Conservation Services Programme Annual Research Summary 2023-24

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1. Introduction

1.1 Purpose

This report outlines the research carried out through the Conservation Services Programme (CSP) Annual Plan 2023/24 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 2023/24[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 2023/24 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 2023/24 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 2023/24. 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:

22 December 2022	Updated medium term research plans, initial list of research proposals and CSP RAG prioritisation framework circulated to CSP RAG.
28 February 2023	CSP RAG meeting to discuss and prioritise initial research proposals.
15 March 2023	Additional feedback received from CSP RAG on research proposals and their prioritisation.
14 April 2023	Draft CSP Annual Plan 2023/24 released for public consultation.
15 May 2023	Public consultation period closed.
Early-June 2023	Summary of public submissions and response to comments completed.
Mid-June 2023	Director-General of Conservation conveyed the Conservation Services Programme Annual Plan 2023/24, 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/202324/final-csp-annual-plan-2023-24.pdf

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

Conservation Services Programme activities in 2023/24 were divided into three main areas:

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

2. Interaction Projects

2.1 Observing commercial fisheries

Project objective

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

Specific objectives

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

Rationale

Understanding the nature and extent of interactions between commercial fisheries and protected species can identify where the most significant interactions are occurring and can be used to inform development of ways to mitigate those interactions and adverse effects. Such data contributes to the assessment 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 Fisheries New Zealand Observer Services (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 on board commercial fishing vessels operating within the New Zealand Exclusive Economic Zone (EEZ). The observers collect both quantitative and qualitative information on interactions, both of which can and have been used to identify key areas of importance. The observations can also help in the development and assessment of mitigation strategies aimed at reducing the impact of commercial fisheries on protected species.

Observer coverage is, where possible, planned jointly with 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 2023 - 30 June 2024.**

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 2023-30 September 2024).

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 or 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 509 observed protected species interactions occurred during the July 2023 - June 2024 reporting period. Of these, there were 395 seabirds, 102 marine mammals, 12 protected fish, and 1,333.9 kgs of protected coral. New Zealand fur seals (n=96) were the most frequently observed protected species interaction during this year, and Salvin's albatross were the most frequently observed seabird interaction. This summary is divided into separate 'fisheries' where certain target species are grouped according to

[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

fishing method. For each 'fishery' an overall summary of commercial effort, observer effort and protected species bycatch is provided by Fisheries Management Area (Figure 1). Protected species interactions are then broken down by fate of the animal (live or dead) and 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 2023/24 observer year.

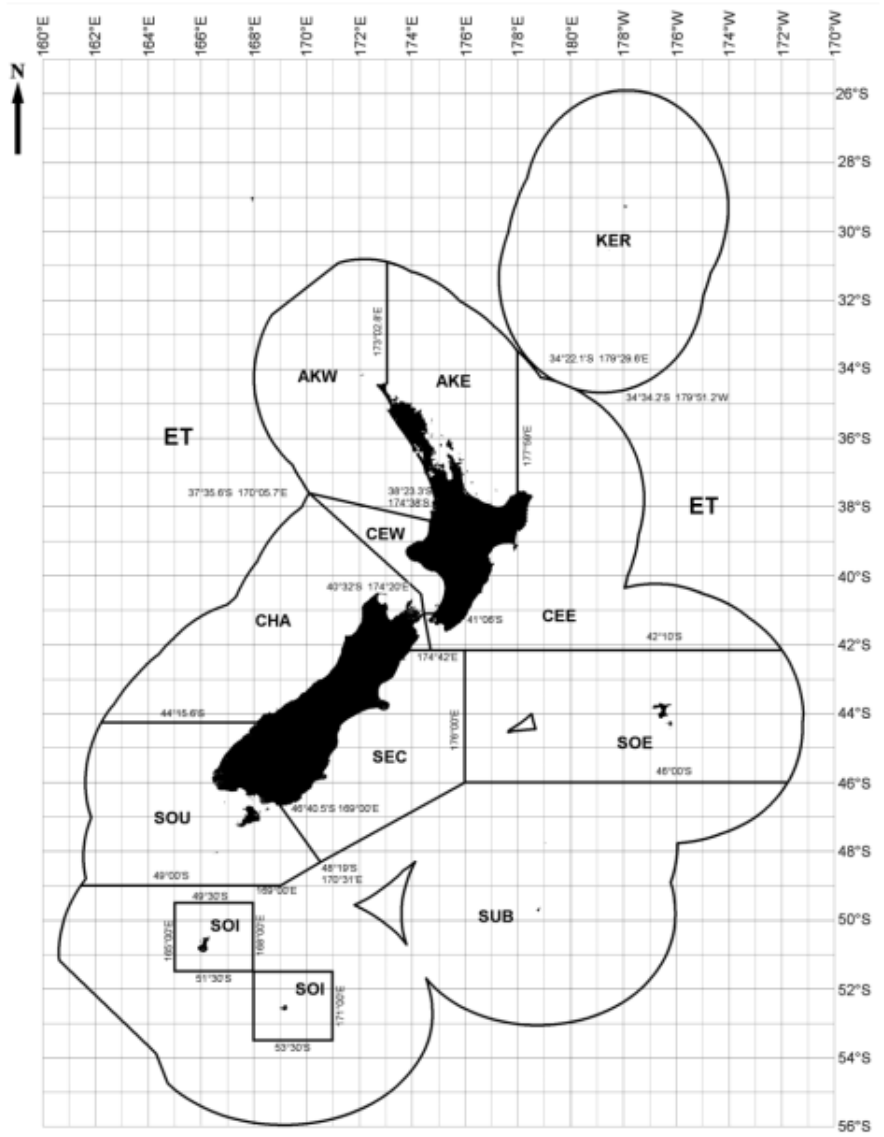
Observer coverage has significantly decreased in the inshore and highly migratory fleets since 2022–23 as vessels transition to on-board cameras. Further information can be found on the Fisheries New Zealand website[4].

Table 1. Summary of commercial effort, observed effort and protected species interactions in fisheries with observer coverage > 0% during the 2023/24 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	12,427	4,803	38.6	164	87.8
Middle Depth Trawl - Southern Blue Whiting	615	614	100	18	0.0
Middle Depth Trawl - Scampi	4,757	1,013	21.3	18	549.2
Middle Depth Trawl - Squid	2,791	2,489	89.2	193	148.5
Pelagic Trawl - Mackerel and Barracouta	3,892	2,148	55.2	40	0.2
Deepwater Bottom Trawl	2,887	1,312	45.4	9	337.7
Inshore Trawl	25,614	402	1.6	3	4.0
Inshore Setnet	19,485	259	1.3	14	198.0
Surface Longline	1,664	18	1.1	18	0.0
Deepwater Bottom Longline	4,574	595	12.8	26	4.7
Inshore Bottom Longline	5,155	18	0.3	0	0.8
Bottom Longline - Snapper	5,353	124	2.3	2	3.0
Purse Seine - Skipjack	41	26	63.4	4	0.0
Purse Seine - Other	527	49	9.3	0	0.0
Precision Seafood Harvesting (PSH)	1,549	56	3.6	0	2.0

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

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



Key:

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

Middle Depth Trawl Fisheries

Hoki, Hake, Ling and Warehou species

The hoki, hake, ling 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 used one of the 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 2023/24 observer year. In the 2023/24 observer year the commercial effort decreased by 3.3% from the previous year and observer coverage increased by 4.8%.

The number of seabird captures observed in 2023/24 decreased by 13.1% from 137 in the previous observer year to 119 (McGovern & Hewetson 2025). Observed marine mammal captures decreased by 30.5% from 59 in 2022/23 to 41 in 2023/24. Observed protected fish captures increased from 1 in 2022/23 to 4 in 2023/24 (McGovern & Hewetson 2025). A total of 87.8 kg of coral bycatch was observed this year, in comparison to the 103.4 kg of coral bycatch observed in 2022/23.

In summary, 94 observed trips were conducted aboard 30 vessels, with protected species captures occurring on 59 trips aboard 25 vessels (62.8% of observed trips, and 83.3% 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 2023/24 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	218	1	0.5	0	0.0	0	0.0	0	0.0	0.0	0.0
2. CEE	937	209	22.3	4	1.9	15	7.2	0	0.0	0.0	0.0
3. SEC	3,838	1,404	36.6	39	2.8	16	1.1	2	0.0	76.0	5.4
4. SOE	2,299	738	32.1	20	2.7	0	0.0	0	0.0	6.6	0.9
5. SOU	1,090	385	35.3	8	2.1	1	0.0	0	0.0	0.9	0.2
6. SUB	990	576	58.2	17	3.0	2	0.0	2	0.3	3.3	0.6
7. CHA	3,025	1,489	49.2	31	2.1	7	0.5	0	0.0	1.0	0.1
8. CEW	11	1	9.1	0	0.0	0	0.0	0	0.0	0.0	0.0
9. AKW	19	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0.0
Total	**12,427**	**4,803**	**38.6**	**119**	**2.5**	**41**	**0.9**	**4**	**0.1**	**87.8**	**1.8**

Table 3 reports on the numbers of interactions by species and fate immediately post interaction for the 2023/24 observer year. 65.2% of protected species interactions resulted in mortalities. Salvin's albatross were the most commonly bycaught seabird species in this fishery and New Zealand fur seals were the most bycaught species overall.

Table 3. Protected species interactions in the hake, hoki, ling and warehou middle depth trawl fisheries during the 2023/24 observer year.

Species	Alive	Dead	Total
Seabirds			
Albatrosses (Unidentified)	1	0	**1**
Buller's albatross	2	21	**23**
Buller's and Pacific albatross	5	0	**5**
Cape petrel	4	2	**6**
Fairy prion	1	0	**1**
Flesh-footed shearwater	1	0	**1**
Grey-backed storm petrel	1	0	**1**
Little black cormorant	1	0	**1**
Mid-sized Petrels & Shearwaters	0	1	**1**
Petrels, Prions and Shearwaters	2	0	**2**
Prions (Unidentified)	3	0	**3**
Procellaria petrels	1	1	**2**
Royal albatrosses	3	0	**3**
Salvin's albatross	9	21	**30**
Shags	1	0	**1**
Shearwaters	1	0	**1**
Smaller albatrosses	2	1	**3**
Sooty shearwater	6	7	**13**
Southern royal albatross	0	1	**1**
Westland petrel	0	1	**1**
White-capped albatross	8	4	**12**
White-chinned petrel	0	7	**7**
Seabirds Total	**52**	**67**	**119**
Marine Mammals			
Bottlenose dolphin	0	2	**2**
Common dolphin	0	1	**1**
New Zealand fur seal	2	36	**38**
Marine Mammals Total	**2**	**39**	**41**
Protected Fish			
Basking shark	2	1	**3**
White pointer shark	1	0	**1**
Protected Fish Total	**3**	**1**	**4**
Total	**57**	**107**	**164**

Tables 4a and b detail the method of interaction for each species. Net capture was the most prevalent form of interaction overall, with 79.7% 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 2023/24 observer year.

a) Protected species released alive

Species	Brought on board	Caught in net	Impact against vessel	Other/Unknown	Total
Seabirds					
Albatrosses (Unidentified)	0	0	1	0	1
Buller's albatross	0	1	1	0	2
Buller's and Pacific albatross	3	1	1	0	5
Cape petrel	0	2	2	0	4
Fairy prion	1	0	0	0	1
Flesh-footed shearwater	0	0	1	0	1
Grey-backed storm petrel	0	0	1	0	1
Little black cormorant	0	0	1	0	1
Petrels, Prions and Shearwaters	0	0	2	0	2
Prions (Unidentified)	0	1	2	0	3
Procellaria petrels	0	0	1	0	1
Royal albatrosses	0	3	0	0	3
Salvin's albatross	1	7	1	0	9
Shags	0	0	1	0	1
Shearwaters	1	0	0	0	1
Smaller albatrosses	0	1	1	0	2
Sooty shearwater	1	4	0	1	6
White-capped albatross	1	3	4	0	8
Seabird Total	**8**	**23**	**20**	**1**	**52**
Marine Mammals					
New Zealand fur seal	0	1	0	1	2
Marine Mammal Total	**0**	**1**	**0**	**1**	**2**
Protected Fish					
Basking shark	0	2	0	0	2
White pointer shark	0	1	0	0	1
Protected Fish Total	**0**	**3**	**0**	**0**	**3**
Total	**8**	**27**	**20**	**2**	**57**

b) Dead protected species

Species	Caught in net	Caught on warp door	Caught in tori line	Impact against vessel	Other/ unknown	Total
Seabirds						
Buller's albatross	14	5	0	1	1	21
Cape petrel	2	0	0	0	0	2
Mid-sized Petrels & Shearwaters	1	0	0	0	0	1
Procellaria petrels	1	0	0	0	0	1
Salvin's albatross	20	1	0	0	0	21
Smaller albatrosses	0	0	0	0	1	1
Sooty shearwater	5	1	0	1	0	7
Southern royal albatross	0	0	1	0	0	1
Westland petrel	1	0	0	0	0	1
White-capped albatross	4	0	0	0	0	4
White-chinned petrel	6	0	0	0	1	7
Seabird Total	**54**	**7**	**1**	**2**	**3**	**67**
Marine Mammals						
Bottlenose dolphin	2	0	0	0	0	2
Common dolphin	1	0	0	0	0	1
New Zealand fur seal	36	0	0	0	0	36
Marine Mammal Total	**39**	**0**	**0**	**0**	**0**	**39**
Protected Fish						
Basking shark	1	0	0	0	0	1
Protected Fish Total	**1**	**0**	**0**	**0**	**0**	**1**
Total	**94**	**7**	**1**	**2**	**3**	**107**

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 & Hewetson 2025).

Table 5 presents a summary of commercial fishing effort, observer effort and protected species captures in the fishery during the 2023/24 observer year. There was a 19.0% increase in fishing effort in this fishery in this observer year, however the number of observed tows was comparable to the previous year, therefore there was no difference in observer coverage in this fishery between 2022/23 and 2023/25.

Observed seabird captures in the 2023/24 observer year increased from 4 in 2022/23 to 7 in 2023/24 (McGovern & Hewetson 2025). Marine mammal captures increased from 2 in the 2022/23 observer year to 11 in 2023/24 (McGovern & Hewetson 2025).

In summary, thirteen observed trips were conducted aboard twelve vessels, with protected species captures occurring on five trips aboard five vessels (38.5% of observed trips involved protected species captures and 41.7% of these vessels had protected species interactions in 2023/24).

Table 5. Summary of commercial effort, observer effort and protected species interactions in the southern blue whiting fishery during the 2023/24 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird captures	Seabirds /100 tows	Mammal captures	Mammals /100 tows
1. AKE	0	0	0.0	0	0.0	0	0.0
2. CEE	0	0	0.0.	0	0.0	0	0.0
3. SEC	0	0	0.0	0	0.0	0	0.0
4. SOE	0	0	0.0	0	0.0	0	0.0
5. SOU	0	0	0.0	0	0.0	0	0.0
6. SUB	614	614	100.0	7	1.1	11	1.8
7. CHA	0	0	0.0	0	0.0	0	0.0
8. CEW	0	0	0.0	0	0.0	0	0.0
9. AKW	0	0	0.0	0	0.0	0	0.0
Total	**614**	**614**	**100.0**	**7**	**1.1**	**11**	**1.8**

Table 6 reports the numbers of interactions by species and fate immediately post interaction for the 2023/24 observer year. 66.7% of the observed interactions resulted in mortalities.

Table 6. Protected species interactions in the southern blue whiting fishery during the 2023/24 observer year.

Species	Alive	Dead	Total
Seabirds			
Campbell albatross	0	1	1
Cape petrel	3	0	3
Common diving petrel	1	0	1
Petrels, Prions and Shearwaters	1	0	1
Prions (Unidentified)	1	0	1
Seabirds Total	**6**	**1**	**7**
Marine Mammals			
New Zealand fur seal	0	9	9
New Zealand sea lion	0	2	2
Marine Mammals Total	**0**	**11**	**11**
Total	**6**	**12**	**18**

Tables 7a and b detail the method of interaction by species.

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 2023/24 observer year.

a) Protected species released alive

Species	Impact against vessel	Total
Seabirds		
Cape petrel	3	3
Common diving petrel	1	1
Petrels, Prions and Shearwaters	1	1
Prions (Unidentified)	1	1
Seabirds Total	**6**	**6**
Total	**6**	**6**

b) Dead protected species

Species	Caught in net	Caught in SLED	Total
Seabirds			
Campbell albatross	1	0	1
Seabird Total	**1**	**0**	**1**
Marine Mammals			
New Zealand fur seal	9	0	9
New Zealand sea lion	0	2	2
Marine Mammal Total	**9**	**2**	**11**
Total	**10**	**2**	**12**

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 2023/24 observer year. Commercial effort increased by 2.4% in comparison to the year prior (2022/23) and overall observer coverage increased by 28.6% (McGovern & Hewetson 2025).

The number of seabird interactions in the 2023/24 observer year decreased from 30 seabird interactions in 2022/23 to 18 in 2023/24. There was 549.2 kg of coral bycatch in this fishery in 2023/24, a decrease from the 1,041 kg that was bycaught in 2022/23 (McGovern & Hewetson 2025).

In summary, 15 observed trips were conducted aboard 10 vessels, with 10 protected species captures occurring aboard 10 vessels (66.7% of trips involved protected species captures and 80% of vessels that operated within this fishery during the 2023/24 year had protected species captures).

Table 8. Summary of commercial effort, observer effort and protected species interactions in the scampi fishery during the 2023/24 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird captures	Seabirds /100 tows	Coral catch (kg)	Coral catch /100 tows
1. AKE	510	206	40.4	0	0.0	0.0	0.0
2. CEE	586	114	19.5	2	0.0	0.0	0.0
3. SEC	6	2	33.3	0	0.0	0.0	0.0
4. SOE	1,830	382	20.9	9	2.4	549.2	143.8
5. SOU	0	0	0.0	0	0.0	0.0	0.0
6. SUB	1,702	309	18.2	7	2.3	0.0	0.0
7. CHA	123	0	0.0	0	0.0	0.0	0.0
8. CEW	0	0	0.0	0	0.0	0.0	0.0
9. AKW	0	0	0.0	0	0.0	0.0	0.0
Total	**4,757**	**1,013**	**21.3**	**18**	**1.8**	**549.2**	**54.2**

Table 9 reports the number of interactions by species and fate immediately post interaction.

Table 9. Protected species interactions in the scampi fishery during the 2023/24 observer year.

Species	Alive	Dead	Total
Seabirds			
Buller's albatross	0	3	3
Cape petrel	1	0	1
Fairy prion	1	0	1
Salvin's albatross	4	5	9
Smaller albatrosses	0	1	1
White-capped albatross	0	1	1
White-chinned petrel	0	2	2
Seabirds Total	6	12	18
Total	**6**	**12**	**18**

Table 10a and b detail the method of interaction by species.

Table 10. Method of interaction for a) protected species released alive and b) dead protected species observed in the scampi fishery during the 2023/24 observer year.

a) Protected species released alive

Species	Impact against vessel	Total
Cape petrel	1	1
Fairy prion	1	1
Salvin's albatross	4	4
Seabirds Total	6	6
Total	**6**	**6**

b) Dead protected species

Species	Caught in net	Caught in warp door	Total
Seabirds			
Buller's albatross	2	1	3
Salvin's albatross	2	3	5
Smaller albatrosses	0	1	1
White-capped albatross	0	1	1
White-chinned petrel	2	1	2
Seabirds Total	6	6	12
Total	**6**	**6**	**12**

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 en route 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 11 presents a summary of commercial fishing effort, observer effort and protected species captures in the fishery during the 2023/24 observer year. Commercial fishing effort increased by 25.5% and observer coverage increased by 4.1% from the previous year (McGovern & Hewetson 2025).

Seabird interactions decreased by 15.1%, from 185 in 2022/23 to 157 in 2023/24. Similar to previous years, the majority of observed seabird interactions occurred in the SOU and SOE FMAs. Marine mammal captures increased from 10 interactions in 2022/23 to 35 in 2023/24 (McGovern & Hewetson 2025). Protected fish captures decreased by 80% from 5 in the previous observer year (2022/23) to 1 in 2023/24. Observed coral bycatch decreased from 1,252.2 kg in 2022/23 to 148.5 kg in 2023/24 (McGovern & Hewetson 2025).

In summary, 66 observed trips were conducted aboard 21 vessels, with protected species captures occurring on 42 trips aboard 19 vessels (63.6% of trips involved protected species captures and 90.5% of vessels that operated within this fishery during the 2023/24 year had protected species captures).

Table 11. Summary of commercial effort, observer effort and protected species interactions in the squid fishery during the 2023/24 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	0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0.0
2. CEE	0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0.0
3. SEC	661	559	84.6	17	3.0	4	0.7	0	0.0	98.6	17.6
4. SOE	301	259	86.0	30	11.6	2	0.8	0	0.0	3.8	1.5
5. SOU	1,590	1,481	93.1	102	6.9	27	1.8	0	0.0	45	3.0
6. SUB	239	188	78.7	8	4.3	2	1.1	1	0.5	1.1	0.6
7. CHA	0	2	0.0	0	0.0	0	0.0	0	0.0	0.0	0.0
8. CEW	0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0.0
9. AKW	0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0.0
Total	**2,791**	**2,489**	**89.2**	**157**	**6.3**	**35**	**1.4**	**1**	**0.04**	**148.5**	**6.0**

Table 12 lists the protected coral species bycaught in 2023/24, with *Coral (unidentified)* being the most commonly bycaught species, the majority of which occurred during one trip.

Table 12. Protected species of coral bycaught in the squid trawl fishery during the 2023/24 observer year.

Species	Weight (kg)
Sea fans	1.0
Black corals	0.2
Bottlebrush coral	0.2
Caryophyllia spp.	0.1
Coral (Unidentified)	90.6
Coral rubble-dead	50.0
Flabellum cup corals	2.9
Gorgonian coral	0.1
Hydrocorals	3.0
Red hydrocorals	0.1
Spiny white hydrocorals	0.2
Stony corals	0.1
Total	**148.5**

Table 13 reports the numbers of interactions by species and fate immediately post interactions. Salvin's albatross were the most commonly bycaught protected species. All but one marine mammal capture resulted in mortality; this individual was a fur seal that was released from the net however was indicated as unlikely to survive. There were four seabird interactions in this fishery that were recorded as deck strikes but could not be associated with a fishing event and therefore are not included in this report.

Table 13. Protected species interactions in the squid fishery during the 2023/24 observer year.

Species	Alive	Dead	Total
Seabirds			
Buller's albatross	5	2	7
Buller's and Pacific albatross	3	0	3
Fairy prion	1	0	1
Great albatrosses	1	0	1
Petrel (Unidentified)	2	0	2
Petrels, Prions and Shearwaters	1	0	1
Prions (Unidentified)	1	1	2
Procellaria petrels	3	2	5
Royal albatrosses	1	0	1
Salvin's albatross	6	35	41
Smaller albatrosses	1	0	1
Sooty shearwater	3	31	34
Southern royal albatross	0	1	1
Storm petrels	0	1	1
White-capped albatross	16	14	30
White-chinned petrel	5	20	25
Seabirds Total	**49**	**108**	**157**
Marine Mammals			
New Zealand fur seal	1	34	35
Marine Mammals Total	**1**	**34**	**35**
Protected Fish			
White pointer shark	1	0	1
Protected Fish Total	**1**	**0**	**1**
Total	**51**	**142**	**193**

Tables 14a and b detail the method of interaction for each species. Net capture in fishing gear was the most prevalent form of interaction overall and was responsible for 89.4% of the interactions that resulted in mortalities. A white pointer shark, likely a juvenile, was caught in the SLED and released however it was noted that it was unlikely to survive.

Table 14. Method of interaction for a) protected species released alive and b) dead protected species in the squid fishery during the 2023/24 observer year.

a) Protected species released alive

Species	Brought on board	Caught in net	Caught in SLED	Impact against vessel	Total
Seabirds					
Buller's albatross	0	5	0	0	5
Buller's and Pacific albatross	0	3	0	0	3
Fairy prion	0	0	0	1	1
Great albatrosses	0	1	0	0	1
Petrel (Unidentified)	0	2	0	0	2
Petrels, Prions and Shearwaters	0	1	0	0	1
Prions (Unidentified)	0	0	0	1	1
Procellaria petrels	0	2	0	1	3
Royal albatrosses	0	1	0	0	1
Salvin's albatross	2	4	0	0	6
Smaller albatrosses	0	1	0	0	1
Sooty shearwater	1	2	0	0	3
White-capped albatross	0	14	0	2	16
White-chinned petrel	0	4	0	1	5
Seabirds Total	**3**	**40**	**0**	**6**	**49**
Marine Mammals					
New Zealand fur seal	0	1	0	0	1
Marine Mammals Total	**0**	**1**	**0**	**0**	**1**
Protected Fish					
White pointer shark	0	0	1	0	1
Protected Fish Total	**0**	**0**	**1**	**0**	**1**
Total	**3**	**41**	**1**	**6**	**51**

b) Dead protected species

Species	Caught in SLED	Caught in net	Caught on warp	Impact against vessel	Other/ Unknown	Total
Seabirds						
Buller's albatross	0	2	0	0	0	2
Prions (Unidentified)	0	1	0	0	0	1
Procellaria petrels	0	2	0	0	0	2
Salvin's albatross	0	33	2	0	0	35
Sooty shearwater	0	29	0	1	1	31
Southern royal albatross	0	1	0	0	0	1
Storm petrels	0	0	0	1	0	1
White-capped albatross	0	8	5	0	1	14
White-chinned petrel	0	20	0	0	0	20
White-faced storm petrel	0	0	0	1	0	1
Seabirds Total	**0**	**96**	**7**	**3**	**2**	**108**
Marine Mammals						
New Zealand fur seal	3	31	0	0	0	34
Marine Mammals Total	**3**	**31**	**0**	**0**	**0**	**34**
Total	**3**	**127**	**7**	**3**	**2**	**142**

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 15 presents a summary of commercial fishing effort, observer effort and protected species captures in the fishery during the 2023/24 observer year. Commercial effort in this fishery decreased slightly by 15.3% since the previous year (2022/23), and overall observer coverage increased by 19.8% in this fishery from the previous observer year (2022/23).

The number of seabird captures increased from 16 in the previous observer year (2022/23) to 36 in 2023/24 (McGovern & Hewetson 2025). Marine mammal captures decreased by 72.7%, from 11 captures in 2022/23 to 3 captures in 2023/24. Coral bycatch in 2023/24 decreased in comparison to the year prior (from 1.2 kg in 2022/23 to 0.2 kg) (McGovern & Hewetson 2025).

In summary, 57 observed trips were conducted aboard 13 vessels, with protected species captures occurring on 13 trips aboard 8 vessels (22.8% of trips involved protected species captures and 61.5% of vessels that operated within this fishery during the 2023/24 year had protected species captures).

Table 15. Summary of commercial effort, observer effort and protected species interactions in the jack mackerel and barracouta pelagic trawl fishery during the 2023/24 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	5	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0.0
2. CEE	31	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0.0
3. SEC	1,176	397	33.8	25	6.3	0	0.0	0	0.0	0.2	0.1
4. SOE	240	225	93.8	2	0.9	0	0.0	0	0.0	0.0	0.0
5. SOU	433	323	74.6	8	2.5	3	0.9	1	0.3	0.0	0.0
6. SUB	0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0.0
7. CHA	718	349	48.6	0	0.0	0	0.0	0	0.0	0.0	0.0
8. CEW	1,079	733	67.9	1	0.1	0	0.0	0	0.0	0.0	0.0
9. AKW	210	121	57.6	0	0.0	0	0.0	0	0.0	0.0	0.0
Total	**3,892**	**2,148**	**55.2**	**36**	**1.7**	**3**	**0.1**	**1**	**0.0**	**0.2**	**0.0**

Table 16 reports the number of interactions by species and fate immediately post interaction.

Table 16. Protected species interactions in the jack mackerel and barracouta pelagic trawl fisheries during the 2023/24 observer year.

Species	Alive	Dead	Total
Seabirds			
Buller's albatross	0	2	0
Buller's and Pacific albatross	1	1	2
Fairy prion	0	1	1
Pterodroma petrels	1	0	1
Salvin's albatross	1	0	0
Sooty shearwater	11	18	29
Seabirds Total	**14**	**22**	**36**
Marine Mammals			
New Zealand fur seal	0	3	3
Marine Mammals Total	**0**	**3**	**3**
Protected Fish			
White pointer shark	0	1	1
Protected Fish Total	**0**	**1**	**1**
Total	**14**	**26**	**40**

Tables 17a and b detail the method of interaction for each species. Impact against vessel was the most prevalent form of interaction overall with the majority of interactions occurring during one trip, all involving sooty shearwaters.

Table 17. 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 2023/24 observer year.

a) Protected species released alive

Species	Brought on board	Impact against vessel	Total
Seabirds			
Buller's albatross	0	1	2
Pterodroma petrels	0	1	1
Salvin's albatross	1	0	1
Sooty shearwater	0	11	29
Seabirds Total	**1**	**13**	**14**
Total	**1**	**13**	**14**

b) Dead protected species

Species	Caught in net	Caught on warp or door	Impact against vessel	Total
Seabirds				
Buller's albatross	2	0	0	2
Buller's and Pacific albatross	1	0	0	1
Fairy prion	0	0	1	1
Sooty shearwater	11	1	6	18
Seabird Total	**14**	**1**	**7**	**22**
Marine Mammals				
New Zealand fur seal	3	0	0	3
Marine Mammal Total	**3**	**0**	**0**	**3**
Protected Fish				
White pointer shark	1	0	0	1
Protected Fish Total	**1**	**0**	**0**	**1**
Total	**18**	**1**	**7**	**26**

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 18 presents a summary of commercial fishing effort, observer effort and protected species captures in the deep water trawl fishery during the 2023/24 observer year. Commercial effort decreased by 24.% in 2023/24 and there was a 24.2% increase in overall observer coverage in comparison to the previous observer year (2022/23).

The rate of seabird captures decreased by 25% from 12 captures in the 2022/23 observer year to 9 in 2023/24 (McGovern & Hewetson 2025). Coral bycatch for this observer year decreased from 2,925.5 kg in 2022/23 to 335.4 kg in 2023/24 (McGovern & Hewetson 2025).

In summary, 19 observed trips were conducted aboard 10 vessels, with protected species captures occurring on 12 trips aboard 6 vessels (63.2% of trips involved protected species captures and 60% of vessels that operated within this fishery during the 2023/24 year had protected species captures).

Table 18. Summary of commercial effort, observer effort and protected species interactions in the orange roughy, cardinal and oreo deep water bottom trawl fisheries during the 2023/24 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird captures	Seabirds /100 tows	Coral catch (kg)	Coral catch /100 tows
1. AKE	35	0	0.0	0	0.0	0	0.0
2. CEE	697	81	11.6	2	0.0	34.1	42.1
3. SEC	388	214	55.2	1	0.5	54.3	25.4
4. SOE	896	600	67.0	6	1.0	33.8	5.6
5. SOU	61	38	62.3	0	0.0	0.1	0.3
6. SUB	188	188	100.0	0	0.0	56.9	30.3
7. CHA	394	134	34.0	0	0.0	0.0	0.0
8. CEW	0	0	0.0	0	0.0	0.0	0.0
9. AKW	178	57	32.0	0	0.0	156.2	274.0
Total	**2,837**	**1,312**	**46.2**	**9**	**0.7**	**335.4**	**25.6**

Table 19 lists the protected coral species bycaught in 2023/24. The most commonly identified species recorded as bycatch was deepwater branching coral, all of which occurred during one trip.

Table 19. Protected species of coral bycaught in the orange roughy, cardinal and oreo deep water bottom trawl fisheries during the 2023/24 observer year.

Species	Weight (kg)
Bamboo coral	12.1
Bamboo corals	5.31
Black corals	0.3
Bottlebrush coral	0.4
Bubblegum coral	39.7
Bushy hard coral	14.7
Callogorgia spp.	0.1
Conopora spp.	0.1
Coral (Unidentified)	44.1
Crested cup coral	11
Deepwater branching coral	97.8
Golden corals	0
Gorgonian coral	0.1
Hydrocorals	4.1
Leiopathes black coral	0.2
Leiopathes spp.	0.3
Lillipathes spp.	0.2
Madrepora coral	0.2
Parantipathes spp.	0.3
Primnoa spp.	9.3
Primnoidae (Family)	2.1
Solitary bowl coral	1.4
Stony branching corals	3.8
Stony corals	90.1
Total	**337.71**

Table 20 reports the number of interactions by species and fate immediately post interaction.

Table 20. Protected species interactions in the orange roughy, cardinal and oreo deep water bottom trawl fisheries during the 2023/24 observer year.

Species	Alive	Dead	Total
Seabirds			
Albatrosses (Unidentified)	1	1	2
Buller's albatross	0	2	2
Cape petrel	1	1	2
Petrels, Prions and Shearwaters	1	0	1
Salvin's albatross	1	1	2
Seabirds Total	**4**	**5**	**9**
Total	**4**	**5**	**9**

Tables 21a and b detail the method of interaction for each species. Impact against vessel was the most prevalent form of interaction overall.

Table 21. Method of interaction for a) observed protected species released alive and b) dead protected species in the orange roughy, cardinal and oreo deep water bottom trawl fisheries during the 2023/24 observer year.

a) Protected species released alive

Species	Caught in net	Impact against vessel	Total
Seabirds			
Albatrosses (Unidentified)	0	1	1
Cape petrel	0	1	1
Petrels, Prions and Shearwaters	0	1	1
Salvin's albatross	1	0	1
Seabird Total	**1**	**3**	**4**
Total	**1**	**3**	**4**

b) Dead protected species

Species	Caught in net	Caught on warp door	Impact against vessel	Total
Seabirds				
Albatrosses (Unidentified)	0	1	0	1
Buller's albatross	1	0	1	2
Cape petrels	0	0	1	1
Salvin's albatross	0	1	0	1
Seabird Total	**1**	**2**	**2**	**5**
Total	**1**	**2**	**2**	**5**

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 on shore or travelling between ports. Additionally, observer coverage in the inshore fisheries has reduced significantly since 2022 due to the introduction of onboard cameras.

Table 22 presents a summary of commercial fishing effort, observer effort and protected species captures in the inshore trawl fishery during the 2023/24 observer year. Commercial effort decreased by 1.2% over 2023/24 and observer coverage decreased by 40.1% since the previous year (McGovern & Hewetson 2025).

Seabird interactions decreased from 4 captures observed in 2022/23 to 0 captures in 2023/24 (McGovern & Hewetson 2025). There was one marine mammal capture observed in 2023/24, in comparison to three captures in 2022/23 (McGovern & Hewetson 2025). 2.0 kg of coral bycatch was observed in 2023/24 compared to 30.2 kg of coral bycatch observed in 2022/23 (McGovern & Hewetson 2025).

In summary, 10 observed trips were conducted aboard 10 vessels, with protected species captures occurring on 2 trips onboard 2 vessels (20% of trips involved protected species captures and 20% of vessels that operated within this fishery during the 2023/24 year had protected species captures).

Table 22. Summary of the commercial effort, observer effort and protected species interactions in the inshore trawl fisheries during the 2023/24 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)	Mammal captures	Mammals/100 tows	Protected fish captures	Protected fish/100 tows	Coral catch (kg)	Coral catch/100 tows
1. AKE	3,044	126	4.1	1	0.0	2	1.6	2	1.6
2. CEE	3,555	88	2.5	0	0.0	0	0.0	0	0.0
3. SEC	7,273	151	2.1	0	0.0	0	0.0	0	0.0
4. SOE	0	0	0.0	0	0.0	0	0.0	0	0.0
5. SOU	2,125	0	0.0	0	0.0	0	0.0	0	0.0
6. SUB	0	0	0.0	0	0.0	0	0.0	0	0.0
7. CHA	7,083	0	0.0	0	0.0	0	0.0	0	0.0
8. CEW	995	0	0.0	0	0.0	0	0.0	0	0.0
9. AKW	1,537	37	2.4	0	0.0	0	0.0	0	0.0
Total	**25,612**	**402**	**1.6**	**1**	**0.2**	**2**	**0.50**	**2.0**	**0**

Table 23 reports the number of interactions by species and fate immediately post interaction. Smalltooth sandtiger shark was the most commonly bycaught species.

Table 23. Protected species interactions in the inshore trawl fisheries during the 2023/24 observer year.

Species	Alive	Dead	Total
Marine Mammals			
Bottlenose dolphin	0	1	1
Marine Mammals Total	**0**	**1**	**1**
Protected Fish			
Smalltooth sandtiger shark	2	0	2
Protected Fish Total	**2**	**0**	**2**
Total	**2**	**1**	**3**

Tables 24a and b detail the method of interaction for each species. All interactions were equated to internal net capture.

Table 24. Method of interaction for a) protected species released alive and b) dead protected species observed in the inshore trawl fisheries during the 2023/24 observer year.

a) Protected species released alive

Species	Caught in net	Total
Protected Fish		
Smalltooth sandtiger shark	2	2
Protected Fish Total	**2**	**2**
Total	**2**	**2**

b) Dead protected species

Species	Caught in net	Total
Marine Mammals		
Bottlenose dolphin	1	1
Marine Mammal Total	1	1
Total	**1**	**1**

Inshore Setnet

Setnet fisheries have received low levels of observer coverage due to the difficulty of placing observers on board these generally very small vessels. 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. Additionally, observer coverage in the inshore fisheries has significantly reduced due to the introduction of onboard cameras.

Table 25 presents a summary of commercial fishing effort, observer effort and protected species captures in the fishery during the 2023/24 observer year. Fishing effort in 2023/24 increased by 10.2% from the 2022/23 fishing year, and overall observer coverage decreased by 70.7% (McGovern & Hewetson 2025).

Seabird captures decreased by from 20 observed interactions in 2022/23 to 6 in 2023/24 (McGovern & Hewetson 2025). The number of marine mammal captures increased from 6 in 2022/23 to 8 in 2023/24. The amount of coral bycatch in 2023/24 increased to 181 kg, compared to 148 kg of corals bycaught in 2022/23 (McGovern & Hewetson 2025).

In summary, six observed trips were conducted aboard six vessels, with protected species captures occurring on four trips aboard four vessels (66.7% of trips involved protected species captures and 66.7% of vessels that operated within this fishery during the 2023/24 year had protected species captures).

Table 25. Summary of commercial effort, observer effort and protected species interactions in the inshore setnet fishery during the 2023/24 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	5,178	0	0.0	0	0.0	0	0.0	0	0.0
2. CEE	1,700	0	0.0	0	0.0	0	0.0	0	0.0
3. SEC	3,552	250	7.0	6	2.4	8	3.2	181	72.4
4. SOE	0	0	0.0	0	0.0	0	0.0	0	0.0
5. SOU	1,084	9	0.8	0	0.0	0	0.0	0	0.0
6. SUB	0	0	0.0	0	0.0	0	0.0	0	0.0
7. CHA	450	0	0.0	0	0.0	0	0.0	0	0.0
8. CEW	449	0	0.0	0	0.0	0	0.0	0	0.0
9. AKW	7,066	0	0.0	0	0.0	0	0.0	0	0.0
Total	**19,479**	**259**	**1.3**	**6**	**2.3**	**8**	**3.1**	**181.0**	**69.9**

Table 26 reports the number of interactions with inshore setnet fishery by species and fate immediately post interaction. The observed coral bycatch in this fishery occurred across two trips, and was a mixture of hydrocorals and stony branching corals.

Table 26. Protected species interactions in the inshore setnet fishery during the 2023/24 observer year.

Species	Alive	Dead	Total
Seabirds			
Cape petrel	1	0	1
Otago shag	0	3	3
Westland petrel	0	1	1
White-chinned petrel	1	0	1
Seabirds Total	**2**	**4**	**6**
Marine Mammals			
New Zealand fur seal	0	8	8
Marine Mammals Total	**0**	**8**	**8**
Total	**2**	**12**	**14**

Tables 27a and b detail the method of interaction by species.

Table 27. Method of interaction for a) protected species released alive and b) dead protected species observed in the setnet fishery during the 2023/24 observer year

a) Protected species released alive

Species	Impact against vessel	Total
Seabirds		
Cape petrel	1	1
White-chinned petrel	1	1
Seabird Total	**2**	**2**
Total	**2**	**2**

b) Dead protected species

Species	Caught in net	Total
Seabirds		
Westland petrel	1	2
Otago shag	3	1
Seabird Total	**4**	**3**
Marine Mammals		
New Zealand fur seal	8	8
Marine Mammal Total	**8**	**8**
Total	**12**	**11**

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 also 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 2023/24 observer year. Commercial effort decreased by 7.0% in comparison to the previous year (2022/23). There was a significant decrease of 67.7% in overall observer coverage in this fishery since the previous observer year (2022/23).

The number of seabird interactions observed in 2023/24 increased by 25%, with 15 interactions in 2023/24 compared to 12 interactions observed in 2022/23 (McGovern & Hewetson 2025). The number of marine mammal observed captures decreased by 75% from 12 observed interactions in 2022/23 to 3 in 2023/24 (McGovern & Hewetson 2025).

In summary, two observed trips were conducted aboard two vessels, with protected species captures occurring on both trips (100% of trips involved protected species captures and 100% of vessels that were observed within this fishery during the 2023/24 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 2023/24 observer year

FMA	Effort Lines	Observed Lines	Coverage (%)	Number of hooks observed	Seabird captures	Seabirds /1000 hooks	Mammal captures	Mammals/ 1000 hooks
1. AKE	416	3	0.7	2,717	0	0.0	0	0.0
2. CEE	283	1	0.4	1,001	1	1.0	0	0.0
3. SEC	598	0	0.0	0	0	0.0	0	0.0
4. SOE	1	0	0.0	0	0	0.0	0	0.0
5. SOU	0.0	0	0.0	0	0	0.0	0	0.0
6. SUB	3	0	0.0	0	0	0.0	0	0.0
7. CHA	256	14	5.5	10,145	14	1.4	3	0.3
8. CEW	4	0	0.0	0	0	0.0	0	0.0
9. AKW	103	0	0.0	0	0	0.0	0	0.0
Total	**1,664**	**18**	**1.1**	**13,863**	**15**	**1.08**	**3**	**0.22**

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Table 30 reports the number of interactions by species and fate immediately post interaction. White-capped albatross were the most common protected species interaction in the 2023/24 observer year (44% of all interactions). Overall, 89% of interactions resulted in mortalities.

Table 30. Protected species interactions in the domestic tuna and swordfish fishery during the 2023/24 observer year.

Species	Alive	Dead	Total
Seabirds			
Buller's albatross	0	2	2
Campbell albatross	0	1	1
Southern royal albatross	0	1	1
Storm petrels	1	0	1
Westland petrel	0	2	2
White-capped albatross	0	8	8
Seabirds Total	**1**	**14**	**15**
Marine Mammals			
New Zealand fur seal	1	2	3
Marine Mammals Total	**1**	**2**	**3**
Total	**2**	**16**	**18**

Tables 31a and b detail the method of interaction for each species.

Table 31. Method of interaction for a) protected species released alive, and b) dead protected species observed in the domestic tuna and swordfish fishery during the 2023/24 observer year.

a) Protected species released alive

Species	Caught on hook	Impact against vessel	Total
Seabirds			
Storm petrels	0	1	1
Seabird Total	**0**	**1**	**1**
Marine Mammals			
New Zealand fur seal	1	0	1
Marine Mammal Total	**1**	**0**	**1**
Total	**1**	**1**	**2**

b) Dead protected species

Species	Caught on hook	Total
Seabirds		
Buller's albatross	2	2
Campbell albatross	1	1
Southern royal albatross	1	1
Westland petrel	2	2
White-capped albatross	8	8
Seabird Total	**14**	**14**
Marine Mammals		
New Zealand fur seal	2	2
Marine Mammal Total	**2**	**2**
Total	**16**	**16**

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.

Previously, 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 5000 hooks/day. To align reporting with FNZ, the deepwater bottom longline fishery will now be defined as: Vessels 20 m in overall length and greater, and all autoliners.

Table 32 presents a summary of commercial fishing effort, observer effort and protected species captures in the deepwater bottom longline fishery during the 2023/24 observer year. Commercial effort increased by 24.5%, however the number of observed lines was comparable to 2022/23 resulting in a 11% decrease in observer coverage in 2023/24.

The number of seabirds captured in this fishery increased by 38.8%, from 19 captures in 2022/23 (McGovern & Hewetson 2025) to 26 observed interactions in 2023/24. There was 4.7 kg coral bycatch observed in 2023/24, compared to 0.5 kg in 2022/23 (McGovern & Hewetson 2025).

In summary, eight observed trips were conducted aboard six vessels, with protected species captures occurring on six trips aboard five vessels (75% of trips involved protected species captures on 83.3% of vessels that were observed within this fishery during the 2023/24 year).

Table 32. Summary of commercial effort, observer effort and protected species interactions in the deepwater bottom longline fishery during the 2023/24 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	130	0	0.0	0	0	0.0	0	0.0	0.0	0.0
2. CEE	533	0	0.0	0	0	0.0	0	0.0	0.0	0.0
3. SEC	369	36	9.8	20,840	3	0.1	0	0.0	1.0	0.0
4. SOE	523	115	22.0	1,721,441	4	0.0	0	0.0	0.0	0.0
5. SOU	308	131	42.5	1,209,805	12	0.0	0	0.0	0.0	0.0
6. SUB	706	196	27.8	2,495,242	5	0.0	0	0.0	3.4	0.0
7. CHA	1,307	117	9.0	192,075	2	0.0	0	0.0	0.3	0.0
8. CEW	210	0	0.0	0	0	0.0	0	0.0	0.0	0.0
9. AKW	488	0	0.0	0	0	0.0	0	0.0	0.0	0.0
Total	**4,574**	**595**	**13.0**	**5,639,403**	**26**	**0.005**	**0.0**	**0.0**	**4.7**	**0.001**

Table 33 reports the number of interactions in the deepwater bottom longline fishery by species and fate immediately post interaction. 61.5% of interactions resulted in mortalities.

Table 33. Protected species interactions in the deepwater bottom longline fishery during the 2023/24 observer year.

Species	Alive	Dead	Total
Seabirds			
Cape petrel	1	0	1
Chatham Island albatross	0	1	1
Grey petrel	1	0	1
Northern giant petrel	1	0	1
Petrels, Prions and Shearwaters	3	0	3
Salvin's albatross	1	1	2
Sooty shearwater	0	9	9
Southern royal albatross	1	0	1
Storm petrels	1	0	1
White-chinned petrel	1	5	6
Seabirds Total	**10**	**16**	**26**
Total	**10**	**16**	**26**

Tables 34a and b detail the method of interaction by species.

Table 34. Method of interaction for a) protected species released alive, and b) dead protected species observed in the deepwater bottom longline fishery during the 2023/24 observer year.

a) Protected species released alive

Species	Caught in warp scarer	Caught on hook	Impact against vessel	Tangled in snood	Total
Seabirds					
Cape petrels	0	0	1	0	1
Grey petrel	0	0	1	0	1
Northern giant petrel	0	0	1	0	1
Petrels, Prions and Shearwaters	0	1	2	0	3
Salvin's albatross	0	1	0	0	1
Southern royal albatross	0	0	0	1	1
Storm petrels	0	0	1	0	1
White-chinned petrel	1	0	0	0	1
Seabird Total	**1**	**2**	**6**	**1**	**10**
Total	**1**	**2**	**6**	**1**	**10**

b) Dead protected species

Species	Caught on hook	Impact against vessel	Total
Seabirds			
Chatham Island albatross	1	0	1
Salvin's albatross	1	0	1
Sooty shearwater	8	1	9
White-chinned petrel	5	0	5
Seabird Total	**15**	**1**	**16**
Total	**15**	**1**	**16**

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.

Previously, 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 5000 hooks or less/day. To align reporting with FNZ, the inshore bottom longline fishery will now be defined as: Vessels under 20 m in overall length, excluding autoliners.

Table 36 presents a summary of commercial fishing effort, observer effort and protected species captures in the fishery during the 2023/24 observer year. In comparison to the previous observer year, commercial effort decreased by 14.3%, however there was a slight increase in observer coverage from 0.1% in 2022/23 to 0.3% 2023/24 (McGovern & Hewetson 2025).

There have been no protected species interactions observed in this fishery in the since the 2020/21 fishing year. In summary, two observed trips were conducted aboard two vessels, with no protected species captures occurring.

Table 35. Summary of commercial effort, observer effort and protected species interactions in the inshore bottom longline fisheries during the 2023/24 observer year.

FMA	Effort Lines	Observed Lines	Coverage (%)	Number of hooks observed	Protected species captures
1. AKE	633	10	1.6	5,093	0
2. CEE	1,110	0	0.0	0	0
3. SEC	805	0	0.0	0	0
4. SOE	271	0	0.0	0	0
5. SOU	395	0	0.0	0	0
6. SUB	0	0	0.0	0	0
7. CHA	1,008	0	0.0	0	0
8. CEW	553	0	0.0	0	0
9. AKW	380	8	2.1	4,277	0
Total	**5,155**	**18**	**0.3**	**9,370**	**0**

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 36 presents a summary of commercial fishing effort, observer effort and protected species captures in the fishery during the 2023/24 observer year. In comparison to 2022/23, there was a 29.1% increase in commercial fishing effort, and observer coverage of the fishery increased from 1.2% in 2022/23 to 2.3% in 2023/24.

The number of seabirds captured in this fishery decreased from 7 captures in 2022/23 (McGovern & Hewetson 2025) to 2 observed interactions in 2023/24. There have been no observed marine mammal or protected fish interactions in this fishery since the 2021/22 fishing year. There was 3.0 kg of coral bycatch observed in 2023/24, compared to none in 2022/23 (McGovern & Hewetson 2025).

In summary, 11 observed trips were conducted aboard 9 vessels, with protected species captures occurring on 3 trips aboard 3 vessels (27.3% of trips involved protected species captures on 33.3% of vessels that were observed within this fishery during the 2023/24 year).

Table 36. Summary of commercial effort, observer effort and protected species interactions in the snapper bottom longline fishery during the 2023/24 observer year.

FMA	Effort Lines	Observed Lines	Coverage (%)	Number of hooks observed	Seabird captures	Seabirds /1000 hooks	Coral catch (kg)	Coral catch/1000 hooks
1. AKE	4,502	124	2.8	317,320	2	0.01	3	0.01
2. CEE	0	0	0.0	0	0	0.00	0	0.0
3. SEC	0	0	0.0	0	0	0.00	0	0.0
4. SOE	0	0	0.0	0	0	0.00	0	0.0
5. SOU	0	0	0.0	0	0	0.00	0	0.0
6. SUB	0	0	0.0	0	0	0.00	0	0.0
7. CHA	316	0	0.0	0	0	0.00	0	0.0
8. CEW	36	0	0.0	0	0	0.00	0	0.0
9. AKW	499	0	0.0	0	0	0.00	0	0.0
Total	**5,353**	**124**	**2.3**	**317,320**	**2**	**0.06**	**3.0**	**0.6**

Table 37 reports the number of interactions by species and fate immediately post interaction. One flesh-footed shearwater was caught on a hook and released alive, the other died as a result of impact against vessel.

Table 37. Protected species interactions in the snapper bottom longline fishery during the 2023/24 observer year.

Species	Alive	Dead	Total
Seabirds			
Flesh-footed shearwater	1	1	1
Seabirds Total	**1**	**1**	**1**
Total	**1**	**1**	**1**

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 rays are caught in purse seine fisheries for tuna in New Zealand and worldwide, CSP observer coverage of the purse seine fishery began in the 2011/12 observer year.

Table 38 presents a summary of commercial fishing effort, observer effort and protected species captures in the fishery during the 2023/24 observer year. Commercial fishing effort in the skipjack tuna purse seine fishery increased by more than 100% since the previous year (2022/23). Observer coverage increased from 36.4% coverage in 2022/23 to 63.4% coverage in 2023/24.

There were four protected fish interactions observed in this fishery in 2023/24, compared to none in 2022/23 (McGovern & Hewetson 2025).

In summary, two observed trips were conducted aboard two vessels, with four protected species captures occurring during one trip (50% of these trips involved protected species captures and 50% of vessels that were observed within this fishery during the 2023/24 year had protected species captures).

Table 38. Summary of commercial effort, observer effort and protected species interactions in the skipjack tuna purse seine fishery during the 2023/24 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)	Protected fish captures	Protected fish/100 tows
1. AKE	41	26	63.4	4	15.4
2. CEE	0	0	0.0	0	0.0
3. SEC	0	0	0.0	0	0.0
4. SOE	0	0	0.0	0	0.0
5. SOU	0	0	0.0	0	0.0
6. SUB	0	0	0.0	0	0.0
7. CHA	0	0	0.0	0	0.0
8. CEW	0	0	0.0	0	0.0
9. AKW	0	0	0.0	0	0.0
Total	**41**	**26**	**63.4**	**4**	**15.38**

Table 39 reports the number of interactions by species and fate immediately post interaction. All four rays were caught in the net in the same set during a single trip; two of the rays were recorded as showing no signs of life while one was alive but injured and one was released unharmed.

Table 39. Protected species interactions in the skipjack tuna purse seine fishery during the 2023/24 observer year.

Species	Alive	Dead	Total
Protected fish			
Spine-tailed devil ray	2	2	4
Protected fish Total	**2**	**2**	**4**
Total	**2**	**2**	**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 40 presents a summary of commercial fishing effort and observer effort in this fishery during the 2023/24 observer year. There was an increase of 12.1% in commercial effort in 2023/24, however observer coverage decreased by 63.6% decrease in 2023/24.

There were no protected species interactions observed in this fishery in 2023/24. In summary, four observed trips were conducted aboard three vessels, with no protected species captures occurring.

Table 40. Summary of commercial effort, observer effort and protected species interactions in the fisheries during the 2023/24 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)	Protected species captures
1. AKE	487	36	7.4	0
2. CEE	7	6	85.7	0
3. SEC	0	0	0.0	0
4. SOE	0	0	0.0	0
5. SOU	0	0	0.0	0
6. SUB	0	0	0.0	0
7. CHA	12	0	0.0	0
8. CEW	21	7	33.3	0
9. AKW	0	0	0.0	0
Total	**527**	**49**	**9.3**	**0**

Precision Seafood Harvesting (PSH)

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.

Table 41 presents a summary of commercial fishing effort and observer effort in this fishery during the 2023/24 observer year. PSH fishing effort in both mid and bottom trawl decreased by 27.2% in the 2023/24 year in comparison to the year prior, and observer coverage decreased from 13.4% in the 2022/23 fishing year to 3.6% in the 2023/24 year.

Observed coral bycatch in this fishery decreased from 5.6kg in 2022/23 to 2kg in 2023/24 (McGovern & Hewetson 2025). There were no other protected species captures in this fishery in 2023.24.

In summary, three observed trips were conducted aboard three vessels, with one protected species interaction occurring during one trip (33.3% of these trips involved protected species captures and 33.3% of vessels that were observed within this fishery during the 2023/24 year had protected species captures).

Table 41. Summary of commercial effort, observer effort and protected species interactions in the PSH fishery during the 2023/24 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)	Coral catch (kg)	Coral catch /100 tows
1. AKE	541	56	10.4	2	3.6
2. CEE	55	0	0.0	0	0.0
3. SEC	5	0	0.0	0	0.0
4. SOE	0	0	0.0	0	0.0
5. SOU	0	0	0.0	0	0.0
6. SUB	0	0	0.0	0	0.0
7. CHA	4	0	0.0	0	0.0
8. CEW	183	0	0.0	0	0.0
9. AKW	761	0	0.0	0	0.0
Total	**1,549**	**56**	**3.6**	**2.0**	**4**

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; there were no observed trips conducted during 2023/24.

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. There was no observer coverage in this fishery during the 2023/24 year.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $1,647,489. Services were provided by Fisheries New Zealand Observer Services.

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2.2 INT2021-04 Collection and curation of tissue samples from protected fishes and turtles

Project objective

1. To provide coordinated storage and curation of tissue samples collected from protected marine fishes and sea turtles by researchers, Fisheries 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

Completed.

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 699 samples from 166 individuals of protected fishes and reptiles were curated in the tissue archive during the project (December 2021 – June 2024; Figure 1; Appendix A). Only 16 samples from six individuals were collected by the fisheries observer program. The Department of Conservation is currently working to give fishers authority to collect tissue samples from deceased specimens of fishes and reptiles, for vessels where no observers are onboard, and by doing so hope to significantly increase the sampling effort over time. As a result of the low numbers of samples initially received in this project, a decision was made by the Museum and the DOC Marine Species Manager to instead focus on existing samples held by the Department of Conservation and from Massey University.

During this project two loan requests have been completed in consultation with the DOC Marine Species Manager. One of tissue samples from sharks and rays (3 subsamples) to The University of Otago and the second of leatherback turtles (4 subsamples) to the Australian Museum.

The initial 3-years of the program has been a success over all, resulting in 699 tissue vials from 166 individuals. The Archive acts as a central repository for samples and their data that is managed long-term. The Protected Species Tissue Archive is an essential tool for ongoing protected species management in both NZ and Internationally. Museums are ideal places for tissue archives, providing

greater stability in the long-term care and management of collections. The Archive holds great potential to be expanded to other species groups such as protected and threatened fauna.

Recommendations

Recommendations include continuing and expanding the tissue archive, consolidating all tissue samples currently held by various locations by DOC, and provide for fishers to collect tissue samples from deceased specimens of bycatch protected fishes and reptiles.

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 was made available on the CSP webpage in July 2024.
- Final report was made available on the CSP webpage in July 2024.

Citation

Bray, R. 2024. Collection and curation of tissue samples from protected fishes and turtles (2021-2024). INT2021-04 final report prepared for Conservation Services Programme, Department of Conservation. 33 p.

Weblink

Final report: INT2021-04 Collection and curation of tissue samples from protected fishes and turtles 2021-2024

2.3 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 year 2 of a multi-year project. Year 2 (2023/24) reporting is complete.

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.

Weblink

Year 2 (2023/24) final report: Identification of seabirds captured in New Zealand fisheries 1 July 2023 - 30 June 2024: csp report

2.4 INT2022-03 Identification, storage and genetics 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 year 2 of a multi-year project. Year 2 (2023/24) reporting is complete.

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.

Weblink

Year 2 (2023/24) final report: INT2022-03 Identification and storage of cold-water coral bycatch 1 July 2023 - 30 June 2024:

2.5 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

Complete.

Summary of the methods and key findings

Three methods were used to determine the relative risk of commercial fisheries to several types of protected corals. Bottom trawling physically damages fragile corals, and they recover from damage extremely slowly, if at all. Understanding relative risk from fisheries can inform measures of coral vulnerability and resilience, and guide coral conservation measures.

Three methods were applied to evaluate relative risk of commercial fisheries to several types of protected corals:

1. a Productivity-Susceptibility Analysis (PSA) approach, which examines the extent of fishing impact using coral ‘productivity’ values (determined from biological traits and susceptibility) that infer recovery potential;
2. the dynamic Relative Benthic Status (dRBS) method, which combines modelled coral distributions, impact and recovery rate metrics, and fishing effort data to produce annual estimates of the spatial distribution of coral abundance, and
3. Bayesian Networks (BNs), a graphical framework building on PSA methodology that indicates the likelihood of a scenario with allowances for uncertainties and limited data.

In total, eleven different coral groups were assessed, including representatives of the four main protected coral groups in the Wildlife Act; stony corals, black corals, gorgonians and a family of lace corals. Some corals were assessed at individual species level (e.g. the stony coral Solenosmilia variabilis), other groups represented several species (e.g., bamboo corals). Each method differed in their assessment of risk among these groups, but generally, stony corals, black corals and tree-like gorgonians were deemed to be at higher risk from fishing than cup corals, hydrocorals and sea pens.

Spatial scale considerations are highly relevant when interpreting the outputs of this project. Risk was assessed across the entirety of the Exclusive Economic Zone (EEZ), within multiple NZ bioregions, and finally at the scale of the orange roughy trawl fishery (from which most coral bycatch originates) divided into Quota Management Areas. The results demonstrate that the spatial scale used to assess status is critical, and much lower status may be expected if the assessed area was limited to fishable depths or to specific fished features or groups of features such as seamount complexes.

Results presented are informative but need careful interpretation, as large variation in fishing pressure and coral abundance across the scales assessed can provide misleadingly favourable relative risk scores and benthic statuses that do not reflect localised or smaller scale fishing impacts.

Consequently, coupled with uncertainty in model input values, results should not be used to manage fishery impacts locally and should not be used when assessing and managing localised fishing impacts, such as at fishing stock level.

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.

2.6 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 year 2 of a multi-year project. Year 2 is complete.

Summary of the methods and key findings

Three research cruises in year 1 (to June 2023) were completed, and a further three cruises in year 2 (to May 2024) were completed. One, possibly two, further cruises are expected where data will be collected for this project in year 3.

In 2023/24 four main activities were undertaken:

1. The development of a Whole Genome Sequence for *Antipathella fiordensis*;
2. The collection of shallow and deep *A. fiordensis* samples from multiple sites in Fiordland for genetic analysis, and extracting DNA from these samples;
3. Collecting more *A. fiordensis* abundance data from deep and shallow locations in Fiordland; and
4. Securing the data for building a population model for *A. fiordensis*.

Project logistics summary statement

Year 1 and 2 of this project were 100% crown funded, year 3 was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $20,000 over three years.

Weblink

Year 2 progress update: INT2022-05 Determining the resilience of Fiordland corals to fisheries impacts 23/24 progress update

2.7 INT2023-02 Species identification of camera-detected protected species captures in New Zealand fisheries

Project objectives

1. To determine, through examination of camera footage clips, the taxon and, where possible, sex, age-class and provenance of protected species captured in New Zealand fisheries (for live captures or dead specimens discarded at sea).
2. To assess the taxonomic resolution of cameras during processing of camera footage.
3. To inform future process of delivery once cameras are fully deployed.

Rationale

The accurate determination of the taxon of protected species captured in New Zealand fisheries is vital for examining the potential threat to population viability posed by incidental fisheries captures. Historically, at-sea identification has been undertaken by Fisheries Observers, however with the rollout of cameras on inshore commercial vessels, experts will be required to assess records of protected species interactions captured via camera footage to identify species to the lowest possible taxonomic level. Data from this project will inform ongoing bycatch estimation, risk assessment, research, and modelling of the effects of fisheries bycatch on protected species populations. This project also acts as a pilot to assess the incoming information associated with having cameras on vessels, including the extent to which protected species can be identified (i.e., taxonomic resolution) from camera footage, as well as to project the anticipated scale of work once cameras are fully deployed. The outcomes of this project will identify any barriers to smooth operations and inform how protected species identification from camera footage is managed in the future. The project will also recommend any other areas for possible future analysis or investigation.

Project status

Complete, final report currently with FNZ.

Project logistics summary statement

This project was 100% MPI funded. The planned cost for the project was $60,000.

Weblink

2.8 INT2023-03 Characterising surface longline fishing fleet behaviour for sea turtle bycatch

Project objective

To characterise and understand the behaviour of the commercial surface longline fishing fleet operating off the eastern North Island so that spatial mitigation strategies for turtles can be evaluated.

Rationale

This project builds upon outcomes from CSP project INT2021-03 (Review of commercial fishing interactions with marine reptiles). That project, and research subsequently conducted by NIWA (Dunn et al., submitted), has shown that a recent increase in leatherback turtle captures was most likely associated with a change in fisher behaviour. The change in fisher behaviour was unlikely to be related to turtles, but rather to a change in the fishing practices or distribution of the target species, tuna and swordfish. The 2020–21 fishing year saw a considerable increase in reported leatherback captures to 50 individuals, which is also likely to be an underestimate (Abraham et al., 2021; Dunn et al., 2022). Leatherback turtles around New Zealand most likely originate from the western Pacific population, which has been declining at an estimated rate of 6% per year (Martin et al., 2020). The total regional population, based on the annual number of nesting females, is poorly estimated but is likely to be around 2,000 individuals (Martin et al., 2020). Leatherback captures in New Zealand appear to be adults and therefore, assuming a 50:50 sex ratio, New Zealand captured perhaps 1.25% of the adult population in 2020–21 (Dunn et al., 2022).

Project status

Completed.

Summary of the methods and key findings

Leatherback turtles (Dermochelys coriacea) are the most frequently reported turtle bycatch in New Zealand commercial surface longline fisheries. Leatherback turtles are protected under the Wildlife Act 1953. This project updated the fishery captures of leatherbacks in New Zealand waters up to, and including, the 2022–23 fishing year and attempted to identify any temporal changes in fishing practices and/or catch composition associated with changes in leatherback bycatch.

Most surface longline fishing effort targeted southern bluefin tuna (*Thunnus maccoyi*), followed by bigeye tuna (*T. obesus*), and swordfish (*Xiphias gladius*). The surface longline fishery started in northern waters around October and moved south as the season progressed and waters warmed, returning to more northern waters as winter approached. In summer months, the southern bluefin tuna fishery extended to the southeast of the South Island, while the swordfish fishery occurred on the southeast North Island and west coast South Island. Bigeye tuna catches were centred further north, rarely extending beyond the Bay of Plenty and East Cape.

Leatherback captures have been centred in the Bay of Plenty. The leatherback spatial ‘hotspot’ and season (the ‘hotspot’) occurred between latitudes of 36° S and 38° S from January to April. Bigeye tuna, and then swordfish fishing, had the greatest spatial and temporal overlap with the leatherback hotspot. The southern bluefin tuna fishery had very little overlap. About 75% of the bigeye tuna catch, 80% of the swordfish catch, and almost all the southern bluefin tuna catch, ware taken outside of the

leatherback hotspot. The greatest leatherback captures were reported from 2021 when fishing effort was relatively low, but more focused on the east coast North Island than usual.

The fisheries characterisation using reported commercial catch and effort data indicated the strongest interaction was between leatherbacks and the fishery targeting bigeye tuna. An alternative analysis based on clustering of catch compositions produced a different result, with the strongest association being between leatherbacks and swordfish. This difference was because the reported target species did not always accurately describe the catch composition. The catch composition analyses did not isolate the Bay of Plenty region as a specific fishery subunit, meaning there was nothing apparently unique about the fishing in and around the leatherback hotspot.

A Generalised Additive Model (GAM) was developed to investigate the potential reasons for trends in leatherback captures in 2021. The GAM analysis was updated to 2023 with additional environmental and fisheries variables included and restricted to the east coast North Island. The updated GAM explained more of the variability in leatherback bycatch probability, but with a different set of predictor variables. The variables used were proximity to steep sea surface temperature (SST) gradients (fronts), mixed-layer depth, water depth, strength of the west-to-east current, number of hooks between floats (an alias for fishing depth), number of light sticks used between floats, and moon phase. Further GAMs predicting leatherback occurrence and fish catch rates from environmental conditions found the closest association was between leatherbacks and swordfish. A close association between swordfish catch rates and leatherback captures is consistent with international leatherback capture mitigation focusing on swordfish target fisheries.

Comparison of vessels reporting and not reporting leatherbacks was made and found the greatest difference was in location fished. Overall, fishing location was the most persistent and important factor determining the likelihood of a vessel capturing a leatherback.

Recommendations

- Leatherback size should be recorded wherever possible. There may be important differences in foraging behaviour between adults, which make regular migrations to nesting beaches, and juveniles, which do not.
- Further consideration of spatiotemporal closures to protect leatherbacks should be deferred until after the aerial survey has been completed in 2025.
- If a SDM is required for risk assessment and/or informing potential aerial closures, then research needs to be completed to identify the most robust SDM approach and data set, and variables should be included in SDMs only when they have plausible predicted effects.
- Variables describing distance from land or particular isobaths might be tested as potential additional predictor variables (DiMatteo et al. 2024) and as criteria for fished-area restrictions.
- A tool to show areas outside leatherback bycatch hotspots where target catch could be maintained for swordfish and tuna could be developed, similar to the US West Coast fisheries EcoCast product.

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.

Review milestones

- Draft final report was made available on the CSP webpage and presented to the CSP TWG in July 2024.
- Final report was made available on the CSP webpage in August 2024.

Citation

Dunn, M.R., Finucci, B., Sutton, P., Pinkerton, M.H. (2024). Characterising surface longline fishing fleet behaviour in relation to leatherback bycatch. NIWA Client Report 2024214WN. 80 p.

Weblink

Final report: INT2023-03 Characterising surface longline fishing fleet behaviour in relation to leatherback bycatch

2.9 INT2023-04 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 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 which can be used to resolve uncertain identification determinations from photographs.

Project status

This is year 1 of a multi-year project; year 1 is complete.

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.

Weblink

Final report: INT2023-04: Identification of marine mammals, turtles and protected fish captured in New Zealand fisheries (1 July 2023 to 30 June 2024)

2.10 INT2023-05 High-resolution estimates of species diversity for a protected coral family commonly occurring as trawl bycatch

Project objective

To use high resolution genomic data to determine the first assessment of the number of species of *Paramuriceidae* (sea fans) in areas impacted by deep sea trawling.

Rationale

The diversity and relationships of protected octocoral species impacted by deepwater fisheries is not currently understood since morphological identification by Fisheries Observers and taxonomic experts often only places specimens within higher taxonomic rankings (e.g., to family or genus-level), and relies on comparisons to existing species descriptions. This research would continue to use genetic approaches to establish how many distinct and potentially new/cryptic species are present among octocoral bycatch and allow estimation of potential impacts of deep-sea trawling on octocoral diversity.

Project status

Complete.

Summary of the methods and key findings

Theme 1 of the CSP Medium-Term Research Plan (MTRP) for protected corals highlights requirements for species-level data in determinations of susceptibility to commercial fishing impacts. However, most protected gorgonian corals (*Cnidaria: Anthozoa: Octocorallia*) known to occur in the territorial seas of Aotearoa New Zealand have not been documented at species-level and many represent undescribed taxa. Sea-fans of the family *Paramuriceidae* are recognised as one of the most diverse groups of gorgonians within the EEZ but there are currently only two records of described species from this group, despite being a regular component of bottom trawl bycatch.

This research addresses Biodiversity and Distribution aspects of Theme 1 of the coral MTRP, using genetic delimitation of species distributed across spatially explicit regions relevant to commercial fishing. Genomic DNA sequencing using target-bait enrichment was applied to available specimens of *Paramuriceidae* held in the NIWA Invertebrate Collection, which were obtained from both bycatch and non-bycatch sources on the Chatham Rise (FMA4) and Campbell and Bounty plateaus (FMA6). DNA sequencing was used to determine the number of distinct taxa present in each region and examine fishing-related impacts on protected coral diversity. 51 specimens were successfully sequenced, and 32 distinct taxa were discriminated, including a distinct genetic lineage that may represent a new family of protected gorgonians. The two FMA regions shared representatives of most major lineages, but one lineage was confined to the Chatham Rise and members of the tentative new family were confined to the Campbell and Bounty plateaus, where they were obtained primarily as bycatch. Overall, all major genetic lineages were represented among sampled bycatch, except the lineage found only on the Chatham Rise. In combination with previous genetic characterisation, the current project brings the total number of genetically detected or confirmed protected octocorals represented in trawl bycatch to 43 taxa (genera and species) distributed amongst at least seven families (five described, one in question, one undescribed).

The continued use of genomic approaches in the characterisation of coral bycatch is supported by its ability to produce large amounts of data that can resolve relationships at multiple taxonomic levels, and its resilience to highly degraded sample sources. While current and previous studies support target-bait enrichment as an effective means of characterising identity and relationships of bycatch specimens, recent advances and cost reductions in whole genome 'skimming' make this an attractive method.

Recommendations

Recommendations for further research improvements in bycatch documentation and characterisation:

- Incorporation of larger UCE and genome skimming datasets from international studies, to resolve the taxonomic status of OTUs and place unrecognised families of protected gorgonians in broader context. Datasets have already been obtained and are ready for use (A. Quattrini, pers. comm.)
- Genetic characterisation of more reference and bycatch specimens of *Paramuriceidae*, to represent the breadth of genus-level diversity in New Zealand and improve distributional records for OTUs.
- Summarisation of distribution and taxonomic status (described vs. undescribed taxa) for well-documented taxa of gorgonian octocorals, and identification of taxa in need of further characterisation/study.
- Investigation into feasibility of incorporating biomass, frequency and genetic characterisation into bycatch documentation and associated considerations of fishing impacts.

Recommendations for operational considerations in bycatch characterisation and potential mitigation:

- Incorporation of uncertainty and potential for undocumented or cryptic species diversity in risk assessments and habitat suitability and hotspot modelling.
- Consideration of diversity (documented and cryptic) and potential for regional endemism when assessing fisheries impacts on protected gorgonian corals.
- Promoting increased coral bycatch sampling by fisheries observers and exploring means for reducing sampling logistics (e.g. eliminating cold-chain requirements in favour of dried specimens and ethanol-preserved vouchers/sub-samples).

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $58,000.

Review milestones

- Draft final report was made available on the CSP webpage and presented to the CSP TWG in July 2024.
- Final report was made available on the CSP webpage in September 2024.

Citation

Bilewitch, J. 2024. High-resolution estimation of species diversity for a protected coral family commonly occurring as trawl bycatch. INT2023-05 final report prepared by NIWA for Department of Conservation. 31 p.

Weblink

Final report: INT2023-05 High-resolution estimation of species diversity for a protected coral family commonly occurring as trawl bycatch

2.11 INT2023-06 Investigating the impact of fisheries on endangered hoiho diet, microbiome, and disease susceptibility

Project objective

The main research objective is to investigate the relationship between hoiho microbiome and susceptibility to illness and changing diet, as a result of bottom trawling fishing practices.

Rationale

Hoiho are classified as Nationally Endangered (NZCTS) and could be functionally extinct on the mainland of Aotearoa New Zealand within a few decades (Mattern et. al, 2017). Despite extensive conservation efforts to improve the status of the northern hoiho population (NZ South Island and Rakiura), progress has been impeded in part by poor animal health. In recent years disease has played a more significant role in the declining numbers of adults and chicks (Seddon et. al, 2013). Recent research has indicated major changes in hoiho diet over the last 30 years; whereas in the 1980s hoiho were feeding largely on small oily fish species such as sprat, immature red cod and āhuru, now blue cod, a fish very low in oil, makes up most of their diet (Young et. al, 2020). The reasons for this change remain unexplained, but fishing practices such as bottom trawling may have altered hoiho feeding habits. For example, GPS tracking suggests that some hoiho are following furrows carved by bottom trawlers, where the damaged ocean floor could be providing food for scavengers such as blue cod (Young et. al, 2020). Crucially, the loss of important prey species could play a role in the increased disease vulnerability in the Northern population. Moreover, rising sea temperatures can alter the microbiome of threatened species by reducing microbiome diversity and promoting opportunistic pathogenicity in previously benign microbial taxa (West et. al, 2019). Thus, fishing practices may be having a larger impact on hoiho health and survival than previously suspected. The recent changes in hoiho diet due to fishing practices, and exacerbated by climate change, may have led to an imbalance in the hoiho microbiome and, as a result, their susceptibility to disease. This research will determine links between hoiho diet, microbiome health and disease, and will inform conservation management approaches to ensure the continued survival of hoiho across their range

Project status

In progress. Year 1 of a multi-year project.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $50,000 per annum over two years.

2.12 INT2023-07 Expert identifications of protected coral

Project objective

To determine the distribution and taxonomic composition to the lowest level possible of protected coral samples and data currently identified by parataxonomists and held by the NIWA Invertebrate Collection (NIC).

Rationale

A description of the full range of coral species diversity in the New Zealand region is incomplete, which impedes our understanding of the impacts of commercial fishing on coral diversity. This project would use expert identification of coral samples and descriptions of their geographic locations to produce identifications and maps at the lowest taxonomic level (mostly to species) for select coral groups. The project builds on POP2022-04 that prioritised identifications by parataxonomists to Family level.

Project status

Completed.

Summary of the methods and key findings

The work described here acts on a recommendation of the POP2022-04 'Deep diving into decades of uncatalogued corals' CSP project (Mills et al. 2023), by bringing an international taxonomic expert to New Zealand to confirm and revise identification of protected coral specimens in the NIWA Invertebrate Collection.

Dr Kirrily Moore (KM) from the Tasmanian Museum and Art Gallery, is a taxonomic expert in deep-sea coral species in the gorgonian octocoral families *Mopseidae* and *Victorgorgiidae*, plus genera previously contained in family *Anthothelidae*: *Anthothela*, *Icilogorgia* and *Solenocaulon* (genera now reassigned to families *Alcyoniidae* and *Melithaeidae*). During her visit (24 June–5 July 2024), Dr. Moore identified 240 sample jars (295 colonies) and taught the higher-level identification of these gorgonian groups at a workshop held at the NIWA Wellington campus on 4 July 2024.

Amongst the samples identified were ten described species, six new genera and 15 new species, collected from within the New Zealand Exclusive Economic Zone. There is still work to be done to verify some of the identifications with genetic analyses, and eventual taxonomic descriptions of the identified new genera and species is required. The identifications completed for this project add to and improve our knowledge of protected coral fauna in the New Zealand region and wider region within Australian, International, and Antarctic waters that connect to our zone.

Recommendations

The project team recommend that two new family level MPI species codes are created for the families *Keratoisididae* and *Mopseidae*, and that the taxonomic name and descriptive notes are updated for the code AND, which currently represents the anthothelid corals. We also recommend that additional protected coral taxonomic experts are invited to New Zealand in future to continue to identify and describe under-studied octocoral groups where we have a lack of understanding of the genus and species level diversity.

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.

Review milestones

- Dr. Moore's visit to do the research and host a workshop was held from 24 June – 5 July 2024
- The draft final report was made available to CSP in July 2024.

Citation

Mills, S., Bilewitch, J., Moore, K. (2024) INT2023-07 Expert identifications of protected corals: Mopseidae, *Anthothela*, *Victorgorgia* and kin. Prepared for Conservation Services Programme, Department of Conservation NIWA Client Report 2024234WN. 56 p.

Weblink

Final report: INT2023-07 Expert identification of protected corals: Mopseidae, Anthothela, Victorgorgia and kin

2.13 INT2023-08 Albatross diet: composition of natural prey versus fisheries bait/waste

Project objective

1. Identify prey (species level) from existing albatross scat/stomach samples using established DNA metabarcoding techniques for dietary analysis.
2. Obtain information on vessel bait/discard species in the surface longline fishery (SLL) from the FNZ Centralised Observer Database and compare with DNA results to identify proportion of naturally foraged vs fisheries related prey.
3. Conduct a literature review and use findings from the current study to inform current knowledge about the reliance of albatross on fishing vessels for foraging, especially during breeding season.
4. Develop recommendations for future work that could better inform seabird bycatch risk assessment and identify potential for improved mitigation efforts to reduce attractiveness of vessels to seabirds.

Rationale

During breeding season, albatross alter their foraging behaviour and typically exhibit shorter flight durations to reduce time spent away from nests. It is well understood that fishing vessels are supplementary food sources and provide an easy foraging option, especially if found in areas nearer to breeding colonies. What is less understood are the impacts to albatross populations if adult birds incubating or feeding chicks are increasing their reliance on fishing vessels as food sources. Dietary plasticity resulting in increased interaction and reliance on vessels correlates with increased risk of bycatch. For breeding birds, this has extremely poor outcomes for the egg or chick left in the nest and therefore the breeding population, given the k-type reproductive characteristics of albatross species. Fisheries management actions to deter albatross interactions with vessels, particularly in the SLL fishery, include mitigation efforts to reduce bait depredation (e.g., hook-shield devices) and implementation of policies around managing vessel waste and fish discards to reduce attractiveness of vessels to seabirds. It is important to monitor changes in foraging preference (i.e., reliance on fishing vessels vs naturally foraged food) to better inform risk assessment and mitigation for albatross species. Previous methods to study diet have largely been done at a trophic level (e.g., stable isotope analysis) or via gross morphological studies (e.g., fish, squid). By using DNA metabarcoding to identify prey at a species level, and using easily obtainable scat samples, we can extrapolate far more detail than has previously been achieved. This is an exciting new area of research to help better inform both conservation and fisheries management for vulnerable albatross species.

Project status

Completed.

Summary of the methods and key findings

Seabird injury or mortality caused by interactions with New Zealand commercial fishing activities is a major conservation concern with the majority of interactions occurring in the surface longline (SLL) and trawl (TWL) fisheries. Albatrosses (*Diomedeidae*) are among the most threatened seabirds and the majority of these long-lived, large seabirds have broad geographic ranges. Seabirds are attracted to fishing vessel activity as an additional food source and this puts them at risk of interacting with

vessel structures and fishing gear. This includes incidental capture whilst feeding on bait and discards. It is not clear to what extent the diet of albatrosses consists of naturally foraged prey in comparison to fisheries bait/waste associated with fishing activity, and ultimately their reliance on commercial fisheries as a food source.

In this dietary study, scat from colony birds and stomach contents from necropsy samples (commercial fishing mortalities) were used to detect taxa consumed by 10 albatross species using DNA metabarcoding. Scat samples (n=86) were opportunistically collected from four subantarctic islands between January 2019 to April 2024. Albatross necropsies (n=72) took place from September 2022 to February 2024. Based on the frequency of occurrence, the diet among all albatross samples consisted largely of fishes (> 50% deep-sea and beyond known albatross diving depths) and to lesser extent cephalopods. Differences in prey diversity (higher in necropsy samples) were found to be significant between sample type, however, no specific prey species were found to be responsible for this difference. Observer and fisher reported bait and discard species were predominantly squid and mackerel.

Overall, the majority of fish and cephalopod species identified in both colony scat and necropsy samples overlapped extensively with species that were most likely to be made available through SLL and TWL fisheries activities, i.e., discard/species targeted/bait used. These results suggest that albatrosses are heavily reliant on fisheries as a food source whether they were sampled from fishing vessels (i.e., necropsy) or from nesting sites (i.e., scats).

Recommendations

- Improved data collection on specific bait species in the COD
- Future species-specific DNA diet studies using GPS tracking of breeding pairs in conjunction with scat collection and overlaid with fishing vessel activity
- Biochemical analysis of the nutritional composition of wild versus fisheries derived prey supported by reconciliation of existing catch and processing data from 1990
- Retain all albatross bycatch from the deepwater trawl fishery
- Provide COI sequence data to GenBank for all albatross species to increase species matches
- Further develop the methodology for DNA genetic sex identification in albatrosses and ground truth with morphological examinations
- Greater auditing of low observer coverage fisheries to look for improvements in management practices to further reduce vessel attraction to seabirds around discard / fish waste.

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.

Review milestones

- Draft final report was made available on the CSP webpage and presented to the CSP TWG in October 2024.
- Final report was made available on the CSP webpage in November 2024.

Citation

Van der Reis, A.,Tham, F.F., Jeffs, A. 2024. Albatross diet: Composition of natural prey versus fisheries bait/waste. INT2023-08 final report prepared for Conservation Services Programme, Department of Conservation. 42 p.

Weblink

Final report: INT2023-08 Albatross diet: Composition of natural prey versus fisheries bait/waste

2.14 INT2023-09 Understanding the extent and usage of coral rubble reporting codes by fisheries observers

Project objective

To improve our understanding of coral rubble reporting by Fisheries Observers, and to use those findings to inform current understanding of the distribution of and target fisheries involved in bycatch of coral rubble.

Rationale

This project will help us to understand the extent and accuracy of coral bycatch reporting of coral rubble and to determine any necessary refinements to observer reporting guidelines, or to develop post-collection data grooming steps that improve coral reporting accuracy.

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 $30,000.

2.15 INT2023-10 Understanding coral bycatch – assessing large catches

Project objective

To improve our understanding and ground truthing processes for reporting of coral bycatch by Fisheries Observers, and to assess and map reported large catches (e.g., 500 kg–1 tonne/event or trip).

Rationale

For reports of large coral bycatch events, it is difficult to disentangle what is feasible but unlikely from what is potentially erroneous; closer examination of such reports will improve understanding of the extent of genuine large catches. These outputs could inform management efforts and build a more confident picture of coral bycatch across the EEZ.

Project status

Complete.

Project status

Complete.

Summary of the methods and key findings

All coral species in Orders Antipatharia and Scleractinia as well as gorgonian corals in Order Alcyonacea and hydrocorals in Family Stylasteridae are protected under the Wildlife Act 1953. This protection prohibits intentional damage and removal. To better enable delivery of this protection, we need to continually seek to improve our knowledge of these corals – in particular their diversity, distribution, abundance, and vulnerability to human activities.

Coral species are frequently taken as bycatch in commercial fisheries and when this occurs on vessels with scientific observers on board care is taken to identify them as accurately as possible and record the weight of the catch. Frequently observers also retain a sample of the corals caught, especially when identification is uncertain, for examination by expert taxonomists ashore. The coral catch data collected by observers has been used to address many of the gaps in our knowledge, and thus it is vital that the data obtained are as accurate as possible. Records of large catches of coral are particularly valuable as these provide a strong indication of locations of high coral abundance. However, occasional errors in the recording of catch weights are likely to have occurred in the past, and continue to occur, due to recording or transcribing mistakes including the use of an incorrect taxonomic code and mis-weighing or mis-entering measured weights.

In this study a close examination of reported coral catches was made to improve understanding of the extent of genuine large catches and to build a more confident picture of coral bycatch across the New Zealand region, including the location of “hot-spots” of coral abundance. Further benefits include improved catch information for cross-validation of coral abundance models, and provision of guidance for verification of future reported large coral catches when loading observer records into database tables.

A complete extract of historic observed protected coral catches was obtained from the observer (COD) database, and a further set of coral catch data was obtained from research trawl records. These data were used together to establish weight thresholds signifying a “large” catch of coral for the purposes

of mapping such occurrences and setting or updating values for flagging suspiciously large catches when loading future data into database tables.

A range of datasets and methods for verification of these large catches was developed. These included examination of:

1. Observer trip reports, diaries, and logbooks
2. Observer photographs
3. Vessel-reported coral catches from matched fishing events
4. Spatial comparison with locations of high abundance predicted in species distribution models
5. Spatial comparison with underwater topographical features (seamounts, etc.)

These verification methods were applied to observed catch records and maps produced for all protected coral taxa to provide a more reliable picture of coral captures in the New Zealand region, especially large catches. Revised large catch threshold values were set so that all 98 recording codes for protected coral taxa are included, updating existing values (many of which were set too high) and providing values for many more recent codes for which no value had been set.

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.

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Final report: INT2023-10 Understanding coral bycatch: assessing large catches

3. Population Projects

3.1 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 Tītī 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 non-breeders need to be consistently large scale to provide a robust mark-recapture dataset. Tītī 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

Complete.

Summary of the methods and key findings

During the 2023/24 season 263 and 291 study burrows were monitored on Ohinau Island and Lady Alice Island respectively. Of these 71.5% and 71.8% were breeding burrows for Ohinau and Lady Alice respectively. 61% of breeding birds in burrows on Ohinau Island were identified and 86% of burrows on Lady Alice Island.

Determining breeding success was not a deliverable for this season. On Ohinau, 5.1% of chicks which have been banded since monitoring began have been recaptured at the colony and on Lady Alice 11.8% of banded chicks have been recaptured.

Burrow transects were carried out on both Ohinau Island and Lady Alice Island to gather data for an updated population estimate for these islands. On Ohinau, 116 transects, each aiming to cover 40m², were completed within eight different colonies on the island. It is estimated that there are a total of 3,722 occupied breeding burrows (1,881 – 5,566, 95% CI) on Ohinau Island which is a decrease of 4.17% since 2018. On Lady Alice Island 323 transects were completed within nine colonies. It is estimated that there are a total of 2,367 occupied breeding burrows (1,431-3,303, 95% CI) which is a decrease of 26.4% since 2019.

Tracked adults from Lady Alice foraged in similar areas to previous years during incubation. Travelling around the west coast of the North Island and out to the Louisville Seamount Chain. Birds were undertaking reasonably long trips with an average of 13 days. No devices were retrieved from Ohinau Island, with adults being away for 12 days or more.

Fledging chicks tracked from Tītī Island travelled north through the Pacific, taking two routes either east or west up the North Island and then into the South Pacific Ocean, migrating past Vanuatu, New Caledonia and the Solomon Islands. This work reveals that there is a clear demarcation of migration routes between different populations of flesh-footed shearwater fledglings within New Zealand (at least within the first 30 days after fledging). In previous years, fledging chicks tracked from Ohinau Island maintained a migration route along the Kermadec/Tongan Trench.

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.
- Tītī Island, Marlborough Sounds, be considered as a potential future monitoring location.
- Repeat population estimates on Ohinau Island, Lady Alice Island and Tītī Island be undertaken as soon as possible.
- Other breeding colony sites for flesh-footed shearwaters be considered for population estimates.
- Future tracking should use lighter devices with a maximum of 2.5% device body weight and be undertaken at Lady Alice, Ohinau and/or Tītī Islands.
- Trial harnesses for chick tracking.
- 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 and 50% Crown funded. The planned cost for the project was $60,000 for Year 1 and $70,000 for Year 2 and Year 3.

Review milestones

- Draft final report was made available on the CSP webpage and presented to the CSP TWG in July 2024.
- Final report was made available on the CSP webpage in September 2024.

Citation

Ray, S. Burgin, D., Lamb, S., Olsthoorn, M. 2024. Toanui/flesh-footed shearwater population monitoring and estimates: 2023/24 season. Unpublished Wildlife Management International Technical Report to the Department of Conservation. 58 p.

Weblink

Year 3 (2023-24) report: POP2021-04: Flesh-footed shearwater population monitoring and estimate: 2023/24

3.2 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 non philopatric 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 lightweight 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. Year 2 (2023/24) reporting is complete.

Summary of the methods and key findings

Black petrel monitoring on Aotea /Great Barrier Island

During the 2023/24 breeding season, 482 tākoketai study burrows were monitored at Mt Hobson/Hirakimata on Aotea. Of these, 306 (63.5%) were occupied by breeding pairs, 58 (12%) by non-breeding birds, and 118 (24.5%) were unoccupied. A total of 222 chicks were produced from study burrows, representing a fledgling success rate of 72.5%, though this may drop to 70.9% due to underweight chicks.

Nine census grids accounted for 199 of the inspected study burrows, with 120 occupied by breeding pairs and 86 chicks produced, resulting in a fledgling success rate of 71.7%, potentially reducing to 69.2% due to poor chick condition.

During the season, 700 adults and 223 fledgling chicks were captured, with 274 adults and 223 chicks banded. Nocturnal surveys over the past three seasons increased to 6-8 hours nightly, resulting in higher recapture rates compared to ad-hoc and at-sea surveys.

A total of 461 returned chicks have been recaptured since they were banded prior to fledging, of which 126 were identified in the 2023/24 season. Monitoring of feral pigs and predators showed rat

presence but no feral cat predation. Continued pest control is essential to protect the tākoketai population.

At sea captures

This at-sea capture project continues work started in 2022 to look at survival and return rates of juvenile black petrels not visiting the main study areas. Capture, mark-recapture of black petrels in the Hauraki Gulf will also provide information from a random sample of birds away from the study colonies to help estimate current population size of this species. This report provides details of the methods used to capture black petrels, comments on what worked and what did not, and includes photographs illustrating the methods used.

Recommendations

Black petrel monitoring on Aotea/Great Barrier Island

- Continue intensive population monitoring on Aotea with three seasonal visits to track trends and impacts.
- Conduct multiple-night expeditions for nocturnal surveys to assess juvenile survival and recapture rates.
- Sex all tākoketai during recruitment expeditions and in study burrows to identify sex biases and survival differences.
- Perform consistent mark/recapture sessions over several nights to estimate population size.
- Undertake transect surveys across core tākoketai habitat to update population estimates.
- Implement satellite tracking of chicks to South American waters to determine migration routes and risks.
- Explore collaborative at-sea capture expeditions in Ecuador to assess juvenile presence and risks.
- Investigate colony areas at risk from rainfall events for climate resilience assessment.
- Model the effects of age, age differences in pairs, and experience on breeding success.
- Compare breeding success in public vs. non-public access areas to evaluate human disturbance impacts.
- Continue investigating predator deterrence methods, focusing on feral pigs and cats at Cooper's Castle

At sea captures

- Continue using the net gun method for captures to reduce reliance on attracting birds to the main boat.
- Extend the capture season to the end of April, considering budget constraints and potential drop-in capture rates as non-breeders depart.
- Target events where black petrels feed with cetaceans to improve capture success and investigate this feeding association.
- Capture black petrels further offshore and in areas beyond Aotea to enhance population estimates.
- Maximize data return by taking blood and feather samples for additional analyses during captures.
- Preserve regurgitated samples for dietary analysis to understand prey targeting throughout the breeding season.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry and 50% Crown funded. The planned cost for the project was $70,000 for year 1 and $100,000 for year 2 and 3.

Review milestones

- Draft final report was made available on the CSP webpage and presented to the CSP TWG in July 2024.
- Final report was made available on the CSP webpage in September 2024.

Citation

Bell, E.A.; Lamb, S. & Ray, S. (2024). Key demographic parameters and population trends of tākoketai/black petrels (Procellaria parkinsoni) on Aotea/Great Barrier Island: 2023/24. Unpublished Wildlife Management International Ltd. Technical Report to the Conservation Services Programme, Department of Conservation, Wellington. 67 p.

Weblink

Year 2 (2023/24) reports:
POP2022-01 Key demographic parameters and population trends of tākoketai/black petrels (Procellaria parkinsoni) on Aotea/Great Barrier Island: 2023/24
POP2022-01 Black petrel population monitoring - at sea captures
POP2022-01 Black petrel population monitoring - at sea captures addendum

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

Project objectives

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 lightweight tags and different attachment methods that allow birds to be monitored across multiple years.

Project status

Complete.

Summary of the methods and key findings

Seven nearly fledged flesh-footed shearwater chicks on Tītī Island (Marlborough Sounds) were fitted with Lotek Sunbird satellite tags on 8 May 2024. The original plan was to attach these tags using a wing harness design used on other seabirds. In the field it was found that the prominent sternum on the breast of this species could create problems for these birds and made using this design of harness unsuitable for long term deployment. Instead, the tags were attached to the central back feathers with a standard tape on attachment method. These tags had a solar panel and were expected to last for up to a year.

Six fledglings tracked from Tītī Island travelled north through the western Pacific (one tag failed around departure time). The birds took two routes, either east or west up the North Island and then into the South Pacific Ocean, migrating past Vanuatu, New Caledonia and the Solomon Islands. The birds reached an area with high densities of surface longline fisheries east of Vanuatu. All tags ceased transmitting within 2 months for unknown reasons. This work reveals that there is a clear demarcation of migration routes between different populations of flesh-footed shearwater fledglings within New Zealand (at least within the first 30 days after fledging). In previous years, fledging chicks tracked from Ohinau Island maintained a migration route along the Kermadec/Tongan Trench and reached the equatorial central Pacific with one bird travelling as far east as Tahiti.

The results of this project and POP2021-04 Flesh-footed shearwater population monitoring were merged into one report which is cited below.

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.

Review milestones

- Draft final report was made available on the CSP webpage and presented to the CSP TWG in July 2024.
- Final report was made available on the CSP webpage in September 2024.

Citation

Ray, S. Burgin, D., Lamb, S., Olsthoorn, M. 2024. Toanui/flesh-footed shearwater population monitoring and estimates: 2023/24 season. Unpublished Wildlife Management International Technical Report to the Department of Conservation. 58 p.

Weblink

Final report: POP2021-04: Flesh-footed shearwater population monitoring and estimate: 2023/24

3.4 POP2022-03 Deep-sea protected coral reproduction study

Project objectives

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

Complete.

Summary of the methods and key findings

The report builds on a previous literature review of the reproductive and larval processes of New Zealand protected deep-sea corals. In this review, the following species were identified as suitable for future reproduction studies: the stony cup coral *Desmophyllum dianthus* (Order Scleractinia), the stony branching reef-forming corals *Goniocorella dumosa* and *Enallopsammia rostrata* (Order Scleractinia), and the Scleralcyonacea gorgonian octocorals *Primnoa notialis* and *Paragorgia arborea*.

Within the current project, histological methods were used to understand reproductive strategies for the above species, together with additional histological samples of black corals (Antipatharia) and Hydrocorals (Stylasteridae), to attempt to obtain reproductive information covering all protected coral groups. It was confirmed that *G. dumosa* and *E. rostrata* collected within New Zealand are gonochoric (single sex within a polyp), with both species having either male or female specimens (i.e., all polyps on a specimen were the same sex).

It was also confirmed that *G. dumosa* is a brooder in wild populations on the Chatham Rise, a reproductive mode whereby gametes are fertilised and develop internally into larvae before being released into the surrounding water. Stage IV oocytes were present throughout the year and the limited number of male specimens examined had mature stage IV spermiaries present in both seasons sampled (April and August). We conclude, from the limited seasonal spread of available data, that there was no evidence of reproductive periodicity in *G. dumosa* and that it may have the ability to reproduce year-round when environmental conditions are favourable. Previous observations of larvae

in aquaria from September to November 2020 (Beaumont et al. 2024), and with a consistent food supply, support this theory.

Although there was a limited seasonal spread of data for *E. rostrata*, there was no evidence of seasonality with mature or maturing oocytes present in all female specimens examined (sampled in April, June and August). There was no evidence of larvae nor brooding and as such, *E. rostrata* are considered broadcast spawners. Mature (stage IV) spermaries were observed in male specimens from all seasons sampled (April, June and August). We, therefore, suggest that *E. rostrata* could be a continuous or aperiodic spawner, rather than a seasonal spawner, though further sampling would be required to confirm this.

E. rostrata had a lower estimated fecundity than *G. dumosa* though they had a similar sized maximum oocyte diameter (although morphologically there are differences as *E. rostrata* oocytes are long and thin and *G. dumosa* are more rounded). However, *E. rostrata* is considered likely to be a broadcast spawner and *G. dumosa* a brooder. This goes against the general assumption that brooders have fewer but larger oocytes/larvae.

The inclusion of black corals (Antipatharia) and hydrocorals (Stylasteridae) in this study were as a trial only to assess the quality of histological sections that could be prepared from fixed specimen samples in order to enable clear observations of reproductive data. Our trials on the black corals *Leiopathes bullosa* and *Sibopathes sp.* showed that it will be possible to assess the reproductive state of future sections of these species. However, hydrocorals proved problematic due to their extensive calcification, with more than 95 % of the animal being comprised of hard carbonate skeletal matrix and therefore difficulty in obtaining adequate tissue for examination.

The histological analyses of the stony cup coral *Desmophyllum*, and the two gorgonian octocoral species *Paragorgia* and *Primnoa* planned for this study are being carried out by a PhD student at the University of Gothenburg, but these results have been delayed, and as such will be added to this report as an addendum when available (expected early 2025).

Specimens used within this study were historic (some dating back to 2000) and many had not been preserved with histological analyses in mind. While we were able to get some data from all specimens used, in some cases the quality of data was compromised by the quality of histological sections. In addition, the variability observed in reproductive data between polyps and specimens highlights the importance of replicate samples across multiple time points when investigating reproductive mode, seasonality and fecundity. We recommend that, where possible, deep-sea coral specimens are collected and placed into an appropriate preservative to enable further histological analyses to address knowledge gaps.

There remain questions regarding the reproduction of corals that can only be addressed by observations of live animals, such as larval behaviour, pelagic larval duration and settlement preferences.

These data and results have been communicated to relevant concurrent research projects (e.g., INT2022-04, risk assessment for protected corals) where they have been used to help evaluate scores for productivity attributes in Productivity Susceptibility Analyses (PSA). In addition, they will inform future research to support risk assessment and development of appropriate management options.

Recommendations

- Further histological analyses could elucidate seasonality and reproductive mode where this is not yet known. The variability observed in reproductive data between polyps and specimens highlights the importance of replicate samples across multiple time points. Specimens should be placed into an appropriate preservative to enable future histological analyses to address remaining knowledge gaps.
- Increased knowledge of environmental cues for settlement and recruitment are necessary to improve how we interpret the reproductive parameters in a risk assessment context. At present the best we can do is assume an even distribution of suitable habitat but know this isn't the case in the real world; further experimental laboratory studies could be a practical way to advance our knowledge about settlement cues (and larval behaviour and pelagic larval duration which are important aspects in determining dispersal potential).
- Analyses should be broadened to include more of the key coral groups that are able to be identified from imagery and hence used in abundance-based habitat-suitability models as applied in INT2022- 04: e.g., the stony corals *S. variabilis* and *M. oculata*, as they are key seamount species, and black corals as they also appear to have variable longevity and growth rates with region and species.
- An improved understanding of reproductive variability within higher taxonomic categories (e.g., at the species level) is especially important if risk assessment starts being carried out at smaller spatial scales, where the taxa will differ between such areas.

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. During year two of this project an extra $8,000 was added to the project and the reporting milestones delayed slightly to accommodate unforeseen cost and time increases.

Review milestones

- Draft final report was made available on the CSP webpage and presented to the CSP TWG in July 2024.
- Final report was made available on the CSP webpage in September 2024.

Citation

Beaumont, J., Marriott, P., Connell, A., Moreno Moran, D., Waller, R., Tracey, D. and Clark, M. 2024. Protected coral reproduction. POP2022-03 final report prepared by NIWA for Conservation Services Programme, Department of Conservation. 64 p.

Weblink

Final report: POP2022-03 Protected coral reproduction study

3.5 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. Year 1 (2022/23) and Year 2 (2023/24) reporting is complete.

Summary of the methods and key findings

Gibson's albatross

Breeding success in 2023 was close to the mean (60%) though chick development was slower and fledging later than usual. The number of nesting pairs in three representative census blocks in 2024 was the lowest it has been since the 2006 population crash, likely due in part to the relatively high numbers nesting the previous summer. However, there are signs the number of breeding pairs of Gibson's wandering albatross is again in decline (2016 to present) after a slow but nearly significant growth rate for the decade 2006–2015.

The satellite transmitters taped to the back feathers of 22 juvenile Gibson's wandering albatross in December 2022 remained attached for an average of 291 days with the longest lasting 540 days, much longer than transmitters on adults, presumably because juveniles delay their first moult. Juveniles were found to spend much more time than adults foraging in tropical waters north of 30 degrees (2.4% cf 0.6%), which means juveniles have greater exposure to interactions with tuna longline fishing fleets. Two of the juveniles wearing transmitters appear likely to have been caught by longliners in winter 2023, one near an Australian-flagged vessel off Queensland within the Australian EEZ and one near a Chinese Taipei-flagged vessel in the high seas north-east of New Zealand. Twenty adult Gibson's wandering albatrosses were fitted with satellite transmitters in late December 2023, of which one

breeding female was almost certainly caught in June 2024 in the mid Tasman Sea by a longliner flagged to Chinese Taipei.

Drone photographs were taken of 63% of the 4,040 ha of Gibson's wandering albatross breeding habitat on Adams Island, and the number of albatrosses on the ground seen in the photographs were counted. Concurrent ground calibration checks undertaken to determine the proportion of birds on the ground which had eggs provided a "correction factor" which varied from 30% to 88% depending on area and time of day, with an average 54% of birds on the ground having a nest with an egg. After correction for pretend breeders and failed nests, a total of 3,348 breeding birds were counted in the 2,565 ha of albatross habitat which was successfully droned, an area which in the past supported 80% of the population. Assuming the distribution of albatrosses has not changed, an estimated 4,181 pairs of Gibson's wandering albatrosses were breeding on Adams Island in 2024.

The western and eastern extremities of Adams Island are still to be droned; this will be undertaken in January 2025, when some of the already counted parts of the island will be re-counted, to account for differences due to interannual variation.

White-capped albatross

White-capped albatrosses are the most frequently incidentally bycaught albatross species in New Zealand commercial fisheries. The species ranks highly in New Zealand Government risk assessment, with uncertainty around the estimate of adult survival. A white-capped albatross mark-recapture study was established on Disappointment Island in January 2015 to improve estimates of adult survival, and other key population demographic parameters. A 3.5-day research trip to Disappointment Island was conducted 18–21 January; the tenth visit to the island for white-capped albatross survival rate research. Annual survival rates for white-capped albatrosses vary substantially year-on-year, ranging between 0.83 ± 0.06 (± SE) in 2015 to 0.96 ± 0.03 in 2020. Mean annual survival over that period was 0.89 ± 0.04 (excluding the estimate for 2018 which had particularly high variance). Robust estimates of survival and productivity of white-capped albatross require continued visits to Disappointment Island. Banding should be a high priority to ensure the core mark-recapture study is not compromised, since precision of survival estimates is reliant on it. Tracking devices, and cameras to assess productivity, were also recovered and deployed.

Recommendations

Gibson's albatross

Although the demography of Gibson's albatross gradually improved in the decade following the 2005–06 crash, over the last 8 years this improvement has stalled, with the population at best stable but showing signs of decreasing. Monitoring the size of the population and its structure and trend on Adams Island remains a priority, as does more tracking to better understand the overlap and interaction of Gibson's albatross with longline fishing fleets to help understand causes of population changes.

Population trends are best assessed from the mark-recapture study, and from the counts of parts of the island that are easy to census accurately and have been repeatedly censused.

To obtain an updated population size estimate, census of the nesting population on Adams Island using drones showed the technique worked well and should be completed next summer.

White-capped albatross

- Continue visits to Disappointment Island for robust survival and productivity estimates of white-capped albatross.
- Prioritize banding to ensure the core mark-recapture study's precision.
- Extend annual trips for thorough resighting, banding, and other objectives (e.g., nest cameras, trackers, drone trials).
- Reinstate annual nest counts to complement survival data.
- Use drone photography for wider Castaways Bay colony coverage and count nests in orthomosaics.
- Collect nest-contents data during band resighting and drone overflights.
- Schedule mark-recapture studies in early February for optimal resighting rates.
- Include substantial weather contingency in work plans due to variable sea state conditions.

Project logistics summary statement

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

Review milestones

- White-capped albatross draft final report was made available on the CSP webpage and presented to the CSP TWG in May 2024.
- Final report was made available on the CSP webpage in June 2024.
- Gibson's albatross draft final report was made available on the CSP webpage and presented to the CSP TWG in August 2024.
- Final report was made available on the CSP webpage in September 2024.

Citation

Elliott G, Walker K, Rexer-Huber K, Tinnemans J, Long J, Sagar R, Osborne J, Parker, G. 2024. Gibson's wandering albatross: demography, satellite tracking and census. Final Report Prepared for New Zealand Department of Conservation. 33 p.

Parker, G.C., Osborne, J., Sagar, R., Schultz, H., Rexer-Huber, K. 2024. White-capped albatross population study, Disappointment Island 2024. POP2022-08 Final report to the Conservation Services Programme, Department of Conservation. Parker Conservation, Dunedin. 14 p.

Weblink

Year 2 (2023/24) final reports:
POP2022-08 Gibson's wandering albatross: demography, satellite tracking and census 2024
POP2022-08 White-capped albatross population study, Disappointment Island 2024

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

Project objectives

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 multiyear project due for completion in June 2025. Year 1 (2022/23) and Year 2 (2023/24) reporting is complete.

Summary of the methods and key findings

Antipodean wandering albatross

This season's field programme allowed updates to the trend in nesting population size, survival, productivity and recruitment. There are some signs that the rate of decline is 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 (from 97% in 2014 to 84% in 2019). Breeding success in 2023 at 71% approached the average pre-crash nesting success of 74%, although the mean 2006–2023 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 last whole-island count of nesting Antipodean albatross took place during 1994–96. The first year of a two-year effort to update the whole-island estimate involved a combination of ground counts (27% of the 1,546 ha Antipodean albatross nesting distribution) and drone aerial photography for counts in orthomosaics (1,023 ha or 66% overflown). Drone counts were corrected for pretend-nesters (apparently nesting birds with no egg) using data from concurrent nest-contents transects, and both count types were corrected for nest failures occurring before the date of count. Part of the Antipodean albatross breeding range could not be covered this first season (356 ha or 23% not counted). Numbers nesting in these not-counted areas were estimated by categorising nesting-habitat quality across the island, then extrapolating nest densities by habitat-quality class to uncounted areas. The number nesting island-wide in 2024 estimated from drone and ground counts (3,383 breeding pairs with 95% CI 3,182–3,585) is similar to the figure estimated from the annual ground count since 1997 (15% of the island or 3,307 breeding pairs), indicating that the 15% of the island chosen for annual counts remains representative of the whole island.

Trends in nest numbers and demographic parameters from the core annual study indicate that 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

A mark-recapture study to estimate vital rates, survival in particular, was established in late 2022. This first season of band resighting highlighted the importance of quality monitoring data: banded white-chinned petrels were resighted at an unexpectedly low rate of only 0.243. Indeed, fewer study burrows were reoccupied than expected, and in new burrows, occupancy was lower than last year. Without quality monitoring data, we cannot yet tell whether these breeding rates are now normal for Antipodes white-chinned petrels, having shifted over the decade since the last study, or whether it has simply been a bad year. Substantial effort to grow the mark-recapture study this year mean there are now 301 banded white-chinned petrels in 156 marked burrows in the two study areas.

Recommendations

Antipodean albatross

- Ongoing mark-recapture monitoring of demographic and population-size trends
- The second year of effort toward the island-wide population size estimate, to complete whole-island coverage
- Research into causes of decline. More-targeted ongoing engagement is also needed to achieve better bycatch mitigation in line with ACAP best practice.

White-chinned petrel

- For accurate, precise survival estimates this marked population needs building further, along with recaptures at existing marked burrows for a minimum of three years.

Project logistics summary statement

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

Review milestones

- Draft final report was made available on the CSP webpage and presented to the CSP TWG in August 2024.
- Final report was made available on the CSP webpage in September 2024.

Citation

Rexer-Huber K., Whitehead E., Parker G.C., Patterson, E., Walker K., Welch, J., Elliott G. 2024. Antipodean wandering albatrosses and white-chinned petrels 2024. Final report to the Department of Conservation. Parker Conservation, Dunedin. 29 p.

Weblink

Year 2 (2023/24) final report: POP2022-10 Antipodean wandering albatross and white-chinned petrels 2024

3.7 POP2023-01 Aerial survey of leatherback turtles off Northeast North Island

Project objective

1. Assess feasibility of using aerial surveys to monitor leatherback turtles in New Zealand waters.
2. To collect fishery independent information on the distribution, relative abundance and size of leatherback turtles in New Zealand waters.
3. To collect data on pelagic species associated with leatherback turtles in New Zealand waters.

Rationale

Western Pacific leatherback turtles are Critically Endangered due to a variety of anthropogenic impacts, including bycatch in commercial fisheries throughout their range. Leatherbacks are the sea turtle most regularly interacting with commercial fisheries in New Zealand waters, with the greatest number being caught on surface longlines targeting swordfish and bigeye tuna off the Northeast North Island (FMA 1, FMA 2) during summer and autumn. Interactions with surface longlines are also reported from FMA 7, FMA 8 and FMA 9. Fishery independent data on leatherback distribution and abundance are required to determine overlap with commercial fisheries, inform national and regional risk assessments for this species and identify potential environmental indicators that could be used to avoid or reduce fishery interactions. Identification of hot spots for the species would also assist the development of satellite tagging studies of free-swimming leatherbacks on their foraging grounds. Such studies would provide information on diving behaviour and long-distance movements and could potentially identify critical habitat in NZ waters and confirm source populations of leatherbacks interacting with New Zealand fisheries.

Project status

In progress. This is a multiyear project due for completion in June 2026.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry and 50% funded by the Crown. The planned cost for the project was $50,000 for year one, $100,000 for year two and $50,000 for year three.

3.8 POP2023-02 Southern Buller's population study

Project objective

1. Monitor key demographic parameters of southern Buller's albatross (*Thalassarche bulleri bulleri*) (adult survival, breeding probability, breeding success, and population size) on the Snares Islands to reduce uncertainty in risk estimates from commercial fishing and to measure the success of management interventions.
2. Provide updated, high-resolution insights into the at-sea distribution of adult southern Buller's albatrosses from the Snares and Solander Islands.
3. Provide an updated population estimate from Solander Island using an aerial survey.
4. Describe the diving behaviour of southern Buller's Albatrosses from the Snares Islands using time depth recorders (TDRs).

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 project delivers priority research components of the CSP Seabird Plan involving the estimation of key demographic parameters of southern Buller's albatross at the Snares and Solander islands and investigates at-sea distribution and diving behaviour. Three established study sites exist at the Snares, with substantial historic mark-resight effort (Sagar 2014), and demographic data having been collected annually at these sites annually since 1992, excluding 2018 and 2021.

Project status

This is a multiyear project due for completion in June 2026. Year 1 reporting is complete.

Summary of the methods and key findings

Population studies of southern Buller's albatrosses at Tini Heke / The Snares Islands and Hautere / Solander Islands

Demographic studies at the three study colonies on The Snares' Northeast Island have been undertaken annually 1992–2024, with the exception of 2018 and 2021. Estimates of the numbers of breeding pairs, made by recording the contents of each nest mound, decreased substantially in all three study colonies compared to 2023, with numbers in the Mollymawk Bay study colony being the lowest recorded during the current study. With the assumption that the combined total number of breeding pairs in the three study colonies was representative of Northeast Island as a whole, then the breeding population probably peaked in 2005–2006 and has since undergone marked annual variations, with decreases in the past two years. If the decreases of 27.3% to 34.8% in the three study colonies are reflected in the population as a whole, then this will be a major concern for the conservation status of the species.

A total of 315 birds that had been banded previously in the study colonies as breeding adults of unknown age were recaptured. A further 26 breeding birds were banded in the study colonies - these are presumed to be first-time breeders. Although the most recent estimate of annual survival of birds banded as breeders (0.93 ± 0.03) was similar to the previous year's estimate of 0.94 ± 0.01, the last

four estimates over the period 2018 to 2023 have varied between 0.84 and 0.94. 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, 92 of these birds were recaptured, with birds from cohorts banded from 1994 and 2002 recorded as breeding for the first time. This demonstrates the long-term monitoring required to obtain reliable estimates of survival of such known-age birds. In addition, five birds that had been banded as near-fledging in the study colonies during Sep 2013 and Sep 2014 were also recaptured for the first time.

At Solander, 20 trackers were deployed on breeding Buller's albatrosses to follow year-round at sea distributions. At the Snares Time Depth Recorders (TDRs), Global Location Sensing (GLS) light-based geolocators and IgotU Global Positioning System (GPS) data loggers were deployed on 13 breeding Buller's albatrosses to investigate diving behaviour and at sea distribution patterns. These deployments were short-term, and 12 of 13 devices were recovered during the trip. Eight Druid satellite transmitting tags paired with eight GLS were also fitted to breeding Buller's albatrosses and these were securely attached for long term deployments to inform year-round at sea distributions.

In 2020, 50 GLS tags were attached to the metal leg bands of breeding birds in the Mollymawk Bay study colony at The Snares; of these, 31 were retrieved in 2022, a further three during the 2023 field season, and one this year. A further 26 GLS tags were deployed at the Mollymawk Bay study colony in the visit reported here.

Twelve replacement trail cameras were deployed to upgrade those previously installed in 2022 at breeding colonies on The Snares and set to record one photograph every hour during daylight for a further year.

Population survey of Southern Buller's albatross on the Solander Islands

An aerial photographic survey of Great and Little Solander islands was carried out on 9 March 2024, mid-way through the Southern Buller's Albatross incubation period. Overall, 6771 individuals were counted in non-overlapping zones drawn on the images: 6215 (92 %) on Great Solander, 556 (8 %) on Little Solander. Of these, 4581 individuals were associated with occupied nests, 3845 (84 %) with a sitting bird alone (no assumptions being made about whether or not the nest contained an egg); the remaining 736 individuals (16 %) were in pairs, with one bird sitting. This means a further 368 occupied nests, giving an initial total of 4213 occupied nests, considered to be the minimum number.

Among other birds seen clearly, 583 were standing by empty nests (referred to here as occupied sites), 75 % as single birds. Loafers (145) comprised the balance of the definable birds. The status of a further 1462 individuals (22 % of the total birds counted) could not be determined directly. Assuming that their status was in the same proportions to those of the clearly observed birds, 1160 of these initially indeterminate individuals would be sitting on nests, giving an overall total of 5373 occupied nests, considered the maximum number.

Compared with the last survey in 2016, which combined aerial survey and counts of sitting birds from vantage points, the minimum estimate would loosely imply 25 % fewer birds at nests. But with the more likely number of occupied nests being c. 5373, the falloff since 2016 might only be about 4 %.

Surveys of 54 occupied nests along seven short transects found only 62.3 % on average had eggs (33 nests). The rest (21 nests, 37.7 %) had birds sitting on empty nests (Sagar et al. 2024). The status of

these latter birds is unclear. They could be pre-breeders returning to the islands prior to nesting for the first time; recent failed breeders that have not yet abandoned their nest; or breeders from previous years taking a break from breeding for some reason. Given the timing of the survey, about halfway through the incubation period, it is unlikely that any of these birds were yet to lay eggs. The proportion of birds sitting on empty nests had only previously been reported in the 2016 survey. If the 2024 ground survey is considered broadly representative of the population, then 27% fewer birds were breeding in 2024.

The number of birds associated with empty nests, both from the aerial survey counts and from the ground survey, together with the numerous empty nests and nest sites seen on the aerial photographs, suggests that many birds may not have bred in 2024.

Recommendations

- Additional trips to The Snares Islands in August–September to record breeding success and band fledglings.
- Attach plastic uniquely numbered alpha-numeric bands to all birds, in addition to metal bands.
- Plan for longer trips to enable recapture of a greater number of birds.
- Conduct satellite tracking of fledgling Southern Buller's albatrosses.
- More needs to be known about the nature of birds sitting on empty nests.
- As a population monitoring tool, future aerial photographic surveys may be better focused on comparing counts from images taken of several clearly demarcated, more-open areas on the two islands, interspersed at longer intervals with longer-duration, more intensive, combined ground and aerial censuses of both islands, as done in the past.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry and 50% funded by the Crown. The planned cost for the project was $150,000 per annum over three years.

Review milestones

- Draft reports presented to CSP TWG in June and August 2024
- Final reports made available on the CSP webpage in June and September 2024.

Citation

Sagar, P., Rexer-Huber, K., Thompson, D., Parker, G. 2024. Population studies of southern Buller's albatrosses at Tini Heke / The Snares Islands and Hautere / Solander Islands. Final report to the Conservation Services Programme, Department of Conservation. Parker Conservation, Dunedin. 13 p.

Frost, P., Baker, B.G., Fischer, J., and Sagar, P. 2024. Population survey of Southern Buller's Albatross T*halassarche bulleri bulleri* on the Solander Islands | Hautere, March 2024. Final report to the Conservation Services Programme, Department of Conservation. 25 p.

Weblink

POP2023-02 Population studies of southern Buller's albatrosses at Tini Heke/The Snares Islands and Hautere/Solander Islands

POP2023-02 Population survey of Southern Buller's albatross on the Solander Islands

3.9 POP2023-03 Updated population estimate and marine habitat utilisation of yellow-eyed penguins/hoiho breeding on Campbell Island

Project objective

1. To obtain an up-to-date estimate of abundance for Campbell Island hoiho (which may include mark-recapture methods and nest searches for breeding pairs).
2. To monitor the health status of hoiho on Campbell Island.
3. To collect data on the marine habitat utilisation and diet of hoiho for data deficient breeding and non-breeding periods as well as for different life history stages (adults, juveniles).

Rationale

The nationally endangered, yellow-eyed penguin/hoiho has experienced a more than 70% decline across its New Zealand mainland range over the past decade. This is likely due to a variety of threats including but not limited to disease, predation, climate change and fishing interactions. However, little information exists about the status of the southern population of hoiho breeding on the Auckland and Campbell Islands. While a coarse recent population estimate exists for the Auckland Island archipelago (577 breeding pairs; Muller et al. 2020), the last population estimate for Campbell Island dates back over three decades (350-460 breeding pairs; Moore 1992). Importantly, an up-to-date population estimate for the southern population is critical for assessing the species wide risk (i.e., combined northern and southern populations) from fisheries, particularly set netting, which constitutes a high risk for hoiho (Rowe 2013). Preliminary tracking of hoiho on Campbell Island indicates that birds forage as far as 100 kilometres away from the colony, highlighting the importance of collecting habitat use, diet and foraging distribution data for the southern population to inform any assessments of direct or indirect effects of trawling activities on hoiho. This project supports Te Kaweka Takohaka mō te Hoiho/the strategy for hoiho and Te Mahere Rima Tau/five-year action plan; specifically, actions 5c (provide knowledge about status and health of southern population), 6f (update SEFRA with new info), and 6h (assess the risk of bycatch from trawl fisheries).

Project status

In progress. This is a multi-year project due for completion in June 2025.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $90,000 per annum over two years.

3.10 POP2023-04 Campbell Island seabird research

Project objective

1. To provide updated counts of Southern Royal Albatross nests in representative study and index sites.
2. To monitor the key demographic parameters of Southern Royal Albatross and reduce uncertainty or bias in estimates of risk from commercial fishing and measure the success of management interventions.
3. To describe the at-sea distribution of Southern Royal Albatross to inform overlap with and risk from commercial fishing.
4. To provide updated population estimates through traditional photo point counts of Grey-headed Albatross.
5. To monitor the key demographic parameters of Grey-headed Albatross at study and index sites and reduce uncertainty or bias in estimates of risk from commercial fishing and measure the success of management interventions.
6. To map any Northern Giant Petrel nests located opportunistically during surveys of other priority species.

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 Campbell Island, research on Southern Royal Albatross has been combined with research on other priority species, such as Grey-headed Albatross, into one Campbell Island seabird research project. Population counts conducted during time-constrained visits in 2019 (BCBC2019-03) and 2023 (POP2022-11) indicate that the Southern Royal Albatross population on Campbell Island has decreased over the last 20 years at a similar rate as the Antipodean Albatross, a species highly vulnerable to bycatch. Counts at Enderby Island mirror these trends. Therefore, dedicated and prolonged counts of Southern Royal Albatross nests on Campbell Island are needed to provide clarity on the species' decline. Demographic parameters (adult survival and productivity) should also be monitored to provide further insights into the drivers of Southern Royal Albatross trends. Similarly, the at-sea distribution of Southern Royal Albatross should be described to gain further information on fisheries risks. Additionally, this project also aims to provide updated estimates of population size and key vital rates (survival and reproduction) for Grey-headed Albatross, another seabird species vulnerable to bycatch. This project may also provide a platform for additional research on other seabird species as risk from bycatch (e.g., Northern Giant Petrel, Antipodean Albatross, Campbell Albatross, and White-chinned Petrels), but this is a lower priority than research on the species mentioned above and is dependent on logistics.

Project status

This is a multiyear project due for completion in June 2025. Year 1 reporting is complete.

Summary of the methods and key findings

Nests were counted in two study (Col and Moubray) and three index areas (Faye, Paris, Honey) to compare to historical counts. Additional aims were to resight marked birds, band up to 200 pairs in the Col study area, deploy PTT and GLS tags, and set up remote cameras on nests to monitor breeding success. Other species work included conducting photo point counts for Campbell and grey-headed albatross and to deploy remote cameras on grey-headed albatross nests. Accessible nest sites were

searched for light-mantled sooty albatross, PTT trackers deployed, and remote cameras set up at nests. Opportunistic searches while traveling or within southern royal albatross study and index areas were done for Antipodean albatross, and any unbanded birds were marked. Opportunistic searches and counts were also done for northern giant petrels and white-chinned petrels.

Nest counts for southern royal albatross showed an overall decline of 32.8% since the 1990s and a 26.5% decline since the 2000s. Paris index area had the highest percent change of -46.2% since the 1990s, and Col study area had the lowest at -23.6%. A total of 35 PTT trackers were deployed on southern royal albatross in the Col study area which show birds moving north to the Chatham Rise, west to Tasmania, south towards Antarctica, and to the Patagonian Shelf east of Argentina. Thirty-four GLSs devices were also deployed. For demographics, 113 nests have both birds of the pair marked within the Col study area, and 22 cameras were set up on nests to monitor breeding success. For Campbell and grey-headed albatross photo point counts, the percent change between 2019/20 and 2023/24 showed a decline in the total number of Campbell albatross (sitting and loafing birds) of 16.1% and a decline of 27.6% of grey-headed albatross. For breeding success monitoring of grey-headed albatross, five cameras covering 28 nests were deployed. For light-mantled sooty albatross, ten PTT trackers were deployed on non-breeding birds which show most birds travelling south towards Antarctica. A total of 11 cameras covering 14 nests were set up for breeding success monitoring. For Antipodean albatross, eight birds were found on the Moubray Peninsula, of which three were previously banded as chicks on Campbell Island in the 1990s.

Recommendations

- Deploy tracking devices on birds breeding in the Paris index area.
- Continue the capture-mark-recapture work for at least another year, but preferably annually to better understand the drivers of the population decline.
- Repeat the count efforts for southern royal, Campbell, and grey-headed albatross next year to account for the second cohort of breeders as well as annual variability, and then at least every 5 years, if not more regularly to keep a closer eye on the population
- Deploy tracking devices on Campbell albatross and grey-headed albatross to better understand what is causing the population declines.
- Re-start the capture-mark-recapture banding study on Campbell and grey-headed albatross to understand the drivers of the population declines.
- When traveling around the island for southern royal albatross study and index plot counts, spend a day or two in the given areas to focus solely on northern giant petrel counts and searching for white-chinned petrel burrows (following methods used by Rexer-Huber et al. 2020). This should include revisiting previously located sites for both species.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry and 50% funded by the Crown. The planned cost for the project was $90,000 per annum over two years.

Review milestones

- Draft report made available on the CSP webpage and presented to CSP TWG in June 2024
- Final reports made available on the CSP webpage in June and September 2024.

Citation

Mischler, C., Thompson, T., Moore, P., Philip, B., Wickes, C. 2024. Campbell Island Seabird Research. POP2023-04 final report prepared for Conservation Services Programme, Department of Conservation. 49 p.

Weblink

Year 1 (2023/24) final report: POP2023-04 Campbell Island seabird research 2024

3.11 POP2023-05 Auckland Islands New Zealand sea lions

Project objective

1. To estimate annual New Zealand sea lion pup production on Enderby Island, Dundas Island and Figure of Eight Island.
2. To mark a subset of pups following established protocol.
3. To collect tag resights at all locations to provide survivorship data for the demographic model.

Rationale

The New Zealand sea lion (Phocarctos hookeri), one of the world's rarest sea lions, is currently classed as Nationally Vulnerable, with a total population estimate of 10,000 individuals breeding mostly on the subantarctic Auckland Islands (Baker et al. 2019, Roberts & Edwards, unpublished research). New Zealand 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 areas. Approximately 70% of New Zealand sea lions breed at the Auckland Islands, where population data have been collected since the mid-1990s, including estimates of pup production and resighting of marked animals. Since 2001, there has been a considerable decline in pup production at the Auckland Islands (Campbell et al. 2006; Chilvers et al. 2007). The New Zealand sea lion Threat Management Plan (TMP), first implemented in 2017, established a range of research and management actions to address the threats to the recovery of this species. 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 to determine the key demographic factors driving the observed decline of New Zealand sea lions at the Auckland Islands. This project 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 New Zealand sea lion population is vital to the ongoing assessment of direct and indirect risks to the species from commercial fisheries, as described in fisheries operational plans, and to determine the overall size and vulnerability of the population.

Project status

This is a multiyear project due for completion in June 2026. Year 1 reporting is complete.

Summary of the methods and key findings

The field team spent a total of seven weeks at the Auckland Islands undertaking the CSP project; 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 each of the colonies. At Dundas Island, the team conducted a mark-recapture analysis to determine a pup production estimate. All live pups (297 total) at Sandy Bay, Enderby Island, were double-flipper tagged and microchipped, and 200 pups were double-flipper tagged at Dundas Island.

Resightings of marked (flipper tagged/microchipped) animals of all age and sex classes were collected daily on Enderby Island. 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 2023/24 was estimated as 1457 ± 19 pups (mean ± 1 SE), slightly higher than the historic low of 1278 ± 23 pups reported in 2022/23 (Manno & Young 2023). As was the case in the previous season, 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 and the Squid 6T Operational Plan.

The past two field seasons have reported 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. Further research is needed to determine the cause of the decline and the management implications for the species. The continued lower level of pup production compared to previous seasons supports a review of the effectiveness of current management actions to recover New Zealand sea lions in their subantarctic range.

Recommendations

- Review and implement a new iteration of the NZ sea lion TMP with Te Rūnanga o Ngāi Tahu and Fisheries New Zealand as partners.
- Analyse tag resight data from 2022/23 and 2023/24 to investigate any changes in breeding rate or demographics of female New Zealand sea lions observed at Sandy Bay.
- Repeat this population survey in 2024/25, with an increased emphasis on tag resightings to provide quality data for an updated demographic model.
- Update the demographic model for the Auckland Islands New Zealand sea lion population in 2024, including quality resight data from 2022 - 2024.
- Investigate links between the continued low levels of pup production this year with oceanographic conditions and fisheries patterns.
- Conduct tracking of female New Zealand sea lions at Auckland Islands in winter and summer 2024/25, to provide insights into the observed decline in pup production.
- Determine evidence for nutritional stress from samples collected during tracking.
- Incorporate new information on population size and trajectory into assessment of threats and threat mitigation measures for New Zealand sea lions.

Project logistics summary statement

This project was 90% funded via Conservation Service Levies on the fishing industry and 10% funded by the Crown. The planned cost for the project was $150,000 over three years.

Review milestones

- Draft report made available on the CSP webpage and presented to CSP TWG in June 2024
- Final report made available on the CSP webpage in July 2024.

Citation

Manno KL, Whyte J, Young MJ. 2024. New Zealand sea lion/pakake/whakahao field research report Auckland Islands 2023/24. Dunedin: Department of Conservation, 30 p.

Weblink

Year 1 (2023/24) final report: POP2023-05 Auckland Islands New Zealand sea lions 2023/24

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 2023-24 fishing year (1 October 2023 - 30 September 2024), the liaison programme reviewed and updated 146 PSRMPs and established 11 new PSRMPs for inshore and Highly Migratory Species (HMS) vessels. A total of 27 PSRMP audits were completed by Observer services. These were comprised of 0 surface longline, 8 bottom longline, 12 trawl and 4 set net audit and 3 purse seine audits. The Liaison Programme received 214 triggers that were reported by 73 different vessels through NFPS-Catch reporting. Trigger follow-ups were made up of captures totalling 528 seabirds, 34 pinnipeds, 32 cetaceans, 10 turtles and 7 sharks/rays. The 10 turtle captures occurred 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 2023-24 Liaison Programme Annual Report. Work is also underway to establish Electronic Monitoring Review reports that can inform Liaison Programme activities moving forward.

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 over 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

Postponed by one year.

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 over two years.

4.3 MIT2023-01 Understanding the relationship between fishhook size and bait type with seabird and turtle captures

Project objectives

1. Literature review of available data on hook size and bait type for seabird and turtle bycatch rates across different target fisheries using existing information sources to provide recommendations for improved data collection.
2. Review international literature on current fisheries best practice to reduce the impact of hook size on bycatch.
3. Interview all SLL operators to identify preferred hook size and bait type as turtle/seabird deterrents to better inform protected species risk management plans (PSRMPs) and to help characterise current gear set-ups in SLL fisheries.

Rationale

Seabirds are caught on fishing hooks either by swallowing baited hooks, or by being hooked in the mouth or body by a bare hook. Research shows that the risk of seabird bycatch is reduced with the use of circle hooks instead of 'J' hooks, however little is known about the effect of hook size and bait type on bycatch rates for various seabird species. By comparison, research shows that the risk of turtle bycatch is also reduced with the use of circle hooks, as well as large hooks and fish bait instead of squid bait. This project is a pilot study aimed at using data collected through the CSP seabird necropsy programme, and other sources, to investigate the effect of hook size and bait type on seabird bycatch rates across different target fisheries. Results will enable us to provide consistent messaging on mitigation recommendations for reducing the risk of both seabird and turtle bycatch and meet our international commitments for the protection for these highly migratory species.

Project status

Complete.

Summary of the methods and key findings

Hook size and bait type affect seabird and sea turtle bycatch risk in longline fisheries. This report reviews published and grey literature that presented comparisons of bycatch rates for different hook and bait types to assess the effectiveness of certain hooks (e.g., circle hooks) and baits (e.g., fish) at reducing bycatch of seabird and sea turtle species. Literature on international best practices for hook and bait type was also reviewed. Additionally, this report summarises data collected through the Conservation Services Programme (CSP) seabird necropsy project as well other data sources, such as the Centralised Observer Database. These datasets were assessed for their suitability to obtain complete and representative information about sea turtle and seabird bycatch in relation to hook size and bait type. Lastly, results from a questionnaire administered to surface longline (SLL) fishers via the Department of Conservation are presented to understand current gear configurations being used in the New Zealand SLL fleet and the first-hand experience of fishers using different gear in response to seabird and sea turtle bycatch.

Internationally, squid, fish, or a combination are primarily used as bait in longline fisheries. Fish bait, particularly mackerel, reduced sea turtle interactions in eight studies compared to squid, although the effectiveness varies. Conversely, mackerel increased the number of shearwater, gannet, and gull captures in one study and was inconclusive in another. The impact of bait type on target species catch

rates was less clear, with similarly conflicting findings reported. The effectiveness of dyed bait remained mixed across studies, with some reporting lower seabird bycatch rates.

Studies consistently showed that larger circle hooks, such as 18/0, significantly decreased the capture rates of sea turtles and seabirds compared to traditional J hooks and improved post-release survival of captured turtles. However, the effectiveness of hook type and size varied depending on factors such as fishing effort, bait type, and regional differences in fishing practices. Mitigation measures such as Hookpods, which shield the hook during setting, have shown promising results in reducing seabird and sea turtle captures and are now required for the New Zealand SLL fleet.

A review of bycatch data obtained from several sources, which includes observer-reported data, fisher-reported data, and necropsy data, revealed that data may be insufficient to conduct robust statistical analyses on the effects of bait or hook type on protected species captures. Bait type and hook type were rarely reported, and the consistency in hook type (mostly 16/0) and bait (squid) used across the fleet in recent years could prevent a comparison of bycatch rates across different baits and hooks. It will also take considerable effort to link all the different tables across the different databases.

Based on the questionnaire responses, 17 operators in the New Zealand SLL fleet universally used circle hooks (14/0-17/0) baited with squid bait when targeting tuna and swordfish. Along with Hookpods, fishers employed various hook and line weighting and bait dying, especially during full moon phases, to mitigate seabird interaction risk. Little mitigation is focused on sea turtles at present.

Recommendations

Based on this review, recommendations in international guidelines adhere to the most current knowledge of the most effective hook and bait type for seabird and/or sea turtle bycatch mitigation. Typical recommendations include the use of large circle hooks (16/0 or larger) with offsets less than 10° and the use of fish bait where possible. It is also commonly suggested to use additional methods to reduce bycatch such as single hooking fish bait, reduced gear soak time, night setting, mitigation devices (e.g., tori lines, Hookpods), line weighting, and seabird/sea turtle hotspot avoidance. More research is required to determine if colour dyeing bait is effective at reducing turtle and seabird bycatch.

It is also recommended that New Zealand electronic catch and effort reporting for both surface and longline fisheries be at the trip and station level (not just associated with a protected species capture) and include additional information on hook type, size, offset, and manufacturer, along with information on bait species, hooking method, and bait state. Lastly, more research is required to understand how bait and hooks influence bycatch rates for both sea turtles and seabirds in New Zealand. Future analyses should quantify catch rates of target and non-target species using fish versus squid as bait and smaller versus larger circle hooks, considering different combinations of hooks and baits that are currently being used on longline vessels.

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.

Review milestones

- Draft report made available on the CSP webpage and presented to CSP TWG in August 2024.

- Final report made available on the CSP webpage in October 2024.

Citation

Hickcox, R.P. Meyer, S., and MacKenzie, D.I. 2024. Effects of hook and bait type on commercial longline fisheries bycatch (MIT2023-01). Report for the Department of Conservation, Conservation Services Programme, Proteus Client Report: 187. Proteus, Outram, New Zealand. 98 p.

Weblink

Final report: MIT2023-01 Effects of hook and bait type on commercial longline fisheries bycatch

4.4 MIT2023-02 Understanding and mitigating seabird and turtle bycatch during the pelagic longline soak period

Project objectives

1. Characterise surface longline hook depth profiles throughout the fishing period via the deployment of TDRs.
2. Assess risk of captures during the soak period by identifying incidents of exposed hooks at the surface during the 'soak period'.
3. Compare depth profiles of sets with and without protected species captures and identify any apparent patterns.
4. Review international research and consider the effectiveness of existing mitigation practices on hook exposure during the soak period.

Rationale

Seabird bycatch mitigation development in pelagic longline fisheries has focused primarily on the risk during setting and more recently on the haul period. However, it is known that pelagic longlines can also be brought up to the surface during the soak, e.g., by hooked sharks, where exposed baited hooks can pose bycatch risk to seabirds. The extent of this risk is currently unknown as it is difficult to determine the point at which birds are caught during a fishing operation. Similarly, there is little information on the depth and time for which turtles are caught during the fishing period.

Project status

Literature review is complete. At-sea component in progress.

Summary of the methods and key findings

This literature review provides New Zealand's Department of Conservation (DOC) with an up-to-date synthesis of bycatch mitigation measures for seabirds and turtles during the soak period of surface longline fishing. A series of mitigation measures were collated, summarized, and analysed for their potential efficacy in reducing seabird and turtle bycatch in New Zealand, as well as any barriers to implementation they may be associated with. The findings from the literature review collation and analysis stages were summarized into a series of recommendations for the DOC to take forward, with focus being on future testing of new measures to reduce soak period bycatch of these focal taxa within the surface longline fishery.

This review identified a series of key challenges in reducing seabird and turtle bycatch during the soak, as well as recommendations outlining potential candidate measures to mitigate against the bycatch associated with them. Candidate measures identified with the potential to reduce the likelihood of mainlines shoaling include proper weighting of the mainline via weights at the base of float lines and the use of increased branchline weighting; using deep-set longlines where possible; and the potential use of line shooters where the mainline is kept out of vessels' propeller turbulence during setting. Measures to reduce the likelihood of seabirds and turtles interacting with baited hooks where they are exposed during the soak include night soaking, bait dyeing, using longer branchlines with weights close to hooks, the use of fish bait, and the use of novel hook designs to prevent ingestion. Finally, where bycatch rates reach concerning levels, the use of spatial and temporal management measures may be used to limit fishing effort in specific fisheries management areas, or during periods that are known to be associated with high bycatch rates. However, implementing these closures with any level

of confidence around their expected efficacy is challenging where historical observer data on seabird and turtle bycatch is limited. Despite a paucity of literature on experimental measures, this report recommends further investigation of the potential use of automatic release mechanisms, and the use of hook timers alongside TDRs to reveal how mainlines are brought to the surface and the scale of seabird interaction with them where they do shoal to the surface.

Recommendations

- Increased deep setting across the surface longline fleet where possible, using weighted longline configurations as described in the report.
- Increased branchline length and weighting, particularly towards the hook, using sliding weights to reduce the risk to crew in the event of fly back events.
- Continued use of circle hooks, with testing of larger hook dimensions with a minimum size 18/0.
- Further testing of the effects of bait dyeing and hooking technique.
- Test replacing squid bait with finfish bait and assess the extent which finfish bait increases shark bycatch.
- Where bycatch levels are at their highest, FNZ and the DOC might consider the use of LRPs and spatio-temporal closures or restrictions.
- Adjusting fishing operations to increase the proportion of the soak period in darkness hours ('night soaking').
- Investigate the use of hook timers to link target and bycatch capture.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $90,000.

Review milestones

- Final report made available on the CSP webpage in September 2024.

Citation

Peat, W., Vella, E. and Pearce, J. 2024. Literature Review of Soak Period Bycatch Mitigation Measures for New Zealand's Surface Longline Fleet. MIT2023-02B final report prepared by MRAG Ltd. 54 p.

Weblink

Final report: MIT2023-02B Literature Review of Soak Period Bycatch Mitigation Measures for New Zealand's Surface Longline Fleet

4.5 MIT2023-03 Describing the marine habitat utilisation and diet of hoiho to analyse the effectiveness of mitigation tools at a major breeding colony on Rakiura/Stewart Island

Project objectives

1. Study the habitat utilisation and diet of hoiho breeding at two sites during different breeding stages (guard, post-guard and pre-moult) to quantify the spatial overlap of hoiho with local fishing activities and fisheries target species (dietary overlap).
2. Investigate whether this can explain differences in breeding success between the two main breeding sites of the Neck area on Stewart Island/Rakiura.
3. Review the appropriateness of recently established voluntary set net closures adjacent to the Neck area.

Rationale

Fisheries activities can pose direct and indirect threats to seabirds. Direct effects include incidental captures in fishing nets and benthic disturbance, whereas indirect effects include resource competition when fisheries and seabirds target the same prey, potentially affecting seabird breeding success. The wider Neck area on Stewart Island/Rakiura harbours ~20% of the current breeding population of the nationally endangered hoiho on Rakiura making this an important breeding colony. Breeding areas on the Neck are concentrated at two main sites: Little Glory Bay, which lies on the Paterson Inlet side of the Neck, and Steep Head which lies on the seaward side. Based on previous tracking studies of hoiho breeding on islands in Paterson Inlet (POP2018-02, POP2020-05), it is assumed that hoiho breeding at Little Glory Bay will also forage in Paterson Inlet, whereas hoiho breeding at Steep Head are more likely to feed out at sea. Importantly, hoiho at Steep Head may face a higher risk from incidental capture in setnets compared to hoiho breeding at Little Glory Bay, Paterson Inlet and other sites (e.g., voluntary exclusion zones) where no set netting activity takes place. Furthermore, hoiho breeding at Steep Head have shown reduced breeding success in recent years compared to birds from Little Glory Bay, possibly due to less favourable foraging conditions.

Project status

Delayed, due for completion in June 2026.

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.

4.6 MIT2023-04 Synthetic trawl warps to mitigate seabird warp strikes

Project objectives

To assess whether brightly coloured synthetic trawl warps reduce seabird warp strikes.

Rationale

In trawl fisheries the highest unmitigated risk of seabird bycatch is typically through cable strikes (birds, typically larger species such as albatross, being hit by the trawl warp or other cables). The true extent of these interactions is poorly known as most interactions are cryptic, or not readily observed (most birds that are hit by cables are lost to the sea). This high level of cryptic mortality uncertainty drives a high bycatch risk for inshore trawl fisheries. Brightly coloured synthetic Dyneema warps are used by some inshore trawlers in place of traditional steel cables. It is possible that the characteristics of such material may influence the likelihood of warp strikes, for example by making the warps more visible to seabirds. However, no evidence has been collected to date to test this hypothesis.

Project status

Delayed due to lack of observer trips.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $60,000.

4.7 MIT2023-05 Enabling uptake of best practice seabird bycatch mitigation in the surface longline fishery

Project objectives

Increase uptake of seabird bycatch mitigation that is in line with Mitigation Standards for surface longliners by:

1. Assessing which surface longline vessels are not currently aligned with the Mitigation Standards and identify vessel-specific barriers.
2. Sourcing mitigation gear (e.g. novel line weighting options, hauling mitigation).
3. Coordinating, promoting and supplying mitigation gear suitable for vessel-specific operations and closely support its implementation.

Rationale

Monitoring the uptake and implementation of best practice seabird bycatch mitigation, as described in the Mitigation Standards under the NPOA-Seabirds 2020, has highlighted limited progress in the surface longline fleet. This is especially apparent with a lack of alignment to the recommended use of either hook-shielding devices on 100% of hooks or 3/3 mitigation (tori line, night-setting, and line weighting to ACAP standards). Seabird bycatch remains high in the surface longline fleet, and more support is required to facilitate the uptake of bycatch mitigation solutions that are practicable for each vessel's operations and are in alignment with best practice Mitigation Standards.

Project status

Complete. Outcomes documented in Liaison Programme reporting.

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.

4.8 MIT2023-06 Underwater line setting devices for bottom longline vessels

Project objectives

To further develop and test one or more underwater line setting seabird bycatch mitigation device(s) to widen their potential application across small vessel bottom longline fisheries.

Rationale

The Mitigation Standards to reduce the incidental captures of seabirds in bottom longline fisheries set a requirement that hooks set during high-risk periods are protected by the aerial extent of the tori line until the hooks have reached a depth of 10 m, or 5 m outside of high-risk periods. Underwater setting has the potential to increase sink rates and reduce risk to birds. It is particularly relevant to meeting the Mitigation Standards, whilst maintaining flexibility of gear configuration for fishers. It also has the potential to effectively mitigate bycatch during higher risk periods. Previous projects, most recently that reported by Goad et al (2022), and further work currently underway as part of CSP project MIT2021-03, have focussed on two devices. The first was initially conceived by Dave Kellian and is described as the 'underwater setter'. It is towed behind the vessel at depth and the longline passes under a guide. The second device was conceived by Nigel Hollands and uses a roller held under the surface by a pole fixed to the vessel, with the longline passing under the roller. It is described as the 'line depressor'. These devices represent a novel new approach to mitigating seabird bycatch in longline fisheries.

Project status

Delayed, due for completion in 2026.

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.

4.9 MIT2023-07 Novel seabird bycatch mitigation for floated demersal longline fisheries

Project objectives

1. To identify potential novel options to mitigate seabird bycatch in floated demersal longline fishing gear.
2. To test one or more novel bycatch mitigation option(s) identified for floated demersal longline operations and assess the feasibility and practicality of commercial implementation.

Rationale

There are significant challenges for some floated demersal longline fisheries in achieving desired sink rates of gear to meet Mitigation Standards to reduce the incidental captures of seabirds in bottom longline fisheries. For example, the slow setting speeds typical in bluenose target fisheries limit the extent of aerial protection that tori lines can provide. Identifying and proving new bycatch mitigation options will allow for increased flexibility in how fishing operators can most effectively minimize seabird bycatch in their particular operation.

Project status

Complete.

Summary of the methods and key findings

The introduction of mitigation standards and subsequent changes to regulations require fishers to sink demersal longlines to a depth of five metres within the aerial extent of the tori line. Previous experimental trials without hooks identified gear modifications to reduce sink times to depth for 'floating' demersal longlines set with multiple floats attached between widely spaced weights. In combination with tori line improvements, these modifications were shown to meet regulations.

This project tested compliant gear configurations in a fishing context to examine their practicality, workability, and influence on catch rates compared to control gear set as per the skipper's normal practice. Deployment of modified floats with a seven-metre rope between the float and the longline and a small weight on the longline was successful. Increased line weight size and reduced line weight spacing were also employed. These measures resulted in reduced times to depth and, in combination with tori lines providing coverage up to 90 m astern, met the regulated depth of five metres at the end of the tori line.

The use of more weight and modified floats resulted in a marginal increase in workload for the crew, but did not hinder setting or hauling operations. Modified floats performed well, did not frequently tangle with the longline or tori line, and proved simple to set and retrieve.

Poor and patchy catch rates precluded firm conclusions on the influence of experimental gear configurations. However, if necessary, options were identified to more precisely control the height hooks fish above the seabed whilst meeting regulations.

Recommendations

Translating results from trips with a dedicated researcher on board measuring sink times to depth into normal fishing operations across the fleet could be facilitated by providing fishers with user-friendly TDRs to estimate depth at the end of the tori line.

Trips to sea with fishers are extremely productive, not only for quantifying performance of mitigation measures, as described above, but also supporting fishers to make changes with minimal impact on operations. All opportunities should be taken to join fishers at sea and, if fishers have particular concerns with meeting regulations, then demonstrating options at sea on a commercial trip can be hugely productive.

Further refinement of this approach particularly regarding line tension and use of floats directly on the backbone at the start of multi-float sections should be considered. However, this will not necessarily translate between vessels and skippers so should be part of supporting individual vessels in the fleet to improve sink times to depth where necessary.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $120,000.

Review milestones

- Draft final report made available on the CSP webpage in May 2024.
- Final report made available on the CSP webpage in June 2024.

Citation

Goad, D. 2024. Novel seabird bycatch mitigation for floated demersal longline fisheries. MIT2023-07A final report prepared by Vita Maris for the New Zealand Department of Conservation, Wellington. 22p.

Weblink

Final report: MIT2023-07A Novel seabird bycatch mitigation for floated demersal longline fisheries