



INT 2016/02 IDENTIFICATION OF SEABIRD CAPTURED IN NEW ZEALAND FISHERIES QUARTERLY REPORT: 1 July 2016 to 31 December 2016.

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Introduction:

New Zealand waters support a large and diverse range of seabird species. Much of the commercial fishing activity within New Zealand waters overlap with these seabirds. The accurate identification of seabirds captured in New Zealand fisheries is vital to determine the potential impact of fisheries interaction with these seabird populations. New Zealand Government observers are placed on commercial vessels in order to investigate interactions with seabird species. These observers are not always able to identify seabirds at sea with high precision. The autopsy programme has been in place to accurately determine the identification (and age, sex, diet and provenance) of specimens recovered dead by observers, but the identification reported for seabirds released alive were often poor and were not confirmed by an expert. The photography programme was developed to enable observers to capture and return images of birds interacting with vessels (whether alive or dead) which would enable correct identification to be determined.

Observers present on fishing trips within New Zealand's Exclusive Economic Zone have to return all seabirds caught and killed as incidental bycatch during fishing operations for necropsy. 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.

Objectives:

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

The specific objectives are:

1. To determine, through examination of returned seabird specimens, the taxon, sex and where possible age class and provenance of seabirds killed in New Zealand fisheries (for returned dead specimens).
2. To detail the injuries, body condition and stomach contents and, where possible, the likely cause of mortality (for returned dead specimens).

3. To report any changes in the protocol used for necropsy of seabirds (for returned dead specimens).
4. To determine, through examination of photographs, the taxon and where possible, sex, age-class and provenance of seabirds captured in New Zealand fisheries (for live captures or dead specimens discarded at sea).

Scope of work completed:

This report summarises identification work completed on dead birds caught and returned and/or using photographs from 1 July 2016 to 31 December 2016.

There have been 46 birds necropsied from this period. Due to the length of some fishing trips and subsequent transport it is possible some birds captured in this period may not have been received at the time of writing. Any further specimens received will be reported at a later date.

Examination of photographs from Ministry of Primary Industries observers gave a total of 96 birds that were reported captured or photographed as bird interactions with fishing vessels (and may include some non-capture interactions) for this period. The extract of seabird captures from the Ministry of Primary Industries Central Observer Database ("COD") has not been received for this entire period; part extract information has been used to assess images to date.

Methods:

The necropsy 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). 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 where current taxonomy and nomenclature is in a state of flux, a combination of Nunn et al. (1996) and Robertson & Nunn (1998) has been used.

Birds were sexed by internal examination during necropsy except when birds were damaged by fishing gear and/or machinery, or from sea lice. 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 were birds of breeding morphology, but that active breeding could not be confirmed; breeding adults were considered to be actively breeding at the time of capture and non-breeding adults were identified by feather moult and gonadal evidence. Sub-adults (pre-breeders) were those birds in mostly adult or near adult plumage, but that had no gonadal evidence of obtaining breeding condition and immatures and juveniles were birds in non-adult plumage and/or morphology.

Body condition was determined by assigning a fat score based on the relative amount of subcutaneous fat and fat on and around organs. Fat scores go from '1' = no fat, to '5' = extremely fat (where internal examination becomes difficult).

Feather moult and the condition of the brood patch were recorded. For each bird, any injuries were recorded, and together with observer comments on the autopsy label, likely cause of death was determined.

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. Additionally, any bait material was recorded, as was offal or discarded material, plastic, stones, algae and goose barnacle plates. All autopsy specimens were allocated a unique number.

Table 1 Common and scientific names of seabirds captured and returned or photographed from New Zealand fisheries between 1 July 2016 and 31 December 2016.

COMMON NAME	SCIENTIFIC NAME	AUTOPSY	PHOTO (P) or EXTRACT (E)
Albatross (unidentified)			E
Black petrel	<i>Procellaria parkinsoni</i>	✓	
Black-backed gull	<i>Larus dominicanus</i>		E
Buller's albatross	<i>Thalassarche bulleri bulleri</i>	✓	P
Buller's and Pacific albatross	<i>Thalassarche bulleri</i>		P
Campbell albatross	<i>Thalassarche impavida</i>	✓	
Cape petrel	<i>Daption capense</i>	✓	
Diving petrel	<i>Pelecanoides urinatrix</i>		E
Fairy prion	<i>Pachyptila turtur</i>		P & E
Fiordland crested penguin	<i>Eudyptes pachyrhynchus</i>	✓	
Flesh-footed shearwater	<i>Puffinus carneipes</i>	✓	
Gibson's albatross	<i>Diomedea antipodensis gibsoni</i>		P & E
Great-winged petrel	<i>Pterodroma macroptera</i>		P
Grey petrel	<i>Procellaria cinerea</i>	✓	P & E
Grey-backed storm petrel	<i>Garrodia nereis</i>		P
Little blue penguin	<i>Eudyptula minor</i>	✓	
New Zealand white-capped albatross	<i>Thalassarche steadi</i>	✓	P & E
Prion (unidentified)	<i>Pachyptila spp.</i>		E
Salvin's albatross	<i>Thalassarche salvini</i>	✓	E
Shearwater (unidentified)			E
Sooty shearwater	<i>Puffinus griseus</i>	✓	P & E
Southern black-browed albatross	<i>Thalassarche melanophris</i>	✓	
Southern royal albatross	<i>Diomedea epomophora</i>	✓	
Stewart Island shag	<i>Phalacrocorax chalconotus</i>	✓	
Storm petrel (unidentified)			P
Westland petrel	<i>Procellaria westlandica</i>	✓	
White-chinned petrel	<i>Procellaria aequinoctialis</i>	✓	P & E

Details relating to each specimen are available on request from the Manager, Marine Conservation Services, DOC (email csp@doc.govt.nz). In some cases (i.e. those specimens damaged by fishing gear and machinery, or by sea lice) it was not possible to collect all data; these are reported as 'unknown', and appear as such in the relevant tables.

Photographs were provided in electronic format with associated observer information (such as vessel name, date of capture, time of capture etc.) from the Ministry of Fisheries Central Observer Database in an Excel spreadsheet. Individual seabirds were allocated a unique autopsy number. The photograph (or photographs), the information from the observers and any other information observed in the photograph was entered into an Access database.

Where possible, the taxon, age, sex and provenance of the seabirds pictured were determined. Bill and head morphology and colour was usually sufficient to allow identification of albatross and larger petrels to species, but other key features (such as size, shape, foot colour, and wing markings) were needed for other smaller species. If key features were not visible in the photograph or the image was out of focus, identification to species was not possible. Common and scientific names of all species caught, photographed or reported as interactions are provided in Table 1.

Results:

AUTOPSY BIRDS:

A total of 46 seabirds (comprising of 16 taxa) were returned from 16 vessels between 1 July 2016 and 31 December 2016 (Table 2). Seabirds returned to date were dominated by four species white-chinned petrel *Procellaria aequinoctialis* (n = 12, 26.1%); little blue penguin *Eudyptula minor* (n = 8, 17.4%), Salvin's albatross *Thalassarche salvini* (n = 6, 13.0%) and sooty shearwater *Puffinus griseus* (n = 6, 6.5%) (Table 2). These five species accounted for 63% of all returns to date (Table 2). All the other species had either one or two captures each (Table 2).

Table 2 Species and numbers of seabirds killed and returned from observed fishing vessels between 1 July 2016 and 31 December 2016, by month of capture.

SPECIES	MONTH												TOTAL	% TOTAL
	J	F	M	A	M	J	J	A	S	O	N	D		
Black petrel												2	2	4.3
Buller's albatross												1	1	2.2
Campbell albatross							1	1					2	4.3
Cape petrel							1						1	2.2
Fiordland crested penguin								2					2	4.3
Flesh-footed shearwater										1			1	2.2
Grey petrel							1	1					2	2.2
Little blue penguin								8					8	17.4
NZ white-capped albatross						1			1				2	4.3
Salvin's albatross								2	2	2			6	13.0
Sooty shearwater									1	2			3	6.5
Southern black-browed albatross						1							1	2.2
Southern royal albatross								1					1	2.2
Stewart Island shag											1		1	2.2
Westland petrel										1			1	2.2
White-chinned petrel									7	4	1		12	26.1
TOTAL	0	0	0	0	0	0	2	3	15	11	10	5	46	
% TOTAL							4.3	13	32.6	23.9	21.7	10.9		

One banded bird were returned during this period. One adult male Campbell albatross had a uniquely numbered metal band (M-49034), having been banded in March 1992 as a chick on Bull Rock at Campbell Island. Banded specimens provide valuable longevity, survival and at-sea distribution data. No specimens carried PTT tags.

The monthly distribution of returned specimens was not evenly spread across the fishing year with most birds returned to date being caught in September ($n = 15$, 32.6%) (Table 2). However this is to be expected as these specimens were only returned from those vessels fishing at sea between 1 July 2016 and 31 December 2016. It is likely that this distribution pattern will change as further specimens are returned through the remainder of the reporting period.

Nearly $\frac{3}{4}$ of all birds returned were males ($n = 33$, 71.7%). However the cape petrel, little blue penguin, southern black-browed albatross and Stewart Island shag captures were either all females or dominated by females (Table 3). The majority of black petrel, Buller's albatross, Campbell albatross, grey petrel, Salvin's albatross, sooty shearwater, southern royal albatross and Westland petrel returned to date were male (Table 3).

Table 3 Species and numbers of seabirds killed and returned from observed fishing vessels between 1 July 2016 and 31 December 2016, 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						
	M	F	U	A	BA	N	SA	I	J	U
Black petrel	2			2	2					
Buller's albatross	1			1						
Campbell albatross	2			2	2					
Cape petrel		1		1	1					
Fiordland crested penguin	1	1		2	2					
Flesh-footed shearwater		1		1	1					
Grey petrel	2			2	1					
Little blue penguin	3	5		8	1					
NZ white-capped albatross	1	1		2	2					
Salvin's albatross	5	1		6	6					
Sooty shearwater	3			3	2					
Southern black-browed albatross		1					1			
Southern royal albatross	1			1						
Stewart Island shag		1		1						
Westland petrel	1			1						
White-chinned petrel	11	1		12	12					
TOTAL	33	13	0	45	32	0	1	0	0	0
% TOTAL	71.7%	28.3%		97.8%	71.1%		2.2%			

The majority of the birds returned were adults ($n = 45$, 97.8%) (Table 3), with only the southern black-browed albatross having a sub-adult bird returned. Over 71% of the adult birds were in breeding condition (Table 3).

Fat scores of 1 or 2 were most often recorded in the birds returned between 1 July 2016 and 31 December 2016 ($n = 32$, 69.6%), with 87% of birds having fat scores of 3 or less (Table 4). Only 5 birds (13 had fat scores higher than 3 (Table 4). The mean fat score was 2.1 ± 0.2 (Table 4).

Using this preliminary data, it appears that the mean fat scores will be similar to other recent fishing years (Bell 2011, 2012, 2013, 2014; Bell & Mischler 2015; Thompson 2009, 2010 a, b), although this may relate to time of the year and breeding condition and is likely to change as more birds are autopsied throughout the remainder of the year.

Table 4 Comparison of fat scores in the returned birds between 1 July 2016 and 31 December 2016 (1= no fat to 5 = extremely fat, U = unknown).

SPECIES	FAT SCORE						MEAN (\pm SE)
	1	2	3	4	5	U	
Black petrel	1	1					1.5 ± 0.5
Buller's albatross	1						1.0 ± 0.0
Campbell albatross			1	1			3.5 ± 0.5
Cape petrel		1					2.0 ± 0.0
Fiordland crested penguin		1			1		3.5 ± 1.5
Flesh-footed shearwater	1						1.0 ± 0.0
Grey petrel	1	1					1.5 ± 0.5
Little blue penguin	1	5	1	1			2.3 ± 0.3
NZ white-capped albatross	1			1			2.5 ± 1.5
Salvin's albatross	2	1	3				2.2 ± 0.4
Sooty shearwater	2		1				1.3 ± 0.3
Southern black-browed albatross	1						1.0 ± 0.0
Southern royal albatross	1						1.0 ± 0.0
Stewart Island shag	1						1.0 ± 0.0
Westland petrel	1						1.0 ± 0.0
White-chinned petrel	2	6	2	1		1	2.2 ± 0.3
TOTAL	16	16	8	4	1	1	2.1 ± 0.2
% TOTAL	34.8%	34.8%	17.4%	8.7%	2.2%		

Stomach contents have been identified into main groups following a similar method to Thompson (2009, 2010a, b) and are shown in Table 5. Only 45.6% of the birds had bait, offal or discards in their stomachs and another 12 (26.1%) had empty stomachs (Table 5). One Campbell albatross contained proventricular oil in the stomach which is evidence of feeding a chick (Table 5).

Most of the gizzard contents were natural food items (squid beaks, fish bones and eyeballs and otoliths), but over 50% of the birds returned had empty gizzards (Table 6). Eight birds (17.3%) had worms in their gizzards and two birds (4.3%) had seaweed in their gizzards (Table 6). Samples (e.g. squid beaks and otoliths) have been collected for further analysis. There were only four birds (8.7%) with plastic in their gizzards, but this may relate to the low numbers of shearwater species being caught and returned for necropsy in the current reporting period (Table 6).

Table 5 Stomach contents of seabirds killed and returned on fishing vessels between 1 July 2016 and 31 December 2016.

Note: Birds can have multiple items in the stomachs resulting in higher content figures than the total number of seabirds killed and returned ($n = 46$).

SPECIES	EMPTY	BAIT	OFFAL (OR DISCARDS)	NATURAL	SLUDGE	PROVENTRICULAR OIL	WORMS
Black petrel			2				
Buller's albatross				1			
Campbell albatross		1				1	
Cape petrel	1						
Fiordland crested penguin					2		
Flesh-footed shearwater	1						
Grey petrel	1		1				
Little blue penguin					8		
NZ white-capped albatross		1	4				
Salvin's albatross	2	2	3	3			
Sooty shearwater		3					
Southern black-browed albatross		1					
Southern royal albatross				1			1
Stewart Island shag				2			
Westland petrel	1						
White-chinned petrel	6	2	1	3			
TOTAL	12	10	11	10	10	1	1
% TOTAL	26.1%	21.7%	23.9%	21.7%	21.7%	2.2%	2.2%

Table 6 Gizzard contents of seabirds killed and returned on fishing vessels between 1 July 2016 and 31 December 2016.

Note: Birds can have multiple items in the gizzard resulting in higher content figures than the total number of seabirds killed and returned ($n = 46$).

SPECIES	EMPTY	SQUID BEAKS	OTOLITHS	FISH OR SQUID EYEBALLS	FISH BONES/SKIN	PLASTIC	SEAWEED	WORMS
Black petrel	1	1	1	1	1			
Buller's albatross			1	1			1	
Campbell albatross	1	1						
Cape petrel								1
Fiordland crested penguin	1							
Flesh-footed shearwater		1				1	1	
Grey petrel		2	1					1
Little blue penguin	6							
NZ white-capped albatross	1		1	1	1			
Salvin's albatross	2	3		1				
Sooty shearwater	1	2				3		
Southern black-browed albatross	1							
Southern royal albatross		1		1				
Stewart Island shag					1			
Westland petrel		1						1
White-chinned petrel	12	5	1	1	2			5
TOTAL	26	17	5	6	5	4	2	8
% TOTAL	56.5%	40.0%	10.9%	13.0%	10.9%	8.7%	4.3%	17.3%

Table 7 Number of seabirds of each species killed and returned from observed fishing vessels between 1 July 2016 and 31 December 2016, by fisheries type and location.

Species	Bottom/Midwater Trawl				Longline	Set net	Deck Strike	Total
	Net	Cod-end	Other	Warp				
Black petrel	2							2
Buller's albatross		1						1
Campbell albatross	1			1				2
Cape petrel			1					1
Fiordland crested penguin						2		2
Flesh-footed shearwater					1			1
Grey petrel	2							2
Little blue penguin						8		8
NZ white-capped albatross			1	1				2
Salvin's albatross	4	1	1					6
Sooty shearwater	2				1			3
Southern black-browed albatross					1			1
Southern royal albatross							1	1
Stewart Island shag						1		1
Westland petrel	1							1
White-chinned petrel	4		2		6			12
Total	16	2	5	2	9	11	1	46
% Total	34.8%	4.3%	10.9%	4.3%	19.6%	23.9%	2.2%	
TOTAL	25				9	11	1	
% TOTAL	56.3%				19.6%	23.9%	2.2%	

Table 8 Number of seabirds killed and returned from observed fishing vessels between 1 July 2016 and 31 December 2016, by injury.

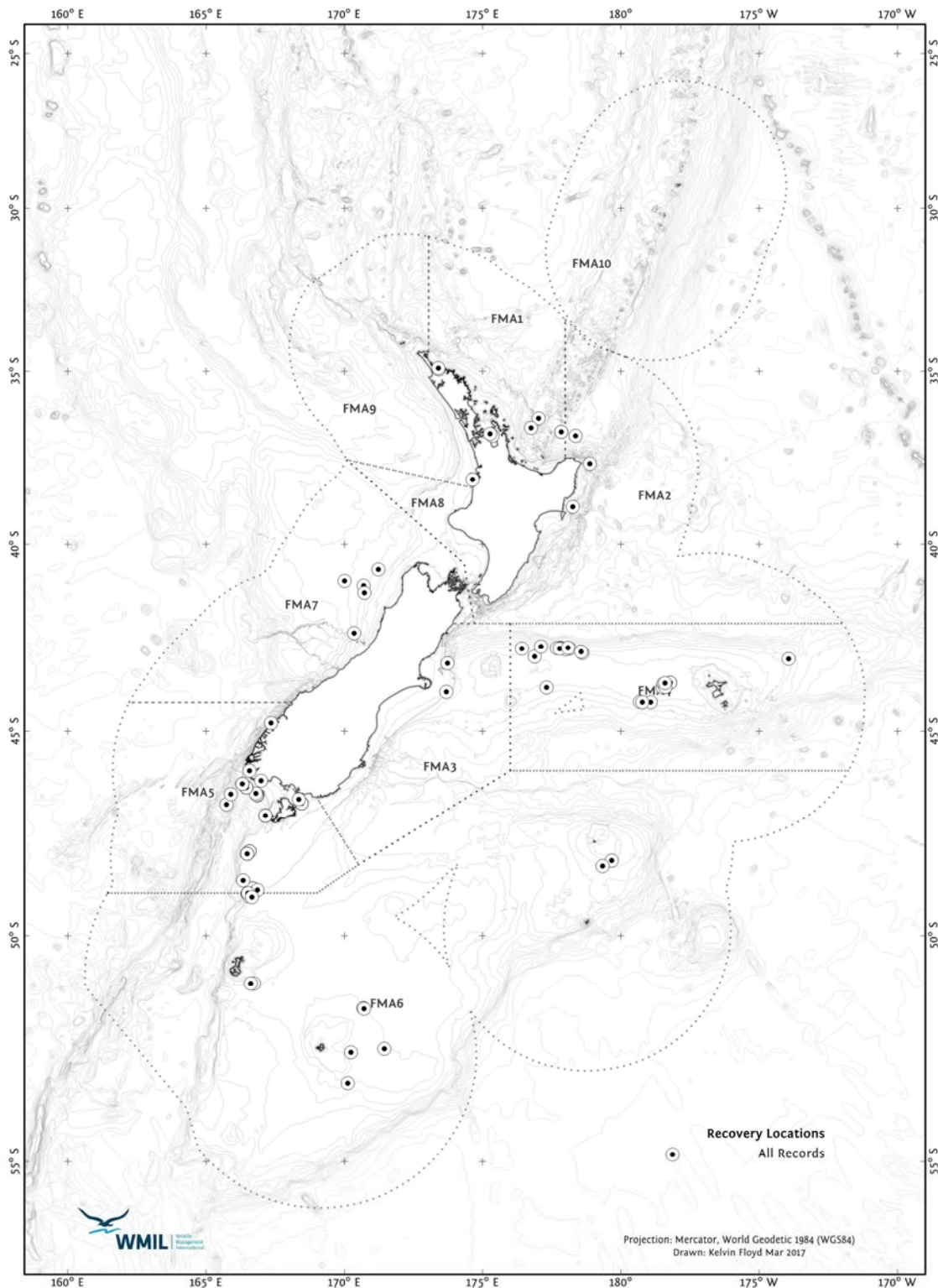
Note: Birds can have multiple injuries resulting in higher figures than the total number of seabirds killed and returned ($n = 46$).

Species	No injuries	Hook					Broken bones, etc.	Lacerations	Crushed	Greased	Waterlogged
		Body	Wing	Throat or Swallowed	Foot	Unknown ¹					
Black petrel											2
Buller's albatross							1		1		1
Campbell albatross	1						2		1	1	2
Cape petrel								1			1
Fiordland crested penguin	1						1				1
Flesh-footed shearwater						1		1			1
Grey petrel								1	1	1	1
Little blue penguin	2						7				1
NZ white-capped albatross							3			1	1
Salvin's albatross	1						2	2		2	3
Sooty shearwater	1						1				4
Southern black-browed albatross											1
Southern royal albatross							1				
Stewart Island shag							1				1
Westland petrel	1										1
White-chinned petrel	1		1	2			6	1	1		10
Total	8	0	1	2	0	1	25	6	3	6	31
% Total	17.4%		2.2%	4.3%		2.2%	54.3%	13.0%	6.5%	13.0%	67.4%

¹ An unknown hook location relates to a seabird caught and killed on a longline vessel but with no apparent hook injury anywhere on the body. No additional capture information was provided by the observer. These seabirds may have been tangled in the line rather than hooked.

Figure 1 Catch locations of all seabirds killed and returned in New Zealand fisheries for necropsy between 1 July 2016 and 31 December 2016

Note: some 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).



Trawl and longline vessels have returned birds to date and preliminary data are shown in Table 7. There were 26 birds returned from trawl vessels (25 in the net, cod-end or warp and one as a deck strike; 58.5%), 9 from longline vessels (26.1%) and 11 birds returned from set net vessels (23.9%) (Table 7). Detailed analysis of captures per vessel type and target fisheries will be undertaken at the end of the reporting year when this information has been collated from DOC CSP and MPI.

Most of the returned birds to date had a range of injuries from 'no obvious injury' to 'crushed' (Table 8). Three birds showed injuries suggesting entanglement and crush injuries from the trawl warp and blocks. Six birds had grease covering part or all of the body. Eight birds had no obvious injuries. Most (67.4%) birds were waterlogged and had drowned in the trawl nets or when attached to hooks. More detailed reporting of injuries and cause of death will be reported in the end of year report.

Over $\frac{3}{4}$ ($n = 37$, 80.4%) of the returned seabirds between 1 July 2016 and 31 December 2016 were identified correctly by the observers. There were six (13%) identified to the correct group and two birds (4.3%) had no identification code on the label. One Westland petrel was wrongly identified as a white-chinned petrel (2.2%).

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

PHOTOGRAPH BIRDS:

Examination of the Ministry of Primary Industries Central Observer Database ("COD") and images provided by Government observer gave a total of 96 seabirds that were reported captured or photographed as seabird interactions with 20 fishing vessels (and may include some non-capture interactions) (Table 9). Of these 96 reported interactions, only 19 seabirds were photographed by observers for the period 1 July 2016 to 31 December 2016 and this includes one that is not listed in the COD extract to date (Table 9). Information in the COD extract stated that three seabirds were photographed, but the images have not been received to date (Table 9).

Table 9 Number of seabird interactions photographed or recorded on fishing vessels between 1 July 2016 and 31 December 2016

	Dead	Not recovered (Dead)	Alive	Total
Photographed and listed in MPI COD extract	11	0	4	15
Photographed but not listed in MPI COD extract	0	0	1	1
Photographed and listed in MPI COD extract, but image not received to date	1	0	2	3
Listed as an interaction in MPI COD extract, but not photographed	6	2	69	77
Total	18	2	76	96
% Total	18.8%	2.1%	79.2%	

Birds that were either photographed or recorded as an interaction were from 20 different vessels; longline ($n = 56$, 58.3%), trawl ($n = 39$, 40.6%) and set net ($n = 1$, 1.0%). Of the 18 dead birds, 13 were drowned in the net and the remaining seven were killed by warp strike. Of the two birds that were not recovered, one fell off a hook and the other fell out of the net. Of the 15 birds that are listed in the COD extract and photographed, eleven were identified correctly by the observers

(73.3%), one was identified to the correct species group (6.7%) and two were identified as large seabird or albatross only (13.3%).

The quality of the images continues to vary widely; particularly for live captures. There were a number of issues including only one photograph for some seabirds, not all key features were photographed, poor focus, and under or over-exposure. Poor images were common for birds that were alive and seen onboard for short periods (when photographs were taken from a long distance).

Seventy-seven seabirds were recorded as having an interaction with the vessel (80.2%), but no images were taken of these birds and as a result, identification of these birds could not be confirmed. It is important that more photographs are taken of each seabird and that there are images of head, bill, feet, wings (upper and lower) and whole body shots taken. Photographs need to be taken of all bird interactions (as much as possible) and if a photograph of a seabird is taken, data relevant to that bird should be recorded (i.e. observer identification, date, time, haul, sample etc.).

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