Conservation Services Programme Annual Research Summary 2015-16

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May 2017

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1. Introduction

1.1 Purpose

This report outlines the research carried out through the Conservation Services Programme Annual Plan 2015/16, and provides updates on multi-year projects started in previous years.

1.2 Background

The Department of Conservation has the statutory duty to protect certain marine animals as defined in the Wildlife Act 1953 and the Marine Mammals Protection Act 1978. While the sustainable management of fishery resources is the statutory responsibility of the Minister of Fisheries (Fisheries Act 1996), the protection and conservation of seabirds, marine mammals and other protected species is the responsibility of the Minister of Conservation.

Since 1995, the New Zealand government has been implementing a scheme to recover from the domestic commercial fishing industry a proportion of funding required to investigate and mitigate the impacts of fishing on protected species of marine wildlife (Conservation Services). Conservation Services are defined in the Fisheries Act 1996 (as amended in 1999) as being outputs produced in relation to the adverse effects of commercial fishing on protected species, as agreed between the minister responsible for administering the Conservation Act 1987 and the Director-General of the Department of Conservation.

1.3. CSP Vision and Objectives

The Conservation Services Programme (CSP) vision is that:

> "Commercial fishing is undertaken in a manner that does not compromise the protection and recovery of protected species in New Zealand fisheries waters".

The suite of research and other conservation services delivered as part of the CSP falls into three categories:

1. Understanding the nature and extent of adverse effects on protected species from commercial fishing activities in New Zealand fisheries waters.
2. Developing effective solutions to mitigate adverse effects of commercial fishing on protected species in New Zealand fisheries waters.
3. Developing population management plans, where appropriate.

Detailed outcome-based objectives for CSP are provided in the Conservation Services Programme Strategic Statement 2015[1].

[1] Available to download from http://www.doc.govt.nz/csp-strategic-statement-2015

1.4 Development of the Annual Plan

The Conservation Services Programme Annual Plan 2015/16[2] described the conservation services to be delivered as the Conservation Services Programme (CSP), and subject to cost recovery from the commercial fishing industry. As such, this Annual Plan formed the basis for levying the commercial fishing industry under the Fisheries Act 1996. For further background information on CSP, including extracts of relevant legislation, refer to the Conservation Services Programme Strategic Statement. In the development of this Annual Plan a series of discussions were held with Ministry for Primary Industries (MPI) staff to harmonize the CSP and MPI research programmes for 2015/16 and to ensure there was no duplication. A formal consultation process was also used as described below.

1.5 Consultation process

The Annual Plan took account of feedback from stakeholders, and was approved, along with the final costs to be levied, by the Minister of Conservation.

The collaborative processes used to develop the 2015/16 Annual Plan are as follows:

Inshore observer coverage is based on a continuation of delivering objectives identified by a process conducted in preparation for the CSP Annual Plan 2015/16. This process was developed jointly by the CSP team at the DOC and the Inshore Fisheries team at MPI.

Deepwater observer coverage was developed jointly by the CSP team at DOC and the deepwater fisheries team at MPI.

Key stages for stakeholder input, including formal consultation on this plan, were as follows:

3 December 2014	Initial CSP RAG meeting – review and gap analysis.
28 January 2015	Updated medium term research plans, initial list of research proposals and draft CSP RAG prioritisation framework circulated to CSP RAG.
12 February 2015	Feedback on prioritisation framework and additional research proposals from CSP RAG
18 February 2015	Second CSP RAG meeting to discuss and prioritise initial research proposals. Note: there was disagreement between RAG members on implementation of the prioritisation framework, but feedback on relative priority between proposals was recorded.
4 March 2015	Additional feedback received from CSP RAG on research proposals and their prioritisation.
20 March 2015	Draft Conservation Services Programme Annual Plan 2015/16 released for public consultation
17 April 2015	Public consultation period closes
May 2015	Summary of public submissions and response to comments completed
June 2015	Director-General of Conservation conveys the Conservation Services Programme Annual Plan 2015/16, amended in accordance with public submissions, to the Minister of Conservation for agreement

[2] Available to download from http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/plans/csp-annual-plan-2015-16.pdf

1.6 Explanation of reporting structure

This report first describes the objectives and rationale for each project, then provides an update on project status and a summary of the key results and recommendations from the projects. A project logistics summary statement is included detailing the service provider, the project budget (excluding administration costs), identification of the relevant provisions within the Fisheries (Cost Recovery) Rules 2001 that determine cost allocation and review milestones. Finally, a citation and weblink are provided to enable ease of access to the final research reports.

Conservation Services Programme activities in 2015/16 were divided into three main areas:

1. Fisheries interactions projects
2. Population studies
3. Mitigation projects

2. Interaction Projects

2.1 INT2015-01 Observing commercial fisheries

Overall objective

To understand the nature and extent of protected species interactions with New Zealand commercial fishing activities.

Specific objectives

1. To identify, describe and, where possible, quantify protected species interactions with commercial fisheries
2. To identify, describe and, where possible, quantify measures for mitigating protected species interactions
3. To collect information relevant to identifying levels of cryptic mortality of protected species resulting from interactions with commercial fisheries
4. To collect other relevant information on protected species interactions that will assist in assessing, developing and improving mitigation measures

Rationale

Understanding the nature and extent of interactions between commercial fisheries and protected species can identify where the most significant interactions are occurring and can be used to inform development of ways to mitigate those interactions and adverse effects. Such data contribute to assessments of the risks posed to protected species by commercial fishing and whether mitigation strategies employed by fishing fleets are effective at reducing protected species captures.

The CSP Observer Programme continued to purchase baseline services for “offshore” fisheries from MPI Observer Services, given the scale of their operation, which allowed observers to be placed strategically across New Zealand Fisheries. For the purposes of providing costings, the rate provided by MPI Observer Services has been used.

Project status

In progress.

Summary of the methods and key findings

One of the tools to gain a better understanding of the nature and extent of interactions between commercial fisheries and protected species is the placement of Government observers on board commercial fishing vessels operating within the New Zealand Exclusive Economic Zone (EEZ). The observers collect both quantitative and qualitative information on interactions, both of which can and have been used to identify key areas of importance. The observations can also help in the development and assessment of mitigation strategies aimed at reducing the impact of commercial fisheries on protected species.

Observer coverage is, where possible, planned jointly with the Ministry for Primary Industries to ensure that coverage objectives are aligned. For the purposes of planning observer coverage, fisheries are divided into two broad categories: firstly, those fisheries that are poorly known and generally characterised by small vessel, owner operated fleets operating in the inshore, the second; better understood deepwater fisheries which have been subject to long-term monitoring.

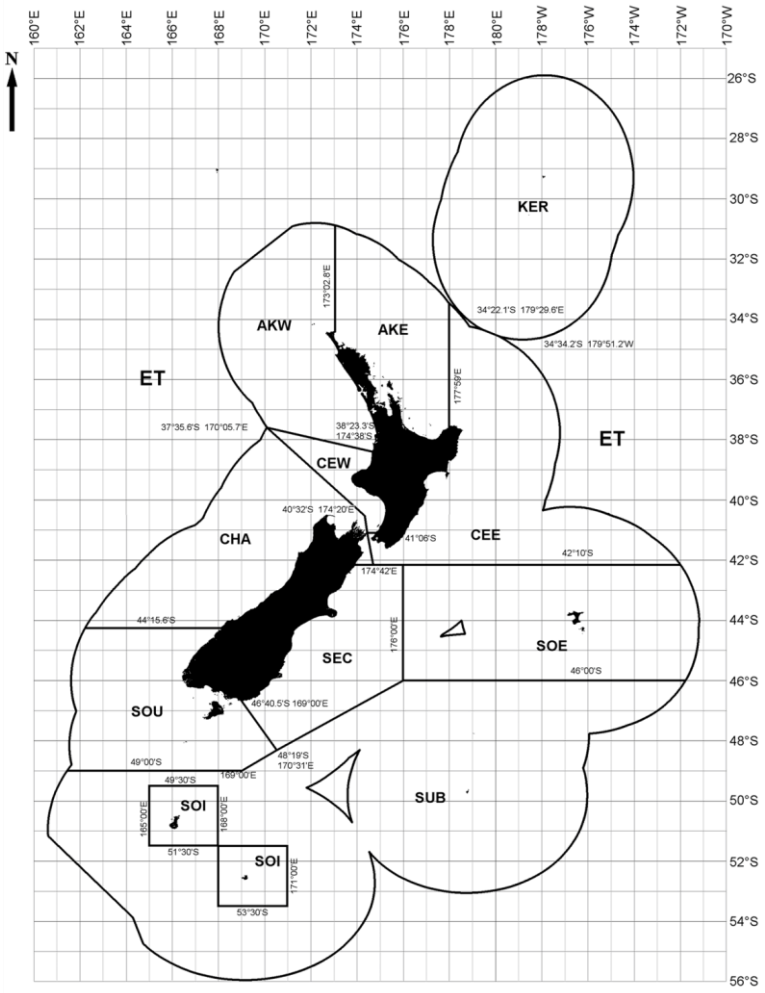
While the majority of the 'poorly understood' fisheries operate in the inshore area (i.e. to around 200 m depth), some small vessels, particularly bottom longline vessels under 36 m, will operate in deeper waters such as the Chatham Rise. Details of the approach used to set days in these fisheries are described in the Joint Department of Conservation/Ministry of Fisheries Inshore Observer Programme 2011/12 plan. In general, coverage in these fisheries was aimed at reducing uncertainty around the risk to particular protected species identified in both the level 1 and level 2 risk assessments and assessing mitigation options for interactions identified.

For better observed fisheries, long-term datasets exist which allow for ongoing monitoring to detect whether changes are occurring in the nature and extent of captures. In these offshore fisheries where higher levels of coverage are already undertaken CSP purchases a portion of existing observer time to allow data collection to be spread strategically over the fishing fleet.

The observer coverage presented in this report extends work conducted in previous years.

The remainder of this project report is divided into separate 'fisheries' where certain target species are grouped according to fishing method. For each 'fishery' an overall summary of commercial effort, observer effort and protected species bycatch is provided by Fisheries Management Area (Figure 1). Protected species interactions are then broken down by fate of the animal (live or dead) and method of interaction.

Figure 1: New Zealand Fisheries Management Areas (source: Ministry of Fisheries)



Key:

AKE	FMA 1	East North Island from North Cape to Bay of Plenty
CEE	FMA 2	East North Island from south of Bay of Plenty to Wellington
SEC	FMA 3	East coast South Island from Pegasus Bay to Catlins
SOE	FMA 4	Chatham Rise
SOU	FMA 5	South Island from Foveaux Strait to Fiordland
SUB	FMA 6	Subantarctic including Bounty Island and Pukaki Rise
SOI	FMA6A	Southern offshore islands – Auckland and Campbell Islands
CHA	FMA 7	West Coast South Island to Fiordland including Kaikoura
CEW	FMA 8	West North Island from South Taranaki Bight to Wellington
AKW	FMA 9	West North Island from North Cape to North Taranaki Bight
KER	FMA 10	Kermadec
ET		Outside NZ EEZ

Middle Depth Trawl Fisheries

Hoki, Hake, Ling and Warehou species

The hoki, hake, ling, warehou trawl complex spans all months, FMAs and vessel sizes. Within the fishery complex there is a distinct subset targeting the hoki spawn in the Cook Strait. This occurs between June and September and is fished only by vessels under 42m, in an area straddling the CHA and CEE FMAs. The remaining fishing effort occurs during the other months with hoki, hake, ling and warehou targeted largely in SEC, SUB, SOE and partly SOU areas. All vessels over 28m in this fishery are required to used one of the three permissible forms of regulated bird scaring equipment and offal management. Industry defined codes of practice can also apply.

Table 1 presents a summary of commercial fishing effort, observer effort and protected species captures in the fishery during the 2015/16 observer year. Both the recorded effort and observed tows were slightly lower than in the previous observer year (2014/15), however, the level of observer coverage was very similar (Hjorvarsdottir 2016).

The rate of seabird captures decreased by almost 50%, with 95 seabird interactions recorded in this observer year in comparison to 207 in the previous observer year (2014/15) (Hjorvarsdottir 2016). Both mammal and protected fish captures were comparable to the 2014/15 observer year (Hjorvarsdottir 2016). A total of 180.6 kg of coral catch was observed, with coral rubble and stony cup corals being the most commonly observed species.

In summary, 118 trips were conducted on board 39 vessels, with protected species captures occurring on 55 trips on board 31 vessels.

Table 1. Summary of commercial effort, observer effort and protected species captures in the hoki, hake, ling and warehou middle depth trawl fisheries during the 2015/16 observer year.

FMA	Effort tows	Observed tows	Coverage (%)	Seabird captures *	Seabirds per 100 tows	Mammal captures	Mammals per 100 tows	Protected fish captures	Protected fish per 100 tows	Coral catch (kg)	Coral catch per 100 tows
1. AKE	427	90	21.1	0	0.0	1	1.1	0	0.0	0.0	0.0
2. CEE	1,567	47	3.0	0	0.0	7	14.9	0	0.0	0.0	0.0
3. SEC	2,913	693	23.8	28	4.0	0	0.0	0	0.0	82.1	11.8
4. SOE	2,228	606	27.2	24	4.0	1	0.2	0	0.0	5.3	0.9
5. SOU	1,259	457	36.3	20	4.4	0	0.0	0	0.0	71.1	15.6
6. SUB	831	343	41.3	14	4.1	1	0.3	3	0.9	12.2	3.6
7. CHA	6,478	2,266	35.0	9	0.4	31	1.4	2	0.1	9.9	0.4
8. CEW	36	0	0.0	-	-	-	-	-	-	-	-
9. AKW	21	0	0.0	-	-	-	-	-	-	-	-
Total	**15,760**	**4,502**	**28.6**	**95**	**2.1**	**41**	**0.9**	**5**	**0.1**	**180.6**	**4.0**

Table 2 reports the numbers of interactions by species and fate immediately post interaction for the 2015/16 fishing year. Of the observed seabird interactions, 63% resulted in mortalities. The most commonly caught seabird species was Salvin's albatross. Similar to previous observer years, marine mammal captures were dominated by New Zealand fur seals, with 78% of the interactions resulting in mortalities.

Table 2. Protected species interactions in the hake, hoki, ling and warehou middle depth trawl fisheries during the 15/16 observer year.

Species Name	Alive	Dead	Decomposing	Total
Birds				
Buller's albatross	1	8		9
Buller's and Pacific albatross		2		2
Cape petrels		1		1
Common diving petrel	1			1
Fairy prion	1			1
Giant petrels (Unidentified)		1		1
Great albatrosses	3			3
Petrel (Unidentified)	2			2
Petrels, Prions and Shearwaters	1			1
Prions (Unidentified)	2			2
Procellaria petrels	1			1
Salvin's albatross	11	14	1	26
Shearwaters		5		5
Sooty shearwater	1	12		13
White-capped albatross	5	6		11
White-chinned petrel	5	11		16
Birds Total	**34**	**60**	**1**	**95**
Marine Mammals				
New Zealand fur seal	8	32	1	41
Marine Mammals Total	**8**	**32**	**1**	**41**
Protected Fish				
Porbeagle shark		2		2
Basking shark	2	1		3
Protected Fish Total	**2**	**3**		**5**
Grand Total	**44**	**95**	**2**	**141**

Tables 3a, b & c detail the broad method of interactions for each species. Net capture was the most prevalent form of interaction overall, with over 70 % resulting in mortalities. Eight interactions were recorded as 'other', most of them being seabirds landing on the vessel, and one a New Zealand fur seal that was washed on board with a wave.

Table 3. Method of interaction for a) Protected species released alive, b) dead protected species, c) decomposing protected species observed in the hake, hoki, ling and warehou middle depth trawl fisheries during the 2015/16 observer year.

a) Protected species released alive

Species Name	Caught in net	Impact against vessel	Other	Unknown	Total
Birds					
Buller's albatross	1				1
Common diving petrel			1		1
Fairy prion				1	1
Great albatrosses	3				3
Petrel (Unidentified)		1	1		2
Petrels, Prions and Shearwaters			1		1
Prions (Unidentified)		2			2
Procellaria petrels	1				1
Salvin's albatross	11				11
Sooty shearwater	1				1
White-capped albatross	2		2	1	5
White-chinned petrel	3		2		5
Birds Total	**22**	**3**	**7**	**2**	**34**
Marine Mammals					
New Zealand fur seal	7		1		8
Marine Mammals Total	**7**		**1**		**8**
Protected Fish					
Basking shark	2				2
Protected Fish Total	**2**				**2**
Grand Total	**31**	**3**	**8**	**2**	**44**

b) Dead protected species

Species Name	Caught in net	Caught on warp or door	Other	Unknown	Total
Birds					
Buller's albatross	6	1		1	8
Buller's and Pacific albatross	2				2
Cape petrels	1				1
Giant petrels (Unidentified)			1		1
Salvin's albatross	11	1		2	14
Shearwaters	5				5
Sooty shearwater	11			1	12
White-capped albatross	2	3		1	6
White-chinned petrel	11				11
Birds Total	**49**	**5**	**1**	**5**	**60**
Marine Mammals					
New Zealand fur seal	32				32
Marine Mammals Total	**32**				**32**
Protected Fish					
Porbeagle shark	2				2
Basking shark	1				1
Protected Fish Total	**3**				**3**
Grand Total	**84**	**5**	**1**	**5**	**95**

c) Decomposing protected species

Species Name	Caught in net	Total
Birds		
Salvin's albatross	1	1
Birds Total	**1**	**1**
Marine Mammals		
New Zealand fur seal	1	1
Marine Mammals Total	**1**	**1**
Grand Total	**2**	**2**

Southern Blue Whiting

The southern blue whiting fishery is both spatially and temporally distinct from other middle depth trawl fisheries. The location of fishing effort is variable and dependent of the presence of spawning aggregations of southern blue whiting. Most effort occurs in the waters around Campbell Island. Unlike other middle depth trawl fisheries, protected species interactions tend to be dominated by marine mammal captures, specifically fur seals. Sea lion captures, however, have occurred in most years at variable levels (up to 14) (Rowe 2009, Rowe 2010, Ramm 2010, Ramm 2012a, Ramm 2012b, Clemens-Seely et al. 2014., Clemens-Seely & Hjorvarsdottir 2016, Hjorvarsdottir 2016).

Historically, the southern blue whiting fishery is one of the most highly observed fisheries (Clemens-Seely et al. 2014). In the 2015/16 observer year, the observer coverage achieved was 99.9%, with only one tow that wasn't observed. All tows recorded were in the SUB FMA.

The number of seabird captures in the 2015/16 observer year were similar to the year before (2014/15), although the rate increased by 14% (Hjorvarsdottir 2016) due to a decrease in effort in the 2015/16 observer year. Mammal captures decreased by 56% from the previous observer year (2014/15) (Hjorvarsdottir 2016).

In summary, 16 trips were conducted on board ten vessels, with protected species captures occurring on ten trips on board eight vessels.

Table 4. Summary of commercial effort, observer effort and protected species captures in the southern blue whiting fishery during the 2015/16 observer year.

FMA	Effort tows	Observed tows	Coverage (%)	Seabird captures *	Seabirds per 100 tows	Mammal captures	Mammals per 100 tows
1. AKE	-	-	-	-	-	-	-
2. CEE	-	-	-	-	-	-	-
3. SEC	-	-	-	-	-	-	-
4. SOE	-	-	-	-	-	-	-
5. SOU	-	-	-	-	-	-	-
6. SUB	669	668	99.9	25	3.7	47	7.0
7. CHA	-	-	-	-	-	-	-
8. CEW	-	-	-	-	-	-	-
9. AKW	-	-	-	-	-	-	-
Total	**669**	**668**	**99.9**	**25**	**3.7**	**47**	**7.0**

Table 5 reports the numbers of interactions by species and fate immediately post interaction for the 2015/16 observer year. In comparison to the 2014/15 fishing year, observed interactions declined by 41%, mainly due to fewer New Zealand fur seal interactions (Hjorvarsdottir 2016). All the marine mammal interactions resulted in mortalities.

Table 5. Protected species interactions in the southern blue whiting fishery during the 2015/16 observer year.

Species Name	Alive	Dead	Total
Birds			
Campbell albatross	1		1
Cape petrels	1		1
Grey petrel	12	6	18
Light-mantled sooty albatross	2	1	3
Salvin's albatross		2	2
Birds Total	**16**	**9**	**25**
Marine Mammals			
New Zealand sea lion		6	6
New Zealand fur seal		41	41
Marine Mammals Total		**47**	**47**
Grand Total	**16**	**56**	**72**

Tables 6 a & b detail the broad method of interactions by species. Net capture was the most prevalent form of interaction and exclusively resulted in mortalities. Almost half of the protected species interactions that resulted in mortalities occurred on a single vessel during a single trip. Seven of the mammal interactions that resulted in mortalities were recorded as 'other', the remarks stated that these animals had been caught in the Sea Lion Exclusion Device (SLED).

Table 6. Method if interaction for a) protected species released alive and b) dead protected species observed in the southern blue whiting fishery during the 2015/16 observer year.

a) Protected species released alive

Species Name	Impact against vessel	Total
Birds		
Campbell albatross	1	1
Cape petrels	1	1
Grey petrel	12	12
Light-mantled sooty albatross	2	2
Birds Total	**16**	**16**
Grand Total	**16**	**16**

b) Dead protected species

Species Name	Caught in net	Caught on warp or door	Impact against vessel	Other	Unknown	Total
Birds						
Grey petrel	4		1		1	6
Light-mantled sooty albatross			1			1
Salvin's albatross		2				2
Birds Total	**4**	**2**	**2**		**1**	**9**
Marine Mammals						
New Zealand sea lion	4			2		6
New Zealand fur seal	36			5		41
Marine Mammals Total	**40**			**7**		**47**
Grand Total	**44**	**2**	**2**	**7**	**1**	**56**

Scampi

Observations in the scampi fishery are undertaken primarily to monitor interactions with seabirds and New Zealand sea lions. Historically, captures of seabirds by this fishery have been recorded in most areas, with known captures of black petrels in AKE, along with captures of New Zealand sea lions in the SUB FMA.

The observer coverage in the scampi fishery has been decreasing for the past two observer years (2013/14 and 2014/15) (Clemens-Seely & Hjorvarsdottir, 2016; Hjorvarsdottir, 2017). In the 2015/16 observer year, the observer coverage was similar to the previous observer year, while effort and number of observed tows both increased slightly. Unlike the 2014/15 observer year, where all observed tows were in the SEC and SOE FMAs (Hjorvarsdottir 2016), the observed tows in 2015/16 were distributed between the AKE, SEC, SOE and SUB FMAs, with the greatest number of tows recorded in SOE.

Only ten seabird interactions were observed, with the rate going down by 35% from the previous observer year (2014/15) (Hjorvarsdottir 2016). Coral catch was 27 kg this observer year, with branching stony corals being the only species observed. Only one mammal interaction was recorded.

In summary, four trips were conducted on board three vessels, with protected species captures occurring on three trips on board all three vessels.

Table 7. Summary of commercial effort, observer effort and protected species captures in the scampi fishery during the 2015/16 observer year.

FMA	Effort tows	Observed tows	Coverage (%)	Seabird captures *	Seabirds per 100 tows	Mammal captures	Mammals per 100 tows	Coral catch (kg)	Coral catch per 100 tows
1. AKE	865	72	8.3	7	9.7	0	0.0	0.0	0.0
2. CEE	630	0	0.0	-	-	-	-	-	-
3. SEC	5	2	40.0	0	0.0	0	0.0	0.0	0.0
4. SOE	2,222	140	6.3	3	2.1	1	0.7	27.0	19.3
5. SOU	0	-	-	-	-	-	-	-	-
6. SUB	1,142	22	1.9	0	0.0	0	0.0	0.0	0.0
7. CHA	136	0	0.0	-	-	-	-	-	-
8. CEW	0	-	-	-	-	-	-	-	-
9. AKW	0	-	-	-	-	-	-	-	-
Total	**5,000**	**236**	**4.7**	**10**	**4.2**	**1**	**0.4**	**27.0**	**11.4**

Table 8 reports the number of interactions by species and fate immediately post interaction. Nearly all the interactions resulted in the live release of the animal involved, excluding two seabird interactions that resulted in mortalities. Flesh-footed shearwaters were the most commonly caught species.

Table 8. Protected species interactions in the scampi fishery during the 2015/16 observer year.

Species Name	Alive	Dead	Total
Birds			
Flesh-footed shearwater	5	1	6
Grey-backed storm petrel	1		1
Salvin's albatross	1		1
Storm petrels	1		1
White-capped albatross		1	1
Birds Total	**8**	**2**	**10**
Marine Mammals			
New Zealand fur seal	1		1
Marine Mammals Total	**1**		**1**
Grand Total	**9**	**2**	**11**

Tables 9 a and b detail the broad method of interactions for each species. The majority of the interactions were recorded as 'other' by the observers, and remarks stated that the seabirds had landed on deck and were assisted off the vessel.

Table 9. Method of interaction for a) Protected species released alive and b) dead protected species observed in the scampi fishery during the 2015/16 observer year.

a) Protected species released alive

Species Name	Caught in net	Impact against vessel	Tangled in line	Other	Total
Birds					
Flesh-footed shearwater				5	5
Grey-backed storm petrel				1	1
Salvin's albatross			1		1
Storm petrels		1			1
Birds Total		**1**	**1**	**6**	**8**
Marine Mammals					
New Zealand fur seal	1				1
Marine Mammals Total	**1**				**1**
Grand Total	**1**	**1**	**1**	**6**	**9**

b) Dead protected species

Species Name	Caught in net	Caught on warp or door	Total
Birds			
Flesh-footed shearwater	1		1
White-capped albatross		1	1
Birds Total	**1**	**1**	**2**
Grand Total	**1**	**1**	**2**

Squid

Observer coverage in the squid fishery is often higher than other trawl fisheries due to previous high rates of bycatch of New Zealand sea lions and seabirds. The bulk of the seabirds captures have included white-capped albatross, sooty shearwaters and white-chinned petrels and this trend continues into the current year, although sooty shearwater interactions were lower than in previous years. Being over 28m in length, all vessels in this fishery are required to deploy one of the three permitted types of seabird mitigation devices (tori line, warp scarer, or bird baffler), industry defined codes of practice also apply and are monitored against by observers. Offal has been identified as a key issue leading to warp captures in this fishery. Vessel Management Plans have been developed to ensure each vessel has a specific plan to manage discharge of offal during fishing activity.

Particularly in the SQU6T area around the Auckland Islands, the observer coverage is focused on recording New Zealand sea lion captures. Sea Lion Exclusion Devices (SLEDs) are used by all vessels operating in the SQU6T fishery. The majority of observer coverage in the squid fishery has been targeted at the SQU6T fishery, with high levels of coverage also being achieved in SOU as the vessels trawl enroute to and from SQU6T.

Seabird captures in this fishery tend to vary between years' dependent upon the spatial and temporal activity of vessels and its overlap with breeding seabirds, in particular white-chinned petrels and sooty shearwaters. In comparison to the previous observer year (2014/15), the rate of seabird captures decreased by 43% (Hjorvarsdottir 2016), with 343 observed seabird interactions. Majority of the seabird captures occurred in the SOU and SUB FMAs. The rate of mammal captures also decreased from the previous year (Hjorvarsdottir 2016), with only ten mammal interactions recorded. The rate of coral catch increased significantly from the previous observer year, reaching 83.9 kg or coral per 100 tows this year in comparison to 6.9 kg last year (Hjorvarsdottir 2016). This was likely due to a few trips that had a large amount of coral catch. For example, on one trip in the SOU FMA, 700 kg of unidentified coral was caught.

In summary, 60 trips were conducted on board 20 vessels, with protected species captures occurring on 49 trips on board 19 vessels.

Table 10. Summary of commercial effort, observer effort and protected species captures in the squid fishery during the 2015/16 observer year.

FMA	Effort tows	Observed tows	Coverage (%)	Seabird captures *	Seabirds per 100 tows	Mammal captures	Mammals per 100 tows	Protected fish captures	Protected fish per 100 tows	Coral catch (kg)	Coral catch per 100 tows
1. AKE	6	0	0.0	-	-	-	-	-	-	-	-
2. CEE	0	-	-	-	-	-	-	-	-	-	-
3. SEC	475	125	26.3	4	3.2	6	4.8	0	-	637.7	510.2
4. SOE	17	15	88.2	0	0.0	0	-	0	-	104	693.3
5. SOU	1003	959	95.6	154	16.1	1	0.1	0	-	1189.7	124.1
6. SUB	1342	1,267	94.4	185	14.6	3	0.2	1	0.08	54.3	4.3
7. CHA	0	-	-	-	-	-	-	-	-	-	-
8. CEW	0	-	-	-	-	-	-	-	-	-	-
9. AKW	0	-	-	-	-	-	-	-	-	-	-
Total	**2,843**	**2,366**	**83.2**	**343**	**14.5**	**10**	**0.4**	**1**	**0.04**	**1985.7**	**83.9**

Table 11 reports the numbers of interactions by species and fate immediately post interactions. Similar to previous years, white-chinned petrel, sooty shearwater and white-capped albatross accounted for a large part of the seabird interactions, although the sooty shearwater interactions declined by 79% from the 2014/15 observer year (Hjorvarsdottir 2016). In addition, the number of Buller's albatross captures increased from the previous observer year, with 34 recorded this observer year, in comparison to five in the 2014/15 observer year. White-chinned petrel interactions were fewer than in the 2014/15 observer year (Hjorvarsdottir 2016). However, the number of white-chinned petrels caught in the past two observer years have been around and over 50% higher than in the observer years before (2013/14).

Table 11. Protected species interactions in the squid fishery during the 2015/16 observer year.

Species Name	Alive	Dead	Decomposing	Unknown	Total
Birds					
Albatrosses (Unidentified)	6			1	7
Black (Parkinson's) petrel		2			2
Buller's albatross	7	27			34
Buller's and Pacific albatross		6			6
Cape petrels	1				1
Common diving petrel	6	7		2	15
Great albatrosses	1				1
Mid-sized Petrels & Shearwaters	2				2
Petrel (Unidentified)	1				1
Petrels, Prions and Shearwaters	1				1
Procellaria petrels	8	2			10
Salvin's albatross	2	5			7
Shearwaters	1	4		1	6
Smaller albatrosses	5				5
Sooty shearwater	5	18			23
Storm petrels	9	1		5	15
White-capped albatross	28	40	1		69
White-chinned petrel	31	98			129
White-headed petrel	7			1	8
Birds Total	**121**	**210**	**1**	**10**	**342**
Marine Mammals					
Seals and Sealions			1		1
New Zealand fur seal		10			10
Marine Mammals Total		**10**	**1**		**11**
Protected Fish					
White pointer shark	1				1
Protected Fish Total	**1**				**1**
Grand Total	**122**	**220**	**2**	**10**	**354**

Tables 12a, b, c, and d detail the broad method of interactions for each species. Net capture was the most prevalent form of interaction overall, and was responsible for 77% of the interactions that resulted in mortalities. Fourteen interactions were recorded as other; one white pointer shark, one fur seal and one white-chinned petrel retrieved from the Sea Lion Exclusion Device (SLED), one unidentified albatross that landed on the deck of the vessel, and one Buller's albatross, two white-capped albatrosses, four white-chinned petrels and three Salvin's albatrosses that got tangled in the net lines.

Table 12. Method of interaction for a) protected species released alive, b) dead protected species, c) Decomposing protected species and d) protected species with unknown fate in the squid fishery during the 2015/16 observer year.

a) Protected species released alive

Species Name	Caught in net	Impact against vessel	Other	Tangled in line	Unknown	Total
Birds						
Albatrosses (Unidentified)	3	2	1			6
Buller's albatross	7					7
Cape petrels	1					1
Common diving petrel		5			1	6
Great albatrosses	1					1
Mid-sized Petrels & Shearwaters	2					2
Petrel (Unidentified)	1					1
Petrels, Prions and Shearwaters	1					1
Procellaria petrels	8					8
Salvin's albatross	1		1			2
Shearwaters	1					1
Smaller albatrosses	4	1				5
Sooty shearwater	5					5
Storm petrels		9				9
White-capped albatross	25	2		1		28
White-chinned petrel	28	2		1		31
White-headed petrel		7				7
Birds Total	**88**	**28**	**2**	**2**	**1**	**121**
Protected Fish						
White pointer shark			1			1
Protected Fish Total			**1**			**1**
Grand Total	**88**	**28**	**3**	**2**	**1**	**122**

b) Dead protected species

Species Name	Caught in net	Caught on warp or door	Impact against vessel	Other	Tangled in line	Unknown	Total
Birds							
Black (Parkinson's) petrel	2						2
Buller's albatross	18	8		1			27
Buller's and Pacific albatross	2	4					6
Common diving petrel			7				7
Procellaria petrels	2						2
Salvin's albatross	3			2			5
Shearwaters	4						4
Sooty shearwater	18						18
Storm petrels			1				1
White-capped albatross	23	14	1	2			40
White-chinned petrel	89			5	1	3	98
Birds Total	**161**	**26**	**9**	**10**	**1**	**3**	**210**
Marine Mammals							
New Zealand fur seal	9			1			10
Marine Mammals Total	**9**			**1**			**10**
Grand Total	**170**	**26**	**9**	**11**	**1**	**3**	**220**

c) Decomposing protected species

Species Name	Caught in net	Total
Birds		
White-capped albatross	1	1
Birds Total	**1**	**1**
Marine Mammals		
Seals and Sealions	1	1
Marine Mammals Total	**1**	**1**
Grand Total	**2**	**2**

d) Protected species with unknown fate

Species Name	Caught on warp or door	Impact against vessel	Total
Birds			
Albatrosses (Unidentified)	1		1
Common diving petrel		2	2
Shearwater		1	1
Storm petrels		5	5
White-headed petrel		1	1
Birds Total	**1**	**9**	**10**
Grand Total	**1**	**9**	**10**

Pelagic Trawl Fisheries

Jack Mackerel and Barracouta

In previous years, common dolphins have been captured in the pelagic trawl fishery and in some instances multiple capture events have occurred. A Marine Mammal Operating Procedure (MMOP) has been developed by industry to reduce dolphin captures. These practices include not setting or hauling at certain times of the day in certain areas, a watch being kept for dolphins in the vicinity of fishing operations, trawl doors being hauled partially on deck whilst turning (in order to close off the mouth of the net) and not setting while dolphins are present close to the vessel. As all the vessels in this fishery are larger than 28m and are required by law to deploy bird capture mitigation devices.

The observer coverage levels in this fishery have been increasing for the past years, with the 2014/15 observer year coverage levels reaching 57% (Clemens-Seely & Hjorvarsdottir, 2016), the highest percentage since 2004/05 (Rowe 2009, Rowe 2010, Ramm 2010, Ramm 2012a, Ramm 2012b, Clemens-Seely et al. 2014 and Clemens-Seely & Hjorvarsdottir 2016). This year's coverage was 52.2%, with the highest numbers of observed tows reported from the SOU, CEW and AKW FMAs. Differences between observed and commercially reported tows are apparent in the data; this may be due to differences in reported target species or FMA.

The rate of seabird captures was very similar to the previous observer year (2014/15) (Hjorvarsdottir, 2017). The highest rate of seabird captures was reported from the SOU and SEC FMAs. The rate of mammal captures decreased by 75% (Hjorvarsdottir, 2017), with only six recorded interactions this year.

In summary, 62 trips were conducted on board 15 vessels, with protected species captures occurring on 23 trips on board 11 vessels.

Table 13. Summary of commercial effort, observer effort and protected species captures in the jack mackerel and barracouta pelagic trawl fishery during the 2015/16 observer year.

FMA	Effort tows	Observed tows	Coverage (%)	Seabird captures *	Seabirds per 100 tows	Mammal captures	Mammals per 100 tows	Coral catch (kg)	Coral catch per 100 tows
1. AKE	9	1	11.1	0	0.0	0	0.0	0	0.0
2. CEE	97	0	0.0	-	-	-	-	-	-
3. SEC	1,160	207	17.8	16	7.7	0	0.0	0	0.0
4. SOE	164	108	65.9	6	5.6	0	0.0	0	0.0
5. SOU	333	329	98.8	22	6.7	2	0.6	0.1	0.0
6. SUB	0	-	-	-	-	-	-	-	-
7. CHA	1,160	494	42.6	1	0.2	1	0.2	2.7	0.5
8. CEW	633	572	90.4	0	0.0	2	0.3	0.4	0.1
9. AKW	195	246	126.2	2	0.8	1	0.4	0.3	0.1
Total	**3,751**	**1,957**	**52.2**	**47**	**2.4**	**6**	**0.3**	**3.5**	**0.2**

Table 14 reports the number of interactions by species and fate immediately post interaction. Sooty shearwater, white-capped albatross and Salvin's albatross were the most commonly caught species. Unlike the two previous fishing years (2013/14 and 2014/15) (Clemens-Seely & Hjorvarsdottir 2016, Hjorvarsdottir 2016), there were only two common dolphin interactions, a 90% decline since the 2014/15 fishing year (Hjorvarsdottir 2016). Over 85% of the interactions resulted in mortalities.

Table 14. Protected species interactions in the jack mackerel and barracouta pelagic trawl fisheries furing the 2015/16 observer year.

Species Name	Alive	Dead	Total
Birds			
Australasian gannet	1		1
Broad-billed prion		1	1
Buller's albatross		7	7
Cape petrels	1		1
Common diving petrel	1	2	2
Petrel (Unidentified)		2	2
Petrels, Prions and Shearwaters		1	1
Salvin's albatross	1	7	8
Sooty shearwater	1	10	11
White-capped albatross	2	7	9
White-chinned petrel		3	3
Birds Total	**7**	**40**	**46**
Marine Mammals			
Common dolphin		2	2
New Zealand fur seal		3	3
New Zealand sea lion		1	1
Marine Mammals Total		**6**	**6**
Grand Total	**7**	**46**	**53**

Table 15a and b detail the broad method of interaction for each species. Net capture was the most prevalent form of interaction overall, and was responsible for 87% of the interactions that resulted in mortalities. Four interactions were recorded as 'other'; one was found under a plastic covering of a crate, one deck strike, one landing on deck, and one caught on the paravane.

Table 15. Method of interaction for a) protected species released alive and b) dead protected species observed in the jack mackerel and barracouta pelagic trawl fisheries during the 2015/16 observer year.

a) Protected species released alive

Species Name	Caught in net	Other	Total
Birds			
Australasian gannet	1		1
Cape petrels		1	1
Common diving petrel	1		1
Salvin's albatross	1		1
Sooty shearwater	1		1
White-capped albatross	1	1	2
Birds Total	**5**	**2**	**7**
Grand Total	**5**	**2**	**7**

b) Dead protected species

Species Name	Caught in net	Caught on warp or door	Other	Unknown	Total
Birds					
Broad-billed prion	1				1
Buller's albatross	6		1		7
Common diving petrel	2				2
Petrel (Unidentified)	2				2
Petrels, Prions and Shearwaters			1		1
Salvin's albatross	4	2		1	7
Sooty shearwater	10				10
White-capped albatross	6	1			7
White-chinned petrel	3				3
Birds Total	34	3	2	1	40
Marine Mammals					
Common dolphin	2				2
New Zealand fur seal	3				3
New Zealand sea lion	1				1
Marine Mammals Total	**6**				**6**
Grand Total	**40**	**3**	**2**	**1**	**46**

Deep water Bottom Trawl Fisheries

Orange Roughy, Cardinal and Oreo species

In deep water bottom trawl fisheries, one of the main focuses of observer coverage is to describe the impact of the trawls on benthic communities, more specifically protected corals, particularly on the Chatham rise. Seabird behaviour and abundance is also monitored around the vessels in this fishery. Discard, offal and management, as well as the mandatory use of bird scaring devices are employed by the fleet to mitigate seabird interactions.

The observer coverage in the orange roughy, cardinal, and oreo deep water bottom trawl fisheries has been increasing for the past two observer years (Hjorvarsdottir 2016), reaching an overall observer coverage of 36% this observer year. Observations were conducted in all FMAs, with the highest coverage in SOE.

The rate of seabird captures increased by 50% in comparison to the previous observer year (2014/15) (Hjorvarsdottir 2016). However, the rate of seabird captures was 0.6 seabirds per 100 tows, with only 9 seabird interactions recorded. The rate of coral catch for this observer year was 714.1 kg per 100 tows, in comparison to 27.58 kg in the last observer year (Hjorvarsdottir, 2016). Majority of the coral catch was recorded as hydrocorals and coral rubble. Majority of the catch came from one trip in the SOE FMA, with recorded 10,092 kg of coral rubble and 500 kg of hydrocorals. Only one mammal capture was recorded in this observer year.

In summary, 24 trips were conducted on board 12 vessels, with protected species captures occurring on six trips on board five vessels.

Table 16. Summary of commercial effort, observer effort and protected species captures in the orange roughy, cardinal and oreo deep water bottom trawl fisheries during the 2015/16 observer year.

FMA	Effort tows	Observed tows	Coverage (%)	Seabird captures *	Seabirds per 100 tows	Mammal captures	Mammals per 100 tows	Coral catch (kg)	Coral catch per 100 tows
1. AKE	227	4	1.8	0	-	0	-	0	0.0
2. CEE	538	90	16.7	0	-	0	-	19	21.1
3. SEC	506	52	10.3	0	-	0	-	4	7.7
4. SOE	1,912	909	47.5	7	0.8	1	0.1	10858.9	1194.6
5. SOU	50	29	58.0	0	-	0	-	38.2	131.7
6. SUB	258	95	36.8	1	1.1	0	-	2.7	2.8
7. CHA	323	99	30.7	0	0.0	0	-	6.6	6.7
8. CEW	28	0	0.0	-	-	-	-	-	-
9. AKW	430	264	61.4	1	0.4	0	-	81.7	30.9
Total	**4,272**	**1,542**	**36.1**	**9**	**0.6**	**1**	**0.1**	**11011.1**	**714.1**

Table 17 reports the number of interactions by species and fate immediately post interactions. Observed interactions this fishing year increased to thirteen from three in the year before (14/15) (Hjorvarsdottir 2016). Only 38% of the interactions resulted in live releases, and three interactions were recorded as 'unknown' and were noted to have been tossed overboard before observer could assess the animals.

Table 17. Protected species interactions in the orange roughy, cardinal and oreo deep water bottom trawl fisheries during the 2015/16 observer year.

Species Name	Alive	Dead	Unknown	Total
Birds				
Albatrosses (Unidentified)			1	1
Buller's albatross	1			1
Chatham Island albatross		1		1
Great-winged (Grey-faced) petrel	3			3
Petrels, Prions and Shearwaters			1	1
Salvin's albatross		3		3
White-chinned petrel			1	1
White-faced storm petrel	1			1
Birds Total	**5**	**4**	**3**	**12**
Marine Mammals				
New Zealand fur seal		1		1
Marine Mammals Total		**1**		**1**
Grand Total	**5**	**5**	**3**	**13**

Table 18a, b, and c detail the broad method of interaction for each species. Net capture was the most prevalent form of interaction, with over 70% of them resulting in mortalities. One interaction was recorded as 'other', as the bird was found in the pound after a tow and it was assumed that it flew in on its own.

Table 18. Method of interaction for a) protected species released alive, b) dead protected species and c) protected species with unknown fate observed in the orange roughy, cardinal and oreo deep water bottom trawl fisheries during the 2015/16 observer year.

a) Protected species released alive

Species Name	Caught in net	Impact against vessel	Other	Total
Birds				
Buller's albatross	1			1
Great-winged (Grey-faced) petrel		3		3
White-faced storm petrel			1	1
Birds Total	**1**	**3**	**1**	**5**
Grand Total	**1**	**3**	**1**	**5**

b) Dead protected species

Species Name	Caught in net	Total
Birds		
Chatham Island albatross	1	1
Salvin's albatross	3	3
Birds Total	**4**	**4**
Marine Mammals		
New Zealand fur seal	1	1
Marine Mammals Total	**1**	**1**
Grand Total	**5**	**5**

c) Protected species with unknown fate

Species Name	Caught in net	Caught on warp or door	Unknown	Total
Birds				
Albatrosses (Unidentified)		1		1
Petrels, Prions and Shearwaters			1	1
White-chinned petrel	1			1
Birds Total	**1**	**1**	**1**	**3**
Grand Total	**1**	**1**	**1**	**3**

Inshore Fisheries

Inshore Trawl

Inshore fishing within the New Zealand EEZ is an immensely diverse activity, with large amounts of variation in individual practice and effort. In the case of trawl and bottom longline, it becomes difficult to draw a simple distinction between the inshore and offshore sectors, as a number of vessels make seasonal shifts across this artificial boundary. Individual vessels can range in size from just two metres in length to over thirty metres. Equally, activity can range from 20 days per year to over 300 for each vessel. Overly simplified characterisation of the inshore sector is problematic and may lead to false conclusions about the fishery. Therefore, it is critical when gathering information on the inshore fishing sector to get as broad and representative coverage as possible.

Observer coverage of inshore fisheries has historically been at very low levels due to the inherent difficulties of placing observers on small vessels in remote ports. Additionally, many of the fishers only operate part time, either seasonally or sporadically. As a result, observers often spend much of their time on shore or travelling between ports.

For the past two observer years (2013/14 and 2014/15) observer coverage has increased substantially (Clemens-Seely & Hjorvarsdottir 2016, Hjorvarsdottir 2016). This year, it increased again, now up to 4.5% overall coverage. Much of the increased coverage for the past years has occurred in the AKE snapper fishery, which was driven out of ministerial directives for high levels of coverage to monitor snapper discards. This year, the coverage levels in AKW increased by 85%. This increase was driven by a combination of snapper discards and Māui dolphin bycatch monitoring.

The rate of seabird captures increased by 21% from the previous observer year (2014/15) (Hjorvarsdottir 2016), with 34 observed seabird interactions. Seven marine mammal interactions were observed. All interactions occurred in the AKE and AKW FMAs, which were also the FMAs with the highest number of observed tows.

In summary, 50 trips were conducted on board 23 vessels, with protected species captures occurring on 11 trips on board eight vessels.

Table 19. Summary of the commercial effort, observer effort and protected species captures in the inshore trawl fisheries during the 2015/16 observer year.

FMA	Effort tows	Observed tows	Coverage (%)	Seabird captures *	Seabirds per 100 tows	Mammal captures	Mammals per 100 tows	Coral catch (kg)	Coral catch per 100 tows
1. AKE	5,822	789	13.6	20	2.5	4	0.5	24.8	3.1
2. CEE	7,882	17	0.2	0	0.0	0	0.0	0.0	0.0
3. SEC	10,707	85	0.8	0	0.0	0	0.0	0.0	0.0
4. SOE	52	0	0.0	-	-	-	-	-	-
5. SOU	3,632	0	0.0	-	-	-	-	-	-
6. SUB	4	1	25.0	0	0.0	0	0.0	0.0	0.0
7. CHA	10,468	1	0.0	0	0.0	0	0.0	0.0	0.0
8. CEW	1,717	4	0.2	0	0.0	0	0.0	0.0	0.0
9. AKW	2,921	1,068	36.6	14	1.3	3	0.3	1	0.1
Total	**43,205**	**1,965**	**4.5**	**34**	**1.7**	**7**	**0.4**	**25.8**	**1.3**

Table 20 reports the number of interactions by species and fate immediately post interaction. Seabird and mammal interactions were in similar numbers to the previous year (2014/15) (Hjorvarsdottir 2016). However, this year, two marine reptile interactions were observed, one that resulted in the live release of the animal and one that ended in mortality.

Table 20. Protected species interactions in the inshore trawl fisheries during the 2015/16 observer year.

Species Name	Alive	Dead	Unknown	Total
Birds				
Black (Parkinson's) petrel		2		2
Buller's shearwater	1			1
Common diving petrel	3			3
Flesh-footed shearwater	1			1
Fluttering shearwater	1			1
Great-winged (Grey-faced) petrel	2			2
Procellaria petrels	10		1	11
Shearwaters	2			2
Storm petrels	2			2
Westland petrel	2			2
White-capped albatross		2		2
White-faced storm petrel	4			4
Birds Total	**28**	**4**	**1**	**33**
Marine Mammals				
Common dolphin		4		4
New Zealand fur seal	1			1
Marine Mammals Total	**1**	**4**		**5**
Marine Reptiles				
Green turtle	1			1
Leatherback turtle		1		1
Marine Reptiles Total	**1**	**1**		**2**
Other				
Unidentifiable			1	1
Other total			**1**	**1**
Grand Total	**30**	**9**	**2**	**41**

Table 14a, b and c detail the broad method of interaction for each species. Net capture was the most prevalent form of interaction, but resulted in the live release of the animal involved in 65% of the interactions. Over 87% of the seabird interactions resulted in the live release of the animals.
One animal was recorded as ‘unidentifiable’; feathers and bones were discovered in the splicing of the warp wire, but no samples were taken due to safety issues. Although the unidentifiable animal was recorded with unknown fate, it is likely, due to the feathers and bones seen, that the animal did not survive.

Table 21. Method of interaction for a) protected species released alive, b) dead protected species and c) protected species with unknown fate observed in the inshore trawl fisheries during the 2015/16 observer year.

a) Protected species released alive

Species Name	Caught in net	Impact against vessel	Other	Total
Birds				
Buller's shearwater			1	1
Common diving petrel		1	2	3
Flesh-footed shearwater	1			1
Fluttering shearwater			1	1
Great-winged (Grey-faced) petrel		2		2
Procellaria petrels	10			10
Shearwaters	2			2
Storm petrels			2	2
Westland petrel			2	2
White-faced storm petrel		3	1	4
Birds Total	**13**	**6**	**9**	**28**
Marine Mammals				
New Zealand fur seal	1			1
Marine Mammals Total	**1**			**1**
Marine Reptiles				
Green turtle	1			1
Marine Reptiles Total	**1**			**1**
Grand Total	**15**	**6**	**9**	**30**

b) Dead protected species

Species Name	Caught in net	Caught on warp or door	Total
Birds			
Black (Parkinson's) petrel	2		2
White-capped albatross		2	2
Birds Total	**2**	**2**	**4**
Marine Mammals			
Common dolphin	4		4
Marine Mammals Total	**4**		**4**
Marine Reptiles			
Leatherback turtle	1		1
Marine Reptiles Total	**1**		**1**
Grand Total	**7**	**2**	**9**

c) Protected species with unknown fate

Species Name	Caught in net	Caught on warp door	Total
Birds			
Procellaria petrels	1		1
Birds Total	**1**		**1**
Other			
Unidentifiable		1	1
Other Total		**1**	**1**
Grand Total	**1**	**1**	**2**

Inshore Setnet

Setnet fisheries have received low levels of observer coverage due to the difficulty of placing observers on board these generally very small vessels. However, in recent years increased monitoring has occurred in some areas, driven by Threat Management Plans for Hector's and Māui dolphins. Captures of a number of protected species have been reported in the past, including Hector's dolphins, yellow-eyed penguins, shags, sooty shearwaters and Westland petrels. Setnet is one of the few fisheries, like inshore trawl by vessels under 28m, which does not have any regulated mitigation device requirements. As with inshore trawl, spatial closures have been put in place to reduce the risk of interaction with Hector's and Māui dolphins.

Observer coverage was initially low in this fishery but increased in 2008/09 due to concerns about Hector's dolphin bycatch. However, the observer coverage this year decreased by 41%, from the 2014/15 observer year (Hjorvarsdottir 2016), mainly due to a lower number of observed tows in CEW and SOU FMAs.

In comparison to the previous observer year (2014/2015), the rate of seabird captures tripled (Hjorvarsdottir 2016), with 17 observed seabird interactions, all occurring in the SEC and CEW FMAs. The number of mammal captures decreased from 18 captures in the 2014/15 observer year (Hjorvarsdottir 2016) to only two observed captures this year.

In summary, 13 trips were conducted on board five vessels, with protected species captures occurring on five trips on board two vessels.

Table 22. Summary of commercial effort, observer effort and protected species captures in the inshore setnet fishery during the 2015/16 observer year.

FMA	Effort tows	Observed tows	Coverage (%)	Seabird captures *	Seabirds per 100 tows	Mammal captures	Mammals per 100 tows	Coral catch (kg)	Coral catch per 100 tows
1. AKE	5,474	0	0.0	-	-	-	-	-	-
2. CEE	776	0	0.0	-	-	-	-	-	-
3. SEC	4,482	118	2.6	15	12.7	1	0.8	101	85.6
4. SOE	19	0	0.0	-	-	-	-	-	-
5. SOU	608	49	8.1	0	0.0	0	0.0	160	326.5
6. SUB	1	-	-	-	-	-	-	-	-
7. CHA	816	0	0.0	-	-	-	-	-	-
8. CEW	1,223	207	16.9	2	1.0	1	0.5	0.00	0.0
9. AKW	5,723	0	0.0	-	-	-	-	-	-
10. KER	1	-	-	-	-	-	-	-	-
Total	**19,123**	**374**	**2.0**	**17**	**4.5**	**2**	**0.5**	**261**	**69.8**

Table 23 reports the number of interactions by species and fate immediately post interaction. Over half of the interactions resulted in the live release of the animals involved. Unlike the previous fishing year (14/15) (Hjorvarsdottir 2016) no New Zealand sea lion or New Zealand fur seal interactions were recorded.

Table 23. Protected species interactions in the inshore setnet fishery during the 2015/16 observer year.

Species Name	Alive	Dead	Total
Birds			
Cape petrels		1	1
Flesh-footed shearwater		1	1
Northern giant petrel		1	1
Salvin's albatross	1		1
Stewart Island shag		1	1
White-capped albatross	2		2
White-chinned petrel	7		7
Yellow-eyed penguin		3	3
Birds Total	**10**	**7**	**17**
Marine Mammals			
Dusky dolphin		1	1
Marine Mammals Total		**1**	**1**
Protected Fish			
White pointer shark		1	1
Protected Fish Total		**1**	**1**
Grand Total	**10**	**9**	**19**

Tables 24a and b detail the broad method of interaction for each species. Impact against vessel was the most common form of interaction, and exclusively resulted in the live release of the animals involved. Of the interactions that resulted in mortality, 89% were net captures. One interaction was recorded as 'other'', a white-capped albatross that landed on deck.

Table 24. Method of interactions for a) protected species relased alive and b) dead protected species observed in the setnet fishery during the 2015/16 observer year.

a) Protected species released alive

Species Name	Impact against vessel	Other	Total
Birds			
Salvin's albatross	1		1
White-capped albatross	1	1	2
White-chinned petrel	7		7
Birds Total	**9**	**1**	**10**
Grand Total			

b) Dead protected species

Species Name	Caught in net	Tangled in line	Total
Birds			
Cape petrels	1		1
Flesh-footed shearwater	1		1
Northern giant petrel		1	1
Stewart Island shag	1		1
Yellow-eyed penguin	3		3
Birds Total	**6**	**1**	**7**
Marine Mammals			
Dusky dolphin	1		1
Marine Mammals Total	**1**		**1**
Protected Fish			
White pointer shark	1		1
Protected Fish Total	**1**		**1**
Grand Total	**8**	**1**	**9**

Surface Longline Fisheries

Domestic Tuna and Swordfish

The domestic tuna and swordfish fishery (targeting bigeye, southern bluefin and swordfish) has historically had low levels of observer coverage. This is primarily due to the inherent difficulties in placing observers on these small vessels, which generally work irregular patterns. Consequently, data on this fleet's interactions with protected species are poor. Southern bluefin tuna, bigeye tuna and swordfish were introduced into the quota system at the start of the 2004/05 fishing year. After a large capture event in November 2006, regulations were put in place requiring departure notices and seabird mitigation use (deployment of a streamer line and either line weighting or night setting). CSP has also distributed turtle dehookers to aid in the quick and efficient release of not only turtles but also fur seals and a number of shark species.

Observer coverage in domestic tuna and swordfish has remained fairly constant over the past seven years, fluctuating around 6-8% coverage (Rowe 2010, Ramm 2010, Ramm 2012a, Ramm 2012b, and Clemens-Seely et al. 2014, Clemens-Seely & Hjorvarsdottir 2016). However, last observer year (2014/15) the coverage dropped to 5% (Hjorvarsdottir 2016). The observer coverage this year increased significantly, reaching 11.3%, with a high increase in observed lines in the CEE and CHA FMAs.

The rate of seabird captures increased almost five-fold from the previous observer year (2014/15) (Hjorvarsdottir 2016), with 133 seabird interactions observed. Number of mammal captures also increased from seven captures in the 2014/15 observer year (Hjorvarsdottir 2016) to 21 this year. In addition, six captures of marine turtles were observed.

In summary, 21 trips were conducted on board 18 vessels, with protected species captures occurring on 18 trips on board 15 vessels.

Table 25. Summary of commercial effort, observer effort and protected species captures in the domestic tuna and swordfish fishery during the 2015/16 observer year.

FMA	Effort lines	Observed lines	Coverage (%)	Number of hooks observed	Seabird captures *	Seabirds per 1000 hooks	Mammal captures	Mammals per 100 tows	Marine reptile captures	Marine reptiles per 1000 hooks
1. AKE	903	61	6.8	45,105	15	0.3	4	6.6	3	0.07
2. CEE	688	97	14.1	92,331	16	0.2	14	14.4	3	0.03
3. SEC	0	-	-	-	-	-	-	-	-	-
4. SOE	0	-	-	-	-	-	-	-	-	-
5. SOU	5	4	80.0	3,500	30	8.6	0	0.0	0	0.00
6. SUB	0	-	-	-	-		-	-	-	-
7. CHA	667	118	17.7	123,420	72	0.6	3	2.5	0	0.00
8. CEW	6	0	0.0	-	-	-	-	-	-	-
9. AKW	254	6	2.4	5,150	0	0.0	0	0.0	0	0.00
Total	**2,523**	**286**	**11.3**	**269,506**	**133**	**0.5**	**21**	**7.3**	**6**	**0.02**

Table 26 reports the number of interactions by species and fate immediately post interaction. Number of interactions went up to 160 from being only 18 in the previous fishing year (14/15) (Hjorvarsdottir 2016). The most commonly caught species were white-capped albatross and Buller's albatross. Over 65% of the interactions resulted in mortalities.

Table 26. Protected species interactions in the domestic tuna and swordfish fishery during the 2015/16 observer year.

Species Name	Alive	Dead	Decomposing	Total
Birds				
Albatrosses (Unidentified)	1			1
Antipodean albatross		1		1
Black (Parkinson's) petrel		7		7
Black-browed albatross (Unidentified)		2		2
Buller's albatross	1	22		23
Buller's and Pacific albatross		24	5	29
Common diving petrel	3			3
Great-winged (Grey-faced) petrel	1			1
Grey petrel	2			2
Prions (Unidentified)	2			2
Southern black-browed albatross		3		3
Southern royal albatross	1	1		2
Storm petrels	1			1
Wandering albatross (Unidentified)	2	5	1	8
Westland petrel	2	8		10
White-capped albatross	4	30	4	38
Birds Total	**20**	**103**	**10**	**133**
Marine Mammals				
Bottlenose dolphin	2			2
New Zealand fur seal	17	2		19
Marine Mammals Total	**19**	**2**		**21**
Marine Reptiles				
Leatherback turtle	4			4
Marine turtles	2			2
Marine Reptiles Total	**6**			**6**
Grand Total	**45**	**105**	**10**	**160**

Table 27a, b, and c detail the broad method of interaction for each species. Hook capture was the most prevalent form of interaction, with 69% resulting in mortalities. Ten seabirds were recorded as decomposing and the observers had made remarks stating that they were half eaten or water logged.

Table 27. Method of interaction for a) protected species released alive, b) dead protected species abd c) decomposing protected species observed in the domestic tuna and swordfish fishery during the 2015/16 observer year.

a) Protected species released alive

Species Name	Caught on hook	Impact against vessel	Tangled in line	Total
Birds				
Albatrosses (Unidentified)	1			1
Buller's albatross	1			1
Common diving petrel		3		3
Great-winged (Grey-faced) petrel		1		1
Grey petrel		2		2
Prions (Unidentified)		2		2
Southern royal albatross	1			1
Storm petrels		1		1
Wandering albatross (Unidentified)	1		1	2
Westland petrel	2			2
White-capped albatross	4			4
Birds Total	**10**	**9**	**1**	**20**
Marine Mammals				
Bottlenose dolphin	1		1	2
New Zealand fur seal	17			17
Marine Mammals Total	**18**		**1**	**19**
Marine Reptiles				
Leatherback turtle	4			4
Marine turtles	2			2
Marine Reptiles Total	**6**			**6**
Grand Total	**34**	**9**	**2**	**45**

b) Dead protected species

Species Name	Caught on hook	Tangled in line	Unknown	Total
Birds				
Antipodean albatross	1			1
Black (Parkinson's) petrel	6		1	7
Black-browed albatross (Unidentified)	2			2
Buller's albatross	22			22
Buller's and Pacific albatross	23	1		24
Southern black-browed albatross	3			3
Southern royal albatross	1			1
Wandering albatross (Unidentified)	5			5
Westland petrel	8			8
White-capped albatross	29	1		30
Birds Total	**100**	**2**	**1**	**103**
Marine Mammals				
New Zealand fur seal	2			2
Marine Mammals Total	**2**			**2**
Grand Total	**102**	**2**	**1**	**105**

c) Decomposing protected species

Species Name	Caught on hook	Total
Birds		
Buller's and Pacific albatross	5	5
Wandering albatross (Unidentified)	1	1
White-capped albatross	4	4
Birds Total	**10**	**10**
Grand Total	**10**	**10**

Bottom Longline Fishery

Offshore bottom longline

The offshore bottom longline fishery is observed to monitor seabird and marine mammal interactions. A relatively small fleet conducts a large amount of fishing effort in terms of hook set, mainly in the areas of SOE, SUB and CEE. Regulations on this fishery require the use of tori lines and either night-setting or line weighting. Other industry applied mitigation techniques include gas cannons and offal and bait discard management.

Because of the high variety of vessels and fishing grounds in the bottom longline fisheries, a new characterisation was been applied for the 2014/15 annual research summary. In addition, the 2013/14 observer year was back-calculated for comparison (Hjorvarsdottir 2016). In this new grouping, the offshore bottom longline fishery is characterised as: all bottom longline vessels over 34m in overall length, and all vessels between 20-34m in overall length that set over 5000 hooks per day.

In comparison to last observer year (2014/15) the observer coverage increased from 3.5% up to 9.1% (Hjorvarsdottir 2016). This increase was due to a higher observer coverage in the SEC, SOE and CHA FMAs. The number of seabird captures increased significantly, with 95 observed captures this year in comparison to 13 captures in the 2014/15 observer year (Hjorvarsdottir 2016).

In summary, four trips were conducted on board three vessels, with protected species captures occurring on all trips.

Table 28. Summary of commercial effort, observer effort and protected species captures in the deep-sea bottom longline fishery during the 2015/16 observer year.

FMA	Effort lines	Observed lines	Coverage (%)	Number of hooks observed	Seabird captures *	Seabirds per 1000 hooks	Coral catch (kg)	Coral catch per 1000 hooks
1. AKE	14	0	0.0	-	-	-	-	-
2. CEE	234	0	0.0	-	-	-	-	-
3. SEC	315	13	4.1	67,181	0	0.00	0.0	0.00
4. SOE	2,181	305	14.0	1,879,598	87	0.05	20.7	0.01
5. SOU	92	0	0.0	-	-	-	-	-
6. SUB	544	0	0.0	-	-	-	-	-
7. CHA	189	14	7.4	56,119	8	0.14	0.0	0.00
8. CEW	59	0	0.0	-	-	-	-	-
9. AKW	4	0	0.0	-	-	-	`	-
Total	**3,632**	**332**	**9.1**	**2,002,898**	**95**	**0.05**	**20.7**	**0.01**

Table 29 reports the numbers of interactions by species and fate immediately post interaction. There were 95 seabird interactions recorded this year, in comparison to 13 in the previous year (14/15) (Hjorvarsdottir 2016). White-chinned petrels accounted for 83% of the interactions observed.

Table 29. Protected species interactions in the offshore bottom longline fishery during the 2015/16 observer year.

Species Name	Alive	Dead	Total
Birds			
Buller's albatross	1	1	2
Grey petrel		3	3
Petrel (Unidentified)		1	1
Procellaria petrels		2	2
Royal albatrosses	1		1
Salvin's albatross		6	6
Seabird (unspecified)	1		1
White-chinned petrel	3	76	79
Birds Total	**6**	**89**	**95**
Grand Total	**6**	**89**	**95**

Tables 30 a & b details the broad method of interaction for each species. Hook capture was the most prevalent form of interaction and exclusively resulted in mortalities. Eighty-four of the seabirds caught, including 74 white-chinned petrels, were caught on one vessel during two trips.

Table 30. Method of interaction for a) protected specie released alive and b) dead protected species

a) Protected species released alive

Species Name	Impact against vessel	Other	Total
Birds			
Buller's albatross		1	1
Royal albatrosses		1	1
Seabird (unspecified)	1		1
White-chinned petrel	3		3
Birds Total	**4**	**2**	**6**
Grand Total	**4**	**2**	**6**

b) Dead protected species

Species Name	Caught on hook	Total
Birds		
Buller's albatross	1	1
Grey petrel	3	3
Petrel (Unidentified)	1	1
Procellaria petrels	2	2
Salvin's albatross	6	6
White-chinned petrel	76	76
Birds Total	**89**	**89**
Grand Total	**89**	**89**

Inshore bottom longline – Ling, Bluenose, Hāpuku, and Bass

As with other inshore fishing methods, observer coverage in the inshore bottom longline fishery has been generally limited. In the past, coverage has been focused at certain time periods in selected ports or regions. Mitigation techniques used and tested (to varying extents) in this fishery include; weighting regimes, night setting, use of tori lines and use of fish oil to deter birds. In April 2008, regulations on mitigation were introduced for all bottom longline vessels, covering night setting or line weighting, tori line, and offal/discard management.

Bottom longline vessels targeting the species assemblage of ling, bluenose, hāpuku and bass tend to fish over wide areas with fishing occurring in all FMAs and ranging from 'inshore' to the Chatham rise. These fishing grounds overlap with a number of protected species' ranges, including a number of petrel and albatross species.

Because of the high variety of vessels and fishing grounds in the bottom longline fisheries, a new characterisation was been applied for the 2014/15 annual research summary. In addition, the 2013/14 observer year was back-calculated for comparison (Hjorvarsdottir 2016). In this new grouping, the inshore bottom longline fishery is characterised as: all bottom longline vessels under 20m in overall length, and all vessels between 20-34m in overall length that set 5000 hooks or less per day.

In comparison to the previous fishing year (2014/15), the coverage decreased by 45%, which can mainly be attributed to a drop in observed lines in SEC. The number of seabird captures decreased to nine captures recorded this year, in comparison to 20 recorded in the 2014/15 observer year (Hjorvarsdottir 2016).

In summary, 11 trips were conducted on board eight vessels, with protected species captures occurring on six trips on board three vessels.

Table 31. Summary of commercial effort, observer effort and protected species captures in the inshore bottom longline fisheries during the 2015/16 observer year.

FMA	Effort lines	Observed lines	Coverage (%)	Number of hooks observed	Seabird captures *	Seabirds per 1000 hooks	Coral catch (kg)	Coral catch per 1000 tows
1. AKE	1,277	23	1.8	61,970	2	0.03	0.0	0.00
2. CEE	1,949	7	0.4	16,500	0	0.00	0.0	0.00
3. SEC	505	0	0.0	-	-	-	-	-
4. SOE	500	23	4.6	74,700	0	0.00	0.0	0.00
5. SOU	226	0	0.0	-	-	-	-	-
6. SUB	0	-	-	-	-	-	-	-
7. CHA	1,019	13	1.3	33,500	0	0.00	2.4	0.07
8. CEW	459	126	27.5	140,070	7	0.05	0.0	0.00
9. AKW	605	20	3.3	20,500	0	0.00	0.0	0.00
10. KER	2	0	0.0	0	-	-	-	-
Total	**6,542**	**212**	**3.2**	**347,240**	**9**	**0.03**	**2.4**	**0.01**

Table 32 reports the number of interactions by species and fate immediately post interaction. There was over 50% decline in interactions from the previous year (2014/15) (Hjorvarsdottir 2016), with only nine interactions recorded this fishing year.

Table 32. Protected species interactions in the inshore bottom longline fisheries during the 2015/16 observer year.

Species Name	Alive	Dead	Total
Birds			
Flesh-footed shearwater	2	5	7
Northern giant petrel	1		1
Westland petrel	1		1
Birds Total	**4**	**5**	**9**
Grand Total	**4**	**5**	**9**

Table 33 a and b detail the method of interaction for each species. Hook captures and line entanglements were the only forms of interactions recorded.

Table 33. Method of interaction for a) protected species released alive and b) dead protected species observed in the inshore bottom longline fisherie during the 2015/16 observer year.

a) Protected species released alive

Species Name	Caught on hook	Tangled in line	Total
Birds			
Flesh-footed shearwater	2		2
Northern giant petrel	1		1
Westland petrel		1	1
Birds Total	**3**	**1**	**4**
Grand Total	**3**	**1**	**4**

b) Dead protected species

Species Name	Caught on hook	Total
Birds		
Flesh-footed shearwater	5	5
Birds Total	**5**	**5**
Grand Total	**5**	**5**

Bottom longline – Snapper

Throughout the past eight years, coverage has been irregular in the snapper fishery. Fluctuating between under 1% up to 8% (Hjorvarsdottir 2016). In the 2014/15 observer year, there was no observer coverage due to a switch in observer focus to the bluenose bottom longline fishery.

The observer coverage in this year was all conducted in AKE. The rate of seabird capture was 0.02 seabirds per 1000 hooks, with seven seabird interactions recorded.

In summary, 18 trips were conducted onboard 18 vessels, with protected species captures occurring on four trips onboard four vessels.

Table 34. Summary of commercial effort, observer effort and protected species captures in the snapper bottom longline fishery during the 2015/16 observer year.

FMA	Effort lines	Observed lines	Coverage (%)	Number of hooks observed	Seabird captures *	Seabirds per 1000 hooks
1. AKE	4,703	182	3.87	289,282	7	0.02
2. CEE	0	-	-	-	-	-
3. SEC	0	-	-	-	-	-
4. SOE	0	-	-	-	-	-
5. SOU	0	-	-	-	-	-
6. SUB	0	-	-	-	-	-
7. CHA	29	0	-	-	-	-
8. CEW	10	0	-	-	-	-
9. AKW	53	0	-	-	-	-
Total	**4,795**	**182**	**3.80**	**289,282**	**7**	**0.02**

Table 35 reports the numbers of interactions by species and fate immediately post interaction. Only seven interactions were recorded this fishing year, all of them being flesh-footed shearwaters.

Table 35. Protected species interactions in the snapper bottom longline fishery during the 2015/16 observer year.

Species Name	Alive	Dead	Total
Birds			
Flesh-footed shearwater	3	4	7
Birds Total	**3**	**4**	**7**
Grand Total	**3**	**4**	**7**

Tables 36 a and b) detail the broad method of interactions. Hook capture and line entanglement were the only interaction methods recorded.

Table 36. Method of interaction for a) protected species released alive and b) dead protected species observed in the snapper bottom longline fishery during the 2015/16 observer year.

a) Protected species released alive

Species Name	Caught on hook	Total
Birds		
Flesh-footed shearwater	3	3
Birds Total	**3**	**3**
Grand Total	**3**	**3**

b) Dead protected species

Species Name	Caught on hook	Tangled in line	Total
Birds			
Flesh-footed shearwater	3	1	4
Birds Total	**3**	**1**	**4**
Grand Total	**3**	**1**	**4**

Purse Seine Fisheries

Skipjack Tuna

In July 2011, the spinetail devil ray (*Mobula japanica*) and manta ray (*Manta birostris*) became fully protected under Schedule 7A of the Wildlife Act (1953). Since these two species of rays are caught in purse seine fisheries for tuna in New Zealand and worldwide, CSP observer coverage of the purse seine fishery began in the 2011/12 observer year. This season marks the fifth year of reported coverage of the purse seine fishery.

The observer coverage in 2015/16 increased by 29% from the previous observer year (2014/15) (Hjorvarsdottir 2016). However, both effort and observed tows were lower, mainly because of a drop in both effort and observed tows in the AKE FMA. Seabird and mammal captures are mostly non-existing or very low in this fishery (Clemens-Seely et al. 2014, Clemens-Seely & Hjorvarsdottir, 2016). This year, no seabird or mammal captures were observed. However, seven captures of spine-tailed devil rays were observed, all in the AKE FMA.

In summary, three trips were conducted onboard three vessels. Protected species interactions occurred on one trip.

Table 37. Summary of commercial effort, observer effort and protected species captures in the purse seine fishery during the 2015/16 observer year.

FMA	Effort tows	Observed tows	Coverage (%)	Protected fish captures *	Protected fish per 100 tows
1. AKE	145	44	30.3	7	15.9
2. CEE	0	-	-	-	-
3. SEC	0	-	-	-	-
4. SOE	0	-	-	-	-
5. SOU	0	-	-	-	-
6. SUB	0	-	-	-	-
7. CHA	19	0	0.0	-	-
8. CEW	17	0	0.0	-	-
9. AKW	119	36	30.3	-	-
Total	**300**	**80**	**26.7**	**7**	**8.8**

Table 38 reports the numbers of interactions by species and fate immediately post interaction. Only seven interactions were recorded this year, all of them being spine-tailed devil ray. This is a decline of 71% from the previous observer year (14/15), where 24 spine-tailed devil ray interactions were observed.

Table 38. Protected species interactions in the purse seine fishery during the 2015/16 observer year.

Species Name	Alive	Dead	Total
Protected Fish			
Spine-tailed devil ray	6	1	7
Protected Fish Total	**6**	**1**	**7**
Grand Total			

Table 39 a and b detail the method of interaction recorded. The only interaction method observed was net capture, with only one of them resulting in the mortality of the spine-tailed devil ray.

Table 39. Method of interaction for a) protected species released alive and b) dead protected species observed in the skipjack tuna purse seine fishery during the 2015/16 obserer year.

a) Protected species released alive

Species Name	Caught in net	Total
Protected Fish		
Spine-tailed devil ray	6	6
Protected Fish Total	**6**	**6**
Grand Total	**6**	**6**

b) Dead protected species

Species Name	Caught in net	Total
Protected Fish		
Spine-tailed devil ray	1	1
Protected Fish Total	**1**	**1**
Grand Total	**1**	**1**

Mackerel & Other

The purse seine fishery targeting English mackerel, jack mackerel, kahawai, pilchard, snapper, trevally and other minor species is observed independently from the purse seine fishery targeting skipjack tuna because of temporal differences in fishing seasons as well as some differences in fishing practices and net construction.

The commercial fishing effort of the fishery is mainly carried out in the AKE FMA, although some effort was conducted in CEE, CEW and AKW. There was only one observed tow recorded this year. No bycatch of protected species was observed.

Table 40. Summary of commerial effort, observer effort and protected species captures in the purse seine mackerel fishery during the 2015/16 observer year.

FMA	Effort tows	Observed tows	Coverage (%)
1. AKE	450	1	0.2
2. CEE	21	0	0.0
3. SEC	0	-	-
4. SOE	0	-	-
5. SOU	0	-	-
6. SUB	0	-	-
7. CHA	1	0	0.0
8. CEW	9	0	0.0
9. AKW	27	0	0.0
Total	**508**	**1**	**0.2**

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $1,063,143. Services were provided by the Ministry for Primary Industries Observer Services.

Citations

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2.2 INT2013-02 Identification of seabirds captured in New Zealand fisheries

Overall objective

To determine which seabird species are captured in fisheries and the mode of their capture.

Specific objectives

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 the 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)

Rationale

Large numbers of seabirds frequent New Zealand commercial fishing waters. Birds with significant differences in conservation status can appear morphologically similar. The accurate determination of the taxon of seabirds captured in New Zealand fisheries is vital for examining the potential threat to population viability posed by incidental fisheries captures. Observers on commercial vessels are not always able to identify seabirds at sea with high precision and the assessment of the age-class, sex and provenance of captured individuals requires autopsy in the majority of cases. Historically all dead seabird specimens collected by observers have been returned for necropsy where possible. However, in many cases, the taxon can be confirmed through expert examination of photographs taken by observers, and this can be achieved at lower cost than returning carcases and performing necropsy. In order to maximise cost efficiencies, and in recognition of increased observer coverage levels in the offshore Foreign Charter Vessel fleet, a new protocol has been developed to determine which specimens are returned for full necropsy. This protocol aims to strike a balance between returning birds for full necropsy (for rarer species and in less observed fisheries) and photographing birds for determination of taxon (for commonly caught species in well observed fisheries).

Examining the causes of mortality and types of injuries incurred by individual seabirds returned from fisheries is necessary to help reduce future seabird captures in New Zealand fisheries by identifying gear risks. Linking this information to species, age- and sex-class, and breeding status, helps identify if different groups of seabirds are vulnerable to different risks in fishing interactions.

Information gained through this project will link to Ministry for Primary Industries databases, seabird bycatch estimates, and will inform ongoing risk assessment, research and modelling of the effects of fisheries bycatch on seabird populations. Further, the mode of capture and associated information

will enable robust analyses to be made of the factors contributing to seabird capture events and inform the development of appropriate mitigation strategies.

Project status

This is a multi-year project that was due for completion in December 2016. Currently awaiting data from The Ministry of Primary Industries for completion.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $80,000 per annum. Services were provided by Wildlife Management International Ltd.

Review milestones:

- Presentation of 2015-16 results presented at the CSP TWG meeting on 24 May 2017

2.3 INT2015-02 Identification of marine mammals, turtles and protected fish captured in New Zealand fisheries

Overall objective

To determine which marine mammal, turtle and protected fish species are captured in fisheries and their mode of capture.

Specific objectives

1. To determine, primarily through examination of photographs, the taxon and, where possible, sex, age-class and provenance of marine mammals, turtles and protected fish captured in New Zealand fisheries (for live captures and dead specimens discarded at sea)

Rationale

The accurate determination of the taxon of marine mammals, turtles and protected fish captured in New Zealand fisheries is vital for examining the potential threat to population viability posed by incidental fisheries captures. Observers on commercial vessels are not always able to identify marine mammals, turtles and protected fish at sea with high precision, and the assessment of the age-class may require expert knowledge. Information gained through this project will link to Ministry for Primary Industry databases and will inform ongoing bycatch estimation, risk assessment, research and modelling of the effects of fisheries bycatch on marine mammals, turtles and protected fish populations.

This is a new project and is designed to complement the existing seabird identification project. Observers routinely collect samples of genetic material from these taxa, and these can be used to resolve uncertain identification determinations from photographs.

Project status

Awaiting data from The Ministry of Primary Industries for completion.

Recommendations

To improve photo-identifications in the future, wherever possible, all interactions should be photographed and recorded with haul/sample information included in the image. Further training should be given to observers to ensure that all key demographic features such as head, flippers, body shape etc. are included, with scale where possible. Photograph numbers should be recorded on the observer non-fish bycatch form. Photographs (and extracts from the observer log books) should be provided regularly throughout the fishing year for photo-identification.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $15,000 per annum. Services were provided by Anton van Helden, Marine Mammal Consultant.

2.4 INT2015-03 Identification and storage of cold-water coral bycatch specimens

Overall objective

To identify coral bycatch that cannot be identified by Government fisheries observers to the finest taxonomic level (assign codes to coral specimens to the species level wherever possible, when this is not possible; identify specimens to genus or family level).

Specific objectives

1. To determine through expert examination, the taxa of unidentified cold water corals returned by fisheries observers.
2. Record all identified coral specimens and make them available for appropriate taxonomic collections.
3. Ensure preparation of genetic samples of selected octocoral specimens (*Thouarella sp.* Specifically *Thouarella crenlata*) is undertaken by taxonomic collection technicians during identification, in order to feed into planned coral connectivity work.
4. Formalise Fisheries Observer briefings with updated coral identification information.

Rationale

The 2010 amendment of Schedule 7A of the Wildlife Act 1953 protects all hard corals, including: black corals (all species in the order Antipatharia); gorgonian corals (all species in the order Alcyonacea (previously known as Order Gorgonacea)); stony corals (all species in the order Scleractinia); and hydrocorals (all species in the family Stylasteridae). Identifying coral bycatch that is unable to be identified by Government fisheries observers to the finest taxonomic level provides vital baseline information that can help to better inform research and marine protection such as predictive modelling, benthic risk assessments and management of benthic marine protected species.

The aim of this project is to improve the quality of data collection and protected coral identifications. Observer briefings can continue and be formalised, and Observers can be informed about how the research data are used. This will improve their skills at identifying and collecting samples and bycatch data. Specialists can then confirm identifications to help understand distributions at a more detailed taxonomic level. This work will also feed into planned coral connectivity research, which will enable more robust assessment of areas at risk from fisheries impacts.

Project status

Ongoing. This is a three-year term project.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $40,000 per annum. Services were provided by NIWA.

2.5 INT2015-04 Black petrel and flesh-footed shearwater foraging behaviour around fishing vessels

Overall objective

To determine the diving capabilities and behaviour of black petrels and flesh-footed shearwaters around fishing vessel

Specific objectives

1. To determine, through specific experimental trials, the diving capabilities and behaviour of black petrels and flesh-footed shearwaters in response to available baits.
2. To document the environmental and operational factors which effect this behaviour.
3. To provide recommendations on methods for reducing bycatch risk based on seabird diving behaviour.

Rationale

In order to achieve effective seabird mitigation solutions for longline fisheries it is important to understand the availability of baited hooks to seabirds. Black petrels are capable of diving to considerable depths (Bell 2014,). This project will investigate the diving behaviour of black petrels, the seabird most at risk from commercial fisheries, and flesh-footed shearwaters, in response to bait in circumstances recreating small vessel bottom longline fishing activity, the fishery posing most risk (Richard et. al. 2013). This information need has been identified in the Black Petrel and Flesh-footed Shearwater Action Plan, as part of the implementation of the National Plan of Actions-Seabirds.

Project status

Complete.

Summary of the methods and key findings

Petrels and shearwaters are known to have an extra-ordinary ability to dive while seeking food - shearwaters for example are capable of diving to the astonishing depth of over 65m. As fishing baits can attract seabirds, there is a significant risk of fatal interactions between seabirds and commercial and recreational fishing activities. Black petrel *Procellaria parkinsoni* and flesh-footed shearwater *Ardenna carneipes* have been identified as being at high risk from commercial fisheries in New Zealand waters, particularly longline fisheries that target snapper and bluenose, in addition to interactions with other commercial fisheries and recreational fishers. This threat is most pronounced during their breeding season (ie. September-April) as these species migrate out of New Zealand waters during winter. Other species were also observed during this study, notably Buller's shearwater (*A. bulleri*) and fluttering shearwater (*Puffinus gavia*). We present distinctions in the bait preference and diving behaviour of black petrels and flesh-footed shearwaters towards baited experiments.

The study was carried out on board a vessel in the Hauraki Gulf, New Zealand from November 26, 2016 to March 6, 2017. Experimental treatments were used to quantify diving behavior and propensity of species to dive to particular baits. Combination of bait type and depth intervals were used to create 12 experiments that were exposed to seabirds in the Hauraki Gulf.

The results showed species-specific trends in how target species, black petrels and flesh-footed shearwaters, interact with both bait types, and behavior, but not with the depth at which they would interact with baits. Flesh-footed shearwaters and black petrels indicated a divergence in their preference for experimental bait types. Black petrels interacted with treatments where squid baits were used more than fish, while flesh-footed shearwaters more commonly interacted with fish baits. In addition, several prominent foraging behaviors were observed and described.

Recommendations

1) Baits should be weighted. Floating or slow-sinking baits are easily taken up by seabirds and could result in hooking or tangling of the bird.
2) Baits should be rapidly sunk, and be protected from seabirds by adequate mitigation measures, to a depth of at least 10m.
3) Baits should be lowered into the water close to fishing vessels. Seabirds rarely forage under or very close to the stern of a boat especially where there is wave action.
4) Baits should never be cast when seabirds are in the vicinity even with weights.
5) Seabirds are attracted to berley or fish discards at or near the surface of the water from fishing vessels. The ability of seabirds to detect potential food sources through smell over long-distances has been well-documented. Seabirds clearly recognise boats as a potential source of food and as such the risks to seabirds from interactions with recreational fishing are real and continuous. Any discharge from vessels whilst fishing gear is being set or in the water should be eliminated or minimized to reduce the number of birds being attracted and put at risk of bycatch.
6) Where large numbers of seabirds are present, aggression and competition for baits within and between species may make any fishing un-safe for birds. In such instances, the best course of action is to move.
7) Baits should be retrieved as quickly as possible.
8) Throwing bait scraps or 'used' baits over-board for disposal only serves to encourage the birds to chase them, which when there are numbers around, do so aggressively.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $40,000 per annum. Services were provided by Northern New Zealand Seabird Trust.

Review milestones:

- Project update presented at the CSP TWG meeting on 10 June 2016
- Progress report published on the CSP website on 20 October 2016
- Draft report presented at the CSP TWG meeting on 16 March 2017
- Final Report published on the CSP website in May 2017

Citation

Friesen, M.R., Ross, J.R., Robinson, R., Kozmian-Ledward, L. & Gaskin, C.P. 2016. Diving & foraging behaviour of petrels & shearwaters. Report prepared by Northern New Zealand Seabird Trust for the New Zealand Department of Conservation, Wellington. 26p.

Weblink

http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2015-16/diving-and-foraging-behaviour-of-petrels-and-shearwaters/

3. Population Projects

3.1 POP2014-02: Seabird population research 2014-15: Southern Buller's albatross - Solander Island

Overall Objective

To produce an updated population estimate of southern Buller's albatross at the Solander Islands.

Specific objectives

1. Produce a whole-island group (main Solander and Little Solander Islands) population estimate of southern Buller's albatross through ground, vantage and aerial photographic counts

Overall Rationale

The Draft Conservation Services Programme Seabird medium term research plan 2014 (Draft CSP seabird plan) outlines a five-year research programme to deliver on the seabird population research component of CSP. It is targeted at addressing relevant CSP Objectives (as described in the CSP Strategic Statement) and National Plan of Action – Seabirds Objectives. It was developed as part of the work of the CSP Research Advisory Group. The Draft CSP seabird plan will be revised following updates to the Richard & Abraham (2013) risk assessment. The update is in progress, and aims to address issues highlighted in a review of the 2013 risk assessment (MPI 2014). For the purposes of this Annual Plan, key components of research described in the draft CSP seabird plan have been identified for inclusion in this project, with consideration of the recommendations made by the risk assessment review (MPI 2014) and considerations to maximise logistical synergies with other work in order to deliver cost efficiencies. In particular, the multiple CSP research objectives at the Auckland Islands will be delivered by a programme of research that maximises cost efficiencies, for example in transport logistics and through collaboration with other researchers.

Project status

Complete.

Summary of the methods and key findings

In February 2016, a whole-island group (Solander Island and Little Solander Island) breeding population estimate was derived for southern Buller's albatross *Thalassarche bulleri bulleri* using a combination of direct ground counts, counts from vantage points on the ground and counts from photographs of the birds on the islands. Overall, the Solander Islands population was estimated at 5,620 breeding pairs, with 5,280 of these on Solander Island and 340 pairs on Little Solander Island. This estimate is higher than the two previous whole-island estimates, from 2002 and 1996. Trend analysis using TRIM indicated an average population growth rate of 1.36% per year between 1996 and 2016. The Snares Islands/Tini Heke still hold the majority of the southern Buller's albatross breeding population, with the current Solander Islands population representing approximately 40% of the total.

Recommendations

1. An aerial survey should be the primary means of estimating the breeding population of southern Buller's albatross at the Solander Islands.
2. The frequency of whole-island aerial surveys could be carried out on an annual basis.
3. An aerial survey could be augmented with concurrent ground-based work: for example, study plot monitoring including band resighting and nest content analysis.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $40,000. Services were provided by NIWA.

Review milestones:

- Draft final report presented at the CSP TWG meeting 10 June 2016

Citation

Thompson, D.; Sagar, P.; Baker, B.; Jensz, K. (2017). Southern Buller's albatross survey at the Solander Islands 2016. NIWA Client Report 2017079WN. Report to the conservation Services Programme, Department of Conservation, Wellington, New Zealand.

Weblink

http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2015-16/population-study-of-southern-bullers-albatrosses-on-solander-islands-2015-2016/

3.2 POP2015-01 Black petrel: Aotea/Great Barrier Island & Hauturu/Little Barrier Island population project

Overall objectives

To estimate the population size and key demographic parameters of black petrel at Great Barrier Island, Little Barrier Island and Moehau.

Specific objectives

1. To estimate the population trend, fecundity and age-class survival of black petrels on Great Barrier Island/Aotea.
2. To estimate the populations size, trend, fecundity and age-class survival of black petrel at Little Barrier Island.
3. To identify the presence of black petrels (or other seabirds) on the Moehau range, Coromandel, using automated acoustic recorders.

Rationale

The Conservation Services Programme Seabird medium term research plan 2015 (CSP seabird plan 2015) outlines a five-year research programme to deliver on the seabird population research component of CSP. It is targeted at addressing relevant CSP Objectives (as described in the CSP Strategic Statement) and National Plan of Action – Seabirds Objectives. It was developed as part of the work of the CSP Research Advisory Group. Key components of research described in the CSP seabird plan 2015 for delivery in 2015/16 were identified and prioritised by the CSP RAG. This proposal covers prioritised components involving field work on black petrel, classified as at very high risk from commercial fisheries. Supporting rationale for all the components is summarised in the CSP seabird plan 2015. Key areas of uncertainty for black petrels are around the population size on Aotea/Great Barrier Island outside of the main colony (see Bell et al. 2011; 2013) and on Hauturu/Little Barrier Island. Other locations such as Coromandel have been indicated as potentially containing breeding sites. CSP Project POP2014-02 initiated research to better estimate the total population size by targeting survey effort at areas outside the main breeding colony on Great Barrier Island, and at Little Barrier Island. Trials of a mixed method approach using acoustic monitoring and ground searching are being conducted during 2015/16.

Project status

Complete.

Summary of the methods and key findings

This project was conducted in three parts:

<u>1) Great Barrier Island/Aotea</u>

This report is part of the ongoing study of the black petrel, *Procellaria parkinsoni*, on Great Barrier Island/Aotea that was begun in the 1995/96 breeding season. During the 2015/16 breeding season, 433 numbered burrows within the 35-ha study area near Mount Hobson/Hirakimata were checked and intensively monitored. Of these 419 are used as study burrows and 286 were used by breeding pairs, 75 by non-breeding adults and the remaining 59 burrows were non-occupied. By 10 May 2016, 191 chicks were still present in the study burrows, corresponding to a breeding success of 66.8%. Nine census grids were monitored within the study area and accounted for 164 of the inspected burrows

and 154 of the study burrows, with 103 burrows being used for breeding. There were 108 chicks from earlier breeding seasons were recaptured within the Mount Hobson/Hirakimata colony area this season (a total of 254 'returned chicks' have been caught since the 1999/2000 season). Over 1550 hours of recordings were collected by automated acoustic recording units showing black petrels began calling between 2100 and 2252 hours and that activity was highest near the summit (Mt Hobson/Hirakimata). Mean clacking rate varied between 1.1 to 12.7 clacks per minute. Analysis of the stratified census grid and mean transect data estimated that there were 1947 to 2197 birds present in the 35-ha area around Mount Hobson/Hirakimata Unfortunately the tracking and diving behaviour work could not be completed due to technical failure of both the GPS and TDR devices.

2) Little Barrier Island/Hauturu-o-Toi

This report covers the population monitoring of black petrels, *Procellaria parkinsoni*, on Hauturu-o-Toi/Little Barrier Island in the 2015/16 breeding season. On Hauturu-o-Toi/Little Barrier Island, 149 study burrows were monitored, of which 92 were original study burrows established in 1997 by Mike Imber. Only 56% were being used by breeding pairs, but those pairs had 85.2% breeding success with 69 chicks fledging this season. Twenty automated acoustic devices were placed out across Hauturu-o-Toi/Little Barrier Island in December 2015 and were retrieved in March 2016. Black petrel calls were recorded at five locations: Thumb Ladder (LC7), Summit (LC11), Track 7 junction (LC15), Track 8 highpoint (LC16) and Track 8 halfway to Mt Kiriraukawa (LC17. Thirty-six transects were completed with a total of 49 breeding, 18 non-breeding and 50 unoccupied burrows found (n = 117 burrows). Surveys with a seabird-detector dog covered 52.5 km (approximately 73 ha) finding 121 breeding burrows. Analysis of the acoustic recorder units and surveys estimated that there were approximately 620 breeding pairs of black petrels present on Hauturu-o-Toi/Little Barrier Island.

3) Moehau range, Coromandel

An important factor for addressing the estimation of the total black petrel (*Procellaria parkinsoni*) population is to identify any additional breeding sites away from Great Barrier Island/Aotea and Hauturu-o-Toi/Little Barrier Island. The Moehau Range, Coromandel was identified as one possible area for black petrel as shown by historical presence. Nocturnal seabirds are ideal candidates for acoustic monitoring because they are highly vocal at their colonies, particularly during the breeding season. Black petrels call on the ground when trying to attract mates to their burrows between October and February, with peak activity between November and January. Seventeen automated acoustic recording units were deployed on the Moehau range between 30 November 2015 and 31 January 2016. No black petrel calls were recorded, but Cook's petrel (*Pterodroma cookii*) flight calls were recorded.

Recommendations

1.1. Continue monitoring of the black petrel population using the study burrows up to the 2024/25 season.
1.2. TDR & GPS devices deployed on 30 adults to obtain foraging information in NZ waters.
1.3. GLS devices deployed on 30 adults to obtain information on migration to South America.
1.4. Satellite devices deployed on juveniles to obtain information on migration to South America.
1.5. Random transects and ground surveys throughout the 35-ha study area around Mount Hobson for adult and juvenile recaptures (to improve survival and immigration estimates) and to compare with earlier transect surveys to determine population trends.
1.6. Cat trapping continues, on and around Hirakimata prior to the breeding season.
1.7. Future analysis of the resighting data is completed.

2.1. Continue monitoring of the black petrel population using the study burrows up to the 2019/20 season.
2.2. Deploy acoustic recording devices in areas that haven't been covered during previous surveys to obtain information on the range and density of birds on the island.
2.3. Complete further random transects and seabird detector dog surveys to recapture adults and juveniles (to improve survival and immigration estimates) and to provide a population estimate.
2.4. Establish the exact limits of the Hauturu-o-Toi/Little Barrier Island black petrel colony or habitat and the area calculated by a ground truth survey.

3.1. Deploy acoustic recording devices in areas that haven't been covered during the previous survey to obtain further information on the presence of seabirds on the Moehau range.
3.2. Deploy acoustic devices over a range of times throughout the survey period in case birds are calling later that at the known colonies.
3.3. Repeat the acoustic monitoring survey on the Moehau Range every 5-10 years to determine changes in the area following on-going predator control and whether seabirds are trying to colonise the area.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $100,000. In addition, The Ministry for Primary Industries supported the project by contributing $80,000. Services were provided by Wildlife Management International Ltd.

Review milestones:

- Preliminary results presented at the CSP TWG meeting 10 June 2016
- Draft final reports presented at the CSP TWG meeting 22 September 2016
- Final reports published on the CSP webpage on 18 October 2016

Citation

1) Bell, E.A.; Mischler, C.P.; MacArthur, N.; Sim, J.L.; Scofield, R.P. 2016. Population parameters of black petrels (Procellaria parkinsoni) on Great Barrier Island/Aotea, 2015/16. Report to the Conservation Services Programme, Department of Conservation. Wellington, New Zealand
2) Bell, E.A.; Mischler, C.P.; MacArthur, N.; Sim, J.L. 2016. Black petrel (Black petrel (Procellaria parkinsoni) population study on Hauturu-o-Toi/Little Barrier Island, 2015/16. Report to the Conservation Services Programme, Department of Conservation. Wellington, New Zealand.
3) Bell, E.A.; Stewart, P. 2016. Black petrels (Procellaria parkinsoni) population study on Moehau Range, Coromandel, 2015/16. Report to the Conservation Services Programme, Department of Conservation. Wellington, New Zealand.

Weblink

http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2015-16/black-petrel-population-study-great-barrier-island-little-barrier-island-and-moehau-range/

3.3 POP2015-02 Flesh-footed shearwater: Various locations populations project

Overall objectives

1. To estimate the population size of flesh-footed shearwater at Middle Island (Mercury Islands).
2. To estimate key demographic parameters of flesh-footed shearwater at Lady Alice Island/Mauimua and Ohinau Islands.
3. To describe the at-sea distribution of flesh-footed shearwater breeding at Northland breeding sites.

Rationale

The Conservation Services Programme Seabird medium term research plan 2015 (CSP seabird plan 2015) outlines a five-year research programme to deliver on the seabird population research component of CSP. It is targeted at addressing relevant CSP Objectives (as described in the CSP Strategic Statement) and National Plan of Action – Seabirds Objectives. It was developed as part of the work of the CSP Research Advisory Group. Key components of research described in the CSP seabird plan 2015 for delivery in 2015/16 were identified and prioritised by the CSP RAG. This proposal covers prioritised components involving field work on flesh-footed shearwater, classified as at very high risk from commercial fisheries. Supporting rationale for all the components is summarised in the CSP seabird plan 2015.

Project status

Ongoing. This is a multi-year project, the annual report for 15/16 (demographic component) is now complete.

Summary of the methods and key findings

The trends and population dynamics of flesh-footed shearwaters (*Puffinus carneipes*) in New Zealand are not well understood. The threat classification was changed from "Not Threatened" to "Nationally Vulnerable" between 2008 and 2012 which falls within the criteria of predicted decline of 50-70%.

A clearer understanding of the population dynamics of this species is necessary to pinpoint the key problem areas. This project focused on one study site, Ohinau Island, Mercury Islands group, Coromandel, and expanded on previous work done on flesh-footed shearwaters started in 2012.

A two-week trip was carried out during late chick rearing, with the aim of bandings as many chicks and adults as possible, both caught in burrows and on the surface at night. A total of 357 birds were banded, of which 90 were adults and 267 were chicks.

In addition, 186 study burrows were marked with access to the nest chamber, and 32 burrows were included as control burrows which would only be checked with a burrow-scope. These 218 burrows provide an excellent starting point for the next two seasons where the focus will be on monitoring reproductive success and continuing to increase the marked population and recapturing of banded birds.

Recommendations

It is recommended that next season's field team is prepared to dig additional hatches and find additional burrows to keep the sample size large.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. This is a three-year term project and the planned cost for the project was $80,000 per annum. Services were provided by Wildlife Management International Ltd.

Review milestones:

- Project update presentation at the CSP TWG meeting on 10 June 2016
- Final Annual report published on the CSP webpage on 26 June 2016

Citation

Mischler, C.P. 2016. Conservation Services Programme, Flesh-footed Shearwater Project 4653, Demographic Component, April-May 2016 Report. Unpublished technical report to the Department of Conservation. Report prepared by Wildlife Management International Ltd for the New Zealand Department of Conservation, Wellington. 11p.

Weblink

http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2015-16/flesh-footed-shearwater-demographic-component-2015-16/

3.4 POP2015-03 Seabird population research: Auckland Islands 2015-16

Overall objective

To collect information on key aspects of the biology of selected at-risk seabird species in order to reduce uncertainty or bias in estimates of risk from commercial fishing.

Rationale

The Conservation Services Programme Seabird medium term research plan 2015 (CSP seabird plan 2015) outlines a five-year research programme to deliver on the seabird population research component of CSP. It is targeted at addressing relevant CSP Objectives (as described in the CSP Strategic Statement) and National Plan of Action – Seabirds[3] Objectives. It was developed as part of the work of the CSP Research Advisory Group. Key components of research described in the CSP seabird plan 2015 for delivery in 2015/16 were identified and prioritised by the CSP RAG. This proposal covers prioritised components involving field work at the Auckland Islands, which have been developed to maximise cost and logistical efficiencies between components. Supporting rationale for all the components is summarised in the CSP seabird plan 2015.

Gibson's albatross

Specific objectives

1. To estimate the population size of Gibson's albatross at the Auckland Islands.
2. To continue the mark-recapture study on Adams Islands, Auckland Islands, to collect information on adult survival and other key demographic parameters.

Project status

Complete

Summary of the methods and key findings (ground component)

The size and trend of the Gibson's albatross population was estimated by counts of active nests in 3 representative parts of their main breeding grounds on Adams Island that have been re-counted repeatedly since 1998. In addition a larger area (Astrolabe Basin) was also counted, and these counts compared with counts undertaken in 1997 and 2000.

Estimates of population size, survivorship, productivity and recruitment are made from a mark-recapture study undertaken in a 61 ha intensively monitored study area.

The numbers of birds nesting in 2016 was the highest it has been since the 2005 population crash, probably partly because breeding success in 2015 was low.

The number of birds nesting in the wider Astrolabe area was about 8% higher than that estimated using the proportionate change in the annually counted blocks since the last whole-island census. This total probably does not reflect a real increase in numbers but rather the use of more accurate count techniques, and the application of correction factors to daily census totals for late egg laying and early

[3] National Plan of Action – 2013 to reduce the incidental catch of seabirds in New Zealand Fisheries. Available for download at: http://www.mpi.govt.nz/

nest failure. There were estimated to be 5,817 pairs of Gibson's albatross breeding in 2016 compared to 5,527 pairs in the very low 2000 breeding season and 7,857 pairs in 1997.

The survivorship and productivity of Gibson's wandering albatross has improved since the population crash in 2005, but still have not risen to the levels they were before the crash. The mark-recapture estimates of the size of the breeding population indicate that the rate of decline of the population has slowed though it is still decreasing. In contrast counts of the number of nesting birds have gradually increased since the 2005 crash. The apparent contradiction between the nest counts and the mark-recapture estimates of population size arise from the changing demography of Gibson's wandering albatross. Immediately after the 2005 crash a high proportion of the population did not breed. Since then the proportion of birds breeding each year has increased, so that even though the total population of breeding birds declined, the number nesting increased because a higher proportion of the birds chose to nest.

The population of Gibson's wandering albatross is still declining though at slower rate than previously. We estimate that there were about 5,817 pairs of Gibson's albatross breeding in 2016.

Monitoring the population structure as well as trends of Gibson's albatrosses remains an important conservation priority as the population is still declining, and simple counts of nesting birds does not accurately reflect the conservation status of the species.

Recommendations (ground component)

- Population size and trend and adult survival should continue to be estimated at regular intervals until the population substantially increases.
- A detailed modelling exercise such as the one carried out by Francis et al in 2012 would give a better indication of the trajectory of the whole population and should be undertaken within the next five years.
- Recent estimates of the size of the population are sufficiently accurate that a whole-island census is probably unnecessary.

Summary of the methods and key findings (aerial component)

In 2014 and 2015 exploratory aerial census work of great albatross populations in the Auckland Islands identified issues of efficient aerial coverage and the need to develop camera/lens/flight height combinations that would provide sufficient photographic resolution to permit nesting birds to be identified. This study sought to build on this earlier work and refine recommendations for robustly estimating the total population size of Gibson's albatross at Adams Island, where 95% of the global population breed.

In January 2016, we undertook a partial survey of Adams Island using aerial photography. We trialled the use of a vertically-oriented camera that was GPS linked to take a series of photographs to estimate the number of Gibson's albatross breeding in defined areas. These areas overlapped an area that was ground-counted at the time of the photography, which allowed ground truthing and comparison with ground survey methods.

Using a Squirrel AS350B3 helicopter, we flew a series of transects spaced at 70 m centres that ran across the terrain from east to west, and used the aerial guidance system TracMap Flight Pro to define and accurately fly the transects. The transects were flown over the terrain under the following flight and photographic specifications: Flight height 500 ft agl; ground speed 40 knots; camera and lens: a full-frame DSLR Camera (Nikon D800) and 50 mm lens; and a photo frame rate of 2 second intervals. The camera was vertically-mounted in a purpose-built camera mount that was

fitted in a weatherproof pod suspended underneath the aircraft, and manually controlled from the helicopter. To assist with spatial resolution of each photo, a GPS was connected to the cameras to permit spatial data to be recorded for each photograph.

Between 80 and 100 photos covering each of three areas were selected for analysis. These were uploaded to an Internet-based online geo-referencing interface Maps Made Easy for stitching and geo-referencing. The high-resolution maps produced by this process were then analysed using the image editing software Adobe Photoshop and the GIS program QGIS for counting as well as spatially locating birds and or nests.

Aerial assessment identified a total of 129 birds ashore on the three maps. Ground-truthing showed that only 95 (74%) of these birds at the time of the aerial count, or subsequently, were nesting. The other 34 birds (26%) were therefore loafing at the time of the aerial count. The resolution of the images was substantially improved over that obtained in aerial photography in 2015, leading to very little uncertainty separating nesting albatrosses from the large number of white rocks that are present at this site.

The camera/lens/flight height combinations used in this study provide a suitable methodology to undertake a count of Gibson's albatross on Adams Island using aerial photography. However, substantial helicopter flying time and data analysis would be required to do this for the entire island, and the ever-changing nature of the weather on Adams Island means it may not be possible to fly all breeding areas in one breeding season. Development of a survey schedule that plans to survey the island over three or four years would be appropriate, with flexibility provided so that advantage can be taken of good weather conditions when they arise.

Recommendations (aerial component)

In the knowledge that helicopters remain the only feasible aerial platform available for surveying Gibson's albatross in the Auckland Islands at this stage, we recommend the following camera/lens/flight height combinations when conducting counts of nesting albatrosses using aerial photography:

1. the use of a series of transects spaced at 70 m centres, established and flown using an appropriate aerial guidance system to define and accurately fly each transect;
2. flight height 500 ft agl;
3. camera and lens: a full-frame high-resolution (>35 mp) DSLR Camera and 50 mm lens, with the camera vertically-mounted. The camera should have GPS capability to permit spatial data to be recorded with each photograph.
4. data analysis using a geo-referencing interface to produce high resolution mapping for subsequent analysis using GIS and image-processing software; and
5. supporting aerial photography by ground-truthing to develop meaningful correction factors that account for loafers/non-breeders in colonies. Maintaining and potentially expanding the existing Amherst – Astrolabe census block,) is recommended for this purpose.

Review milestones:

- Project update and proposed scope presented to the CSP meeting webpage on 25 August 2015
- Draft final reports presented at the CSP TWG meeting on 10 June 2016 (ground and aerial components)
- Final report published at the CSP webpage on 18 August 2016 (ground component)
- Final report published on the CSP webpage on 18 April 2017 (aerial component)

Citations (ground component)

Elliott, G., Walker, K., Parker, G., Rexer-Huber, K. 2016. Gibson's wandering albatross census and population study 2015/16. Report prepared for the New Zeland Department of Conservation, Wellington. 19p.

Citation (aerial component)

Baker, G.B.; Jensz, K.; Elliot, G. & Walker K. (2017). Aerial survey for Gibson's albatross on Adams Island, 2016. Report to the Conservation Services Programme, Department of Conservation, Wellington, New Zealand.

Weblink (ground component)

http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2015-16/gibsons-wandering-albatross-survey-auckland-islands-2015-16/

Weblink (Aerial component)

http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2015-16/aerial-survey-for-gibsons-albatross-on-adams-island-2016/

Project logistics summary statement for both components

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $80,000. Services were provided by Albatross Research and Latitude 42.

White-capped albatross

Specific objectives

1. To estimate the population size of white-capped albatross at the Auckland Islands

Although not costed into this proposal, two secondary objectives are listed:

2. To conduct ground trothing of the aerial survey methodology used in Objective 1
3. To collect resight data from a study colony established on Disappointment Island to contribute to the estimation of key demographic parameters.

These secondary objectives are target information identified in the CSP seabird plan 2015 that were not costed in this proposal, for reasons of prioritisation, but were possible extensions.

Project status

The aerial component of this project is complete. Ground component will be reported on in 2016/17.

Summary of the methods and key findings

White-capped albatrosses are endemic to New Zealand, breeding on Disappointment Island, Adams Island and Auckland Island in the Auckland Island group, and Bollons Island in the Antipodes Island Group. The population status of white-capped albatrosses breeding on the Auckland Islands was poorly known until 2006 when annual population census was commences using aerial photography. These population censuses have now been conducted over nine years, permitting population size to be estimated and population trends determined.

In January 2016, aerial photographs were obtained for all three colonies (Disappointment Island, South-West Cape and Adams Island). At each colony we conducted two circuits to provide images suitable for counting the breeding birds on the island, which were taken using a photo-extension of 70 mm. Additional photographs using maximum photo-extension (200 mm or 300mm) were also taken at Disappointment Island, the largest of the colonies, to assist in determining the proportion of empty nests and non-breeding birds in the colonies. The photos taken are a complete series of overlapping images that cover the entire area of the sites where albatrosses were nesting; approximately 2,200 digital photographs were taken during the survey flight.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $30,000. Services were provided by Latitude 42 & NIWA.

Review milestones:

- Project update for aerial survey and ground component presented at the CSP TWG on the 10 June 2016.
- Final report published to the CSP webpage on 17 November 2016.

Citation

Baker, G.B. & Jensz, K. 2016. White-capped albatross aerial photographic survey 2013. Report prepared by Latitude 42 for the New Zealand Department of Conservation. 3p.

Weblink

http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2015-16/white-capped-albatross-aerial-survey-auckland-islands/

White-chinned petrel

Specific objectives

1. To estimate the population size of white-chinned petrel at the Adams Islands, Auckland Islands.

Project status

Complete.

Summary of the methods and key findings

The White-chinned Petrel *Procellaria aequinoctialis* is one of the most frequently observed seabird species captured in fisheries bycatch, yet some populations remain virtually unstudied. In the New Zealand region, the priority programmes to fill key information gaps included surveying, tracking and collecting demographic data from White-chinned Petrels in the Auckland Islands. Survey of the Campbell Island population and clarification of taxonomic uncertainty in the New Zealand region were secondary aims. This information paper provides a progress update and reports some preliminary findings. An estimated 186,000 (95% CI: 131,000–248,000) White-chinned Petrel pairs breed in the Auckland Islands, and the Campbell Island group supports around 22,000 (15,000–29,000) breeding pairs. A tracking programme in the Auckland Islands has retrieved 38 geolocators from White-chinned Petrels to date. Our work on phylogenetic affinities of White-chinned Petrels supported the idea of an NZ regional population, with all three breeding islands grouping together. A study was initiated to collect demographic data from White-chinned Petrels at Adams Island, Auckland Islands. Two years of data have since been collected.

At Adams Island, burrow density and occupancy data were collected in December 2015. The difficult cliff-shelf terrain used by White-chinned Petrels on Adams Island limited sapling to density sampling plots. A stratified random design produced 10 strata with 327 sampling plots in total. Observer effects and detection probability were also tested. Burrow density was calculated from plots. Mean burrow occupancy was 0.64 ± 0.04. We estimated 32,900 (11,700–52,600) breeding pairs on Adams Island at early incubation.

Recommendations

Resight data have been collected annually at the Auckland Islands since 2013 and monitoring should continue for the project to yield useful demographic data.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $25,000. Services were provided by Otago University.

Review milestones:

- Project update presentation at the CSP TWG meeting on 10 June 2016
- Report published to the CSP webpage on 20 October 2016

Citation

Rexer-Huber, K. Parker, G. & Thompson D. 2016. New Zealand White-chinned Petrel population research update. Third meeting of the Population and Conservation Status Working Group, La Serena, Chile. 8p

Weblink

http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2015-16/white-chinned-petrel-population-research-progress-report/

Northern giant petrel

Specific objectives

1. To estimate and map total breeding pairs on all small off-lying islands in the Auckland Islands group known or suspected to have breeding birds.

Project status

Complete.

Summary of the methods and key findings

On each island the number of pre-fledging chicks present and their spatial distribution was recorded. To achieve this, two workers conducted parallel strip-transects spaced at approximately 30 m intervals to exhaustively survey the available Northern giant petrel nesting habitat. The exceptions were Enderby and Dundas where a single person conducted exhaustive searches of all available habitat. All vegetation classes were treated as available habitat, with the exception of the interior of southern rata dominated forest interiors. Hand-held GPS units with topographical mapping software were used to record all line transect surveys and the locations of all chicks detected.

Nests that showed clear signs of having failed in the current breeding season were also counted. Caution was used to avoid counting old nests and 'play' nests constructed by non-breeding birds. In an attempt to correct for nesting failure during the egg and early chick stage, the total number of Northern giant petrels breeding was calculated by applying the average, lowest and highest records of breeding success from the past ten years on Macquarie Island to the number of nests we found. Macquarie Island, 350 nautical miles southwest of the Auckland Islands, is the nearest Northern giant petrel colony where these data have been collected.

Surveys counted 216 Northern giant petrel chicks on eight of the 15 islands visited in December 2015 and January 2016. Enderby Island had the largest breeding population, with 96 chicks counted. This represents a large increase in the population on Enderby Island compared to the only historic comprehensive count, in 1988, when just two Northern giant petrel chicks were counted. The second and third largest populations were on Disappointment (38, 18%) and Dundas Islands. Fourteen failed nests were recorded, eleven of which were on Enderby. No breeding Northern giant petrels were reported from Rose and Friday Islands, where the species has previously been recorded breeding. Chicks were counted at two locations previously not reported to support breeding Northern giant petrels, at French's Island and Crozier Point on the main Auckland Island.

Applying crude correction factors based on breeding success at the nearest Northern giant petrel colony where these data have been collected, Macquarie Island, we estimate the breeding population in the Auckland Islands 2015-2016 to be approximately 340 (range 310-390) breeding pairs. Our quantitative estimate is higher than the four historical, non-quantitative records of breeding pairs. The population has been documented as 50 breeding pairs three times (Taylor 2000; Taylor 1988; Bell 1975) and once as 200 breeding pairs (CJ Robertson in Hunter 1986).

Recommendations

- We recommend future monitoring of the Auckland Island Northern giant petrel breeding population. Ideally island-wide surveys would be repeated every three to five years. Enderby Island would be the ideal location for regular, annual counts of breeding birds. Disturbance

from tourism may negatively impact upon breeding Northern giant petrels on Enderby Island, and should be monitored given that the island supports such a large proportion of the Auckland Island breeding population.

- Because there are no trend data for Northern giant petrels anywhere in the NZ region, we strongly advise that the Antipodes and Campbell Islands populations are re-counted in the near future and the results related to previous counts (Wiltshire and Scofield 2000; Wiltshire and Hamilton 2000)

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $20,000. Services were provided by Parker Conservation.

Review milestones:

- Draft final report presented at the CSP TWG meeting on 10 June 2016
- Final report published to the CSP webpage on 22 July 2016

Citation

Parker, G.C., Muller, C.G., Rexer-Huber, K. 2016. Northern giant petrel Macronectes halli breeding population survey, Auckland Islands, December 2015 – February 2016. Report prepared by Parker Conservation for the New Zealand Department of Conservation, Wellington. 16p.

Weblink

http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2015-16/northern-giant-petrel-survey-auckland-islands-2015-16/

3.5 POP2015-04 Northern Buller's albatross: review taxonomy

Specific objectives

1. To reassess the taxonomic status of breeding populations of northern Buller's albatross.
2. To identify genetic markers to allow routine genetic assessment of bycaught Buller's albatross to determine their population of origin.

Rationale

The Conservation Services Programme Seabird medium term research plan 2015 (CSP seabird plan 2015) outlines a five-year research programme to deliver on the seabird population research component of CSP. It is targeted at addressing relevant CSP Objectives (as described in the CSP Strategic Statement) and National Plan of Action – Seabirds Objectives. It was developed as part of the work of the CSP Research Advisory Group. Key components of research described in the CSP seabird plan 2015 for delivery in 2015/16 were identified and prioritised by the CSP RAG. This proposal is one of the prioritised components. Supporting rationale for all the components is summarised in the CSP seabird plan 2015.

Currently two subspecies of Buller's albatross, northern and southern, are generally recognised, though uncertainty remains around the taxonomic relationships across the Buller's albatross clade. An isolated breeding population occurs at the Three Kings, and the taxonomic status of this population is of current research interest (M. Rayner pers. comm.). Northern and southern Buller's albatross is currently categorised as at high and very high risk.

Project status

This project consisted to two components; a genetic taxonomic assessment and to support collection of samples from the Three Kings population. The taxonomic assessment is complete and reported here. Collection of samples from the Three Kings has been delayed to 2017/18.

Summary of the methods and key findings

To resolve the degree of differentiation between two subspecies of Buller's Albatross, Northern (*Thalassarche bulleri platei*) and Southern (*Thalassarche bulleri bulleri*), a total of 73 blood samples were obtained from chicks and nesting adults between 1996 and 2007. Twenty-six samples are representative of *Thalassarche bulleri platei* (22 = Motuhara, 4 = Rangitatahi) and an additional 47 samples are representative of *Thalassarche bulleri bulleri* (24 = North East Island, 23 = Solander Island). Liver samples from a further 97 individuals were harvested during routine necropsy of bycatch between July 1999 and June 2016. Analysis of a 221 bp fragment of the mitochondrial DNA control region Domain II revealed high levels of diversity similar to those previously reported for Domain I of the control region in other seabirds (add reference). Regional differentiation was difficult to assess due to the high variation within Northern Buller's Albatross (percent pairwise differences ranged from 0 – 6.4%). However, pairwise comparisons among colonies demonstrated high levels of differentiation between colonies from different regions (pairwise ΦST = 0.586 - 0.703, $p < 0.00001$). Regional population structure was further examined without a priori assignment in BAPSv6.0 (Bayesian Analysis of Population Structure). BAPS identified three haplogroups; Haplogroups I & II were only found in the Northern Buller's Albatross, and Haplogroup III was found only in Southern Buller's Albatross. All but two individuals from samples of known provenance were able to be assigned to the population of origin with maximum probability (P =1.00). These two

individuals from Motuhara shared the genetic characteristics of all 3 haplogroups, but were most strongly associated with Haplogroup III. This suggests that there may be additional haplogroups not represented within the current sample set and increased colony sampling may resolve this uncertainty.

Despite the presence of this one ambiguous haplotype, all 97 samples collected from bycatch were able to be assigned to their population of origin with maximum probability. A total of 19 bycatch individuals were representative of Northern Buller's Albatross (Haplogroup I: n = 8, Haplogroup II: n = 11), while the remaining 78 bycatch samples were assigned to Southern Buller's Albatross (Haplogroup III). This method did not permit assignment back to distinct colonies or sites. This may be because there is genetic homogeneity between colonies within regions. Our findings were similar to previous work on the Southern Buller's Albatross which reported finding no differentiation among two southern colonies. However, these new findings support the conclusion that Northern and Southern Buller's are genetically differentiated populations, and show that assignment to source is possible using short CRII sequences as a tool.

Recommendations

The mtDNA assay appears to be able to determine whether a Buller's Albatross is from the Northern or Southern group. However, the level of certainty for this mtDNA-based identification approach does need to be tested further. It can be gradually phased in as a potential stand-alone method for assigning individuals to their population of origin as the level of certainty improves. It is recommended that more samples of known Northern and Southern Buller's albatross are collected and DNA-typed to increase the sample sizes and help improve the statistical power of the method. Increasing the number of samples of known provenance should enable the ambiguity of the haplotype shared by two *Thalassarche bulleri platei* individuals sampled from Motuhara to be resolved. This will also enable a better assessment of the diversity within the observed haplogroups and precisely define all of the haplogroups.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $20,000. Services were provided by Victoria University of Wellington.

Review milestones:

- Preliminary results presented at the CSP TWG meeting on 10 June 2016
- Summary report published on the CSP webpage in May 2017

Citation

This project is a part of a Master thesis and detailed results will be made available in the thesis and any resulting papers. Links to these will be provided here when available.

Weblink

http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2015-16/northern-bullers-albatross-review-of-taxonomy/

3.6 POP2015-05 New Zealand Sea Lion: Auckland Islands population project

Overall objective

This research project was scoped to collect key information required to understand the impact of commercial fishing on the Auckland Islands New Zealand sea lion population, in line with CSP Objective E

Specific objectives

1. To estimate New Zealand sea lion pup production at Enderby, Figure of 8 and Dundas Islands.
2. To mark New Zealand sea lion pups at Enderby and Dundas Islands following established techniques.
3. To conduct a five-week period of resighting previously marked animals at Enderby Island.
4. To update the New Zealand sea lion database.
5. To collect data on pup weight, to contribute towards time series data on population dynamics.

Rationale

New Zealand sea lions are classified as Nationally Critical (Baker et al. 2010), and are incidentally killed each year in southern commercial trawl fishing operations targeting species including squid, scampi and southern blue whiting. The foraging areas of New Zealand sea lions at the Auckland Islands have been shown to overlap with commercial trawl fishing activity, particularly SQU6T and SCI6A. Approximately 7o% of New Zealand sea lions breed at the Auckland Islands, where population data have been collected since the mid-1990s, including estimates of pup production and resighting of marked animals. Since 2001 there has been a considerable decline in pup production at the Auckland Islands. A literature review to identify potential indirect effects of commercial fishing on the Auckland Islands population as part of CSP project POP2010-01 (Bowen 2012) highlighted a number of key information gaps that currently prevent a full understanding of any such potential indirect effects, including time series data of population dynamics as collected in this project. CSP project POP2012-02 analysed population data collected during previous years in order to determine the key demographic factors driving the observed population decline of New Zealand sea lions at the Auckland Islands. It found that low pupping rates, a declining trend in cohort survival to age 2 and low adult survival may explain declining pup counts in one studied population (Roberts et al. 2014).

In response to the continued decline at the Auckland Islands, the Ministers of Conservation and Primary Industries announced that a Threat Management Plan (TMP) for New Zealand sea lions would be developed. This research project is scoped to collect key information required to understand the impact of commercial fishing on the Auckland Islands population, in line with CSP Objective E. It is envisaged that other research, and/or management actions, will be progressed as part of the TMP, and may be delivered alongside the research programme proposed here.

Project status

Complete.

Summary of the methods and key findings

Pup production was estimated for NZSL colonies at Sandy Bay (n=321), Dundas Island (n=1,347), Figure of Eight Island (n=59) and South East Point (n=0); with total pup production for the Auckland Islands in 2015/16 estimated as 1,727. The estimate for 2015/16 is 10% higher than for 2014/15 and is 15% higher than the lowest ever estimate for pup production in 2008/09. The steep decline in total pup

production seen from 1997/98 until 2008/2009 appears to have levelled off although total pup production is still significantly lower than the peak in 1997/98. Since the lowest ever record of total pup production at the Auckland Islands in 2008/09, pup production has seen annual increases in five of the last seven years and overall production appears to have stabilised at around 1600-1700 pups per annum since 2008/09. While the stabilisation of total pup production is a positive step, it is important to note that pup production in 2015/16 still represents a 43% decline since the peak in 1997/98.

Estimates of pup mortality to the date of the pup production estimate in mid-January are broadly comparable too previous 'non-epidemic' years. However, these figures do not represent full season surveys and are not directly comparable to data collected prior to 2012/13, and so should be viewed as a minimum. Pup mortality estimates to the date of pup count are: Sandy Bay 4% (to 15 January 2016), Dundas Island 9% (to 18 January 2016) and Figure of Eight Island 10% (to 9 January 2016) and overall for all sites 8%.

Seven hundred and fifty-seven pups were marked at the Auckland Islands including: Sandy Bay – 198 flipper tagged and microchipped, and 110 microchipped only (Note that this was a new protocol implemented in 2014/15 with only approximately 50% rather than 100% of pups being tagged at Sandy Bay); Dundas Island – 400 flipper tagged only; and Figure of Eight Island – 49 flipper tagged only.

Of the 34 dead pups recovered at Sandy Bay, 33 were in sufficient state for necropsy. Preliminary provisional diagnosis for cause of death includes 61% bacterial infection (suspected with Klebsiella pneumoniae), 12% open diagnosis (decomposed, scavenged or no significant findings), 21% starvation, 3% trauma and 3% intestinal perforation. It is important to note that these diagnoses are provisional and will be refined and/or confirmed once full histopathology analysis has been completed at Massey University pending funding;

Between 11 November 2015 and 20 February 2016, there were a total of 6,667 resights of marked NZSLs of which 6,411 were suitable for use (i.e. contained sufficient information allowing positive identification).

Recommendations

- Future teams allocate more time and training to microchipping to reduce this loss rate
- Restart microchipping and tagging of all pups at Sandy Bay, at least until microchip retention rates can be minimised
- Investigation of an additional electronic tagging/tracking method to identify individuals at a distance
- Increased monitoring effort and a review of existing pup ramps at Dundas Island.
- Review of tagging and microchipping methods to consider new methods & approaches
- Surveys of other Islands to search of sea lions breeding away from the main colonies
- Consideration of increase in the active management of pup mortality
- Collection of body condition information on adult females

Project logistics summary statement

This project was 90% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $250,000. Services were provided by Blue Planet Marine NZ.

Review milestones:

- Final results presented at the CSP TWG meeting on 18 May 2016
- Final report published on the CSP webpage on 7 June 2016

Citation

Childerhouse S, Miller C, Burns T, French R, Kay E (2016) Final Report for CSP Project New Zealand sea lion ground component 2015/16. Report prepared by Blue Planet Marine for the New Zealand Department of Conservation, Wellington. 52p.

Weblink

http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2015-16/new-zealand-sea-lion-ground-component-2015-16/

3.7 POP2015-06 Marine reptiles – review of interactions and populations

Overall objective

To review existing information to describe the nature and extent of interactions and population information on risks from commercial fishing on marine reptiles in New Zealand's EEZ.

Specific objectives

1. To review existing information to describe the nature and extent of interactions between commercial fishing and marine reptiles.
2. To review existing information to describe population information relevant to assessing risk from commercial fishing to marine reptiles.
3. To review existing information on possible mitigation options relevant to New Zealand fisheries to minimize marine reptile bycatch.
4. To identify information gaps in the understanding of the nature and extent of interactions between commercial fishing and marine reptiles, population information and mitigation options, and provide recommendations for further research to address any gaps identified.

Rationale

All marine reptiles are fully protected in the New Zealand EEZ, with five species of sea turtles recorded as well as sea snakes and kraits. Observer coverage has reported low but regular bycatch of sea turtles in surface longline and inshore trawl fisheries with green turtles being the most commonly caught. There have also been records of leatherback and hawksbill turtle captures. While observed bycatch incidence has been low, this is likely influenced by low observer coverage in these fisheries. The life history parameters of marine reptiles make them susceptible to adverse effects from fisheries bycatch. Understanding the nature and extent of these interactions is important to develop appropriate management, including mitigation.

Project status

Complete.

Summary of the methods and key findings

Five species of marine turtles and four species of sea snakes and kraits have been recorded in New Zealand waters. These species are susceptible to adverse effects from commercial fisheries to varying degrees. This research investigated commercial bycatch data to describe the nature and extent of marine reptile interactions in New Zealand's Exclusive Economic Zone from 2008 to 2015.

Existing population information was reviewed to assess potential risks to fisheries, to identify information gaps, and ultimately make recommendations to mitigate impacts. In total, 120 marine turtle bycatch records were reported while no bycatch of sea snakes or kraits were documented.

Leatherback turtles (*Dermochelys coriacea*) were most frequently captured comprising 75% (n = 90) of all records. In contrast, green turtles (*Chelonia mydas*), hawksbill turtles (*Eretmochelys imbricata*), and loggerhead turtles (*Caretta caretta*) were captured in relatively low numbers, comprising 10% (n = 12), 5% (n = 6) and 2% (n = 2), respectively. The large majority of all bycatch events occurred in fisheries management areas off northeastern New Zealand (74%) and during summer (51%, n = 61) and autumn (38%, n = 45). Surface longline (SLL) activities targeting swordfish and tunas posed the greatest risk to marine turtles, recording the highest number of bycatch overall (91%, n = 109). In

particular, leatherback turtles were most frequently captured in this fishery, accounting for 73% (n = 88) of total bycatch.

The potentially significant threat of SLL activities to marine turtles is reflected by the annual bycatch rate (for all species combined) which, in some years, exceeded the Western and Central Pacific Fisheries Commission recommended minimal marine turtle interaction rate of 0.019 turtles per 1000 hooks. In addition, very low observer coverage was allocated to fisheries and management areas where marine turtle bycatch was most likely to occur. Overall, very little local population information is available for marine reptile species in New Zealand.

Ultimately, given the potential impacts to marine turtles and information gaps identified, several recommendations are made in order to mitigate bycatch risk in New Zealand.

Recommendations

This research has identified five key recommendations to address the impact of commercial fisheries on marine reptiles in New Zealand waters. These are:

1. Adopt the Western and Central Pacific Fisheries Commission's (WCPFC) resolution RES2005-04 and conservation and management measure CMM2008-03. Thus, it is recommended to implement a minimal marine turtle interaction rate of 0.019 turtles per 1000 hooks or less, for shallow-set longline fisheries that target swordfish.
2. Adopt the United Nations Food and Agriculture Organisation (FAO) Guidelines to Reduce Sea Turtle Mortality.
3. Review the allocation of observer coverage to more appropriately monitor high risk areas and time periods.
4. Improve data quality and reporting.
5. Improve population information and research.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $20,000. Services were provided by Karearea Consultants.

Review milestones:

- Final report presented at the CSP TWG meeting on 22 September 2016
- Final report published on the CSP webpage in November 2016

Citation

Godoy, D. 2016. Marine reptiles - review of interactions and populations, Final report. Report prepared by Karearea Consultants for the New Zealand Department of Conservation. 53p.

Weblink

http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2015-16/marine-reptiles-review-of-interactions-and-populations/

3.8 POP2015-07 Supporting genetic analysis of protected fish species

Specific objectives

1. To establish a repository for genetic samples of protected fish species.
2. To conduct a stock take of complete, current and planned genetic analyses internationally, in relation to New Zealand's nine protected fish species.
3. To provide recommendations on the most appropriate methods of furthering genetic analyses in order to inform management of New Zealand's protected fish species in relation to fisheries bycatch.

Rationale

Reviews of the nine fish species protected under the Wildlife Act 1953 have highlighted a general paucity of data on the genetic structuring of stocks (Francis & Lyon 2012; 2014). This lack of information on population structure makes meaningful quantification of the extent of risk to these species problematic. Internationally there are a number of universities and research institutes undertaking genetic analyses on these species, with work being at various stages of planning or completion. Undertaking a stock take of these projects and pooling of samples with those collected from bycaught animals in New Zealand will allow a more strategic approach to planning and support of research to understand the genetic structuring of these protected fish species, allowing for robust assessment of risk from commercial fishing to these taxa over time in accordance with the National Plan of Action-Sharks.

Project status

Complete.

Summary of the methods and key findings

Nine fish species are currently protected in New Zealand fisheries waters (white shark, basking shark, whale shark, oceanic whitetip shark, deepwater nurse shark, spinetail devilray, giant manta ray, spotted black grouper and giant grouper). All nine species have low productivity, which in combination with fisheries threats make them vulnerable to over-exploitation. The wide distributions of most species, and the broad expanses of ocean between New Zealand and other population centres of all nine species, raise the possibility that some or all of them may have multiple, isolated, geographic populations. Understanding population structure is important for managing the New Zealand populations of these nine species. Even though the species are protected within the New Zealand EEZ, they may be subjected to fishing and environmental impacts elsewhere if they form part of more extensive geographic populations. The present study carries out a detailed investigation of the genetics of the nine species in order to (a) establish a repository for genetic samples of protected fish species, (b) conduct a stock take of complete, current and planned genetic analyses internationally, and (c) provide recommendations on the most appropriate methods of furthering genetic analyses in order to inform management of New Zealand's protected fish species in relation to fisheries bycatch.

NIWA has been collecting tissue samples from white shark since 1991, from basking shark since 1997, and from spinetail devilray since 2013. Many of these tissue samples have been contributed to international studies on the population genetics of these species. We aggregated all of NIWA's tissue samples to form the nucleus of a new library of protected species tissue samples, and a database of worldwide tissue samples of New Zealand's protected fish species was compiled. The database

contains good sample sizes of white shark (N=102) and basking shark (N=56) but small or no samples of the remaining seven species. Few of the tissues are held in the NIWA repository, with most being held elsewhere.

Genetic studies on the nine protected species found during a literature review and correspondence with geneticists worldwide are summarised and reviewed. Worldwide population genetics studies have been completed for white shark, basking shark, whale shark and spinetail devilray, although no studies on whale shark have included New Zealand material. The remaining species have been studied in only part of their range (spotted black grouper; no New Zealand material included) or not at all (oceanic whitetip shark, deepwater nurse shark, giant manta ray, giant grouper).

Recommendations

Most of the species covered in this review have global distributions but samples sizes of many studies were limited. A key priority is to continue to gather samples to complement samples collected from other locations. To increase the levels of genetic resolution, future studies should aim to build comprehensive reference genomes and single-nucleotide polymorphism databases, by using genotyping-by-sequencing or brute force population-scale genome sequencing. These approaches better resolve weak patterns of genetic variation and detect local-adaptive differences among populations. Specific recommendations are made for further study of white shark, basking shark, deepwater nurse shark and spotted black grouper.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $30,000. Services were provided by NIWA.

Review milestones:

- Draft final report presented at the CSP TWG meeting on 16 June 2016
- Final report published on the CSP webpage 25 August 2016

Citation

Francis M. & Ritchie, P. 2016. Genetic studies of New Zealand's protected fish species 2015/16. Report prepared by NIWA and Victoria University of Wellington for the New Zealand Department of Conservation, Wellington. 33p.

Weblink

http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2015-16/supporting-genetic-analysis-of-protected-fish-species/

4. Mitigation Projects

4.1 MIT2014-01 Protected species bycatch newsletter

Overall objective

To produce a newsletter to communicate protected species-related information to trawl and longline fishermen.

Rationale

Reducing the impacts of commercial fishing on protected species relies on individual fishermen actively applying best practice mitigation methods to their fishing activity. Applying and developing mitigation methods in specific circumstances requires an understanding of the protected species that may be impacted, and the nature with which they interact with fishing activity. A range of relevant information exists, often the result of research projects, and the newsletter will serve as a vehicle for communication to fishermen, fishing companies, and other interested parties. An evaluation of previous examples of this work by Pierre (2012) indicates that this format shows promise in reaching a broad sector of the fishing community and wider stake holders, and provides recommendations for further development.

Project status

Complete.

Summary of the Methods and Key Findings

The objective of Conservation Services Programme project MIT2014-01 was to produce a bimonthly newsletter to communicate protected species-related information to commercial fishermen. This project's two-year term has now concluded, with 12 issues of the newsletter produced.

Articles covered best practice mitigation methods, new and emerging mitigation measures, work underway to develop bycatch reduction approaches, current events of relevance to commercial fishers, and other protected species information relevant to commercial fishing. Key references were also provided in each issue, to facilitate reader access to additional information on topics of particular interest.

The target audience for the newsletter comprised commercial fishers and others involved in the fishing industry. Recipients included holders of fishing quota and annual catch entitlement, seafood company representatives, Seafood New Zealand's Sector Representative Entities and Commercial Stakeholder Organisations, Ministry for Primary Industries regional office staff, the New Zealand Federation of Commercial Fishermen, and individuals working in the fishing industry or on fisheries bycatch issues. In addition, fisheries observers and seabird liaison staff distributed copies to fishers in person, when newsletter items had particular relevance to their activities or the fisheries in which they were deployed.

Throughout this project term, the newsletter was circulated directly to around 1,700 recipients. It was distributed in five forms: as an html newsletter delivered via email, via Twitter and Facebook links, as an A4 2-page pdf file distributed electronically, and a hard copy newsletter mailed to recipients who indicated a preference for this medium or who did not have an electronic point of contact. Throughout the project term, the html newsletter was viewed electronically by 33 – 43.3% of the emailed recipients (mean = 39%). The html newsletter included an 'unsubscribe' option as well as providing for

recipients to update their contact details. Since December 2014, 47 recipients have unsubscribed. Ten 'subscribe' requests were received and 9 recipients have updated their contact details online. The majority of readers (83 - 94%) were New Zealand-based, with international readers accessing the newsletter from Australia, USA, Japan, Germany, Canada, the Czech Republic and Thailand. In addition, the newsletter's Twitter circulation attracted 57 'opens' on average for each edition (range = 22 - 103). The newsletter's circulation list was constructed using information from Ministry for Primary Industries databases, fisheries stakeholder circulation lists, government agency staff lists, and personal contacts amongst government and industry.

To broaden the audience for key messages regarding protected species interactions with commercial fisheries, the newsletter format could in future be supplemented with the publication of topical articles in industry media and presentations at industry meetings and conferences. This would also provide the opportunity to tailor key messages to particular interest groups (e.g., commercial fishers active in a particular region).

Recommendations

The newsletter's circulation list was constructed using information from Ministry for Primary Industries databases, fisheries stakeholder circulation lists, government agency staff lists, and personal contacts amongst government and industry. To broaden the audience for key messages regarding protected species interactions with commercial fisheries, the newsletter format could be supplemented with the publication of topical articles in industry media and presentations at industry meetings and conferences. This would also provide the opportunity to tailor key messages to particular interest groups (e.g., commercial fishers active in a particular region or dealing with particular protected species issues).

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $20,000. Services were provided by Johanna Pierre Environmental Consulting Ltd.

Review milestones:

- 2014/15 annual review presented at the CSP TWG meeting on 17 of June 2015
- Final report presented at the CSP TWG meeting on 16 June 2016
- Final report published on the CSP webpage on 20 July 2016

Citation

Pierre, P. 2016. Protected species bycatch newsletter: Final Report. Report prepared by Johanna Pierre Environmental Consulting Ltd. for the New Zealand Department of Conservation, Wellington. 7p.

Weblink

http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2015-16/protected-species-bycatch-newsletter-final-report/

Newsletters available at:
http://www.doc.govt.nz/our-work/conservation-services-programme/bycatch-bylines-newsletter/

4.2 MIT2015-01 Seabird bycatch reduction (small vessel longline fisheries)

Specific objectives

1. To provide one or more liaison officers to the inshore bottom longline and small vessel surface longline fishing fleets, with a focus on northern North Island, to assist those fleets reduce their seabird bycatch.
2. To coordinate the seabird liaison officer roles with wider efforts targeted at seabird bycatch reduction in relevant fisheries to achieve the greatest possible reduction in bycatch.

Rationale

To effectively reduce the risk of interactions with seabirds it is important for vessels to take the latest developments in mitigation technology and be able to adapt them to their specific operations. Translating the latest scientific research and fishing regulations into operational parameters is not always a straight forward process. To reduce that risk at a species level it is necessary for there to be consistency of application of mitigation across all fleets interacting with the species. Seabird liaison officers have formed a vital interface between skippers, government and researchers. Other projects and processes are also underway, which aim to reduce seabird bycatch, including the work of collaborative groups involving industry, Government and eNGOs, and process driven by the Ministry for Primary Industries. Coordinating liaison officers with these other processes to maximise reduction results is important.

Liaison officers were trialled in the snapper longline fleet around the Hauraki Gulf in 2013/14 and its initial positive results led to an expanded project being jointly resourced between DOC and MPI in 2014/15. This project expanded to a wider area and over a broader range of seasons, in particular to a larger portion of the Snapper longline fleet whilst also moving into the bluenose/hapuku fleet to develop vessel specific Seabird Management Plans (SMPs) along with liaison with the domestic surface longline fleet. Based the outcomes of two years of this work the ongoing need for the liaison role has been demonstrated to allow review, refinement and expansion of SMPs or equivalent on inshore vessels interacting with seabird species.

Project status

Complete.

Summary of the methods and key findings

With activities based from ports around the country and their focus being on the business of catching fish, fishers may find it difficult to stay abreast of developments in the field of bycatch mitigation, as well as changes in government policies and management approaches that overarch the fisheries they are active in. Liaison officers provide a mechanism to address this. In 2013/14, liaison officers were deployed in the snapper (*Pagrus auratus*) bottom longline fleet in Fishery Management Area 1. The success of that programme led to its continuation in 2014/15. This project (MIT2015-01) builds on previous liaison officer work with another two-year term.

Its objectives are:

1. To provide one or more liaison officers to the inshore bottom longline and small vessel surface longline fishing fleets, with a focus on the northern North Island, to assist those fleets in reducing their seabird bycatch.

2. To coordinate the seabird liaison officer roles with wider efforts targeted at seabird bycatch reduction in relevant fisheries to achieve the greatest reduction in bycatch possible.

The liaison team for 2015/16 comprised two liaison officers and a coordinator. The programme was established with documentation outlining roles and responsibilities, modes of interaction with government and stakeholders, and prioritised lists of vessels for engagement. Vessels included in the programme were surface and bottom longliners active in Fisheries Management Area 1 and targeting snapper (*Pagrus auratus*) (38 vessels) and bluenose (*Hyperoglyphe antarctica*) (17 vessels), and surface longline vessels operating off the east coast of the North Island and the west coast of the South Island (38 vessels). The activities of liaison officers were supported with information collection by government fisheries observers, who documented details of mitigation strategies in use on vessels.

In bottom longline fisheries, Seabird Management Plans were the vehicle for documenting strategies employed day to day on vessels to reduce seabird capture risk. These plans were introduced in 2014/15, and reviewed in 2015/16. In surface longline fisheries, Operational Plans had a similar function, and were developed in 2015/16 for the first time. The range of measures described in these plans varied significantly amongst vessels, illustrating opportunities to continue to encourage the implementation of improved bycatch mitigation strategies in future.

Amongst bottom longline vessels included in the liaison programme in 2015/16, liaison officers had up to four contacts with bluenose vessels and up to 12 contacts with snapper vessels. Up to six contacts were made by the liaison officer with surface longline vessel operators. Engagement with industry, government, research providers, environmental groups and other stakeholders has been valuable for the liaison programme in 2015/16. In particular, licensed fish receivers have made extremely important contributions to the programme and this is encouraged for future years.

Recommendations

In addition to fostering the involvement of licensed fish receivers in the liaison programme, recommendations for future years include providing a more closely located liaison resource for the west coast of the South Island, having seabird liaison officers and fisheries observers go to sea only in their respective capacities to ensure role clarity, prioritising a small group of higher risk vessels for dedicated liaison activities in 2016/17 such that their mitigation strategies demonstrably improve, and providing regular online updates for stakeholders interested in the activities of liaison team.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $150,000 per annum for two years. Services were provided by JPEC Ltd.

Review milestones:

- Draft final report presented at the CSP TWG meeting 22 September 2016
- Final report published on the CSP webpage in September 2016

Citation

Pierre, J.P. 2016. Conservation Services Programme Project MIT2015-01: Seabird bycatch reduction (small vessel longline fisheries): Liaison Coordinator Final Report. Report prepared by JPEC Ltd. for the New Zealand Department of Conservation, Wellington. 56p.

Weblink

http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2015-16/seabird-bycatch-reduction-small-vessel-longline-fisheries/

4.3 MIT2015-02 Small vessel seabird mitigation project

Specific objectives

1. To test the efficacy of mitigation strategies or devices identified by the work of the seabird liaison officers operating in the small vessel bottom longline fleets.
2. To support efficacy testing of the improved tori line designs produced as an output of project MIT2014-02.

Rationale

The small vessel surface longline fishery poses substantial risk to most, high and very high risk seabirds (see Table 7 of the CSP seabird plan 2015) despite current mitigation requirements and use. Implementation of proven mitigation strategies is known to be variable both within and between these fleets. Seabird Liaison officers have been deployed in the northern inshore bottom longline fleets for the past two years, also moving into the surface longline fleet during 2014/15, and further work is proposed in project MIT2015-01. In order to provide robust advice on best practice to fishers it is important that new or adapted mitigation options are backed up with adequate testing of efficacy. Recent work has included testing of new weighting options, setting practices and novel devices such as the hook pod (including CSP projects MIT 2011-03, MIT 2012-01 and MIT2013-02). Research is underway to develop improved tori line designs (CSP project MIT2014-02).

Project status

Implementation planned for completion in 2016/17 and 2017/18.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $150,000 in 2015/16.