



# Conservation Services Programme Annual Plan 2021/22

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Conservation Services Programme  
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[www.doc.govt.nz/csp](http://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. Dr. Ayesha Verrall  
*Acting Minister of Conservation*



Lou Sanson  
*Director-General of Conservation*

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## 1. Overview

### 1.1 Introduction

The Conservation Service 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 2021/22 (Annual Plan) includes the conservation services to be delivered as the Conservation Services Programme (CSP), and subject to cost recovery from the commercial fishing industry. As such, this Annual Plan forms the basis for levying the commercial fishing industry under the Fisheries Act 1996. For a summary of the legal basis of levied work described in this Annual Plan, refer to the Conservation Services Programme Strategic Statement<sup>1</sup> (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 (described in the Strategic Statement) 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. 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 outlines the objectives of CSP and describes the process through which each annual plan of services will be developed and delivered. It provides detail on the wider management context (for example, how CSP delivers on whole of government plans such as the National Plan of Action for seabirds, National Plan of Action for sharks and relevant Threat Management Plans), the research planning and prioritisation processes used by CSP, and the way CSP is implemented by working with others.

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<sup>1</sup> 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>



The CSP planning considers and works in parallel with other relevant planning and management processes such as the Hector's and Māui dolphin and the New Zealand sea lion Threat Management Plans (TMP). 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<sup>2</sup> 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 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 2021/22 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. Historically, inshore coverage has been planned using a process developed by CSP and the Inshore Fisheries Management team at Fisheries New Zealand using a tiered approach identified by a process conducted in preparation for the CSP Annual Plan 2011/12.

Recently, CSP and Fisheries New Zealand have been working to streamline the planning process to ensure both agencies' objectives are being met and to align the cost-recovery process. Whilst the process to align planning against objectives has been completed, work to align planning to cost-recovery requirements is still in progress at the time of drafting this document. Therefore, CSP opted to proceed with the consultation on the draft CSP Annual Plan without the observer programme component to allow stakeholders sufficient time for consideration of the proposed research plan. A consultation on the cost recovery of the observer programme component took place in June 2021 and the CSP component of the final observer programme plan has been included in this final CSP Annual Plan 2021-22.

## 1.5 Consultation

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

18 December 2020	Updated medium term research plans, initial list of research proposals and CSP RAG prioritisation framework circulated to CSP RAG.
8 March 2021	CSP RAG meeting to discuss and prioritise initial research proposals.
22 March 2021	Additional feedback received from CSP RAG on research proposals and their prioritisation.
21 April 2021	Draft CSP Annual Plan 2021/22 released for public consultation.
25 May 2021	Public consultation period closed.

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<sup>2</sup> These are available to download from <http://www.doc.govt.nz/csp-rag>

Early-June 2021	Summary of public submissions and response to comments completed.
Mid-June 2021	Director-General of Conservation conveys the CSP Annual Plan 2021/22, 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 INT2021-01 (Observing commercial fisheries) where the administration cost is fixed at \$110,000. This approach is broadly appropriate as the highest cost project (INT2021-01 Observing commercial fisheries) incurs the majority of administration expenses. For that project, administration includes 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. These have been reduced in previous years and since 2011/12 have been maintained at the same level. We welcome stakeholder views on different ways to attribute administration costs across projects.

## 1.7 COVID-19

DOC is cognisant that COVID-19 has had a significant impact on fishing activities, and this has been accounted for in the proposed work programme. DOC remains committed to working with Māori, Fisheries New Zealand, the fishing industry, and stakeholders to respond to any continuing effects arising from COVID-19.

## 2. Interaction Projects

### 2.1 Observing commercial fisheries

Project code: INT2021-01

Start Date: 1 July 2021

Completion Date: 30 June 2022

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

**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 contributes 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.

The CSP Observer Programme will continue to purchase baseline services for offshore fisheries from Fisheries New Zealand Observer Services (Observer Services), given the scale of their operation, this allows observers to be placed strategically across New Zealand Fisheries. Inshore fisheries observer coverage will also be delivered by Observer Services. Where data collection involves using techniques beyond observation and recording, providers with specific expertise and/or equipment will be considered. For the purposes of providing costings, the rate provided by 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 National Plan of Action (NPOA-Seabirds 2020) have been considered in the planning of the observer days this year. Ministerial decision on the Hector’s and Māui dolphin Threat Management Plan (HMD TMP) will drive changes to the inshore

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<sup>3</sup> National Plan of Action - Seabirds <https://www.mpi.govt.nz/dmsdocument/38054/direct>

<sup>4</sup> National Plan of Action -Sharks (under review in 2021): <https://www.mpi.govt.nz/consultations/npoa-sharks-2013/>

<sup>5</sup> Hector’s and Māui Threat Management plan <https://www.mpi.govt.nz/fishing-aquaculture/sustainable-fisheries/protecting-marine-life/protecting-hectors-and-maui-dolphins/#threat-mngmt>

observer coverage, however it is proposed that inshore coverage for the TMP is planned to be over and above the coverage that has been indicated in the 2021/22 CSP draft plan. The additional coverage will allow for tasks specific to the HMD TMP while also gathering standard data for that method and area to meet a variety of goals and outputs across the observer programme.

### *Research Approach*

To date, the bulk of publicly available information on at-sea interactions between fishing vessels and protected species in New Zealand waters, has been collected by government (DOC/FNZ) observers.

The allocation of observer coverage across fisheries will be made in relation to:

- 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. 2013, Abraham et al. 2017).
- Requirements under the NPOA-Seabirds<sup>6</sup>, and Sharks<sup>7</sup> and any relevant TMPs.
- Information needs identified for recently protected species.

Coverage levels are driven by several factors including data needs for protected species and fisheries management, compliance, international obligations, and ministerial directives. These ministerial directives include 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 bodies or samples of deceased protected species for identification and necropsy.
- Recording observational data on numbers and behaviour of marine mammal and seabird species observed around fishing vessels.
- Collecting information to better understand cryptic mortality 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.

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<sup>5</sup>NPOA-Seabirds 2020 available at <https://www.mpi.govt.nz/dmsdocument/38054/direct>

<sup>6</sup>NPOA-Sharks 2013 available at <https://www.mpi.govt.nz/dmsdocument/1138/loggedIn>

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 PSRMPs.

It is important to note that Observer Programmes typically have high spatial and temporal variation, as well as multiple priorities for information collection, which can often make the data challenging 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, weather conditions and access to vessels, 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 2021/22*

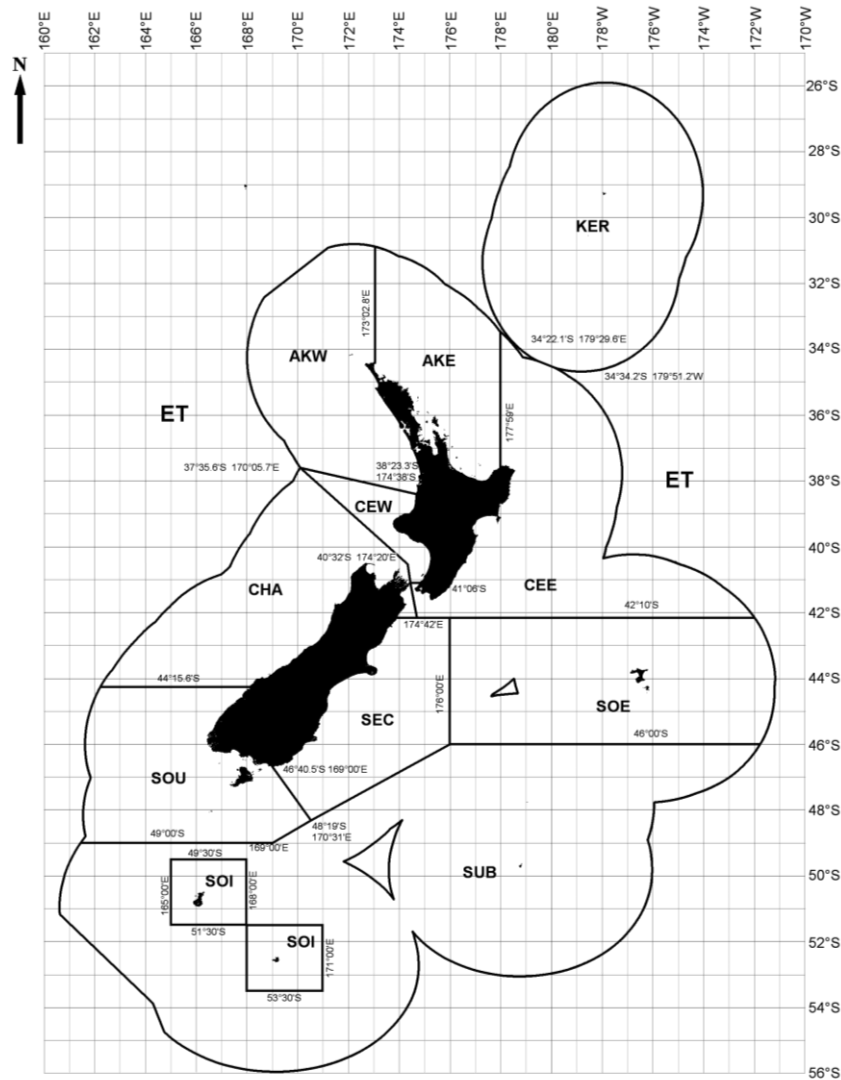
For the purposes of planning observer coverage, fisheries are divided into two broad categories.

Firstly, those fisheries that are poorly known and generally characterised by small vessel, owner operated fleets (see Section 2.1.1). Most of these vessels operate in the inshore area (up to roughly 200m depth). 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 uncertainty 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. 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, in the first instance dealing with improved data for the development of a quantitative risk assessment like that produced for seabirds. The NPOA-Sharks 2013 is currently under review and due for completion in 2021.

The second group of fisheries can be considered 'better known' 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 EEZ and are termed 'offshore' fisheries. Observers working in these fisheries generally have multiple priorities including stock assessment data collection, compliance monitoring, and protected species interactions. DOC contributes to a portion of observer time in these fisheries and, as such, days are planned differently to the data deficient fisheries. To set observer days for the period 1 July 2021 – 30 June 2022, effort data from previous years was examined, to ensure that desired coverage levels are achievable with the days planned and that these coverage levels would ideally meet the data requirements of both agencies. All time periods are based on 1 July – 30 June annually in line with the period that observer coverage runs, rather than the fishing year.

The most recent observer coverage and protected species statistics are summarised by Weaver (2019). Previous protected species interaction data references and download links can be found in the references section.

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



**Key:**

AKE	FMA 1	East North Island from North Cape to Bay of Plenty
CEE	FMA 2	East North Island from south of Bay of Plenty to Wellington
SEC	FMA 3	East coast South Island from Pegasus Bay to Catlins
SOE	FMA 4	Chatham Rise
SOU	FMA 5	South Island from Foveaux Strait to Fiordland
SUB	FMA 6	Subantarctic including Bounty Island and Pukaki Rise
SOI	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. These decisions were informed by relevant risk assessments, the NPOA-Seabirds and -Sharks, relevant TMP priorities, and previous observer data and fish-stock related data collection. 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 cost of the observer programme has increased markedly this year due largely to the increase in observer daily rates, and an increase in the proportion of the inshore plan levied up front. As a result of PSA negotiated observer contracts, the cost of an observer day has been increased from \$1,090 to \$1,493 to reflect the increase in cost of those days.

The number of days in this year's plan was reduced slightly to compensate for these increased rates and the increase in the levy of planned inshore days from 50% to 80%.

For 2021/22 the cost of inshore observer coverage is being jointly recovered by both DOC and Fisheries New Zealand as with past plans. For coverage driven by protected species interactions in inshore fisheries, cost will be recovered equally by each agency.

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

**SETNET**

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***East Coast South Island / Otago and Kaikoura*****Overall project aim/information needs**

1. Estimate the capture rate of Hector's dolphin and hoiho South Island populations in **setnet fisheries**.

<b>Start Date</b>	1 July 2021
<b>Completion Date</b>	30 June 2022
<b>Targeted Statistical Areas</b>	018, 024, 026

**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**

An overall capture rate for the Hector's dolphin needs to be estimated as the East Coast has some of the highest levels of coastal setnet effort in the country. Observer coverage is targeted in statistical areas where there are high levels of setnet fishing occurring within the Hector's dolphin habitat. Ongoing delivery issues in relation to safety requirements around crewing levels and ability to safely carry observers has continued to impact upon coverage rates therefore, 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 to 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 include observer coverage to obtain further temporal and spatial data on the nature and extent of setnet interactions with hoiho.

**Proposed Coverage**

- Statistical area 018, 024, 026
- 284 observer days are planned for Kaikoura and 280 days are planned for Otago

**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 PSPMPs 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

- 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 2021
Completion Date	30 June 2022
Targeted Statistical Areas	025, 027, 030

#### 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.

#### Proposed Coverage

- Statistical areas 025, 027, 030
- 181 observer days are planned

#### 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.

## INSHORE TRAWL

### West Coast North Island

#### Overall project aim/information needs

1. 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 2021
Completion Date	30 June 2022
Targeted Statistical Areas	040, 041, 042, 045, 046

#### 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 the nature and extent of interactions with other protected species in the area.
4. 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 camera verification and 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.

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.

#### Proposed Coverage

- Statistical areas 040, 041, 042, 045, 046
- 250 observer days are planned in addition to camera monitoring

#### 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.

*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.

<b>Start Date</b>	1 July 2021
<b>Completion Date</b>	30 June 2022
<b>Targeted Statistical Areas</b>	011-016, 018, 020, 022, 024, 025,026, 027, 030, 038

**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 this year 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 inshore trawl pose 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 a reduction in seabird bycatch. Observational and audit data is necessary in this fishery to achieve the objectives in the NPOA.

**Proposed Coverage**

- Statistical areas 011-016, 018, 020, 022, 024, 025,026, 027, 030, 038

- Observer days planned include:
  - 295 for the ECSI (TMP) coastal trawl
  - 184 for ECSI (TAR) inshore Trawl
  - 128 for SCSI inshore trawl
  - 154 for lower North Island inshore trawl (TAR 2)

#### Secondary information to be collected

- Collection information on the nature and extent of interactions with other marine protected species.
- Observer observations 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** – Standard trawl and PSH

**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 2021
Completion Date	30 June 2022
Targeted Statistical Areas	002-010

**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 protected SRMPs 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.

**Proposed Coverage**

- Statistical areas 002-010
- Observer days:
  - 158 standard trawl
  - 80 PSH

**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

Start Date	1 July 2021
Completion Date	30 June 2022
Targeted Statistical Areas	002-010

#### **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.

#### **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 fishery 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.

#### **Proposed Coverage**

- Statistical areas 002-010
- Summer coverage is required (black petrels and flesh-footed shearwaters are absent in winter)
- 74 observer days are planned

#### **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 HAP 1 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**

Start Date	1 July 2021
Completion Date	30 June 2022
Targeted Statistical Areas	002-010

**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.

**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. 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 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).

**Proposed Coverage**

- Statistical areas 002-010
- Summer coverage is required (black petrels and flesh-footed shearwaters are absent in winter)
- 249 observer days are planned

**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 PSRMPs and adherence to operational procedures.

**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.

### 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 15% of the total days, which reflects the time that observers are likely to spend on protected species tasks. For specific fisheries, such as scampi, southern blue whiting and squid trawl, this apportioning is increased to 20% to reflect an increased focus on protected species data collection due to specifically identified risks.

These fisheries have generally received 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 2021/22 are summarised in the 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 as follows to reflect the increase in cost of delivering those days:

- HMS from \$725 to \$1,196
- Middle depth from \$590 to \$890
- Deepwater from \$590 to \$725

The levy of deepwater, middle-depth and bottom longline fisheries has been decreased from 100% to 90%. The levy of surface longline and purse seine fisheries will remain at 100% cost recovery.

For coverage driven by fisheries needs but also collecting protected species information (i.e., in deepwater fisheries) the observer's time will be prorated to reflect the time spent on each set of tasks, generally 80-90% Fisheries, and 10-20% for Conservation Services. Some observer days included in the Fisheries New Zealand levied plan are not 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 primarily target hoki, hake, ling, warehou, jack mackerel and southern blue whiting. A large proportion of observer coverage in these fisheries will be targeted at foreign owned vessels, and vessels 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 and discard management, and the use of bird scaring devices (legally required for larger vessels). This fleet has had observed interactions with a wide range of seabirds and has high levels of fur seal interactions. 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 2021 and May and June 2022.

#### *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). Observer coverage for the period October to May will be spread across SEC and SOE. 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. During the 2021/22 observer year coverage is planned to target the period October to December and April to June to coincide with key jack mackerel fishing periods.

#### **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.

#### **Squid6T**

Areas of CSP interest in this fishery include offal and discard management and captures of sea lions and seabirds in trawl nets. Observer placement in 2021/22 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.

## DEEP WATER 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 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 2021/22 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 2021/22 will be focussed on smaller bottom longline vessels operating on the Chatham Rise to monitor seabird interactions during September, October, May, and June, though some coverage will be spread over all areas.

## 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 INT 2019-02: Identification of seabirds captured in NZ fisheries and INT 2019-04: Identification and storage of cold-water bycatch specimens).
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>
- Clemens-Seely, K., Clements, K., and Ramm, K. 2014a. Conservation Services Programme annual research summary 2011-12. Department of Conservation, Wellington. Available to download from



<http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/meetings/csp-annual-research-summary-2011-12.pdf>

- Clemens-Seely, K., Clements, K., and Ramm, K. 2014b. Conservation Services Programme annual research summary 2012-13. Department of Conservation, Wellington. Available to download from <http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/reports/csp-annual-research-summary-2012-13.pdf>
- Clemens-Seely, K., and Hjørvarsdóttir, F. O. 2017: Conservation Services Programme annual research summary 2013-14. Department of Conservation, Wellington. Available to download from <http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/reports/draft-csp-annual-research-summary-2013-14.pdf>
- Ford, R.B., Francis, M.P., Holland, L. P., Clark, M.R., Duffy, C.A.J., Dunn, M. R., Jones, E., Wells, R. 2018: Qualitative (Level 1) Risk Assessment of the impact of commercial fishing on New Zealand Chondrichthyans: an update for 2017. New Zealand Aquatic Environment and Biodiversity Report No. 201. Available for download from <https://fs.fish.govt.nz/Page.aspx?pk=113&dk=24619>
- Hjørvarsdóttir, F. 2016. Conservation Services Programme Annual Research Summary 2014-15. Report prepared by the Conservation Services Programme of the New Zealand Department of Conservation, Wellington. 80p. Available for download from <http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2014-15/annual-research-summary/>
- Hjørvarsdóttir, F. 2017. Conservation Services Programme Annual Research Summary 2015-16. Report prepared by the Conservation Services Programme of the New Zealand Department of Conservation, Wellington. 84p. Available for download from <https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/csp-annual-research-summary2015-2016.pdf>
- Hjørvarsdóttir, F. & Isaacs, R. 2018. Conservation Services Programme Annual Research Summary 2016-17. Report prepared by the Conservation Services Programme of the New Zealand Department of Conservation, Wellington. 91p. Available for download from <https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/csp-annual-research-summary-2016-17.pdf>
- Ramm, K. 2010: Conservation Services Programme observer report: 01 July 2008 to 30 June 2009. Final research report. Department of Conservation, Wellington. Available for download from <http://www.doc.govt.nz/upload/documents/science-and-technical/2008-09-csp-observer-report.pdf>
- Ramm, K. 2012: Conservation Services Programme observer report: 01 July 2009 to 30 June 2010. Final research report. Department of Conservation, Wellington. Available for download from <http://www.doc.govt.nz/upload/documents/conservation/marine-and-coastal/fishing/draft-csp-observer-report-2009-10.pdf>
- Ramm, K. 2013: Conservation Services Programme observer report: 01 July 2010 to 30 June 2011. Final research report. Department of Conservation, Wellington. Available for download from: <http://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/csp-observer-report-%202010-2011.pdf>
- 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 <http://www.doc.govt.nz/publications/conservation/marine-and-coastal/marine-conservation-services/csp-reports/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/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/level1-seabird-risk-assessment.pdf>

Rowe, S.J. 2010b: Conservation Services Programme observer report: 01 July 2007 to 30 June 2008. DOC Marine Conservation Services Series 4. Department of Conservation, Wellington. 97p. Available for download from <http://www.doc.govt.nz/upload/documents/science-and-technical/dmcs4entire.pdf>

Weaver, S. 2019. Conservation Services Programme Annual Research Summary 2017-18. Report prepared by the Conservation Services Programme of the New Zealand Department of Conservation, Wellington. 93p. Available for download from <https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/final-csp-annual-research-summary-2017-18.pdf>

Weaver, S. 2019. Conservation Services Programme Annual Research Summary 2018-19. Report prepared by the Conservation Services Programme of the New Zealand Department of Conservation, Wellington. 91p. Available for download from <https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/final-reports/final-csp-annual-research-summary-2018-19.pdf>

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

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

**Fish Stocks:** See Appendix for details

*NOTE: This multi-year project (INT2019-02) was consulted on in 2019/20 and is included here for completeness.*

## **2.2 Identification of seabirds captured in New Zealand fisheries**

**Project Code:** INT2019-02

**Start Date:** 1 July 2019

**Completion Date:** 30 June 2022

**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 DNA analysis, 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).
5. 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 new protocol has been developed to determine which specimens are returned for full necropsy. This protocol aims to strike a balance between returning birds for full necropsy (for rarer species and in less observed fisheries) and photographing birds for determination of taxon (for commonly caught species in well observed fisheries). A new addition to this protocol is the collection of feather samples from bycaught seabirds to allow genetic determination of identification for difficult species groups.

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

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

## 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
- Moulting 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.

Feather samples will be collected from bycaught seabirds and analysed to allow genetic determination of identification of specimens of difficult to identify species groups (e.g., wandering albatrosses).

### 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:** \$100,000 per annum

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

**Fish stocks:** BAR<sub>1, 7</sub>, BIG<sub>1</sub>, BNS<sub>1, 2, 3, 7</sub>, BUT<sub>5, 7</sub>, BWS<sub>1</sub>, ELE<sub>3, 5, 7</sub>, EMA<sub>1, 3, 7</sub>, FLA<sub>1, 2, 3, 7</sub>, GMU<sub>1</sub>, GSH<sub>1, 3, 4, 7, 8, 9</sub>, GSP<sub>1, 7</sub>, GUR<sub>1, 2, 3, 7, 8</sub>, HAK<sub>1, 4, 7</sub>, HOK<sub>1</sub>, HPB<sub>1, 2, 3, 4, 7, 8</sub>, JDO<sub>1, 2, 3, 7</sub>, JMA<sub>1, 3, 7</sub>, KIN<sub>1, 7, 8</sub>, LEA<sub>1, 2, 3</sub>, LIN<sub>1, 2, 3, 4, 5, 6, 7</sub>, MAK<sub>1</sub>, MOK<sub>1, 3, 5</sub>, MOO<sub>1</sub>, ORH<sub>1, 2A, 2B, 3A, 3B</sub>, OEO<sub>1, 3A, 4, 6</sub>, PAR<sub>1, 9</sub>, POR<sub>1</sub>, POS<sub>1</sub>, RBM<sub>1</sub>, RSN<sub>1, 2</sub>, RIB<sub>1, 2</sub>, RCO<sub>1, 3, 7</sub>, RSK<sub>1, 3, 7, 8</sub>, SBW<sub>6A, 6R, 6L, 6B</sub>, SCH<sub>1, 2, 3, 4, 5, 7</sub>, SCI<sub>1, 2, 4A, 6A, 6B</sub>, SKI<sub>1, 3, 7</sub>, SNA<sub>1, 2, 3, 7, 8</sub>, SPD<sub>1, 3, 4, 5, 7, 8</sub>, SPE<sub>1, 3, 4, 7</sub>, SPO<sub>1, 3, 7, 8</sub>, SQU<sub>1T, 6T</sub>, SSK<sub>1, 3, 7, 8</sub>, STA<sub>1, 3, 4, 5, 7</sub>, STN<sub>1</sub>, SWA<sub>1, 3, 4</sub>, SWO<sub>1</sub>, TAR<sub>1, 2, 3, 4, 5, 7, 8</sub>, TOR<sub>1</sub>, TRE<sub>1, 2, 7</sub>, TRU<sub>3, 4</sub>, WAR<sub>1, 2, 3, 7, 8</sub>, WWA<sub>2, 3, 4, 5B, 7</sub>, YEM<sub>1, 8, 9</sub>.

*NOTE: This multi-year project (INT2019-04) was consulted on in 2019/20 and is included here for completeness.*

### **2.3 Identification and storage of cold-water coral bycatch specimens**

**Project Code:** INT2019-04

**Start Date:** 1 July 2019

**Completion Date:** 30 June 2022

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

**Project Objectives:**

1. To identify coral bycatch that cannot be identified by Fisheries Observers to the lowest taxonomic level (assign codes to coral specimens to the species level wherever possible, when not possible, identify specimens to genus or family level).
2. To record all identified coral specimens and ensure storage in an appropriate taxonomic collection.
3. To update coral identification information and resources for Fisheries Observers.

#### **Rationale**

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

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

#### **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), 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.

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.

#### **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 for use in training government Fisheries Observers.

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

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

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

**Fish stocks:** BAR<sub>1, 5</sub>, BYX<sub>1, 2</sub>, HAK<sub>1</sub>, HOK<sub>1</sub>, JM<sub>3, 8</sub>, LIN<sub>1, 5, 6</sub>, ORH<sub>1, 2A, 2B, 3A, 3B</sub>, OEO<sub>4 6</sub>, SBW<sub>6A, 6R, 6I, 6B</sub>, SCI<sub>4A</sub>, SQU<sub>1T, 6T</sub>, SWA<sub>3, 4</sub>, WWA<sub>5B</sub>.

*NOTE: This multi-year project (INT2020-02) was consulted on in 2020/21 and is included here for completeness.*

## 2.4 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, 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 a quarterly 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:** BAR<sub>1, 7</sub>, BIG<sub>1</sub>, BNS<sub>1, 2, 3, 7</sub>, BUT<sub>5, 7</sub>, BWS<sub>1</sub>, ELE<sub>3, 5, 7</sub>, EMA<sub>1, 3, 7</sub>, FLA<sub>1, 2, 3, 7</sub>, GMU<sub>1</sub>, GSH<sub>1, 3, 4, 7, 8, 9</sub>, GSP<sub>1, 7</sub>, GUR<sub>1, 2, 3, 7, 8</sub>, HAK<sub>1, 4, 7</sub>, HOK<sub>1</sub>, HPB<sub>1, 2, 3, 4, 7, 8</sub>, JDO<sub>1, 2, 3, 7</sub>, JMA<sub>1, 3, 7</sub>, KIN<sub>1, 7, 8</sub>, LEA<sub>1, 2, 3</sub>, LIN<sub>1, 2, 3, 4, 5, 6, 7</sub>, MAK<sub>1</sub>, MOK<sub>1, 3, 5</sub>, MOO<sub>1</sub>, ORH<sub>1, 2A, 2B, 3A, 3B</sub>, OEO<sub>1, 3A, 4, 6</sub>, PAR<sub>1, 9</sub>, POR<sub>1</sub>, POS<sub>1</sub>, RBM<sub>1</sub>, RSN<sub>1, 2</sub>, RIB<sub>1, 2</sub>, RCO<sub>1, 3, 7</sub>, RSK<sub>1, 3, 7, 8</sub>, SBW<sub>6A, 6R, 6I, 6B</sub>, SCH<sub>1, 2, 3, 4, 5, 7</sub>, SCI<sub>1, 2, 4A, 6A, 6B</sub>, SKI<sub>1, 3, 7</sub>, SNA<sub>1, 2, 3, 7, 8</sub>, SPD<sub>1, 3, 4, 5, 7, 8</sub>, SPE<sub>1, 3, 4, 7</sub>, SPO<sub>1, 3, 7, 8</sub>, SQU<sub>1T, 6T</sub>, SSK<sub>1, 3, 7, 8</sub>, STA<sub>1, 3, 4, 5, 7</sub>, STN<sub>1</sub>, SWA<sub>1, 3, 4</sub>, SWO<sub>1</sub>, TAR<sub>1, 2, 3, 4, 5, 7, 8</sub>, TOR<sub>1</sub>, TRE<sub>1, 2, 7</sub>, TRU<sub>3, 4</sub>, WAR<sub>1, 2, 3, 7, 8</sub>, WWA<sub>2, 3, 4, 5B, 7</sub>, YEM<sub>1, 8, 9</sub>.

## 2.5 Characterisation of protected coral interactions

**Project Code:** INT2021-02

**Start Date:** 1 July 2021

**Completion Date:** 30 June 2022

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

**Project Objectives:**

1. To improve our understanding of the current extent and variation of protected coral bycatch across multiple fisheries and fishing methods.
2. To improve our understanding of the risks of fishing to protected coral groups and how those risks vary temporally and spatially.
3. To inform focus areas / fisheries for mitigation efforts.
4. To inform development of a risk assessment.

### Rationale

This project seeks to collate available protected coral bycatch records to update and improve our understanding of where various coral groups and taxa are caught, and which fisheries, fishing methods and areas pose the highest risk to corals.

### Research approach

This desktop project will examine and quantify coral bycatch from commercial fisheries by analysing observer and fisher-reported coral by area, target fishery, coral taxon, fishing method etc, and will identify areas where bycatch indicates the greatest relative fishing risk to corals. The project will include observer and fisher-reported data, will consider all target fisheries and fishing methods for which a coral has been reported and/or collected, and will consider various reporting codes and taxonomic resolution in consideration and interpretation of the results. The quality and consistency of the available data will inform the time period and spatial extent included in analyses but would ideally be at least the past ten years (to compare with outputs of INT2010-03).

### Outputs

1. A technical report describing and mapping the distribution of coral bycatch in relation to fishing effort.
2. 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 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.

## 2.6 Review of commercial fishing interactions with marine reptiles

**Project Code:** INT2021-03

**Start Date:** 1 July 2021

**Completion Date:** 30 June 2022

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

**Project Objectives:**

1. Characterise commercial fishery interactions with marine reptiles, particularly sea turtles, within New Zealand fishery waters.
2. Report on total numbers of captures and fate of bycaught marine reptiles by species, fishery, and year.
3. Identify species most at risk from commercial fishing and fisheries with the highest observed or reported catches of marine reptiles.

### Rationale

Five species of sea turtle and three species of sea snake are recorded from New Zealand waters. All are protected under the Wildlife Act 1953. All Pacific populations of sea turtles are considered threatened or endangered. Leatherback and green turtles are the marine reptiles most frequently reported as bycatch in commercial fisheries, reflecting the higher frequency and duration of their occurrence in New Zealand waters. Satellite tagging has shown that adult leatherback turtles migrate directly from breeding beaches in the tropical southwest Pacific to offshore areas of high planktonic productivity off northern New Zealand and may remain in or close to New Zealand waters for more than a year. In contrast, juvenile green turtles recruit to coastal habitats, harbours, and rocky reefs in Northland from the pelagic phase and potentially remain in New Zealand waters for up to five or six years before migrating to adult habitats in tropical regions. The last review of bycatch of marine reptiles was conducted in 2016 and covered the period 2008 to 2015. This report found that in some years turtle bycatch in surface longlines fisheries exceeded the minimal marine turtle interaction rate recommended by the Western and Central Pacific Fisheries Commission.

### Research Approach

Data for reported and observed catch from 2008/09 to 2019/20 fishing years will be groomed to remove duplicates and records incorrectly assigned protected species codes. For each species catch and fate/condition upon release will be reported by year, method and FMA. The spatial distribution of captures will be mapped for each species. Where sufficient data exist interannual changes in the spatial distribution of catch, and seasonal and long-term trends in catch will be described. Particular attention will be given to examining annual bycatch rates of leatherback turtles in surface longline fisheries.

### Outputs

1. A technical report characterising reported marine reptile interactions with commercial fisheries from 2008/09 to 2019/20 fishing years.
2. Groomed marine reptile bycatch data and maps in electronic formats.
3. Advice on levels of reported bycatch of marine turtles relative to New Zealand's international obligations to conserve these species, and published estimates of sustainable bycatch from known source populations.
4. Recommendations on factors potentially influencing bycatch and mortality rates of marine turtles in commercial fisheries.

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

**Indicative Research Cost:** \$33,000

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

**Fish stocks:** BIG1, SNA1, STN1, SWO1, TOR1.

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

**Project Code:** INT2021-04

**Start Date:** 1 July 2021

**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.

### 3. Population Projects

*NOTE: This multi-year project (POP2018-03) was consulted on in 2018/19 and is included here for completeness.*

#### 3.1 New Zealand Sea Lion: Auckland Islands pup count

**Project code:** POP2018-03

**Start Date:** 1 July 2018

**Completion Date:** 30 June 2022

**Guiding Objectives:** CSP Objective E; New Zealand sea lion Threat Management Plan.

**Project Objectives:**

1. To estimate New Zealand sea lion pup production at Enderby, Figure of 8 and Dundas Islands.
2. To update the New Zealand sea lion database.

#### **Rationale**

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

The New Zealand sea lion Threat Management Plan sets in place a holistic range of research, monitoring, and management actions for New Zealand sea lions both at the Mainland / Stewart Island and the sub-Antarctic Islands. This research project, funded through CSP, forms a component of that wider suite of work and is scoped to collect pup count information required to manage the impact of commercial fishing on the Auckland Islands population, in line with CSP Objective E. It is envisaged that other research, and/or management actions, progressed as part of the TMP, will be delivered alongside the research programme proposed here to provide logistical synergies.

#### **Research Approach**

Pup production at Dundas and Enderby Island has historically been estimated using a range of methods including aerial (Baker et al. 2013) and ground-based mark-recapture methods (Chilvers 2012; Childerhouse et al. 2013). It is proposed that a ground-based pup count only be conducted, over a shorter field season than previously undertaken. Depending on logistical

constraints, pup production at Figure of 8 Island will be by direct count following established methods (Chilvers 2012; Childerhouse et al. 2013).

It is intended that other objectives such as re-sightings, disease monitoring, and pup survival estimations will be considered and potentially undertaken as part of the outputs of the New Zealand sea lion Threat Management Plan.

### Outputs

1. Data collected, in an electronic format suitable for upload into the New Zealand sea lion database.
2. New Zealand sea lion database updated and made available to relevant investigators. Any changes to the structure of the database must be fully documented.
3. A technical report (or reports) detailing the methods used, a summary of data collected and estimates of New Zealand sea lion pup production at the Auckland Islands.

**Note:** Maximum cost efficiencies will be achieved through aligned delivery with subantarctic projects, particularly in relation to transport logistics.

### References

- Baker C.S., Chilvers B.L., Constantine R., DuFresne S., Mattlin R., van Helden A., Hitchmough R. 2010. Conservation status of New Zealand Marine Mammals (suborders Cetacea and Pinnipedia), 2009. *New Zealand Journal of Marine & Freshwater Research* 44:101-115.
- Baker, B., Jenz, K., Chilvers, L. 2013. Aerial survey of New Zealand sea lions – Auckland Islands 2011/12. Report prepared Department of Conservation. Available for download from: <https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/aerial-survey-of-nz-sea-lions-auckland-islands-2011-12.pdf>
- Bowen, W.D. 2012. A review of evidence for indirect effects of commercial fishing on New Zealand sea lions (*Phocarctos hookeri*) breeding on the Auckland Islands. Report of Department of Conservation, Wellington. 41 p. Available for download at <https://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/pop-2010-01-nz-sea-lion-indirect-effects-review.pdf>
- Childerhouse SJ, Amey J, Hamer D, McCrone A 2013. Final report for CSP Project 4426 New Zealand sea lion ground component 2012/13. Report to the Department of Conservation, Wellington, New Zealand. Version 1.2. 26 p. Available to download from <https://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/pop-2012-02-sea-lion-ground-survey-final-report.pdf>
- Chilvers, B.L. 2012. Research to assess the demographic parameters of New Zealand sea lions, Auckland Islands 2011/12. Final Research Report, November 2012. Department of Conservation, Wellington. Available for download <https://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/pop-2011-01-nz-sea-lion-field-report-2011-12.pdf>
- Roberts, J., Fu, D., Doonan, I., & Francis, C. 2014. New Zealand sea lion: demographic assessment of the causes of decline at the Auckland Islands. Demographic model options: demographic assessment. Report prepared by NIWA for the Department of Conservation, Wellington. 142 p. Available for download <https://www.doc.govt.nz/Documents/conservation/marine-and-coastal/marine-conservation-services/reports/NZ-sea-lion-demographic-assessment-causes-decline-auckland-islands-part-1.pdf>

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

**Indicative Research Cost:** \$100,000 per annum

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

**Fish Stocks:** SQU6T, SCI6A.



*NOTE: This multi-year project (POP2019-04) was consulted on in 2019/20 and is included here for completeness. The second year of this project was postponed due to COVID-19. The funding for year 2 of the project was cost recovered in 20/21 and was locked in for 21/22. As a result, no funds will be cost recovered this year. Year 3 of the project will be cost recovered in 22/23.*

### **3.2 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.

### 3.3 Black petrel research

**Project code:** POP2021-01

**Start Date:** 1 July 2021

**Completion Date:** 30 June 2022

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

**Project Objectives:**

1. To monitor 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. Undertake at-sea capture of black petrels to determine proportions of banded birds and identify if current low juvenile survival rates are affected by any non-philopatric behaviour at the study colony.

#### **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 project extends on demographic work funded by commercial fisheries levies and DOC/MPI since 1996. Black petrels are the species at highest risk from commercial fisheries in northern New Zealand. Continuing research on this species is necessary to gather current rates of adult mortality, breeding success, juvenile survival and recruitment until suitable mitigation methods significantly reduce the capture risk to this species.

#### **Research approach**

The capture and marking 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 for adult captures (annual breeding rates, adult survival, and juvenile recruitment) and chick fledgling period to monitor breeding success and banding surviving chicks.

A new element to the work programme will be to safely capture black petrels at sea off northern New Zealand to look at ratios of banded to un-banded birds to use for modelling of current population size of this species based on mark-recapture estimates away from the study colony. In addition, the bands of captured birds will be matched against recoveries from the study colony to assess survival rates for returning immatures that may have been missed in the past. To achieve this target, hundreds of birds will need to be captured at sea and checked for bands, plus temporary spray-paint marking and applying bands to newly captured birds. This will be a major focus of this new project. The at-sea capture project will be a pilot year to test the effectiveness of recapturing banded birds at sea to decide if it is worth continuing in the future.

#### **Outputs**

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

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

**Indicative Research Cost:** \$75,000

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

**Fish Stocks:** BIG1, BNS 1, SNA 1.

### 3.4 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 one, \$40,000 year two

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

**Fish Stocks:** BAR<sub>1, 5</sub>, BYX<sub>1, 2</sub>, HAK<sub>1</sub>, HOK<sub>1</sub>, JMA<sub>3, 8</sub>, LIN<sub>1, 5, 6</sub>, ORH<sub>1, 2A, 2B, 3A, 3B</sub>, OEO<sub>4, 6</sub>, SBW<sub>6A, 6R, 6I, 6B</sub>, SCI<sub>4A</sub>, SQU<sub>1T, 6T</sub>, SWA<sub>3, 4</sub>, WWA<sub>5B</sub>.

### 3.5 Seabird population research: Chatham Islands

**Project Code:** POP2021-03

**Start Date:** 1 July 2021

**Completion Date:** 30 June 2022

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

**Project Objectives:**

1. Collect and download data files from archival tags and trail cameras deployed in early 2021 on Motuhara Island.
2. Continue to band large sample of albatrosses and giant petrels, and GPS map nesting sites to help inform demographic parameters about these species.
3. Collect drone imagery of the colony to use for population counts.

#### **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. In January 2021, an opportunity became available to carry out work on three species of albatross and petrels on Motuhara (Forty-fours), a privately owned seabird island off Chatham Islands. This work replaced other projects planned for the subantarctic islands and called off due to COVID-19 concerns. Toroa Consulting Ltd had negotiated access to Motuhara with the landowners and they approved a programme of work to attach satellite tags to albatross and giant petrels. In addition, 55 GLS tags (archival tags) were placed on a sample of breeding northern Buller's albatross. Toroa Consulting Ltd also banded a large sample of northern giant petrel chicks as well as some adults of the two species of albatrosses. Trail cameras were left in situ to collect data on breeding success of these three species in 2021. To capitalise on this programme of work a visit is required in 2022 to recover technical equipment and continue banding of adults and chicks to build a robust sample of marked birds for future demographic modelling.

#### **Research approach**

The private landowners have given permission to return to Motuhara in 2022 to continue the seabird research. This includes retrieval of GLS tags from the northern Buller's albatross for allow for analysis of at-sea distribution in the late chick rearing period, non-breeding season and incubation period in 2021/22. The trail cameras will also be retrieved and downloaded to look at breeding success of the three species and return dates of northern giant petrels for nesting. Recoveries of banded birds will be prioritised, and a sample of newly banded birds will be added to increase the numbers of marked birds in this population to allow for future demographic modelling on adult survival rates. If weather permits, flying a drone will allow high quality aerial imagery of the colony for conducting population counts of giant petrel chicks and breeding northern royals.

#### **Outputs**

1. A technical report providing methods used and results of the albatross and giant petrel marking projects and population assessments.
2. Review trail camera footage for key breeding success parameters and timing of species breeding cycles on island.
3. 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:** BAR<sub>1, 5</sub>, BYX<sub>1, 2</sub>, HAK<sub>1</sub>, HOK<sub>1</sub>, JM<sub>3, 8</sub>, LIN<sub>1, 5, 6</sub>, ORH<sub>1, 2A, 2B, 3A, 3B</sub>, OEO<sub>4 6</sub>, SBW<sub>6A, 6R, 6I, 6B</sub>, SCI<sub>4A</sub>, SQU<sub>1T, 6T</sub>, SWA<sub>3, 4</sub>, WWA<sub>5B</sub>.

### 3.6 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, SNA 1, GUR8.



### 3.7 Age estimation of great white sharks

Project code: POP2021-05

Start Date: 1 July 2021

Completion Date: 30 June 2022

Guiding Objectives: CSP Objective E; CSP Fish plan; National Plan of Action- Sharks.

Project Objectives:

1. To estimate age and growth of New Zealand great white sharks (*Carcharodon carcharias*).
2. To associate age estimates with tissue samples of New Zealand great white sharks used for close-kin mark recapture population estimates.

#### Rationale

Age and growth data is essential to estimating population growth rates and can be used to estimate other important demographic parameters such as maximum age, natural mortality, and age at maturity. In addition, the 2018 assessment of the status of the Eastern Australian – New Zealand great white shark population used sex-specific parameters estimated from genetic identification of half-sibling pairs. The detection of these pairs requires knowledge of the year of sampling and age or estimated age (from length) at sampling. Although the samples used in this analysis were obtained from across the species' Australian range, none of New Zealand samples came from sharks of known age. At present there are no age-at-length data available for juvenile great white sharks from New Zealand and only a single estimate of age for an adult.

#### Research Approach

This project will use archived vertebral samples from 53 juvenile and sub-adult white sharks (1.6-4.7 m TL). Vertebrae will be cleaned, thin sectioned and annual growth rings counted by at least two experienced counters. Age and growth rates will be modelled and compared to published estimates of growth from other countries. Growth ring counts will be associated with tissue samples used in the 2018 population estimate and any new samples collected during the project.

#### Outputs

1. A technical report providing age and growth estimates for New Zealand great white sharks.
2. Age, length, and sex data for all sharks aged in the project in electronic format.
3. Archived vertebrae and thin sections of vertebrae from all sharks aged in the project.
4. Archived tissue samples for genetic research.

Note: A one-year term is proposed

Indicative Research Cost: \$70,000

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

Fish Stocks: N/A

### 3.8 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, 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 Zealand.

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

**Indicative Research Cost:** \$60,000 year one, \$40,000 year two

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

**Fish Stocks:** N/A

### 3.9 Foveaux and Otago shag population census

**Project code:** POP2021-07

**Start Date:** 1 July 2021

**Completion Date:** 30 June 2024

**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 be 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 three-year term is proposed

**Indicative Research Cost:** \$20,000 per annum

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

**Fish Stocks:** N/A

### 3.10 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 one, \$40,000 year two

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

**Fish Stocks:** N/A

## 4. Mitigation Projects

*NOTE: This multi-year project (MIT2020-031) was consulted on in 2020/21 and is included here for completeness. The second year of this project has been redesigned, and as a result, has been re-costed.*

### 4.1 Hook-shielding use in the surface longline fishery

**Project code:** MIT2020-01

**Start Date:** 1 July 2020

**Completion Date:** 30 June 2022

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

**Project Objectives:**

1. To facilitate ongoing use of hook-shielding devices in the surface longline fishery.
2. To assess the operational and bycatch reduction effectiveness of hook-shielding devices used in the surface longline fishery.

#### Rationale

Surface longline fisheries in New Zealand pose bycatch risk to a range of seabird species, and implementation of highly effective mitigation has continued to be challenging (for example developing effective yet practical tori line designs for small vessels, and safety concerns regarding some line weighting options). Hook-shielding devices represent a new, stand-alone, mitigation option for hook setting in pelagic longlines, and is recognized globally as a best practice mitigation option. These devices physically protect the barb of the hook until it is sunk below the reach of seabirds. As a stand-alone method, it overcomes the difficulties encountered in deploying effective traditional mitigation options such as tori lines and line weighting. This project forms part of a Government supported rollout of Hookpods, currently the only proven and available hook-shielding device, to the domestic surface longline fleet to address the bycatch risk posed during hook setting.

#### Research Approach

DOC and Fisheries New Zealand have funded the provision of hook-shielding devices to surface longline operators to achieve best practice bycatch reduction. Operators receiving hook-shielding devices will provide data on their operational use, and observations will also be made by fishery liaison officers, observers, and compliance officers. Replacement devices will be provided as part of this project to operators providing the required data on device loss or failure project. This project will also collate and report on operational data provided by fishers, liaison officers, observers, and compliance officers, and make a comparative assessment of bycatch and target fish capture rates between vessels using hook-shielding devices and those using other mitigation options. Project uptake to March 2021 has been at a lower level than anticipated, limiting the data collected to date. The project costs have been recast based on full uptake by ten vessels, and a comprehensive analysis will be undertaken in late 2021 after a full year of operation.

#### Outputs

1. Replacement hook-shielding devices provided to participating vessels.
2. Year one report providing an initial assessment of uptake, to inform year two of the project.
3. Final report on device uptake, device practicality/durability and a comparative analysis of bycatch and target fish capture rates.

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

**Indicative Research Cost:** \$110,000 in year one, \$30,000 in year two

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

**Fish stocks:** BIG1, STN1, SWO1.



## 4.2 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

(Note: it is intended that additional Crown funds from the Biodiversity 2018 budget will also be used to grow liaison outreach into additional fisheries and provide more effort for high-risk vessels to work towards zero bycatch).

**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

### 4.3 Cetacean interactions with pot fisheries in New Zealand waters

Project code: MIT2021-02

Start Date: 1 July 2021

Completion Date: 30 June 2022

Guiding Objectives: CSP Objectives A, B; CSP Marine mammal plan.

Project Objectives:

1. Update the previous analysis of cetacean entanglements.
2. Hold a workshop with fishers to explore mitigation options that could be implemented in New Zealand pot fisheries.

#### Rationale

Conservation and animal welfare concerns exist around the entanglement of large whales in pot/trap and set net fishery lines worldwide. As whale populations continue to recover, the frequency of interactions with fisheries is likely to increase. In New Zealand, the most entangled species are humpback whales (*Megaptera novaeangliae*) and orca (*Orcinus orca*). Previous analysis under project MIT2016-02 highlighted that reported entanglements appear to be spatially and temporally distinct, with humpback whales interacting with crayfish pot lines in the Kaikoura region primarily during the month of June (where the species northern migration and the peak of potting activity in CRA5 coincide). DOC implemented disentanglement training in the early 2000's and has personnel trained throughout the country to free whales that are reported as entangled safely. To compliment this approach, it is important to address the issue at the source by looking into options to reduce the chance of whales interacting with fishing gear in the first instance.

Given the widespread occurrence of whale entanglements, there has been a range of innovation and trials to attempt to mitigate this issue internationally. Despite lobster fisheries differing in practice across the world (soak times, setting depths etc) there may be mechanisms or practices that are proving effective elsewhere that should be considered within the New Zealand setting. The rock lobster fishery in New Zealand does not currently enforce any whale entanglement mitigation practices, however the industry body has published recommendations for fishers as a component of their Whalesafe Identification Guide (NZRLIC 2016) and are currently updating the industry Whalesafe Manual.

#### Research Approach

This project builds upon the research and recommendations in MIT2016-02 and INT2019-03. This project will start with an updated review of all entanglement events in New Zealand since the 2016 report and update the analysis of commercial effort in the lobster pot fishery. It will also involve a brief assessment of disentanglement events since training for this commenced (number of personnel trained, learnings, limitations etc). Following these preliminary steps, a workshop will be held, targeting the circumstances in Kaikoura as being the hotspot of whale entanglements in New Zealand. This workshop will involve industry representatives and fishers to discuss research underway internationally and work with fishers to establish feasible mitigations to trial in the future, including gear modifications and use of satellite buoys. This workshop will be action focused and incorporate presentations from suppliers who have developed whale entanglement mitigation gear.

### Outputs

1. Updated presentation on whale entanglements to date, disentanglement review and international research currently underway to set the scene for a workshop to be held in Kaikoura.
2. Facilitation of the workshop and collation of a workshop report including recommended actions agreed by fishers and officials to trial to reduce the likelihood of interactions in pot fisheries.

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

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

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

**Fish Stocks:** CRA<sub>1,2,3,4,5,6,7,8,9</sub>.

#### 4.4 Methods to increase the sink rate of hooks in small bottom longline fisheries

**Project code:** MIT2021-03

**Start Date:** 1 July 2021

**Completion Date:** 30 June 2022

**Guiding Objectives:** CSP Objectives A, B; CSP Seabird plan; National Plan of Action-Seabirds.

**Project Objectives:**

1. To identify options for increasing the sink rate of hooks in small bottom longline fisheries.
2. To test the performance and efficacy of methods to increase the sink rate of hooks in small bottom longlines.

##### **Rationale**

Inshore bottom longline fisheries pose seabird bycatch risk to some of the seabird species at highest risk from commercial fisheries, such as black petrel and flesh-footed shearwater. The mitigation standard introduced by the NPOA-Seabirds 2020 contains expectations around achieving sink depths of hooks by the end of the aerial extent of the tori line (10m deep at high-risk times and 5m deep at other times). Achieving some of the standard sink rates has been challenging in some segments of the fleet.

##### **Research Approach**

This project aims to further identify, refine, and test methods for achieving the desired sink rates, to mitigate seabird bycatch. The initial stage will be an expert and stakeholder workshop to identify possible options for increasing the sink rate of hooks in small bottom longline fleets posing most risk of bycatch to seabirds.

The second stage of this project will involve the at-sea trialling of one or more options identified during the expert and stakeholder workshop. The trials will focus on quantifying sink rate of hooks compared to status quo operations as well as document feasibility, practicality and any safety issues encountered. Any recommendations for further improvement in efficacy or practicality of the methods tested will also be identified.

##### **Outputs**

1. A workshop report describing the nature and priority of options to improve sink rates in small bottom longline fisheries.
2. A technical report describing the methods and results from at-sea trial(s) of method(s) to increase the sink rate in small vessel bottom longline fisheries, and any recommendations for further improvement to the method(s).
3. Data collected during the project to be made available in electronic format.

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

**Indicative Research Cost:** \$80,000

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

**Fish Stocks:** BNS1, HPB1, LIN1, 2, 3, 4, 5, 6, 7, SNA1.

## Appendix: Cost Recovery Tables

### A: CSP 2021/22 Project Costs

Code	Project	Research	Admin	Total	CR Item	Industry %	Industry	Crown
<b>Interaction Projects</b>								
INT2019-02	Identification of seabirds captured in New Zealand Fisheries	\$100,000	\$10,726	\$110,726	4	100	\$110,726	\$0
INT2019-04	Identification and storage of cold-water coral bycatch specimens	\$60,000	\$6,436	\$66,436	4B	100	\$66,436	\$0
INT2020-02	Identification of marine mammals, turtles and protected fish captured in New Zealand fisheries	\$15,000	\$1,609	\$16,609	4	100	\$16,609	\$0
INT2021-01	Observing commercial fisheries	\$2,333,951	\$110,000	\$2,443,951	8	100	\$2,443,951	\$0
INT2021-02	Characterisation of protected coral interactions	\$30,000	\$3,218	\$33,218	4B	100	\$33,218	\$0
INT2021-03	Review of commercial fishing interactions with marine reptiles	\$30,000	\$3,218	\$33,218	4	100	\$33,218	\$0
INT2021-04	Collection and curation of tissues samples from protected fishes and turtles	\$22,000	\$2,360	\$24,360	4	100	\$24,360	\$0
<b>Population Projects</b>								
POP2018-03	New Zealand sea lion: Auckland Island pup count	\$100,000	\$10,726	\$110,726	2	90	\$99,653	\$11,073
POP2019-04	Southern Buller's albatross: Snares/Tini Heke population project	\$0	\$0	\$0	3	50	\$0	\$0
POP2021-01	Black petrel research	\$75,000	\$8,045	\$83,045	3	50	\$41,522	\$41,522
POP2021-02	Identification of protected coral hotspots using species distribution modelling	\$70,000	\$7,508	\$77,508	4B	100	\$77,508	\$0
POP2021-03	Seabird population research: Chatham Islands	\$40,000	\$4,290	\$44,290	3	50	\$22,145	\$22,145
POP2021-04	Flesh-footed shearwater population monitoring	\$60,000	\$6,436	\$66,436	3	50	\$33,218	\$33,218
POP2021-05	Age estimation of white sharks	\$70,000	\$7,508	\$77,508	-	0	\$0	\$77,508
POP2021-06	Fur seal population estimate and bycatch analysis: Cook Strait	\$60,000	\$6,436	\$66,436	-	0	\$0	\$66,436
POP2021-07	Otago and Foveaux shag census	\$20,000	\$2,145	\$22,145	-	0	\$0	\$22,145
POP2021-08	Assessment of causes of low burrow occupancy rates in Westland petrels	\$60,000	\$6,436	\$66,436	-	0	\$0	\$66,436
<b>Mitigation Projects</b>								
MIT2020-01	Hook-shielding use in the surface longline fishery	\$30,000	\$3,218	\$33,218	4	100	\$33,218	\$0
MIT2021-01	Protected species liaison project	\$250,000	\$26,815	\$276,815	4	100	\$276,815	\$0
MIT2021-02	Cetacean interactions with pot fisheries	\$40,000	\$4,290	\$44,290	4	100	\$44,290	\$0
MIT2021-03	Methods for increasing sink rates for bottom longline	\$80,000	\$8,581	\$88,581	4	100	\$88,581	\$0
<b>TOTAL</b>		<b>\$3,545,951</b>	<b>\$240,000</b>	<b>\$3,785,951</b>			<b>\$3,445,468</b>	<b>\$340,483</b>

## B: CSP Observer Cost recovery

Fishery	Stocks	%Effort	Total Days	Training days	2021/22 levied	MPI %	MPI days	CSP %	CSP days	Cost Per day	CSP Research Cost
<b>Training (100% of plan levied)</b> 400 days total, spread amongst Deepwater, Pelagic, & Middle depth trawl fisheries as shown below											
<b>Deepwater trawl fisheries (100% of plan levied)</b>											
North Island Deepwater	ORH1, ORH2A, ORH2B, ORH3A, BYX2, CDL2	15-20	75	6	81	90%	73	10%	8	\$725	\$5,881
Chatham Rise Deepwater	ORH3B, OEO3A, OEO4, BYX3	25-30	275	22	297	90%	268	10%	30	\$725	\$21,565
Sub-Antarctic Deepwater	ORH3B, OEO1, OEO6	60-80	75	6	81	90%	73	10%	8	\$725	\$5,881
West Coast Deepwater	ORH7A	50	80	7	87	90%	78	10%	9	\$725	\$6,273
<b>Pelagic trawl fisheries (100% of plan levied)</b>											
West Coast North Island	JMA7, EMA7, BAR7	30	255	21	248	85%	211	15%	37	\$890	\$33,139
<b>Middle Depth trawl fisheries (90% of plan levied)</b>											
West Coast South Island	HOK1, HAK7, LIN7, SWA1	50	500	41	487	85%	414	15%	73	\$890	\$64,979
Chatham Rise Middle Depth	HOK1, HAK1, HAK4, LIN3, LIN4, SWA3, SWA4, JMA3, BAR1, BAR4	30-40	680	56	662	85%	563	15%	99	\$890	\$88,372
Subantarctic Middle Depth	HOK1, HAK1, LIN5, LIN6, SWA4, WWA5B, BAR5, JMA3,	20-30	550	45	535	85%	455	15%	80	\$890	\$71,477
Southern blue whiting	SBW6B, SBW6I	100	450	37	438	80%	350	20%	88	\$890	\$77,975
Squid	SQU1T, SQU6T	80-90	1960	160	1908	80%	1526	20%	382	\$890	\$339,624
Hoki Cook Strait	HOK1	15-20	100		90	85%	77	15%	14	\$890	\$12,015
WCSI Hoki-Inside the line	HOK1	15-20	100		90	85%	77	15%	14	\$890	\$12,015
Scampi 6A	SCI6A	25-30	201		181	80%	145	20%	36	\$890	\$32,200
Scampi	SCI1, SCI2, SCI3, SCI4A	10-15	200		180	80%	144	20%	36	\$890	\$32,040
<b>Bottom longline fisheries (90% of plan levied)</b>											
Ling Bottom Longline >34m	LIN2, LIN3, LIN4, LIN5, LIN6	25-30	120		108	85%	92	15%	16	\$890	\$14,418
Mixed BLL <34m	LIN2, LIN3, LIN5, LIN7, BNS2, SCH7, SCH8, HPB2, HPB3, SNA8	10-15	300		270	85%	230	15%	41	\$890	\$36,045

Surface longline fisheries (100% of plan levied)											
Domestic tuna longline - North Island STN	STN1	-	145		145	85%	123	15%	22	\$1,196	\$26,013
Domestic tuna longline - South Island STN	STN1	-	145		145	85%	123	15%	22	\$1,196	\$26,013
Domestic SLL - North Island BIG/SWO	BIG1, SWO1	-	120		120	85%	102	15%	18	\$1,196	\$21,528
Domestic SLL - South Island BIG/SWO	BIG1, SWO1	-	25		25	85%	21	15%	4	\$1,196	\$4,485
Purse seine fisheries (100% of plan levied)											
Domestic purse seine	SKJ, JMA1, EMA1, PIL1	-	72		72	85%	61	15%	11	\$1,196	\$12,917
Domestic purse seine (super seiner)	SKJ	-	30		30	85%	26	15%	5	\$1,196	\$5,382
Inshore Fisheries (80% of plan levied)											
WCNI trawl	JDO1, SCH1, SCH8, SPO1, SPO8, TRE7, SNA8, KAH8, TAR1, TAR8, GUR1, GUR8,	14	250		200	50%	100	0.5	100	\$1,493	\$149,300
SNA1 trawl - standard (no PSH)	SNA1	12	158		126	50%	63	50%	63	\$1,493	\$94,358
SNA1 trawl - PSH	SNA1	7	80		64	50%	32	50%	32	\$1,493	\$47,776
TAR2 trawl	TAR2	10	154		123	50%	62	50%	62	\$1,493	\$91,969
ECSI trawl - TMP	FLA3, GUR3	35	295		236	50%	118	50%	118	\$1,493	\$176,174
ECSI trawl - TAR	TAR3	30	184		147	50%	74	50%	74	\$1,493	\$109,885
SCSI trawl	FLA3, STA5	10	128		102	50%	51	50%	51	\$1,493	\$76,442
Bottom longline - North east NI (SNA)	SNA1	7	249		199	50%	100	50%	100	\$1,493	\$148,703
Bottom longline - BNS target (FMA1)	BNS1, HPB1	15	74		59	50%	30	50%	30	\$1,493	\$44,193
Set net SCSI	SCH5, SPO3, BUT5	65	181		145	50%	72	50%	72	\$1,493	\$108,093
Set net ECSI - Kaikoura	TAR3, HPB3, SPO3, SCH3	25	284		227	50%	114	50%	114	\$1,493	\$169,605
Set net ECSI - Otago	SPO3, SCH3, HPB3	65	280		224	50%	112	50%	112	\$1,493	\$167,216
<b>Total</b>											<b>\$2,333,951</b>