



## MNF Voyage Summary Report

Voyage #:	IN2021_V04		
Voyage title:	Biodiversity assessment of Australia's Indian Ocean Territories.		
Mobilisation:	Darwin, Friday, 25 June 2021		
Depart:	Darwin, 1000 Wednesday 30 June 2021		
Return:	Hobart, 1130 Thursday, 29 July 2021		
Demobilisation:	Hobart, Friday, 30 July 2021		
Voyage Manager:	Max McGuire	Contact details:	Max.Mcguire@csiro.au
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Project name:	As above		

# Voyage Summary

## Objectives and brief narrative of voyage

### Scientific objectives

- Characterise benthic biodiversity from seamounts (200-2000 m) across the EEZ in Australia's Indian Ocean Territories (IOT) for the first time. This includes collecting representative samples of seabed invertebrates and fish that can be preserved in museums for planned (and future) morphological and DNA analysis.
- Test whether the proposed bioregionalisation for the territories (Brewer et al 2009, derived from environmental data) is an adequate surrogate for patterns of seafloor diversity across a series of depth strata. In particular, test whether differences in geology or water mass drive community composition.
- Assess the conservation significance of these seamount communities, particularly the presence of Vulnerable Marine Ecosystems (VMEs) including cold water coral and sponge communities.
- Substantially contribute to the AusSeabed project by maximising new multibeam coverage through 1) transiting along the edge of the western Australian margin through the (largely unmapped) Abrolhos, Carnarvon and Gascoyne Marine Parks, 2) mapping every IOT seamount that summits in less than 1500 m, and 3) transiting between IOT seamounts along unmapped tracks.
- Understand the biogeographical relationships of the fauna through community and evolutionary (DNA) comparisons with other Australian, west Pacific and Indian Ocean faunas. In particular to estimate the influence of the 'Indonesian Throughflow' current on shaping patterns of biodiversity in the NE Indian Ocean.

### Voyage objectives

1. Characterise benthic biodiversity from seamounts (100-5000 m) across the EEZ in Australia's Indian Ocean Territories (IOT) for the first time.
2. To provide specimens and tissues samples to taxonomists for species identification and descriptions.
3. Test whether the proposed bioregionalisation for the territories (Brewer et al 2009, derived from environmental data) is an adequate surrogate for patterns of seafloor diversity across a series of depth strata.
4. Assess the conservation significance of these seamount communities, particularly the presence of Vulnerable Marine Ecosystems (VMEs) including cold water coral and sponge communities.
5. Document spatial and bathymetric patterns of oceanographic characteristics and plankton distribution.
6. Substantially contribute to the AusSeabed project by maximising new Multibeam coverage.
7. Understand the biogeographical relationships of the fauna through community and evolutionary (DNA) comparisons with other Australian, west Pacific and Indian Ocean faunas.
8. Communicate the conservation values of the area to the Australian public.

## **Results**

The data and specimens collected by the voyage are sufficient to analyse and describe the faunal communities from the limited area surveyed, including benthic communities around Christmas Island, the Karma, Bartlett and Golden Bo'sunbird seamounts. However, the voyage was terminated early, after only spending 12 out of a projected 32 days on site. Consequently, the results obtained to date cover only one third of the targeted area. So the results outlined here are provisional and only apply to the 12 days of data that was obtained. CSIRO/MNF have committed to scheduling a future second voyage to the region in order to complete the planned survey.

In addition to the seamounts surveyed, we also mapped numerous other features that occurred along our voyage track, including the Argo Canyon (in the Argo Rowley Terrace MP), seamounts on the Roo Rise, the previously unknown 'Eye of Sauron' caldera, unnamed seamounts to the north of 'Clara Marie' and to the NW of 'Balthazar', the 'Ulrike' seamount to the SW of the Christmas Island EEZ, several small seamounts in the Indian Ocean, and substantial transects through several continental Australian Marine Parks.

In all, CTD and benthic samples were obtained from all the seamounts targeted, including the Christmas Island seamount, 'Max', Karma, 'Clara Marie', 'Apollo 8', Shcherbakov, and 'Balthazar'. In addition, the seamounts were almost completely mapped using multibeam sonar. We conducted 25 CTD casts, all but one (Op 038) corresponding to a benthic sample, and obtained laboratory calibrated profiles of oceanographic data. In addition water from the 36-bottle rosette was filtered for eDNA samples for multicellular (total of 100 samples) and unicellular (182 samples) organisms. We deployed the beam trawl in 20 operations (2 failed), the Sherman epibenthic sled for 5 operations (2 failed), and the rock dredge for one operation.

We deployed the deep-towed video system twice (around Christmas Island). However, ongoing issues with spooling the cable precluded its further use until we reached 'Balthazar' where the voyage was terminated.

Some collected animals were identified by taxonomists on the voyage. The overall collection included around 80 species of fish, only 8 of which have been previously recorded before from the IOT. This is undoubtedly an underestimate of the deep-sea fauna of the region. The new finds include the midwater Tube Eye (*Stylephorus chordates*) which is the first record of the taxonomic Order Stylephoriformes for Australian waters. Other likely new records are amongst the cuskeels, seabats, and halasaurs. The Andriashev's Seabat (*Halieutopsis andriashevi*) was previously only recorded from the Mascarene Islands in the Western Indian Ocean. The invertebrates included very rare barnacles that parasitize scale-worms, rare black corals, sea spiders, gastropods, bivalves, crabs, lobsters and numerous echinoderms (feather-stars, sea-stars, brittle-stars, sea-urchins, and sea-cucumbers).

The (brittle-stars) ophiuroids have been fully identified. There were 46 species, 8-12 of which are probably new species. Qualitative assessments indicate that species are limited by depth range with major faunal transitions occurring at 1100, 1900 and 3300 m (Fig. 6). Ophiuroids were often the most abundant species in the samples, although the dominant species depended on the depth of the seamount summit being sampled.

In summary, the voyage objectives were met as follows:

1. Benthic biodiversity can be characterised from seamounts from the 7 seamounts surveyed.
2. Representative collections were made of benthic fauna from seamounts from the 7 seamounts surveyed.
3. Testing the adequacy of the existing bioregionalisation for the territories (Brewer et al 2009) will have to await the second voyage.
4. Recording the presence Vulnerable Marine Ecosystems (VMEs) was hampered by our inability to deploy the deep-towed video. However, we do have data from the Christmas Island seamount.
5. Spatial and bathymetric patterns of oceanographic characteristics and pelagic multicellular and unicellular organisms will be possible from the samples collected.
6. We substantially contributed to the AusSeabed project through the acquisition of a multibeam dataset covering 151,315 km<sup>2</sup>.
7. Overall biogeographical analyses will have to await additional collections from the second voyage, and in particular future collections from the relatively shallow water environments (200-1500 m) around Cocos (Keeling) Island and the Murfield seamount, which are key to this objective. However, sufficient specimens were collected from the seamounts surveyed to facilitate these analyses.
8. We extensively communicated the conservation values of the area through 169 media items, live crosses to 9 schools and extensive social media outputs.

## **Voyage narrative**

### **Transit from Darwin to Christmas Island (June 30<sup>th</sup> to July 5<sup>th</sup> 2021)**

The 6 day transit to Christmas Island initially traversed the Timor Sea, through the Oceanic Shoals Marine Park, and past Seringapatam Reef. During the morning of July 3<sup>rd</sup> we deviated slightly to map the deep Argo Canyon, a massive mid-bathyal structure that lies on the edge of the Australian continental margin inside the Argo-Rowley Terrace Marine Park (Fig. 3). We then crossed into international waters passing over some large unnamed seafloor features on the Roo Rise. We again deviated slightly along the northern border of the Christmas Island Territory to map some deep seafloor. This seafloor did not contain deep holes in the seafloor as expected from satellite gravity measurements but instead was a flat plain at 6000-6100 m depth with a series of parallel ridges running through it (Fig. 4). The deepest seafloor was 6252 m at 10 30.32° S and 105 53.76° E.

Notable wildlife observed were blue whales in the Timor Sea, schools of flying fish near Seringapatam Reef, Spinner dolphins over the Roo Rise and numerous seabirds near Christmas Island (see next section).

### **Christmas Island seamount (July 6-9<sup>th</sup> 2021)**

The flanks of the Christmas Island Seamount had previously only been partially mapped with multibeam sonar. No previous backscatter data was available. We completed two near-circuits of the island to complete as mapping as possible and prioritising areas that had not been previously mapped or appeared promising for sampling. Generally, for safety reasons, we remained approximately a nautical mile from the island, except on the sheltered western coast where we approached 1 km from shore and were photographed by a shore-based drone (Fig. 5).

The Christmas Island seamount is marked by very steep rocky flanks which made benthic sampling difficult. The seamount is characterised by what appears to be a series of offshore sediment slumps

adjacent to each embayment on the island which are characterised by concave depth contours at shallow depths and convex contours at the seamount base (Fig. 7). These slumps are punctuated by spurs off each island point. The flatter areas of these spurs were often capped by a layer of sediment. Consequently, sampling was concentrated off the SE, NW and SW spurs of the seamount on relatively flat sections of seafloor along spurs or in shallow canyons.

We conducted two deep-video tows (ops 001 and 014, see appendix for details) prior to sampling, respectively off the SE and NW corners of the island, to gauge the rugosity of the terrain. We successfully completed three CTD casts (003, 004, 006) and 3 beam trawls (002, 005, 007) on the SE spur; 5 CTDs (008, 010, 011, 015, 017), 3 beam trawls (009, 012, 013) and 2 epibenthic sleds (016, 018) on the NW spur; and 2 CTD (019, 021), 1 beam trawl (022) and one sled (020) on the SW spur. We also collected one CTD (023) and one beam trawl (024) from abyssal depths to the south of Christmas Island.

Numerous seabirds were evident around Christmas Island, including the endemic Abbott's booby, red and brown boobies, red and white tropic birds, frigate birds, and terns.

### **Karma seamounts (July 10-11<sup>th</sup> 2021)**

We mapped 'Max' seamount around the south and eastern flanks and over the summit (Fig. 10-11), almost completing the mapping of this feature. We then conducted a CTD cast (Op 025) just north of the summit at 1926 m, followed by a beam trawl (Op 026) on the SE summit in 1915-1990 m, terminating in a small cliff. The catch was representative and included 8 species of brittle star, most notably the large widespread species *Ophiomusa lymani* and *Bathypectinura heros*.

On the transit to the Karma seamounts transit, we mapped a large caldera with a central cone that was over 8 km diameter that we nicknamed the "Eye of Sauron" (Fig. 12-14) (see <https://theconversation.com/weve-discovered-an-undersea-volcano-near-christmas-island-that-looks-like-the-eye-of-sauron-164855>). We mapped the length of an unnamed seamount in the Karma cluster which was 'L' shaped at the base and elongate at the summit, SW to NE in orientation, with a central ridge at 2600 m and sloping sides with scattered debris fields at the lower bathyal depths around the periphery. We performed a CTD (Op 027) along the central ridge of the Karma seamount in 2600 m, a beam trawl (Op 028) to the SW and a rock dredge (Op 029) at 2500 m on the NE coast. A large manta ray circled the CTD wire at the surface as it descended (Fig. 29). The beam trawl resulted in a clean catch, including numerous invertebrates and fish. One batfish was the first record from the eastern Indian Ocean. The rock dredge resulted in some basalt, manganese nodules and carbonates. The beam trawl contained a lot of pumice.

Unfortunately, there was a spooling issue with the deep-towed video cable that prevented it being deployed. This was not resolved until the long transit from 'Clara Marie' to 'Apollo 8'.

### **Bartlett seamounts (July 11-12<sup>th</sup> 2021)**

We multi-beamed several smaller seamounts on the 19 hour transit to the 'Clara Marie' seamount near the southern border of the Christmas EEZ, including a transect across the large Bartlett seamount that has a flat summit between 2100 and 2200 m with a few smaller volcanic peaks to 1800 m. Once at 'Clara Marie' we mapped the eastern flank and southern summit, before conducting a CTD (Op 030) and beam trawl (Op 031) near the summit, and another CTD (Op 032)

and beam Trawl (Op 033) on the SE spur. The last contained a large manganese encrusted rock nodule. There was little bird life.

### **Golden Bo'sunbird Seamounts (July 13-17<sup>th</sup> 2021)**

On the 16 hour transit north to the Golden Bo'sunbird seamount cluster we first multibeamed several deep sections of crust down to 6100 m, and then a conical unnamed seamount (12.54S, 105.3E) that summited at ~2600 m.

On arrival at 'Apollo 8' we multibeamed the eastern flank and central summit. This enormous seamount is 50 km long. The summit is a gentle dome shape, between 1300 and 1600 m deep. There are a cluster of volcanic cones on the mid-eastern side that rise up to 1100 m. We started with a CTD (Op 034) and beam trawl (Op 035) at 1300 m on the very gently sloping sedimentary summit, followed by a CTD (Op 036) and beam trawl (Op 037) at 1600 m on the SE of the summit. Finally we conducted a third CTD (Op 038) near the volcanic cones. The planned deep-towed video and Sherman epibenthic sled were cancelled due to winch repairs. Bird and sealife was again evident, up to 30 red boobys flew around the boat, a few brown boobys, as well as a sailfish and smaller fish in the water. A red booby landed on the rear deck. We mapped the NE section of the seamount on the transit to Shcherbakov.

Shcherbakov consists of a flat platform to the SW and a small hill to the NE with intermediate knobs. We first mapped the southern boundary, then deployed the CTD (Op 039) and beam trawl (Op 040) at 1600 m near the SW corner. The catch was dominated by large crabs, small pumice stones and thousands of small red ophiuroids (*Ophiura aequalis*). Next we conducted a CTD (Op 041) and Sherman sled (Op 042) on the SW Flank in 3000 m. The Sherman did not contain any catch and may have bounced along the seafloor. Finally we conducted a third CTD (Op 043) and Sherman (Op 044) in a gully between peaks at 2000 m. The Sherman had only a range of small manganese-covered rocks with very few animals. We transited to west along the northern flank. Many brown boobys followed the boat with flocks of red boobies further out. Near the NW corner of Shcherbakov there were numerous flying fish. We also passed a bulk carrier, the "Venture III", the first for the voyage. We multibeamed a large unnamed ridge-like seamount to the NW of 'Balthazar' which lacked a flattened summit.

We arrived at the SW of Balthazar and mapped along its extensive western flank before commencing sampling. 'Balthazar' is a massive SW to NE seamount with two flat summits separated by a central gully. We started with a CTD (Op 045) and beam trawl (Op 046) at 1200-1250 m near the centre of the NE summit, and a CTD (Op 047) and beam trawl (Op 048) at 1330 near the summit's NE margin. We next conducted a CTD (Op 049) and beam trawl (Op 050) at 2300 m down slope on a ridge, with the catch again dominated by brittle stars (*Ophioplithus*). This was followed by another CTD (Op 051) and beam trawl at 3400 m on the plain at base of the gully. The beam trawl was hooked up almost immediately, and took almost an hour to free. The last beam trawl (Op 053) was on the on sediment plain on southern summit in 1560-1770 m.

### **Transit to Hobart (July 17-29<sup>th</sup> 2021)**

The voyage was suspended on the 17<sup>th</sup> July as a precautionary measure to undertake an urgent port-based review of some of the ship's high-pressure compression equipment and the *RV Investigator* headed back to Fremantle. The planned tow of the magnetometer on the transit home was also

cancelled. Unfortunately, the vessel was unable to dock in Fremantle due to covid19-induced restrictions and the decision was made to transit back to Hobart where we arrived on the 29<sup>th</sup> July 2021.

On the long transit home, we maximised the acquisition of new multibeam data, opportunistically mapping several additional seamounts and long transects through several continental Australian Marine Parks and through international waters. The seamounts included the large 'Ulrike' seamount (12°55'S, 103°59'E) in the south of the Christmas Island Territory, and several unnamed seamounts (15°30'S, 105°08'E) summitting at 3700-4000 m on the Indian Ocean abyssal plain. Transects were mapped through the Abrolhos, Parth Canyon, SW Corner, Eastern Recherche, Tasman Fracture and Huon Marine Parks.

### **Outreach, education and communications activities**

The Museums Victoria media department recorded 169 media items associated with the voyage, reaching a potential national/international audience of 675,035,439. This included 30 Australian online/print media items, 66 broadcast media items and 73 international media items.

Media highlights included:

- NT News: RV Investigator and a team of scientists cleared for 45-day fact-finding trip - syndicated in The Advertiser, The Daily Telegraph, Townsville Bulletin, Cairns Post, Geelong Advertiser, Herald Sun, The Mercury, The Courier-Mail, The West Australian and Gold Coast Bulletin - 30 June
- The Conversation: 'We've discovered an undersea volcano near Christmas Island that looks like the Eye of Sauron' - syndicated by Science Alert, MSN, ABC News, The Guardian, Australian Geographic, New York Post, Fox News and many more.
- ABC Radio Melbourne Drive: Interview with Dr Tim O'Hara on the day of departure - 30 June
- ABC Pilbara (North West WA): Interview with Dr Tim O'Hara used across hourly national news - 2 July
- ABC News Hobart: Interview with Dr Tim O'Hara and Melanie Mackenzie including overlay footage of the first week of the voyage - broadcasted on ABC National and ABC World News - 7 July
- ABC Radio Melbourne: Dr Tim O'Hara interviewed for Evenings on the return to Hobart discussing the undersea volcanos discovered around Christmas Island - 22 July
- ABC Hobart: Dr Tim O'Hara and Melanie Mackenzie interviewed at the CSIRO port in Hobart after returning from the voyage - 27 July

Kate Garrock from the Department of Agriculture, Water and Environment's BushBlitz program hosted live crosses from the vessel, including interviews with onboard scientists, to the following schools: Broome Senior High School, Mirboo North Secondary School, Lyndale Greens Primary, Hunter School of Performing Arts, Bialik College, Kingston High School, Caboolture East State School, Christmas Island District (x2, advanced marine science class year 11/12 and primary).

We also hosted the following students/early career researchers on the voyage: Stephanie Moorish (University of Tasmania), Alice Chen Yan (Fulbright Fellowship, Australian Museum), Claire Rowe (Australian Museum), Jeremy Horowitz (James Cook University), Katrina West (CSIRO), and Tiffany Sih (Monash University).

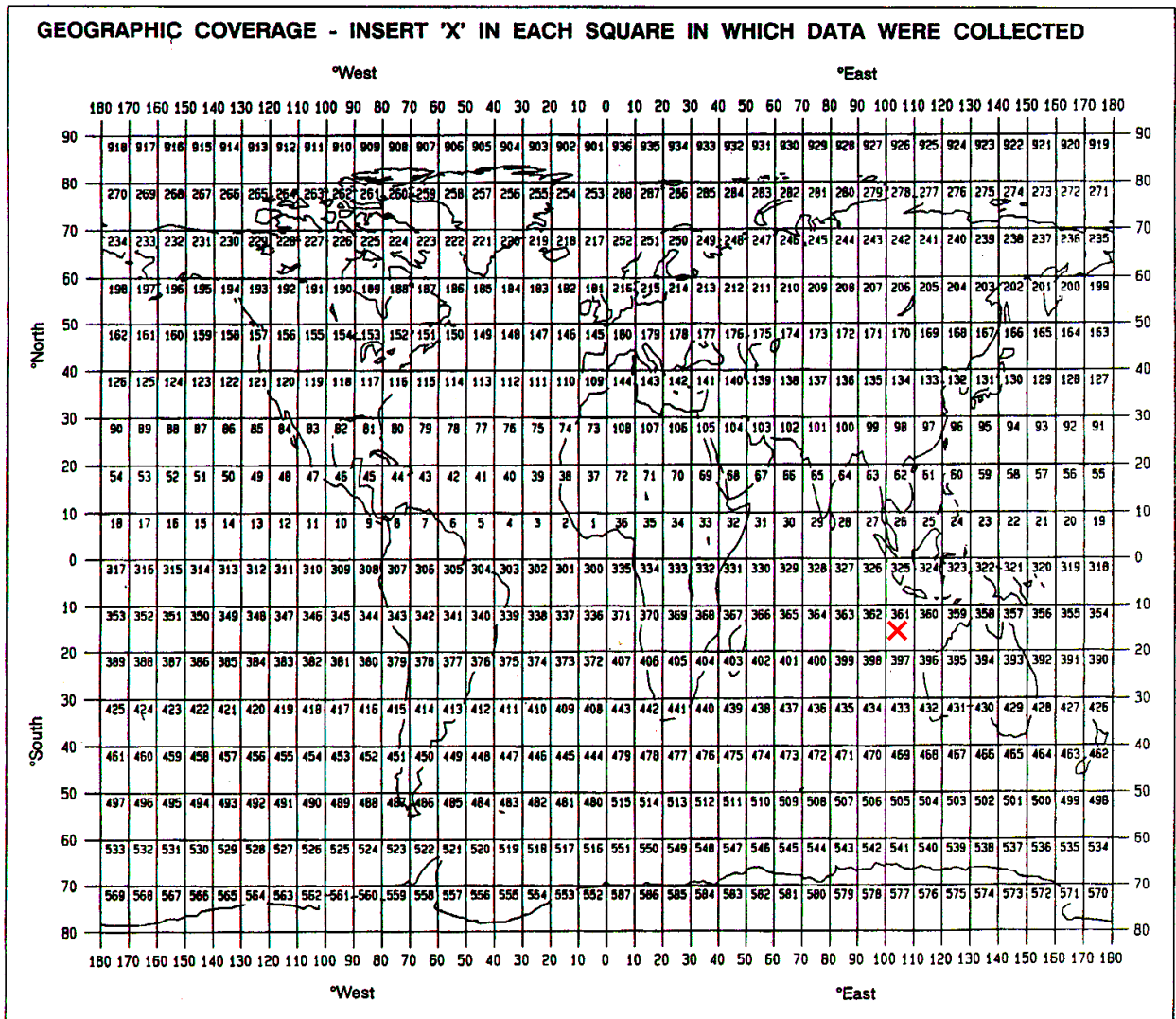
The Australian Museum also hosted blog pieces on their website from the voyage and numerous participants and collaborating institutions posted on social media. Participants have also delivered online lectures post-voyage, including a presentation by Tim O'Hara & Mel Mackenzie on '*Treasures of Deep Sea-Science*' on 22 Sept 2021 that attracted 411 viewers.

## **Summary**

We achieved much in the 12 days on site. We assembled comprehensive datasets on benthic and pelagic (eDNA) community composition, oceanography, and bathymetry for the seven seamounts that we surveyed. Combining these data with those collected in future from a second replacement voyage to the region (and in particular from the Cocos Keeling EEZ), will enable us to fully deliver on the proposed project objectives.



# Marsden Squares



**Summary of data and samples collected**

Item Name, Identifier (e.g. serial number)	Principal Investigator (see Title Page)	NO (see above)	UNITS (see above)	DATA TYPE	DESCRIPTION
				Enter code(s) from list in Appendix A	Identify, as appropriate, the nature of the data and of the instrumentation/sampling gear and list the parameters measured. Include any supplementary information that may be appropriate e.g. vertical or horizontal profiles, depth horizons, continuous recording or discrete samples, etc. For samples taken for later analysis on shore, an indication should be given of the type of analysis planned, i.e. the purpose for which the samples were taken.
Beam trawl samples	Tim O’Hara/Museums Victoria	20	samples	B18	Beam trawl biological samples. Archived into museum collections, including Museums Victoria, Australian Museum, South Australian Museum, Queensland Museum, Tasmanian Museum & Art Gallery, CSIRO National Fish collection.
Sherman epibenthic sled samples	Tim O’Hara/Museums Victoria	5	samples	B18	Sherman Sled biological samples. Archived into museum collections, including Museums Victoria, Australian Museum, South Australian Museum, Queensland Museum, Tasmanian Museum & Art Gallery, CSIRO National Fish collection.
Rock samples	Stephanie Morrish/UNiversity of Tasmania	26	samples	G01	Rock samples from Beam Trawls (x20), Sherman epibenthic sleds (x5), and rock dredge (x1), archived at the University of Tasmania for analysis
Deep-towed video	Tim O’Hara/Museums Victoria	2	Video transects	G08	Video footage and stills of 2 benthic transects around Christmas Island
Multicellular eDNA filter samples	Katrina West/CSIRO	100	filters	B07	Filtration of 10L water from 4 depths per 25 CTD casts. Frozen at -80C
Unicellular eDNA filter samples	Andrew Bisset/CSIRO	182	filters	B09	Filtration of 2L water from standard depths per 25 CTD casts. Frozen at -80C.

Item Name, Identifier (e.g. serial number)	Principal Investigator (see Title Page)	NO (see above)	UNITS (see above)	DATA TYPE  Enter code(s) from list in Appendix A	DESCRIPTION
					Identify, as appropriate, the nature of the data and of the instrumentation/sampling gear and list the parameters measured. Include any supplementary information that may be appropriate e.g. vertical or horizontal profiles, depth horizons, continuous recording or discrete samples, etc. For samples taken for later analysis on shore, an indication should be given of the type of analysis planned, i.e. the purpose for which the samples were taken.
CTD sensor data	MNF	25	casts	H10	Temperature, salinity, conductivity, pressure, oxygen, turbidity, fluorescence
CTD hydrochemisty analyses	MNF/hydrochemisty	25	casts	H10	Analysis of salinity, oxygen, silicate, nitrate+nitrite, phosphate concentrations from water samples.
Multibeam data	MNF/GSM	151,315	km2	G74	Multibeam data from the EM122 and EM710 sonars

## Curation Report

Item #	Description	Storage	Access	Custodian
1.	Fish specimens	Museum Victoria* & CSIRO National Fish Collection	Archived, scientific access	Martin Gomon (MV) and John Pogonoski (CSIRO)
2.	Invertebrate specimens: ophiuroids, holothurians, asteroids, crinoids, cephalopods, pyncogonids, isopods, tanaids, zooanthids	Museum Victoria	Archived, scientific access	Tim O'Hara & Melanie Mackenzie (MV)
3.	Invertebrate specimens: prawns, hermit crabs, barnacles, bivalves, hard corals, hydroids, bryozoans	Western Australian Museum*	Archived, scientific access	Andrew Hosie & Ana Hara (WAM)
4.	Invertebrate specimens: sponges, anemones, amphipods	South Australian Museum*	Archived, scientific access	Shirley Sorokin (SAM)
5.	Invertebrate specimens: carnivorous sponges	Queensland Museum*	Archived, scientific access	Merrick Ekins (QM)
6.	Invertebrate specimens: jelly fish, gastropods, annelids, echinoids	Australian Museum*	Archived, scientific access	Elena Kupriyanova & Frank Köhler (AM)
7.	Invertebrate specimens: soft corals	Tasmanian Museum and Art Gallery	Archived, scientific access	Kirrily Moore (TMAG)
8.	Invertebrate specimens: black corals	Museum of Tropical Queensland	Archived, scientific access	Tom Bridge (MTQ)

\* Specimens will be sent to these institutions once covid-19 work restrictions are removed

## Track Chart

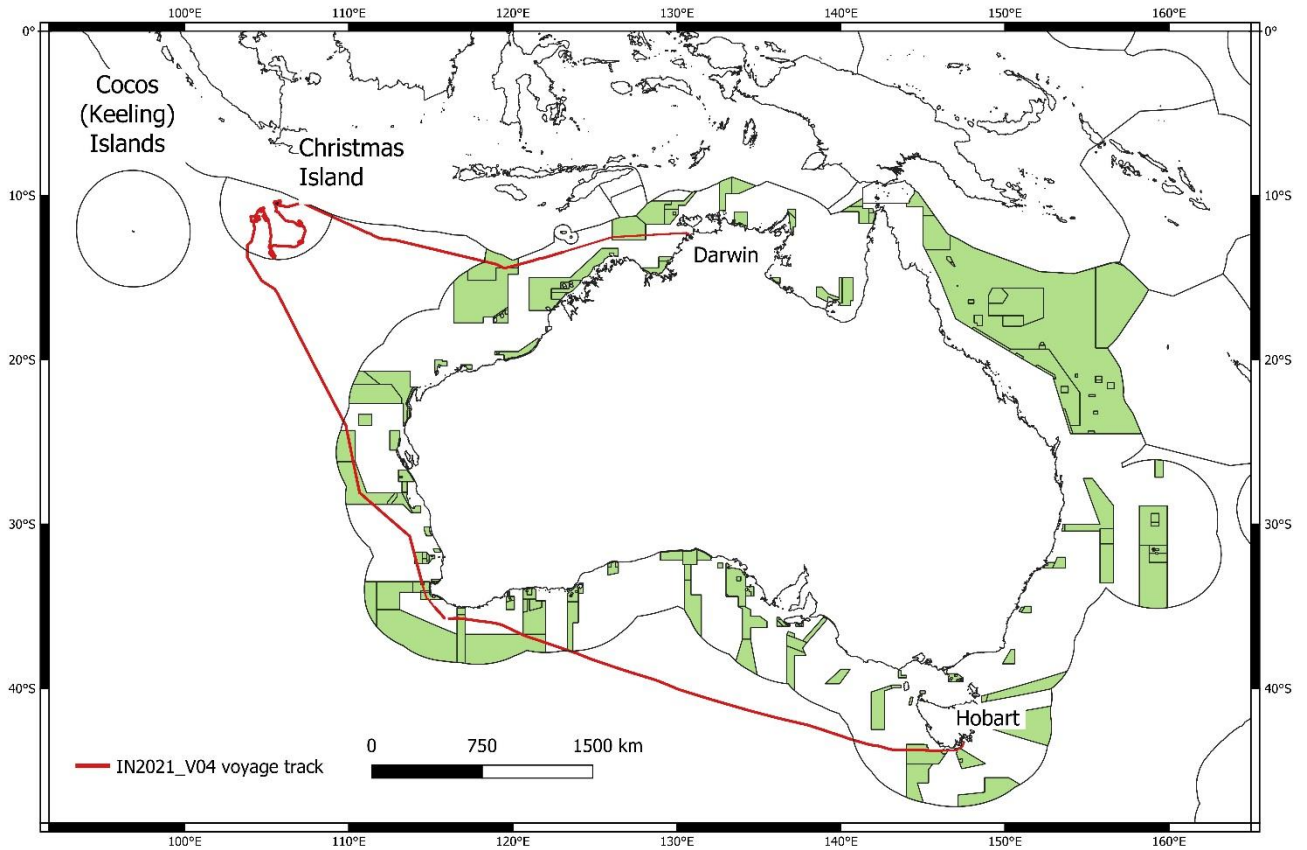


Fig. 1. Voyage track for the IN2021\_V04

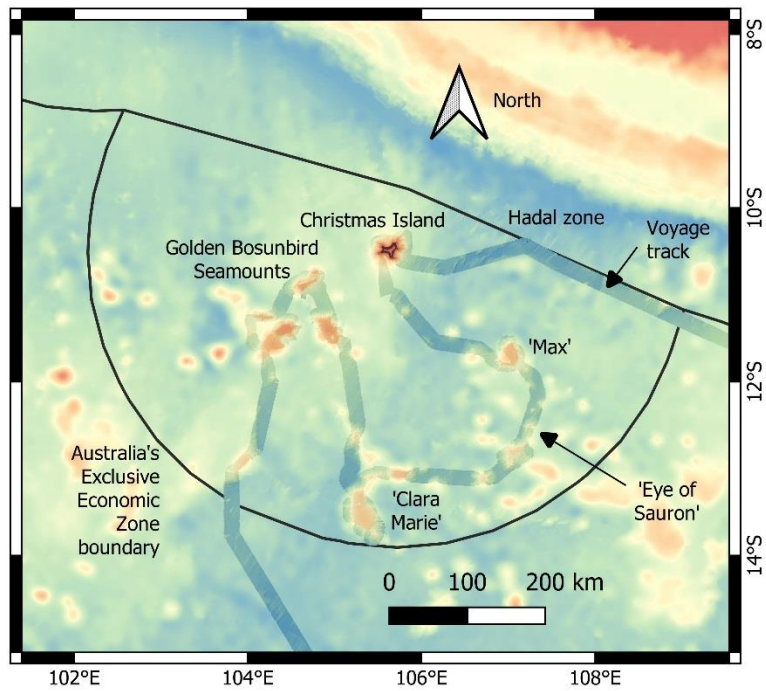


Fig. 2. Voyage track for the IN2021\_V04 within the Christmas Island territory.


## **Acknowledgements**

The following science team participated on the expedition.

Max McGuire	Voyage Manager	CSIRO MNF
Hanuman Crawford	SIT Support	CSIRO MNF
Trevor Goodwin	SIT Support	CSIRO MNF
Phil Vandenbossche	GSM Support	CSIRO MNF
Nelson Kuna	GSM Support	CSIRO MNF
Peter Shanks	DAP Support	AWE
Stephanie Zeliadt	DAP Support	CSIRO MNF
Kendall Sherrin	Hydrochemist	CSIRO MNF
Julie Janssens	Hydrochemist	CSIRO MNF
Curt Chalk	Field Operations	CSIRO MNF
Mark Lewis	Field Operations	CSIRO MNF
Tim O'Hara	Chief Scientist	Museums Victoria
Alan Williams	Alt Chief Scientist	CSIRO
Thomas Schlacher	Science - inverts	Museums Victoria
Elena Kupriyanova	Science - inverts	Australian Museum
Di Bray	Science - fish	Museums Victoria
Martin Gomon	Science - fish	Museums Victoria
Stephanie Morrish	Science - geology	University of Tasmania
Melanie Mackenzie	Science - inverts	Museums Victoria
Ingo Burghardt	Science - inverts	Australian Museum
Nish Nizar	Science - inverts	Museums Victoria
Jeremy Horowitz	Science - inverts	James Cook University
Rob French	Reporter/Videographer	Museums Victoria
Alastair Graham	Science - fish	CSIRO
John Pogonoski	Science - fish	CSIRO
Ana Hara	Science - inverts	Western Australian Museum
Claire Rowe	Science - inverts	Australian Museum
Frank Köhler	Science - inverts	Australian Museum
Andrew Hosie	Science - inverts	Western Australian Museum
Katrina West	Science - eDNA	CSIRO
Tiffany Sih	Science – fish/DNA	Museums Victoria
Shirley Sorokin*	Science - inverts	South Australian Museum
Alice Chen	Science - inverts	Australian Museum
Kate Garock	Education	BushBlitz
April Abbott*	Narrator	BushBlitz

\* planned but unable to participate

## **Signature**

Your name:	Dr Timothy D. O'Hara
Title:	Chief Scientist
Signature:	
Date:	6 <sup>th</sup> October 2021

## **Appendix B – Photographs**

See attached.