

CSP Initial research proposals 2022/23

CSP RAG 7 March 2022

Purpose

These initial project proposals have been developed to deliver outputs to address research gaps identified by the Conservation Services Programme (CSP) Research Advisory Group (RAG). These gaps have been identified through the development of medium-term research plans, or at previous meetings of the RAG. It is intended that these initial proposals, and any other proposals identified by the RAG, will be prioritised at the CSP RAG meeting of 7 March 2022. The prioritised proposals will be used to develop the CSP Annual Plan 2022/23.

These initial research proposals should be considered in light of the following key documents:

- [CSP Strategic Statement](#)
- [CSP Seabird medium term research plan](#)
- [CSP Protected fish medium term research plan](#)
- [CSP Marine mammal medium term research plan](#)
- [CSP Protected coral medium term research plan](#)
- [CSP Annual Plan 2021/22](#)

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Interaction Projects

Ongoing projects

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

This multi-year project was consulted on in 2020/21 and is due for completion in June 2023. It is proposed to form part of the CSP Annual Plan 2022/23. Full details are provided in the CSP Annual Plan 2020/21.

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

This multi-year project was consulted on in 2021/22 and is due for completion in June 2024. It is proposed to form part of the CSP Annual Plan 2022/23. Full details are provided in the CSP Annual Plan 2021/22.

Proposed projects

INT-1 Observing commercial fisheries

Term: 1 year

Guiding Objectives: A, B and C; National Plan of Action – Seabirds, National Plan of Action – Sharks; New Zealand sea lion and Hector’s and Māui dolphin Threat Management Plans.

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

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

The CSP Observer Programme will continue to purchase baseline services for “offshore” fisheries from Fisheries New Zealand Observer Services, given the scale of their operation, which allows observers to be placed strategically across New Zealand Fisheries. Inshore fisheries observer coverage will also be delivered by Fisheries New Zealand Observer Services, per a joint planning process. DOC purchases 50% of inshore observer services.

Planning of observer coverage is undertaken jointly by Fisheries New Zealand and DOC as part of a separate process and will be consulted on as part of the consultation on the CSP Annual Plan 2022/23.

Indicative cost: TBD in consultation with FNZ

INT-2 Identification of seabirds captured in New Zealand waters

Term: 3 years

Guiding Objectives: B, C, E

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

Specific Objectives:

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

Large numbers of seabirds frequent New Zealand commercial fishing waters. Birds with significant differences in conservation status can appear morphologically similar. The accurate determination of the taxon of seabirds captured in New Zealand fisheries is vital for examining the potential threat to population viability posed by incidental fisheries captures. Observers on commercial vessels are not always able to identify seabirds at sea with high precision and the assessment of the age-class, sex and provenance of captured individuals requires autopsy in the majority of cases. 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. In order to maximise cost efficiencies, a protocol is in place to determine which specimens are returned for full necropsy. This protocol aims to strike a balance between returning birds for full necropsy (for rarer species and in less observed fisheries) and photographing birds for determination of taxon (for commonly caught species in well observed fisheries).

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

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

Indicative Cost: \$70,000 per annum

INT-3 Identification and storage of cold-water coral bycatch specimens

Term: 3 years

Guiding Objectives: B, C, E

Project Objectives: To confirm or update observed coral bycatch identifications via physical specimens and images.

1. Identify coral bycatch that cannot be identified by Government fisheries observers to the finest taxonomic level (assign codes to coral specimens to the species level wherever possible, when this is not possible; identify specimens to genus or family level).
2. Record all identified coral specimens and ensure storage in an appropriate taxonomic collection.

3. Update coral identification information for Fisheries Observers.

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 government 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.

Indicative Cost: \$60,000 per annum

INT-4 Observed marine mammal sightings database

Term: 1 year

Guiding Objectives: B, C

Project Objective: Collate and verify observer-recorded marine mammal sightings data and input into existing databases.

As done with seabirds, observers collect data and imagery of sightings of marine mammals at sea and sightings data has been collected since 2003-04. This project will involve collating and inputting this data from previous and current data collection forms (paper and digital) into appropriate databases. Sightings data is a useful resource alongside fishing interactions to inform species distributions, risk assessments etc. Observer images and video could be utilised to confirm species IDs increasing the accuracy of the data. This project will also look into marine mammal abundance around fishing vessels in relation to fishing method. Visualisation of this data could be made available online as seabird sightings data is [here](#).

Indicative Cost: \$20,000

INT-5 Pelagic foraging seabirds in the wider Hauraki Gulf region

Term: 1 year

Guiding Objectives: D

Project Objective: To better understand the impact of fisheries extractions on the Hauraki Gulf food-web and foraging success for declining seabird populations in north-east New Zealand.

This project builds on the recent pilot study funded by DOC and is envisaged as a 1- year project to seek partnerships, and seed fund relevant projects, which cover:

- population monitoring of key populations (gulls, terns, fluttering shearwaters, prions and Buller's shearwaters)
- diet of birds at key colonies
- at-sea assessment of food availability in shoals, including inter-annual, seasonal and spatial variation
- review of purse-seine fisheries extractions of key seabird foraging species

North-eastern North Island waters, from the Three Kings Islands to East Cape, are notable for large numbers of seabirds, and many other species in the gulf ecosystem, regularly, but not exclusively, feeding in association with large aggregations of fish species that drive zooplankton and small fish to the surface. These aggregations also contain prey species of interest to purse seine fisheries. Maintaining sustainable levels of species richness and abundance within this delicate food web to support seabird populations that rely on them for survival, needs several factors to be considered. These include land-based effects and changing environmental conditions, and fish extraction from customary, commercial, and recreational fishing activity. As highlighted in the Revitalising the Gulf: Government action on the Sea Change Plan 2021, seabird populations in the gulf region are currently declining (acknowledging longitudinal population monitoring is required to better assess trends) and we need to better understand the role that fish harvest across the whole of the north-east northern New Zealand is likely to play in a loss of productivity within the Hauraki Gulf ecosystem if we are to better manage conservation efforts.

CSP research has begun preliminary investigations into the relationship between seabirds and their prey species in the gulf (MIT2020-08 being the most recent), focusing on seabird diet at key colonies, makeup of zooplankton in fish aggregations, and investigating which seabird species are associated with which fish schools. MIT2020-08 is due for completion in 2022 and will conclude with modelling of historical records purse seine fish extractions to characterise spatial/temporal changes in fish shoal/school aggregations in East Northland, Hauraki Gulf and Bay of Plenty. The model will use group size, tonnage of sightings, and abundance, then examine the relationship between environmental/oceanography factors and fish distribution patterns to better understand potential indirect effects of fisheries pressures on seabird populations. In 2021 FNZ led a NIWA research project, modelling the role of low and mid-trophic level fish in the Hauraki Gulf ecosystem to better understand how seabird foraging associations are impacted by removal of these species by the purse seine fishery. Much has also been done by universities and conservation groups to investigate changes to seabird populations in the gulf ecosystem.

This project aims to (a) conduct a stocktake and gaps analysis of findings from all current and historic research of seabird conservation the Hauraki Gulf, and (b) develop a framework for a consolidated and multi-disciplinary research approach to ensure the mauri of the Hauraki Gulf supports healthy seabird populations. This will be achieved by bringing industry, government and independent research providers together in a DOC led workshop to start korero about the potential to develop a joint project (e.g. MBIE funded) tackling impacts on seabird populations, including commercial fish extractions.

Indicative Cost: \$60,000

INT-6 Impact of fishing on the ecosystem services provided by deep-sea corals in the New Zealand region

Term: 1 year

Guiding Objectives: B, C, D

Project Objective: Determine the relationship between the abundance/biomass of protected corals and the ecosystem services they provide, and compare the provision of these services in unfished, fished and closed areas.

The aim of this project is to determine the relationship between abundance/biomass of deepsea corals, and the ecosystem services they provide, and compare provision of them in unfished, fished and closed areas. Coral ecosystem services have never been estimated in New Zealand waters. To do this, the project will examine varied data sources including trawling distribution data, abundance-based species distribution model outputs (e.g., POP2021-02), and existing video and still imagery data to determine various ecosystem services measures relating to supporting, provisioning and regulation services (e.g., habitat provision for diverse associated invertebrates, habitat and nursery grounds for commercially exploited

fish, and carbon cycling and storage). The project will establish the relationship between the abundance of four stony coral species (*Solenosmilia variabilis*, *Goniocorella dumosa*, *Madrepora oculata* and *Enllopsammia rostrata*) and the abundance and diversity of associated invertebrates and fish, information which can then be used to establish coral density thresholds at which high biodiversity is supported, and to determine whether stony corals are a potential nursery ground for juvenile fish. Initially, the project will focus on seamount complexes and other areas on the Chatham Rise, examining areas subject to differing fishing pressures, subsequent mapping of this information EEZ-wide could feed into consideration of spatial management and mitigation approaches.

Indicative Cost: \$70,000

INT-7 Post-release survival of spine-tailed devil ray bycatch in the New Zealand skipjack tuna purse seine fishery

Term: 3 years

Guiding Objectives: A, B, C

Project Objective: To determine the survival of spinetailed devil rays released using current industry practices.

This project is an extension of MIT2011-01 and INT2018-05. Changes in the composition and operation of purse seine fisheries in New Zealand mean the characterisation of spinetailed devil ray handling and post-release survival may no longer be accurate. Previous estimates of post-release survival using survival tags attached to rays that had been landed on deck indicated low survival following release. These results may not be representative of actual post-release survival as spinetailed devil rays caught by vessel currently operating in New Zealand waters are reportedly brailled for direct release or released over the cork-line and therefore not landed onboard the vessel. This project would describe current industry practice around interactions with devil rays, including their handling and release, and assess post-release survival of up to 30 devil rays using satellite tags deployed on bycaught rays that have been treated in a manner comparable to practices currently occurring on purse seine vessels. The tagging methodology would be developed in collaboration with Pelco.

Indicative Cost: \$101,000 total (\$27,377 yr. 1; \$51,623 yr. 2; \$22,000 yr. 3)

INT-8 Investigate and characterise the behaviour of Hector's dolphins around set nets at Kaikōura

Term: 1 year

Guiding Objectives: B

Project Objective: Utilise passive acoustic monitoring to investigate the potential of Hector's dolphins interacting with deep-set set nets in the waters off Kaikoura.

The underwater and acoustic behaviour of Hector's dolphins in the presence of fishing equipment has not been quantified in conjunction with the fishing industry. This project aims to investigate and characterise the behaviour of Hector's dolphins around set nets in Kaikoura using passive acoustic monitoring systems deployed in conjunction with set nets (to 100m depth). To understand the presence of animals in the vicinity of the nets at the depth they are set, and where relative to the nets or vessel detected animals are in the water column, along with the potential for interactions during the active periods of fishing. This study would enable understanding the risk posed to animals from these fisheries and establish whether further mitigation or active monitoring is required, e.g., a precursor to "pinger" trials.

Indicative Cost: \$150,000-\$200,000

INT-9 Determining the resilience of the black coral *Antipathella fiordensis* to fisheries impacts

This project proposal was submitted by Victoria University of Wellington.

Term: 3 years

Guiding Objectives: B, C, E

Project Objective: Increase understanding of the ecology and impacts of fishing on the 'at risk' black coral *Antipathella fiordensis* in Fiordland

This project feeds into a wider VUW project that aims to increase understanding of the ecology of this poorly studied black coral in Fiordland and determine how this species will respond to environmental impacts including fishing, climate change, and changes in land use. The shallow distribution (and therefore accessibility) of *A. fiordensis* in Fiordland provides a unique opportunity to study and monitor it regularly in light of these pressures, and the species can then be used as a model to ascertain black coral resilience more widely. This aspect of the project focuses on how they are impacted by fishing activity specifically. Commercial fishing is prohibited in the inner waters of Fiordland, however, rock lobster potting and trawl fishing for blue cod is known to occur in the outer areas of the fiords, where *A. fiordensis* is abundant and there is virtually no fisheries observer presence. To increase our understanding of *A. fiordensis* and support its management, the project will include fieldwork, lab work and modelling approaches to focus on four areas over three years

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

Indicative Cost: \$110,000 total (\$40,000 for first 2 years, \$30,000 for year 3)

INT-10 Documenting cryptic coral diversity in fisheries bycatch

This project proposal was submitted by NIWA.

Term: 1 year

Guiding Objectives: B, E

Project Objective: Use DNA sequencing of Observer-sampled octocoral specimens to genetically quantify the species-level diversity contained within deepwater fisheries bycatch, to improve understanding of fishery impacts.

Prior results from INT2019-05 indicated that the full extent of species diversity in the sampled gorgonian octocoral bycatch 'community' had not yet been fully documented, additionally bycatch from target trawl fisheries other than orange roughy were under-represented in the dataset. This proposed research would

continue to use genetic barcoding on additional unexamined bycatch specimens submitted to NIWA by fisheries observers to attempt to document the remaining cryptic species diversity. This would establish a diversity estimate for the impacts of trawl fisheries on protected gorgonian corals and would further understanding of coral diversity within the EEZ.

Coral tissue samples from observer-collected bycatch specimens will be used for genetic identification of species. In addition to 62 previously studied samples, NIWA holds at least 75 unsampled gorgonian octocoral specimens, plus 45 specimens that previously produced incomplete data. This project will use DNA sequence data to infer the identity of at least 60 additional gorgonian specimens and their relatedness to similar NIC reference specimens, plus related species for which sequence data is available. DNA barcoding will use two barcode genes that are capable of distinguishing most gorgonian species (mtMutS).

Specimens originating in oreo target fisheries (BOE, OEO, SSO) will be prioritised as they represent the next most numerous set of bycatch specimens after ORH, which was extensively sampled (n=30) during INT2019-05. Increasing the breadth of bycatch data from other target fisheries could uncover different communities due to differing spatial and temporal coverage of their trawl footprint. Otherwise, additional data collection would focus on ORH bycatch to attempt to fully document affected gorgonian species diversity. Diversity will be examined per target fishery and species discovery curves will be used to determine whether the extent of species diversity has been adequately sampled.

Indicative Cost: \$28,000

INT-11 Risk Assessment for Protected Corals

Term: 1-2 years

Guiding Objectives: C, E

Project Objective: Undertake a semi or fully quantitative coral risk assessment to assist with protected coral research prioritisation.

The aim of this project is to undertake an inventory of suitable data, develop methodology for, and run the first semi or fully quantitative coral risk assessment, following a pilot risk assessment undertaken in 2014 (POP2013-05). The current lack of a risk assessment is noted as the most needed and important gap in the coral MTRP and is a priority for CSP. Depending on new data available and their adequacy to improve the method in the pilot (PSA / ERAEF), a similar approach could be used (but more nuanced and detailed), or a fuller more quantitative approach (such as recent shark RAs). The project would include multiple species and/or multiple coral groups but will not cover all known protected corals (>300 sp), instead focusing on a core subset representing the four major protected coral groups (black corals, stony corals, gorgonians and lace corals). Risk assessment data will be used for research prioritisation, and in coral conservation and fisheries management. The success and feasibility of this project depends heavily upon the availability of suitable data and its scalability EEZ-wide.

Indicative Cost: \$150,000

Population Projects

Ongoing Projects

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

This multi-year project was consulted on in 2019/20 and is due for completion in June 2023.

It is proposed to form part of the CSP Annual Plan 2022/23.

Full details are provided in the CSP Annual Plan 2019/20.

POP2021-04 Flesh-footed shearwater population monitoring

This multi-year project was consulted on in 2021/22 and is due for completion in June 2024.

It is proposed to form part of the CSP Annual Plan 2022/23.

Full details are provided in the CSP Annual Plan 2021/22.

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

This multi-year project was consulted on in 2021/22 and is due for completion in June 2023.

It is proposed to form part of the CSP Annual Plan 2022/23.

Full details are provided in the CSP Annual Plan 2021/22.

POP2021-07 Otago and Foveaux shag census

This multi-year project was consulted on in 2021/22 and is due for completion in June 2024.

It is proposed to form part of the CSP Annual Plan 2022/23.

Full details are provided in the CSP Annual Plan 2021/22.

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

This multi-year project was consulted on in 2021/22 and is due for completion in June 2023.

It is proposed to form part of the CSP Annual Plan 2022/23.

Full details are provided in the CSP Annual Plan 2021/22.

Proposed Projects

POP-1 Flesh-footed shearwater additional proposed research

Term: 2 years

Guiding Objectives: E

Project Objective: Track juvenile Flesh-footed shearwaters to determine whether they are utilising the same foraging areas as breeding adults

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

One previous attempt to track juvenile flesh-footed shearwaters was not overly successful. The birds flew north to the tropics but then the tags progressively stopped working around 1 month. It was uncertain if the tags fell off the birds, or the tag interfered with bird survival or if the birds encountered high risk fisheries in the central tropics (tuna long-line fisheries). There has been a lot of development of tracking technology in the past 5 years with new light-weight tags and different attachment methods that allow birds to be monitored across multiple years. We will investigate the options of using a leg loop harness

attachment as used on wading birds and lighter weight GPS tags to follow a cohort of chicks across at least one full year. If successful we will find out if the juveniles go to the same areas as adults in the North Pacific and where they stay at sea in their first returning summer before they begin to visit colonies 3-4 years after fledging. We hope to deploy between 10 and 20 tags depending on which type is used and their cost. The analysis of the data would be completed in a separate year once all tags stop working.

Indicative Cost: \$30,000 per annum

POP-2 Black Petrel research

Term: 3 years

Guiding Objectives: B, E

Project Objectives:

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

This project delivers on priority monitoring and data gaps as per the CSP seabird plan. The project builds on previous CSP project POP2021-01. Continuing research on this species is necessary to provide current estimates of adult survival, juvenile survival, recruitment, breeding probability, and breeding success. Continued at-sea captures are necessary to generate sufficient sample sizes for the independent estimation of population size and juvenile survival. New tags allow for the tracking of juveniles, a poorly understood cohort.

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

The safe capture of black petrels at sea off northern New Zealand will also continue to increase current sample sizes. At-sea capture-recapture work is aimed to use ratios of banded to un-banded birds for independent modelling of current population size of this species away from the study colony. In addition, the bands of captured birds will be matched against banding histories from the study colony to assess survival rates for returning immatures that may have dispersed out of the study colony. To achieve these two objectives, large numbers (i.e., several hundreds) of birds will need to be captured at sea and checked for bands. As such, the at-sea capture-recapture work of POP2021-01 will continue in this year.

New lightweight solar-powered tags at a comparatively low cost have become available. These new tags provide an opportunity to improve our understanding of the at-sea range of juveniles. Improving insights into the distribution of this poorly understood cohort of birds is crucial.

Indicative Cost: \$70,000 per annum

POP-3 Westland petrel additional proposed research

Term: 1 year

Guiding Objectives: B, E

Project Objectives:

1. To describe the foraging distribution from GLS devices deployed in 2021.
2. To describe the dive behaviour of Westland Petrels. This would involve deployment of TDRs and subsequent analysis.

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

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

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

Indicative cost: \$40,000

POP-4 Auckland Islands seabird research

Term: 3 years

Guiding Objectives: B, E; CSP Seabird Medium Term Research Plan, National Plan of Action- Seabirds.

Project Objectives:

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

This proposal delivers key components of the CSP Seabird Plan involving field work on Gibson's albatross and white-capped albatross.

A long-term study site for Gibson's albatross at the Auckland Islands enables trends in population size and demographic parameters to be assessed (Francis et al. 2012; Elliott et al. 2018). The project will collect data to improve estimates of key demographic parameters via continued mark-recapture monitoring. This will follow established methods (Walker & Elliott 1999) to estimate survival, productivity and recruitment, and estimate the size and trend of the population. This suite of data allows more precise assessment of population trends than from simple nest counts. Drone-based aerial survey methods will be used to

conduct wider population counts beyond the study plots. GLS and satellite tags will be used to improve our knowledge of at-sea distribution and overlap with fisheries posing bycatch risk.

The largest population of white-capped albatross occurs on Disappointment Island in Auckland Island group. Population trend data for this site has been gathered through use of aerial photography in 2006 to 2017. Since 2015 ground-based monitoring of a marked study colony on Disappointment Island has started to obtain data to allow for improved survival estimates for this species. Tracking of adults has also been undertaken using GLS tags since 2018. The population study has primarily been an add on to the current work programme occurring with Gibson's wandering albatross. This has hampered the project in terms of only minimal days are spent on white-capped albatross data collection. This will include surveys of the Disappointment Island study colony to help interpret past aerial photography data sets, deploy trail cameras to monitor breeding activity and timing of nest failures, collect band recovery data from study colony birds, continue to mark a sample of breeding birds to build up robust datasets for adult survival analysis and deploy and collect GLS tags from a sample of birds to look at extent of movements of birds in relation to annual variability in foraging conditions.

Indicative cost: \$160,000 per annum

POP-6 Northern Buller's albatross

Term: 1 year

Guiding Objectives: B, E; CSP Seabird Medium Term Research Plan, National Plan of Action- Seabirds.

Project Objectives:

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

GLS tags were placed on a large sample of northern Buller's albatross in 2021 and have recently been recovered from most of these birds. This is the largest sample of tracking tags ever deployed on this species. This study seeks to understand the full annual cycle of the birds and the amount of time they spend visiting the colony versus being at sea. For the at-sea tracking, the analysis will look at how extensive are the albatross movements in the pre-laying period, and during each stage of incubation and chick-rearing. Do the birds stay entirely within the EEZ during this period or forage in the high seas? This will affect the level of risk they are exposed to from domestic fisheries. For the inter-breeding period from June to September we will assess the migration patterns to determine which areas the birds use for moulting and potential extent of overlap with international fisheries. The tags can also be interpreted to look at breeding success and when each bird departed from the Chathams either as failed breeder or a successful breeder.

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

Indicative cost: \$30,000

POP-7 Antipodes Island seabird research

Term: 3 years

Guiding Objectives: B, E; CSP Seabird Medium Term Research Plan.

Project Objectives:

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

This project delivers on priority monitoring and data gaps as per the CSP seabird plan. Due to logistical costs involved in getting to Antipodes Island, the Antipodean Albatross and White-chinned petrel projects have been combined into one Antipodean Island seabird research project. Antipodean albatross is extremely vulnerable to bycatch and continues to decline at 5% per annum, albeit this decline appears to be caused predominantly by bycatch outside of the NZ EEZ. The project would continue the demographic monitoring of Antipodean albatross conducted in previous years. In addition, this project will involve a (multi-year) population wide census, based on methods to be trialled in 2021/22. An Antipodean albatross population estimate is highly overdue as the previous independent estimate was conducted in 1994-1996. This project also aims to provide insights into the diet and potential nutritional stress in Antipodean albatross under the onset of climate change; a currently poorly-known aspect of the ecology of this species, with potentially large implications. In addition to the Antipodean albatross work, this project also aims to estimate key vital rates and population size for White-chinned petrels on Antipodes Island, another seabird species vulnerable to bycatch.

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

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

Indicative cost: \$160,000 per annum

POP-8 Northern royal albatross

Term: 2 years

Guiding Objectives: B, E; CSP Seabird Medium Term Research Plan, National Plan of Action- Seabirds.

Project Objectives:

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

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

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

Indicative cost: \$25,000 per annum

POP-11 Otago and Foveaux shags additional research

Term: 3 years

Guiding Objectives: B, E; CSP Seabird Medium Term Research Plan, National Plan of Action- Seabirds.

Project Objective: Describe the foraging distribution, and overlap with fishing effort, for key colonies.

Otago shag (*Leucocarbo chalconotus*) and Foveaux shag (*L. stewartia*) are species endemic to coastal waters and harbours in Southern New Zealand, feeding predominantly on demersal species including flat fish, and they have threat classification status of 'Nationally Vulnerable' and 'At Risk - recovering' (respectively). Both are susceptible to bycatch in set-nets and colony disturbance from human activity. A lack of population monitoring since the 1970's resulted in data deficiencies which are currently being addressed through a breeding census for both species (CSP POP2021-07) due for completion in 2022. Results will identify whether populations are in decline or have remained stable over the last 40-years and be considered in the context of emerging threats such as fishing pressures and prey species availability.

There are limitations with boat-based and aerial-surveys (POP2021-07) to look at fine scale detail on changing population demographics. In order to better assess population trends and inform conservation management decisions, further research is required to gather additional demographic information.

Using similar tracking technology recently developed for King shag populations, this project aims to GPS track individuals from key colonies and investigate the bird's life at sea too assess foraging distribution, overlap with commercial set-net fishery, and emigration rates between colonies.

Indicative cost: \$60,000 per annum

POP-12 Spotted shag

Term: 1 year

Guiding Objectives: E; CSP Seabird Medium Term Research Plan, National Plan of Action- Seabirds.

Project Objectives:

1. Estimate the East Coast South Island population size and trend.
2. Describe the foraging distribution, and overlap with fishing effort, for key colonies.

Spotted shag/parekareka (*Stictocarbo punctatus*) are a species found at some sites in the North Island of New Zealand but predominantly in coastal waters in the South Island, with key populations existing in the Marlborough Sounds and Banks Peninsula. They feed predominantly in deep water up to 16 km offshore on small fish and invertebrates. Based on genetic analysis, blue shag (*Stictocarbo punctatus oliveri*) is now considered the same species as spotted shag (Rawlence et. al., 2019). Once found in the tens of thousands in the wider Hauraki Gulf region during the early 1900's (and now thought to be a sub-species), spotted shag breeding colonies in this area have been abandoned in recent times, likely due to food availability and human impacts, and populations have declined to concerning levels.

In 2021 the threat classification status has changed from 'Not Threatened' to 'Threatened - Nationally Vulnerable' (Robertson et. al. 2021) based on continued decline in breeding pairs in Banks Peninsula (largely due to earthquakes in 2010-11), which is thought to support between 30-50% of the national breeding population. The population has not recovered, and it is likely that birds migrated to other breeding sites. In 1996 the Banks Peninsula population was around 20,000 breeding pairs and it is not known where it currently sits. Notwithstanding usual fluctuations in breeding effort related to species biology, longitudinal monitoring at some North Island sites also continues to show declining numbers. Spotted shag are susceptible to bycatch in set-nets, colony disturbance from human activity, and changes to food availability which can be brought about in part, by fish extraction of prey species.

Given the considerable recent decline of spotted shag abundance, a precautionary approach is needed for conservation management. A full population census will better assess trends in population dynamics and guide decision making. 40% of observed 'other seabird' bycatch in the commercial set-net fishery in the 2018-19 fishing year was spotted shag (FNZ bycatch data) and it is possible that bycatch of this species has historically been under reported. FNZ bycatch risk assessment for spotted shag was increased from "low risk" to "medium risk" (AEBR 237, Richard et. al. 2020).

Using the methodology approved for aerial census of other New Zealand shag species, this project aims to identify, through various methods, the location of all spotted shag breeding colonies in the South Island (desk top study), conduct an aerial census (Marlborough Sounds colonies), compare census results with historical records, identify areas where foraging distribution may overlap with commercial fisheries and consider possible population limitations as a result of food availability and fishing effort. Although this species forages in deep-water, it is acknowledged that set-net fishing by recreational fishers is also likely to have an impact but does not form a component of CSP projects.

This initial 1-year project will focus on breeding colonies in the Marlborough Sounds because it has a large stronghold of spotted shag and has no recent census data, will apply aerial methods (drone) developed for use with King shags in the Marlborough Sounds (co-roosters with spotted shag), Otago Shag/Foveaux Shag populations (BCBC2020-04), and spotted shags in northern North Island. Results will inform potential expansion of the census (funding dependent) to include all South Island populations in subsequent years.

Indicative cost: \$30,000

POP-14 Grey petrel population monitoring

Term: 2 years

Guiding Objectives: B, E, CSP Seabird Medium Term Research Plan, National Plan of Action- Seabirds.

Project Objectives:

1. To estimate the population size and trend at Antipodes Island.
2. To describe the dive behaviour of grey petrels.

This project delivers on priority monitoring and data gaps as per the CSP Seabird Plan. Antipodes Island is thought to have by far the largest population globally of grey petrels, but the trend in population size over time remains unknown. This project builds upon prior work (POP2020-04) and involves undertaking a population assessment based on the recommended methodology. In order to obtain a grey petrel population size estimate on Antipodes a spatial coverage distance sampling approach is envisaged, with an extended season to survey census grids to allow for trend assessment against previous research. Cost-saving synergies will be utilised with other research at the island to the greatest extent possible.

This project would also seek to deploy time depth recorders (TDRs) and subsequent analysis to describe dive behaviour.

Indicative Cost: \$90,000 per annum

POP-15 Hutton's shearwater

Term: 2 years

Guiding Objectives: B, E

Project Objectives:

1. To track birds to better understand bycatch risks including domestic recreational setnet and international fisheries.
2. To characterise dive behaviour using time-depth recorders, to better understand the range of potential risk from different fishing methods.

This project supplements the priorities identified in the CSP seabird plan, for a species of interest related to recreational fishing bycatch.

Hutton's shearwaters only breed in two colonies in the Seaward Kaikoura Ranges (inland from Kaikoura) plus a new site established on the Kaikoura Peninsula. There has been some limited tracking work done with GLS tags and dive depth tags but the sample sizes for breeding males and females are still too low to understand the risks associated for both sexes and there is very limited data available for younger age classes. The colony on the Kaikoura Peninsula has an expanding population and each nest is monitored closely with PIT tagged birds. This presents a real opportunity to learn in some detail the at-sea movements and diving behaviour of this species with excellent background knowledge about the status and sex of each bird and their normal pattern of onshore visits. The species is known to be at risk from set-netting and is very susceptible to light attraction so more understanding of where they forage at sea and comparing diurnal and nocturnal activity patterns will inform the level of risk to this species from fisheries interactions.

Indicative Cost: \$40,000 per annum

POP-16 Deep sea protected coral reproduction study

Term: 2 years

Guiding Objectives: E

Project Objective: To address knowledge gaps in reproductive strategies for protected coral species in the New Zealand region by quantifying gross morphometrics of preserved corals and carrying out histological analysis of selected specimens.

New Zealand has a rich complement of diverse and abundant deep-sea corals, yet very little is understood regarding their life history traits. Such data are important to understand potential population longevity and connectivity, as well as vulnerability and resilience to physical impacts such as those caused by bottom trawling. This project will examine coral reproductive strategies from archived specimens in the NIWA Invertebrate Collection to improve our understanding of the reproductive ecology of the stony corals *Desmophyllum dianthus*, *Goniocorella dumosa* and *Enallopsammia rostrata*, and the octocorals *Paragorgia arborea* and *Primnoa notialis*. This project follows on from DOC project BCBC2020-01 that demonstrated high levels of variability in reproductive modes employed by corals and will address knowledge gaps for these key species in the New Zealand region. These species have also been identified as high and medium risk in a pilot coral risk assessment and sufficient samples are already available. Results from this project can be combined with other life history data to inform and improve estimates for productivity parameters in a full Risk Assessment, can inform spatial models and biophysical dispersal models, and can feed into coral recovery studies., and can be considered alongside video imagery to inform site or population-specific reproductive outputs.

Indicative Cost: \$40,000 per annum

POP-19 Auckland Islands New Zealand sea lions

Term: 3 years

Guiding Objectives: E

Project Objective: To undertake pup counts and resightings on Enderby Island, Dundas Island and Figure 8 to provide survivorship and interaction data for the demographic model.

The New Zealand sea lion is listed as Nationally Vulnerable (Baker et al. 2019). The New Zealand sea lion Threat Management Plan, first implemented in 2017, established a range of research and actions to be undertaken to reduce and mitigate the range of threats sea lions are exposed to. Sea lions are incidentally bycaught in southern commercial trawl fishing operations targeting species including squid, scampi, and southern blue whiting. The foraging areas of New Zealand sea lions at the Auckland Islands have been shown to overlap with commercial trawl fishing activity, particularly SQU6T and SCI6A. 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 several key information gaps that prevent a full understanding of any such potential indirect effects, including time series data of population dynamics as collected in this project. CSP project POP2012-02 analysed population data collected during previous years 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). In order to evaluate the effectiveness of actions taken through the Fisheries Operational Plans and the Threat Management Plan, demographic data of the Auckland Islands population is vital.

Indicative cost: \$100,000 per annum

POP-20 Campbell Island seabird research

Term: 4 years

Guiding Objectives: E, CSP Seabird Medium Term Research Plan, National Plan of Action- Seabirds

Project Objectives:

1. Assess the current population trends of southern royal albatross at Campbell Island.
2. Monitor numbers of grey headed albatross on Campbell Island.

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

The project aims to count the number of breeding pairs of southern royal albatross at the Col study area and one other index site on the island. Map accurately using GPS each nest for comparison with satellite imagery and search for previously marked/banded birds for help in a demographic study of this species to compare with past demographic research in the 1990s. The field team will apply satellite and GLS tracking tags to compare movements today with those reported in past tracking studies more than 15-20 years ago. This will determine if there has been a range expansion or change in foraging patterns over time that might increase the level of risk to this species.

The grey-headed albatross has been in decline for decades at Campbell Island and many other southern colonies. The main risk appears to be fisheries in the high seas with very few reported captured in the New Zealand EEZ. While the field team is on Campbell Island, long-term photo points at the northern mollymawk colonies will be monitored to help assess changes in numbers of this species (using ground and possibly drone photography to record these populations). A search for previously banded birds will be carried out to see if birds banded from 1960s to 1990s are still present and breeding at the two former study colonies.

The project has been costed based on maximising synergies and cost sharing with other research activities at Campbell Island.

Indicative cost: \$80,000 per annum

POP-21 Into the Unknown: Cataloguing decades of undocumented protected coral specimens

This project proposal was submitted by Di Tracey, NIWA.

Term: 1 year

Guiding Objectives: E

Project Objective: Determine the distribution and taxonomic composition of unidentified protected coral samples and data currently held by the NIWA Invertebrate Collection.

This project would carry out an exploratory study to determine the distribution and taxonomic composition of unidentified protected coral samples and data currently held by the NIC. The summary

produced in Report format will provide DOC with an enhanced list of coral taxa and their geographic locations to help determine where further work is needed to improve taxonomic resolution and discover the full range of biodiversity in our region.

The research approach will be for the NIC to investigate the backlog of uncatalogued samples from the 1950s-2004, collected from early fisheries and biodiversity research programmes. These specimens and their accompanying data are essentially 'invisible' to science in their current state. Initial estimates indicate that there are 378 protected coral samples held in the NIC from the New Zealand region which could be catalogued into the NIC Specify database niwainvert and identified. There are an additional 309 protected coral samples that are already catalogued in niwainvert that are immediately available for further identification. This funding would allow work to begin on this backlog. The corals were collected by various NIWA research programmes across a wide geographic range. Further identification of these specimens to family, genus or species level would help to identify key areas where taxonomic experts could be enlisted for focused studies. Note that as the list of specimens are from fisheries and biodiversity research voyages, this work would exclude bycaught coral specimens collected by Fisheries New Zealand Observers that are identified under a separately funded DOC coral project (DOC20303-INT2019-04). The data exploration to produce an enhanced list of taxa and their provenance would however complement this work.

Indicative cost: \$35,000

Mitigation Projects

Ongoing projects

MIT-2021-01 Protected Species Liaison Programme

This multi-year project was consulted on in 2021/22 and is due for completion in June 2024.

It is proposed to form part of the CSP Annual Plan 2022/23.

Full details are provided in the CSP Annual Plan 2021/22.

Proposed Projects

MIT-1 Large trawl vessel warp mitigation

Term: 1 year

Guiding Objective: A, National Plan of Action- Seabirds

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

Mitigation requirements in this fleet have remained unchanged for a number of years, with mandatory mitigation introduced in the early 2000s. Since this time substantial new data on bycatch between vessels and across sectors of the fleet is available from good levels of observer coverage.

This project aims to further improve mitigation effectiveness to progress towards a zero bycatch goal by using observer data to assess effectiveness of current options and make recommendations for best practice across the fleet. Of particular note, some mitigation used, i.e. bird bafflers, are not currently recognised as best practice globally. As well as informing targeted improvements in the New Zealand fleet, the findings from this research will also be made available to inform global best practice mitigation specifications, and opportunities for comparative analyses with similar fleets operating in other Southern Ocean regions will be sought.

This project has been scoped as a desk-based exploratory study and may make recommendations for further research including any improvements in data collection to better inform bycatch effectiveness assessments, or potential at-sea trials for improved mitigation.

Indicative cost: \$30,000

MIT-2 Inshore trawl warp mitigation

Term: 1 year

Guiding Objective: A, National Plan of Action- Seabirds

Project Objectives:

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

Inshore trawl poses a substantial portion of risk to seabirds from commercial fisheries. There remains uncertainty over the effectiveness of the various seabird bycatch mitigation options that have been used

by some operators. Currently there are no mandatory mitigation requirements for trawl vessels <28m in length, and the mitigation standard introduced by the NPOA-Seabirds 2020 contains limited advice on the relative effectiveness of the warp mitigation options identified. A number of warp strike mitigation options are currently being used, with no clear guidance on best practice.

Observer coverage has been low in many parts of this fleet, so in addition to data compilation and review, this project will involve undertaking dedicated observations of bird behaviour in relation to different mitigation options, as a measure of bycatch risk, and proxy for bycatch rates. This data will be analysed to describe and quantify the relative effectiveness of mitigation options currently being used. Based on this assessment, the project will provide recommendations on best practice options for the fleet, identify focus areas and/or devices for further development and testing, as well as recommendations to improve future data collection to enable ongoing improvements to mitigation effectiveness in this fishery.

Indicative cost: \$100,000

MIT-4 Bait retention as a driver to mitigation use in the surface longline fishery

Term: 1 year

Guiding Objective: A

Project Objective: To quantify bait loss rates in relation to seabird attacks.

The role of bait retention as a driver to mitigation use in the surface longline fishery is hard to quantify due to the lack of robust data on bait loss and the economic consequences. This project will identify ways to collect and compile data on bait loss rates across a variety of fishing operations and seabird bycatch mitigation use and source data on the economic implications. There may be synergies with proposed data collection focussed on Hookpods. This will better inform economic modelling on seabird bycatch mitigation use in surface longline fisheries, which may act as an important driver for mitigation update both domestically and internationally.

This project has been scoped as a desk-top study and will review existing data from New Zealand fisheries as well as work internationally on this topic.

Indicative cost: \$30,000

MIT-5 Weak hook trials in the surface longline fishery

Term: 2 years

Guiding Objective: A

Project Objectives: Trial the use of weak hooks as a mitigation device to reduce bycatch of a range of protected species in the surface longline fishery.

Marine protected species such as orca, pilot whales, fur seals, turtles and great white sharks may remove bait or hooked fish from surface longline fisheries, referred to as depredation. These species risk getting hooked or entangled in the fishing gear which can result in injuries or death. There are limited options to mitigate depredation in longline fisheries, though internationally, weak hooks, or whale-safe hooks are being trialled and implemented in some fisheries. Weak hooks (hooks with a wire diameter below a

threshold), in combination with strong branchlines have the potential of allowing bycaught animals to straighten the hook and free themselves, thus aiding in post-release survival. This is due to the breaking strength exceeding the pull force required for the hook to bend. These hooks are said to enable this without impacting target catch rates.

This project would supply weak hooks to surface longline vessels to trial in areas of high protected species interactions e.g. FMA1. The study would be designed to ensure an effective sample size and align the information to be recorded with other international studies. Trial vessels would alternate use of weak hooks and their usual fishing gear to determine the effect on target catch rates.

Indicative cost: \$80,000 per annum

MIT-7 Understanding drivers and barriers to mitigation uptake in small vessel bottom longline

Term: 1 year

Guiding Objective: A, National Plan of Action- Seabirds

Project Objectives: Better understand the drivers and barriers to uptake and implementation of best practice seabird bycatch mitigation by small vessel longline vessel operators.

There are a range of proven bycatch mitigation options available for bottom longline fisheries, including best practice advice. However, achieving consistent bycatch reduction across all vessels and fleet sectors remains challenging. This project will apply a social science methodology to understand key drivers and barriers in achieving fleet-wide implementation of mitigation standards from a fishers' perspective.

This builds project builds from similar research reported by Southern Seabirds in 2021 for the surface longline fishery, which was based on in-depth interviews. Given the different nature of the bottom longline fishery, in particular the far greater fleet size and wider range of operational variability, a modified methodology will need to be developed as the first part of the project.

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

Indicative cost: \$50,000

MIT-8 Longline hauling mitigation devices

Term: 2 years

Guiding Objective: A, National Plan of Action- Seabirds

Project Objectives:

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

Whilst seabird bycatch mitigation development and implementation has focussed on the setting of longlines, captures also occur on hauling. This is particularly when lines are set a night, as hauling is often by day when bird activity is higher, and the relative proportion of haul captures appears to be particularly high in New Zealand longline fisheries compared to other fisheries globally.

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

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

Indicative cost: \$70,000

MIT-10 Light mitigation

Term: 1 year

Guiding Objective: A

Project Objective: To continue and improve the initial trials of different lighting set-ups both on land at seabird colonies and on commercial fishing vessels and identify options for mitigating seabird deck strikes.

Artificial light from fishing vessels has been identified as a threat to several seabird species, particularly when vessels are operating in close proximity to seabird breeding locations in low visibility conditions (e.g., foggy and misty nights). Bright lighting (e.g., spot and flood lights) can lead to species such as prions, petrels, and shearwaters being disorientated and subsequently colliding with vessel structures (i.e., deck strikes), resulting in contamination with onboard chemicals, waterlogging, injury, or death. Consequently, identifying light types and set-ups that minimize the attraction and disorientation current vessel lights cause is of key conservation concern. However, vessel lighting is essential for safety of crew and the operations of the vessel, so this research has to identify light types and set-ups that allow for safe operations, while reducing risks to seabirds.

Outcomes from the previous CSP project (MIT2019-03) suggest that insufficient land-based and boat-based experiments were conducted to successfully identify light types (e.g., wave lengths/colours) and set-ups (e.g., shielding and beam width) that allow for safe vessel operations, while reducing deck-strike risks to seabirds. Consequently, further work must increase the sample size of experiments both on land and at sea, compared to the previous project. Large deck strike events are rare, but have potentially catastrophic impacts and as such, to successfully identify light types and set-ups that work best under different environmental conditions, a larger number of repeat experiments must be conducted across a longer time period (e.g., weeks). More experiments over a longer time-period would allow for appropriate incorporation of temporal variation due to varying moon phases, weather conditions, and seabird phenology. An increased number of experiments will aid the identification light types (e.g., wave lengths/colours) and set-ups (e.g., shielding and beam width) that have the potential to reduce deck strikes. Once the right treatment has been identified, it could be recommended for wider trials within the operating fishing fleet.

Indicative cost: \$50,000

MIT-11 Economic Aspects of Bycatch Reduction

This project proposal was submitted by Cawthron Institute.

Term: 1 year

Guiding Objective: A

Project Objectives: Identify and assess potential mechanisms from the use of economics to incentivise bycatch reduction in commercial fisheries.

Economic mechanisms can provide useful drivers to incentivise fishers to reduce their bycatch, especially in fisheries where bycatch appears to consistently occur with little or no reductions over time. Lent & Squires (2017) state that there are policy instruments that can be used for reducing bycatch that move away from top-down, command-and-control measures (e.g., effort reduction, time/area closures, gear restrictions, bycatch quotas) towards an approach that creates incentives to reduce bycatch (e.g. transferable bycatch allowances, taxes, and other measures). Unlike the regulatory process, individual operators in the fishery sector can make adjustments to their harvesting practices as soon as the incentives for such changes are apparent and inputs or operations can be modified.

This project would consist of a literature review that considers what has been used overseas and what could be applied here including an assessment of the likelihood of success of such mechanisms. Also comments on what legislative changes might be required to implement such economic drivers.

Indicative cost: \$15,000

MIT-12 DOC Coral Symposium 2022/23

Term: 1 year

Guiding Objective: A

Project Objective: Host a symposium on the topic of New Zealand corals (=Hexacorallia and Octocorallia), to progress ideas on how they might best be managed and protected.

This symposium will bring together interested parties to provide updates and coordination between multiple work programmes relevant to coral conservation.

This will be achieved by presentations and discussion focused on:

- 1) coral research and knowledge – achievements and gaps since the 2017 gaps workshop;
- 2) identification of threats and approaches for mitigation; and
- 3) potential management scenarios and goals within the framework of new and upcoming policy and other workstreams (e.g., Biodiversity Strategy, MPA reform, bycatch 4-year workstreams, IUCN BBNJ work, MTRP, BRAG work streams, benthic forum).

The symposium is not intended as a repeat of the 2017 gaps analysis workshop; although relevant research updates will be included, identified research gaps remain largely the same. Instead, the purpose of the symposium is to drive an active network of stakeholders and bring interested parties together for the first time in several years, and to provide them with government and industry contexts and contacts for ongoing improvement of management outcomes for protected corals. Example outcomes include a summary report of the symposium, including a themed synthesis of current research, identification of novel gaps, discussion outcomes on management scenarios, and identification (through discussions and break-out

sessions) of next steps to plan coral research that improves coral protection, particularly within relevant policy frameworks.

Indicative cost: \$20,000

Unprioritised Projects

INT-4 Reviewing and assessing the utility of camera footage for identifying protected species interactions with commercial fisheries

This project proposal was put forward by DOC but will not be progressed in 2022/23 due to delays in the camera rollout schedule and data availability, it will be reviewed for inclusion in 2023/24.

Term: 1 year

Guiding Objective: A

Project Objectives: The potential utility and scope of using camera footage for understanding, quantifying, and mitigating interactions of New Zealand fisheries with protected species is unclear, and in need of clarifying given the protected species driven objectives of the camera rollout. This project aims to use footage arising from vessels and fisheries implementing cameras during the next stage of the cameras rollout from the 2022/23 fishing year to ascertain how data analysis can be targeted and standardised through the lifespan of the cameras Implementation Plan and Tranche 2 of the rollout to inform review protocols. Depending on footage obtained (and fisheries involved), a particular protected species group may be focus taxa of this study, but there may be scope to address footage usage applicability to all protected species groups commonly bycaught. Builds upon INT2017-02.

Indicative cost: \$50,000

MIT-3 Hook-shielding device use in the surface longline fishery

This project proposal was put forward by DOC but will not be progressed in 2022/23 as there is sufficient funding within current project MIT2020-01.

Term: 1 year

Guiding Objective: A

Project Objectives: Continue support for use of hook-shielding devices in the surface longline fleet.

This project will seek to ensure continued supply of replacement Hookpods to surface longline vessels opting to use this mitigation option.

Indicative cost: \$80,000

MIT-6 Methods to improve small vessel bottom longline sink rates

This project proposal was put forward by DOC but will not be progressed in 2022/23 as there are delays in delivery of the current project MIT2021-03.

Term: 1 year

Guiding Objective: A

Project Objectives: Workshop and progress options to increase longline sink rates

Project to progress any options to increase line sink rates partially developed, or identified for development, during 2021/22, including those considered as part of MIT2021-03. Project to be developed and device(s) to be trialled will be scoped at a workshop as the first milestone of this project.

Indicative cost: \$80,000

MIT-9 Suitability of lasers as a seabird mitigation option

This project proposal was put forward by DOC but will not be progressed due to further investigation found the envisaged methodology to be unfeasible and highlighted serious welfare concerns for birds via the use of lasers. Outreach to fishers to highlight these concerns will be progressed.

Term: 2 years

Guiding Objective: A

Project Objectives: Follow up to MIT2018-02 (Hauling mitigation for small longline vessels). Further refine the most effective and operationally practical options to construct and implement for longline.

This project will apply a social science methodology to understand key drivers and barriers in achieving fleet-wide implementation of mitigation standards from a fishers' perspective.

Indicative cost: \$30,000 per annum

Investigation of New Zealand fur seal (NZFS) bycatch in the Cook Strait Hoki fishery and mitigation options

This project proposal was submitted by Cawthron Institute. It will not be considered this year as many elements of the proposal are being covered in research projects currently underway (POP2021-06) and another awaiting publication (INT2019-03). These will provide recommendations on further work and research required in the fur seal bycatch mitigation space.

Term: 3 years

Project Objectives: To investigate and characterise NZFS bycatch in the Cook Strait Hoki fishery with the view to identifying potential options for mitigation

The current level of bycatch could be unsustainable for local populations of fur seals if all the bycatch is coming from a single or small number of colonies. It is recommended that consideration is given to investigating potential impacts on local fur seal populations. Such a research programme should include the following elements:

- Identification and monitoring of breeding and non-breeding fur seal sites around the Cook Strait area in the vicinity of the fishery
- Investigation of whether it is possible to establish which locations bycaught seals may be coming from (e.g., genetics – which would require samples collected from bycaught individuals)
- Undertaking satellite tracking of foraging seals from local Cook Strait colonies as it is well documented that pinnipeds vary their foraging strategies depending on their location and available prey
- Using the data from (3) to establish spatial overlap between seals and the fishery to explore mitigation options using the SEFRA approach

- Development of estimates of the total bycatch of fur seals in this fishery
- Identify potential mitigation approaches to manage and reduce this mortality. This element also has the potential to be applied to other fisheries with NZFS bycatch (e.g., other hoki fisheries, Southern blue whiting)

Indicative cost: \$260,000 per annum

Investigation of common dolphin (CD) bycatch from small vessels (<28m) in the Taranaki trawl fishery

This project proposal was submitted by Cawthron Institute. Project rationale and proposed additional observer coverage has been rolled into the observer programme planning process.

Term: 1 year

Project Objectives: To investigate and characterise CD bycatch from small vessels (<28m) in the Taranaki trawl fishery with a view of exploring mitigation options

There is no specific consideration of the common dolphin bycatch in the small vessel trawl fishery in the Taranaki region (i.e., < 28m). This is despite an average of 88 (max = 137) dolphins being killed annually in these fisheries over the period 2003 to 2015 when records end (Data from the MPI PSD) for a total of over 1,100 dolphins. Please note that this fishery is different to the well-known, large vessel trawl fishery which catches common dolphins while targeting Jack Mackerel.

This project would include:

A. Increasing observer coverage in this fishery to 25% to allow for improved estimates of bycatch to ascertain if the apparent high level of bycatch is real. These data would then be used to generate new, more robust estimates of common dolphin bycatch

B. If the work in #1 above, confirms a high level of bycatch (or fails to reduce the high degree of uncertainty around the estimate), then a review of mitigation options should be undertaken to identify potential methods.

Indicative cost: \$25,000