

**INT 2013/02 IDENTIFICATION OF SEABIRDS
CAPTURED IN NEW ZEALAND FISHERIES:
1 JULY 2014 TO 30 June 2015**



INT2013/02 Identification of seabirds captured in New Zealand fisheries: 1 July 2014 to 30 June 2015

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ABSTRACT

New Zealand waters support a diverse range of seabird species, but much of the commercial fishing activity in the region overlaps with their ranges. The accurate identification of seabirds captured in New Zealand fisheries is vital for determining the potential impact of fisheries on these populations. Between 1 July 2014 and 30 June 2015 a total of 352 seabirds comprising 20 taxa were incidentally killed as bycatch and returned for autopsy by on-board New Zealand Government observers. Birds were returned from longline (n = 41) and trawl (n = 310) vessels and one from a set net vessel, and were dominated numerically by five species (white-chinned petrel *Procellaria aequinoctialis*, sooty shearwater *Puffinus griseus*, New Zealand white-capped albatross *Thalassarche steadi*, Salvin's albatross *Thalassarche salvini* and Buller's albatross *Thalassarche bulleri bulleri*). All birds returned from longline fisheries had injuries consistent with being hooked or entangled in the bill or throat. In contrast, most birds (88.3%) returned from trawl fisheries were killed through entanglement in the net or cod-end, with the remaining 11.7% likely to have been killed by warp interaction or entanglement. Three birds were killed by striking the deck of the vessel. Birds had a higher mean fat scores than in the previous fishing year, and discards, including offal, appear to continue to be an attractant for many seabirds. In addition to the seabirds that were returned for autopsy, examination of the Ministry of Primary Industries Central Observer Database and images provided by Government observer gave a total of a further 433 seabirds that were reported captured (as dead or alive captures) or photographed as seabird interactions with 46 fishing vessels (and may include some non-capture interactions). Out of these 433 extra records of seabird interactions on fishing vessels, photographs were taken of 34 seabirds consisting of 14 taxa. Of these 34 seabirds, only 24 had corresponding information recorded in the COD extract. Image quality varied widely, with poor images being particularly common for birds that were alive and seen on-board for short periods. Recommendations are made to improve photo-identifications in the future.

Keywords: commercial fishing, seabirds, autopsy, photo-identification, incidental mortality, longline, trawl.

1. INTRODUCTION

New Zealand waters support a large and diverse range of seabird species. However, much of the commercial fishing activity within New Zealand waters overlaps with the ranges of these seabirds (Robertson et al. 2003). Therefore, the accurate identification of seabirds captured in commercial fisheries operations is vital for determining the potential impact of fisheries on these seabird populations.

New Zealand Government observers have been placed on commercial vessels since 1998 to investigate interactions between fisheries and seabird species, but are not always able to accurately identify seabirds at sea. Consequently, an autopsy programme has been in place since 1998 to accurately determine the taxon (and age, sex, diet and provenance) of specimens recovered dead by observers. Observers present on fishing trips within New Zealand's Exclusive Economic Zone (EEZ) are generally required to return all seabirds caught and killed as incidental bycatch during fishing operations for autopsy. Additional information such as vessel name, location of capture (latitude and longitude) and date of capture is also recorded. Specific catch locations and vessel names have not been provided in this report on the grounds of commercial sensitivity. All autopsies were performed for the Department of Conservation (DOC) as part of Conservation Services Programme (CSP) project INT2013/02.

In the past, identification of seabirds released alive were often of unknown accuracy and were not confirmed by an expert. Consequently, a photography programme was developed to enable observers to record and return images of birds interacting with vessels (whether alive or dead), enabling the identification to be checked and verified.

This report provides a summary of the species of seabird identified as being captured in New Zealand fisheries between 1 July 2014 and 30 June 2015. Identifications were based on dead birds caught and returned and/or photographs of live or dead birds.

1.1 Objectives

The overall objective of the observer programme is to determine which seabird species are captured in New Zealand commercial fisheries and the mode of capture.

The specific objectives of the autopsy programme are to:

1. Determine the taxon, sex and, where possible, age class and provenance of seabirds killed in New Zealand fisheries (for returned dead specimens).
2. Describe the injuries, body condition and stomach contents and, where possible, the likely cause of mortality (for returned dead specimens).
3. Report any changes in the protocol used for autopsy of seabirds (for returned dead specimens).
4. Determine the taxon and, where possible, sex, age-class and provenance of seabirds captured in New Zealand fisheries through examination of photographs (for live captures or dead specimens discarded at sea).

2. METHODS

2.1 Autopsy

The autopsy methods followed those described by Bartle (2000) and used in autopsies in subsequent fishing years (Robertson 2000; Robertson & Bell 2002a, b; Robertson et al. 2003, 2004; Conservation Services Programme 2008; Thompson 2009, 2010a, b; Bell 2011, 2012, 2013; Bell & Mischler 2014). Common and scientific names of all species caught and returned are provided in Table 1. Nomenclature generally follows Marchant & Higgins (1990), but for the albatrosses for which current taxonomy and nomenclature is in a state of flux, it is based on a combination of Nunn et al. (1996) and Robertson & Nunn (1998), and is consistent with the taxonomy recognised by the Agreement on the Conservation of Albatrosses & Petrels (ACAP 2010).

During autopsy, all birds were sexed by internal examination, with the exception of birds that had been damaged by fishing gear, machinery or sea lice. Feather moult and the condition of the brood patch were also recorded. Birds were characterised as either adult, breeding adult, non-breeding adult, sub-adult (pre-breeder), immature or juvenile based on a combination of plumage, morphological (such as bill size and colour), gonadal and brood patch characteristics.

- Adults – adult morphology (e.g. body size, bill size, bill colour, plumage colour), but active breeding could not be confirmed
- Breeding adults - considered to be actively breeding at the time of capture (e.g. bare brood patch, swollen ovaries or testes)
- Non-breeding adults - identified by feather moult (e.g. downy brood patch, body moult, wing moult) and gonadal evidence (i.e. regressed or small ovaries and testes)
- Sub-adults (pre-breeders) – non-adult or near-adult plumage and/or morphology (e.g. bill colour), but no gonadal evidence that they had obtained breeding condition
- Juveniles - juvenile plumage and/or morphology (e.g. bill colour, bill size, leg and foot colour)

Body condition was determined by assigning a fat score based on the relative amount of subcutaneous fat and fat on and around organs: '1' = no fat, to '5' = extremely fat (where internal examination becomes difficult). In instances where the birds have been damaged by sea lice, the fat score was listed as unknown. Stomach and gizzard contents were identified to broad dietary groupings (i.e. squid, fish, crustaceans, etc.) and any hard parts (squid beaks, otoliths) were retained for future identification where possible. In addition, any bait material, offal or discarded material, plastic, stones, algae and goose barnacle plates were recorded. Photographs were taken of plastic debris in the gizzard or stomach.

For each bird, any injuries were recorded, and this information, together with observer comments on the autopsy label, was used to determine the likely cause of death.

Table 1 Common and scientific names of seabirds captured and returned or photographed from New Zealand fisheries between 1 July 2014 and 30 June 2015.

COMMON NAME	SCIENTIFIC NAME	AUTOPSY	PHOTO (P) OR EXTRACT REPORT (E)
Albatross (unidentified)			E
Black petrel	<i>Procellaria parkinsoni</i>	✓	P
Black-bellied storm petrel	<i>Fregetta tropica</i>	✓	
Black-browed albatross (unidentified)	<i>Thalassarche spp.</i>		E
Buller's albatross	<i>Thalassarche bulleri bulleri</i>	✓	E
Buller's or Pacific albatross (unidentified)	<i>Thalassarche spp.</i>		E
Buller's shearwater	<i>Puffinus bulleri</i>		P
Campbell albatross	<i>Thalassarche impavida</i>	✓	
Cape petrel	<i>Daption capense</i>	✓	
Cape petrels (unidentified)	<i>Daption spp.</i>		E
Chatham Island albatross	<i>Thalassarche eremita</i>		E
Common diving petrel	<i>Pelecanoides urinatrix</i>	✓	P
Cook's petrel	<i>Pterodroma cookii</i>		P
Fairy prion	<i>Pachyptila turtur</i>	✓	P
Flesh-footed shearwater	<i>Puffinus carneipes</i>	✓	P
Fluttering shearwater	<i>Puffinus gavia</i>		E
Giant petrel (unidentified)	<i>Macronectes spp.</i>		E
Gibson's albatross	<i>Diomedea antipodensis gibsoni</i>	✓	
Great albatross (unidentified)	<i>Diomedea spp.</i>		E
Great-winged petrel	<i>Pterodroma macroptera</i>	✓	P
Grey petrel	<i>Procellaria cinerea</i>	✓	P
Grey-backed storm petrel	<i>Garrodia nereis</i>	✓	P
Mid-sized petrel & shearwater (unidentified)			E
New Zealand white-capped albatross	<i>Thalassarche steadi</i>	✓	P
Northern giant petrel	<i>Macronectes halli</i>		E
Pacific albatross	<i>Thalassarche bulleri platei</i>	✓	
Petrel (unidentified)			E
Petrels, prion and shearwaters (unidentified)			E
Prion (unidentified)	<i>Pachyptila spp.</i>		E
Procellaria petrel (unidentified)	<i>Procellaria spp.</i>		E
Salvin's albatross	<i>Thalassarche salvini</i>	✓	P
Seabird (small)			E
Shearwater (unidentified)			E
Shy albatross	<i>Thalassarche cauta</i>		E
Small albatross (unidentified)	<i>Thalassarche spp.</i>		E
Snares cape petrel	<i>Daption capense australe</i>		E
Sooty shearwater	<i>Puffinus griseus</i>	✓	P
Southern royal albatross	<i>Diomedea epomophora</i>	✓	E
Storm petrel (unidentified)			E
Wandering albatross (unidentified)	<i>Diomedea spp.</i>		E
Westland petrel	<i>Procellaria westlandica</i>	✓	E
White-chinned petrel	<i>Procellaria aequinoctialis</i>	✓	P
White-faced storm petrel	<i>Pelagodroma marina</i>	✓	P

Each specimen was allocated a unique autopsy number and photographed. This number, along with the information on the observer specimen tag and all other information collected during autopsy was entered into an Access database. Details relating to each specimen are available on request from the Manager, Marine Conservation Services, DOC (email: csp@doc.govt.nz).

2.2 Photo-identification

The photographs used in this analysis were of seabird captures for which the records indicated that only observer identification had been made, rather than a confirmed identification following autopsy. This covered live captures, mortalities where a specimen was not returned for autopsy (for whatever reason), images of birds that had no associated observer data (i.e. missing from Ministry of Primary Industries (MPI) Central Observer Database ('COD') extracts) and reported interactions in the MPI COD extract with no corresponding image and may include non-capture interactions. Photographs were provided in electronic format with associated observer extracted information (vessel name, type of fishery, date of capture, time of capture etc.) in an Excel spreadsheet. Common and scientific names of all species caught, photographed or recorded in the COD extract are provided in Table 1.

Dead specimens were generally photographed with a label that bore the trip, station and sample number making it easy to correlate to the MPI COD extract. However, photographs of live captures often contained no information on station or sample number, making it difficult to match the specimen to the extract unless the time and date stamp on the camera had been set correctly.

All photographed seabirds were identified to the lowest possible taxon. Various seabird reference books (including Marchant & Higgins 1990; Bartle 2000; Shirihai 2002; Onley & Scofield 2007) were used to confirm identification when necessary. Bill and head morphology and colour were usually sufficient to allow the identification of albatrosses and larger petrels to species, but other key features (such as size, shape, foot colour and wing markings) were needed to identify smaller species. If key features were not visible in the photograph or the image was out of focus, identification to species was not possible. Where possible, the age, sex and provenance of the photographed seabirds were also determined.

Each Individual seabird was allocated a unique number. The photograph (or photographs), the information from the observers and any other information observed in the photograph or the MPI COD extract were entered into an Access database.

3. RESULTS

3.1 Autopsy

3.1.1 Returned seabirds

A total of 352 seabirds comprising 20 taxa were returned from 38 vessels between 1 July 2014 and 30 June 2015 (Table 2, Fig 1). Seabirds returned were dominated by five species: white-chinned petrel ($n = 149$, 42.3%), sooty shearwater ($n = 66$, 18.8%), NZ white-capped albatross ($n = 41$, 11.6%), Salvin's albatross ($n = 33$, 9.4%) and Buller's albatross ($n = 27$, 7.7%) (Table 2). These five species accounted for 89.8% of all returns (Table 2). Of the remaining fifteen taxa, nine had only single captures, Westland petrels and flesh-footed shearwaters had six captures, and grey petrels had nine captures (Table 2).

One female Buller's albatross had a uniquely numbered metal band, having been banded on 23 March 2015 as a first-time breeding adult at the Mollymawk Bay study colony, North East Island, The Snares (band number M89902) (P. Sagar, NIWA, pers. comm.). Banded specimens provide valuable longevity and survival data.

The monthly distribution of returned specimens was not evenly spread across the fishing year with most birds returned being caught in March ($n = 83$, 23.6%), February ($n = 60$, 17.1%) or April ($n = 49$, 13.9%)

(Table 2). This pattern reflects the timing of seabird breeding, presence within the New Zealand EEZ, timing and location of all observed fisheries, and observer coverage.

Table 2. Number of seabirds of each species killed and returned from observed fishing vessels between 1 July 2014 and 30 June 2015, by month of capture.

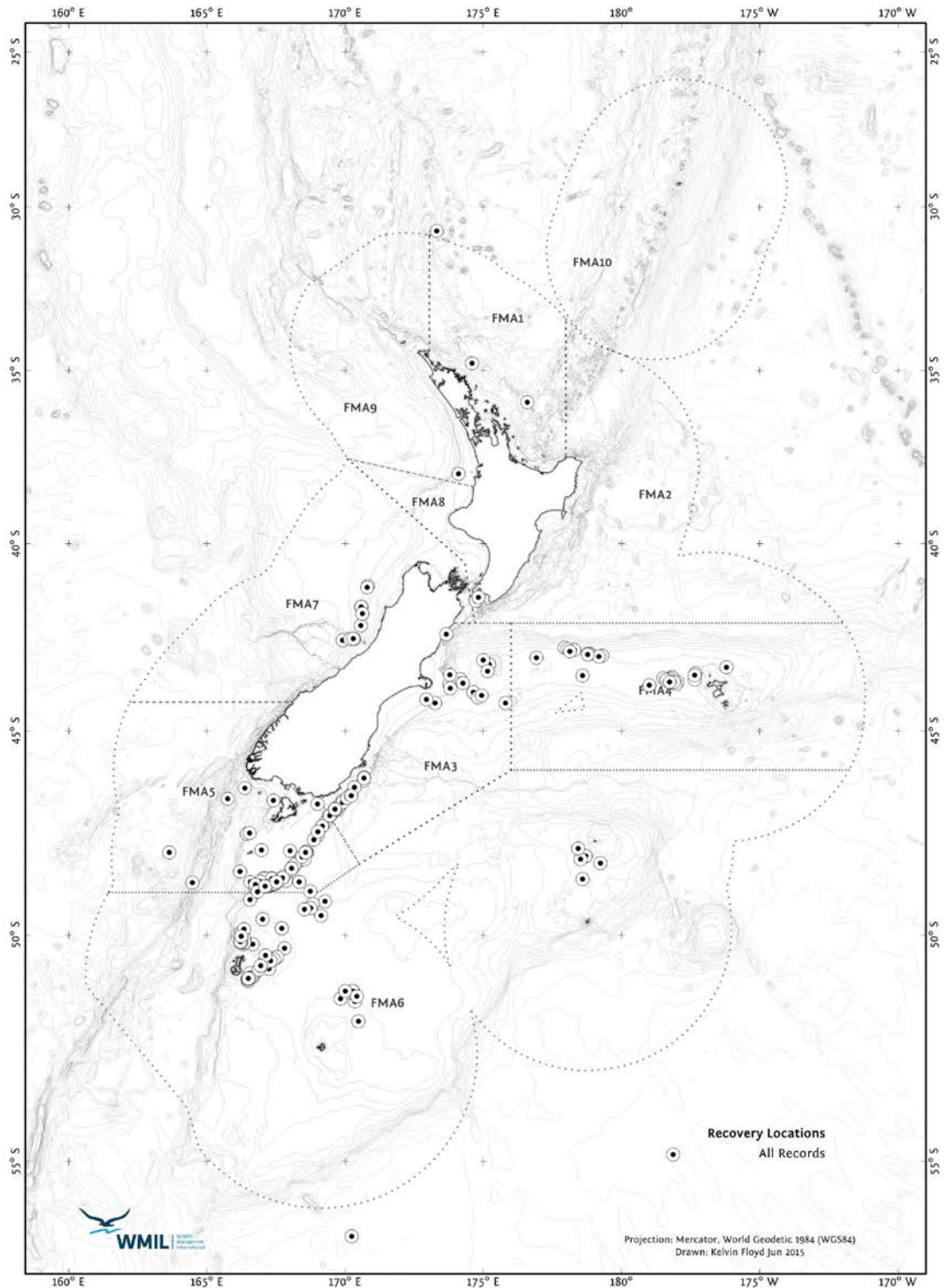
SPECIES	MONTH												TOTAL	% TOTAL
	J	F	M	A	M	J	J	A	S	O	N	D		
Black petrel		1											1	0.3
Black-bellied storm petrel				1									1	0.3
Buller's albatross	1	2	3		9	6	5	1					27	7.7
Campbell albatross					1								1	0.3
Cape petrel					1			1					2	0.6
Common diving petrel			1										1	0.3
Fairy prion							1						1	0.3
Flesh-footed shearwater	2	2	1									1	6	1.7
Gibson's albatross				1									1	0.3
Great-winged petrel					1					1			2	0.6
Grey petrel								1	8				9	2.6
Grey-backed storm petrel									2				2	0.6
NZ white-capped albatross	5	11	8	3	4		2	1	2	1		4	41	11.6
Pacific albatross							1						1	0.3
Salvin's albatross	9							5	6	5	1	7	33	9.4
Sooty shearwater	2	5	23	22	5					7	1	1	66	18.8
Southern royal albatross								1					1	0.3
Westland petrel					4			1	1				6	1.7
White-chinned petrel	16	39	47	22	1				1	14	2	7	149	42.3
White-faced storm petrel												1	1	0.3
TOTAL	35	60	83	49	26	6	9	11	20	28	4	21	352	
% TOTAL	9.9	17.1	23.6	13.9	7.4	1.7	2.6	3.1	5.7	8.0	1.1	6.0		

Table 3 Species and numbers of seabirds killed and returned from observed fishing vessels between 1 July 2014 and 30 June 2015, by sex (M = male, F = female, U = unknown) and age (A = adult, BA = breeding adult, N = non-breeding adult, SA = sub-adult, I = immature and J = juvenile, U = unknown).

SPECIES	SEX			AGE							TOTAL	% TOTAL
	M	F	U	A	BA	N	SA	I	J	U		
Black petrel	1			1	1						1	0.3
Black-bellied storm petrel	1			1	1						1	0.3
Buller's albatross	15	11	1	27	17						27	7.7
Campbell albatross		1		1							1	0.3
Cape petrel	1	1		2							2	0.6
Common diving petrel	1			1							1	0.3
Fairy prion		1		1							1	0.3
Flesh-footed shearwater	5	1		6	3						6	1.7
Gibson's albatross	1			1							1	0.3
Great-winged petrel		2		1			1				2	0.6
Grey petrel	8	1		9	9						9	2.6
Grey-backed storm petrel	1	1		2	1						2	0.6
NZ white-capped albatross	24	17		36	33	1	3	1		1	41	11.6
Pacific albatross		1		1							1	0.3
Salvin's albatross	21	11	1	33	30	2					33	9.4
Sooty shearwater	62	4		66	49	14					66	18.8
Southern royal albatross		1		1	1						1	0.3
Westland petrel	4	2		6	3						6	1.7
White-chinned petrel	114	35		149	116	27					149	42.3
White-faced storm petrel	1			1	1						1	0.3
TOTAL	260	90	2	346	265	44	4	1	0	1	352	
% TOTAL	73.9	25.5	0.6	98.3	75.3	12.5	1.1	0.3	0	0.3		

Figure 1 Catch locations of all seabirds killed and returned in New Zealand fisheries for necropsy between 1 July 2014 and 30 June 2015

Note: catch location symbols may be obscured by overlying symbols (e.g. where several individuals were captured from the same tow or set, each bird will have the same catch location and appear on the maps as a single symbol).



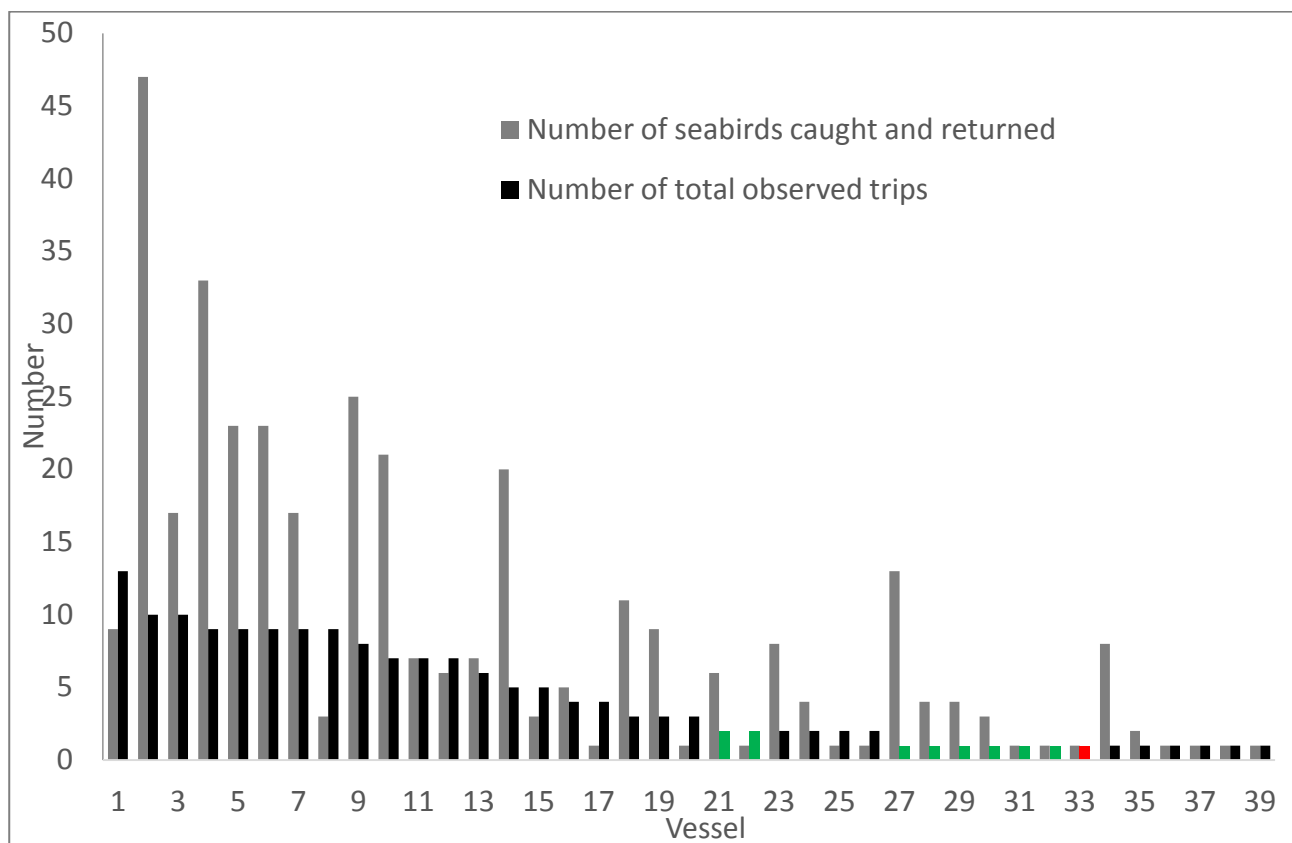
The majority of birds were males (n = 260, 73.9%, Table 3). Black petrel, black-bellied storm petrel, common diving petrel, Gibson’s albatross and white-faced storm petrels only returned males. However Campbell albatross, cape petrel, grey-faced petrel, Pacific albatross and southern royal albatross had either equal numbers or only female returns. Most birds were adults (n = 346, 98.3%). Of these adults, 265 (75.3%) were breeding and 44 (12.5%) were non-breeding. Five birds (1.4%) were pre-breeders (i.e. either immature or juvenile birds).

3.1.2 Target vessel and fishery

The seabirds killed and returned were caught in a range of Fishing Management Areas (FMA 1, 2, 3, 4, 5, 6, 7 and 9) as well as just outside FMA1 and FMA6 and general positions are show in Figure 1.

For the fishing period 1 July 2014 to 30 June 2015, there were 263 observed trips on 101 vessels (Kris Ramm, CSP DOC, pers. comm.), and 39 (38.6%) of these vessels returned birds during this period. Over half the vessels returned relatively low numbers of birds (< 5 birds caught and returned; n = 25, 65.8%) (Figure 2). On average, there were 9.1 birds (± 1.7) caught and returned from 4.3 trips (± 0.6) per vessel. Seven vessels caught 20 or more birds as shown in Figure 2.

Figure 2 The number of seabirds killed and returned in New Zealand fisheries, and the number of trips for each observed vessel between 1 July 2014 and 30 June 2015
Where ● is trawl vessel, ● is longline vessel and ● is set net vessel.



Bottom and surface longline fisheries returned a total of 42 birds (11.9% of total returns), with vessels targeting tuna (*Thunnus* spp.) accounting for 15.4% (n = 6) of longline specimens and the remainder targeting ‘other’ species (mainly hoki *Macruronus novaezelandiae* or snapper *Centroberyx affinis*) (Table 4).

Bottom and midwater trawl fisheries combined returned 309 birds (87.8% of total returns), with trawlers targeting squid (*Nototodarus* spp.) accounting for 36.8% (n = 115) of all trawl returns, trawlers targeting hoki (*Macruronus novaezelandiae*) accounting for 23.1% (n = 72), trawlers targeting scampi (*Metanephrops challengerii*) accounting for 0.3% (n = 1) and trawlers targeting ‘other’ species accounting for 39.4% (n = 123) (Table 4). The ‘other’ species included barracouta (*Thyrsites atun*), hake (*Merluccius australis*), jack mackerel (*Trachurus* spp.), silver warehou (*Seriola punctata*), southern blue whiting (*Micromesistius australis*) and white warehou (*S. caerulea*).

Table 4 Number of seabirds of each species killed and returned from observed fishing vessels between 1 July 2014 and 30 June 2015, by fisheries type.

Species	Trawl (Bottom/Midwater)					Longline (Surface/Bottom)			Setnet	Total	
	Scampi	Squid	Hoki	Ling	Other	Tuna	Snapper	Other			
Black petrel							1			1	
Black-bellied storm petrel					1					1	
Buller's albatross		10	9		4	2		2		27	
Campbell albatross								1		1	
Cape petrel			1						1	2	
Common diving petrel		1								1	
Fairy prion					1					1	
Flesh-footed shearwater								6		6	
Gibson's albatross								1		1	
Great-winged petrel					1			1		2	
Grey petrel					9					9	
Grey-backed storm petrel					2					2	
NZ white-capped albatross		12	6	1	17	3		2		41	
Pacific albatross			1							1	
Salvin's albatross	1	4	8		19			1		33	
Sooty shearwater		24	20		21		1			66	
Southern royal albatross								1		1	
Westland petrel			4		1	1				6	
White-chinned petrel		64	23		43			19		149	
White-faced storm petrel					1					1	
TOTAL	1	115	72	1	121	6	2	34	1	352	
		309					42				1
% TOTAL		87.8					11.9			0.3	

Table 5 Number of seabirds of each species killed and returned from longline and trawl fisheries between 1 July 2014 and 30 June 2015, by likely cause of death. The proportion of albatross and non-albatross taxa returned is also presented.

Species	Longline				Trawl				Setnet	Vessel strike	Total
	Bill or Throat	Wing	Legs or Feet	Not obvious	Warp	Net	Pound or Cod-end	Other			
Black petrel							1				1
Black-bellied storm petrel						1					1
Buller's albatross	1			3	4	15		4			27
Campbell albatross				1							1
Cape petrel						1			1		2
Common diving petrel						1					1
Fairy prion										1	1
Flesh-footed shearwater		2	1	3							6
Gibson's albatross	1										1
Great-winged petrel				1			1				2
Grey petrel						8		1			9
Grey-backed storm petrel							1			1	2
NZ white-capped albatross	2	1		2	9	21	4	2			41
Pacific albatross					1						1
Salvin's albatross				1	19	8	4	1			33
Sooty shearwater						47	18	1			66
Southern royal albatross				1							1
Westland petrel				1		4	1				6
White-chinned petrel			1	20		107	16	4		1	149
White-faced storm petrel							1				1
Total	4	3	2	33	33	213	47	13	1	3	352
% of total longline or trawl	9.8	7.1	4.8	78.6	10.7	68.9	15.2	4.2	0.3	0.9	
Albatrosses (%)	100	33	0	25	100	20.7	17.0	53.8	0	0	
Non-albatross (%)	0	66	100	75	0	79.3	83.0	46.2	100	100	

3.1.3 Injuries and likely cause of death

The condition of the returned birds ranged from 'no obvious injury' to 'crushed'. Of the birds caught and returned from longline vessels, most had hook injuries and 8 of these still had hooks still present (3 in the wing and 5 in the feet or legs) (Table 5).

As in previous years (Robertson et al. 2004; Conservations Services Programme 2008; Thompson 2010 a, b), birds caught and returned from trawl fisheries had different injuries from those caught by longline vessels. Most birds had been caught in the trawl nets or recovered in the pound or cod ends (i.e. had drowned, n = 273, 88.3%) and were very wet and sandy with crush injuries (broken wings, broken chest, crushed organs etc.) (Table 5). Other birds had injuries suggesting entanglement and crush injuries from the trawl warp and blocks (n = 33), many with grease covering part or all of the body and multiple fractures or missing body parts. Non-albatross taxa were mostly recovered from the net (79.3%) while only albatross taxa were affected by warp strikes (100%) exhibiting serious wing injuries or lacerations.

3.1.4 Body condition

Between 1 July 2014 and 30 June 2015, 78.2% of returned birds had fat scores of less than 3, 9.9% of birds had fat scores of 3 and 37% of birds had fat scores over 3 (Table 6). This suggests that the mean fat scores of returned birds between 1 July 2014 and 30 June 2015 (mean (\pm SE) = 1.8 ± 0.1) was higher than the last fishing year (the mean fat score (\pm SE) of all returned birds from the 2013/14 fishing year = 1.4 ± 0.04) but lower than the 2013/13 fishing year (the mean fat score (\pm SE) = 2.1 ± 0.1 ; Bell, in press). Only five birds (1.4%) could not have their fat scores confirmed due to damage.

Table 6 Fat scores of seabirds killed and returned from fishing vessels between 1 July 2014 and 30 June 2015 (1= no fat, to 5 = extremely fat; U = unknown).

SPECIES	FAT SCORE						TOTAL	MEAN (\pm SE)
	1	2	3	4	5	U		
Black petrel		1					1	2.0 \pm 0.0
Black-bellied storm petrel	1						1	1.0 \pm 0.0
Buller's albatross	14	7	3			3	27	1.5 \pm 0.2
Campbell albatross		1					1	2.0 \pm 0.0
Cape petrel		1		1			2	3.0 \pm 1.0
Common diving petrel	1						1	1.0 \pm 0.0
Fairy prion				1			1	4.0 \pm 0.0
Flesh-footed shearwater	5	1					6	1.2 \pm 0.2
Gibson's albatross	1						1	1.0 \pm 0.0
Great-winged petrel	2						2	1.0 \pm 0.0
Grey petrel	1	7	1				9	2.0 \pm 0.2
Grey-backed storm petrel				2			2	4.0 \pm 0.0
NZ white-capped albatross	23	4	9	3	1	1	41	1.9 \pm 0.2
Pacific albatross		1					1	2.0 \pm 0.0
Salvin's albatross	9	8	2	8	5	1	33	2.8 \pm 0.3
Sooty shearwater	44	13	7	1	1		66	1.5 \pm 0.1
Southern royal albatross			1				1	3.0 \pm 0.0
Westland petrel	3	3					6	1.5 \pm 0.2
White-chinned petrel	100	24	11	10	4		149	1.6 \pm 0.1
White-faced storm petrel			1				1	3.0 \pm 0.0
TOTAL	204	71	35	26	11	5	352	1.8 \pm 0.1
% TOTAL	58.0	20.2	9.9	7.4	3.1	1.4		

Table 7 Stomach contents of seabirds killed and returned from fishing vessels between 1 July 2014 and 30 June 2015.Note: Birds can have multiple items in the stomachs resulting in higher stomach content figures than the total number of seabirds killed and returned ($n = 352$).

SPECIES	EMPTY	GONE ¹	BAIT ²	OFFAL/DISCARDS ³	NATURAL ⁴	SLUDGE ⁵	PROVENTRICULAR OIL	OTHER ⁶
Black petrel	0	0	0	2	0	0	1	0
Black-bellied storm petrel	1	0	0	0	0	0	0	0
Buller's albatross	8	2	1	11	10	0	0	1
Campbell albatross	0	0	0	0	1	0	0	0
Cape petrel	1	0	0	0	0	1	0	0
Common diving petrel	1	0	0	0	0	0	0	0
Fairy prion	0	0	0	0	0	0	1	0
Flesh-footed shearwater	2	0	0	0	4	0	0	0
Gibson's albatross	1	0	0	0	0	0	0	0
Great-winged petrel	1	0	0	0	0	1	0	0
Grey petrel	0	0	0	8	1	2	9	0
Grey-backed storm petrel	1	0	0	0	0	0	1	0
NZ white-capped albatross	21	0	3	13	13	2	2	1
Pacific albatross	0	0	0	1	0	0	0	0
Salvin's albatross	5	1	1	39	7	0	6	3
Sooty shearwater	29	0	8	4	25	4	3	1
Southern royal albatross	0	0	0	0	1	1	0	0
Westland petrel	0	0	0	3	4	0	2	0
White-chinned petrel	64	1	22	35	40	2	8	4
White-faced storm petrel	1	0	0	0	0	0	0	1
TOTAL	133	4	35	114	106	13	33	11
% TOTAL	37.8	1.1	9.9	32.4	30.1	3.7	9.4	3.1

¹ Stomach missing or damaged by sea lice.² Identifiable (regularly sized) pieces of fish or squid.³ Whole fish (usually small bycatch fish); fish heads, fillets, vertebrae and skin; or squid tentacles, heads and beaks.⁴ Identifiable prey fish or squid (whole or parts), salps and krill.⁵ Usually fish sludge (minced fish or squid); could be offal or discards, or natural.⁶ Seaweed, worms or nylon cord

Table 8 Gizzard contents of seabirds killed and returned from fishing vessels between 1 July 2014 and 30 June 2015.Note: Birds can have multiple items in the gizzard resulting in higher figures than the total number of seabirds killed and returned ($n = 352$).

SPECIES	EMPTY	GONE	SQUID BEAKS	OTOLITHS	FISH OR SQUID EYEBALLS	FISH BONES OR SKIN	PLASTIC OR STRING	SEEDS, STONES OR SHELL	WORMS	BARNACLES OR SEAWEED
Black petrel	0	0	1	0	1	0	0	0	0	0
Black-bellied storm petrel	1	0	0	0	0	0	0	0	0	0
Buller's albatross	8	2	4	6	7	5	0	1	3	0
Campbell albatross	0	0	0	0	0	1	1	1	0	0
Cape petrel	0	0	1	1	0	0	0	0	0	0
Common diving petrel	1	0	0	0	0	0	0	0	0	0
Fairy prion	1	0	0	0	0	0	0	0	0	0
Flesh-footed shearwater	0	0	4	1	0	0	2	3	0	0
Gibson's albatross	1	0	0	0	0	0	0	0	0	0
Great-winged petrel	0	0	2	0	0	0	0	0	0	0
Grey petrel	0	0	9	4	1	4	0	0	3	0
Grey-backed storm petrel	0	0	0	0	0	1	0	0	0	1
NZ white-capped albatross	12	5	9	4	11	17	0	3	2	0
Pacific albatross	0	0	1	0	0	0	0	0	0	0
Salvin's albatross	6	1	4	15	15	20	10	0	3	4
Sooty shearwater	12	0	40	20	4	4	0	5	12	1
Southern royal albatross	0	0	1	0	1	0	0	0	0	0
Westland petrel	0	0	5	4	1	0	3	2	3	0
White-chinned petrel	6	1	140	33	28	29	0	2	63	2
White-faced storm petrel	1	0	0	0	0	0	0	0	0	0
TOTAL	49	9	221	88	66	81	16	17	89	8
% TOTAL	13.9	2.6	62.8	25.0	18.8	23.0	4.5	4.8	25.3	2.3

3.1.5 Stomach and gizzard contents

Stomach contents were identified to main groups following a similar method to that used since 2009 (Thompson 2009, 2010a, b; Bell 2011, 2012, 2013; Bell & Mischler 2014). In total, 114 birds (32.4%) had offal or discards in their stomachs and 35 birds has bait in their stomach (9.9%) (Table 7). In addition, 133 birds (37.8%) had empty stomachs. A further 4 birds (1.1%) had missing stomachs due to interaction with fishing gear or damage due to sea lice.

Most of the gizzard contents were natural food items (squid beaks 62.8%, fish bones 23.0%, squid or fish eyeballs 18.8% and otoliths 25.0%), but 4.5% of the birds returned had also ingested plastic or string and 4.8% had ingested stones or seeds (Table 8). In addition, 49 birds (13.9%) had empty stomachs and 9 birds (2.6%) had missing gizzards due to damage by fishing gear or sea lice. Samples (e.g. squid beaks and otoliths) have been collected for detailed identification to species if required. Photographs and samples of plastic content were also taken.

3.1.6 Identification

Autopsy confirmed that the majority (86.6%) of the seabirds returned between 1 July 2014 and 30 June 2015 were identified correctly by the observers (based on the information provided by observers on the specimen tags) (Table 9).

Table 9 Comparison of identifications (ID) recorded by on-board observers at sea compared with autopsy identification for seabirds killed and returned from observed fishing boats between 1 July 2014 and 30 June 2015.

Species	ID correct	ID to correct species group*	ID as seabird large or albatross*	ID as petrel unidentified*	ID wrong	ID not on label or code didn't exist	Total
Black petrel		1					1
Black-bellied storm petrel		1					1
Buller's albatross	24	2				1	27
Campbell albatross		1					1
Cape petrel	1	1					2
Common diving petrel					1		1
Fairy prion		1					1
Flesh-footed shearwater	6						6
Gibson's albatross		1					1
Grey-faced petrel	1				1		2
Grey petrel	9						9
Grey-backed storm petrel		2					2
NZ white-capped albatross	35	3			1	2	41
Pacific albatross		1					1
Salvin's albatross	30		1		2		33
Sooty shearwater	60	2		2	2		66
Southern royal albatross		1					1
Westland petrel	4	2					6
White-chinned petrel	135	2		1	8	3	149
White-faced storm petrel		1					1
Total	305	22	1	3	15	6	352
% total	86.6	6.3	0.3	0.9	4.3	1.7	

* Identified to correct group or size class, but given the wrong species code.

Twenty-two (6.3%) were identified to the correct group or size class, but were given the wrong species code (although this may relate to changes in the coding system), which included black petrel, black-bellied

storm petrel, Buller's albatross, Campbell albatross, cape petrel, fairy prion, Gibson's albatross, grey-backed storm petrel, NZ white-capped albatross, Pacific albatross, sooty shearwater, southern royal albatross, Westland petrel, white-chinned petrel and white-faced storm petrel. A further 15 (4.3%) were identified incorrectly including the following species: common diving petrel, grey-faced petrel, NZ white-capped albatross, Salvin's albatross, sooty shearwater and white-chinned petrel. Six birds (1.7%) did not have an observer identification code on the return label or had a code that did not exist (Table 9).

3.2 Photographs

In total, 433 birds were either photographed, photographed and reported in the MPI COD extract as captured (both live and dead seabirds) or were recorded in the MPI COD interacting with fishing vessels (this number may include some non-capture interactions) but not photographed between 1 July 2014 and 30 June 2015; nearly all of these represented live bird interactions (n = 414, 95.6%) (Table 10).

There were 399 observed seabird captures for which no photographs had been taken (a mixture of birds that were either released alive or discarded dead by the crew) and 10 photographed birds with no corresponding information in the MPI COD extract (Table 10). Only 24 seabird interactions had both photographs and corresponding entries in the MPI COD extract.

Examination of the 24 photographed seabird interactions confirmed that observers had accurately identified 79.2% (n = 19) of seabirds (Table 11). It should be noted that the majority of specimens were diving petrels, fairy prions, NZ white-capped albatross and white-chinned petrels which are relatively simple to identify. The Buller's shearwater, one of the fairy prions and one of the white-faced storm petrels were incorrectly identified (Table 11). One new species of seabird was observed interacting with a fishing vessel; a Cook's petrel hit the deck and was released alive by the observer once it recovered.

It should be noted that although the photographs have been received for entire reporting period, there were 20 sets of photographs missing (i.e. recorded as photographed by Observers in the MPI COD extract, but not been delivered to date). Further updates for this reporting year will be updated as additional photographs or updated MPI COD extracts are received.

The 433 seabirds that were either photographed or recorded as an interaction were from 46 different vessels; one on set net (0.2%), 21 on longline (4.8%) and 411 on trawl (94.9%). Of the 19 dead seabirds, ten were drowned in the trawl nets, three were drowned on longline hooks, one was tangled in a tori line and five were killed by warp strike.

3.2.1 Quality and number of photographs

The quality of the images obtained by observers continued to vary widely, particularly for live birds (Fig 3). Issues included only one photograph for some seabirds, not all key features were photographed, poor focus, and under- or over-exposure. Poor images were particularly common for birds that were alive and seen on-board for short periods (particularly when photographs were taken from a long distance).

Figure 3 Range of images received from Government observers for seabird interactions recorded between 1 July 2014 and 30 June 2015.



Table 10 Number of seabirds of each species reported as captured or photographed as interacting with fishing vessels between 1 July 2014 and 30 June 2015.

Species	Photographed & listed in COD extract	Photographed, but not listed in COD extract	Not photographed, but listed in COD extract	Total
Albatross (unidentified)	0	0	6	6
Black petrel	1	0	3	4
Black-browed albatross (unidentified)	0	0	1	1
Buller's albatross	0	0	8	8
Buller's and Pacific albatross (unidentified)	0	0	3	3
Buller's shearwater	1	0	2	3
Cape petrels	0	0	4	4
Chatham Island albatross	0	0	1	1
Common diving petrel	3	0	11	14
Cook's petrel	1	0	0	1
Fairy prion	3	3	13	19
Flesh-footed shearwater	0	1	6	7
Fluttering shearwater	0	0	1	1
Giant petrel (unidentified)	0	0	8	8
Great albatross (unidentified)	0	0	1	1
Great-winged petrel	0	1	0	1
Grey petrel	1	0	5	6
Grey-backed storm petrel	1	0	0	1
Mid-sized petrel/shearwater (unidentified)	0	0	7	7
New Zealand white-capped albatross	4	2	38	44
Northern giant petrel	0	0	2	2
Petrel (unidentified)	0	0	46	46
Petrels/prion/shearwaters (unidentified)	0	0	2	2
Prion (unidentified)	0	0	13	13
Procellaria petrel (unidentified)	0	0	6	6
Salvin's albatross	1	0	17	18
Seabird (small)	0	0	1	1
Shearwater (unidentified)	0	0	5	5
Shy albatross	0	0	1	1
Small albatross (unidentified)	0	0	6	6
Snares cape petrel	0	0	1	1
Sooty shearwater	2	0	54	56
Storm petrel (unidentified)	0	0	4	4
Wandering albatross (unidentified)	0	0	3	3
Westland petrel	0	0	5	5
White-chinned petrel	4	1	112	117
White-faced storm petrel	2	2	1	5
Total	24	10	399	433
Dead	1	2	16	19
Alive	23	8	383	414

Table 11 Comparison of 24 observer identifications with expert identifications for observed and photographed captures listed in COD from fishing vessels between 1 July 2014 and 30 June 2015, by species. 'Confirmed' = photograph identification confirmed the observer identification; 'new, consistent' = photograph identification was to a lower taxonomic group, but consistent with the observer identification; and 'new, not consistent' = photograph identification was not consistent with the observer identification.

Species	Confirmed	New, consistent	New, not consistent	Total
Black petrel	1	0	0	1
Buller's shearwater	0	0	1	1
Common diving petrel	3	0	0	3
Cook's petrel	0	1	0	1
Fairy prion	2	0	1	3
Grey petrel	1	0	0	1
Grey-backed storm petrel	1	0	0	1
NZ white-capped albatross	4	0	0	4
Salvin's albatross	1	0	0	1
Sooty shearwater	2	0	0	2
White-chinned petrel	3	1	0	4
White-faced storm petrel	1	0	1	2
Total	19	2	3	24
Live	18	2	3	23
Dead	1	0	0	1

3.2.1 Recommendations for photograph identification

It is recommended that:

1. Wherever possible, all seabird interactions are photographed and recorded. If possible, haul and sample information should be included in the image.
2. Images (with scale if possible) include the head and bill from the side and above, body (full body and side shots), wings (above and below) and shots of the feet whenever possible. This is particularly important for dead birds.
3. Photo logs are completed for all images (which can be correlated to date and time stamps from the camera). Descriptions of the interaction would also help with the identification and matching of images.
4. Photograph numbers are recorded on the observer non-fish bycatch form.
5. Photographs (and extracts from the MPI observer log books) are provided regularly throughout the fishing year for photo-identification.
6. Training and instruction on the use of the cameras and on how to take suitable photographs for identification use is provided (i.e. number of images, type of images, date and time stamps etc.) is provided for all observers.

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