



# INT 2013-02 IDENTIFICATION OF SEABIRDS CAPTURED IN NEW ZEALAND FISHERIES: 1 JULY 2016 TO 30 June 2017



# **INT2016-02 Identification of seabirds captured in New Zealand fisheries: 1 July 2016 to 30 June 2017**

Elizabeth Bell and Mike Bell

Wildlife Management International Ltd  
PO Box 607  
Blenheim 7240  
New Zealand  
[www.wmil.co.nz](http://www.wmil.co.nz)  
[biz@wmil.co.nz](mailto:biz@wmil.co.nz)

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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 2016 and 30 June 2017, a total of 193 seabirds comprising 19 taxa were incidentally killed as bycatch and returned for autopsy by on-board New Zealand Government observers. Birds were returned from 14 longline (n = 65 birds), 28 trawl (n = 115 birds) and 4 set net (n = 13 birds) vessels and were dominated numerically by five species (Salvin's albatross *Thalassarche salvini*, Buller's albatross *Thalassarche bulleri bulleri*, sooty shearwater *Puffinus griseus*, New Zealand white-capped albatross *Thalassarche steadi* and white-chinned petrel *Procellaria aequinoctialis*). All birds returned from longline fisheries had injuries consistent with being hooked or entangled in the bill, throat or wing. In contrast, most birds (79.4%) returned from trawl fisheries were killed through entanglement in the net, cod-end or pound, with 10.7% likely to have been killed by warp interaction or entanglement. Four birds were killed by striking the deck of the vessel. Birds had a higher mean fat scores as in the last 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 for Primary Industries Central Observer Database and images provided by Government observers gave a total of a further 762 seabirds that were reported as interactions or photographed (as dead or alive captures) with 60 fishing vessels (and may include some non-capture interactions). Over two-thirds (69.9%) of the seabirds reported in these interactions or photographed birds were released alive. Out of these 762 records of seabird interactions, photographs were taken of 252 seabirds consisting of 18 taxa. Image quality varied widely, with poor images being particularly common for birds that were alive and seen on-board for short periods. Images for dead birds have improved with a number of images taken for each specimen. 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 INT2016-02.

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 2016 and 30 June 2017. Identifications were based on dead birds caught and returned and/or photographs or videos 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 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, 2015, Bell & Bell 2016). 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, photographed or reported as an interaction from New Zealand fisheries between 1 July 2016 and 30 June 2017.

COMMON NAME	SCIENTIFIC NAME	AUTOPSY	PHOTO (P) OR EXTRACT REPORT (E)
Albatross (unidentified)			E
Black (Parkinson's) petrel	<i>Procellaria parkinsoni</i>	✓	P & E
Black-backed gull	<i>Larus dominicanus</i>		E
Black-bellied storm petrel	<i>Fregetta tropica</i>		P
Buller's albatross	<i>Thalassarche bulleri bulleri</i>	✓	P & E
Buller's or Pacific albatross (unidentified)	<i>Thalassarche spp.</i>		E
Buller's shearwater	<i>Puffinus bulleri</i>		E
Campbell albatross	<i>Thalassarche impavida</i>	✓	
Cape petrel	<i>Daption capense</i>	✓	
Cape petrels (unidentified)	<i>Daption spp.</i>		E
Common diving petrel	<i>Pelecanoides urinatrix</i>	✓	P & E
Cook's petrel	<i>Pterodroma cookii</i>		P
Fairy prion	<i>Pachyptila turtur</i>		P & E
Fiordland crested penguin	<i>Eudyptes pachyrhynchus</i>	✓	
Flesh-footed shearwater	<i>Puffinus carneipes</i>	✓	E
Giant petrel (unidentified)	<i>Macronectes spp.</i>		E
Gibson's albatross	<i>Diomedea antipodensis gibsoni</i>	✓	P & E
Great-winged (grey-faced) petrel	<i>Pterodroma macroptera</i>		P & E
Grey petrel	<i>Procellaria cinerea</i>	✓	P & E
Grey-backed storm petrel	<i>Garrodia nereis</i>	✓	P
Little blue penguin	<i>Eudyptula minor</i>	✓	
Mottled petrel	<i>Pterodroma inexpectata</i>		P & E
New Zealand white-capped albatross	<i>Thalassarche steadi</i>	✓	P & E
Petrel (unidentified)			P & E
Petrels, prion and shearwaters (unidentified)			E
Prion (unidentified)	<i>Pachyptila spp.</i>		E
Procellaria petrel (unidentified)	<i>Procellaria spp.</i>		E

COMMON NAME	SCIENTIFIC NAME	AUTOPSY	PHOTO (P) OR EXTRACT REPORT (E)
Red-billed gull	<i>Larus scopulinus</i>		P
Royal albatross (unidentified)	<i>Diomedea</i> spp.		E
Salvin's albatross	<i>Thalassarche salvini</i>	✓	P & E
Shearwater (unidentified)			E
Shy albatross	<i>Thalassarche cauta</i>		E
Small albatross (unidentified)	<i>Thalassarche</i> spp.		E
Sooty shearwater	<i>Puffinus griseus</i>	✓	P & E
Southern black-browed albatross	<i>Thalassarche melanophris</i>	✓	
Southern giant petrel	<i>Macronectes giganteus</i>		E
Southern royal albatross	<i>Diomedea epomophora</i>	✓	P
Stewart Island shag	<i>Phalacrocorax chalconotus</i>	✓	
Storm petrel (unidentified)			E
Westland petrel	<i>Procellaria westlandica</i>	✓	E
White-chinned petrel	<i>Procellaria aequinoctialis</i>	✓	P & E
White-faced storm petrel	<i>Pelagodroma marina</i>		P & E
White-fronted tern	<i>Sterna striata</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, Conservation Services Programme, DOC (email: [csp@doc.govt.nz](mailto: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 for 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.

Each bird or interaction was separated as follows:

- *Photo (Photo and Extract)*: seabird photographed by observer, image provided, and interaction recorded in MPI COD
- *Photo (Image not received to date)*: seabird apparently photographed by observer but not received to date and interaction recorded in MPI COD
- *Photo (Not in extract to date)*: image of seabird received but interaction not listed in MPI COD to date
- *Interaction*: seabird interaction with vessel (i.e. live or dead capture, warp or deck strike, etc.) listed in MPI COD, but no image taken by observer

Photographs were provided in electronic format with associated observer MPI COD 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 193 seabirds comprising 19 taxa were returned from 46 vessels between 1 July 2016 and 30 June 2017 (Table 2, Figure 1).

Seabirds returned were dominated by five species: Salvin's albatross (n = 14, 7.3%), Buller's albatross (n = 18, 9.3%), sooty shearwater (n = 18, 9.3%), New Zealand white-capped albatross (n = 44, 22.8%), and white-chinned petrel (n = 57, 29.5%) (Table 2). These five species accounted for 78.2% of all returns.

Of the remaining 14 taxa, six had only single captures, four had two captures, one had three captures (southern royal albatross), two had eight captures (little blue penguin and Westland petrels) and one had nine captures (black petrel) (Table 2).

There were three banded birds within those captured and returned between 1 July 2016 and 30 June 2017. One female black petrel had a uniquely numbered metal band (H-34856) and had been banded as an adult on Great Barrier Island/Aotea on 16 February 2005 (making this bird at least 17 years old when caught and killed). One male Buller's albatross had a uniquely numbered metal band (M-17328) and had been banded as a chick on North East Island at The Snares on 1 July 1972 (making this bird 45 years old when caught and killed). One male Campbell albatross had a uniquely numbered metal band (M-49034) and had been banded as a chick on Bull Rock at Campbell Island on 23 March 1992 (making this bird 25 years old when caught and killed). 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 2017 (n = 49, 25.4%), February 2017 (n = 36, 18.7%) or April 2017 (n = 25, 13.0%) (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 2016 and 30 June 2017, by month of capture.

SPECIES	MONTH												TOTAL	% TOTAL
	J	F	M	A	M	J	J	A	S	O	N	D		
Black (Parkinson's) petrel	1	2	4									2	9	4.7%
Buller's albatross	1		2	3	7	4						1	18	9.3%
Campbell albatross								1	1				2	1.0%
Cape petrel								1					1	0.5%
Common diving petrel		1											1	0.5%
Fiordland crested penguin									2				2	1.0%
Flesh-footed shearwater		1									1		2	1.0%
Gibson's albatross					1								1	0.5%
Grey petrel								1	1				2	1.0%
Grey-backed storm petrel		1											1	0.5%
Little blue penguin									8				8	4.1%
New Zealand white-capped albatross	4	11	11	9	3	4	1			1			44	22.8%
Salvin's albatross	1	5	2						2	2	2		14	7.3%
Sooty shearwater	1	1	6	4	2					1	3		18	9.3%
Southern black-browed albatross							1						1	0.5%
Southern royal albatross				1	1				1				3	1.6%
Stewart Island shag												1	1	0.5%
Westland petrel				3	2	2					1		8	4.1%
White-chinned petrel	2	14	24	5						7	4	1	57	29.5%
<b>TOTAL</b>	<b>10</b>	<b>36</b>	<b>49</b>	<b>25</b>	<b>16</b>	<b>10</b>	<b>2</b>	<b>3</b>	<b>15</b>	<b>11</b>	<b>11</b>	<b>5</b>	<b>193</b>	
<b>% TOTAL</b>	<b>5.2%</b>	<b>18.7%</b>	<b>25.4%</b>	<b>13.0%</b>	<b>8.3%</b>	<b>5.2%</b>	<b>1.0%</b>	<b>1.6%</b>	<b>7.8%</b>	<b>5.7%</b>	<b>5.7%</b>	<b>2.6%</b>		

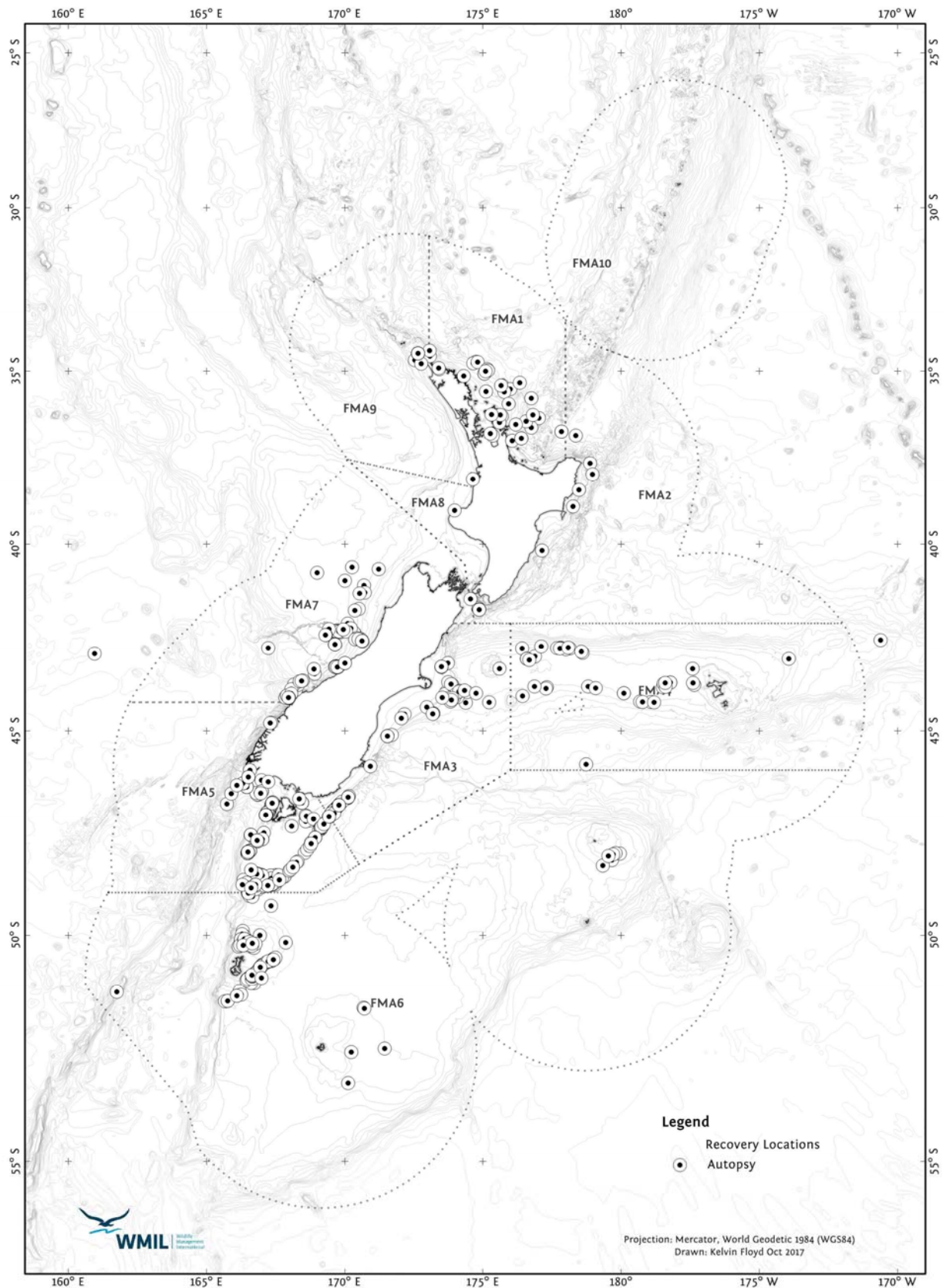


**Table 3** Species and numbers of seabirds killed and returned from observed fishing vessels between 1 July 2016 and 30 June 2017, by sex (M = male, F = female, U = unknown) and age (A = adult, BA = breeding adult, N = non-breeding adult, SA = sub-adult, I = immature and J = juvenile, U = unknown).

SPECIES	SEX			AGE							TOTAL	% TOTAL
	M	F	U	A	BA	N	SA	I	J	U		
Black (Parkinson's) petrel	6	3		9	8						9	4.7%
Buller's albatross	13	5		18	6						18	9.3%
Campbell albatross	2			2	2						2	1.0%
Cape petrel		1		1	1						1	0.5%
Common diving petrel		1		1		1					1	0.5%
Fiordland crested penguin	1	1		2	2						2	1.0%
Flesh-footed shearwater	1	1		2	1						2	1.0%
Gibson's albatross	1			1							1	0.5%
Grey petrel	2			2	1						2	1.0%
Grey-backed storm petrel	1			1							1	0.5%
Little blue penguin	3	5		8	1						8	4.1%
New Zealand white-capped albatross	24	15	5	41	14		2	1			44	22.8%
Salvin's albatross	12	2		12	6		2				14	7.3%
Sooty shearwater	15	2	1	17	7					1	18	9.3%
Southern black-browed albatross		1					1				1	0.5%
Southern royal albatross	1	2		3							3	1.6%
Stewart Island shag		1		1							1	0.5%
Westland petrel	6	2		8		2					8	4.1%
White-chinned petrel	42	15		55	25		2				57	29.5%
<b>TOTAL</b>	<b>130</b>	<b>57</b>	<b>6</b>	<b>184</b>	<b>74</b>	<b>3</b>	<b>7</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>193</b>	
<b>% TOTAL</b>	<b>67.4%</b>	<b>29.5%</b>	<b>3.1%</b>	<b>95.3%</b>	<b>38.3%</b>	<b>1.6%</b>	<b>3.6%</b>	<b>0.5%</b>	<b>0</b>	<b>0.5%</b>		

**Figure 1** Catch locations of all seabirds killed and returned in New Zealand fisheries for necropsy between 1 July 2016 and 30 June 2017.

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 = 130, 67.4%, Table 3). Campbell albatross, Gibson's albatross, grey petrel and grey-back storm petrel only returned males. However, cape petrel, common diving petrel, little blue penguin, southern black-browed albatross, southern royal albatross and Stewart island shag had either more female or only female returns. Most birds were adults (n = 184, 95.3%, Table 3). Of these adults, 74 (38.3%) were breeding and 3 (1.6%) were non-breeding (Table 3). Eleven birds (5.7%) were pre-breeders (i.e. either sub-adult, immature or juvenile birds, Table 3).

### 3.1.2 Target vessel and fishery of necropsy seabirds

The seabirds killed and returned were caught in a range of Fishing Management Areas (FMA 1, 2, 3, 4, 5, 6, 7, 8 and 9) and general positions are show in Figure 1.

For the fishing period 1 July 2016 to 30 June 2017, there were 294 observed trips on 125 vessels (Katie Clemens-Seely, CSP DOC, pers. comm.). Forty-six vessels (36.8%) returned birds during this period. Over half of these 46 vessels returned relatively low numbers of birds (< 5 birds caught and returned; n = 28, 60.9%) (Figure 2). Five vessels caught 10 or more birds with one longline vessel catching and returning 14 birds on one observed trip and one set-net vessel catching and returning 10 birds from one observed trip as shown in Figure 2.

Seventy-nine vessels did not return any birds from 122 observed trips during this fishing year. On average, there were 4.2 birds ( $\pm 0.5$ ) caught and returned from 3.7 trips ( $\pm 0.5$ ) per vessel.

Of the 46 vessels that caught and returned seabirds, 14 were either bottom or surface long-liners (30.4%), four were set-netters (8.7%) and the remaining 28 vessels were trawlers (60.9%) (Table 4).

Bottom and surface longline fisheries returned a total of 65 birds (33.7% of total returns), with vessels targeting tuna (*Thunnus* spp.) accounting for 47.7% of longline specimens (n = 31) and those targeting snapper *Centroberyx affinis* accounting for 4.6% of longline specimens (n = 3) and the remainder targeting 'other' species (mainly ling *Genypterus blacodes*) accounted for 47.7% of longline specimens (n = 31) (Table 4).

Bottom and midwater trawl fisheries combined returned 115 birds (59.6% of total returns), with trawlers targeting squid (*Nototodarus* spp.) accounting for 47.8% (n = 55) of all trawl returns, trawlers targeting hoki (*Macruronus novaezelandiae*) accounting for 15.7% (n = 18), trawlers targeting ling accounting for 2.6% (n = 3), trawlers targeting scampi (*Metanephrops challengeri*) accounting for 5.2% (n = 6) and trawlers targeting 'other' species accounting for 28.7% (n = 33) (Table 4). The 'other' species included barracouta (*Thyrsites atun*), orange roughy (*Hoplostethus atlanticus*), jack mackerel (*Trachurus* spp.), silver warehou (*Seriolella punctata*) and southern blue whiting (*Micromesistius australis*).

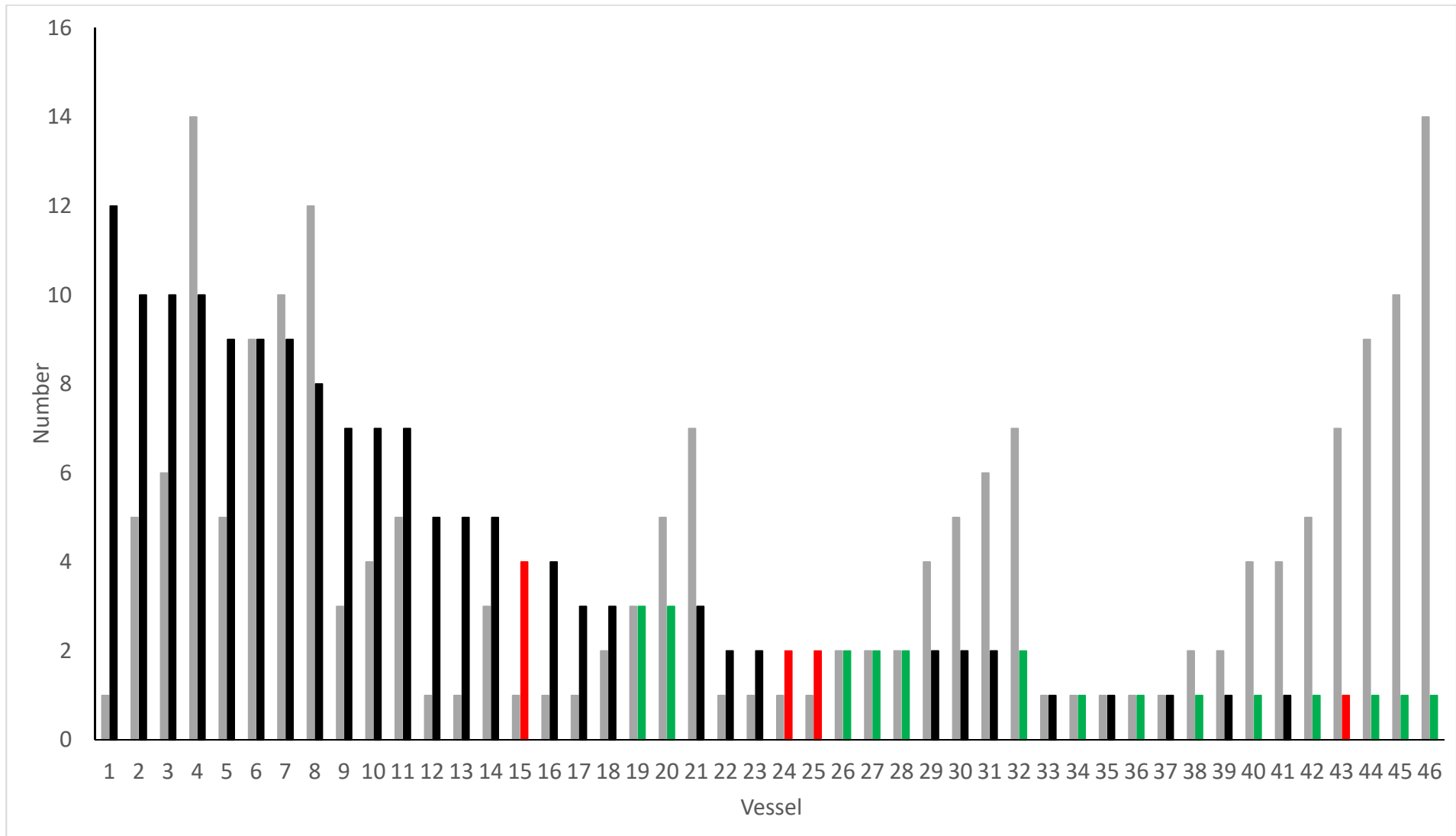
Thirteen seabirds were caught and killed on set net vessels (6.7% of total returns), with vessels targeting school sharks (*Galeorhinus galeus*) accounting for 7.7% of all set-net returns (n = 1), those targeting spiny dogfish (*Squalus acanthias*) accounting for 7.7% of all set-net returns (n = 1) and those targeting butterfish (*Odax pullus*) accounting for 84.6% of all set-net returns (n = 11) (Table 4).

### 3.1.3 Injuries and likely cause of death of necropsy seabirds

The condition of the returned birds ranged from 'no obvious injury', 'waterlogged', 'greased' or 'hook present' to 'crushed'.

**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 2016 and 30 June 2017.

Where ● is the number of observed trips by a trawl vessel, ● is the number of observed trips by a longline vessel and ● is the number of observed trips by a set net vessel and ● is the total number of seabirds caught and returned by that vessel in all observed trips combined.



**Table 4** Number of seabirds of each species killed and returned from observed fishing vessels between 1 July 2016 and 30 June 2017, by fisheries type.

Species	Trawl (Bottom/Midwater)					Longline (Surface/Bottom)			Setnet	Total
	Scampi	Squid	Hoki	Ling	Other	Tuna	Snapper	Other		
Black (Parkinson's) petrel					3	5	1			9
Buller's albatross		3	2		5	8				18
Campbell albatross			1		1					2
Cape petrel					1					1
Common diving petrel		1								1
Fiordland crested penguin									2	2
Flesh-footed shearwater							1		1	2
Gibson's albatross						1				1
Grey petrel					2					2
Grey-backed storm petrel					1					1
Little blue penguin									8	8
New Zealand white-capped albatross	1	22	3		6	10		2		44
Salvin's albatross	5		3	1	4			1		14
Sooty shearwater		7	2	1	6		1		1	18
Southern black-browed albatross								1		1
Southern royal albatross		1	1			1				3
Stewart Island shag									1	1
Westland petrel			1			6		1		8
White-chinned petrel		21	5	1	4			26		57
TOTAL	6	55	18	3	33	31	3	31	13	193
	5.2%	47.8%	15.7%	2.6%	28.7%	47.7%	4.6%	47.7%		
	115					65				
% TOTAL	59.6%					33.7%			6.7%	

**Table 5** Number of seabirds of each species killed and returned from longline and trawl fisheries between 1 July 2016 and 30 June 2017, 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	Tangled	Warp	Net	Pound or Cod-end	Other			
<b>Black (Parkinson's) petrel</b>	1				4		2		2			<b>9</b>
<b>Buller's albatross</b>	4			2	1	2	5	2				<b>18</b>
<b>Campbell albatross</b>						1	1					<b>2</b>
<b>Cape petrel</b>									1			<b>1</b>
<b>Common diving petrel</b>											1	<b>1</b>
<b>Fiordland crested penguin</b>										2		<b>2</b>
<b>Flesh-footed shearwater</b>		1								1		<b>2</b>
<b>Gibson's albatross</b>				1								<b>1</b>
<b>Grey petrel</b>							1		1			<b>2</b>
<b>Grey-backed storm petrel</b>							1					<b>1</b>
<b>Little blue penguin</b>										8		<b>8</b>
<b>New Zealand white-capped albatross</b>	3	2		7		9	15	5	2		1	<b>44</b>
<b>Salvin's albatross</b>	1						10	2	1			<b>14</b>
<b>Sooty shearwater</b>				1			11	4	1	1		<b>18</b>
<b>Southern black-browed albatross</b>		1										<b>1</b>
<b>Southern royal albatross</b>					1				1		1	<b>3</b>
<b>Stewart Island shag</b>										1		<b>1</b>
<b>Westland petrel</b>	2			4			1		1			<b>8</b>
<b>White-chinned petrel</b>	14	4		8			21	8	1		1	<b>57</b>
<b>Total</b>	<b>25</b>	<b>8</b>	<b>0</b>	<b>23</b>	<b>6</b>	<b>12</b>	<b>68</b>	<b>21</b>	<b>11</b>	<b>13</b>	<b>4</b>	<b>193</b>
<b>Total (each type)</b>	<b>64</b>					<b>112</b>				<b>13</b>	<b>4</b>	
% of total longline or trawl	39.6%	12.5%	0	35.9%	9.4%	10.7%	60.7%	18.75%	9.8%			
Albatrosses (%)	32.0%	37.5%	0	43.5%	33.3%	100%	45.6%	42.9%	63.6%	0	50.0%	
Non-albatross (%)	68.0%	62.5%	0	56.5%	66.7%	0	54.4%	57.1%	36.4%	100%	50.0%	

**Table 6** Types of injuries recorded on seabirds of each species killed and returned from longline and trawl fisheries between 1 July 2016 and 30 June 2017. The proportion of albatross and non-albatross taxa returned is also presented.

Note: Birds can have multiple injuries resulting in higher figures than the total number of seabirds killed and returned ( $n = 193$ ).

	No visible injuries	Waterlogged	Broken wing	Broken neck	Broken legs or feet	Broken bill	Hook in bill or throat (including swallowed hook)	Hook in wing	Hook in leg or feet	Open wound	Crushed or more than 3 injuries	Greased	Liced
Black (Parkinson's) petrel	5	4	1				1			1			
Buller's albatross	7	3	3		1	1	4			6	2	3	
Campbell albatross	1	2	1		1						1	1	
Cape petrel		1								1			
Common diving petrel	1											1	
Fiordland crested penguin	1	1											
Flesh-footed shearwater		1	1		1			1					
Gibson's albatross						1				1			
Grey petrel										1	1	1	
Grey-backed storm petrel						1							
Little blue penguin	3		5		1	1				1			
New Zealand white-capped albatross	10	4	15	1	4	2	3	2		12	5	9	3
Salvin's albatross	2	5	4	1	2		1			3		2	
Sooty shearwater	8	8	1		3	2					1	1	
Southern black-browed albatross		1						1					
Southern royal albatross			1	1									
Stewart Island shag		1		1									
Westland petrel	6	1				1	2			1			
White-chinned petrel	26	19	2		7	4	14	4		3	1	2	
<b>Total</b>	<b>70</b>	<b>51</b>	<b>34</b>	<b>4</b>	<b>20</b>	<b>13</b>	<b>25</b>	<b>8</b>	<b>0</b>	<b>30</b>	<b>11</b>	<b>20</b>	<b>3</b>
<b>% Total</b>	<b>36.3%</b>	<b>26.4%</b>	<b>17.6%</b>	<b>2.1%</b>	<b>10.4%</b>	<b>6.7%</b>	<b>12.9%</b>	<b>4.1%</b>	<b>0</b>	<b>15.5%</b>	<b>5.7%</b>	<b>10.4%</b>	<b>1.5%</b>
Albatrosses (%)	28.6%	29.4%	67.6%	75.0%	40.0%	23.1%	32.0%	37.5%	0	73.3%	72.7%	75.0%	100%
Non-albatross (%)	71.4%	70.6%	32.4%	25.0%	60.0%	76.9%	68.0%	62.5%	0	26.7%	27.3%	25.0%	0



As in previous years (Robertson et al. 2004; Conservations Services Programme 2008; Thompson 2010 a, b; Bell 2011, 2012, 2013; Bell & Mischler 2014, 2015, Bell & Bell 2016), birds caught and returned from trawl fisheries had different injuries from those caught by longline vessels.

Of the 65 birds caught and returned from longline vessels, most were waterlogged and had hook injuries (Tables 5 and 6). Of these, 33 (50.8%) still had hooks still present (25 in the bill, throat or neck and 8 in the wing) (Tables 5 and 6).

Of the 115 birds caught and returned from trawl vessels, most had been caught in the nets or recovered in the pound or cod ends (i.e. had drowned, n = 100, 87.0%) and were very wet and sandy with crush injuries (broken wings, broken chest, crushed organs etc.) (Tables 5 and 6). Other birds had injuries suggesting entanglement and crush injuries from the trawl warp and blocks (n = 31, 27.0%), 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 (54.4%) while only albatross taxa were affected by warp strikes (100%) exhibiting serious wing injuries or lacerations (Tables 5 and 6).

There were 4 seabirds returned that had been killed by impacting the vessel (1.9%) (Tables 5 and 6). Three of these were reported from trawl vessels and one from a longline vessel.

### 3.1.4 Body condition of necropsy seabirds

Between 1 July 2016 and 30 June 2017, 80.3% of returned birds had fat scores of less than 3, 9.3% of birds had fat scores of 3 and only 6.2% of birds had fat scores over 3 (Table 7).

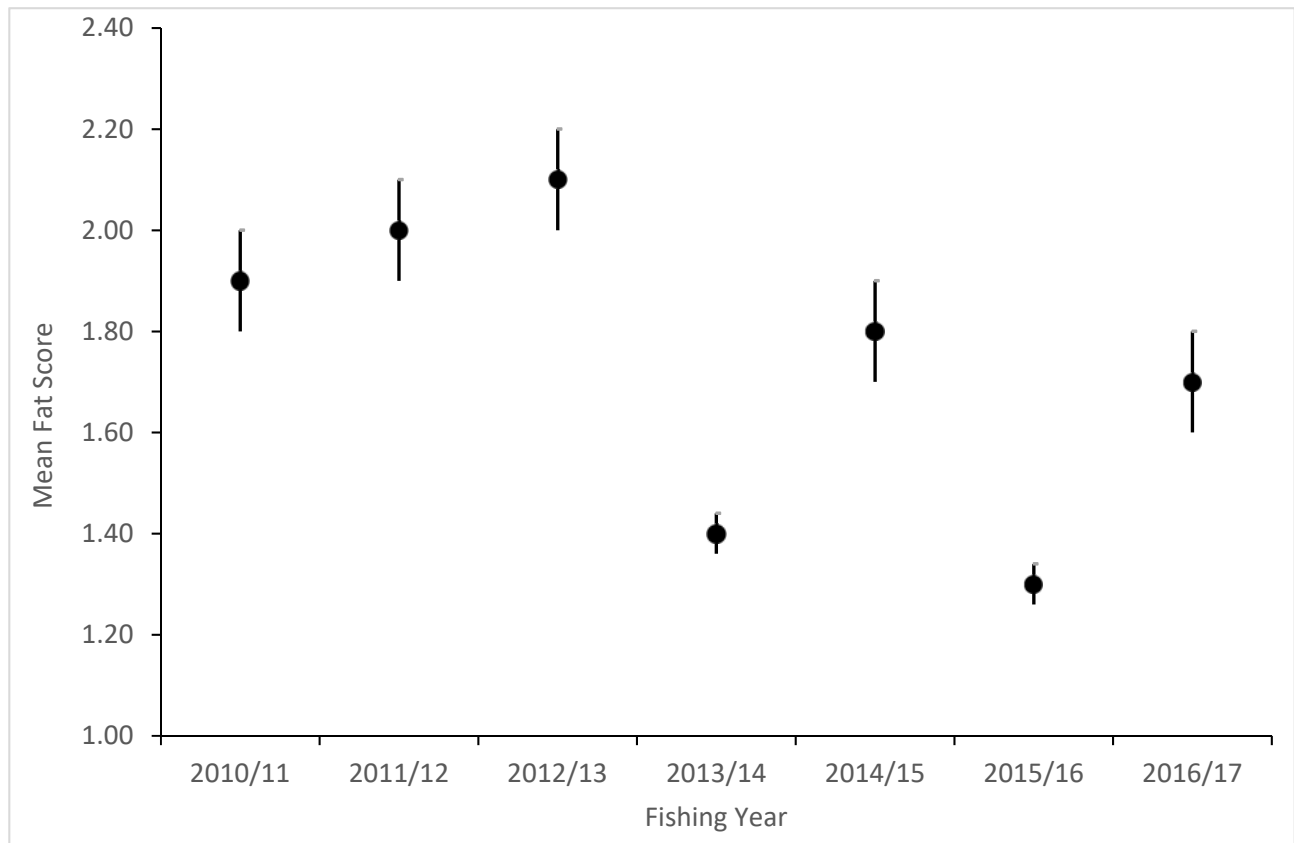
**Table 7** Fat scores of seabirds killed and returned from fishing vessels between 1 July 2016 and 30 June 2017 (1= no fat, to 5 = extremely fat; U = unknown).

SPECIES	FAT SCORE						TOTAL	MEAN (±SE)
	1	2	3	4	5	U		
Black (Parkinson's) petrel	6	3					9	1.3 ± 0.2
Buller's albatross	12	3	2	1			18	1.6 ± 0.2
Campbell albatross			1	1			2	3.5 ± 0.5
Cape petrel		1					1	2.0 ± 0.0
Common diving petrel		1					1	2.0 ± 0.0
Fiordland crested penguin		1			1		2	3.5 ± 1.5
Flesh-footed shearwater	1	1					2	1.5 ± 0.5
Gibson's albatross		1					1	2.0 ± 0.0
Grey petrel	1	1					2	1.5 ± 0.5
Grey-backed storm petrel	1						1	1.0 ± 0.0
Little blue penguin	1	5	1	1			8	2.3 ± 0.3
New Zealand white-capped albatross	23	10	3	2		6	44	1.6 ± 0.1
Salvin's albatross	9	2	3				14	1.6 ± 0.2
Sooty shearwater	10	5	1	2			18	1.8 ± 0.3
Southern black-browed albatross	1						1	1.0 ± 0.0
Southern royal albatross	3						3	1.0 ± 0.0
Stewart Island shag	1						1	1.0 ± 0.0
Westland petrel	2	2	1	3			8	2.6 ± 0.5
White-chinned petrel	25	24	6	1		1	57	1.7 ± 0.1
<b>TOTAL</b>	<b>96</b>	<b>60</b>	<b>18</b>	<b>11</b>	<b>1</b>	<b>7</b>	<b>193</b>	<b>1.7 ± 0.1</b>
<b>% TOTAL</b>	<b>49.7%</b>	<b>31.1%</b>	<b>9.3%</b>	<b>5.7%</b>	<b>0.5%</b>	<b>3.6%</b>		

This suggests that the mean fat scores of returned birds between 1 July 2016 and 30 June 2017 (mean (± SE) = 1.7 ± 0.1) was higher than the last fishing year (2015/16 = 1.3 ± 0.04), but lower than

the 2014/15 fishing year ( $1.8 \pm 0.1$ ) (Bell 2013; Bell & Mischler 2014, 2015, Bell & Bell 2016). The mean fat score has fluctuated over the past seven years, mean fat scores steadily increased until 2012/13 and then have alternated between low and higher mean fat scores over the past four fishing years (Bell 2013; Bell & Mischler 2014, 2015, Bell & Bell 2016; Figure 3). Only 7 birds (3.6%) could not have their fat scores confirmed due to damage (Table 7).

**Figure 3** The mean fat scores for all seabirds killed and returned in New Zealand fisheries, per fishing year, between 1 October 2010 and 30 June 2017.



### 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, 2015, Bell & Bell 2016).

In total, 70 birds (36.3%) had offal or discards in their stomachs and 25 birds (13.0%) had bait in their stomach (Table 8). In addition, 74 birds (38.3%) had empty stomachs. A further 2 birds (1.0%) had missing stomachs due to interaction with fishing gear or damage due to sea lice. One Buller's albatross had worms in its stomach and one southern royal albatross had plastic twine in its stomach (listed as 'Other' in Table 8).

Most of the gizzard contents were natural food items (squid beaks 54.4%, fish bones 13.5%, squid or fish eyeballs 11.9% and otoliths 19.7%), but 7.3% of the birds returned had also ingested plastic or string and 0.5% had ingested stones or seeds (Table 9).

In addition, 45 birds (23.3%) had empty stomachs and two birds (1.0%) 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.

**Table 8** Stomach contents of seabirds killed and returned from fishing vessels between 1 July 2016 and 30 June 2017.Note: Birds can have multiple items in the stomachs resulting in higher stomach content figures than the total number of seabirds killed and returned ( $n = 193$ ).

SPECIES	EMPTY	GONE <sup>1</sup>	BAIT <sup>2</sup>	OFFAL/DISCARDS <sup>3</sup>	NATURAL <sup>4</sup>	SLUDGE <sup>5</sup>	PROVENTRICULAR OIL	OTHER <sup>6</sup>
Black (Parkinson's) petrel	4			7				
Buller's albatross	8		3	3	3	2		1
Campbell albatross			1				1	
Cape petrel	1							
Common diving petrel	1							
Fiordland crested penguin						2		
Flesh-footed shearwater	2							
Gibson's albatross	1							
Grey petrel	1			2				
Grey-backed storm petrel	1							
Little blue penguin						8		
New Zealand white-capped albatross	10	2	4	31	2	11		
Salvin's albatross	4		5	7	4			
Sooty shearwater	8			3	1	6		
Southern black-browed albatross	1							
Southern royal albatross	2				1			1
Stewart Island shag					2			
Westland petrel	5		1	2	1			
White-chinned petrel	25		11	15	8	4		
<b>TOTAL</b>	<b>74</b>	<b>2</b>	<b>25</b>	<b>70</b>	<b>22</b>	<b>33</b>	<b>1</b>	<b>2</b>
<b>% TOTAL</b>	<b>38.3%</b>	<b>1.0%</b>	<b>13.0%</b>	<b>36.3%</b>	<b>11.4%</b>	<b>17.1%</b>	<b>0.5%</b>	<b>1.0%</b>

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

**Table 9** Gizzard contents of seabirds killed and returned from fishing vessels between 1 July 2016 and 30 June 2017.Note: Birds can have multiple items in the gizzard resulting in higher figures than the total number of seabirds killed and returned ( $n = 193$ ).

SPECIES	EMPTY	GONE	SQUID BEAKS	OTOLITHS	FISH OR SQUID EYEBALLS	FISH BONES OR SKIN	PLASTIC OR STRING	SEEDS, STONES OR SHELL	WORMS	KRILL, FEATHERS, BARNACLES OR SEAWEED
<b>Black (Parkinson's) petrel</b>	1		8	1	2	2				
<b>Buller's albatross</b>	6		7	3	2	2				1
<b>Campbell albatross</b>	1		1							
<b>Cape petrel</b>									1	
<b>Common diving petrel</b>	1									
<b>Fiordland crested penguin</b>	1									
<b>Flesh-footed shearwater</b>			1				2			1
<b>Gibson's albatross</b>			1		1					
<b>Grey petrel</b>			2	1					1	
<b>Grey-backed storm petrel</b>	1									
<b>Little blue penguin</b>	6									
<b>New Zealand white-capped albatross</b>	17	2	7	11	6	14	1			1
<b>Salvin's albatross</b>	3		5	3	3	5				
<b>Sooty shearwater</b>	4		8	5		3	7	1		
<b>Southern black-browed albatross</b>	1									
<b>Southern royal albatross</b>	1		2		2					
<b>Stewart Island shag</b>						1				
<b>Westland petrel</b>			8	2					1	
<b>White-chinned petrel</b>	2		55	12	7	4	4		5	
<b>TOTAL</b>	<b>45</b>	<b>2</b>	<b>105</b>	<b>38</b>	<b>23</b>	<b>31</b>	<b>14</b>	<b>1</b>	<b>8</b>	<b>3</b>
<b>% TOTAL</b>	<b>23.3%</b>	<b>1.0%</b>	<b>54.4%</b>	<b>19.7%</b>	<b>11.9%</b>	<b>16.1%</b>	<b>7.3%</b>	<b>0.5%</b>	<b>4.1%</b>	<b>1.6%</b>

### 3.1.6 Identification of necropsy birds

Autopsy confirmed that the majority (76.2%) of the seabirds returned between 1 July 2016 and 30 June 2017 were identified correctly by the observers (based on the information provided by observers on the specimen tags) (Table 10).

**Table 10** 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 2016 and 30 June 2017.

Species	ID correct	ID wrong	ID to correct species group*	ID as seabird large or albatross*	ID as petrel unidentified *	ID not on label or code didn't exist	Total
Black (Parkinson's) petrel	8					1	9
Buller's albatross	14	1	3				18
Campbell albatross			2				2
Cape petrel			1				1
Common diving petrel		1					1
Fiordland crested penguin	2						2
Flesh-footed shearwater	2						2
Gibson's albatross			1				1
Grey petrel	2						2
Grey-backed storm petrel			1				1
Little blue penguin	8						8
New Zealand white-capped albatross	33	7	1	1		2	44
Salvin's albatross	13	1					14
Sooty shearwater	14	2	2				18
Southern black-browed albatross			1				1
Southern royal albatross	1		2				3
Stewart Island shag			1				1
Westland petrel	6	1	1				8
White-chinned petrel	44	4	3		2	4	57
<b>Total</b>	<b>147</b>	<b>17</b>	<b>19</b>	<b>1</b>	<b>2</b>	<b>7</b>	<b>193</b>
<b>% Total</b>	<b>76.2%</b>	<b>8.8%</b>	<b>9.8%</b>	<b>0.5%</b>	<b>1.0%</b>	<b>3.6%</b>	

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

Nineteen (9.8%) 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). These included Buller's albatross, Campbell albatross, cape petrel, Gibson's albatross, grey-backed storm petrel, New Zealand white-capped albatross, sooty shearwater, southern black-browed albatross, southern royal albatross, Stewart Island shag, Westland petrel and white-chinned petrel. A further 17 (8.8%) were identified incorrectly including the following species: Buller's albatross, common diving petrel, New Zealand white-capped albatross, Salvin's albatross, sooty shearwater, Westland petrel and white-chinned petrel. Seven birds (3.6%) did not have an observer identification code on the return label or had a code that did not exist (Table 10).

## 3.2 Photographs and Interactions

### 3.2.1 Numbers of photographed seabirds or those listed as interactions

In total 762 birds were either photographed and reported in the MPI COD extract as captured (both live and dead seabirds), photographed but not reported in the MPI COD extract 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 2016 and 30 June 2017 (Table 11).

**Table 11** Number of seabirds of each species reported as photographed or interacting with fishing vessels between 1 July 2016 and 30 June 2017.

Species	Photograph	Interaction	Total
	In COD extract	In COD extract with no image	
Albatross (unidentified)		9	9
Black (Parkinson's) petrel	3	18	21
Black-backed gull		2	2
Black-bellied storm petrel	1		1
Buller's albatross	5	10	15
Buller's and Pacific albatross		2	2
Buller's shearwater	1	3	4
Cape petrels		2	2
Common diving petrel	2	276	278
Cook's petrel	1		1
Fairy prion	3	3	6
Flesh-footed shearwater		1	1
Giant petrel (unidentified)		1	1
Gibson's albatross	1	1	2
Great-winged (Grey-faced) petrel	1	1	2
Grey petrel	1	1	2
Grey-backed storm petrel	3		3
Mottled petrel	1	4	5
New Zealand white-capped albatross	36	32	68
Petrel (unidentified)		9	9
Petrels, prion and shearwaters (unidentified)		4	4
Prion (unidentified)		14	14
Procellaria petrel (unidentified)		5	5
Royal albatross (unidentified)		3	3
Salvin's albatross	6	9	15
Shearwater (unidentified)		6	6
Shy albatross		1	1
Small albatross (unidentified)		1	1
Sooty shearwater	105	22	127
Southern giant petrel		1	1
Southern royal albatross	1		1
Storm petrel (unidentified)		3	3
Westland petrel		6	6
White-chinned petrel	77	31	108
White-faced storm petrel	3	29	32
White-fronted tern	1		1
<b>Total</b>	<b>252</b>	<b>510</b>	<b>762</b>

**Table 12.** Number of photograph and interaction seabirds recorded from observed fishing vessels between 1 July 2016 and 30 June 2017, by month of capture.

SPECIES	MONTH												TOTAL	% TOTAL
	J	F	M	A	M	J	J	A	S	O	N	D		
Albatross (unidentified)			2		1	5					1		9	1.0%
Black (Parkinson's) petrel	8	10	1									2	21	2.8%
Black-backed gull											2		2	0.3%
Black-bellied storm petrel				1									1	0.1%
Buller's albatross		1		3	6	2	1	1	1				15	2.0%
Buller's and Pacific albatross						1				1			2	0.3%
Buller's shearwater	4												4	0.5%
Cape petrels		1				1							2	0.3%
Common diving petrel			8						256	14			278	36.5%
Cook's petrel	1												1	0.1%
Fairy prion			2			2		1			1		6	0.8%
Flesh-footed shearwater			1										1	0.1%
Giant petrel (unidentified)												1	1	0.1%
Gibson's albatross									2				2	0.3%
Great-winged (Grey-faced) petrel						1		1					2	0.3%
Grey petrel									2				2	0.3%
Grey-backed storm petrel				1			1						2	0.3%
Mottled petrel										4		1	5	0.7%
New Zealand white-capped albatross	5	14	21	12	7	1	4		2	1	1		68	9.1%
Petrel (unidentified)		1		7								1	9	1.2%
Petrels, prion and shearwaters (unidentified)		4											4	0.5%
Prion (unidentified)			1	1			1		10		1		14	1.8%
Procellaria petrel (unidentified)		2	2		1								5	0.7%
Royal albatross (unidentified)			1	1	1								3	0.4%
Salvin's albatross	3	2					1				5	4	15	2.0%
Shearwater (unidentified)			2	2				2					6	0.8%
Shy albatross						1							1	0.1%
Small albatross (unidentified)		1											1	0.1%
Sooty shearwater	3	2	12	104	2				1	3			127	16.7%



<b>Southern giant petrel</b>				1									<b>1</b>	<b>0.1%</b>
<b>Southern royal albatross</b>						1							<b>1</b>	<b>0.1%</b>
<b>Storm petrel (unidentified)</b>		1				1						1	<b>3</b>	<b>0.4%</b>
<b>Westland petrel</b>		2	1	1	2								<b>6</b>	<b>0.8%</b>
<b>White-chinned petrel</b>	10	30	21	30	5	1				8	2	1	<b>108</b>	<b>14.2%</b>
<b>White-faced storm petrel</b>		30								2			<b>32</b>	<b>4.3%</b>
<b>White-fronted tern</b>	1												<b>1</b>	<b>0.1%</b>
<b>TOTAL</b>	<b>35</b>	<b>101</b>	<b>75</b>	<b>165</b>	<b>25</b>	<b>17</b>	<b>8</b>	<b>5</b>	<b>274</b>	<b>33</b>	<b>13</b>	<b>11</b>	<b>762</b>	
<b>% TOTAL</b>	<b>4.6%</b>	<b>13.3%</b>	<b>9.8%</b>	<b>21.7%</b>	<b>3.3%</b>	<b>2.2%</b>	<b>1.0%</b>	<b>0.7%</b>	<b>36.0%</b>	<b>4.3%</b>	<b>1.7%</b>	<b>1.4%</b>		

Of these, 510 had no photographs taken (a mixture of birds that were either released alive or discarded dead by the crew) and 252 seabird interactions that were photographed and had corresponding entries in the MPI COD extract (Table 11).

Like the necropsied seabirds, the monthly distribution of photograph and interaction seabirds was also not evenly spread across the fishing year with most birds being reported in September 2016 (n = 274, 36.0%), April 2017 (n = 165, 21.7%) or February 2017 (n = 101, 13.3%) (Table 12). This pattern reflects the timing of seabird breeding, presence within the New Zealand EEZ, timing and location of all observed fisheries, and observer coverage. The high level of seabird records in September 2016 relates to one crew members informing the observer that while they were off-duty that the crew helped 256 individual common diving petrels off the vessel during one trip; this was due to a foggy night where the lights disorientated hundreds of these small seabirds.

### 3.2.2 Target fishery and vessels of photographed or interaction seabirds

The seabirds that were photographed and listed in the MPI COD extract and discarded dead or released alive were caught in a range of Fishing Management Areas (FMA 1, 2, 3, 4, 5, 6, 7 and 9) and general positions are show in Figure 4.

The seabirds that were reported as an interaction in the MPI COD extract but not photographed were caught in a range of Fishing Management Areas (FMA 1, 2, 3, 4, 5, 6, 7 and 9) and general positions are show in Figure 5.

The 762 seabirds that were either photographed or recorded as an interaction were from 60 different vessels; 12 on 4 set net vessels (1.6%), 369 on 22 longline vessels (48.3%) and 383 on 34 trawl vessels (50.1%) (Table 12).

**Table 13** Number of seabirds recorded as interactions or photographed from fisheries vessels between 1 July 2016 and 30 June 2017 (with the number of individual vessels in parentheses).

	Photograph seabirds	Interaction Seabirds	Total
Longline vessels	17 (12)	350 (14)	367 (22)
Trawl vessels	229 (24)	154 (28)	383 (34)
Set net vessels	6 (3)	6 (4)	12 (4)
<b>Total</b>	<b>252 (39)</b>	<b>510 (46)</b>	<b>762 (60)</b>

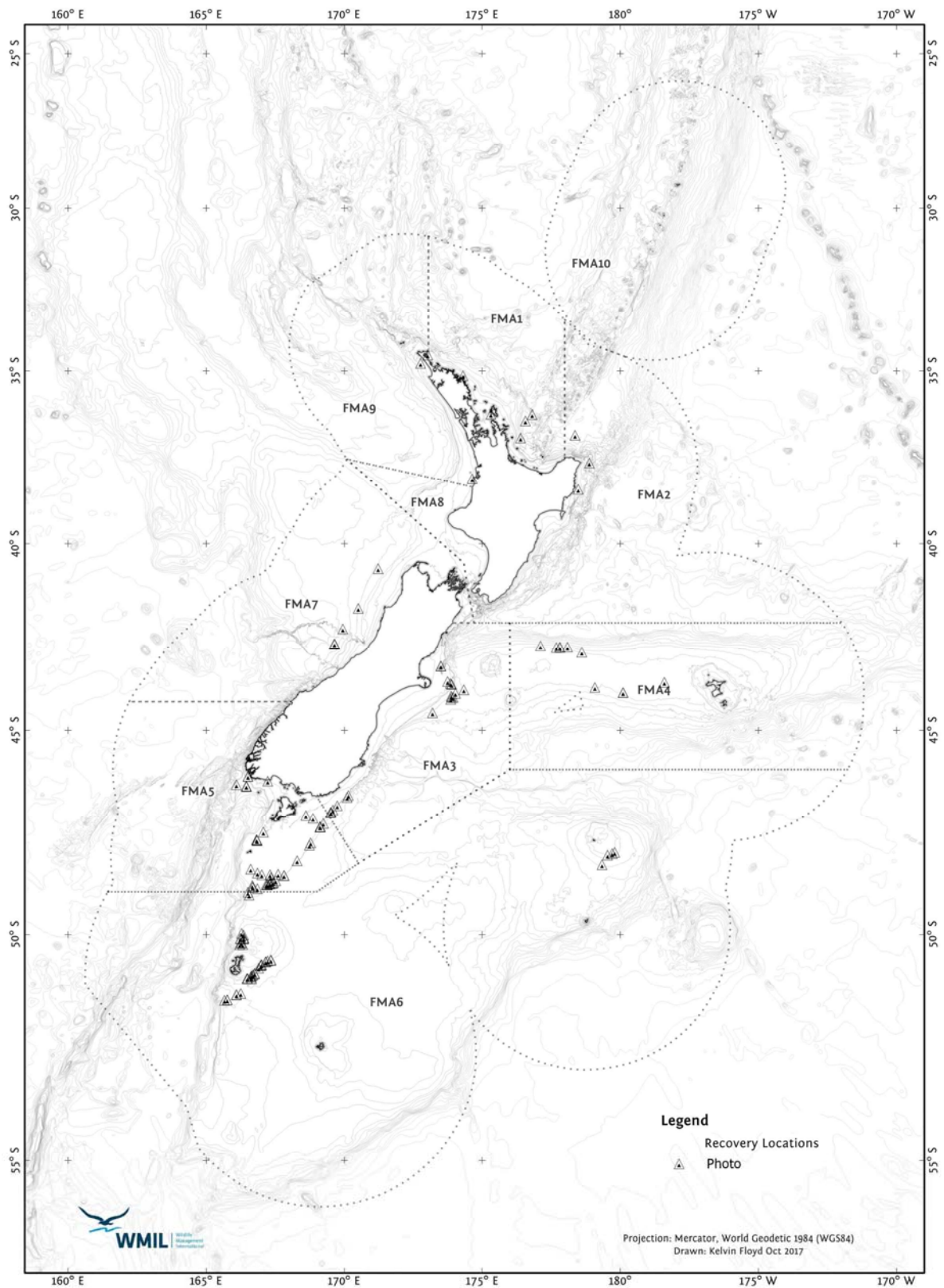
### 3.2.3 Injuries of photographed or interaction seabirds

Over two-thirds of these interaction or photographed birds represented live bird interactions (n = 532, 69.8%) (Table 13). Only 43 of the photographed birds were released alive (17.1%) compared to 489 interaction birds (95.9%) and most of these interaction birds were released by the crew prior to the Observer being able to photograph the birds (Table 13).

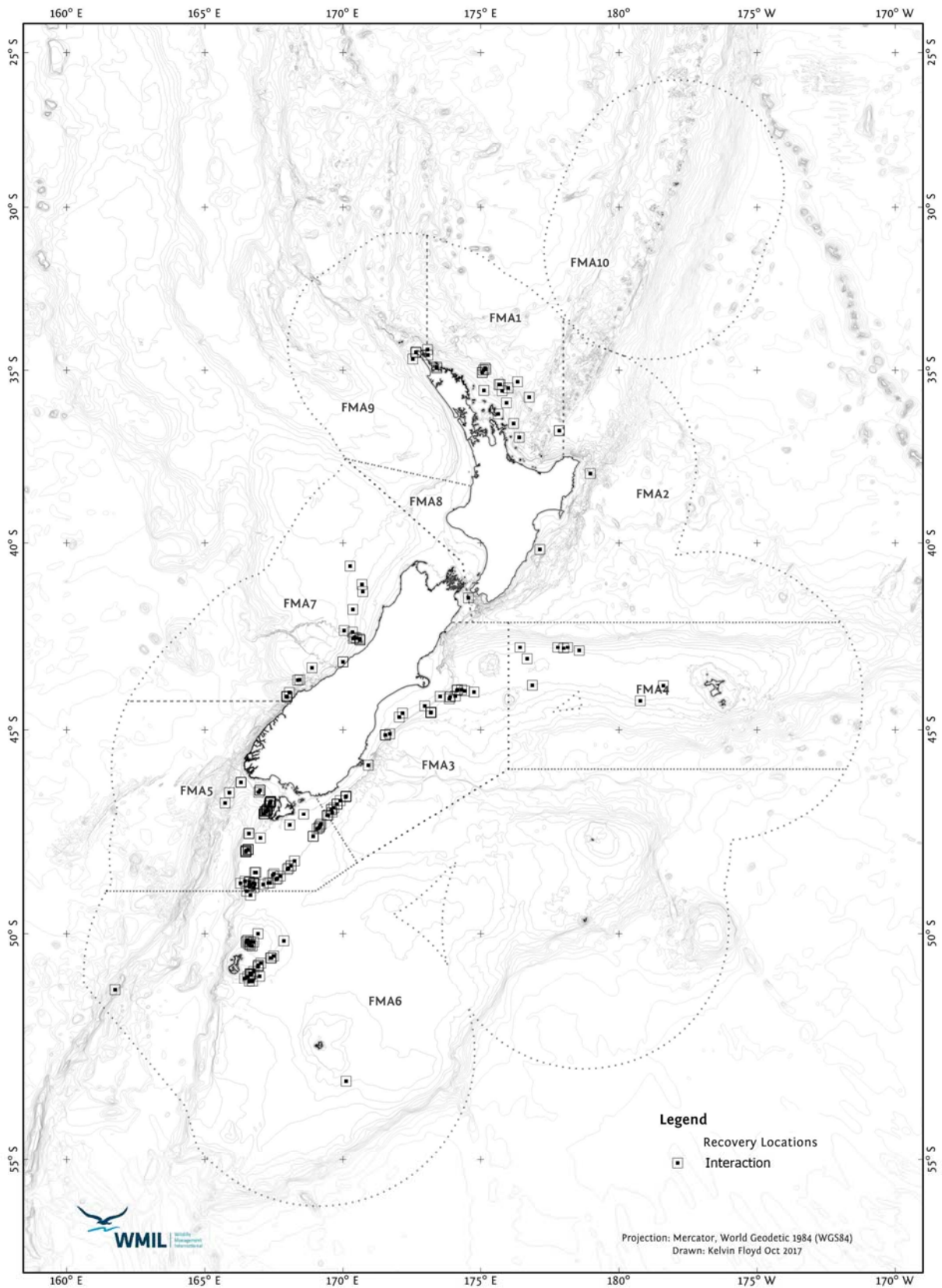
**Table 14** Number of seabirds recorded as interactions or photographed from fisheries vessels between 1 July 2016 and 30 June 2017.

	Photograph seabirds	Interaction Seabirds	Total	% Total
Alive	43	489	532	69.8%
Dead	208	8	216	28.3%
Not recovered (alive)		5	5	0.7%
Not recovered (dead)	1	8	9	1.2 %
<b>Total</b>	<b>252</b>	<b>510</b>	<b>762</b>	

**Figure 4** Catch locations of all seabirds caught and photographed in New Zealand fisheries between 1 July 2016 and 30 June 2017.  
 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).



**Figure 5** Catch locations of all seabirds reported as an interaction (and not photographed) in New Zealand fisheries between 1 July 2016 and 30 June 2017.  
 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).



Eight reported dead birds could not be recovered as they fell off the warp or hook prior to coming aboard and eight live birds also could not be photographed as they escaped or untangled from lines or hooks unharmed before coming aboard (Table 13).

For the 208 seabirds that had been photographed and were dead, 193 were drowned in the trawl nets (92.8%), three were drowned on longline hooks (1.4%), 10 died as results of warp strike (4.8%), one died when it became tangled in a tori line (1.0%) and one died after hitting the vessel (1.0%).

For the 15 seabirds that were recorded dead following an interaction (but not photographed) with the fishing vessel, five were drowned in the trawl nets (33.3%), two drowned in the set net (13.3%), two were drowned on longline hooks (13.3%) and six could not be recovered after falling off the warp (33.3%).

There were a range of injuries on the interaction and photographed birds as shown in Table 14. Most of the birds (n = 513, 67.3%) had no visible injuries and most of these birds were released alive (n = 466, 90.7%).

There were 51 interaction birds (10.0%) and 9 photographed birds (3.5%) that could not have injuries assessed by the observer as these birds had been released or discarded by the crew or had fallen overboard before retrieval (Table 14).

One bird was released alive with a broken wing; it is unlikely that this bird will survive (Table 14).

**Table 15** Types of injuries recorded on seabirds that were photographed or recorded as interactions from fisheries vessels between 1 July 2016 and 30 June 2017.

	Photograph		Interaction		Total			% Total
	Alive	Dead	Alive	Dead	Alive	Dead	All	
No visible injuries	38	48	425	2	463	50	513	67.3%
Disorientated	3		8		11		11	1.4%
Waterlogged		120		1		121	121	15.9%
Broken wing		1	2	2	2	3	5	0.7%
Hook in bill or throat	2	1	5	2	7	3	10	1.3%
Hook in wing		3	4		4	3	7	0.9%
Hook in foot or leg		1	2	1	2	2	4	0.5%
Open wound		8	2	1	2	9	11	1.4%
Crushed/More than 3 injuries		16				16	16	2.1%
Greased	1	2	1		2	2	4	0.5%
Liced		1				1	1	0.1%
Unknown (unable to assess)		7	45	7	45	14	58	7.7%
Total	44	208	494	15	538	224	762	
	252		510		762			

### 3.2.4 Identification of photographed seabirds

There were 18 different seabird taxa that had been photographed by the Observers (Tables 11 and 16).

Examination of the 252 photographed seabird interactions confirmed that observers had accurately identified 88.5% (n = 224) of seabirds (Table 16). It should be noted that the majority of specimens were sooty shearwaters, New Zealand white-capped albatross and white-chinned petrels which are relatively easy to identify.

**Table 16** Comparison of 252 observer identifications with expert identifications for observed and photographed captures listed in COD from fishing vessels between 1 July 2016 and 30 June 2017, by species.

Where: '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	3			3
Black-bellied storm petrel		1		1
Buller's albatross	2	2	1	5
Buller's shearwater	1			1
Common diving petrel	2			2
Cook's petrel			1	1
Fairy prion	2	1		3
Gibson's albatross		1		1
Great-winged petrel	1			1
Grey petrel	1			1
Grey-backed storm petrel	2		1	3
Mottled petrel		1		1
NZ white-capped albatross	30	2	4	36
Salvin's albatross	6			6
Sooty shearwater	100	2	3	105
Southern royal albatross			1	1
White-chinned petrel	74	2	1	77
White-faced storm petrel	2	1		3
White-fronted tern	1			1
<b>Total</b>	<b>224</b>	<b>14</b>	<b>14</b>	<b>252</b>

A Buller's albatross, a Cook's petrel, a grey-backed storm petrel, four New Zealand white-capped albatross, three sooty shearwaters, a southern royal albatross and one white-chinned petrel were incorrectly identified (n= 15, 5.9%; Table 16).

### 3.2.5 Quality and number of photographs

The quality of the images obtained by observers continued to vary widely, particularly for live birds (Figure 6). Video footage is also now being received as well as still imagery.

Photography of dead birds continues to improve with a number of images being taken for most of the dead specimens.

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 6** Range of images received from Government observers for seabird interactions recorded between 1 July 2016 and 30 June 2017.



### 3.2.6 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 (i.e. number of images, type of images, date and time stamps etc.) is provided for all observers.

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