

Incidental capture of seabirds, marine mammals, and marine reptiles in tuna longline fisheries in New Zealand waters, 2000-01 to 2001-02

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Abstract

Ministry of Fisheries observers reported the incidental capture of seabirds, New Zealand fur seals (*Arctocephalus forsteri*), and turtles from domestic owner-operator and chartered Japanese tuna longline vessels in New Zealand waters during the fishing years 2000–01 and 2001–02. At least 93% of the effort by the four chartered vessels in their main area (Area 3) of fishing was observed. About 6% of observed chartered sets in Area 3 caught seabirds in 2000–01 compared with 22% in 2001–02. Thus, annual mean seabird catch rates for this area were substantially different, with 0.026 seabirds per 1000 hooks (95% confidence intervals of 0.011–0.042) in 2000–01 compared with 0.117 (0.082–0.154) in 2001–02. For this fleet, the total (observed) numbers of each seabird taxa are given for the 15 seabirds reported in 2000–01 and 76 seabirds in 2001–02. These numbers are given as the total captures for each season because of the very high observer coverage. At least five albatross taxa and two petrel taxa were reported from all observed chartered longlines during these two seasons. The numbers of seabird species reported from observed domestic owner-operator tuna longline vessels are reported by area. With less than 5% of the 7 million domestic hooks set in the main area of fishing (Area 1) in 2000–01 and about 2% of the 7.7 million hooks set here in 2001–02, the very poor observer coverage of these vessels has precluded any further analysis of the data for this area. In 2000–01, 38 seabirds were reported from domestic owner-operator vessels, and 91 seabirds were reported in 2001–02. Four albatross and four petrel taxa were reported from these vessels. As in previous years, no seabirds were reported from observed sets off the west coast north of 40° S.

All New Zealand fur seal captures were reported from observed chartered and domestic sets south of 40° S, with 44 fur seals reported in 2000–01 (91% released alive) and 46 in 2001–02 (96% released alive). Six turtles were observed caught on domestic longlines; five off the east coast north of 40° S (four released alive) and one (released alive) from a set off the west coast south of 45° S.

1. Introduction

This paper reports on the incidental capture of seabirds, marine mammals, and marine reptiles on chartered Japanese and domestic owner-operator tuna longlines set in New Zealand waters between 1 October 2000 and 30 September 2002. The information presented here updates that presented at previous ERSWG meetings (for example, Baird 2001).

Ministry of Fisheries (MFish) observers have reported seabird captures from observed tuna longline fishing activities in New Zealand waters since 1988 for each fishing year (1 October to 30 September) (for example, Baird 2001, Baird & Bradford 2000, Murray et al. 1993). Numbers of other nonfish species such as New Zealand fur seals (*Arctocephalus forsteri*) and turtles are also reported. Since 1996–97, the observer effort has been concentrated on the

chartered Japanese fleet targeting southern bluefin tuna (*Thunnus maccoyii*), and thus there is good information on the capture of seabirds and marine mammals by these vessels. Little is known about the relative captures by domestic owner-operator vessels.

2. Methods

2.1 Data used

Tuna species targeted by use of surface longlines in New Zealand waters in 2000–01 and 2001–02 included southern bluefin (*Thunnus maccoyii*), bigeye (*T. obesus*), albacore (*T. alalunga*), yellowfin (*T. albacares*), and Pacific (previously “northern”) bluefin (*T. orientalis*). Commercial effort data and data collected by MFish observers (number of observed sets, hooks, and seabird, marine mammal, or marine reptile captures) were used to calculate the mean catch rates of these nonfish species. In this report, “captures” refer to all observed nonfish captures, whether landed dead or captured alive and released, as observed and reported by MFish observers.

The following observer data were extracted for each longline set: trip number, set number, number of hooks, target species, latitude and longitude, date and time, vessel identifier and nation, number of seabirds, seabird species, number of marine mammals, life status (alive or dead), handling code (released, discarded, or retained), and sex, as recorded by MFish scientific observers. The following total fishing effort data for each fishing operation were extracted: target species, gear type, latitude and longitude, date and time, and vessel identifier and nation. Where seabirds were landed dead, observers returned the seabirds to the Department of Conservation for autopsy (for example, Robertson & Bell 2002)), and the resulting information was used to update the species identification and sex fields in the appropriate databases.

Data were stratified by fleet (chartered Japanese vessels or domestic owner-operator vessels) because different fishing practices are used by the two fleets (Murray et al. 1999). After further data checking, each set was allocated to one of the four analysis areas shown in Figure 1. In the chartered data, some bigeye tuna sets reported for Area 3 ($n = 5$ sets in 2001–02) were allocated to Area 4 because their locations were just south of the Area 4 southern boundary, well north of the earlier southern bluefin tuna effort to the south of Area 3.

All chartered sets were observed and the total hook data recorded by observers represented 99.6% of the total hook data reported on commercial forms for this fleet. The number of hooks observed in each set is estimated from the proportion of the haul observed (based on the haul duration and the time recorded as unobserved in the observer events logs) multiplied by the number of hooks set.

2.2 Seabird data analysis

The extracted observer data were stratified by fleet, area, and month. Data were pooled across months to provide seasonal fishery estimates for the 2000–01 and 2001–02 fishing years. The incident rate is defined as the number of observed longline sets with observed seabird incidental captures.

Seabird catch rates are expressed as the number of seabirds observed caught per 1000 hooks. Mean catch rates for defined strata were calculated by use of the ratio-of-means estimator:

$$\bar{y} = \frac{\sum c_i}{\sum n_i}$$

where n_i is the observed effort (1000 hooks), and c_i is the number of observed incidental captures of seabirds. [Note that in previous years the mean catch rate has been estimated by use of the mean-of-ratios estimator (see Baird 2001).] The 95% confidence intervals of the observed bycatch rate were estimated by bootstrapping (randomly resampling the observed data 1000 times, after Efron & Tibshirani (1993)).

For the domestic data, the spread of observer effort data (number of sets, hooks, and vessels) by area and time period was compared with that for the commercial data to determine whether the observed data were representative of the commercial data. This process was not necessary for the chartered Japanese data because observers were present on all vessels for the duration of their fishing in New Zealand waters. Mean catch rates are given for those strata where the data are representative and at least 10% of the hooks were observed.

2.3 Marine mammal and marine reptile data analysis and reporting

Mean catch rates per vessel are calculated for the fleet-area strata with observed marine mammal captures as described above. The numbers of each species (where known) of turtle caught are provided.

3. Results and discussion

3.1 Seabirds

Ministry of Fisheries scientific observers reported 53 seabird captures during tuna longline fisheries in 2000–01: 15 from chartered vessels and 38 from domestic vessels (Table 1). Another 167 seabird captures were observed in 2001–02: 76 from chartered vessels and 91 from domestic vessels. Captures were reported primarily off the west coast of the South Island south of 43° S and the east coast of the North Island between 34° and 40° S (Figures 1 and 2).

3.1.1 Chartered Japanese vessels

Four chartered Japanese vessels targeted southern bluefin tuna in southern waters in Areas 2 and 3 during April–June 2001 and March–June 2002 (Figure 1, Table 2). An MFish observer was placed on each vessel and allsets in both years. At least 93% of the hooks were observed in each area in each season (Table 2). In the main area fished (Area 3), seabird captures were reported from 6% of observed sets in 2001 and 22% of observed sets in 2002. The Area 3 mean catch rate in 2002 was substantially higher than that in 2001 (Table 2), primarily because of high catch rates by one vessel at the start of the 2002 season (Figure 3).

Twelve (80%) of the observed seabirds were landed dead in 2001 and returned for formal identification. In 2002, all 25 seabirds landed dead were formally identified (Table 3). In Area 3, three albatross and two petrel taxa were represented in the returned birds, with Buller's (*Thalassarche bulleri*) and white-capped (*T. steadi*) albatrosses dominating the catch (Table 3). Other species reported from this area were southern royal albatross (*Diomedea epomophora*), Westland petrel (*Procellaria westlandica*), and white-chinned petrel (*P. aequinoctialis*). Two

other albatross taxa were reported from Area 2: Campbell albatross (*T. impavida*) and Salvin's albatross (*T. salvini*).

Although the identification of the seabirds released alive is not verified, the observers on these vessels are very competent at seabird identification. If the species identification as recorded by the observers is assumed to be correct, and given the very high observer coverage in this fishery, the actual numbers of seabirds caught is given here as the total catch for the seasons. Buller's albatross dominated the catch in both seasons (Table 4).

The injuries sustained by seabirds are noted in Table 5.

3.1.2 Domestic owner-operator vessels

About 128 domestic owner-operator tuna longline vessels fished in 2000–01, and more than 150 vessels fished in 2001–02. The number of longlines set increased from at least 7870 in 2000–01 to at least 8170 in 2001–02, and this equates to an increase in hook numbers from about 9.1 million hooks to at least 9.7 million hooks. Most effort was in Area 1 (Table 6), and vessels fishing in this area and Area 4 throughout the fishing year.

The average observer cover was 13.2%, averaged over all areas in 2000–01 (range 5 – 25% by area) and 5.7% in 2001–02 (range 0 – 7% by area). In 2000–01, seabirds were reported from vessels operating in Area 1, where 38 were observed captured. The mean rates of incidental capture for this year were estimated as 0.0 in both Areas 2 and 3. These were identified as Salvin's albatross and white-chinned, black (*Procellaria parkinsoni*) and grey-faced petrels (*Pterodroma macroptera*) (Table 7).

In 2001–02, observers reported 91 seabird captures; four from Area 3 and 87 from Area 1. The rate of capture, estimated in Area 3 only for this year was 0.042 (95% CI, 0–0.095).

All were recorded as Buller's albatrosses, and were released alive.

The paucity of observer coverage of these vessels and the disparate numbers of seabirds caught per vessel (especially in 2001–02) constrains the analysis of domestic tuna longline-seabird interactions in Area 1 to simple reporting of the fishing effort, numbers caught, and seabird species representation in the catch.

3.2 New Zealand fur seals in tuna longline fisheries

In 2000–01, New Zealand fur seals were observed caught on 16% of observed sets in Area 3 during May and June (see Figure 4 for distribution of sets with fur seal captures). Of the 44 reported captures, 40 were released alive and 4 were landed dead. Most incidents were of single captures (33), with two vessels catching two fur seals on one set and one catching seven fur seals on a set. All observed vessels reported fur seal captures, with 31 reported from the chartered vessels (where almost 100% hooks were observed) and 13 from the large domestic vessel (86% hooks observed). Mean bycatch rates varied from 0.027 to 0.121 fur seals per 1000 hooks for the five vessels.

In 2001–02, New Zealand fur seals were observed caught on 15% of observed sets in Area 3 during April–June and in one set in Area 2 in March (where 7 sets were observed) (see Figure 4). Of the 46 reported captures, 44 were released alive and 2 were landed dead. Most incidents were of single captures (36), with another five sets made by three different vessels that caught two fur seals per set. All observed vessels reported fur seal captures, with 29 reported from the chartered vessels and 17 from the large domestic vessel that often fishes in more inshore waters. Mean catch rates varied from 0.051 to 0.174 fur seals per 1000 hooks for the five vessels.

Most fur seals were hooked in the mouth (Table 8). In 2000–01, of the fur seals released alive, about 55% were released with the hook and tracer (often between 20–100 cm long), 25% with the hook, and 20% without the hook. In the following season, of the 44 fur seals released alive, 84% were released with the hook and tracer (often between 20–100 cm long), 7% with the hook, and 9% without the hook.

3.3 Turtles in tuna longline fisheries

Six turtle captures were reported from domestic tuna longlines in 2000–01 and 2001–02. All were caught in different sets. Two leatherback turtles (*Dermochelys coriacea*) were observed caught (hooked in the mouth) and released alive from domestic longline sets in February (set start position 37° S, 177° 30' E) and May 2001 (set start position 45° 35' S, 165° 06' E) (Figure 5). Another turtle (species unknown) was caught in the right flipper and landed dead in March 2001 (39° 14' S, 178° 45' E).

Captures in 2001–02 were in more northern waters. All were released alive, with the hook and tracer attached. One leatherback was caught in November 2001 (32° 30' S, 178° 10' E), and one small loggerhead (*Caretta caretta*) and a large unidentified turtle were caught in two consecutive sets in February 2002 (37° S, 177° 20' E).

4. Acknowledgements

This report was prepared for the Ministry of Fisheries by Suze Baird, National Institute of Water and Atmospheric Research, Wellington.

5. References

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Table 1: Frequency of seabird captures for observed chartered Japanese and domestic tuna longlines, by area (see Figure 1 for areas), 2000–01 and 2001–02.

No. seabirds per observed set	Chartered vessels				Domestic vessels			
	Area 2	Area 3	Area 4	Total	Area 1	Area 3	Area 4	Total
2000–01								
0	16	171	–	187	165	42	40	247
1	1	8	–	9	21	–	–	21
2	–	3	–	3	4	–	–	4
3	–	–	–	–	3	–	–	3
Observed seabirds							0	
	1	14	–	15	38	0		38
Observed sets	17	182	–	199	193	0	0	275
% sets with seabirds							0	
	6	6	–	6	15	0		10
2001–02								
0	6	174	4	184	88	38	4	130
1	1	32	–	33	16	2	–	18
2	–	12	–	12	6	1	–	7
3	–	2	–	2	1	–	–	1
4	–	2	–	2	2	–	–	2
5	–	1	–	1	–	–	–	–
6	–	–	–	–	3	–	–	3
7	–	–	–	–	–	–	–	–
8	–	–	–	–	–	–	–	–
9	–	–	–	–	1	–	–	1
10	–	–	–	–	1	–	–	1
11	–	–	–	–	1	–	–	1
Observed seabirds					87	4	0	
	1	75	0	76				91
Observed sets	7	223	4	234	119	41	4	164
% sets with seabirds					26	7	0	
	14	22	0	21				21

Table 2: Total number of vessels and 1000 hooks, percent vessels and hooks observed, number seabirds observed, and seabird catch rate (mean number seabirds per observed 1000 hooks with 95% confidence intervals) for chartered Japanese tuna longline vessels in Areas 2–4, 2001 and 2002.

Area	Total no. vessels	% vessels observed	Total no. hooks (10 ³)	% hooks observed	No. birds observed caught	Mean seabird catch rate (± 95% CI)*
April-June 2001						
Area 2	1	100	53.010	100	1	–
Area 3	4	100	567.998	95	14	0.026 (0.011– 0.042)
All	4	100	621.008	96	15	–
March-June 2002						
Area 2	1	100	22.100	95	1	–
Area 3	4	100	692.372	93	75	0.117 (0.082– 0.154)
Area 4	2	100	12.006	98	0	0
All	4	100	726.478	93	76	–

* No overall mean catch rates are given for a season because it is inappropriate to pool data across areas.

Table 3: Number of each seabird species landed dead and returned for autopsy from observed chartered tuna longlines, by area as shown in Figure 1, 2001 and 2002.

Common name	Scientific name	Area	No. males	No. females	Total
April-June 2001					
Campbell albatross	<i>Thalassarche impavida</i>	2	–	1	1
Buller's albatross	<i>Thalassarche bulleri</i>	3	1	6	7
White-capped albatross	<i>Thalassarche steadi</i>	3	1	2	3
White-chinned petrel	<i>Procellaria aequinoctialis</i>	3	1	–	1
March-June 2002					
Southern royal albatross	<i>Diomedea epomophora</i>	3	1	–	1
Buller's albatross	<i>Thalassarche bulleri</i>	3	6	3	9
Salvin's albatross	<i>Thalassarche salvini</i>	2	1	–	1
White-capped albatross	<i>Thalassarche steadi</i>	3	4	6	10
Westland petrel	<i>Procellaria westlandica</i>	3	1	–	1
White-chinned petrel	<i>Procellaria aequinoctialis</i>	3	2	1	3

Table 4: Total number of each seabird species (based on observer and verified identification of all captures) caught during the 2001 and 2002 chartered tuna longline fisheries.

Common name	April-June 2001	March-June 2002
	Total number	Total number
Area 2		
Salvin's albatross	0	1
Campbell albatross	1	0
Area 3		
Black-browed albatross*	0	1
Buller's albatross	10	55
Southern royal albatross	0	1
White-capped albatross	3	13
Westland petrel	0	1
White-chinned petrel	1	4

* The observer record did not differentiate by species: therefore this bird could be *Thalassarche impavida*, *T. melanophrys*, or another albatross taxon.

Table 5: Method of capture for seabirds observed caught on observed tuna longlines, 2001–02.

Vessels	Swallowed	Bill	Wing	Other	Tangled	Unknown	Total
Chartered	16	23	12	6	18	1	76
Domestic	11	17	15	7	40	1	91

Table 6: Total number of vessels and 1000 hooks, percent vessels and hooks observed, number seabirds observed, and seabird catch rate (mean number seabirds per observed 1000 hooks) for domestic tuna longline vessels in Areas 1–4, 2000–01 and 2001–02.

Area	Total no. vessels	% vessels observed	Total no. hooks (10 ³)	% hooks observed	No. birds observed caught	Mean seabird catch rate (± 95% CI)*
2000–01						
Area 1	124	12	7 059.0	4	38	–
Area 2	4	25	99.7	0	–	–
Area 3	8	13	229.5	63	0	0.0
Area 4	83	5	1 797.8	3	0	0.0
All	128	13	9 186.0	5	38	–
2001–02						
Area 1	141	7	7 699.8	2	87	–
Area 2	7	0	38.9	0	–	–
Area 3	22	5	493.4	20	4	0.042 (0–0.095)
Area 4	81	1	1 491.1	< 1	0	0.0
All	151	7	9 723.2	2	91	–

* Data were not representative in most strata to provide mean catch rates. No overall mean catch rate is given for 2002 because it is inappropriate to pool data across areas.

Table 7: Number of each seabird species landed dead and returned for autopsy from observed domestic tuna longlines in Area 1 during fishing years 2000–01 and 2001–02.

Common name	Scientific name	No. males	No. females	Total
2000–01				
Salvin's albatross	<i>Thalassarche salvini</i>	1	–	1
Black petrel	<i>Procellaria parkinsoni</i>	–	2	2
White-chinned petrel	<i>Procellaria aequinoctialis</i>	1	–	1
Grey-faced petrel	<i>Pterodroma macroptera</i>	1	–	1
2001–02				
Antipodean albatross	<i>Diomedea antipodensis</i>	0	1	1
Black-browed albatross	<i>Thalassarche melanophrys</i>	1	0	1
Buller's albatross	<i>Thalassarche bulleri</i>	0	2	2
Salvin's albatross	<i>Thalassarche salvini</i>	0	4	4
Black petrel	<i>Procellaria parkinsoni</i>	1	2	3
White-chinned petrel	<i>Procellaria aequinoctialis</i>	1	1	2
Grey-faced petrel	<i>Pterodroma macroptera</i>	0	1	1
Flesh-footed shearwater	<i>Puffinus carneipes hullianus</i>	3	7	10

Table 8: Percent of captured New Zealand fur seals relative to hook position for 2000–01 and 2001–02.

Hook position	2000–01 (n = 44) % captures	2001–02 (n = 46) % captures
Mouth	70	78
Flipper/body part	20	13
Swallowed	10	0
Unknown	–	9

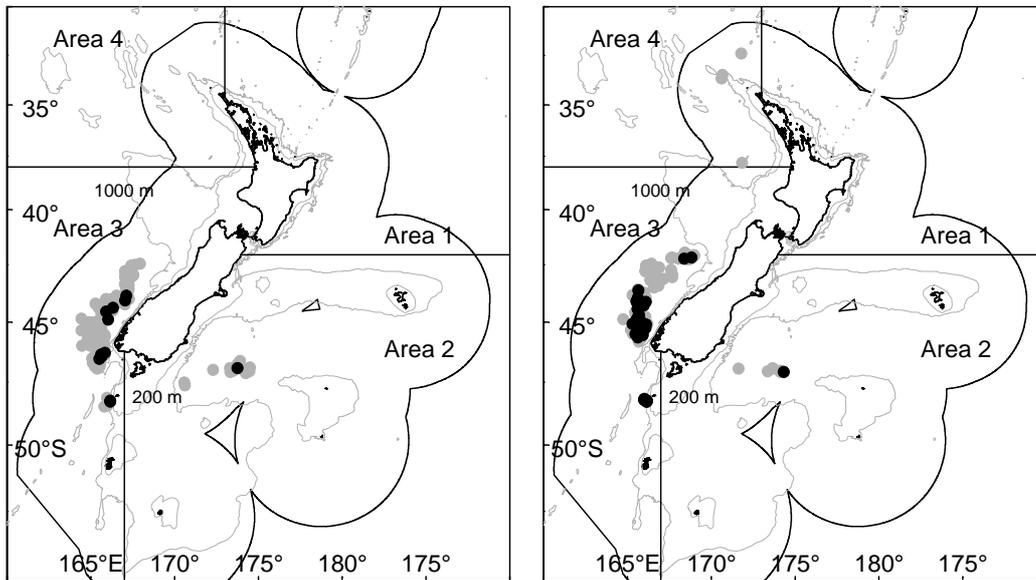


Figure 1: Start positions of observed sets (●), including those with seabird bycatch (●), for chartered Japanese vessels in April-June 2001 (left) and March-June 2002 (right).

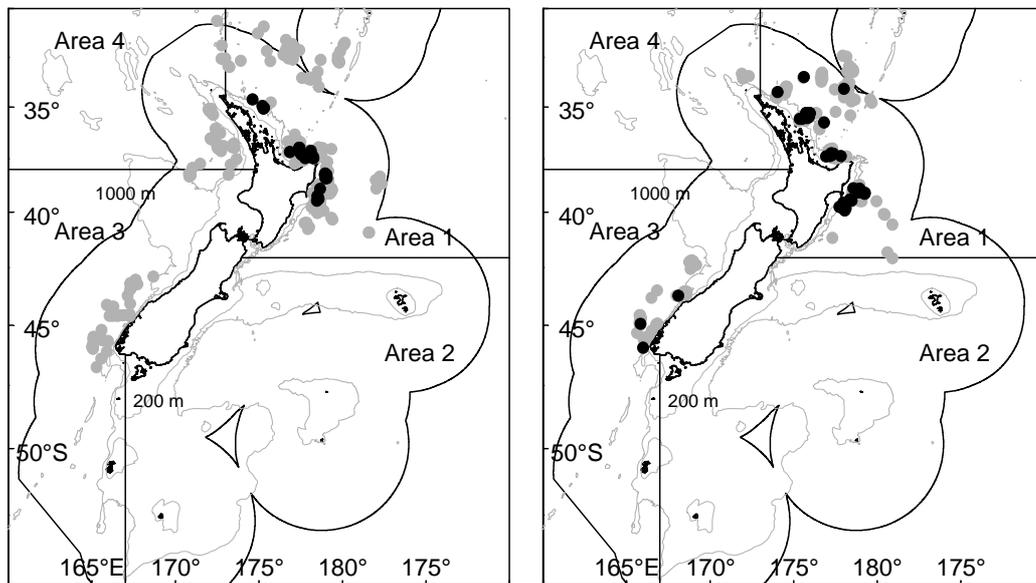


Figure 2: Start positions of observed sets (●), including those with seabird bycatch (●), for domestic owner-operator vessels in 2000-01 (left) and 2001-02 (right).

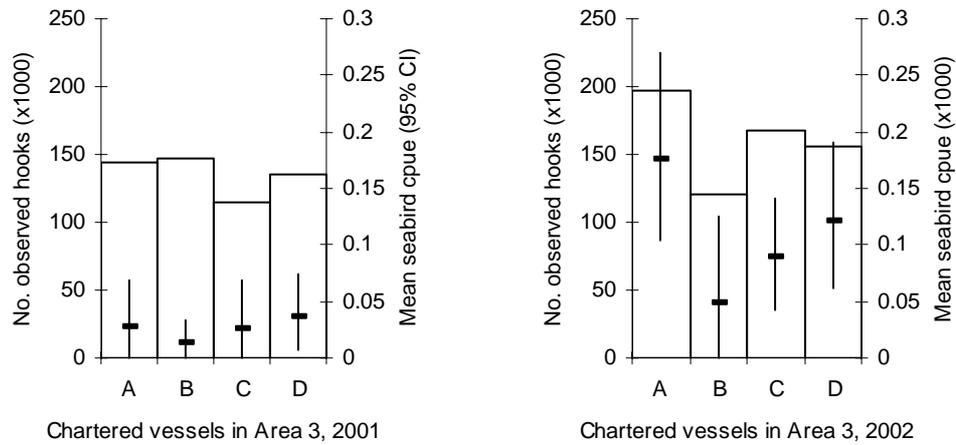


Figure 3: Number of observed hooks (histogram) and mean number of seabirds per 1000 hooks (\pm 95% confidence intervals) for chartered Japanese vessels in Area 3 in 2001 (left) and 2002 (right).

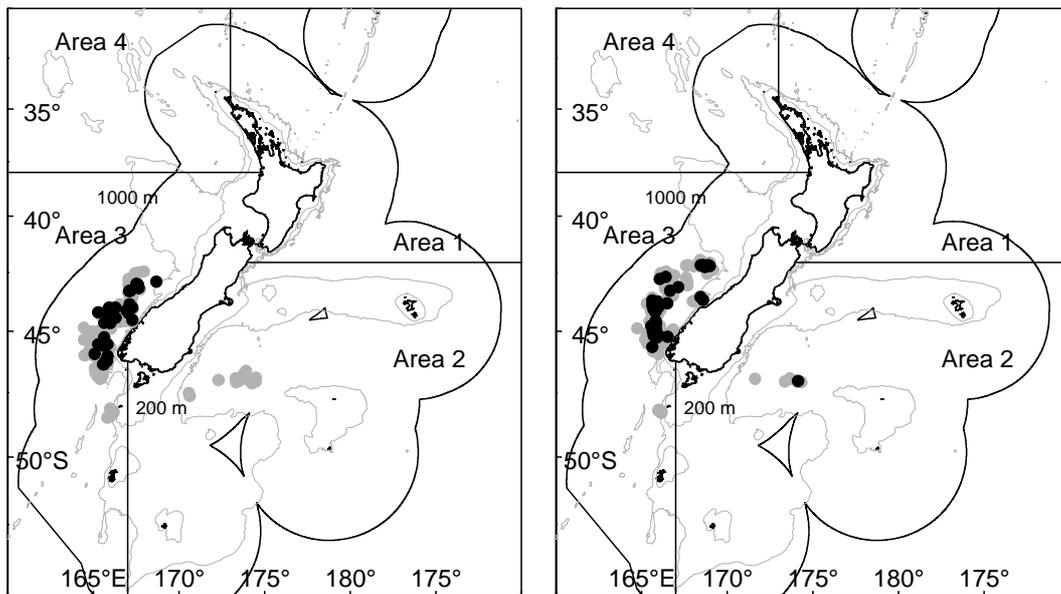


Figure 4: Start positions of observed chartered and domestic tuna longline sets in southern waters (●), including those with observed fur seal incidental captures (●), for 2000-01 (left) and 2001-02 (right).

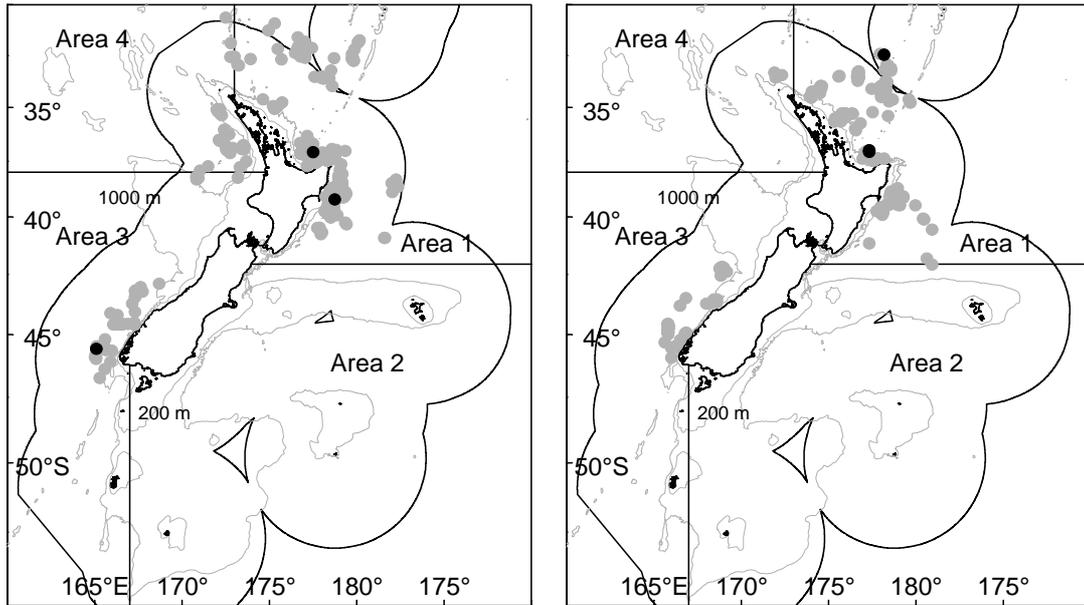


Figure 5: Start positions of observed domestic tuna longline sets (●), including those with observed turtle incidental captures (●), for 2000–01 (left) and 2001–02 (right).