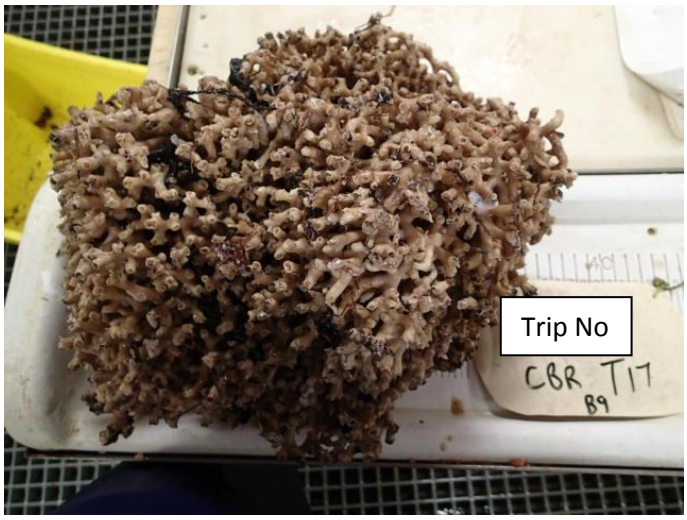
NIWA
Taihoro Nukurangi

Identification of Protected Corals Progress Report

Progress Report

Prepared for Conservation Services Programme Department of Conservation

RFP: 4650 INT2015-03 IDENTIFICATION AND STORAGE OF COLD-WATER CORALS



July 2017

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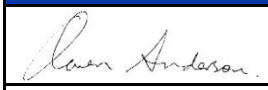	Reviewed by:	Owen Anderson
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Cover image: *Observer image of the branching stony coral (CBR) Goniocorella dumosa (GDU).*

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Executive summary

The Marine Species and Threats Group within the Conservation Services Programme, Department of Conservation, recognise that Government fisheries observers on commercial fishing vessels are not always able to identify protected cold-water corals at sea with high precision (especially down to the species level), with the confirmation of bycaught species requiring identification from a coral taxonomist in the majority of cases.

Building on the description of the protected coral specimens identified and presented on in the April 2017 Progress Report, this Report summarises the sample identifications for the year ending 31 July, 2017, and includes coral identifications made by visiting gorgonian octocoral expert Dr Phil Alderslade (CSIRO). A total of 168 specimens were identified to lowest taxonomic level possible and appropriate updates made to the Centralised Observer Database (*COD*). The number of coral tissue samples held in storage for future genetic studies increased from 17 to 22 between April and July, 2017, and sampling is on-going.

The identification of protected corals from digital images provided by Observers are also described. There were 163 images identified and 112 protected coral images geo-referenced. Efforts were made to use trip number and image properties (date, time), to help populate the data poor images with georeferenced information. The use of existing instructions to Government Observers on methods to capture images at-sea will be stressed via the MPI Observer Programme. Additionally, recommendations are made in this report to help improve the at-sea image data labelling and to automate the image geo-referencing workflow. Potentially the process of geo-referencing could be made more robust by adding business rules for metadata validation. We also suggest additional funding support be sought to identify High Seas protected coral samples.

1 Background

The 2010 amendment of Schedule 7A of the Wildlife Act 1953 protects all hard corals, including: black corals (all species in the order Antipatharia); gorgonian octocorals in the order Alcyonacea (previously known as Order Gorgonacea); stony corals (all species in the order Scleractinia); and hydrocorals (all species in the family Stylasteridae). These groups all have ecological significance in the New Zealand region and the various forms, including reef-like scleractinian or stony corals, are important bioengineers that provide refuge and structural habitat for a diverse species community. These corals are vulnerable to human pressures such as fishing, mineral extraction, ocean acidification and global warming.

Identifying coral bycatch that was unable to be fully identified by observers is seen as a priority for conservation managers as it provides:

- vital baseline information that can help to better inform research and marine protection such as predictive modelling, benthic risk assessments and management of benthic marine protected species
- information on the interaction between commercial fishing vessels and protected cold-water corals in New Zealand waters, and
- allows for a more comprehensive mitigation framework to be implemented in future in order to protect cold-water corals in New Zealand waters.

An additional benefit of the collection, identification and storage of bycaught cold-water corals is an increase in the number of protected cold-water coral species samples housed in the NIWA Invertebrate Collection (NIC), one of New Zealand's National taxonomic collections. This allows for more robust studies on cold-water corals in future such as those to support morphological and molecular descriptions, and for biological research to investigate for example age and growth, and age validation to assess recovery (e.g., see *POP2017-07: The age and growth of New Zealand protected corals at high risk*).

Progress for the service requirements were summarised in Tracey et al (2017). Methods were prepared and presented on, instructions were provided to Observers on deep-sea commercial fishing vessels for when cold-water coral specimens are bycaught in commercial fishery operations – i.e., the required data recording, sub-sampling or image collection of the corals. Also presented were the number of protected coral samples provided (excluding several gorgonian octocorals), the number identified, and the number of coral tissue samples that have been taken and held in storage for future genetic studies. The Contract states that no more than 200 protected coral samples and no more than 200 specimen images are to be identified per annum.

This Final Report updates the numbers of protected corals identified to lowest taxonomic level – for both returned specimens and images. The updated numbers include the additional sample identifications made by visiting gorgonian octocoral expert taxonomist Dr Phil Alderslade (CSIRO), who visited the NIC in May 2017, andidentifications of fauna in 163 observer collected digital images. Where possible, the identified protected coral images were georeferenced to show provenance.

2 Methods

2.1 Specific Objectives

2.1.1 Service Requirements

The specific objectives of the Conservation Services Requirements are:

1. Identify cold-water coral bycatch that cannot be identified by Government fisheries observers to the finest taxonomic level (assign codes to coral specimens to the species level wherever possible; when this is not possible, identify specimens to genus or family level).

   To the extent possible, the contractor will identify potential interactions between corals collected and fishing gear, and identify factors that may have contributed to coral mortality. Data will be reported by fishery stratum (fishing method, fishery area, and where possible, target species)

2. Record all identified coral specimens and store in an appropriate taxonomic collection.

3. Ensure a sub-sample of each specimen is taken for future genetic analysis.

4. Bring international cold-water coral taxonomic expertise to New Zealand for identification of specific coral groups.

2.1.2 Specific objectives

In Schedule 1 the specific objectives in Contract INT2015-03 are:

1. To determine, through examination of returned cold-water coral specimens and photos, the taxon, and where possible the provenance of cold-water corals killed in New Zealand fisheries (for returned dead specimens).

2. To collect sub-samples of all protected cold-water coral specimens for genetic analysis in future.

2.2 Objective 1: To determine, through examination of returned cold-water coral specimens and photos, the taxon, and where possible the provenance of cold-water corals killed in New Zealand fisheries (for returned dead specimens).

A presentation of the Methods for this project was provided to the CSP Technical Working Group on the 16th of November, 2016 (Tracey 2016a), and subsequently accepted. The presentation included a description of methods to instruct Observers on the at-sea recording and collection of deep-sea corals, details of the planned expert examination of specimens and images returned by Observers, and an update of progress in loading of identified coral catch data into NIWA and Ministry for Primary Industries (MPI) databases (Objective 1). Also included were details on methods for collection of sub-samples of returned cold-water coral specimens for genetic analysis in the future, (Objective 2).

Progress for the service requirements were summarised in Tracey et al (2017). Methods for the key activities to meet the final stages of this project are provided below and include:

- the identification of gorgonian octocorals
- loading data into the MPI Observer database *COD*, and
- digital photo processing

2.2.1 Identification of corals returned to NIWA

The cold-water coral bycatch that could not be identified by Observers at-sea were returned to NIWA (whole specimens or sub-samples of the specimens) for identification to the finest taxonomic level. A similar method used to process by-catch collected by Government fisheries observers under MPI Project DAE2015-05, (Tracey & Mills, 2016b), was followed here. Experts identified all corals to the species level wherever possible and when this was not possible, to genus or family level.

The corals were thawed, sorted into main groups and initially identified to coarse taxonomic level (mostly to order and family level). The tasks of fixing and preserving samples, providing containment, documenting samples (station numbering, labelling), sorting (dividing samples into major or minor taxonomic groups – 'taxa' – in the laboratory, were all carried out under the "DAT E" general MPI data management project DAT2016-01E. Data were entered into the web-interfaced NIWA Observer Samples Database (*OSD*), then returned to frozen storage, fixed in ethanol, or dried where appropriate.

A catalogue of all samples/specimens received in NIWA was provided to the NIWA Invertebrate Collection (NIC) Manager. Data from *OSD* were uploaded into the NIC database *Specify* and the specimens were curated and examined at NIWA to determine their taxonomic identification.

The identification methods followed NIWA procedures for identifying fauna and biological specimens housed in the NIC. NIWA currently manages specimens according to the: "Guidelines for the care of natural history collections". NIWA also has its own collection policy document: "NIWA Marine Invertebrate Collection Policy and Procedures", which also guided the process. Specimens retained are held in stewardship for the DOC.

To meet the Final Report requirements, NIWA coral experts and Dr Phil Alderslade (CSIRO) carried out the identifications of gorgonian octocorals, and the updated species names and counts were entered into *Specify* database. Identifications by Dr Alderslade included corals in the families Chrysogorgiidae, Corallidae, Isididae, Paragorgiidae, and Plexauridae.

A second priority for the project was to identify research trawl-collected protected corals. Four protected corals have been returned to date from trawl surveys carried out since July 31 2016, and these along with an additional historical specimen from a 1995 research trawl survey, were identified for this project.

2.2.2 Loading data into *COD*

To help identify potential interactions between corals collected and fishing gear, and identify factors that may have contributed to coral mortality, the loading of identified coral catch data into NIWA and MPI databases took place toward the end of the reporting period.

Sample information for 160 observer records extracted from *Specify* were provided to the *COD* database manager for loading. Updating catch records took place following that described in Tracey & Sanders (2010). Sample data are loaded into a *COD* database 'load' table, z_invertebrate_samples.

The data is then used to update catch records in the stage and report tables, y_benthic, y_trw_new_observer_greenweight, y_lfs_catch, y_ctn_catch and x_fishing_event_catch.

High Seas samples were not able to be differentiated from within zone samples at the time of arrival at NIWA for processing. Trip data are provided on sacks of frozen material but no information on general location is given. As such, High Seas samples were processed as part of this project.

2.2.3 Photographing corals at-sea

The at-sea instructions to Observers document (Tracey & Mills, 2016c) was prepared and provided to CSP and, following their approval, forwarded to the Observer Services Unit of the MPI Observer Programme in early 2017. The section on the digital collection of photographic images at-sea instructions were emphasised and expanded for this project. Specifically, the instructions state that images are to be captured in good light using a plain grey background if possible and a size scale, with the specimen label showing trip and tow numbers included in the image. The name of the Observer taking the image was to be retained as this is important to include in the geo-referencing particularly for acknowledgements, feedback to the observer, training, or if the images are used for other purposes, e.g., guide production.

2.2.4 Digital photo processing

The digital photo images and associated details collected by Observers were obtained from a CSP Group representative from the MPI Observer Programme and uploaded to NIWA's FTP site in April 2017. There were 456 image files provided to NIWA late April, 2017, and 163 were processed to meet the reporting for this period. The identification of protected corals in the photos was carried out by various experts (Phil Alderslade (CSIRO), Di Tracey, Rob Stewart, Diana Macpherson, and Peter Marriott (NIWA)), and the images were then georeferenced to show provenance (where possible). The image metadata is provided via a handwritten label which the Observer includes in the photograph, collating these data is a manual process. The process of geo-referencing the images was to add information to the metadata file for each image – e.g., the species name to the lowest taxon possible, trip and tow number, three-letter MPI species code, keywords relevant to the subject of the image, NIC catalogue number (where applicable), image rating (1-5; 1=best of, 5=adequate), and the observer name. Using the ACDSee Pro 3 (version 3.0) software the metadata information for each image was added manually into the relevant field or by assigning a value from a drop down 'picklist', and then embedded in the image file. A descriptive data output and summary output table was then produced with appended location data and other required information sourced from *COD* - e.g., position, depth, along with target species, Observer Fisheries Management Area.

2.3 Objective 2: To collect sub-samples of all protected cold-water coral specimens for genetic analysis in the future.

Tissue samples were taken from all protected coral samples provided to NIWA by observers in 2017 and stored with a unique label in standard vials in 99% high grade absolute ethanol. The Progress Report (Tracey et al. 2017) summarised the genetic samples. There are now 22 samples held in storage, and collection is on-going.

3 Results

The specific objectives of the Conservation Services Requirements have been followed. Specimens and images of cold-water protected coral bycatch that could not be identified by Government fisheries observers were returned to NIWA for expert identification. Details of the coral bycatch specimen collection by fishery stratum (fishing method, fishery area and where possible target species) are provided. All identified coral specimens have been stored in the NIWA Invertebrate Collection (NIC). Sub-samples of each specimen continue to be taken for future genetic analysis and these too are in storage in the NIC. Dr Phil Alderslade visited NIWA for a period of 10 days in May 2017 to identify specimens in his specific coral group – gorgonian octocorals.

All specific objectives have been completed for the final reporting period, 2016/17 year. Dr Phil Alderslade was funded from this project along with additional support for identification, database, and administration costs from the NIWA 'Enhancing Collections' budget provided. Since 30 April, 2017, all coral identifications and associated data were loaded into the MPI database *COD*, images provided by DOC from the Observers were examined and geo-referenced.

3.1 Objective 1: Identification of corals

A summary of the number of corals identified by protected coral group is presented in Table 3-1. Between March 2016 and May 2017 only 38 samples were collected and returned to NIWA for identification possibly due to the emphasis on collecting digital images for identification purposes. The remaining samples in this table (n= 130) are historical, collected between 2009 and 2015, and held in storage at NIWA awaiting identification.

Appendix A presents in spreadsheet form a list of species identified, with associated details extracted from *Specify*. The column headings include:

- Trip_code
- Station_no
- NIC catalogue number
- OSD Number if available
- Observer ID label if available
- Phylum
- Order
- Family
- Genus
- Species
- Determiner - Expert identifiers name (most recent expert ID)
- Determined date
- Count
- Collection Date
- Latitude (truncated to 1 d.p.)
- Longitude (truncated to 1 d.p.)
- Depth start
- Depth finish

Experts have identified to date 22 black corals, 74 gorgonian octocorals, 11 hydrocorals, and 59 scleractinian stony corals (Table 3-1). Rob Tilney of Clement & Associates Ltd provided two stony coral and one black coral sampls to Di Tracey, NIWA for identification (Industry Voyage, Chatham Rise). The gorgonian octocorals identified by Dr Alderslade (N= 72 specimen lots), included some new and intriguing

species and genera. Among these were the first confirmation of the plexaurid sea fan coral *Clematissa* in the New Zealand region; a new species of *Rosgorgia* which is a recently described Antarctic genus of the Family Subergorgiidae, better known from the tropical Indo-West Pacific; and two new species of the bubblegum coral *Paragorgia*, confirming how species-rich this particular genus is in our region (14 species are already known, 6 of which are likely endemic). Other species identification highlights were:

- A new genus and that is related to *Helicogorgia*, currently, and perhaps wrongly, classified as being in the family Chrysogorgiidae.
- Several species of the genus *Chrysogorgia* that will be very valuable to Ms Candice Untiedt who is studying the genus for a PhD project.
- A species of *Narella* that is additional to those described from the NIWA collections by Dr Stephen Cairns (Smithsonian Institute).
- the first record of plexaurid sea fan genus *Anthomuricea*.

Tracey et al (2017) summarised the protected coral species identified up to April 2017. These included gorgonian octocorals (genus *Corallium*) commonly confused with the pink stylasterid hydrocoral *Errina*, black corals *Leiopathes* and *Bathypathes*, and a diverse range of Hydrocorals: several genera of the white forms - *Conopora, Crypthelia*, *Lepidopora*, *Stylaster*, and *Errina*. The scleractinian corals comprised both the branching and cup forms, the most common being the branching corals *Solenosmilia variabilis*, *Enallopsammia rostrata*, and *Madrepora oculata*. The cup coral samples included two species of *Caryophyllia* (*C. lamellifera* and *C. profunda*), *Desmophyllum dianthus*, and *Flabellum knoxi*.

Table 3-1: Sample summary of the number of specimens identified by experts (all NIWA except for Phil Alderslade (CSIRO)) for each of the Protected Coral Groups along with a count of samples selected for genetic analyses. See *Appendix A* for a detailed species list.

Protected Coral Group	Number of identified samples	Determiner	Number of genetic subsamples
Black corals (all species in the order Antipatharia)	22	Rob Stewart	8
Gorgonian corals (all species in the order Alcyonacea previously known as Order Gorgonacea)	74	Phil Alderslade/Peter Marriott/Sadie Mills	5
Hydrocorals (all species in the family Stylasteridae)	11	Peter Marriott	4
Stony corals (all species in the order Scleractinia)	61#	Di Tracey	5
Total number of samples	**168**		**22**

3.1.1 Loading into *COD*

The species identifications and all associated data from the Specify extract (Appendix A) were loaded into the MPI database *COD*. The data loading process is described in previous reports (Tracey & Mills 2016c). An extract of the samples loaded into *COD* is appended (Appendix B), and includes information such as corresponding fishing method, fishery areaand where possible target species data field. This information helps identify potential interactions between the corals collected and fishing gear, and identify factors that may have contributed to coral mortality.

There are often some complexities when loading these data into *COD*. Record updates and additions are summarised below:

- 67 records where the initial identification matched a catch species and the expert identification differed were updated.
- In several instances there was more than one identified species for one UNI record, in these cases the first record was updated. Some tows had greater than one UNI/UNX records, records were updated for the matching number of expert identifications available.
- 42 records in *COD* catch did not require updating as the MPI species code recorded was the same as the expert identification MPI code.
- 47 new records were added to (insert into) the catch tables. New records occur when no data was entered by the observer and this usually occurs with the historical samples or when more than one species is associated with a coral record (e.g., a coral associate)
- 4 samples could not be used due to missing or invalid trip number/tow numbers or lack of available catch effort data recorded in *COD.*

Data summaries are provided below and include a count by Observer Area code and Fisheries Management Areas (Table 3-2), and a count of tows by target species (Table 3-3). For the High Seas sample counts four samples could not be linked to the CE data and so were omitted. Sample counts represent samples collected in 2016-17 as well as the historical samples.

Table 3-2: Protected coral count by Observer Fisheries Management Area. High Seas (ET) samples came from areas HOWE, CET, WANB, LOUR – see table description.

Area	Description	Count of Samples
SOE	South-East (FMA4)	31
SUB	Sub-Antarctic (FMA6)	22
HOWE	Lord Howe Rise (ET)	18
AKE	Auckland East (FMA1)	18
CET	Challenger Plateau (ET)	15
SEC	South-East Coast (FMA3)	11
WANB	Wanganella Bank (ET)	10
SOU	Southland (FMA5)	7
TMAR	Tasmanian Ridge (ET)	7
LOUR	Louisville Ridge (ET)	6
AKW	Auckland West (FMA9)	6
SOI	Southern Offshore Islands (FMA6A)	3
CEE	Central East (FMA2)	2

Table 3-3: Count of tows by target fishery where protected corals were sampled.

Target fishery (common name)	MPI code	Count of Tows
Orange roughy	ORH	65
Smooth oreo	SSO	20
Black oreo	BOE	12
Alfonsino	BYS	11
Bass groper	BAS	10
Oreos	OEO	5
Scampi	SCI	5
Hoki	HOK	5
Hapuku & bass	HPB	4
White warehou	WWA	4
Bluenose	BNS	3
Arrow squid	SQU	3
Alfonsino & long-finned beryx	BYX	2
Ling	LIN	2
Tarakihi	TAR	2
Trevally	TRE	1
Hake	HAK	1
Silver warehou	SWA	1

3.1.2 Digital photos

The digital photo images and associated details collected by Observers were obtained from a CSP Group representative from the MPI Observer Programme and uploaded to NIWA's FTP site. There were 456 image files provided and 163 were able to be processed in the time available for this reporting period (up to end of July 2017). Of the 163 images, 119 were protected coral images and were identified to the lowest taxon level possible, and 112 of these were georeferenced to show provenance. Seven coral images and one non-coral image could not be attributed to a fishing event due to missing/invalid station number or incomplete MPI photographic logs/'Benthic Materials' form data, and therefore were not geoferenced. The remaining images were of non-protected coral taxa, e.g., bryozoans, sponges, and hydroids (n=44). We note that some of these groups can be easily confused with protected corals.

Many of the images were of excellent standard of impressive coral specimens, and included a label in the image with all required data. However, while the instructions to Observers include statements such as “the image is to include the specimen label showing trip and tow numbers”, we noted that in several of the images provided to NIWA, some included non-corals and several lacked tow data information. Examples are shown in Figure 3.1 of both the digital images of correctly labelled and un-labelled photos. Efforts were made to use information such as the TRIP number and the date and the time stamp of image capture, (extracted from the digital image properties), to help obtain tow details from the *COD* database in order to populate the image database. Although this was a time-consuming task, we were mostly successful in obtaining the required geo-reference information from the *COD* database. The image data are currently held in spreadsheet form (Appendix C), and in a secure drive at NIWA. A potential depository for these images is the NIWA official repository image database Atlas [https://atlas.niwa.co.nzpublic.jsp/]. Further discussion with the Client will take place to progress the final destination of the stored images. Some approvals will be required from MPI as part of this process.

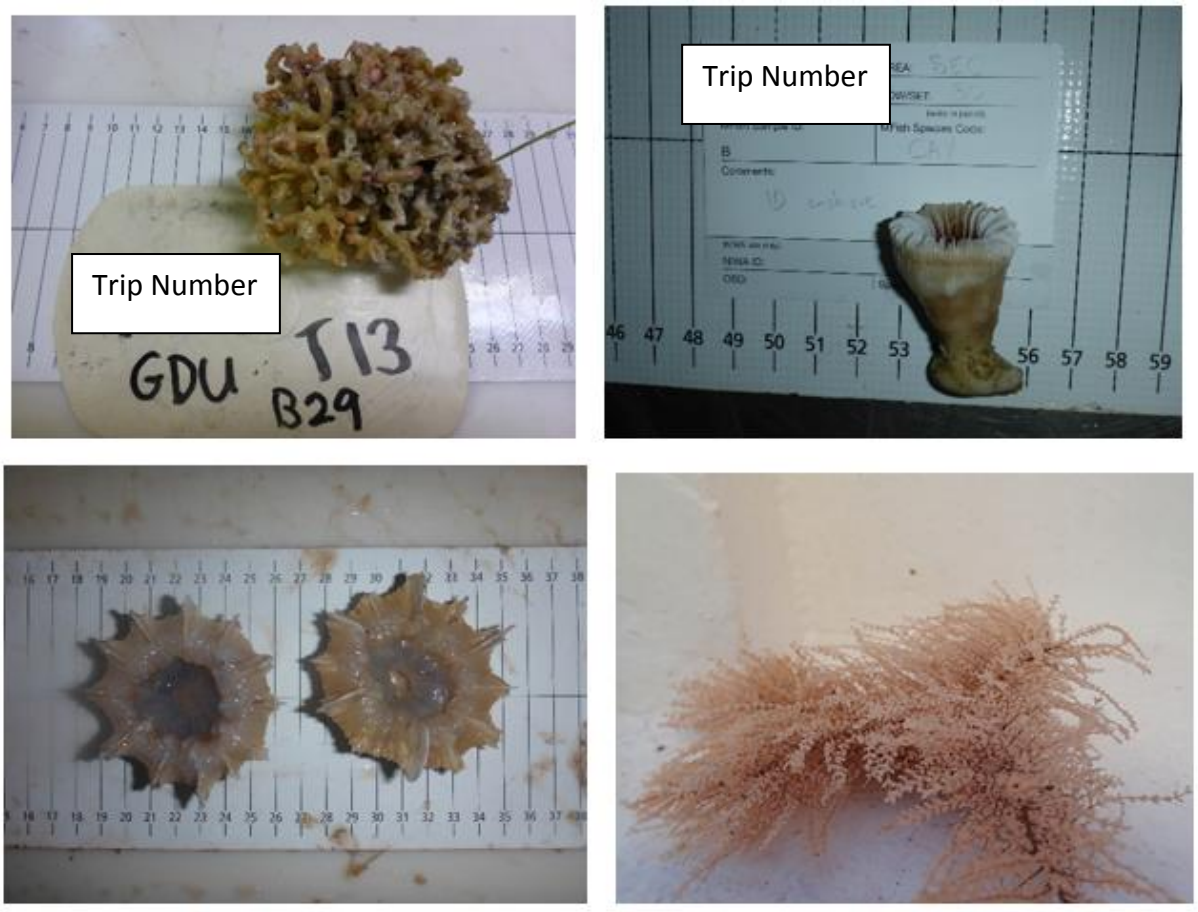

Figure 3-1: Digital images of protected corals taken at-sea and showing correctly labelled (top) as well as un-labelled (bottom) specimen photos.

Data summaries for the images are provided below and include a count by Fisheries Management Areas (Table 3-4) and a count of tows by target species (Table 3-5). There were 53 samples

photographed from the High Seas (ET) areas (LOUR, CET). Many of the tows targeting orange roughy collected digital images of protected corals (n=64).

Table 3-4: Count of images by Observer and Fisheries Management Area.

Area	Description	Count of Samples
LOUR	Louisville Ridge (ET)	37
SOU	Southland (FMA5)	24
CET	Challenger Plateau (ET)	16
AKW	Auckland West (FMA9)	15
CHA	Challenger (FMA7)	12
SOE	South-East (FMA4)	12
SUB	Sub-Antarctic (FMA6)	11
CEW	Central West (FMA8)	9
AKE	Auckland East (FMA1)	7
SEC	South-East Coast (FMA3)	5
SOI	Southern Offshore Islands (FMA6A)	4
HOWE	Lord Howe Rise (ET)	3

Table 3-5: Count of tows from which images were taken, by target fishery.

Target fishery (common name)	MPI code	Count of tows
Orange roughy	ORH	64
Arrow squid	SQU	16
Alfonsino & long-finned beryx	BYX	13
Jack mackerel	JMA	12
Ling	LIN	11
Hake	HAK	10
White warehou	WWA	7
Hapuku & bass	HPB	7
Snapper	SNA	7
Hoki	HOK	4
Silver warehou	SWA	2

Scampi	SCI	1
Bluenose	BNS	1

3.2 Specific objective 2: Tissue samples

Tissue samples taken during the sorting thawing process is on-going with thenumber of tissue samples processed and stored currently at 22. The focus on the project work between May and July 2017 reporting has been on other Project activities.

4 Summary conclusions

The objective to identify the protected coral specimen samples was met, and the process was reasonably efficient as the methods have been on-going and standardised for several years. More than 160 specimen lots were examined and these included some taxonomic highlights, such as new and intriguing species and genera. The accuracy of the Observer identifications at sea have not been analysed in detail but there were 42 records that did not require an update of the original observer identification in *COD* and we note that several samples identified by experts were from historical samples stored in the NIC. These identifications contribute significantly to our understanding of this important coral group, expand our New Zealand's biodiversity science data, and fill knowledge gaps.

This was however, the first instance of processing a large number of Observer-collected digital photographs and the process to identify the images has been reasonably labour intensive. Despite this, we were able to process 163 images, (an appropriate number given the target is a maximum of 200 images for each year of the project). Where image station data were missing because of the specimen image having no label, considerable effort was made to trace the trip, image date and time details back to information stored in the *COD* database in order to obtain the required meta-data for geo-referencing. There were also instances where a number of non-protected corals images were provided (e.g., of sponges, bryozoans, wood, hydroids, soft corals, sea pens), and as all images had to be examined, these non-protected coral images added to the processing time. Samples and or duplicates of the protected coral sample images were often provided. Duplications can easily be dealt with and it is useful for the experts carrying out the identifications to have a close up image provided along with the overall colony image, but when an overall deck shot, a colony image, and a zoomed in image of the same colony is provided, it is time consuming to analyse and annotate all three images. We note this here as the target of 200 may be over-ambitious.

5 Recommendations:

- **Briefings:** We suggest direct liaison with CSP Group, DOC and the Observer Services Unit, MPI to take place early in the second year of the project to ensure that the at-sea instructions on photographing specimens are followed more closely by Observers.
- **Image database storage:** We suggest an improved image database storage system for the Observer collected digital images and, as part of the discussion, we will outline the processing methods applied by NIWA and what is required to load the data into NIWA's Atlas database. Some approvals will be required from MPI as part of this process.

  Given the required image metadata is provided via a handwritten label which the observer includes in the photograph, collating these data will be a manual process for

the foreseeable future unless GPS referenced cameras are to become standard. Apart from this aspect, the workflow can be largely automated to both simplify the work for the staff undertaking it, and potentially make the process more robust by adding business rules for metadata validation. The output from a user working through the photographs will be a spreadsheet (CSV text file) containing the basic image metadata (with one row per image), including: trip code; station; date etc. NIWA can develop a script which reads this file, row by row, and for each row interrogates the *COD* database for the tow times, positions, depths, etc for that tow. The script can also include checks are carried out for consistencies e.g., matching the date/time data from the image with the tow data, and the depth can be cross checked against a NIWA bathymetry model to help ensure depth data accuracy. This script would output a CSV file suitable for an Atlas database bulk upload, so the user could use this file for an upload of all the images in a single transaction. As noted MPI approval would be needed for the user connecting to *COD* in the script to directly access the necessary *COD* tables. We note that this is being carried out by proxy at present, in a manual operation, and so this is not inherently any less secure than the current approach.

- **High Seas samples:** The High Seas outside the NZ EEZ coral samples were processed as part of this project even though CSP do not currently fund their identification. Samples have been identified primarily due to labelling issues (TRIP data are provided on sacks of frozen material but no information on general location is given), and hence the subsequent difficulty in sorting the High Seas samples from those returned to NIWA from inside the zone. We suggest a variation to future contracts to cover the costs of the High Seas (South Pacific Regional Fisheries Management Organisation (SPRFMO) samples. This also applies to the digital image data, several (n=53) came from High Seas areas.

- **The backlog of unidentified protected coral samples** was reduced this year (n=130) due to a decreasing number of observer sample specimens returned to identify (possibly because of an increase in digital images being collected), and few research trawl survey samples. However, while decreasing in number, a portion of accumulated historical research trawl and observer samples held at NIWA still remain unidentified. We recommend that this backlog continues to be addressed.

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