

# POP2022-04 Deep diving into decades of uncatalogued corals

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Technical Working Group, Wellington

Climate, Freshwater & Ocean Science



**NIWA**

Taihoro Nukurangi

# Background

- The NIWA Invertebrate Collection (NIC) had an estimated backlog of ~670 unidentified and/or unregistered coral specimens collected on wide-ranging fisheries and biodiversity research surveys in the New Zealand region over the past 70 years in storage.
- These unregistered specimens were essentially invisible to researchers.
- Through this project, which funded registration and identification, these specimens are now visible, and their identification and location details are now available to be accessed.



# Objectives

- Determine the taxonomic composition of previously collected unidentified protected coral specimens currently held in the NIWA Invertebrate Collection (NIC). Priority given to specimens collected within the NZ EEZ.
- Augment and improve existing coral and/or bycatch databases with new taxonomic and collection location information.
- Improve understanding of coral diversity and distribution in the New Zealand region





# Methods

- Locate unregistered holdings within the NIWA Invertebrate Collection
- Register the unregistered, historically collected corals
- Prioritise samples to be identified under this project
- Facilitate expert identification of previously unidentified corals, including the newly registered corals
- Coral experts identify to the lowest taxonomic level through morphological examination
- Update *niwainvert* Specify database with expert identifications

Expert	Affiliation	Taxon Group
Di Tracey	NIWA	Scleractinia, Gorgonian octocorals previously in the order Alcyonacea and now in orders Scleralcyonacea and Malalcyonacea
Peter Marriott	NIWA	Stylasteridae (hydrocorals)
Rob Stewart	NIWA	Antipatharia (Black corals)
Jaret Bilewitch	NIWA	Plexauridae, Acanthogorgiidae, other Gorgonian octocorals previously in the order Alcyonacea and now in orders Scleralcyonacea and Malalcyonacea

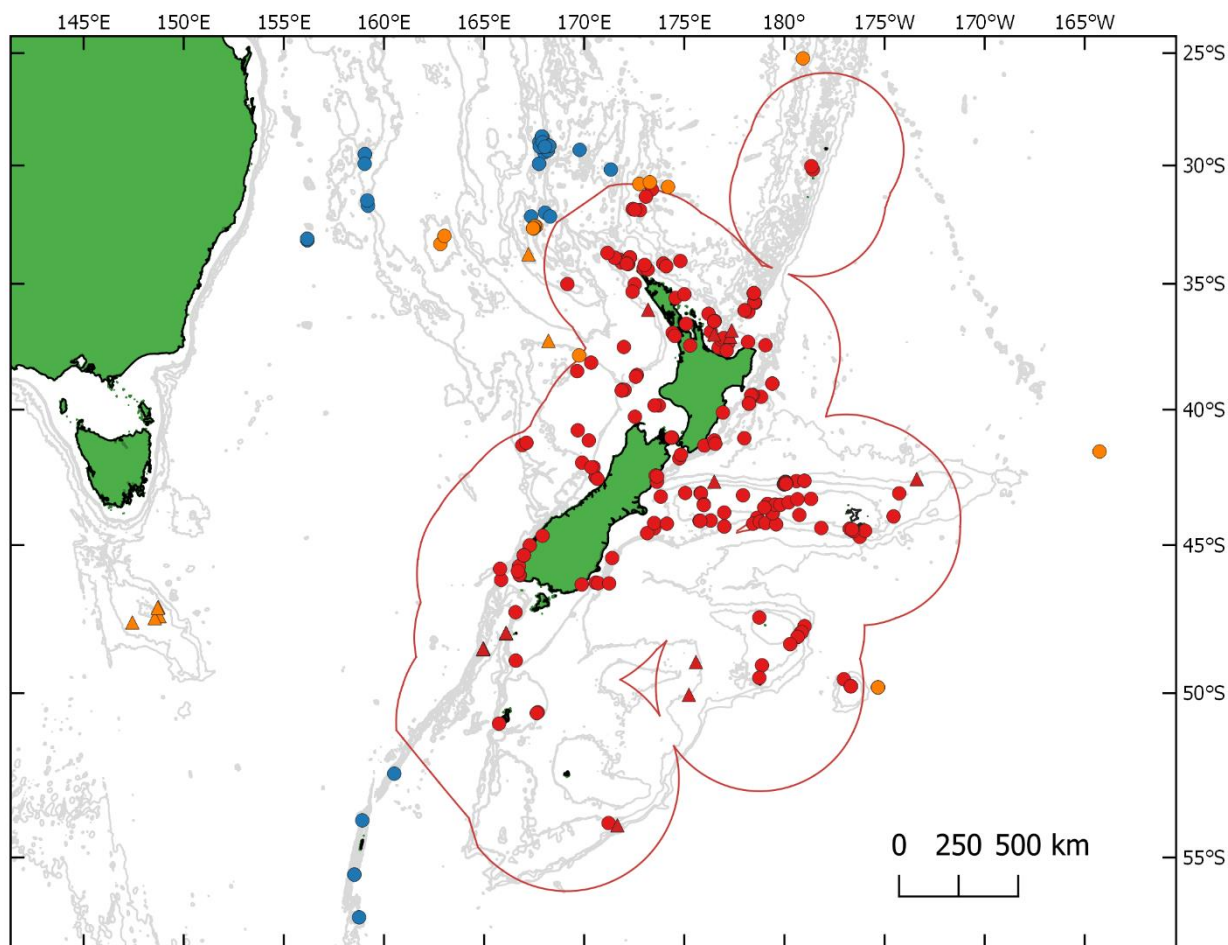


# Results: Cataloguing of unregistered protected corals

Zone	NZOI/NIWA surveys	Scientific Observer	Total No. of samples
New Zealand EEZ	<b>236</b>	18	254
International waters (Challenger Plateau, Three Kings Ridge, South Tasman Rise, Norfolk Ridge, Wanganella Bank)	18	8	26
Australian Territorial waters (Macquarie Ridge, Tasmanian Seamount, Lord Howe & Norfolk Ridge areas)	43		43
Total	297	26	323

- Total no. of samples registered = 323
  - This is slightly less than the 378 unregistered corals we originally estimated
  - a number of the unregistered samples in the shelves were either collected from the Ross Sea, were unprotected soft coral species, or were duplicate jars of existing registered material
- Total number of newly registered NZ EEZ samples = 236

# Map of newly catalogued protected corals



Blue = Australian waters, Orange = international waters, Red = NZ waters. Triangle = Scientific observer collected samples and were not further identified under this project.

Coral group	No. of samples
Cnidaria	
Anthozoa	
Alcyonacea	
Acanthogorgiidae	3
Anthothelidae	9
Chrysogorgiidae	9
Isididae	1
Keratoisididae	44
Keroeidae	1
Mopseidae	30
Plexauridae	37
Primnoidae	32
Gorgonacea	5
Antipatharia	2
Antipathidae	1
Scleractinia	39
Caryophylliidae	13
Flabellidae	8
Hydrozoa	
Anthoathecata	
Stylasteridae	2
<b>Grand Total</b>	<b>236</b>

# Cataloguing of unregistered protected corals

- 26 Scientific Observer samples will be identified under the DOC protected coral bycatch ID project (INT2022-03) as time allows
- Priority for the POP2022-04 project are samples collected from within the NZ EEZ (n = 236 + already catalogued unidentified specimens)
- Backlog of uncatalogued protected coral samples remaining in the NIC is now only shallow water Pacific Island corals (Cook Islands, Tonga, New Caledonia, Fiji)



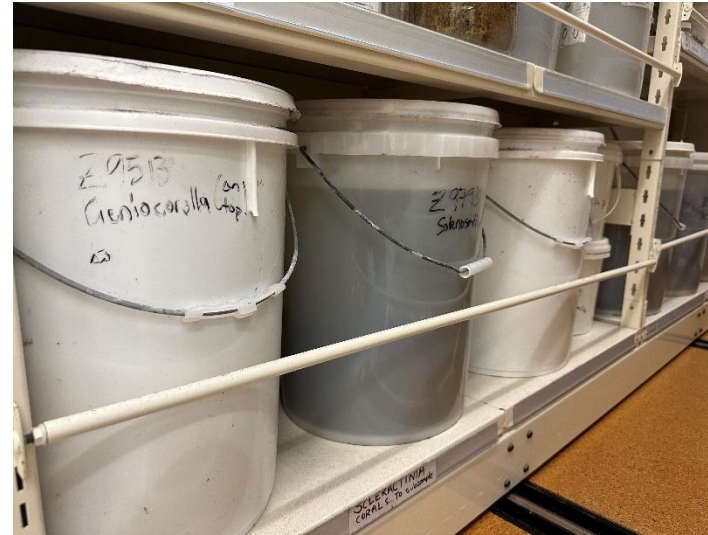
# Preparation for identification of protected corals

- 31 of the 236 unregistered NZ EEZ corals were already identified by experts and IDs were applied at time of cataloguing.
- A combined spreadsheet was prepared with all unidentified protected corals from within the NZ EEZ.
- This totals **650 samples**
- This excludes unidentified samples from the Kermadec region, which will be identified in the Te Mana O Rangitāhua project in collaboration with Auckland Museum (n = 148 samples)

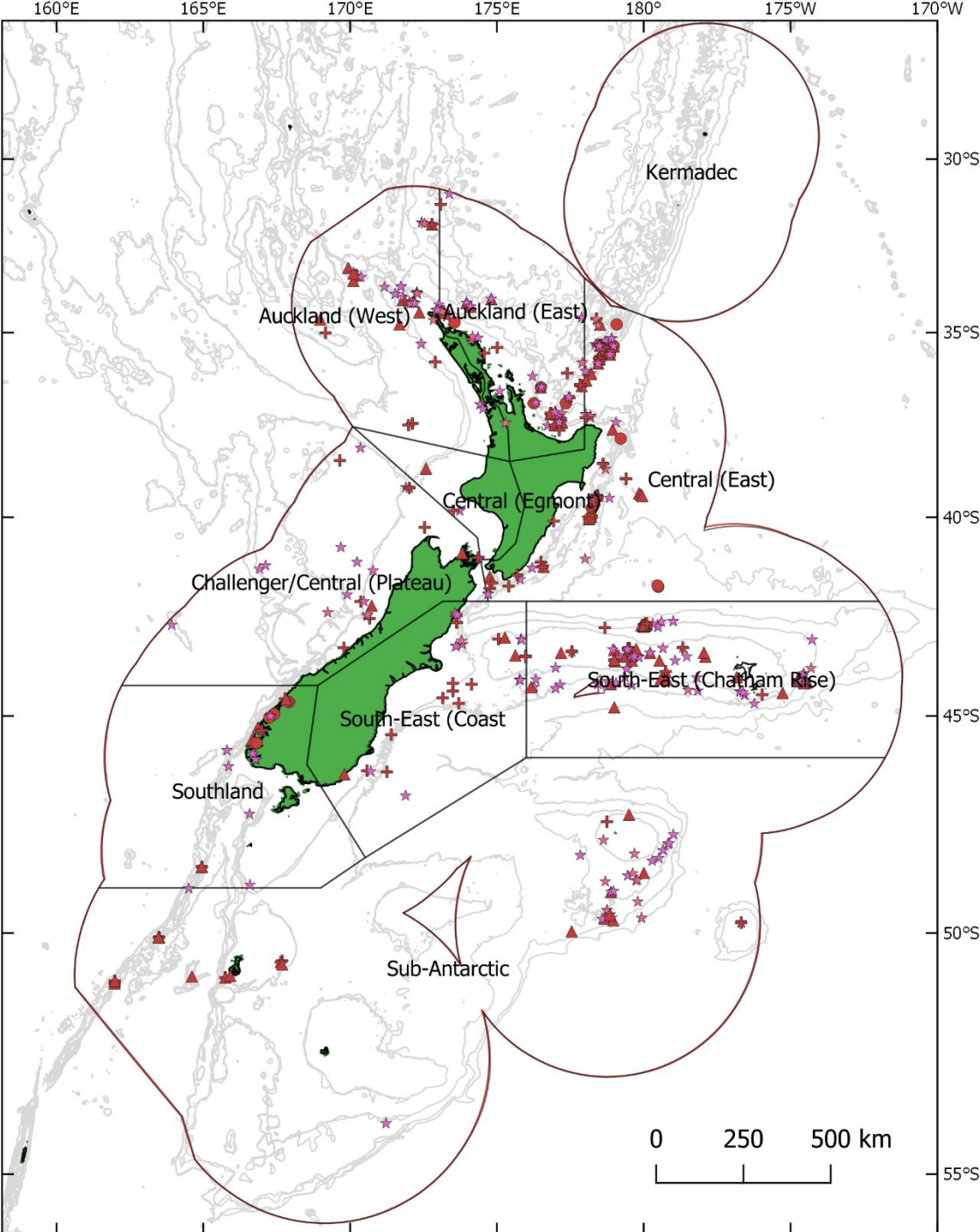


Coral groups	No. of samples
Cnidaria	
Anthozoa	
Alcyonacea	
Acanthogorgiidae	10
Anthothelidae	11
Chrysogorgiidae	18
Coralliidae	2
Keratoisididae	84
Mopseidae	29
Paragorgiidae	5
Plexauridae	52
Primnoidae	77
Gorgonacea	61
Antipatharia	
	20
Antipathidae	1
Leiopathidae	4
Schizopathidae	4
Scleractinia	
	51
Caryophylliidae	41
Dendrophylliidae	7
Flabellidae	12
Fungiidae	1
Oculinidae	3
Hydrozoa	
Anthoathecata	
Stylasteridae	157
<b>Grand Total</b>	<b>650</b>

## Breakdown of corals to be identified



# Location of unidentified corals



- ★ = gorgonian corals (Alcyonacea)
- + = stony corals (Scleractinia)
- = black corals (Antipatharia)
- ▲ = hydrocorals (Stylasteridae)

# Results: Identifying corals

- A total of 652 protected coral samples collected within the NZ EEZ were identified by experts and IDs updated in *niwainvert* database.
- This final number differs to the earlier pre-identification total. During the ID process, some samples were split upon identification and others were identified as non-corals (mainly Bryozoa misidentified as hydrocorals).



## Results: Taxonomic highlights – Order Alcyonacea (Gorgonian corals)

- Order Alcyonacea had the highest number of samples identified (n=386), as well as the highest number of individual specimens recorded.
- The protected soft corals, in the family Primnoidae, were the group with the greatest number of samples identified (n=107).
- The two bamboo coral families Mopseidae and Keratoisididae followed with 70 and 62 samples respectively.
- Other families with more than 20 samples identified included Paramuriceidae (n = 38), Anthothelidae (n = 28), and Acanthogorgiidae (n = 27)
- Corals were identified from a total of 18 different families, within the Order Alcyonacea

Order	Family	No. of samples	No. of specimens
Alcyonacea	Gorgonian indet.	3	3
	Acanthogorgiidae	27	89
	Anthothelidae	28	31
	Astrogorgiidae	1	2
	Chrysogorgiidae	19	23
	Coralliidae	1	1
	Ellisellidae	2	2
	Euplexauridae	5	5
	Isididae	1	1
	Keratoisididae	62	71
	Keroeidae	1	1
	Keroeidae?	1	1
	Mopseidae	70	233
	Paragorgiidae	3	3
	Paramuriceidae	38	47
	Plexauridae	9	9
	Primnoidae	107	276
	Scleralcyonacea n. fam.	8	16
<b>Alcyonacea Total</b>		<b>386</b>	<b>814</b>



## Results: Taxonomic highlights – Order Alcyonacea (Gorgonian corals)

- Samples identified during this project add to the known specimens of a newly recognised undescribed family of gorgonian corals in the revised order Scleralcyonacea.
- These are very similar to the genus *Primnoeides*, in the family Primnoidae but are not that genus, nor in that family.
- They also bear some resemblance to the family Pleurogorgiidae but after closer inspection of the specimens and comparing sequence data from another project (Bilewitch, 2022) we believe they are representatives of a separate, new family.
- A rare specimen of *Isidooides* was identified during this project and adds to the distribution records for this group.



# Results: Taxonomic highlights – Order Scleractinia (Stony corals)

- The next order with previously high numbers of unidentified samples was the stony corals, order Scleractinia.
- A total of 106 samples comprising of 397 specimens were identified.
- Fifty-eight samples were identified from Family Caryophylliidae (227 specimens), with the next most identified Family being Flabellidae.
- Corals were identified from a total of 6 different families, within the Order Scleractinia

Order	Family	No. of samples	No. of specimens
Scleractinia	Scleractinia indet.	4	9
	Caryophylliidae	58	227
	Dendrophylliidae	15	87
	Flabellidae	22	51
	Fungiidae	4	11
	Oculinidae	1	3
	Rhizangiidae	2	9
<b>Scleractinia Total</b>		106	397

# Results: Taxonomic highlights – Order Antipatharia (Black corals)

- Black corals, order Antipatharia, had a total of 25 samples that had updated identifications.
- Eleven of these were from the family Schizopathidae.
- Corals were identified from a total of 5 different families, within the Order Antipatharia

Order	Family	No. of samples	No. of specimens
Antipatharia	Antipathidae	2	2
	Leiopathidae	5	5
	Myriopathidae	6	6
	Schizopathidae	11	11
	Stylopathidae	1	1
<b>Antipatharia Total</b>		25	25

## Results: Taxonomic highlights – Order Anthoathecata (Hydro corals)

- One hundred and thirty-five samples were identified from the protected hydrocoral Family Stylasteridae, comprising 446 individuals.
- Additional specimens of several undescribed new species of stylasterid hydrocorals were identified amongst the historical samples.
- A new species *Errinopsis* n. sp. (62 specimens in 5 jars) was identified from the Andes and Diamondhead seamounts on the Chatham Rise
- A single specimen identified as a new species cf. *Distichopora* n. sp. was identified from Diamondhead seamount; finally,
- A new species of *Lepidotheca* n. sp. was identified from the NZ region of the Macquarie Ridge seamounts.

Order	Family	No. of samples	No. of specimens
Anthoathecata	Stylasteridae	135	446
Anthoathecata Total		135	446





## Results: Augment and improve existing coral and/or bycatch databases with new taxonomic and collection location information.

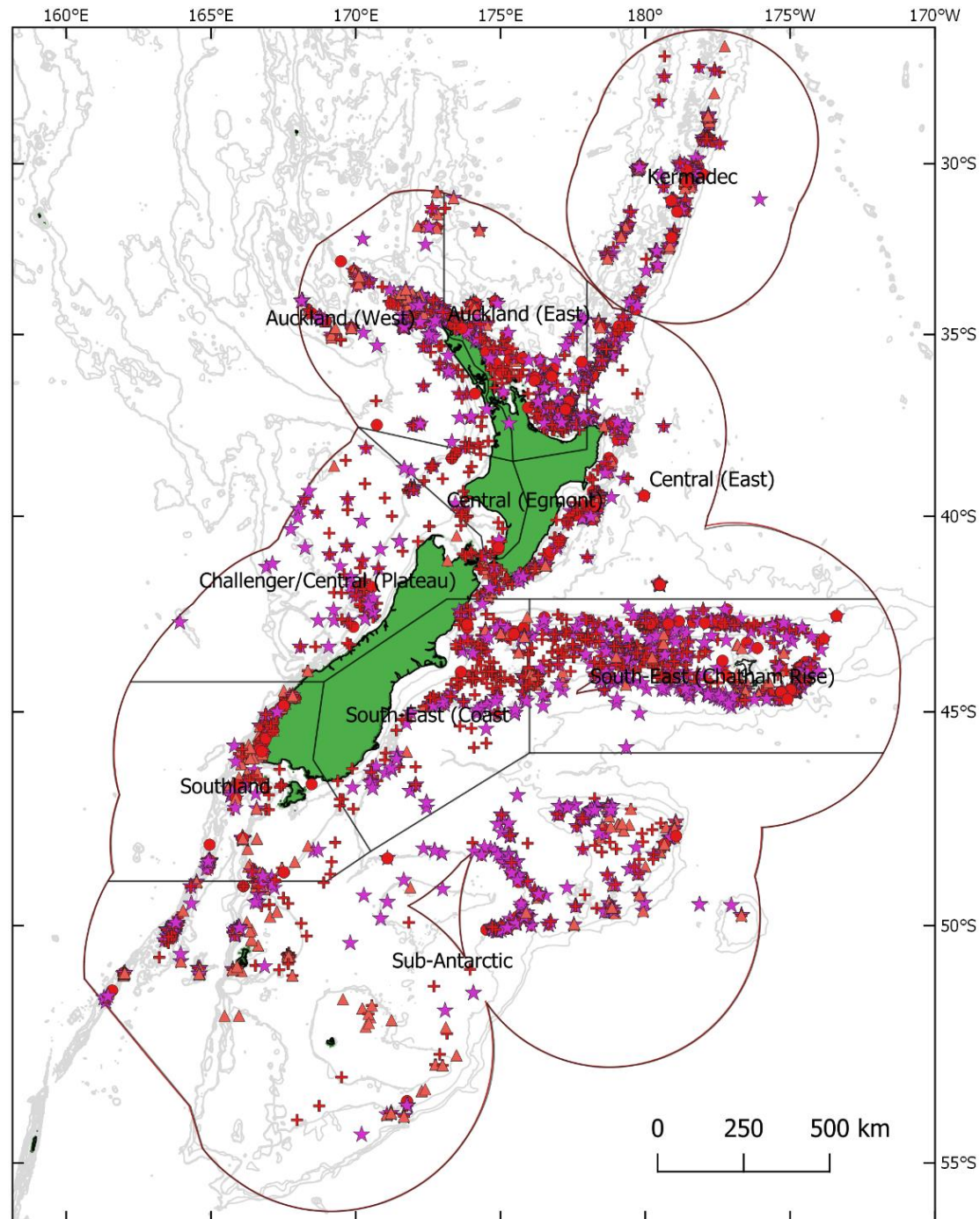
- Identifications (taxon names) were updated in *niwainvert* database for all the samples examined by coral experts.
- This was an opportunity to tidy up other information held in *niwainvert* for these specimens.
- Taxonomic ID corrections, jar label updates and physical storage location updated – where samples were originally identified as corals that were in fact other taxons, e.g. non-protected soft corals, sea-pens, hydroids or non-coral groups such as Bryozoa.
- 37 samples contained multiple coral species, these were split and registered separately with updated identification.

## Results: Augment and improve existing coral and/or bycatch databases with new taxonomic and collection location information.

- An updated *niwainvert* extract with the new protected coral information included in the next annual upload from *niwainvert* to the OBIS and GBIF online databases – November 2023.
- 42 of the identified coral records were collected on fisheries research trawl surveys. A summary list of protected coral identification updates has been provided to the Fisheries New Zealand contracted Research Data Manager at NIWA to enable database updates to be made by an appropriate database expert onto the Fisheries New Zealand Research Trawl Database (trawl).

# Results: Coral diversity and distribution

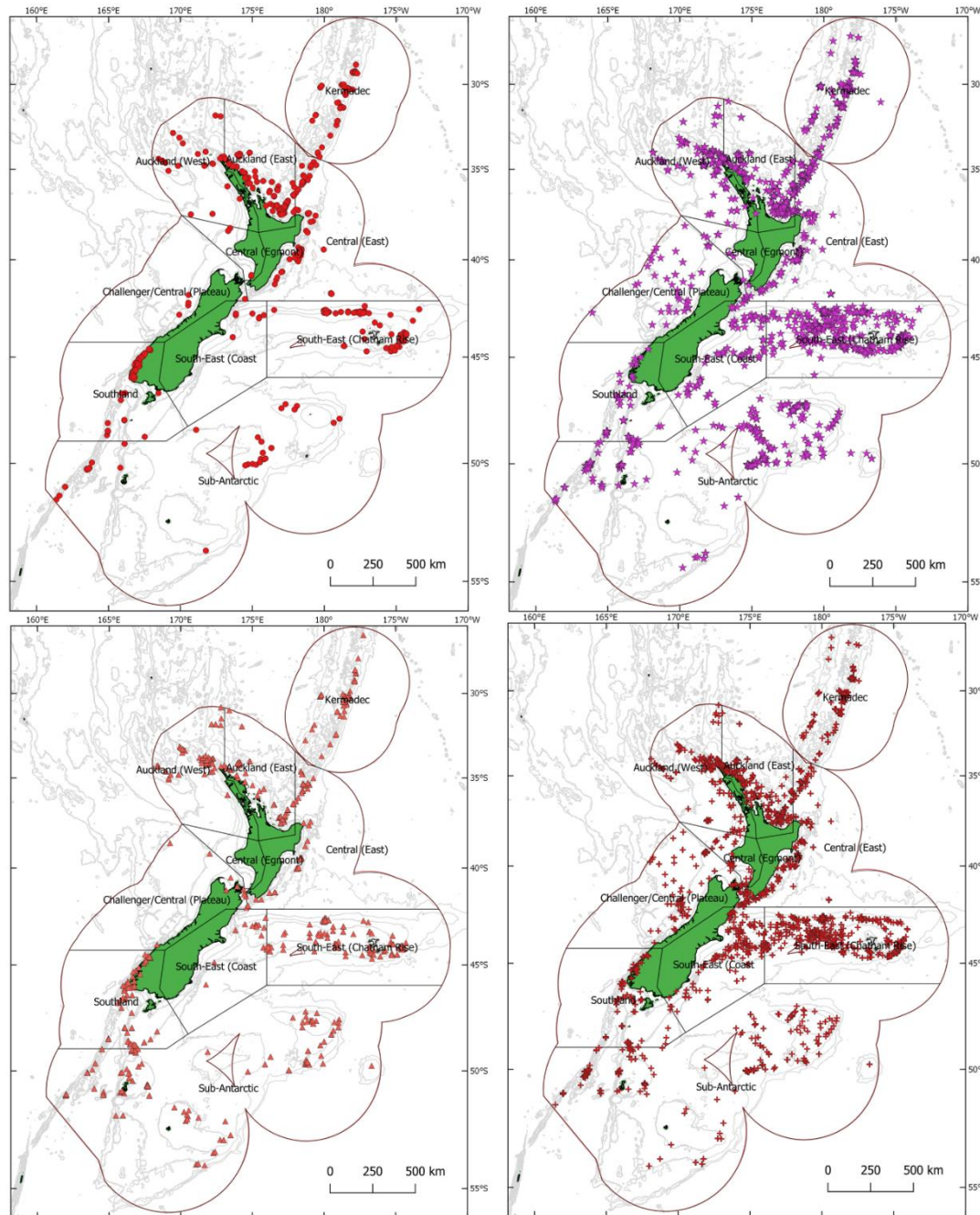
- An extract from *niwainvert* on 19 July 2023 includes a total of 9596 records (22,247 specimens) of coral collected from within the boundaries of the NZ EEZ.



- ★ = gorgonian corals (Alcyonacea)
- + = stony corals (Scleractinia)
- = black corals (Antipatharia)
- ▲ = hydrocorals (Stylasteridae)

# Results: Coral diversity and distribution

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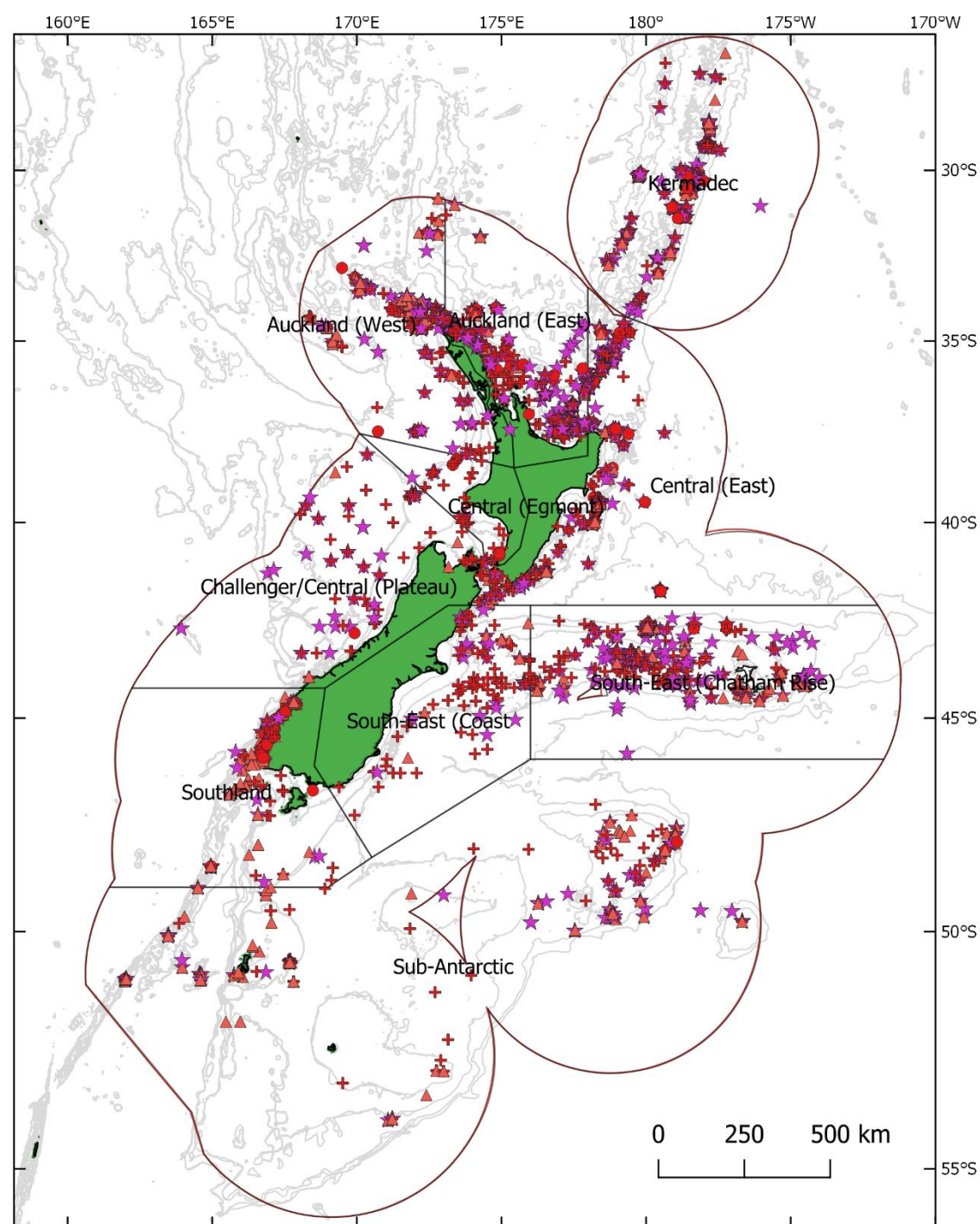
# Results: Improve understanding of coral diversity and distribution in the New Zealand region.

- An extract from *niwainvert* on 19 July 2023 includes a total of 9596 records (22,247 specimens) of coral collected from within the boundaries of the NZ EEZ.
- Broken down by collection source.
- **Biodiversity** = Collected on either NIWA, NZOI or overseas research vessels for the purposes of biodiversity, geology or other survey type using a range of sampling gears targeted to the survey and bottom type; (n=6,858)
- **Fishery trawl survey** = bycatch collected by scientific fisheries research trawl survey staff; (n=750)
- **Observer** = Scientific observer collected bycaught corals from commercial fishing activities (1,988)

Class	Protected coral group	Collection source	No. of samples	No. of specimens	
Anthozoa	Black corals	Biodiversity	654	1108	
		Fishery trawl survey	82	83	
		Observer	298	312	
	Black corals Total			<b>1034</b>	<b>1503</b>
	Gorgonian corals	Biodiversity	2483	4893	
		Fishery trawl survey	355	457	
		Observer	913	1041	
	Gorgonian corals Total			<b>3751</b>	<b>6391</b>
	Stony corals	Biodiversity	2638	9550	
Fishery trawl survey		276	611		
Observer		689	1000		
Stony corals Total			<b>3603</b>	<b>11161</b>	
Hydrozoa	Hydrocorals	Biodiversity	1083	3039	
		Fishery trawl survey	37	45	
		Observer	88	108	
Hydrocorals Total			<b>1208</b>	<b>3192</b>	
<b>Grand Total</b>			<b>9596</b>	<b>22247</b>	

# Results: Coral diversity and distribution - Biodiversity

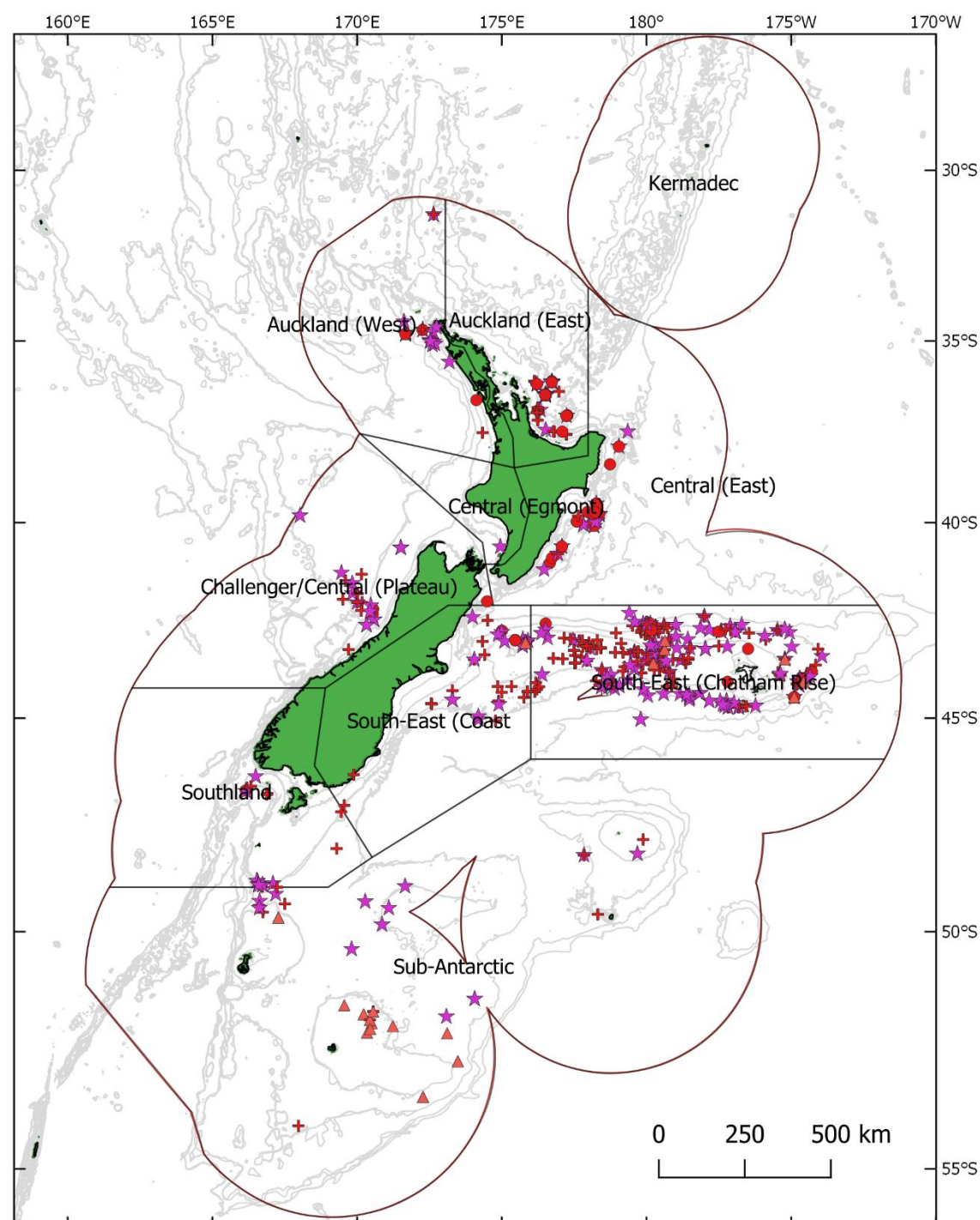
- Corals collected on Biodiversity trips
- Collected on either NIWA, NZOI or overseas research vessels for the purposes of biodiversity, geology or other survey type using a range of sampling gears targeted to the survey and bottom type;
- Collected between 1955 - 2022



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- ▲ = hydrocorals (Stylasteridae)

# Results: Coral diversity and distribution - Fisheries trawl survey

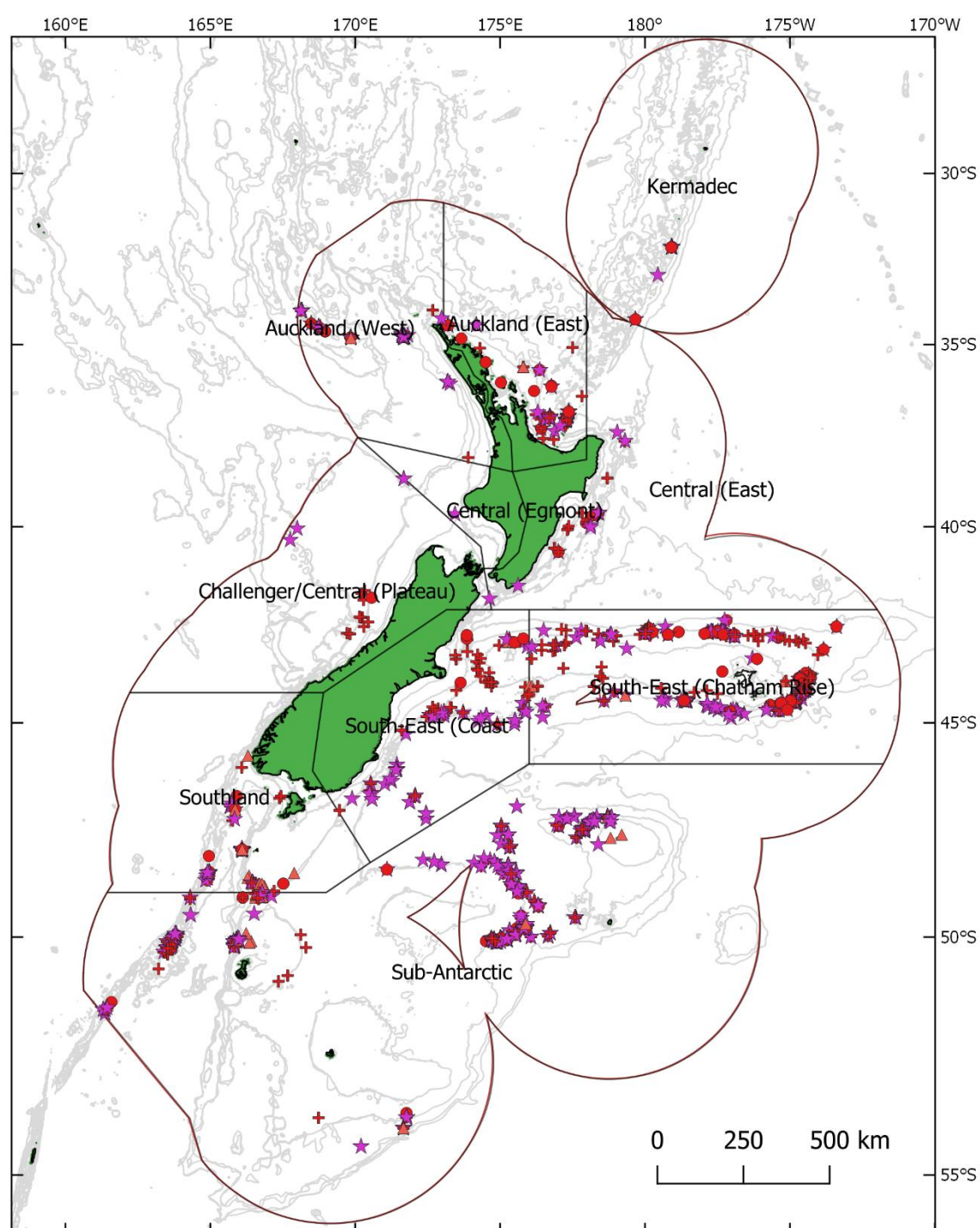
- Corals collected Fisheries trawl survey trips
- Bycatch collected by scientific fisheries research trawl survey staff
- Collected between 1970 - 2022





# Results: Coral diversity and distribution - FNZ Observers

- Corals collected FNZ Observer trips
- Scientific observer collected bycaught corals from commercial fishing activities
- Collected between 1987 - 2023



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- ▲ = hydrocorals (Stylasteridae)

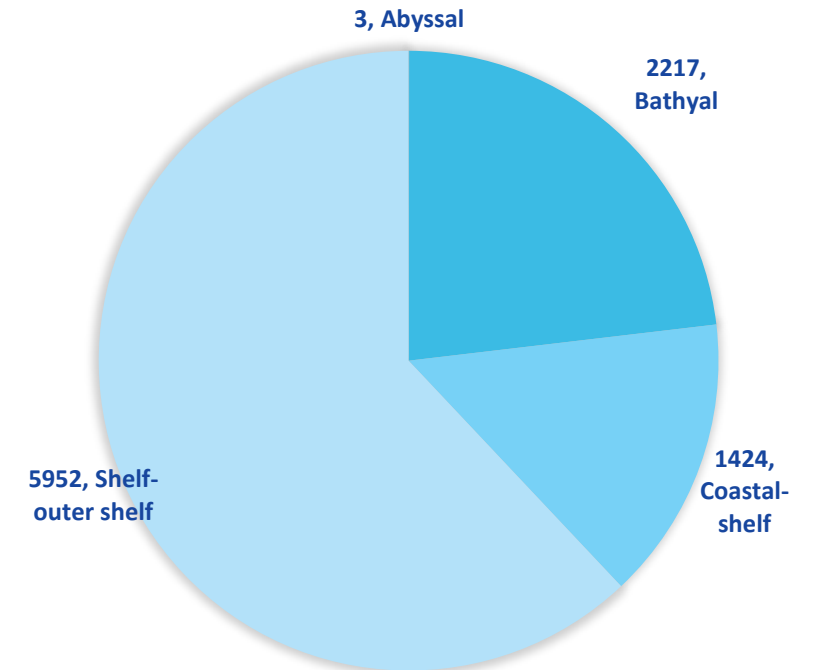


## Results: Coral diversity and distribution

- Biodiversity survey trips collected a much greater number of samples than observer and fishery trawl surveys over a wider area of the EEZ.
- Almost all samples known from the Kermadec, Three Kings and Challenger Plateau regions were collected on biodiversity trips.
- The number of observer collected samples are higher than numbers of fishery trawl survey samples in the NIC, but the distribution of observer collected samples is much more concentrated on specific areas compared to fishery trawl survey samples.

# Results: Coral diversity and distribution

- Corals have been collected from shallow diving depths through to 5748 m .
- The oldest sample collected was in 1955 from a NZOI survey near North Cape, and the most recently collected was in April 2023 (an observer collected sample).
- Most records are from shelf to outer shelf and slope depths (5952 samples in the 201–1000 m depth range).
- A total of 330 coral records are from within recreational diving depth limits of 40 m with the rest of the 1094 records in the coastal-shelf depth range occurring from 41–200 m. In the bathyal range (1001–4000 m) there are only 70 records from below 2000 m, and only 7 records below 3000 m. Three records were collected from below 4000 m in the abyssal zone.



## Results: Areas for future focus

- 1011 samples within the Niwa Invertebrate Collection remain as undetermined or not yet verified by an expert.
- Of the 1011 samples there are 391 samples with family or higher taxon level identification that could be determined further.
- Of the 8585 specimens previously examined by an expert there are 409 records with family or higher level identification.
- There are a total of 800 samples with family or higher taxon level ID within the Invertebrate Collection which could benefit from expert review.



# Results: Areas for future focus

- The gorgonian corals are the most in need of further identification with the highest number of samples not yet identified beyond family (548 samples, 849 specimens), followed by hydrocorals, stony corals and black corals with less than a hundred samples each that are not yet identified beyond family.
- Within the undetermined gorgonians, the bamboo corals Keratoisididae and sea fan family Plexauridae have the highest number of unidentified samples and could benefit from further taxonomic attention.
- Samples from FMA10 will be identified further through the Te Mana o Rangitāhua project – led by Ngāti Kuri and Auckland War Memorial Museum
- Observer collected samples will be identified under a separate DOC project looking at protected coral bycatch (INT2022-03).





# Conclusions & recommendations

- The 652 new identifications and the 9596 coral records from the full NZ EEZ extract from *niwainvert* will specifically provide more confidence and resolution for assessment of threat to coral species during the next New Zealand Threat Classification workshop for marine invertebrates.
- There are still many specimens (800 samples, 1734 specimens), particularly in the gorgonian coral groups, that have only been identified to family or higher taxon level, highlighting the gap in knowledge of this group in NZ waters. We recommend that international expert taxonomists are invited to further identify specimens to further determine genus and species level diversity of the groups Paramuriceidae/Plexauridae, Keratoisididae and Mopseidae.



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