NIWA
Taihoro Nukurangi

INT2024-04 Exploring impacts and recovery potential of protected deep-sea stony corals

Preliminary observations and summary of RV *Sonne* voyage SO309, 16 January - 15 February 2025

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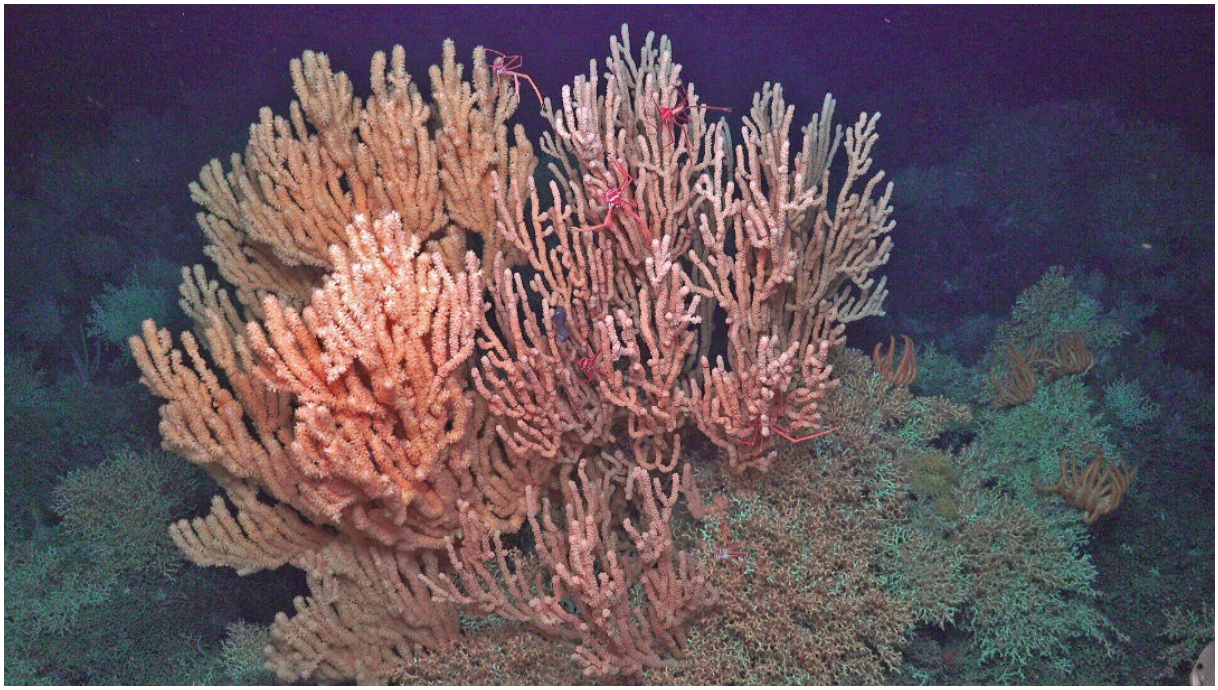

Climate, Freshwater & Ocean Science

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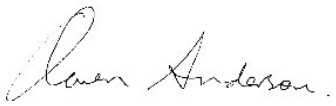	Reviewed by:	Owen Anderson
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Caption for image: *Corals on summit of Ghoul, Graveyard Knolls region, Chatham Rise, observed by MARUM SQUID ROV. [copyright: MARUM University of Bremen]*

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Executive summary

The New Zealand marine region has one of the most diverse cold-water coral (CWC) fauna globally, ranging from cosmopolitan framework-building hard coral species to the mostly endemic stylasterid hydrocorals. They are found in depths ranging from shallow coastal waters to several kilometres deep in offshore waters, where they provide habitat to a wide range of marine invertebrates and fish. Most CWC taxa are legally protected in Aotearoa New Zealand and many aspects of their biology, distribution, and threats induced by short- or long-term disturbances are still poorly understood.

In early 2025, the German RV *Sonne* expedition 'CoralNewZ' (SO309) set out to systematically investigate select CWC hotspots off New Zealand and to apply a multi-disciplinary sampling approach to address biological and geological research questions. The main biology objectives of the voyage were to: (i) use high-resolution mapping to identify regional CWC habitats; (ii) use video mapping and faunal sampling to perform a systematic inventory of CWCs and the fauna they are associated with; and (iii) characterise controlling environmental factors by measuring oceanographic parameters and sampling water in the immediate vicinity of CWCs.

Three areas around New Zealand were sampled during the SO309 expedition: (i) the continental shelf break east of Rakiura Stewart Island, including the first detailed observations and sampling of the Rakiura Hills, a group of small guyots and knolls; (ii) the deep (>100 m) Fiordland Marine Area (Te Moana o Atawhenua), including Thompson, Doubtful, Breaksea and Dusky Sound, and the coastal area off Milford Sound; and (iii) the Chatham Rise region (including a repeat survey of four of the previously surveyed features of the Graveyard Knoll complex, and two areas on the top of the Chatham Rise).

In total, 17 Remotely Operated Vehicle (ROV) dives were successfully conducted, a total of 82 hours of bottom time, with 16 dives live streamed to an international audience. A total of 31 Ocean Floor Observation System (OFOS) towed-camera transects were conducted, 29 of which were repeat transects of four knolls in the Graveyard Knoll complex (Morgue, Graveyard, Diabolical and Ghoul), providing an opportunity to build on a 20-year time series of observations in the area. Other gear deployments (13 TV-guided box corers, 25 gravity corers, eight epibenthic sleds (EBS), and 20 CTD casts) were successfully completed and are described in detail in the voyage report provided by Freiwald et al. (2025) but are not covered in further detail here.

The purpose of this technical report is to summarise sampling and preliminary observations during the voyage as relevant to Department of Conservation (DOC) Conservation Services Programme (CSP) contract INT2024-04 (Exploring impacts and recovery potential of protected deep-sea stony corals, utilising Remotely Operated Vehicle capability on RV Sonne in the New Zealand region) and Ministry for Primary Industries (MPI) contract BEN2024-06 (Contribution towards a survey on deep-sea coral biodiversity and environmental drivers around New Zealand). A summary of main voyage activities is provided, focussing on CWC biology, including a detailed description of the observations and sampling conducted using the ROV and OFOS deployments. The ROV enabled fine-scale and high-resolution observations and sampling, particularly of species associations and community assemblages. The OFOS complemented these observations by covering longer distances over the ground and a fixed down-facing camera view, providing comparability to previous studies conducted on long-term coral recovery rates on the Chatham Rise.

We present high-resolution maps and preliminary taxonomic determinations of corals, a species inventory of the 296 samples of Hexacorallia (stony corals and black corals), Octocorallia (gorgonian and soft corals) and Stylasteridae (hydrocorals) from all sampling locations, and commentary on the subsampling (including genetic subsampling, histology and geochemical analyses to be conducted at the German Senckenberg am Meer, MARUM Center for Marine Environmental Sciences and GEOMAR institutes). The taxonomic identification by experts, including the use of molecular taxonomic tools, will be required to confirm species records in the future.

The ability to conduct fine-scale sampling provided the opportunity to collect targeted specimens with which to study the reproduction of New Zealand stony corals. A description of the 24 coral specimens collected and the onboard aquarium is provided. This project is part of a parallel CSP study (POP2024-02: Improving knowledge on coral life history traits, Beaumont and Marriott (2025)).

This report is intended to build on the SO309 voyage report by Freiwald et al. (2025) with detailed descriptions of the samples and observations that will provide resources for ongoing work by New Zealand partners. Scientific highlights of the voyage included first detailed maps and in-situ observations of the Rakiura Hills and their abundant coral communities, exploring the deep basins of the Fiordland region, including a new species of soft coral and potential new records of hard corals for the area. In addition, the detailed ROV survey of extensive coral gardens on Ghoul and Morgue, some of them documented for the first time, and growing evidence supporting the presence of coral mound structures, the first report of such in the SW Pacific, indicate the local persistence of CWC over geological time scales.

Further studies will provide distributional records for regions previously unexplored, evaluate fine-scale observations of the complex CWC communities, and improve our understanding of the damage to and recovery potential of corals from the effects of human impacts such as bottom fishing activities. The data and specimens gathered will, in the future, be used to address many of the identified knowledge gaps on CWC's in the region including their spatial distribution, biology and ecology, and their resilience to ongoing anthropogenic threats. Furthering our understanding will help inform risk assessments and management plans for these protected deep-sea corals.

1 Background: Cold-water Coral Biology & Geology off Aotearoa New Zealand voyage SO309

Cold-water corals (CWCs) can occur in high abundances in shallow waters of higher latitudes and in cold, deeper waters worldwide. The colonial forms of corals include both stony corals (Scleractinia), black corals (Antipatharia) and gorgonians (members of the Octocorallia), the colonies forming what are considered the oceans largest sessile benthic invertebrates (Sánchez 2005). The stony CWCs in particular can produce large three-dimensional frameworks that cover greater areas than some well-known tropical shallow-water coral reefs (e.g. Cordes & Mienis 2023). The New Zealand region is considered a hotspot for CWCs, hosting some of the highest diversity recorded for a single country (see reviews by Tracey & Hjorvarsdottir 2019, Macpherson et al. 2023, Tracey et al. 2023). The main framework-building corals are the stony corals *Goniocorella dumosa* (endemic to the Indo-Pacific), *Madrepora oculata* and *Solenosmilia variabilis* (both cosmopolitan), that have been found to be important local habitat formers and are widespread throughout the region (Morrison et al. 2014, Anderson et al. 2023, Tracey et al 2023).

In 2024, the international expedition Cold-water Coral Biology & Geology off Aotearoa New Zealand (CoralNewZ voyage SO309) by the German Research Vessel *Sonne* ('Sun'), under the leadership of Professor André Freiwald and Dr. Lydia Beuck of the Senckenberg am Meer (Wilhelmshaven, Germany) and in primary partnership with NIWA, conducted a four-week survey of select CWC hotspots around the region. The focus of the voyage was to document small-scale distribution patters and habitat zonation, species diversity and long-term evolution of the New Zealand CWC ecosystems, and to compare findings with those CWCs extensively studied in the Atlantic Ocean (Freiwald et al. 2004, Buhl-Mortensen & Freiwald 2023). The voyage planning details involved NIWA and Senckenberg am Meer and iwi groups and Environment Southland Regional Council were included pre-voyage to seek endorsement of the sampling in various rohe. NIWA's Pou Ārahi facilitated the engagement process.

A multi-disciplinary sampling approach included: (i) use of high-resolution bathymetric mapping to identify possible CWC habitats; (ii) use of video mapping and faunal sampling to perform a systematic inventory of CWCs and the fauna they are associated with; and (iii) characterisation of controlling environmental factors by measuring oceanographic parameters and sampling water in the immediate vicinity of CWCs. This biological methodology was paired with a strong geological and paleoenvironmental focus using long sediment cores to identify growth phases of the past, reconstruct paleoenvironmental changes, and evaluate environmental factors that governed the emergence or decline of CWC reefs under various climatic conditions and disturbance in the past.

A detailed description of the research activities of the SO309 voyage is provided in a full voyage report provided by Freiwald et al. (2025). This report is focussed on imagery and voucher specimens collected, including live corals; and to provide additional descriptions of the methods and observations of the CWC habitats of the three regions sampled: the Rakiura Hills east off Stewart Island, the Fiordland Marine Area and the Chatham Rise.

The Department of Conservation Te Papa Atawhai (DOC) Conservation Services Programme (CSP), Ministry for Primary Industries (MPI) and the MBIE Strategic Science Investment Fund (managed through NIWA's SSIF Platform Programme Marine Biological Resources) provided the opportunity for the authors to participate in this science voyage, in order to collect specimens and data that will continue to help address many of the known gaps on spatial distribution, validate predictive

modelling outputs, and expand understanding of coral biology, the ocean environment, and on-going threats.

1.1 Protection status of corals in New Zealand

The term 'coral' used here is defined broadly as those cnidarian groups belonging to the groups commonly known as stony corals, black corals and gold corals (Hexacorallia), gorgonian corals, soft corals and sea pens (Octocorallia) and hydrocorals (Stylasteridae).

The following corals are legally protected under Schedule 7A of the New Zealand Wildlife Act 1953:

Anthozoa (corals and sea anemones):

- Black corals – all species in the order Antipatharia
- Gorgonian corals –species formerly in the order Gorgonacea (now Malacalcyonacea + Scleralcyonacea that include the non-protected soft corals)
- Stony corals – all species in the order Scleractinia

Hydrozoa (hydra-like animals):

- Hydrocorals – all species in the family Stylasteridae)

The following corals are protected under Schedule 6 of the NZ EEZ and Continental shelf Act (Environmental Effects – Permitted Activities) Regulations 2013:

Stony coral thickets or reefs

A stony coral reef or thicket exists if:

A colony of a structure-forming species (ie, *Madrepora oculata*, *Solenosmilia variabilis*, *Goniocorella dumosa*, *Enallopsammia rostrata*, *Oculina virgosa*) covers 15 % or more of the seabed in a visual imaging survey of 100 m^2 or more; or

- A specimen of a thicket-forming species is found in two successive point samples; or
- A specimen of a structure-forming species is found in a sample collected using towed gear.

Sea pen field

A sea pen field exists if:

- A specimen of sea pen is found in successive point samples; or
- Two of more specimens of sea pen per m^2 are found in a visual imaging survey or a survey collected using towed gear.

1.2 Study sites

Figure 1-1 shows the track of the RV *Sonne* during the SO309 voyage. Three study areas were visited: Rakiura Hills to the east of Stewart Island, Fiordland Marine Area and the Chatham Rise.

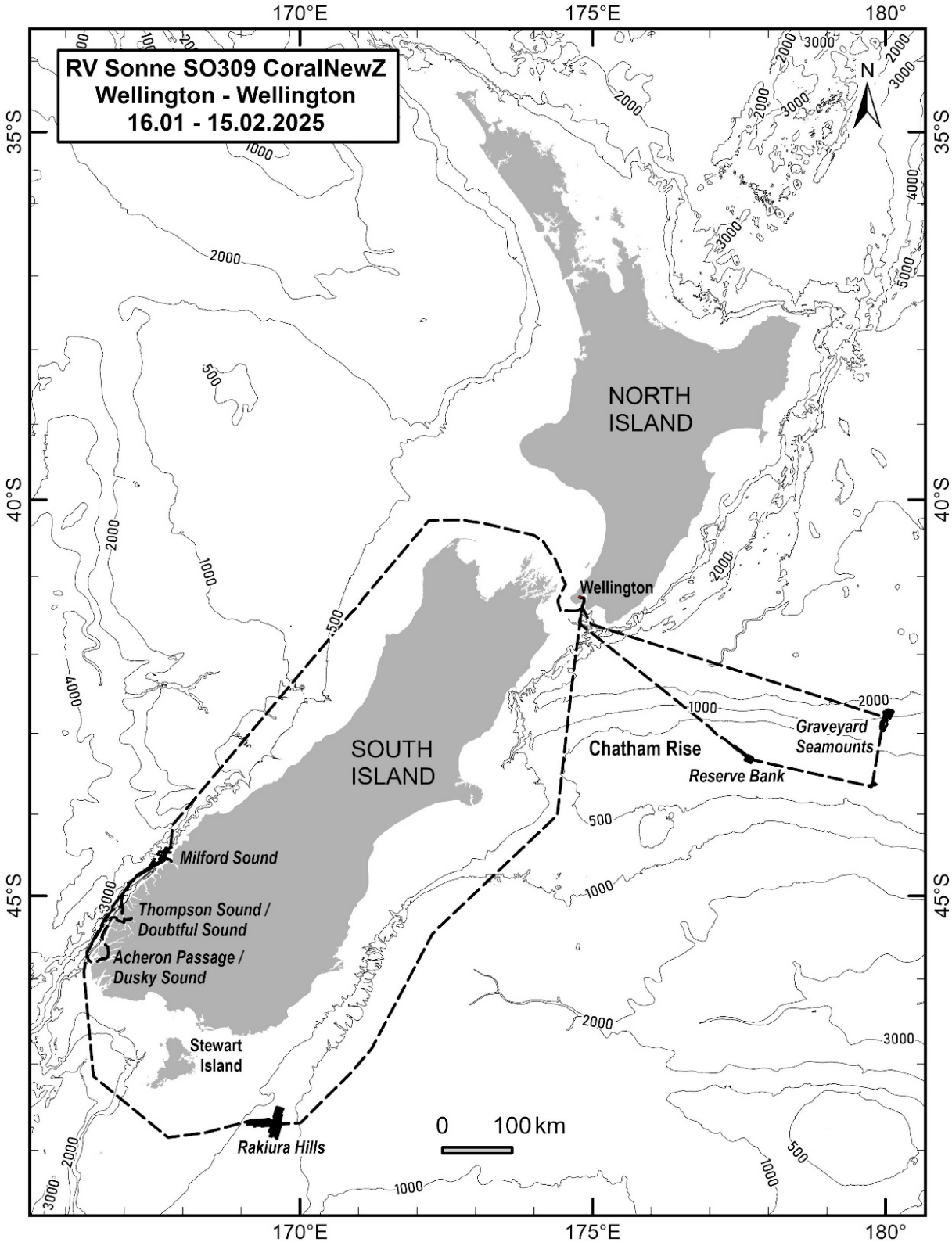

Figure 1-1: Voyage track showing locations of work areas of the RV *Sonne* cruise SO309. The expedition started in Wellington on 16 January 2025 and ended in Wellington on 15 February 2025.

1.2.1 Rakiura Hills

Rakiura Hills, a region of suspected CWC mound structures east of Stewart Island, was the first study area visited to be investigated (Figure 1-2). Multibeam-Parasound mapping revealed these structures, previously recorded on an RV *Tangaroa* voyage in 2018 (Sutton et al. 2018), to be conspicuous, capped, guyots approximately 100 m in elevation.

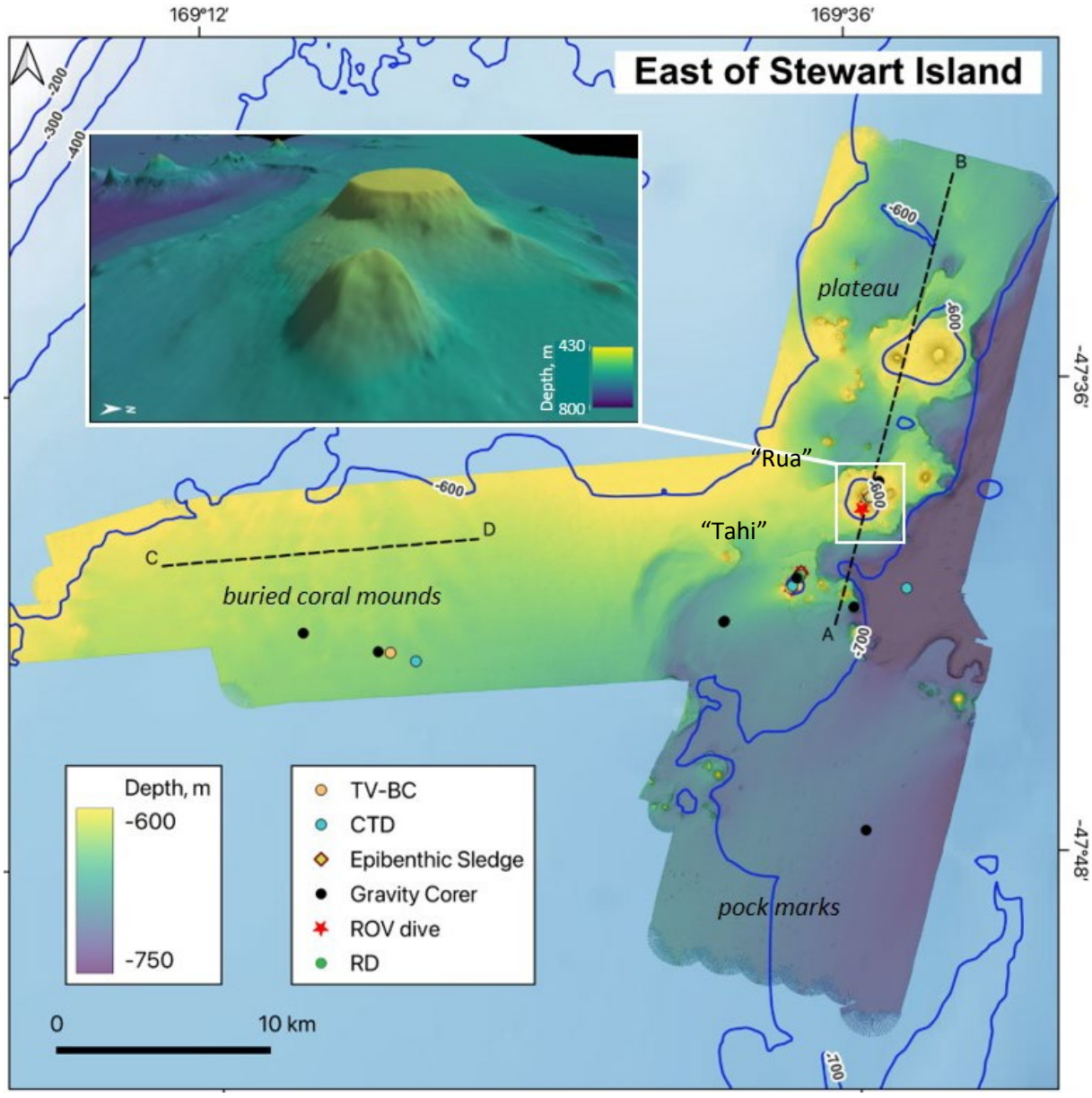

Figure 1-2: Bathymetric map of the working area east of Stewart Island. Sampling sites of RV *Sonne* expedition SO309 are indicated. The inset shows a 3D-view of the largest Rakiura Hill (looking westward). The dashed lines A-B and C-D mark the PARASOUND sub-bottom profile lines

1.2.2 Fiordland

Knowledge of benthic communities in New Zealand's fjords is mostly limited to shallow subtidal habitats with very few studies in water depths greater than 30 m (e.g. Brewin et al. 2008, Kelly et al. 2021, Harris et al. 2021, Bell et al. 2024). The main SO309 objectives in the Fiordland region were to locate CWC habitats in deep sections of the fiord basins and compare them with those of Norwegian

habitats (e.g. Freiwald et al. 1997, Buhl-Mortensen & Freiwald 2023, Büscher et al. 2024). RV *Sonne* received the Environment Southland Regional Council Coastal Permit (AUTH-20222454) to operate in the Thompson Sound-Doubtful Sound and in the Acheron Passage-Dusky Sound in confined "boxes" for 96 hours in total (Figure 1-3).

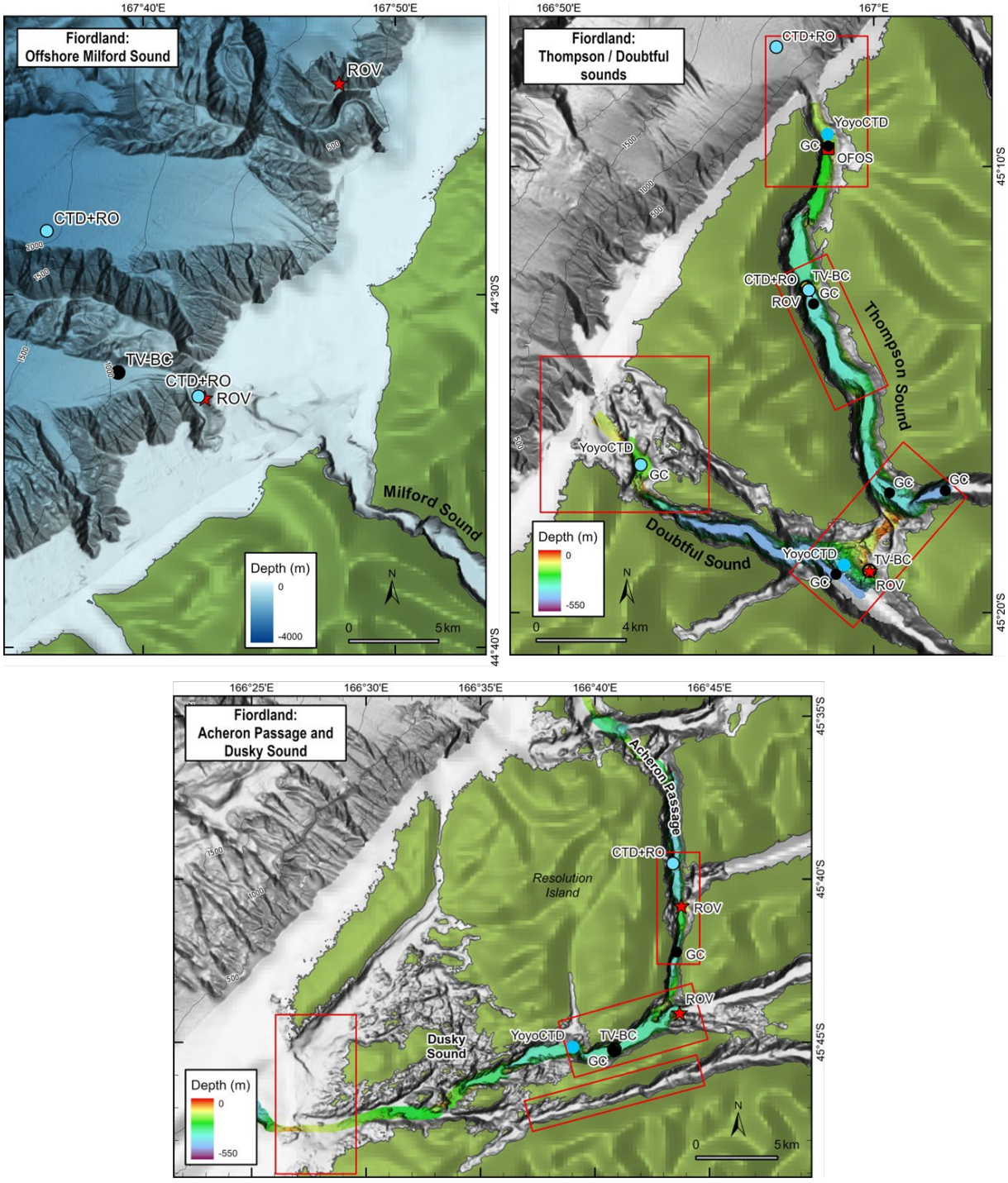

Figure 1-3: Bathymetric maps of study areas in the Fiordland region with sampling sites indicated. Top left: Continental margin off Milford Sound. Top right: Thompson and Doubtful sounds, the northernmost fiords visited during the SO309 expedition. Bottom: Dusky Sound and Acheron Passage, the southernmost fiords visited during the SO309 expedition (BC = Bowen Channel). The red boxes outline the areas for which sampling was permitted within Fiordland. ROV = Remove Operated Vehicle, GC = Gravity Corer, TV-BC = TV guided Box Corer, Yoyo CTD = series of Conductivity, Temperature and Depth (CTD) casts and RO = water samples.

1.2.3 Chatham Rise

The Chatham Rise extends eastward from New Zealand's South Island, with shallow banks of <100 m water depth occurring at its top, including the Chatham Islands (Figure 1-4). Along the 1000 m depth contour it has an E-W-extension of ~550 nm and a N-S extension of ~100 nm on average. Three areas within the broader Chatham Rise study area were investigated during SO309, comprising the Graveyard Knolls (variably also called Graveyard Seamounts), the Central Chatham Rise, and the eastern edge of Reserve Bank.

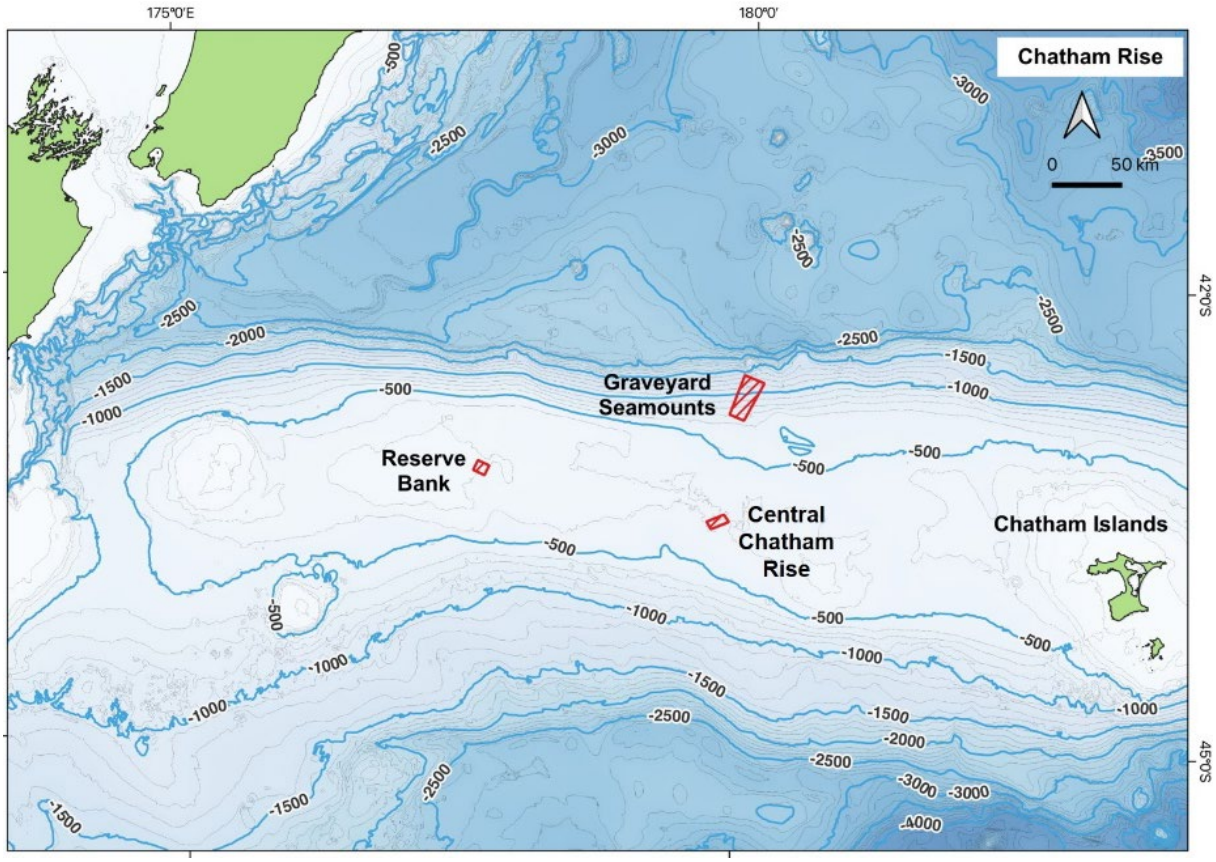

Figure 1-4: Bathymetric map of the Chatham Rise with the three working areas (red boxes) of RV *Sonne* expedition SO309.

The Graveyard Knolls are a cluster of about twenty small features on the northern mid-Chatham Rise that cover an area of approximately 140 km^2, with summit depths ranging from 750–1250 m, and basal depths between 1050–1600 m (Figure 1-5). The Graveyard knoll complex has been the focus of a deepwater commercial trawl export fishery since the mid-1990s, primarily targeting orange roughy (*Hoplostethus atlanticus*). Most of the trawling has been focused on Morgue and Graveyard, with other features in the group remaining largely unfished (Clark et al. 2019). In 2001, a number of features around New Zealand, including Morgue, Gothic, and Pyre in the Graveyard Knolls area, were closed to fishing and dredging. The highest fishing effort now occurs on Graveyard with light fishing effort on Zombie and Diabolical (Clark et al. 2022).

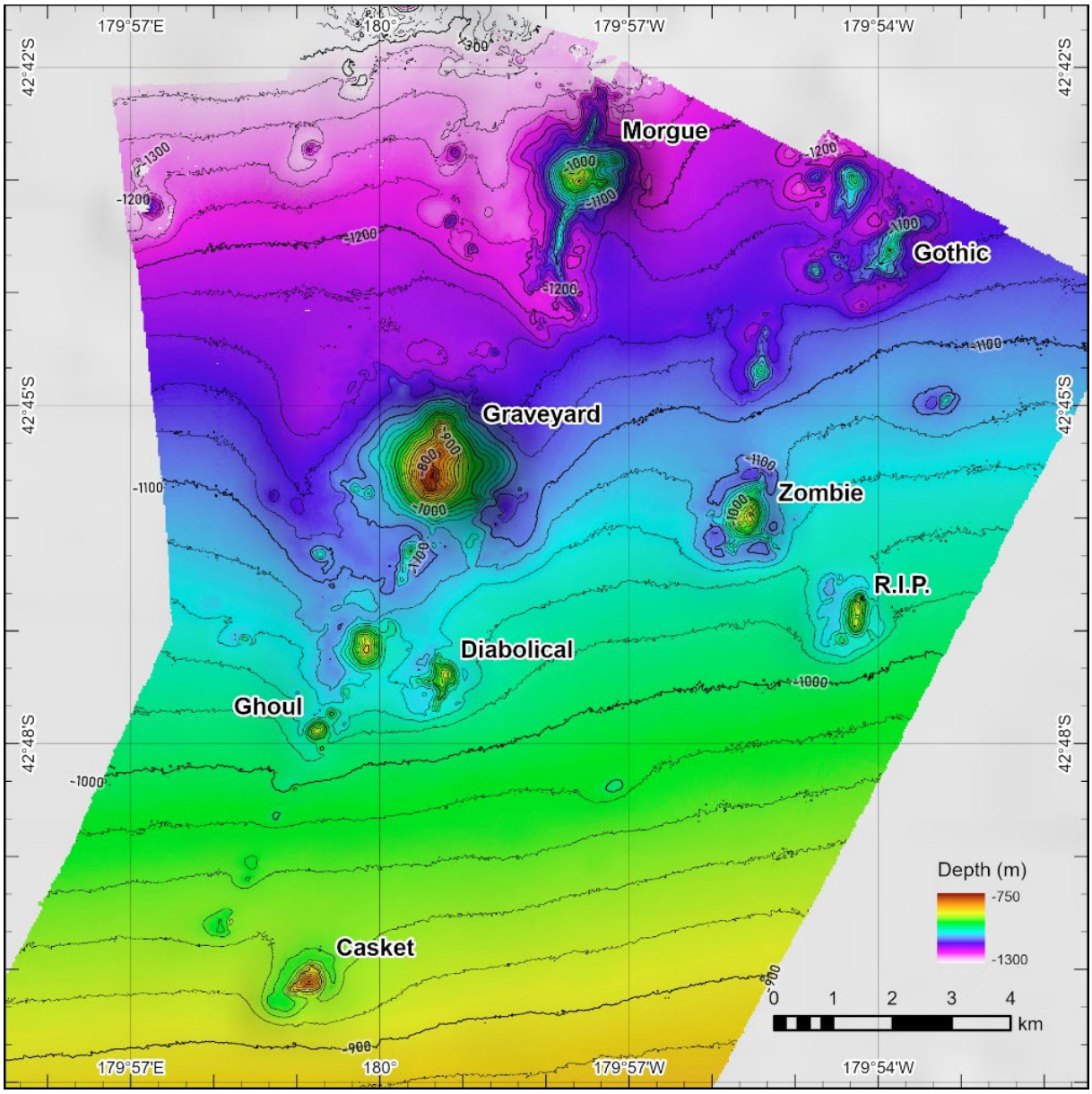

Figure 1-5: Overview of the Graveyard Knoll area, northern mid-Chatham Rise, New Zealand.

1.3 Sampling gear

At each study area the following sampling was conducted: an initial CTD cast was followed by hydroacoustic mapping utilizing the Acoustic Doppler Current Profiler (ADCP), the PARASOUND (PS) sub-bottom profiler, and the multibeam echosounder systems (MBES). This was typically followed by Remote Operated Vehicle (ROV) dives before physical sampling by epibenthic sled (EBS), TV-guided box corer (TV-BC) and/or gravity corer (GC). A single, unsuccessful, attempt was made at a NIWA benthic (seamount) sled tow.

At some locations, the Ocean Floor Observation System (OFOS), RV *Sonne*'s towed camera system was deployed prior to the ROV due to weather constraints and/or concerns over possible fishing gear entanglement of the ROV. The OFOS was also used to repeat some previous towed camera transects on the Graveyard Knoll complex using NIWA's Deep Towed Imaging System (DTIS). To minimise

overall risk to survey equipment ROV operations were always conducted during daylight hours, with OFOS operations typically conducted at night.

The sampling gear used in the collection of coral samples and data relevant to this report is described here. For a detailed description of all sampling methods used on the voyage, including the TV-BC, EBS and GC, see the full voyage report provided by Freiwald et al. (2025), the complete list of stations and gear deployed is included below as Appendix A.

1.3.1 MARUM Remote Operating Vehicle (ROV), Squid.

The ROV MARUM-SQUID is a light work-class ROV manufactured by SAAB Seaeye (UK) for operations down to 2000 m (Figure 1-6). The ROV system is realized on a small footprint with a comparably low weight and is shipped in a single 20" ISO container. The system was adapted for marine research at MARUM and has been in operation since early 2016.

The main scientific camera mounted on the ROV is a SULIS Z70, which provides 4K UHD video resolution at 30 fps. Accurate positioning of the ROV was determined using the ship mounted Sonardyne RANGER II USBL system. Sampling equipment on board the ROV included a Conductivity, Temperature and Depth (CTD) probe, two Niskin bottles to collect seawater samples, four push corers, a small shovel for collecting small organisms and other samples from the seafloor, and two net samplers.

A rotary box with eight individual acrylic cylinders is mounted at the front of the ROV for storage of specimens, as well as a storage area in the centre of the rotary box. A large main sample box and two additional sample boxes were available for storage of larger/heavier samples (Figure 1-6). Of the storage areas, only the eight acrylic cylinders retain water to keep specimens in seawater at all times, including recovery onto the deck of the *Sonne*.

During the ROV dives, real-time biological and geological observations, as well as the location of sampling, were recorded with a timestamp, position and depth of the ROV on the seabed that were saved in the navigation file. During SO309 the ROV was deployed 17 times. Deployment details are provided in Appendix A, with detailed descriptions of each deployment in Appendix C.

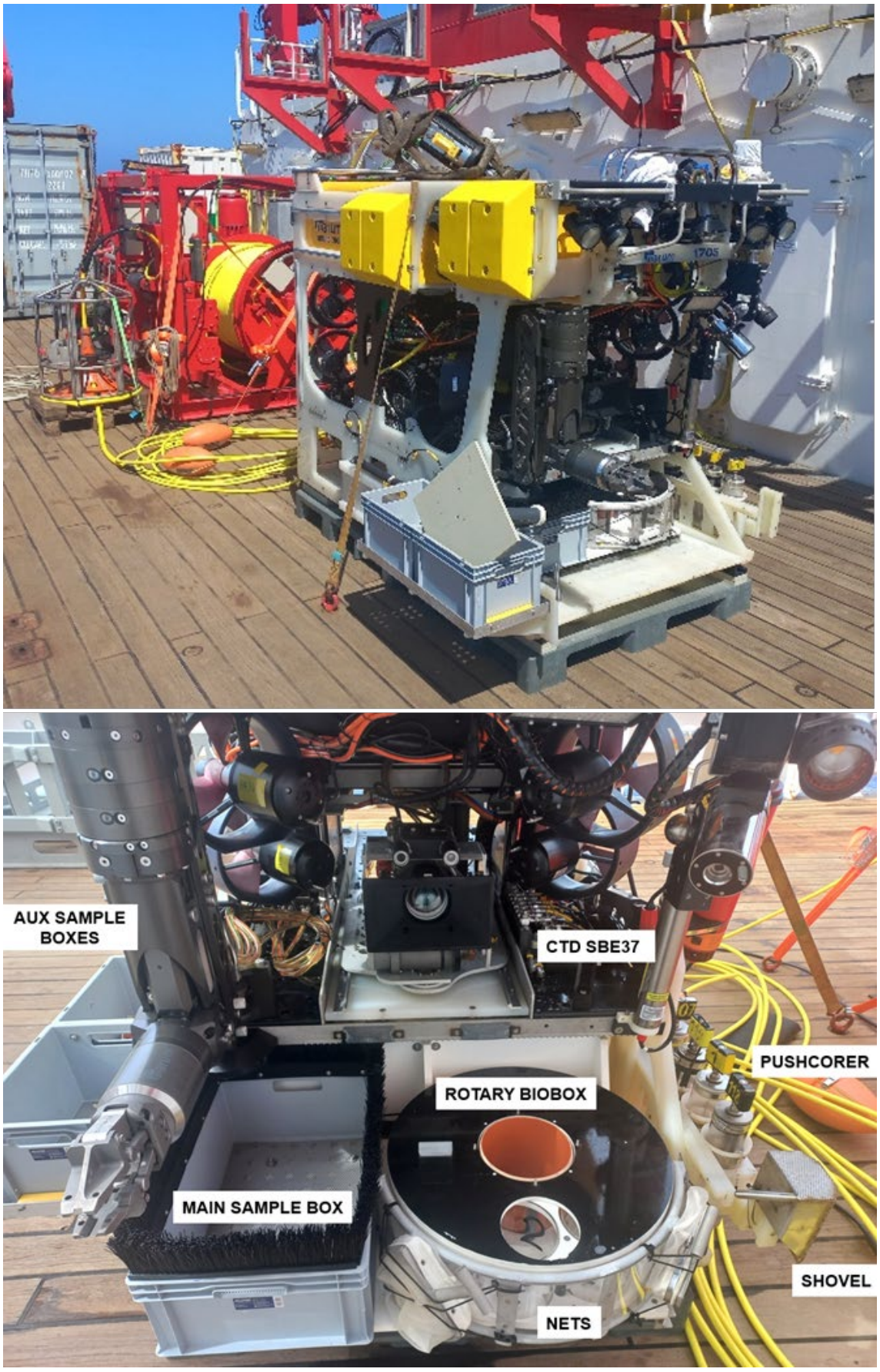

Figure 1-6: ROV MARUM-SQUID 2000. Top: ROV and the winch placed on the working deck of RV *Sonne*; Bottom: tools and sample boxes installed on ROV MARUM-SQUID. Adapted from Freiwald et al. (2025).

1.3.2 Ocean Floor Observation System (OFOS)

The Ocean Floor Observation System (OFOS, Figure 1-7) was used for HD photographic surveys using a 6000 m depth-rated frame-mounted camera that transfers live imagery to the vessel via fibre optic cable, weighted according to the requirements of RV *Sonne*'s winch-controlled cable stabilisation technology that stabilizes the unit at depth. Full specifications are in the Appendix of Freiwald et al. (2025). Still images were taken every eight (8) seconds and video imagery was collected continuously throughout the duration of each transect. Precise navigation was achieved through the use of the vessels Dynamic Positioning System. An operator viewing a real-time video feed recorded annotated observations into a categorical dashboard that automatically captures timestamps and position for later reference, and scale was achieved with an array of three lasers, each 40 cm apart. The biological observations were made using a combination of pre-determined header options ("buttons") and a free text comment field. The buttons were not specific to this voyage and broadly defined. The real-time interpretation and recording may have varied over the course of the survey and between analysts. Therefore, initial observation data shown here are only tentative, and the high-resolution images will require re-analysis using standard protocols and experts.

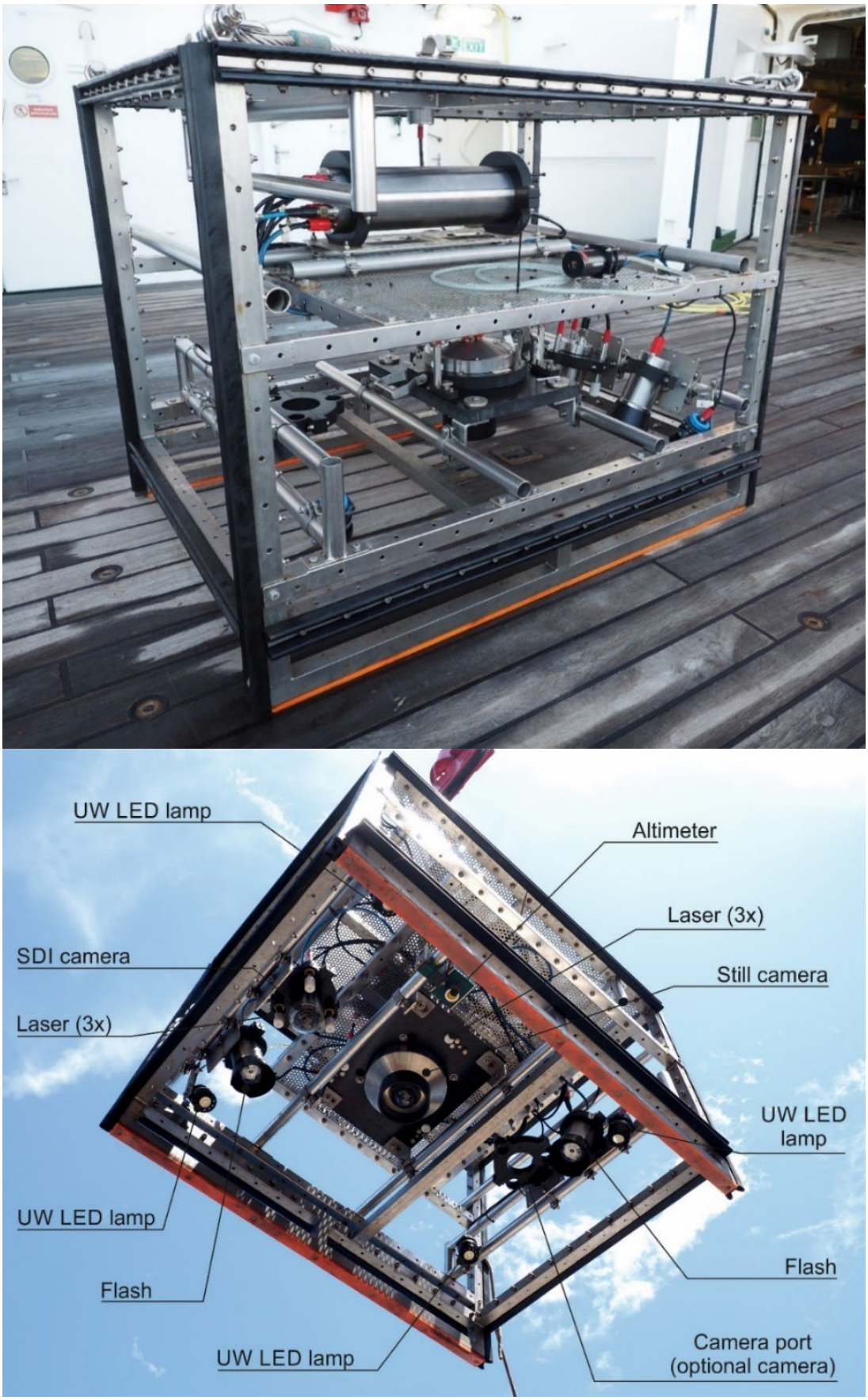

Figure 1-7: Ocean Floor Observation System (OFOS) towed camera system deployed during voyage SO309. Top: side view of frame. Bottom: bottom view of frame showing components.

1.3.3 TV-guided Box Corer

A large box corer was the main sampling tool used by the team of geologists to obtain undisturbed surface sediments during RV *Sonne* expedition SO309 (Figure 1-8). The sampling box had a diameter of 50 × 50 cm and a height of 55 cm. It was additionally equipped with a digital telemetry system on which a HD digital camera with a resolution of 1920 × 1080 pixels was installed. The video camera enabled a targeted sampling of the seabed. A two-point-laser (distance: 10 cm) allowed measurement of the size of seabed objects. Further details of the TV-BC and camera system can be found in the SO309 Cruise Report (Freiwald et al. 2025). While the box corer was predominantly a tool for sediment sampling, it was also able to incidentally collect biological specimens including, on occasion, scleractinian corals.

Figure 1-8: TV-guided box corer on deck of RV *Sonne*. Equipped with a video camera mounted next to the sampling box.

1.4 Further technical information and survey results

Technical information about voyage SO309 are deposited on the PANGAEA Data Publisher for Earth & Environmental Science website (https://www.pangaea.de/expeditions/bybasis/Sonne_2) that at time of publishing this report included a short narrative with a complete list of sampling stations in a Short Cruise Report (Freiwald 2025a) and the geographic Master track dataset (Freiwald 2025b). The repository will include the final Cruise Report (Freiwald et al. 2025) and select Data over time.

The preliminary results of all sampling conducted during the RV *Sonne* expedition SO309 are provided in the Cruise Report (Freiwald et al. 2025). This includes details of hydroacoustic mapping, hydrographic measurements, video observations and sediment/fauna sampling based on a range of instrumentations (MBES/PS, ADCP, CTD-rosette, ROV MARUM SQUID, OFOS, TV-BC, GC, EBS). All instruments, including their technical specifications, operational set-up and list of deployments are presented in its Appendix. The Appendix of Freiwald et al. (2025) also provides details on sample treatment and methodologies as well as detailed core descriptions (TV-BC, GC), a first overview of the CWC associated molluscs, fishes, EBS samples and the NIWA aquarium system. In order to provide a comprehensive summary here, the complete station list is reproduced Appendix A, a more detailed list of OFOS deployments (Appendix B) and detailed descriptions of the ROV and OFOS dives (Appendix C).

1.5 Scope of this report

The purpose of this technical report is to summarise sampling and preliminary observations during RV *Sonne* voyage SO309 as relevant to Department of Conservation (DOC) Conservation Services Programme (CSP) contract INT2024-04 (Exploring impacts and recovery potential of protected deep-sea stony corals, utilising Remotely Operated Vehicle capability on RV Sonne in the New Zealand region) and Ministry for Primary Industries (MPI) contract BEN2024-06 (Contribution towards a survey on deep-sea coral biodiversity and environmental drivers around New Zealand).

The objectives of INT2024-04 are:

1. To assess direct impacts of fishing on corals and to determine their recovery at seamounts and other sites subject to a range of fishing intensity.
2. To survey, assess and collect corals at multiple unexplored sites across the EEZ to improve recent coral distribution /fisheries overlap assessments and to ground truth coral habitat models.

2 Summary of ROV dives, OFOS camera tows and sampling

A general summary of ROV dives across the three regions sampled is provided here. Details of samples collected during the ROV dives are provided in the station list included in Appendix A (based on Freiwald 2025a).

2.1 Rakiura Hills

Five ROV dives were conducted in the Rakiura Hills study area. ROV dive SO309_23 had to be aborted due to technical issues, therefore, four dives were completed successfully (Figure 2-1, Figure 2-2).

A total of 41 coral voucher specimens were deposited in the NIWA Invertebrate Collection (NIC) from the Rakiura Hills area (Table 2-1), 15 coral specimens were provided to Senckenberg am Meer, MARUM and GEOMAR for geochemical analyses (Table 2-2), and nine specimens were provided to Senckenberg am Meer for DNA sequencing (Table 2-3). In addition, 20 specimens were collected for future histological analyses (Table 2-4).

SO309 research activities provide the first ever detailed maps and *in-situ* observations of these features. Most notable were the two large, flattened guyots, and a number of smaller conical and flat-topped features in the vicinity (Figure 1-2). Video footage and rocks collected from the Rakiura Hills suggested a volcanic origin. Biological communities included typical bathyal soft-bottom communities at the base of the features (the sediment apron deposited in the northeastern current lee of the larger feature was sampled during ROV Dive 102, Figure 2-1) interspersed with dense, low patches of purple *Enallopsammia rostrata* and occasional sponges. The rocky substrates of the two large guyots referred to on the voyage as ‘Tahi’ and ‘Rua’ hosted some diverse suspension- and filter feeders, including solitary hard corals, gorgonians and soft corals, sponges and other mobile invertebrates. The flat top of ‘Rua’ guyot was visited by two consecutive dives #104 and #105 (Figure 2-2), in both cases dense communities of gorgonian corals (Acanthogorgiidae and Plexauridae) were observed and sampled.

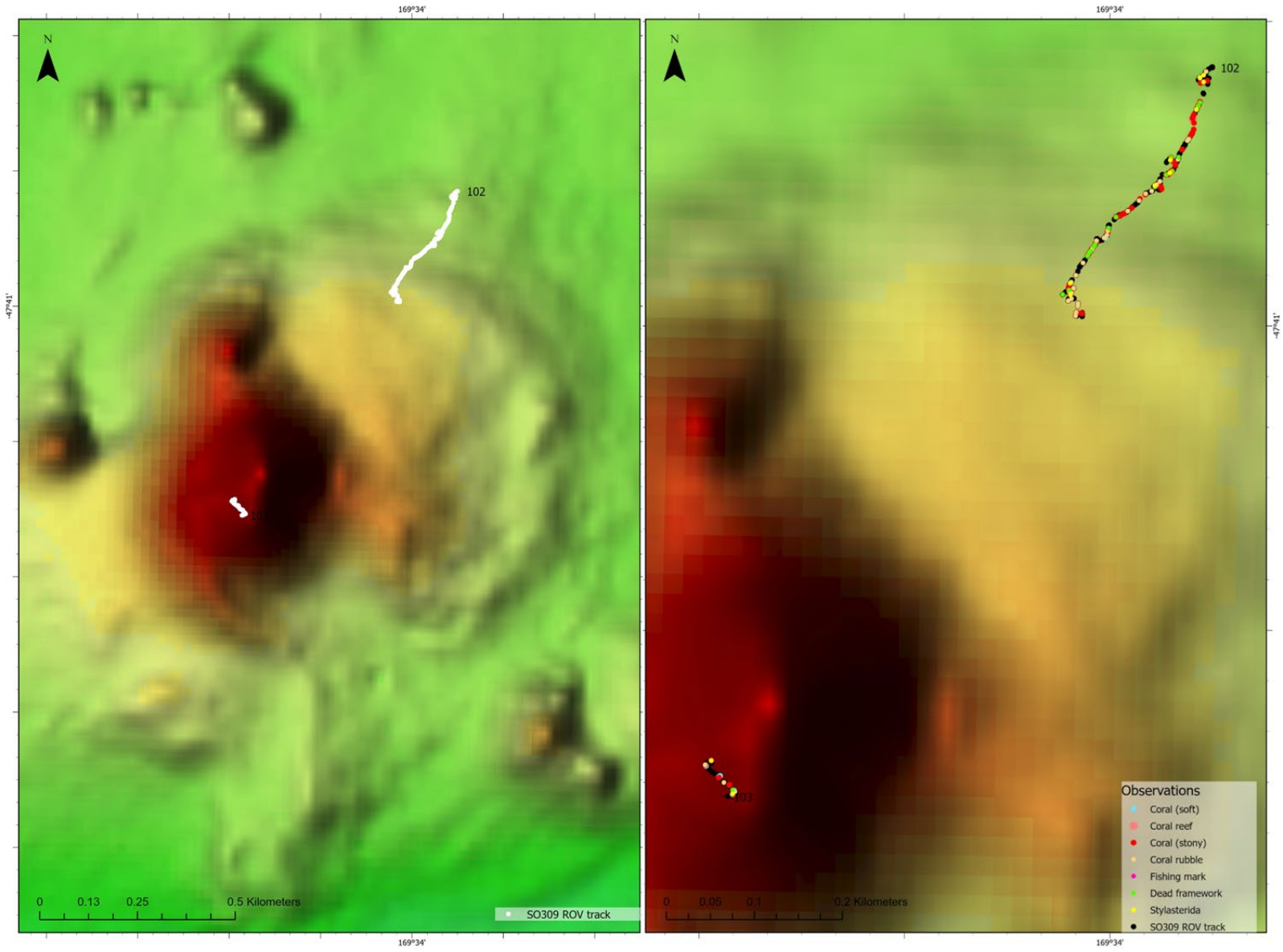

Figure 2-1: Location of ROV dives 102 and 103 at the Rakiura Hills study area. Left: ROV dive tracks. Right: close-up of dive tracks with some real-time observations of corals and coral substrates. See Figure 1-2 for overview map.

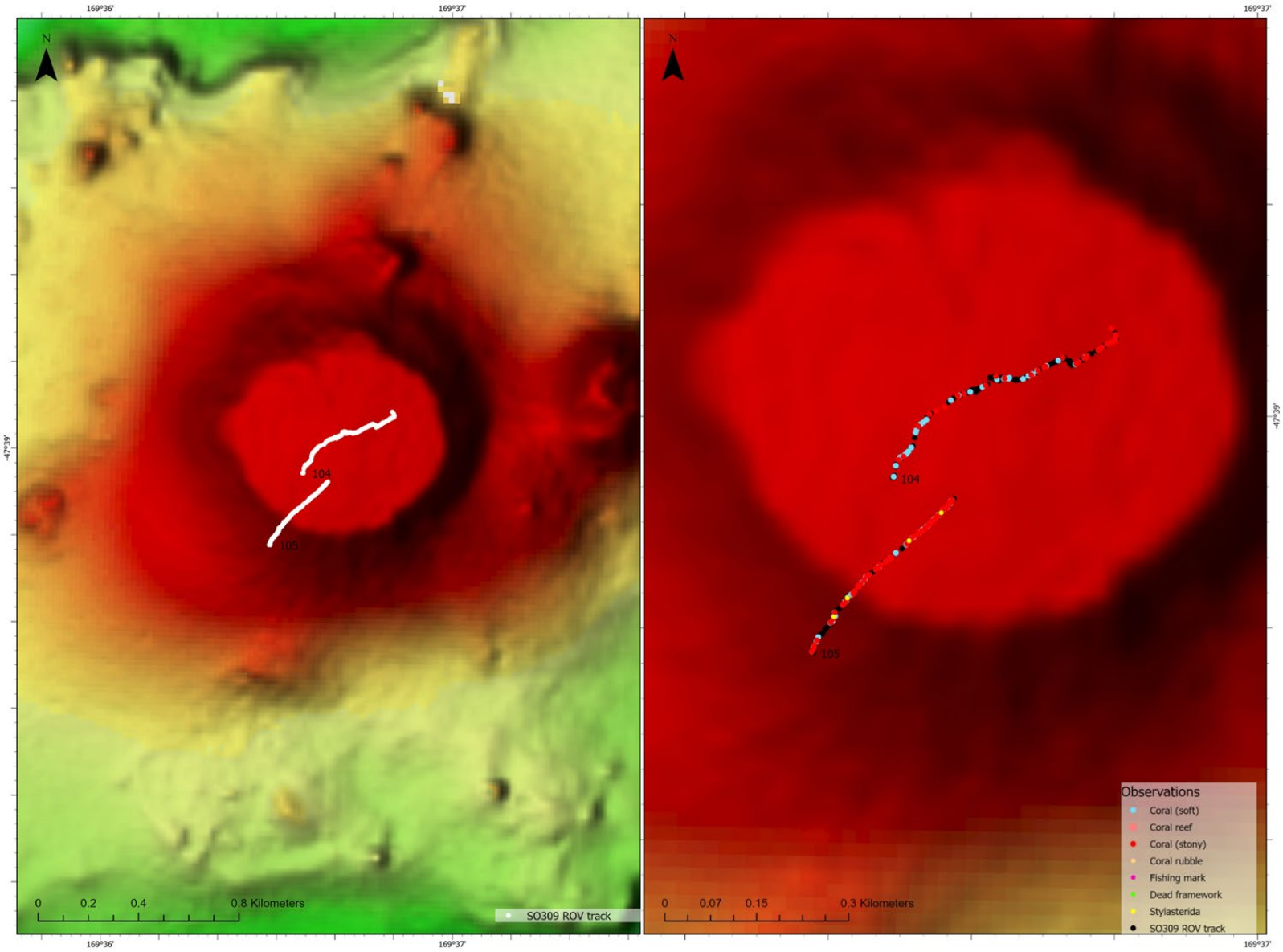

Figure 2-2: Location of ROV dives 104 and 105 at the Rakiura Hills study area. Left: ROV dive tracks. Right: close-up of dive tracks with some real-time observations of corals and coral substrates. See Figure 1-2 for overview map.

2.2 Fiordland

Six ROV dives were successfully completed within the Fiordland area; one in each of Central Thompson Sound (Figure 2-3), Doubtful Sound (Figure 2-4), Acheron Passage (Figure 2-5) and Dusky Sound (Figure 2-6) and two outside Milford Sound (Figure 2-7, Figure 2-8). In addition, two OFOS deployments were conducted in the Fiordland area: one in Thompson Sound and one outside of Thompson Sound.

A total of 31 coral voucher specimens were deposited in the NIC from the Fiordland area (Table 2-1), nine coral specimens were provided to Senckenberg am Meer, MARUM and GEOMAR for geochemical analyses (Table 2-2), and 15 specimens were provided to Senckenberg am Meer for DNA sequencing (Table 2-3). In addition, 15 specimens were collected for future histological analyses (Table 2-4) and six live coral specimens were transferred to NIWA's Marine Environmental Manipulation Facility in Wellington (Table 2-5).

Observations include multiple encounters with the most enigmatic corals of the Fiordland Marine Area (as listed in Kelly et al. 2021); the tall black coral *Antipathella fiordensis* was sighted during every dive, and the locally abundant, often bright red hydrocoral *Errina novaezelandiae* was seen on some of the exposed steep walls and during ROV Dive 110 outside Milford Sound. Cairns (1995) has previously listed nine scleractinian hard coral species from the area, those records in most cases providing the shallowest depth records for these species; the solitary corals *Aulocyathus recidivus, Culicia rubeola, Caryophyllia profunda, Desmophyllum dianthus, Monomyces rubrum,* and the branching forms of *Balanophyllia gigas*, *Dendrophyllia alcocki, Eguchipsammia japonica* and *Madrepora oculata* were all at least reported from 'off Fiordland' and shallow depths (<300 m). Some of these names were used to identify corals during live OFOS and ROV observations but are pending authoritative taxonomic identification of the images and specimens collected. Two specimens collected as *Madrepora* cf. *oculata* during Dives 106 and 108 (Figure 2-9) displayed a more robust form and require confirmation of genus and species identifications by taxonomic experts. A soft coral observed and collected from steep rocky walls during ROV Dives 108 and 109 are undergoing taxonomic examination and likely belong to a new species or genus that will be formally presented in the near future (S. Korfhage pers. comm.)

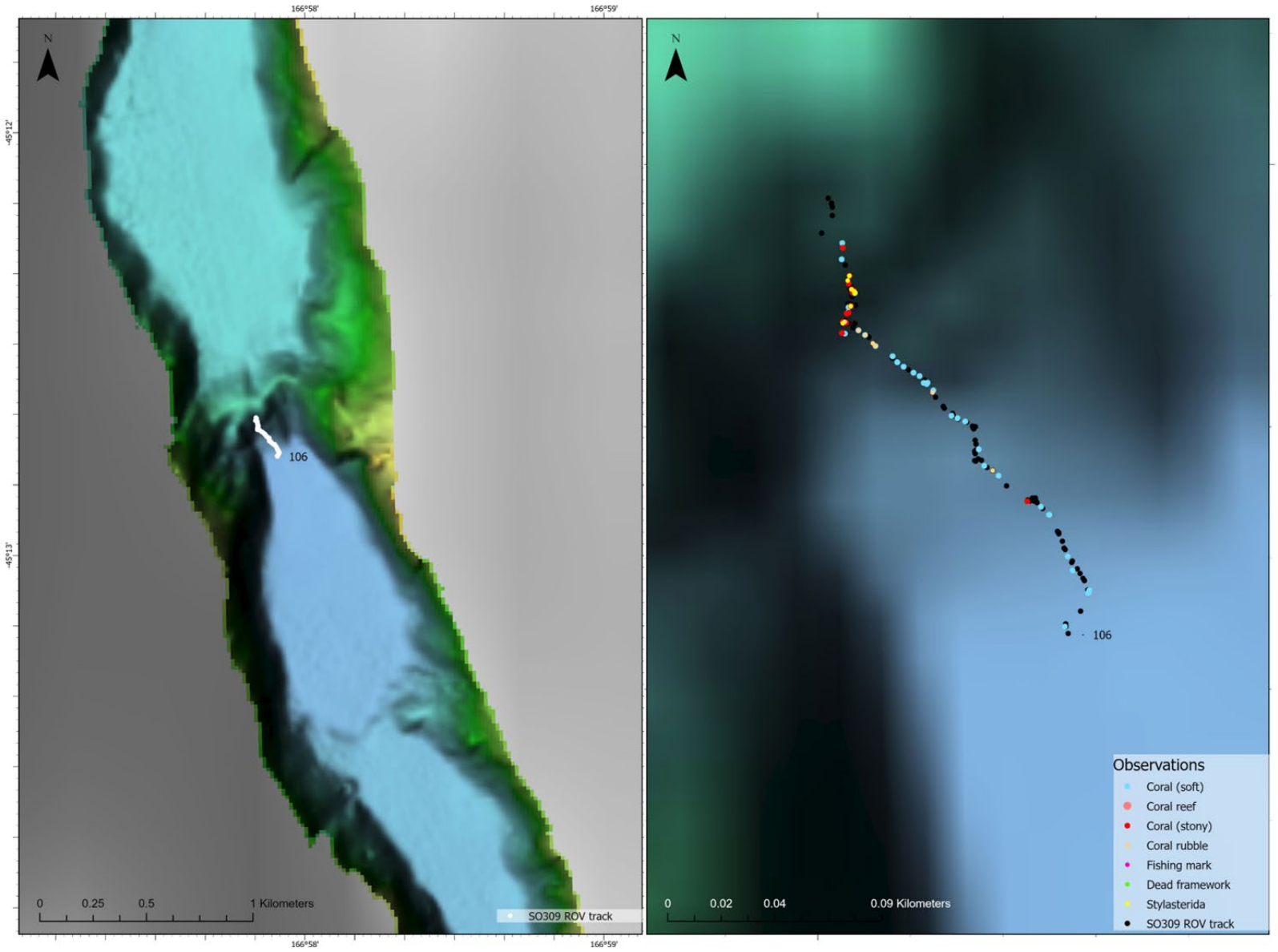

Figure 2-3: Location of Thompson Sound dive 106. Left: ROV dive tracks. Right: close-up of dive tracks with some real-time observations of corals and coral substrates. See Figure 1-3 for overview map.

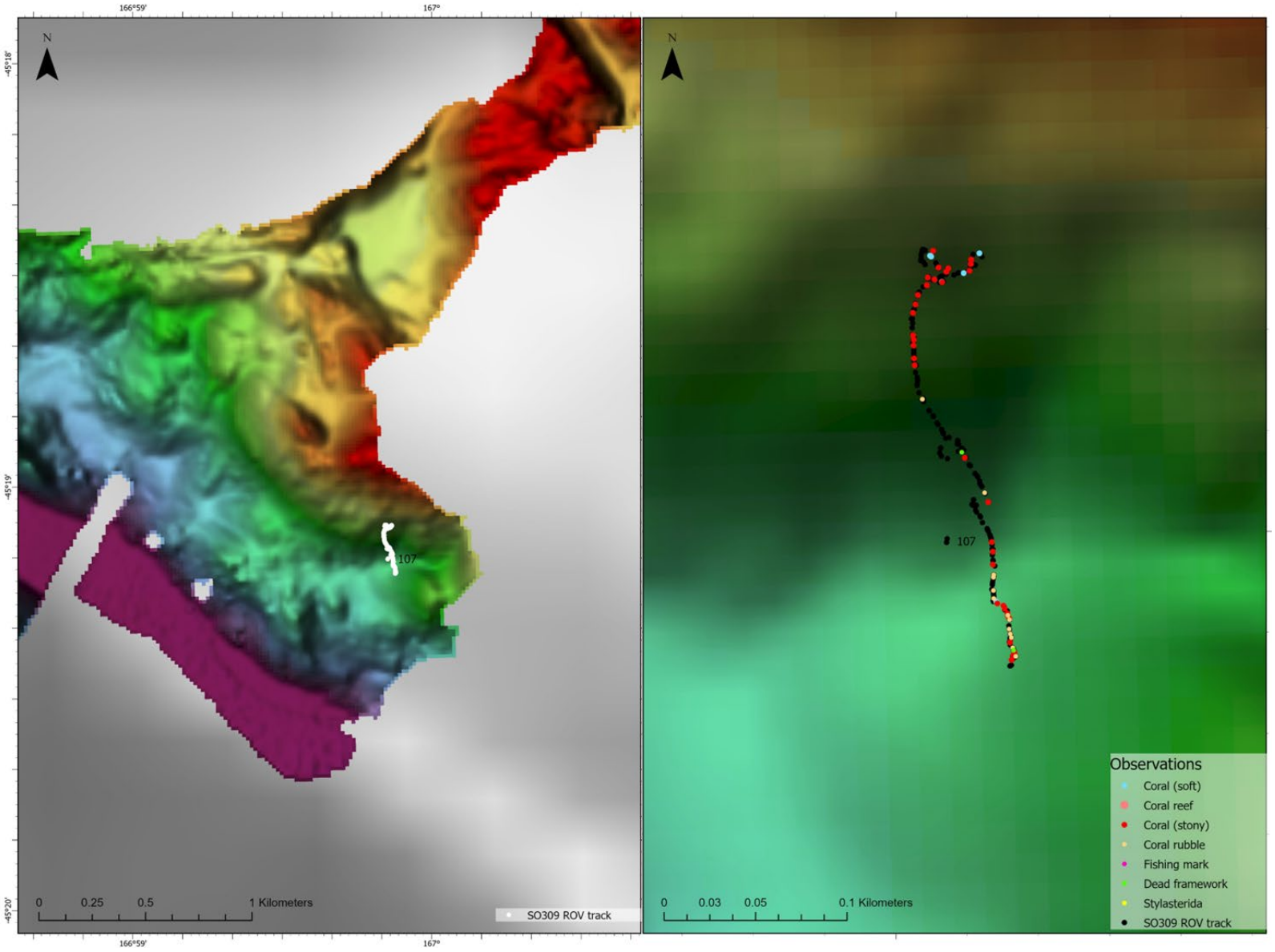

Figure 2-4: Location of Doubtful Sound dive 107. Left: ROV dive tracks. Right: close-up of dive tracks with some real-time observations of corals and coral substrates. See Figure 1-3 for overview map.

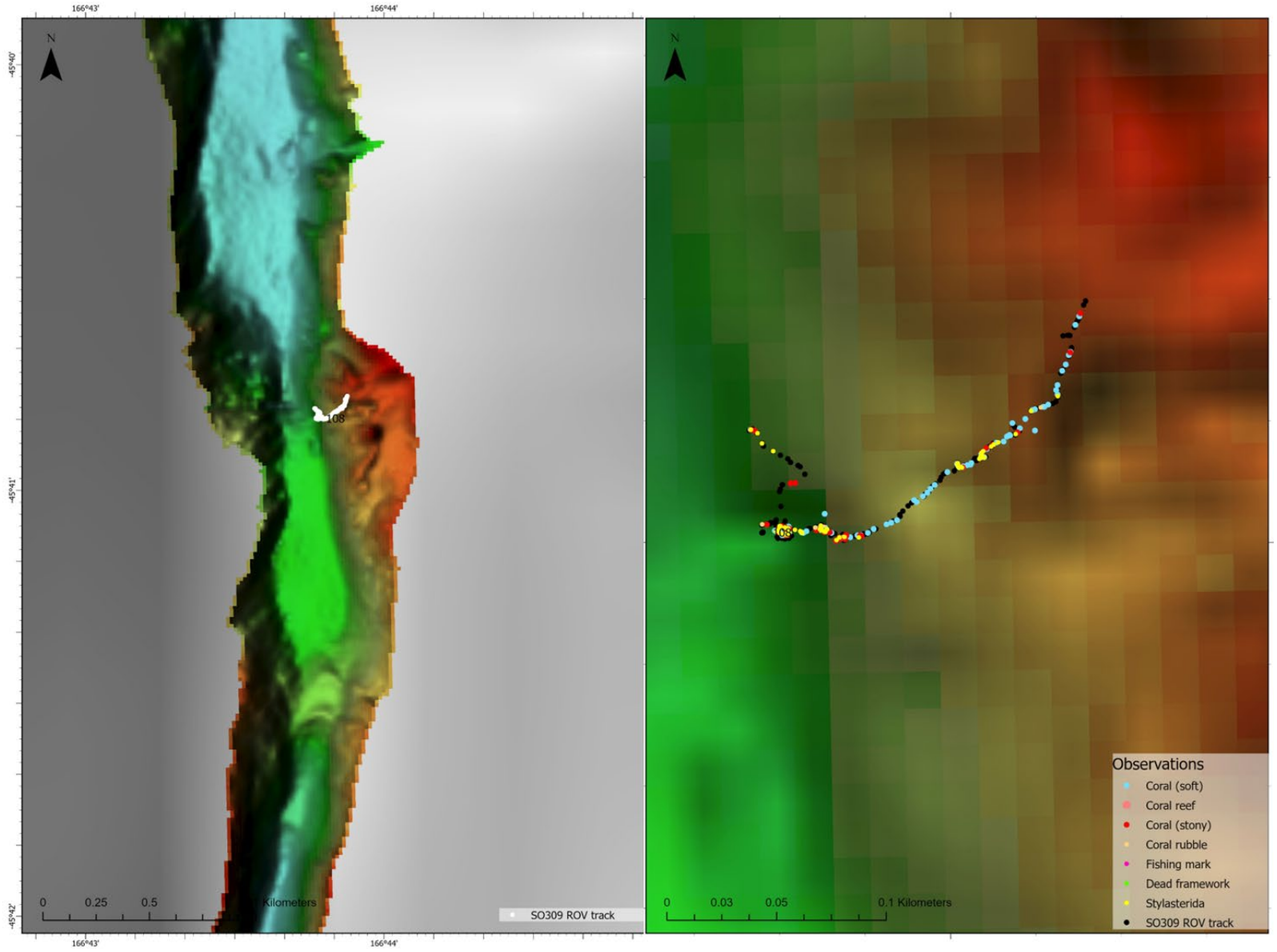

Figure 2-5: Location of Acheron Passage dive 108. Left: ROV dive tracks. Right: close-up of dive tracks with some real-time observations of corals and coral substrates. See Figure 1-3 for overview map.

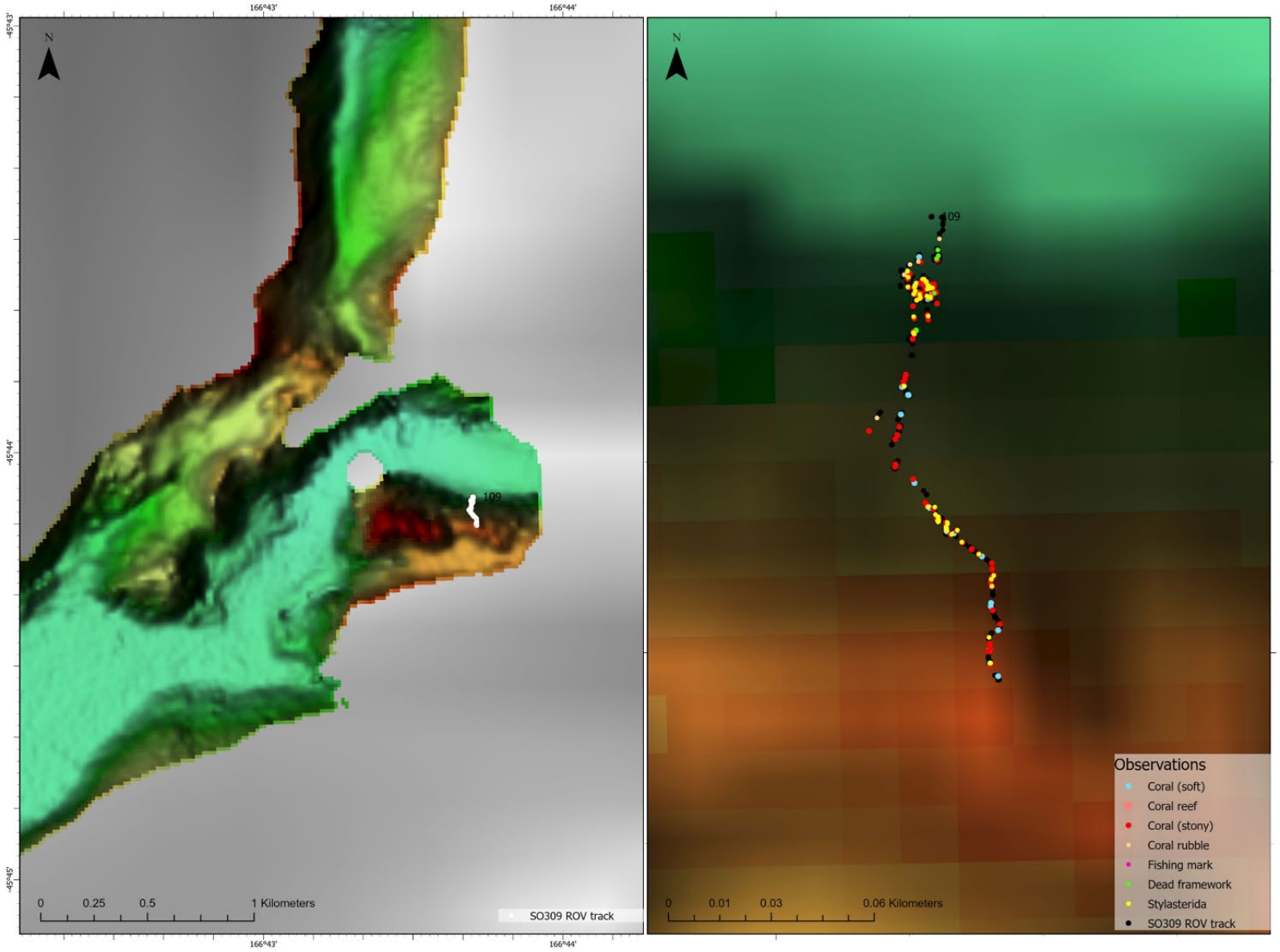

Figure 2-6: Location of Dusky sound dive 109. Left: ROV dive tracks. Right: close-up of dive tracks with some real-time observations of corals and coral substrates. See Figure 1-3 for overview map.

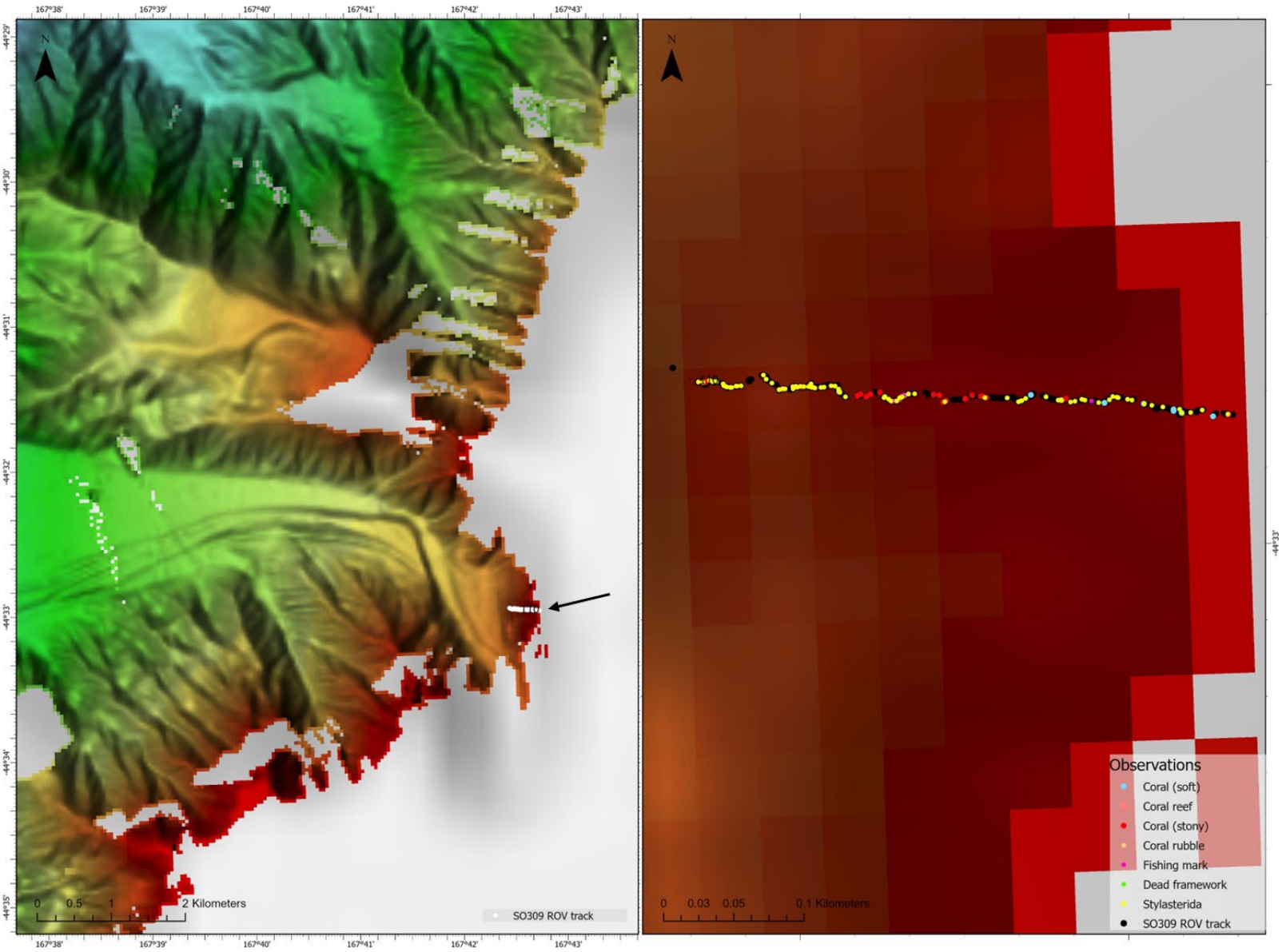

Figure 2-7: Location of "Off Milford Sound" dive 110. Left: ROV dive tracks. Right: close-up of dive tracks with some real-time observations of corals and coral substrates. See Figure 1-3 for overview map.

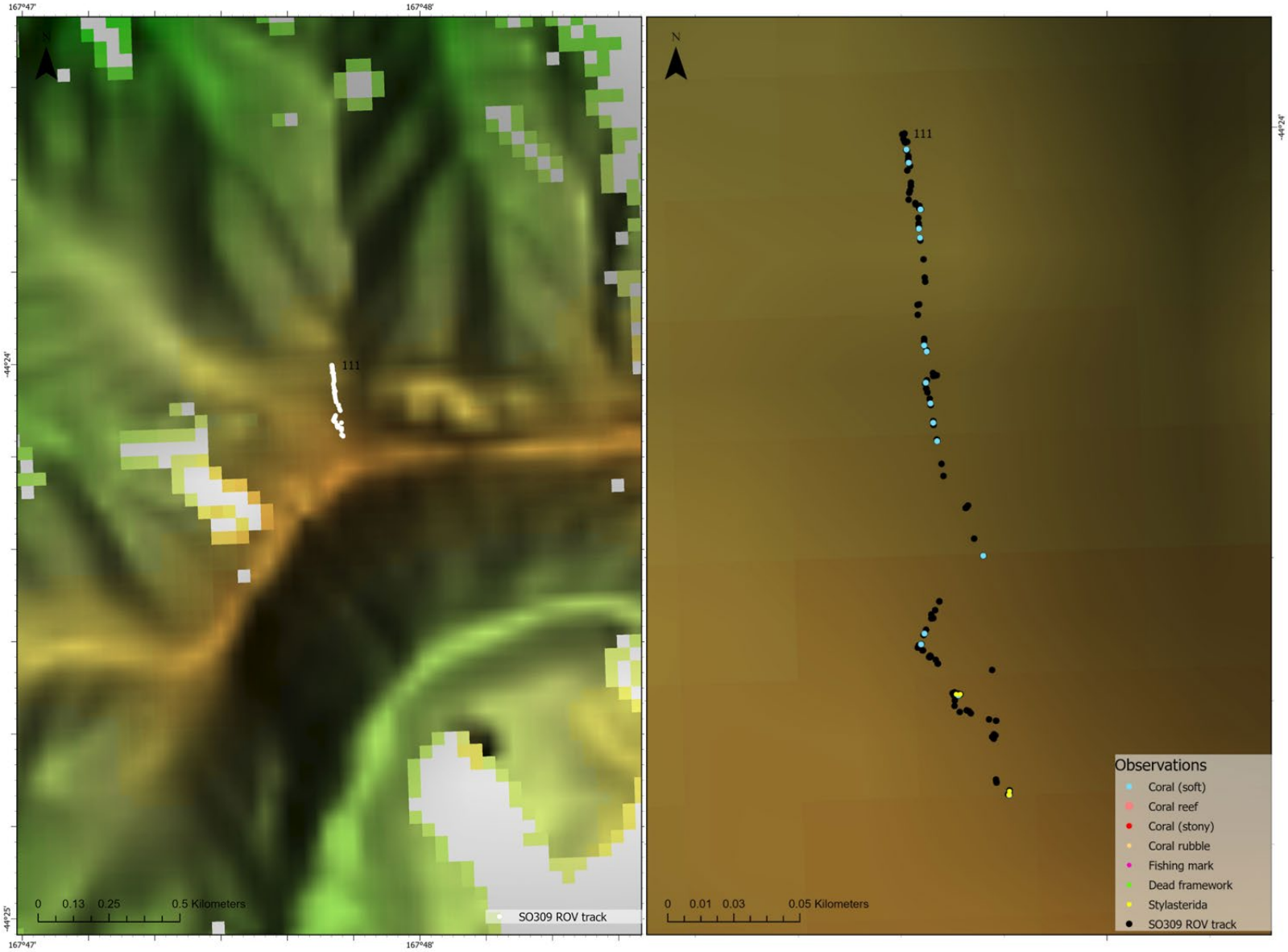

Figure 2-8: Location of "Off Milford Sound" dive 111. Left: ROV dive tracks. Right: close-up of dive tracks with some real-time observations of corals and coral substrates. See Figure 1-3 for overview map.

Figure 2-9: Two specimens of *Madrepora* cf. *oculata* collected from Fiordland. These specimens require confirmation of genus and species identification by taxonomic experts. Left: SO309_44-1_Dive108_Sample5. Right image: SO309_44_1_Dive106_sample 5.

2.3 Chatham Rise

Seven ROV dives were successfully completed in the Chatham Rise study area; three on Ghoul (Figure 2-10 shows two of the dives, the remaining dive was a 3D mapping dive covering a small area with no real-time observations recorded), and one dive on each of the following: the south ridge of Morgue (Figure 2-11), Diabolical (Figure 2-12), a known *Goniocorella* reef site on the crest of the rise (Figure 2-13), and the Reserve bank (Figure 2-14).

In addition, 29 OFOS towed camera transects were conducted within the Graveyard Knoll complex. The aim of these towed camera dives was to reconnoitre proposed ROV dives to check for fishing gear and to replicate previous towed camera transects to continue a time-series study into the recovery of corals from fishing disturbances. A summary of OFOS transects and observations are described below (Section 3) and in Appendix C.

A total of 53 coral voucher specimens were collected for the NIC from the Chatham Rise area (Table 2-1), 19 coral specimens were provided to Senckenberg am Meer, MARUM and GEOMAR for geochemical analyses (Table 2-2), and 15 specimens were provided to Senckenberg am Meer for DNA sequencing (Table 2-3). In addition, 18 specimens were collected for future histological analyses (Table 2-4) and 17 live coral specimens were transferred to NIWA's Marine Environmental Manipulation Facility in Wellington (Table 2-5).

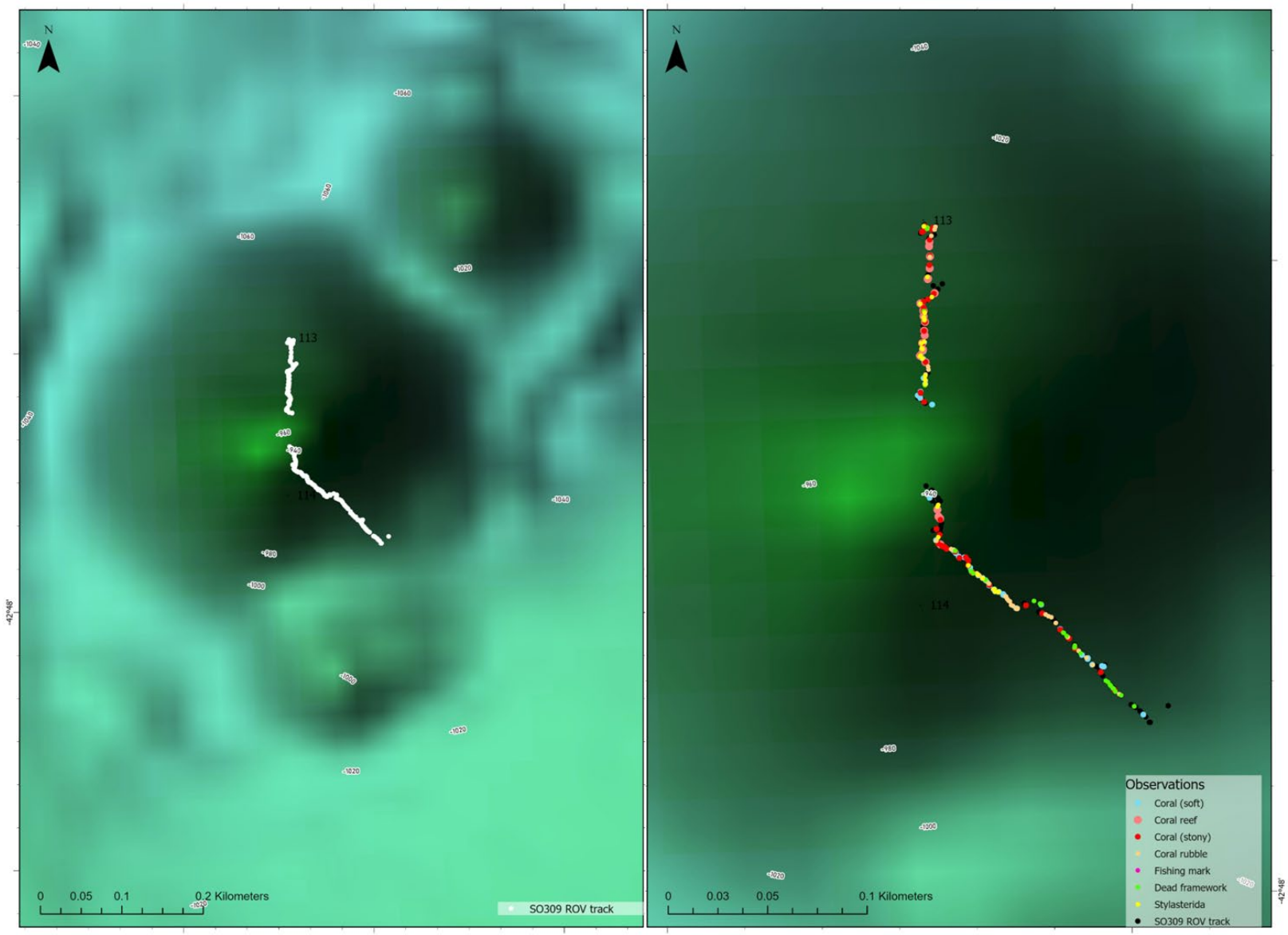

Figure 2-10: Location of the ROV dives 112 and 113 on Ghoul. Left: ROV track. Right: Real-time observations of coral, coral substrates, and fishing gear. See Figure 1-5 for overview map

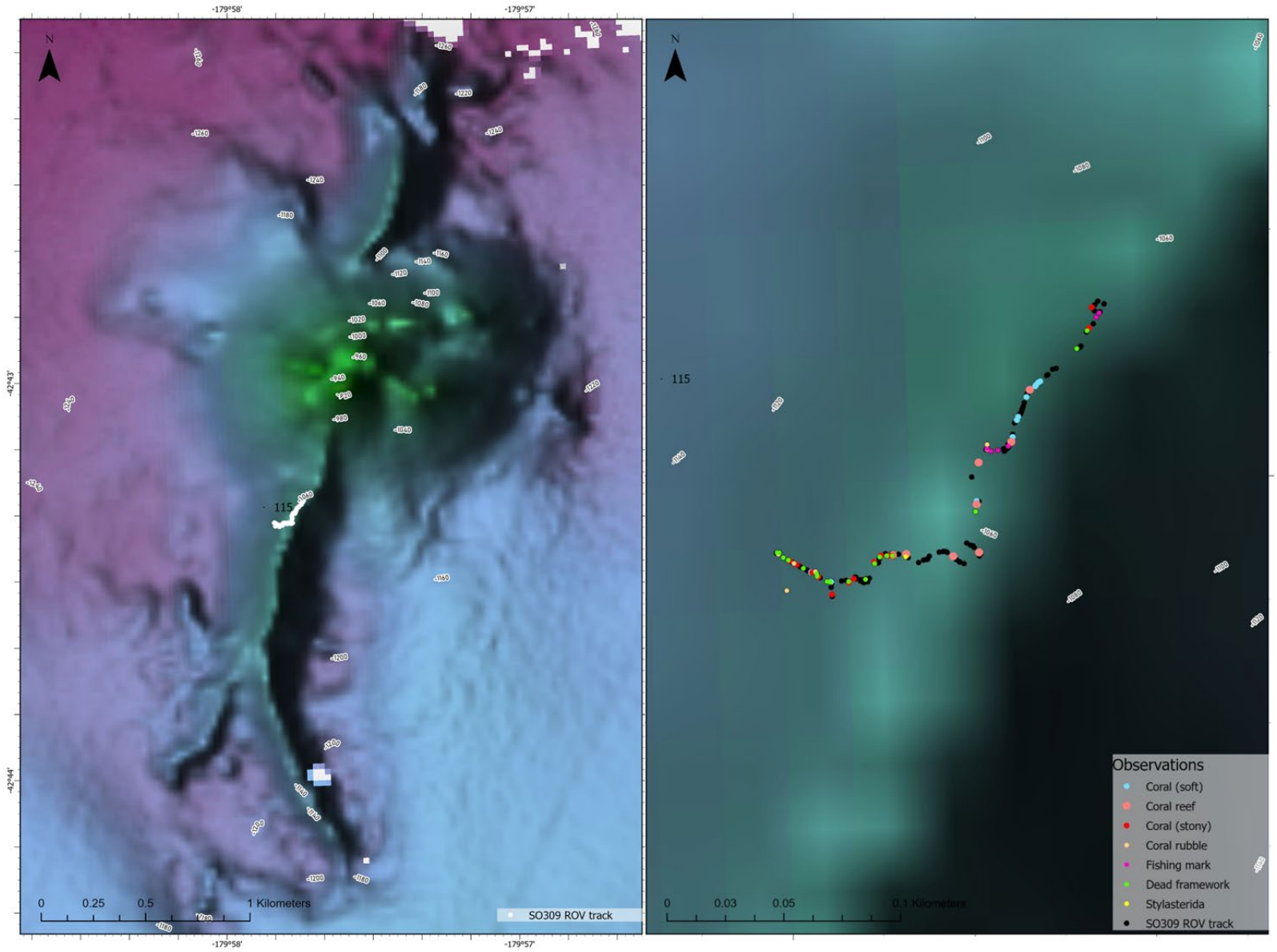

Figure 2-11: Location of the ROV dive 115 on the south ridge of Morgue. Left: ROV track. Right: Real-time observations of coral, coral substrates, and fishing gear. See Figure 1-5 for overview map.

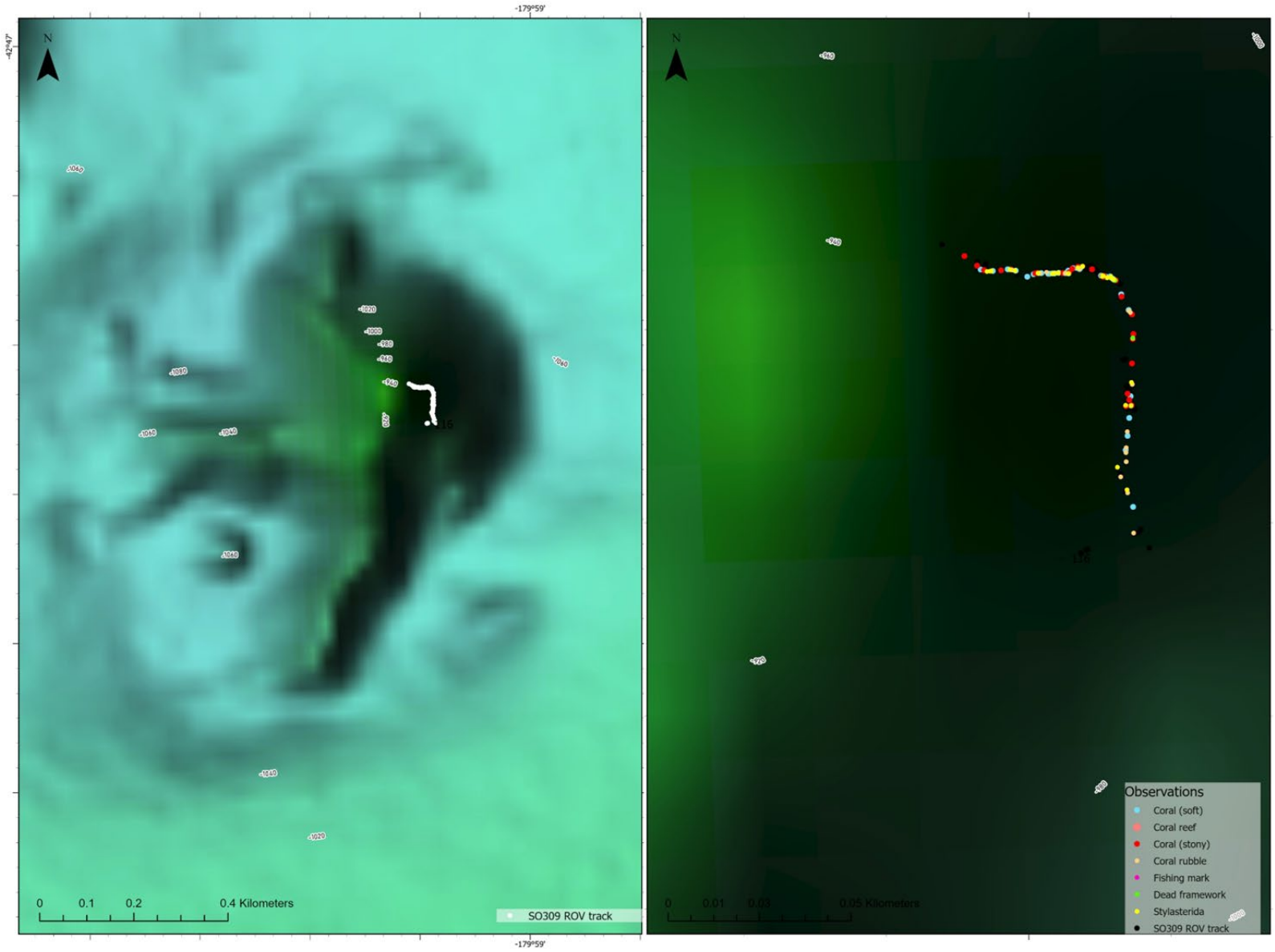

Figure 2-12: Location of the ROV dive 116 on Diabolical. Left: ROV track. Right: Real-time observations of coral, coral substrates, and fishing gear. See Figure 1-5 for overview map.

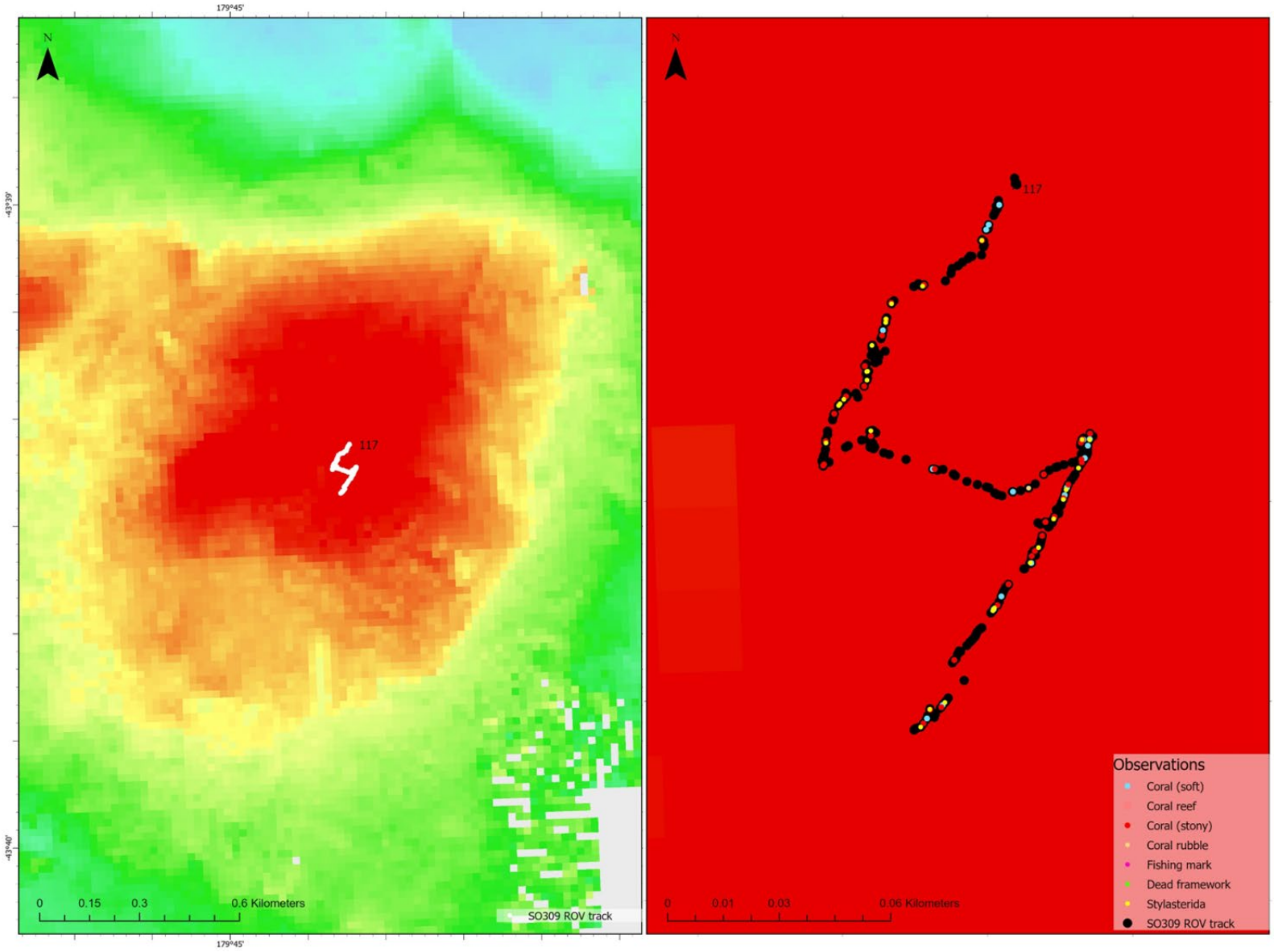

Figure 2-13: Location of the ROV dive 117 on the crest of the Chatham Rise: *Goniocorella* site. Left: ROV track. Right: Real-time observations of coral, coral substrates, and fishing gear. See Figure 1-4 for overview map.

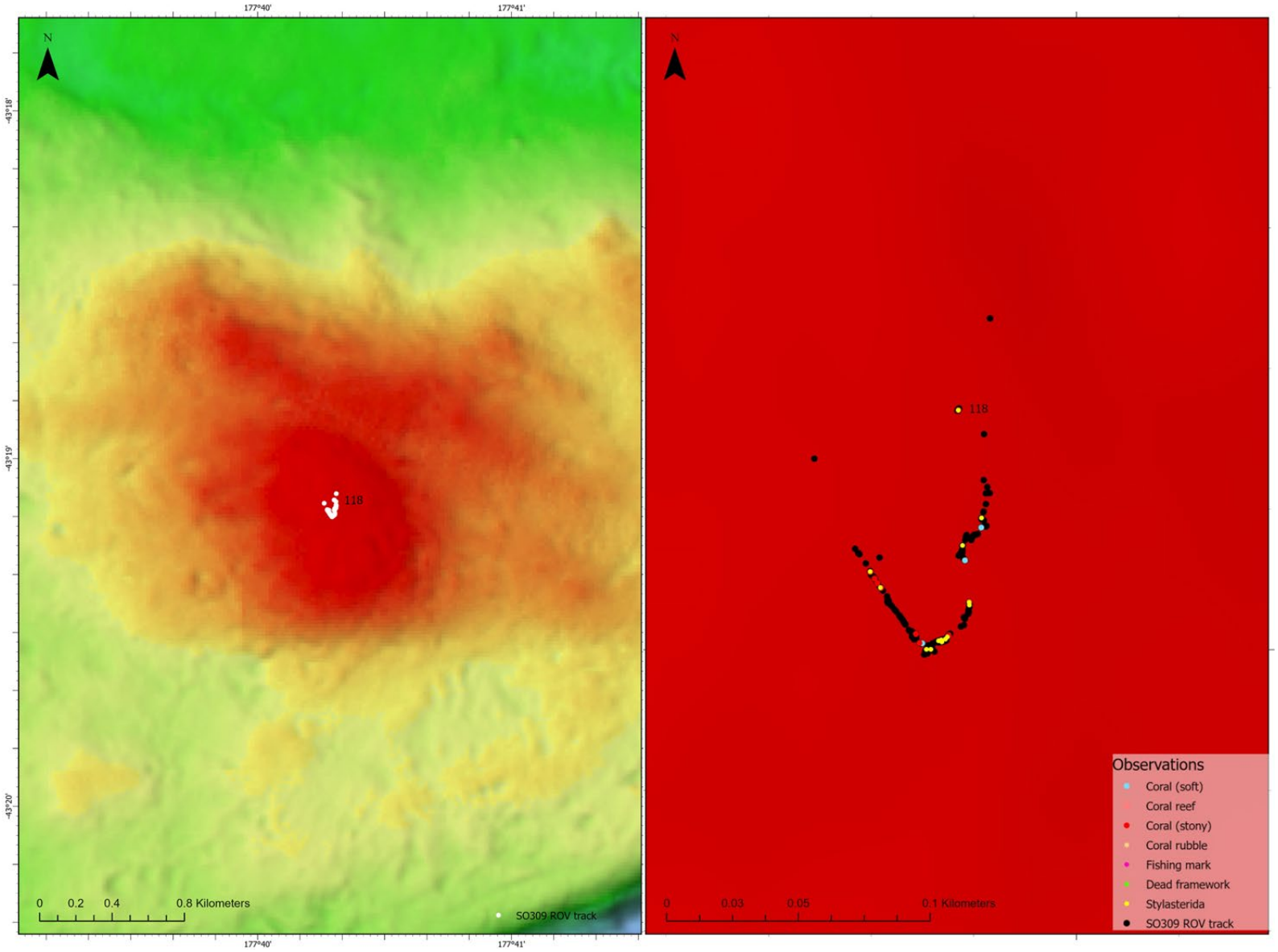

Figure 2-14: Location of the ROV dive 118 at the Reserve Bank on the crest of the Chatham Rise. Left: ROV track. Right: Real-time observations of coral, coral substrates, and fishing gear. See Figure 1-4 for overview map.

Table 2-1: Voucher specimens deposited in the NIWA Invertebrate Collection (NIC).

Place name	Order	Family	Preferred Taxon	Station ID	Count of NIWA Catalog Number
Rakiura Hills	Scleractinia	Caryophylliidae	*Caryophyllia*	SO309_21	1
		Dendrophylliidae	*Enallopsammia rostrata*	SO309_12	4
				SO309_16	1
		Flabellidae	*Flabellum knoxi*	SO309_21	1
	Anthoathecata	Stylasteridae	*Conopora verrucosa*	SO309_12	1
				SO309_7	1
			Conopora verrucosa	SO309_15	1
			Errina bicolor	SO309_7	1
			Errina cheilopora	SO309_12	1
			Stylasteridae	SO309_12	1
				SO309_7	2
				SO309_15	1
				SO309_30	1
	Malacalcyonacea		Malacalcyonacea	SO309_30	1
		Acanthogorgiidae	*Acanthogorgia*	SO309_21	3
		Melithaeidae	*Iciligorgia*	SO309_21	2
		Plexauridae	Plexauridae	SO309_15	3
				SO309_21	2
		Tubiporidae	*Rhodelinda*	SO309_30	1
			Telesto	SO309_15	3
				SO309_21	1
	Leptothecata	Plumulariidae	Plumulariidae	SO309_15	1
	Scleralcyonacea	Primnoidae	*Metafannyella*	SO309_15	1
			Thouarella	SO309_15	1
			Thouarella	SO309_30	4
			Octocorallia	SO309_15	1
Fiordland, Acheron Passage	Malacalcyonacea	Acanthogorgiidae	Acanthogorgiidae	SO309_56	1
		Nephtheidae	Nephtheidae	SO309_56	1
Fiordland, Central Thompson Sound	Scleractinia	Dendrophylliidae	*Balanophyllia*	SO309_44	1
			Eguchipsammia	SO309_44	1
		Oculinidae	*Madrepora oculata*	SO309_44	1
	Anthoathecata	Stylasteridae	*Stylaster eguchii*	SO309_44	2
	Scleralcyonacea	Echinoptilidae	*Echinoptilum*	SO309_44	2

Place name	Order	Family	Preferred Taxon	Station ID	Count of NIWA Catalog Number
Fiordland, Doubtful Sound	Antipatharia	Myriopathidae	*Antipathella fiordensis*	SO309_49	1
	Scleractinia	Caryophylliidae	*Caryophyllia*	SO309_49	1
		Dendrophylliidae	*Eguchipsammia*	SO309_49	1
		Oculinidae	*Madrepora oculata*	SO309_49	1
	Malacalcyonacea	Clavulariidae	*Clavularia*	SO309_49	3
Fiordland, Dusky Sound	Scleractinia	Dendrophylliidae	*Eguchipsammia*	SO309_61	1
	Anthoathecata	Stylasteridae	*Stylaster eguchii*	SO309_61	1
	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia*	SO309_61	1
		Alcyoniidae	*Anthomastus*	SO309_61	2
outside Milford Sound	Anthoathecata	Stylasteridae	*Errina cheilopora*	SO309_63	1
			Errina novaezelandiae	SO309_63	1
			Stylaster eguchii	SO309_63	4
	Malacalcyonacea		Malacalcyonacea	SO309_63	1
		Clavulariidae	Clavulariidae	SO309_63	2
		Plexauridae	Plexauridae	SO309_63	1
Ghoul, Graveyard Knolls	Scleractinia	Caryophylliidae	*Caryophyllia*	SO309_75	1
			Solenosmilia variabilis	SO309_75	2
	Anthoathecata	Stylasteridae	*Calyptopora*	SO309_89	1
			Stylasteridae	SO309_84	2
				SO309_89	5
	Malacalcyonacea	Alcyoniidae	*Anthomastus zealandicus*	SO309_89	1
		Plexauridae	Plexauridae	SO309_89	3
	Scleralcyonacea	Primnoidae	*Tokoprymno*	SO309_75	2
Morgue, Graveyard Knolls	Scleractinia	Caryophylliidae	*Solenosmilia variabilis*	SO309_93	1
Diabolical, Graveyard Knolls	Scleractinia	Caryophylliidae	*Caryophyllia*	SO309_97	1
				SO309_98	1
	Anthoathecata	Stylasteridae	Stylasteridae	SO309_97	6
				SO309_98	2
	Malacalcyonacea	Alcyoniidae	Alcyoniidae	SO309_97	1
		Clavulariidae	Clavulariidae	SO309_97	2
		Victorgorgiidae	*Victorgorgia*	SO309_98	2
	Scleralcyonacea	Mopseidae	Mopseinae	SO309_98	1

Place name	Order	Family	Preferred Taxon	Station ID	Count of NIWA Catalog Number
		Primnoidae	*Tokoprymno*	SO309_97	1
				SO309_98	4
Central Chatham Rise	Scleractinia	Caryophylliidae	*Caryophyllia*	SO309_108	2
			Goniocorella dumosa	SO309_108	2
	Anthoathecata	Stylasteridae	*Errina*	SO309_108	1
			Stylasteridae	SO309_108	4
			Octocorallia	SO309_108	1
	Malacalcyonacea	Clavulariidae	Clavulariidae	SO309_108	1
		Tubiporidae	Telesto	SO309_108	1
	Scleralcyonacea	Primnoidae	Primnoidae	SO309_108	2
Grand Total					125

Subsamples provided for other studies:

Table 2-2: Samples provided to Senckenberg am Meer, MARUM and GEOMAR for geochemical analyses.

Place name	Order	Family	Preferred Taxon	Station ID	Count of NIWA Catalog Number
Rakiura Hills	Scleractinia	Caryophylliidae	*Desmophyllum dianthus*	SO309_12	1
				SO309_15	3
				SO309_30	1
		Dendrophylliidae	*Enallopsammia rostrata*	SO309_12	4
				SO309_16	1
		Flabellidae	*Flabellum knoxi*	SO309_21	1
	Anthoathecata	Stylasteridae	Stylasteridae	SO309_7	1
	Malacalcyonacea	Melithaeidae	*Iciligorgia*	SO309_21	1
		Plexauridae	Plexauridae	SO309_21	2
Fiordland, Acheron Passage	Scleractinia	Oculinidae	*Madrepora oculata*	SO309_56	1
Fiordland, Central Thompson Sound	Scleractinia	Dendrophylliidae	*Balanophyllia*	SO309_44	2
			Eguchipsammia	SO309_44	2
		Oculinidae	*Madrepora oculata*	SO309_44	1
	Anthoathecata	Stylasteridae	*Stylaster eguchii*	SO309_44	1
Fiordland, Doubtful Sound	Scleractinia	Oculinidae	*Madrepora oculata*	SO309_49	1
Fiordland, Dusky Sound	Scleractinia	Dendrophylliidae	*Eguchipsammia*	SO309_61	1
Ghoul, Graveyard Knolls	Scleractinia	Caryophylliidae	*Solenosmilia variabilis*	SO309_75	2
				SO309_84	1
					2
				SO309_89	4
	Anthoathecata	Stylasteridae	Stylasteridae	SO309_89	1
	Scleralcyonacea	Mopseidae	Mopseidae	SO309_89	1
Morgue, Graveyard Knolls	Scleractinia	Caryophylliidae	*Solenosmilia variabilis*	SO309_93	2
					1
Diabolical, Graveyard Knolls	Scleractinia		*Scleractinia*	SO309_98	1
		Dendrophylliidae	*Enallopsammia rostrata*	SO309_97	1
		Oculinidae	*Madrepora oculata*	SO309_98	2
Central Chatham Rise	Scleractinia	Caryophylliidae	*Goniocorella dumosa*	SO309_108	1
Grand Total					44

Table 2-3: Samples provided to Senckenberg am Meer for DNA sequencing.

Place name	Order	Family	Preferred Taxon	Sation ID	Count of NIWA Catalog Number
Rakiura Hills	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia*	SO309_21	1
		Melithaeidae	*Iciligorgia*	SO309_21	2
		Plexauridae	*Plexauridae*	SO309_21	1
		Tubiporidae	*Rhodelinda*	SO309_30	1
	Scleralcyonacea	Primnoidae	*Thouarella*	SO309_15	1
			Thouarella	SO309_30	3
Fiordland, Acheron Passage	Malacalcyonacea	Nephtheidae	*Nephtheidae*	SO309_56	1
Fiordland, Central Thompson Sound	Scleractinia	Dendrophylliidae	*Balanophyllia*	SO309_44	2
			Eguchipsammia	SO309_44	1
		Oculinidae	*Madrepora oculata*	SO309_44	1
	Scleralcyonacea	Echinoptilidae	*Echinoptilum*	SO309_44	2
Fiordland, Doubtful Sound	Antipatharia	Myriopathidae	*Antipathella fiordensis*	SO309_49	1
	Scleractinia	Oculinidae	*Madrepora oculata*	SO309_49	1
	Malacalcyonacea	Clavulariidae	*Clavularia*	SO309_49	2
Fiordland, Dusky Sound	Scleractinia	Dendrophylliidae	*Eguchipsammia*	SO309_61	1
	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia*	SO309_61	1
		Alcyoniidae	*Anthomastus*	SO309_61	1
outside Milford Sound	Malacalcyonacea		*Malacalcyonacea*	SO309_63	1
Ghoul , Graveyard Knolls	Malacalcyonacea	Plexauridae	*Plexauridae*	SO309_89	2
		Clavulariidae	*Clavulariidae*	SO309_63	2
Diabolical , Graveyard Knolls	Scleractinia	Dendrophylliidae	*Enallopsammia rostrata*	SO309_97	1
				SO309_98	1
		Oculinidae	*Madrepora oculata*	SO309_98	2
	Malacalcyonacea	Alcyoniidae	*Alcyoniidae*	SO309_97	1
		Victorgorgiidae	*Victorgorgia*	SO309_98	1
	Scleralcyonacea	Primnoidae	*Tokoprymno*	SO309_98	4
Central Chatham Rise	Malacalcyonacea	Clavulariidae	*Clavulariidae*	SO309_108	1
Grand Total					39

Table 2-4: Specimens taken for histological examinations.

Place name	Order	Family	Preferred Taxon	Station ID	Count of NIWA Catalog Number
Rakiura Hills	Scleractinia	Caryophylliidae	*Desmophyllum dianthus*	SO309_15	1
				SO309_30	2
		Dendrophylliidae	*Enallopsammia rostrata*	SO309_12	3
				SO309_16	1
		Flabellidae	*Flabellum knoxi*	SO309_21	1
	Anthoathecata	Stylasteridae	*Errina cheilopora*	SO309_12	1
	Malacalcyonacea	Acanthogorgiidae	*Acanthogorgia*	SO309_21	1
		Melithaeidae	*Iciligorgia*	SO309_21	2
			Plexauridae	SO309_15	1
				SO309_21	2
	Scleralcyonacea	Primnoidae	*Thouarella*	SO309_15	1
				SO309_30	3
		Tubiporidae	*Rhodelinda*	SO309_30	1
Fiordland, Acheron Passage	Scleractinia	Oculinidae	*Madrepora oculata*	SO309_56	1
	Anthoathecata	Stylasteridae	*Conopora*	SO309_56	1
			Stylaster eguchii	SO309_56	1
Fiordland, Central Thompson Sound	Scleractinia	Dendrophylliidae	*Eguchipsammia*	SO309_44	1
		Oculinidae	*Madrepora oculata*	SO309_44	1
Fiordland, Doubtful Sound	Antipatharia	Myriopathidae	*Antipathella fiordensis*	SO309_49	1
	Scleractinia	Oculinidae	*Madrepora oculata*	SO309_49	1
Fiordland, Dusky Sound	Scleractinia	Caryophylliidae	*Caryophyllia*	SO309_61	1
	Anthoathecata	Stylasteridae	*Stylaster eguchii*	SO309_61	1
outside Milford Sound	Anthoathecata	Stylasteridae	*Errina cheilopora*	SO309_63	1
			Errina novaezelandiae	SO309_63	1
			Stylaster eguchii	SO309_63	3
	Malacalcyonacea		*Malacalcyonacea*	SO309_63	1
Ghoul , Graveyard Knolls	Scleractinia	Caryophylliidae	*Caryophyllia*	SO309_75	1
			Solenosmilia variabilis	SO309_84	2
				SO309_89	2

Place name	Order	Family	Preferred Taxon	Station ID	Count of NIWA Catalog Number
Morgue , Graveyard Knolls	Scleractinia	Caryophylliidae	*Solenosmilia variabilis*	SO309_93	1
Diabolical , Graveyard Knolls	Scleractinia	Dendrophylliidae	*Enallopsammia rostrata*	SO309_97	2
				SO309_98	1
		Oculinidae	*Madrepora oculata*	SO309_98	2
	Anthoathecata	Stylasteridae	*Stylasteridae*	SO309_97	1
				SO309_98	1
Central Chatham Rise	Scleractinia	Caryophylliidae	*Goniocorella dumosa*	SO309_108	5
Grand Total					56

Table 2-5: Live coral specimens collected during SO309. Specimens were transferred to NIWA's Marine Experimental Manipulation Facility on return to Wellington.

Collection location	Station number	Collection method	Collection date	Species	Sample
Fiordland, Thompson Inlet	SO309_44-1	ROV dive 106	27/01/2025	*Madrepora* cf. *oculata*	GeoB26344_6, #5
Fiordland, Doubtful sound	SO309_49-1	ROV dive 107	28/01/2025	*Madrepora oculata*	GeoB26349_8, #7
Fiordland, Doubtful sound	SO309_49-1	ROV dive 107	28/01/2025	*Antipathella fiordensis*	GeoB26349_10, #9
Fiordland, Acheron channel	SO309_56-1	ROV dive 108	29/01/2025	*Madrepora* cf. *oculata*	GeoB26356_6, #5
Fiordland, Acheron channel	SO309_56-1	ROV dive 108	29/01/2025	*Madrepora oculata*	GeoB26356_7, #6
Fiordland, Dusky Sound	SO309_61-1	ROV dive 109	30/01/2025	*Madrepora oculata*	GeoB26361_8, #7
Chatham Rise, Ghoul	SO309_75-1	ROV dive 112	6/02/2025	*Solenosmilia variabilis*	GeoB 26375_7, #6
Chatham Rise, Ghoul	SO309_75-1	ROV dive 112	6/02/2025	*Solenosmilia variabilis*	GeoB 26375_9, #8
Chatham Rise, Ghoul	SO309_84-1	ROV dive 113	8/02/2025	*Solenosmilia variabilis*	GeoB 26384_4, #3
Chatham Rise, Ghoul	SO309_84-1	ROV dive 113	8/02/2025	*Solenosmilia variabilis*	GeoB 26384_7, #6
Chatham Rise, Ghoul	SO309_89-1	ROV dive 114	9/02/2025	*Solenosmilia variabilis*	GeoB 26389_6, #5
Chatham Rise, Ghoul	SO309_89-1	ROV dive 114	9/02/2025	*Solenosmilia variabilis (orange)*	GeoB 26389_11, #10
Chatham Rise, Ghoul	SO309_89-1	ROV dive 114	9/02/2025	*Solenosmilia variabilis (white)*	GeoB 26389_11, #10
Chatham Rise, Ghoul	SO309_93-1	ROV dive 115	10/02/2025	*Solenosmilia variabilis*	GeoB26393_7, #6
Chatham Rise, Diabolical	SO309_98-1	ROV dive 116	11/02/2025	*Enallopsammia rostrata*	GeoB26398_6, #5
Chatham Rise, Diabolical	SO309_98-1	ROV dive 116	11/02/2025	*Madrepora oculata*	GeoB 26398_7, #6
Chatham Rise, Diabolical	SO309_98-1	ROV dive 116	11/02/2025	*Enallopsammia rostrata*	GeoB26398_14, #13
Chatham Rise, Diabolical	SO309_98-1	ROV dive 116	11/02/2025	*Madrepora oculata*	GeoB26398_2, #1
Chatham Rise, Diabolical	SO309_97-1	TV Box Core	11/02/2025	*Enallopsammia rostrata*	GeoB26397_1
Chatham Rise, Crest	SO309_103-1	ROV dive 117	12/02/2025	*Goniocorella dumosa*	GeoB26804-16, #15
Chatham Rise, Crest	SO309_103-1	ROV dive 117	12/02/2025	*Goniocorella dumosa*	GeoB26804-5, #4
Chatham Rise, Crest	SO309_103-1	ROV dive 117	12/02/2025	*Goniocorella dumosa*	GeoB26804-9, #8
Chatham Rise, Crest	SO309_103-1	ROV dive 117	12/02/2025	*Goniocorella dumosa*	GeoB26804-14, #13
Chatham Rise, Crest	SO309_103-1	ROV dive 117	12/02/2025	*Goniocorella dumosa*	GeoB26804-2, #1

3 Preliminary observations of OFOS transects at the Graveyard complex

An OFOS survey of four Graveyard features was conducted with the aim of continuing the Graveyard time series of DTIS surveys designed to measure recovery of fauna and habitat after damage caused by intensive bottom trawling prior to the closure of selected features in 2001 (Clark et al. 2022). This latest survey adds data at 24 years from the start of the time series, with previous surveys conducted in 2001, 2006, 2009, 2015, and 2020 (Table 3-1).

Methods for previous surveys are detailed in Clark et al. (2021) but, in brief, DTIS was used to collect video data and high-definition colour digital video with simultaneous high definition still images taken at 15 second intervals. Three features have now been surveyed at all survey time points, Graveyard, Morgue and Diabolical, with Ghoul being included from the second survey onwards.

The SO309 OFOS survey focused on four features: Ghoul, Morgue, Graveyard and Diabolical. Ghoul, an unfished feature, was selected as a baseline (undisturbed coral community). Morgue was heavily fished until its closure which makes this an interesting site to examine coral and benthic habitat recovery dynamics. Graveyard has been heavily fished and is still open to fishing and was included to assess evidence of recovery relative to unfished features. Diabolical is still open to fishing but fishing effort is low. The dominant coral fauna here also differs to that of Ghoul.

Table 3-1: Overview of the monitoring surveys conducted on selected features in the Graveyard complex with RV *Tangaroa* (TAN) and with RV *Sonne* (SO309). Adapted from Clark et al. (2022)

SURVEYS	2001 (T1)	2006 (T2)	2009 (T3)	2015 (T4)	2020 (T5)	2025 (T6)
VOYAGES	TAN0104	TAN0604	TAN0905	TAN1503	TAN2009	SO309
FEATURES						
Graveyard	X	X	X	X	X	X
Morgue	X	X	X	X	X	X
Diabolical	X	X	X	X	X	X
Gothic		X	X	X	X	
Zombie		X	X	X	X	
Ghoul		X	X	X	X	X
Pyre		X				
Scroll		X				

3.1 Sampling gear (OFOS) and survey design

On all surveys seabed photographic transects started at the summit and ran down the flanks to the base. Transects followed the tracks from earlier surveys as closely as possible (Figure 3-1), which were mostly aligned along the cardinal and intercardinal points of the compass (i.e., N, NE, E, SE, S, SW, W, NW).

Due to time constraints, OFOS transects mostly finished at the base of the feature, where soft sediments were consistently encountered. As such some of the OFOS transects are shorter than the DTIS transects they were replicating. The transect on the south ridge of Morgue (GeoB26388-5) started off the summit to avoid lost fishing gear previously observed that was deemed an entanglement risk (see Clark et al. 2021).

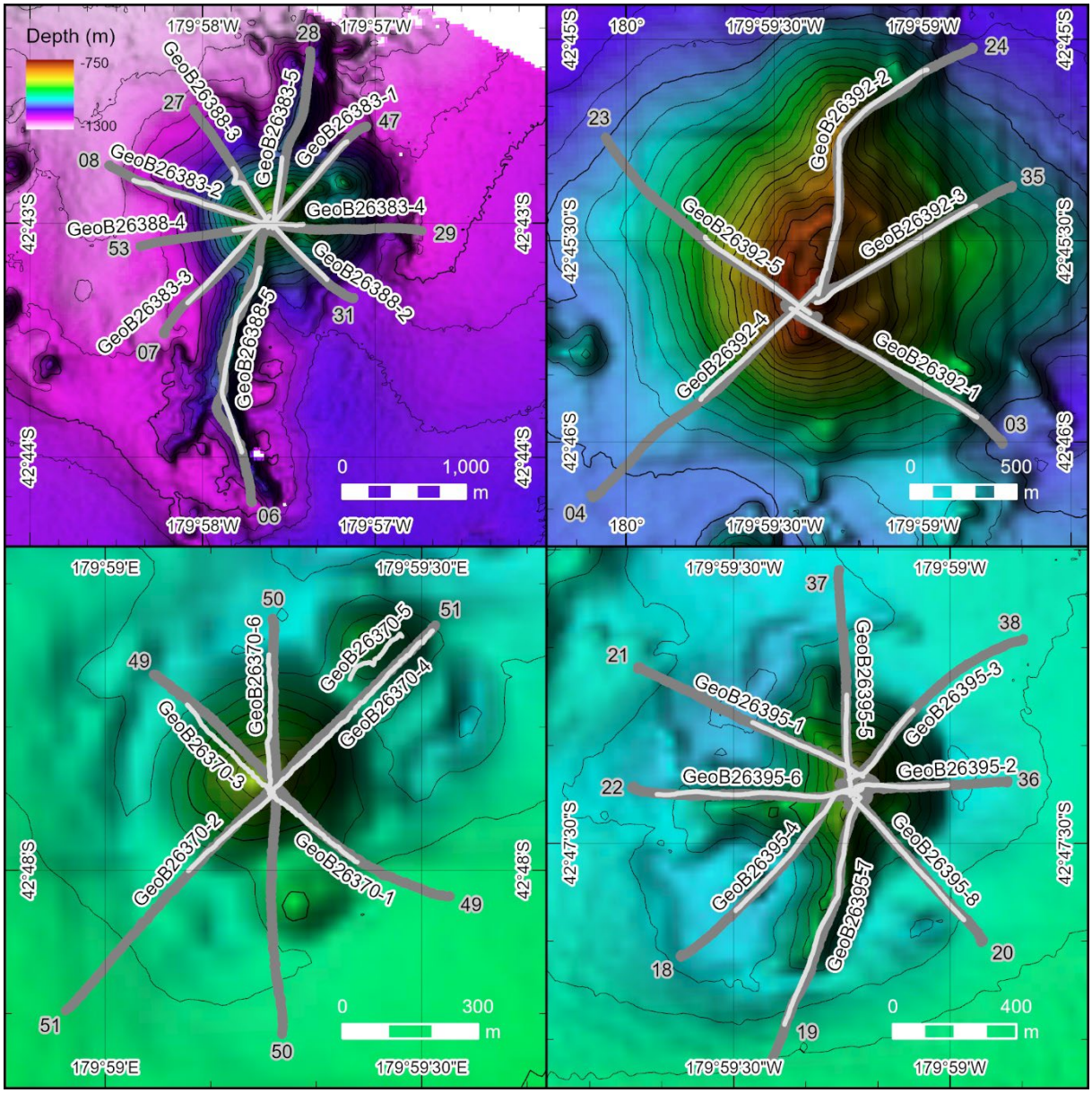

Figure 3-1: The four features in the Graveyard Knolls complex surveyed during SO309. Top left - Morgue, top right - Graveyard, bottom left – Ghoul, and bottom right- Diabolical. Grey lines show transects conducted using NIWA's DTIS system in 2020 labelled with the station numbers assigned during voyage TAN2009. White lines show transects conducted using OFOS on SO309.

3.2 OFOS Survey Summary

Table 3-2 provides some characteristics for select Graveyard knolls surveyed during SO309, and the number of OFOS transects conducted on each feature. The start and end positions of each transect are given in Appendix A. Preliminary observations from each feature are summarised below.

Table 3-2: Physical and fishery characteristics of the surveyed features using OFOS during SO309. Summit depth is depth below sea surface; elevation is height of summit above basal contour; area is area within basal contour. Fishing status shows broad categorisation of trawling intensity before and after the first photographic survey (T1) (refer Clark et al. 2019).

Feature	Summit depth (m)	Elevation (m)	Fishing status (pre/post 2001 closure)	Date surveyed	Station	# Transects
Ghoul	935	100	zero / zero	6/02/2025	GEOB26370	5
Morgue	890	310	high / closed	7/02/2025	GEOB26383 GEOB26388	9
Graveyard	748	350	high / high	9/02/2025	GEOB26392	5
Diabolical	894	160	Intermediate / low	11/02/2025	GEOB26395	8

3.3 Preliminary observations from OFOS imagery

3.3.1 Ghoul (OFOS GeoB26370)

Ghoul is an unfished feature and coral diversity, cover, and condition appeared high relative to the other studied features. Although some coral rubble was present at the summit, intact and live coral was extensive on the summit and upper flanks (e.g., Figure 3-2) and was dominated by *Solenosmilia variabilis* with a few signs of yellow *Enallopsammia rostrata*. Live coral patches were also observed towards the base of the feature as bedrock, soft sediment and mud became the dominant substrate.

Other notable prevalent taxa included octocorals (*Anthomastus* spp., *Narella* spp. and other primnoid corals), echinoderms (with many large brisingid seastars on live coral), and hexactinellid sponges. A large *Paragorgia* (bubblegum coral) and large bamboo coral were also observed at Ghoul using both OFOS and subsequent ROV dives (see Appendix C for more detail for each deployment).

The spatial distribution of live corals recorded in real-time observations of OFOS tows on Ghoul are shown in Figure 3-6. Unfortunately, at this time, real-time observations were only available for a small section of the northern transect. However, this partial transect shows the extent of the intact coral reef located near the summit, which was representative of much of this feature, and observations correspond with those provided by Clark et al. (2021). Detailed analyses and identifications will be conducted from the original high-resolution images collected in any future work.

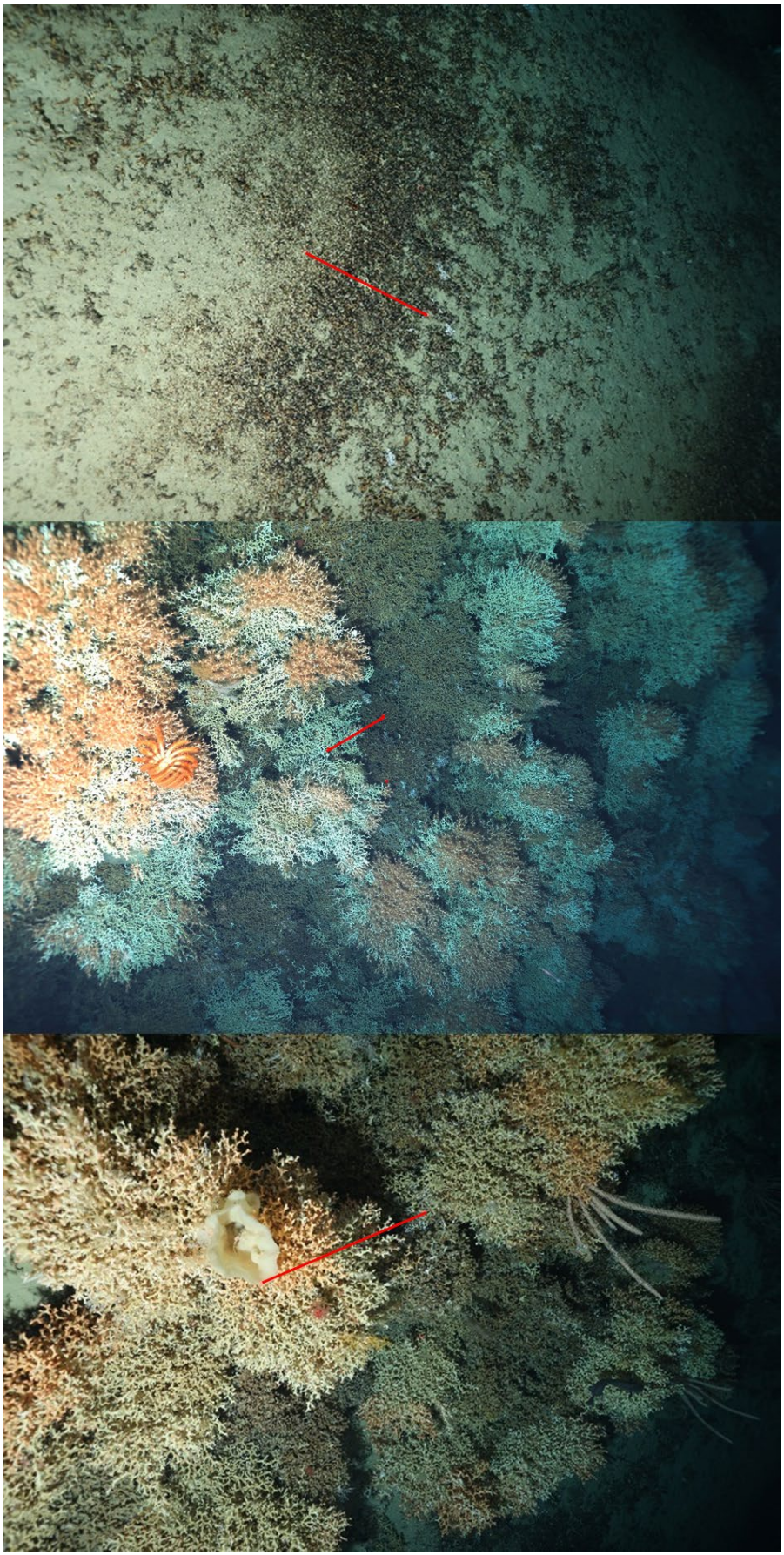

Figure 3-2: OFOS images from Ghoul. Top: area of soft sediment and coral rubble at the summit. Middle and bottom images: Extensive *Solenosmilia* reef and associated fauna. Red scale bars are 40 cm.

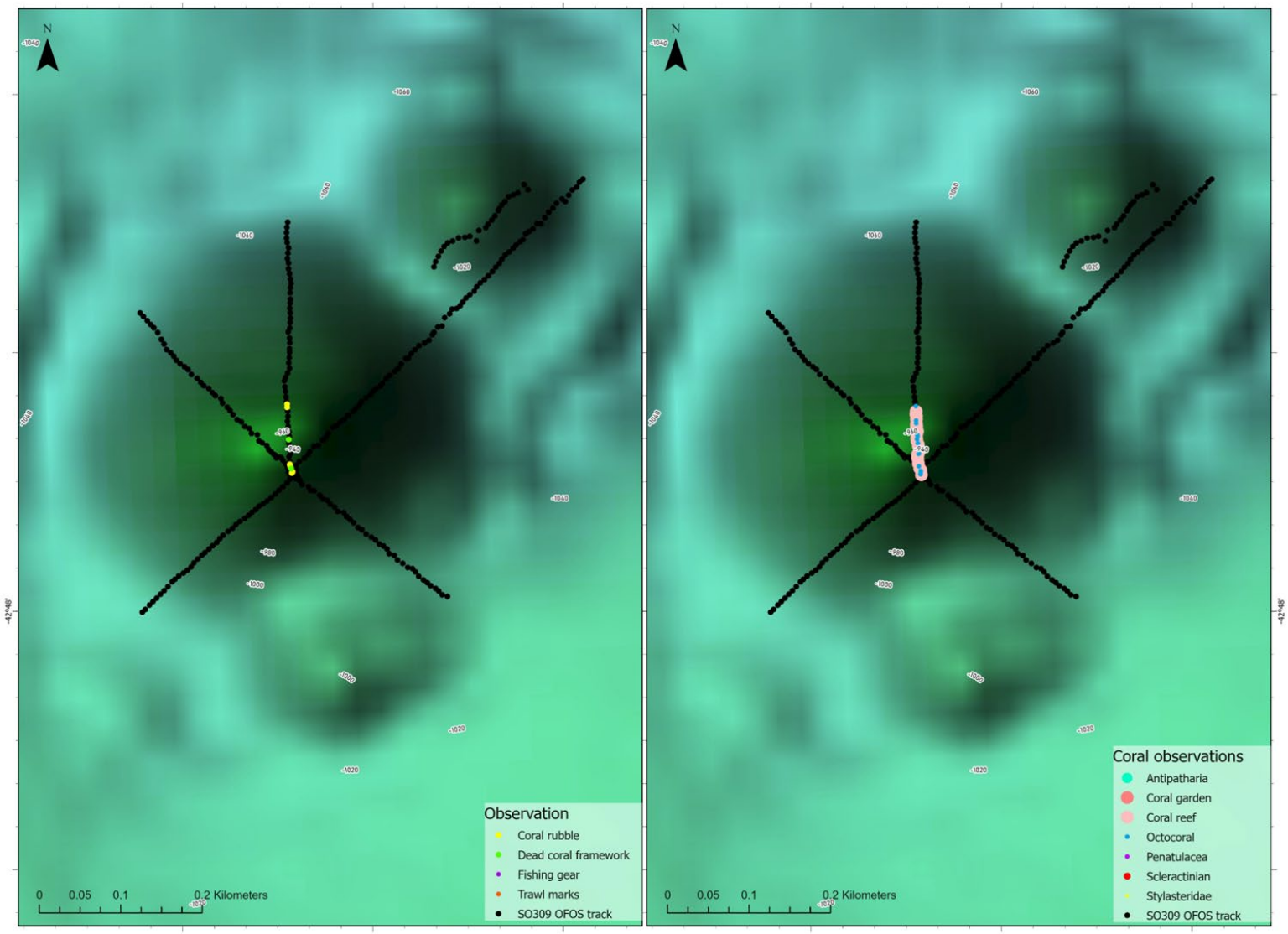

Figure 3-3: OFOS transects on Ghoul. Left: Observations of coral substrate, fishing gear and trawl marks. Right: Observations of live corals. Note that these are real-time observations and require review and taxonomic verification. Note also that real-time observations were only available for a small section of the northern transect.

3.3.2 Graveyard (GeoB26392)

Graveyard has been fished extensively; coral rubble dominated the substrate on transects here with trawl marks evident (Figure 3-4). Few live corals were present at the summit, however, abundant octocorals (sea fans, likely plexaurids) were observed on the flanks, especially in the transect running to the north from the summit. Two large black corals (*Bathypathes* sp. or *Telopathes* sp. and ?*Dendrobathypathes* sp., Figure 3-5) were also observed, along with a few very small remnant patches of yellow *Enallopsammia rostrata*.

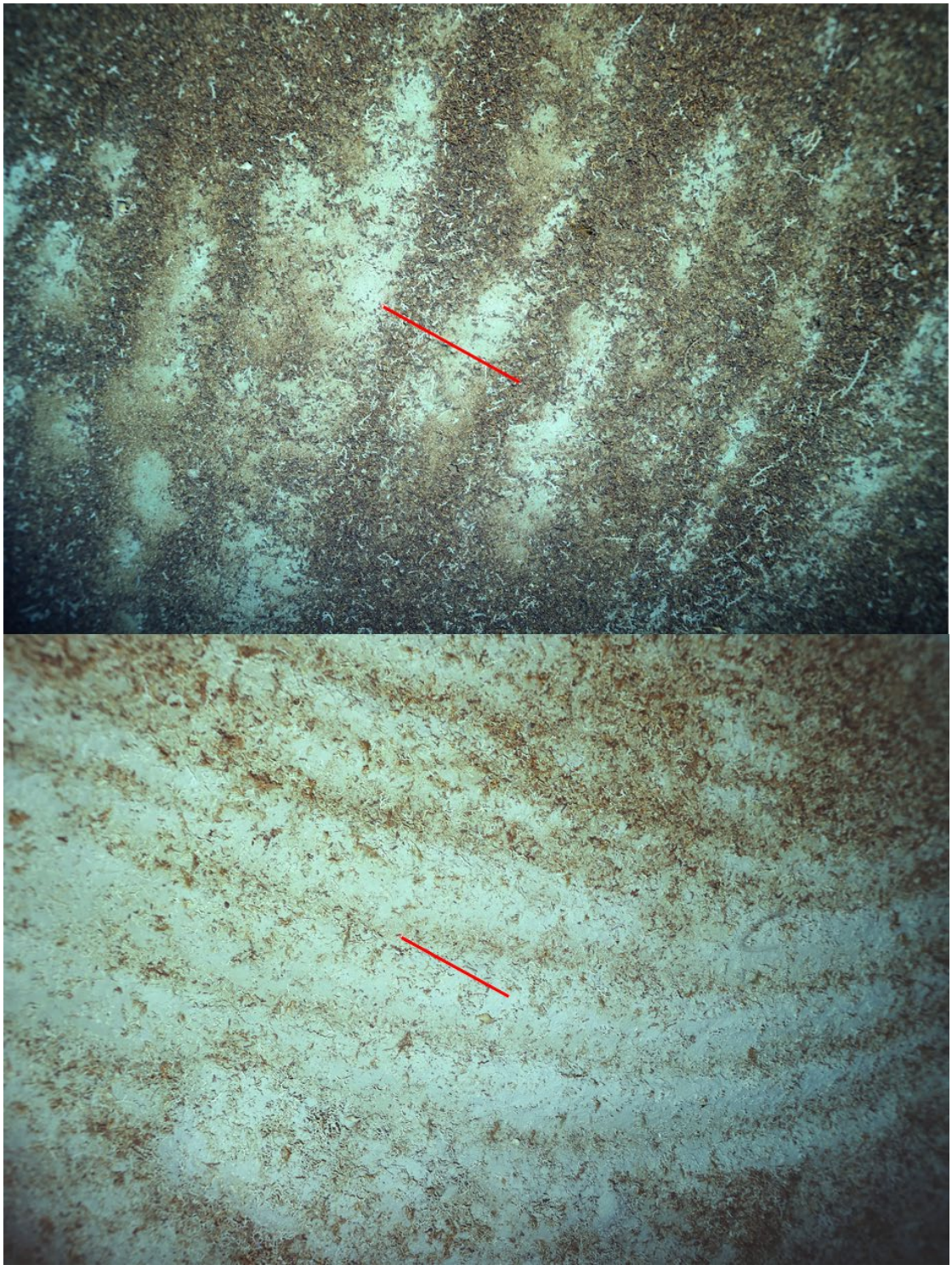

Figure 3-4: Example of trawl marks seen on Graveyard. Red scale bars are 40 cm.

Figure 3-5: Example images of corals observed on Graveyard. Top left: garden of plexaurid sea fans observed near the summit; Top right: large orange black coral (*Bathypathes* sp. or *Telopathes* sp.) with white stylasterid hydrocorals; Bottom left: large orange black coral (?*Dendrobathypathes* sp.) with white stylasterid hydrocorals; Bottom right: purple octocoral *Trachythela* sp. and white stylasterid hydrocorals.

The spatial distribution of live corals recorded in real-time observations of OFOS tows on Graveyard are shown in Figure 3-6.

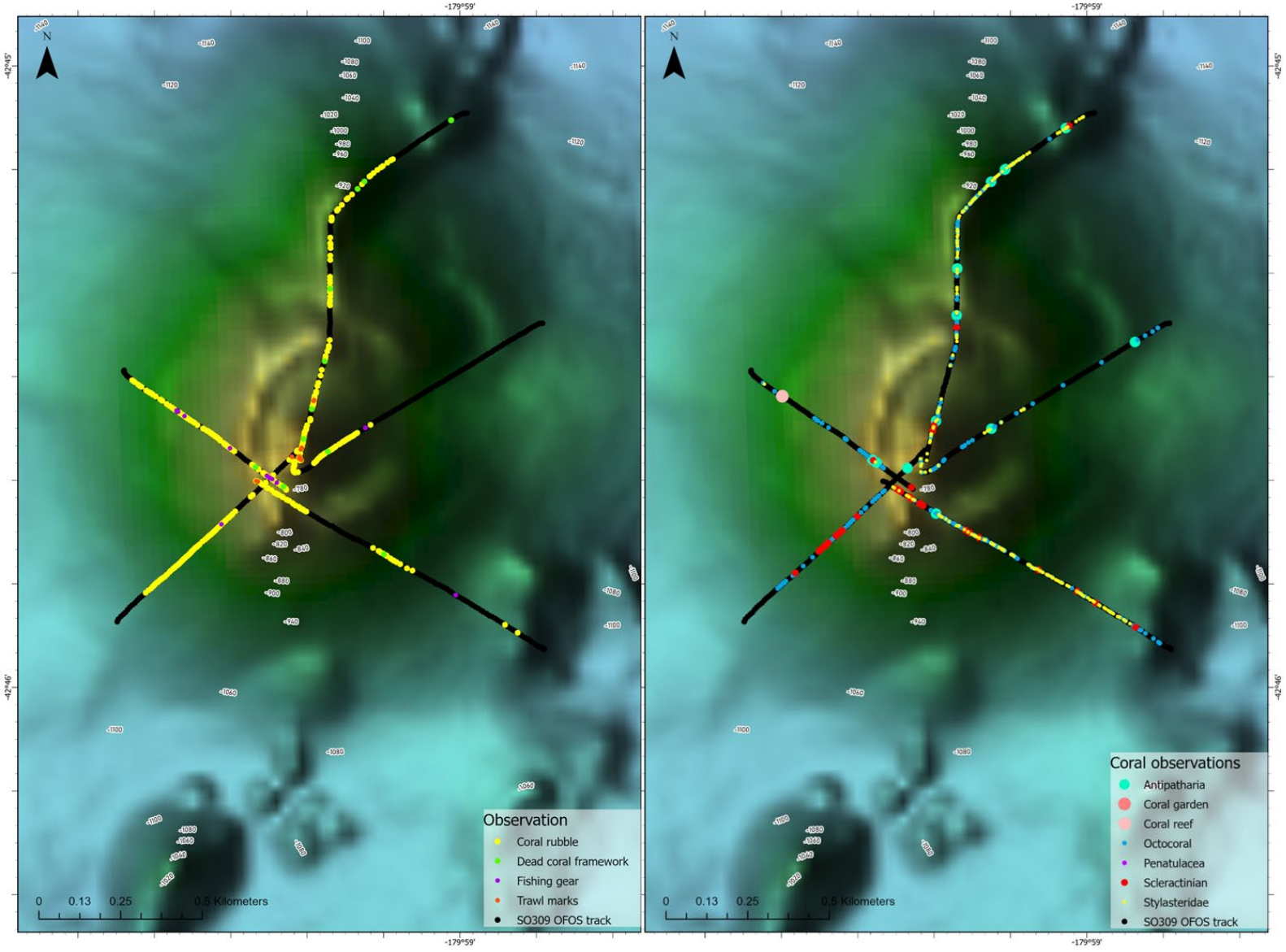

Figure 3-6: OFOS transects on Graveyard. Left: Observations of coral substrate, fishing gear and trawl marks. Right: Observations of live corals. Note that these are real-time observations and require review and taxonomic verification..

3.3.3 Morgue (GeoB26383 and GeoB26388)

The summit of Morgue was characterised by coral rubble over soft sediment, with bedrock and boulder-sized rock outcrops / lava interspersed with patches of coral rubble and soft sediment down the flanks to the base (Figure 3-7). Bedrock was sparsely covered, with dominant fauna including small stylasterids and crinoids, both highly abundant in places. Initial observations suggest the coral rubble mostly consisted of *M. oculata* with the identification of some fragments of *S. variabilis* to be confirmed.

Figure 3-7: Coral rubble and bedrock on Morgue. Top left: coral rubble with cobbles/boulders and an orange roughy fish. Top right: sparse coral rubble on sandy sediments with four orange roughy fish; Bottom left: bedrock with a few gastropods. Bottom right: bedrock with numerous comatulid crinoids. Red scale bars are 40 cm.

Although few live coral colonies were observed on the main feature, a large area of live *Solenosmilia variabilis* reef was observed on the southern ridge of Morgue, on the eastern flank below the summit of the ridge (Figure 3-8). This live reef area had not previously been observed in DTIS tows due to a slight difference in tracks. The OFOS transect (GeoB26388-5) started south of the summit in order to avoid known lost fishing gear which was an entanglement risk (as noted in Clark et al. 2021).

Following these observations of extensive live coral reef along a central section of the South ridge, ROV dive 115 was conducted, starting below the ridge line and meeting the OFOS track along a small section of the ridge (see Section 2.3 above and Appendix C below).

Figure 3-8: ***Solenosmilia variabilis*** **reef and associated fauna on the southern ridge of Morgue.** Red scale bar is 40 cm.

The spatial distribution of live corals recorded in real-time observations of OFOS tows on Graveyard are shown in Figure 3-9 with a close-up view of observations on the summit in Figure 3-10.

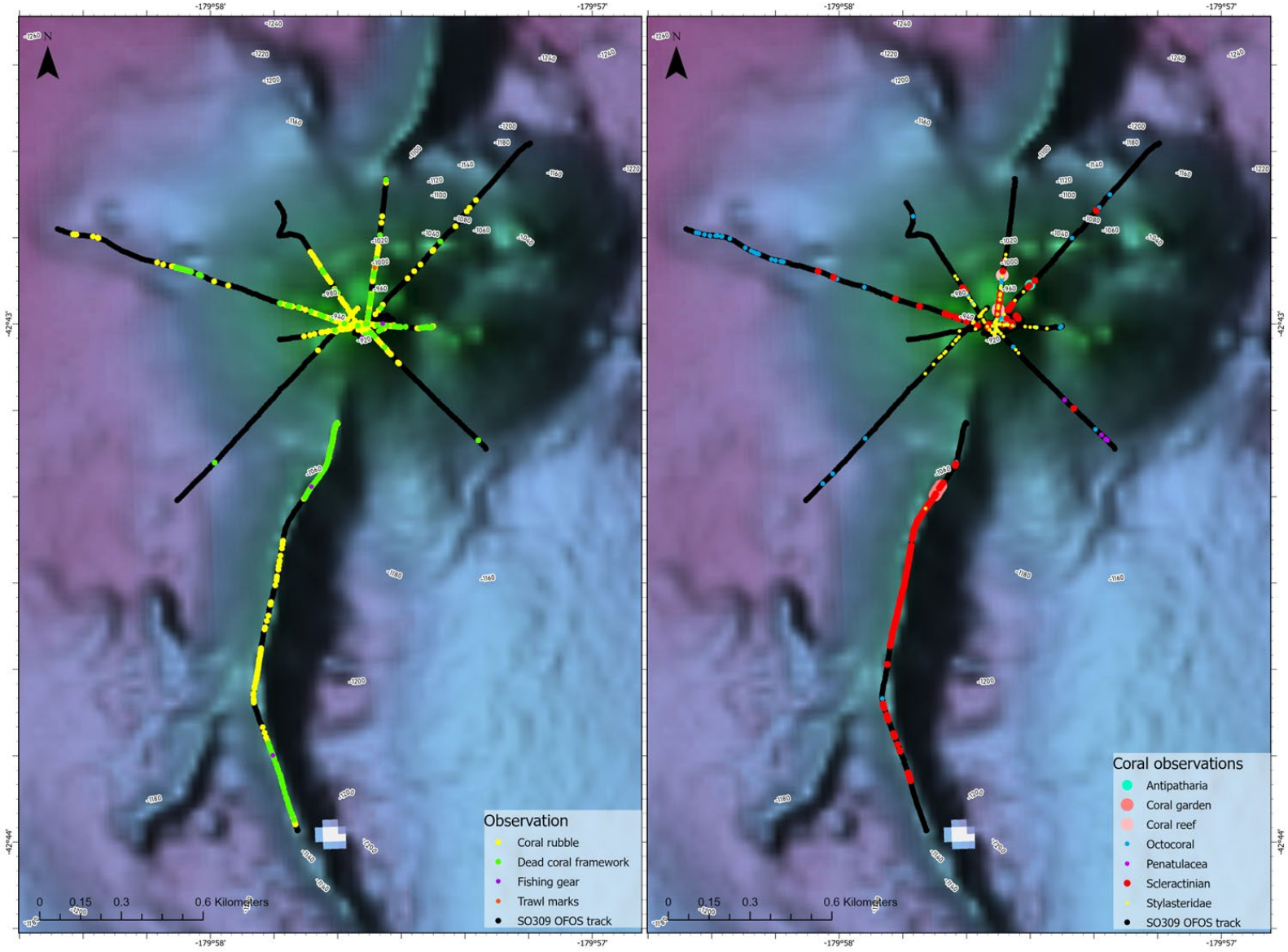

Figure 3-9: OFOS transects on Morgue. Left: Observations of coral substrate, fishing gear and trawl marks. Right: Observations of live corals. Note that these are real-time observations and require review and taxonomic verification.

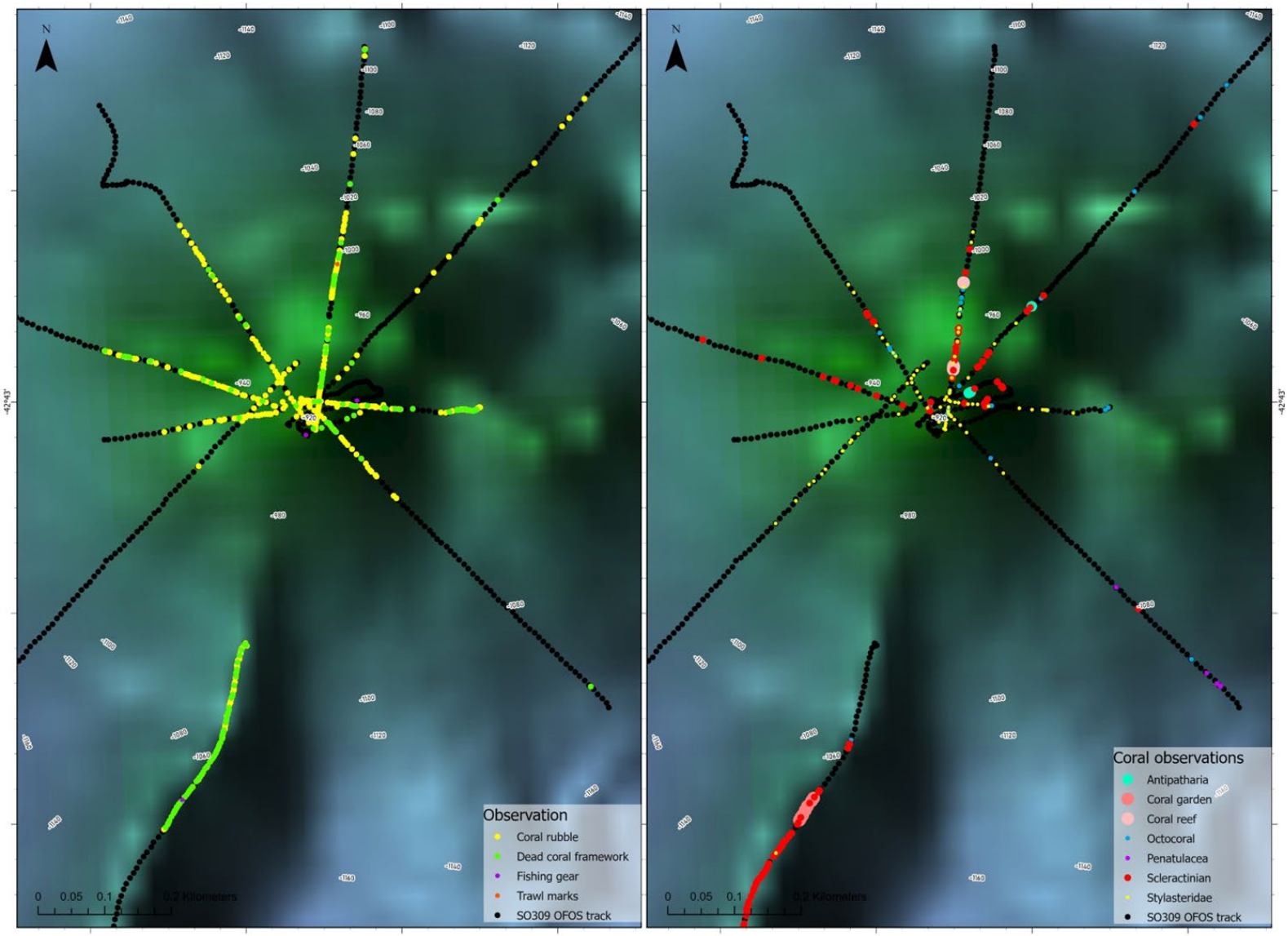

Figure 3-10: Close-up of OFOS observations on the summit of Morgue. Left: Observations of coral substrate, fishing gear and trawl marks. Right: Observations of live corals. Note that these are real-time observations and require review and taxonomic verification.

Evidence of coral recruitment on Morgue

As Morgue has been closed to commercial fishing for 24 years after previously being heavily trawled, this feature is likely to be the most interesting with respect to evidence of coral recruitment/recovery. Previous analysis of DTIS survey data from Morgue has demonstrated temporal and spatial shifts in stylasterid abundance on Morgue in response to the trawl footprint, with indications that there is some re-occurence of *Solenosmilia variabilis* in some areas, albeit sparse and patchy (Goode *et al.* 2025).

A number of metal mooring weights (wagon wheels) were deployed near the summit of Morgue in 2010 and 2012, introducing a new, unfouled, substrate to the seabed with a known deployment date (Clark et al. 2021). At the time of deployment these wheels each had seven plastic settlement panels attached (Figure 3-11) for the purpose of studying settlement and recruitment of deep-sea fauna.

While the approximate locations of the wagon wheels were known, from the surface release points, only one of the wheels had been observed since deployment and so the exact location of these wheels on the seafloor was unknown for most. During SO309, three wagon wheels were observed during an OFOS deployment dedicated to searching for these wheels which was a deemed a success (Figure 3-12). Although there was no evidence of any of the settlement panels remaining on the wagon wheels, the wheels themselves provide a settlement substrate and could be examined for settlement/ recruitment.

Figure 3-11: Wagon wheel prior to deployment. Grey squares are settlement panels that were attached to the wheels to study settlement and recruitment of deep-sea fauna (see Clark et al. 2021).

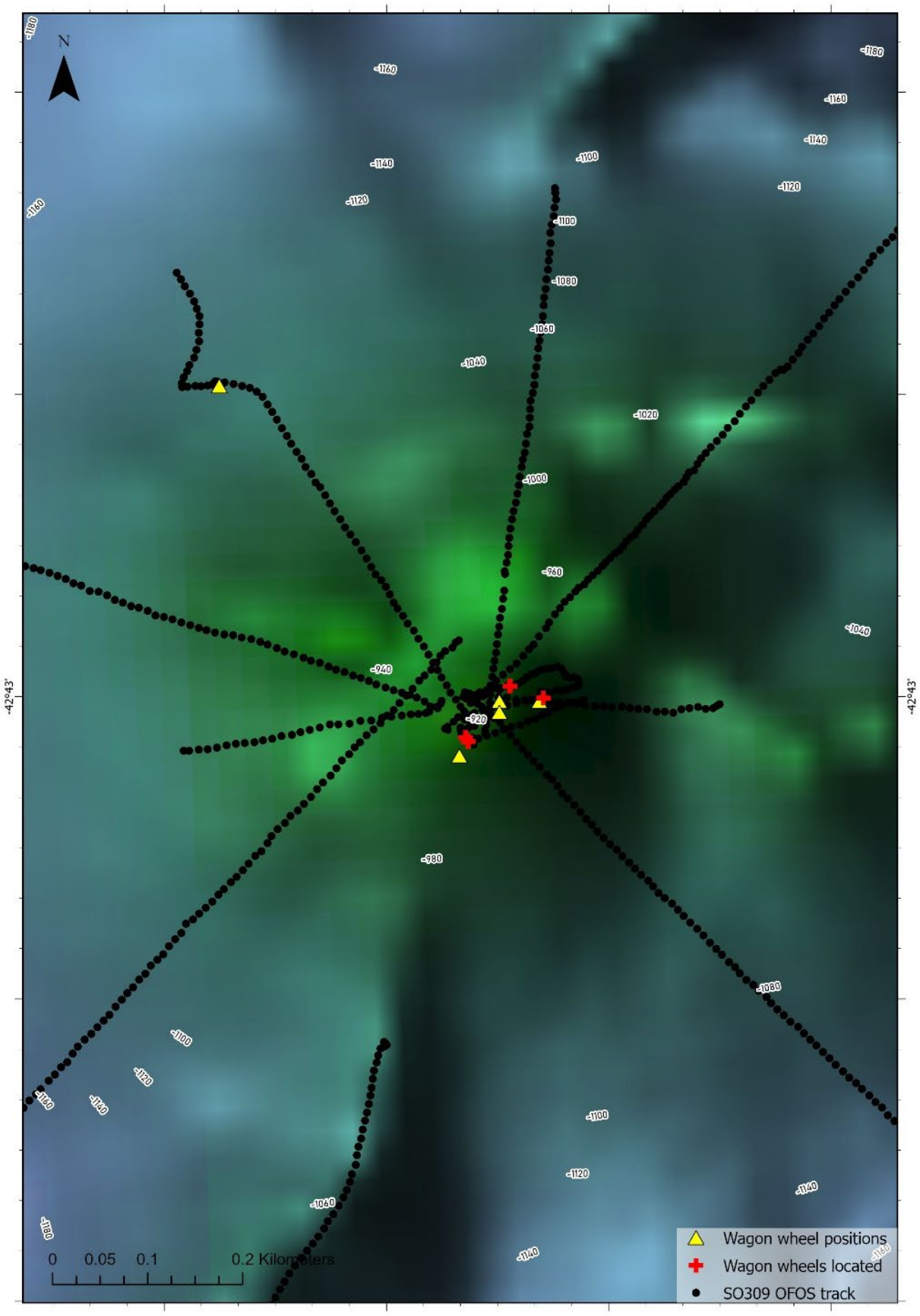

Figure 3-12: Recorded position and find location of wagon wheels on Morgue. Yellow triangles indicate the approximate location of wagon wheels recorded at deployment. Red crosses are where wagon wheels were observed on the summit of Morgue.

Preliminary observations show that stylasterid hydrocorals have settled and recruited to the steel wagon wheels (Figure 3-13). Although it was not possible to deploy the ROV to this site to get detailed images of the recruitment to the wagon wheels, it may be possible to estimate the size of some stylasterid hydrocorals attached to the wheels. Stylasterid recruitment was also observed on both rock and coral rubble substrates on the summit of Morgue (Figure 3-14). These observations are consistent with previous surveys (e.g., Clark et al. 2022). Preliminary observations suggest no settlement/recruitment of branching stony corals.

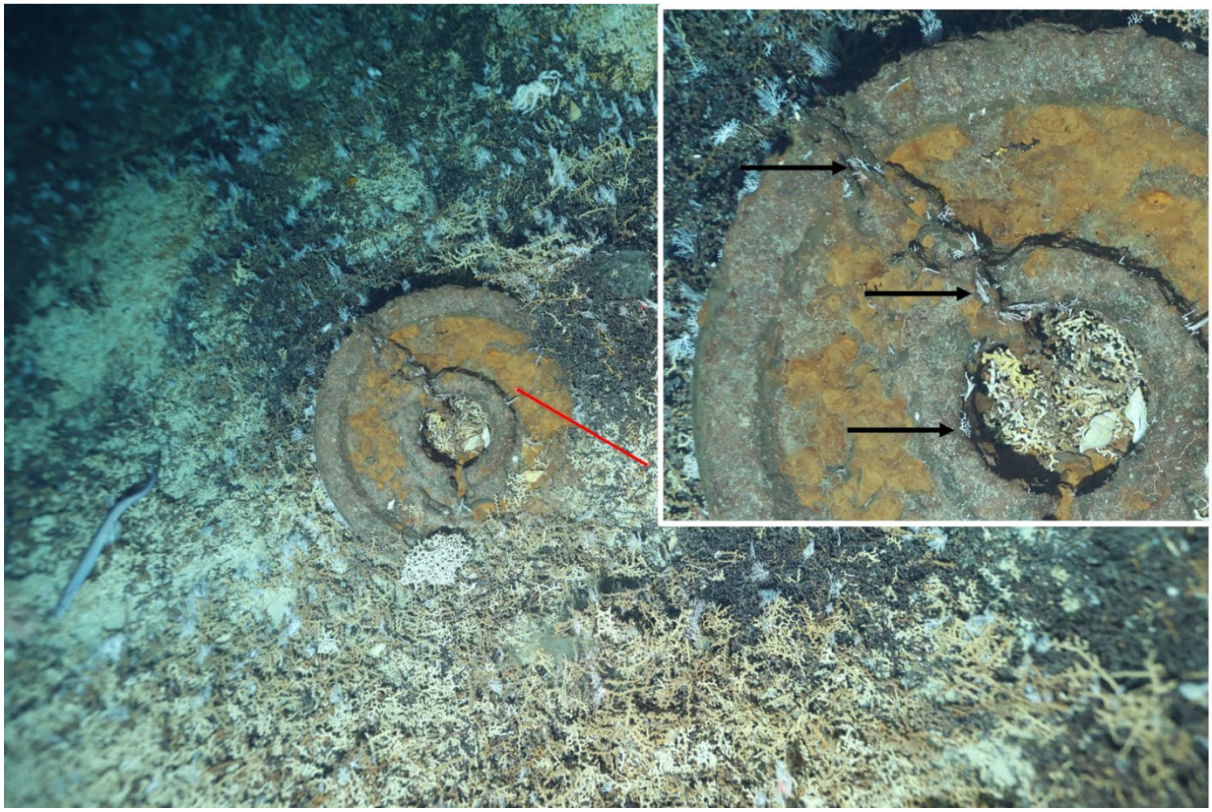

Figure 3-13: Stylasterid hydrocorals attached to a wagon wheel observed on Morgue. Inset image with white border is a close-up of part of the wagon wheel. Red scale bar is 40 cm. Black arrows indicate some of the stylasterid hydrocorals attached to the wagon wheel.

Figure 3-14: Stylasterid hydrocoral recruitment to rock and coral rubble on the summit of Morgue. OFOS dive GeoB26383-1. Red scale bars are 40 cm. Black arrows indicate some of the many white stylasterid hydrocorals present.

Small octocoral colonies were also observed amongst the coral rubble near the summit of Morgue (Figure 3-15), indicating some recruitment and recovery of these corals following the cessation of fishing. There are two different morphotypes in the image below; a branching pink form, and a grey bottle-brush form. There is some indication from previous DTIS analysis that stony coral recruits of *Solenosmilia variabilis* and *Madrepora oculata* may also occur in some areas of Morgue including the summit (Goode *et al.* 2025), but none were apparent in the preliminary observations of SO309 OFOS data.

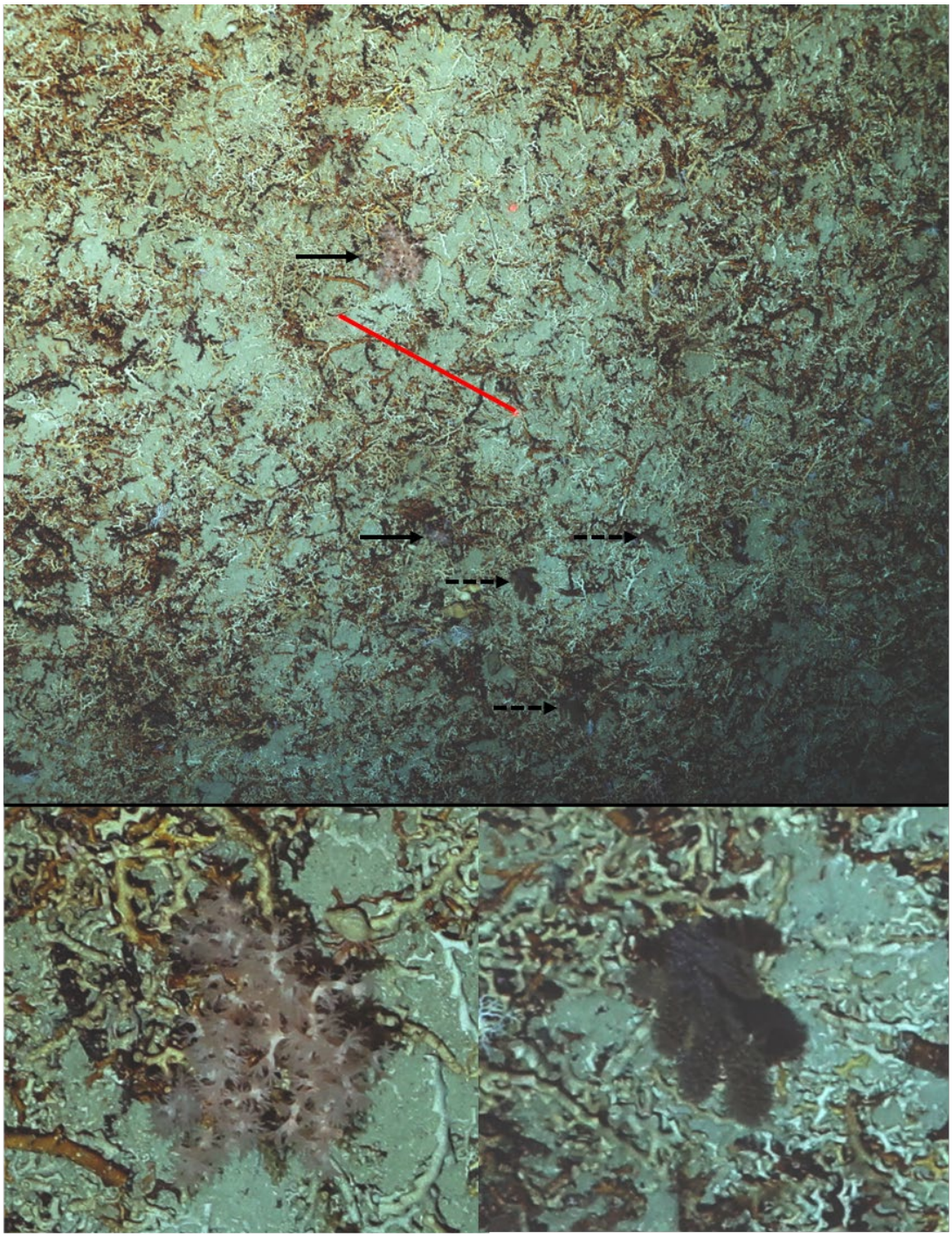

Figure 3-15: Live octocorals on coral rubble on the summit of Morgue. Top: cropped image GeoB26383_2_2025_02_07_2656. The red scale bar is 40 cm long. Solid black arrows show small pink octocoral colonies. Dashed black arrows show small bottlebrush shaped octocorals. Bottom images: the two forms of octocoral are enlarged to show detail.

3.3.4 Diabolical (GeoB26395)

Preliminary observations of corals at Diabolical suggest zoned coral distribution, with numerous large patches of purple *Enallopsammia rostrata* observed near to the summit and large areas of live and healthy *Madrepora oculata* observed further down the flank (Figure 3-16). Coral rubble was mostly composed of *M. oculata*, with some *S. variabilis* and cup corals. This indicates the presence of all of the dominant matrix-forming Scleractinia in the region on this feature at some point in the past. Deeper down the flanks, substrates included bedrock and pillow lava with some barnacle plate hash present.

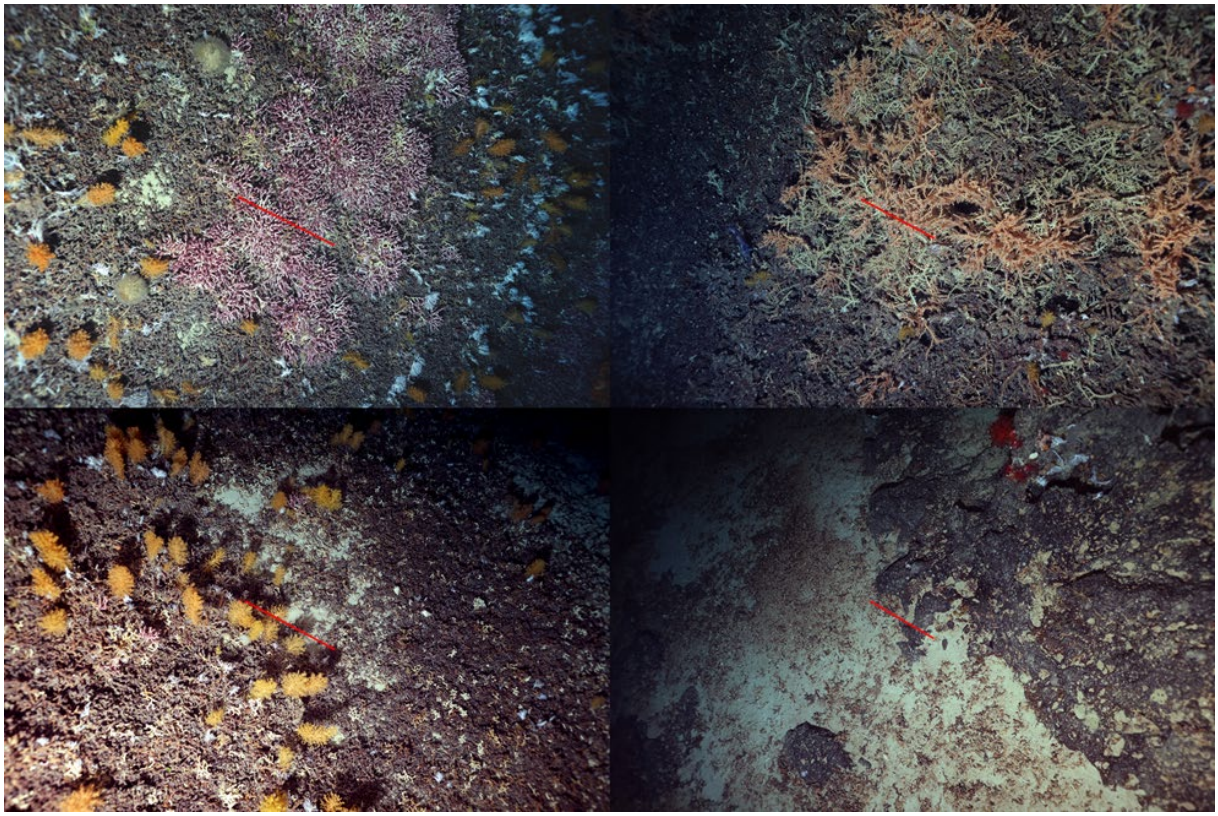

Figure 3-16: Images of corals observed on Diabolical. Top left: Purple *Enallopsammia rostrata* with orange ?*Tokoprymno* bottle brush corals and white stylasterid hydrocorals. Top right: Orange *Madrepora oculata*. Bottom left: Orange ?*Tokoprymno* bottle brush corals on coral rubble. Bottom right: *Anthomastus* soft corals on bedrock with white stylasterid hydrocorals. Red scale bars are 40 cm.

The spatial distribution of live corals recorded in real-time observations of OFOS tows on Diabolical are shown in Figure 3-17.

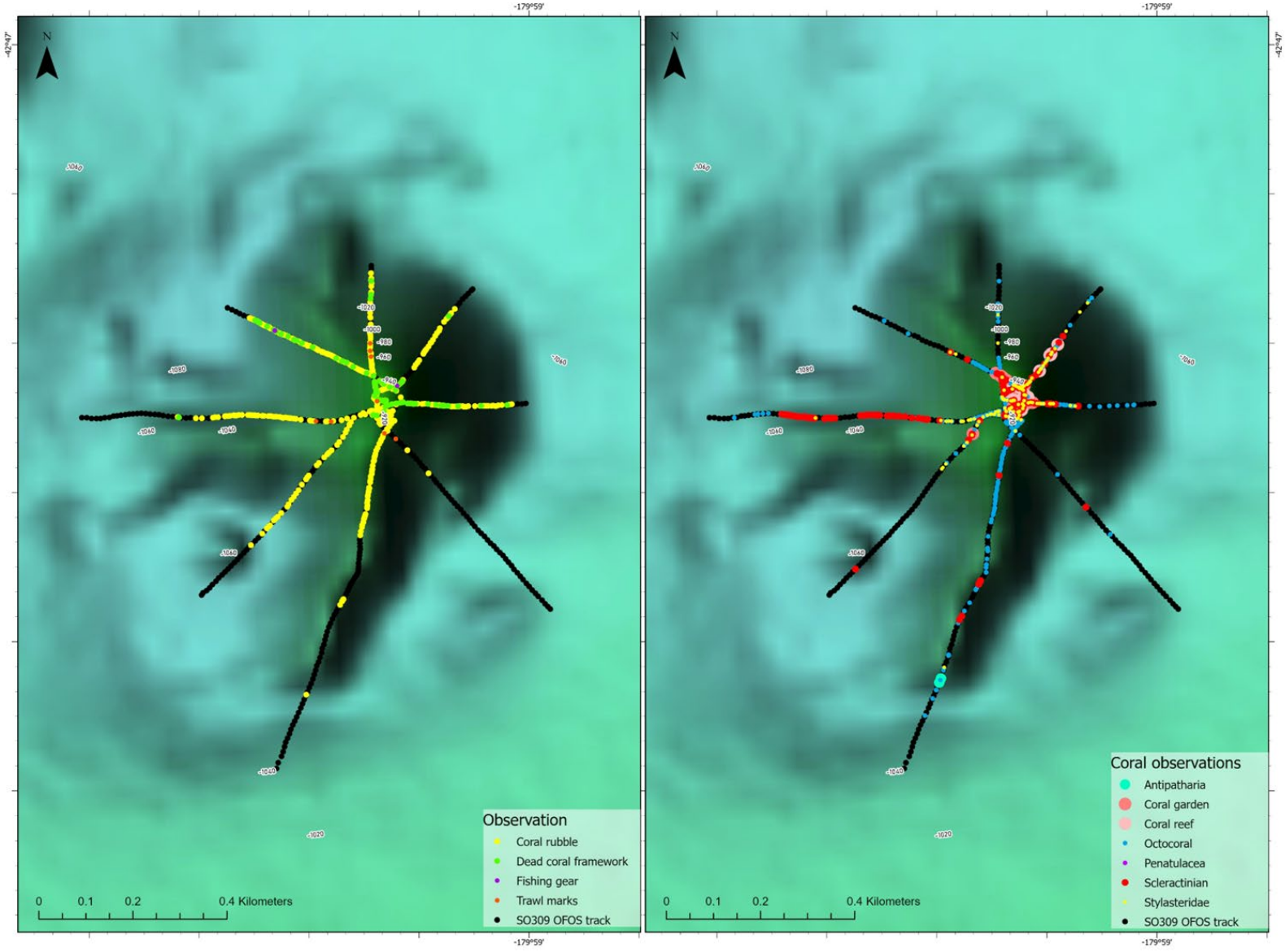

Figure 3-17: OFOS transects on Diabolical. Left: Observations of coral substrate, fishing gear and trawl marks. Right: Observations of live corals. Note that these are real-time observations and require review and taxonomic verification.

4 Coral reproduction study: collection and husbandry of live corals

A selection of live scleractinian coral specimens collected onboard the SO309 voyage were placed in an onboard aquarium (see section 4.3) and carefully transported to NIWA Wellington for the purpose of studying the reproductive biology/ecology of deep-sea corals. This work is presented in more detail in Beaumont and Marriott (2025).

4.1 Fiordland

We collected five specimens of live scleractinian coral and a small sample of *Antipathella fiordensis* between 27 and 30 January. Of the five scleractinian specimens, three were identified as *Madrepora oculata* and two specimens, with a thicker skeleton and large polyps, are awaiting formal identification but referred to here as *Madrepora* cf. *oculata*. The images below (Figure 4-1) show some of the specimens collected.

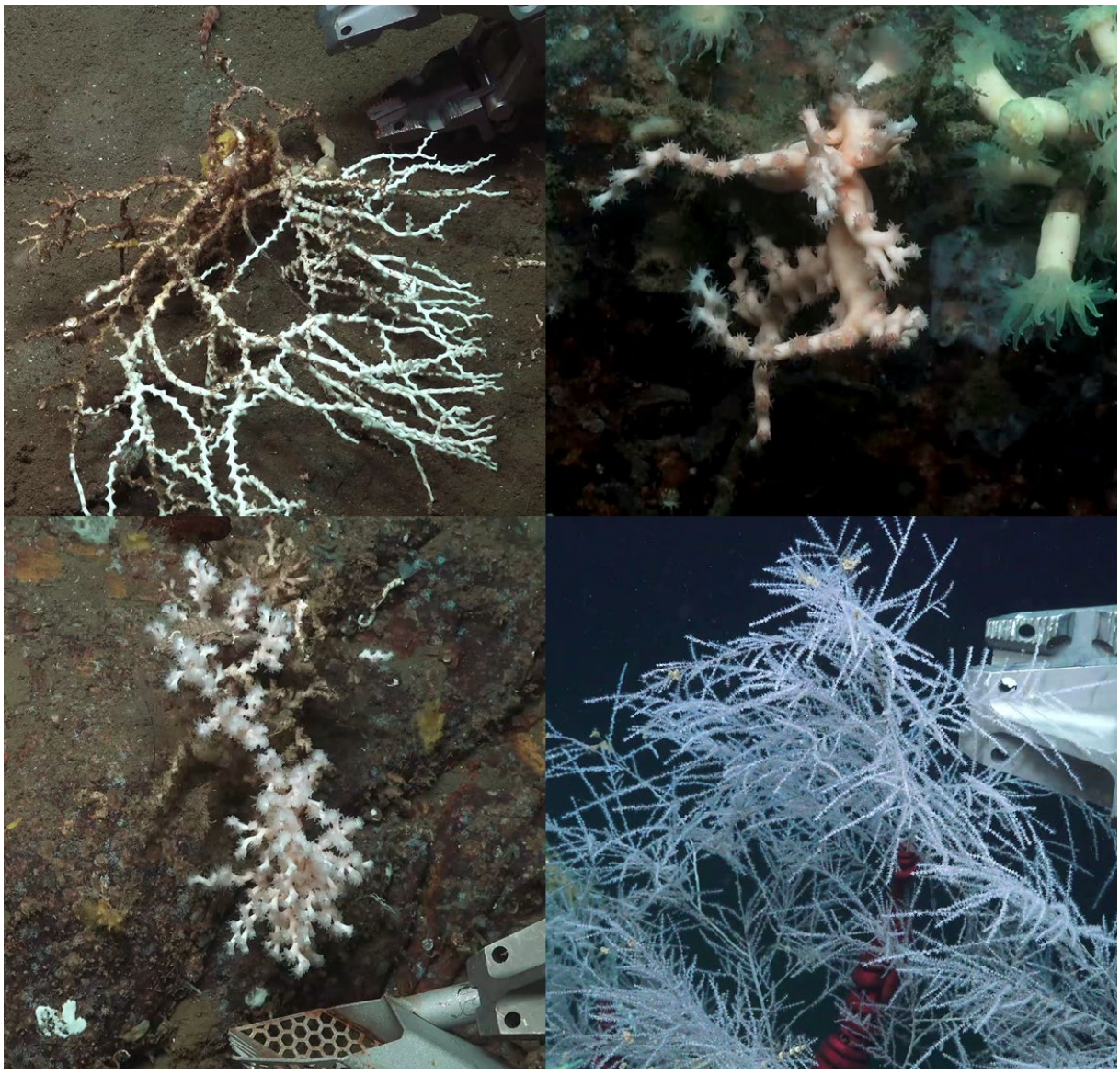

Figure 4-1: In-situ images of some of the coral specimens collected from Fiordland. Top left: Dive107 sample 7, *Madrepora oculata*. Top right: Dive 106 sample 5, *Madrepora* cf. *oculata* next to *Eguchipsammia japonica*. Bottom left: Dive 108 sample 5, *Madrepora* cf. *oculata*, Bottom right: Dive 107 sample, 9 *Antipathella fiordensis*.

These specimens were held at 12.7°C while onboard and transferred to NIWA Wellington on 4 February when the *Sonne* called into port to collect survey gear and an engine part.

4.2 Chatham Rise

At the Graveyard complex (6 – 11 February) the ROV was used to collected eight live *Solenosmilia variabilis* specimens from Ghoul plus two *Enallopsammia rostrata* and two *Madrepora oculata* from Diabolical. In addition, some small colonies of *E. rostrata* were collected using a TV box corer from Diabolical. These corals were initially held at 6°C to reflect their collection temperatures.

On the crest of the Chatham Rise (12 February), a further five specimens of *Goniocorella dumosa* were collected in temperatures of 8.5°C. This species is also found on some of the features of the Graveyard complex in cooler temperatures. The temperature of the onboard aquariums system was increased to 6.5°C to bring the water temperature a bit closer to the *Goniocorella dumosa* in-situ collection temperature.

The images below (Figure 4-2) show some of the specimens collected from the Chatham Rise region.

Unfortunately, the temperature in the on-board aquarium spiked three times between collecting the Chatham Rise corals and returning to port in Wellington, with temperatures increasing to between 8.5°C and 15.5°C. This was unfortunate as, after initial issues with the water supply being turned off (prior to our Fiordland visit), the system had been stable for several weeks with no issues.

The corals were transferred to NIWA's MEMF on return to Wellington on 15 February. During transfer of the corals to aquarium tanks within the MEMF, it was apparent that the *S. variabilis* specimens had excreted a lot of mucous which was considered likely to be a stress response.

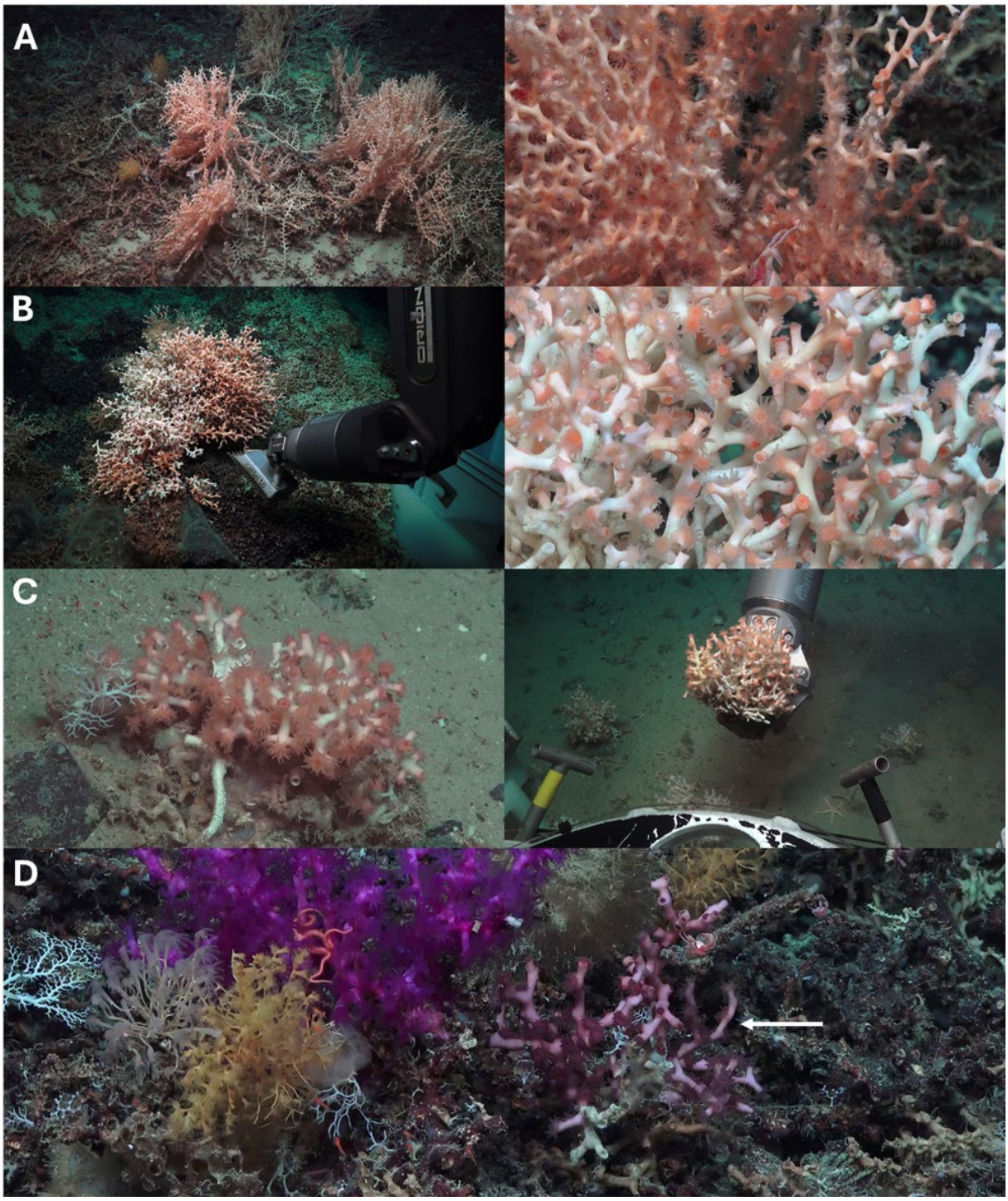

Figure 4-2: In-situ images of some of the coral specimens collected from the Graveyard complex on the Chatham Rise. A) Left: Dive 116 sample 1, *Madrepora oculata*. Right: Close-up image showing *M. oculata* polyps and tentacles; B) Left: Dive 115 sample 6, *Solenosmilia variabilis*. Right: Close-up image showing *S. variabilis* polyps and tentacles. C) Left: *Gonicorella dumosa* in situ. Right: being collected by the ROV's manipulator arm. D) *Enallopsammia rostrata* (white arrow) prior to collection by the ROV manipulator arm.

4.3 Onboard aquaria set-up

The onboard aquarium consisted of a chiller unit, a sump (water reservoir) and three aquaria, each with six small animal tanks inside (Figure 4-3). Two water supplies were connected to the aquarium system – a clean water supply to the sump and a high flow supply to the chiller.

Figure 4-3: Aquarium set-up onboard RV *Sonne*. The aquarium consisted of a chiller unit (white unit back left), a sump (grey unit at the front) and three aquaria, each with 6 small animal tanks inside. Two water supplies are connected to the system: a high flow of water to the chiller system and a low-pressure feed of clean, filtered, water to the sump. The sump water is cooled by the chiller unit before being circulated to the three aquaria containing animals.

Coral colonies were held onboard, in the dark, in three rectangular black plastic aquaria (each 64 L volume). Inside each black bin the six small black plastic animal tanks (each 4 L volume) were tightly packed inside an insulated polybin (Figure 4-3). The corals were exposed to a continuous flow (approximately 50 mL min^{-1}) of chilled seawater to reflect temperatures at the sample collection sites. The water was filtered to 200 µm to remove any large particles and prevent blockages within the system. Oyster mesh was placed in the bottom of the tanks to stop the corals sliding around in heavy weather. Animals were fed on collection day and then every two days with two food types; a larval shellfish diet (larval shellfish diet 1800, Reed Mariculture, Campbell, CA, USA) made up of 10% feed and 80% filtered sea water (FSW), as per manufacturers recommendations, and a mixture of 0.5 tsp of commercial coral food (Reef-Roids, Poly lab, Canada) mixed into 100 mL of filtered sea water. Approximately 2 mL of each food type was given to each animal tank. The inflow water to the animal tanks was turned off for approximately 20 minutes to allow the animals to feed without losing food to the outflow pipe.

The aim of the aquarium system was to hold the animals in a suitable environment (cool and dark) until they could be transferred to an onshore aquarium at NIWA Wellington where the animal's reproductive biology will be studied over the next 12 months.

The aquarium set-up worked well particularly as this was the first time a system such as this had been installed onboard RV *Sonne*. There were initial problems with a consistent water supply for the chiller unit, with the water being turned off on several occasions and the water temperature in the sump and animal tanks rapidly increasing to ambient surface temperatures.

Figure 4-4: Aquarium set-up onboard RV *Sonne*. Inside each insulated polybin were 6 x 4 L black plastic tanks (top left), each with a dedicated water supply of chilled water via a silicone tube (top right). Bottom images show coral colonies (*Madrepora* cf. *oculata)* inside 4 L tanks, both with their polyps extended.

5 Summary and next steps

This Department of Conservation CSP project INT2024-02 leveraged the visit of the German RV *Sonne* to conduct a CWC-specific voyage in the region and provided funding for staff time for ship-board observations and sampling. A range of tools to physically sample the ocean floor and a state-of-the-art ROV and OFOS towed camera system were used to gather high-resolution camera survey data and to sample biological and geological specimens.

On the Chatham Rise, a large amount of data from seamounts with varied fishing pressure were collected towards Objective 1 of the project (to assess direct impacts of fishing on corals and to determine their recovery at seamounts and other sites subject to a range of fishing intensity). Based on preliminary live annotation and review of footage obtained, as expected (e.g., Clark et al 2022) there was no compelling evidence for widespread coral recovery on these seamounts. Recruits observed on artificial substrate with an associated timestamp further demonstrate that coral recovery is a slow process. However, and pending subsequent quantitative analysis, there was evidence that some stylasterid corals may be early colonisers in the recovery process and that some gorgonian taxa may recruit onto coral rubble.

Using established and published protocols, a comprehensive review of image data is required to add to the 20-year time series of Graveyard knolls community analyses. Clark et al. (2022) provided an analysis of five time-steps from between 2001 and 2020 (T1–5). Providing comparable data from the SO309 survey would extend the observation series to 25 years for four of the six seamount features presented by Clark et al. (2022). This time series provides crucial and rarely measured coral recovery metrics that help to underpin benthic impact assessments required for fisheries management (e.g., Anderson et al. 2024, Freeman & Cryer 2019). A follow-on project (CSP INT2025-07) will incorporate data from this voyage to examine more closely coral recovery dynamics on Chatham Rise seamounts

For Objective 2 (to survey, assess and collect corals at multiple unexplored sites across the EEZ to improve recent coral distribution /fisheries overlap assessments and to ground truth coral habitat models), the detailed voyage report by Freiwald et al. (2025) and the present report provides preliminary observations and descriptions of the data and specimens gathered. Some collaborations with German research partners are underway to analyse aspects of CWC biology and geology as per voyage objectives (including genetic barcoding, coral associations, geochemical analyses, paleoenvironmental reconstruction).

The voyage generated an enormous amount of data and samples, providing opportunities to fill significant knowledge gaps. Addressing these will require taxonomic identification of specimens physically collected and captured in video and stills during ROV and OFOS transects. A range of undescribed species and new records have already been identified across all invertebrates collected and observed, that are being processed by international and New Zealand experts.

The identified specimens will function as important vouchers that are deposited in the NIWA Invertebrate Collection and that will be linked to the species inventory used for the underwater camera analysis. The records will also be linked to the genetic data (DNA barcoding) that is gathered by our German partners, and that is ultimately to be loaded in to publicly available data repositories (such as Barcode of Life Initiative and NCBI GenBank). Specimen records are also loaded to the Ocean Biodiversity Information System (OBIS) through the NIC. Authoritative identification by taxonomic experts will therefore be critical to ensure the validity of the associated specimen data.

This voyage provided a unique opportunity to collect a targeted selection of live scleractinian coral specimens in good condition. These are being held in the MEMF at NIWA Wellington for the purpose of studying the reproductive biology/ecology of these deep-sea corals. CWC in the deep-sea are generally assumed to be broadcast spawners. However, previous opportunistic work on live corals showed *Goniocorella dumosa* to be a brooder releasing relatively few, large larvae from September to November 2022, which settled within 2–8 days (Beaumont et al 2024a). Recent work (POP2023-03) assessed the reproductive mode and timing of some key New Zealand deep-sea coral species (Beaumont et al. 2024b). *Goniocorella dumosa* was confirmed to be a brooder in wild populations and *E. rostrata* was shown to produce large oocytes (up to 1095µm which is similar to those of *G. dumosa*) and to have a relatively low fecundity (also similar to *G. dumosa* which is a brooder). There was no evidence of brooding larvae in the limited specimens available and so this species is still assumed to be a broadcast spawner. The work on live coral specimens collected during SO309 will improve our knowledge of the reproductive biology and life history traits of some of these poorly studied CWC species, and a concurrent CSP project is underway (POP2024-02) to examine reproductive traits of live corals collected during the voyage.

The distribution records for both CWC and associated invertebrates and fish species will fill important gaps that have been highlighted previously. Anderson et al. (2023) conducted an abundance-based spatial analysis of a range of corals in the region to determine geographic hotspots. They conclude that specific gaps in spatial distribution models remain e.g. around the west coast of the South Island, the Bounty and Campbell Plateau and that '*collection of additional seafloor image data from these locations would be highly valuable for both model validation and improvement of model predictions.*'

6 Acknowledgements

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7 Glossary of abbreviations and terms

ADCP	Acoustic Doppler Current Profiler
BC	Bowen Channel, Fiordland
CoralNewZ	Cold-water Coral Biology & Geology off Aotearoa New Zealand
CSP	Conservation Services Programme, Department of Conservation
CTD	Conductivity, Temperature Depth
CTD+RO	Conductivity, Temperature, Depth plus water sampler
CWC	Cold Water Coral
DOC	Department of Conservation
DTIS	NIWA's Deep Towed Imaging System
EBS	Epibenthic sled
FSW	Filtered Sea Water
GC	Gravity Corer
GEOMAR	GEOMAR Helmholtz Centre for Ocean Research
HD	High Definition
MARUM	Center for Marine Environmental Sciences at the University of Bremen, Germany
MBES	Multibeam Echosounder Systems
MBES/PS	Multibeam Echosounder and PARASOUND sub-bottom profiler
MBIE	New Zealand Ministry for Business, Innovation and Employment
MEMF	Marine Environmental Manipulation Facility at NIWA Wellington
MPI	New Zealand Ministry for Primary Industries
NIC	NIWA Invertebrate Collecton
NIWA	National Institute of Water & Atmospheric Research Ltd
OBIS	Ocean Biodiversity Information System. https://obis.org
OFOS	Ocean Floor Observation Protocol (towed camera system)
PS	Parasound
RD	Rock dredge. NIWA's benthic 'seamount' sled
ROV	Remotely Operated Vehicle (MARUM ROV *SQUID* 2000 was used during SO309)
ROV-s	ROV sample
SaM	Senckenberg am Meer, Senckenberg Society for Nature Research, Wilhelmshaven, Germany

SO309	RV *Sonne* expedition/voyage number
SSIF	Strategic Science Investment Fund administered by MBIE
TV-BC	TV-guided box corer
UHD	Ultra High Definition
USBL	Ultra Short BaseLine acoustic positioning system

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Appendix A Station List SO309

The full station list is reproduced from the Short Cruise Report filed by Freiwald (2025a)

Station	GeoB-ID	Gear	Date dd/m/yyyy	Time UTC	Latitude	Longitude	Depth (m)	Remarks
Rakiura Hills east of Stewart Island								
SO309_1-1	26301-1	CTD+RO	16/1/2025	12:00	42°15.070 S	174°40.060E	1952	sound velocity profiling; water sampling at 14 & 1942 m
SO309_2-1	26302-1	MBES/PS	16/1/2025	12:44	42°15.066S	174°40.063E	1948	*survey start*
			17/1/2025	20:50	45°26.957S	172°16.214E	1340	*survey end*
SO309_3-1	26303-1	CTD+RO	17/1/2025	21:27	45°26.952 S	172°16.210E	1339	sound velocity profiling; water sampling at 10 & 1326 m
SO309_4-1	26304-1	MBES/PS	17/1/2025	22:12	45°27.160S	172°16.225E	1332	*survey start*
				21:15	47°41.050S	170°00.418E	1018	*survey end*
SO309_5-1	26305-1	CTD+RO	18/1/2025	21:45	47°41.058S	170°00.426E	1016	sound velocity profiling; water sampling at 10 & 1006 m
SO309_6-1	26306-1	MBES/PS	18/1/2025	23:14	47°40.998S	170°00.210E	1017	survey interrupted between 01:09 and 02:13
			19/1/2025	04:30	47°41.416S	169°37.401E	761	survey end
SO309_7-1	26307-1	TV-BC	19/1/2025	05:35	47°41.753S	169°36.027E	635	with Sonardyne; recovery: 27 cm
SO309_8-1	26308-1	MBES/PS	19/1/2025	06:40	47°41.981S	169°33.836E	658	*survey start*
				17:11	47°38.531S	169°40.699E	790	*survey end*
SO309_9-1	26309-1	GC	19/1/2025	18:33	47°42.047S	169°31.175E	658	with Sonardyne; empty; corer toppled over
SO309_10-1	26310-1	GC	19/1/2025	20:08	47°41.752S	169°36.032E	627	with Sonardyne; same position as GeoB26307-1 (TV-BC); whitish carbonate rich sediments; recovery: 49 cm
SO309_11-1	26311-1	GC	19/1/2025	21:28	47°42.070S	169°31.143E	656	with Sonardyne; empty
SO309_12-1	26312-9	ROV-s	20/1/2025	04:46	47°40.994S	169°33.978E	600	sample#8: solitary coral (Desmophyllum dianthus)
SO309_12-1	26312-10	ROV-s	20/1/2025	04:56	47°40.994S	169°33.978E	600	sample#9: water sample
SO309_12-1	26312-8	ROV-s	20/1/2025	03:01	47°40.922S	169°34.039E	614	sample#7: yellow sponge and associated fauna
SO309_12-1	26312-7	ROV-s	20/1/2025	02:00	47°40.903S	169°34.058E	618	sample#6: purple scleractinian, sponge, stylasterid
SO309_12-1	26312-2	ROV-s	20/1/2025	00:53	47°40.864S	169°34.078E	620	sample#1: purple scleractinian
SO309_12-1	26312-3	ROV-s	20/1/2025	01:06	47°40.867S	169°34.079E	620	sample#2: purple scleractinian

Station	GeoB-ID	Gear	Date dd/m/yyyy	Time UTC	Latitude	Longitude	Depth (m)	Remarks
SO309_12-1	26312-4	ROV-s	20/1/2025	01:06	47°40.867S	169°34.079E	620	sample#3: purple scleractinian
SO309_12-1	26312-5	ROV-s	20/1/2025	01:11	47°40.872S	169°34.075E	620	sample#4: water sample
SO309_12-1	26312-6	ROV-s	20/1/2025	01:17	47°40.872S	169°34.076E	620	sample#5: gastropod (bubble snail)
SO309_12-1	26312-1	ROV	20/1/2025	00:23	47°40.859S	169°34.083E	621	DIVE102
				05:03	47°40.994S	169°33.978E	600	*dive end*
SO309_13-1	26313-1	EBS	20/1/2025	07:49	47°40.855S	169°34.082E	589	*survey start*
				07:54	47°40.926S	169°34.043E	589	*survey end*
SO309_14-1	26314-1	MBES/PS	20/1/2025	09:09	47°41.340S	169°39.199E	773	*survey start*
				18:17	47°46.942S	169°29.224E	679	*survey end*
SO309_15-1	26315-4	ROV-s	20/1/2025	22:08	47°41.256S	169°33.695E	517	sample#3: water sample
SO309_15-1	26315-1	ROV	20/1/2025	21:35	47°41.256S	169°33.694E	518	DIVE103
			21/1/2025	02:05	47°41.238S	169°33.677E	520	*dive end*
SO309_15-1	26315-2	ROV-s	20/1/2025	21:47	47°41.256S	169°33.694E	518	sample#1: Thouarella attached to gastropod; Desmophyllum, stylasterid, soft coral
SO309_15-1	26315-3	ROV-s	20/1/2025	22:02	47°41.256S	169°33.695E	518	sample#2: live Desmophyllum
SO309_15-1	26315-5	ROV-s	20/1/2025	22:12	47°41.256S	169°33.695E	518	sample#4: Acesta shell + sediment
SO309_15-1	26315-6	ROV-s	20/1/2025	22:19	47°41.256S	169°33.695E	518	sample#5: dead shark
SO309_15-1	26315-7	ROV-s	20/1/2025	22:30	47°41.256S	169°33.695E	518	sample#6: rock
SO309_15-1	26315-8	ROV-s	20/1/2025	22:54	47°41.246S	169°33.684E	519	sample#7: Callogorgia, gastropod (small+large), red soft coral
SO309_15-1	26315-9	ROV-s	20/1/2025	23:22	47°41.246S	169°33.683E	519	sample#8: rock
SO309_15-1	26315-10	ROV-s	20/1/2025	23:30	47°41.246S	169°33.683E	519	sample#9: rock (piece of sample #8)
SO309_15-1	26315-11	ROV-s	21/1/2025	00:05	47°41.239S	169°33.672E	522	sample#10: dead & live Acesta, gastropod
SO309_15-1	26315-12	ROV-s	21/1/2025	00:43	47°41.239S	169°33.672E	522	sample#11: live Acesta with Capulus
SO309_15-1	26315-13	ROV-s	21/1/2025	01:06	47°41.239S	169°33.672E	522	sample#12: Acesta shells, dead Desmophyllum, gastropod
SO309_15-1	26315-14	ROV-s	21/1/2025	01:19	47°41.239S	169°33.673E	521	sample#13: rock
SO309_15-1	26315-15	ROV-s	21/1/2025	01:50	47°41.239S	169°33.672E	519	sample#14: soft coral, bamboo coral
SO309_15-1	26315-16	ROV-s	21/1/2025	01:53	47°41.239S	169°33.672E	519	sample#15: sponge

Station	GeoB-ID	Gear	Date dd/m/yyyy	Time UTC	Latitude	Longitude	Depth (m)	Remarks
SO309_15-1	26315-17	ROV-s	21/1/2025	01:54	47°41.238S	169°33.676E	519	sample#16: water sample
SO309_16-1	26316-1	TV-BC	21/1/2025	04:28	47°40.920S	169°34.057E	611	with Sonardyne; recovery: 25 cm
SO309_17-1	26317-1	TV-BC	21/1/2025	05:34	47°40.988S	169°33.987E	598	with Sonardyne; recovery: 38-40 cm
SO309_18-1	26318-1	CTD+RO	21/1/2025	06:48	47°41.194S	169°33.747E	486	water sampling at 10 & 488 m and for bio labs
SO309_19-1	26319-1	MBES/PS	21/1/2025	07:40	47°43.207S	169°33.422E	678	*survey start*
				17:23	47°51.667S	169°36.649E	711	*survey end*
SO309_20-1	26320-1	RD	21/1/2025	19:00	47°40.958S	169°33.993E	599	tow for 200 m, but came up empty
				19:08	47°41.037S	169°33.991E	589	*survey end*
SO309_21-1	26321-1	ROV	21/1/2025	21:39	47°39.047S	169°36.577E	459	DIVE104
			22/1/2025	03:01	47°38.934S	169°36.836E	458	*dive end*
SO309_21-1	26321-2	ROV-s	21/1/2025	22:10	47°39.024S	169°36.598E	459	sample#1: red echinoid, soft coral A1
SO309_21-1	26321-3	ROV-s	21/1/2025	22:14	47°39.023S	169°36.598E	459	sample#2: rock (formerly colonized by coral A1)
SO309_21-1	26321-4	ROV-s	21/1/2025	22:15	47°39.023S	169°36.598E	459	sample#3: soft coral A2
SO309_21-1	26321-5	ROV-s	21/1/2025	22:18	47°39.023S	169°36.598E	459	sample#4: soft coral A3
SO309_21-1	26321-6	ROV-s	21/1/2025	22:45	47°38.989S	169°36.648E	457	sample#5: two small rocks
SO309_21-1	26321-7	ROV-s	21/1/2025	23:12	47°38.981S	169°36.672E	457	sample#6: crinoid (piece of coral A3!)
SO309_21-1	26321-8	ROV-s	21/1/2025	23:28	47°38.978S	169°36.675E	457	sample#7: pillow star
SO309_21-1	26321-9	ROV-s	21/1/2025	23:40	47°38.975S	169°36.686E	457	sample#8: water sample
SO309_21-1	26321-10	ROV-s	21/1/2025	23:49	47°38.970S	169°36.688E	457	sample#9: rock with barnacles
SO309_21-1	26321-11	ROV-s	22/1/2025	00:01	47°38.969S	169°36.688E	457	sample#10: net with small gastropod
SO309_21-1	26321-12	ROV-s	22/1/2025	00:31	47°38.971S	169°36.694E	457	sample#11: Calliostoma --> moved out of tube (?), found attached to vehicle
SO309_21-1	26321-13	ROV-s	22/1/2025	00:57	47°38.971S	169°36.714E	457	sample#12: Acanthogorgia
SO309_21-1	26321-14	ROV-s	22/1/2025	01:03	47°38.972S	169°36.718E	457	sample#13: small complete Acanthogorgia
SO309_21-1	26321-15	ROV-s	22/1/2025	01:07	47°38.971S	169°36.719E	457	sample#14: Acanthogorgia
SO309_21-1	26321-16	ROV-s	22/1/2025	02:08	47°38.956S	169°36.781E	457	sample#15: live Flabellum
SO309_21-1	26321-17	ROV-s	22/1/2025	02:16	47°38.957S	169°36.782E	457	sample#16: red seastar (Benthopecten) --> lost during recovery

Station	GeoB-ID	Gear	Date dd/m/yyyy	Time UTC	Latitude	Longitude	Depth (m)	Remarks
SO309_21-1	26321-18	ROV-s	22/1/2025	02:17	47°38.957S	169°36.782E	457	sample#17: water sample
SO309_21-1	26321-19	ROV-s	22/1/2025	02:24	47°38.957S	169°36.780E	457	sample#18: small live Flabellum
SO309_21-1	26321-20	ROV-s	22/1/2025	02:26	47°38.957S	169°36.780E	457	sample#19: dead Flabellum
SO309_22-1	26322-1	YoyoCTD	22/1/2025	17:17	47°41.300S	169°38.027E	754	13 casts (05:26 - 17:17 UTC); water sampling last cast at 10 & 755 m
SO309_23-1	26323-1	ROV	22/1/2025	19:08	47°39.288S	169°36.386E	551	deployment aborted at 19:26 due to technical problems
SO309_24-1	26324-1	GC	22/1/2025	20:33	47°40.987S	169°33.908E	594	with Sonardyne (same position as GeoB26317 TV-BC); rope tension: 39kN; overpenetration, recovery: 563 cm
SO309_24-2	26324-2	GC	22/1/2025	22:59	47°40.989S	169°33.909E	592	with Sonardyne (same position as GeoB26317 TV-BC); rope tension: 41kN; recovery: 856 cm
SO309_25-1	26325-1	MBES/PS	22/1/2025	23:37	47°42.268S	169°28.545E	639	*survey start*
			23/1/2025	01:32	47°42.063S	169°18.678E	622	*survey end*
SO309_26-1	26326-1	TV-BC	23/1/2025	02:28	47°42.678S	169°18.631E	619	with Sonardyne; recovery: 11-13 cm
SO309_27-1	26327-1	CTD+RO	23/1/2025	08:41	47°42.907S	169°19.577E	628	sound velocity profiling; water sampling at 10 & 614 m
SO309_28-1	26328-1	GC	23/1/2025	04:44	47°42.647S	169°18.170E	618	tube bent, some semi-lithified sandy sediment collected from CC
SO309_29-1	26329-1	MBES/PS	23/1/2025	05:23	47°42.154S	169°18.421E	620	*survey start*
				19:46	47°38.282S	169°32.994E	595	*survey end*
SO309_30-1	26330-1	ROV	23/1/2025	21:38	47°39.186S	169°36.480E	504	DIVE105; dive track: 311 m
			24/1/2025	03:02	47°39.065S	169°36.646E	459	*dive end*
SO309_30-1	26330-2	ROV-s	23/1/2025	21:49	47°39.185S	169°36.483E	503	sample#1: 2x rock
SO309_30-1	26330-3	ROV-s	23/1/2025	21:53	47°39.186S	169°36.481E	504	sample#2: live & dead Desmophyllum dianthus
SO309_30-1	26330-4	ROV-s	23/1/2025	22:01	47°39.186S	169°36.481E	504	sample#3: water sample
SO309_30-1	26330-5	ROV-s	23/1/2025	22:11	47°39.157S	169°36.400E	495	sample#4: crust (?)
SO309_30-1	26330-6	ROV-s	23/1/2025	22:40	47°39.157S	169°36.508E	483	sample#5: soft coral, barnacles
SO309_30-1	26330-7	ROV-s	23/1/2025	23:00	47°39.154S	169°36.508E	481	sample#6: 2x Acesta, echinoid
SO309_30-1	26330-8	ROV-s	23/1/2025	23:47	47°39.153S	169°36.509E	480	sample#7: crust
SO309_30-1	26330-9	ROV-s	23/1/2025	23:49	47°39.153S	169°36.5095E	480	sample#8: large black rock with barnacles
SO309_30-1	26330-10	ROV-s	24/1/2025	00:08	47°39.145S	169°36.521E	472	sample#9: soft coral, Desmophyllum+sponge

Station	GeoB-ID	Gear	Date dd/m/yyyy	Time UTC	Latitude	Longitude	Depth (m)	Remarks
SO309_30-1	26330-11	ROV-s	24/1/2025	01:03	47°39.142S	169°36.5212E	470	sample#10: soft coral, Calliostoma
SO309_30-1	26330-12	ROV-s	24/1/2025	01:38	47°39.132S	169°36.537E	466	sample#11: 2x rock, layered
SO309_30-1	26330-13	ROV-s	24/1/2025	02:17	47°39.099S	169°36.592E	466	sample#12: soft coral
SO309_30-1	26330-14	ROV-s	24/1/2025	02:34	47°39.083S	169°36.620E	462	sample#13: large crust with soft coral, broken
SO309_30-1	26330-15	ROV-s	24/1/2025	02:38	47°39.083S	169°36.620E	462	sample#14: soft coral
SO309_30-1	26330-16	ROV-s	24/1/2025	02:57	47°39.065S	169°36.646E	459	sample#15: water sample
SO309_31-1	26331-1	GC	24/1/2025	04:28	47°38.583S	169°37.053E	565	with Sonardyne; overpenetration, top disturbed, top bulk corals collected, recovery: 578 cm
SO309_32-1	26332-1	EBS	24/1/2025	05:44	47°39.117S	169°36.593E	461	*survey start*
				05:56	47°39.143S	169°36.525E	476	*survey end*
SO309_33-1	26333-1	GC	24/1/2025	07:44	47°47.400S	169°36.343E	704	with Sonardyne; recovery: 200 cm
SO309_34-1	26334-1	MBES/PS	24/1/2025	10:56	47°43.354S	169°13.171E	620	*survey start*
				11:52	47°39.984S	169°6.163E	578	*survey end*
					Fiordland			
SO309_35-1	26335-1	CTD+RO	25/1/2025	17:22	45°7.317S	166°56.910E	776	sound velocity profiling; water sampling (last cast) at 10, 50, 150, 766 m
SO309_36-1	26336-1	MBES/PS	26/1/2025	04:59	45°8.585S	166°58.158E	130	*survey start*
				05:13	45°9.599S	166°58.608E	194	*survey end*
SO309_37-1	26337-2	OFOS	26/1/2025	05:45	45°9.599S	166°58.558E	203	*survey start*
				07:20	45°9.349S	166°58.413E	161	*survey end*
SO309_38-1	26338-1	YoyoCTD	26/1/2025	16:35	45°9.276S	166°58.532E	145	27 casts (07:45 - 16:35); water sampling at 10, 80, 131 m
SO309_39-1	26339-2	OFOS	26/1/2025	18:06	45°8.153S	166°57.550E	228	*survey start*
				20:13	45°8.613S	166°58.092E	148	*survey end*
SO309_40-1	26340-1	GC	26/1/2025	20:53	45°9.544S	166°58.558E	154	corer toppled over; empty, but few siliciclastic sand in CC
SO309_41-1	26341-1	MBES/PS	26/1/2025	21:06	45°9.289S	166°58.086E	155	*survey start*
				21:56	45°13.084S	166°58.086E	349	*survey end*
SO309_42-1	26342-1	GC	26/1/2025	22:08	45°13.084S	166°58.093E	348	recovery: 555 cm (for Uni Otaga)

Station	GeoB-ID	Gear	Date dd/m/yyyy	Time UTC	Latitude	Longitude	Depth (m)	Remarks
SO309_43-1	26343-1	CTD+RO	26/1/2025	23:08	45°12.773S	166°57.933E	351	sound velocity profiling
SO309_44-1	26344-12	ROV-s	27/1/2025	05:21	45°12.674S	166°57.836E	281	sample#11: water sample
SO309_44-1	26344-11	ROV-s	27/1/2025	05:07	45°12.693S	166°57.843E	298	sample#10: yellow coral (several polyps)
SO309_44-1	26344-10	ROV-s	27/1/2025	04:48	45°12.694S	166°57.843E	305	sample#9: yellow coral (one polyp)
SO309_44-1	26344-9	ROV-s	27/1/2025	04:34	45°12.696S	166°57.843E	312	sample#8: Pulvinites
SO309_44-1	26344-6	ROV-s	27/1/2025	03:51	45°12.700S	166°57.841E	323	sample#5: live Madrepora (?)
SO309_44-1	26344-7	ROV-s	27/1/2025	04:09	45°12.699S	166°57.841E	323	sample#6: Eguchipsammia
SO309_44-1	26344-8	ROV-s	27/1/2025	04:11	45°12.699S	166°57.841E	323	sample#7: stylasterid
SO309_44-1	26344-5	ROV-s	27/1/2025	02:31	45°12.735S	166°57.889E	340	sample#4: water sample
SO309_44-1	26344-4	ROV-s	27/1/2025	02:27	45°12.738S	166°57.896E	342	sample#3: coral rubble in net
SO309_44-1	26344-2	ROV-s	27/1/2025	01:19	45°12.764S	166°57.908E	345	sample#1: white soft coral + sediment
SO309_44-1	26344-3	ROV-s	27/1/2025	01:45	45°12.757S	166°57.914E	346	sample#2: white soft coral + sediment
SO309_44-1	26344-1	ROV	27/1/2025	01:08	45°12.764S	166°57.907E	347	DIVE106; dive track: ~180 m
				05:23	45°12.681S	166°57.834E	281	*dive end*
SO309_45-1	26345-1	TV-BC	27/1/2025	07:04	45°12.711S	166°57.863E	342	with Sonardyne; recovery: 40-45 cm; first deployment failed because lights did not work
SO309_46-1	26346-1	YoyoCTD	27/1/2025	16:53	45°18.932S	166°59.061E	339	17 casts (08:46 - 16:53); water sampling at 10, 100, 315 m
SO309_47-1	26347-1	GC	27/1/2025	17:42	45°19.143S	166°58.805E	442	recovery: 842 cm (for Uni Otaga)
SO309_48-1	26348-1	GC	27/1/2025	18:48	45°17.317S	167°0.502E	356	recovery: 755 cm
SO309_49-1	26349-10	ROV-s	28/1/2025	02:26	45°19.098S	166°59.852E	127	sample#9: Antipathella
SO309_49-1	26349-9	ROV-s	28/1/2025	02:03	45°19.096S	166°59.846E	128	sample#8: water sample
SO309_49-1	26349-7	ROV-s	28/1/2025	00:23	45°19.097S	166°59.846E	133	sample#6: rock with tube (fallen off)
SO309_49-1	26349-8	ROV-s	28/1/2025	00:59	45°19.094S	166°59.853E	134	sample#7: live Madrepora
SO309_49-1	26349-6	ROV-s	27/1/2025	21:56	45°19.186S	166°59.871E	227	sample#5: Clavularia + gastropod
SO309_49-1	26349-5	ROV-s	27/1/2025	21:37	45°19.196S	166°59.878E	237	sample#4: water sample
SO309_49-1	26349-3	ROV-s	27/1/2025	21:32	45°19.197S	166°59.877E	239	sample#2: rock with Eguchipsammia attached
SO309_49-1	26349-4	ROV-s	27/1/2025	21:34	45°19.197S	166°59.878E	239	sample#3: Protula tube

Station	GeoB-ID	Gear	Date dd/m/yyyy	Time UTC	Latitude	Longitude	Depth (m)	Remarks
SO309_49-1	26349-2	ROV-s	27/1/2025	21:13	45°19.201S	166°59.879E	242	sample#1: red sea cucumber
SO309_49-1	26349-1	ROV	27/1/2025	20:51	45°19.072S	166°59.878E	244	DIVE107
			28/1/2025	02:36	45°19.003S	166°59.864E	112	*dive end*
SO309_50-1	26350-1	GC	28/1/2025	03:47	45°17.268S	167°2.270E	437	recovery: 803 cm
SO309_51-1	26351-1	TV-BC	28/1/2025	05:26	45°19.061S	166°59.861E	118	with Sonardyne; recovery: 33 cm
SO309_52-1	26352-1	MBES/PS	28/1/2025	17:54	45°17.276S	167°2.089E	423	*survey start*
				18:52	45°16.701S	166°52.605E	210	*survey end*
SO309_53-1	26353-1	CTD+RO	28/1/2025	19:10	45°16.691S	166°52.607E	209	sound velocity profiling; water sampling at 4 & 191 m
SO309_54-1	26354-1	GC	28/1/2025	19:35	45°16.695S	166°52.594E	216	tube bent
SO309_55-1	26355-1	CTD+RO	28/1/2025	23:27	45°39.518S	166°43.401E	352	sound velocity profiling; water sampling at 10 & 337 m
SO309_56-1	26356-1	ROV	28/1/2025	01:04	45°40.829S	166°43.772E	231	DIVE108
			29/1/2025	05:37	45°40.778S	166°43.877E	99.5	*dive end*
SO309_56-1	26356-2	ROV-s	29/1/2025	01:22	45°40.825S	166°43.778E	225	sample#1: Pulvinites
SO309_56-1	26356-3	ROV-s	29/1/2025	01:35	45°40.825S	166°43.778E	225	sample#2: water sample
SO309_56-1	26356-4	ROV-s	29/1/2025	02:32	45°40.832S	166°43.777E	209	sample#3: elongated soft coral
SO309_56-1	26356-5	ROV-s	29/1/2025	02:40	45°40.830S	166°43.782E	204	sample#4: fan-shaped soft coral
SO309_56-1	26356-6	ROV-s	29/1/2025	03:22	45°40.832S	166°43.789E	183	sample#5: live Madrepora
SO309_56-1	26356-7	ROV-s	29/1/2025	03:46	45°40.833S	166°43.799E	165	sample#6: live Madrepora
SO309_56-1	26356-8	ROV-s	29/1/2025	04:07	45°40.825S	166°43.799E	165	sample#7: stylasterid
SO309_56-1	26356-9	ROV-s	29/1/2025	05:36	45°40.778S	166°43.877E	99.6	sample#8: water sample
SO309_57-1	26357-1	GC	29/1/2025	06:54	45°42.230S	166°43.561E	349	recovery: 564 cm; some shells at top (bag sample)
SO309_58-1	26358-1	YoyoCTD	29/1/2025	16:52	45°45.142S	166°39.039E	257	18 casts (08:17 - 16:52); water sampling at 10, 40, 120, 243 m
SO309_59-1	26359-1	GC	29/1/2025	17:56	45°45.239S	166°40.834E	299	recovery: 844 cm (for Uni Otaga)
SO309_60-1	26360-1	TV-BC	29/1/2025	19:11	45°45.228S	166°40.849E	299	with Sonardyne; recovery: 45 cm
SO309_61-1	26361-1	ROV	29/1/2025	21:07	45°44.103S	166°43.701E	287	DIVE109
			30/1/2025	02:57	45°44.171S	166°43.713E	102	*dive end*
SO309_61-1	26361-2	ROV-s	29/1/2025	21:37	45°44.109S	166°43.700E	282	sample#1: net with bivalve shells + coral framework

Station	GeoB-ID	Gear	Date dd/m/yyyy	Time UTC	Latitude	Longitude	Depth (m)	Remarks
SO309_61-1	26361-3	ROV-s	29/1/2025	21:48	45°44.109S	166°43.7E	282	sample#2: water sample
SO309_61-1	26361-4	ROV-s	29/1/2025	22:12	45°44.112S	166°43.697E	273	sample#3: 1x live Acesta
SO309_61-1	26361-5	ROV-s	29/1/2025	22:38	45°44.114S	166°43.697E	265	sample#4: live Acesta (1x broken, 1x small)
SO309_61-1	26361-6	ROV-s	29/1/2025	22:42	45°44.114S	166°43.695E	265	sample#5: live Pulvinites
SO309_61-1	26361-7	ROV-s	29/1/2025	23:02	45°44.113S	166°43.693E	263	sample#6: 1x live Acesta
SO309_61-1	26361-8	ROV-s	29/1/2025	00:22	45°44.115S	166°43.699E	223	sample#7: live Madrepora
SO309_61-1	26361-9	ROV-s	29/1/2025	00:37	45°44.115S	166°43.699E	223	sample#8: red soft coral
SO309_61-1	26361-10	ROV-s	29/1/2025	01:25	45°44.120S	166°43.695E	172	sample#9: live Eguchipsammia
SO309_61-1	26361-11	ROV-s	29/1/2025	01:55	45°44.128S	166°43.693E	159	sample#10: fan-shaped gorgonian
SO309_61-1	26361-12	ROV-s	29/1/2025	02:11	45°44.139S	166°43.691E	142	sample#11: stalked sponges
SO309_61-1	26361-13	ROV-s	29/1/2025	02:35	45°44.149S	166°43.704E	112	sample#12: elongated soft coral
SO309_61-1	26361-14	ROV-s	29/1/2025	02:55	45°44.171S	166°43.713E	101	sample#13: red crinoid + stylasterid
SO309_61-1	26361-15	ROV-s	30/1/2025	02:56	45°44.171S	166°43.713E	101	sample#14: water sample
SO309_62-1	26362-1	CTD+RO	30/1/2025	20:59	44°32.890S	167°42.193E	450	sound velocity profiling; water sampling at 10, 80,200, and 436 m
SO309_63-1	26363-1	ROV	30/1/2025	22:55	44°32.942S	167°42.452E	313	DIVE110
			31/1/2025	04:10	44°32.953S	167°42.719E	108	*dive end*
SO309_63-1	26363-2	ROV-s	30/1/2025	23:46	44°32.943S	167°42.496E	264	sample#1: stylasterid
SO309_63-1	26363-3	ROV-s	31/1/2025	00:08	44°32.942S	167°42.506E	254	sample#2: stylasterid + brown soft coral
SO309_63-1	26363-4	ROV-s	31/1/2025	00:42	44°32.946S	167°42.531E	235	sample#3: water sample
SO309_63-1	26363-5	ROV-s	31/1/2025	01:06	44°32.947S	167°42.552E	216	sample#4: pink stylasterid on tube
SO309_63-1	26363-6	ROV-s	31/1/2025	02:15	44°32.946S	167°42.618E	160	sample#5: soft coral + crinoid
SO309_63-1	26363-7	ROV-s	31/1/2025	02:34	44°32.948S	167°42.633E	151	sample#6: stylasterid+ sponge
SO309_63-1	26363-8	ROV-s	31/1/2025	02:37	44°32.948S	167°42.633E	151	sample#7: soft coral on rock
SO309_63-1	26363-9	ROV-s	31/1/2025	03:04	44°32.948S	167°42.654E	138	sample#8: yellow soft coral (branch)
SO309_63-1	26363-10	ROV-s	31/1/2025	03:07	44°32.948S	167°42.654E	138	sample#9: rest of yellow soft coral (see S#8)
SO309_63-1	26363-11	ROV-s	31/1/2025	03:20	44°32.946S	167°42.658E	134	sample#10: pink stylasterid (small branches)
SO309_63-1	26363-12	ROV-s	31/1/2025	04:09	44°32.953S	167°42.7195E	108	sample#11: water sample

Station	GeoB-ID	Gear	Date dd/m/yyyy	Time UTC	Latitude	Longitude	Depth (m)	Remarks
SO309_64-1	26364-1	TV-BC	31/1/2025	05:30	44°32.208S	167°39.011E	957	with Sonardyne; recovery: 37 cm
SO309_65-1	26365-1	CTD+RO	31/1/2025	12:43	44°28.191S	167°36.176E	2100	sound velocity profiling; water sampling at 10, 100, 250, 500, 1100 and 2085 m
SO309_66-1	26366-1	MBES/PS	31/1/2025	14:00	44°27.799S	167°35.854E	2133	*survey start*
				18:55	44°31.815S	167°41.816E	275	*survey end*
SO309_67-1	26367-1	GC	31/1/2025	19:39	44°32.212S	167°39.009E	957	recovery: 267 cm; turbidite
SO309_68-1	26368-1	ROV	31/1/2025	23:11	44°24.001S	167°47.779E	575	DIVE111
			1/1/2025	03:03	44°24.105S	167°47.802E	482	*dive end*
SO309_68-1	26368-2	ROV-s	31/1/2025	23:31	44°24.004S	167°47.779E	573	sample#1: red echinoid
SO309_68-1	26368-3	ROV-s	1/2/2025	01:22	44°24.095S	167°47.786E	514	sample#2: water sample
SO309_68-1	26368-4	ROV-s	1/2/2025	02:24	44°24.118S	167°47.803E	499	sample#3: sediment (pockmark)
					Chatham Rise			
SO309_69-1	26369-1	CTD+RO	5/2/2025	03:14	42°47.903S	179°59.459W	1002	sound velocity profiling; water sampling at 10, 750 and 996 m
SO309_70-1	26370-1	OFOS	5/2/2025	04:53	42°47.910S	179°59.260E	938	*survey start*
				05:36	42°47.991S	179°59.399E	1018	*survey end*
SO309_70-1	26370-2	OFOS	5/2/2025	06:40	42°47.909S	179°59.266E	931	*survey start*
				07:27	42°48.005S	179°59.132E	1031	*survey end*
SO309_70-1	26370-3	OFOS	5/2/2025	08:03	42°47.915S	179°59.269E	946	*survey start*
				08:53	42°47.808S	179°59.115E	1043	*survey end*
SO309_70-1	26370-4	OFOS	5/2/2025	09:31	42°47.909S	179°59.262E	929	*survey start*
				10:55	42°47.721S	179°59.518E	1032	*survey end*
SO309_70-1	26370-5	OFOS	5/2/2025	11:22	42°47.728S	179°59.469E	1009	*survey start*
				11:46	42°47.779S	179°59.386E	1023	*survey end*
SO309_70-1	26370-6	OFOS	5/2/2025	12:16	42°47.912S	179°59.263E	940	*survey start*
				13:09	42°47.742S	179°59.259E	1059	*survey end*
SO309_71-1	26371-1	MBES/PS	5/2/2025	14:26	42°50.102S	179°57.582E	918	*survey start*
				18:36	42°45.922S	179°58.594W	1128	*survey end*

Station	GeoB-ID	Gear	Date dd/m/yyyy	Time UTC	Latitude	Longitude	Depth (m)	Remarks
SO309_72-1	26372-1	TV-BC	5/2/2025	20:03	42°47.898S	179°59.294E	952	with Sonardyne; not released
SO309_73-1	26373-1	EBS	5/2/2025	22:13	42°47.962S	179°59.354E	1019	*survey start*
				22:19	42°48.000S	179°59.432E	1020	*survey end*
SO309_74-1	26374-1	EBS	6/2/2025	00:01	42°47.700S	179°58.969E	1033	*survey start*
				00:12	42°47.684S	179°58.992E	1036	*survey end*
SO309_75-1	26375-1	ROV	6/2/2025	02:14	42°47.955S	179°59.261E	1006	DIVE112
				05:54	42°47.896S	179°59.261E	921	*dive end*
SO309_75-1	26375-2	ROV-s	6/2/2025	02:15	42°47.952S	179°59.336E	1006	sample#1: water sample
SO309_75-1	26375-3	ROV-s	6/2/2025	02:29	42°47.946S	179°59.327E	997	sample#2: large dead coral framework
SO309_75-1	26375-4	ROV-s	6/2/2025	02:52	42°47.939S	179°59.317E	992	sample#3: gorgonian (3 colonies)
SO309_75-1	26375-5	ROV-s	6/2/2025	03:16	42°47.935S	179°59.313E	988	sample#4: coral rubble + seastar
SO309_75-1	26375-6	ROV-s	6/2/2025	03:24	42°47.935S	179°59.313E	988	sample#5: small dead coral framework
SO309_75-1	26375-7	ROV-s	6/2/2025	03:59	42°47.924S	179°59.295E	970	sample#6: live Solenosmilia
SO309_75-1	26375-8	ROV-s	6/2/2025	04:14	42°47.925S	179°59.291E	969	sample#7: basaltic rock
SO309_75-1	26375-9	ROV-s	6/2/2025	05:13	42°47.914S	179°59.275E	947	sample#8: live Solenosmilia + gastropod
SO309_75-1	26375-10	ROV-s	6/2/2025	05:52	42°47.896S	179°59.261E	922	sample#9: water sample
SO309_76-1	26376-1	TV-BC	6/2/2025	07:37	42°47.901S	179°59.297E	974	with Sonardyne; not released -> slope too steep for coring
SO309_77-1	26377-1	TV-BC	6/2/2025	09:14	42°47.870S	179°59.531E	1040	with Sonardyne; recovery: 36-40 cm
SO309_78-1	26378-1	MBES/PS	6/2/2025	10:22	42°49.560S	179°58.206E	939	*survey start*
				19:28	42°50.672S	179°58.912W	885	*survey end*
SO309_79-1	26379-1	GC	6/2/2025	21:56	42°46.546S	179°59.018W	1063	recovery: 516 cm
SO309_80-1	26380-1	GC	7/2/2025	00:09	42°54.172S	179°54.996E	768	recovery: 78 cm; tube bent, but some sediment recovered
SO309_81-1	26381-1	GC	7/2/2025	02:12	42°47.920S	179°59.290E	970	recovery: 386 cm; corals throughout, overpenetration, corals in weight and CC collected as bulk sample
SO309_81-2	26381-2	GC	7/2/2025	03:52	42°47.924S	179°59.284E	971	recovery: 842 cm; corals throughout (more abundant in the upper 4-5 sections
SO309_82-1	26382-1	CTD+RO	7/2/2025	05:59	42°41.864S	179°58.743E	1302	sound velocity profiling; water sampling at 10, 800, 900, 1100, 1292 m

Station	GeoB-ID	Gear	Date dd/m/yyyy	Time UTC	Latitude	Longitude	Depth (m)	Remarks
SO309_83-1	26383-1	OFOS	7/2/2025	07:42	42°43.017S	179°57.620W	892	WP 1-2
				09:41	42°42.652S	179°57.164W	1182	*survey end*
SO309_83-1	26383-2	OFOS	7/2/2025	10:56	42°43.002S	179°57.654W	905	WP 5-6
				12:56	42°42.818S	179°58.396W	1203	*survey end*
SO309_83-1	26383-3	OFOS	7/2/2025	13:57	42°42.970S	179°57.610W	930	WP 3-4
				15:40	42°43.336S	179°58.081W	1190	*survey end*
SO309_83-1	26383-4	OFOS	7/2/2025	16:31	42°42.999S	179°57.606W	895	WP 7-8
				17:05	42°43.004S	179°57.421W	938	*survey end*
SO309_83-1	26383-5	OFOS	7/2/2025	17:34	42°42.720S	179°57.540W	901	WP 11-12
				18:42	42°42.720S	179°57.540W	1098	*survey end*
SO309_84-1	26384-1	ROV	7/2/2025	21:15	42°47.824S	179°59.259E	980	DIVE113
			8/2/2025	01:49	42°47.894S	179°59.262E	923	*dive end*
SO309_84-1	26384-2	ROV-s	7/2/2025	21:51	42°47.828S	179°59.261E	977	sample#1: water sample
SO309_84-1	26384-3	ROV-s	7/2/2025	22:02	42°47.827S	179°59.261E	977	sample#2: coral rubble
SO309_84-1	26384-4	ROV-s	7/2/2025	22:06	42°47.828S	179°59.26E	976	sample#3: live Solenosmilia
SO309_84-1	26384-5	ROV-s	7/2/2025	23:40	42°47.848S	179°59.258E	956	sample#4: stylasterid
SO309_84-1	26384-6	ROV-s	7/2/2025	23:43	42°47.848S	179°59.258E	956	sample#5: live Acesta
SO309_84-1	26384-7	ROV-s	7/2/2025	23:45	42°47.848S	179°59.258E	956	sample#6: live Solenosmilia
SO309_84-1	26384-8	ROV-s	8/2/2025	00:44	42°47.872S	179°59.262E	923	sample#7: water sample
SO309_85-1	26385-1	GC	8/2/2025	03:26	42°47.880S	179°59.284E	934	recovery: x cm; corals throughout (more abundant in the upper 4-5 sections
SO309_86-1	26386-1	EBS	8/2/2025	05:51	42°43.327S	179°56.691W	1194	*survey start*
				05:59	42°43.270S	179°56.554W	1182	*survey end*
SO309_87-1	26387-1	EBS	8/2/2025	08:12	42°42.309S	179°58.707W	1271	*survey start*
				08:21	42°42.268S	179°58.598W	1271	*survey end*
SO309_88-1	26388-3	OFOS	8/2/2025	13:24	42°43.017S	179°577.591W	897	Track II
				14:44	42°42.763S	179°57.824W	1103	*survey end*

Station	GeoB-ID	Gear	Date dd/m/yyyy	Time UTC	Latitude	Longitude	Depth (m)	Remarks
SO309_88-1	26388-2	OFOS	8/2/2025	11:31	42°43.004S	179°57.602W	899	Track I
				12:48	42°43.234S	179°57.284W	1116	*survey end*
SO309_88-1	26388-4	OFOS	8/2/2025	15:27	42°43.008S	179°57.637W	909	Track V
				15:53	42°43.029S	179°57.804W	1007	*survey end*
SO309_88-1	26388-1	OFOS	8/2/2025	10:10	42°43.005S	179°57.524W	942	Line 1, wheel survey
				11:27	42°43.005S	179°57.608W	898	*survey end*
SO309_88-1	26388-5	OFOS	8/2/2025	16:25	42°43.192S	179°57.667W	1023	Track III
				19:15	42°43.974S	179°57.773W	1100	*survey end*
SO309_89-1	26389-1	ROV	8/2/2025	21:50	42°47.910S	179°59.263E	939	DIVE114
			9/2/2025	02:01	42°47.869S	179°59.279E	925	*dive end*
SO309_89-1	26389-2	ROV-s	8/2/2025	21:55	42°47.91S	179°59.263E	939	sample#1: bamboo coral (?)
SO309_89-1	26389-3	ROV-s	8/2/2025	22:05	42°47.909S	179°59.262E	936	sample#2: Anthomastus (3x)
SO309_89-1	26389-4	ROV-s	8/2/2025	22:55	42°47.93S	179°59.275E	936	sample#3: "Schlontz" + sponge + stylasterid
SO309_89-1	26389-5	ROV-s	8/2/2025	23:41	42°47.895S	179°59.285E	937	sample#4: Solenosmilia
SO309_89-1	26389-6	ROV-s	8/2/2025	23:47	42°47.895S	179°59.284E	937	sample#5: Solenosmilia + gastropod
SO309_89-1	26389-7	ROV-s	9/2/2025	00:04	42°47.895S	179°59.284E	937	sample#6: water sample
SO309_89-1	26389-8	ROV-s	9/2/2025	00:17	42°47.886S	179°59.287E	936	sample#7: plexaurid sea fan A1
SO309_89-1	26389-9	ROV-s	9/2/2025	00:29	42°47.886S	179°59.287E	936	sample#8: plexaurid sea fan A2
SO309_89-1	26389-10	ROV-s	9/2/2025	00:34	42°47.886S	179°59.287E	936	sample#9: plexaurid sea fan A3
SO309_89-1	26389-11	ROV-s	9/2/2025	00:52	42°47.886S	179°59.287E	936	sample#10: live Solenosmilia
SO309_89-1	26389-12	ROV-s	9/2/2025	01:29	42°47.862S	179°59.296E	936	sample#11: water sample
SO309_89-1	26389-13	ROV-s	9/2/2025	01:47	42°47.863S	179°59.286E	934	sample#12: Solenosmilia framework
SO309_90-1	26390-1	GC	9/2/2025	03:55	42°47.878S	179°59.287E	968	recovery: 529 cm; corals throughout (weight was completely in sediment, sediment slipped out of pipe??), lot of water
SO309_91-1	26391-1	GC	9/2/2025	06:15	42°43.945S	179°59.786	1119	toppled over, empty
SO309_92-1	26392-1	OFOS	9/2/2025	07:43	42°45.668S	179°59.479W	766	*survey start*
				09:39	42°45.936S	179°58.824W	1062	*survey end*

Station	GeoB-ID	Gear	Date dd/m/yyyy	Time UTC	Latitude	Longitude	Depth (m)	Remarks
SO309_92-1	26392-2	OFOS	9/2/2025	10:40	42°45.633S	179°59.345W	766	*survey start*
				13:00	42°45.077S	179°58.994W	1047	*survey end*
SO309_92-1	26392-3	OFOS	9/2/2025	14:01	42°45.627S	179°59.362W	760	*survey start*
				15:46	42°45.410S	179°58.830W	1010	*survey end*
SO309_92-1	26392-4	OFOS	9/2/2025	16:30	42°45.617S	179°59.352W	757	*survey start*
				17:51	42°45.886S	179°59.735W	1038	*survey end*
SO309_92-1	26392-5	OFOS	9/2/2025	18:37	42°45.683S	179°59.378W	784	*survey start*
				19:44	42°45.501S	179°59.724W	991	*survey end*
SO309_93-1	26393-9	ROV-s	10/2/2025	02:02	42°43.294S	179°57.74W	1037	sample#8: water sample
SO309_93-1	26393-7	ROV-s	10/2/2025	01:15	42°43.328S	179°57.769W	1047	sample#6: gastropod +live Solenosmilia
SO309_93-1	26393-8	ROV-s	10/2/2025	01:24	42°43.328S	179°57.769W	1047	sample#7: "schlontz" + coral rubble
SO309_93-1	26393-6	ROV-s	10/2/2025	00:47	42°43.326S	179°57.774W	1050	sample#5: coral rubble, Acesta shell, gastropods
SO309_93-1	26393-5	ROV-s	9/2/2025	23:30	42°43.357S	179°57.811W	1067	sample#4: carnivorous sponge on dead coral framework
SO309_93-1	26393-4	ROV-s	9/2/2025	22:57	42°43.357S	179°57.812W	1068	sample#3: large dead coral framework with live Solenosmilia
SO309_93-1	26393-3	ROV-s	9/2/2025	22:45	42°43.357S	179°57.814W	1070	sample#2: water sample
SO309_93-1	26393-2	ROV-s	9/2/2025	22:32	42°43.351S	179°57.838W	1102	sample#1: coral rubble, barnacle plates
SO309_93-1	26393-1	ROV	10/2/2025	22:20	42°43.351S	179°57.838W	1102	DIVE115
				02:08	42°43.295S	179°57.738W	1038	*dive end*
SO309_94-1	26394-1	EBS	10/2/2025	04:49	42°45.618S	179°58.173W	1100	*survey start*
				04:54	42°45.620S	179°58.174W	1100	*survey end*
SO309_95-1	26395-1	OFOS	10/2/2025	06:26	42°47.385S	179°59.202W	901	Line I
				07:15	42°47.297S	179°59.448W	1075	*survey end*
SO309_95-1	26395-2	OFOS	10/2/2025	07:43	42°47.408S	179°59.226W	908	Line II
				08:16	42°47.401S	179°59.002W	1056	*survey end*
SO309_95-1	26395-3	OFOS	10/2/2025	08:46	42°47.317S	179°59.213W	896	Line III
				09:30	42°47.279S	179°59.093W	1051	*survey end*
SO309_95-1	26395-4	OFOS	10/2/2025	09:58	42°47.402S	179°59.180W	903	Line IV

Station	GeoB-ID	Gear	Date dd/m/yyyy	Time UTC	Latitude	Longitude	Depth (m)	Remarks
				11:19	42°47.612S	179°59.494W	1062	*survey end*
SO309_95-1	26395-5	OFOS	10/2/2025	11:49	42°47.425S	179°59.223W	920	Line V
				12:16	42°47.251S	179°59.239W	1036	*survey end*
SO309_95-1	26395-6	OFOS	10/2/2025	12:58	42°47.407S	179°59.227W	909	Line VI
				14:14	42°47.417S	179°59.681W	1041	*survey end*
SO309_95-1	26395-7	OFOS	10/2/2025	14:59	42°47.4196S	179°59.207W	916	Line VII
				16:38	42°47.787S	179°59.3732W	1039	*survey end*
SO309_95-1	26395-8	OFOS	10/2/2025	17:18	42°47.411S	179°59.216W	902	Line VIII
				18:20	42°47.618S	179°58.982W	1039	*survey end*
SO309_96-1	26396-1	CTD+RO	10/2/2025	20:11	42°43.145S	179°55.816W	1171	sound velocity profiling; water sampling at 10, 900, 1159 m
SO309_97-1	26397-1	TV-BC	10/2/2025	22:15	42°47.385S	179°47.198W	908	with Sonardyne; recovery: 23 cm, live purple Enallopsammia
SO309_98-1	26398-11	ROV-s	11/2/2025	03:45	42°47.38S	179°59.177W	927	sample#10: Thouarella A1
SO309_98-1	26398-12	ROV-s	11/2/2025	03:48	42°47.38S	179°59.177W	927	sample#11: Thouarella A2
SO309_98-1	26398-13	ROV-s	11/2/2025	03:49	42°47.38S	179°59.177W	927	sample#12: Thouarella A3
SO309_98-1	26398-14	ROV-s	11/2/2025	03:53	42°47.38S	179°59.177W	927	sample#13: purple Enallopsammia
SO309_98-1	26398-15	ROV-s	11/2/2025	03:54	42°47.38S	179°59.177W	927	sample#14: water sample
SO309_98-1	26398-10	ROV-s	11/2/2025	03:32	42°47.381S	179°59.169W	936	sample#9: bamboo coral
SO309_98-1	26398-9	ROV-s	11/2/2025	03:09	42°47.38S	179°59.154W	948	sample#8: purple+orange gorgonian on rubble
SO309_98-1	26398-7	ROV-s	11/2/2025	02:19	42°47.383S	179°59.149W	956	sample#6: live Madrepora
SO309_98-1	26398-8	ROV-s	11/2/2025	02:32	42°47.383S	179°59.149W	956	sample#7: live Madrepora (same colony as S#6)
SO309_98-1	26398-2	ROV-s	11/2/2025	00:53	42°47.399S	179°59.147W	959	sample#1: live Madrepora
SO309_98-1	26398-3	ROV-s	11/2/2025	00:58	42°47.399S	179°59.147W	959	sample#2: live Madrepora (same colony as S#1)
SO309_98-1	26398-4	ROV-s	11/2/2025	01:01	42°47.399S	179°59.147W	959	sample#3: water sample
SO309_98-1	26398-5	ROV-s	11/2/2025	01:33	42°47.398S	179°59.147W	959	sample#4: stylasterid+gastropod+asteroid+rubble
SO309_98-1	26398-6	ROV-s	11/2/2025	01:50	42°47.394S	179°59.146W	960	sample#5: yellow Enallopsammmia + hydroids+rubble
SO309_98-1	26398-1	ROV	11/2/2025	00:17	42°47.418S	179°59.146W	961	DIVE116
				03:56	42°47.377S	179°59.184W	918	*dive end*

Station	GeoB-ID	Gear	Date dd/m/yyyy	Time UTC	Latitude	Longitude	Depth (m)	Remarks
SO309_99-1	26399-1	GC	11/2/2025	06:00	42°43.302S	179°57.746W	1040	recovery: 213 cm, tube bent
SO309_100-1	26801-1	EBS	11/2/2025	08:54	42°45.338S	179°58.879E	1145	*survey start*
				09:00	42°45.337E	179°58.874E	1145	*survey end*
SO309_101-1	26802-1	CTD+RO	11/2/2025	17:07	43°38.536S	179°46.311E	389	sound velocity profiling; water sampling at 10 & 379 m
SO309_102-1	26803-1	MBES/PS	11/2/2025	17:40	43°39.548S	179°45.711E	375	*survey start*
				21:32	43°37.858E	179°45.977E	395	*survey end*
SO309_103-1	26804-7	ROV-s	12/2/2025	00:24	43°39.394S	179°45.229E	356	sample#6: water sample
SO309_103-1	26804-8	ROV-s	12/2/2025	00:50	43°39.396S	179°45.228E	356	sample#7: red echinoid+stylasterid
SO309_103-1	26804-9	ROV-s	12/2/2025	00:52	43°39.396S	179°45.228E	356	sample#8: white Goniocorella
SO309_103-1	26804-10	ROV-s	12/2/2025	01:06	43°39.397S	179°45.229E	356	sample#9: rock with soft coral
SO309_103-1	26804-11	ROV-s	12/2/2025	01:48	43°39.411S	179°45.219E	356	sample#10: rock with solitary coral
SO309_103-1	26804-4	ROV-s	12/2/2025	00:00	43°39.387S	179°45.237E	357	sample#3: orange/white Goniocorella
SO309_103-1	26804-5	ROV-s	12/2/2025	00:08	43°39.387S	179°45.237E	357	sample#4: Goniocorella framework
SO309_103-1	26804-6	ROV-s	12/2/2025	00:17	43°39.387S	179°45.237E	357	sample#5: stylasterid on Goniocorella fragment
SO309_103-1	26804-1	ROV	11/2/2025	23:09	43°39.375S	179°45.252E	358	DIVE117
			12/2/2025	03:32	43°39.448E	179°45.236E	358	*dive end*
SO309_103-1	26804-2	ROV-s	11/2/2025	23:35	43°39.381S	179°45.249E	358	sample#1: orange Goniocorella
SO309_103-1	26804-3	ROV-s	12/2/2025	23:37	43°39.381S	179°45.249E	358	sample#2: rocks (5x)
SO309_103-1	26804-12	ROV-s	12/2/2025	01:49	43°39.411S	179°45.219E	358	sample#11: white broken Goniocorella framework
SO309_103-1	26804-13	ROV-s	12/2/2025	01:57	43°39.411S	179°45.219E	358	sample#12: orange Goniocorella with tube
SO309_103-1	26804-14	ROV-s	12/2/2025	01:58	43°39.411S	179°45.219E	358	sample#13: Goniocorella with soft coral
SO309_103-1	26804-17	ROV-s	12/2/2025	03:27	43°39.448S	179°45.237E	358	sample#16: water sample
SO309_103-1	26804-15	ROV-s	12/2/2025	02:47	43°39.420S	179°45.262E	359	sample#14: Acesta
SO309_103-1	26804-16	ROV-s	12/2/2025	02:52	43°39.420S	179°45.262E	359	sample#15: rock with Goniocorella+scallops
SO309_104-1	26805-1	TV-BC	12/2/2025	04:32	43°39.379S	179°42.243E	355	with Sonardyne; recovery: 17 cm
SO309_105-1	26806-1	MBES/PS	12/2/2025	05:20	43°39.604S	179°44.884E	365	*survey start*
				16:07	43°19.486S	179°43.506E	303	*survey end*

Station	GeoB-ID	Gear	Date dd/m/yyyy	Time UTC	Latitude	Longitude	Depth (m)	Remarks
SO309_106-1	26807-1	CTD+RO	12/2/2025	16:36	43°19.607S	179°43.340E	301	sound velocity profiling; water sampling at 10 & 283 m
SO309_107-1	26808-1	MBES/PS	12/2/2025	17:00	43°19.601S	177°42.990E	265	*survey start*
				20:35	43°18.795S	177°38.564E	260	*survey end*
SO309_108-1	26809-8	ROV-s	13/2/2025	01:20	43°19.129S	177°40.262E	232	sample#7: water sample
SO309_108-1	26809-1	ROV	12/2/2025	22:13	43°19.124S	177°40.308E	233	DIVE118; technical problems
			13/2/2025	00:55	43°19.149S	177°40.280E	229	*dive end*
SO309_108-1	26809-2	ROV-s	12/2/2025	22:23	43°19.154S	177°40.309E	234	sample#1: coral framework with serulids
SO309_108-1	26809-3	ROV-s	12/2/2025	22:50	43°19.144S	177°40.304E	234	sample#2: cidarid echinoid
SO309_108-1	26809-4	ROV-s	12/2/2025	22:54	43°19.145S	177°40.303E	234	sample#3: rocks (3x)
SO309_108-1	26809-5	ROV-s	12/2/2025	23:17	43°19.148S	177°40.301E	234	sample#4: live Goniocorella + nudibranch + eggs
SO309_108-1	26809-6	ROV-s	13/2/2025	00:12	43°19.160S	177°40.293E	234	sample#5: live gastropod
SO309_108-1	26809-7	ROV-s	13/2/2025	00:46	43°19.159S	177°40.283E	234	sample#6: large rock with serpulid
SO309_109-1	26810-1	MBES/PS	13/2/2025	02:02	43°18.842S	177°38.748E	258	*survey start*
				20:08	43°9.829S	177°24.646E	279	*survey end*

Abbreviations: CTD+RO: CTD plus water sampler, MBES/PS: surveys with Multibeam Echosounder and PARASOUND sub-bottom profiler; GC: gravity corer; TV-BC: video-guided box corer, EBS: epibenthic sled; RD: rock dredge; OFOS: camera sled; ROV: remotely operated vehicle SQUID; ROV-s: ROV sample.

Appendix B OFOS transect summaries

Site	Ship Station-No.	No.	Date dd/mm/yyyy	Time (start) UTC	Latitude (start)	Longitude (start)	Depth (start) (m)	Latitude (end)	Longitude (end)	Depth (end) (m)	Rerun of TAN2009 transect/ direction
Ghoul SMT	SO309_70-1	3a	5/02/2025	4:53	42°47.910 S	179°59.260 E	938	42°47.991 S	179°59.399 E	1018	TAN2009/49 SE
Ghoul SMT	SO309_70-1	3b	5/02/2025	6:40	42°47.909 S	179°59.266 E	931	42°48.005 S	179°59.132 E	1031	TAN2009/51 SW
Ghoul SMT	SO309_70-1	3c	5/02/2025	8:03	42°47.915 S	179°59.269 E	946	42°47.808 S	179°59.115 E	1043	TAN2009/49 NW
Ghoul SMT	SO309_70-1	3d	5/02/2025	9:31	42°47.909 S	179°59.262 E	929	42°47.721 S	179°59.518 E	1032	TAN2009/51 NE
Ghoul SMT	SO309_70-1	3e	5/02/2025	11:22	42°47.728 S	179°59.469 E	1009	42°47.779 S	179°59.386 E	1023	NA
Ghoul SMT	SO309_70-1	3f	5/02/2025	12:16	42°47.912 S	179°59.263 E	940	42°47.742 S	179°59.259 E	1059	TAN2009/50 N
Morgue SMT	SO309_83-1	4a	7/02/2025	7:42	42°43.017 S	179°57.620 W	892	42°42.652 S	179°57.164 W	1182	TAN2009/47 NE
Morgue SMT	SO309_83-1	4b	7/02/2025	10:56	42°43.002 S	179°57.654 W	905	42°42.818 S	179°58.396 W	1203	TAN2009/08 WNW
Morgue SMT	SO309_83-1	4c	7/02/2025	13:57	42°42.970 S	179°57.610 W	930	42°43.336 S	179°58.081 W	1190	TAN2009/7 SW
Morgue SMT	SO309_83-1	4d	7/02/2025	16:31	42°42.999 S	179°57.606 W	895	42°43.004 S	179°57.421 W	938	TAN2009/29 E
Morgue SMT	SO309_83-1	4e	7/02/2025	17:34	42°42.720 S	179°57.540 W	901	42°42.720 S	179°57.540 W	1098	TAN2009/28 N
Morgue SMT	SO309_88-1	5a	8/02/2025	10:10	42°43.005 S	179°57.524 W	942	42°43.005 S	179°57.608 W	898	NA
Morgue SMT	SO309_88-1	5b	8/02/2025	11:31	42°43.004 S	179°57.602 W	899	42°43.234 S	179°57.284 W	1116	TAN2009/31 SE
Morgue SMT	SO309_88-1	5c	8/02/2025	13:24	42°43.017 S	179°577.591 W	897	42°42.763 S	179°57.824 W	1103	TAN2009/27 NNW
Morgue SMT	SO309_88-1	5d	8/02/2025	15:27	42°43.008 S	179°57.637 W	909	42°43.029 S	179°57.804 W	1007	TAN2009/53 W
Morgue SMT	SO309_88-1	5f	8/02/2025	16:25	42°43.192 S	179°57.667 W	1023	42°43.974 S	179°57.773 W	1100	TAN2009/06 S
Graveyard SMT	SO309_92-1	6a	9/02/2025	7:43	42°45.668 S	179°59.479 W	766	42°45.936 S	179°58.824 W	1062	TAN2009/03 SE
Graveyard SMT	SO309_92-1	6b	9/02/2025	10:40	42°45.633 S	179°59.345 W	766	42°45.077 S	179°58.994 W	1047	TAN2009/24 N
Graveyard SMT	SO309_92-1	6c	9/02/2025	14:01	42°45.627 S	179°59.362 W	760	42°45.410 S	179°58.830 W	1010	TAN2009/35 NE
Graveyard SMT	SO309_92-1	6d	9/02/2025	16:30	42°45.617 S	179°59.352 W	757	42°45.886 S	179°59.735 W	1038	TAN2009/04 SW
Graveyard SMT	SO309_92-1	6e	9/02/2025	18:37	42°45.683 S	179°59.378 W	784	42°45.501 S	179°59.724 W	991	TAN2009/23 NW
Diabolical SMT	SO309_95-1	7a	10/02/2025	6:26	42°47.385 S	179°59.202 W	901	42°47.297 S	179°59.448 W	1075	TAN2009/21 NW
Diabolical SMT	SO309_95-1	7b	10/02/2025	7:43	42°47.408 S	179°59.226 W	908	42°47.401 S	179°59.002 W	1056	TAN2009/36 E
Diabolical SMT	SO309_95-1	7c	10/02/2025	8:46	42°47.317 S	179°59.213 W	896	42°47.279 S	179°59.093 W	1051	TAN2009/38 NE

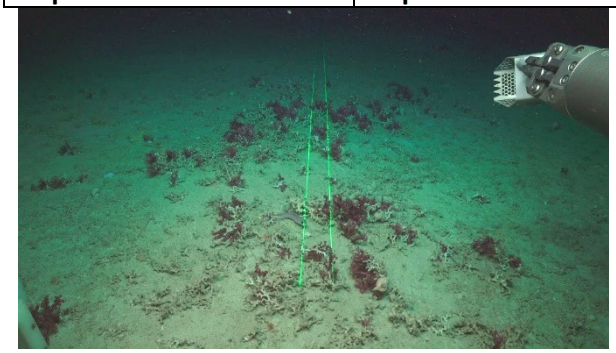
Site	Ship Station-No.	No.	Date dd/mm/yyyy	Time (start) UTC	Latitude (start)	Longitude (start)	Depth (start) (m)	Latitude (end)	Longitude (end)	Depth (end) (m)	Rerun of TAN2009 transect/ direction
Diabolical SMT	SO309_95-1	7d	10/02/2025	9:58	42°47.402 S	179°59.180 W	903	42°47.612 S	179°59.494 W	1062	TAN2009/18 SW
Diabolical SMT	SO309_95-1	7e	10/02/2025	11:49	42°47.425 S	179°59.223 W	920	42°47.251 S	179°59.239 W	1036	TAN2009/37 N
Diabolical SMT	SO309_95-1	7f	10/02/2025	12:58	42°47.407 S	179°59.227 W	909	42°47.417 S	179°59.681 W	1041	TAN2009/22 W
Diabolical SMT	SO309_95-1	7g	10/02/2025	14:59	42°47.4196 S	179°59.207 W	916	42°47.787 S	179°59.3732 W	1039	TAN2009/19 S
Diabolical SMT	SO309_95-1	7h	10/02/2025	17:18	42°47.411 S	179°59.216 W	902	42°47.618 S	179°58.982 W	1039	TAN2009/20 SE

Appendix C RV *Sonne* voyage SO309 biological sample summary by station (Time converted from UTC to NZT) using ROV MARUM SQUID and OFOS

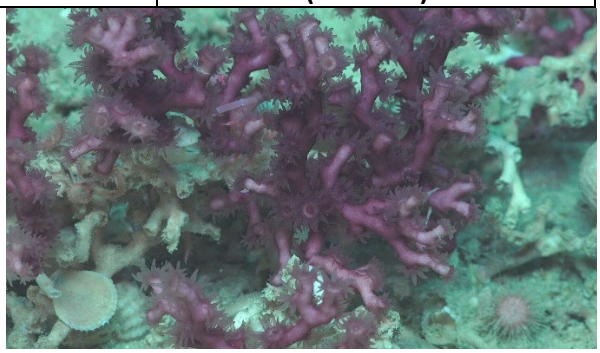
Note: File names for images are provided in each caption; these are the "date_sequential image number" for OFOS camera tows and screen shots taken by the primary HD camera (SULIS Z70) every 5 seconds and automatically saved into an onboard 'flipbooks' folder. Images are presented in chronological order of the tow or dive. Distance between laser points are: ROV=10 cm, OFOS=40 cm.

Rakiura Hills

Area: Stewart Island E/ 'Tahi' base	**Station: SO309_12**	**GeoB Station: 26312-1**
Date: 20/01/2025	**Time Start (NZT): 13:23**	**Time Stop (NZT): 18:03**
Depth start: 621 m	**Depth end: 600 m**	**Gear: ROV (Dive 102)**



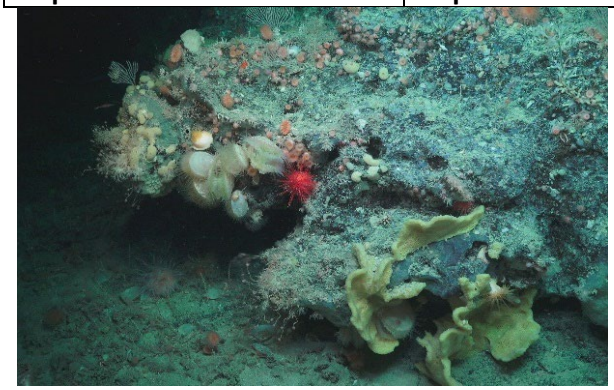
SO309_102_HDSulisRecorder_2025-01-20-00h56m21s



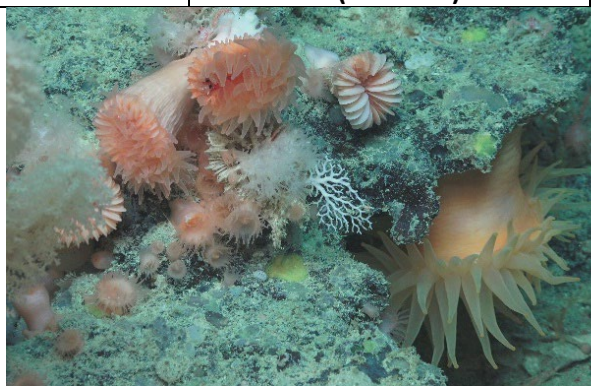
SO309_102_HDSoulisRecorder_2025-01-20-00h59m26s (purple form of *Enallopsammia rostrata* coral)

Transect summary:
The transect started on a sediment apron deposited in the northeastern current lee of 'Tahi' in 621 m depth, heading to southwest upslope. The prevailing bottom current was more than one knot. The ROV struggled to move forward in the current, and visibility was impaired by abundant plankton and organic particles in the water column. Numerous quill worms and some bioturbation were observed. The ROV passed over numerous patchy coral thickets 10 to 20 cm in framework height. These were healthy purple *Enallopsammia rostrata* communities associated with numerous pagurids, gastropods, bivalves, sponges, bryozoans, echinoderms and other crustaceans. The transect ended on the sediment apron still well short of the planned end of transect on the steep flank of the 'Tahi' cone in 600 m water depth. Nine samples were collected in total.

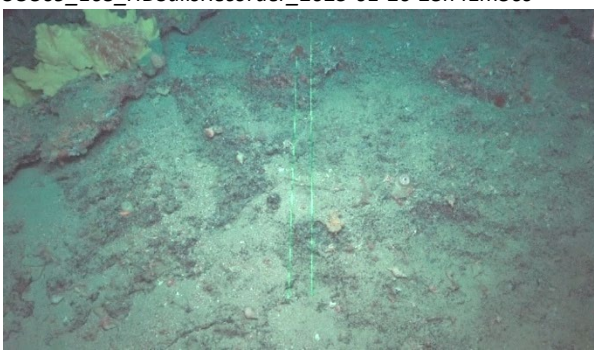
Area: Stewart Island E/ 'Tahi' Feature summit	Station: SO309_15	GeoB Station: 26315-1
Date: 21/01/2025	Time Start (NZT): 10:35	Time Stop (NZT): 15:05
Depth start: 518 m	Depth end: 520 m	Gear: ROV (Dive 103)



SO309_103_HDSulisRecorder_2025-01-20-23h41m30s



SO309_103_HDSulisRecorder_2025-01-20-21h3m20

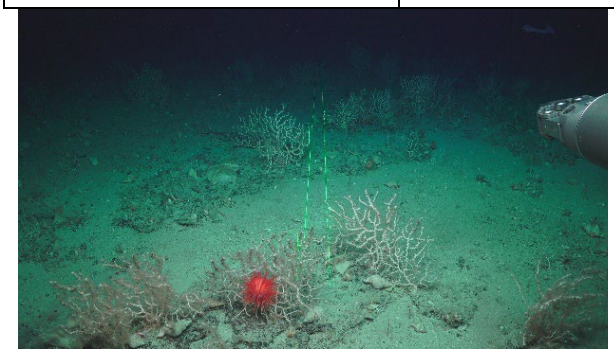


SO309_103_HDSulisRecorder_2025-01-21-01h35m55s

SO309_103_HDSulisRecorder_2025-01-20-22h51m30s

Transect summary:
Dive started SSW of peak of 'Tahi', moved parallel to the contour between 518 and 520 m water depth around outcropping volcanic deposits that provided substrate for diverse suspension- and filter feeders, including octocorals (*Anthomastus, Thouarella, Callogorgia,* and *Telesto*) and large *Desmophyllum dianthus* solitary hard corals. Other fauna observed included the large file clams *Acesta maui*, hoki, anemones, sponges and urchins. Black light test revealed no bioluminescence. Sixteen (16) samples were collected during this dive.

Area: Stewart Island E/ 'Rua' guyot summit	Station: SO309_21	GeoB Station: 26321-1
Date: 22/01/2025	Time Start (NZT): 10:39	Time Stop (NZT): 16:01
Depth start: 459 m	Depth end: 458 m	Gear: ROV (Dive 104)



SO309_104_HDSulisRecorder_2025-01-21-22h00m02s

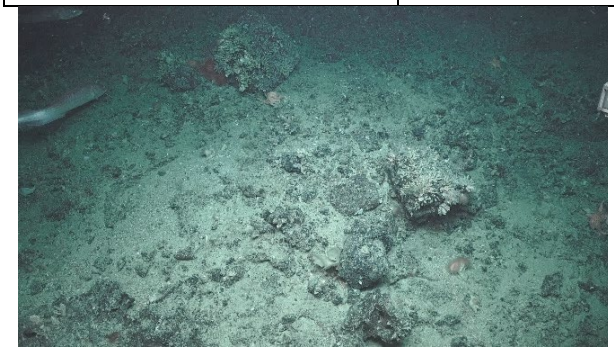
SO309_104_HDSulisRecorder_2025-01-22-01h52m42s

Transect summary:
The summit surface of the guyot at a depth of 460 m showed slight relief differences of only one meter. Rounded cobbles and outcropping crusts formed hard substrate islands for a megafauna dominated by octocorals, consisting of Acanthogorgiidae and Plexauridae. The solitary coral *Flabellum knoxi* was frequently observed on the coarse-sand substrate (right figure). For the first time, the corallivorous snail *Maurea simulans* was also sampled live. A total of 19 samples were collected on this dive.

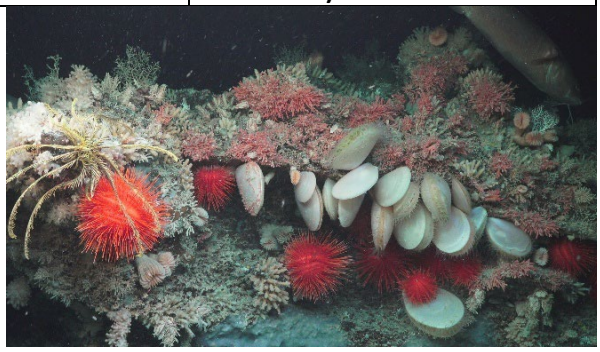
Area: Stewart Island E	Station: SO309_23	GeoB Station: 26323-1
Date: 23/01/2025	Time Start (NZT): 08:08	Time Stop (NZT): 13:00
Depth start: 551 m	Depth end: NA	Gear: ROV (aborted)

Transect summary:
Technical issue with ROV, dive aborted. No data kept.

Area: Stewart Island E/ 'Rua' guyot upper flank	Station: SO309_30	GeoB Station: 26330-1
Date: 24/01/2025	Time Start (NZT): 10:38	Time Stop (NZT): 16:02
Depth start: 504 m	Depth end: 459 m	Gear: ROV (Dive 105, initially called 106)



SO309_105_HDSulisRecorder_2025-01-24-23h53m06s



SO309_105_HDSulisRecorder_2025-01-24-00h27m26s

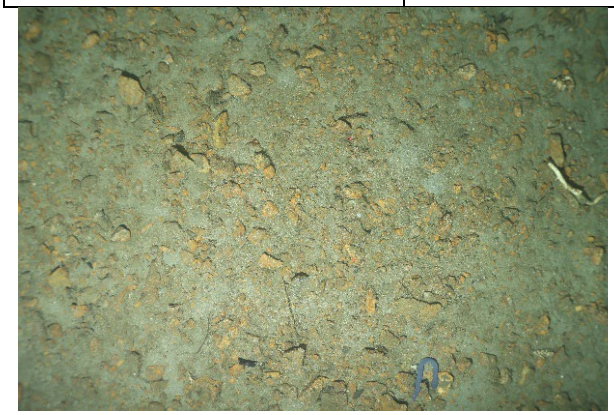
Transect summary:
Dive started on the SW flank of the mound and up onto the flat summit of the mound.

A fish (Ling) swam into the lasers at the start of the dive and knocked them out of place, rendering the laser inoperable throughout dive.

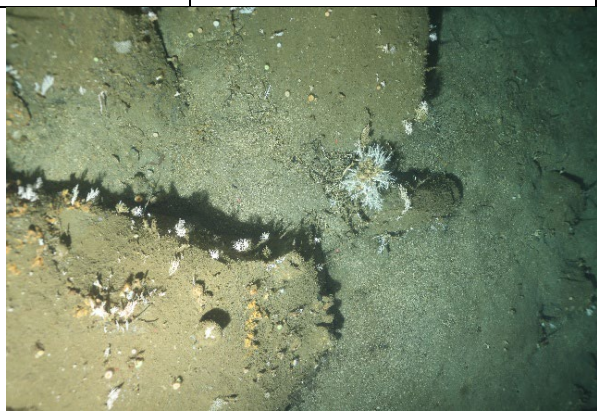
Visible exposed deposits of volcanic origin and sediment pockets filled with the remains of various calcareous shells (barnacle plates, clams, snails, bryozoans, and echinoderms). Hard substrates showed a dense colonization of live *Desmophyllum dianthus* clusters, barnacles, red sea urchin *Dermechinus horridus*, crinoids and stoloniferous octocorals, including *Rhodelinda* and bottle brush gorgonian *Thouarella.* Overhangs on the upstream side were densely populated with *Acesta maui*. The final section of the transect reached the flattened plateau of the Guyot at 460 m depth and with a similar megafauna dominated by octocorals, as described on Dive 104. Ling were present throughout the dive, as well as hairy conger eels, sea perch, chimera, and various smaller fish. A total of 15 samples were taken.

Fiordland

Area: Fiordland /Thompson Sound entrance sill	**Station: S0309_37**	**GeoB Station: 26337-2**
Date: 26/01/2025	**Time Start (NZT): 18:45**	**Time Stop (NZT): 20:20**
Depth start: 203 m	**Depth end: 161 m**	**Gear: OFOS**



IMG_0458



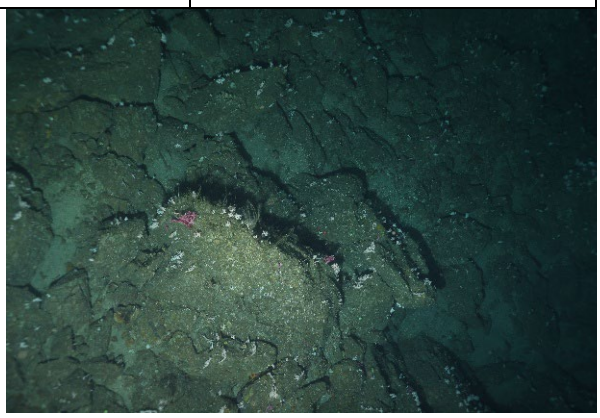
IMG_0222

Transect summary:
Transect started in approx. 200 m water depth and moving over the sill area of outer fjord into the first deeper basin. Floor was covered by metre-sized rounded boulder barricades, interspersed by fields of cobbles and pebbles, sediments were softer as transect progressed into basin. Macrofauna was dominated by the stylasterid *Errina novaezelandiae*, especially colonizing the outer fringes of large boulders. Other fauna included a few small colonies of live and dead branching Scleractinia (white and orange polyps, some possibly *Madrepora*), cup corals (*Caryophyllia* and possibly *Desmophyllum*), occasional gorgonian/seafan, gastropods, oysters and sponges were also observed. Soft sediment rich in bioturbation features and occasional large *Protula bispiralis* serpulid tube worms were seen in the deeper parts. Some stands of *Ecklonia radiata* kelp – assume drift algae.

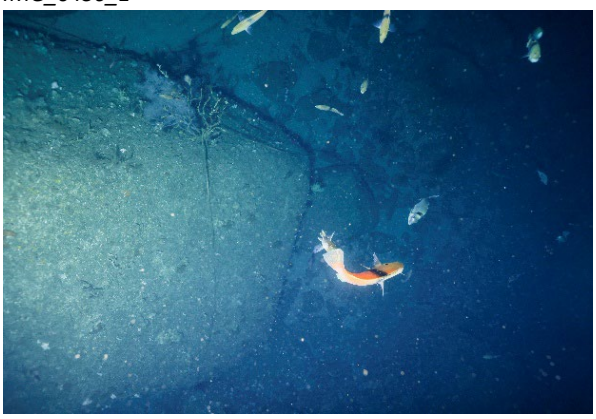
Rubbish – we saw a beer bottle and a line/wire.

Area: Fiordland, Thompson Sound entrance	Station: S0309_39-1	GeoB Station: 26339-2
Date: 27/01/2025	Time Start (NZT):	Time Stop (NZT): 09:13
Depth start:	Depth end: 148 m	Gear: OFOS

IMG_0456_1



IMG_0287



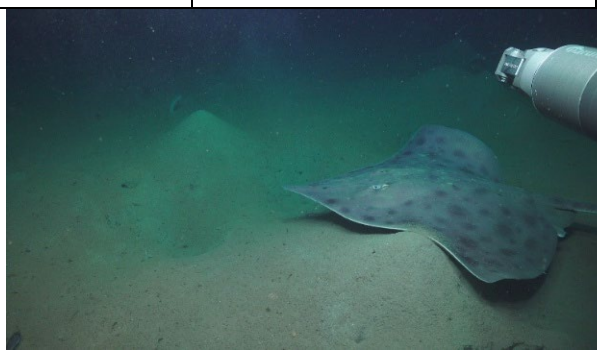
IMG_0348_1j (showing fishing line)

Transect summary:
Transect started at 202 m outside the fjord, in soft sediments with some pebbles/cobbles and shell hash before heading up over a steep rocky sill with large boulders/outcrops. Dropping down into the fjord basin the substrate went back to muddy sediments with cobbles/pebbles and gravel.

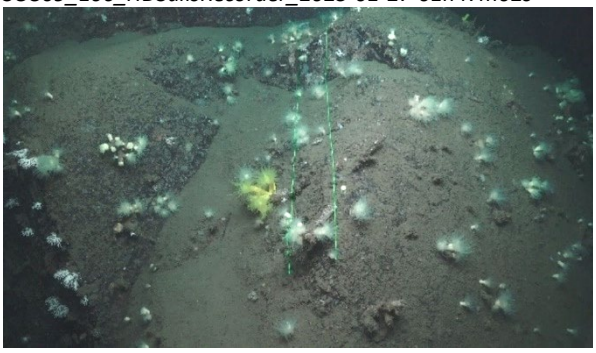
Fauna relatively sparse at the start though there was a swarm of mysids around the strobes. Benthic fauna included holothurians, large *Protula bispiralis* worms, stylasterids abundant on steep rocky surfaces, occasional *Antipathella fiordensis* black corals were seen on boulders, sometimes with zoanthids. A cray pot line had wrapped around a colony (bottom figure). Some dark crinoids on boulders, some orange bryozoans and sea fans. On inner fjord side of the sill, there were muddy sediments with occasionally dense seapens, serpulid worms and occasional crayfish. Sediments towards the end of the dive had more shell hash (*Tucetona*), pebbles and cobbles. Large mobile fauna comprised a few crayfish and abundant fish – especially girdled wrasse but also butterfly perch, blue cod, red-banded perch, tarakihi, hagfish, and a spiny dogfish.

Area: Fiordland/ central Thompson Sound	Station: S0309_44	GeoB Station: 26344-1
Date: 27/01/2025	Time Start (NZT): 14:08	Time Stop (NZT): 18:23
Depth start: 347 m	Depth end: 281 m	Gear: ROV (Dive 106)

SO309_106_HDSulisRecorder_2025-01-27-01h47m02s



SO309_106_HDSulisRecorder_2025-01-27-01h30m17s



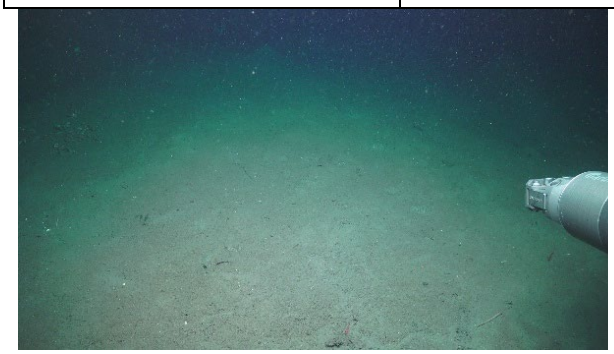
SO309_106_HDSulisRecorder_2025-01-27-04h55m22s.jpg (central yellow form of Balanophyllia coral)

SO309_106_HDSulisRecorder_2025-01-27-0h29m32 (Eguchipsammia sp.)

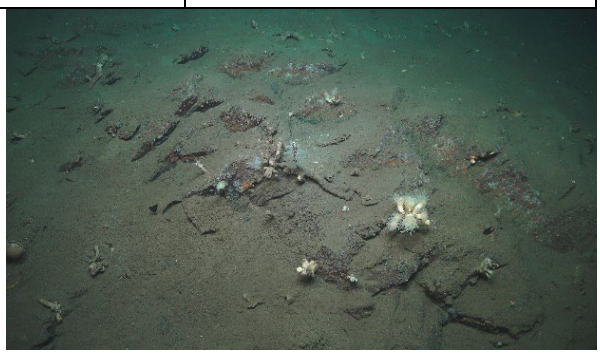
Transect summary:

The dive started in the 350 m deep fjord basin and ascended up a rocky ledge to 282 m. The sediments we comprised of soft, muddy sediments with large mounds, pits and some burrows. Some locally abundant *Echinoptilum* seapens, scyphozoans, squat lobsters, scampi, ophiuroids, small fish and occasional skate and rattail. The abrupt transition to the steep rock wall occurred at 328 m. Dense populations of pseudocolonial dendrophylliid hard corals immediately appeared, appearing in two colour varieties: transparent, presumably *Eguchipsammia* (bottom right figure), and, relatively rarely, intensely yellow *Balanophyllia* (bottom left figure). Sparse, isolated colonies of presumably even rarer *Madrepora oculata* coral were observed and sampled. At a depth of 315 m, the rock walls formed vertical sections inhabited by the ostreid bivalve *Pulvinites exempla*. This is the sole extant member of the Pulvinitidae family, which is otherwise only known from the Paleocene of California and the Mesozoic of Europe, North America, and Antarctica. In total, eleven samples were taken during Dive 106.

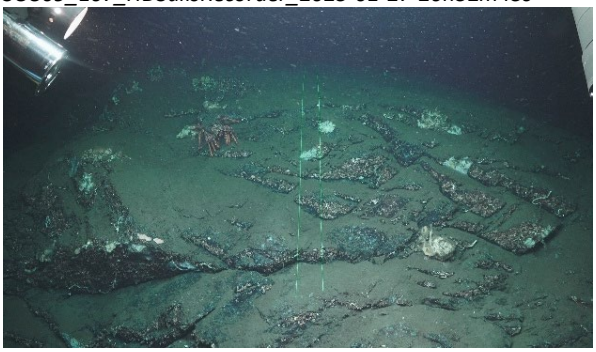
Area: Fiordland/ Doubtful Sound, Pendulo Reach	Station: S0309_49	GeoB Station: 26349-1
Date: 28/01/2025	Time Start (NZT): 09:51	Time Stop (NZT): 15:36
Depth start: 244 m	Depth end: 112 m	Gear: ROV (Dive 107)



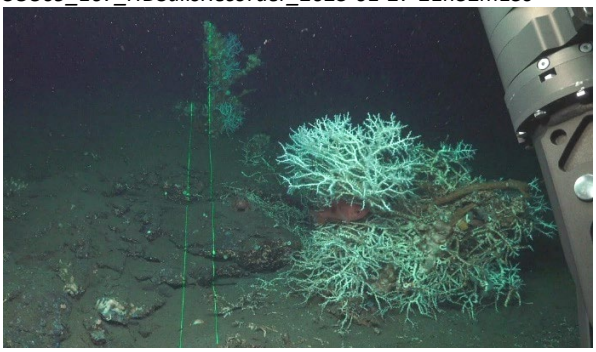
SO309_107_HDSulisRecorder_2025-01-27-20h52m45s



SO309_107_HDSulisRecorder_2025-01-27-21h52m15s



SO309_107_HDSulisRecorder_2025-01-28-23h59m35s



SO309_107_HDSulisRecorder_2025-01-28-01h12m15s

SO309_107_HDSulisRecorder_2025-01-28-01h33m55s

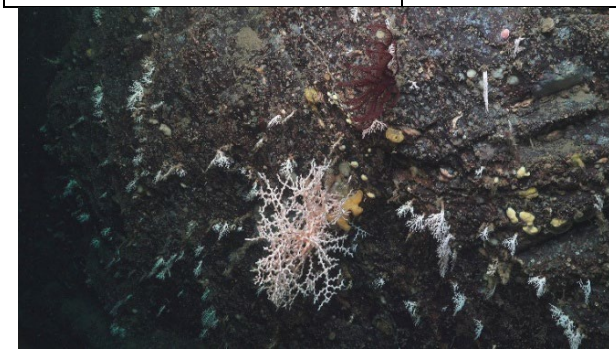
SO309_107_HDSulisRecorder_2025-01-28-01h45m30s

Transect summary:

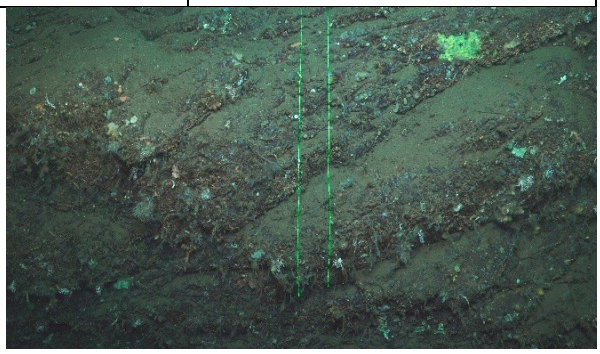
The dive was deployed on the southern slope of a glacial sill, known as Pendulo Reach, at depths ranging from 245 to 112 m. The slope of the sill was considerably flatter than on the previous Dive 106. The rocks were interspersed with foliation planes and therefore rarely formed large-scale rock ledges for the hard substrate fauna. In addition, fluffy detritus created a thick sediment cover on the less inclined surfaces almost everywhere. *Eguchipsammia* occurred here primarily at 241 m depth, along with serpulid *Protula* tubes up to 35 cm in size. Small serpulid tubes, encrusting sponges, psolid holothurians, and a diverse ascidian community dominated from 200 to 134 m depth. Using the UV lamp mounted on the ROV, we were able to observe bioluminescence on a large anemone for the first time. From 143 m depth, we occasionally encountered the southern rock lobster *Jasus edwardsii*. Between 134 and 130 m depth, we encountered 60 cm tall living *Madrepora oculata* colonies in which some orange perch, *Lepidoperca tasmanica,* were sheltering. In the shallowest part

of the dive (130–112 m), meter-sized black corals, *Antipathella fiordensis,* came into view. A total of nine samples were collected with the ROV.

Area: Fiordland / Acheron Passage	**Station: S0309_56**	**GeoB Station: 26356-1**
Date: 29/01/2025	**Time Start (NZT): 14:04**	**Time Stop (NZT): 18:37**
Depth start: 231 m	**Depth end: 100 m**	**Gear: ROV (Dive 108)**

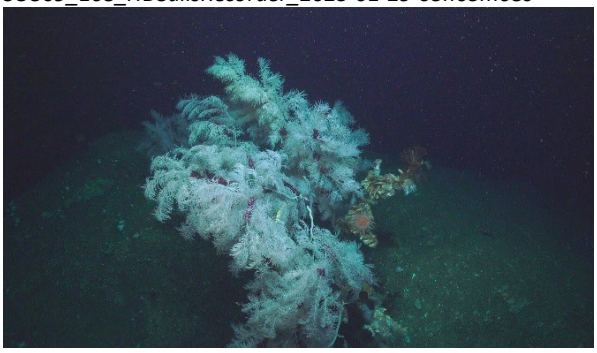


SO309_108_HDSulisRecorder_2025-01-29-02h49m23s



SO309_108_HDSulisRecorder_2025-01-29-05h05m08s

SO309_108_HDSulisRecorder_2025-01-29-05h04m23s

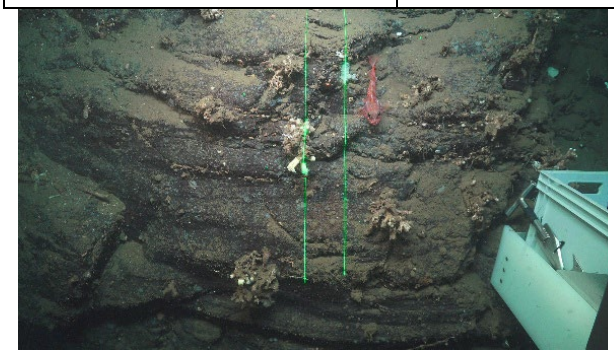


SO309_108_HDSulisRecorder_2025-01-29-05h11m48s

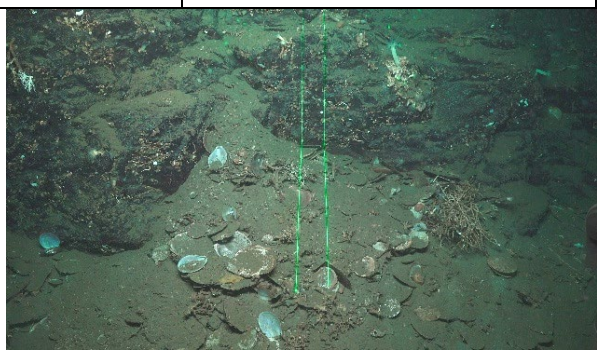
Transect summary

The dive explored an east-facing slope in the central area of Acheron Passage, just below the entrance to the West Jacket Arm, and covered a depth range of 231 to 100 m. The lowest 30 m of this transect were characterized by a nearly vertical cliff face. At a depth of 226 m, the ostreid bivalve *Pulvinites exempla* was highly abundant on the vertical wall, several specimens were successfully sampled. Occasional 10 to 30 cm high colonies of *M. oculata* were found, along with numerous stylasterids (top left image) and scattered *Eguchipsammia* corals (top right image). A striking sediment-covered terrace at 185 m depth, dotted with fallen *Madrepora* framework, was located at the base of another vertical cliff rising to 105 m. From 180 m, the abundance of *Acanthogorgia* octocorals increased significantly, and the first *A. fiordensis* colonies were documented at 167 m depth. An exhumed, rust-brown foliation surface was extremely densely populated with encrusting serpulids and ascidians (131–122 m depth). From 105 m depth, the slope levelled off into a plateau, and thicker sediment cover provided habitat for sea pen beds. A total of eight samples were collected with the ROV.

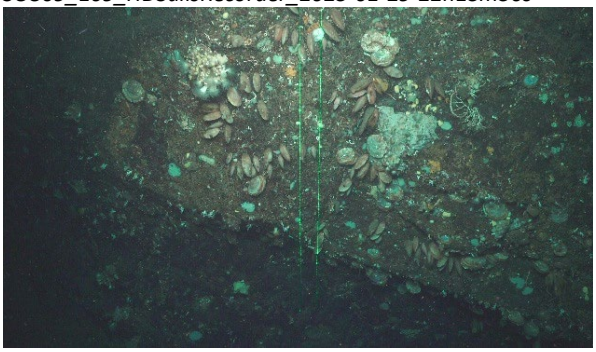
Area: Fiordland /Dusky Sound, Bowen Channel	Station: S0309_61	GeoB Station: 26361-1
Date: 30/01/2025	Time Start (NZT): 10:07	Time Stop (NZT): 15:57
Depth start: 287 m	Depth end: 102 m	Gear: ROV (Dive 109)



SO309_109_HDSulisRecorder_2025-01-29-22h15m50s

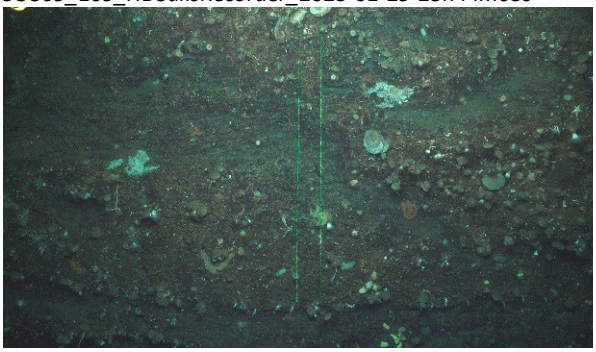


SO309_109_HDSulisRecorder_2025-01-29-22h17m55s



SO309_109_HDSulisRecorder_2025-01-29-23h44m05s

SO309_109_HDSulisRecorder_2025-01-29-23h49m55s



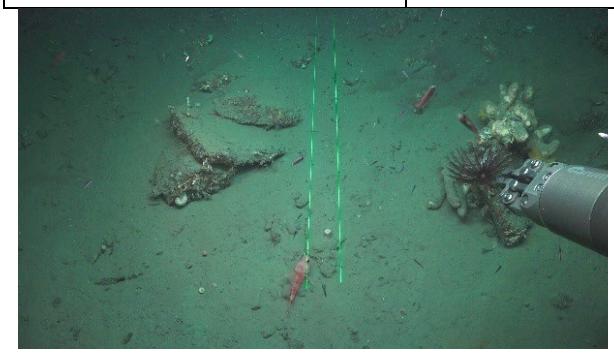
SO309_109_HDSulisRecorder_2025-01-30-01h02m35s

SO309_109_HDSulisRecorder_2025-01-30-02h05m10s

Transect summary:

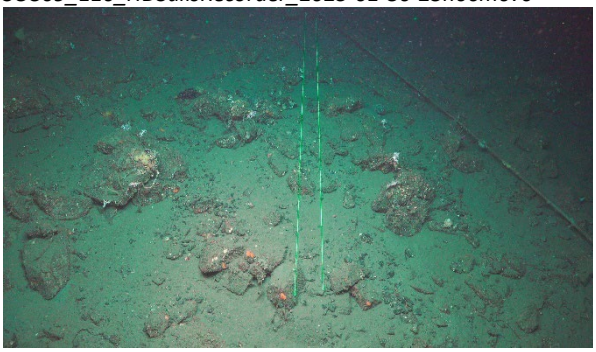
The dive track passed over a rocky outcrop at the eastern entrance to Bowen Channel in Dusky Sound and covered a bathymetric range from 289 to 102 m water depth. The transect began in the basin with fluffy, fine-grained sediments. From 286 m, the rocky outcrop began to rise. Several shell-rich aprons consisted primarily of the fallen shells of *Acesta* sp., *P. exempla*, dead *M. oculata* colonies, and some live *Eguchipsammia* corals mixed with cobbles. *Pulvinites* and *Acesta* were observed and sampled between 276 to 194 m depth. *Eguchipsammia* was the most abundant coral up to 172 m depth. Occasionally, we noticed highly bioluminescent solitary *Caryophyllia* sp., *Anthomastus zealandicus* octocoral, brachiopods, soft coral and an area dotted with small, stalked hexactinellid glass sponges (*Stylocordyla* sp.) at 142 m depth (bottom right image), a species not found on any other of the Fiordland ROV dives. The shallowest *M. oculata* colonies were found at 107 m depth, associated with *Caryophyllia* sp., *Acanthogorgia* sp., and stylasterids. Fourteen samples were collected.

Area: Off Milford Sound	Station: S0309_63	GeoB Station: 26363-1
Date: 31/01/2025	Time Start (NZT): 11:55	Time Stop (NZT): 17:10
Depth start: 313 m	Depth end: 108 m	Gear: ROV (Dive 110)

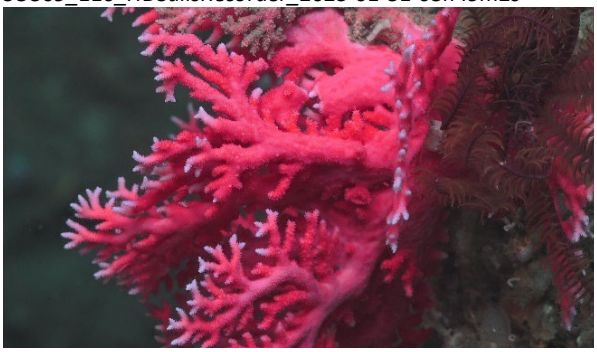


SO309_110_HDSulisRecorder_2025-01-30-23h00m07s

SO309_110_HDSulisRecorder_2025-01-31-03h49m2s



SO309_110_HDSulisRecorder_2025-01-31-02h50m27s (showing trawl warp)

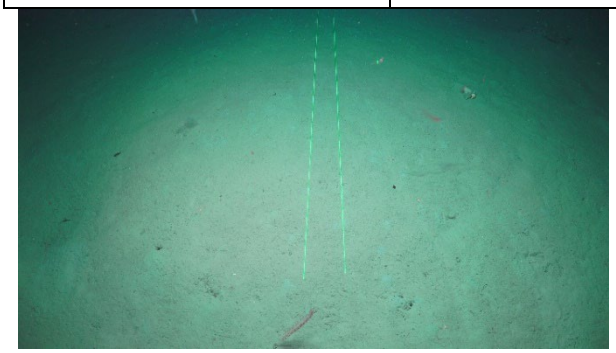


SO309_110_HDSulisRecorder_2025-01-31-03h37m32s

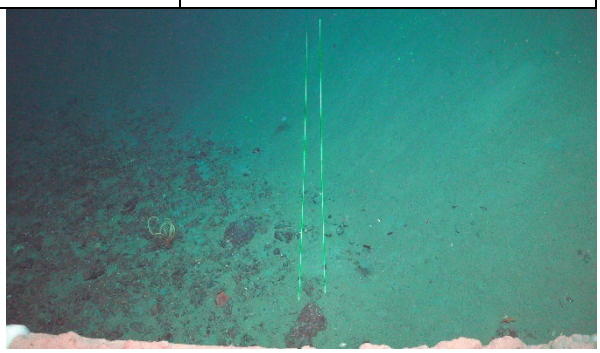
Transect summary:

Dive 110 was designed to explore a section of the Milford Sound glacial outwash fan in the depth range 314 to 108 m. Chaotic layers of boulders, often overlain by a thin layer of hemipelagic sediment, characterize the seafloor across the entire transect. Exposed and thus sediment-free rock faces were generally densely populated by stylasterids, sponges, serpulids, and brachiopods. The mobile macrofauna was dominated by gastropods, squat lobsters, ophiuroids, and crinoids. Solitary Scleractinia, including the bioluminescent *Caryophyllia* sp., became more common from 196 m. The first black corals, *Antipathella fiordensis* (top right image), appeared from 150 m depth upslope. At 134 m depth and shallower, we crossed dense populations of *Errina novaezelandiae* (bottom right image) in the white and pink colour varieties. The ROV encountered lost fishing gear such as trawl ropes at water depths of 222, 213, and 142 m (bottom left). A total of 11 samples were collected.

Area: Off Milford Sound, deep site	Station: S0309_68	GeoB Station: 26368-1
Date: 1/02/2025	Time Start (NZT): 12:11	Time Stop (NZT): 16:03
Depth start: 575 m	Depth end: 482 m	Gear: ROV (Dive 111)



SO309_111_HDSulisRecorder_2025-02-01-01h26m12s



SO309_111_HDSulisRecorder_2025-02-01-01h51m07s

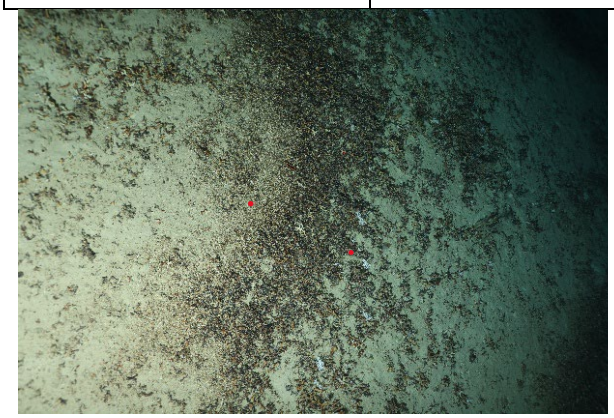
SO309_111_HDSulisRecorder_2025-02-01-02h38m52s

Transect summary:

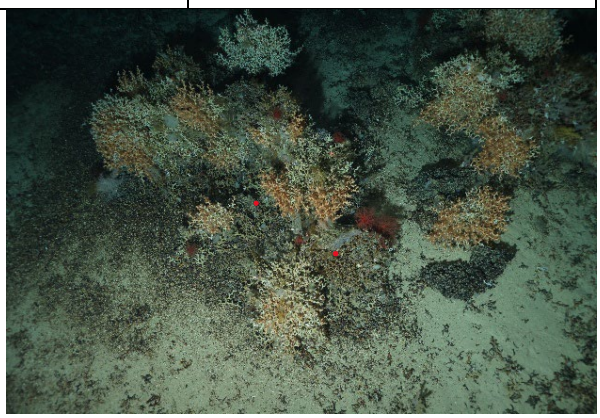
Dive 111 was placed on the slope of a paleocanyon arch whose connection to the hinterland has probably been displaced far from its original location as a result of intense strike-slip tectonics. While the first ROV dive in the south of this offshore Fiordland working area (GeoB26363, Dive 110) revealed a rich benthic fauna on exposed boulders, the second ROV dive in the north (GeoB26368, Dive 111) yielded a surprise. The dive began at 578 m depth, where the seabed was completely covered by bioturbated soft sediments with sea pen fields. At 566 m water depth, the rather uniform seabed was suddenly punctuated by a sequence of almost circular deep depressions along the upslope ROV transect. The potential pockmarks were characterised by steep slopes of soft sediment (partly semi-lithified), while the bottoms of the holes were covered by rocks and pebbles (top right image). ROV-sonar images revealed an average diameter of ~10 m, with their bottoms being ~2–3 m below the surrounding sediments. The overall lack of sessile benthic life on the rocks at the bottom of the holes, despite their suitability as settling grounds, points either to a relatively recent formation of the holes or to an environment not being conducive for such organisms. Only close to the end of the dive in 504 m depth, the rocks began to host some life and to have a thin veneer of sediments, pointing to a greater age of the depressions above ~500 m depth. Large fauna included sea pens, anemones, tam-o-shanters, shrimp, hermit crabs and small purple encrusting soft corals (bottom left image). Fish included Dawsons cat shark, bluenose, rattails, hairy congers, sea perch. Dive ended early due to technical/positioning issue, a total of three samples were collected.

Chatham Rise

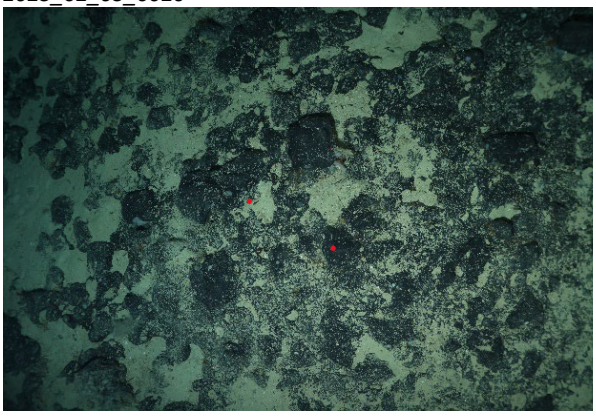
Area: Ghoul, Chatham Rise (SE)	**Station: S0309_70-1 (rerun TAN2009/49 SE)**	**GeoB Station: 26370-1**
Date: 05/02/2025	**Time Start (NZT): 17:53**	**Time Stop (NZT): 18:36**
Depth start: 938 m	**Depth end: 1018 m**	**Gear: OFOS (images 001–268)**



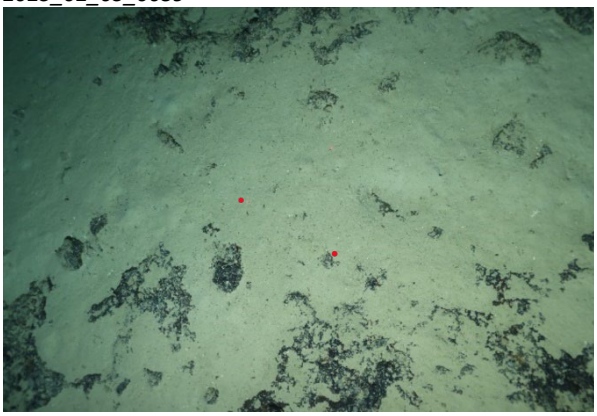
2025_02_05_0020



2025_02_05_0039



2025_02_05_0128

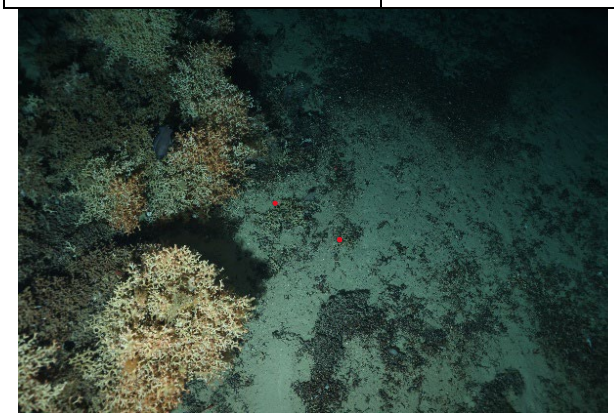


2025_02_05_0177

Transect summary:
OFOS survey of the SE transect from the summit downwards.

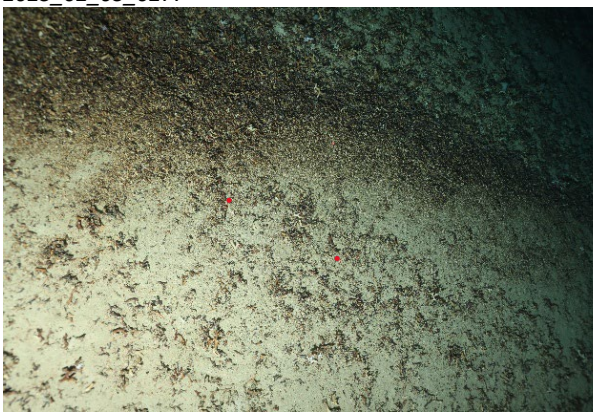
Mostly coral rubble and dead matrix on soft sediments, few patchy areas of live *Solenosmilia variabilis* coral (*Solenosmilia variabilis*). Towards the end of the transect the soft sediments turned into flat bedrock (lava) which was mostly clear of fauna. The transect ended on muddy sediments with burrows with occasional rattail and tam-o-shanter.

Area: Ghoul, Chatham Rise (SW)	Station: S0309_70-2 (rerun TAN2009/51 SW)	GeoB Station: 26370-2
Date: 05/02/2025	Time Start (NZT): 19:40	Time Stop (NZT): 20:27
Depth start: 931 m	Depth end: 1031 m	Gear: OFOS (images 269–558)



2025_02_05_0277

2025_02_05_0297



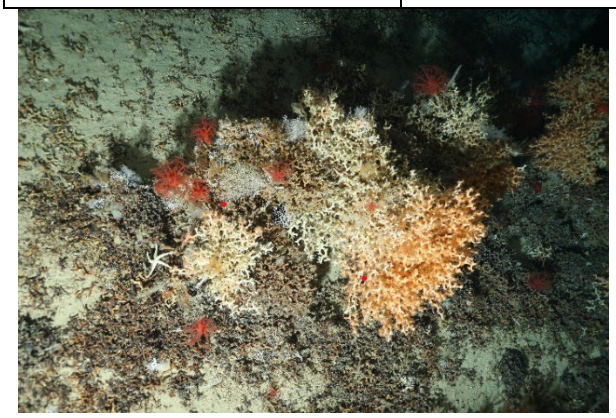
2025_02_05_0320

2025_02_05_0528

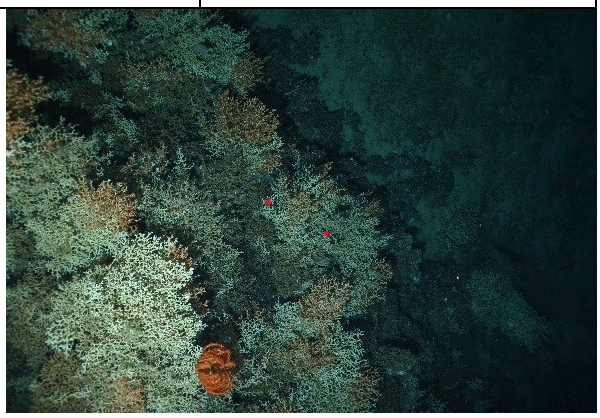
Transect summary:

Transect started at summit and headed down the SW flank. Some intact live *Solenosmilia variabilis* colonies at the start of the tow, with primnoids, stylasterids and sponges associated and high accumulations of dead matrix. As the OFOS descended down the flank, the substrate turned to muddy sediments with coral rubble and then to bedrock (lava) with occasional live coral colonies (*Solenosmilia variabilis*) and dead coral matrix. Some patches of unknown “webbing/Schlontz” on corals that looked a bit like spider webs (later sampled during ROV Dive 114). The transect progressed on to muddy sediments with coral rubble, to flat clean (little fauna) lava, and onto flat muddy sediments with burrows and occasional tam-o-shanter, rings of burrows, and a skate (bottom right image).

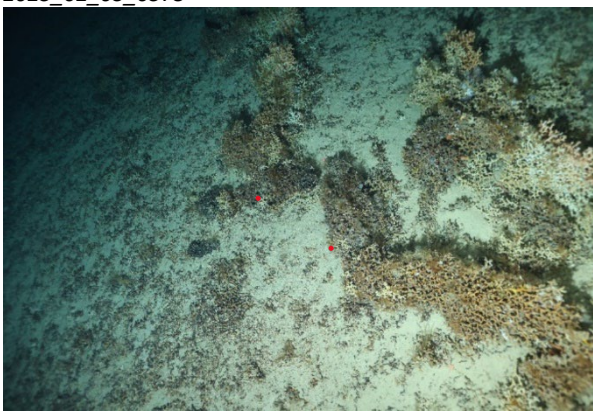
Area: Ghoul, Chatham Rise (NW)	Station: S0309_70-3 (rerun TAN2009/49 NW)	GeoB Station: 26370-3
Date: 05/02/2025	Time Start (NZT): 21:03	Time Stop (NZT): 21:53
Depth start: 946 m	Depth end: 1043 m	Gear: OFOS (images 559–890)



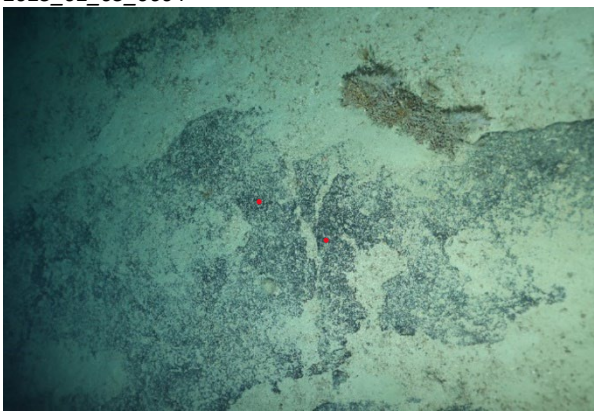
2025_02_05_0573



2025_02_05_0604



2025_02_05_0744

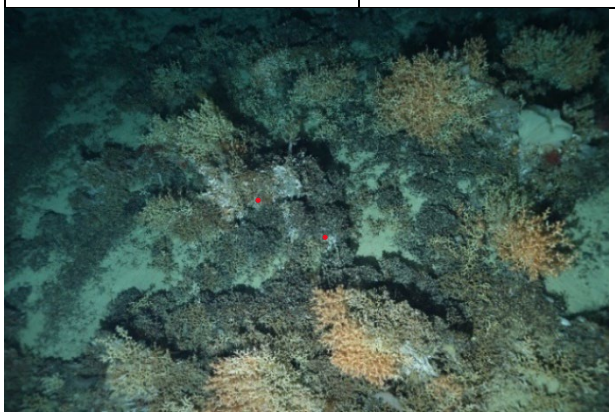


2025_02_05_0815

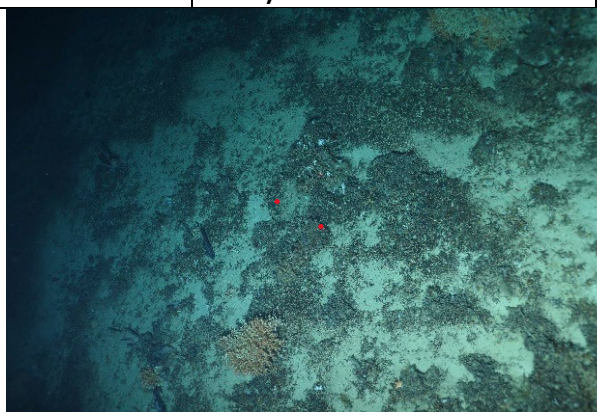
Transect summary:

Transect started at the summit and headed down the NW flank of the feature. Mostly muddy sediments with patches of dead and live coral matrix at the start, often with *Anthomastus* attached (top left image). As OFOS descended the flank it traversed over a dense coral garden (*Solenosmilia variabilis*) with sometimes nearly 100% coverage of the substrate by large coral colonies. Coral associates included brisingids, crinoids, sponges, also unknown “webbing/Schlontz” (see comment above). Towards the middle of the tow, coral matrix became less prevalent and bare sediments were mainly muddy or smooth bedrock with only the occasional piece of dead coral matrix (bottom right image). Lower flanks were characterised by flat volcanic rock with little epifaunal colonisation, transitioning to muddy sediments with burrows and occasional rattails, tam-o-shanters, and sea cucumbers/sea pigs.

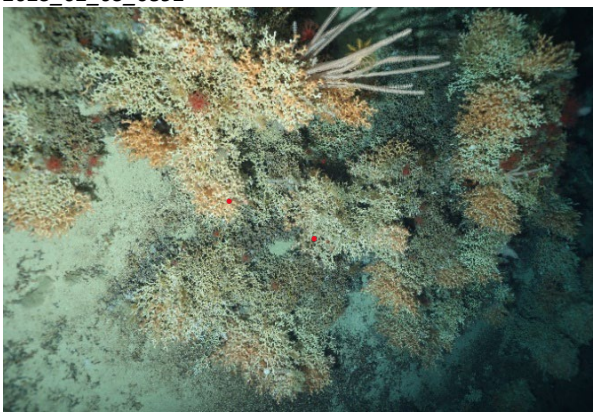
Area: Ghoul, Chatham Rise (NE)	Station: S0309_70-4 (rerun TAN2009/51)	GeoB Station: 26370-4
Date: 05/02/2025	Time Start (NZT): 22:31	Time Stop (NZT): 23:55
Depth start: 929 m	Depth end: 1032 m	Gear: OFOS (images 891–1544)



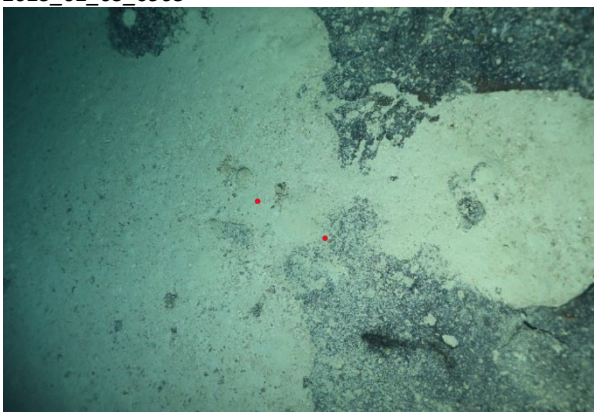
2025_02_05_0892



2025_02_05_0963



2025_02_05_1005

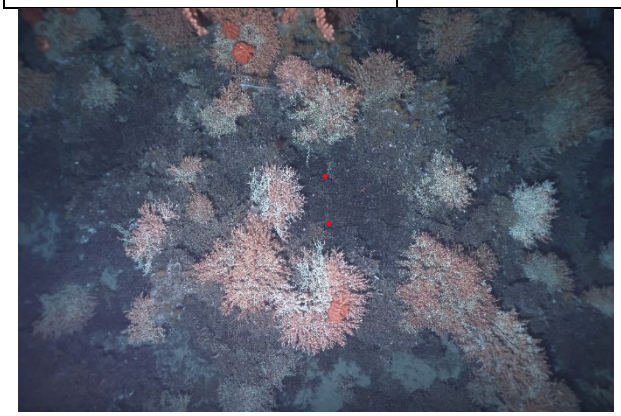


2025_02_05_1145

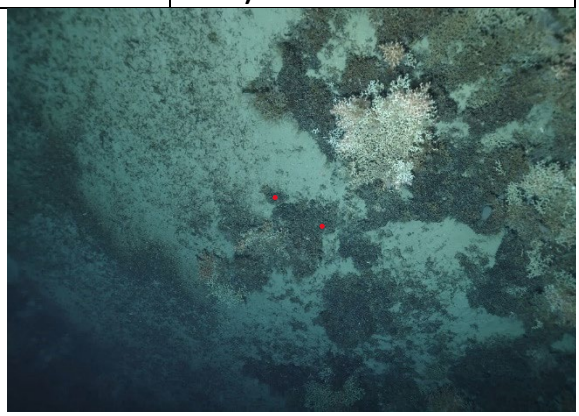
Transect summary:

Transect started at the summit and descended the NE flank of the feature with relatively dense dead *Solenosmilia variabilis* coral matrix with some live colonies and stylasterids. Then changed to muddy sediments with coral rubble, in well sorted lines, potentially indicating strong currents. There were patches of dead and live coral matrix in this area. Towards the middle of the transect the sediment changed to flat volcanic rock with little associated fauna and then onto soft sediments with burrows. The bedrock returned a short time later, with more soft sediments before more patches of dead and live coral matrix (*Solenosmilia variabilis*, bottom left). This change between soft sediment, flat barren rock and patches of coral matrix continued down the transect. The transect ended on soft, muddy sediments.

Area: Ghoul, Chatham Rise (NE Knobble)	Station: S0309_70-5 (new transect)	GeoB Station: 26370-5
Date: 06/02/2025	Time Start (NZT): 00:22	Time Stop (NZT): 00:46
Depth start: 1009 m	Depth end: 1023 m	Gear: OFOS (images 1545–1882)



2025_02_05_1594



2025_02_05_1728

Transect summary:
A short, additional, transect conducted following completion of previous tow and during return transit to peak of Ghoul. This transect has not been conducted during previous RV *Tangaroa* surveys. Started towards the top of the small conical feature to the NE of Ghoul and down the S/SW flank. Extensive intact coral (*Solenosmilia variabilis*) observed on the way up and near the summit, cascading down steep slope on southern side of peak, transitioning to sparse fauna with bare, flat rock (lava) and pockets of sediments.

Area: Ghoul, Chatham Rise (N)	Station: S0309_70- 6 (rerun TAN2009/50)	GeoB Station: 26370-6
Date: 06/02/2025	Time Start (NZT): 01:16	Time Stop (NZT): 02:09
Depth start: 940 m	Depth end: 1059 m	Gear: OFOS

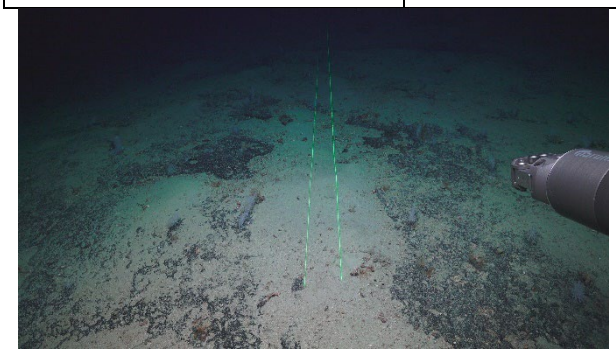
Screen shot 2025_02_05_12h23m56s ('flagpole' bamboo coral on summit of Ghoul)

Screen shot 2025_02_05_12h34m29s

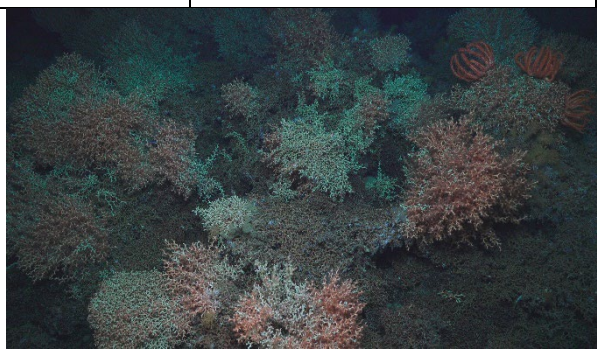
Transect summary:
Transect running northward across the peak. Coral rubble and fine sediments at the southern approach of the peak, then traversing a dense field of live *Solenosmilia variabilis* coral and octocorals (screen shot of large bamboo coral at 923 m on left). The distinct 'flagpole' bamboo coral at the peak of Ghoul was recognised during multiple transects. Live corals thinning out at 926 m with exposed

soft sediments, followed by extensive and continuous live coral beds from around 940 m (bottom right image, 944 m) to over 970 m. Some live *Solenosmilia variabilis* fragments observed in small pockets at 991 m.

Area: Ghoul, Chatham Rise	**Station: S0309_75**	**GeoB Station: 26375-1**
Date: 06/02/2025	**Time Start (NZT): 15:14**	**Time Stop (NZT): 18:54**
Depth start: 1006 m	**Depth end: 921 m**	**Gear: ROV (Dive 112)**



SO309_112_HDSulisRecorder_2025-02-06-03h00m06s



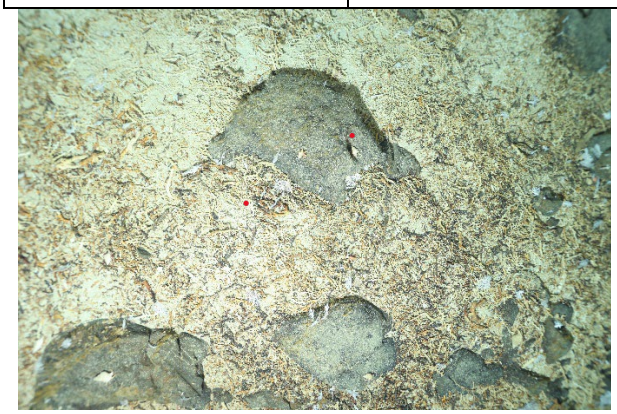
SO309_112_HDSulisRecorder_2025-02-06-05h43m52s

SO309_112_HDSulisRecorder_2025-02-06-05h54m22s
(‘flagpole’ bamboo coral at Ghoul summit)

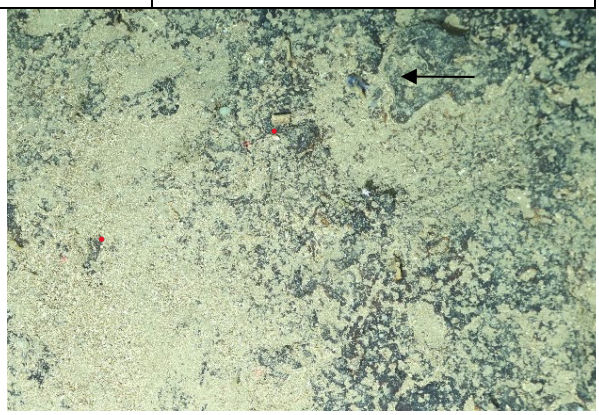
SO309_112_HDSulisRecorder_2025-02-06-05h53m02s
(detail of bamboo coral colony polyps)

Transect summary:
Dive 112 investigated the southeast flank of Ghoul, starting at 1011 m at the base and concluding at the summit at 925, roughly following the OFOS transect SO309_70-1. Between outcropping basalts, pockets of bioclastic sediment gradually grew upslope in size. From as deep as 1000 m, the first areas of black-stained *Solenosmilia* rubble emerged. These dead coral frameworks grew larger from a depth of 974 m, where the first living *Solenosmilia variabilis* clumps were seen and sampled. The living reef-front started at 939 m and extended to 925 m at the dive's shallowest point. It was made up of masses of *S. variabilis* cauliflower-shaped colonies, with live polyps around the tips, that were m high and had almost 100% cover. A prominent bamboo coral with associated *Sternostylus rogeri* squat lobster at the peak was recognized from a previous OFOS transect that crossed this one (see above). Nine samples were taken.

Area: Morgue (NE), Chatham Rise	Station: S0309_83-1 (rerun TAN2009/47)	GeoB Station: 26383-1
Date: 07/02/2025	Time Start (NZT): 20:42	Time Stop (NZT): 22:41
Depth start: 892 m	Depth end: 1182 m	Gear: OFOS (images 1884–2621)



2025_02_07_2160

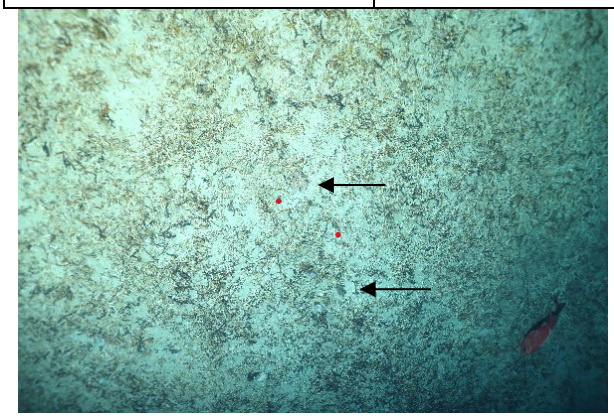


2025_02_07_2160 (phantom angler fish Halophryne mollis)

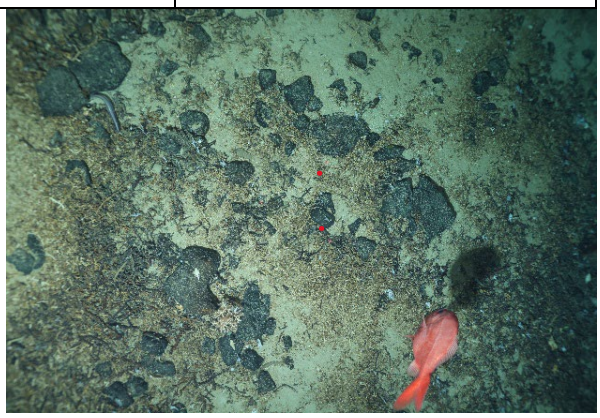
Transect summary:

Repeat of TAN2009/047 (NE). Transect started at the summit of Morgue and headed down the northeastern flank. The summit was covered with coral rubble including *Madrepora oculata* (*Madrepora oculata*) and potentially *Solenosmilia variabilis* over soft sediment, with bedrock becoming visible relatively quickly. Progressing along the transect, boulder-sized rock outcrops/lava appeared in patches, followed by more coral rubble over soft sediments. Bedrock mostly sparsely covered, with dominant fauna being small stylasterids and crinoids. Little coral rubble on the large areas of bedrock. A few images contained large, dead, overgrown arborescent colonies (probably bamboo corals), suggesting their presence on this feature previously. Orange roughy were visible occasionally. Unusual highlights –a small phantom angler fish *Halophryne mollis* (right image with arrow). A big dead bamboo coral was observed, with occasional cup corals, crinoids, and small octocorals visible on some images when zoomed in.

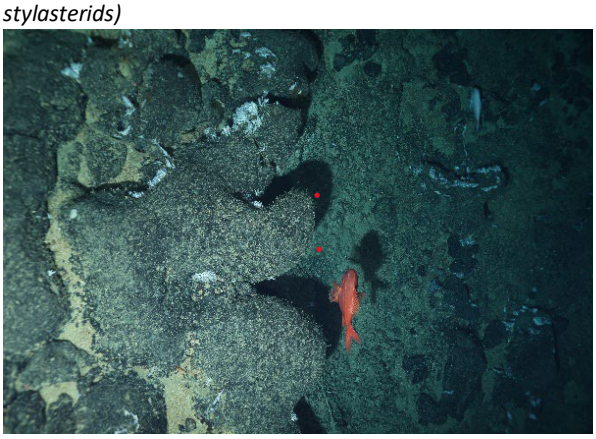
Area: Morgue, Chatham Rise	Station: S0309_83-2 (rerun TAN2009/08)	GeoB Station: 26383-2
Date: 07/02/2025	Time Start (NZT): 23:56	Time Stop (NZT): 01:56
Depth start: 905 m	Depth end: 1203 m	Gear: OFOS (images 2622–3371)



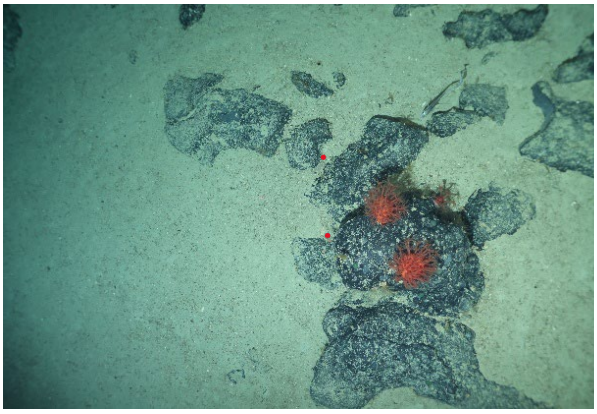
2025_02_07_2656 (possible new growth of octocorals and stylasterids)



2025_02_07_2686



2025_02_07_2780 (showing small white stylasterids)



2025_02_07_3286

Transect summary:

Repeat of TAN2009/8 (WNW), starting at the summit of Morgue and heading down the western flank. At the start of the transect there was a lot of coral rubble (*Madrepora oculata*) over soft sediments, with evidence of some new coral settlement (probably octocoral) and abundant small colonies of stylasterids (top and bottom left images). Fish observed near the summit were orange roughy and sharks. Boulders and bedrock progressively increased in coverage, with soft sediments becoming more patchy towards the base of the feature. Stylasterids (near top) and small brown crinoids (near base) were locally abundant on volcanic bedrock along parts of the transect. Further down the flank the substrate changed to muddy sediments with tracks. Seapens (*Umbellula* sp. and *Pennatula* sp?) as well as stalked sponges covered in zooanthids. Crinoids still present on hard substrates, including some stalked crinoids. Also occasional *Anthomastus* and tam-o-shanters.

Most coral rubble appeared to be *Madrepora*, some areas also appeared to show abundant *Desmophyllum* skeletons.

Area: Morgue, Chatham Rise	Station: S0309_83-3 (rerun TAN2009/07)	GeoB Station: 26383-3
Date: 08/02/2025	Time Start (NZT): 02:57	Time Stop (NZT): 04:40
Depth start: 930 m	Depth end: 1190 m	Gear: OFOS (images 3372–3994)

2025_02_07_3385

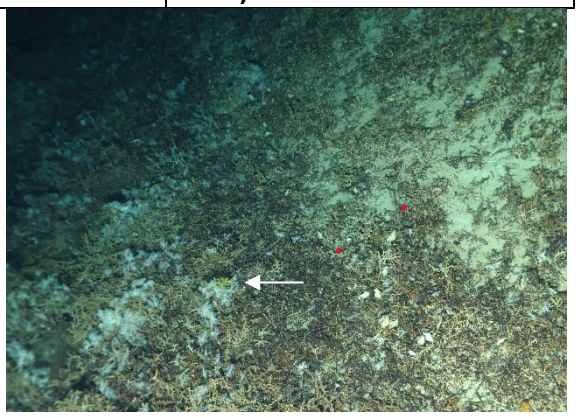
2025_02_07_3808

Transect summary:

Repeat of TAN2009/7 (SW). Soft sediments and coral rubble around peak, extensive pillow lava, outcrops and crusts downslope. Small stylasterids on margins of larger boulders and bed rock on upper slope, small comatulid crinoids on lower slope. Orange Roughy and rattail fish abundant around upper slopes. Sparse *Anthomastus* and brisingids around 1160 m, a few holothurians, stalked crinoids and cerianthids appearing as the gradient eased and substrate transitioned to soft sediment.

Area: Morgue, Chatham Rise	Station: S0309_83-4 (rerun TAN2009/29)	GeoB Station: 26383-4
Date: 08/02/2025	Time Start (NZT): 05:31	Time Stop (NZT): 06:05
Depth start: 895 m	Depth end: 938 m	Gear: OFOS (images 3995–4203)

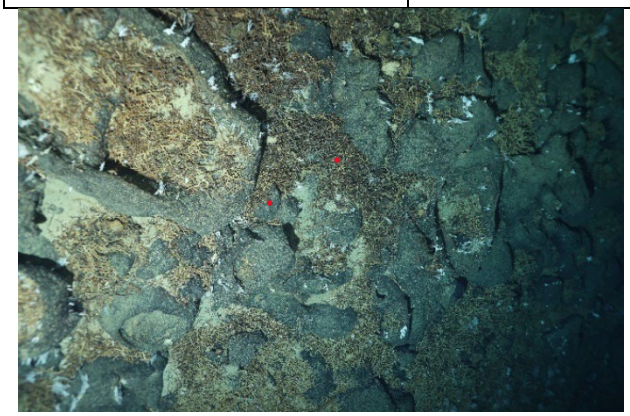
2025_02_07_4051



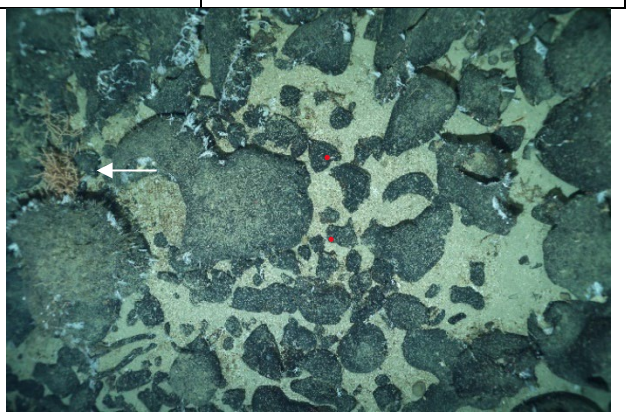
2025_02_07_4063 (showing small stylasterids and live yellow hard coral [arrow])

Transect summary:
Partial repeat of TAN2009/29 (East transect), upper portion of transect only, short search for wagon wheel (unsuccessful). *Madrepora oculata* coral rubble and larger coral fragments (bubble gum coral?) near peak. Patchy areas of small white stylasterids (left image) and potential live polyps on hard coral fragments (right image).

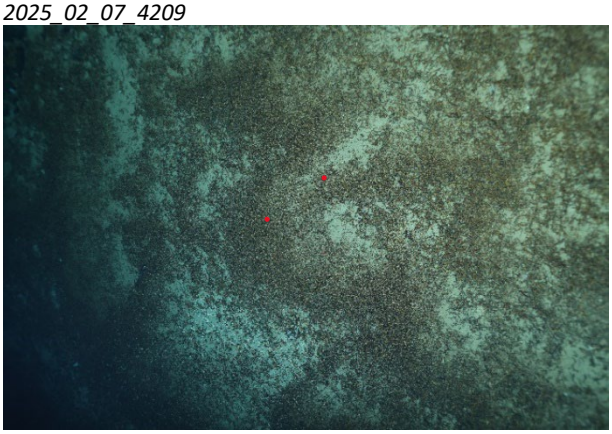
Area: Morgue, Chatham Rise	**Station: S0309_83-5 (rerun TAN2009/28)**	**GeoB Station: 26383-5**
Date: 08/02/2025	**Time Start (NZT): 06:34**	**Time Stop (NZT): 07:42**
Depth start: 901 m	**Depth end: 1098 m**	**Gear: OFOS (images 4204–4611)**



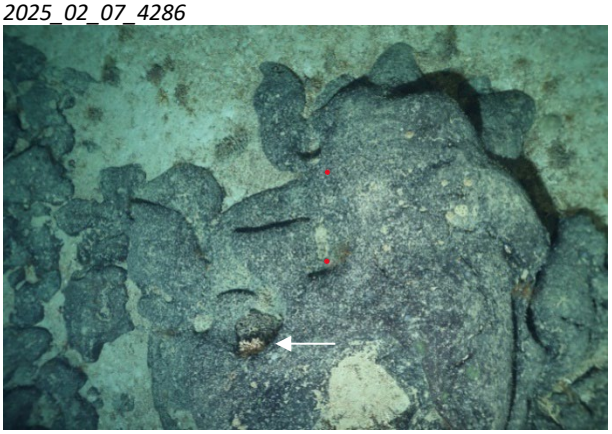
2025_02_07_4209



2025_02_07_4286



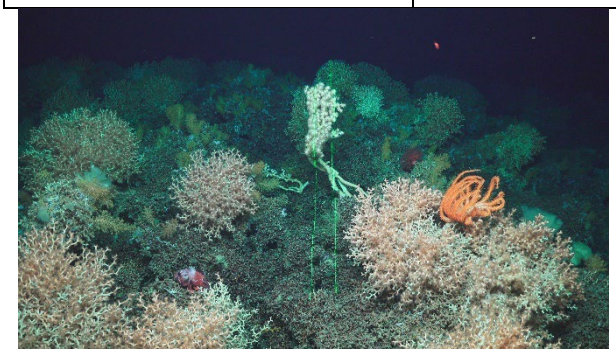
2025_02_07_4353



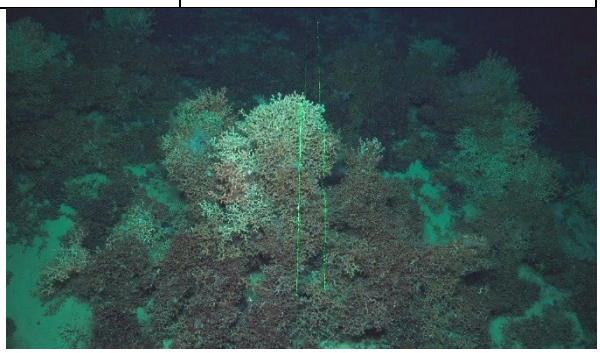
2025_02_07_4606

Transect summary:
Partial repeat of TAN2009/28 (North transect) downslope of main peak, aborted where northern ridge begins to rise northward. Observations similar to previous transects, including patchy stylasterid corals and potential live hard coral clumps (right top and bottom images).

Area: Ghoul, Chatham Rise	Station: S0309-84	GeoB Station: 26384-1
Date: 08/02/2025	Time Start (NZT): 10:15	Time Stop (NZT): 14:49
Depth start: 980 m	Depth end: 923 m	Gear: ROV (Dive 113)



SO309_113_HDSulisRecorder_2025-02-07-21h23m28s

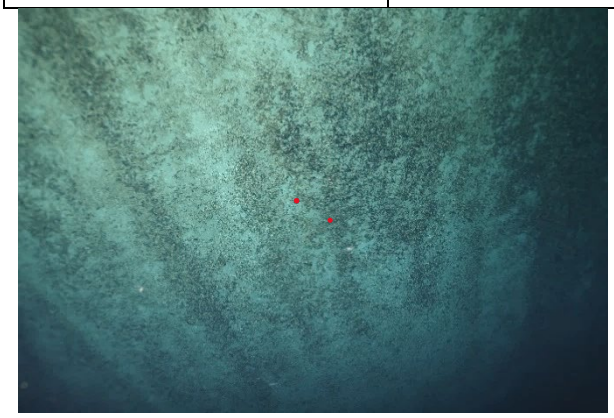


SO309_113_HDSulisRecorder_2025-02-08-00h53m57s

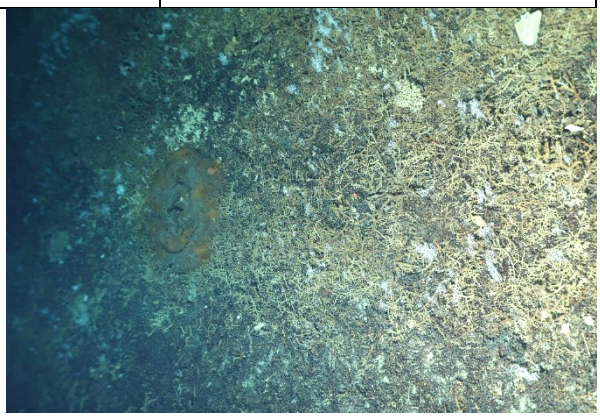
Transect summary:

This was a mapping-focussed (3D photogrammetry) dive on Ghoul, scanning the *Solenosmilia* reef from the north, starting at a water depth of 966 m, southward over the summit at 927 m to the southern end of the reef to a water depth of 943 m. Seven samples collected including two live *Solenosmilia variabilis* specimens for aquarium studies, coral rubble, stylasterids, a live *Acesta saginata* and water samples.

Area: Morgue, Chatham Rise	Station: S0309_88-1	GeoB Station: 26388-1
Date: 08/02/2025	Time Start (NZT): 23:10	Time Stop (NZT): 00:27
Depth start: 942 m	Depth end: 898 m	Gear: OFOS (images 4612–5077)

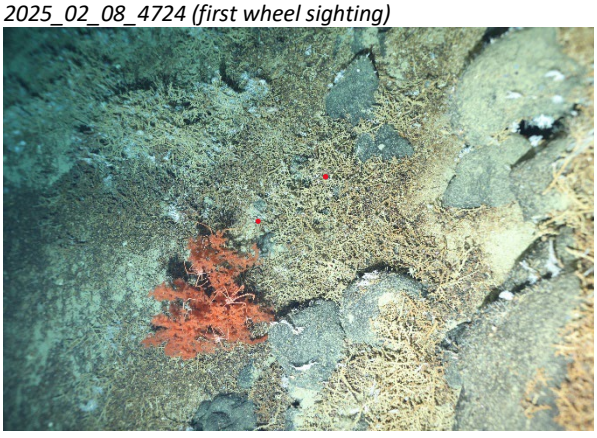


2025_02_08_4615

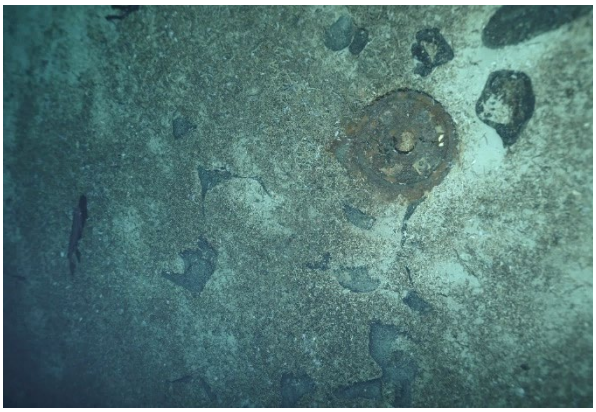


2025_02_08_4724 (first wheel sighting)

2025_02_08_4830 (second wheel sighting)



2025_02_08_4997 (black coral with Sternostylus rogeri*)*

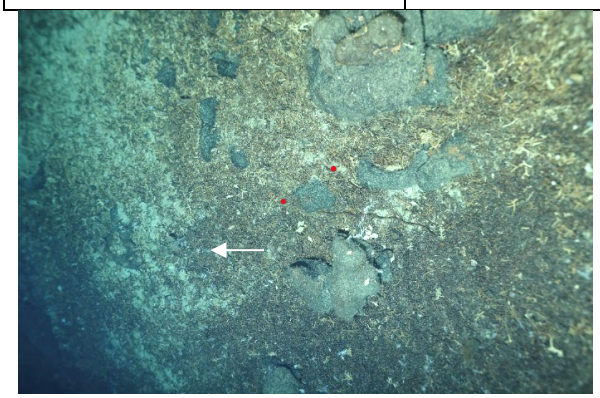


2025_02_08_5011 (third wheel sighting)

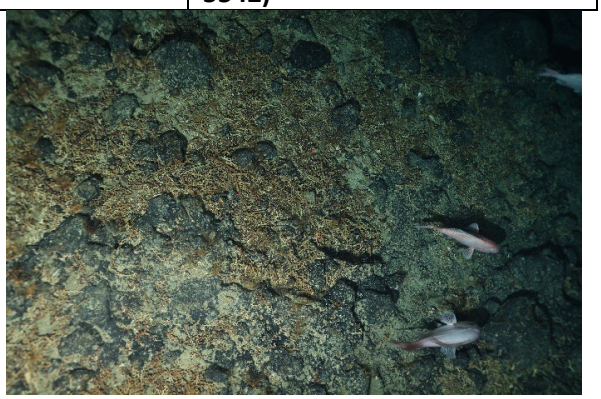
Transect summary:

A search for the settlement wheels on top of Morgue. We ran 3 parallel lines and found a wheel on each of the lines (a total of 3 wheels). The wheels had stylasterids growing on them but no other apparent colonisation. Black coral colony with multiple squat lobsters (*Sternosylus rogeri*) observed near wheels (bottom right image).

Area: Morgue, Chatham Rise	**Station: S0309_88-2 (rerun TAN2009/31)**	**GeoB Station: 26388-2**
Date: 09/02/2025	**Time Start (NZT): 00:31**	**Time Stop (NZT): 01:48**
Depth start: 899 m	**Depth end: 1116 m**	**Gear: OFOS (images 5078–5542)**



2025_02_08_5103 (showing dead black coral fragment [centre] and small octocoral colony [arrow])

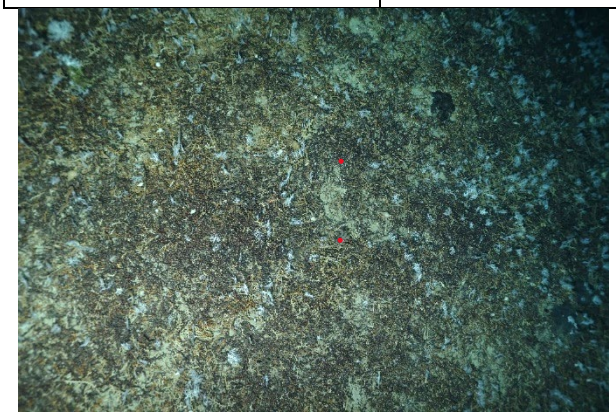


2025_02_08_5262

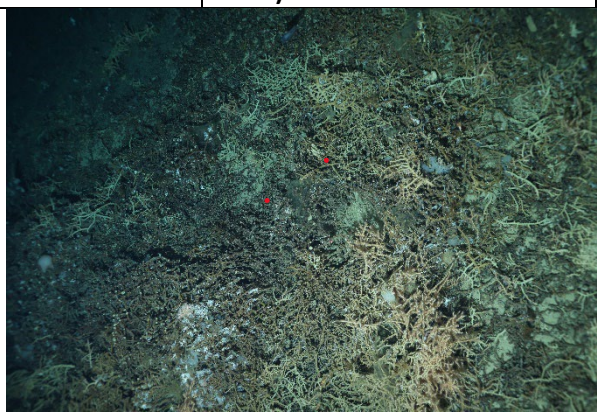
Transect summary:

Repeat of TAN2209/31 (SE). Transect started with a lot of coral rubble on soft sediments. As the gear progressed down the SE flank the substrate became harder with quite barren rock. Scattered small octocoral colonies and small stylasterids appear to grow on coral rubble near summit (eg. left image). Very little fauna – a few crinoids, starfish and gastropods and hermit crabs. Orange roughy, rattails and deep-sea sharks and occasional oreos. At the end of the transect we saw patches of soft sediment with bioturbation and sea pens.

Area: Morgue, Chatham Rise	Station: S0309_88-3 (rerun TAN2009/27)	GeoB Station: 26388-3
Date: 09/02/2025	Time Start (NZT): 02:24	Time Stop (NZT): 03:44
Depth start: 897 m	Depth end: 1103 m	Gear: OFOS (images 5543–6009)



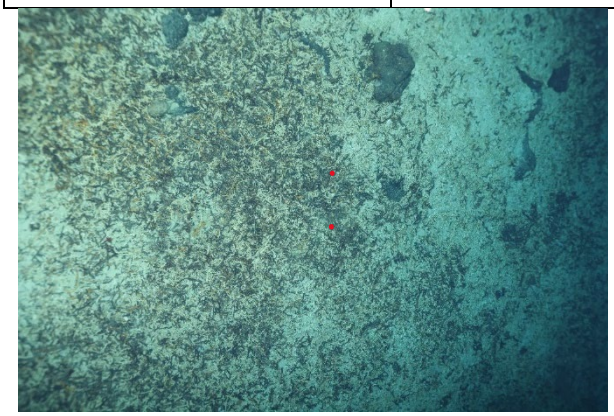
2025_02_08_5574



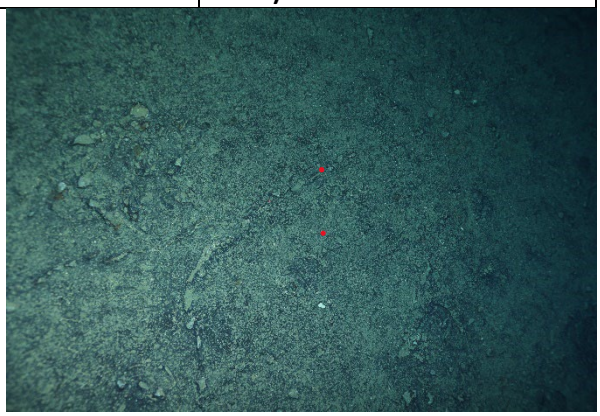
2025_02_08_5689

Transect summary:
Rerun of TAN2009/27 (NNW) with small diversion to look for wagon wheel (unsuccessful). Characteristics similar to previous tows; *Madrepora oculata* coral rubble near peak, with locally abundant small stylasterids and octocorals. Small band of live coral (*Madrepora oculata*) downslope (right image).

Area: Morgue, Chatham Rise	Station: S0309_88-4 (rerun TAN2009/53)	GeoB Station: 26388-4
Date: 09/02/2025	Time Start (NZT): 04:27	Time Stop (NZT): 04:53
Depth start: 909 m	Depth end: 1007 m	Gear: OFOS (images 6011–6186)



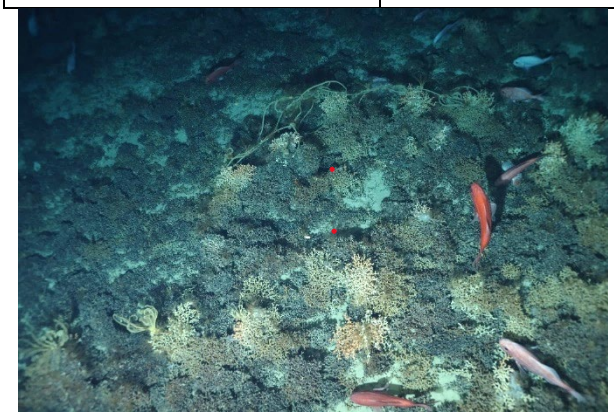
2025_02_08_6059



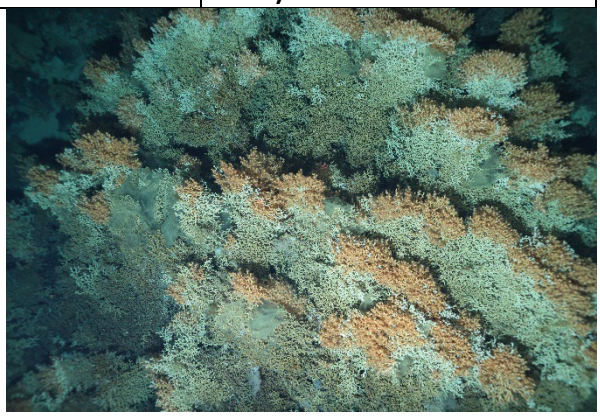
2025_02_08_6183

Transect summary:
Partial rerun of TAN2009/53 (W), short transect from peak westwards downslope. Coral rubble transitions to smooth or complex volcanic bedrock, with few animals.

Area: Morgue, Chatham Rise	Station: S0309_88-5 (rerun TAN2009/06)	GeoB Station: 26388-5
Date: 09/02/2025	Time Start (NZT): 05:25	Time Stop (NZT): 08:15
Depth start: 1023 m	Depth end: 1100 m	Gear: OFOS (images 6187–7204)



2025_02_08_6369 (showing lost rope)



2025_02_08_6420

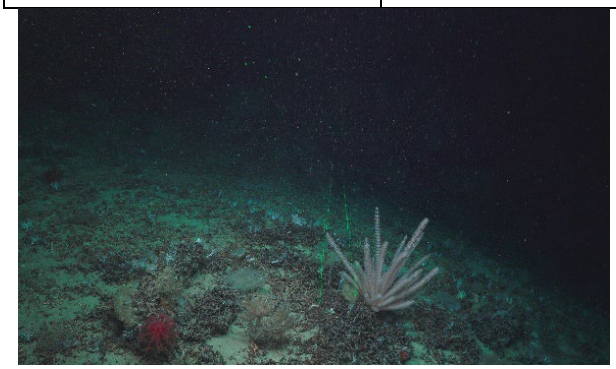
2025_02_08_6907

2025_02_08_7147

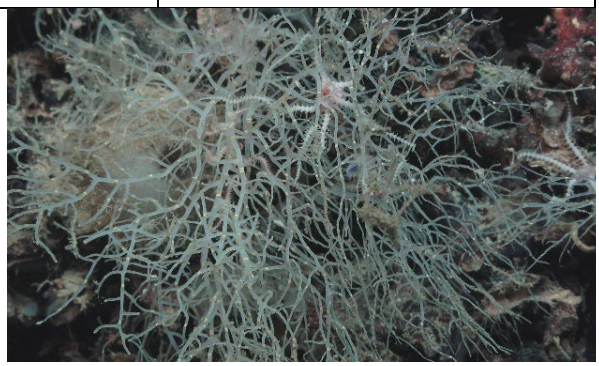
Transect summary:

Repeat of TAN2009/06 DTIS transect, running along the southern ridge of Morgue, beginning mid-slope of main cone due to avoid risk of entanglement with lost fishing gear found during the 2009 transect. The flank of the main cone was covered with coral rubble, with larger coral matrix appearing as OFOS moved on to ridge (progressively intact and live *Solenosmilia variabilis*). The ridge line appeared to be covered in extensive *Solenosmilia variabilis* colonies (image 6377 onwards), large patches of live coral in some areas, intact dead coral matrix observed in other parts as the camera sled traversed and sidled along the narrow ridgeline. Many crinoids, including large hyocrinids, sponges, few octocorals, many starfish, including brisingids, urchins, anemones and two lengths of rope (rubbish) noted (e.g. left image). Dead coral matrix covered most of the rest of the ridge, until the camera moved over a sharp drop (image 6907) that appeared to be exposed pillow lava (bottom left image). Dead coral matrix and coral rubble was evident until shortly before the end of the transect in around 1000 m of water (bottom right).

Area: Ghoul, Chatham Rise	Station: S0309_89	GeoB Station: 26389-1
Date: 09/02/2025	Time Start (NZT): 10:50	Time Stop (NZT): 15:01
Depth start: 939 m	Depth end: 925 m	Gear: ROV (Dive 114)



SO309_114_HDSulisRecorder_2025-02-08-22h17m52s

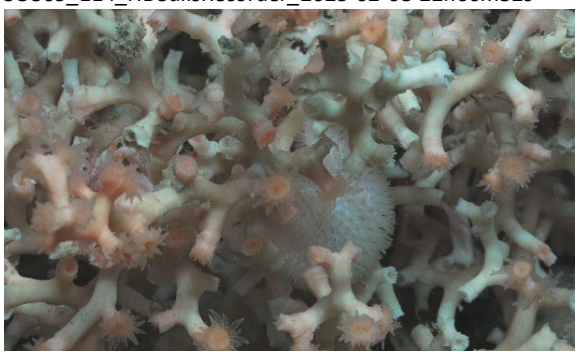


SO309_114_HDSulisRecorder_2025-02-08-21h50m57s

SO309_114_HDSulisRecorder_2025-02-08-01h06m02s

SO309_114_HDSulisRecorder_2025-02-08-22h00m32s

SO309_114_HDSulisRecorder_2025-02-08-01h12m52s

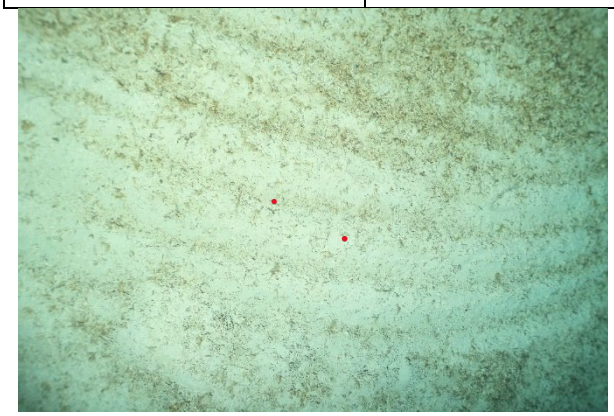


SO309_114_HDSulisRecorder_2025-02-08-22h14m57s

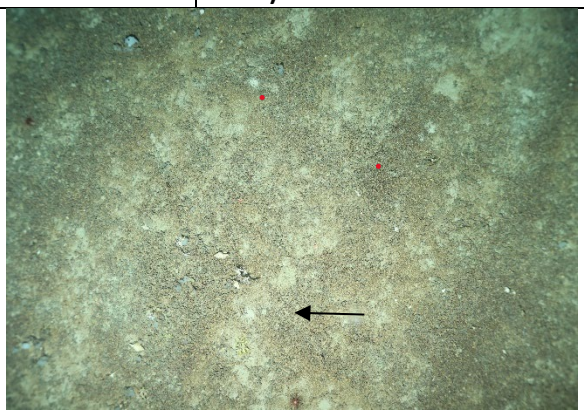
Transect summary:

ROV Dive 114 aimed to conduct intensive sampling of the coral fauna and add detailed observations of biological interactions on the reef. To minimise damage to the *Solenosmilia* reef, the transect was conducted in the south-eastern reef foreland and continued north-eastward along the reef edge at a depth of 940 to 930 m. Samples of octocorals, including *Anthomastus* sp., *Narella* sp., and *Minuisis* sp., were taken. Furthermore, observations of corallivory by the calliostomatid snail *Venustatrochus ecclectus* and an unnamed species tentatively assigned to *Fautor* sp. on *S. variabilis* were made. Furthermore, spider web-like structures of unknown origin which we tentatively called 'Schlontz' were sampled. Twelve samples were taken.

Area: Graveyard, Chatham Rise	Station: S0309_92-1 (rerun TAN2009/03)	GeoB Station: 26392-1
Date: 9/02/2025	Time Start (NZT): 20:43	Time Stop (NZT): 22:39
Depth start: 766 m	Depth end: 1062 m	Gear: OFOS (images 7206–7901)

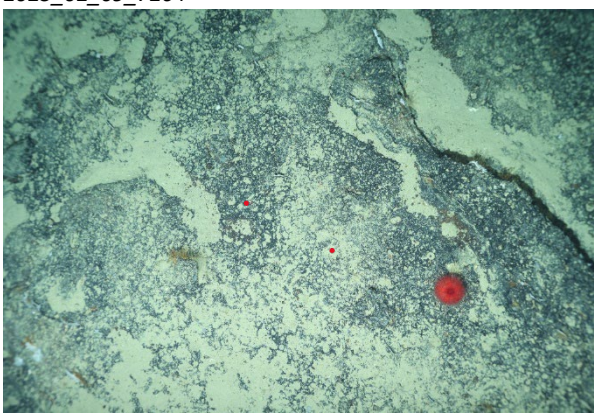


2025_02_09_7237



2025_02_09_7264

2025_02_09_7396

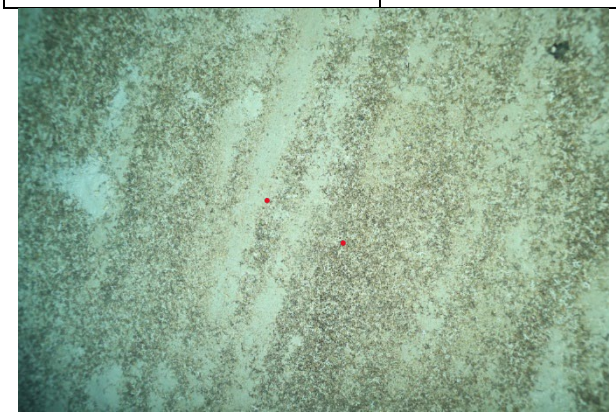


2025_02_09_7793

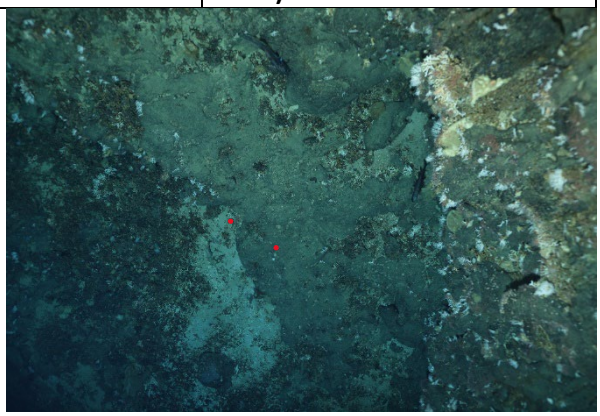
Transect summary:

Rerun of TAN2009/03 (SE) starting at the southern edge of the summit area running straight down to the base of the feature. Summit area scarred with many trawl marks over fine sediments, coral rubble with limited mobile or sessile fauna. Small clusters of live hard coral occasionally noted (eg. right image possibly *Enallopsammia rostrata*). Rocky ledge downslope with small stylasterids and sponges. Smooth bedrock flank colonised with multiple gorgonian fans over the upper slope (bottom left image), becoming more sparse as the bedrock broke up and transitioned to softer sediments at the base. Small brown crinoids abundant in crevices (bottom right image).

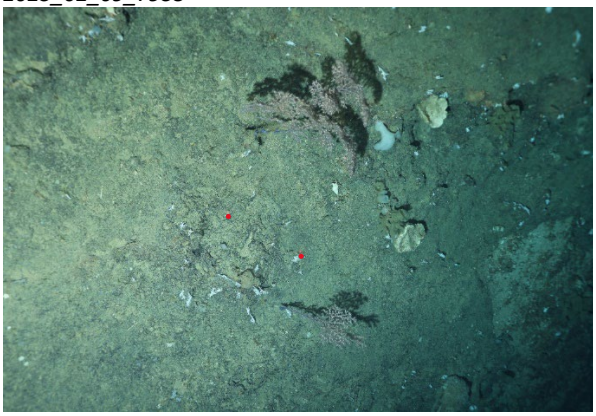
Area: Graveyard, Chatham Rise	Station: S0309_92-2 (rerun TAN2009/24)	GeoB Station: 26392-2
Date: 09/02/2025	Time Start (NZT): 23:40	Time Stop (NZT): 02:00
Depth start: 766 m	Depth end: 1047 m	Gear: OFOS (images 7902–8741)



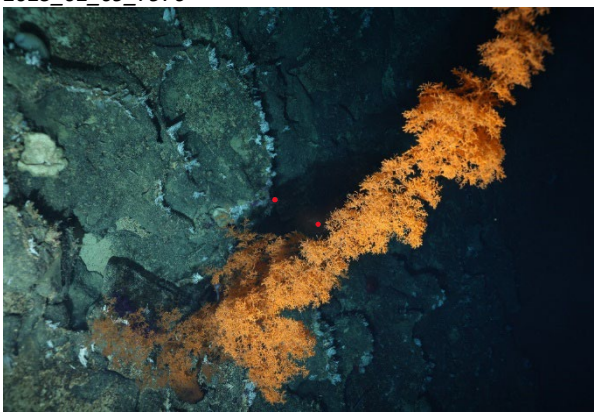
2025_02_09_7953



2025_02_09_7976



2025_02_09_8206

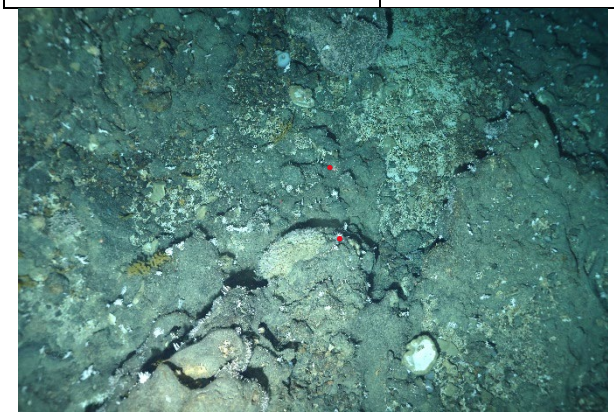


2025_02_09_8386

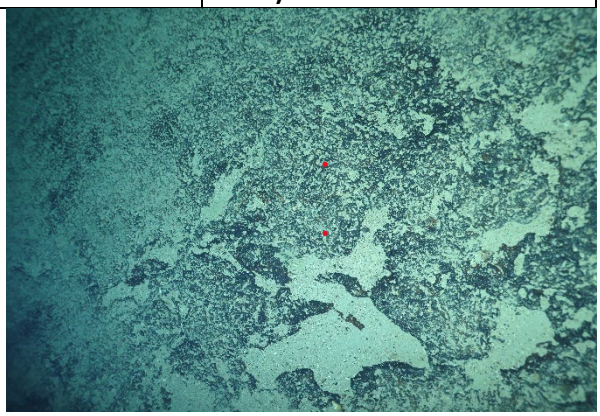
Transect summary:

Rerun of TAN2009/24, northern transect with eastward deflection following along the low northern ridgeline. Summit area with trawl marks and coral rubble. Rocky escarpments intercept further smooth rubble slopes with trawl marks. The bedrock forms small ledges and overhangs with clusters of small stylasterids and other encrusting fauna visible (eg. top right image). Sidled along the northern rocky ridge with steep rocky escarpments/boulders and smooth rock faces with some locally abundant plexaurid fans, stylasterids, occasional sponges and black corals (bottom images). Rocky volcanic bedrock to the end of the camera tow.

Area: Graveyard, Chatham Rise	Station: S0309_92-3 (rerun TAN2009/35)	GeoB Station: 26392-3
Date: 10/02/2025	Time Start (NZT): 03:01	Time Stop (NZT): 04:46
Depth start: 760 m	Depth end: 1010 m	Gear: OFOS (images 8742–9394)



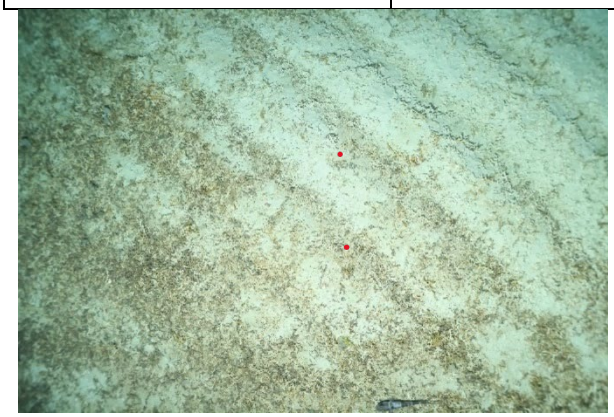
2025_02_09_8840



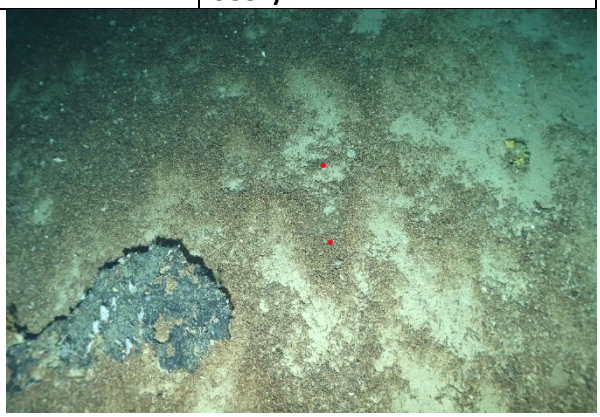
2025_02_09_9348

Transect summary:
Repeat of TAN2009/35 (NE) straight downslope. Slope dominated by rocky outcrops and bedrock with less smooth, soft sediments covering the slopes compared to the other sides of the feature. Coral rubble and rocky outcrops from the start, with small encrusting fauna, occasional small gorgonian sea fans and some larger sponges. Short sections mid-slope covered with soft sediments show signs of trawling. Thin veneer of soft sediments on smooth bedrock and little fauna along the lower part of the flank (right image).

Area: Graveyard, Chatham Rise	Station: S0309_92-4 (rerun TAN2009/04)	GeoB Station: 26392-4
Date: 10/02/2025	Time Start (NZT): 05:30	Time Stop (NZT): 06:51
Depth start: 757 m	Depth end: 1038 m	Gear: OFOS (images 9395–9884)



2025_02_09_9514

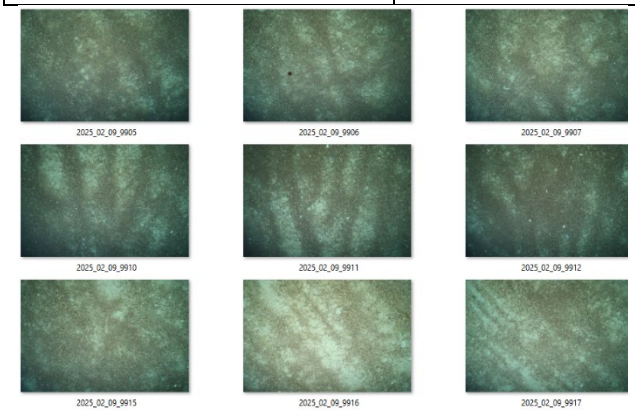


2025_02_09_9682

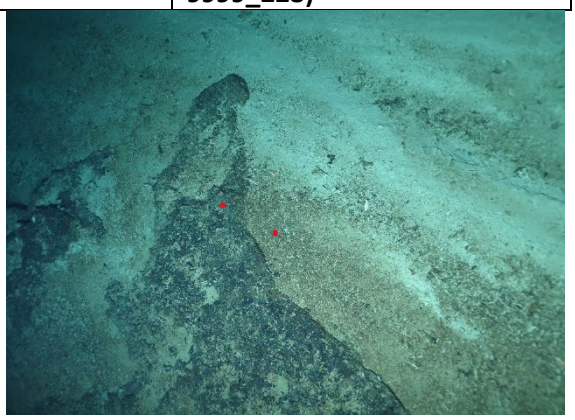
Transect summary:
Repeat of TAN 2009/4 (SW) straight downslope track starting on smooth coral rubble sediments on summit, showing abundant trawl marks, interspersed by small rocky outcrops and boulders that are encrusted with small stylasterid, gorgonian and scleractinian coral (eg. right image). Most of flank

covered in soft sediments with overlay of coral fragments, last ~quarter of tow with volcanic boulders, cobbles and bedrock with little sediment overlay.

Area: Graveyard, Chatham Rise	Station: S0309_92-5 (rerun TAN2009/23)	GeoB Station: 26392-5
Date: 10/02/2025	Time Start (NZT): 07:37	Time Stop (NZT): 08:44
Depth start: 784 m	Depth end: 991 m	Gear: OFOS (images 9885–9999_228)



Compilation of stills showing trawl marks near summit

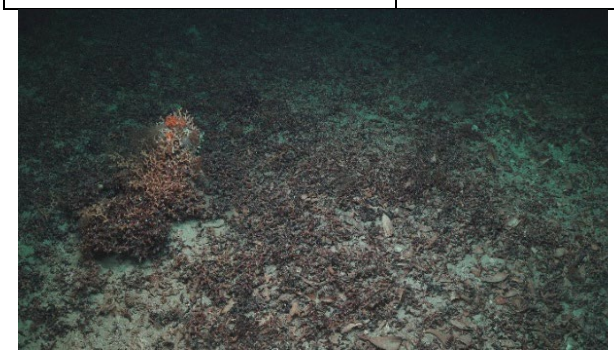


2025_02_09_9999_229

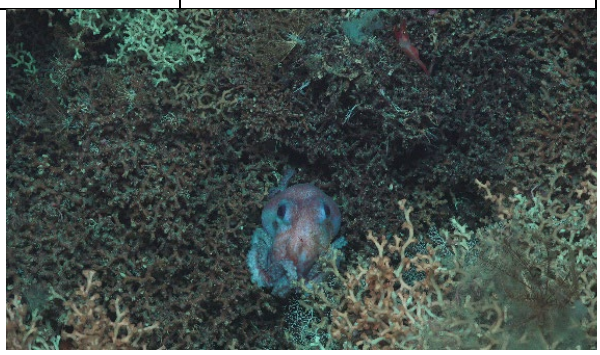
Transect summary:

Partial rerun of TAN2009/23 (NW). Upper and mid-slope with smooth soft sediments, coral rubble and trawl marks (left images), intercepted by steep drop-off. OFOS tow terminated about mid-slope, over patchy bedrock with sediment and coral rubble overlay. Little encrusting or mobile fauna.

Area: Morgue, Chatham Rise	Station: S0309_93	GeoB Station: 26393-1
Date: 10/02/2025	Time Start (NZT): 11:20	Time Stop (NZT): 15:08
Depth start: 1102 m	Depth end: 1038 m	Gear: ROV (Dive 115)

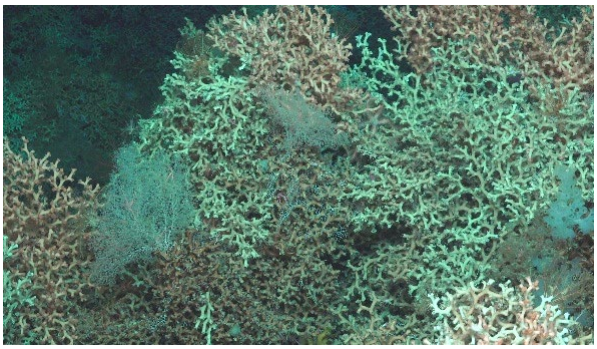


SO309_115_HDSulisRecorder_2025-02-19-22h16m55s

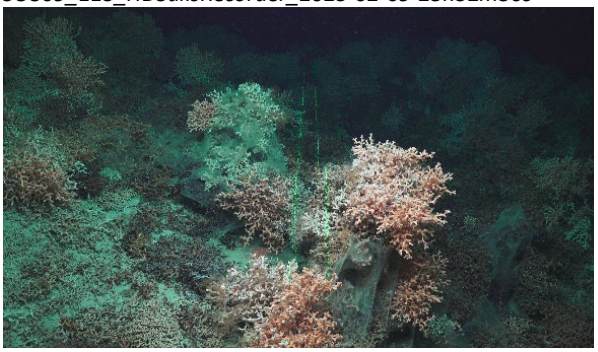


SO309_115_HDSulisRecorder_2025-02-19-23h44m30s

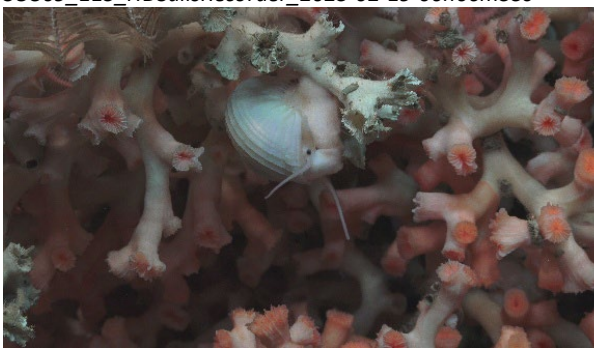
SO309_115_HDSulisRecorder_2025-02-09-23h52m30s



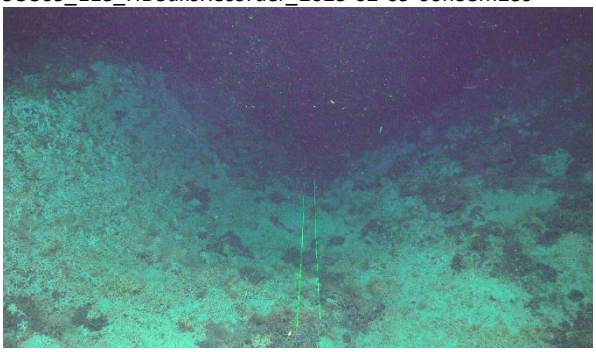
SO309_115_HDSulisRecorder_2025-02-19-00h06m55s



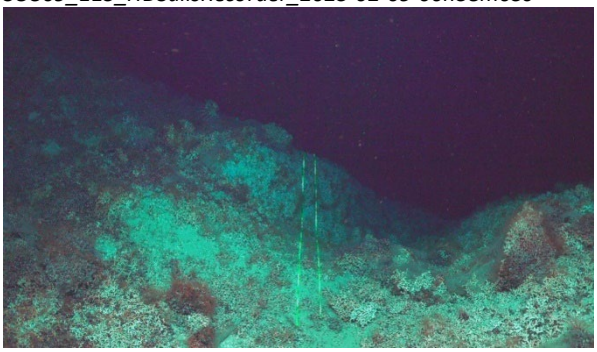
SO309_115_HDSulisRecorder_2025-02-09-00h53m25s



SO309_115_HDSulisRecorder_2025-02-09-00h58m05s



SO309_115_HDSulisRecorder_2025-02-10-01h53m40s (in the scour mark, looking left)

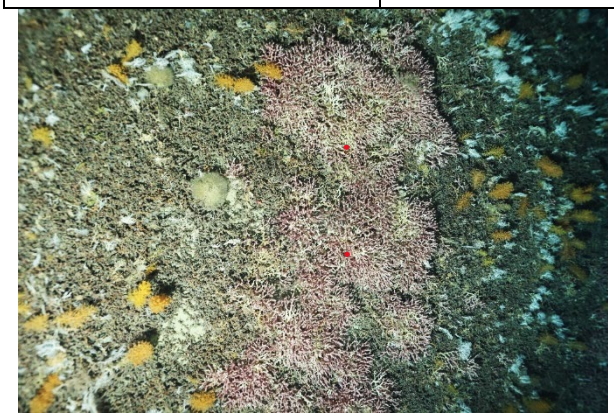


SO309_115_HDSulisRecorder_2025-02-10-01h54m40s (inside scour mark, looking right)

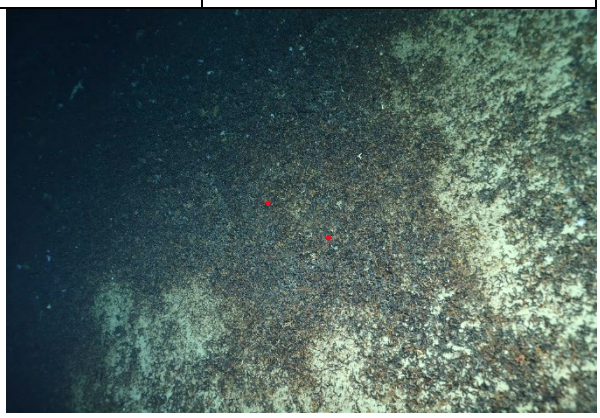
Transect summary:

A dive on the southern ridge of Morgue, following a section of OFOS transect GeoB26388. The dive started on the eastern flank below the ridge line and worked up to the ridge line, then followed the ridge to the north. Coral rubble with barnacle plates and a few orange roughy and sharks at the start of the dive. Dead *Solenosmilia variabilis* framework with small live colonies turned into a dense reef with deep framework and a lot of live *Solenosmilia variabilis* corals. Sponges, crinoids, brisingids, fish and an octopus were seen in the reef, together with gastropods and a slime/'Schlonz' covering small areas of coral. Occasional visible bedrock was volcanic pillow lava. Mid-dive we found the edge of the coral reef and carried out some sampling as the ROV could be set down, sampling coral rubble with a net, including an *Acesta* shell and live gastropod, a snail and *Solenosmilia variabilis*, a carnivorous sponge, some slime/'Schlonz', and some dead coral framework. As we traversed along the ridgeline the corals became more sparse, with soft sediment and patchy, mostly dead coral matrix. At the end of the dive we came across a deep scar in the ridgeline, dividing the intact reef body with only coral rubble remaining (bottom images). Due to time constraints, we terminated the dive at 1035 m water depth. Eight samples were recovered

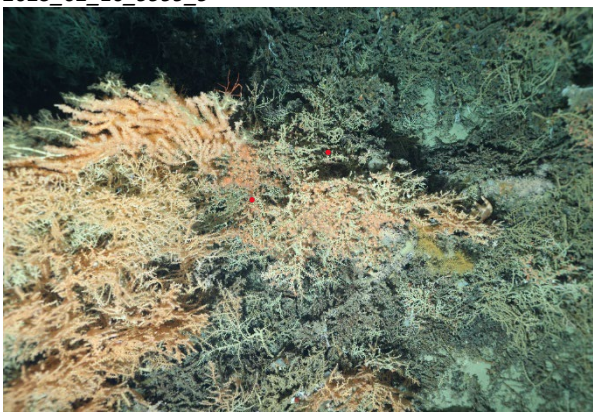
Area: Diabolical, Chatham Rise	Station: S0309_95-1 (rerun TAN2009/21)	GeoB Station: 26395-1
Date: 10/02/2025	Time Start (NZT): 19:26	Time Stop (NZT): 20:15
Depth start: 901 m	Depth end: 1075 m	Gear: OFOS (images 1–294)



2025_02_10_9999_9



2025_02_10_9999_64



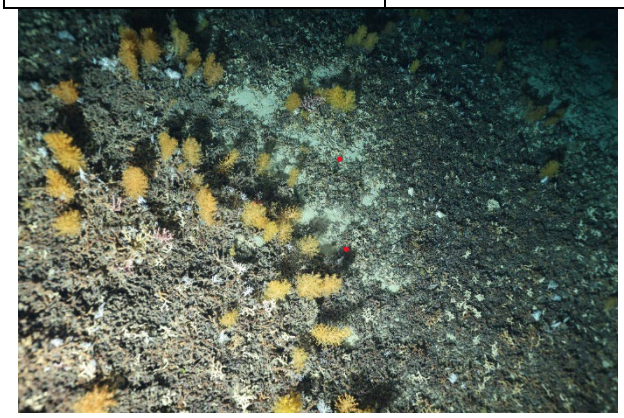
2025_02_10_9999_71

2025_02_10_9999_196

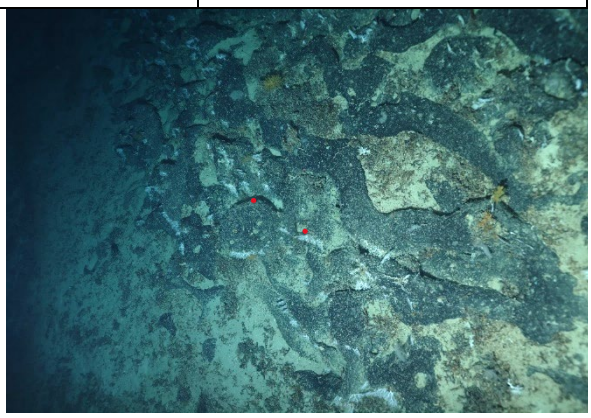
Transect summary:

Rerun of TAN2009/21 (NW), OFOS arrives on northern area of summit over patch of live corals including purple *Enallopsammia rostrata*, bottle bush coral, stylasterids and glass sponges (left image). The area downslope was primarily smooth sediment with coral rubble overlay and scattered small stylasterids. OFOS traversed one small area of live corals, including *Madrepora oculata*, overgrown in parts with zoanthids and bamboo corals (right image). The base of the feature was covered primarily in fine sediments with occasional emergent volcanic boulders, overlaid with a mix of coral rubble and barnacle hash (bottom right image).

Area: Diabolical, Chatham Rise	Station: S0309_95-2 (rerun TAN2009/36)	GeoB Station: 26395-2
Date: 10/02/2025	Time Start (NZT): 20:43	Time Stop (NZT): 21:16
Depth start: 908 m	Depth end: 1056 m	Gear: OFOS (images 1–212)



2025_02_10_9999_17



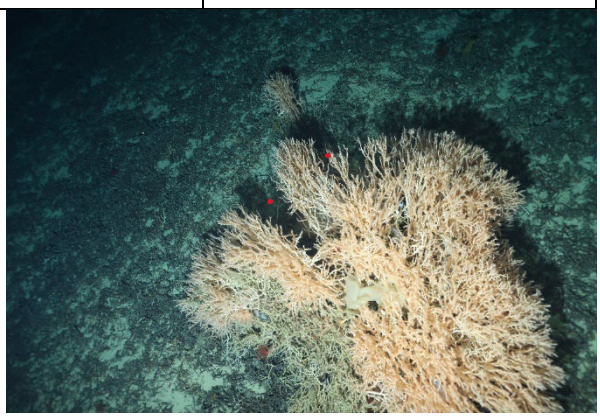
2025_02_10_9999_105

Transect summary:

Rerun TAN2009/36 (E) straight from summit to base. Arriving on central summit on area of coral rubble, then traversing over patch with abundant bottle brush (?*Tokoprymno*), stylasterids and small clusters of purple *Enallopsammia rostrata* (left image). The downslope transect was characterised by soft sediments with a thin layer of dead coral fragments, occasionally abundant larger stylasterids, few gorgonians, occasional clusters of live *Madrepora oculata*. After traversing a band of pillow lava with a range of encrusting corals (right image), the substrate remained fine with little fauna or indication of bioturbation until the end of the transect.

Area: Diabolical, Chatham Rise	Station: S0309_95-3 (rerun TAN2009/38)	GeoB Station: 26395-3
Date: 10/02/2025	Time Start (NZT): 21:46	Time Stop (NZT): 22:30
Depth start: 896 m	Depth end: 1051 m	Gear: OFOS (images 1–243)

2025_02_10_9999_5 (summit, with Paralomis zealandica *king crab in centre)*



2025_02_10_9999_154 (live Madrepora oculata)

Transect summary:

Repeat of TAN2009/38 (NE), overlapping at the top with S0309_95-1. Starting over summit with purple *Enallopsammia rostrata*, ?*Tokoprymno* and other primnoid gorgonians (incl. rasta coral), stylasterids before traversing transverse bands of sediment and rubble, multiple patches of live *Madrepora oculata* and small areas of purple *Enallopsammia rostrata*, stylasterids and gorgonians.

Lower flank primarily soft sediment covered with thinning overlay of coral rubble, only small band of emergent volcanic bedrock near end of transect.

Area: Diabolical, Chatham Rise	Station: S0309_95-4 (rerun TAN2009/18)	GeoB Station: 26395-4
Date: 10/02/2025	Time Start (NZT): 22:58	Time Stop (NZT): 0:19
Depth start: 903 m	Depth end: 1062 m	Gear: OFOS (images 1–432)

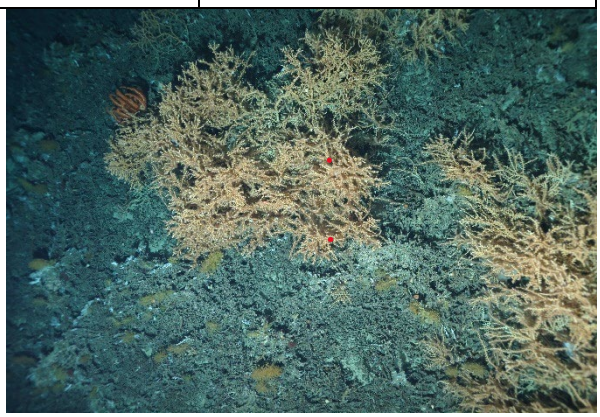
2025_02_10_9999_96

2025_02_10_9999_171

Transect summary:
Repeat of TAN2009/18 (SW), down short and steep flank from western part of summit, traversing a short distance across the moat and skirting along a small outcrop before the end of the transect on background sediments showing bioturbation and burrows. Summit assemblage with purple *Enallopsammia rostrata* and gorgonian corals, dead coral rubble covering the upper flanks. Locally abundant orange ?*Tokoprymno* bottle brush corals, stylasterids and scattered *Anthomastus* (left image). Only three small live *Madrepora oculata* framework at the end of the coral rubble fan (right image). Very little mobile fauna observed.

Area: Diabolical, Chatham Rise	Station: S0309_95-5 (rerun TAN2009/37)	GeoB Station: 26395-5
Date: 11/02/2025	Time Start (NZT): 0:49	Time Stop (NZT): 1:16
Depth start: 920 m	Depth end: 1036 m	Gear: OFOS (images 1–218)

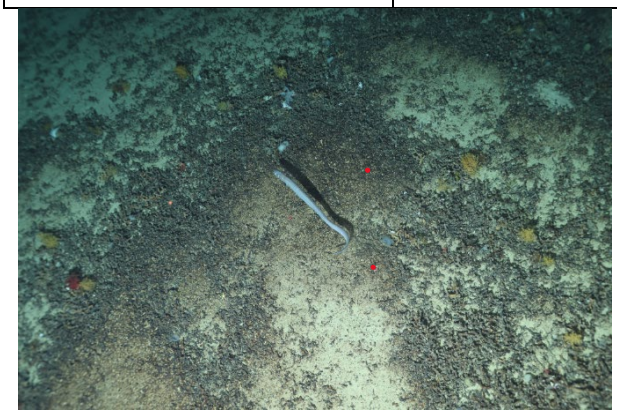
2025_02_10_9999_34



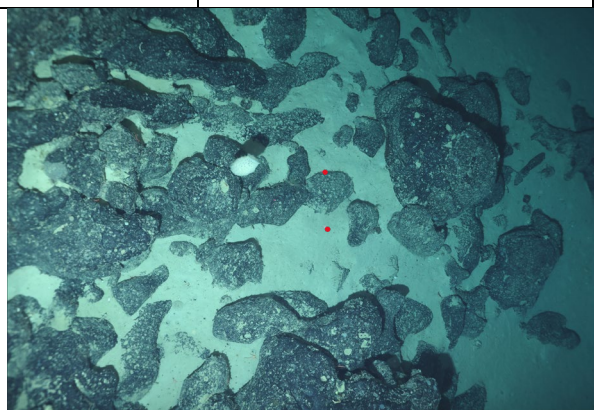
2025_02_10_9999_71

Transect summary:
Partial repeat of TAN2009/37, due North from summit down about two-thirds of flank before aborting due to time constraints. Start of transect over dense coral rubble (trawl/sled mark) with scattered bottle brush corals (left image). Band of live *Madrepora oculata* below summit (right image), fan of progressively thinning layer of coral rubble over fine sediments and band of emerging volcanic bedrock near end. Little mobile fauna, including tam-o-shanters, starfish, eels and rat tails.

Area: Diabolical, Chatham Rise	**Station: S0309_95-6 (rerun TAN2009/22)**	**GeoB Station: 26395-6**
Date: 11/02/2025	**Time Start (NZT): 1:58**	**Time Stop (NZT): 3:14**
Depth start: 909 m	**Depth end: 1041 m**	**Gear: OFOS (images 1–455)**



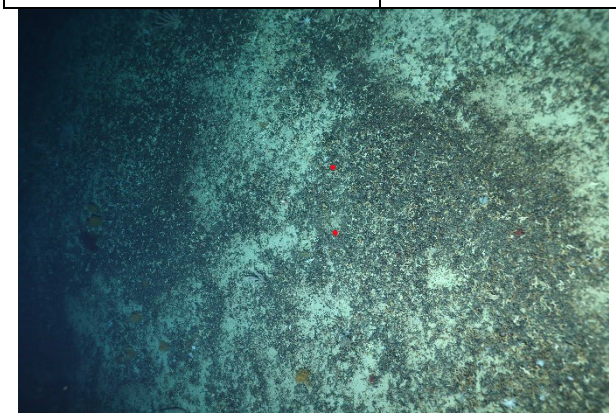
2025_02_10_9999_78



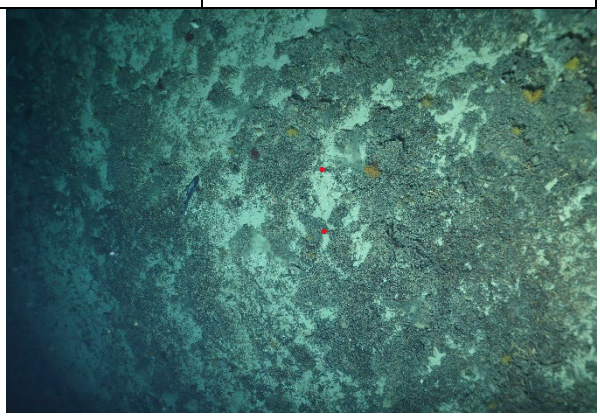
2025_02_10_9999_419

Transect summary:
Repeat of TAN2009/22 (W), starting just below the peak over thick coral rubble and bottle brush coral and stylasterids, very sparse live *Enallopsammia rostrata* on or near the peak, not as abundant as seen during previous transects. Live *Madrepora* was absent on this tow. The flank comprised coral rubble and mixed invertebrates (stylasterids, *Anthomastus*, *Tokoprymno*, *Narella*) and some fish (rattails, eels). A few emerging lava boulders near base with some encrusting fauna (eg. euplectellid sponge in right image) and mobile fauna such as small shrimp and a number of scyphozoans. Followed by smooth soft sediments with burrows, tam-o-shanters and gastropods.

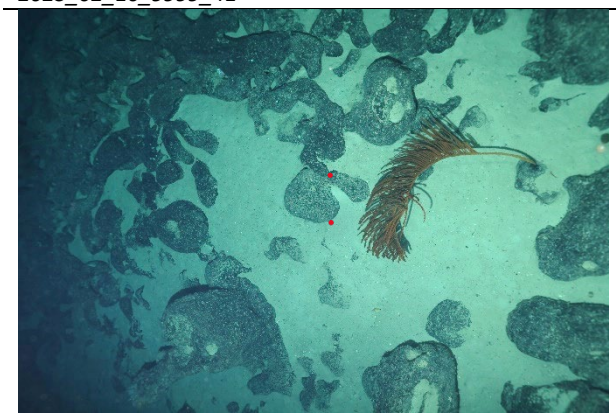
Area: Diabolical, Chatham Rise	Station: S0309_95-7 (rerun TAN2009/19)	GeoB Station: 26395-7
Date: 11/02/2025	Time Start (NZT): 3:59	Time Stop (NZT): 5:38
Depth start: 916 m	Depth end: 1039 m	Gear: OFOS (images 1–597)



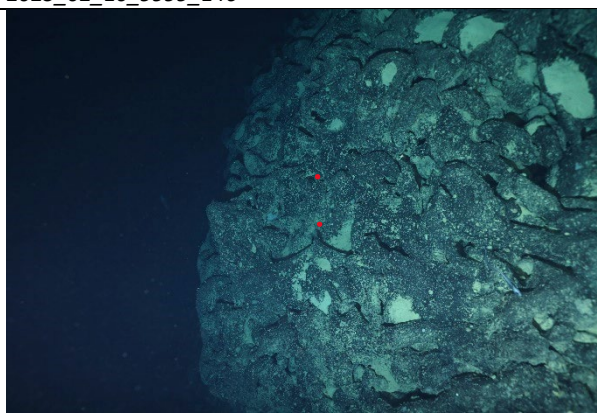
2025_02_10_9999_41



2025_02_10_9999_146



2025_02_10_9999_494



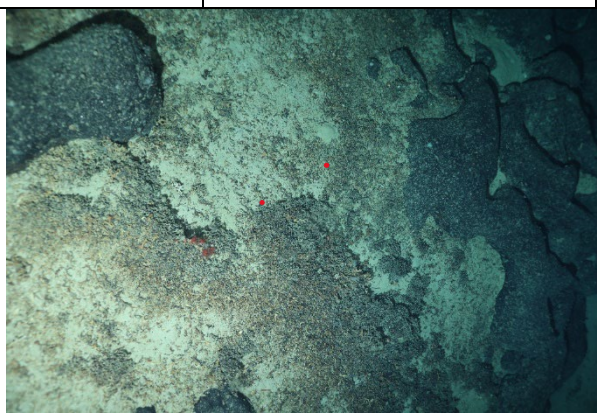
2025_02_10_9999_499

Transect summary:

Repeat of TAN2009/19 (S ridge transect), dropping on to the southern summit. Substrate was largely coral rubble with scattered *Tokoprymno,* rasta coral, stylasterids and *Anthomastus* (left image). Live hard coral appeared to be absent, band of intact dead coral framework was visible downslope (right image). Two steep drop-offs at about half-way through transect, comprising thick pillow lava. Fauna included *Anthomastus,* sessile and mobile crinoids, starfish, echiurans in the interstitial sediments and two large black corals (cf. *Bathypathes,* bottom left image). The transect ended over muddy sediment with rattails.

Area: Diabolical, Chatham Rise	Station: S0309_95-8 (rerun TAN2009/20)	GeoB Station: 26395-8
Date: 11/02/2025	Time Start (NZT): 6:18	Time Stop (NZT): 7:20
Depth start: 902 m	Depth end: 1039 m	Gear: OFOS (images 1–370)

2025_02_10_9999_51

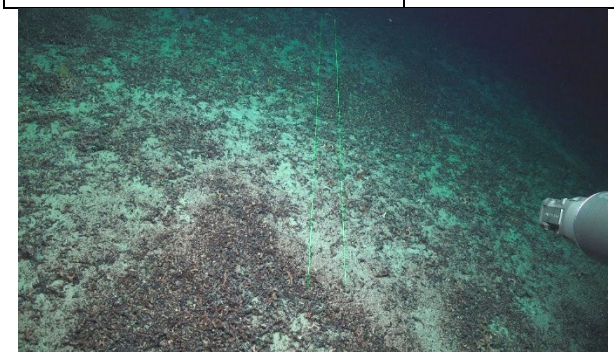


2025_02_10_9999_191

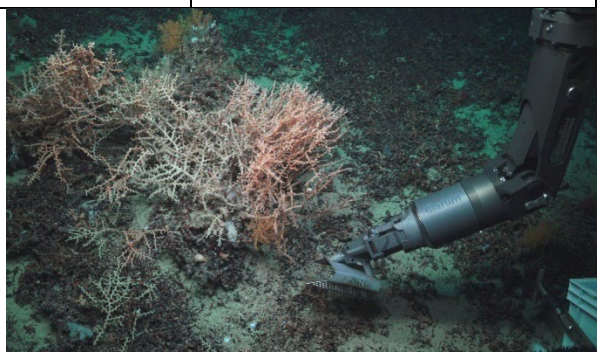
Transect summary:

Repeat of TAN2009/20 (SE). Summit with thick coral rubble, patches of live purple *Enallopsammia rostrata*, primnoids, stylasterids and *Anthomastus.* Downslope thinning layer of coral rubble on soft sediments, with little fauna other than few fish (rattail, eel, morid). Two bands of emerging pillow lava and bedrock alternating with soft sediments, a few clumps of intact coral scattered on sediments (left image).

Area: Diabolical, Chatham Rise	Station: S0309_98	GeoB Station: 26398-1
Date: 11/02/2025	Time Start (NZT): 13:17	Time Stop (NZT): 16:56
Depth start: 961 m	Depth end: 918 m	Gear: ROV (Dive 116)



SO309_116_HDSulisRecorder_2025-02-11-00h29m47s

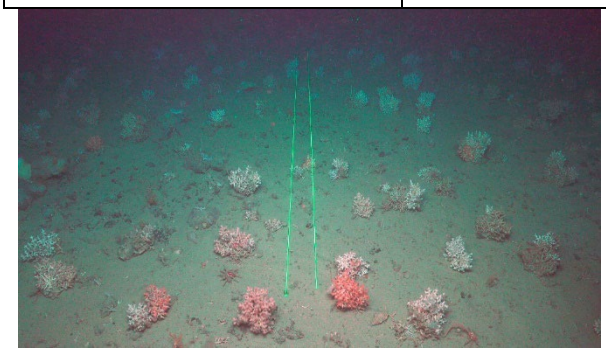


SO309_116_HDSulisRecorder_2025-02-11-00h56m17s

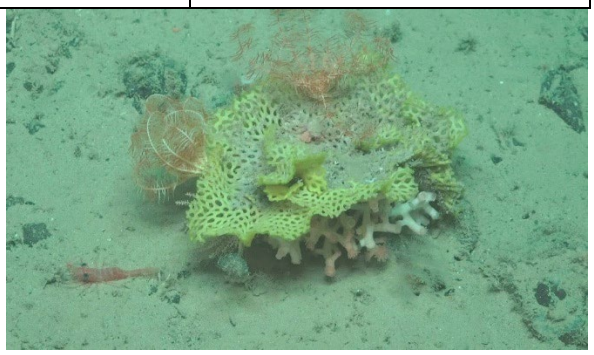
Transect summary:

ROV Dive 116 explored the eastern slope of Diabolical from 964 m at the base to the top in 925 m water depth. The transect initially led northward, almost parallel to the slope, to sample patches of *Madrepora oculata* previously found with the OFOS, which were encountered between 963 m and 952 m depth. Here, isolated specimens of *Enallopsammia rostrata* in a yellow colour variety were also found. The final section of the transect led westward directly to the top of Diabolical, where we encountered increasingly dense populations of various octocorals. Below the summit, we crossed patches of purple *Enallopsammia rostrata* along with a wide range of octocorals. The dive ended at 925 m water depth after collecting a total of 14 samples.

Area: *Goniocorella* site, Chatham Rise	Station: S0309_103	GeoB Station: 26804-1
Date: 12/02/2025	Time Start (NZT): 12:09	Time Stop (NZT): 16:32
Depth start: 358 m	Depth end: 358 m	Gear: ROV (Dive 117)



SO309_117_HDSulisRecorder_2025-02-12-01h11m05s

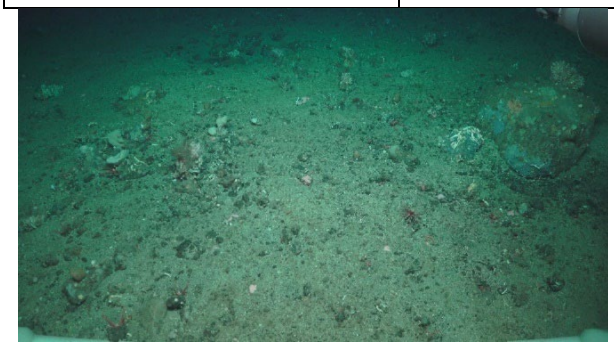


SO309_117_HDSulisRecorder_2025-02-12-02h57m20s

Transect summary:

ROV Dive 117 conducted over an unnamed shallow bank in the central area of the Chatham Rise to investigate the habitats of the colonial cold-water coral *Gonicorella dumosa* (GDU). The seabed was characterized by a high coverage of cobbles of polymictic composition alongside silty-sandy sediments with washed-out and bioturbated ripple structures. The cobbles serve as an attachment substrate for GDU. The majority of the colonies had framework heights between 10 and 20 cm (left image) and were forming aggregations with other invertebrates such as bryozoans, sponges, crinoids, crustaceans and molluscs (eg. right image). Neighbouring colonies rarely fused into a thicket. GDU occured in two colour varieties, either with translucent or reddish soft tissue. Local aggregations of the sea urchin *Dermechinus horridus* were observed and sampled. A total of 16 samples were collected.

Area: Reserve Bank, Chatham Rise	Station: S0309_108	GeoB Station: 26809-1
Date: 13/02/2025	Time Start (NZT): 11:13	Time Stop (NZT): 13:55
Depth start: 233 m	Depth end: 229 m	Gear: ROV (Dive 118)



SO309_118_HDSulisRecorder_2025-02-12-21h48m09s

SO309_118_HDSulisRecorder_2025-02-12-23h00m39s
(Complex invertebrate community living with GDU)

Transect summary:

The last ROV operation on SO309, Dive 118, was conducted on a small elevation that defines the eastern end of the Reserve Bank. The relief differences were slight, with water depths ranging from 232 to 234 m. GDU grew on cobbles and boulders and was relatively rare and bioconstructions of serpulids and larger bryozoan colonies were relatively abundant. Invertebrates were diverse and

representative of Chatham Rise fauna, with abundant *Thouarella* gorgonian*, Goniocidaris* urchin, *Scolonida gracilis* squat lobster, *Dagnaudus petterdi* antlered crab and a few fish, such as bigeye sea perch and some pigfish. The trunks of larger hydrozoans and octocorals were not infrequently used for the deposition of cephalopod egg clutches (right image). Due to a technical problem, this transect had to be aborted earlier than planned and only seven samples could be collected.