-	0.01	500
1997	0.53	0.43	0.01	-	-	0.03	467
1998	0.44	0.53	0.02	-	-	0.01	432
1999	0.37	0.61	0.01	-	0.01	0.01	385
2000	0.43	0.54	0.01	-	0.01	0.01	487
2001	0.28	0.65	0.02	-	0.04	0.01	430
2002	0.48	0.48	0.02	-	0.01	0.01	575
2003	0.26	0.69	0.03	-	0.01	0.01	382
2004	0.29	0.57	0.05	0.01	0.05	0.03	487
2005	0.55	0.34	0.05	0.02	0.03	0.02	592
2006	0.55	0.36	0.07	0.01	-	0.02	306
2007	0.61	0.28	0.06	-	0.01	0.04	440
2008	0.38	0.46	0.04	0.01	0.05	0.05	294
2009	0.41	0.39	0.04	-	0.13	0.03	379
2010	0.62	0.33	0.04	-	-	0.02	374
2011	0.71	0.22	0.01	0.03	-	0.02	476
2012	0.52	0.23	0.01	0.23	-	0.01	467
2013	0.53	0.32	0.03	0.11	-	0.01	409
Total	0.52	0.40	0.02	0.02	0.02	0.02	10 055

Table C12b: Proportion of ribaldo catch reported by target species from the Eastern fishery area for the 1990 to 2013 fishing years for bottom trawling only.

Fishing year	HOK	ORH	HAK	Other	Total
1990	0.69	0.24	-	0.07	54
1991	0.94	0.01	-	0.05	146
1992	0.96	0.02	-	0.02	140
1993	0.94	0.02	0.03	0.01	173
1994	0.93	0.04	-	0.03	74
1995	0.93	0.06	-	0.01	130
1996	0.94	0.04	0.02	-	151
1997	0.97	0.02	0.01	-	196
1998	0.95	0.04	-	0.01	237
1999	0.97	0.01	0.01	0.01	241
2000	0.95	0.02	0.03	0.01	276
2001	0.91	0.02	0.05	0.01	305
2002	0.93	0.04	0.03	0.01	294
2003	0.94	0.04	0.01	0.01	275
2004	0.82	0.08	0.07	0.03	331
2005	0.80	0.12	0.06	0.02	250
2006	0.82	0.15	-	0.03	134
2007	0.78	0.16	0.04	0.03	160
2008	0.76	0.07	0.08	0.08	178
2009	0.67	0.06	0.21	0.06	224
2010	0.85	0.10	0.01	0.04	141
2011	0.89	0.05	-	0.06	114
2012	0.92	0.03	-	0.05	115
2013	0.88	0.09	-	0.02	142
Total	0.89	0.06	0.03	0.02	4 481

Table C12c: Proportion of ribaldo catch reported by target species from the Eastern fishery area for the 1990 to 2013 fishing years for bottom long lining only.

Fishing year	LIN	RIB	Other	Total
1990	0.95	-	0.05	1
1991	1.00	-	-	87
1992	1.00	-	-	101
1993	1.00	-	-	136
1994	1.00	-	-	234
1995	0.99	-	0.01	524
1996	0.99	-	0.01	337
1997	0.96	-	0.04	255
1998	1.00	-	-	175
1999	0.99	-	0.01	140
2000	1.00	-	-	205
2001	1.00	-	-	99
2002	1.00	-	-	254
2003	1.00	-	-	79
2004	0.97	0.02	0.01	138
2005	0.99	-	0.01	324
2006	0.99	-	0.01	169
2007	0.95	-	0.04	279
2008	0.93	0.02	0.05	115
2009	0.99	0.01	-	154
2010	0.99	-	0.01	231
2011	0.95	0.04	0.01	357
2012	0.69	0.31	-	351
2013	0.82	0.18	-	263
Total	0.95	0.04	0.01	5 009

Table C13: Proportion of ribaldo catch reported by gear type from the Southern fishery area for the 1990 to 2013 fishing years.

Fishing year	BT	BLL	Other	Total (t)
1990	0.95	0.05	-	35
1991	0.98	-	0.02	155
1992	0.90	0.09	-	218
1993	0.79	0.21	-	183
1994	0.21	0.79	-	115
1995	0.20	0.80	-	185
1996	0.18	0.82	-	152
1997	0.23	0.77	-	234
1998	0.47	0.53	-	363
1999	0.55	0.45	-	302
2000	0.67	0.32	0.01	305
2001	0.78	0.22	-	264
2002	0.79	0.20	-	396
2003	0.88	0.11	0.01	222
2004	0.69	0.31	0.01	251
2005	0.71	0.28	0.01	147
2006	0.79	0.21	-	104
2007	0.90	0.09	-	105
2008	0.88	0.12	-	120
2009	0.81	0.18	-	89
2010	0.65	0.35	-	118
2011	0.77	0.23	-	89
2012	0.60	0.40	-	90
2013	0.97	0.02	0.01	95
Total	0.66	0.34	0.01	4 340

Table C14a: Proportion of ribaldo catch reported each month from the Southern fishery area for the 1990 to 2013 fishing years for all fishing methods.

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (t)
1990	-	-	0.07	0.10	-	0.03	0.03	0.26	0.35	0.05	-	0.10	35
1991	0.06	0.23	0.18	0.18	0.03	0.04	0.05	0.10	0.04	0.03	-	0.06	155
1992	0.10	0.14	0.11	0.07	0.18	0.14	0.05	0.08	0.04	0.05	0.02	0.01	218
1993	0.19	0.12	0.18	0.05	0.16	0.16	0.01	0.08	0.03	0.02	-	-	183
1994	0.03	0.13	0.05	0.04	0.06	0.03	-	-	0.01	0.64	-	0.01	115
1995	0.08	0.10	0.15	0.03	0.42	-	-	0.09	0.11	0.01	-	-	185
1996	0.02	0.08	0.12	0.10	0.01	0.06	0.47	0.01	0.05	0.07	-	0.02	152
1997	0.04	0.05	0.13	0.14	0.25	0.05	0.15	0.04	0.09	0.05	-	0.01	234
1998	0.06	0.07	0.06	0.06	0.12	0.15	0.06	0.08	0.11	0.09	0.13	-	363
1999	0.06	0.12	0.03	0.08	0.01	0.12	0.11	0.22	0.11	0.06	0.04	0.02	302
2000	0.04	0.07	0.12	0.01	0.08	0.02	0.13	0.11	0.13	0.22	0.04	0.03	305
2001	0.06	0.06	0.08	0.12	0.06	0.05	0.05	0.23	0.06	0.21	0.01	0.01	264
2002	0.02	0.14	0.11	0.10	0.13	0.01	0.12	0.12	-	0.24	-	0.01	396
2003	0.06	0.11	0.18	0.16	0.13	0.04	0.06	0.13	0.05	0.08	-	0.01	222
2004	0.03	0.20	0.13	0.10	0.05	0.06	0.06	0.05	0.10	0.18	0.04	0.01	251
2005	0.17	0.20	0.17	0.14	0.05	0.07	0.09	0.06	-	0.02	0.02	0.01	147
2006	0.07	0.57	0.02	0.03	-	-	0.11	0.07	0.05	0.03	0.03	0.02	104
2007	0.12	0.34	0.15	0.07	0.05	-	0.01	0.01	-	0.04	0.11	0.11	105
2008	0.12	0.20	0.31	0.10	0.08	0.10	0.01	-	0.01	0.01	0.04	0.02	120
2009	0.05	0.33	0.14	0.13	0.06	0.03	0.01	0.03	0.17	0.01	0.04	-	89
2010	0.05	0.18	0.04	0.05	0.02	0.01	0.15	0.10	0.09	0.29	0.01	0.03	118
2011	0.02	0.24	0.16	0.01	0.16	0.06	-	0.09	0.17	0.09	-	-	89
2012	0.06	0.21	0.03	0.03	0.05	0.04	0.10	0.11	0.06	0.03	0.28	-	90
2013	0.10	0.28	0.17	0.03	0.08	-	0.03	0.14	0.08	0.04	0.04	0.01	95
Total	0.06	0.15	0.12	0.08	0.10	0.06	0.09	0.10	0.07	0.12	0.03	0.02	4 340

Table C14b: Proportion of ribaldo catch reported each month from the Southern fishery area for the 1990 to 2013 fishing years for bottom trawling only.

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (t)
1990	0.01	-	0.07	0.11	-	0.03	0.03	0.28	0.36	-	-	0.10	33
1991	0.06	0.24	0.19	0.18	0.03	0.03	0.03	0.10	0.04	0.03	-	0.06	151
1992	0.11	0.15	0.10	0.08	0.12	0.15	0.06	0.09	0.04	0.06	0.02	0.02	197
1993	0.17	0.07	0.19	0.07	0.20	0.12	0.02	0.10	0.04	0.03	-	-	146
1994	0.15	0.27	0.06	0.18	0.12	0.12	0.01	-	0.03	-	-	0.05	24
1995	0.11	0.22	0.02	0.13	0.35	-	-	0.15	0.02	-	-	-	37
1996	0.10	0.14	0.27	0.07	-	0.04	0.11	0.06	0.12	0.01	-	0.08	28
1997	0.16	0.04	0.06	0.06	0.01	0.12	0.09	0.18	0.11	0.14	-	0.03	54
1998	0.12	0.03	-	0.10	0.06	0.20	0.09	0.12	0.22	0.06	-	-	170
1999	0.11	0.08	0.04	0.03	-	0.10	0.11	0.26	0.14	0.11	-	0.04	166
2000	0.06	0.07	0.09	0.02	0.11	0.03	0.17	0.15	0.19	0.11	-	-	204
2001	0.03	0.07	0.04	0.15	0.08	0.06	0.06	0.27	0.08	0.13	0.02	0.02	206
2002	0.03	0.13	0.14	0.13	0.16	0.01	0.15	0.15	-	0.10	-	0.01	315
2003	0.06	0.08	0.16	0.18	0.15	0.04	0.07	0.15	0.06	0.06	-	-	196
2004	0.04	0.23	0.11	0.14	0.08	0.09	0.02	0.07	0.14	0.08	-	-	172
2005	0.22	0.14	0.14	0.20	0.06	0.10	0.01	0.08	-	0.02	0.02	0.01	104
2006	0.09	0.48	0.03	0.04	-	-	0.12	0.08	0.07	0.04	0.03	0.02	82
2007	0.13	0.28	0.16	0.08	0.06	-	0.01	0.01	-	0.05	0.12	0.12	95
2008	0.10	0.14	0.36	0.11	0.09	0.11	-	-	0.01	0.01	0.04	0.02	105
2009	0.06	0.34	0.16	0.16	0.07	0.02	0.01	0.04	0.07	0.02	0.05	-	73
2010	0.07	0.27	0.06	0.08	0.02	0.02	0.21	0.06	0.14	0.03	0.01	0.04	77
2011	0.02	0.28	0.21	0.02	0.21	-	-	0.08	0.12	0.06	-	-	69
2012	0.10	0.31	0.05	0.04	0.08	0.07	0.05	0.18	0.07	-	0.04	-	54
2013	0.10	0.29	0.17	0.03	0.08	-	0.04	0.14	0.08	0.03	0.04	0.01	92
Total	0.08	0.15	0.12	0.10	0.10	0.07	0.07	0.13	0.08	0.06	0.01	0.02	2 849

Table C14c: Proportion of ribaldo catch reported each month from the Southern fishery area for the 1990 to 2013 fishing years for bottom long lining only.

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (t)
1990	-	-	-	-	-	-	-	-	-	1.00	-	-	2
1991	-	-	-	-	-	0.95	-	0.05	-	-	-	-	0
1992	-	-	0.24	-	0.73	-	-	-	-	0.03	-	-	20
1993	0.25	0.31	0.15	-	-	0.28	-	-	0.01	-	-	-	38
1994	-	0.09	0.05	-	0.04	-	-	-	-	0.81	-	-	91
1995	0.07	0.07	0.19	-	0.44	-	-	0.07	0.14	0.02	-	-	148
1996	-	0.07	0.09	0.10	0.01	0.06	0.55	-	0.04	0.08	-	-	124
1997	-	0.05	0.15	0.17	0.32	0.02	0.16	-	0.09	0.03	-	-	180
1998	0.01	0.12	0.10	0.04	0.17	0.11	0.04	0.04	-	0.12	0.25	-	193
1999	-	0.17	0.02	0.15	0.03	0.16	0.11	0.18	0.07	0.01	0.10	-	136
2000	-	0.04	0.17	0.01	0.02	0.01	0.04	0.03	-	0.46	0.13	0.09	99
2001	0.16	-	0.25	-	-	-	-	0.09	-	0.50	-	-	58
2002	-	0.18	-	0.01	0.01	0.01	0.01	-	-	0.78	-	-	80
2003	-	0.36	0.39	-	0.01	-	0.01	-	-	0.22	-	-	25
2004	-	0.15	0.16	-	-	-	0.14	0.02	-	0.39	0.13	0.01	77
2005	0.04	0.37	0.26	-	-	0.02	0.31	-	0.01	-	-	0.01	42
2006	-	0.92	-	-	-	-	0.05	-	-	-	0.01	0.02	22
2007	0.09	0.89	-	-	-	-	-	-	0.01	0.01	-	-	10
2008	0.23	0.58	-	-	0.06	0.02	0.10	-	-	-	-	-	14
2009	-	0.26	0.03	-	-	0.06	-	-	0.64	-	-	-	16
2010	-	-	-	-	-	-	0.04	0.18	-	0.78	-	-	41
2011	-	0.11	-	-	-	0.24	-	0.12	0.33	0.17	0.01	-	20
2012	-	0.06	-	-	-	-	0.18	-	0.03	0.08	0.64	-	36
2013	0.02	0.12	0.03	-	-	0.01	-	-	-	0.80	0.02	-	2
Total	0.03	0.13	0.12	0.05	0.12	0.05	0.11	0.04	0.05	0.23	0.07	0.01	1474

Table C15a: Proportion of ribaldo catch reported for each statistical area from the Southern fishery area for 1990 to 2013 fishing years for all methods.

Fishing year	027	028	030	504	602	603	610	618	Other	Total (t)
1990	0.16	0.25	0.10	0.11	0.03	0.01	-	-	0.34	35
1991	0.04	0.08	0.03	0.05	0.17	0.59	-	-	0.04	155
1992	0.07	0.07	0.12	0.11	0.04	0.52	0.03	-	0.04	218
1993	0.07	0.03	0.13	0.11	0.24	0.36	-	-	0.05	183
1994	0.03	0.01	0.14	0.02	0.01	0.25	0.52	-	0.02	115
1995	0.12	0.02	0.17	0.03	0.20	0.13	0.01	0.16	0.16	185
1996	0.03	0.01	0.07	0.03	0.11	0.10	-	0.07	0.57	152
1997	0.02	0.04	0.23	0.02	0.31	0.10	0.06	0.10	0.13	234
1998	0.03	0.06	0.12	0.02	0.23	0.25	0.18	0.07	0.04	363
1999	0.03	0.08	0.12	0.02	0.32	0.17	0.07	0.05	0.15	302
2000	0.05	0.08	0.08	0.03	0.39	0.23	0.02	0.06	0.09	305
2001	0.04	0.06	0.14	0.02	0.30	0.24	0.01	0.12	0.08	264
2002	0.02	0.05	0.06	0.02	0.13	0.38	0.23	0.01	0.10	396
2003	0.04	0.05	0.10	0.03	0.19	0.39	0.05	0.11	0.04	222
2004	0.02	0.05	0.10	0.02	0.30	0.28	0.15	0.06	0.02	251
2005	0.02	0.05	0.18	0.02	0.25	0.34	0.06	0.03	0.05	147
2006	0.04	0.20	0.21	0.01	0.40	0.10	-	0.01	0.02	104
2007	0.08	0.18	0.14	0.02	0.31	0.24	-	-	0.02	105
2008	0.04	0.15	0.14	0.02	0.23	0.39	0.01	-	0.01	120
2009	0.06	0.16	0.06	0.04	0.19	0.33	0.13	-	0.02	89
2010	0.03	0.16	0.01	0.03	0.19	0.27	0.20	0.08	0.03	118
2011	0.02	0.17	0.04	0.06	0.23	0.30	0.03	0.08	0.07	89
2012	0.02	0.16	0.05	0.02	0.26	0.15	0.19	0.07	0.09	90
2013	0.03	0.17	0.04	0.03	0.51	0.07	-	0.02	0.11	95
Total	0.04	0.08	0.11	0.03	0.24	0.27	0.09	0.05	0.09	4 340

Table C15b: Proportion of ribaldo catch reported for each statistical area from the Southern fishery area for 1990 to 2013 fishing years for bottom trawling only.

Fishing year	027	028	030	504	602	603	618	625	Other	Total (t)
1990	0.25	0.38	0.15	0.17	0.04	0.01	-	-	-	23
1991	0.04	0.07	0.03	0.05	0.18	0.63	-	-	-	145
1992	0.08	0.08	0.08	0.13	0.02	0.61	-	-	-	184
1993	0.10	0.04	0.03	0.14	0.21	0.48	-	-	-	140
1994	0.15	0.03	0.03	0.12	0.04	0.63	-	-	-	22
1995	0.11	0.03	0.01	0.14	0.06	0.66	-	-	-	36
1996	0.19	0.04	0.02	0.18	0.12	0.45	-	-	-	27
1997	0.08	0.18	0.03	0.07	0.35	0.28	-	-	-	53
1998	0.07	0.12	0.01	0.05	0.45	0.28	-	0.02	-	169
1999	0.05	0.14	0.01	0.03	0.45	0.19	0.01	0.12	-	165
2000	0.07	0.12	0.03	0.04	0.49	0.12	0.06	0.07	-	201
2001	0.05	0.08	0.10	0.02	0.40	0.28	0.05	0.02	-	190
2002	0.03	0.07	0.02	0.04	0.19	0.55	0.01	0.09	-	271
2003	0.05	0.06	0.04	0.03	0.22	0.45	0.12	0.02	-	190
2004	0.02	0.08	0.01	0.02	0.37	0.43	0.08	-	-	164
2005	0.02	0.07	0.03	0.03	0.34	0.47	0.03	0.02	-	102
2006	0.05	0.26	0.03	0.01	0.52	0.13	-	-	-	81
2007	0.09	0.20	0.05	0.03	0.35	0.27	-	-	-	93
2008	0.04	0.17	0.05	0.02	0.27	0.44	-	-	-	105
2009	0.08	0.20	0.01	0.05	0.24	0.42	-	-	-	71
2010	0.05	0.26	0.02	0.04	0.24	0.39	-	-	-	75
2011	0.03	0.24	0.02	0.07	0.20	0.39	-	0.04	-	66
2012	0.03	0.28	0.04	0.03	0.39	0.24	-	-	-	52
2013	0.03	0.18	0.05	0.04	0.54	0.08	0.02	0.06	-	90
Total	0.06	0.12	0.04	0.05	0.30	0.38	0.03	0.03	-	2 714

Table C15c: Proportion of ribaldo catch reported for each statistical area from the Southern fishery area for 1990 to 2013 fishing years for bottom long lining only.

Fishing year	030	601	602	603	610	618	Other	Total (t)
1990	-	-	-	-	-	-	1.00	2
1991	-	-	-	-	-	-	1.00	0
1992	0.60	-	0.24	0.09	0.03	-	0.04	20
1993	0.52	-	0.36	-	0.02	-	0.10	38
1994	0.17	-	-	0.16	0.66	-	0.01	91
1995	0.21	-	0.24	-	0.02	0.20	0.34	148
1996	0.08	0.55	0.10	0.03	-	0.08	0.15	124
1997	0.29	-	0.30	0.05	0.07	0.13	0.16	180
1998	0.22	0.01	0.05	0.23	0.33	0.14	0.03	193
1999	0.24	-	0.17	0.15	0.16	0.09	0.20	136
2000	0.18	-	0.19	0.46	0.05	0.05	0.08	99
2001	0.32	-	0.06	0.17	0.05	0.35	0.05	58
2002	0.19	-	-	0.01	0.78	0.01	0.01	80
2003	0.57	-	-	-	0.38	-	0.04	25
2004	0.28	0.01	0.19	0.01	0.39	0.04	0.08	77
2005	0.54	-	0.06	0.08	0.20	0.04	0.08	42
2006	0.91	-	-	-	0.02	0.03	0.04	22
2007	0.98	-	-	-	-	-	0.02	10
2008	0.79	-	-	0.06	0.10	-	0.04	14
2009	0.29	-	-	-	0.70	-	0.01	16
2010	-	-	0.11	0.07	0.58	0.22	0.01	41
2011	0.11	-	0.35	0.04	0.13	0.34	0.03	20
2012	0.06	-	0.09	0.03	0.47	0.17	0.18	36
2013	0.01	-	-	-	-	-	0.99	2
Total	0.25	0.05	0.14	0.11	0.23	0.11	0.12	1 474

Table C16a: Proportion of ribaldo catch reported by target species from the Southern fishery area for the 1990 to 2013 fishing years for all fishing methods.

Fishing year	HOK	LIN	Other	Total (t)
1990	0.74	0.13	0.13	35
1991	0.79	0.18	0.03	155
1992	0.89	0.10	0.01	218
1993	0.77	0.23	0.01	183
1994	0.20	0.79	-	115
1995	0.20	0.80	-	185
1996	0.18	0.82	-	152
1997	0.21	0.77	0.02	234
1998	0.47	0.53	-	363
1999	0.51	0.49	0.01	302
2000	0.67	0.33	-	305
2001	0.73	0.23	0.04	264
2002	0.77	0.21	0.02	396
2003	0.83	0.14	0.02	222
2004	0.64	0.33	0.03	251
2005	0.48	0.40	0.11	147
2006	0.31	0.57	0.12	104
2007	0.42	0.47	0.12	105
2008	0.42	0.47	0.10	120
2009	0.51	0.36	0.13	89
2010	0.48	0.46	0.06	118
2011	0.63	0.30	0.07	89
2012	0.36	0.55	0.09	90
2013	0.46	0.41	0.12	95
Total	0.56	0.41	0.04	4 340

Table C16b: Proportion of ribaldo catch reported by target species from the Southern fishery area for the 1990 to 2013 fishing years for bottom trawling only.

Fishing year	HOK	LIN	Other	Total (t)
1990	0.78	0.09	0.14	33
1991	0.81	0.18	0.01	151
1992	0.98	0.01	0.01	197
1993	0.97	0.03	0.01	146
1994	0.98	0.01	0.01	24
1995	0.99	-	0.01	37
1996	0.99	-	0.01	28
1997	0.92	0.01	0.07	54
1998	1.00	-	-	170
1999	0.92	0.07	0.01	166
2000	0.99	0.01	-	204
2001	0.93	0.01	0.06	206
2002	0.97	-	0.03	315
2003	0.94	0.04	0.02	196
2004	0.93	0.04	0.03	172
2005	0.68	0.18	0.14	104
2006	0.39	0.46	0.15	82
2007	0.46	0.41	0.13	95
2008	0.48	0.40	0.12	105
2009	0.63	0.21	0.16	73
2010	0.74	0.17	0.09	77
2011	0.81	0.10	0.09	69
2012	0.60	0.26	0.14	54
2013	0.48	0.40	0.12	92
Total	0.85	0.10	0.05	2 849

Table C16c: Proportion of ribaldo catch reported by target species from the Southern fishery area for the 1990 to 2013 fishing years for bottom long lining only.

Fishing year	LIN	Other	Total (t)
1990	1.00	-	2
1991	0.36	0.64	<0.01
1992	1.00	-	20
1993	1.00	-	38
1994	1.00	-	91
1995	1.00	-	148
1996	1.00	-	124
1997	1.00	-	180
1998	1.00	-	193
1999	1.00	-	136
2000	1.00	-	99
2001	1.00	-	58
2002	1.00	-	80
2003	1.00	-	25
2004	0.98	0.02	77
2005	0.98	0.02	42
2006	1.00	-	22
2007	1.00	-	10
2008	1.00	-	14
2009	1.00	-	16
2010	1.00	-	41
2011	1.00	-	20
2012	1.00	-	36
2013	1.00	-	2
Total	1.00	<0.01	1 474

Table C17: Proportion of ribaldo catch reported by gear type from the West coast South Island fishery area for the 1990 to 2013 fishing years.

Fishing year	BT	MW	MB	Other	Total (t)
1990	0.61	0.16	0.23	-	31
1991	0.73	0.05	0.11	0.10	44
1992	0.61	0.19	0.17	0.02	43
1993	0.58	0.19	0.21	0.02	87
1994	0.73	0.05	0.13	0.10	36
1995	0.36	0.46	0.06	0.12	33
1996	0.40	0.40	0.14	0.07	54
1997	0.59	0.28	0.06	0.07	69
1998	0.32	0.56	0.06	0.06	117
1999	0.51	0.34	0.09	0.05	219
2000	0.47	0.40	0.12	0.02	260
2001	0.57	0.36	0.05	0.01	277
2002	0.97	0.01	0.01	-	259
2003	0.97	0.02	0.01	-	323
2004	0.97	0.01	0.03	-	354
2005	0.96	0.02	0.02	-	296
2006	0.98	0.01	-	0.01	278
2007	0.94	0.04	0.02	-	413
2008	0.98	-	-	0.01	313
2009	0.99	-	-	0.01	452
2010	1.00	-	-	-	189
2011	0.96	-	0.01	0.03	191
2012	0.87	-	-	0.12	161
2013	0.94	-	0.01	0.05	194
Total	0.84	0.10	0.04	0.02	4 692

Table C18: Proportion of ribaldo catch reported each month from the West coast South Island fishery area for the 1990 to 2013 fishing years.

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (t)
1990	-	-	-	-	-	0.01	0.01	-	0.02	0.39	0.13	0.43	31
1991	0.09	0.05	-	-	-	-	0.01	0.01	0.03	0.34	0.31	0.15	44
1992	-	0.01	-	-	-	-	0.02	0.01	0.18	0.30	0.24	0.24	43
1993	0.06	0.04	-	-	-	-	-	-	0.15	0.29	0.06	0.39	87
1994	0.02	0.01	0.01	-	-	0.01	-	-	0.04	0.36	0.24	0.30	36
1995	0.23	0.06	0.03	0.03	0.01	-	-	0.02	0.31	0.09	0.12	0.07	33
1996	0.05	-	-	-	-	0.02	0.03	0.04	0.17	0.38	0.19	0.11	54
1997	0.03	0.02	0.02	-	-	-	0.01	0.03	0.08	0.24	0.43	0.14	69
1998	0.04	0.01	0.01	-	-	0.01	0.02	0.03	0.36	0.30	0.10	0.11	117
1999	0.01	0.02	0.07	0.02	0.03	0.04	0.02	0.02	0.12	0.43	0.17	0.05	219
2000	0.04	0.01	-	-	-	0.01	0.01	0.02	0.26	0.50	0.09	0.06	260
2001	0.05	0.11	-	-	-	-	-	0.04	0.40	0.22	0.07	0.10	277
2002	0.03	-	-	-	-	-	-	0.03	-	0.63	0.25	0.05	259
2003	-	0.01	-	-	-	-	0.01	0.02	0.47	0.26	0.13	0.10	323
2004	0.04	0.01	-	-	-	-	-	0.01	0.49	0.30	0.06	0.07	354
2005	0.02	0.06	-	-	-	-	-	0.01	0.39	0.30	0.12	0.10	296
2006	0.03	0.05	0.01	-	-	-	0.01	0.01	0.12	0.32	0.31	0.14	278
2007	0.15	0.01	-	-	-	-	-	-	0.12	0.48	0.17	0.06	413
2008	0.16	-	-	-	-	-	-	0.01	0.17	0.29	0.19	0.18	313
2009	0.15	-	-	-	-	-	-	-	0.08	0.23	0.21	0.33	452
2010	0.35	-	-	-	-	-	-	-	0.06	0.17	0.25	0.17	189
2011	0.14	-	-	-	-	0.01	-	0.01	0.18	0.24	0.20	0.22	191
2012	0.10	-	-	-	-	0.03	0.04	0.02	0.02	0.33	0.23	0.24	161
2013	0.15	-	-	-	-	-	0.04	0.04	0.16	0.30	0.15	0.15	194
Total	0.09	0.02	0.01	-	-	0.01	0.01	0.02	0.21	0.33	0.17	0.14	4 692

Table C19: Proportion of ribaldo catch reported for each statistical area from the West coast South Island fishery area for 1990 to 2013 fishing years for all methods.

Fishing year	033	034	035	Other	Total (t)
1990	0.02	0.77	0.14	0.08	31
1991	0.07	0.60	0.11	0.22	44
1992	0.04	0.79	0.10	0.07	43
1993	0.01	0.93	0.04	0.01	87
1994	0.07	0.70	0.18	0.06	36
1995	0.05	0.88	0.04	0.03	33
1996	0.02	0.89	0.06	0.02	54
1997	0.07	0.73	0.12	0.07	69
1998	0.03	0.82	0.11	0.04	117
1999	0.07	0.61	0.22	0.10	219
2000	0.03	0.67	0.27	0.04	260
2001	0.02	0.75	0.22	0.01	277
2002	0.02	0.62	0.35	0.01	259
2003	0.03	0.80	0.16	0.01	323
2004	0.03	0.87	0.10	0.01	354
2005	0.03	0.86	0.11	-	296
2006	0.02	0.77	0.20	0.01	278
2007	0.02	0.88	0.10	-	413
2008	0.01	0.70	0.29	-	313
2009	-	0.86	0.13	-	452
2010	0.01	0.68	0.31	-	189
2011	0.03	0.67	0.30	-	191
2012	0.05	0.58	0.35	0.02	161
2013	0.08	0.65	0.25	0.01	194
Total	0.03	0.76	0.19	0.02	4 692

Table C20: Proportion of ribaldo catch reported by target species from the West coast South Island fishery area for the 1990 to 2013 fishing years for all fishing methods.

Fishing year	HAK	HOK	ORH	Other	Total
1990	-	0.85	0.09	0.06	31
1991	-	0.60	0.26	0.15	44
1992	0.18	0.65	0.09	0.07	43
1993	0.41	0.52	0.01	0.05	87
1994	0.27	0.54	0.07	0.12	36
1995	0.20	0.59	0.05	0.16	33
1996	0.37	0.49	0.06	0.07	54
1997	0.01	0.79	0.12	0.07	69
1998	0.02	0.84	0.07	0.07	117
1999	0.24	0.54	0.12	0.09	219
2000	0.24	0.66	0.09	0.02	260
2001	0.41	0.54	0.03	0.02	277
2002	0.11	0.84	0.05	0.01	259
2003	0.58	0.39	0.03	-	323
2004	0.76	0.20	0.03	0.01	354
2005	0.83	0.10	0.05	0.02	296
2006	0.79	0.17	0.03	0.01	278
2007	0.87	0.10	0.01	0.02	413
2008	0.96	0.02	-	0.02	313
2009	0.98	0.01	-	0.01	452
2010	0.96	0.04	-	0.01	189
2011	0.91	0.05	-	0.05	191
2012	0.74	0.11	0.01	0.14	161
2013	0.67	0.22	0.01	0.11	194
Total	0.63	0.30	0.03	0.03	4 692

Table C21: Species codes used in the report.

Code	Common name	Scientific name
HAK	Hake	*Merluccius australis*
HOK	Hoki	*Macruronus novaezelandiae*
LIN	Ling	*Genypterus blacodes*
ORH	Orange roughy	*Hoplostethus atlanticus*
RIB	Ribaldo	*Mora moro*

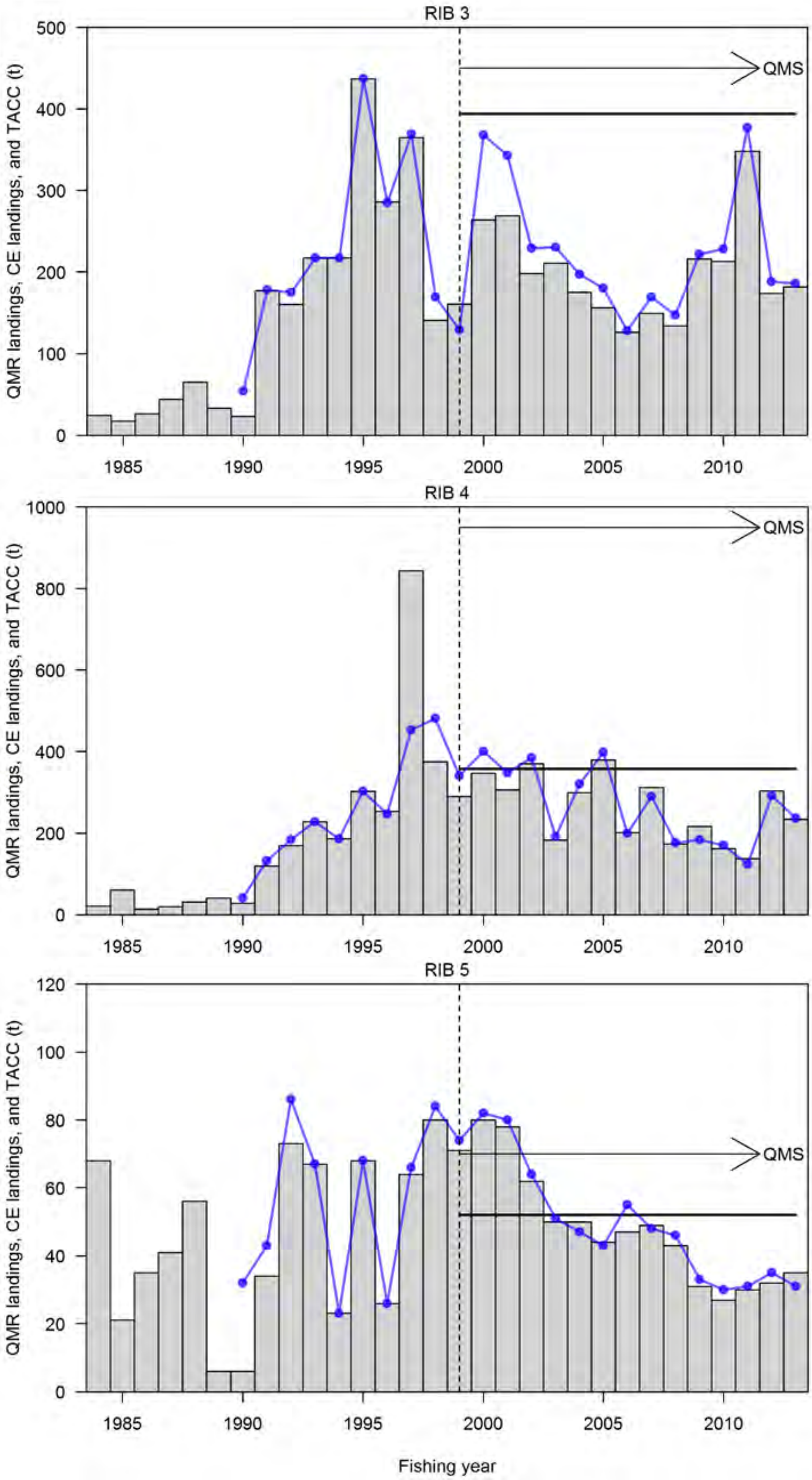


Figure C1: The QMR/MHR landings (gray bars), un-groomed catch effort landings (blue line), and TACC (black line) for RIB 3–5.

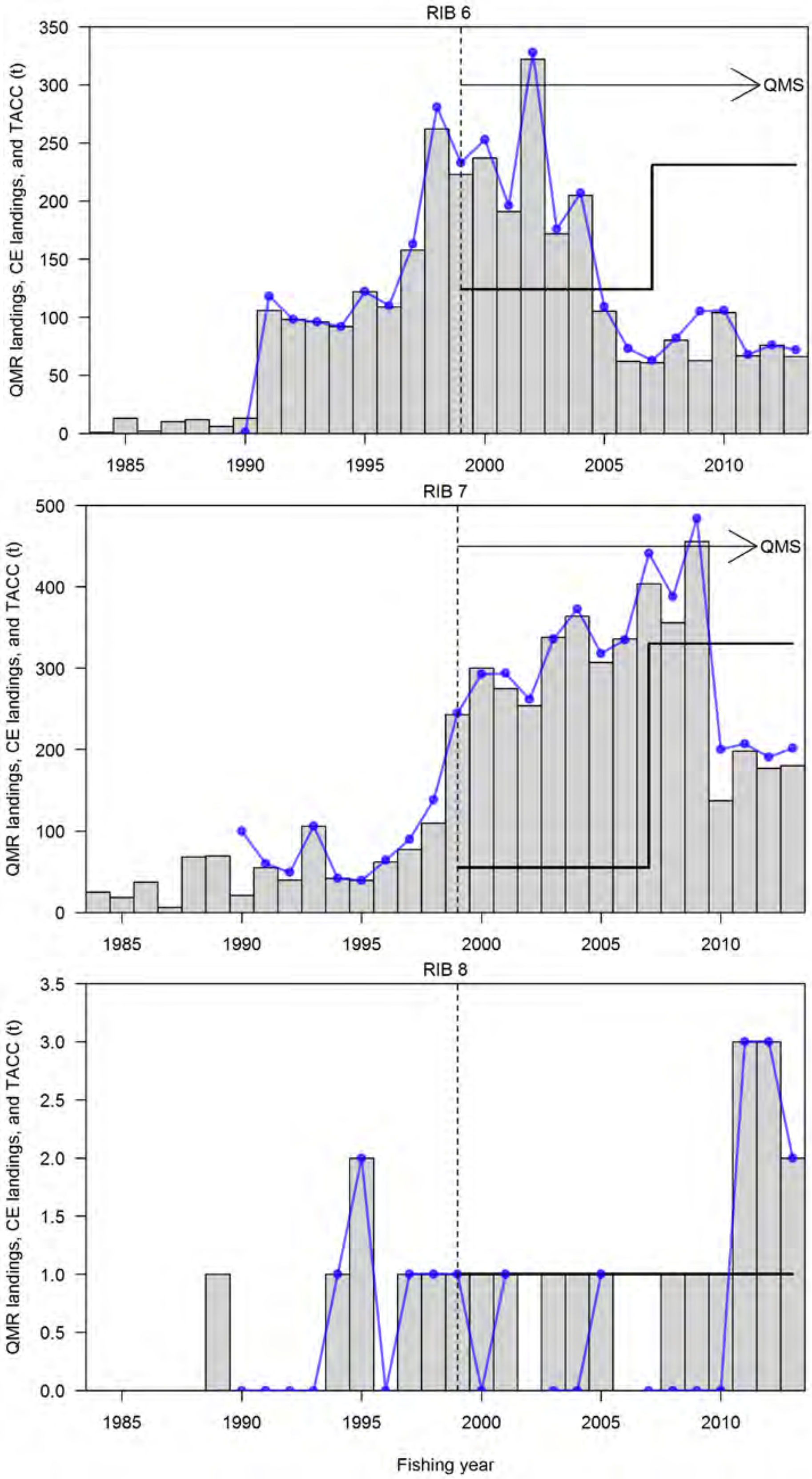


Figure C1 continued: The QMR/MHR landings (gray bars), un-groomed catch effort landings (blue line), and TACC (black line) for RIB 6–8.

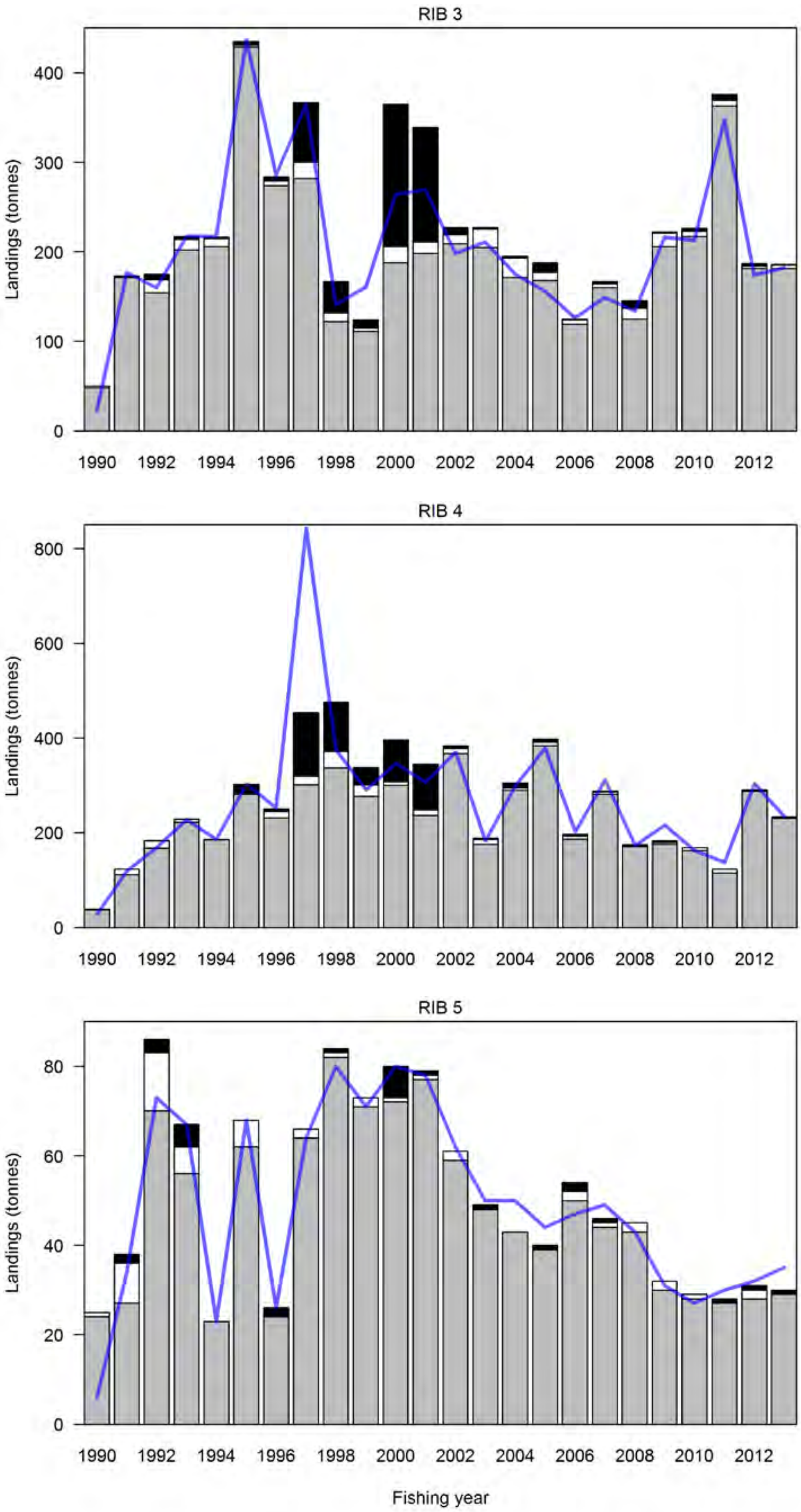


Figure C2: The retained landings (grey bars), interim landings (white bars), and landings dropped during data grooming (black bars), and MHR landings (blue line) for RIB 3–5 from the 1990 to 2013 fishing year.

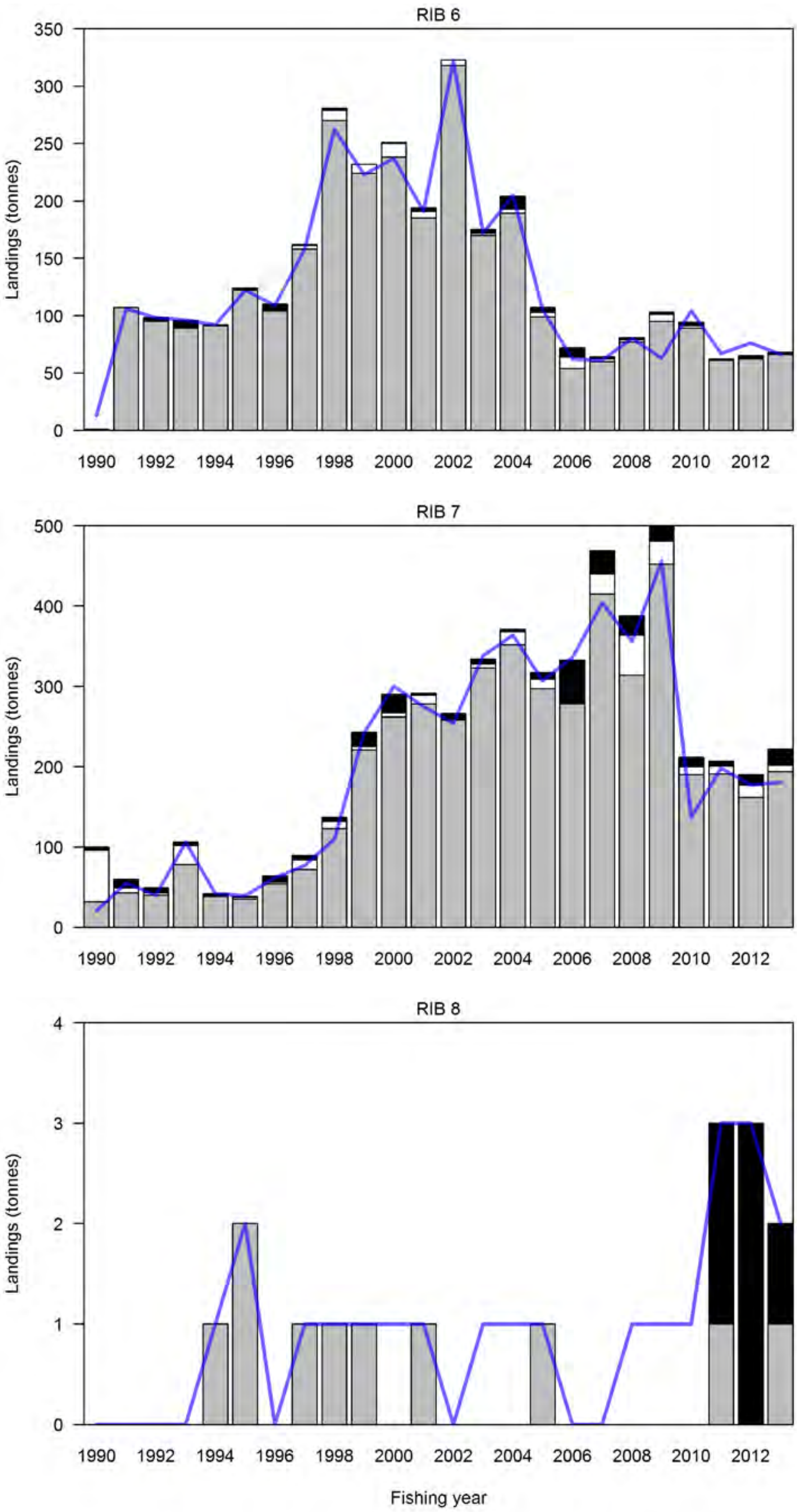


Figure C2 continued: The retained landings (grey bars), interim landings (white bars), and landings dropped during data grooming (black bars), and MHR landings (blue line) for RIB 6–8 from the 1990 to 2013 fishing year.

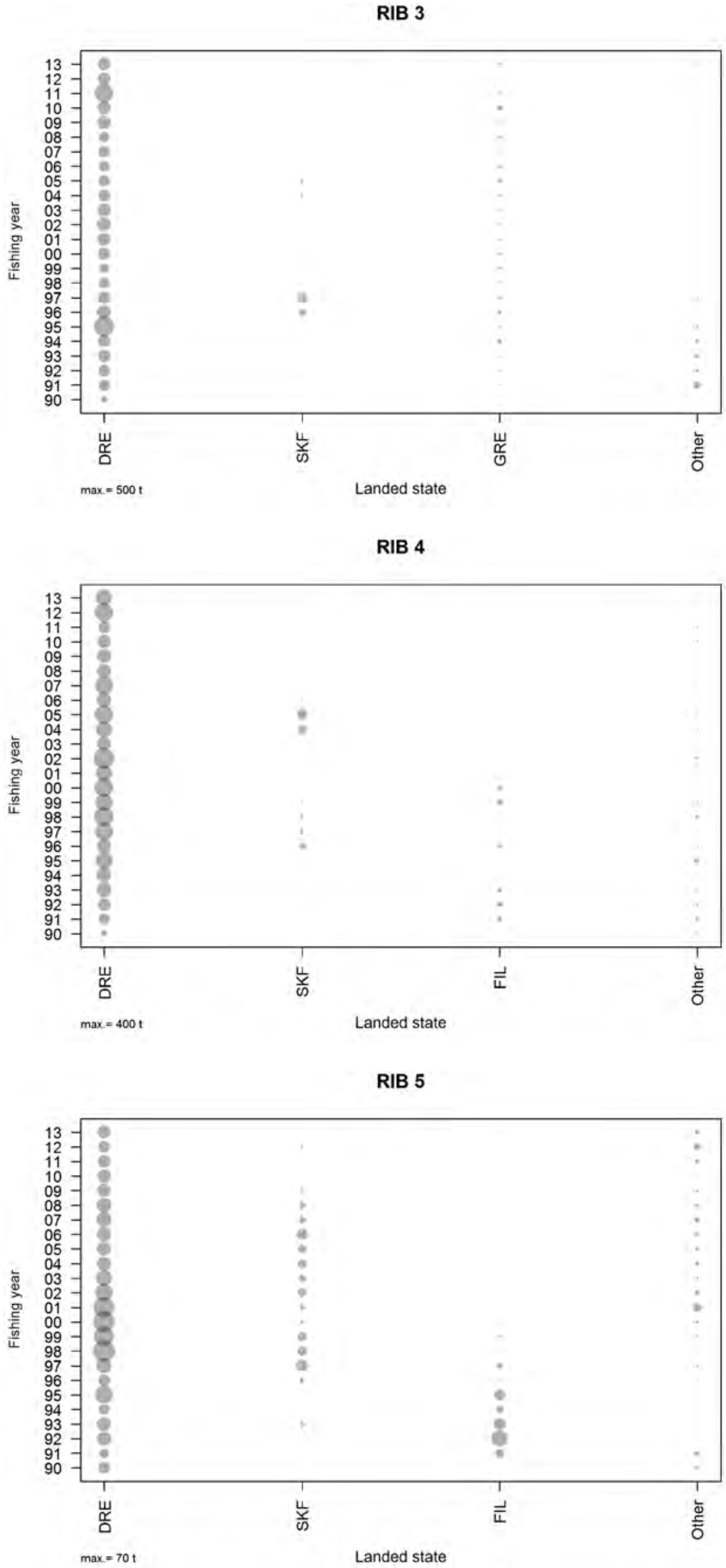
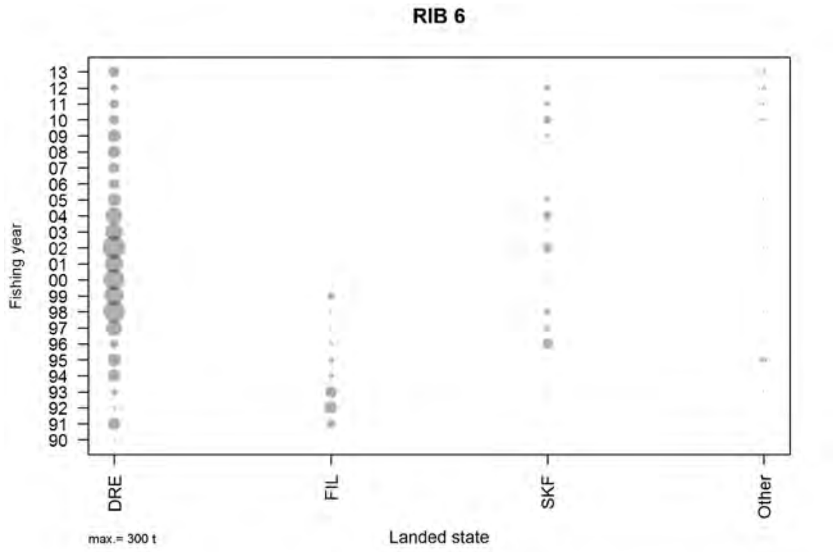
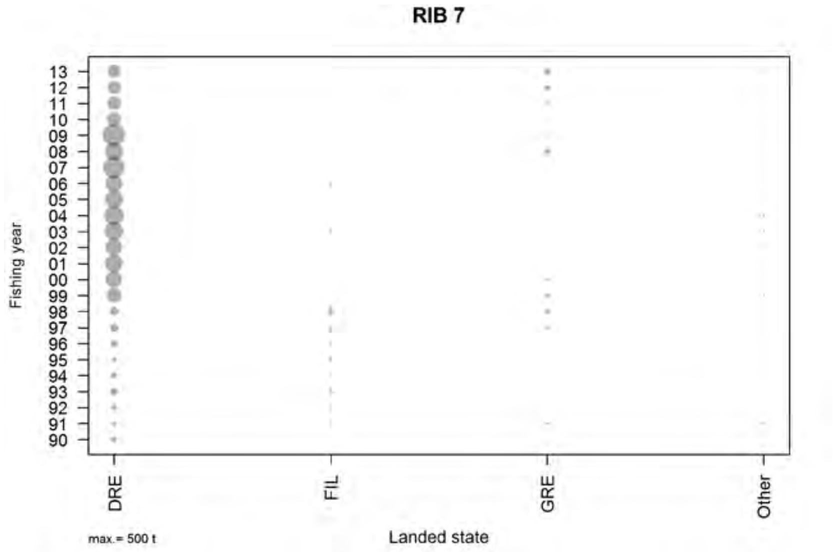


Figure C3: Retained landings (greenweight in tonnes) by processed state for RIB 3–5 for the 1990 to 2013 fishing years in the groomed and unmerged dataset. DRE, dressed or headed, gutted, and tailed; SKF, fillets skin off; GRE, Green; and FIL, fillets skin on.





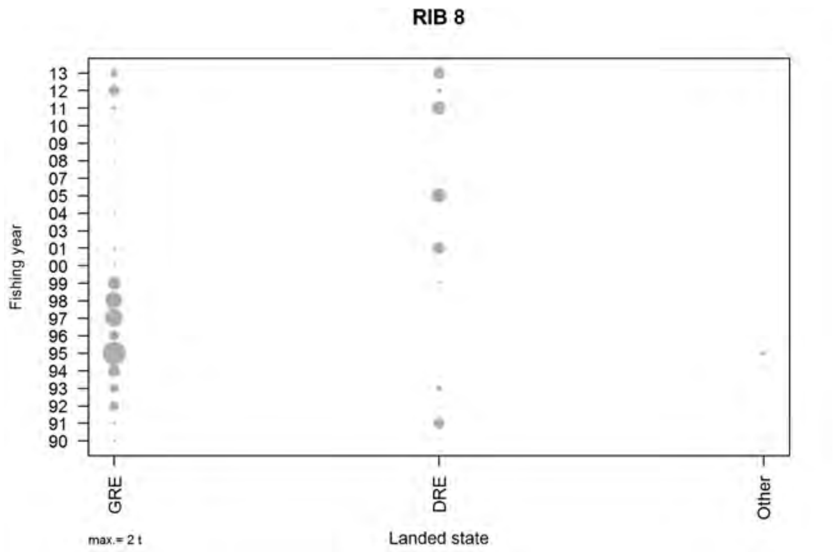


Figure C3 continued: Retained landings (greenweight in tonnes) by processed state for RIB 6–8 for the 1990 to 2013 fishing years in the groomed and unmerged dataset. DRE, dressed or headed, gutted, and tailed; SKF, fillets skin off; GRE, Green; and FIL, fillets skin on.

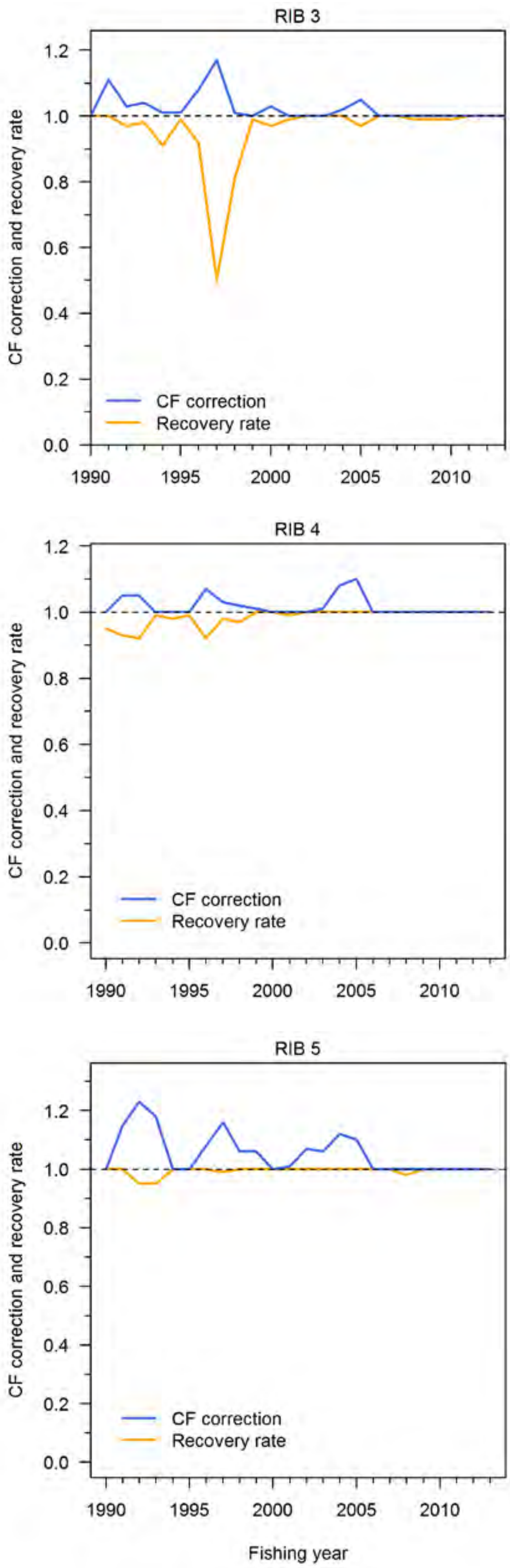


Figure C4: Conversion factor (CF) corrections (by the centroid method), defined as the ratio of annual green weight recalculated using the most recent correction factors for each processed state to the reported green weight, and the recovery rate, defined as the ratio of annual landings in the groomed and merged dataset to those in the groomed and unmerged dataset, for RIB 3–5 for the 1990–2013 fishing years.

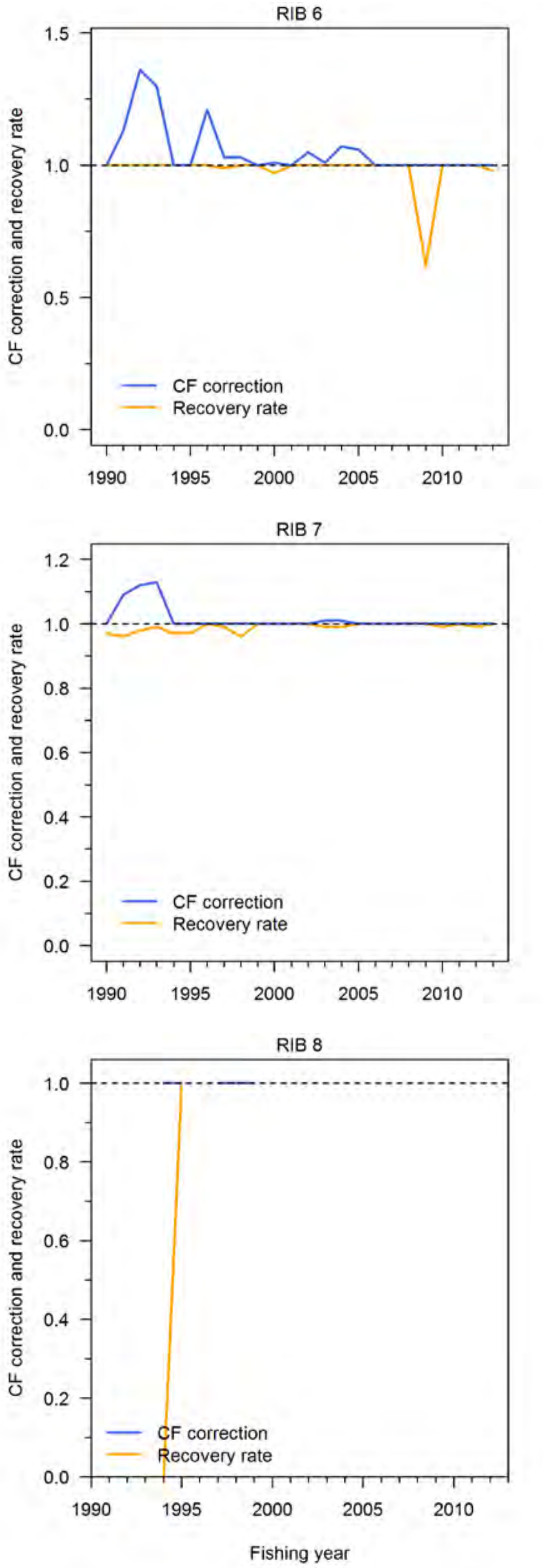


Figure C4 continued: Conversion factor (CF) corrections (by the centroid method), defined as the ratio of annual green weight recalculated using the most recent correction factors for each processed state to the reported green weight, and the recovery rate, defined as the ratio of annual landings in the groomed and merged dataset to those in the groomed and unmerged dataset, for RIB 6–8 for the 1990–2013 fishing years.

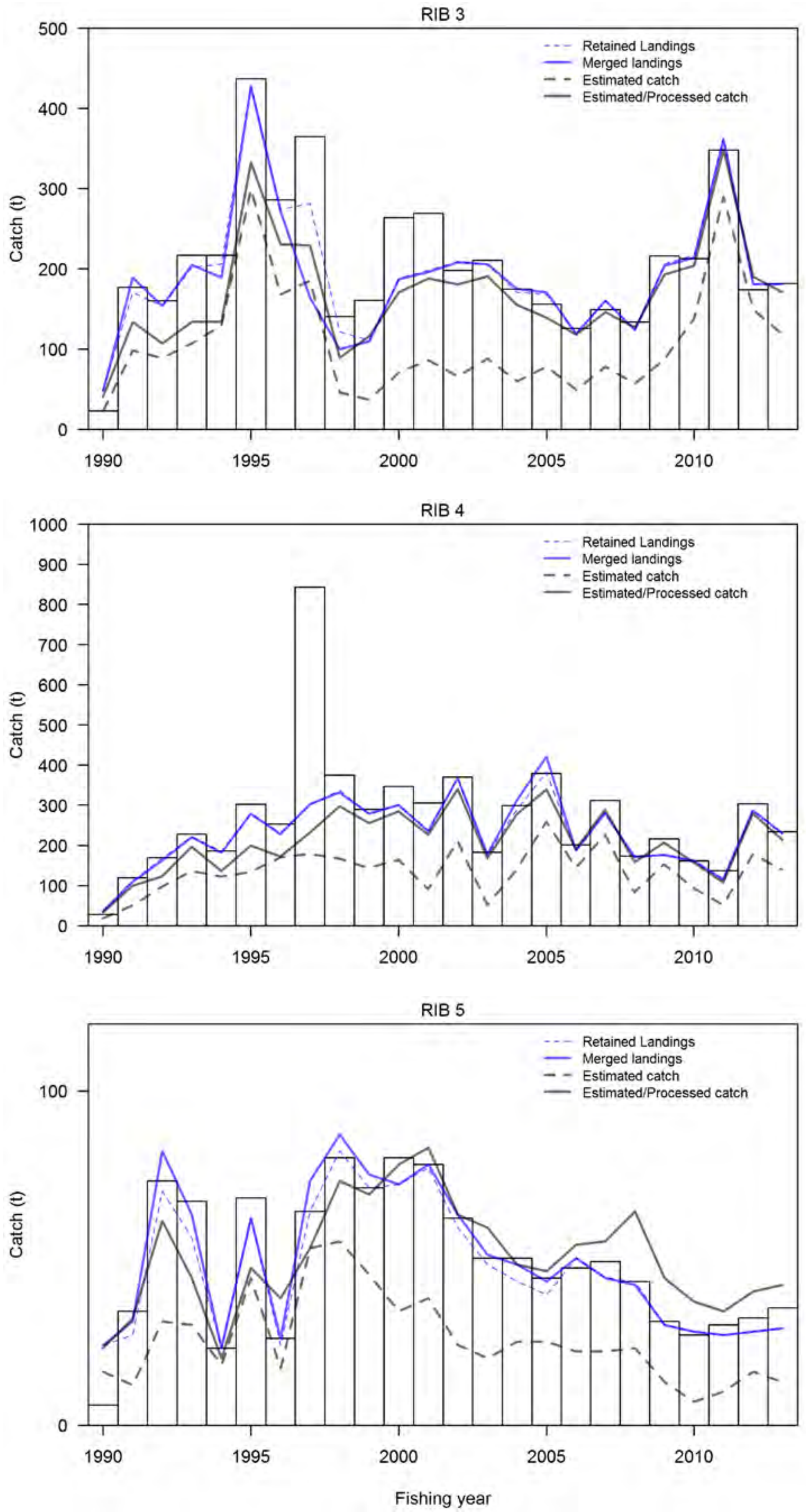


Figure C5: The QMR/MHR landings (white bars), retained landings in the groomed and unmerged dataset (blue dashed line), retained landings in groomed and merged dataset (blue solid line), and combined daily processed catch from trawlers and estimated catch from bottom longline vessels (grey solid line), using the centroid method, for RIB 3–5 for the 1990–2013 fishing years.

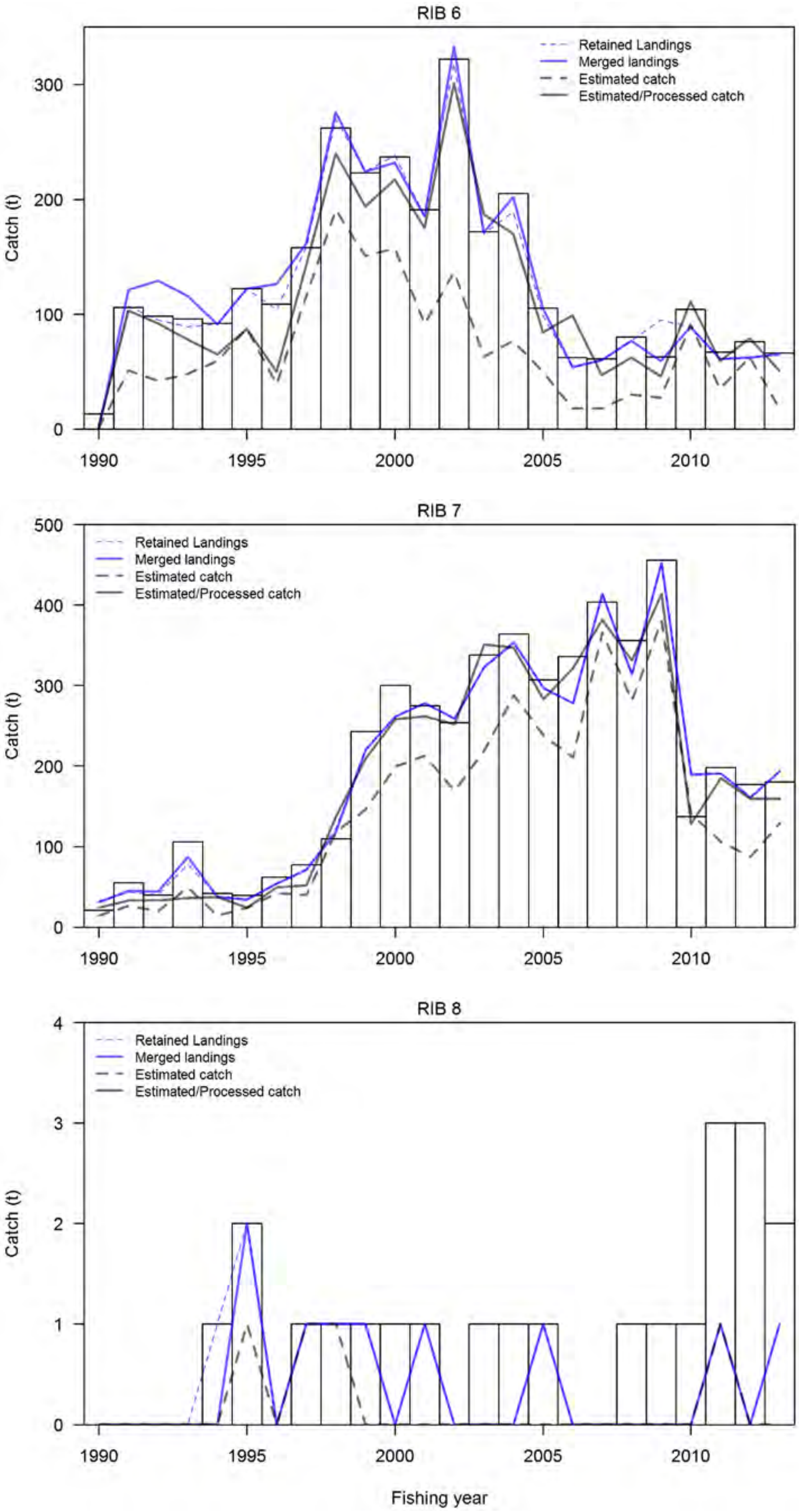


Figure C5 continued: The QMR/MHR landings (white bars), retained landings in the groomed and unmerged dataset (blue dashed line), retained landings in groomed and merged dataset (blue solid line), and combined daily processed catch from trawlers and estimated catch from bottom longline vessels (grey solid line), using the centroid method, for RIB 6–8 for the 1990–2013 fishing years.

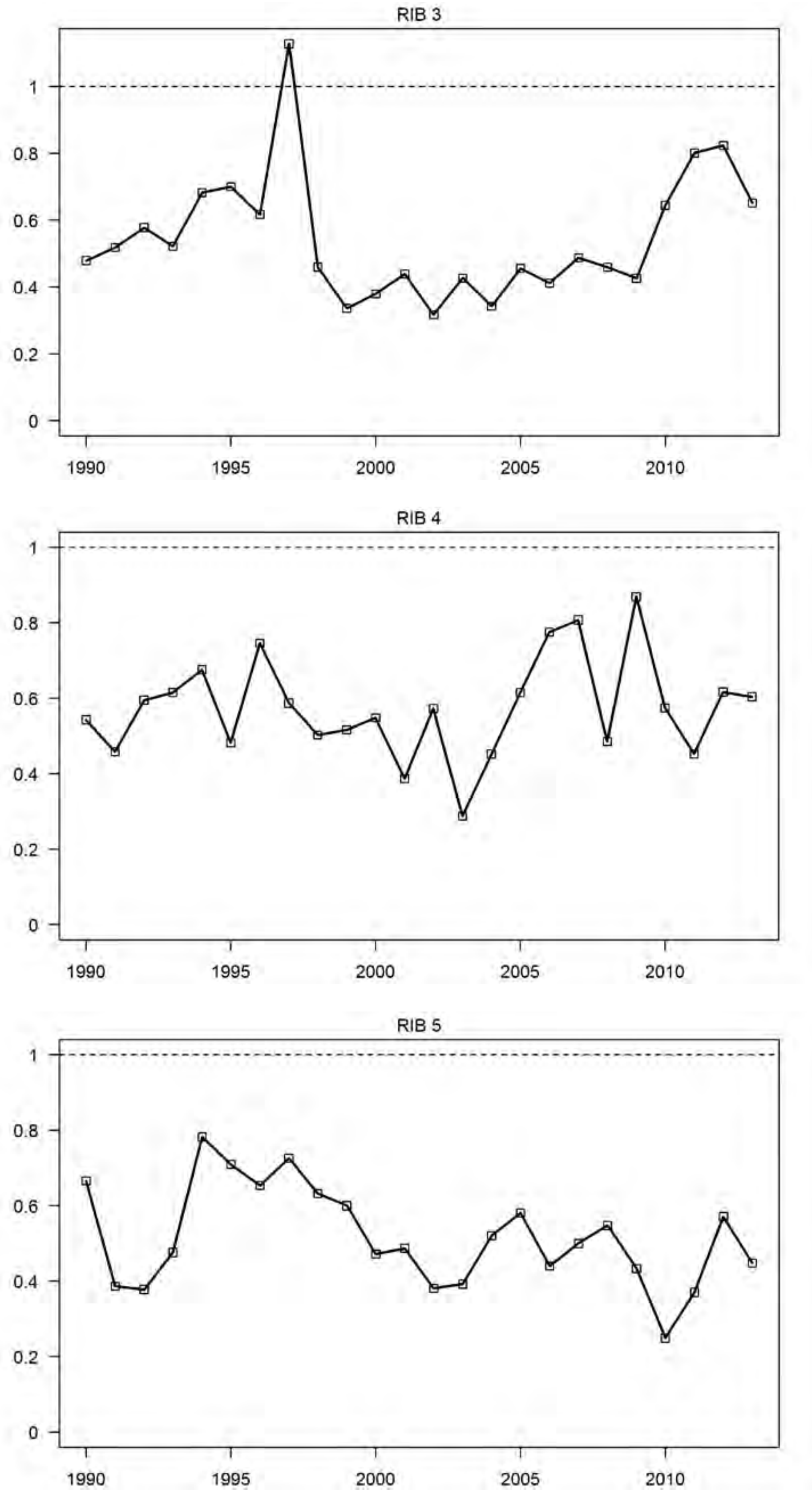


Figure C6: The reporting rate, defined as the ratio of greenweight from estimated catches to retained landings in the groomed and merged dataset, for RIB 3–5 for the 1990–2013 fishing years.

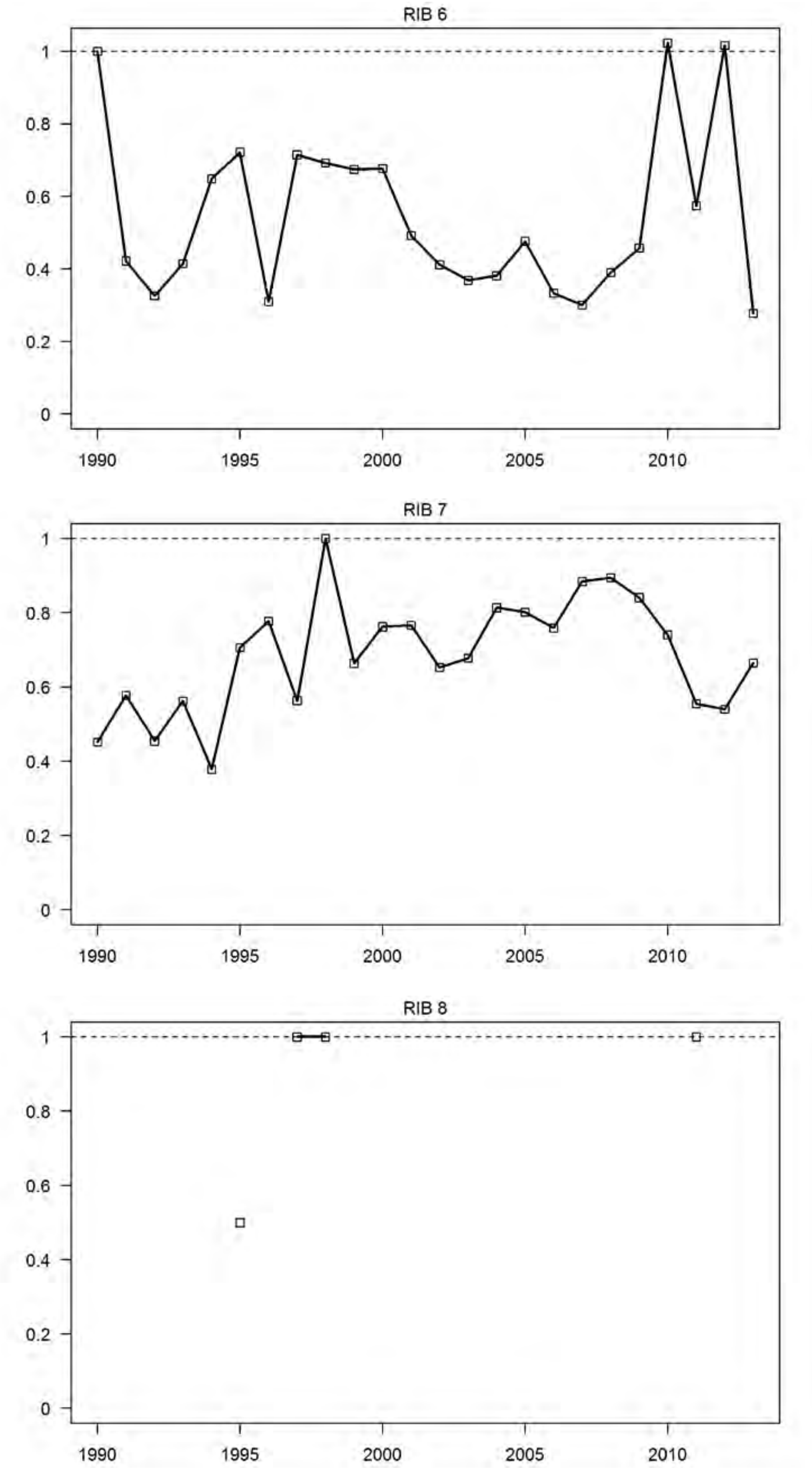


Figure C6 continued: The reporting rate, defined as the ratio of greenweight from estimated catches to retained landings in the groomed and merged dataset, for RIB 6–8 for the 1990–2013 fishing years.

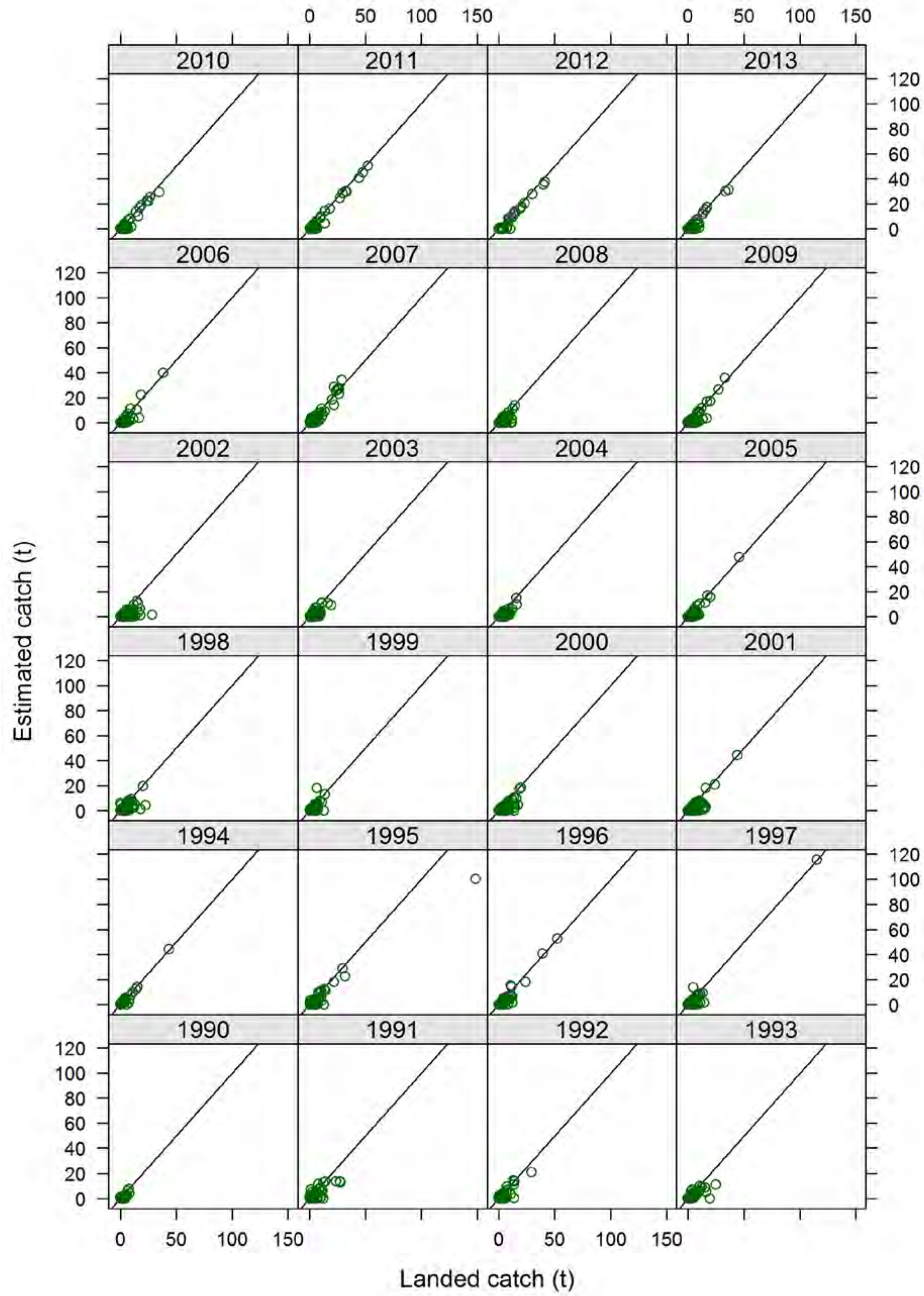


Figure C7a: Estimated catch vs. reported landings on a trip basis in the groomed and merged dataset, for RIB 3 for the 1990–2013 fishing years.

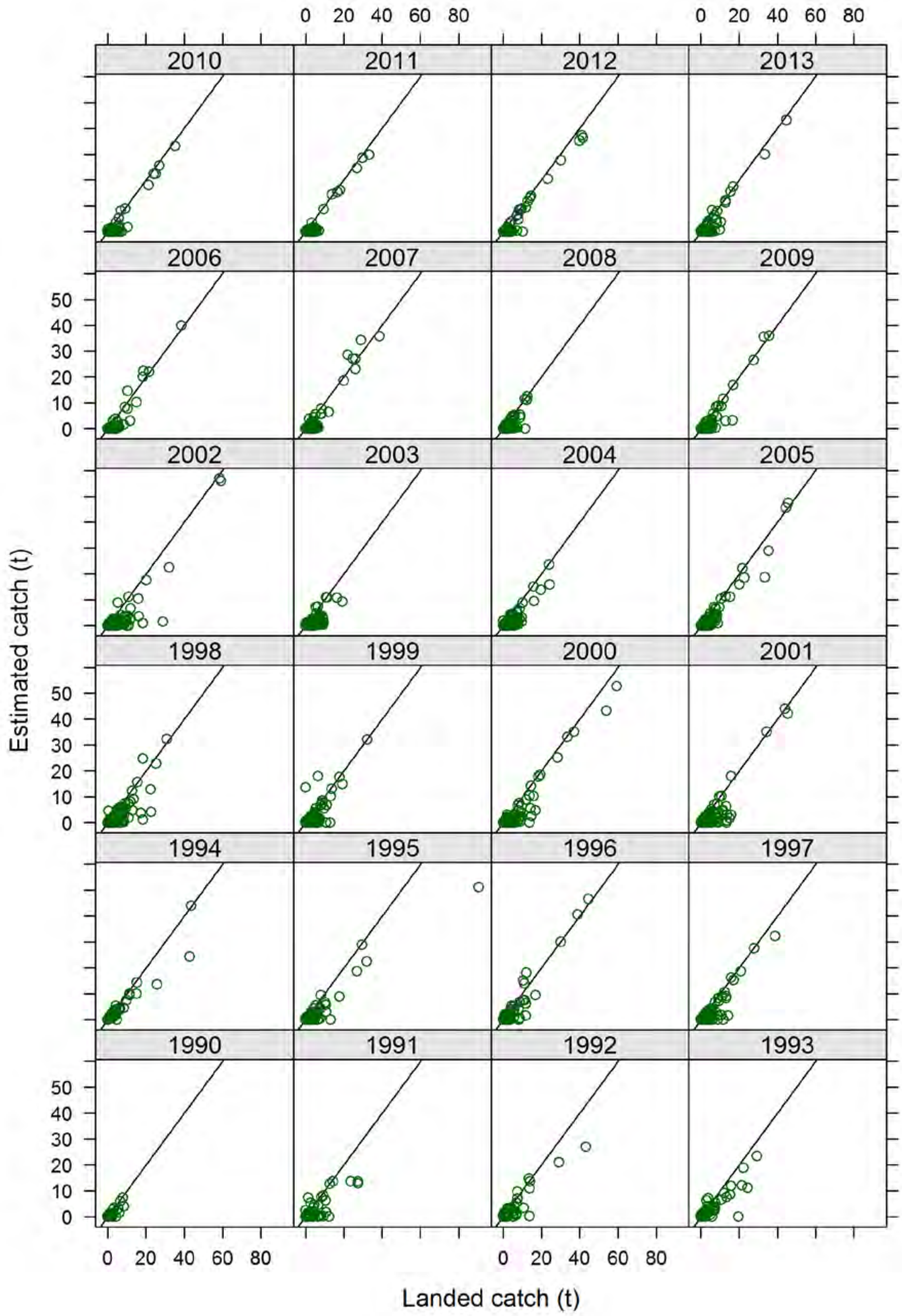


Figure C7b: Estimated catch vs. reported landings on a trip basis in the groomed and merged dataset, for RIB 4 for the 1990–2013 fishing years.

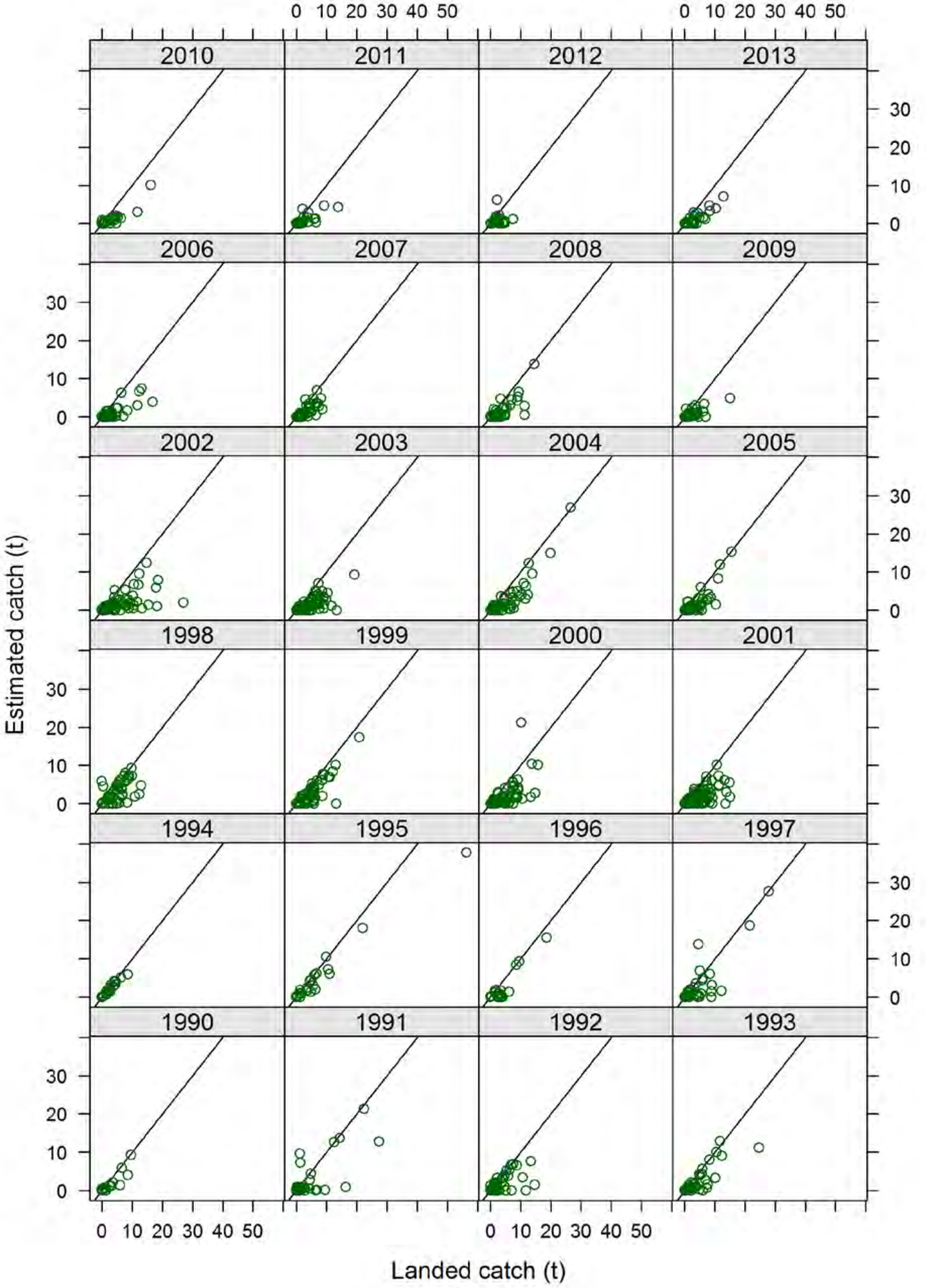


Figure C7c: Estimated catch vs. reported landings on a trip basis in the groomed and merged dataset, for RIB 5 for the 1990–2013 fishing years.

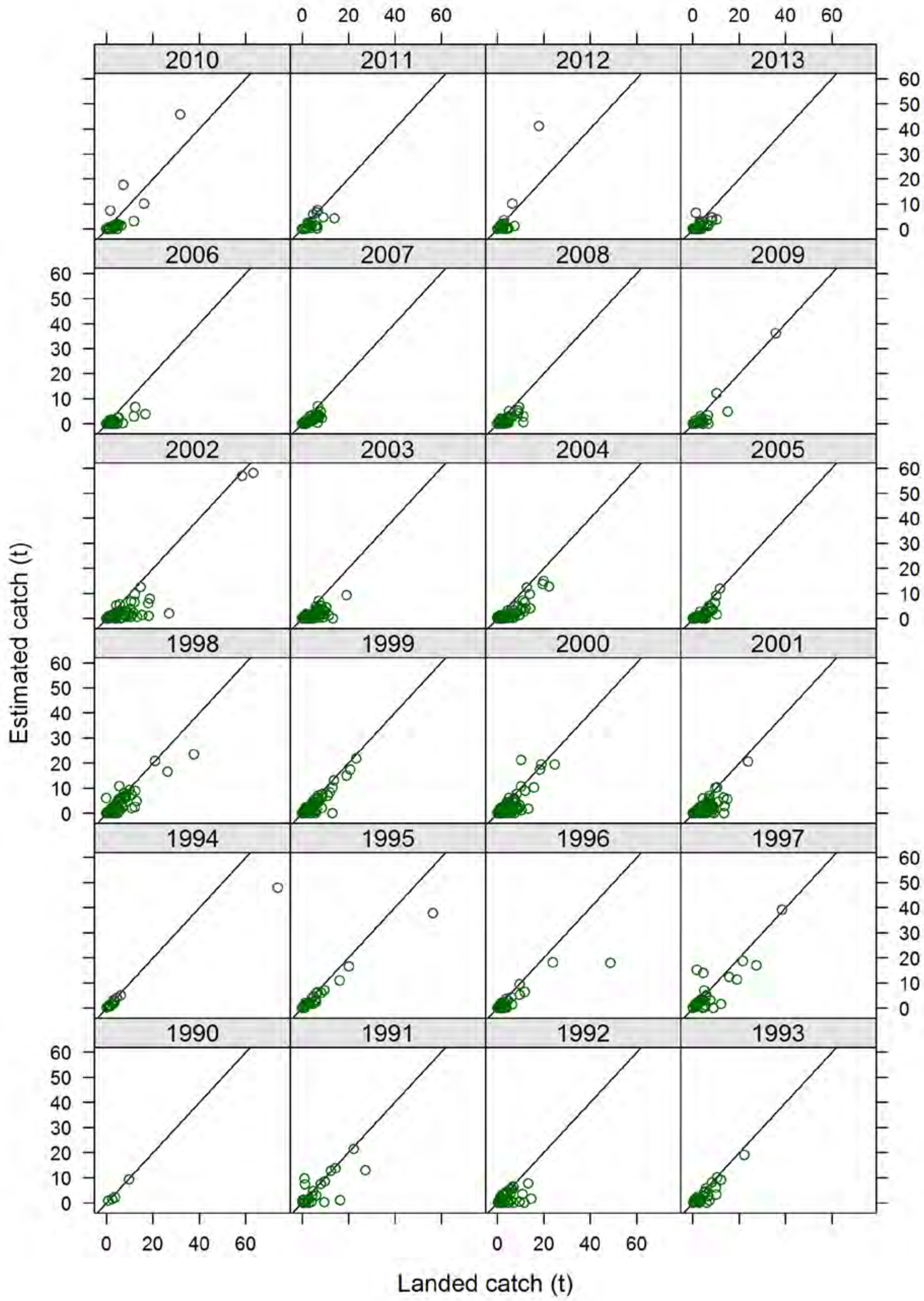


Figure C7d: Estimated catch vs. reported landings on a trip basis in the groomed and merged dataset, for RIB 6 for the 1990–2013 fishing years.

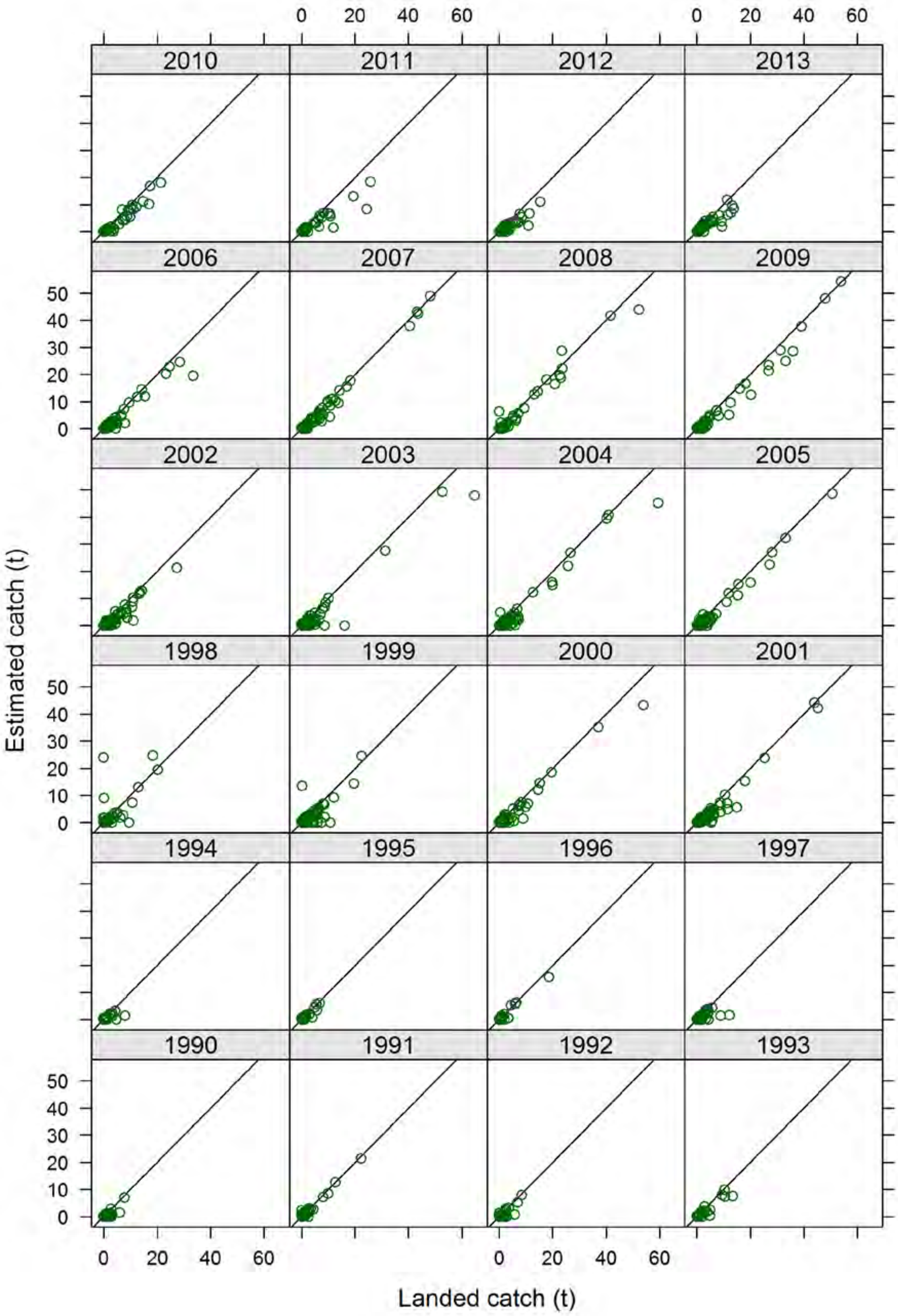


Figure C7e: Estimated catch vs. reported landings on a trip basis in the groomed and merged dataset, for RIB 7 for the 1990–2013 fishing years.

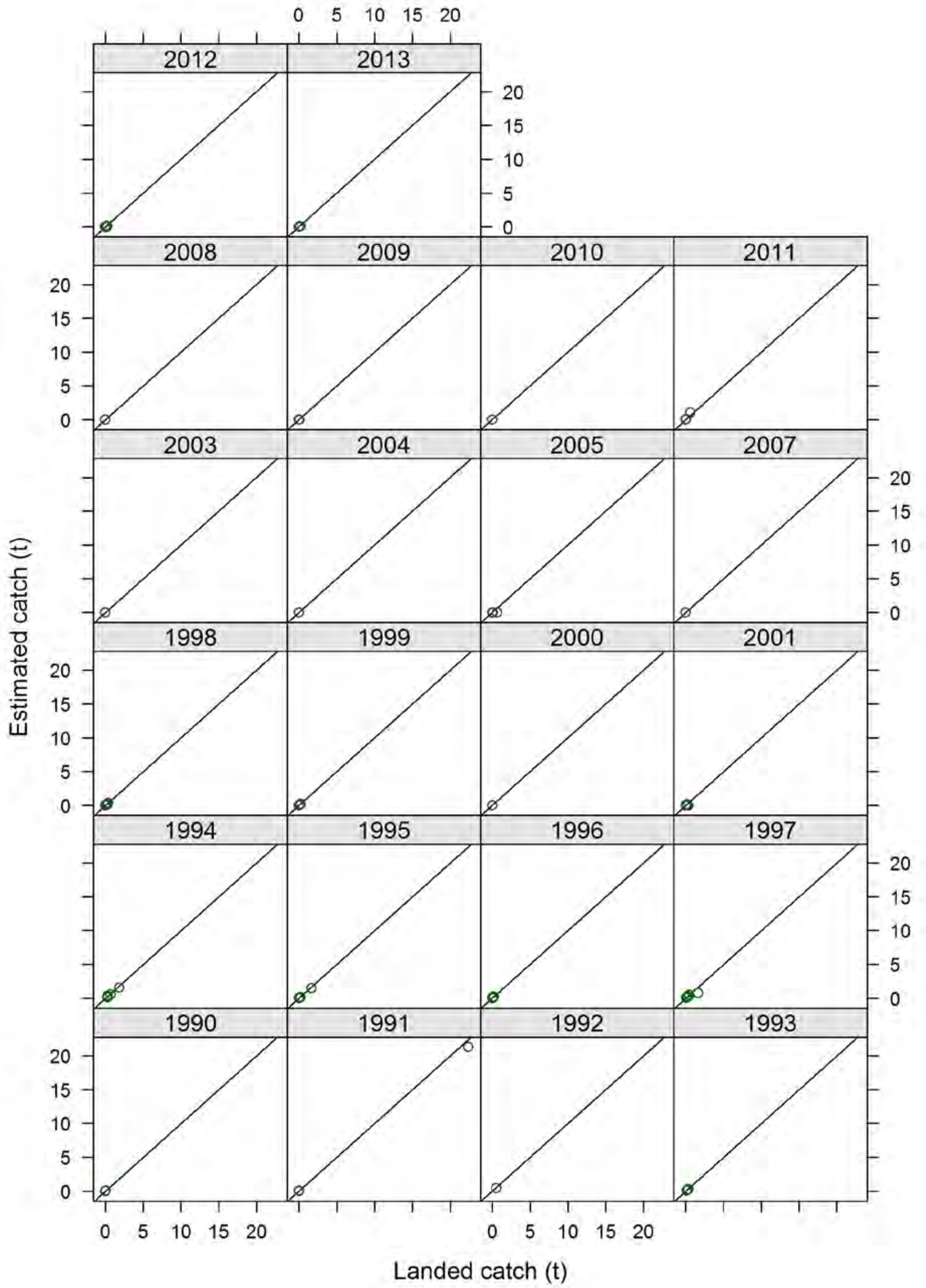


Figure C7f: Estimated catch vs. reported landings on a trip basis in the groomed and merged dataset, for RIB 8 for the 1990–2013 fishing years.

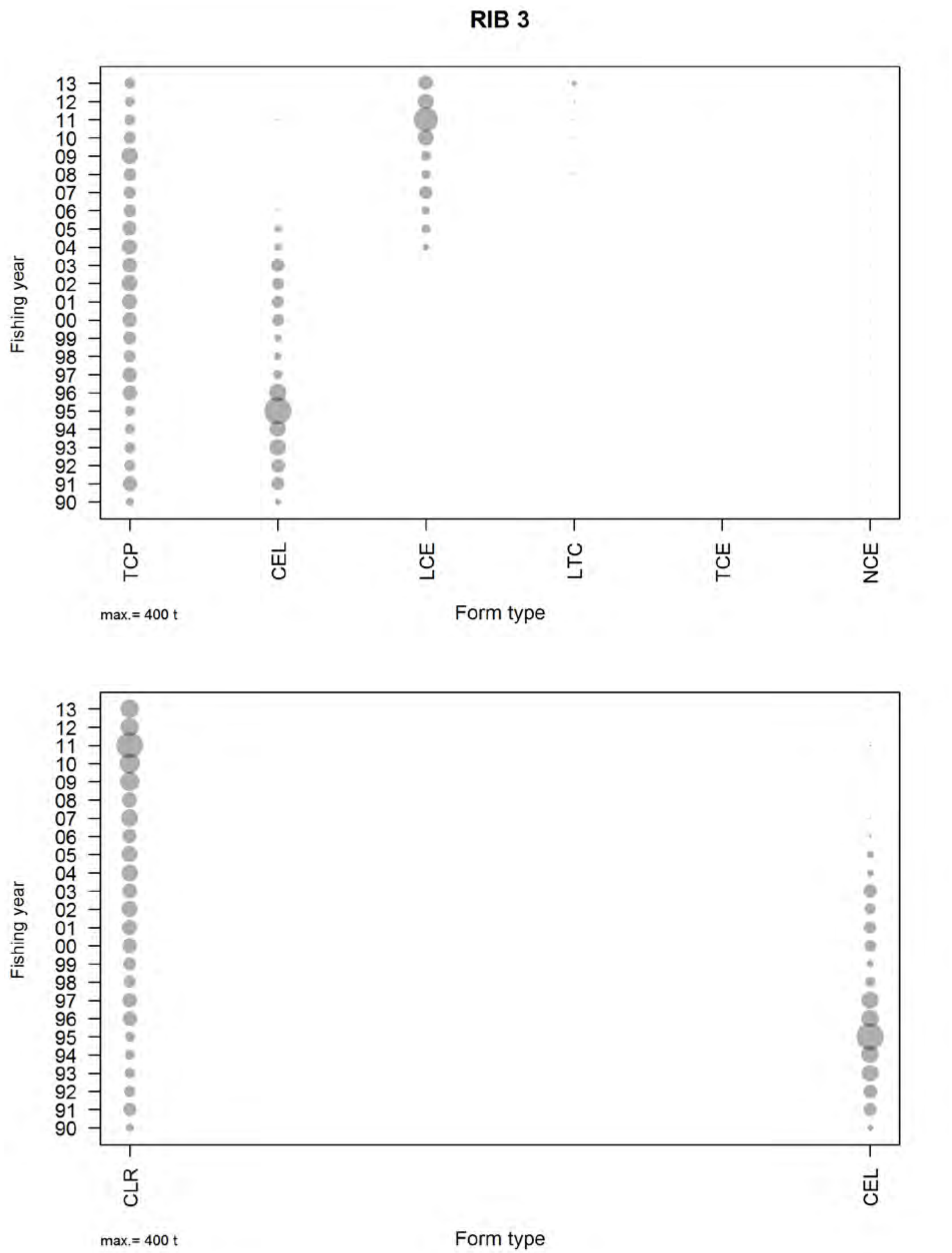


Figure C8a: Proportion of estimated catch by form type in the groomed and unmerged dataset, and proportion of landed catch by form type in the groomed and merged dataset, for RIB 3 for the 1990–2013 fishing years. where TCP is Trawl Catch Effort Processing Return; CEL is Catch, Effort, Landing Return; LCE is Lining Catch Effort Return; LTC is Lining Trip Catch Effort Return; TCE is Trawl Catch Effort Return; NCE is Netting Catch Effort and Landing Return; CLR is Catch Landing Return.

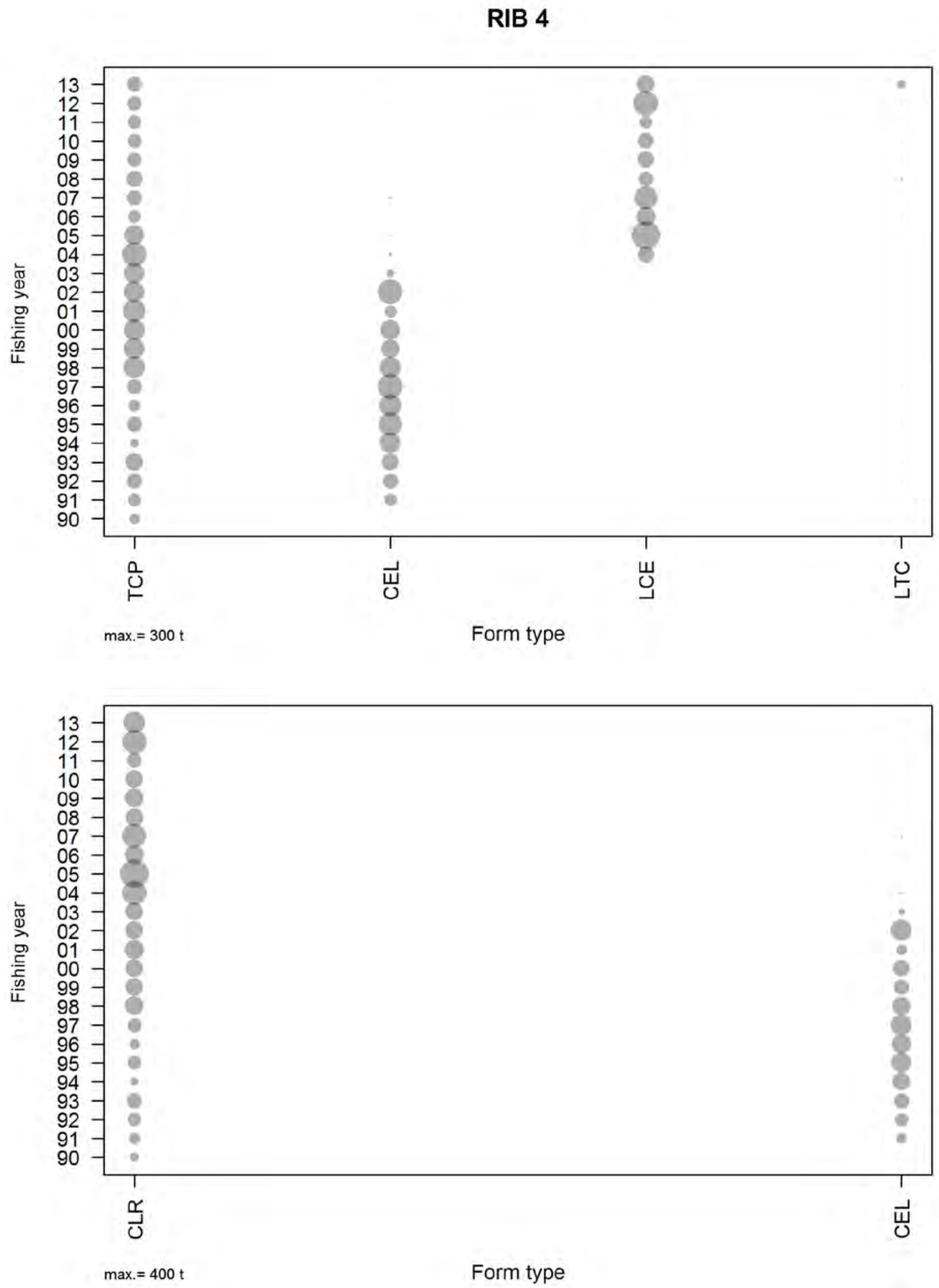


Figure C8b: Proportion of estimated catch by form type in the groomed and unmerged dataset, and proportion of landed catch by form type in the groomed and merged dataset, for RIB 4 for the 1990–2013 fishing years. where TCP is Trawl Catch Effort Processing Return; CEL is Catch, Effort, Landing Return; LCE is Lining Catch Effort Return; LTC is Lining Trip Catch Effort Return; CLR is Catch Landing Return.

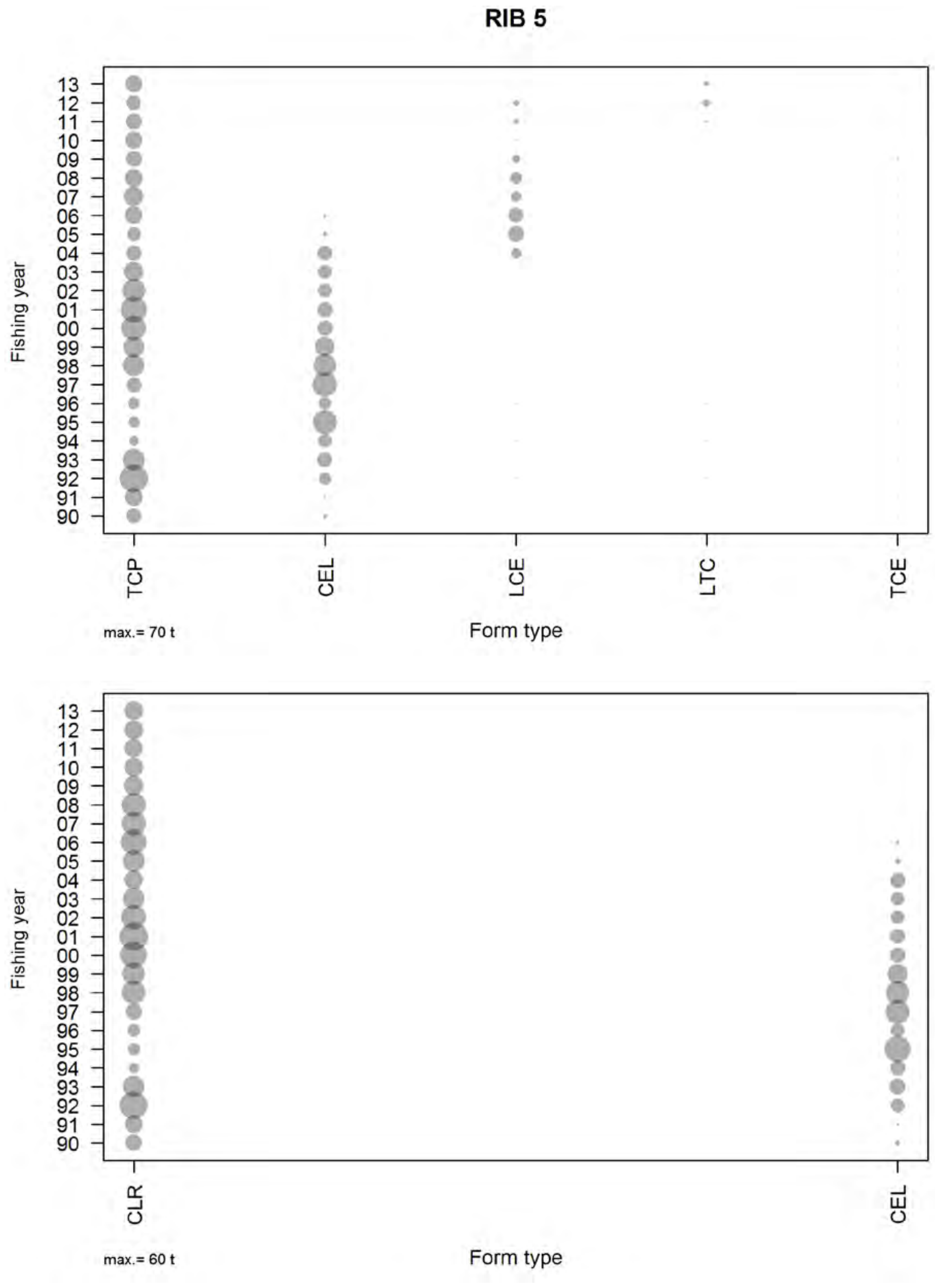


Figure C8c: Proportion of estimated catch by form type in the groomed and unmerged dataset, and proportion of landed catch by form type in the groomed and merged dataset, for RIB 5 for the 1990–2013 fishing years. where TCP is Trawl Catch Effort Processing Return; CEL is Catch, Effort, Landing Return; LCE is Lining Catch Effort Return; LTC is Lining Trip Catch Effort Return; TCE is Trawl Catch Effort Return; CLR is Catch Landing Return.

RIB 6

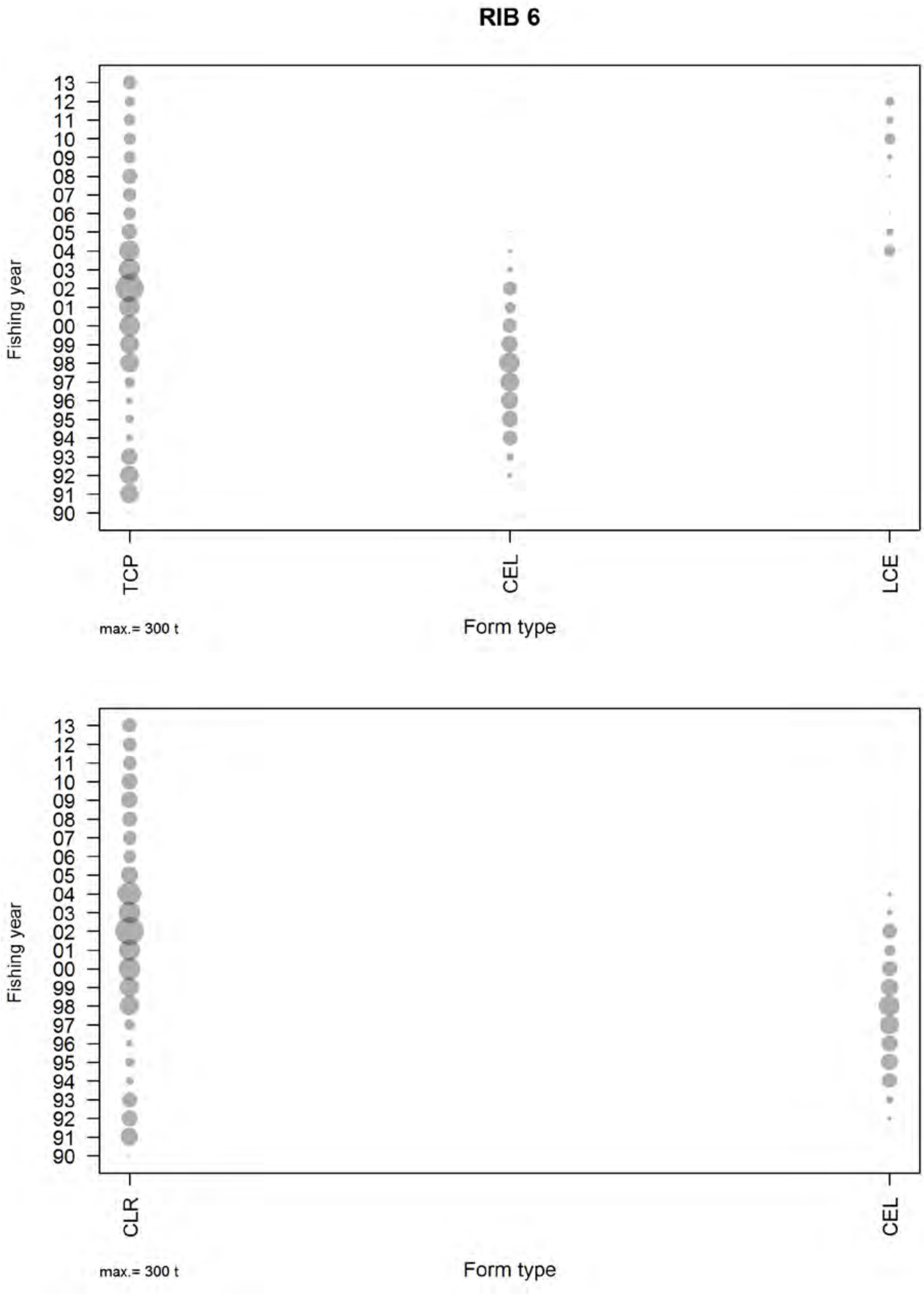


Figure C8d: Proportion of estimated catch by form type in the groomed and unmerged dataset, and proportion of landed catch by form type in the groomed and merged dataset, for RIB 6 for the 1990–2013 fishing years. where TCP is Trawl Catch Effort Processing Return; CEL is Catch, Effort, Landing Return; LCE is Lining Catch Effort Return; CLR is Catch Landing Return.

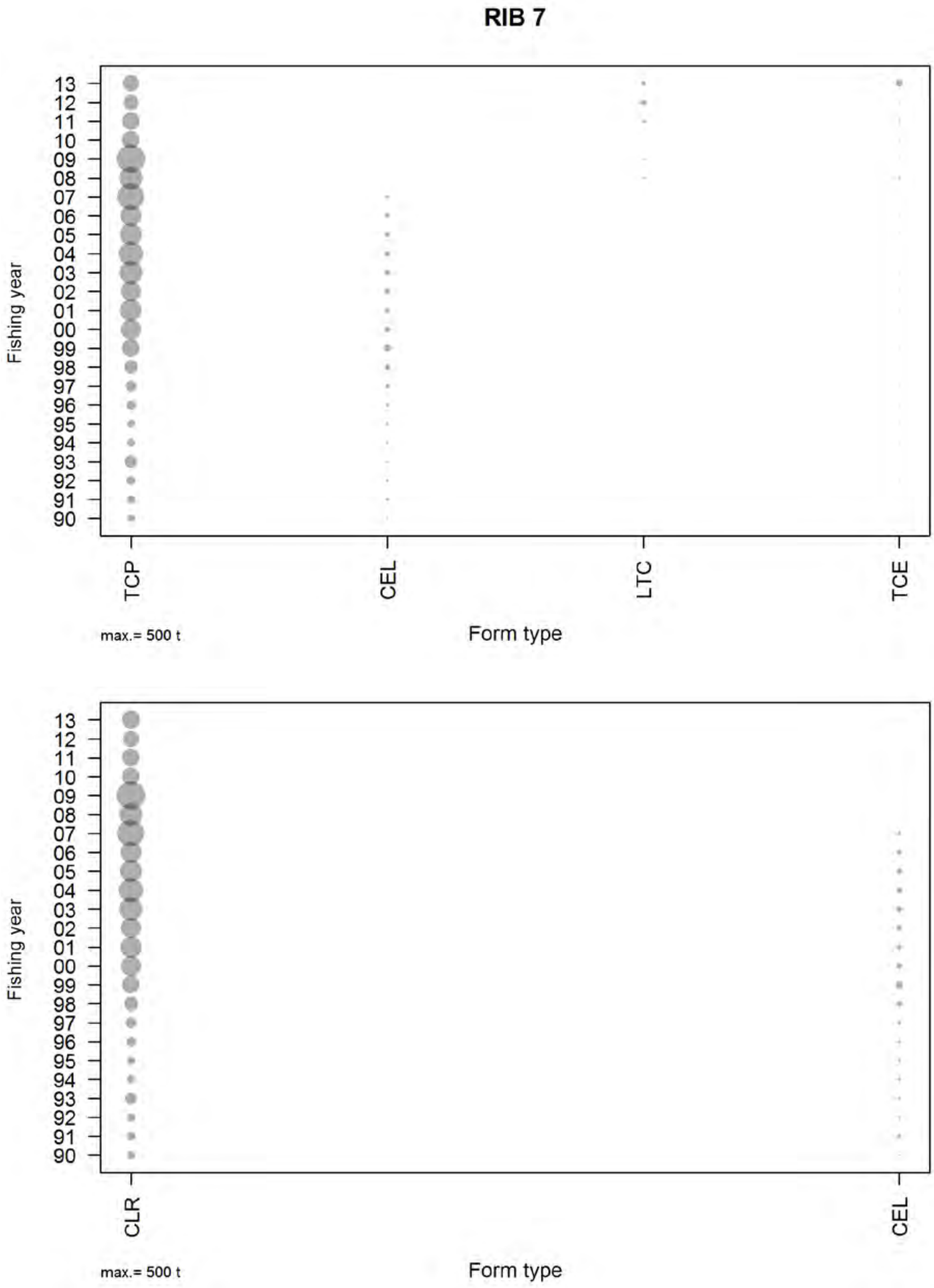


Figure C8e: Proportion of estimated catch by form type in the groomed and unmerged dataset, and proportion of landed catch by form type in the groomed and merged dataset, for RIB 7 for the 1990–2013 fishing years. where TCP is Trawl Catch Effort Processing Return; CEL is Catch, Effort, Landing Return; LTC is Lining Trip Catch Effort Return; TCE is Trawl Catch Effort Return; CLR is Catch Landing Return.

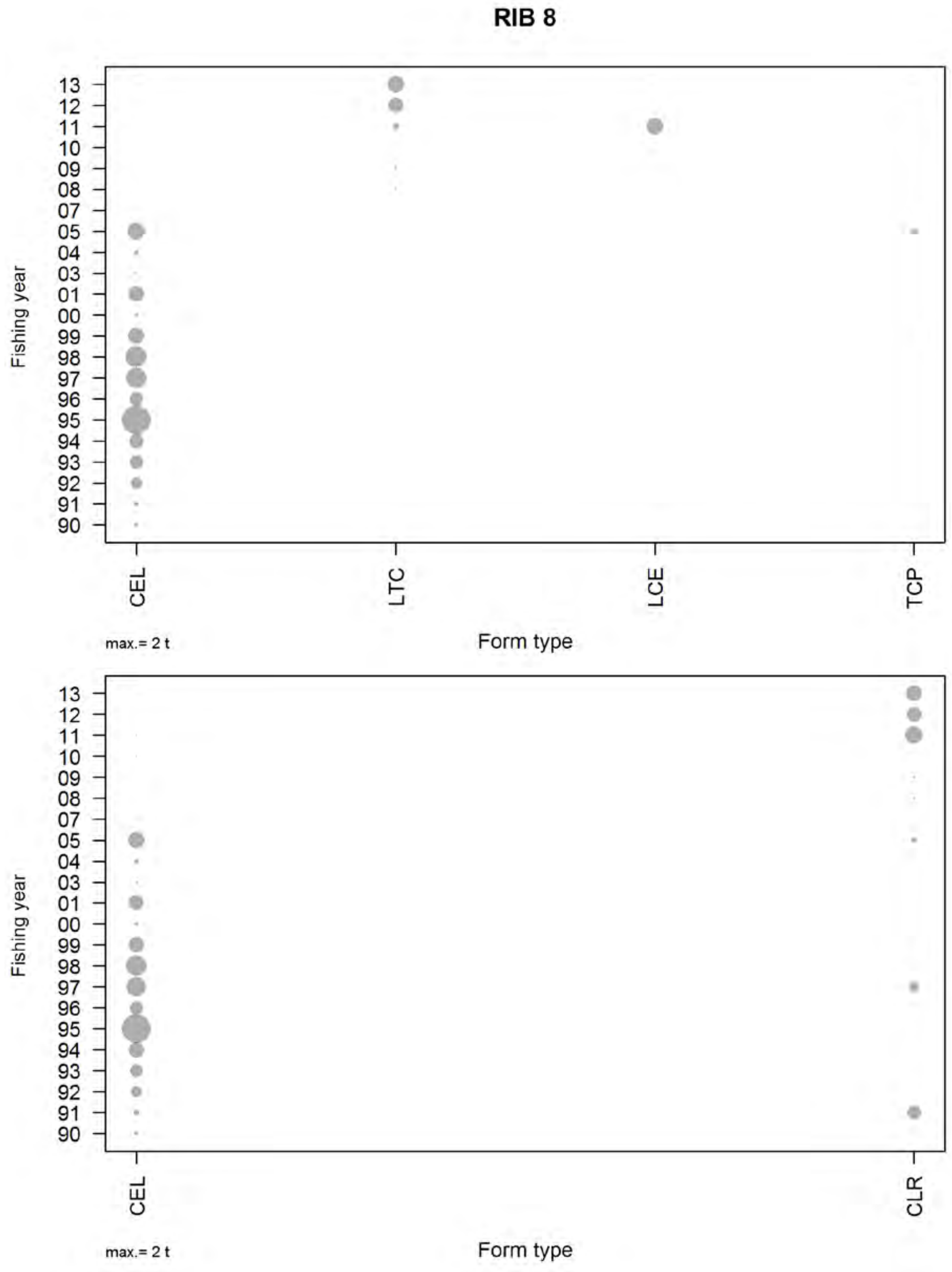


Figure C8f: Proportion of estimated catch by form type in the groomed and unmerged dataset, and proportion of landed catch by form type in the groomed and merged dataset, for RIB 8 for the 1990–2013 fishing years. where TCP is Trawl Catch Effort Processing Return; CEL is Catch, Effort, Landing Return; LCE is Lining Catch Effort Return; LTC is Lining Trip Catch Effort Return; CLR is Catch Landing Return.

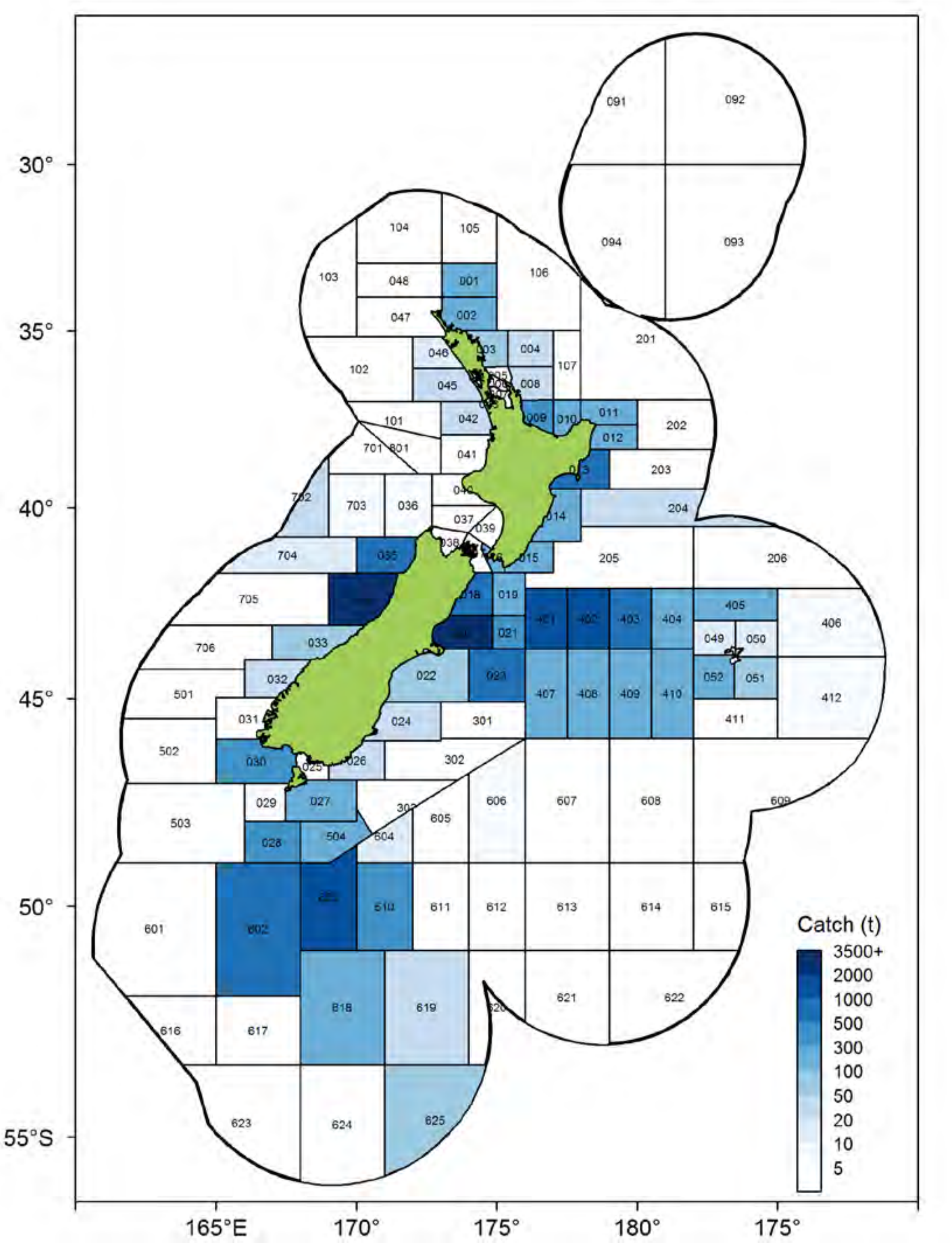


Figure C9: Combined catch (in tonnes) of all commercial ribaldo catches from for all years combined by statistical area for the 1990–2013 fishing years.

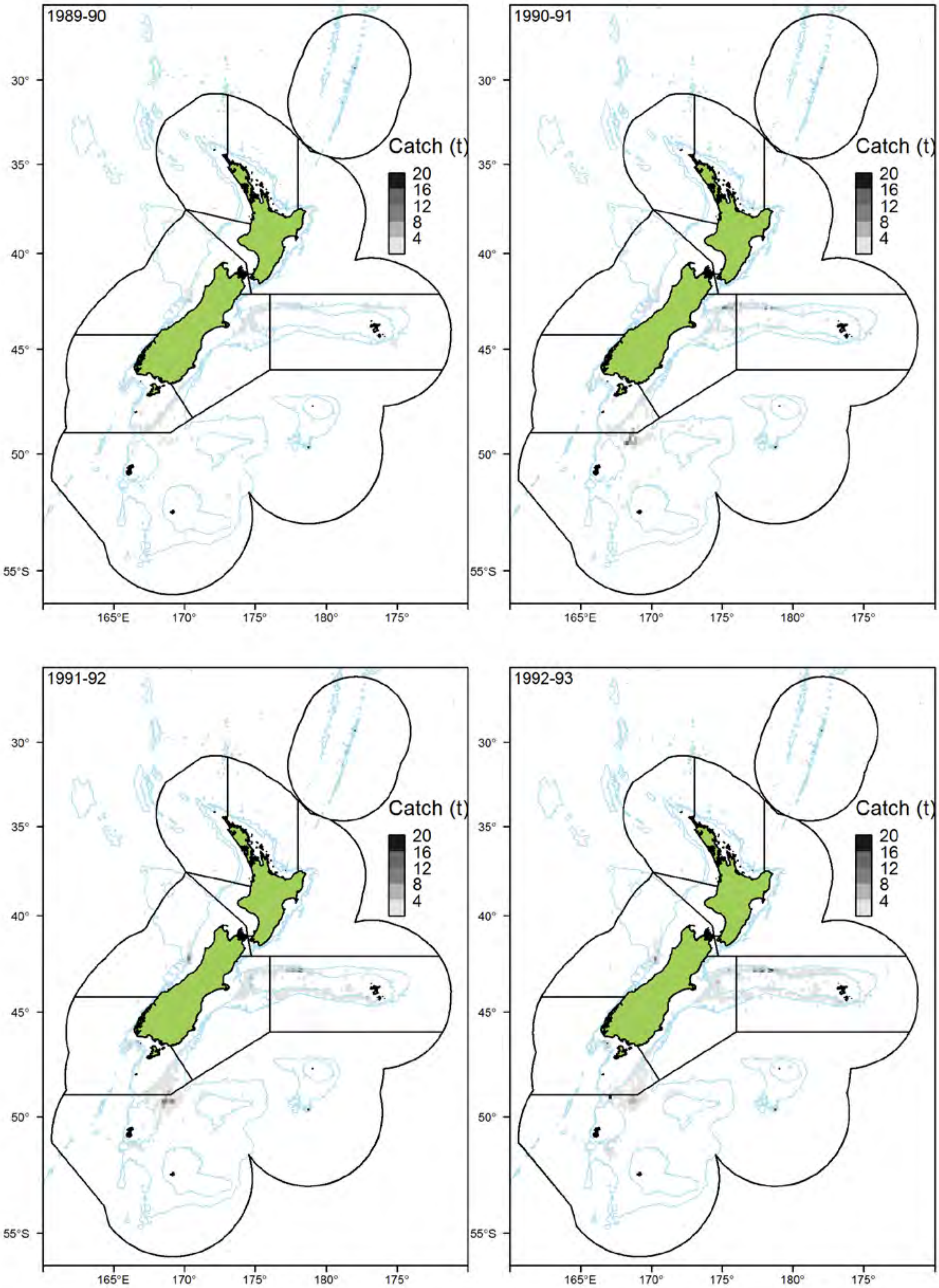


Figure C10: Combined ribaldo estimated catch of bottom long line vessels and daily processed catch of trawlers reporting on TCEPR forms (in tonnes) by fishing year, aggregated into 0.2 degree spatial blocks 1990–1993 fishing years.

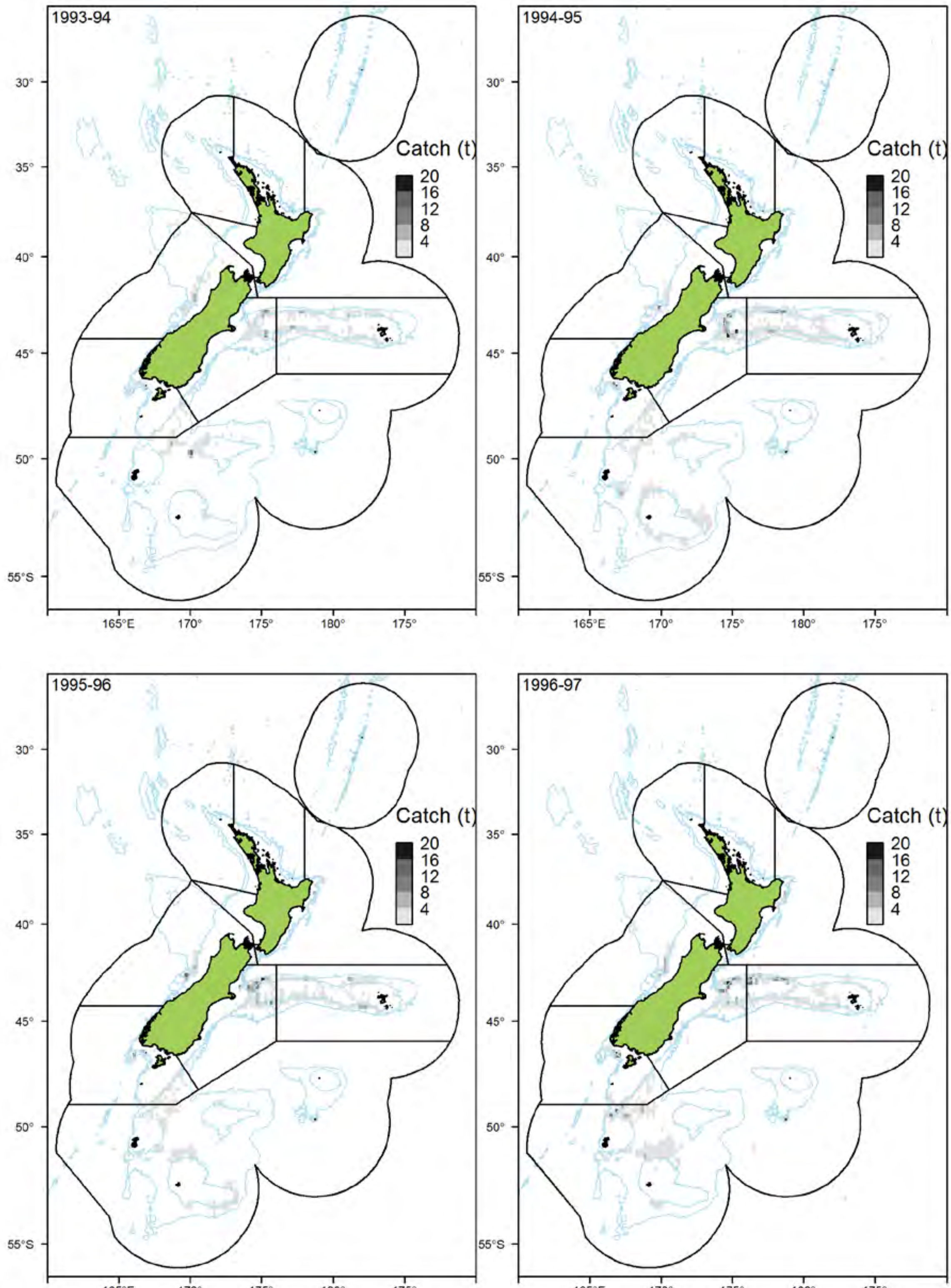


Figure C10 continued: Combined ribaldo estimated catch of bottom long line vessels and daily processed catch of trawlers reporting on TCEPR forms (in tonnes) by fishing year, aggregated into 0.2 degree spatial blocks 1994–1997 fishing years

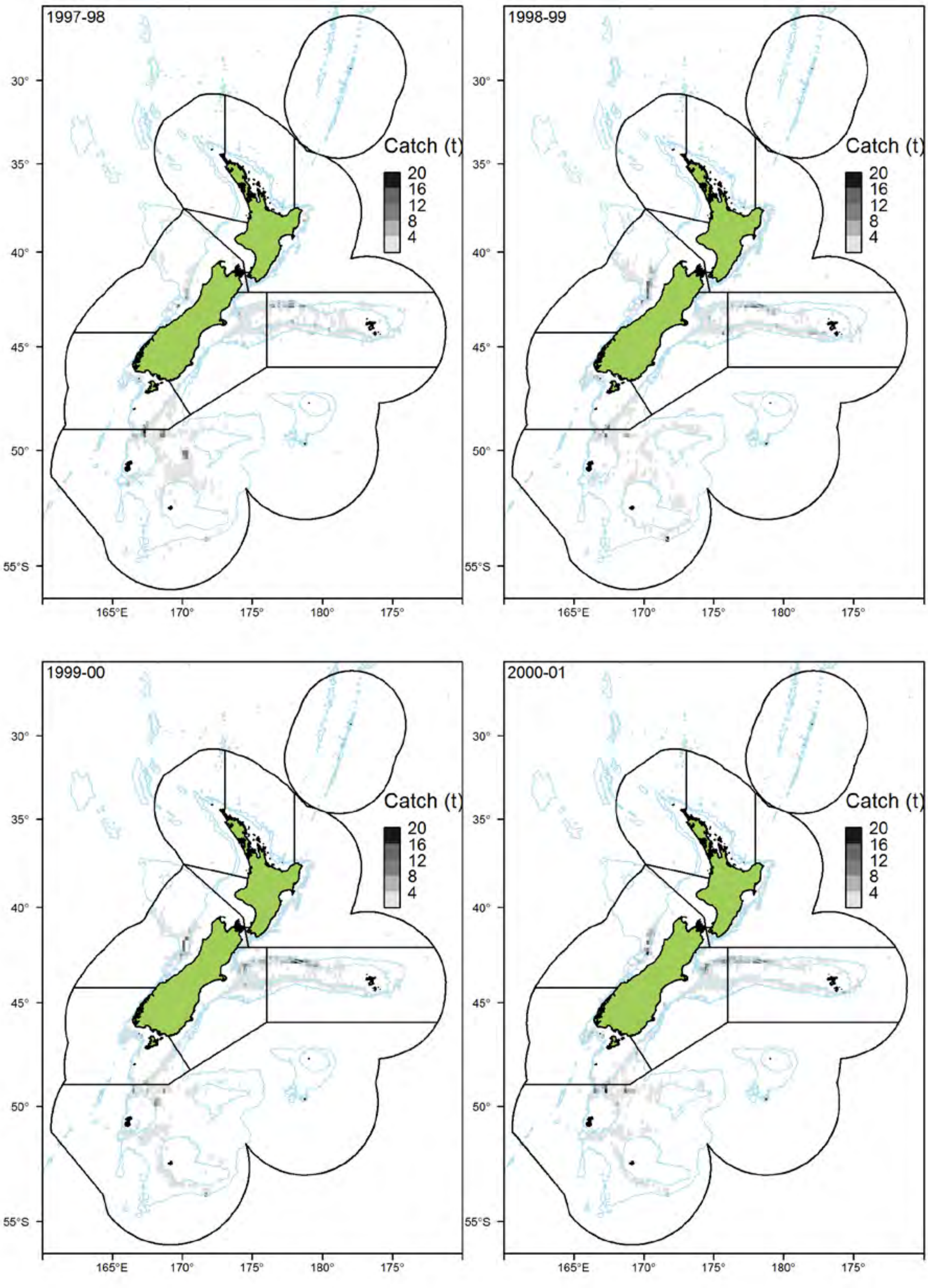


Figure C10 continued: Combined ribaldo estimated catch of bottom long line vessels and daily processed catch of trawlers reporting on TCEPR forms (in tonnes) by fishing year, aggregated into 0.2 degree spatial blocks 1998–2001 fishing years.

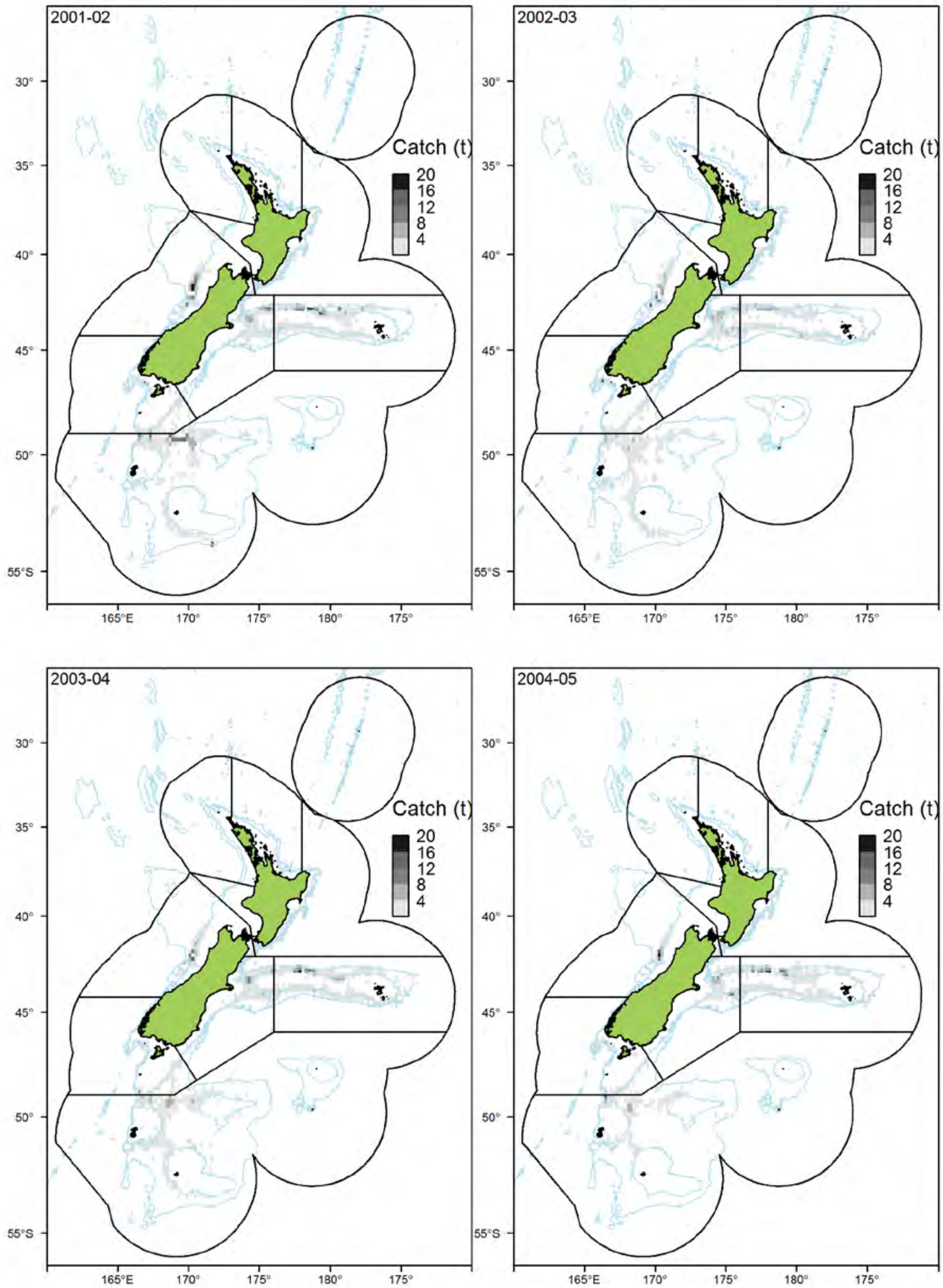


Figure C10 continued: Combined ribaldo estimated catch of bottom long line vessels and daily processed catch of trawlers reporting on TCEPR forms (in tonnes) by fishing year, aggregated into 0.2 degree spatial blocks 2002–2005 fishing years.

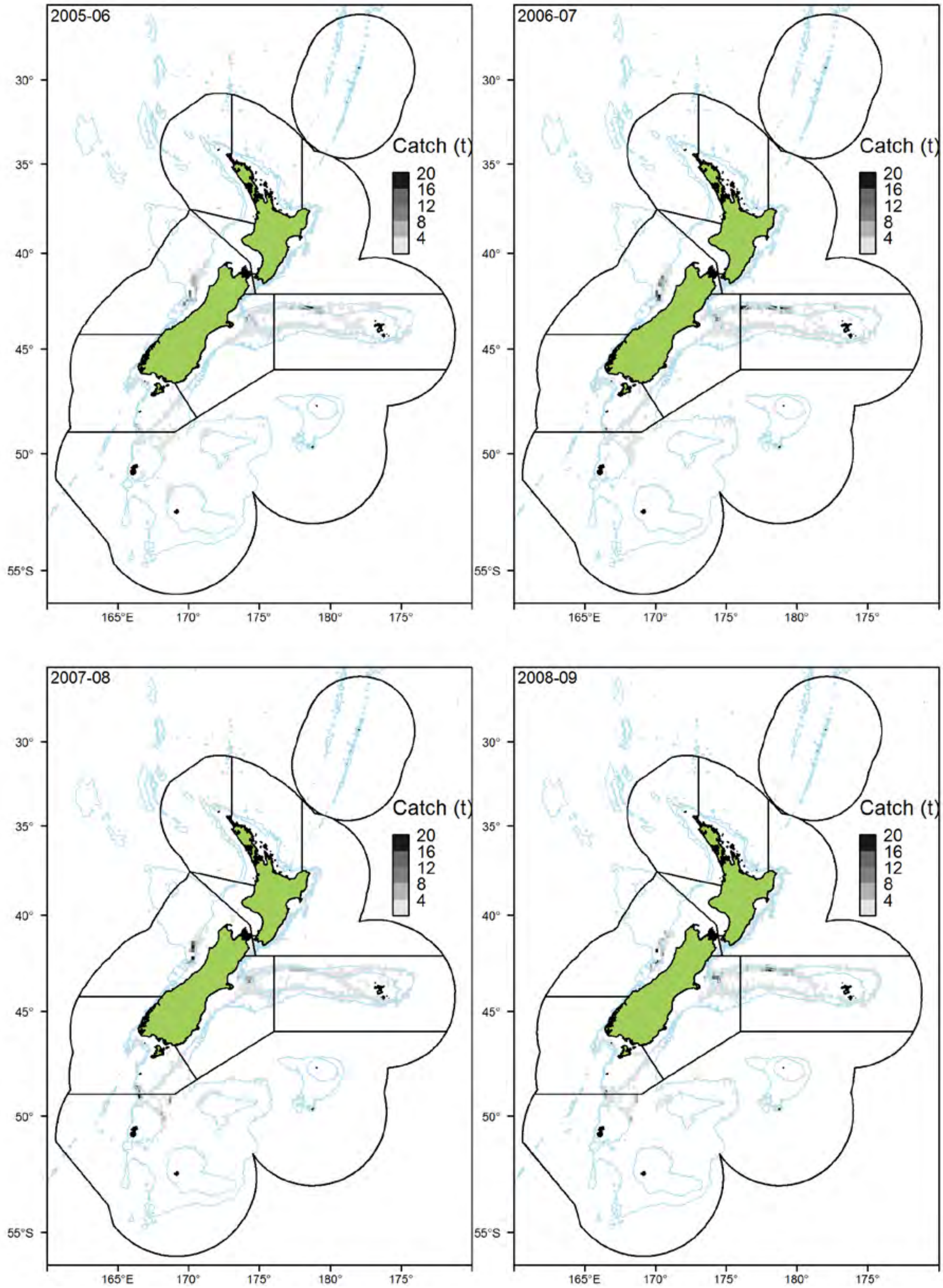


Figure C10 continued: Combined ribaldo estimated catch of bottom long line vessels and daily processed catch of trawlers reporting on TCEPR forms (in tonnes) by fishing year, aggregated into 0.2 degree spatial blocks 2006–2009 fishing years.

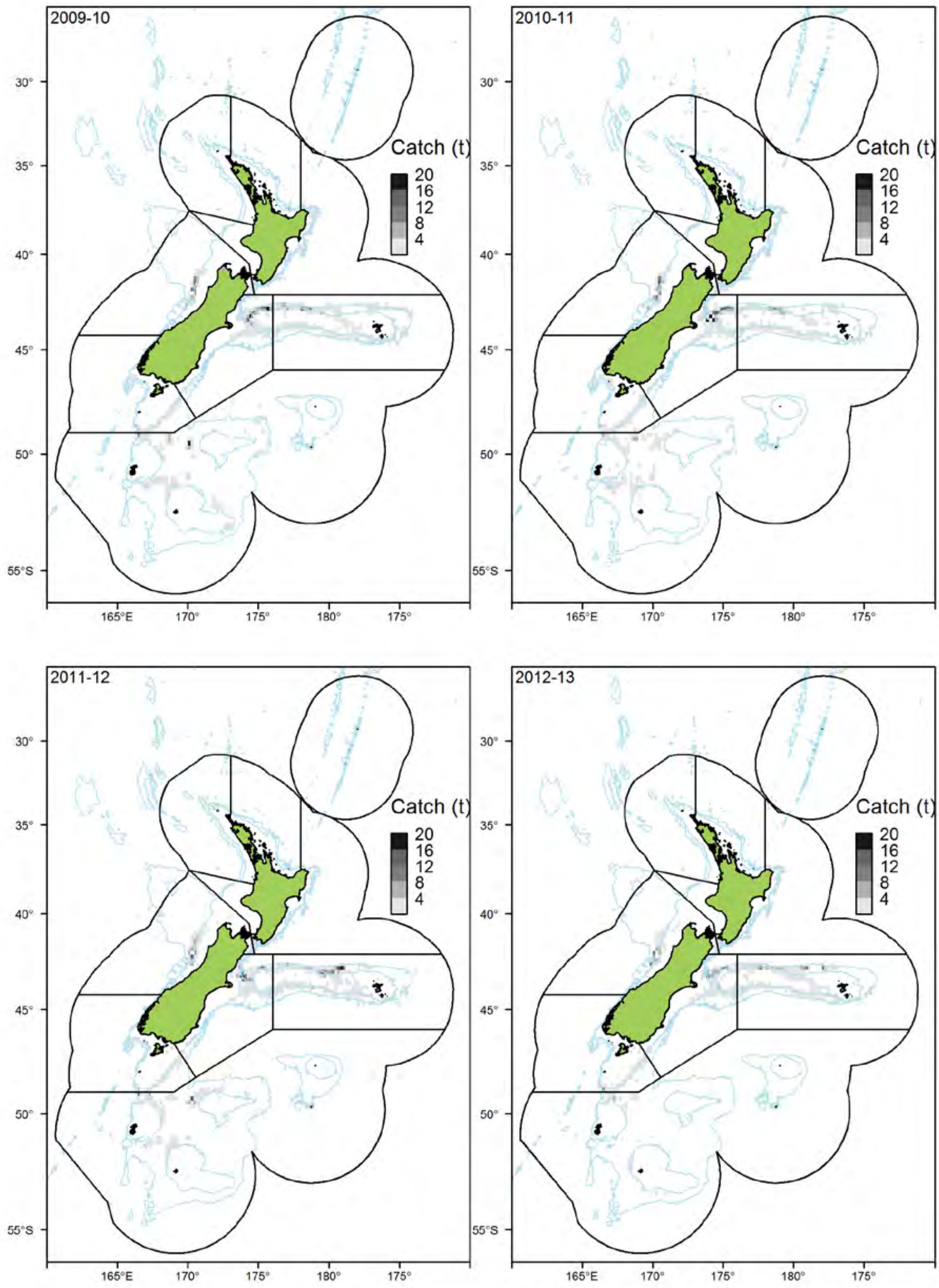


Figure C10 continued: Combined ribaldo estimated catch of bottom long line vessels and daily processed catch of trawlers reporting on TCEPR forms (in tonnes) by fishing year, aggregated into 0.2 degree spatial blocks 2010–2013 fishing years.

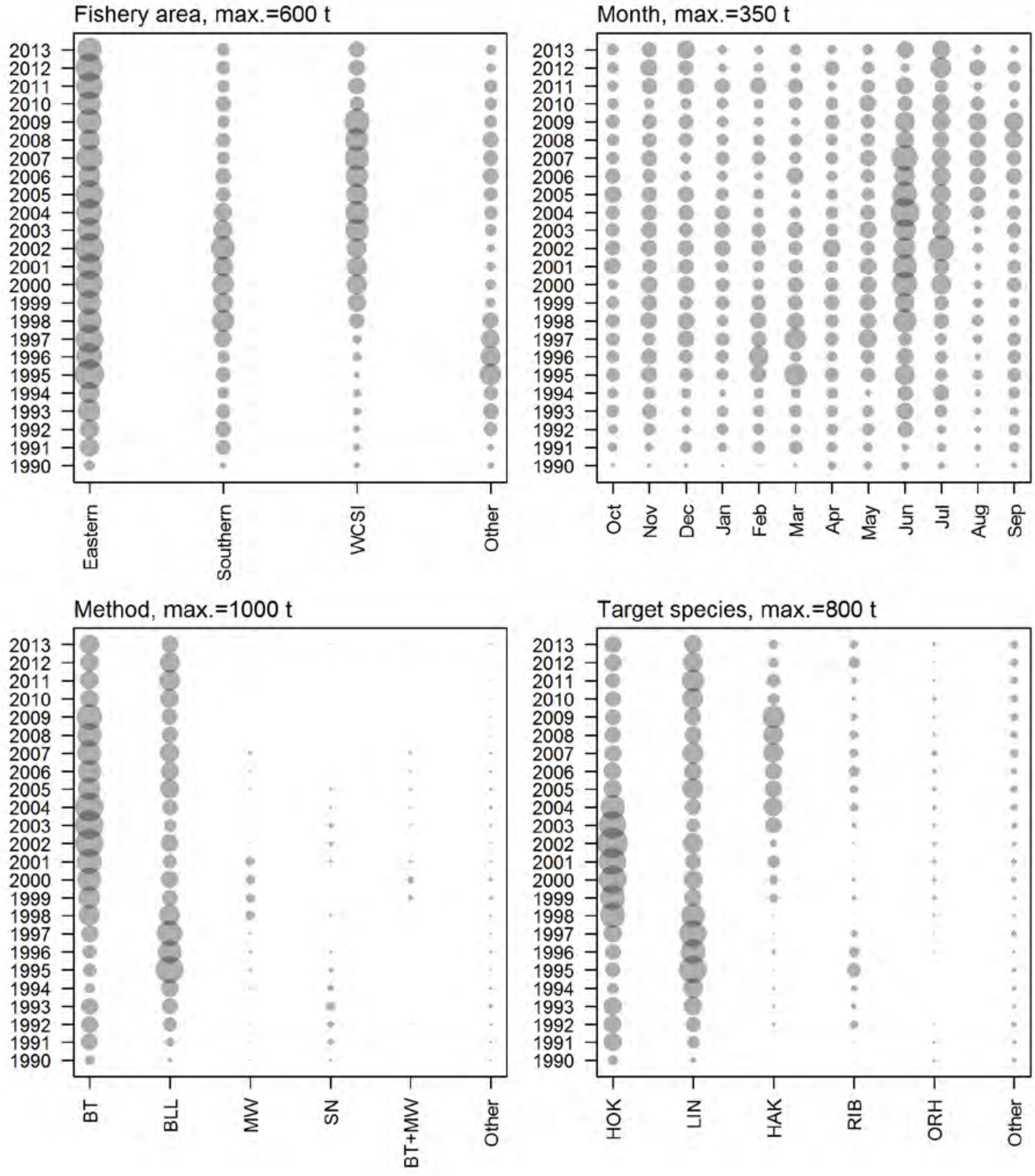


Figure C11: Distribution of annual ribaldo catch by fishery area, month, method, and target species for all combined daily processed TCEPR data and unmerged data for non-TCEPR vessels. Circle size is proportional to catch; maximum circle size is indicated on each plot. Fishery areas are shown in Figure 2. BT is bottom trawl; BLL is bottom longline; MW is midwater trawl; SN is set net, BT+MW are daily processed data days with an even mix of bottom and midwater trawl. Species codes are defined in Table C21.

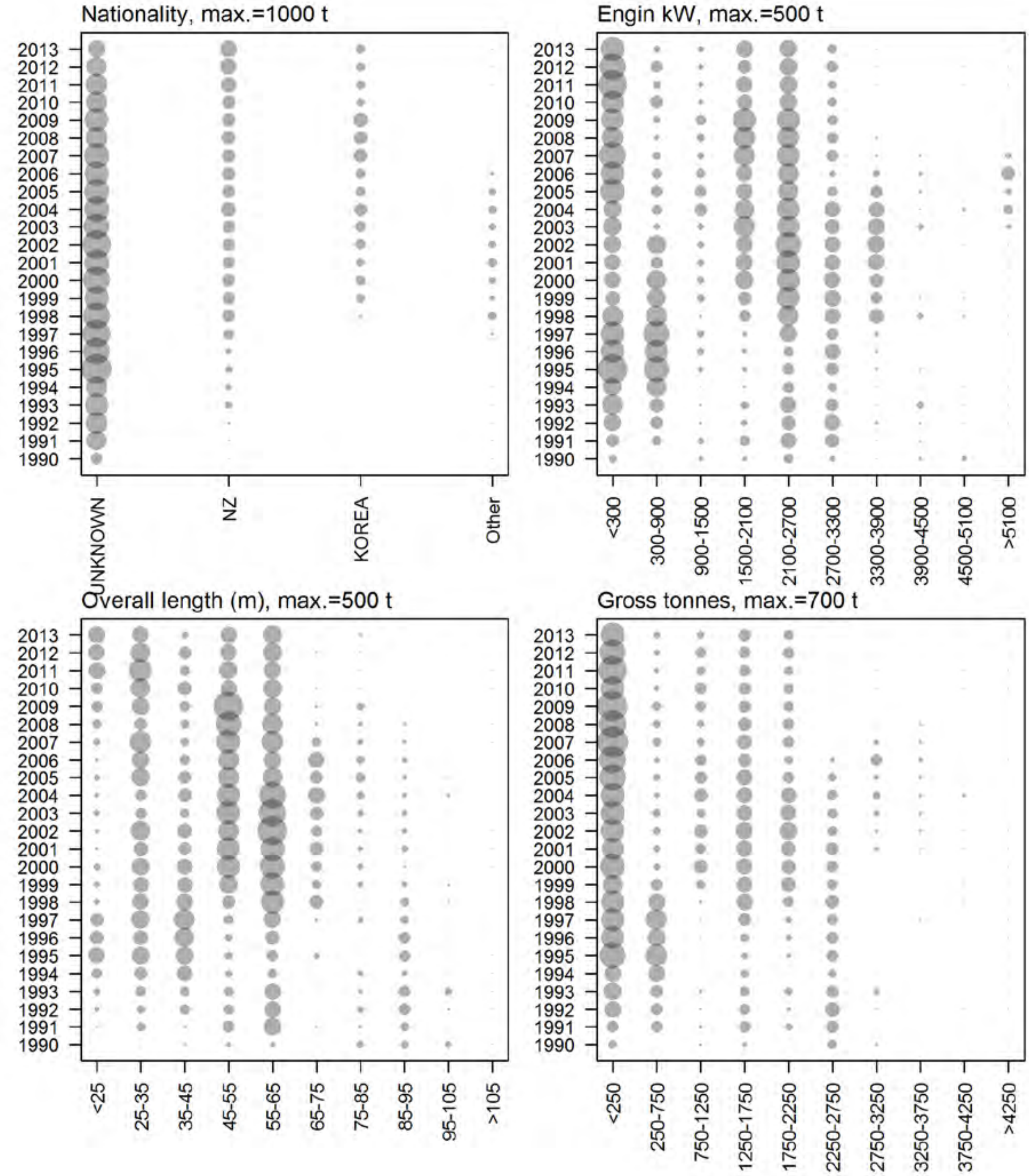


Figure C12: Distribution of annual ribaldo catch by nationality, vessel power (kW), overall length (m), and gross tonnage for all combined daily processed TCEPR data and unmerged data for non-TCEPR vessels. Circle size is proportional to catch; maximum circle size is indicated on each plot.

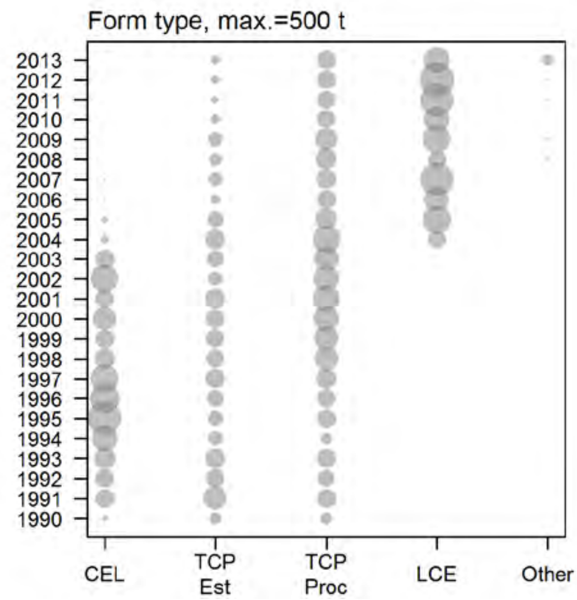


Figure C13a: Distribution of annual ribaldo catch by form type in the Eastern fishery (see Figure 2) for estimated and merged daily processed data. Circle size is proportional to catch; maximum circle size is 500 t. CEL is Catch Effort Landing Return, TCP Est is estimated catch data from the Trawl, Catch, Effort, and Processing Return; TCP Proc is daily processed data from the Trawl, Catch, Effort, and Processing Return; LCE is Lining Catch Effort Return.

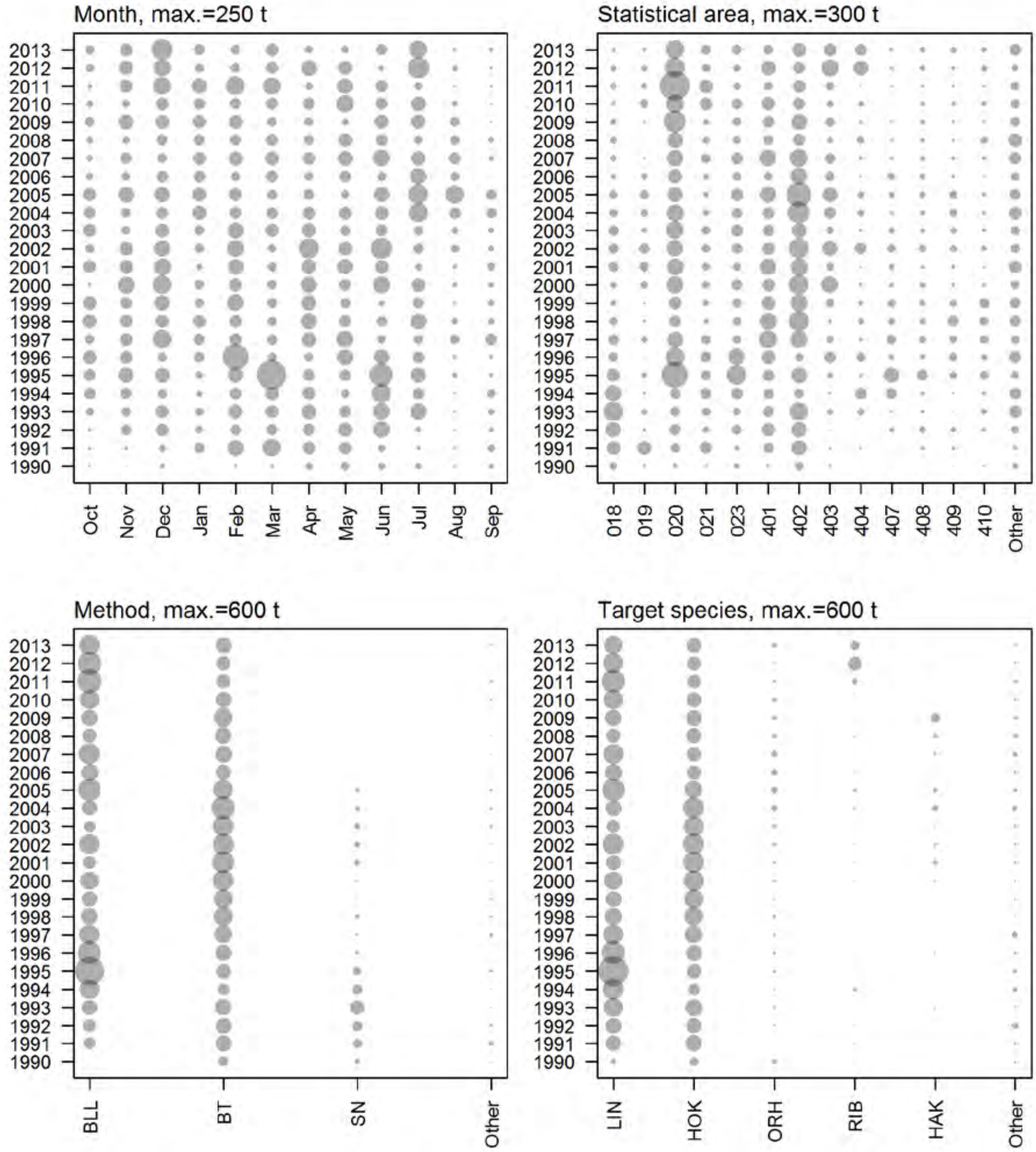


Figure C13b: Distribution of annual ribaldo catch by month, statistical area, method, and target species in the Eastern fishery for all merged data. Circle size is proportional to catch; maximum circle size is indicated on each plot.

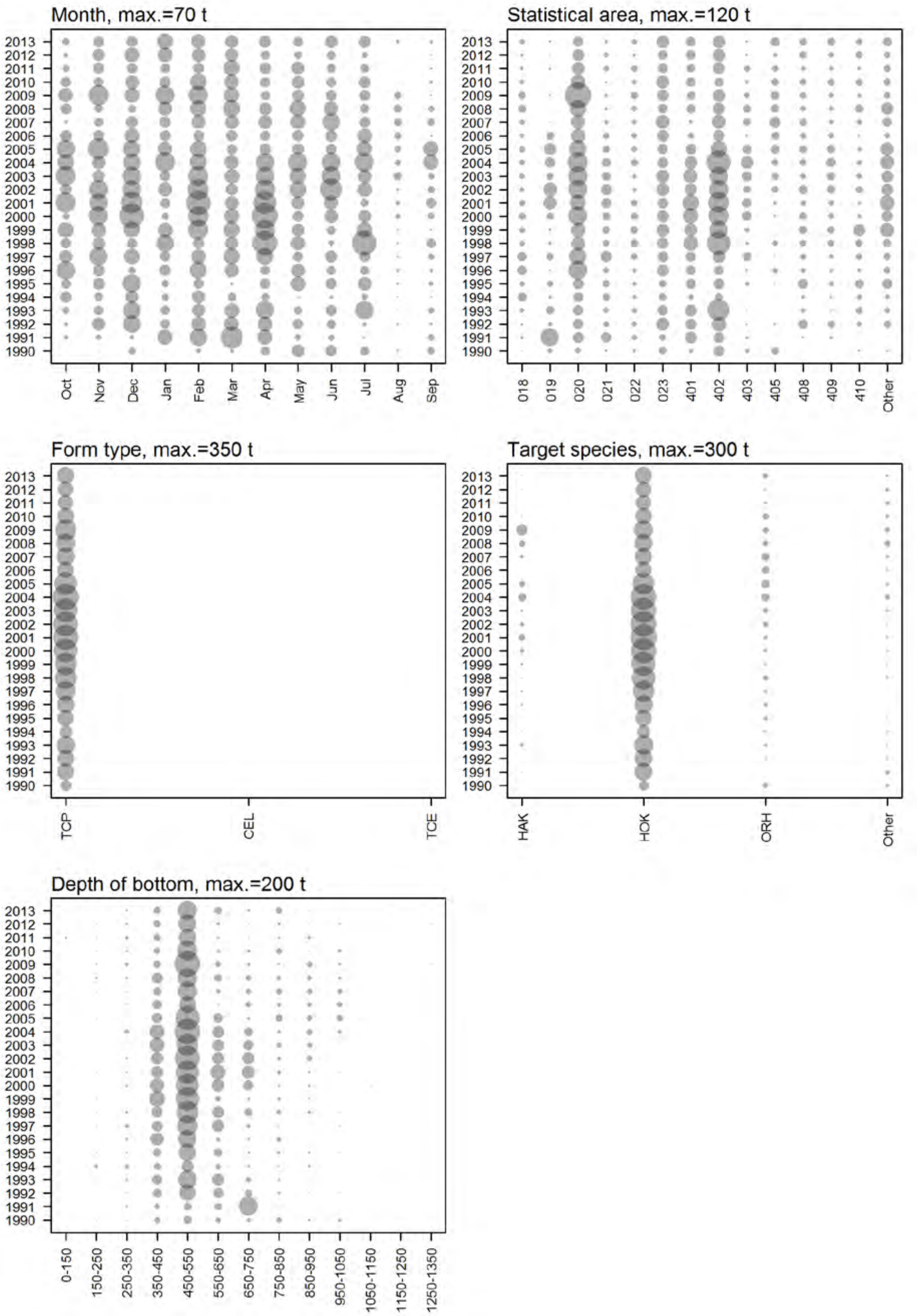


Figure C13c: Distribution of annual ribaldo catch by month, statistical area, form type, target species, and depth in the Eastern fishery for daily processed catch from bottom trawling. Circle size is proportional to catch; maximum circle size is indicated on each plot.

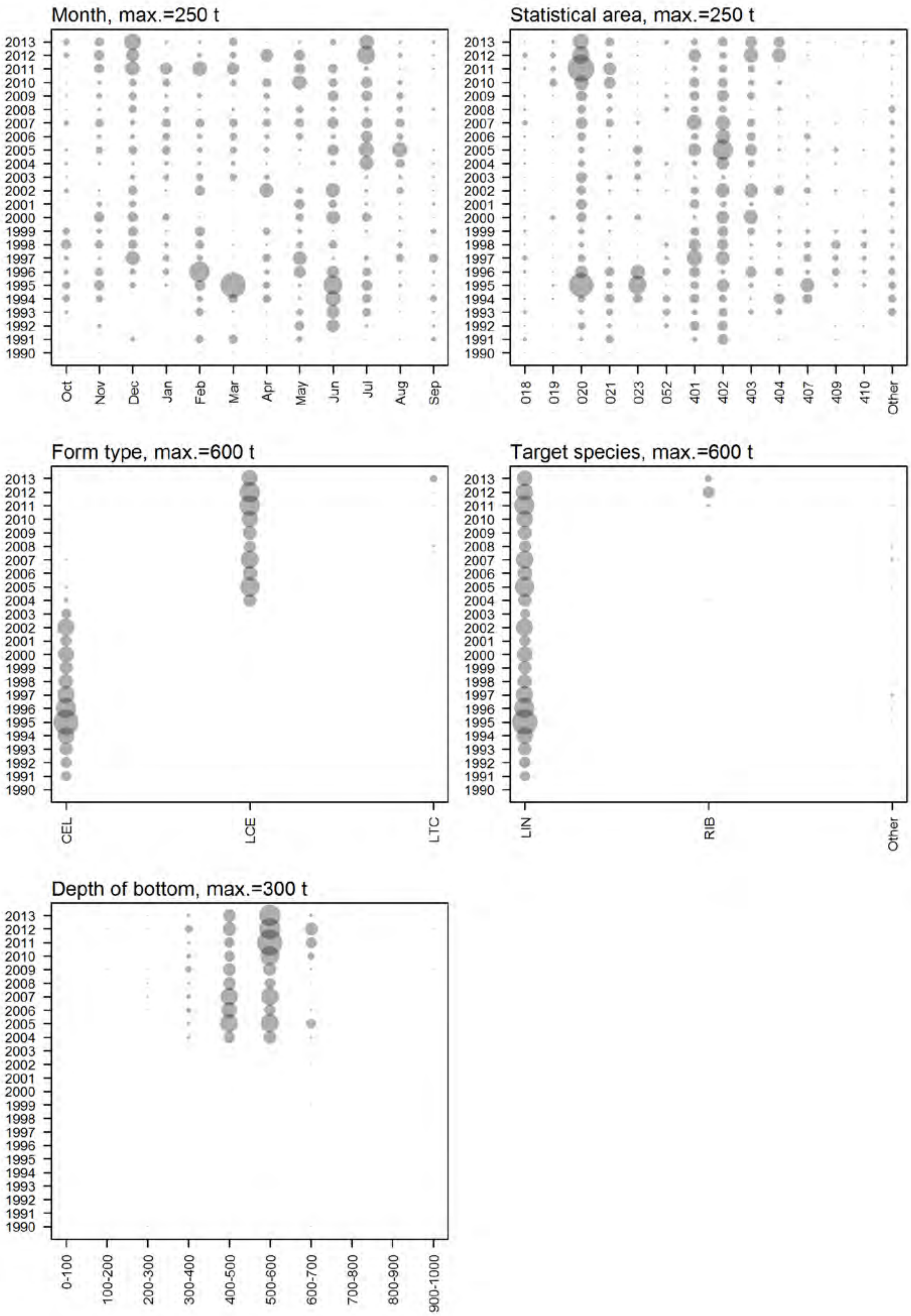


Figure C13d: Distribution of annual ribaldo catch by month, statistical area, form type, target species, and depth in the Eastern fishery for estimated catch from bottom long lining. Circle size is proportional to catch; maximum circle size is indicated on each plot. NB: depth of bottom was not recorded until bottom longline vessels started to record on LCE forms.

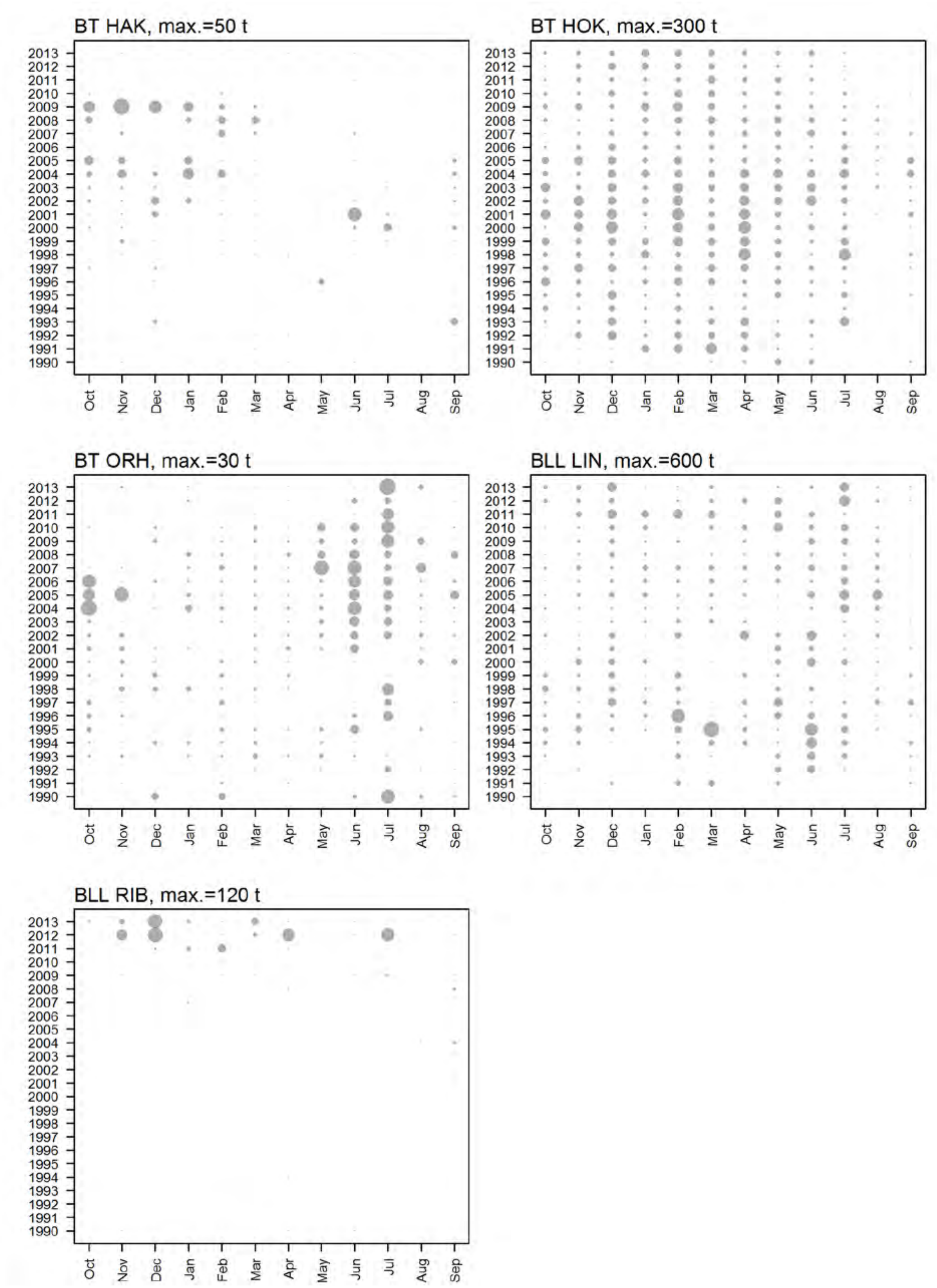


Figure C14: Distribution of annual ribaldo catch (t) in the Eastern fishery by method and target species for each year and month. BT data is daily processed catch, BLL data is estimated catch. Circle size is proportional to catch; maximum circle size is indicated on the top left hand corner of each plot.

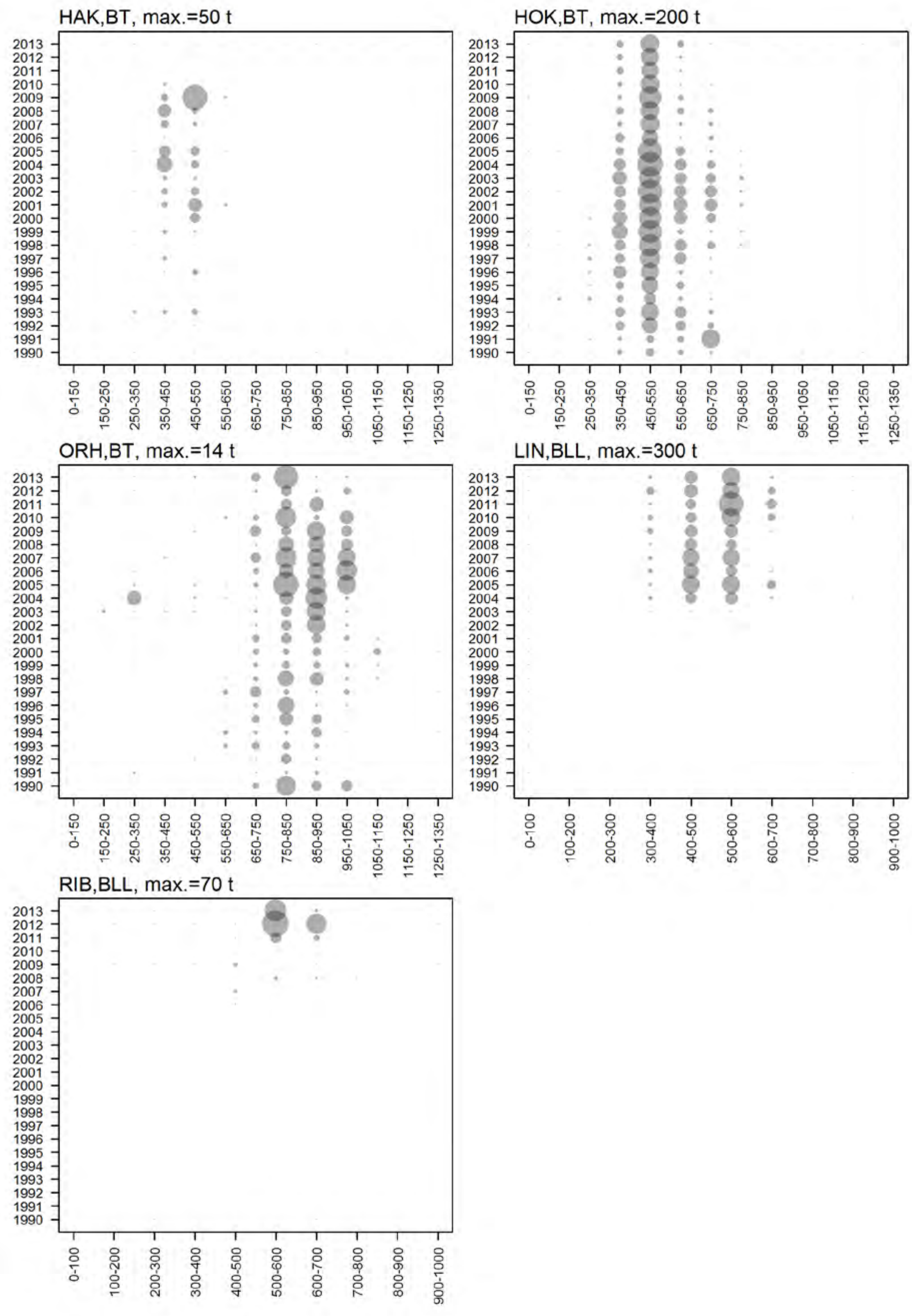


Figure C15: Distribution of annual ribaldo catch (t) by depth in the Eastern fishery by method and main target species. BT data is daily processed catch, BLL data is estimated catch. Circle size is proportional to catch; maximum circle size is indicated on the top left hand corner of each plot.

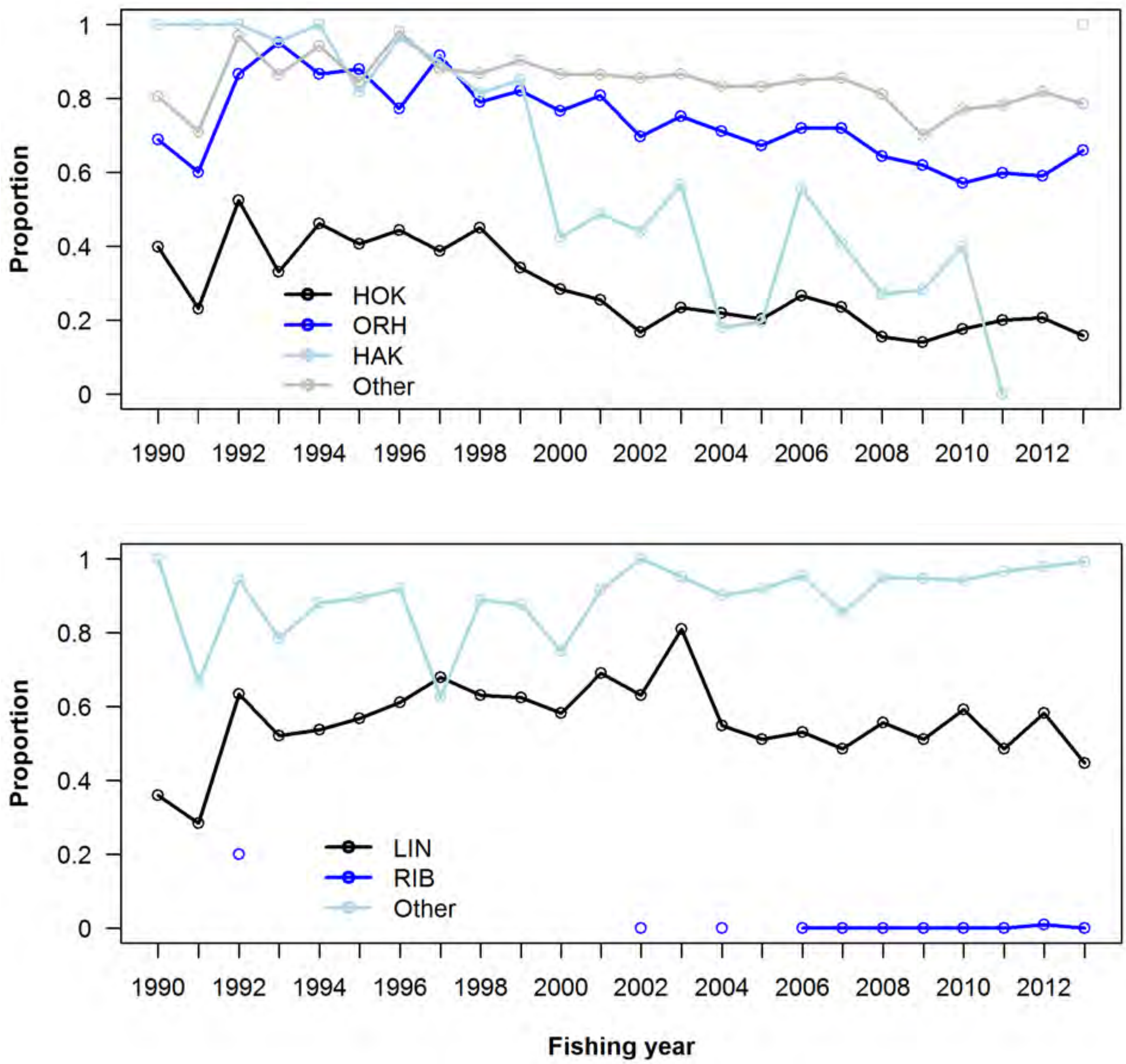


Figure C16: Proportion of days that recorded no processed ribaldo in the daily processed data by target species for bottom trawl (top plot), and proportion of bottom long line sets that reported no estimated ribaldo catch in the unmerged data by target species (bottom plot).

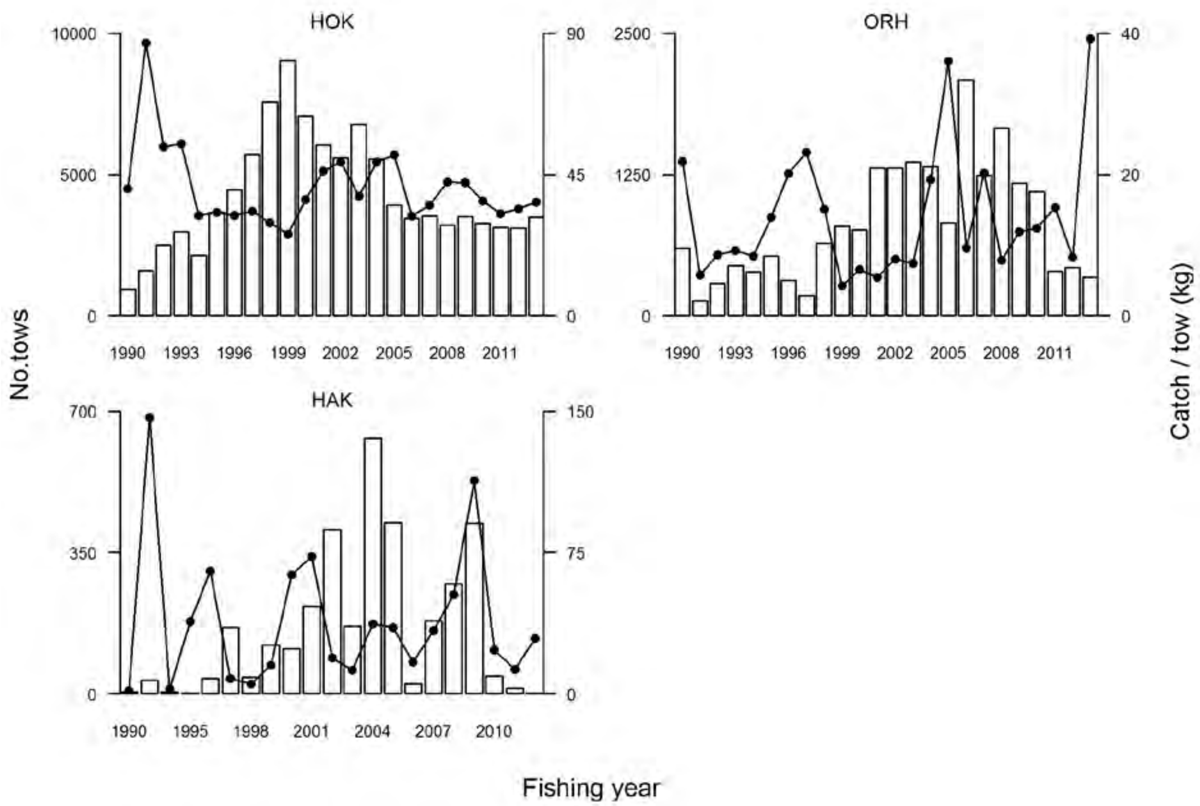


Figure C17: Unstandardised catch rates of ribaldo by main target species (kg/tow) and the number of tows in the Eastern fishery using bottom trawl gear.

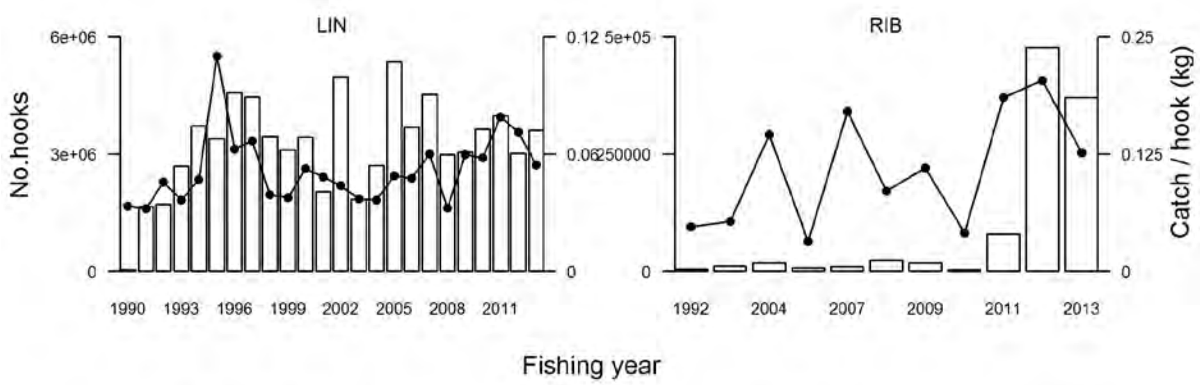


Figure C18: Unstandardised catch rates of ribaldo by main target species (kg/hook) and the number of hooks in the Eastern fishery using bottom long line.

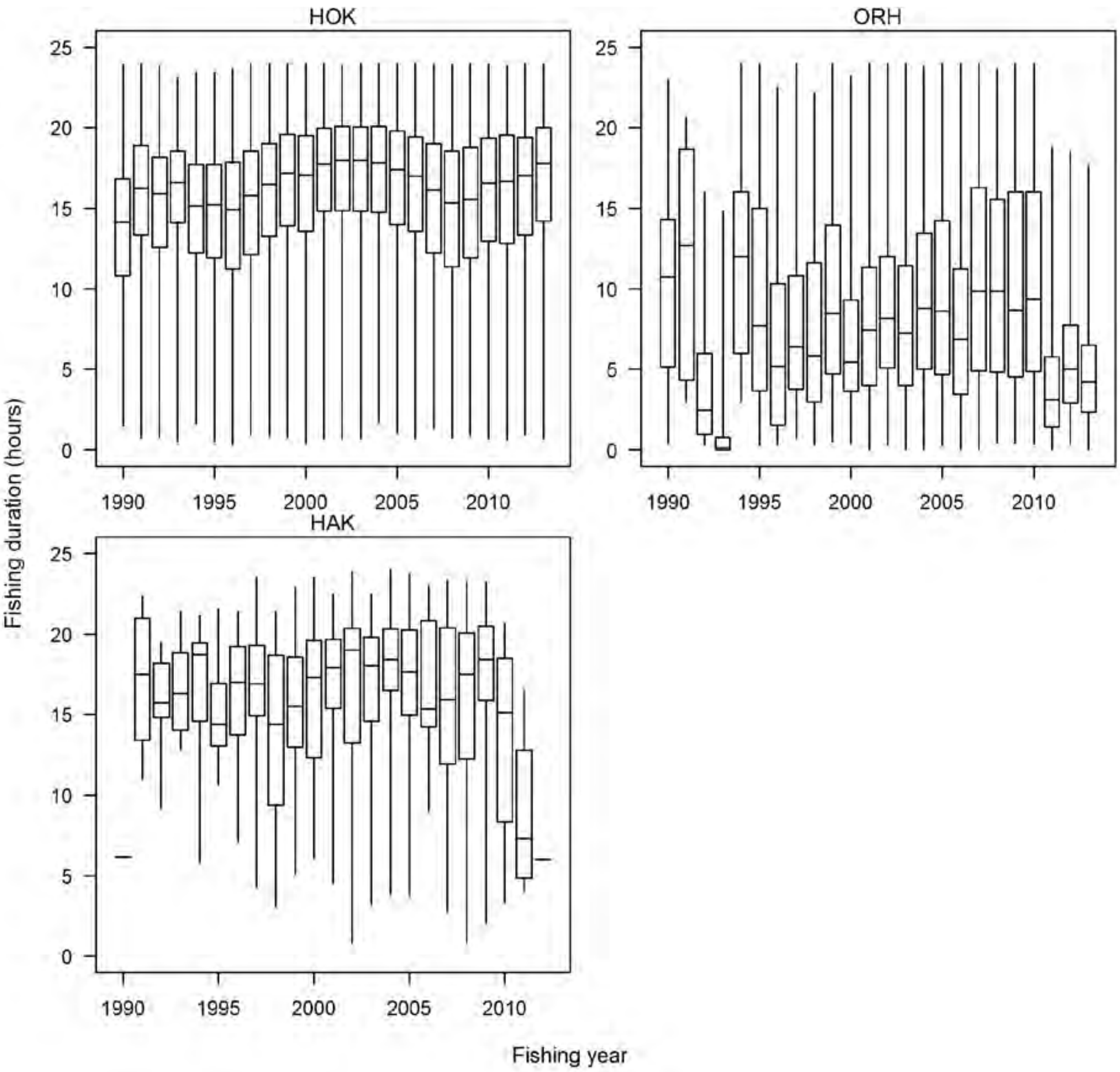


Figure C19: Annual median (horizontal line), inter-quartile range (box), and range (vertical lines) for summed daily tow durations (hours) reported by main target species in the Eastern fishery catching ribaldo with bottom trawl gear.

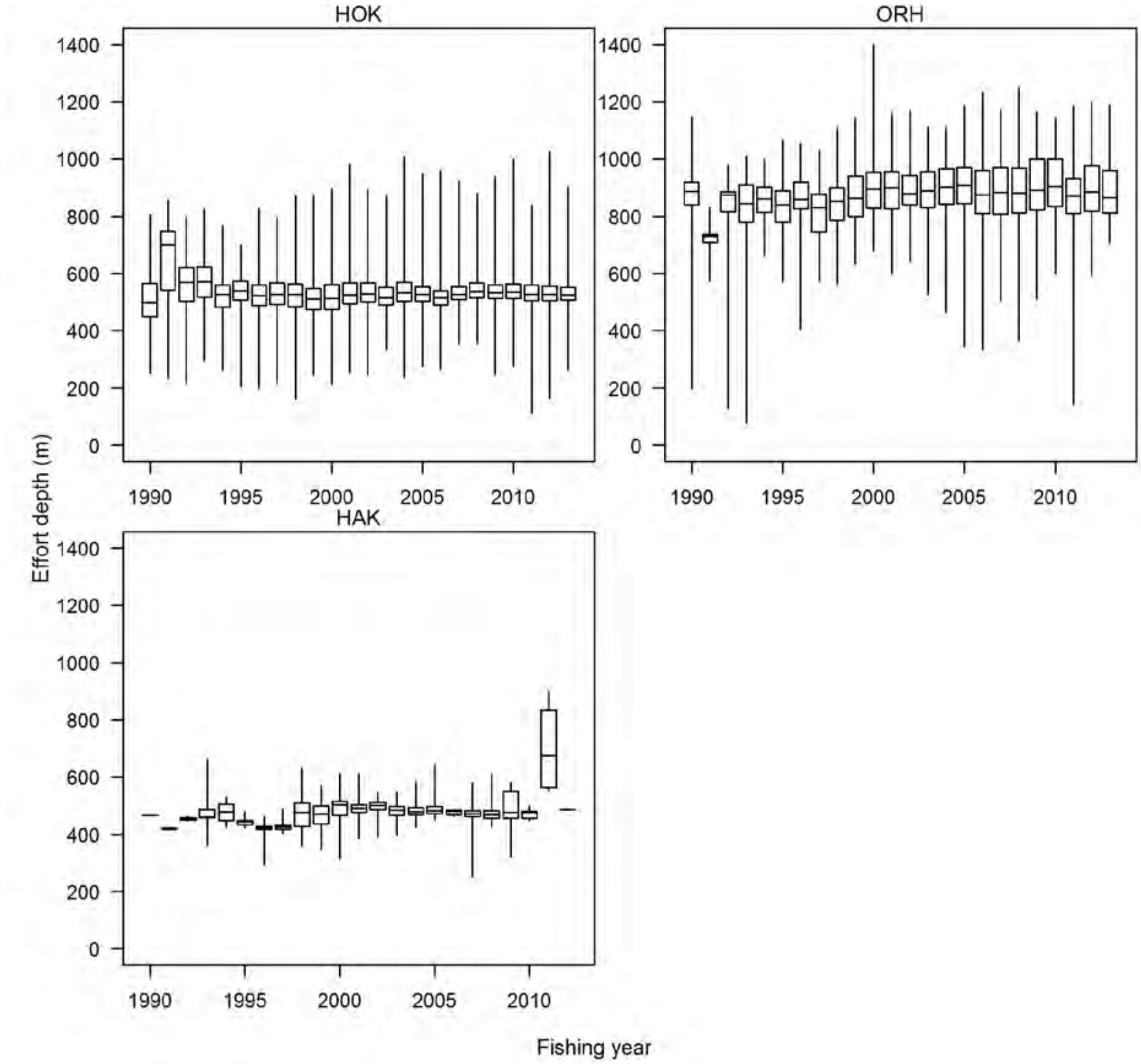


Figure C20: Annual median (horizontal line), inter-quartile range (box), and range (vertical lines) for mean daily effort depth (m) reported by main target species in the Eastern fishery catching ribaldo using bottom trawl gear.

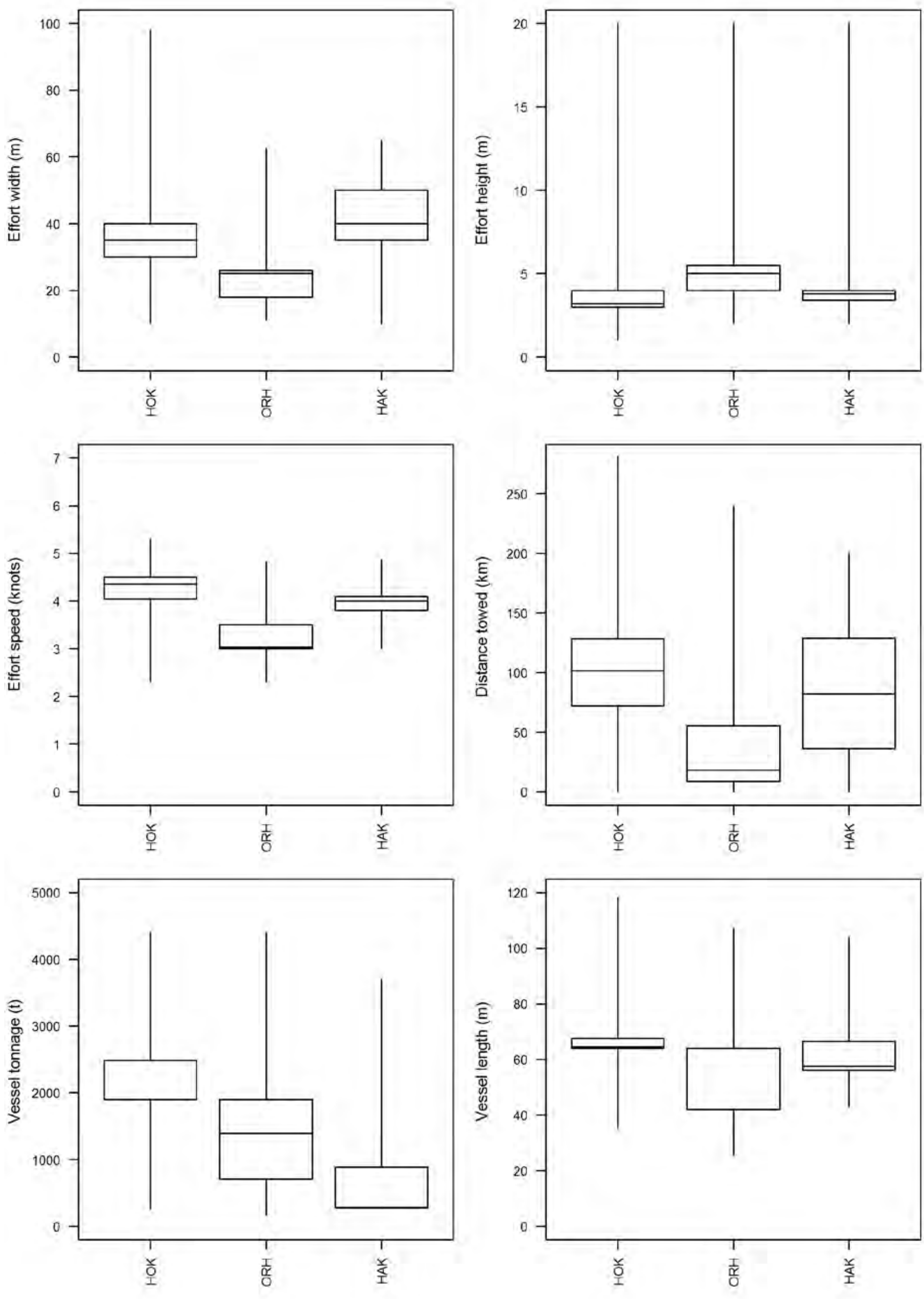


Figure C21: Median (horizontal line), inter-quartile range (box), and range (vertical lines) for distribution of other fishing effort variables and vessel characteristics by main target species in the Eastern fishery catching ribaldo using bottom trawl gear.

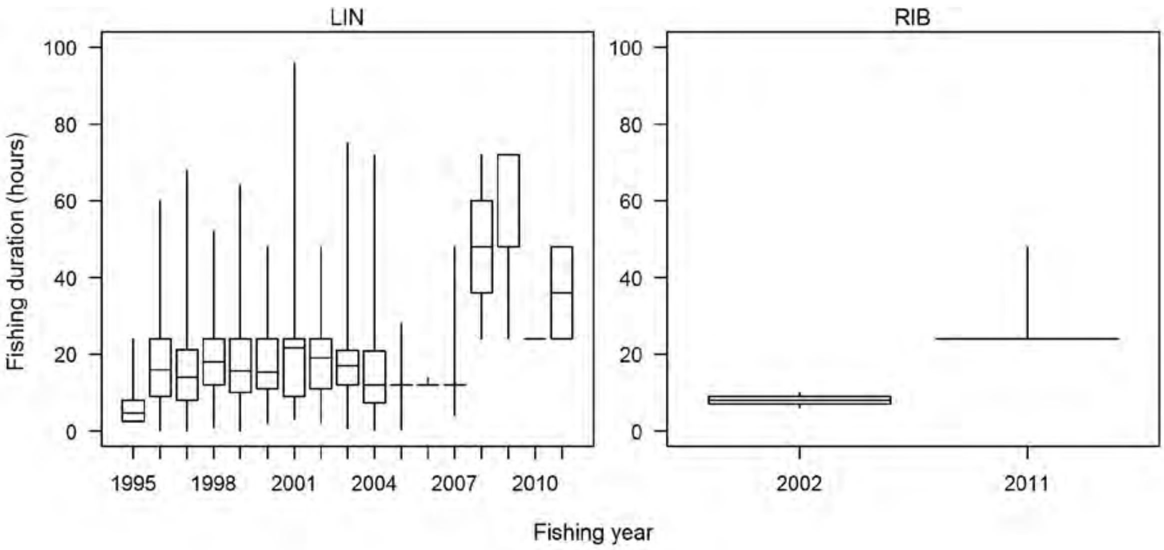


Figure C22: Annual median (horizontal line), inter-quartile range (box), and range (vertical lines) for fishing duration (hours) reported by main target species in the Eastern fishery catching ribaldo using bottom long line gear.

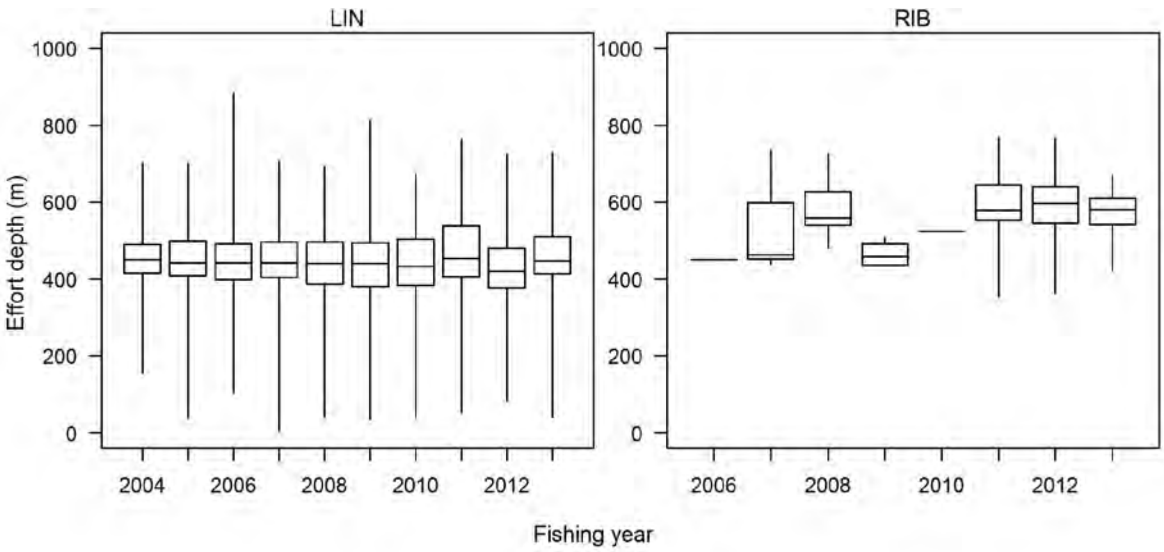


Figure C23: Annual median (horizontal line), inter-quartile range (box), and range (vertical lines) for daily effort depth (m) reported by main target species in the Eastern fishery catching ribaldo using bottom long line gear.

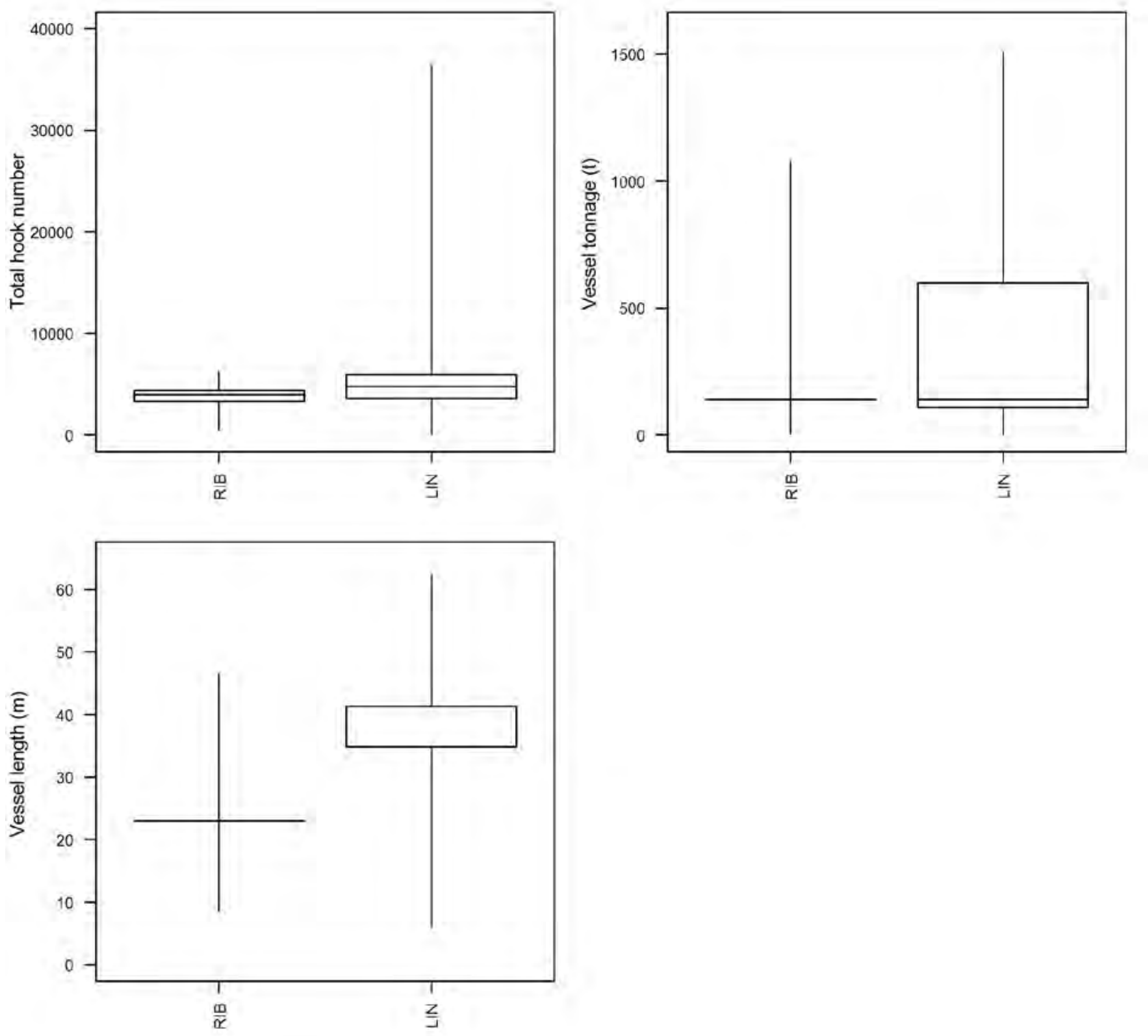


Figure C24: Median (horizontal line), inter-quartile range (box), and range (vertical lines) for distribution of other fishing effort variables and vessel characteristics by main target species in the Eastern fishery catching ribaldo using bottom long line gear.

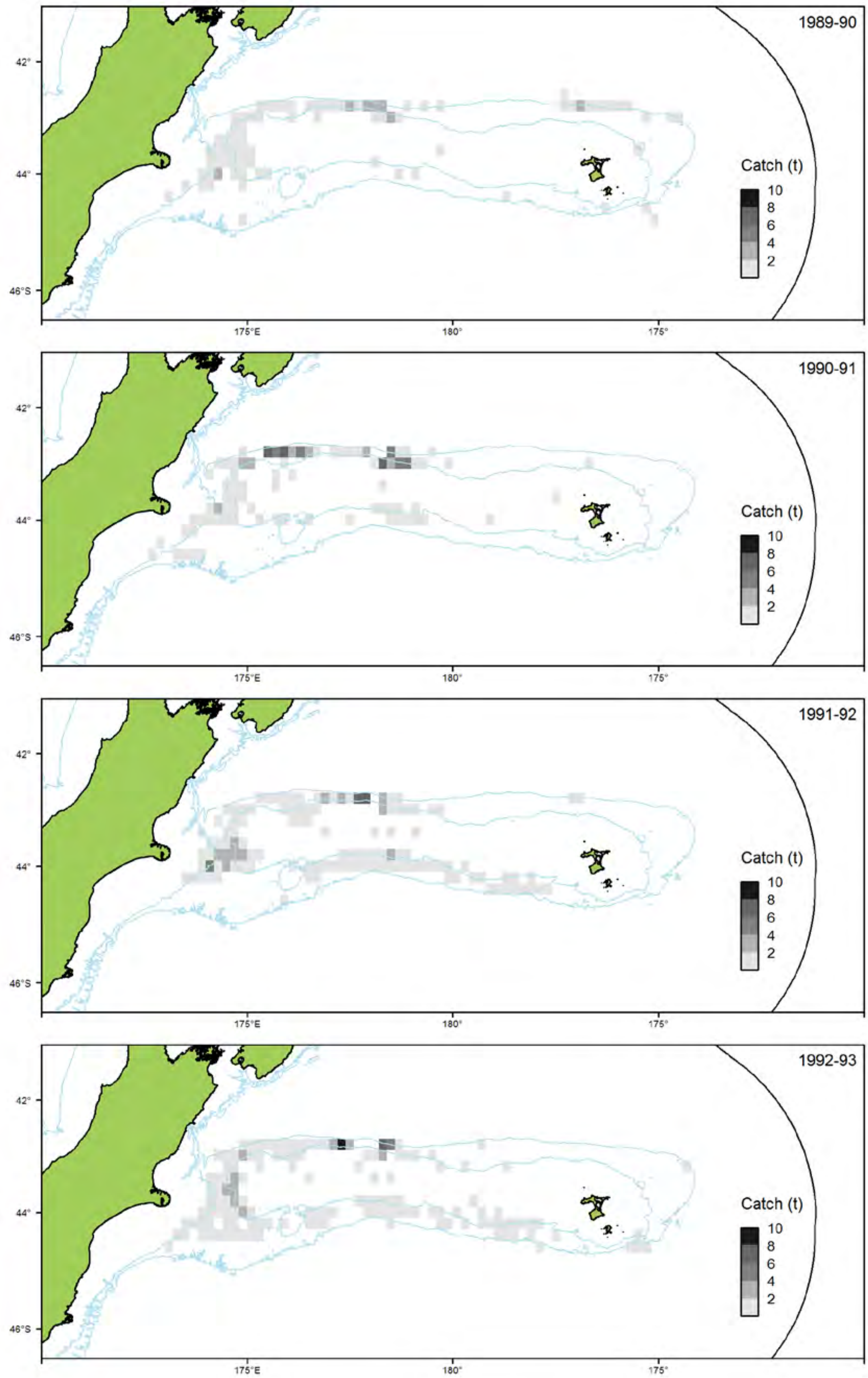


Figure C25: Distribution of daily processed ribaldo catch taken by bottom trawl gear in the Eastern fishery aggregated into 0.2 degree spatial blocks for 1990 to 1993 fishing years from the TCEPR form.

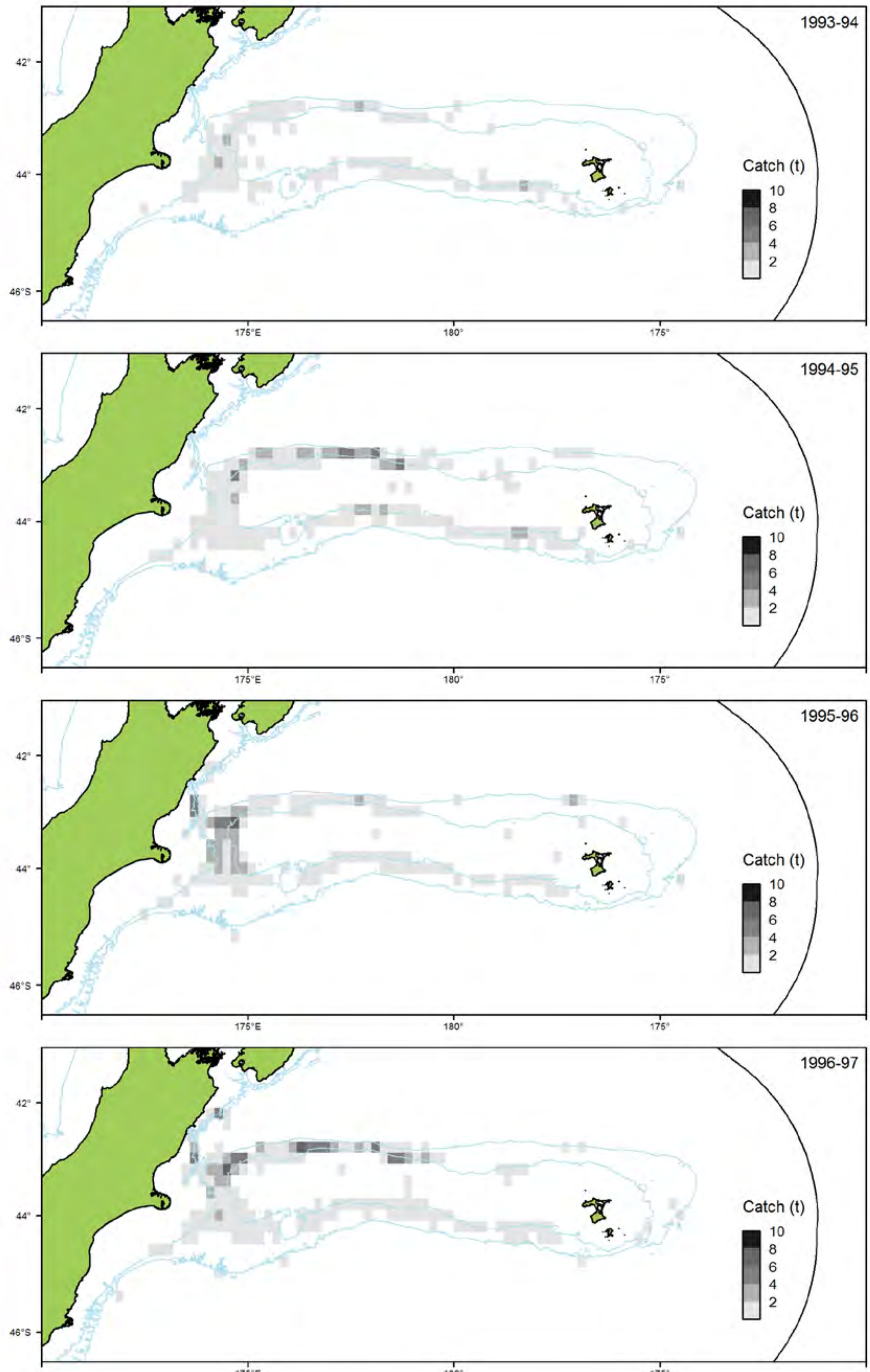


Figure C25 continued: Distribution of daily processed ribaldo catch taken by bottom trawl gear in the Eastern fishery aggregated into 0.2 degree spatial blocks for 1994 to 1997 fishing years from the TCEPR form.

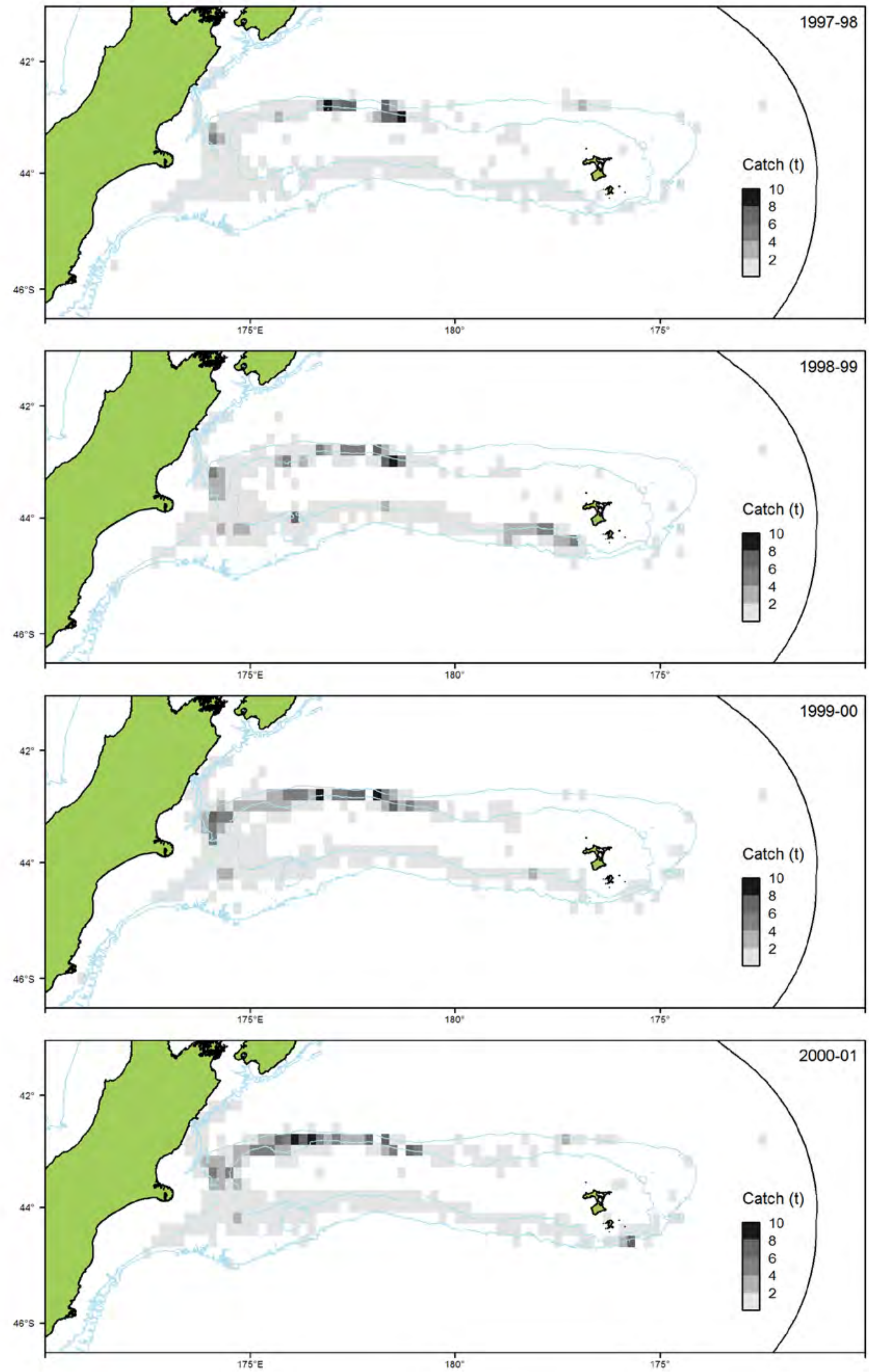


Figure C25 continued: Distribution of daily processed ribaldo catch taken by bottom trawl gear in the Eastern fishery aggregated into 0.2 degree spatial blocks for 1998 to 2001 fishing years from the TCEPR form.

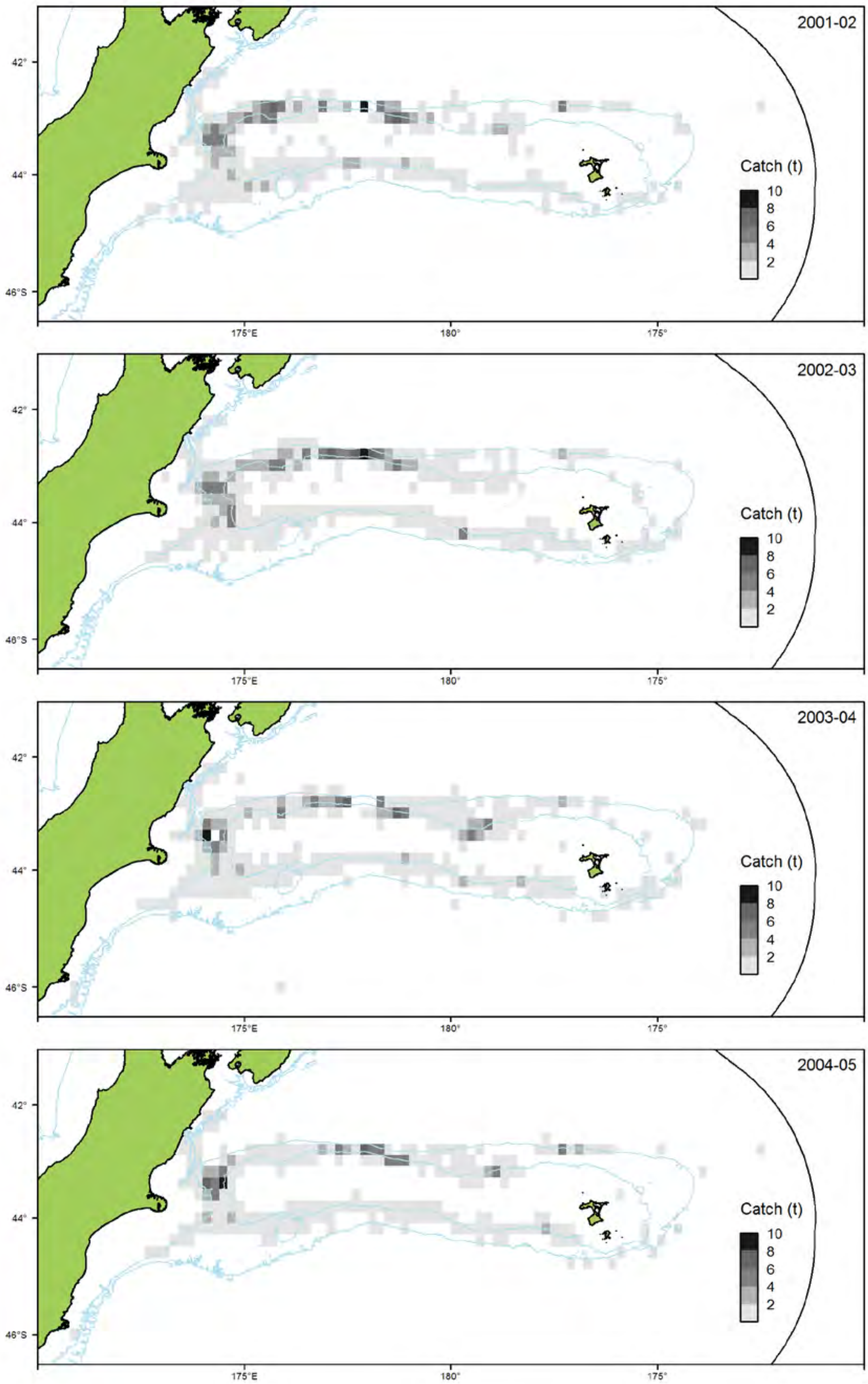


Figure C25 continued: Distribution of daily processed ribaldo catch taken by bottom trawl gear in the Eastern fishery aggregated into 0.2 degree spatial blocks for the 2002 to 2005 fishing years from the TCEPR form.

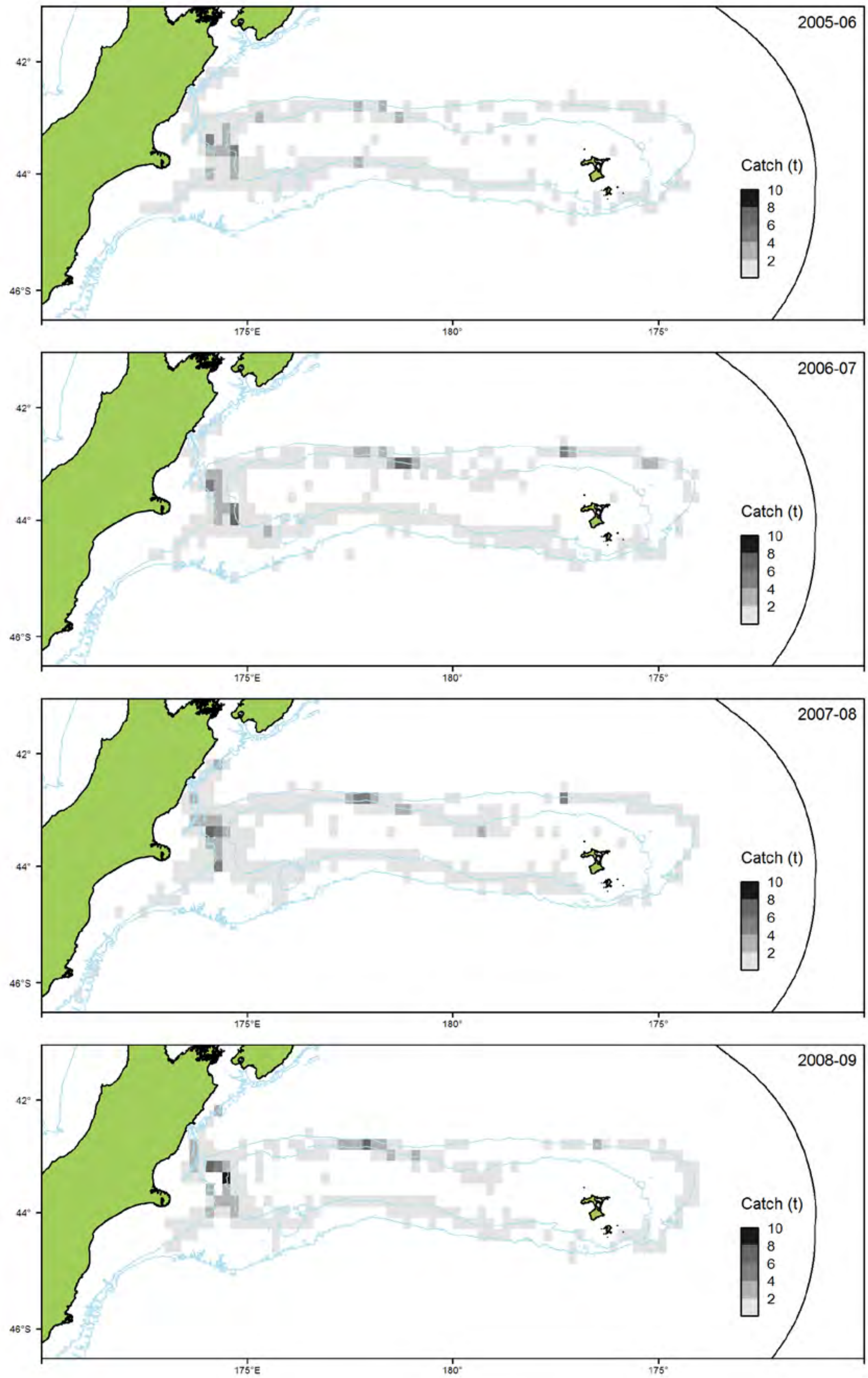


Figure C25 continued: Distribution of daily processed ribaldo catch taken by bottom trawl gear in the Eastern fishery aggregated into 0.2 degree spatial blocks for the 2006 to 2009 fishing years from the TCEPR form.

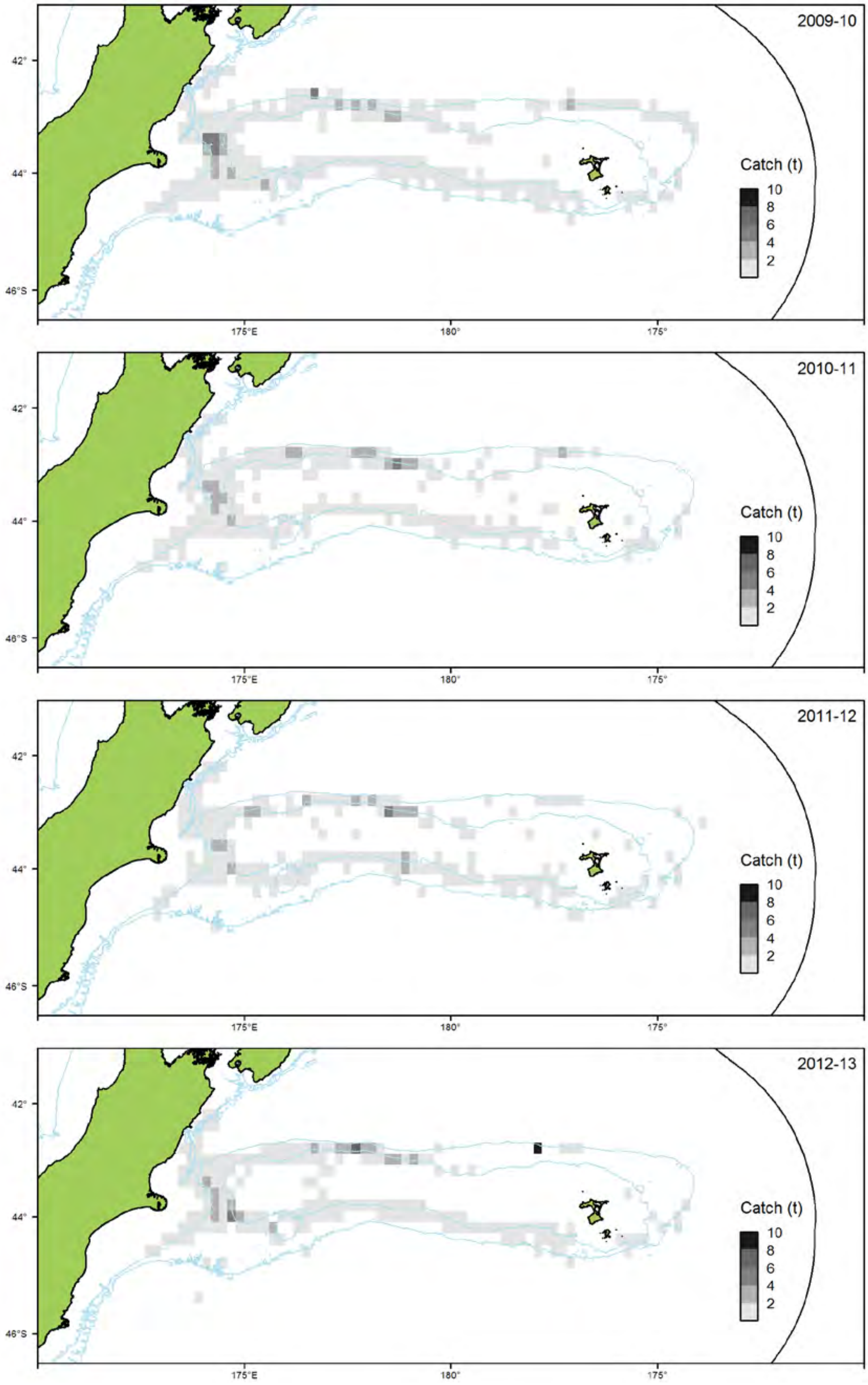


Figure C25 continued: Distribution of daily processed ribaldo catch taken by bottom trawl gear in the Eastern fishery aggregated into 0.2 degree spatial blocks for the 2010 to 2013 fishing years from the TCEPR form.

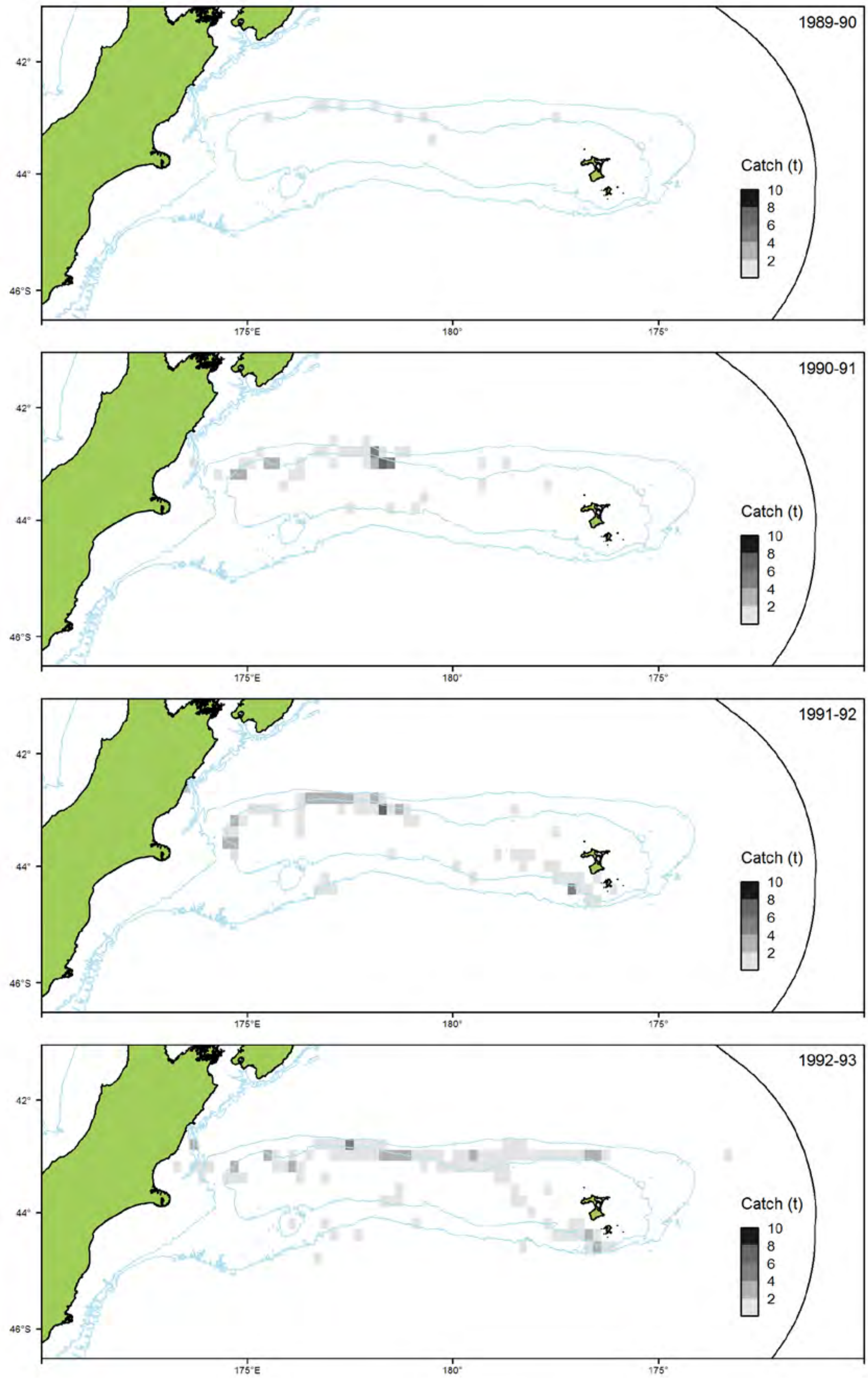


Figure C26: Distribution of estimated ribaldo catch taken by bottom long line gear in the Eastern fishery aggregated into 0.2 degree spatial blocks for fishing years 1994–1997.

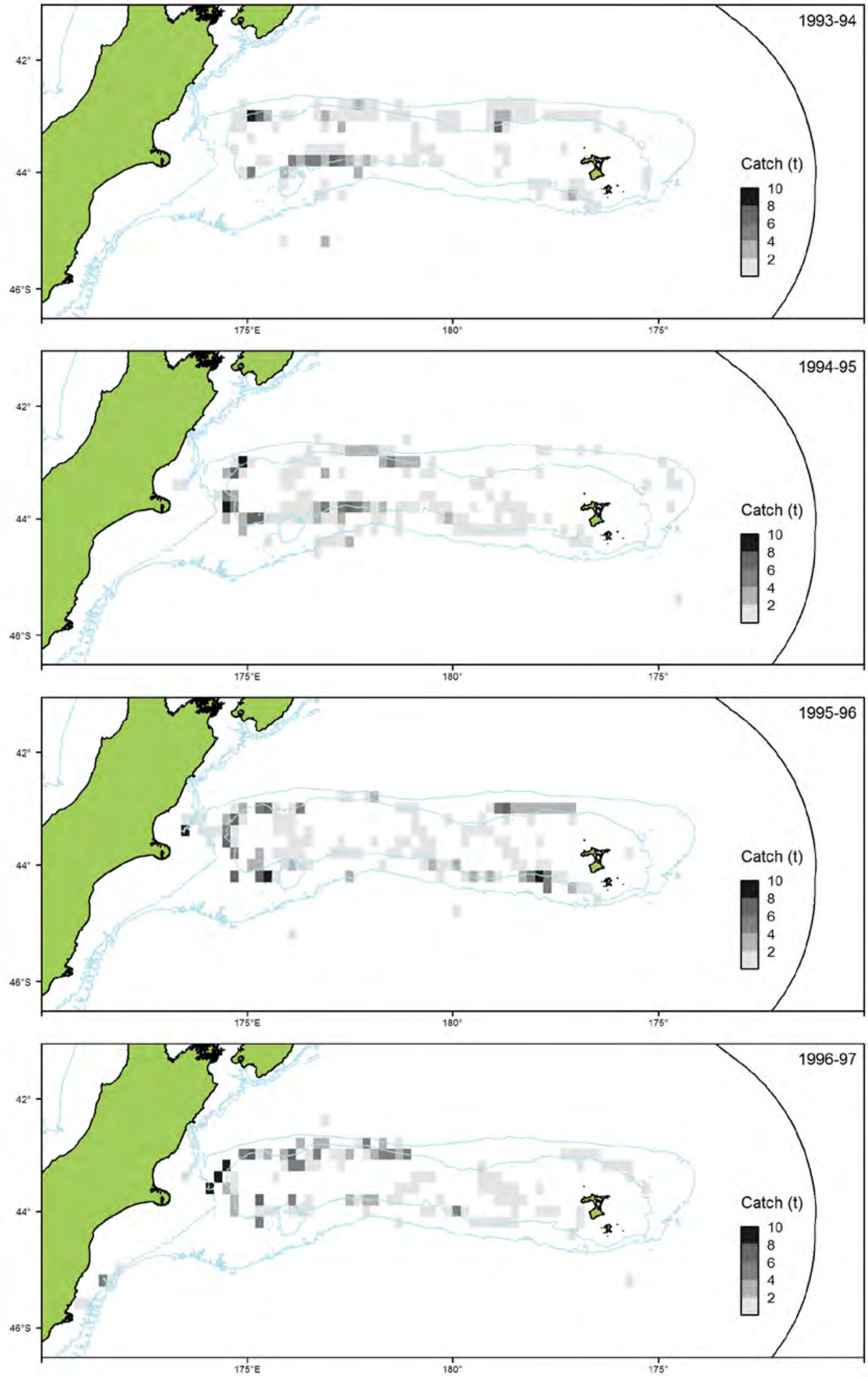


Figure C26 continued: Distribution of estimated ribaldo catch taken by bottom long line gear in the Eastern fishery aggregated into 0.2 degree spatial blocks for fishing years 1994–1997.

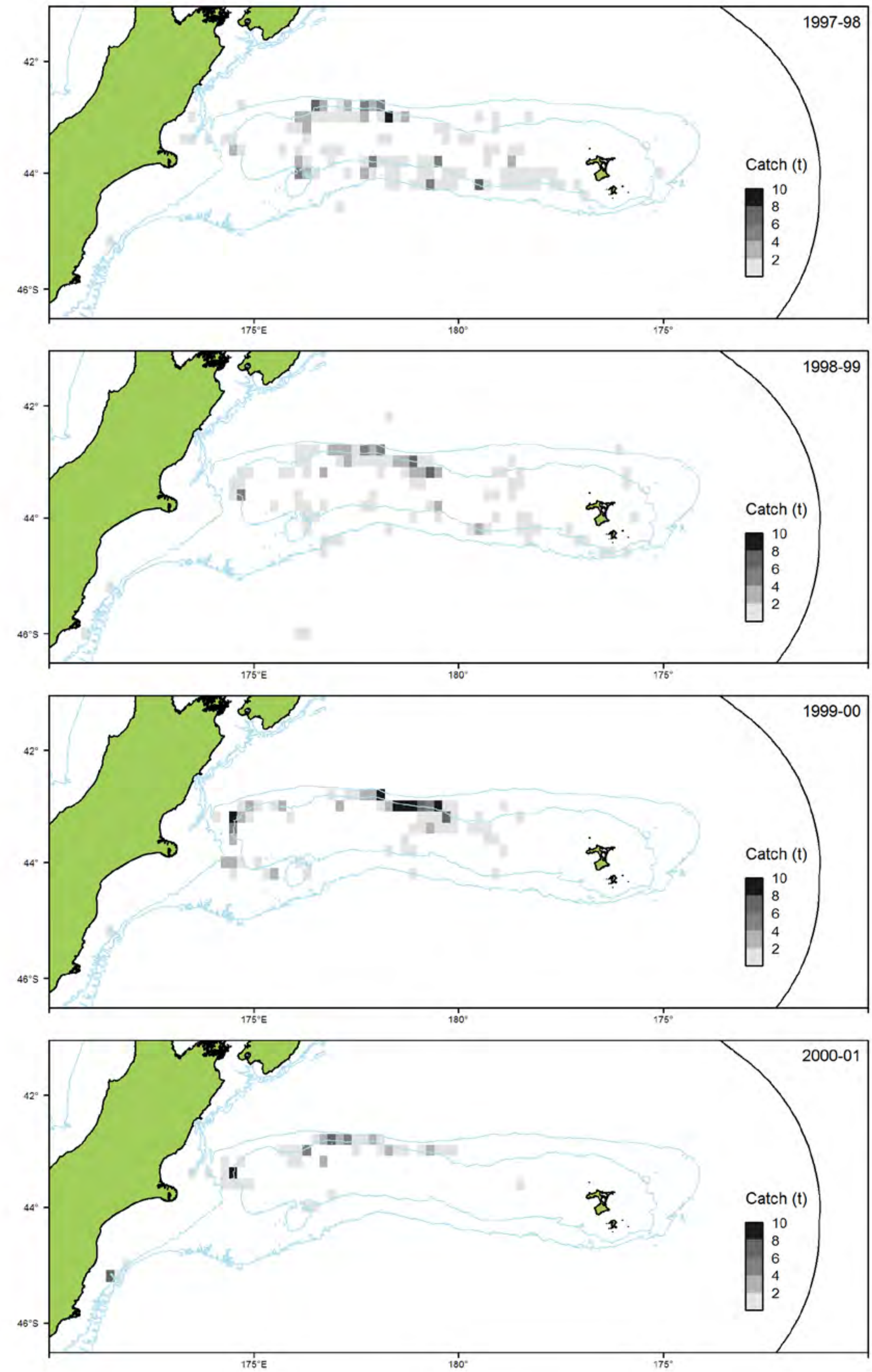


Figure C26 continued: Distribution of estimated ribaldo catch taken by bottom long line gear in the Eastern fishery aggregated into 0.2 degree spatial blocks for fishing years 1998–2001.

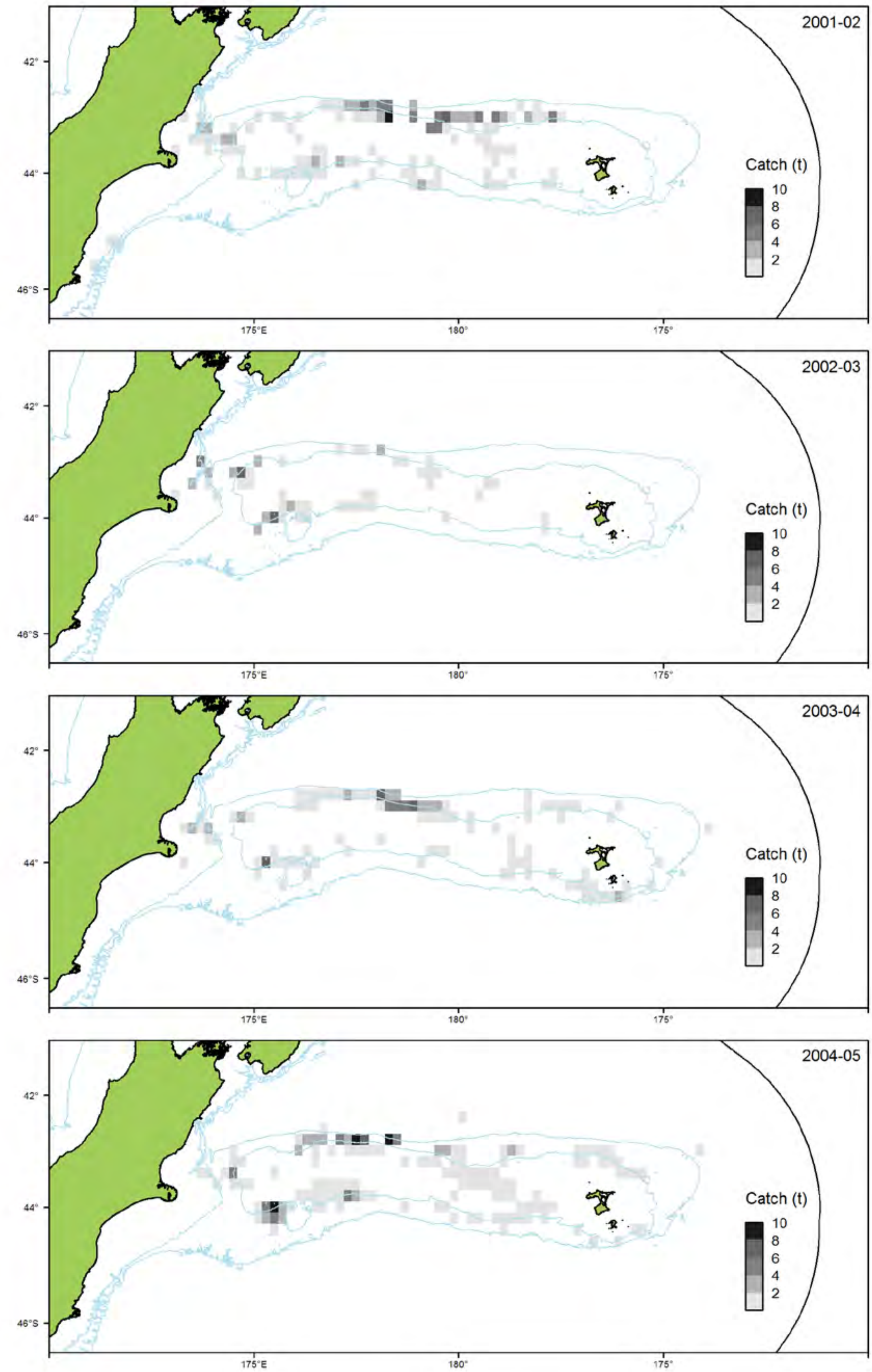


Figure C26 continued: Distribution of estimated ribaldo catch taken by bottom long line gear in the Eastern fishery aggregated into 0.2 degree spatial blocks for fishing years 2002–2005.

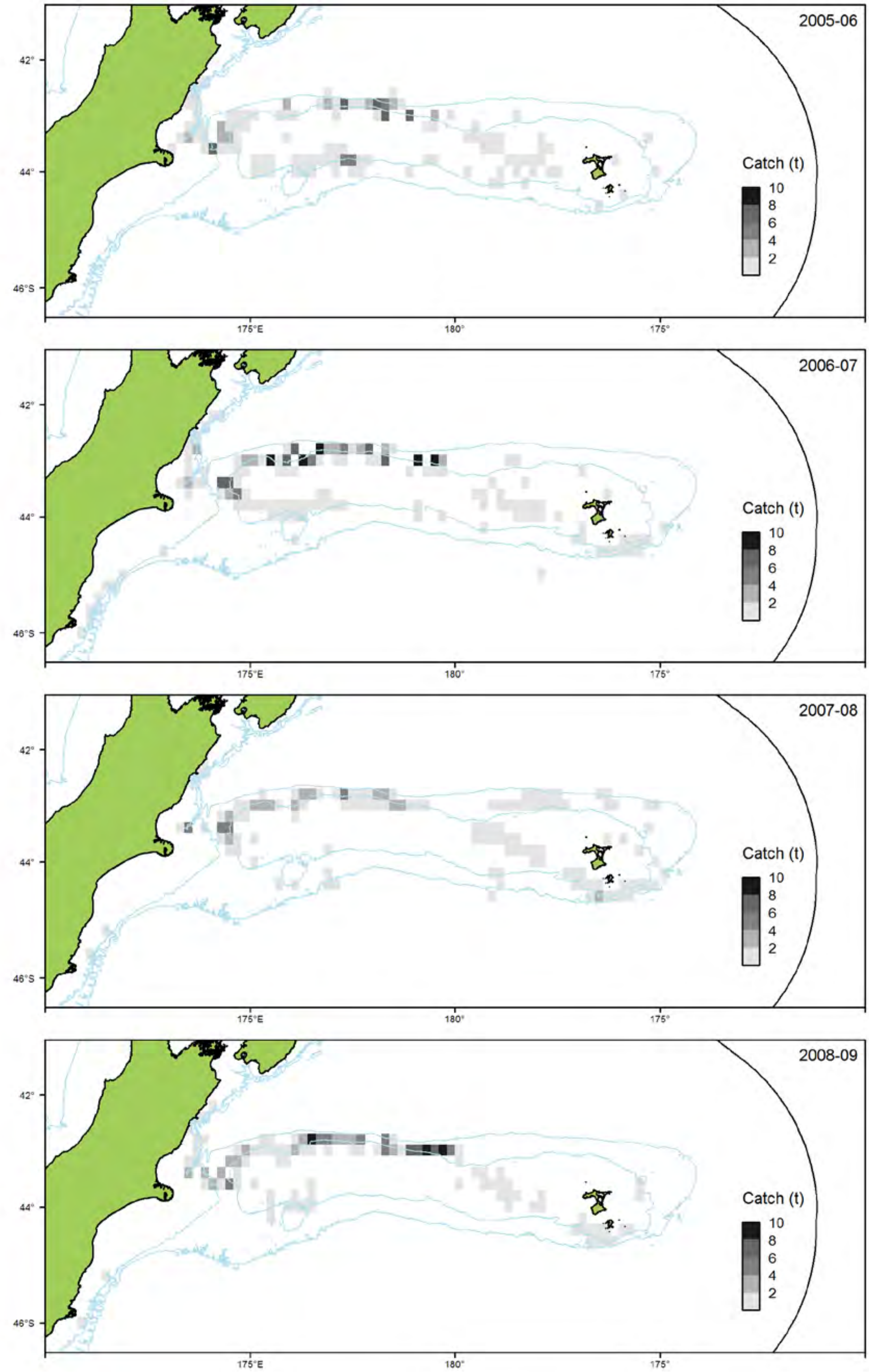


Figure C26 continued: Distribution of estimated ribaldo catch taken by bottom long line gear in the Eastern fishery aggregated into 0.2 degree spatial blocks for fishing years 2006–2009.

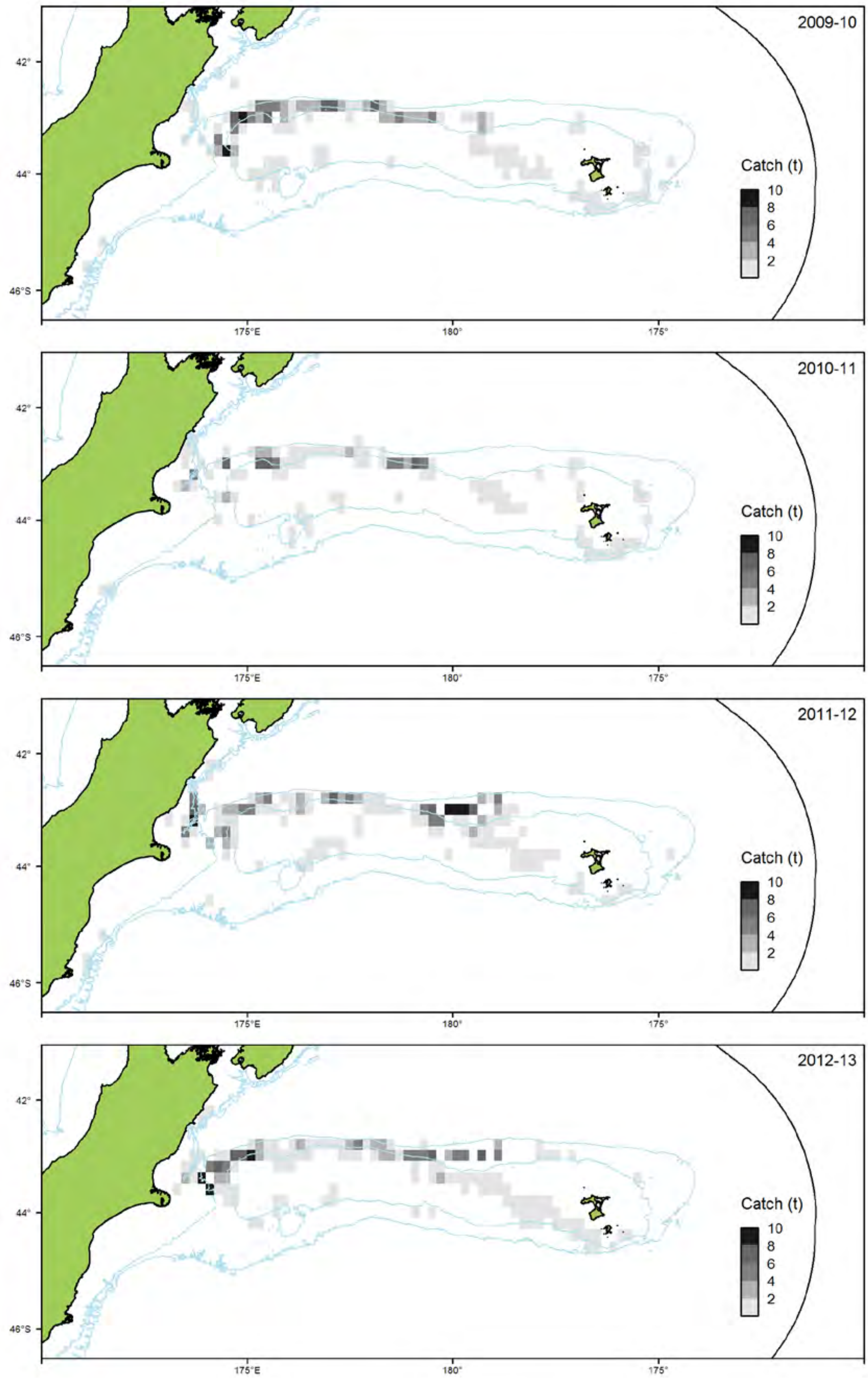


Figure C26 continued: Distribution of estimated ribaldo catch taken by bottom long line gear in the Eastern fishery aggregated into 0.2 degree spatial blocks for fishing years 2010–2013.

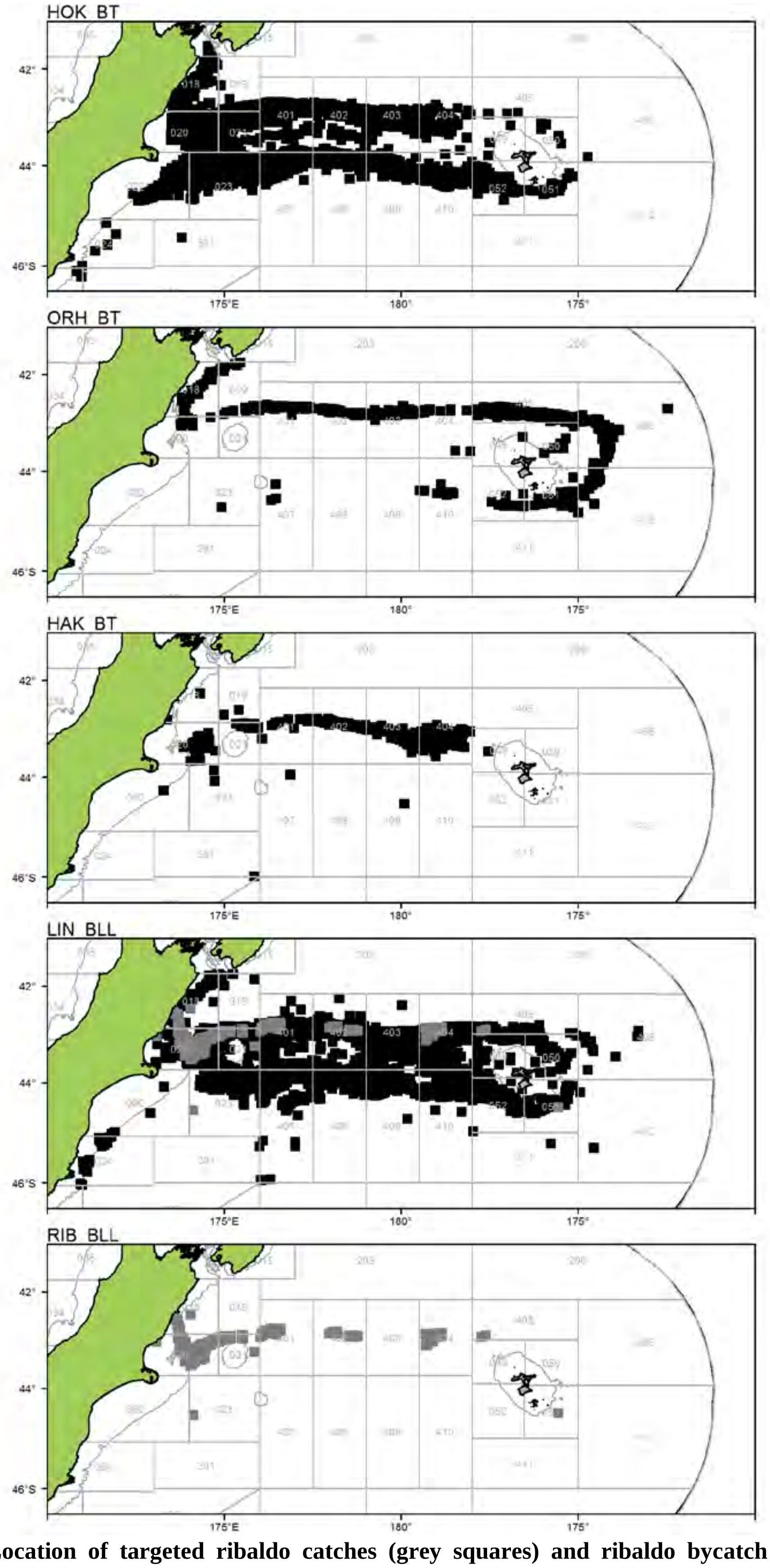


Figure C27: Location of targeted ribaldo catches (grey squares) and ribaldo bycatch (black squares) for the main target species and methods for all years combined. NB: there has been no targeting of ribaldo by bottom trawl in the Eastern fishery.

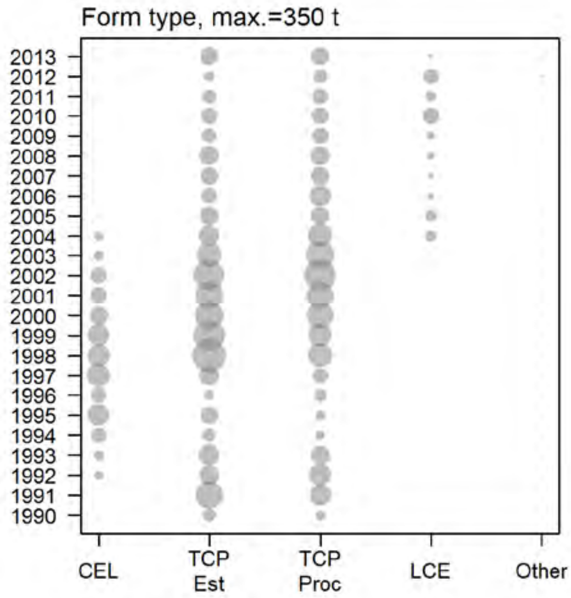


Figure C28a: Distribution of annual ribaldo catch by form type in the Southern fishery (see Figure 2) for the estimated and merged daily processed data. Circle size is proportional to catch; maximum circle size is 350 t. CEL is Catch Effort Landing Return, TCP Est is estimated catch data from the Trawl, Catch, Effort, and Processing Return; TCP Proc is daily processed data from the Trawl, Catch, Effort, and Processing Return; LCE is Lining Catch Effort Return.

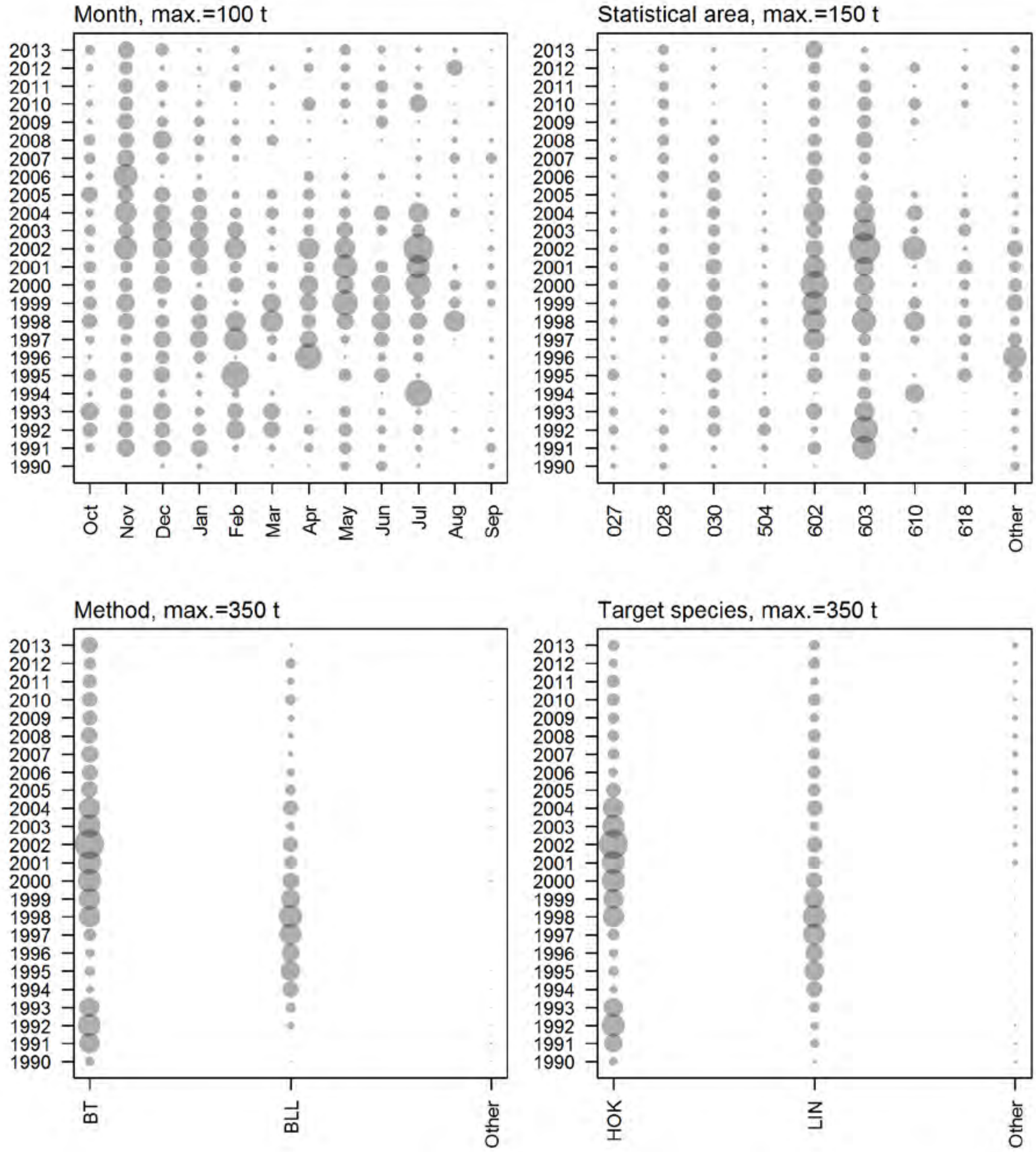


Figure C28b: Distribution of annual ribaldo catch by month, statistical area, method, and target species in the Southern fishery for all merged data. Circle size is proportional to catch; maximum circle size is indicated on each plot.

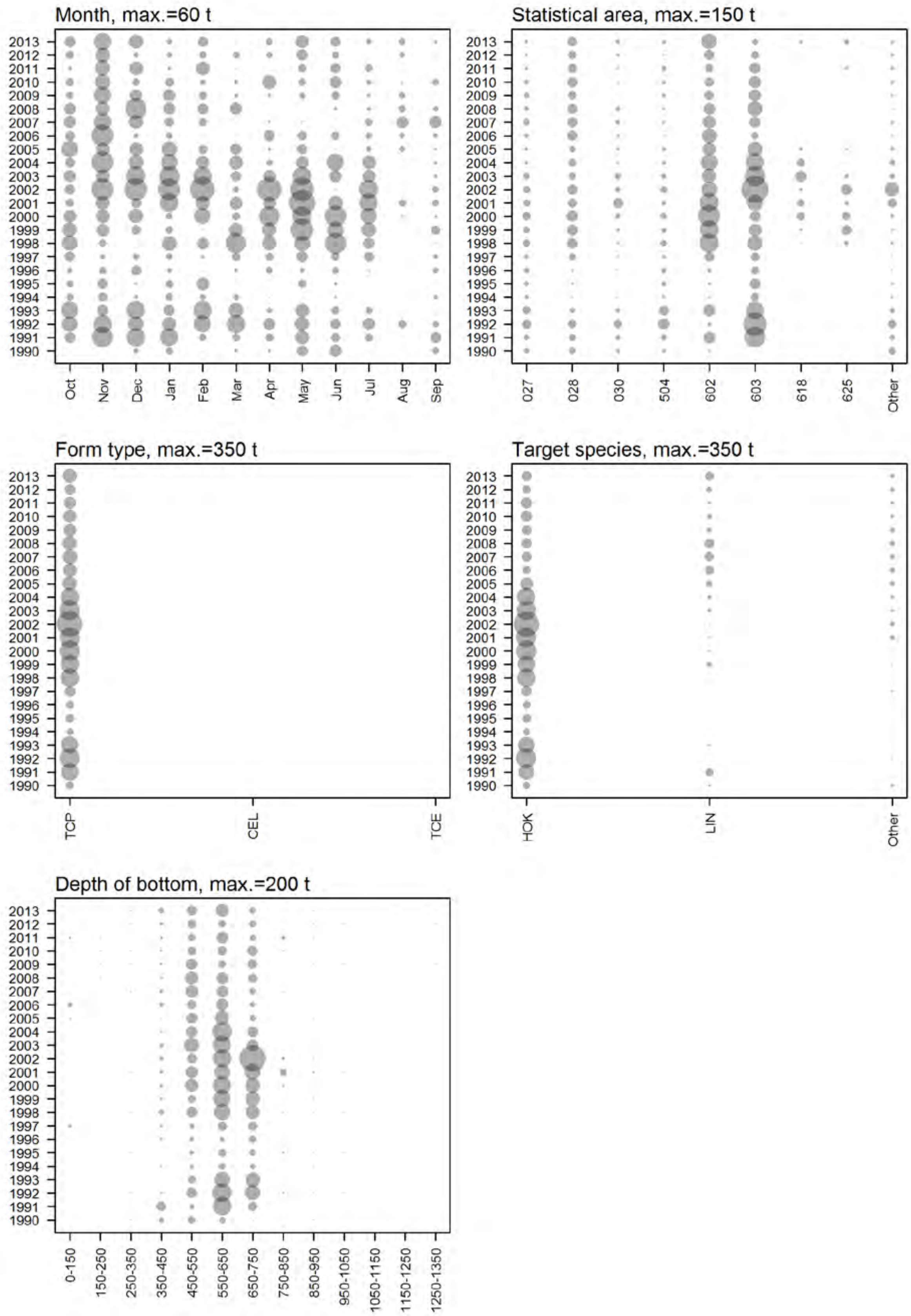


Figure C28c: Distribution of annual ribaldo catch by month, statistical area, form type, target species, and depth in the Southern fishery for daily processed catch from bottom trawling. Circle size is proportional to catch; maximum circle size is indicated on each plot.

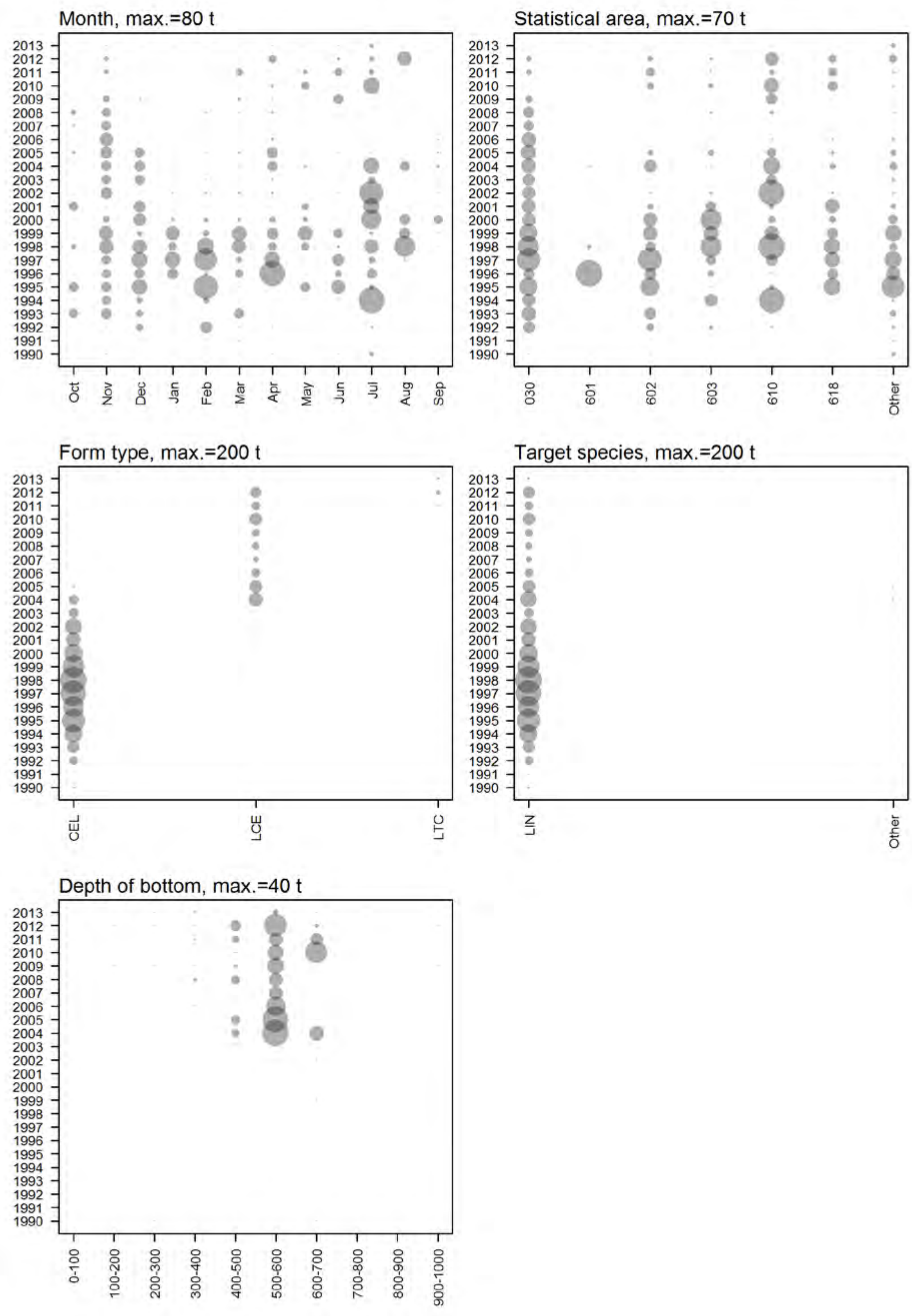


Figure C28d: Distribution of annual ribaldo catch by month, statistical area, form type, target species, and depth in the Southern fishery for estimated catch from bottom long lining. Circle size is proportional to catch; maximum circle size is indicated on each plot. NB: depth of bottom was not recorded until bottom longline vessels started to record on LCE forms.

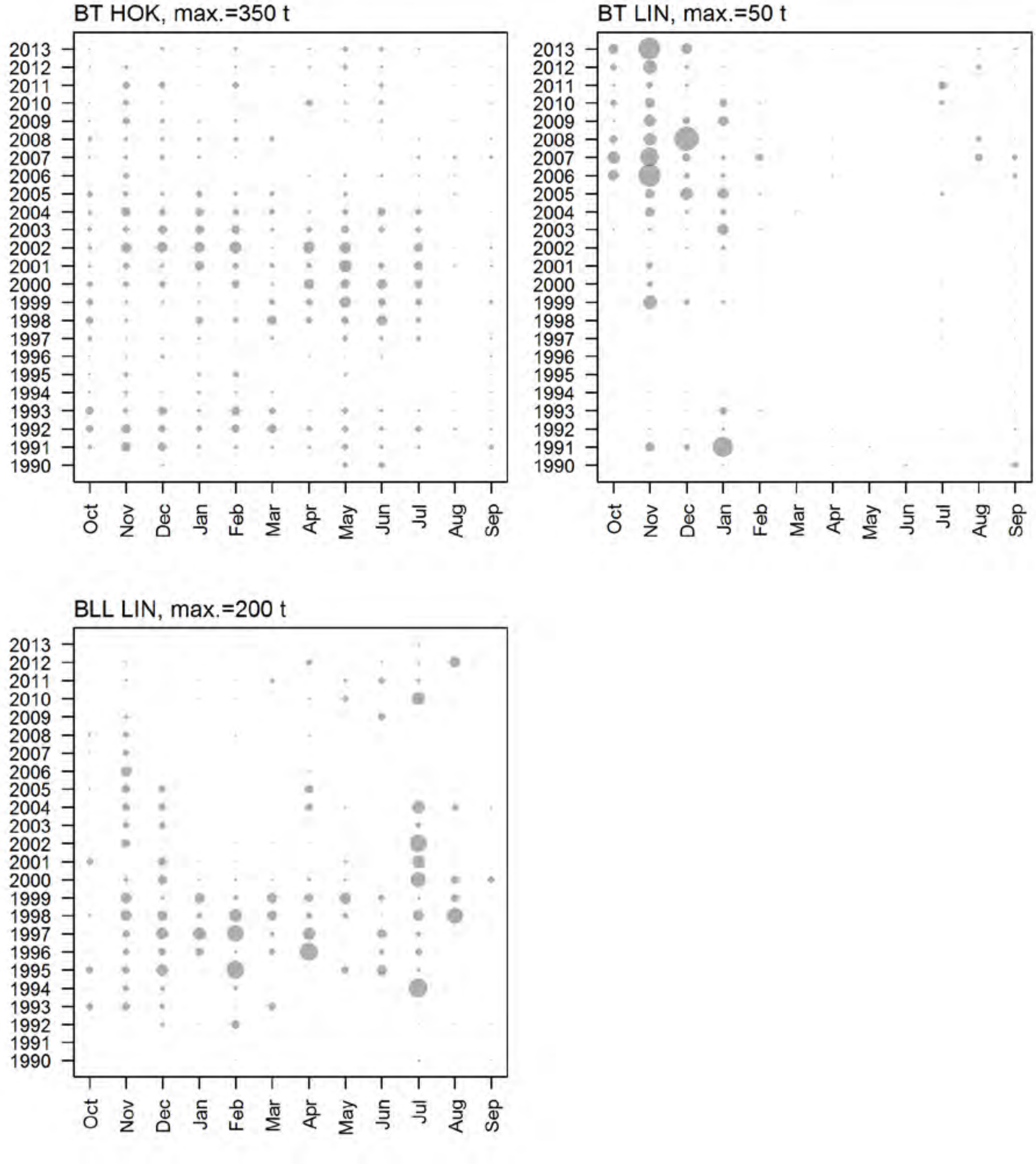


Figure C29: Distribution of annual ribaldo catch (t) in the Southern fishery by method and target species for each year and month. BT data is daily processed catch, BLL data is estimated catch. Circle size is proportional to catch; maximum circle size is indicated on the top left hand corner of each plot.

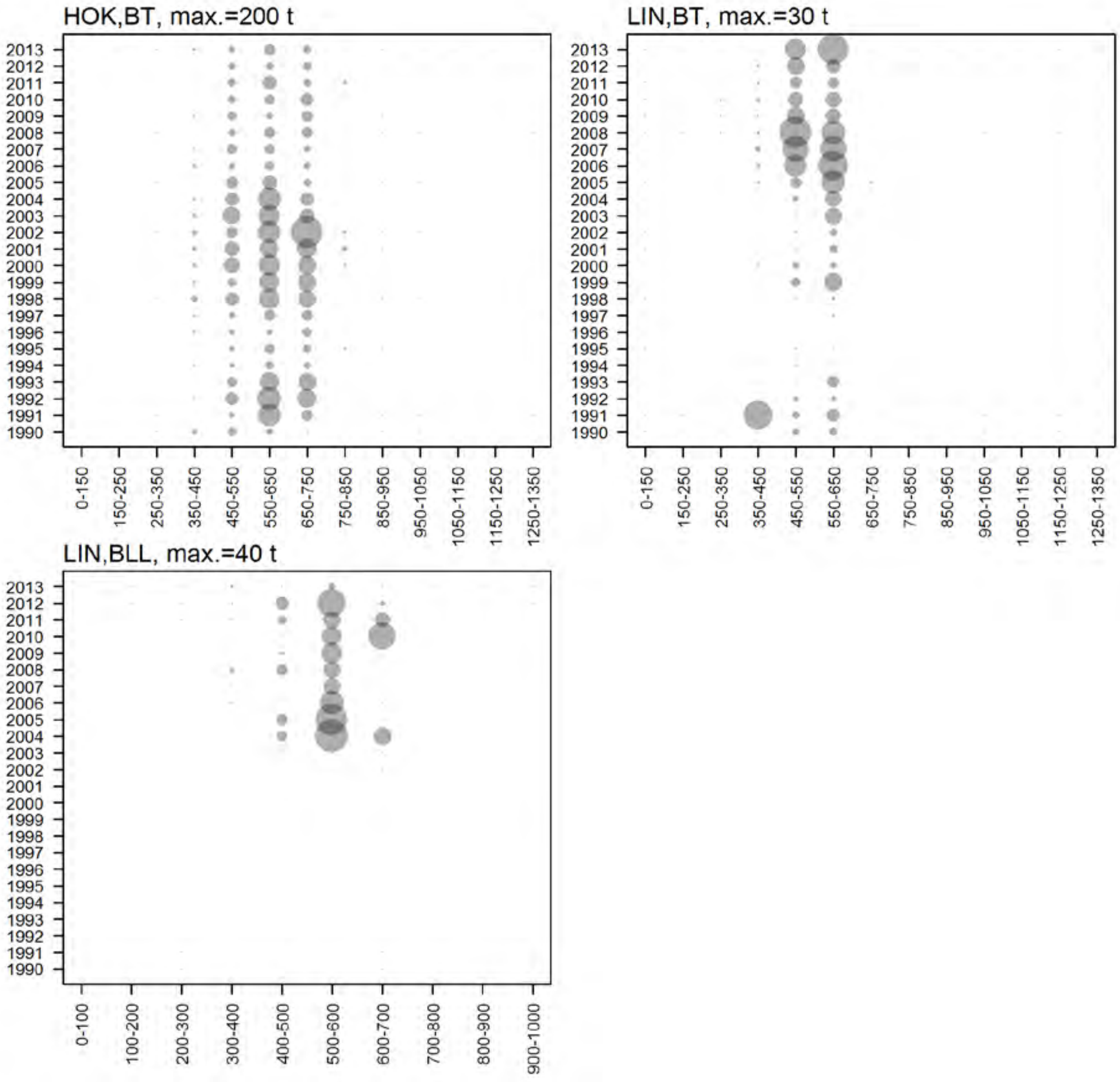
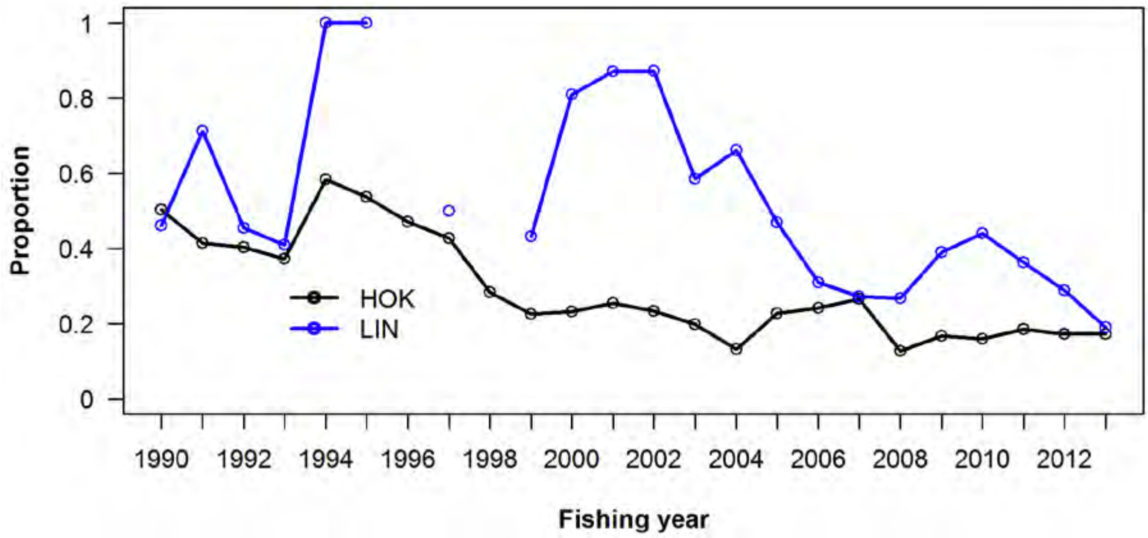


Figure C30: Distribution of annual ribaldo catch (t) by depth in the Southern fishery by main method and main target species. BT data is daily processed catch, BLL data is estimated catch. Circle size is proportional to catch; maximum circle size is indicated on the top left hand corner of each plot.



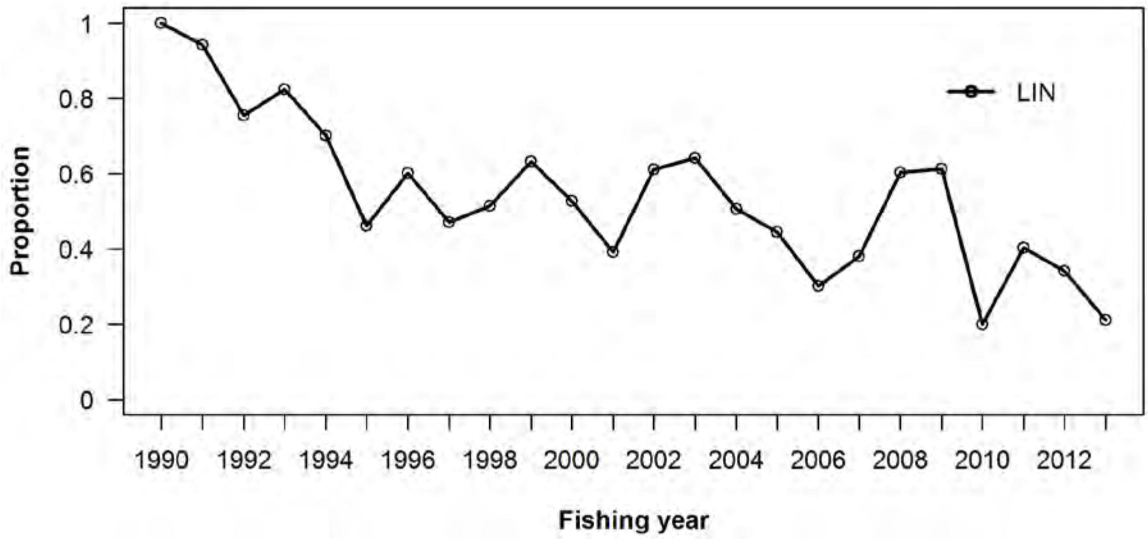


Figure C31: Proportion of days that recorded no processed ribaldo by target species in the daily processed data for bottom trawl (top plot), and proportion of bottom long line sets that reported no estimated ribaldo catch for the unmerged data by target species (bottom plot) in the Southern fishery.

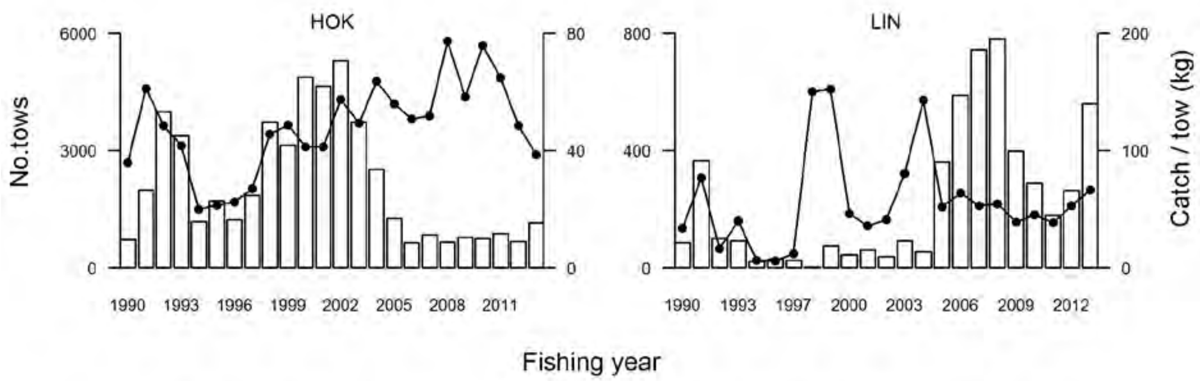


Figure C32: Unstandardised catch rates of ribaldo by main target species (kg/tow) and the number of tows in the Southern fishery using bottom trawl gear.

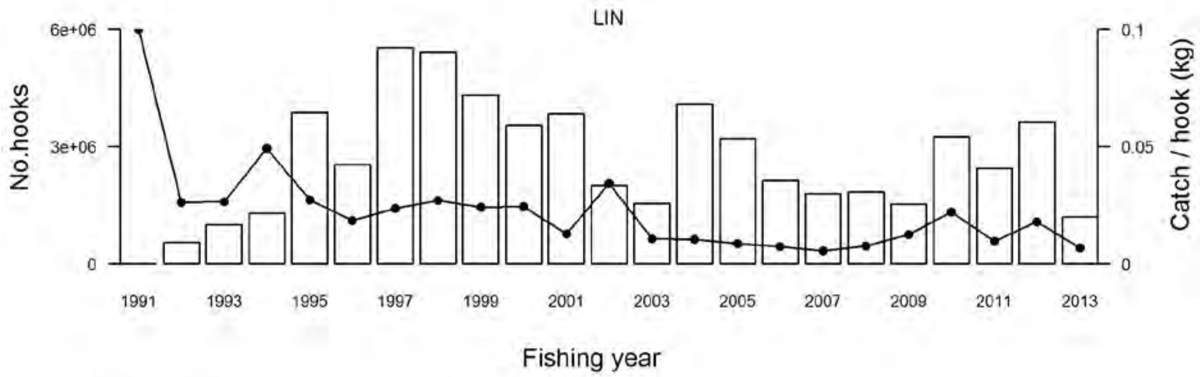


Figure C33: Unstandardised catch rates of ribaldo by main target species (kg/hook) and the number of hooks in the Southern fishery using bottom long line.

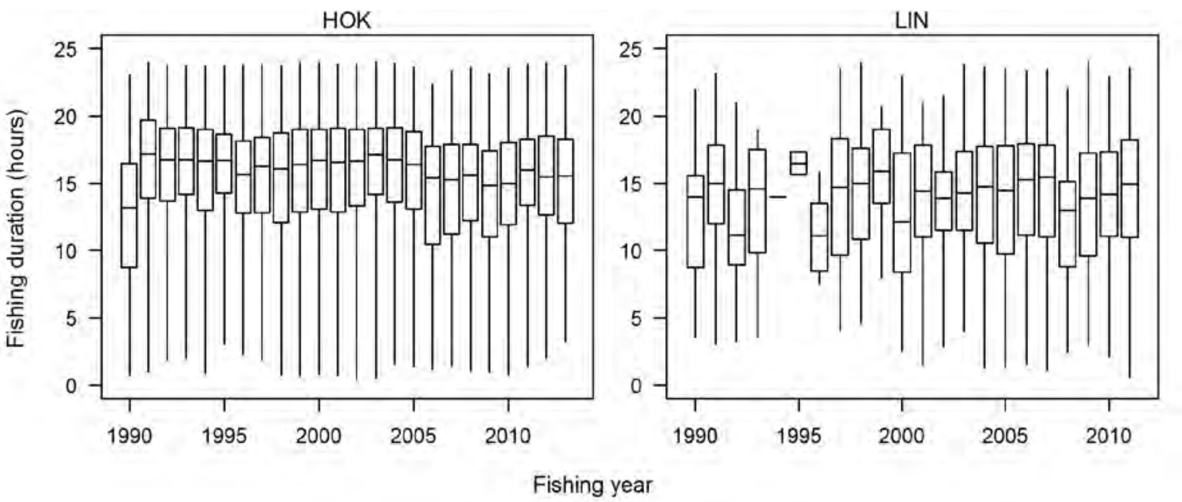


Figure C34: Annual median (horizontal line), inter-quartile range (box), and range (vertical lines) for summed daily tow durations (hours) reported by main target species in the Southern fishery catching ribaldo using bottom trawl gear.

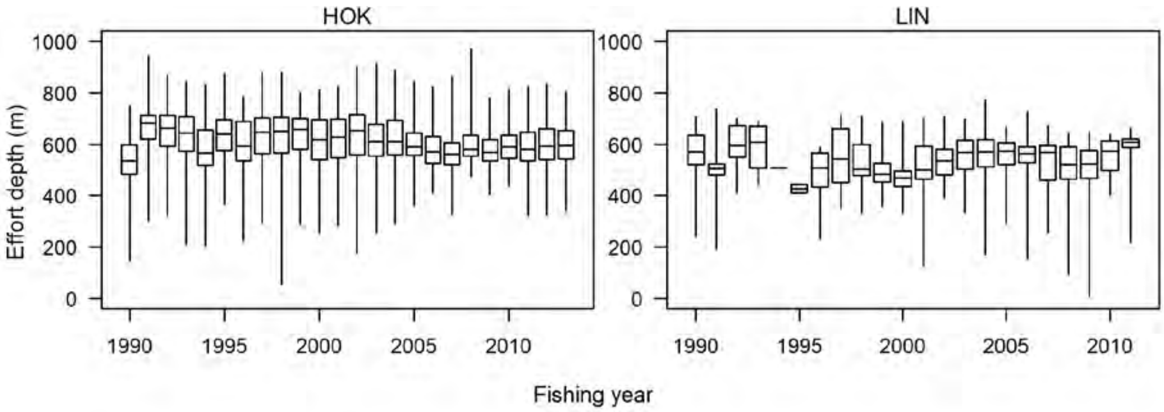


Figure C35: Annual median (horizontal line), inter-quartile range (box), and range (vertical lines) for mean daily effort depth (m) reported by main target species in the Southern fishery catching ribaldo using bottom trawl gear.

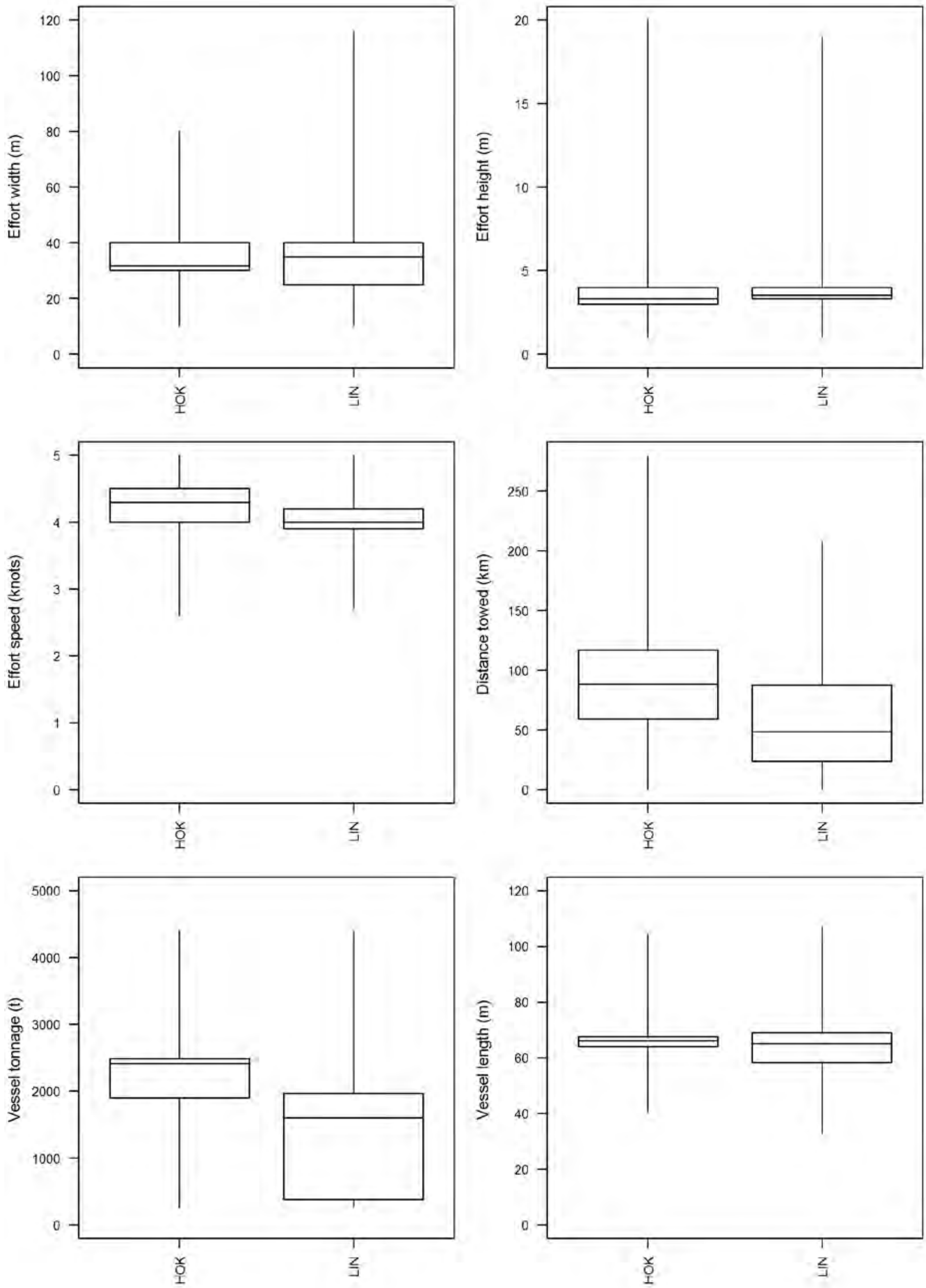


Figure C36: Median (horizontal line), inter-quartile range (box), and range (vertical lines) for distribution of other fishing effort variables and vessel characteristics by main target species in the Southern fishery catching ribaldo using bottom trawl gear.

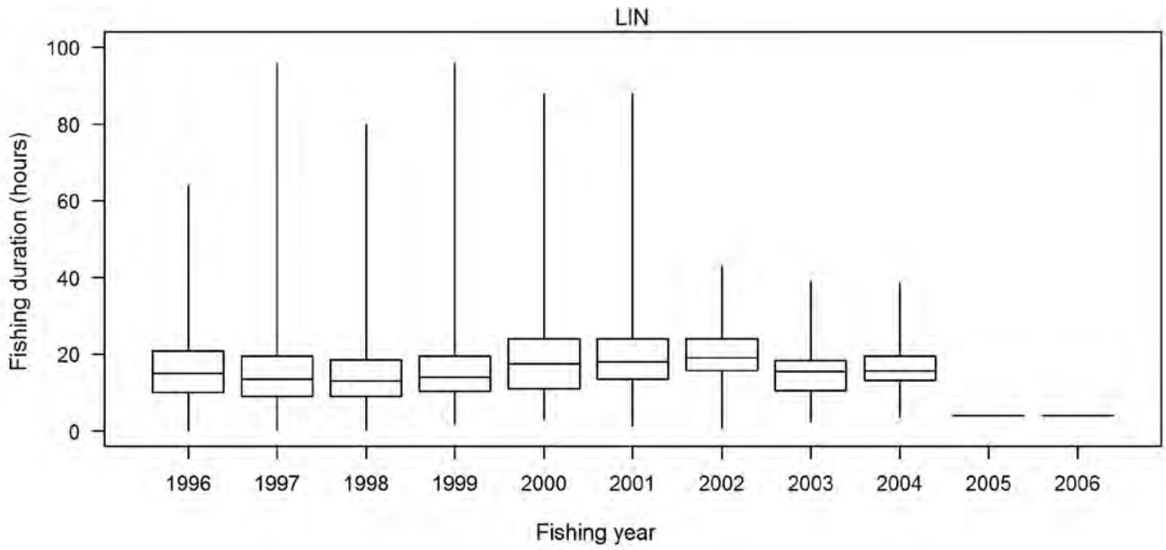


Figure C37: Annual median (horizontal line), inter-quartile range (box), and range (vertical lines) for fishing duration (hours) reported by main target species in the Southern fishery catching ribaldo using bottom long line gear.

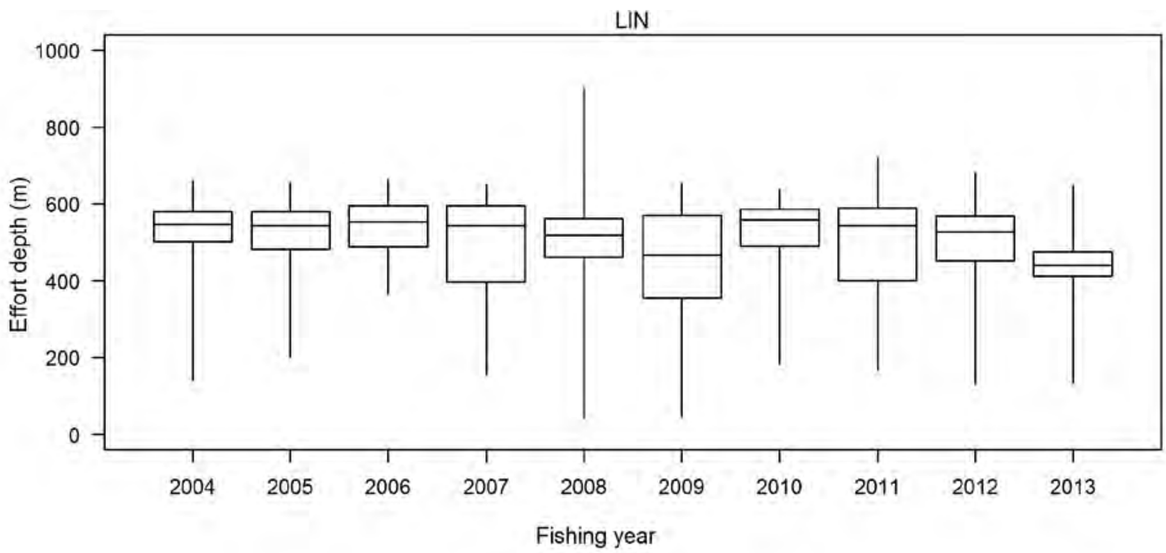


Figure C38: Annual median (horizontal line), inter-quartile range (box), and range (vertical lines) for daily effort depth (m) reported by main target species in the Southern fishery catching ribaldo using bottom long line gear.

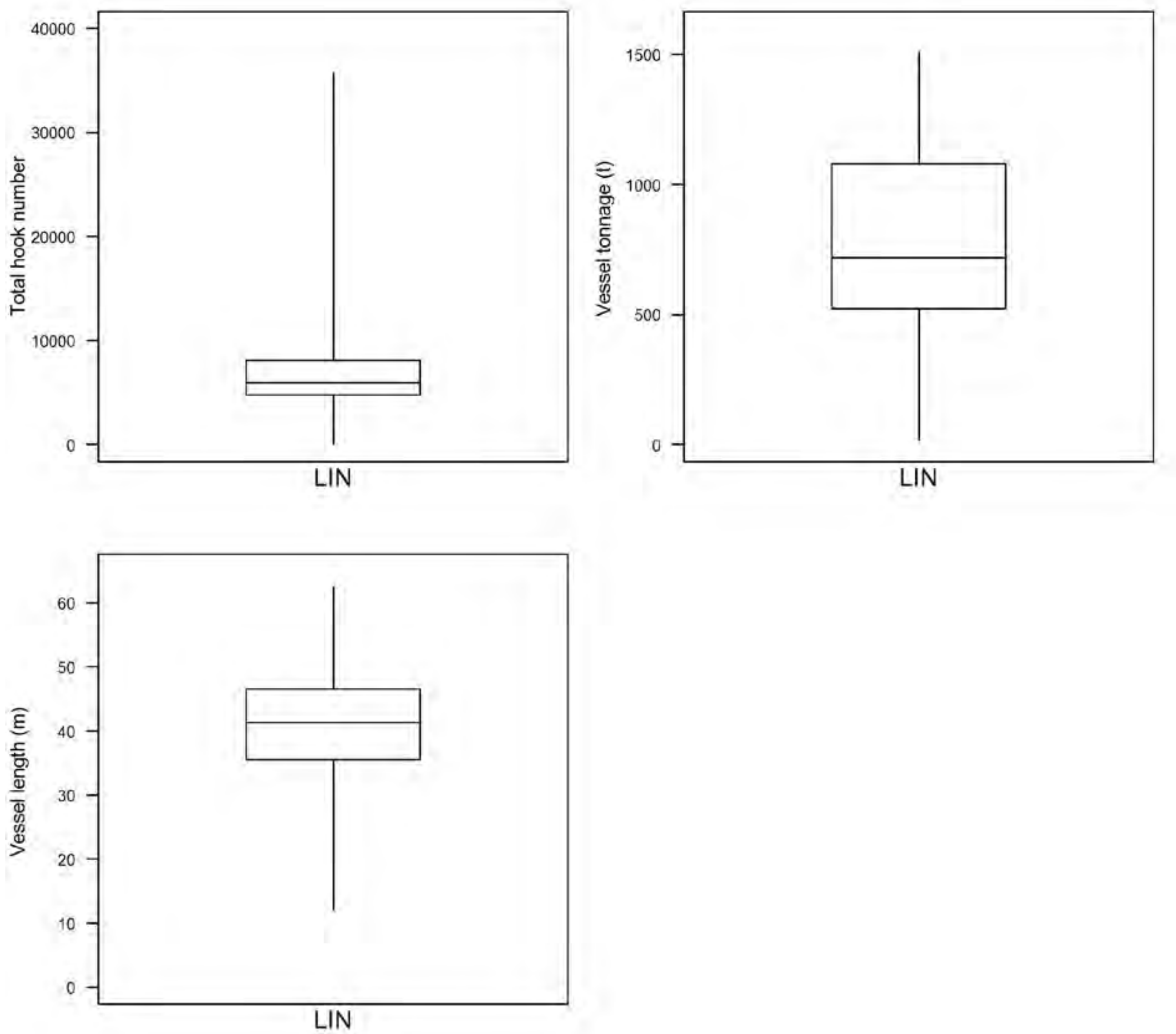


Figure C39: Median (horizontal line), inter-quartile range (box), and range (vertical lines) for distribution of other fishing effort variables and vessel characteristics by main target species in the Southern fishery catching ribaldo using bottom long line gear.

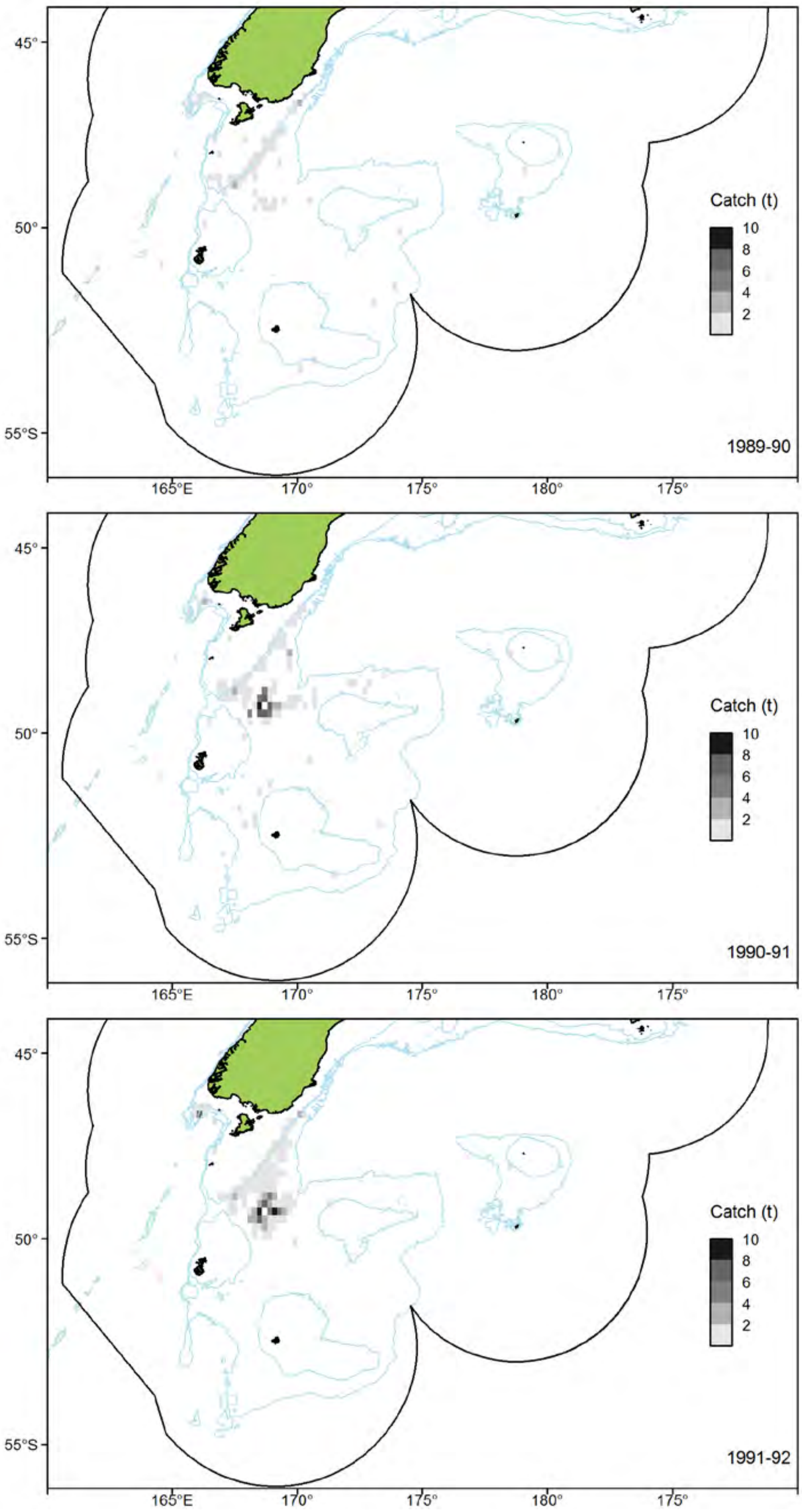


Figure C40: Distribution of daily processed ribaldo catch taken by bottom trawl gear in the Southern fishery aggregated into 0.2 degree spatial blocks for the 1990 to 1992 fishing years from the TCEPR form.

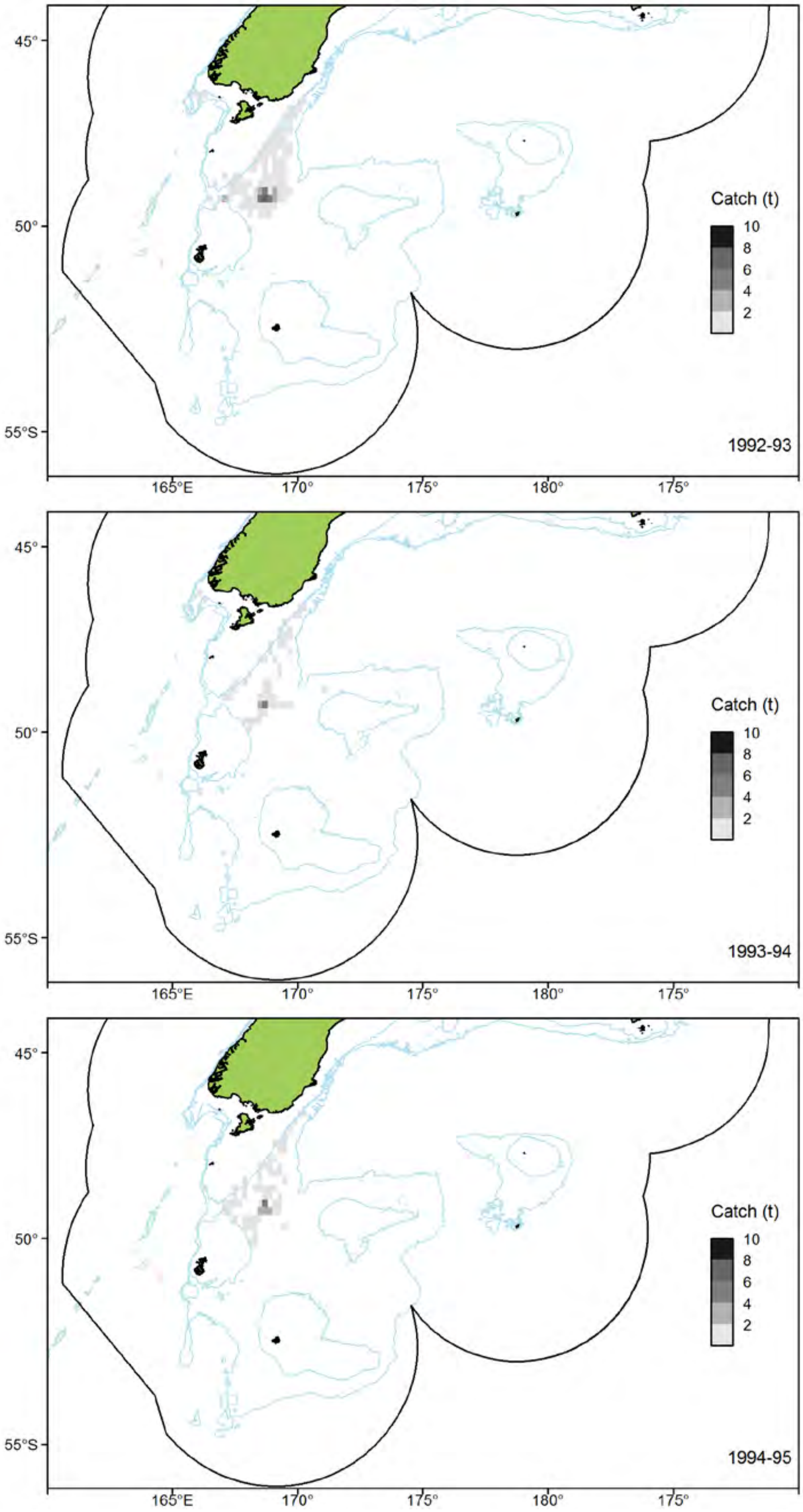


Figure C40 continued: Distribution of daily processed ribaldo catch taken by bottom trawl gear in the Southern fishery aggregated into 0.2 degree spatial blocks for the 1993 to 1995 fishing years from the TCEPR form.

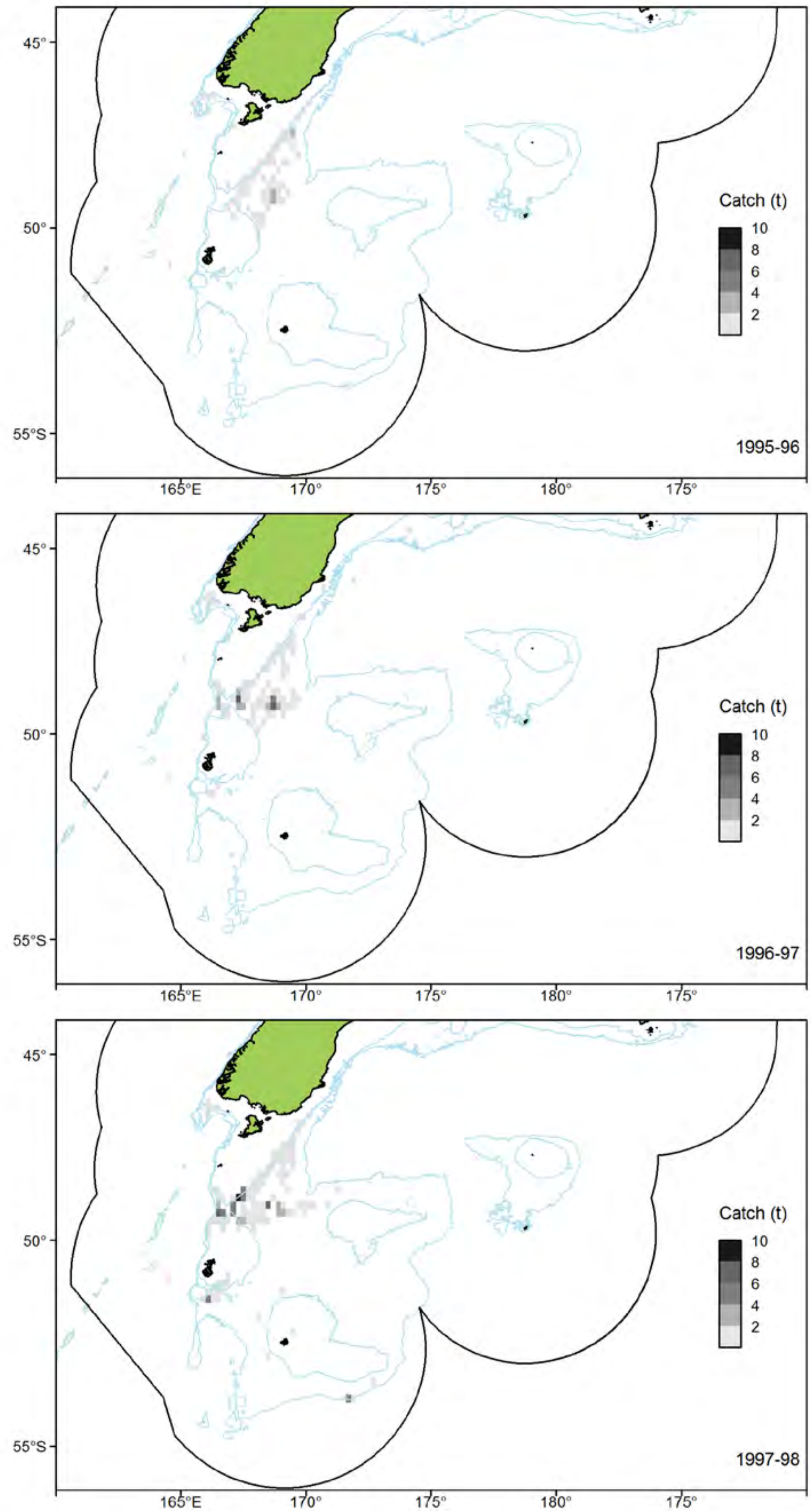


Figure C40 continued: Distribution of daily processed ribaldo catch taken by bottom trawl gear in the Southern fishery aggregated into 0.2 degree spatial blocks for the 1996 to 1998 fishing years from the TCEPR form.

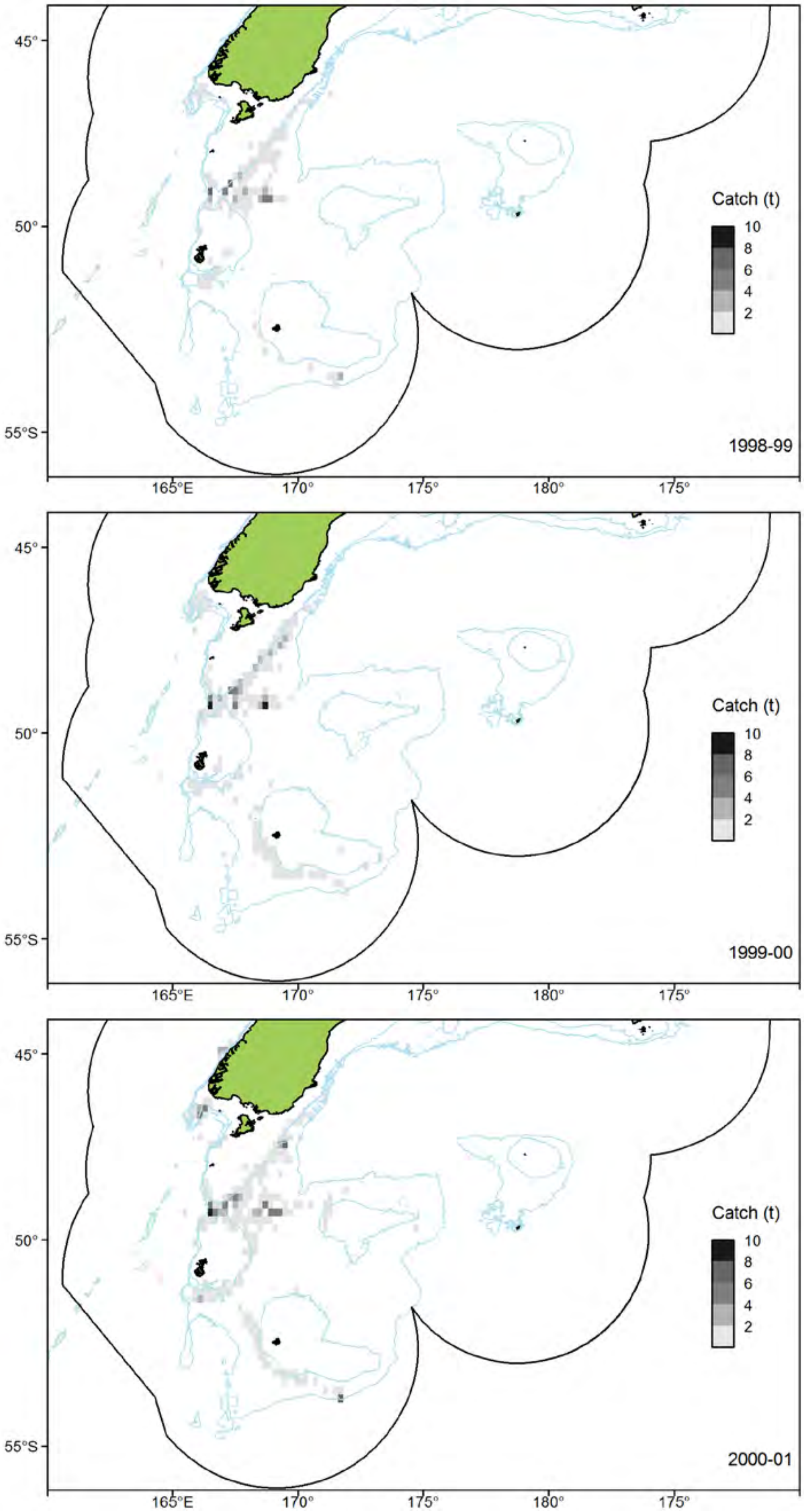


Figure C40 continued: Distribution of daily processed ribaldo catch taken by bottom trawl gear in the Southern fishery aggregated into 0.2 degree spatial blocks for the 1999 to 2001 fishing years from the TCEPR form.

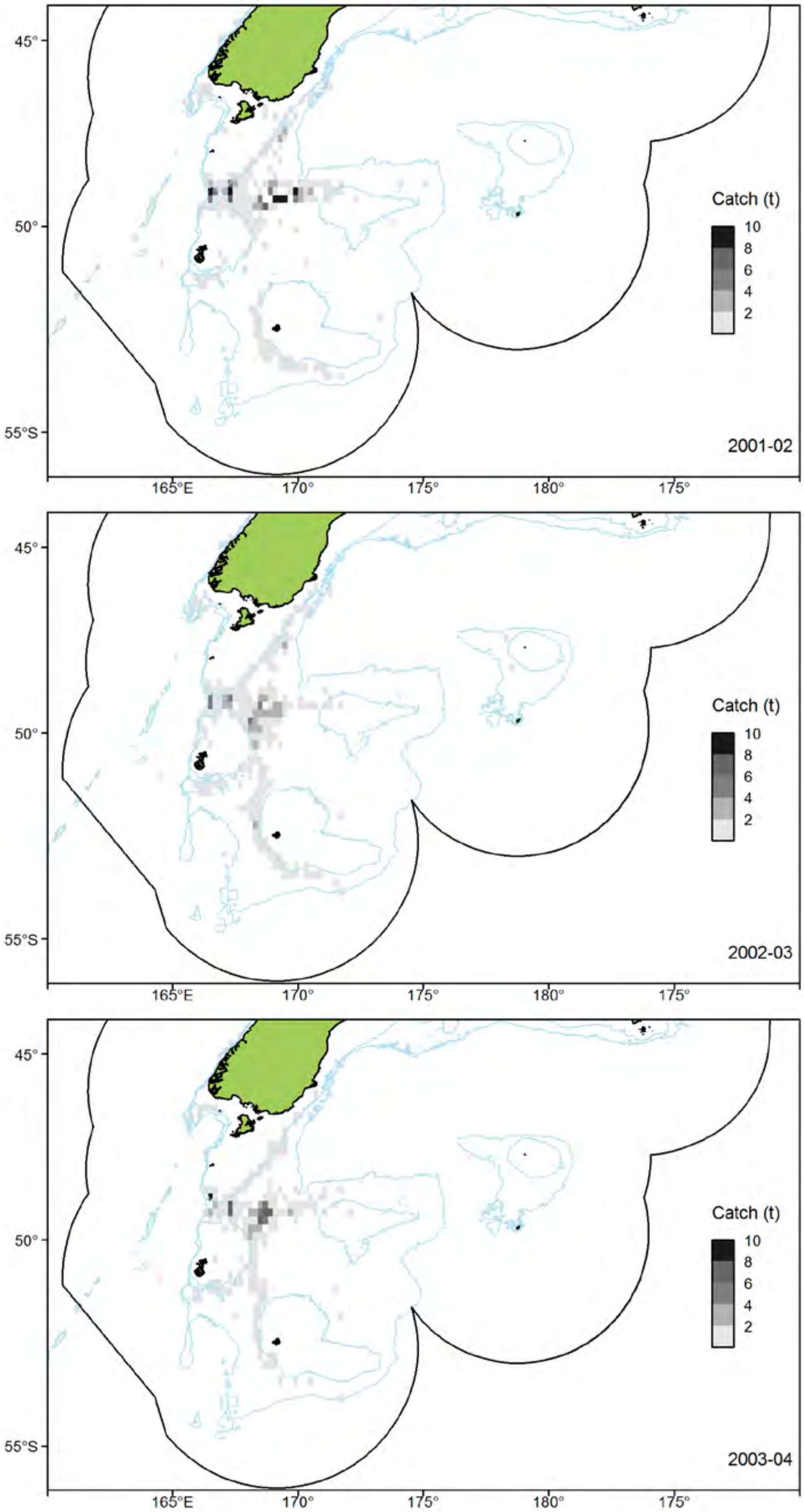


Figure C40 continued: Distribution of daily processed ribaldo catch taken by bottom trawl gear in the Southern fishery aggregated into 0.2 degree spatial blocks for the 2002 to 2004 fishing years from the TCEPR form.

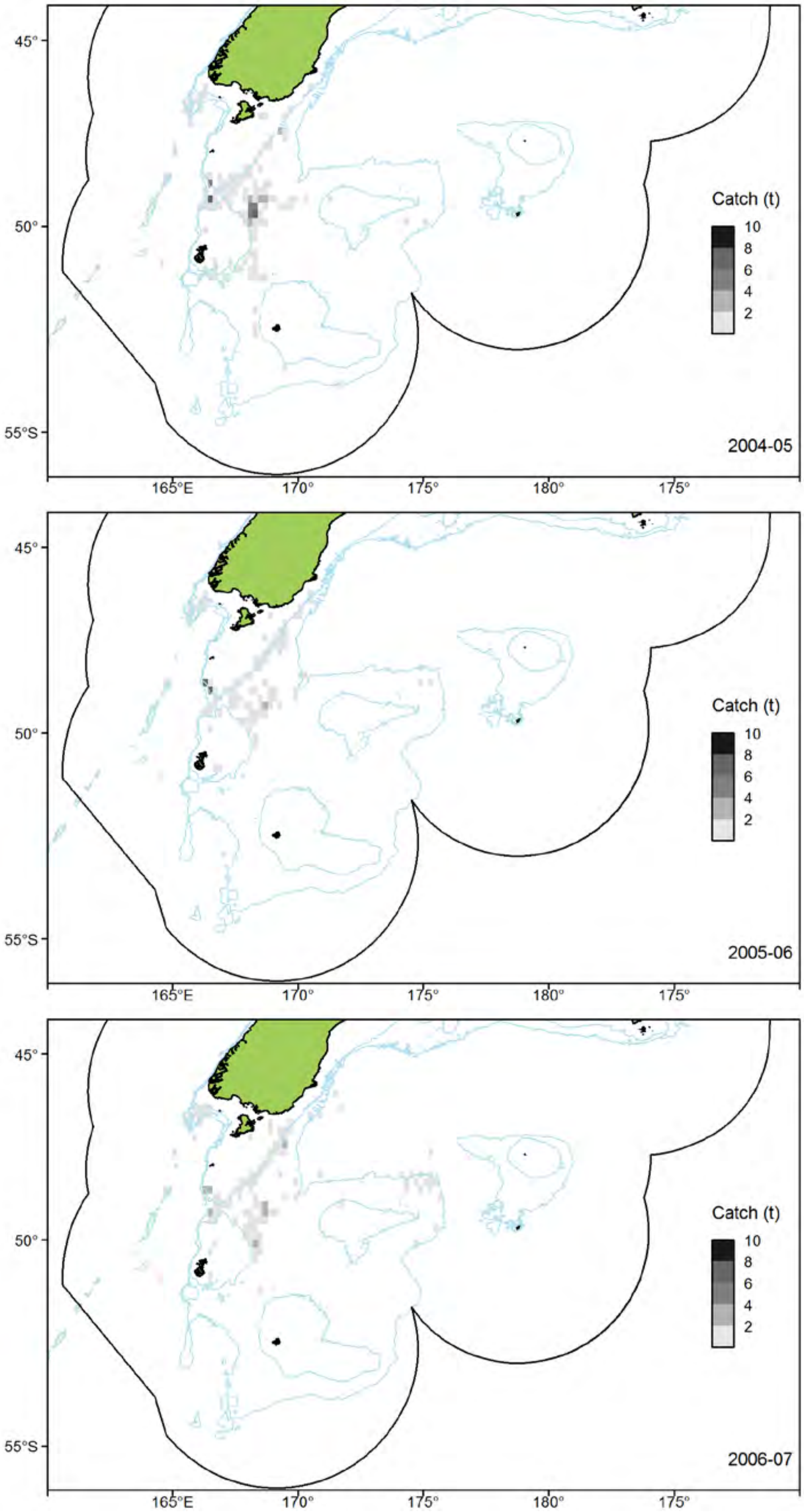


Figure C40 continued: Distribution of daily processed ribaldo catch taken by bottom trawl gear in the Southern fishery aggregated into 0.2 degree spatial blocks for the 2005 to 2007 fishing years from the TCEPR form.

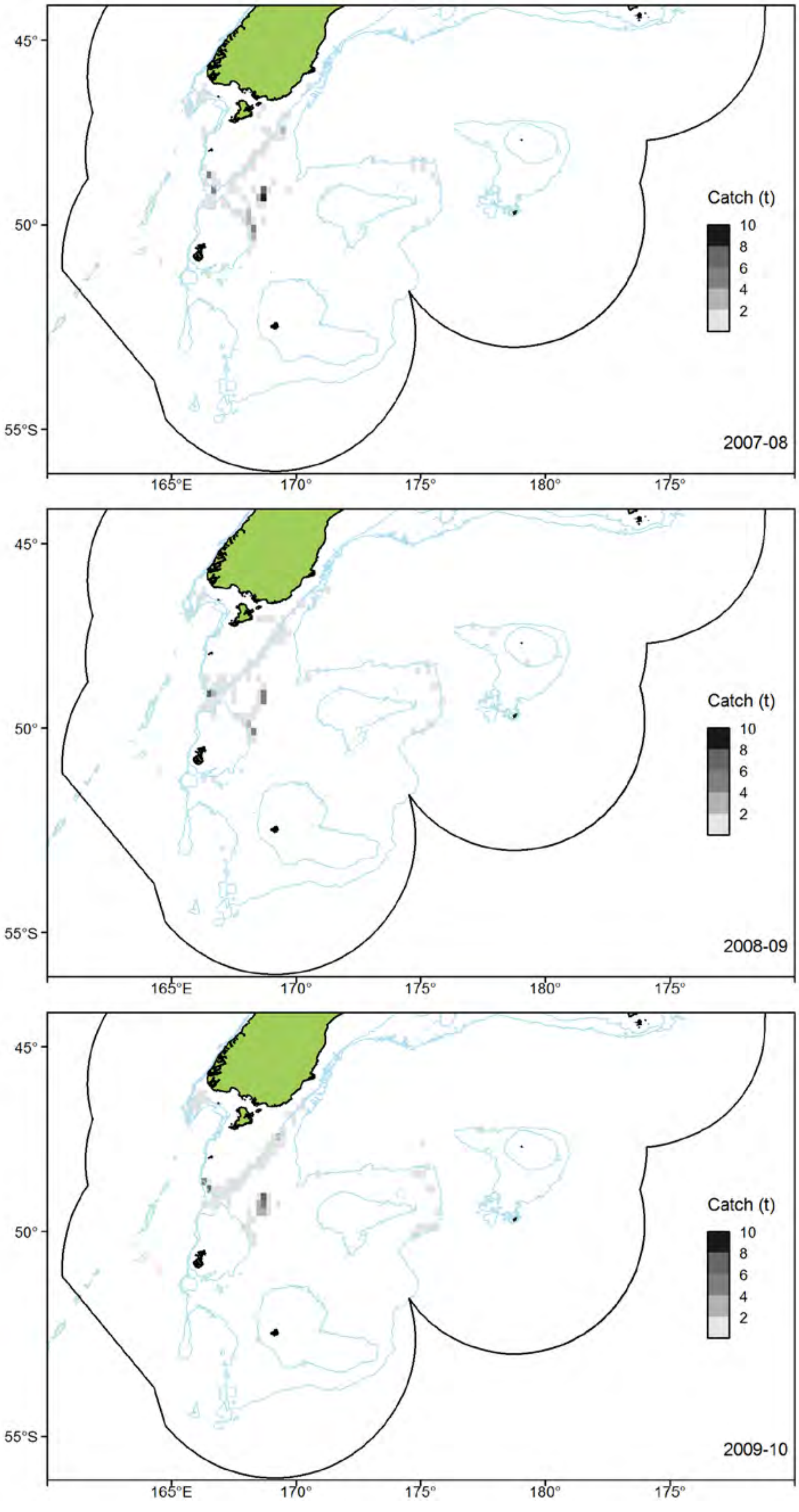


Figure C40 continued: Distribution of daily processed ribaldo catch taken by bottom trawl gear in the Southern fishery aggregated into 0.2 degree spatial blocks for the 2008 to 2010 fishing years from the TCEPR form.

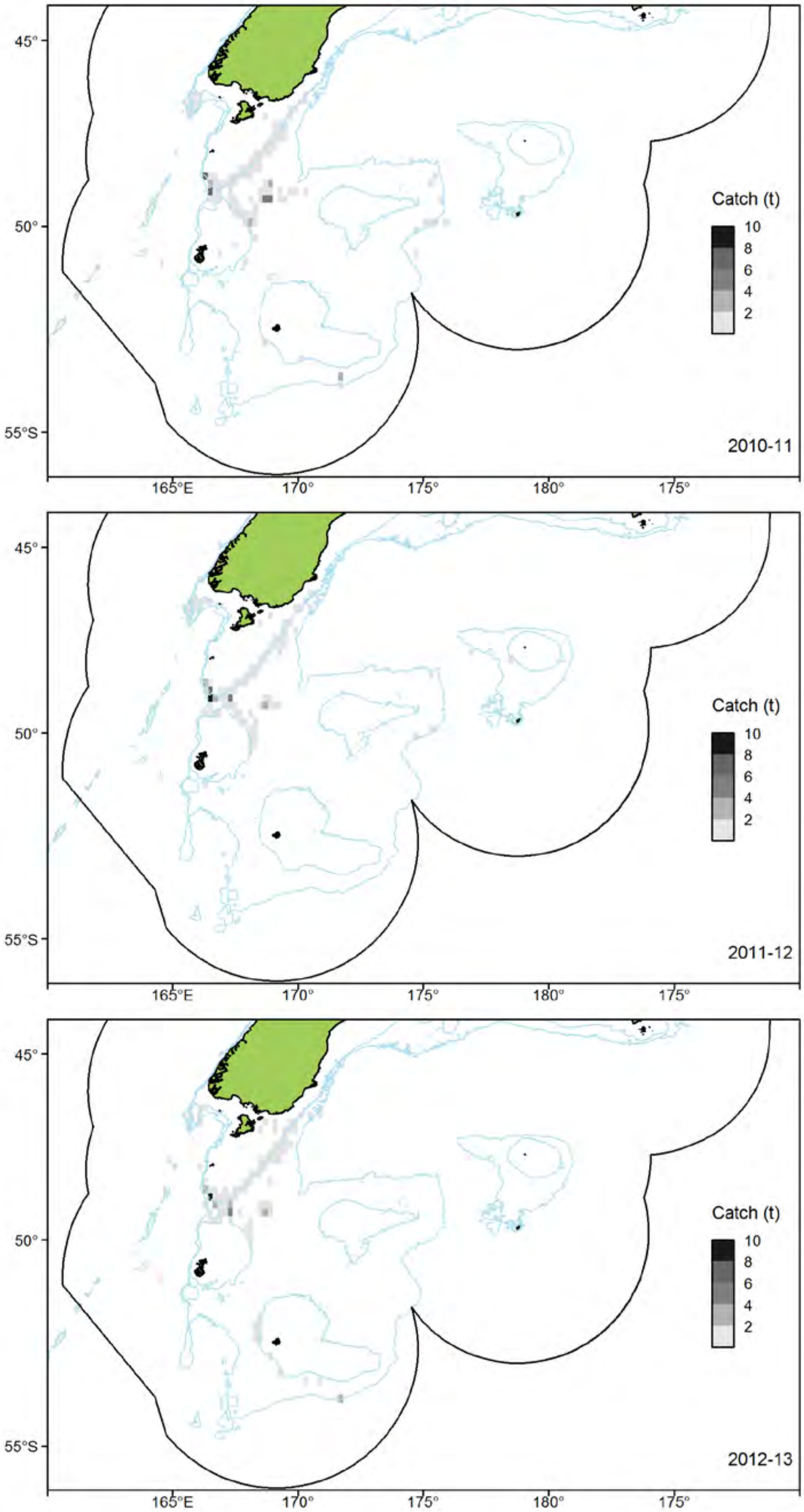


Figure C40 continued: Distribution of daily processed ribaldo catch taken by bottom trawl gear in the Southern fishery aggregated into 0.2 degree spatial blocks for the 2011 to 2013 fishing years from the TCEPR form.

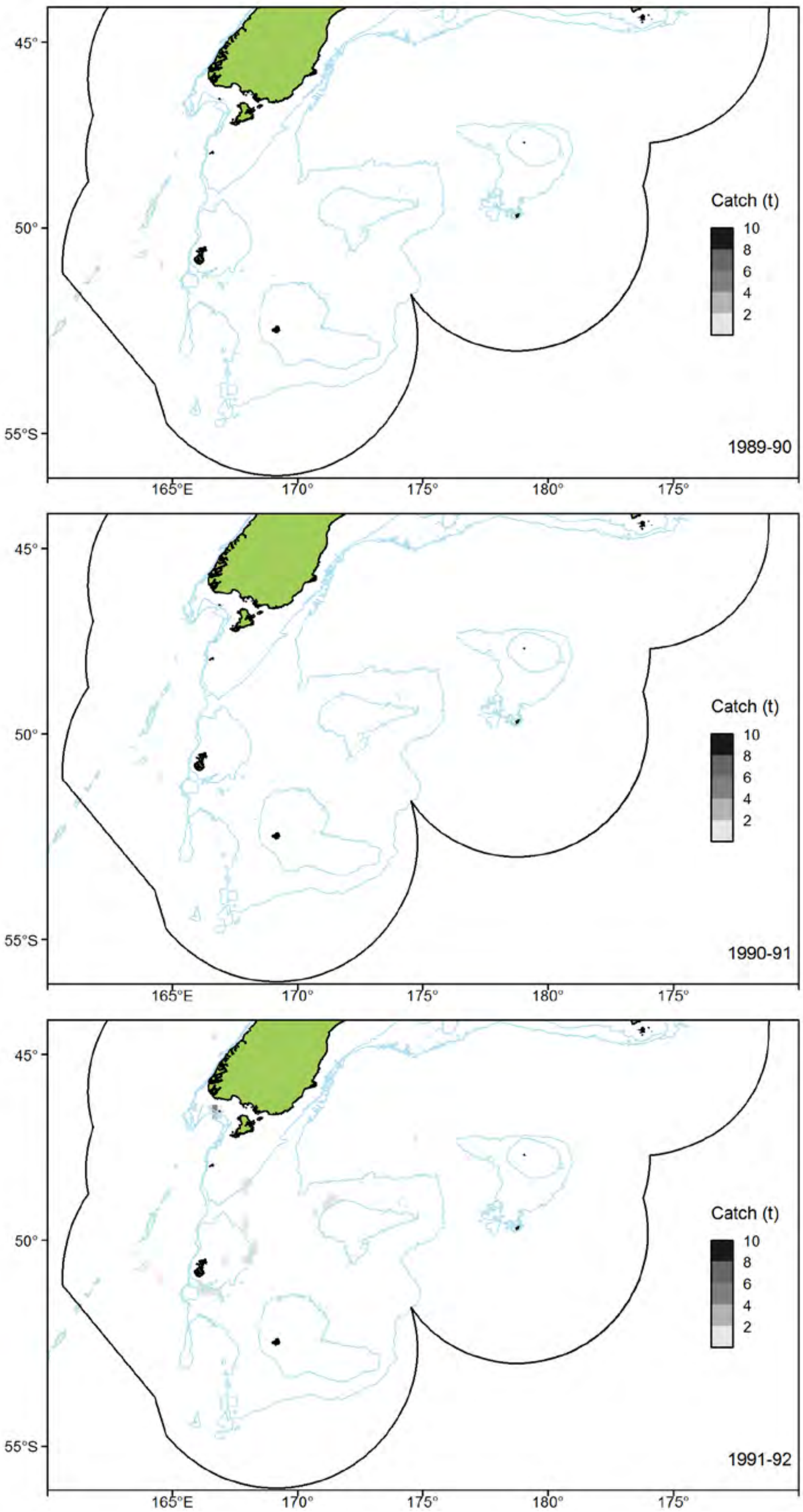


Figure C41: Distribution of estimated ribaldo catch taken by bottom long line gear in the Southern fishery aggregated into 0.2 degree spatial blocks for the 1990 to 1992 fishing years.

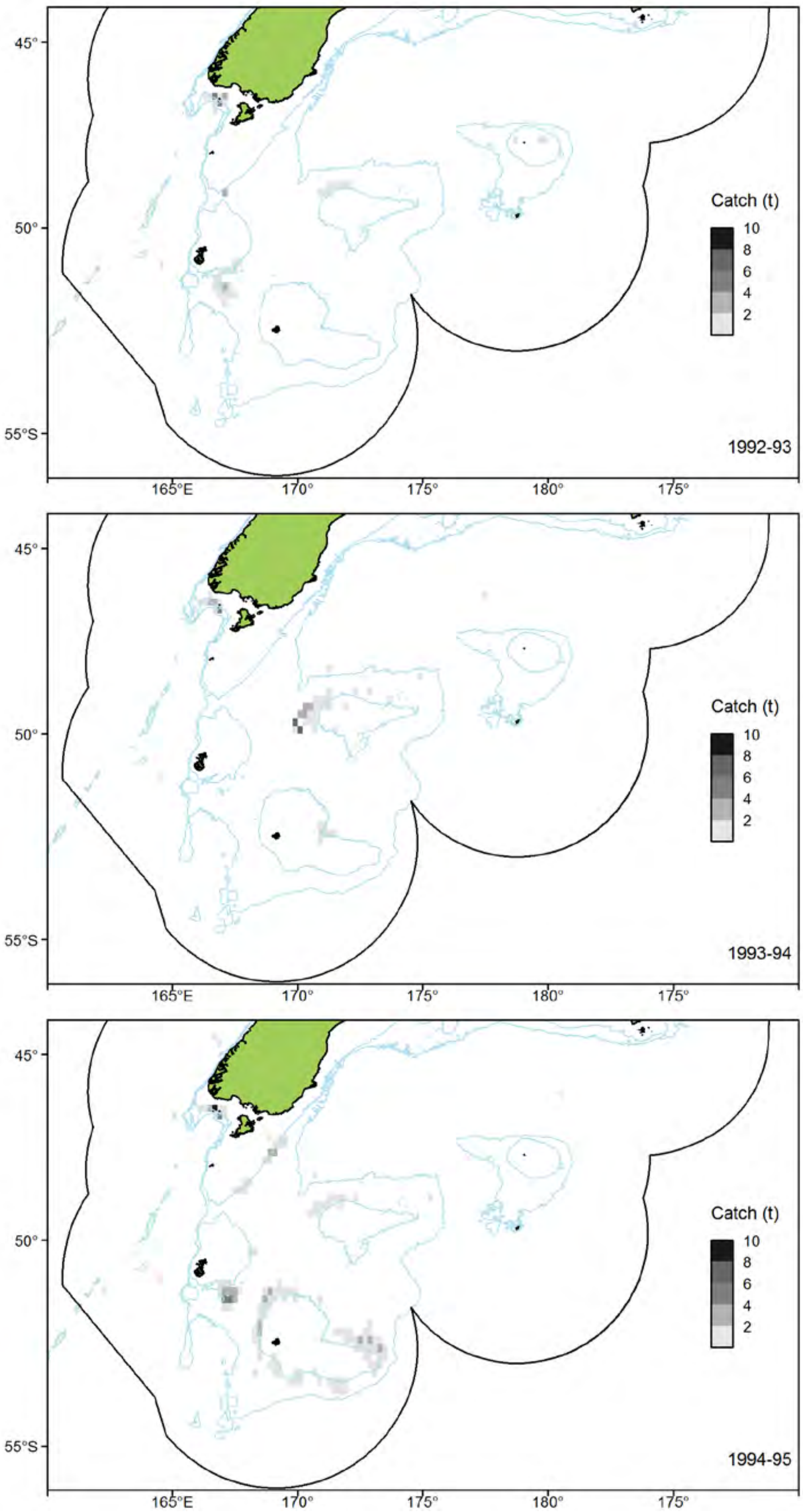


Figure C41 continued: Distribution of estimated ribaldo catch taken by bottom long line gear in the Southern fishery aggregated into 0.2 degree spatial blocks for the 1993 to 1995 fishing years.

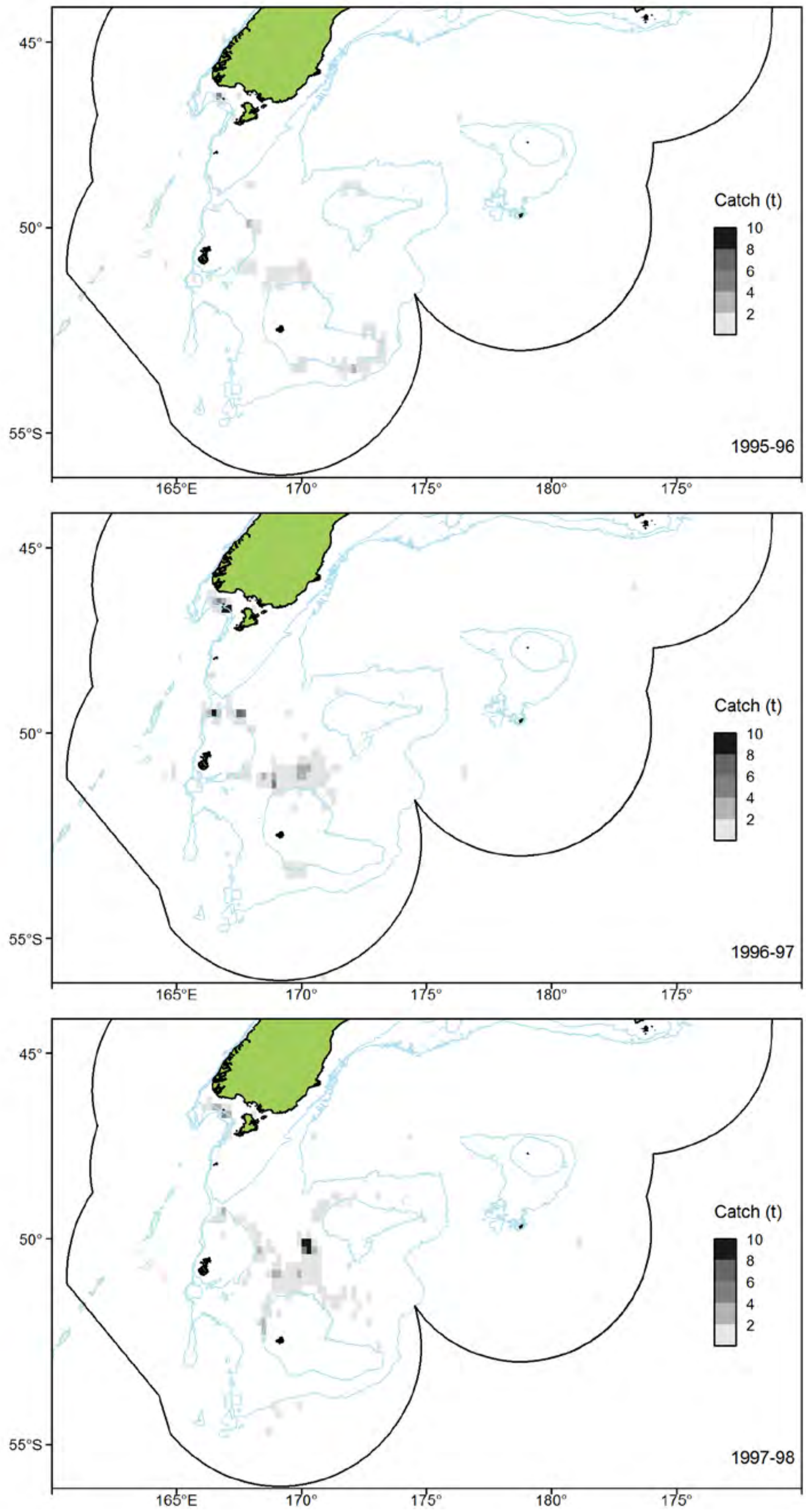


Figure C41 continued: Distribution of estimated ribaldo catch taken by bottom long line gear in the Southern fishery aggregated into 0.2 degree spatial blocks for the 1996 to 1998 fishing years.

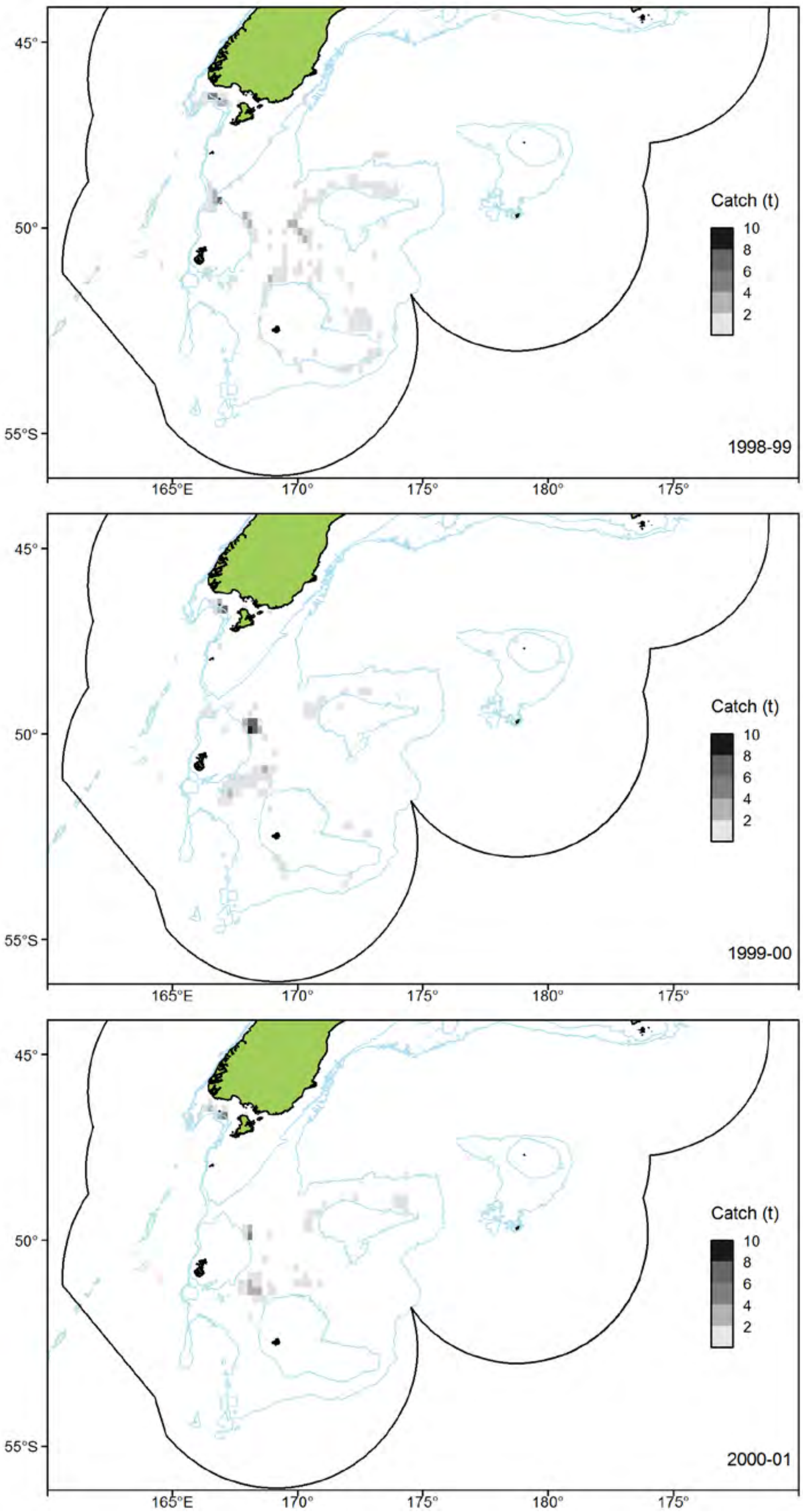


Figure C41 continued: Distribution of estimated ribaldo catch taken by bottom long line gear in the Southern fishery aggregated into 0.2 degree spatial blocks for the 1999 to 2001 fishing years.

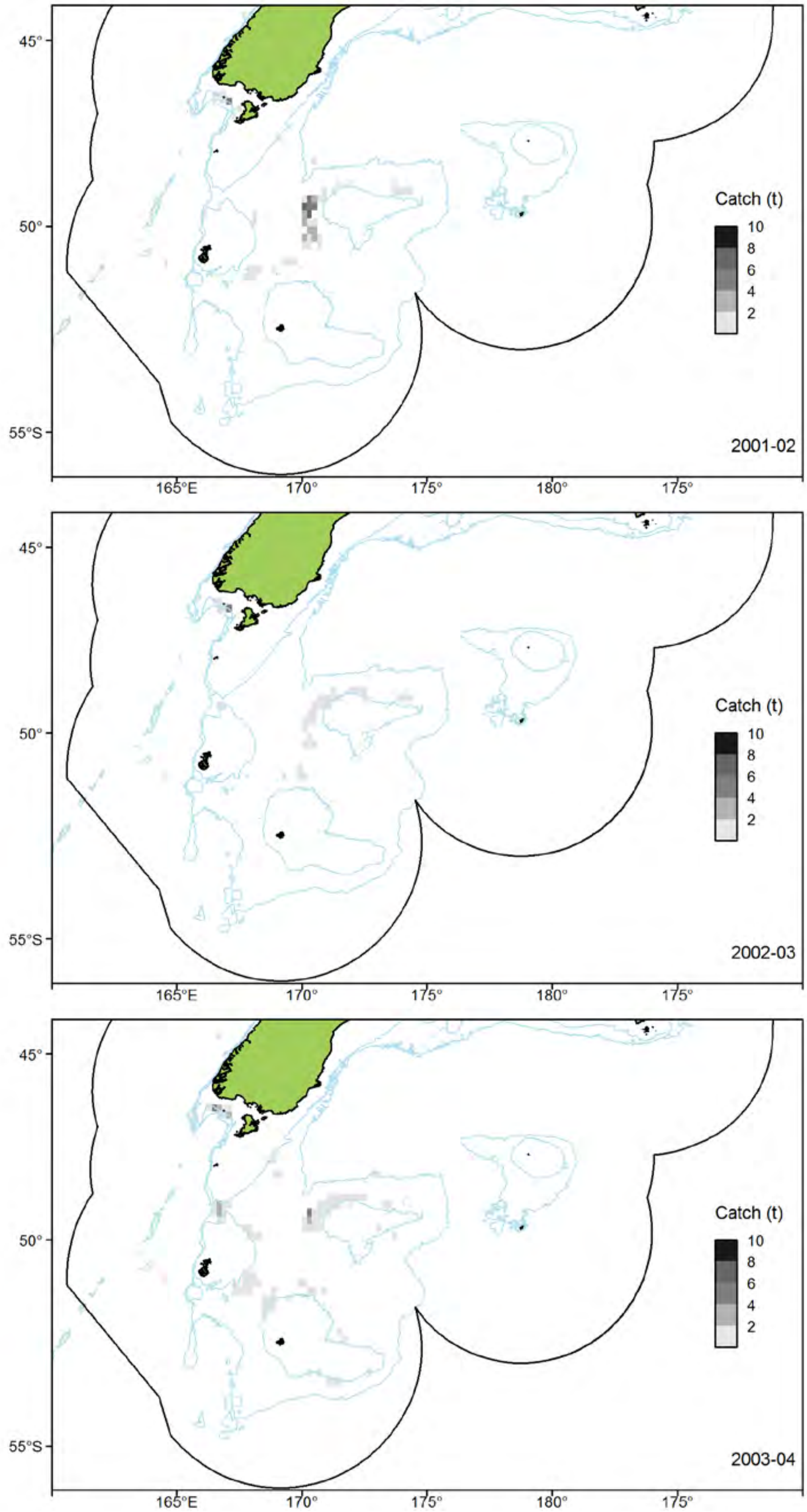


Figure C41 continued: Distribution of estimated ribaldo catch taken by bottom long line gear in the Southern fishery aggregated into 0.2 degree spatial blocks for the 2002 to 2004 fishing years.

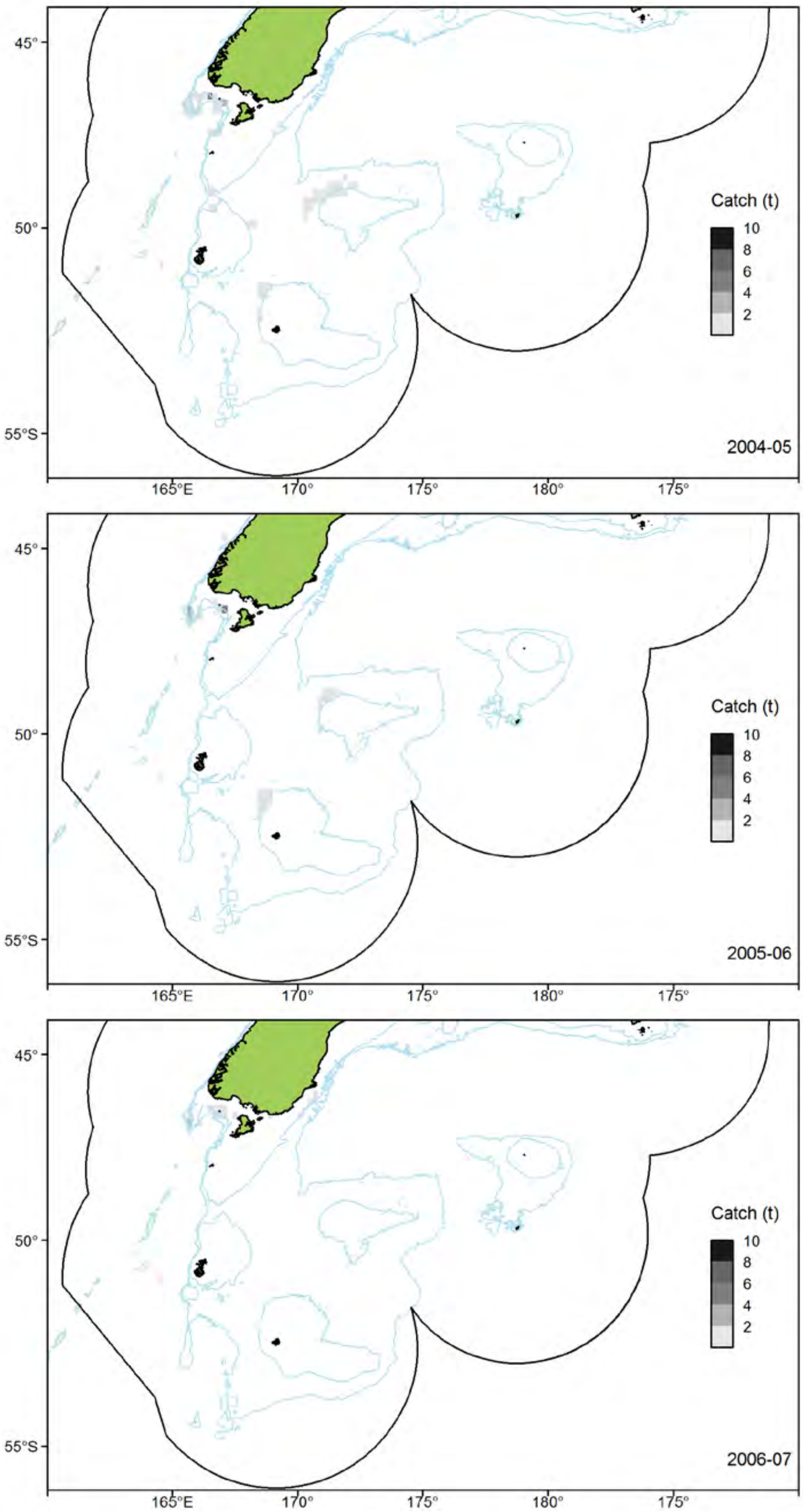


Figure C41 continued: Distribution of estimated ribaldo catch taken by bottom long line gear in the Southern fishery aggregated into 0.2 degree spatial blocks for the 2005 to 2007 fishing years.

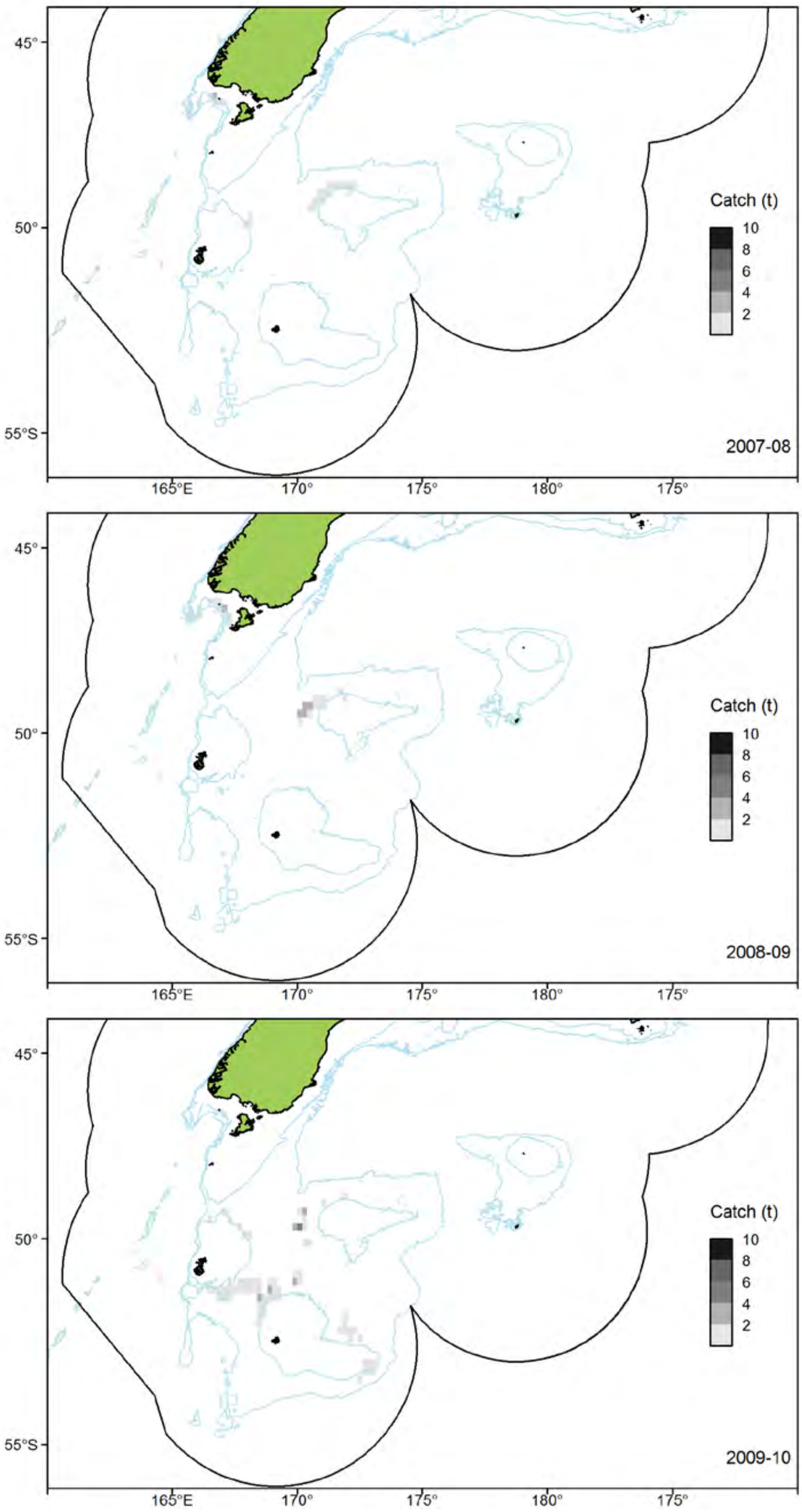


Figure C41 continued: Distribution of estimated ribaldo catch taken by bottom long line gear in the Southern fishery aggregated into 0.2 degree spatial blocks for the 2008 to 2010 fishing years.

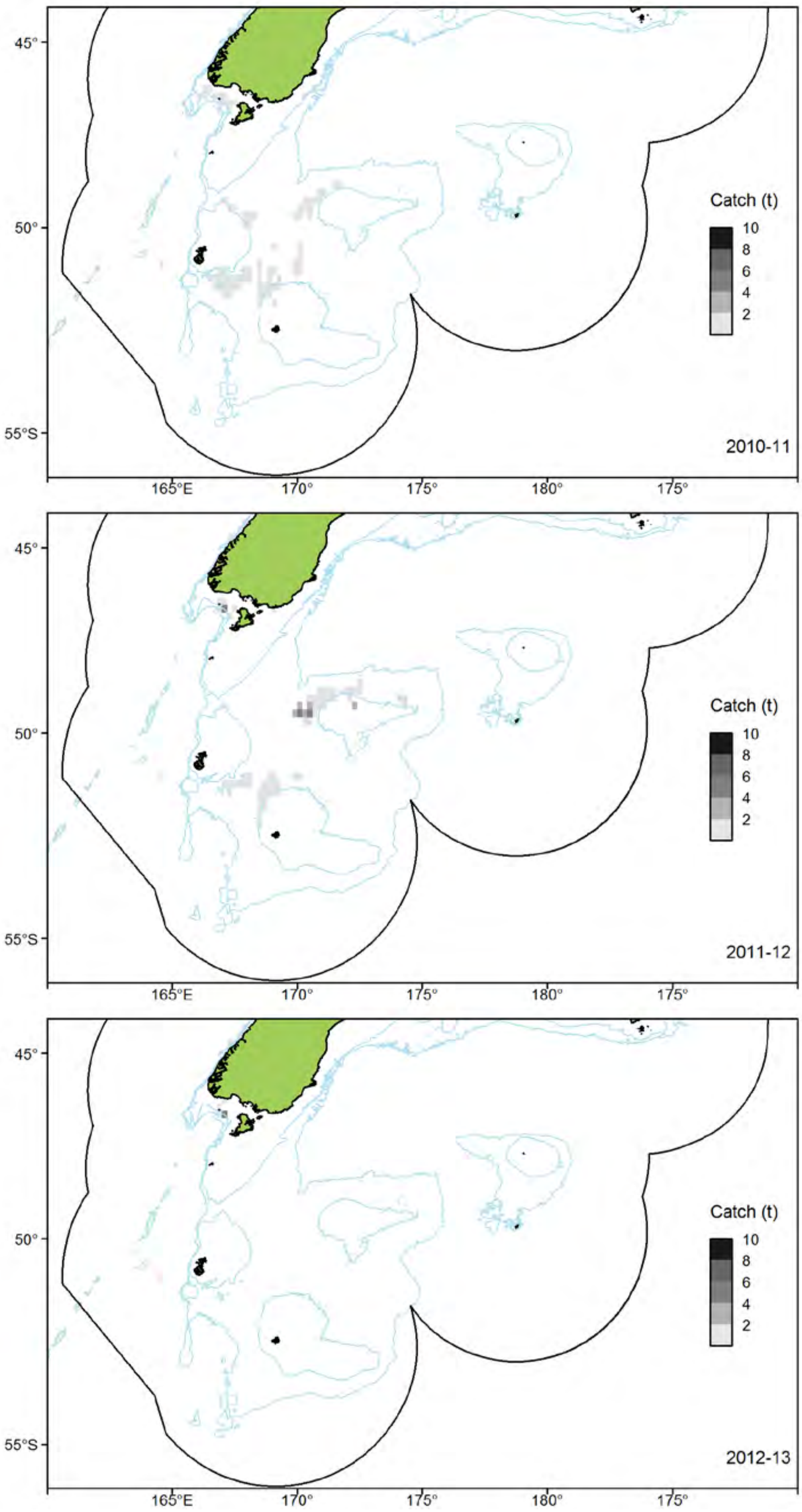


Figure C41 continued: Distribution of estimated ribaldo catch taken by bottom long line gear in the Southern fishery aggregated into 0.2 degree spatial blocks for the 2011 to 2013 fishing years.

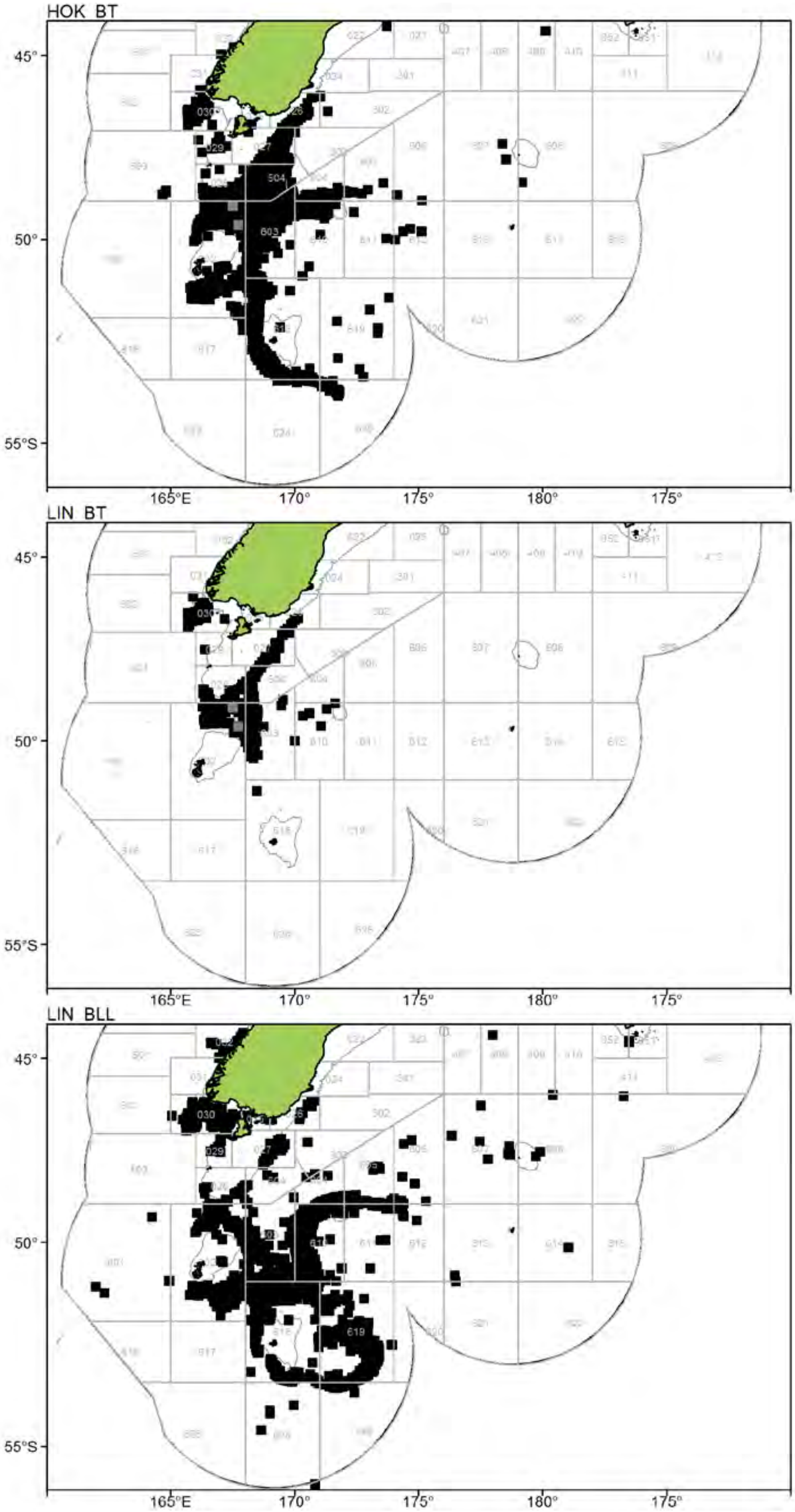


Figure C42: Location of targeted ribaldo catches (grey squares) and ribaldo bycatch (black squares) for the main target species and methods for all years combined. NB: there has been no targeting of ribaldo in the Southern fishery by bottom long line.

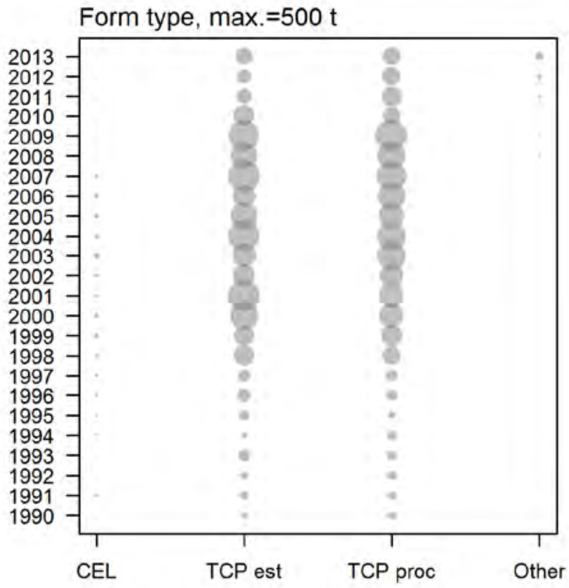


Figure C43a: Distribution of annual ribaldo catch by form type for the west coast South Island fishery (see Figure 2) for the estimated and merged daily processed data. Circle size is proportional to catch; maximum circle size is 500 t. CEL is Catch Effort Landing Return, TCP Est is estimated catch data from the Trawl, Catch, Effort, and Processing Return; TCP Proc is daily processed data from the Trawl, Catch, Effort, and Processing Return.

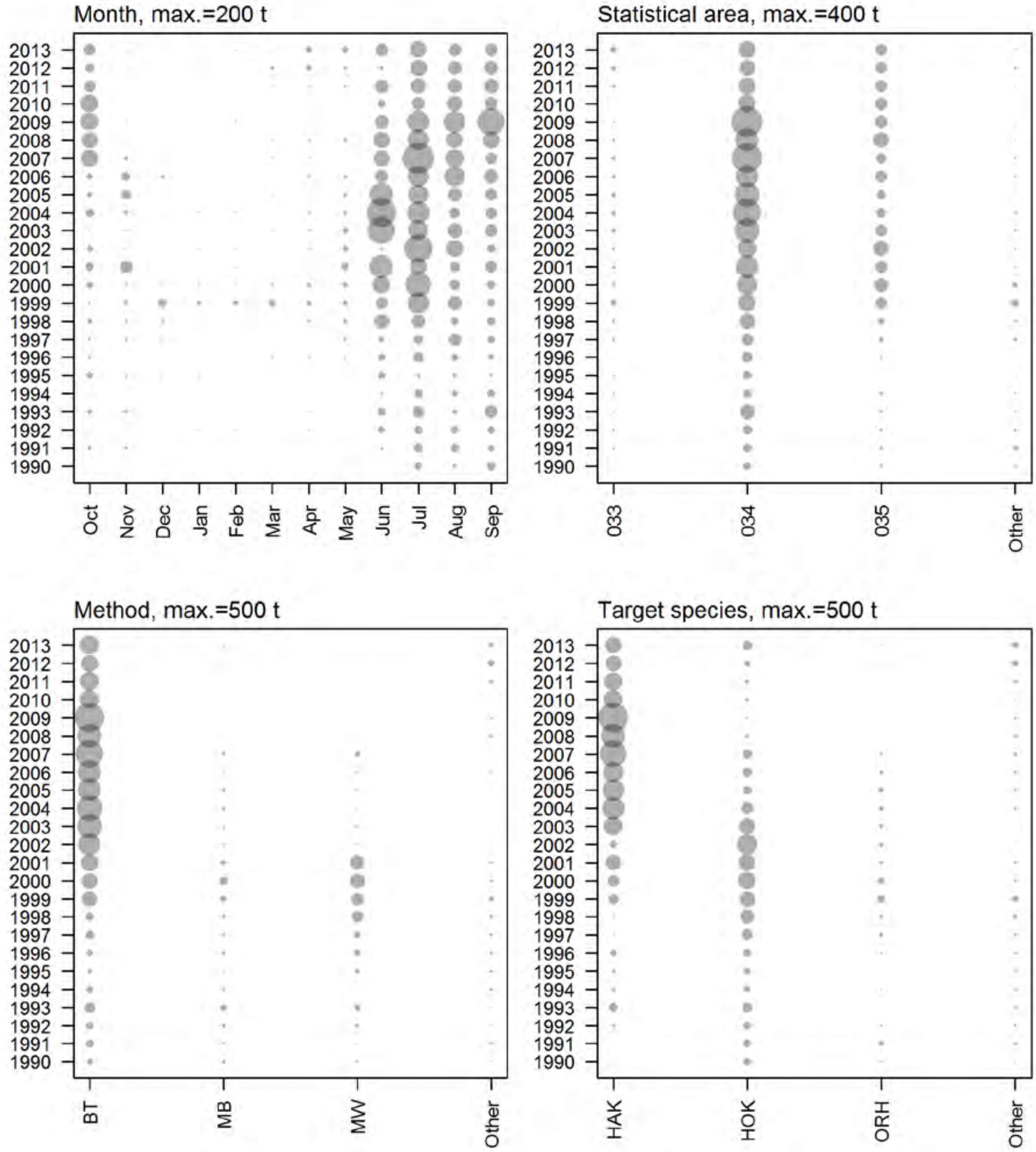


Figure C43b: Distribution of annual ribaldo catch by month, statistical area, method, and target species in the West coast South Island for all merged data. Circle size is proportional to catch; maximum circle size is indicated on each plot.

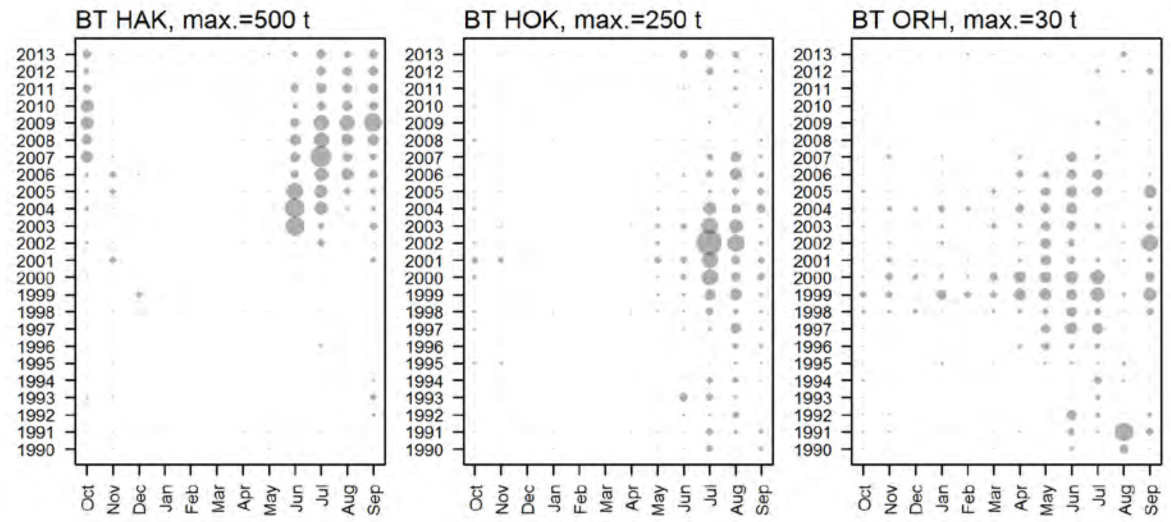


Figure C43c: Distribution of annual ribaldo catch by month for the main methods and target species in the West coast South Island for all merged data. Circle size is proportional to catch; maximum circle size is indicated on each plot.

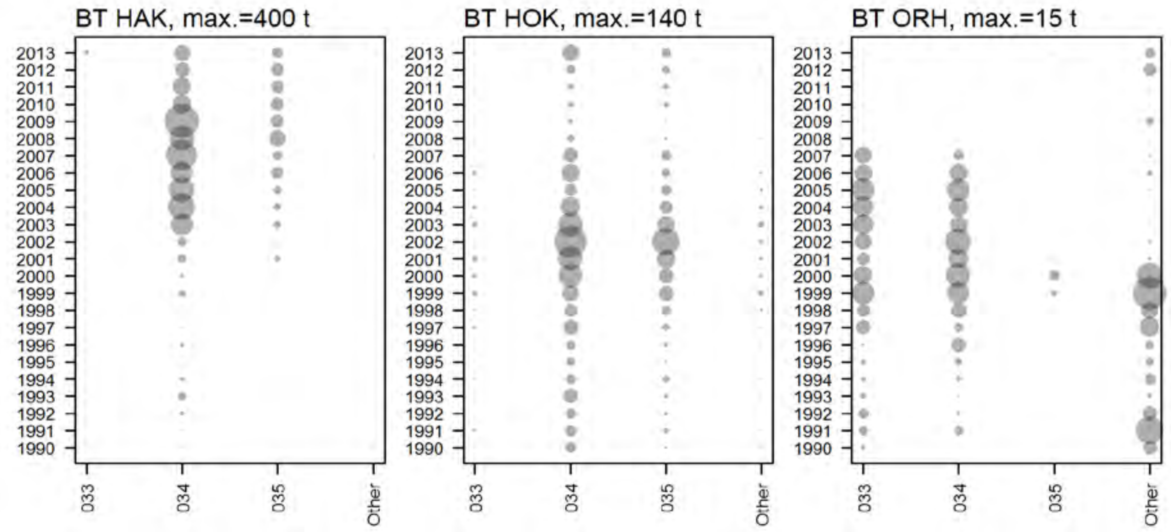


Figure C43d: Distribution of annual ribaldo catch by statistical area for the main methods and target species in the West coast South Island for all merged data. Circle size is proportional to catch; maximum circle size is indicated on each plot.

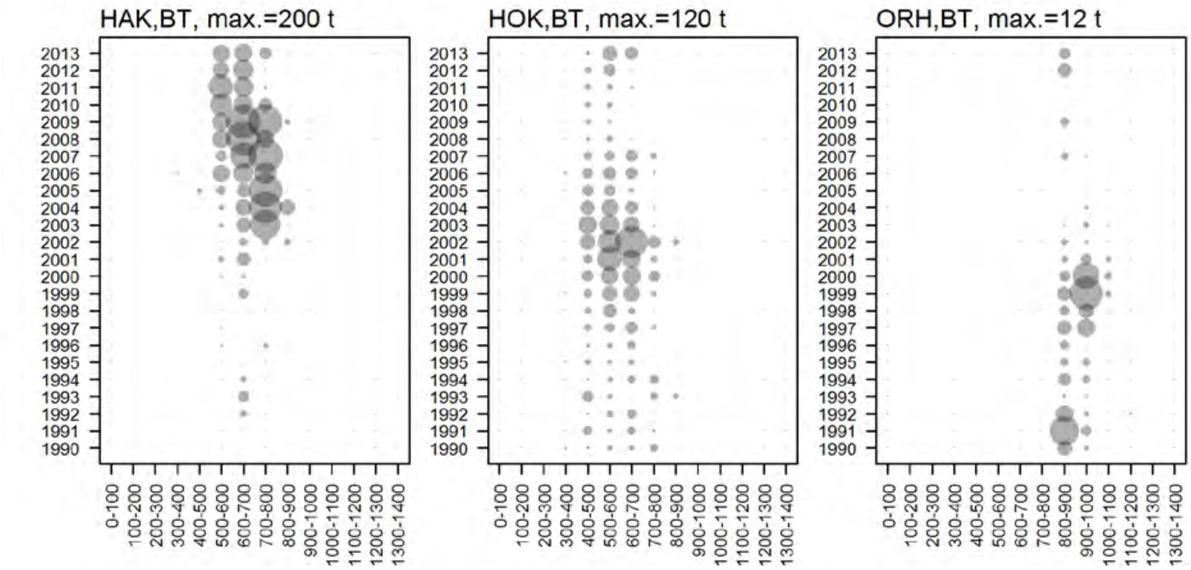


Figure C43e: Distribution of annual ribaldo catch by depth for the main methods and target species in the West coast South Island for all merged data. Circle size is proportional to catch; maximum circle size is indicated on each plot.

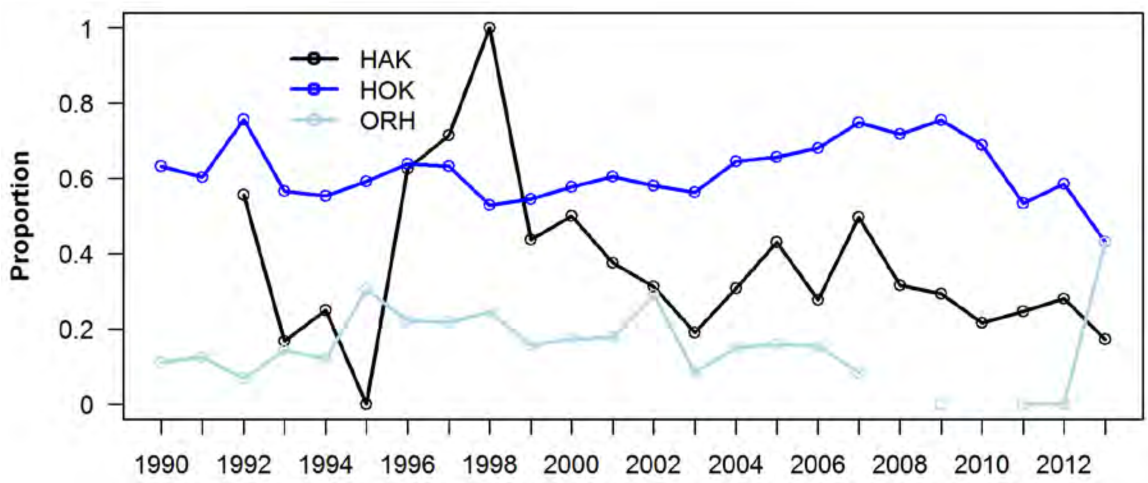


Figure C44: Proportion of days that recorded no processed ribaldo by target species in the daily processed data set for bottom trawl in the west coast South Island fishery.

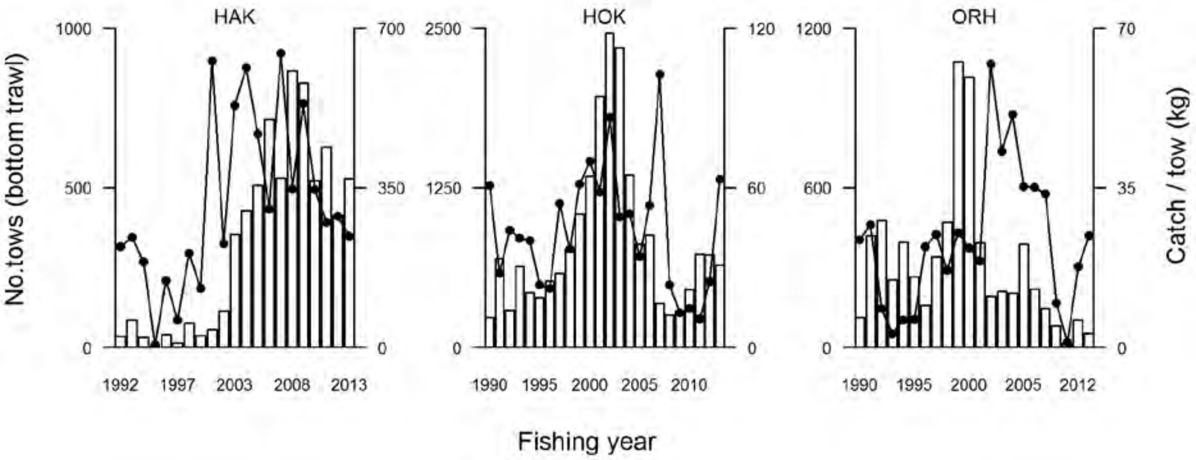


Figure C45: Unstandardised catch rates of bottom trawl-caught ribaldo by main target species (kg/tow) and the number of tows in the west coast South Island fishery.

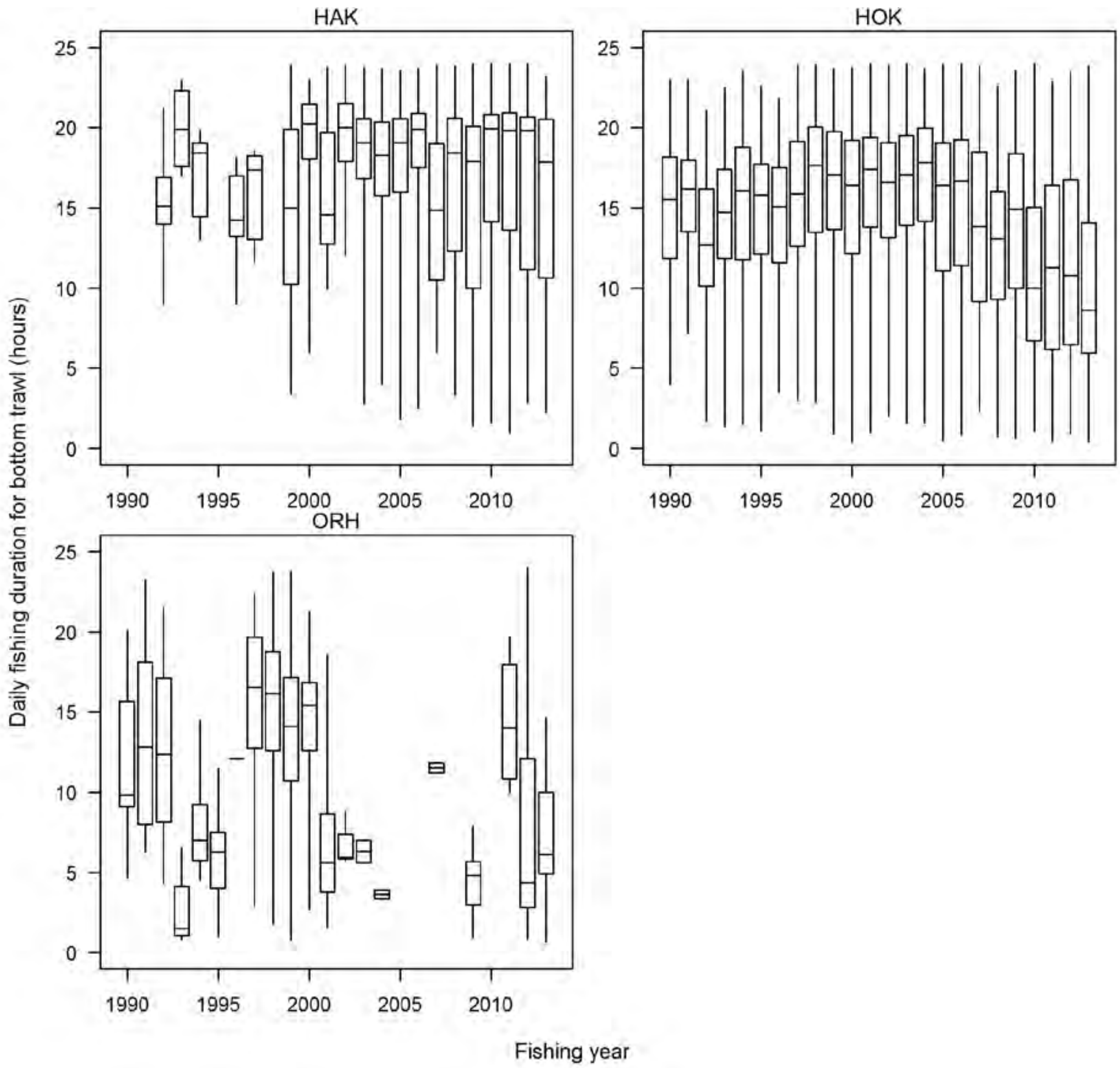


Figure C46: Annual median (horizontal line), inter-quartile range (box), and range (vertical lines) for summed daily tow durations (hours) reported by main target species in the west coast South Island fishery catching ribaldo using bottom trawl gear.

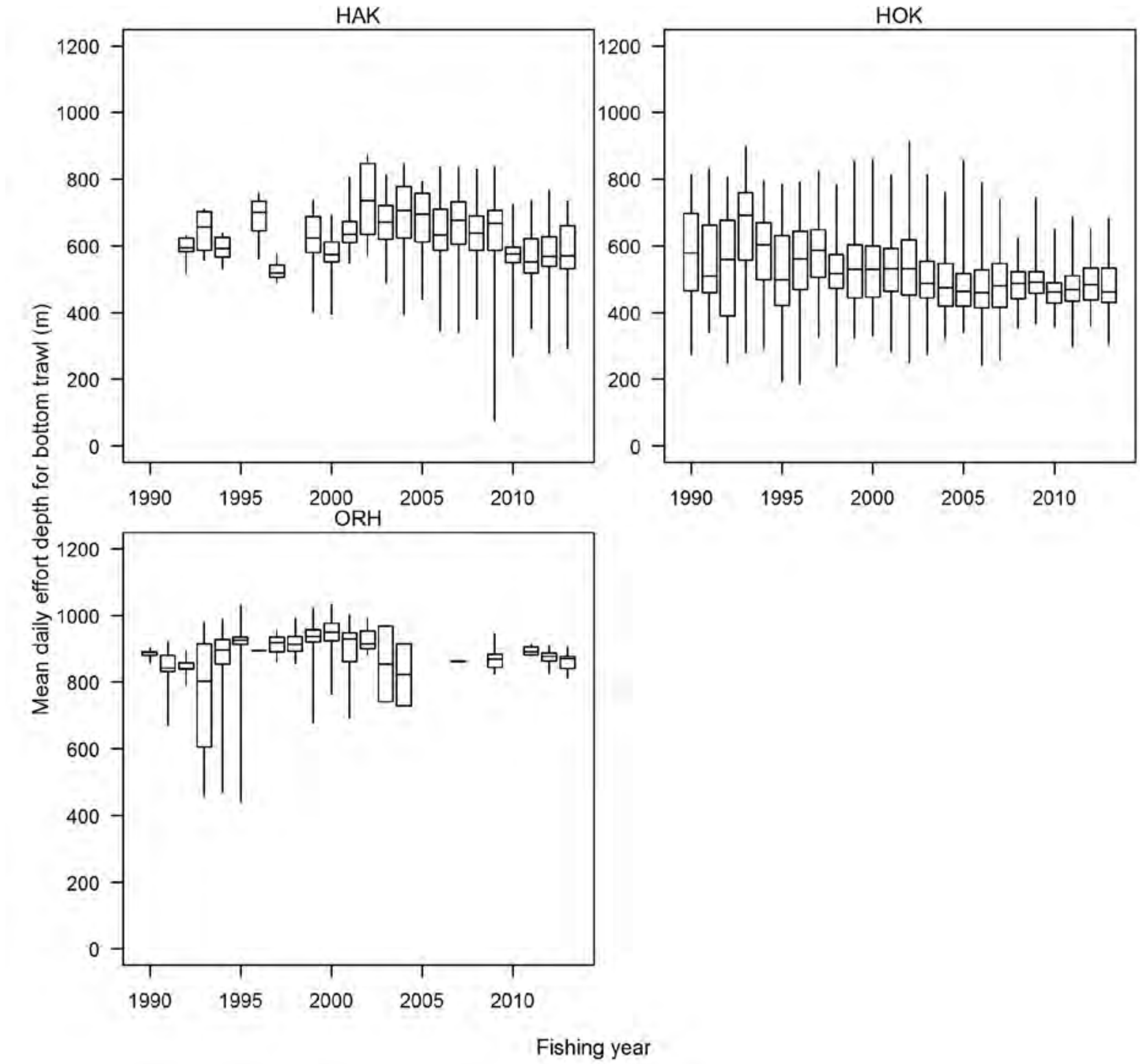


Figure C47: Annual median (horizontal line), inter-quartile range (box), and range (vertical lines) for mean daily effort depth (m) reported by main target species in the west coast South Island catching ribaldo using bottom trawl gear.

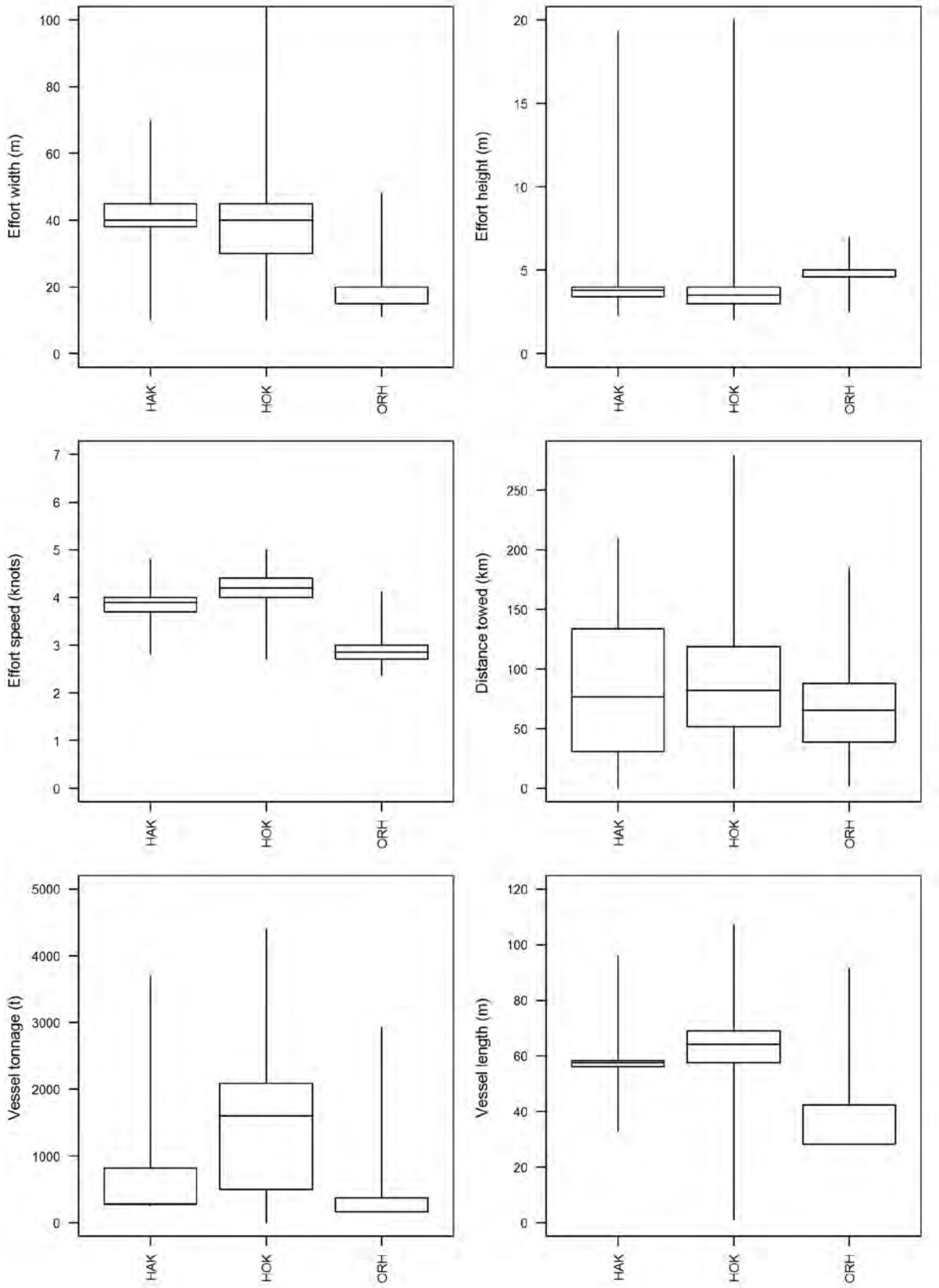


Figure C48: Median (horizontal line), inter-quartile range (box), and range (vertical lines) for distribution of other fishing effort variables and vessel characteristics by main target species in the west coast South Island catching ribaldo using bottom trawl gear.

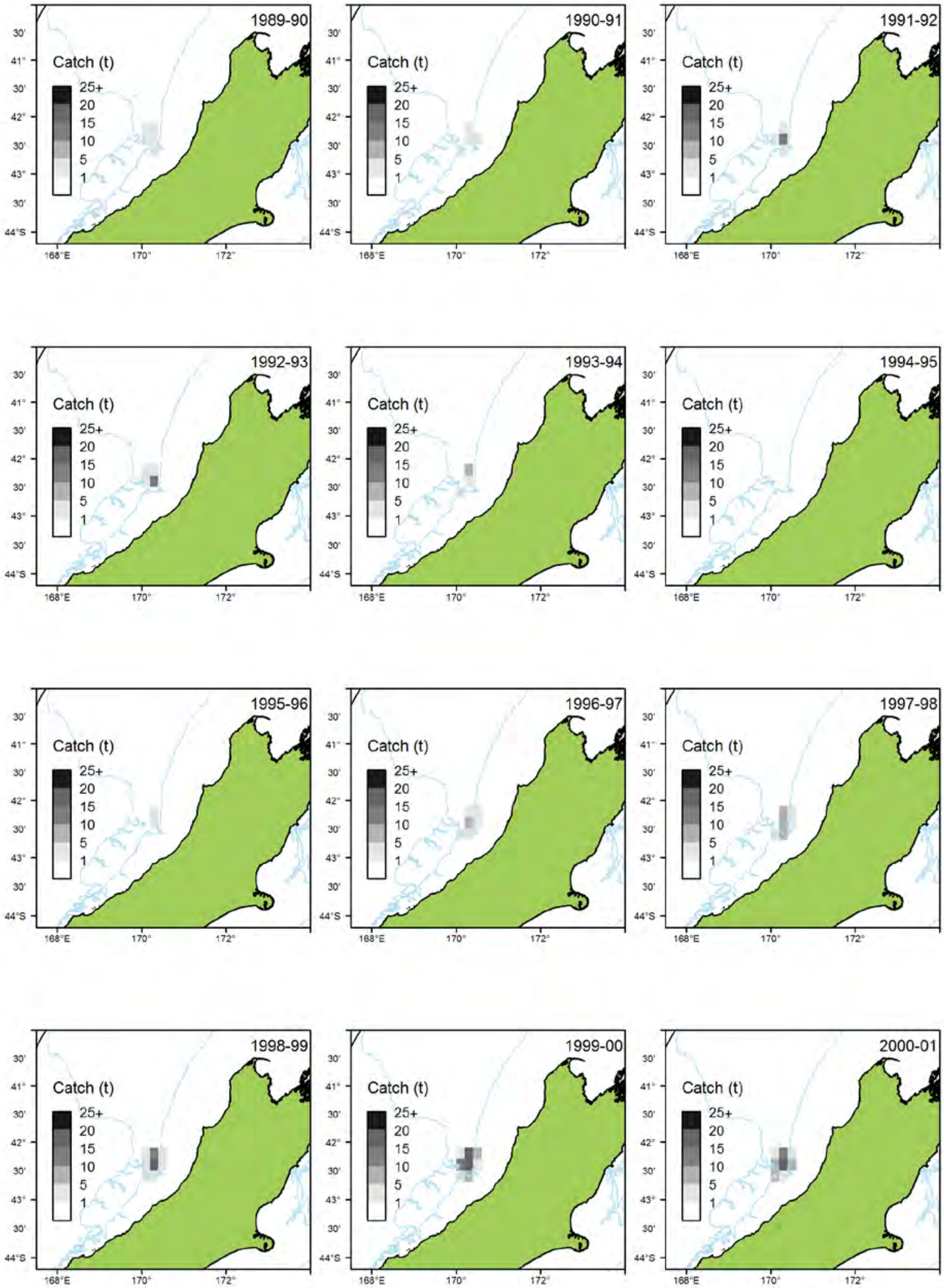


Figure C49: Distribution of daily processed ribaldo catch taken by all trawl gear in the west coast South Island aggregated into 0.2 degree spatial blocks for the 1990 to 2001 fishing years from the TCEPR form.

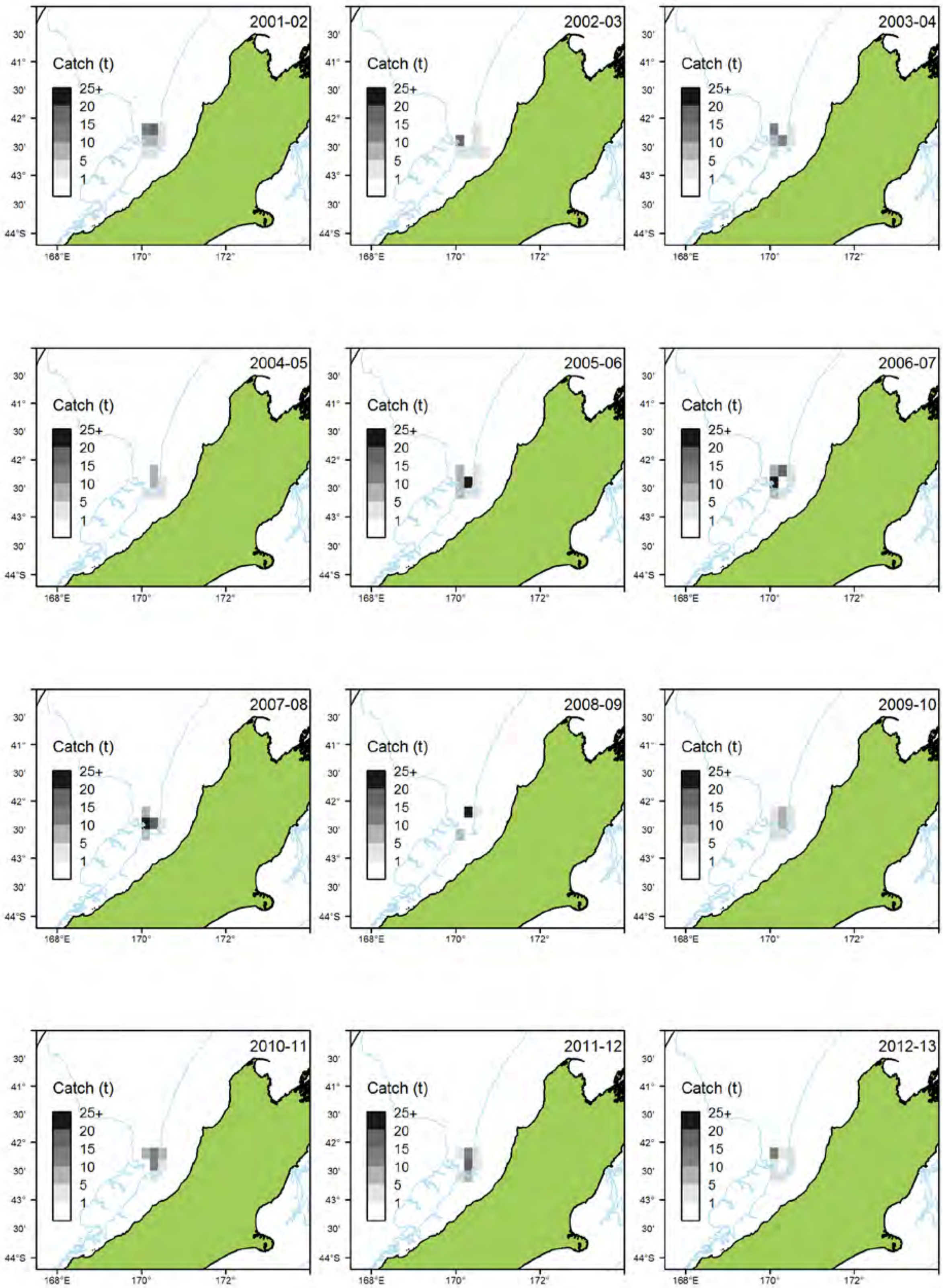


Figure C49 continued: Distribution of daily processed ribaldo catch taken by all trawl gear in the west coast South Island aggregated into 0.2 degree spatial blocks for the 2002 to 2013 fishing years from the TCEPR form.

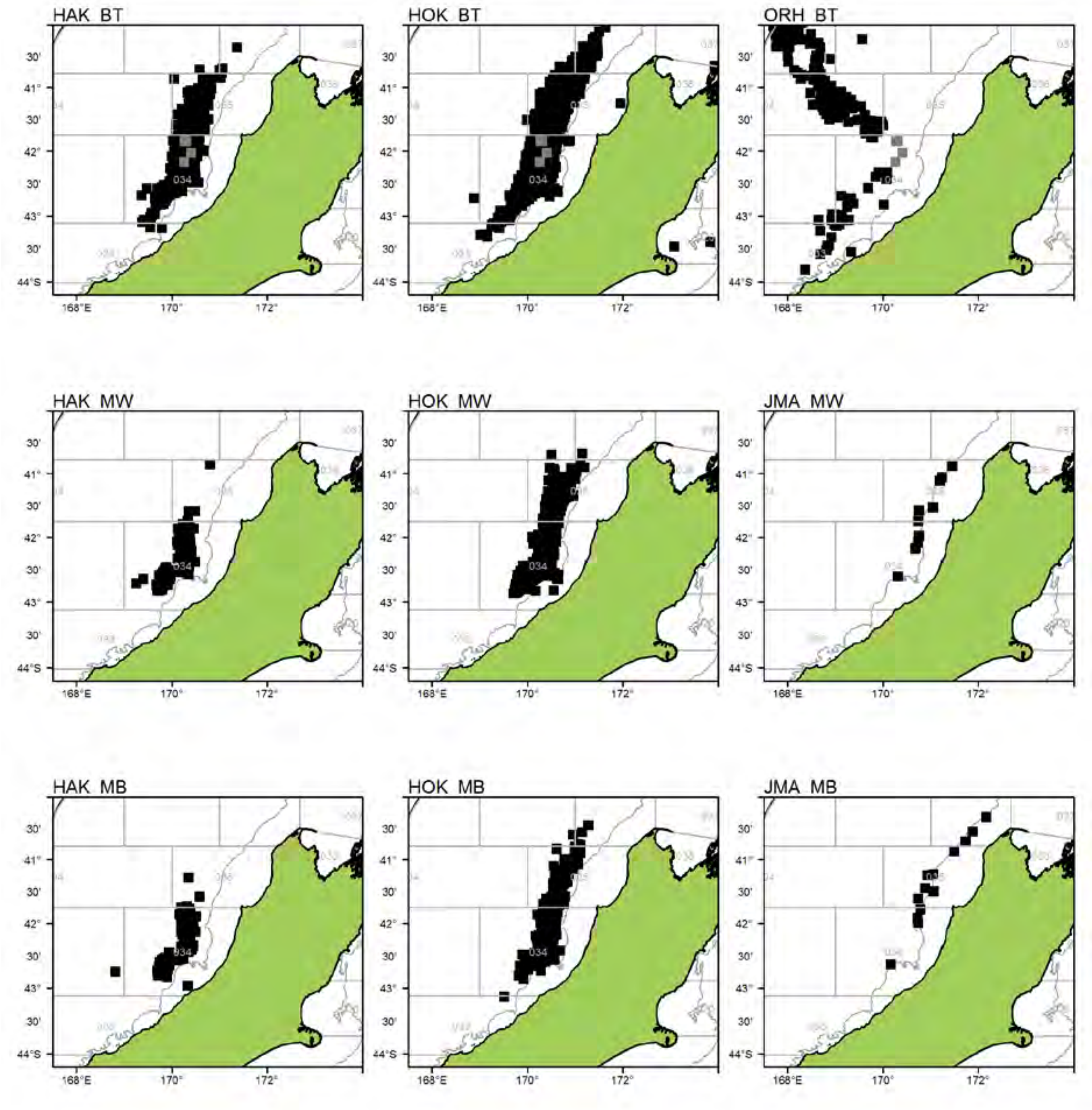


Figure C50: Location of targeted ribaldo catches (grey squares) and ribaldo bycatch (black squares) for the main target species and methods for all years combined. NB: there has been no targeting of ribaldo in the west coast South Island fishery.

APPENDIX D: CATCH-PER-UNIT-EFFORT ANALYSES

Table D1: CPUE datasets for all vessels and for core vessels for each year (1999–2013) for the Eastern fishery CPUE Model 1. CPUE is unstandardised catch per non-zero processing day.

	All vessels						Core vessels					
Year	No. of vessels	No. of days	Zeros	Catch	Effort	CPUE	No. of vessels	No. of days	Zeros	Catch	Effort	CPUE
1999	35	2561	0.34	226.7	1692	0.13	14	2029	0.30	186.5	1428	0.13
2000	27	2255	0.28	263.3	1616	0.16	14	1908	0.23	251.1	1476	0.17
2001	31	2296	0.26	262	1707	0.15	16	1897	0.17	246.2	1567	0.16
2002	25	1918	0.17	260.2	1598	0.16	16	1750	0.15	247.4	1494	0.17
2003	26	2383	0.23	245.8	1824	0.13	15	2010	0.20	223.1	1604	0.14
2004	27	1952	0.22	253.6	1523	0.17	14	1718	0.20	238.3	1371	0.17
2005	19	1438	0.20	165.7	1146	0.14	11	1182	0.20	144.3	941	0.15
2006	17	1383	0.27	114.6	1015	0.11	9	1090	0.27	95.3	797	0.12
2007	18	1401	0.24	136.8	1071	0.13	8	1091	0.20	122.8	873	0.14
2008	21	1277	0.16	137.3	1079	0.13	8	1004	0.14	117.3	859	0.14
2009	20	1057	0.14	135.5	910	0.15	9	905	0.13	104.1	785	0.13
2010	21	1209	0.18	119.8	996	0.12	9	1094	0.15	111.7	928	0.12
2011	22	1198	0.20	111.8	958	0.12	10	1018	0.17	100.5	848	0.12
2012	21	1200	0.19	112.8	972	0.12	10	1081	0.16	103.9	903	0.12
2013	21	1096	0.16	123.8	923	0.13	10	977	0.15	106.9	827	0.13
Total		24624		2669.7	19030			20754		2399.4	16701	

Table D2: Variables retained in order of decreasing explanatory value for the Eastern fishery Model 1 and the corresponding total R^2 value.

Variable	R^2
Fishing year	0.95
Statistical area	21.22
Effort depth	26.84
Month	29.66
Vessel	31.58
Fishing duration	33.60

Table D3: The Eastern fishery CPUE Model 1 estimated values, upper and lower confidence intervals and CVs by year.

Year	CPUE	Lower CI	Upper CI	CV
1999	0.91	0.86	0.96	0.03
2000	1.03	0.97	1.08	0.03
2001	0.93	0.88	0.98	0.03
2002	1.01	0.95	1.06	0.03
2003	0.93	0.88	0.98	0.03
2004	1.05	1.00	1.12	0.03
2005	1.06	0.99	1.13	0.03
2006	1.05	0.98	1.13	0.04
2007	1.03	0.96	1.10	0.03
2008	1.13	1.06	1.21	0.03
2009	1.03	0.96	1.11	0.04
2010	1.01	0.95	1.08	0.03
2011	0.82	0.76	0.88	0.03
2012	0.93	0.87	0.99	0.03
2013	1.15	1.07	1.23	0.03

Table D4: CPUE datasets for all vessels and for core vessels for each year (1999–2013) for the Southern fishery CPUE Model 1. CPUE is unstandardised catch per non-zero processing day.

	All vessels						Core vessels					
Year	No. of vessels	No. of days	Zeros	Catch	Effort	CPUE	No. of vessels	No. of days	Zeros	Catch	Effort	CPUE
1999	25	833	0.22	148.7	647	0.23	8	622	0.16	128.6	522	0.25
2000	25	1337	0.23	198.3	1034	0.19	8	1031	0.15	177.4	873	0.20
2001	27	1431	0.24	190.0	1083	0.18	9	1050	0.17	163	871	0.19
2002	26	1494	0.21	268.8	1178	0.23	9	1197	0.15	245.7	1014	0.24
2003	27	1194	0.18	174.9	974	0.18	10	879	0.10	151.9	790	0.19
2004	21	811	0.12	156.4	710	0.22	8	723	0.09	152	660	0.23
2005	14	409	0.21	66.3	325	0.20	7	344	0.18	52.1	282	0.18
2006	12	235	0.24	32.2	178	0.18	5	186	0.20	29.2	149	0.20
2007	17	338	0.26	40.8	249	0.16	5	203	0.14	32.8	175	0.19
2008	8	281	0.12	49.0	246	0.20	5	267	0.10	48.5	240	0.20
2009	10	256	0.17	36.6	213	0.17	4	247	0.15	36.4	210	0.17
2010	10	350	0.16	56.1	294	0.19	4	315	0.13	53.9	274	0.20
2011	12	337	0.18	51.5	276	0.19	3	290	0.09	51.0	264	0.19
2012	13	307	0.17	31.9	254	0.13	5	228	0.12	24.2	200	0.12
2013	14	377	0.17	45.0	312	0.14	4	305	0.11	39.6	270	0.15
Total		9990		1546.5	7973			7887		1386.3	6794	

Table D5: Variables retained in order of decreasing explanatory value for the Southern fishery Model 1 and the corresponding total R^2 value.

Variable	R^2
Fishing year	2.66
Effort depth	19.46
Month	25.71
Statistical area	28.21
Vessel	29.38

Table D6: The Southern fishery CPUE Model 1 estimated values, upper and lower confidence intervals and CVs by year.

Year	CPUE	Lower CI	Upper CI	CV
1999	1.16	1.05	1.28	0.05
2000	1.02	0.94	1.10	0.04
2001	0.95	0.87	1.02	0.04
2002	0.92	0.86	0.99	0.04
2003	0.96	0.89	1.04	0.04
2004	1.12	1.03	1.22	0.04
2005	0.96	0.85	1.08	0.06
2006	1.26	1.08	1.48	0.08
2007	1.34	1.15	1.57	0.08
2008	0.94	0.83	1.07	0.06
2009	0.97	0.85	1.12	0.07
2010	1.06	0.94	1.20	0.06
2011	0.92	0.81	1.04	0.06
2012	0.73	0.63	0.84	0.07
2013	0.85	0.75	0.97	0.06

Table D7: CPUE datasets for all vessels and for core vessels for each year (1999–2013) for the west coast South Island fishery CPUE Model 1. CPUE is unstandardised catch per non-zero processing day.

	All vessels						Core vessels					
Year	No. of vessels	No. of days	Zeros	Catch	Effort	CPUE	No. of vessels	No. of days	Zeros	Catch	Effort	CPUE
2003	13	127	0.03	56.9	123	0.46	7	58	0.03	34.9	56	0.62
2004	14	89	0.02	78.4	87	0.90	7	62	0.02	61.4	61	1.01
2005	12	128	0.09	87.3	117	0.75	6	78	0.12	52.9	69	0.77
2006	18	269	0.04	161.9	259	0.63	9	227	0.02	149.1	222	0.67
2007	19	211	0.03	167.6	204	0.82	9	159	0.04	137	153	0.90
2008	13	455	0.05	265.7	433	0.61	7	357	0.03	249.7	346	0.72
2009	14	332	0.03	221.3	322	0.69	7	290	0.02	205.1	285	0.72
2010	11	208	0.05	86.4	198	0.44	7	193	0.02	85.7	189	0.45
2011	12	274	0.07	124.6	254	0.49	8	255	0.05	123.8	242	0.51
2012	12	154	0.09	72.2	140	0.52	8	141	0.06	71.7	132	0.54
2013	9	168	0.07	61	156	0.39	6	141	0.04	59.9	136	0.44
Total		2415		1383.3	2293			1961		1231.2	1891	

Table D8: Variables retained in order of decreasing explanatory value for the west coast South Island fishery Model 1 and the corresponding total R^2 value.

Variable	R^2
Fishing year	<0.01
Effort depth	7.41
Vessel	32.04
Month	37.52
Distance towed	38.70

Table D9: The west coast South Island fishery CPUE Model 1 estimated values, upper and lower confidence intervals and CVs by year.

Year	CPUE	Lower CI	Upper CI	CV
2003	0.96	0.89	1.04	0.04
2004	1.12	1.03	1.22	0.04
2005	0.96	0.85	1.08	0.06
2006	1.26	1.08	1.48	0.08
2007	1.34	1.15	1.57	0.08
2008	0.94	0.83	1.07	0.06
2009	0.97	0.85	1.12	0.07
2010	1.06	0.94	1.20	0.06
2011	0.92	0.81	1.04	0.06
2012	0.73	0.63	0.84	0.07
2013	0.85	0.75	0.97	0.06

Table D10: CPUE datasets for all vessels and for core vessels for each year (2003–2013) for the west coast South Island fishery CPUE Model 2. CPUE is unstandardised catch per tow.

	All vessels						Core vessels					
Year	No. of vessels	No. of tows	Zeros	Catch	Effort	CPUE	No. of vessels	No. of tows	Zeros	Catch	Effort	CPUE
2003	13	323	0.34	65.5	212	0.31	7	190	0.37	46.6	120	0.39
2004	15	438	0.34	109.2	288	0.38	9	244	0.20	85.3	196	0.44
2005	14	730	0.33	140.4	488	0.29	7	270	0.38	75.3	167	0.45
2006	17	806	0.43	122.4	457	0.27	10	537	0.37	109.4	337	0.32
2007	20	659	0.31	173.4	454	0.38	10	344	0.16	124	288	0.43
2008	14	844	0.40	181.6	510	0.36	8	597	0.27	170	437	0.39
2009	15	788	0.39	174.2	483	0.36	9	644	0.33	159.4	432	0.37
2010	12	541	0.36	105.2	347	0.30	7	484	0.32	102.7	330	0.31
2011	14	633	0.55	74.7	287	0.26	8	558	0.49	74.5	283	0.26
2012	12	468	0.43	72.5	267	0.27	8	396	0.35	71	257	0.28
2013	11	444	0.47	79.1	236	0.34	8	378	0.38	79.1	235	0.34
Total		6674		1298.2	4029			4642		1097.3	3082	

Table D11: Variables retained in order of decreasing explanatory value for the west coast South Island fishery Model 2 and the corresponding total R^2 value.

Variable	R^2
Fishing year	<0.01
Vessel	6.22
Effort depth	20.57
Fishing duration	31.26
Month	36.35
Effort width	37.94

Table D12: The west coast South Island fishery CPUE Model 2 estimated values, upper and lower confidence intervals and CVs by year.

Year	CPUE	Lower CI	Upper CI	CV
2003	0.96	0.79	1.04	0.09
2004	1.28	1.09	1.22	0.08
2005	1.24	1.02	1.08	0.10
2006	0.93	0.83	1.48	0.06
2007	1.30	1.14	1.57	0.06
2008	1.05	0.95	1.07	0.05
2009	1.03	0.93	1.12	0.05
2010	0.92	0.82	1.20	0.06
2011	0.80	0.70	1.04	0.06
2012	0.77	0.67	0.84	0.07
2013	0.89	0.78	0.97	0.07

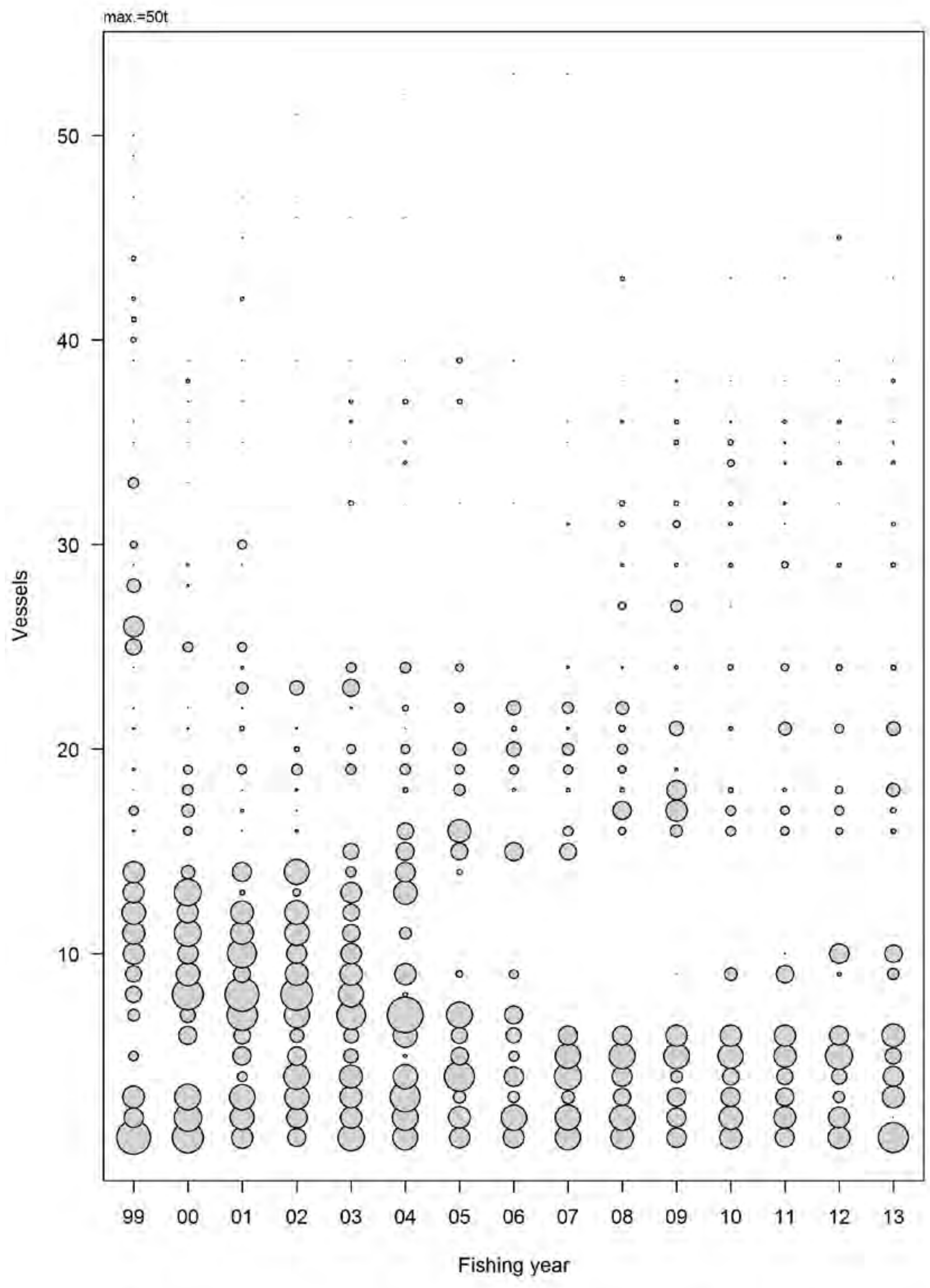


Figure D1: The Eastern fishery Model 1 scaled annual catch for all vessels.

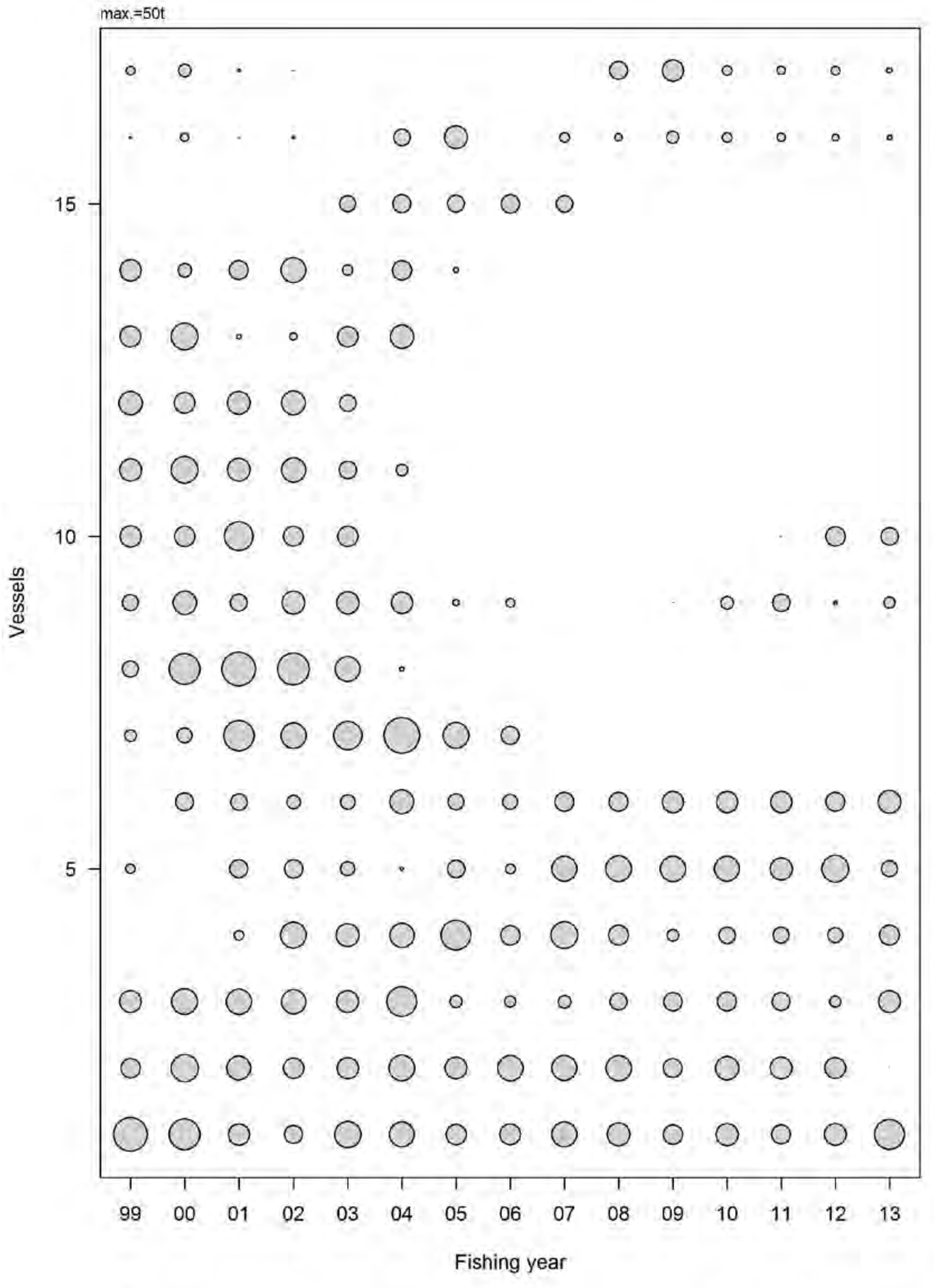


Figure D2: The Eastern fishery Model 1 scaled annual catch for core vessels.

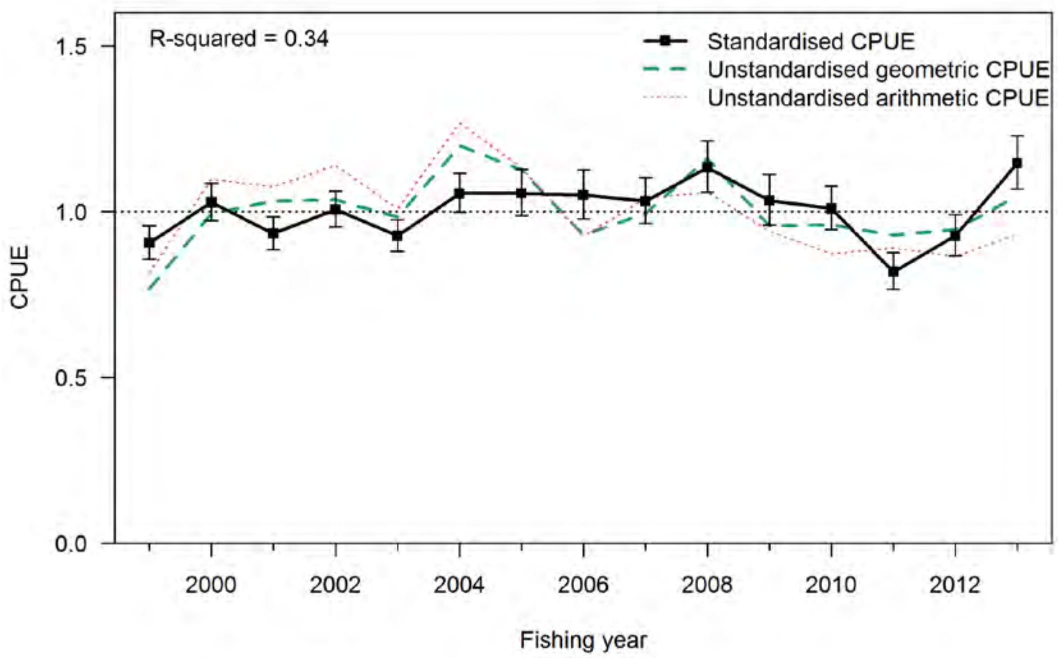


Figure D3: The Eastern fishery Model 1 standardised, geometric, and arithmetic CPUE for fishing years 1999–2013.

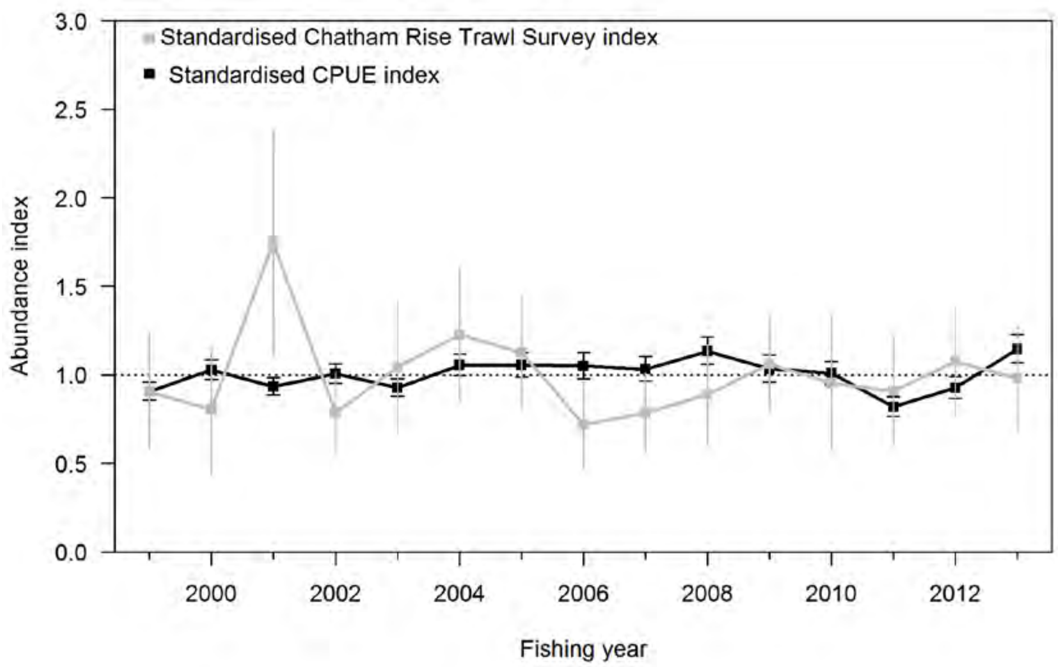


Figure D4: Comparison of the Eastern fishery Model 1 standardised CPUE and standardised Chatham Rise trawl survey abundance indices for fishing years 1999–2013.

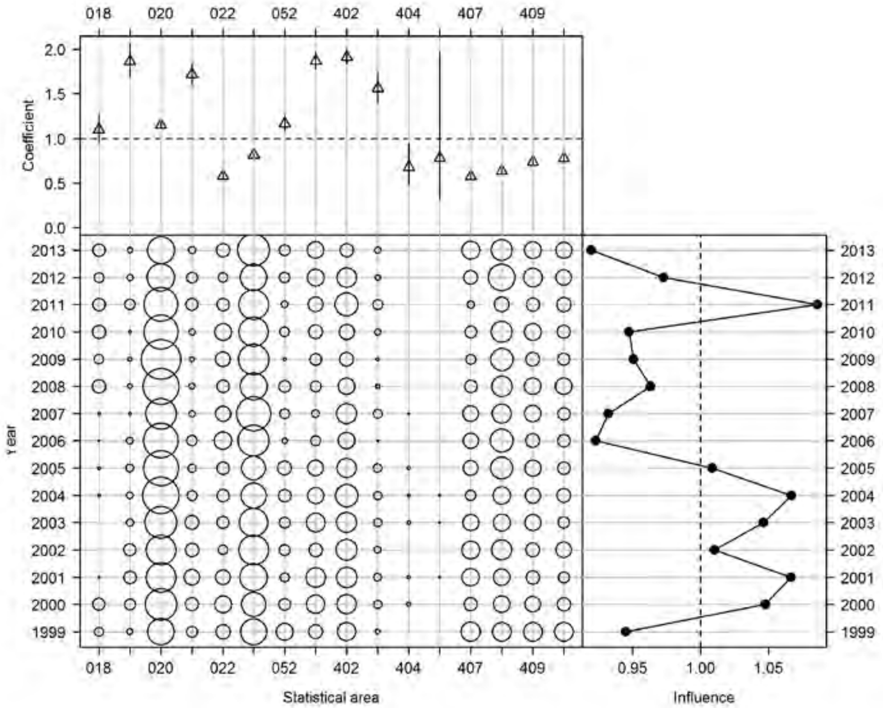


Figure D5: Effect and influence of statistical area for the Eastern fishery CPUE Model 1. Top: relative effect by level of variable. Bottom left: relative distribution of variable (statistical area) by fishing year. Bottom right: influence of variable (statistical area) on unstandardised CPUE by fishing year.

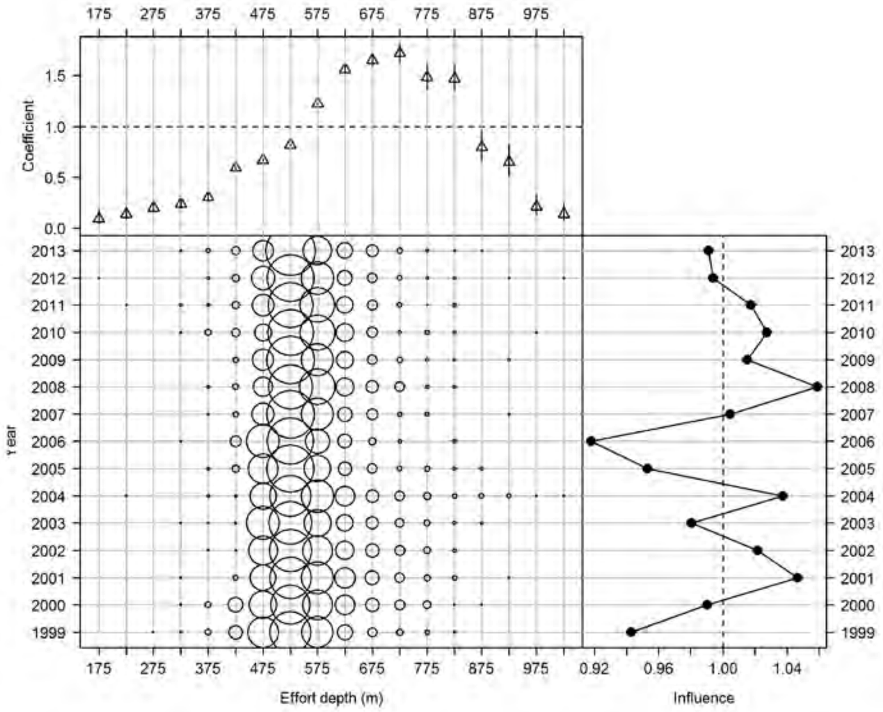


Figure D6: Effect and influence of effort depth for the Eastern fishery CPUE Model 1. See caption on Figure D5 for details.

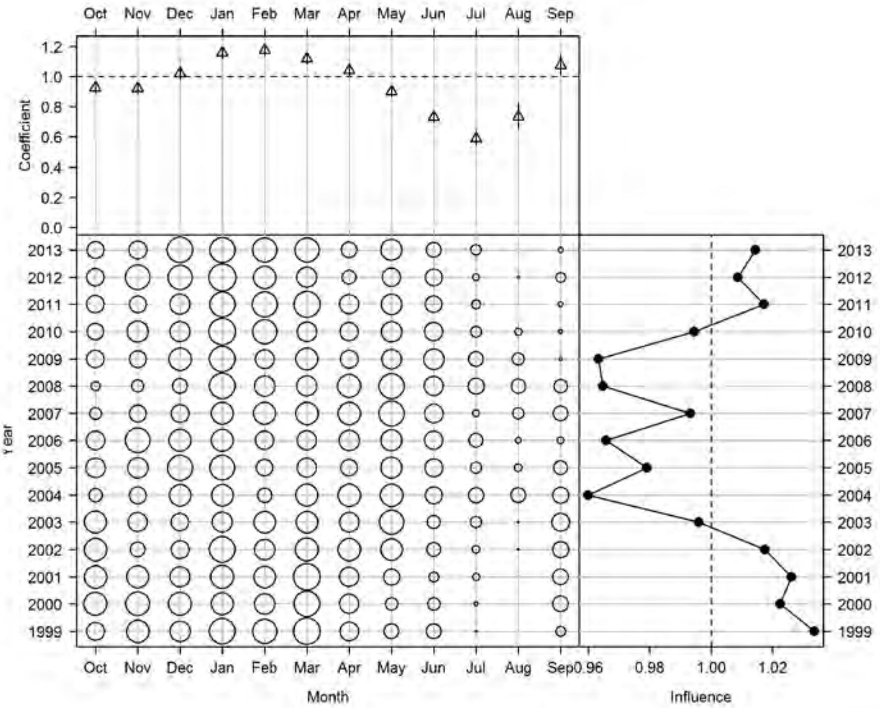


Figure D7: Effect and influence of month for the Eastern fishery CPUE Model 1. See caption on Figure D5 for details.

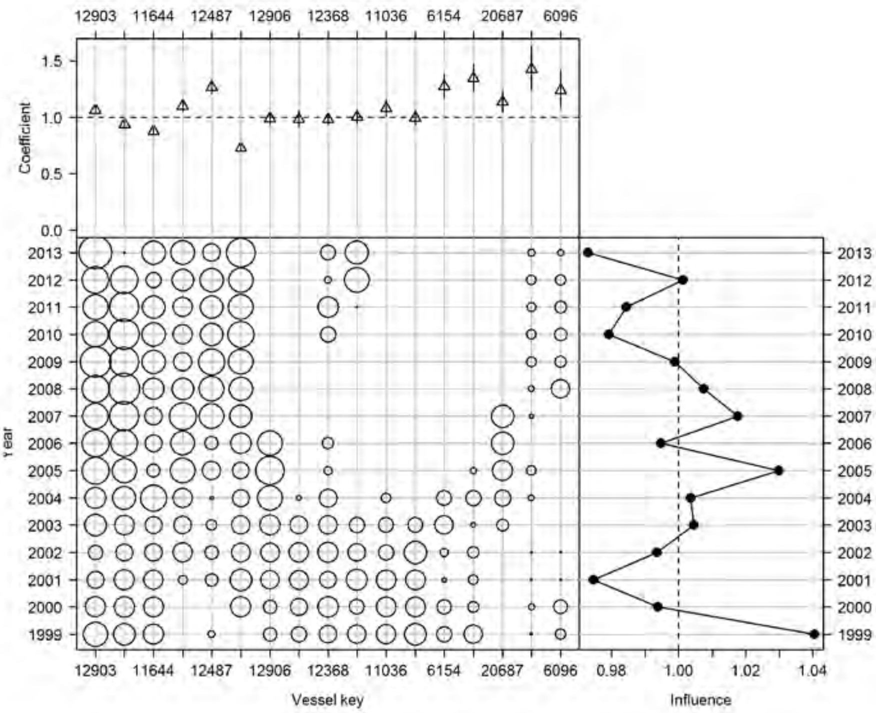


Figure D8: Effect and influence of vessel for the Eastern fishery CPUE Model 1. See caption on Figure D5 for details.

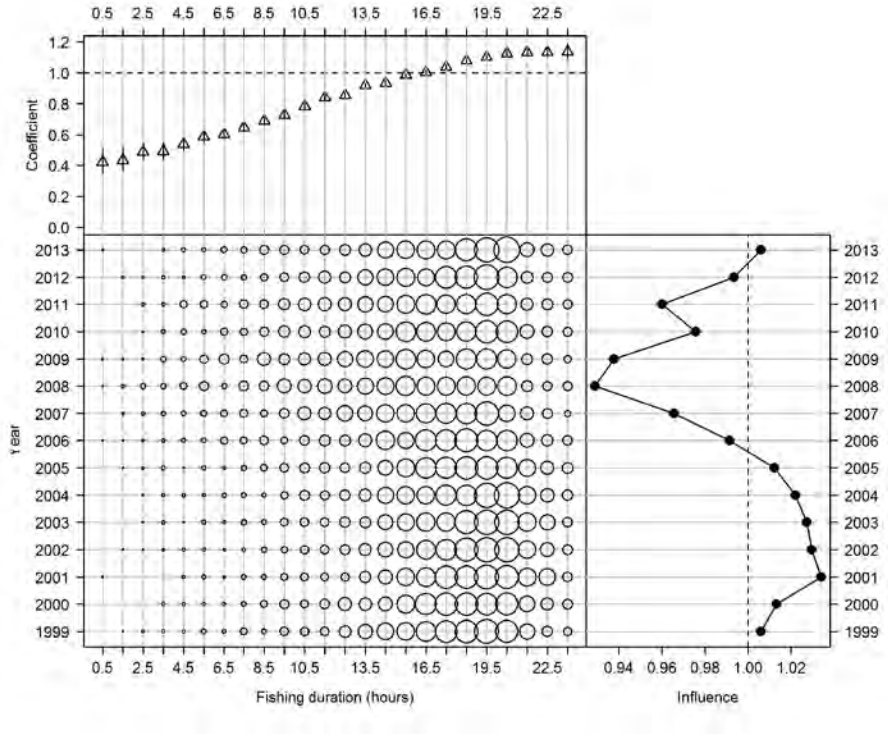


Figure D9: Effect and influence of fishing duration for the Eastern fishery CPUE Model 1. See caption on Figure D5 for details.

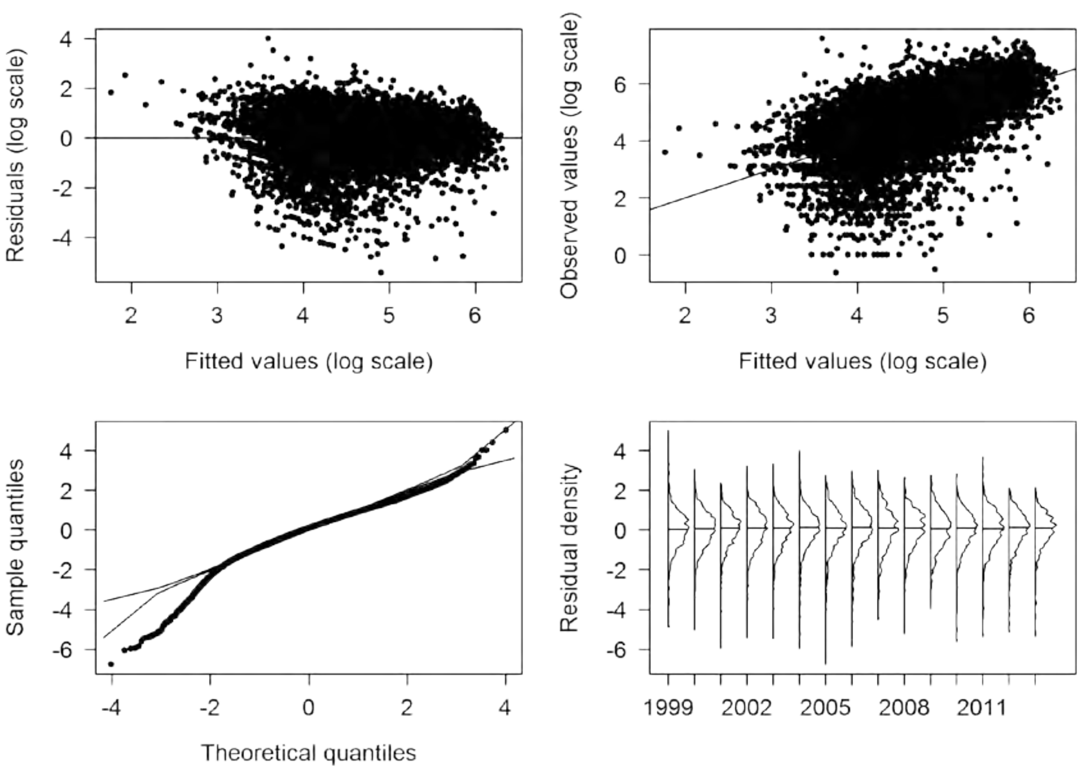


Figure D10: The Eastern fishery CPUE Model 1 residual diagnostic plots describing the fit of the GLM CPUE model.

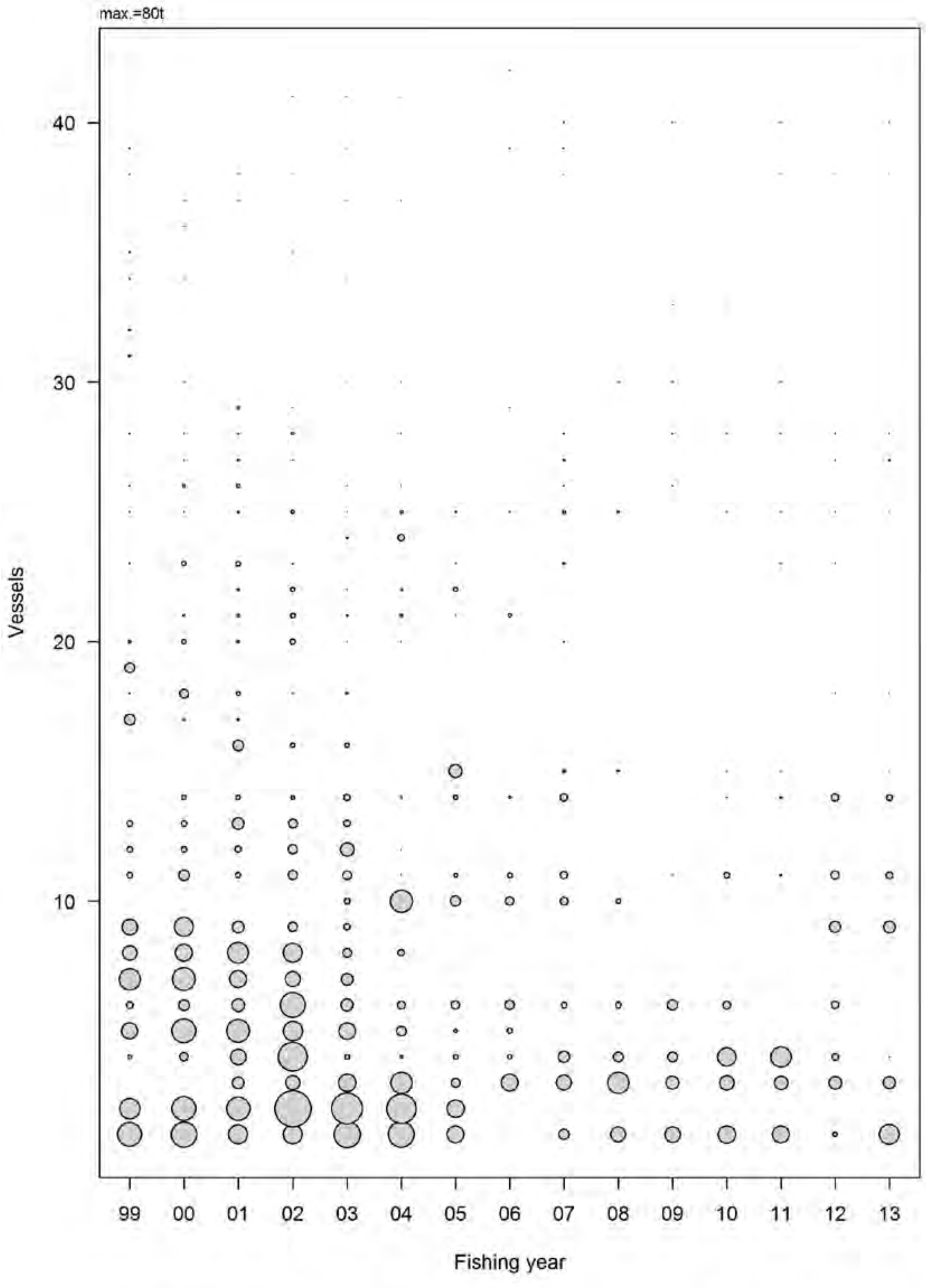


Figure D11: The Southern fishery Model 1 scaled annual catch for all vessels.

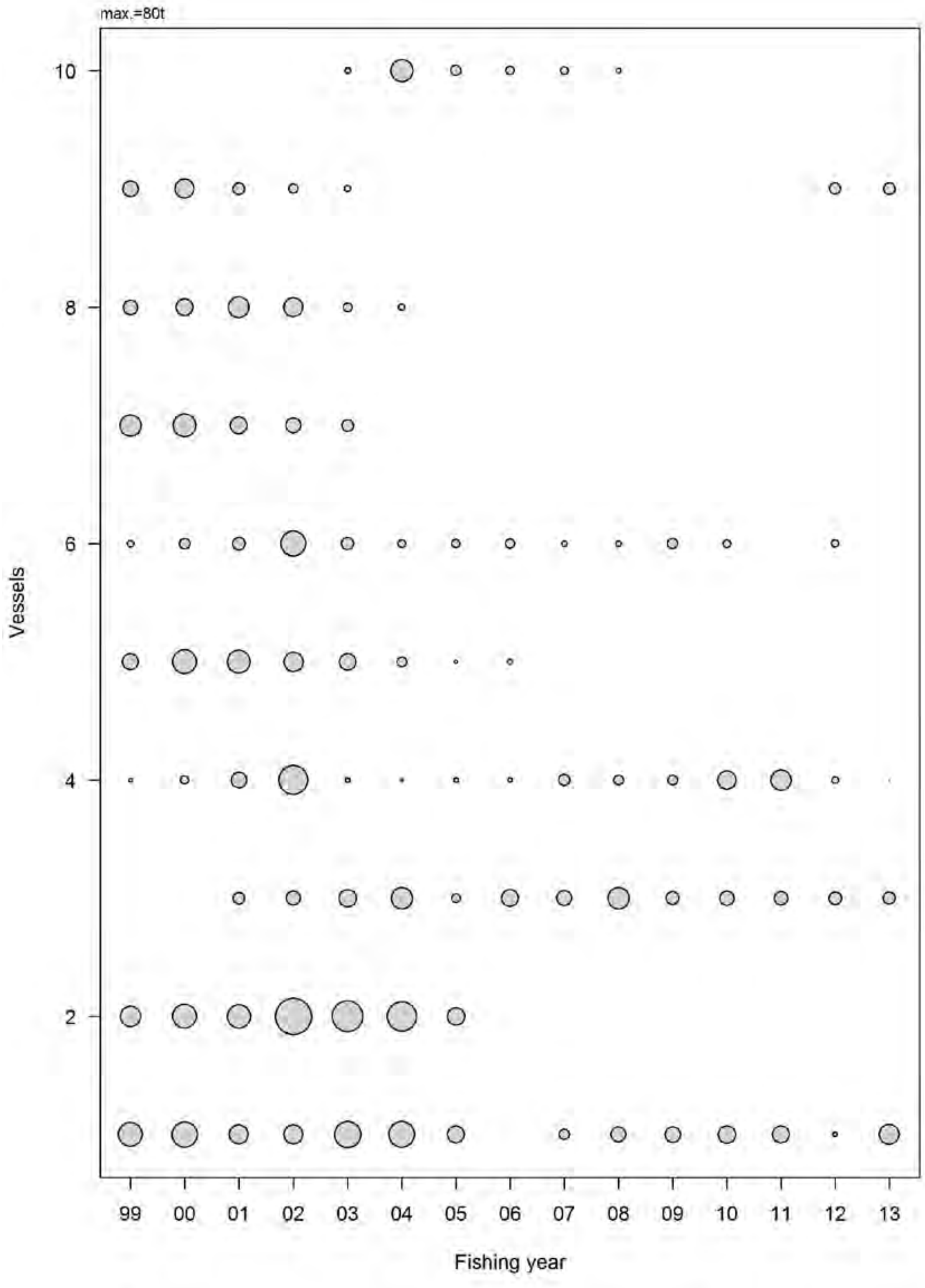


Figure D12: The Southern fishery Model 1 scaled annual catch for core vessels.

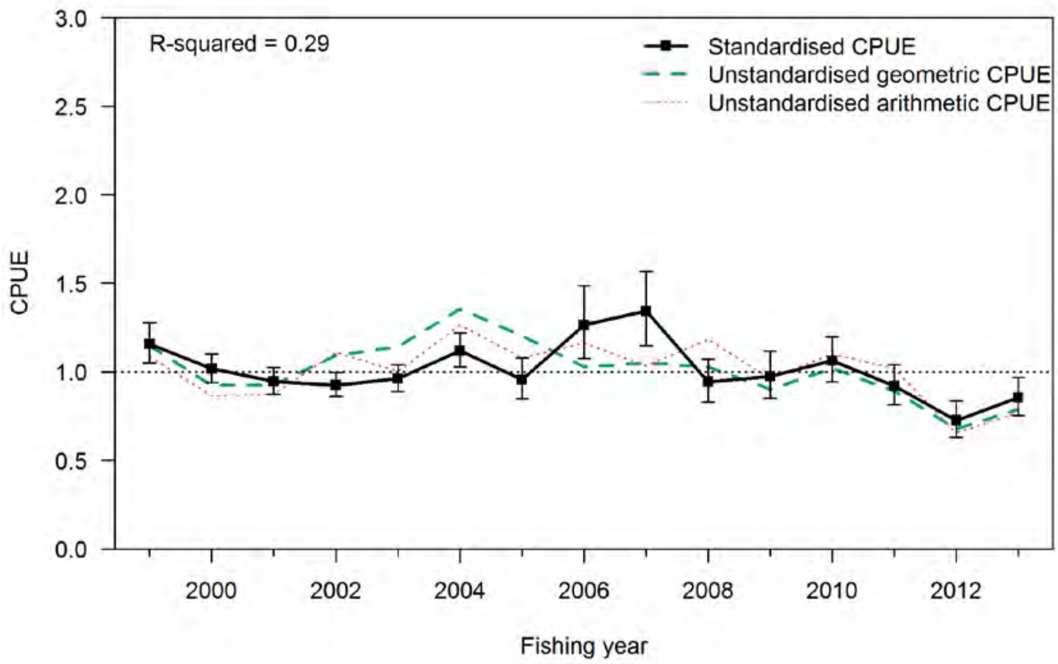


Figure D13: The Southern fishery Model 1 standardised, geometric, and arithmetic CPUE for fishing years 1999–2013.

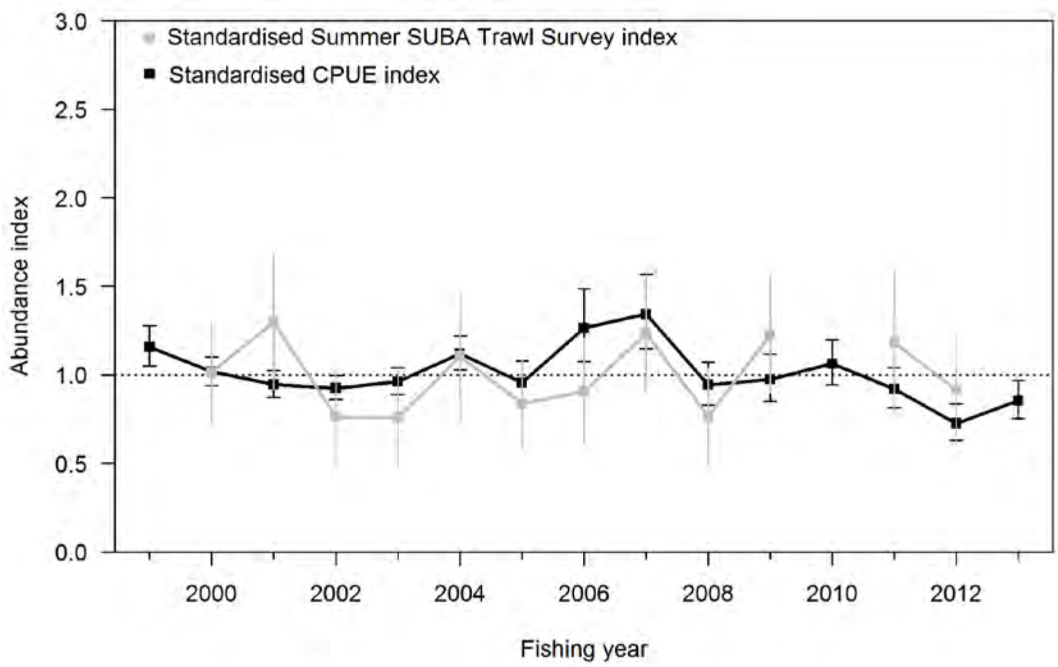


Figure D14: Comparison of the Southern fishery Model 1 standardised CPUE and standardised summer Sub-Antarctic trawl survey abundance indices for fishing years 1999–2013.

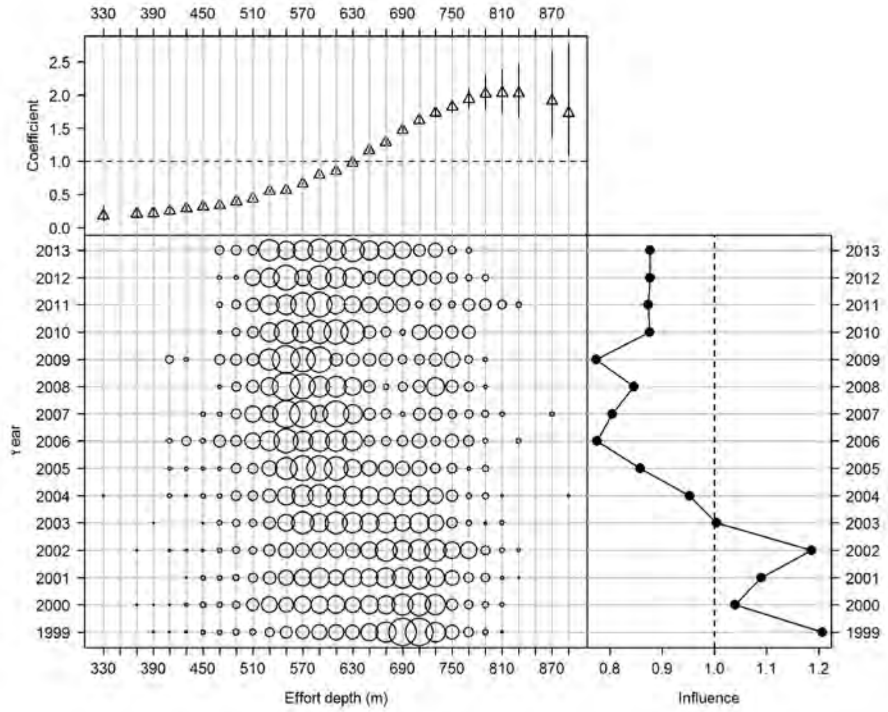


Figure D15: Effect and influence of effort variable for the Southern fishery CPUE Model 1. Top: relative effect by level of variable. Bottom left: relative distribution of variable (effort depth) by fishing year. Bottom right: influence of variable (effort depth) on unstandardised CPUE by fishing year.

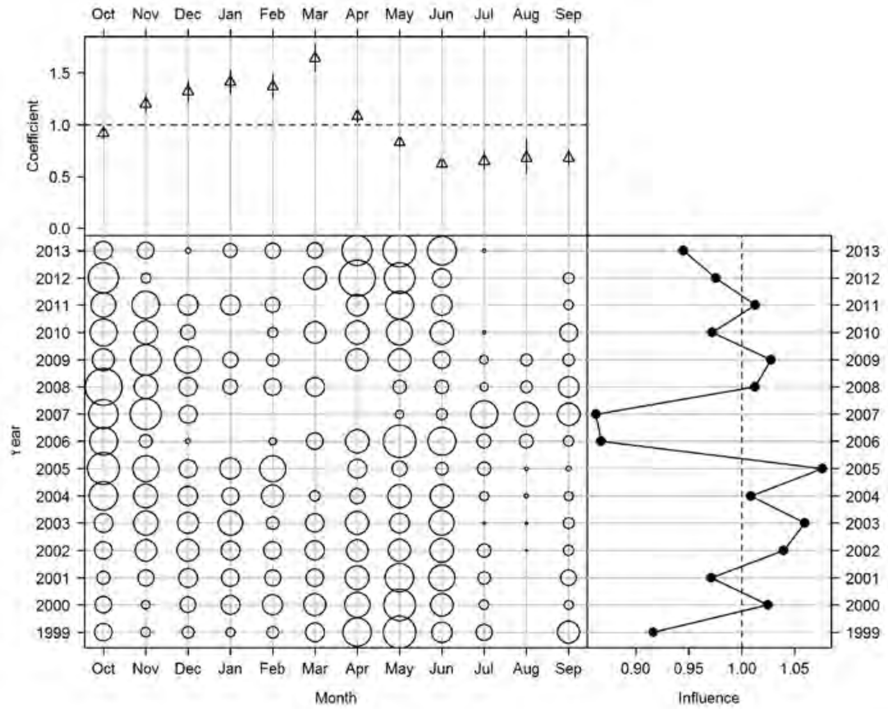


Figure D16: Effect and influence of month for the Southern fishery CPUE Model 1. See caption on Figure D15 for details.

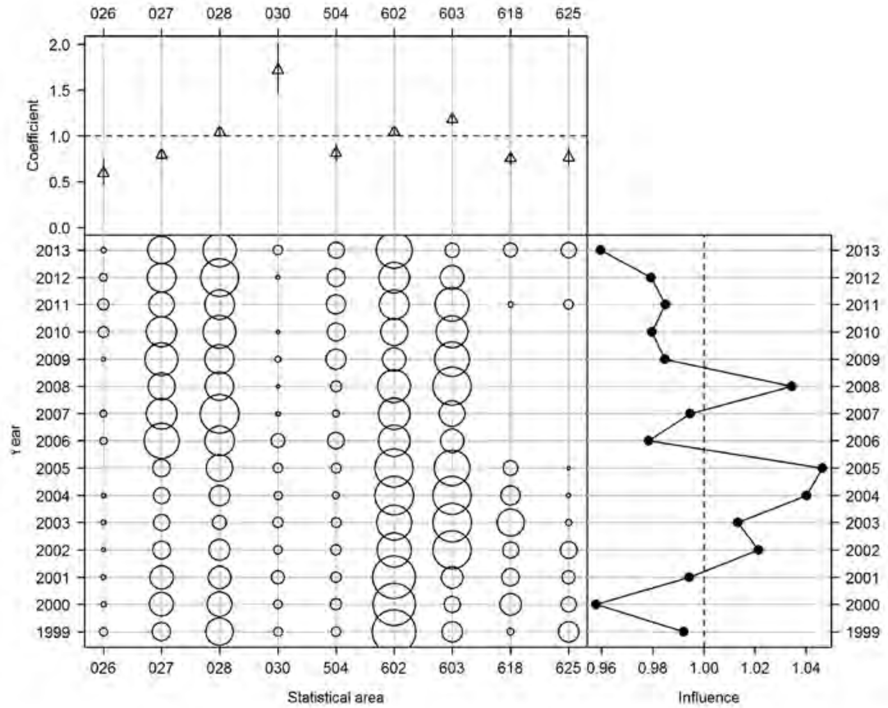


Figure D17: Effect and influence of statistical area for the Southern fishery CPUE Model 1. See caption on Figure D15 for details.

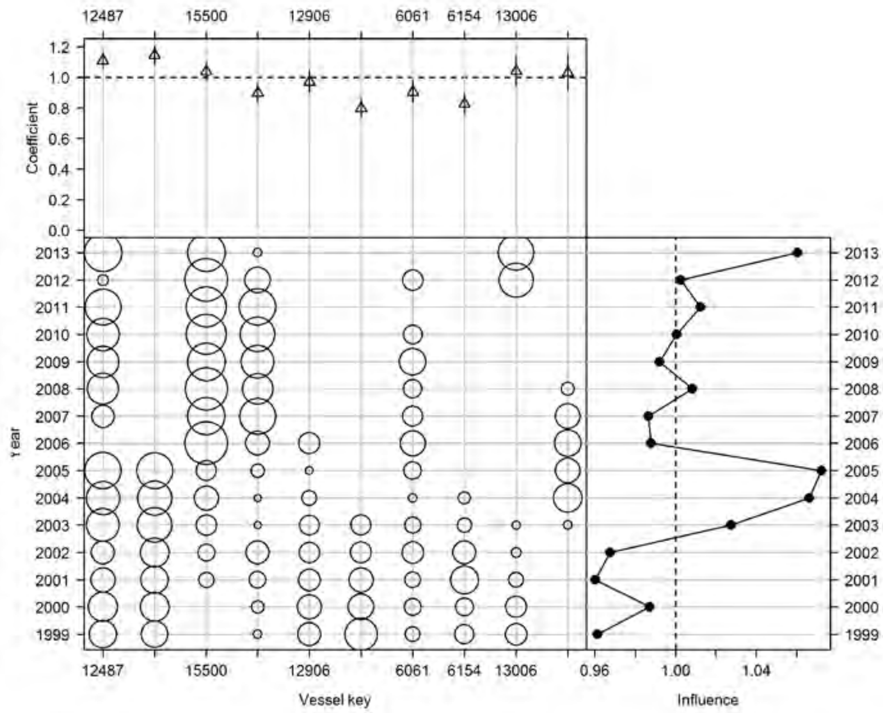


Figure D18: Effect and influence of vessel for the Southern fishery CPUE Model 1. See caption on Figure D15 for details.

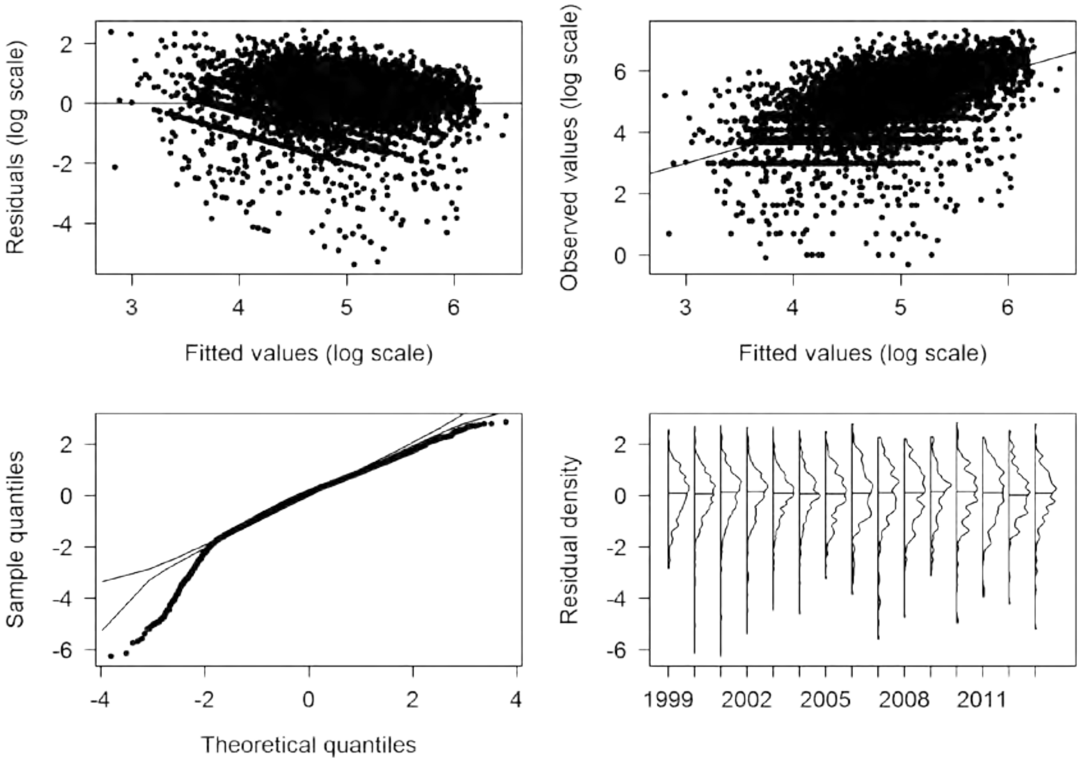


Figure D19: The Southern fishery CPUE Model 1 residual diagnostic plots describing the fit of the GLM CPUE model.

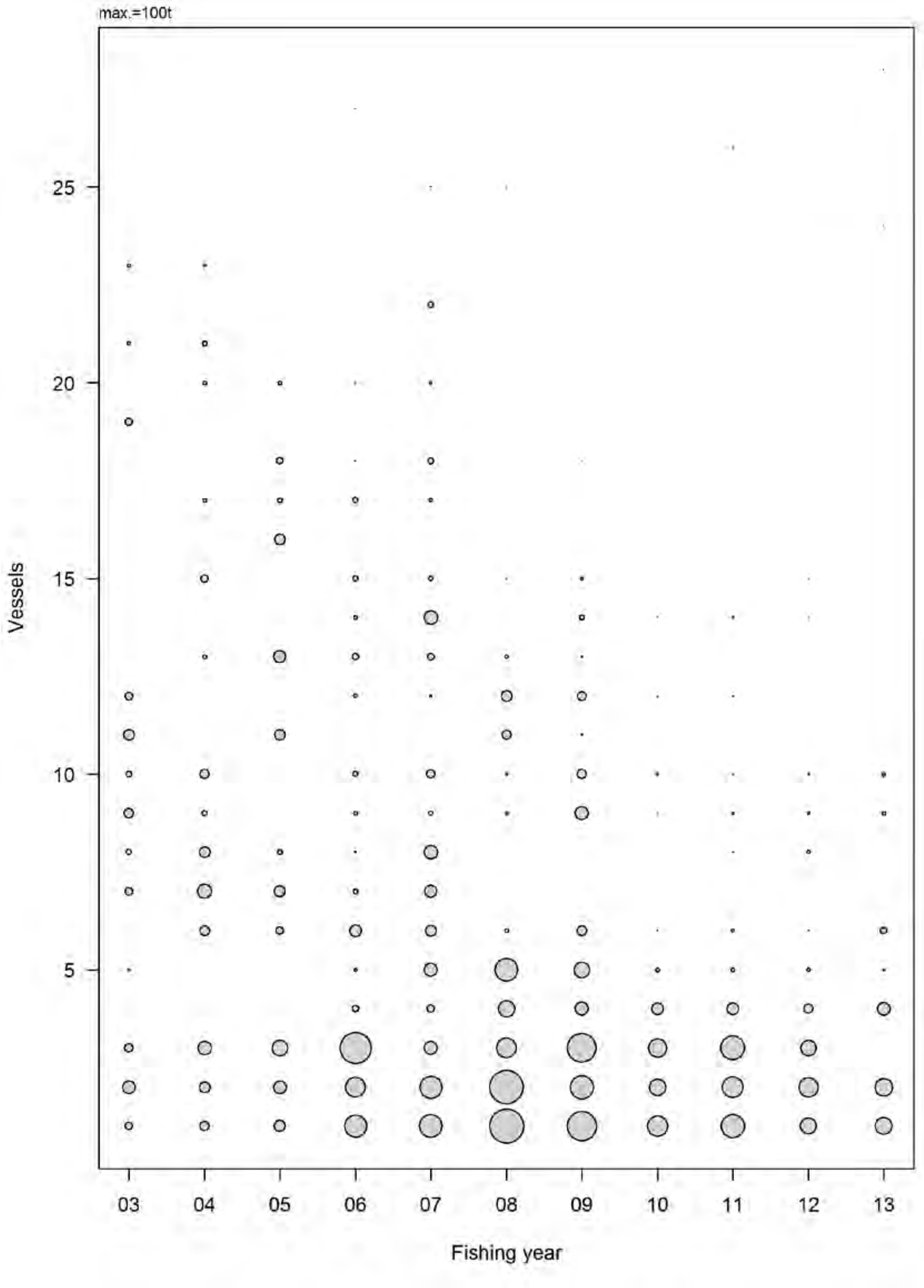


Figure D20: The west coast South Island fishery Model 1 scaled annual catch for all vessels.

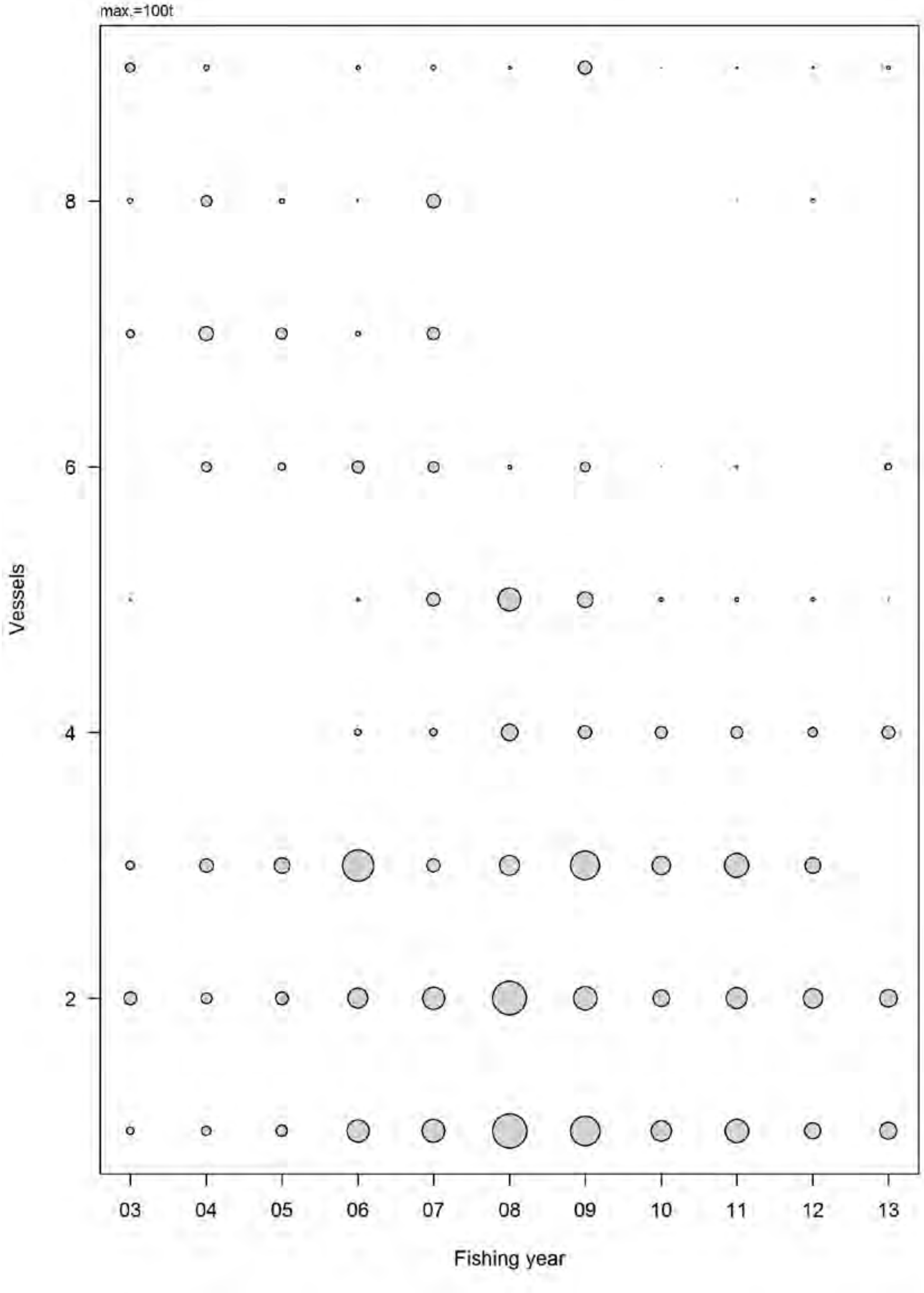


Figure D21: The west coast South Island fishery Model 1 scaled annual catch for core vessels.

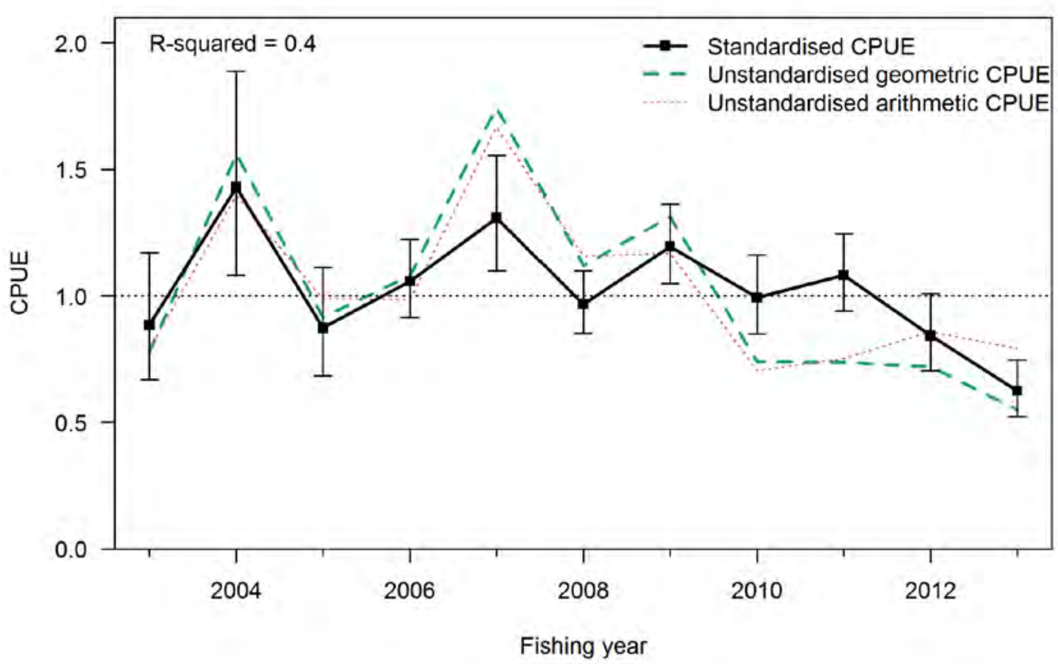


Figure D22: The west coast South Island fishery Model 1 standardised, geometric, and arithmetic CPUE for fishing years 2003–2013.

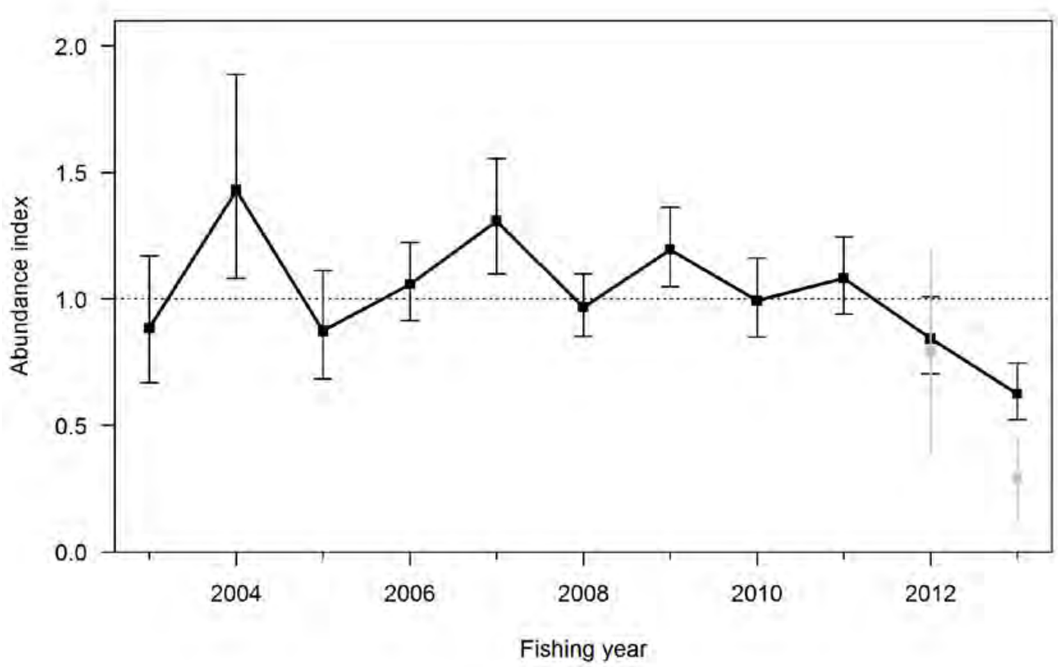


Figure D23: Comparison of the west coast South Island fishery Model 1 standardised CPUE and standardised west coast South Island middle depth trawl survey abundance indices for fishing years 2003–2013.

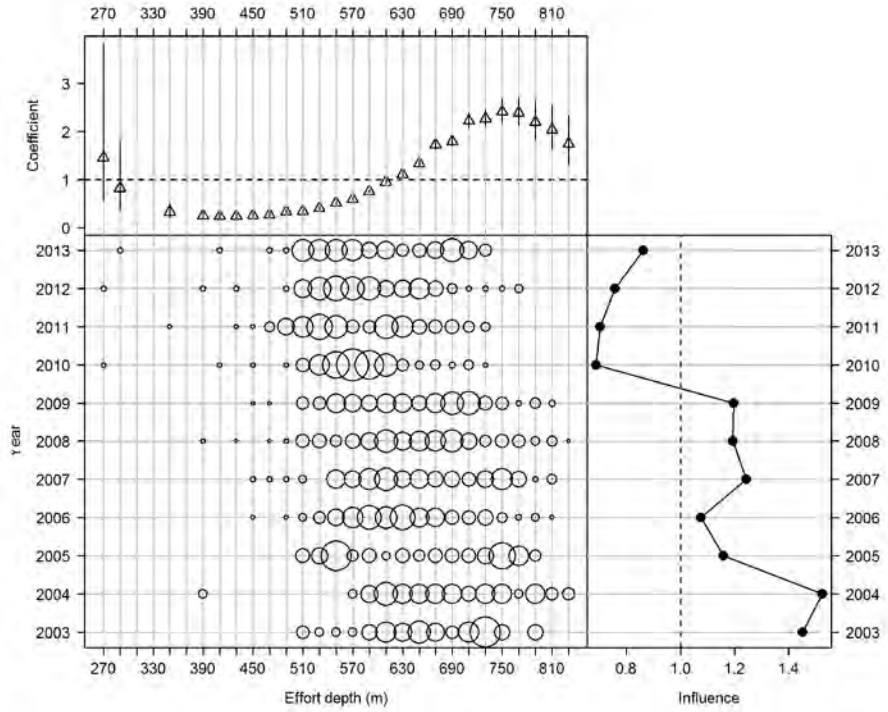


Figure D24: Effect and influence of effort depth for the west coast South Island fishery CPUE Model 1. Top: relative effect by level of variable. Bottom left: relative distribution of variable (effort depth) by fishing year. Bottom right: influence of variable (effort depth) on unstandardised CPUE by fishing year.

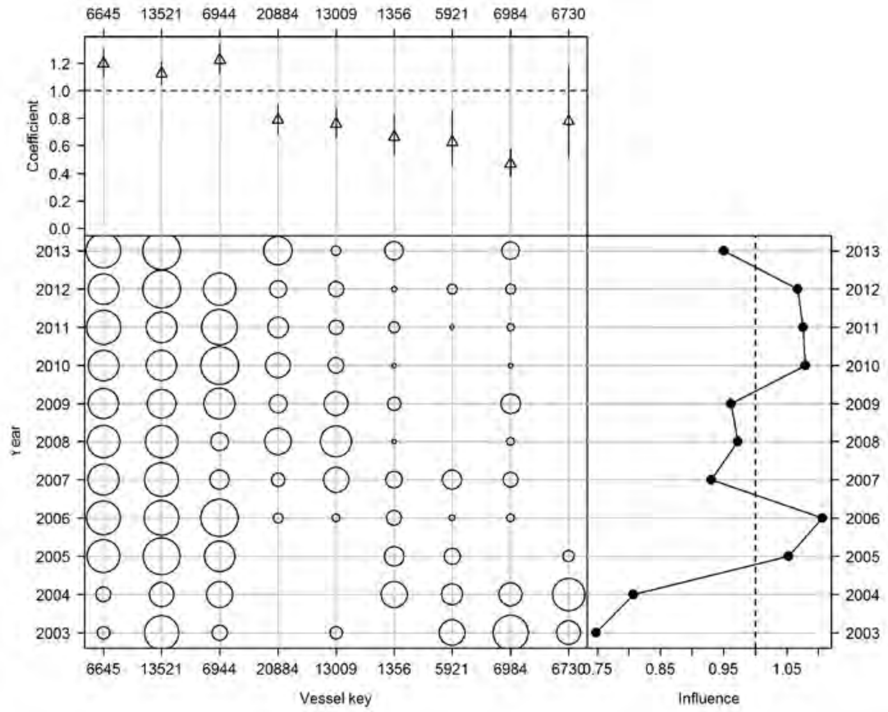


Figure D25: Effect and influence of vessel for the west coast South Island fishery CPUE Model 1. See caption on Figure D24 for details.

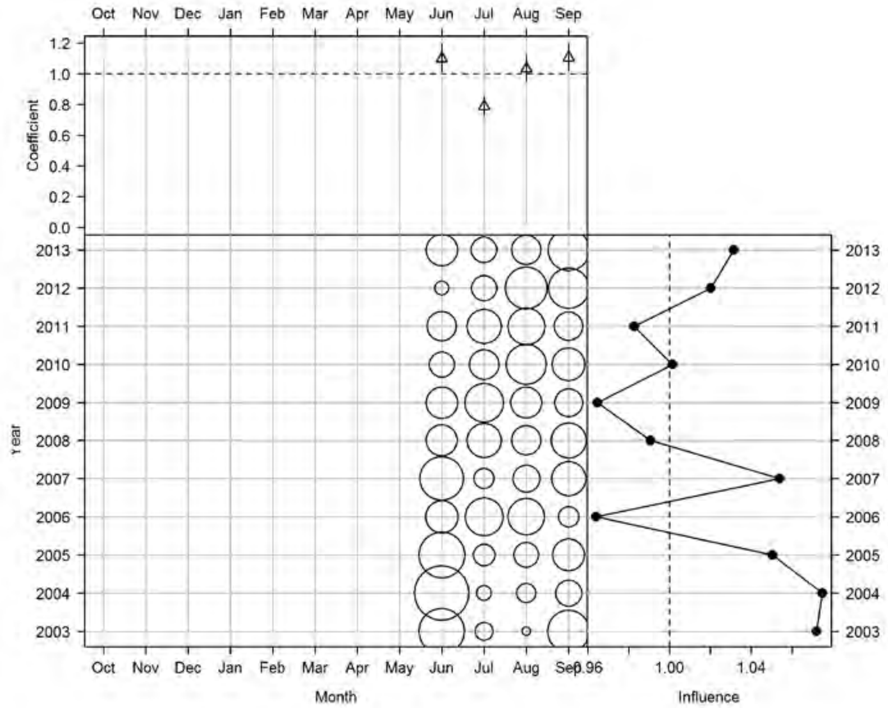


Figure D26: Effect and influence of month for the west coast South Island fishery CPUE Model 1. See caption on Figure D24 for details.

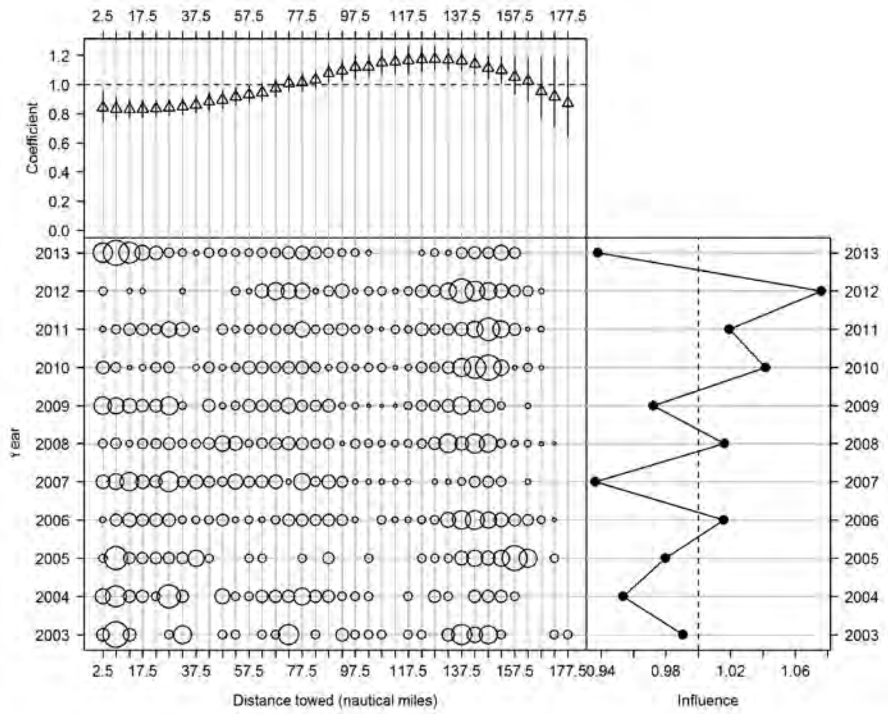


Figure D27: Effect and influence of distance towed for the west coast South Island fishery CPUE Model 1. See caption on Figure D24 for details.

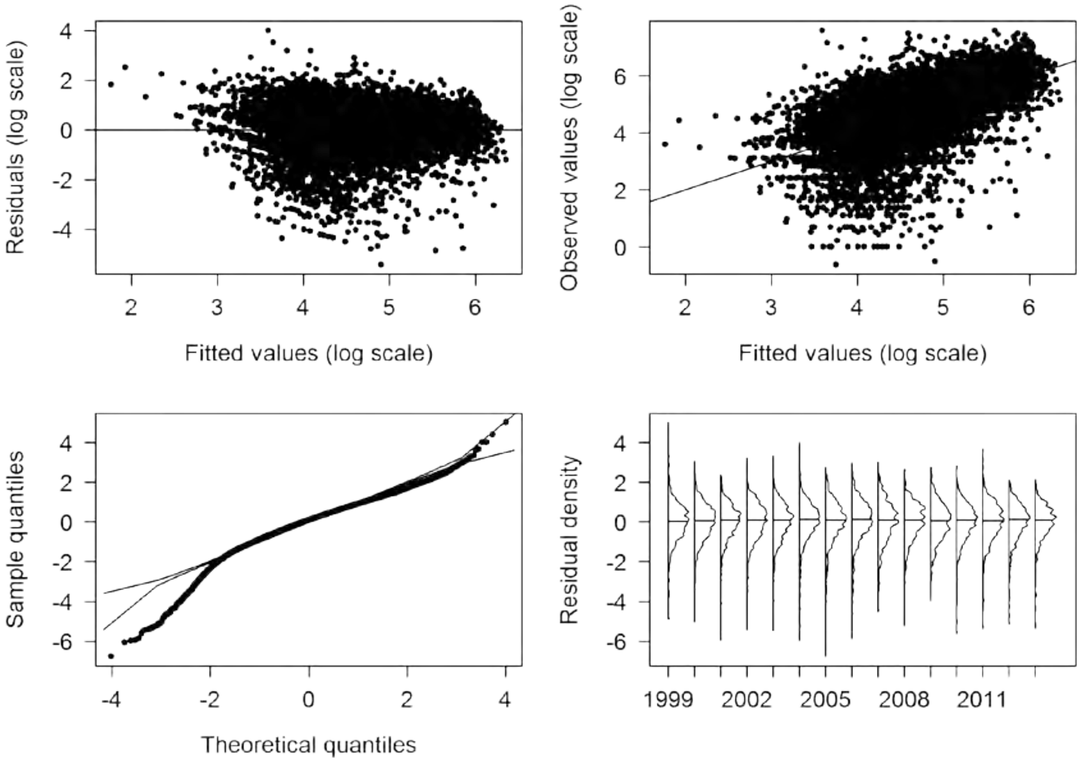


Figure D28: The west coast South Island fishery CPUE Model 1 residual diagnostic plots describing the fit of the GLM CPUE model.

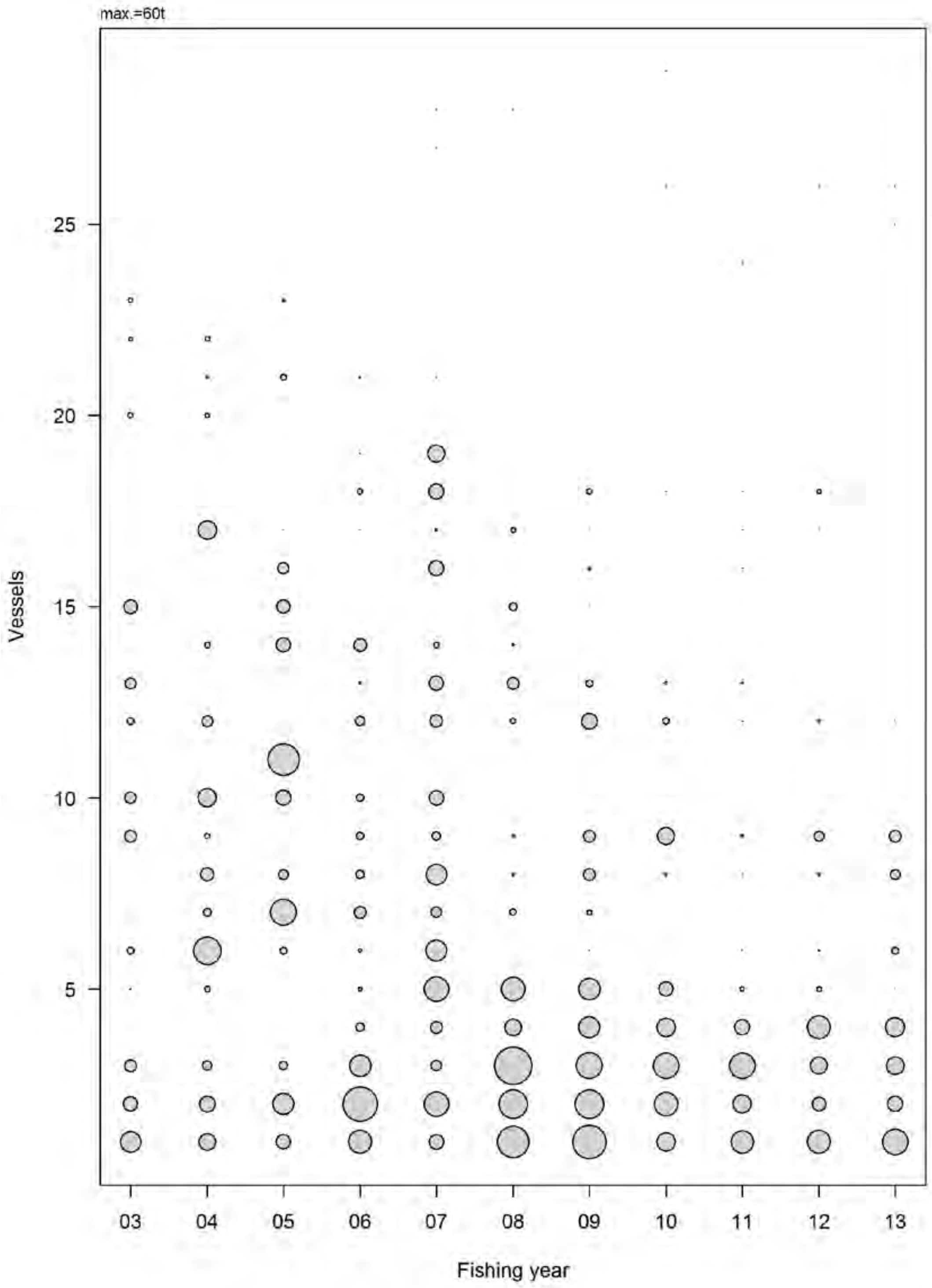


Figure D29: The west coast South Island fishery Model 2 scaled annual catch for all vessels.

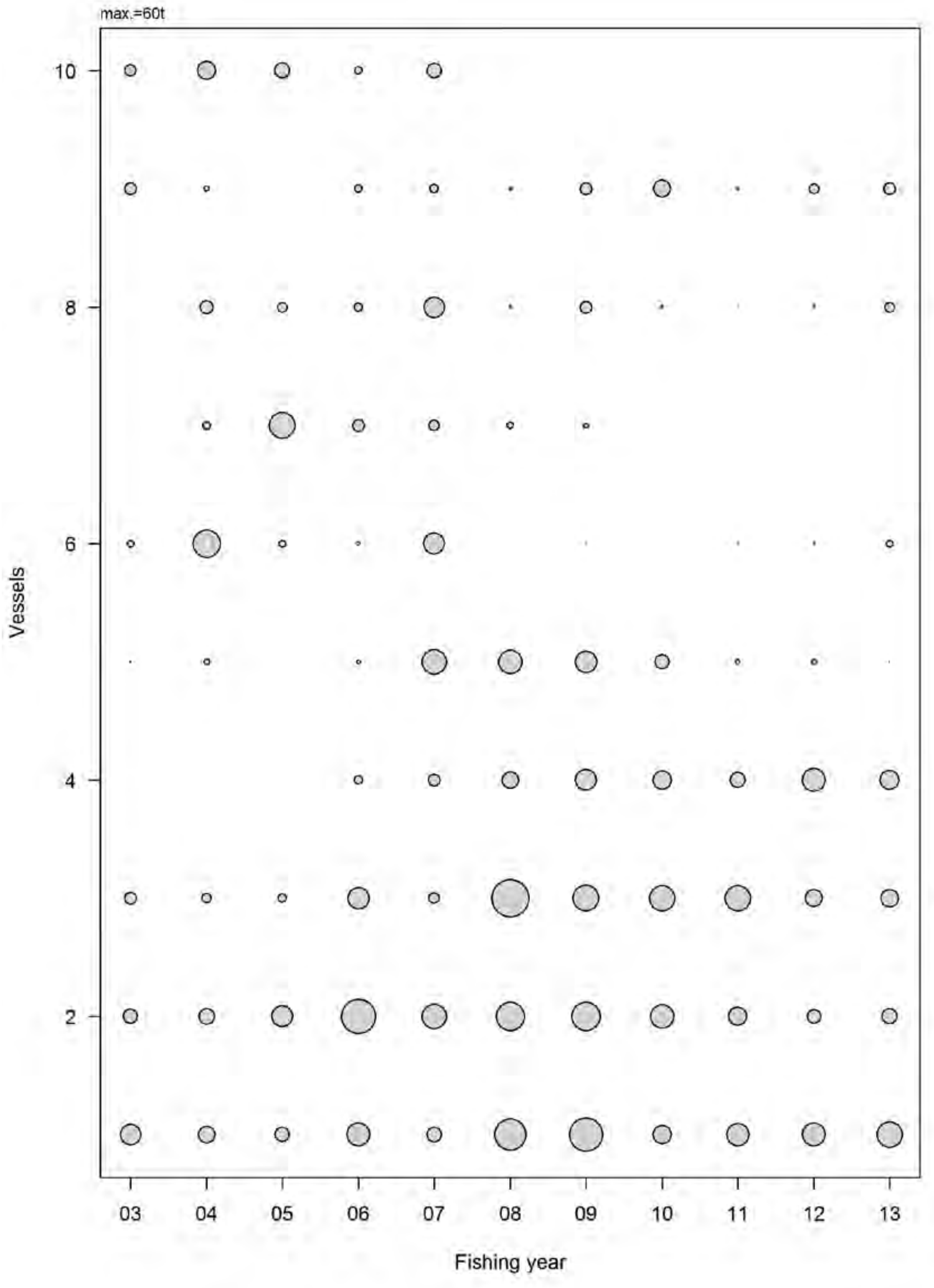


Figure D30: The west coast South Island fishery Model 2 scaled annual catch for core vessels.

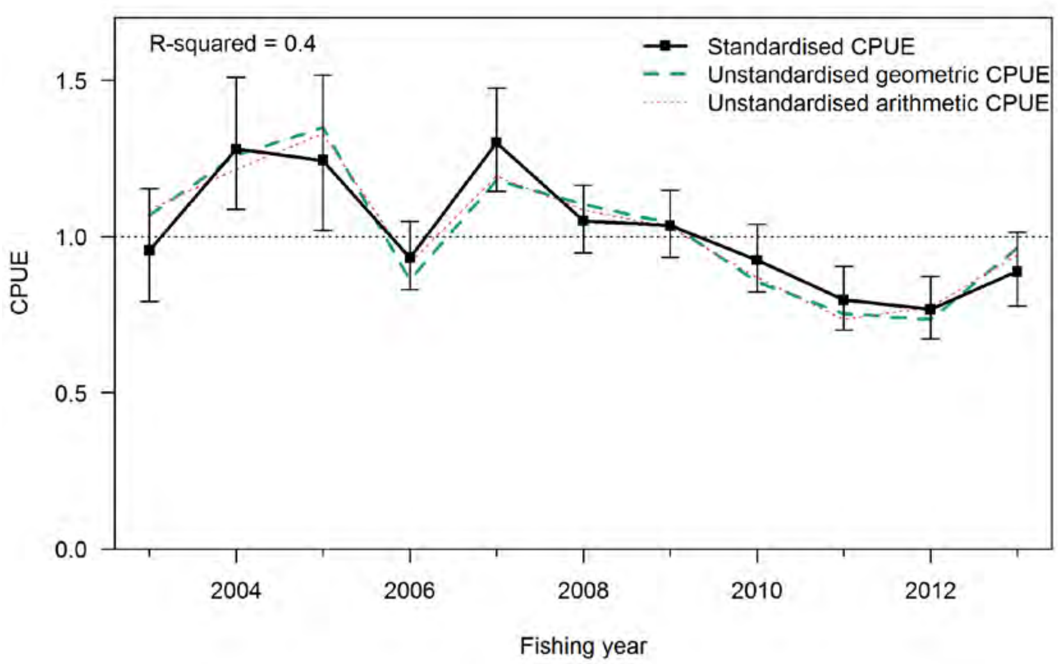


Figure D31: The west coast South Island fishery Model 2 standardised, geometric, and arithmetic CPUE for fishing years 2003–2013.

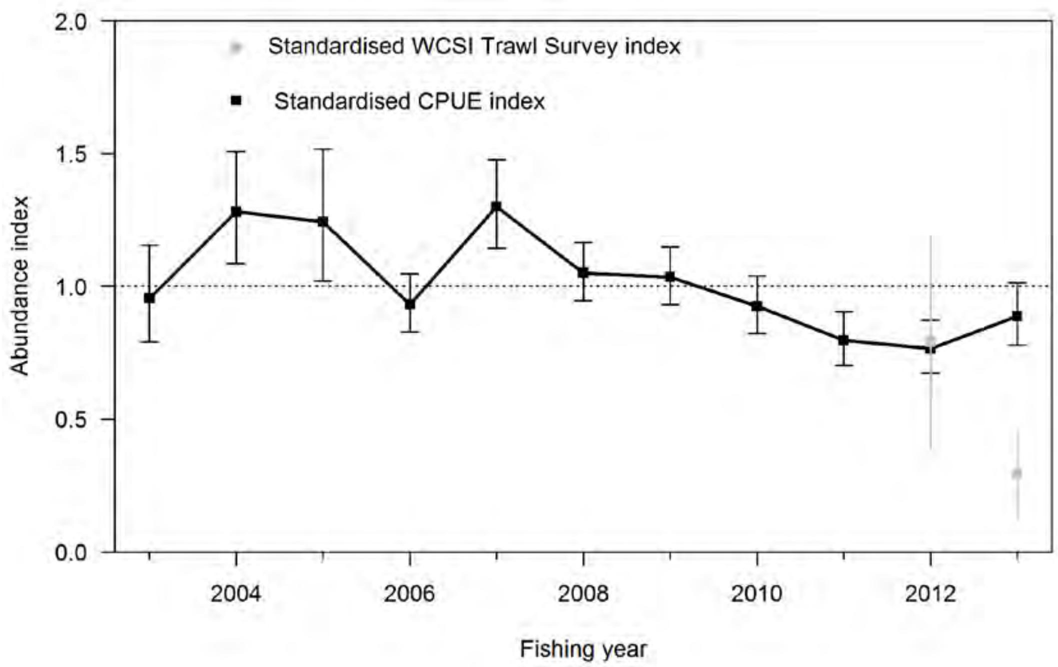


Figure D32: Comparison of the west coast South Island fishery Model 2 standardised CPUE and standardised west coast South Island middle depth trawl survey abundance indices for fishing years 2003–2013.

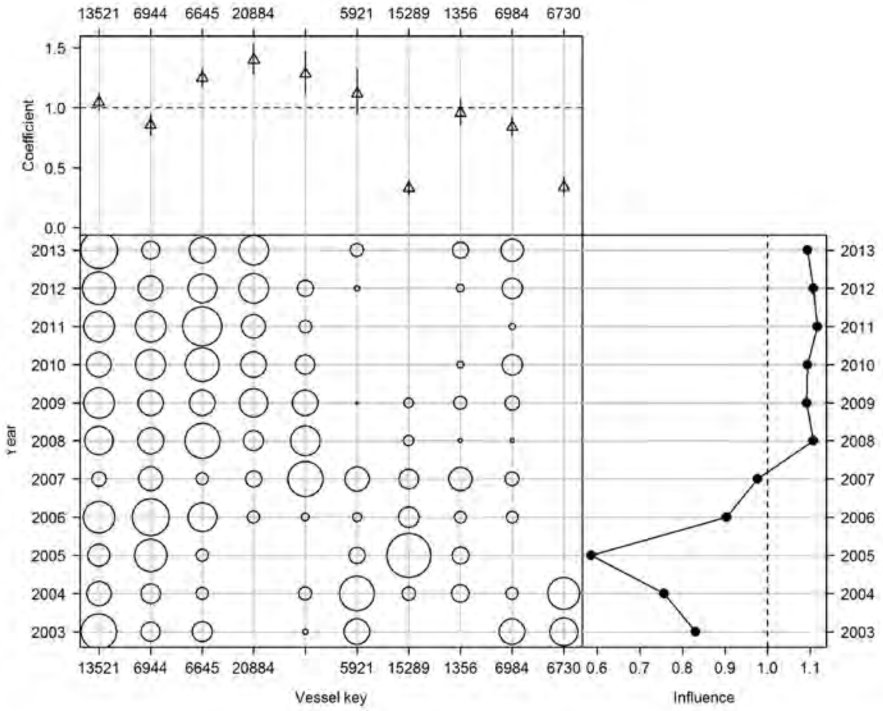


Figure D33: Effect and influence of vessel key for the west coast South Island fishery CPUE Model 2. Top: relative effect by level of variable. Bottom left: relative distribution of variable (vessel key) by fishing year. Bottom right: influence of variable (vessel key) on unstandardised CPUE by fishing year.

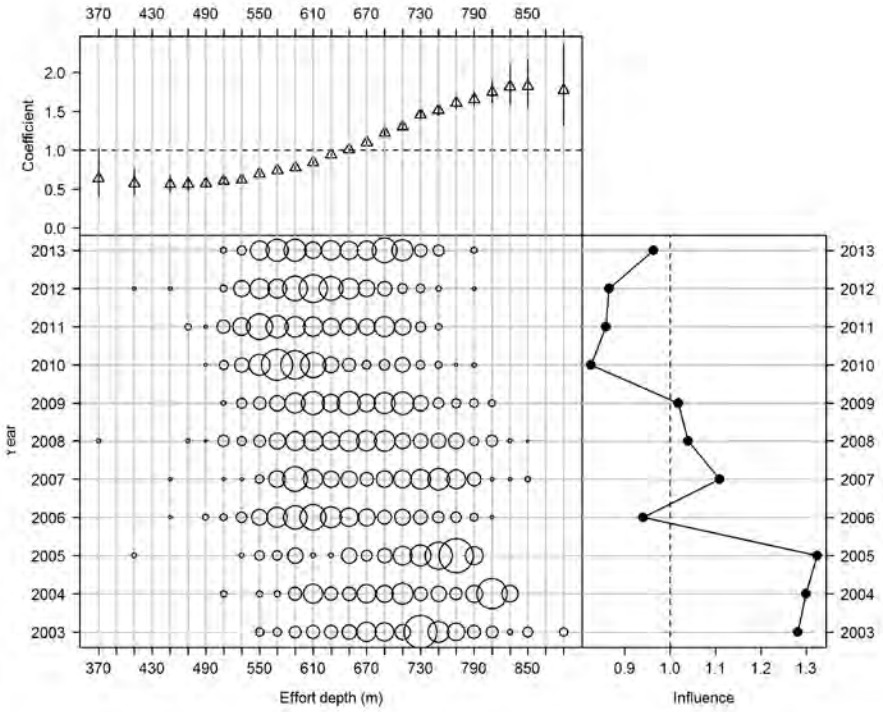


Figure D34: Effect and influence of effort depth for the west coast South Island fishery CPUE Model 2. See caption on Figure D33 for details.

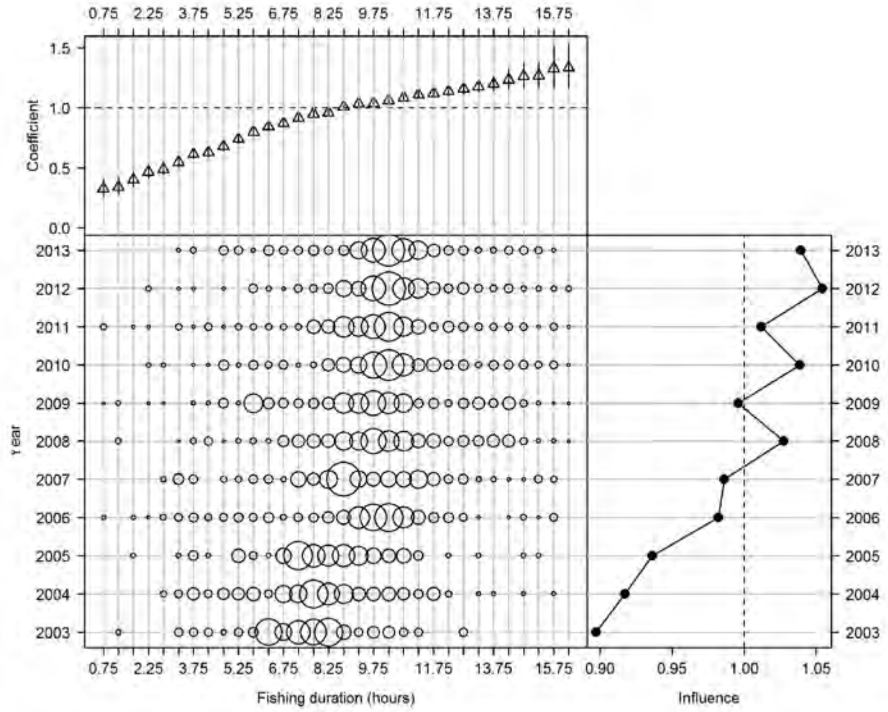


Figure D35: Effect and influence of fishing duration for the west coast South Island fishery CPUE Model 2. See caption on Figure D33 for details.

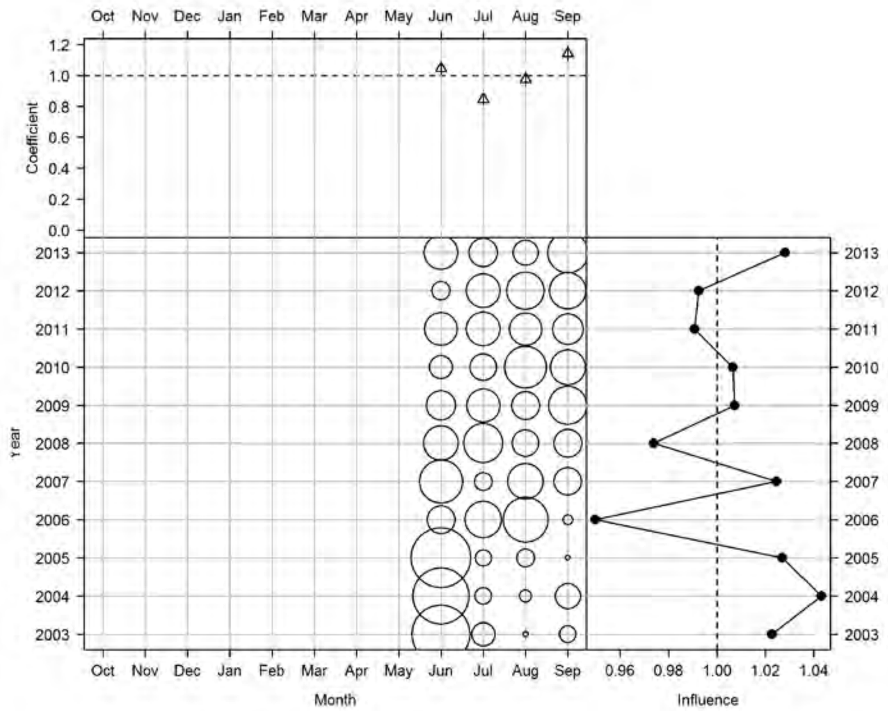


Figure D36: Effect and influence of month for the west coast South Island fishery CPUE Model 2. See caption on Figure D33 for details.

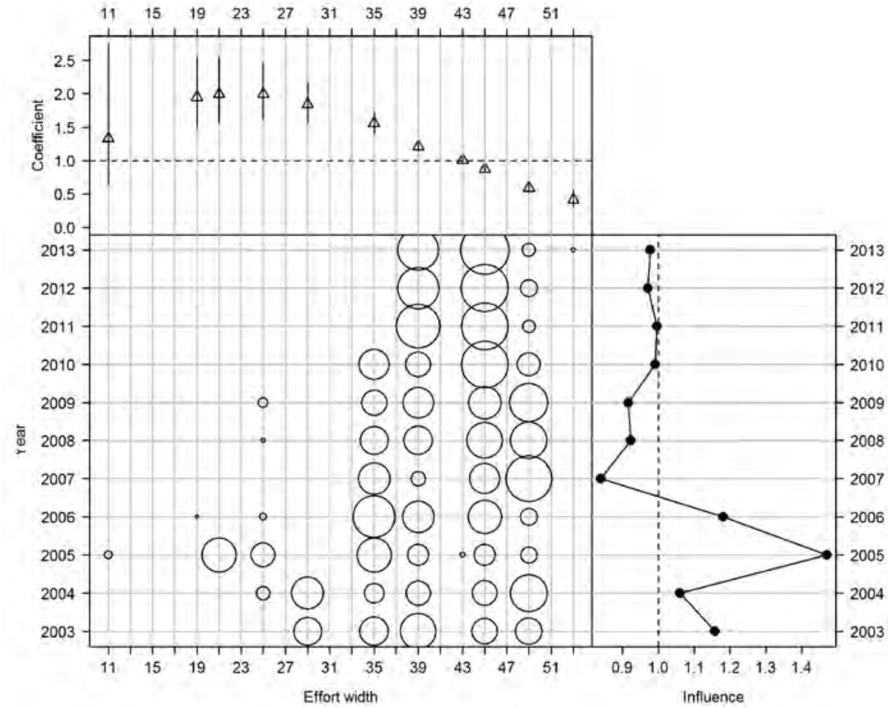


Figure D37: Effect and influence of effort width for the west coast South Island fishery CPUE Model 2. See caption on Figure D33 for details.

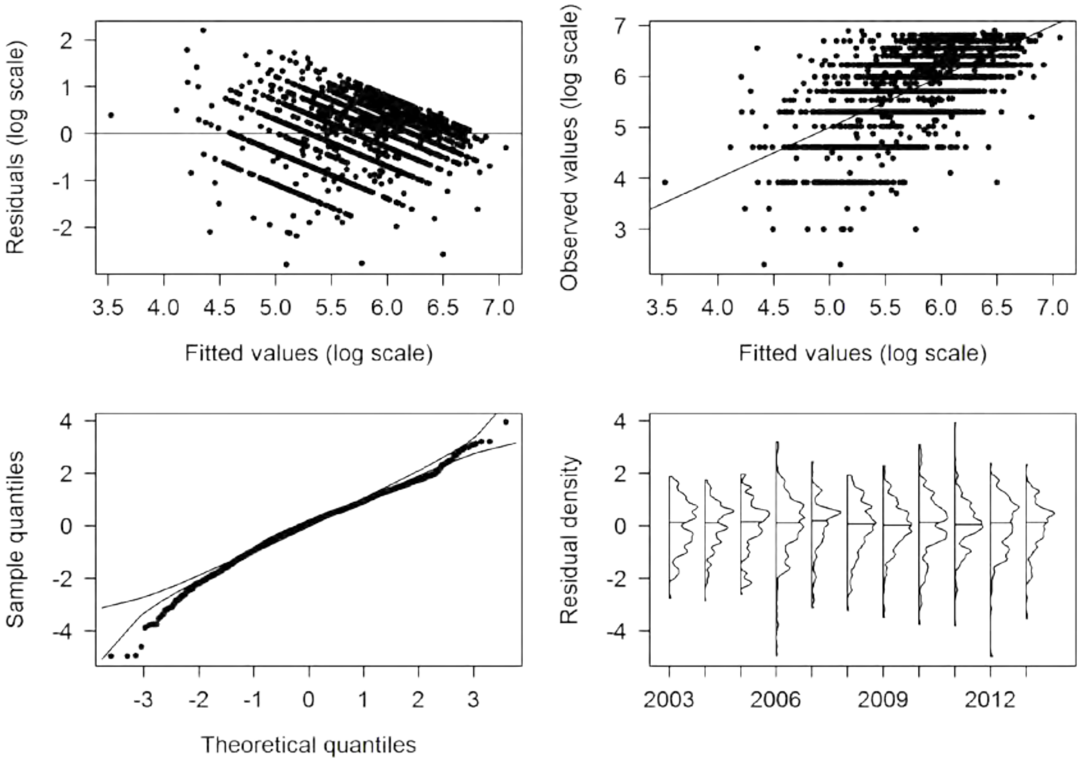


Figure D38: The west coast South Island fishery CPUE Model 2 residual diagnostic plots describing the fit of the GLM CPUE model.

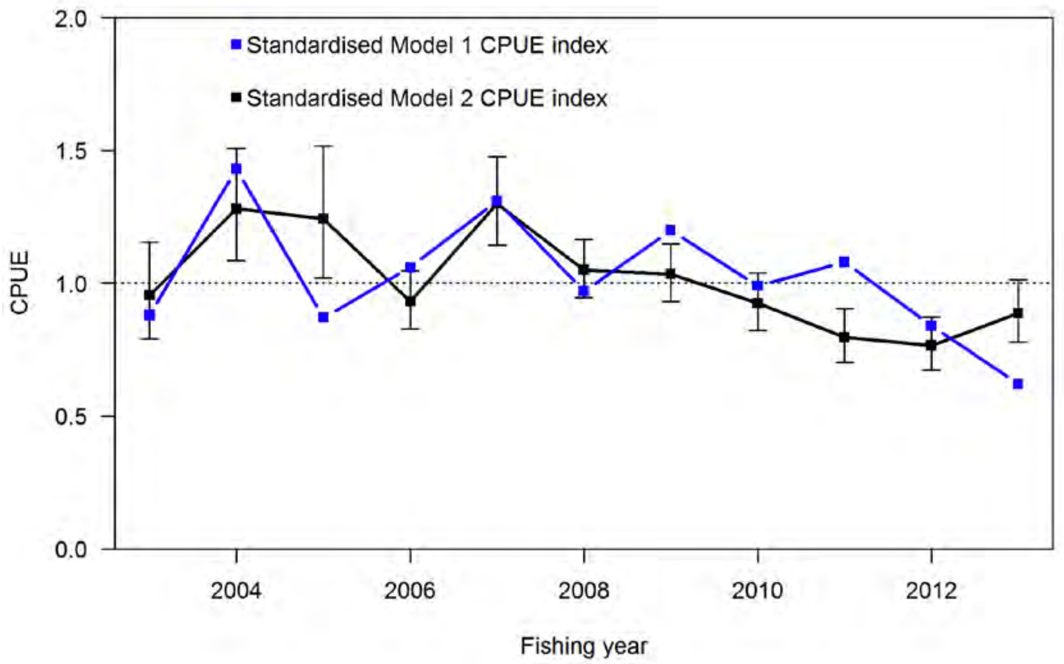


Figure D39: Comparison of CPUE models 1 and 2 for the west coast South Island fishery.