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

Milestone 9. Final Annual Report

Prepared for Conservation Services Programme, Department of Conservation

June 2026

Prepared by:
Diana Macpherson, Jaret Bilewitch, Amber Brooks, Amelia Connell, Sadie Mills, Lisa Smith, Caroline R. Wood

For any information regarding this report please contact:
DOC Conservation Services Programme csp@doc.govt.nz
or:
Diana Macpherson
Marine Biology Technician, Assistant Collection Manager
Collections Curation
+64 4 382 1628
diana.macpherson@earthsciences.nz

New Zealand Institute for Earth Science Limited
Private Bag 14901
Kilbirnie
Wellington 6241
Phone +64 4 386 0300

Client Report No: 2026101WN
Report date: June 2026
Project No: DOC23303 INT2022-03

Revision	Description	Date
Version 1.0	Final version sent to client	04 May 2026
Version 1.1	Final version approved by client with no changes	16 June 2026

Quality Assurance Statement		
	Reviewed by:	Owen Anderson
	Formatting checked by:	Jess Moffat
	Approved for release by:	Alison MacDiarmid

Cover image: An at sea digital image of protected black coral *Bathypathes* sp. Caught by bottom trawl targeting orange roughy (ORH) from the Chatham Rise (SOE; FMA 4) on the 27th of August 2024 [Observer, FNZ].

Citation: Macpherson, D., Bilewitch, J., Brooks, A., Connell, A., Mills, S., Smith, L., Wood, C. R. (2026) INT2022-03 Identification, storage and genetics of cold-water coral bycatch specimens. Milestone 9. Final Annual Report. Prepared for Conservation Services Programme, Department of Conservation. Earth Sciences New Zealand Client Report 2026101WN. 93p

Contents

Tables

Figures

Executive summary

Protected coral species frequently occur as bycatch in commercial fisheries around New Zealand. Accurate knowledge of the species diversity of coral bycatch is essential to facilitate their management and conservation and help to further understand how vulnerable they are to anthropogenic impacts. The Conservation Services Programme (CSP) of the Department of Conservation (DOC) recognise that Government Fisheries Observers on commercial fishing vessels are not always able to identify bycatch at sea with high precision (especially to species level), with the confirmation of species requiring identification from a coral taxonomist in many cases.

This project facilitates, through the examination of returned coral specimens and specimen digital images by experts, confirmation of the taxon and the provenance of corals bycaught in New Zealand fisheries. This report, covering the third and final year of a three-year contract, summarises the sample and image identifications of all observed coral bycatch that was returned during the period 1 July 2024 to 30 June 2025. A total of 25 physical specimens (in 25 samples) were collected by Observers and returned for identification during the reporting period. Twenty subsamples from live-caught specimens with sufficient live tissue were taken for future genetic studies. Additionally, there were 19 historical physical specimens (from 18 samples) collected by Observers prior to 1 July 2024 for which revised higher-level identifications were made during the reporting period. Identifications for a further six research trawl-collected specimens in six samples are also reported here.

There were 6162 specimens identified from 125 digital images and one digital video file that were processed during the reporting period; 6145 were identified by experts as protected coral taxa. The remaining 17 specimens from images were of other, non-protected coral, taxa. The location of capture of all specimens from images was able to be determined (i.e. all files were able to be georeferenced) and 6158 specimens were confirmed to be from within the New Zealand Exclusive Economic Zone (EEZ) (four specimens were from the Lord Howe Rise, beyond the EEZ).

Corrected identifications (where the Observer identification is revised by an expert) have been made where necessary in the COD database, with both the original and amended identifications retained. All raw data are provided in the Appendices of this report and as a separate Excel file.

Data summaries of protected coral bycatch occurring in New Zealand region fisheries are presented by Fisheries Management Areas (FMAs), fishing method, and target fishery. The greatest number of protected coral specimen counts from images came from SEC South-East Coast (FMA 3) and SOE South-East (Chatham Rise) (FMA 4) followed by CEE Central East (FMA 2) regions. Most were taken by bottom trawl operations targeting hoki, smooth oreo and orange roughy, although there were also few captures from bottom trawling, longlining and potting targeting ling, and bottom trawling alfonsino & long-finned beryx, scampi and several other fisheries. Similarly, most protected corals identified from physical specimens came from SEC South East Coast (FMA 3) management area (OEO 3A) bottom trawling for smooth oreo. The remainder were captured from SOE South East (Chatham Rise) (FMA 4) targeting smooth oreo, scampi and orange roughy, and CEE Central East (FMA 2) targeting alfonsino & long-finned beryx.

While no formal analyses of accuracy have been carried out during this reporting period, comparing Observer and Earth Sciences New Zealand expert identifications, brief non-statistical summaries of accuracy are provided to help inform Observers.

As part of this project, Earth Sciences New Zealand hosted an in-person Observer refresher training workshop on New Zealand Aotearoa's protected coral species in Wellington on 7 November 2025. Observers were shown examples of protected coral species using specimens from the Earth Sciences New Zealand National Invertebrate Collection (NIC) and following the descriptions and instructions in the updated Coral Identification Guide[1], shown how to characterise them and tell them apart from easily confused non-coral taxa.

Following prioritisation discussions with CSP, genetic analysis for this year of the project focused on identification and characterisation of the diversity of bycaught specimens of bubblegum corals (*Paragorgia* spp.). A review of all NIC holdings identified 69 Observer-collected specimens of these species plus 12 reference specimens obtained through other means (research expeditions and fisheries research trawls) from SOE South East (Chatham Rise) (FMA 4) and SUB Subantarctic incl. Bounty Is and Pukaki Rise (FMA 6), which were targeted for genomic characterisation. Genome skimming was successfully conducted on 72 specimens (60 bycatch + 12 non-bycatch and reference specimens), including the holotypes of eight species. After assembly and matching to known UCE (Ultra-Conserved Elements) loci, 65 specimens retained sufficient data for diversity analyses. A phylogenetic analysis of these specimens indicated the majority of specimens were correctly identified as *P. arborea* and *P. alisonae*. However, significant genetic variation within these two species warrants fine-scale examination using population-genomic approaches, to determine if cryptic species are present. The remaining specimens represented occurrences of other rare species plus a potentially new or undocumented species but a lack of sufficient sample size made assessments of distribution patterns and taxonomic validity premature. Further genetic or genomic assessment of bubblegum corals are required but currently there is evidence for a minimum of six (possibly seven) species being represented among Observer-collected fisheries bycatch samples, four of which are represented in the focal areas FMA 4 and FMA 6.

[1] https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/resources/csp-fishers-guide-to-protected-coral-2025.pdf

1 Background

Deep-sea protected coral samples taken as bycatch in commercial fishery operations are collected by government Observers on commercial fishing vessels. Under the New Zealand Wildlife Act (1953) protected corals are deemed to be protected whether they are dead or alive. Protected coral and other invertebrate bycatch are routinely photographed by Observers as part of their at sea reporting. This research project "Identification and storage of cold-water coral bycatch specimens" was initiated in 2016 (INT2015-03 – DOC16307), continued in 2020 (INT2019-04 – DOC20303) and 2022 (INT2022-03 – DOC23303) contracts Earth Sciences New Zealand to determine, through the examination of returned coral specimens and specimen images, the taxon, provenance (i.e. the location of capture) and, for the current project, the genetics of corals bycaught in New Zealand fisheries. All such corals are identified by Earth Sciences New Zealand experts and associated taxonomists to the lowest feasible taxonomic level, counted, and the information reported in the relevant databases. Since 2016, this information, along with associated fishing data including fishing method, fishery area, and target species, have been presented in reports. All raw data have also been provided to the Conservation Services Programme (CSP) in spreadsheet form.

Data from this research helps to better characterise interactions between protected corals and commercial fishing activities (Tracey et al. 2011; Clark et al. 2019). It provides vital baseline information that can help to better inform research underpinning marine protection planning including habitat suitability modelling (e.g., Anderson et al. 2014; Rowden et al. 2017; Georgian et al. 2019), coral risk assessments (Clark et al. 2014; Clark et al. 2025), benthic impact assessments (Rowden et al. 2024, SPRFMO 2024), and management of benthic marine protected species. It also helps to pave the way forward towards a more comprehensive mitigation framework to be implemented to protect cold-water corals in New Zealand waters.

The research has a similar focus to earlier CSP Projects INT2015-03 – DOC16307 and INT2019-04 – DOC0303 (Identification and storage of cold-water coral bycatch specimens) and to Fisheries New Zealand (FNZ) Projects DAE201804 and BEN202103 (Identification of benthic invertebrate samples from research trawls and observer trips) (Schnabel et al. 2026), all of which provide identification and enumeration of benthic invertebrate bycatch in New Zealand waters. The overall purpose of these research efforts is to continually improve information on the nature of coral and benthic bycatch reported and collected through the Observer Services Programme and thus continually provide higher-quality data and resources for downstream usage.

For this three-year contract (INT2022-03 – DOC23303 Identification, storage and genetics of cold-water coral bycatch specimens) for CSP, Earth Sciences New Zealand provides:

- the identification of coral specimens, database updates, and specimen storage,
- the identification and georeferenced labelling of images and the digital storage there-of, database updates,
- the sub-sampling of protected coral tissue samples for future genetic studies,
- input into training and resources for Government Fisheries Observers, and
- genetic analysis on archival and recent tissue samples.

The contract provides for up to 200 protected coral samples (physical specimens) and 200 specimen images to be identified per annum. As few physical specimens were provided by Observers this year, a backlog of historical coral samples collected by Observers were identified, with priority given to recent Observer collected samples from within EEZ, for the current year and historical, followed by research trawl survey samples, then high sea samples.

This project does not report on coral specimens by images photographed from the high seas.

Throughout the report we refer to specimens and samples, for clarity we provide the following explanation of these terms:

- Physical specimens – individual animals or colonies returned physically to the Earth Sciences New Zealand National Invertebrate Collection.
- Specimens from images – individual animals or colonies photographed in a digital image and/or video.
- Samples – a bag, pail or jar of one or more individual physical specimens or colonies collected from one unique station.

On 1 July 2025, NIWA merged with GNS Science to become Earth Sciences New Zealand. The physical specimens and subsamples related to this project are returned to Earth Sciences New Zealand and stored at the Earth Sciences New Zealand National Invertebrate Collection (formerly the NIWA Invertebrate Collection). All other aspects of the collection remain the same as in previous years of this project, i.e. the location and management of the collection. The acronyms ESNZ for Earth Sciences New Zealand and NIC for National Invertebrate Collection are used from now on in this report.

2 Objectives

This project forms part of the Conservation Services Programme (CSP) and is part of a long-term series of analyses that began in 2016. The purpose of this research is to continually improve information on the nature of coral bycatch reported and collected through the Fisheries Observer Programme.

The specific objectives for this project (INT2022-03 - DOC23303) are:

Specific Objectives

1. To confirm or update identifications of coral bycatch reported by Fisheries Observers to the lowest taxonomic level (i.e., to assign codes to coral specimens at the species level wherever possible, or to genus or family level if not possible).
2. To record all identified coral specimens and their metadata (including haplotype/genetic data) and ensure storage of the physical specimens in an appropriate taxonomic collection.
3. To update relevant government coral identification and observer databases.
4. To determine whether genetic taxonomic assessment of coral ID is an efficient means to determine or improve image-based or morphological coral ID, and to use genetic data to better understand coral bycatch.
5. To update and provide input into coral-relevant resources for Fisheries Observers, including reference material and material for observer training.

This is a three-year project, comprising biannual reporting of six-monthly progress reports (November each year), and annual reports (May each year). Reporting to date includes Connell et al. (2023, 2024) and Macpherson et al. (2024, 2025b, 2025c). Here we report on Milestone 8: DRAFT Final Annual Report detailing methods and results for each specific objective for all corals identified from physical samples and images assessed for the period 1 July 2024 - 30 June 2025. This is the final year of the project, and this report will also summarise results for all three years of the project.

3 Methods

3.1 Objective 1

To confirm or update identifications of coral bycatch reported by Fisheries Observers to the lowest taxonomic level (i.e., to assign codes to coral specimens at the species level wherever possible, or to genus or family level if not possible).

There are two key activities for specific objective 1:

3.1.1 Identification of returned physical specimens

Some of the deep-sea coral bycatch that could not be identified by Observers at sea were retained (whole specimens or subsamples of the specimens) and delivered frozen to ESNZ for identification. Specifically, samples were photographed and or collected opportunistically from commercial fishing activity when either Observers were uncertain of their identification of the coral specimen, the specimen was caught outside the expected depth range or distribution, or when the specimen was considered rare or unusual. A similar method was followed to process bycatch of invertebrates (excluding protected corals) collected by Observers under a Fisheries New Zealand (FNZ) project in previous years (BEN202103) (Schnabel et al. 2026).

The corals were thawed, sorted into main groups and initially identified to coarse taxonomic level (mostly to order and family level), then returned to frozen storage, fixed in ethanol, or dried where appropriate. The tasks of fixing and preserving samples, providing containment (jar or pail storage), documenting samples (station numbering, labelling) and high level sorting (dividing samples into major or minor taxonomic groups in the laboratory), were all carried out under the FNZ Data Custodianship Services project DAT2016-01P. Sample data were entered into the web-interfaced ESNZ Observer Samples Database (OSD) (version 2.4.21; 2026).

High seas samples were not differentiated from within-EEZ samples at the time of arrival at ESNZ for processing, as trip data are provided in sacks of frozen material without detailed information on location. Once the frozen sacks have thawed and labels with location data revealed, it is most efficient to process all of their contents rather than separating and refreezing high seas samples. As such, high seas samples are partially processed within this project. These samples are a very useful contribution to habitat suitability modelling exercises in the high seas (e.g., see Georgian et al. 2019, Stephenson et al. 2021).

Data from OSD were uploaded into the NIC Specify database *niwainvert* where the specimens are curated for long-term storage and formal taxonomic identification.

Experts then identified all corals to species level wherever possible and when this was not possible, to genus or family level, and assigned the most appropriate Ministry for Primary Industries (MPI) three-letter code (noting that coral codes have not yet been allocated for all coral taxa recognised by experts). Specimen handling followed ESNZ procedures for identifying specimens housed in the NIC. ESNZ currently manages specimens according to the "Guidelines for the care of natural history collections" (Committee on Common Philosophies and Objectives 2010) and follows the principles of "Preventive Conservation: Collection Storage" (Elkin & Norris 2019). The NIC has its own collection policy document: "Earth Sciences New Zealand Invertebrate Collection Policy and Procedures", which also guided the process. Specimens retained in the NIC are held in stewardship for DOC.

Expert identification of the samples was carried out and entered into *niwainvert*. See Table 3-1 for the list of experts that carried out identifications. Note that some specimens that were identified as corals by Observers but were not corals were identified by experts in other groups.

Table 3-1: Taxonomic experts, their affiliation and their speciality.

Expert	Affiliation	Taxon Group
Amelia Connell	ESNZ	Scleractinia (in training with Di Tracey)
Dennis Opresko	Smithsonian Institution	Antipatharia (black corals)
Di Tracey	ESNZ retired emerita	Scleractinia
Jaret Bilewitch	ESNZ	Gorgonian octocorals
Kirrily Moore	Tasmanian Museum & Art Gallery	Gorgonian octocorals
Peter Marriott	ESNZ	Stylasteridae (hydrocorals)
Rob Stewart	Independent	Antipatharia (black corals)
Diana Macpherson	ESNZ	Hydrozoa (hydroids)
Michelle Kelly	ESNZ	Porifera (sponges)

3.1.2 Processing and identification of specimens from images

Observers are asked to follow instructions for the collection and reporting of protected coral specimens and data, as outlined in the revised Coral Identification Guide (Tracey et al. 2025) and the "Instructions to observers when carrying out at-sea protected coral data collection" document (Macpherson et al. 2025a), which should be used in conjunction with the most recent MPI Fisheries Observer Manual and Observer Briefing Notes. Specifically, these instructions emphasise that all coral bycatch are sorted into species groups, recorded, labelled, photographed and subsampled. Images are to be captured in a well-lit area using a plain grey background if possible, including a reference size scale, and a specimen label and/or photo card filled in with at least the trip and tow/set number, species code, and sample number so that the specimen can be matched to a record in the Centralised Observer Database (COD) later.

The digital images and metadata collected by Observers for this reporting period were obtained directly from the FNZ Fisheries Data Management Team (RDM) on the 10th of February 2026 (172 digital images and one video file). The files were reviewed and decisions made whether to process further. Metadata cannot be embedded to video files so if there was an image alongside the video of the same specimen, then the image was chosen to process and the video used to complement the image for identification purposes only. Some specimen images were collected from extra territorial (ET)/high seas areas beyond New Zealand's EEZ and given this project generally does not identify specimens collected from the high seas, where it was obvious that they were from ET areas these images were not processed and identified. Furthermore, some images were of non-protected coral taxa (such as sea pens and zoantharians) which the Observer correctly identified onboard (i.e. the Observer did not confuse these with a protected coral taxa), so no further processing under this project was needed.

Identifications of the specimens were carried out by coral and non-coral experts (Table 3-1). Since images are identified in a separately timed process to the identification of physical

specimens, all images are identified by experts regardless of whether a physical specimen associated with an image was returned or not.

3.1.3 Georeferencing and matching to benthic records in COD

To georeference the images, the trip and tow number need to be accurately determined so that the location of capture can be retrieved from COD. Digital files were delivered to ESNZ already organised into trip numbered folders. Tow numbers and any other details such and the MPI sample number and the initial Observer ID (MPI three-letter species code) were able to be determined to a reasonable degree of accuracy using a variety of methods (see Earth Sciences New Zealand 2025 section 5.16 for further details). In many cases these data were fully or partially provided in the specimen labels or photo cards showing in the image. Sometimes this information was recorded on the label incorrectly by the Observer at the time of taking the photo and was later corrected in the MPI Benthic Materials Forms[2] and COD, therefore an extract of updated data from COD (provided by MPI RDM at the time of image delivery) was used by the Collections Curation team to suggest a match for the specimen to a benthic record using the available data, which was then passed on to the ESNZ Fisheries Data Services (FDS) to check.

FDS then work through a set of scenarios and categories using a combination of the trip and tow number, the MPI sample number, the initial Observer ID (three-letter species code), NIWA catalogue number (if a physical specimen matched the specimen in the image), and image filename, depending on which of these data are available. If some data are missing, then a broader search of benthic records within a trip can be done to find the best possible match using the data available. FDS through a systematic approach double checked the suggested match and with consultation with the Collections Curation team who finalised the matches. FDS then added the expert ID (expert species code, phylum, taxon, NIWA_image_filename, NIWA catalog number) to the matched records in COD. They then provided a full extract of all COD fishing data in a spreadsheet, including:

- target_species
- fishing_method and fishing_method_desc
- gear_code and gear_desc
- event_start_date and event_start_time
- event_end_date and event_end_time
- trunc_start_latitude and trunc_start_longitude
- trunc_end_latitude and trunc_end_longitude
- start_obs_fma and end_obs_fma
- start_seabed_depth and end_seabed_depth
- img_initial_species_code (the Observer initial ID as shown in the image label)
- ben_initial_species_code (the Observer initial ID as entered into COD)
- img_mpi_sample_number (the MPI sample number as shown in the image label)
- ben_mpi_sample_number (the MPI sample number as entered into COD)

[2] See page 629 of Earth Sciences New Zealand (2025) Fisheries database documentation series: cod database (Version 3.1) to see an image of this data form: https://marlin.niwa.co.nz/files/dataHoldings/scientificResearchDbs/cod.pdf

Sometimes the Observer writes a different initial ID and/or MPI sample number on the specimen label or photo card from what they later enter into the Benthic Materials Forms (which is loaded into COD after completion of the trip). The Observer might decide to change their ID as the trip progresses and they become more familiar with the fauna in the fishing area. The MPI sample number can be different due to Observer error, and it is generally accepted that COD contains the correct data, but all data are retained for clarity. The fact that the Observer IDs are very often different between these two sources of data is the reason for the matching process being fairly complex.

There are two main tables in COD which are used for this project - the "benthic" (y_benthic) table and the "general catch" (x_fishing_event_catch) table (Earth Sciences New Zealand 2025, section 5.16). Originally the benthic table contained all benthic invertebrate species. However, since approximately 2022, generally only strictly sessile, benthic species are entered into the benthic table. All records entered into the benthic table are also entered into the general catch table (also known as the "report table"), which contains all catch records (not just those of benthic species), but the benthic table does not hold general catch table records. Both need to be interrogated in case a coral record has been added to the general catch table and not the benthic one, so that the best possible match is made. This can be useful, for example, in case a specimen is identified as a species not included in the benthic table by the Observer, so in order to update its identification with the expert ID it needs to be found in the general catch table, not the benthic one.

However, in recent years, the field "fnz_image_filename" has been added to the Observer Benthic Materials Forms and in the benthic table in COD and can therefore be used to match images directly to COD benthic records, although sometimes these are recorded incorrectly by the Observer (or other MPI staff) or not recorded at all.

Note that the coral bycatch records are verified by FDS upon loading into COD to check that the species ID and end type (e.g. discarded, retained) are valid for benthic catch, that the weight is in the expected range, and that the image filename has been supplied if an image was taken. If any fields do not pass verification, then MPI is consulted and they provide corrections to the data. Further details with regards to specific weight thresholds of protected coral taxa are described by Anderson et al. (2025).

3.1.4 Embedding metadata to the files

Using the ACDSee Photo Studio Professional 2021 (version 14.0) software to manage the metadata information, data for each image was either added manually into the relevant field or assigned from a drop down 'picklist'. The following metadata were embedded into each image file (metadata cannot be embedded to video files):

- expert ID in the form of taxonomic name (species, genus or family level),
- trip and tow number,
- initial Observer ID and expert ID in the form of three-letter MPI code,
- specimen count,
- specimen comments,
- the NIWA catalogue number (where applicable), and
- image rating (where the best rating is 1 (very good quality) and the worst is 5 (very poor quality)).

An image rating classification was developed specifically for this research programme as there is no universal standard (International Press Telecommunications Council 2025). Image ratings help indicate the quality and usefulness of an image and, as part of the workflow, enable the images to be sorted and filtered at a later point in time. Table 3-2 shows the image rating classification used and outlines the factors taken into consideration when assigning a rating to an image.

Table 3-2: The classification system used to assign a rating to an image.

Image rating	Classification
1	Very good quality. The specimen is in focus and the whole specimen has been photographed. Good lighting and background. The image includes a label with complete data. There may also be a scale present. The specimen weight may also be shown in the image.
2	Good quality. All the specimen, or part of the specimen is in focus. The lighting and background are sufficient. The image includes a label with some or complete data. May include more than one coral specimen. There may also be a scale present. The specimen weight may also be shown in the image.
3	Average quality. All the specimen, or part of the specimen is in focus. The image may include a label with some data, and a specimen weight may be shown. Insufficient lighting and background. May include more than one coral specimen.
4	Bad quality. All the specimen, or part of the specimen may be in focus, or in focus enough to be able to determine what it is. There is no label in the image. It is not photographed against a good background with a scale and good lighting, and/or photographed at an unhelpful angle. The image is of an aggregated group of corals and other specimens, so it is not clear what the subject of the image is. The image is of a non-coral.
5	Very bad quality. The specimen, or part of the specimen is out of focus and is not able to be identified to a sufficient taxonomic level as a result. There is no label in the image. It is not photographed against a good background with a scale and good lighting, and/or photographed at an unhelpful angle. The image is of an aggregated group of corals and other specimens, so it is not clear what the subject of the image is. The image is of a non-coral.

Finally, all metadata for the images, including the trip and tow number, COD fishing data (the start and end coordinates, date, depth and FMA of the tow, fishing method, target species) and the Observer initial ID, the expert ID in the form of MPI code, taxon name and its full hierarchy (phylum, class, order, superfamily, family, genus, species), the MPI sample numbers, NIWA catalogue number, image filenames and specimen count were assembled manually in a spreadsheet (a summary of which is presented in Appendix C, and the full data file is submitted alongside this report named “DOC23303 INT202203 Milestone 8 Appendices.xlsx”).

3.2 Objective 2

To record all identified coral specimens and their metadata (including haplotype/genetic data) and ensure storage of the physical specimens in an appropriate taxonomic collection.

Tissue subsamples were taken from all live-collected protected coral samples provided to ESNZ by Observers and stored with their corresponding NIC registration label in standard vials in 99% high grade absolute ethanol. The subsamples are currently stored in the NIC wet collection

along with the parent samples for long-term storage and curation, and their metadata managed by the NIC collection management software Specify database *niwainvert*.

3.3 Objective 3

To update relevant government coral identification and observer databases.

Expert identifications and relevant data (particularly trip, tow, and sample numbers, and initial Observer ID) of all physical specimens and specimens from images collected/photographed by Observers for this reporting period were provided to the ESNZ FDS for loading and table updates. ESNZ manages the COD database for FNZ and it is regularly updated with revised identifications when corals are returned from sea. In this process the generic three-letter MPI codes initially used by Observers to record unidentified corals are updated with the expert identification code. For example, SIA (Scleractinia) to COF (*Flabellum* spp. cup coral). Notes are also added with the expert identification, NIWA catalogue number, and date added to COD. For specimens from images, the MPI image file name and ESNZ image file name are also added. Note that the benthic table contains more information fields than the general catch table. The benthic table stores the three-letter MPI code for the observer ID as well as the expert ID, whereas the general catch table only stores one code, so the three-letter MPI code for the observer ID is overwritten by that of the expert ID.

Physical sample information of expert-identified coral specimens collected by fisheries research trawl surveys for this reporting period were extracted from *niwainvert* and provided to the ESNZ *trawl* database manager for loading and table updates. The matching process is based on trip number, tow number, and species.

These updates made to COD and trawl allow for the potential interactions between individual coral taxa and fishing gear to be better quantified and therefore help to identify factors that may have contributed to coral mortality.

3.4 Objective 4

To determine whether genetic taxonomic assessment of coral ID is an efficient means to determine or improve image-based or morphological coral ID, and to use genetic data to better understand coral bycatch.

After consultation with CSP, genetic analysis for the 2024-2025 year of the project focused on improving identifications and the characterisation of diversity among bubblegum corals (*Paragorgia* and *Sibogagorgia* spp.; Figure 3-1), an iconic group of protected corals belonging to the Family Coralliidae, which is regularly encountered as fisheries invertebrate bycatch (Anderson et al. 2017). Of the 23 currently accepted species of *Paragorgia* and *Sibogagorgia*, ten have been recorded from New Zealand (Macpherson et al. 2023), making the region a globally significant hotspot of bubblegum coral diversity (Sánchez 2005). An understanding of the impacts of commercial fishing on this natural diversity requires a sensitive and objective assessment of the breadth of species being encountered.

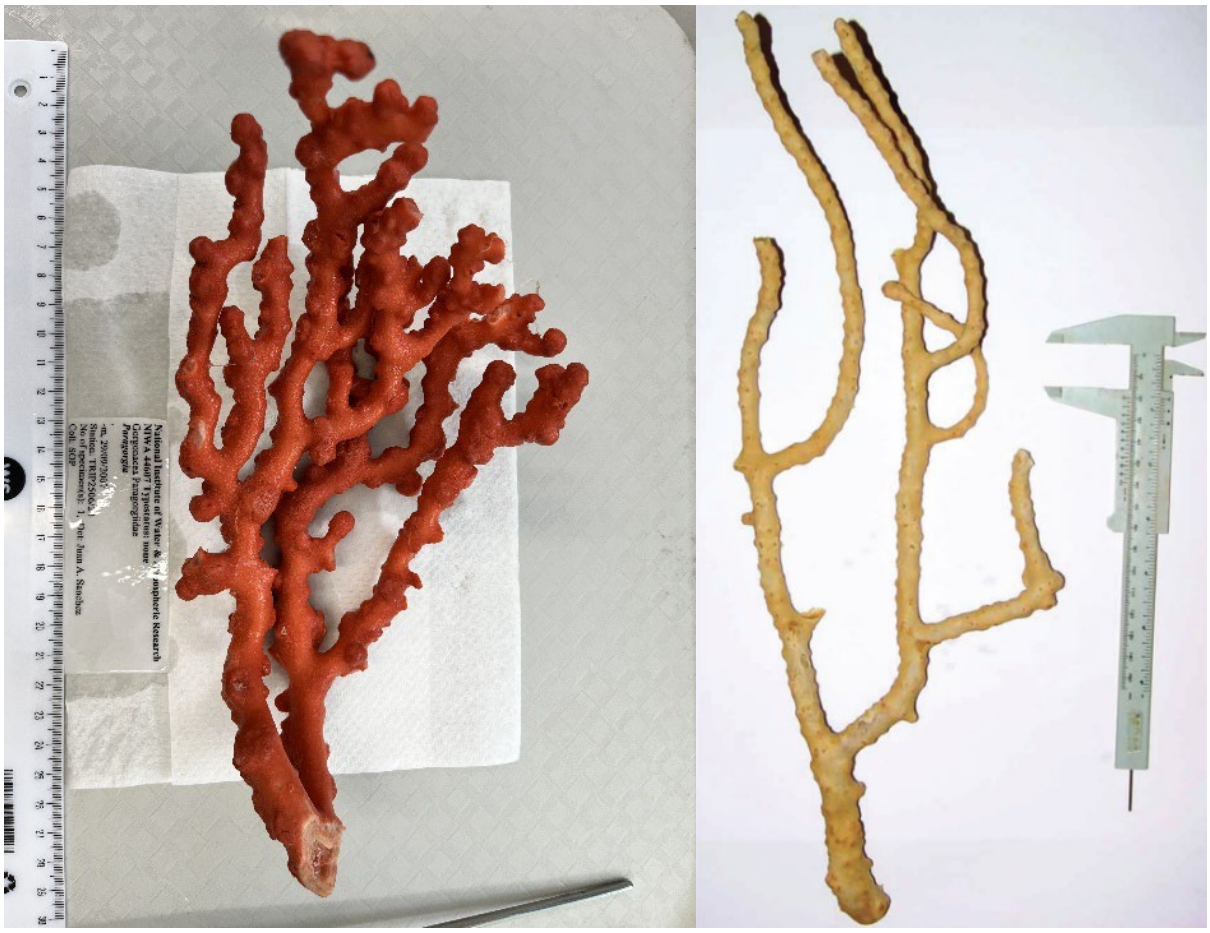

Figure 3-1: Photographs of examples of the bubblegum corals *Paragorgia* (left) and the holotype specimen of *Sibogagorgia dennisgordoni* (NIWA 3328) (right). This specimen of *Paragorgia* was included in the current study [left: J. Bilewitch, ESNZ; right: sourced from Sánchez (2005)].

Since the description of six endemic species by Sánchez (2005), no comprehensive genetic assessment of *Paragorgia* diversity had been conducted. Subsequent molecular systematic studies (Herrera et al. 2010; Herrera et al. 2016) included only a subset of New Zealand species and used small sample sizes (n=1-4) for those which were examined. Hence an assessment of species diversity among Observer-collected bycatch specimens was conducted this year, in conjunction with a molecular systematic assessment of the validity and relationships of documented bubblegum species in New Zealand. As in the previous year, this assessment used genome skimming to provide high-resolution DNA sequence data for Ultra-Conserved Elements (UCEs), which are commonly employed to resolve evolutionary and taxonomic relationships of octocorals (McFadden et al 2022; Quattrini et al. 2017).

The NIC currently holds 122 *Paragorgia* and two *Sibogagorgia* bycatch specimens collected by Observers by commercial fishing, plus 60 specimens obtained through other means (research expeditions and fisheries research trawls). A selection of these was made for genomic sequencing, with a geospatial focus on two regions with significant historical bottom trawling activity: FMA 4 (South East Chatham Rise) and FMA 6 (Subantarctic including Bounty Is and Pukaki Rise). For FMA 6, the north-eastern extent (the region between Campbell and Bounty Plateaus) was selected as it has provided the entirety of bubblegum coral bycatch specimens for the area and represents the same study area as used in the previous year for other protected octocoral groups (Macpherson et al. 2025b). The resulting shortlist of specimens for FMA 4 and FMA 6 comprised 69 Observer bycatch specimens plus 12 non-Observer-collected specimens

(Figure 3-2). Non-Observer specimens were selected based on taxonomic relevance (type material and rare species) and to improve coverage of regions that were under-represented by bycatch specimens (Figure 3-2: red datapoints). A specimen of the precious coral *Corallium* (NIWA 131527) was also included, to serve as an outgroup reference.

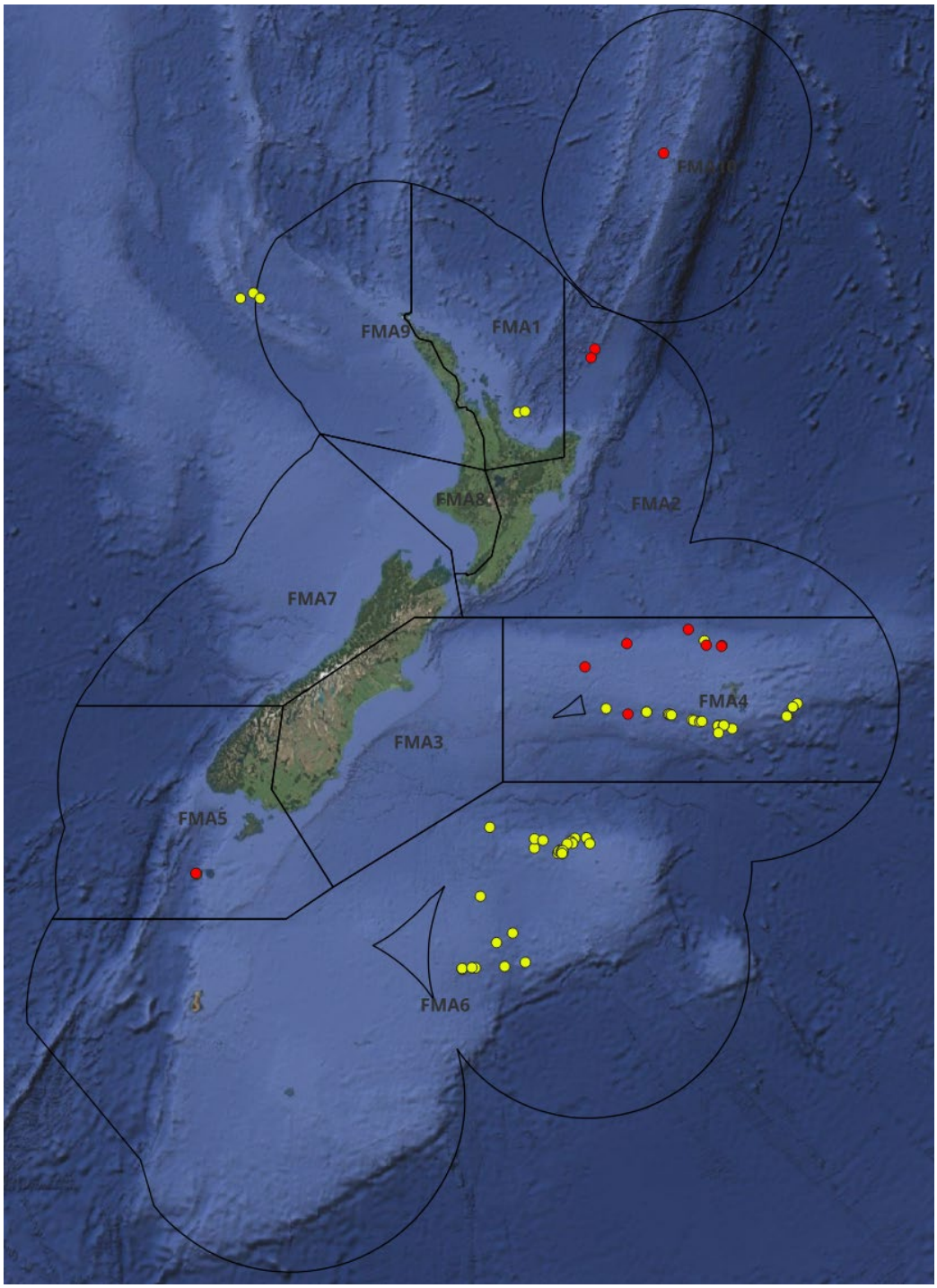

Figure 3-2: Selected specimens of bubblegum corals available within the NIC, with a focus on FMA4 and FMA6. Yellow circles represent the collection location of Observer bycatch specimens; red circles represent specimens obtained via other means. Black lines delineate the EEZ extent and FMA boundaries. Observer bycatch specimens from other FMAs include type material of three species and the sole record of *P. coralloides*. Reference specimens (non-Observer-collected) from other FMAs include type material for three species and reference specimens of the rare genus *Sibogagorgia*, a close relative of *Paragorgia*.

Selected specimens were obtained from the NIC and 50mg tissue samples were taken using sterilised forceps. Total genomic DNA was extracted from samples using a Qiagen DNeasy Blood & Tissue kit, following the manufacturer's protocol with several modifications; samples were digested with proteinase K at 56°C overnight and final elution used two volumes of 40µl. Resulting extracts were quantified using a Quant-iT PicoGreen dsDNA kit (Invitrogen) and samples yielding sufficient DNA were submitted to Livestock Improvement Corp. (Hamilton, NZ) for library preparation and 150bp paired-end genomic sequencing. Initial testing and library balancing was based on output from an iSeq 100 sequencer (Illumina) 2x150 test run, followed by full scale data production on a NovaSeq X sequencer (Illumina) using two lanes of a SP 300 flowcell.

Resulting DNA sequence data was processed as done in previous years (see Macpherson et al. 2025b for details), producing final DNA sequence alignments requiring either 70% or 80% of all samples to be represented at each UCE locus (70%- or 80%-'occupancy'). Additional reference data for genera of the Coralliidae were obtained from previous studies (McFadden et al 2022; Quattrini et al. 2024) and included in a phylogenetic analysis, with partitioning by UCE locus. Fourteen datasets for 'outgroup' genera (*Paraminabea, Anthomastus, Heteropolypus, Pseudoanthomastus,* and *Hemicorallium*) were included, plus four datasets for related 'ingroup' taxa (*Sibogagorgia dennisgordoni, S. cauliflora* [x2]*, Paragorgia johnsoni*).

Phylogenetic analysis was conducted to examine the evolutionary relationships and genetic diversity of sequenced specimens. *Exabayes* (Aberer et al. 2014) was used for Bayesian phylogenetic tree reconstruction and to estimate support values for resulting clades (posterior probabilities). For each occupancy dataset, four chains of $1x10^6$ generations were sampled every 1000 steps, with 5% discarded as burn-in prior to construction of consensus trees using only clades with ≥90% posterior probability support.

Additional comparative phylogenetic analysis was conducted using mitochondrial genes harvested as data byproducts in genome skimming datasets (Quattrini et al. 2024). Assembled contigs were queried in *MitoFinder* (Allio et al. 2020) with seed reference annotations obtained from whole coralliid mitochondrial genomes available in NCBI GenBank. The resulting predictions were subjected to blastn queries (blast.ncbi.nlm.nih.gov) to ensure sequences did not originate from contaminant organisms. Fourteen protein-coding and two ribosomal genes were concatenated for each sample, prior to alignment using *MAFFT* (Katoh & Standley 2013) with manual adjustment, and maximum likelihood phylogenetic analysis using *IQTree3* (Minh et al. 2020), with 1000 bootstrap replicates used to assess clade confidence. The analysis of mitochondrial genes was used as a semi-independent dataset for comparison to the UCE results (Quattrini et al. 2023).

3.5 Objective 5

> *To update and provide input into coral-relevant resources for Fisheries Observers, including reference material and material for Observer training.*

Consultation with the Conservation Services Programme throughout the year directs the work to be completed to meet this objective. Input into Observer refresher training occurs as MPI funding and Observer availability allows. One refresher training course was conducted this year which is presented in Macpherson et al. (2025c) and in section 4.5 of this report.

4 Results

4.1 Objective 1: To confirm or update identifications of coral bycatch reported by fisheries observers to the lowest taxonomic level

4.1.1 Identification of returned physical specimens

During the reporting period 1 July 2024 to 30 June 2025, a total of 25 Observer-collected protected coral specimens in 25 sample lots were received and processed by the NIC and have now been identified (Table A-1). A further 19 historical (i.e., collected prior to the current reporting year) specimens (in 18 samples) have been identified since delivery of the last final annual report (Macpherson et al. 2025b; Table A-2). Table 4-1 lists the number of specimens of each species identified this reporting period from Observer-collected samples.

Table 4-1: Expert identifications of physical specimens collected in 2024-2025 and historically, identified in the current reporting year, by number of specimens.

Class	Order	Family	Taxon	Reporting year	No. of specimens
Hexacorallia	Antipatharia		Antipatharia indet.	historical	1
		Leiopathidae	*Leiopathes*	historical	1
			Leiopathes acanthophora	2024-2025	1
		Schizopathidae	*Bathypathes*	2024-2025	2
			Bathypathes	historical	1
			Parantipathes cf. *robusta*	2024-2025	1
	Scleractinia	Caryophylliidae	*Caryophyllia profunda*	2024-2025	1
			Goniocorella dumosa	2024-2025	1
			Stephanocyathus platypus	2024-2025	2
		Flabellidae	*Flabellum*	2024-2025	1
		Madreporidae	*Madrepora oculata*	2024-2025	1
Hydrozoa	Anthoathecata	Stylasteridae	*Errina dendyi*	2024-2025	1
Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia* sp. 1	historical	4
			Acanthogorgia sp. 2	historical	2
			Acanthogorgia sp. 3	historical	1
			Anthomuricea	historical	1
			Discogorgia	historical	1
			Placogorgia	2024-2025	1
			Placogorgia	historical	3
		Alcyoniidae	*Anthothela*	2024-2025	1
		Plexauridae	*Swiftia*	2024-2025	1
		Rosgorgiidae	*Rosgorgia*	historical	3
			Rosgorgia sp. 2	historical	1
	Scleralcyonacea	Coralliidae	*Paragorgia arborea*	2024-2025	1
		Keratoisididae	*Keratoisis*	2024-2025	1
		Primnoidae	*Callogorgia*	2024-2025	1

Class	Order	Family	Taxon	Reporting year	No. of specimens
			Callozostron	2024-2025	1
			Dasystenella	2024-2025	1
			Metafannyella	2024-2025	1
			Pachyprimnoa?	2024-2025	1
			Primnoa notialis	2024-2025	3
			Tokoprymno maia	2024-2025	1
				Total	44

Further details of protected coral bycatch specimens collected between 1 July 2024 to 30 June 2025 including updated expert IDs is provided in the NIC Specify Database *niwainvert* extract (Table A-1) and presented in Figure 4-5.

Additionally, identifications are reported for six research trawl-collected protected coral specimens (in six samples), collected between 2010 and 2024. Data for these samples are included in Table A-3 and Figure 4-5.

The Earth Sciences New Zealand experts identifying physical specimens returned during this reporting period are shown in Table 3-1.

A non-statistical summary of the accuracy of Observer ID is presented for this period and will be useful for on-going Observer training exercises. For the current reporting year Observers correctly identified 20 of the 25 samples, with four samples correctly identified to species level (*Goniocorella dumosa* – GDU, *Stephanocyathus platypus* – STP, *Paragorgia arborea* – PAB, and *Primnoa notialis* – PMN), four to genus level (*Leiopathes* spp. – LEI, *Flabellum* spp. – COF, *Swiftia* – SWI, *Keratoisis* – BOO), eleven to order level (Antipatharia – COB, Scleractinia – SIA and Malacalcyonacea and Scleralcyonacea - GOC) and one correctly identified as an unknown coral – COU. This indicates an 80% accuracy of Observer code use overall for the physical samples, regardless of the taxonomic level of the ID (see colour coding in Table A-1). Observer accuracy of code use was much lower in the previous two reporting years (56% accuracy of code use in Macpherson et al. 2025b; 55% accuracy of code use in Connell et al. 2024).

Four of the samples were incorrectly identified by Observers. One of the samples was assigned to the correct family Primnoidae, but an incorrect genus level code was used: THO (*Thouarella*) instead of DSY (*Dasystenella*), however these are easily confused taxa. Similarly, the code for family Plexauridae (PLE) was used incorrectly for a *Placogorgia* coral (PLO) from family Acanthogorgiidae. Plexaurids and acanthorgorgiids recently have been taxonomically reviewed so it is not surprising that there is some confusion over the recognition of these taxa. One sample was assigned to the wrong order level: a *Callogorgia* primnoid coral was assigned as a black coral (COB) (Figure 4-1). Finally, one specimen of solitary bowl coral *Stephanocyathus platypus* (STP) was coded as UNF – 'unidentified'. This code is not linked to any specific animal group.

One live specimen of primnoid coral *Metafannyella* (MEF) was split off from a lot containing dead *Madrepora oculata* which was correctly coded by the Observer as a stony coral, Scleractinia (SIA).

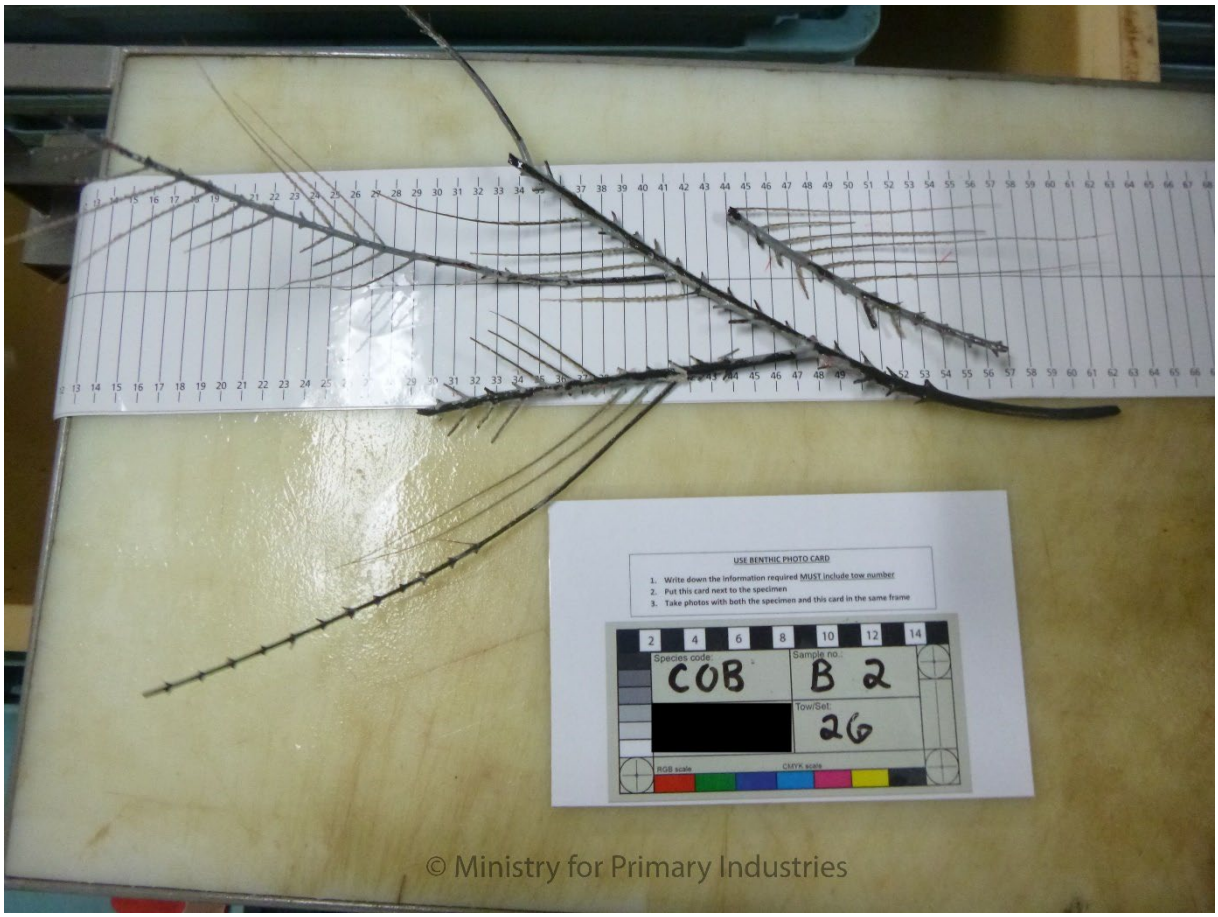

Figure 4-1: A specimen of a *Callogorgia* (CLG) primnoid coral mistakenly identified as a black coral (COB). Further inspection of the polyps show it is a primnoid octocoral (NIWA 173102). The dark coloured skeleton can be confused with the general appearance of a black coral skeleton.

4.1.2 Identification of specimens from images

During the reporting period 1 July 2024 to 30 June 2025, ESNZ received 154 digital images and one digital video file. All images and videos were reviewed and 29 of the images were not processed for identification, for reasons explained in the Methods section 3.1.2 (e.g., location outside of EEZ, non-protected coral taxon). A summary of the digital files received are presented in Table C-1.

Of the 125 images and one video processed there were a total of 115 images and one video taken of protected coral taxa and 10 images taken of non-coral or non-protected coral taxa. All processed image and video files were able to be georeferenced.

In total, approximately 6162 specimens were identified from the 125 images and one video that were processed. Four specimens were collected from beyond the New Zealand EEZ on the Lord Howe Rise (HOWE) and the remaining specimens were from within the EEZ. The number of specimens differs from the number of images because sometimes there are multiple images of the same specimen and sometimes multiple specimens in one image. Of the 6162 specimens, 6145 were protected coral taxa. The remaining 17 specimens were determined to be non-protected taxa including hydroids, sea pens, sponges and bryozoans (Table 4-2).

Table 4-2: Expert identifications of specimens from images by number of specimens and the count of distinct tows they were caught in.

Phylum	Class	Order	Superfamily; Family	Genus	Species	Protected species	No. of specimens	Count of tows
Bryozoa						N	1	1
Chordata					Bone	N	1	1
Cnidaria	Hexacorallia	Antipatharia	Leiopathidae	*Leiopathes*		Y	1	1
					acanthophora	Y	1	1
			Myriopathidae	*Antipathella*		Y	1	1
			Schizopathidae	*Bathypathes*		Y	4	4
				Dendrobathypathes		Y	1	1
				Parantipathes	cf. *robusta*	Y	1	1
			Stylopathidae	*Tylopathes*		Y	1	1
		Scleractinia	Caryophylliidae	*Desmophyllum*	*dianthus*	Y	36	5
				Goniocorella	*dumosa*	Y	13	9
				Solenosmilia	*variabilis*	Y	6002	3
			Flabellidae	*Flabellum*		Y	2	2
					knoxi	Y	34	6
			Madreporidae	*Madrepora*	*oculata*	Y	5	5
			Stephanocyathidae	*Stephanocyathus*	*platypus*	Y	1	1
	Hydrozoa	Anthothecata	Stylasteridae			Y	1	1
		Leptothecata				N	1	1
			Zygophylacidae	*Cryptolaria*		N	2	2
			Plumularioidea			N	3	3
	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia*		Y	1	1
				cf. *Acanthogorgia*		Y	1	1
				Placogorgia		Y	1	1
			Plexauridae	*Swiftia*		Y	2	2
		Scleralcyonacea	Chrysogorgiidae	*Radicipes*		Y	2	2
			Coralliidae	*Paragorgia*		Y	8	7
					arborea	Y	1	1
			Keratoisididae	*Acanella*		Y	2	2
				cf. *Lepidisis*		Y	1	1
				Isidella		Y	1	1
				Keratoisis		Y	10	9
			Mopseidae	cf. *Minuisis*		Y	1	1
			Primnoidae	*Callogorgia*		Y	3	3
				cf. *Primnoa*		Y	1	1
				Primnoa		Y	1	1

Phylum	Class	Order	Superfamily; Family	Genus	Species	Protected species	No. of specimens	Count of tows
					notialis	Y	2	2
				Thouarella		Y	2	2
				Tokoprymno	*maia*	Y	1	1
			Pennatuloidea; Balticinidae	cf. *Balticina*		N	7	2
Porifera						N	1	1
	Demospongiae	Poecilosclerida	Coelosphaeridae	*Coelosphaera*		N	1	1
Total							6162	66

Of this specimen count, approximately 6000 specimens were identified from four images alone, from one large single capture of stony branching coral *Solenosmilia variabilis* (SVA) from the Chatham Rise (SOE, FMA 4) by bottom trawl targeting orange roughy. The weight of the catch was estimated at 6000 kg, and the coral was broken into fragments which were an assortment of live-captured and already dead (Figure 4-2). Colonies of this species produce large three-dimensional matrices that form reefs, mounds or thickets composed of dead coral framework nearer to the seafloor in the lower zone and living coral growing outwards away from the seafloor in the upper zone (Tracey et al. 2019; Figure 4-2). For the purpose of estimating a specimen count, one large unbroken matrix equals roughly 1kg and therefore there were approximately 6000 broken matrices.

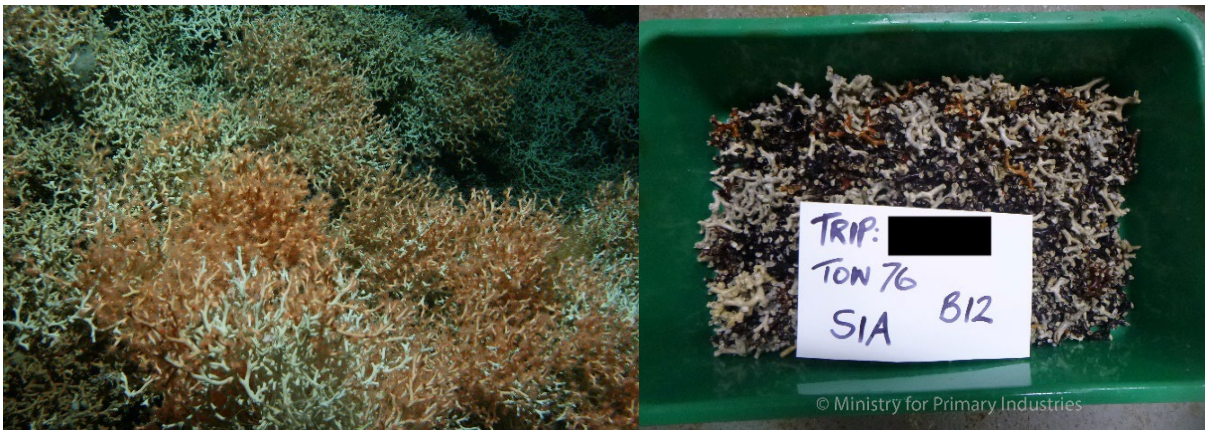

Figure 4-2: Large matrices of *Solenosmilia variabilis* in situ (left); a mixture of long-dead, dead and live-caught broken fragments (right). [left: DTIS, ESNZ; right: Observer, FNZ].

For the remainder of protected corals species, stony cup corals *Desmophyllum dianthus* and *Flabellum knoxi* were the most abundant with 36 and 34 specimens caught between five and six tows, respectively. Thirteen specimens of *Goniocorella dumosa* was collected by nine tows. For the gorgonian octocorals, bamboo coral *Keratoisis* and bubblegum coral *Paragorgia* were the most abundant with 10 and eight specimens caught between nine and seven tows, respectively. Four specimens of back coral *Bathypathes* were caught from four tows. See Figure 4-3 for a selection of protected coral specimens identified by images during this reporting period.

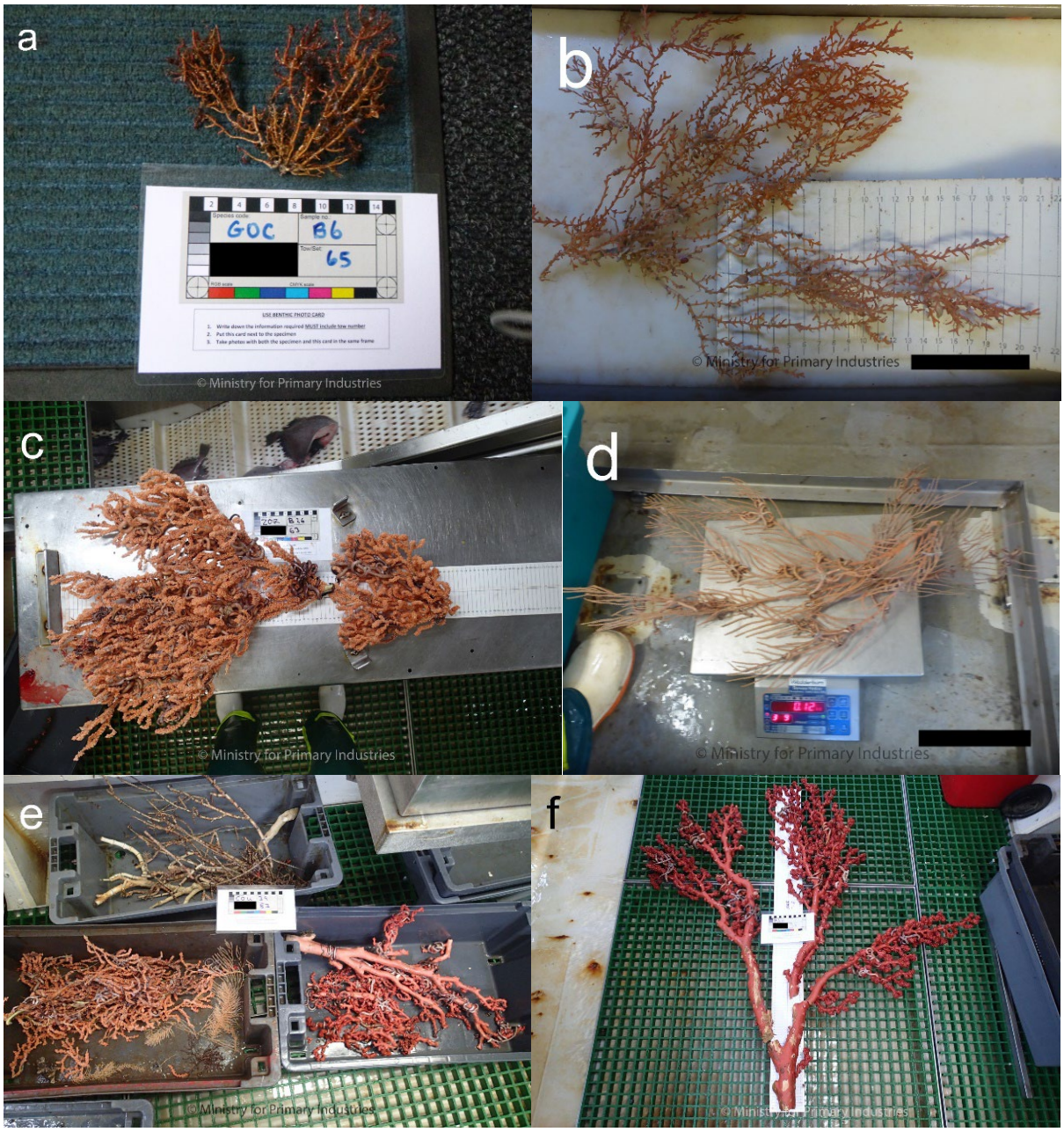

Figure 4-3: A selection of images showing protected coral species identified during this reporting period. a) bamboo coral *Acanella*; b) bamboo coral cf. *Lepidisis*; c) primnoid coral *Primnoa notialis* (NIWA 173125); d) primnoid coral *Callogorgia*; e) fish bins containing bamboo coral *Keratoisis*, bubblegum coral *Paragorgia*, and primnoids cf. *Primnoa*, *Thouarella* and *Callogorgia*; f) bubblegum coral *Paragorgia*; g) plexaurid coral *Swiftia*; h) the elongate form of stony cup coral *Desmophyllum dianthus*; i) stony cup coral *Flabellum knoxi*; j) stony branching coral *Goniocorella dumosa*; k) black coral *Tylopathes*; l) black coral *Bathypathes*.

Figure 4-3a: A selection of images showing protected coral species identified during this reporting period. a) bamboo coral *Acanella*; b) bamboo coral cf. *Lepidisis*; c) primnoid coral *Primnoa notialis* (NIWA 173125); d) primnoid coral *Callogorgia*; e) fish bins containing bamboo coral *Keratoisis*, bubblegum coral *Paragorgia*, and primnoids cf. *Primnoa*, *Thouarella* and *Callogorgia*; f) bubblegum coral *Paragorgia*; g) plexaurid coral *Swiftia*; h) the elongate form of stony cup coral *Desmophyllum dianthus*; i) stony cup coral *Flabellum knoxi*; j) stony branching coral *Goniocorella dumosa*; k) black coral *Tylopathes*; l) black coral *Bathypathes*.

No formal analyses of accuracy have been carried out between Observer and expert identifications, such as those presented in Parker et al. (2009), but a non-statistical summary of the accuracy of the Observer ID is presented for this period. The initial Observer three-letter identification codes were sourced from the best matched benthic record in COD, rather than relying on the label showing in the image or the Observer Benthic Materials Forms as in previous years, as the codes can change from the time they are written on the label to when they are entered into COD (as described in Methods section 3.1.3). This summary applies to all expertly identified specimens including non-corals (6162 specimens) but for simplicity the large 6000 kg catch (6000 specimens) of *Solenosmilia variabilis* (SVA) is excluded and the remaining 162 specimen count is used to calculate the following percentages:

During this reporting period, Observers correctly assigned genus or species codes to 68 specimens (42%). In addition, 73 (45%) specimens were correct to the level of family and/or order, meaning that either a higher-level coral code was given by the Observer and the expert identified to a lower taxonomic level, or an incorrect coral code was recorded by the Observer at species/genus level but that identification was correct to the level of family and/or order. Note that the large 6000 SVA specimen catch falls into this category as it was initially identified by the Observer as Scleractinia (SIA; order level). Eight specimens (4.9%) given coral codes were identified by experts as not corals, i.e. the Observer identified five specimens as coral unidentified (COU), but the experts identified them as hydroids (CRT, HDF, HDR) (Figure 4-4) or bone (FRA). Other examples include mistakenly confusing two black corals (DEN) with hydroids (CRT, HDF) (Figure 4-4), and a cup coral (CUP) with a bryozoan (COZ). There were four specimens of protected coral that were identified incorrectly by the Observer as other types of protected corals: three specimens were identified by Observers as black coral (COB) but were expertly identified as primnoid octocorals *Acanthogorgia* (ACC) and *Callogoria* (CLG), and bamboo coral *Keratoisis* (BOO). The inverse was also noted as the Observer mistakenly identified a black coral *Tylopathes* (TYL) as a gorgonian octocoral (GOC).

There were nine specimens that were not given an initial ID by the Observer as they were recorded and identified by experts as extra specimens showing in an image during expert examination, i.e. they were not recorded into the benthic table by the Observer on board. These include seven protected coral specimens identified as primnoids *Callogorgia* and *Primnoa notialis* (PMN), stony corals *Desmophyllum dianthus* (DDI), *Goniocorella dumosa* (GDU) and *Madrepora oculata* (MOC), and two non-protected sponges.

Figure 4-4: Different species of hydroids (non-protected) mistakenly identified as coral unidentified (COU; top) and black coral *Dendrobathypathes* (DEN; bottom).

4.2 Objective 2: To record all identified coral specimens and their metadata (including haplotype/genetic data) and ensure storage of the physical specimens in an appropriate taxonomic collection

All specimens are registered and stored in the NIC in Wellington and all associated specimen metadata is registered in *niwainvert*.

During this reporting period, tissue subsamples were taken from 20 specimens from all live-caught Observer collected protected coral samples. Not all specimens returned had sufficient live tissue for subsampling. Accumulated protected coral tissue subsamples retained for future genetic studies now number 198, and CSP funded projects using these samples for molecular studies have been carried out or are underway (e.g., see Bilewitch & Tracey 2020a, 2020b; Bilewitch 2022; Bilewitch 2024; Connell et al 2024; Macpherson 2025b).

4.3 Objective 3: To update relevant government coral identification and observer databases

4.3.1 Summary of physical specimen data loading processes into COD

The revised physical specimen identifications from the *niwainvert* database for the current reporting year (1 July 2024–30 June 2025) and historical samples were provided for uploading into COD. The COD extract summary is provided in Table B-1.

As described in Methods section 3.1.3, there are two main tables in COD which are used for this project - the “benthic” (y_benthic) table and the “general catch” (x_fishing_event_catch) table. Records entered into the benthic table are also entered into the general catch table, which contains all catch records (not just those of benthic species), but the benthic table does not hold general catch information. Records (i.e. rows) from both need to be interrogated in case a coral record has been added to the general catch table and not the benthic one, so that the best possible match is made.

Of the 43 rows of Observer-collected physical specimen data (25 current year, 18 historical) provided for uploading into COD:

- 30 specimens were matched in the benthic table.
- 7 specimens were inserted into the benthic table.
- 5 specimens were matched on the general catch table only.
- 1 specimen were inserted into the general catch table only.

4.3.2 Data summaries and locality plot for physical specimen identifications

Data summaries for the physical specimens identified from Observer collected protected coral samples in the current reporting year (1 July 2024–30 June 2025) and historical samples are provided below. These include a count by Fisheries Management Area (FMA) (Table 4-3) and a count of tows and specimens by fishing method and target fishery (Table 4-4, Table B-2). Also see Figure 4-5 that illustrates the geographic spread of physical sample coral bycatch in the region.

Some physical samples were collected from extra territorial (ET) areas beyond the New Zealand EEZ, which were two historical physical samples each from the Lord Howe Rise (HOWE) and the Challenger Plateau (CET).

Table 4-3: Summary of protected coral samples/specimens by Fisheries Management Area (FMA) or from high seas regions (ET), for Observer collected protected coral.

(a) Collected during the current reporting year (1 July 2024-30 June 2025).

FMA	Description	Count of samples	No. of specimens
SEC	South East Coast (FMA 3)	14	14
SOE	South East (Chatham Rise) (FMA 4)	7	7
CEE	Central East (FMA 2)	3	3
SUB	Subantarctic incl. Bounty Is and Pukaki Rise (FMA 6)	1	1
Total from all areas		**25**	**25**

(b) Historical samples identified in this reporting period.

FMA	Description	Count of samples	No. of specimens
SUB	Subantarctic incl. Bounty Is and Pukaki Rise (FMA 6)	8	9
SOE	South East (Chatham Rise) (FMA 4)	3	3
CET	Challenger Plateau, beyond the EEZ (ET)	2	2
HOWE	Lord Howe Rise (ET)	2	2
SOU	Southland (FMA 5)	2	2
AKE	Auckland East (FMA 1)	1	1
Total from all areas		**18**	**19**

Table 4-4: Count of tows and samples/ specimens by fishing method and target fishery for physical specimens. (a) Samples collected in the current reporting year (1 July 2024–30 June 2025). BT = Bottom Trawl, BLL = Bottom Longline.

Target Fishery (Common Name)	Code	Fishing method code	Count of tows	Count of samples	No. of specimens
Smooth oreo	SSO	BT	8	16	16
Alfonsino & long-finned beryx	BYX	BT	2	3	3
Orange roughy	ORH	BT	2	2	2
Scampi	SCI	BT	1	2	2
Hoki	HOK	BT	1	1	1
Ling	LIN	BLL	1	1	1
Total				**25**	**25**

(b) Historical samples identified in this reporting period. BT = Bottom Trawl.

Target Fishery (Common Name)	Code	Fishing method code	Count of tows	Count of samples	No. of specimens
Black oreo	BOE	BT	6	6	6
Orange roughy	ORH	BT	5	5	5
Oreos	OEO	BT	2	2	3
Cardinalfish	CDL	BT	1	2	2
Hoki	HOK	BT	1	1	1
Ling	LIN	BT	1	1	1
Smooth oreo	SSO	BT	1	1	1
Total				**18**	**19**

For the current reporting period, most protected corals identified from physical specimens came from SEC South East Coast (FMA 3) management area (OEO 3A) bottom trawling for smooth oreo, and one specimen from bottom trawling for hoki. These specimens represented a range of protected species, including black corals, bamboo corals, bubblegum coral and stony cup coral, primnoids and other gorgonian octocorals. The remainder of the specimens were captured from SOE South East (Chatham Rise) (FMA 4) targeting smooth oreo, scampi and orange roughy, and CEE Central East (FMA 2) targeting alfonsino & long-finned beryx. One specimen was captured by bottom longlining targeting ling from SUB (Subantarctic) (FMA 6). These specimens represented further species of black corals, primnoids and stony corals, and a hydrocoral.

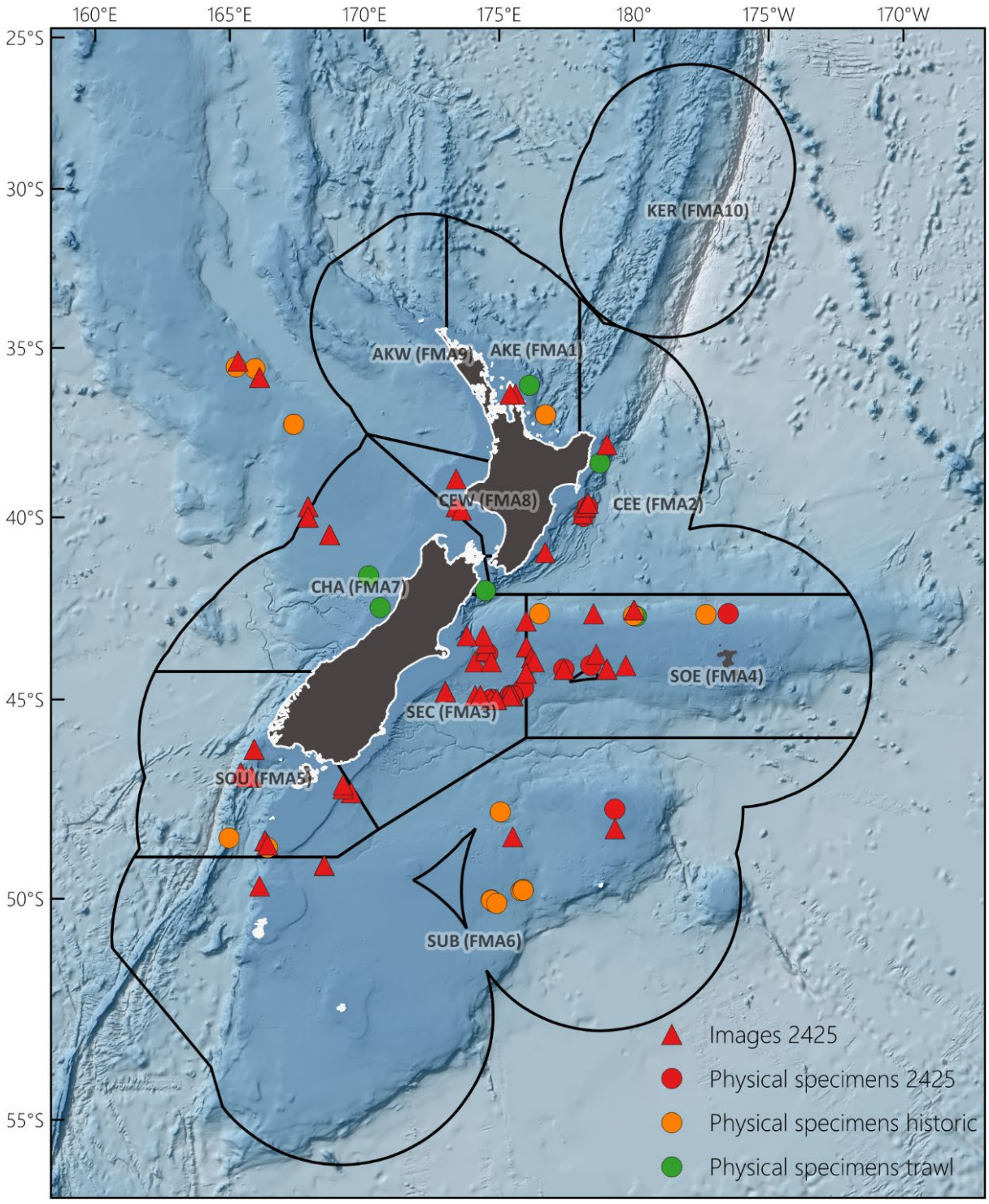

Figure 4-5: Location of identified protected coral samples within Fisheries Management Areas (FMAs). Red circles: current year physical samples; orange circles: historical physical samples; green circles: research trawl survey physical samples; red triangles: current year images. Some historical physical specimens and current year images were identified from ET areas within the map area beyond the EEZ to the northwest, from the Challenger Plateau (CET), Lord Howe Rise (HOWE).

4.3.3 Summary of specimens from images data loading into COD

The revised identifications of the specimens from images in the current reporting year (1 July 2024 – 30 June 2025) were provided for uploading into COD.

In total, 143 digital files were provided which consists of 125 images and one video, and 17 duplicate images (due to some images showing more than one protected coral taxa, these were duplicated so that the expert identification of each taxon could be uploaded/updated). Of the 143 files:

- 133 images (87 table rows/items) were matched in the benthic table.
- 10 images (7 table rows/items rows) were inserted into the benthic table.

4.3.4 Data summaries and locality plot for specimens from images identifications

Data summaries for the protected coral specimens identified from images in the current reporting year (1 July 2024 – 30 June 2025) are provided below. These include a count by FMA (Table 4-5) and a count of tows and protected coral specimens by fishing method and target fishery (Table 4-6; Table C-2). Also presented is a summary of the number tows with images of more than one species of protected coral (Table 4-7) and the number of tows that a protected coral species is caught across (Table 4-8). For simplicity, these tables exclude the large 6000 specimen catch of *Solenosmilia variabilis* mentioned in section 4.1.2. Also see Figure 4-5 that illustrates the geographic spread of protected coral bycatch from digital images in the region.

These data summaries only report on the number of specimens counted from digital images, and no reporting is done on unphotographed protected coral bycatch that is recorded by Observers in the benthic or general catch tables.

Table 4-5: Protected coral specimens from images by Fisheries Management Area (FMA), ordered by specimen count. *plus large 6000 specimen SVA catch

FMA	Description	No. of specimens
SEC	South East Coast (FMA 3)	61
SOE	South East (Chatham Rise) (FMA 4)	55*
CEE	Central East (FMA 2)	9
SOU	Southland (FMA 5)	7
CHA	Challenger (Central Plateau) (FMA 7)	4
HOWE	Lord Howe Rise (ET)	4
AKE	Auckland East (FMA 1)	2
SUB	Subantarctic (FMA 6)	2
SOU – SEC	Southland (FMA 5) to South East Coast (FMA 3)	1
	Total	145

Table 4-6: Count of tows by fishing method and target fishery for protected coral specimens from images. BT = Bottom Trawl, MW = Midwater Trawl, BLL = Bottom Longlining, POT = Potting. *plus large 6000 specimen SVA catch

Target fishery (common name)	Code	Fishing method code	Count of tows	No. of specimens
Hoki	HOK	BT	6	62
Smooth oreo	SSO	BT	12	32
Orange roughy	ORH	BT	17	19*
Alfonsino & long-finned beryx	BYX	BT	3	7
Scampi	SCI	BT	4	6
Ling	LIN	POT	2	4
Arrow squid	SQU	BT	2	4
Ling	LIN	BT	2	2
Oreos	OEO	BT	1	2
Snapper	SNA	BT	2	2
Barracouta	BAR	BT	1	1
Black oreo	BOE	BT	1	1
Ling	LIN	BLL	1	1
Southern blue whiting	SBW	MW	1	1
White warehou	WWA	BT	1	1
		Total	56	145

Table 4-7: Count of tows by number of coral taxa photographed.

Number of different coral taxa	Number of tows
1 taxon of coral was photographed	44
2 taxa of coral were photographed	7
3 taxa of coral were photographed	2
5 taxa of coral were photographed	1
6 taxa of coral were photographed	1
7 taxa of coral were photographed	1

Table 4-8: Count of tows in which a coral taxon was caught.

Coral taxon	Code	Number of tows caught in
Goniocorella dumosa, Keratoisis	GDU, BOO	9
Paragorgia	PAB	7
Flabellum knoxi	COF	6
Desmophyllum dianthus, Madrepora oculata	DDI, MOC	5
Bathypathes	BTP	4
Callogorgia, Solenosmilia variabilis	CLG, SVA	3
Acanella, Flabellum, Primnoa notialis, Radicipes, Swiftia, Thouarella	ACN, COF, PMN, RAD, SWI, THO	2
Acanthogorgia, cf. Acanthogorgia, Antipathella, Dendrobathypathes, Isidella, Leiopathes, Leiopathes acanthophora, cf. Lepidisis, cf. Minuisis, Paragorgia aborea, Paratipathes cf. robusta, Placogorgia, Primnoa, cf. Primnoa, Stephanocyathus platypus, Stylasteridae, Tokoprymno maia, Tylopathes	ACC, AHL, DEN, ISP, LEI, LLE, MIN, PAB, PTP, PLO, PMN, STP, COR, TOK, TYL	1

The FMAs with the highest number of photographed protected coral bycatch specimens were the SEC South-East Coast (FMA 3) and SOE South-East (Chatham Rise) (FMA 4) regions, with CEE Central East (FMA 2) the next highest. Four specimens were collected from the Lord Howe Rise (HOWE) extra territorial (ET) area beyond the New Zealand EEZ. The bottom trawl operations which collected the highest number of photographed protected coral specimens (excluding the 6000 kg SVA catch) were those targeting hoki across only six tows, and these were mostly stony corals *Desmophyllum dianthus* (DDI) and *Flabellum knoxi* (COF). The next highest were those targeting smooth oreo and orange roughy which collected a diverse selection of octocorals, bamboo corals, bubblegum corals, black corals and stony corals.

4.4 Objective 4: Determine whether genetic taxonomic assessment of coral ID is an efficient means to determine or improve image-based or morphological coral ID, and to use genetic data to better understand coral bycatch

Of the 69 Observer bycatch and 12 non-bycatch bubblegum coral samples prioritised for genomic analysis, 66 and 12 (respectively) were located and sampled for further processing. DNA extraction produced an average concentration of 48.8ng/ul for bycatch and 59.2ng/ul for non-bycatch. Of these, 60 bycatch and 11 non-bycatch samples were selected for DNA sequencing via genome skimming; the remaining samples were excluded as they had low DNA concentrations, they represented taxa already sampled in their collection area, or they had data already available from other studies.

DNA sequencing data was successfully produced for 71 samples plus an additional *Corallium* sample. After quality control, the combined data output from one preliminary iSeq run plus two lanes of a NovoSeq run resulted in an average of 25 million reads per sample (range: 0.7-43.9),

or 3.4 billion basepairs of DNA sequence per sample. Matching of assembled DNA contigs to *octocoral-v2* baits resulted in an average of 1900 UCE loci (range: 8-2468) but matching was highly variable and ranged from less than 100 loci (5 samples) to over 2400 loci (10 samples) (Appendix D). Four bycatch and two non-bycatch samples were excluded due to insufficient UCE loci (<200), leaving 56 bycatch and 9 non-bycatch samples for final phylogenomic analysis (Figure 4-6).

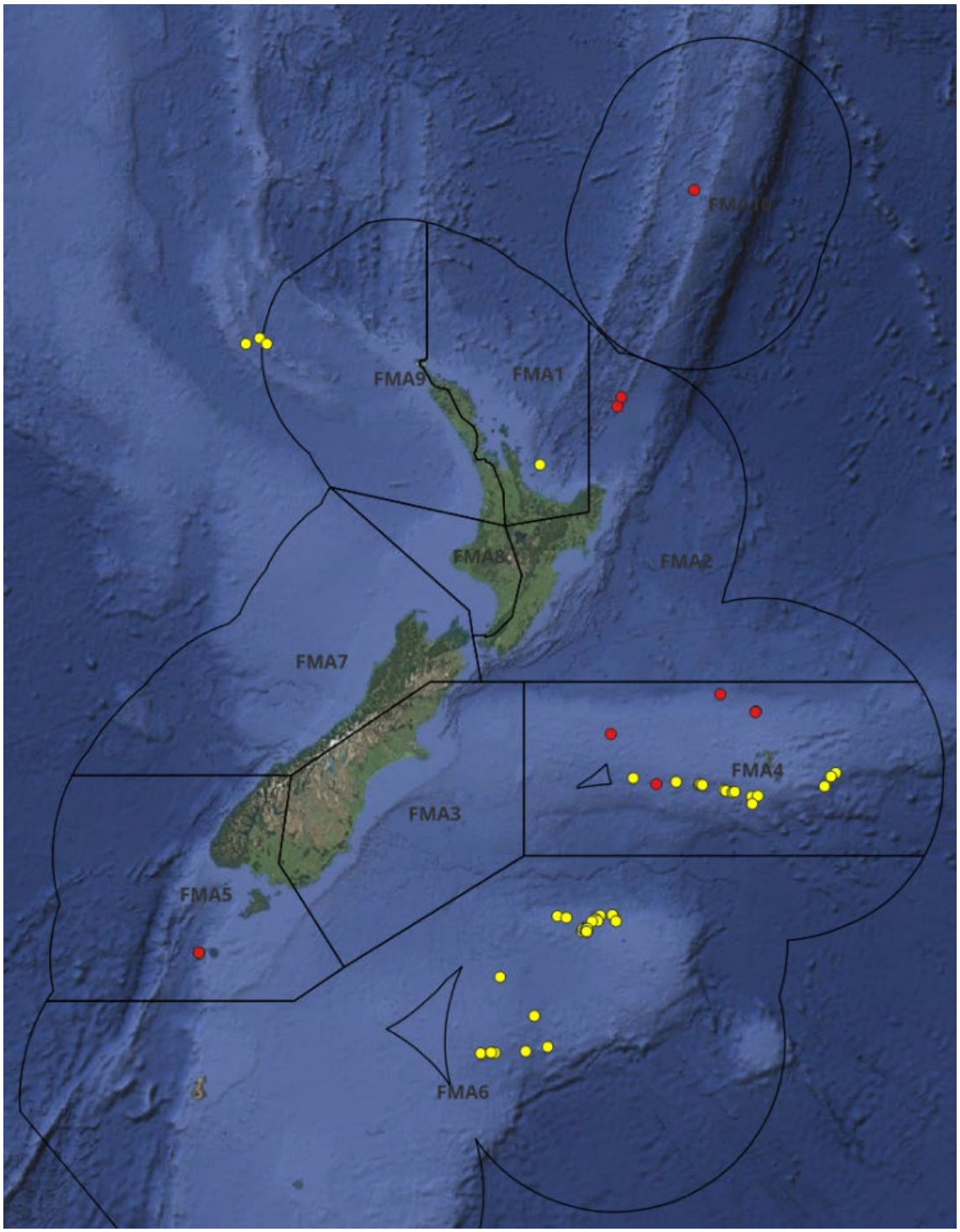

Figure 4-6: Distribution of bubblegum coral specimens included in final UCE data analysis. Yellow = observer-collected bycatch; red = non-bycatch.

The final DNA alignment matrix for UCE analysis consisted of 1,392,289 bp across 1984 loci for the 70% occupancy dataset and 558,714bp across 754 loci for the 80% occupancy matrix. Both datasets included 85 samples in total, after addition of data from previous studies (McFadden et al. 2022, Quattrini et al. 2024). Bayesian analysis produced phylogenetic trees that were congruent for both datasets; only the 80% occupancy results are presented here since they represent the more conservative results.

The results of the UCE phylogenetic analysis of bubblegum corals are shown in Figure 4-7. Most included specimens of *Paragorgia* belonged to one of two large assemblages: *P. arborea* or *P. alisonae*. The remaining bycatch specimens consisted of unknown or less common taxa that were represented as singletons: *P. kaupeka* (n=1), *P. coralloides* (n=1), *P. maunga* (n=1), and a clade containing two specimens misidentified as *P. alisonae* (66159) and *cf. Sibogagorgia* (88590) that did not correspond to any readily recognisable taxon.

Within the *P. alisonae* clade, three specimens were misidentified as *P. kaupeka* (47202), *P. aotearoa* (65925), and *P. arborea* (146463). No included specimens within the *P. arborea* clade were misidentified. No Observer-collected specimens of *Sibogagorgia* were present; three sequenced specimens originated as non-bycatch and a single observer-collected specimen was a misidentified *Paragorgia* specimen (88590). These results indicate that morphological identification accuracy for more common bubblegum coral taxa (*P. arborea, P. alisonae*) appears to be high but identification of less common *Paragorgia* taxa is more uncertain. As indicated in previous reports (Connell et al. 2024, Macpherson et al. 2025b), the use of genomic approaches is warranted in these cases where the identification of esoteric species and recognition of undescribed species are required.

The results of the UCE analysis confirm a minimum of six species of *Paragorgia* are represented among commercial fisheries bycatch: *P. arborea, P. alisonae, P. kaupeka, P. coralloides, P. maunga,* and an unidentified taxon. However, much genetic variation exists within each clade of *P. alisonae* and *P. arborea*, which may represent intraspecific population/regional diversity or further cryptic, undescribed species among bycatch and non-bycatch specimens. Disentangling these influences will require a more detailed population genomic analysis of how variation is partitioned and shared among specimens and regions. This was beyond the scope of the current project but is recommended for future investigation.

No clear distribution patterns between FMA 4 and FMA 6 were observed for any taxa that were well sampled (Figure 4-6). Both *P. arborea* and *P. alisonae* were present across both regions, with most samples originating from the southern flank of the Chatham Rise, the northern flank of the Bounty Plateau, and the Pukaki Saddle (between Bounty and Campbell Plateaus). Uncommon and reference taxa appeared to be more restricted in their distribution, likely as a result of under sampling: *Sibogagorgia* is only recorded from the Kermadec/Rangitāhua region (FMA 2, FMA 10), *P. aotearoa* is only recorded from the northern flank of the Chatham Rise (FMA 4), *P. kaupeka* is known from the holotype locality in the western Bay of Plenty (FMA 1), *P. maunga* and *P. coralloides* are only recorded from the northeastern edge of the Challenger Plateau (FMA 9), and the unknown taxon represented by the two misidentified specimens is present in FMA 9 (northeastern Challenger Plateau) and FMA 6 (Pukaki Saddle). Whether these taxa represent regional endemics with highly restricted distributions or more widespread species that are frequently mis-identified as *P. arborea* and *P. alisonae* cannot be determined but further genetic identification of other bubblegum coral specimens could uncover additional records and provide insights into the extent of their distributional range.

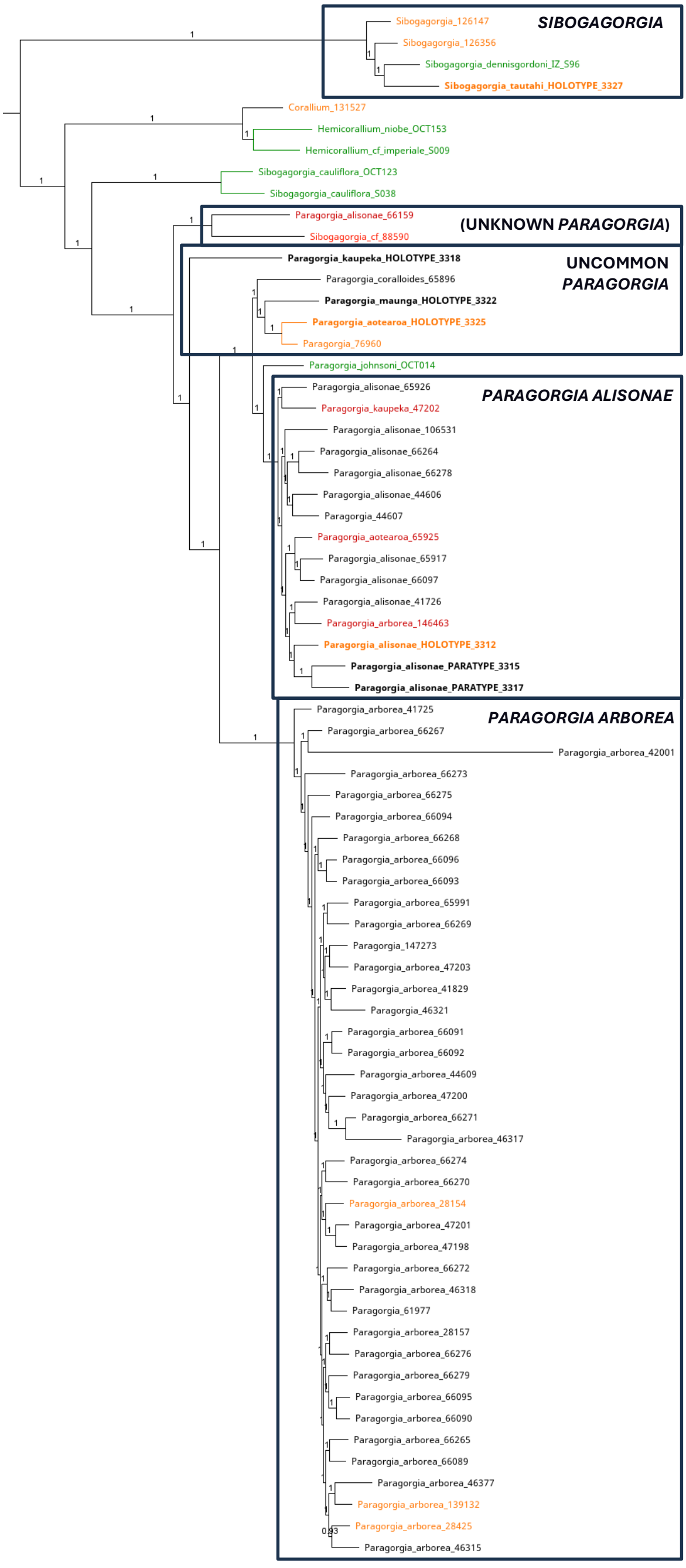

Figure 4-7: Bayesian phylogenetic analysis of 80% occupancy UCE dataset. Red = misidentified bycatch specimens; Orange = non-bycatch specimens; boldface = taxonomic type specimens; Green = data obtained from previous studies (includes non-New Zealand taxa).

Extraction of mitochondrial genes from genome skimming sequence data successfully produced DNA sequence data for all 14 protein-coding genes plus both ribosomal genes, although not all genes were recovered for all samples. At least 64 samples produced DNA sequence for each gene, with the highest number of samples (69) producing DNA sequence for the *mtMutS* gene (a key marker for octocoral molecular systematics). Concatenation of all 16 gene sequences produced a final alignment matrix consisting of 18,548 bp across all 71 samples (including *Corallium*).

Phylogenetic analysis of the concatenated mitogenomic dataset resulted in a tree that was mostly (but not entirely) congruent with the UCE analysis and which allowed the inclusion of data for three additional bycatch specimens and two non-bycatch specimens (Figure 4-8). This increases the number of bubblegum coral species represented among commercial fisheries bycatch to a minimum of seven, through the addition of a single specimen of *P. whero* (3436).

Three of the additional specimens represented holotypes of uncommon *Paragorgia* and *Sibogagorgia* species, which added further taxonomic context to the analysis: *Paragorgia wahine* appears as another singleton specimen among the clade of uncommon *Paragorgia* while *P. whero* is nested among *P. alisonae* specimens. The holotype of *S. weberi* forms a non-canonical sister relationship with the holotype of *P. kaupeka*. While these results indicate significant taxonomic revision of bubblegum coral species is required and some species may be synonymous (*eg. P. whero* and *P. alisonae*), caution must be exercised since this mitochondrial dataset represents an incomplete and unverified *in silico* prediction that may be prone to contamination from nuclear pseudogenes (Schizas 2012) and associated organisms held within the same specimen container (Jeunen et al. 2026). While the extraction and use of mitochondrial genes from genome skimming datasets represents added value for specimen identification (DNA barcoding) and confirmation of molecular systematic patterns, UCE-based datasets still present a higher-confidence result that is less prone to confounding effects (Quattrini et al. 2023).

Figure 4-8: Maximum likelihood phylogenetic analysis of 16 mitochondrial genes extracted from genome skimming dataset. All DNA sequence datasets originated from the current study. Orange = non-bycatch specimens; red = specimens not included in UCE analysis; boldface = taxonomic type specimens.

4.5 Objective 5: Update and provide input into coral-relevant resources for Fisheries Observers, including reference material and material for observer training

After discussions held in early 2025, the Coral Identification Guide revisions were finalised with CSP and the updated guide became available online in May 2025 (Macpherson et al 2025b, Tracey et al. 2025). The revisions included changes to the taxonomic hierarchy, some minor species description corrections, layout adjustments, and changes to some specimen images. On the 7th of November 2025, Earth Sciences New Zealand hosted 11 MPI Observers, two MPI office staff members, and two DOC staff, for refresher training on how to identify protected coral species at sea within New Zealand's EEZ, a summary of which was presented in Macpherson et al (2025c).

5 Summary and Conclusions

This is the third and final year of a three-year project for the identification, storage and genetics of protected coral bycatch and continues the work of several multi-year time-series of fisheries bycatch projects. Not only do these accumulated coral records contribute to filling knowledge gaps around spatial distribution of species, but they help describe the overall composition of observed bycatch and provide data that can be used to improve both predictive habitat suitability models and risk assessments, as well as expand knowledge of the region's biodiversity.

Both the physical specimens and specimens from images identified by this project are highly valuable and continue to augment datasets used to highlight interactions between fishing and protected corals, for example in the modelling of species distributions and community classifications. Recognising the importance of these data for enhancing basic understanding of coral distribution and given recent elucidation of unexplored cryptic diversity in some coral groups, we encourage Observers to return a specimen or subsample of it whenever they are able to, regardless of how confident they are in their identification. Emphasis has been given through the in-person refresher training to retain a subsample of every species of coral bycatch in order to increase physical sample collection for expert identification and genetic subsampling.

The objective for this reporting period to detail all bycaught physical samples and digital images returned by fisheries Observers has been successfully completed. The methods used to achieve this have been consistent and standardised over several years, and the required database updates for both physical specimens and specimens from images have been made.

A total of 50 physical specimens (including research trawl and historical Observer collected), and 6162 specimens from images and videos were identified or verified to the lowest taxon level possible by experts and updated in COD, and *trawl* and *niwainvert (*physical specimens only). All the processed images and videos were able to be georeferenced. There were 6145 specimens from images of protected coral taxa and 17 specimens of non-protected coral taxa.

Data summaries of protected coral bycatch occurring in New Zealand region fisheries were presented by FMA, fishing method, and target fishery. These results are consistent with those seen in the previous two years: the greatest number of protected coral specimen counts from both the physical specimens and specimens from images from this reporting period came from SEC South-East Coast (FMA 3) and SOE South-East (Chatham Rise) (FMA 4). Most were taken by bottom trawl operations targeting hoki, smooth oreo and orange roughy. Stony corals were again the most caught and photographed coral species; this year they were cup corals *Desmophyllum dianthus* and *Flabellum knoxi*. As in previous years, large numbers of gorgonian octocorals were caught, particularly bamboo coral *Keratoisis*, bubblegum coral *Paragorgia* and the large primnoid octocoral *Primnoa notialis*.

Overall, the accuracy of the Observer identification is good and for some groups can usually be correctly carried out to family and sometimes genus or species level. The sample sizes used in the general accuracy summaries are small, however, they show that during this reporting period the Observers were 80-87% accurate in their code use for the physical specimens and specimens from images regardless of the taxonomic level of the ID. It is nevertheless clear

certain taxa continue to be confused, for this reporting report it was hydroids that were the most confused with protected coral taxa.

Genomic sequencing and phylogenomic analysis of 70 of the 182 available specimens of bubblegum corals held in the NIC indicates six or seven species are present among fisheries bycatch. However, incomplete sampling and potential for cryptic taxa may limit the identification of additional species. While the accuracy of morphological identification for the two most common species was high, genetic approaches are required to confirm or correct identifications of rarer taxa. Likewise, most collected specimens (bycatch and non-bycatch) belong to two common species while other species are represented by relatively few (or single) specimens. The taxonomic validity of all described species of *Paragorgia* in New Zealand is thus difficult to evaluate but genetic evidence will be key in any future revision and the data presented here can form a basis on which further effort can be built.

6 Recommendations

Hands-on and in-person training for new Observers or refresher training for experienced Observers is proving to be the most effective method of taxonomic knowledge transfer, and it is recommended that this type of training is continued with supplemented or full funding from MPI. They provide an excellent opportunity to demonstrate to Observers the easily confused non-coral taxa and emphasise the return of subsamples of each species of coral bycaught in the fishing area. Focusing on explaining and demonstrating the differences between non-protected hydroids and easily confused protected coral taxa is recommended for the next training. Yet, for this reporting period the Observers were 80-87% accurate in their IDs to some taxonomic level, indicating that these refresher courses and updated ID guides are proving useful for the Observers.

The continued use of genetic and genomic approaches in confirming and revising the identification of difficult and cryptic groups of protected corals is warranted, given the current and past results of this bycatch characterisation project. Furthermore, the ability of genomic approaches to identify fine-scale variations that span the boundary between species-level and population-level (intraspecific or individual-level) patterns requires a shift from evolutionary-scale phylogenomic approaches to population-level approaches focused at ecological and biogeographic scales.

7 Three-year project summary

This project only reports on the protected coral specimens counted from digital images taken by Observers and physical samples sent in by Observers when they are uncertain about their identification. No reporting is done on other protected coral bycatch that is recorded by Observers in the benthic or general catch tables, which is unphotographed and is not sent to the NIC for identification. No attempt to quantify the proportion of protected coral bycatch that is returned or photographed has been made. This project does not report on protected coral bycatch reported by fishing vessels that do not have Observers on them.

Over the three years of this project a trend has emerged for the Observer returned specimens, across both physical specimens returned to the NIC and specimens from images. The FMAs with the highest specimen counts of protected coral species have been SOE Chatham Rise (FMA 4) and SEC South East Coast (FMA 3), collected by bottom trawling, targeting orange roughy, smooth oreo, scampi and hoki. The coral species predominantly trawled up in these areas are stony corals, branching forms such as *Solenosmilia variabilis* (SVA) and *Goniocorella dumosa* (GDU), and cup coral forms such as *Flabellum knoxi* (COF) or *Desmophyllum dianthus* (DDI). Of these species, cup corals *Flabellum* live in soft sediment in regions of flat slope, whereas *Desmophyllum* prefers hard substrate. Both are abundant genera of stony corals. Branching corals *Solenosmilia* and *Goniocorella* form extensive reef-like structures which provide habitat for other benthic invertebrate and fish species. Species of bubblegum coral *Paragorgia*, primnoid octocoral *Primnoa*, and bamboo coral *Keratoisis* are also commonly represented throughout the project duration. These species are also considered habitat-forming as they produce large upright 'bushy' colonies (Tracey et al. 2019).

For historic Observer collected physical coral samples processed over the three years of the project, the highest number of specimens identified were collected from the FMAs SOE Chatham Rise (FMA 4) and SUB Subantarctic (FMA 6).

The number of Observer specimens photographed was high for the current (2024-2025) reporting period compared to physical sample returns. However, the number of images provided and processed in this final project year was less than the previous two years: 154 images and one video in this reporting period (6162 specimens) compared to 332 images and 19 videos in 2023-2024 (765 specimens) and 382 images in 2022-2023 (2854 specimens). Physical samples returned for identification from within the EEZ were relatively low (25 physical specimens in 25 samples) compared to 2023-2024 (39 specimens in 23 samples) but were higher than 2022-2023 (15 specimens in 11 samples). Three of the physical specimens returned and processed in the 2023-2024 processing year were samples collected in the 2022-2023 year.

7.1 Specimen identifications

7.1.1 Physical specimens

The total number of physical specimens identified and updated in COD over the three years of the project is shown in Table 7-1, noting that this includes four non-protected coral specimens which were identified by the Observer as coral but expert-identified as non-coral. Also shown are the number of historical Observer collected, and fisheries research trawl specimens identified and updated in COD and *trawl* over the duration of the project. The number of genetic samples taken from the physical specimens is also shown. Not all specimens returned had sufficient live tissue to allow for genetic subsampling.

Table 7-1: The number of physical specimens identified and updated in COD over the three project years. *includes 3 samples processed in the 2023-24 year. Historic specimens for 2023-24 processing year adjusted accordingly.

Reporting year	Current year no. specimens	Historic specimens	No. of (historic) research trawl specimens	Total no. of records updated in COD	No. of genetic samples taken
1 Jul 2022 – 30 Jun 2023	15*	67	20	60	9
1 Jul 2023 – 30 Jun 2024	39	89	46	109	10
1 Jul 2024 – 30 Jun 2025	25	19	6	43	20
Total	**79**	**175**	**72**	**212**	**39**

For the current year physical coral specimens sent in by Observers, two FMAs (South East Coast and South East (Chatham Rise) (FMA 3 and FMA 4)) had specimens returned from them in all three project years. These two FMAs also returned the highest number of samples for the current year returns. Historically collected physical Observer samples, that were processed over the project, predominantly came from South East (Chatham Rise) (FMA 4) and Subantarctic (FMA 6) FMAs. The distribution of physical specimen returns for current year Observer collected samples across the different FMAs are shown in Table 7-2 and Figure 7-1.

It should be noted that the distribution of these samples is strongly driven by Observer coverage in each year.

Table 7-2: Physical specimens by Fisheries Management Area (FMA) for the three years of the project. *includes 3 samples processed in the 2023-24 year.

FMA	FMA Description	1 Jul 2022 - 30 Jun 2023*	1 Jul 2023 - 30 Jun 2024	1 Jul 2024 - 30 Jun 2025	Historic 1997 - 2019
AKE	Auckland East (FMA1)		1		14
AKW	Auckland West (FMA 9)				1
CEE	Central East (FMA 2)		1	3	3
CET	Challenger Plateau, beyond the EEZ (ET)		3		4
HOWE	Lord Howe Rise (ET)				5
KER	Kermadec (FMA 10)				3
LOUR	Louisville Ridge (ET)				1
SEC	South East Coast (FMA 3)	2	19	14	3
SOE	South East (Chatham Rise) (FMA 4)	7	12	7	47
SOI	Southern Offshore Islands - Auckland & Campbell Is (FMA 6A)		1		7
SOU	Southland (FMA 5)	6	1		11
SUB	Subantarctic (FMA 6)		1	1	60
TMAR	Tasmanian Ridge (ET)				13
WANB	Wanganella Bank (ET)				3
Total		**15**	**39**	**25**	**175**

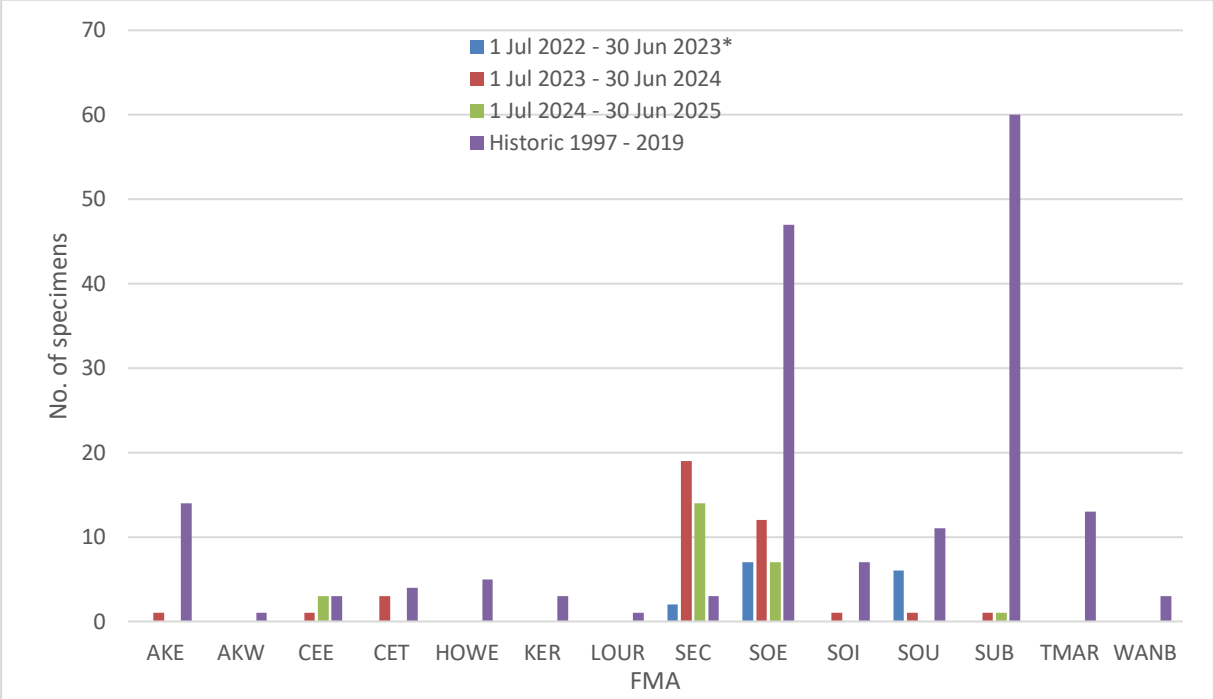

Figure 7-1: Physical specimens by Fisheries Management Area (FMA) processed over the three-year project. *includes 3 samples processed in the 2023-24 year. FMA descriptions in Table 7-2.

The map in Figure 7-2 illustrates the geographic spread of physical specimens collected by Observers in the region over the past three years of the project. The map in Figure 7-3 illustrates the geographic spread of physical specimens from the historical Observer collected samples and research trawl survey samples that were additionally identified over the past three years.

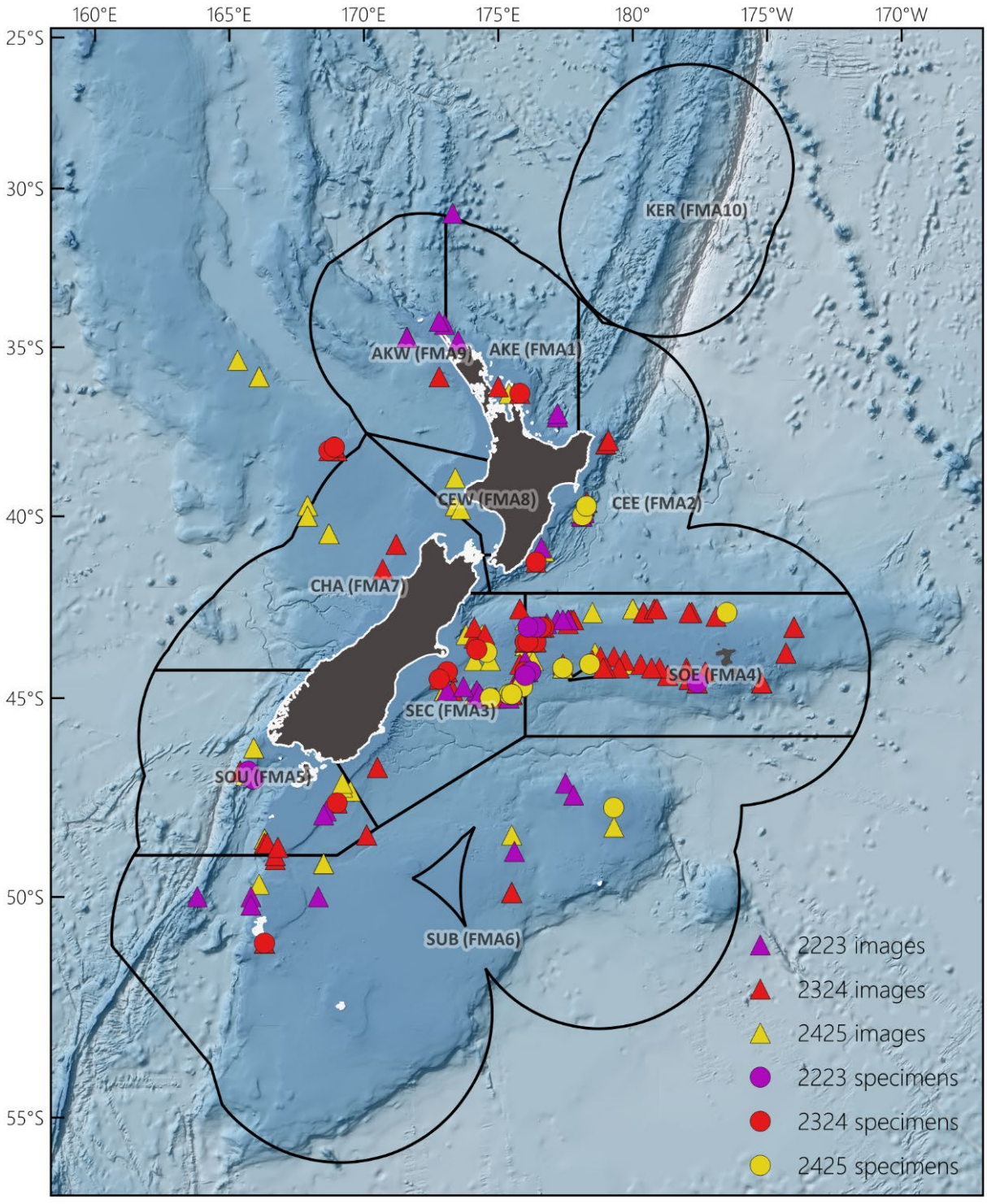

Figure 7-2: Location of identified protected coral samples collected by Observers over the past three years of the project within Fisheries Management Areas (FMA). Images are indicated by triangle symbols, physical specimens are indicated by circles. 2022-23 project is indicated by purple symbols, 2023-24 project is indicated by red symbols, 2024-25 project is indicated by yellow symbols.

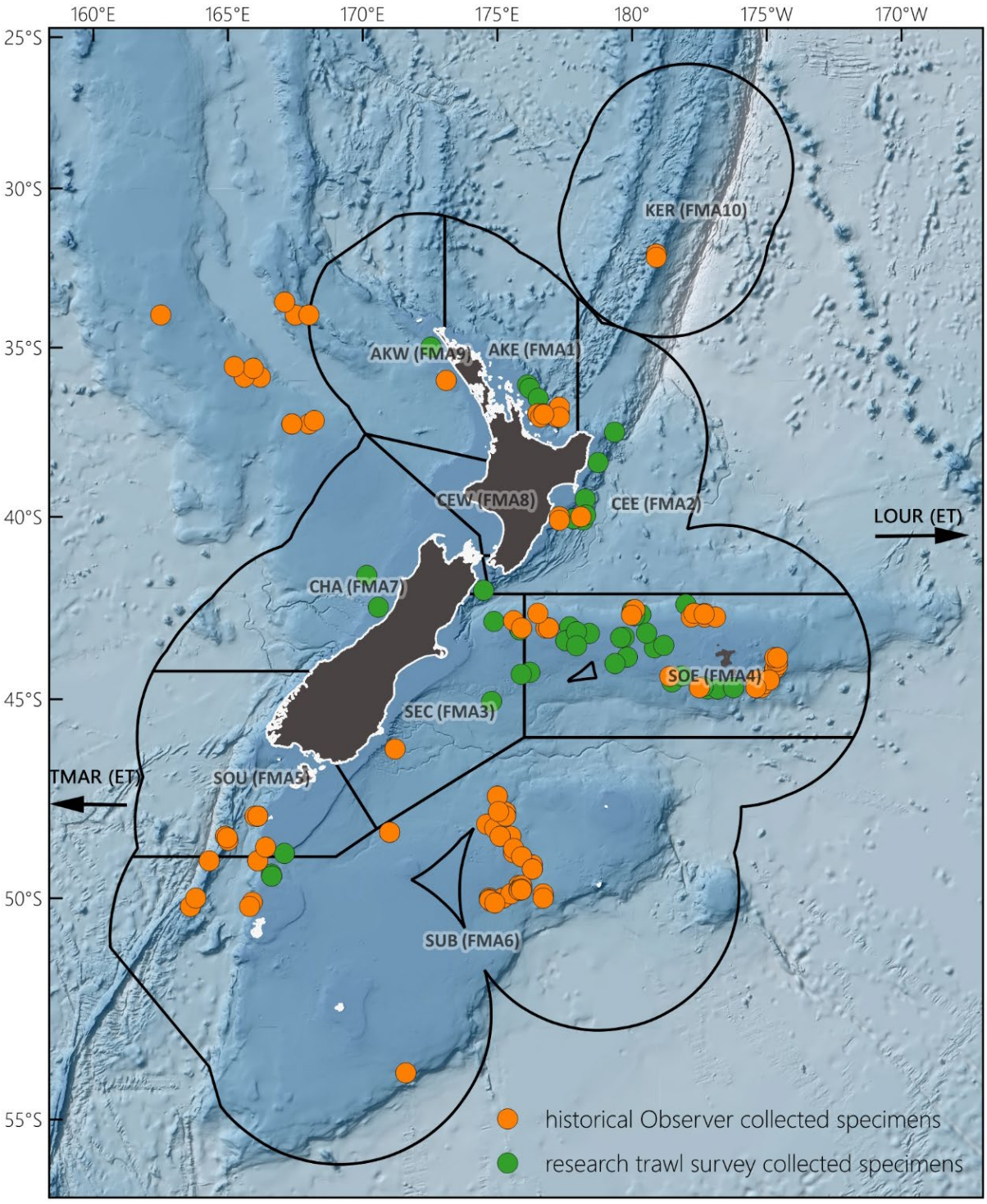

Figure 7-3: Location of identified protected coral samples collected by Observers historically or on research trawl surveys within Fisheries Management Areas (FMAs) completed over the past three years of the project. Orange circles: historical observer physical; green circles: research trawl survey physical samples. Some historical physical samples were collected from the ET area beyond New Zealand's EEZ and outside of this map range, to the far east from the southeast Louisville Seamount Chain (LOUR) and the far west from the Tasmanian Ridge (TMAR) (black arrows).

The number of expert-identified physical specimens returned by Observers, summarised by number of taxa, target fishery and gear type for the three years of this project (1 July 2022 to 30 June 2025) is shown in Table 7-6. Also see Appendix E for this table showing the full list of expert taxon IDs.

Table 7-3: The number of physical specimens summarised by species count, target fishery and gear type for the last three years. The fishing gear codes are as follows: BT = Bottom Trawl, MW = Midwater Trawl, BLL = Bottom Longlining. *includes 3 samples processed in the 2023-24 year.

			1 Jul 2022 - 20 Jul 2023*		1 Jul 2023 - 30 Jun 2024		1 Jul 2024 - 30 Jun 2025	
Target species code	Target species common name	Gear code	No. of specimens	No. of taxa	No. of specimens	No. of taxa	No. of specimens	No. of taxa
BAR	Barracouta	MW	2	1				
BNS	Bluenose	BLL			3	3		
BYX	Alfonsino & long-finned beryx	BT					3	3
HOK	Hoki	BT			2	2	1	1
LIN	Ling	BT	1	1				
LIN		BLL					1	1
OEO	Oreos	BT			1	1		
ORH	Orange roughy	BT	4	3	1	1	2	1
SCI	Scampi	BT	2	2	12	5	2	2
SNA	Snapper	BLL			1	1		
SQU	Arrow squid	BT	5	4	2	2		
SSO	Smooth oreo	BT	1	1			16	14
SWA	Silver warehou	BT			17	1		
Total			**15**	**12**	**39**	**16**	**25**	**22**

7.1.2 Specimens from images

Table 7-4 shows the total number of protected coral specimens expertly identified from images by reporting year, and Table 7-5 and Figure 7-4 shows the number of specimens identified from images and updated in COD by FMA.

Table 7-4: The number of protected coral specimens identified from images for the last three years.

Reporting year	No. of specimens
1 Jul 2022 – 30 June 2023	2595
1 Jul 2023 – 30 June 2024	706
1 Jul 2024 – 30 June 2025	6145

Table 7-5: Protected coral specimens from images by Fisheries Management Area (FMA) for the last three years. *1 specimen collected from start FMA SOU and end FMA SEC combined into SOU row.

FMA	Description	1 Jul 2022 – 30 Jun 2023	1 Jul 2023 – 30 Jun 2024	1 Jul 2024 – 30 Jun 2025
		No. of specimens		
SOE	South East (Chatham Rise) (FMA 4)	2493	306	6055
SEC	South East Coast (FMA 3)	30	181	61
SUB	Subantarctic (FMA 6)	29	24	2
SOU	Southland (FMA 5)	19	7	8*
AKE	Auckland East (FMA 1)	9	4	2
AKW	Auckland West (FMA 9)	4	109	
CEE	Central East (FMA 2)	3	57	9
SOI	Southern Offshore Islands - Auckland & Campbell Is. (FMA 6A)	3	5	
TKET	Three Kings Rise, beyond the EEZ (ET)	2		
CET	Challenger Plateau, beyond the EEZ (ET)		10	
CHA	Challenger (Central Plateau) (FMA 7)		3	4
HOWE	Lord Howe Rise (ET)			4
No FMA provided	No FMA provided	3		
	Total	2595	706	6145

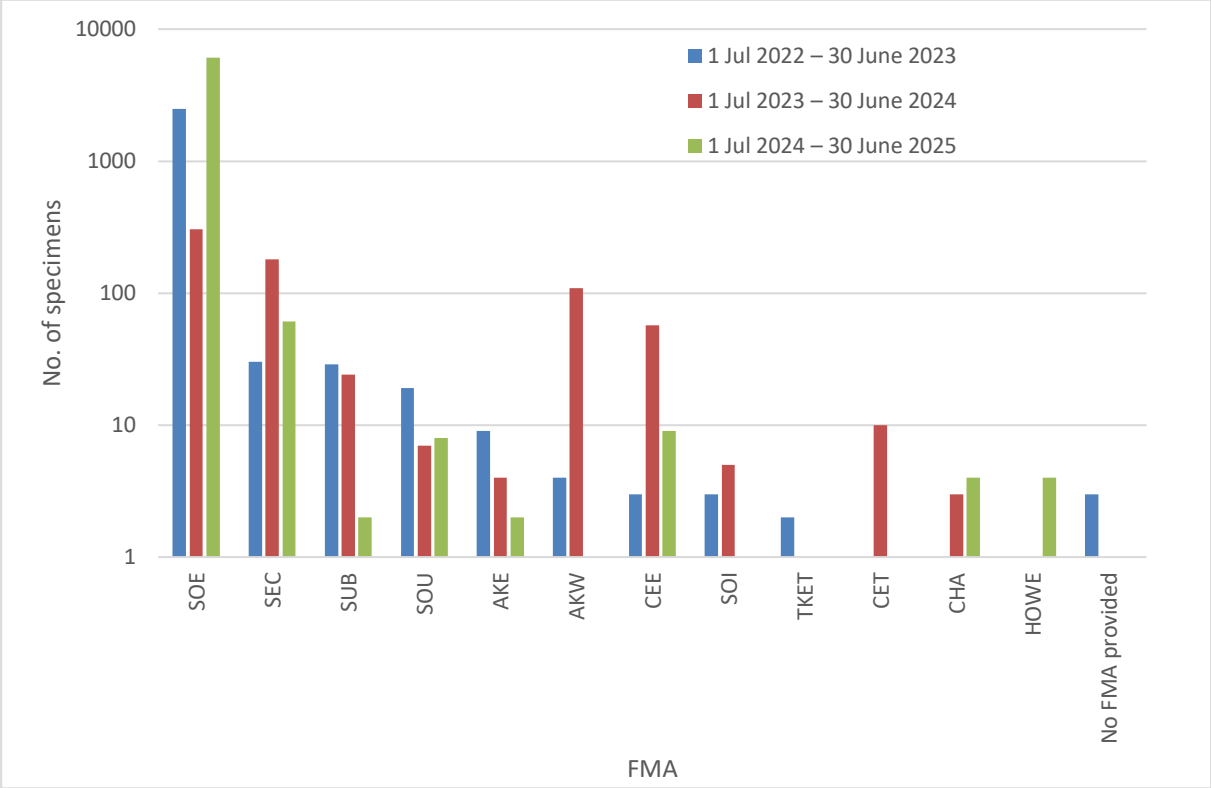

Figure 7-4: Protected coral specimens from images by Fisheries Management Area (FMA) for the last three years.

The map in Figure 7-2 illustrates the geographic spread of protected coral bycatch from images in the region over the past three years of the project.

The number of expert-identified protected coral specimens from images photographed by Observers summarised by species, target fishery and gear type for the three years of this project (1 July 2022 to 30 June 2025) is shown in Table 7-6. Also see 0 for this table showing a full list of expert taxon IDs.

Table 7-6: The number of protected coral specimens identified from images summarised by species count, target fishery and gear type for the last three years. The fishing method codes are as follows: BT = Bottom Trawl, MW = Midwater Trawl, BLL = Bottom Longlining, POT = Potting, PRB = Precision Seafood Harvesting Bottom Trawl.

Target species code	Target species common name	Gear code	1 Jul 2022 – 30 June 2023		1 Jul 2023 – 30 June 2024		1 Jul 2024 – 30 June 2025		Total no. of species	Total no. of specimens
			No. of species	No. of specimens	No. of species	No. of specimens	No. of species	No. of specimens		
BAR	Barracouta	BT	1	1			1	1	2	2
		All	**1**	**1**			**1**	**1**	**2**	**2**
BNS	Bluenose	BLL	2	2	4	10			6	12
		All	**2**	**2**	**4**	**10**			**6**	**12**
BOE	Black oreo	BT	3	3	4	4	1	1	7	8
		All	**3**	**3**	**4**	**4**	**1**	**1**	**7**	**8**
BYX	Alfonsino & long-finned beryx	BT			2	21	5	7	7	28
		All			2	21	5	7	7	28
HAK	Hake	BT			2	3			2	3
		All			**2**	**3**			**2**	**3**
HOK	Hoki	BT			2	154	3	62	4	216
		All			**2**	**154**	**3**	**62**	**4**	**216**
LIN	Ling	BLL					1	1	1	1
		BT	2	2	3	6	2	2	6	10
		POT					2	4	2	4
		All	**2**	**2**	**3**	**6**	**4**	**7**	**8**	**15**
No target fishery provided		No gear type provided	1	3					1	3
		All	**1**	**3**					**1**	**3**
OEO	Oreos	BT			2	21	1	2	3	23
		All			**2**	**21**	**1**	**2**	**3**	**23**
ORH	Orange roughy	BT	21	2126	17	183	14	6019	34	8328
		All	**21**	**2126**	**17**	**183**	**14**	**6019**	**34**	**8328**
SBW	Southern blue whiting	MW					1	1	1	1
		All					**1**	**1**	**1**	**1**
SCI	Scampi	BT	7	338	8	195	4	6	13	539
		All	**7**	**338**	**8**	**195**	**4**	**6**	**13**	**539**

Target species code	Target species common name	Gear code	1 Jul 2022 – 30 June 2023		1 Jul 2023 – 30 June 2024		1 Jul 2024 – 30 June 2025		Total no. of species	Total no. of specimens
SNA	Snapper	BLL			2	3			2	3
		BT					2	2	2	2
		PRB	1	1					1	1
		All	**1**	**1**	**2**	**3**	**2**	**2**	**5**	**6**
SQU	Arrow squid	BT	5	63	5	7	2	4	10	74
		All	**5**	**63**	**5**	**7**	**2**	**4**	**10**	**74**
SSO	Smooth oreo	BT	10	54	17	81	17	32	33	167
		All	**10**	**54**	**17**	**81**	**17**	**32**	**33**	**167**
SWA	Silver Warehou	BT			1	17			1	17
		All			**1**	**17**			**1**	**17**
TAR	Tarakihi	PRB	2	2					2	2
		All	**2**	**2**					**2**	**2**
TRE	Trevally	BT			1	1			1	1
		All			**1**	**1**			**1**	**1**
WWA	White warehou	BT					1	1	1	1
		All					**1**	**1**	**1**	**1**
		Total	41	2595	39	706	33	6145	78	9446

The large specimen counts in year 1 (2022-2023) and year 3 (2024-2025) reflects four large captures of stony corals ranging from 115 kg to 6000 kg. All of these large captures occurred in SOE Chatham Rise (FMA 4), bottom trawling for orange roughy, and one for scampi. Furthermore, over the last three years, bottom trawling targeting orange roughy returns the least diverse but largest catches, with 8328 specimens of 34 species, followed by bottom trawling scampi, hoki and smooth oreo which in total returns 539 specimens of 13 species, 216 specimens of 4 species, and 167 specimens of 33 species, respectively. This highlights that these fisheries, and particularly the orange roughy fishery, returns high numbers of the same species (reflecting these large single catches), which are usually stony coral species. Many of the other fisheries return a larger diversity of corals in smaller numbers. However, there are exceptions to this over the years, such as a large catch of *Flabellum knoxi* by bottom trawling for arrow squid in year 1.

7.2 Genetic results

Genetic applications to coral identification in the first year of the project were dedicated to characterising a new and potentially undescribed family of protected gorgonian octocorals, which were first discovered in a previous CSP project (Bilewitch 2024). All eight records originated from the Andes Seamounts on the eastern Chatham Rise. A UCE-based phylogenomic analysis was conducted to determine the relationships of these specimens to

known octocoral groups and determined that the specimens represented a new family related to the 'calcaxonian' octocorals (primnoid, chrysogorgiid and bamboo corals). Further morphological analysis was required to characterize the family and confirm its status.

The second year of the project leveraged a visit by international coral expert Dr. Kirrily Moore, who studied and identified NIC specimens of the protected octocoral *Anthothela* as part of INT2023-07. Thirty-seven specimens of *Anthothela* and related genera, including observer bycatch samples, were selected for UCE analysis using genome skimming. The results identified mis-identified specimens and indicated at least two species of *Anthothela* were present in New Zealand, whereas only a single species has previously been recognised. As with the current study, this work identified the importance of population-level analyses in disentangling inter- and intra-specific variation among morphologically cryptic samples.

7.3 Observer training and resources

Over the course of the project, various resources and training workshops directed at Observers has been completed and they are listed here:

- Updated coral ID guide, two versions (Tracey et al 2023, 2025)
- Updated Instructions to Observers (Macpherson et al 2025c)
- Several Observer refresher training workshops were held at ESNZ since 2022:
  - Two half-day workshops were held in November 2023, and two full day workshops were held in April 2024 (contacted by MPI projects MPI24302 and MPI24304). Half of each of these workshops focused on coral identification, and to distinguish between easily confused groups.
  - Half day workshops on the 8th of April 2025 and 7th of November 2025 (funded by this project) focused on how to identify protected coral species at sea within New Zealand's EEZ, and to distinguish between easily confused groups.

8 Acknowledgements

We thank Te Papa Atawhai Department of Conservation, Conservation Services Programme for their ongoing support of protected coral research in New Zealand, particularly Hollie McGovern and Marine Senior Science Advisor, Lyndsey Holland. We also thank FNZ Observers for their efforts at sea and FNZ RDM for providing Observer images and data. The various taxonomic experts who provided identifications for this reporting period are gratefully acknowledged, these include: Di Tracey, Peter Marriott, Michelle Kelly (all ESNZ), Rob Stewart (Independent), Dennis Opresko (Smithsonian Institution), and Kirrily Moore (Tasmanian Museum & Art Gallery). We acknowledge Jeff Forman (ESNZ) for processing the Observer samples and the ESNZ Invertebrate Collection Curation team for providing ongoing curatorial support for the specimens. We thank the staff at Livestock Improvement Corp. (LIC) for advice and assistance with genome skimming. Our thanks to the ESNZ Fisheries Data Services for COD data extracts and data uploading. Thanks to Jess Moffat for formatting, and Owen Anderson for his timely turn around in thoroughly reviewing this report, and Alison MacDiarmid (ESNZ Operations Manager, Wellington) for her final comments and sign off. This work was funded by DOC Project INT2022-03, approved through the 2022/23 CSP Annual Plan: final-csp-annual-plan-2022-23.pdf.

9 References

Aberer, A.J., Kobert, K., Stamatakis, A. (2014) ExaBayes: Massively Parallel Bayesian Tree Inference for the Whole-Genome Era. *Molecular Biology and Evolution,* 31(10): 2553- 2556. 10.1093/molbev/msu236

Allio, R., Schomaker-Bastos, A., Romiguier, J., Prosdocimi, F., Nabholz, B., Delsuc, F. (2020) MitoFinder: Efficient automated large-scale extraction of mitogenomic data in target enrichment phylogenomics. *Molecular Ecology Resources,* 20(4): 892-905. 10.1111/1755-0998.13160

Anderson, O., Carswell, S., Connell, A. (2025) Understanding coral bycatch. Assessing large catches. Report prepared for Project INT2023-10, Conservation Services Programme, Department of Conservation. *NIWA Client Report* 2025053WN. 53 p. https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202324-annual-plan/int2023-10-understanding-coral-bycatch-assessing-large-catches-final-report.pdf

Anderson, O.F., Ballara, S.L., Edwards, C.T.T. (2017) Fish and invertebrate bycatch and discards in New Zealand orange roughy and oreo trawl fisheries from 2001–02 until 2014–15. *New Zealand Aquatic Environment and Biodiversity Report No. 190*. 220. https://www.mpi.govt.nz/dmsdocument/26156/direct

Anderson, O., Tracey, D., Bostock, H., Williams, M., Clark, M. (2014) Refined habitat suitability modelling for protected coral species in the New Zealand EEZ. Prepared for Marine Species and Threats, Department of Conservation. *NIWA Client Report* WLG2014-69. 46. https://dxcprod.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/meetings/pre-2020-meetings/protected-coral-distribution-modelling.pdf

Bilewitch, J.P., Tracey, D. (2020a) Coral biodiversity in deep-water fisheries bycatch. Final Report prepared by NIWA for the Conservation Services Programme, Department of Conservation. DOC19304-INT201905. *NIWA Client Report* 2020223WN: 36 p.

Bilewitch, J.P., Tracey, D. (2020b) Protected coral connectivity in New Zealand. Final Report prepared by NIWA for the Conservation Services Programme, Department of Conservation. DOC19306-POP201806. *NIWA Client Report* 2020222WN: 32 p.

Bilewitch, J.P. (2022) Octocoral bycatch diversity on the Chatham Rise. DOC21302. *NIWA Client Report* 2022138WN: 23 p.

Bilewitch, J. (2024) High-resolution estimation of species diversity for a protected coral family commonly occurring as trawl bycatch. INT2023-05 final report prepared by NIWA for Department of Conservation. *NIWA Client Report* 2024188WN. 31 p. https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202324-annual-plan/int2023-05-high-resolution-estimation-of-species-diversity-for-a-protected-coral-family-commonly-occurring-as-trawl-bycatch-final-report.pdf

Clark, M., Anderson, O., Kaikkonen L., Stephenson, F. Tracey, D., Finucci, B. (2025) INT2022-04 Risk Assessment for Protected Corals. Final Report Prepared for Conservation Services Programme, Department of Conservation. *NIWA Client Report* 2024376WN. 100. https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/202223-annual-plan/int2022-04-coral-risk-assessment-final-report.pdf

Clark, M.R., Bowden, D.A., Rowden, A.A., Stewart, R. (2019) Little evidence of benthic community resilience to bottom trawling on seamounts after 15 years. *Frontiers in Marine Science*, 6: 63 p.

Clark, M., Tracey, D., Anderson, O., Parker, S. (2014) Pilot ecological risk assessment for protected corals. Prepared for New Zealand Department of Conservation, Wellington. *NIWA Client Report* WLG2014-70. 32 p.

Committee on Common Philosophies and Objectives (2010) *Guidelines for the Care of Natural History Collections*. Society for the Preservation of Natural History Collections. Webpage url: http://cool.conservation-us.org/byorg/spnhc/spnhc1.html last accessed 13 April 2026.

Connell, A., Mills, S., Bilewitch, J., Macpherson, D. (2023) INT2022-03 Identification and storage of cold-water coral bycatch specimens 1 July 2022 – 31 December 2022. Milestone 1. Six monthly progress update prepared by NIWA for the Conservation Services Programme, Department of Conservation. DOC23303 – INT2022-03. *NIWA Client Report* 2023325WN 26 p.

Connell, A., Macpherson, D., Mills, S., Bilewitch, J., Wood, C. (2024) INT2022-03 Identification, storage and genetics of cold-water coral bycatch specimens (1 July 2022–30 June 2023). Milestone 3. Final Annual Report. Prepared for Conservation Services Programme, Department of Conservation. *NIWA Client Report* 2024096WN. 64p.

Earth Sciences New Zealand. (2025) Fisheries database documentation series: cod database (Version 3.1). Prepared for the Ministry for Primary Industries (MPI). https://marlin.niwa.co.nz/files/dataHoldings/scientificResearchDbs/cod.pdf

Elkin, L., Norris, C.A. (Eds) (2019) *Preventive Conservation: Collection Storage*. Society for the Preservation of Natural History Collections; American Institute for Conservation of Historic & Artistic Works; Smithsonian Institution; The George Washington Museum Studies Program, New York, USA. 926 p.

Georgian, S., Anderson, O., Rowden, A. (2019) Ensemble habitat suitability modelling of vulnerable marine ecosystem indicator taxa to inform deep-sea fisheries management in the South Pacific Ocean. *Fisheries Research*, 211: 256–274.

International Press Telecommunications Council (November 2025) *IPTC Photo Metadata User Guide*. Retrieved 24 March 2026 from iptc.org: https://www.iptc.org/std/photometadata/documentation/userguide/

Jeunen, G.J., Mills, S., Bailie, M., Mauvisseau, Q., Lamare, M., Mariani, S., Pearman, W., Zavodna, M., Treece, J., Ferreira, S., Gemmell, N.J. (2026) Recovering Historical eDNA From Museum-Preserved Filter Feeders via Non-Destructive Metabarcoding. *Mol Ecol Resour*, 26(3): e70132. 10.1111/1755-0998.70132

Katoh, K., Standley, D.M. (2013) MAFFT multiple sequence alignment software version 7: improvements in performance and usability. *Molecular Biology & Evolution,* 30(4): 772-780. 10.1093/molbev/mst010

Herrera, S., Baco, A., Sánchez, J.A. (2010) Molecular systematics of the bubblegum coral genera (Paragorgiidae, Octocorallia) and description of a new deep-sea species. *Molecular Phylogenetics & Evolution,* 55: 123–135.

Herrera, S., Shank, T.M. (2016) RAD sequencing enables unprecedented phylogenetic resolution and objective species delimitation in recalcitrant divergent taxa. *Molecular Phylogenetics and Evolution,* 100: 70–79. 10.1016/j.ympev.2016.03.010

Macpherson, D., Tracey, D., Bilewitch, J., Opresko, D., Bo, M., Kitahara, M.V., Cairns, S., Sinniger, F., Kessel, G., Alderslade, P., Rodríguez, E., Neill, K., Miranda, L.S., Schuchert, P., Gordon, D.P. (2023) Chapter 6. Kingdom Animalia, phylum Cnidaria (corals, medusae, anemones, hydroids, staurozoans, & myxozoans). Pp. 131–155 in: Kelly, M., Mills, S., Terezow, M., Sim-Smith, C., Nelson, W. (Eds) The Marine Biota of Aotearoa New Zealand. Updating our marine biodiversity inventory. *NIWA Biodiversity Memoir 136*, 494 pp.

Macpherson, D., Connell, A., Bilewitch, B., Wood, R.C. (2024) INT2022-03 Identification, storage and genetics of cold-water coral bycatch specimens. Milestone 4. Six monthly progress update. Prepared by NIWA for the Conservation Services Programme, Department of Conservation. DOC23303-INT2022-03. *NIWA Client Report* 2024354WN. 34.

Macpherson, D., Mills, S., Connell, A. (2025a) Instructions to observers when carrying out at-sea protected coral data collection. Project INT2022-03. 8.

Macpherson, D., Connell, A., Bilewitch, J., Smith, L., Wood, C.R., Mills, S. (2025b) INT2022-03 Identification, storage and genetics of cold-water coral bycatch specimens. Milestone 6. Final Annual Report. Prepared for Conservation Services Programme, Department of Conservation. *NIWA Client Report* 2025093WN. 81.

Macpherson, D., Bilewitch, J., Mills, S. (2025c) INT2022-03 Identification, storage and genetics of cold-water coral bycatch specimens. Milestone 7. Six monthly progress update. Prepared for Conservation Services Programme, Department of Conservation. *Earth Sciences New Zealand Client Report* 2025360WN. 14.

McFadden, C.S., Van Ofwegen, L.P., Quattrini, A.M. (2022) Revisionary systematics of Octocorallia (Cnidaria: Anthozoa) guided by phylogenomics. *Bulletin of the Society of Systematic Biologists,* 1(3). 10.18061/bssb.v1i3.8735

Minh, B.Q., Schmidt, H.A., Chernomor, O., Schrempf, D., Woodhams, M.D., von Haeseler, A., Lanfear, R. (2020) IQ-TREE 2: New Models and Efficient Methods for Phylogenetic Inference in the Genomic Era. *Molecular Biology & Evolution*, 37(5): 1530–1534. 10.1093/molbev/msaa015

Parker, S.J., Mormede, S., Tracey, D., Carter, M. (2009) Evaluation of VME taxa monitoring by scientific observers from New Zealand in the Ross Sea Antarctic toothfish longline fishery during the 2008-09 season. Document WG-TASO 09/08. CCAMLR, Hobart, Australia: 13 p.

Quattrini, A.M., Faircloth, B.C., Dueñas, L.F., Bridge, T.C.L., Brugler, M.R., Calixto-Botía, I.F., DeLeo, D.M., Forêt, S., Herrera, S., Lee, S.M.Y., Miller, D.J., Prada, C., Rádis-Baptista, G., Ramírez-Portilla, C., Sánchez, J.A., Rodríguez, E., McFadden, C.S. (2017) Universal target-enrichment baits for anthozoan (Cnidaria) phylogenomics: New approaches to long-standing problems. *Molecular Ecology Resources*, 2017: 1-15. 10.1111/1755-0998.12736

Quattrini, A.M., Snyder, K.E., Purow-Ruderman, R., Seiblitz, I.G.L., Hoang, J., Floerke, N., Ramos, N.I., Wirshing, H.H., Rodriguez, E., McFadden, C.S. (2023) Mito-nuclear discordance within Anthozoa, with notes on unique properties of their mitochondrial genomes. *Scientific Reports*, 13(1): 7443. 10.1038/s41598-023-34059-1

Quattrini, A.M., McCartin, L.J., Easton, E.E., Horowitz, J., Wirshing, H.H., Bowers, H., Mitchell, K., Gonzalez-Garcia, M.D.P., Sei, M., McFadden, C.S., Herrera, S. (2024) Skimming genomes for systematics and DNA barcodes of corals. *Ecology & Evolution*, 14(5): e11254. 10.1002/ece3.11254

Rowden, A.A., Anderson, O.F., Neubauer, P., Hamill, J., Bowden, D.A., Tremblay-Boyer, L., Charsley, A., MacGibbon, D. (2024) Spatially explicit benthic impact assessments for bottom trawling in New Zealand. *New Zealand Aquatic Environment and Biodiversity Report No. 329*. 118 p. https://fs.fish.govt.nz/Doc/25617/AEBR-329-Spatially-Explicit-Benthic-Impact-Assessment-For-Bottom-Trawling-4430-2024.pdf.ashx

Rowden, A., Anderson, O.F., Georgian, S.E., Bowden, D.A., Clark, M.R., Pallentin, A., Miller, A. (2017) High-resolution Habitat Suitability Models for the Conservation and Management of Vulnerable Marine Ecosystems on the Louisville Seamount Chain, South Pacific Ocean. *Frontiers in Marine Science,* 4*:* 1–19.

Sánchez, J.A. (2005) Systematics of the bubblegum corals (Cnidaria: Octocorallia: Paragorgiidae) with description of new species from New Zealand and the Eastern Pacific. *Zootaxa,* 1014: 1–72.

Schnabel, K.E., Mills, V.S., Connell, A.M., Macpherson, D., Mitchell, M., Kelly, M., Peart, R.A., Bolstad, K.S.R., Braid, H.E., Hayward, L., Clinchard, S., Wood, C.R., Yeoman, J. (2026). Identification of benthic invertebrate samples from research trawls and observer trips 2021–24. *New Zealand Aquatic Environment and Biodiversity Report No. 371*. 66. https://www.mpi.govt.nz/dmsdocument/71152-

AEBR-3712026-Identification-of-benthic-invertebrate-samples-from-research-trawls-and-observer-trips-202124

Schizas, N.V. (2012) Misconceptions regarding nuclear mitochondrial pseudogenes (Numts) may obscure detection of mitochondrial evolutionary novelties. *Aquatic Biology*, 17: 91–96.

SPRFMO (2024) Updated quantitative benthic impact assessment for New Zealand and Australian bottom fisheries. SC 12 – DW 12_rev1. 12th Meeting of the Scientific Committee, Lima, Peru, 30 September - 5 October 2024 https://sprfmo.int/assets/Meetings/02-SC/12th-SC-2024/Deepwater/SC12-DW12-NZL-Updated-quantitative-benthic-impact-assessment-for-New-Zealand-and-Australian-bottom-fisheries.pdf

Stephenson, F., Rowden, A.A., Anderson, O.F., Pitcher, C.R., Pinkerton, M.H., Petersen, G., Bowden, D.A. (2021) Presence-only habitat suitability models for vulnerable marine ecosystem indicator taxa in the South Pacific have reached their predictive limit. *ICES Journal of Marine Science*, 78 (8): 2830-2843. https://doi.org/10.1093/icesjms/fsab162

Tracey, D., Macpherson, D., Stewart, R., Bilewitch, J., Marriot, P., Cairns, S., Opresko, D., Alderslade, P., Sinniger, F., Kitahara, M. (2023) An observer's identification guide: New Zealand's protected corals. Revised 2023. Prepared for the Conservation Services Programme, Department of Conservation Te Papa Atawhai. Project POP2020-02. Wellington. 34 p. https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/resources/resources-for-fishers/csp-fishers-guide-to-protected-coral-2024.pdf

Tracey, D., Macpherson, D., Stewart, R., Bilewitch, J., Marriot, P., Cairns, S., Opresko, D., Alderslade, P., Sinniger, F., Kitahara, M. (2025) An observer's identification guide: New Zealand's protected corals. Revised 2025. Prepared for the Conservation Services Programme, Department of Conservation Te Papa Atawhai. Project POP2020-02. Wellington. 34 p. https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/resources/csp-fishers-guide-to-protected-coral-2025.pdf

Tracey, D.M., Stewart, R., Bilewitch, J., Macpherson, D., Chin, C., Mills, S., Neill, K., Kessel, G., Aquirre, D., Liggins, L. (2019). Key Coral Groups, Chapter 12 In: Tracey, D.M. & Hjorvarsdottir, F. (2019). The State of Knowledge of Deep-Sea Corals in the New Zealand Region. *NIWA Science and Technology Series Number 84*. 140 p.

Tracey, D., Baird, S.J., Sanders, B.M., Smith, M.H. (2011) Distribution of protected corals in relation to fishing effort and assessment of accuracy of observer identification. *NIWA Client Report* WLG2011-33 prepared for Department of Conservation, Wellington: 74 p.

Wildlife Act (1953) https://www.legislation.govt.nz/act/public/1953/0031/latest/whole.html

Appendix A Summary output from Earth Sciences New Zealand National Invertebrate Collection (NIC) Specify Database *niwainvert*

This publicly accessible website can be used to search the initial and expert ID species codes: https://marlin.niwa.co.nz/species_codes/ and FMA codes: https://marlin.niwa.co.nz/area_codes/. Please note that the trip number has been removed from this table for reporting, but a complete dataset is available on request from FNZ RDM. NIWA Catalogue numbers are the registration number for specimens deposited in the NIC Specify database *niwainvert*.

Table A-1: Revised identifications of 25 bycatch specimens (in 25 sample lots) returned by observers between 1 July 2024 to 30 June 2025. Green highlighted cells indicate the level of matching where three-letter identification codes were correctly used, yellow highlighted cells indicate the level at which the identification is valid where incorrect identification codes were used. One specimen is not colour coded (Metafannyella) as it was split off from another lot of dead Madrepora oculata that was correctly identified by the Observer as SIA.

NIWA Cat Num	Tow	OSD Num	MPI Sample Num	Initial ID Code	Expert ID code	Class	Order	Family	Full Taxon	Count	Date	Latitude1	Longitude1	Depth 1	Depth 2
173124	131	6793	66	LEI	LEI	Hexacorallia	Antipatharia	Leiopathidae	*Leiopathes acanthophora*	1	Nov-24	-45	174.7	980	1034
173101	14	6751	B1	COB	BTP	Hexacorallia	Antipatharia	Schizopathidae	*Bathypathes*	1	Jul-24	-40	178.1	523	
178693	50	6903	2	COB	BTP	Hexacorallia	Antipatharia	Schizopathidae	*Bathypathes*	1	May-25	-43.3	-176.1	391	405
173117	63	6786	28	COB	PTP	Hexacorallia	Antipatharia	Schizopathidae	*Parantipathes* cf. *robusta*	1	Nov-24	-44.9	175.5	993	1243
173103	26	6753	B3	SIA	CAY	Hexacorallia	Scleractinia	Caryophylliidae	*Caryophyllia profunda*	1	Jul-24	-39.7	178.3	265	
178692	50	6902	1	GDU	GDU	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella dumosa*	1	May-25	-43.3	-176.1	391	405
173099	43	6739	2	UNF	STP	Hexacorallia	Scleractinia	Caryophylliidae	*Stephanocyathus platypus*	1	Aug-24	-42.7	-176.5	1062	1122
178699	53	6910	B1	STP	STP	Hexacorallia	Scleractinia	Caryophylliidae	*Stephanocyathus platypus*	1	Jun-25	-42.8	-176.2	1123	1169
173095	64	6680		COF	COF	Hexacorallia	Scleractinia	Flabellidae	*Flabellum*	1	Jul-24	-43.8	174.6	533	523
173105	8	6770	6	SIA	MOC	Hexacorallia	Scleractinia	Madreporidae	*Madrepora oculata*	1	Oct-24	-44.2	177.4	1035	
178680	14	6889		COU	ERR	Hydrozoa	Anthoathecata	Stylasteridae	*Errina dendyi*	1	Mar-25	-47.8	179.3	128	154
173129	131	6798		PLE	PLO	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Placogorgia*	1	Nov-24	-45	174.7	980	1034
179090	96	6788	49	GOC	ANB	Octocorallia	Malacalcyonacea	Alcyoniidae	*Anthothela*	1	Nov-24	-44.9	175.5	960	

NIWA Cat Num	Tow	OSD Num	MPI Sample Num	Initial ID Code	Expert ID code	Class	Order	Family	Full Taxon	Count	Date	Latitude1	Longitude1	Depth 1	Depth 2
173130	131	6799	68	SWI	SWI	Octocorallia	Malacalcyonacea	Plexauridae	*Swiftia*	1	Nov-24	-45	174.7	980	1034
173127	63	6796	B28	PAB	PAB	Octocorallia	Scleralcyonacea	Coralliidae	*Paragorgia arborea*	1	Nov-24	-44.9	175.5	993	1243
173107	5	6772	1	BOO	BOO	Octocorallia	Scleralcyonacea	Keratoisididae	*Keratoisis*	1	Oct-24	-44.9	175.5	1068	1150
173102	26	6752	B2	COB	CLG	Octocorallia	Scleralcyonacea	Primnoidae	*Callogorgia*	1	Jul-24	-39.7	178.3	265	
173116	61	6785	25	GOC	PRI	Octocorallia	Scleralcyonacea	Primnoidae	*Callozostron*	1	Nov-24	-44.9	175.4	1130	
173110	11	6775	8	THO	DSY	Octocorallia	Scleralcyonacea	Primnoidae	*Dasystenella*	1	Oct-24	-44.1	178.4	988	
179091	8	6770	6	N/A	MEF	Octocorallia	Scleralcyonacea	Primnoidae	*Metafannyella*	1	Oct-24	-44.2	177.4	1035	
179092	61	6785	25	GOC	PRI	Octocorallia	Scleralcyonacea	Primnoidae	*Pachyprimnoa*?	1	Nov-24	-44.9	175.4	1130	
173115	58	6784		GOC	PMN	Octocorallia	Scleralcyonacea	Primnoidae	*Primnoa notialis*	1	Nov-24	-44.7	175.9	1059	1111
173125	63	6794	B27	PMN	PMN	Octocorallia	Scleralcyonacea	Primnoidae	*Primnoa notialis*	1	Nov-24	-44.9	175.5	993	1243
173119	96	6788	49	GOC	PMN	Octocorallia	Scleralcyonacea	Primnoidae	*Primnoa notialis*	1	Nov-24	-44.9	175.5	960	
173118	63	6787	29	GOC	TOK	Octocorallia	Scleralcyonacea	Primnoidae	*Tokoprymno maia*	1	Nov-24	-44.9	175.5	993	1243

Table A-2: Revised identifications of 19 historical bycatch specimens (in 18 sample lots) returned by Observers, identified between 19 February 2025 and 23 March.

NIWA Cat Num	Tow	OSD Num	MPI Sample Num	Initial ID Code	Expert ID Code	Class	Order	Family	Full Taxon	Count	Date	Latitude1	Longitude1	Depth1	Depth2
101769	8				LEI	Hexacorallia	Antipatharia	Leiopathidae	*Leiopathes*	1	09/1998	-37.3	167.4	876	
101768	8				BTP	Hexacorallia	Antipatharia	Schizopathidae	*Bathypathes*	1	09/1998	-37.3	167.4	876	
149766	113				COB	Hexacorallia	Antipatharia		Antipatharia indet.	1	12/1998	-48.5	164.9	937	
42485	125	125			ACC	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia* sp. 1	1	07/2008	-50	174.7	859	93
42499	102	153			ACC	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia* sp. 1	1	07/2008	-49.8	175.9	998	
66122	59	923	59	SEO	ACC	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia* sp. 1	1	11/2008	-50	174.7	857	1035
66317	96	455			ACC	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia* sp. 1	1	09/2009	-50.1	174.9	1005	1020
88600	20	2620			ACC	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia* sp. 2	1	07/2013	-35.6	165.2	928	967
131932	37	4808	33	GOC	ACC	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia* sp. 2	1	12/2019	-42.7	-177.3	1182	1182
75804	57	2058			ACC	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia* sp. 3	1	01/2012	-48.8	166.4	608	575
111980	39				ACD	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Anthomuricea*	1	08/1997	-37	176.7	976	
69555	23	1279			ACD	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Discogorgia*	1	12/2010	-35.6	165.9	747	1078
16447	158			GOC	PLO	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Placogorgia*	1	12/1999	-42.7	176.5	650	608
42483	207	298			PLO	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Placogorgia*	1	08/2008	-50	174.8	911	1083
42488	127				PLO	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Placogorgia*	1	06/2008	-42.7	180	773	1116
42492	111				GOC	Octocorallia	Malacalcyonacea	Rosgorgiidae	*Rosgorgia*	1	07/2008	-49.8	175.9	1041	1084
47778	39				GOC	Octocorallia	Malacalcyonacea	Rosgorgiidae	*Rosgorgia*	2	04/2008	-49.8	175.9	870	1005
42550	27				GOC	Octocorallia	Malacalcyonacea	Rosgorgiidae	*Rosgorgia* sp. 2	1	09/2007	-47.9	175	1057	1108

Table A-3: Revised identifications of six research trawl survey collected specimens (in six sample lots) returned by ESNZ fisheries staff between 2010 and 2024 identified during the current reporting year.

NIWA Cat Num	Voyage	Tow	Initial ID Code	Expert ID Code	Class	Order	Family	Full Taxon	Count	Date	Latitude1	Longitude1	Depth 1	Depth 2
76755	TAN1003	110		TYL	Hexacorallia	Antipatharia	Stylopathidae	*Tylopathes*	1	31/03/2010	-42.07	174.49	1115	
155078	TAN1003	63		BTP	Hexacorallia	Antipatharia	Schizopathidae	*Bathypathes*	1	26/03/2010	-38.44	178.74	815	834
173468	TAN2407	46	STP	STP	Hexacorallia	Scleractinia	Caryophylliidae	*Stephanocyathus platypus*	1	02/08/2024	-41.65	170.15	805	795
92172	TAN9406	X483		PLO	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Placogorgia*	1	04/07/1994	-42.76	-179.91	890	
111970	KAH0004	28		PLO	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Placogorgia*	1	21/04/2000	-42.53	170.58	277	
171903	KAH9401	5		DDI	Hexacorallia	Scleractinia	Caryophylliidae	*Desmophyllum dianthus*	1	04/01/1994	-36.13	176.12	225	223

Appendix B Summary of physical specimen data loaded into COD

This publicly accessible website can be used to search target species and expert species codes: https://marlin.niwa.co.nz/species_codes/ and FMA codes: https://marlin.niwa.co.nz/area_codes/. The fishing method codes are as follows: BLL = Bottom longlining, BT = Bottom Trawl. NIWA Catalogue numbers are the registration number for specimens deposited in the NIC Specify database *niwainvert*.

Table B-1: Summary of data loaded into COD including historical and current year protected coral samples returned by Observers between 1 July 2024 to 30 June 2025. Please note that the trip number and target fishery data have been removed from this table, but a complete dataset is available on request from FNZ RDM.

niwa_cat_num	station_number	gear_code	event_start_date	start_obs_fma	trunc_start_latitude	trunc_start_longitude	start_seabed_depth	end_seabed_depth	initial_species_code	expert_species_code	class_name	order_name	family_name	taxon	sample_count
149766	113	BT	Dec-98	SOU	-48.5	164.9	1079	1205		COB	Hexacorallia	Antipatharia		Antipatharia indet.	1
101769	8	BT	Sep-98	CET	-37.3	167.3	755	876		LEI	Hexacorallia	Antipatharia	Leiopathidae	*Leiopathes*	1
173124	131	BT	Nov-24	SEC	-45	174.7	980	1034	LEI	LEI	Hexacorallia	Antipatharia	Leiopathidae	*Leiopathes acanthophora*	1
101768	8	BT	Sep-98	CET	-37.3	167.3	755	876		BTP	Hexacorallia	Antipatharia	Schizopathidae	*Bathypathes*	1
173101	14	BT	Jul-24	CEE	-39.9	178.1	523		COB	BTP	Hexacorallia	Antipatharia	Schizopathidae	*Bathypathes*	1
178693	50	BT	May-25	SOE	-43.3	183.9	391	405	COB	BTP	Hexacorallia	Antipatharia	Schizopathidae	*Bathypathes*	1
173117	63	BT	Nov-24	SEC	-44.9	175.5	993	1243	COB	PTP	Hexacorallia	Antipatharia	Schizopathidae	*Parantipathes* cf. *robusta*	1
173103	26	BT	Jul-24	CEE	-39.7	178.2	265		SIA	CAY	Hexacorallia	Scleractinia	Caryophylliidae	*Caryophyllia profunda*	1
178692	50	BT	May-25	SOE	-43.3	183.9	391	405	GDU	GDU	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella dumosa*	1
173099	43	BT	Aug-24	SOE	-42.7	183.5	1062	1122	UNF	STP	Hexacorallia	Scleractinia	Caryophylliidae	*Stephanocyathus platypus*	1
173095	64	BT	Jul-24	SEC	-43.7	174.5	533	523	COF	COF	Hexacorallia	Scleractinia	Flabellidae	*Flabellum*	1
173105	7	BT	Oct-24	SOE	-44.2	177.4	1011		SIA	MOC	Hexacorallia	Scleractinia	Madreporidae	*Madrepora oculata*	1
178699	53	BT	Jun-25	SOE	-42.8	183.8	1123	1169	STP	STP	Hexacorallia	Scleractinia	Stephanocyathidae	*Stephanocyathus platypus*	1
178680	14	BLL	Mar-25	SUB	-47.8	179.2	128	154	COU	ERR	Hydrozoa	Anthoathecata	Stylasteridae	*Errina dendyi*	1
42499	102	BT	Jul-08	SUB	-49.7	175.8		1060		ACC	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia* sp. 1	1
42485	125	BT	Jul-08	SUB	-50	174.7	1002	873		ACC	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia* sp. 1	1

niwa_cat_num	station_number	gear_code	event_start_date	start_obs_fma	trunc_start_latitude	trunc_start_longitude	start_seabed_depth	end_seabed_depth	initial_species_code	expert_species_code	class_name	order_name	family_name	taxon	sample_count
66122	59	BT	Nov-08	SUB	-50	174.7	867	1035	SEO	ACC	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia* sp. 1	1
66317	96	BT	Sep-09	SUB	-50.1	174.9				ACC	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia* sp. 1	1
88600	20	BT	Jul-13	HOWE	-35.5	165.2	964			ACC	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia* sp. 2	1
131932	37	BT	Dec-19	SOE	-42.7	182.6	1182	1182	GOC	ACC	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia* sp. 2	1
75804	57	BT	Jan-12	SOU	-48.7	166.3	608	504		ACC	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia* sp. 3	1
111980	39	BT	Jul-97	AKE	-37	177.3	915	977		ACD	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Anthomuricea*	1
69555	23	BT	Dec-10	HOWE	-35.6	165.9				ACD	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Discogorgia*	1
16447	158	BT	Dec-99	SOE	-42.7	176.5	650	608	GOC	PLO	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Placogorgia*	1
42488	127	BT	Jun-08	SOE	-42.7	179.9				PLO	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Placogorgia*	1
42483	207	BT	Aug-08	SUB	-50	174.7				PLO	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Placogorgia*	1
173129	131	BT	Nov-24	SEC	-45	174.7	980	1034	PLE	PLO	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Placogorgia*	1
179090	96	BT	Nov-24	SEC	-44.9	175.5	960		GOC	ANB	Octocorallia	Malacalcyonacea	Alcyoniidae	*Anthothela*	1
173130	131	BT	Nov-24	SEC	-45	174.7	980	1034	SWI	SWI	Octocorallia	Malacalcyonacea	Plexauridae	*Swiftia*	1
47778	39	BT	Apr-08	SUB	-49.8	175.8		1112		GOC	Octocorallia	Malacalcyonacea	Rosgorgiidae	*Rosgorgia*	2
42492	111	BT	Jul-08	SUB	-49.8	175.8	1103	1090		GOC	Octocorallia	Malacalcyonacea	Rosgorgiidae	*Rosgorgia*	1
42550	27	BT	Sep-07	SUB	-47.8	175	1252	1259		GOC	Octocorallia	Malacalcyonacea	Rosgorgiidae	*Rosgorgia* sp. 2	1
173127	63	BT	Nov-24	SEC	-44.9	175.5	993	1243	PAB	PAB	Octocorallia	Scleralcyonacea	Coralliidae	*Paragorgia arborea*	1
173107	5	BT	Oct-24	SEC	-44.9	175.5	1068	1150	BOO	BOO	Octocorallia	Scleralcyonacea	Keratoisididae	*Keratoisis*	1
173102	26	BT	Jul-24	CEE	-39.7	178.2	265		COB	CLG	Octocorallia	Scleralcyonacea	Primnoidae	*Callogorgia*	1
173116	62	BT	Nov-24	SEC	-44.9	175.4	1150	1220	GOC	PRI	Octocorallia	Scleralcyonacea	Primnoidae	*Callozostron*	1
173110	11	BT	Oct-24	SOE	-44.1	178.4	988		THO	DSY	Octocorallia	Scleralcyonacea	Primnoidae	*Dasystenella*	1
179091	7	BT	Oct-24	SOE	-44.2	177.4	1011		SIA	MEF	Octocorallia	Scleralcyonacea	Primnoidae	*Metafannyella*	1

niwa_cat_num	station_number	gear_code	event_start_date	start_obs_fma	trunc_start_latitude	trunc_start_longitude	start_seabed_depth	end_seabed_depth	initial_species_code	expert_species_code	class_name	order_name	family_name	taxon	sample_count
179092	62	BT	Nov-24	SEC	-44.9	175.4	1150	1220	GOC	PRI	Octocorallia	Scleralcyonacea	Primnoidae	*Pachyprimnoa*?	1
173115	58	BT	Nov-24	SEC	-44.7	175.9	1059	1111	GOC	PMN	Octocorallia	Scleralcyonacea	Primnoidae	*Primnoa notialis*	1
173125	63	BT	Nov-24	SEC	-44.9	175.5	993	1243	PMN	PMN	Octocorallia	Scleralcyonacea	Primnoidae	*Primnoa notialis*	1
173119	96	BT	Nov-24	SEC	-44.9	175.5	960		GOC	PMN	Octocorallia	Scleralcyonacea	Primnoidae	*Primnoa notialis*	1
173118	63	BT	Nov-24	SEC	-44.9	175.5	993	1243	GOC	TOK	Octocorallia	Scleralcyonacea	Primnoidae	*Tokoprymno maia*	1

Table B-2: The number of expertly identified protected coral physical specimens returned by Observers summarised by species, target fishery and gear type for the reporting period 1 July 2024 to 30 June 2025. The fishing method codes are as follows: BLL = Bottom longlining, BT = Bottom Trawl.

Target Species Code	Target Species Common Name	Gear Code	Expert ID Taxon	Expert ID Code	Total
BYX	Alfonsino & long-finned beryx	BT	*Bathypathes*	BTP	1
			Callogorgia	CLG	1
			Caryophyllia profunda	CAY	1
				Alfonsino & long-finned beryx Total	**3**
HOK	Hoki	BT	*Flabellum*	COF	1
				Hoki Total	**1**
LIN	Ling	BLL	*Errina dendyi*	ERR	1
				Ling Total	**1**
ORH	Orange roughy	BT	*Stephanocyathus platypus*	STP	2
				Orange roughy Total	**2**
SCI	Scampi	BT	*Bathypathes*	BTP	1
			Goniocorella dumosa	GDU	1
				Scampi Total	**2**
SSO	Smooth oreo	BT	*Anthothela*	ANB	1
			Callozostron	PRI	1
			Dasystenella	DSY	1
			Keratoisis	BOO	1
			Leiopathes acanthophora	LEI	1
			Madrepora oculata	MOC	1
			Metafannyella	MEF	1
			Pachyprimnoa?	PRI	1
			Paragorgia arborea	PAB	1
			Parantipathes cf. robusta	PTP	1
			Placogorgia	PLO	1

Target Species Code	Target Species Common Name	Gear Code	Expert ID Taxon	Expert ID Code	Total
			Primnoa notialis	PMN	3
			Swiftia	SWI	1
			Tokoprymno maia	TOK	1
				Smooth oreo Total	**16**
				Grand Total	**25**

Appendix C Summary of digital images processed and identified

This publicly accessible website can be used to search the target species, initial and expert ID species codes: https://marlin.niwa.co.nz/species_codes/ and FMA codes: https://marlin.niwa.co.nz/area_codes/. The fishing method codes are as follows: BT = Bottom Trawl, MW = Midwater Trawl, BLL = Bottom Longlining, POT = Potting.

Table C-1: Summary of images identified by experts for the reporting period 1 July 2024 to 30 June 2025. Please note that the trip number and target fishery data have been removed from this table, but a complete dataset is available on request from FNZ RDM.

Station number	Fishing method	Event start date	Start FMA	End FMA	Start latitude	Start longitude	Start seabed depth	End seabed depth	Phylum	Class	Order	Superfamily; Family	Genus	Species	NIWA Cat. No.	Specimen count	Initial OBS ID Code	Expert ID Code
77	BT	Jul-24	SEC	SEC	-44	174.1	530	565	Cnidaria	Hexacorallia	Scleractinia	Flabellidae	*Flabellum*	*knoxi*		3	COF	COF
64	BT	Jul-24	SEC	SEC	-43.7	174.5	533	523	Cnidaria	Hexacorallia	Scleractinia	Flabellidae	*Flabellum*		173095	1	COF	COF
64	BT	Jul-24	SEC	SEC	-43.7	174.5	533	523	Cnidaria	Hexacorallia	Scleractinia	Flabellidae	*Flabellum*		173095	0	COF	COF
64	BT	Jul-24	SEC	SEC	-43.7	174.5	533	523	Cnidaria	Hexacorallia	Scleractinia	Flabellidae	*Flabellum*		173095	0	COF	COF
64	BT	Jul-24	SEC	SEC	-43.7	174.5	533	523	Cnidaria	Hexacorallia	Scleractinia	Flabellidae	*Flabellum*		173095	0	COF	COF
14	BT	Jul-24	SOU	SEC	-47.4	169.5	324	305	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella*	*dumosa*		1	GDU	GDU
14	BT	Jul-24	CEE	CEE	-39.9	178.1	523		Cnidaria	Hexacorallia	Antipatharia	Schizopathidae	*Bathypathes*		173101	1	COB	BTP
14	BT	Jul-24	CEE	CEE	-39.9	178.1	523		Cnidaria	Hexacorallia	Antipatharia	Schizopathidae	*Bathypathes*		173101	0	COB	BTP
26	BT	Jul-24	CEE	CEE	-39.7	178.2	265		Cnidaria	Octocorallia	Scleralcyonacea	Primnoidae	*Callogorgia*		173102	1	COB	CLG
26	BT	Jul-24	CEE	CEE	-39.7	178.2	265		Cnidaria	Octocorallia	Scleralcyonacea	Primnoidae	*Callogorgia*		173102	0	COB	CLG
26	BT	Jul-24	CEE	CEE	-39.7	178.2	265		Cnidaria	Octocorallia	Scleralcyonacea	Primnoidae	*Callogorgia*		173102	0	COB	CLG
26	BT	Jul-24	CEE	CEE	-39.7	178.2	265		Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella*	*dumosa*		3		GDU
26	BT	Jul-24	CEE	CEE	-39.7	178.2	265		Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella*	*dumosa*		0		GDU
26	BT	Jul-24	CEE	CEE	-39.7	178.2	265		Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella*	*dumosa*		0		GDU
24	BT	Aug-24	CHA	CHA	-39.7	167.9	880		Cnidaria	Octocorallia	Scleralcyonacea	Primnoidae	*Callogorgia*			1	PRI	CLG
24	BT	Aug-24	CHA	CHA	-39.7	167.9	880		Cnidaria	Octocorallia	Scleralcyonacea	Primnoidae	*Callogorgia*			0	PRI	CLG
25	BT	Aug-24	CHA	CHA	-40	167.9	946	920	Cnidaria	Hexacorallia	Antipatharia	Schizopathidae	*Bathypathes*			1	BTP	BTP
25	BT	Aug-24	CHA	CHA	-40	167.9	946	920	Cnidaria	Hexacorallia	Antipatharia	Schizopathidae	*Bathypathes*			0	BTP	BTP
26	BT	Aug-24	CHA	CHA	-40	167.9	895		Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	*Acanella*			1	ACN	ACN

Station number	Fishing method	Event start date	Start FMA	End FMA	Start latitude	Start longitude	Start seabed depth	End seabed depth	Phylum	Class	Order	Superfamily; Family	Genus	Species	NIWA Cat. No.	Specimen count	Initial OBS ID Code	Expert ID Code
31	BT	Aug-24	CHA	CHA	-40.5	168.7	940	895	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	cf. *Lepidisis*			1	ISI	LLE
31	BT	Aug-24	CHA	CHA	-40.5	168.7	940	895	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	cf. *Lepidisis*			0	ISI	LLE
31	BT	Aug-24	CHA	CHA	-40.5	168.7	940	895	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	cf. *Lepidisis*			0	ISI	LLE
31	BT	Aug-24	CHA	CHA	-40.5	168.7	940	895	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	cf. *Lepidisis*			0	ISI	LLE
31	BT	Aug-24	CHA	CHA	-40.5	168.7	940	895	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	cf. *Lepidisis*			0	ISI	LLE
7	BT	Jul-24	AKE	AKE	-36.4	175.6	59	90	Cnidaria	Hexacorallia	Antipatharia	Myriopathidae	*Antipathella*			1	COB	AHL
7	BT	Jul-24	AKE	AKE	-36.4	175.6	59	90	Cnidaria	Hexacorallia	Antipatharia	Myriopathidae	*Antipathella*			0	COB	AHL
25	BT	Aug-24	AKE	AKE	-36.4	175.4	48	48	Cnidaria	Hexacorallia	Scleractinia	Flabellidae	*Flabellum*			1	CUP	COF
56	BT	Aug-24	SOE	SOE	-42.7	178.5	1117	1192	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	*Isidella*			1	LLE	ISP
3	MW	Aug-24	SUB	SUB	-48.3	179.3	360	332	Cnidaria	Octocorallia	Malacalcyonacea	Acanthogorgiidae	cf. *Acanthogorgia*			1	GOC	ACC
81	BT	Sep-24	SUB	SUB	-48.5	175.5	920		Cnidaria	Hexacorallia	Scleractinia	Madreporidae	*Madrepora*	*oculata*		1	CBR	MOC
5	BT	Aug-24	SOE	SOE	-42.6	180.4	1235	1259	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella*	*dumosa*		1	GDU	GDU
9	BT	Aug-24	SOE	SOE	-42.6	180	1347	1340	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella*	*dumosa*		1	GDU	GDU
9	BT	Aug-24	SOE	SOE	-42.6	180	1347	1340	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella*	*dumosa*		0	GDU	GDU
9	BT	Aug-24	SOE	SOE	-42.6	180	1347	1340	Cnidaria	Hexacorallia	Scleractinia	Madreporidae	*Madrepora*	*oculata*		1		MOC
9	BT	Aug-24	SOE	SOE	-42.6	180	1347	1340	Cnidaria	Hexacorallia	Scleractinia	Madreporidae	*Madrepora*	*oculata*		0		MOC
33	BT	Aug-24	SOE	SOE	-43.8	185.7	1006	1103	Cnidaria	Hexacorallia	Antipatharia	Schizopathidae	*Bathypathes*			1	COB	BTP
33	BT	Aug-24	SOE	SOE	-43.8	185.7	1006	1103	Cnidaria	Hexacorallia	Antipatharia	Schizopathidae	*Bathypathes*			0	COB	BTP
65	BT	Oct-24	SOU	SOU	-46.9	165.4	962	1138	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	*Acanella*			1	COU	ACN
65	BT	Oct-24	SOU	SOU	-46.9	165.4	962	1138	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	*Acanella*			0	COU	ACN
65	BT	Oct-24	SOU	SOU	-46.9	165.4	962	1138	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	*Acanella*			0	COU	ACN
88	BT	Oct-24	SOU	SOU	-47	165.8	957	1104	Cnidaria	Octocorallia	Scleralcyonacea	Coralliidae	*Paragorgia*			1	GOC	PAB
88	BT	Oct-24	SOU	SOU	-47	165.8	957	1104	Cnidaria	Octocorallia	Scleralcyonacea	Coralliidae	*Paragorgia*			0	GOC	PAB
88	BT	Oct-24	SOU	SOU	-47	165.8	957	1104	Cnidaria	Octocorallia	Scleralcyonacea	Coralliidae	*Paragorgia*			0	GOC	PAB
88	BT	Oct-24	SOU	SOU	-47	165.8	957	1104	Cnidaria	Octocorallia	Scleralcyonacea	Coralliidae	*Paragorgia*			0	GOC	PAB
88	BT	Oct-24	SOU	SOU	-47	165.8	957	1104	Cnidaria	Octocorallia	Scleralcyonacea	Coralliidae	*Paragorgia*			0	GOC	PAB

Station number	Fishing method	Event start date	Start FMA	End FMA	Start latitude	Start longitude	Start seabed depth	End seabed depth	Phylum	Class	Order	Superfamily; Family	Genus	Species	NIWA Cat. No.	Specimen count	Initial OBS ID Code	Expert ID Code
88	BT	Oct-24	SOU	SOU	-47	165.8	957	1104	Cnidaria	Octocorallia	Scleralcyonacea	Coralliidae	*Paragorgia*			0	GOC	PAB
88	BT	Oct-24	SOU	SOU	-47	165.8	957	1104	Cnidaria	Octocorallia	Scleralcyonacea	Coralliidae	*Paragorgia*			0	GOC	PAB
88	BT	Oct-24	SOU	SOU	-47	165.8	957	1104	Cnidaria	Octocorallia	Scleralcyonacea	Coralliidae	*Paragorgia*			0	GOC	PAB
90	BT	Oct-24	SOU	SOU	-47	165.8	1073	1323	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	*Keratoisis*			1	GOC	BOO
90	BT	Oct-24	SOU	SOU	-47	165.8	1073	1323	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	*Keratoisis*			0	GOC	BOO
90	BT	Oct-24	SOU	SOU	-47	165.8	1073	1323	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	*Keratoisis*			0	GOC	BOO
90	BT	Oct-24	SOU	SOU	-47	165.8	1073	1323	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	*Keratoisis*			0	GOC	BOO
42	BT	Oct-24	SOU	SOU	-47	165.6	430		Cnidaria	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia*			1	COB	ACC
5	BT	Oct-24	HOWE	HOWE	-35.4	165.3	965	989	Cnidaria	Hexacorallia	Antipatharia	Leiopathidae	*Leiopathes*			1	COB	LEI
8	BT	Oct-24	HOWE	HOWE	-35.9	166.1	990	997	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Desmophyllum*	*dianthus*		1	SIA	DDI
8	BT	Oct-24	HOWE	HOWE	-35.9	166.1	990	997	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	*Keratoisis*			1	COB	BOO
8	BT	Oct-24	HOWE	HOWE	-35.9	166.1	990	997	Cnidaria	Hexacorallia	Antipatharia	Stylopathidae	*Tylopathes*			1	GOC	TYL
16	BT	Oct-24	SOE	SOE	-43.6	176	354	395	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Desmophyllum*	*dianthus*		1	CAY	DDI
16	BT	Oct-24	SOE	SOE	-43.6	176	354	395	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Desmophyllum*	*dianthus*		0	CAY	DDI
5	BT	Oct-24	SEC	SEC	-44.9	175.5	1068	1150	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	*Keratoisis*		173107	1	BOO	BOO
5	BT	Oct-24	SEC	SEC	-44.9	175.5	1068	1150	Cnidaria	Octocorallia	Scleralcyonacea	Chrysogorgiidae	*Radicipes*			1	GOC	RAD
7	BT	Oct-24	SOE	SOE	-44.2	177.4	1011		Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	*Keratoisis*			1	BOO	BOO
7	BT	Oct-24	SOE	SOE	-44.2	177.4	1011		Cnidaria	Hexacorallia	Scleractinia	Madreporidae	*Madrepora*	*oculata*	173105	1	SIA	MOC
63	BT	Nov-24	SEC	SEC	-44.9	175.5	993	1243	Cnidaria	Octocorallia	Scleralcyonacea	Primnoidae	*Primnoa*	*notialis*	173125	1	PMN	PMN
63	BT	Nov-24	SEC	SEC	-44.9	175.5	993	1243	Cnidaria	Octocorallia	Scleralcyonacea	Coralliidae	*Paragorgia*	*arborea*	173127	1	PAB	PAB
63	BT	Nov-24	SEC	SEC	-44.9	175.5	993	1243	Cnidaria	Hexacorallia	Antipatharia	Schizopathidae	*Parantipathes*	cf. *robusta*	173117	1	COB	PTP
63	BT	Nov-24	SEC	SEC	-44.9	175.5	993	1243	Cnidaria	Hexacorallia	Scleractinia	Madreporidae	*Madrepora*	*oculata*		1	SIA	MOC
63	BT	Nov-24	SEC	SEC	-44.9	175.5	993	1243	Cnidaria	Octocorallia	Scleralcyonacea	Primnoidae	*Tokoprymno*	*maia*	173118	1	GOC	TOK
83	BT	Nov-24	SEC	SEC	-44.8	173	1060	1125	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	*Keratoisis*			1	BOO	BOO
83	BT	Nov-24	SEC	SEC	-44.8	173	1060	1125	Cnidaria	Octocorallia	Scleralcyonacea	Coralliidae	*Paragorgia*			1	PAB	PAB
83	BT	Nov-24	SEC	SEC	-44.8	173	1060	1125	Cnidaria	Octocorallia	Scleralcyonacea	Primnoidae	cf. *Primnoa*			1	PMN	PMN

Station number	Fishing method	Event start date	Start FMA	End FMA	Start latitude	Start longitude	Start seabed depth	End seabed depth	Phylum	Class	Order	Superfamily; Family	Genus	Species	NIWA Cat. No.	Specimen count	Initial OBS ID Code	Expert ID Code
83	BT	Nov-24	SEC	SEC	-44.8	173	1060	1125	Cnidaria	Octocorallia	Scleralcyonacea	Primnoidae	*Thouarella*			1	THO	THO
83	BT	Nov-24	SEC	SEC	-44.8	173	1060	1125	Cnidaria	Octocorallia	Scleralcyonacea	Primnoidae	*Callogorgia*			1		CLG
83	BT	Nov-24	SEC	SEC	-44.8	173	1060	1125	Cnidaria	Octocorallia	Malacalcyonacea	Plexauridae	*Swiftia*			1	GOC	SWI
85	BT	Nov-24	SEC	SEC	-44.9	174.1	963		Cnidaria	Octocorallia	Scleralcyonacea	Coralliidae	*Paragorgia*			1	PAB	PAB
92	BT	Nov-24	SEC	SEC	-45	174.7	1039		Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	*Keratoisis*			1	BOO	BOO
92	BT	Nov-24	SEC	SEC	-45	174.7	1039		Cnidaria	Octocorallia	Scleralcyonacea	Coralliidae	*Paragorgia*			1	PAB	PAB
96	BT	Nov-24	SEC	SEC	-44.9	175.5	960		Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	*Keratoisis*			1	BOO	BOO
99	BT	Nov-24	SEC	SEC	-44.9	175.4	1147		Cnidaria	Octocorallia	Scleralcyonacea	Mopseidae	cf. *Minuisis*			1	MIN	MIN
99	BT	Nov-24	SEC	SEC	-44.9	175.4	1147		Cnidaria	Octocorallia	Scleralcyonacea	Chrysogorgiidae	*Radicipes*			1	GOC	RAD
99	BT	Nov-24	SEC	SEC	-44.9	175.4	1147		Cnidaria	Octocorallia	Scleralcyonacea	Primnoidae	*Primnoa*	*notialis*		1		PMN
131	BT	Nov-24	SEC	SEC	-45	174.7	980	1034	Cnidaria	Octocorallia	Malacalcyonacea	Acanthogorgiidae	*Placogorgia*		173129	1	PLE	PLO
131	BT	Nov-24	SEC	SEC	-45	174.7	980	1034	Cnidaria	Octocorallia	Malacalcyonacea	Plexauridae	*Swiftia*		173130	1	COU	SWI
131	BT	Nov-24	SEC	SEC	-45	174.7	980	1034	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	*Keratoisis*			1	BOO	BOO
131	BT	Nov-24	SEC	SEC	-45	174.7	980	1034	Cnidaria	Hexacorallia	Antipatharia	Leiopathidae	*Leiopathes*	*acanthophora*	173124	1	LEI	LEI
131	BT	Nov-24	SEC	SEC	-45	174.7	980	1034	Cnidaria	Octocorallia	Scleralcyonacea	Coralliidae	*Paragorgia*			1	PAB	PAB
131	BT	Nov-24	SEC	SEC	-45	174.7	980	1034	Cnidaria	Hexacorallia	Scleractinia	Madreporidae	*Madrepora*	*oculata*		1	SIA	MOC
131	BT	Nov-24	SEC	SEC	-45	174.7	980	1034	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	*Keratoisis*			1	BOO	BOO
1	MW	Nov-24	CEW	CEW	-38.9	173.4	129		Cnidaria	Hydrozoa	Leptothecata	Plumularioidea				1	COU	HDF
29	MW	Nov-24	CEW	CEW	-39.7	173.4	95		Cnidaria	Hydrozoa	Leptothecata	Plumularioidea				1	COU	HDF
29	MW	Nov-24	CEW	CEW	-39.7	173.4	95		Cnidaria	Hydrozoa	Leptothecata	Plumularioidea				0	COU	HDF
32	MW	Nov-24	CEW	CHA	-39.8	173.6	88	83	Cnidaria	Hydrozoa	Leptothecata					1	COU	HDR
10	BT	Nov-24	SOU	SOU	-48.6	166.3	380		Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella*	*dumosa*		1	GDU	GDU
10	BT	Nov-24	SOU	SOU	-48.6	166.3	380		Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella*	*dumosa*		0	GDU	GDU
10	BT	Nov-24	SOU	SOU	-48.6	166.3	380		Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella*	*dumosa*		0	GDU	GDU
10	BT	Nov-24	SOU	SOU	-48.6	166.3	380		Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella*	*dumosa*		0	GDU	GDU
66	BT	Dec-24	SUB	SUB	-49.2	168.5	730	707	Chordata							1	COU	FRA

Station number	Fishing method	Event start date	Start FMA	End FMA	Start latitude	Start longitude	Start seabed depth	End seabed depth	Phylum	Class	Order	Superfamily; Family	Genus	Species	NIWA Cat. No.	Specimen count	Initial OBS ID Code	Expert ID Code
66	BT	Dec-24	SUB	SUB	-49.2	168.5	730	707	Chordata							0	COU	FRA
66	BT	Dec-24	SUB	SUB	-49.2	168.5	730	707	Chordata							0	COU	FRA
80	BT	Dec-24	SEC	SEC	-45	174.9	950	950	Cnidaria	Octocorallia	Scleralcyonacea	Primnoidae	*Primnoa*			1	PMN	PMN
80	BT	Dec-24	SEC	SEC	-45	174.9	950	950	Cnidaria	Octocorallia	Scleralcyonacea	Primnoidae	*Primnoa*			0	PMN	PMN
81	BT	Dec-24	SEC	SEC	-44.9	174.3	1036	1100	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Solenosmilia*	*variabilis*		1	GDU	SVA
81	BT	Dec-24	SEC	SEC	-44.9	174.3	1036	1100	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Solenosmilia*	*variabilis*		0	GDU	SVA
81	BT	Dec-24	SEC	SEC	-44.9	174.3	1036	1100	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Solenosmilia*	*variabilis*		0	GDU	SVA
131	BT	Jan-25	SOE	SOE	-43.8	178.6	451	481	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Desmophyllum*	*dianthus*		30	CBR	DDI
22	BT	Dec-24	SEC	SEC	-44.8	173	1061		Cnidaria	Octocorallia	Scleralcyonacea	Coralliidae	*Paragorgia*			1	PAB	PAB
76	BT	Dec-24	SOE	SOE	-42.6	180	1001	1003	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Solenosmilia*	*variabilis*		6000	SIA	SVA
76	BT	Dec-24	SOE	SOE	-42.6	180	1001	1003	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Solenosmilia*	*variabilis*		0	SIA	SVA
76	BT	Dec-24	SOE	SOE	-42.6	180	1001	1003	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Solenosmilia*	*variabilis*		0	SIA	SVA
76	BT	Dec-24	SOE	SOE	-42.6	180	1001	1003	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Solenosmilia*	*variabilis*		0	SIA	SVA
13	POT	Feb-25	SOE	SOE	-43.9	176.2	487	517	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Desmophyllum*	*dianthus*		1	CUP	DDI
13	POT	Feb-25	SOE	SOE	-43.9	176.2	487	517	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella*	*dumosa*		1	CBR	GDU
13	POT	Feb-25	SOE	SOE	-43.9	176.2	487	517	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Desmophyllum*	*dianthus*		1		DDI
14	POT	Feb-25	SOE	SOE	-44	176.3	495	533	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella*	*dumosa*		1	CBR	GDU
9	BT	Nov-24	CEE	CEE	-39.6	178.3	683	748	Cnidaria	Octocorallia	Scleralcyonacea	Keratoisididae	*Keratoisis*			1	BOO	BOO
9	BT	Nov-24	CEE	CEE	-39.6	178.3	683	748	Cnidaria	Hexacorallia	Antipatharia	Schizopathidae	*Dendrobathypathes*			1	COB	DEN
38	BT	Dec-24	CEE	CEE	-41	176.7	992	1006	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella*	*dumosa*		1	SIA	GDU
54	BT	Jan-25	SEC	SEC	-43.5	174.5	536	501	Cnidaria	Hexacorallia	Scleractinia	Flabellidae	*Flabellum*	*knoxi*		1	COF	COF
28	BT	Jan-25	CEE	CEE	-37.9	179	956	1661	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Solenosmilia*	*variabilis*		1	GDU	SVA
64	BT	Feb-25	SOE	SOE	-44.2	179	940	1105	Cnidaria	Octocorallia	Scleralcyonacea	Coralliidae	*Paragorgia*			2	GOC	PAB
64	BT	Feb-25	SOE	SOE	-44.2	179	940	1105	Cnidaria	Octocorallia	Scleralcyonacea	Coralliidae	*Paragorgia*			0	GOC	PAB
8	BT	Feb-25	SOE	SOE	-44.3	176	184	161	Cnidaria	Hexacorallia	Scleractinia	Flabellidae	*Flabellum*	*knoxi*		3	COF	COF
88	BT	Apr-25	SOE	SOE	-44.1	179.7	520	484	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Desmophyllum*	*dianthus*		2	DDI	DDI

Station number	Fishing method	Event start date	Start FMA	End FMA	Start latitude	Start longitude	Start seabed depth	End seabed depth	Phylum	Class	Order	Superfamily; Family	Genus	Species	NIWA Cat. No.	Specimen count	Initial OBS ID Code	Expert ID Code
21	BT	Mar-25	SOI	SOI	-49.7	166.1	150	181	Cnidaria	Hydrozoa	Leptothecata	Plumularioidea				1	DEN	HDF
38	BT	Apr-25	SOU	SOU	-47.3	169.2	310	319	Cnidaria	Hydrozoa	Leptothecata	Zygophylacidae	*Cryptolaria*			1	DEN	CRT
88	BT	Apr-25	SEC	SEC	-43.3	174.4	524	538	Cnidaria	Octocorallia	Scleralcyonacea	Pennatuloidea; Balticinidae	cf. *Balticina*			2	FQU	HWL
101	BT	Apr-25	SEC	SEC	-44	174.7	519	533	Cnidaria	Hexacorallia	Scleractinia	Flabellidae	*Flabellum*	*knoxi*		25	COF	COF
118	BT	Apr-25	SOE	SOE	-42.9	176	530	548	Cnidaria	Octocorallia	Scleralcyonacea	Pennatuloidea; Balticinidae	cf. *Balticina*			5	FQU	HWL
40	BT	May-25	SOE	SOE	-43.4	183.9	376	383	Cnidaria	Hexacorallia	Scleractinia	Flabellidae	*Flabellum*	*knoxi*		1	COF	COF
50	BT	May-25	SOE	SOE	-43.3	183.9	391	405	Cnidaria	Hexacorallia	Antipatharia	Schizopathidae	*Bathypathes*		178693	0	COB	BTP
50	BT	May-25	SOE	SOE	-43.3	183.9	391	405	Cnidaria	Hexacorallia	Antipatharia	Schizopathidae	*Bathypathes*		178693	1	COB	BTP
53	BT	May-25	SOE	SOE	-43.2	183.5	391	375	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella*	*dumosa*		3	GDU	GDU
53	BT	May-25	SOE	SOE	-43.2	183.5	391	375	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella*	*dumosa*		0	GDU	GDU
53	BT	May-25	SOE	SOE	-43.2	183.5	391	375	Cnidaria	Hexacorallia	Scleractinia	Caryophylliidae	*Goniocorella*	*dumosa*		0	GDU	GDU
84	BT	Apr-25	SOU	SOU	-47.2	169.2	123	270	Cnidaria	Hydrozoa	Leptothecata	Zygophylacidae	*Cryptolaria*			1	COU	CRT
28	BLL	Apr-25	SOU	SOU	-46.3	165.9	481	549	Cnidaria	Hydrozoa	Anthothecata	Stylasteridae				1	COR	COR
28	BLL	Apr-25	SOU	SOU	-46.3	165.9	481	549	Porifera	Demospongiae	Poecilosclerida	Coelosphaeridae	*Coelosphaera*			1		DSO
65	BT	Jun-25	SOE	SOE	-44.3	176	199	234	Bryozoa							1	CUP	COZ
65	BT	Jun-25	SOE	SOE	-44.3	176	199	234	Porifera							1		ONG
63	BT	Jun-25	SOU	SOU	-48.7	166.4	580	571	Cnidaria	Octocorallia	Scleralcyonacea	Primnoidae	*Thouarella*			1	COU	THO
63	BT	Jun-25	SOU	SOU	-48.7	166.4	580	571	Cnidaria	Octocorallia	Scleralcyonacea	Primnoidae	*Thouarella*			0	COU	THO
53	BT	Jun-25	SOE	SOE	-42.8	183.8	1123	1169	Cnidaria	Hexacorallia	Scleractinia	Stephanocyathidae	*Stephanocyathus*	*platypus*		1	STP	STP
12	BT	Jun-25	SEC	SEC	-43.3	173.8	188		Cnidaria	Hexacorallia	Scleractinia	Flabellidae	*Flabellum*	*knoxi*		1	COF	COF

Table C-2: The number of expert-identified . Protected coral specimens from images photographed by Observers summarised by species, target fishery and gear type for the reporting period 1 July 2024 to 30 June 2025. Please note that some data (2 specimens) that do not meet the MPI three-permit holder rule have been removed from this table.

Target Species Code	Target Species Common Name	Gear Code	Expert ID Taxon	Expert ID Code	Total
BAR	Barracouta	BT	*Flabellum knoxi*	COF	1
				Barracouta Total	**1**
BYX	Alfonsino & long-finned beryx	BT	*Bathypathes*	BTP	1
			Dendrobathypathes	DEN	1
			Goniocorella dumosa	GDU	3
			Keratoisis	BOO	1
			Callogorgia	CLG	1
				Alfonsino & long-finned beryx Total	**7**
HOK	Hoki	BT	*Desmophyllum dianthus*	DDI	32
			Flabellum	COF	1
			Flabellum knoxi	COF	29
				Hoki Total	**62**
LIN	Ling	BLL	*Stylasteridae*	COR	1
		BT	*Goniocorella dumosa*	GDU	1
			Thouarella	THO	1
		POT	*Desmophyllum dianthus*	DDI	2
			Goniocorella dumosa	GDU	2
				Ling Total	**7**
OEO	Oreos	BT	*Paragorgia*	PAB	2
				Oreos Total	**2**
ORH	Orange roughy	BT	*Leiopathes*	LEI	1
			Bathypathes	BTP	2

Target Species Code	Target Species Common Name	Gear Code	Expert ID Taxon	Expert ID Code	Total
			Tylopathes	TYL	1
			Desmophyllum dianthus	DDI	1
			Goniocorella dumosa	GDU	3
			Solenosmilia variabilis	SVA	6001
			Madrepora oculata	MOC	1
			Stephanocyathus platypus	STP	1
			Paragorgia	PAB	1
			Acanella	ACN	2
			cf. *Lepidisis*	LLE	1
			Isidella	ISP	1
			Keratoisis	BOO	2
			Callogorgia	CLG	1
				Orange roughy Total	**6019**
SBW	Southern blue whiting	MW	cf. *Acanthogorgia*	ACC	1
				Southern blue whiting Total	**1**
SCI	Scampi	BT	*Bathypathes*	BTP	1
			Desmophyllum dianthus	DDI	1
			Goniocorella dumosa	GDU	3
			Flabellum knoxi	COF	1
				Scampi Total	**6**
SNA	Snapper	BT	*Antipathella*	AHL	1
			Flabellum	COF	1
				Snapper Total	**2**
SQU	Arrow squid	BT	*Goniocorella dumosa*	GDU	1
			Flabellum knoxi	COF	3

Target Species Code	Target Species Common Name	Gear Code	Expert ID Taxon	Expert ID Code	Total
				Arrow squid Total	**4**
SSO	Smooth oreo	BT	*Leiopathes acanthophora*	LEI	1
			Parantipathes cf. *robusta*	PTP	1
			Solenosmilia variabilis	SVA	1
			Madrepora oculata	MOC	3
			Placogorgia	PLO	1
			Swiftia	SWI	2
			Radicipes	RAD	2
			Paragorgia	PAB	5
			Paragorgia arborea	PAB	1
			Keratoisis	BOO	7
			cf. *Minuisis*	MIN	1
			Callogorgia	CLG	1
			Primnoa	PMN	1
			Primnoa notialis	PMN	2
			Thouarella	THO	1
			Tokoprymno maia	TOK	1
			cf. *Primnoa*	PMN	1
				Smooth oreo Total	**32**
				Grand Total	**6143**

Appendix D Genome skimming data, UCE matching, and mitogenome recovery

Table D-1: Genomic sequencing results for each included specimen. Preliminary sequencing was conducted using an iSeq followed by final data production on two lanes of a NovoSeq, followed by assembly and matching to the octocoral-v2 UCE baitset. Values represent counts of reads, assembled contigs and DNA base-pairs for each stage of raw data processing.

	iSeq				NovoSeq 1				NovoSeq 2				Assembly						UCEs				
Sample name	reads	sum of read lengths	average read length	SE of read length	reads	sum of read lengths	average read length	SE of read length	reads	sum of read lengths	average read length	SE of read length	contigs	total bp	min length	max length	median legnth	contigs >1kb	contigs	total bp	min length	max length	median length	contigs >1kb
Corallium_131527	1.11E+05	1.52E+07	137	0.083	1.41E+07	2.02E+09	144	0.006	1.43E+07	2.05E+09	144	0.006	1.91E+06	3.86E+08	55	19096	82	55440	2333	2426756	156	6569	856	952
Paragorgia_131934	8.87E+04	1.29E+07	145	0.060	1.32E+07	1.94E+09	147	0.004	1.33E+07	1.97E+09	147	0.004	3.84E+05	1.15E+08	56	226305	106	16585	11	49946	220	23518	1916	6
Paragorgia_147273	7.70E+04	1.06E+07	137	0.098	9.85E+06	1.41E+09	143	0.007	9.93E+06	1.42E+09	143	0.007	1.28E+06	2.77E+08	56	33175	86	38144	2180	1849927	132	4495	689.5	603
Paragorgia_44607	1.07E+05	1.31E+07	122	0.112	1.16E+07	1.51E+09	131	0.010	1.16E+07	1.52E+09	131	0.010	1.13E+06	2.44E+08	55	133405	96	23633	2059	1398992	152	6070	560	343
Paragorgia_46321	8.88E+04	1.14E+07	129	0.113	1.05E+07	1.44E+09	137	0.009	1.05E+07	1.44E+09	137	0.009	9.96E+05	2.23E+08	55	66219	111	17450	1759	1017649	66	6017	491	167
Paragorgia_61977	9.62E+04	1.31E+07	137	0.090	1.02E+07	1.45E+09	142	0.007	1.02E+07	1.46E+09	142	0.007	1.27E+06	2.80E+08	55	34140	92	37061	2270	1931618	164	5674	710	647
Paragorgia_76960	1.48E+05	1.99E+07	134	0.075	1.48E+07	2.06E+09	139	0.006	1.48E+07	2.07E+09	139	0.006	1.81E+06	3.77E+08	55	57403	93	49209	2347	2456424	158	6288	832	931
Paragorgia_alisonae_106531	4.79E+04	5.70E+06	119	0.169	4.33E+06	5.46E+08	126	0.017	4.31E+06	5.45E+08	126	0.017	5.76E+05	1.28E+08	56	38225	154	7876	933	397668	207	30879	308	11
Paragorgia_alisonae_41726	9.85E+04	1.27E+07	129	0.108	9.84E+06	1.35E+09	137	0.009	9.89E+06	1.36E+09	137	0.009	1.29E+06	2.75E+08	55	12998	88	34582	2244	1936119	64	7411	692	635
Paragorgia_alisonae_42002	6.10E+04	8.73E+06	143	0.085	1.09E+07	1.60E+09	146	0.005	1.10E+07	1.61E+09	147	0.005	6.36E+04	4.88E+07	56	692565	270	3648	58	2900851	211	477779	470.5	16
Paragorgia_alisonae_44606	1.05E+05	1.42E+07	134	0.091	1.09E+07	1.53E+09	140	0.007	1.10E+07	1.54E+09	141	0.007	1.45E+06	2.97E+08	55	34731	87	34600	2168	1644010	200	6191	634	482
Paragorgia_alisonae_65917	9.18E+04	1.13E+07	123	0.122	8.72E+06	1.15E+09	132	0.011	8.72E+06	1.15E+09	132	0.011	9.74E+05	2.12E+08	55	36304	107	16818	1861	1084151	181	6384	485	192
Paragorgia_alisonae_65926	1.25E+05	1.56E+07	125	0.098	1.25E+07	1.65E+09	131	0.009	1.25E+07	1.65E+09	132	0.009	1.30E+06	2.78E+08	55	30154	96	29102	2202	1606674	89	4581	606.5	438
Paragorgia_alisonae_66097	1.33E+05	1.82E+07	136	0.075	1.33E+07	1.88E+09	141	0.006	1.33E+07	1.88E+09	141	0.006	1.62E+06	3.45E+08	55	19040	87	51375	2373	2444397	135	7657	844	936
Paragorgia_alisonae_66159	9.13E+04	1.24E+07	136	0.092	1.25E+07	1.79E+09	142	0.006	1.26E+07	1.80E+09	143	0.006	1.42E+06	3.29E+08	56	18714	89	58936	2407	3239357	163	8823	1051	1269
Paragorgia_alisonae_66264	1.23E+05	1.59E+07	130	0.095	1.48E+07	2.02E+09	137	0.007	1.48E+07	2.03E+09	137	0.007	1.51E+06	3.26E+08	55	40845	86	50059	2365	2529095	57	7928	836	956
Paragorgia_alisonae_66278	1.18E+05	1.47E+07	125	0.102	1.20E+07	1.59E+09	132	0.009	1.20E+07	1.59E+09	132	0.009	1.28E+06	2.52E+08	55	60723	93	18403	1841	1048694	91	10075	497	149
Paragorgia_alisonae_HOLOTYPE_3312	1.97E+05	2.55E+07	130	0.070	1.71E+07	2.30E+09	135	0.007	1.70E+07	2.29E+09	135	0.007	1.42E+06	3.15E+08	55	416041	97	39108	2264	2084464	148	125666	695.5	644
Paragorgia_alisonae_PARATYPE_3315	1.43E+05	1.65E+07	115	0.101	1.16E+07	1.42E+09	123	0.011	1.15E+07	1.42E+09	123	0.011	1.27E+06	2.17E+08	55	133055	87	8990	1096	434049	56	5539	327.5	23
Paragorgia_alisonae_PARATYPE_3317	1.10E+05	1.36E+07	124	0.108	1.07E+07	1.42E+09	133	0.010	1.07E+07	1.42E+09	133	0.010	1.47E+06	2.52E+08	55	65184	88	10990	1228	571935	65	6376	370.5	62
Paragorgia_aotearoa_65925	1.05E+05	1.42E+07	135	0.091	1.19E+07	1.68E+09	141	0.007	1.20E+07	1.69E+09	141	0.007	1.48E+06	3.18E+08	55	42107	85	48277	2404	2505062	70	5654	828.5	926
Paragorgia_aotearoa_HOLOTYPE_3325	1.75E+05	2.33E+07	133	0.070	1.78E+07	2.46E+09	138	0.006	1.79E+07	2.47E+09	138	0.006	1.96E+06	3.18E+08	55	18923	76	25709	2013	1464601	81	4234	590	407
Paragorgia_arborea_139132	1.39E+05	1.94E+07	139	0.067	1.39E+07	1.99E+09	143	0.006	1.39E+07	2.00E+09	143	0.006	1.47E+06	3.35E+08	56	55734	89	57314	2401	2800151	78	7472	941	1132
Paragorgia_arborea_146463	9.14E+04	1.25E+07	137	0.094	1.07E+07	1.53E+09	143	0.007	1.08E+07	1.54E+09	143	0.007	1.46E+06	3.12E+08	55	18563	86	46766	2298	2218717	160	8866	757	793
Paragorgia_arborea_28154	1.42E+05	1.97E+07	138	0.067	1.53E+07	2.18E+09	143	0.005	1.53E+07	2.19E+09	143	0.005	1.46E+06	3.35E+08	56	20632	87	60058	2435	3139752	75	8979	1006	1228
Paragorgia_arborea_28157	1.21E+05	1.69E+07	140	0.069	1.45E+07	2.09E+09	144	0.005	1.46E+07	2.10E+09	144	0.005	1.62E+06	3.41E+08	55	16089	84	54371	2375	2859034	88	7966	934	1104
Paragorgia_arborea_28425	1.79E+05	2.36E+07	132	0.070	1.63E+07	2.24E+09	138	0.006	1.63E+07	2.24E+09	138	0.006	1.45E+06	3.21E+08	55	33059	89	48113	2339	2334372	146	10196	810	861
Paragorgia_arborea_41725	1.08E+05	1.47E+07	137	0.086	1.34E+07	1.90E+09	142	0.006	1.34E+07	1.92E+09	143	0.006	1.48E+06	3.33E+08	55	33603	84	59412	2434	3133327	125	11252	982	1196
Paragorgia_arborea_41829	1.03E+05	1.41E+07	137	0.085	1.26E+07	1.80E+09	143	0.006	1.27E+07	1.81E+09	143	0.006	1.51E+06	3.20E+08	55	37110	92	40059	2247	2209293	70	11939	753	747
Paragorgia_arborea_42000	1.05E+05	1.45E+07	138	0.082	1.62E+07	2.34E+09	144	0.005	1.63E+07	2.35E+09	144	0.005	4.34E+04	3.88E+07	56	414820	283	2784	8	371531	217	204432	1355.5	4
Paragorgia_arborea_42001	8.26E+04	1.13E+07	137	0.097	9.27E+06	1.32E+09	142	0.008	9.34E+06	1.33E+09	142	0.007	5.34E+05	2.24E+08	56	1773212	275	29721	530	594009	88	373621	286.5	17

	iSeq				NovoSeq 1				NovoSeq 2				Assembly						UCEs				
Sample name	reads	sum of read lengths	average read length	SE of read length	reads	sum of read lengths	average read length	SE of read length	reads	sum of read lengths	average read length	SE of read length	contigs	total bp	min length	max length	median legnth	contigs >1kb	contigs	total bp	min length	max length	median length	contigs >1kb
Paragorgia_arborea_44609	8.96E+04	1.20E+07	134	0.103	1.10E+07	1.54E+09	141	0.007	1.10E+07	1.55E+09	141	0.007	9.71E+05	2.17E+08	55	17008	105	19780	1875	1150121	64	5346	518	236
Paragorgia_arborea_46315	8.46E+04	1.10E+07	130	0.114	9.32E+06	1.28E+09	138	0.009	9.34E+06	1.29E+09	138	0.009	9.58E+05	2.03E+08	55	15194	100	16150	1794	1046563	139	6506	492	188
Paragorgia_arborea_46317	1.23E+05	1.56E+07	127	0.102	1.23E+07	1.67E+09	136	0.009	2.89E+06	3.94E+08	136	0.018	1.65E+05	4.56E+07	56	41509	239	2784	393	167048	70	41509	273	4
Paragorgia_arborea_46318	1.03E+05	1.36E+07	132	0.098	1.32E+07	1.85E+09	140	0.007	1.33E+07	1.86E+09	140	0.007	8.46E+05	2.04E+08	55	26826	142	19662	1899	1304292	75	7010	556	328
Paragorgia_arborea_46377	1.16E+05	1.58E+07	136	0.084	1.10E+07	1.56E+09	142	0.007	1.10E+07	1.57E+09	142	0.007	8.63E+05	2.44E+08	56	49451	211	25634	1431	695047	88	5921	411	68
Paragorgia_arborea_47198	1.17E+05	1.62E+07	139	0.076	1.34E+07	1.92E+09	143	0.006	1.35E+07	1.93E+09	143	0.006	1.44E+06	3.24E+08	56	18749	87	55136	2405	2809821	144	8960	921	1098
Paragorgia_arborea_47200	1.07E+05	1.50E+07	140	0.078	1.43E+07	2.06E+09	145	0.005	1.44E+07	2.08E+09	145	0.005	1.77E+06	3.70E+08	55	44889	84	58458	2394	3011972	207	10375	967	1158
Paragorgia_arborea_47201	1.10E+05	1.49E+07	135	0.087	1.22E+07	1.73E+09	141	0.007	1.23E+07	1.74E+09	141	0.007	1.35E+06	2.95E+08	55	16554	89	41519	2285	2089607	109	7202	745	731
Paragorgia_arborea_47203	9.70E+04	1.33E+07	137	0.089	1.16E+07	1.64E+09	142	0.007	1.16E+07	1.65E+09	142	0.007	1.49E+06	3.06E+08	55	31183	88	35030	2127	1646787	187	6468	640	475
Paragorgia_arborea_65991	9.37E+04	1.26E+07	134	0.098	1.10E+07	1.56E+09	142	0.007	1.11E+07	1.57E+09	142	0.007	1.33E+06	2.94E+08	55	43746	86	45283	2329	2222577	70	6288	762	814
Paragorgia_arborea_66089	1.24E+05	1.72E+07	139	0.072	1.41E+07	2.02E+09	143	0.006	1.42E+07	2.04E+09	144	0.005	1.46E+06	3.36E+08	55	18505	87	61307	2436	3225306	199	8276	1039.5	1290
Paragorgia_arborea_66090	1.01E+05	1.40E+07	138	0.084	1.18E+07	1.70E+09	143	0.006	1.19E+07	1.71E+09	143	0.006	1.38E+06	3.10E+08	55	18430	86	51598	2383	2486233	109	6536	845	965
Paragorgia_arborea_66091	1.36E+05	1.89E+07	139	0.069	1.44E+07	2.06E+09	143	0.005	1.45E+07	2.08E+09	143	0.005	1.49E+06	3.36E+08	56	19914	86	59444	2398	2963472	125	7866	946	1129
Paragorgia_arborea_66092	1.31E+05	1.78E+07	136	0.079	1.40E+07	1.98E+09	141	0.006	1.41E+07	1.99E+09	141	0.006	1.42E+06	3.25E+08	55	19053	87	56323	2396	2841552	87	7437	947	1128
Paragorgia_arborea_66093	1.29E+05	1.78E+07	138	0.071	1.52E+07	2.18E+09	143	0.005	1.53E+07	2.19E+09	143	0.005	1.49E+06	3.35E+08	55	31149	85	58679	2370	2847469	84	7790	947	1106
Paragorgia_arborea_66094	1.21E+05	1.66E+07	137	0.077	1.41E+07	2.00E+09	142	0.006	1.41E+07	2.01E+09	142	0.006	1.45E+06	3.30E+08	56	33137	88	56967	2386	2791404	207	7265	928	1087
Paragorgia_arborea_66095	1.15E+05	1.57E+07	137	0.081	1.24E+07	1.77E+09	142	0.006	1.25E+07	1.77E+09	142	0.006	1.39E+06	3.13E+08	56	18323	88	50423	2359	2431295	93	5467	813	918
Paragorgia_arborea_66096	1.36E+05	1.88E+07	138	0.072	1.51E+07	2.17E+09	143	0.005	1.52E+07	2.18E+09	143	0.005	1.54E+06	3.50E+08	55	32007	87	61894	2389	3047474	125	9429	1009	1208
Paragorgia_arborea_66265	9.98E+04	1.39E+07	139	0.081	1.05E+07	1.50E+09	143	0.006	1.05E+07	1.51E+09	143	0.006	1.44E+06	2.90E+08	55	22358	86	35137	2100	1675528	109	11877	651	519
Paragorgia_arborea_66267	1.41E+05	1.92E+07	136	0.076	1.65E+07	2.34E+09	142	0.006	1.66E+07	2.36E+09	142	0.006	1.52E+06	3.51E+08	55	76930	89	61258	2388	3074889	69	9049	1022	1222
Paragorgia_arborea_66268	1.10E+04	1.43E+06	131	0.309	1.63E+07	2.28E+09	139	0.007	1.64E+07	2.29E+09	139	0.006	1.72E+06	3.84E+08	56	63725	87	58802	2286	2693823	88	7017	929.5	1040
Paragorgia_arborea_66269	1.03E+05	1.42E+07	138	0.085	1.27E+07	1.81E+09	143	0.006	1.28E+07	1.83E+09	143	0.006	1.46E+06	3.12E+08	55	32870	87	45788	2328	2653688	185	11062	870	993
Paragorgia_arborea_66270	8.24E+04	1.12E+07	136	0.099	9.50E+06	1.35E+09	142	0.007	9.59E+06	1.36E+09	142	0.007	1.22E+06	2.66E+08	55	25589	89	33635	2201	1830782	185	8959	678	576
Paragorgia_arborea_66271	1.23E+05	1.63E+07	132	0.089	1.17E+07	1.62E+09	138	0.008	1.17E+07	1.62E+09	139	0.008	1.28E+06	2.58E+08	55	47427	89	22965	2024	1366389	114	9126	564	328
Paragorgia_arborea_66272	9.48E+04	1.30E+07	137	0.090	1.08E+07	1.54E+09	143	0.007	1.09E+07	1.55E+09	143	0.007	1.36E+06	2.97E+08	55	76272	89	39876	2261	2016269	209	8400	729	702
Paragorgia_arborea_66273	9.92E+04	1.27E+07	128	0.108	9.49E+06	1.31E+09	138	0.009	9.53E+06	1.31E+09	138	0.009	3.77E+05	8.89E+07	55	39272	217	5035	929	390897	70	3527	336	31
Paragorgia_arborea_66274	1.14E+05	1.58E+07	139	0.077	1.13E+07	1.62E+09	144	0.006	1.13E+07	1.63E+09	144	0.006	1.33E+06	2.99E+08	55	79134	88	45641	2304	2224550	208	11241	779.5	796
Paragorgia_arborea_66275	5.85E+04	7.94E+06	136	0.123	8.32E+06	1.19E+09	142	0.008	8.40E+06	1.20E+09	143	0.008	1.20E+06	2.62E+08	55	14989	91	34240	2275	1848961	70	4575	678	609
Paragorgia_arborea_66276	1.15E+05	1.53E+07	133	0.090	1.22E+07	1.70E+09	139	0.007	1.22E+07	1.71E+09	139	0.007	1.30E+06	2.91E+08	56	76004	91	39266	2271	2090527	205	13779	750	728
Paragorgia_arborea_66279	1.31E+05	1.79E+07	137	0.077	1.53E+07	2.17E+09	142	0.006	1.53E+07	2.18E+09	142	0.006	1.46E+06	3.31E+08	56	89236	86	55319	2376	2711461	130	8020	899	1063
Paragorgia_coralloides_65896	9.72E+04	1.35E+07	139	0.084	1.22E+07	1.75E+09	144	0.006	1.22E+07	1.76E+09	144	0.006	1.01E+06	3.08E+08	55	88898	246	23102	1207	522550	207	4142	354	34
Paragorgia_kaupeka_47202	9.22E+04	1.15E+07	125	0.115	8.67E+06	1.15E+09	133	0.011	8.67E+06	1.15E+09	133	0.011	1.17E+06	2.53E+08	55	38345	104	21504	1881	1099955	154	6248	502	189
Paragorgia_kaupeka_HOLOTYPE_3318	9.08E+04	1.21E+07	133	0.103	1.20E+07	1.69E+09	140	0.007	1.21E+07	1.70E+09	140	0.007	1.47E+06	3.13E+08	55	14584	84	46250	2276	2130321	207	7358	761	746
Paragorgia_maunga_HOLOTYPE_3322	1.48E+05	1.81E+07	122	0.095	1.22E+07	1.57E+09	129	0.010	1.21E+07	1.57E+09	129	0.010	1.15E+06	2.42E+08	55	162705	102	19104	1897	1257638	88	26769	540	285
Paragorgia_wahine_HOLOTYPE_3326	2.49E+05	2.28E+07	92	0.078	1.70E+07	1.68E+09	98	0.010	1.68E+07	1.66E+09	99	0.010	8.84E+05	2.68E+08	55	101263	246	13910	112	49359	75	6287	253.5	8

	iSeq				NovoSeq 1				NovoSeq 2				Assembly							UCEs				
Sample name	reads	sum of read lengths	average read length	SE of read length	reads	sum of read lengths	average read length	SE of read length	reads	sum of read lengths	average read length	SE of read length	contigs	total bp	min length	max length	median legnth	contigs >1kb	contigs	total bp	min length	max length	median length	contigs >1kb
Paragorgia_whero_HOLOTYPE_3436	2.92E+03	3.39E+05	116	0.666	3.62E+05	4.44E+07	123	0.059	3.62E+05	4.45E+07	123	0.059	4.59E+04	9.96E+06	56	19040	221	249	79	21600	64	2290	239	1
Sibogagorgia_126147	2.17E+05	2.84E+07	131	0.065	2.09E+07	2.86E+09	137	0.006	2.09E+07	2.86E+09	137	0.006	1.56E+06	3.34E+08	55	45285	77	62967	2428	3439753	164	8112	1122	1381
Sibogagorgia_126356	2.60E+05	3.31E+07	127	0.064	2.19E+07	2.91E+09	133	0.006	2.18E+07	2.90E+09	133	0.006	1.53E+06	3.32E+08	55	19477	78	62514	2468	3411394	73	10554	1108	1388
Sibogagorgia_cf_88590	6.02E+04	8.43E+06	140	0.104	8.97E+06	1.30E+09	145	0.007	9.04E+06	1.31E+09	145	0.007	1.26E+06	2.93E+08	55	19064	90	51004	2408	2627368	70	6522	852	1001
Sibogagorgia_tautahi_HOLOTYPE_3327	2.95E+05	2.63E+07	89	0.070	1.90E+07	1.80E+09	95	0.009	1.87E+07	1.78E+09	95	0.009	9.73E+05	2.26E+08	55	48081	212	16137	738	269772	63	6117	299	13
Sibogagorgia_weberi_HOLOTYPE_3330	8.45E+03	9.77E+05	116	0.404	4.42E+06	5.37E+08	121	0.017	4.38E+06	5.33E+08	122	0.017	4.34E+05	1.28E+08	55	93538	244	5281	46	12566	64	578	248	0

Appendix E Three-year summary of physical specimens

Table E-1: The physical protected coral specimens summarised by species, target fishery and fishing gear type for the last three years. The fishing gear codes are as follows: BT = Bottom Trawl, MW = Midwater Trawl, BLL = Bottom Longlining. *includes 3 samples processed in the 2023-24 year.

Target species code	Target species common name	Gear code	Expert ID taxon	Expert ID code	1 Jul 2022 - 20 Jul 2023*	1 Jul 2023 - 30 Jun 2024	1 Jul 2024 - 30 Jun 2025
BAR	Barracouta	MW	*Cryptolaria*	CRT	1		
		MW	*Cryptolaria prima*	CRT	1		
BNS	Bluenose	BLL	Acanthogorgia	ACC		1	
		BLL	*Keratoisis*	BOO		1	
		BLL	*Thouarella (Euthouarella) hilgendorfi*	THO		1	
BYX	Alfonsino & long-finned beryx	BT	*Bathypathes*	BTP			1
		BT	*Caryophyllia profunda*	CAY			1
		BT	*Callogorgia*	CLG			1
HOK	Hoki	BT	Acanthogorgiidae	ACD		1	
		BT	*Flabellum knoxi*	COF		1	
		BT	*Flabellum*	COF			1
LIN	Ling	BT	*Jasonisis*	JAS	1		
LIN	Ling	BLL	*Errina dendyi*	ERR			1
OEO	Oreos	BT	Parazoanthidae	ZAH		1	
ORH	Orange roughy	BT	*Keratoisis*	BOO	1		
			Conopora verrucosa	COO	1		
			Telopathes tasmaniensis	TEO	2		
			Leiopathes secunda	LSE		1	
		BT	*Stephanocyathus platypus*	STP			2
SCI	Scampi	BT	Anthothelidae	AND	1		
			Bathypathes	BTP			1
			Desmophyllum dianthus	DDI		1	

Target species code	Target species common name	Gear code	Expert ID taxon	Expert ID code	1 Jul 2022 - 20 Jul 2023*	1 Jul 2023 - 30 Jun 2024	1 Jul 2024 - 30 Jun 2025
			Goniocorella dumosa	GDU		2	1
			Caryophylliidae	SIA		7	
			Solenosmilia variabilis	SVA	1	1	
			Tokoprymno	TOK		1	
SNA	Snapper	BLL	Antipatharia indet.	COB		1	
SQU	Arrow squid	BT	*Flabellum*	COF		1	
			Flabellum knoxi	COF	2		
			Cryptolaria	CRT		1	
			Errina chathamensis	ERR	1		
			Aglaopheniidae	HDF	1		
			Metafannyella chathamensis	MEF	1		
SSO	Smooth oreo	BT	*Anthothela*	ANB			1
			Keratoisis	BOO			1
			Dasystenella	DSY			1
			Leiopathes acanthophora	LEI			1
			Metafannyella	MEF			1
			Madrepora oculata	MOC			1
			Paragorgia	PAB	1		
			Paragorgia arborea	PAB			1
			Placogorgia	PLO			1
			Primnoa notialis	PMN			3
			Callozostron	PRI			1
			Pachyprimnoa?	PRI			1
			Parantipathes cf. *robusta*	PTP			1
			Swiftia	SWI			1
			Tokoprymno maia	TOK			1

Target species code	Target species common name	Gear code	Expert ID taxon	Expert ID code	1 Jul 2022 - 20 Jul 2023*	1 Jul 2023 - 30 Jun 2024	1 Jul 2024 - 30 Jun 2025
SWA	Silver warehou	BT	*Flabellum knoxi*	COF		17	
				Total	**15**	**39**	**25**

Appendix F Three-year summary of specimens from images

Table F-1: The number of expertly identified protected coral specimens from images summarised by species, target fishery and gear type for the last three years. The fishing method codes are as follows: BT = Bottom Trawl, MW = Midwater Trawl, BLL = Bottom Longlining, POT = Potting, PRB = Precision Seafood Harvesting Bottom Trawl. Please note that some data (6 specimens) that do not meet the MPI three-permit holder rule have been removed from this table.

Target species code	Target fishery common name	Gear code	Expert ID Taxon	Expert ID Code	1 Jul 2022 – 30 June 2023	1 Jul 2023 – 30 June 2024	1 Jul 2024 – 30 June 2025	Total
BAR	Barracouta	BT	*Flabellum knoxi*	COF			1	1
			Stylasteridae	COR	1			1
				Barracouta Total	**1**		**1**	**2**
BNS	Bluenose	BLL	*Acanthogorgia*	ACC		1		1
			Eguchipsammia japonica	EJA		7		7
			Keratoisis	BOO		1		1
			Leiopathes	LEI	1			1
			Paramuriceidae	PLE	1			1
			Thouarella (Euthouarella) hilgendorfi	THO		1		1
				Bluenose Total	**2**	**10**		**12**
BOE	Black oreo	BT	*Goniocorella dumosa*	GDU	1			1
			Isididae	ISI	1			1
			Paragorgia	PAB	1			1
				Black oreo Total	**3**			**3**
BYX	Alfonsino & long-finned beryx	BT	*Bathypathes*	BTP			1	1
			Callogorgia	CLG			1	1
			Dendrobathypathes	DEN			1	1

Target species code	Target fishery common name	Gear code	Expert ID Taxon	Expert ID Code	1 Jul 2022 – 30 June 2023	1 Jul 2023 – 30 June 2024	1 Jul 2024 – 30 June 2025	Total
			Fanellia?	PRI		20		20
			Goniocorella dumosa	GDU			3	3
			Keratoisis	BOO			1	1
			Lillipathes	LIL		1		1
				Alfonsino & long-finned beryx Total		**21**	**7**	**28**
HAK	Hake	BT	*Acanthogorgia*	ACC		1		1
			Thouarella	THO		2		2
				Hake Total		**3**		**3**
HOK	Hoki	BT	*Desmophyllum dianthus*	DDI			32	32
			Flabellum	COF			1	1
			Flabellum knoxi	COF		153	29	182
			Solenosmilia variabilis	SVA		1		1
				Hoki Total		**154**	**62**	**216**
LIN	Ling	BLL	Stylasteridae	COR			1	1
		BT	*Acanthogorgia*	ACC		2		2
			Acanthogorgiidae	ACD		2		2
			Flabellum? angiostonum	COF	1			1
			Goniocorella dumosa	GDU			1	1
			Jasonisis	JAS	1			1
			Thouarella	THO		2	1	3
		POT	*Desmophyllum dianthus*	DDI			2	2
			Goniocorella dumosa	GDU			2	2
				Ling Total	**2**	**6**	**7**	**15**

Target species code	Target fishery common name	Gear code	Expert ID Taxon	Expert ID Code	1 Jul 2022 – 30 June 2023	1 Jul 2023 – 30 June 2024	1 Jul 2024 – 30 June 2025	Total
	No target fishery provided	No gear type provided	*Madrepora oculata*	MOC	3			3
				No target fishery provided Total	**3**			**3**
OEO	Oreos	BT	*Acanella*	ACN		1		1
			Paragorgia	PAB			2	2
			Solenosmilia variabilis	SVA		20		20
				Oreos Total		**21**	**2**	**23**
ORH	Orange roughy	BT	*Acanella*	ACN			2	2
			Bathypathes	BTP	3		2	5
			Callogorgia	CLG		1	1	2
			Candidella	PRI	1			1
			cf. *Lepidisis*	LLE			1	1
			Chrysogorgia	CHR		1		1
			Conopora verrucosa	COO		1		1
			Dendrobathypathes	DEN	1			1
			Dendropathes	DDP	1			1
			Desmophyllum dianthus	DDI	1000		1	1001
			Enallopsammia rostrata	ERO		1		1
			Goniocorella dumosa	GDU	4	49	3	56
			Iridogorgia	IRI	2			2
			Isidella	ISP		3	1	4
			Keratoisididae	ISI	1	2		3
			Keratoisis	BOO	5	42	2	49
			Keratoisis? magnifica	BOO	1			1
			Leiopathes	LEI	1	1	1	3

Target species code	Target fishery common name	Gear code	Expert ID Taxon	Expert ID Code	1 Jul 2022 – 30 June 2023	1 Jul 2023 – 30 June 2024	1 Jul 2024 – 30 June 2025	Total
			Leiopathes secunda	LSE		1		1
			Madrepora oculata	MOC	2		1	3
			Octocorallia	COU	1			1
			Paragorgia	PAB	8		1	9
			Parantipathes	PTP		2		2
			Parastenella	PLD		1		1
			Primnoa notialis	PMN	1			1
			Primnoidae	PRI	1			1
			Schizopathidae	COB	1			1
			Scleractinia	SIA	0	1		1
			Solenosmilia variabilis	SVA	1088	68	6001	7157
			Stephanocyathus platypus	STP		7	1	8
			Stylasteridae indet.	COR		1		1
			Telopathes tasmaniensis	TEO	2			2
			Thouarella	THO		1		1
			Tylopathes	TYL	2		1	3
				Orange roughy Total	**2126**	**183**	**6019**	**8328**
SBW	Southern blue whiting	MW	cf. *Acanthogorgia*	ACC			1	1
				Southern blue whiting Total			**1**	**1**
SCI	Scampi	BT	*Bathypathes*	BTP			1	1
			Caryophyllia	CAY	1	2		3
			Caryophyllia profunda	CAY	10			10
			Caryophylliidae	GDU	1			1

Target species code	Target fishery common name	Gear code	Expert ID Taxon	Expert ID Code	1 Jul 2022 – 30 June 2023	1 Jul 2023 – 30 June 2024	1 Jul 2024 – 30 June 2025	Total
				SIA		117		117
			Desmophyllum	DDI	1			1
			Desmophyllum dianthus	DDI	9	31	1	41
			Flabellum knoxi	COF			1	1
			Goniocorella dumosa	GDU	305	34	3	342
			Leiopathes	LEI		1		1
			Metafannyella	MEF	11			11
			Solenosmilia variabilis	SVA		1		1
			Thouarella	THO		4		4
			Tokoprymno	TOK		5		5
				Scampi Total	**338**	**195**	**6**	**539**
SNA	Snapper	BLL	Antipatharia indet.	COB		1		1
			Culicia rubeola	CUR		2		2
		BT	*Antipathella*	AHL			1	1
			Flabellum	COF			1	1
		PRB	*Saropathes*	SRO	1			1
				Snapper Total	**1**	**3**	**2**	**6**
SQU	Arrow squid	BT	?*Trochocyathus*	CUP	2			2
			Culicia rubeola	CUR	13			13
			Errina	ERR		1		1
			Errina chathamensis	ERR	1			1
			Flabellum	COF		1		1
			Flabellum knoxi	COF	46	3	3	52

Target species code	Target fishery common name	Gear code	Expert ID Taxon	Expert ID Code	1 Jul 2022 – 30 June 2023	1 Jul 2023 – 30 June 2024	1 Jul 2024 – 30 June 2025	Total
			Goniocorella dumosa	GDU			1	1
			Metafannyella	MEF	1			1
			Metafannyella chathamensis	MEF		1		1
			Thouarella	THO		1		1
				Arrow squid Total	**63**	**7**	**4**	**74**
SSO	Smooth oreo	BT	*Acanthogorgia*?	ACC		1		1
			Anthothela	ANB	2			2
			Antipatharia indet.	COB		1		1
			Callogorgia	CLG			1	1
			Caryophyllia	CAY		2		2
			cf. *Minuisis*	MIN			1	1
			cf. *Primnoa*	PMN			1	1
			Desmophyllum dianthus	DDI	3	2		5
			Enallopsammia	ERO	3			3
			Enallopsammia rostrata	ERO		1		1
			Goniocorella dumosa	GDU	18			18
			Keratoisis	BOO	4	2	7	13
			Keratoisis? hikurangiensis	BOO	1			1
			Leiopathes	LEI		1		1
			Leiopathes acanthophora	LEI			1	1
			Madrepora oculata	MOC		10	3	13
			Metafannyella chathamensis	MEF		1		1
			Paragorgia	PAB	5	21	5	31

Target species code	Target fishery common name	Gear code	Expert ID Taxon	Expert ID Code	1 Jul 2022 – 30 June 2023	1 Jul 2023 – 30 June 2024	1 Jul 2024 – 30 June 2025	Total
			Paragorgia arborea	PAB			1	1
			Parantipathes	PTP		1		1
			Parantipathes cf. *robusta*	PTP			1	1
			Placogorgia	PLO			1	1
			Primnoa	PMN			1	1
			Primnoa notialis	PMN	6	9	2	17
			Radicipes	RAD			2	2
			Scleractinia	SIA	2			2
			Solenosmilia variabilis	SVA	10	24	1	35
			Stylasteridae indet.	COR		1		1
			Swiftia	SWI			2	2
			Thouarella	THO		2	1	3
			Tokoprymno	TOK		1		1
			Tokoprymno maia	TOK			1	1
			Trachythela?	VIC		1		1
				Smooth oreo Total	**54**	**81**	**32**	**167**
SWA	Silver Warehou	BT	*Flabellum knoxi*	COF		17		17
				Silver warehou Total		**17**		**17**
TAR	Tarakihi	PRB	*Callogorgia*	CLG	1			1
			Cupressopathes	COB	1			1
				Tarakihi Total	**2**			**2**
TRE	Trevally	BT	*Flabellum*	COF		1		1
				Trevally Total		**1**		**1**
				Total	**2595**	**702**	**6143**	**9440**