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Seamount recovery: factual voyage report of a survey of seamounts on the northwest and southeast Chatham Rise (TAN2009)

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Clark, M.R.; Bowden, D.A.; Stewart, R.; Schnabel, K.; Quinn, W.; Lennard, B.; Goode, S.L.; Davis, A. (2021). Seamount recovery: factual voyage report of a survey of seamounts on the northwest and southeast Chatham Rise (TAN2009).

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Benthic faunal communities on deepwater seamount features are commonly characterised by extensive growth of cold-water corals. These are vulnerable to impacts from bottom trawl gear, and substantial reductions in the biogenic habitat formed by corals have been recorded on fished seamount features in both New Zealand and Australia. However, the overall resilience of such benthic communities, and the time frame required for recolonisation and regrowth, is uncertain; yet such information is important for evaluating appropriate options for management of fishing impacts.

On the Chatham Rise there are groups of small seamounts in close geographic proximity, of a broadly similar size, depth range, and elevation, and with varying levels of historical fishing effort. These can provide a natural 'compare and contrast' setting to evaluate the effects of bottom fishing. Importantly, a number of these features were closed to bottom trawling in 2001, including both fished and unfished features in the Graveyard Seamounts complex on the northwestern Chatham Rise. The Graveyard seamounts provide an opportunity to maintain a long-term monitoring study to determine the mechanisms and rates of recovery of benthic fauna, population connectivity, and linkages between proximate seamounts, because this area was surveyed in 2001, 2006, 2009, and 2015.

This report documents activities, timing, samples, and data collected during the two-week survey commissioned by Fisheries New Zealand in August 2020 to continue the time series. The survey used primarily a towed camera system with high definition digital video and still cameras. The focus area was the Graveyard seamounts (55 camera transects), although additional survey work was carried out also on seamounts in the Andes area (24 camera transects, 3 epibenthic sled tows), and Epilogue Seamount (1 camera transect). Transects were aimed at repeating those done in 2015, with full use of the ship's Dynamic Positioning System enabling good camera control to repeat the course. Over 71 hours of video and 18000 still images were collected. Plots of some taxa distributions and descriptions of each camera transect are provided. Data and samples from the voyage will take several months to process and analyse, with the intention to extend analyses of changes in the benthic communities over time to almost 20 years. This makes the Graveyard survey series one of only a few globally that has regularly monitored deep-sea habitats over several decades.

1. INTRODUCTION

Seamounts, knolls, and hills are prominent features of underwater topography in the New Zealand region and are often sites of high biodiversity and productivity. They are the focus of important commercial fisheries for deepwater species, with about 80% of known seamount features at suitable depths for deepwater fisheries having been exploited.

Benthic faunal communities on deepwater seamount features are commonly characterised by extensive growth of cold-water corals. These are vulnerable to impacts from bottom trawl gear, and substantial reductions in the biogenic habitat formed by corals have been recorded on fished seamount features (Clark et al. 2016). However, the overall resilience of such benthic communities, and the time frame required for recolonisation and regrowth, is uncertain; yet such information is important for evaluating appropriate options for management of fishing impacts.

On the Chatham Rise there are groups of small seamounts in close geographic proximity, of a broadly similar size, depth range, and elevation, and with varying levels of historical fishing effort. Two such groups are the 'Graveyard Seamounts' on the northwest Chatham Rise, and the 'Andes Seamounts' on the eastern margin of the Chatham Rise (Figure 1). A number of these features were closed to bottom trawling in 2001 (Brodie & Clark 2003). The Graveyard seamounts in particular provide an opportunity to maintain a long-term monitoring study to determine the mechanisms and rates of recovery of benthic fauna, population connectivity, and linkages between proximate seamounts, because this area was surveyed in 2001, 2006, 2009, and 2015. Analysis of this 4-survey time series has shown little evidence of resilience of the benthic community, nor signs of settlement or recruitment of the main coral species (Clark et al. 2019). However, work off Hawaii (Baco et al. 2019) indicates that measurable changes might be expected in the order of 2–3 decades, a time approaching with the Graveyard series.

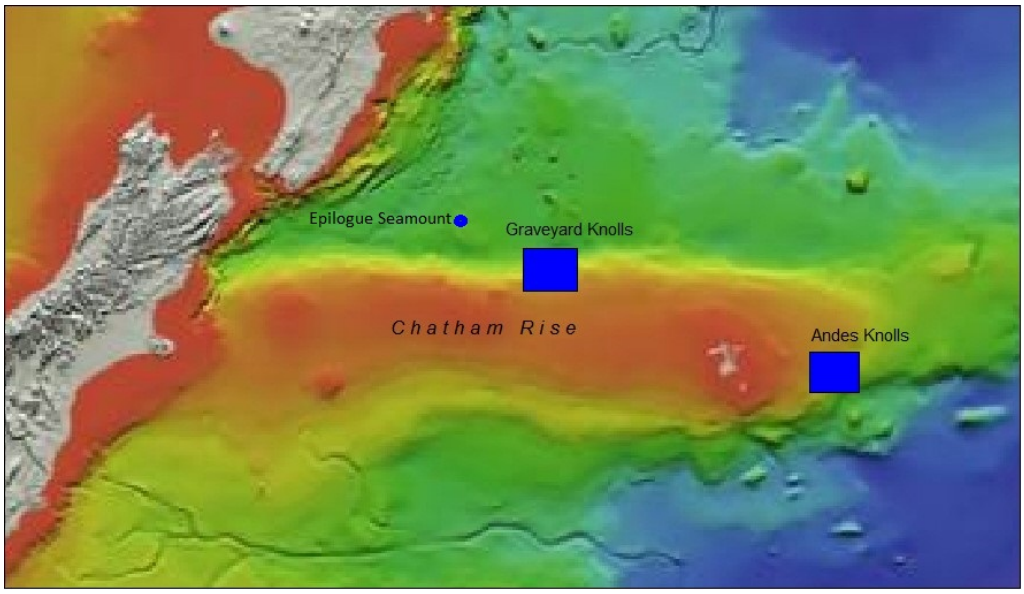

Figure 1: Seamount survey areas on the Chatham Rise

1.1 Objectives

Overall objective:
The overall project objective of ZBD2020-07 is "To understand the nature and time-scale of changes and recovery dynamics of benthic invertebrate communities on seamounts following closure of certain areas to bottom trawling".

Specific voyage objectives were:

1. To repeat the quantitative photographic survey of benthic invertebrate communities on features of the Graveyard Knolls complex.
2. To assess changes in benthic communities since the first survey in 2001.

These extended to the Andes seamounts if time and weather conditions permitted:
3. To repeat the quantitative photographic survey of benthic invertebrate communities on features of the Andes Knolls (Diamond Head peaks).
4. To gather data to assess changes in benthic communities since the first survey in 2009.

2. METHODS

2.1 Survey area

Graveyard seamounts

The Graveyard seamounts (also known as the Graveyard Knolls, but the term seamounts is used here because it has been widely used in the ecological literature to include seamounts, knolls, and hills) consist of about twenty small features ranging in depths from 750 m to 1250 m at their peaks, and from 1050 m to 1600 m at their bases (Figure 2). They lie in close proximity to one another, spanning an area of approximately 140 km^2. Several features in the complex have been the focus of a bottom trawl fishery for orange roughy (*Hoplostethus atlanticus*) since the mid-1990s. Fishing has been confined mainly to four of the seamounts: Graveyard, Morgue, Scroll, and Zombie. Three (Pyre, Gothic, and Ghoul) have had no recorded commercial fishing activity. Morgue, Gothic, and Pyre were closed to fishing and dredging in 2001 (Brodie & Clark 2003).

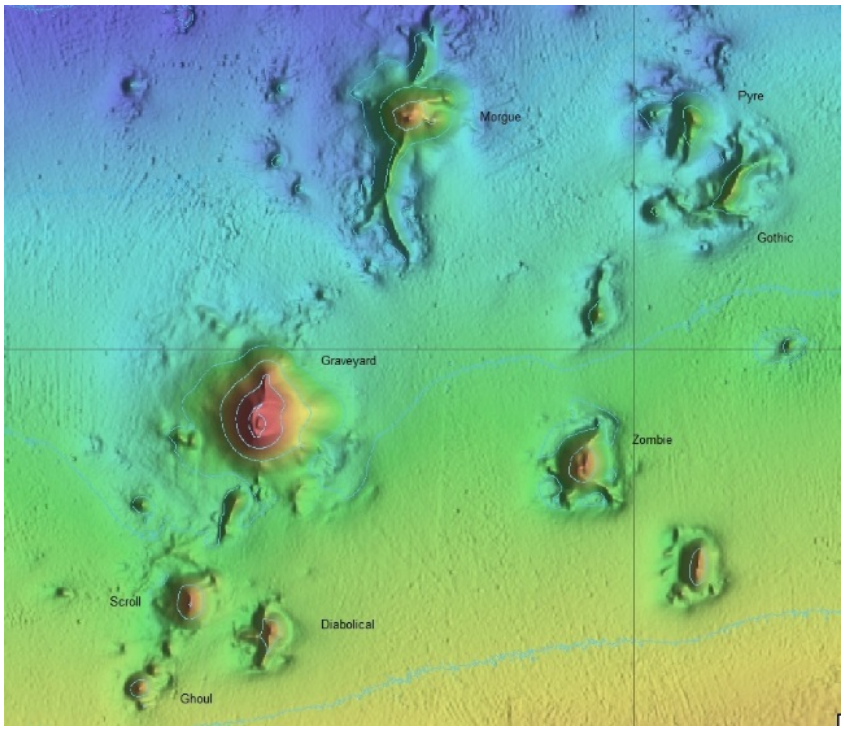

Figure 2: Detail of Graveyard Knolls, Northwest Chatham Rise

Since 2001 a time series of photographic surveys has been developed to track the recovery of several of the Graveyard seamounts that have been closed to fishing. To date, eight features have been sampled, with a core set of six revisited on each of the last three voyages (Table 1). The current voyage constituted a fifth photographic survey of the Graveyard region, five years after the last voyage in 2015, and extends the recovery monitoring period to almost 20 years following the cessation of trawling on Morgue seamount in 2001.

Table 1: Photographic surveys of seamounts in the Graveyard complex visited in each survey year.

Seamount	2001 (TAN0104)	2006 (TAN0604)	2009 (TAN0905)	2015 (TAN1503)	2020 (TAN2009)
Graveyard	Y	Y	Y	Y	Y
Morgue	Y	Y	Y	Y	Y
Diabolical	Y	Y	Y	Y	Y
Gothic	Y	Y	Y	Y	Y
Zombie		Y	Y	Y	Y
Ghoul		Y	Y	Y	Y
Pyre		Y			
Scroll		Y			

Andes seamounts

The Andes is a cluster of about 12 small knolls and hills 130 km east of the Chatham Islands. They range in depth from 500 m at the summit to 1300 m at their base (Figure 3). Most of the seamounts in the cluster have been trawled since the 1990s for orange roughy, but several close by have not been. One complex ('Diamond Head' which has several peaks) was largely unfished and protected in 2001 at the same time as several of the Graveyard Seamounts**.** The region was surveyed during the Graveyard voyages in 2009 (but with only two camera transects) and more fully in 2015 (Table 2).

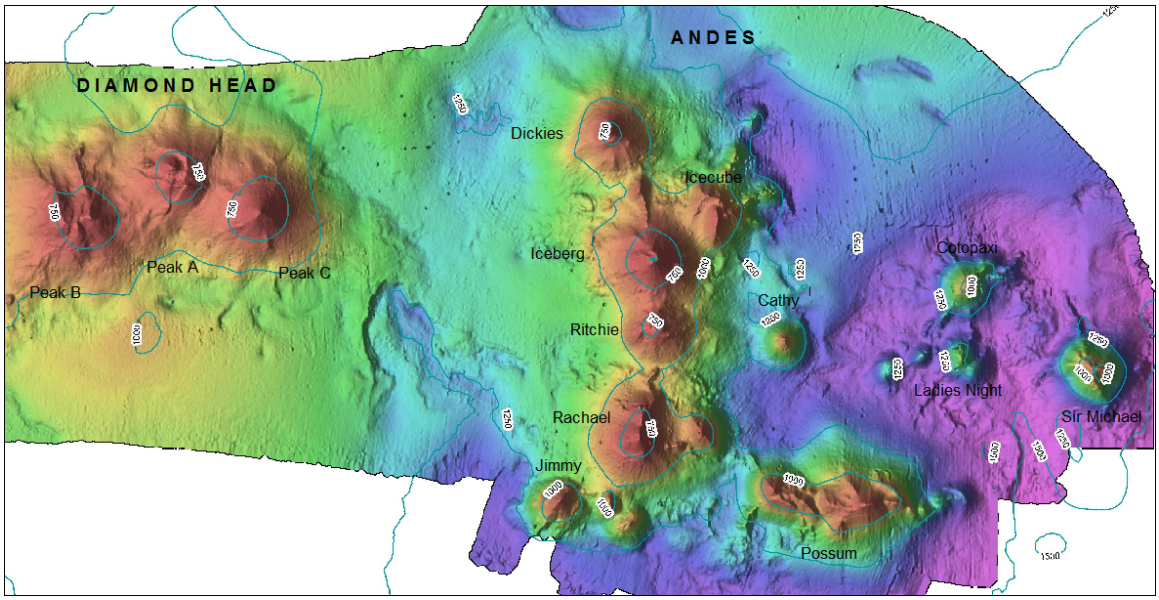

Figure 3: Andes Knolls, East Chatham Rise, including Diamond Head.

Table 2: Photographic surveys of seamounts in the Andes complex visited in each survey year.

Seamount	2009 (TAN0905)	2015 (TAN1503)	2020 (TAN2009)
Diamond Head A	Y	Y	Y
Diamond Head B		Y	Y
Diamond Head C	Y	Y	Y
Iceberg		Y	
Dickies		Y	
Rachael		Y	

2.2 Photographic transect survey

Photographic transects were carried out from the summit of each seamount down the flanks to the base (except for Ghoul where it was possible to tow 'up and over' the seamount). The plan was for 8 transects (N, NE, E, SE, S, SW, W, NW) to be carried out on each feature. These replicate the seabed tracks of the 2015 transects where possible, because this was a survey that used the vessel Dynamic Positioning System for the first time and enabled much improved control over the speed and direction of the survey transects. On Morgue, more detailed coverage was undertaken because settlement and growth of sessile fauna may be patchy in the early years of recolonisation after closure to fishing, and the 8-line design was thought to possibly be too coarse to detect fine-scale settlement.

The camera gear used was NIWAs 'Deep Towed Imaging System' (DTIS) (Hill 2009). DTIS (Figure 4) is a battery-powered towed camera frame which records continuous high definition digital video (HD1080p format) and simultaneously takes high resolution (24 megapixel) still images at 15 s intervals. Full resolution video and still images are recorded at the seabed and downloaded on return to the surface. A low-resolution video image is transmitted to the surface in real time enabling control of camera altitude and recording of initial observations of fauna and seabed substratum types. Operation of cameras and lights is controlled from the surface. The seabed position of DTIS is monitored by an acoustic ultra-short baseline (USBL) transponder system and plotted in real time using the OFOP (Ocean Floor Observation Protocol) system. A Conductivity-Temperature-Depth recorder (CTD) was attached to the DTIS frame to collect additional environmental data for each seamount.

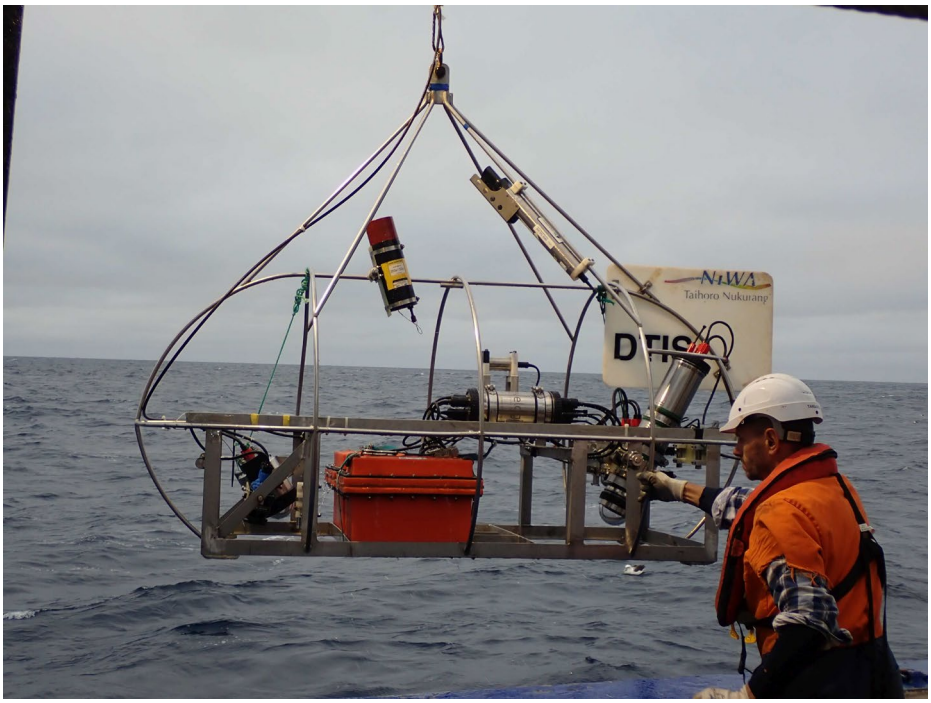

Figure 4: NIWA's Deep Towed Imaging System towed camera.

During all deployments, spatially-referenced observations on the occurrence of biological assemblages (at relatively coarse taxonomic resolution) and substratum types were recorded in real time by observers using the OFOP system. These initial observations were logged directly to an onboard database. After each transect, all still images and video files were downloaded and transferred to the ship's server for storage.

In 2007, 2010, and 2012, instrument moorings were deployed on the summit of Morgue as part of a study of orange roughy behaviour. At the time of deployment, the ballast weights for some of these moorings were fitted with ceramic plates designed to detect settlement and early growth of sessile

benthic invertebrates. During the survey, specific DTIS tows were made to locate the ballast weights to image any settlement of fauna.

2.3 Direct sampling

A limited number of physical samples were taken from the seamounts, targeted to identify specific faunal types to confirm DTIS photographs, as well as provide material for genetic, microbiome, and reproductive studies on certain coral species. A small epibenthic sled (the NIWA 'Seamount Sled' (Clark & Stewart 2016) with an opening of 1 m width) was used, towed at 1 knot for 5–10 minutes. The sled was fitted with a C-Node USBL beacon (the same as used on DTIS), and this enabled more accurate determination of location and time on the bottom to maximise the efficiency of the tow and minimise unnecessary impact. Biological material recovered from the sled received initial onboard sorting and processing. Macro-invertebrates were identified to the lowest possible taxon, with data entered in NIWA's *niwainvert* database.

Station data for each DTIS and sled shot were entered in *Tangaroa*'s 'Trawl Coordinator'.

3. RESULTS

3.1 Voyage timetable and narrative

The vessel, R.V. *Tangaroa*, sailed from Wellington on 7 August 2020 and started sampling on the Graveyard seamounts on 8 August. This phase continued until 15 August, when the vessel steamed to the Andes area and started surveying Diamond Head on 16 August. The vessel returned to the Graveyard seamounts on 20 August for some additional DTIS transects before transiting towards Wellington, sampling Epilogue Seamount, and arriving on 22 August (Table 3).

Table 3: Voyage progress summary, August 2020.

Date	Activity
7 Aug	Mobilisation, sail from Wellington 1800.
8 Aug	Transit towards Graveyard, arrive 2000. DTIS on Graveyard (1).
9 Aug	DTIS on Graveyard (2), Zombie (1). CTD cable problem, repair. DTIS on Morgue (3).
10 Aug	DTIS on Morgue (1), Gothic (4), Zombie (3). Zombie (1), Diabolical (5), Graveyard (2), Morgue (2). Wind remaining 20–25 knots SW but building swell, forecast 5 m.
11 Aug	DTIS on Zombie (1), Diabolical (5), Graveyard (2), Morgue (2).
12 Aug	DTIS on Morgue (5), Gothic (2), Graveyard (1). Swell at 3–4 m.
13 Aug	DTIS on Graveyard (1), complete Diabolical (3), complete Graveyard (1), Zombie (3), Gothic (1), Morgue (1).
14 Aug	DTIS on Morgue (2 mooring weight searches, 1 repeat transect), complete a re-run on Zombie (1), complete Ghoul (4).
15 Aug	DTIS on Morgue (1, and 1 mooring weight search), begin transit to Andes.
16 Aug	Arrive Andes, 30–35 knot SW, 4 m swell. DTIS (1) on Diamond Head C marginal. Sled on Rachael (1) and Iceberg (1) for coral study samples. DTIS on Diamond Head C (1) as swell eases.
17 Aug	DTIS on Diamond Head C (1), Diamond Head B (3), Diamond Head A (3)
18 Aug	DTIS on Diamond Head A (4). Stills camera issue, change over camera unit, continue with DTIS on Diamond Head C (3) and B (1).
19 Aug	DTIS on Diamond Head B (3), complete Diamond Head A (1), short target sled on peak A (1), complete Diamond Head C (3). As weather worsens, begin transit back to Graveyard.
20 Aug	Arrive back at Graveyard for some repeat DTIS tows: Graveyard (1), Gothic (1),
21 Aug	Complete additional DTIS work on Morgue (mooring search). Begin transit back to Wellington. DTIS tow on Epilogue Seamount.
22 Aug	Arrive Wellington. Demobilisation.

3.2 Sampling stations

The total number of stations completed was 86, of which 55 were in the main survey area of Graveyard (all camera), and 27 (24 camera, 3 sled) in the Andes (Table 4). There was also a single camera tow on Epilogue Seamount (see Figure 1) on the return transit to Wellington, and 3 deployments of the Continuous Plankton Recorder during transits between Wellington and Graveyard, and Graveyard and Andes.

Table 4: Count of stations by gear type completed in the survey area during TAN2009. The number in parentheses indicate unsatisfactory tows that were repeated.

Seamount	No. camera transects	No. sled tows
GRAVEYARD		
Graveyard	8	
Morgue	14	
Morgue (mooring)	4	
Gothic	8	
Diabolical	8	
Ghoul	4	
Zombie	9 (1)	
ANDES		
Diamond Head A	8	1
Diamond Head B	7	
Diamond Head C	9 (1)	
Iceberg		1
Rachael		1
EPILOGUE SEAMOUNT	1	
TOTAL	80	3

CTD data were collected from all DTIS stations.

3.3 Camera stations

The survey sampled 6 features in the Graveyard complex: Graveyard, Morgue, Gothic, Zombie, Diabolical, and Ghoul, repeating transect lines run on these seamounts in previous surveys from 2006 to 2015. The locations of camera transects during the survey are shown in Figure 5.

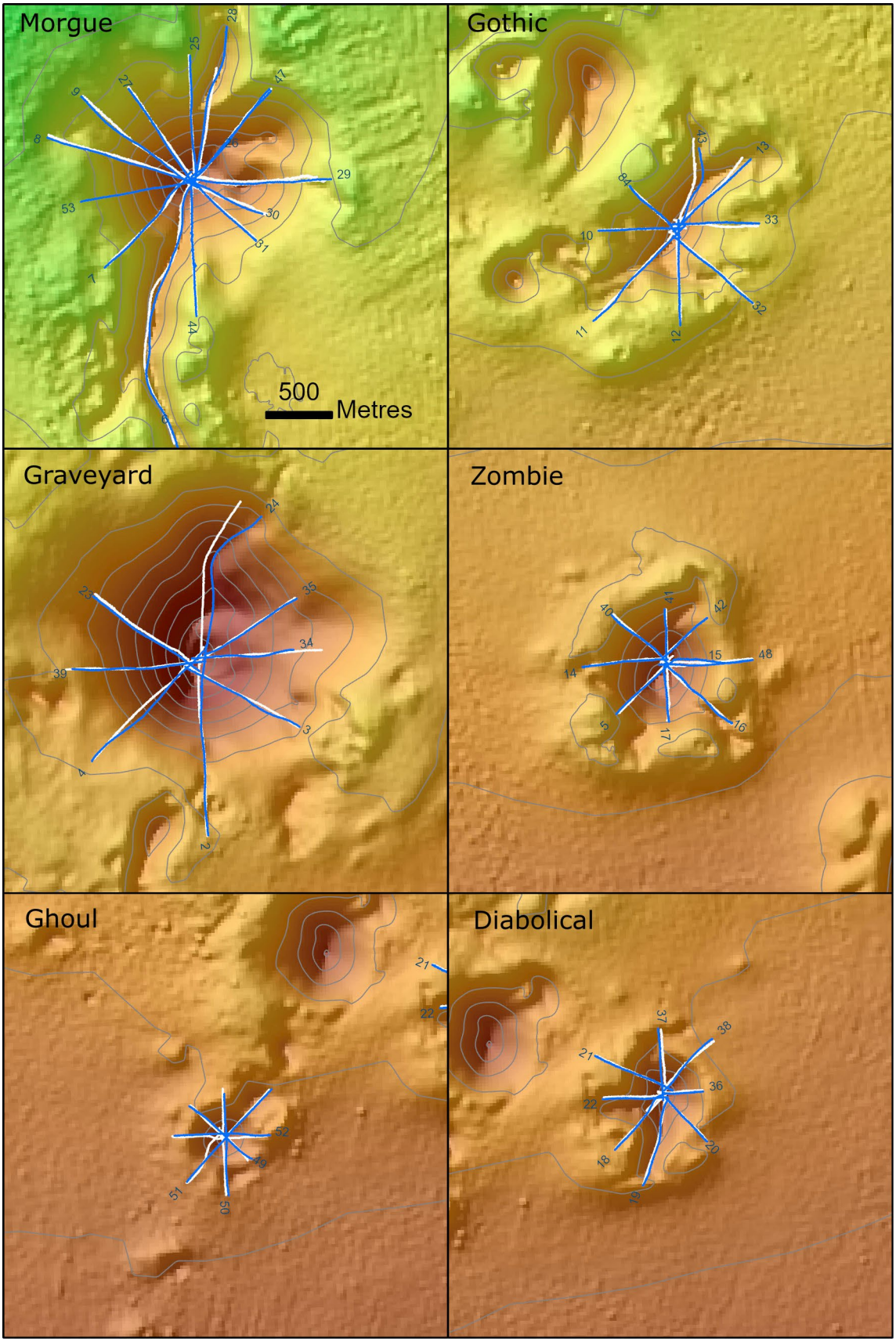

Figure 5: **Seamount features surveyed in the Graveyard complex, showing TAN2009 camera transects (blue lines with station numbers) superimposed on corresponding transects from TAN1503 (white lines). All panels are to the same scale and isobaths are at 50 m intervals.**

In the Andes complex, the three peaks (A, B, and C) of Diamond Head were surveyed extensively with camera transects, again repeating transect lines run on these features in previous surveys. The locations of camera transects are shown in Figure 6.

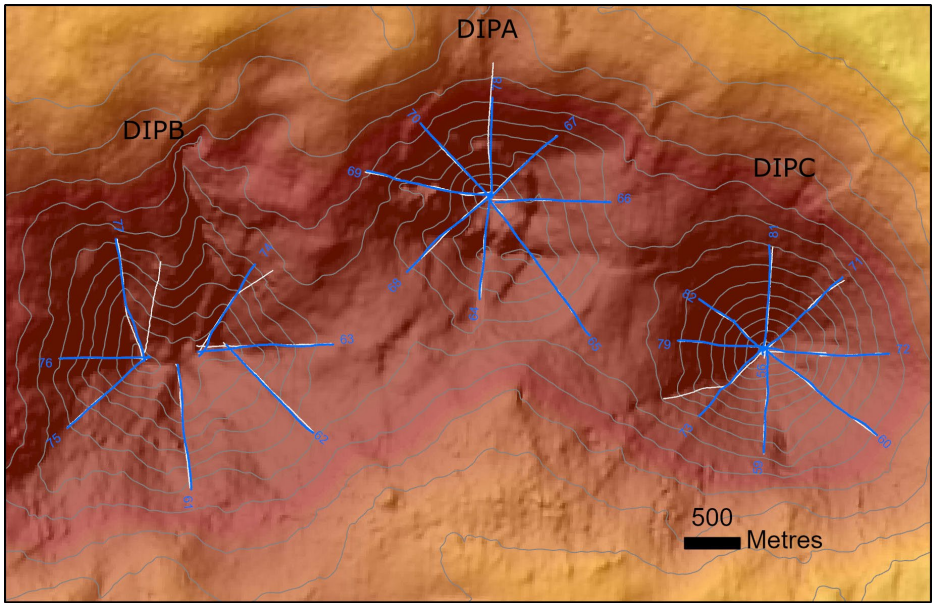

Figure 6: Seamount features surveyed by camera transects in the Andes complex, showing TAN2009 transects (blue lines with station numbers) superimposed on corresponding transects from TAN1503.

Further details of station locations are given in Appendix 1.

During the DTIS camera transects, more than 71 hours of video were recorded, and almost 18 000 still images were taken (Table 5). Image quality was very high, with video being High Definition (HD 1080p), and each still photograph taken at 24 MP resolution.

Table 5: Summary of DTIS data collected during TAN2009. Duration of video and number of still images per seamount.

Seamount	No. of stations	No. of still images	Size (GB)	Video time (hr: min: secs)	Size (GB)
Graveyard	8	2 023	22.4	7:23:14	88.74
Morgue	14	3 502	38.36	14:17:30	160.66
Diabolical	8	1 112	11.7	3:04:21	51.52
Gothic	8	1 443	14.15	5:56:57	66.67
Zombie	9	1 327	14.07	5:26:41	61.02
Ghoul	4	729	7.8	3:00:31	33.66
Morgue (mooring weight search)	4	2 024	19.82	8:25:28	94.3
Diamond Head, peak A	8	1 822	21.28	7:42:44	84.37
Diamond Head, peak B	7	1 669	20.6	6:51:04	76.45
Diamond Head, peak C	9	1 836	22.3	7:43:31	85
Epilogue	1	357	3.3	1:26:46	16.2
Total	**80**	**17 844**	**195.78**	**71:18:47**	**818.59**

A description of each transect, together with some representative seafloor images of each seamount, is given in Appendix 2.

Graveyard

The target of 8 transect lines (i.e., 4 complete crossings of the seamount) was met for each of the 6 features selected. Additional transects were run on Morgue to increase the density of coverage and enable comparisons with extra lines along the ridge-like lava flows to the SSW and NNE.

Detailed image examination and analysis will require extensive time back at the lab and will occur in 2020–21. Onboard, however, with OFOP the distribution of major substrate types, faunal groups, and signs of human impact were recorded. A series of multiple-panel figures shows comparative distributions of a number of common taxa between the 6 Graveyard complex features (Figures 7–11), summarised as follows:

- Intact coral matrix and live Scleractinia (mainly *Solenosmilia variabilis* with *Madrepora oculata* and *Enallopsammia rostrata*) (Figure 7). Intact coral matrix and live coral thickets were infrequently seen on Graveyard seamount, with only few and scattered records. There were more distinct and scattered patches on Morgue, especially along the ridge to the SSW where coral cover was continuous over the lower part of the transect. This was in contrast to the NNE ridge on Morgue where there was extensive intact coral, but it was dead. There were also scattered patches on Zombie and Diabolical, both of which are moderately fished. Intact and live coral was very extensive on the summit and upper flanks of Gothic and Ghoul, which are unfished.
- Hexactinellid sponges (Figure 8). Glass sponges generally occurred as individuals on rocky substrate or attached to the surface of stony corals. They were frequently observed on the summit and northern side of Graveyard, along the ridge. They were also frequently seen on the summit and northern transect of Gothic, as well as on the summit of Ghoul. Individual sponges were widely distributed, but more scattered, on the other seamounts.
- Stylasterid hydrocorals (Figure 9). Hydrocorals were widespread on the fished seamounts, where there were large areas of exposed bedrock. On Graveyard, Morgue, Zombie, and Diabolical, their distribution was extensive near the summits and patchier down the flanks. In close-up still images, they often occurred in high densities on the edges of boulders and rocky outcrops. They were comparatively rare on Gothic.
- Actiniaria (anemones) (Figure 10). The distribution of anemones varied among the seamounts. They were very scattered on Graveyard, Morgue, and Diabolical. They also had a patchy distribution on Gothic, although it was notable they occurred mainly down the flanks and away from any areas of intact coral matrix. Very few were seen on Zombie and Ghoul. Anemones have been observed to recolonise St Helens seamount off Tasmania after cessation of fishing (Clark et al. 2010).
- Gorgonian corals (Figure 11). These include a range of taxa but are typically medium-large and solitary species. Their distribution was scattered on Morgue, Zombie, and Gothic, but more extensive and often continuous along transects on Graveyard, Ghoul, and Diabolical.

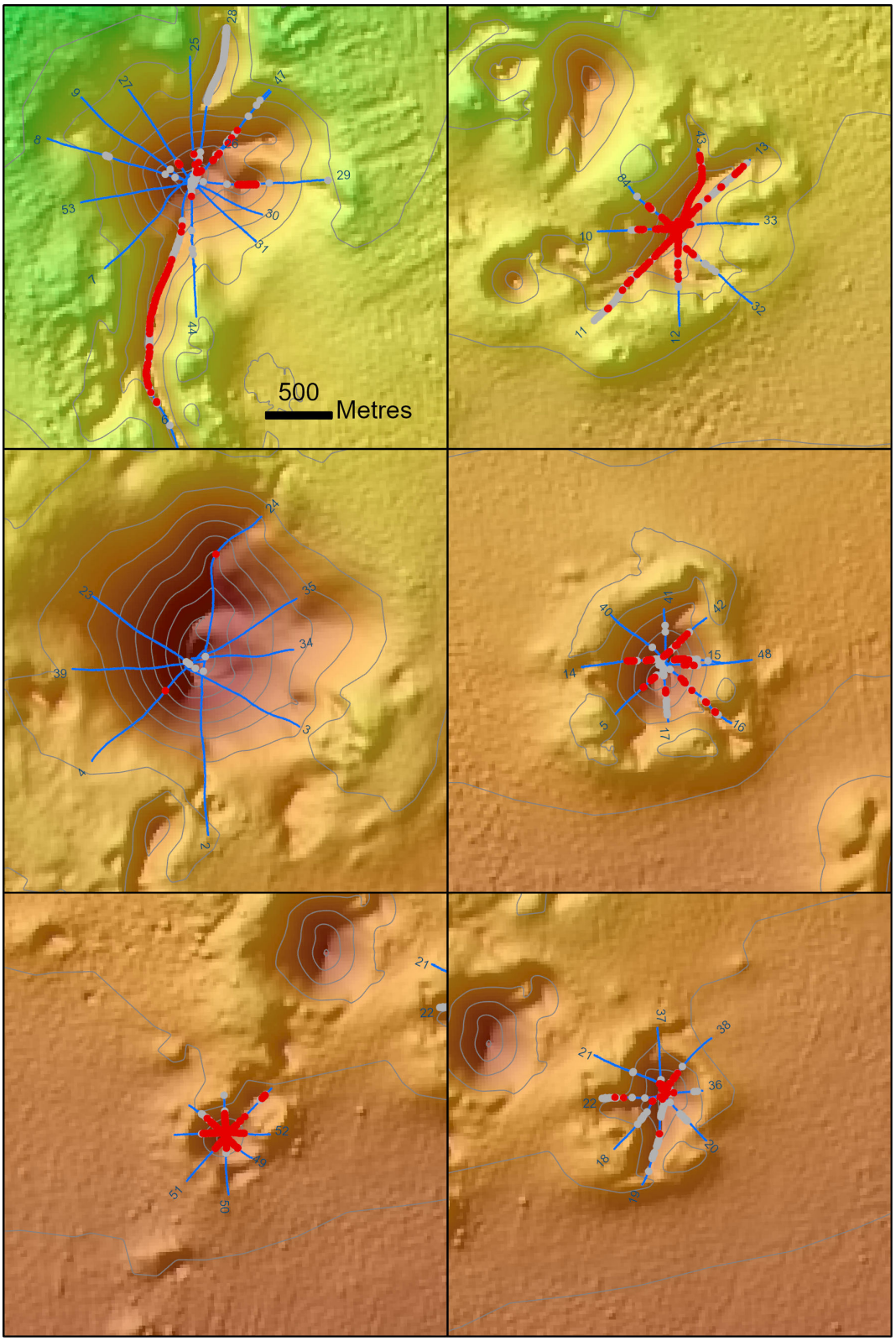

Figure 7: **The distribution of intact coral matrix (grey) overlain with live scleractinian coral (red) along photographic transects (blue) on the 6 seamounts of the Graveyard complex: Morgue (top left), Gothic (top right), Graveyard (middle left), Zombie (middle right), Ghoul (bottom left), and Diabolical (bottom right). Each mark indicates an observation of the taxon recorded in OFOP logs. All panels are to the same scale and isobaths are at 50 m intervals.**

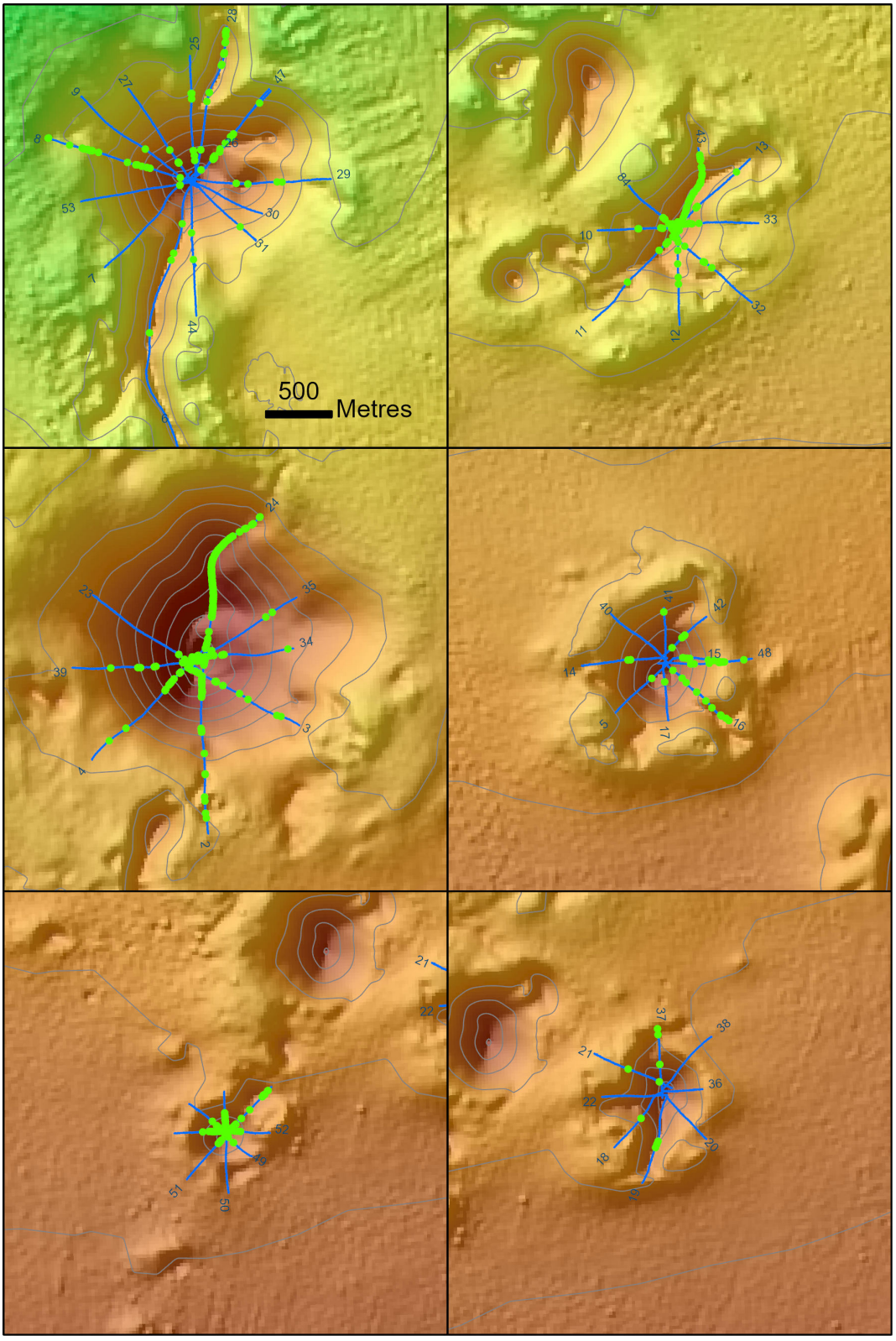

Figure 8: **The distribution of hexactinellid sponges (green) along photographic transects (blue) of the 6 seamounts of the Graveyard complex (layout as per Figure 7). Each mark indicates an observation of the taxon recorded in OFOP logs. All panels are to the same scale and isobaths are at 50 m intervals.**

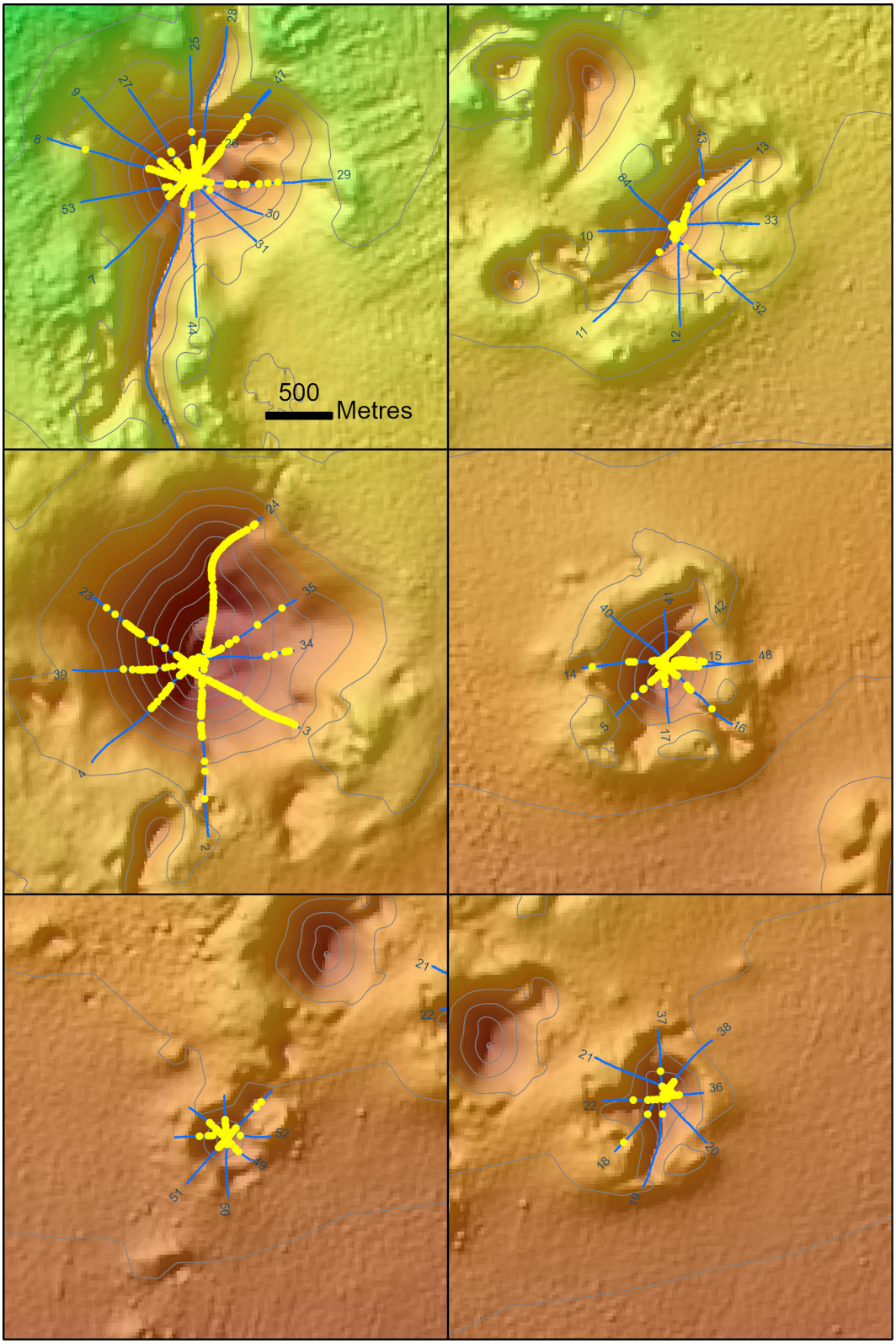

Figure 9: **The distribution of stylasterid hydrocorals (yellow) along photographic transects (blue) of the 6 seamounts of the Graveyard complex (layout as per Figure 7). Each mark indicates an observation of the taxon recorded in OFOP logs. All panels are to the same scale and isobaths are at 50 m intervals.**

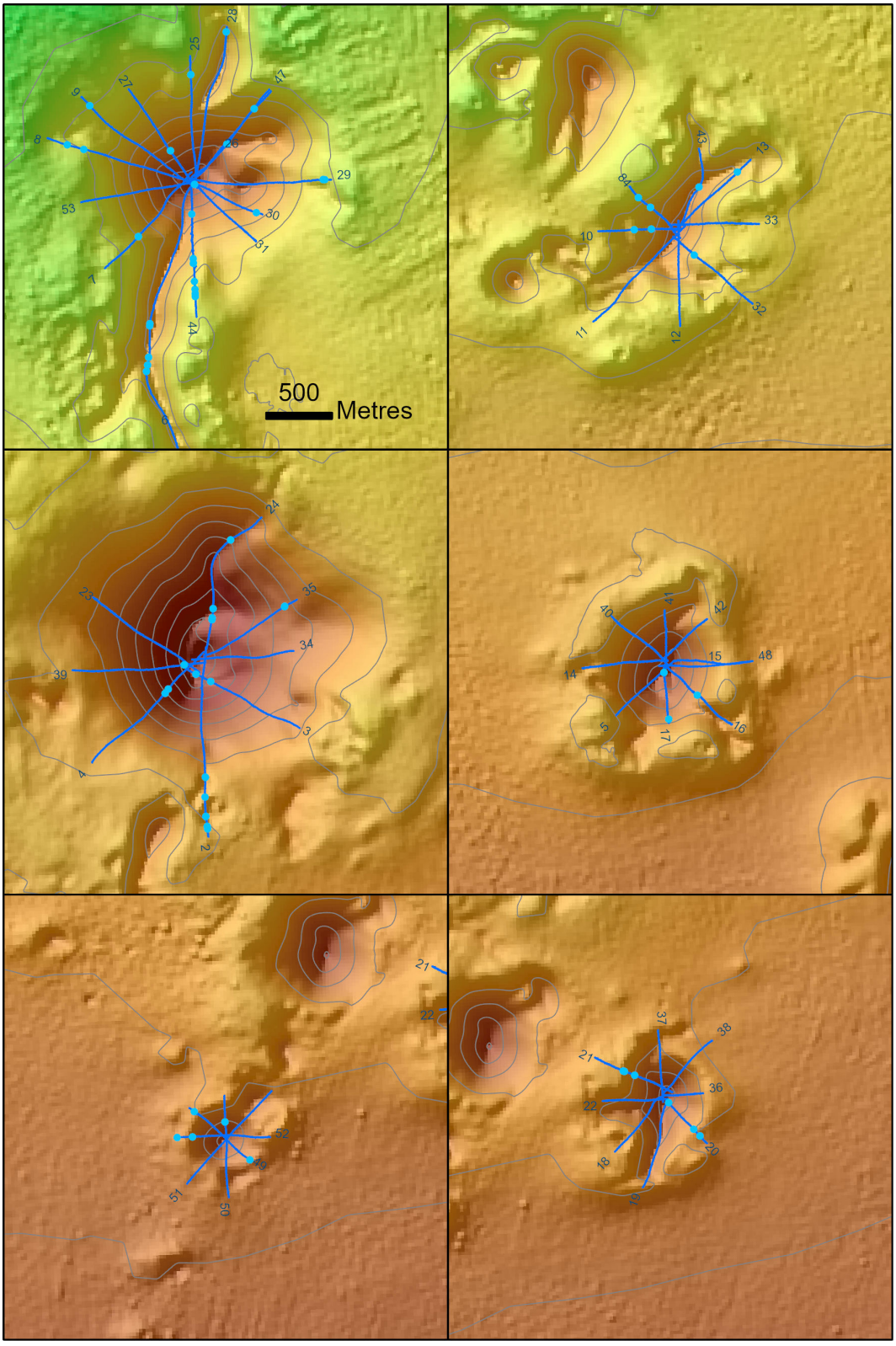

Figure 10: The distribution of anemones (light blue) along photographic transects (blue) of the 6 seamounts of the Graveyard complex (layout as per Figure 7). Each mark indicates an observation of the taxon recorded in OFOP logs. All panels are to the same scale and isobaths are at 50 m intervals.

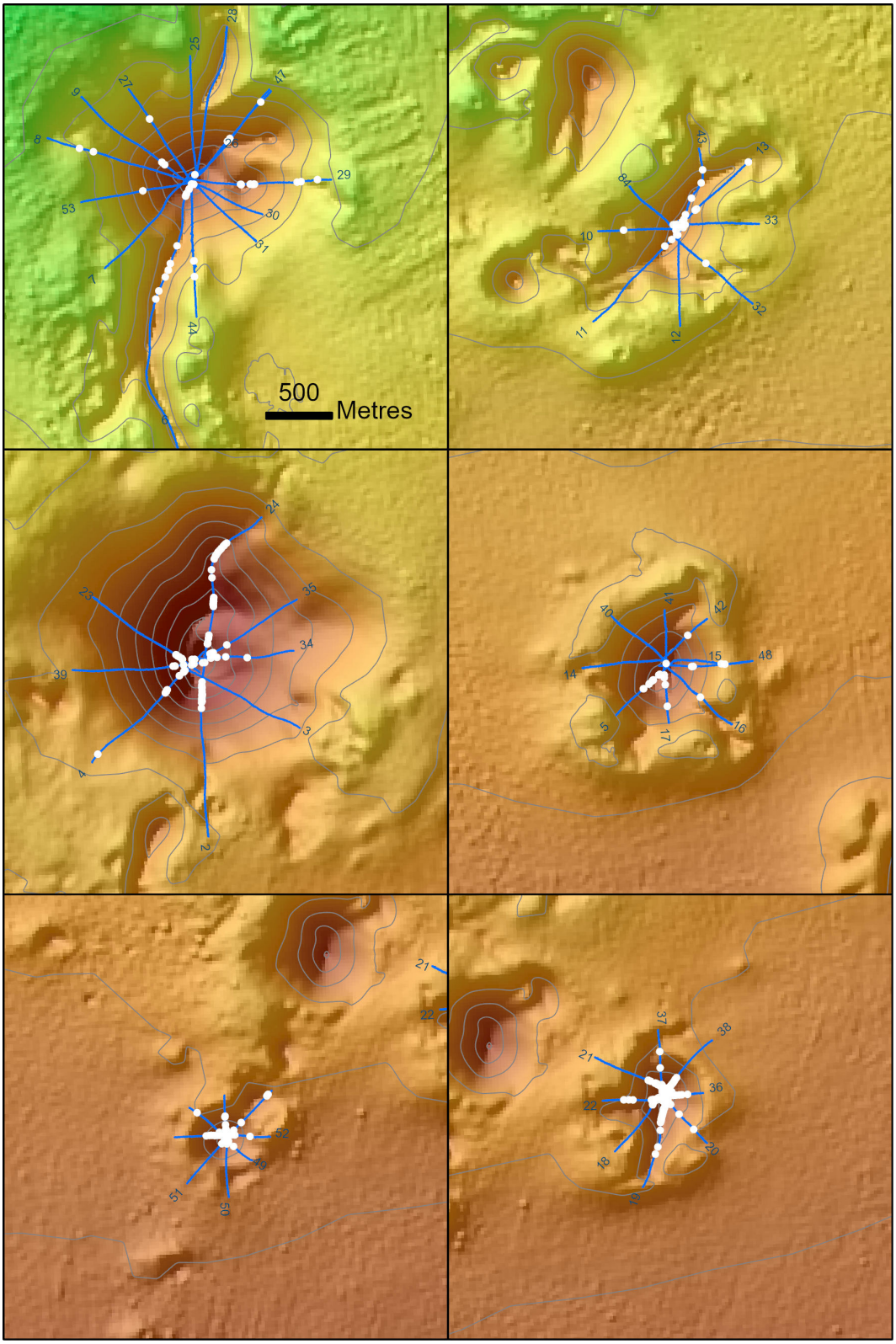

Figure 11: The distribution of gorgonian corals, combining observations of gorgonacean Alcyonacea, separately identified Isididae, *Thouarella/Tokoprymno* sp., and Primnoidae (white) along photographic transects (blue) of the 6 seamounts of the Graveyard complex (layout as per Figure 7). Each mark indicates an observation of the taxon recorded in OFOP logs. All panels are to the same scale and isobaths are at 50 m intervals.

Andes

Survey work on the Andes was a lower priority than Graveyard but was possible given the good progress through the first week of the survey. Although winds were typically 20–30 knots, and there was a 3–4 m swell to contend with, progress was maintained. The target of 8 transect lines (i.e., 4 complete crossings of the seamount) was met for Diamond Head Peaks A and C, and 7/8 for Peak B. The latter was not fully surveyed because of time as well as the weather coming away which expedited the return transit to Graveyard.

A description of each transect, together with some representative seafloor images of each seamount, is given in Appendix 2.

The DTIS data will not be processed and analysed under this project. Onboard, however, with OFOP the distribution of major substrate types, faunal groups, and signs of human impact were recorded. A series of multiple-panel figures shows comparative distributions of a number of taxa between the Diamond Head peaks:

- Intact coral matrix and live Scleractinia (mainly *Enallopsammia rostrata*) (Figure 12). Coral matrix was less frequently seen than on seamounts of the Graveyard Knolls. Nevertheless, patchy thickets of *E. rostrata* were common on the summit of Diamond Head A, and also occurred frequently on the eastern side of Diamond Head C. Their distribution along transects was less continuous on Diamond Head B.
- Hexactinellid sponges (Figure 13). Sponges were frequently observed and occurred on every transect on the three Diamond Head peaks. They were much more frequent and abundant than on the Graveyard seamounts.
- Stylasterid hydrocorals (Figure 14). Hydrocorals were a dominant taxon on all the Diamond Head seamounts, which was noted also in the 2015 survey. Their distribution was almost continuous on most transects on Diamond Head B and Diamond Head C, and there were only small areas with no records on Diamond Head A. They often occurred in high densities on exposed rocky outcrops and bedrock. This habitat was similar to where they occurred on the Graveyard seamounts, but on Diamond Head the individuals were much larger-sized than on Graveyard.
- Actiniaria (anemones) (Figure 15). Anemones dominated the summit area of Diamond Head C, where they were very dense in places on boulders and exposed bedrock. Their distribution was more scattered (and solitary individuals rather than aggregations) on Diamond Head A and B. This was similar to the 2015 survey observations.
- Gorgonian corals (Figure 16). These included a range of taxa, with bamboo corals, plexaurid fan corals, *Primnoella* whip corals, and often dense patches of *Thouarella*. Their distribution varied with depth on the seamounts.

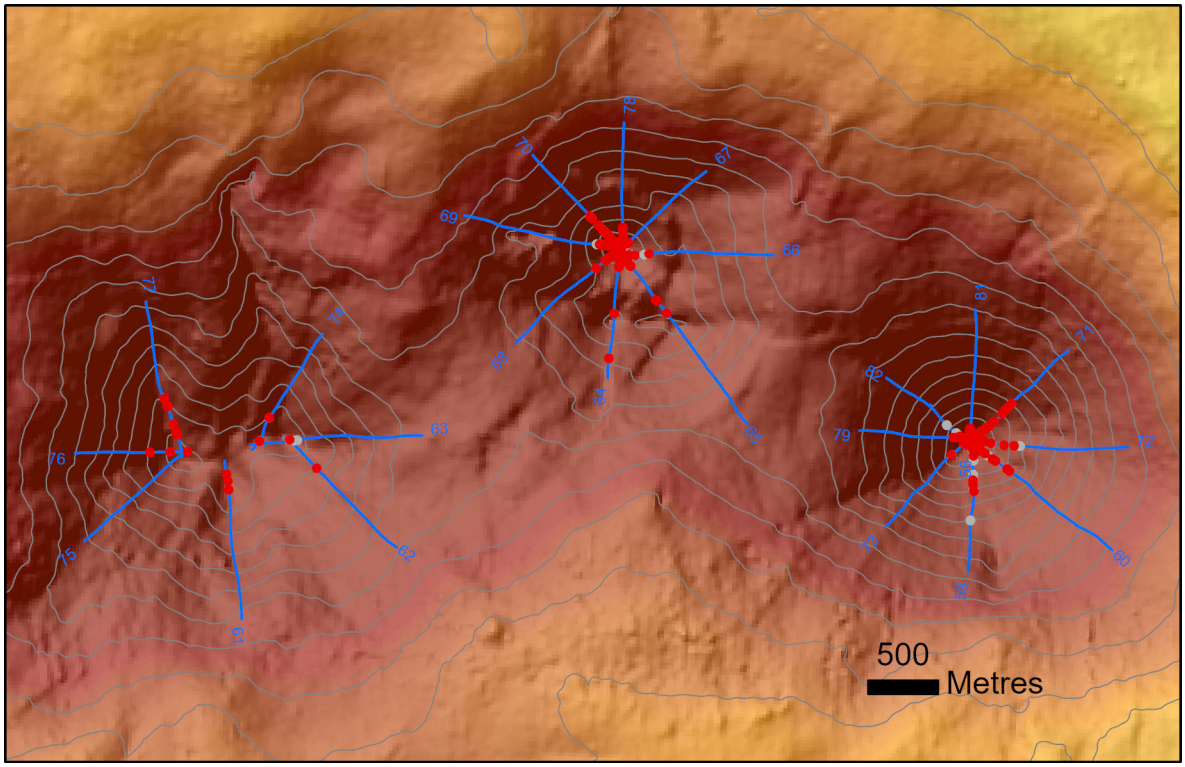

Figure 12: The distribution of intact coral (grey) overlain with live scleractinian coral (red) along photographic transects (blue) on the three peaks of Diamond Head in the Andes complex: Diamond Head A (centre), Diamond Head B (left), and Diamond Head C (right). Each mark indicates an observation of the taxon recorded in OFOP logs. All panels are to the same scale and isobaths are at 50 m intervals.

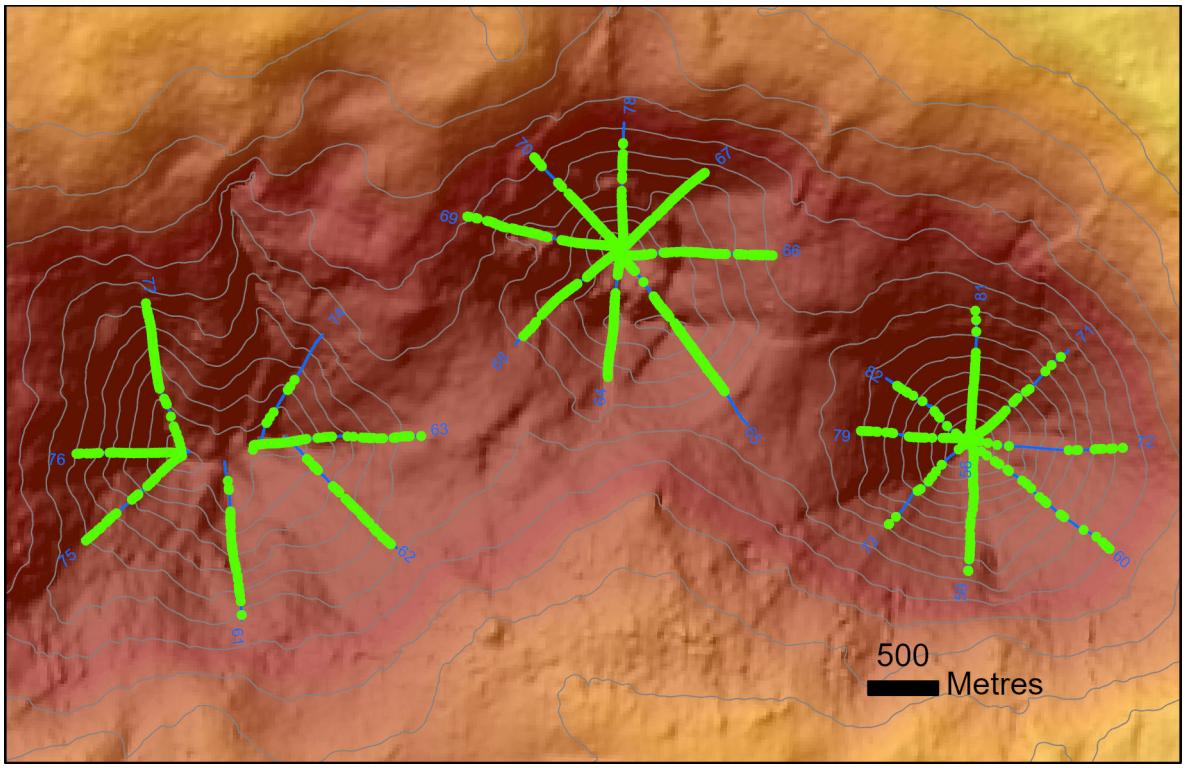

Figure 13: The distribution of hexactinellid sponges (green) along photographic transects (blue) on the three peaks of Diamond Head in the Andes complex. Details as for Figure 12.

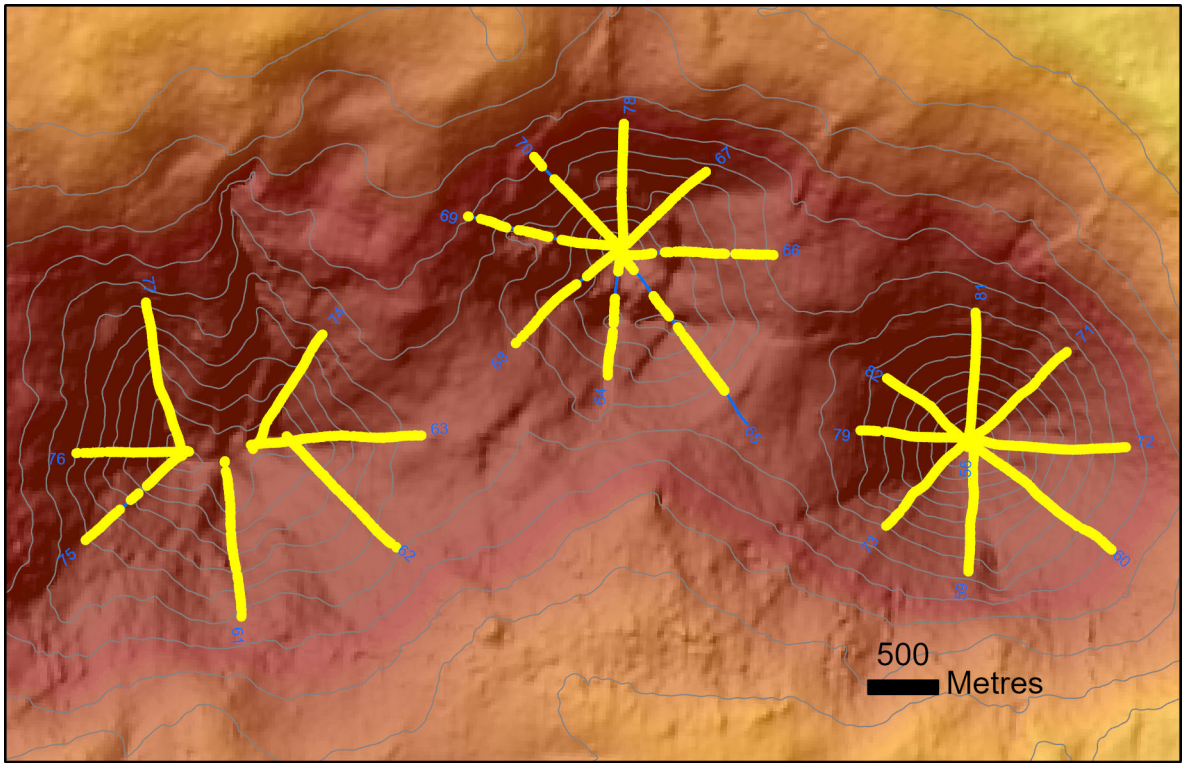

Figure 14: The distribution of stylasterid hydrocorals (yellow) along photographic transects (blue) on the three peaks of Diamond Head in the Andes complex. Details as for Figure 12.

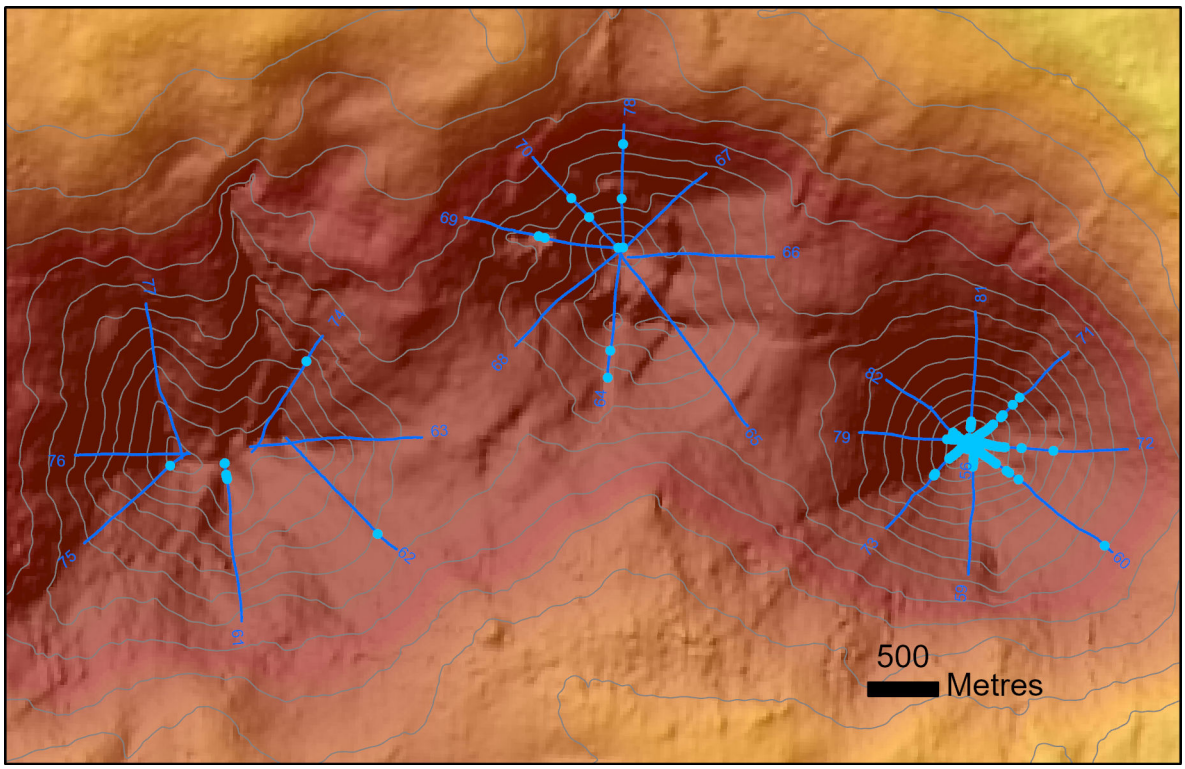

Figure 15: The distribution of anemones (light blue) along photographic transects (blue) on the three peaks of Diamond Head in the Andes complex. Details as for Figure 12.

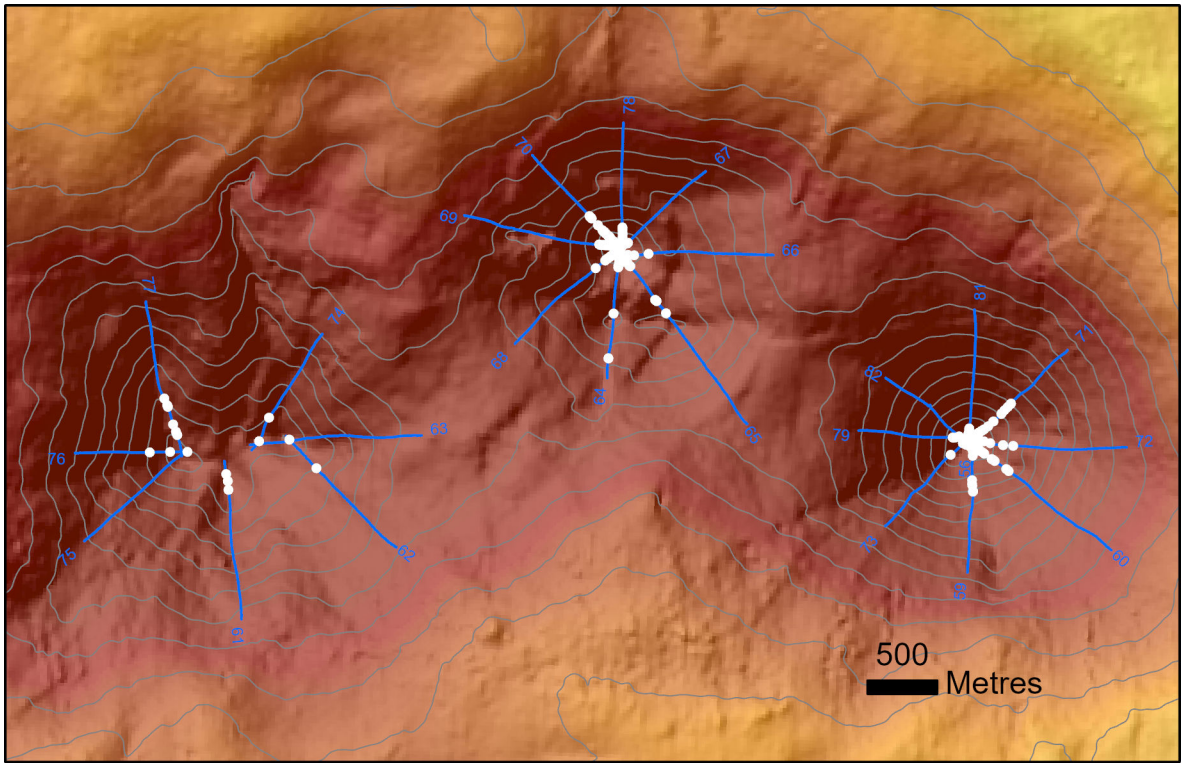

Figure 16: The distribution of gorgonian corals, combining observations of gorgonacean Alcyonacea, separately identified Isididae, *Thouarella* sp., and Primnoidae (white) along photographic transects (blue) on the three peaks of Diamond Head in the Andes complex. Details as for Figure 12.

3.4 Biological stations

Short sled tows, using the seamounts epibenthic sled, were completed on three features in the Andes complex: one tow on each of Iceberg, Rachael, and Diamond Head A (Figure 17). These were targeted based on DTIS images from either the 2015 or 2020 surveys. Tow duration was kept as short as possible to minimise any bottom impact.

A total of 71 specimen lots were collected, comprising 350 invertebrate specimens from 6 phyla (Table 6).

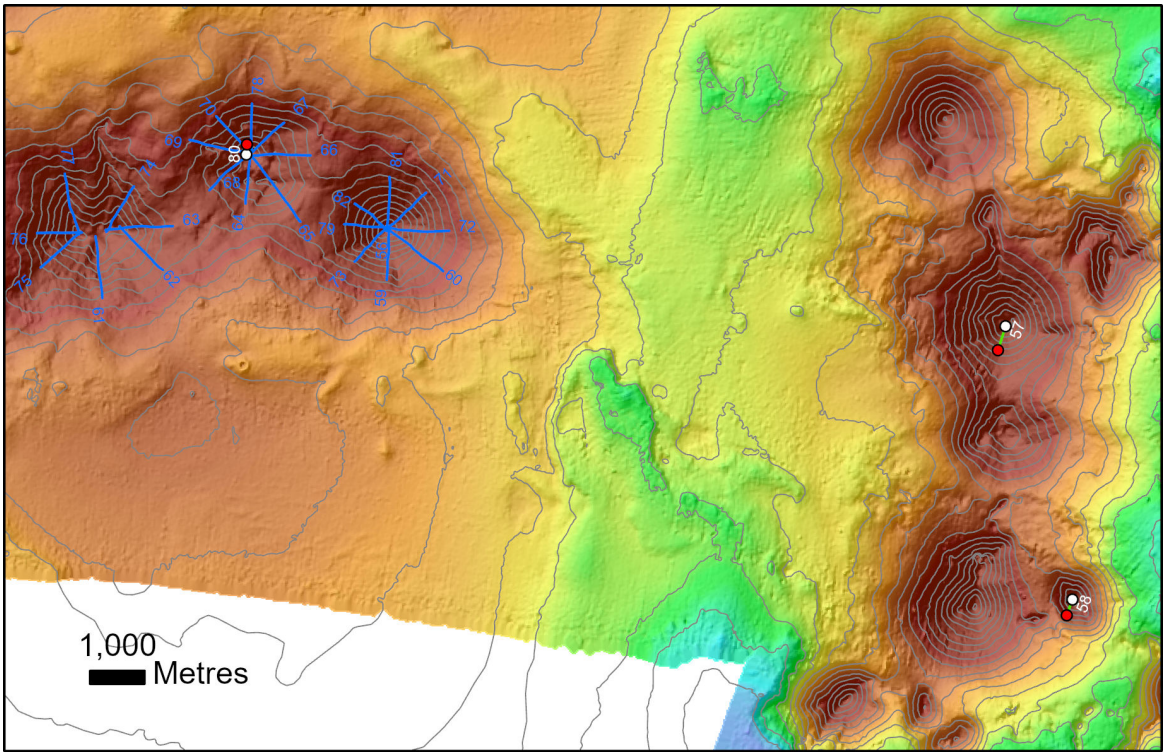

Figure 17: Epibenthic sled deployments on the Andes seamounts: Diamond Head A (station #80); Iceberg (station #57), and Rachael (station #58). Start (white dot) and end (red) points are shown, as recorded by HiPAP ultra-short baseline seabed tracking system.

These specimens provide additional material to augment that collected in 2009 and 2015, enabling more reliable image identification, and complete species descriptions to be undertaken by NIWA and international taxonomists. Several hard coral samples were subsampled as per requests:

- for microbiome (Sarah Seabrook, postdoc University of Auckland)
- for population genetics (Marcelo Kitahara, Universidade Federale de Sao Paulo, Brazil)
- for reproductive studies (Di Tracey, NIWA).

Table 6: List of species (lowest practical determination) and total number of specimens collected on the Andes seamounts during TAN2009. (Continued on next two pages)

Phylum	Class	Order	Genus	Taxon name	Station ID	Count
Annelida	Polychaeta			Polychaeta	TAN2009/57	12
Annelida	Polychaeta			Polychaeta	TAN2009/58	9
Annelida	Polychaeta			Polychaeta	TAN2009/80	5
Arthropoda	Malacostraca	Amphipoda		Amphipoda	TAN2009/80	4
Arthropoda	Malacostraca	Decapoda	*Porcellanopagurus*	*Porcellanopagurus*	TAN2009/57	6
Arthropoda	Malacostraca	Decapoda	*Phylladiorhynchus*	*Phylladiorhynchus nui*	TAN2009/57	7
Arthropoda	Malacostraca	Decapoda	*Carcinoplax*	*Pycnoplax*	TAN2009/57	1
Arthropoda	Malacostraca	Decapoda		*Pleocyemata*	TAN2009/57	7
Arthropoda	Malacostraca	Decapoda	*Munida*	*Munida*	TAN2009/57	3
Arthropoda	Malacostraca	Decapoda	*Sympagurus*	*Sympagurus dimorphus*	TAN2009/57	4
Arthropoda	Malacostraca	Decapoda	*Propagurus*	*Propagurus deprofundis*	TAN2009/57	12
Arthropoda	Malacostraca	Decapoda	*Uroptychus*	*Uroptychus*	TAN2009/57	12
Arthropoda	Malacostraca	Decapoda		Galatheidae	TAN2009/58	17
Arthropoda	Malacostraca	Decapoda		Galatheidae	TAN2009/58	9
Arthropoda	Malacostraca	Decapoda		Galatheidae	TAN2009/58	2
Arthropoda	Malacostraca	Decapoda		Paguridae	TAN2009/58	1
Arthropoda	Malacostraca	Decapoda	*Uroptychus*	*Uroptychus*	TAN2009/80	35
Arthropoda	Malacostraca	Decapoda	*Munidopsis*	*Munidopsis*	TAN2009/80	2
Arthropoda	Malacostraca	Decapoda	*Munida*	*Munida*	TAN2009/80	8
Arthropoda	Malacostraca	Decapoda		Paguridae	TAN2009/80	2
Arthropoda	Malacostraca	Decapoda	*Porcellanopagurus*	*Porcellanopagurus*	TAN2009/80	3
Arthropoda	Maxillopoda			Cirripedia	TAN2009/58	1
Cnidaria	Anthozoa	Alcyonacea	*Thouarella*	*Thouarella*	TAN2009/58	3
Cnidaria	Anthozoa	Alcyonacea		Isididae	TAN2009/58	1
Cnidaria	Anthozoa	Alcyonacea		Alcyonacea	TAN2009/58	1
Cnidaria	Anthozoa	Alcyonacea	*Minuisis*	*Minuisis*	TAN2009/80	5
Cnidaria	Anthozoa	Alcyonacea	*Thouarella*	*Thouarella*	TAN2009/80	1
Cnidaria	Anthozoa	Gorgonacea (now ALCYONACEA)		Gorgonacea (now ALCYONACEA)	TAN2009/80	1
Cnidaria	Anthozoa	Scleractinia	*Goniocorella*	*Goniocorella dumosa*	TAN2009/57	5
Cnidaria	Anthozoa	Scleractinia	*Desmophyllum*	*Desmophyllum dianthus*	TAN2009/57	13
Cnidaria	Anthozoa	Scleractinia	*Goniocorella*	*Goniocorella dumosa*	TAN2009/80	3

Phylum	Class	Order	Genus	Taxon name	Station ID	Count
Cnidaria	Anthozoa	Scleractinia	*Enallopsammia*	*Enallopsammia rostrata*	TAN2009/80	10
Cnidaria	Anthozoa	Scleractinia	*Enallopsammia*	*Enallopsammia rostrata*	TAN2009/80	10
Cnidaria	Anthozoa	Scleractinia		Caryophylliidae	TAN2009/80	11
Cnidaria	Anthozoa	Telestacea	*Telesto*	*Telesto*	TAN2009/58	4
Cnidaria	Anthozoa	Telestacea	*Telesto*	*Telesto*	TAN2009/58	4
Cnidaria	Anthozoa	Telestacea	*Telesto*	*Telesto*	TAN2009/80	5
Cnidaria	Hydrozoa			Hydrozoa	TAN2009/57	3
Cnidaria	Hydrozoa			Hydrozoa	TAN2009/58	1
Cnidaria	Hydrozoa			Hydrozoa	TAN2009/58	1
Cnidaria	Hydrozoa	Anthoathecata	*Errina*	*Errina*	TAN2009/57	7
Cnidaria	Hydrozoa	Anthoathecata		Stylasteridae	TAN2009/57	3
Cnidaria	Hydrozoa	Anthoathecata		Stylasteridae	TAN2009/57	3
Cnidaria	Hydrozoa	Anthoathecata		Stylasteridae	TAN2009/57	1
Cnidaria	Hydrozoa	Anthoathecata		Stylasteridae	TAN2009/57	4
Cnidaria	Hydrozoa	Anthoathecata		Stylasteridae	TAN2009/58	3
Cnidaria	Hydrozoa	Anthoathecata		Stylasteridae	TAN2009/58	3
Cnidaria	Hydrozoa	Anthoathecata		Stylasteridae	TAN2009/80	1
Echinodermata	Echinoidea	Cidaroida	*Goniocidaris*	*Goniocidaris*	TAN2009/57	1
Echinodermata	Echinoidea	Cidaroida		Cidaridae	TAN2009/58	3
Echinodermata	Echinoidea	Cidaroida	*Goniocidaris*	*Goniocidaris*	TAN2009/80	7
Echinodermata	Echinoidea	Echinothurioida		Echinothuriidae	TAN2009/58	1
Echinodermata	Ophiuroidea			Ophiuroidea	TAN2009/57	9
Echinodermata	Ophiuroidea			Ophiuroidea	TAN2009/58	16
Echinodermata	Ophiuroidea			Ophiuroidea	TAN2009/80	12
Echinodermata	Ophiuroidea	Euryalida	*Astrotoma*	*Astrotoma*	TAN2009/80	4
Mollusca	Bivalvia			Bivalvia	TAN2009/57	4
Mollusca	Bivalvia			Bivalvia	TAN2009/58	2
Mollusca	Gastropoda		*Calliostoma*	*Maurea*	TAN2009/57	2
Porifera	Demospongiae			Demospongiae	TAN2009/57	2
Porifera	Demospongiae			Demospongiae	TAN2009/57	1
Porifera	Demospongiae			Demospongiae	TAN2009/58	1
Porifera	Demospongiae			Demospongiae	TAN2009/58	1
Porifera	Demospongiae			Demospongiae	TAN2009/58	2
Porifera	Demospongiae			Demospongiae	TAN2009/80	1

Phylum	Class	Order	Genus	Taxon name	Station ID	Count
Porifera	Demospongiae			Demospongiae	TAN2009/80	1
Porifera	Hexactinellida			Hexactinellida	TAN2009/58	4
Porifera	Hexactinellida			Hexactinellida	TAN2009/58	1
Porifera	Hexactinellida			Hexactinellida	TAN2009/58	1
Porifera	Hexactinellida	Sceptrulophora		Farreidae	TAN2009/58	4
Porifera	Hexactinellida	Sceptrulophora	*Aphrocallistes*	*Aphrocallistes beatrix beatrix*	TAN2009/80	1

3.5 Signs of recovery/recolonisation

The images from the survey will be processed and examined in detail in coming months. However, during the survey, there were several observations made about either remnant patches of coral or indications of possible recolonisation. Both these aspects are important for evaluating the resilience of benthic communities on the seamounts to the effects of bottom trawling.

Remnant patches of *Solenosmilia variabilis* 'reef' have previously been noted on Morgue, especially on the ridge that extends SSW of the main feature that has not previously been trawled (Clark et al. 2016). However, even in sectors that have in the past been trawled extensively, pockets of coral remain, scattered around the seamount (see Figure 7). On the DTIS transect from the summit due east, there were stretches of intact coral (both *Solenosmilia variabilis* and *Madrepora oculata*) on the upper flank near a small secondary cone (Figure 18).

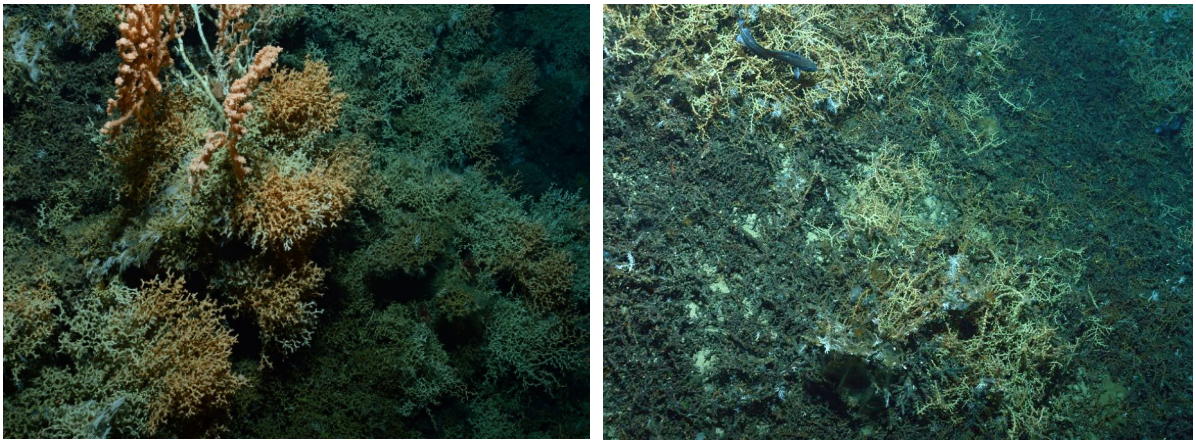

Figure 18: Image from DTIS of patches of live *Solenosmilia* (left) and *Madrepora (right)* coral.

Stylasterid hydrocorals have previously been reported as likely early colonisers following trawl disturbance on the Graveyard Seamounts (Clark & Rowden 2009). They were again observed to be common on the fished seamounts, including in areas where there was extensive coral rubble likely to have been caused by bottom trawling (Figure 19).

Figure 19: Coral rubble with live stylasterid hydrocorals and orange roughy on Morgue.

Other signs of potential recruitment were on Diabolical Seamount, where patches of small gorgonian corals (*Tokoprymno* sp.) were widespread (see Figure 20 and bottom right panel of Figure 11), and on Graveyard where there were several patches of plexaurid gorgonians (Figure 21). Whereas some seen

on DTIS were relatively large, there were frequent small-sized corals as well. Colonisation from remnant patches of coral could be important factors in the overall resilience and recovery of benthic communities from the effects of trawling (Clark et al. 2019).

Figure 20: Image from DTIS of small gorgonian corals on dead coral rubble on Diabolical Seamount.

Figure 21: Plexaurid gorgonian fans along slope of Graveyard Seamount.

Trawl marks were regularly observed on Graveyard, Zombie, and Diabolical seamounts, even though there were few sightings of trawl gear or discarded vessel rubbish. One intact trawl net with warps and floats still attached was recorded on Morgue. Although the warp (which was encountered first) appeared old with some small stylasterid growth, the subsequent net and floats were relatively clean of any fouling (Figure 22), which is perhaps unexpected after 20 years of closure to any trawling. See Station 6 description in Appendix 2.

Figure 22: Frame grab from video on Morgue showing trawl netting and headline floats.

3.6 Mooring location

In 2007, 2010, and 2012, camera moorings had been deployed in experimental research on Morgue to improve acoustic surveys of orange roughy on seamounts. On each occasion, railway wagon wheels had been used as weights to keep the camera lines in place. Some of these were fitted with settlement plates at the time of deployment, so that colonisation of benthic invertebrates might be monitored if the units could be relocated in subsequent surveys. Four specific DTIS deployments were carried out, using the ships Dynamic Positioning System to shift small amounts (often 5 or 10 m in a search pattern), enabling the camera to slowly move between and around the reported locations of each mooring wheel (Figure 23).

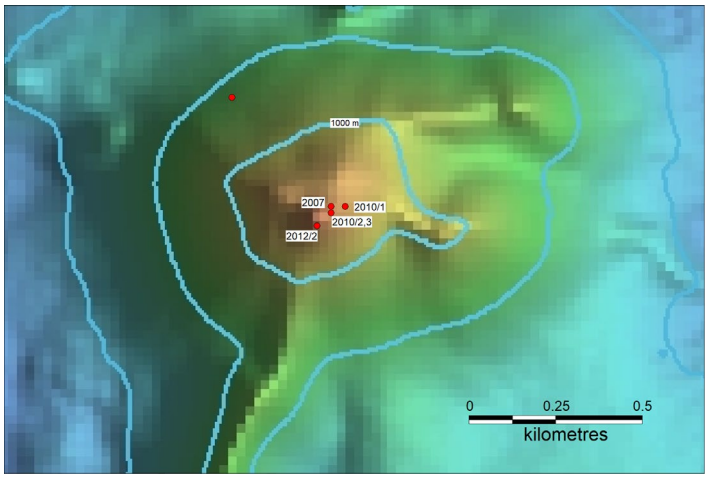

Figure 23: The location of reported mooring weight positions (red dots) on Morgue.

The first attempt at finding the 2007 and 2010/2,3 (see Figure 23) moorings failed to locate any wheels. The second deployment located one assumed to be 2010/1, which was thought to have been found in 2015, although it now had no settlement plates. The third deployment targeted the 2015 mooring site again. The wheel from the previous DTIS deployment was relocated twice, and it was subsequently determined this was likely to be the same one that was imaged in 2015 (and was in fact 2010/1), but which had in the intervening years lost its ceramic plates (Figure 24). Its position was observed at 42° 42.9989’ S, 179° 57.55’ W based on the USBL-derived DTIS position. The wheel was imaged in high detail by the still camera and showed some minor colonisation by stylasterids.

Figure 24: Mooring wheel 2010/1 located in 2020.

On returning to Morgue Seamount after completion of sampling in the Andes complex, a fourth deployment of DTIS was made targeting one of the moorings deployed in 2012 (2012/2, TAN1208). The wheel was located briefly, very close to its reported deployment coordinates, and recorded in video but not still imagery. The resulting images were not of sufficiently high quality to provide any detailed information about colonisation. Its position was 42° 43.0265' S, 179° 57.6054' W.

3.7 Continuous Plankton Recorder (CPR) tows

The CPR was deployed on a number of occasions during the voyage, while in transit from Wellington to the Graveyard Seamounts, between the Graveyard and Andes, and again on the transit back from Graveyard to Wellington (Figure 25). The total distance covered was 1800 km. Samples are yet to be analysed.

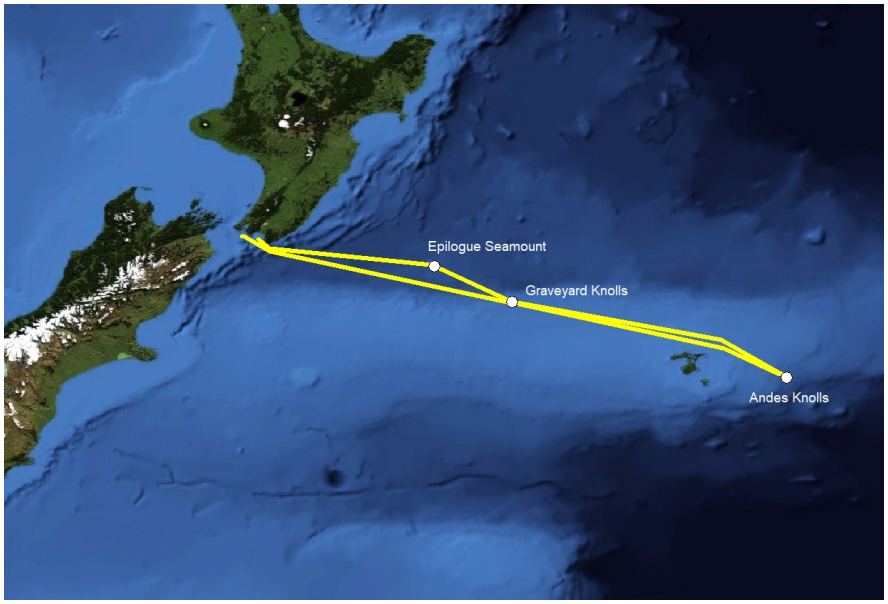

Figure 25: The coverage of the CPR during TAN2009.

4. ACKNOWLEDGMENTS

Thanks to all the scientific staff and vessel officers and crew for their enthusiasm and hard work during the survey. The skill of the camera winch drivers in maintaining DTIS height, and bridge officers working difficult lines with weather, was greatly appreciated. Funding for vessel time provided through the Tangaroa Reference Group, and project funding from Fisheries New Zealand under project ZBD2020-07, is gratefully acknowledged. We thank Dr Mary Livingston (Fisheries New Zealand) for her support in enabling the survey. Owen Anderson and Barb Hayden (NIWA) provided helpful comments on the manuscript.

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APPENDIX 1: STATION RECORD SUMMARY. CAM=CAMERA, SEL=EPIBENTHIC SLED, CPR=CONTINUOUS PLANKTON RECORDER. PERF=GEAR PERFORMANCE (1, GOOD; 2, ACCEPTABLE; 3, POOR), START AND FINISH DEPTHS (S_DEP, F_DEP) IN M. GRAV=GRAVEYARD, MORG=MORGUE, ZOMB=ZOMBIE, GOTH=GOTHIC, DIAB=DIABOLICAL, GHOU=GHOUL, DIPA=DIAMOND HEAD PEAK A, DIPB=DIAMOND HEAD PEAK B, DIPC=DIAMOND HEAD PEAK C, ICEB=ICEBERG, RACH=RACHAEL FEATURES.

Stn	Area	Method	Date	Time	lat_d	lat_min	lon_d	lon_min		s_dep	f_dep	n.mile	dir	Perf	Comments
1	Transit	CPR	7-Aug	1929	41	26.41	174	47.86	E	0	0	241.10	109	1	CPR run from Wellington Heads to survey area.
2	GRAV	CAM	8-Aug	2038	42	45.59	179	59.33	W	766	1097	0.76	181	2	Repeat TAN1503/038 to SE. Fauna mostly sparse but numerous stylasterids in some patches. Some video lost with bottom contact.
3	GRAV	CAM	9-Aug	46	42	45.67	179	59.44	W	768	1043	0.52	120	2	Repeat TAN1503/034. Extensive areas with moderate densities of gorgonians (Pleaxauridae?) in mid-transect. Lasers failed at depth.
4	GRAV	CAM	9-Aug	338	42	45.62	179	59.35	W	762	1088	0.62	227	2	Repeat TAN1503/033 to SW. Extensive trawl marks on summit. No lasers.
5	ZOMB	CAM	9-Aug	727	42	45.95	179	55.54	W	890	1076	0.31	227	2	Repeat TAN1503/008. Trawled but middle section with corals and sponges. No lasers.
6	MORG	CAM	9-Aug	1442	42	43.02	179	57.6	W	899	1137	1.05	185	2	Repeat TAN1503/15 down SSW "tail" of Morgue. Extensive intact coral with live heads on ridge. Orange roughy abundant. No lasers.
7	MORG	CAM	9-Aug	2049	42	42.97	179	57.61	W	927	1216	0.49	224	1	Repeat TAN1503/14 SW transect on Morgue. Sparse benthic fauna throughout but orange roughy abundant on flank. Lasers repaired and working.
8	MORG	CAM	9-Aug	2356	42	43.02	179	57.64	W	910	1211	0.60	290	1	Repeat TAN1503/13 WNW transect on Morgue. Sparse benthic fauna throughout, orange roughy abundant on flank, numerous stalked glass sponges on muddy sediments towards end of transect.
9	MORG	CAM	10-Aug	259	42	43.03	179	57.59	W	918	1205	0.58	311	2	Repeat TAN1503/69. Orange abundant to 1100m. Sparse fauna.
10	GOTH	CAM	10-Aug	555	42	43.63	179	53.84	W	1017	1148	0.33	270	1	Repeat TAN1503/26. Dense and extensive live *Solenosmilia* on summit.
11	GOTH	CAM	10-Aug	851	42	43.62	179	53.82	W	1024	1139	0.52	225	1	Repeat TAN1503/24. SW on Gothic, *Solenosmilia* on tops of ridges, scattered intact coral clumps out to end of transect.
12	GOTH	CAM	10-Aug	1149	42	43.61	179	53.85	W	991	1162	0.42	181	2	Repeat TAN1503/25. *Solenosmilia* at summit.

Stn	Area	Method	Date	Time	lat_d	lat_min	lon_d	lon_min		s_dep	f_dep	n.mile	dir	Perf	Comments
13	GOTH	CAM	10-Aug	1426	42	43.65	179	53.87	W	1010	1012	0.50	41	2	Repeat TAN1503/27. *Solenosmilia* on summit and in patches on flank.
14	ZOMB	CAM	10-Aug	1649	42	45.95	179	55.57	W	912	1075	0.41	268	2	Repeat of TAN1503/7. Coral rubble on summit, with trawl tracks. Patches of old-growth *Solenosmila* on flank, with yellow *Enalopsammia* in places.
15	ZOMB	CAM	10-Aug	1942	42	45.95	179	55.54	W	891	893	0.30	92	2	Repeat of TAN1503/47 & 43. Coral rubble on summit, patches of live coral, *Madrepora*, on upper flank, then bedrock, boulders, and mixed sediments.
16	ZOMB	CAM	10-Aug	2225	42	45.97	179	55.58	W	921	1070	0.35	133	2	Repeat of TAN1503/46. Coral rubble on summit, small patches of intact coral on upper flank. Rugged lava outcrop at end of transect.
17	ZOMB	CAM	11-Aug	110	42	45.97	179	55.58	W	923	925	0.23	178	1	Repeat of TAN1503/9. coral rubble on summit and down flank. Trawl tracks throughout, sparse fauna.
18	DIAB	CAM	11-Aug	324	42	47.41	179	59.22	W	899	1062	0.30	225	2	Repeat of TAN1503/057. SW side, diverse *Tokoprymno*, some *Madrepora*.
19	DIAB	CAM	11-Aug	541	42	47.42	179	59.21	W	929	1044	0.37	198	2	Repeat of TAN1503/53. Along ridge from summit to 1000m.
20	DIAB	CAM	11-Aug	810	42	47.43	179	59.2	W	934	1030	0.23	139	2	Repeat of TAN1503/52.
21	DIAB	CAM	11-Aug	1032	42	47.39	179	59.18	W	916	1074	0.34	296	2	Repeat of TAN1503/49). Good patch of *Madrepora* on NW side at 930m.
22	DIAB	CAM	11-Aug	1245	42	47.42	179	59.21	W	916	1052	0.26	270	2	Repeat of TAN1503/58 from summit down western flank.
23	GRAV	CAM	11-Aug	1500	42	45.68	179	59.38	W	779	1051	0.51	306	2	Repeat of TAN1503.37. Coral rubble with trawl marks on summit, bedrock and boulders on upper flank, sand and coral rubble with some boulders on lower flank. Sparse fauna.
24	GRAV	CAM	11-Aug	1806	42	45.6	179	59.33	W	767	1028	0.57	25	2	Repeat of TAN1503/36. Interesting transect. Numerous hexactinellid sponges on upper flank of main feature and many sponges and stylasterids on spur to the NE.
25	MORG	CAM	11-Aug	2103	42	43	179	57.59	W	895	1209	0.49	000	2	Repeat of TAN1503/10. Coral rubble and rock with sparse fauna.
26	MORG	CAM	11-Aug	2339	42	42.99	179	57.61	W	916	1168	0.50	46	2	Repeat of TAN1503/22. Coral rubble and rock with patches of intact, live coral on summit and upper flank. Numerous stalked crinoids on northern flank of ridge.
27	MORG	CAM	12-Aug	220	42	43.02	179	57.6	W	906	1153	0.46	327	2	Repeat of TAN1503/11. Orange roughy scattered along most of transect.

Stn	Area	Method	Date	Time	lat_d	lat_min	lon_d	lon_min		s_dep	f_dep	n.mile	dir	Perf	Comments
28	MORG	CAM	12-Aug	457	42	43.02	179	57.59	W	904	1123	0.65	13	2	Repeat of TAN1503/12, with extension to NNEridge. Ridge had extensive dead coral thickets 1070-1100m.
29	MORG	CAM	12-Aug	803	42	43	179	57.6	W	897	1184	0.54	92	2	Repeat of TAN1503/023. Good live coral on small hill on east flank.
30	MORG	CAM	12-Aug	1053	42	43	179	57.63	W	909	911	0.33	117	2	Repeat of TAN1503/19. Coral rubble, bedrock, sparse fauna.
31	MORG	CAM	12-Aug	1322	42	43	179	57.61	W	899	1149	0.35	135	2	Repeat of TAN1503/017. Coral rubble, bedrock, sparse fauna.
32	GOTH	CAM	12-Aug	1621	42	43.67	179	53.87	W	1017	1139	0.41	133	2	Repeat of TAN1503/42. Extensive live scleractinian coral growth on summit ridge. Video not focused.
33	GOTH	CAM	12-Aug	1902	42	43.62	179	53.88	W	1007	1152	0.35	92	2	Repeat of TAN1503/41. Extensive live scleractinian coral growth on summit ridge. Video not focused.
34	GRAV	CAM	12-Aug	2154	42	45.64	179	59.4	W	760	989	0.41	87	3	Repeat of TAN1503/39. Coral rubble, bedrock and coarse sediments with sparse fauna. Video not focused.
35	GRAV	CAM	13-Aug	46	42	45.63	179	59.33	W	769	1010	0.42	60	2	Repeat of TAN1503/40. Along trawl tracks; coral rubble, rock, and trawl marks. Sparse fauna.
36	DIAB	CAM	13-Aug	319	42	47.39	179	59.2	W	902	1054	0.15	94	2	Repeat of TAN1503/048. Coral rubble, trawl tracks, patches of intact live coral.
37	DIAB	CAM	13-Aug	450	42	47.42	179	59.23	W	929	1010	0.28	357	2	Repeat of TAN1503/051. Patches of purple *Enallopsammia* coral.
38	DIAB	CAM	13-Aug	709	42	47.39	179	59.22	W	909	1009	0.30	46	2	Repeat of TAN1503/050. Good reef of *Madrepora oculata* at 940 m.
39	GRAV	CAM	13-Aug	909	42	45.65	179	59.34	W	758	1070	0.53	269	2	Repeat of TAN1503/35. Sparse fauna.
40	ZOMB	CAM	13-Aug	1204	42	45.96	179	55.57	W	912	1100	0.30	313	2	Repeat of TAN1503/006. Sparse fauna, few fish.
41	ZOMB	CAM	13-Aug	1408	42	45.96	179	55.57	W	919	1018	0.22	0	2	Repeat of TAN1503/04. Sparse fauna.
42	ZOMB	CAM	13-Aug	1616	42	45.93	179	55.57	W	936	1085	0.23	48	2	Repeat of TAN1503/5. Patches of intact, live, scleractinian coral on upper flank.
43	GOTH	CAM	13-Aug	1853	42	43.63	179	53.85	W	1001	1114	0.33	15	2	Repeat of TAN1503/29 and 31. Live scleractinian coral growth along summit ridge and on knoll to the north.
44	MORG	CAM	13-Aug	2223	42	43	179	57.61	W	908	1199	0.54	180	2	Repeat of TAN1503/16. Coral rubble and orange roughy on summit and upper flank. Sparse benthic fauna.
45	MORG	CAM	14-Aug	118	42	42.99	179	57.59	W	906	900		var	1	Search for mooring sinkers on Morgue; nothing found.

Stn	Area	Method	Date	Time	lat_d	lat_min	lon_d	lon_min		s_dep	f_dep	n.mile	dir	Perf	Comments
46	MORG	CAM	14-Aug	414	42	43	179	57.57	W	897	895		var	1	Search for mooring wheel. Found #2010/01. Some stylasterids on wheel rim.
47	MORG	CAM	14-Aug	1126	42	43.02	179	57.62	W	896	1164	0.49	42	2	Repeat tow to improve still images from #026.
48	ZOMB	CAM	14-Aug	1413	42	45.97	179	55.61	W	934	1067	0.38	88	2	Repeat tow to improve still images from #015.
49	GHOU	CAM	14-Aug	1705	42	47.77	179	59.08	E	1048	1020	0.32	133	1	Repeat of TAN1503/64+66. Extensive live scleractinian coral cover on northwest flank and summit.
50	GHOU	CAM	14-Aug	1932	42	47.73	179	59.26	E	1052	1020	0.40	179	1	Repeat of TAN1503/65+61. Extensive live scleractinian coral cover on northern flank and summit.
51	GHOU	CAM	14-Aug	2148	42	47.72	179	59.52	E	1042	1025	0.50	225	1	Repeat of TAN1503/60+62. Live scleractinian cover on scarp at start of transect and extensive coral cover on north-eastern flank and summit.
52	GHOU	CAM	15-Aug	28	42	47.89	179	58.99	E	1036	1038	0.38	90	1	Repeat of TAN1503/63+59. Extensive live scleractinian coral cover on western flank and summit.
53	MORG	CAM	15-Aug	319	42	43.01	179	57.64	W	899	1212	0.42	262	2	New transect to WSW on Morgue. Sparse fauna.
54	MORG	CAM	15-Aug	555	42	43	179	27.55	W	908	892	0.00	var	1	Search for mooring wheel. Found 2010/01 again (twice), determine same as seen on TAN1503/020 and has lost settlement plates.
55	Transit	CPR	15-Aug	925	42	42.84	179	57.12	W	0	0	239.00	110	1	Continuous Plankton Recorder in transit Graveyard to Andes.
56	DIPC	CAM	16-Aug	1000	44	8.81	174	41.38	W	420	428	0.04	180	3	Repeat of TAN1503_070. Large swell, abort tow.
57	ICEB	SEL	16-Aug	1335	44	9.54	174	33.26	W	486	659	0.24	196	1	Summit of Iceberg to sample for corals. 50kg catch. 3 bins of coral rubble, good clumps of live GDU, with sponges, stylasterids, *Thouarella*, pagurids.
58	RACH	SEL	16-Aug	1757	44	12.09	174	32.26	W	782	933	0.16	199	1	Summit of Rachael down SW flank, Two bins (33kg) of coral and sponge rubble, large hexactinellid sponges.
59	DIPC	CAM	16-Aug	2129	44	8.83	174	41.38	W	424	834	0.47	180	2	Repeat of TAN1503/70. Swell still marginal but workable. Bellowsfish. orange anemones, sponges, and stylasterid corals on summit and upper flank. Large stylasterids on flank..
60	DIPC	CAM	17-Aug	13	44	8.81	174	41.39	W	420	906	0.67	127	1	Repeat of TAN1503/74. Bellowsfish. orange anemones, sponges, and stylasterid corals on summit and upper flank. Large stylasterids on flank.

Stn	Area	Method	Date	Time	lat_d	lat_min	lon_d	lon_min		s_dep	f_dep	n.mile	dir	Perf	Comments
61	DIPB	CAM	17-Aug	321	44	8.99	174	45.21	W	552	863	0.67	171	2	Repeat of TAN1503/091: Bedrock substrate, stylasterids, sponges dominant.
62	DIPB	CAM	17-Aug	542	44	8.89	174	44.89	W	533	824	0.57	133	2	Repeat of TAN1503/090. Bedrock substrate, stylasterids, bryozoans, sponges.
63	DIPB	CAM	17-Aug	821	44	8.93	174	45.07	W	582	814	0.63	85	2	Repeat of TAN1503/092. Bedrock, stylasterids, sponges, gorgonians.
64	DIPA	CAM	17-Aug	1109	44	8.14	174	43.22	W	602	776	0.51	183	2	Repeat of TAN1503/080. Bedrock, hard and rough over a knob, then down. Stylasterids, lots of glass sponges.
65	DIPA	CAM	17-Aug	1400	44	8.15	174	43.23	W	612	830	0.68	141	2	Repeat of TAN1503/81. Bedrock and stylasterid rubble. Sponges and stylasterids common but patches of *Enallopsammia* and *Goniocorella* on summit. Antipatharian corals at depth.
66	DIPA	CAM	17-Aug	2240	44	8.18	174	43.17	W	615	854	0.53	88	2	Repeat of TAN1503/94. Bedrock and stylasterid rubble. Sponges and stylasterids common with *Enallopsammia* on summit. Isidid and antipatharian corals at depth.
67	DIPA	CAM	18-Aug	117	44	8.15	174	43.19	W	613	827	0.42	45	2	Repeat of TAN1503/95. Bedrock and stylasterid rubble. Sponges and stylasterids common, some *Enallopsammia* on summit. Isidid and antipatharian corals at depth.
68	DIPA	CAM	18-Aug	337	44	8.15	174	43.21	W	612	770	0.53	226	1	Repeat of TAN1503/084. Patches of *Enallopsammia* at summit, stylasterids and hexactinellid sponges common.
69	DIPA	CAM	18-Aug	841	44	8.14	174	43.21	W	609	898	0.59	279	2	Repeat of TAN1503/082. *Enallopsammia* at summit with *Goniocorella*. Extensive down to 700m. Stylasterids and hexactinellids common throughout.
70	DIPA	CAM	18-Aug	1140	44	8.16	174	43.21	W	613	912	0.48	315	2	Repeat of TAN1503/85. Similar to others on this peak, with *Enallopsammia*, *Goniocorella*, stylasterids, hexactinellid sponges.
71	DIPC	CAM	18-Aug	1405	44	8.83	174	41.43	W	451	822	0.52	47	2	Repeat of TAN1503/72. Anemones, stylasterids, and small clumps of scleractinian corals on summit. Rock and gravel with large stylasterids, sponges, primnoids, and other fauna on flank.
72	DIPC	CAM	18-Aug	1639	44	8.81	174	41.37	W	424	868	0.57	91	2	Repeat of TAN1503/73+75. Anemones, stylasterids, and small clumps of scleractinian corals on summit. Rock and gravel with large stylasterids, sponges, primnoids and other fauna on flank.

Stn	Area	Method	Date	Time	lat_d	lat_min	lon_d	lon_min		s_dep	f_dep	n.mile	dir	Perf	Comments
73	DIPC	CAM	18-Aug	1932	44	8.83	174	41.42	W	435	801	0.43	221	2	Repeat of TAN1503/78. Anemones, stylasterids, and sponges on summit. Rock and gravel with stylasterids on flank.
74	DIPB	CAM	18-Aug	2140	44	8.94	174	45.07	W	589	794	0.50	30	1	Repeat of TAN1503/93. Muddy sediments at start then mixed bedrock and coarse sediments. Relatively sparse fauna but stylasterids throughout, patches of gorgonians and isidids on lower flank, and one large black coral.
75	DIPB	CAM	19-Aug	35	44	8.96	174	45.41	W	544	808	0.51	226	2	Repeat of TAN1503/89. Sparse fauna, demosponges, stylasterids, hexactinellids.
76	DIPB	CAM	19-Aug	304	44	8.96	174	45.39	W	537	798	0.42	267	1	Repeat of TAN1503/89. Sparse fauna, demosponges, stylasterids, hexactinellids.
77	DIPB	CAM	19-Aug	522	44	8.97	174	45.42	W	524	800	0.58	344	2	Repeat of TAN1503/87 along NW-NNW ridge. Demosponge, stylasterid and hexactinellid sponges dominated fauna on transect.
78	DIPA	CAM	19-Aug	816	44	8.16	174	43.2	W	613	900	0.46	358	1	Repeat of TAN1503/83. Stylasterids, demosponges, hexactinellid sponges, small gorgonians. Few stony corals.
79	DIPC	CAM	19-Aug	1039	44	8.81	174	41.38	W	419	750	0.42	271	1	Repeat of TAN1503/77. Stylasterids, anemones, demosponges, hexactinellid sponges, small gorgonians.
80	DIPA	SEL	19-Aug	1256	44	8.17	174	43.27	W	640	622	0.09	0	2	Sled to sample for corals. 164 kg catch. 6 bins coral rubble, live *Enallopsammia* (orange and purple) and *Goniocorella*.
81	DIPC	CAM	19-Aug	1440	44	8.84	174	41.4	W	438	798	0.51	1	2	Repeat of TAN1503/83. Stylasterids, anemones, demosponges, hexactinellid sponges, small gorgonians. Few stony corals near summit.
82	DIPC	CAM	19-Aug	1730	44	8.82	174	41.4	W	432	728	0.39	307	1	Repeat of TAN1503/79. Stylasterids, anemones, demosponges, hexactinellid sponges, small gorgonians. Few stony corals near summit.
83	Transit	CPR	19-Aug	1900	44	8	174	41.96	W	5	5	478.00	289	1	CPR from DIPC to Graveyard hills, Epilogue, and onto Wellington. Same station number retained for a single silk.
84	GOTH	CAM	20-Aug	2101	42	43.67	179	53.85	W	1052	1189	0.41	319	2	Repeat of TAN1503/28. Started on E of summit ridge, then over and down NW flank. Marginal conditions but some good imagery. Live *Solenosmilia* abundant.

Stn	Area	Method	Date	Time	lat_d	lat_min	lon_d	lon_min		s_dep	f_dep	n.mile	dir	Perf	Comments
85	MORG	CAM	20-Aug	2357	42	43.03	179	57.61	W	922	914	0.00	0	1	Search for mooring sinker 2012/2 on Morgue; target found and recorded in video: 179:57.6030 W 42:43.0248 S
86	EPIL	CAM	21-Aug	1138	42	0.66	178	29.53	E	1711	1939	0.64	303	2	Epilogue Seamount. Abundant *Dermechinus* near summit at 1664m, scattered corals and sponges, tall isidid corals.

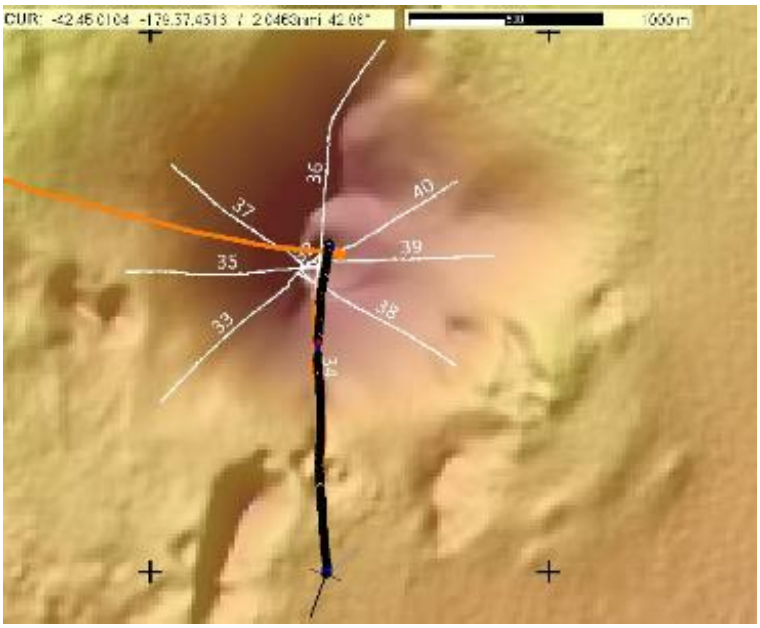
APPENDIX 2: TAN2009 DTIS STATION SUMMARIES

Station 002: Graveyard S transect

Repeat of TAN1503/034

Start depth: 775m Finish depth: 1100m

The tow commenced at the summit of Graveyard in 775m and headed down the south flank to a depth of 1100m. The summit substrate consisted of bedrock and soon became extensive areas of coral rubble with many trawl marks. Down slope there were areas of outcropped bedrock colonised by demosponges, hexactinellids, stylasterids, gorgonians, and occasional stalked crinoids. Lower downslope was typified by bedrock and extensive boulder and cobble fields with sand patches. Less fauna was observed in this zone. The transect ended after an area of sand which became mud and burrows. Three dropouts of the DTIS signal occurred during the deployment.



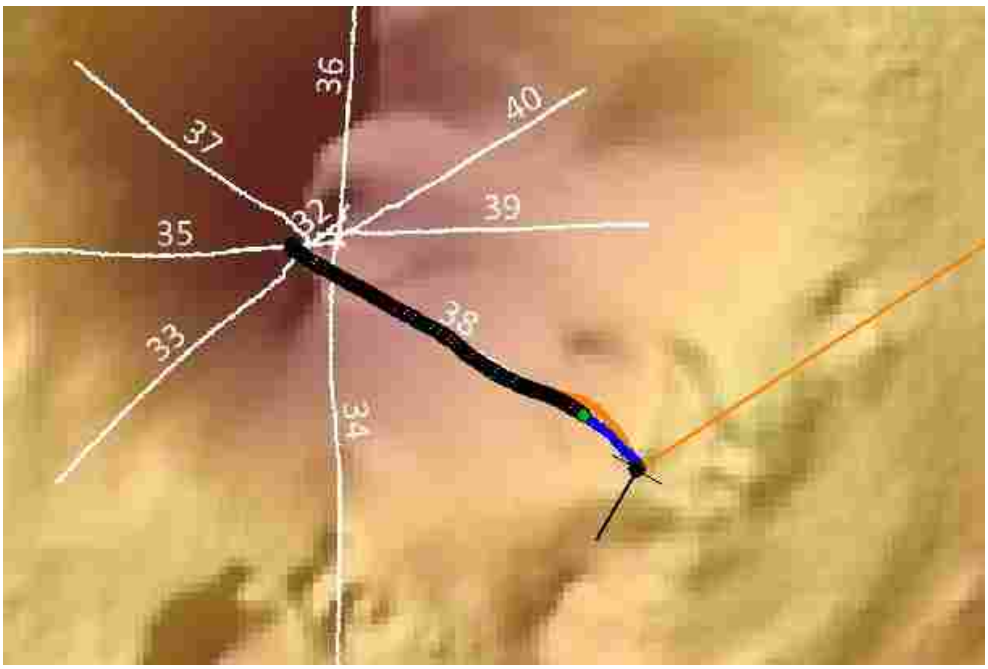
Left: TAN2009_002_102.jpg; Small ?plexaurid gorgonian corals, stylasterids hydrocoral, *Aphrocallistes* glass sponge among patches of coral rubble. Right: TAN2009_002_122.jpg; Small plexaurid gorgonian corals and stylasterid hydrocoral fans downslope of Graveyard Seamount peak.

Station 003: Graveyard SE transect

Repeat of TAN1503/038

Start depth: 765 m Finish depth: 1041 m

The summit was characterised by coral rubble and trawl marks mostly, with increasing visible bedrock, boulders, and cobbles colonised by dense fields of plexaurids, hexactinellids, demosponges, stylasterids, crinoids, echinoids, and some *Anthomastus*. Several rattails and orange roughy were also visible down the flanks. A few antipatharians were seen.



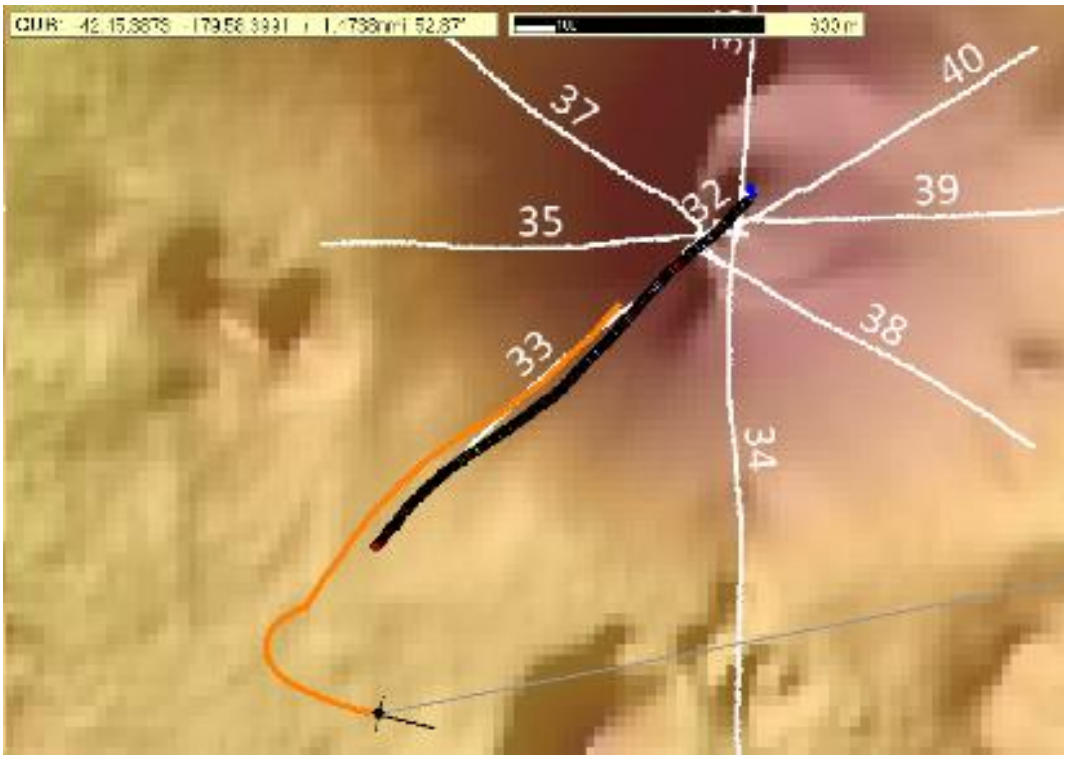
Left: TAN2009_003_024.jpg; Small yellow colonies of *Enallopsammia* hard coral, hydrocoral and glass sponges among coral rubble around peak. Right: TAN2009_003_062.jpg; Gorgonian plexaurid fans along slope of Graveyard Seamount.

Station 004: Graveyard SW transect

Repeat of TAN1503/033

Start depth: 758 m Finish depth: 1089 m

Mostly coral rubble with trawl marks and occasional outcrops of bedrock to begin with up towards the summit and down the other flank. Extensive trawl marks were evident at beginning. Presence of rattails, sponges, starfish, gastropods, and several small gorgonians. At around 990 m, moved into a cobble field with occasional bedrock outcroppings and soft sediment. Several small clusters of stylasterids were sighted along with sponges, anemones, rattails, orange roughy, and starfish.



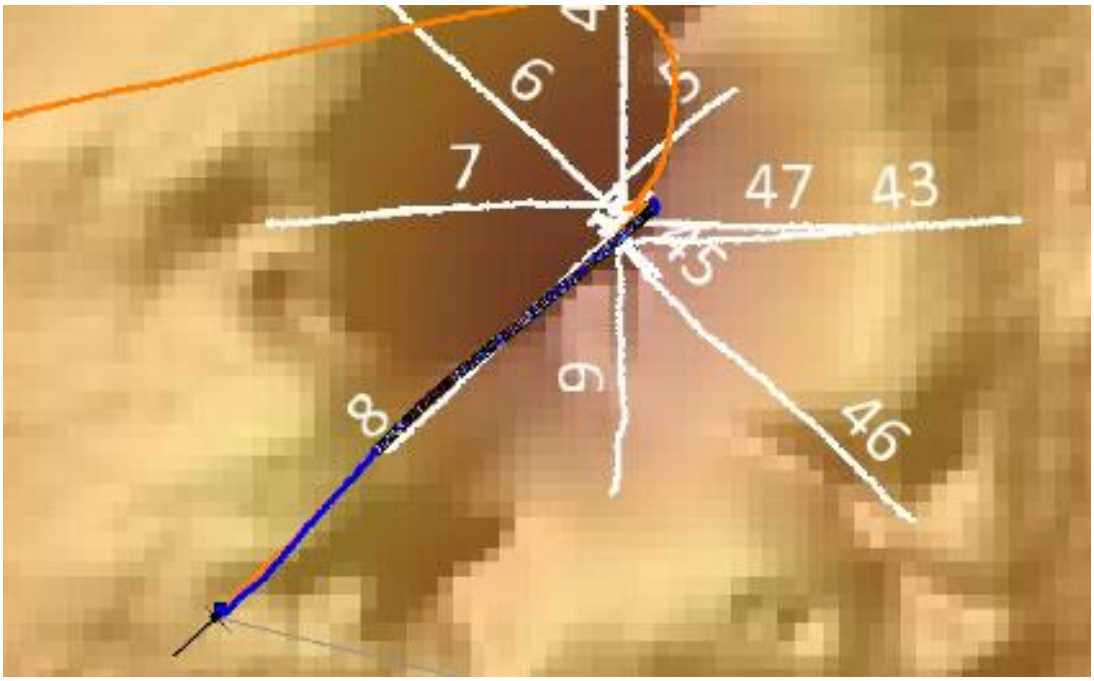
Left: TAN2009_004_052.jpg; Hydrocorals and coral rubble on bedrock along edge of crater. Right: TAN2009_004_020.jpg; Fresh trawl mark and coral rubble on muddy slope of Graveyard Seamount.

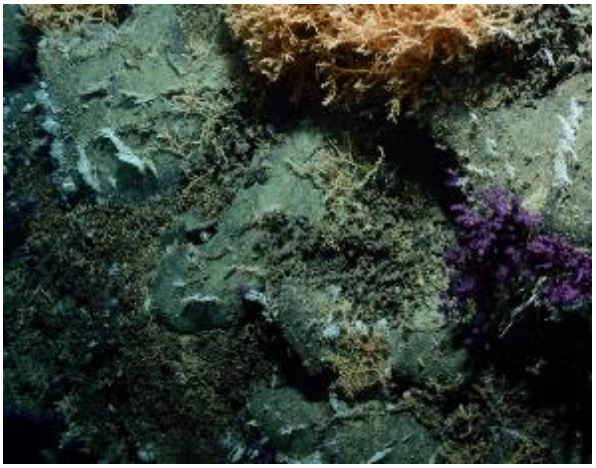
Station 005: Zombie SW transect

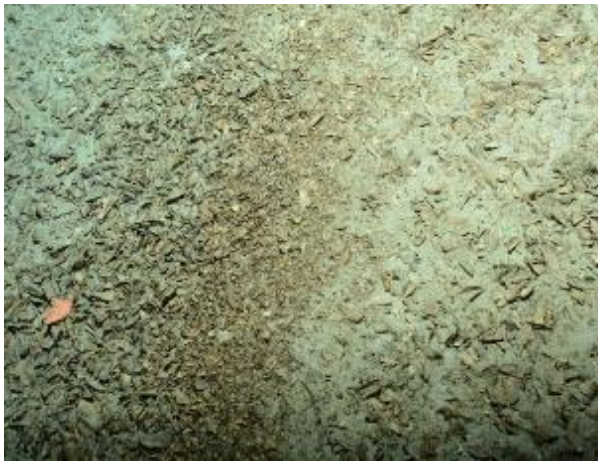
Repeat TAN1503/008

Start depth: 891 m Finish depth: 1102 m

The majority of the seamount was covered in alternating swaths of coral rubble and bedrock outcrops. The coral rubble had fish (oreos, orange roughy, rattails, eels, shark), live coral (*Solenosmilia*, stylasterids, gorgonians, *Enallopsammia*), and some trawl marks were visible. The bedrock outcrops primarily had live corals (zooanthids, *Solenosmilia*, *Enallopsammia*, gorgonians, stylasterids, fish (orange roughy, rattails). Towards the end of the tow (1046 m), there was primarily soft sediment with crinoids, orange roughy, eels, shrimp, urchins, and burrows visible. Barnacle plates were extensive at the base.







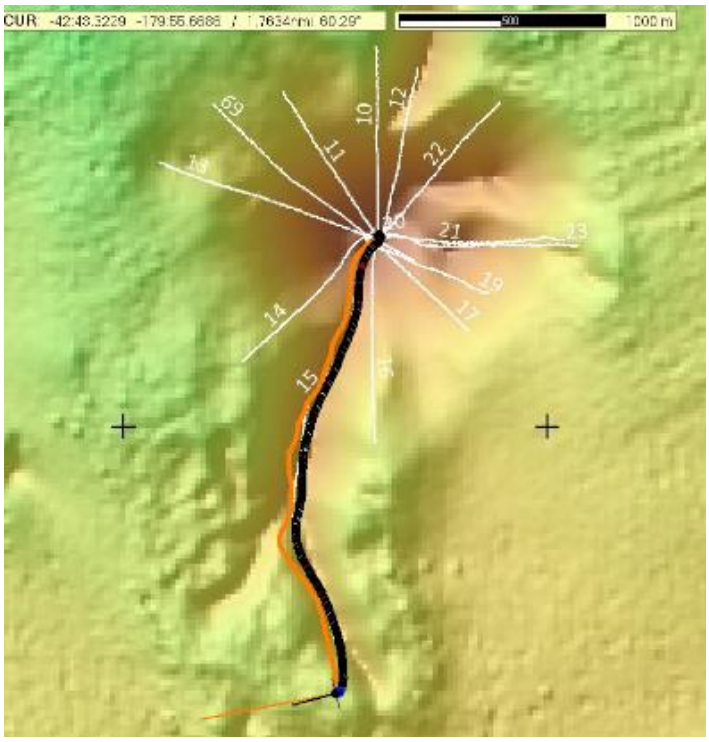
Left: TAN2009_005_064.jpg; Diverse coral community including live colonies of *Madrepora oculata*, purple soft coral *Trachythela*, gorgonian and hydrocorals. Right: TAN2009_005_100.jpg; Accumulation of barnacle plates and small *Hippasteria* starfish on soft sediments towards end of transect on Zombie Seamount.

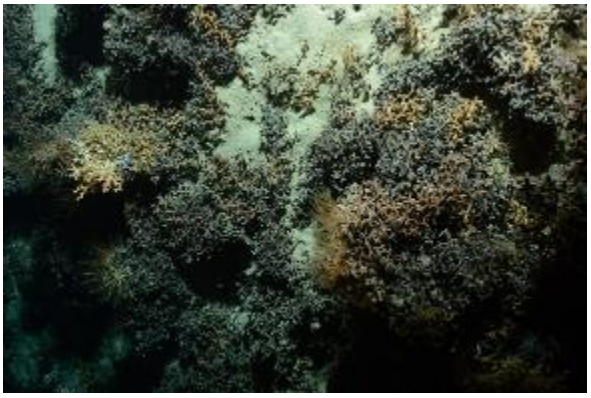
Station 006: Morgue SSW ridge transect

Repeat TAN1503/008

Start depth: 894 m Finish depth: 1143 m

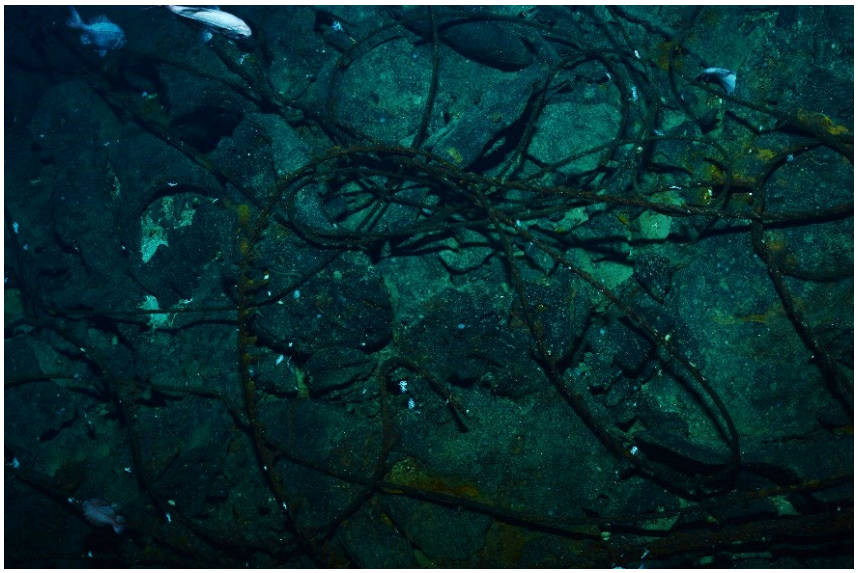
Summit at 894m consisted of coral rubble with some trawl marks. Many orange roughy were observed, and occasional ghost sharks. At 948 m boulders were evident with gorgonians and small stylasterids. At 969 m snagged trawl gear was observed with wire, nets, and floats. Further down the ridge boulders were common (lava) with crinoids and extensive areas of intact scleractinian corals. Other associated fauna included gorgonians, brisingids, hexactinellid sponges, stalked crinoids, primnoids, and echinoids. Fish sightings were mainly orange roughy, rattails, sharks, and a large morid cod.





Left: TAN2009_006_105.jpg; Dead intact and fragmented hardcoral with small attached invertebrates including glass sponges and hydroids, small ?solasterid starfish and orange roughy. Right: TAN2009_006_223; Small colony of live *Solenosmilia* hard coral at the top of a patch of dead intact coral with attached hydrocorals and crinoids along southern ridge of Morgue Seamount.

Fishing gear was also observed at the start of the transect.



Top: Image TAN2009_006_049; showing trawl wire.

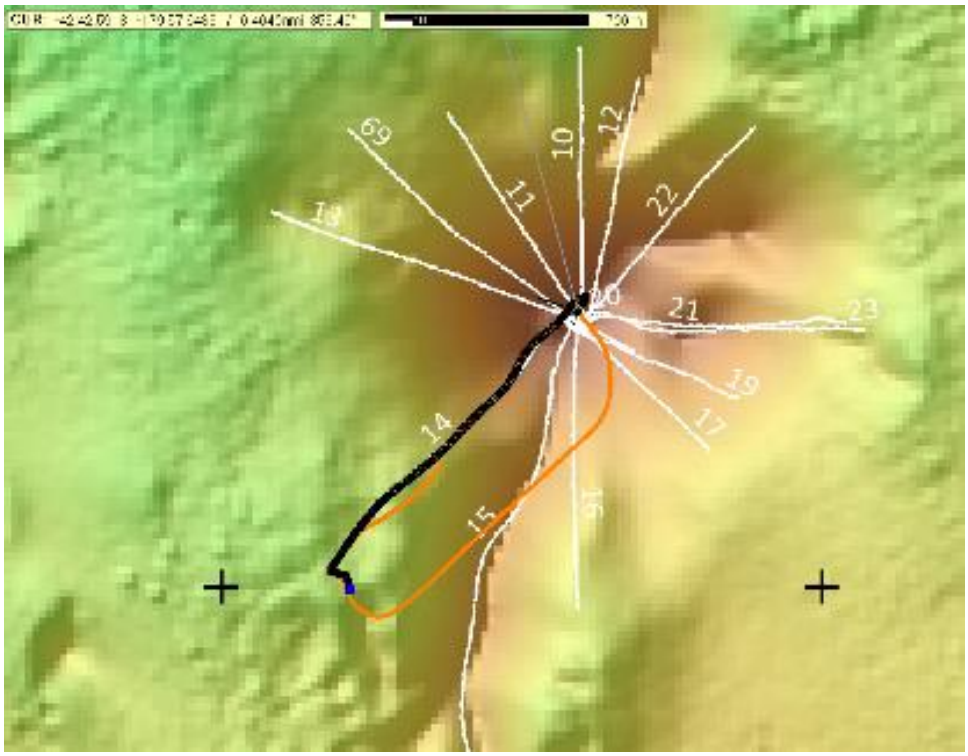
Bottom: Screenshot from TAN2009_006 video at time 12:41, showing the headline section of the net and floats.

Station 007: Morgue SW transect

Repeat of TAN1503_014

Start depth: 895 m Finish depth: 1223 m

The summit was characterised by coral rubble, sand, and cobbles with small colonising stylasterids. There was sparse benthic fauna down the flanks, which became mostly bedrock, boulders, and cobble. Orange roughy became abundant from about 1000 m depth. The last part of the transect was composed of a mixed substrate, with bedrock, boulders, cobbles, pebbles, gravel, and sand. Some patches of holothurians, anemones, and crinoids were observed. Several pieces of whale bone were also seen during the middle of the transect (see bottom left photo).



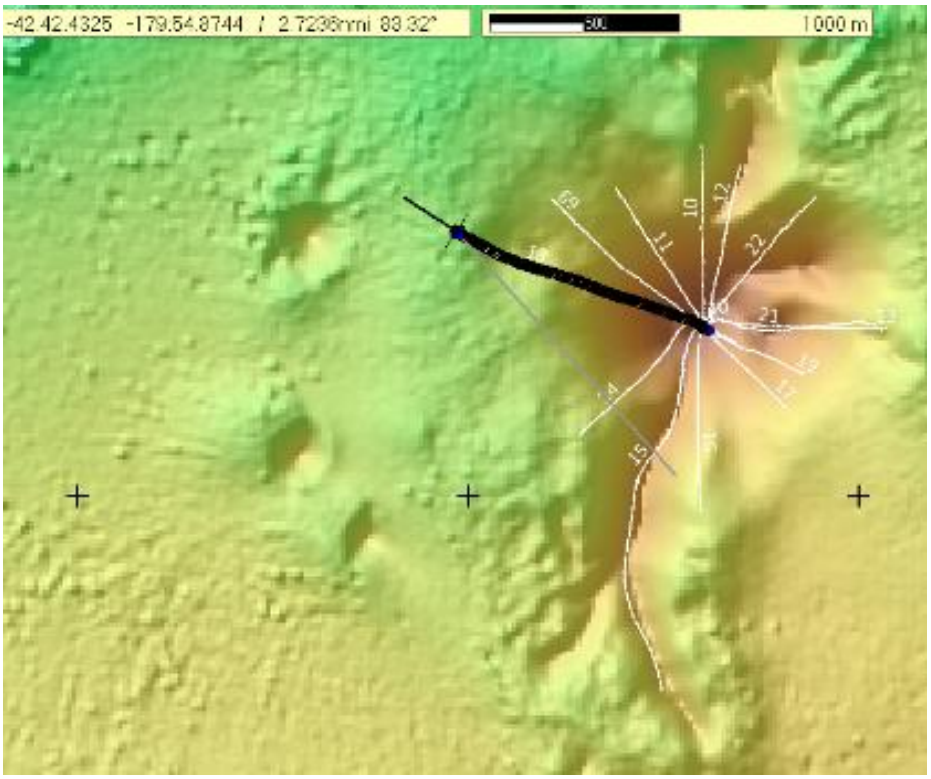
Left: TAN2009_007_021.jpg; coral rubble with small stylasterids hydrocorals at the start of the transect. Right: TAN2009_007_064.jpg; fragmented whale bone and orange roughy among lava boulders downslope of Morgue Seamount.

Station 008: Morgue W transect

Repeat of TAN1503_013

Start depth: 895 m Finish depth: 1210 m

Summit sections of the transect consisted of coral rubble, sand, and cobbles with a few orange roughy. On the flanks, substrate was bedrock, cobbles, and boulders with sparse benthic fauna but numerous orange roughy at 950 m with a few chimeras. The flank ran out to boulders, cobbles, and a muddy sand plain with small intact clumps of scleractinian corals and a patch of numerous stalked hexactinellid sponges (*Hyalonema* sp.). A feature of the transect was the observation of scattered whale bones.



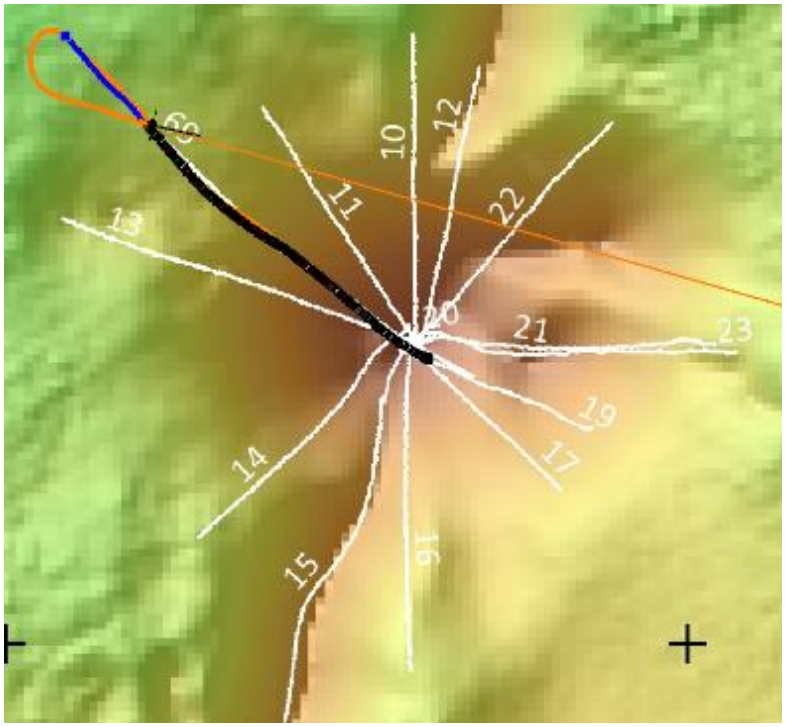
Left: TAN2009_008_018.jpg; boulders and cobbles with small encrusting hydrocorals among coral rubble. Right: TAN2009_008_256.jpg; stalked crinoids on lava rock at the base of Morgue Seamount.

Station 009: Morgue NW transect

Repeat of TAN1503_069

Start depth: 896 m Finish depth: 1229 m

The summit down to 929 m was thickly covered with coral rubble with a variety of fish (large aggregations of orange roughy with some oreos, rattails, shark, and cardinal fish), with stylasterids along edges of bedrock. Down the flank to 996 m was a mixture of coral rubble and bedrock with schools of orange roughy and few other fish (rattails, sharks, ghost sharks) as well as stylasterids and small numbers of other invertebrates (mainly gorgonians). Below 1000 m substrate was mainly bare bedrock with some sediment overlay at the base of the seamount, along with orange roughy and occasional sightings of oreos, rattails, ghost sharks, but few invertebrates (crinoids, one *Enypniastes eximia*).



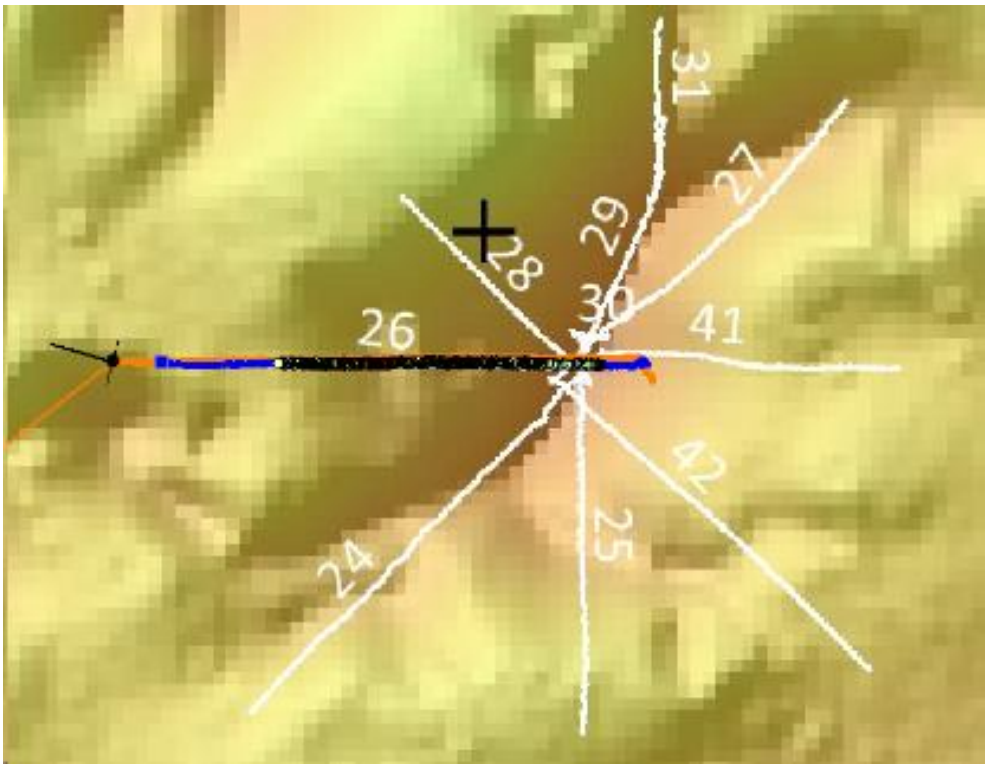
Left: TAN2009_009_018.jpg; coral rubble with live stylasterids and orange roughy. Right: TAN2009_009_188.jpg; ghost shark over lava bedrock, with a small xenophyophore foraminiferan on Morgue Seamount.

Station 010: Gothic W transect

Repeat of TAN1503/026

Start depth 1005m Finish depth 1135m

Summit of Gothic at 990 m had an extensive and continuous reef of *Solenosmilia*, with some sponges, gorgonians, and asteroids. This continued down to 1040 m, where live coral heads were less frequent, with patchy intact clumps, and more frequent brisingids. The base of the seamount was mixed areas of bedrock, coral rubble, boulders, and cobbles, with muddy sediment patches at the end with tam-o-shanter urchins. Orange roughy and rattails were scattered throughout the transect.



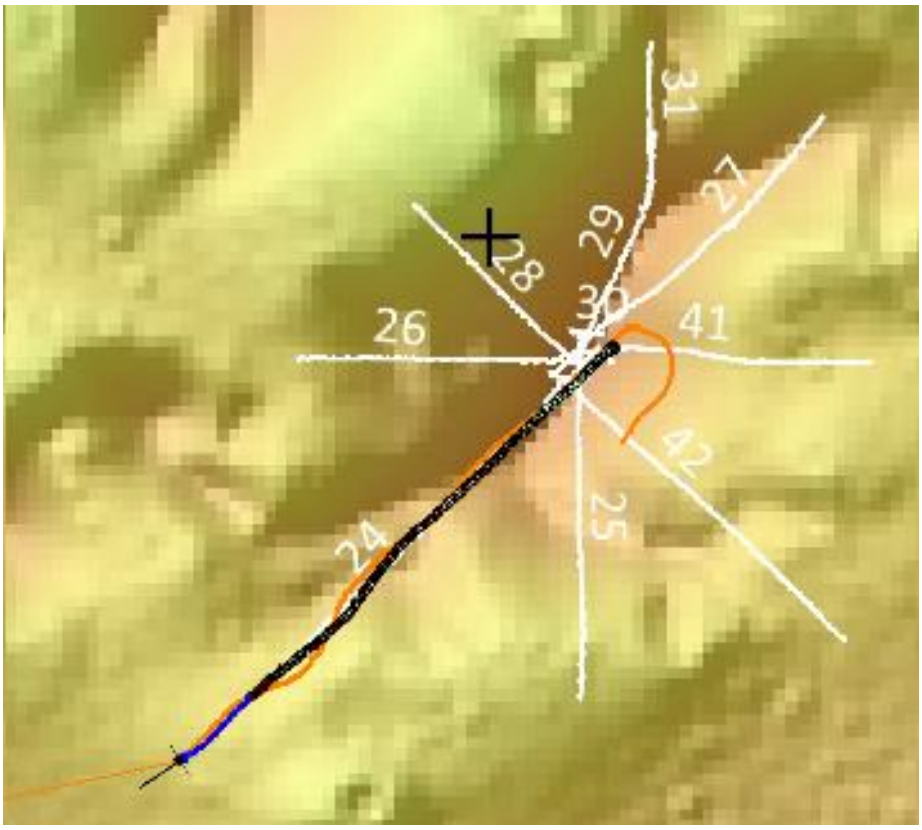
Left: TAN2009_010_029.jpg; dense thicket of live *Solenosmilia* coral below ridge. Right: TAN2009_010_085.jpg; small patch of *Solenosmilia* coral with brisingid starfish downslope of Gothic Seamount.

Station 011: Gothic SW transect

Repeat of TAN1503/024

Start depth 1024 m Finish depth 1150 m

From the top of the summit to 1065 m there was a thick cover of live *Solenosmilia variabilis*, with a range of invertebrates and some orange roughy and other fish. The rest of the transect was a mixture of muddy sediment and bedrock with coral rubble and cobbles (1065–1150 m) with observed live and dead *Solenosmilia*, orange roughy, rattails, ghost sharks, eels, crinoids, brisingids, tam o'shanters, sponges, ophiuroids, and asteroids. The transect finished on pillow lava substrate.

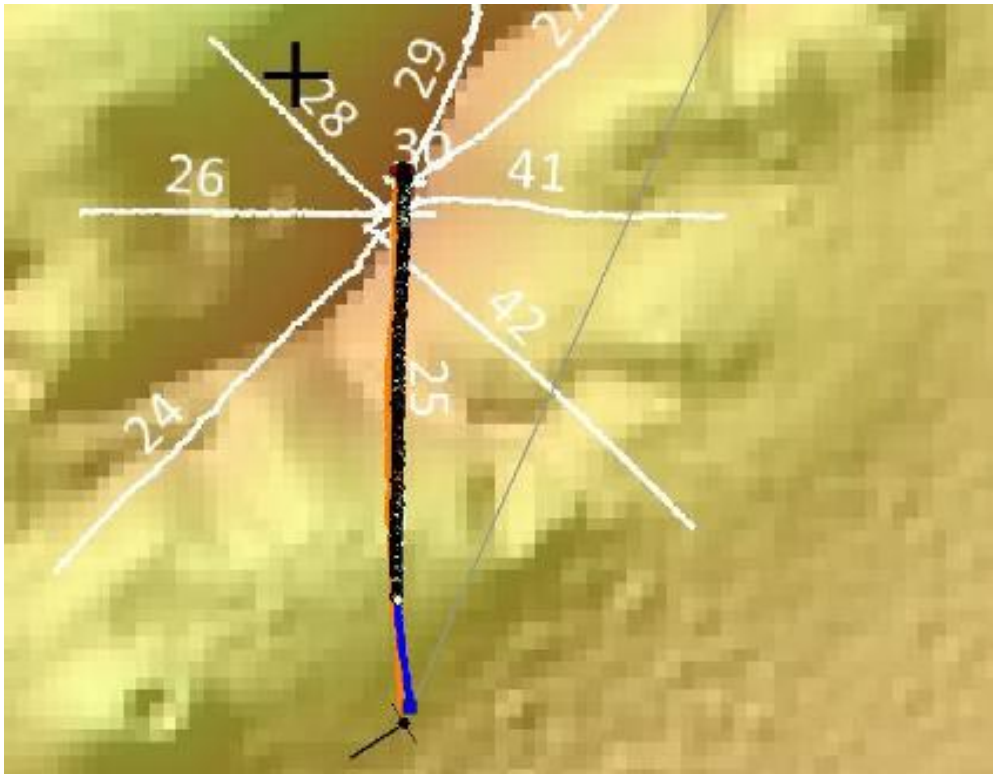


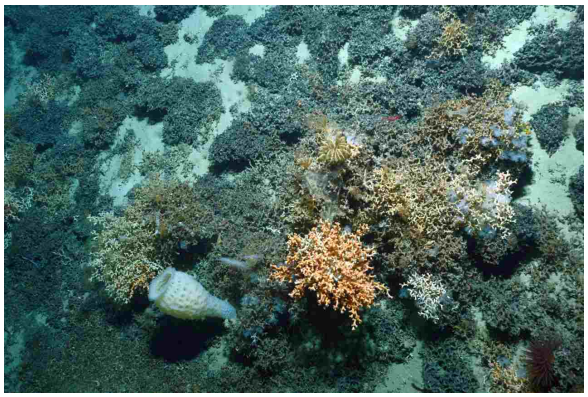
Left: TAN2009_011_055.jpg; dense live *Solenosmilia* coral near ridge. Right: TAN2009_011_118.jpg; stalked crinoids and smaller invertebrates among clumps of dead intact coral on lower flank of Gothic Seamount.

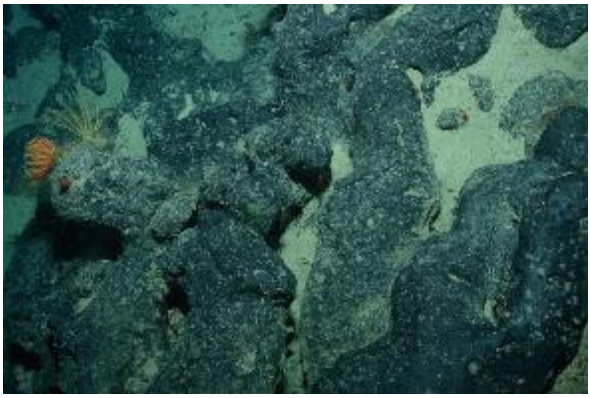
Station 012: Gothic seamount S transect

Rerun of TAN1503/25

Live *Solenosmilia* reef covered the summit area. This thinned going down the southern flank, where there were patches of intact dead reef mixed with live heads, and extensive low bedrock. Beyond 1150 m, soft sediment was dominant, with frequent tam-o-shanters. *Enypniastes* were common above the seabed. Orange roughy and rattails were scattered along the transect.







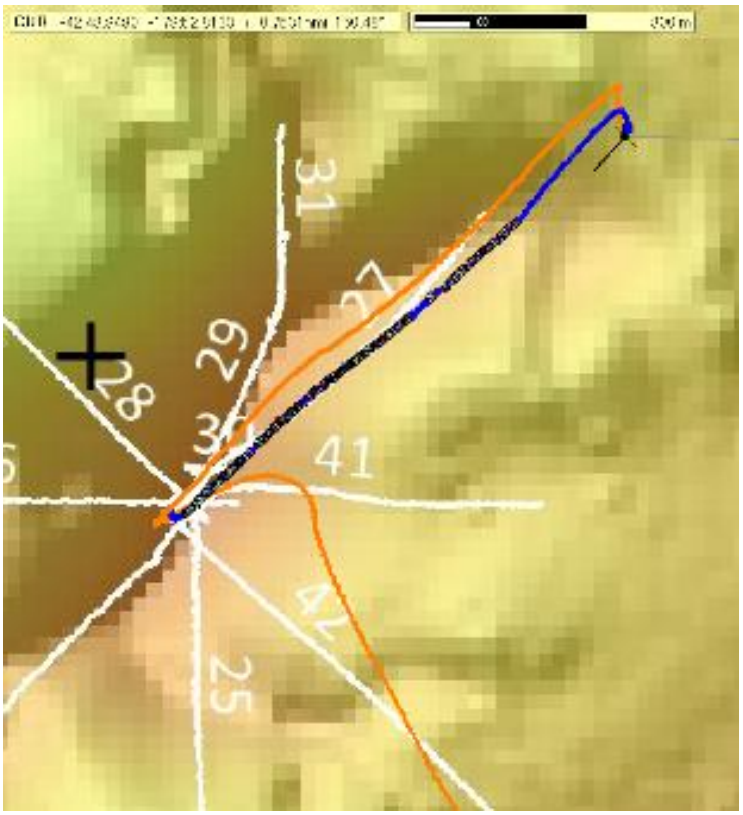
Left: TAN2009_012_054.jpg; diverse invertebrate community including live *Solenosmilia* coral, gorgonians, glass sponges, and crinoids. Right: TAN2009_012_127.jpg; brisingid starfish, *Anthomastus* soft coral and crinoids on volcanic bedrock along slope of Gothic Seamount.

Station 013: Gothic seamount NE

Repeat of TAN1503/027

Start depth: 1045 m Finish depth: 1137 m

The summit was characterised by intact coral, some live *Solenosmilia* heads, gorgonians, asteroids, crinoids, demosponges, orange roughy, rattails, and a ghost shark. Substrate became bedrock with patches of *Solenosmilia* intact coral and coral rubble down the flanks, colonised by brisingids, bamboo corals, hexactinellids, and gastropods. The lower end of the flank was comprised of bedrock with patches of intact coral and coral rubble colonised by brisingids and crinoids. The last section of transect was mostly muddy sediment, tracks, and burrows.



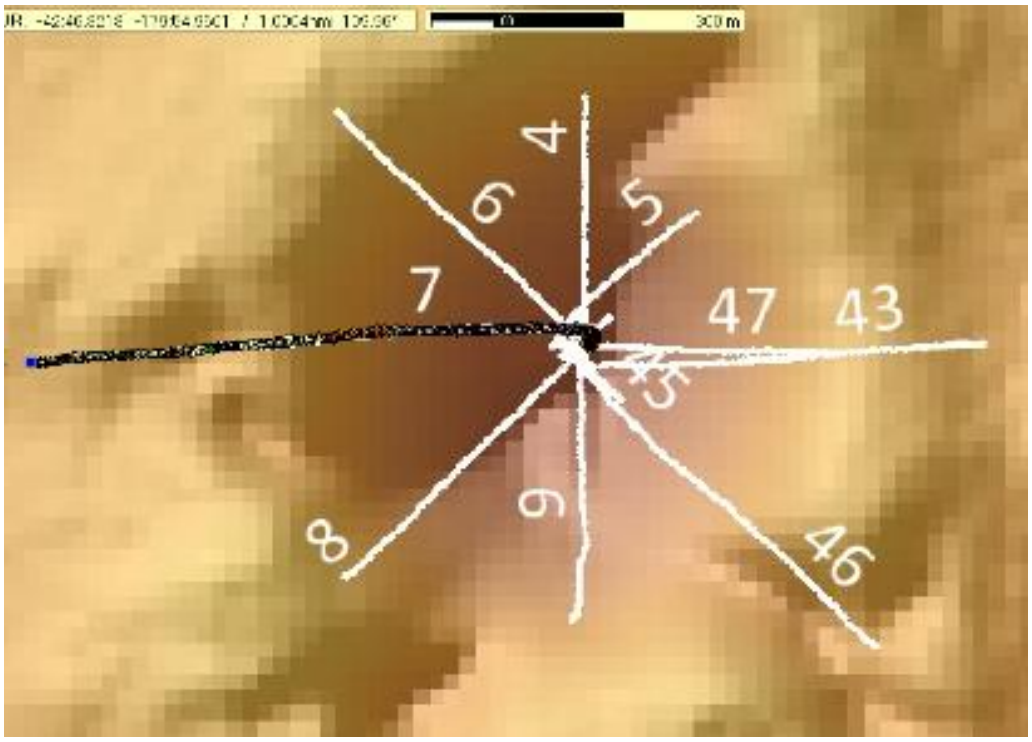
Left: TAN2009_013_011.jpg; dense live *Solenosmilia* coral community. Right: TAN2009_013_148.jpg; dead coral fragments densely covered with crinoids along lower ridge of Gothic Seamount.

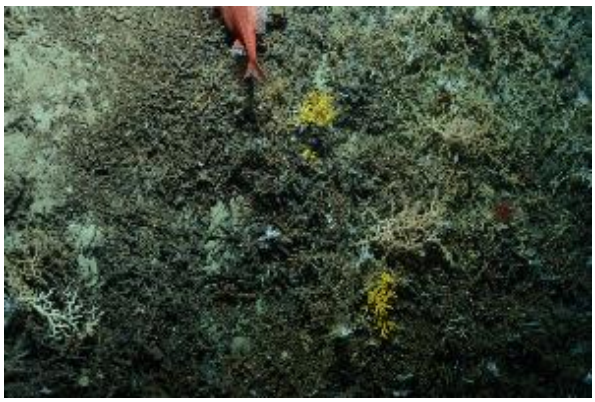
Station 014: Zombie seamount W transect

Repeat of TAN1503/007

Start depth: 899 m Finish depth: 1075 m

Summit substrate consisted of coral rubble and sand with trawl tracks. On the upper flanks at 945 m there were a few small heads of intact coral. Further down slope was high relief of *Madepora* thickets in patches of coral rubble including some small *Enallopsammia*. Muddy sediment with burrows and tracks were present at the base of the seamount with many rattails and swimming holothurians *(Enypniastes eximia*). Occasional bedrock outcrops were also present but with sparse fauna.





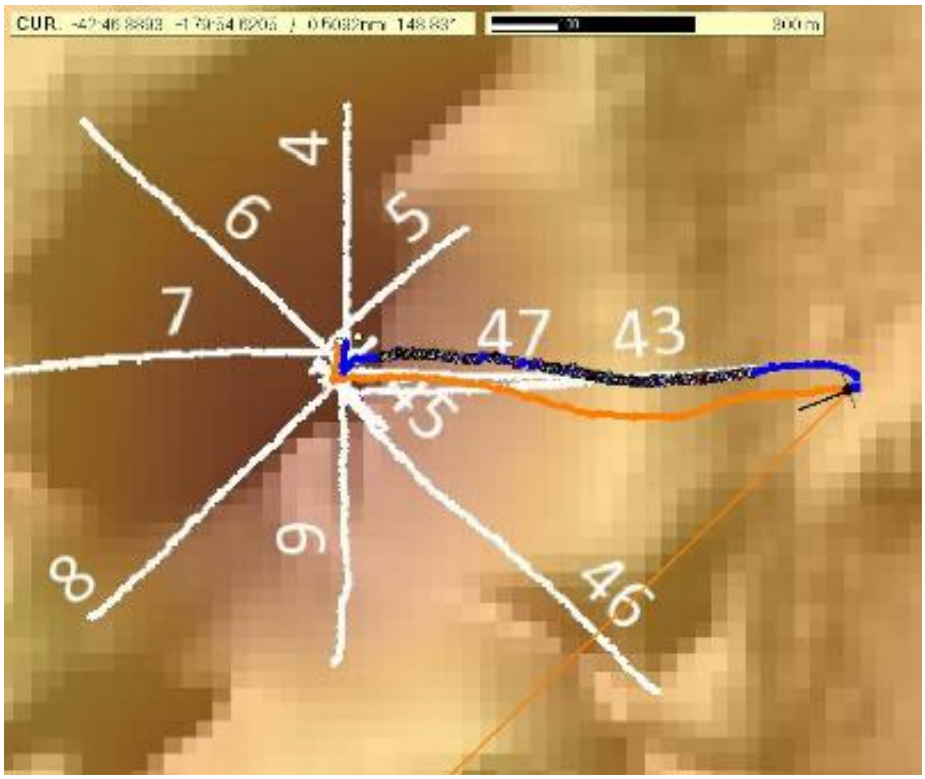
Left: TAN2009_014_014.jpg; live *Madrepora* and yellow *Enallopsammia* coral. Right: TAN2009_014_084.jpg; patches of live *Madrepora* coral on upper flank of Zombie Seamount.

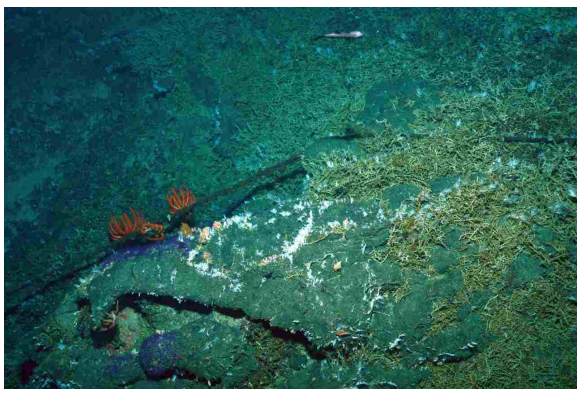
Station 015: Zombie seamount - E transect

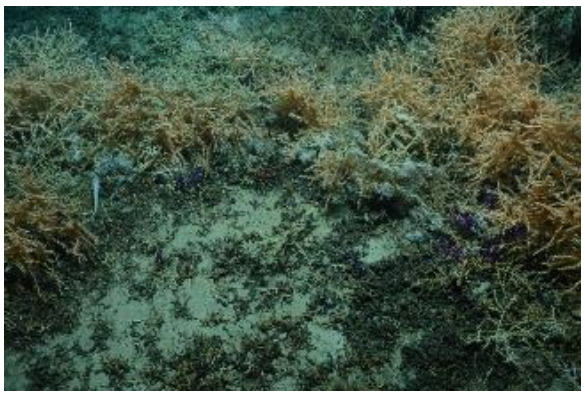
Repeat of TAN1503/047 & 043

Start depth: 894 m Finish depth: 1063 m

Summit was mostly coral rubble with areas of intact live *Madrepora oculata* colonised by stylasterids, crinoids, and brisingids, which then gradually became a mix of bedrock, rubble, and sand on the lower flanks. Some orange roughy occurred at the summit and in parts of the upper flank. Muddy sediment dominated the lower flank and moat, with many rattails, burrows, swimming holothurians, and echinoids.







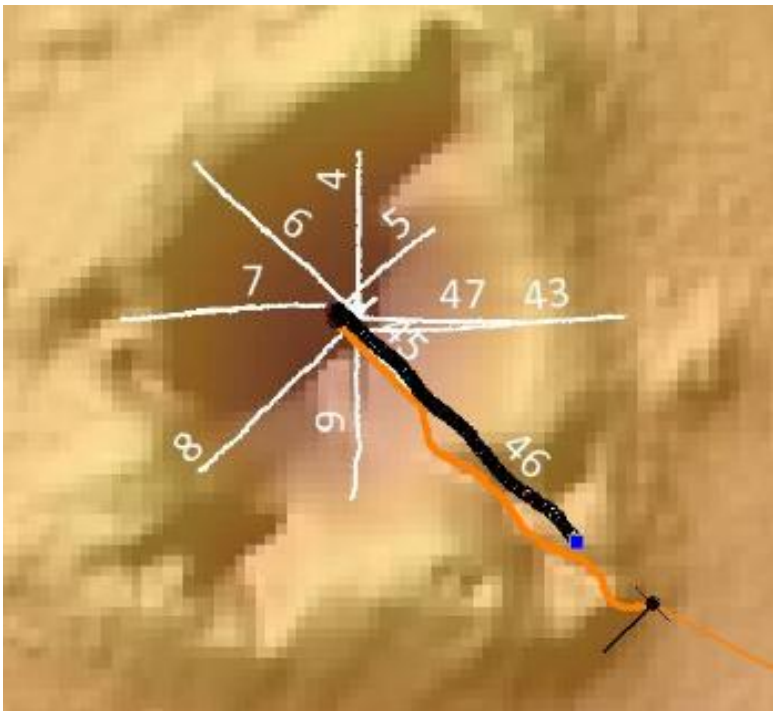
Left: TAN2009_015_003.jpg; invertebrate community around a volcanic ledge, includes purple *Trachythela* soft coral, hydrocorals, and brisingid starfish. Right: TAN2009_015_025.jpg; live *Madrepora oculata* community near the top of Zombie Seamount.

Station 016: Zombie seamount – SE transect

Repeat of TAN1503/046

Start depth: 934 m Finish depth: 1070 m

Summit substrate consisted of coral rubble with trawl tracks but there were also areas of compacted muddy sand overlaid with coral rubble colonised by stylasterids and 'purple soft coral'. Patches of intact live coral including *Enallopsamia* occurred on the upper flanks. Muddy sediment with boulders characterised the lower flanks. At the end of the transect there was a rise up to rugged lava outcrops. There was generally sparse fauna in these boulder fields but some live *Solenosmilia* corals occurred.



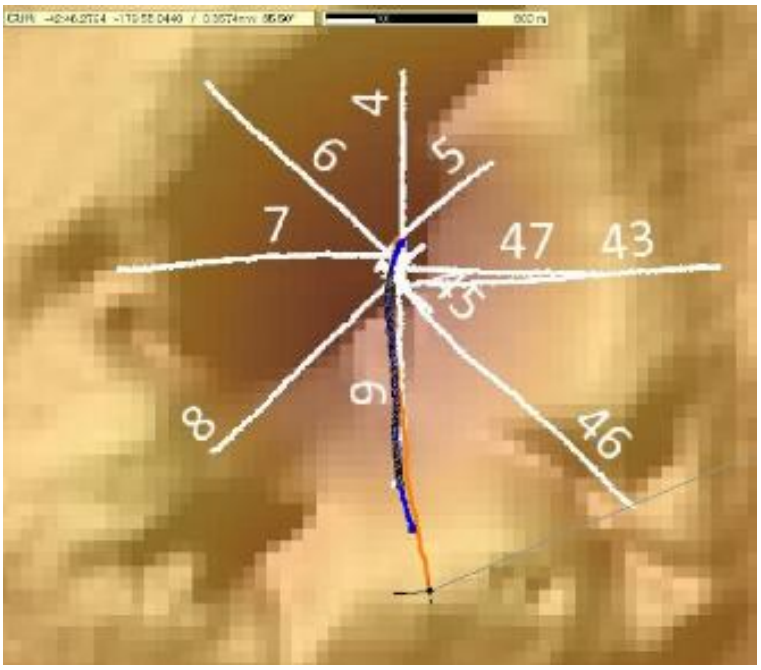
Left: TAN2009_016_018.jpg; coral rubble with small colonies of hydrocorals and *Trachythela* softcorals. Right: TAN2009_016_060.jpg; live *Enallopsammia rostrata* and a passing deep-sea shark on upper slope of Zombie Seamount.

Station 017: Zombie seamount S transect

Repeat of TAN1503_09

Start depth: 923 m Finish depth: 1058 m

Summit was dominated by coral rubble with very clear trawl marks, which the DTIS track followed continuously along the summit and upper flank. Purple soft corals and stylasterids were observed amongst the coral rubble on the summit. Down the flanks there were small patches of intact and live coral (*Madrepora*) and trawl marks were dense. A number of primnoids and stylasterids were seen amongst the rubble on the flanks, along with several eels and rattails. There was a steep slope towards the end of the transect with large boulders and rocky outcrops.



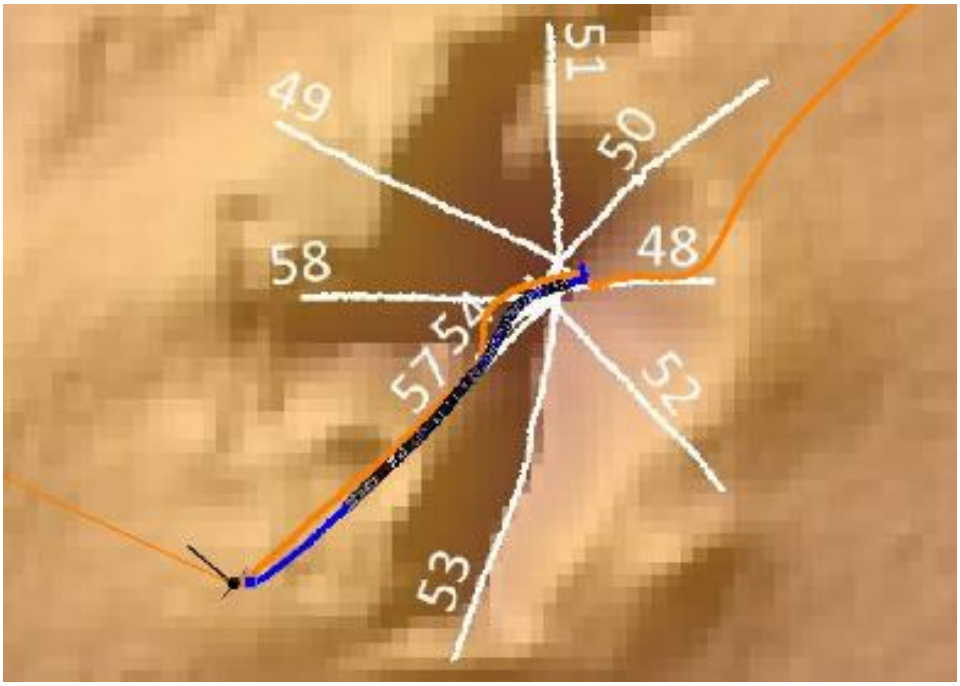
Left: TAN1503_017_018.jpg; deep-sea anemone and eel on coral rubble. Right: TAN1503_017_086.jpg; small sessile invertebrates (gorgonian, stylasterid corals, ?cladorhizid sponges) on Zombie Seamount.

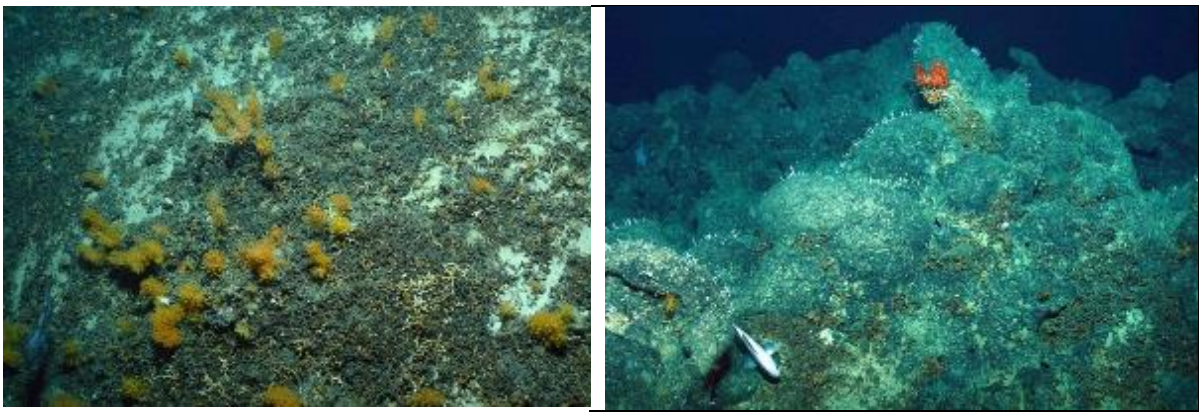
Station 018: Diabolical SW transect

Rerun of TAN1503/62

Start depth: 899 m Finish depth: 1062 m

Substrate at the peak was coral rubble with a few trawl marks (many looked old) and abundance of small bushy primnoid gorgonians (*Tokoprymno)*, some 'rasta' coral (*Narella hypsocalyx*), small *Anthomastus*, and a few fish (orange roughy, eels, rattails). Off the peak, at 957 m, there was a small patch of intact and live scleractinian coral. The flank was covered with coral rubble. There was a steep ridge and drop-off of about 20 m at 985 m, live coral occurred briefly before traversing the steep ridge. The remainder of the transect was smooth with the flank being muddy, progressively less coral rubble (tam o'shanters, *Enypniastes eximia*, shrimps, rattails, orange roughy), a small field of lava boulders, then soft mud with typical bioturbation at the end. The camera track veered westwards off TAN1503/57 at the start, but otherwise was a good match.





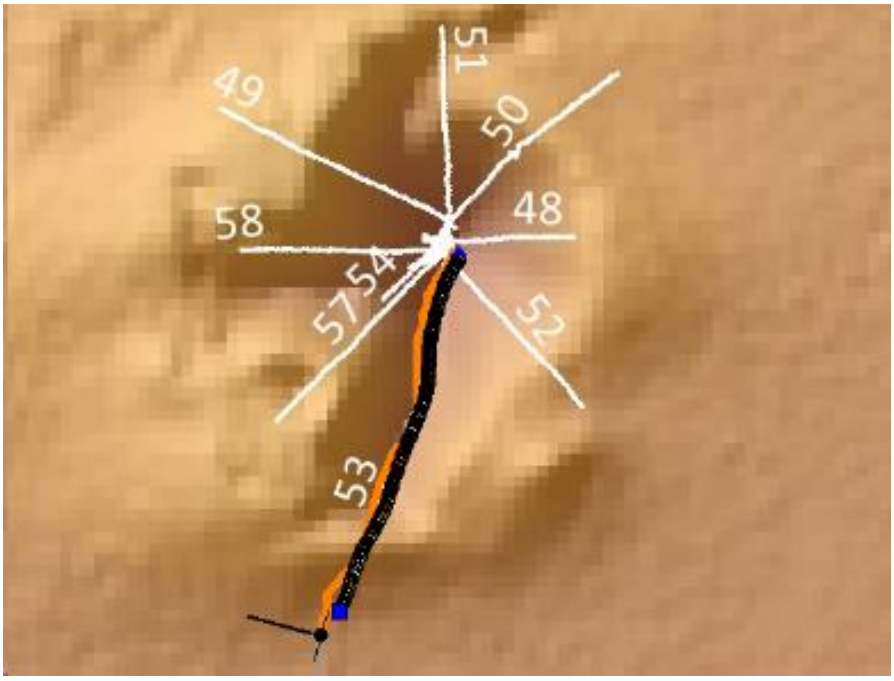
Left: TAN2009_018_ 015.jpg; small gorgonian corals on hard coral rubble. Right: TAN2009_018_ 061.jpg; small cluster of *Solenosmilia* coral with brisingid starfish, small ?cladorhizid sponges growing on exposed volcanic rock, Diabolical Seamount.

Station 019: Diabolical S (ridge) transect

Rerun of TAN1503/53

Start depth: 943 m Finish depth: 1020 m

The transect started a little east of the line as DTIS was pushed to the east by the current, but came onto the summit ridge and down along the ridge to the south following the previous line well. Substrate was largely coral rubble with scattered *Tokoprymno, Anthomastus*, Rasta coral, and small patches of live coral. The coral rubble extended down to about 980 m depth where bedrock, boulders, and cobbles became more frequent, with occasional intact coral patches, stalked crinoids, and scattered *Anthomastus*. The transect ended over muddy sediment with rattails.



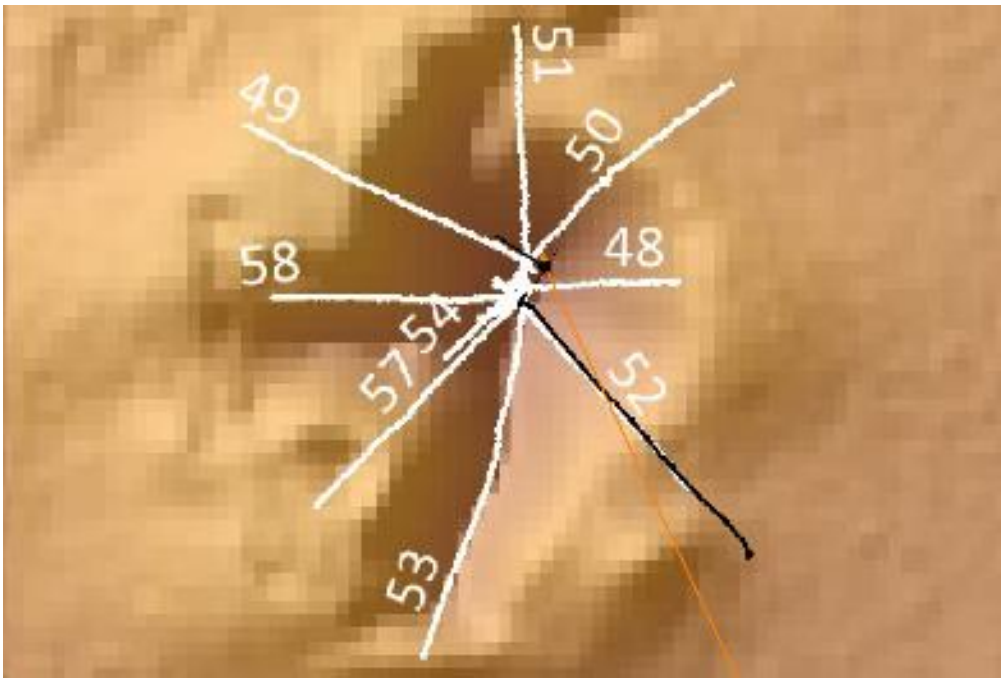
Left: TAN2009_019_011.jpg; small octopus on soft sediment with coral rubble. Right: TAN2009_019_116.jpg; dead hard coral on volcanic bedrock on the flank of Diabolical Seamount.

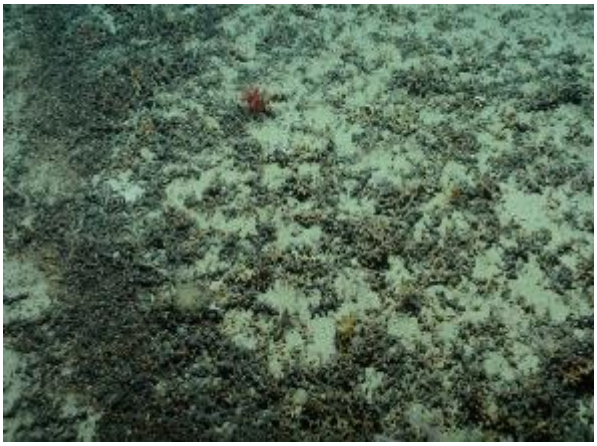
Station 020: Diabolical SE transect

Repeat of TAN1503_052

Start depth: 919 m Finish depth: 1037 m

Coral rubble with *Tokoprymno* and *Narella* were present at the summit down to 1008 m with some fish (rattail, eel, orange roughy, morid), and *Epizoanthus*, *Anthomatus*, and tam o'shanters. There were alternating patches of bedrock and muddy sediment down the rest of the transect with clumps of intact coral from 1013 m to 1042 m. Fish (orange roughy, rattails), *Chrysogorgia*, stalked crinoids, asteroids, an anemone, several *Enypniastes*, sea pen, tam o'shanters, and several holothurians were observed.





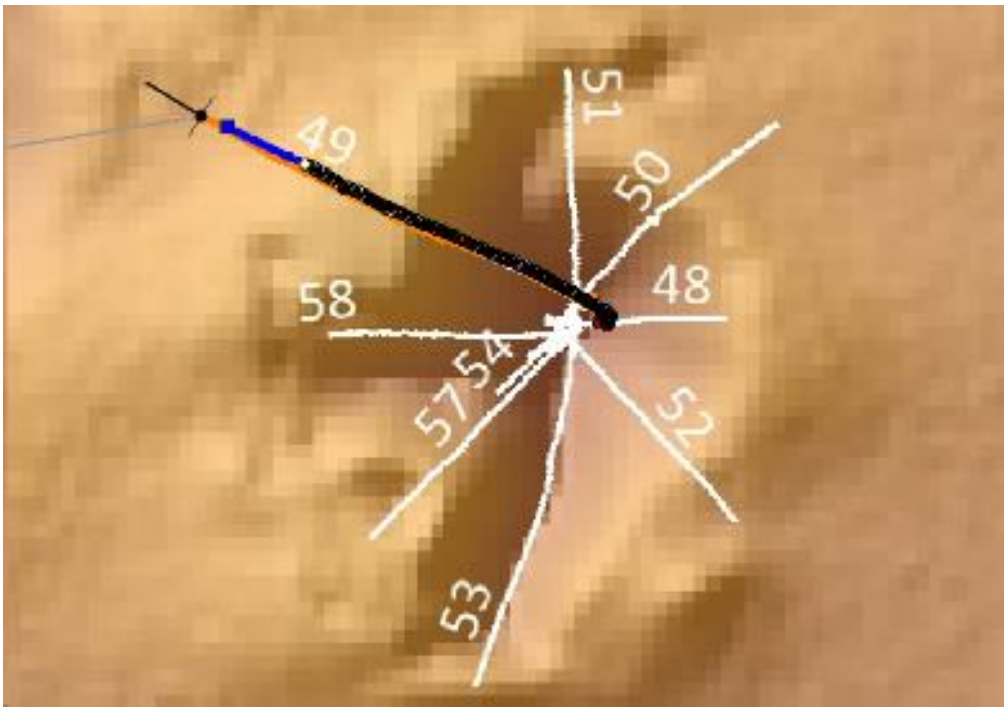
Left: TAN2009_020_022.jpg; *Anthomastus* soft coral on coral rubble. Right: TAN2009_020_130.jpg; *Enypniastes eximia* sea cucumber and rattail on muddy sediment around Diabolical Seamount.

Station 021: Diabolical Seamount, NW transect

Rerun of TAN1503/49

Start depth: 915 m Finish depth 1075 m

The tow started on the east side of the peak, coming over the summit down into the moat to the NW. Initially substrate was coral rubble with *Tokoprymno*, stylasterids, some *Anthomastus*, and rasta coral. The transect crossed over the summit at 900 m. From 925–935 m on the northwest side was a patch of live *Madrepora* coral. The substrate then reverted to coral rubble, with a band of pillow lava at around 1050 m, and soft sediment (with shell hash) to 1090 m with rattails and frequent *Enypniastes*.



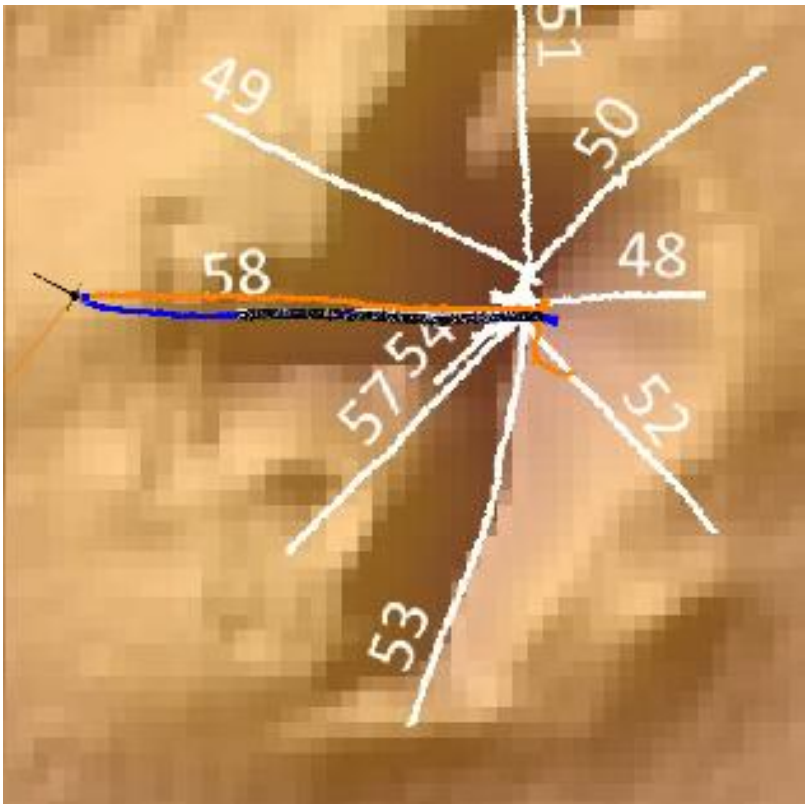
Left: TAN2009_021_017.jpg; purple *Enallopsammia rostrata* east of peak. Right: TAN2009_021_030.jpg; *Madrepora oculata* west of peak of Diabolical Seamount.

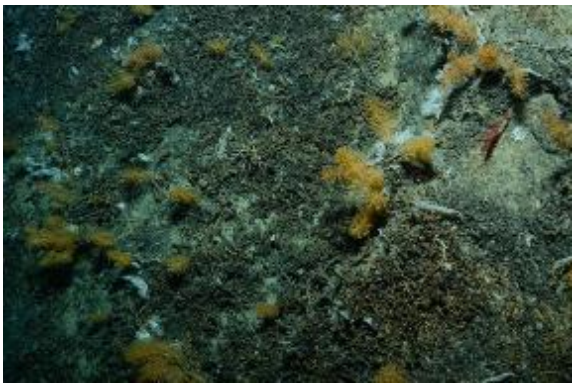
Station 022: Diabolical Seamount, W transect

Rerun of TAN1503/58

Start depth: 917 m Finish depth 1040 m

The start of the transect was on the eastern side just below the peak. There was a brief patch of live coral (*Enallopsammia*) and a patch of live *Madrepora* just after crossing the peak on the western side. The flank comprised coral rubble and mixed invertebrates (stylasterids, *Anthomastus*, *Tokoprymno*, *Narella*) and some fish (orange roughy, rattails, eels). There was a band of lava rocks at 980 m, followed by smooth soft sediments with rubble (coral/shell hash). At the end of the transect were boulders, some with live and dead hard coral, and a relatively steep climb out of the moat with intact dead coral scattered on the soft sediment.





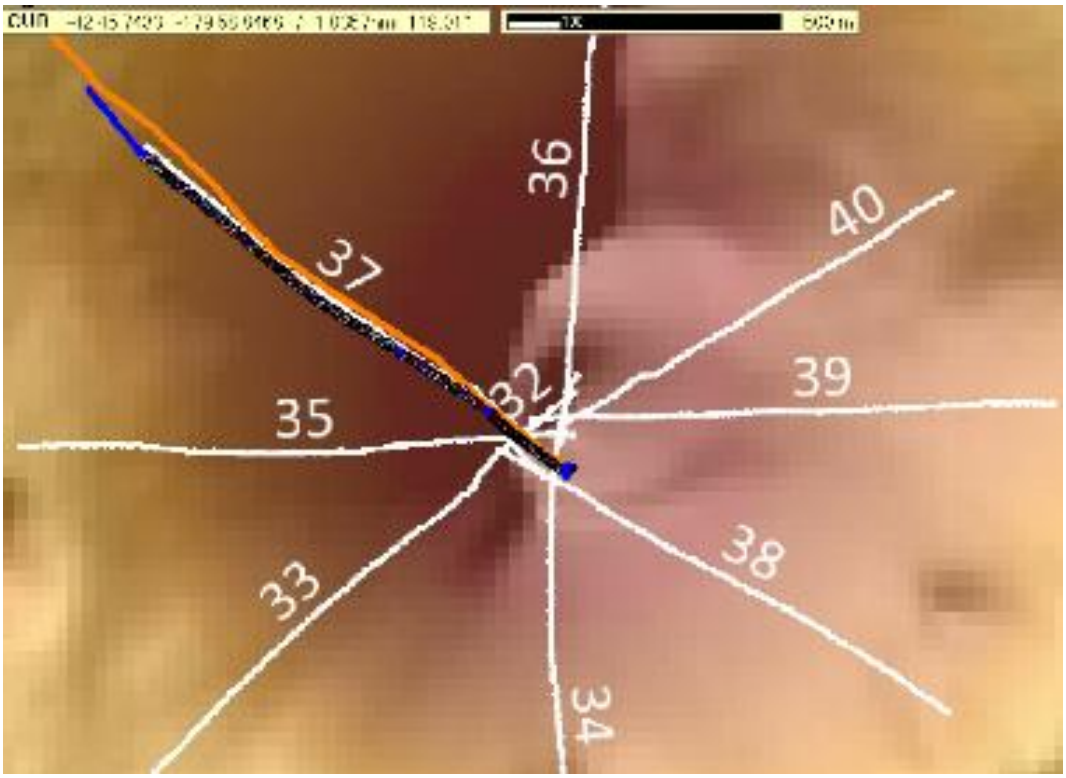
Left: TAN2009_022_019.jpg; *Tokoprymno* gorgonian and hydrocoral. Right: TAN2009_022_120.jpg; coral rubble and rattail on soft substrate on the lower slope of Diabolical Seamount.

Station 023: Graveyard Seamount, NW transect

Rerun of TAN1503/37

Start depth: 770 m Finish depth 1053 m

There were extensive areas of coral rubble at the summit with many trawl marks. On the flanks were bedrock outcrops amongst coral rubble. Overall, very few invertebrate fauna were observed with occasional sponges, gorgonians, *Anthomastus*, and stylasterids. Fish included rattails, orange roughy, sharks, and a ghost shark. Lower down slope there was a mix of bedrock, boulders, cobbles, and pebbles with a few crinoids.



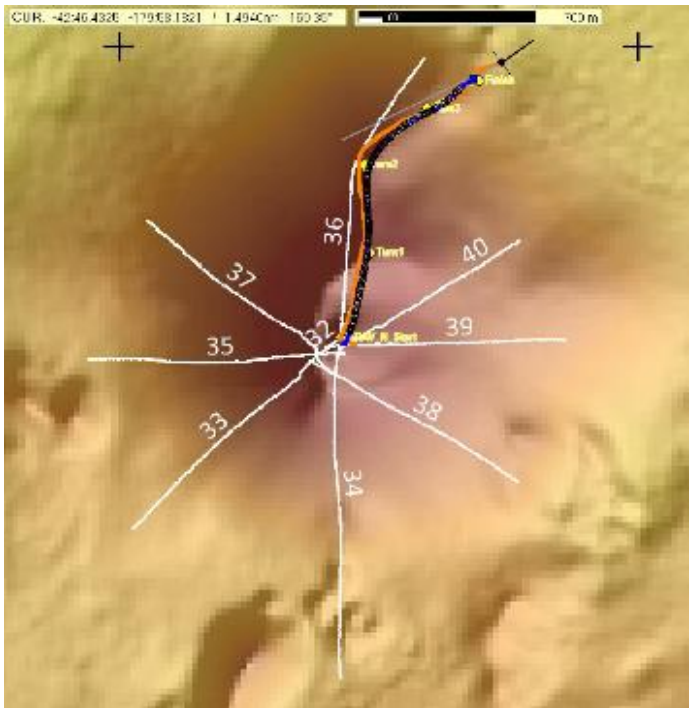
Left: TAN2009_023_026.jpg; trawl marks near the summit. Right: TAN2009_023_057.jpg; exposed volcanic rock with small cnidarian polyps on Graveyard Seamount.

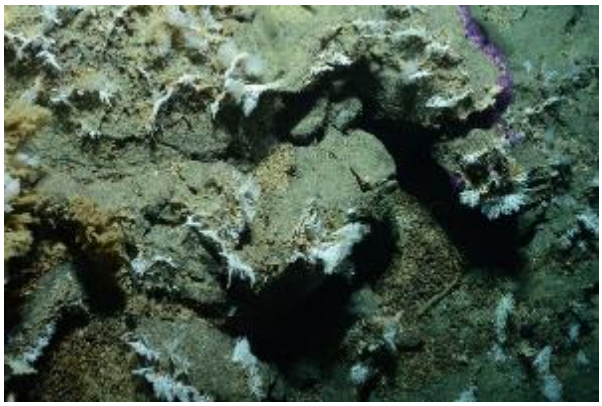
Station 024: Graveyard Seamount, N ridge transect

Rerun of TAN1503/36

Start depth: 750 m Finish depth 1030 m

This was a diverse transect with a high density of benthic fauna. Initially gorgonians, sponges, and stylasterids were abundant on bedrock at the start of the transect. Some areas of coral rubble with trawl marks were also observed early on. In the crater, the substrate was composed of sand and coral rubble, then bedrock and coral rubble on the 'rim' of the crater. On the upper flanks was continuing moderate to high densities of scleractinians, hexactinellid sponges, and demosponges, with several patches of gorgonian fans observed on a large bedrock outcrop, and a large antipatharian was observed at approximately 30 mins. At the start of the north ridge, there was a high density of sponges amongst coral rubble and bedrock, along with stylasterids and soft corals (mostly *Anthomastus* sp). Further along the ridge, sponges were still abundant and several sharks and rattails were seen. The end of the transect coming off the ridge became a mix of muddy sediment, sand, boulders, cobbles, and pebbles with sparse fauna, but some comatulid crinoids along the edges of the boulders.





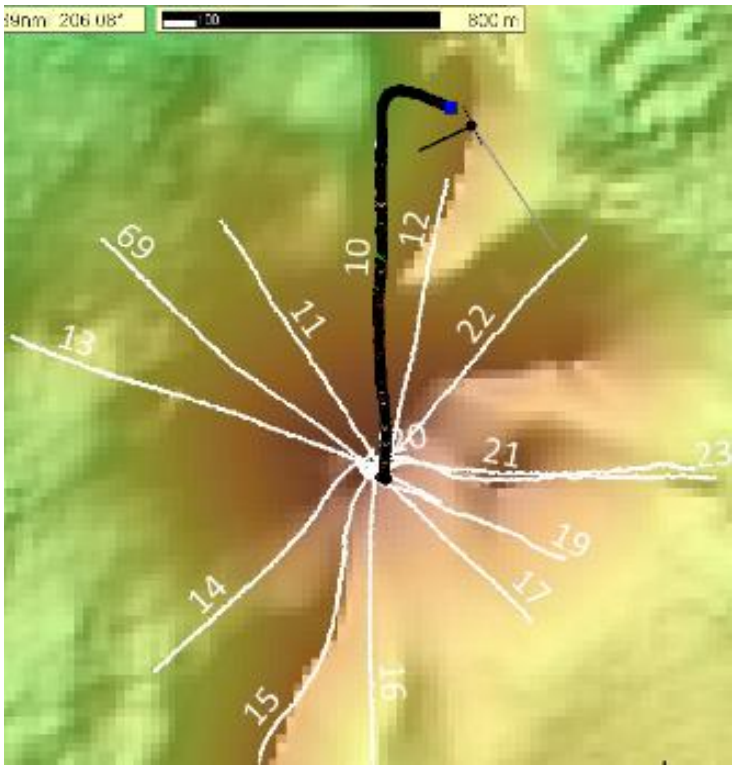
Left: TAN2009_024_091.jpg; ?plexaurid gorgonian fans and glass sponges. Right: hydrocorals, *Trachythela* soft coral and *Farrea* glass sponges on Graveyard Seamount.

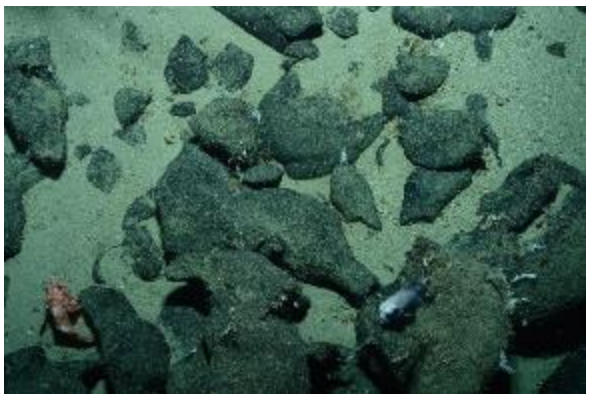
Station 025: Morgue Seamount, N ridge transect

Rerun of TAN1503/10

Start depth: 894 m Finish depth 1211 m

Summit substrate consisted of coral rubble and bedrock. Down slope on the upper flank were some small patches of live scleractinian coral amongst bedrock and rubble areas. Other fauna included stylasterids and sponges but in low numbers. The mid to lower flank substrate had distinctive layered lava rock formations which became fields of boulders and cobbles with few fauna apart from one large anemone. Fish included numerous orange roughy in the summit area with occasional rattails and sharks scattered throughout the transect.





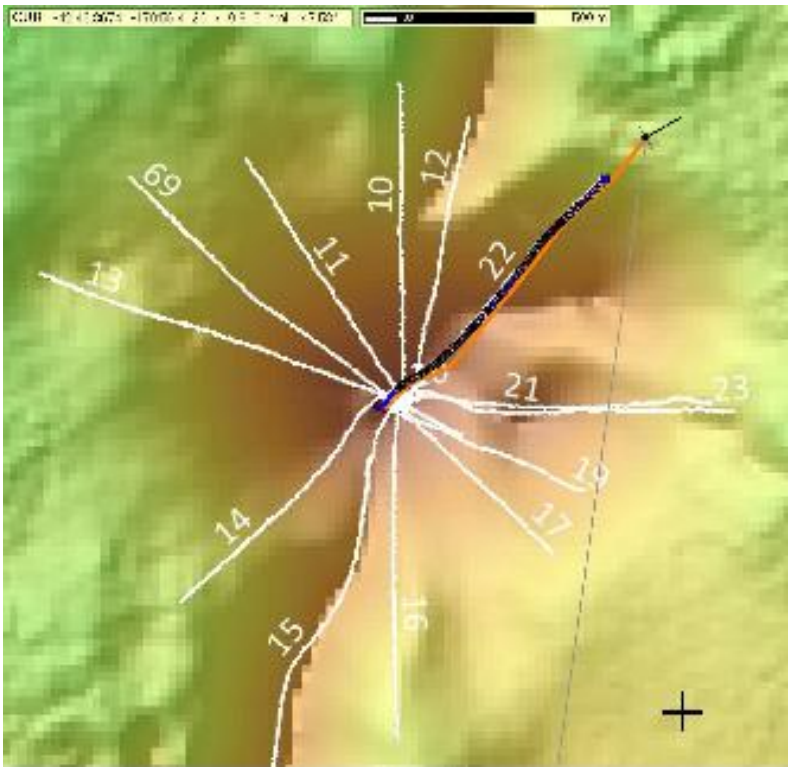
Left: TAN2009_025_022.jpg; deep-sea perch and black spikey oreo. Right: TAN2009_025_080.jpg; cardinal fish on volcanic bedrock with coral rubble on Morgue Seamount.

Station 026: Morgue Seamount, NE transect

Rerun of TAN1503/22

Start depth: 914 m Finish depth 1172 m

On the summit at the start was coral rubble on bedrock, boulders, and sand. There were some patches of intact coral matrix and many orange roughy. Sand, cobbles, and boulders occurred on the upper flank. There was a large patch of live coral on the upper flank, then mixed substrata of bedrock, boulders, and sand with some intact coral. Following the ridge were rocky outcrops, lava, and small clumps of coral. Dense orange roughy occurred at the bottom of the flank with sparse benthic fauna on bedrock, boulders, and cobbles. There were several gorgonians, stylasterids, stalked crinoids, and motile crinoids near the end of the transect on a large rocky outcrop.



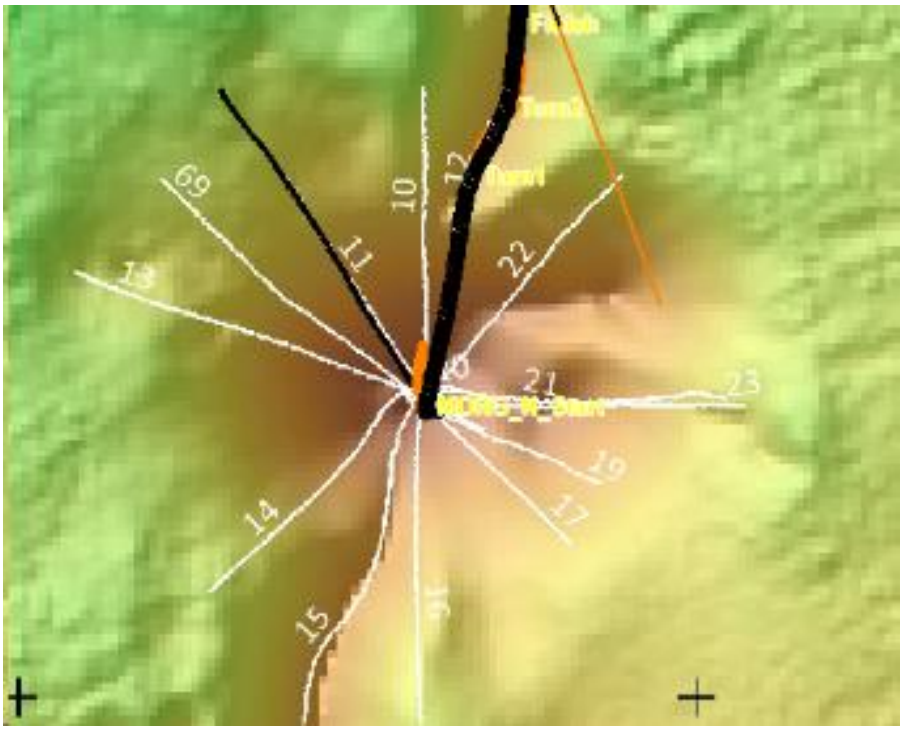
Left: TAN2009_026_073.jpg; patch of live *Madrepora* coral. Right: TAN2009_026_184.jpg; volcanic bedrock with crinoids on lower flank of Morgue Seamount.

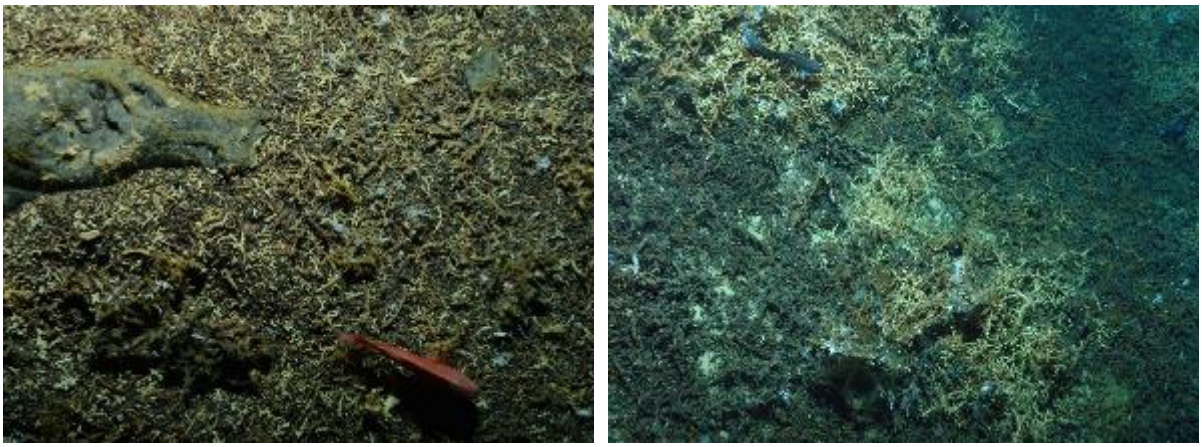
Station 027: Morgue Seamount, NW transect

Repeat of TAN1503/11

Start depth: 897 m Finish depth 1190 m

Coral rubble, sand, rock, and boulders were present from the summit to mid-flank with visible trawl marks and orange roughy along with other fish species. There was some live coral matrix, rubble, sand, and rocky slope starting mid-flank which continued down slope with numerous orange roughy sighted. From 1125 m, there was primarily bedrock and some muddy sediment with several orange roughy as well as some crinoids, brisingids, sharks, eels, and holothurians.





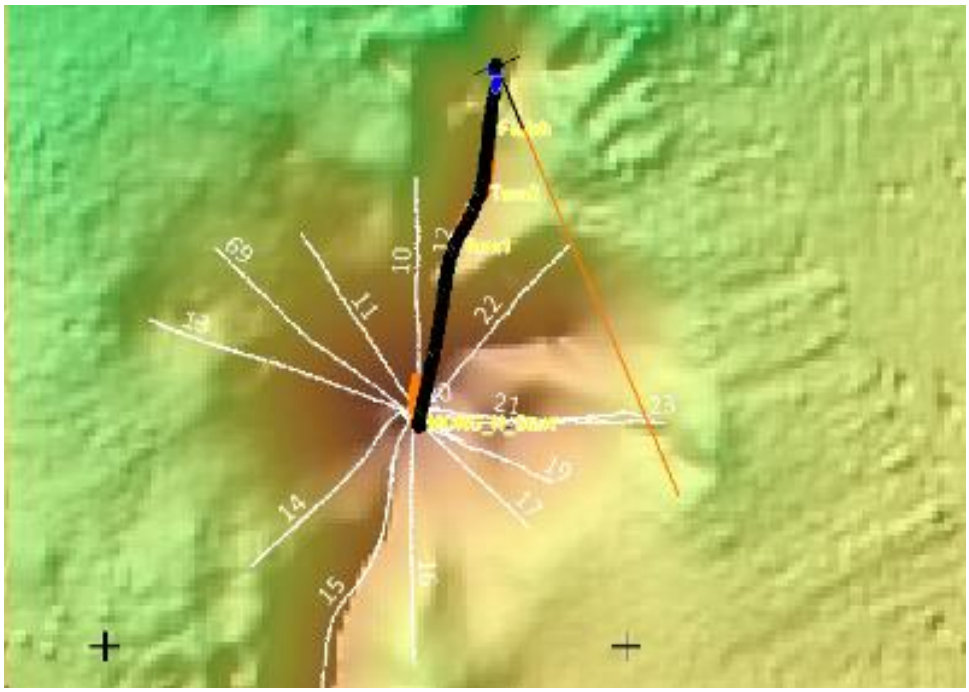
Left: TAN2009_027_010.jpg; coral rubble and orange roughy. Right: TAN2009_027_059.jpg; patches of live *Madrepora* coral with morid cod near peak of Morgue Seamount.

Station 028: Morgue Seamount, NNE ridge transect

Repeat of TAN1503/012, with extension onto follow ridge.

Start depth: 905 m Finish depth 1125 m

The transect started at the summit of Morgue with coral rubble, hosting numerous stylasterids, and occasional small patches of intact live coral. There was extensive bedrock on the northern flank with a patch of several *Leiopathes* at 925 m. The northern ridge peaked at 1070 m, with extensive areas of intact scleractinian (all dead) with numerous crinoids.



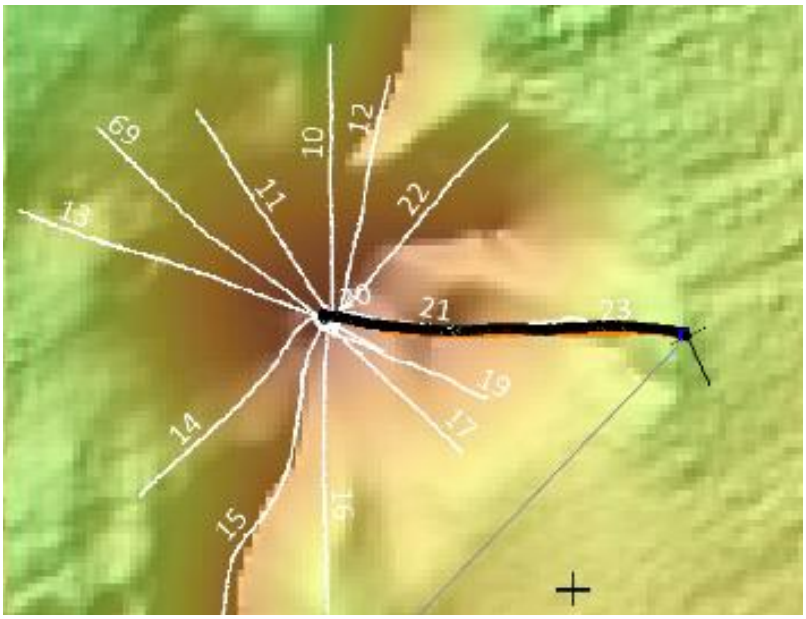
Left: *Leiopathes* black coral, north of peak of Morgue, screengrab at 14:37 mins. Right: TAN2009_028_220.jpg; dense intact but dead coral with crinoids on the lower ridge of Morgue Seamount.

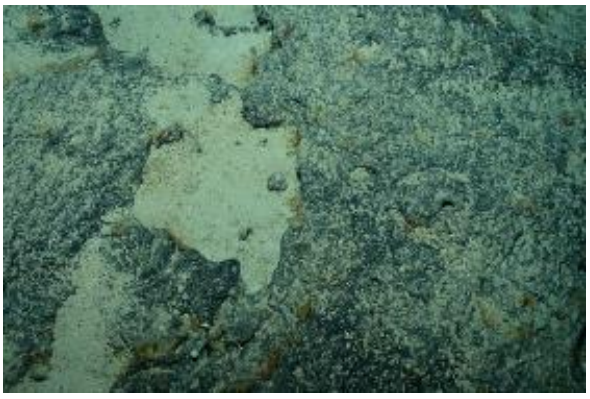
Station 029: Morgue Seamount E transect

Repeat of TAN1503/023

Start depth 899 m Finish depth 1192 m.

The tow started on the peak, with thick coral rubble and some boulders (orange roughy, oreo, cardinal fish, rattails), and abundant stylasterids. Down the eastern flank were trawl marks, coral rubble, some patches of bedrock, and lava boulders in the saddle region. The transect sidled along a secondary cone, striking layers of lava rocks, few fish (oreo, orange roughy) and invertebrates (asteroids, stylasterids). There was an extensive field of live *Solenosmilia* coral around the secondary peak, 962 m down to 975 m along the eastern flank. Large bamboo corals, and a few fish were observed. Coral rubble, bedrock, and mixed soft and rocky substrates occurred to the end, with some *Hyalonema* sponges in soft patches.





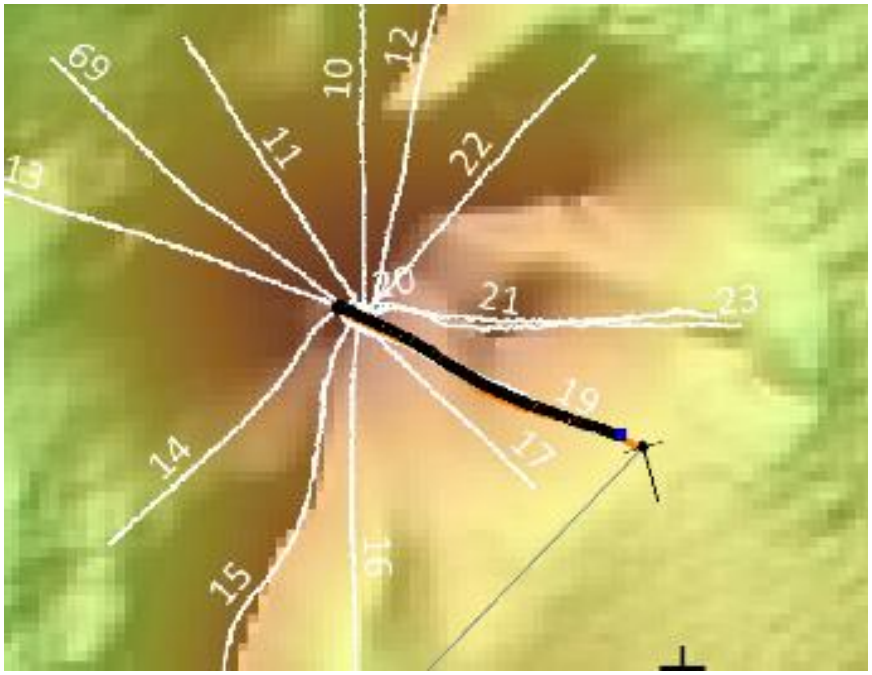
Left: TAN2009_029_125.jpg; live *Solenosmilia* community with large bamboo coral, stylasterids and glass sponges near top of secondary cone. Right: TAN2009_029_163.jpg; exposed volcanic bedrock with small crinoids on flank of Morgue Seamount.

Station 030: Morgue Seamount, ESE transect

Rerun of TAN1503/019.

Start depth 907 m Finish depth: 1085 m.

The transect started slightly on the west side and came over the peak at 895 m. Substrate was coral rubble with some boulders and cobbles. Trawl marks were observed. Stylasterids were relatively abundant in the rubble in patches. From 1000 m depth, bedrock was dominant, with sparse fauna (some echinoids, crinoids). Orange roughy occurred throughout the transect.



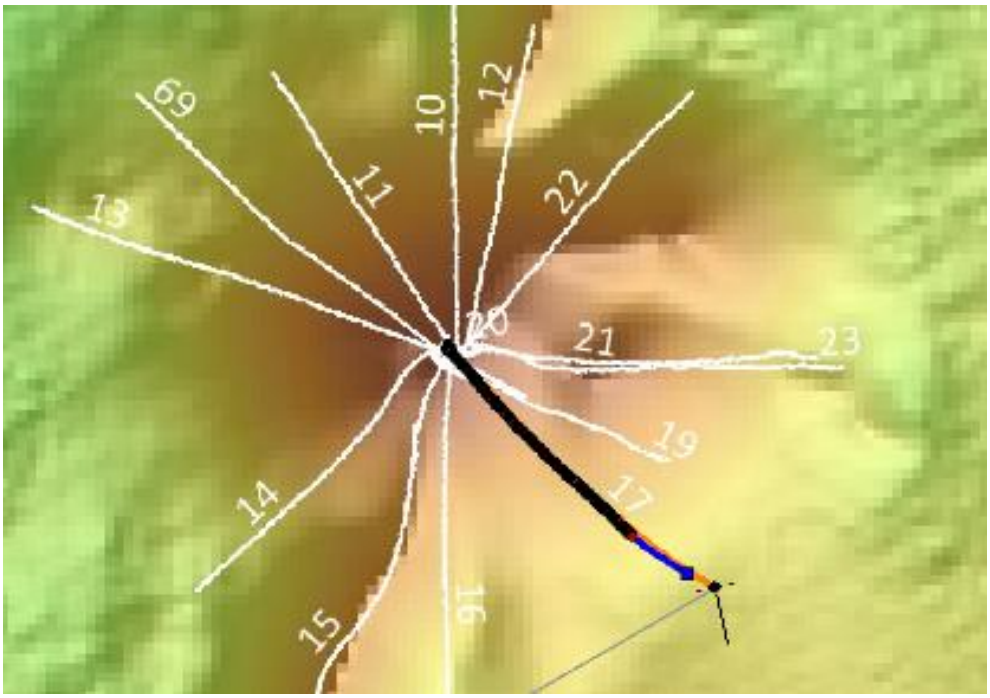
Left: TAN2009_030_ 041.jpg; orange roughy and cardinal fish on coral rubble. Right: TAN2009_030_094; orange roughy on smooth volcanic bedrock on Morgue Seamount.

Station 031. Morgue Seamount, SE transect

Rerun of TAN1503/017

Start depth: 898 m Finish depth: 1147 m

Coral rubble with muddy sediment and cobbles was prevalent from the summit to 964 m depth with trawl marks visible at 941 m and sightings of orange roughy, oreo, rattail, morid cod, and stylasterids on both coral rubble and rock edges. The rest of the transect substrate was composed of bedrock with some muddy sediment and cobbles and orange roughy. Fauna were sparse, including eels, rattails, a ghost shark, asteroid, echinoid, and tam o'shanters.



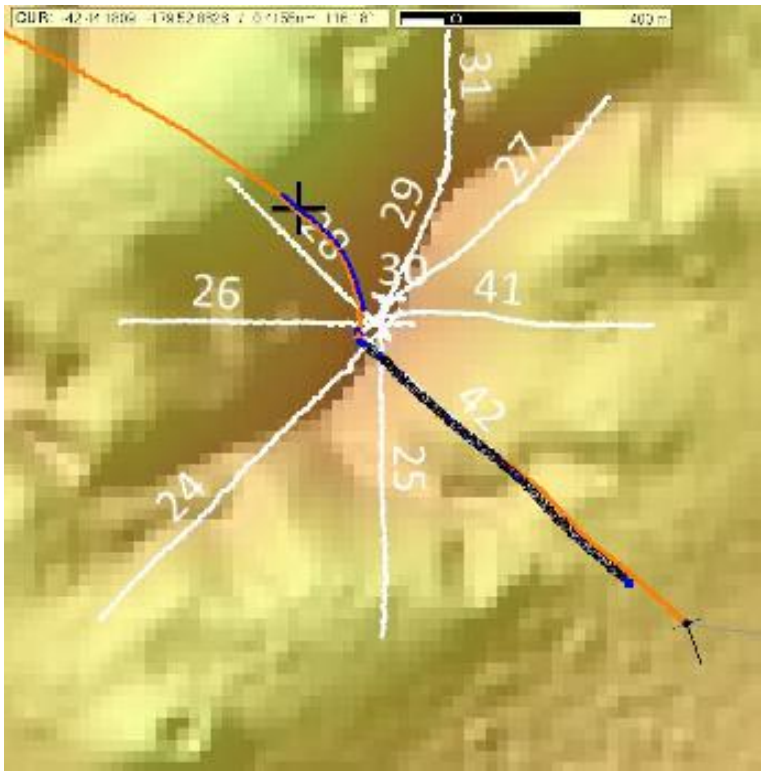
Left: TAN2009_031_009.jpg; orange roughy and stylasterids on coral rubble. Right: TAN2009_031_125.jpg; soft substrate with barnacle plates, pebbles and small hermit crabs towards the base of Morgue Seamount.

Station 032: Gothic seamount, SE transect

Rerun of TAN1503/042

Start depth: 1022 m Finish depth: 1138 m

There was extensive live and intact coral at the summit. A steep drop-off on the southeast flank had more exposed sand and bedrock substrate. By 1050 m depth, corals were restricted to isolated clumps and by 1060 m substrate was predominantly sand, rock, gravel, and pebble substrate with sparse benthic fauna (though crinoids were abundant in some areas) and occasional orange roughy. Muddy sediment, burrows, and tracks dominated the seafloor at the bottom of the flank, with dense aggregations of rattails, occasional echinoids (tam o' shanters), and some shrimp.



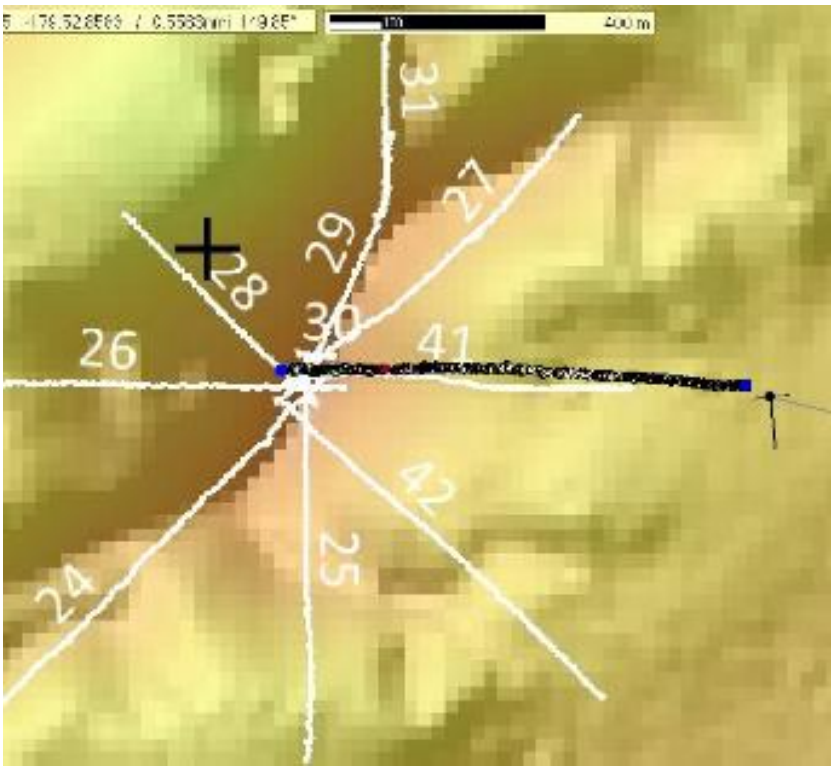
Left: TAN2009_032_013.jpg; live *Solenosmilia* coral and orange roughy near top of ridge. Right: TAN2009_032_062.jpg; diverse invertebrates (including hard coral, stalked crinoid, anemone, gastropod) on lava rocks on upper flank of Gothic Seamount.

Station 033: Gothic seamount, E transect

Rerun of TAN1503/041

Start depth: 1035 m Finish depth: 1152 m

Extensive areas of live *Solenosmilia* scleractinian coral were present at the summit and down the upper flanks. Associated fauna included stylasterids, primnoids, hexactinellid sponges, and crinoids. Fish included a giant lepidion and some orange roughy. Further downslope live intact coral thickets reduced in their abundance as the substrate transitioned to sand areas with coral rubble. Towards the end of the transect there were extensive areas of muddy sediment with burrows. Tam o'shanters, rattails, and *Enypniastes* (swimming holothurians) were very common in this region.



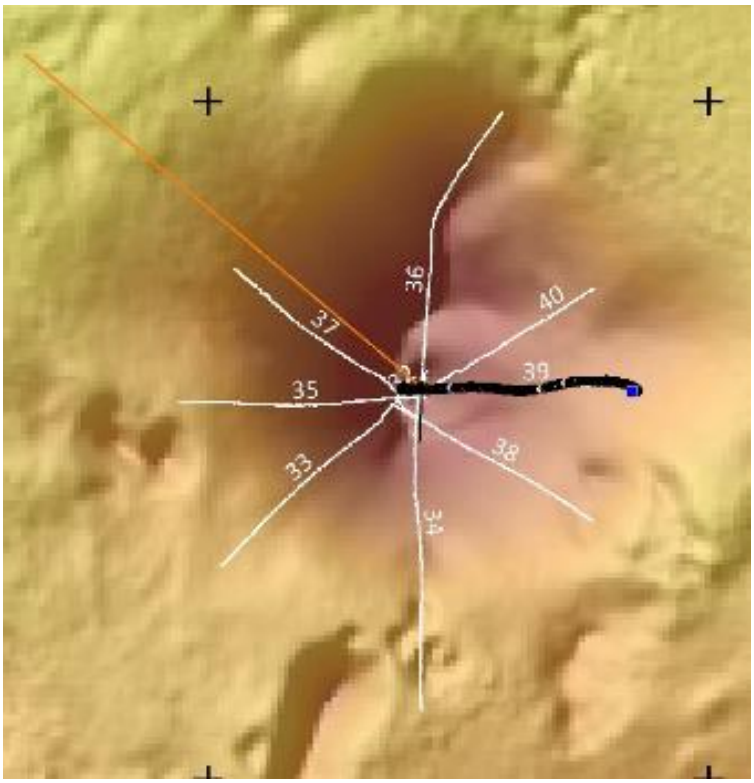
Left: TAN2009_033_004.jpg; dense *Solenosmilia* coral. Right: TAN2009_033_127; soft bottom with shrimp, tam o'shanter and *Coryphaenoides subserrulatus* rattails at the base of Gothic Seamount.

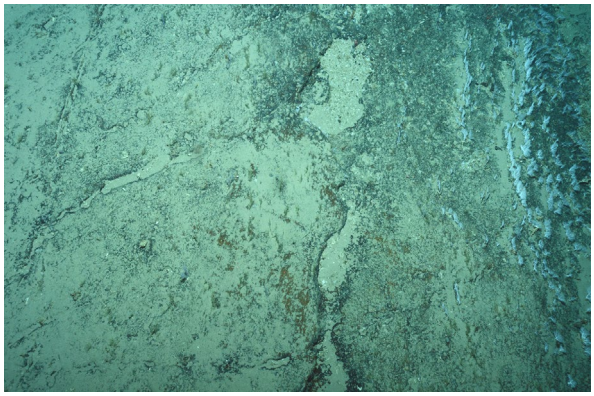
Station 034: Graveyard Seamount, E transect

Rerun of TAN1503/039

Start depth: 770 m Finish depth: 1002 m

The transect began at the rim of the crater, where coral rubble and bedrock were abundant with some stylasterids and sponges. There was generally sparse fauna throughout the transect, apart from a rocky outcrop part way down the flank with dense demosponges, crinoids, and stylasterids. Two antipatharians (*Leiopathes* and ?*Parantipathes*) and several gorgonians were also observed around this point. Coming further down the flank, the substrate was mixed bedrock, muddy sediment, cobbles, and pebbles. Fauna seen included some echinoids and bony fish. The transect was cut short due to DTIS issues (video appeared out of focus) and the weather deteriorating.





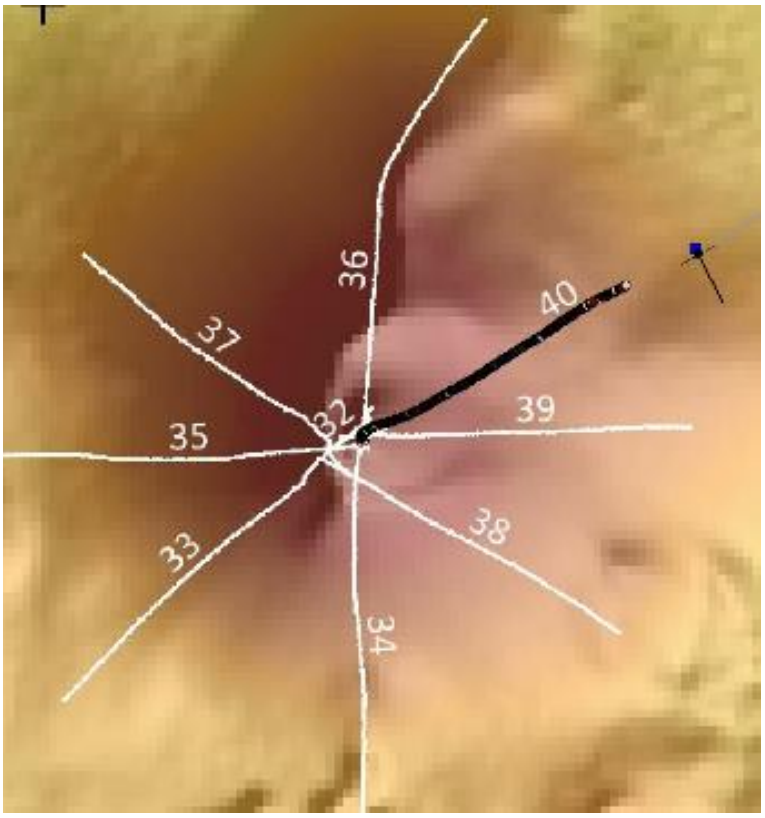
Left: TAN2009_034_18; black coral (?*Parantipathes*), stylasterids and solitary cup corals at the beginning of the transect. Right: TAN2009_034_141.jpg; a cluster of dense stylasterids on the flank of Graveyard Seamount.

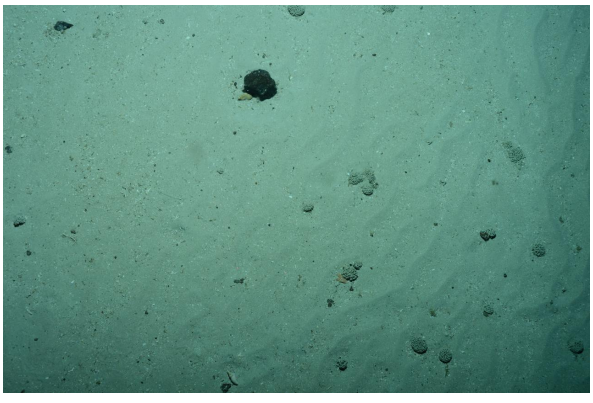
Station 035: Graveyard seamount, NE transect

Rerun of TAN1503/040

Start depth: 769 m Finish depth: 1010 m

Coral rubble and numerous trawl tracks were present at the summit and on the upper slopes. Down slope isolated bedrock and boulders were colonised by stylasterids, sponges, gorgonians, and a few black corals. Substrate was mostly bedrock on the slope with very sparse fauna levelling out to muddy sediment but with massive bedrock outcrops at the outer caldera rim. Current-rippled soft sediments scattered with pebbles were evident beyond the rim and occasional rock and boulder outcrops with minimal associated fauna.





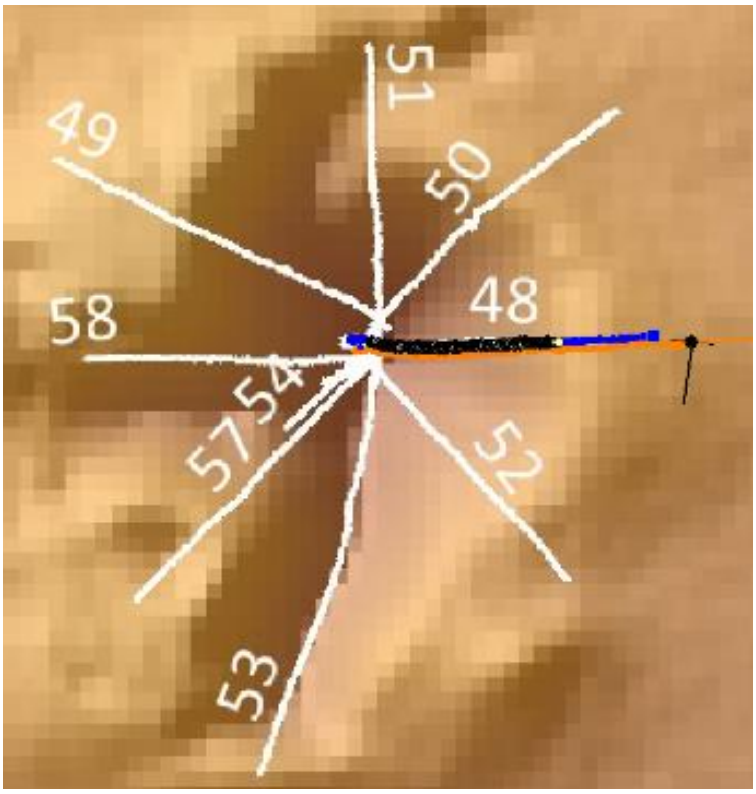
Left: TAN2009_035_037.jpg; trawl marks at beginning of transect. Right: TAN2009_035_138.jpg; ripples and xenophyophore foraminiferans on the flank of Graveyard seamount.

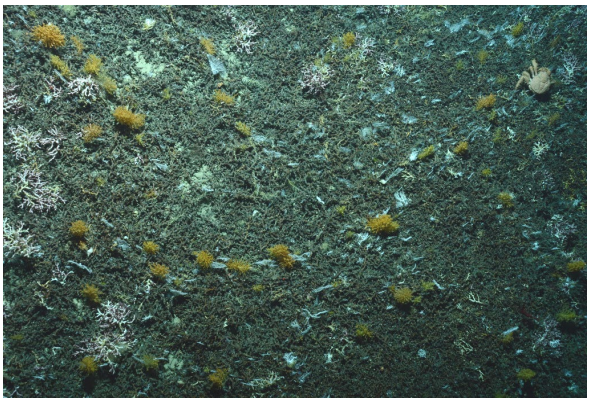
Station 036: Diabolical seamount, E transect

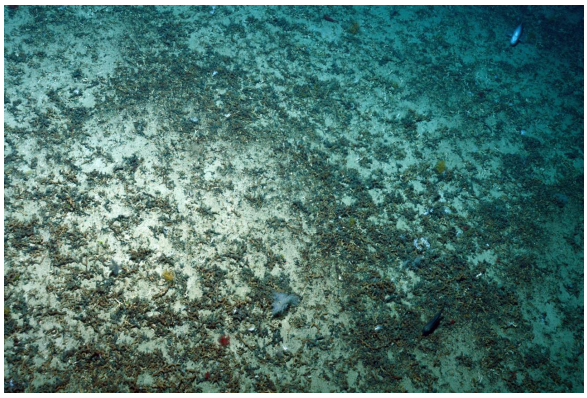
Rerun of TAN1503/048

Start depth: 915 m Finish depth: 1049 m

The start of the transect was slightly west of the peak. There was coral rubble substrate with abundant *Tokoprymno* and stylasterids, and some trawl marks. Intact live purple *Enallopsammia* coral (as on Stn 021) occurred just eastward of the peak at ~900 m. Coral rubble, *Tokoprymno*, stylasterids, and a few primnoid 'rasta' coral and *Anthomastus* were observed downslope. There was an outcrop of bedrock at 972 m, but the rest of the slope was muddy with progressively thinning coral rubble. Rattails were abundant at the end of the transect.







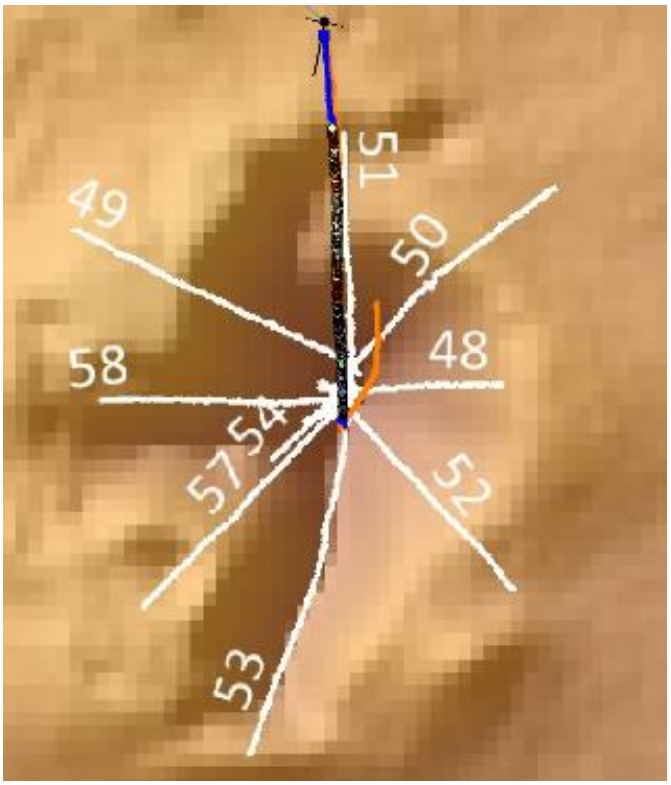
Left: TAN2009_036_012.jpg; Purple *Enallopsammia* coral and colonies of *Tokoprymno* gorgonian among coral rubble. Note the *Paralomis* king crab in the top right. Right: TAN2009_036_034.jpg; Small gorgonian, stylasterid and *Anthomastus* soft corals among coral rubble along the flank of Diabolical Seamount.

Station 037: Diabolical seamount, N transect

Rerun of TAN1503/051

Start depth: 925 m Finish depth: 1057 m

Patches of intact scleractinian coral and coral rubble were prominent from the ridge of the summit down to 915 m with sightings of *Tokoprymno*, stylasterids, *Anthomastus*, gorgonians, brisingids, sharks, and shrimp. Mixtures of bedrock, coral rubble, and muddy sediment occurred down the mid-flank to about 1023 m with several eel sighted along with a shark, morid cod, and hexactinellid sponge. The end of the transect from 1023 m to 1050 m was dominated by alternating patches of muddy sediment and bedrock with rattails, *Enypniastes*, tam o'shanter urchins, asteroids, gastropod, and hexactinellid sponge.



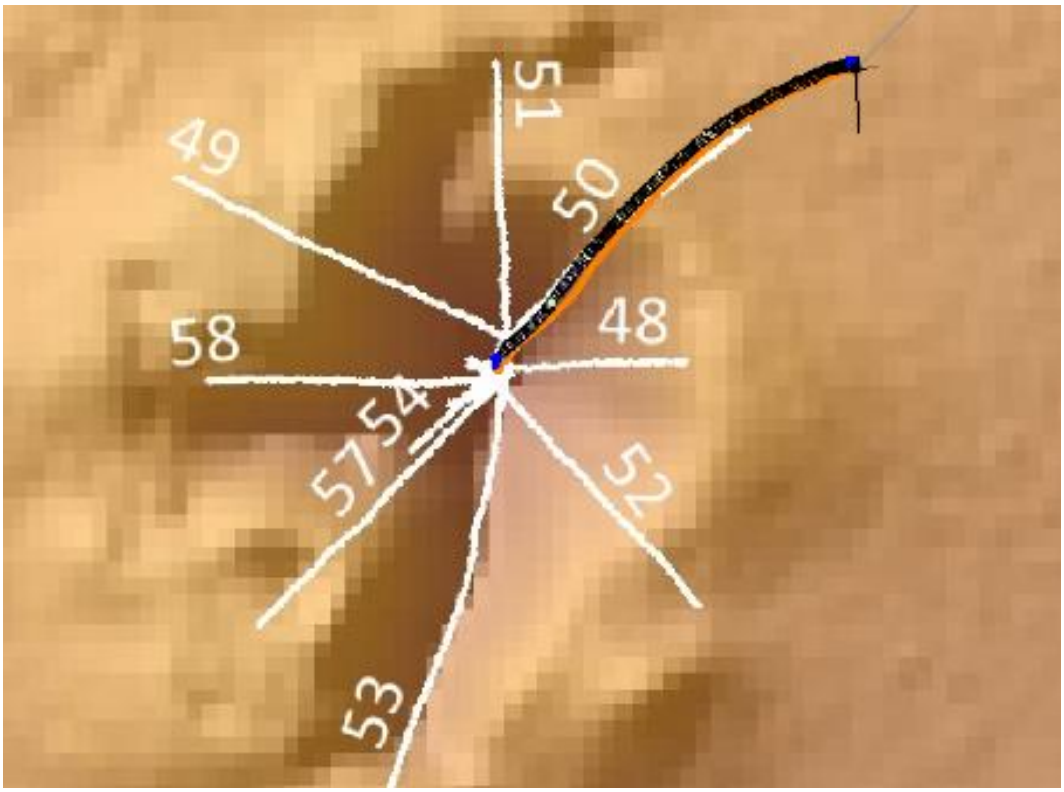
Left: TAN2009_037_007.jpg; diverse corals around live *Madrepora* hard coral (*Tokoprymno* gorgonians, zoanthids and hydrocorals) on peak. Right: TAN2009_037_138.jpg; transition from lava field to soft plain at the base of Diabolical Seamount.

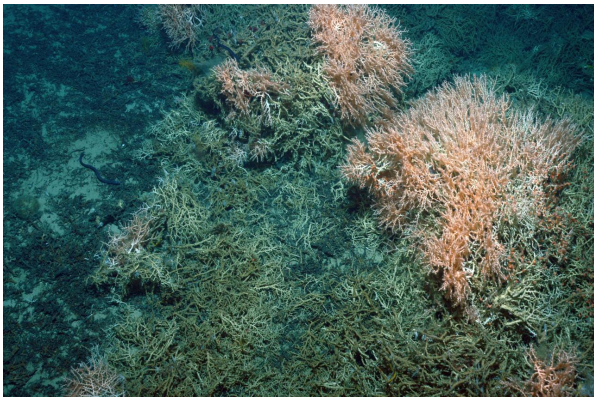
Station 038: Diabolical Seamount, NE transect

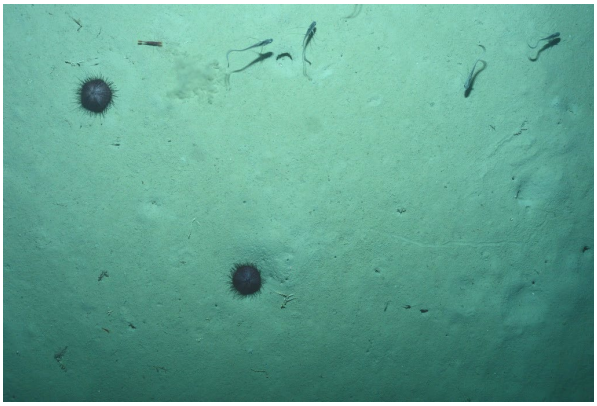
Rerun of TAN1503/50

Start depth: 908 m Finish depth 1010 m

The tow started close to the summit with a substrate of coral rubble with stylasterids and *Tokoprymno*. Intact live *Madrepora* clumps occurred from 914 m, with a spectacular reef at 947 m with dense live matrix, as well as isidid corals. Substrate after that was coral rubble, with scattered clumps of intact coral. There were occasional trawl marks, and a seamount sled track at 1000 m. A band of bedrock gave way to soft sediment, with tam-o-shanters, rings of burrows, and abundant rattails.







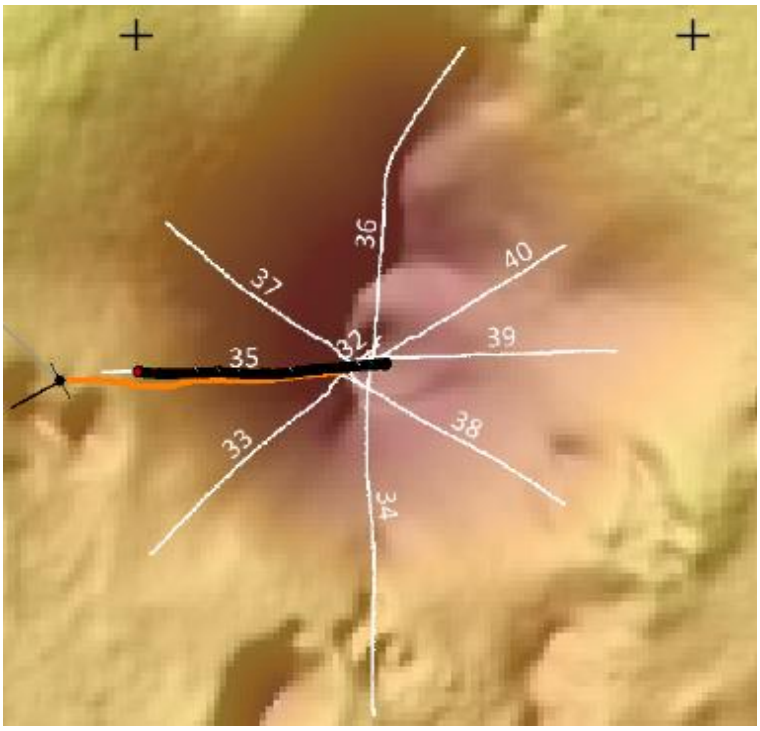
Left: TAN2009_038_039.jpg; narrow band of intact live *Madrepora* coral at 914 m. Right: TAN2009_038_092.jpg; tam o'shanter urchins, shrimp and four-rayed rattails.

Station 039: Graveyard Seamount, W transect

Rerun of TAN1503/35

Start depth: 758m Finish depth 1083m

The tow started in the crater, with hard bedrock, some rubble, and scattered hexactinellid sponges, and occasional morid cods. There was a transition to soft sediments with coral rubble once out of the crater onto the flank. There were many trawl marks, scattered small hexactinellid sponges and very few other invertebrates (*Anthomastus*, anemones, stylasterids). From ~900 m substrate was mostly hard bedrock with a thin veneer of soft sediment, with stylasterids to ~930 m. There were few fish. (Note the map shows the tow being short, but the mapping of DTIS didn't show across the 180 line)



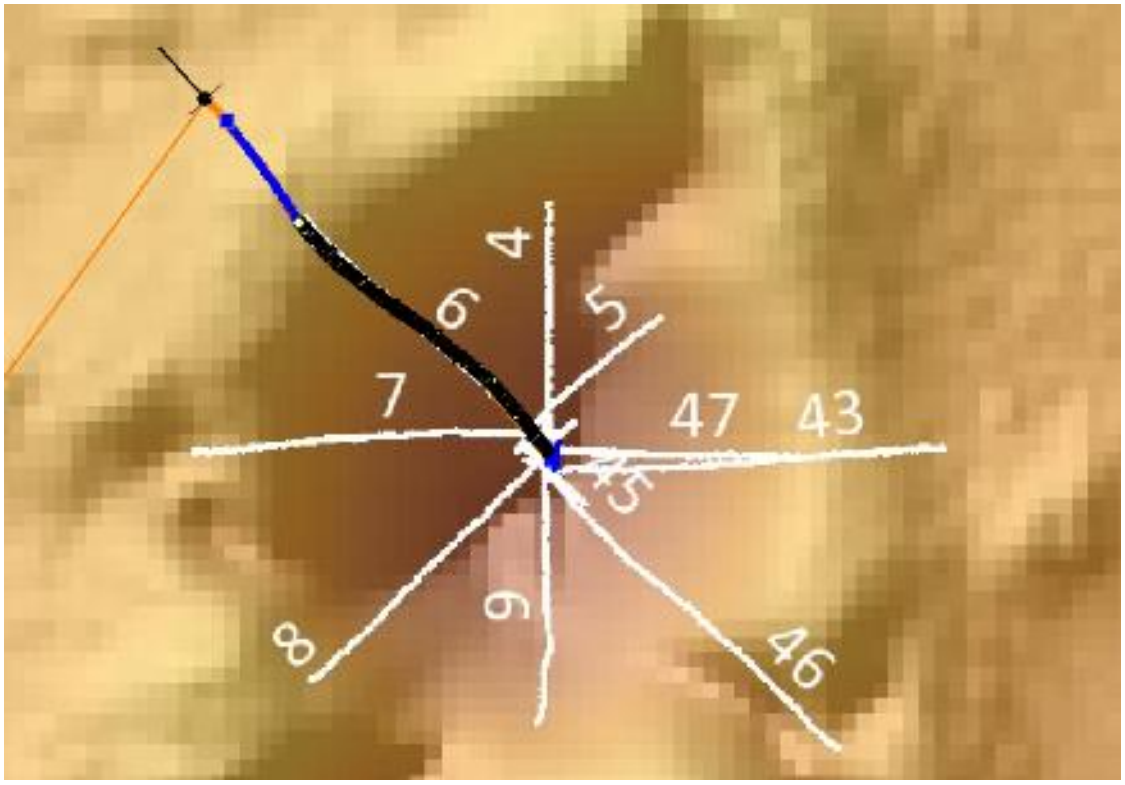
Left: TAN2009_039_025.jpg; a piece of rope among *Madrepora* coral rubble, glass sponges, and gastropods at the beginning of the transect. Right: TAN2009_039_076.jpg; trawl marks on the flank of Graveyard Seamount.

Station 040: Zombie Seamount NW transect

Rerun of TAN1503/006

Start depth 908 m Finish depth 1100 m

The tow started just over the summit, with substrate comprising coral rubble, clearly outlining numerous trawl marks (door and bobbin grooves). This continued down to 950 m, with occasional orange roughy and asteroids. Bedrock and cobbles dominated from 1000 m out to 1170 m, with sparse fauna. Soft sediment to the end of the tow at 1100 m hosted rattails.



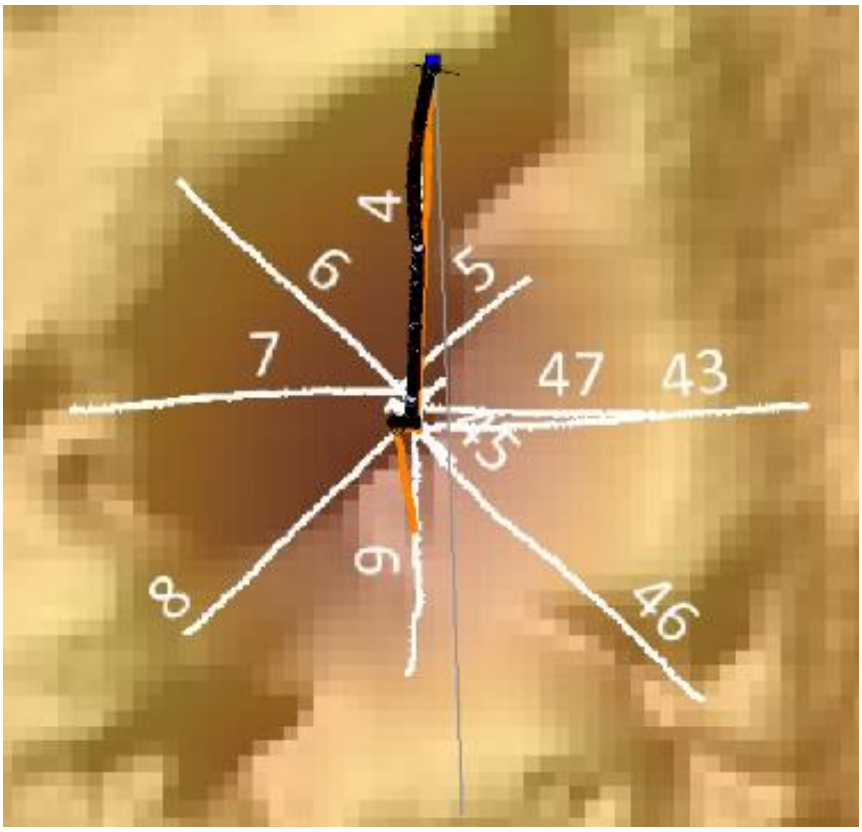
Left: TAN2009_040_006.jpg; small colony of *Trachythela* purple soft coral growing among coral rubble shortly after start of transect. Right: TAN2009_040_106.jpg; four-rayed rattail, brittle stars, and hydroids on the lower flank of Zombie Seamount.

Station 041: Zombie Seamount N transect

Rerun of TAN1503/004

Start depth 918 m Finish depth 1023m

From the summit down to 995 m on the northern flank, the substrate was primarily coral rubble with some muddy sediment. A number of fish (oreo, orange roughy, morid cod, rattail, cardinal fish, shark), *Trachythela*, tam o'shanters, and trawl marks were observed. The rest of the transect was bedrock with a veneer or small pockets of muddy sediment, and some coral rubble along the mid-flank. Rattails were frequent with the occasional morid cod, crinoids, echinoids, tam o'shanters, and hexactinellid sponges.



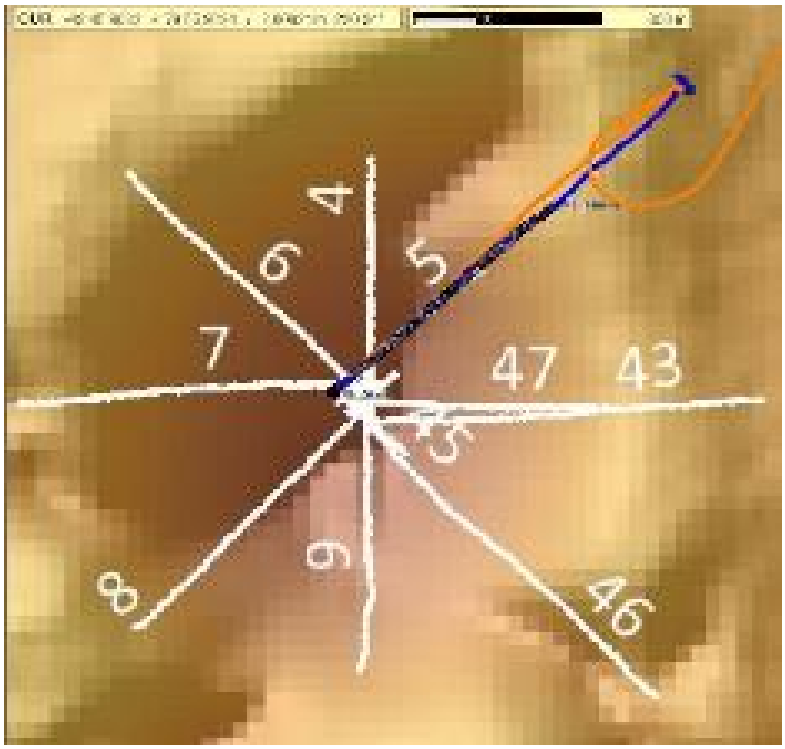
Left: TAN2009_041_081.jpg; small patch of diverse invertebrates, including live yellow *Enallopsammia* coral, *Tokoprymno* gorgonian, *Anthomastus* soft coral, and *Farrea* glass sponges. Right: TAN2009_041_107.jpg; smooth lava bedrock with stalked crinoid, gorgonian coral fan, and starfish on Zombie Seamount.

Station 042: Zombie Seamount NE transect

Rerun of TAN1503/005

Start depth 945 m Finish depth 1085m

The summit area was characterised by dense coral rubble with some alcyonaceans and live scleractinian coral (?*Enallopsammia*). Some trawl wire was also observed. Close to the outer edge of the summit, beginning down the slope, there were large patches of live matrix with brisingids, sponges, and crinoid associates. Lower down the flank, the substrate became a mix of muddy sediment, sand, cobble, and pebble with sparse benthic fauna. Many swimming holothurians, rattails, and several orange roughy were also observed.



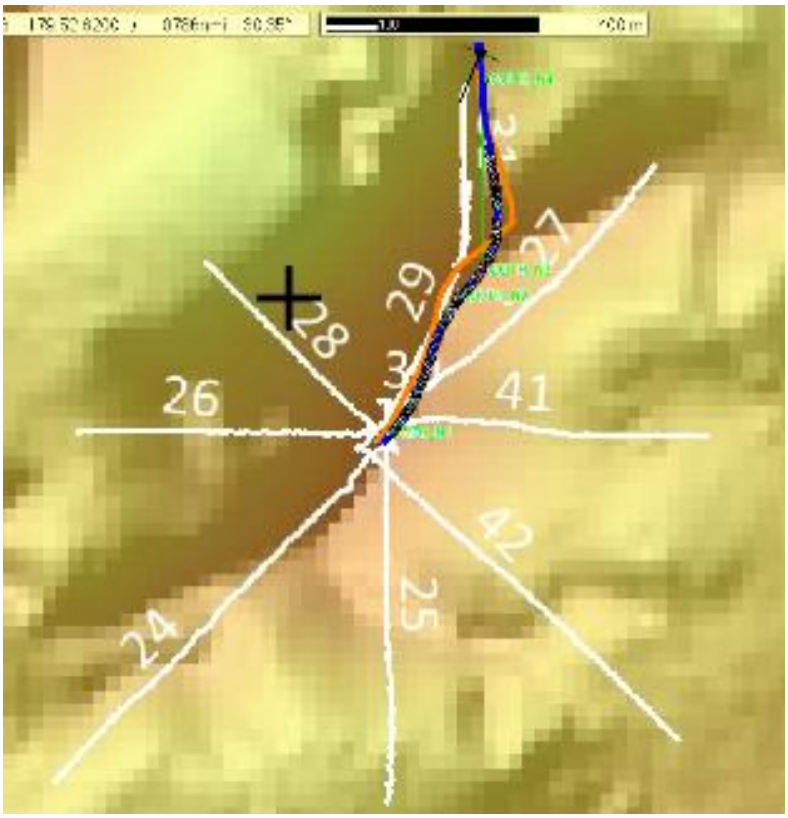
Left: TAN2009_042_004.jpg; coral rubble with small colonies of *Narella* primnoid coral and purple *Trachythela* soft coral. Right: TAN2009_042_065.jpg; some live *Madrepora* coral among dead intact coral near top of Zombie Seamount.

Station 043: Gothic Seamount N transect

Rerun of TAN1503/29 & 31

Start depth: 1040 m Finish depth: 1114 m

Extensive areas of intact scleractinian coral *Solenosmilia variabilis* were observed at the summit and along the ridge. A diverse associated fauna included primnoids, isidids, brisingids, *Anthomatus*, stylasterids, crinoids, and sponges. Fish included orange roughy, oreos, rattails, and sharks. Along the ridge there was a break in the coral distribution where barnacle plates covered a sand substate amongst bedrock and boulders. It reverted back to bedrock and intact corals towards the end of the transect where the DTIS caught on an overhang.



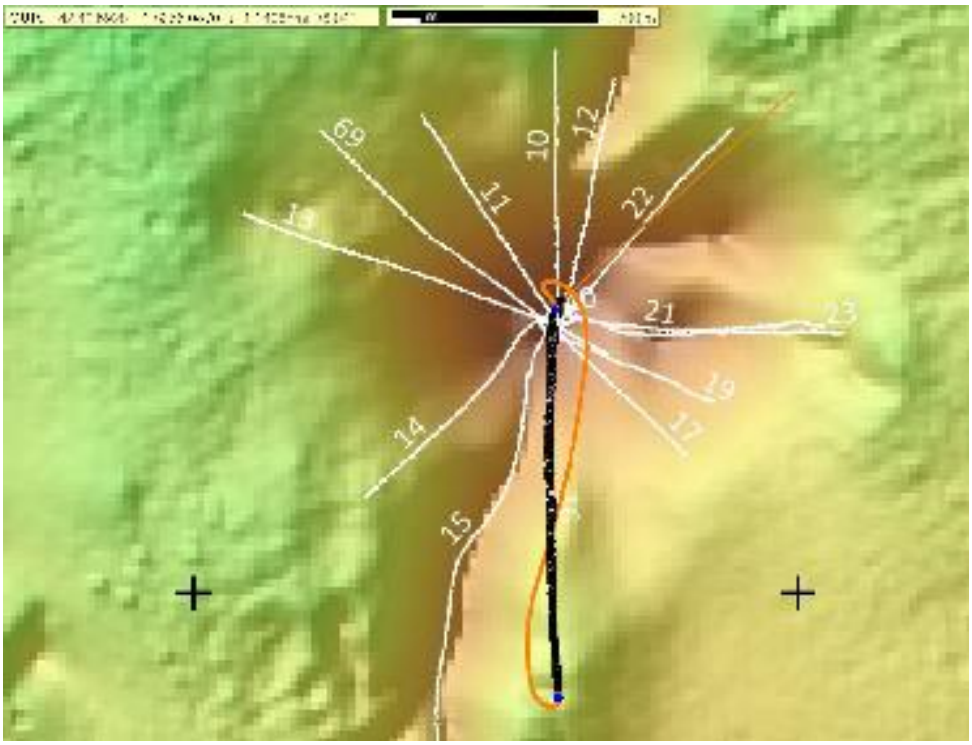
Left: TAN2009_043_016.jpg; Right: TAN2009_043_120.jpg; live *Solenosmilia* coral with associated invertebrate fauna (*Tokoprymno* gorgonian, stylasterids, *Anthomastus* soft coral and crinoids) along the ridge of Gothic Seamount.

Station 044: Gothic Seamount NW transect

Rerun of TAN1503/16

Start depth: 917 m Finish depth: 1200 m

The beginning of the transect was dominated by coral rubble, boulders, and cobbles, with many orange roughy and several oreos. Soft sediment and coral rubble occurred on the upper flank with increasing exposed bedrock as the transect progressed down the flank. Several trawl marks were noted, and trawl wire was seen at 990–1000 m. Barnacle plates were abundant from 1060 m, then exposed outcrop from 1070 m with coral rubble. Several black corals and soft corals were noted on the larger boulders. There was sparse benthic fauna towards the end of transect, but abundant orange roughy and rattails.

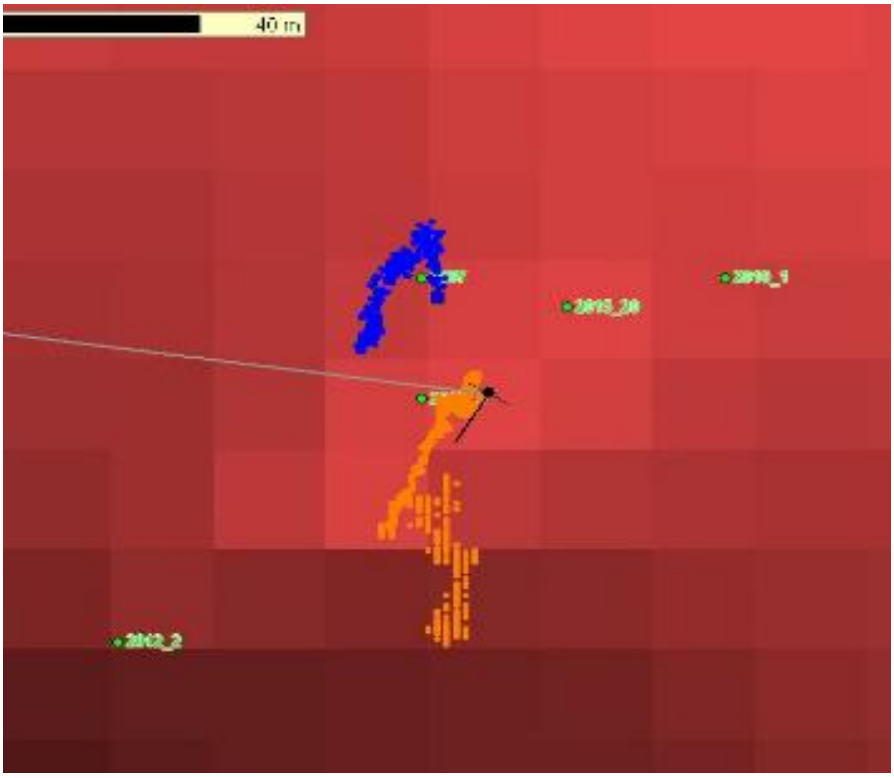


Left: TAN2009_044_035.jpg; orange roughy on coral rubble. Right: TAN2009_044_060.jpg; trawl warp near the top of Gothic Seamount.

Station 045: Morgue Seamount – mooring search

Start depth: 911 m Finish depth: 900 m

The first target was mooring '2007'. The search pattern moved slowly northwards and then southwest. After 44 minutes the ship moved to the 2010_2 mooring and searched for about 25 minutes before running north again to the 2007 position and hauling after 1 hr 12 minutes.

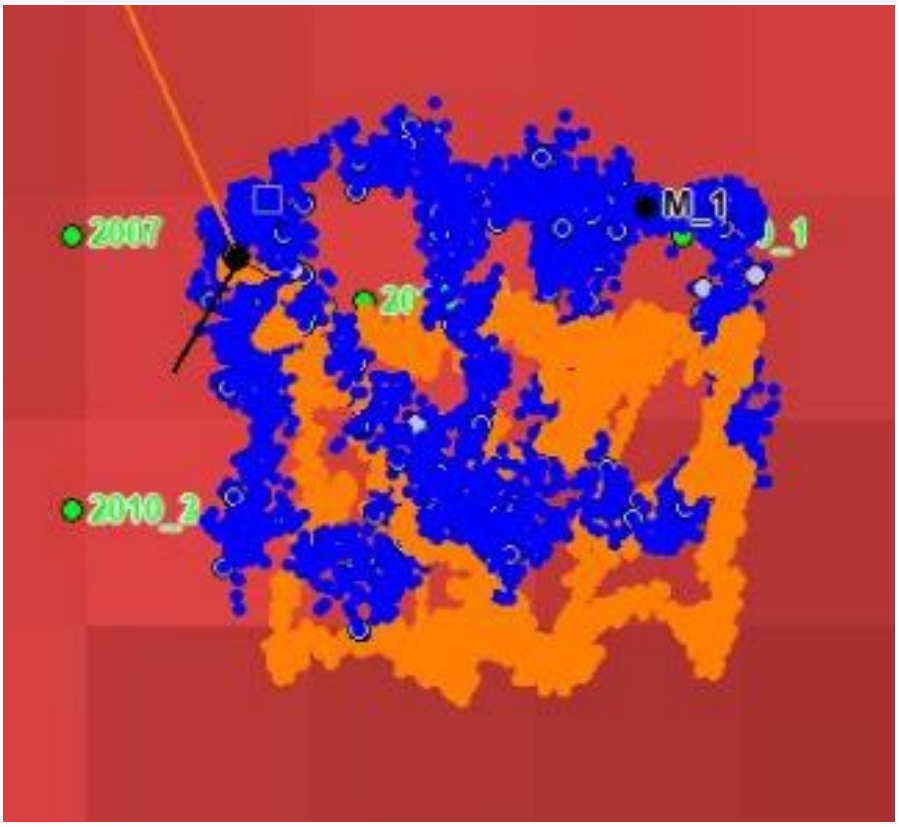


Plot of DTIS position (blue dots, first part of tow; orange dots second part of tow).

Station 046: Morgue Seamount – mooring search

Start depth: 895 m Finish depth: 885 m

This tow searched for the wagon-wheel mooring weight from TAN1503_020. A box pattern search with 10 m movements was conducted. The 2010/1 wheel was located at 42° 42.999' S, 179° 57.55' W. There were no obvious signs of faunal settlement. Tow duration was 2.5 hours, hauled as battery running low.



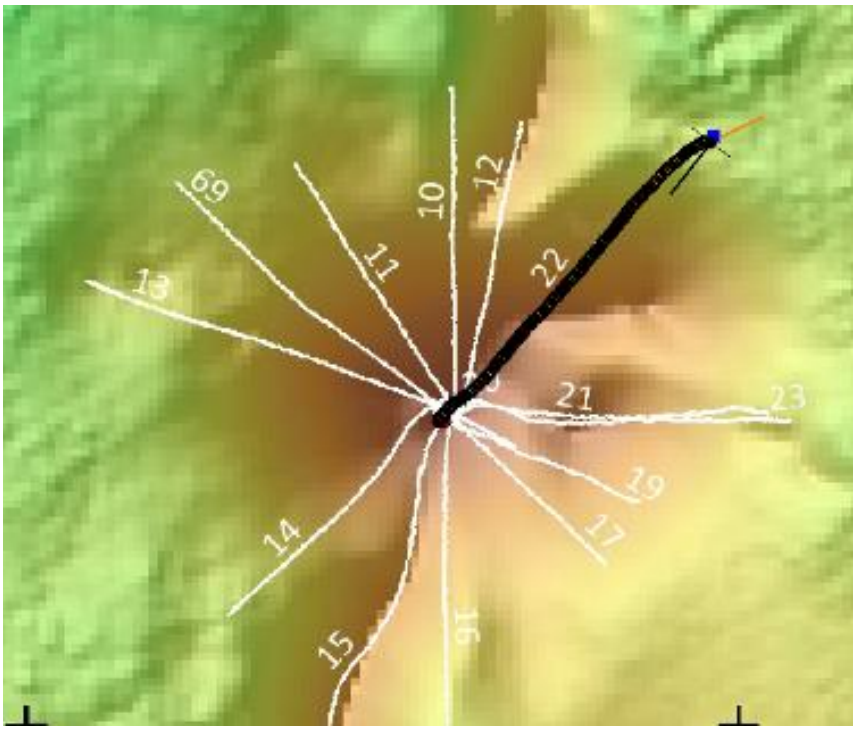
Plot of DTIS position during the tow (blue dots) and ship position (orange dots).

TAN2009_046_468.jpg; 2010/01 wheel (settlement plates lost) located on Morgue Seamount.

Station 047: Morgue Seamount NE transect

Start depth: 896 m Finish depth: 1146 m

The tow started below the peak to the southwest, with coral rubble above which were abundant orange roughy, cardinal fish, and oreos. The rest of the transect was dominated by fractured and intact bedrock with coral rubble most of the way. Stylasterids occurred along the margins of rocks, with a large *Leiopathes*. There were no live corals observed, and only a few intact dead coral clumps. Scattered fish occurred down the ridge (orange roughy, rattails), with some stalked crinoids and stylasterids on volcanic rocks through to the end of the transect.



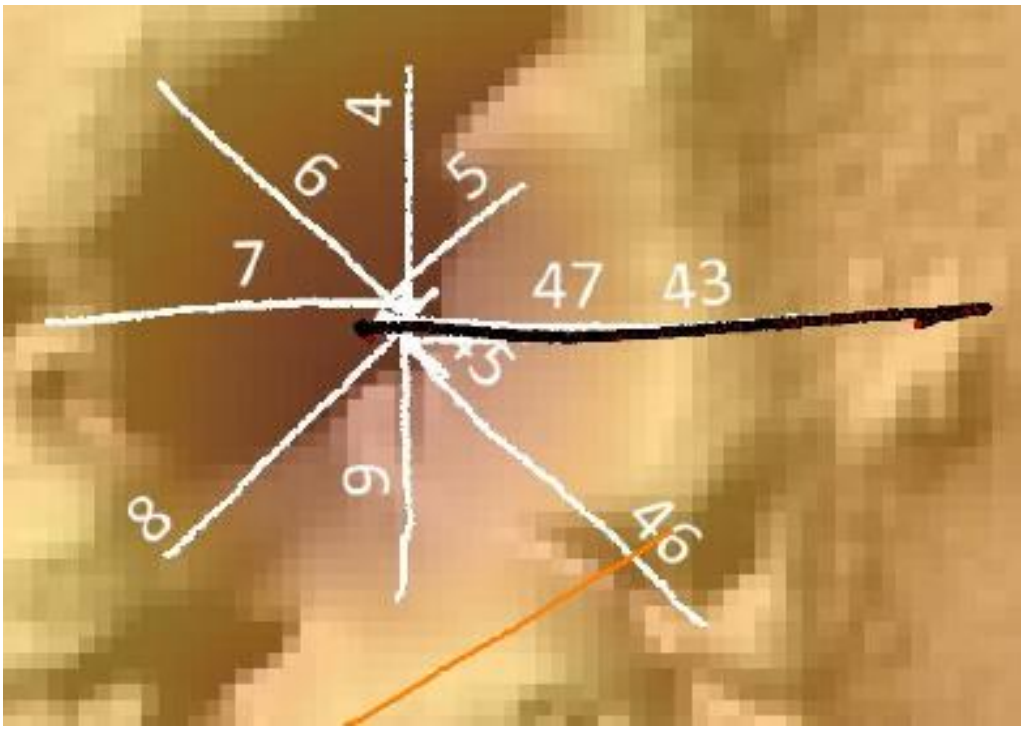
Left: TAN2009_047_13.jpg; orange roughy on volcanic bedrock overlain by coral rubble. Right: TAN2009_047_089.jpg; orange roughy on smooth volcanic substrates on Morgue Seamount.

Station 048: Zombie Seamount E transect

Re-run of TAN1503_43

Start depth: 897 m Finish depth: 1059 m

The transect started just below the summit ridge, and initially the tow came upslope. Substrate consisted of coral rubble and small patches of dead intact coral, with one small patch of live coral. Progressing down the slope were small gorgonians and *Anthomastus,* a few orange roughy and cardinal fish. Bedrock dominated at depths >990m, with soft sediment beyond about 1050 m with burrows, and cobbles in the moat region. There was an abundance of rattails and *Enypniastes eximia* towards the end of the transect.



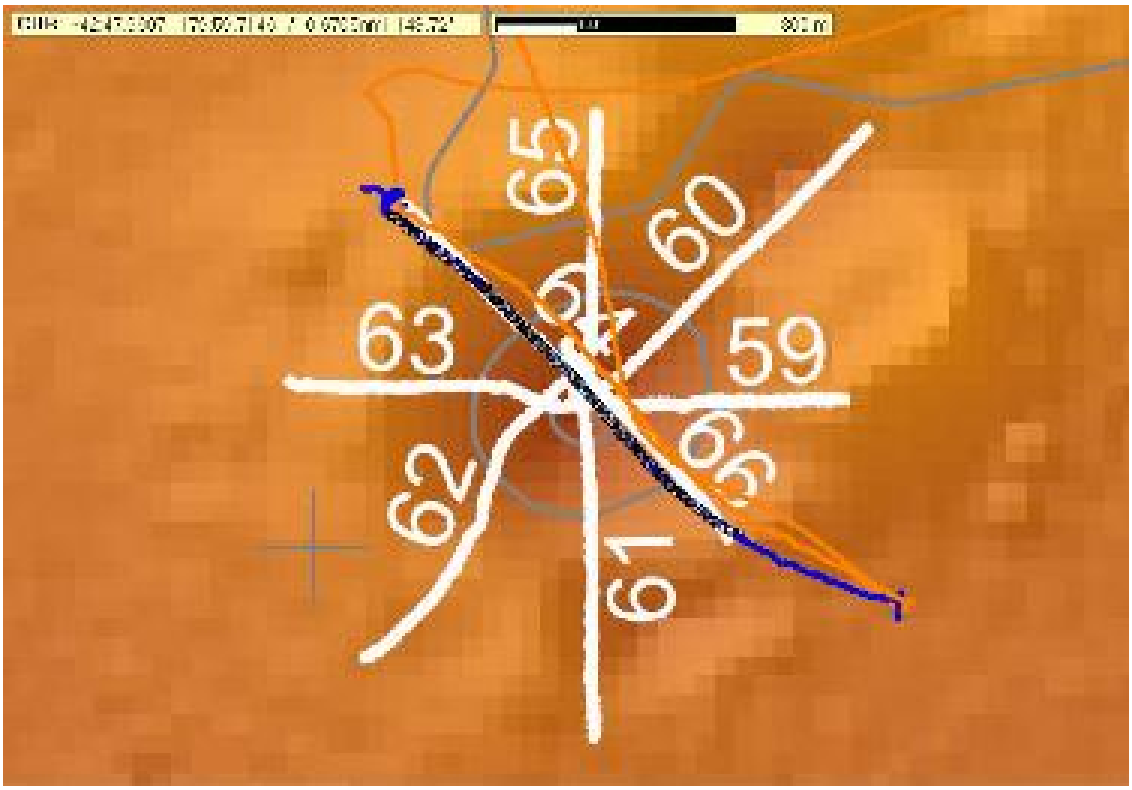
Left: TAN2009_048_074.jpg; small stylasterid hydrocoral on volcanic bedrock. Right: TAN2009_048_151.jpg; high densities of *Enypniastes eximia* were observed towards the end of the transect on Zombie Seamount.

Station 049: Ghoul Seamount NW to SE transect

Re-run of TAN1503_64 & 66

Start depth: 1046 m Finish depth: 1020 m

Muddy sediment, burrows, coral rubble, and some intact coral occurred on the base of the northwest sector. Bedrock increased coming up the hill and towards the peak. On the mid-upper flank and summit there were dense patches of intact live scleractinian coral. Brisingids, *Anthomastus*, crinoids, hexactinellid sponges and demosponges, echinoids, and asteroids were seen in association with the live coral. On the southeastern side of the summit substrate became a mix of cobbles, muddy sediment, pebbles, burrows, and tracks. There were many rattails, *Enypniastes*, and some echinoids towards the bottom of the southeast flank.



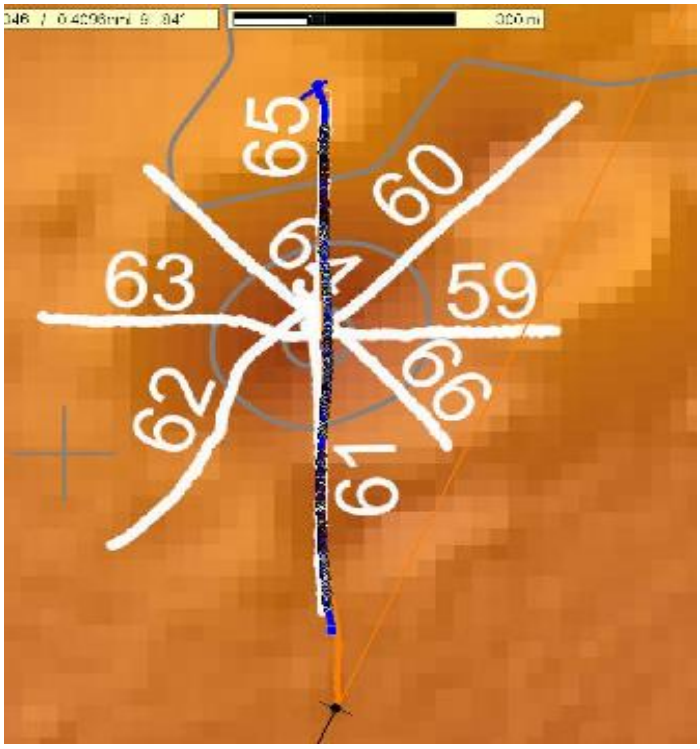
Left: TAN2009_049_086.jpg; brisingid starfish on live *Solenosmilia* coral. Right: TAN2009_049_031.jpg; ring of burrows in soft mud around Ghoul Seamount.

Station 050: Ghoul Seamount N to S transect

Re-run of TAN1503_65 & 61

Start depth: 1041 m Finish depth: 1051 m

This transect started in the north at 1060 m on muddy sediment with abundant rattails and swimming holothurians. From the base of the knoll there were patches of bedrock amongst mud and sand with scattered coral rubble and small intact clumps of coral. From 980 m to the summit at 923 m there were high densities of live scleractinian coral with brisingids, primnoids, *Anthomastus* soft corals, stylasterids, and sponges. From the summit to the south side there was less scleractinian cover than the northern approaches. Sand and coral rubble became more prevalent at 930 m down towards the base with bedrock and soft sediments. Limited invertebrate fauna was observed in this zone but rattails were common.



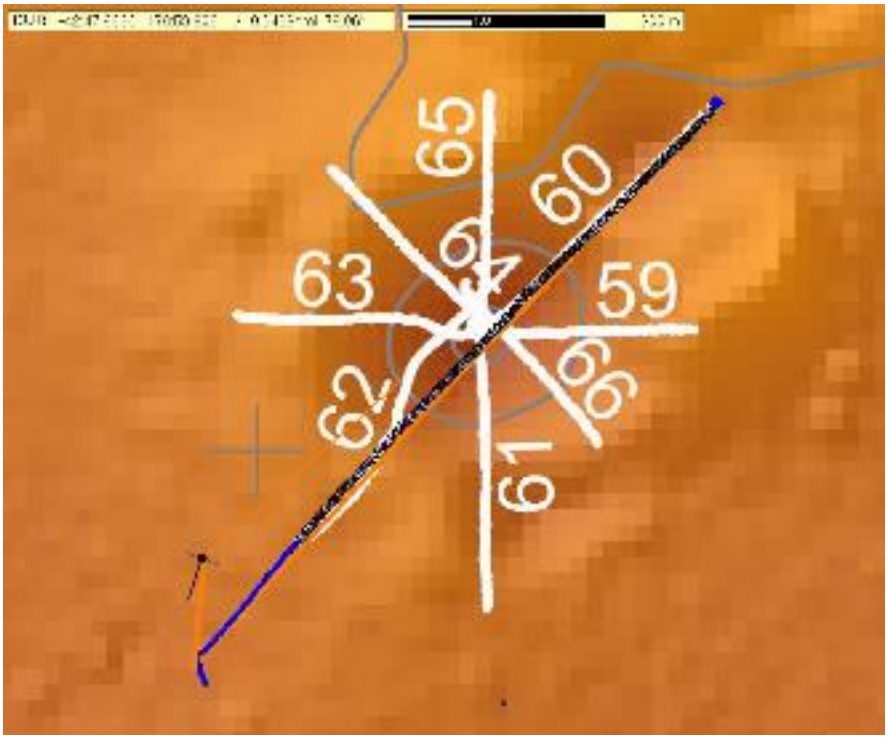
Left: TAN2009_050_018.jpg; veneer of muddy sediments on volcanic bedrock. Right: TAN2009_050_066.jpg; *Solenosmilia* coral community on Ghoul Seamount.

Station 051: Ghoul Seamount NE to SW transect

Re-run of TAN1503_60 & 62

Start depth: 1040 m Finish depth: 1022 m

Muddy sediment, cobble, and pebble substrate occurred at the beginning of the transect on the NE flank of Ghoul, with increasing exposed bedrock coming up the flank. Near the peak, intact live coral occurred in large reefs with associated stylasterids, gorgonian corals, *Anthomastus*, and crinoids. Coming down the SW flank, bedrock and sediment were the dominant substrate, with some smaller patches of live coral and intact dead coral. Muddy sediment, burrows, tracks, rattails, eels, and echinoids were the most common observations on the lower SW flank and extending to the plain. Rocky outcrops with boulders were observed towards the end of the transect, which then became muddy sediment with abundant burrows and tracks.



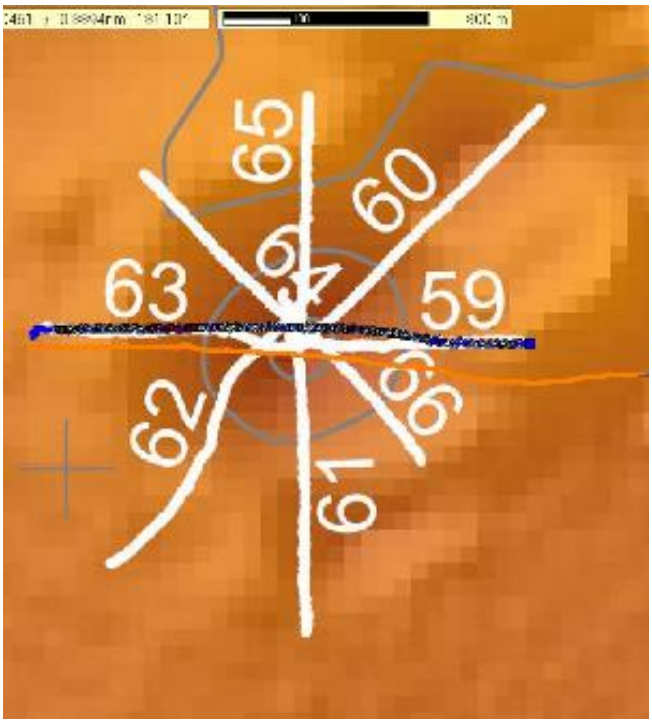
Left: TAN2009_051_129.jpg; live *Solenosmilia* coral; Right: TAN2009_051_208.jpg; veneer of muddy sediments on volcanic rock on Ghoul Seamount.

Station 052: Ghoul Seamount W to E transect

Re-run of TAN1503_63 & 59

Start depth: 1036 m Finish depth: 1047 m

A massive boulder field was present at the deep western end with flat muddy sediment between the boulders. Coral rubble increased on the lower slope amongst bedrock and sand. On the upper western slopes and up to the summit there were high density patches of scleractinian corals with *Solenosmilia* and a single patch of *Enallopsamia*. Associated fauna included *Anthomastus*, brisingids, *Narella*, primnoids, stylasterids, crinoids, and sponges. Fewer scleractinian thickets were observed on the upper eastern flank where the substrate reverted to coral rubble, boulders, and sand. On the lower eastern slope, the habitat changed to muddy sediment with abundant rattails and occasional tam o'shanters.



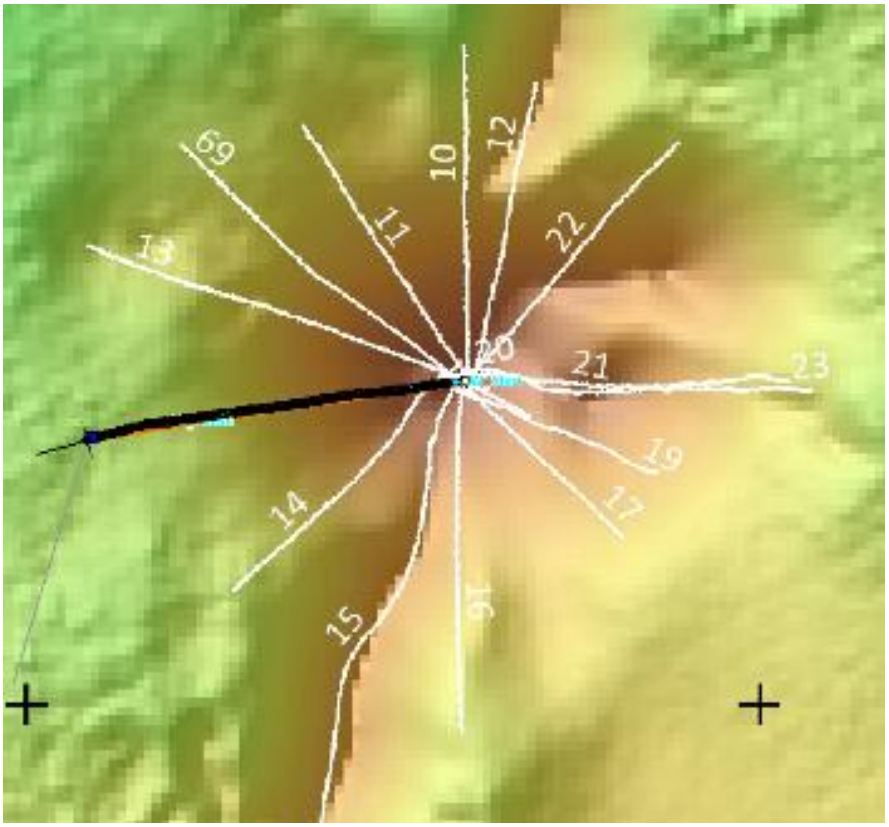
Left: TAN2009_052_101.jpg; *Tokoprymno* gorgonian coral, stylasterids, and glass sponges growing on live and dead *Solenosmilia*. Right: TAN2009_052_115.jpg; close-up of *Solenosmilia* coral community on Ghoul Seamount.

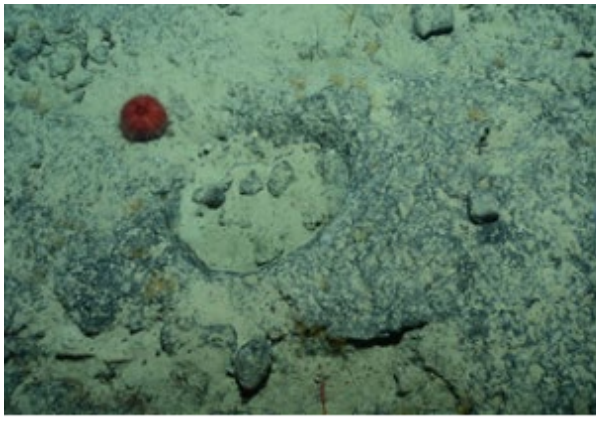
Station 053: Morgue Seamount W transect

New transect (not conducted during TAN1503)

Start depth: 897 m Finish depth: 1210 m

Substrate was primarily coral rubble at the summit with a school of cardinal fish and orange roughy. Shortly after crossing over the summit and starting down the flank substrate turned to bedrock down to the end of the transect. There were few fauna, but sightings of orange roughy, rattails, a shark, echinoids, asteroids, and crinoids.



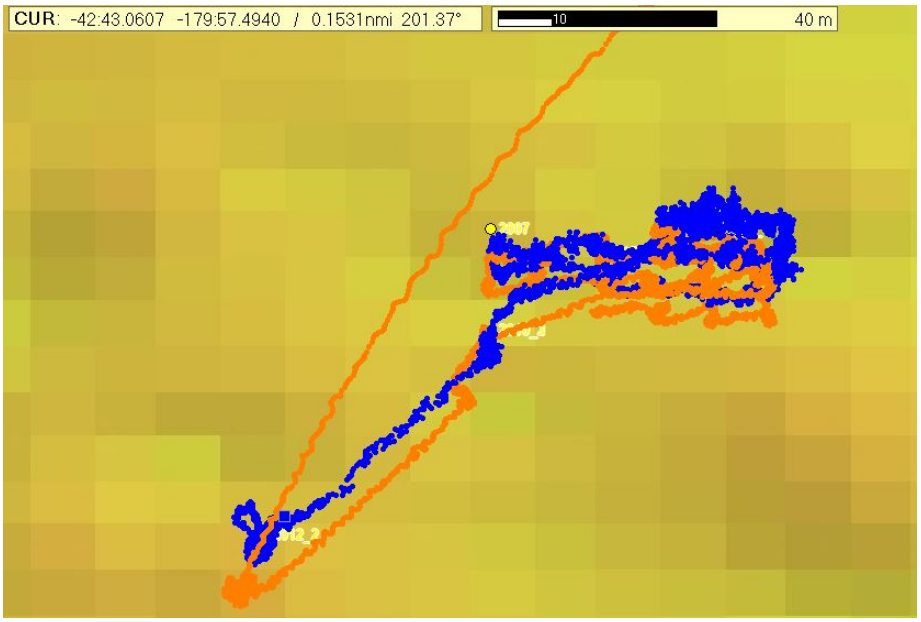


Left: TAN2009_053_039.jpg; ghost shark hovering over smooth volcanic rock. Right: TAN2009_053_116.jpg; urchin and small crinoids on the flank of Morgue Seamount.

Station 054: Morgue moorings search v2

Planned for extending TAN2009/046 west-east runs, with a focus on rubble areas to the east (910–920 m)

We attempted to run east-west lines at 5 m separation from the previous search. DTIS track was erratic. We re-located the mooring weight from station 046 on the first run to the east, and again while returning to the west. Determined that the weight is actually the same as the one observed with settlement plates, but since 2015 they must have been lost With battery life reducing, we steamed SW to run single lines over locations of 2010/2 and 2012/2, but with no sign. The tow finished after 2hrs 40 minutes.



Vessel track (orange) and DTIS track (blue) during TAN2009/054.

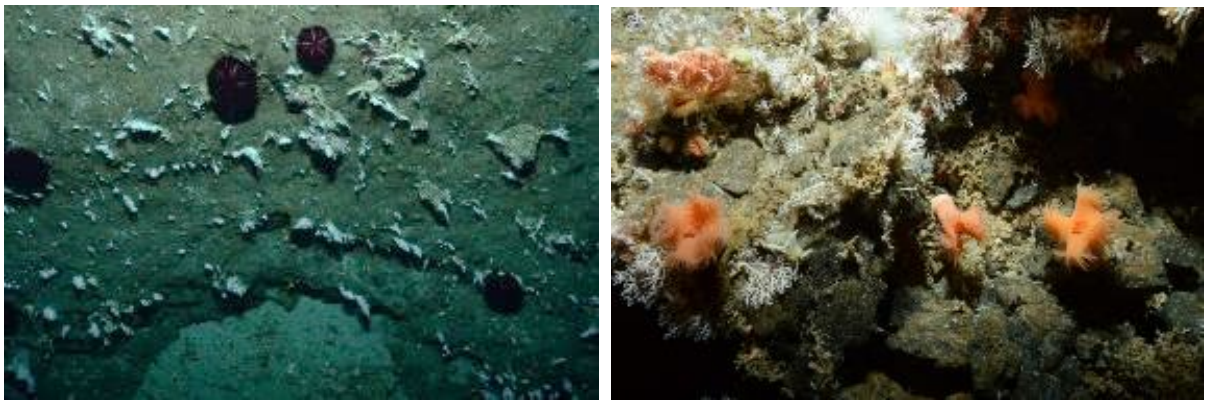
TAN2009_054_367.jpg The mooring weight located near the summit of Morgue Seamount.

Station 056: Diamond Head peak C, S transect

Rerun of TAN1503/070

Start depth: 416 m Finish depth: 437 m

The summit was covered by an assortment of bedrock, coral rubble, and muddy sediment with several intact live scleractinia, echinoids, anemones, demospongiae, stylasterids, and a bellowsfish. The weather was marginal, with SW at 30–35 knots, and a 3–4 m swell. Even though this peak was selected because it was smoother on its summit than the other two, the surging was too much to maintain an even height above the seafloor and get good imagery as well as avoid crashing into the bottom. The transect was cut short after just a few minutes due to large swells.



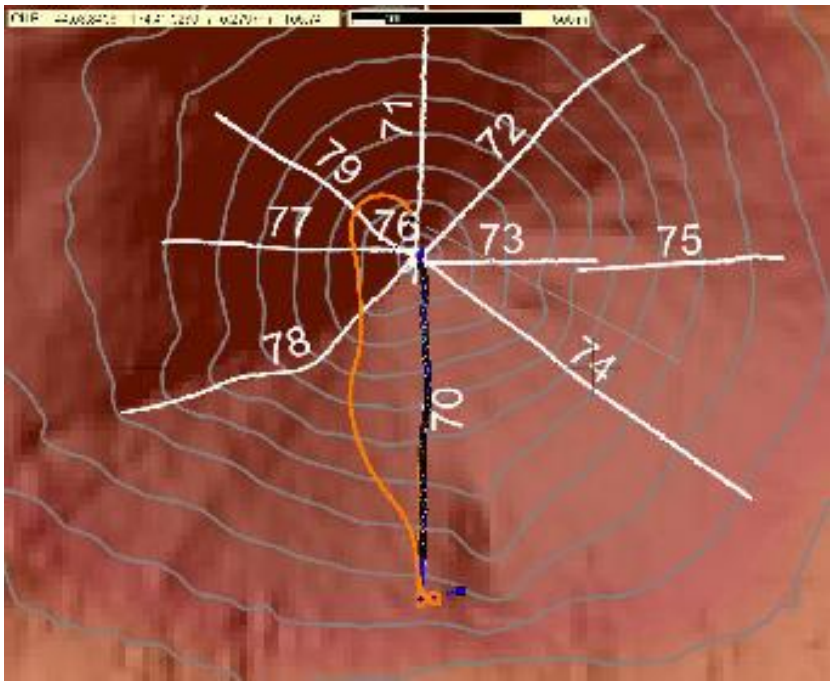
Left: TAN2009_056_003.jpg; urchins and stylasterids on volcanic bedrock. Right: TAN2009_056_011.jpg; closeup of anemone and stylasterid community on the top of Diamond Head peak C Seamount.

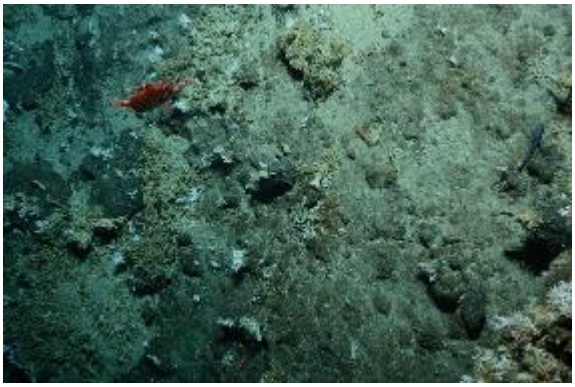
Station 059: Diamond Head peak C, S transect

Rerun of TAN1503/070

Start depth: 425 m Finish depth: 836 m

Demosponges, stylasterids, hexactinellids, and anemones were abundant on bedrock substrate at the beginning of the transect. Some small patches of intact live coral (?*Enallopsammia*) were also observed. Further along the tow, substrate became cobble, boulder, gravel, and sediment, with some bedrock in places. Benthic faunal composition remained largely the same throughout the transect, from peak to base, but with abundance decreasing slightly with depth. Several oreos were observed towards the end of the transect.





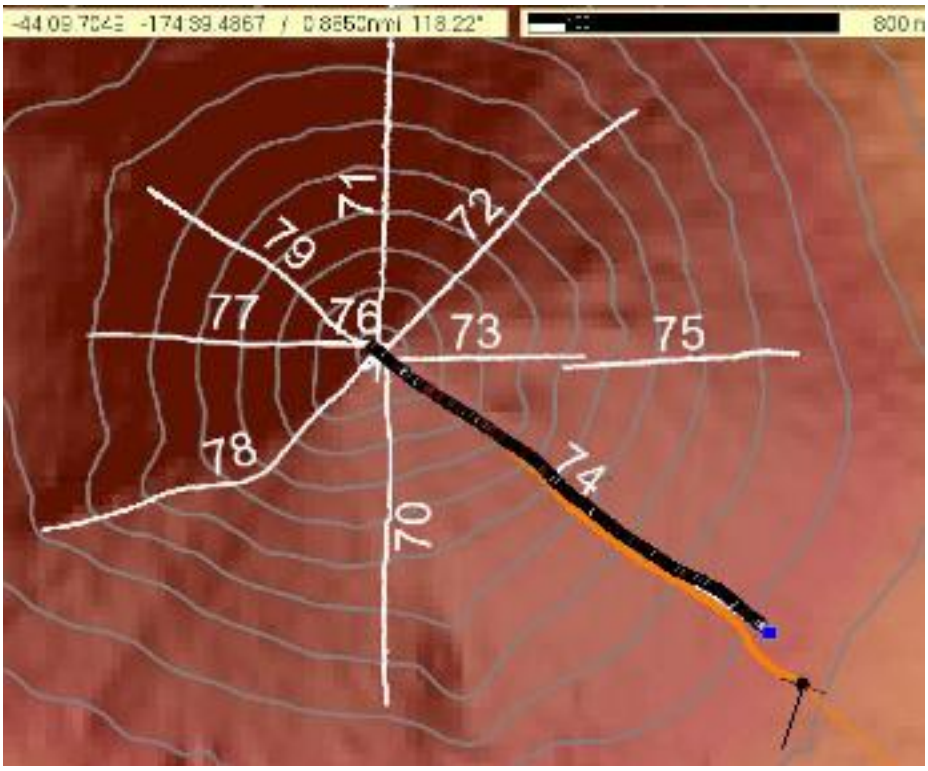
Left: TAN2009_059_002.jpg; bellowsfish over diverse coral community, live stylasterids, cup corals and small patches of live *Goniocorella* hard coral. Right: TAN2009_059_037.jpg; sponges and stylasterids on Diamond Head Peak C.

Station 060: Diamond Head peak C, SE transect

Rerun of TAN1503/074

Start depth: 421 m Finish depth: 914 m

At the summit bellowsfish and anemones were in high abundance on a bedrock, rubble, sand, and gravel substrate. Possible *Enallopsammia* in small colonies. Stylasterids became very abundant with fewer demosponges, hexatinellids, and tam o'shanters on flat bedrock with some boulders and cobbles. Oreos were present from 600 m with fewer stylasterids. From 700 m stylasterids were again common with some *Primnoella* on rock outcrops amongst coral rubble and sand substrate.



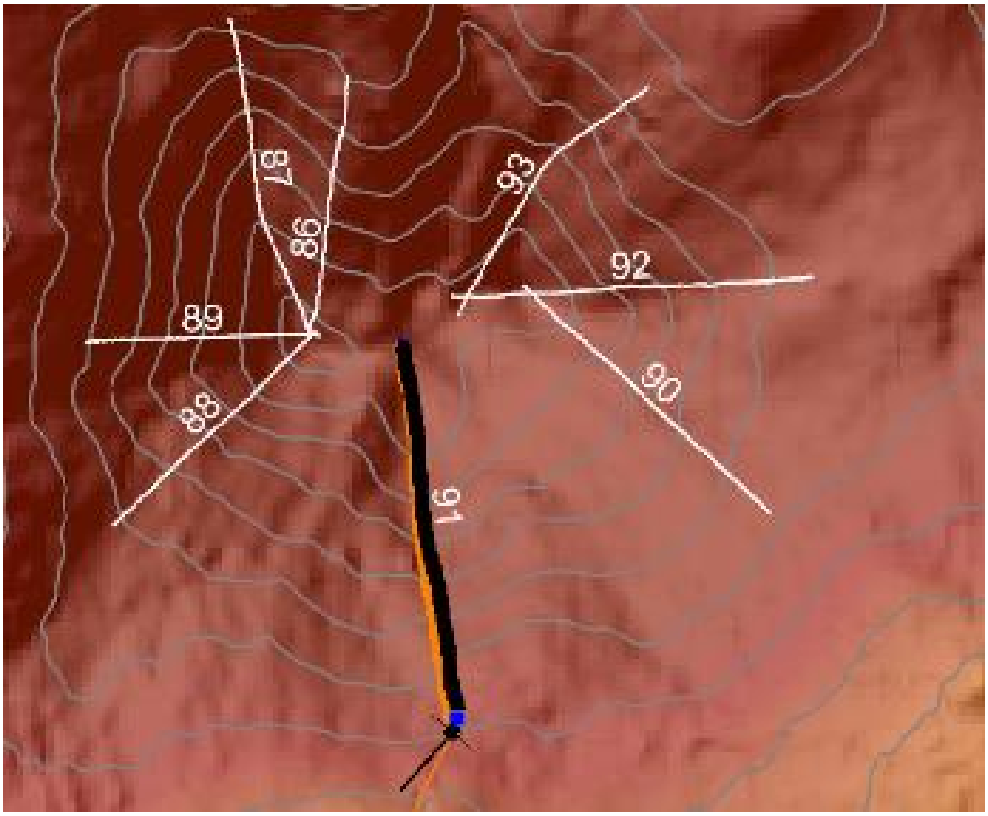
Left: TAN2009_060_019.jpg; diverse invertebrate community near peak. Right: TAN2009_060_287.jpg; unbranched spiralling gorgonian *Primnoella* and stylasterids on lower flank of Diamond Head peak C.

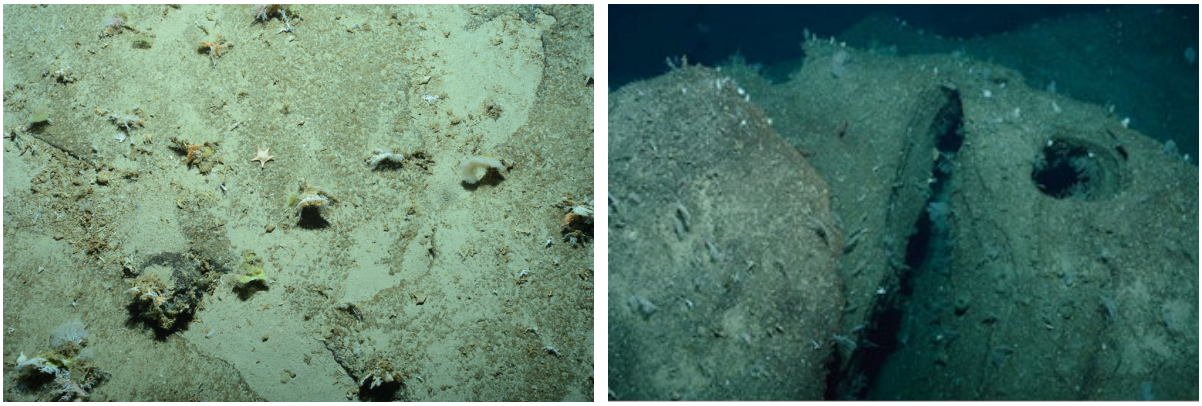
Station 061: Diamond Head peak C transect

Rerun of TAN1503/91

Start depth: 551 m Finish depth: 865 m

The whole transect consisted of bedrock with patches of muddy sediment with cobbles. Stylasterids and sponges (both Demospongiae and hexactinellids) dominated the fauna, with occasional cidarids, gastropods, asteroids, anemones. Oreos, sea perches, rattails, and eels were the fish observed. There was fishing gear, probably trawl wire, at 694 m depth.





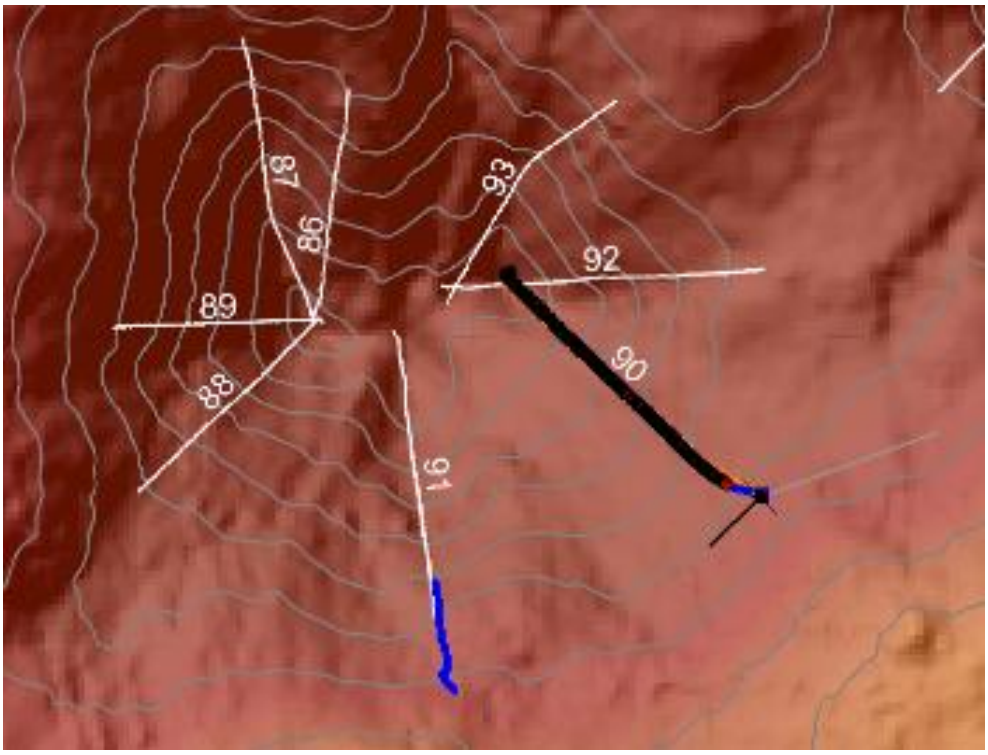
Left: TAN2009_061_054.jpg; small starfish among community of various corals and bryozoans. Right: TAN2009_061_188.jpg; corals and sponges on the edge of a volcanic ledge on the lower flank.

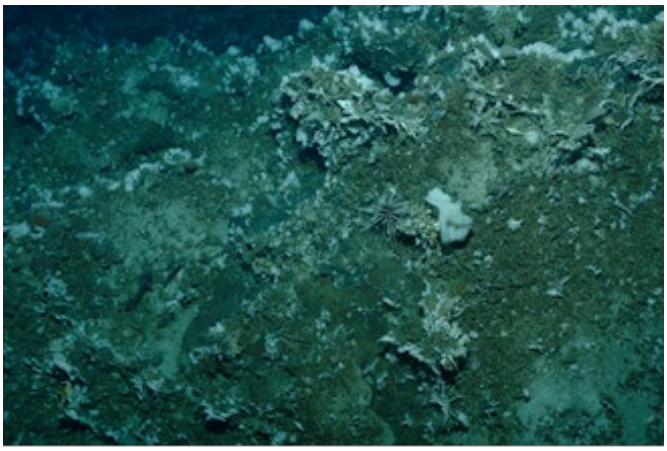
Station 062: Diamondhead Peak B, SE transect

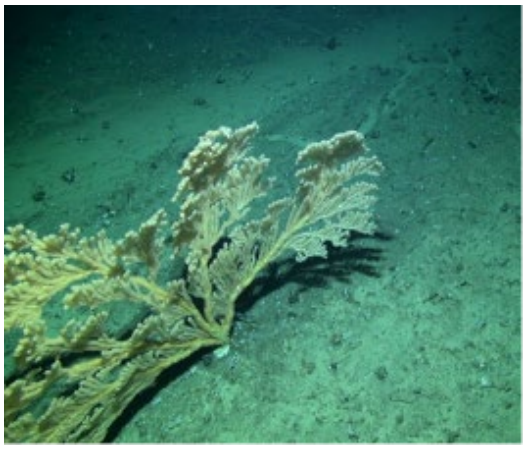
Rerun of TAN1503/90

Start depth: 535 m Finish depth: 833 m

At the start of the transect was a mix of bedrock and coral rubble, with abundant stylasterids (white and purplish), yellow bryozoans, demosponges, and *Thouarella*. As DTIS progressed downslope, there was more continuous bedrock with stylasterids, scattered bryozoans, hexactinellid sponges, with an occasional echinoid and cidarid. Stylasterids dominated throughout. Around 750m were abundant *Primnoella* spiral gorgonians and several bamboo corals.







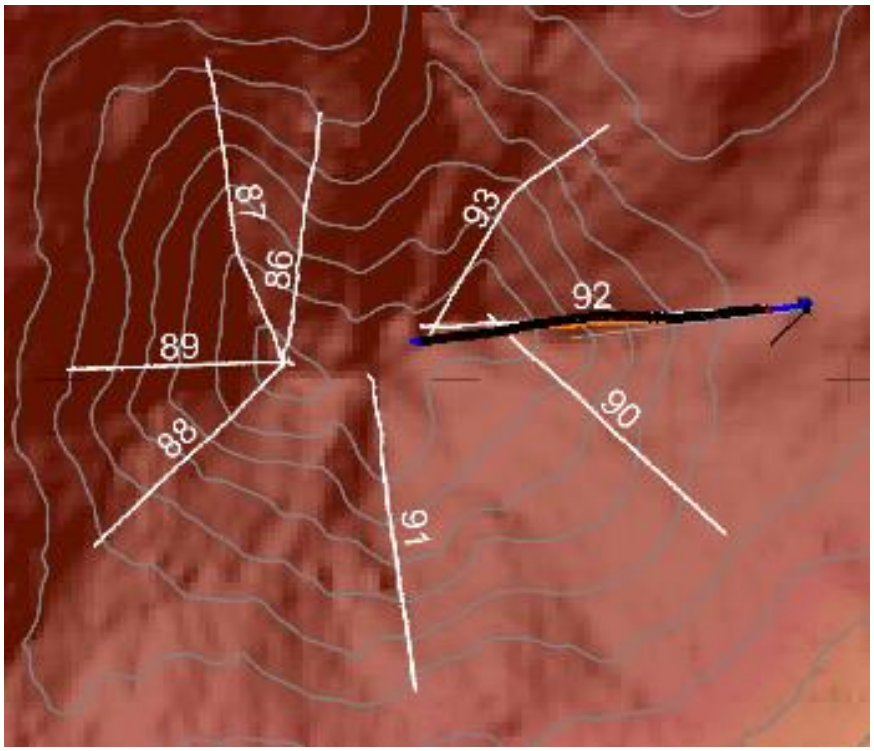
Left: TAN2009_062_007.jpg; abundant stylasterids, small bushy gorgonians, glass sponges and a cidarid pencil urchin. Right: TAN2009_062_screenshot at 45:15', large bamboo coral on lower flank of Diamond Head Peak B.

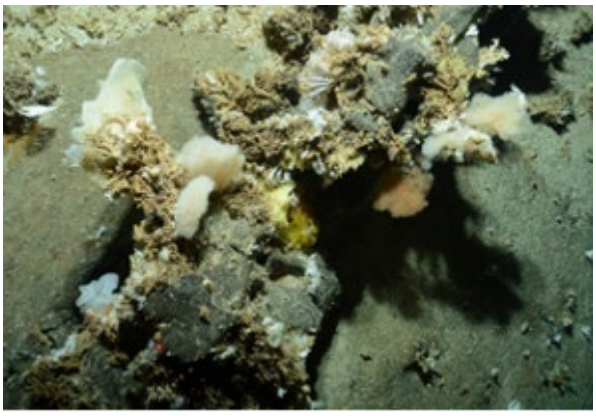
Station 063: Diamond Head peak B, E transect

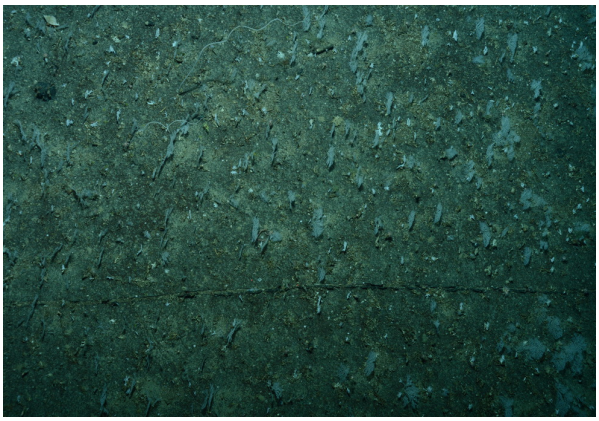
Rerun of TAN1503/92

Start depth: 578 m Finish depth: 812 m

The summit to the crest of the ridgeline was covered with a mix of bedrock, coral rubble, and muddy sediment with several stylasterids, hexactinellids, bryozoans, demosponges, *Thouarella*, with some, gorgonians, bellowsfish, asteroids, and hermit crabs. There was a prominent bedrock outcrop at 654 m depth with more stylasterids, gorgonians, and hexactinellids. The rest of the transect was dominated by bedrock and coral rubble with observations of stylasterids, fish (rattails, oreos, bony fish, eels), an octopus, asteroids, cidarids, echinoids, an antipatharian, and demosponges. A field of small hydroids was seen at 700 m, and *Primnoella* started at 725 m depth and continued down the transect.







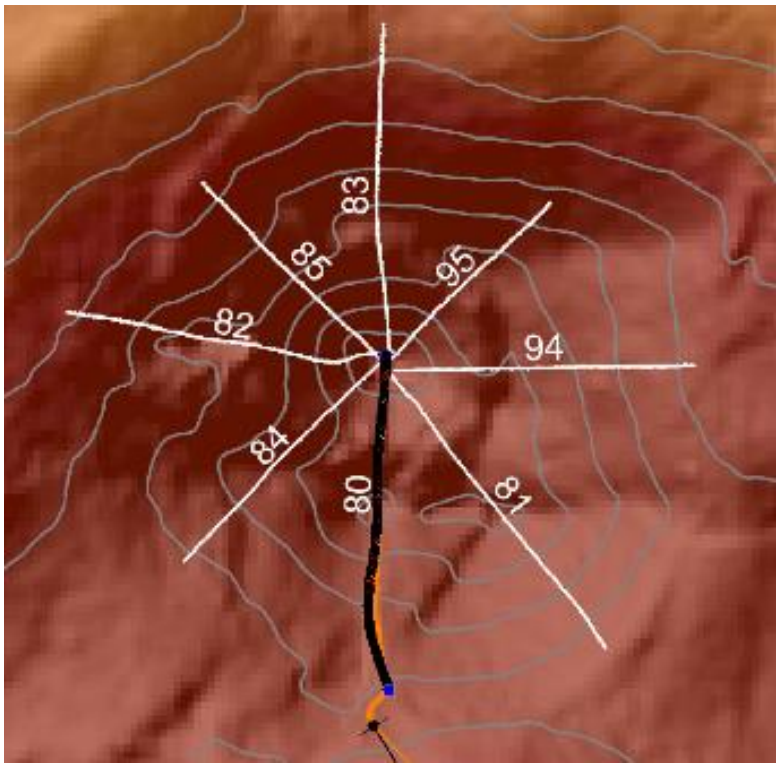
Left: TAN2009_063_073.jpg; dense invertebrate community including various corals and sponges. Right: TAN2009_063_221.jpg; small stylasterids on volcanic bedrock at end of transect, Diamond Head Peak B.

Station 064: Diamond Head peak A, S transect

Rerun of TAN1503/80

Start depth: 603 m Finish depth: 776 m

The transect started on the peak, with bedrock substrate and abundant hexactinellids, small gorgonians and stylasterids. Small colonies of live *Goniocorella dumosa* occurred between 620 and 650m. Down slope were progressively more soft sediments, mud mixed with coarse grains (?coral rubble). A broad saddle of bioturbated soft bottom and sparse fauna occurred around 680 m. The transect shoaled by about 50 m coming over a ridge with its top at 620 m, covered with small stylasterids, small gorgonians, and hexactinellids. Below were a few cidarid urchins, occasional octopus, and black coral, with scattered *Primnoella* and fish.



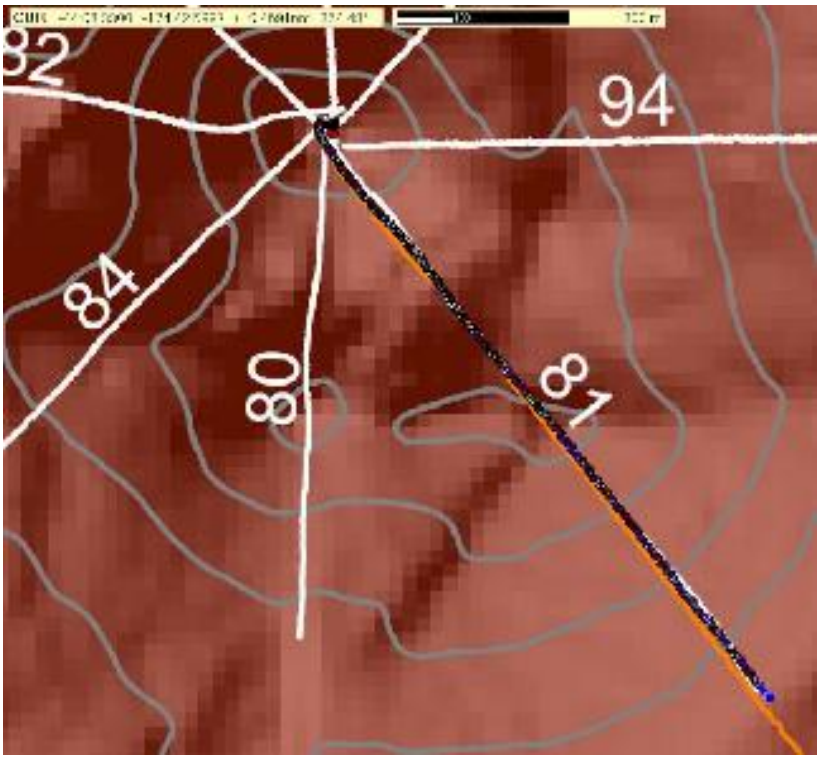
Left: TAN2009_064_143.jpg; diverse encrusting fauna of corals and sponges. Right: TAN2009_064_227.jpg; glass sponges, gorgonians, stylasterids, and a crinoid along a steep drop-off on Diamond Head peak A.

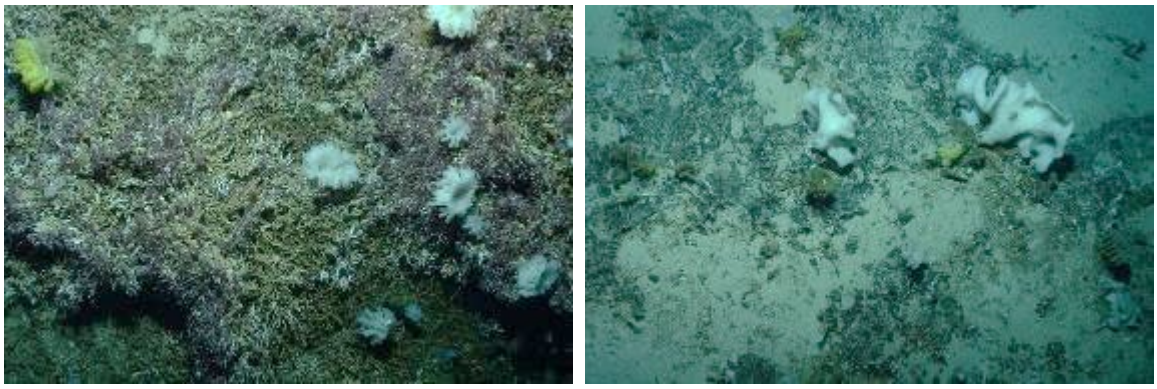
Station 065: Diamond Head peak A, SE transect

Rerun of TAN1503/81

Start depth: 608 m Finish depth: 832 m

Coral rubble, live *Enallopsammia* patches, stylasterids, *Goniocorella dumosa*, hexactinellids, and gorgonians occurred on the summit amongst bedrock with soft sediment patches. There was a short period of soft sediment with sparse fauna along the summit before coming down the flank, where *Aphrocallistes beatrix beatrix* with associated zoanthids were relatively abundant, with scattered echinoids, stylasterids, *Primnoella*, cidarids, black corals, and bamboos on bedrock with scatterings of rubble/sand.





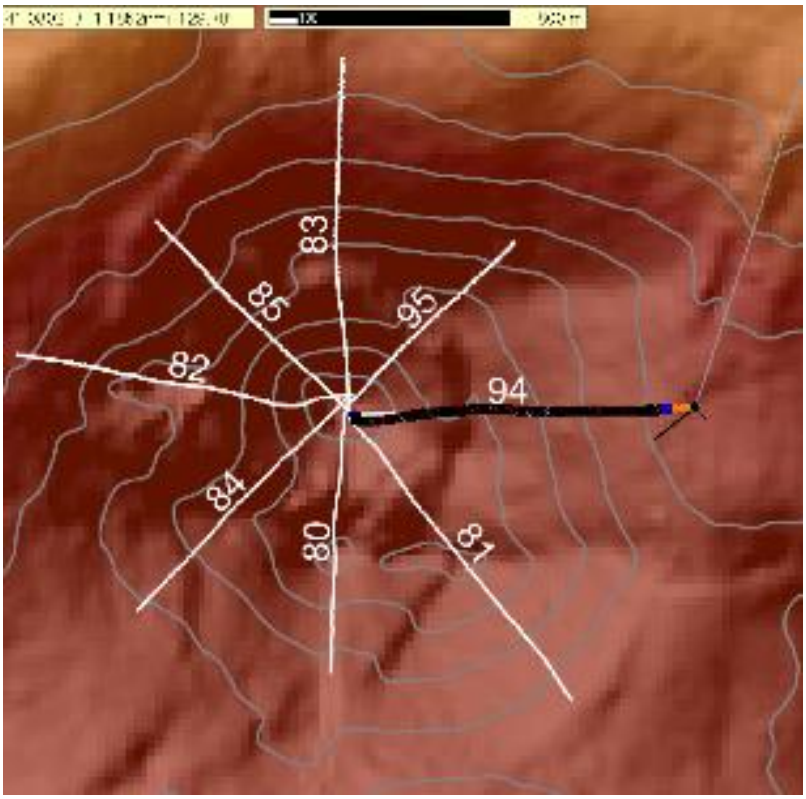
Left: TAN2009_065_024.jpg; purple *Enallopsammia* hard coral beds near peak. Right: TAN2009_064_061.jpg; characteristic glass sponge for Diamond Head peak A slope.

Station 066: Diamond Head peak A, E transect

Rerun of TAN1503/94

Start depth: 615 m Finish depth: 856 m

At the summit there was a patch of purple *Enallopsamia* with sponges, stylasterids, and gorgonians amongst a substrate of bedrock and sand. Some rocky outcrops featured from the peak and across the caldera floor consisting of sediment and rubble. This area was colonised by many hexactinellids and stylasterids. On the outer flank there were more hexactinellids and stylasterids but also some antipatharians, isidids, and crinoids.



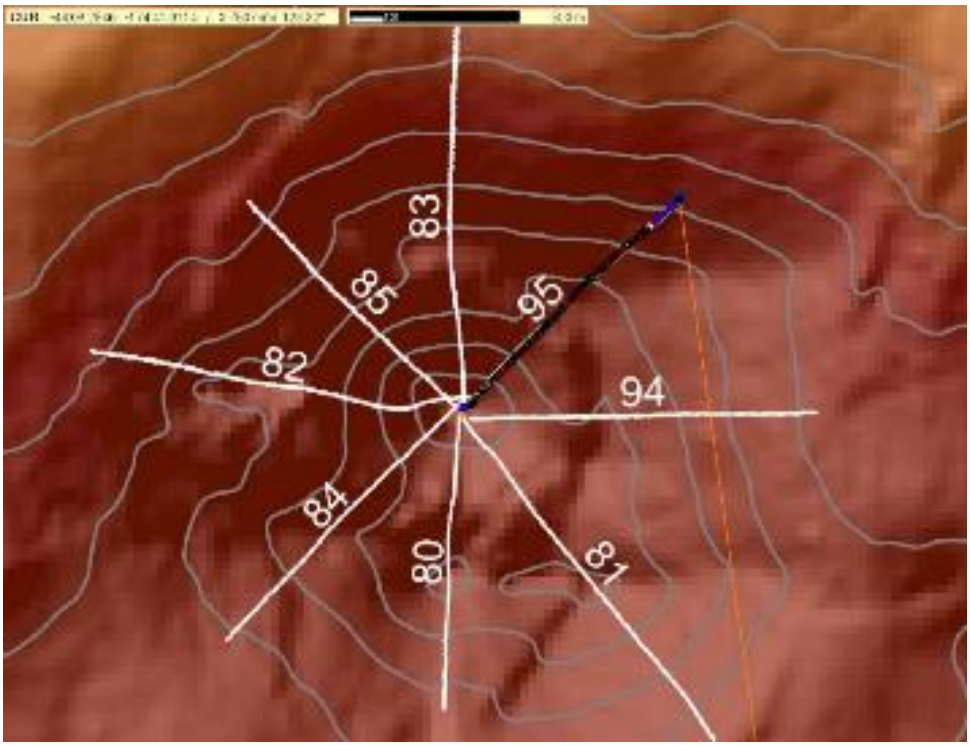
Left: TAN2009_066_007.jpg; a diverse range of corals, sponges and cidarid pencil urchin. Right; TAN2009_066_205.jpg; *Aphrocallistes* glass sponges, stylasterids and a large bamboo coral coming into view at end of transect, Diamond Head peak A Seamount.

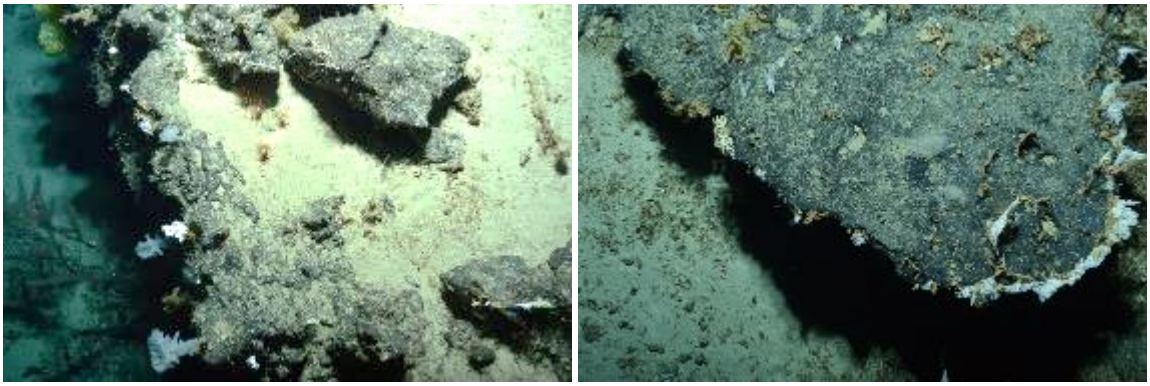
Station 067: Diamond Head peak A, NE transect

Rerun of TAN1503/95

Start depth: 613 m Finish depth: 837 m

Bedrock with small patches of *Enallopsammia* occurred on the summit. Running across the caldera was bedrock, coral rubble, gravel, and cobbles with abundant sponges, stylasterids, and gorgonians. Several large antipatharian corals were seen. Beyond the crater rim , some outcropping areas were observed with crinoids, gorgonians, sponges, and stylasterids. Hexactinellids and stylasterids were abundant throughout most of the transect. The end of transect was mostly sand interspersed with some small areas of bedrock.





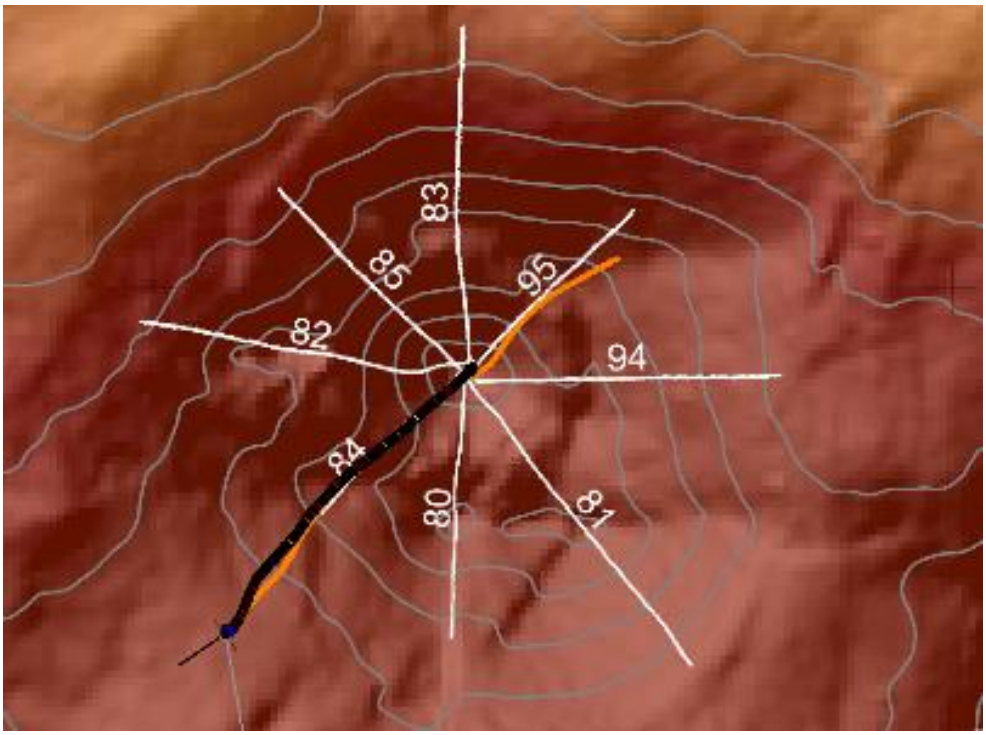
Left:TAN2009_067_114.jpg; *Parantipathes* black coral coming into view below ledge. Right: TAN2009_067_156.jpg; stylasterid fans growing along the edge of a boulder on flank of Diamond Head peak A Seamount.

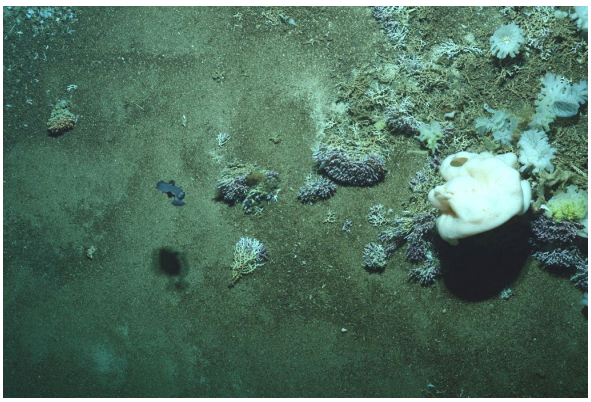
Station 068: Diamond Head peak A, SW transect

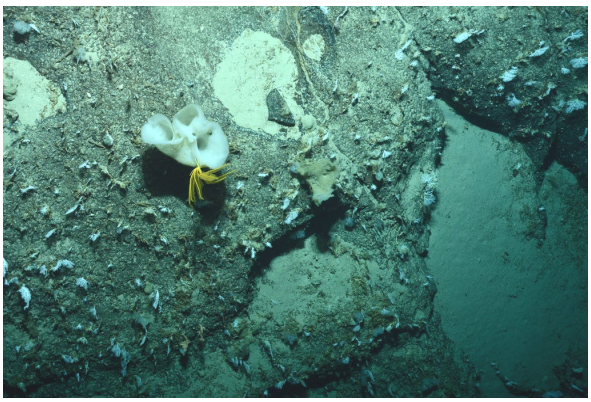
Rerun of TAN1503/84

Start depth: 611 m Finish depth: 794 m

The summit was covered with coral rubble with muddy sediment and patches of intact live Scleractinia at 613 m with hexactinellids, stylasterids, *Thouarella*, oreo, and perch. The rest of the transect consisted of patchy sections of bedrock, coral rubble, and muddy sediment with consistent and regular observations of hexactinellids and stylasterids as well as occasional gorgonians, prominent isidids, oreo, rattails, pink frogmouth fish, morid cod, eel, octopus, gastropods, *Anthomastus*, cidarid, and crinoids. *Primnoella* were first sighted around 711 m depth near the crest of the second ridge.







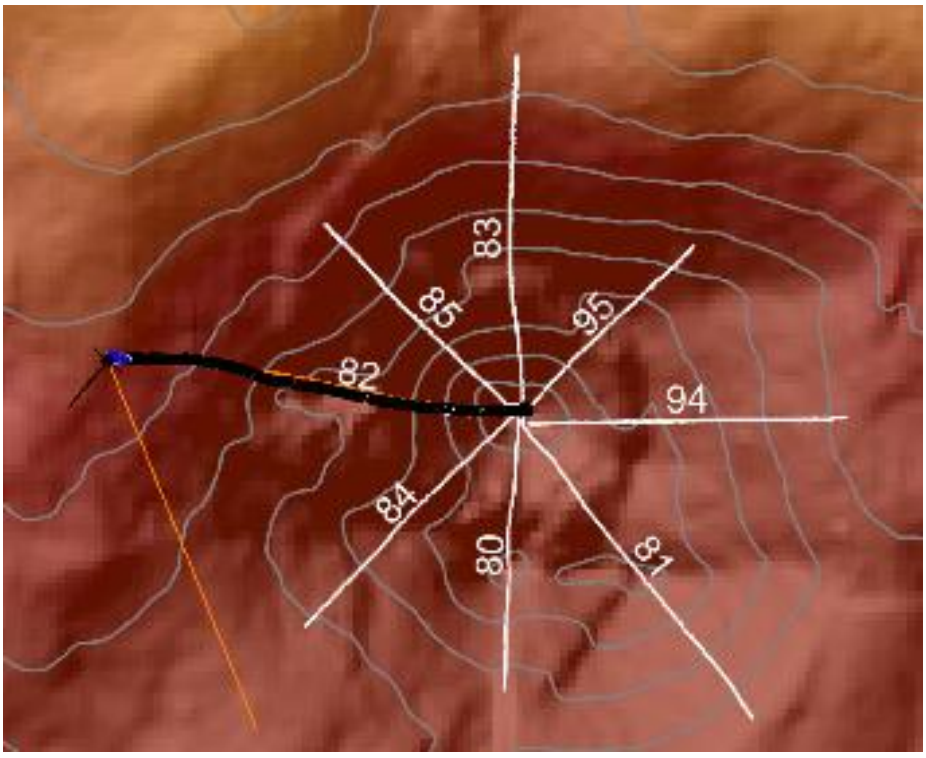
Left: TAN2009_068_012.jpg; purple *Enallopsammia rostrata* and diverse glass sponges near the peak. Right: TAN2009_068_118.jpg; a yellow crinoid perched on a large hexactinellid glass sponge on rocky ridge, Diamond Head peak A Seamount.

Station 069: Diamond Head peak A, W transect.

Rerun of TAN1503/82

Start depth: 608 m Finish depth 901 m

The summit at 609 m had abundant *Enallopsammia*, hexactinellid sponges, and stylasterids. Down slope at 612 m were dense *Goniocorella* patches and intact matrix of live *Enallopsammia* with hexactinellids. *Enallopsammia* continued down to 690 m, with stylasterids and hexactinellid sponges, and occasional gorgonians, echinoids, *Primnoella*, and oreos. A knob to the west rose 30 m, with black corals, isidids, hexactinellids, and stylasterids. Downslope was a short steep outcrop at 790 m, followed down to 900 m over mainly bedrock, with scattered *Primnoella*, black coral, some orange roughy.



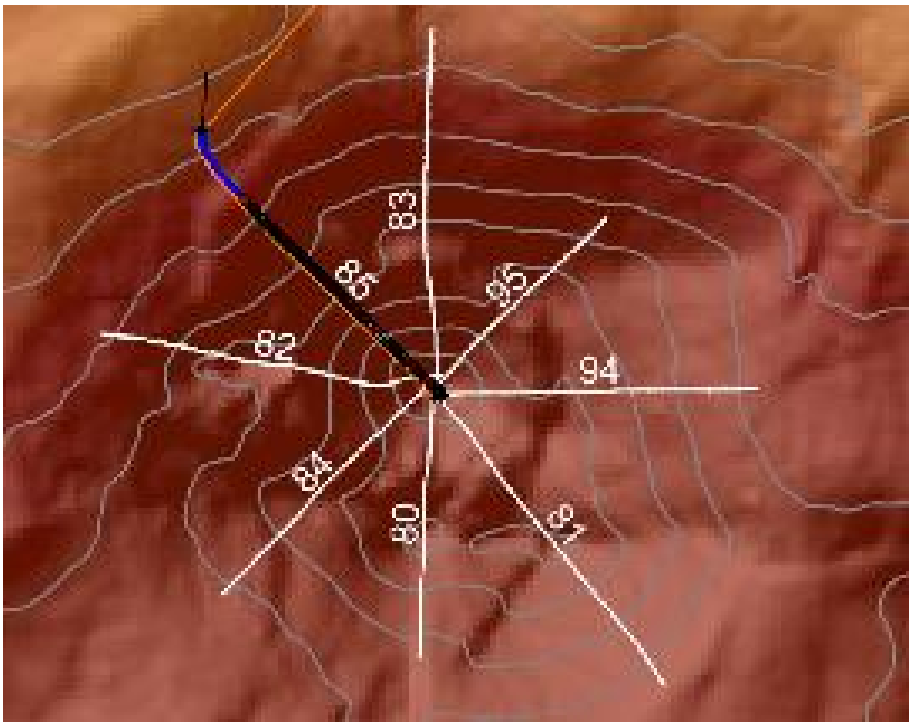
Left: TAN2009_069_007.jpg; purple and yellow colour morphs of *Enallopsammia rostrata* coral near the peak. Right: TAN2009_069_206.jpg; whip-like *Primnoella* gorgonian coral and urchin at the end of the transect on Diamond Head peak A Seamount.

Station 070: Diamond Head Seamount Peak A, NW transect

Repeat of TAN1503/085

Start depth: 607 m Finish depth: 918 m

The transect started on the summit, with coral rubble/bedrock and patches of intact and live *Enallopsammia*. Moving down off the summit fauna was a mix of hexactinellid sponges, stylasterids, *Goniocorella*, and cidarids. Deeper was an extensive patch of *Goniocorella dumosa* and *Ennallopsammia rostrata*, the latter being more yellow than the purple on the summit. At 720 m were several large isidid corals. Substrate down the mid-flank was a mix of exposed bedrock, rubble (shell hash) and mud, with stylasterids, hexactinellids, and *Primnoella*. Deeper were areas of sandy mud, and then bedrock again at the end of the transect.



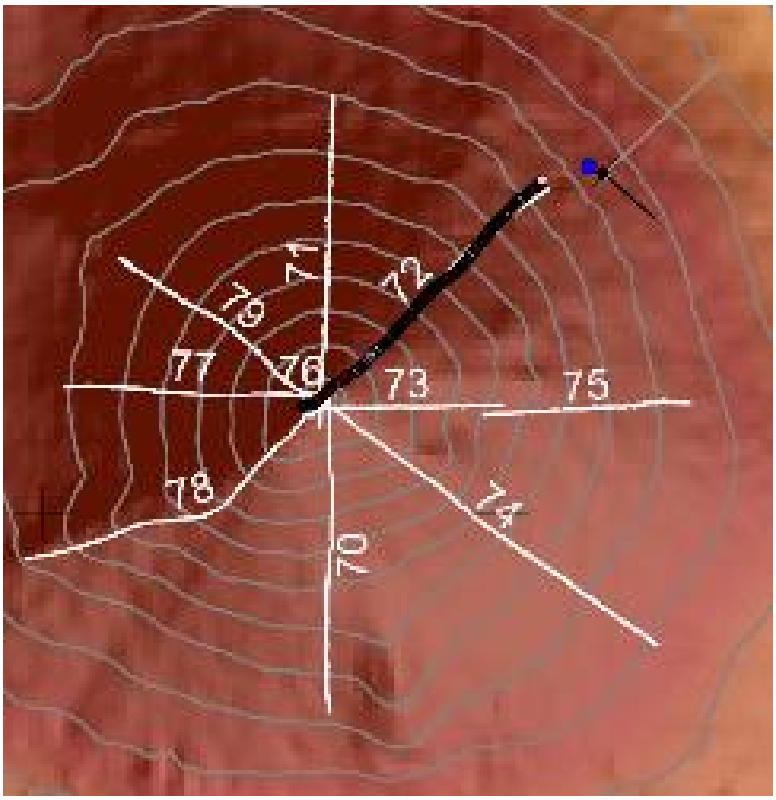
Left: TAN2009_070_036.jpg; dense cover around peak, including purple *Enallopsammia rostrata* and large *Aphrocallistes g*lass sponges. Right: TAN2009_070_090.jpg; closeup of stylasterids, small bushy gorgonian, glass sponges on Diamond Head peak A Seamount.

Station 071: Diamond Head Seamount Peak C, NE transect

Repeat of TAN1503/072

Start depth: 448 m Finish depth: 818 m

The summit was covered with anemones, stylasterids, and echinoids on a substrate of bedrock, coral rubble, and some soft sediment. There were also sightings of hexactinellids, crabs, cidarids, eel, bellowsfish, and gorgonians. The rest of the transect starting around 543 m was alternating patches of bedrock, muddy sediment, and coral rubble and areas of full muddy sediment with observations of large stylasterids, hexactinellids, *Primnoella*, a shark, isidid, eels, frogmouths, oreos, echinoids, and rattails.



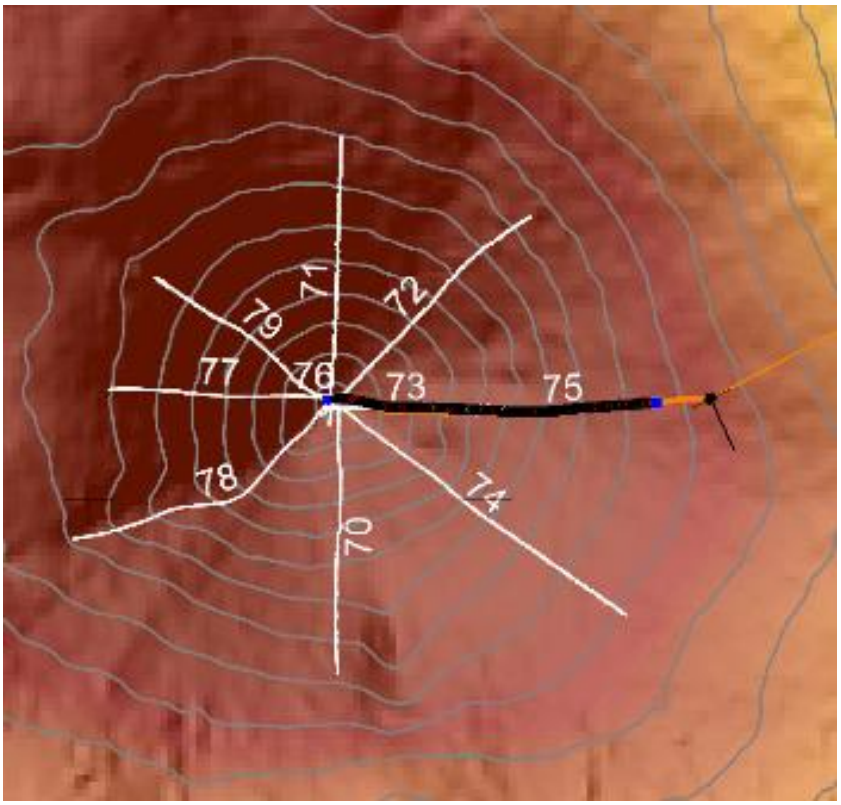
Left: TAN2009_071_046.jpg; dense patch of anemones near peak. Right: TAN2009_071_187.jpg; cidarid pencil urchin and low encrusting fauna downslope of Diamond Head peak C Seamount.

Station 072: Diamond Head Seamount Peak C, E transect

Repeat of TAN1503/73 & 75

Start depth: 424 m Finish depth: 868 m

At the summit amongst bedrock, boulders and coral rubble patches there were abundant stylasterids, tam o'shanters, and banded bellowsfish. Also present, were demosponges, anemones, gorgonians, and small clumps of *Goniocorella dumosa*. Downslope there were extensive areas of stylasterids with some gorgonians, demosponges, but fewer hexactinellids. Towards the end of the transect, amongst the bedrock and coral rubble, stylasterids were frequently observed as well as *Primnoella* whips and occasional isolated isidid and black coral colonies. Fish included oreos and rattails.



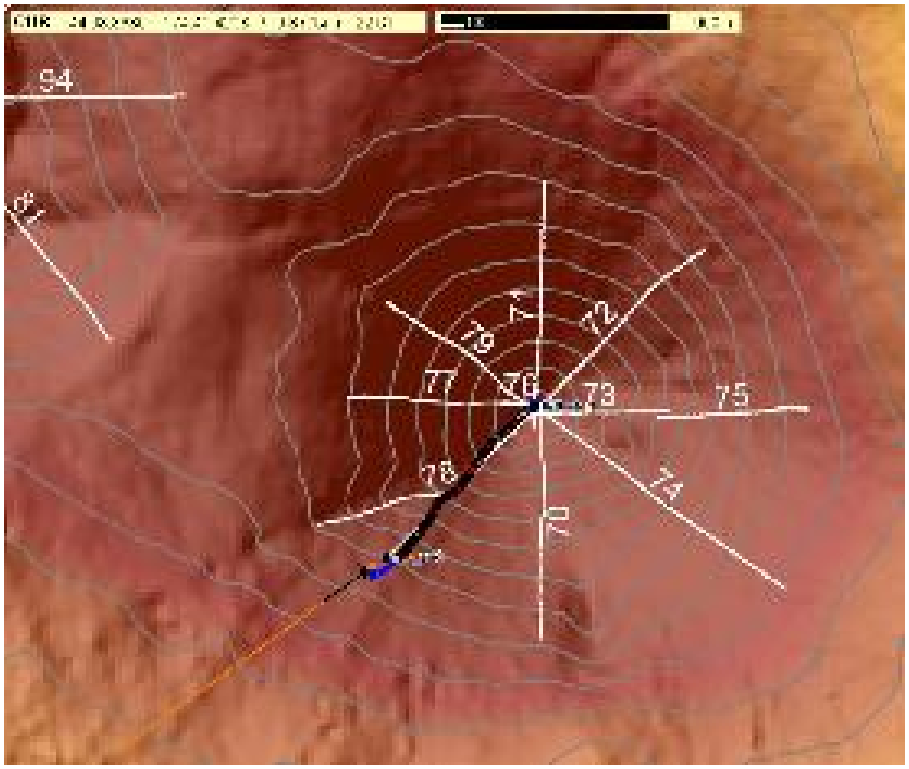
Left: TAN2009_072_004.jpg; diverse invertebrate community near peak. Right: TAN2009_072_066.jpg; ?plexaurid gorgonian fans, stylasterids and small hard corals near peak of Diamond Head peak C.

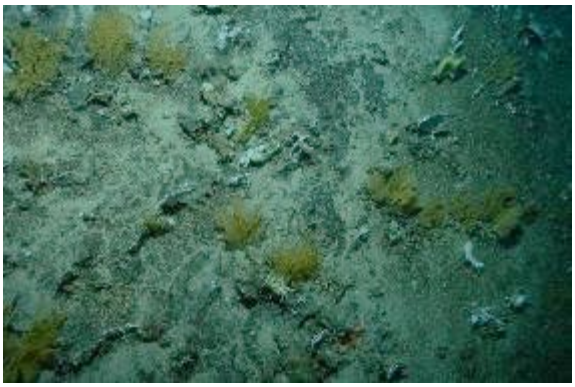
Station 073: Diamond Head Seamount Peak C, SW transect

Repeat of TAN1503/78

Start depth: 439 m Finish depth: 804 m

Coral rubble and bedrock substrate dominated at the summit, with abundant echinoids, anemones, stylasterids, lacey bryozoans, and gorgonians. Stylasterids remained abundant throughout the transect, with substrate becoming a mix of sand, rubble, and some bedrock down the flanks colonised by stylasterids. Sand, pebble, and rubble substrate occurred at the end of the transect.





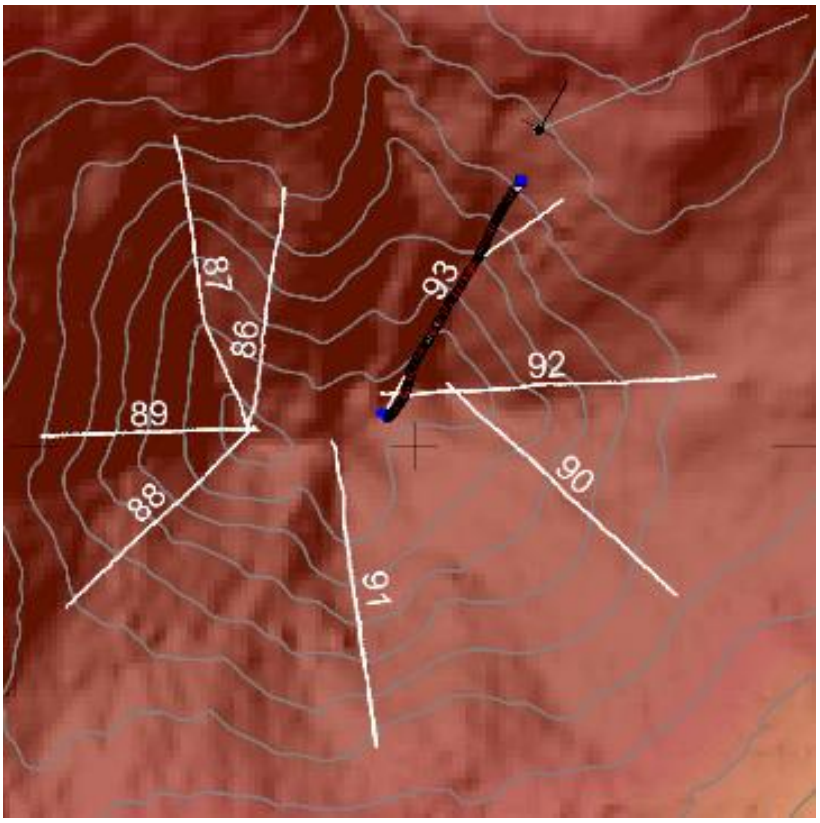
Left: TAN2009_073_014.jpg; anemones and stylasterids with a banded bellowsfish in the centre. Right: TAN2009_073_040; ?plexaurid gorgonian fans and stylasterids on Diamond Head peak C Seamount.

Station 074: Diamond Head Seamount Peak B, NE transect

Repeat of TAN1503/93

Start depth: 562 m Finish depth: 812 m

Muddy sediment with pebbles dominated at the start of the transect transitioning to bedrock with small stylasterids, sponges, and gorgonians. Down the flank bedrock became predominant with sediment overlay and sparse fauna. At 610 m there was a dense patch of erect purple gorgonians. At 660 m there were areas of small hydroids/isidids. Small *Thouarella* became common at 675 m with a large antipatharian at 745 m. Fish records included oreos at the summit and mid depths with orange roughy, alfonsinos, and rattails deeper.



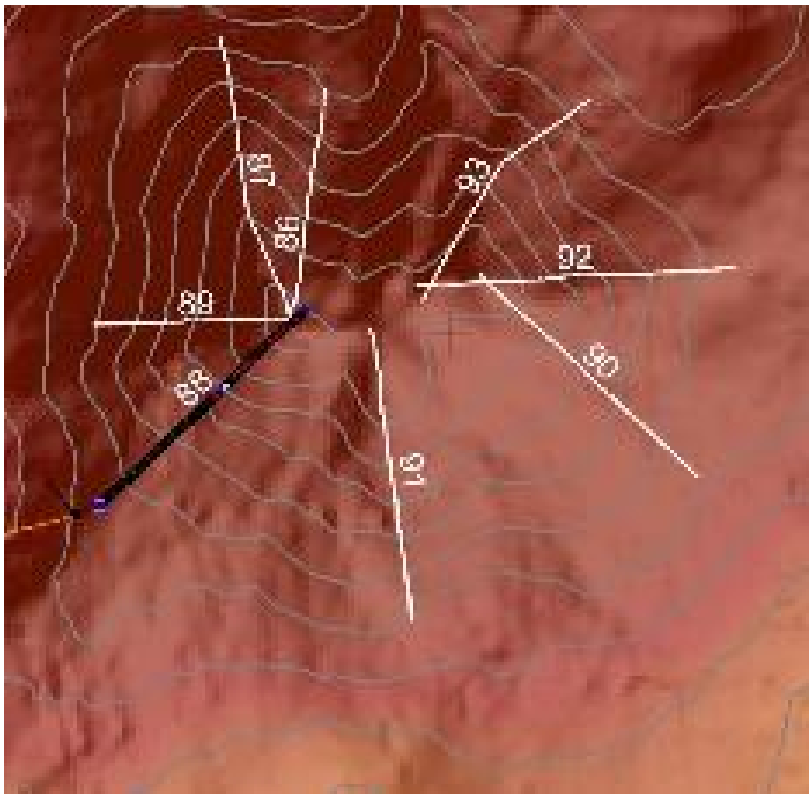
Left: TAN2009_074_108.jpg; dense patch of unusual purple gorgonian corals. Right: TAN2009_074_184.jpg; stylasterids, shrimp, and squat lobsters along flank of Diamond Head peak B.

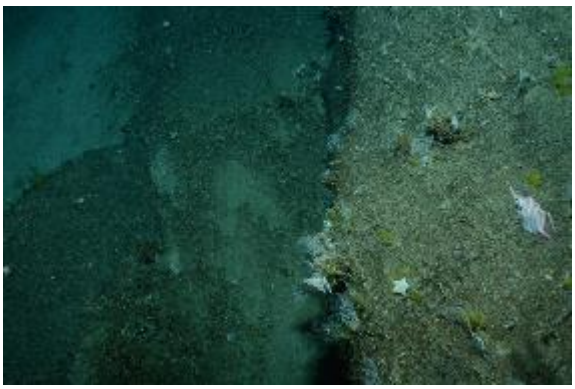
Station 075: Diamond Head Seamount Peak B, SW transect

Repeat of TAN1503/088

Start depth: 540 m Finish depth: 808 m

Bedrock with sponges, stylasterids, and small white gorgonians (possibly primnoids) in low densities occurred at the beginning of the transect. Coral rubble amongst the bedrock hosted some tam o'shanters echinoids, asteroids, and cidarids. Continuing down the flank there was rock, sand, and rubble substrate with similar fauna throughout. Some oreos, sharks, and rattails were observed. Several gorgonians were scattered along the flank. Dominant benthic fauna deeper were stylasterids, present throughout most of the transect. Towards the base was increasing sand/rubble substrate with sparse fauna.





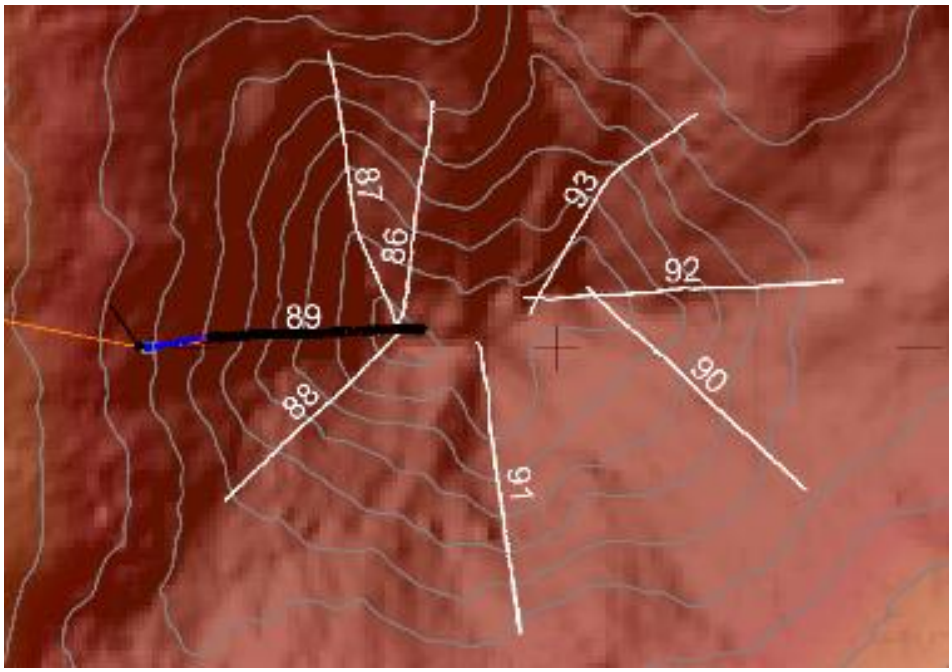
Left: TAN2009_075_041.jpg; three antlered crabs (*Dagnaudus petterdi*) on exposed volcanic bedrock. Right: TAN2009_075_093.jpg; banded bellowsfish over small ledge encrusted with sylasterids on Diamond Head peak B Seamount.

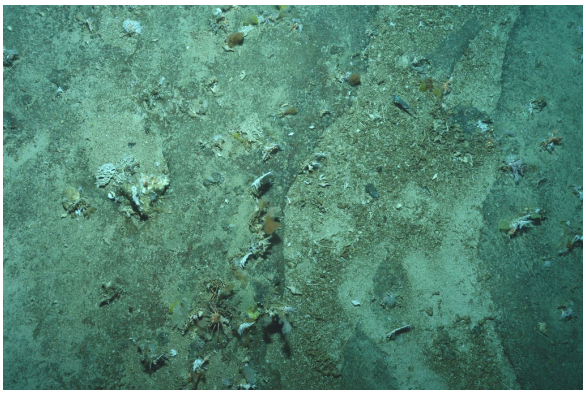
Station 076: Diamond Head Seamount Peak B, W transect

Repeat of TAN1503/89

Start depth: 538 m Finish depth: 796 m

The summit down to 731 m was bedrock and muddy sediment, with demosponges and stylasterids and occasional crinoids, scleractinians, echinoids, morid cods, hexactinellids, gorgonians, bryozoans, oreos, and eels. The rest of the transect was mixed substrate, with patches of muddy sediment with rubble and bedrock. Fauna were sparse, even stylasterids were infrequent, occasional oreos and small fish were observed.





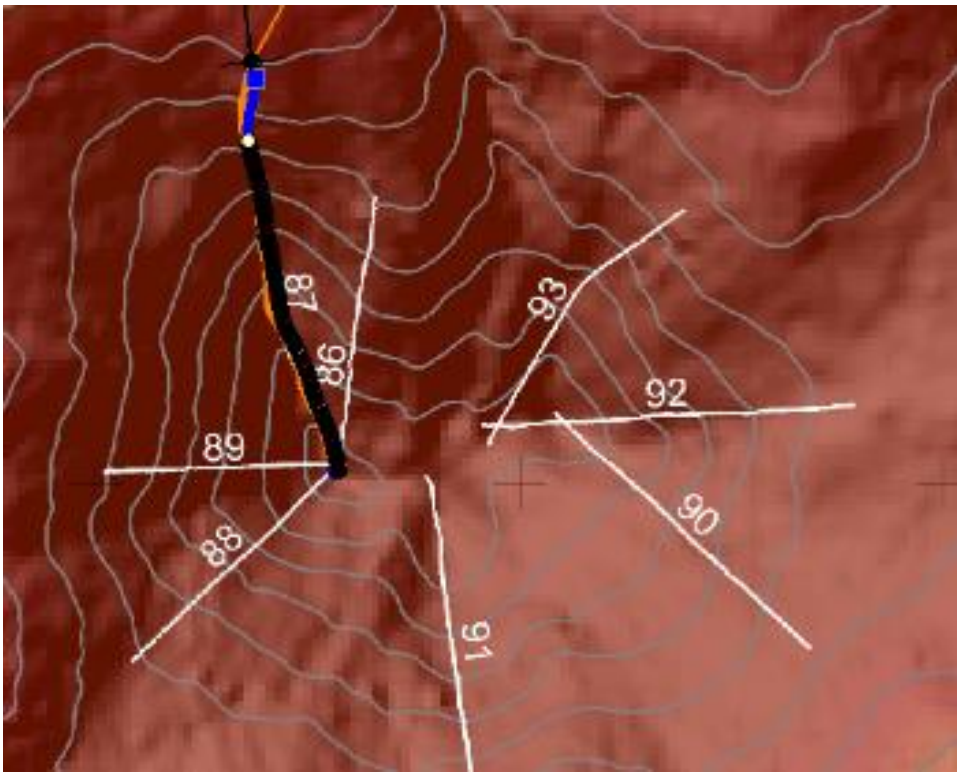
Left: TAN2009_076_023.jpg; low encrusting fauna including small stylasterids and gorgonian corals. Left: TAN2009_076_110.jpg; volcanic bedrock with low encrusting fauna on Diamond Head peak B Seamount.

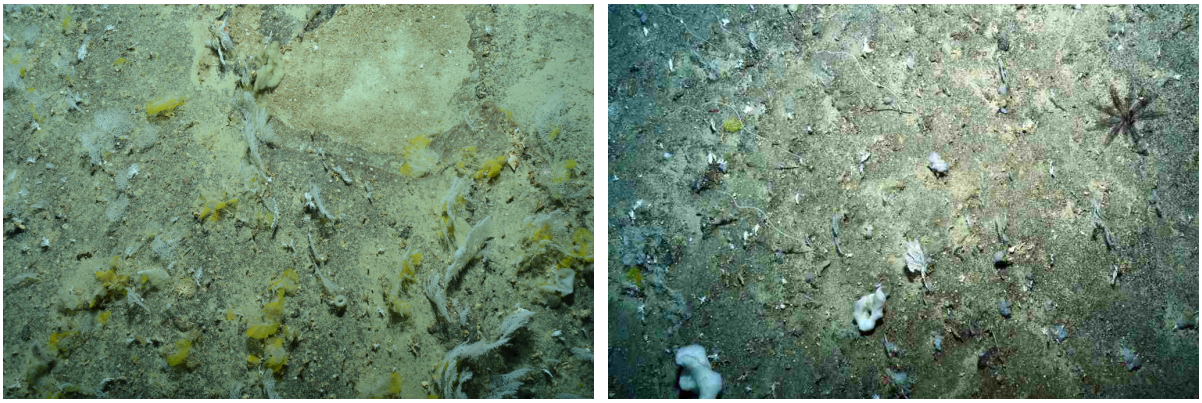
Station 77: Diamond Head Seamount, Peak B, NW transect

Rerun of TAN1503/87

Start depth: 524 m Finish depth: 803 m

At the summit substrate was bedrock, dominated by stylasterids with common demosponge (cow pat) and echinoids. There was a small patch of *Enallopsammia*. Hexactinellids became more abundant below 550 m as demosponges decreased. Below 600 m fauna were still dominated mainly by stylasterids, but there were some dense patches of hexactinellid sponges, and bryozoans (small yellow). *Primnoella* increased below 700 m., and there was a nice black coral and isidid at the end.





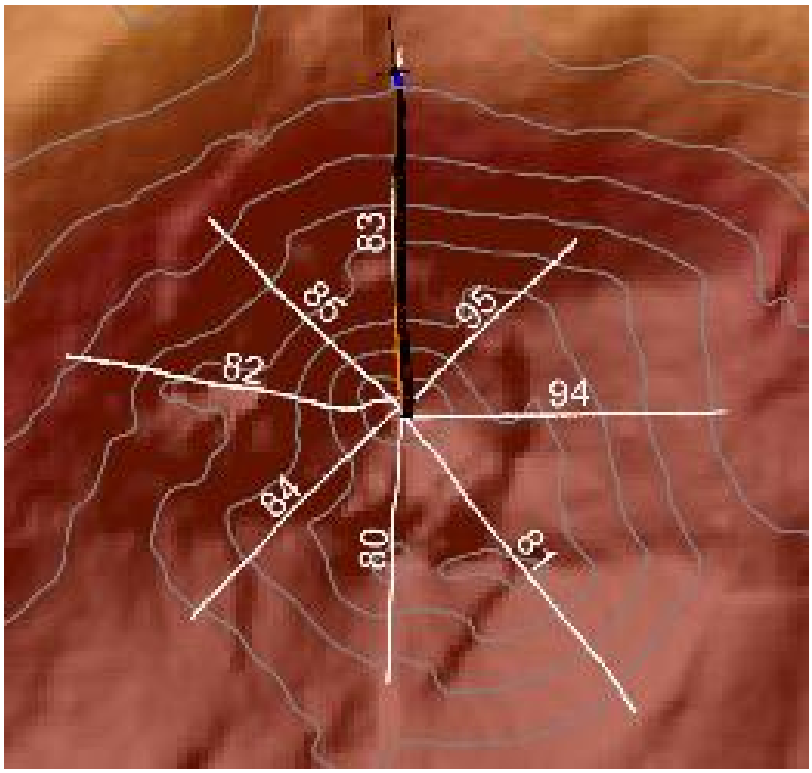
Left: TAN2009_077_136.jpg; yellow bryozoans and stylasterid fans. Right: TAN2009_077_197.jpg; black crinoid, hexactinellid sponges, stylasterids, and whip-like *Primnoella* below 650m.

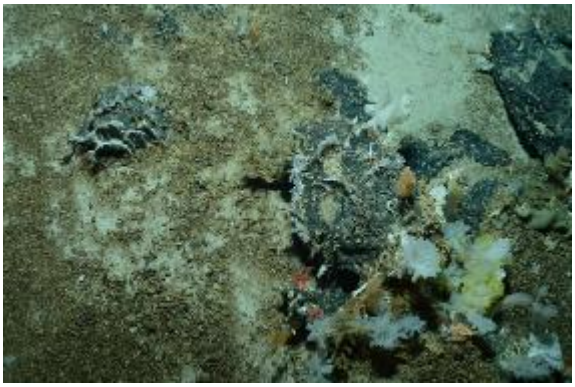
Station 078: Diamond Head Seamount, Peak A, N transect

Rerun of TAN1503/83

Start depth: 612 m Finish depth: 920 m

The summit was a flat top with bedrock and patches of rubble, hexactinellids, and stylasterids with scattered scleractinians (*Goniocorella dumosa*) at the edge. There were abundant yellow *Aphrocallistes*-zoanthid communities. The flank comprised a mix of bedrock and soft sediment, stylasterids, hexactinellids, and small gorgonians. There were a few *Primnoella* below 700m, and some black coral and large bamboo corals around 750 m. A broad soft sediment terrace occurred between 770–780m. Deeper there were scattered oreos, rattails, a giant lepidion, and bellowsfish





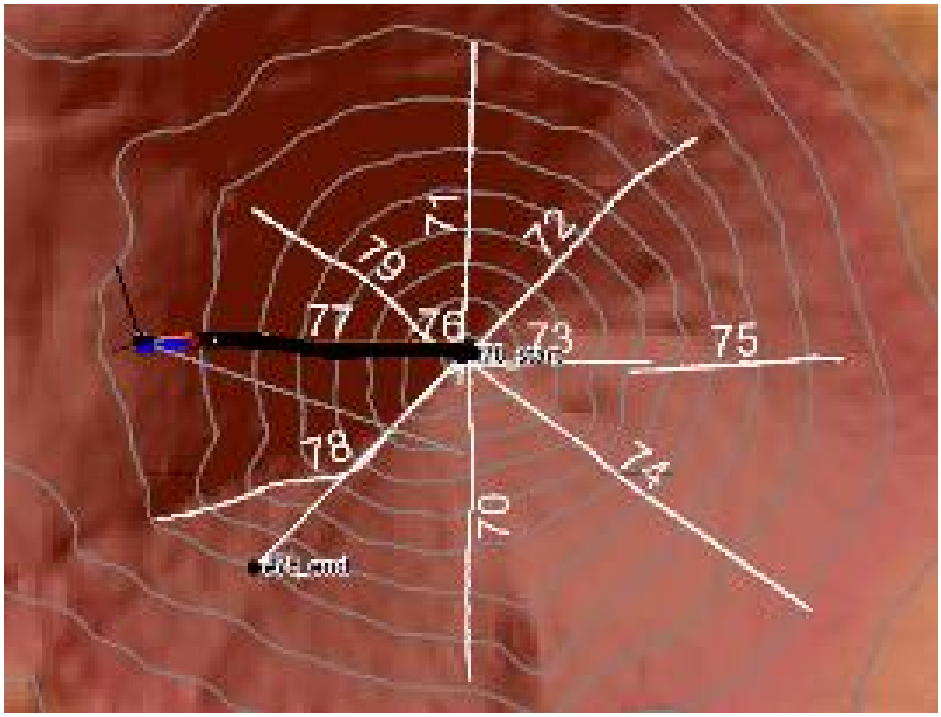
Left: TAN2009_078_15.jpg; a small cluster of purple *Enallopsammia rostrata* and *Aphrocallistes beatrix beatrix*. Right: TAN2009_078_079.jpg; diverse invertebrate community on Diamond Head peak A Seamount.

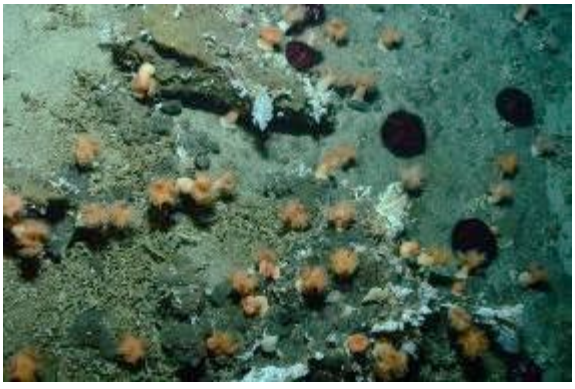
Station 079: Diamond Head Peak A, W transect.

Rerun of TAN1503/77

Start depth: 420 m Finish depth: 750 m

Stylasterids, echinoids, and anemones dominated the summit down to 435 m on bedrock and muddy sediment. The rest of the transect was a mix of bedrock, coral rubble, and muddy sediment with stylasterids present most of the time and observations of deepsea perch, anemones, an asteroid, a few scleractinians, gorgonians, hexactinellids, rattails, and morid cods.





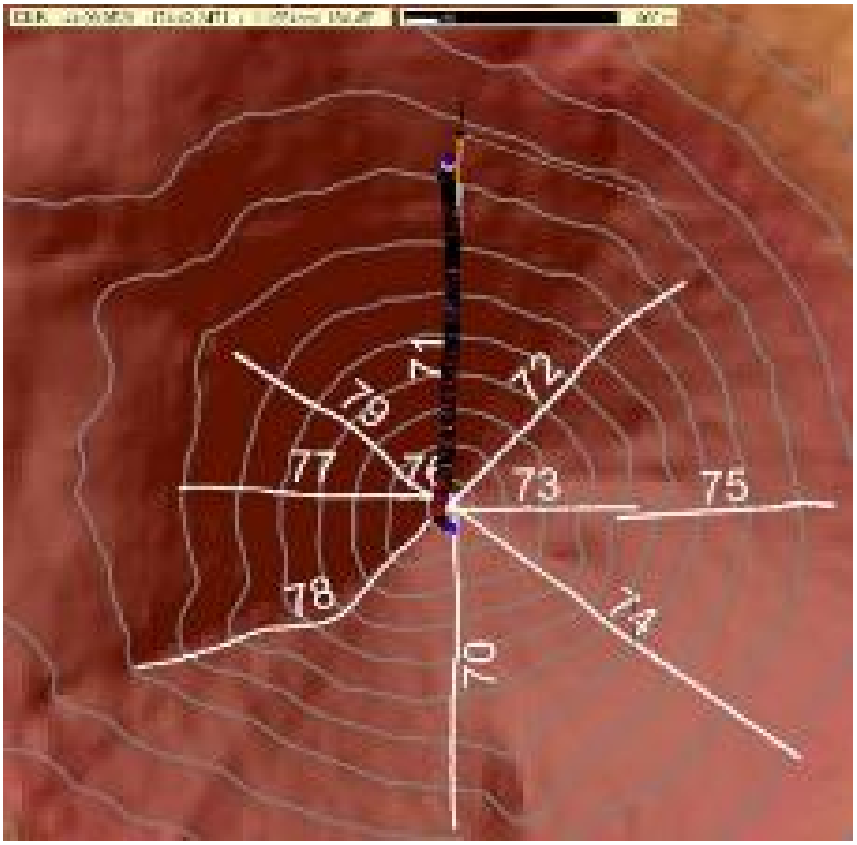
Left: TAN2009_079_10.jpg; abundant anemones, stylasterids, and large urchins. Right: TAN2009_079_060jpg; small gorgonians, stylasterids, and bryozoans on Diamond Head peak A Seamount.

Station 081: Diamond Head Peak A, N transect.

Rerun of TAN1503/71

Start depth: 423 m Finish depth: 784 m

The transect commenced in 435 m amongst a bedrock/rubble substrate with abundant anemones, echinoids, and stylasterids. Other fauna included asteroids, crabs, sponges, and gorgonians. Downslope in the cobbles and rubble stylasterids became dominant as anemones thinned out. The lower end of the flank consisted of sparse fauna (some stylasterids) with mixed substrata of bedrock and muddy sediment.



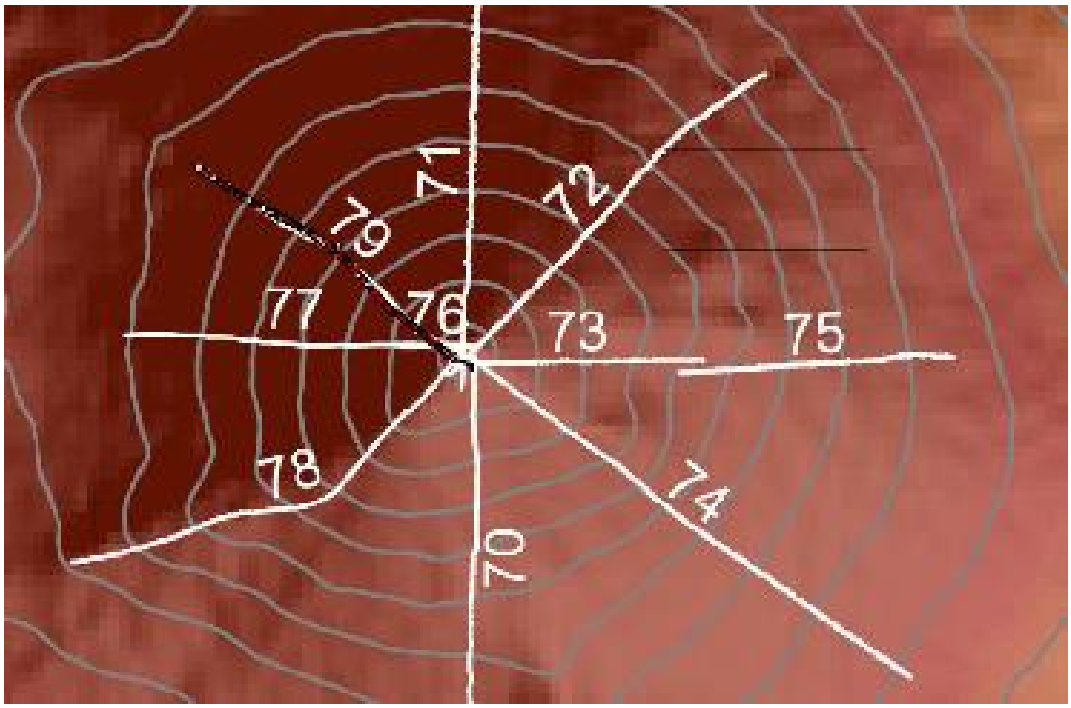
Left: TAN2009_081_038.jpg; scattered stylasterids, anemones, sponges, and a starfish. Right: TAN2009_081_064.jpg; large boulder with encrusting fauna on Diamond Head peak A Seamount.

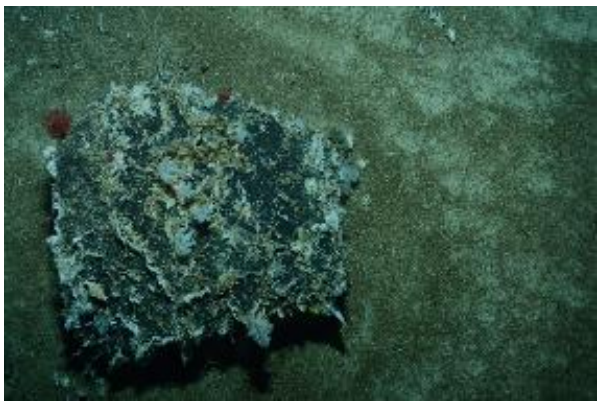
Station 082: Diamond Head Peak C, NW transect

Rerun of TAN1503/

Start depth: 432 m Finish depth: 728 m

At the summit the substrate was bedrock, cobble, and rubble. Dominant fauna included anemones, tam o'shanters, stylasterids, sponges, lacey bryozoans, and bellowsfish, with a few gorgonians and crabs. Small clumps of *Goniocorella dumosa* were also observed. Stylasterids remained abundant throughout the transect down the flank; substrata were mostly bedrock with an overlay of rubble and sand. The end of the transect comprised bedrock interspersed with patches of soft sediment with stylasterids, several oreos, and rattails.





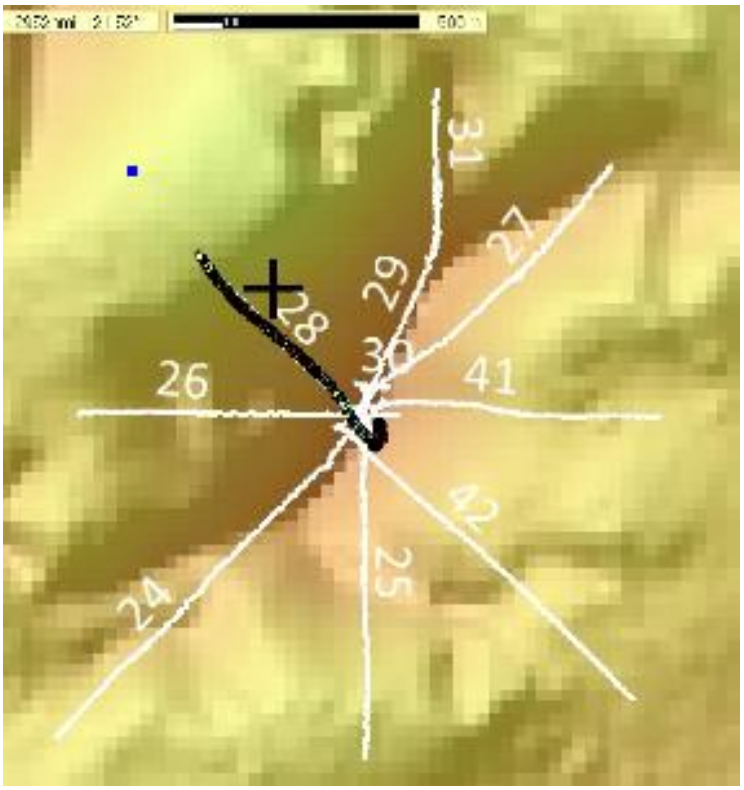
Left: TAN2009_082_053.jpg; coral fans and glass sponges, note the hard corals cradled in the stylasterid fans. Right: TAN2009_082_157.jpg; boulder with encrusting invertebrate fauna on Diamond Head peak A.

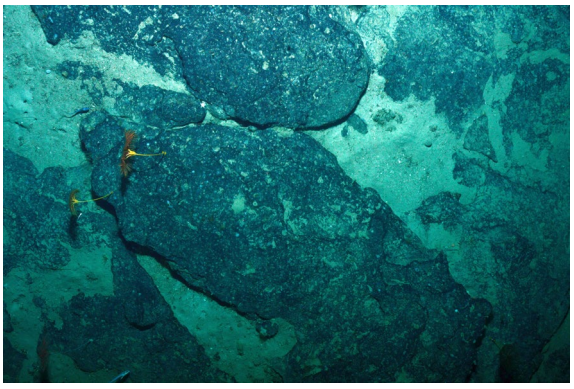
Station 084: Gothic seamount, NW transect

Rerun of TAN1503/28

Start depth: 1052 m Finish depth: 1189 m

The transect started at 1052 m on the southeast side of the summit. There were extensive areas of intact corals (*Solenosmilia variabilis*) with occasional sponges and crinoids. Up and over the summit at 935 m, the intact live coral extended on the northwest side to 1040 m with associated crinoids and brisingid seastars. Downslope bedrock with boulders, cobbles, rubble, and sand was the predominant substrate with limited fauna present. However, a bedrock outcrop region at 1100 m had live scleractinian corals and brisingids with both stalked and motile crinoids. Beyond this depth were muddy sediment, pebbles, and cobbles with few fauna present. Fish observed on the transect included orange roughy and rattails.



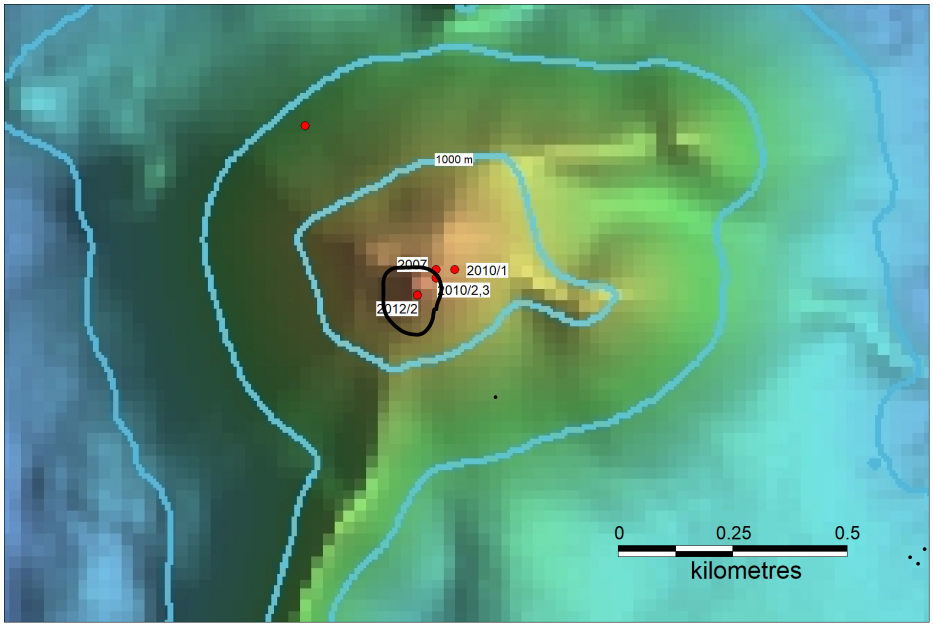


Left: TAN2009_084_051.jpg; *Solenosmilia variabilis* corals with comatulid crinoids. Right: TAN2009_084_109.jpg: Bedrock with sand patches and stalked crinoids.

Station 085: Morgue seamount, mooring search

Start depth: 923 m Finish depth: 916 m

This DTIS deployment targeted the TAN2012/02 mooring weight. An expanding box-grid search failed to reveal the weight, but on returning towards the start position it was observed on the video at -42.7171, -179.9601.



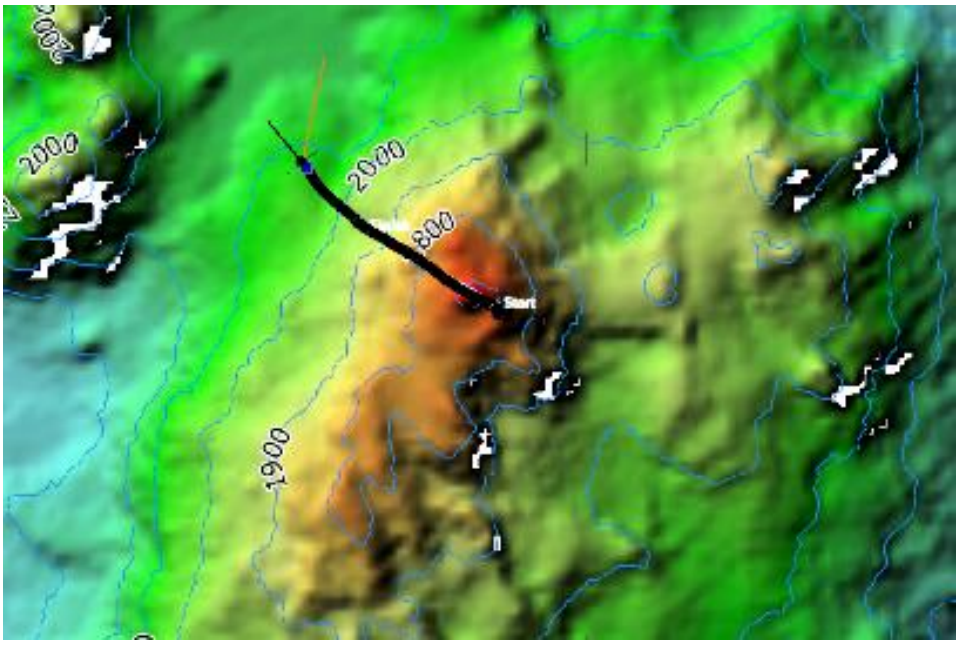
The general position of the 2012/02 mooring weight on Morgue (black circle).

The TAN1202/02 mooring weight. Frame grab from video, 1hr 40:30' into the tow.

Station 86: Epilogue Seamount

Start depth: 1138 m Finish depth: 1939 m

The tow was from the eastern side of the caldera up to the peak and down the northwestern flank. There were several clusters of *Dermechinus horridus* primarily lining edges of bedrock outcrops and pockets of sediment at and around the summit (1664 m) down to 1684 m. Substrate was primarily bedrock and muddy sediment down to 1855 m where it switched to fully muddy sediment. Several antipatharians and isidids were sighted around 1700–1720 m with patches of isidids, some up to ~5 m tall, also found at 1777–1855 m. Most diversity was around the summit. On the eastern summit face, there were gorgonians, brachiopods, isidids, sea pens, crinoids, king crab, shark egg cases, antipatharians, asteroids, and broken echinoid tests. Along the western flank there were sightings of oreo, slickhead, cusk eels, morid cods, rattails, gorgonians, isidids, *Anthomastus*, hexactinellids, crinoids, lollipop sponges, ophiuroids, and stalked crinoids. The soft substrate past 1855 m depth had burrows, ring of burrows, tracks, bony fish, asteroids, and dead coral branches associated with it.



Left: TAN2009_086_030.jpg. Dense aggregations of the urchin *Dermechinus horridus* near the summit of Epilogue Seamount. Right: TAN2009_086_272.jpg. Dense crinoid cluster and ophiuroids wrapped around a coral stem, with a rattail.