# Conservation Services Programme Annual Plan 2022/23

August 2022
Conservation Services Programme
Department of Conservation
PO Box 10 420
Wellington
www.doc.govt.nz/csp

Department of Conservation
*Te Papa Atawhai*

New Zealand Government

# Statement on Conservation Services

Conservation services are defined in section 2 of the Fisheries Act 1996 as follows:

> *"Conservation services means outputs produced in relation to the adverse effects of commercial fishing on protected species, as agreed between the Minister responsible for the administration of the Conservation Act 1987 and the Director-General of the Department of Conservation, including—*
>
> *(a) Research relating to those effects on protected species:*
>
> *(b) Research on measures to mitigate the adverse effects of commercial fishing on protected species:*
>
> *(c) The development of population management plans under the Wildlife Act 1953 and the Marine Mammals Protection Act 1978."*

We agree that the outputs described in the following pages, to be delivered in 2021/22, are "conservation services" in accordance with this definition. Cost recovery principles have been applied in accordance with section 262 of the Fisheries Act 1996.

Hon. Poto Williams
*Minister of Conservation*

Penny Nelson
*Director-General of the Department of Conservation*

# Table of Contents

1. Overview ..... 5
1.1 Introduction ..... 5
1.2 Format ..... 5
1.3 Guiding frameworks, research planning and prioritisation ..... 5
1.4 Observer planning ..... 6
1.5 Consultation ..... 6
1.6 Administrative costs ..... 6
2. Interaction Projects ..... 8
2.1 Observing commercial fisheries ..... 8
2.2 Identification of marine mammals, turtles and protected fish captured in New Zealand fisheries ..... 31
2.3 Collection and curation of tissue samples from protected fishes and turtles ..... 33
2.4 Identification of seabirds captured in New Zealand fisheries ..... 35
2.5 Identification, storage, and genetics of cold-water bycatch specimens ..... 38
2.6 Risk assessment for protected corals ..... 40
2.7 Determining the resilience of Fiordland corals to fisheries impacts ..... 42
2.8 The distribution and abundance of marine mammals observed around commercial fishing vessels in New Zealand waters ..... 44
2.9 Post-release survival of bycaught spine-tailed devil rays in the New Zealand skipjack tuna purse seine fishery ..... 46
3. Population Projects ..... 48
3.1 Southern Buller's albatross: Snares/Tini Heke population project ..... 48
3.2 Identification of protected coral hotspots using species distribution modelling 50
3.3 Flesh-footed shearwater population monitoring ..... 52
3.4. Fur seal population estimate and bycatch analysis, Cook Strait ..... 54
3.5 Otago and Foveaux shag population census ..... 56
3.6 Assessment of causes of low burrow occupancy rates in Westland petrels ..... 58
3.7 Black petrel population monitoring ..... 60
3.8 Flesh-footed shearwater juvenile survival and dispersal ..... 62
3.9 Deep sea protected coral reproduction study ..... 63
3.10 Deep diving into decades of uncatalogued corals ..... 65
3.11 Northern Buller's albatross population monitoring ..... 67
3.12 Northern royal albatross population monitoring ..... 69
3.13 Westland petrel foraging movements and diving behaviour ..... 71
3.14 Auckland Island seabird research: Gibson's and white-capped albatross ..... 73
3.15 Auckland Islands New Zealand sea lions ..... 75
3.16 Antipodean Island seabird research: Antipodean albatross + white chinned petrel ..... 77
3.17 Campbell Island Seabird Research ..... 79

4. Mitigation Projects ..... 81
4.1 Protected Species Liaison Project ..... 81
4.2 Longline hauling mitigation devices ..... 83
4.3 Understanding drivers and barriers to mitigation uptake in small vessel bottom longline ..... 85
4.4 DOC Coral Symposium 2022/23 ..... 87
4.5 Bait retention as a driver to mitigation use in the surface longline fishery ..... 89
4.6 Large trawl vessel warp mitigation ..... 90
4.7 Light mitigation: reducing vessel interactions with seabirds ..... 92
4.8 Inshore trawl warp mitigation ..... 94
Appendix: Cost Recovery Tables ..... 96
A: CSP 2022/23 Project Costs ..... 96
B: CSP Observer Cost recovery ..... 98

# 1. Overview

## 1.1 Introduction

The Conservation Services Programme (CSP) has operated under the administration of DOC since 1996, with the aim of avoiding, remedying, or mitigating the adverse effects of commercial fisheries on protected species. The Conservation Services Programme Annual Plan 2022/23 (Annual Plan) outlines the conservation services to be delivered as the Conservation Services Programme (CSP), and subject to cost recovery from the commercial fishing industry in the 2022/23 financial year. As such, this Annual Plan forms the basis for levying the commercial fishing industry under the Fisheries Act 1996. For a summary of the legal basis of levied work described in this Annual Plan, refer to the Conservation Services Programme Strategic Statement[1] (Strategic Statement).

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*". To meet this vision, the following CSP Objectives, as described in the Strategic Statement, have been identified:

- Objective A: Proven mitigation strategies are in place to avoid or minimise the adverse effects of commercial fishing on protected species across the range of fisheries with known interactions.
- Objective B: The nature of direct adverse effects of commercial fishing on protected species is described.
- Objective C: The extent of known direct adverse effects of commercial fishing on protected species is adequately understood.
- Objective D: The nature and extent of indirect adverse effects of commercial fishing are identified and described for protected species that are at particular risk to such effects.
- Objective E: Adequate information on population level and susceptibility to fisheries effects exists for protected species populations identified as at medium or higher risk from fisheries.

## 1.2 Format

The format used to specify the conservation services in this Annual Plan includes an outline of the objectives and rationale for each project, and the anticipated outputs. Guiding objectives, both CSP Objectives and relevant management plans, are identified for each project. The project specifications also indicate cost recovery information, i.e., indicative project costs (excluding administration costs), relevant provisions within the Fisheries (Cost Recovery) Rules 2001 that determine cost recovery allocation, and relevant fish stocks to which cost recovery is applied. Costs are summarised in the Appendix. All financial amounts appearing in this document are exclusive of GST.

## 1.3 Guiding frameworks, research planning and prioritisation

The Strategic Statement describes the process through which each annual plan of conservation services will be developed and delivered. It provides detail on the wider management context, the research planning and prioritisation processes used by CSP, and the way CSP is implemented by working with others.

The CSP planning considers and works in parallel with other relevant planning and management processes such as the National Plans of Action (NPOAs) for seabirds and sharks, and the

[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

Hector's and Māui dolphin and the New Zealand sea lion Threat Management Plans (TMPs). The iterative and inclusive planning process ensures that gaps are identified, and research synergies are maximised.

The CSP Research Advisory Group (RAG), was established in 2013 following finalisation of the Strategic Statement and provided guidance for the development of this Annual Plan. Four medium term research plans[2] have also been developed as part of the work of the RAG: the CSP seabird medium term research plan (CSP Seabird Plan), the CSP protected fish medium term research plan (CSP Fish Plan), the CSP marine mammal medium term research plan (CSP Mammal Plan), and the CSP protected coral medium term research plan (CSP Coral Plan). These plans have been used to inform and guide relevant sections of this Annual Plan. In time, a medium-term research plan for the remaining protected species group (marine reptiles) will also be developed.

A summary of the planning and prioritisation milestones, in accordance with the Strategic Statement, undertaken in developing the Annual Plan 2022/23 can be found in the Consultation section below.

## 1.4 Observer planning

Observer coverage is planned and prioritised based on specific monitoring objectives for protected species interactions with fisheries and achieving adequate coverage levels for high-risk fisheries to allow detection of changes in bycatch over time. These objectives are balanced with other fisheries management objectives, available resources of the observer programme and feasibility of delivery.

## 1.5 Consultation

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

| | |
|---|---|
| 15 December 2021 | Updated medium term research plans, initial list of research proposals and CSP RAG prioritisation framework circulated to CSP RAG. |
| 7 March 2022 | CSP RAG meeting to discuss and prioritise initial research proposals. |
| 20 March 2022 | Additional feedback received from CSP RAG on research proposals and their prioritisation. |
| 21 April 2022 | Draft CSP Annual Plan 2022/23 released for public consultation. |
| 27 May 2022 | Public consultation period closes. |
| Early–June 2022 | Summary of public submissions and response to comments completed. |
| Mid–June 2022 | Director-General of the Department of Conservation conveys the CSP Annual Plan 2022/23, amended in accordance with public submissions, to the Minister of Conservation for agreement. |

## 1.6 Administrative costs

The administrative requirements of each project differ, as does the time required to address these. Currently, administration charges are distributed in a pro-rated fashion across projects, in accordance with the cost of the project, except for INT2022-01 (Observing commercial fisheries) where the administration cost is fixed at $110,000. This approach is appropriate, as the highest

[2] These are available to download from http://www.doc.govt.nz/csp-rag

cost project (INT2022-01) incurs the majority of administration expenses including observer training programmes, training materials, data management, briefing and debriefing, liaison at sea and with other agencies when necessary, and reporting. For other projects, the administration component may be significantly less. Administration also includes charges for the use of Departmental facilities and services.

DOC is continually striving to maximise efficiencies and the administration costs for delivering conservation services. We welcome stakeholder views on different ways to attribute administration costs across projects. These have been reduced in previous years to the current level of $240,000, which has been in place since 2011/12.

# 2. Interaction Projects

## 2.1 Observing commercial fisheries

**Project code:** INT2022-01

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2023

**Guiding Objectives:** CSP Objectives A, B, C; National Plan of Action – Seabirds[3], National Plan of Action – Sharks[4]; New Zealand sea lion Threat Management Plan and Hector's and Māui dolphin Threat Management Plan[5].

**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**

*Management approach*

Understanding the nature and extent of interactions between commercial fisheries and protected species can identify where the most significant interactions are occurring and can be used to inform development of ways to mitigate those interactions and adverse effects. Such data contribute to 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.

CSP will continue to purchase baseline services for offshore fisheries observers from Fisheries New Zealand Observer Services (Observer Services). Inshore fisheries observer coverage will be delivered by Observer Services, with CSP purchasing 50% of the levied cost. This allows observers to be placed strategically across New Zealand fisheries (Appendix B). For the purposes of providing costings, the daily rate provided by Observer Services has been used. As such, for the purposes of planning, costings for observer coverage are a best estimate based upon this rate.

The objectives outlined in the NPOA–Seabirds 2020, the NPOA Sharks 2013 and the Hector's and Māui dolphin Threat Management Plan 2020 have been considered in the planning of the observer days this year.

[3] National Plan of Action - Seabirds https://www.mpi.govt.nz/dmsdocument/38054/direct
[4] National Plan of Action -Sharks (under review in 2021) https://www.mpi.govt.nz/dmsdocument/1138-National-Plan-of-Action-for-the-Conservation-and-Management-of-Sharks-2013
[5] Hector's and Māui Threat Management plan: https://www.doc.govt.nz/globalassets/documents/conservation/native-animals/marine-mammals/maui-tmp/hectors-and-maui-dolphin-threat-management-plan-2020.pdf

*Research Approach*

The allocation of observer coverage across inshore, deepwater and highly migratory species fisheries is guided by several factors including data needs for protected species and fisheries management, compliance, and international obligations, in consideration of:

- Historic mortality of protected species.
- Fishing effort.
- Past observer coverage.
- The status of threatened protected species.
- Current level of information.
- Risk assessment work which has been undertaken (e.g., Rowe 2010a, Richard & Abraham. 2015, Abraham et al. 2017).
- Requirements under the NPOA Seabirds, and NPOA Sharks and any relevant TMPs.
- Information needs identified for recently protected species.
- Ministerial directives.

Ministerial directives include high squid 6T coverage for sea lion captures, both trawl and set net vessel coverage on the West coast of the North Island to address some of the Māui dolphin issues raised in the HMD TMP, and coverage of snapper trawl in the Hauraki Gulf to look at concerns around snapper stocks and undersized snapper. Where coverage is driven by ministerial direction and provides a platform for delivery of the CSP Observer Programme, CSP will continue to purchase a relevant portion of that coverage for protected species.

The duties of an observer in respect to the CSP Observer Programme are summarised as:

- Monitoring and recording the interactions of protected species with fishing operations.
- Reporting on the efforts made to mitigate the adverse effects of commercial fishing on protected species.
- Recording, photographing, and tagging all protected species bycatch.
- Recovering and returning the carcasses or samples of deceased protected species for identification, necropsy or genetic work.
- Recording observational data on numbers and behaviour of marine mammal and seabird species observed around fishing vessels.
- Collecting information to better understand cryptic morality of protected species.
- Monitoring vessel activities against any relevant operational plans such as Protected Species Risk Management Plans (PSRMPs) or Vessel Management Plans (VMPs).
- Carrying out other tasks (e.g., making observations on fish and offal discharge) as required.

In addition to the duties listed above, observers will collect data for specific mitigation or information acquisition projects. Examples of past projects include fish waste trials, tori line observations and blue-dyed bait trials.

Information collected includes:

- Environmental conditions (e.g., sea state).
- Fishing methods (including a description of gear employed) and operations.
- Management practices for processing waste.
- Abundance and behaviour of protected species near vessels.
- Types of mitigation practices applied.
- Knowledge and approach of crew towards mitigation.
- Interactions between protected species and fishing gear and vessel.
- Auditing of Protected Species Risk Management Plans.

It is important to note that observer placements and coverage rates typically have high spatial and temporal variation, as well as multiple competing priorities for information collection. This can make data collection inconsistent and hamper efforts to interpret and extrapolate to estimate bycatch rates by fishery, location, or other variables. Data accuracy and reliability can be affected by inter-observer variability and weather conditions, while precision is affected by the observer sampling design. Data quality may also be biased by the opportunistic allocation of observers to vessels, as it is not always possible to place observers on vessels randomly or representatively. Nevertheless, the use of fisheries observers is currently considered to be the most reliable and flexible means of acquiring data on protected species interactions.

### *Planning of observer coverage by fishery in 2022/23*

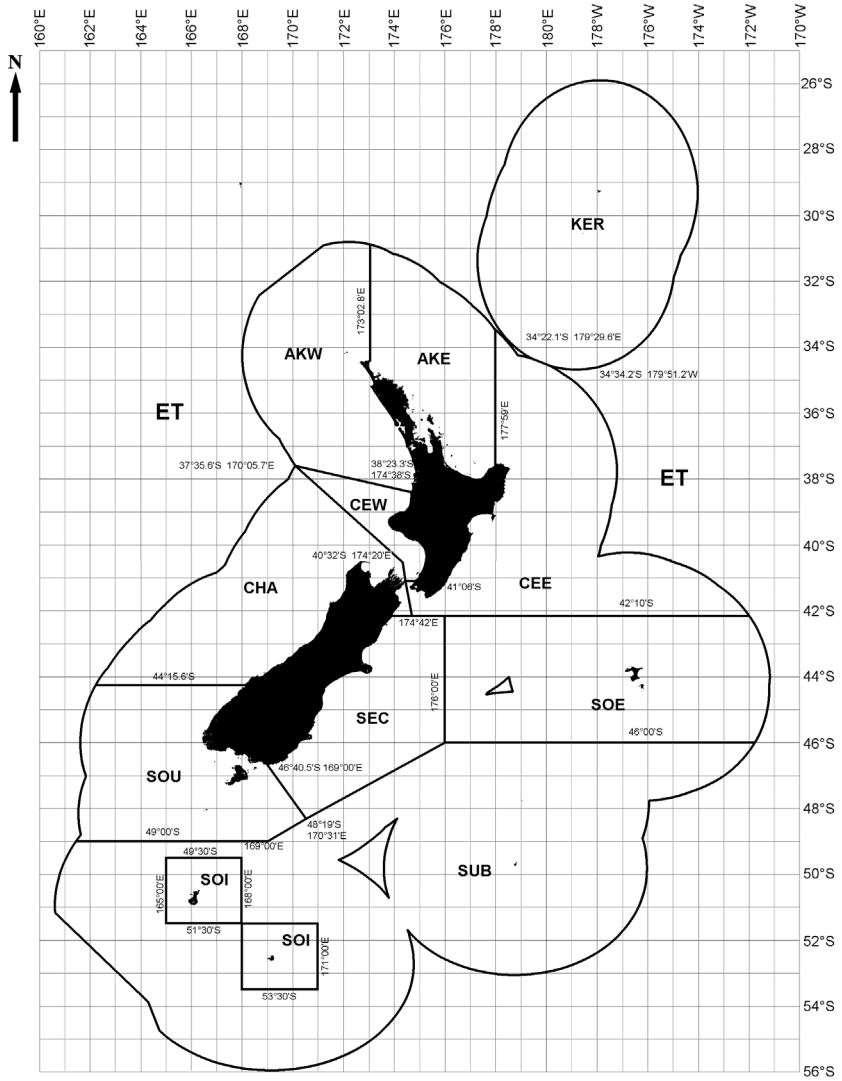
Planning is based on the financial year (1 July – 30 June) in line with the period that observer coverage runs, rather than the fishing year. For the purposes of planning observer coverage, fisheries are divided into two broad categories.

Firstly, those fisheries that have typically received lower observer coverage are characterised by small vessel, owner operated fleets (see Section 2.1.1). Most of these vessels operate in the inshore area (up to roughly 200m depth), although some small vessels, particularly bottom longline vessels under 36m, will operate in deeper waters such as the Chatham Rise and target deepwater species such as ling, and so are observed as part of deepwater longline coverage. In general, coverage within inshore fisheries is aimed at reducing uncertainly around the risks to protected species which are identified in risk assessments, as well as assessing mitigation options for identified interactions and delivering on the relevant TMP objectives for Hector's and Māui dolphins and New Zealand sea lions, and National Plans of Action (NPOAs). The NPOA Seabirds 2020 plan highlights the importance of observer data in meeting the objectives of the plans, including monitoring and auditing functions of risk management plans. The NPOA Sharks 2013 also gives guidance on data collection priorities to inform protection and management of sharks, such as improved data for the development of a quantitative risk assessment like that produced for seabirds (note: the NPOA Sharks is under review and due for completion in 2022, as are risk assessments for mammals, sharks, and seabirds).

The second group of fisheries can be considered 'better characterised' and have generally had some level of ongoing observer coverage over the last ten years or more (see Section 2.1.2). Most of these fisheries are deepwater and middle depth fisheries characterised by large vessels operating beyond the 12 nautical mile limit of the territorial sea out to and beyond the 200 nautical mile limit of the Exclusive Economic Zone (EEZ). These are termed and managed as 'offshore' or 'highly migratory species' fisheries. Observers working in these fisheries have multiple priorities including stock assessment data collection, compliance monitoring, and protected species interaction monitoring. DOC contributes to a smaller portion of observer time in these fisheries and, as such, days are planned differently to the data deficient inshore fisheries, with a greater focus on fish stock biological data. For the 2022/23 year, the number of days allocated to coverage in SQU6T has been reduced, coinciding with planned regulations for Sea Lion Exclusion Devices (SLEDs).

The most recent observer coverage and protected species statistics are summarised by Weaver (2021). Previous protected species interaction data references and download links can be found in the references section.

*Figure 1: New Zealand Fisheries Management Areas (source: Fisheries New Zealand)*




**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 | FMA 6A | 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 | Kermadecs |

### 2.1.1 Inshore Fisheries: Joint DOC-MPI Inshore Observer Programme

Introduction

Final decisions on the levels and placement of this observer coverage were undertaken by Fisheries New Zealand with consideration of capacity of the Observer Services Unit. Ongoing delivery issues in relation to safety requirements around crewing levels and ability to safely carry observers has continued to impact upon coverage rates in inshore fisheries. While the tiered approach and risk assessments highlight the observer effort required to reduce uncertainty in these fisheries, often the levels of coverage required cannot be reached due to the nature of the inshore fleet as described above.

The overall cost of the observer programme this year is similar to last year, but with fewer days overall. This is largely due to an increase to the daily rates for observers, driven by incremental annual increases of PSA negotiated observer contracts. For inshore fisheries, the daily rate has risen from $1,493 to $1,561. Like last year, the levy of planned inshore days is 80%, except for the WCNI trawl fishery that will be 40% in consideration of the ongoing cameras programme.

For 2022/23 the cost of inshore observer coverage is being jointly and equally recovered by both DOC and Fisheries New Zealand as with past plans.

The main goals of the Inshore Observer Programme are to:

- Inform management of impacts from fishing on protected species by identifying and quantifying interactions between inshore fisheries and protected species, and assessing the effectiveness of mitigation measures, where appropriate.

- Meet obligations and commitments outlined in National Plans of Action for Seabirds and Sharks and delivering on the relevant TMP objectives for Hector's and Māui dolphins and New Zealand sea lions.

- Inform management of fish stocks by gathering biological and other information on board fishing vessels.

## SETNET

### *East Coast South Island / Otago and Kaikoura*

**Overall project aim/information needs**
Estimate the capture rate of Hector's dolphin and hoiho South Island populations in **setnet fisheries**.

| | |
|---|---|
| **Start Date** | 1 July 2022 |
| **Completion Date** | 30 June 2023 |
| **Statistical area** | 018, 024, 026 |
| **Proposed Coverage** | 182 observer days are planned for Kaikoura and 283 days are planned for Otago |

**Project Objectives**

1. Gather information to estimate the number of captures and the capture rate of Hector's dolphin and hoiho in setnet fisheries on the East Coast of the South Island.
2. Gather information to identify the nature and extent of setnet fisheries interactions with Hector's dolphin, hoiho, New Zealand fur seals, and shags on the East Coast of the South Island.

**Information Needs**
Observer coverage is targeted in statistical areas where there are high levels of setnet fishing occurring within the Hector's dolphin habitat, with the East Coast having some of the highest levels of coastal setnet effort in the country. Ongoing delivery issues in relation to safety requirements around crewing levels and ability to safely carry observers has continued to impact upon coverage rates, and more data is needed to ensure robust estimates of captures and capture rates to inform risk assessments.

Robust estimation of total Hector's dolphin captures requires that the fishing behaviour observed is representative of normal situations (i.e., if we can assume that observer placement is not changing behaviour). To minimise any potential bias, relatively high coverage as a percentage of effort by area/month was proposed, across the entire fleet operating in these statistical areas.

Hoiho have also been identified by several processes, including risk assessments and observed captures, as being at risk from setnet fisheries from Banks Peninsula south. Due to the decrease in their mainland population from a variety of factors, the impacts of fishing on the remaining populations have a greater effect. Current recommendations within Te Kaweka Takohaka mō te Hoiho[6] include observer coverage to obtain further temporal and spatial data on the nature and extent of setnet interactions with hoiho.

**Secondary information to be collected**
To make the best use of observers' time, secondary information will be collected when possible, which will then inform other research priorities. Secondary information collected will include:

- Audit of PSRMPs and adherence to operational procedures.
- Information on the nature and extent of setnet interactions with other species including seabirds, marine mammals, and protected fish.
- Observer counts to provide spatial distribution data for seabirds and marine mammals.
- Biological sampling of fish to help inform stock assessments.
- Total catch verification to provide better information about specific target fisheries.

**Related Research**

[6] https://www.doc.govt.nz/globalassets/documents/conservation/native-animals/birds/sea-and-shore/te-kaweka-takohaka-mo-te-hoiho-2020.pdf

- An East Coast South Island aerial survey has obtained robust estimates of Hector's dolphin abundance and distribution, which when combined with up-to-date reliable capture observations will allow estimation of the risk posed by setnet fisheries in this area.
- An ongoing necropsy programme for Hector's and Māui dolphins aims to identify sub-species, cause of death, body condition, and the extent of parasitism for any beach-cast or captured dolphins. This allows better understanding of the health and condition of individual Hector's and Māui dolphins.
- Ongoing hoiho population monitoring and adult and juvenile tracking studies will assist in the estimation of risk of interaction and identification of foraging habitat.

*South Coast South Island*

### Overall project aim/information needs

Estimate the capture rate and interactions of hoiho, great white sharks and Hector's dolphin in setnet fisheries.

| | |
|---|---|
| **Start Date** | 1 July 2022 |
| **Completion Date** | 30 June 2023 |
| **Statistical Areas** | 025, 027, 030 |
| **Proposed Coverage** | 266 observer days are planned |

### Project Objectives

1. Gather information to estimate the number of captures, and the capture rate, of hoiho and great white sharks.
2. Gather information to identify the nature and extent of interactions between setnet fisheries and great white sharks, hoiho, Fiordland crested penguins, Otago & Foveaux shags, dolphins, and sea lions on the South Coast of the South Island.
3. Gather spatial distribution data for seabirds and marine mammals.

### Information Needs

Observer coverage is targeted in statistical areas where there are high levels of setnet fishing occurring within the Hector's dolphin habitat. Further information is needed to ensure a robust estimate of captures and capture rates to inform risk assessments and management decisions. More data is also needed in this area to assess capture rates of hoiho and great white sharks.

Hoiho have been identified by several processes, including risk assessments, as being at risk from setnet fisheries on the South Coast South Island. Due to the decrease in their mainland population from a variety of factors, their susceptibility to fishing impacts has a greater effect. Current recommendations within Te Kaweka Takohaka mō te Hoiho include increased observer coverage to obtain further temporal and spatial data on the nature and extent of setnet interactions with hoiho.

The NPOA–Sharks 2013 sets goals and objectives to better understand and ultimately reduce the capture of protected shark species. Understanding the factors that lead to captures will assist in the development of effective mitigation. Additionally, a number of captured great white sharks are alive (though with injuries and survival rates are unknown) at time of release therefore, further information on the factors which contribute to safe and successful release of animals is important to developing adequate guidelines for fishers.

Robust estimation of total captures requires that the fishing behaviour observed is representative of normal situations to reduce any effect that observer placement may have on behavioural change. To minimise any potential bias, relatively high coverage as a percentage of effort by area/month is proposed.

### Secondary information to be collected

To make the best use of observers' time, secondary information will be collected when possible, which will then inform other priorities. Secondary information collected will include:

- Audit of PSRMPs and adherence to operational procedures.
- Information on the nature and extent of setnet interactions with other species of seabirds, marine mammals, and protected fish.
- Observer counts to provide spatial distribution data for seabirds and marine mammals.
- Total catch verification in line with providing better information about the specific target fisheries.

Related Research

- Ongoing hoiho population monitoring and adult and juvenile tracking studies will assist in the estimation of risk of interaction.
- Hoiho review including the range and distribution, population levels and trends.
- An East Coast South Island aerial survey has obtained estimates of Hector's dolphin abundance and distribution, which when combined with up-to-date reliable capture observations will allow estimation of the risk posed by setnet fisheries in this area.
- Post-release survival of great white sharks in setnet fisheries.
- An ongoing necropsy programme for Hector's and Māui dolphins aims to identify sub-species, cause of death, body condition, and the extent of parasitism for any beach-cast or captured dolphins. This allows better understanding of the health and condition of individual Hector's and Māui dolphins.
- An update to the NPOA-Sharks 2013 is underway (expected 2022).

## INSHORE TRAWL

### *West Coast North Island* (setnet, trawl and bottom longline combined)

**Overall project aim/information needs**
Gather information on species distribution and monitor captures of Māui dolphins and other protected species in trawl fisheries on the West Coast of the North Island.

| | |
|---|---|
| **Start Date** | 1 July 2022 |
| **Completion Date** | 30 June 2023 |
| **Statistical Areas** | 040, 041, 042, 045, 046 |
| **Proposed Coverage** | 182 observer days are planned (across all three methods) |

**Project Objectives**
1. Gather information on all Māui dolphin captures that may occur within the trawl fishery on the West Coast of the North Island.
2. Observational survey to gather spatial distribution data for Māui dolphins.
3. Gather information on captures of protected sharks (i.e., white pointers) in this area.
4. Gather information on the nature and extent of interactions with other protected species in the area.
5. Audit of PSRMPs for adherence and improvements to mitigation standards.

**Information Needs**
Observer coverage is targeted to reflect Ministerial decision made for 100% monitoring of trawl vessels operating within the restricted fishing zone to avoid capture of Māui dolphins on the West Coast North Island. Currently part of this monitoring is undertaken via placement of vessel cameras, and observers will be utilised for monitoring on remaining vessels that do not have cameras.

Robust estimation of total Māui dolphin captures requires that the fishing behaviour observed is representative of normal situations to reduce any effect that observer placement may have on behavioural change. To minimise any potential bias, relatively high coverage as a percentage of effort by area/month needs to be achieved.

Information will be collected on white shark (*Carcharodon carcharias*) captures in the WCNI inshore fisheries, as they are known to occur as bycatch as juveniles and occasionally adults, throughout North Taranaki around the top end to at least Karikari Peninsula on the East Coast (in SN, TWL and BLL fisheries).

Previous observer coverage in the area has identified interactions with other protected species including seabirds such as white capped albatross, dolphins, and fur seals. Improved information on the nature and extent of these interactions is important in the development of effective management and mitigation strategies.

**Secondary information to be collected**
- Observer observations to provide spatial distribution data for seabirds and marine mammals.
- Information on the nature and extent of setnet interactions with other species including seabirds, marine mammals, and protected fish.
- Total catch and camera verification in line with providing better information about the specific target fisheries.

**Related Research**
- Ongoing aerial and boat-based surveys of the West Coast North Island supported by biopsy sampling where possible.

- An ongoing necropsy programme for Hector's and Māui dolphins aims to identify sub-species, cause of death, body condition, and the extent of parasitism for any beach-cast or captured dolphins. This allows better understanding of the health and condition of individual Hector's and Māui dolphins.
- Research conducted to meet the objectives of the Hector's and Māui dolphin TMP.
- An update to the NPOA-Sharks 2013 is underway (expected 2022).

*East and South Coast of the South Island & East Coast of the North Island*

**Overall project aim/information needs**

To assess the rate of Hector's dolphin and seabird captures in inshore trawl fisheries on the East Coast (ECSI) and South Coast of the South Island (SCSI), and the East Coast of the North Island (ECNI). Audit and assess mitigation techniques and gather information to inform cryptic mortality estimates due to warp strikes.

| | |
|---|---|
| **Start Date** | 1 July 2022 |
| **Completion Date** | 30 June 2023 |
| **Statistical Areas** | 011-016, 018, 020, 022, 024, 025, 026, 030, 031, 032, 033, 034, 035, 036, 38 |
| **Proposed Coverage** | Observer days planned are: 298 for the ECSI (TMP) coastal trawl, 127 for ECSI (TAR) inshore trawl, 118 for SCSI inshore trawl, 207 for lower North Island inshore trawl (TAR2), 35 for SCSI inshore trawl PSH |

**Project Objectives**

1. Estimate the capture rate of seabirds in inshore trawl fisheries on the East and South Coast of the South Island.
2. Gather data on warp strikes to improve estimations of cryptic mortality.
3. Estimate capture rate of Hector's dolphins in inshore trawl fisheries on the East and South Coasts of the South Island.
4. Audit of PSRMPs for adherence and improvements to mitigation standards.

**Information needs**

The coverage is split into ECSI coastal (FLA/GUR), ECSI inshore (TAR) trawl, SCSI inshore trawl and ECNI (TAR2). This is partly due to the Ministerial requirement to have 100% monitoring of the East Coast tarakihi fishery. This will include observer coverage and a camera rollout in this fleet.

Information on total mortality of seabirds is important to inform robust fisheries management decision making and mitigation practices in relation to fishery related deaths. The level 2 seabird risk assessment identifies that inshore trawl poses a risk to several albatross species and there is significant uncertainty surrounding the level of cryptic and total mortality, especially in inshore trawl fisheries.

Previous observer coverage in statistical areas 020, 022, 024, 025, 026 identified captures of Salvin's and white-capped albatross on trawl warps, therefore, further data on the nature and extent of these interactions is necessary to understand cryptic mortality and to accurately estimate the capture rate of seabirds within this fishery. Information on mitigation use to avoid warp strikes is also important to better understand how to reduce captures and fishing related mortality. Data collected by fisheries observers can be used to inform management plans on the efficiency and effectiveness of mitigation techniques used.

The South and South East Coast have some of the highest levels of trawl effort in the country with known overlap and interactions with Hector's dolphin. Further assessment of captures and capture rates is needed to improve estimates for Hector's dolphin populations in the ECSI and SCSI. For these coastal areas, observer coverage is targeted in statistical areas where there are high levels of trawl fishing occurring within Hector's dolphin habitat.

The NPOA–Seabirds 2020 set goals and objectives for better understanding and ultimately reducing seabird bycatch. Observational and audit data is necessary in this fishery to achieve the objectives in the NPOA.

### Secondary information to be collected

- Collection information on the nature and extent of interactions with other marine protected species.
- Observer data to provide spatial distribution data for seabirds and marine mammals.

### Related Research

- Ongoing hoiho population monitoring and adult and juvenile tracking studies will assist in estimating the risk of interaction with fishing vessels and gear.
- An ECSI aerial survey obtained estimates of Hector's dolphin abundance and distribution, which when combined with up-to-date reliable capture observations will allow estimation of the risk posed by trawl fisheries in this area. The Spatially Explicit Fisheries Risk Assessment (SEFRA) model has provided estimates on high-risk areas to Hector's dolphin.
- Characterisation and mitigation of protected species interactions with inshore trawl fisheries which highlights the need for additional data on the extent of interactions and cryptic mortality in the ECSI trawl fishery.

*North-East North Island – Snapper target*

### Overall project aim/information needs

Monitor the capture rate of black petrels and flesh-footed shearwaters and collect information on interactions and effectiveness of mitigation, auditing of protected species risk management plans.

| | |
|---|---|
| **Start Date** | 1 July 2022 |
| **Completion Date** | 30 June 2023 |
| **Statistical Areas** | 002-010 |
| **Proposed Coverage** | 216 observer days (including PSH) |

### Project Objectives

1. Collect information on the nature of interactions with protected species, particularly black petrels, and flesh-footed shearwaters to inform mitigation strategies.
2. Gather data on seabird warp strikes to inform estimations of cryptic mortality.
3. Audit of PSRMPs for adherence and improvements to mitigation standards.

### Information needs

Black petrels are identified by the seabird level 2 risk assessment as the single most at-risk seabird species from commercial fisheries interactions and flesh-footed shearwaters are also in the very high-risk category.

The risk assessment has highlighted trawl warps in the snapper trawl fishery as posing a risk to black petrels and flesh-footed shearwaters. Further data on the nature and extent of these interactions is necessary to understand cryptic mortality and to accurately estimate the capture rate of seabirds within this fishery. Information on mitigation use to avoid warp strikes is also important to better understand how to reduce captures and inform cryptic mortality.

To gain accurate information on the nature and extent of interactions, continued observer coverage is necessary. Camera trials are no longer underway or included in the programme, review of historical footage is continuing.

### Secondary information to be collected

- Information on the nature and extent of inshore trawl interactions with species of seabirds, mammals, turtles, and protected fish species.

## BOTTOM LONGLINE

### *North-East North Island – Bluenose target*

**Overall project aim/information needs**

Monitor the capture rate of black petrel and flesh-footed shearwaters and collect information on interactions and effectiveness of mitigation in bottom longline fisheries.

| | |
|---|---|
| **Start Date** | 1 July 2022 |
| **Completion Date** | 30 June 2023 |
| **Statistical Areas** | 002-010 |
| **Proposed Coverage** | 39 observer days, in summer (black petrels and flesh-footed shearwaters are absent in winter) |

**Project Objectives**

1. Collect information to reduce uncertainty associated with the estimated capture rate of at-risk seabird species (primarily black petrels and flesh-footed shearwaters) in inshore bottom longline fisheries targeting bluenose.
2. Collect information to inform current estimates of cryptic mortality/live-release survival in inshore bottom-longline fisheries.
3. Collect information to evaluate the efficacy of inshore bottom longline mitigation efforts.
4. Audit of PSRMPs for adherence and improvements to mitigation standards.

**Information Needs**

The black petrel is identified by the seabird SEFRA model as the single most at-risk seabird species from commercial fisheries interactions, and limited observer coverage has been a key uncertainty in risk estimates for this species. The primary objective of observer coverage with a focus on black petrels is to better understand what factors most strongly determine variable capture rates, to support development of mitigation options in bottom longline fisheries (snapper, bluenose).

Another at-risk species from inshore bottom longline fisheries is flesh-footed shearwater. Risk to this species arises primarily from bottom longline vessels targeting snapper. Due to low historical observer coverage in all inshore bottom longline fishery groups, these risk estimates are subject to considerable uncertainty. Capture rates recorded by observers are expected to substantially improve these estimates. If coverage is unrepresentative (i.e., because vessels of a particular class resist accepting observers, or the presence of an observer biases fisher behaviour), capture rate estimation arising from the risk assessment will be poorly informed, and associated risk estimates are likely to remain uncertain (or possibly biased low).

Current estimates of cryptic mortality in inshore bottom longline fisheries do not include consideration of post-release survivability for live-captured birds. Observer coverage tasked to collect data to characterise interactions, handling procedures and to evaluate the likely fate of birds released alive is a high priority.

**Secondary information to be collected**

- Information on the nature and extent of bottom longline interactions with other species of seabirds, mammals, turtles, and protected fishes.
- Information for BNS and HAP1 catch assessments.

**Related Research**

- Joint industry government initiatives around electronic monitoring.
- Research planned to model black petrel (and flesh-footed shearwater) capture rates as a function of multiple variables potentially affecting interactions with fisheries, including

analysis of higher resolution spatial and temporal distributions (of both birds and vessels), and fleet variables such as vessel experience and mitigation.

*North-East North Island – Snapper target*

### Overall project aim/information needs

Monitor the capture rate of black petrel and flesh-footed shearwaters and collect information on interactions and effectiveness of mitigation, and auditing of protected species risk management plans in trawl and bottom longline fisheries targeting snapper.

| | |
|---|---|
| **Start Date** | 1 July 2022 |
| **Completion Date** | 30 June 2023 |
| **Statistical Areas** | 002-010 |
| **Proposed Coverage** | 302 observer days are planned, in summer (black petrels and flesh-footed shearwaters are absent in winter) |

### Project Objectives

1. Collect information to reduce uncertainty associated with the estimated capture rate of at-risk seabird species (primarily black petrels and flesh-footed shearwaters) in inshore bottom longline fisheries targeting snapper.
2. Collect health assessment data information to improve current estimates of cryptic mortality/ live-release survival in inshore bottom-longline fisheries.
3. Collect information to assess the efficacy of electronic monitoring trial being undertaken in the area.
4. Collect information to evaluate the efficacy of inshore bottom longline mitigation efforts.

### Information Needs

Black petrels are identified by the seabird SEFRA model as the single most at-risk seabird species from commercial fisheries interactions, and limited observer coverage has been a key uncertainty in risk estimates for this species. The primary objective of observer coverage focused on black petrels is to better understand what factors most strongly determine variable capture rates, to support development of mitigation options in bottom longline fisheries (snapper, bluenose).

Another at-risk species from inshore bottom longline fisheries is flesh-footed shearwater, primarily from bottom longline vessels targeting snapper. Due to low historical observer coverage in all inshore bottom longline fishery groups, these risk estimates are subject to considerable uncertainty. Capture rates recorded by fishery observers can be expected to substantially improve these estimates. If coverage is unrepresentative (i.e., because vessels of a particular class resist accepting observers, or the presence of an observer biases fisher behaviour), capture rate estimation arising from the risk assessment will be poorly informed, and associated risk estimates are likely to remain uncertain (or possibly biased).

Current estimates of cryptic mortality in inshore bottom longline fisheries do not include consideration of post-release survivability for live-captured birds. Observer coverage tasked to collect health assessment data, characterise interactions and handling procedures, and to evaluate the likely fate of birds released alive is a high priority.

The black petrel camera monitoring program is continuing to operate on a number of bottom longline snapper vessels. The data collected from this will be used to update capture rate estimations and the risk assessments as outlined above. Although there will be a focus this year on non-camera vessels, coverage will still be needed on camera vessels to assess mitigation use and audit PSRMPs. If vessels coverage is unrepresentative, capture rate estimation arising from the new model will be poorly informed and associated risk estimates are likely to remain uncertain (or possibly biased low).

### Secondary information to be collected

- Information on the nature and extent of bottom longline interactions with other species of seabirds, mammals, turtles, and protected fishes.
- Audit of Protected Species Risk Management Plans and adherence to operational procedures.

### Related Research

- Joint industry government initiatives around electronic monitoring (cameras).
- Research planned to model black petrel (and flesh-footed shearwater) capture rates as a function of multiple variables potentially affecting interactions with fisheries, including analysis of higher resolution spatial and temporal distributions (of both birds and vessels), and fleet variables such as vessel experience and mitigation.

### 2.1.2 Offshore Fisheries

As for previous years, planning of observer days was conducted jointly with Fisheries New Zealand to identify an overall amount of observer coverage to meet both agencies' goals. Costs were then apportioned to each agency based on how much of the observers' work in each fishery will be focused on Conservation Services. Typically, the CSP component is 10-15% of the total deepwater days, which reflects the time likely to be spent on protected species tasks. For specific fisheries (e.g., scampi, southern blue whiting and squid trawl), this apportioning is increased to 20%, reflecting an increased focus on protected species data due to specifically identified risks.

These fisheries generally receive higher levels of observer coverage compared to the fisheries discussed in 2.1.1, with coverage levels being dictated by several objectives from fisheries management requirements (primarily the collection of data for fish stock assessment purposes), protected species research and benthic interaction monitoring. For middle-depth trawl fisheries, to better reflect the fact that vessels will target multiple species over a single trip, they have been divided on an area basis to both assist in addressing information needs and observer planning.

Planned days for 2022/23 are summarised in Appendix B. These fisheries are monitored to track changes in protected species interactions and mitigation efficacy over time. Data is collected to allow estimation of capture levels and to better understand the nature of protected species interactions to develop mitigation solutions.

As a result of PSA negotiated observer contracts, the daily costs of migratory species and deepwater observer days have been increased from 2021/22 as follows to reflect the increase in cost of delivering those days:

- HMS from $1,196 to $1,259
- Middle depth from $890 to $945
- Deepwater from $725 to $858

The levy of planned coverage for deepwater, surface longline and purse seine fisheries will be 100%. Middle-depth and bottom longline fisheries will be 90%.

Some observer days included in the Fisheries New Zealand levied plan may not be included in this CSP plan, in coming years these days will be added if additional protected species risks are identified.

## PELAGIC AND MIDDLE DEPTH TRAWL FISHERIES

### Finfish

Pelagic and middle-depth trawl fisheries involve domestic and foreign owned vessels that primarily target hoki, hake, ling, warehou, jack mackerel and southern blue whiting, that often target multiple species in the same trip. The rationale provided here is divided on a geographic and fishery basis to best identify CSP information needs:

#### *West Coast South Island*

Coverage will largely be targeted at the 'hoki season' from July to September. Observers record information on which mitigation techniques are employed in this fishery including offal management and discards, and the use of bird scaring devices (legally required for larger vessels). This fleet has high levels of interactions with a wide range of seabirds and fur seals. The fleet can be broadly divided by size, with larger vessels (both domestic and foreign owned vessels) operating outside of the 25nm offshore management area and the smaller fleet operating within 25nm of the coast. Due to the differences in fleet dynamics and bycatch profiles between the smaller and larger vessel fleets coverage levels have been specified separately for each.

#### *Cook Strait*

This fishery operates distinctly from other hoki fisheries, in that vessel size is limited to less than 46m. Many vessels shift to this fishery from other areas with a short but intense period of fishing taking place during the Cook Strait spawning season, from late June to mid-September. Trips are generally overnight with catch rates of hoki being high. This fishery has some of the highest numbers of fur seal captures, therefore observer coverage in this fishery has been increased. Observers record information on which mitigation techniques are employed in this fishery including offal and discard management, and the use of bird scaring devices (legally required for larger vessels). The fishery typically operates between observer years therefore coverage in the Cook Strait will be targeted in July and August 2022 and May and June 2023.

#### *Chatham Rise*

The Chatham Rise middle-depth trawl fishery operates in a spatially distinct area to the other middle-depth trawl fisheries, and so encounters different protected species. This fishery is operated exclusively by larger vessels. Observers record information on which mitigation techniques are employed in this fishery including offal and discard management, and the use of bird scaring devices (legally required for larger vessels). The landing of protected coral will also be recorded, and sub-samples will be taken for identification.

Observer coverage for the period October to May will be spread across SEC and SOE (shown in Figure 1). This coverage will be achieved under the domestic middle-depth trawl lines identified in the table in Appendix B.

#### *Subantarctic*

The subantarctic middle-depth trawl fishery is largely dominated by tows targeting southern blue whiting around the Bounty Islands and Campbell Island where captures of both New Zealand sea lions and fur seals have taken place. Observer time will be focussed on monitoring and recording behaviour of, and interactions with, fur seals and sea lions. Data is also collected on seabird interactions and behaviour due to the location of this fishery and its close vicinity to many seabird breeding islands. The landing of protected coral will also be recorded, and sub-samples will be taken for identification.

Observers are tasked with recording information on which mitigation techniques are employed on vessels to better understand interactions between fishing gear and captures of protected species including offal and discard management and the use of bird scaring devices.

Due to increased interactions with New Zealand sea lions around Campbell Island, CSP will fund 20% of the observer days in the southern blue whiting portion of the subantarctic fishery, reflecting an increasing focus of observers' time being on protected species observation, particularly marine mammal abundance and behaviour. Overall, it is intended that all vessels operating in the southern blue whiting fishery will be observed.

### *West Coast North Island*

This fishery group is dominated by the jack mackerel trawl fishery. Observer time will be focussed on recording protected species interactions and the behaviour of cetaceans, pinnipeds, and seabirds around the vessel. Observers will also record information on which mitigation and avoidance techniques are employed in this fishery. Vessels can employ several techniques aimed at reducing the likelihood of interacting with dolphins, including not fishing during hours of the day when dolphin interactions are more likely, not shooting nets when dolphins are sighted and avoiding a shallow headline depth.

### Scampi

The priority for observers in southern areas will be to monitor interactions with seabirds and New Zealand sea lions. Priority for observations in northern waters will be monitoring of interactions with very high-risk seabirds such as black petrels and flesh-footed shearwaters. In southern waters monitoring of interactions with sea lions and albatross is prioritised. The landing of protected coral will also be recorded, and sub-samples will be taken for identification. Data is also collected on seabird interactions and behaviour around vessels. Observers record information on which mitigation techniques are employed in this fishery, including offal and discard retention, the use of bird scaring devices and net restrictors, as well as specific gear configurations used. Over the last five years scampi coverage has increased to better understand protected species interactions. CSP will fund 20% of observer days in this fishery due to the significant protected species focus of the coverage.

### Squid 6T

Areas of CSP interest in this fishery include offal and discard management, captures of sea lions and seabirds in trawl nets, and adherence to implementation of and specifications regarding Sea Lion Exclusion Devices (SLEDs). Observer placement in 2022/23 will be focussed to monitor interactions from January to May. The CSP Observer Programme will form 20% of days planned for the squid 6T fishery to monitor interactions with protected species and measures taken by fishers to reduce those interactions.

## DEEPWATER BOTTOM TRAWL FISHERIES

### Orange Roughy and Oreo

Observer time will be focussed on assessing the extent of protected coral landed on vessels as well as monitoring and recording interactions with, and behaviours of, seabirds. Sub-samples and photographs of corals will be taken for identification. Mitigation techniques employed in this fishery include offal and discard management, the use of bird scaring devices and trawling known tracks to avoid catching deep sea invertebrates. CSP will fund only 10% of observer days in this fishery due to the relatively low workload relating to protected species interactions.

## SURFACE LONGLINE FISHERIES

### Domestic surface longline

Monitoring priorities for 2022/23 will include collecting information on protected species interactions, mitigation techniques and offal/discard management practices employed in the fishery. Coverage may also be utilised in relation to CSP mitigation projects relating to seabird bycatch mitigation and the auditing of the protected species risk management plans. Observer coverage will be in AKE, CEE, and CHA to monitor interactions with seabirds and turtles. Coverage will occur throughout the year.

## BOTTOM LONGLINE FISHERIES

### Deep-sea ling

Observer time will be focussed on monitoring and recording interactions with seabirds including captures and behaviour around vessels. Observers will record information on which mitigation techniques are employed in this fishery, including the use of tori lines and line weighting regimes. Observer coverage in 2022/23 will be focussed on smaller bottom longline vessels operating on the Chatham Rise to monitor seabird interactions.

## CSP OBSERVER PROGRAMME OUTPUTS

1. A descriptive report summarising observer data relating to protected species collected in offshore fisheries and inshore fisheries will be provided to stakeholders as part of the Annual Research Summary (ARS) reports.
2. All seabirds and corals are returned and/or photographed, where possible, for identification and necropsy (see project INT2019-02: Identification of seabirds captured in NZ fisheries and INT2019-04: Identification and storage of cold-water bycatch specimens), as well as marine mammals, turtles and protected fish (INT2020-02, INT2021-04).
3. Data will be available for other DOC and Fisheries New Zealand projects including mitigation development/testing, bycatch estimation, risk management and other modelling projects.

## References

Abraham, E.R., Neubauer, P., Berkenbusch, K. and Richard, Y. 2017. Assessment of the risk to New Zealand marine mammals from commercial fisheries. New Zealand Aquatic Environment and Biodiversity Report No 189. Available for download from https://fs.fish.govt.nz/Doc/24554/AEBR-2017-189-Marine-mammal-risk-assessment.pdf.ashx

Richard, Y.; Abraham, E.R. 2015 Assessment of the risk of commercial fisheries to New Zealand seabirds, 2006-07 to 2012-13. New Zealand Aquatic Environment and Biodiversity Report No. 162. Available for download from https://www.mpi.govt.nz/dmsdocument/10523/loggedIn

Rowe, S.J. 2009: Conservation Services Programme observer report: 01 July 2004 to 30 June 2007. DOC Marine Conservation Services Series 1. Department of Conservation, Wellington. 93p. Available for download from https://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/archive/2006-2007/csp-observer-report-01-july-2004-to-30-june-2007/

Rowe, S. 2010a: Level 1 Risk Assessment for incidental seabird mortality associated with New Zealand fisheries in the NZ-EEZ. Marine Conservation Services, Department of Conservation, Wellington. 75 p. Available for download from https://www.doc.govt.nz/our-work/conservation-services-programme/other-publications/level-1-risk-assessment-for-incidental-seabird-mortality-associated-with-new-zealand-fisheries-in-the-nz-eez/

Weaver, S. 2021. Conservation Services Programme Annual Research Summary 2019-20. Report prepared by the Conservation Services Programme of the New Zealand Department of Conservation, Wellington. 106p. Available for download from https://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/201920/annual-research-summary-2019-20/

**Indicative Research Cost:** See Appendix B for details

**Cost Recovery:** F(CR) Item 8 (100% Industry). This project is observer coverage.

**Fish Stocks:** See Appendix B for details

*NOTE: This multi-year project was consulted on in 2020/21 and is included here for completeness*

## 2.2 Identification of marine mammals, turtles and protected fish captured in New Zealand fisheries

**Project Code:** INT2020-02

**Start Date:** 1 July 2020

**Completion Date:** 30 June 2023

**Guiding Objectives:** CSP Objectives B and C; National Plan of Action – Sharks; New Zealand sea lion Threat Management Plan.

**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 observed captured in New Zealand fisheries (for live captures and dead specimens discarded at sea).

**Rationale**

The accurate determination of the taxon of marine mammals, turtles and protected fish captured in New Zealand fisheries is vital for examining the potential threat to population viability posed by incidental fisheries captures. Observers on commercial vessels are not always able to identify marine mammals, turtles, and protected fish at sea with high precision, and the assessment of the age-class may require expert knowledge. Information gained through this project will link to 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 a continuation of INT2017-03 and is designed to complement the existing seabird and coral identification projects. Observers routinely collect samples of genetic material from these taxa, and these can be used to resolve uncertain identification determinations from photographs.

**Research approach**

Where Fisheries Observers recorded an incidental capture of a marine mammal, turtle, or protected fish, generally no specimen is retained. Instead, photographic records and a genetic sample are taken. Live interactions are photographed where possible. All photographs obtained, by specimen, will be delivered to a suitable expert for that taxonomic group in electronic format on an annual basis. Details on the date, time, location, and fishery of capture will also be provided. Photographs will be examined to determine the following:

- Identification, to the lowest taxonomic level possible
- Sex (where possible)
- Age (where possible), and
- Provenance (origin) (where possible).

These data will be reported by taxon and fishery stratum (fishing method, fishery area and target species). When a specimen is identified, the identification features used shall be fully described.

Genetic samples of all bycaught marine mammals, turtles and protected fish are routinely collected by observers and where photographic analysis cannot adequately determine taxa, genetic analysis may be undertaken.

Funding will contribute to both expert identification and development of a web-based platform which allows for the pairing of imagery to metadata, which will then be made available to relevant experts.

Outputs

1. A summary of results will be reported, reviewed by the CSP TWG, and published on an annual basis.
2. Information requested by CSP will be provided within a reasonable timeframe (usually 10 working days).
3. Provision of all data collected in electronic format, suitable for updating Fisheries New Zealand databases and/or other relevant databases.

**Note:** A three-year term is proposed

**Indicative Research Cost:** $15,000 per annum

**Cost Recovery:** F(CR) Item 4 (100% Industry)

**Fish stocks:** BAR1, 7, BIG1, BNS1, 2, 3, 7, BUT5, 7, BWS1, ELE3, 5, 7, EMA1, 3, 7, FLA1, 2, 3, 7, GMU1, GSH1, 3, 4, 7, 8, 9, GSP1, 7, GUR1, 2, 3, 7, 8, HAK1, 4, 7, HOK1, HPB1, 2, 3, 4, 7, 8, JDO1, 2, 3, 7, JMA1, 3, 7, KIN1, 7, 8, LEA1, 2, 3, LIN1, 2, 3, 4, 5, 6, 7, MAK1, MOK1, 3, 5, MOO1, ORH1, 2A, 2B, 3A, 3B, OEO1, 3A, 4, 6, PAR1, 9, POR1, POS1, RBM1, RSN1, 2, RIB1, 2, RCO1, 3, 7, RSK1, 3, 7, 8, SBW6A, 6R, 6I, 6B, SCH1, 2, 3, 4, 5, 7, SCI1, 2, 4A, 6A, 6B, SKI1, 3, 7, SNA1, 2, 3, 7, 8, SPD1, 3, 4, 5, 7, 8, SPE1, 3, 4, 7, SPO1, 3, 7, 8, SQU1T, 6T, SSK 1, 3, 7, 8, STA1, 3, 4, 5, 7, STN1, SWA1, 3, 4, SWO1, TAR1, 2, 3, 4, 5, 7, 8, TOR1, TRE1, 2, 7, TRU3, 4, WAR1, 2, 3, 7, 8, WWA2, 3, 4, 5B, 7, YEM1, 8, 9.

*NOTE: This multi-year project was consulted on in 2021/22 and is included here for completeness*

## 2.3 Collection and curation of tissue samples from protected fishes and turtles

**Project Code:** INT2021-04

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2024

**Guiding Objectives:** CSP Objectives B, C, E; CSP Fish plan; National Plan of Action- Sharks.

**Project Objectives:**

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

### Rationale

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

### Research approach

This project represents a continuation and extension of INT2018-04. Tissue sample collection will be extended to all protected fish and sea turtle species taken as bycatch in commercial fisheries. Sampling kits and sampling instructions will be provided to interested commercial fishers and fishery observers deployed in fisheries likely to catch protected species. Costs of returning samples and unused kits will be met by the project. Legal authority to collect and retain samples from protected species will be provided to participating fishers. Sample storage and curation will be consistent with accepted international standards and data standards and tracking will be interoperable with national and international initiatives such as IraMoana, Genomics Aotearoa and GEOME.

Access to archived samples will be moderated by the Marine Species Manager, Department of Conservation.

### Outputs

1. Archived tissue collection and associated electronic metadata.
2. Annual report on tissues housed in the archive, the use or fate of archived samples, and any publications arising from their use.
3. Final report describing the structure of the database, including use of Traditional Knowledge and Biocultural Labels and Notices.

**Note:** A three-year term is proposed

**Indicative Research Cost:** $22,000 per annum

**Cost Recovery:** F(CR) Item 4 (100% Industry)

**Fish stocks:** BIG1, BUT5, CDL6, GUR1, HAK1, 4, 7, HOK1, HPB1, JMA7, LIN5,6, OEO6, ORH1, 2A, 2B, 3B, RCO3, SBW61, 6B, SCH1, 5, SCI6A, 6B, SKI1, SKJ1, SNA1, 8, SOD3, 5, SQU1T, 6T, STN1, SWA3, 4, SWO1, TAR2, TOR1, TRE1, WWA5B.

## 2.4 Identification of seabirds captured in New Zealand fisheries

**Project Code:** INT2022-02

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2025

**Guiding Objectives:** CSP Objectives B, C; National Plan of Action – Seabirds.

**Project Objective:**

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

**Specific Objectives:**

1. To determine, through examination of returned seabird specimens, the taxon, sex, and where possible age-class and provenance of seabirds killed in New Zealand fisheries (for returned dead specimens).
2. To detail the injuries, body condition and stomach contents and, where possible, the likely cause of mortality (for returned dead specimens).
3. To report any changes in the protocol used for the necropsy of seabirds (for returned dead specimens).
4. To determine, through examination of photographs, the taxon and, where possible, sex, age-class and provenance of seabirds captured in New Zealand fisheries (for live captures or dead specimens discarded at sea).

**Rationale**

Large numbers of seabirds frequent New Zealand 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 protocol was developed to determine which specimens are returned for full necropsy. This protocol aims to strike a balance between returning birds for full necropsy (for rarer species and in less observed fisheries) and photographing birds for determination of taxon (for commonly caught species in well observed fisheries).

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

Information gained through this project will link to 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.

### Research approach

Specific objectives 1-4

Deceased birds returned by government observers will be delivered, suitably packaged, and labelled, to the research provider. Observers make note of the circumstances of capture and provide a tentative identification. Seabirds returned will be examined to determine the following:

- Species identification and classification
- Sex
- Moult and brood patch development (as a partial indicator of breeding status)
- Age
- Provenance (origin) (where possible)
- Subcutaneous fat score as an index of body condition
- Stomach and gizzard contents, and
- General body condition including any signs of injury and cause of death (where possible).

The data will be reported on by species and fishery stratum (fishing method, fishery area and target species). The methodologies used in examining the specimens and categorising them into different groups shall be fully described. Differences in research protocols compared to previous necropsy research on New Zealand seabirds returned from fisheries shall be fully detailed and the implications of any differences discussed.

Specific objective 5

Where government observers record an incidental bird capture and no specimen is retained (either live captures or discarded dead birds), all photographs obtained, by specimen, will be delivered to the contractor in electronic format. Details of the date, time, location, and fishery of capture will also be provided. Photographs will be examined to determine the following:

- Identification and classification, to the lowest taxonomic level possible
- Sex (where possible)
- Age (where possible), and
- Provenance (origin) (where possible).

These data will be reported by taxon and fishery stratum (fishing method, fishery area and target species). When a specimen is identified and separated from similar species, the identification features used shall be fully described.

### Outputs

1. A summary of results will be reported, for circulation to stakeholders, on a quarterly basis.
2. Information requested by CSP will be provided within a reasonable timeframe (usually 10 working days).
3. Annual report(s) of confirmed identification, sex, age, provenance, and all other data collected, of all specimens examined. To the extent possible, the final report will also identify potential interactions between seabirds and fishing gear and identify factors that may have contributed to seabird mortality. Data will be reported by fishery stratum (fishing method, fishery area and where possible target species).
4. Presentation of six monthly and annual reports to the CSP TWG.
5. Provision of all data collected in electronic format, suitable for updating Fisheries NZ databases and/or other relevant databases.

6. Provision of seabird specimens, where requested by iwi for cultural purposes, as stated in section 1.4 of the CSP Strategic Statement.

**Note:** A three-year term is proposed

**Indicative Research Cost:** $80,000 per annum

**Cost Recovery:** F(CR) Item 4 (100% Industry)

**Fish stocks:** BAR1, 7, BIG1, BNS1, 2, 3, 7, BUT5, 7, BWS1, ELE3, 5, 7, EMA1, 3, 7, FLA1, 2, 3, 7, GMU1, GSH1, 3, 4, 7, 8, 9, GSP1, 7, GUR1, 2, 3, 7, 8, HAK1, 4, 7, HOK1, HPB1, 2, 3, 4, 7, 8, JDO1, 2, 3, 7, JMA1, 3, 7, KIN1, 7, 8, LEA1, 2, 3, LIN1, 2, 3, 4, 5, 6, 7, MAK1, MOK1, 3, 5, MOO1, ORH1, 2A, 2B, 3A, 3B, OEO1, 3A, 4, 6, PAR1, 9, POR1, POS1, RBM1, RSN1, 2, RIB1, 2, RCO1, 3, 7, RSK1, 3, 7, 8, SBW6A, 6R, 6I, 6B, SCH1, 2, 3, 4, 5, 7, SCI1, 2, 4A, 6A, 6B, SKI1, 3, 7, SNA1, 2, 3, 7, 8, SPD1, 3, 4, 5, 7, 8, SPE1, 3, 4, 7, SPO1, 3, 7, 8, SQU1T, 6T, SSK1, 3, 7, 8, STA1, 3, 4, 5, 7, STN1, SWA1, 3, 4, SWO1, TAR1, 2, 3, 4, 5, 7, 8, TOR1, TRE1, 2, 7, TRU3, 4, WAR1, 2, 3, 7, 8, WWA2, 3, 4, 5B, 7, YEM1, 8, 9.

## 2.5 Identification, storage, and genetics of cold-water bycatch specimens

**Project Code:** INT2022-03

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2025

**Guiding Objectives**: CSP Objectives B, C, E; CSP Coral plan.

**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.

### Research approach

A catalogue of Observer-collected coral samples will be created and maintained. These samples will be verified taxonomically by domestic experts at regular intervals throughout the year. In addition to this (when possible and as needed), international coral experts will refine the taxonomic identification even further. The updated taxonomic identification of the bycatch samples will then be shared with Fisheries New Zealand for them to update this information in the COD database.

In addition to taxonomic verification of returned specimens and photographs, the project will incorporate funding to facilitate genetic analysis of bycatch. Genetic methods can further elucidate the extent of diversity, refine taxonomic resolution, and distinguish cryptic species. Genetic analyses can also be applied to archived specimens for targeted research on specific taxa or target fisheries.

Observer briefings, manuals, and training material will be revised based on outputs of this project to continue to improve the accuracy of at-sea identification, and thus continually provide higher-quality data for downstream usage.

Outputs

1. Records and imagery of previously unidentified cold-water coral bycatch obtained by government funded Fisheries Observers within the New Zealand EEZ.
2. Creation and maintenance of a catalogue of Observer collected coral samples.
3. Report(s) detailing confirmed identification, provenance, and all other data collected, for all specimens examined. Data will be reported by fishery stratum (fishing method, fishery area, and, where possible, target species).
4. Updated coral identification guides and other resources for use in training government Fisheries Observers.

**Note:** A three-year term is proposed

**Indicative Research Cost:** $80,000 per annum

**Cost Recovery:** F(CR) Item 4B (100% Industry)

**Fish stocks:** BAR1, 5, BYX1, 2, HAK1, HOK 1, JM3, 8, LIN1, 5, 6, ORH1, 2A, 2B, 3A, 3B, OEO4 6, SBW 6A, 6R, 6I, 6B, SCI4A, SQU1T, 6T, SWA3, 4, WWA5B.

## 2.6 Risk assessment for protected corals

**Project Code:** INT2022-04

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2024

**Guiding Objectives:** CSP Objectives C and E, CSP Coral Plan.

**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.

### Research approach

This will be a two-year project, with an initial focus on collation of data and model inputs, methodology exploration, alignment with and consideration of related research and pilot testing, prior to fully running the assessment in the second year. The chosen methodology will be guided by the tendering process and recommendations/value add suggested by the successful supplier, in addition to refinement during the first year. The assessment will include multiple species and multiple groups representative of, for example, the four protected coral groups, corals of varied threat status in the New Zealand Threat Classification Scheme, corals with various morphological and life history traits, and potentially taxa with varied amounts of available data. Risk will be determined against varied fishing-related metrics, for example target fishery, fleet/vessel category, fishing gear.

Depending on new data available and their adequacy to improve the Productivity-Susceptibility-Analysis (PSA) approach used in the pilot that considers the extent of impact on the relevant species due to fishing activity ("susceptibility"), and the potential of the species to recover from the impact ("productivity"), a similar approach may be used (but more nuanced and detailed). Preferably, a fuller more quantitative approach incorporating methods more akin to those employed in shark, mammal or seabird risk assessments will be used. There is an expectation that methodology development and progression of the project will align with related coral research and outputs (e.g., most recent species distribution models), and parametrisation will be agreed through a targeted CSP Technical Working Group to ensure consistency in use of definitions and values (e.g., for naturalness, catchability, selectivity etc.). Risk assessment outputs will be used in future research, and as a guide for prioritisation of coral conservation and fisheries management. The success and feasibility of this project depends heavily upon data uniformity and its scalability EEZ-wide; this will be ascertained during the first year of the project and will decide whether more information is required to meet the project aim.

Outputs

1. Annual progress reports and presentation to the CSP Technical Working Group.
2. A final technical report and summary of results will be provided to and reviewed by the CSP Technical Working Group, and made available online.
3. Groomed data and maps in electronic formats.
4. Recommendations on future research and conservation management implications of the research for corals.

**Note:** A two-year term is proposed

**Indicative Research Cost:** $75,000 per annum

**Cost Recovery:** F(CR) Item 4B (100% Industry)

**Fish stocks:** BAR1, 5, BYX1, 2, HAK1, 4, 7, HOK 1, JMA3, 8, LIN1, 5, 6, ORH1, 2A, 2B, 3A, 3B, 7A, 7B, OEO1, 3A, 4, 6, SBW 6A, 6R, 6I, 6B, SCI4A, SQU1T, 6T, SWA3, 4, WWA5B.

## 2.7 Determining the resilience of Fiordland corals to fisheries impacts

**Project Code:** INT2022-05

**Start Date:** 1 July 2022

**Completion Date**: 30 June 2025

**Guiding Objectives:** CSP Objectives B, C, and E.

**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.

### Research Approach

To increase our understanding of *A. fiordensis* and support its management, the project will include fieldwork, lab work and modelling approaches, and employ an ROV to expand sampling capacity beyond the limits of SCUBA. There are four main components to the project:

1. Fisheries impacts – compiling data from fisher surveys, abundance surveys and creation of a database of colony health status /observed fishing impacts.
2. Distribution patterns – based upon SCUBA and ROV surveys, coral size and abundance will be determined at multiple locations in Doubtful, Dusky and Breaksea Sounds, and resulting data combined with environmental correlates to ground truth and develop species distribution models.
3. Long-term monitoring plots will be established and SCUBA and ROV surveys, and 3D photogrammetry, will be used to determine population dynamics, recruitment, recovery from physical damage and growth through time.
4. Connectivity patterns between coral populations will be determined across vertical gradients, and between fished and unfished areas using genetic approaches.

### Outputs

1. Annual progress reports and presentation to the CSP Technical Working Group.
2. A final technical report and summary of results will be provided to and reviewed by the CSP Technical Working Group, and made available online.
3. Groomed data and maps in electronic formats.

4. Recommendations on future research and conservation management implications of the research for black corals.

**Note:** A three-year term is proposed

**Indicative Research Cost:** $30,000 per annum

**Cost Recovery:** 100% Crown funded for year 1 of the project. The cost recovery of years 2 and 3 of the project will be considered and consulted on in developing the CSP Annual Plan 2023/24 .

**Fish Stocks:** N/A (for year 1 of the project).

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

**Project Code:** INT2022-06

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2023

**Guiding Objectives:** CSP Objectives B and C.

**Project Objectives:**

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

### Rationale

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

### Research Approach

This project will involve the collation of observer sightings forms with marine mammal data from 2003/04 to 2020/21 and collecting further trip information from other observer documentation to infill data fields such as date, time, location, weather conditions, species identification, number of animals and juvenile/adult numbers. These fields are required to make sure the data can be integrated into existing marine mammal databases. No identifying information related to a fishing vessel will be used in this project. Observer images and video could also be utilised to confirm species IDs increasing the accuracy of the data, though they will not be available for all sighting events. Due to the large dataset, imagery ID verification could be focussed on high-risk species, data-deficient species, or easily mis-identified species. Imagery metadata could further assist in determining date, time, and location of sighting if not otherwise available through observer information.

This data will be utilised to look into marine mammal abundance around fishing vessels in relation to fishing method, target species, time of year and over the course of the data collection period. Visualisation of this data could be made available online within an interactive platform as is done for observed seabird sightings data. Alternatively, observer sightings data combined with public sightings data could be visualised.

### Outputs

1. A technical report summarising methods, results and analysis of marine mammal observer sightings around commercial fishing vessels from 2003/04 to 2020/21.
2. Groomed marine mammal observer sightings data suitable for inclusion in the final database repositories as determined by DOC.
3. A summary of results will be reported to and reviewed by the CSP Technical Working Group, and made available online.

4. Recommendations on ongoing utilisation of this data source, data capturing method and frequency.

**Note:** A one-year term is proposed

**Indicative Research Cost:** $20,000

**Cost Recovery:** F(CR) Item 4 (100% Industry)

**Fish stocks:** BAR1, 7, BIG1, BNS1, 2, 3, 7, BUT5, 7, BWS1, ELE3, 5, 7, EMA1, 3, 7, FLA1, 2, 3, 7, GMU1, GSH1, 3, 4, 7, 8, 9, GSP1, 7, GUR1, 2, 3, 7, 8, HAK1, 4, 7, HOK1, HPB1, 2, 3, 4, 7, 8, JDO1, 2, 3, 7, JMA1, 3, 7, KIN1, 7, 8, LEA1, 2, 3, LIN1, 2, 3, 4, 5, 6, 7, MAK1, MOK1, 3, 5, MOO1, ORH1, 2A, 2B, 3A, 3B, OEO1, 3A, 4, 6, PAR1, 9, POR1, POS1, RBM1, RSN1, 2, RIB1, 2, RCO1, 3, 7, RSK1, 3, 7, 8, SBW6A, 6R, 6I, 6B, SCH1, 2, 3, 4, 5, 7, SCI1, 2, 4A, 6A, 6B, SKI1, 3, 7, SNA1, 2, 3, 7, 8, SPD1, 3, 4, 5, 7, 8, SPE1, 3, 4, 7, SPO1, 3, 7, 8, SQU1T, 6T, SSK 1, 3, 7, 8, STA1, 3, 4, 5, 7, STN1, SWA1, 3, 4, SWO1, TAR1, 2, 3, 4, 5, 7, 8, TOR1, TRE1, 2, 7, TRU3, 4, WAR1, 2, 3, 7, 8, WWA2, 3, 4, 5B, 7, YEM1, 8, 9.

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

**Project Code:** INT2022-07

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2025

**Guiding Objectives:** CSP Objectives A, B and C.

**Project Objectives:**

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

### Rationale

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

### Research Approach

This project will describe current industry practice around interactions with devil rays, including their handling and release, and assess post-release survival of up to 30 devil rays using satellite tags deployed on bycaught rays that have been treated in a manner comparable to practices currently occurring on purse seine vessels. The project will be developed and conducted in collaboration with Pelco and Conservation International. Free-swimming devil rays will be tagged as controls for bycaught rays by researchers from Conservation International currently working on mobulid rays off northeast North Island.

### Outputs

1. A technical report describing structural changes in the fishery, methods currently used by the industry to avoid and mitigate purse seine interactions with devil rays and the post release survival of tagged devil rays.
2. A summary of results will be reported, reviewed by the CSP Technical Working Group, and made available online.
3. Recommendations on the need to review the Purse Seine Operational Procedure for Protected Species Risk Management.

**Note:** A three-year term is proposed due to the variability of devil ray interactions with the fishery and the interannual variability of the skipjack fishery itself.

**Indicative Research Cost:** $34,000 per annum

**Cost Recovery:** F(CR) Item 4 (100% Industry)

**Fish stocks:** SKJ1.

# 3. Population Projects

*NOTE: This multi-year project was consulted on in 2019/20 and is included here for completeness. The second and third year of this project were postponed due to COVID-19 and budget constraints. Year 3 of the project will be cost-recovered this year (2022/23).*

## 3.1 Southern Buller's albatross: Snares/Tini Heke population project

**Project code:** POP2019-04

**Start Date**: 1 July 2019

**Completion Date**: 30 June 2023 (Year 2 postponed to 21/22, Year 3 – 22/23)

**Guiding Objectives:** CSP Objective E; CSP Seabird plan; National Plan of Action – Seabirds.

**Project Objective:**

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

### Rationale

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

### Research Approach

This project will continue the established mark-recapture monitoring methodology to further improve estimates of key demographic parameters, particularly adult survival which was noted as declining in the most recent data assessment by Sagar et al. (2017). Breeding success will also be quantified through the deployment of trail cameras. Several cameras will be placed on trees or stakes within colonies to include as many nests as practical in the field of view. Images will be recorded hourly during daylight hours. Similar cameras set up on Auckland Islands in 2018 obtained data on nesting productivity of white-capped albatross with up to 11 months of images stored on camera.

### Outputs

1. A technical report providing methods used and results found, including an updated population estimate and updated estimates of key demographic parameters (survival of marked birds and breeding pairs, occupancy rates, and breeding success) of Southern Buller's albatross at the Snares.
2. Provision of all data collected (including all banding records of adults and chicks) in electronic format.

### References

Sagar, P. 2014. Population studies of Southern Buller's albatrosses on The Snares. Research report prepared by NIWA, for DOC, MPI, and DWG.

Sagar, P., Thompson, D. & Scofield, P. 2017. Population Study of Southern Buller's Albatross on The Snares. Report prepared for the Deepwater Group Limited. 13p.

**Note:** A three-year term is proposed

**Indicative Research Cost:** $40,000 per annum, $0 in 21/22 – Year 2 already cost recovered in 20/21, $40,000 in Year 3 (22/23)

**Cost Recovery:** F(CR) Item 3 (50% Industry, 50% Crown)

**Fish Stocks:** BAR1, BAR4, BAR5, BIG1, HOK1, LIN5, LIN7, SCI3, SCI6A, SQU1T, SQU6T, STN1, SWA4, WWA5B.

*NOTE: This multi-year project was consulted on in 2021/22 and is included here for completeness*

## 3.2 Identification of protected coral hotspots using species distribution modelling

**Project code:** POP2021-02

**Start Date**: 1 July 2021

**Completion Date**: 30 June 2023

**Guiding Objectives:** CSP Objectives A, C, E.

**Project Objectives:**

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

**Rationale**

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

**Research approach**

Species distribution models (SDMs) will be produced for single coral species using only records with reliable abundance/biomass (i.e., catch weight) data from research trawls, fisheries observer data, and image-based seafloor surveys. Restricting input data to these sources may allow absence data to be treated as true absences and therefore modelling may employ a fishing effort (or naturalness) variable as a potential predictor of current relative abundance, by determining the level of fishing effort preceding each record at its location. This then allows predictions of species relative abundance which account for spatial estimates of the historical effects of fishing.

This project will occur in several concurrent and consecutive stages:

1. DTIS data collation (Year 1). The NIWA Deep-Towed-Image-System (DTIS) database will be interrogated to determine the extent of existing data comparability between trawl surveys. Subsequently, records from selected regions of interest will be audited against the original source imagery to refine taxonomic identifications, estimates of abundance, habitat associations, and spatial coverage, that will feed into 2) and 3), and that will support DOC CSP priorities.
2. Model development and refinement (Year 1 and 2). Data inputs and model parametrisation will commence and be refined as data become available from 1) and are

collated from research trawls and fisheries observer data. Regions of interest may include the Chatham Rise, the Campbell Plateau, the Macquarie Ridge and the Kermadec Region, and taxa including habitat-forming stony corals (*Goniocorella dumosa*, *Enallopsammia rostrata, Madrepora oculata* and *Solenosmilia variabilis*), as well as selected black corals, stylasterids, and octocorals.

3. Coral hotspot and fisheries interaction mapping (Year 2). Depending on the influence of fishing effort in the models, the final models may be used to estimate pre-fishing (pre-1990) distributions by fitting a model with zero fishing effort (or 100% naturalness), thus providing a spatial representation of the historical effects of fishing on the relative abundance of these species. The predicted distributions of each species will be combined to highlight the location of hotspots for protected corals in the New Zealand EEZ.

Outputs

1. A summary of DTIS-derived available live coral record data from research trawl surveys conducted across the EEZ, and a summary of abundance estimates for selected taxa and regions of interest.
2. A technical report that describes the development of spatial estimates of the current relative abundance of key species of protected corals within deep waters of the New Zealand EEZ, along with an appropriate set of maps in a standard GIS format. The report will include any detectable changes in distribution of the modelled species due to the accumulated effects of bottom trawling since 1990.
3. Data collected during the project to be made available in electronic format.

**Note:** A two-year term is proposed

**Indicative Research Cost:** $70,000 year 1, $40,000 year 2

**Cost Recovery:** F(CR) Item 4B (100% Industry)

**Fish Stocks:** BAR1, 5, BYX1, 2, HAK1, 4, 7, HOK1, JMA3, 8, LIN1, 5, 6, ORH1, 2A, 2B, 3A, 3B, 7A, 7B, OEO1, 3A, 4, 6, SBW 6A, 6R, 6I, 6B, SCI4A, SQU1T, 6T, SWA3, 4, WWA5B.

*NOTE: This multi-year project was consulted on in 2021/22 and is included here for completeness*

## 3.3 Flesh-footed shearwater population monitoring

**Project code:** POP2021-04

**Start Date:** 1 July 2021

**Completion Date:** 30 June 2024

**Guiding Objectives:** CSP Objective E; CSP Seabird plan; National Plan of Action – Seabirds.

**Project Objectives**:

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

### Rationale

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

### Research Approach

Capturing and marking of adults and chicks will continue at Lady Alice and Ohinau Islands. To capitalise on this huge banding effort since 2016 (including thousands of chicks), the opportunity now arises to collect detailed information about the age of first return and first breeding in this species, plus juvenile survival rates from fledgling to first return. Over the next three years a large sample of banded birds will be recaptured at study burrows, newly dug burrows in study plots, and on the surface, allowing for demographic studies on survival rates in two regions.

The small colony on Titi Island in the Marlborough Sounds is the southernmost population in New Zealand of flesh-footed shearwaters. A resurvey and estimate of population size at this colony will provide information about whether population trends observed on northern colonies are matched by those at this outlier site.

### Outputs

1. A technical report providing methods used and results of the flesh-footed shearwater population and demography assessments.
2. Data collected during the project to be made available in electronic format.

**Note:** A three-year term is proposed

**Indicative Research Cost:** $60,000 per annum

**Cost Recovery:** F(CR) Item 3 (50% Industry 50% Crown)

**Fish Stocks:** BIG1, BNS 1, SNA1, TAR1, 2, 8, TRE1, GUR8, JDO1, STN1, SWO1.

*NOTE: This multi-year project was consulted on in 2021/22 and is included here for completeness*

## 3.4. Fur seal population estimate and bycatch analysis, Cook Strait

**Project code:** POP2021-06

**Start Date**: 1 July 2021

**Completion Date**: 30 June 2023

**Guiding Objectives:** CSP Objectives B and E.

**Project Objectives:**

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

### Rationale

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

### Research Approach

This project has three areas of focus:

- Providing colony estimates for fur seal colonies within the Cook Strait area that are believed to be impacted by the hoki fishery. This will enable an assessment of the impact bycatch may have on these colonies.
- It will include genetic analysis of bycaught animals to confirm locations most impacted by the fishery, building on work from Stovall 2016.
- Additionally, more information is also needed on when, how, and what animals are caught and are most vulnerable to interacting with this fishery (Baird 2004). Project INT2019-03 analysed fur seal interactions across all trawl fisheries 1993-94 to 2018-19. This project will provide a more localised analyses with observed and fisher reported bycatch of fur seals within this fishery to determine if patterns around bycatch of this species persist.

The information gathered via these three focal areas will guide where, when, and how to focus mitigation research and efforts for fur seal bycatch in this region going forward.

### Outputs

Year 1:

1. A technical report providing a broad-brush assessment of the status of fur seal colonies in the region, using a mixture of methods DOC assisted (boat surveys, drones, etc.).
2. A technical report analysing genetic samples of bycaught animals, to genotype back to their original region (building on genetic analysis and molecular method improvement from Emami-Khoyi 2015, and Stovall 2016).
3. A technical report analysing fisher and observer reported protected species interaction data within the Cook Strait to determine spatial, temporal, and other trends in bycatch risk.
4. Recommendations from the above three points on what colonies are most at risk to fisheries interaction in the region, this will inform year 2 of this project.

Year 2:

1. A technical report providing:
    a. More precise assessment of the fur seal population at colonies determined to be at greatest bycatch risk, (e.g., mark-recapture counts).
    b. Assessment compared with current bycatch levels if these colonies are in fact at risk.
    c. Recommendations on appropriate mitigation work that might be required.
2. Data collected during the project to be made available in electronic format.

### References

Baird, S.J. (2004) Paper for the Hoki Fishery Management Company Environmental Steering Group discussion on possible approaches to mitigating fur seal bycatch in the hoki fishery. 8 p.

Baker, C.S., Boren, L., Childerhouse, S., Constantine, R., van Helden, A., Lundquist, D., Rayment W. and Rolfe, JR. (2019) Conservation status of New Zealand marine mammals. 22 p.

Emami-Khoyi, A. (2015) Population and diet of the New Zealand fur seal (*Arctocephalus forsteri*): molecular approaches. (Thesis, Doctor of Philosophy). Lincoln University, Lincoln, New Zealand.

Mattlin, R.H. (1987). New Zealand fur seal, *Arctocephalus forsteri*, within the New Zealand region. *In* Croxall, J.P.; Gentry, R.L. Status, biology, and ecology of fur seals: Proceedings of an international symposium and workshop, Cambridge, England, 23–27 April 1984. *NOAA Technical Report NMFS-51*.

Rowe, S.J. 2009: Conservation Services Programme Observer Report for the period 1 July 2004 to 30 June 2007. DOC Marine Conservation Services Series 1. Department of Conservation, Wellington. 97 p.

Stovall, W. R. (2016). Population genetics of New Zealand fur seals (*Arctocephalus forsteri*): Genomic tools for research and management (Thesis, Master of Science). Otago University, Dunedin, New Zeland.

**Note:** A two-year term is proposed

**Indicative Research Cost:** $60,000 year 1, $40,000 year 2

**Cost Recovery:** N/A (100% Crown funded)

**Fish Stocks:** N/A

*NOTE: This multi-year project was consulted on in 2021/22 and is included here for completeness*

## 3.5 Otago and Foveaux shag population census

**Project code:** POP2021-07

**Start Date**: 1 July 2021

**Completion Date**: 30 June 2023

**Guiding Objectives:** CSP Objective E; CSP Seabird plan; National Plan of Action – Seabirds.

**Project Objective:**

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

**Rationale**

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

**Research Approach**

Field based research at mainland and island seabird colonies to conduct a full breeding population survey of Otago and Foveaux shag following approved methodology detailed in BCBC2020-24. Work will begin in 2022 and continue for three consecutive breeding seasons at colony locations identified in BCBC2020-04. Survey timings will be dictated by inter- and colony-specific breeding biology but are likely to conducted between the months of April and July of each year.

Permission will be obtained from all landowners for access to private land and DOC Operations regional staff for access to Public Conservation Land.

**Outputs**

1. A technical report detailing research undertaken to census the breeding population of all known Otago and Foveaux shag colonies, and comparison with previous published census data.
2. Data collected during the project to be made available in electronic format.

**Note:** A two-year term is proposed

**Indicative Research Cost:** $20,000 year 1, $40,000 year 2

**Cost Recovery:** N/A (100% Crown funded)

**Fish Stocks:** N/A

*NOTE: This multi-year project was consulted on in 2021/22 and is included here for completeness*

## 3.6 Assessment of causes of low burrow occupancy rates in Westland petrels

**Project code:** POP2021-08

**Start Date**: 1 July 2021

**Completion Date**: 30 June 2023

**Guiding Objectives:** CSP Objective E; CSP Seabird plan; National Plan of Action – Seabirds.

**Project Objective:**

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

**Rationale**

The CSP Seabird medium term research plan (CSP seabird plan) outlines a five-year research programme to deliver on the seabird population research component of CSP. It is targeted at addressing relevant CSP Objectives (as described in the CSP Strategic Statement) and National Plan of Action – Seabirds Objectives. Westland petrels only breed on the West Coast of the South Island at Punakaiki. The species is bycaught on commercial longlines and is rated as a medium-high risk species from commercial fishing activity. Uncertainty around current levels of burrow use and occupancy rates by breeding birds has affected population estimates for this species. These rates vary between different studies but are typically half those observed in other closely related species. The status of the birds maintaining burrow sites but not apparently breeding in them is still unclear. A large pool of non-breeding birds, especially of one sex, may have implications for the risk assessment modelling for this species in terms of total population size estimates. The movements of birds outside the breeding season and especially younger age classes are still a significant gap in our knowledge of this species.

**Research Approach**

The study will be conducted over two years with field monitoring annually from March to November. Trail cameras and mark-recapture will be used to determine activity at nest sites and whether birds occupy one or more nests without breeding. Sexing of birds will be done using DNA techniques from feather samples. Accurate estimates will be gained of breeding occupancy rates (eggs laid per nest) in the chosen study areas. These will be used to quantify the best estimate of current population size by relating numbers of actual breeders to the recent counts made of apparently active burrows.

While at-sea tracking has been carried out on breeding adults using GPS tracking tags during the breeding season, there has been no recent assessment of year-round movements of this species. A sample of breeding and non-breeding adults will be tagged with GLS tags to collect data on foraging range throughout the year to compare with studies done in the early 2000's. A sample of GPS tracking tags will also be applied to fledglings in late 2021 to determine if this age class follows the same migration patterns of adults who visit Chile during the non-breeding season. This information will be used to inform risk assessments on this species by refining at sea distributions of two age classes.

**Outputs**

1. A technical report providing methods used and results of the Westland petrel burrow assessments and tracking studies.
2. Data collected during the project to be made available in electronic format.

3. A final project report in a format suitable for DOC publication detailing methodology, results, and recommendations.

**Note:** A two-year term is proposed

**Indicative Research Cost:** $60,000 year 1, $40,000 year 2

**Cost Recovery:** N/A (100% Crown funded)

**Fish Stocks:** N/A

## 3.7 Black petrel population monitoring

**Project code:** POP2022-01

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2025

**Guiding Objectives:** CSP Objectives B and E; CSP Seabird plan; National Plan of Action – Seabirds.

**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 light-weight tracking tags allow for the tracking of juvenile dispersal and migration, a poorly understood cohort.

### Research Approach

The capture and banding of breeding and non-breeding birds will continue at the main study sites on Aotea/Great Barrier Island. This work will be focussed on the incubation period to band and recapture adults (for estimates of annual breeding probability, adult survival, juvenile survival, and recruitment) and the fledgling period to band surviving chicks (to estimate breeding success).

Live capture of black petrels at-sea off northern New Zealand will also continue to increase sample sizes of recaptures of banded birds attracted to the research vessel. At-sea capture-recapture work aims to use ratios of banded to un-banded birds for independent modelling of the current population size of this species away from the main study colony. In addition, the bands of captured birds will be matched against banding histories from the study colony to assess survival rates for returning immatures that may have dispersed out of the study colony. To achieve these two objectives, large numbers (i.e., hundreds of birds) will need to be safely live-captured at sea and checked for metal bands and any unmarked birds will be banded. As such, the at-sea capture-recapture work of POP2021-01 will continue over the next three years.

Depending on availability of resources and products, new lightweight solar-powered tags will be used to track age classes of black petrels where we have limited information on their movements. In particular tracking tags provide an opportunity to improve our understanding of the at-sea

movements of juvenile black petrels. Improving insights into the distribution of this poorly understood cohort of birds is crucial. This research will be done in one of the three study seasons.

Outputs

1. A technical report providing methods used and results of the black petrel demographic research, and at-sea capture-recapture of black petrels.
2. Data collected during the project to be made available in electronic format.

**Note:** A three-year term is proposed

**Indicative Research Cost:** $70,000 per annum

**Cost Recovery:** F(CR) Item 3 (50% Industry 50% Crown)

**Fish Stocks:** BIG1, BNS1, HOK1, HPB1, SNA1, STN1, SWO1, TAR1, 2.

## 3.8 Flesh-footed shearwater juvenile survival and dispersal

**Project code:** POP2022-02

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2024

**Guiding Objectives:** CSP Objective E; CSP Seabird plan; National Plan of Action – Seabirds.

**Project Objective**:

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

### Rationale

This project supplements current population monitoring under project POP2021-04 to fill additional data gaps utilising cost-saving synergies with the CSP project on Ohinau Island. This new project involves satellite tracking juvenile FFSW for at least the full first year post-fledging, using new lightweight solar powered tags. This will allow for the opportunity to improve our understanding of the at-sea range of this poorly understood cohort of birds and how they might overlap with fisheries throughout the annual cycle.

One previous attempt to track juvenile flesh-footed shearwaters was not overly successful. The birds flew north to the tropics but then the tags progressively stopped working around one month post deployment. It was uncertain if the tags fell off the birds, or the tag interfered with birds' survival or if the birds encountered high risk fisheries in the central tropics (tuna longline fisheries). There has been a lot of development of tracking technology in the past five years with new light-weight tags and different attachment methods that allow birds to be monitored across multiple years.

### Research Approach

We will investigate the options of using either a leg-loop harness attachment as used on wading birds or a tail mounted tag. There is a range of solar-powered light weight satellite tags available from major suppliers that are suitable to follow a cohort of FFSW chicks across at least one full year. If successful, we will find out if the juvenile birds go to the same areas as adults in the North Pacific and where the stay at sea in their first returning summer before they begin to visit colonies 3-4 years after fledging. We expect to deploy between 10 and 20 tags depending on which tag type is used and their current cost. The analysis of the data would be completed in a separate year once all these tags stop working.

Tags will be deployed on FFSW chicks on Ohinau Island just prior to fledging. This site is monitored under POP2021-04 and 10-20 high quality chicks will be selected for the tracking study.

### Outputs

1. A technical report summarising the methods used to deploy tags and the initial results of the tracking study (first month).
2. A summary of these results will be reported to and reviewed by the CSP Technical Working Group and made available online.
3. Any recommendations on improvements for use of tracking tags on this species.

**Note:** A two-year term is proposed

**Indicative Research Cost:** $30,000 per annum

**Cost Recovery:** F(CR) Item 3 (50% Industry 50% Crown)

**Fish Stocks:** BIG1, BNS 1, SNA1, TAR1, 2, 8, TRE1, GUR8, JDO1, STN1, SWO1.

## 3.9 Deep sea protected coral reproduction study

**Project code:** POP2022-03

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2024

**Guiding Objectives:** CSP Objective E; CSP Coral Plan.

**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.

### Research Approach

The study will examine physical specimens of preserved corals to analyse morphometrics and carry out histological analyses. The study will build upon the desktop study undertaken in BCBC2020-01 that identified candidate taxa for further analysis; the stony corals *Desmophyllum dianthus*, *Goniocorella dumosa* and *Enallopsammia rostrata,* and the octocorals *Paragorgia arborea* and *Primnoa notialis*. These species have also been identified as high and medium risk in the pilot coral risk assessment and sufficient samples are already available. Additional taxa will be included to represent the four protected coral groups, and to align with taxa commonly (or intended to be) included in coral fisheries risk assessments and species distribution models.

### Outputs

1. Annual progress reports and presentations to the CSP Technical Working Group.
2. A written summary of results will be provided, along with a full technical report. This will also be presented to and reviewed by the CSP Technical Working Group and made available online.
3. Data to be provided in an electronic format.
4. Recommendations to be provided on how to apply the data to concurrent and future coral research, in particular suggested productivity parameters for risk assessment approaches, and how data might inform conservation management of protected corals.

**Note:** A two-year term is proposed

**Indicative Research Cost:** $40,000 per annum

**Cost Recovery:** F(CR) Item 4B (100% Industry)

**Fish Stocks:** BAR1, 5, BYX1, 2, HAK1, HOK1, JMA3, 8, LIN1, 5, 6, ORH1, 2A, 2B, 3A, 3B, 7A, 7B, OEO4 6, SBW 6A, 6R, 6I, 6B, SCI4A, SQU1T, 6T, SWA3, 4, WWA5B.

## 3.10 Deep diving into decades of uncatalogued corals

**Project Code:** POP2022-04

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2023

**Guiding Objectives:** CSP Objective E; CSP Coral plan.

**Project Objectives**:

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

### Rationale

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

### Research Approach

This project would involve examination of the backlog of unidentified protected coral specimens held at NIC from the 1950s-2004, collected from wide-ranging early fisheries and biodiversity research programmes through NIWA. These specimens and their accompanying data are essentially 'invisible' to science in their current state; initial estimates indicate that there are 378 such samples held in the NIC from the New Zealand region to be catalogued into the NIC Specify database and identified, with an additional 309 already catalogued and ready for further identification. This project excludes fisheries observer-collected specimens examined through the ongoing coral identification project (INT2022-03).

This project would allow work to begin on this backlog and the results used to update databases relevant to coral diversity and distribution for current and downstream research purposes. The results will also be used to provide updated taxonomic inventory and location lists, to identify key areas where taxonomic experts could be enlisted for focused studies and to generate updated presence-based distribution maps for select taxa of interest to the Conservation Services Programme, to include, for example: representatives of the four protected coral groups, corals of varied threat status in the 2022 New Zealand Threat Classification Scheme, corals and coral groups of varied morphology, and comparisons between corals collected by observers, trawl surveys, fishers and researchers.

### Outputs

1. Updated inventory lists and distribution maps for select taxa.
2. A summary of results will be reported to and reviewed by the CSP Technical Working Group and made available online.
3. A technical report for CSP, including recommendations on how the new inventory can inform and update related ongoing and future research.
4. Data to be provided to CSP in an electronic format.

**Note:** A one-year term is proposed

**Indicative Research Cost:** $35,000

**Cost Recovery:** F(CR) Item 4B (100% Industry)

**Fish Stocks:** BAR1, 5, BYX1, 2, HAK1, HOK1, JMA3, 8, LIN1, 5, 6, ORH1, 2A, 2B, 3A, 3B, 7A, 7B, OEO4 6, SBW 6A, 6R, 6I, 6B, SCI4A, SQU1T, 6T, SWA3, 4, WWA5B.

## 3.11 Northern Buller's albatross population monitoring

**Project code:** POP2022-05

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2023

**Guiding Objectives:** CSP Objective E; CSP Seabird plan; National Plan of Action – Seabirds.

**Project Objectives**:

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

### Rationale

GLS tags were placed on a large sample of northern Buller's albatross in 2020/21 and have recently been recovered from most of these birds. This is the largest sample of tracking tags ever deployed on this species. This study seeks to understand the full annual cycle of the birds and the amount of time they spend visiting the colony versus being at sea. For the at-sea tracking, the analysis will look at how extensive are the albatross movements in the pre-laying period, and during each stage of incubation and chick-rearing. Do the birds stay entirely within the EEZ during this period or forage in the high seas? This will affect the level of risk they are exposed to from domestic fisheries. For the inter-breeding period from June to September we will assess the migration patterns to determine which areas the birds use for moulting and potential extent of overlap with international fisheries. The tags can also be interpreted to look at breeding success and when each bird departed from the Chathams either as failed breeder or a successful breeder.

Trail cameras deployed in the same colony with the GLS tagged birds will allow a visual interpretation of study nests to determine general breeding activity and behaviour, and to help identify dates when nests failed or when chicks fledged. This information will be used to compare with the GLS tracking data when known GLS tagged birds are in view of the cameras.

### Research Approach

The raw data files from recovered GLS tags will be analysed using the programme probGLS to calculate at-sea positions throughout the year. The activity file (seawater contact) and location proximity to the colony will be used to estimate when birds are most likely ashore and when they are at-sea to determine the extent of time the birds spend on land versus foraging. Knowledge of the breeding cycle of these birds will be used to compare different parts of the breeding season (pre-lay, incubation, chick-rearing). Where possible footage from trail cameras will be used to help verify behaviour of tagged birds on land to calibrate interpretation of the GLS activity data.

This project may combine some elements of this project with the similar assessments being planned for northern royal albatross trail camera work to categorise behaviour of birds seen onshore including assessment of breeding success, timing and causes of nest failure, fledging dates, return dates of birds to colony and timing of egg laying.

### Outputs

1. A technical report on the at-sea movements and activity patterns of northern Buller's albatross based on GLS datasets.
2. A technical report summarising the breeding cycle, breeding activity behaviour and breeding success from trail camera footage (this aspect may be combined with northern royal albatross study on Motuhara also using trail cameras).
3. A summary of these results will be reported and reviewed by the CSP Technical Working Group and will be made available online.
4. Copies of all electronic files and summary data sheets.

5. Recommendations on study design improvements and future research needed on this species.

**Note:** A one-year term is proposed

**Indicative Research Cost:** $30,000

**Cost Recovery:** F(CR) Item 3 (50% Industry 50% Crown)

**Fish Stocks:** BAR1, BIG1, HOK1, LIN3,4, 5, 7, SCI3, 4A, SNA1, STN1, SQU1J, 1T, 6T, SWA3, 4, SWO1, TAR1, 2.

## 3.12 Northern royal albatross population monitoring

**Project code:** POP2022-06

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2023

**Guiding Objectives:** CSP Objectives B and E; CSP Seabird plan; National Plan of Action – Seabirds.

**Project Objectives**:

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

### Rationale

Satellite tracking of northern royal albatross took place on breeding birds on the Motuhara colony (Chatham Islands) in the summer of 2020/21. Some of these birds failed early in the breeding season and flew to South America while others continued chick rearing. Trail cameras were deployed in the same colonies to monitor some of the satellite tagged birds. It is hoped that a comparison of daily images from the trail cameras will allow breeding outcomes for these satellite tracked birds plus non-tracked birds to be followed across multiple months. Timing of nest failures will help interpret the satellite tracking data. The trail camera footage will also help to assess how successful or otherwise the breeding colony was in the 2020/21 season in this nationally endangered species. The information can also be used to compare with the breeding behaviour of the birds at Taiaroa Head to see whether this small colony is representative of what happens at the larger eastern colonies.

Analysis of the available satellite tracking data will allow assessment for the period of time spent within the New Zealand EEZ compared to the high seas for this seabird, at least during incubation and chick-rearing when sufficient tracking tags were operating.

### Research Approach

Trail camera footage was downloaded from the trail cameras in Jan/Feb 2022. Satellite tracking from a sample of northern royal albatross was undertaken in 2021. These information sources will be analysed and compared to understand the timing of nest failures in the 2021/22 breeding season and the breeding success rate in the monitored areas. These results will be compared with data collected at the Taiaroa Head colony to determine if the breeding activity recorded at the regularly monitored small mainland colony is representative of what happens at the larger but less frequently monitored Chatham colonies.

The trail camera footage from the northern Buller's albatross study may be analysed as part of this project depending on contractor availability and experience.

### Outputs

1. A technical report comparing breeding activity and success observed from trail cameras on Motuhara with behavioural comparisons from the albatross satellite tracking data and breeding observations from the Taiaroa Head colony.
2. A summary of these results will be reported and review by the CSP Technical Working Group and made available online.
3. Copies of all electronic files and summary data sheets.
4. Recommendations on improvements or future relevant research.

**Note:** A one-year term is proposed

**Indicative Research Cost:** $25,000

**Cost Recovery:** F(CR) Item 3 (50% Industry 50% Crown)

**Fish Stocks:** BAR7, BIG1, FLA7.

## 3.13 Westland petrel foraging movements and diving behaviour

**Project code:** POP2022-07

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2023

**Guiding Objectives:** CSP Objective E; CSP Seabird plan; National Plan of Action – Seabirds.

**Project Objectives:**

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

### Rationale

Westland petrels only breed on the West Coast of the South Island at Punakaiki. The species is bycaught on commercial longlines and is rated as a medium-high risk species from commercial fishing activity. This project supplements current population monitoring (POP2021-08) to fill additional data gaps utilising cost-saving synergies.

Past tracking of this species in the early 2000's with GLS tracking tags provided insights into the inter-breeding period and the migrations of this species. Detailed GPS tracking was carried out 10 years ago on a sample of breeding birds and showed the extent of local movements in the peak of the breeding season. The current study seeks to understand the full annual cycle of the birds and the amount of time they spend visiting the colony versus being at sea. For the at-sea tracking, the analysis will look at how extensive are the petrel movements in the pre-laying period, and during each stage of incubation and chick-rearing. Do the birds stay entirely within the EEZ during this period or forage in the high seas? This will affect the level of risk they are exposed to from domestic fisheries. For the inter-breeding period from November to March we will assess the migration patterns to determine if there is inter-annual variation on the movements observed 15 years ago.

Time-depth recorders will be deployed on breeding birds and the data analysed to look at how deep the petrels dive, how frequently they dive and compare the level of diurnal and nocturnal diving behaviour to assess risks with fisheries interactions.

### Research Approach

GLS tags were deployed on a large sample of adult Westland petrels in 2021. These birds will be recaptured in 2022 breeding season and the tags downloaded prior to redeployment. The first year of tag data will be analysed to look at at-sea movements across the entire annual cycle, especially determining the proportion of time spent in the NZ EEZ and areas where the birds overlap with fisheries. The time spent ashore will also be calculated using the wet/dry activity sensor data on these GLS tags and the proportion of days spent within burrows can be assessed by continuous dark periods on the light sensor across 24-hour periods.

Time depth recorders will be deployed in the 2022 breeding season and recovered tags will be analysed to determine maximum dive depths, diving frequency, diurnal and nocturnal diving behaviour/timing and average dive depths. This information will help to understand the level of vulnerability of Westland petrels to longline fishing and how capable the birds might be of reaching baited sets in the water column at various depths below the surface.

Outputs

1. A technical report describing the at-sea movements, activity patterns ashore and diving performance of Westland petrels.
2. A summary of these results will be reported to and reviewed by the CSP Technical Working Group.
3. Recommendations on improvements or future research on Westland petrels.
4. Data collected during the project to be made available in electronic format.

**Note:** A one-year term is proposed

**Indicative Research Cost:** $40,000

**Cost Recovery:** F(CR) Item 3 (50% Industry 50% Crown)

**Fish Stocks:** HAK7, HOK1, LIN3, 4, 7, SCI3, STN1, SWO1, SQU1T, 1J, 6T.

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

**Project code:** POP2022-08

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2025

**Guiding Objectives:** CSP Objectives B and E; CSP Seabird plan; National Plan of Action – Seabirds.

**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.

### Research Approach

The project will collect data to improve estimates of key demographic parameters of Gibson's albatross via continued mark-recapture monitoring. This will follow established methods (Walker & Elliott 1999) to estimate survival, productivity, and recruitment, and estimate the size and trend of the population. This suite of data allows more precise assessment of population trends than from simple nest counts. Drone-based aerial survey methods will be used to conduct wider population counts beyond the study plots. GLS and satellite tags will be used to improve our knowledge of at-sea distribution and overlap with fisheries posing bycatch risk.

The research component for white-capped albatross will include surveys of the Disappointment Island study colony to help interpret past aerial photography data sets, deploy trail cameras to monitor breeding activity and timing of nest failures, collect band recovery data from study colony birds, continue to mark a sample of breeding birds to build up robust datasets for adult survival analysis and deploy and collect GLS tags from a sample of birds to look at the extent of movements of birds in relation to annual variability in foraging conditions. Opportunities to investigate the use of drones to estimate total population size more accurately may also be progressed as feasible.

This project will also provide recommendations for a long-term monitoring strategy that can most efficiently and effectively provide the data required to understand the drivers behind population change and monitor the outcome of fisheries bycatch reduction management.

Outputs

1. Annual technical report(s) on the work undertaken and results found, including update estimates of key demographic parameters and population estimates.
2. Annual summary of results will be presented to, and reviewed by, the CSP Technical Working Group, and made available online.
3. Recommendations for an efficient and effective long-term monitoring strategy.
4. Data collected during the project to be made available annually in electronic format.

**Note:** A three-year term is proposed

**Indicative Research Cost:** $160,000 per annum

**Cost Recovery:** F(CR) Item 3 (50% Industry 50% Crown)

**Fish Stocks:** BAR1, 5, BIG1, GUR1, 7, HAK1, HOK1, HPB4, 7, 8, JMA3, 7, LIN1, 4, 5, 6, 7, RIB2, 3, 4, 5, 7, SCH3, 8, SCI3, 6A, SQU1J, 1T, 6T, STN1, SWA1, 3, 4, SWO1, TAR1,2, 3, 7, TOR1, WAR3, WWA5B.

## 3.15 Auckland Islands New Zealand sea lions

**Project code:** POP2022-09

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2023

**Guiding Objectives:** CSP Objective E; Sea lion Threat Management Plan.

**Project Objectives**:

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

### Rationale

The New Zealand sea lion is listed as Nationally Vulnerable (Baker et al. 2019). The New Zealand sea lion Threat Management Plan, first implemented in 2017, established a range of research and actions to be undertaken to reduce and mitigate the range of threats sea lions are exposed to. Sea lions are incidentally bycaught in southern commercial trawl fishing operations targeting species including squid, scampi and southern blue whiting. The foraging areas of New Zealand sea lions at the Auckland Islands have been shown to overlap with commercial trawl fishing activity, particularly SQU6T and SCI6A (Chilvers et al. 2005). Approximately 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 re-sighting of marked animals.

Since 2001 there has been a considerable decline in pup production at the Auckland Islands (Campbell et al. 2006; Chilvers et al. 2007). A literature review to identify potential indirect effects of commercial fishing on the Auckland Islands population as part of CSP project POP2010-01 (Bowen 2012) highlighted several key information gaps that prevent a full understanding of any such potential indirect effects, including time series data of population dynamics as collected in this project. CSP project POP2012-02 analysed population data collected during previous years to determine the key demographic factors driving the observed population decline of New Zealand sea lions at the Auckland Islands. It found that low pupping rates, a declining trend in cohort survival to age 2 and low adult survival may explain declining pup counts in one studied population (Roberts et al. 2014). Demographic data from the Auckland Islands population is vital to the ongoing assessment of direct and indirect risks to the species from commercial fisheries, as described in Fisheries Operational Plans.

### Research Approach

Pup production at Dundas and Enderby Island has historically been estimated using a range of methods including aerial (Baker et al. 2012) and ground-based mark-recapture methods (Chilvers 2012; Childerhouse 2013). It is proposed that a ground-based pup count be conducted with additional emphasis on tag re-sightings. Pup production at Figure of 8 Island will be by direct count following established methods (Chilvers 2012; Childerhouse 2012). It is expected this work will take approximately two weeks.

In the interest of cost-savings, this project may be undertaken in conjunction with wider NZ sea lion Threat Management Plan research or management actions on the Auckland Islands.

### Outputs

1. A technical report(s) providing methods used and results of the New Zealand sea lion population assessments.

2. Data collected during the project to be made available in electronic format suitable for upload into the New Zealand sea lion database.

**Note:** A one-year term is proposed

**Indicative Research Cost:** $150,000

**Cost Recovery:** F(CR) Item 2 (90% Industry 10% Crown)

**Fish Stocks:** SQU6T, SCI6A.

**References:**

Baker B, Jensz K & Chilvers L (2012) Aerial survey of New Zealand sea lions – Auckland Islands 2011/12. Report prepared for Ministry of Agriculture & Forestry, DeepWater Group Limited & Department of Conservation, Wellington, New Zealand. 12p.

Baker CS, Boren L, Childerhouse S, Constantine R, van Helden A, Lundquist D, Rayment W & Rolfe JR (2019) Conservation status of New Zealand marine mammals. Department of Conservation, Wellington, New Zealand. 22 p.

Bowen WD (2012) A review of evidence for indirect effects of commercial fishing on New Zealand sea lions (*Phocarctos hookeri*) breeding on the Auckland Islands. Report prepared for the Conservation Services Programme, Department of Conservation, Wellington, New Zealand. 41p.

Campbell RA, Chilvers BL, Childerhouse S & Gales NJ (2006). Conservation management issues and status of the New Zealand (*Phocarctos hookeri*) and Australian (*Neophoca cinerea*) sea lions. In: Trites AW, Atkinson S, DeMaster DP, Fritz LW, Gelatt LD, Rea LD, Wynne KM eds. Sea lions of the world. Alaska Sea Grant Alaska College Prog

Childerhouse SJ (2012) Methodology for CSP Project 4426 New Zealand sea lion ground component 2012/13. Report prepared for the Conservation Services Programme, Department of Conservation, Wellington, New Zealand. 8p.

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

Chilvers BL, Wilkinson IS & Childerhouse S (2007). New Zealand sea lion, *Phocarctos hookeri*, pup production—1995 to 2006. New Zealand Journal of Marine and Freshwater Research, 41:2, 205-213.

Chilvers BL, Wilkinson IS, Duignan PJ & Gemmell NJ (2005) Summer foraging areas for lactating New Zealand sea lions *Phocarctos hookeri*. Marine Ecology Progress Series vol. 304: 235–247.

Roberts J, Fu D, Doonan I & Francis C (2014) NZ sea lion: demographic assessment of the causes of decline at the Auckland Islands. Demographic model options: demographic assessment. Report prepared by NIWA for the Conservation Services Programme, Department of Conservation, Wellington, New Zealand. 142p.

## 3.16 Antipodes Island seabird research: Antipodean albatross + white chinned petrel

**Project code:** POP2022-10

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2025

**Guiding Objectives:** CSP Objective E; CSP Seabird plan; National Plan of Action – Seabirds.

**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 trialed 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.

### Research Approach

The monitoring of key Antipodean albatross demographic parameters (adult survival, juvenile survival, recruitment, breeding probability, and breeding success) will take place during the austral summer. As this is a bi-annual breeder whose chicks take close to a year to fledge, both returning adults starting to breed, and chicks close to fledging can be monitored during the same trip allowing for a full assessment of all key vital rates. Monitoring will take place using protocols standardised over the last 20 years. However, an independent population estimate is out of date and a major data gap. Methods developed during 2021/22 will be employed to provide this key demographic parameter. Both streams of Antipodean albatross work involve close handling of birds and as such, feather sampling for stable isotope analyses and stress analyses (i.e., CORT) will be a simple addition to this work plan. The diet and stress analyses across multiple years and cohorts will provide much needed insights into the potential effects climate change has on this rapidly declining species. This project will also provide recommendations for a long-term monitoring strategy that can most efficiently and effectively provide the data required to

understand the drivers behind population change and monitor the outcome of fisheries bycatch reduction management.

White-chinned petrels breed at a similar time as Antipodean albatrosses and as such this species can be monitored at the same time. Key vital rates for this species are needed and as such a capture-mark-recapture study will be set up to facilitate the estimation of adult survival, juvenile survival, recruitment, and breeding probability). Additionally, while population estimates exist for both Auckland Islands (POP2017-04) and Campbell Island (BCBC2019-03), population estimates for Antipodes Island, another stronghold for the species, are lacking. As such, a population estimate employing methods developed on Auckland and Campbell Island will be conducted. Combined, these two work streams will provide updated parameters for one of the most bycaught species in New Zealand.

Outputs

1. Annual technical report(s) on the work undertaken and results found, including update estimates of key demographic parameters and population estimates.
2. Annual summary of results will be presented to, and reviewed by, the CSP Technical Working Group, and made available online.
3. Recommendations for an efficient and effective long-term monitoring strategy.
4. Data collected during the project to annually be made available in electronic format.

**Note:** A three-year term is proposed

**Indicative Research Cost:** $160,000 per annum

**Cost Recovery:** F(CR) Item 3 (50% Industry 50% Crown)

**Fish Stocks:** BAR1, 5, 7, BIG1, HAK1, 7, HOK1, HPB3, 4, 7, JMA3, 7, LIN3, 4, 5, 6, 7, RCO3, SBW6A, 6B, 6I, 6R, SCH3, 4, SCI1, 2, 3, 6A, STN1, SWA1, 3, 4, SWO1, SQU1J, 1T, 6T, TOR1, WAR3, WWA5B.

## 3.17 Campbell Island Seabird Research

**Project code:** POP2022-11

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2023

**Guiding Objectives:** CSP Objective E; CSP Seabird plan; National Plan of Action – Seabirds.

**Project Objectives:**

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

### Rationale

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

### Research Approach

The project has been scoped as a desk-based methodology development project, to inform future on island research when maximum synergies and cost sharing with other research activities at Campbell Island (sea lions, penguin research) are possible, tentatively scheduled for 2023/24. This project will provide recommendations for a long-term monitoring strategy that can most efficiently and effectively provide the data required.

The project will aim to develop methods to count the number of breeding pairs of southern royal albatross at the Col study area and at least one other index site on the island. Methods to be explored will include the use of high-resolution satellite images and drones to census birds, and use of future field research to map accurately using GPS each nest for comparison with satellite imagery. Consideration will be given to allowing for trend assessment with previous work using long-term photo points at the northern mollymawk/albatross colonies. Methods for monitoring birds with trail cameras will also be considered.

### Outputs

1. A technical report on the work undertaken and results found and recommendations for an efficient and effect long-term monitoring strategy.
2. Recommendations will be presented to, and reviewed by, the CSP Technical Working Group, and made available online.
3. Data collated during the project to be made available in electronic format.

**Note:** A one-year term is proposed

**Indicative Research Cost:** $15,000

**Cost Recovery:** F(CR) Item 3 (50% Industry 50% Crown)

**Fish Stocks:** BAR1, 5, 7, BIG1, HOK1, HPB3, 5, 7, LIN3, 4, 5, 6, 7, RCO3, 7, SCI2, 3, 4A, SQU1J, 1T, 6T, SWO1, TAR1, 2, 3, 7W.

# 4. Mitigation Projects

*NOTE: This multi-year project was consulted on in 2021/22 and is included here for completeness.*

## 4.1 Protected Species Liaison Project

**Project Code:** MIT2021-01

**Start Date:** 1 July 2021

**Completion Date:** 30 June 2024

**Guiding Objectives:** CSP Objective A; CSP Seabird plan; National Plan of Action – Seabirds, National Plan of Action – Sharks.

**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 non-regulatory 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.

### Research Approach

Within the next three years the capacity of the programme is expected to grow substantially. The role of the Liaison Officers will largely remain the same, supporting and educating fishers in best practice mitigation and providing a vital interface between skippers, government, and researchers. The growth over the next three years will consist of additional Liaison Officers to expand into additional fisheries and areas, increased contact with high-risk vessels and fleets, development, and delivery of a training programme for crew on protected species and mitigation and the hiring of a full-time Liaison Coordinator to ensure the operational oversight of the programme.

Improvements in the next phase of the project are needed to measure the success of the Protected Species Liaison Programme and overcome constraints in reporting capability. This will be addressed through database development and standardised procedures. There will also be

increased engagement with quota holders to support the uptake of PSRMPs and Mitigation Standards.

Outputs

1. Database including PSRMPs installed and updated, vessels visited, trigger responses, mitigation materials and training provided.
2. Creation of an inter-agency Advisory Group and internal Project Executives Group to work through challenges within the programme and report progress.
3. Development of management protocols and responses to triggers.
4. Reports to relevant advisory groups detailing progress and any developments which have come from the fleet.
5. Annual written reporting will be provided as part of the NPOA-Seabirds – Annual Research Report.

**Note:** A three-year term is proposed

**Indicative Research Cost:** $250,000 per annum

**Cost Recovery:** F(CR) Item 4 (100% Industry)

**Fish stocks:**

| Objective/Species | Indicative Cost | Fish Stocks |
|---|---|---|
| 1. Surface Longline | $50,000 | ALB1, BIG1, STN1, SWO1 |
| 2. Bottom Longline | $50,000 | BNS1, HPB1, SNA1 |
| 3. Inshore Trawl | $50,000 | BAR1, 7, FLA1, GUR1, JDO1, LIN1, 2, RCO3, SNA1, 2, TAR1, 2, 3, TRE1, 7 |
| 4. Setnet | $50,000 | SCH3, 5, SPO3, ELE3, 5, MOK3, SPD5 |
| 5. Purse seine | $50,000 | SKJ1, JMA1, EMA1, PIL1 |

## 4.2 Longline hauling mitigation devices

**Project code:** MIT2022-01

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2024

**Guiding Objectives:** CSP Objective A; National Plan of Action- Seabirds.

**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.

### Research Approach

CSP project MIT2018-02 (Hauling mitigation for small longline vessels) developed two simple devices and conducted limited trialling which showed the devices to be effective at deterring birds from the hauling station where baited hooks can become available to seabirds. This project will seek to promote uptake of the devices developed and collect further data on bird activity to supplement previous findings.

Small longline vessel operators will be sought who are willing to participate in the project, and their preferred design of haul mitigation device will be supplied for deployment. To assess the effectiveness and practicality of the device, a data collection protocol will be developed. This is likely to involve at-sea data collection, reporting by crew, and through camera deployments where appropriate. It is envisaged that the protocols will be based on those developed by CSP project MIT2018-02, adapted as required to utilise a range of data inputs most effectively for the longer-term deployments during this project.

The project will include an initial workshop with industry representatives and other stakeholders to refine and target the approach taken.

The project will also include recommendations for any further refinement to improve the effectiveness and operationally practicality of the devices.

### Outputs

1. A technical report on the work undertaken and results found.
2. A summary of results will be presented for review by the CSP Technical Working Group and made available online.
3. Recommendations on further refinements to improve effectiveness of haul mitigation devices and/or steps to further achieve wider uptake of these devices in longline fisheries.
4. Data collected during the project to be made available in electronic format.

**Note:** A two-year term is proposed

**Indicative Research Cost:** $70,000 per annum

**Cost Recovery:** F(CR) Item 4 (100% Industry)

**Fish Stocks:** BIG1, STN1, SWO1, BNS1, BNS2, BNS3, BNS7, BNS8, HPB1, LIN1, LIN2, SNA1.

## 4.3 Understanding drivers and barriers to mitigation uptake in small vessel bottom longline

**Project code:** MIT2022-02

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2023

**Guiding Objectives:** CSP Objective A; National Plan of Action-Seabirds.

**Project Objective:**

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

### Rationale

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

### Research Approach

This project will apply a social science methodology to understand key drivers and barriers in achieving fleet-wide implementation of mitigation standards from a fisher's perspective. The study is scoped to be exploratory and builds from similar research reported by Southern Seabirds in 2021 for the surface longline fishery, which was based on in-depth interviews. Given the different nature of the bottom longline fishery, in particular the far greater fleet size and wider range of operational variability, a modified methodology will need to be developed as the first part of the project.

The project will explicitly consider the role that DOC Liaison Officers can play in understanding these factors and make recommendations for how future operation of the Fisheries Liaison Programme can be improved to better understand and address underlying drivers and barriers to mitigation uptake.

The initial stage of the project will include a workshop with social science practitioners, industry representatives, Liaison Officers and other relevant stakeholders to further scope the project.

Results will be presented back to fishers, industry representatives and other stakeholders and will be targeted at informing management actions and future research to promote drivers and overcome barriers to best practice mitigation uptake.

### Outputs

1. A technical report describing the work undertaken and results found.
2. Targeted outputs to summarise results to fishers and other key audiences.
3. A summary of results will be presented to and reviewed by the CSP Technical Working Group and made available online.
4. Recommendations on possible management actions or future research to promote uptake of bycatch mitigation.
5. Workshop on the results of the study, with the aim of working through actions to address drivers and barriers. This workshop will also aim to provide recommendations to the

Fisheries Liaison Programme and its Liaison Officers, for how they may better collect information to understand the underlying drivers and barriers of mitigation uptake.

6. Data collected during the project to be made available in electronic format.

**Note:** A one-year term is proposed

**Indicative Research Cost:** $50,000

**Cost Recovery:** F(CR) Item 4 (100% Industry)

**Fish Stocks:** BNS1, BNS2, BNS3, BNS7, BNS8, HPB1, GUR1, GUR7, GUR8, LIN1, LIN2, SCH3, SCH5, SNA1, TAR1, TAR2, TAR3

## 4.4 DOC Coral Symposium 2022/23

**Project code: MIT2022-03**

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2023

**Guiding Objective:** CSP Objective A.

**Project Objective:**

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

### Rationale

Four coral groups are protected under the Wildlife Act 1953: the order Antipatharia (black corals), the order Alcyonacea (gorgonians), the order Scleractinia (stony corals), and the family Stylasteridae (lace corals). Despite this protected status, there is limited and ineffective coral protection in New Zealand. Effective protection and management is particularly challenging given such large numbers of data deficient species and a lack of specific management objectives and policies. Nonetheless, commitments within the Wildlife and Fisheries Acts to protect biodiversity and to mitigate adverse environmental impacts, coupled with parallel inter-agency work programmes, an updated marine invertebrate New Zealand Threat Classification System report expected in 2022 and imminent Wildlife Act reforms, there is strong suggestion that a 2023 symposium is timely.

This symposium will bring together interested invited parties to provide updates and coordination between multiple work programmes relevant to coral conservation. The symposium is not intended as a repeat of the 2017 gaps analysis workshop (although relevant research updates will be included). Instead, the purpose of the symposium is to drive an active network of stakeholders and bring them together for the first time in several years, and to provide them with government and industry contexts and contacts for ongoing improvement of management outcomes for protected corals. This will be achieved by presentations and discussion focused on 1) coral research and knowledge – achievements and gaps since the 2017 gaps workshop; 2) identification of threats and approaches for mitigation; and 3) potential management approaches within the context of new and upcoming policy frameworks and other workstreams.

### Research Approach

The symposium will be hosted by DOC with an independent facilitator. To maximise networking potential, we envisage a 2-3 day event to be held at DOC with invitees attending wherever possible in person, with COVID and online contingencies. The symposium will include a mixture of presentation themes and break-out discussion sessions (being a hybrid between a conference and a workshop), on topics such as:

- Coral biodiversity – summary and insights since the 2017 research gaps workshop
- Corals, fishing and understanding current and historical overlap (e.g., interagency)
- Mesophotic reefs/shallower corals and inshore impacts
- Mitigation approaches – gaps, opportunities, innovation
- Corals and climate change, and future proofing protection efforts
- Corals in our policy framework (e.g., Wildlife Act and MPA reform, 2020 Biodiversity Strategy, RFMO work)

- Coral conservation and management next steps and challenges (e.g., spatial targets, international commitments and lessons, synergies with other agencies).

Outputs

1. A summary report of the symposium, to be reviewed by the CSP Technical Working Group, and made available online.
2. Recommendations (through discussions and break-out sessions) on next steps to improve our understanding of corals and their protection, particularly within current government policy frameworks and work programmes.

**Note:** A one-year term is proposed

**Indicative Research Cost:** $20,000

**Cost Recovery:** Project cost will be split 50% cost recovered ($10,000 will be 100% industry F(CR) Item 4B) and 50% crown funded ($10,000)

**Fish Stocks:** BAR1, 5, BYX1, 2, HAK1, 4, 7, HOK 1, JMA3, 8, LIN1, 5, 6, ORH1, 2A, 2B, 3A, 3B, 7A, 7B, OEO1, 3A, 4, 6, SBW 6A, 6R, 6I, 6B, SCI4A, SQU1T, 6T, SWA3, 4, WWA5B.

## 4.5 Bait retention as a driver to mitigation use in the surface longline fishery

**Project code:** MIT2022-04

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2023

**Guiding Objectives:** CSP Objective A; National Plan of Action-Seabirds.

**Project Objective**:

To quantify bait loss rates in relation to seabird attacks.

### Rationale

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

### Research Approach

This project will identify ways to collect and compile data on bait loss rates across a variety of fishing operations. Together with data on seabird bycatch mitigation use, this will form important source data for assessing economic implications. Synergies will be sought with other data collection projects, such as those focussed on hook shielding devices, as well as investigating ways to maximise data collection through new and developing programmes such as electronic monitoring.

This project has been scoped as a desktop study and will review existing data from New Zealand fisheries as well as work internationally on this topic. The project will also seek to identify recommendations on potential improvements to future data collection through existing (e.g., Observer Programme) and emerging (e.g., Electronic Monitoring) data collection platforms, to ensure robust data availability going forwards. This will better inform economic modelling on seabird bycatch mitigation use in surface longline fisheries, which may act as an important driver for mitigation update both domestically and internationally.

### Outputs

1. A technical report on the work undertaken and summarising available data in a format suitable to inform economic assessments.
2. A summary of results will be presented to and reviewed by the CSP Technical Working Group and made available online.
3. Recommendations on potential improvements to future data collection.
4. Data collected during the project to be made available in electronic format

**Note:** A one-year term is proposed

**Indicative Research Cost:** $30,000

**Cost Recovery:** F(CR) Item 4 (100% Industry)

**Fish Stocks:** BIG1, STN1, SWO1, TOR1.

## 4.6 Large trawl vessel warp mitigation

**Project code:** MIT2022-05

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2023

**Guiding Objectives:** CSP Objective A; National Plan of Action-Seabirds.

**Project Objective**:

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

### Rationale

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

### Research Approach

This project aims to further improve mitigation effectiveness to progress towards a zero bycatch goal, as outlined in the National Plan of Action – Seabirds 2020, by using observer data to assess effectiveness of current options. Of particular note, some mitigation used, i.e., bird bafflers, are not currently recognised as best practice globally. This project will complement a recent assessment of the risk factors for seabird net captures in selected sub-Antarctic trawl fisheries (New Zealand Aquatic Environment and Biodiversity Report No. 266).

As well as informing targeted improvements in the New Zealand fleet, the findings from this research will also be made available to inform global best practice mitigation specifications, and opportunities for comparative analyses with similar fleets operating in other Southern Ocean regions will be sought.

This project has been scoped as a desk-based exploratory study and will include an initial workshop with fishing industry representatives, fisheries data experts and other stakeholders to refine the scope of analyses and identify all relevant data inputs.

The project may also make recommendations for further research including any improvements in data collection to better inform bycatch effectiveness assessments, or potential at-sea trials for improved mitigation.

### Outputs

1. A technical report on the research undertaken and results found, suitable to both inform domestic bycatch mitigation management and international audiences.
2. A summary of results will be presented to and reviewed by the CSP Technical Working Group and made available online.
3. Recommendations on improvements to best practice mitigation advice to further reduce large vessel warp interactions.
4. Data collected during the project to be made available in electronic format.

**Note:** A one-year term is proposed

**Indicative Research Cost:** $30,000

**Cost Recovery:** F(CR) Item 4 (100% Industry)

**Fish Stocks:** BAR1, 4, 5, 7, BYX1, 3, 7, CDL2, HAK1, 4, 7, HOK1, JDO1, JMA3, 7, LIN1, 6, OEO1, 3A, 6, ORH1, 2A, 2B, 3B, 7A, 7B, RBT3, RBY1, 2, SBW6A, SCH1, SCI1, 2, 4A, SKI7, SNA1, 8, SPE4, SQU1T, 6T, SWA3, 4, TAR1, 2, TRE1, 7, WWA3, 5B.

## 4.7 Light mitigation: reducing vessel interactions with seabirds

**Project code:** MIT2022-06

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2023

**Guiding Objectives:** CSP Objective A; National Plan of Action-Seabirds.

**Project Objectives**:

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

### Rationale

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

### Research Approach

Outcomes from the previous CSP project (MIT2019-03) suggest that insufficient land-based and boat-based experiments were conducted to successfully identify light types that allow for safe vessel operations, while reducing deck-strike risks to seabirds. Consequently, further research must be conducted to achieve the goal of identifying options for deck strike mitigation. Firstly, the current light set-ups in use on fishing vessels should be re-characterised. Particularly, the potential shift to LED lights should be investigated. For this re-characterisation, metrics relevant to light pollution and wildlife interactions should be quantified, including correlated colour temperature (in K), luminance (in lm), illuminance (in lx), and shielding (in % of light per ° from nadir). Furthermore, the sample size of experiments on land and at sea, compared to the previous project, should be increased. Large deck strike events are rare, but have potentially catastrophic impacts and as such, to successfully identify light types and set-ups that work best under different environmental conditions, a larger number of repeat experiments must be conducted across a longer time period (e.g., weeks). More experiments over a longer time-period would allow for appropriate incorporation of temporal variation due to varying moon phases, weather conditions, and seabird phenology. The experiments should be tailored following the findings of the lighting characterisation and use the same relevant metrics. While an increased sample size will increase operating costs, choosing more accessible study sites for the terrestrial experiments, than those chosen during the previous project, could alleviate costs. Similarly, at-sea experiments could be conducted on operating vessels, if possible, to reduce costs (for compensations) and increase sample sizes. An increased number of experiments will aid the identification of light types (in K and lx) and set-ups (i.e., shielding) that have the potential to reduce deck strikes. Once the right treatment has been identified, it could be recommended for wider trials within the operating fishing fleet.

Outputs

1. A technical report detailing lighting use within the fishing fleet, methods and results of on-land experiments, and methods and results of at-sea experiments.
2. A summary of results will be reported and reviewed by the CSP Technical Working Group, and made available online.
3. Recommendations on bird-friendly lights that do not impact the safe operation of vessels.
4. Data collected during the project to be made available in electronic format.

**Note:** A one-year term is proposed

**Indicative Research Cost:** $50,000

**Cost Recovery:** F(CR) Item 4 (100% Industry)

**Fish Stocks:** BAR1, 5, BIG1, BNS1, HAK1, HOK1, JDO1, JMA3, 7, LIN2, 4, 6, ORH1, 3A, 3B, RBY1, SBW1, 6A, 6B, 6I, SCH5, SCI1, 4A, SNA1, STN1, SQU6T, SWA3, 4, TAR1, 5, TRE1, WAR3.

## 4.8 Inshore trawl warp mitigation

**Project code:** MIT2022-07

**Start Date:** 1 July 2022

**Completion Date:** 30 June 2023

**Guiding Objectives:** CSP Objective A; National Plan of Action-Seabirds.

**Project Objectives**:

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

### Rationale

Inshore trawl poses a substantial portion of risk to seabirds from commercial fisheries. There remains uncertainty over the effectiveness of the various seabird bycatch mitigation options that have been used by some operators. Currently there are no mandatory mitigation requirements for trawl vessels <28m in length, and the mitigation standard introduced by the NPOA-Seabirds 2020 contains limited advice on the relative effectiveness of the warp mitigation options identified. Bird collisions with trawl warp cables form a major component of the bycatch risk associated with this fishing method. Several warp strike mitigation options, which aim to form a visible and physical barrier to deter birds from approaching the warp, are currently being used. However, no clear guidance on best practice has been developed due to a lack of observational data on the effectiveness of the different options.

### Research Approach

Observer coverage has been low in many parts of this fleet, so in addition to data compilation and review, this project will seek to also undertake dedicated observations of bird behaviour in relation to different mitigation options, as a measure of bycatch risk, and proxy for bycatch rates. A workshop will be held with industry and other interested stakeholders to advise on further refinement to the project scope. The workshop will consider the results from updated risk assessment work commissioned by Fisheries New Zealand to ensure this project focuses on parts of the fleet posing highest risk of warp strikes. This data obtained from at-sea trials will be analysed to describe and quantify the relative effectiveness of mitigation options currently being used. Based on this assessment, the project will provide recommendations on best practice options for the fleet, identify focus areas and/or devices for further development and testing, as well as recommendations to improve future data collection, including consideration of emerging tools such as electronic monitoring, to enable ongoing improvements to mitigation effectiveness in this fishery.

### Outputs

1. A workshop held with industry and other interested participants to advise on refining the scope of the project
2. A technical report on the work undertaken and results found.
3. A summary of results will be reported to and reviewed by the CSP Technical Working Group and made available online.
4. Recommendations on best practice options for mitigating seabird interactions with trawl warp.

5. Recommendations for future data collection to continue monitoring effectiveness of mitigation options and inform continual improvement.
6. Data collected during the project to be made available in electronic format

**Note:** A one-year term is proposed

**Indicative Research Cost:** $100,000

**Cost Recovery:** F(CR) Item 4 (100% Industry)

**Fish Stocks:** BAR1, 7, FLA1, GUR1, JDO1, LIN1, 2, RCO3, SNA1, 2, TAR1, 2, 3, TRE1, 7.

# Appendix: Cost Recovery Tables

## A: CSP 2022/23 Project Costs

| Code | Project | Research | Admin | Total | CR Item | Industry % | Industry | Crown |
|---|---|---|---|---|---|---|---|---|
| **Interaction Projects** | | | | | | | | |
| INT2020-02 | Identification of marine mammals, turtles and protected fish captured in New Zealand fisheries | $15,000 | $989 | $15,989 | 4 | 100 | $15,989 | $0 |
| INT2021-04 | Collection and curation of tissues samples from protected fishes and turtles | $22,000 | $1,451 | $23,451 | 4 | 100 | $23,451 | $0 |
| INT2022-01 | Observing commercial fisheries | $2,345,762 | $110,000 | $2,455,762 | 8 | 100 | $2,455,762 | $0 |
| INT2022-02 | Identification of seabirds captured in New Zealand fisheries | $80,000 | $5,277 | $85,277 | 4 | 100 | $85,277 | $0 |
| INT2022-03 | Identification, storage, and genetics of cold-water coral bycatch specimens | $80,000 | $5,277 | $85,277 | 4B | 100 | $85,277 | $0 |
| INT2022-04 | Risk Assessment for protected corals | $75,000 | $4,947 | $79,947 | 4B | 100 | $79,947 | $0 |
| INT2022-05 | Determining the resilience of Fiordland corals to fisheries impacts | $30,000 | $1,979 | $31,979 | - | 0 | $0 | $31,979 |
| INT2022-06 | The distribution and abundance of marine mammals observed around commercial fishing vessels in New Zealand waters | $20,000 | $1,319 | $21,319 | 4 | 100 | $21,319 | $0 |
| INT2022-07 | Post-release survival of bycaught spine-tailed devil rays in the New Zealand skipjack tuna purse seine fishery | $34,000 | $2,243 | $36,243 | 4 | 100 | $36,243 | $0 |
| **Population Projects** | | | | | | | | |
| POP2019-04 | Southern Buller's albatross: Snares/Tini Heke population project | $40,000 | $2,638 | $42,638 | 3 | 50 | $21,319 | $21,319 |
| POP2021-02 | Identification of protected coral hotspots using species distribution modelling | $40,000 | $2,638 | $42,638 | 4B | 100 | $42,638 | $0 |
| POP2021-04 | Flesh-footed shearwater population monitoring | $60,000 | $3,957 | $63,957 | 3 | 50 | $31,979 | $31,979 |
| POP2021-06 | Fur seal population estimate and bycatch analysis: Cook Strait | $40,000 | $2,638 | $42,638 | - | 0 | $0 | $42,638 |
| POP2021-07 | Otago and Foveaux shag population census | $40,000 | $2,638 | $42,638 | - | 0 | $0 | $42,638 |
| POP2021-08 | Assessment of causes of low burrow occupancy rates in Westland petrels | $40,000 | $2,638 | $42,638 | - | 0 | $0 | $42,638 |
| POP2022-01 | Black Petrel population monitoring | $70,000 | $4,617 | $74,617 | 3 | 50 | $37,308 | $37,308 |
| POP2022-02 | Flesh-footed shearwater juvenile survival and dispersal | $30,000 | $1,979 | $31,979 | 3 | 50 | $15,989 | $15,989 |
| POP2022-03 | Deep sea protected coral reproduction study | $40,000 | $2,638 | $42,638 | 4B | 100 | $42,638 | $0 |
| POP2022-04 | Deep diving into decades of uncatalogued corals | $35,000 | $2,308 | $37,308 | 4B | 100 | $37,308 | $0 |
| POP2022-05 | Northern Buller's albatross population monitoring | $30,000 | $1,979 | $31,979 | 3 | 50 | $15,989 | $15,989 |
| POP2022-06 | Northern royal albatross population monitoring | $25,000 | $1,649 | $26,649 | 3 | 50 | $13,324 | $13,324 |
| POP2022-07 | Westland petrel foraging movements and diving behaviour | $40,000 | $2,638 | $42,638 | 3 | 50 | $21,319 | $21,319 |
| POP2022-08 | Auckland Islands seabird research: Gibson's and white-capped albatross | $160,000 | $10,553 | $170,553 | 3 | 50 | $85,277 | $85,277 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| POP2022-09 | Auckland Islands New Zealand sea lions | $150,000 | $9,893 | $159,893 | 2 | 90 | $143,904 | $15,989 |
| POP2022-10 | Antipodes island seabird research: Antipodean albatross + white chinned petrel | $160,000 | $10,553 | $170,553 | 3 | 50 | $85,277 | $85,277 |
| POP2022-11 | Campbell Island Seabird Research | $15,000 | $989 | $15,989 | 3 | 50 | $7,995 | $7,995 |
| **Mitigation Projects** | | | | | | | | |
| MIT2021-01 | Protected species liaison project | $250,000 | $16,489 | $266,489 | 4 | 100 | $266,489 | $0 |
| MIT2022-01 | Longline hauling mitigation devices | $70,000 | $4,617 | $74,617 | 4 | 100 | $74,617 | $0 |
| MIT2022-02 | Understanding drivers and barriers to mitigation uptake in small vessel bottom longline | $50,000 | $3,298 | $53,298 | 4 | 100 | $53,298 | $0 |
| MIT2022-03 | DOC Coral Symposium 2022/23 | $20,000 | $1,319 | $21,319 | 4B | 100 | $10,660 | |
| | | | | | - | 0 | | $10,660 |
| MIT2022-04 | Bait retention as a driver to mitigation use in the surface longline fishery | $30,000 | $1,979 | $31,979 | 4 | 100 | $31,979 | $0 |
| MIT2022-05 | Large trawl vessel warp mitigation | $30,000 | $1,979 | $31,979 | 4 | 100 | $31,979 | $0 |
| MIT2022-06 | Light mitigation: reducing vessel interactions with seabirds | $50,000 | $3,298 | $53,298 | 4 | 100 | $53,298 | $0 |
| MIT2022-07 | Inshore trawl warp mitigation | $100,000 | $6,596 | $106,596 | 4 | 100 | $106,596 | $0 |
| **TOTAL** | | **$4,316,762** | **$240,000** | **$4,556,762** | | | **$4,034,444** | **$522,319** |

## B: CSP Observer Cost recovery

| Fishery | Stocks | %Effort | Total Days | Training days | 2022/23 levied | MPI % | MPI days | CSP % | CSP days | Cost Per day | CSP Research Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Training (100% of plan levied)** | 300 days total, spread amongst Deepwater, Pelagic, & Middle depth trawl fisheries as shown below | | | | | | | | | | |
| **Deepwater trawl fisheries (100% of plan levied)** | | | | | | | | | | | |
| North Island Deepwater | ORH1, ORH2A, ORH2B, ORH3A, BYX2, CDL2 | 15-20 | 110 | 6.53 | 117 | 90% | 105 | 10% | 12 | $858 | $9,998 |
| Chatham Rise Deepwater | ORH3B, OEO3A, OEO4, BYX3 | 25-30 | 290 | 17.22 | 307 | 90% | 276 | 10% | 31 | $858 | $26,359 |
| Sub-Antarctic Deepwater | ORH3B, OEO1, OEO6 | 60-80 | 100 | 5.94 | 106 | 90% | 95 | 10% | 11 | $858 | $9,090 |
| West Coast Deepwater | ORH7A | 50 | 70 | 4.16 | 74 | 90% | 67 | 10% | 7 | $858 | $6,363 |
| **Pelagic trawl fisheries (90% of plan levied)** | | | | | | | | | | | |
| West Coast North Island | JMA7, EMA7, BAR7 | 30 | 300 | 17.82 | 286 | 85% | 243 | 15% | 43 | $945 | $40,546 |
| **Middle Depth trawl fisheries (90% of plan levied)** | | | | | | | | | | | |
| West Coast South Island | HOK1, HAK7, LIN7, SWA1 | 50 | 400 | 23.76 | 381 | 85% | 324 | 15% | 57 | $945 | $54,061 |
| Chatham Rise Middle Depth | HOK1, HAK1, HAK4, LIN3, LIN4, SWA3, SWA4, JMA3, BAR1, BAR4 | 30-40 | 555 | 32.96 | 529 | 85% | 450 | 15% | 79 | $945 | $75,009 |
| Subantarctic Middle Depth | HOK1, HAK1, LIN5, LIN6, SWA4, WWA5B, BAR5, JMA3 | 20-30 | 325 | 19.30 | 310 | 85% | 263 | 15% | 46 | $945 | $43,924 |
| Southern blue whiting | SBW6B, SBW6I | 100 | 250 | 14.85 | 238 | 80% | 191 | 20% | 48 | $945 | $45,051 |
| Squid | SQU1T, SQU6T | 80-90 | 1846 | 109.64 | 1760 | 80% | 1408 | 20% | 352 | $945 | $332,654 |
| Hoki Cook Strait | HOK1 | 15-20 | 200 | 11.88 | 191 | 85% | 162 | 15% | 29 | $945 | $27,031 |
| WCSI Hoki-Inside the line | HOK1 | 15-20 | 105 | 6.24 | 100 | 85% | 85 | 15% | 15 | $945 | $14,191 |
| Scampi 6A | SCI6A | 25-30 | 200 | 11.88 | 191 | 80% | 153 | 20% | 38 | $945 | $36,041 |
| Scampi | SCI1, SCI2, SCI3, SCI4A | 10-15 | 300 | 17.82 | 286 | 80% | 229 | 20% | 57 | $945 | $54,061 |
| **Bottom longline fisheries (90% of plan levied)** | | | | | | | | | | | |
| Ling Bottom Longline | LIN2, LIN3, LIN4, LIN5, LIN6, LIN7, BNS2, HPB2 | 25-30 | 630 | | 567 | 85% | 482 | 15% | 85 | $945 | $80,372 |
| **Surface longline fisheries (100% of plan levied)** | | | | | | | | | | | |
| Domestic tuna longline - North & South Island STN | STN1 | - | 300 | | 300 | 85% | 255 | 15% | 45 | $1,259 | $56,655 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Domestic SLL - North & South Island BIG/SWO | BIG1, SWO1 | - | 145 | | 145 | 85% | 123 | 15% | 22 | $1,259 | $27,383 |
| **Purse seine fisheries (100% of plan levied)** | | | | | | | | | | | |
| Domestic purse seine | SKJ, JMA1, EMA1, PIL1, KAH1, TRE1 | - | 130 | | 130 | 85% | 111 | 15% | 20 | $1,259 | $24,551 |
| **Inshore Fisheries (80% of plan levied, except for WCNI trawl which is 40%)** | | | | | | | | | | | |
| Set net ECSI - Kaikoura | TAR3, HPB3, SPO3, SCH3 | 25 | 182 | | 146 | 50% | 73 | 50% | 73 | $1,561 | $113,641 |
| Set net ECSI - Otago | SPO3, SCH3, HPB3 | 65 | 283 | | 226 | 50% | 113 | 50% | 113 | $1,561 | $176,705 |
| Set net SCSI | SCH5, SPO3, BUT5 | 65 | 266 | | 213 | 50% | 106 | 50% | 106 | $1,561 | $166,090 |
| SNA1 trawl - standard (no PSH) & PSH | SNA1 | 12 | 216 | | 173 | 50% | 86 | 50% | 86 | $1,561 | $134,870 |
| WCNI trawl (including set net and BLL) | JDO1, SCH1, SCH8, SPO1, SPO8, TRE7, SNA8, KAH8, TAR1, TAR8, GUR1, GUR8 | 14 | 182 | | 73 | 50% | 36 | 0.5 | 36 | $1,561 | $56,820 |
| Bottom longline - Northeast NI (SNA) | SNA1 | 7 | 302 | | 242 | 50% | 121 | 50% | 121 | $1,561 | $188,569 |
| Bottom longline - BNS target (FMA1) | BNS1, HPB1 | 15 | 39 | | 31 | 50% | 16 | 50% | 16 | $1,561 | $24,352 |
| Bottom trawl ECSI - TMP | FLA3, GUR3 | 35 | 298 | | 238 | 50% | 119 | 50% | 119 | $1,561 | $186,071 |
| Bottom trawl ECSI - TAR | TAR3 | | 127 | | 102 | 50% | 51 | 50% | 51 | $1,561 | $79,299 |
| Bottom trawl SCSI | FLA3, STA5 | 10 | 118 | | 94 | 50% | 47 | 50% | 47 | $1,561 | $73,679 |
| SI trawl - PSH | ELE3, ELE5, ELE7, FLA3, FLA7 | | 35 | | 28 | 50% | 14 | 50% | 14 | $1,561 | $21,854 |
| Potting | CRA8 | | 50 | | 40 | 50% | 20 | 50% | 20 | $1,561 | $31,220 |
| TAR2 trawl | TAR2 | 10 | 207 | | 166 | 50% | 83 | 50% | 83 | $1,561 | $129,251 |
| **Total (excluding $110,000 administration cost)** | | | | | | | | | | | **$2,345,762** |