Conservation Services Programme
DRAFT
Annual Research Summary
2022-23

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1. Introduction

1.1 Purpose

This report outlines the research carried out through the Conservation Services Programme (CSP) Annual Plan 2022/23 and provides updates on multi-year projects started in previous years.

The CSP is one component of the Department of Conservation (DOC)'s wider bycatch programme and describes those services delivered as 'conservation services'.

1.2 Background

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

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

1.3. CSP Vision and Objectives

The 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 fall 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 objectives for CSP are provided in the Conservation Services Programme Strategic Statement[1].

[1] Available to download from: https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/resources/rag-resources/csp-strategic-statement-2020.pdf

1.4 Development of the Annual Plan

The Conservation Services Programme Annual Plan 2022/23[2] described the conservation services to be delivered as the Conservation Services Programme, and subject to cost recovery from the commercial fishing industry. As such, this Annual Plan formed the basis for levying the commercial fishing industry under the Fisheries Act 1996. For further background information on CSP, including extracts of relevant legislation, refer to the Conservation Services Programme Strategic Statement.

In the development of this Annual Plan a series of discussions were held with Fisheries New Zealand (FNZ) staff to harmonise the CSP and FNZ research programmes for 2022/23 and to ensure there was no duplication. A formal consultation process was also used as described below.

1.5 Consultation process

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

The collaborative processes used to develop the 2022/23 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 2022/23. This process was developed jointly by the CSP team at DOC and the Inshore Fisheries team at FNZ.
- Deepwater and Highly Migratory Species (HMS) observer coverage was developed jointly by the CSP team at DOC and the deepwater and HMS fisheries team at FNZ.

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

7 December 2021	Updated medium term research plans, initial list of research proposals and CSP RAG prioritisation framework circulated to CSP RAG.
7 March 2022	CSP RAG meeting to discuss and prioritise initial research proposals.
20 March 2022	Additional feedback received from CSP RAG on research proposals and their prioritisation.
21 April 2022	Draft CSP Annual Plan 2022/23 released for public consultation.
27 May 2022	Public consultation period closed.
9 August 2022	Summary of public submissions and response to comments completed.
9 August 2022	Director-General of Conservation conveyed the Conservation Services Programme Annual Plan 2022/23, amended in accordance with public submissions, to the Minister of Conservation for agreement.

1.6 Report structure

This report first describes the objectives and rationale for each project, then provides an update on project status and a summary of the key results and recommendations from the projects. A project logistics summary statement is included detailing the service provider, project budget (excluding administration

[2] Available to download from: https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/plans-and-submissions/202223/final-csp-annual-plan-2022-23.pdf

costs) and review milestones. Additionally, a citation and weblink are provided to access the final research reports online.

Conservation Services Programme activities in 2022/23 were divided into three main areas:

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

2. Interaction Projects

2.1 INT2022-01 Observing commercial fisheries

Overall objective

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

Specific objectives

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

Rationale

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

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

Project status

Complete.

Summary of the methods and key findings

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

Observer coverage is, where possible, planned jointly with FNZ to ensure that coverage objectives are aligned. For the purposes of planning observer coverage, fisheries are divided into two broad categories:

firstly, those fisheries that are poorly known and generally characterised by small vessel owner-operated fleets operating in the inshore; the second, better understood deepwater fisheries which have been subject to long-term monitoring.

While the majority of the 'poorly understood' fisheries operate in the inshore area (i.e. to around 200 m depth) some small vessels, particularly bottom longline vessels under 36 m, will operate in deeper waters such as the Chatham Rise. Details of the approach used to set days in these fisheries are described in the Joint Department of Conservation/Ministry of Fisheries Inshore Observer Programme 2011/12 plan[3]. In general, coverage in these fisheries was aimed at reducing uncertainty around the risk to particular protected species identified in both the level 1 and level 2 risk assessments and assessing mitigation options for interactions identified. For better observed fisheries, long-term datasets exist which allow for ongoing monitoring to detect whether changes are occurring in the nature and extent of captures. In these offshore fisheries where higher levels of coverage are already undertaken, CSP purchases a portion of existing observer time to allow data collection to be spread strategically over the fishing fleet.

Reporting of protected species interactions in New Zealand commercial fisheries relies on observer data and commercial fishing effort data. The following analysis covers all fishing events that ended between **1 July 2022 - 30 June 2023.**

The preparation of data for this report generally follows the same procedure as previous years and any future changes will be documented within this report. Fisheries New Zealand also report on protected species captures using observer-recorded captures and fisher-reported captures to inform protected species capture estimation at a fishery wide scale. These are reported by fishing year (1 October 2022-30 September 2023).

Where possible, data grooming protocols align with FNZ, though some differences do occur, notably:

- This summary includes vessel impacts/deck strikes where it is possible to link the interaction with a fishing event.
- For protected species that were neither photographed nor necropsied, the observer identification is considered correct (unless a DOC species expert is very confident a misidentification has occurred, e.g. a species being identified well beyond its known range).
- All protected species groups are included in this summary.

A total of 573 observed protected species interactions occurred during the July 2022 - June 2023 reporting period. Of these, there were 457 seabirds, 107 marine mammals, 9 protected fish, and 6,704 kgs of protected coral. White-chinned petrels (n=100) and New Zealand fur seals (n=100) were the most frequently observed protected species interaction during this year. This summary 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

[3] Available to download here: https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/pre-2019-annual-plans/approved-mcs-annual-plan-2011-12.pdf

Fisheries Management Area (Figure 1). Protected species interactions are then broken down by fate of the animal (live or dead) and location of capture.

Table 1 presents a summary of commercial fishing effort, observer effort, and observer coverage, in addition to protected species captures (including seabirds, marine mammals, protected fish and reptiles) and protected coral catch, in each fishery with observer coverage during the 2022/23 observer year.

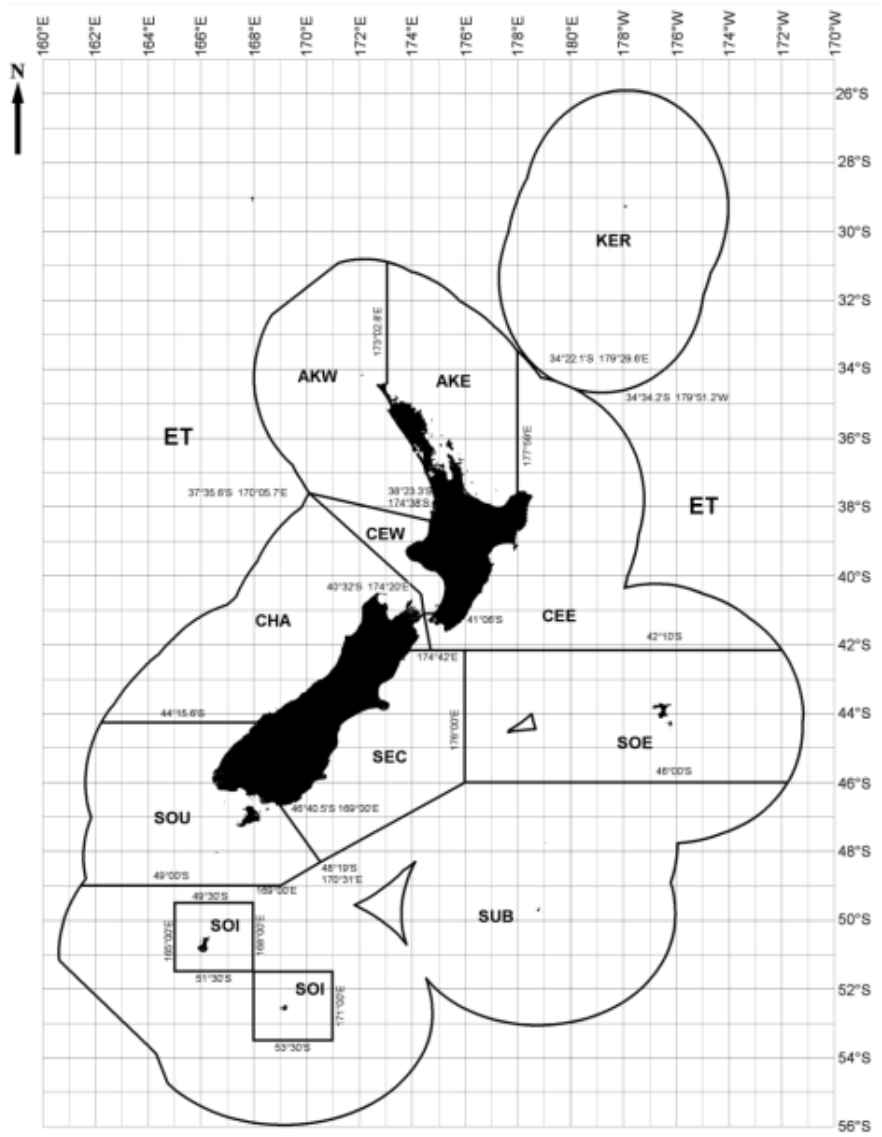
During the 2022/23 year observer coverage was affected by watchkeeping practices on some vessels, primarily smaller vessels operating in the inshore and surface long line vessels. Further information can be found on the Fisheries New Zealand website[4].

Table 1. Summary of commercial effort, observed effort and protected species interactions in fisheries with observer coverage > 0% during the 2022/23 observer year.

Fishery	Effort tows/lines /nets	Observed tows/lines /nets	Coverage (%)	Protected species captures	Coral catch (kg)
Middle Depth Trawl - Hoki, Hake, Ling and Warehou	12,857	4,739	36.9	197	103.4
Middle Depth Trawl - Southern Blue Whiting	517	516	99.8	7	-
Middle Depth Trawl - Scampi	4,644	769	16.6	30	1,041.0
Middle Depth Trawl - Squid	2,224	1,908	85.8	200	2,448.2
Pelagic Trawl - Mackerel and Barracouta	4,594	2,121	46.2	27	1.2
Deepwater Bottom Trawl	3,751	1,392	37.1	15	2,925.5
Inshore Trawl	25,926	679	2.6	9	30.2
Inshore Setnet	17,683	802	4.5	26	148.0
Surface Longline	1,789	60	3.4	24	-
Deepwater Bottom Longline	3,674	537	14.6	20	0.5
Inshore Bottom Longline	6,012	8	0.1	-	-
Bottom Longline - Snapper	4,146	48	1.2	7	-
Purse Seine - Skipjack	11	4	36.4	8	-
Purse Seine - Other	470	120	25.5	-	-
Precision Seafood Harvesting (PSH)	2,127	240	11.3	3	5.6

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

[4] https://www.mpi.govt.nz/fishing-aquaculture/sustainable-fisheries/commercial-fishing-monitored-by-fisheries-observers/



Key:

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

Middle Depth Trawl Fisheries

Hoki, Hake, Ling and Warehou species

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

Table 2 presents a summary of commercial fishing effort, observer effort, and protected species captures in the fishery during the 2022/23 observer year. In the 2022/23 observer year the commercial effort increased by 23.2% from the previous year and observer coverage decreased by 5.5%.

The number of seabird captures observed in 2022/23 increased by 11.4%, with 137 seabird captures in comparison to 123 in the previous observer year (McGovern 2024). Marine mammal captures increased by 90.3%, from 31 in 2021/22 to 59 in 2022/23. One protected fish capture occurred, compared with two in 2021/22 (McGovern 2024). A total of 103.4 kg of coral bycatch was observed this year, in comparison to the 61.5 kg of coral bycatch observed in 2021/22.

In summary, 109 observed trips were conducted aboard 41 vessels, with protected species captures occurring on 59 trips aboard 33 vessels (54.1% of observed trips, and 80.5% of vessels, involved protected species captures).

Table 2. Summary of commercial effort, observer effort, and protected species interactions in the hoki, hake, ling and warehou middle depth trawl fisheries during the 2022/23 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird captures	Seabirds /100 tows	Mammal captures	Mammals /100 tows	Protected fish captures	Protected fish/100 tows	Coral catch (kg)	Coral catch /100 tows
1. AKE	248	11	4.4	-	-	-	-	-	-	-	-
2. CEE	919	289	31.4	1	0.3	24	8.3	-	-	1	0.3
3. SEC	3,600	939	26.1	38	4.0	16	1.7	-	-	15.9	1.7
4. SOE	1,667	409	24.5	7	1.7	-	-	-	-	0.5	0.1
5. SOU	1,247	458	36.7	32	7.0	1	-	-	-	58.1	12.7
6. SUB	1,425	945	66.3	43	4.6	-	-	1	0.1	26.2	2.8
7. CHA	3,697	1,688	45.7	16	0.9	18	1.1	-	-	1.7	0.1
8. CEW	25	-	-	-	-	-	-	-	-	-	-
9. AKW	29	1	3.4	-	-	-	-	-	-	-	-
Total	**12,857**	**4,740**	**36.9**	**137**	**2.9**	**59**	**1.2**	**1**	**0.02**	**103.4**	**2**

Table 3 reports on the numbers of interactions by species and fate immediately post interaction for the 2022/23 observer year. 73.1% of protected species interactions resulted in mortalities. White-chinned petrels were the most commonly bycaught seabird species, however NZ fur seals were the most bycaught species overall in this fishery.

Table 3. Protected species interactions in the hake, hoki, ling and warehou middle depth trawl fisheries during the 2022/23 observer year.

Species	Alive	Dead	Total
Seabirds			
Albatrosses (Unidentified)	2	4	**6**
Buller's albatross	-	3	**3**
Buller's and Pacific albatross	-	7	**7**
Cape petrels	1	-	**1**
Common diving petrel	1	-	**1**
Fairy prion	2	1	**3**
Giant petrels (Unidentified)	1	-	**1**
Great albatrosses	1	-	**1**
Mid-sized Petrels & Shearwaters	1	-	**1**
Mottled petrel	-	1	**1**
Petrel (Unidentified)	1	3	**4**
Petrels, Prions and Shearwaters	11	1	**12**
Prions (Unidentified)	1	-	**1**
Procellaria petrels	1	3	**4**
Royal albatrosses	1	-	**1**
Salvin's albatross	3	19	**22**
Smaller albatrosses	1	1	**2**
Sooty shearwater	1	11	**12**
Westland petrel	2	3	**5**
White-capped albatross	14	3	**17**
White-chinned petrel	6	26	**32**
Seabirds Total	**51**	**86**	**137**
Marine Mammals			
New Zealand fur seal	2	57	59
Marine Mammals Total	**2**	**57**	**59**
Protected Fish			
Basking shark	-	1	1
Protected Fish Total	**0**	**1**	**1**
Total	**53**	**144**	**197**

Tables 4a and b detail the method of interaction for each species. Capture in fishing gear was the most prevalent form of interaction overall, with 85.5% of these interactions resulting in mortalities.

Table 4. Method of interaction for a) protected species released alive and b) dead protected species observed in the hake, hoki, ling and warehou middle depth trawl fisheries during the 2022/23 observer year.

a) Protected species released alive

Species	Caught in fishing gear	Caught in mitigation device	Impact against vessel	Other/ unknown	Total
Seabirds					
Albatrosses (Unidentified)	-	2	-	-	2
Cape petrels	-	-	-	1	1
Common diving petrel	-	-	-	1	1
Fairy prion	-	-	-	2	2
Giant petrels (Unidentified)	-	-	-	1	1
Great albatrosses	1	-	-	-	1
Mid-sized Petrels & Shearwaters	-	1	-	-	1
Petrel (Unidentified)	-	-	-	1	1
Petrels, Prions and Shearwaters	-	-	-	11	11
Prions (Unidentified)	-	-	-	1	1
Procellaria petrels	-	-	1	-	1
Royal albatrosses	-	1	-	-	1
Salvin's albatross	1	2	-	-	3
Smaller albatrosses	-	-	-	1	1
Sooty shearwater	-	1	-	-	1
Westland petrel	-	-	-	2	2
White-capped albatross	1	10	-	3	14
White-chinned petrel	-	4	-	2	6
Seabird Total	**3**	**21**	**1**	**26**	**51**
Marine Mammals					
New Zealand fur seal	-	2	-	-	2
Marine Mammal Total	**0**	**2**	**0**	**0**	**2**
Total	**3**	**23**	**1**	**26**	**53**

b) Dead protected species

Species	Caught in net	Caught on warp or door	Impact against vessel	Other/ unknown	Total
Seabirds					
Albatrosses (Unidentified)	3	1	-	-	4
Buller's albatross	3	-	-	-	3
Buller's and Pacific albatross	7	-	-	-	7
Fairy prion	-	-	1	-	1
Mottled petrel	-	-	1	-	1
Petrel (Unidentified)	3	-	-	-	3
Petrels, Prions and Shearwaters	-	-	1	-	1
Procellaria petrels	3	-	-	-	3
Salvin's albatross	19	-	-	-	19
Smaller albatrosses	1	-	-	-	1
Sooty shearwater	10	-	-	1	11
Westland petrel	3	-	-	-	3
White-capped albatross	2	1	-	-	3
White-chinned petrel	25	-	-	1	26
Seabird Total	**79**	**2**	**3**	**2**	**86**
Marine Mammals					
New Zealand fur seal	57	-	-	-	57
Marine Mammal Total	**57**	**0**	**0**	**0**	**57**
Protected Fish					
Basking shark	-	1	-	-	1
Protected Fish Total	**0**	**1**	**0**	**0**	**1**
Total	**136**	**3**	**3**	**2**	**144**

Southern Blue Whiting

The southern blue whiting fishery is both spatially and temporally distinct from other middle depth trawl fisheries. The location of fishing effort is variable and dependent on the presence of spawning aggregations of southern blue whiting. Most effort occurs in the waters around Campbell Island in the subantarctic region. Unlike other middle depth trawl fisheries, protected species interactions tend to be dominated by marine mammal captures, specifically fur seals. Sea lion captures have also occurred in most previous fishing years at variable levels (up to 14) (Rowe 2009, Rowe 2010, Ramm 2010, Ramm 2012a, Ramm 2012b, Clemens-Seely et al. 2014., Clemens-Seely & Hjorvarsdottir 2016, Hjorvarsdottir 2016, Hjorvarsdottir 2017, Hjorvarsdottir & Isaacs 2018, McGovern & Weaver 2022, McGovern 2024).

Table 5 presents a summary of commercial fishing effort, observer effort, and protected species captures in the fishery during the 2022/23 observer year. There was a 17.2% increase in fishing effort in this fishery in this observer year. The fishery received full observer coverage this year, with an increase of 29.7% from the previous year (McGovern 2024). Seabird captures in the 2022/23 observer year did not change from the previous year (four seabird interactions in 2022/23 and in 2021/22) (McGovern 2024). Marine mammal captures decreased from seven captures in 2021/22 to two captures in 2022/23. One protected fish capture occurred, whereas none were caught the year prior (McGovern 2024).

In summary, fourteen observed trips were conducted aboard ten vessels, with protected species captures occurring on four trips aboard four vessels (28.6% of observed trips involved protected species captures and 40% of these vessels had protected species interactions in 2022/23).

Table 5. Summary of commercial effort, observer effort, and protected species interactions in the southern blue whiting fishery during the 2022/23 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird captures	Seabirds /100 tows	Mammal captures	Mammals /100 tows	Protected fish captures	Protected fish /100 tows
1. AKE	-	-	-	-	-	-	-	-	-
2. CEE	-	-	-	-	-	-	-	-	-
3. SEC	-	-	-	-	-	-	-	-	-
4. SOE	-	-	-	-	-	-	-	-	-
5. SOU	-	-	-	-	-	-	-	-	-
6. SUB	517	517	100	4	0.8	2	0.4	1	0.2
7. CHA	-	-	-	-	-	-	-	-	-
8. CEW	-	-	-	-	-	-	-	-	-
9. AKW	-	-	-	-	-	-	-	-	-
Total	**517**	**517**	**100**	**4**	**0.8**	**2**	**0.4**	**1**	**0.19**

Table 6 reports the numbers of interactions by species and fate immediately post interaction for the 2022/23 observer year. 85.7% of the observed interactions resulted in mortalities.

Table 6. Protected species interactions in the southern blue whiting fishery during the 2022/23 observer year.

Species	Alive	Dead	Total
Seabirds			
Southern royal albatross	-	2	2
Storm petrels	1	-	1
White-bellied storm petrel	-	1	1
Seabirds Total	**1**	**3**	**4**
Marine Mammals			
New Zealand fur seal	-	1	1
New Zealand sea lion	-	1	1
Marine Mammals Total	**0**	**2**	**2**
Protected Fish			
White pointer shark	-	1	1
Protected Fish Total	**0**	**1**	**1**
Total	**1**	**6**	**7**

Tables 7a and b detail the method of interaction by species. Net capture was the most common form of interaction.

Table 7. Method of interaction for a) protected species released alive and b) dead protected species observed in the southern blue whiting fishery during the 2022/23 observer year.

a) Protected species released alive

Species	Impact against vessel	Total
Cape petrels	1	1
Total	**1**	**1**

b) Dead protected species

Species	Caught on warp or door	Net capture	Total
Seabirds			
Black-browed albatross (Unidentified)	-	2	2
Southern royal albatross	1	0	1
Seabird Total	**1**	**2**	**3**
Marine Mammals			
New Zealand fur seal	-	1	1
New Zealand sea lion	-	1	1
Marine Mammal Total	**0**	**2**	**2**
Protected Fish			
White pointer shark	-	1	1
Protected Fish Total	**0**	**1**	**1**
Total	**1**	**5**	**6**

Scampi

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

Table 8 presents a summary of commercial fishing effort, observer effort, and protected species captures in the fishery during the 2022/23 observer year. Commercial effort increased by 3.3% in comparison to the year prior (2021/22). Overall observer coverage increased by 97.1% in 2022/23 (McGovern 2024).

The number of seabird interactions in the 2022/23 observer year increased from 5 observed interactions in 2021/22 to 30 in 2022/23. Coral bycatch increased significantly from 0.2 kg in 2021/22 (McGovern 2024) to 1,041 kg observed in 2022/23.

In summary, thirteen observed trips were conducted aboard 9 vessels, with protected species captures occurring on 8 trips aboard 6 vessels (61% of trips involved protected species captures and 67% of vessels that operated within this fishery during the 2022/23 year had protected species captures).

Table 8. Summary of commercial effort, observer effort, and protected species interactions in the scampi fishery during the 2022/23 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird captures	Seabirds /100 tows	Coral catch (kg)	Coral catch /100 tows
1. AKE	498	93	18.7	4	4.3	-	-
2. CEE	532	58	10.9	-	-	3.4	5.9
3. SEC	37	1	2.7	-	-	100	10,000
4. SOE	1,788	251	14.0	3	1.2	937.6	373.5
5. SOU	-	-	-	-	-	-	-
6. SUB	1,789	366	20.5	23	6.3	-	-
7. CHA	-	-	-	-	-	-	-
8. CEW	-	-	-	-	-	-	-
9. AKW	-	-	-	-	-	-	-
Total	**4,644**	**769**	**16.6**	**30**	**3.9**	**1,041.0**	**135**

Table 9 lists the protected coral species bycaught in 2022/23, with crested cup corals being the most commonly bycaught species, which can mostly be attributed to one large bycatch event (310kg) during a single trip.

Table 9. Protected species of coral bycaught in the scampi trawl fishery during the 2022/23 observer year.

Species	Greenweight (kg)
Bottlebrush coral	3.6
Bushy hard coral	301.6
Coral rubble	0.6
Crested cup coral	361.4
Flabellum cup corals	162
Stony corals	211.8
Total	**1,041**

Table 10 reports the number of interactions by species and fate immediately post interaction. White-capped albatross were the most commonly bycaught species.

Table 10. Protected species interactions in the scampi fishery during the 2022/23 observer year.

Species	Alive	Dead	Total
Albatrosses (Unidentified)	1	-	1
Black (Parkinson's) petrel	1	1	2
Buller's and Pacific albatross	5	2	7
Common diving petrel	1	-	1
Flesh-footed shearwater	2	-	2
Salvin's albatross	1	-	1
Seabird - Large	-	1	1
White-capped albatross	6	7	13
White-chinned petrel	-	2	2
Total	**17**	**13**	**30**

Table 11a and b detail the method of interaction by species. Capture on warp or door was the most prevalent form of interaction overall. Three of the six tori line interactions occurred across one trip.

Table 11. Method of interaction for a) protected species released alive and b) dead protected species observed in the scampi fishery during the 2022/23 observer year.

a) Protected species released alive

Species	Caught on warp or door	Net capture	Tangled in tori line	Impact against vessel	Total
Albatrosses (Unidentified)	-	-	-	1	1
Black (Parkinson's) petrel	-	1	-	-	1
Buller's and Pacific albatross	4	-	1	-	5
Common diving petrel	-	-	-	1	1
Flesh-footed shearwater	-	-	-	2	2
Salvin's albatross	-	-	1	-	1
White-capped albatross	2	-	4	-	6
Total	**6**	**1**	**6**	**4**	**17**

b) Dead protected species

Species	Caught on warp or door	Net Capture	Total
Black (Parkinson's) petrel	1	-	1
Buller's and Pacific albatross	1	1	2
Seabird - Large	1	-	1
White-capped albatross	4	3	7
White-chinned petrel	-	2	2
Total	**7**	**6**	**13**

Squid

Observer coverage in the squid fishery is often higher than other trawl fisheries due to previous high rates of bycatch of New Zealand sea lions and seabirds. Being over 28 m in length, all vessels in this fishery are required to deploy one of the three permitted types of seabird mitigation devices (tori line, warp scarer, or bird baffler), industry defined codes of practice also apply and are monitored against by observers. Offal discarding has been identified as a key issue leading to warp captures in this fishery. Vessel Management Plans have been developed to ensure each vessel has a specific plan to manage discharge of offal during fishing activity.

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

Seabird captures in this fishery tend to vary between years dependent upon the spatial and temporal activity of vessels and its overlap with breeding seabirds, in particular, white-chinned petrels and sooty shearwaters. Commonly, the bulk of the seabird captures have included white-capped albatrosses, sooty shearwaters and white-chinned petrels and this trend continues into the current year.

Table 12 presents a summary of commercial fishing effort, observer effort, and protected species captures in the fishery during the 2022/23 observer year. Commercial fishing effort decreased by 31.4%, and the number of observed tows also decreased, resulting in a 7.5% decrease in observer coverage from the previous year (McGovern 2024).

Seabird interactions increased by 1.6%, from 182 in 2021/22 to 185 in 2022/23. As with previous years, the majority of observed seabird interactions occurred in the SOU and SUB FMAs. The number of observed marine mammal interactions decreased by 54.5%, and protected fish captures increased by 25% from the previous observer year (2021/22). Coral bycatch increased from 1,252.2 kg in 2021/22 to 2,448.2 kg in 2022/23 (McGovern 2024). The majority of coral bycatch occurred in the SOU FMA.

In summary, 62 observed trips were conducted aboard 21 vessels, with protected species captures occurring on 36 trips aboard 16 vessels (58.1% of trips involved protected species captures and 76.2% of vessels that operated within this fishery during the 2022/23 year had protected species captures).

Table 12. Summary of commercial effort, observer effort, and protected species interactions in the squid fishery during the 2022/23 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird captures	Seabirds /100 tows	Mammal captures	Mammals /100 tows	Protected fish captures	Protected fish /100 tows	Coral catch (kg)	Coral catch /100 tows
1. AKE	-	-	-	-	-	-	-	-	-	-	-
2. CEE	-	-	-	-	-	-	-	-	-	-	-
3. SEC	536	396	73.9	16	4.0	4	1.0	-	-	0.115	-
4. SOE	399	265	66.4	21	7.9	1	0.4	-	-	12.44	4.7
5. SOU	564	549	97.3	60	10.9	1	0.2	-	-	2,379.7	433.5
6. SUB	725	695	95.9	88	12.7	4	0.6	5	0.7	55.9	8.0
7. CHA	-	-	-	-	-	-	-	-	-	-	-
8. CEW	-	-	-	-	-	-	-	-	-	-	-
9. AKW	-	-	-	-	-	-	-	-	-	-	-
Total	**2,224**	**1,905**	**85.7**	**185**	**9.7**	**10**	**0.5**	**5**	**0.26**	**2,448.2**	**129**

Table 13 lists the protected coral species bycaught in 2022/23, with *Dendrobathpathyes* spp. (black corals) being the most commonly bycaught species and occurred across one trip.

Table 13. Protected species of coral bycaught in the squid trawl fishery during the 2022/23 observer year.

Species	Weight (kg)
Bottlebrush coral	0.1
Bushy hard coral	55.5
Coral (Unidentified)	22.6
Coral rubble	1
Coral rubble-dead	49
Crested cup coral	0.1
Dendrobathypathes spp.	2,300
Flabellum cup corals	8.1
Spiny white hydrocorals	0.015
Stony corals	11.74
Total	**2,448.155**

Table 14 reports the numbers of interactions by species and fate immediately post interactions. As with the previous year, white-chinned petrels were the most commonly bycaught protected species. The 40 unidentified prions were recorded as a single deck strike event.

Table 14. Protected species interactions in the squid fishery during the 2022/23 observer year.

Species	Alive	Dead	Total
Seabirds			
Albatrosses (Unidentified)	2	-	2
Black-bellied storm petrel	1	-	1
Buller's albatross	1	2	3
Buller's and Pacific albatross	-	3	3
Giant petrels (Unidentified)	-	1	1
Great albatrosses	1	-	1
Petrel (Unidentified)	1	1	2
Petrels, Prions and Shearwaters	1	-	1
Prions (Unidentified)	40	-	40
Procellaria petrels	7	5	12
Salvin's albatross	6	6	12
Shearwaters	1	-	1
Smaller albatrosses	1	-	1
Sooty shearwater	4	15	19
Storm petrels	1	1	2
White-capped albatross	17	15	32
White-chinned petrel	20	32	52
Seabirds Total	**104**	**81**	**185**
Marine Mammals			
New Zealand fur seal	-	9	9
New Zealand sea lion	-	1	1
Marine Mammals Total	**0**	**10**	**10**
Protected Fish			
Basking shark	-	1	1
White pointer shark	3	1	4
Protected Fish Total	**3**	**2**	**5**
Total	**107**	**93**	**200**

Tables 15a and b detail the method of interaction for each species. External net capture was the most prevalent form of interaction overall and was responsible for 45.5% of the interactions that resulted in mortalities.

Table 15. Method of interaction for a) protected species released alive and b) dead protected species in the squid fishery during the 2022/23 observer year.

a) Protected species released alive

Species	Brought on board	Internal net capture	External net capture	Impact against vessel	Total
Seabirds					
Albatrosses (Unidentified)	-	-	2	-	2
Black-bellied storm petrel	-	-	1	-	1
Buller's albatross	-	-	1	-	1
Great albatrosses	-	1	-	-	1
Petrel (Unidentified)	-	-	1	-	1
Petrels, Prions and Shearwaters	-	-	1	-	1
Prions (Unidentified)	-	-	-	40	40
Procellaria petrels	-	-	7	-	7
Salvin's albatross	1	1	4	-	6
Shearwaters	-	1	-	-	1
Smaller albatrosses	-	1	-	-	1
Sooty shearwater	-	-	4	-	4
Storm petrels	-	-	-	1	1
White-capped albatross	-	1	15	1	17
White-chinned petrel	-	-	18	2	20
Seabirds Total	**1**	**5**	**54**	**44**	**104**
Protected Fish					
White pointer shark	-	3	-	-	3
Protected Fish Total	**0**	**3**	**0**	**0**	**3**
Total	**1**	**8**	**54**	**44**	**107**

b) Dead protected species

Species	Caught in grid of SLED	Internal net capture	Caught on warp or door	External net capture	Impact against vessel	Unknown	Total
Seabirds							
Buller's albatross	-	1	-	1	-	-	2
Buller's and Pacific albatross	-	2	-	1	-	-	3
Giant petrels (Unidentified)	-	-	1	0	-	-	1
Petrel (Unidentified)	-	1	-	0	-	-	1
Procellaria petrels	-	5	-	0	-	-	5
Salvin's albatross	-	1	1	3	-	1	6
Sooty shearwater	-	2	-	13	-	-	15
Storm petrels	-	-	-	-	1	-	1
White-capped albatross	-	3	10	2	-	-	15
White-chinned petrel	-	13	1	17	-	1	32
Seabirds Total	**0**	**28**	**13**	**37**	**1**	**2**	**81**
Marine Mammals							
New Zealand fur seal	1	8	-	-	-	-	9
New Zealand sea lion	1	-	-	-	-	-	1
Marine Mammals Total	**2**	**8**	**0**	**0**	**0**	**0**	**10**
Protected Fish							
Basking shark	-	1	-	-	-	-	1
White pointer shark	1	-	-	-	-	-	1
Protected Fish Total	**1**	**1**	**0**	**0**	**0**	**0**	**2**
Total	**3**	**37**	**13**	**37**	**1**	**2**	**93**

Pelagic Trawl Fisheries

Mackerel and Barracouta

In previous years, common dolphins have been captured in the pelagic trawl fishery and in some instances multiple capture events have occurred. A Marine Mammal Operating Procedure (MMOP) has been developed by industry to reduce dolphin captures. These practices include: not setting or hauling at certain times of the day in certain areas, a watch being kept for dolphins in the vicinity of fishing operations, trawl doors being hauled partially on deck whilst turning (in order to close off the mouth of the net), not setting while dolphins are present close to the vessel and using dolphin dissuasive devices (DDDs) on all JMA7 night tows. All the vessels in this fishery are larger than 28 m and are required by law to deploy a seabird scaring device.

Table 16 presents a summary of commercial fishing effort, observer effort, and protected species captures in the fishery during the 2022/23 observer year. Commercial effort in this fishery decreased slightly by 10.4% since the previous year (2021/22), however the number of observed tows was comparable, resulting in a slight increase of 3.8% in overall observer coverage in this fishery from the previous observer year (2021/22).

The number of observed seabird captures decreased by 59.0% and marine mammal captures decreased by 8.3%, in the 2022/23 observer year in comparison to the previous year (2021/22). Coral bycatch in 2022/23 increased from 0.1 kg in 2021/22 (McGovern 2024) to 1.2 kg in 2022/23.

In summary, 48 observed trips were conducted aboard 16 vessels, with protected species captures occurring on 11 trips aboard 7 vessels (22.9% of trips involved protected species captures and 43.8% of vessels that operated within this fishery during the 2022/23 year had protected species captures).

Table 16. Summary of commercial effort, observer effort, and protected species interactions in the jack mackerel and barracouta pelagic trawl fishery during the 2022/23 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird captures	Seabirds /100 tows	Mammal captures	Mammals /100 tows	Coral catch (kg)	Coral catch /100 tows
1. AKE	1	0	0.0	0	0	0	0	0	0
2. CEE	27	0	0.0	0	0	0	0	0	0
3. SEC	1,355	391	28.9	4	1.0	2	0.5	1	0.3
4. SOE	106	92	86.8	1	1.1	2	2.2	0	0
5. SOU	491	299	60.9	10	3.3	2	0.7	0.2	0.1
6. SUB	0	0	0	0	0	0	0	0	0
7. CHA	1,711	852	49.8	0	0	4	0.5	0	0
8. CEW	850	456	53.6	1	0.2	1	0.2	0	0
9. AKW	53	27	50.9	0	0	0	0	0	0
Total	**4,594**	**2,117**	**46.1**	**16**	**0.8**	**11**	**0.5**	**1.2**	**0**

Table 17 reports the number of interactions by species and fate immediately post interaction. New Zealand fur seals were the most commonly bycaught species in this fishery.

Table 17. Protected species interactions in the jack mackerel and barracouta pelagic trawl fisheries during the 2022/23 observer year.

Species	Alive	Dead	Total
Seabirds			
Grey petrel	-	1	1
Salvin's albatross	1	1	2
Smaller albatrosses	1	1	2
Sooty shearwater	1	2	3
Southern royal albatross	1	-	1
White-capped albatross	1	2	3
White-chinned petrel	2	2	4
Seabirds Total	**7**	**9**	**16**
Marine Mammals			
Common dolphin	-	1	1
New Zealand fur seal	-	10	10
Marine Mammals Total	**0**	**11**	**11**
Total	**7**	**20**	**27**

Tables 18a and b detail the method of interaction for each species. Internal net capture was the most prevalent form of interaction overall and was responsible for 48.1% of the interactions that resulted in mortalities.

Table 18. Method of interaction for a) protected species released alive and b) dead protected species observed in the jack mackerel and barracouta pelagic trawl fisheries during the 2022/23 observer year.

a) Protected species released alive

Species	Internal net capture	External net capture	Impact against vessel	Total
Seabirds				
Salvin's albatross	-	1	-	1
Smaller albatrosses	1	-	-	1
Sooty shearwater	-	-	1	1
Southern royal albatross	-	-	1	1
White-capped albatross	-	1	-	1
White-chinned petrel	-	2	-	2
Total	**1**	**4**	**2**	**7**

b) Dead protected species

Species	Internal net capture	External net capture	Impact against vessel	Total
Seabirds				
Grey petrel	-	-	1	1
Salvin's albatross	-	1	-	1
Smaller albatrosses	1	-	-	1
Sooty shearwater	-	2	-	2
White-capped albatross	-	2	-	2
White-chinned petrel	1	1	-	2
Seabirds Total	**2**	**6**	**1**	**9**
Marine Mammals				
Common dolphin	-	1	-	1
New Zealand fur seal	10	-	-	10
Marine Mammals Total	**10**	**1**	**0**	**11**
Total	**12**	**7**	**1**	**20**

Deep Water Bottom Trawl Fisheries

Orange Roughy, Cardinal and Oreo Species

This trawl fishery spans all FMAs and also takes place in areas outside of the NZ EEZ. In deep water bottom trawl fisheries, one of the main focuses of observer coverage is to describe the impact of the trawls on benthic communities, more specifically protected corals. Seabird behaviour and abundance are also monitored around the vessels in this fishery. Discards and offal management, as well as the mandatory use of bird scaring devices, are employed by the fleet to mitigate seabird interactions.

Table 19 presents a summary of commercial fishing effort, observer effort, and protected species captures in the deep-water trawl fishery during the 2022/23 observer year. Commercial fishing effort decreased by 14.0% in 2022/23, however the number of observed tows was comparable to the previous year, resulting in a 14.6% increase in overall observer coverage in comparison to the previous observer year (2021/22).

The rate of seabird captures decreased by 20% in 2022/23, with 12 observed captures in comparison to 15 captures in the 2021/22 observer year (McGovern 2024). There were three observed marine mammal interactions in 2022/24, compared to none in 2021/22. Coral bycatch for this observer year increased from 755.7 kg in 2021/22 to 2,925.5 kg in 2022/23 (McGovern 2024). The majority of the coral bycatch occurred in the SUB and SOE FMAs.

In summary, 30 observed trips were conducted aboard 13 vessels, with protected species captures occurring on eight trips aboard three vessels (26.7% of trips involved protected species captures and 23.1% of vessels that operated within this fishery during the 2022/23 year had protected species captures).

Table 19. Summary of commercial effort, observer effort, and protected species interactions in the orange roughy, cardinal and oreo deep water bottom trawl fisheries during the 2022/23 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird captures	Seabirds /100 tows	Mammal captures	Mammals/100 tows	Coral catch (kg)	Coral catch /100 tows
1. AKE	93	41	44.1	-	-	-	-	6.3	15.4
2. CEE	933	48	5.1	-	-	3	6.3	5.8	12.1
3. SEC	492	280	56.9	2	0.7	-	-	107.2	38.3
4. SOE	1,235	480	38.9	4	0.8	-	-	1,285.9	267.9
5. SOU	67	35	52.2	-	-	-	-	15.6	44.6
6. SUB	379	356	93.9	-	-	-	-	1,487.6	417.9
7. CHA	457	143	31.3	6	4.2	-	-	5.7	4.0
8. CEW	-	-	-	-	-	-	-	-	-
9. AKW	95	14	14.7	-	-	-	-	11.4	81.4
Total	**3,751**	**1,397**	**37.2**	**12**	**0.9**	**3**	**0.2**	**2,925.5**	**209**

Table 20 lists the protected coral species bycaught in 2022/23, with unidentified coral being recorded as the most commonly identified bycaught coral.

Table 20. Protected species of coral bycaught in the orange roughy, cardinal and oreo deepwater bottom trawl fisheries during the 2022/23 observer year.

Species	Weight (kg)
Bamboo coral	9.5
Bamboo corals	24.8
Bathypathes spp.	2.2
Black corals	3.2
Bottlebrush coral	0.2
Bubblegum coral	184.4
Bushy hard coral	879.8
Coral (Unidentified)	1,508.3
Coral rubble	4.5
Crested cup coral	0.1
Deepwater branching coral	2.3
Golden corals	1.1
Gorgonian coral	0.2
Leiopathes spp.	6
Precious corals	8
Primnoa spp.	24.6
Red hydrocorals	9
Solitary bowl coral	5.6
Stony branching corals	5.8
Stony corals	111.4
Stony cup corals	134.3
Trissopathes spp.	0.2
Total	**2,925.5**

Table 21 reports the number of interactions by species and fate immediately post interaction.

Table 21. Protected species interactions in the orange roughy, cardinal and oreo deepwater bottom trawl fisheries during the 2022/23 observer year.

Species	Alive	Dead	Total
Seabirds			
Albatrosses (Unidentified)	1	1	2
Antipodean and Gibson's albatross	-	1	1
Buller's albatross	-	1	1
Northern giant petrel	1	-	1
Petrels, Prions and Shearwaters	4	-	4
Procellaria petrels	1	-	1
Royal albatrosses	-	1	1
Salvin's albatross	-	1	1
Seabirds Total	**7**	**5**	**12**
Marine Mammals			
New Zealand fur seal	-	3	3
Marine Mammals Total	**0**	**3**	**3**
Total	**7**	**8**	**15**

Tables 22a and b detail the method of interaction for each species. Deck strike was the most prevalent form of interaction overall.

Table 22. Method of interaction for a) observed protected species released alive and b) dead protected species in the orange roughy, cardinal and oreo deepwater bottom trawl fisheries during the 2022/23 observer year.

a) Protected species released alive

Species	Impact against vessel	Total
Albatrosses (Unidentified)	1	1
Northern giant petrel	1	1
Petrels, Prions and Shearwaters	4	4
Procellaria petrels	1	1
Total	**7**	**7**

b) Dead protected species

Species	Caught on warp or door	External net capture	Impact against vessel	Internal net capture	Total
Seabirds					
Albatrosses (Unidentified)	1	-	-	-	1
Antipodean and Gibson's albatross	-	-	1	-	1
Buller's albatross	-	-	-	1	1
Royal albatrosses	-	1	-	-	1
Salvin's albatross	1	-	-	-	1
Seabird Total	**2**	**1**	**1**	**1**	**5**
Marine Mammals					
New Zealand fur seal	-	-	-	3	3
Marine Mammal Total	**0**	**0**	**0**	**3**	**3**
Total	**2**	**1**	**1**	**4**	**8**

Inshore Fisheries

Inshore Trawl

Inshore fishing within the New Zealand EEZ is an immensely diverse activity, with large amounts of variation in individual practice and effort. In the case of trawl and bottom longline, it becomes difficult to draw a simple distinction between the inshore and offshore sectors, as a number of vessels make seasonal shifts across this artificial boundary. Individual vessels can range in size from just two metres in length to over 30 m. Equally, activity can range from 20 days per year to over 300 for each vessel. Overly simplified characterisation of the inshore sector is problematic and may lead to false conclusions about the fishery. Therefore, it is critical when gathering information on the inshore fishing sector to get as broad and representative coverage as possible.

Observer coverage of inshore fisheries has historically been low due to the inherent difficulties of placing observers on small vessels in remote ports. Additionally, many of the fishers only operate part time, either seasonally or sporadically. As a result, observers often spend much of their time onshore or travelling between ports. During the 2022/23 year, observer coverage was affected by watchkeeping practices on some vessels, in particular smaller vessels operating in the inshore and surface longline vessels.

Table 23 presents a summary of commercial fishing effort, observer effort, and protected species captures in the inshore trawl fishery during the 2022/23 observer year. Commercial effort decreased by 9.1% over 2022/23 and observer coverage decreased by 25.2% since the previous year (McGovern 2024).

Observed seabird interactions decreased by 76.5%, from 17 captures observed in 2021/22 to 4 captures in 2022/23 (McGovern 2024). There were three marine mammal interactions observed in 2022/23, in comparison to no interactions in 2021/22 (McGovern 2024). 30.2 kg of coral bycatch was observed in 2022/23 compared to no coral bycatch observed in 2021/22 (McGovern 2024).

In summary, 23 observed trips were conducted aboard 17 vessels, with protected species captures occurring on five trips on board five vessels (21.7% of trips involved protected species captures and 29.4% of vessels that operated within this fishery during the 2022/23 year had protected species captures).

Table 23. Summary of the commercial effort, observer effort, and protected species interactions in the inshore trawl fisheries during the 2022/23 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird captures	Seabirds /100 tows	Mammal captures	Mammals /100 tows	Protected fish captures	Protected fish/ 100 tows	Coral catch (kg)	Coral catch/ 100 tows
1. AKE	2,317	18	0.8	-	-	-	-	-	-	-	-
2. CEE	3,473	37	1.1	-	-	-	-	-	-	-	-
3. SEC	7,093	310	4.4	4	1.3	3	1.0	-	-	-	-
4. SOE	-	-	-	-	-	-	-	-	-	-	-
5. SOU	3,093	76	2.5	-	-	-	-	-	-	-	-
6. SUB	-	-	-	-	-	-	-	-	-	-	-
7. CHA	7,093	-	-	-	-	-	-	-	-	-	-
8. CEW	899	43	4.8	-	-	-	-	-	-	-	-
9. AKW	1,958	195	10.0	-	-	-	-	2	1.0	30.2	15.5
Total	**25,926**	**679**	**2.6**	**4**	**0.6**	**3**	**0.4**	**2**	**0.29**	**30.2**	**4**

Table 24 reports the number of interactions by species and fate immediately post interaction.

Table 24. Protected species interactions in the inshore trawl fisheries during the 2022/23 observer year.

Species	Alive	Dead	Total
Seabirds			
Pied shag	-	1	1
Salvin's albatross	-	1	1
Smaller albatrosses	-	1	1
White-capped albatross	-	1	1
Seabirds Total	**0**	**4**	**4**
Marine Mammals			
Hector's dolphin	-	1	1
New Zealand fur seal	-	2	2
Marine Mammals Total	**0**	**3**	**3**
Protected Fish			
White pointer shark	2	-	2
Protected Fish Total	**2**	**0**	**2**
Total	**2**	**7**	**9**

Tables 25a and b detail the method of interaction for each species. Capture in warp or door was the most prevalent interaction type.

Table 25. Method of interaction for a) protected species released alive and b) dead protected species observed in the inshore trawl fisheries during the 2022/23 observer year.

a) Protected species released alive

Species	Caught in fishing gear	Total
White pointer shark	2	2
Total	**2**	**2**

b) Dead protected species

Species	Caught on warp or door	External net capture	Internal net capture	Total
Seabirds				
Pied shag	-	-	1	1
Salvin's albatross	1	-	-	1
Smaller albatrosses	1	-	-	1
White-capped albatross	1	-	-	1
Seabird Total	**3**	**0**	**1**	**4**
Marine Mammals				
Hector's dolphin	-	-	1	1
New Zealand fur seal	-	2	-	2
Marine Mammal Total	**0**	**2**	**1**	**3**
Total	**3**	**2**	**2**	**7**

Inshore Setnet

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

Observer coverage was initially low in this fishery but increased in 2008/09 due to concerns about Hector's dolphin bycatch. However, in recent years, the coverage has dropped again due to other priorities, such as observer coverage of inshore trawling on the west coast of the North Island and black petrel interactions in the Hauraki gulf. During the 2022/23 year, observer coverage was affected by watchkeeping practices on some vessels, primarily smaller vessels operating in the inshore and surface long line vessels.

Table 26 presents a summary of commercial fishing effort, observer effort, and protected species captures in the fishery during the 2022/23 observer year. Fishing effort in 2022/23 increased slightly by 4.9% from the 2021/22 fishing year, and the number of observed sets increased slightly, resulting in an overall observer coverage increase of 22.6% (McGovern 2024).

The number of observed seabird interactions decreased from 26 in 2021/22 to 20 in 2022/23 (McGovern 2024). The number of marine mammal captures decreased from nine in 2021/22 to six in 2022/23. The amount of coral bycaught in 2022/23 increased to 148 kg, compared to 1 kg of corals bycaught in 2021/22 (McGovern 2024).

In summary, 12 observed trips were conducted aboard seven vessels, with protected species captures occurring on seven trips aboard four vessels (58.3% of trips involved protected species captures and 57.1% of vessels that operated within this fishery during the 2022/23 year had protected species captures).

Table 26. Summary of commercial effort, observer effort, and protected species interactions in the inshore setnet fishery during the 2022/23 observer year.

FMA	Effort sets	Observed sets	Coverage (%)	Seabird captures	Seabirds /100 sets	Mammal captures	Mammals /100 sets	Coral catch (kg)	Coral catch /100 sets
1. AKE	4,322	-	-	-	-	-	-	-	-
2. CEE	1,671	-	-	-	-	-	-	-	-
3. SEC	3,772	744	19.7	20	2.7	6	0.8	148	19.9
4. SOE	-	-	-	-	-	-	-	-	-
5. SOU	1,158	58	5.0	-	-	-	-	-	-
6. SUB	-	-	-	-	-	-	-	-	-
7. CHA	480	-	-	-	-	-	-	-	-
8. CEW	551	-	-	-	-	-	-	-	-
9. AKW	5,729	-	-	-	-	-	-	-	-
Total	**17,683**	**802**	**4.5**	**20**	**2.5**	**6**	**0.7**	**148.0**	**18**

Table 27 reports the number of interactions with inshore setnet fishery by species and fate immediately post interaction. 65.4% of the interactions resulted in mortalities.

Table 27. Protected species interactions in the inshore setnet fishery during the 2022/23 observer year.

Species	Alive	Dead	Total
Seabirds			
Cape petrels	-	1	1
Otago shag	-	1	1
Shags	-	5	5
Sooty shearwater	1	-	1
White-capped albatross	3	-	3
White-chinned petrel	5	-	5
Yellow-eyed penguin	-	4	4
Seabirds Total	**9**	**11**	**20**
Marine Mammals			
Dusky dolphin	-	1	1
Hector's dolphin	-	1	1
New Zealand fur seal	-	4	4
Marine Mammals Total	**0**	**6**	**6**
Total	**9**	**17**	**26**

Tables 28a and b detail the method of interaction by species. 80.8% of interactions were associated with net capture.

Table 28. Method of interaction for a) protected species released alive and b) dead protected species observed in the setnet fishery during the 2022/23 observer year

a) Protected species released alive

Species	Net capture	Impact against vessel	Total
Seabirds			
Sooty shearwater	1	-	1
White-capped albatross	1	2	3
White-chinned petrel	2	3	5
Seabird Total	**4**	**5**	**9**
Total	**4**	**5**	**9**

b) Dead protected species

Species	Net capture
Seabirds	
Cape petrels	1
Otago shag	1
Shags	5
Yellow-eyed penguin	4
Seabird Total	**11**
Marine Mammals	
Dusky dolphin	1
Hector's dolphin	1
New Zealand fur seal	4
Marine Mammal Total	**6**
Total	**17**

Surface Longline Fisheries

Domestic Tuna and Swordfish

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

Table 29 presents a summary of commercial fishing effort, observer effort, and protected species captures in the fishery during the 2022/23 observer year. Commercial effort increased by 11.3% in comparison to the previous year (2021/22). There was a significant decrease of 56.4% in overall observer coverage in this fishery since the previous observer year (2021/22). This decrease can mostly be attributed to the difficulties in placing observers on smaller vessels affected by watchkeeping practices.

The number of seabird interactions observed in 2022/23 decreased by 84%, with 12 interactions observed in 2022/23 compared to 75 in 2021/22 (McGovern 2024). The number of marine mammal observed captures decreased by 58.6% from 29 observed interactions in 2021/22 to 12 in 2022/23 (McGovern 2024). The number of marine reptile captures decreased from 5 observed interactions in 2021/22 to no interactions in 2022/23 (McGovern 2024).

In summary, five observed trips were conducted aboard four vessels, with protected species captures occurring on five trips aboard four vessels (100% of trips involved protected species captures and 100% of vessels that were observed within this fishery during the 2022/23 year had protected species captures).

Table 29. Summary of commercial effort, observer effort, and protected species interactions in the domestic tuna and swordfish fishery during the 2022/23 observer year.

FMA	Effort Lines	Observed Lines	Coverage (%)	Number of hooks observed	Seabird captures	Seabirds /1000 hooks	Mammal captures	Mammals /1000 hooks
1. AKE	519	-	-	-	-	-	-	-
2. CEE	316	-	-	-	-	-	-	-
3. SEC	529	38	7.2	37,020	4	0.11	10	0.27
4. SOE	-	-	-	-	-	-	-	-
5. SOU	3	-	-	-	-	-	-	-
6. SUB	1	-	-	-	-	-	-	-
7. CHA	276	22	8.0	18,040	8	0.44	2	0.11
8. CEW	12	-	-	-	-	-	-	-
9. AKW	133	-	-	-	-	-	-	-
Total	**1,789**	**60**	**3.4**	**55,060**	**12**	**0.22**	**12**	**0.22**

Table 30 reports the number of interactions by species and fate immediately post interaction. New Zealand fur seals were the most common protected species interaction in the 2022/23 observer year (46% of all interactions). Overall, 50% of interactions resulted in mortalities. Capture in fishing gear accounted for 100% of interactions.

Table 30. Protected species interactions in the domestic tuna and swordfish fishery during the 2022/23 observer year.

Species	Alive	Dead	Total
Seabirds			
Buller's albatross	-	1	1
Northern royal albatross	-	1	1
Westland petrel	-	3	3
White-capped albatross	-	5	5
White-chinned petrel	1	1	2
Seabirds Total	**1**	**11**	**12**
Marine Mammals			
New Zealand fur seal	10	1	11
Orca	1	-	1
Marine Mammals Total	**11**	**1**	**12**
Total	**12**	**12**	**24**

Bottom Longline Fishery

Deepwater Bottom Longline

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

The deepwater bottom longline fishery has been characterised as all bottom longline vessels over 34 m in length, and all vessels between 20-34 m that set over 5,000 hooks/day.

Table 31 presents a summary of commercial fishing effort, observer effort, and protected species captures in the deepwater bottom longline fishery during the 2022/23 observer year. Commercial effort decreased by 26.0%, however the number of observed lines slightly increased, resulting in an increase of 87.4% in overall observer coverage in 2022/23.

The number of observed interactions in this fishery decreased by 56.8%, from 44 captures in 2021/22 (McGovern 2024) to 19 observed interactions in 2022/23. One marine mammal interaction was observed in 2022/23, compared to no observations in 2021/22. There was 0.5 kg coral bycatch observed in 2022/23, compared to none in 2021/22 (McGovern 2024).

In summary, seven observed trips were conducted aboard five vessels, with protected species captures occurring on six trips aboard two vessels (85.7% of trips involved protected species captures on 40% of vessels that were observed within this fishery during the 2022/23 year).

Table 31. Summary of commercial effort, observer effort, and protected species interactions in the deepwater bottom longline fishery during the 2022/23 observer year.

FMA	Effort Lines	Observed Lines	Coverage (%)	Number of hooks observed	Seabird captures	Seabirds /1000 hooks	Mammal captures	Mammals /1000 hooks	Coral catch (kg)	Coral catch /1000 hooks
1. AKE	41	0	0	0	0	0	0	0	0	0
2. CEE	126	0	0	0	0	0	0	0	0	0
3. SEC	82	0	0	0	0	0	0	0	0	0
4. SOE	960	216	22.5	2,330,143	6	0.0026	1	0.0004	0	0
5. SOU	158	0	0	0	0	0	0	0	0	0
6. SUB	605	229	37.9	2,946,247	6	0.0020	0	0	0.5	0.0002
7. CHA	1,615	92	5.7	134,400	7	0.0521	0	0	0	0
8. CEW	87	0	0	0	0	0	0	0	0	0
9. AKW	0	0	0	0	0	0	0	0	0	0
Total	**3,674**	**537**	**14.6**	**5,410,790**	**19**	**0.0035**	**1**	**0.0002**	**0.5**	**0.0001**

Table 32 reports the number of interactions in the deepwater bottom longline fishery by species and fate immediately post interaction. 100% of interactions resulted in mortalities. Westland petrels were the most commonly bycaught protected species which occurred during one trip.

Table 32. Protected species interactions in the deepwater bottom longline fishery during the 2022/23 observer year.

Species	Alive	Dead	Total
Seabirds			
Albatrosses (Unidentified)	1	-	1
Petrels, Prions and Shearwaters	2	-	2
Pterodroma petrels	-	1	1
Royal albatrosses	1	-	1
Salvin's albatross	-	4	4
Westland petrel	-	7	7
White-bellied storm petrel	1	-	1
White-chinned petrel	-	2	2
Seabirds Total	**5**	**14**	**19**
Marine Mammals			
New Zealand fur seal	1	-	1
Marine Mammals Total	**1**	**0**	**1**
Total	**6**	**14**	**20**

Tables 33a and b detail the method of interaction by species. The New Zealand fur seal interaction that was recorded as Other was released alive after being hooked by the gaff.

Table 33. Method of interaction for a) protected species released alive, and b) dead protected species observed in the deepwater bottom longline fishery during the 2022/23 observer year.

a) Protected species released alive

Species	Caught in fishing gear	Impact against vessel	Other	Total
Seabirds				
Albatrosses (Unidentified)	-	1	-	1
Petrels, Prions and Shearwaters	-	2	-	2
Royal albatrosses	1	-	-	1
White-bellied storm petrel	-	1	-	1
Seabird Total	**1**	**4**	**0**	**5**
Marine Mammals				
New Zealand fur seal	-	-	1	1
Marine Mammal Total	**0**	**0**	**1**	**1**
Total	**1**	**4**	**1**	**6**

b) Dead protected species

Species	Caught in fishing gear	Tangled in tori line	Impact against vessel	Total
Albatrosses (Unidentified)	-	-	1	1
Petrels, Prions and Shearwaters	4	-	-	4
Royal albatrosses	7	-	-	7
White-bellied storm petrel	-	2	-	2
Total	**11**	**2**	**1**	**14**

Inshore Bottom Longline

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

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

The inshore bottom longline fishery has been characterised as all bottom longline vessels under 20 m, and all vessels between 20-34 m in length that set 5,000 hooks or less/day.

Table 34 presents a summary of commercial fishing effort, observer effort, and protected species captures in the fishery during the 2022/23 observer year. Commercial effort decreased by 5.5% since the 2021/22 fishing year and observer coverage decreased from 2.8% in 2021/22 to 0.2% in 2022/23. This decrease can mostly be attributed to the difficulties in placing observers on smaller vessels affected by watchkeeping practices.

There were no protected species interactions observed in this fishery in the 2021/22 or 2022/23 fishing years. In summary, one observed trip was conducted aboard one vessel, with no protected species captures occurring on this trip.

Table 34. Summary of commercial effort, observer effort, and protected species interactions in the inshore bottom longline fisheries during the 2022/23 observer year.

FMA	Effort Lines	Observed Lines	Coverage (%)	Number of hooks observed
1. AKE	572	-	-	-
2. CEE	1,503	-	-	-
3. SEC	677	-	-	-
4. SOE	358	-	-	-
5. SOU	718	-	-	-
6. SUB	-	-	-	-
7. CHA	824	-	-	-
8. CEW	648	-	-	-
9. AKW	712	8	1.1	4,000
Total	**6,012**	**8**	**0.1**	**4,000**

Bottom Longline - Snapper

Throughout the past ten years, observer coverage has been irregular in the snapper fishery, fluctuating between < 1% up to 8%. This fishery is predominantly conducted in the AKE FMA by vessels under 20 m in length.

Table 35 presents a summary of commercial fishing effort, observer effort, and protected species captures in the fishery during the 2022/23 observer year. In comparison to 2021/22, there was a 0.1% decrease in commercial fishing effort, and overall observer coverage of the fishery decreased by 53.7% in 2022/23. This decrease can mostly be attributed to the difficulties in placing observers on smaller vessels affected by watchkeeping practices.

The number of seabirds captured in this fishery increased from five captures in 2021/22 (McGovern 2024) to seven observed interactions in 2022/23. There was no coral bycatch in 2022/23 compared with 1.4 kg in 2021/22.

In summary, four observed trips were conducted aboard four vessels, with protected species captures occurring on two trips aboard two vessels (50% of trips involved protected species captures on 50% of vessels that were observed within this fishery during the 2022/23 year).

Table 35. Summary of commercial effort, observer effort, and protected species interactions in the snapper bottom longline fishery during the 2022/23 observer year.

FMA	Effort Lines	Observed Lines	Coverage (%)	Number of hooks observed	Seabird captures	Seabirds /1000 hooks
1. AKE	3,709	48	1.3	93,001	7	0.08
2. CEE	-	-	-	-	-	-
3. SEC	-	-	-	-	-	-
4. SOE	-	-	-	-	-	-
5. SOU	-	-	-	-	-	-
6. SUB	-	-	-	-	-	-
7. CHA	8	-	-	-	-	-
8. CEW	157	-	-	-	-	-
9. AKW	272	-	-	-	-	-
Total	**4,146**	**48**	**1.2**	**93,001**	**7**	**0.08**

Table 36 reports the number of interactions by species and fate immediately post interaction. Capture in fishing gear accounted for 100% of interactions. There were no observed mortalities in this fishery.

Table 36. Protected species interactions in the snapper bottom longline fishery during the 2022/23 observer year.

Species	Alive	Dead	Total
Flesh-footed shearwater	6	-	6
Fluttering shearwater	1	-	1
Total	**7**	**0**	**7**

Purse Seine Fisheries

Skipjack Tuna

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

Table 37 presents a summary of commercial fishing effort, observer effort, and protected species captures in the fishery during the 2022/23 observer year. Commercial fishing effort in the skipjack tuna purse seine fishery significantly decreased by 76.6% since the previous year (2021/22), however there was a slight increase in the number of observed tows, resulting in an increase of 36.4% in observer coverage.

In summary, one observed trip was conducted aboard one vessel, with no protected species captures occurring.

Table 37. Summary of commercial effort, observer effort, and protected species interactions in the skipjack tuna purse seine fishery during the 2022/23 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)
1. AKE	6	3	50.0
2. CEE	3	1	33.3
3. SEC	-	-	-
4. SOE	-	-	-
5. SOU	-	-	-
6. SUB	-	-	-
7. CHA	-	-	-
8. CEW	-	-	-
9. AKW	2	-	-
Total	**11**	**4**	**36.4**

Mackerel & Other

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

Table 38 presents a summary of commercial fishing effort and observer effort, in this fishery during the 2022/23 observer year. There was a slight decrease of 8.9% in commercial effort in 2022/23, however the number of observed tows slightly increased, resulting in a 60.6% increase in overall observer coverage in 2022/23.

Eight seabird captures were observed in 2022/23, the same as in 2021/22 (McGovern 2024).

In summary, four observed trips were conducted aboard three vessels, with protected species captures occurring on one trip onboard one vessel (25% of these trips involved protected species captures and 33% of vessels that were observed within this fishery during the 2022/23 year had protected species captures).

Table 38. Summary of commercial effort, observer effort, and protected species interactions in the purse seine fishery during the 2022/23 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird captures	Seabirds /100 tows
1. AKE	386	67	17.4	8	11.9
2. CEE	39	18	46.2	-	-
3. SEC	-	-	-	-	-
4. SOE	-	-	-	-	-
5. SOU	-	-	-	-	-
6. SUB	-	-	-	-	-
7. CHA	7	7	100.0	-	-
8. CEW	18	12	66.7	-	-
9. AKW	20	16	80.0	-	-
Total	**470**	**120**	**25.5**	**8**	**6.7**

Table 39. reports the number of interactions in the purse seine fisheries by species and fate immediately post interaction. 100% of interactions were identified as common diving petrels.

Table 39. Protected species interactions in the purse seine fisheries during the 2022/23 observer year.

Species	Alive	Dead	Total
Common diving petrel	2	6	8
Total	**2**	**6**	**8**

Tables 40a and b detail the method of interaction by species. Net capture accounted for 83.3% of observed mortalities.

Table 40. Method of interaction for a) protected species released alive, and b) dead protected species observed in the purse seine fishery during the 2022/23 observer year.

a) Protected species released alive

Species	Net capture	Total
Seabirds		
Common diving petrel	2	**2**
Total	**2**	**2**

a) Dead protected species

Species	Net capture	Impact against vessel	Total
Seabirds			
Common diving petrel	5	1	6
Total	**5**	**1**	**6**

Precision Seafood Harvesting (PSH)

Precision Seafood Harvesting (PSH) testing started in October 2012 and has been active every year since then. PSH uses a prototype harvesting system, called the Modular Harvest System or 'MHS', that aims to target specific species and fish sizes, and enables fish to be landed in much better condition than traditional trawls. The method also opens the opportunity for holding and on-rearing live fish to enable fresh fish to be provided on demand. PSH uses a new system that replaces a part of the traditional trawl net with a flexible PVC landing liner, which is dotted with escape portals. These portals minimise bycatch by increasing the likelihood of undersized and non-target species escaping the net. Targeted fish then continue to swim at a natural pace, within the liner, until such time as they are landed.

Although PSH falls under the trawling sector, the technology used differs in fundamental ways which could cause differences in the incidental capture rate of protected species, thus, observer reporting is carried out separately. This is the sixth year PSH has been reported on.

Table 41 presents a summary of commercial fishing effort, observer effort, and protected species captures in the fishery during the 2022/23 observer year. PSH fishing effort in both mid and bottom trawl decreased by 9.8% in the 2022/23 year in comparison to the year prior (McGovern 2024). Overall observer coverage in this fishery decreased by 25.1% since the previous year (2021/22).

The number of seabird interactions decreased from ten observed interactions in 2021/22 to three in 2022/23 (McGovern 2024). Coral bycatch increased from 1 kg (2021/22) to 5.6 kg in the 2022/23 observer year (McGovern 2024).

In summary, eleven observed trips were conducted aboard seven vessels, with protected species captures occurring on two of these trips aboard two vessels (18.2% of these trips involved protected species captures and 28.6% of vessels that were observed within this fishery during the 2022/23 year had protected species captures).

Table 41. Summary of commercial effort, observer effort, and protected species interactions in the PSH fishery during the 2022/23 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird captures	Seabirds /100 tows	Coral catch (kg)	Coral catch /100 tows
1. AKE	1,369	174	12.7	-	-	2.2	1.3
2. CEE	54	-	-	-	-	-	-
3. SEC	116	49	42.2	2	4.1	-	-
4. SOE	35	17	48.6	-	-	-	-
5. SOU	4	8	200.0	-	-	-	-
6. SUB	5	15	300.0	-	-	-	-
7. CHA	9	-	-	-	-	-	-
8. CEW	143	-	-	-	-	-	-
9. AKW	392	22	5.6	1	4.5	3.4	15.5
Total	**2,127**	**285**	**13.4**	**3**	**1.1**	**5.6**	**2**

Table 42 reports the number of interactions by species and fate immediately post interaction.

Table 42. Protected species interactions in the PSH fishery during the 2022/23 observer year.

Species	Alive	Dead	Total
Seabirds			
Great albatrosses	1	-	1
Petrels, Prions and Shearwaters	-	1	1
Salvin's albatross	-	1	1
Total	**1**	**2**	**3**

Tables 43a and b detail the method of interactions by species.

Table 43. Method of interaction for a) observed protected species released alive and b) dead protected species, in the PSH fishery during the 2022/23 observer year.

a) Protected species released alive

Species	Impact against vessel	Total
Fluttering shearwater	1	1
Total	**1**	**1**

b) Dead protected species

Species	External net capture	Total
White-capped albatross	1	1
White-chinned petrel	1	1
Total	**2**	**2**

Troll - Albacore

The troll fishery in New Zealand targets albacore tuna over the summer period (December – May), primarily on the west coasts of the North and South Islands. Roughly 90% of albacore tuna caught in New Zealand are caught using this method. Vessels in the fishery are typically 12-24 m in length, operating with crews of two to five. Being seasonal, albacore fishing usually forms one of several fishing activities for the vessels involved.

Commercial albacore trollers in New Zealand tow 12-18 lines simultaneously from the vessel's stern and from long outrigger poles mounted amidships. The line lengths or depths are adjusted to permit hauling of any one line without tangling or interfering with the others.

Observer coverage in this fishery has occurred opportunistically in the past.

In summary, no observed trips were conducted during 2022/23.

Pot fisheries- Ling

Pot fishing can present many advantages to other fishing methods in its ability to reduce bycatch and impact on the seafloor. Whilst its use in fisheries such as rock lobster (and many other species) is well established, the potting method has also proven to be a viable harvesting method for the large bottom-dwelling fish, ling. There is interest in this method being utilised for further target species also e.g., scampi, gurnard and rig.

Observer coverage in the pot fishery has occurred sporadically in the past alongside set net coverage. Interactions with seabirds and marine mammals are relatively low, though pot lines can create an entanglement risk. There are no current mitigation methods for this fishery.

Table 44 presents a summary of commercial fishing effort, observer effort, and protected species captures in the fishery during the 2022/23 observer year.

In summary, two observed trips were conducted aboard two vessels, with no protected species captures occurring.

Table 44. Summary of commercial effort, observer effort, and protected species interactions in the pot fishery during the 2022/23 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)
1. AKE	168	-	-
2. CEE	17	-	-
3. SEC	971	63	6.5
4. SOE	850	-	-
5. SOU	2,745	-	-
6. SUB	127	-	-
7. CHA	743	-	-
8. CEW	2	-	-
9. AKW	129	-	-
Total	**5,752**	**63**	**1.1**

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $2,433,951. Services were provided by Fisheries New Zealand Observer Services.

References

Rowe, S.J. 2009. Conservation Services Programme observer report: 1 July 2004 to 30 June 2007. Report prepared by the Conservation Services Programme of the New Zealand Department of Conservation, Wellington. 94p.

Rowe, S.J. 2010. Conservation Services Programme observer report: 1 July 2007 to 30 June 2008. Report prepared by the Conservation Services Programme of the New Zealand Department of Conservation, Wellington. 98p.

Ramm, K. 2010. Conservation Services Programme Observer Report: 1 July 2008 to 30 June 2009. Report prepared by the Conservation Services Programme of the New Zealand Department of Conservation, Wellington. 126p.

Ramm, K. 2012a. Conservation Services Programme Observer Report: 1 July 2009 to 30 June 2010. Report prepared by the Conservation Services Programme of the New Zealand Department of Conservation, Wellington. 130p.

Ramm, K. 2012b. Conservation Services Programme Observer Report: 1 July 2010 to 30 June 2011. Report prepared by the Conservation Services Programme of the New Zealand Department of Conservation, Wellington. 121p.

Clemens-Seely, K. & Hjorvarsdottir, F. 2016. Conservation Services Programme Annual Research Summary 2013-14. Report prepared by the Conservation Services Programme of the New Zealand Department of Conservation, Wellington. 80p.

Hjorvarsdottir, F. 2016. Conservation Services Programme Annual Research Summary 2014-15. Report prepared by the Conservation Services Programme of the New Zealand Department of Conservation, Wellington. 80p.

Hjorvarsdottir, F. 2017. Conservation Services Programme Annual Research Summary 2015-16. Report prepared by the Conservation Services Programme of the New Zealand Department of Conservation, Wellington. 84p.

Hjorvarsdottir, F. & Isaacs, R. 2018. Conservation Services Programme Annual Research Summary 2016-17. Report prepared by the Conservation Services Programme of the New Zealand Department of Conservation, Wellington. 91p.

McGovern, H. & Weaver, S. 2022. Conservation Services Programme Annual Research Summary 2020-21. Report prepared by the Conservation Services Programme of the New Zealand Department of Conservation, Wellington. 85 p.

McGovern, H. 2024. Conservation Services Programme Annual Research Summary 2021-22. Report prepared by the Conservation Services Programme of the New Zealand Department of Conservation, Wellington. 86 p.

2.2 INT2020-02 Identification of marine mammals, turtles and protected fish captured in New Zealand fisheries

Project objective

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

Rationale

The accurate determination of the taxon of marine mammals, turtles and protected fish captured in New Zealand fisheries is vital for examining the potential threat to population viability posed by incidental fisheries captures. Observers on commercial vessels are not always able to identify marine mammals, turtles and protected fish at sea with high precision, and the assessment of the age-class may require expert knowledge. Information gained through this project will link to Fisheries New Zealand databases and will inform ongoing bycatch estimation, risk assessment, research and modelling of the effects of fisheries bycatch on marine mammals, turtles and protected fish populations. This project is designed to complement the existing seabird and coral identification projects. Observers routinely collect samples of genetic material from these taxa, these can be used to resolve uncertain identification determinations from photographs.

Project status

Complete.

Summary of the methods and key findings

Marine mammals

There were 109 marine mammal bycatch events reported between 1 July 2022 to 30 June 2023. Of these events, 88 (81%) had either photos or videos that could be assessed to confirm taxa identification and other information. The remaining 21 (19%) events had no photos associated with them and were therefore not able to be assessed. There is some discussion of potential reasons for a lack of photos within the report.

Taxon identification by observers was confirmed as correct in all events where reasonable quality photos were available.

Protected fishes and reptiles

There were nine protected fish and reptile bycatch events reported by observers between 1 July 2022 to 30 June 2023. Of these events, seven (78%) had either photos or videos that could be assessed to confirm taxa identification and other information. The remaining two (22%) events had either poor quality photos, or no photos at all associated with them, and were therefore not able to be assessed. Taxa identification by observers was confirmed as correct all events where reasonable quality photos were available.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $15,000 per annum over three years.

Review milestones

- Draft final report for 2022/23 made available on the CSP webpage in August 2024
- Final report for 2022/23 made available on the CSP webpage in September 2024

Citation

Johnston O. 2024. Identification of marine mammals captured in New Zealand fisheries 2022-23 INT2020-02 final report prepared by Cawthron Institute for the Department of Conservation. 26 p.

Weblink

INT2020-02: Identification of marine mammals captured in New Zealand fisheries 2022-23

2.3 INT2021-04 Collection and curation of tissues samples from protected fishes and turtles

Project objectives

1. To provide co-ordinated storage and curation of tissue samples collected from protected marine fishes and sea turtles by researchers, fishery observers and fishers.
2. To ensure all relevant meta-data is associated with each sample, that samples are accessible to bona-fide researchers, appropriate cultural controls on the use of samples are in place, and that the use of samples and publications arising from their use are tracked.

Rationale

Biological sampling or retention of carcasses of protected species taken as incidental bycatch in commercial fisheries can be difficult particularly for large pelagic species such as basking sharks, great white sharks, devil rays and some turtles. In addition to operational constraints, health and safety considerations can make examination or necropsy of dead animals difficult or impossible. However, genetic and stable isotope analyses that use small tissue samples can provide valuable information on population structure, connectivity and size, and habitat preferences and feeding ecology, respectively.

Project status

This is a multi-year project due for completion in June 2024. 2021/22 and 2022/2023 reporting is complete, 2023/24 is in progress.

Summary of the methods and key findings

The Protected Species Tissue Archive (Fishes and Turtles) is currently held at Tāmaki Paenga Hira Auckland War Memorial Museum and has been running for 18 months. The archive is an extension of project INT2018-04 Improving the collection of data and samples from bycatch basking sharks (Francis 2019, Finucci et al. 2021). It ensures appropriate curation of tissue samples obtained from protected fishes and turtles, improved visibility of and access to samples by researchers, and will track the fate of samples, as well as the outputs of research that they are used for.

A total of 114 samples from 62 individuals of protected fishes and reptiles were curated in the tissue archive in the second year of the project (July 2022 – June 2023). Samples collected as part of the POP2021-05 project (Finucci & Maolagáin 2022) were provided by NIWA and have been integrated into the archive. Only 10 samples from three individuals were collected by the fisheries observer program.

The limited number of tissue samples (three individuals) collected by fishery observers represents a missed opportunity. Tissue samples from bycaught species allow for ongoing genetic monitoring of populations, including estimation of population size, stock structure, inter and intra-group relatedness, movements and connectivity of populations and identification of source populations (e.g. Pardini et al. 2001; Hoelzel et al. 2006; Gubili et al. 2012; Francis & Ritchie 2016; Corrigan et al. 2018; Hillary et al. 2018; Lieber et al. 2020; Jensen et al. 2022). As a result of the limited numbers Auckland Museum will prioritise the integration of existing samples held by DOC and researchers in the 2023-2024 year including researchers from Massey University and Auckland Zoo to integrate existing sea turtle samples into the Archive.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $22,000 per annum over three years.

Review milestones

- Draft final report for 2022/23 made available on the CSP webpage in June 2023
- Final report for 2022/23 made available on the CSP webpage in July 2023

Citation

Bray, R. 2023. Annual report 2022/23 - Collection and curation of tissue samples from protected fishes and turtles. INT2021-04 final report prepared for Conservation Services Programme, Department of Conservation. 13 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/int2021-04-protected-fishes-and-turtles-tissue-archive-2022-23-draft-report.pdf

2.4 INT2022-02 Identification of seabirds captured in New Zealand fisheries

Project objective

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

Rationale

Large numbers of seabirds frequent New Zealand waters. Birds with significant differences in conservation status can appear morphologically similar. The accurate determination of the taxon of seabirds captured in New Zealand fisheries is vital for examining the potential threat to population viability posed by incidental fisheries captures. Observers on commercial vessels are not always able to identify seabirds at sea with high precision and the assessment of the age-class, sex and provenance of captured individuals requires necropsy in most cases. Historically all dead seabird specimens collected by observers have been returned for necropsy where possible. However, in many cases, the taxon can be confirmed through expert examination of photographs taken by observers, and this can be achieved at a lower cost than returning carcasses and performing necropsy. To maximise cost efficiencies a new protocol has been developed to determine which specimens are returned for full necropsy. This protocol aims to strike a balance between returning birds for full necropsy (for rarer species and in less observed fisheries) and photographing birds for determination of taxon (for commonly caught species in well observed fisheries). A new addition to this protocol is the collection of feather samples from bycaught seabirds to allow genetic determination of identification for difficult species groups.

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 Fisheries NZ databases, seabird bycatch estimates, and will inform ongoing risk assessment, research and modelling of the effects of fisheries bycatch on seabird populations. Further, the mode of capture and associated information will enable robust analyses to be made of the factors contributing to seabird capture events and inform the development of appropriate mitigation strategies.

Project status

This is a multi-year project due for completion in June 2025. 2022/23 reporting is in progress and due in June 2023.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $80,000 per annum over three years.

2.5 INT2022-03 Identification and storage of cold-water coral bycatch specimens

Project objectives

1. To confirm or update bycaught coral identifications determined at-sea by Fisheries Observers to the lowest taxonomic level (i.e., to assign codes to coral specimens at the species level wherever possible, or to genus or family level if not possible).
2. To record all identified coral specimens and their metadata (including haplotype/genetic data) and ensure storage of the physical specimens in an appropriate taxonomic collection.
3. To update relevant government coral identification and observer databases.
4. To update and provide input into coral-relevant resources for Fisheries Observers, including reference material and observer training.

Rationale

The overarching aim of this ongoing project is to continually improve information on the nature of coral bycatch reported and collected through the Fisheries Observer Programme. The 2010 amendment of Schedule 7A of the Wildlife Act 1953 protects all hard corals, including: black corals (all species in the order Antipatharia); gorgonian corals (all species in the order Alcyonacea); stony corals (all species in the order Scleractinia); and hydrocorals (all species in the family Stylasteridae). Expert verification of coral bycatch that is difficult or inconsistently identified by Fisheries Observers to the finest taxonomic level provides vital baseline information that can help to better inform research and marine protection such as predictive modelling, fisheries characterisations, benthic risk assessments, connectivity studies and management of benthic marine protected species.

Project status

This is a multi-year project due for completion in June 2025. 2022/23 reporting is in progress and due in June 2023.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $80,000 per annum over three years.

2.6 INT2022-04 Risk Assessment for protected corals

Project objectives

1. Develop a semi- or fully quantitative coral risk assessment model, incorporating updated coral distribution and abundance data.
2. Implement the model to determine relative risks and vulnerabilities of different coral taxa to fishing activity.

Rationale

The 2010 amendment of Schedule 7A of the Wildlife Act 1953 protects all hard corals and some soft corals in New Zealand waters, including: black corals (all species in the Order Antipatharia), gorgonian corals (selected species in the Order Alcyonacea), stony corals (all species in the Order Scleractinia) and hydrocorals (all species in the Family Stylasteridae). Nonetheless, a clear understanding of species-specific vulnerabilities and areas to fishing impacts remains elusive. The aim of this project is to undertake an inventory of applicable data, develop methodology for, and conduct a quantitative coral risk assessment, following on from a pilot risk assessment undertaken in 2014 (POP2013-05). The current lack of a risk assessment is noted as the most needed and important gap in the CSP Coral Plan and is a priority for CSP.

Project status

In progress. This is a multi-year project due for completion in Nov 2024.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $75,000 per annum over two years.

2.7 INT2022-05 Determining the resilience of Fiordland corals to fisheries impacts

Project objectives

1. Increase understanding of the ecology and impacts of fishing on protected corals in Fiordland, including the black coral Antipathella fiordensis and stylasterid (lace) corals.
2. Improve our understanding of the distribution of Fiordland corals inside and outside of protected areas and determine patterns and likely routes of connectivity.
3. Use varied approaches (modelling, surveys, repeat monitoring of field stations) to inform our understanding of black coral resilience to fishing impacts and threats in Fiordland, which can then be applied to these taxa in a wider context.

Rationale

This research feeds into a wider Victoria University of Wellington study that aims to increase understanding of the ecology of protected corals in the Fiordland region and to determine how they will respond to environmental impacts, such as fishing, climate change, and changes in land use. The focus of the project will be the black coral species Antipathella fiordensis, with additional opportune sampling of stylasterid (lace) corals, both of which are protected and have widespread distribution within the fiords. The shallow distribution (and therefore accessibility) of A. fiordensis in Fiordland provides a unique opportunity to study and monitor it regularly in light of these pressures, and the species can then be used as a model to ascertain black coral resilience more widely. The CSP aspect of the project focuses on how they are impacted by fishing activity. Commercial fishing is prohibited in the inner waters of Fiordland, however, rock lobster potting and trawl fishing for blue cod is known to occur in the outer areas of the fiords, where A. fiordensis is abundant and there is virtually no fisheries observer presence.

Project status

This is a multi-year project due for completion in June 2025. 2022/23 reporting is complete with a progress report (available upon request).

Summary of the methods and key findings

Three research voyages including work that contributes to this project were undertaken in 2023, with surveys undertaken at 9 locations. Genetic methods development and analysis are underway, including acquisition and assembly of a full genome sequence for *Antipathella fiordensis*.

Project logistics summary statement

This project was 100% crown funded. The planned cost for the project was $30,000 per annum over three years.

2.8 INT2022-06 The distribution and abundance of marine mammals observed around commercial fishing vessels in New Zealand waters

Project objectives

1. Collate and verify observer-recorded marine mammal sightings data and input into existing databases.
2. Analyse marine mammal sightings data and make data visualisations available online.

Rationale

As done with seabirds, observers collect data and imagery of sightings of marine mammals at sea and sightings data has been collected since 2003-04. Species include seals, sea lions and cetaceans (whales and dolphins). This long-term data set has not been utilised for marine mammal sightings before. This project will involve collating and inputting this data from previous and current data collection forms (paper and digital) into appropriate databases. Public marine mammal sightings information is currently self-reported to DOC via the DOC website. Sightings data is a useful resource alongside other data sources such as fishing interactions to inform species distributions, risk assessments and, more broadly, population sizes, breeding rates and movement patterns.

Project status

Delayed, due for completion in January 2024.

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 over one year.

2.9 INT2022-07 Post-release survival of bycaught spine-tailed devil rays in the New Zealand skipjack tuna purse seine fishery

Project objectives

1. To describe current industry practice around devil-ray interactions and handling and release.
2. To determine the survival of spine-tailed devil rays released using satellite tags.

Rationale

This project is an extension of MIT2011-01 and INT2018-05 and is targeted at delivering CSP objectives and the goals and objectives of the NPOA Sharks. Spine-tailed devil ray (*Mobula mobular*) is the most frequently caught protected fish in commercial fisheries, with almost all reported captures occurring in the skipjack purse seine fishery. Initial research indicated post-release survival was low but appeared to improve following adoption of recommendations on handling and release practices by the industry. However, this finding was qualified by the very small sample size. Recent structural changes to the New Zealand purse seine fishery also mean that the recommendations regarding devil ray handling may no longer be appropriate. This project will work with industry to enable a statistically robust assessment of post-release survival, evaluate current industry practice with respect to the handing and release of devil rays and if necessary, recommend changes to the Purse Seine Operational Procedure for Protected Species Risk Management.

Project status

Cancelled and funds returned to industry.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $34,000 over three years.

3. Population Projects

3.1 POP2019-04 Southern Buller's albatross: Snares/Tini Heke population project

Project objective

To estimate key demographic parameters of Southern Buller's albatross at the Snares.

Rationale

The Conservation Services Programme Seabird medium term research plan (CSP seabird plan) outlines a five-year research programme to deliver on the seabird population research component of CSP. It is targeted at addressing relevant CSP Objectives (as described in the CSP Strategic Statement) and National Plan of Action – Seabirds Objectives. This proposal delivers priority research components of the CSP seabird plan involving the estimation of key demographic parameters of Southern Buller's albatross at the Snares. An established study site for Southern Buller's albatross, with substantial historic mark-resight effort, exists at the Snares (Sagar 2014), one of the most accessible subantarctic island groups. Information involving demographic parameters have been collected at the three study sites annually since 1992.

Project status

Complete.

Summary of the methods and key findings

Demographic studies at the three study colonies on North East Island have been undertaken annually 1992-2023, with the exception of 2018 and 2021, and so this report incorporates some of these data in the current analysis. Estimates of the numbers of breeding pairs, made by recording the contents of each nest mound, decreased in all three study colonies compared to 2022, when estimated numbers were at an all-time high over the 30 plus years of this study. With the assumption that the combined total number of breeding pairs in the three study colonies was representative of North East Island as a whole then the breeding population probably peaked in 2005-2006 and has since undergone marked annual variations.

A total of 374 birds that had been banded previously in the study colonies as breeding adults of unknown age were recaptured. A further 82 breeding birds were banded in the study colonies - these are presumed to be first-time breeders. Estimates of annual survival of birds banded as breeders improved in 2022 with an estimate of 0.931. During the period 1992-2004 all chicks that survived to near-fledging in the study colonies were banded and their survival to return to the study colonies in subsequent years has been monitored. This year 139 of these birds were recaptured, with birds from cohorts banded from 1998 to 2004 being recaptured for the first time. This demonstrates the long term monitoring required to obtain reliable estimates of survival of such known-age birds. Of the 139 known-age birds recaptured in 2023, 11 were found breeding for the first time, and so were recorded as being recruited to the breeding population. In addition, three birds that had been banded as near-fledging in the study colonies during September 2013 and September 2014 were also recaptured for the first time.

In 2020 50 Global Location Sensing (GLS) tags were attached to the metal leg bands of breeding birds in the Mollymawk Bay study colony; of these, 31 were retrieved in 2022 and a further 3 during the 2023 field season.

Twelve trail cameras were deployed at breeding colonies and set to record one photograph every hour during daylight in April 2022. All of these were checked in 2023 when the SD cards were removed and replaced with new cards.

Recommendations

- Analyse trail camera photographs to identify timing of return of adults to the breeding colonies, estimated breeding success and the timing of departure from the breeding colonies.
- Analysis and data interpretation of GLS data loggers.
- Continued monitoring of southern Buller's to better understand the continued decline of the estimated annual survival rates of birds banded as breeding birds of unknown ages.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $40,000 over three years.

Review milestones

- Final results for 2022/23 presented at the CSP TWG on 11 July 2023
- Final report for 2022/23 made available on the CSP webpage in August 2023

Citation

Thompson, D., Sagar, P. 2023. Population studies of southern Buller's albatross on Tini Heke/The Snares. POP2019-04 final report prepared by NIWA for the Department of Conservation. 18 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/pop2019-04-southern-bullers-population-snares-final-report.pdf

3.2 POP2021-02 Identification of protected coral hotspots using species distribution modelling

Project objectives

1. To collate, curate and analyse cold water coral records from existing seabed towed camera transects in the New Zealand region.
2. To identify hotspots for selected protected coral species in the New Zealand EEZ using predictions from abundance-based species distribution models.
3. To better understand the historical effects of fishing on observed patterns of coral distribution and relative abundances.

Rationale

This project will focus on abundance data to identify high conservation value hotspots for protected corals across the New Zealand EEZ. This is a novel modelling approach that builds upon available regional-scale habitat suitability models to improve our knowledge of coral abundance and distribution (rather than previous presence-absence models), and our knowledge of how current and historical commercial fishing effort shapes those patterns. As the first component of the project includes collation and analysis of new seabed imagery data to inform the model, the project will also serve to audit data available for future image-based coral research. Model outputs can inform future models, risk assessments, and management strategies that consider ecological processes, coral biology, and the impact of fishing on ecosystem services provided by deep-sea corals.

Project status

Complete.

Summary of the methods and key findings

The report presents maps of abundance within the New Zealand region for eleven coral taxa, based on species distribution modelling using abundance values measured at 949 sample sites from image data collected by towed camera or remotely operated vehicle (ROV) systems. Most of these sites were sampled using NIWAs Deep-towed Imaging System (DTIS) and abundance values were based on archived analyses of video data. Further analysis of video data from three surveys was undertaken during this study to provide abundance values for selected locations not covered by archived data.

The species distribution models were constructed as an ensemble of predictions using two tree-based methods, Random Forests and Boosted Regression Trees. For each method abundance was estimated using a hurdle model – the combination of a presence-absence model predicting probability of presence and a regression model predicting abundance at locations of species presence. Uncertainty in the predictions was estimated using a bootstrap resampling technique to measure variability in predictions among 100 models built from random subsets of the sample data for each taxon.

The environmental predictor variables offered to the models represented a combination of seafloor characteristics, water chemistry, and productivity, tailored slightly for each taxon according to the chemical composition of their skeleton. In addition, and for the first time in any New Zealand species distribution modelling study, a date-specific trawl-contact variable representing bottom-trawling on the seafloor prior to the sample date was also included, based on compilation of recorded fishing effort in the region since 1990.

Models were successfully constructed for 11 of the 15 taxa considered, with observations of the remaining 4 taxa proving too rare in the data for models to be produced. Model performance metrics indicated good fits to the input data and a high level of agreement between observed and predicted values; these were backed up by metrics based on comparison of predicted values with values from data withheld from the model in each bootstrap sample.

A map of overall abundance for the set of protected corals modelled was made by adding abundance estimates across all taxa. Hotspots of coral abundance, nominally defined as areas where overall abundance was predicted to be over 40 individuals per 1000 m2, represented about 2% of the modelled area (the area of the seafloor between 50 m and 3000 m). These hotspots were spread widely around the region, most notably on the Norfolk Ridges, Challenger Plateau, Macquarie Ridge, Eastern Chatham Rise, and Kermadec Ridge.

The influence of the fishing impact variable was low in models for most taxa. For two taxa where it was important, *Radicipes spp*. and *Goniocorella dumosa*, maps were constructed to estimate pre-fishing distributions. However, these proved to differ very little from those predicting current distributions, probably because of insufficient temporal spread in the coral sample data for models to detect negative effects from fishing disturbance (i.e., most historical fishing effort and impacts precede collection of coral data in certain areas).

Recommendations

- Continued development of methods to better incorporate the effects of spatial autocorrelation.
- To improve the spatial spread of input data into abundance models, methods for incorporating specimen-based and fisheries bycatch-based presence records should continue to be investigated, as fishing grounds and research surveys cover a wider area than the current set of camera-based surveys.
- Analysis of unprocessed DTIS footage to further improve in model performance and reliability, particularly in currently unsampled predictor space.
- Collection of additional seafloor image data from key predicted hotspot locations would be valuable for both model validation and improvement of model predictions.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $110,000 over two years.

Review milestones

- Final results presented at the CSP TWG on 11 July 2023
- Final report made available on the CSP webpage in September 2023

Citation

Anderson, O., Schnabel, K., Bowden, D., Davey, N., Hart, A. 2023 Identification of protected coral hotspots using species distribution modelling. POP2021-02 final report prepared by NIWA for Conservation Services Programme, Department of Conservation. 63 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/pop2021-02-protected-coral-hotspots-final-report.pdf

3.3 POP2021-04 Flesh-footed shearwater population monitoring

Project objectives

1. To collect key demographic parameters of flesh-footed shearwater at Lady Alice Island/Mauimua and Ohinau Islands, especially juvenile survival and recruitment.
2. To estimate the current population size of flesh-footed shearwaters at Titi Island, Marlborough Sounds.

Rationale

The CSP Seabird medium term research plan (CSP seabird plan) outlines a five-year research programme to deliver on the seabird population research component of CSP. It is targeted at addressing relevant CSP Objectives (as described in the CSP Strategic Statement) and National Plan of Action – Seabirds Objectives. This proposal extends on the work initiated under POP2015-02 and continued under POP2018-04 to address priority population estimate gaps and better estimate key demographic rates of this at-risk species, including new information about juveniles. Previous reports recommended that recapture efforts of breeding adults and nonbreeders need to be consistently large scale to provide a robust mark-recapture dataset. Titi Island, Marlborough Sounds, has not been monitored for shearwaters for almost a decade. A repeat survey of this sole Cook Strait breeding colony will inform recent population trends in this region.

Project status

This is a multi-year project due for completion in 2024. 2021/22 and 2022/23 reporting is complete.

Summary of the methods and key findings

During the 2022/23 season WMIL monitored 271 study burrows on Ohinau Island. The breeding success (burrows with an egg that produce a chick that is likely to survive to fledging) on Ohinau Island was 10%. This represents a large decrease compared to the 59% measured in the 2022/23 season. This is postulated to be because of the significant storm events that occurred in the region just after peak laying (December 2022 through to February 2023), and therefore as a result of climate change. There was a detectable difference in breeding success between study and burrowscope (control) burrows, indicating potential impact of handler disturbance. However, it is believed this is more likely due to the topography and location of the burrowscope colony compared to the other colony sites, which allowed these burrows to avoid the worst of the flooding. We were able to identify 51.5% of the birds in breeding study burrows on Ohinau Island. An additional 75 flesh-footed shearwaters were banded on Ohinau Island this season, with 47 adults and 28 chicks.

Due to weather constraints that led to 8 days being lost during the January 2023 expedition, an updated population estimate for Ohinau Island was unable to be completed. WMIL has recommended that the limited data that was able to be collected, not be used for the purposes of calculating a population estimate. Instead WMIL recommends postponing this work until the 2023/2024 season.

Recommendations

- Population monitoring on Ohinau and Lady Alice Islands be continued with 200 breeding study burrows monitored annually over two expeditions (Dec/Jan and Apr/May).

- The number of burrowscope burrows monitored annually continue to be 50 on each island There is continued, focused effort to band and recapture as many flesh-footed shearwaters on the surface and in burrows on both islands.
- Titi Island, Marlborough Sounds, be considered as a potential future monitoring location.
- A repeat population estimate on Ohinau Island be undertaken in January 2024.
- Undertaking plastic collection from the surface of colonies, necropsy of dead individuals found at colony sites, as well as the lavage technique to understand more about plastic ingestion.
- A survival analysis be undertaken to estimate adult survival on each island.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $60,000 per annum for three years.

Review milestones

- Results for 2022/23 presented to the CSP TWG on 11 July 2023
- Final report for 2022/23 made available on the CSP webpage in August 2023

Citation

Ray, S. and Burgin, D. 2023. Flesh-footed shearwater population monitoring and estimate Ohinau Island: 2022/23 season. POP2021-04 final report prepared by Wildlife Management International Limited for the Department of Conservation. 50 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/pop2021-04-flesh-footed-shearwater-population-monitoring-final-report.pdf

3.4 POP2021-06 Fur seal population estimate and bycatch analysis: Cook Strait

Project objectives

1. To identify New Zealand fur seal colonies and/or haul outs within the Cook Strait which could overlap with fisheries.
2. To increase the understanding of interactions between New Zealand fur seals and the commercial hoki fishery within this area.

Rationale

New Zealand fur seals (Arctocephalus forsteri) are the most frequently bycaught marine mammal in New Zealand due to spatial and temporal overlap between fur seal foraging areas and commercial fishing areas (Mattlin 1987, Rowe 2009). Despite an estimated increasing population trend overall (Baker et al. 2019), high mortality rates in the Cook Strait area may be at an unsustainable level for local colonies. The hoki trawl fishery targets this area annually from lateJune to mid-September, peaking effort in July and August. A range of mitigation methods have been trialled (such as a seal exclusion device) though further research and trials are needed. To better inform mitigation options going forward it's important to know the following: which colonies, sex and age class are the most impacted, and in what season, and is the bycatch likely to have a detrimental impact on the colonies in question? The focus areas of this project target answering these questions with the end goal of making recommendations of the most appropriate mitigation options.

Project status

In progress, year one reporting is complete and year two reporting on genetic analysis is due for completion in February 2024.

Project logistics summary statement

This project was 100% crown funded. The planned cost for the project was $100,000 across two years ($60,000 in year one, and $40,000 in year two).

3.5 POP2021-07 Otago and Foveaux shag population census

Project objective

To provide an updated breeding population census and assess the population trend of Otago and Foveaux shag to adequately inform risk assessment and species management.

Rationale

Endemic to Southern New Zealand coastal waters and harbours, Foveaux shag (*Leucocarbo stewarti*) and Otago shag (*Leucocarbo chalconotus*) populations are respectively 'Nationally Vulnerable' and 'At Risk - recovering'. Formerly recognised singularly as Stewart Island shag, in 2016 Foveaux and Otago shags were classified as two genetically distinct species (Rawlence et al., 2016). The last population estimates are based on data from 1981 and early 1990's respectively and urgently need updating to inform evidence-based species conservation management and risk assessment. In 2021, preliminary studies were undertaken (BCBC2020-24) to identify current colony locations and develop a methodology for conducting a population survey. The current project will build on findings from BCBC2020-24 and complete three consecutive breeding population censuses to provide a robust comparison to the previous population estimates. Both species are known to be susceptible to incidental set-net fishery pressures and breeding colony disturbance. It is also noted that, whilst not relevant to CSP levied projects, there are also emerging threats to population stability arising from areas such as indirect fisheries pressures from the expansion of aquaculture in the Foveaux Strait region and plans to increase open seas aquaculture on the East and South Coasts of the South Island in areas these shag species are known to inhabit.

Project status

Complete.

Summary of the methods and key findings

Endemic to Southern New Zealand, Foveaux shag Leucocarbo stewarti are classified as Threatened-Vulnerable, but there is little recent information on their population status and trends to inform conservation management. The aim of this project was to conduct a breeding population census of Foveaux shags. Eight current breeding sites were identified, and three sites that have stopped being used since the last breeding record.

Comprehensive surveys were conducted in targeted visits of current breeding sites. Aerial photographs for Foveaux shag counts were taken using a drone where appropriate (11 sites) or aerial DSLR photographs where a drone could not be flown (two sites). Building on animal response trials in previous work with shag species, these drone overflights during the breeding season first determined the drone flight height appropriate at each site to cause minimal disturbance. Survey flights were all taken within three days of each other, at the start of the breeding season in October 2022.

Photographs were counted for the number of Foveaux shags on nests. Since breeding starts earlier than October at some sites (breeding asynchronous), we expect to have missed some nesting attempts that failed before the survey, so figures should be understood as minimum breeding population estimates.

Results show breeding colonies ranged in size from two small colonies at Raratoka, with ~9 nests each, to the much larger colony at Fife Rock comprising some 275 breeding pairs (best estimate; range 273–277). The Foveaux shag population estimate—at least 1007 (1002–1012) breeding pairs at the start of

the 2022 breeding season—is roughly similar to the last whole-population count in 2011. However, for assessment of population trends to be robust the population size estimate should be repeated.

Recommendations

In the absence of nest-failure rate data for this species, timing photography to the start of the breeding season is important to avoid underestimating breeding numbers due to failures before survey. Survey in early October was appropriate for the latest-nesting colony (Tihaka), but survey might have been better at the end of September for Raratoka, Rabbit Isl, Omaui Isl, Dog Isl and Whero Rock, and mid-September timing would likely have produced more accurate counts of breeding numbers at Fife Rock and Seal Rocks. Preferably, colonies would be checked for status leading up to the breeding season, wherever possible, to confirm the breeding timing. This could be in person (drone flight from access point or boat), or from footage from colony cameras deployed to the nesting site beforehand.

If surveys cannot be timed to the start of breeding, footage from colony cameras at the two annually-monitored sites should provide nest survival data. Daily survival rates could be used to correct the number of nests counted partway through the breeding season (when a colony's lay dates are known), giving a more accurate estimate of the actual number of breeding pairs.

Nest contents should be recorded for at least one of the annually-monitored sites, to build a dataset of occupancy error at the time of imagery.

Project logistics summary statement

This project was 100% crown funded. The planned cost for the project was $60,000 over two years ($20,000 in year one and $40,000 year two).

Review milestones

- Draft final report made available on the CSP webpage in June 2023
- Findings presented to the CSP TWG on 8 June 2023
- Final report made available on the CSP webpage in July 2023

Citation

Rexer-Huber, K.; Parker, G.C. 2023. Foveaux shag population census. POP2021-07 final report for the Department of Conservation. Dunedin, Parker Conservation. 22 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202122-annual-plan/pop2021-07-foveaux-shag-pop-estimate-final-report.pdf

3.6 POP2021-08 Assessment of causes of low burrow occupancy rates in Westland petrels

Project objective

To provide an updated breeding population census and assess the population trend to adequately inform risk assessment and species management.

Rationale

The CSP Seabird medium term research plan (CSP seabird plan) outlines a five-year research programme to deliver on the seabird population research component of CSP. It is targeted at addressing relevant CSP Objectives (as described in the CSP Strategic Statement) and National Plan of Action – Seabirds Objectives. Westland petrels only breed on the West Coast of the South Island at Punakaiki. The species is bycaught on commercial longlines and is rated as a medium-high risk species from commercial fishing activity. Uncertainty around current levels of burrow use and occupancy rates by breeding birds has affected population estimates for this species. These rates vary between different studies but are typically half those observed in other closely related species. The status of the birds maintaining burrow sites but not apparently breeding in them is still unclear. A large pool of non-breeding birds, especially of one sex, may have implications for the risk assessment modelling for this species in terms of total population size estimates. An evaluation of burrow occupancy rates and how it has been determined will help us to interpret past breeding census data in this species. This will inform the interpretation of population trends from different colony survey techniques. Global location sensing (GLS) tags will be attached to adult birds to monitor activity patterns (periods spent ashore and at-sea) as well as tracking year-round movements.

Project status

In progress, to be completed in 2024.

Summary of the methods and key findings

A sample of burrows were monitored by trail cameras to assess activity and behaviour around burrow entrances. Individual birds had a temporary numbered tags attached to the back to identify their behaviour at nest sites. Burrowscopes and hand-held cameras were used to check the nest contents of a range of burrows (both long-term study burrows and randomly selected new burrows in the colony). Checks of nest contents were made several times during incubation to look for presence of eggs and hatched chicks. All nests were checked in November for breeding success. Global location sensing tags (GLS) were also applied to a large sample of birds to monitor rates of visitation on land versus time spent at-sea using the wet/dry sensor to determine periods of time away from the sea and the light sensor data to identify time spent within burrows by day.

These data are still to be fully analysed but the early findings are that nest occupancy rates vary annually but ranged between 57% and 78% across three seasons. Occupancy rates were higher in the study nests as they were presumably selectively chosen to follow breeding pairs. Occupancy rates were lower in randomly selected nests during this study. Matching of onshore behaviour with breeding attempts will help to determine if pairs are using nests but not breeding or if early nest failures might be affecting occupancy estimates.

Recommendations

For future population estimates it is important to select random samples of burrows to monitor occupancy rates and compare also between different sub-colonies. Repeat these measures across at least 2 breeding seasons to account for inter-annual variability in breeding rates.

Project logistics summary statement

This project was 100% crown funded. The planned cost for the project was $100,000 over two years ($60,000 year 1 and $40,000 year 2). Funding also included purchase of various tracking tags to monitor bird activity ashore and beyond the colony.

Citation

Simister, K., Bose, S., Fischer, J., Taylor, G. 2023. Progress report on Westland Petrel projects (POP2021-08) and (POP2022-07) investigating burrow occupancy, foraging behaviour and at-sea movement. Report prepared for the Conservation Services Programme, Department of Conservation.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/meetings/2023/twg-11-jul/pop2021-08-draft-progress-report.docx

3.7 POP2022-01 Black Petrel population monitoring

Project objectives

1. To continue monitoring the key demographic parameters at the breeding colony of this threatened seabird to reduce uncertainty or bias in estimates of risk from commercial fishing.
2. To continue at-sea capture-recapture of black petrels to determine proportions of banded birds and identify if the current low juvenile survival rates are affected by any nonphilopatric behaviour at the study colony.
3. To update model estimates of key population demographic estimates and population size based on results from at-sea mark-recapture.
4. To satellite track juvenile black petrels for at least the full first year post-fledging.

Rationale

The CSP Seabird medium term research plan (CSP seabird plan) outlines a five-year research programme to deliver on the seabird population research component of CSP. It is targeted at addressing relevant CSP Objectives (as described in the CSP Strategic Statement) and National Plan of Action – Seabirds Objectives. Black petrels are the species at highest risk from commercial fisheries in northern New Zealand. The project builds on previous CSP project POP2021-01. Continuing research on this species is necessary to provide current estimates of adult survival, juvenile survival, recruitment, breeding probability, and breeding success. Continued at-sea captures are necessary to generate sufficient sample sizes for the independent estimation of population size and juvenile survival. New light-weight tracking tags allow for the tracking of juvenile dispersal and migration, a poorly understood cohort.

Project status

This is a multi-year project due for completion in June 2025. 2022/23 reporting is complete.

Summary of the methods and key findings

Land component

During the 2022/23 breeding season 480 black petrel study burrows were intensively monitored within the Mt Hobson/Hirakimata study area on Aotea/Great Barrier Island. There were 313 (65.2%) burrows occupied by breeding pairs, 64 (13.3%) occupied by non-breeding birds, and 103 (21.5%) were unoccupied. Overall, 191 chicks were produced from the study burrows representing a fledgling success rate of 61%, but 13 chicks were found to be below weight and smaller in size during the May chick banding trip, and most of these chicks were not expected to survive to fledging. This would further reduce breeding success to 56.9%.

Breeding success was impacted by weather events, specifically the Auckland flood event on 27 January 2023 and Cyclone Gabrielle between 12-16 February 2023. A number of burrows flooded, causing eggs to fail and small chicks to drown or chill and die, and foraging success of parents appeared to be reduced with 13 chicks being in poor condition by May prior to fledging.

Nine census grids were monitored within the study area and accounted for 197 of the inspected study burrows. Of these, 119 were occupied by breeding pairs (60.4%) and 68 chicks were produced representing a fledging success rate of 57.1%. Again 7 of these chicks were in poor condition and were not expected to fledge, reducing breeding success to 52.1%.

A total of 664 adults and 129 fledgling chicks were captured during the 2022/23 field season with 174 adults banded this season (including 52 from study burrows). Of the 129 fledgling chicks banded during the 2022/23 field season, 119 were banded in study burrows; 72 could not be banded due to torrential rain over the chick banding trip, and one had already fledged prior to the banding visit in May 2023.

There have been a total of 420 returned chicks recaptured at the colony since they were banded prior to fledging. Of these, 117 returned chicks were identified during the 2022/23 breeding season; 28 of which were caught for the first time at the colony. The majority of all 420 returned chicks were from the 2016/17 breeding season, followed by the 2013/14 cohort. Not all cohorts were represented as no returned chicks from the 1995/96, 1996/97 and 1997/98 cohorts were recaptured this season.

Additional monitoring of pig and other predator occurrence and impact on black petrels on Cooper's Castle was undertaken this season. Eighteen black petrel burrows were identified within the boundaries of this study area; three were breeding sites and four sites were being visited by non-breeding birds. All other burrows were empty. Trail cameras were placed along pig pathways, walking tracks and outside active black petrel burrows. Footage confirmed feral pig, rat, and feral cat presence. While no interactions with black petrels were caught on camera at Cooper's Castle, there was one cat predation of an unbanded adult and one chick from a random, non-monitored burrow. There was one rat predation event at the study colony on Hirakimata this season. Introduced species still pose a threat to the black petrel population and it is imperative pest control measures continue.

At-sea captures

In March 2023 WMIL staff were able to undertake a three-day catching trip out in the waters northeast of the Marotere (Chicken) Islands group, and north of Aotea/Great Barrier Island. A total of 80 black petrels were caught from the back of the boat using a hand cast net. This total included six already banded birds from WMIL study colonies on Aotea/Great Barrier Island, or banded previously at sea. Additional species caught were 78 toanui/flesh-footed shearwater (Ardenna carneipes) (Threat Status - At Risk: Relict), 3, takahikare/white-faced storm petrel (Pelagodroma marina) (Threat Classification - At Risk: Relict), 1 takahikare-raro/New Zealand storm petrel (Fregetta maoriana) (Threat Classification: Nationally Vulnerable), 2 rako/Buller's shearwater (Ardenna bulleri) (Threat Classification - At Risk: Declining) and 1 tarāpunga/red-billed gull (Chroicocephalus novaehollandiae) (Threat Classification - At Risk: Declining).

Recommendations

Intensive population monitoring using the study burrows on Great Barrier Island/Aotea continues with three visits (i.e., at egg-laying (December); at chick hatching/chick guard in late January/early February and at chick fledging in late April/early May) per season to the colony to track population trends and determine impacts to the birds and colony.

Multiple-night expeditions to focus on recruitment (i.e., nocturnal surveys to capture prebreeders and returned chicks) to the Great Barrier Island/Aotea study colony continue to determine juvenile survival and recapture probabilities.

Sexing of all tākoketai caught during the recruitment expedition and in the study burrows is completed to determine any sex biases and survival differences between sexes at the colony and within the study burrows.

A focused, consistent and repeatable mark/recapture session (e.g., a 2-hour capture period at known launch sites) is completed over a number of nights to capture as many banded and unbanded birds as

possible and that data are used to provide another population estimate as well as being compared to estimates obtained from at-sea captures and burrow monitoring.

Transect surveys across the core tākoketai habitat (1000 ha around the summit) are undertaken to provide an updated population estimate for Great Barrier Island/Aotea.

Satellite tracking of chicks to and in South American waters is undertaken to determine migration routes and foraging areas to estimate risk in these areas.

The possibility of collaborative at-sea capture expeditions in Ecuador is investigated. Discussions between the Department of Conservation and New Zealand Government with Ecuadorian Government and researchers will have to be conducted to enable this type of collaborative work. At-sea work in Ecuador could determine the level of juvenile tākoketai presence in this area and risk within this area, and this mark/recapture work could provide another population estimate to compare with the New Zealand data.

Further investigation to determine whether particular areas of the colony are more at risk to rainfall events than others (e.g., burrows in flatter areas being more prone to flooding) as a preliminary assessment on climate resilience.

In-depth modelling on the effect of age, age difference in pairs, and experience on breeding success is completed to understand this relationship in tākoketai.

Analysis of and comparison between breeding success in public and non-public access areas is completed to determine whether human disturbance is a factor at the Great Barrier Island/Aotea colony.

Investigation into possible deterrence methods of all predators, but specifically pigs and feral cats, should be undertaken at Coopers Castle.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $70,000 per annum for three years.

Review milestones

- Draft final report for land component and progress report for at-sea captures 2022/23 made available on the CSP webpage in June 2023
- Findings presented to the CSP TWG on 11 July 2023
- Final report for land component 2022/23 made available on the CSP webpage in July 2023

Citation

Bell, E.A., Lamb, S. & Maclean, C. 2023. Key demographic parameters and population trends of tākoketai/black petrels (Procellaria parkinsoni) on Aotea/Great Barrier Island: 2022/23. POP2022-01 final report prepared by Wildlife Management International Ltd for the Conservation Services Programme, Department of Conservation, Wellington. 41 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/pop2022-01-takoketai-black-petrel-aotea-2022-2023-season-monitoring-final-report.pdf

3.8 POP2022-02 Flesh-footed shearwater juvenile survival and dispersal

Project objective

To track juvenile flesh-footed shearwaters to determine whether they are utilising the same foraging areas as breeding adults during their first year at sea.

Rationale

This project supplements current population monitoring under project POP2021-04 to fill additional data gaps utilising cost-saving synergies with the CSP project on Ohinau Island. This new project involves satellite tracking juvenile FFSW for at least the full first year post-fledging, using new lightweight solar powered tags. This will allow for the opportunity to improve our understanding of the at-sea range of this poorly understood cohort of birds and how they might overlap with fisheries throughout the annual cycle. One previous attempt to track juvenile flesh-footed shearwaters was not overly successful. The birds flew north to the tropics but then the tags progressively stopped working around one month post deployment. It was uncertain if the tags fell off the birds, or the tag interfered with birds' survival or if the birds encountered high risk fisheries in the central tropics (tuna longline fisheries). There has been a lot of development of tracking technology in the past five years with new light-weight tags and different attachment methods that allow birds to be monitored across multiple years.

Project status

In progress. This is a multi-year project due for completion in June 2024.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $30,000 per annum for two years.

3.9 POP2022-03 Deep sea protected coral reproduction study

Project objective

1. Address knowledge gaps in reproductive strategies for protected coral species in the New Zealand region.
2. Use available life history and reproductive data to inform relative productivity/vulnerability parameters for relevant concurrent and future research.

Rationale

New Zealand has a rich complement of diverse and abundant deep-sea corals, yet very little is understood regarding their life history traits. Such data are important to understand potential population longevity and connectivity, as well as vulnerability and resilience to physical impacts such as those caused by bottom trawling. This project will examine coral reproductive strategies from archived specimens in the NIWA Invertebrate Collection to improve our understanding of the reproductive ecology of corals. This project follows on from DOC project BCBC2020-01 that demonstrated high levels of variability in reproductive modes employed by corals and will address knowledge gaps for key species in the New Zealand region. Results from this project can be combined with other life history data to inform and improve estimates for productivity parameters in a full Risk Assessment, can inform spatial models and biophysical dispersal models, can feed into coral recovery studies, can be considered alongside video imagery to inform site or population-specific reproductive outputs, and can act as a proxy for vulnerability assessments.

Project status

In progress. This is a multi-year project due for completion in June 2024.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $40,000 per annum for two years.

3.10 POP2022-04 Deep diving into decades of uncatalogued corals

Project objectives

1. Determine the taxonomic composition of previously collected unidentified protected coral specimens currently held in the NIWA Invertebrate Collection (NIC).
2. Augment and improve existing coral and/or bycatch databases with new taxonomic and collection location information.
3. Improve understanding of coral diversity and distribution in the New Zealand region.

Rationale

Achieving core CSP strategic objectives relies on robust data and a good understanding of the distribution and abundance of protected species. This element is picked up in the CSP Coral Medium-Term Research Plan, where research priorities list the 'identification of biodiversity hot spots/ areas of high protection value' and 'modelling distribution abundance/ biomass (not just presence/absence)' with high and medium-high priority, respectively. Both priorities depend on the accurate and consistent identification and measurement of live coral communities in the region. Therefore, this project will examine stored coral specimens to improve coral taxonomic and distribution information, and to discover the full range of coral biodiversity in our region.

Project status

Complete.

Summary of the methods and key findings

The NIWA Invertebrate Collection (NIC) had an estimated backlog of ~670 unregistered and unidentified coral specimens collected on wide-ranging fisheries and biodiversity research surveys in the New Zealand region over the past 70 years in storage. These specimens were essentially invisible to researchers, and through this project, which funded specimen registration and identification, their details have now been made available. After the registration process was completed and non-protected coral groups were excluded from exports, a total of 650 unidentified protected coral samples were located and made available to subject matter experts for identification. In the period from March–June 2023 a total of 652 protected coral samples collected from the New Zealand EEZ (1682 specimens) were identified by experts and updated in the NIC niwainvert database.

Data summaries of the recently identified samples are provided in tables and as maps, followed by summaries of all protected coral specimen data held in the NIC from the NZ EEZ. Taxonomic highlights are noted including the discovery of a new family within the order Scleralcyonacea (one of the orders of gorgonian corals originally placed in order Gorgonacea, then moved into order Alcyonacea before this was taxonomically redescribed. Gorgonian corals are now placed in two orders: Scleralcyonacea and Malacalcyonacea).

At the conclusion of the project a total of 9,596 samples and 22,247 specimens of protected coral are now recorded in the niwainvert database, from observer, fishery trawl survey and biodiversity trip sources. The largest number of samples in the NIC were collected from biodiversity surveys, followed by observer collections, then fishery trawl surveys, and the widest spatial distribution of corals were collected from biodiversity surveys. Corals in niwainvert have been collected from shallow diving depths in Fiordland through to 5748 m in the Kermadec Trench and were collected from the years

1955 to 2023. Most records come from shelf to outer shelf and slope depths (201–1000 m depth range) with very few coral records from below 2000 m.

Recommendations

A total of 800 samples are not yet identified beyond family level and could benefit from further expert attention, especially the gorgonian coral groups Keratoisididae and Plexauridae. It is recommended that international experts are invited to further identify these challenging protected coral taxon groups that are still poorly known and contain many undescribed taxa. (current CSP project INT2023-07 directly addresses this recommendation).

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $35,000 for one year.

Review milestones

- Draft final report made available on the CSP webpage in August 2023
- Findings presented to the CSP TWG on 5 September 2023
- Final report made available on the CSP webpage in September 2023

Citation

Mills, S., Connell, A., Bilewitch, J., Stewart, R., Marriott, P., Tracey, D. 2023. Deep diving into decades of uncatalogued corals. POP2022-04 final report. Prepared for Conservation Services Programme, Department of Conservation NIWA Client Report 2023211WN. 64 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/pop2022-03-protected-coral-reproduction-progress-report-2022-23.pdf

3.11 POP2022-05 Northern Buller's albatross population monitoring

Project objectives

1. To describe the at-sea distribution of northern Buller's albatross based on GLS tags deployed in 2020/21.
2. To estimate breeding success from nest monitoring cameras deployed in 2020/21.

Rationale

Global Location Sensing (GLS) tags were placed on a large sample of northern Buller's albatross in 2020/21 and have recently been recovered from most of these birds. This is the largest sample of tracking tags ever deployed on this species. This study seeks to understand the full annual cycle of the birds and the amount of time they spend visiting the colony versus being at-sea. For the at-sea tracking, the analysis will look at how extensive are the albatross movements in the pre-laying period, and during each stage of incubation and chick-rearing. Do the birds stay entirely within the EEZ during this period or forage in the high seas? This will affect the level of risk they are exposed to from domestic fisheries. For the inter-breeding period from June to September we will assess the migration patterns to determine which areas the birds use for moulting and potential extent of overlap with international fisheries. The tags can also be interpreted to look at breeding success and when each bird departed from the Chatham Islands either as failed breeder or a successful breeder. Trail cameras deployed in the same colony with the GLS tagged birds will allow a visual interpretation of study nests to determine general breeding activity and behaviour, and to help identify dates when nests failed or when chicks fledged. This information will be used to compare with the GLS tracking data when known GLS tagged birds are in view of the cameras. Ground counts of nesting northern Buller's albatross were undertaken by the field team.

Project status

Complete.

Summary of the methods and key findings

Fifty-five northern Bullers albatross breeding on Motuhara had GLS tags attached in January 2021 and 47 of these tags were recovered and downloaded a year later. The recovered tags were then redeployed for another year. In total 69 bird years of data were obtained. These covered the entire annual cycle of breeding around New Zealand and the migration across to Chile and Peru. Activity in the New Zealand region was focussed around the Chatham Rise and east of the North Island. There was minimal overlap with southern Buller's albatross breeding at Snares Islands. There was also limited overlap between the two subspecies off South America with differences in timing of migrations rather than spatial differences being the reason for separation.

Trail cameras were deployed on Motuhara in 2021 to monitor bird activity patterns and breeding success. These cameras allowed peak times of non-breeders ashore to be estimated to assist with interpreting aerial survey counts. Individual nests were identified on images and followed through until chicks fledged. A total of 86 northern Buller's albatross nests were monitored, of which 28 proved to be empty but occupied by pairs of birds. From the remaining 58 nests, 39 chicks fledged successfully (i.e., they were all last seen alive during the fledging period). Fledging started on 4 June 2021 and was completed just over a month later on 6 July. From data collected on the island on early nest failures and information from the cameras, breeding success was estimated as 51% in 2021.

A complete census of the northern Buller's albatross was undertaken across Motuhara from 10-12 December 2022. A total of 15,809 breeding pairs were counted on the main island and further pairs would be present on the nearby stacks (photographed using a drone but yet to be analysed).

Recommendations

Further analysis of trail camera footage from additional years would allow estimates to be made of interannual variability in breeding success in northern Buller's albatross.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $30,000 for one year.

Review milestones

- Draft final report made available on the CSP webpage in July 2023
- Findings presented to the CSP TWG on 11 July 2023
- Final report made available on the CSP webpage in July 2023

Citation

Bell, M. 2023. Motuhara seabird research: field trip report December 2022. Report prepared by Toroa Consulting Limited for the Conservation Services Programme, Department of Conservation. 4 p.

Frost, P., Bell, M., Taylor, G. 2023. Trail-camera assessment of the fates of Northern Royal Albatross and Northern Buller's Mollymawk chicks: 2021 breeding season, Motuhara. Report prepared for the Conservation Services Programme, Department of Conservation. 25 p.

Fischer, J.H., Bell, M., Frost, P., Sagar, P.M., Thompson, D.R, Middlemiss, K.L., Debski, I., Taylor, G. 2023. Year-round GLS tracking of Northern Buller's albatross and comparison with Southern Buller's albatross. POP2022-05 final report prepared for the Conservation Services Programme, Department of Conservation. 16 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/motuhara-seabird-research-field-trip-report-dec-2022.pdf

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/evaluation-of-motuhara-trail-camera-images-final-report.pdf

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/northern-bullers-gls-tracking-2021-final-report.pdf

3.12 POP2022-06 Northern royal albatross population monitoring

Project objectives

1. To describe the at-sea distribution of northern royal albatross based on satellite tags deployed in 2020/21 season.
2. To estimate breeding success from nest monitoring cameras deployed in 2020/21

Rationale

Satellite tracking of northern royal albatross took place on breeding birds on the Motuhara colony (Chatham Islands) in the summer of 2020/21 to determine distribution and foraging patterns in the New Zealand region. Trail cameras were deployed in the same colonies to monitor some of these satellite tagged birds and diurnal activity patterns. It is hoped that a comparison of daily images from the trail cameras will allow breeding outcomes for these satellite tracked birds plus non-tracked birds to be followed across multiple months. Timing of nest failures will help interpret the satellite tracking data. The trail camera footage will also help to assess how successful or otherwise the breeding colony was in the 2020/21 season in this nationally endangered species. The information can also be used to compare with the breeding behaviour of the birds at Taiaroa Head to see whether this small colony is representative of what happens at the larger eastern colonies. Analysis of the available satellite tracking data will allow assessment for the period of time spent within the New Zealand EEZ compared to the high seas for this seabird, at least during incubation and chick-rearing when sufficient tracking tags were operating. A count of nesting northern royal albatross was carried out by the field team while ashore on Motuhara Island.

Project status

Complete.

Summary of the methods and key findings

A total of 30 TAV-2630 Platform Terminal Transmitters (PTT) from Telonics Inc. were deployed on breeding northern royal albatrosses in January 2021. In total thirteen nests had both partners tracked and four nests had a single bird tracked. Only four pairs succeeded in rearing chicks and the others failed, mainly early in the breeding season. The birds that failed departed the New Zealand EEZ and flew to South America with the majority of the time away from New Zealand being in the Chilean EEZ (57.79%) and the Argentinian EEZ (18.84%). Breeding birds spent almost 100% of their time inside the NZ EEZ. Additionally, a pair of birds at the small Taiaroa Head colony (Otago Peninsula) were tracked along with their fledgling. Only the male from this pair ventured into the Tasman Sea. All other tracked birds stayed east of New Zealand.

From examination of trail camera footage, the number of adult northern royal albatrosses was highest at the end of January and early February, declining sharply as the brood-guard phase ended (5 February–8 March 2021). Early in this period, daily numbers were highest at dawn and dusk and lowest around midday. There was no obvious relationship with the prevailing wind speed or direction. Of the 62 Northern royal albatross nests monitored, four turned out to be empty, leaving 58 active nests from which 48 chicks apparently fledged. Fledging took place between 7 September and 4 October 2021, with most birds apparently leaving between 11–17 September. Nest failures were concentrated in the brood-guard stage and soon after. Combining the results with separate but wider, near-simultaneous assessment of the number of nests that had failed up to when the trail cameras were installed suggests an overall nesting success for Northern royal albatross of 76%.

A complete census of the northern royal albatross nesting population on Motuhara Island was undertaken on 13 December 2022, with a total of 1,614 breeding nests counted.

Recommendations

Further analysis of trail camera footage from additional years would allow estimates to be made of interannual variability in breeding success in northern royal albatross.

Further satellite tracking of northern royal albatross is needed to determine if at-sea distribution if linked to wider climate/ocean temperature regimes (e.g. El Nino and La Nina events).

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $25,000 for one year.

Review milestones

- Draft final report made available on the CSP webpage in July 2023
- Findings presented to the CSP TWG on 11 July 2023
- Final report made available on the CSP webpage in August 2023

Citation

Frost, P., Bell, M., Taylor, G. 2023. Trail-camera assessment of the fates of Northern Royal Albatross and Northern Buller's Mollymawk chicks: 2021 breeding season, Motuhara. Report prepared for the Conservation Services Programme, Department of Conservation. 25 p.

Bose, S., Bell, M., Taylor, G. 2023. Northern Royal Albatross tracking from Motuhara, Chatham Islands, and Taiaroa Head in 2021. POP2022-06 final report prepared for the Conservation Services Programme, Department of Conservation. 9 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/motuhara-seabird-research-field-trip-report-dec-2022.pdf

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/evaluation-of-motuhara-trail-camera-images-final-report.pdf

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/northern-royal-albatross-tracking-from-motuhara-chatham-islands-and-taiaroa-head-2021-final-report.pdf

3.13 POP2022-07 Westland petrel foraging movements and diving behaviour

Project objectives

1. To describe the foraging distribution of Westland petrels from GLS devices deployed in 2021.
2. To describe the dive behaviour of Westland petrels. This would involve deployment of Time-depth recorders (TDRs) and subsequent analysis.

Rationale

Westland petrels only breed on the West Coast of the South Island at Punakaiki. The species is bycaught on commercial longlines and is rated as a medium-high risk species from commercial fishing activity. This project supplements current population monitoring (POP2021-08) to fill additional data gaps utilising cost-saving synergies. Past tracking of this species in the early 2000's with GLS tracking tags provided insights into the inter-breeding period and the migrations of this species. Detailed GPS tracking was carried out 10 years ago on a sample of breeding birds and showed the extent of local movements in the peak of the breeding season. The current study seeks to understand the full annual cycle of the birds and the amount of time they spend visiting the colony versus being at sea. For the at-sea tracking, the analysis will look at how extensive are the petrel movements in the pre-laying period, and during each stage of incubation and chick-rearing. Do the birds stay entirely within the EEZ during this period or forage in the high seas? This will affect the level of risk they are exposed to from domestic fisheries. For the inter-breeding period from November to March we will assess the migration patterns to determine if there is inter-annual variation on the movements observed 15 years ago. Time-depth recorders (TDR's) will be deployed on breeding birds and the data analysed to look at how deep the petrels dive, how frequently they dive and compare the level of diurnal and nocturnal diving behaviour to assess risks with fisheries interactions. As many GLS tags are still currently deployed on the petrels and will not be recovered before July 2024, this project will need to continue for a further year.

Project status

An updated report is due in 2024 and further analysis of currently deployed tracking tags by 2025.

Summary of the methods and key findings

A total of 46 time-depth recorders (TDR's) of two types (Star-Oddi and CEFAS) were deployed across different stages of the breeding cycle (pre-laying, incubation and chick rearing). So far 23 tags had been recovered by July 2023. The dive data are being analysed as part of a MSc study. Preliminary analysis indicates mean daily maximum dive depths for Westland Petrels across years and phenological stages averaged at 2.2 m. Total maximum dive depth across years and phenological stages averaged 7.7 m. The deepest dive recorded was 14 m. It appears that Westland Petrels perform shallower dives during pre-laying and incubation compared to the dives they performed during chick-rearing. Underwater light levels may be a factor as the species breeds in winter and spring.

47 of the 50 GLS tags that were deployed in 2021 (94%) were recovered during the 2022 breeding season. One of the birds lost its GLS tag and two birds were not resighted in the area in the subsequent season. Another 29 GLS tags were deployed for short term tracking on breeding adults during the breeding season of 2022 to identify movement and foraging areas during incubation and brood guard stage. Of these tags, 21 out of 29 tags (72.41%) were retrieved after two months. Finally, 54 additional

GLS tags were deployed in July 2022 on adult birds to collect year-round data. Out of the total 68 tags retrieved by 2022, 11 tags could not be downloaded due to failed connections and tag wear. GLS tags are still out on many birds in 2023. Analysis of a sample of tags showed the birds followed the same pattern as the previous GLS deployment in early 2000's with birds foraging locally in the Tasman Sea and off the South Island east coast. After breeding the birds flew to South America to the seas off Chile. Interestingly, one bird passed through Drake Passage and foraged in the South Atlantic off Argentina.

The satellite tracking of juvenile Westland petrels was not successful. There was either high mortality of departing chicks once at sea or the tags were lost soon after departure. One bird did fly north of New Zealand and around into the South Pacific and was last recorded from east of the Chatham Islands heading in the same direction as the adult birds. This aspect will be repeated in 2024 after testing of different tag attachment methods on adult birds in winter of 2023.

Recommendations

Analyse the GLS tracking datasets to understand inter-annual variability in at-sea distribution and activity patterns in this species.

Repeat the chick tracking using satellite tags to better understand movements of juvenile Westland petrels.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $40,000 for one year.

Review milestones

- Draft progress report presented to the CSP TWG on 11 July 2023

Citation

Simister, K., Bose, S., Fischer, J., Taylor, G. 2023. Progress report on Westland Petrel projects (POP2021-08) and (POP2022-07) investigating burrow occupancy, foraging behaviour and at-sea movement. Report prepared for the Conservation Services Programme, Department of Conservation.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/meetings/2023/twg-11-jul/pop2021-08-draft-progress-report.docx

3.14 POP2022-08 Auckland Islands seabird research: Gibson's and white-capped albatross

Project objectives

1. To monitor the key demographic parameters of Gibson's albatross and white-capped albatross to reduce uncertainty or bias in estimates of risk from commercial fishing.
2. To estimate the population size of Gibson's albatross.
3. To describe at-sea distribution of Gibson's albatross and white-capped albatross.

Rationale

This proposal delivers key components of the CSP Seabird Plan involving field work on Gibson's albatross and white-capped albatross. A long-term study site for Gibson's albatross at the Auckland Islands has enabled trends in population size and demographic parameters to be assessed (Francis et al. 2012; Elliott et al. 2018). The largest population of white-capped albatross occurs on Disappointment Island in the Auckland Islands group. Population trend data for this site has been gathered through use of aerial photography in 2006 to 2017. Since 2015 ground-based monitoring of a marked study colony on Disappointment Island has started to obtain data to allow for improved survival estimates for this species. Tracking of adults has also been undertaken using GLS tags since 2018. The white-capped albatross population study has primarily been an add on to the research programme on Gibson's wandering albatross, which has constrained the project in terms of limited days spent on white-capped albatross data collection.

Project status

This is a multiyear project due for completion in June 2025. 2022/23 reporting is complete.

Summary of the methods and key findings

Gibson's albatross

The survival and productivity of Gibson's wandering albatross has recovered from the dramatically low rates recorded during 2006–08, but the average survival rate for both sexes remain lower than before the population crash in 2005, and nest success has only just recovered to pre-crash levels. Recent increases in the number of nesting birds are almost certainly attributable to a higher proportion of the population choosing to breed and mark-recapture models estimates of population size still show a decline. The data missed because of the late cancellation of the 2021 season field trip precludes better estimates of population size until next year.

Twenty-two juvenile Gibson's wandering albatrosses were fitted with satellite transmitters and dataloggers before they fledged in late December 2022. In the subsequent seven months juveniles spent more time foraging north-east of New Zealand than previously tracked adult birds. No information has previously been collected on the at-sea distribution of juvenile Gibson's wandering albatross, so this data filled a major data gap.

For investigation into diet and mercury pollution in Gibson's wandering albatross, work additional to the CSP annual plan, feather and blood samples were collected from 20 juvenile and 58 adult birds outside the main albatross study area.

Drone census techniques were refined, allowing a more reliable estimate of the effort required for a whole-island drone-assisted count of the number of Gibson's wandering albatross nesting on Adams

Island. High variability in the number of birds sitting on nests but not incubating eggs (loafing birds) is a large source of error when trying to count breeding birds from the air, which would require substantial concurrent ground-truthing to ameliorate. The costs and benefits of undertaking whole-island nest counts using a variety of methods including drones are explored.

White-capped albatross

Banded white-capped albatross were re-sighted at a rate of 0.25 in the study colony of 643 banded birds. Adult survival was 0.92, a little higher than estimated last year. Nine of ten trail cameras monitoring the last half of the 2022 breeding season and the start of the 2023 breeding season gave some data, and seven cameras continued functioning for the full 12 months, though only two stayed upright long enough for the outcome of all the nests in the frame to be determined. Seven of the nine 2022 season cameras drooped over time, probably because the island's soft peat was so wet it was not strong enough to support the waratahs the cameras were attached to.

Chick success, or the survival of a chick from hatching to fledging, was 66% (22 out of 33 nests). Chicks fledged ~26 July (range 17 June–20 August), and adults returned to the colony from around 10 October (earliest 20 September). Camera images supported earlier findings that white capped albatross is predominantly a biennially-breeding species. This means cameras placed to capture clear views of a cluster of nests being used one season seldom capture many in the next, at least when chick success is reasonably high and nest density only moderate. Reliable information on nest failure rates between laying and hatching will be difficult to obtain without a late November visit to Disappointment Island to position cameras on clusters of nests with confirmed eggs.

An additional 24 unbanded birds were banded and darvic bands were added to three already metal-banded birds. A few feathers were collected from each of these birds for determination of sex, and GLS dataloggers were attached to the leg bands of 26 of them to follow their movements at sea. Blood samples were collected from 20 of these birds for analysis of the levels of mercury pollution.

A comprehensive ground count was made of birds nesting in part of the eastern Castaway Bay colony. The eastern and the western Castaway Bay colony were then photographed from the air by drone twice. There was great variability in the number of non-breeding birds present on the ground between counts (36-106), depending on conditions, which would make it difficult to get an accurate count of breeding birds from drone photographs.

Recommendations

Gibson's albatross

The island's large size, height and persistent bad weather mean a large amount of time and resources are required to obtain a reliable whole-island count using any method. It would be a major undertaking, requiring its own dedicated effort, best done after the regular field programme to ensure the vital mark-recapture trend monitoring dataset is not compromised.

White-capped albatross

Any whole island drone-based census of nests will need to be accompanied with simultaneous ground truthing. Before a reliable drone-based whole island census can be made, the following is required:

1. Trials to determine whether the vertical orthomosaics which have so far only been tested on gentle ground, will work on the steep cliffs and narrow gullies which characterise the

western and northern colonies, or whether more complicated 3D models of the steep slopes need to be constructed.
2. Purchase of ~25 batteries and possibly 2 drones (if batteries no longer available for existing drones).
3. Purchase of an improved digital elevation model.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $160,000 per annum for three years.

Review milestones

- Draft final report made available on the CSP webpage in June 2023
- Findings presented to the CSP TWG on 8 June 2023
- Final report made available on the CSP webpage in August 2023

Citation

Walker K, Elliott G, Parker GC, Rexer-Huber K. 2023. Gibson's wandering albatross: population study and potential for drone-based whole-island census. POP2022-08 final report prepared for New Zealand Department of Conservation. 28 p.

Elliott G, Walker K, Rexer-Huber K, Parker GC. 2023. White-capped albatross population study: Disappointment Island 2023. POP2022-08 final report prepared for the New Zealand Department of Conservation. 26 p.

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https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/pop2022-08-gibsons-albatross-final-report.pdf

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/pop2022-08-white-capped-albatross-final-report.pdf

3.15 POP2022-09 Auckland Islands New Zealand sea lions

Project objective

1. To undertake pup counts on Enderby Island, Dundas Island and Figure of 8.
2. To collect re-sighting data at all locations to provide survivorship data for the demographic model.

Rationale

The New Zealand sea lion is listed as Nationally Vulnerable (Baker et al. 2019). The New Zealand sea lion Threat Management Plan, first implemented in 2017, established a range of research and actions to be undertaken to reduce and mitigate the range of threats sea lions are exposed to. Sea lions are incidentally bycaught in southern commercial trawl fishing operations targeting species including squid, scampi and southern blue whiting. The foraging areas of New Zealand sea lions at the Auckland Islands have been shown to overlap with commercial trawl fishing activity, particularly SQU6T and SCI6A (Chilvers et al. 2005). Approximately 7o% of New Zealand sea lions breed at the Auckland Islands, where population data have been collected since the mid-1990s, including estimates of pup production and re-sighting of marked animals. Since 2001 there has been a considerable decline in pup production at the Auckland Islands (Campbell et al. 2006; Chilvers et al. 2007). A literature review to identify potential indirect effects of commercial fishing on the Auckland Islands population as part of CSP project POP2010-01 (Bowen 2012) highlighted several key information gaps that prevent a full understanding of any such potential indirect effects, including time series data of population dynamics as collected in this project. CSP project POP2012-02 analysed population data collected during previous years to determine the key demographic factors driving the observed population decline of New Zealand sea lions at the Auckland Islands. It found that low pupping rates, a declining trend in cohort survival to age 2 and low adult survival may explain declining pup counts in one studied population (Roberts et al. 2014). Demographic data from the Auckland Islands population is vital to the ongoing assessment of direct and indirect risks to the species from commercial fisheries, as described in Fisheries Operational Plans.

Project status

Complete.

Summary of the methods and key findings

The field team spent a total of seven weeks at the Auckland Islands (8 December 2022 – 22 January 2023); six weeks at Enderby Island, three nights on Dundas Island, and a half day on Figure of Eight Island. Direct counts of pups were undertaken each day that the team were stationed at the colonies. At Dundas Island, the team conducted a mark-recapture experiment to determine the Dundas Island pup production estimate. All live pups (258 total) at Sandy Bay, Enderby Island, were double-flipper tagged and microchipped, and 200 pups were double-flipper tagged at Dundas Island.

Resights of marked (flipper tagged/microchipped) animals of all age and sex classes were collected daily. Total counts of pups, females, sub-adult males, and adult males were undertaken daily at Sandy Bay, and weekly around Enderby Island.

New Zealand sea lion pup production at the Auckland Islands in 2022/23 was estimated as 1278 ± 23 pups (mean ± 1 SE), 24% lower than the pup production estimate from 2021/22 (1686 ± 51 pups; Young & Manno 2022). This year's pup production estimate falls below the minimum level set to

trigger reviews of both the New Zealand sea lion Threat Management Plan (DOC & MPI 2017) and the Squid 6T Operational Plan (FNZ 2019).

These results describe an unexplained and significant drop from the relatively stable pup production trend over the past decade. This could indicate a temporary reduction in breeding rate or a decline in adult female survival or fecundity.

Recommendations

Further research is needed to determine the cause of the decline and the management implications for the species.

These results emphasise the need for continued investment in this monitoring programme, with a view to updating the demographic model for New Zealand sea lions as soon as possible. The change in pup production supports a review of the effectiveness of current management strategies to recover the species.

Project logistics summary statement

This project was 90% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $150,000 for one year.

Review milestones

- Draft final report made available on the CSP webpage in May 2023
- Findings presented to the CSP TWG on 19 May 2023
- Final report made available on the CSP webpage in July 2023

Citation

Manno KL, Young MJ. 2023. New Zealand sea lion/pakake/whakahao field research report Auckland Islands 2022/23. Dunedin: Department of Conservation, 27 p.

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https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/pop2022-09-nzsl-auckland-islands-final-report.pdf

3.16 POP2022-10 Antipodes Island seabird research: Antipodean albatross and white chinned petrel

Project objective

1. To monitor the key demographic parameters at the Antipodean albatross study site and reduce uncertainty or bias in estimates of risk from commercial fishing and measure the success of management interventions.
2. To estimate the total population size of the Antipodean albatross on Antipodes Island.
3. To describe the diet of the Antipodean albatross and assess signatures of nutritional stress.
4. To monitor the key demographic parameters of white-chinned petrels and reduce uncertainty or bias in estimates of risk from commercial fishing and measure the success of management interventions.
5. To estimate the total population size of white-chinned petrels on Antipodes Island.

Rationale

This project delivers on priority monitoring and data gaps as identified in the CSP Seabird Plan. Due to logistical costs involved in getting to Antipodes Island, the Antipodean Albatross and white-chinned petrel projects have been combined into one Antipodean Island seabird research project. Antipodean albatross is extremely vulnerable to bycatch and continues to decline at 5% per annum, with fisheries bycatch, both within and beyond the New Zealand EEZ, being the greatest known threat. The project would continue the demographic monitoring of Antipodean albatross conducted in previous years. In addition, this project will involve a (multi-year) population wide census, based on methods to be trialled in 2021/22. An Antipodean albatross population estimate is a major data gap, as the only previous independent estimate was conducted in 1994-1996. This project also aims to provide insights into the diet and potential nutritional stress in Antipodean albatross; currently a poorly known aspect of the ecology of this species. In addition to the Antipodean albatross work, this project also aims to estimate key vital rates and population size for white-chinned petrels on Antipodes Island, another seabird species vulnerable to bycatch.

Project status

This is a multi-year project due for completion in June 2025. 2022/23 reporting is complete.

Summary of the methods and key findings

Antipodean albatross

There are some signs that the rate of decline might be slowing. The number of Antipodean wandering albatrosses breeding has been roughly stable for the past four seasons, and female survival shows some suggestion of improving since 2014 (4-year rolling averages), although it is still highly variable year to year. Breeding success in 2022 at 72% approached the average pre-crash nesting success of 74%, although the mean 2006–2022 rate remains comparatively low at 62%. However, the actual number of chicks produced remains small, even in good breeding-success years, since numbers nesting remain low. Recruitment is starting to draw from the (much smaller) cohorts produced since the crash, so population numbers will soon no longer be supplemented by higher recruitment rates seen over the past decade.

The population has been approximately stable for the last four years. However, there is so far no evidence of any sustained improvement in Antipodean wandering albatross demography, as required for the population to recover, with tentative improvements recorded here merely slowing the decline.

White-chinned petrel

Burrow density is estimated from a representative sample of burrowed areas then corrected for burrow occupancy and extrapolated to the available area of nesting habitat to estimate the breeding population of white-chinned petrels. For an estimate as accurate and precise as possible we built on previous efforts in 2009–11 and 2021–22 (Thompson 2019; Elliott & Walker 2022). To estimate burrow density we used the distance sampling dataset from 2021–22 and expanded the sampling coverage across the whole island, adding 93 transects to a new total of 248 island-wide sampling locations. Distance sampling enabled burrow density estimates that explicitly account for burrow detectability. Occupancy was assessed by inspecting 293 burrows just after laying, calculating rates and corrections using the approach developed for the 2009–11 study (burrow numbers corrected for entrances that are not in fact burrows, and for other species using white-chinned petrel burrows). The area used by white-chinned petrels, with two habitat types distinguishable, was drawn from comprehensive habitat mapping 2021–22. Antipodes Island had an estimated 26,400 (95% CI: 22,200–31,600) white-chinned petrel pairs breeding in Dec 2022 during early incubation. Burrow detectability was different in the two habitat types and occupancy rates differed, so for accuracy the estimate used burrow density, area and occupancy specific to each habitat type. These refinements to 2009–11 and 2021–22 methods result in a population size estimate here that is smaller but more accurate and precise.

Population change is more readily detected via intensive study of birds in a representative study population, so we established a mark-recapture study to estimate vital rates, survival in particular. Marked burrows in two study areas contain 169 banded white-chinned petrels. For accurate, precise survival estimates this marked population needs building further, along with recaptures at existing marked burrows for a minimum of three years.

Recommendations

Antipodean albatross

Recommendations include ongoing mark-recapture monitoring of demographic and population-size trends; an island-wide population size estimate; and research into causes of declines. More-targeted ongoing engagement is also needed, internationally and domestically, to achieve better bycatch mitigation in line with ACAP best practice.

White-chinned petrel

Recommendations include an efficient and effective long-term monitoring strategy which could combine annual intensive monitoring effort in a representative study population, as set up here, supplemented by occasional whole-island population size estimates (5–10-year intervals). Ongoing mark-recapture will enable robust trend estimation over time, with whole-island estimates providing occasional more-general overview of breeding numbers.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $160,000 per annum for three years.

Review milestones

- Draft final report made available on the CSP webpage in June 2023
- Findings presented to the CSP TWG on 8 June 2023
- Final report made available on the CSP webpage in July 2023

Citation

Parker G.C., Rexer-Huber K., Walker K., Elliott G. 2023. Antipodean wandering albatross population study 2023. POP2022-10 final report to the Department of Conservation. Parker Conservation, Dunedin. 21 p.

Rexer-Huber K., Parker G.C., Elliott G., Walker K. 2023. Antipodes white-chinned petrel population size and survival study setup. POP2022-10 final report to the Department of Conservation. Parker Conservation, Dunedin. 18 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/pop2022-10-white-chinned-petrel-2023-final-report.pdf

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/pop2022-10-antipodean-albatross-2023-final-report.pdf

3.17 POP2022-11 Campbell Island Seabird Research

Project objectives

1. Develop methods to assess the current population trends of southern royal and greyheaded albatrosses at Campbell Island.
2. Assess the efficacy of using satellite imagery to monitor southern royal albatross.

Rationale

There are strong indications that the colony of southern royal albatross at Campbell Island is following the same pattern of declines observed in other large albatross species in New Zealand (Antipodean, Gibson's, and northern royals). A survey of the Col study area on Campbell Island in March 2020 found the lowest numbers breeding since the late 1980s and well below numbers reported during the last period of intensive counts made in the early to mid-2000s. This indicates the possibility that the same pattern of decline observed post 2005 for Gibson's and Antipodean albatross may have gone unnoticed in this species as there has been no study on this species for almost 15 years. The grey-headed albatross has been in decline for decades at Campbell Island and many other southern colonies.

Project status

Completed.

Summary of the methods and key findings

This project was initially scoped as a desk-based project to identify cost-efficient monitoring methodologies for Campbell Island. However, when Operation Endurance (a collaboration between DOC and the Navy facilitating access to Campbell Island) was announced to take place in February 2023, POP2022-11 was re-scoped to implement actual monitoring, rather than identifying future monitoring avenues.

The February 2023 Operation Endurance trip to Campbell Island built on work from the March 2020 Operation Endurance trip, focusing on southern royal albatross (Diomedea epomophora). The main aims were counting of nests of southern royal albatross in the Col study area (and Moubray study area, if time permitted) to gain insight into population trends, deploying 29 GLS devices to gather long-term information on offshore distribution, collecting resight data (bands and PIT tags) for future demographic studies, and installing remote cameras at nests to study breeding biology, phenology, and success. Additional aims included counting of Antipodean albatross (Diomedea antipodensis) nests and conducting genomic sampling as well as deploying remote cameras on grey-headed albatross (Thalassarche chrysostoma) nests, if time permitted.

The trip to Campbell Island lasted one day, and hence it was only possible to deploy the 29 GLS tags and set up all 12 available remote cameras on southern royal albatross nests. No systematic search and count of the Col study area was possible, and there was insufficient time for Antipodean and grey-headed albatross work. Four banded southern royal albatrosses were resighted in the Col study area. Anecdotal evidence based on the limited nests sighted during this trip aligns with sightings during the 2020 trip and continues to suggest a concerning decline of the southern royal albatross at its stronghold. This is particularly alarming because even though southern royal albatross breed biennially, both cohorts (and hence the overall population) appear to be declining at the same rate because the 2020 survey covered one cohort and the 2023 survey the other.

Recommendations

An in-depth and up-to-date population study of southern royal albatross, including a thorough (preferably island-wide) nest count, is still needed to further assess the status of the southern royal albatross population and its trends.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $15,000 for one year.

Review milestones

- Draft final report made available on the CSP webpage in April 2023
- Findings presented to the CSP TWG on 26 April 2023
- Final report made available on the CSP webpage in May 2023

Citation

Mischler, C. and Wickes, C. 2023. Campbell Island/Motu Ihupuku Seabird Research & Operation Endurance February 2023. POP2022-11 final report prepared for Conservation Services Programme, Department of Conservation. 15 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/pop2022-11-campbell-island-seabird-research-2023-final-report.pdf

4. Mitigation Projects

4.1 MIT2021-01 Protected species liaison project

Project objectives

1. To grow liaison capacity across inshore fleets around the country including surface longline, bottom longline, trawl, set net and purse seine.
2. To coordinate Liaison Officer effort and target protected species bycatch reduction by encouraging vessel operators to meet best-practice bycatch mitigation.
3. To deliver on the vision and outcomes of relevant cross-government plans (NPOAs, TMPs, etc).

Rationale

To effectively reduce the risk of interactions with protected species, it is important for vessels to be using best practice mitigation and take all necessary steps, both regulatory and nonregulatory measures, to avoid interactions. To measure success of mitigation and identify areas where further development is needed across each fleet, there needs to be consistency in the mitigation measures used while still allowing for innovation. Through the NPOA-Seabirds, a suite of best practice mitigation standards for each method have been developed; these mitigation standards will underpin the work that the Liaison Officers do and will be rolled out as part of the Liaison Programme through the Protected Species Risk Management Plans (PSRMPs). The purpose of the PSRMPs is to outline the vessels' current practices and work towards achieving all the best practice mitigation standards, and Liaison Officers will record where vessels are not able to achieve all standards and why. These notes will be shared with MPI for evaluation, where they will either reassess the mitigation standards or investigate how to better assist vessel operators to achieve the set standards. Auditing of PSRMPs by Fisheries Observers will then describe the steps the vessel is taking to meet the mitigation measures outlined in their plan and highlight areas for improvement.

Project status

In progress.

Summary of the methods and key findings

In the 2022-23 fishing year (1 October 2022 - 30 September 2023), the liaison programme reviewed and updated 140 PSRMPs and established 24 new PSRMPs for inshore and Highly Migratory Species (HMS) vessels. A total of 34 PSRMP audits were completed by Observer services. These were comprised of 5 surface longline, 3 bottom longline, 15 trawl and 11 set net audits. None of the surface longline vessels audited were using hook-shielding devices. The Liaison Programme received 96 triggers that were reported by 43 different vessels through NFPS-Catch reporting. Notable incidents included 5 Hector's dolphin captures in the FMA 3 trawl and set net fisheries, 4 Hoiho captures in the FMA 3 set net fishery, as well as some large capture events for seabirds in the surface longline fleet. This has led to further questions around seabird capture risk during the soak period and what potential mitigation options could be available. There were also 21 turtle captures within the surface longline fleet. From April 2023, turtle captures now also result in a questionnaire to inform the effects on post-release survival.

Please note, all numbers listed are tentative and will be verified and finalised in the 2022-23 Liaison Programme Annual Report.

Recommendations

The efficacy of the Liaison Programme depends on the connection of fishers with Liaison Officers, the monitoring of bycatch mitigation practices at sea, and the real-time communication of information influencing bycatch risk. The ongoing difficulties in placing observers due to watchkeeping will continue to limit Liaison Programme activity. The cameras rollout provides a good opportunity for receiving further information on protected species interactions and mitigation practices. Work with Fisheries New Zealand is underway to develop EM review reports analogous to the observer PSRMP audits. The long awaited liaison database (shared between FNZ and DOC) is still in development and continues to be a missing essential piece towards ensuring efficient Liaison Programme operations and targeted engagement.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $250,000 per annum for three years.

4.2 MIT2022-01 Longline hauling mitigation devices

Project objectives

1. To promote uptake of haul mitigation in longline fisheries.
2. To further quantify the effectiveness of haul mitigation devices used.
3. Make recommendations for any modifications to haul mitigation devices to improve bycatch reduction effectiveness or increase uptake by fishers.

Rationale

Whilst seabird bycatch mitigation development and implementation has focussed on the setting of longlines, captures also occur on hauling. This is particularly evident when lines are set a night, as hauling is often by day when bird activity is higher, and the relative proportion of haul captures appears to be particularly high in New Zealand longline fisheries compared to other fisheries globally. This project will contribute to continual improvement towards zero bycatch as laid out in the National Plan of Action – Seabirds 2020.

Project status

In progress.

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 per annum for two years.

4.3 MIT2022-02 Understanding drivers and barriers to mitigation uptake in small vessel bottom longline fishery

Project objective

To better understand the drivers and barriers to uptake and implementation of best practice seabird bycatch mitigation by small vessel bottom longline vessel operators.

Rationale

There are a range of proven bycatch mitigation options available for bottom longline fisheries, including best practice advice. However, achieving consistent bycatch reduction across all vessels and fleet sectors remains challenging. Understanding the drivers and barriers to mitigation uptake by fishers can help better inform the targeting of outreach activities such as education or liaison activities and the development of fit for purpose mitigation tools.

Project status

Completed.

Summary of the methods and key findings

The Navigators (an independent social research agency) were commissioned to seek feedback from fishers in New Zealand's inshore small vessel bottom longline commercial fleet. The Navigators conducted 18 in-depth interviews with skippers, owner-operators and owners, representing two-thirds of the fishing effort across the fleet.

Research found that fishers are driven by a range of factors which influence decision making around seabird mitigation and these can be broadly categorised as internal and external motivators. Internal motivators included fisher reverence for seabirds which drives their commitment to reduce bycatch, whilst external motivators were focused on government intervention (e.g. DOC liaison programme, observers, cameras on boats), productivity (e.g. impacts of bait depredation, including financial), industry sustainability (commercial market needs), and crew health and safety.

There were also several barriers identified which fishers believe impede their ability to successfully mitigate seabird bycatch due to reasons related to capability, safety and motivation, and they highlighted the need for industry and government engagement to address these issues.

Key barriers identified were:

- Fishers' experiences were that they had not personally caught any, or had caught very few, seabirds per year and there was a lack of understanding about the actual number of seabird captures for their fleet and which vessels were responsible. This is causing frustration leading to decreased motivation around mitigation implementation;
- Fishers did not believe mitigation standards accurately reflect high risk times for seabird captures. Regulations currently state that high-risk periods for seabird captures are "during daylight hours (0.5 hours before nautical dawn and 0.5 hours after nautical dusk) or during a full moon and three days either side of a full moon". Fisher definition of 'high risk' periods additionally included consideration of breeding season, dawn/dusk, seabirds active around vessels, during seabird feeding frenzies, line setting, gear issues, less experienced crew, faster setting using lighter weights and/or smaller hooks, and when the weather is windy.

Fishers also didn't understand why it's necessary to mitigate against seabird captures at times when seabirds are not present;

- fishers identified several additional practices that could be included to avoid bycatch including avoiding fishing when there were large numbers of birds present, adding floats behind the boat when seabirds are present, holding baits, bird lasers and use of bait types; and
- fishers identified the need for continued innovation to improve mitigation techniques and they considered current efforts with underwater bait setters and line suppressors as promising.

One of the key fisheries identified as having a significant issue with mitigation barriers is the bluenose and hāpuka fishery which fishers highlighted as being unable to meet the tori line and line weighting regulations. There are also a broad range of other barriers specific to the each of the mitigation standards and these are tabulated in the report.

Recommendations

The recommendations from this research list a broad range of opportunities to improve seabird mitigation in the fishery and/or to get fishers to consistently follow the mitigation standards. The recommendations are grouped under four topic areas to address each of the following:

a. Achievability and safety barriers are in most need of attention from a fishers' point of view and ideally need to be addressed before cameras come onboard. They mostly relate to bluenose and hāpuka fishing, solo fishing, as well as the use of tori lines and hauling mitigation.

b. Motivational barriers must be resolved if fishers are going to willingly do more than they are currently. They mostly relate to fishers' experience in regard to not catching seabirds, their low versus high-risk scenarios, and technical issues regarding tangles, weighting, and sink rate tests.

c. Information, clarity and direction, which relates to suggested areas of improvement to help fishers better understand what is expected of them as well as to help increase their knowledge (e.g. through knowledge sharing).

d. sense of fairness and robustness: These recommendations in this section relate to fishers' understanding and the measurement of seabird capture statistics, as well as how fishers are perceived by the public and NGOs.

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 for one year.

Review milestones

- Draft final report made available on the CSP webpage in September 2023
- Findings presented to the CSP TWG on 5 September 2023
- Final report made available on the CSP webpage in October 2023

Citation

Turner, P. 2023. Understanding drivers and barriers to seabird bycatch mitigation uptake in small vessel bottom longline fisheries. MIT2022-02 final report prepared by The Navigators Ltd for the Department of Conservation. 123 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/mit2022-02-barriers-to-seabird-mitigation-uptake-final-report.pdf

4.4 MIT2022-03 DOC Coral Symposium 2022/23

Project objective

To hold a symposium on the topic of New Zealand corals (Hexacorallia and Octocorallia), including a review of progress against research gaps identified through the 2017 DOC Coral Workshop, and to discuss ideas on how they might best be managed and protected through mitigation efforts.

Rationale

Four coral groups are protected under the Wildlife Act 1953: the order Antipatharia (black corals), the order Alcyonacea (gorgonians), the order Scleractinia (stony corals), and the family Stylasteridae (lace corals). Despite this protected status, there is limited and ineffective coral protection in New Zealand. Effective protection and management is particularly challenging given such large numbers of data deficient species and a lack of specific management objectives and policies. Nonetheless, commitments within the Wildlife and Fisheries Acts to protect biodiversity and to mitigate adverse environmental impacts, coupled with parallel inter-agency work programmes, an updated marine invertebrate New Zealand Threat Classification System report (2023) and imminent Wildlife Act reforms, there is strong suggestion that a coral symposium is timely. This symposium will bring together interested invited parties to provide updates and coordination between multiple work programmes relevant to coral conservation. The symposium is not intended as a repeat of the 2017 gaps analysis workshop (although relevant research updates will be included). Instead, the purpose of the symposium is to drive an active network of stakeholders and bring them together for the first time in several years, and to provide them with government and industry contexts and contacts for ongoing improvement of management outcomes for protected corals. This will be achieved by presentations and discussion focused on 1) coral research and knowledge – achievements and gaps since the 2017 gaps workshop; 2) identification of threats and approaches for mitigation; and 3) potential management approaches within the context of new and upcoming policy frameworks and other workstreams.

Project status

This project has been delayed due to competing priorities and pending outcomes of the interagency benthic forum. It is tentatively scheduled for early 2024.

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 for one year.

4.5 MIT2022-04 Bait retention as a driver to mitigation use in the surface longline fishery

Project objective

To quantify bait loss rates in relation to seabird attacks.

Rationale

A recent exploratory economic analysis of seabird bycatch reduction in surface longline fisheries found bait retention as an important factor driving the economic consequences of seabird bycatch mitigation. As such, improved bait retention can act as a driver to mitigation uptake. However, real world data on bait retention rates, and its consequent economic impact, were lacking in the literature and hindered further development of the economic modelling of seabird bycatch mitigation use.

Project status

Completed.

Summary of the methods and key findings

This project comprised a review of existing literature for methods to estimate bait loss caused by seabirds in New Zealand's commercial surface longline (SLL) fisheries and to model economic impact of bait loss, in addition to an assessment of whether data exists that could be used to estimate bait loss and economic impacts for the fisheries.

The methods ranged from observations of successful bait taking attempts, observations of secondary attacks on bait stealing seabirds (a conservative measure of successful bait taking attempts, since primary attacks are not always successful), or immediate retrieval of lines after setting to reduce other factors contributing to bait loss other than seabirds (e.g., predatory fish, disintegration, physical stresses from wave action, longline deployment and retrieval). However, depending on how bait loss is determined or defined, estimates can range by orders of magnitude. Moreover, visual determination of seabird depredation of bait leads to results with limited applicability to actual fishery operation (e.g., daylight observations are required, but most SLL fishing in New Zealand occurs during night).

As per legal requirements, SLL fishing vessels use some combination of seabird bycatch mitigation (e.g., using a combination of tori lines for the duration of all setting events, weighting lines, setting lines at night, or alternatively hookpod devices can be used as the sole bycatch mitigation method).

Recommendations

Implementing a case-control study is recommended, to assess how different bycatch mitigation strategies affect bait loss. To ensure that bait loss due to seabird depredation is assessed, fishing practices need to be held constant between vessels with different bycatch mitigation measures. Alternatively, vessels with different fishing practices could alternate bycatch mitigation measures (e.g., switching bycatch mitigation measures half-way through the season) such that all assessed vessels were operating under different bycatch mitigation strategies.

To model economic consequences, collecting data on direct revenue for catch and costs of bycatch mitigation measures and other operational costs is recommended, because the scope of such work would be to incentivize fishers for the use of specific bycatch mitigation measures. Within New Zealand, commercial fishers can only sell fish to licensed fish receivers, and data on fish sold and prices

for fish at the time of selling might be available through seafood industry owned databases. Alternatively, revenue and costs could be directly collected as part of a study dedicated to assessing bait loss.

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 for one year.

Review milestones

- Draft final report made available on the CSP webpage in March 2023
- Findings presented to the CSP TWG on 9 March 2023
- Final report made available on the CSP webpage in April 2023

Citation

Meyer, S., Hickcox, R. 2023. Bait retention as a driver to mitigation use in the surface longline fishery. MIT2022-04 final report prepared by Proteus for Conservation Services Programme, Department of Conservation. 50 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/mit2022-04-bait-retention-final-report.pdf

4.6 MIT2022-05 Large trawl vessel warp mitigation

Project objective

Assess the use and effectiveness of warp mitigation options currently in use across the fleet.

Rationale

Large vessels trawl fisheries have been identified as posing considerable bycatch risk to seabirds, particularly through warp strikes. Mandatory mitigation in large vessel trawl fisheries were introduced in the early 2000s, but mitigation requirements have remained largely unchanged for several years. Whilst substantial reductions in seabird bycatch estimates were documented in the 2000s, there has been little evidence for further bycatch rate reduction in more recent years. Since the introduction of mandatory mitigation, substantial new data on bycatch between vessels and across sectors of the fleet is available from relatively high levels of observer coverage.

Project status

Delayed, due for completion in February 2024.

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 for one year.

4.7 MIT2022-06 Light mitigation: reducing vessel interactions with seabirds

Project objectives

1. Characterise current light set-ups in use on fishing vessels.
2. Improve initial trials of different light set-ups both on land at seabird colonies and on commercial fishing vessels.
3. Identify options for mitigating seabird deck strikes.

Rationale

Artificial light at night from fishing vessels has been identified as a threat to several seabird species, particularly when vessels are operating near seabird colonies in low visibility conditions (e.g., foggy and misty nights). Bright lighting (e.g., spot and flood lights) can lead to species, such as prions, petrels and shearwaters being disorientated, attracted to, and subsequently colliding with vessel structures (i.e., deck strikes). This can result in contamination with onboard chemicals, waterlogging, injury, or death. Therefore, identifying lighting types and set-ups that minimise the attraction that current vessel lights cause is of high conservation interest. However, vessel lighting is essential for the safety of crew and operation of the vessel, so this research must identify light types and set-ups that allow for safe operations, while reducing risks to seabirds.

Project status

Completed.

Summary of the methods and key findings

Artificial light produced by vessels operating at night has been shown to influence behaviour and cause negative impacts to seabirds. Of particular concern, birds may be attracted to fishing vessels by light and become disorientated and confused, leading to collisions with the vessel (vessel strikes) and subsequently injury or death.

This work describes two sets of trials examining bird responses to a series of different light treatments of varying colour and amount. Land-based trials at a fairy prion breeding colony used short duration treatment periods in three blocks per night over a two-hour period. At-sea trials in the Hauraki Gulf used the same lights and treatments, but with longer durations and two blocks per night.

Snapshot abundance and behaviour counts were made from video footage recorded using a thermal camera. For the colony-based data, generalised linear mixed-effects models were applied to the counts from treatment periods, taking into account the experimental design and the variation in bird numbers throughout the night. Behaviour counts showed greater differences between treatments than snapshot abundance counts. More light and whiter lights attracted significantly higher counts of birds than amber and red lights. Environmental variables incorporated in the model, including relative humidity, wind speed, wind direction, and moon phase and illumination described variation in both the snapshot or behaviour counts. Counts of birds were much lower at sea and appeared to be dominated by variation in the number of birds attending the vessel.

Results are consistent with those in the literature and support the recently introduced Mitigation Standards to reduce light-induced vessel strikes of seabirds with New Zealand commercial fishing vessels.

Recommendations

Based on the findings in this study, we make two recommendations for future work:

- The use of amber lights should be tested under fishing conditions to see if they are suitable for use on fishing vessels.
- Support vessels to implement the mitigation standards and minimise unnecessary use of light.

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 for one year.

Review milestones

- Draft final report made available on the CSP webpage in June 2023
- Findings presented to the CSP TWG on 8 June 2023
- Final report made available on the CSP webpage in June 2023

Citation

Goad, D., Middlemiss, K., Cieraad, E., Duke, K., Bell, H., Le Lec, Marc., Le Lec, Marissa., Fischer, J., Taylor, G. 2023. Light mitigation: reducing vessel interactions with seabirds. MIT2022-06 final report prepared for Conservation Services Programme, Department of Conservation. 16 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/mit2022-06-lighting-mitigation-final-report.pdf

4.8 MIT2022-07 Inshore trawl warp mitigation

Project objectives

1. To assess the effectiveness of mitigation options currently in use.
2. Provide recommendations for future mitigation development and testing in this fishery to inform best practice advice.
3. Provide recommendations for improved data collection to allow for demonstrated continual improvement in bycatch mitigation in this fleet.

Rationale

Inshore trawl poses a substantial portion of risk to seabirds from commercial fisheries. There remains uncertainty over the effectiveness of the various seabird bycatch mitigation options that have been used by some operators. Currently there are no mandatory mitigation requirements for trawl vessels.

Project status

Literature review is completed, at-sea component in progress.

Summary of the methods and key findings

A literature review was conducted for eight mitigation devices that are used on trawl vessels in New Zealand and around the world, only two of which are currently being used on vessels less than 28 meters in length overall. Data on seabird capture rates from the reviewed studies is presented and supplemented with observer data collected in New Zealand coastal trawl fisheries between 2015 and 2020. Current best practices for data collection regarding seabird abundance and warp strike observations were critiqued in preparation for a workshop that was held with invited experts. Workshop attendees met to discuss research approaches and develop recommendations (Phase 1) for at-sea trials of devices to quantify their relative effectiveness in mitigating warp strike (Phase 2).

Warp strike/capture rate was 0.59 captures/100 tows on observed New Zealand coastal trawl vessels <28m between 2015 and 2020, regardless of mitigation method. Mitigation devices were used during 42% of all observed trawl tows between 2015 and 2020, with the bird baffler being the most frequently used. Based on the review of 14 international studies, it was determined that tori lines, bird bafflers, warp scarers, plastic cones, and water sprayers are the best candidate devices for trials on trawl vessels <28m to test their effectiveness at reducing seabird warp strike.

During the workshop, tori lines, bird bafflers, pinkie buoy warp deflectors, and plastic cone warp deflectors were recommended for at-sea trials, based on expert opinions of feasibility, cost, practicality, and safety. Due to the large variation in vessel configurations, experts suggested categorising <28m vessels into three additional size classes. Sample size, vessel selection, gear configuration and type (e.g., size, structure, use of Dyneema warps), and the effects of discharge management were also discussed relative to efficient data collection methods and study design. Considerable challenges with testing mitigation devices at sea were raised that may make an at-sea trial difficult and/or impossible, including sample size and the confounding effects of many factors influencing warp strike rates.

Recommendations

Best practices for data collection of abundance and warp strike rates, used by the Agreement on the Conservation of Albatrosses and Petrels, the Department of Conservation, and Fisheries New Zealand,

should form the basis of at-sea trial methodology, with some suggested modifications based on international studies and trials. Trial scope, device availability on vessels, cost, and feasibility will determine which of the four recommended mitigation devices are prioritised for testing. If a statistical approach is taken to address project objectives, alternative data collection methods such as electronic monitoring and on-board cameras should be considered to supplement observer data on warp strikes and the effectiveness of mitigation devices.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $100,000 for one year.

Review milestones

- Literature review draft final report made available on the CSP webpage in June 2023
- Literature review presented to the CSP TWG on 8 June 2023
- Literature review final report made available on the CSP webpage in August 2023

Citation

Hickox, R.P., Mackenzie, D. 2023. Review of warp strike mitigation methods on <28m commercial trawl vessels in New Zealand. MIT2022-07 final report prepared by Proteus for the Department of Conservation. 72 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/mit2022-07-inshore-trawl-warp-mitigation-final-report.pdf