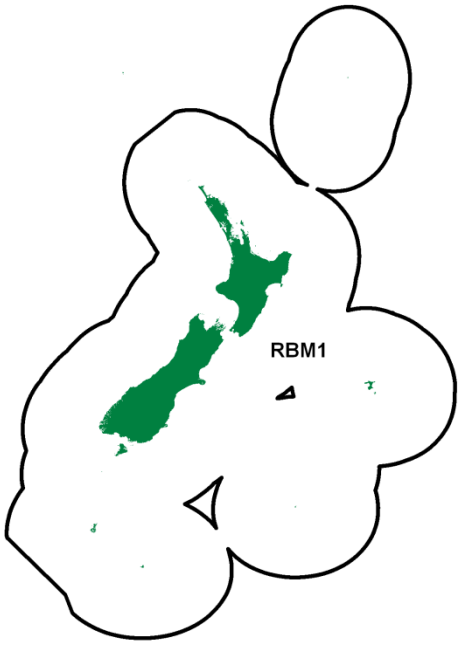
RAY'S BREAM (RBM)

(Brama brama)



1. FISHERY SUMMARY

Ray's bream (*Brama brama*) was introduced into the QMS on 1 October 2004 under a single QMA, RBM 1, with allowances, TACC and TAC in Table 1.

Table 1: Recreational and Customary non-commercial allowances, TACC and TAC (all in tonnes) for Ray's bream.

Fishstock	Recreational Allowance	Customary non-commercial Allowance	Other mortality	TACC	TAC
RBM 1	10	5	50	980	1045

At least two closely related species (*Brama brama* and *Brama australis*) are thought to be caught in New Zealand fisheries. Southern Ray's bream (*Brama australis*), which is difficult to distinguish using external features from *B. brama*, has been reported in both catch statistics and research surveys but the actual proportions of the two species in the catch is unknown. A third closely related species, bronze bream (*Xenobrama microlepis*), is more easily distinguished from the other two, but is also likely to have been recorded as Ray's bream in catch statistics.

1.1 Commercial fisheries

Ray's bream is a highly migratory species and has a wide distribution, being found throughout the subtropical to sub-Antarctic waters across the whole South Pacific between New Zealand and Chile. The catch of Ray's bream, while fluctuating, appeared to be have been declining within New Zealand fisheries waters, from a high of 1001 t in 2000–01 to 143 t in 2011–12, followed by a larger catch of 627 t in 2012-13 (Tables 2 and 3). Licensed fish receiver returns indicate between 119 and 815 t were processed for the same period.

Based on records since 2003–04, most (46%) Ray's bream is caught by mid-water trawl. Bottom trawling accounts for 27% of the total, surface longlining 18%, trolling 5% and bottom longlining 3%. Ray's bream is caught by mid-water trawlers in all FMAs around the South Island, with the largest amount in mid-water trawls being taken from Stewart-Snares shelf (FMA 5) and the

Chatham Rise (FMA 3). The major catches by bottom trawling have occurred on the Chatham Rise (FMA 3). Ray's bream is taken on surface tuna longlines on the east coast of the North Island, especially in the Bay of Plenty-East Cape (FMA 1). Most of the South Island longline catch comes from the west coast in FMAs 5 and 7. It is also taken by tuna trolling, especially on the west coast of the South Island (FMA 7). While observer coverage of the troll fleet is limited (0.5% of fishing days), observer records for the troll vessels have identified 100% of the Ray's bream in the troll catch as *B. brama.* Figure 1 shows historical landings and longline fishing effort for the two Ray's bream fisheries.

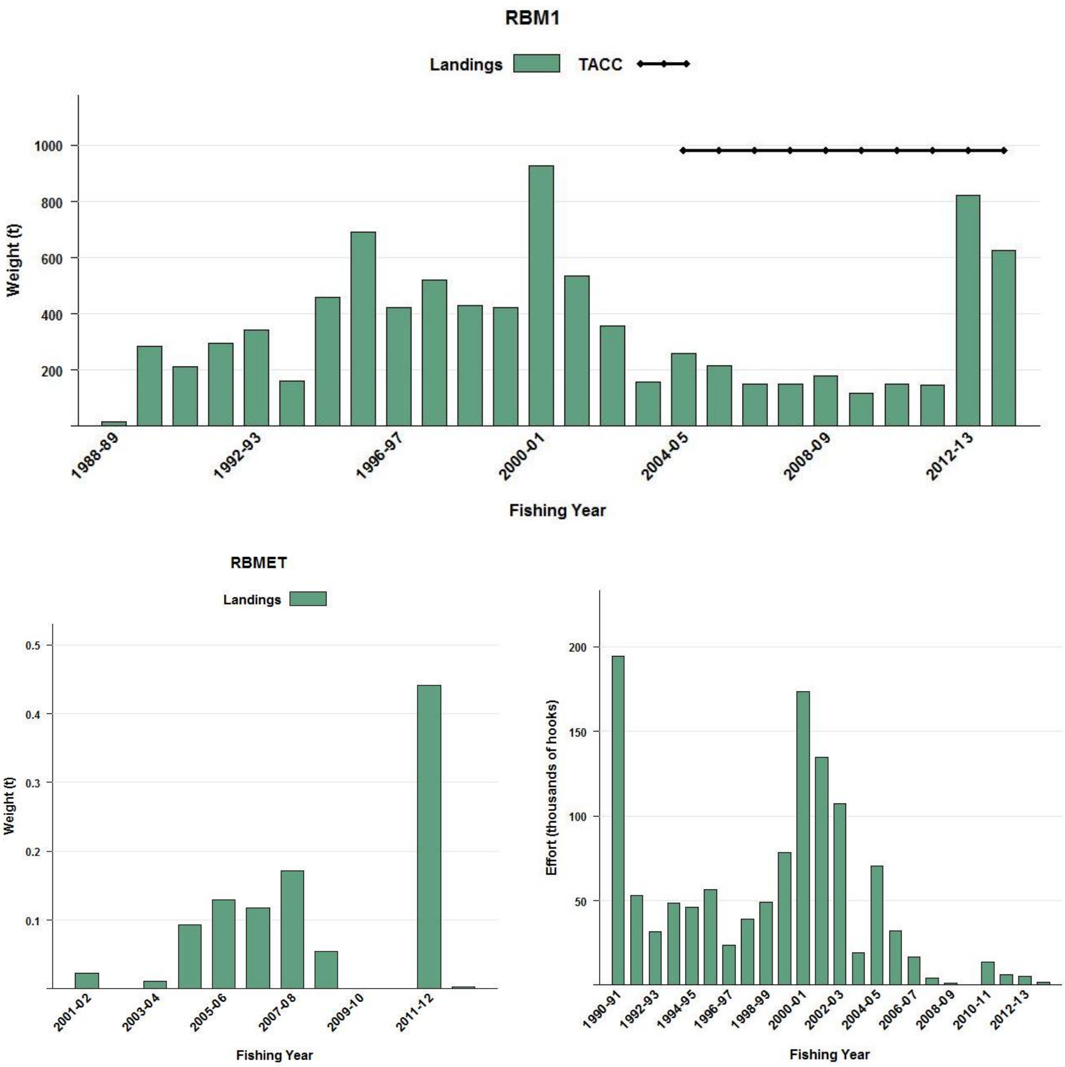


Figure 1: [Top] Ray's Bream catch from 1988–89 to 2013–14 within New Zealand waters (RBM 1) and 2001-02 to 2013-14 on the high seas (RBM ET). Fishing effort (number of hooks set) for high seas New Zealand flagged surface longline vessels from 1990–91 to 2013–14 [Continued on next page].

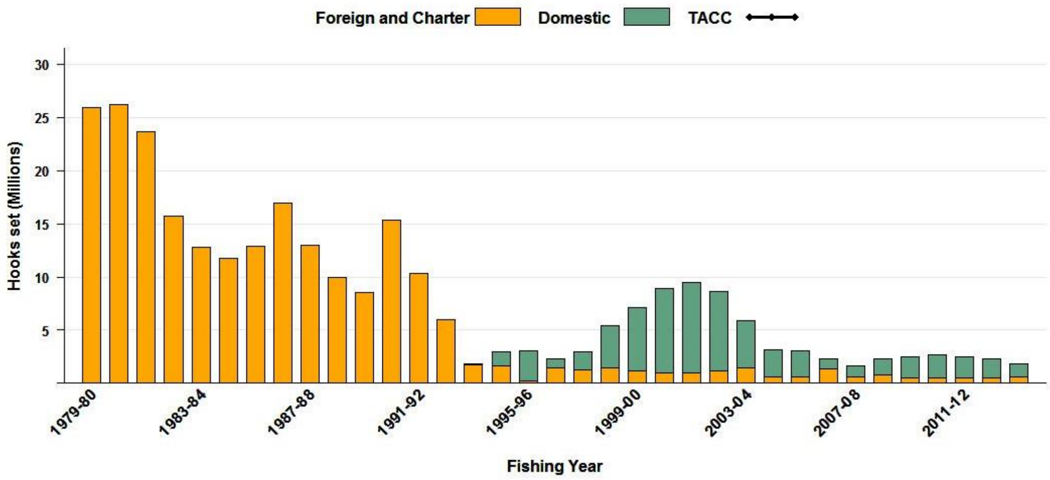


Figure 1 [continued]: Fishing effort (number of hooks set) for all domestic vessels (including effort by foreign vessels chartered by New Zealand fishing companies) from 1979–80 to 2013–14.

Table 2: Reported commercial landings and discards (t) of Ray's bream from CELRs and CLRs, and LFRRs (processor records) by fishing year.

	Reported by fishers			
	CELR and CLR		Total	Processed
Year	Landed	Discarded	reported	LFRR
1988–89	9	0	9	16
1989–90	328	< 1	328	284
1990–91	239	< 1	239	211
1991–92	297	< 1	297	295
1992–93	340	1	341	342
1993–94	151	3	154	160
1994–95	462	8	470	460
1995–96	717	3	720	693
1996–97	356	7	362	421
1997–98	546	8	554	520
1998–99	425	10	435	431
1999–00	444	23	467	423
2000–01	941	60	1 001	926

Table 3: LFRR and MHR data on Ray's bream catches by fishing year.

Year	LFRR Data	MHR Data
2001–02	541	536
2002–03	347	357
2003–04	154	157
2004–05	257	259
2005–06	212	215
2006–07	149	149
2007–08	149	152
2008–09	176	179
2009–10	119	119
2010–11	137	150
2011–12	143	147
2012–13	815	823
2013–14	622	627

The majority of Ray's bream are caught in the New Zealand squid, hoki and Jack mackerel mid-water trawl fisheries with 11% of the Ray's bream landings coming from the Southern bluefin target surface longline fishery with small amounts coming from a range of other fisheries (Figure 2). Ray's bream make up less than 1% of the surface longline catch by weight (Figure 3). Most of the New Zealand Ray's bream catch is landed on the west coast of the South Island and sub-Antarctic islands (Figure 4).

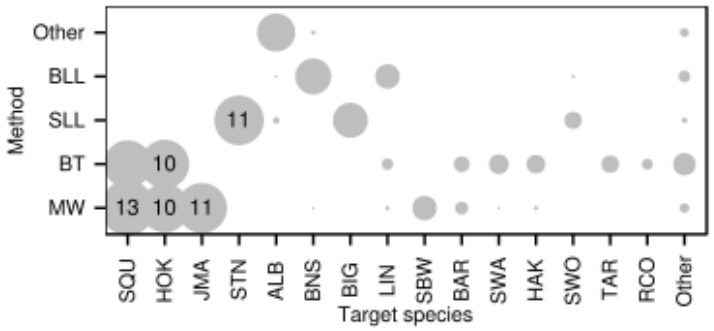


Figure 2: A summary of the proportion of landings of Ray's bream taken by each target fishery and fishing method. The area of each circle is proportional to the percentage of landings taken using each combination of fishing method and target species. The number in the circle is the percentage. SLL = surface longline MW = mid-water trawl, BLL = bottom longline, BT = bottom trawl (Bentley et al 2013).

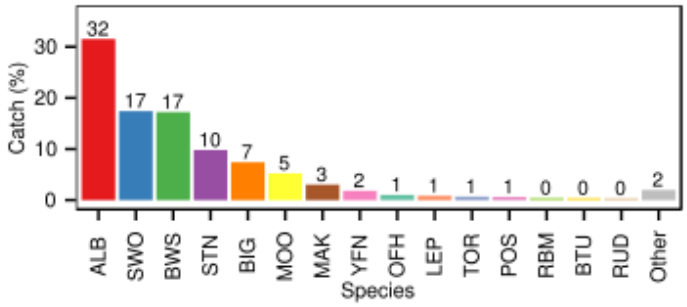


Figure 3: A summary of species composition of the reported surface longline catch. The percentage by weight of each species is calculated for all surface longline trips (Bentley et al 2013).

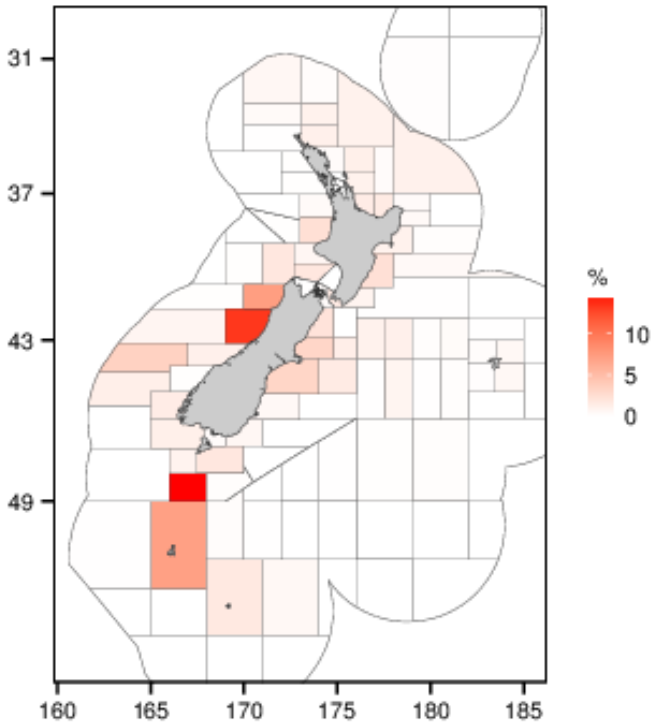


Figure 4: Distribution of catch of Ray's bream by statistical area for all years and all fishing gears. (Bentley et al 2013).

Across all fleets of the longline fishery, most of the Ray's bream were alive when brought to the side of the vessel (95%) (Table 4). The domestic fleets retain around 95–99% of their Ray's bream catch, while the foreign charter fleet retained 97–99% of their Ray's bream catch (Table 5).

Table 4: Percentage of Ray's bream (including discards) that were alive or dead when arriving at the longline vessel and observed during 2006–07 to 2009–10, by fishing year, fleet and region. Small sample sizes (number observed < 20) were omitted (Griggs & Baird 2013).

Year	Fleet	Area	% alive	% dead	Number
2006–07	Charter	North	87.0	13.0	215
		South	96.0	4.0	10 350
	Domestic	North	65.8	34.2	442
	Total		**94.6**	**5.4**	**11 019**
2007–08	Charter	South	95.7	4.3	3 680
	Domestic	North	70.2	29.8	151
	Total		**94.6**	**5.4**	**3 831**
2008–09	Charter	North	90.1	9.9	313
		South	97.9	2.1	4 277
	Domestic	North	78.8	21.2	551
		South	94.1	5.9	34
	Total		**95.4**	**4.6**	**5 175**
2009–10	Charter	South	96.3	3.7	3 259
	Domestic	North	85.6	14.4	264
		South	92.0	8.0	88
	Total		**95.5**	**4.5**	**3 611**
Total all strata			**94.9**	**5.1**	**23 636**

Table 5: Percentage of Ray's bream that were retained, or discarded or lost, when observed on a longline vessel during 2006–07 to 2009–10, by fishing year and fleet. Small sample sizes (number observed < 20) omitted (Griggs & Baird 2013).

Year	Fleet	% retained	% discarded or lost	Number
2006–07	Charter	96.8	3.2	11 744
	Domestic	95.7	4.3	442
	Total	**96.8**	**3.2**	**12 198**
2007–08	Charter	96.8	3.2	3 714
	Domestic	98.7	1.3	152
	Total	**96.9**	**3.1**	**3 866**
2008–09	Charter	98.7	1.3	4 646
	Domestic	98.3	1.7	585
	Total	**98.7**	**1.3**	**5 231**
2009–10	Charter	98.8	1.2	3 291
	Domestic	95.3	4.7	361
	Total	**98.4**	**1.6**	**3 652**
Total all strata		**97.4**	**2.6**	**24 947**

1.3 Recreational fisheries

Recreational fishers take Ray's bream infrequently, generally as bycatch when targeting bluenose, hapuku and bass over deep reefs. The recreational harvest is assumed to be low, and is likely to be insignificant in the context of the total landings.

1.4 Customary non-commercial fisheries

There is no quantitative information available to allow the estimation of the harvest of Ray's bream by customary fishers, however, the harvest is assumed to be insignificant in the context of the commercial landings.

1.5 Illegal catch

There is no known illegal catch of Ray's bream.

1.6 Other sources of mortality

Ray's bream is a desirable species, and only a small percentage (about 1–5% annually) has been reported or observed as having been discarded. Most of the trawl catch of Ray's bream that is reported on CELR and CLR forms is retained. Most of the discarding appears to occur in the tuna fisheries, but these fisheries only take a small proportion of the total catch of Ray's bream. There may be some unobserved shark and cetacean depredation of longline caught Ray's bream.

2. BIOLOGY

Until recently, little was known about the biology of Ray's bream in New Zealand waters. A 2004 study examined growth rates, natural mortality and maturity for Ray's bream. Unfortunately, the actual species examined in this study could not be determined. It is possible that more than one species was involved, and the one (or more) species may not have been representative of the New Zealand catch recorded as Ray's bream. Until further samples are collected, the identification cannot be confirmed, but it is likely that the study was based wholly or partly on Southern Ray's bream (*Brama australis*).

It is expected that the main biological characteristics of Ray's bream will be similar to Southern Ray's bream, so the general findings of the recent study are reported here (Table 6). The small otoliths proved to be extremely difficult to age; notwithstanding this, Southern Ray's bream appear to have rapid initial growth, reaching 40–50 cm in 3–5 years, with little increase in length after this time. The maximum age observed was 25 years.

Table 6: Estimates of biological parameters.

Parameter		Estimate	Source
1. Weight = $a \cdot (\text{length})^b$ (Weight in t, length in cm)			
	Both sexes	$a = 5.31 \times 10^{-9}$ b = 3.320	Livingston et al 2004

3. STOCKS AND AREAS

Ray's bream probably come from a wide-ranging single stock found throughout the South Pacific Ocean and southern Tasman Sea. The catch of Ray's bream elsewhere in the South Pacific needs to be considered when assessing the status of Ray's bream within New Zealand's fisheries waters.

4. ENVIRONMENTAL AND ECOSYSTEM CONSIDERATIONS

This section was updated for the November 2014 Fishery Assessment Plenary after review by the Aquatic Environment Working Group. This summary is from the perspective of Ray's bream but

there is no directed fishery for them and the incidental catch sections below reflect the New Zealand longline fishery as a whole and are not specific to this species; a more detailed summary from an issue-by-issue perspective is available in the Aquatic Environment & Biodiversity Annual Review where the consequences are also discussed (www.mpi.govt.nz/document-vault/5008). (Ministry for Primary Industries 2014).

4.1 Role in the ecosystem

Ray's bream (*Brama brama*) is found in mid-water depths down to 1000 m. Ray's bream undertakes daily vertical migrations (Lobo & Erzini 2001) and is thought to feed opportunistically on small fish and cephalopods. It is known to be predated on by deepwater sharks such as the deepwater dogfish species *Centrophorus squamosus* and *Centroscymnus owstonii*, and the school shark *Galeorhinus galeus* (Dunn et al 2010).

4.2 Incidental catch (seabirds, sea turtles and mammals)

The protected species, capture estimates presented here include all animals recovered onto the deck (alive, injured or dead) of fishing vessels but do not include any cryptic mortality (e.g., seabirds caught on a hook but not brought onboard the vessel).

4.2.1 Seabird bycatch

Between 2002–03 and 2013–14, there were zero observed captures of birds across other surface longline target fisheries (those not targeting albacore tuna, bigeye tuna, southern bluefin tuna, and swordfish). Seabird captures since 2003 are presented in Figures 5 and 6. Seabird captures were more frequent off the south west coast of the South Island (Figure 7). Bayesian models of varying complexity dependent on data quality have been used to estimate captures across a range of methods (Richard & Abraham 2014). Observed and estimated seabird captures in surface longline fisheries are provided in Table 8[1] .

Through the 1990s the minimum seabird mitigation requirement for surface longline vessels was the use of a bird scaring device (tori line) but common practice was that vessels set surface longlines primarily at night. In 2007 a notice was implemented under s 11 of the Fisheries Act 1996 to formalise the requirement that surface longline vessels only set during the hours of darkness and use a tori line when setting. This notice was amended in 2008 to add the option of line weighting and tori line use if setting during the day. In 2011 the notices were combined and repromulgated under a new regulation (Regulation 58A of the Fisheries (Commercial Fishing) Regulations 2001) which provides a more flexible regulatory environment under which to set seabird mitigation requirements.

Risk posed by commercial fishing to seabirds has been assessed via a level 2 method which supports much of the NPOA-Seabirds 2013 risk assessment framework (MPI 2013b). The method used in the level 2 risk assessment arose initially from an expert workshop hosted by the Ministry of Fisheries in 2008. The overall framework is described in Sharp et al. (2011) and has been variously applied and improved in multiple iterations (Waugh et al. 2009, Richard et al. 2011, Richard & Abraham 2013, Richard et al. 2013 and Richard & Abraham in press). The method applies an "exposure-effects" approach where exposure refers to the number of fatalities is calculated from the overlap of seabirds with fishing effort compared with observed captures to estimate the species vulnerability (capture rates per encounter) to each fishery group. This is then compared to the population's productivity, based on population estimates and biological characteristics to yield estimates of population-level risk.

[1] As part of its data reconciliation processes, MPI has identified that less than 2% of observed protected species captures between 2002 and 2015 were not recorded in COD. Steps are being taken to update the database and estimates of protected species captures and associated risks. Accordingly, some estimates of protected species captures or risk in this document may have a small negative bias. Neither Maui nor Hector's dolphins are affected. Updated estimates will be reviewed by the Aquatic Environment Working Group in the second quarter of 2016.

The 2014 iteration of the seabird risk assessment (Richard & Abraham in press) assessed other surface longline target fisheries (those not targeting albacore tuna, bigeye tuna, southern bluefin tuna, and swordfish) contribution to the total risk posed by New Zealand commercial fishing to seabirds (see Table 8). These target fisheries contribute 0.003 of PBR_1 to the risk to Southern Buller's albatross which was assessed to be at very high risk from New Zealand commercial fishing (Richard & Abraham in press).

Table 7: Effort, observed and estimated seabird captures by fishing year for the New Zealand surface longline fishery within the EEZ. For each fishing year, the table gives the total number of hooks; the number of observed hooks; observer coverage (the percentage of hooks that were observed); the number of observed captures; the capture rate (captures per thousand hooks); and the mean number of estimated total captures (with 95% confidence interval). Estimates are based on methods described in Thompson et al (2013) and are available via http://www.fish.govt.nz/en-nz/Environmental/Seabirds/. Estimates from 2002–03 to 2013–14 are based on data version 2015003.

Fishing year	Fishing effort			Observed captures		Estimated captures	
	All hooks	Observed hooks	% observed	Number	Rate	Mean	95% c.i.
2002–2003	173 410	0	0	0	-	34	11–76
2003–2004	220 787	13 000	5.9	0	0	37	12–83
2004–2005	100 290	800	0.8	0	0	87	32–198
2005–2006	40 320	0	0	0	-	11	2–30
2006–2007	45 795	0	0	0	-	12	2–30
2007–2008	47 755	0	0	0	-	12	2–32
2008–2009	16 178	0	0	0	-	5	0–17
2009–2010	26 800	0	0	0	-	8	1–22
2010–2011	20 100	0	0	0	-	5	0–16
2011–2012	18 900	0	0	0	-	3	0–11
2012–2013	43 160	0	0	0	-	10	2–28
2013–2014	19 700	820	4.2	0	0	4	0–14

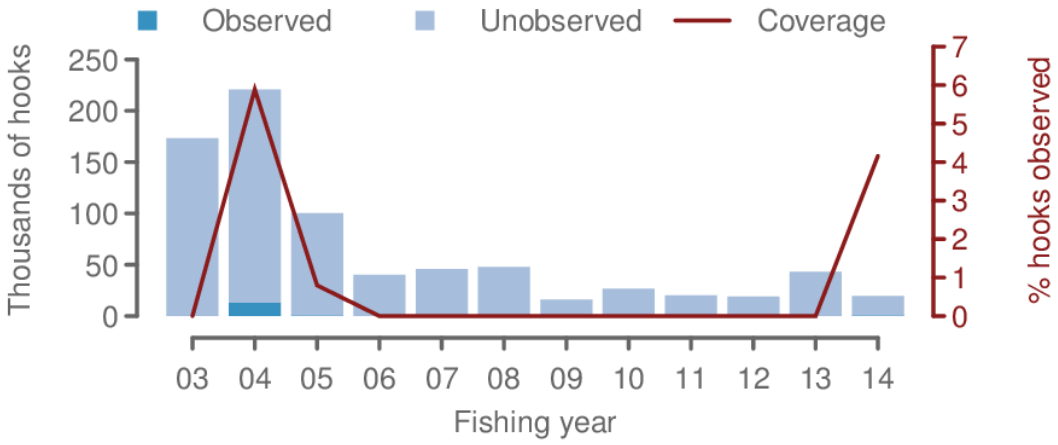


Figure 5: Observed captures of seabirds in the New Zealand surface longline fisheries from 2002–03 to 2013–14.

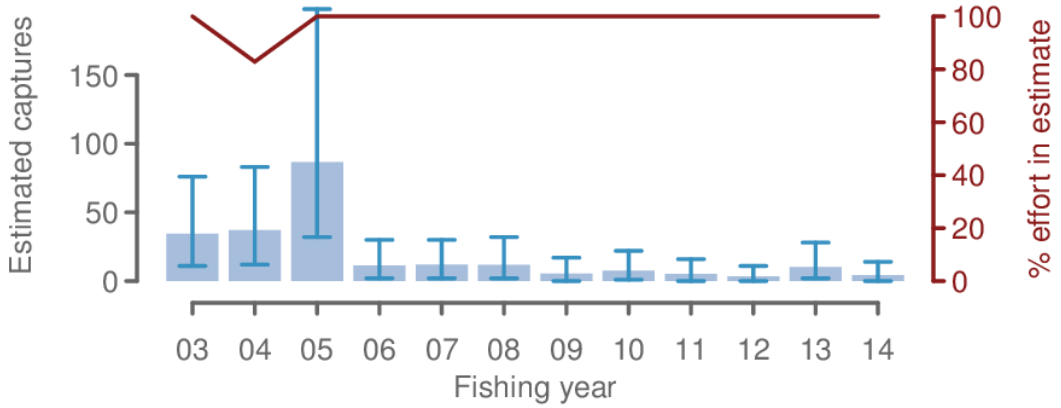


Figure 6: Estimated captures of seabirds in the New Zealand surface longline fisheries from 2002–03 to 2013–14.

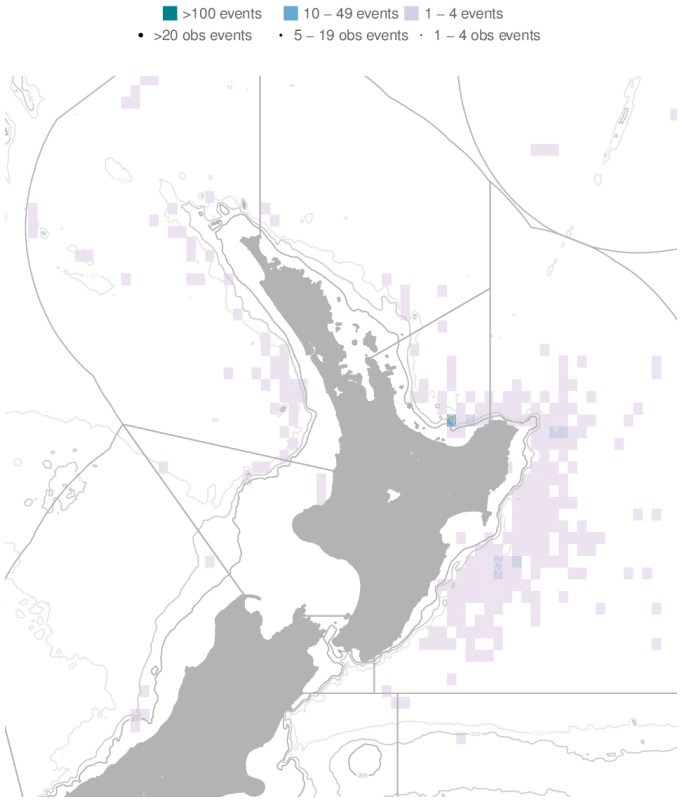


Figure 7: Distribution of fishing effort in the New Zealand surface longline fisheries and observed seabird captures, 2002–03 to 2013–14. Fishing effort is mapped into 0.2-degree cells, with the colour of each cell being related to the amount of effort. Observed fishing events are indicated by black dots, and observed captures are indicated by red dots. Fishing is only shown if the effort could be assigned a latitude and longitude, and if there were three or more vessels fishing within a cell. In this case, 89.4% of the effort is shown. See glossary for areas used for summarising the fishing effort and protected species captures.

Table 8: Risk ratio of seabirds predicted by the level two risk assessment for the other species target surface longline fisheries (those not targeting albacore tuna, bigeye tuna, southern bluefin tuna, pacific bluefin tuna and swordfish) and all fisheries included in the level two risk assessment, 2006–07 to 2012–13, showing seabird species with risk category of very high or high, or a medium risk category and risk ratio of at least 1% of the total risk. The risk ratio is an estimate of aggregate potential fatalities across trawl and longline fisheries relative to the Potential Biological Removals, PBR_1 (from Richard and Abraham 2014 where full details of the risk assessment approach can be found). PBR_1 applies a recovery factor of 1.0. Typically a recovery factor of 0.1 to 0.5 is applied (based on the state of the population) to allow for recovery from low population sizes as quickly as possible. This should be considered when interpreting these results. The New Zealand threat classifications are shown (Robertson et al 2013 at http://www.doc.govt.nz/documents/science-and-technical/nztcs4entire.pdf)

	Risk ratio				
Species name	OTH target SLL	Total risk from NZ commercial fishing	% of total risk from NZ commercial fishing	Risk category	NZ Threat Classification
Black petrel	0.000	15.095	0.00	Very high	Threatened: Nationally Vulnerable
Salvin's albatross	0.000	3.543	0.00	Very high	Threatened: Nationally Critical
Southern Buller's albatross	0.003	2.823	0.10	Very high	At Risk: Naturally Uncommon
Flesh-footed shearwater	0.000	1.557	0.00	Very high	Threatened: Nationally Vulnerable
Gibson's albatross	0.000	1.245	0.00	Very high	Threatened: Nationally Critical
New Zealand white-capped albatross	0.000	1.096	0.01	Very high	At Risk: Declining
Chatham Island albatross	0.000	0.913	0.00	High	At Risk: Naturally Uncommon
Antipodean albatross	0.000	0.888	0.00	High	Threatened: Nationally Critical
Westland petrel	0.000	0.498	0.00	High	At Risk: Naturally Uncommon
Northern Buller's albatross	0.000	0.336	0.13	High	At Risk: Naturally Uncommon
Campbell black-browed albatross	0.000	0.304	0.00	High	At Risk: Naturally Uncommon
Stewart Island shag	0.000	0.301	0.00	High	Threatened: Nationally Vulnerable

4.2.2 Sea turtle bycatch

Between 2002–03 and 2013–14, there were 15 observed captures of sea turtles across all surface longline fisheries (Tables 9 and 10, Figure 8). Observer records documented all but one sea turtle as captured and released alive. Sea turtle capture distributions predominantly occur throughout the east coast of the North Island and Kermadec Island fisheries (Figure 9).

Table 9: Number of observed sea turtle captures in the New Zealand surface longline fisheries, 2002–03 to 2013–14, by species and area. Data from Thompson et al (2013), retrieved from http://data.dragonfly.co.nz/psc/. See glossary above for a description of the areas used for summarising the fishing effort and protected species captures.

Species	Bay of Plenty	East Coast North Island	Kermadec Islands	West Coast North Island	Total
Leatherback turtle	1	4	3	3	11
Green turtle	0	1	0	0	1
Unknown turtle	0	1	0	2	3
Total	1	6	3	5	15

Table 10: Effort and sea turtle captures in surface longline fisheries by fishing year. For each fishing year, the table gives the total number of hooks; the number of observed hooks; observer coverage (the percentage of hooks that were observed); the number of observed captures (both dead and alive); and the capture rate (captures per thousand hooks). For more information on the methods used to prepare the data see Thompson et al (2013).

Fishing year	Fishing effort			Observed captures	
	All hooks	Observed hooks	% observed	Number	Rate
2002–2003	10 770 488	2 195 152	20.4	0	0
2003–2004	7 386 484	1 607 304	21.8	1	0.001
2004–2005	3 679 765	783 812	21.3	2	0.003
2005–2006	3 690 869	705 945	19.1	1	0.001
2006–2007	3 739 912	1 040 948	27.8	2	0.002
2007–2008	2 246 139	421 900	18.8	1	0.002
2008–2009	3 115 633	937 496	30.1	2	0.002
2009–2010	2 995 264	665 883	22.2	0	0
2010–2011	3 188 179	674 572	21.2	4	0.006
2011–2012	3 100 177	728 190	23.5	0	0
2012–2013	2 876 932	560 333	19.6	2	0.004
2013-2014	2 546 764	773 527	30.4	0	0

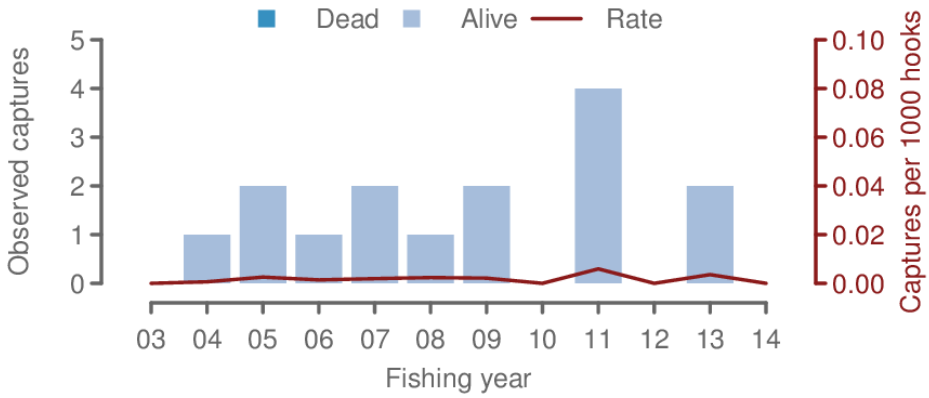


Figure 8: Observed captures of sea turtles in the New Zealand surface longline fisheries from 2002–03 to 2013–14.

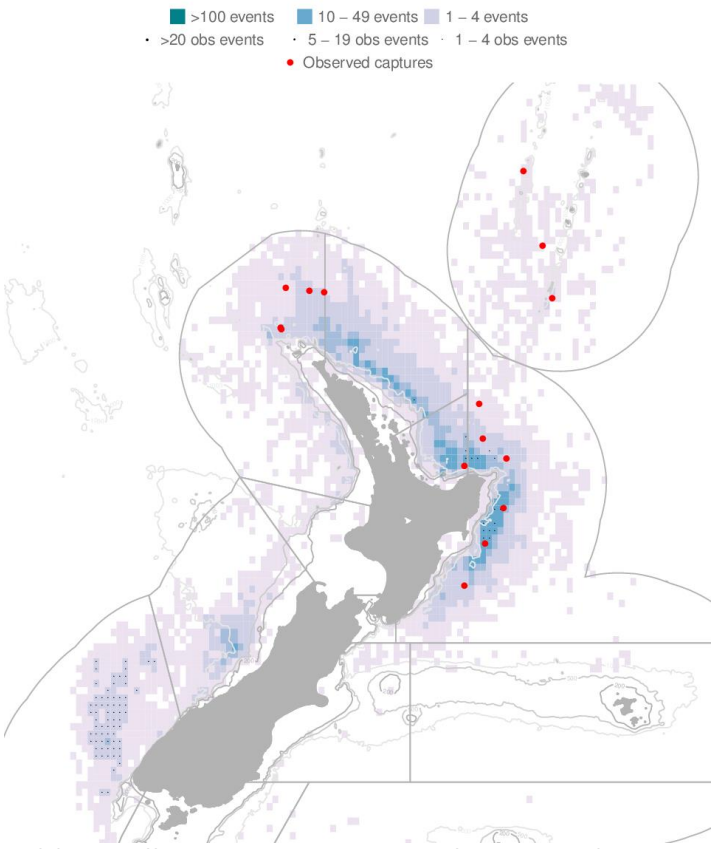


Figure 9: Distribution of fishing effort in the New Zealand surface longline fisheries and observed sea turtle captures, 2002–03 to 2013–14. Fishing effort is mapped into 0.2-degree cells, with the colour of each cell being related to the amount of effort. Observed fishing events are indicated by black dots, and observed captures are indicated by red dots. Fishing is only shown if the effort could be assigned a latitude and longitude, and if there were three or more vessels fishing within a cell. In this case, 89.4% of the effort is shown. See glossary for areas used for summarising the fishing effort and protected species captures.

4.2.3 Marine Mammals

4.2.3.1 Cetaceans

Cetaceans are dispersed throughout New Zealand waters (Perrin et al 2008). The spatial and temporal overlap of commercial fishing grounds and cetacean foraging areas has resulted in cetacean captures in fishing gear (Abraham & Thompson 2009, 2011).

Between 2002–03 and 2013–14, there were seven observed captures of whales and dolphins in surface longline fisheries. Observed captures included 5 unidentified cetaceans and 2 long-finned Pilot whales (Tables 11 and 12, Figure 10) (Thompson et al 2013). All captured animals recorded were documented as being caught and released alive (Thompson et al 2013). Cetacean capture distributions are more frequent off the east coast of the North Island (Figure 11).

Table 11: Number of observed cetacean captures in the New Zealand surface longline fisheries, 2002–03 to 2013–14, by species and area. Data from Thompson et al (2013), retrieved from http://data.dragonfly.co.nz/psc/. See glossary above for a description of the areas used for summarising the fishing effort and protected species captures.

Species	Bay of Plenty	East Coast North Island	Fiordland	Northland and Hauraki	West Coast North Island	West Coast South Island	Total
Long-finned pilot whale	0	1	0	0	0	1	2
Unidentified cetacean	1	1	1	1	1	0	5
Total	1	2	1	1	1	1	7

Table 12: Effort and captures of cetaceans in surface longline fisheries by fishing year. For each fishing year, the table gives the total number of hooks; the number of observed hooks; observer coverage (the percentage of hooks that were observed); the number of observed captures (both dead and alive); and the capture rate (captures per thousand hooks). For more information on the methods used to prepare the data, see Thompson et al (2013).

Fishing year	Fishing effort			Observed captures	
	All hooks	Observed hooks	% observed	Number	Rate
2002–2003	10 770 488	2 195 152	20.4	1	0
2003–2004	7 386 484	1 607 304	21.8	4	0.002
2004–2005	3 679 765	783 812	21.3	1	0.001
2005–2006	3 690 869	705 945	19.1	0	0
2006–2007	3 739 912	1 040 948	27.8	0	0
2007–2008	2 246 139	421 900	18.8	1	0.002
2008–2009	3 115 633	937 496	30.1	0	0
2009–2010	2 995 264	665 883	22.2	0	0
2010–2011	3 188 179	674 572	21.2	0	0
2011–2012	3 100 177	728 190	23.5	0	0
2012–2013	2 876 932	560 333	19.5	0	0
2013–2014	2 546 764	773 527	30.4	0	0

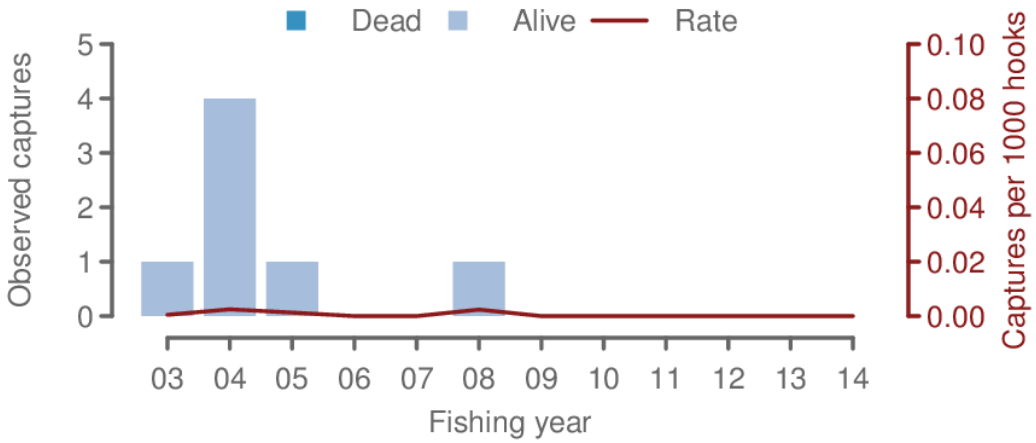


Figure 10: Observed captures of cetaceans in the New Zealand surface longline fisheries from 2002–03 to 2013–14.

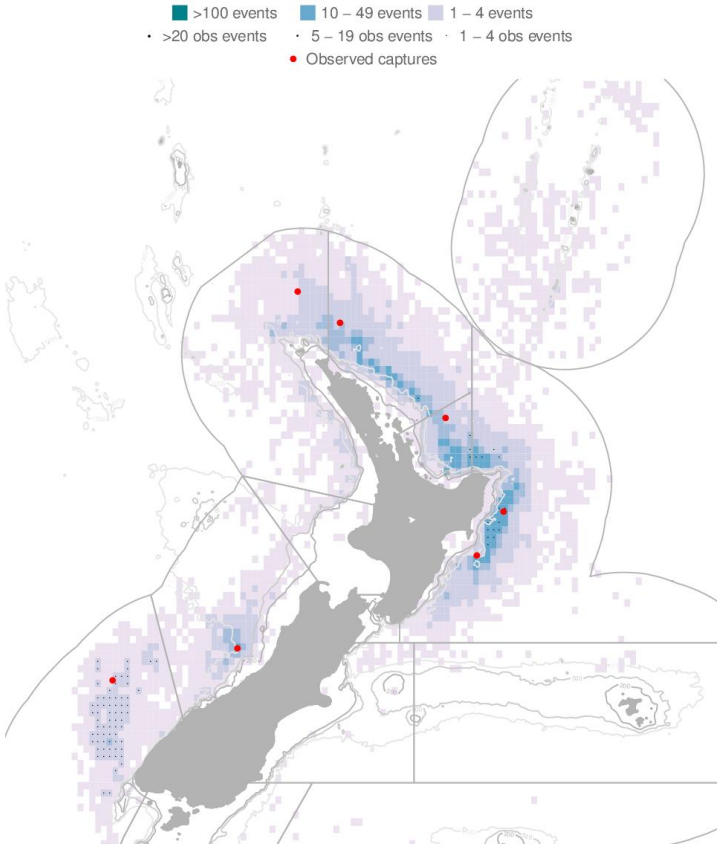


Figure 11: Distribution of fishing effort in the New Zealand surface longline fisheries and observed cetacean captures, 2002–03 to 2013–14. Fishing effort is mapped into 0.2-degree cells, with the colour of each cell being related to the amount of effort. Observed fishing events are indicated by black dots, and observed captures are indicated by red dots. Fishing is only shown if the effort could be assigned a latitude and longitude, and if there were three or more vessels fishing within a cell. In this case, 89.4% of the effort is shown. See glossary for areas used for summarising the fishing effort and protected species captures.

4.2.3.2 New Zealand fur seal bycatch

Currently, New Zealand fur seals are dispersed throughout New Zealand waters, especially in waters south of about 40º S to Macquarie Island. The spatial and temporal overlap of commercial fishing grounds and New Zealand fur seal foraging areas has resulted in New Zealand fur seal captures in fishing gear (Mattlin 1987, Rowe 2009). Most fisheries with observed captures occur in waters over or close to the continental shelf, which slopes steeply to deeper waters relatively close to shore, and thus rookeries and haulouts, around much of the South Island and offshore islands. Captures on longlines occur when the fur seals attempt to feed on the bait and fish catch during hauling. Most New Zealand fur seals are released alive, typically with a hook and short snood or trace still attached.

New Zealand fur seal captures in surface longline fisheries have been generally observed in waters south and west of Fiordland, but also in the Bay of Plenty-East Cape area when the animals have attempted to take bait or fish from the line as it is hauled. These capture rates include animals that are released alive (100% of observed surface longline capture in 2008–09; Thompson & Abraham 2010). Capture rates in 2011–12 and 2013-14 were higher than they were in the early 2000s (Figures 12 and 13). While fur seal captures have occurred throughout the range of this fishery most New Zealand captures have occurred off the Southwest coast of the South Island (Figure 14). Between 2002–03 and 2013–14, there were 323 observed captures of New Zealand fur seal in surface longline fisheries (Tables 13 and 14).

Table 13: Number of observed New Zealand fur seal captures in the New Zealand surface longline fisheries, 2002–03 to 2013–14, by species and area. Data from Thompson et al (2013), retrieved from http://data.dragonfly.co.nz/psc/. See glossary above for a description of the areas used for summarising the fishing effort and protected species captures.

	Bay of Plenty	East Coast North Island	Fiordland	Northland and Hauraki	Stewart Snares Shelf	West Coast North Island	West Coast South Island	Total
New Zealand fur seal	16	33	228	4	4	2	36	323

Table 14: Effort and captures of New Zealand fur seal in the New Zealand surface longline fisheries by fishing year. For each fishing year, the table gives the total number of hooks; the number of observed hooks; observer coverage (the percentage of hooks that were observed); the number of observed captures (both dead and alive); and the capture rate (captures per thousand hooks). Data from Thompson et al (2013), retrieved from http://data.dragonfly.co.nz/psc/. Estimates from 2002–03 to 2010–11 and preliminary estimates for 2012–13 are based on data version 2015003.

Fishing year	Fishing effort			Observed captures		Estimated captures	
	All hooks	Observed hooks	% observed	Number	Rate	Mean	95% c.i.
2002–2003	10 772 188	2 195 152	20.4	56	0.026	299	199–428
2003–2004	7 386 484	1 607 304	21.8	40	0.025	134	90–188
2004–2005	3 679 765	783 812	21.3	20	0.026	66	38–99
2005–2006	3 690 869	705 945	19.1	12	0.017	47	23–79
2006–2007	3 739 912	1 040 948	27.8	10	0.010	32	14–55
2007–2008	2 246 139	421 900	18.8	10	0.024	40	19–68
2008–2009	3 115 633	937 496	30.1	22	0.023	53	29–81
2009–2010	2 995 264	665 883	22.2	19	0.029	77	43–121
2010–2011	3 188 179	674 572	21.2	17	0.025	64	35–101
2011–2012	3 100 177	728 190	23.5	40	0.055	140	92–198
2012–2013	2 876 932	560 333	19.5	21	0.037	110	65–171
2013-2014	2 546 764	773 527	30.4	56	0.072	103	88-121

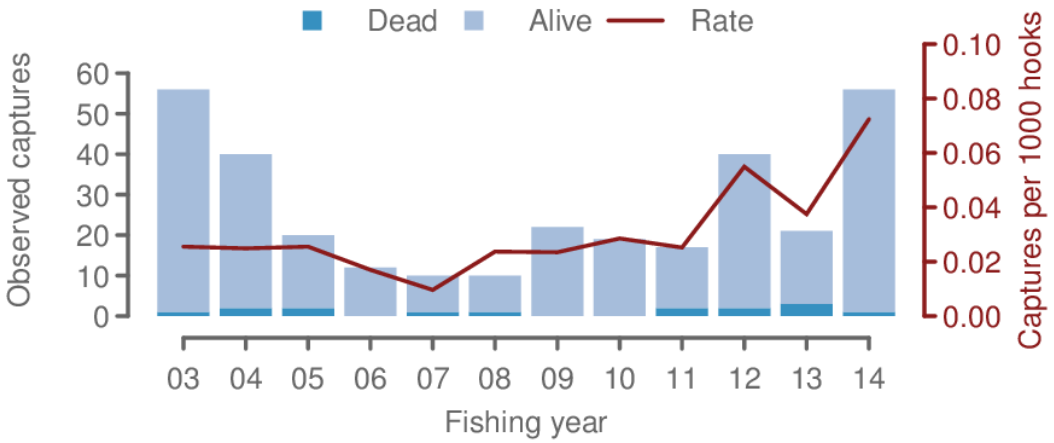


Figure 12: Observed captures of New Zealand fur seal in the New Zealand surface longline fisheries from 2002–03 to 2013–14.

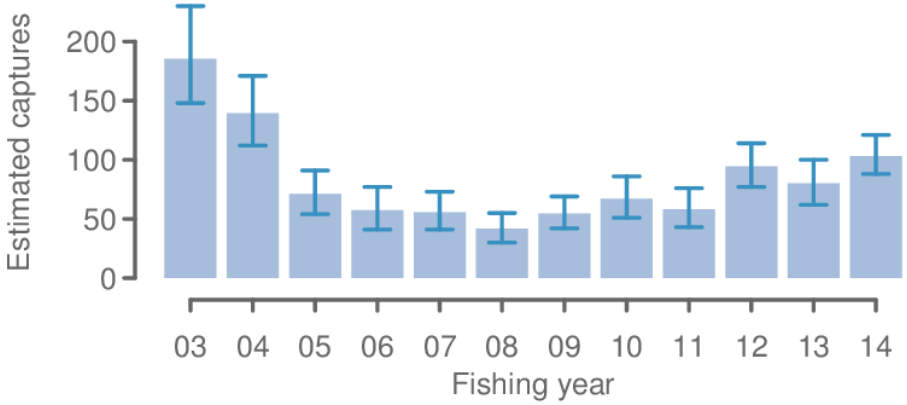


Figure 13: Observed and estimated captures of New Zealand fur seal in the New Zealand surface longline fisheries from 2002–03 to 2013–14.

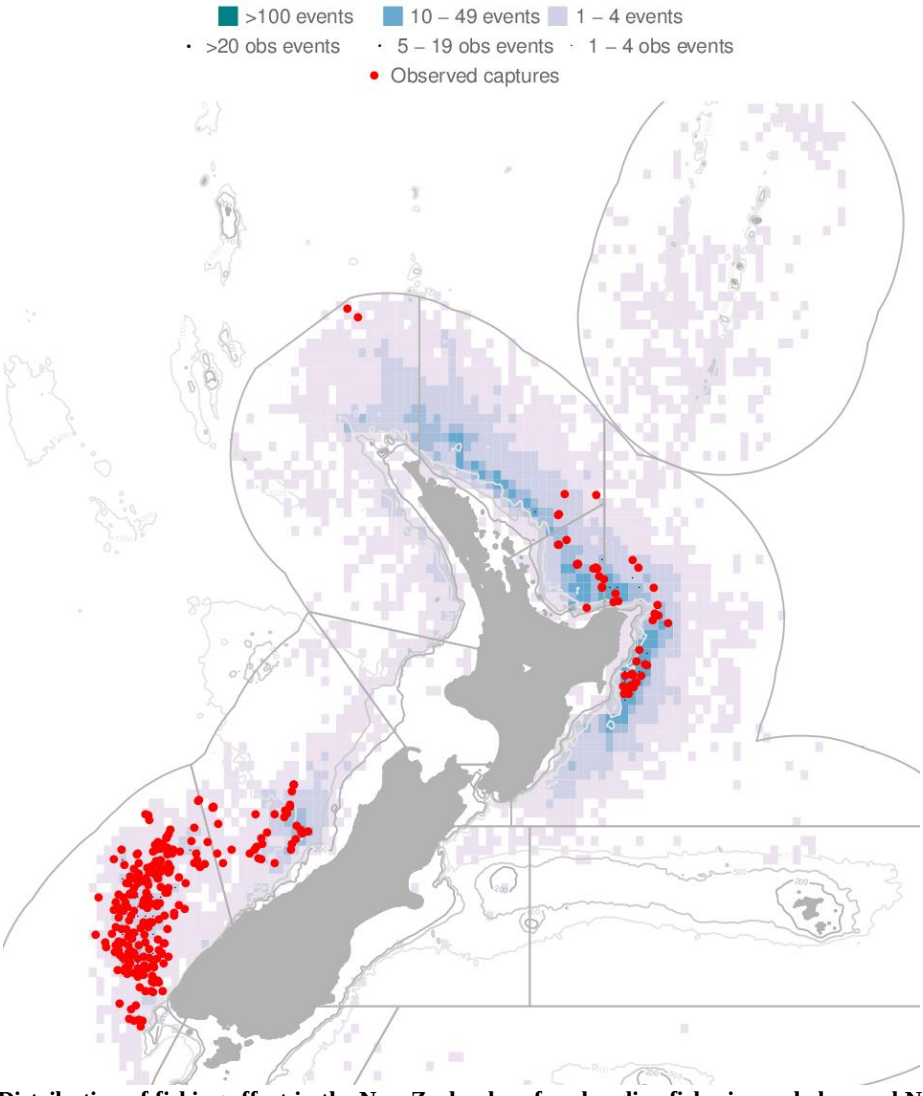


Figure 14: Distribution of fishing effort in the New Zealand surface longline fisheries and observed New Zealand fur seal captures, 2002–03 to 2013–14. Fishing effort is mapped into 0.2-degree cells, with the colour of each cell being related to the amount of effort. Observed fishing events are indicated by black dots, and observed captures are indicated by red dots. Fishing is only shown if the effort could be assigned a latitude and longitude, and if there were three or more vessels fishing within a cell. In this case, 89.4% of the effort is shown. See glossary for areas used for summarising the fishing effort and protected species captures.

4.3 Incidental fish bycatch

Observer records indicate that a wide range of species are landed by the longline fleets in New Zealand fishery waters. Blue sharks are the most commonly landed species (by number), followed by lancetfish and Ray's bream (Table 15).

Table 15: Total estimated catch (numbers of fish) of common bycatch species in the New Zealand longline fishery as estimated from observer data from 2011 to 2014. Also provided is the percentage of these species retained (2013 data only) and the percentage of fish that were alive when discarded, N/A (none discarded).

Species	2011	2012	2013	2014	% retained (2014)	discards % alive (2014)
Blue shark	53 432	132 925	158 736	80 118	16.2	89.2
Lancetfish	37 305	7 866	19 172	21 002	0.3	24.4
Porbeagle shark	9 929	7 019	9 805	5 061	30.6	70.7
Rays bream	18 453	19 918	13 568	4 591	96.1	7.4
Mako shark	9 770	3 902	3 981	4 506	30.3	68.8
Sunfish	3 773	3 265	1 937	1 981	2.4	80.0
Moonfish	3 418	2 363	2 470	1 655	96.6	87.5
Dealfish	223	372	237	910	0.4	24.9
Butterfly tuna	909	713	1 030	699	77.3	3.4
Pelagic stingray	4 090	712	1 199	684	0.0	93.5
Escolar	6 602	2 181	2 088	656	88.6	0.0
Deepwater dogfish	548	647	743	600	1.2	80.9
Oilfish	1 747	509	386	518	82.1	40.0
Rudderfish	338	491	362	327	10.7	83.3
Thresher shark	349	246	256	261	28.6	80.0
Big scale pomfret	139	108	67	164	74.5	75.0
Striped marlin	175	124	182	151	0.0	94.3
School shark	49	477	21	119	72.0	78.6
Skipjack tuna	255	123	240	90	80.0	0.0

4.4 Benthic interactions

N/A

4.5 Key environmental and ecosystem information gaps

Cryptic mortality is unknown at present but developing a better understanding of this in future may be useful for reducing uncertainty of the seabird risk assessment and could be a useful input into risk assessments for other species groups.

The survival rates of released target and bycatch species is currently unknown.

Observer coverage in the New Zealand fleet is not spatially and temporally representative of the fishing effort.

5. STOCK ASSESSMENT

No assessments are available for Ray's bream; therefore estimates of biomass and yield are not available.

5.1 Estimates of fishery parameters and abundance

A time series of relative abundance estimates is available from the Chatham Rise trawl survey, but these estimates may not be a reliable index of relative abundance because Ray's bream are thought

to reside in the mid-water and their vulnerability to the trawl survey gear is unknown, and could be extremely low. Similarly, a time series of unstandardised CPUE from the tuna longline fishery is highly variable and may not reflect relative abundance.

CPUE estimates were calculated for the longline fishery by each fleet and area stratum in which eight or more sets were observed and at least 2% of the hooks were observed (Griggs & Baird 2013). CPUE estimates were calculated for Ray's bream for each fleet and area in 2006–07 to 2009–10 and added to the time series for 1988–89 to 2005–06 and these are shown in Figure 15 (Griggs & Baird 2013). The CPUE results from the Domestic fleet should be interpreted with caution due to the lower observer coverage of this fleet. CPUE estimates for the Charter fleet can be considered reliable from 1992–93 onwards. CPUE of Ray's bream, was highest in the South and for the Charter fleet. CPUE of Ray's bream increased to a peak in 2004–05, and remained high but has since decreased in the most recent years. However, as the surface longline catch of Ray's bream accounts for only a small proportion of the catch the longline CPUE (Figure 15) is unlikely to be sufficient to represent stock status and trends in abundance for the stock as a whole.

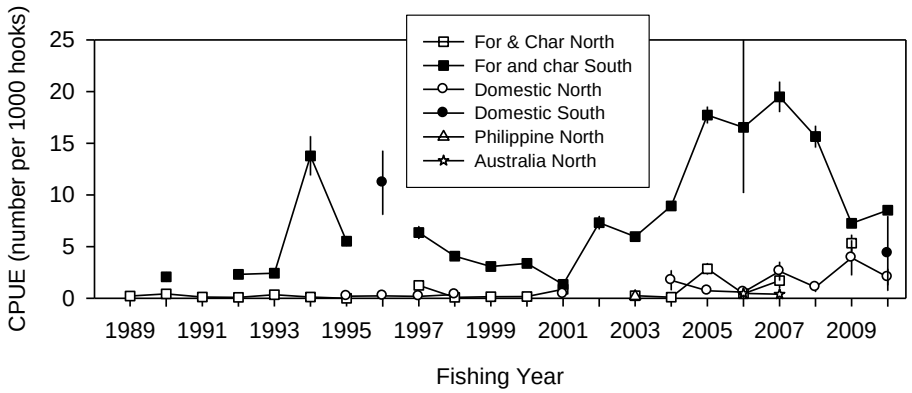


Figure 15: Annual variation in Ray's bream CPUE by fleet and area. Plotted values are the mean estimates with 95% confidence limits. Fishing year 1989 = October 1988 to September 1989 (Griggs & Baird 2013).

5.2 Biomass estimates

No biomass estimates are available for Ray's bream.

5.3 Other yield estimates and stock assessment results

There are no other yield estimates or stock assessment results available for Ray's bream.

5.4 Other factors

At least three closely related species are thought to be caught in New Zealand fisheries. Two species from the genus *Brama*, Ray's bream (*Brama brama*) and southern Ray's bream (*Brama australis*), are difficult to distinguish from external features and have been reported together in both catch statistics and research survey data in unknown ratios. A third closely related species, bronze bream (*Xenobrama microlepis*), is more easily distinguished from the other two, but is also likely to have been recorded as Ray's bream in catch statistics.

As none of the reported catch is from target fishing, the quota allocated under the QMS system will cover bycatch of mid-water trawl fisheries for squid, hoki, and jack mackerels, and target tuna longline fisheries.

The length distributions of Ray's bream for each year in the North and South regions are shown in Figure 16. Ray's bream are usually kept whole and not sexed, but in 2006–07 and 2009–10 fish were further processed and the fish were sexed, and distributions are shown for 2006–07 and 2009–10 by region and sex. There are differences in the North/South distributions, with fish from the South being larger, but the distributions for males and females are similar (Figure 16). Female Ray's

bream mature at about 43 cm (Francis et al 2004), and most females were probably mature (78.7% over the four year period).

It is not known if observers are distinguishing Ray's bream from Southern Ray's bream (*Brama australis*) and it is possible that there are two species with different distributions. However observer training and fish identification guides now used by the observers should allow for correct identification and as a result the incidents of misidentification in recent years is likely to be low.

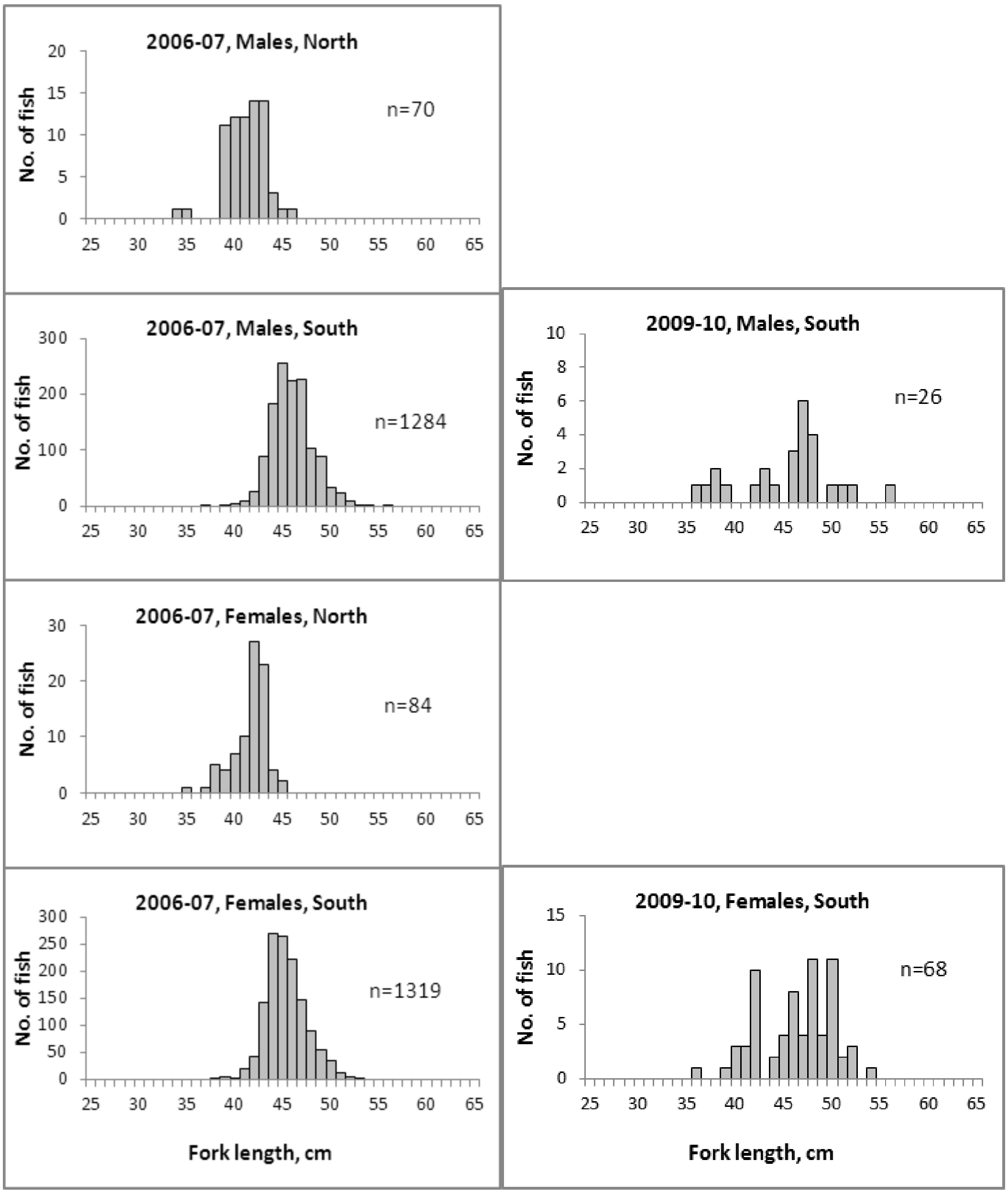


Figure 16: Length-frequency distributions of Ray's bream by fishing year, sex, and region. Sample sizes of less than 20 fish not shown (Griggs & Baird 2013). [Continued on next page]

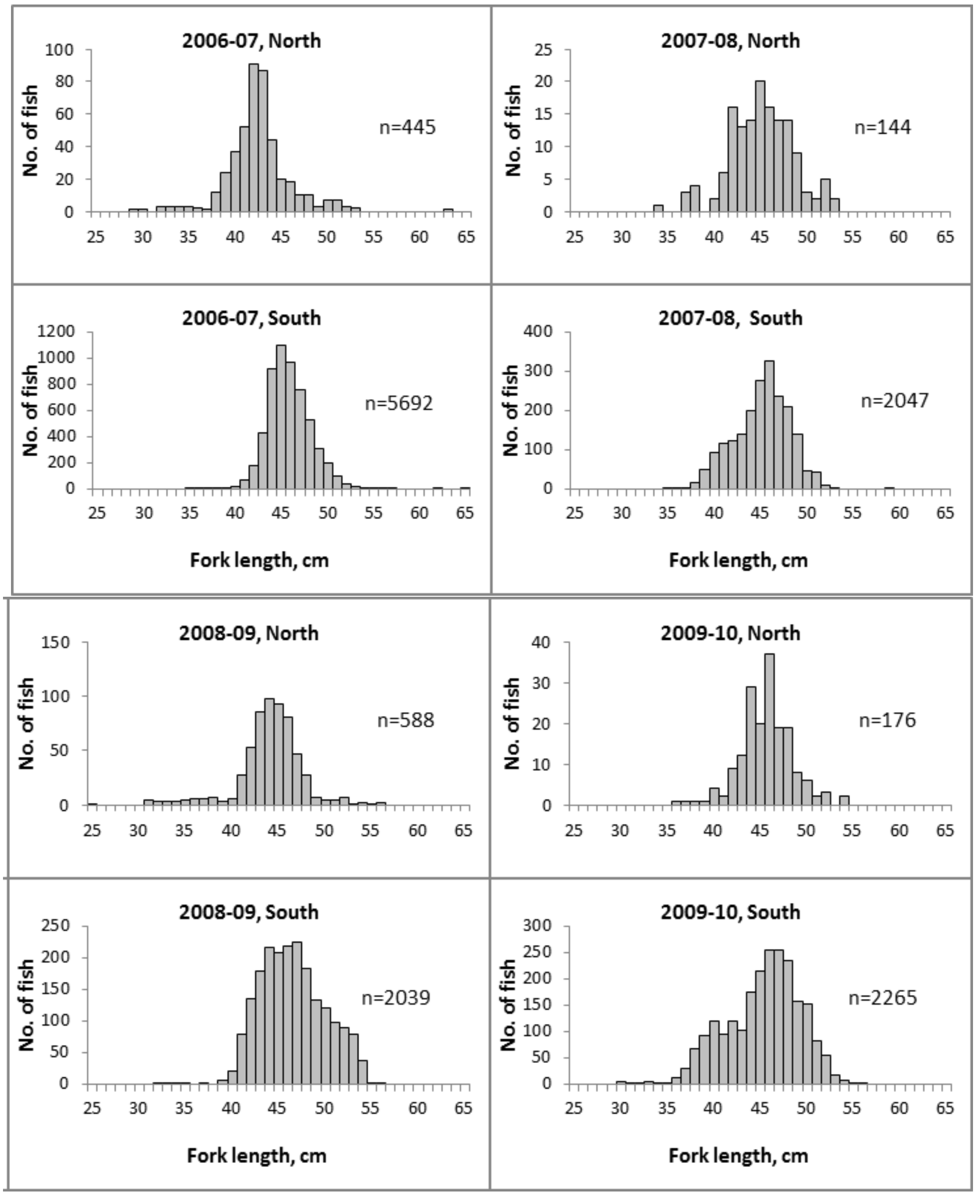


Figure 16 [continued]:

STATUS OF THE STOCKS

Stock structure assumptions

RBM 1 is assumed to be part of the wider South Western Pacific Ocean stock but the assessment below relates only to the New Zealand component of that stock.

Stock Status	
Year of Most Recent Assessment	No assessment
Assessment Runs Presented	-
Reference Points	Target: Not established Soft Limit: Not established but HSS default of 20% SB_0 assumed Hard Limit: Not established but HSS default of 10% SB_0 assumed Overfishing threshold: Not established
Status in relation to Target	Unknown
Status in relation to Limits	Unknown

Status in relation to Overfishing	Unknown

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	Unknown
Recent Trend in Fishing Intensity or Proxy	Unknown
Other Abundance Indices	Catches in New Zealand increased from the late 1980s to 2000 but have declined from highs of 1001 t in the early 2000s to 150 t in 2010–11.
Trends in Other Relevant Indicator or Variables	Unknown

Projections and Prognosis		
Stock Projections or Prognosis	Unknown	
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Unknown Hard Limit: Unknown	
Probability of Current Catch or TACC causing Overfishing to remain or to commence	Unknown	
Assessment Methodology and Evaluation		
Assessment Type	Level 4: Low information evaluation - There are only data on catch and TACC, with no other fishery indicators.	
Assessment Method	-	
Assessment Dates	Latest assessment: none	Next assessment: Unknown
Overall assessment quality rank	N/A	
Main data inputs (rank)	-	
Data not used (rank)	-	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	-	

Qualifying Comments
There is no target fishery for Ray's bream but it is a bycatch in mid-water trawl, bottom trawl, surface longlining, trolling and bottom longlining.

Fishery Interactions
-

7. FOR FURTHER INFORMATION

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