



Identification of Protected Corals

**NIWA Client Report: WLG2010-07
February 2010**

NIWA Project: DOC09305 / INT2008-02

Identification of Protected Corals

Author
Di Tracey

Prepared for

CSP Group

Department of Conservation Te Papa Atawhai

NIWA Client Report: WLG2010-07
February 2010

NIWA Project: DOC009305 / INT2008-02

National Institute of Water & Atmospheric Research Ltd
301 Evans Bay Parade, Greta Point, Wellington
Private Bag 14901, Kilbirnie, Wellington, New Zealand
Phone +64-4-386 0300, Fax +64-4-386 0574
www.niwa.co.nz

© All rights reserved. This publication may not be reproduced or copied in any form without the permission of the client. Such permission is to be given only in accordance with the terms of the client's contract with NIWA. This copyright extends to all forms of copying and any storage of material in any kind of information retrieval system.

Contents

Executive Summary	iv
1. Overall Objective	1
1.1 Specific Objectives:	1
1.1.1 Specific Objective 2. Update the Centralised Observer Database (COD) as necessary with correct species identifications	4
2. General comments:	7
3. Acknowledgements	8
4. References	9
5. Appendices	11

Reviewed and Approved for release by:



Dr Don Robertson

Executive Summary

This final research report presents on the requirements of Project DOC09305/ INT2008-02: To identify samples of corals returned through the CSP observer programme during the 2008/09 fishing year (1 October 2008 – 30 September 2009).

Protected species need to be adequately described to ensure legal obligations of the Wildlife Act are followed. Samples of protected coral taxa, or of coral species that may appear to be protected coral taxa, have been returned by observers from commercial fishing vessels during the 2008/09 fishing year (1 October 2008 – 30 September 2009) as part of the Department of Conservation CSP Observer Programme requirements.

The coral by-catch samples (n=302), were sorted and identified to lower taxa (families, genera, species). International experts confirmed a proportion of the coral species identifications. Using common links of trip number and station number the data were loaded from NIWA databases (from either an excel spreadsheet database or from the recently developed Central Observer Database (OSD)) into the MFish Centralised Observer Database (COD) managed by NIWA. NIWA Collections (NIC) database (*Specify*) currently stores a proportion the information as several coral samples are held in stewardship by NIWA for the Department of Conservation.

All associated event data (e.g. target species, depth), have been made available to help monitor and quantify protected species interactions with commercial fisheries. Samples returned for identification at NIWA were taken as by-catch from 21 commercial trips targeting 8 fisheries and representing 11 Fishery Management Areas (FMAs). Fisheries that have had corals recorded as by-catch include those for deepwater and middle depths species such as orange roughy, smooth oreo, alfonsino, and hoki,

The deepsea coral samples returned by observers represent a valuable data source. Accurate identification data can be used to assess the incidental catch of corals (Rowe and Tracey 2008), to contribute to producing distribution plots for protected or species proposed to be protected (Consalvey et al, 2006; Rowden et al. 2008; Tracey et al in prep); for systematics and species identification (Sánchez et al. 2008), and to elucidate the relationships between invertebrates and commercial fishing activity. The information will continue to enable researchers and managers to help identify where specific coral groups and their associated fauna are at the highest risk of interactions with fishing gear.

1. Overall Objective

To identify samples of corals returned through the CSP observer programme during the 2008/09 fishing year (1 October 2008 – 30 September 2009).

1.1 Specific Objectives:

- 1) Samples of corals returned by observers to be identified to lower taxa (families, genera, species).
- 2) Update the Ministry of Fisheries Centralised Observer Database (*COD*) as necessary with correct species identifications.

Specific Objective 1.

This objective consists of 5 main tasks:

- providing input into MFish observer briefing process
- sorting frozen samples to putative identification level
- entering data into Excel spreadsheet and more latterly into the NIWA Observer Samples Database (OSD) developed during the project duration
- taxonomists confirm identification
- Excel spreadsheet or OSD data exported into NIWA Invertebrate Collection (NIC) *Specify* database, the database that manages data for all invertebrate specimens held at NIWA.

Task 1: Providing input into observer briefing process.

As part of this project, no input into the coral observer briefing process has been required since June, 2008.

Tasks 2–5: Sorting frozen samples to putative identification level, entering data into electronic spreadsheet, and more latterly into the NIWA Observer Samples Database (OSD), developed during the project duration, confirming identification, spreadsheet or database updates, entry into *Specify* database.

Methods used follow those already established and detailed in Tracey & Consalvey (2005), and Tracey et al (2007) and use resources such as the Coral and Invertebrate Guides (Tracey et al. 2007; Tracey et al 2008), and the recently published Biodiversity Inventory (Gordon 2009). The coral taxa that have been returned by fisheries observers from commercial fishing voyages were thawed, sorted into main groups, identified to the lowest possible taxonomic level, returned to frozen storage, the data entered onto a recording form and subsequently entered into an electronic spreadsheet or more recently into the newly developed web interfaced NIWA database OSD. The OSD provides more system integrity and security and has linkages with existing databases - *MFish Species Master* for common and scientific names linked to match MFish species codes, *COD* (Central Observer Database), and *Specify* database. Data were loaded from the spreadsheet and from OSD into *Specify*.

Any voucher specimens were registered and fixed, and these will be maintained in the NIWA Invertebrate Collection (NIC). Several of the specimens are held in stewardship for the Department of Conservation. Not all samples are retained but those that have been catalogued, or will be catalogued, and associated data loaded into *Specify*.

Taking advantage of the Deepsea Coral Symposium, December 2008, a small proportion of the coral fauna were identified to the lowest taxa possible by coral experts visiting NIWA. The black coral (*Antipatharia*) samples were identified by Dennis Opresko, Oak Ridge National Laboratory, USA, and Tina Molodtsova (Shirshov Institute of Oceanology). Steve Cairns (Smithsonian Institution), identified Scleractinia and Stylasteridae; Les Watling (University of Hawaii), Scott France (University of Louisiana at Lafayette), Juan Sanchez (Universidad de los Andes, Colombia) and Asako Matsumoto (University of Tokyo); identified Octocorallia (Gorgonian corals).

Easily confused species for the Observers include some of the stony branching corals (e.g. *Madrepora oculata*, *Enallopsammia rostrata* (Figure 1, left image), *Goniocorella dumosa*, *Solenosmilia variabilis*, and the endemic species *Oculina virgosa*, (Figure 1 right image), black corals (*Antipatharia*), and some of the hydrocorals and gorgonian corals (e.g. Primnoidae). The training workshops held at NIWA in December, 2008, improved our coral identification skills for these challenging groups. Unfortunately no Government Observers were able to attend the Workshop.



Figure 1: Branching stony corals: *Enallopsammia rostrata* (left) and the New Zealand endemic *Oculina virgosa* (right)

NIWA has processed 302 CSP observer coral samples collected and or processed from October 2008 to September 2009. Due to their condition, some samples can only be identified to a higher level – order, or even phylum. When possible, hydrocorals (*Stylasteridae*, HDR) have been identified further to either hydrocoral (COR) or hydroid (HDF). Some samples were attached to other samples, e.g. to another coral, or a sponge. Table 1 lists the species represented for the sorted coral samples and their associated MFish code.

Table 1: Corals to putative identification level represented in the samples retained by Government Observers, 2008-2009.

MFish code	Species	Common name
ANT	Anthozoa (Class)	Anemones
BOO	<i>Keratoisis</i> spp.	Bamboo coral
BTP	<i>Bathypathes</i> spp.	Black coral
CAY	<i>Caryophyllia</i> spp.	<i>Caryophyllia</i> cup coral
CBR	Dendrophylliidae, Oculinidae (Families) and some species in Caryophyllidae (Family)	Stony branching corals
CHR	<i>Chrysogorgia</i> spp.	Golden coral
CLG	<i>Callogorgia</i> spp.	<i>Callogorgia</i> spp.
COB	Antipatharia (Order) (includes <i>Triadopathes</i>)	Black coral
COF	<i>Flabellum</i> spp.	<i>Flabellum</i> cup coral
COU	Alcyonacea, Gorgonacea, Scleractinia, Antipatharia (Orders) And Stylasteridae(Family)	Hydrocorals Coral (Unspecified)
CRE	<i>Calyptopora reticulata</i>	White hydrocoral
CUP	Flabellidae, Fungiacyathidae (Families) and some species in Caryophyllidae (Family)	Stony cup corals
DDI	<i>Desmophyllum dianthus</i>	<i>Desmophyllum</i> cup coral
EPZ	<i>Epizoanthus</i> sp.	Zoanthid
ERO	<i>Enallopsammia rostrata</i>	Deepwater branching coral
ERR	<i>Errina</i> spp.	Red hydrocoral
GDU	<i>Goniocorella dumosa</i>	Bushy hard coral
GOC	Gorgonacea (Order)	Gorgonian coral
GYS	<i>Gyrophyllum sibogae</i>	Sea pen
HDF	Leptomeduseae (Order) and Anthoathecatae (Order), excluding family Stylasteridae	Feathery hydroids
HDR	Hydrozoa (Class)	Stylasterid hydroids
HMT	Hormathiidae (Family)	Warty deepsea anemone
IRI	<i>Iridogorgia</i> spp.	Iridescent coral
ISI	Isididae (Family)	Bamboo corals
LEI	<i>Leiopathes</i> spp. (includes <i>L. acanthopora</i>)	Black coral
LLE	<i>Lepidisis</i> spp.	Bamboo coral
LSE	<i>Leiopathes secunda</i>	Black coral
MOC	<i>Madrepora oculata</i>	Deepwater branching coral
MTL	<i>Metallogorgia</i> spp.	Metallic coral
PAB	<i>Paragorgia arborea</i>	Bubblegum coral
PRI	Primnoidae	Sea fan
PTP	<i>Parantipathes</i> spp.	Black coral
PTU	Pennatulacea (Order)	Sea pens
SIA	Scleractinia (Order)	Scleractinia
SOC	Alcyonacea (Order)	Soft coral
STP	<i>Stephanocyathus platypus</i>	Solitary bowl coral
SVA	<i>Solenosmilia variabilis</i>	Deepwater branching coral
THO	<i>Thouarella</i> spp.	Bottlebrush coral

The samples processed were collected from 21 MFish / CSP fisheries observer trips.

While the focus of the project is to collect deepsea coral samples in order to help monitor and quantify protected species interactions with the deepsea commercial fisheries, samples were also collected from other non-deepsea target fisheries. The target species and number of trips for each species (bracketed) is summarised below:

BYS Alfonsino (2), HOK hoki (2), JMA Jack mackerel (4), LIN ling (1), ORH orange roughy (13), SBW Southern blue whiting (1), SOR spiky oreo (1), and SSO smooth oreo (5).

Outputs of the observer collected corals that have been processed and are currently held in the NIWA Collection (NIC) can be produced from *Specify* by NIC staff with the following database headers:

Cruise/Station No	
Station Latitude	
Longitude	
Start depth	
Phylum/TaxonName	
Class/TaxonName	
Subclass/TaxonName	
Order/TaxonName	
Family/TaxonName	
Genus/TaxonName	
Species/TaxonName	(species name e.g. <i>Madrepora oculata</i>)
Determination	
Lot number	(NIC <i>Specify</i> database Catalogue number)
No of specimens	
Identified by	(e.g. Sanchez, Juan; Cairns, Stephen; Opresko, Dennis)
Date last modified	
Remarks	(Opresko, Dennis Sub-sampled from oversized <i>Bathypathes</i> B (orange) from freezer for genetics; Dead or Live status)

Trip and station are the common links to load data into both *Specify* and *COD* (see Objective 2 below). This enables subsequent *COD* updates to be made from the *Specify* if a species revision occurs. Scientific names and not MFish species codes are entered into *Specify*.

All, or sub-samples of all specimens, are currently being retained due to their potential future research value. Where species identification of bubblegum, bamboo, and precious corals required molecular phylogenetic analyses or genetic analyses, tissue samples were removed (Juan Sanchez, Universidad de los Andes, Colombia).

Appendix 1 contains the output from *Specify* for this reporting period and lists to lowest possible taxon the corals collected and identified by experts. To date 96 coral records have been entered into *Specify*. Note that when identifications have been made by experts, data will be updated or entered into in *Specify*.

1.1.1 Specific Objective 2. Update the Centralised Observer Database (COD) as necessary with correct species identifications

This objective was to be reported on at project completion, March 2010. The final stage of this project was to update the *COD*. Sorted and identified coral sample data have been loaded into *COD*. If any revised identifications are made by visiting expert Juan Sanchez later this year *COD* will be updated under Projects DOC10301, DOC10304)

The Ministry of Fishery's contracted Research Data Manager (RDM) (NIWA) was provided with the coral spreadsheet data to enable *COD* to be updated as required under this and the MFish DAT200601E Project.

The data including species codes, weights, and sample numbers were entered into tables in *COD* (270 records; 302 samples). All data were entered using the common link of trip_number and station_number. Any updates from expert taxonomist's identifications can be made subsequent to loading. To aid this several new MFish species codes have been created and are now available e.g. for both the commonly occurring Antipatharian (black coral) and Primnoidae (sea fans) genera. The newly assigned codes are listed in Table 2.

Table 2: Newly created Ministry of Fisheries three-letter codes for Cnidaria group.

MFish code	Phylum	Class	Order	Family	Sci_name	Common name
PLE	Cnidaria	Anthozoa	Gorgonacea	Plexauridae	Plexauridae	Sea fan
PRI	Cnidaria	Anthozoa	Gorgonacea	Primnoidae		
CLG	Cnidaria	Anthozoa	Gorgonacea	Primnoidae	<i>Callogorgia</i> spp.	
CTP	Cnidaria	Anthozoa	Gorgonacea	Primnoidae	<i>Calyptrophora</i> spp.	
NAR	Cnidaria	Anthozoa	Gorgonacea	Primnoidae	<i>Narella</i> spp.	Rasta coral
PLL	Cnidaria	Anthozoa	Gorgonacea	Primnoidae	<i>Plumarella</i> spp.	
PMN	Cnidaria	Anthozoa	Gorgonacea	Primnoidae	<i>Primnoa</i> spp.	
PML	Cnidaria	Anthozoa	Gorgonacea	Primnoidae	<i>Primnoella</i> spp.	
STI	Cnidaria	Anthozoa	Antipatharia	Antipathidae	<i>Stichopathes</i> spp.	
BTP	Cnidaria	Anthozoa	Antipatharia	Schizopathidae	<i>Bathypathes</i> spp.	
CIR	Cnidaria	Anthozoa	Antipatharia	Antipathidae	<i>Cirripathes</i> spp.	Whip corals
DEN	Cnidaria	Anthozoa	Antipatharia	Schizopathidae	<i>Dendrobathypathes</i> spp.	
LIL	Cnidaria	Anthozoa	Antipatharia	Schizopathidae	<i>Lilipathes</i> spp.	
TPT	Cnidaria	Anthozoa	Antipatharia	Cladopathidae	<i>Trissopathes</i> spp.	
ATP	Cnidaria	Anthozoa	Antipatharia	Antipathidae	<i>Antipathes</i> spp.	
PTP	Cnidaria	Anthozoa	Antipatharia	Schizopathidae	<i>Parantipathes</i> spp.	
LEI	Cnidaria	Anthozoa	Antipatharia	Leiopathidae	<i>Leiopathes</i> spp.	

To produce data summaries including target species and position data relating to the coral samples, data were extracted from *COD* by linking 'trip' and 'station'.

All associated event data (e.g. position, target species, gear type) for the samples returned by observers from the 21 commercial trips are now included, along with the coral data, in a spreadsheet summary (Appendix 2). Depth data are missing for some of the trips and a trip number is missing for vessel *Voyager* (stations 4 and 9)

The *COD* extract excel spreadsheet with appended coral data (Appendix 2), contains the following station data:

Trip No.
Station No.

target_species
start_seabed_depth
end_seabed_depth
event_start_date
start_obs_fma (e.g. SOE Chatham Rise (FMA 4))
end_obs_fma
trunc_start_latitude
trunc_start_longitude
trunc_end_latitude
trunc_end_longitude
Vessel Name

as well as coral data:

Vitality (specimen 'live or dead' status)
MFish Sample No.
Obs. Species ID (MFish code; often not provided)
NIWA Species ID (by NIWA experts)
NIWA Species Sci. Name
NIWA Species Com. Name
NIWA Species Family Sci. Name
Taxonomist Name (overseas expert's species identification - groundtruthing)
Weight (estimated weight in kg obtained when sorting)
No. of Specimens

From the MFish species codes, links are made to *Species Master* database to obtain the species, scientific, and common names. This was carried out for the OSD samples but not for the earlier spreadsheet data. The Cnidaria phylum includes Orders Anthozoa, Hydrozoa, Scyphozoa – corals, anemones, jellyfish, and hydroids, hence all these groups have been included in the summary list.

Government Observers are now using the 'Observer Benthic Materials Form' and instructions are that they do not enter the same invertebrate 'materials' catch data into the green weight section of the catch forms for the same catch. However there are problems that the Ministry of Fisheries are aware of occurring with the use of Benthic Forms e.g. duplication of data due to catch information being entered into both the catch and benthic forms and errors with the recording of weight data in the benthic form. As a result of these errors, not all Observer Benthic Materials Forms data have been loaded into *COD*. To confirm that our correct species identifications for this project are loaded into *COD*, a preliminary extract has been carried out and a summary output produced (Appendix 3). All Cnidaria data entered to date from the catch or benthic forms and the loaded coral data processed at NIWA are presented in this preliminary extract but no summaries (e.g. for total Cnidaria weight) are produced due to the current problems occurring with loading complete and accurate catch data.

2. General comments:

- The Coral Identification Guide (Tracey et. al. 2008) was published as part of the previous DoC contract (DOC08309). Some updates are required and visiting coral experts who read over the guide in December 2008 have suggested some additions/changes. Some updates would benefit data collection by observers and researchers use of the Coral ID Guide. Currently the electronic version of the guide has had a number of new MFish codes added and an updated version forwarded to CSP Unit, DoC.

(See <http://www.doc.govt.nz/publications/conservation/marine-and-coastal/marine-conservation-services/other-publications/coral-identification-guide/>)

- In the next year as part of DoC Grant (Project DOC09310), *COD* will be updated with the information from the historical samples already processed by Te Papa and / or by Dr W. Blom, Marine Department, Auckland War Memorial Museum. A list was provided by Te Papa of the processed and identified samples. The already identified historical coral material that have been received by Te Papa over the last few years will have their identification confirmed by an experienced taxonomist, assigned appropriate Ministry of Fisheries species codes, and the data will be loaded into *COD* and also into *Specify* if vouchers are obtained by NIC. All other non-coral invertebrates listed in the Te Papa spreadsheet will also be coded and entered into *COD*. Additional funding has been provided to carry out the above tasks and to fund visiting expert Juan Sanchez to visit NIWA and confirm coral identifications. Some black corals owned by DoC were accessed from Te Papa in December 2008 and we now hold voucher specimens from these at NIWA and the information is stored on *Specify*.

3. Acknowledgements

Thanks to the Government Observers who have collected the coral samples for this project. Special thanks to NIWA staff particularly Dean Stotter and Mark Fenwick for sample sorting and database input. Thanks to Brian Sanders for updating the Centralised Observer Database (*COD*) and for data extracts, to Karen Schnabel and Sadie Mills (NIC) for ensuring data were entered into *Specify* and to Karen for data extracts. We are most grateful to visiting taxonomists to NIC who were able to contribute to the identifications of a proportion of the observer collected Cnidaria: Juan Sanchez, Dennis Opresko, Tina Molodtsova, Steve Cairns, Les Watling, Scott France, Asako Matsumoto, Daphne Fautin (University of Kansas); Frederic Sinniger (University of the Ryukyus¹ Senbaru, Okinawa). I wish to acknowledge Erika Mackay for her updates to the Coral Guide. Thanks to Don Robertson Chief Scientist, Biodiversity and Biosecurity, and Project Manager, for his helpful review of this document. Finally thanks to Johanna Pierre (CSP Manager, DoC) and Stephanie Rowe (formerly DoC, now with Biosecurity NZ) for their support of this project.

4. References

- Consalvey, M, MacKay, K., Tracey, D. 2006: Information review for protected deep-sea coral species in the New Zealand region. NIWA Client Report prepared for Department of Conservation. WLG2006-85. 60 p.
- Gordon, D.P (2009) New Zealand Inventory of Biodiversity. Volume 1. Kingdom Animalia: Radiata, Lophotrochozoa, Deuterostomia. Canterbury University Press, Christchurch. 568 [+ 16] p.
- Rowe S, Tracey D. 2008: Assessing the Incidental Catch of Corals in New Zealand Fisheries. Presentation to the Deepsea Coral Symposium 2008. Theme: Management Decisions and Policy for Corals, Conservation and Human Impacts. 1 p.
- Rowden A, Tracey D, Mackay K, Leathwick J 2008. Distribution of Structure-Forming Scleractinian Corals in the New Zealand Region. Presentation to the Deepsea Coral Symposium 2008. Theme: Coral Ecosystems and Habitats associated with Seamounts. 1 p.
- Sánchez J, Dueñas L, Tracey D. 2008: Systematics and Distribution of Deep-Sea Bamboo Corals (Octocorallia: Isididae) in New Zealand Waters. Presentation to the Deepsea Coral Symposium 2008. Theme: Systematics and Biogeography. 1 p.
- Tracey, D.M.; Anderson, O.F.; Naylor, J. R. (Comps.) 2007. A guide to common deepsea invertebrates in New Zealand waters. *New Zealand Aquatic Environment and Biodiversity Report No. 10*. 282 p.
- Tracey, D. Consalvey, M. 2006. Archived benthic by-catch Final Research Report submitted to the Ministry of Fisheries for Research Project IPA200508, Objective 1. 8p. (Unpublished report held by the Ministry of Fisheries, Wellington.)
- Tracey, D. Gauthier, S. Consalvey, M. 2007. Archived benthic by-catch Final Research Report submitted to the Ministry of Fisheries for Research Project IPA200604, Objective 1. 26p. (Unpublished report held by the Ministry of Fisheries, Wellington.)
- Tracey, D.; Mackay, E.; Gordon D.; Sanchez, J.; Opresko, D.; Rowe, S. (2008) Coral Identification Guide. Report prepared for CSP Unit, Department of Conservation, DOC08309 Project (Objective 3). 16 p.

Tracey, D., Consalvey, M., Mackay, K. (2008): New Zealand's protected corals: what do we know? Presentation to the Deepsea Coral Symposium 2008. Theme: Management Decisions and Policy for Corals, Conservation and Human Impacts. 1 p.

Tracey D, Mackay E. 2008: Coral ID – No Longer 'All at Sea': Marrying Taxonomic Descriptions of Deepsea Corals with At-Sea ID Guides. Presentation to the Deepsea Coral Symposium 2008. Theme: Systematics and Biogeography. 1 p.

Tracey D., Rowden A., Mackay K., Leathwick J., Compton, T. (in prep). Distribution of Structure-Forming Scleractinian Corals in the New Zealand Region.

5. Appendices – (available on request from Marine Conservation Manager, DOC)

Appendix 1: Specify export February 2010 spreadsheet.

This Appendix provides a summary of Cnidaria by-catch processed to date by NIWA as part of the DOC09305 Project and catalogued at NIWA. Species have been confirmed by expert taxonomists Note: no MFish species codes are entered into the *Specify* database.

Appendix 2: Station data and details of Government Observer coral samples processed at NIWA

This Appendix provides a summary of Cnidaria (Anthozoa, Hydrozoa, Scyphozoa – corals, anemones, jellyfish, and hydroids), by-catch processed to date by NIWA with the corresponding station data as part of the DOC09305 Project. Some samples have had their identification confirmed by expert taxonomists. Juan Sanchez will confirm identification of the remaining samples when he visits in June, 2010. Some samples can only be identified to a higher level – order, phylum.

Appendix 3: Preliminary COD extract January 2009 spreadsheet

This Appendix provides a summary of station data and Cnidaria (Anthozoa, Hydrozoa, Scyphozoa – corals, anemones, jellyfish, and hydroids), by-catch recorded by Government Observers at sea as well as of those corals retained to be processed by NIWA as part of the DOC09305 Project and subsequently loaded into *COD*.