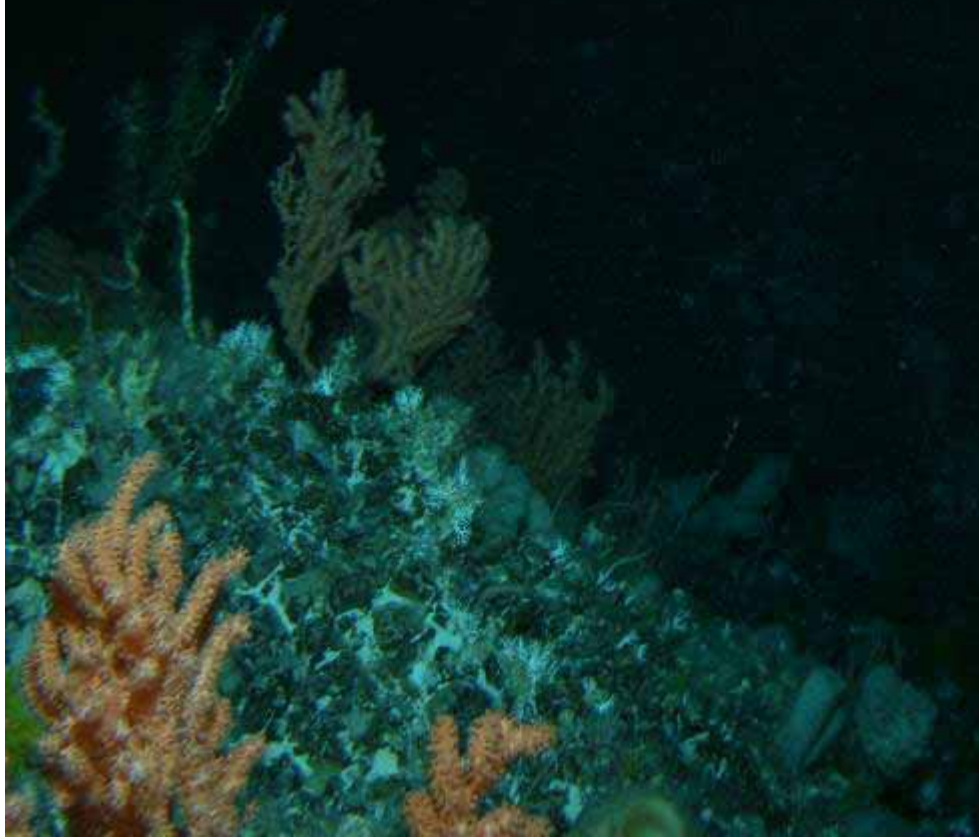
Identification of protected corals

DOC08309 / INT2007-03

Di Tracey



Department of Conservation
Te Papa Atawhai

NIWA
Taihoro Nukurangi

1. Progress report to DoC

2. Summary of coral records selected from MFish Observer database *COD* up to November 2007, and compare with commercial fishing activity

Understanding the ecosystem role, function, and value of deepsea corals (azooxanthellate = no symbiotic algae >200 m, 700-1500 m) **and associated fauna has become a priority topic for researchers in the last decade**

Main aim:

Standardise instructions for retaining benthic by-catch material - including protected coral species or species believed to be protected, and sampled at sea by fisheries observers, (legal obligations of the Wildlife Act).

Improve
- knowledge of the region's biodiversity
- understanding of the ecosystem effects of fishing
- knowledge of areal and vertical distribution of protected coral taxa within and outside the EEZ

Provide a measure of abundance

Help quantify protected species interactions with commercial fisheries

Add to descriptions of the biodiversity of seamount / non seamount habitats

Provide information useful for the consideration of potential MPA's

Overall Objective:

To identify samples of corals returned through the CSP observer programme during the 2007/08 fishing year (1 October 2007 – 30 September 2008).

Specific Objectives:

1) Samples of corals returned by observers to be identified to lower taxa (families, genera, species)
2) Update the observer database (*COD*) as necessary with correct species identifications
3) Develop concise educational materials to complement *A Guide to Common Deepsea Invertebrates in New Zealand Waters* for observers on the identification of protected corals known to be caught during trawling.

4) A variation to project – from additional funding, process and identify the "historic" MFish Observer coral samples (stored at Te Papa).

Obj 1. Samples of corals returned by observers to be identified to lower taxa (families, genera, species)

Specific Objective 1

The objective consists of 5 main tasks:

providing input into observer briefing process

sorting frozen samples returned to NIWA to putative identification level

entering data into electronic spreadsheet

taxonomists confirm identification

spreadsheet updated and data entered into *Specify* database

Task 1: Providing input into observer briefing process

Species ID
At-sea collection
procedures
sample, sub-sample,
label, & code

Aiming for consistency
Observer Benthic
materials Form

Observer Benthic Materials Form (Version 1 - October 2007)

1. Benthic Material includes all **Non-targeted** marine invertebrates, marine plants and/or structures that are connected with the seafloor. You should complete a **separate row** for each individual identifiable item.

2. Write the trip number [ ] and Observer code/s (*first letter of first name then first three letters of surname*) [.] and [.]

Sample number	Tow/Set number	MFish code	End Type	Weight (kg)	Method of analysis	Life status	Links	Quantity (code)	Number (optional)	Comments
B				.						
B				.						
B				.						
B				.						
B				.						
B				.						
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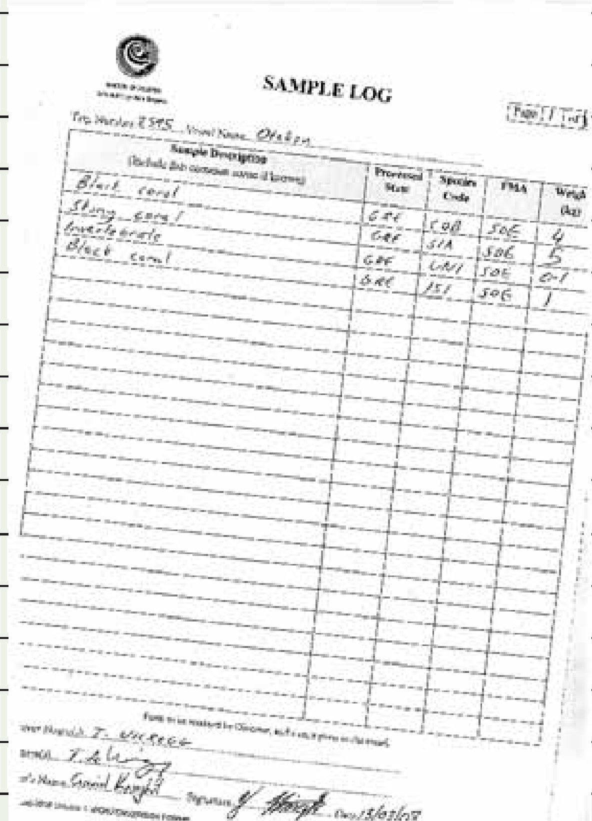


3. This form is page number [ ] for this trip. Is this form the last page for this trip? → Yes [ ] No [ ]

Tasks 2–3: (Obj1 & 4)
Sort frozen samples to putative identification level
Entering data into electronic spreadsheet

To date: processed coral samples collected Oct 2007 & June 2008
>470 samples
43 trips
Data: species ID codes, weight, trip number

Entered electronically

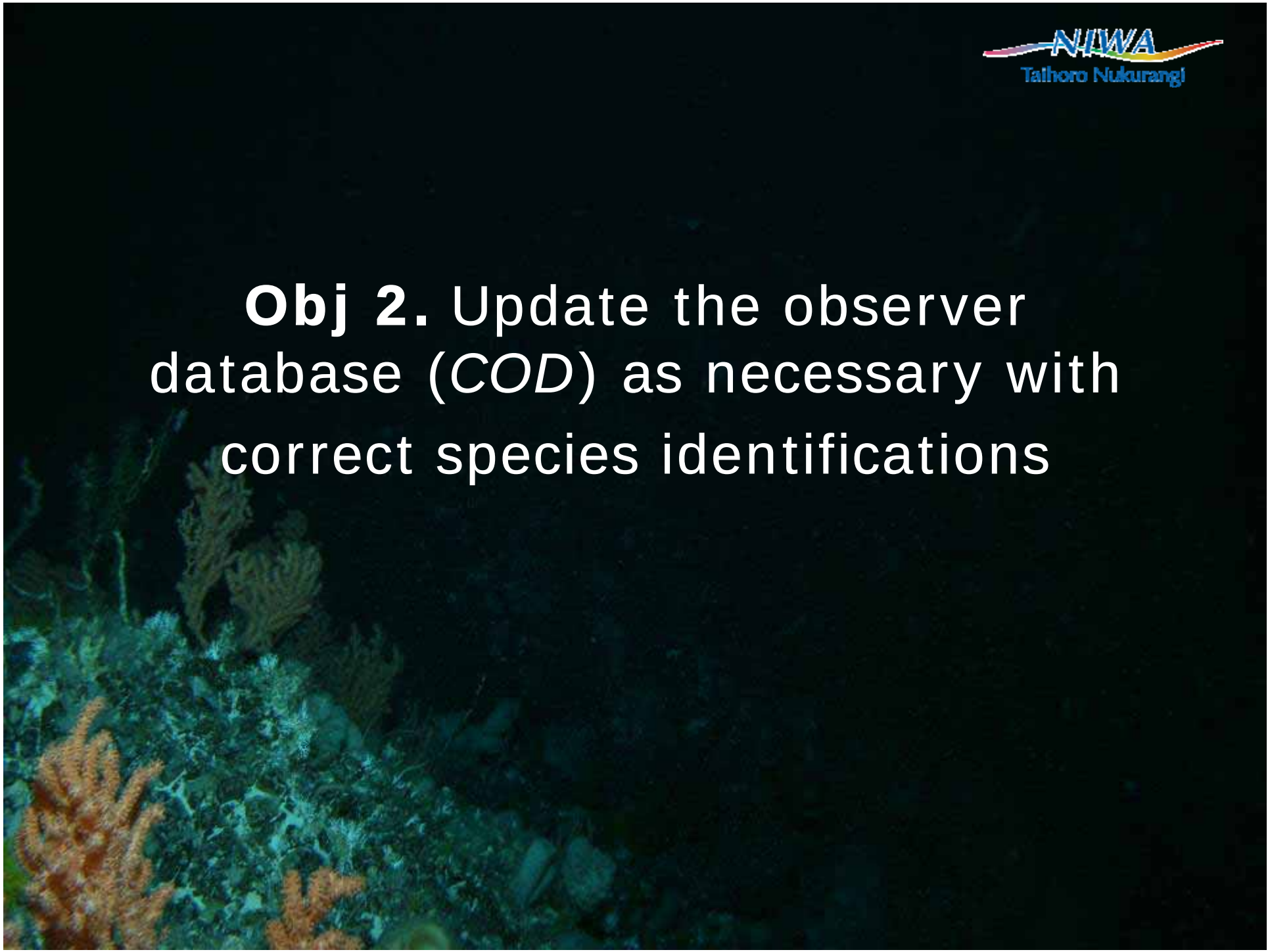
Tasks 4–5:

Confirming identification– (in prep.)

ID / or ground-truthed by taxonomists: Sanchez, Cairns, Opresko, Molodtsova, Fautin, Gordon
(all bar black corals identified)

Spreadsheet updates

Entry into *Specify and COD* databases



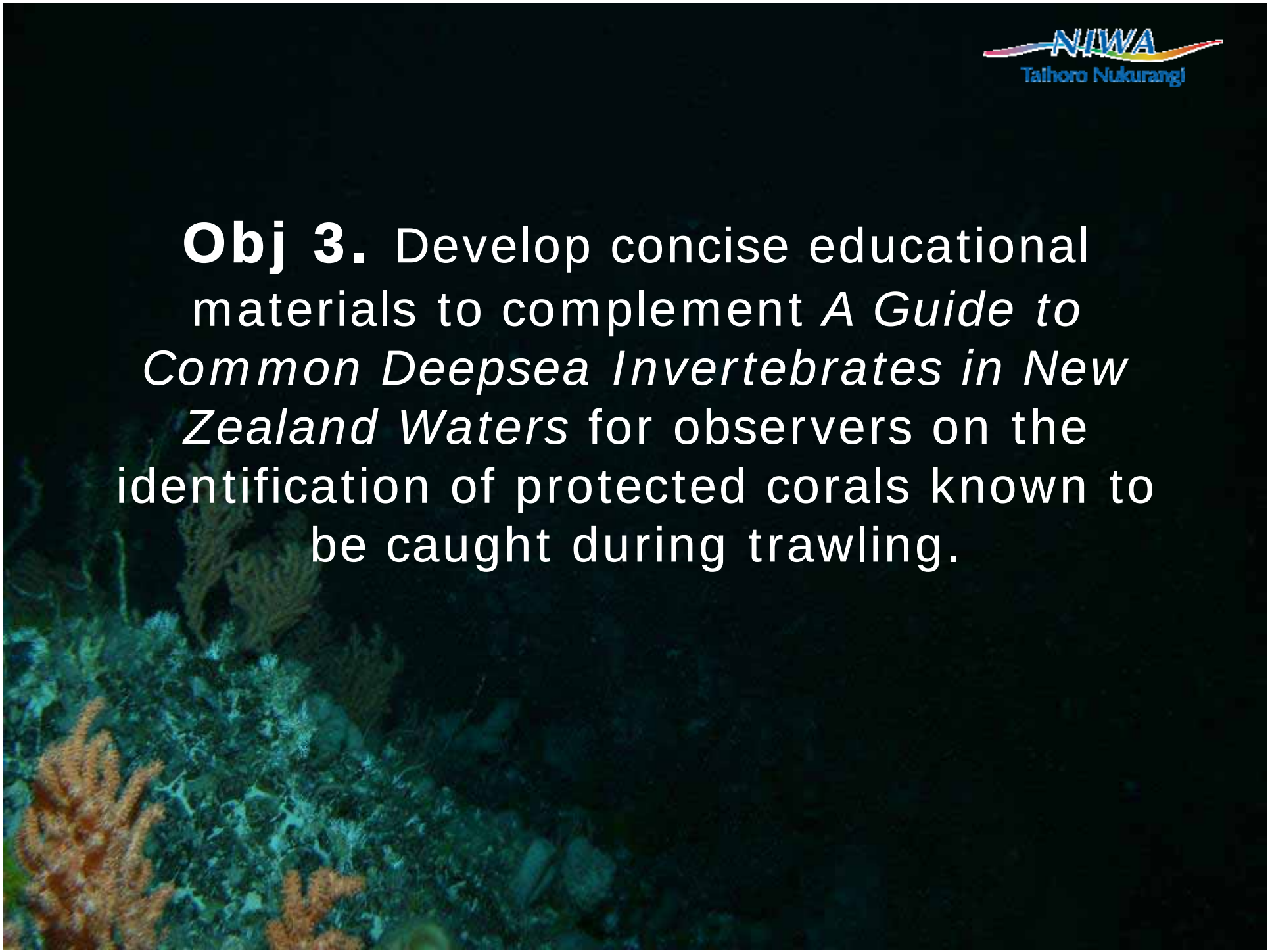
Obj 2. Update the observer database (*COD*) as necessary with correct species identifications

Task 1:
COD database updates (in prep.)

species codes
weights
sample numbers will be added to associated event data in *COD*

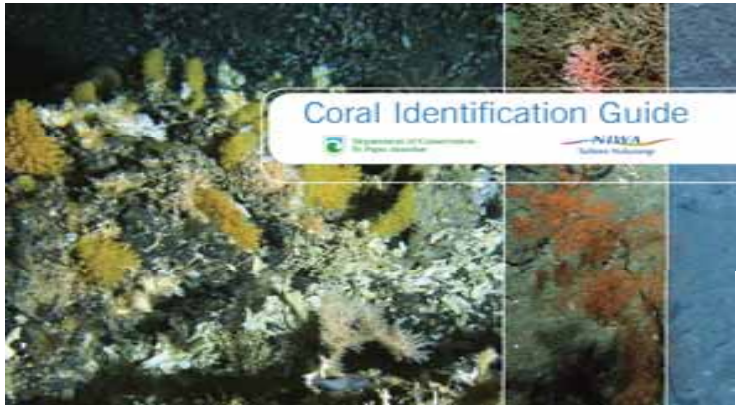
using the common link of trip_number

and station_number



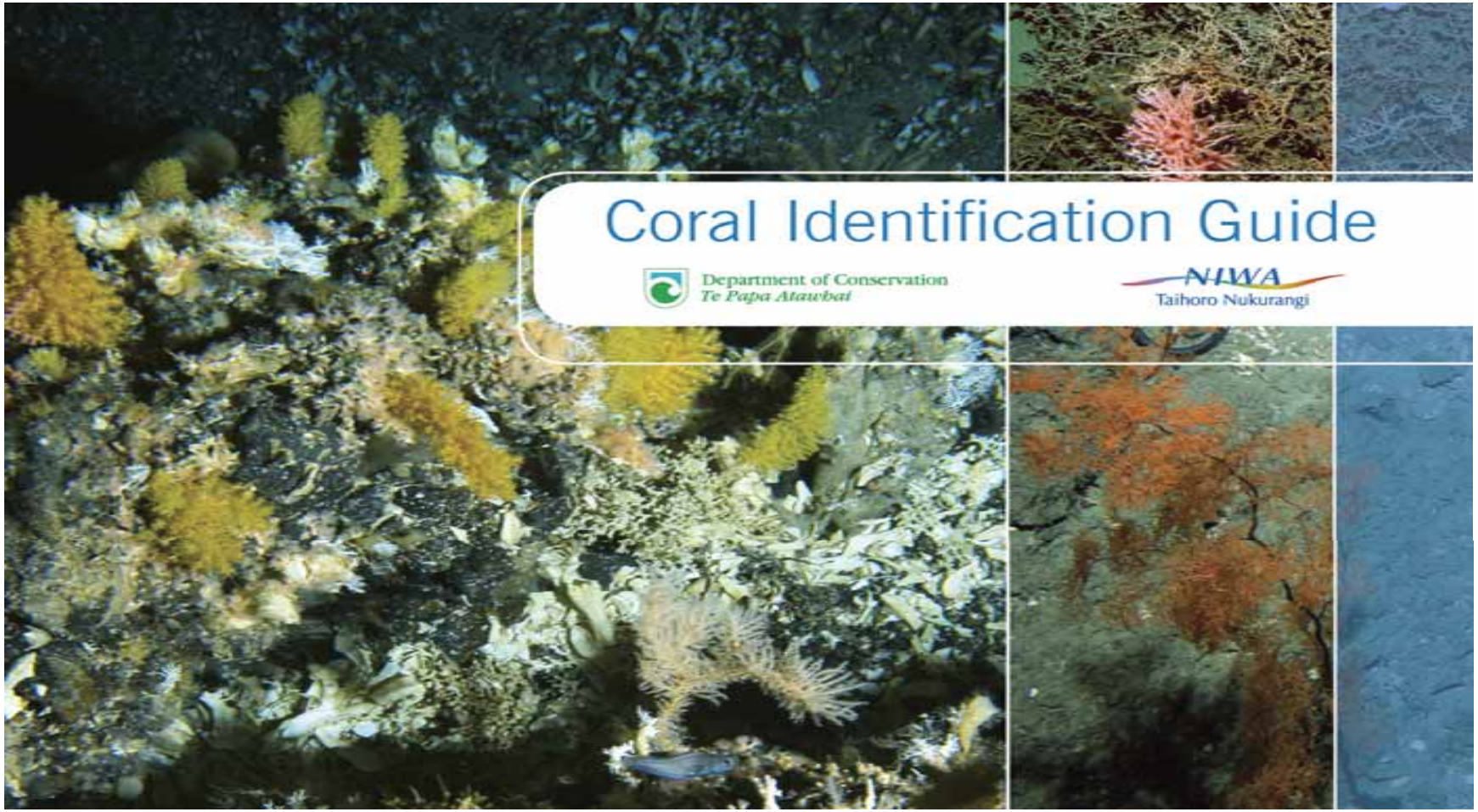
Obj 3. Develop concise educational materials to complement *A Guide to Common Deepsea Invertebrates in New Zealand Waters* for observers on the identification of protected corals known to be caught during trawling.

Development of guides aid at-sea identification



New DoC funded educational material complements & further aids coral identification by observers, researchers, and managers – clear taxonomic descriptions of main coral groups

Objective 3:
Coral ID Guide



Contents

Main Groups

Taxonomy of major coral groups

"Coral" is a general term used to describe several different groups of animals in the Phylum Cnidaria. This guide provides a summary of taxonomic features for the key coral groups we find in the New Zealand region.

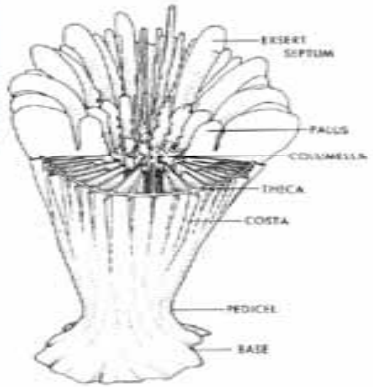
Page numbers in the text refer to ID sheets (Tracey et al 2007)

PHYLUM CNIDARIA

Class Anthozoa – corals, sea anemones, sea pens
- **Subclass** Hexacorallia (Zoantharia)
  - **Order** Scleractinia – stony corals
  - **Order** Antipatharia – black corals
- **Subclass** Octocorallia (Alcyonaria)
  - **Order** Alcyonacea – true soft corals, stoloniferans
  - **Order** Gorgonacea – sea fans, sea whips
  - **Order** Pennatulacea – sea pens

Class Hydrozoa
- **Order** Anthoathecatae – stylasterid corals

Glossary of terms for stony corals



Stony corals

Stony corals SIA

Branching thicket-forming corals CBR

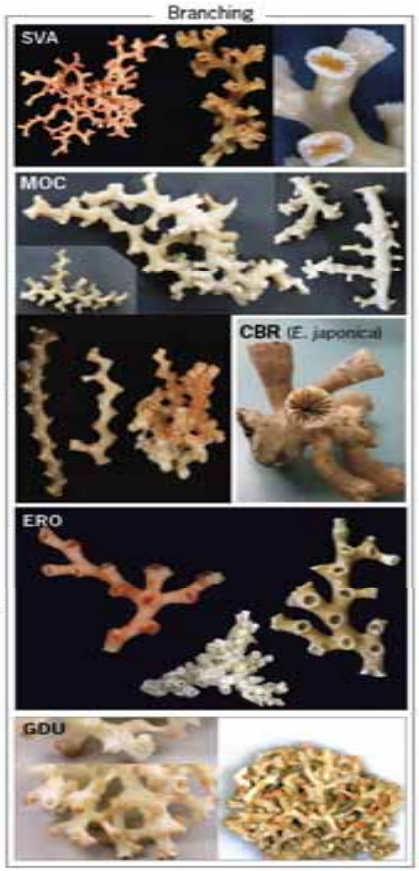
How does branching occur?

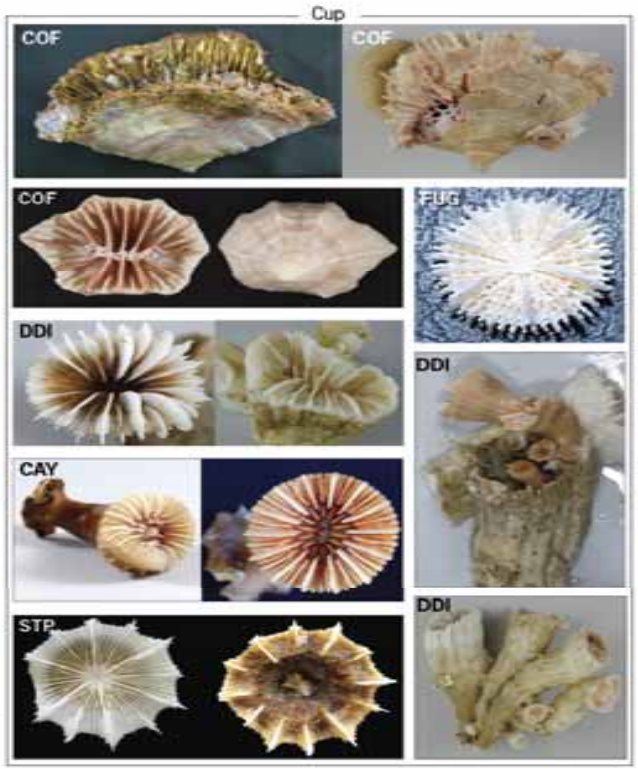
- The polyp calyx divides in two; branching in a 'v' shape:
  ***Solenosmillia variabilis* SVA** (p 75)
- Branching occurs below the calyx:
  - Branches just below the calyx:
    ***Madrepora oculata* MOC** (p 78)
  - Has main branches, then large calyces on one side of the plane of the colony:
    ***Enallopsammia rostrata* ERO** (p 76)
- Branches apart from any calyx, 90 degrees:
  - Only a few large calyces develop as branches:
    Euguchipsammia japonica. (Default **CBR**)
  - A 3D network of thin branches (note the bridges between branches); polyps branch at right angles:
    ***Goniocorella dumosa* GDU** (p 74)

Solitary or cup corals CUP

What is the shape of the solitary coral?

- Compressed: ***Flabellum*** spp. **COF** (p 77)
- Flat bottomed: ***Fungiacyathus*** spp. **FUG**
- Cup-like (conical base):
  - Displays several cycles of progressively smaller (less wide) septa: ***Caryophyllia*** spp. **CAY** (p 72) and allies.
  - Bowl-like (no conical base):
    Stephanocyathus and allies. ***S.platypus* STP** (p 71).



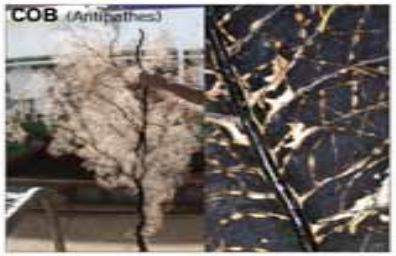


Black corals

Black corals COB

All have spines on the smallest branches and very small polyps (< 1 cm in diameter).

- Colonies Unbranched and unpinnulated; straight, curved, whip-like or spirally coiled:
  - One row of polyps only: ***Stichopathes* COB**
  - Polyps all around stem or sometimes one side free of polyps: ***Cirrhipathes* COB**
- Colonies unbranched but with pinnules (terminal branchlets of nearly equal size) arranged in a symmetrical pattern on stem:
  - Feather-like colonies with upright or curved stem with 2 rows of straight or curved pinnules (rows sometimes close together on one side of stem): ***Bathypathes* COB**
- Colonies usually with sparse branching, and with pinnules on stem and branches:
  - 2 rows of alternately arranged pinnules, one row on either side; some pinnules with small secondary pinnules: ***Dendrobathypathes* COB**
  - 4 rows of long unbranched pinnules, 2 on each side of branch (grouped in pairs); branches appear feather-like: ***Lillipathes* COB**
  - 4 rows of pinnules; 2 lateral (opposite) rows of long, unbranched pinnules and two anterior rows of shorter, branched pinnules; colonies often very slimy: ***Trissopathes* COB**
  - 6 or more rows of unbranched pinnules, equal number on either side of stem and branches (bottlebrush appearance); small colonies often unbranched with long stem: ***Parantipathes* COB**
- Colonies densely branched, without distinct pinnules (smallest branchlets not of uniform size or arrangement, but sometimes restricted to sides of branches in fan-shaped colonies):
  - Colonies fan-shaped, densely branched with multiple orders of branches; smallest branches numerous, irregular, but somewhat alternately arranged on opposite sides of larger branches: ***Antipathes*** (Antipathes cf. speciosa)
  - Colonies loosely spreading, with multiple orders of branches; thicker branches usually smooth and polished; small branches often curved, with branchlets of the next higher order appearing on the convex side: ***Leiopathes*** (***L. secunda* LSE** pg 57)



Confused with black corals

Groups that can be confused with black corals COB

Hydroids HDF – less robust than black corals, with a woody and flexible skeleton, the axis being chitinous.

Gorgonians GOC – naked gorgonian axes can be confused with black coral axes but can be easily distinguished by absence of skeletal spines. Tissue can be scraped off gorgonian axes.

Gorgonian corals e.g., Primnoidae colonies can be easily distinguished from black coral colonies (Parantipathes and others) by the lustre (metallic) or colour of the axis (orange, brown, green), and armoured bud-like polyps (black coral polyps are always fleshy).

Soft corals

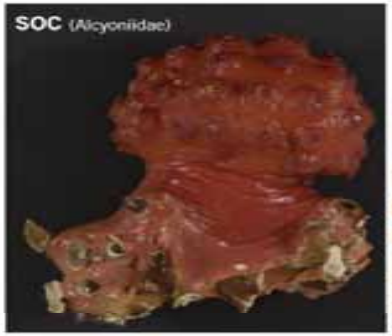
Soft corals SOC

How many polyps do they have?

- One or a few connected by stolons:
  - Gigantic polyp: ***Anthomastus robustus*** **ARO** (p 55)
  - Small and robust, usually white: ***Clavularia*** spp. **SOC**
  - Thin and long, e.g. ***Telestula*** spp. **TLA:** yellow/white, single stem, doesn't branch
- Many polyps:

What is the colony shape?:

- Mushroom-like:
  - Distinctive hemispheric head; paler-coloured base, large polyps stay outside after collection: ***Anthomastus*** spp. (e.g. *A. zealandicus*) **SOC,** key feature is the brain-like stalk on the underside
  - Amorphous though usually rounded: **Alcyoniidae** family **SOC**
- Branching:
  - Thin tubular branches: ***Telesto*** spp. **TLO** (p 56)
  - Single tubes: Runner-like with pink/white polyps. ***Clavularia*** spp. **SOC**
    - Red single tubes: ***Rhodelinda*** spp.
  - Fleshy and thick branches with spikes: ***Chironnephtya*** spp.



Gorgonians: bamboo corals

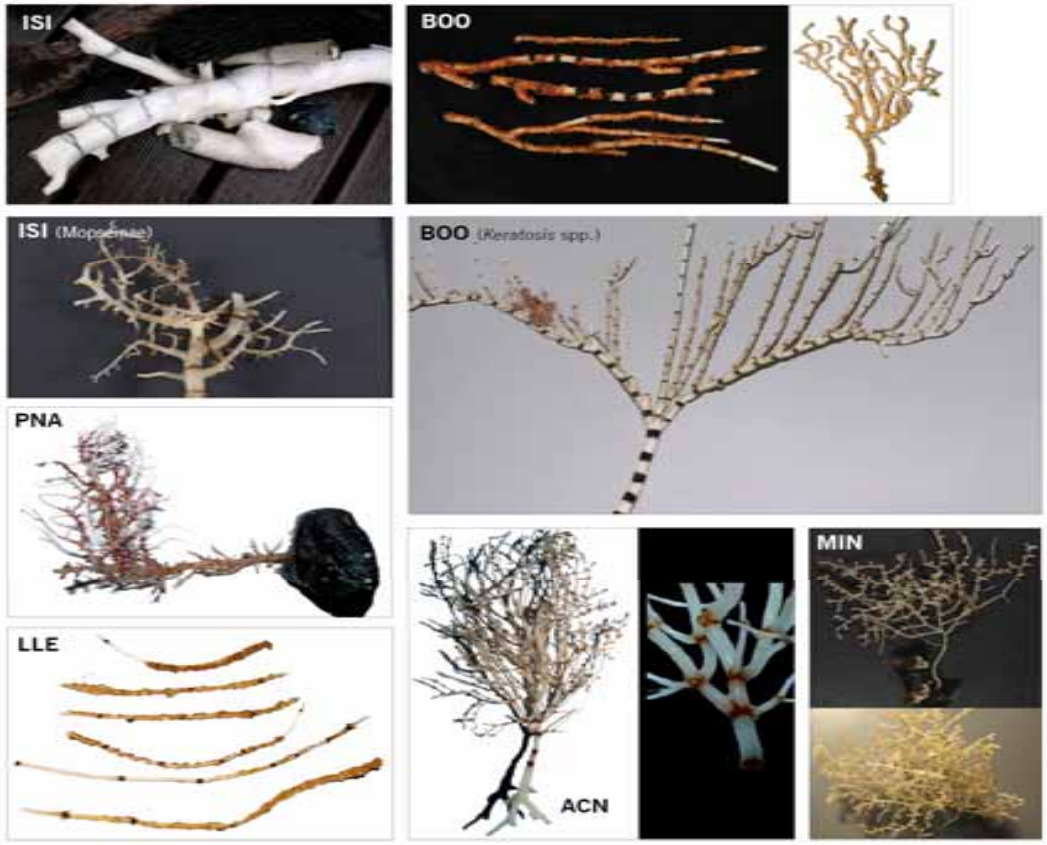
Gorgonian corals GOC

Bamboo corals **ISI** (p 64)

How big are the brown nodes?

- Tiny (need a closer look to spot): **Mopseinae**
  - What shape do they have?
    - Bottle-brush: ***Primnoisis*** spp. (***P. antarctica* PNA**)
    - One main branch and often less than bottle-brush: ***Minuisis*** spp. **MIN**
    - Forked branching and others: many genera of **Mopseinae**
- Long and visible (>1 cm): **Keratoisidinae**
  - Where do the branches come from?
    - No branches: ***Lepidisis*** spp. **LLE** (p 63)
    - From the white internodes: ***Keratosis*** spp. **BOO** (p 62). Keratosis taxonomy is under review, some have unusual candelabra form.
    - From the brown node (usually 2–3 branches from one branching point): ***Acanella*** spp. **ACN**
    - Several other genera exist but they are uncommon in New Zealand.

Both *Keratoisis* and *Lepidisis* are under revision and might be the same genus.



Gorgonians: bubblegum & precious corals

NIWA
Taihoro Nukurangi

Bubblegum corals

What colors?

- Pink and red:
  Paragorgia spp. ***P. arborea*** **PAB** (p 60)
- White or beige:
  Sibogagorgia spp.

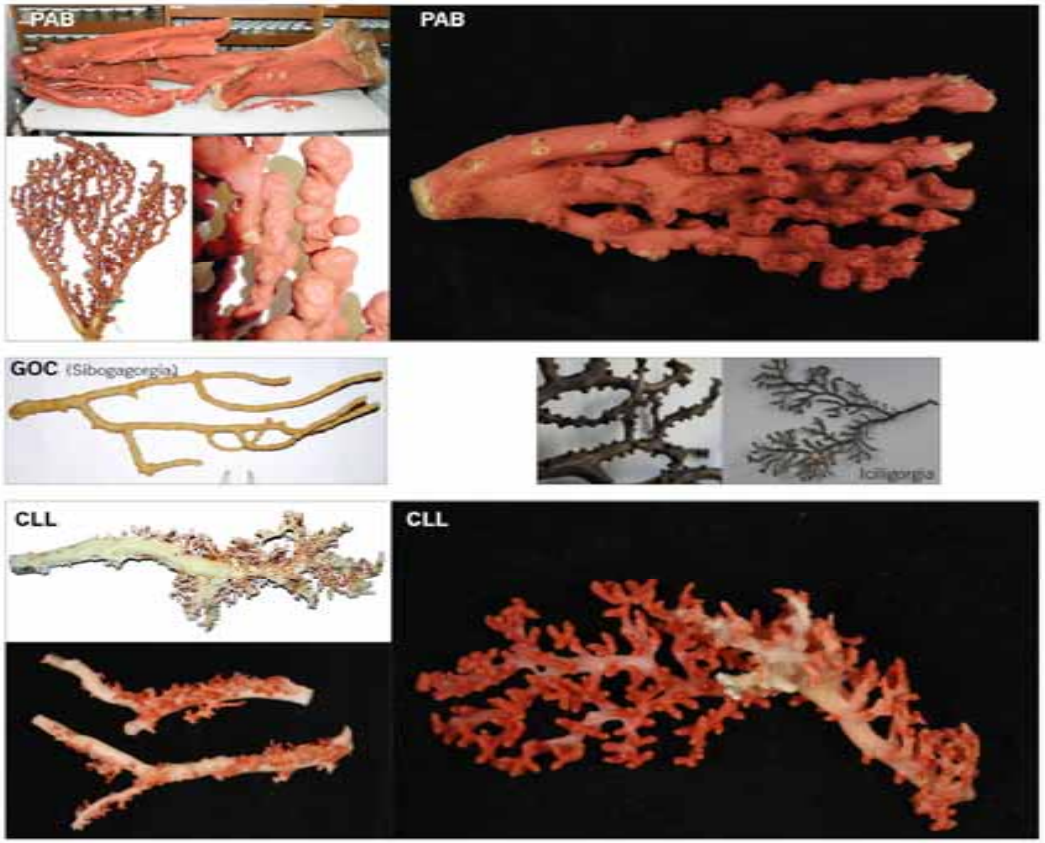
Precious corals

Corallium **CLL** (p 59) indistinguishable with the naked eye from ***Paracorallium***, though the latter is less likely to be found in New Zealand waters, see hydrocoral section to help differentiate them from the precious corals.

False gorgonians

What colour are they?

- Brown or black (fan-like): ***Iciligorgia*** spp.
- Red: ***Sarcodyction*** spp.
- Beige to white: ***Anthothela*** spp.



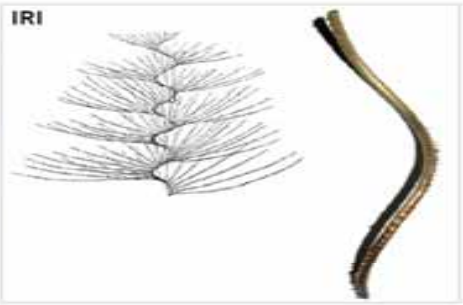
Gorgonians: golden corals

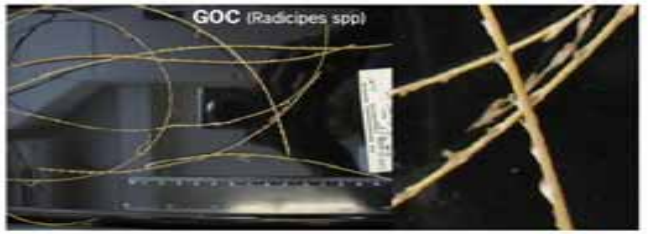
Golden corals

What is the overall shape?

- Delicate bottle-brush: ***Chrysogorgia*** spp. **CHR** (p 61)
- Long stalk ending in a network of branches: ***Metallogorgia*** spp. **MTL**
- Twisted: ***Iridigoria*** spp. **IRI**
- Whip-like: ***Radicipes*** spp. **GOC**

Axes of golden corals have a metallic lustre, they can appear as black/green as well as golden.





Gorgonians: sea fans

Sea Fans **GOC**

Do they have a dark axial skeleton?

- Yes which is often brown or black. (check to ensure they have also a cortex of semi-soft tissue covering the skeleton, otherwise they can be hydroids; note that hydroids have very thin end branches and they never have a hard axis; a darker and harder skeleton with a soft cortex of tissue could be a black coral).

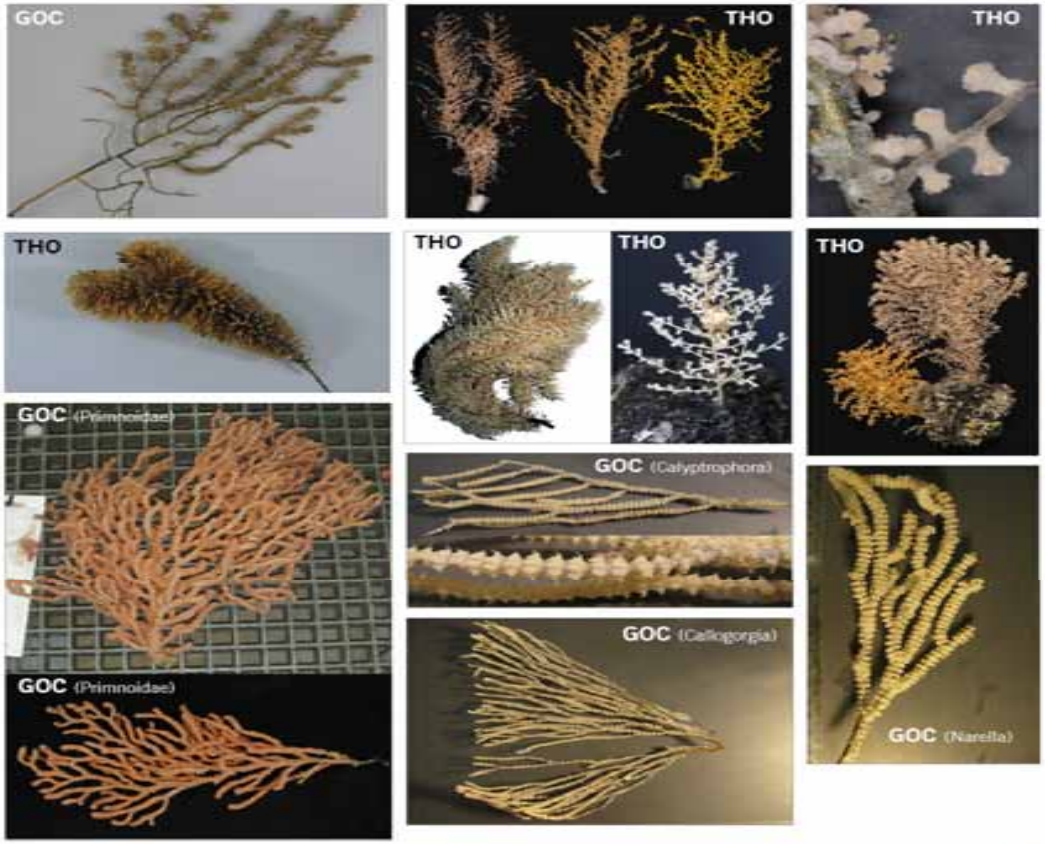
What is the appearance of the covering cortex tissue?

- Uniform colour, usually beige to dark brown, bumpy: Plexauridae (many genera indistinguishable by the naked eye such as **Placogorgia**, **Paramuricea**, **Dentomuricea**, etc.)
- Long and spiny polyp calyces: **Acanthogorgia**.

Golden branches often with orange, white, yellow, pink large and small polyps and usually hard polyp calyces: **Primnoidae GOC**

What is the overall shape?

- Bottlebrush: supercommon ***Thouarella*** spp. **THO** (p 65)
- Whip-like: ***Primnoella*** spp. **GOC**
- Bushy to fan-like and large with robust branches and scales or plates on knobby polyps: ***Primnoa*** spp. (Common Primnoidae)
- Fan-like and flat thin branches: **Callogorgia** and others.
- Thick branches with very elaborated calyces in girdles:
  - Calyx composed of two pair of fused body wall sclerites (scale-like structure): ***Calyptrophora*** spp.
  - Calyx composed of 3 pairs of unfused body wall sclerites: ***Narella*** spp.
  - No dark axial skeleton, breaks easily: False gorgonians (see bubblegum coral, page 11).



Sea Pens

Sea pens PTU

(N.B. sea pens are found only on soft muddy bottoms)

Whip-like (small polyps):
Type of axis?

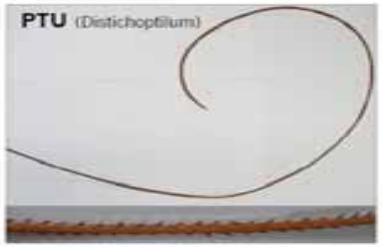
- Cross-like in section: **Funiculina.**
- Cylindrical:
  Red color: **Distichoptilum PTU**

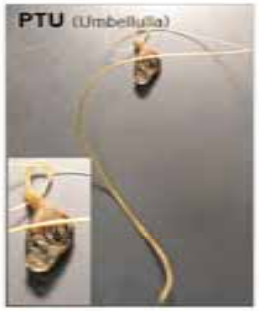
Fleshy:

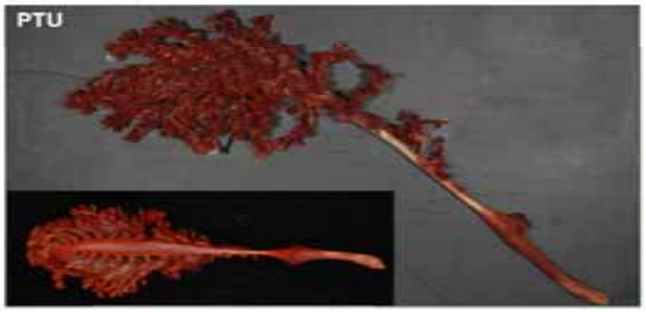
- Long stalk with a terminal bump of large flower-like polyps: **Umbellulla PTU**
- Flower-like polyps arranged along stem: **Kophobelemnon PTU**
- Short with large fleshy 'leaves': ***Gyrophyllum sibogae* GYS** (p 69)

Pen-like:

- Purple and looking like a soaked feather: **Pennatula PNN** (p 70)
- Very long, rows of hard and short spirals of polyps (bluish fluorescence when touched): **Halipteris PTU** (Stylatula is similar but not very common in New Zealand).







Hydrocorals

Hydrocorals (stylasterid hydroids) HDR

Recognising hydrocorals **COR**

- Growths with main branches usually obviously thicker than the side branches.
- Side branches break easily.
- Pore-like apertures, with tiny radii on the circular rim. (i.e. cyclosystems)

Groups of hydrocorals

- Pink to red (some species white, however), short spines, thick branches: ***Errina*** spp **ERR**.
- White colonies: ***Stylaster*** **STL**, ***Conopora*** **COO**, ***Lepidotheca*** **LPT** (p 68), ***Stenohelia***, and ***Crypthelia*** **CRY** (among others). All groups form very similar colonies and are easy to tell apart with a microscope.

Most stylasterids other than some ***Errina*** **ERR** (p 67) species are similar and difficult to tell apart with the naked eye. ***Calyptopora reticulata*** **CRE** (p 66) is very similar to ***Stylaster*** **STL** species; but the latter have visible bump-like reproductive ampullae towards one side of the colony not present in ***Calyptopora***. Some large white colonies of the precious coral ***Corallium*** can be confounded with stylasterids but ***Corallium*** differs in lacking pores of any kind on its corallum (skeleton). *Corallium* does not have the small side branches of ***Calyptopora reticulata***. Some branching bryozoans can have similar shapes but are somewhat crystalline, have thinner branches, and are without robust main branches.

Groups that can be confused with hydrocorals

Hydroids HDF – diminutive coral-like open-branched or reticulate lace-like growths with microscopic openings:

Bryozoans COZ – stout, very hard growths that have a thin layer of tissue usually of a different color than the hard part: Precious red corals (***Corallium* CLL** and ***Paracorallium***).

2. Summary of coral records selected from MFish Observer database *COD* up to November 2007, and compare with commercial fishing activity

Table 1: Summary up to 23/11/2007 of coral by-catch from *COD* (MFish Observer database)

Code	Scientific name	Common name	Number	Weight (kg)
COU		Coral (Unspecified)	1592	478160
COR (likely not hydrocorals)			74	8216
			Total	**486376**
Anemones				
ACS	Actinostolidae	Deepsea anemone	457	1878
ANT		Anemone	1373	40221
BOC		*Bolocera* spp.	70	144
HMT	Hormathiidae	Deepsea anemone	242	1067
LIP	*Liponema* spp.	Deepsea anemone	7	13
SEN	*Actinia* spp.	Sea anemone	6	49
			Total	**43372**

Table 1: cont Summary up to 23/11/2007 of coral by-catch from *COD* (MFish Observer database)

Code	Scientific name	Common name	Number	Weight (kg)
Stony corals (cup)				
DDI	*Desmophyllum dianthus*	Cup coral	25	10
CAY	*Caryophyllia* spp.	Cup coral	7	5
STS	*Stephanocyathus spiniger*	Cup coral	1	71
COF	*Flabellum* spp.	Cup coral	37	91
			Total	**177**
Zoanthids				
EPZ	*Epizoanthus sp.*	*Epizoanthus sp.*	25	25
			Total	**25**
Black corals				
COB	Antipatharia (Order)	Black coral	220	977
LSE	*Leiopathes secunda*	Black coral	35	49
			Total	**1026**
Soft corals				
SOC	Alcyonacea (Order)	Soft coral	1	1
TLO	*Telesto* spp.	Encrusting long polyps, coral	38	8
			Total	**9**

Table 1: cont Summary up to 1986 to 23/11/2007 of coral by-catch from *COD* (MFish Observer database)

Code	Scientific name	Common name	Number	Weight (kg)
Gorgonian corals				
GOC	Gorgonacea (Order)	Gorgonian coral	1	1
PAB	*Paragorgia arborea*	Bubblegum coral	89	2980
CLL	*Corallium* spp.	Precious coral	4	4
ISI	Isididae	Bamboo corals	120	376
LLE	*Lepidisis* spp.	Bamboo coral	4	5
BOO	*Keratoisis* spp.	Bamboo coral	36	51
MIN	*Minuisis* spp.	Worm-commensal bamboo coral	1	1
CHR	*Chrysogorgia* spp.	Golden coral	82	757
THO	*Thouarella* spp.	Bottlebrush coral	5	5
PNN	*Pennatula* spp.	Purple sea pen	25	30
GYS	*Gyrophyllum sibogae*	Siboga sea pen	10	21
			Total	**4231**
Hydrozoans				
COR	Stylasteridae (Family)	Hydrocorals	*	*
COO	*Conopora* spp.	*Conopora* spp	1	1
CRE	*Calyptopora reticulate*	White hydrocoral	4	7
ERR	*Errina* spp. Red coral		3	7
LPT	*Lepidotheca* spp.	Spiny lace coral	2	2
HDR	Hydrozoa (Class)	Hydroid	13	14
			Total	**31**

Table 1:

Pre-DOC08309 sample processing

targeting 33 fish species

Data grooming issue

unrealistic weights for particular species

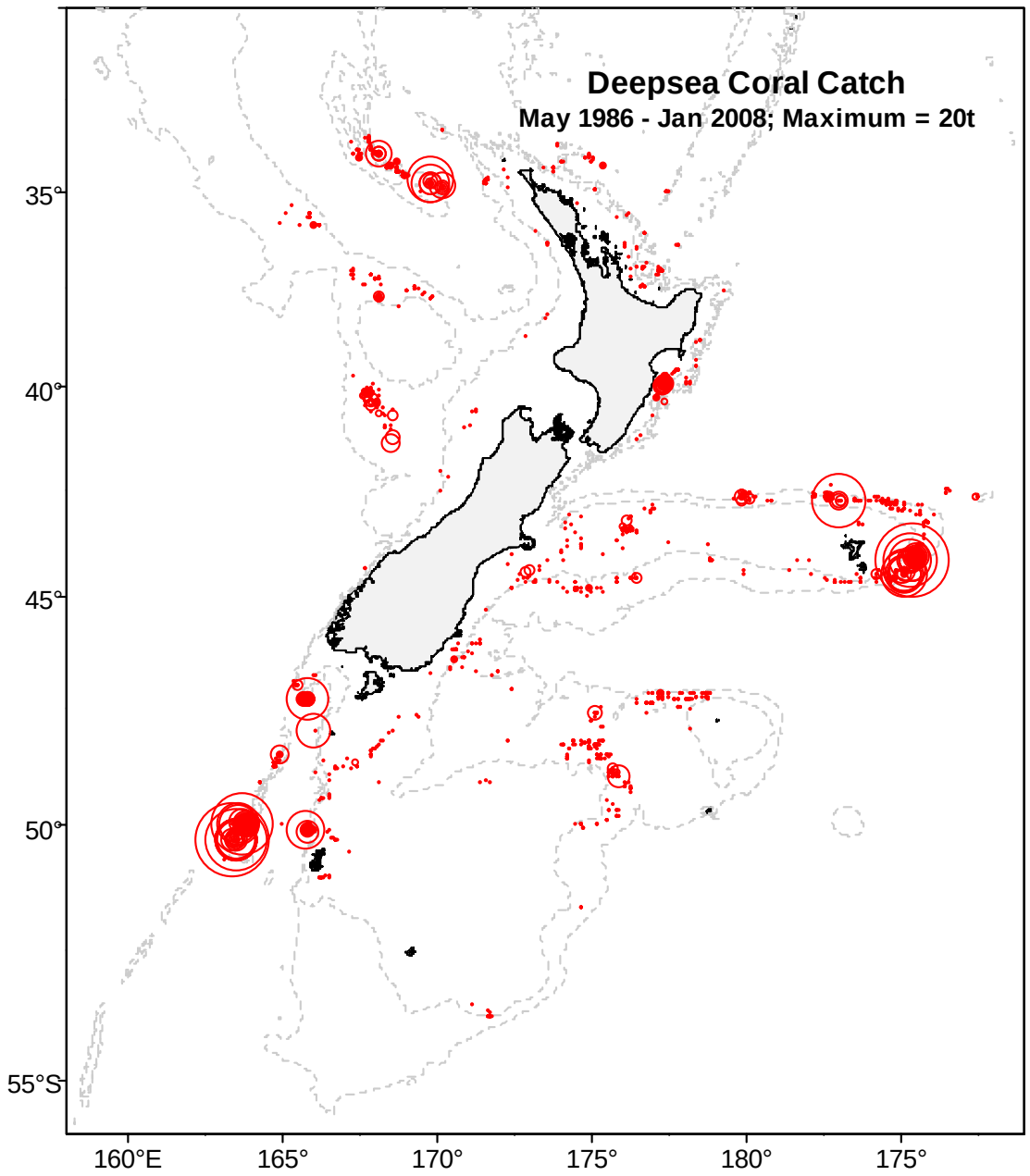
Historically code use not as reliable – COR= coral not hydrocoral; COU = coral confident

Late 2005, Invert Guide ,

more accurate use of codes, more codes

Confident collate by main groups

Overall 600t of anemones and corals (486 t) recorded as by-catch since 1986



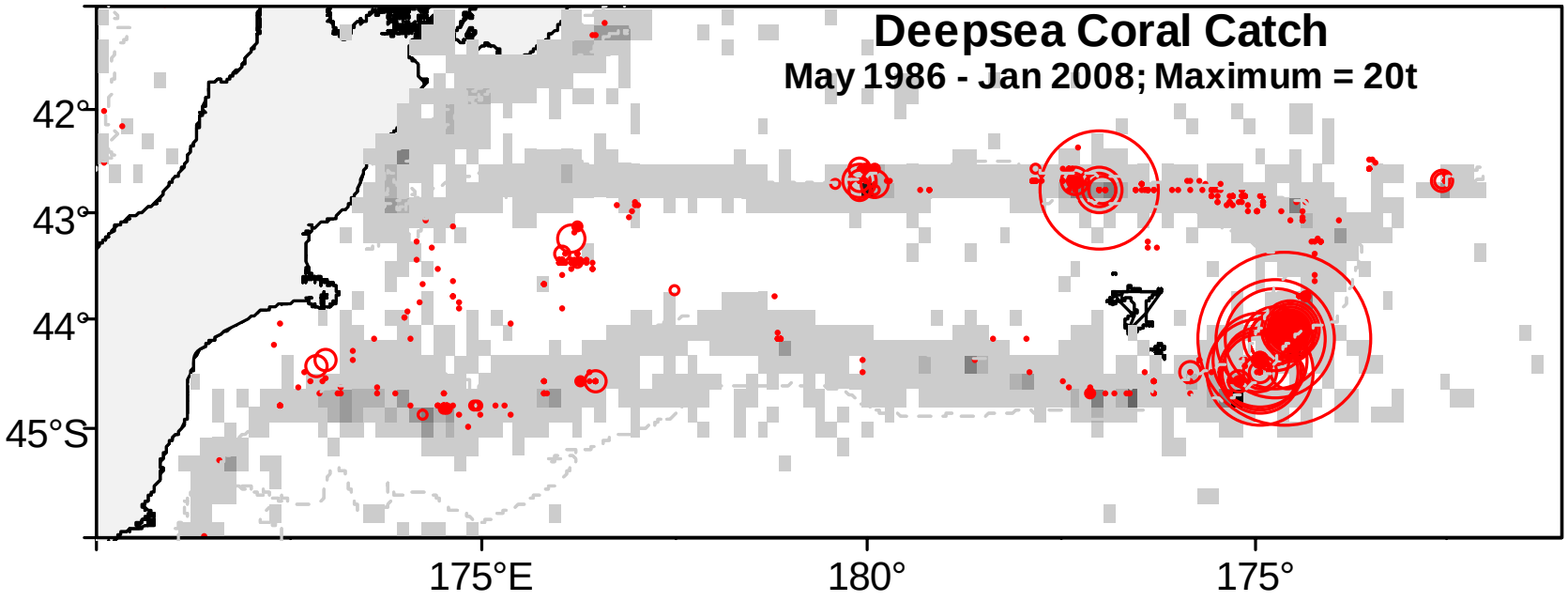
Target deepsea species

Largest circle denotes 20 t

Depth contour 750 & 1500 m

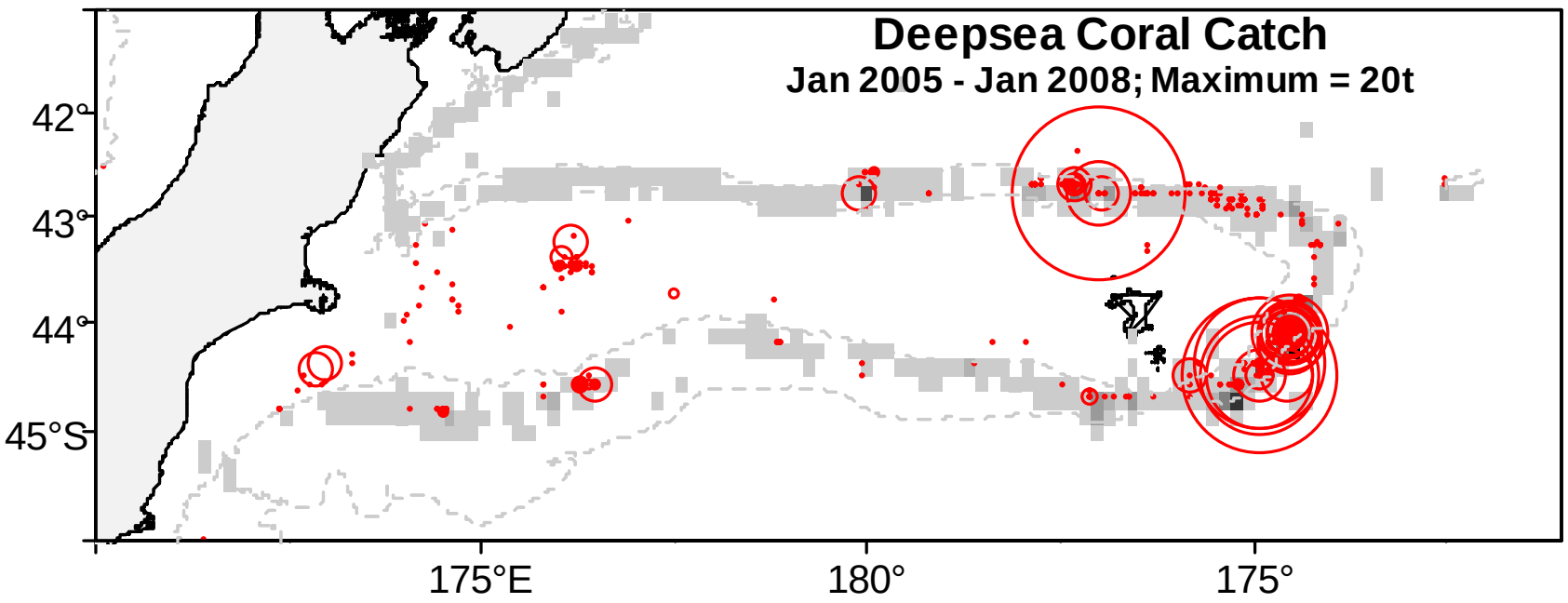
***COD* db**

Can we relate the distribution information to spatial impacts e.g. from the fisheries?

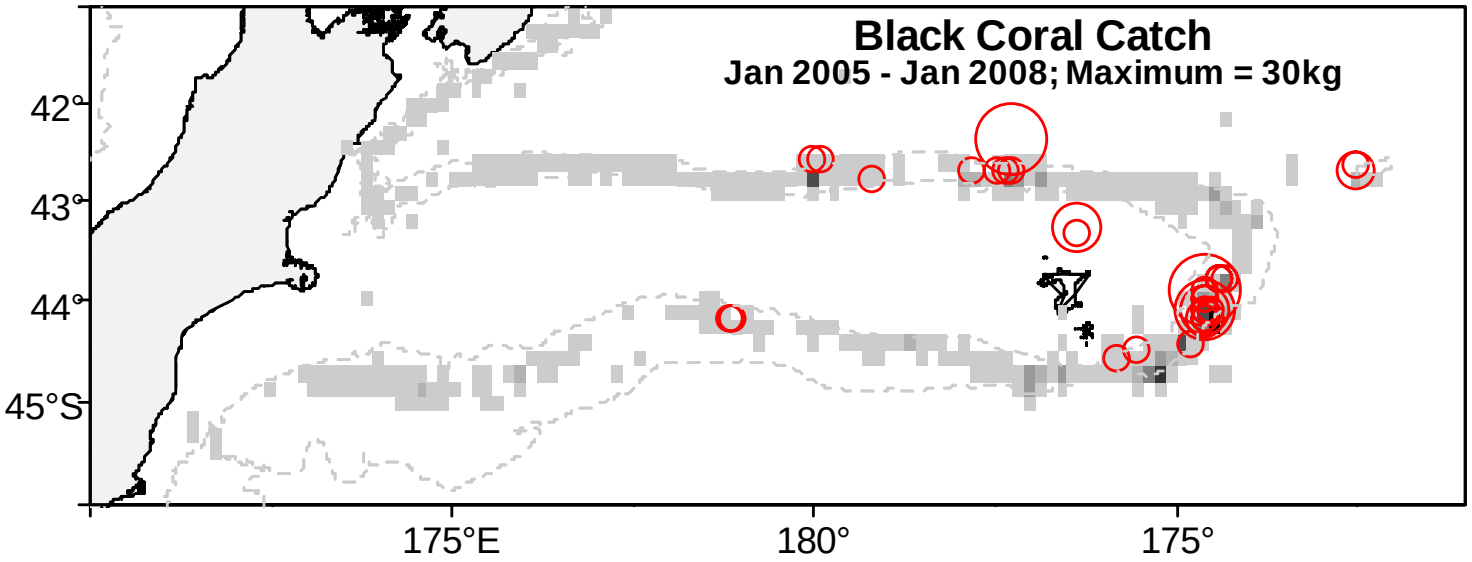


Chatham Rise coral catch (red), orange roughy, oreo tow position (grey scale) ½ deg. grid squares. Max. no. tows per cell >3,700 tonnes. Areas of high fishing density very localised.

Largest circle for coral catches 20 t.

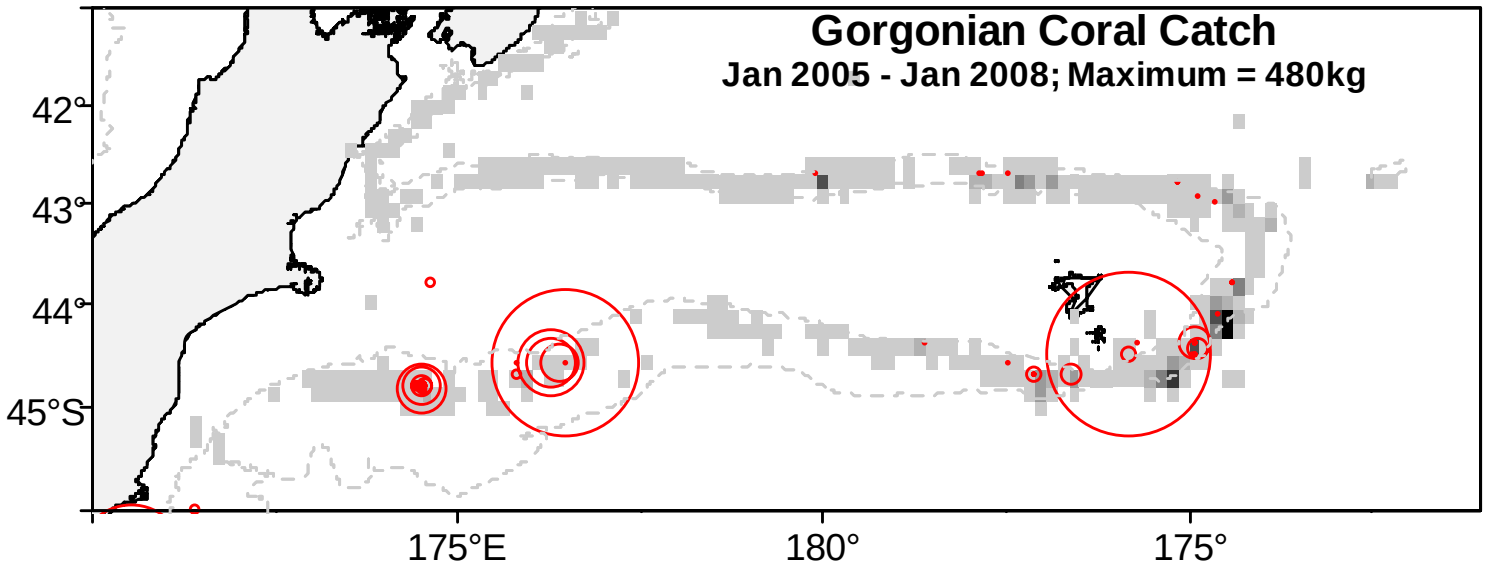


Same data source – reduced period



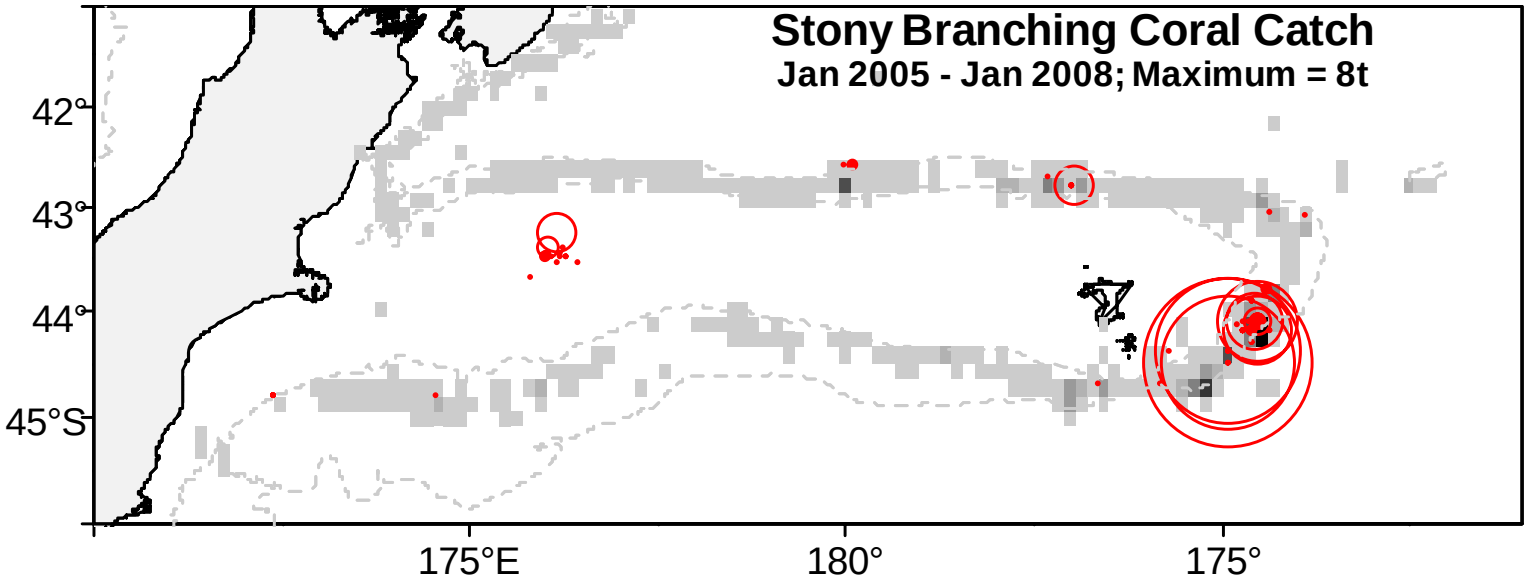
Same data source

Plot “COB” Protected species



Same data source

Plot GOC – some proposed to be protected;
("SOC","ARO","TLO","TLA","GOC","PAB","THO","CHR","MTL","IRI","CLL","ISI","PNA","MIN","LLE","BOO","ACN","PTU","GYS","PNN")



Same data source

Plot SIA

Distribution results

MANY USES……

- **improve areal and vertical distribution knowledge coral taxa within and outside the EEZ (incl protected spp.)**
- **show measures of abundance**
- **help quantify protected species interactions with commercial fisheries**
- **add to descriptions of biodiversity of seamount / non seamount habitats**

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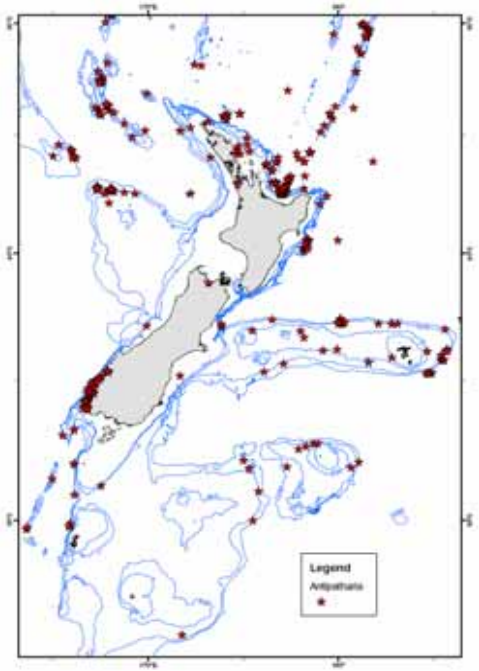
Taxonomists Juan Sanchez, Dennis Opresko, Steve Cairns, Tina Molodtsova.

Description of projects investigating:

1. identification

2. distribution

of corals

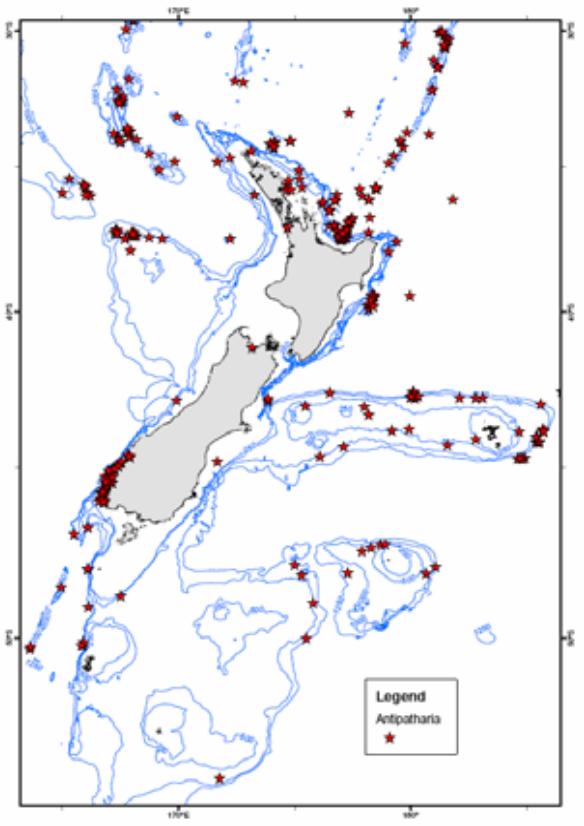


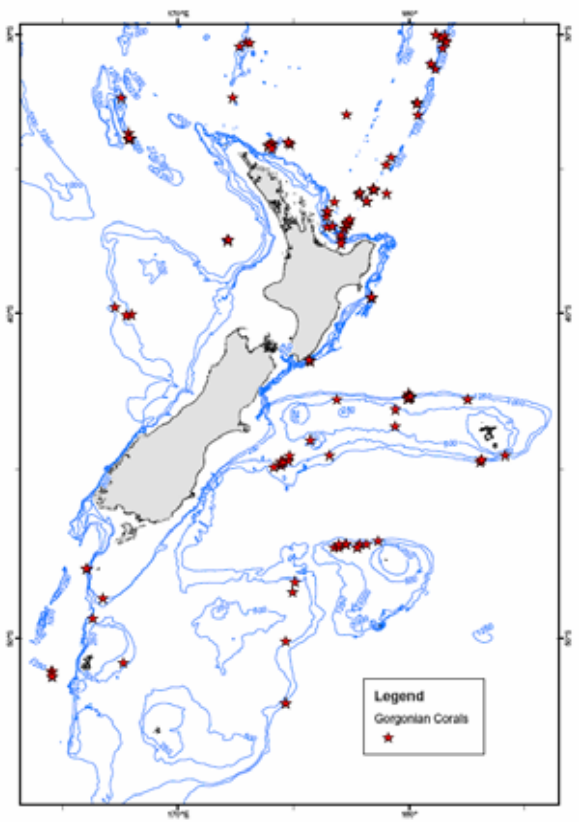
Sources of distribution data

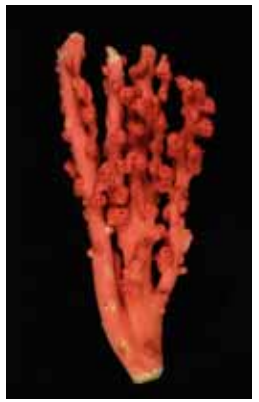
- **NIWA biodiversity stratified random surveys** Seamounts, Oceans 2020, IPY (*AllSeaBio, Specify* db*)*

- **Memoirs – historical**
- **By-catch fisheries research surveys** MFish *trawl* db
- **By-catch observers** *COD* db
- **OE reports** – US, Russian, German research vessels

Information review protected deepsea coral species

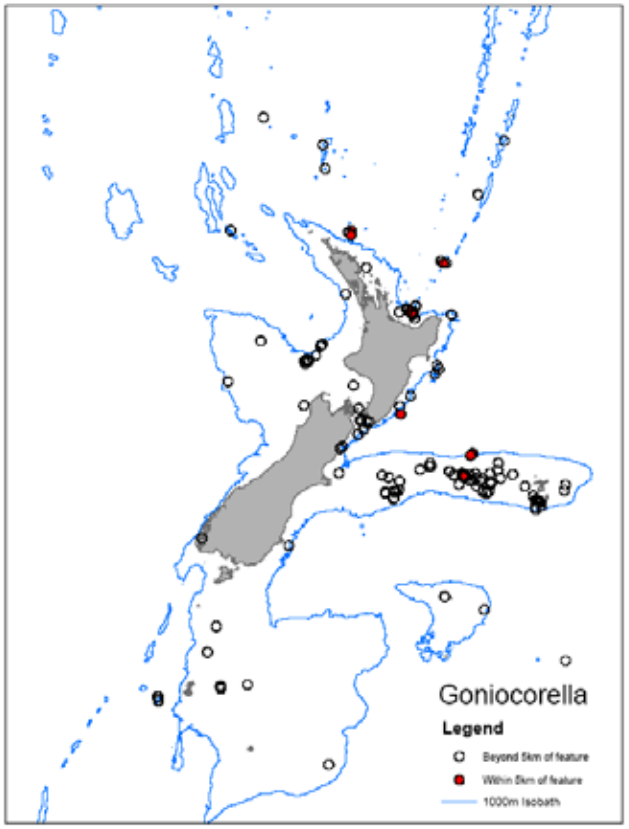


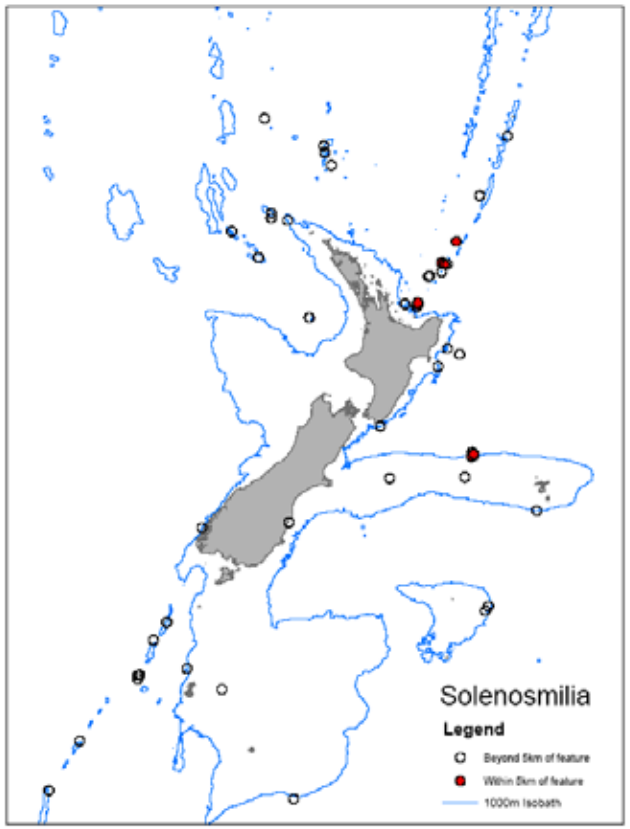


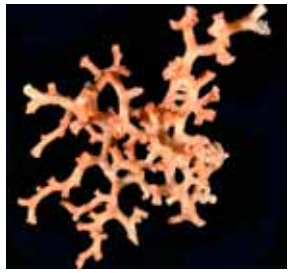


Known localities of black (left) & bubblegum (right) corals

Distribution habitat forming stony corals







Known localities of GDU (left) & SVA (right) corals

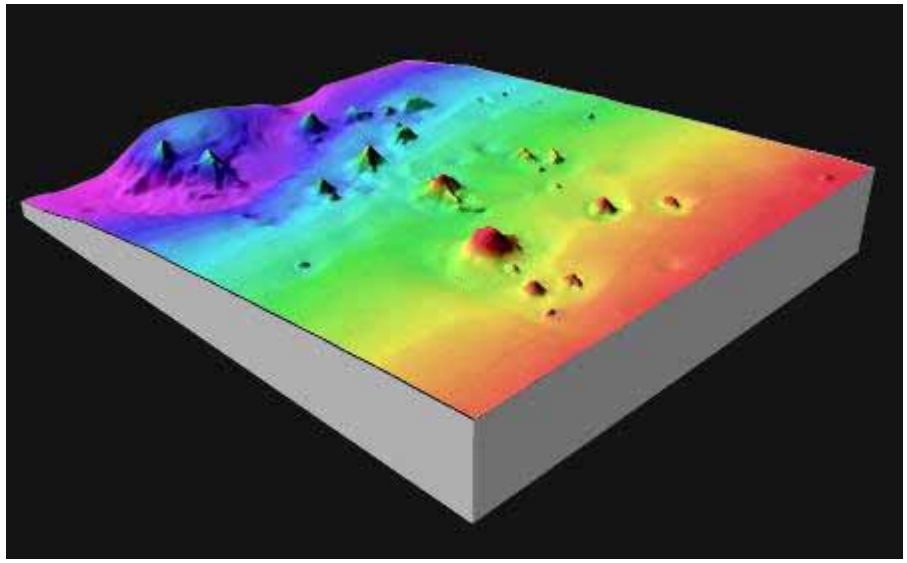
Proportion on / off seamounts

Solenosmilia

56.7%

Goniocorella

27.38%



Extent latitudinal distribution & depth range

Of structure forming spp.