Conservation Services Programme Annual Research Summary 2011-12

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1. Introduction

1.1 Purpose

This report outlines the research carried out through the 2012/13 Conservation Services Annual Plan, and provides updates on multi-year projects started in previous years.

1.2 Background

The Conservation Services Programme (CSP), part of the Department of Conservation (DOC), originated in 1995 after an amendment to the Fisheries Act 1983 allowed for a Conservation Services Levy to be charged to the fishing industry, to recover the costs of research related to the impact of commercial fishing operations on marine protected species in New Zealand waters, and the development of ways to mitigate bycatch. The Minister of Conservation can also require the production of population management plans, which can include the setting of maximum-allowable levels of fishing-related mortality for threatened species.

1.3. CSP Vision and Objectives

The 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 2013[1].

1.4 Development of the Annual Plan

The Conservation Services Programme Annual Plan 2011/12[2] describes 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 forms 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 2013. In the development of this Annual Plan a series of discussions were held with the Ministry of Fisheries staff to harmonize the CSP and the Ministry of Fisheries research programmes for 2011/12 and to ensure there was no duplication. A formal consultation process was also used as described below.

[1] Available to download from http://www.doc.govt.nz/csp-strategic-statement-2013

[2] Available to download from http://www.doc.govt.nz/mcs-annual-plan-2011-12/

Note also that this Annual Plan included a project directly relevant to commercial fishing-protected species interactions but not considered within the levy framework for 2011/12 (INT2011-02). However, it did have allocated (crown-funded) administration components, to reflect staff time involved in delivery.

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 2011/12 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 2011/12. This process was developed jointly by the CSP team at the DOC and the Inshore Fisheries team at the Ministry of Fisheries in consultation with the Seafood Industry Council and the Federation of Commercial Fishermen.

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

The public consultation process on the entire plan was as follows:

4 May 2011	Draft Marine Conservation Services Annual Plan 2011/12 released for public comments.
15 June 2011	Public comment period closes.
1 July 2011	Summary of public submissions and response to comments completed.
4 July 2011	Director-General of Conservation conveys the Marine Conservation Services Annual Plan 2011/12 as amended in accordance with public comments to the Minister of Conservation.

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 agency that provided the services, 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 2012/13 were divided into three main areas:

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

2. Interaction Projects

2.1 INT2011-01 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 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 will continue to purchase baseline services for "offshore" fisheries from the Ministry of Fisheries Observer Services, given the scale of their operation, which allows observers to be placed strategically across New Zealand Fisheries. Where data collection involves using techniques beyond observation and recording, providers with specific expertise and/or equipment will be considered. For the purposes of providing costings, the rate provided by the Ministry of Fisheries Observer Services has been used. As such, for the purposes of planning, costings for observer coverage are based on those provided by the Ministry of Fisheries Observer Services to provide a best estimate.

Project status

Completed.

Summary of the methods and key findings

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 (see 2.1.1). While the majority of these vessels 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 is 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 uncertainly around the risk to particular protected

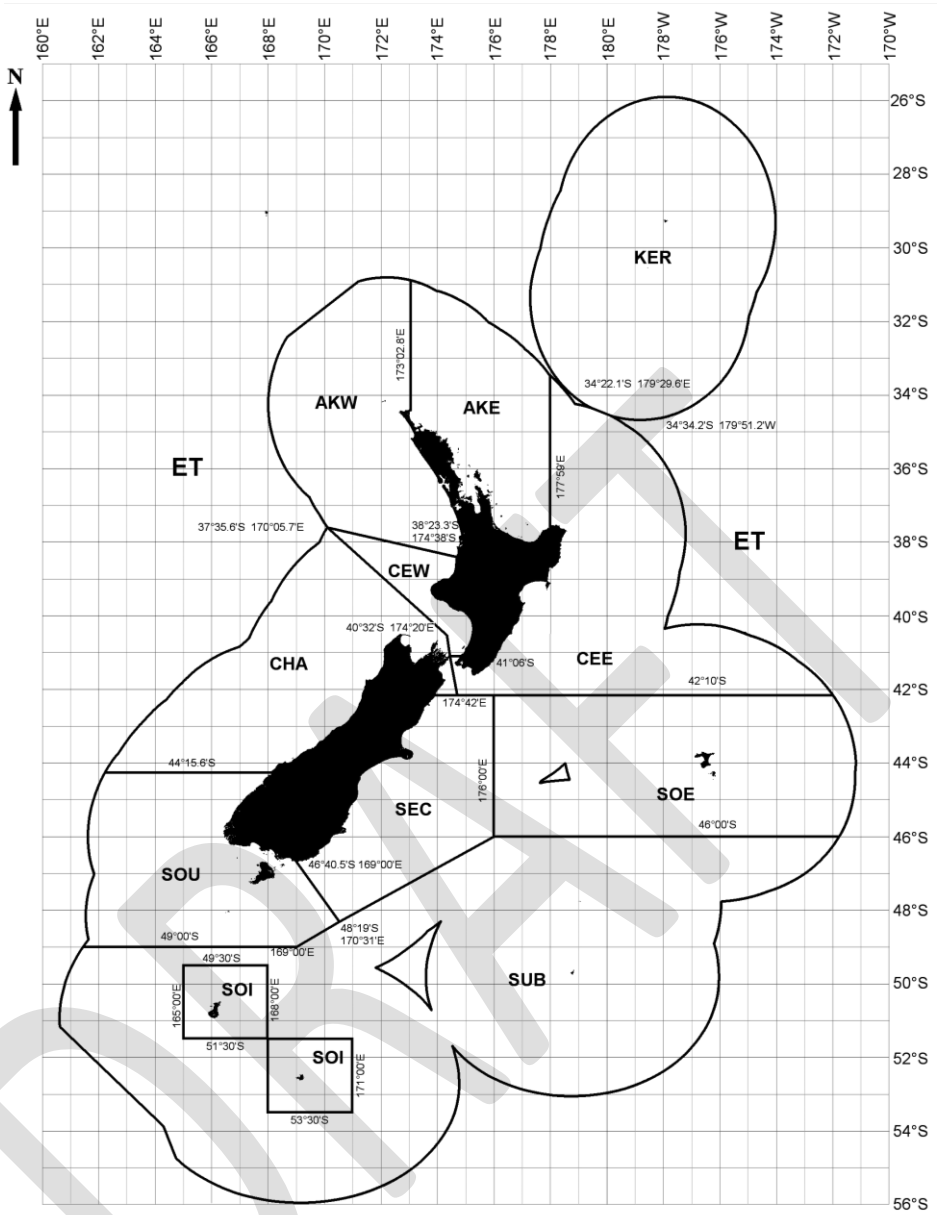
species which was identified in both the level 1 and level 2 risk assessments (Rowe 2010, Richards et. al. 2011), and assessing mitigation options for interactions identified.

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 onboard commercial fishing vessels operating within the New Zealand Exclusive Economic Zone (EEZ) in order to monitor interactions with protected species. 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.

The observer coverage presented in this report extends work conducted in previous years (e.g. Rowe 2009, 2010 Ramm 2011, 2012).

The remainder of this document follows Rowe (2010) and 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

Table 1 Summary

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 (kg)
1. AKE	412	47	11.41	0	0	0	0	0	0	2	4.26
2. CEE	1,364	141	10.34	1	0.71	16	11.35	0	0	0.5	0.35
3. SEC	3,188	412	12.92	23	5.58	2	0.49	0	0	3,371	818.20
4. SOE	2,391	602	25.18	9	1.50	0	0	1	0.17	8,645	1,436.05
5. SOU	1,630	413	25.34	41	9.93	5	1.21	0	0	901	218.09
6. SUB	668	267	39.97	6	2.25	0	0	0	0	184	68.99
7. CHA	4,784	641	13.40	9	1.40	10	1.56	0	0	54	8.44
8. CEW	16	0	-	-	-	-	-	-	-	-	-
9. AKW	45	6	13.33	0	0	0	0	0	0	1	16.67
Total	**14,498**	**2,529**	**17.44**	**89**	**3.52**	**33**	**1.30**	**1**	**0.04**	**13,159**	**520.3**

Table 2 Protected species interactions

Species name	Alive	Dead	Grand Total
Birds			
Buller's albatross	4	12	16
Buller's and Pacific albatross	1		1
Campbell albatross		1	1
Cape petrels	2	4	6
Giant petrels (Unidentified)	1		1
Greater albatross	1		1
New Zealand white-capped albatross	3	7	10
Salvin's albatross	5	8	13
Seabird - Small	1		1
Smaller albatross		1	1
Snares Cape petrel		2	2
Sooty shearwater	4	20	24
Southern royal albatross		1	1
Wandering albatross (Unidentified)	1		1
White-chinned petrel	2	8	10
Birds Total	**25**	**64**	**89**
Marine Mammals			
New Zealand fur seal	6	26	32
New Zealand sea lion	1		1
Marine Mammals Total	**7**	**26**	**33**
Protected Fish			
Basking Shark		1	1
Protected Fish Total		**1**	**1**
Grand Total	**32**	**91**	**123**

Table 3 a Method of interaction - alive

Species name	Caught on warp or door	Impact against vessel	Net capture	Other	Grand Total
Birds					
Buller's albatross			4		4
Buller's and Pacific albatross			1		1
Cape petrels			1	1	2
Giant petrels (Unidentified)		1			1
Greater albatross			1		1
New Zealand white-capped albatross	1		2		3
Salvin's albatross			5		5
Seabird - Small		1			1
Sooty shearwater			4		4
Wandering albatross (Unidentified)			1		1
White-chinned petrel		1	1		2
Birds Total	**1**	**3**	**20**	**1**	**25**
Marine Mammals					
New Zealand fur seal			6		6
New Zealand sea lion			1		1
Marine Mammals Total			**7**		**7**
Grand Total	**1**	**3**	**27**	**1**	**32**

Table 3 b Method of interaction - dead

Species name	Caught on warp or door	Net capture	Other	Unknown	Grand Total
Birds					
Buller's albatross	8	3	1		12
Campbell albatross		1			1
Cape petrels	2	2			4
New Zealand white-capped albatross	4	3			7
Salvin's albatross	4	2	2		8
Smaller albatross	1				1
Snares Cape petrel	2				2
Sooty shearwater		19		1	20
Southern royal albatross	1				1
White-chinned petrel		6	2		8
Birds Total	**22**	**36**	**5**	**1**	**64**
Marine Mammals					
New Zealand fur seal		25	1		26
Marine Mammals Total		**25**	**1**		**26**
Protected Fish					
Basking Shark		**1**			1
Protected Fish Total		**1**			**1**
Grand Total	**22**	**62**	**6**	**1**	**91**

Southern Blue Whiting

Table 4 Summary

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 (kg)
1. AKE	-	-	-	-	-	-	-	-	-
2. CEE	-	-	-	-	-	-	-	-	-
3. SEC	-	-	-	-	-	-	-	-	-
4. SOE	-	-	-	-	-	-	-	-	-
5. SOU	-	-	-	-	-	-	-	-	-
6. SUB	1,223	446	36.47	16	3.59	42	9.42	106.7	23.92
7. CHA	-	-	-	-	-	-	-	-	-
8. CEW	-	-	-	-	-	-	-	-	-
9. AKW	-	-	-	-	-	-	-	-	-
Total	**1,223**	**446**	**36.47**	**16**	**3.59**	**42**	**9.42**	**106.70**	**23.92**

Table 5 Protected species interactions

Species name	Alive	Dead	Grand Total
Birds			
Albatross (Unidentified)	1		1
Grey petrel		5	5
Grey-backed storm petrel	2		2
Petrels, Prions and Shearwaters	1	1	2
Prions (Unidentified)	1		1
Salvin's albatross	1		1
Smaller albatross	1		1
Southern royal albatross		1	1
Storm petrels	2		2
Birds Total	**9**	**7**	**16**
Marine Mammals			
New Zealand fur seal		36	36
New Zealand sea lion	1	5	6
Marine Mammals Total	**1**	**41**	**42**
Grand Total	**10**	**48**	**58**

Table 6a Method of interaction - alive

Species name	Impact against vessel	Net capture	Other	Unknown	Grand Total
Birds					
Albatross (Unidentified)	1				1
Grey-backed storm petrel	1			1	2
Petrels, Prions and Shearwaters		1			1
Prions (Unidentified)			1		1
Salvin's albatross			1		1
Smaller albatross	1				1

Storm petrels	1			1	2
Birds Total	**4**	**1**	**2**	**2**	**9**
Marine Mammals					
New Zealand sea lion		1			1
Marine Mammals Total		**1**			**1**
Grand Total	**4**	**2**	**2**	**2**	**10**

Table 6b Method of interaction - dead

Species name	Net capture	Unknown	Grand Total
Birds			
Grey petrel	5		5
Petrels, Prions and Shearwaters		1	1
Southern royal albatross	1		1
Birds Total	**6**	**1**	**7**
Marine Mammals			
New Zealand fur seal	36		36
New Zealand sea lion	5		5
Marine Mammals Total	**41**		**41**
Grand Total	**47**	**1**	**48**

Scampi

Summary

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 (kg)
1. AKE	812	76	9.36	0	0	0	0	4	5.26	23.1	30.39
2. CEE	538	192	35.69	4	2.08	0	0	0	0	296.9	154.64
3. SEC	2	0	-	-	-	-	-	-	-	-	-
4. SOE	1,537	73	4.75	6	8.22	0	0	0	0	0	0
5. SOU	0	0	-	-	-	-	-	-	-	-	-
6. SUB	1,140	169	14.82	1	0.59	1	1	0	0	1,723	1,019.59
7. CHA	0	0	-	-	-	-	-	-	-	-	-
8. CEW	0	0	-	-	-	-	-	-	-	-	-
9. AKW	0	0	-	-	-	-	-	-	-	-	-
Total	**4,029**	**510**	**12.66**	**11**	**2.16**	**1**	**0.20**	**4**	**0.78**	**2,043**	**400.6**

Protected species interactions

Species name	Alive	Dead	Decomposing	Grand Total
Birds				
Buller's albatross		1		1
Buller's and Pacific albatross		3		3
Fairy prion	1			1
New Zealand white-capped albatross		1		1
Salvin's albatross	1		1	2
Smaller albatross		1		1
Sooty shearwater	1			1
White-chinned petrel		1		1
Birds Total	**3**	**7**	**1**	**11**
Marine Mammals				
New Zealand sea lion			1	1
Marine Mammals Total			**1**	**1**
Protected Fish				
Sand shark		4		4
Protected Fish Total		**4**		**4**
Grand Total	**3**	**11**	**2**	**16**

Method of interaction - alive

Species name	Caught on warp or door	Impact against vessel	Other	Grand Total
Birds	**1**	**1**	**1**	**3**
Fairy prion		1		1
Salvin's albatross			1	1
Sooty shearwater	1			1
Grand Total	**1**	**1**	**1**	**3**

Method of interaction - dead

Species name	Caught on warp or door	Net capture	Unknown	Grand Total
Birds				
Buller's albatross		1		1
Buller's and Pacific albatross		3		3
New Zealand white-capped albatross		1		1
Salvin's albatross		1		1
Smaller albatross	1			1
White-chinned petrel		1		1
Birds Total	**1**	**7**		**8**
Marine Mammals				
New Zealand sea lion		1		1
Marine Mammals Total		**1**		**1**
Protected Fish				
Sand shark			4	4
Protected Fish Total			**4**	**4**
Grand Total	**1**	**8**	**4**	**13**

Squid

Summary

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 (kg)
1. AKE	0	0	-	-	-	-	-	-	-	-	-
2. CEE	0	0	-	-	-	-	-	-	-	-	-
3. SEC	382	22	5.76	0	-	1	4.55	0	0	21.3	96.8
4. SOE	18	3	16.67	0	-	0	-	0	0	11	366.7
5. SOU	1,803	771	42.76	61	8	5	0.65	1		468.52	60.8
6. SUB	1,285	552	42.96	48	9	2	0.36	0	0	95.41	17.3
7. CHA	0	0	-	-	-	-	-	-	-	-	-
8. CEW	0	0	-	-	-	-	-	-	-	-	-
9. AKW	0	0	-	-	-	-	-	-	-	-	-
Total	**3,488**	**1,348**	**38.65**	**109**	**8.09**	**8**	**0.59**	**1**	**0.07**	**596.23**	**44.2**

Protected species interactions

Row Labels	Alive	Dead	Grand Total
Birds			
Albatross (Unidentified)	1	1	2
Buller's albatross	2	7	9
Common diving petrel	1		1
New Zealand white-capped albatross	7	30	37
Petrel (Unidentified)	5	1	6
Seabird (unspecified)	2		2
Shy albatross	2		2
Sooty shearwater	5	3	8
Southern royal albatross	2		2
White-chinned petrel	11	29	40
Birds Total	**38**	**71**	**109**
Marine Mammals			
New Zealand fur seal	1	7	8
Marine Mammals Total	**1**	**7**	**8**
Protected Fish			
Basking shark		2	
Protected Fish Total		**2**	**2**
Grand Total	**39**	**80**	**119**

Method of interaction - alive

Species name	Impact against vessel	Net capture	Other	Unknown	Grand Total
Birds					
Albatross (Unidentified)		1			1
Buller's albatross		2			2
Common diving petrel	1				1
New Zealand white-capped albatross	2	5			7
Petrel (Unidentified)		5			5
Seabird (unspecified)	2				2
Shy albatross		2			2
Sooty shearwater	1	3		1	5
Southern royal albatross		1	1		2
White-chinned petrel	2	9			11
Birds Total	**8**	**28**	**1**	**1**	**38**
Marine Mammals					
New Zealand fur seal		1			1
Marine Mammals Total		**1**			**1**
Grand Total	**8**	**29**	**1**	**1**	**39**

Method of interaction - dead

Species name	Caught on warp or door	Net capture	Other	Unknown	Grand Total
Birds					
Albatross (Unidentified)	1				1
Buller's albatross	2	5			7
New Zealand white-capped albatross	13	17			30
Petrel (Unidentified)		1			1
Sooty shearwater		3			3
White-chinned petrel		28	1		29
Birds Total	**16**	**54**	**1**		**71**
Marine Mammals					
New Zealand fur seal		6	1		7
Marine Mammals Total		**6**	**1**		**7**
Protected Fish					
Basking shark				2	2
Protected Fish Total				**2**	**2**
Grand Total	**16**	**60**	**2**	**2**	**80**

Pelagic Trawl Fisheries

Jack Mackerel and Barracouta

Summary

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 (kg)
1. AKE	11	0	-	-	-	-	-	-	-	-	-
2. CEE	19	0	-	-	-	-	-	-	-	-	-
3. SEC	1,191	163	13.69	4	2.45	0	0	1	0.61	439.9	269.88
4. SOE	53	11	20.75	0	0.00	0	0	0	0	-	-
5. SOU	347	174	50.14	6	3.45	1	0.57	0	0	460.7	264.77
6. SUB	0	0	-	-	-	-	-	-	-	-	-
7. CHA	1,141	302	26.47	0	0	3	0.99	0	0	9.2	3.05
8. CEW	1,113	780	70.08	1	0.13	5	0.64	0	0	20.07	2.57
9. AKW	247	174	70.45	0	0	0	0	0	0	1.5	0.86
Total	**4,122**	**1,604**	**38.91**	**11**	**0.69**	**9**	**0.56**	**1**	**0.06**	**931**	**58.1**

Protected species interactions

Species name	Alive	Dead	Grand Total
Birds			
New Zealand white-capped albatross	2	2	4
Salvin's albatross	2	1	3
Shy albatross		1	1
Storm petrels	1		1
White-chinned petrel	1	1	2
Birds Total	**6**	**5**	**11**
Marine Mammals			
Common dolphin		4	4
New Zealand fur seal		5	5
Marine Mammals Total		**9**	**9**
Protected Fish			
Sand shark		1	1
Protected Fish Total		**1**	**1**
Grand Total	**6**	**15**	**21**

Method of interaction - alive

Species name	Impact against vessel	Net capture	Other	Grand Total
Birds				
New Zealand white-capped albatross	1	1		2
Salvin's albatross		2		2
Storm petrels			1	1
White-chinned petrel	1			1
Grand Total	**2**	**3**	**1**	**6**

Method of interaction - dead

Species name	Net capture	Unknown	Grand Total
Birds			
New Zealand white-capped albatross	2		2
Salvin's albatross	1		1
Shy albatross	1		1
White-chinned petrel	1		1
Birds Total	**5**		**5**
Marine Mammals			
Common dolphin	4		4
New Zealand fur seal	5		5
Marine Mammals Total	**9**		**9**
Protected Fish			
Sand shark		1	1
Protected Fish Total		**1**	**1**
Grand Total	**14**	**1**	**15**

Deep Water Bottom Trawl Fisheries

Orange Roughy, Cardinal, and Oreo species

Summary

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 (kg)
1. AKE	390	64	16.41	0	-	0	-	25.4	39.7
2. CEE	1402	91	6.49	1	1.10	0	-	47.3	52.0
3. SEC	616	56	9.09	0	-	0	-	25	44.6
4. SOE	1833	390	21.28	1	0.26	0	-	534	136.9
5. SOU	61	23	37.70	0	-	0	-	0	0.0
6. SUB	780	204	26.15	1	0.49	0	-	235.6	115.5
7. CHA	225	67	29.78	0	-	0	-	0.8	1.2
8. CEW	0	0	-	-	-	-	-	0	0.0
9. AKW	269	142	52.79	0	-	0	-	688.4	484.8
Total	**5,576**	**1,037**	**18.60**	**3**	**0.29**	**0**	**-**	**1,556.5**	**150.1**

Protected species interactions

Species name	Alive	Dead	Grand Total
Birds			
Buller's shearwater	1		1
Cape petrels		1	1
Salvin's albatross		1	1
Grand Total	**1**	**2**	**3**

Method of interaction

Species name	Caught on warp or door	Impact against vessel	Grand Total
Birds			
Buller's shearwater		1	1
Cape petrels		1	1
Salvin's albatross	1		1
Grand Total	**1**	**2**	**3**

Inshore Fisheries

Inshore Trawl

Summary

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 (kg)
1. AKE	7,958	52	0.65	2	3.85	0	0	0	0.0
2. CEE	9,551	0	0.00	0	-	-	-	-	-
3. SEC	12,045	254	2.11	3	1.18	0	0	0	0.0
4. SOE	21	2	9.52	0	0	0	0	0	0.0
5. SOU	2,926	1	0.03	0	0	0	0	0	0.0
6. SUB	5	0	0.00	0	-	-	-	-	-
7. CHA	12,088	100	0.83	5	5.00	0	0	0	0.0
8. CEW	1,590	16	1.01	0	0	0	0	0	0.0
9. AKW	3,483	24	0.69	1	4.17	0	0	7	29.2
Total	**49,667**	**449**	**0.90**	**11**	**2.45**	**0**	**0**	**7**	**1.6**

Protected species interactions

Species name	Alive	Dead	Grand Total
Birds			
Black petrel	1		1
Flesh-footed shearwater	1		1
New Zealand white-capped albatross		9	9
Grand Total	**2**	**9**	**11**

Method of interaction

Species name	Caught on warp or door	Impact against vessel	Net capture	Grand Total
Birds				
Black petrel			1	1
Flesh-footed shearwater		1		1
New Zealand white-capped albatross	9			9
Grand Total	**9**	**1**	**1**	**11**

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

Summary FMA	Effort Lines	Observed Lines	Coverage (%)	Number of hooks observed	Seabird Captures*	Seabirds per 1000 hooks	Mammal Captures	Mammals per 1000 hooks	Coral catch (kg)	Coral catch per 1000 hooks (kg)
1. AKE	1,237	0	-	-	-	-	-	-	-	-
2. CEE	1,531	0	-	-	-	-	-	-	-	-
3. SEC	133	0	-	-	-	-	-	-	-	-
4. SOE	1,678	0	-	-	-	-	-	-	-	-
5. SOU	140	0	-	-	-	-	-	-	-	-
6. SUB	0	0	-	-	-	-	-	-	-	-
7. CHA	675	16	2.37	14,262	0	0	0	0	8	500.0
8. CEW	415	4	0.96	2,600	0	0	0	0	0	0.0
9. AKW	817	0	-	-	-	-	-	-	-	-
Total	**6,626**	**20**	**0.30**	**16,862**	**0**	**0**	**0**	**0**	**8**	**40.0**

Surface Longline Fisheries

Charter Tuna

Summary

FMA	Effort Lines	Observed Lines	Coverage (%)	Number of hooks observed	Seabird Captures*	Seabirds per 1000 hooks	Mammal Captures	Mammals per 1000 hooks
1. AKE	0	0	0	0	-	-	-	-
2. CEE	0	0	0	0	-	-	-	-
3. SEC	0	0	0	0	-	-	-	-
4. SOE	0	0	0	0	-	-	-	-
5. SOU	57	59	103.51	167,286	32	0.19	11	0.07
6. SUB	0	0	0	0	-	-	-	-
7. CHA	104	103	99.04	291,296	1	0.00	9	0.03
8. CEW	0	0	0	0	-	-	-	-
9. AKW	2	2	100	4,911	0	0.00	0	0.00
Total	**163**	**164**	**100.61**	**463,493**	**33**	**0.07**	**20**	**0.04**

Protected species interactions

Species name	Alive	Dead	Grand Total
Birds			
Buller's albatross	7	20	27
New Zealand white-capped albatross	1	5	6
Birds Total	**8**	**25**	**33**
Marine Mammals			
New Zealand fur seal	19	1	20
Marine Mammals Total	**19**	**1**	**20**
Grand Total	**27**	**26**	**53**

Method of interaction - alive

Species name	Hook capture	Tangled in line	Grand Total
Birds			
Buller's albatross	6	1	7
New Zealand white-capped albatross	1		1
Birds Total	**7**	**1**	**8**
Marine Mammals			
New Zealand fur seal	19		19
Marine Mammals Total	**19**		**19**
Grand Total	**26**	**1**	**27**

Method of interaction - dead

Species name	Hook capture	Tangled in line	Grand Total
Birds			
Buller's albatross	19	1	20
New Zealand white-capped albatross	4	1	5
Birds Total	**23**	**2**	**25**
Marine Mammals			
New Zealand fur seal	1		1
Marine Mammals Total	**1**		**1**
Grand Total	**24**	**2**	**26**

Domestic Tuna and Swordfish

Summary

FMA	Effort Lines	Observed Lines	Coverage (%)	Number of hooks observed	Seabird Captures*	Seabirds per 1000 hooks	Mammal Captures	Mammals per 1000 hooks	Marine Reptile Captures	Marine Reptile Capture per 1000 hooks
1. AKE	1,293	82	6.34	77,767	12	0.15	4	0.05	0	0
2. CEE	553	46	8.32	44,048	2	0.05	10	0.23	1	0.02
3. SEC	0	0	0	-	-	-	-	-	-	-
4. SOE	0	0	0	-	-	-	-	-	-	-
5. SOU	1	0	0	-	-	-	-	-	-	-
6. SUB	0	0	0	-	-	-	-	-	-	-
7. CHA	546	40	7.33	43,150	7	0.16	2	0.05	0	0
8. CEW	8	4	50	4,300	0	0.00	0	0.00	0	0
9. AKW	233	11	4.72	9,050	0	0.00	0	0.00	0	0
Total	**2,634**	**183**	**6.95**	**178,315**	**21**	**0.12**	**16**	**0.09**	**1**	**0.01**

Protected species interactions

Species name	Alive	Dead	Grand Total
Birds			
Albatross (Unidentified)		4	4
Black petrel		1	1
Buller's albatross		4	4
Campbell albatross		2	2
Gibson's albatross		1	1
Grey petrel		1	1
New Zealand white-capped albatross	1	1	2
Wandering albatross (Unidentified)	1	1	2
Westland petrel		1	1
White-chinned petrel		3	3
Birds Total	**2**	**19**	**21**
Marine Mammals			
New Zealand fur seal	15	1	16
Marine Mammals Total	**15**	**1**	**16**
Marine Reptiles			
Green turtle	1		1
Marine Reptiles Total	**1**		**1**
Grand Total	**18**	**20**	**38**

Method of interaction - alive

Species name	Hook capture	Unknown	Grand Total
Birds			
New Zealand white-capped albatross	1		1
Wandering albatross (Unidentified)	1		1
Birds Total	**2**		**2**
Marine Mammals			
New Zealand fur seal	15		15
Marine Mammals Total	**15**		**15**
Marine Reptiles			
Green turtle		1	1
Marine Reptiles Total		**1**	**1**
Grand Total	**17**	**1**	**18**

Method of interaction - dead

Species name	Hook capture	Tangled in line	Grand Total
Birds			
Albatross (Unidentified)	4		4
Black petrel	1		1
Buller's albatross	4		4
Campbell albatross	1	1	2
Gibson's albatross	1		1
Grey petrel		1	1
New Zealand white-capped albatross	1		1
Wandering albatross (Unidentified)	1		1
Westland petrel	1		1
White-chinned petrel	3		3
Birds Total	**17**	**2**	**19**
Marine Mammals			
New Zealand fur seal	1		1
Marine Mammals Total	**1**		**1**
Grand Total	**18**	**2**	**20**

Bottom Longline Fishery

Deep-sea Ling

Summary

FMA	Effort Lines	Observed Lines	Coverage (%)	Number of hooks observed	Seabird Captures*	Seabirds per 1000 hooks	Mammal Captures	Mammals per 1000 hooks
1. AKE	206	0	-	-	-	-	-	-
2. CEE	858	0	-	-	-	-	-	-
3. SEC	806	0	-	-	-	-	-	-
4. SOE	1,208	0	-	-	-	-	-	-
5. SOU	422	0	-	-	-	-	-	-
6. SUB	348	206	59.20	1,783,401	5	0.003	0	0.00
7. CHA	633	35	5.53	29,292	6	0.205	0	0.00
8. CEW	61	0	-	-	-	-	-	-
9. AKW	231	0	-	-	-	-	-	-
Total	**4,773**	**241**	**64.72**	**1,812,693**	**11**	**0.006**	**0**	**0.00**

Protected species interactions

Species name	Alive	Dead	Grand Total
Birds			
Buller's albatross	3		3
Campbell albatross	1		1
Cape petrels	1		1
Grey-backed storm petrel	1		1
New Zealand white-capped albatross	1	1	2
Southern royal albatross	1		1
Westland petrel		1	1
White-chinned petrel		1	1
Grand Total	**8**	**3**	**11**

Method of interaction - alive

Species name	Hook capture	Impact against vessel	Other	Grand Total
Birds				
Buller's albatross	2		1	3
Campbell albatross			1	1
Cape petrels		1		1
Grey-backed storm petrel		1		1
New Zealand white-capped albatross	1			1
Southern royal albatross			1	1
Grand Total	**3**	**2**	**3**	**8**

Method of interaction - dead

Species name	Hook capture	Grand Total
Birds		
New Zealand white-capped albatross	1	1
Westland petrel	1	1
White-chinned petrel	1	1
Grand Total	**3**	**3**

Purse Seine Fisheries

Skipjack Tuna

Summary

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
1. AKE	178	62	34.83	0	0	0	0	3	4.84
2. CEE	0	0	-	-	-	-	-	-	-
3. SEC	0	0	-	-	-	-	-	-	-
4. SOE	0	0	-	-	-	-	-	-	-
5. SOU	0	0	-	-	-	-	-	-	-
6. SUB	0	0	-	-	-	-	-	-	-
7. CHA	67	26	38.81	0	0	0	0	0	0
8. CEW	63	3	4.76	0	0	0	0	0	0
9. AKW	158	22	13.92	0	0	0	0	0	0
Total	**466**	**113**	**24.25**	**0**	**0.00**	**0**	**0.00**	**3**	**2.65**

Protected species interactions

Species name	Alive	Dead	Grand Total
Protected Fish			
Spine-tailed devil ray		3	3
Protected Fish Total		**3**	**3**
Grand Total		**3**	**3**

Method of interaction

Species name	Unknown	Grand Total
Protected Fish		
Spine-tailed devil ray	3	3
Protected Fish Total	**3**	**3**
Grand Total	**3**	**3**

Project logistics summary statement

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

Review milestones:

Citation

XXX

Weblink

http:\\www.XXX

2.2 INT2011-02 Protected species interactions with commercial pot and trap fishing methods in New Zealand

Overall objective

To understand the nature of seabird interactions with New Zealand commercial pot and trap fishing activities.

Specific objectives

1. To describe shag interactions with commercial pot and trap fishing methods around the Chatham Islands.
2. To identify and describe measures for mitigating shag interactions with commercial pot and trap fishing methods around the Chatham Islands.
3. To collect other relevant information on shag interactions with commercial pot and trap fishing methods around the Chatham Islands that will assist in assessing, developing and improving mitigation measures.
4. To make recommendations on suitable methods for collecting information on, and mitigating any impacts of, interactions of shags and commercial pot and trap fishing activity.

Rationale

Recent qualitative risk assessment identified three shag species as being at high or moderate risk to pot and trap fishing methods (Rowe 2010c). Shag captures have been documented in the Chatham Islands (Bell & Bell 2000, DOC unpublished data). No observer coverage has been obtained from these fisheries. Because of the paucity of data, these fisheries were not included in recent quantitative risk assessment work (Richard et al 2011).

Two Nationally Endangered shags, the Chatham Island shag and Pitt Island shag (Miskelly et al 2008) are found in, and are endemic to, the Chatham Islands area. The most recent population estimates are only 271 and 547 breeding pairs, for Chatham Island and Pitt Island shags, respectively (Bester & Charteris 2005), making these species very susceptible to human-induced mortality. Both species are subject of a Threatened Species Recovery Plan (Department of Conservation 2001). The information collected by this project will be used to better determine the nature and extent of interactions between these species and commercial fishing, as well as help identify possible methods to mitigate any impacts.

Fishing returns indicate that approximately 2000 days of rock lobster potting effort, with over 200,000 pot lifts, are conducted each year around the Chatham Islands by 38 vessels ranging from 6 to 16m in length. Peak fishing times are in the months of November to February, which coincides with the breeding period for these shag species (October to January).

Project status

Completed.

Summary of the methods and key findings

Three species of shag breed in the Chatham Islands, two of which (the Chatham Island Shag and Pitt Island shag) are endemic. The populations of both these species have suffered significant declines in

the past 15 years. Accidental bycatch of shags has been reported from the Chatham Islands rock lobster fishery, but there has been no qualitative research into the issue.

Internationally studies of seabird interactions (including shags) in pot and trap fisheries are limited, with shag interactions reported from the Chatham Islands, New Zealand, Australia, North and South America, and few studies have quantified the level of shag bycatch. Outside of New Zealand no mitigation measures have been developed for seabird interactions with commercial pot and trap fisheries, including shag/cormorant interactions. This is probably as a result of the low levels of shag interactions reported. The CRA6 Industry Association has been operating a seabird interaction code of practise since the issue of shag interactions was drawn to their attention in 2010. This appears to be the first such mitigation practise developed for pot and trap fishing in relation to seabird interactions.

Between the 1979/80 – 2009/10 fishing season the annual number of pot lifts has remained relatively stable with an average of 285,300 pot lifts per season (range 163,500 – 428,000), although the number of boats has declined from around 48 to 34. Interviews were carried out with 22 past and present fishermen to determine shag interactions with commercial rock lobster pot fishing in the Chatham Islands. Nine of these fishermen reported catching between 1-5 Pitt Island shag during their entire fishing career. Fishermen reported a total of 20 captures of Pitt Island shag, captures where widely distributed throughout the Chatham Islands although more bycatch was reported from Area 942 than other areas.

All reported bycatch occurred at least 5 years ago, and most over 10 years ago. Generally fishermen could not recall precise dates of shag interactions, but related the bycatch to pot and bait type, commenting that they changed baiting methodology 10-15 years ago. Although fishermen could not remember the precise date of shag captures, all reported that their bycatch occurring when pots were set close to shore in shallow water. This occurs each January and February when fishing gear is moved in shallow to follow the annual movement of rock lobster.

Fishermen who reported bycatch reported that shag captures occurred when they were using hanging baits and they thought shags were attracted to the bait, or small fish attracted to that bait when pots were first lowered into the water. These fishermen reported that since they moved to using snifters (bait holders) they had not caught shags. Fishermen noted that at the time of their shag interaction they were using a different pot design than they do presently. The pots had a larger neck and were covered with large mesh, it was considered that the larger neck and mesh size of old pots provided more opportunity for shags to enter pots, either through the neck or even through the mesh. Modern pots have a narrower neck and smaller mesh size. There was a high level of awareness of shags and shag interactions amongst CRA6 fishermen. This is probably as a result of debate about the relative significance of this issue, and a proposed observer programme.

All fishermen strongly felt that pot fishing was not the cause of shag population declines, and that the rock lobster industry was being singled out. It was felt that all possible threats to shags should be studied to determine the reason for population declines. This included disturbance from stock, impacts of introduced predators, and the impacts of increasing black-backed gull populations. Fishermen also commented that as little is known about the ecology of shags in the Chatham's it is impossible to determine the cause of population declines.

Project logistics summary statement

This project was not funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $10,000. Services were provided by Wildlife Management International Ltd.

Review milestones: Results presented at the CSP TWG meeting on 28 May 2012.

Citation

Bell, M. 2012. Shag interactions with commercial rock lobster pot and trap fishing methods in the Chatham Islands. Report prepared for the New Zealand Department of Conservation, Wellington, 24p.

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http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/int-2011-02-shag-pot-interaction-final-report.pdf

2.2 INT2010-02 Identification of seabirds captured in New Zealand fisheries

NOTE: This multi-year project (INT2010-02) was consulted on in 2010/11 and is included here for completeness

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. Government 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. To enable expert determination of taxon, sex, age-class, provenance and cause of mortality, government observers retain dead bird specimens (subject to any operational limitations), and photograph, where possible, bird captures either alive or dead.

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 of Fisheries' databases 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

On-going (scheduled completion May 2014).

Summary of the methods and key findings

Between 1 July 2011 and 30 June 2012 a total of 176 seabirds comprising 13 taxa were incidentally killed as bycatch and returned for autopsy by onboard New Zealand Government observers. Birds were returned from longline (*n* = 30) and trawl (*n* = 146) vessels, and were dominated numerically by four species (white-chinned petrel *Procellaria aequinoctialis*, New Zealand white-capped albatross *Thalassarche steadi*, Buller's albatross *Thalassarche bulleri bulleri* and sooty shearwater *Puffinus griseus*). These four species, together with Salvin's albatross Thalassarche salvini, accounted for 88.6% of all returns. Of the remaining eight taxa, two had only single captures, four had two captures and Cape petrel and Grey petrel both had five captures.

The majority of birds returned were males (*n* = 114); however, Salvin's albatross returns had more females (*n* = 5) than males. Also, most birds returned were adults (*n* = 171). Of the 171 adults, 129 were breeding, 40 were non-breeding and 2 could not have the breeding status confirmed due to sea lice damage. Of all the birds returned, 3 were pre-breeders or immatures.

All birds returned from longline fisheries had injuries consistent with being hooked or entangled in the bill or throat. In contrast, most birds (79.9%) returned from trawl fisheries were killed through entanglement in the net or cod-end, with the remaining 20.1% likely to have been killed by warp interaction. Two birds were killed by striking the deck. Birds had similar mean fat scores as in the previous fishing year, and discards, including offal, appear to continue to be an attractant for many seabirds.

Out of 138 records of seabird captures on fishing vessels, photographs were taken of 52 seabirds. Image quality varied widely, with poor images being particularly common for birds that were alive and seen onboard for short periods. Recommendations are made to improve photo-identifications in the future.

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. Services were provided by Wildlife Management International Ltd.

Review milestones: Quarterly report to 31/03/2011 tabled at the CSP TWG meeting on 21 June 2011; quarterly report to 31/06/2011 tabled at the CSP TWG meeting on 21 October 2011; draft final report 2010-11 presented at the CSP TWG meeting on 9 December 2011; six-monthly report for 1 July 2011 – 31 December 2011 presented at the CSP TWG meeting on 28 May 2012; draft final report 2011-12 presented at the CSP TWG meeting on 27 November 2012; and six-monthly report for July – December 2012 presented at the CSP TWG meeting on 1 August 2012.

Citation

Bell, E. 2013. Identification of seabirds captured in New Zealand fisheries: 1 July 2011 to 30 June 2012. Report prepared for the New Zealand Department of Conservation, Wellington, 40p.

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http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/int-2010-02-seabird-id-final-report-2011-12.pdf

3. Population Projects

3.1 POP2011-01 New Zealand sea lions - Auckland Islands population study

Overall objective

To provide information on the population level and dynamics of the New Zealand sea lion, relevant to the management of commercial fishing impacts on this species.

Specific objectives

1. To estimate New Zealand sea lion pup production on the Auckland Islands.
2. To collect information on marked animals relevant to improving the understanding of population dynamics of New Zealand sea lions at the Auckland Islands.
3. To maintain and update the New Zealand sea lion database and make all information collected under specific objectives 1 and 2 readily available for relevant analytical or modelling work.

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 (e.g. Chilvers 2008, 2010). Approximately 75% 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. These data have been used to generate estimates of fecundity, survival and other components of population dynamics (e.g. Gilbert 2008; MacKenzie 2010). Over the last decade there has been a considerable decline in pup production at the Auckland Islands (Chilvers 2010). During this period disease events have occurred (Castinel et al 2007), but the reasons for the apparent decline remain unclear. In contrast, pup production appears to have increased on Campbell Island, the second major breeding location for the species (Maloney et al 2009).

In recent years the Minister of Fisheries has, in the absence of a population management plan, set an annual fisheries-related mortality limit on the number of sea lions killed in the SQU6T fishery. In order to determine such a limit in a robust fashion information on the population level, and an understanding of the susceptibility of the population to human-induced mortality is required. The method used to set a limit in recent years has required an annual estimate of pup production at the Auckland Islands (Specific Objective 1), and the suitability of the rules used have been tested by a model which relies on population information including that gathered by sighting previously marked animals (Specific Objective 2). Key population parameters relevant to assessing the susceptibility of a species to human-induced impacts, and therefore relevant to assessing the impact of commercial fishing, include adult survival, fecundity, age of maturation, and juvenile survival. These parameters can be estimated from sighting observations of previously marked animals (Specific Objective 2).

Project status

Completed.

Summary of the methods and key findings

The following results are part of an ongoing long-term study of New Zealand sea lions (NZ sea lion), *Phocarctos hookeri*, at the Auckland Islands that was begun in the 1995/96 breeding season, allowing for estimates of annual sea lion pup production from 1998 to 2010.

There are four pupping sites at the Auckland Islands; Sandy Bay (50°30'S, 166°17'E) and South East Point (SEP, 50°30'S, 166°19'E) on Enderby Island, Dundas Island (50°35'S, 166°19'E) and Figure of Eight Island (50°46'S, 166°01'E). New Zealand sea lion pup production at S.E. Point and Figure of Eight Island was estimated using direct counts, whereas at Sandy Bay and Dundas Island the primary estimation method was a mark-recapture estimate.

Based on the 2010 pup production estimates from the Auckland Islands and from Campbell Island, 76% of all NZ sea lions pups are born at the Auckland Islands. Over the last decade there has been a considerable decline in pup production at the Auckland Islands. This decrease is thought to be aggravated by a combination of incidental bycatch from commercial fishing activity and disease events.

In January 2012 aerial surveys were conducted to estimate New Zealand sea lion pup production at the Auckland Islands for the 2011/12 breeding season using an alternative method to previous surveys, thus reducing the need to access restricted sites where the sea lion colonies occur and minimising disturbance to the colonies. We used aerial photography to count sea lion pups and establish an archival set of photographs that could potentially be used for future trend analysis. It was our intention that the techniques and protocols developed for this work be clearly documented, thus permitting replication in future years to determine trends in population change.

The use of aerial photography appears to have great potential to provide robust, cost-effective estimates of New Zealand sea lion pup production at the major pupping sites in the Auckland Islands, with all but one estimate falling with 4% of the estimate derived by mark-recapture methods. The most likely explanation for this was that pups were missed because they were hidden deep in pup piles. It is clear from the ground count undertaken on that day that all pups at Sandy Bay were still on the beach and had not moved on to the grass sward adjoining the beach, where they may have been more easily missed because of poor contrast.

An appropriate way to deal with this problem would be to accept that aerial counts need to be undertaken on more than one day to achieve a count that can be incorporated into the existing longitudinal dataset with confidence. Pups and pup piles are not static and large piles that may present counting difficulties on one day are likely to break up over a day or two.

It is also important that future aerial surveys are timed to occur as close as possible to the dates historically used for the mark-recapture estimates, to ensure their usefulness in building on the considerable longitudinal data set that exists for the Auckland Island sea lion population and enabling effective monitoring of population trend.

The field component of the work was undertaken in the Auckland Islands between the 10th of December 2011 and 16th of February 2012.

Pup production was estimated for New Zealand sea lion colonies at Sandy Bay (n = 361), Dundas Island (n = 1,248), Figure of Eight Island (n = 74) and South East Point (n = 1) with total pup

production for the Auckland Islands in 2012 estimated as 1,683 – the third lowest pup production ever reported for this species. Seven hundred and ninety pups were tagged at Sandy Bay (*n* = 360), Dundas Island (*n* = 400), and Figure of Eight Island (*n* = 30). Field sightings of previously tagged, branded and/or passive integrated transponder (PIT) tagged animals were collected and recorded.

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 Latitude 42 Environmental Consultants Pty Ltd and Dr. Louise Chilvers.

Review milestones: methods tabled at the CSP TWG meeting on 21 October 2011, 2011/12 field season draft final report presented at the CSP TWG meeting on 28 May 2012, and draft sea lion database presented at the CSP TWG meeting on 13 November 2012.

Citation

Baker, B., Jensz, K., and Chilvers, L. 2012. Aerial survey of New Zealand sea lions - Auckland Islands 2011/12. Report prepared for the New Zealand Department of Conservation, Wellington, 12p.

Chilvers, B. L. 2012. Research to assess the demographic parameters of New Zealand sea lions, Auckland Islands 2011/12. Report prepared for the New Zealand Department of Conservation, Wellington, 11p.

Weblink

http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/aerial-survey-of-nz-sea-lions-auckland-islands-2011-12.pdf

http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/pop-2011-01-nz-sea-lion-field-report-2011-12.pdf

3.2 POP2011-02 Flesh-footed shearwater - population study trial and at-sea distribution

Overall objectives

To assess the feasibility of gaining improved estimates of key flesh-footed shearwater population parameters; and to investigate the at-sea distribution of flesh-footed shearwaters

Specific objectives

1. To develop a project design for a population monitoring programme suitable for estimating key demographic parameters of flesh-footed shearwaters
2. To provide recommendations on the extent of monitoring required to obtain robust estimates of key demographic parameters for flesh-footed shearwaters
3. To collect detailed data on the at-sea distribution and foraging behaviour of flesh-footed shearwaters in New Zealand waters
4. To identify areas where flesh-footed shearwaters are at highest risk of interactions with fishing gear by analysing data collected in Specific Objective 3 in relation to spatial and temporal fishing effort

Rationale

Flesh-footed shearwater is classified as At Risk (Declining) (Miskelly et al 2008), and in New Zealand breed predominantly on islands off northern North Island. A recent population estimate of approximately 8,600 pairs at eight key breeding sites (Baker et al 2010) is considerably lower than the previous estimate of 25,000-50,00 pairs (Taylor 2000). Flesh-footed shearwaters have been observed captured in a number of longline and trawl fisheries, particularly inshore bottom longline targeting snapper and scampi trawl. Quantitative risk assessment found this species to be at high risk to commercial fishing impacts (Richard et al 2011).

Information on population parameters relevant to assessing the susceptibility of this species to human induced impacts is poor. Sensitivity analysis performed as part of recent risk assessment found much of the uncertainty around estimated risk came from uncertainty around estimates of adult survival Richard et al (2011). Developing a project design for a population monitoring programme (specific objectives 1 and 2) would provide a mechanism for gathering information to better estimate adult survival, and other key population parameters relevant to managing fishing impacts on this species (e.g. fecundity, age of maturity, juvenile survival). Flesh-footed shearwaters are a migratory species, and the extent of overlap of their foraging range with New Zealand commercial fishing activity is poorly understood. Collection and analysis of detailed at sea distributional data (specific objectives 3 and 4) will allow a quantification of this overlap and inform both further risk analyses (as a tool for fisheries management) and identify fisheries and areas where management of commercial fishing impacts on this species may be required.

Project status

Project extended to 2013/14 using additional DOC funding.

Summary of the methods and key findings

The following results are sourced from the annual report for the first year (2011/12) of the two year study of flesh-footed shearwater on three off-shore island breeding sites and foraging areas.

Three sites were surveyed during this study: Titi Island, Marlborough; Ohinau Island, Coromandel; and Lady Alice Island, Northland. Data for assessing survival rate was collected at Betthels Beach and Lady Alice Island and formatted for mark-recapture analyses to be conducted in July 2012. The data which we could collect in the part of the 2011-12 breeding season available for the study were completed as programmed. These consisted mainly of logger deployments (3 sites), and establishment of study colonies (3 sites), and population estimates (1 site only). Loggers deployed in April 2012 will not be recovered until 2012-13 or 2013-14 breeding seasons.

Transect surveys were used to assess burrow density and map colonies. Burrowscope surveys were used to assess burrow contents and assist in estimating the populations during the breeding season. Locational loggers were deployed, including GPS and GLS loggers, to assess foraging patterns. Blood and feather samples were collected to determine the trophic-level of prey items by stable isotope analysis. Results for this study are pending following a second year of data gathering and analyses.

Banding and recapture data have been prepared and formatted for survivorship analyses, to allow an assessment of the likely size of study populations necessary to robustly estimate changes in vital rates which may influence population trends. It should be noted, however, that the small size of the study populations from Bethells' Beach and Lady Alice/Mauimua, and sporadic nature of recaptures of burrowing birds means these datasets may not be sufficient to address this problem in isolation.

Plans for the 2012/13 season involve: revisiting the three survey islands, retrieving the data loggers deployed in April 2012, re-surveying the main colonies for density/occupancy information, deploying 30 GPS loggers at each site, collecting further blood and feather samples, and finally, conducting stable isotope analyses.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $90,000. Services were provided by the Museum of New Zealand, Te Papa Tongarewa.

Review milestones: Presentation of proposed methodology at the CSP TWG meeting on 9 December 2011, and presentation of draft report for the 2011/12 field season and update on methodology for the 2012/13 field season at the CSP TWG meeting on 13 November 2012.

Citation

Waugh, S., and Taylor, G. 2012. Annual Report on Project POP2011-02 Flesh-footed Shearwaters – population study trial and at-sea distribution. Report prepared for the New Zealand Department of Conservation, Wellington, 18p.

Weblink

http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/pop-2011-02-flesh-footed-shearwater-draft-report-year-1.pdf

3.3 POP2011-03 Protected fish – review of interactions and populations

Overall objective

To describe the nature and extent of interactions between commercial fishing and protected fish species to the extent possible from existing information and to describe population information relevant to assessing risk to protected fish species from commercial fishing to the extent possible from existing information.

Specific objectives

1. To review existing information to describe the nature and extent of interactions between commercial fishing and:
    - 1.1 basking sharks
    - 1.2 nurse sharks
    - 1.3 white pointer sharks
    - 1.4 whale sharks
    - 1.5 manta rays
    - 1.6 spinetail devil rays
    - 1.7 giant groupers
    - 1.8 spotted black groupers
2. To identify information gaps in the understanding of the nature and extent of interactions between commercial fishing and protected fish species, and provide recommendations for further research to address any gaps identified.
3. To review existing information to describe population information relevant to assessing risk from commercial fishing to:
    - 1.1 basking sharks
    - 1.2 nurse sharks
    - 1.3 white pointer sharks
    - 1.4 whale sharks
    - 1.5 manta rays
    - 1.6 spinetail devil rays
    - 1.7 giant groupers
    - 1.8 spotted black groupers
4. To identify population information gaps relevant to assessing risk from commercial fishing to protected fish species, and provide recommendations for further research to address any gaps identified.

Rationale

Since the development of the Marine Conservation Services Annual Plan 2010/11 a number of fish species were added to Schedule 7A of the Wildlife Act 1953[3], thus becoming absolutely protected. All eight protected fish have been observed bycaught in various commercial fisheries. Some protected fish species have been the subject of scientific studies (e.g. white pointer shark) or assessments of commercial fisheries bycatch (e.g. basking shark), whilst for other species little information exists on either their population status/dynamics, or interactions with commercial fishing. Information is required in both these areas in order to understand the nature and extent of any adverse effects of commercial fishing on protected fish. This work also contributes to meeting of

[3] See Wildlife Order 2010 (SR 2010/159) http://www.legislation.govt.nz/regulation/public/2010/0159/latest/dlm3012938.html and Wildlife (Basking Shark) Order 2010 (SR 2010/411) http://www.legislation.govt.nz/regulation/public/2010/0411/latest/DLM3347006.html

the government's obligations under the National Plan of Action Sharks (NPOA Sharks) Consolidating existing information (specific objectives 1 and 3) and identifying key information gaps in existing information (specific objectives 2 and 4) forms the first stage of this process.

Project status

Completed.

Summary of the methods and key findings

Eight fish species are currently protected in New Zealand fisheries waters: spotted black grouper (*Epinephelus daemelii*), white shark (*Carcharodon carcharias*), spinetail devilray (*Mobula japanica*), manta ray (*Manta birostris*), whale shark (*Rhincodon typus*), deepwater nurse shark (*Odontaspis ferox*), giant grouper (*Epinephelus lanceolatus*) and basking shark (*Cetorhinus maximus*). This study documents and describes their interactions with commercial fisheries in New Zealand waters, and locates and describes the available population information relevant to assessing the risk to these species.

Information on the catches of protected species was obtained from the literature, commercial catch statistics, and observer records. Data were groomed to remove many records that had been incorrectly assigned protected species codes. For each species, the catch distribution, seasonality, fishing method, and reported totals were described. Population and biological characteristics were reviewed under the categories: stock identification, biological productivity, species overlap with fisheries, and response of the species to exploitation.

Whale shark, manta ray and giant grouper are tropical species that are rarely or occasionally seen in northern New Zealand. They are not vulnerable to commercial fisheries in New Zealand and are therefore not regarded as high priority species for research or management. Research and management efforts should focus on basking shark, white shark, deepwater nurse shark, spinetail devilray, and spotted black grouper. These species are present in New Zealand waters in significant numbers for at least part of the year. Basking shark and white shark have the greatest interactions with commercial fisheries, and are potentially the species most impacted by commercial fisheries.

Recommendations for reducing bycatch of basking sharks suggested by Francis & Smith (2010) are still appropriate and useful. White sharks are vulnerable to set net, lines and trawl nets throughout much of the country; however hotspots of abundance occur around the Chatham Islands, Stewart Island, and in the large harbours of the northern North Island suggesting that initial mitigation measures should focus on these areas. Furthermore, white sharks are most common in New Zealand during summer–autumn (most emigrate to tropical waters in winter–spring), so mitigation measures should focus on those periods.

The deepwater nurse shark stands out as having the lowest or equal lowest information level in all four category groupings, so it rates as high priority for future research. Some information types are most easily obtained by destructive necropsies (e.g. growth and longevity estimated from vertebrae; size at sexual maturity for females, litter size and gestation period estimated by examination of reproductive organs). If destructive sampling for research purposes is unacceptable for protected species, then the report recommends specimens that are accidentally caught and killed by fishers become extremely valuable for providing crucial biological information.

The report recommends that efforts are made to increase the availability for research of specimens of protected fish species by (a) making it legal for fishers to land dead specimens; (b) encouraging and educating fishers about the value of specimens for research; and (c) providing the specimens to

a research organisation that can maximise their value by extracting all relevant useful information from each specimen. Other targeted research (e.g. genetic analysis and electronic tagging) should also be implemented urgently as a means of gathering important information in a relatively short time.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $50,000. Services were provided by the National Institute of Water and Atmospheric Research.

Review milestones: Presentation of proposed methodology at the CSP TWG meeting on 9 December 2011, and draft final report presented at the CSP TWG meeting on 27 November 2012.

Citation

Francis, M., and Lyon, W. 2012. Review of commercial fishery interactions and population information for eight New Zealand protected fish species. Report prepared for the New Zealand Department of Conservation, Wellington, 74p.

Weblink

http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/pop2011-03-protected-fish-review.pdf

3.4 POP2011-04 Basking Shark bycatch review

Overall objective

To identify factors related to apparent reductions in basking shark captures.

Specific objectives

To identify factors, including variation in fishing vessels and areas, related to the apparent decline in bycatch of basking sharks over the period 1994/95 to 2007/08.

Rationale

Basking shark was added to Schedule 7A of the Wildlife Act 1953 in 2010[4], thus becoming absolutely protected. A recent study to describe the nature and extent of fishery-induced mortality of basking sharks in New Zealand waters (Francis & Smith 2010) used predictive models to estimate catches in three trawl fisheries between 1994/95 and 2007/08, and predicted that captures peaked in 1997/98 and declined in later years. A previous study (Francis & Duffy 2002) suggested basking shark catch rates varied with depth. An expert panel discussion as part of a recent ecological risk assessment of hoki fisheries hypothesised that high water temperatures may have increased the risk to this species in 1997/98 (Boyd, 2011). Further investigation of the causes of captures, and variables related to capture rates (Specific Objective 1), is required in order to develop mitigation strategies for this interaction. This work also contributes to meeting of the government's obligations under the NPOA Sharks.

Note: consolidation of the entire range of existing information relating to interactions between commercial fishing and basking sharks forms part of project POP2011-03. This project is targeted at an information gap that has already been identified as limiting our understanding of factors relating to basking shark captures.

Project status

Completed.

Summary of the methods and key findings

Basking sharks are caught incidentally in New Zealand trawl and set net fisheries. Previous studies have shown that unstandardised observed trawl catch rates were much higher in 1988–91 than at any time since then. This study tested the hypotheses that (a) the fluctuations in apparent abundance were driven by environmental factors, and (b) that changes in the composition of trawl fleets, and the way that they operate, have reduced the level of interactions between sharks and trawlers.

Raw catch per unit effort (CPUE) indices were calculated for three large fishery areas off east coast of South Island (EC), west coast of South Island (WC) and Southland–Auckland Is (SA), and compared them with three environmental variables (two sea surface temperature indices and sea surface height), vessel nationality, and seven operational trawl variables (vessel length, tow speed, tow duration, headline height, seabed depth, latitude and longitude). CPUE peaked in the late 1980s and

[4] See Wildlife (Basking Shark) Order 2010 (SR 2010/411)
http://www.legislation.govt.nz/regulation/public/2010/0411/latest/DLM3347006.html

early 1990s, and thereafter was considerably lower but variable. In EC and WC, CPUE has been zero for the last seven and six years respectively.

A highly significant association was found between the numbers of sharks caught and vessel nationality in all three fishery areas. This was due to relatively large numbers of sharks being caught by Japanese vessels in the late 1980s and early 1990s. Other variables examined were not correlated with shark CPUE. The report found that reasons for the high catch rates of basking sharks by Japanese trawlers are unknown, but may relate to targeting of the sharks for their liver oil, or a high abundance of sharks in the late 1980s and early 1990s.

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 the National Institute of Water and Atmospheric Research.

Review milestones: Update on proposed methodology at the CSP TWG meeting on 9 December 2011, and draft final report presented at the CSP TWG meeting on 27 November 2012.

Citation

Francis, M., and Sutton, P. 2012. Final Report Draft. Basking Shark Bycatch Review. Report prepared for the New Zealand Department of Conservation, Wellington, 38p.

Weblink

http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/pop2011-04-baskings-shark-by-catch-review-final-report.pdf

3.5 POP2011-05 Identify New Zealand fur seal populations bycaught in commercial fisheries

Overall objective

To identify the populations of New Zealand fur seals caught in key commercial fisheries known to impact on the species.

Specific Objective

To determine the population of origin of New Zealand fur seals caught in key commercial fisheries known to impact on the species.

Rationale

New Zealand fur seals are one of the most commonly observed bycaught protected species (e.g. Thompson & Abraham 2010), with certain area-target trawl fisheries accounting for many of the captures (e.g. hoki trawls on the West Coast South Island and Cook Strait, and southern blue whiting trawls at the Bounty Islands). New Zealand fur seals breed colonially (Harcourt 2001), and long term studies at different colonies have shown differences in population trends (e.g. Boren et al 2006, Best/DOC unpublished data).

An expert panel discussion, as part of a recent ecological risk assessment of hoki fisheries, highlighted the uncertainty around both the level of captures of New Zealand fur seals in the Cook Strait hoki fishery and the populations of fur seals in the region (Boyd, 2011). In order to assess the impact of commercial fishing captures on the regional populations of fur seals it is necessary to identify the natal colonies of bycaught animals (Specific Objective 1). Genetic studies of by-caught fur seals is the most cost-effective way to identify which natal colonies are being most impacted by commercial fishing captures. This research will, where necessary, inform where more detailed monitoring work on fur seal populations should be undertaken, eg, those most heavily impacted by the bycatch from the Cook Strait hoki fishery.

Initial work to identify the natal colony of bycaught animals by genetic analysis has shown promise in the methodology (Robertson & Gemmell 2005). Tissue samples from bycaught animals are routinely collected by the CSP Observer Programme, and a historic collection of material from bycaught animals is available for genetic analysis, as well as ongoing collection from delivery of the 2011/12 CSP Observer Programme (INT2011-01). Additionally, project INT2011-01 aims to achieve higher levels of observer coverage in the Cook Strait hoki fishery during 2011/12, and any fur seals observed incidentally killed will be tissue sampled.

Project status

Project cancelled. Existing genetic markers were unlikely to allow identification of provenance to adequate resolution to address the objectives of this project. DOC is currently supporting work to develop new genetic markers.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $50,000. Full return to industry.

3.6 POP2011-06 Protected coral distribution and overlap with commercial fishing

Overall objective

To identify areas where deep sea corals are at highest risk of interactions with commercial fishing gear.

Specific objectives

1. To expand recent work on identifying areas where deep sea corals are at highest risk of interactions with commercial fishing gear by utilising additional sources of information relevant to the distribution of corals.
2. To provide recommendations on any future research required to further improve the estimation of risk to protected corals from commercial fishing.

Rationale

During 2010, amendment of Schedule 7A of the Wildlife Act 1953[5] widened the range of corals afforded protection to include all deepwater hard corals (all species in the orders Antipatharia, Gorgonacea, Scleractinia, and family Stylasteridae). A number of these taxa are known to be bycaught in commercial fisheries in New Zealand, particularly deepwater trawls targeting orange roughy or oreo species (Tracey & Sanders 2011). In order to understand the risk to protected corals, and ensure commercial fishing impacts on protected corals is minimised, it is important to quantify the spatial extent of these impacts. Work is currently underway to analyse the spatial distribution of coral subsamples returned through the CSP observer programme in relation to fishing effort (Tracey & Baird 2011). Building on the work of Tracey & Baird (2011) by utilising additional sources of information (Specific Objective 1) will broaden our understanding of the nature and extent of interactions and further clarify areas of highest commercial fisheries risk to protected corals.

Project status

Completed.

Summary of the methods and key findings

This report describes research to (1) expand recent work on identifying areas where deep sea corals are at highest risk of interactions with commercial fishing gear by using additional sources of information relevant to the distribution of corals, including mapping of likely coral distributions using predictive models, and (2) provide recommendations on any future research required to further improve the estimation of risk to protected corals from commercial fishing.

The sources of information considered were from research sampling (58%) and from commercial fishing effort where observers had been present (42%). The resulting dataset contained 7731 records, of which 46% were stony corals (56 genera from 15 families in Order Scleractinia), 33% were gorgonians (57 general from 8 families in Order Alcyonacea), 11% were hydrocorals (16 genera from one family in Order Anthoathecata), and 10% were black corals (26 families from 7 genera in Order Antipatharia). Coral records from the four orders were distributed throughout the Fishery

[5]See Wildlife Order 2010 (SR 2010/159) http://www.legislation.govt.nz/regulation/public/2010/0159/latest/dlm3012938.html

Management Areas, though differences by area and depth were evident at the family and genus level, where lower taxonomic detail was available.

Corals were described and analysed in four functional groups. These groups recognised the structural differences that corals exhibit, and the potential biogenic habitat that different coral structures provide. The four groups were described as “tree-like”, “reef-like”, “solitary small”, and “whip-like”.

Boosted regression tree (BRT) analysis was used to predict the likely distribution of coral groups throughout the New Zealand EEZ, according to a set of 10 environmental variables. The areas where the environmental conditions were most suited to the coral groups were generally in deeper waters where the seafloor had steep slopes. Most of the known coral distributions were within the areas predicted by the models to have suitable environment; however, some deepwater and steep relief areas where corals were known to exist were not identified by the predicted distribution. By grouping the corals by their taxonomic orders and by “functional” groups, some details and differences between species were effectively lost.

Generally the areas predicted to have the greatest probability of conditions suitable for corals were outside the main fisheries areas, except for some deepwater fisheries that occurred on areas of steeper relief. The fisheries that pose the most risk to protected corals are the deepwater trawl fisheries for species such as orange roughy, oreo species, black cardinalfish, and alfonsino. In more shallow waters, scampi trawl fisheries appear to pose the greatest risk to corals in all protected orders. Bottom longline fisheries pose a risk to those corals that have a branching or bushy structure. Setnet fisheries may pose a risk in areas of hard substrate.

Recommendations for future research to inform the level of risk posed by fisheries to protected corals include: update and maintain the existing protected coral dataset; increase observer coverage to attempt to cover all fishery methods with seafloor contact, improve the quality of data collection and, in particular, coral identification; collect more biological information about local coral species to better understand their risk to anthropogenic disturbance; where biological information is lacking, review the international literature to identify relevant information; and investigate species associations and better quantify the value of corals as habitat.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $50,000. Services were provided by the National Institute of Water and Atmospheric Research.

Review milestones: Presentation of proposed methodology at the CSP TWG meeting on 9 December 2011, and presentation of draft final report at the CSP TWG meeting on 27 November 2012.

Citation

Baird, S. J., Tracey, D., Mormede, S., and Clark, M. 2013. The distribution of protected corals in New Zealand waters. Report prepared for the New Zealand Department of Conservation, Wellington, 96p.

Weblink

http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/pop-2011-06-coral-distribution.pdf

3.7 POP2011-07 Pied shag – population review and estimate

Overall objective

To describe the range, population level and trend, and key population parameters of pied shags.

Specific objectives

1. To describe the range of pied shags.
2. To estimate regional population levels of pied shags and describe any trends over time.
3. To summarise existing information on key population parameters for pied shags.
4. To provide recommendations for future research to allow a better understanding of the impacts of commercial fishing on pied shags.

Rationale

Pied shags have been observed bycaught in both setnet and inshore bottom longline fisheries (Conservation Services Programme 2010, Ramm 2011, Rowe 2009). Recent qualitative risk assessment work found pied shags to be at higher-moderate potential risk from New Zealand fisheries (Rowe 2010a). Information on the population level and trends for this species is generally poor and patchy. In order to aid future quantitative risk assessment (as a tool for fisheries management) it is important to have thorough information on range, population levels and trends, and key demographic parameters. Some of this information may already be available (specific objectives 1 and 3), others may need to be collected (specific objectives 2 and 4).

Project status

Completed.

Summary of the methods and key findings

A population review of pied shags was carried out by collating colony records from a wide range of sources including published and unpublished "grey" literature, web based recording schemes, and observations from bird watchers.

Over 1500 colony records were found for the period 1934-2013. Using colony count data, the present national population of pied shag was estimated at 3,159 breeding pairs. Extrapolating for breeding age birds not nesting at the time of counts the breeding population is estimated at 6, 400 breeding pairs. The breeding distribution is disjunct, with breeding occurring in three areas; northern North Island (from Wairoa north), central New Zealand (wellington to Canterbury) and the southern South Island (Southland and Stewart Island).

The pied shag population has been increasing since the 1950's, from an estimated 719 breeding pairs in 42 colonies; to 3,159 breeding pairs in 220 colonies in the 2000's; an annual increase of approximately 2.3%. There has been some variation regionally in the rate of population increase. The northern North Island population has increased slower (1.5% per annum), than the central New Zealand population (5.4%), which has expanded into Nelson and Wellington. Unfortunately data from the southern South Island population is too limited to evaluate trends for this region.

Pied shags generally nest in small colonies (mean 18.5 nests, range 1-118), with 58% of colony counts under 15 nests and 85% with fewer than 30 nests. Pied shag colonies were almost exclusively found in marine habitats (87.7%) and the small proportion of colonies in fresh water habitats were all

within 4.2 km of the sea (mean 1.2, range 0.1-4.2km, n = 34). Nests were predominately found in native vegetation (72.6%), with introduced vegetation of lesser importance and only two colonies were found on manmade structures.

Results from banded birds show that the oldest bird lived to 18 years old, and birds are relatively sedentary. Recoveries or re-sightings of both juvenile and adult birds were close to the colony where they were banded; juvenile mean 11.3 km (range 0-39 km), adult mean 12.5 km (range 0-23 km). The breeding biology of pied shags in New Zealand is reasonably well known. Significantly, birds breed all year round, which has implications when estimating the national population.

Pied shags were observed to die at colonies after becoming entangled by fishing line which was attached to a hook imbedded in the bird. This was seen at 9 (13%) of 67 northern North Island colonies visited during field surveys in 2012/13.

Project logistics summary statement

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

Review milestones: Presentation of initial results at the CSP TWG meeting on 28 May 2012, and presentation of draft final report at the CSP TWG meeting on 1 August 2013.

Citation

Bell, M. 2013. Pied shag: A national population review. Report prepared for the New Zealand Department of Conservation, Wellington, 26p.

Weblink

http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/pop-2011-07-pied-shag-draft-final-report.pdf

3.8 POP2011-08 Yellow-eyed penguin – review of population information

Overall objective

To describe the range, population level and trend, and key population parameters of yellow-eyed penguins.

Specific objectives

1. To describe the range of yellow-eyed penguins, to the extent possible from existing information.
2. To estimate regional population levels of yellow-eyed penguins and describe any trends over time, to the extent possible from existing information.
3. To summarise existing information on key population parameters for yellow-eyed penguins.
4. To provide recommendations for future research to allow a better understanding of the impacts of commercial fishing on yellow-eyed penguins.

Rationale

Yellow-eyed penguins (hoiho) are classified as Nationally Vulnerable (Miskelly et al 2008), and are restricted to south-eastern South Island, Stewart Island and offshore islands. A recovery plan has been developed for this species (Department of Conservation 2001). Yellow-eyed penguins have been observed bycaught in set net fisheries over multiple years (Ramm 2010, 2011, Rowe 2009, 2010a). Recent qualitative risk assessment work found yellow-eyed penguins to be at extreme potential risk from setnet fisheries (Rowe 2010c). Relatively large amounts of information exist on localised population levels and parameters, and a review of existing information has recently been completed (Seddon et al, in press). In order to aid future quantitative risk assessment (as a tool for fisheries management) it is important to have thorough information on range, population levels and trends, and key demographic parameters. Some of this information may already be available (specific objectives 1 to 3), others may need to be collected (specific objective 4).

Project status

Completed.

Summary of the methods and key findings

The yellow-eyes penguin (*Megadyptes antipodes*) is endemic to New Zealand and is listed as Nationally Critical under the New Zealand Threat Classification system. It is a long-lived species and population viability analysis shows that even a small increase in adult mortality augments extinction probability dramatically. The yellow-eyed penguin population on the New Zealand mainland, including Stewart Island, is small (600-800 breeding pairs).

Previous population strongholds such as on the Otago Peninsula are declining. Since the mainland population is genetically distinct from sub-Antarctic populations (inferred immigration rate 0.003 per generation) the current loss of yellow-eyed penguins along the Southeast coast of the New Zealand South Island and in the Foveaux Straight will not be compensated by immigration. Fisheries bycatch may be substantial, particularly in the commercial set net fisheries; however, the information available does not allow assessing the full extent of fisheries impact.

This project reviewed and collated information existing to date on yellow-eyed penguin population parameters including range and distribution, population levels and trends, adult survival, juvenile survival, age of first breeding and fecundity. Furthermore, the report summarised the current understanding of yellow-eyed penguin marine ecology and foraging patterns.

Important gaps in knowledge have been identified and recommendations were provided for future research in order to better assess the direct and indirect effects of commercial fisheries on yellow-eyed penguins. The report recommended a priority to increase independent observer coverage on commercial set net and inshore trawl fisheries that operate within foraging areas of yellow-eyed penguins in order to quantify numbers caught and document operational details affecting the likelihood of capture.

Since bycatch rates and extremely uncertain, the report recommends independent observer coverage must be high to achieve reasonable precision in bycatch estimates. Electronic Monitoring was identified as a method of supplementing independent observers and allowing better overall coverage while keeping the related costs manageable. Such data are essential for the development of mitigation measures or temporal/spatial management to reduce yellow-eyed penguin bycatch in the commercial fisheries.

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 Eudyptes EcoConsulting Ltd.

Review milestones: Presentation of draft results at the CSP TWG meeting on 28 May 2012.

Citation

Ellenberg, U., and Mattern, T. 2012. Yellow-eyed penguin - review of population information. Report prepared for the New Zealand Department of Conservation, Wellington, 144p.

Weblink

http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/pop-2011-08-yellow-eyed-penguin-population-information-review.pdf

3.9 POP2011-09 Northern royal albatross - analysis of population data from Tairoa head colony

Overall objective

To estimate key population parameters for northern royal albatross from the Tairoa head colony.

Specific objectives

To update estimates of key population parameters, using existing information, for northern royal albatross at the Tairoa head colony.

Rationale

Northern royal albatross is classified as Naturally Uncommon (Miskelly et al 2008), and breeds primarily at the Chatham Islands, with a small population at Tairoa Head on the Otago Peninsula. This species has been observed captured in offshore trawl and surface longline fisheries (Ramm 2010, Rowe 2010b), and recent quantitative risk assessment work has found considerable potential risk from a range of trawl and longline commercial fisheries (Richard et al 2011). Sensitivity analysis performed as part of this risk assessment found much of the uncertainty around estimated risk came from uncertainty around estimates of adult survival and number of breeding pairs. Whilst detailed information from the main breeding colonies is generally poor, the Tairoa Head colony has been intensively monitored over many years and the potential exists for further analysis of this data to update and improve estimates of adult survival and other population dynamics relevant to assessing susceptibility of this species to human induced impacts (Specific Objective 1). This information will improve future quantitative risk assessment, as a tool for fisheries management.

Project status

Completed.

Summary of the methods and key findings

Data from a small population of northern royal albatross (*Diomedea sanfordi*) that self-established on the mainland of New Zealand at Taiaroa Head, provided a unique data set for the estimation of demographic rates. Banding as well as monitoring of individuals has been carried out at the Taiaroa Head colony since 1938. Data on the presence/absence of birds, as well as on breeding outcomes, were available for the period between 1989/90 and 2011/12, and included 2128 annual resightings of 355 banded individuals of known-age.

The main goal of the present study was to estimate the annual survival rate of juveniles, pre-breeders, and adults at Taiaroa Head. These rates were estimated simultaneously in a single Bayesian multi-state capture-recapture model. Several models were fitted to the data, with different levels of complexity. From the most parsimonious model, the overall annual adult survival rate was estimated as 0.95 (95%CI 0.941–0.959). In this model, adult survival declined with age, from 0.976 (95%CI 0.963–0.988) at 6 years, the minimum age at first breeding, to 0.915 (95%CI 0.879–0.946) at 40 years. Mean annual survival of pre-breeders was 0.966 (95%CI 0.95–0.98), and 0.933 (95%CI 0.908–0.966) for juveniles. There was no discernible difference in survival between males and females, and there was no apparent trend in survival over time.

Estimates of other demographic rates were also obtained during the estimation process. The mean age at first return of juveniles to the colony was estimated as 4.81 years (95%CI 4.63–5.06), and the mean age at first breeding as 8.85 years (95%CI 8.53–9.29).

The number of northern royal albatross present annually at the Taiaroa Head colony has doubled since 1989–90, and the current total population size was estimated to be over 200 individuals. The ratio of the total population size to the number of annual breeding pairs varied between 5 and 12 among years, with an overall mean of 7.65 (95%CI 7.56–7.78).

While long-term data allowed estimates of demographic rates of northern royal albatross at Taiaroa Head, the location of the colony and the ongoing management by staff mean that the population dynamics may differ from those of the main population on the Chatham Islands.

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 Dragonfly Science Ltd.

Review milestones: Draft results presented at the CSP TWG meeting on 5 June 2013.

Citation

Richard, Y., Perriman, L., Lalas, C., and Abraham, E. R. 2013. Demographic rates of northern royal albatross at Taiaroa Head, New Zealand. Report prepared for the New Zealand Department of Conservation, Wellington, 24p.

Weblink

http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/pop-2011-09-northern-royal-albatross-taiaroa-head.pdf

3.10 POP2011-10 King shag – census

Overall objective

To estimate the population level, and trend, for king shags.

Specific objectives

1. To estimate the population level of king shags.
2. To determine any trend in population level of kings shags.

Rationale

King shags are classified as Nationally Endangered (Miskelly et al 2008), are restricted to the Marlborough Sounds region and have a total population estimated to be only 645 birds (Schuckard 2006). Whilst there have been no reported captures of king shags in commercial fishing operations, recent quantitative risk assessment work found very high potential risk to this species, primarily from flatfish trawl (Richard et al 2011). Sensitivity analysis performed as part of this risk assessment found much of the uncertainty around estimated risk came from uncertainty around levels of captures. In the absence of good information on captures, and because of the susceptibility of this species to human induced mortality due to its low population level, it is important to quantify any trend in the population level of king shags (specific objectives 1 and 2) to determine the urgency for any fisheries management actions related to potential impacts on this species. Work is currently underway to summarise existing scientific knowledge on king shags and highlight research gaps (R. Schukard, pers. comm.). It is envisaged that this review will be useful for both identifying existing work relevant to assessing the risk of commercial fishing to king shags, and future research priorities.

Project status

Project cancelled. Additional population counts were made in 2011 independently of this project. Note DOC is funding work to investigate the feasibility of obtaining tracking data for this species (ongoing as at November 2013).

Project logistics summary statement

This project was not funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $10,000.

4. Mitigation Projects

4.1 MIT2011-01 Protected rays - mitigate captures and assess survival of live-released animals

Overall objective

To identify methods to mitigate captures of protected rays and assess the fate of live released rays.

Specific objectives

1. To identify methods to mitigate the capture of protected rays in commercial purse seine fisheries
2. To make recommendations for future work to develop and/or assess the efficacy of methods to mitigate the capture of protected rays in commercial purse seine fisheries
3. To assess the fate of live released protected rays captured in commercial purse seine fisheries and describe their spatial behaviour

Rationale

During 2010 a number of fish species, including manta rays and spinetail devil rays, were added to Schedule 7A of the Wildlife Act 1953[6], thus becoming absolutely protected. These two protected rays are known to be incidentally captured during commercial fishing activity, primarily by the purse seine method (Ministry of Fisheries Observer Programme, unpublished data). Ray captures in purse seine nets are often of live animals, and government observer records indicate the process used by vessel crew to return these individuals to the ocean is variable (Ministry of Fisheries Observer Programme, unpublished data). Development and testing of live release methods that maximise post-release survival (specific objectives 1 and 3) is an obvious mitigation development to minimise the impact of fishing on these species.

Project status

Ongoing.

Summary of the methods and key findings

Devil and manta rays are caught in purse seine fisheries for tuna worldwide. Two species of rays in the Family Mobulidae are known to occur in New Zealand waters – spinetail devilray (*Mobula japanica*) and manta ray (*Manta birostris*). In New Zealand, bycatches of mobulid rays have been reported from the domestic skipjack tuna (*Katsuwonus pelamis*) purse seine fishery, which has operated since the mid 1970s.

Since observer coverage of the purse seine fleet ceased in 1982, bycatch of mobulid rays has apparently not been reported in detail, though the weight of "manta rays" observed, with species identified as "*Mobula japanica"* or "Myliobatidae" have been reported in New Zealand's "Country reports" to the Western Central Pacific Fisheries Commission (WCPFC). The amounts reported and how they are reported vary, but a mobulid ray bycatch was one of the main bycatch species (up to 58% by weight of the annual bycatch total), but representing between 0.06 and 0.35% of the total

[6] See Wildlife Order 2010 (SR 2010/159) http://www.legislation.govt.nz/regulation/public/2010/0159/latest/dlm3012938.html

catch. Further analysis of these data is warranted, as it is clear that catch rates are highly variable and that species identity requires clarification.

Observed manta and devilray bycatch was largely confined to east Northland between Great Barrier Island and Cape Brett. The frequency of occurrence in these areas, based on observer data could be as high at 23% of sets compared to <2% in other areas. Photographic evidence indicates that the majority of incidences involve spinetail devilray.

The current approach of vessels is to try and release manta rays alive where possible, but the requirement to process the catch in as short a time as possible is the priority, and limited their acceptance of proposed methods that might hinder this process. Observer database records from the last seven years suggest that in a high proportion of occurrences, the manta rays are brought on deck in the brailer and then lifted from the deck over the side using hooks or ropes passed through gills or pectoral wings. These handling practices may result in an unknown, possibly unacceptable, level of post-release mortality.

Observations from interviews indicated varied behaviour by manta rays with some active escape searching along the corkline but other situations where the manta rays are mixed in with the catch, meshed in the bunt and sometimes not even noticed until the volume of the net is well reduced. Thus release methods used for dolphins and whale sharks where the net and cork floats along one edge are sunk or a "window" is opened up may not always be feasible. This method also requires time spent to release the manta ray before the process of sacking, rolling and brailing.

If manta rays can be caught and released over the side from the brail net directly, without coming onboard, it is potentially an effective mitigation method. One disadvantage of this method however, is the potential abrasion from the twine and the small size of the brailer used on some vessels compared to the size of many manta & devil rays. The practice developed by one super-seiner of using a large mesh cargo net placed over the hopper, allows a rapid transfer overboard once the brailer is emptied and eliminates the need to use hooks etc. This method is a more practical version of the originally proposed canvas cargo net. Although the initial consultation with small vessel skippers did not result in uptake of the canvas cargo net approach, the large mesh cargo net technique may be a more acceptable option where it is not feasible to catch and release the manta from the brailer directly (eg, if it is scooped up with a large amount of tuna).

The report acknowledged that the best approach to solving bycatch issues and finding practical solutions is to find an effective way to engage skippers and crew in the process. An informal skippers workshop, supported by the fishing companies, is suggested as the most efficient use of skippers time, allowing the reasons for these recommendations to be outlined, the practicality of the above suggestions and likely acceptance in the longer term to be discussed as well as other ideas developed. Such workshops have proved invaluable in many other bycatch mitigation initiatives worldwide.

The report recommends that more detailed information is collected on manta and devil ray encounters over the longer term. Observers should ensure they are clear on the identification of different species and codes, and continue to record details around the behaviour of captured manta and devil rays and release methods of rays caught in both skunked as well as successful sets using the form provided (Appendix 1). A simple way of scoring condition prior to release (e.g. Braccini et al. 2012) should be developed for use by MPI observers.

It is also recommended that spotter plane pilots could record their observations of manta and devil rays using the sheet already used to record tuna schools. This would provide valuable information on

spatial and temporal patterns of occurrence. In the longer term, these data and observations may allow the development of mitigation methods, such that manta rays and the problems associated with them (such as skunked tows, lost time to remove from nets) may be avoided completely.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $70,000. Services were provided by the National Institute of Water and Atmospheric Research.

Review milestones: Presentation of proposed methodology at the CSP TWG meeting on9 December 2011, and review of methods to mitigate the capture of protected rays in commercial purse seine fisheries presented at the CSP TWG meeting on 27 November 2012.

Citation

Hones, E., and Francis, M. 2012. Protected rays – occurrence and development of mitigation methods in the New Zealand tuna purse seine fishery. Report prepared for the New Zealand Department of Conservation, Wellington, 39p.

Weblink

http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/mit2011-01-protected-rays-final-report.pdf

4.2 MIT2011-02 Scampi trawl – mitigate seabird captures

Overall objective

To develop methods to mitigate the capture of seabirds in the commercial scampi trawl fishery.

Specific objectives

1. To identify methods to mitigate the capture of seabirds in the commercial scampi trawl fishery.
2. To test the feasibility, and to the extent possible the effectiveness, of methods to mitigate the capture of seabirds in the commercial scampi trawl fishery.
3. To make recommendations for future work to develop and/or test the effectiveness of methods to mitigate the capture of seabirds in the commercial scampi trawl fishery.

Rationale

CSP Observer Programme coverage of the scampi fishery has focussed on identifying, understanding and providing information to quantify interactions with seabirds and New Zealand sea lions, with recent coverage levels of 6% in 2008/09 and 9% in 2009/10 (Ramm 2011). As documented by Ramm (2011) 15 seabirds were observed captured on one trip on one vessel in 2009/10. In this case the observer highlighted the nature of the fishing operations typical of this fishery, using a triple codend net that remained partially open at the surface for an extended period, contributed to the high capture rate on that vessel. So far during 2010/11 three observed scampi trawl trips have had similar high seabird capture rates (CSP Observer Programme, unpublished data). Because of the particular nature of the trawl operations in this fishery, focussed mitigation efforts are clearly required to develop solutions to avoid or minimise any further large seabird capture events in this fishery (specific objectives 1 and 2). The outputs of this research will be used to inform appropriate mitigation measures for vessel management plans.

Project status

Completed.

Summary of the methods and key findings

Seabird bycatch rates in the scampi fishery are estimated to be the second highest amongst New Zealand trawl fisheries. Seabirds have been reported caught on trawl warps, and also in trawl nets during shooting and hauling. Seabird captures in this fishery are exacerbated by characteristics of the fishing operation: the gear is at or near the sea-surface for extended periods during shooting and hauling, and the catch typically comprises over 80% fish and invertebrate bycatch, which is discharged at the fishing grounds.

A substantial body of work exists on seabird bycatch reduction measures for trawl fisheries. However, characteristics of scampi trawl gear and the prevalence of net captures amongst bycaught birds (for which no deployment-ready mitigation measures are available) present challenges for reducing seabird catch in this fishery. This project sought to identify potential methods with which to mitigate seabird captures in the New Zealand scampi fishery, test the feasibility and effectiveness of these methods, and make recommendations on future work on seabird bycatch in this fishery.

Through reviewing available information and holding an expert workshop (including representatives from the scampi fishing industry), the project identified three areas for work: improving batch offal discharge regimes to ensure discharge is held on-board during shooting and hauling; improving the design and construction of paired streamer lines; and testing the "restrictor" – a novel approach to reducing seabird captures in scampi nets. The first two areas of work will be addressed on an ongoing basis through working with skippers and crews, and utilising observer coverage of scampi vessels.

Deployment of the restrictor prevents the mouth of the net from becoming wide open during shooting and hauling. First, the operational feasibility of the restrictor in the centre net of a triple-rig targeting scampi was examined. Then, an experiment was designed to test the efficacy of the restrictor in reducing seabird catch. Constraints on government observer coverage prevented the implementation of this experiment during the course of the project. However, implementing data collection protocols in future years on observed trips where vessels are using restrictors will allow the assessment of the efficacy of the restrictor in reducing seabird catch.

Video footage collected using underwater cameras confirmed that the height of the centre net in triple-rig scampi gear was reduced by approximately 75% during hauling when restrictor ropes were in place. Video also showed that the headline and some of the body of mesh around the headline sat lower in the water column with restrictors in place than without. Although not a substitute for a designed experiment, this footage is a preliminary indication that the restrictor may be effective in reducing the risk of seabird bycatch in centre nets at shooting and hauling. The report recommends empirical testing of the efficacy of restrictors in the scampi fishery. The method may also warrant exploring in other demersal fisheries in which seabirds are caught in trawl nets.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $90,000. Services were provided by Dragonfly Science Ltd and Clement and Associates Ltd.

Review milestones: Presentation of draft results at the CSP TWG meeting on 5 June 2013.

Citation

Pierre, J. P., Cleal, J., Thompson, F. N., and Abraham, E. R. 2013. Seabird bycatch reduction in scampi trawl fisheries. Report prepared for the New Zealand Department of Conservation, 27p.

Weblink

http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/fishing/mit2011-02-final-report.pdf

4.3 MIT2011-03 Inshore bottom longline – develop strategies to increase line sink rates

Overall objective

To develop strategies to mitigate seabird captures in inshore bottom longline fisheries by increasing line sink rates.

Specific objectives

1. To develop strategies to increase line sink rates in inshore bottom longline fisheries by building on previous investigations on factors related to sink rates in these fisheries.

Rationale

Recent quantitative seabird risk assessment work (Richard et al 2011) has highlighted the high degree of potential risk that small vessel (inshore) bottom longline fisheries pose to a number of protected species, such as black petrels and flesh-footed shearwaters. A suite of mitigation measures are now mandatory in these fisheries[20], but observations suggest the use of mitigation methods across these fisheries is still highly variable, and some methods are deemed not feasible by fishers on some vessels or in some circumstances (Goad et al 2010). A project aiming to identify measures to reduce seabird captures in these fisheries (CSP project MIT2009-01) summarised mitigation practices currently employed, and reported initial findings on factors related line sink rates on inshore bottom longline vessels primarily targeting snapper (Goad et al 2010). Increasing line sink rates through methods such as line weighting reduces the availability of baited hooks to seabirds and has been proven to reduce seabird capture rates in longline fisheries (Bull 2007). Further work is currently underway as part of CSP project MIT2010- 01 to further investigate factors influencing line sink rates in a wider variety of inshore bottom longline fisheries. Results are due to be made available for technical review in June 2011. To ensure feasible, effective mitigation methods are available to manage the impact of these fisheries on protected seabird species it is important that findings from recent investigations are developed and adequately tested (Specific Objective 1).

Project status

Completed. This project was conducted alongside project MIT2012-01, and was reported jointly.

Summary of the methods and key findings

Seabirds of conservation concern, including the black petrel (*Procellaria parkinsoni*), are incidentally captured on bottom longline fishing gear deployed in inshore commercial fisheries in northern New Zealand. These fisheries target a variety of fish species, including snapper (*Pagrus auratus*), bluenose (*Hyperoglyphe antarctica*), hapuku and bass (*Polyprion oxygeneios, P. americanus*), and ling (*Genypterus blacodes*).

Using government fisheries observer coverage, the project investigated the efficacy of operational practices in use in these fisheries for reducing seabird bycatch risk. In addition, potential new measures for reducing seabird captures were explored. Four main components of operational practices are expected to influence seabird bycatch risk in northern bottom longline fisheries. These are the time of day at which longlines are set, the use of weighted longlines, the deployment of streamer lines, and the retention of fish waste.

To reduce the risk of seabird captures in inshore bottom longline fisheries in northern New Zealand, the report recommends that the efficacy of line-weighting strategies in use is increased. This may involve adding more weight to lines and sinking hooks closer to the boat (e.g., using closer weight spacing, more even-sized weights, longer float-ropes, denser weights and slower setting speeds).

In addition, it is recommended that longlines are set prior to nautical dawn, fish waste is held on-board during hauling, the design and construction of streamer lines is improved, the improved streamer lines are deployed on all sets, and sinking longlines to 10 m at the end of streamer lines is considered as a minimum performance standard. In combination, these measures are expected to significantly reduce the risk of seabird captures in inshore bottom longline fisheries.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $60,000. Services were provided by Vita Maris Ltd and Johanna Pierre Environmental Consulting Ltd for project MIT2012-01.

Review milestones: Update on proposed methodology presented at the CSP TWG meeting on 27 November 2012, and presentation of draft results at the CSP TWG meeting on 31 July 2013.

Citation

Pierre, J. P., Goad, D., Thompson, F. N., and Abraham, E. R. 2013. Draft Final Report. Reducing seabird bycatch in inshore bottom longline fisheries. Report prepared for the New Zealand Department of Conservation, Wellington, 84p.

Weblink

http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/mit-2011-03-mit-2012-01-draft-final-report.pdf

4.4 MIT2011-04 Inshore bottom longline – novel methods to reduce availability of hooks to seabirds

Overall objective

To develop one or more novel methods to mitigate seabird captures in inshore bottom longline fisheries by reducing the availability of hooks to seabirds.

Specific objectives

1. To identify one or more novel methods to potentially mitigate seabird captures in inshore bottom longline fisheries by reducing the availability of hooks to seabirds.
2. To develop, test the feasibility, and to the extent possible the effectiveness, of one or more methods identified in Specific Objective 1.
3. To make recommendations for future work to develop and/or test the effectiveness of novel methods to mitigate seabird captures in inshore bottom longline fisheries by reducing the availability of hooks to seabirds.

Rationale

Recent quantitative seabird risk assessment work (Richard et al 2011) has highlighted the high degree of potential risk that small vessel (inshore) bottom longline fisheries pose to a number of protected species, such as black petrels and flesh-footed shearwaters. A suite of mitigation measures are now mandatory in these fisheries[21], but observations suggest the use of mitigation methods across these fisheries is still highly variable, and some methods are deemed not feasible by fishers on some vessels or in some circumstances (Goad et al 2010). To ensure a range of feasible, effective mitigation methods are available to manage the impact of these fisheries on protected seabird species it is important that suitable novel mitigation methods are identified, developed and tested (specific objectives 1 and 2). Existing methods and tests of their efficacy were reviewed by Bull (2007).

Project status

Completed.

Summary of the methods and key findings

The Kellian Line Setter is an underwater setting device developed by Dave Kellian, a fisherman from Leigh, New Zealand. The concept involves running the mainline under a nylon roller towed behind the vessel at depth. The line then runs over second roller, behind and below the first one, to stop weights pulling the backbone off the bottom of the first roller. Snoods, floats and weights pass beside the rollers, rather than over them (Goad 2011; Figures 1 and 2). A 14 kg lead ball on a wire cable holds the device at depth and allows for deployment and recovery with a small winch. Attached to the lead ball a steel tube holds the rollers behind the cable and a paravane on the steel tube assists in maintaining stability during towing. Once deployed, setting depth can be adjusted by increasing or decreasing the cable length.

The initial prototype had been developed through a series of at-sea trials which were conducted during 2011. While these trials had been encouraging, the issue of fouling on the rollers has been identified as needing resolution before further at sea testing should be considered. In 2012 we obtained funding from the New Zealand Department of Conservation's Conservation Services

Programme to refine the existing prototype at the Australian Maritime College (AMC), using the skills and expertise of engineers at the Circulating Water Channel (flume tank) facility of the College. This would permit critical examination of the hydrodynamic characteristics of the device, and re-design to eliminate operational impediments (line fouling) that were inhibiting proof of concept and the potential for uptake of the device by industry.

The line setter was developed to mitigate the catch of black petrels and shearwaters in NZ's inshore snapper fishery, but could be easily applied in any demersal longline operation, including autolining, once the design has been further refined in at-sea trials.

The most significant problem identified in the flume tank was that of weights causing the backbone to be pulled out of the device. To some extent this may have been exacerbated because the length of the flume tank did not permit the mainline to engage the back roller (evident in Figure 3), which would not be the case when fishing because the weight of the longline would drag the mainline down over the roller. The design purpose of the rear roller is to stop weights pulling the backbone off the bottom of the first roller.

The report noted that when deployed under fishing conditions it will be necessary to specify the size and types of floats that are used. Large (4 inch) trawl floats were regularly caught up between the end of the cowling and the rear roller, and while longer snoods could potentially assist in reducing this problem, they did not reliably resolve the problem in the flume tank trials. It is recommended that the use of such floats be avoided, with drift net floats substituted instead.

The entire KLS P2 unit weighs around 32kg, which may pose manual handling issues. This risk will be best mitigated by a specific cradle and winch to raise and lower the bait setter, thus avoiding manual handling where possible. The report also recommends a safety assessment be undertaken before at sea-trials commence.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $60,000. Services were provided by Latitude 42 Environmental Consultants Pty Ltd.

Review milestones: Project update presented at the CSP TWG meeting on 28 May 2012, and presentation of draft results at the CSP TWG meeting on 5 June 2013.

Citation

Baker, G. B., and Frost, R. 2013. Development of the Kellian Line Setter for Inshore Bottom Longline Fisheries to reduce availability of hooks to seabirds. Report prepared for the New Zealand Department of Conservation, 11p.

Weblink

http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/mit-2011-04-kellian-line-setter-final-report.pdf

Non-research mitigation project proposals

The following projects are for non-research services that aim to avoid, remedy or mitigate the impacts of commercial fishing on protected species.

4.5 MIT2011-05 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.

Project status

Completed.

Summary of the methods and key findings

In New Zealand, trawl and longline fishing both have significant incidences of protected species bycatch, including seabirds, marine mammals, turtles and protected corals. A newsletter delivered to fishermen using these methods reaches those involved with a substantial proportion of fishing impacts on marine protected species. The Ocean Guardian has been developed to address protected species issues holistically, with a focus on mitigation measures.

This newsletter is currently targeted to practitioners in the trawl and longline fleets. The distribution list includes fishing company representatives, Commercial Stakeholder Organisations (CSOs), the Federation of Commercial Fishers, fishers reporting landings of >1,000 kg greenweight and more than one trip undertaken in 2010/11, using the trawl or longline method (~370 fishers, identified through the Ministry for Primary Industries' database), stakeholders of Marine Conservation Services (Department of Conservation), seafood industry training bodies, Ministry for Primary Industries regional offices, and any other agency, group, or individual on request. Paper and electronic copies are distributed. Both single copies are sent (e.g. to fishers), and multiple copies (e.g. to CSOs). The newsletter is also available online.

To reach additional potential recipients, the newsletter was also advertised in Seafood magazine prior to the first edition being produced. Subsequently, it has been publicised on the website for the Agreement for the Conservation of Albatrosses and Petrels (www.acap.aq) and through the Seafood Industry Council Chief Executive's "Friday Update".

To evaluate the reach and perceived utility of this newsletter, a 10 question survey was created. Immediately after the second issue was distributed, the following questions were circulated as an online questionnaire, via SurveyMonkey.

The questionnaire was circulated to the newsletter's distribution list, including ~370 fishers, 10 CSOs and industry associations, 16 MPI regional offices, and 143 other stakeholders (such as representatives from industry, government, research providers, and non-governmental organisations, via the Marine Conservation Services stakeholder list). A link to the survey was also circulated by the New Zealand Seafood Industry Council Ltd, on their Chief Executive's "Friday Update".

Two to three weeks after circulating the survey, recipients were reminded of the opportunity to participate. At initial distribution, and when reminded, participants had access to an 'opt out' link, if they did not wish to receive further communications relating to the survey. In total, the survey was open for one calendar month. Thirty one responses were received during this period.

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: Project evaluation report presented at the CSP TWG meeting on 28 May 2012.

Citation

Johanna Pierre Environmental Consulting Ltd. 2012. Project Evaluation Report MIT2012-05 Protected Species Bycatch Newsletter *The Ocean Guardian*. Report prepared for the New Zealand Department of Conservation, Wellington, 18p.

Weblink

http://www.doc.govt.nz/documents/conservation/marine-and-coastal/marine-conservation-services/mit-2011-05-ocean-guardian-evaluation-report.pdf

4.6 MIT 2011-06 Protected species mitigation training for commercial fishing vessel crew

Overall objective

To educate crew of trawl and longline vessels >28 m in length in best practice environmental impact mitigation practices.

Rationale

There are a number of seabird and marine mammal mitigation requirements, both legislative and by industry code of best practice, for offshore trawl and longline commercial fishing vessels (>28 m length). To ensure all these requirements are met, and applied in the most effective way for each vessel, it is important for crew to understand both the environmental issues to be mitigated, and the mitigation methods and how to implement them. Crews of these vessels include speakers of Russian and Korean, and translated information is required to ensure full understanding.

Project status

Completed.

Summary of the methods and key findings

During the year, separate trip reports were sent to DOC, the Ministry for Primary Industries and the Deep Water Group. These reports covered any important issues around the environmental effects of deep-sea fishing.

Getting out meeting the captains and vessel managers, receiving feedback from them on the realities of what happens at sea, and discussing the important environmental issues concerning them has been invaluable.

Visiting the vessels' processing factories and seeing firsthand what equipment is onboard, discussing offal control directly with those who have to manage this has also given some reality of what can be done to improve offal control across sections of the deepwater fleet. Information gathered has been able to be used to improve the development of deepwater operational procedures and improve systems onboard the vessels.

The exchange of information on mitigation devices and other ideas from one fleet to another (i.e. Russian to Korean or the NZ domestic fleets) has also been another benefit of this programme. With the Ministry for Primary Industries and the Deep Water Group 'entrenching' the need to carry out this type of environmental crew training with its inclusion in to the National Plan of Action and the deepwater fisheries plans, ensuring its continued delivery reinforces the benefits this successful program has delivered over the past three years.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $30,000. Services were provided by F.V. Management Services Ltd.

Citation

Cleal, J. 2013. Protected species training for commercial fishing vessel crew. Report prepared for the New Zealand Department of Conservation, Wellington, 10p.

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Pending publishing on the web

4.7 MIT 2011-07 Review mandatory seabird scaring devices on offshore commercial trawl fishing vessels

Overall objective

To assess, and improve where necessary, the design, durability and performance of seabird scaring devices currently deployed by trawl vessels >28 m length.

Rationale

Legislative requirements for deployment of seabird scaring devices were introduced for trawl vessels >28 m in length in 2006. Since that time a large number of variations on standard designs of tori lines, bafflers and warp deflectors have been developed. There has not, however, been a through fleet-wide assessment of the practicality and effectiveness of these devices. Such a fleet-wide assessment would enable the sharing and uptake of the most effective and practical devices by new vessels to the fleet or vessels that may currently operate sub-optimal devices.

Project status

Completed.

Summary of the methods and key findings

The use of devices that aim to reduce seabird strikes on trawl warps has been required on New Zealand trawlers ≥ 28 m in overall length since April 2006. Seabirds may strike, or be struck by trawl warps while feeding opportunistically astern trawl vessels. These strikes can cause injury or death.

Two of the three legally-specified seabird scaring devices were examined - paired streamer lines and bird bafflers - with the aim of improving their design, construction, durability, and ultimately performance and efficacy at sea. For bafflers, the project also sought to use existing data to compare the efficacy of 2- and 4-boom designs.

At-sea trials of streamer line materials were conducted on a deepwater trawler 105 m in length, using midwater gear. These trials produced clear recommendations on streamer line materials and construction. Of the four tested, the best-performing streamer material was Kraton. The optimal configuration for streamers involved direct attachment (i.e., interweaving streamers into the backbone and not using clips or swivels) at 3 m intervals along the backbone of the streamer line. The best-performing terminal object of the five tested was a trawl float 360 mm diameter and 9.1 kg in weight. This could be replaced by a 6.5 kg trawl float of the same diameter on vessels with lower block height. Deploying a terminal object of 1.2 kg for every 1 m of vessel block height is recommended. Amongst the 30 – 60 m lengths tested, a backbone of 30 m almost always performed best. Deploying 5 m of backbone for every 1 m of vessel block height is recommended.

The recommended design specifications of the report have been captured in a fact sheet, and promulgated amongst the deepwater trawl fleet. For bafflers, a step analysis showed that processing waste discharge is consistently more important in determining the prevalence of trawl warp strikes than whether these devices comprised two or four booms. However, the data available were insufficient to support more in-depth modelling.

Drawing on the design, construction and performance features of bafflers currently deployed in the fleet, an improved baffler design is proposed. Further work comparing the performance of bafflers of different designs quantitatively is also recommended.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $50,000. Services were provided by F.V. Management Services Ltd, Johanna Pierre Environmental Consulting Ltd, and Clement and Associates Ltd.

Review milestones: Draft final report tabled for review on 14 March 2013.

Citation

Cleal, J., Pierre, J., and Clement, G. 2013. Draft Final Report. Warp strike mitigation devices in use on trawlers > 28 m in length operating in New Zealand fisheries. Report prepared for the New Zealand Department of Conservation, Wellington, 42p.

Weblink

http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/mit-2011-07-final-report.pdf

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