Helping Tristan da Cunha and St Helena manage their marine environments

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1. **Plain Text Summary**

The BAS-ODA and Cefas Blue Belt cruise, JR17-004, sailed from the Falkland Islands on 14 March towards Tristan da Cunha and St Helena. There were 23 scientists and technical support staff on board the RRS James Clark Ross, from BAS, Cefas, RSPB, SAERI, UKHO, University of Plymouth and University College London. The aim of the cruise was to provide Tristan and St Helena with improved knowledge of their offshore marine ecosystems. Such information can be used to help them manage their marine resources, both to ensure future sustainable exploitation and against external threats such as climate change. This scientific knowledge could also underpin designation and management of marine protected areas.

The marine mammal and bird observations started as soon as the JCR left harbour and were conducted during daylight hours throughout the voyage. 17 marine mammals, including 8 Sei whales were seen on passage to Tristan da Cunha and many thousands of birds.

1.1 Tristan da Cunha

7 marine mammals were sighted within the Tristan da Cunha EEZ, with a cluster located just within the northern limit. Sightings were made of potentially very rare shepherd's beaked whales and type D killer whales, but weather conditions did not allow for confirmation.

The focus of most of the research effort at Tristan da Cunha was to map the habitat and marine ecosystem of Yakhont and Crawford seamounts. Many 10's of thousands of birds were found to use both seamounts, with strong differences in the species found on each seamount. Crawford Seamount was clearly an important habitat for Little shearwaters, that were scarce elsewhere.

Large sections of both seamounts were mapped using swath bathymetry which will feed directly into improved navigational charts. These bathymetry maps were also used to identify different seafloor habitats and this habitat information was used to select sampling locations. Benthic sampling locations were also chosen to cover a range of sites that have been subjected to known levels of historic fishing effort.

The oceanographic environment was mapped with 8 CTD (conductivity, temperature, depth) instrument casts. The CTD also measured PAR, dissolved oxygen, fluorescence and had an ADCP (Acoustic Doppler Current Profiler) to measure the speed and direction of water currents. During one haul at both Yakhont and Crawford seamounts water samples were taken at 5, 25, 50, 75, 125, 200, 450 and 750 m depth and were subsequently filtered to sample particulate organic material, which will be used to measure the stable isotope signature in the water column. 4 expendable bathythermographs (XBT's) were deployed to gain sound velocity profiles to calibrate the multibeam.

The marine biodiversity was mapped using 28 shelf underwater camera (SUCS) deployments, 7 mini-Agassiz benthic trawls, 2 bongo nets for surface plankton and 15 rectangular mid water trawls (RMT8). On the last SUCS deployment the cable snapped while the camera was on the sea floor, however, some clever work by Captain Tim Page and his crew resulted in the recovery of the camera on the first attempt.

The mini Agassiz trawls caught 818 individuals from 17 taxonomic classes. In general the catch reflected what was visible in the SUCS images, with the benthos largely composed of brittle stars (188), corals (144), hermit crabs (100), hydrozoans (82) and sponges (74). Occasional large patches of stylasterid hydrocoral colonies were observed in SUCS images

and in one case sampled by the trawl. The catches did not differ substantially among seamounts.

The RMT8 caught 25 fish and 11 cephalopod taxa. The top of the seamounts were dominated by the small silver fish *Maurolicus inventionis.*

The baited pelagic camera, "4 eyes", was deployed 3 times at Tristan da Cunha. Blue sharks were seen on 2 of these 3 deployments. The camera was left with Trevor Glass, of the Tristan da Cunha Conservation Department, for them to deploy from their inshore boats.

A half day ashore allowed the findings of the cruise to be presented to Tristan Islanders and enabled discussions with government departments. We also embarked the Repetto family of three for passage to St Helena and the Island patrol vessel, the Wavedancer, so it could be mechanically assessed back in the UK.

1.2. St Helena

On arrival at St Helena we anchored off Jamestown to embark 5 observers from St Helena who were onboard to learn about the research conducted during the cruise. We also disembarked the Repetto family after a very enjoyable few days in transit from Tristan.

11 marine mammals sightings were made within St Helena waters, including 3 sightings of sperm whales. Bonaparte seamount was utilised by all three of the dolphin species, Bottlenose, Pantropical spotted and Rough toothed as well as other toothed whales. Counts of seabirds were lower, in the 10's rather than the numbers found at Tristan.

Large sections of the St. Helena shelf were mapped with multibeam as were an uncharted seamount, Sysoev and Bonaparte Seamounts. The habitat classification for selection of sampling locations was conducted using the same protocols as Tristan.

The oceanographic environment was mapped with 13 CTD deployments with the same sensors as at Tristan. The locations of the CTD stations on the St Helena shelf were chosen to cover all of the long term monthly oceanography sampling stations being monitored by the St Helena Darwin + project, with additional sites beyond the depth of their inshore CTD. 2 sets of water samples were taken, one from off the St Helena shelf and one at Bonaparte Seamount, as detailed for Tristan. 6 XBT's were deployed at St Helena for sound velocity profiles.

The SUCS was beyond repair and could not be used at St Helena. However, 8 mini-Agassiz trawls were deployed which caught 700 individuals from 19 classes. The trawl got caught during a tow on Bonaparte Seamount and although it came up bent out of shape it was recovered. Crabs (144) dominated the catches around Saint Helena and Bonaparte, with substantial numbers of polychaetes (73) and echinoids (34). The substrate around Bonaparte was mostly rhodolites with sponge covering them in the slightly deeper (150m) trawl. Interestingly all trawls on Bonaparte brought up both red and green algae indicating that light penetration must be exceptional.

18 RMT8 nets and 6 bongo nets were deployed to sample the pelagic environments at St Helena and Bonaparte seamounts. Diversity was higher with nets catching 50 species of fish and 15 species of cephalopod.

3 Avani trawls were deployed to sample microplastics and surface dwelling plankton.

2. **List of personnel**

2.1. *Scientific and technical*

SA Morley	BAS	PSO
MA Collins	Cefas	PSO
DKA Barnes	BAS	Marine benthic Ecologist
C Sands	BAS	Marine benthic Ecologist
J Bell	Cefas	Marine benthic Ecologist
S Walmsley	BAS	Cefas SIC
WP Goodall-Copestake	BAS	Pelagic Ecologist
FJF Howard	BAS	Hydrographer
TAM Stamford	Cefas	Marine Ecologist
V Laptikhovsky	Cefas	Marine pelagic Ecologist
SM Martin	Ind	Marine Mammal Observer
RA Schofield	RSPB	Marine Bird Observer
RS Shreeve	Ind	Pelagic Ecologist
AR Cotton	UCL	Pelagic ecologist
DR Evans	UKHO	Hydrographer
NAG Piechaud	UoP	Marine benthic Ecologist
PE Brewin	SAERI	Marine Ecologist
K Brigden	SAERI	Marine Ecologist
BH Apeland	BAS	Mechanical Engineer
WDJ Clark	BAS	Electrical Engineer
C Davies	BAS	Mechanical Engineer
SD Polfrey	BAS	Mechanical Engineer
SJ Quirk	BAS	Electrical Engineer
PCD Lens	BAS	IT support

2.2. *Ship's complement*

TS Page	Master
CW Hipsey	Chief Officer
MC Chapman	2nd Officer
RJ Bellis	3rd Officer
JS Greenhow	3rd Officer
MEP Gloistein	ETO Comms
JM Newsom	ETO Comms
GJ Lloyd	Chief Engineer
G Behrmann	2nd Engineer
A Little	3rd Engineer
ER Murray	4th Engineer
JL Jackman	Deck Engineer
SP Amner	ETO
RJ Turner	Purser
A Tomkinson	Doctor
DJ Peck	Bosun/Sci'Ops
AM Bowen	Bosun
FJ Hernandez	Bosun's Mate

ST Smith	SG1A
S English	SG1A
GL Waylett	SG1A
M Neilands	SG1A
DR Peck	SG1B
GM Wale	MG1
GN Henry	MG1
CI Walton	Chief Cook
ZA Fileva	2nd Cook
NR Greenwood	Snr Steward
G Raworth	Steward
OM Burch	Steward
CJ Ray	Steward

2.3. *Tristan Passengers to St Helena*

DS Repetto
RS Repetto
ADM Repetto

2.4. *St Helenian Scientists on cruise*

OC Donovan
LM Henry
AE Small
PJ Cherrett
BA Taylor

3. **Timetable of events**

12 March	Join RRS James Clark Ross
13 March	Depart Stanley for bunkers
14 March	Depart Mare Harbour for Tristan da Cunha
23 March	Commence science operations at Yakhont East Seamount
25 March	Commence science operations at Yakhont West Seamount
27 March	Commence science operations at Crawford East Seamount
29 March	Commence science operations at Crawford West Seamount
31 March	Shore visit to Tristan da Cunha
31 March	Depart Tristan da Cunha for Saint Helena
5 April	Commence Science Operations around Saint Helena
6 April	Passenger transfer Saint Helena
6 April	Continue Science operations around Saint Helena
9 April	Swath unknown seamount on Russian chart
9 April	Swath charted feature NW of St Helena
9-10 April	Swath and science operations at Sysoev Seamount
10 April	Swath and science operations at Bonaparte Seamount
12 April	Depart for St Helena
13 April	Science team disembark and JCR heads North

4. **Introduction**

4.1. *Vision and objectives*

Small Island communities such as Tristan da Cunha and St Helena are highly dependent on marine resources, principally lobster and finfish harvesting. Exploitation of these resources is fundamental to Island economic and food security, including ecotourism revenue. Understanding the future of sustainable resources, in the face of climate change, is, therefore, a key social concern. Our research programme targeted Island specific scientific priorities, employing large scale NERC infrastructure and a multidisciplinary team to build knowledge and capability. Through training and improved understanding we provided the tools to improve management of marine exploitation and protect island biodiversity into the future. This improved knowledge will help locate marine protected areas to maximise conservation benefit and build knowledge to help Islanders to mitigate the impacts of climate change.

4.2. *Background*

Tristan da Cunha (TdC) and Saint Helena are mid-Atlantic Oceanic Islands that form part of the British Overseas Territory of Saint Helena, Ascension and Tristan da Cunha. TdC (37°4'S, 12°19'W) is just one of two, temperate, mid-ocean island archipelagos in the Southern Hemisphere. It is the most isolated, inhabited, island in the world. St Helena (15°46'S, 05°43'W) is tropical, sitting in the easterly trade winds and is also remote from the nearest other populated country. BAS Official Development Assistance (ODA) and Blue Belt funding provided 6 and 10 days of survey time respectively (8 days in each of Tristan da Cunha and St Helena) in March-April 2018. Due to the clash of the shore visit at TdC with Good Friday, the cruise time at TdC was extended by 24 hours. This survey will be followed by an additional ODA/Blue Belt survey in spring 2019, aboard the RRS Discovery.

4.3. *BAS ODA*

BAS has a long history of marine research in the polar-regions, undertaking marine ecosystem research, investigating the health of the marine ecosystem, with an aim to understand the mechanisms determining ecosystem resilience and change. The outcomes of this research provides scientific advice to UK policy makers and fisheries managers, helping, for example, with the designation of marine protected areas. BAS also uses this polar expertise to conduct marine research at lower latitudes, including previous projects at Tristan da Cunha and Ascension Island and a current project at St. Helena.

Non-polar research is now a core activity for BAS as the UK government requires some of BAS's core funding to be used for projects that satisfy the requirements of "Official Development Assistance". ODA projects must provide a direct benefit to a country on the Development Assistance Committee list of ODA eligible countries. The territory of Saint Helena, Ascension and Tristan da Cunha is categorised as an upper middle income country (http://www.oecd.org/dac/financing-sustainable-development/development-finance-standards/DAC_List_ODA_Recipients2014to2017_flows_En.pdf). ODA projects must provide a direct benefit to the DAC listed country and are expected to target one of more of the UN sustainable development goals. (http://www.un.org/sustainabledevelopment/sustainable-development-goals/).

This funding provided an ideal opportunity for BAS to provide additional science support to Tristan da Cunha and St Helena government departments and several themes will be supported by JR17-004, including bentho-pelagic coupling around seamounts; current and larval dispersal modelling and pelagic ecosystem modelling.

This project has benefited greatly from the collaborators who gave their time and expertise to assist with planning and executing the cruise.

4.4. *UKOT Blue Belt Programme*

The Blue Belt Programme supports the delivery of the UK Government's commitment to provide long-term protection of over four million square kilometres of marine environment across the UK Overseas Territories. The Programme is being delivered by a partnership between two UK Government agencies, the Centre for Environment, Fisheries and Aquaculture Science (Cefas) and the Marine Management Organisation (MMO). In partnership with the Overseas Territories, Cefas and the MMO have developed bespoke work plans to help them understand their marine environments, design appropriate marine management and protection strategies, and develop effective monitoring, surveillance and enforcement strategies. As part of this Programme, Cefas is working with the relevant OTs to undertake multidisciplinary field survey campaigns designed to fill some of the most pressing gaps in understanding of their marine environments. JR17-004 was be the first such survey to visit Tristan da Cunha and St Helena and fulfils some of the objectives highlighted in discussions with the OT governments, including seamount topography and communities; pelagic food webs and pollution.

4.5. *Island directed priorities*

4.5.1. *Tristan da Cunha*

Meetings were held at the RSPB headquarters in Sandy and the Foreign and Commonwealth Office in London to collate the findings of previous research and highlight data gaps. These data gaps were then prioritised and research targets identified for JR17-004 research.

Priorities were:

- Survey to underpin MPA designation
- Biological information for whole ecosystem fisheries management
- Knowledge of food web vulnerabilities
- Economic diversity

4.5.2. *St Helena*

Plans for the St Helena leg of the cruise were developed through discussions with staff in the Environment and Natural Resources Directorate of St Helena Government. In particular the cruise was designed to complement work being undertaken on a Darwin Plus funded project on which SHG and BAS are partners.

5. **EM122 Multibeam Echosounder and Expendable Bathythermographs (XBT)**

Floyd Howard, Daniel Evans

5.1. EM122 *Multibeam Echosounder*

5.1.1. *Data acquisition*

Bathymetric data was collected using a hull-mounted Kongsberg 1° x 1° EM122 multibeam echosounder (see Appendix A2 for further details). The EM122 equipment was operated using Kongsberg Seafloor Information System (SIS) and Helmsman software. A detailed report on the acquisition and processing of the data with an evaluation of data quality and surveying methods is presented in Appendix A. Data was organised into six separate surveys, summarised in Table 5.1. Acquisition settings and filters were predominately those summarised in Table 5.2, however they were adjusted as required as dictated by weather conditions, sea state, and ocean depth. Changes to acquisition parameters, sea-state conditions, sound velocity profiles and salinity values were logged using the RRS JCR's digital event logging system and paper survey line logs. Digital copies of these event logs are available on request to the UK Polar Data Centre (polardatacentre@bas.ac.uk).

Table 5.1: Summary of EM122 data collected on JR17004.

Survey Name	Start Date	End Date	Description	Number of files (.all)	Processed (Caris Hips & Sips v9.)	Comment
jr17004_a	19:41:42 14/03/2018	20:16:03 14/03/2018	Transit Falkland Islands – Tristan Da Cunha	2	2	Started a new survey for transit as Grid Engine failed in SIS.
jr17004_b	20:31:02 14/03/2018	09:33:33 23/03/2018	Transit Falkland Islands – Tristan Da Cunha	205	205	
jr17004_c	09:36:38 23/03/2018	11:35:41 01/04/2018	Tristan Da Cunha Seamount Survey	226	226	
jr17001_d	11:35:41 01/04/2018	12:05:00 03/04/2018	Transit Tristan Da Cunha – St Helena	49	49	
jr17004_e	13:25:27 03/04/2018	08:44:02 07/04/2018	Transit Tristan Da Cunha – St Helena	39	39	Started a new survey after JCR power failure stopped em122

Survey Name	Start Date	End Date	Description	Number of files (.all)	Processed (Caris Hips & Sips v9.)	Comment
Jr17004_f	08:44:02 07/04/2018	06:34:00 13/04/2018	St Helena Seamount Survey	243	240	Lines 81 and 82 had water column data logged as JCR transited over a potential shipwreck

Table 5.2: Summary of EM122 sounder and filter settings that were predominately used during JR17004.

Sounder Main Settings		Filter and Gain Settings	
Max Angle	65	Spike Filter Strength	WEAK on seamounts; STRONG during transit
Max Coverage	20000	Range Gate	NORMAL on seamounts; SMALL during transit over abyssal plain
Max/Min Coverage	Variable depending on water depths expected	Phase Ramp	NORMAL
Coverage mode	Manual	Penetration Filter Strength	WEAK on seamounts; STRONG during transit
Ping Mode	Auto		
Beam Spacing	HD Equidistant		

Table 5.3: Summary of total area surveyed during JR17004.

Location	Area (km2)
Transit	74,586
Tristan Da Cunha's EEZ	24,273
St Helena's EEZ	10,054
Total	108,914

In total 108,914 km2 of seabed was surveyed during JR17004 (Table 5.3). Figure 5.1-5.4 illustrate the final bathymetry grids at 50m cell size resolution for the seamounts targeted by JR17004. Figure 5.2 and Figure 5.4 further illustrate slope, and fine scale bathymetric position index (BPI) derived from these bathymetric grids. Values of slope (in degrees) represent the inclination of the seabed. Areas of low slope (arbitrarily chosen as 5° or less) on the seabed were of particular interest during JR17004 as potentially suitable sites for Agassiz trawl sampling, which ideally requires the surveyed seabed to be very gently slope downwards. BPI is a measure of where a location is relative to the area surrounding it. BPI data sets are created through a neighbourhood analysis function and can be completed at a variety of scales. Positive values indicate regions that are higher than the surrounding area (generally hills, ridges) while negative values indicate locally lower areas than the surrounding seabed (valleys, troughs). BPI values near zero are either flat or areas of constant slope (where the slope of the point is significantly greater than zero). BPI was of interest as a proxy for different habitats to identify potential SUCS site locations. Slope and BPI surfaces were calculated using ArcGIS v10.4 Spatial Analyst Slope tool and Benthic Terrain Modeller (Wright et al., 2005) Fine BPI (inner radius = 3, outer radius = 25) tool.

C

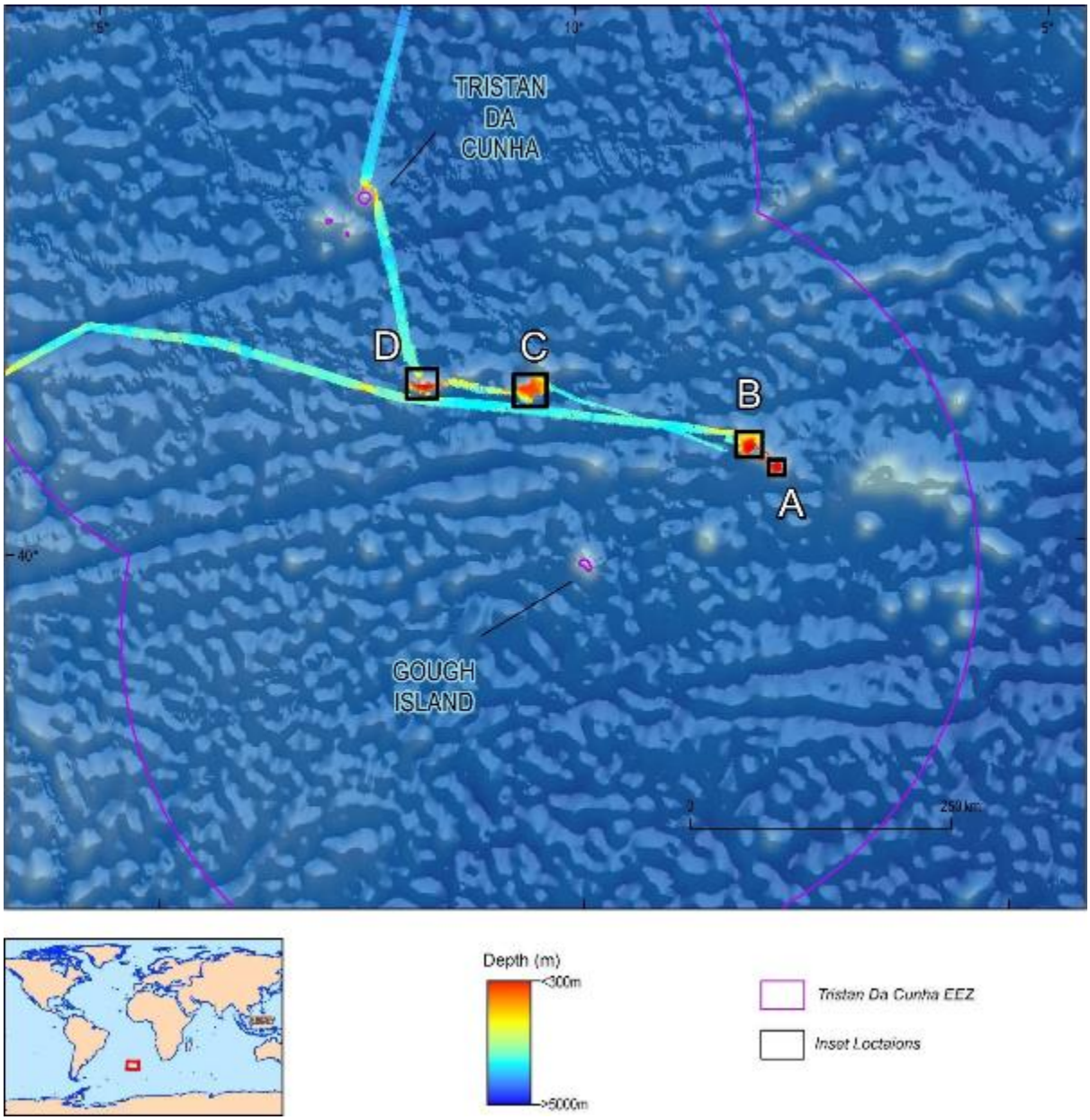


Figure 5.1. Multibeam bathymetry coverage collected within Tristan Da Cunha's Exclusive Economic Zone. Black boxes indicate the extents of insets ⎚5.2⎚.

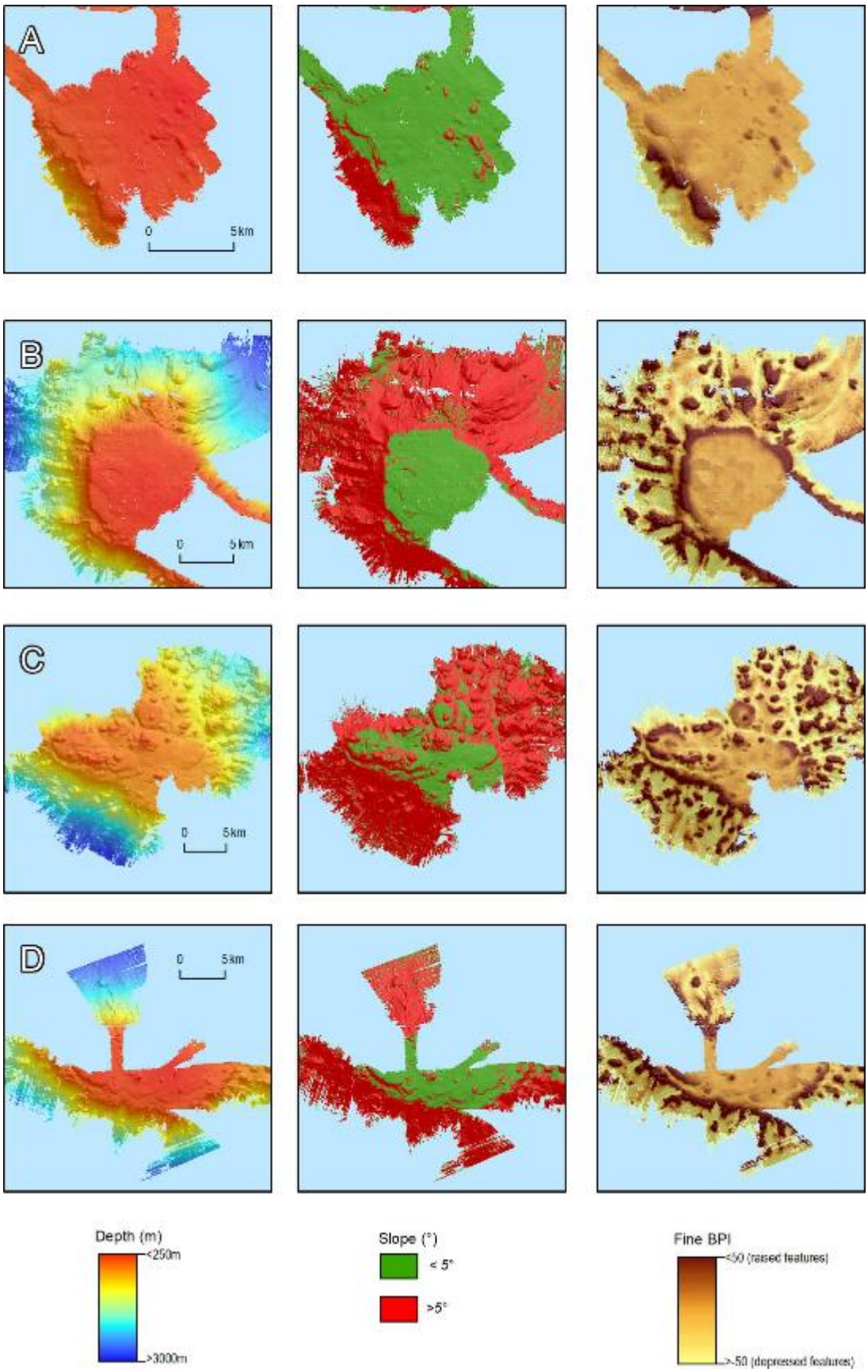


Figure 5.2. Hillshaded multibeam bathymetry, slope and fine-scale bathymetric profile index (BPI) collected from a) Yakhont Seamount (east), b) Yakhont Seamount (west) c) Crawford Seamount (east) and, d) Crawford Seamount (west).

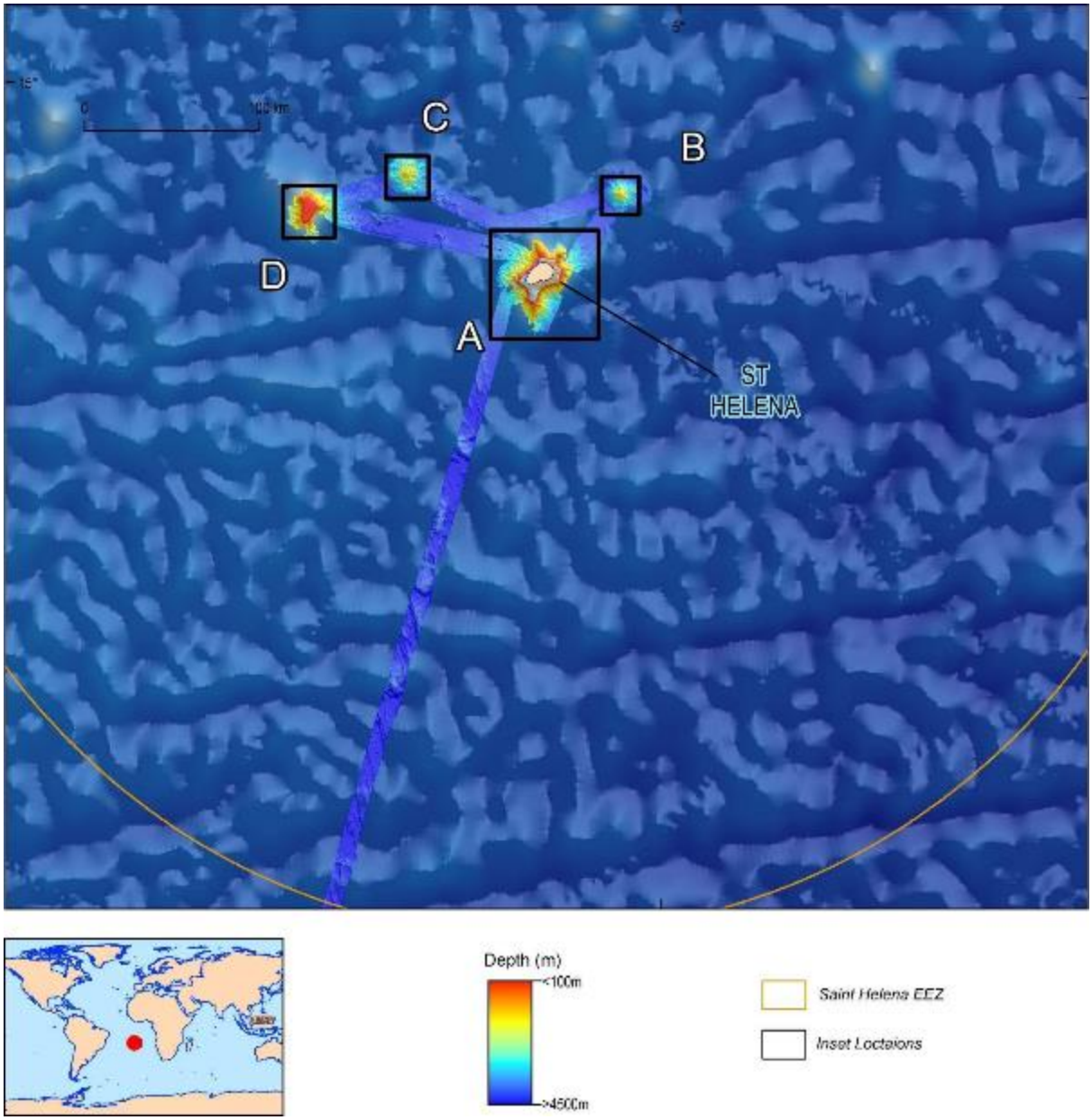


Figure 5.3. Multibeam bathymetry coverage collected within St Helena's Exclusive Economic Zone. Black boxes indicate the extents of insets A-D of Figure 5.4.

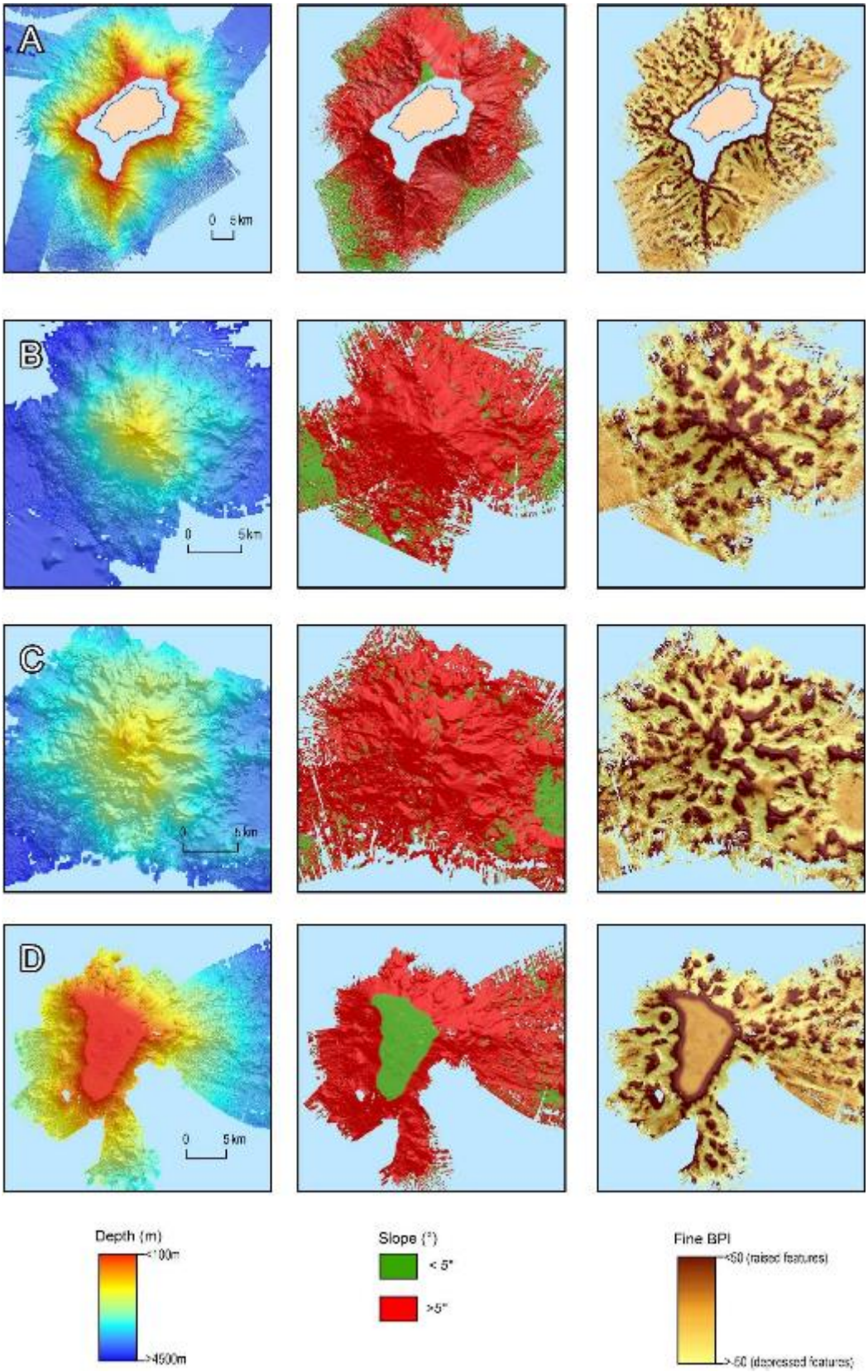


Figure 5.4. Hillshaded multibeam bathymetry, slope and fine-scale bathymetric profile index (BPI) collected from a) St Helena, b) Unnamed seamount, c) Sysoev Seamount and d) Bonaparte Seamount.

5.2. *Expendable bathythermographs (XBT) (Floyd Howard)*

5.2.1. *Data acquisition*

XBTs (T-5 and T-7 models) were deployed during the multibeam mapping components of the cruise to provide sound velocity profile corrections for the EM122 data. Fourteen XBTs were deployed with CTDs and synthetic SVPs generated using HydrOffice Sound Speed Manager v.2018.1.5 software (Gallagher et al., 2017) providing the remaining SVPs. A summary of XBTs deployed is provided in Table 5.4.

Table 5.4. Summary of XBTs deployed collected on JR17004. FI = Falkland Islands, TDC = Tristan Da Cunha, SH = Saint Helena.

XBT ID	Model	Latitude (DD)	Longitude (DD)	Water Depth (m)	Bridge Event	Location	Serial Number
JR17004_BR001_XBT001	T5	-50.3582	-52.7137	2015.1	1	Transit FI-TDC	383641
JR17004_BR002_XBT002	T5	-48.7163	-46.8962	589.07	2	Transit FI-TDC	383640
JR17004_BR003_XBT003	T5	-39.6014	-19.0994	3305.2	3	Transit FI-TDC	383634
JR17004_BR004_XBT004	T5	-38.2287	-14.5127	3156.7	4	Transit FI-TDC	383637
JR17004_BR024_XBT005	T5	-39.3033	-8.19765	1278.4	24	TDC	383633
JR17004_BR040_XBT006	T7	-39.4013	-7.81184	809.28	40	TDC	1220044
JR17004_BR0058_XBT007	T5	-38.7226	-11.4222	2398.7	58	TDC	3383632 (XBT failed)
JR17004_BR0059_XBT008	T5	-38.729	-11.4533	1863.3	59	TDC	383636
JR17004_BR0076_XBT009	T5	-34.3263	-11.388	3940.7	76	Transit TDC-SH	383656
JR17004_BR00105_XBT010	T5	-15.6410	-5.3458	3969.66	105	SH	383600
JR17004_BR00109_XBT011	T5	-15.5693	-6.2271	3958.52	109	SH	383664
JR17004_BR115_XBT012	T5	-15.6276	-6.85497	2377.84	115	SH	383660 (XBT failed)
JR17004_BR116_XBT013	T5	-15.6374	-6.83763	2377.84	116	SH	383657
JR17004_BR125_XBT014	T5	-15.7655	-6.95494		125	SH	38366

5.3. *References*

Gallager, B., Masetti, G., Zhang, C. Clader B.R. & Wilson, M.J. 2017. Sound Speed Manager: An Open-Source Initiative to Streamline the Hydrographic Data Acquisition Workflow. US Hydro 2017, March 20-23.

Wright, D. J., E. R. Lundblad, E. M. Larkin, R. W. Rinehart, J. Murphy, L. Cary-Kothera, and K. Draganov. 2005. ArcGIS Benthic Terrain Modeler. Corvallis, Oregon, Oregon State University,

Davey Jones Locker Seafloor Mapping/Marine GIS Laboratory and NOAA Coastal Services Center. Accessible online at: http://maps.csc.noaa.gov/digitalcoast/tools/btm.

6. **Selection of benthic sample locations**

Prior to the cruise, the resolution of available bathymetry was too poor to sufficiently resolve topographically similar areas in the target areas and so, at each of the survey sites, the first stage was to conduct a detailed bathymetry survey. Following the swath survey, benthic sampling sites were selected within a-priori topographic classifications created in the ArcGIS module 'Benthic Terrain Modeler' (BTM) in ArcGIS v10.5 and BTM v.3.0. This maximised the extent to which the benthic sampling sites could be used to determine impacts of past fishing on the seamounts, by eliminating, as far as possible, community variation attributable to depth or habitat related effects. The main habitat types of interest were classified via a set of parameters, presented in Table XXX.1. The sole input into the workflow is a UTM projected (Zone 29S) digital elevation model (DEM) and all other parameters (e.g. slope) are derived during the workflow. This workflow did not consider parameters such as rugosity or aspect, but these could be incorporated into future analyses.

Most sampling stations were spread across areas with varying degrees of historic bottom fishing activity. In practice, although all areas were classified in each case, the majority of the benthic stations (AGT and SUCS) focussed upon shallow sloping and flat areas, in depths of between 280 – 380 metres1, reflecting the distribution of historic fishing effort. As a rule, all sampling stations were separated by a minimum of 1.5 km for each gear type, but to conserve time during science operations, adjacent sites were generally not separated by more than 3 km. No AGT stations were placed in areas of known demersal fishing activity, to ensure that the maximum amount of biological material could be recovered per deployment (following the assumption that demersal trawling is likely to have decreased abundance of benthos). A small number of deeper SUCS deployments were made, when time allowed, to provide samples of presence-absence data to support ongoing work focussed on modelling the distribution of fauna associated with vulnerable marine ecosystems (University of Plymouth and BAS). See the relevant sections for the specifics of how each gear type was deployed at the stations.

Table 6.1. BTM classification parameters for selection of benthic sampling stations. BPI = Bathymetric Position Index. Inner radius for broad BPI = 25. Outer radius for broad BPI = 250. Inner radius for fine BPI = 3. Outer radius for fine BPI = 25.

	Broad BPI		Fine BPI		Slope (°)		Depth (m)	
Zone	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Abyssal plain (> 3000m)			-100	100				-3000
Abyssal rise (> 3000m)			100					-3000
Abyssal depression (> 3000m)				-100				-3000
Seamount ridges (1000-3000m)			100				-3000	-1000
Seamount depressions (1000-3000m)				-100			-3000	-1000

[1] Within each target area, the depth variation was usually much smaller (e.g. Yakhont NW ranged ~ 300 – 345 m)

Seamount steep face (1000-3000m)			-100	100	30		-3000	-1000
Seamount shallow face (1600-3000m)			-100	100		30	-3000	-1600
Seamount shallow face (1200 - 1600m)			-100	100		30	-1600	-1200
Seamount shallow face (1000 - 1200m)			-100	100		30	-1200	-1000
Seamount crest (500-1000m)	100		100				-1000	-500
Seamount crest (200 - 500 m)	100		100				-500	-200
Seamount ridges (500-1000m)			100				-1000	-500
Seamount ridges (200 - 500 m)			100			50	-500	-200
Seamount depressions (500-1000m)				-100			-1000	-500
Seamount depressions (200 - 500 m)				-100		50	-500	-200
Seamount steep face (200-1000m)			-100	100	50		-1000	-200
Seamount shallow face (500-1000m)			-100	100		30	-1000	-500
Seamount shallow face (200-500m)			-100	100		30	-500	-200
Island Shelf (< 200m)							-200	0

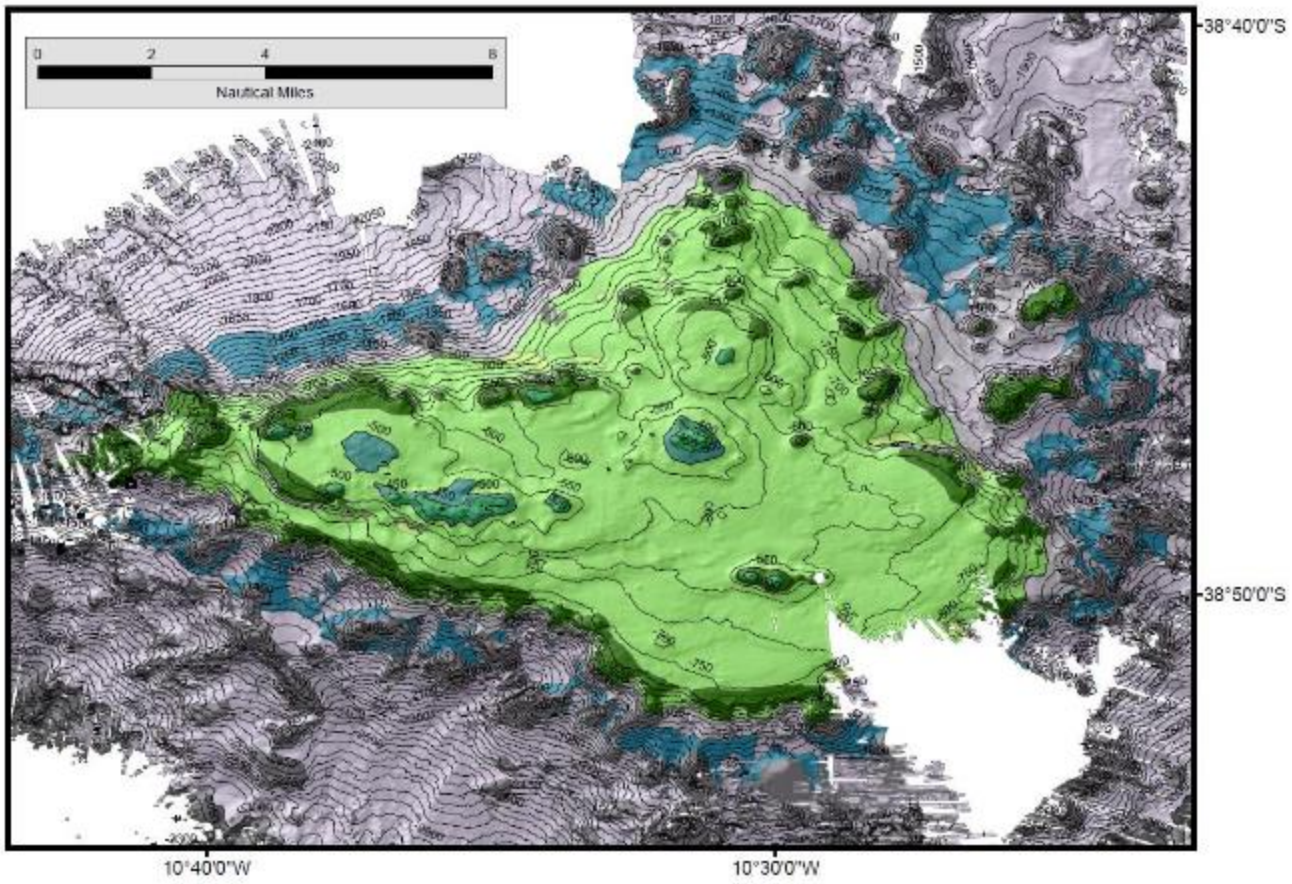


Figure 6.1. Example of BTM workflow product where each colour relates to a topographically distinct area. Classifications coloured in grey were not considered during this cruise. Deeper areas of slope (dark blue) were considered for AGT deployments but ultimately the grounds were considered too rough for a deployment to be considered safe.

7. Sample Locations

7.1. *Tristan da Cunha*

The above topographical selection techniques were used to select sites for (SUCS) camera and AGT (Agassiz trawl) deployments. CTD, XBT and RMT8 deployments were selected based on water depth.

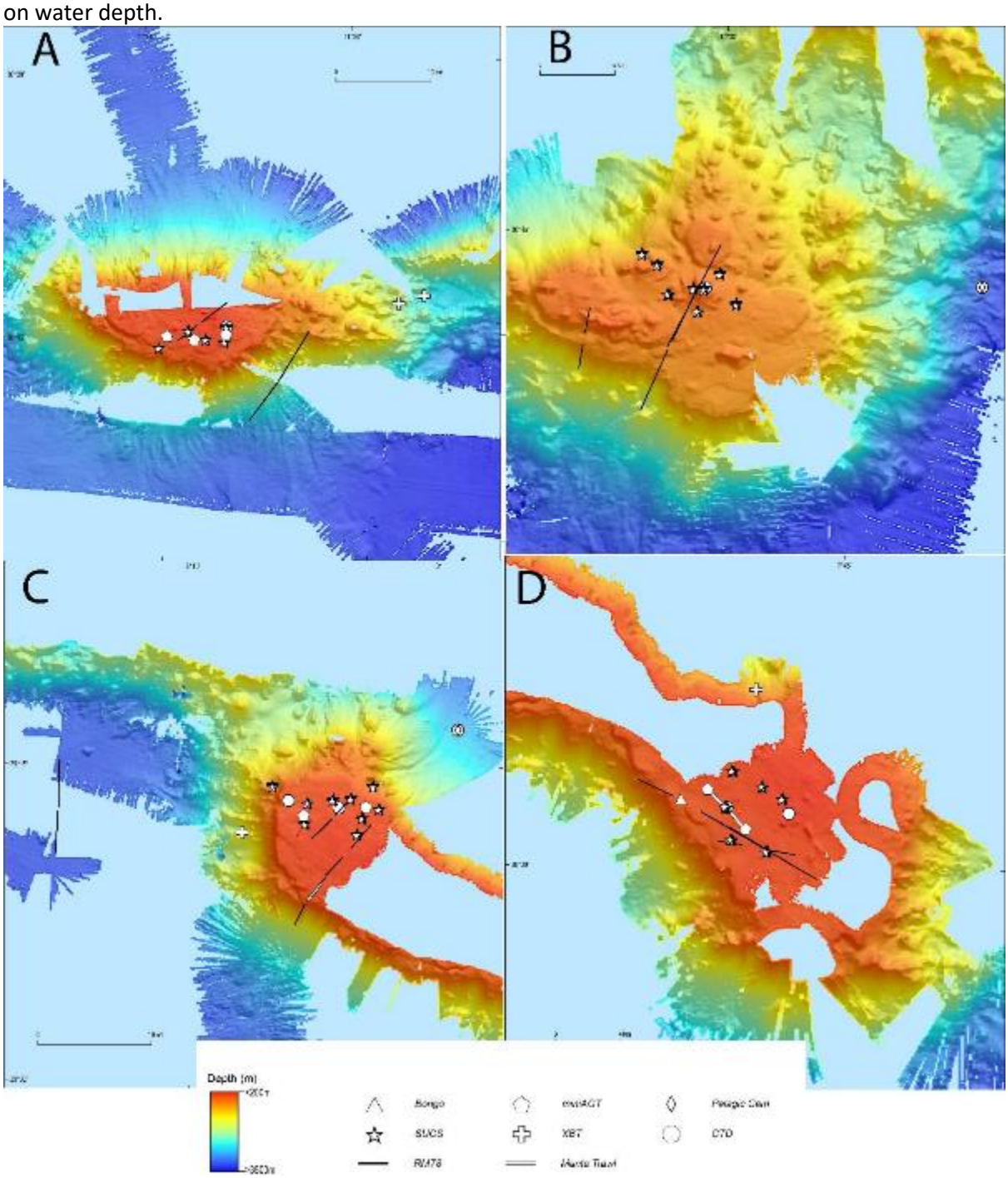


Figure 7.1. Bathymetry and sampling sites at A, Crawford east, B, Crawford west, C,Yakhont east and D, Yakhont west.

7.2. *St Helena*

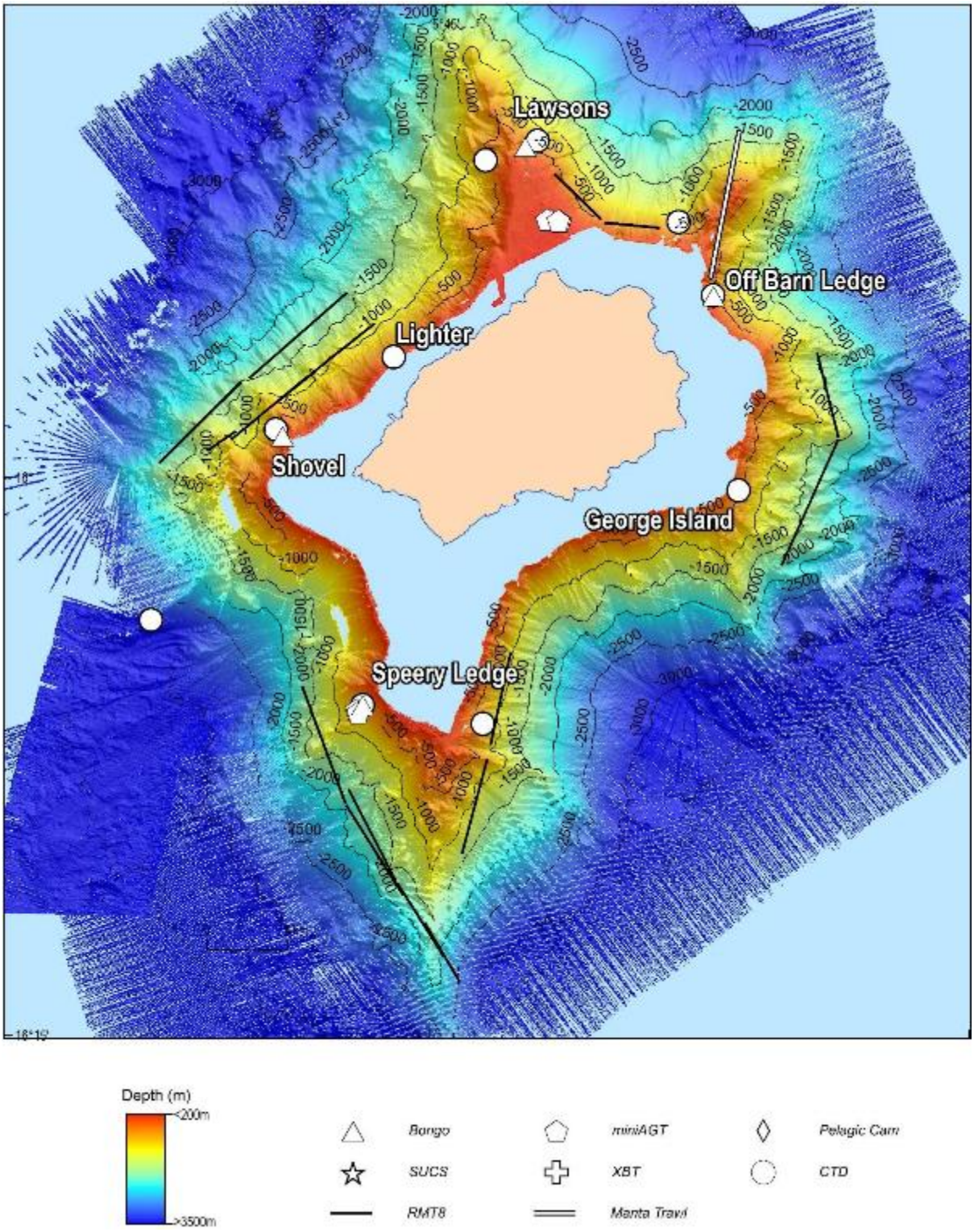


Figure 7.2. Sampling sites around St. Helena

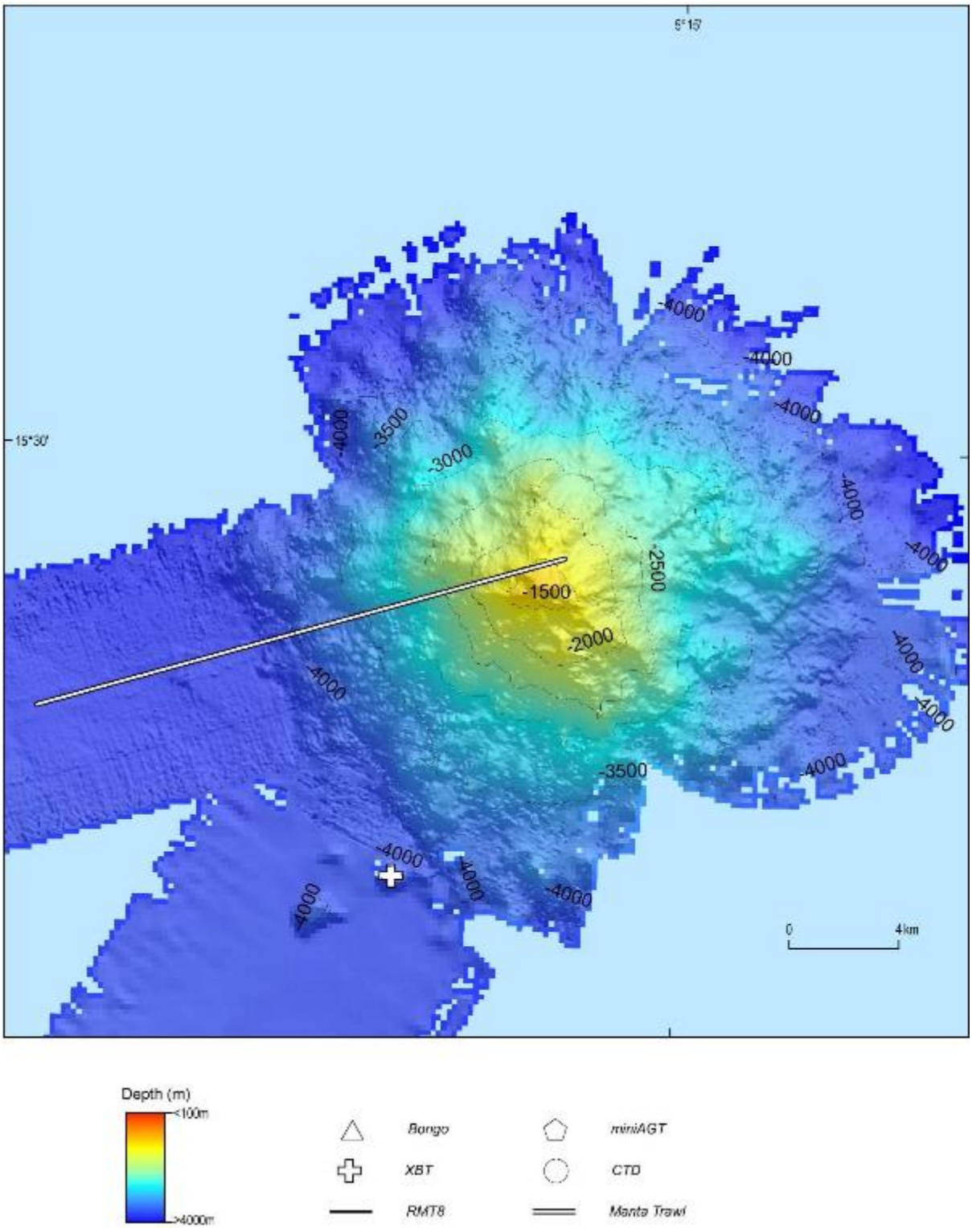


Figure 7.3. Sampling sites around un-named seamount on Russian Chart

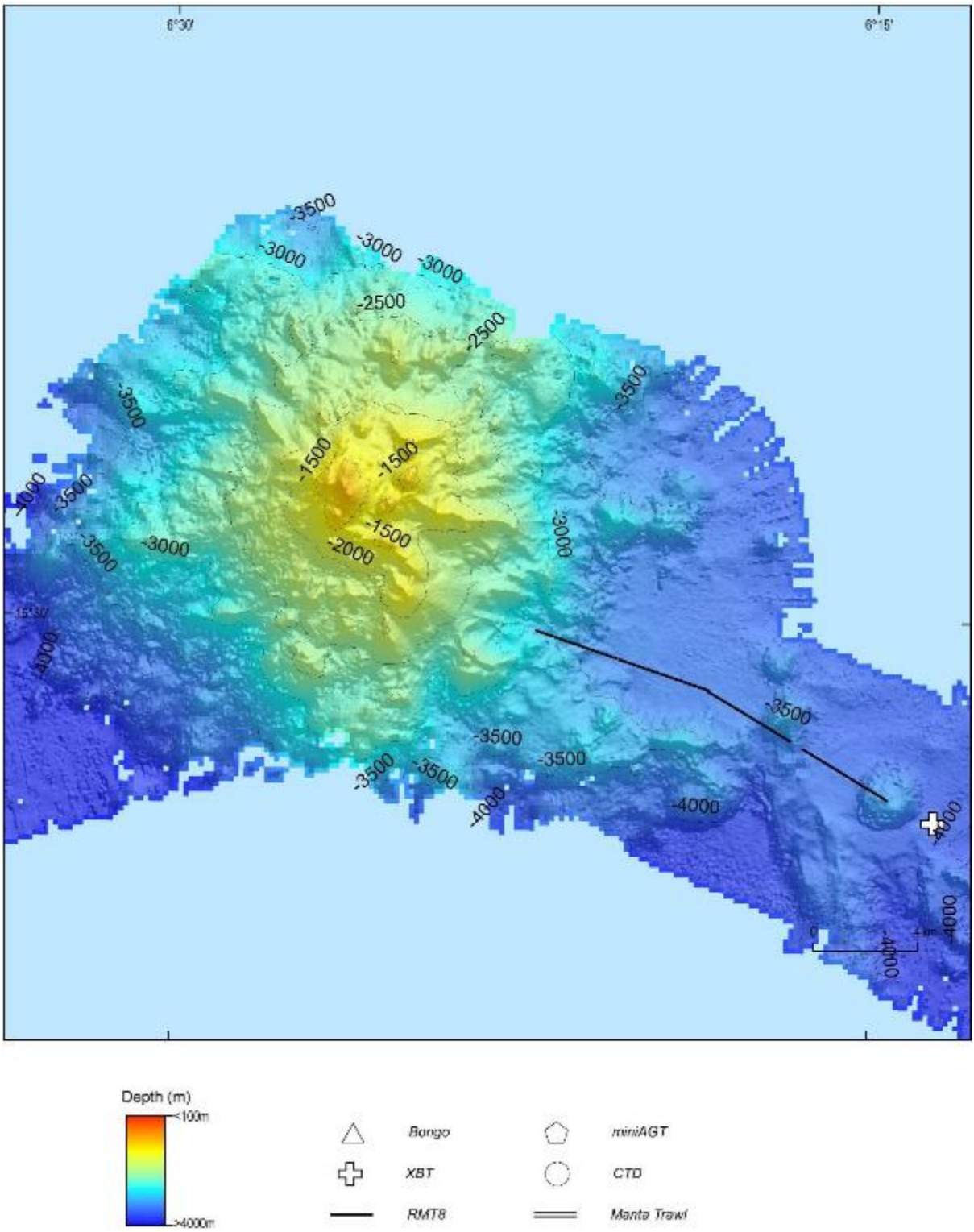


Figure 7.4. Sampling sites around Sysoev Seamount (wrongly named Bagration Seamount on the UK hydrographic office chart)

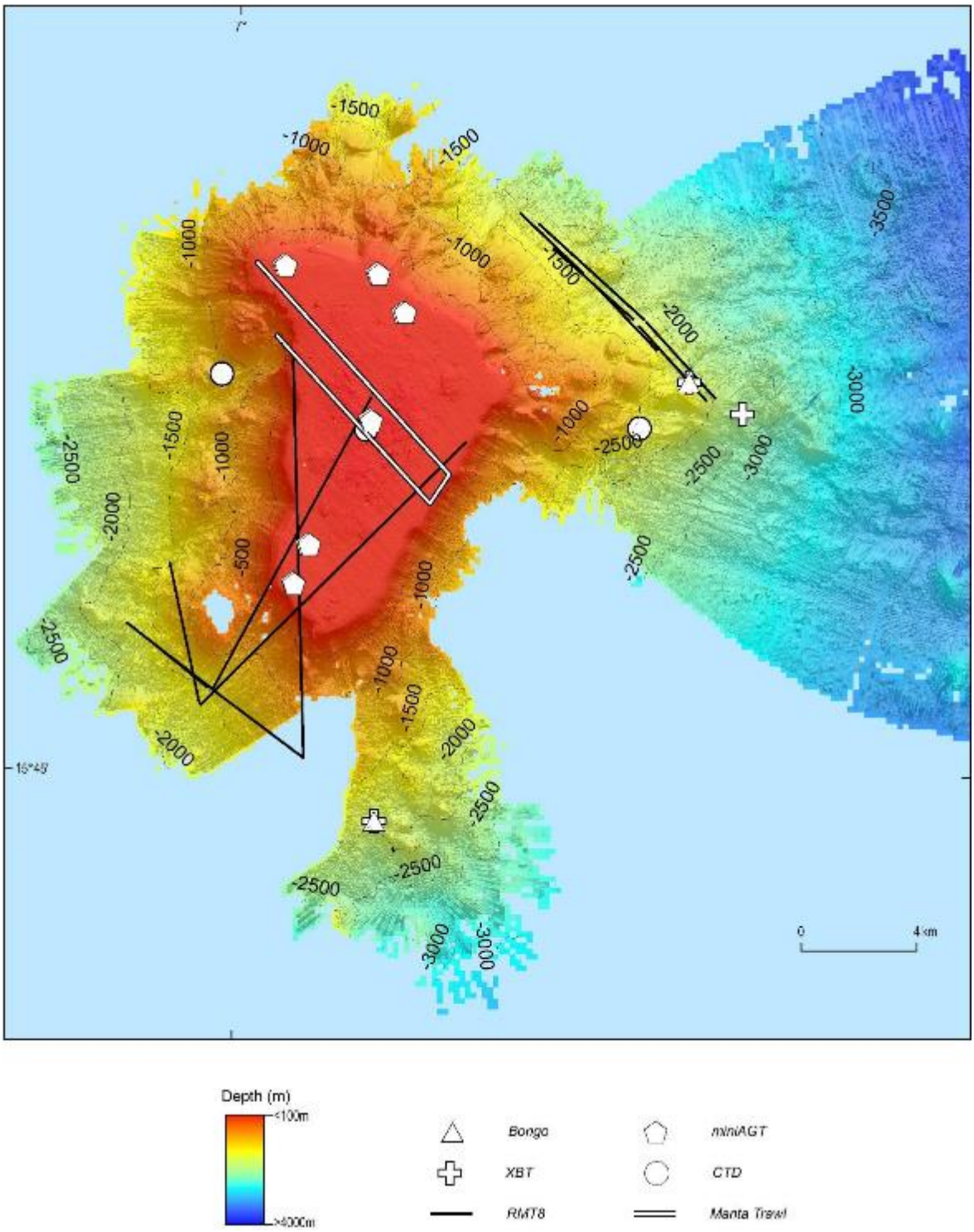


Figure 7.5. Sampling sites around Bonaparte Seamount

8. CTD

8.1. *Tristan da Cunha*

The CTD was deployed 9 times at Tristan da Cunha (see Figure X for samples locations and Appendix 1 for GPS positions). Most CTD casts were on top of the seamounts except for two deeper CTD's which were used for sound velocity profiles to calibrate the EM122 multibeam echosounder and take water samples from 5, 25, 50, 75, 125, 200, 450 and 750m depth.

These water samples were filtered for particulate organic material that will be analysed for stable isotope composition.

8.2. *St Helena*

The CTD was deployed 13 times at St. Helena, 10 casts were around the main Island and 3 at Bonaparte Seamount (see Figure X for samples locations and Appendix 1 for GPS positions). One deeper CTD cast at St Helena and two deeper CTD casts at Bonaparte seamount were used for sound velocity profiles to calibrate the EM122 multibeam echosounder. Water samples from 5, 25, 50, 75, 125, 200, 450 and 750m depth were taken from one deeper CTD at St. Helena and one at Bonaparte seamount. These water samples were filtered for particulate organic material that will be analysed for stable isotope composition. A contour plot of water temperature at 200m around St. Helena indicates possible cooler regions that could be the result of upwelling.

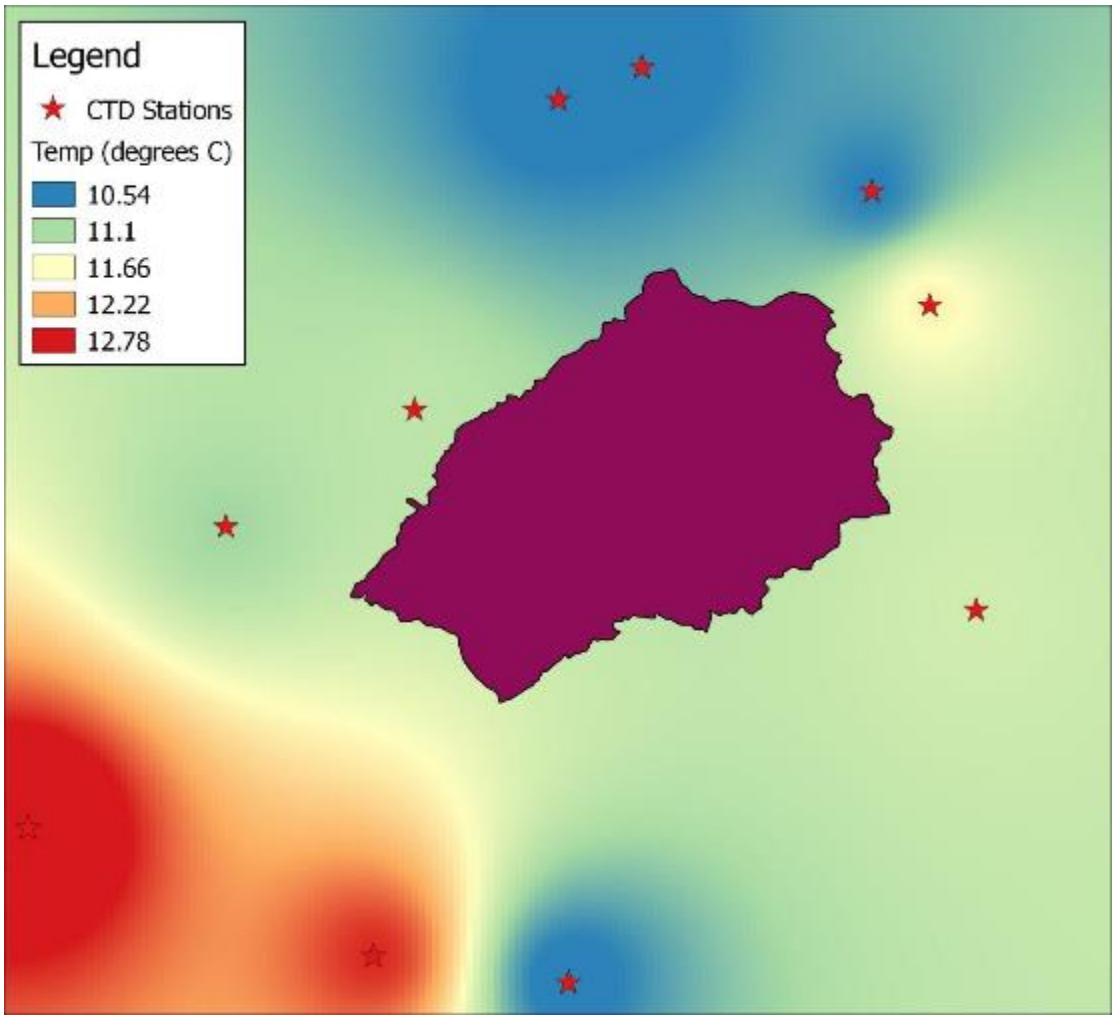


Figure 8.1. Temperature plot at 200m depth, smoothed from CTD deployments around St Helena.

9. Shallow Underwater Camera System (SUCS)

9.1. *Background*

The SUCS for the Tristan da Cunha and St Helena ODA/Blue Belt cruise comprises of three units:
1. UIC unit comprising (i) PC & monitors, (ii) deck box and (iii) aux hard drive.
2. Deck unit consisting of the (i) winch, (ii) UW cable, (iii) deck monitor and (iv) cable pulleys on deck and ships gantry.
3. UW unit consisting of a tripod holding the (i) UW housing including camera, booster & power distribution board, (ii) UW lights and (iii) USBL beacon.

The colour photo stills (2448 x 2050) and video footage (2448 x 2050) can be taken separately or simultaneously. The SUCS is used to assess habitat type (substratum nature, particle size and rugosity), estimate faunal density, biomass and taxon composition of the benthos, which is otherwise difficult to achieve because of the selectivity and qualitative nature of capture by towed apparatus, e.g. the AGT. SUCS has previously been used throughout the Bellingshausen, Scotia and Weddell seas in Antarctica as well as the South Atlantic islands and Arctic Barents Sea. Noteworthy to JR17004 is the use at Tristan da Cunha and Gough (2013) and Ascension Island's seamounts (2017).

The SUCS and Agassiz gears are deployed concurrently at the same sites to gain biodiversity and biomass data. Specimens trawled in the AGT can be identified by detailed morphological inspection and/or molecular methods improve the likelihood and confidence of correct identifications. This can then be used to ground truth individuals seen in the SUCS images. The SUCS images can be examined to reveal the selectivity of AGT, such as what types of benthos were not caught or under-represented. Following image analysis, density information can be ascribed to taxonomic units, form which hard identification can be added by identification from AGT specimens. Likewise, biomass at size and age can be obtained from AGT specimens and then given mass per unit area using the SUCS density information. The latitude, longitude and depth USBL information from each image can then be matched to CTD and multibeam swath data to provide environmental parameters around each image.

9.2. Sampling

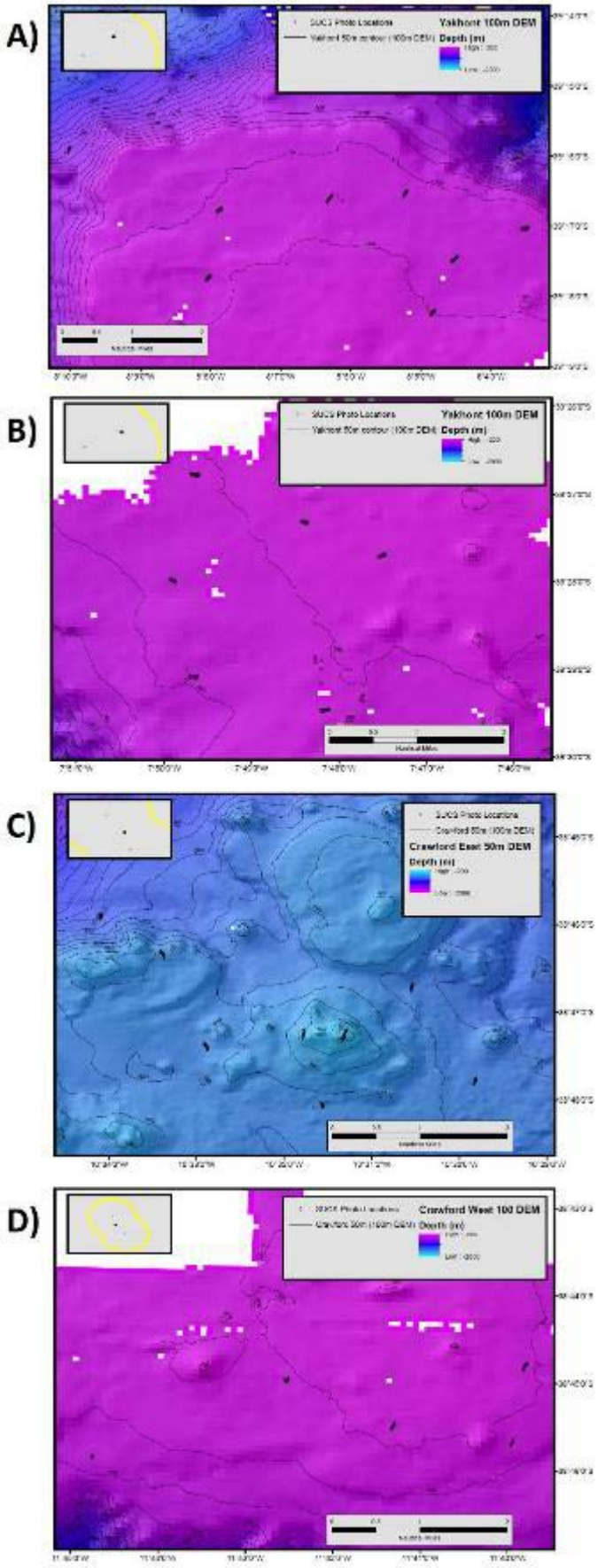

A)
Yakhont 100m DEM
Depth (m)
B)
Yakhont 100m DEM
Depth (m)
C)
Crawford East 50m DEM
Depth (m)
D)
Crawford West 100 DEM

Figure 9.1. Deployment maps of the four sites across Yakhont and Crawford seamounts, showing topography and SUCS image locations.

At Yakhont, detailed data regarding fishing effort were available and so the SUCS deployments were stratified to cover a range of demersal trawl effort values, in areas of seafloor that ranged between 0 and 39 times trawled (resolution of fishing effort layer = 25m^2). Of the 13 Yakhont SUCS deployments on the peak (i.e. not including the slope deployments), 6 were made in areas where no trawling has occurred recently, and 7 were made at varying levels of trawl intensity.

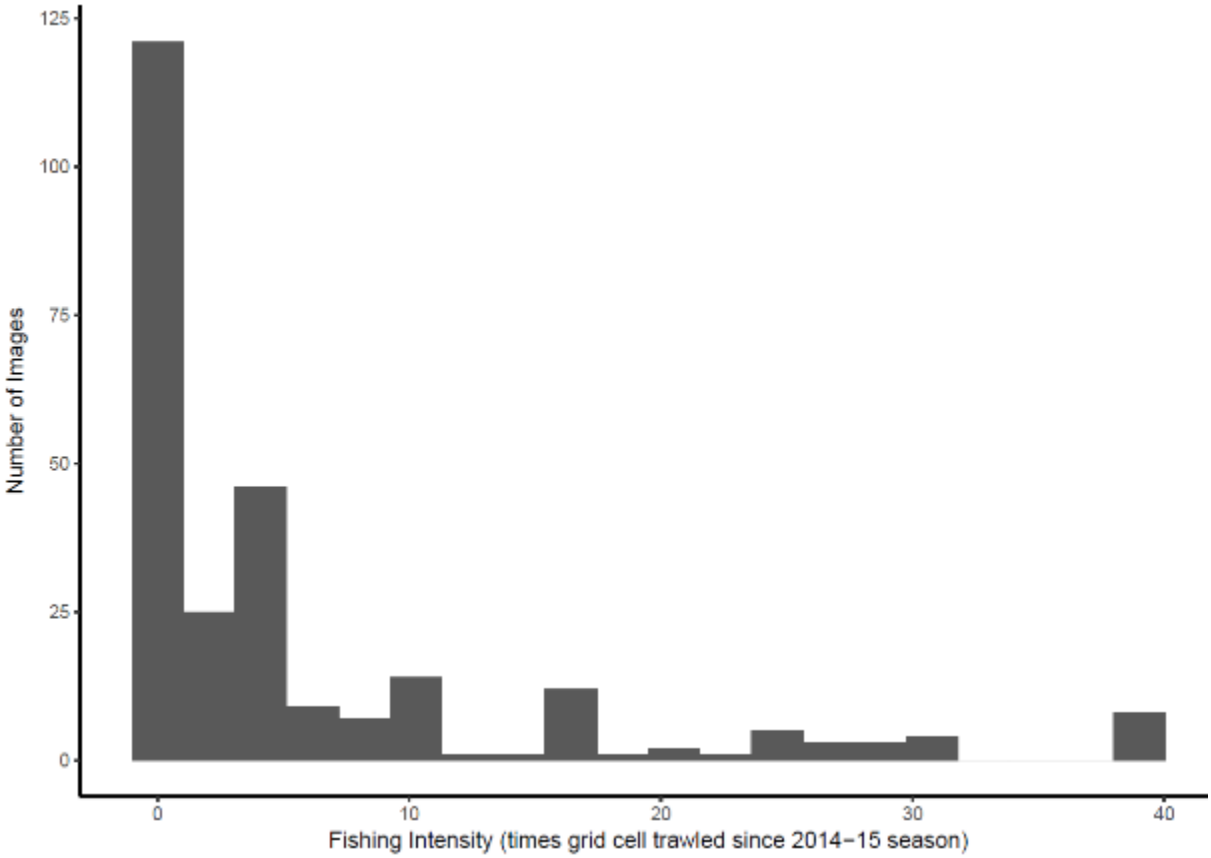


Fig 9.2. Histogram of number of images within varying levels of recent trawl intensity.

Fishing effort data was not available at the same spatio-temporal resolution at the Crawford sites, but there had been no known demersal trawling in these areas since the 2002-03 fishing season. All deployments at these sites were taken as areas that had been subject to an unknown level of fishing effort, but not for some 15 years, thus giving some data on disturbance recovery times.

Seamount plateau habitats of Yakhont.

Fig 9.3. Typical habitats on the plateau of Yakhont West seamount (coarse sand with dispersed cobbles left and foliose coral right)

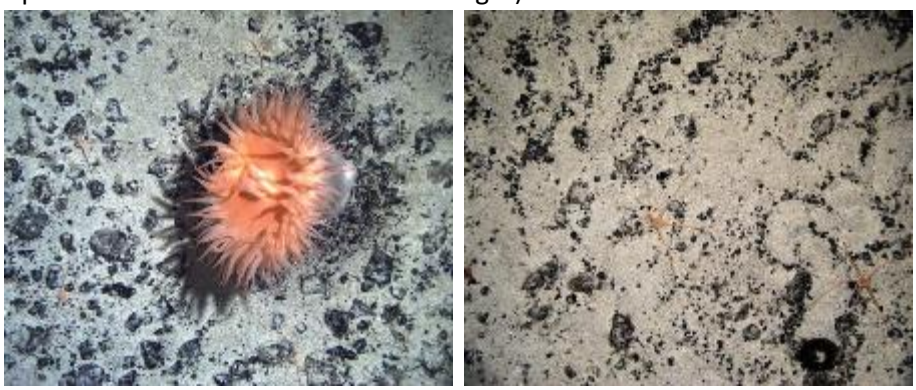


Fig 9.4. Habitats of Yakhont East seamount. Giant anemone on coarse sand, pebble and cobble matrix; left, and irregular sea urchin (echinoid) ploughed sand with pebbles; right.

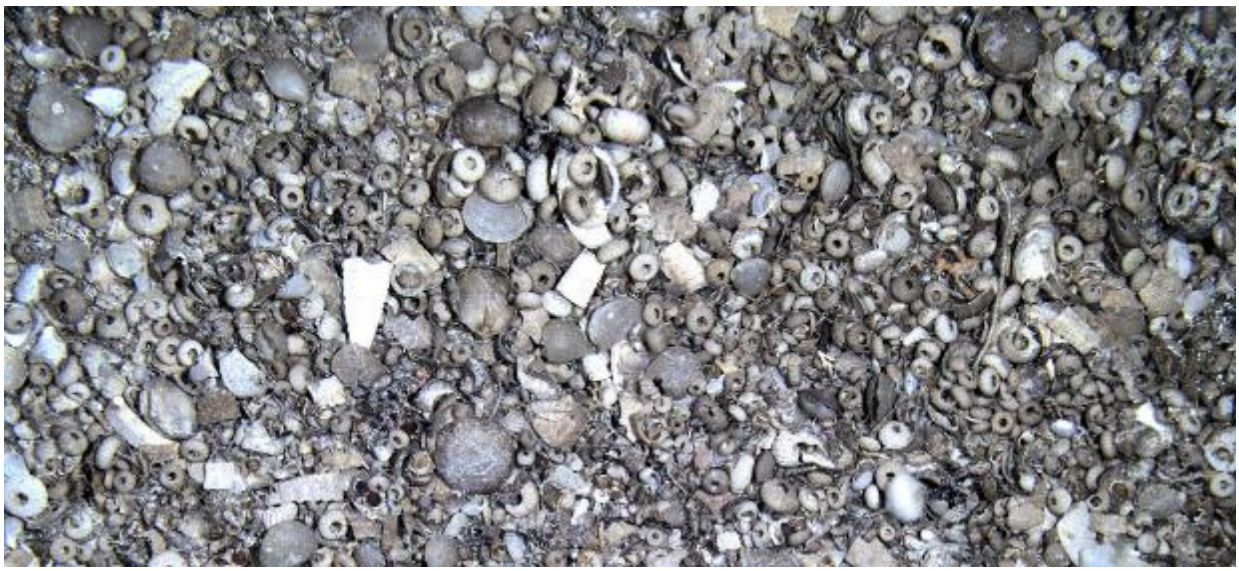


Fig 9.5. spectacular blue carbon accumulations on the slopes of Yakhont seamount, evidencing ecosystem services.

The scientific cruise JR17004 used SUCS at four sites, during which 554 high resolution photo stills and some additional video clips were taken during 28 deployments. The deployment plan targeted two locations on each of two seamounts (Yakhont east and west, and Crawford east and west) south of the main Tristan da Cunha archipelago. Site

selection at Yakhont was primarily based on recent bottom fishing intensity and seabed topography from (EM122 multibeam) seabed mapping data. Most sites were on seamount plateaux and thus fairly flat and 300-600 m but deeper deployments on the seamount sides were also made along with one on an interesting topographic feature raised from the Crawford plateau. The bottom types were broadly bedrock, cobble & pebble matrix, broken coral and coarse sand – mostly typically a mixture of these.

Biological assemblages were imaged across a 274-861 m depth range across the two seamounts. Representatives of 13 phyla were seen, of which at least 11 are present on our 554 haphazard benthic deployment positions. Detailed image analysis over the next year may reveal more. Likewise representatives of 24 classes of fauna were seen of which at least 19 are present on images. Some of the species are characteristic of Vulnerable Marine Environments (such as branching corals eg. *Lophelia*, cup corals eg. *Caryophyllia*, whip corals e.g. *Stichopathes*, black fan corals e.g. *Antipatharia* and erect sponges), all of which are likely to be important in bioconstruction, seabed carbon accumulation and indicators of anthropogenic pressure (such as harvesting intensity).

The most ubiquitous morphotypes were an unidentified (brittlestar, echinoderm), *Caryophyllia* (cup coral) and unidentified hydroids. Abundance levels exceeded 100 ind. m^{-2} in places, but were zero in some images. Key contributors to biomass, 3 dimensional habitat (bioconstruction) and benthic carbon accumulation were patchy outcrops of the coral *Lophelia*.

Seamount plateau habitats of Crawford.

Fig 9.6. Habitats of Crawford East seamount. Hydrocoral growth forms on angular boulders suggest some uni or bi-directional currents; left, and *Lophelia* stands of coral and coral rubble, colonised by an *Anthomastus*; right.

Fig 9.7. habitats of Crawford West seamount. Boulders provide oases for animals requiring hard surface for settlement and establishment, such as cup corals; left and contrasting carbonate sands with sparse fauna; right.

Fig 9.8. A raised feature of Crawford East seamount had very high densities and biomass, including echinoids.

The images collected at Yakhont were coarsely analysed (numbers of individuals per class or order in each image). Preliminary data suggest that recent trawling has reduced the total abundance of sessile species, such as cup corals ($p = 0.018$) but has had no measurable effect upon the abundance of motile species ($p = 0.982$). A more robust analysis will be conducted following the cruise and it should be noted that there was a wide variation in megafaunal abundance in the baseline, untrawled areas.

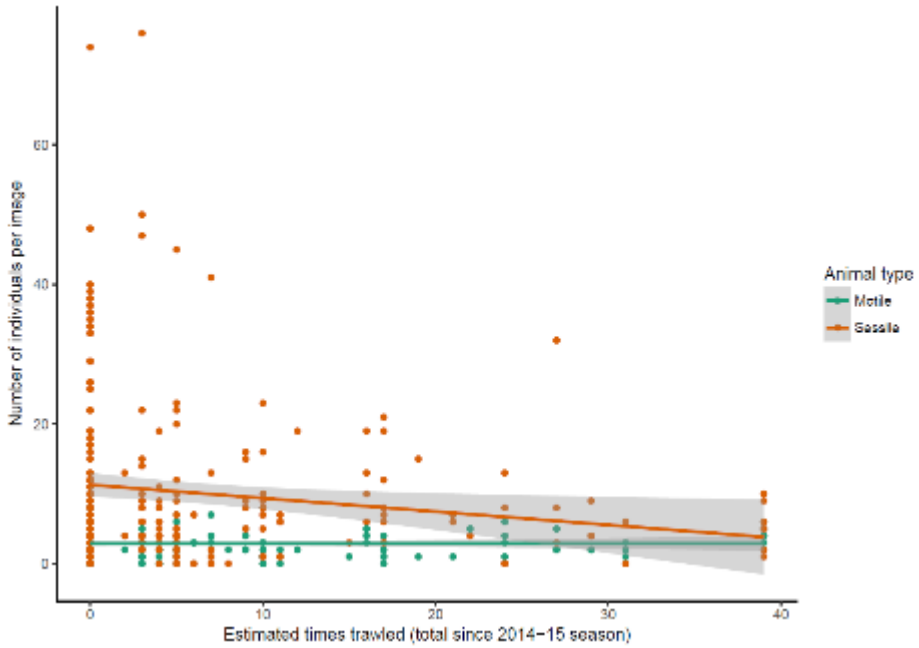


Fig 9.9. Recent trawl intensity vs. abundance of sessile and motile megafauna (at Yakhont seamount). One point = one image. Shaded area = S.E.

9.3. *Vulnerable Marine Ecosystems*

According to the UN Food and Agriculture Organization (2009), an ecosystem can be physically vulnerable when some of its elements can be damaged by direct contact with fishing gears or, functionally vulnerable when selective removal of species may affect the

overall functioning of the system. An easily disturbed and slow to recover system is particularly vulnerable.

Although results of JCR17004 are only preliminary, several organisms and assemblages observed are considered VME indicator species. Most of them were corals but other structure forming animals were also observed.

9.3.1. *Anthozoans*

9.3.1.1. *Antipatharians (black corals)*

These corals are thought to be slow growing but can live for a considerably long time (possibly thousands of years). Their skeleton is flexible and they can sometimes be several meters high. Although they do not form reefs, they can be colonised by a variety of epiphytes and symbionts which are only found associated to them.

They are likely to be poorly resistant to trawling while extremely slow to regrow after direct damage.

Several morphotypes were observed as singletons or at low density and a few dead specimens were also seen. The deepest sites (E41 and E56) seemed to harbour different morphotypes compared to the shallower ones.

9.3.1.2. *Scleractinians (Stony Corals)*

The scleractinians are structure forming corals growing a carbonated skeleton on hard substrate. 2 groups of scleractinians were observed:

- The cup corals are individuals growing from rocks and boulders (figure 8.13). They are common in several location but are too small to form a habitat.

- *Lophelia pertusa* colonies either isolated or forming a reef (figure 8.9 and 8.12). Their nearby presence can also be inferred from high amount of small debris accumulating where topography and currents push them. This species is common in the Atlantic and often dominates cold water coral reefs (along with another scleractinian, *Madrepora occulata*, which has not been observed here). Reefs are particularly rich ecosystems in diversity and biomass. An important part of that diversity is formed meio- and macro-fauna living within the frame formed by the dead corals.

Both these species and associated habitats are highly vulnerable to trawling as the coral branches can break-off easily. Their growth rate, although uncertain and difficult to generalise, is slow and they would presumably take years to decades to recover from trawling impacts. Furthermore, the removal of the 3 dimensional habitat formed by the dead frames will result in the loss of its associated species too.

Both cup-corals and *Lophelia* colonies were highly abundant on top of both seamounts where they were heterogeneously distributed (potentially influenced by trawling). It is worth noting that while most of the cup corals were observed alive when this could be determined with certainty, *Lophelia* colonies were very often dead. The dead colonies of *Lophelia* did not show marks of trawling damages.

Only dead fragments of scleractinians were observed at the deepest sites (E41 and E56) despite the depth of these station being within the bathymetric range of these species. The origin of these fragments could be the top of the seamount or local.

9.3.1.3. *Octocorals (soft corals, gorgonians, bamboo corals and sea-pens)*

Like the antipatharians, these corals form individual colonies and sometime dense aggregations. They have not been observed to dominate a habitat near Tristan but their presence could indicate the nearby existence of coral gardens.

Little data exist on their resistance and resilience to trawling. Some pennatulids could be more resistant than other type of corals due to their capacity to burry themselves in the sediment. The species forming a skeleton (plexaurids and isidids) are sensible to trawling as it can be broken (although it is less fragile than the scleractinians).

A broad range of morphotypes were observed around Tristan Da Cuhna, but only at low density or isolated individuals. The 2 deepest sites showed morphotypes of octocorals unseen on the seamounts tops (like umbellula) but at very low density.

Figure 9.9. Left: Example of Stylasterid-dominated coral garden on Crawford (E55). Right: Relatively high density of poriferas associated to the hydrocorals on Crawford (E55).

9.3.2. *Hydrozoans*

Like the scleractinians, hydrozoans of the family Stylasteridae from a stony. The colour and branching pattern of their Skelton makes them easy to confuse with bryozoans when to colonies are small but stylasterids can grow much larger.

Their fragile skeleton makes them poorly resistant to trawling, although to an unknown degree. Their growth rate is also unknown. Given their high abundance in some stations (figure 8.16), their removal is likely to cause disturbance in ecosystems they dominate.

On Crawford, they form dense aggregation and a few isolated colonies have been observed in other stations.

9.3.3. *Poriferans*

Demosponges form individual colonies and are known to enhance local diversity by providing 3D habitat with their body while alive and forming accumulation of spicules when they die. The spicule mats are also enhancing local diversity and biomass.

Sponges are usually considered vulnerable to direct trawling damages as well as clogging occurring after high of sediment is resuspended by trawl passage. Although, little information exist on their resilience in general.

The sponges on the seamounts near Tristan da Cunha have not been observed to form dense aggregations or habitats. However, high number of fan shaped sponges live in association with the hydrozoans on Crawford seamount.

9.4. *Preliminary Results*

Both seamounts investigated were inhabited by VMEs. The densities were, in general, low at the exception of the scleractinians although their distribution was heterogenous. Many of the morphotypes observed on images were similar to those previously described in the Northern hemisphere (as much as is possible to conclude on the basis of image sampling alone). The diversity and abundance of associated fauna is also low compared to some seamounts. However, many of the coral species tend to favour the raised features and the edges of the seamounts which were not targeted during this cruise. A higher taxonomic determination of the samples will help give a better assessment of resistance and resilience of these VMEs to anthropic pressure. Furthermore, more exploration and data collection during following cruises should give a more accurate measure of the densities of the indicator species and predictive models could help quantify their extent and distribution as well as potential loss habitat due to trawling.

The SUCS images will now be worked up by a combined team from Plymouth University, BAS and CEFAS. Completion of image analysis, together with those of previous expeditions (JR287, JR864 and JR16-NG) should enable robust characterization of regional seamount communities. It should also facilitate testing of impacts and recovery rates from bottom fishing intensity, cold water coral occurrence and abundance hypotheses, and blue carbon accumulation importance. Furthermore a planned expedition (on RRS Discovery) in March/ April 2018 should provide significant additional data, to possibly include RSA and McNish seamounts in the same region.

9.5. *References*

FAO (2009). Report of the Technical Consultation on International Guidelines for the Management of Deep-sea Fisheries in the High Seas. FAO Fisheries and Aqua culture Report, Rome.

10. *Agassiz Trawl*

The mini Agassiz trawl (AGT) is the primary collecting apparatus for benthos. Designed to minimize damage to sensitive sea floors and for use on smaller ships it has proved very successful around the Antarctic continental shelf. On sea mounts and volcanic islands the harsh, rocky terrain proves difficult for the AGT and in the past substantial damage has been done to the nets (JR287) and trawls have been caught on rocky outcrops requiring delicate coordination by the deck and bridge teams (JR15003). As the purpose of this cruise is to survey the ecosystem services provided by sea mounts and coastal waters around the volcanic South Atlantic Islands of Tristan da Cunha and Saint Helena we expected the mini AGT may be difficult to use. However, to verify species identifications of images taken from the SUCS, and for whole specimen collections required for genetic and stable isotope analyses AGT deployments are still required to collect suitable material.

The mini AGT has a mesh size of 1 cm and a mouth width of 1.25 m. Trawl stations were slightly offset from the deployment of the grab, SUCs and multicore and chosen by examining features shown on multibeam sonar (swath) imagery to ensure safe deployment.

The deployment protocol of the mini AGT deviated slightly from previous cruises as the usual coring cable was not available and the back up cable was quite old. While the AGT was lowered, the ship had to compensate for the wire lowering speed of max of 30 m/min by steaming at 0.3 knots until the just before the AGT reached the seabed during when it briefly sped up to 1 knot, slowing back down again once it reached the seabed and maintaining 0.3 knots until the full trawling wire length was put out (standard BAS AGT increases speed to 0.5 knots once the trawl hits the sea floor). The full trawling cable length used was 2 times the water depth (standard BAS AGT uses a cable length of 1.5 times water depth). The net was then trawled at 1 knot for 5 minutes. Afterwards, with the ship speed kept to 0.3 knots, the AGT was hauled at 30 m/min in order to avoid damaging the gear. The reduced size of the trawl and reduced trawling speed results in a slightly smaller catch, damages substantially less seafloor, but the quality of the catch is much higher.

Samples were sorted to class and where possible to morphotype. Most specimens were preserved in 99.8% ethanol (total vial volume at least 80% ethanol) and stored in the -20°C freezer, specimens too large for ethanol containers were directly frozen at -20°C, and a selection of specimens were frozen at -80°C for stable isotope analyses.

10.1. *Tristan da Cunha seamounts*

The two seamount systems were Yakhont and Crawford, both with two areas of interest (east and west). Yakhont was has been subjected to recent fishing (trawling and longline) while no records of fishing were available for Crawford since 2004. In case fishing pressure negatively affected richness, the miniAGT targeted the non fished regions of the sea mounts.

Two trawls were conducted on Yakhont West and East, and three on Crawford West. On successive trawls on Yakhont west the AGT was caught on rocks, and although successfully recovered, the net was badly damaged and replaced. Due to very rocky bottom around Crawford East and the existence of huge styllasterid coral colonies no trawling was conducted in the area.

In general the catch reflected what was visible in the SUCS images, with the benthos largely composed of brittle stars (188), corals (144), hermit crabs (100), hydrozoans (82) and sponges (74). Occasional large patches of stylasterid coral colonies were observed in SUCS images and in one case sampled by the trawl. The catches did not differ substantially among seamounts.

10.2. *St Helena and Bonaparte seamount*

No camera work was conducted around Saint Helena (see SUCS section) so trawling sites were based on consideration of the swath bathymetry alone. The topology around Saint Helena revealed a very steep, rugged slope not considered conducive to bottom trawling. Two locations were identified as possible, one to the south east at “Speery Ledge” along the contour at 650m , and one on the large shallow shelf called “Dawsons” to the north east at 90 m. The first attempt at trawling the shallow site caused some issues with the winch as the total weight of the trawl plus cable resulted in a lack of backtension as the trawl landed on the seafloor. The trawl was repeated using the powered rollers which proved successful.

The top of Bonaparte seamount was generally flat at 130-140m with one 30m feature to avoid. Despite this we managed to find one solid obstacle that produced a 4.2t tension spike

followed by a 3.9t spike resulting in a brake in the weak link and the trawl eventually returning to the surface on the backup cable. Although the trawl was badly damaged we managed to complete 6 trawls on the seamount.

Crabs (144) dominated the catches around Saint Helena and Bonaparte, with substantial numbers of polychaetes (73) and echinoids (34). The substrate around Bonaparte was mostly rhodolites with sponge covering them in the slightly deeper (150m) trawl. Interestingly all trawls on Bonaparte brought up both red and green algae indicating that light penetration must be exceptional.

Figure 10.1. typical catch compostion from Saint Helena including molluscs (top row), echinoids (middle row) and decapods (bottom row).

13.2. Summary of taxa caught in agassiz trawls

		Anthozoa	Ascidiacea	Articulata	Asteroidea	Bivalvia	Bryozoa	Chorophyta	Cirripedia	Copepoda	Crinoidea	Demospongia	Echinoidea	Foraminifera	Gastropoda	Hexactinellidae	Hydrozoa	Malacostraca	Oligochaeta	Ophiuroidea	Polychaeta	Polyplacophora	Rhodophyta	Turbellaria	Pisces
TdC																									
	Yakhont West	51			4	11	1		24			16	4		11		34	17	1	56	8	1			5
	Yakhont East	27			13		22					26	3				14	6		75	3			1	
	Crawford West	66		1	13	12	3		30			32	20		6	1	34	77		57	27				5
StH	Shelf	12			2	2	2				1	6	2		15		18	96		5	3		8		7
	Bonaparte	72	1		1	10	5	13		4		27	34	2	20	1	27	144		4	73		66	1	16

Table10.1 Numbers of individuals of each class sampled at major locations around Tristan da Cuhna (TdC) and Saint Helena (StH)

11. *Rectangular Midwater Trawl (RMT8) on the Down Wire Net Monitor (DWNM)*

11.1. Methods

The pelagic ecosystem was sampled using the 8 m^2 rectangular midwater trawls (RMT8). The RMT8 consists of two nets that are opened and closed on command from the ship to sample discrete depth layers. The net was monitored in real-time using a custom built net monitoring system that logged depth and ambient temperature. Each net had a theoretical mouth opening of 8 m^2, with a cod-end mesh of 4 mm and was towed obliquely at 2.5 – 3 knots for 30–60min in each depth horizon. The net was fitted with a protected cod-end to keep captured animals in good condition. All net hauls were undertaken during the hours of darkness to minimise net avoidance by the mobile micro-nekton.

In the Tristan da Cunha EEZ sampling was principally focussed on the Jakhont and Crawford seamounts. Seven pairs of nets were deployed over the Jakhont Seamount, with three pairs over Crawford (east) and four pairs over Crawford (west) (Table 8.1.; Figures 8.18. & 8.19.). In addition, two sets of RMT nets were deployed over open ocean north of Crawford Seamount, to sample the surface to 400 m. Nets were deployed over either in a non-target stratified manner or to target layers detected on the EK60 (acoustics).

In the St Helena EEZ, most pelagic sampling took place around the shelf break of St Helena (Table 8.2.; Figure 8.20.), close to Sysoev Seamount and near Bonaparte Seamount (Tables 8.3.; Figure 8.21.). Nets were towed from the surface to 1000 m, with the first pair of nets fishing 1000 -700 and 700-400 m and the second pair fishing 400-200 and 200-10 m. In addition a shallow net was fished over the top of Bonaparte Seamount and a shallow net fished to the north of St Helena.

Once the nets were on deck, the cod-ends were emptied into labelled buckets. Nets were processed sequentially. Catches were sorted into morphotypes and identified to the lowest possible taxonomic level. Representative samples were preserved in formalin (10%) or ethanol (70 or 95%) in labelled pots.

Length-frequency data was collected from the most abundant fish species, with standard length measured to the nearest mm. Some specimens were retained for stomach contents analysis and stomachs of Maurolicus inticaris were examined during the cruise.

Photographs were taken of many of the fish and cephalopod species and will be linked to the catch data.

Representative of the catch were preserved in formalin and/or ethanol. Most of the preserved specimens will be registered with the Natural History Museum in London, but some specimens were retained as a reference collection for St Helena. Samples of the more abundant species were frozen (-80 C) for stable isotope analyses. Salps were utilised for work on enzymes (see Section 8.5.3.).

11.2. Preliminary Results

The RMT8 performed well, with good catches in most nets. Fishing at night reduced net avoidance, but there were occasions (e.g. Bonaparte Seamount), when the net passed through significant acoustically identified aggregations, but caught little.

11.2.1. Tristan da Cunha

In the Tristan EEZ, nets focussed on the seamounts and on the aggregation of fish over the seamounts and were only fished to a maximum of 400 m. Net hauls over the seamounts were dominated by catches of the sternoptychid fish, *Maurolicus inventionis,* which formed dense layers on the EK60.

Target hauls fished on discrete layers over the seamounts revealed different sizes of *Maurolicus* in different layers, with smaller fish nearer the surface and larger fish deeper.

In addition to *Maurolicus*, the other abundant fish were myctophids of the genera *Diaphus*, *Hygophum* and *Lampanyctus*. The invertebrate fauna was dominated by euphausids of the genera *Euphausia* and *Nematoscelis*. Among other crustacean taxa, amphipods of the suborder Hyperiidea (Hyperiidae, Lanceolidae, Scinidae, Oxycephalidae) were found. Shrimps were represented by diverse species of families Oplophoridae, Acanthephyridae, Sergestidae and Benthesycimidae. Phyllosoma larvae of the commercially exploited Tristan lobster (*Jasus tristani*) were caught in nets fished in the upper 200 m (Figure 8.19). Two late (glass) larvae were also caught (Figure 8.22.).

Forty-eight cephalopod specimens were caught (Table 8.22.), belonging to 15 species, the most abundant of which was *Onychoteuthis prolata.* Catches included four species of *Histioteuthis* and a specimen of *Nototeuthis*.

11.2.2. St Helena

In the St Helena EEZ, nets were fished to a maximum depth of 1000 m and were mostly fished in a stratified, non-target way (Table 8.19.). Three complete (1000-700; 700-400; 400-200 and 200-10 m) stratified sets of net were fished at the east, west and south of the island (Table 8.2.; Figure 8.21.).

Approximately 100 different species of fish were caught in the St Helena EEZ (Table 8.6.). The most numerous taxa was *Cyclothone* (Gonastomidae), but these were not identified to species level. *Gonostoma elongatum* was also abundant. Preliminary identifications indicate that eleven different genera of the family Myctophidae were caught, with the dominant species being *Benthosema suborbitale* and *Hygophum machrochir.* Hatchetfish of the genera *Argyropelecus* and *Stenoptyx* were also common. Of particular note were 12 specimens of angler-fish of the families Oneirodidae and Lynophrynidae.

Crustaceans were dominated by Euphausiacea, but shrimps were more abundant and diverse than in Tristan EEZ. They included representatives of genera *Acanthephyra*, *Notostomus, Janicella, Oplophorus, Heterocarpus, Plesionica and Systellaspis*. Lobster and crab larvae were also occasionally captured.

Twenty-four species of cephalopod (81 specimens) were caught in the RMT nets in the St Helena EEZ. The most abundant species were *Abralia veranyi*, *Abraliopsis hoylei* and *Pyroteuthis margaritifera.* Catches included possible new species of octopus (?*Pteroctopus* sp.) and squid of the genera *Cycloteuthis* and *Bathyteuthis,* as well as an excellent specimen of the rare vampire squid *Vampyroteuthis infernalis.*

11.2.3. Comparison between locations

Species rarefraction curves were plotted for each sampling location (Figure 8.23.) and the greater diversity seen at St Helena, was almost certainly due to the greater depth range being

sampled. None of the curves reached an asymptote, which suggests further sampling effort is required to detect the full biodiversity of the regions.

Preliminary analysis of the data indicated distinct differences between the fauna of the St Helena EEZ and the Tristan EEZ (Figure 8.24.), but that is likely to be influenced by the greater depth of fishing in the St Helena EEZ.

Table 11.1. RMT8 nets in the Tristan da Cunha EEZ

Net Detail			Net Open					Net Closed					Details		
Event	Date	Net	Time	Lat	Long	Depth	Water	Time	Lat	Long	Depth	Water	Duration	Type	Comment
7	24/03/18	1	04:33:00	-39.2731	-8.08491	260	330	05:02:13	-39.28948	-8.10343	105	327	00:29:13	Stratified	Yakhont Seamount
7	24/03/18	2	05:05:55	-39.29155	-8.10562	105	327	05:36:16	-39.30766	-8.12654	16	322	00:30:21	Stratified	
20	24/03/18	1	22:17:27	-39.29602	-8.06621	290	347	22:48:47	-39.31511	-8.08652	290	306	00:31:20	Target	
20	24/03/18	2	23:01:06	-39.32202	-8.09467	144	302	23:30:40	-39.33643	-8.11158	115	302	00:29:34	Target	
21	25/03/18	1	00:30:51	-39.3371	-8.11103	175	302	00:56:24	-39.35148	-8.12611	175	337	00:25:33	Target	
21	25/03/18	2	01:08:37	-39.35902	-8.13271	88	470	01:31:55	-39.37632	-8.14332	20	318	00:23:18	Target	
32	25/03/18	1	22:59:24	-39.50623	-7.76664	320	351	23:19:28	-39.49805	-7.78503	255	319	00:20:04	Target	
32	25/03/18	2	23:39:13	-39.48978	-7.80327	75	295	00:06:23	-39.47763	-7.83017	10	325	00:27:10	Stratified	
33	26/03/18	1	01:04:56	-39.48499	-7.81377	290	320	01:31:53	-39.46944	-7.85003	295	348	00:26:57	Target	
33	26/03/18	2	02:00:29	-39.46082	-7.87022	100	367	02:25:21	-39.45169	-7.89614	15	450	00:24:52	Stratified	
34	26/03/18	1	03:50:45	-39.49266	-7.7824	250	350	04:10:33	-39.4902	-7.80194	250	350	00:19:48	Target	
34	26/03/18	2	04:27:06	-39.48742	-7.82027	135	350	04:46:28	-39.48557	-7.83795	103	356	00:19:22	Target	
43	26/03/18	1	22:30:06	-39.24617	-8.38453	400	3135	23:25:01	-39.28458	-8.38562	200	3169	00:54:55	Stratified	
43	26/03/18	2	23:25:37	-39.287	-8.38572	200	3165	00:15:07	-39.32176	-8.38846	15	3182	00:49:30	Stratified	
46	27/03/18	1	22:25:37	-38.76166	-10.50853	428	536	23:10:11	-38.7916	-10.5294	300	467	00:44:34	Stratified	Crawford East
46	27/03/18	2	23:11:02	-38.79224	-10.52979	305	476	23:55:11	-38.82285	-10.55136	200	643	00:44:09	Stratified	
47	28/03/18	1	01:05:29	-38.78556	-10.52608	202	425	01:48:59	-38.81949	-10.54752	101	613	00:43:30	Stratified	
47	28/03/18	2	01:54:06	-38.82376	-10.55067	100	641	02:38:29	-38.86079	-10.57265	15	1385	00:44:23	Stratified	
57	28/03/18	1	21:23:10	-38.79844	-10.61039	127	2006	21:41:21	-38.81326	-10.6145	85	2150	00:18:11	Target	

57	28/03/18	2	21:48:39	-38.81985	-10.61621	60	2203	22:06:49	-38.83462	-10.61963	15	2365	00:18:10	Target	
60	29/03/18	1	03:28:07	-38.75307	-11.563	400	704	04:33:40	-38.80015	-11.60229	200	1686	01:05:33	Stratified	Crawford West
60	29/03/18	2	04:34:20	-38.80064	-11.60277	200	1686	05:27:16	-38.83579	-11.63843	15	1680	00:52:56	Stratified	
67	29/03/18	1	22:45:57	-38.71618	-11.64741	270	275	23:29:25	-38.72328	-11.6613	102	275	00:43:28	Stratified	
67	29/03/18	2	23:36:02	-38.744	-11.69853	120	275	00:11:25	-38.7584	-11.72315	10	321	00:35:23	Stratified	
68	30/03/18	1	01:32:41	-38.73001	-11.67439	270	270	02:02:56	-38.74498	-11.70125	207	287	00:30:15	Target	
68	30/03/18	2	02:20:07	-38.75271	-11.71574	70	306	02:41:03	-38.7625	-11.73347	10	348	00:20:56	Target	
69	30/03/18	1	04:01:20	-38.70933	-11.65707	165	469	04:41:42	-38.73524	-11.68011	100	263	00:40:22	Target	
69	30/03/18	2	04:51:53	-38.74198	-11.68581	70	269	05:37:05	-38.77383	-11.713	15	392	00:45:12	Target	
74	30/03/18	1	19:56:19	-38.42137	-11.85863	398	3245	20:52:40	-38.46643	-11.86069	200	3409	00:56:21	Stratified	Open Ocean
74	30/03/18	2	20:59:02	-38.4722	-11.86053	200	3177	21:44:03	-38.50767	-11.858	16	3397	00:45:01	Stratified	

Table 11.2. RMT8 Nets around St Helena

Net			Net Open					Net Closed							
Event	Date	Net	Time	Lat	Long	Depth	Water	Time	Lat	Long	Depth	Water	Duration	Type	Comments
81	06/04/18	1	19:58:28	-15.86032	-5.69875	175	219	20:40:29	-15.88031	-5.67678	100	429	0:42:01	Stratified	NE of ST Helena, shallow depths
81	06/04/18	2	20:43:42	-15.88172	-5.67514	105	430	21:24:12	-15.88373	-5.64969	15	458	0:40:30	Stratified	
82	06/04/18	1	22:58:56	-15.93838	-5.57575	996	1318	23:45:41	-15.97635	-5.56534	700	1275	0:46:45	Stratified	NE of St Helena
82	06/04/18	2	23:46:21	-15.97698	-5.56533	700	1287	0:51:52	-16.0341	-5.5907	400	1731	1:05:31	Stratified	
83	07/04/18	1	3:01:52	-16.07516	-5.71561	400	869	3:49:22	-16.11665	-5.72426	202	793	0:47:30	Stratified	

83	07/04/18	2	3:55:47	-16.1228	-5.72559	200	554	4:43:48	-16.16558	-5.73668	10	1239	0:48:01	Stratified	
91	07/04/18	1	19:50:38	-15.91474	-5.794	1000	1584	21:02:55	-15.954	-5.83885	700	1428	1:12:17	Stratified	Leeward (NW) side of island
91	07/04/18	2	21:07:14	-15.95542	-5.84227	700	1451	22:10:46	-15.99261	-5.8799	400	1650	1:03:32	Stratified	
93	08/04/18	1	1:37:36	-15.92845	-5.78105	405	1029	2:24:18	-15.95141	-5.80999	200	962	0:46:42	Stratified	
93	08/04/18	2	2:26:36	-15.95266	-5.81155	205	1021	3:19:32	-15.98151	-5.84677	15	839	0:52:56	Stratified	
94	08/04/18	1	4:47:25	-15.95022	-5.80794	455	987	5:17:41	-15.96382	-5.825	444	778	0:30:16	Target	Off Lighter Rock
94	08/04/18	2	5:47:28	-15.97767	-5.84447	84	1213	6:07:53	-15.98671	-5.85776	33	1222	0:20:25	Target	
102	08/04/18	1	20:53:40	-16.09177	-5.81201	1000	1634	22:03:43	-16.14414	-5.79098	700	1875	1:10:03	Stratified	Off Speary Island
102	08/04/18	2	22:04:18	-16.14457	-5.79076	700	1872	23:04:40	-16.1845	-5.76377	400	1716	1:00:22	Stratified	
103	09/04/18	1	1:07:35	-16.13718	-5.78989	396	1630	1:55:59	-16.17854	-5.76687	200	1651	0:48:24	Stratified	
103	09/04/18	2	1:56:24	-16.17888	-5.76666	200	1659	2:37:10	-16.21205	-5.74424	16	1845	0:40:46	Stratified	
104	09/04/18	1	3:25:20	-16.19692	-5.75334	55	1665	3:56:52	-16.22276	-5.73695	46	2256	0:31:32	Target	
104	09/04/18	2	3:57:19	-16.22313	-5.73671	46	2260	3:57:43	-16.22346	-5.73649	46	2273	0:00:24	Target	Not fished

Table 11.3. RMT8 Nets near Sysoev and Bonaparte seamounts.

Net			Net Open					Net Closed							
Event	Date	Net	Time	Lat	Long	Depth	Water	Time	Lat	Long	Depth	Water	Duration	Type	Comments
107	09/04/18	1	20:52:58	-15.50376	-6.37033	400	3153	21:36:57	-15.51343	-6.34074	195	3707	0:43:59	Stratified	Near Sysoev Seamount
107	09/04/18	2	21:52:58	-15.51351	-6.34049	200	3709	22:22:08	-15.5241	-6.30773	15	3753	0:29:10	Stratified	
108	10/04/18	1	0:19:14	-15.52408	-6.30869	1000	3754	1:01:36	-15.54148	-6.27832	700	3558	0:42:22	Stratified	
108	10/04/18	2	1:06:56	-15.54375	-6.27443	700	3638	1:51:24	-15.56168	-6.24325	400	3560	0:44:28	Stratified	
111	10/04/18	1	20:14:21	-15.57847	-6.90399	1000	1821	21:14:58	-15.60844	-6.86945	700	1841	1:00:37	Stratified	NE of Bonaparte Seamount
111	10/04/18	2	21:15:36	-15.60878	-6.86912	700	1778	22:00:45	-15.63273	-6.84631	400	1860	0:45:09	Stratified	
112	11/04/18	1	0:04:41	-15.58613	-6.89919	400	1660	0:47:30	-15.60838	-6.8729	200	1744	0:42:49	Stratified	
112	11/04/18	2	0:50:00	-15.60999	-6.87152	200	1724	1:29:49	-15.63359	-6.84918	15	1662	0:39:49	Stratified	
113	11/04/18	1	2:32:26	-15.57518	-6.91003	60	1762	3:02:32	-15.59411	-6.88921	50	1682	0:30:06	Target	Targets NE of Bonaparte
113	11/04/18	2	3:08:14	-15.59795	-6.88532	30	1714	3:38:11	-15.61796	-6.86523	30	1572	0:29:57	Target	
121	11/04/18	1	20:26:55	-15.68503	-7.02158	1000	1415	21:23:01	-15.72945	-7.01152	700	1578	0:56:06	Stratified	W of Bonaparte
121	11/04/18	2	21:23:28	-15.72982	-7.01133	700	1576	22:03:00	-15.75235	-6.99323	400	1554	0:39:32	Stratified	
122	12/04/18	1	0:13:53	-15.70412	-7.03543	400	1701	0:53:31	-15.72481	-7.00736	200	1426	0:39:38	Stratified	
122	12/04/18	2	0:54:16	-15.72521	-7.00685	200	1418	1:34:33	-15.74598	-6.97788	10	1250	0:40:17	Stratified	
123	12/04/18	1	2:56:56	-15.70898	-7.02875	450	1526	3:26:58	-15.72427	-7.00897	419	1439	0:30:02	Target	

123	12/04/18	2	3:56:34	-15.77366	-6.94918	74	1920	4:26:34	-15.77497	-6.94832	43	237	0:30:00	Target	Targets W of Bonaparte
130	12/04/18	1	18:57:30	-15.62155	-6.98239	100	145	19:29:56	-15.63326	-6.95789	96	110	0:32:26	Seamount Top	Top of Bonaparte
130	12/04/18	2	19:30:38	-15.63352	-6.95735	96	110	20:11:17	-15.64675	-6.92636	15	140	0:40:39	Seamount Top	

Table 11.4. Fish species caught in the RMT 8 net hauls in the Tristan EEZ.

Species	Number	Species	Number
Argyropelecus sp.	18	*Lampanyctus* sp. 2	2
Bathylagoides sp.	1	*Lepidophanes gaussi*	2
Congrid larvae	3	*Lepidopus caudatus*	2
Bassanago sp.	4	*Lobianchia dofleini*	8
Diaphus brachiocephala	1	*Macroparalepis macrogeneion*	1
Diaphus hudsoni	23	Macrouridae	1
Diaphus ostenfieldi	1	*Maurolicus inventionis*	>495
Diaphus sp.	15	*Melanostomias niger*	1
Digenichthys atlanticus	1	Myctophid sp.	1
Eel larvae	9	*Myctophum* sp.	1
Electrona risso	4	*Nemichthys curvirostris*	11
Emmelichthys nitidus	1	*Nemichthys* larvae	2
Fish larvae B	2	*Notoscopelus resplendens*	1
Fish larvae unid	2	*Notoscopelus* sp.	1
Fish unid	1	Phosichthyidae	
Gempylus serpens	1	Protomyctophum sp.	1
Gonostomatidae	2	*Protomyctophum subparallelum*	4
Helicolenus mouchesi	9	Scopelarchidae	2
Hygophum reinhardti	26	Scopelarchidae (larvae)	1
Idiacanthus atlantica	1	*Scopelosaurus* sp.	1
Lampadena sp.	5	*Stenoptyx* sp.	1
Lampadena chavesi	1	*Vinciguerria* sp.	12
Lampanyctodes sp.	1	*Vinciguerria attenuata*	1
Lampanyctus intricarius	11	*Vinciguerria poweriae*	3
Lampanyctus sp.	18		

Table 11.5. Cephalopod species caught in the Tristan EEZ.

Species	No.	Species	No.
Nototeuthis sp.	1	*Histioteuthis macrochista*	1
Argonauta sp.	3	*Histioteuthis* sp.	1
Brachioteuthis picta	1	*Liguriella podopthalama*	1
Brachioteuthis sp.	2	Octopodidae	1
Cranchidae	1	*Octopoteuthis* sp.	1
Enoploteuthidae	1	*Onychoteuthis prolata*	16
Enoploteuthis sp.	2	*Onychoteuthis* sp.	4
Galiteuthis sp.	1	*Onykia cariboea*	1
Histioteuthis arturi	1	*Pholidoteuthis* sp.	1
Histioteuthis atlantica	1	*Stoloteuthis leucoptera*	4
Histioteuthis bonellii	3		

Table 11.6. Fish species and number caught in RMT8 nets in the St Helena EEZ

Species	No.	Species	No.	Species	No.
Alepocephalidae	2	*Ectreposebastes* sp	43	Muraenidae	5
Anguillidae	1	eel larva	1	*Muraenidae* sp. (larvae)	8
Anoplogaster cornuta	1	*Epigonus* sp.	1	*Myctophidae*	106
Argyropelecus affinis	10	*Eurypharynx pelecanoides*	2	*Myctophidae sp. 1*	16
Argyropelecus gigas	3	*Eustomia* sp.	2	*Myctophidae sp. 2*	8
Argyropelecus hemigymnus	47	Fish - unidentified	2	*Myctophidae sp. 4*	24
Argyropelecus sp.	5	Fish larvae	94	*Myctophidas sp. 3*	29
Astronestes sp.	2	*Flagellostomias boureei*	1	*Nannobrachium achirus*	1
Astronestidae (larvae)	1	Flatfish larvae unid	3	*Nannobrachium atrum*	13
Avocetina sp.	23	Flying fish	1	*Nannobrachium sp.*	1
Babourisia rufa	1	Flying fish larva	2	*Nansenia sp.*	4
Benthosema fibulatum	1	*Gigantura* sp.	2	Nemichthyidae larva	1
Benthosema sp.	2	*Gonichthys cocco*	1	*Nemichthys curvirostris*	11
Benthosema suborbitale	248	*Gonichthys sp.*	1	*Nemichthys sp.*	16
Bolinichthys sp.	7	*Gonostoma elongatum*	140	*Notoscopelus resplendens*	19
Borostomias mononema	1	*Gonostoma sp.*	3	*Notoscopelus sp.*	3
Bothus mellissi	11	*Gonostomatidae*	16	Oneirodidae	4
Capros aper	1	*Hygophum hygomii*	11	Ophichthidae	3

Ceratoscopelus sp.	7	*Hygophum machrochir*	120	Ophidiidae	3
Ceratoscopelus sp. 1	1	*Hygophum reinhadtii*	10	*Pachystomias microdon*	1
Ceratoscopelus sp. 2	11	*Hygophum sp.*	20	*Pleuronectiformes larvae*	2
Ceratoscopelus warmingii	20	*Hygophum taaningi*	4	*Poromitra crassiceps*	1
Cetomimidae	2	Ichthyococcus	2	*Protomyctophum parallelum*	1
Cetominus hempi	1	Juvenile myctophid	5	Puffer fish larva	1
Cetostoma regani	1	*Kali indica*	1	Ribbon fish larva	1
Chauliodus sloani	5	*Lampadena chavesi*	1	*Rondeletia loricata*	1
Coccorella sp.	2	*Lampadena luminosa*	3	*Saccopharynx pelicanoides*	1
Congridae	9	*Lampadena poutifex*	1	*Saccopharynx sp.*	1
Congridae larva	9	*Lampadena* sp.	1	*Scopelogadus mizolepis*	12
Cyclothone sp.	1540	*Lampanyctus alatus*	15	*Scopelogadus sp.*	12
Cyema atrum	1	*Lampanyctus ater*	2	*Scopelopsis multipunctutus*	5
Cyemidae larva	1	*Lampanyctus intricarius*	18	*Scorpeniformens larva*	1
Cynoglossidae	2	*Lampanyctus pusillus*	1	*Serrivomer beani*	13
Diaphus anderseni	3	*Lampanyctus sp.*	34	*Serrivomer sp.*	1
Diaphus banhoeffeni	3	*Lepidophanes gausi*	1	*Snyderidia canina*	1
Diaphus brachycephalus	23	*Lepidophanes guntheri*	11	*Stemonosudis sp.*	1
Diaphus dumerilii	6	*Lepidopus caudatus*	1	*Sternoptyx*	92
Diaphus effulgens	1	*Leptostomias sp*	1	*Sternoptyx diaphana*	148
Diaphus meidi?	2	*Linophryna* sp.	1	*Sternoptyx pseudobscura*	45
Diaphus mollis	5	*Linophrynidae*	7	*Sternoptyx pseudodiaphana*	99
Diaphus richardsoni	1	*Lobianchia gamellaria*	19	*Stomias boa*	4
Diaphus sp.	8	*Lobianchia sp.*	4	*Stomias sp.*	3
Diaphus taaningi	1	*Macroparalepis affinis*	1	*Stomiidae*	13
Diaphus vanhoeffeni	11	*Melamphaes* sp.	4	*Stomiformes*	1
Dicrolene sp.	1	*Melamphaidae*	28	*Synapobranchidae*	3
Diogenicthys atlanticus	63	*Melanocetus johnsoni*	1	*Taaningichthys mininus*	3
Diogenicthys sp.	3	*Melanocetus* sp.	1	*Taaningichthys sp.*	1
Diplophos	6	*Melanonus gracillis*	1	*Unid fish*	1
Diplophos cabainsi	1	*Melanonus zugmayeri*	2	*Unid fish larva*	3
Diplophus taenia	1	Moray eel larvae	5	*Vinciguerria*	366
Echiodon sp.	11				

Table 11.7. Cephalopod species caught in RMT8 nets in the St Helena EEZ

Species	No.	Species	No.
Abralia veranyi	11	*Histioteuthis arcturi*	1
Abraliopsis atlanticus	4	*Histioteuthis meleagroteuthis*	1
Abraliopsis hoylei	8	*Japatella diaphana*	4
Ancystochirus lesuerii	1	Japatella sp.	2
Argonauta sp.	1	*Leachia atlantica*	1
Bathyteuthis abyssicola	2	*Liocranohia reinhartii*	1
Bathyteuthis cf. baciditera	1	*Megalocranchia oceana?*	1
Bathyteuthis sp.	2	Octopus sp.	2
Cephalopod paralarvae	9	*Pterygioteuthis giardi*	5
Cranchia scabra	2	*Pterygioteuthis* sp.	2
Cranchidae	2	*Pyroteuthis margaritafera*	7
Ctenopteryx sicula	2	*Taonius* sp.	1
Discoteuthis sp.	2	Unid squid	1
Grimalditeuthis bonplaindi	2	*Vampyroteuthis infernalis*	1
Helicocrachia pfefferi	2		

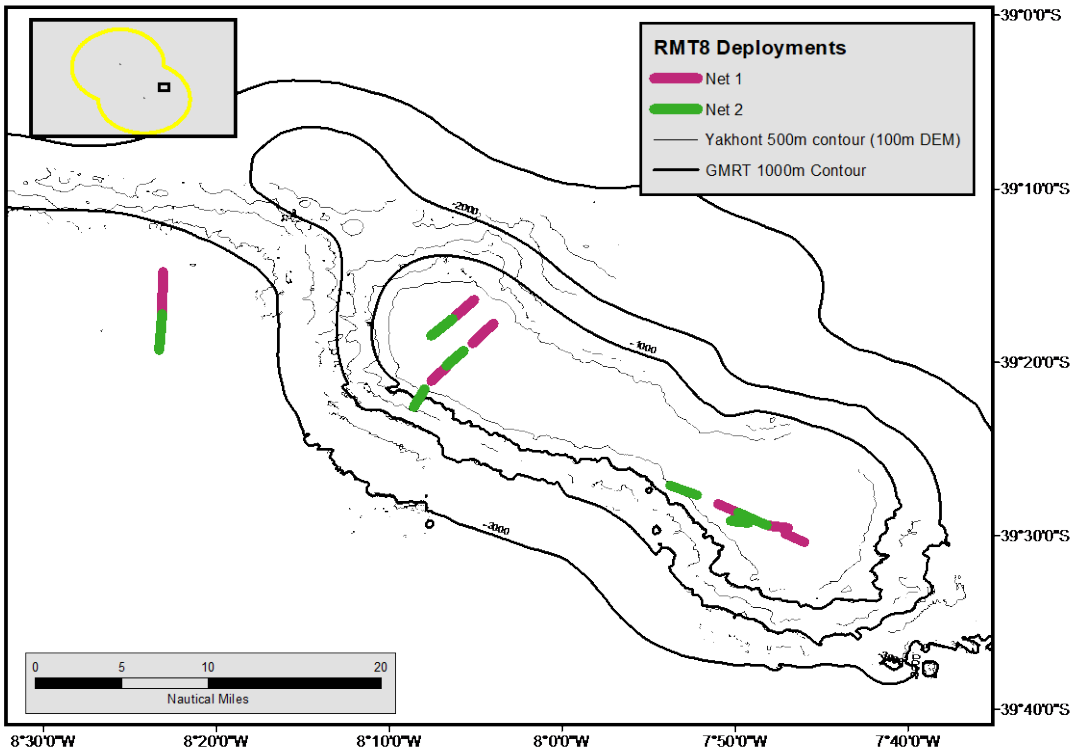


Figure 11.1. RMT8 net hauls near the Yakhont Seamount.

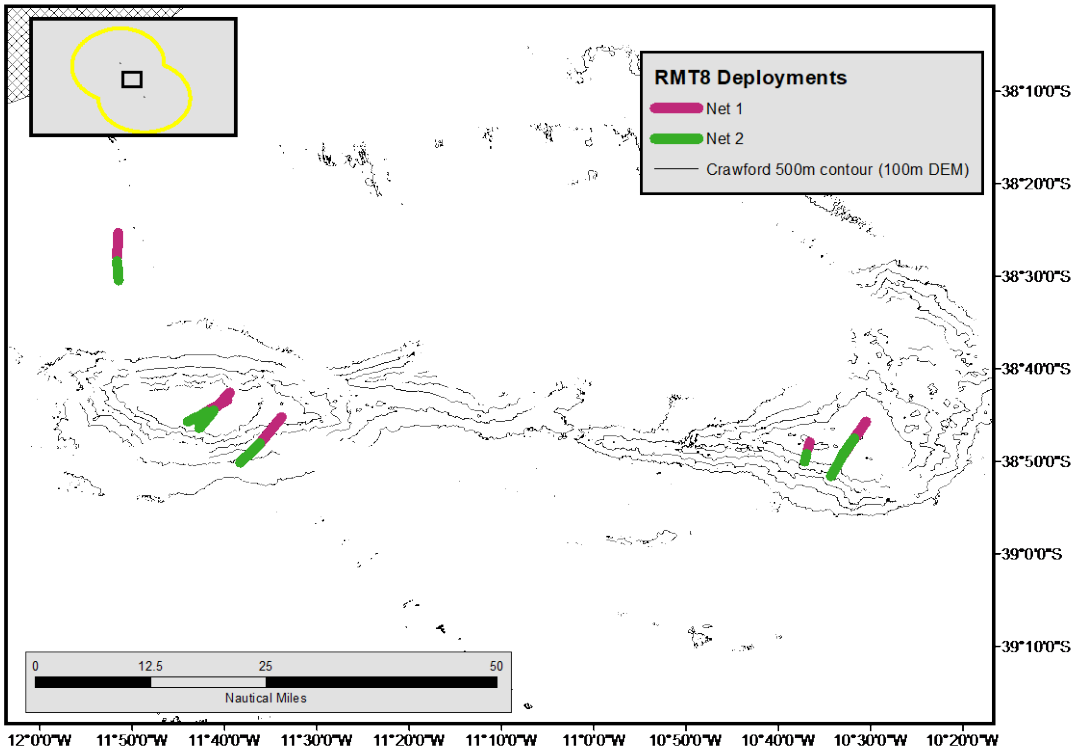


Figure 11.2. RMT8 net hauls on the Crawford Seamount.

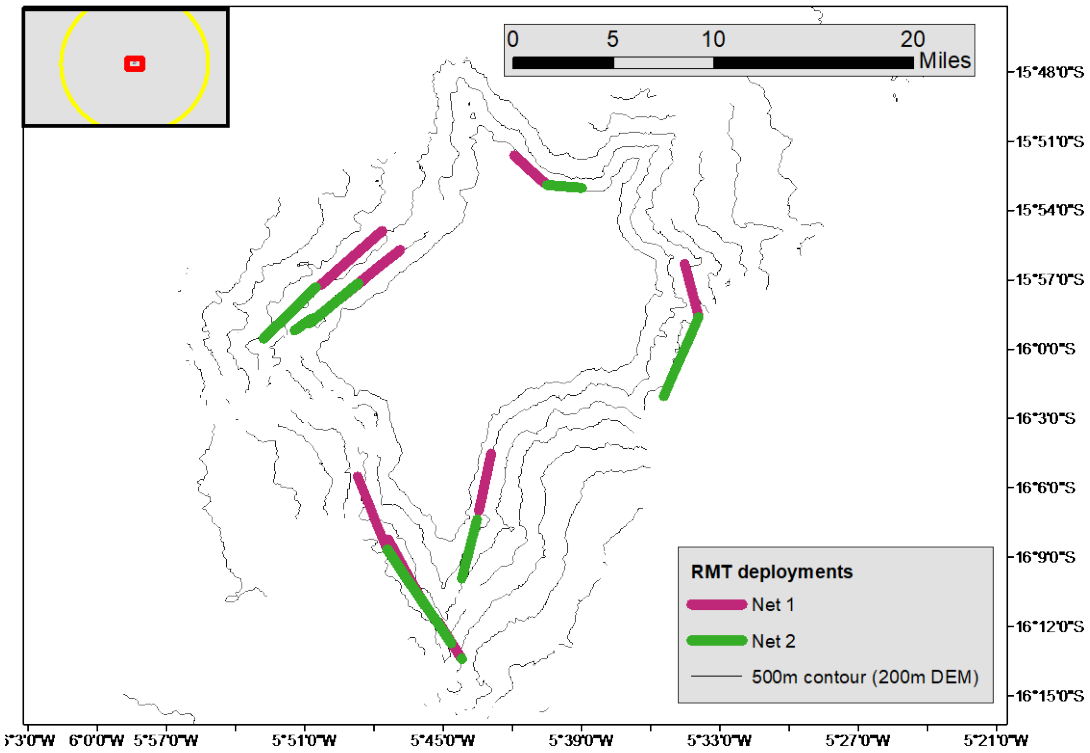


Figure 11.3. Locations of RMT8 nets around the island of St Helena.

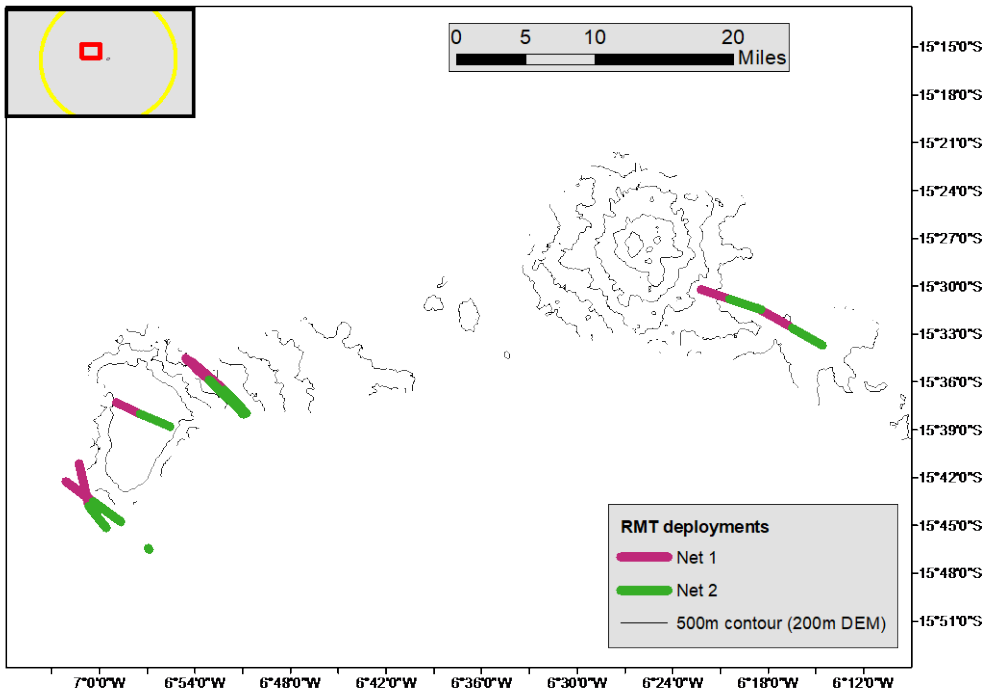


Figure 11.4. Locations of RMT nets near the Sysoev and Bonaparte seamounts.

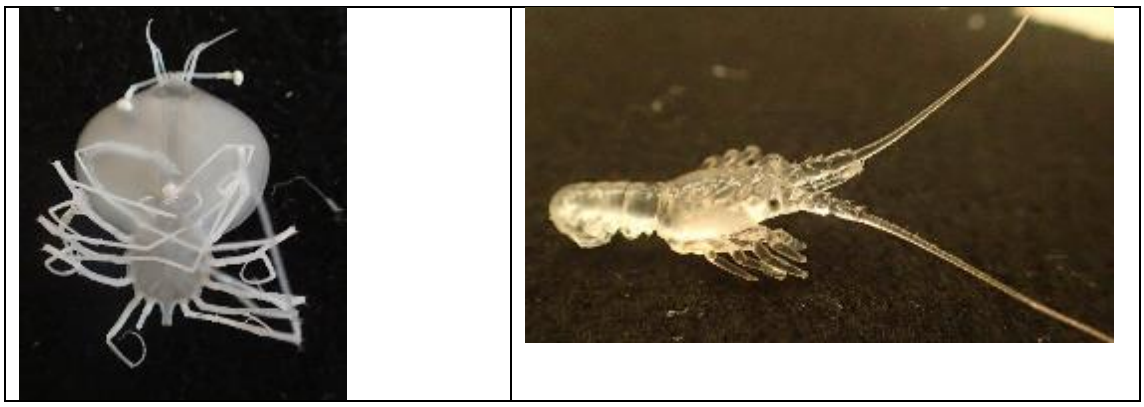


Figure 11.5. Phyllosoma (left) and glass (right) larval stages of the Tristan lobster.

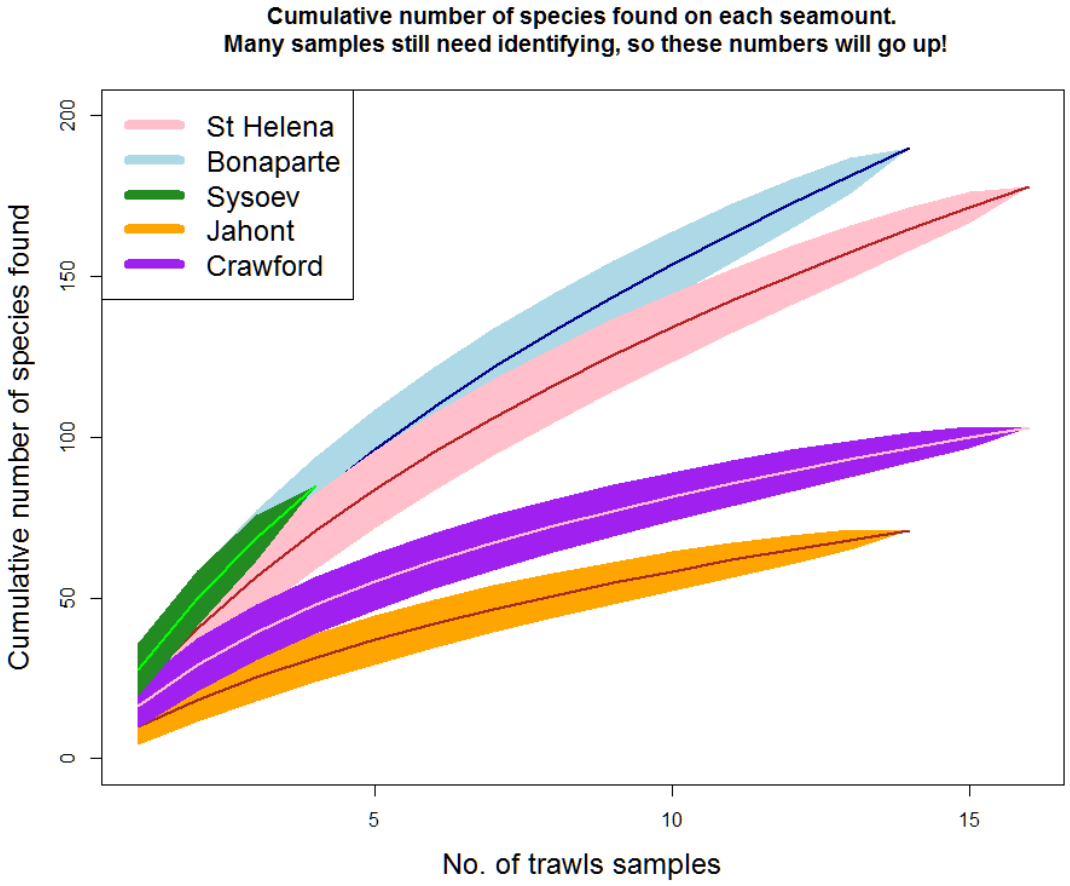


Figure 11.6. Species rarefraction curves for net hauls at each lolcation sampled. Note that nets in the Tristan EEZ (Jahont & Crawdford) were only fished to 400 m, whereas the St Helena stations were fished to 1000 m.

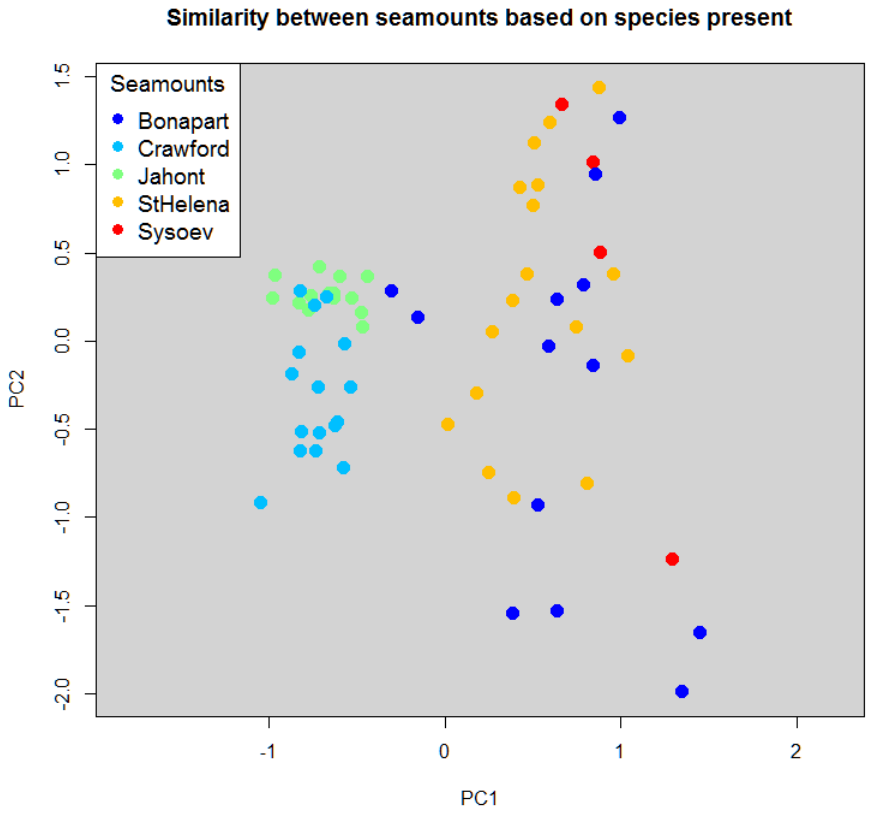


Figure 11.7. Similarity of RMT net hauls based on species present.

11.3. *RMT8 – tunicate analyses*

11.3.1. *Catch processing*

Pelagic tunicates that were easily recognisable by the RMT8 catch sorting team (i.e. large pyrosomes and salps) were examined to confirm their tunicate identity by eye and by using a dissecting microscope when available. Opportunistic sub-samples were taken for population genetics/phylogenetics and biochemical analysis. The sub-samples for genetics were either directly frozen at -80°C or preserved in 95% ethanol and stored at -20°C for transport back to the UK where they will be further analysed subject to funding availability. Basic biochemical analysis were conducted on the RRS James Clark Ross. These aimed to explore the digestive capacity of salps of the same species and reproductive generation. The analysis involved removing the endostyle and nucleus (stomach) of salps, homogenising these tissues on ice, then assessing the capacity of the homogenates to digest carbozymethlycellulose and colloidial chitin embedded within an agar matrix at 4°C. These clearing assays were preserved at -80°C for transport back to the UK where they will be stained and analysed.

11.3.2. *Initial results*

Large pelagic tunicates obtained from the RMT8 net hauls varied in quality. Most were considerably damaged (e.g. ripped apart, without test, nucleus ruptured) or impregnated/imbedded with other planktonic components (chiefly chaetognaths, copepods and siphonophores). Salp species with a firm outer test (*Lasis zonaria* and *Thetys vagina*) were less badly damaged than typically soft salp species such as *Salpa fusiformis* and *Pegea confoederata*.

Pyrosomes (Pyrosoma or Pyrostremma species) were caught in five of the RMT8 deployments. Salps, by contrast, were caught after most of the RMT8 deployments at the Tristan da Cuhna sites and at the St Helena near surface sites, often comprising a substantial fraction of the gelatinous plankton within the hauls near Tristan. A total of six of the 12 known salp genera were caught, details of the species found with each catch are given in Table 1. The most frequently caught species was S. fusiformis, whilst the heaviest salp haul of c.5Kg was comprised of the largest known salp species, *Thetys vagina*. Notably, the pyrosome and salp species caught with the RMT8 from Tristan included both of the species/morphotypes identified within the stomachs of bluenose warehou that had previously been caught from the same area - these were identified during stomach contents analyses carried out en route to Tristan da Cuhna.

Table 11.8. Catch records of Salp species

Event Number	*Pyrosoma spp*	*Iasis zonaria*	*Ihlea spp*	*Pegea confoederata*	*Salpa fusiformis**	*Salpa younti*	*Thetys vagina*	*Weelia cylindrica*
7					X			X
20			X		X			
21					X			
32							X	
34					X			
43				X	X			
46					X			

47		X		X	X			
58				X	X			X
60	X	X			X			
67	X	X			X			X
69					X			
103					X			
104					X	X		
107	X					X		
113	X				X	X		
122	X				X			
123					X			

* included here are oozooids with *S. fusiformis* features (e.g. muscle banding, stolon position) that had a test more like *S. aspera* than *S. fusiformis*.

12. *Bongo nets*

12.1. *Bongo – Salp sampling*

12.1.1. *Gear and sampling sites*

We used motion compensated Bongo nets (60cm id mouth opening, 1X 200µm and 1X100µm mesh size cod ends, Fig. 8.18) to characterise smaller zooplankton that can be missed with the RMT8 net, and also to obtain high quality (undamaged) living samples of delicate pelagic tunicates for morphological and biochemical analyses.

Each Bongo net deployment involved a vertical haul from a depth of 200m. Eight sites were sampled: two near Tristan da Cuhna and six near St Helena (Table 8.1). All of the Bongo deployments were successful.

Fig. 12.1. Bongo nets

12.1.2. *Catch processing*

Bongo catches were delicately poured into buckets upon recovery and cooling blocks added (250mL plastic tubs containing frozen water) to slow the rate of sample degradation. Any 'large' pelagic tunicates were gently removed using a 500mL beaker or wide bore plastic pipette for animals 0.5-1cm in length, then transferred to a bucket of seawater containing a small freezing block. The remainder of the catch was then concentrated using a 100µm mesh filter and suspended in c. 100mL seawater.

Depending on the catch composition, sub-samples from the remainder of the catch were planned for use as a reference collection for project partners on St Helena – these were preserved in 4% formalin/formaldehyde and stored at ambient temperatures – and also for studies of living tunicate morphology, feeding, and population genetics/phylogenetics.

Live tunicates for morphological analysis were maintained in buckets of seawater containing cooling blocks for up to 48 hours and when possible, examined under a dissecting microscope for key morphological features associated with filter feeding. To further study feeding, individuals of the same reproductive generation and species were maintained at 4°C until their guts appeared to have been cleared, they were then separated into sub-samples of at least five individuals and transferred into seawater supplemented with commercially supplied aquarium feed (dead diatom and/or green algae), maintained for six hours and then frozen at -80°C for further analyses back in the UK. Live tunicates intended for population genetics/phylogenetic analysis were sedated by cooling at -20°C and then processed along with any dead tunicates by either directly freezing at -80°C or preserving in 95% ethanol and storing at -20°C for transport back to the UK where they will be further analysed subject to funding availability.

Table 12.1.

Date & Time	Event No.	Latitude	Longitude	Appendicularians	Doliolids	Pyrosomes	Salps
25/03/2018 20:48	31	-39.46243	-7.86493				X
29/03/2018 19:06	66	-38.7498	-11.71037				X
06/04/2018 18:51	80	-15.84829	-5.71243	X	X		X
07/04/2018 05:46	84	-16.09971	-5.78376	X	X		
07/04/2018 23:55	92	-15.97973	-5.82276	X	X		
08/04/2018 16:53	101	-15.9138	-5.62426	X			X
11/04/2018 04:04	114	-15.62758	-6.855	X	X		X
12/04/2018 04:57	124	-15.76549	-6.95494	X	X		X

12.1.3. *Initial results*

Pelagic tunicates obtained using the motion compensated Bongo were generally recovered alive and in very good condition. Details of the overall catch composition will become available after analysis on St Helena is completed. All of the Bongo deployments recovered pelagic tunicates. A list covering which of the four major groups of pelagic tunicates were found in each catch (results from the 100µm and 200 µm nets combined) are given in Table 1. Bongos from the Tristan area yielded three genera of salps (Iasis, Ihlea, Salpa) but no other tunicates, while those from St Helena caught a wider breadth of tunicate diversity but only two genera of salp (Salpa, Thalia). Of particular note are the Thalia caught, the oozooids of which closely resembled a putative new salp species that was obtained from

RMT8 catches on BAS cruise JR287 near Tristan da Cuhna (these are described in J Plankton Res 36: 883-888).

13. *Pelagic camera (four eyes)*

13.1. *Background*

Prior to JR17-004, Tristan Government requested that Cefas supply a pelagic drift camera system. During the Tristan leg of the cruise, the system was trialled, before delivery to TdCG at the end of the Tristan leg. The system is a simple set up of a frame with four camera arms and one bait arm, that is suspended from a surface buoy array at 10 m depth (Figure XXX.1; XXX.2)

Figure 13.1. – Four Eyes camera frame being set up.

The rig consists of a collapsible aluminium frame, upon which are mounted:

- Four Yi 4K cameras with 40 m rated underwater housings. To save memory space on the microSD cards, recordings were made in 2.7k (30 FPS).
- One acrylic bait cannister.

The frame is suspended 10 m below the surface using a mixture of standard nylon rope and a section of bungee cord (intended to dampen vertical movements of the frame from surface swell).

Bait was a mixture of unused samples from the RMT deployments, defrosted whole fish and cow kidneys.

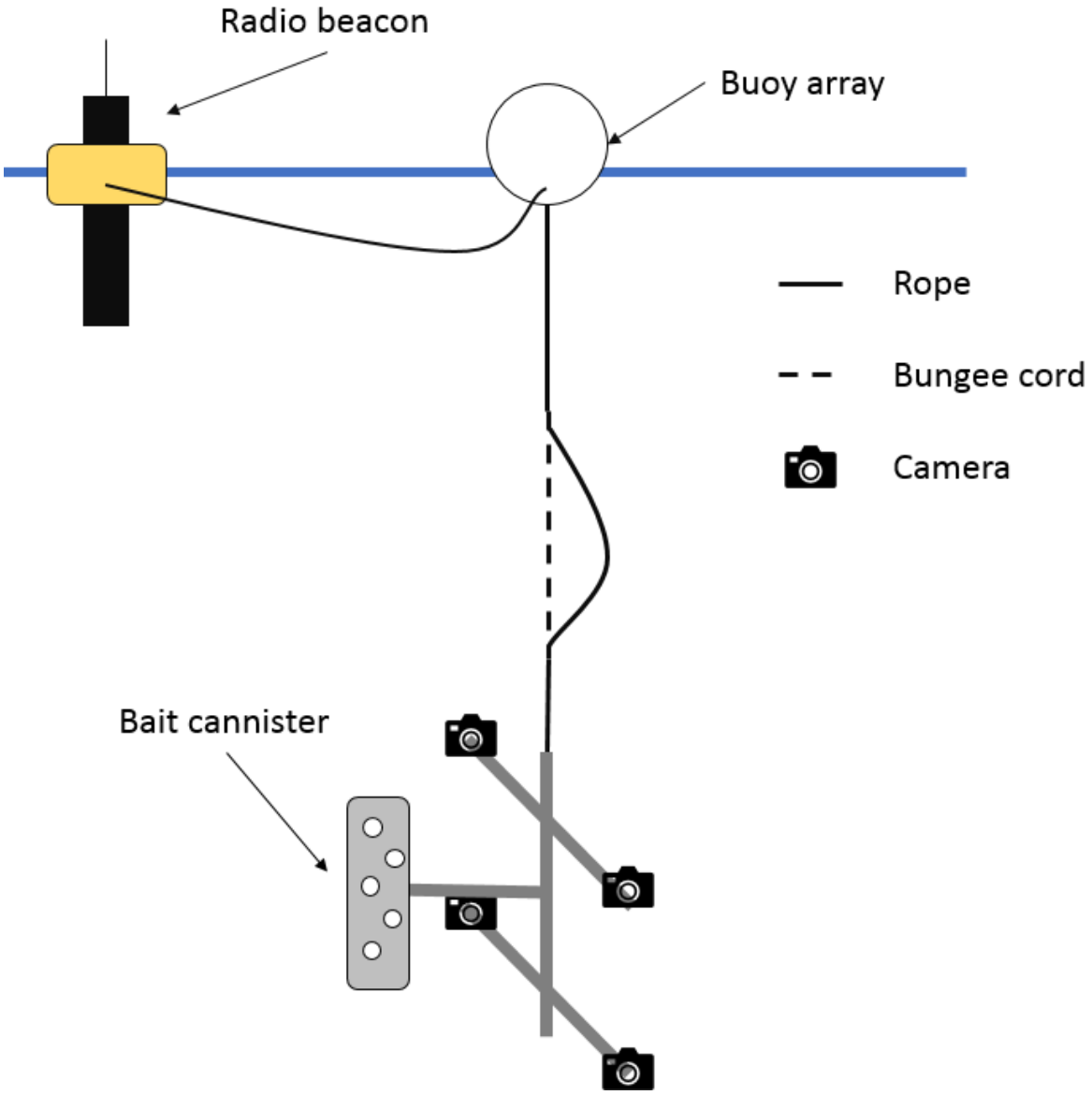


Figure 13.2. – Schematic of Four Eyes rig (camera frame and surface components).

13.2. Pelagic camera deployments

Three deployments were made in total (1 at each Yakhont site and 1 at Crawford East), each lasting between 83 and 123 minutes. Although the system is designed to be deployed remote from the ship (and subsequently located using a 160.725 MHz radio beacon attached to the surface buoys), it was agreed that search and recovery would not be an efficient use of ship time. Consequently, all deployments were made tethered aft of the vessel, with the camera rig drifting approx. 10 – 20 m from the ship.

In each deployment, different configurations of camera position and mode were trialled, to test the versatility of the rig and provide options for subsequent deployments (tuned to the particular research question).

14. *Avani trawl*

14.1. *Background*

Aim

To collect preliminary samples from seamount and open ocean areas to detect surface microplastics.

Gear

Surface 'Avani' trawl (may also be referred to as a manta trawl (Figure XXX.1). Targets buoyant microplastics in upper few cm of water column. The instrument included a flow meter from which readings were taken before and after every deployment, to provide an estimate of the volume of water sampled2

Net mesh size = 33µm with solid cod end.

Figure 14.1 – Avani trawl during a deployment at Bonaparte seamount

14.2. *Deployments*

An ideal means of deployment ensures that the aperture is towed at the surface, at a low enough speed to minimise the bow wave of the instrument but fast enough to sample a reasonable volume of water (ca. 4 – 6 kn).

Initially, it was attempted to deploy the trawl from the midships gantry but it was difficult to position the instrument out of the ship's wake and sufficiently far from the ship itself. Following discussion with the crew and AME staff, we deployed the trawl from the starboard Effer crane, trailing the instrument approximately 10m from the starboard-aft corner of the vessel, which proved successful. All subsequent deployments followed this protocol.

During JR17004, we made 3 deployments, ranging in length between 40 min and 2 hours, as conditions and other operations allowed, at a target speed (over ground) of 5 kn. Owing to the initial difficulties and the demands upon daylight hours during the Tristan da Cunha leg, samples were collected from St Helena waters only.

Samples were visually inspected for zooplankton (these, if present, were preserved separately) and the remainder thoroughly washed in filtered seawater into a pentane-rinsed glass jar and frozen at -20°C. Care was taken to ensure that only metal implements, bowls and sieves were used during sample processing and that staff had covered polyester/ nylon clothing to minimise cross-contamination.

[2] Owing to the swell, this value should be considered an estimate only, since the portion of the aperture that was above or below the surface (and thus the rate of throughflow) varied constantly.

Event Number	Site Name	Deployment length (min)
79	St Helena margin	52
106	St Helena NW Seamount (unnamed)	117
117	Bonaparte Seamount	125

Table 14.1. Avani trawl deployments

These samples will be analysed with a view to assessing whether a more detailed survey should be undertaken on the follow up survey (DY100, March-April 2019).

15. **Marine mammal and bird observations**

The following report is put together as a brief summary and insight into the birds recorded during seabird and marine mammal observations. Observers were Andy Schofield (RSPB) and Stephanie Martin (Consultant marine mammal observer)

During the transit time from March 14-23, we had two observers on the bridge wings scanning for wildlife from 08:30-11:30 and 13:00-17:00 in Sea State 6 or less conditions. During the time on the sea mounts from March 24-30, we had one observer with two hour shifts during the same time period. While we were still in the Tristan EZE on April 1, we went back to the two observer system.

During the transit time from April 1-6, we had two observers on the bridge wings scanning for wildlife from 08:30-11:30 and 13:00-17:00 in Sea State 6 or less conditions. During the time on the in waters near St. Helena and at the sea mounts from April 6-12, we had one observer with two hour shifts during the same time period.

A summary table of daily observation start and end positions and the recorded average sea state conditions is included below:

Table 15.1. Daily observation schedule

DATE	OBSERVATION START POSITION	OBSERVATION END POSITION	AVERAGE SEA STATE throughout observation period
15/03 – DAY 1	50’77’’450’’’ 54’14’’321’’’	50’08’’746’’’ 51’79’’208’’’	4
16/03 – DAY 2	49’02’’264’’’ 48’21’’321’’’		7 - 8
17/03- DAY 3	47’18’’455’’’ 42’19’’895’’’	46’60’’977’’’ 40’37’’282’’’	5
18/03 – DAY 4	45’31’’564’’’ 36’31’’519’’’	44’58’’477’’’ 34’06’’424’’’	3 – 5

19/03 – DAY 5	43’36’’021’’’ 30’35’’980’’’	42’74’’482’’’ 28’52’’012’’’	4 – 6
20/03 – DAY 6	41’61’’889’’’ 25’21’’185’’’		7 – 8
21/03 – DAY 7	40’02’’038’’’ 20’13’’375’’’	39’35’’848’’’ 18’51’’944’’’	3 – 4
22/03 – DAY 8	38’19’’845’’’ 15’63’’197’’’	38’27’858’’’ 14’14’’117’’’	4 – 6
23/03 – DAY 9	39’02’’483’’’ 10’11’’591’’’	39’21’’175’’’ 08’05’’164’’’	3 – 4
24/03 – DAY 10	39’27’’816’’’ 08’15’’099’’’	39’28’’229’’’ 08’07’’191’’’	2 – 4
25/03 – DAY 11	39’50’’504’’’ 07’81’’832’’’	39’49’679’’’ 07’75’’060’’’	6 – 7
26/03 – DAY 12	39’49’’143’’’ 07’80’’370’’’	39’25’’274’’’ 08’06’’700’’’	3 – 5
27/03 – DAY 13	38’91’’430’’’ 09’95’’771’’’	38’79’’126’’’ 10’54’’860’’’	3 – 4
28/03 – DAY 14	38’79’’126’’’ 10’54’’860’’’	38’78’’802’’’ 10’53’’072’’’	3 – 4
29/03 – DAY 15	38’75’’301’’’ 11’67’’793’’’	38’75’169’’’ 11’63’’332’’’	3 – 4
30/03 – DAY 16	38’75’’172’’’ 11’66’’330’’’	38’78’’551’’’ 11’75’’108’’’	2 – 3
31/03 – DAY 17	Only casual observations made as most of the day was spent at anchor or ashore at Tristan Da Cunha.		1 – 2
01/04 – DAY 18	34’34’’268’’’ 11’39’’342’’’	32’88’’268’’’ 10’91’’793’’’	1 – 2
02/04 – DAY 19	30’34’’632’’’ 10’11’’078’’’	29’00’’806’’’ 09’67’’549’’’	3 - 5
03/04 – DAY 20	26’43’’012’’’	25’12’’546’’’	3

	08’90’’372	08’61’’782’’’	
04/04 – DAY 21	22’46’’785’’’ 07’74’’240’’’	21’37’’487’’’ 07’40’’447’’’	4 - 5
05/04 – DAY 22	18’43’’886’’’ 06’55’’886’’’	17’15’’572’’’ 06’19’’313’’’	2 – 4
06/04 – DAY 23	15’96’’277’’’ 05’79’’995’’’	15’87’’901’’’ 05’62’’464’’’	3
07/04 – DAY 24	16’10’’721’’’ 05’72’’792’’’	15’88’’074’’’ 05’70’’191’’’	3
08/04 – DAY 25	15’85’’466’’’ 05’73’’068’’’	15’66’’079’’’ 05’36’’498’’’	3 – 5
09/04 – DAY 26	15’65’’942’’’ 05’36’’409’’’	15’69’’695’’’ 05’86’’448’’’	4 - 5
10/04 – DAY 27	15’50’’100’’’ 06’51’’148’’’	15’63’’983’’’ 06’95’’769’’’	3 - 4
11/04 – DAY 28	15’59’’105’’’ 06’97’’532’’’	15’62’’638’’’ 07’00’’522’’’	4 - 5
12/04 – DAY 29			

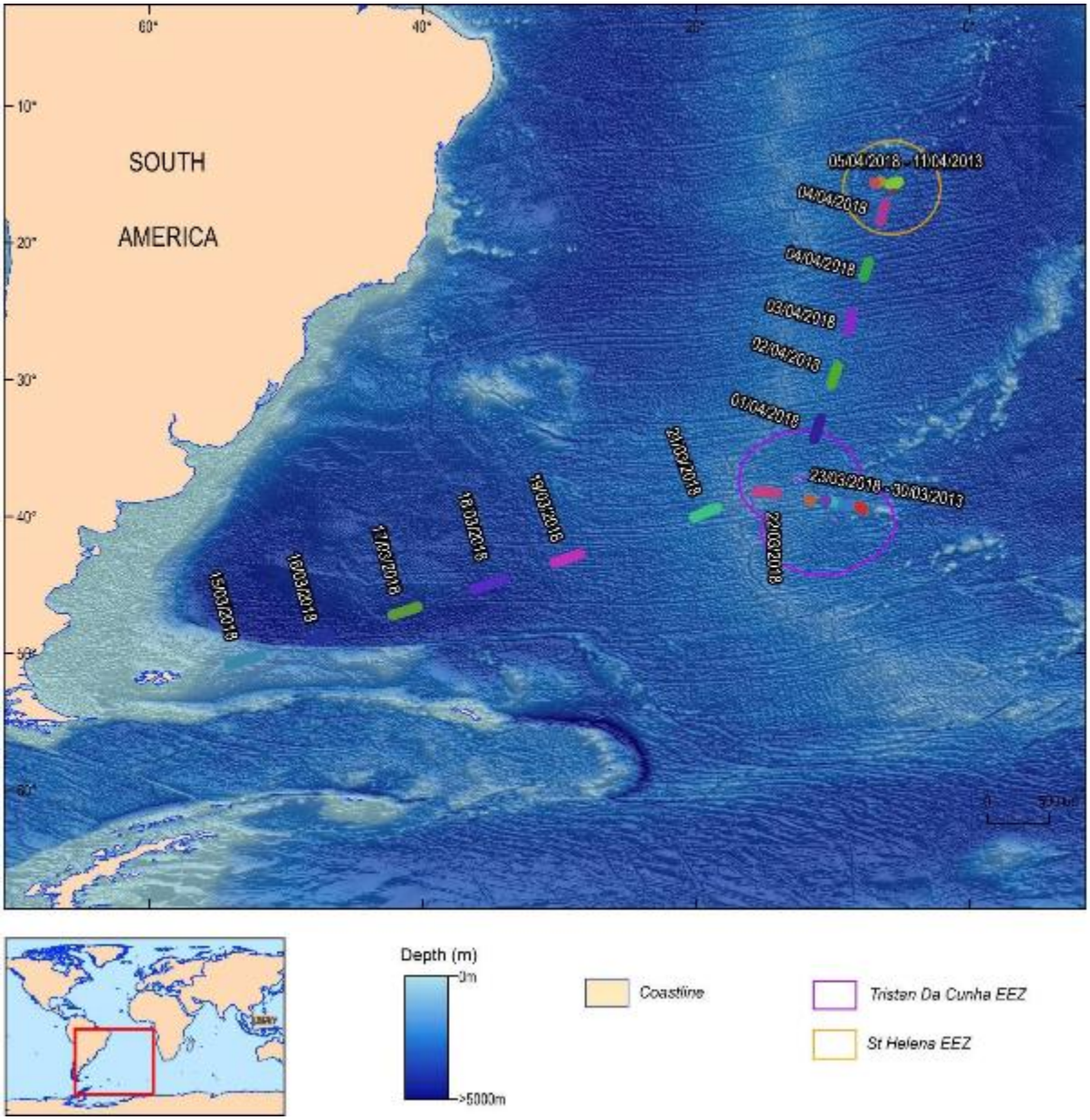


Figure 15.1. Bird and marine mammal observation periods from the Falkland Islands to Tristan da Cunha

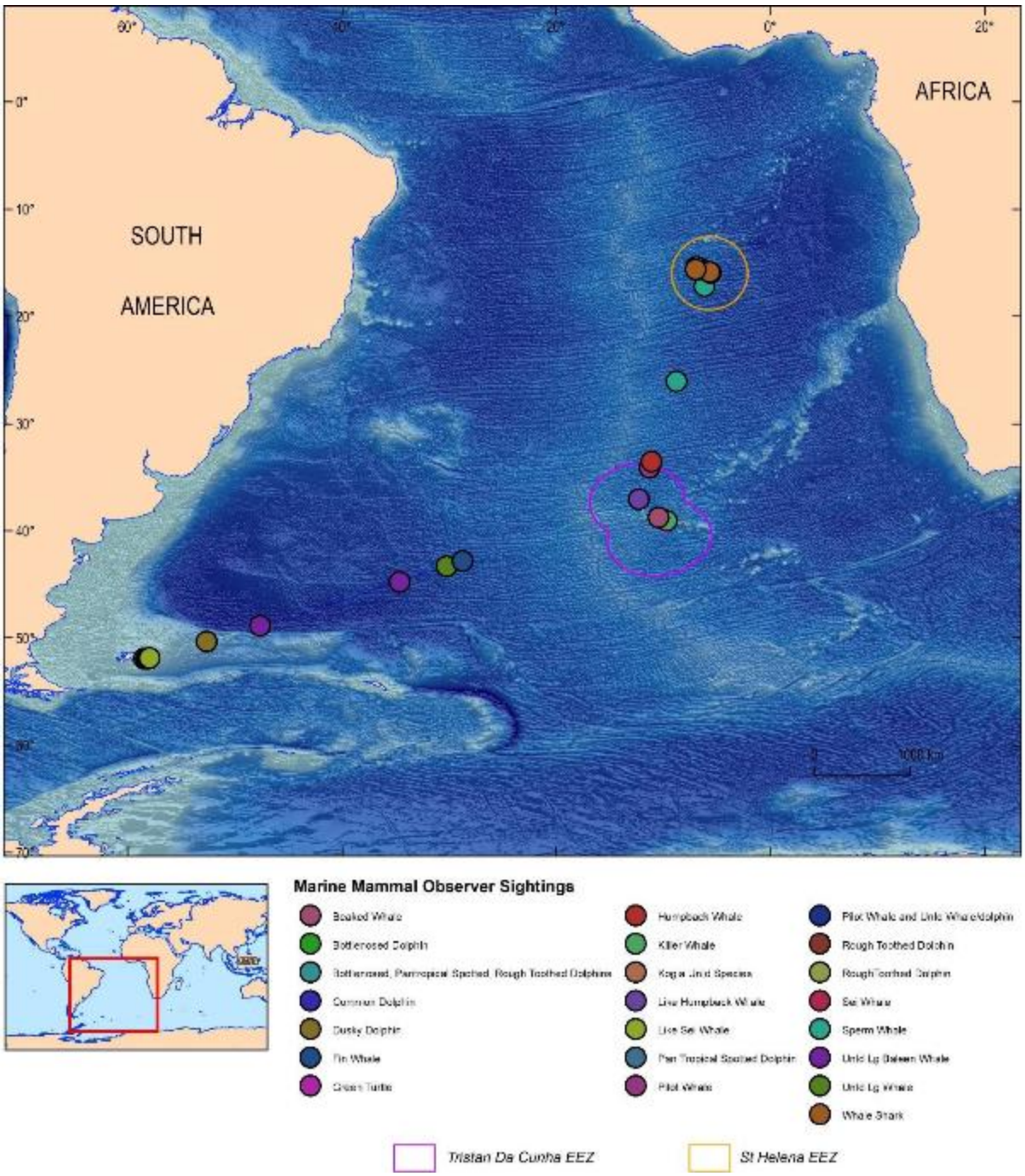


Figure 15.2. Summary of the marine mammal observations throughout the cruise.

15.1. *Marine Mammal Observations*

15.1.1. *Falkland Islands transit and Tristan da Cunha*

We had a total of 25 separate sightings with seven separate identified species. There were 12 sightings in the area near the Falklands, five sightings in transit to TdC, three sightings on or near the TdC sea mounts and four sightings sailing north through the TdC EZE.

Table 15.2. Marine Mammal sightings between the Falkland Islands and leaving the Tristan da Cunha EEZ.

Sighting No	Date	Latitude	Longitude	Common Name	Scientific Name	Sea State	No.
1	14-Mar-18	-51.90154	-58.43708	Sei Whale	*Balaenoptera borealis*	4	4
2	14-Mar-18	-51.9351	-58.19541	Sei Whale	*Balaenoptera borealis*	4	1

3	14-Mar-18	-51.94126	-58.23602	Sei Whale	*Balaenoptera borealis*	4	1
4	14-Mar-18	-51.92837	-58.17057	UnId Lg Baleen Whale		4	10
5	14-Mar-18	-51.92252	-58.15015	Sei Whale	*Balaenoptera borealis*	4	2
6	14-Mar-18	-51.9156	-58.12522	Sei Whale	B*alaenoptera borealis*	4	1
7	14-Mar-18	-51.91316	-58.11629	Sei Whale	*Balaenoptera borealis*	4	1
8	14-Mar-18	-51.89282	-58.04469	UnId Lg Baleen Whale		4	1
9	14-Mar-18	-51.88762	-58.02663	UnId Lg Baleen Whale		4	4
10	14-Mar-18	-51.87659	57.98792	Sei Whale	B*alaenoptera borealis*	4	2
11	14-Mar-18	-51.86965	-57.96336	Sei Whale	*Balaenoptera borealis*	4	1
12	14-Mar-18	-51.86847	-57.95896	Like Sei Whale		4	3
13	15-Mar-18	-50.33704	-52.64028	Dusky Dolphin	*Lagenorhynchus obscurus*	4	10
14	16-Mar-18	-48.85667	-47.6493	UnId Lg Baleen Whale		5	1
15	18-Mar-18	-44.76279	-34.61165	UnId Lg Baleen Whale		5	1
16	19-Mar-18	-43.3148	-30.21982	UnId Lg Whale		4	2
17	19-Mar-18	-42.81843	-28.74658	Fin Whale	B*alaenoptera physalus*	5	1
18	23-Mar-18	-39.06329	-9.687093	Killer Whale	*Orcinus orca*	4	3
19	27-Mar-18	-38.7585	-10.47507	Beaked Whale		4	1
20	31-Mar-18	-37.04789	-12.30129	Like Humpback Whale		2	1
21	01-Apr-18	-34.30518	-11.38091	Common Dolphin	*Delphinus delphis*		40
22	01-Apr-18	-34.13351	-11.32493	Pilot Whale	G*lobicephala sp.*	1	40
23	01-Apr-18	-34.12458	-11.32194	Pilot Whale and UnId Whale/dolphin	*Globicephala sp.*	1	50
24	01-Apr-18	-34.10132	-11.3149	Pilot Whale	*Globicephala sp.*	1	50
25	01-Apr-18	-33.55239	-11.13604	Humpback Whale	*Megaptera novaeangliae*	1	3

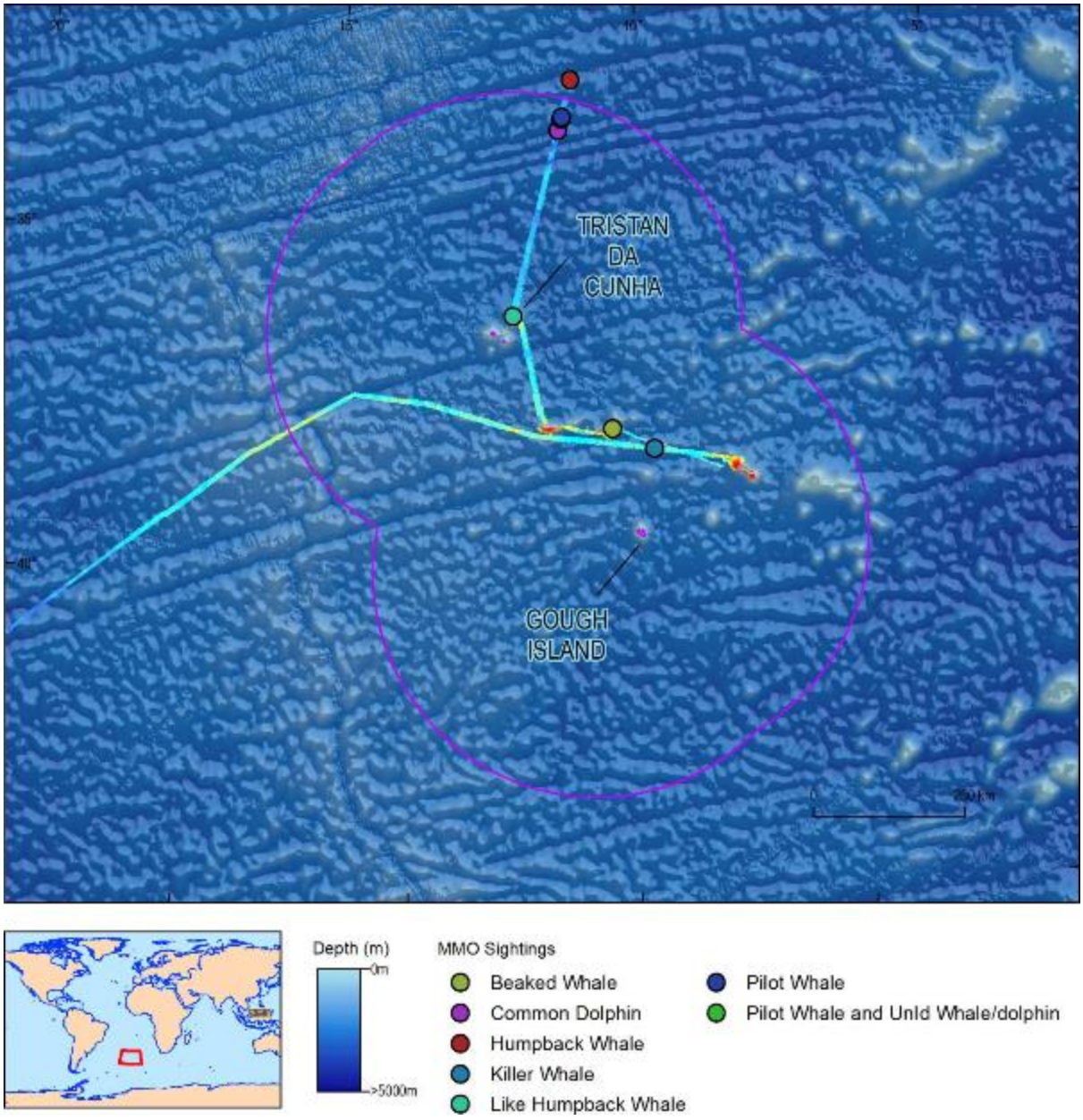


Figure 15.3. Marine mammal sightings at Tristan da Cunha

15.1.2. *St Helena transit and St Helena*

Summary of Marine Mammal Sightings in transit to St. Helena and in St. Helena EZE

We had a total of 12 sightings with two sightings of sperm whales during the transit. We had three sightings near St. Helena and eight sightings in the waters around the sea mounts.

Table 15.3. Marine Mammal sightings from leaving the Tristan da Cunha EEZ until disembarkation at St. Helena.

Sighting No	Date	Latitude	Longitude	Common Name	Scientific Name	Sea State	No
1	03-Apr-18	-26.0566	-8.791659	Sperm Whale	*Physeter macrocephalus*	2	1

2	05-Apr-18	-17.18647	-6.20188	Sperm Whale	*Physeter macrocephalus*	3	1
3	06-Apr-18	-15.89871	-5.624835	Sperm Whale	*Physeter macrocephalus*	4	3
4	07-Apr-18	-15.89573	-5.727099	Pan Tropical Spotted Dolphin	*Stenella attenuata*	4	150-200
5	08-Apr-18	-15.93962	-5.603025	Bottlenose Dolphin	*Tursiops truncatus*	4	10
6	08-Apr-18	-15.93555	-5.608594	Rough Toothed Dolphin	*Steno bredanensis*	4	2
7	10-Apr-18	-15.52411	-6.591421	Sperm Whale	*Physeter macrocephalus*	4	10
8	10-Apr-18	-15.53424	-6.625807	Sperm Whale	*Physeter macrocephalus*	4	3
9	10-Apr-18	-15.60921	-6.933856	Bottlenose Dolphin	*Tursiops truncatus*	4	2
10	10-Apr-18	-15.65979	-6.938553	Rough Toothed Dolphin	*Steno bredanensis*	4	10
11	11-Apr-18	-15.65115	-6.935396	Kogia UnId Species		4	3
12	12-Apr-18	-15.40397	-6.957206	Bottlenose, Rough Toothed, Pantropical Spotted Dolphins	*Tursiops truncatus,Steno bredanensis, Stenella attenuata*	4	5-10

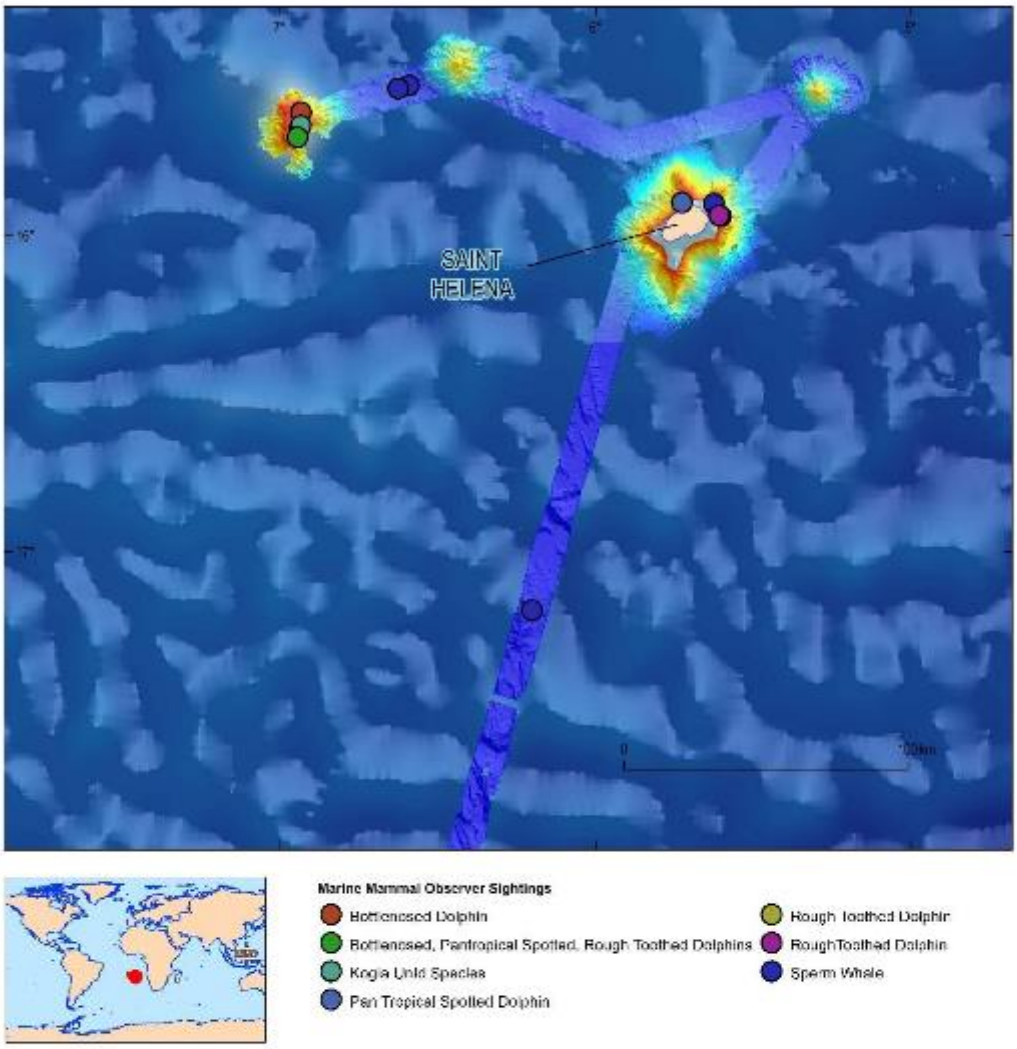


Figure 15.4. Marine mammal sightings at St Helena.

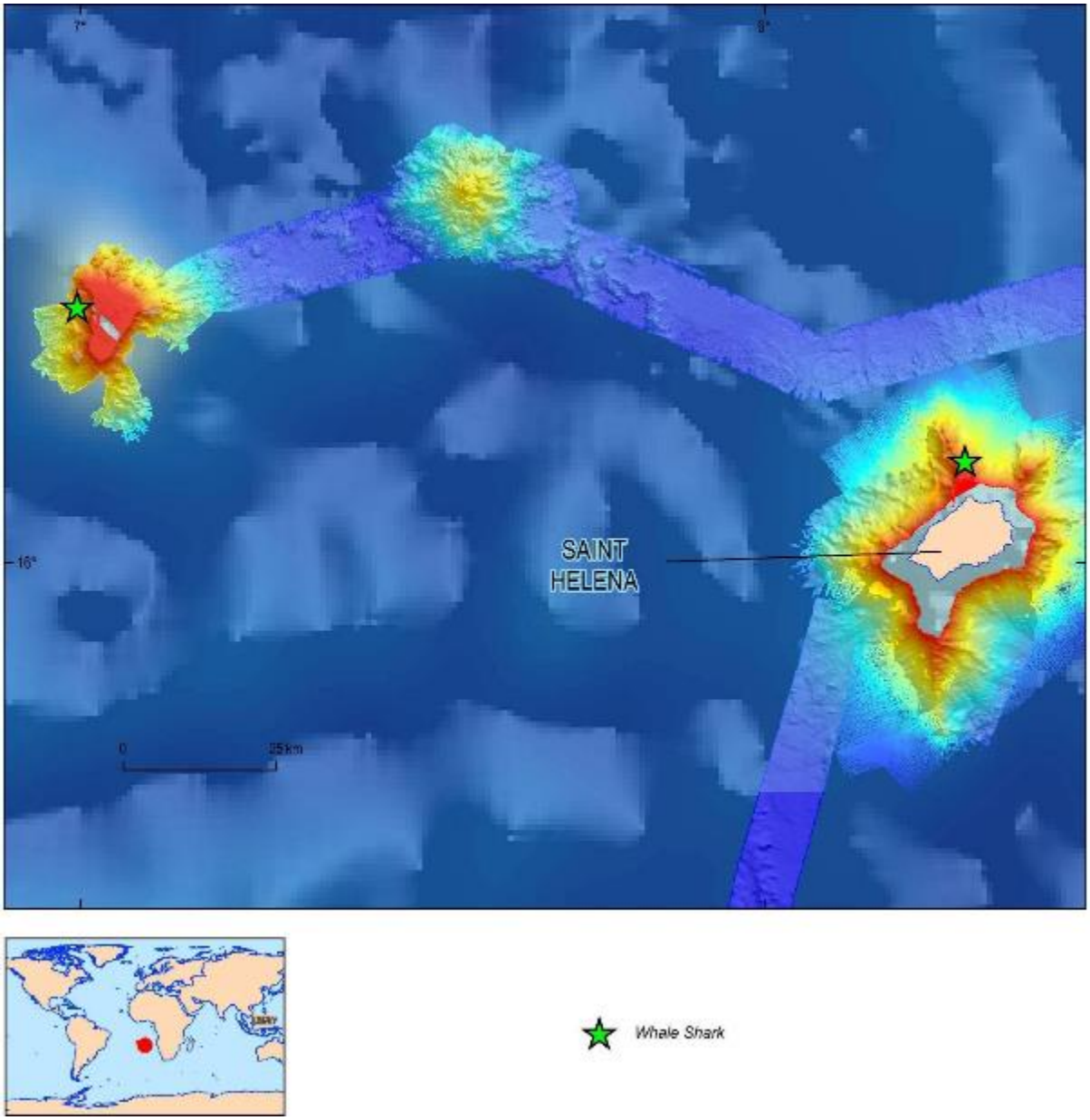


Figure 15.5. Whale shark sightings around St Helena.

15.1.3. *Tristan da Cunha Sonar-vault Mooring deployment*

15.1.3.1. *Background*

The recovery of a BAS SonoVault underwater recorder from the P2 site during January 2018 provided the opportunity for this to be deployed during the Tristan de Cunha visit of JR17004. AME designed a mooring system utilising Sonardyne releases and a Deepwater Buoyancy top float, illustrated below. Anchor weights were provided by the Tristan islanders in the form of two 90kg concrete casts.

15.1.3.2. *Deployment*

The SonoVault was programmed during cruise 17002, and new batteries fitted approximately one week before deployment. Due to an error in the batteries ordered, all 91 required modification to fit. New batteries were also fitted to both releases and deck box, and the releases were tested in the workshop.

The mooring was deployed, float first and without incident, on Saturday 31st March in approximately 100m of water. On completion, both releases were ranged, returning values as listed in Table below. The ship had moved from the station at this point and was in 76m of water.

Figure 15.6. Releases rigged for test in workshop. An additional jubilee clip was added to clamp the releases together, and the red master link under was protected with hose and self amalgamating tape to prevent electrolytic action with the stainless chain.

Table 15.4. Anchor position and range values from acoustic releases

Anchor position:	37 02.7702 S, 012 18.2118 W	
Releases:	SN 240841-004, 004-1	109m
	SN 240841-001, 001-1	108m

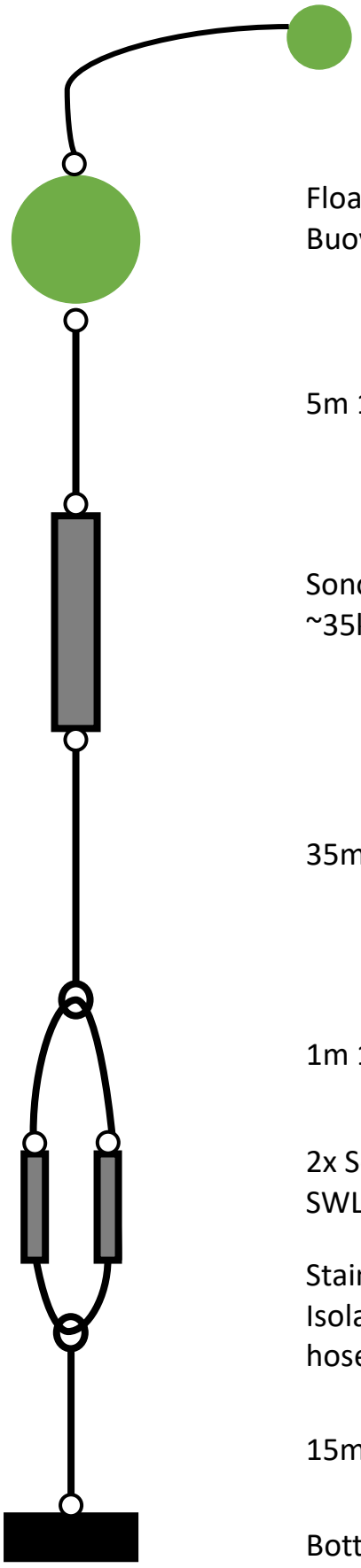


Fig 15.7. Schematic of the SonoVault mooring.

SPECIES SUMMARIES

DIOMEDEIDAE (ALBATROSS SPECIES)

Wandering Albatrosses:

Wandering Albatross (*Diomedea exulans*)

Circumpolar Southern Hemisphere; breeding on higher latitude islands of Southern Ocean except NZ.

Scarce throughout the voyage although a marked and noticeable higher abundance on days two through to six where up to 8-10 birds could be recorded following the ship. Peak count was 12 birds on day 5. True wanderers were very rare around the Tristan EEZ with maximum daily totals only ever reaching low single figures.

Because of this species tendency to associate with vessels it would be vulnerable to fishing methods and in particular long line fishing without appropriate mitigation measures in place.

Tristan Albatross (*Diomedea dabbenena*)

Tristan da Cunha group, breeds on Gough and Inaccessible Islands, range at sea throughout South Atlantic.

Only birds that could definitively identified as Tristan Albatross are covered below, many earlier stage younger birds are very difficult to separate from Wandering Albatross.

Scarce, although occasionally large numbers were recorded especially from the seamounts (Yakhont and Crawford) to the North and North-West of Gough Island.

Large numbers of Tristan Albatross were seen on occasions in the latter half of the leg with numbers of individuals, helped by the recording of age and plumage differentials sometimes reaching nearly 40-50 birds in view at any one point in time. They certainly seemed to favour the seamount edges but it is difficult to say as the ship will have played a part in “drawing them in” slightly as they do associate readily with vessels.

Numbers were certainly higher than expected as it was presumed that this species due to its vast “wandering” nature may be more dispersed in its foraging behaviour, although, many of the breeding birds from Gough Island are currently brooding and provisioning very small chicks so this may well have influenced birds to make much shorter than usual foraging trips and utilising the nearer seamount features more readily. RSPB and Tristan Conservation Department are currently carrying out some GPS tracking of Tristan Albatross during this early chick rearing stage and that may well consolidate these findings that birds at this time of year are spending much more time foraging on the nearer features such as the seamounts we were covering during this cruise.

Because of this critically endangered species tendency to associate with vessels it would be vulnerable to fishing methods and in particular long line fishing without appropriate mitigation measures in place.

Northern Royal Albatross (*Diomedea epomophora sanfordi*)

Circumpolar Southern Hemisphere; breeds mainly on Chatham Islands.

Very rare and only encountered twice on the leg from the Falkland Islands to Tristan Da Cunha.

Two individuals were noted, one mature adult on day three and one 1st year bird which was presumed to be Northern as exceptional views were obtained of crown and tail markings in the early morning of day four.

Southern Royal Albatross (*Diomedea epomophora epomophora*)

Circumpolar Southern Hemisphere; breeds mainly on Campbell Islands.

Very rare and an older adult bird was only recorded once on the third day.

Sooty Albatrosses:

Sooty Albatross (*Phoebetria fusca*)

Circumpolar Southern Hemisphere; warmer subantarctic waters of South Atlantic and Indian Ocean.

Regularly encountered species from the second day onwards all the way to Tristan Da Cunha with an obvious spike in abundance once we reached the Tristan Da Cunha EEZ. At times 50+ birds could be counted visible at any one time along with many birds following the ship for long periods.

There was an obvious abundance of Sooty's around the seamounts, especially Yakhont seamount where daily totals of birds recorded were approximately double the totals of other areas.

Because of this species tendency to associate with vessels it would be vulnerable to fishing methods and in particular long line fishing without appropriate mitigation measures in place.

Light-Mantled Sooty Albatross (*Phoebetria palpebrata*)

Circumpolar Southern Hemisphere; Ranges at sea in colder Antarctic waters as far South as ice edge.

A fairly widespread species which was only encountered rarely during observation periods and all within the first three days apart from one immature bird on the fifth day.

A total of nine birds were recorded. An adult and three immature birds were recorded briefly around the ship on day three with a further adult bird on day four, differentiated from the previous day's adult by moult. Day 5 produced an adult, again a different bird and a further two immatures.

Finally a single immature in advanced body moult followed the ship for a long period on day five associating with large numbers of the more common Sooty Albatross.

It was certainly hoped that many more records of this enigmatic species would be noted but the apparent low numbers may be due to birds on South Georgia foraging closer to nesting sites at this time of year.

Mollymawks:

Shy Albatross (*Thalassarche cauta*)

Circumpolar Southern Hemisphere; breeding on islands off Tasmania.

A single record of this species which was an immature over Yakhont seamount that showed Characteristics of Salvins Albatross (*Thalassarche salvini*) was the only record for the cruise.

Shy Albatross is a very scarce bird in this region and is only recently getting recorded more frequently in the Eastern South Atlantic region (it can now be the most commonly recorded

albatross species between South Africa and a day or twos sailing short of the Eastern periphery of Tristans EEZ). It is therefore unsurprising it was recorded so infrequently on the course of this cruise.

Black-Browed Albatross (*Thalassarche melanophris*)

Circumpolar Southern Hemisphere; breeding on higher latitude islands of Southern Ocean.

Without doubt the commonest recorded albatross species for the first 6-7 days of the cruise with at times over 60-70 birds in view around the ship. This is not surprising given the breeding population currently on the Falkland Islands.

It was interesting perhaps but not overly unexpected that many of the birds within the first two or three days were predominantly adults and then from day four onwards this switched to almost exclusively immature/sub-adult birds.

This species in recent years has started to be much more frequently recorded within Tristan waters with birds now occasionally "summering" around the Islands within the Atlantic Yellow-nosed Albatross colonies. Up to six birds were recorded over Yakhont seamount and three birds over Crawford seamount.

Because of this species tendency to associate with vessels it would be vulnerable to fishing methods and in particular long line fishing without appropriate mitigation measures in place.

Grey-Headed Albatross (*Thalassarche chrysostoma*)

Circumpolar Southern Hemisphere; breeding on higher latitude islands of Southern Ocean.

Typically a species of colder waters of the South Atlantic it was expected that this species would be recorded in much larger numbers than it was, especially in the first few days out of the Falkland Islands.

It proved to be very scarce indeed, in fact, rare.

Only one adult bird was recorded on the Second day and a further six Immatures were recorded over days three (3birds), four (2 birds) and five (1 birds).

All six birds were identified as different through missing wing feathers or moult and extent of markings.

Atlantic Yellow-Nosed Albatross (*Thalassarche chlororynchos*)

Circumpolar Southern Hemisphere; breeding on Tristan Da Cunha group inc Gough Island, range at sea, throughout South Atlantic.

Commonly encountered and in fact by far the commonest albatross species recorded especially by the time the ship had passed over the boundary to Tristan's EEZ. There was an obvious abundance spike over both of the seamounts, especially Yakhont where numbers could easily reach over a hundred birds in view at any one time.

It is difficult to say without further study how much this species uses the seamounts at certain times of the year as most of the tracking studies have shown that this species travels widely and seems to favour heading towards the Angola/Namibia border and then following the West African shelf edge south towards Cape Town and then heading back to the Tristan group of Islands. Numbers present during the observation would suggest that the seamounts do form an important part of their foraging range.

Because of this species tendency to associate with vessels it would be vulnerable to fishing methods and in particular long line fishing without appropriate mitigation measures in place.

PROCELLARIIDAE (PETREL SPECIES.)

Fulmarine Petrels:

Southern Giant Petrel (*Macronectes giganteus*)

Circumpolar Southern Ocean; restricted to Antarctic waters in winter.

Several (up to six) Giant Petrels were in attendance around the ship for most of the voyage from The Falkland Islands all the way to Tristan Da Cunha.

It was very difficult to tell if there was a high turnover of ship followers and to add to the uncertainty many of the birds were very young and it was almost impossible to separate the Northern GP's and Southern GP's as they still attained all dark plumage and had uniform pink bills.

Of the birds definitely showing all the features of Southern GP there was a definite peak in abundance within the Tristan EEZ and especially on the sea mounts, probably due to the close proximity of the large breeding population on Gough Island. Many of the birds seen in this later stage had Gough Island rings on from part of the ongoing study population.

Because of this species tendency to associate with vessels it would be vulnerable to fishing methods and in particular long line fishing without appropriate mitigation measures in place.

Northern Giant Petrel (*Macronectes halli*)

Circumpolar Southern Ocean; occurs in subtropics in winter.

Only two birds with features to be certain that they were of this species were recorded with one on day 3 and one on day six.

Once again many of the Giant Petrels encountered were very young birds so it was very difficult or indeed impossible to separate from Southern.

Cape Petrel (Pintado Petrel) (*Daption capense*)

Circumpolar Southern Ocean; occurs in subtropics in winter.

Can seasonally be a very common bird in the Southern section of the Tristan EEZ and would undoubtedly have been seen much more frequently at a different time of year when birds were not much further South due to their breeding distribution/season.

During the course of the cruise this species was only recorded once with a single individual briefly following the ship on the early morning of day 3.

Kerguelen Petrel (*Lugensa brevirostris*)

Circumpolar Southern Ocean; a cold water species.

A fairly rare species within Tristan waters as this species is at the edge of its range and only ever seen on a small handful of occasions previously on many trips.

7 records of Kerguelen petrel were recorded with two birds seen during the days observing at Crawford Seamount and three birds recorded whilst observing at Yakhont Seamount with a further two birds seen whilst on transit between the two sites.

Presumably all of these birds will be from the relatively small breeding population on Gough Island.

The RSPB Gough Island science team are currently doing some tracking work on this species in partnership with the Tristan Conservation Department and the Percy Fitzpatrick Institute, University

Cape Town and hopefully this will give us a better understanding of this species in the near future and illustrate the use of the seamounts and Tristans waters.

Blue Petrel (*Halobaena caerulea*)

Circumpolar Southern Ocean; a cold water species.

Once again a rare species within Tristan waters as this species is at the edge of its range and only ever seen once previously on many trips.

Only a single record of Blue Petrel was recorded on day 4.

It was slightly surprising that this species proved to be so rare whilst observing on the Crawford and Yakhont Seamounts. It was hoped that with a small breeding population recently discovered on Gough Island that more records would be attained.

Prions:

Prion species are notoriously difficult to identify and will often leave even the most skilled and expert seabird observer pulling their hair out in frustration. With good views of birds coming close to the ship and photographs for comparisons many can with experience be identified.

All records that could be identified to species are included below but this still leaves around 250,000 to 350,000 birds logged that will be unidentified Prion Sp.

Fairy Prion (*Pachyptila turtur*)

Circumpolar species of warmer subantarctic and occasionally subtropical waters.

Fairly scarce and only encountered over the first four day period with a handful of sightings on all days apart from day three where this species was fairly common and widespread with over three hundred records. No Prions were positively identified as this species beyond the fourth day.

Slender-Billed Prion (*Pachyptila belcheri*)

Circumpolar Southern oceans, predominantly a colder water species.

This species was very widespread in the first week of the voyage and at times abundant. Two to three thousand birds that were almost certainly this species were recorded on days two, three and four with noticeably fewer by midday on day five where by this point this species had now become fairly infrequent. No prions were positively identified as this species post this point.

Antarctic Prion (*Pachyptila desolata*)

Circumpolar Southern oceans, predominantly a colder water species.

This species was marginally commoner than Slender-Billed with a similar distribution throughout the voyage but did stay more visible for a day or so longer with still a handful of birds identified as Antarctic's up until late on in day six.

Broad-Billed Prion (*Pachyptila vittata*)

New Zealand and SE Atlantic, in warmer subantarctic waters just north of the subtropical convergence.

A very scarce bird indeed on the first few days of the voyage but once we were in sight of the Tristan EEZ this species became very common and at times abundant.

This was also the case around the Crawford and Yakhont sea mounts were daily totals could exceed 10,000 birds. On Yakhont several flocks of 4-6000 birds could be seen lined up in characteristic long

lines looking like a huge white serpent snaking off in to the distance as birds were filter feeding only to all lift up and chase the food a few hundred metres and all wheel round and drop back on the sea and continue feeding.

Broad billed was the commonest Prion in the northern section of the voyage, in fact, it was probably the commonest recorded and most abundant species along with Great Shearwater. Peak count was in excess of 60,000 on one afternoon whilst approaching Yakhont seamount were thought to be primarily this species.

Gadfly petrels:

Great-Winged Petrel (*Pterodroma macroptera*)

Circumpolar subantarctic and Antarctic waters except New Zealand.

At times can be a very common bird within Tristan waters as it breeds on all four islands within the Tristan group. It is therefore surprising that so few compared to previous visits were recorded with this species only getting logged with around 250 records. This could be explained with the fact that this species is a winter breeder (May) and does seem to tend to disperse with a SE Atlantic bias post breeding.

White-Headed Petrel (*Pterodroma lessonii*)

Circumpolar in colder subantarctic waters.

A rare species in Tristan's waters and was only recorded three times during the cruise. A single individual was recorded on the second day with a further individual on the third day and finally a single bird was recorded in Tristan's EEZ on the Eastern edge of Yakhont Seamount.

Soft-Plumaged Petrel (*Pterodroma mollis*)

Colder waters of Atlantic and New Zealand.

Breeds on all four islands within the Tristan group.

A very common and widespread species and was encountered on all days of the cruise with some daily totals in excess of a thousand birds. Approximately 10,000 birds in total were recorded between the Falkland Islands and the extreme Northern edge of Tristan's EEZ.

Atlantic Petrel (Schlegel's Petrel) (*Pterodroma incerta*)

South Atlantic, breeds within the Tristan Da Cuhna Island group inc. Gough Island.

Endemic to the Tristan Da Cunha group and like Great Winged Petrel is also a winter breeder (eggs laid mainly in June). It is therefore surprising that Atlantic Petrel was much commoner and recorded around twice if not three times as frequently as Great Winged. Although this could be explained by the fact that this species demonstrates a much more Westerly bias to its post breeding dispersal and as this cruise has illustrated is much commoner in the South West Atlantic region.

A total of around 6-700 birds were logged throughout the cruise with a detectable increase in frequency the further North and the nearer Tristan that observations were carried out. Almost a hundred of the birds recorded were at Yakhont seamount (58) and Crawford Seamount (33).

Procellaria petrels:

White-Chinned Petrel (*Procellaria aequinoctialis*)

Circumpolar Southern Ocean; breeds in colder waters, moving North in winter.

As this species shows a distinct and inherent behaviour trait of following vessels which can make it difficult to accurately assess numbers and if birds are following for very long periods of time or if there is indeed a regular turnover of birds in the vessels wake and therefore estimating actual numbers.

Up to 30 birds could be counted daily following the vessel for the first six days after which point numbers started to decrease as we approached the Tristan EEZ where numbers of birds were as low as 6-8.

Once we reached Yakhont Seamount there were regularly 4 birds around the ship but this soon decreased to just the odd occasional sighting as we headed north to Tristan Da Cunha.

Because of this species tendency to associate with vessels it would be vulnerable to fishing methods and in particular long line fishing without appropriate mitigation measures in place.

Spectacled Petrel (*Procellaria conspicillata*)

South West Atlantic, breeding only on Inaccessible Island within the Tristan Da Cunha group.

Again as with White-Chinned Petrel this species shows a distinct and inherent behaviour trait of following vessels which can make it difficult to accurately assess numbers and if birds are following for very long periods of time or if there is indeed a regular turnover of birds in the vessels wake and therefore estimating actual numbers.

Interestingly we picked up the first Spectacled Petrel following the ship on just the second day out of the Falkland Islands which was much sooner than expected.

This steadily increased by two or three more birds each day until we reached the Tristan EEZ where now 20-30 birds could be counted following the ship.

Yakhont and Crawford Seamounts proved good for this species with some days on Yakhont Seamount up to 250 birds could be seen at any one time either associating with the ship or loafing in noisy aggregations or rafts along with the very abundant Great Shearwater (Puffinus gravis).

Abundance was much less at Crawford seamount but daily numbers could still reach in excess of 100 birds.

Because of this species tendency to associate with vessels it would be vulnerable to fishing methods and in particular long line fishing without appropriate mitigation measures in place.

Grey Petrel (*Procellaria cinerea*)

Circumpolar in colder subantarctic waters.

Grey Petrel is a scarce breeding bird within the Tristan group of islands and is another winter breeder, usually laying eggs (March – April). Post breeding it will disperse to the South of the region.

This was true with the recorded sightings of this species. Only around 25 birds were recorded with almost all of those records coming in the first three days of the cruise. The only record within the Tristan EEZ was of a single individual noted on our arrival at Yakhont Seamount.

Larger Shearwaters:

Great Shearwater (*Puffinus gravis*)

Atlantic and occasionally Indian Ocean, breeds within the Tristan Da Cunha Island group, migrates North. In excess of three millions birds breed within the Tristan group.

Ubiquitous species throughout the voyage with numbers unsurprisingly very high throughout the observation periods. Once within the Tristan EEZ numbers could reach in excess of 5-6000 per day quite easily.

Although this species was encountered throughout the observation periods there were distinct spikes in abundance over both Yakhont and Crawford seamounts.

Because of this species tendency to associate with vessels it would be vulnerable to fishing methods and in particular long line fishing without appropriate mitigation measures in place.

Sooty Shearwater (*Puffinus griseus*)

Circumpolar in warm and subantarctic waters, migrates north into mainly the Atlantic and Pacific Oceans.

A common species in the first few days of the cruise which is as expected given the large breeding population in the Falkland Islands.

Approximately 4-600 birds a day were recorded during this period (days, 1, 2, 3, 4 and 5) which decreased dramatically to an average of one bird per day just prior to entering the Tristan EEZ.

Whilst observing on the seamounts a total of six birds were recorded on Yakhont and four birds on Crawford.

A single record of this species was recorded whilst observing in St Helena's waters on the first full day of observations approx. 3 miles to the North East of the Island.

Cory's Shearwater (*Puffinus diomedea*)

Ssp. Borealis, subtropical Western Atlantic, migrant to South Atlantic and Indian Oceans.

A rarely encountered species as far south and central as Tristan Da Cunha which on previous trips is much more commonly encountered to the East nearer to Cape Town.

A single individual Cory's Shearwater was seen on day 7 that was a great surprise as this is the furthest south by a long way that I have ever recorded this species.

A much more less surprising and the only other record was an individual recorded six miles North-west of St Helena on the way to the Bonaparte seamount.

Smaller Shearwaters: Little Shearwater complex.

Sub-Antarctic Little Shearwater (*Puffinus elegans*)

Colder waters of South West Pacific and the Tristan Da Cunha group in South Atlantic.

A very scarce species and not commonly seen despite small breeding populations within the Tristan group.

A small number were recorded, an average of 1-2 per day on the voyage to the sea mounts.

Once we reached Crawford sea mount, particularly Crawford East, sightings increased dramatically and a morning count of 50+ birds were common. It was initially thought that this was a chance encounter of a large number of birds. As we passed on to Yakhont sea mount where numbers declined and reached a max daily total of 5-7 birds. Once we transited back to Crawford numbers

quickly increased once again to 50+ birds yet again showing that Crawford East could be of particular significance at times to this species.

After leaving the sea mounts and heading towards Tristan numbers of this species rapidly declined once again and fell back in to the pattern of no more than 1-2 birds per day and more often only single records.

As an added note it would be interesting to do some tracking of this species in the future to understand further their usage of the sea mounts as it looks as though they may well be a feature the associate strongly with.

PELECANOIDIDAE (Diving Petrels)

South Georgia Diving Petrel (*Pelecanoides georgicus*)

Circumpolar Southern Ocean in colder Subantarctic waters.

Diving petrels can be very difficult indeed to identify, even in the hand. Therefore the following records are presumed to be South Georgian Diving Petrel due to the location of the ship to South Georgia, the very pale underwing and paler face below the eye.

Three birds were seen together on the water in front of the ship at the start of the third day.

Common Diving Petrel (*Pelecanoides urinatrix*)

Ssp. P. u. dacunhae, Tristan Da Cunha group inc Gough Island.

Common Diving Petrel was very rare with only a single record away from Tristan Da Cunha itself which was recorded around an hour north of Crawford Seamount.

Around Tristan whilst at anchor and on approach this species was very common with many hundred birds recorded, especially along the Sea Kelp line around the island.

HYDROBATIDAE (Storm-petrels)

Oceanitinae – Southern Storm-petrels:

Wilson's Storm-petrel (*Oceanites oceanicus*)

Circumpolar distribution of 3 Ssp. Migrates North in winter.

Very few Wilson's Storm Petrel were recorded which is undoubtedly due to the time of year with breeding birds from the South not yet having dispersed north.

A hundred or so birds were recorded on the first couple of days out of the Falklands but the records of this species decreased dramatically to one or two birds per day. There was a small spike in abundance on the Crawford Seamount where up to 20 birds were recorded and no records were noted north of this point.

Grey-Backed Storm-petrel (*Garrodia nereis*)

Circumpolar subantarctic.

Surprisingly only two records of this species were noted with a single bird seen at Yakhont Seamount and another single individual noted at Crawford Seamount.

White-Faced Storm-petrel (*Pelagodroma marina*)

Ssp. P. m. Marina, South Atlantic inc Tristan Da Cunha group.

Very few records of this species which is surprising at it was expected to be encountered much more frequently.

A single individual was recorded on day five, with a further two records on Yakhont Seamount and a single record from Crawford Seamount.

Black-Bellied Storm-petrel (*Fregetta tropica*)

Ssp. F. t. Melanoleuca, Tristan Da Cunha group and South Atlantic. Ssp. F. t. tropica circumpolar subantarctic.

Very few records of "definite" Black-bellied were recorded with most needing identifying from photographs later. Only a handful of birds out of the several hundred records per day could be confidently categorized as being this species. It is no doubt fairly numerous throughout the region of the vessels voyage.

White-Bellied Storm-petrel (*Fregetta grallaria*)

Ssp. F. g. leucogaster, South Atlantic, Tristan Da Cunha group.

This species did seem much more abundant than the previous and was recorded on all days with between 200-650 records each day.

As with the previous species a cautious approach was taken with the positive identifications due to the overlap in characteristics. They would often be treated as one group which is commented on further below.

Fregetta sp.

It can be very difficult to separate these species at sea, whilst mist netting birds on Tristan it can be difficult to separate these two species in the hand without the aid of taking biometrics, especially the Tristan Ssp. of *F. t. melanoleuca* and *F. g. Leucogatster*

Therefore Fregetta Storm-petrels will be treated as *Fregetta sp.* unless positive identification allowed them to be described separately.

Fregetta's were recorded on all days and this group was rarely out of sight at any one time occasionally in some very large numbers. Fregetta's were sometimes abundant and on Yakhont seamount gatherings at upwelling's and slicks or such presumed features could number a thousand or more birds which was a spectacle indeed as they pattered at the surface catching food.

Madeiran Storm-petrel (*Oceanodroma castro*)

This species was encountered on all days whilst observing within the St Helena EEZ but was by far much more commonly recorded within the first three days of observations and was only seen quite rarely when once away from the Island.

Single birds were often encountered throughout observation periods and the highest daily number recorded was on the second day with 24 individuals noted.

PENGUINS

Northern Rockhopper Penguin (*Eudyptes crestatus moseleyi*)

This species is almost exclusively endemic to the Tristan da Cunha group with a small remnant population within the Amsterdam and St Paul group of Islands.

Very few Northern Rockhoppers were recorded throughout the observations within Tristan's EEZ. A small group "porpoising" were observed on the approach to Yakhont seamount and a further three birds were present on one of our stations at Yakhont which foraged around the vessel for a short time. Two birds were present the following morning which may have related to the same birds seen the previous day.

It is unknown how the seamounts that we observed are used by the breeding populations on Tristan (Northern Islands) and Gough but hopefully new tracking data from Project Pinnamin will give us much more of an insight into how this species uses the Tristan marine environment.

TERN SPECIES

South American Tern (*Sterna hirundinacea*)

Included for completeness. This species was recorded in reasonable numbers for the first day travelling North East from the Falkland Islands. Around 200 were recorded during the first days observations.

Antarctic Tern (*Sterna vittata tristanensis*)

Commonly recorded whilst at anchor of Tristan da Cunha but very rare away from the Northern Islands. A peak of 40 birds were recorded just offshore from the Settlement at Tristan.

Arctic Tern (*Sterna paradisaea*)

Very uncommon throughout the voyage but there were still small isolated groups or individuals still encountered. Most birds were on the move North to their breeding grounds. Peak count was six individuals just on the Northern edge of the Tristan EEZ.

Smaller numbers of obviously migrating birds heading North were recorded on five of the days that we were observing in St Helena waters, in total 14 birds were noted.

Sooty Tern (*Sterna fuscata*)

Very scarce as there is only a small breeding population on St Helena. This species was only recorded on a few occasions with only seven birds recorded during observations in St Helena's EEZ.

The peak count was three birds just over three miles to the South of St Helena.

Only a single record came from Bonaparte seamount with an individual associating with a mixed flock of Arctic and Fairy Tern, Brown and Black Noddy and a Whale Shark.

Fairy Tern (*Gygis alba*)

Fairly common and widespread although at a fairly low abundance across all areas of the St Helena EEZ that we observed over.

The biggest concentrations were off the North East of the Island where counts could occaisionally reach 30-40 birds.

Very few birds were encountered over the Bonaparte seamount.

NODDY SPECIES:

Black Noddy (*Anous minutus*)

Fairly common and widespread although at a fairly low abundance similar to Fairy Tern.

This species was recorded across all areas of the EEZ that we observed over but rarely in any great numbers. The largest feeding flock that was encountered was of 22 birds and the highest daily total was on the second day within St Helena EEZ where 106 birds were recorded.

Brown Noddy (*Anous stolidus*)

Much scarcer than the similar Black Noddy and rarely seen in any numbers other than singles or very small scattered groups.

This species was recorded on all days observing. The largest group was of six birds within a mixed feeding flock and the highest daily total was of 41 birds that was recorded on the second day within the St Helena EEZ

TROPICBIRD SPECIES:

Red-Billed Tropicbird (*Phaethon aethereus*)

Despite being a fairly common breeding species on St Helena very few birds were recorded considering the time spent on observations.

Only 40-50 birds were recorded during all observations with the highest abundance recorded in waters close to shore near to Jamestown.

Very few birds were recorded offshore and away from the Island.

White-tailed Tropicbird (*Phaethon lepturus*)

Only a single record of this rare species for St Helena waters with a single bird which was recorded approximately 40 miles to the South of St Helena.

BOOBY SPECIES:

Masked Booby (*Sula dactylatra*)

Regularly encountered in small numbers whilst observing close to the Island. Highest counts were of 30 birds in a day. Once offshore this species was fairly scarce with limited records and numbers.

Brown Booby (*Sula leucogaster*)

Very rare species with only two records.

Two birds were recorded together on the first day's observations close to Speery Island.

SKUA SPECIES

Falkland Skua (*Catharacta antarctica*)

A very small number of Falkland Skua (4-6) followed us from Stanley harbour for approx. four hours on the first days voyage. After this they soon dropped off the ship and this species was not recorded again.

Tristan Skua (*Catharacta antarctica hamiltoni*)

Commonly recorded around the Northern Islands with several individuals following the ship. Three birds associated with the vessel on the Yakhont seamount whilst the vessel was present in the area. No birds were recorded on the Crawford seamount.

Long-Tailed Skua (*Stercorarius longicaudus*)

This species was recorded twice throughout the voyage to Tristan, with one bird on the third day and a further small flock of three birds on day four. It was surprising to see these birds still so far south as it was presumed they would be much further north towards their breeding grounds by this time of year.

16. **Public engagement**

16.1. *Tristan da Cunha*

Unfortunately, the timing of the cruise resulted in no Tristanians being able to join the research cruise. A system of daily updates was instigated so that details of days activities and summaries of the findings were passed to the Island. A summary of outreach activities is provided in table 16.1 and social media in table 16.2.

Table 16.1. Details of the public engagement at Tristan da Cunha.

Date	Type	Recipients
24/3/18 – 30/3/18, 1/4/18	Daily Report	Administrator, head of fisheries, head of conservation
03/04/18	Tristan Newsletter	For Island wide distribution
24/3/18 – 6/4/18	Daily weather Report	Tristan School
31/3/18	Public Talk	Local population
31/3/18	Transport	Tramsport Island patrol vessel, Wave Rider, to the UK
2/4/18	Facebook story	
2/4/18	Talk	Dawn, Robin and Amber Repetto talked on the JCR about Island life.

Table 16.2. Details of social media and its reach at Tristan da Cunha.

Date	URL	Reach	Keywords
15-May-2018 03:50PM	http://www.facebook.com/1854594054830087/posts/2222711428018346	404	Tristan da Cunha,James Clark Ross
28-Apr-2018 05:58PM	http://twitter.com/AlistairDove/statuses/990274158889177088	10999	James Clark Ross,Tristan da Cunha
28-Apr-2018 05:57PM	http://twitter.com/CRHClover/statuses/990273770475675654	5310	James Clark Ross,Tristan da Cunha
27-Apr-2018 08:58PM	http://twitter.com/MorrisLeigh/statuses/989956924941766656	20863	James Clark Ross,Tristan da Cunha
27-Apr-2018 08:00PM	http://twitter.com/jamesckearns/statuses/989942396015308800	1104	James Clark Ross,Tristan da Cunha
27-Apr-2018 06:32PM	http://twitter.com/fredzannarbor/statuses/989920196382076928	2104	James Clark Ross,Tristan da Cunha

27-Apr-2018 06:26PM	http://twitter.com/STHELENANEWS1/statuses/989918743781347331	2854	James Clark Ross,Tristan da Cunha
20-Apr-2018 10:39AM	http://twitter.com/GoughIsland/statuses/987264570371792896	251	James Clark Ross,Tristan da Cunha
19-Apr-2018 11:21PM	http://twitter.com/DeepSeaEcol/statuses/987093960953925633	2852	James Clark Ross,Tristan da Cunha
19-Apr-2018 06:38PM	http://twitter.com/NPiechaud/statuses/987022631177244672	444	James Clark Ross,Tristan da Cunha
19-Apr-2018 01:25PM	http://twitter.com/marthasterias/statuses/986943748495106048	476	James Clark Ross,Tristan da Cunha
19-Apr-2018 10:07AM	http://twitter.com/JamesBellOcean/statuses/986894048857350144	545	James Clark Ross,Tristan da Cunha
06-Apr-2018 12:26PM	http://www.facebook.com/1854594054830087/posts/2172344806388342	394	James Clark Ross,Tristan da Cunha
06-Apr-2018 12:01PM	http://twitter.com/essexforester/statuses/982211775004262400	480	James Clark Ross,Tristan da Cunha
06-Apr-2018 11:05AM	http://twitter.com/sthelenafocus/statuses/982197620322910208	1428	James Clark Ross,Tristan da Cunha
06-Apr-2018 10:01AM	http://twitter.com/GeorgeCredland/statuses/982181546890153984	730	Tristan da Cunha,James Clark Ross
02-Apr-2018 09:41AM	http://twitter.com/phil_harwood_/statuses/980726996677419009	17	Tristan da Cunha,James Clark Ross
01-Apr-2018 11:28PM	http://twitter.com/USelaine/statuses/980572738657034240	1366	Tristan da Cunha,James Clark Ross
01-Apr-2018 11:21PM	http://twitter.com/rachel_marine/statuses/980570755573272576	1618	Tristan da Cunha,James Clark Ross
01-Apr-2018 09:06PM	http://twitter.com/oneeyedlizzie/statuses/980536834232078337	278	Tristan da Cunha,James Clark Ross
01-Apr-2018 08:02PM	http://twitter.com/newcastlemarine/statuses/980520853757718530	1572	Tristan da Cunha,James Clark Ross
01-Apr-2018 07:05PM	http://twitter.com/cqcqcqdx/statuses/980506476774125568	434	Tristan da Cunha,James Clark Ross

01-Apr-2018 01:09PM	http://twitter.com/DeepSeaBex/statuses/980416825275158529	1288	Tristan da Cunha,James Clark Ross
01-Apr-2018 01:07PM	http://twitter.com/DeepSeaEcol/statuses/980416426258419712	2791	Tristan da Cunha,James Clark Ross
01-Apr-2018 10:28AM	http://twitter.com/MCBGeology/statuses/980376236726865920	379	Tristan da Cunha,James Clark Ross
01-Apr-2018 08:34AM	http://twitter.com/rxr_rogers/statuses/980347720467734528	247	Tristan da Cunha,James Clark Ross
01-Apr-2018 07:54AM	http://twitter.com/ron_aird/statuses/980337663990378497	270	Tristan da Cunha,James Clark Ross
01-Apr-2018 07:15AM	http://twitter.com/EvieMcLaughlin/statuses/980327868558438400	0	James Clark Ross,Tristan da Cunha

16.2. *St Helena*

5 personnel joined James Clark Ross at Saint Helena for the duration of the cruise. Details of the public engagement (Table 16.3) and social media output (Table 16.4) are provided.

Table 16.3. Details of the public engagement at St Helena.

Date	Type	
13/04/18	News Story	The Sentinel
13/04/18	News Story	The Independent
17/04/18	Meeting	Environment and Natural Resources Department
18/04/18	Field work	Bird counts
18/04/18	Oceanography	School field trip
18/04/18	Radio Interview	Saint FM
18/04/18	Radio Interview	SAMS radio
19/04//18	Radio Interview	Saint FM
19/04/18	Public talk	70-80 locals in the Museum
20/04/18	Radio Interview	Saint FM
20/04/18	News Story	The Independent

Table 16.4. Summary of social media outputs and their reach at St. Helena

Date	URL	Reach	Keywords
15-May-2018 03:50PM	http://www.facebook.com/1854594054830087/posts/2222711428018346	404	St Helena,James Clark Ross
08-May-2018 06:14PM	http://www.facebook.com/127031794038958/posts/1970689263006526	7883	St Helena,James Clark Ross

03-May-2018 02:12PM	http://www.facebook.com/127031794038958/posts/1963672663708186	7875	St Helena,James Clark Ross
29-Apr-2018 01:06AM	http://www.facebook.com/928314973891499/posts/1746982335358088	1251	James Clark Ross,St Helena
28-Apr-2018 05:58PM	http://twitter.com/AlistairDove/statuses/990274158889177088	10999	James Clark Ross,St Helena
28-Apr-2018 05:57PM	http://twitter.com/CRHClover/statuses/990273770475675654	5310	James Clark Ross,St Helena
27-Apr-2018 08:58PM	http://twitter.com/MorrisLeigh/statuses/989956924941766656	20863	James Clark Ross,St Helena
27-Apr-2018 08:00PM	http://twitter.com/jamesckearns/statuses/989942396015308800	1104	James Clark Ross,St Helena
27-Apr-2018 06:32PM	http://twitter.com/fredzannarbor/statuses/989920196382076928	2104	James Clark Ross,St Helena
27-Apr-2018 06:26PM	http://twitter.com/STHELENANEWS1/statuses/989918743781347331	2854	James Clark Ross,St Helena
20-Apr-2018 10:39AM	http://twitter.com/GoughIsland/statuses/987264570371792896	251	James Clark Ross,St Helena
19-Apr-2018 11:21PM	http://twitter.com/DeepSeaEcol/statuses/987093960953925633	2852	James Clark Ross,St Helena
19-Apr-2018 06:38PM	http://twitter.com/NPiechaud/statuses/987022631177244672	444	James Clark Ross,St Helena
19-Apr-2018 01:25PM	http://twitter.com/marthasterias/statuses/986943748495106048	476	James Clark Ross,St Helena
19-Apr-2018 10:07AM	http://twitter.com/JamesBellOcean/statuses/986894048857350144	545	James Clark Ross,St Helena
15-Apr-2018 11:04PM	http://twitter.com/dwatchnews/statuses/985639988757872640	7038	St Helena,James Clark Ross
15-Apr-2018 11:04PM	http://www.facebook.com/651156804954487/posts/1942103525859802	1125	ST HELENA,St Helena,James Clark Ross
15-Apr-2018 08:36PM	http://twitter.com/dwatchnews_lam/statuses/985602676950908928	546	St Helena,James Clark Ross
14-Apr-2018 07:47PM	http://twitter.com/SAERI_FI/statuses/985228188866547714	1158	James Clark Ross,St Helena
14-Apr-2018 06:00PM	http://www.facebook.com/258607090820923/posts/2042190442462570	721	James Clark Ross,St Helena

14-Apr-2018 05:20PM	http://twitter.com/MeadowsN/statuses/985191071595618304	64	St Helena,James Clark Ross
14-Apr-2018 01:55PM	http://twitter.com/N2RSKnysna/statuses/985139504473362432	184	James Clark Ross,St Helena
14-Apr-2018 01:26PM	http://twitter.com/LallyABrown/statuses/985132186050449408	4070	James Clark Ross,St Helena
14-Apr-2018 12:59PM	http://twitter.com/lisahonan07/statuses/985125283849232384	3924	James Clark Ross,St Helena
14-Apr-2018 11:41AM	http://twitter.com/BAS_News/statuses/985105790410350592	26519	James Clark Ross,St Helena
14-Apr-2018 06:01AM	http://twitter.com/ian_hardacre/statuses/985020155200667652	30023	James Clark Ross,St Helena
13-Apr-2018 11:57PM	http://twitter.com/Phi_Pix/statuses/984928533607845889	61	James Clark Ross,St Helena
13-Apr-2018 11:03PM	http://twitter.com/AndrewJPelling/statuses/984915015236014080	2125	James Clark Ross,St Helena
13-Apr-2018 09:23PM	http://twitter.com/SheilaJPhillip1/statuses/984889899341008898	21	James Clark Ross,St Helena
13-Apr-2018 07:55PM	http://twitter.com/STHELENANEWS1/statuses/984867666426032130	2834	St Helena,James Clark Ross
13-Apr-2018 06:57PM	http://twitter.com/Roger_Mhc8/statuses/984853167765688320	241	James Clark Ross,St Helena
13-Apr-2018 06:57PM	http://twitter.com/Roger_Mhc8/statuses/984853100086349825	241	James Clark Ross,St Helena
13-Apr-2018 06:57PM	http://twitter.com/Roger_Mhc8/statuses/984853041311567874	241	James Clark Ross,St Helena
13-Apr-2018 05:42PM	http://twitter.com/STHELENANEWS1/statuses/984834150938136576	2833	James Clark Ross,St Helena
13-Apr-2018 05:42PM	http://twitter.com/STHELENANEWS1/statuses/984834116666478593	2833	James Clark Ross,St Helena
13-Apr-2018 05:34PM	http://twitter.com/STHELENANEWS1/statuses/984832312029347840	2833	James Clark Ross,St Helena
13-Apr-2018 05:29PM	http://twitter.com/rxr_rogers/statuses/984831026189959168	251	James Clark Ross,St Helena
13-Apr-2018 05:01PM	http://twitter.com/gm0hcq/statuses/984823909739651072	1193	James Clark Ross,St Helena

13-Apr-2018 04:39PM	http://twitter.com/ChrisHe41840457/statuses/984818342652530691	10	James Clark Ross,St Helena
13-Apr-2018 04:34PM	http://twitter.com/Artisan02721851/statuses/984817065868509189	108	James Clark Ross,St Helena
13-Apr-2018 04:04PM	http://twitter.com/gm0hcq/statuses/984809440196079617	1193	James Clark Ross,St Helena
13-Apr-2018 04:02PM	http://twitter.com/gm0hcq/statuses/984808972585717760	1193	James Clark Ross,St Helena
12-Apr-2018 08:02PM	http://twitter.com/DrMJWitt/statuses/984507008849207296	2136	St Helena,James Clark Ross
12-Apr-2018 07:59PM	http://twitter.com/STHELENANEWS1/statuses/984506323021811712	2833	St Helena,James Clark Ross
12-Apr-2018 06:43PM	http://twitter.com/sthelenafocus/statuses/984487171292876802	1435	St Helena,James Clark Ross
12-Apr-2018 03:03PM	http://twitter.com/gm0hcq/statuses/984431717845995520	1194	St Helena,James Clark Ross
11-Apr-2018 09:19PM	http://twitter.com/Kimberley_EBird/statuses/984163997770506240	300	James Clark Ross,St Helena
11-Apr-2018 02:09PM	http://twitter.com/elizacarthy/statuses/984055773218131980	12827	James Clark Ross,St Helena
11-Apr-2018 12:46PM	http://twitter.com/gm0hcq/statuses/984034832966651906	1193	James Clark Ross,St Helena
10-Apr-2018 05:53PM	http://twitter.com/SianLimpenny/statuses/983749906396516352	248	James Clark Ross,St Helena
10-Apr-2018 03:42PM	http://twitter.com/Artisan02721851/statuses/983716879159062529	104	James Clark Ross,St Helena
10-Apr-2018 01:05PM	http://twitter.com/alinabrouwer/statuses/983677440462589952	2271	St Helena,James Clark Ross
10-Apr-2018 10:52AM	http://twitter.com/CambrianCat/statuses/983643976262701056	34	James Clark Ross,St Helena
10-Apr-2018 09:59AM	http://twitter.com/ukgovbluebelt/statuses/983630511682785282	747	James Clark Ross,St Helena
09-Apr-2018 10:10PM	http://twitter.com/STHELENANEWS1/statuses/983452057683333120	2833	James Clark Ross,St Helena
09-Apr-2018 08:12PM	http://twitter.com/gm0hcq/statuses/983422446861766657	1183	James Clark Ross,St Helena

09-Apr-2018 06:03PM	http://twitter.com/ALuthiger/statuses/983389901721915392	3560	St Helena,James Clark Ross
09-Apr-2018 05:21PM	http://twitter.com/STHELENANEWS1/statuses/983379487147642882	2833	St Helena,James Clark Ross
09-Apr-2018 03:43PM	http://twitter.com/gm0hcq/statuses/983354719509929986	1181	St Helena,James Clark Ross
09-Apr-2018 09:25AM	http://twitter.com/CefasGovUK/statuses/983259596105142272	8679	James Clark Ross,St Helena
08-Apr-2018 09:02PM	http://twitter.com/tara_pelembe/statuses/983072551885770752	300	James Clark Ross,St Helena
08-Apr-2018 07:04PM	http://twitter.com/SAERI_FI/statuses/983042951919161345	1150	James Clark Ross,St Helena
08-Apr-2018 06:48AM	http://twitter.com/ALuthiger/statuses/982857600797638656	3551	James Clark Ross,St Helena
08-Apr-2018 06:40AM	http://twitter.com/STHELENANEWS1/statuses/982855636500320256	2834	James Clark Ross,St Helena
07-Apr-2018 09:45PM	http://twitter.com/DrMJWitt/statuses/982721152534671360	2120	James Clark Ross,St Helena
07-Apr-2018 09:39PM	http://twitter.com/gm0hcq/statuses/982719660327161856	1179	James Clark Ross,St Helena
07-Apr-2018 03:45PM	http://twitter.com/Artisan02721851/statuses/9826300438983249926	107	James Clark Ross,St Helena
07-Apr-2018 03:17PM	http://twitter.com/linuxmil/statuses/982623518440423424	546	St Helena,James Clark Ross
07-Apr-2018 07:55AM	http://twitter.com/CambsGeology/statuses/982512226283261952	72	James Clark Ross,St Helena
07-Apr-2018 07:51AM	http://twitter.com/Roger_Mhc8/statuses/982511161571774464	236	James Clark Ross,St Helena
07-Apr-2018 06:58AM	http://twitter.com/nabebuta_x1/statuses/982497934833930240	54	St Helena,James Clark Ross
07-Apr-2018 12:19AM	http://twitter.com/Phi_Pix/statuses/982397366820130816	60	St Helena,James Clark Ross
06-Apr-2018 11:05PM	http://twitter.com/libertad717/statuses/982378831825682432	1131	James Clark Ross,St Helena
06-Apr-2018 07:43PM	http://twitter.com/HelenGavaghan/statuses/982327939537743873	776	St Helena,James Clark Ross

06-Apr-2018 06:53PM	http://twitter.com/SueBrown409/statuses/982315440365023233	21	St Helena,James Clark Ross
06-Apr-2018 06:05PM	http://twitter.com/STHELENANEWS1/statuses/982303211863334912	2831	St Helena,James Clark Ross
06-Apr-2018 06:05PM	http://twitter.com/STHELENANEWS1/statuses/982303196067581953	2831	James Clark Ross,St Helena
06-Apr-2018 04:45PM	http://twitter.com/gm0hcq/statuses/982283103090733057	1171	James Clark Ross,St Helena
06-Apr-2018 12:26PM	http://www.facebook.com/1854594054830087/posts/2172344806388342	394	St Helena,James Clark Ross
06-Apr-2018 12:01PM	http://twitter.com/essexforester/statuses/982211775004262400	480	James Clark Ross,St Helena
06-Apr-2018 11:22AM	http://twitter.com/jodi222/statuses/982201999469891584	410	James Clark Ross,St Helena
06-Apr-2018 11:06AM	http://twitter.com/sthelenafocus/statuses/982197819430727680	1428	James Clark Ross,St Helena
06-Apr-2018 11:05AM	http://twitter.com/sthelenafocus/statuses/982197620322910208	1428	James Clark Ross,St Helena
06-Apr-2018 10:06AM	http://twitter.com/DeepSeaEcol/statuses/982182633017753600	2825	James Clark Ross,St Helena
06-Apr-2018 09:58AM	http://twitter.com/rockyhud/statuses/982180751792721921	522	James Clark Ross,St Helena
06-Apr-2018 09:55AM	http://twitter.com/goldfinches12/statuses/982180058709221376	1128	James Clark Ross,St Helena
06-Apr-2018 09:51AM	http://twitter.com/BAS_News/statuses/982178867799515137	26391	James Clark Ross,St Helena
06-Apr-2018 09:21AM	http://twitter.com/NMewsik4/statuses/982171337291513858	331	St Helena,James Clark Ross
06-Apr-2018 08:08AM	http://twitter.com/AndrewJPelling/statuses/982152978147586049	2129	St Helena,James Clark Ross
06-Apr-2018 07:56AM	http://twitter.com/Roger_Mhc8/statuses/982150043535720448	236	St Helena,James Clark Ross
06-Apr-2018 07:55AM	http://twitter.com/gm0hcq/statuses/982149785623777281	1167	St Helena,James Clark Ross
06-Apr-2018 12:52AM	http://twitter.com/rogerlorton/statuses/982043401611702273	745	James Clark Ross,St Helena

06-Apr-2018 12:24AM	http://twitter.com/SAERI_FI/statuses/982036326982791168	1145	James Clark Ross,St Helena
05-Apr-2018 11:30PM	http://twitter.com/angusde/statuses/982022641174417408	696	James Clark Ross,St Helena
05-Apr-2018 09:21PM	http://twitter.com/MCBGeology/statuses/981990316680122369	379	James Clark Ross,St Helena
05-Apr-2018 08:36PM	http://twitter.com/gm0hcq/statuses/981978946748153856	1167	James Clark Ross,St Helena
05-Apr-2018 06:56PM	http://twitter.com/SomewhereCarr/statuses/981953719314022400	416	James Clark Ross,St Helena
05-Apr-2018 06:55PM	http://twitter.com/STHELENANEWS1/statuses/981953527416279040	2833	James Clark Ross,St Helena
05-Apr-2018 03:38PM	http://www.facebook.com/1414056215474086/posts/2083679121845122	860	James Clark Ross,St Helena
04-Apr-2018 02:08PM	http://www.facebook.com/463229820439821/posts/1654234318006026	5201	James Clark Ross,St Helena
03-Apr-2018 01:00PM	http://www.facebook.com/1436138046633216/posts/2104642729782741	2541	St Helena,James Clark Ross
02-Apr-2018 09:41AM	http://twitter.com/phil_harwood_/statuses/980726996677419009	17	James Clark Ross,St Helena
01-Apr-2018 11:28PM	http://twitter.com/USelaine/statuses/980572738657034240	1366	James Clark Ross,St Helena
01-Apr-2018 11:21PM	http://twitter.com/rachel_marine/statuses/980570755573272576	1618	James Clark Ross,St Helena
01-Apr-2018 08:34AM	http://twitter.com/rxr_rogers/statuses/980347720467734528	247	James Clark Ross,St Helena

17. **Data Management Plan**

17.1. *Data storage*

All data recorded by instrumentation linked to the ship's network were recorded directly to respective folders within /data/cruise/jcr/20180313/ and additional folders were created within /data/cruise/jcr/20180313/work/scientific_work_areas to allow the scientists to back-up their work. When the data are transferred to the Storage Area Network (SAN) at BAS, the pathname to the files will be identical.

17.2. *Event logs*

In addition to the bridge event log, a number of digital logs were maintained to record deployments and sampling:

CTD Bottles

miniAGT

RMT8

FourEyes (Pelagic Camera)

EK60

Bongo

Manta Trawl (in Bridge Log referred to as Avani Trawl)

XBT

SUCS

Deck obs (Marine mammal, seabird observations)

ADCP

EM122

17.3. *Event numbers*

Event numbers were assigned to equipment deployments by the officers on watch and were assigned sequentially when completing the bridge event log. 131 separate events were recorded and comprise the following:

Equipment / activity	Number of deployments	Comments
Min Agassiz Trawl (miniAGT)	16	7 deployments in Tristan Da Cunha's EEZ 8 deployments in St Helena's EEZ 1 failed deployment.
RMT8 Net	34	15 deployments in Tristan Da Cunha's EEZ 18 deployments in St Helena's EEZ 1 test deployment
Shelf Underwater Camera System (SUCS)	28	28 deployments in Tristan Da Cunha's EEZ SUCS failed during its last deployment and was not deployed again.

Conductivity-Temperature-Depth (CTD)	21	8 deployments in Tristan Da Cunha's EEZ 13 deployments in St Helena's EEZ
Expendable Bathythermograph (XBT)	14	5 deployments in Tristan Da Cunha's EEZ 4 deployments in St Helena's EEZ 3 deployments on tranisit 2 failed XBT deployment
Pelagic Camera (Four eyes)	3	3 deployments in Tristan Da Cunha's EEZ
Bongo Net	8	2 deployments in Tristan Da Cunha's EEZ 6 deployments in St Helena's EEZ
High Speed Manta Trawl	5	1 deployment in Tristan Da Cunha's EEZ. 3 deployments in St Helena's EEZ 1 failed deployment
SonoVault Mooring	1	1 deployment in Tristan Da Cunha's EEZ

17.4. *Data sets and their use*

Dataset	**Event metadata**
Instruments	**Various**
Description	Event logs were created digitally using the JCR's shipboard event logging system. This metadata contains vital information for calculating the length, duration, location and other environmental information of scientific equipment deployments.
Analogue data	CTD Logs Survey Line Logs
Digital data	/data/cruise/jcr/20180313/work/scientific_work_areas/event_logsheets
Long term data management	Event metadata will be stored within the Marine Metadata Portal developed by the Polar Data Centre

Other users of the data	All cruise participants

Dataset	**MiniAGT physical samples**
Instruments	**Mini Agassiz Trawl**
Description	Biological samples were sorted after trawls and a record was made of (rough) taxonomy, number of individuals, weight and sample preservation technique all linked to a storage vial ID.
Analogue data	None
Digital data	/data/cruise/jcr/20180313/work/scientific_work_areas/AGT/ODA Book of Lies.xlsx
Physical samples	Samples will be returned to the biological store at BAS and accompanying cruise participants to their respective institutions. Post-cruise the samples will be examined, described and analysed by a variety of cruise and non-cruise participants. Tissue samples of key taxa were preserved in 96% ethanol, RNA-later or frozen at -80 degrees for future molecular and isotopic analysis. A limited amount of taxa specific analysis was undertaken but was too preliminary to include as distinct datasets. Genetics will be submitted to GenBank when finalized, subject to funding.
Long term data management	There are ongoing efforts to hold trawl sample metadata and sample analysis data within the Polar Data Centre but in the meantime Chester Sands will manage these data. The primary repository for physical samples will be the BAS biological store.
Other users of the data	All cruise participants. The list below shows those most likely to work further on samples and sample metadata and their general research area for reference: SANDS, Chester (Ophiuroida; BAS) BARNES, Dave (Bryozoa, Brachiopoda; BAS) GOODALL-COPESTAKE, William (Tunicata; BAS) STOWASER, Gabriela (Stable Isotope Analysis, BAS) (, NHM)

Dataset	**Bongo net physical samples**
Instruments	**Bongo net**
Description	Plankton sample, frozen in water, collected with a Bongo net.
Analogue data	None
Digital data	None
Physical samples	The majority of the samples will be returned to the biological store at BAS and remain fresh frozen at -20 degrees for any future analyses. A small subset of organisms we preserved in 96% ethanol, and frozen at -80 degrees future molecular and isotopic analysis. Genetics will be submitted to GenBank when finalized, subject to funding.
Long term data management	There are ongoing efforts to hold trawl sample metadata and sample analysis data within the Polar Data Centre but in the meantime William Goodall-Copestake will manage these data. The primary repository for physical samples will be the BAS biological store.
Other users of the data	All cruise participants. The list below shows those most likely to work further on samples and sample metadata and their general taxonomic areas for reference: GOODALL-COPESTAKE, William (Tunicata; BAS) COTTON, Alexander (Tunicata; University College London – PhD) STOWASSER, Gabriele (Stable Isotope Analysis, BAS)

Dataset	**RMT8 Trawl biological samples**
Instruments	Rectangular Midwater Trawl 8
Description	A pelagic trawl system, used to catch macro-zooplankton and micro-nekton. The RMT system is operated in combination with the down-wire net monitor, a custom-built electronic system that enables two-way communications between the net and controllers aboard the ship. The net has a mouth opening of 8 m^2.

	Genetic sequences will be submitted to GenBank when finalized, subject to funding.
Analogue data	None
Digital data	None
Physical samples	The majority of the preserved will transferred to the Natural History Museum in London. A small subset of organisms/tissue samples were preserved in 96% ethanol for genetics. Some samples were frozen at -80 degrees for stable isotopic analysis.
Long term data management	There are ongoing efforts to hold trawl sample metadata and sample analysis data within the Polar Data Centre but in the meantime Martin Collins and CEFAS will manage these data. The primary repository for physical samples will be the Natural History Museum.
Other users of the data	All cruise participants. The list below shows those most likely to work further on samples and sample metadata and their general taxonomic areas for reference: COLLINS, Martin (CEFAS) Vladimir (CEFAS) GOODALL-COPESTAKE, William (Tunicata; BAS) COTTON, Alexander (Tunicata; University College London – PhD) STOWASSER, Gabriele (Stable Isotope Analysis, BAS)

Dataset	**High speed Avani trawl physical samples**
Instruments	**High speed Avani trawl**
Description	A high-speed manta trawl with a rectangular opening 50 cm high by 15.5 cm wide, and a 4.5 m long 333 µm net with a 30 × 10 cm cylindrical collecting bag. The system was designed by Marcus Eriksen and is described further in the following paper: https://doi.org/10.3389/fmars.2017.00135

Analogue data	None
Digital data	None
Physical samples	Cod end plastic samples were transferred into glass jars and frozen in the -20°C freezer
Long term data management	Sample metadata will be stored on the SAN at BAS and managed by the Polar Data Centre. The primary repository for physical samples will be CEFAS.
Other users of the data	MAES, Thomas (CEFAS)

Dataset	**SUCS imagery and video**	
Instrument	**SUCS**	
Description	The SUCS frame holds an underwater Prosilica video camera that can be operated in a number of modes. On JR17004 the camera was mainly used to capture still photos when the SUCS frame was at rest on the seabed and occasional video footage between photos.	
Analogue data	None	
Digital data	Raw	/data/cruise/jcr/20180313/sucs/ODA/'sample site'/'event_id'/ Prosilica video files (.avi) are in with the still photos (.png)
Long term data management	Metadata will be stored on the SAN at BAS and managed by the Polar Data Centre.	
Other users of the data	All cruise participants The list below shows those most likely to work further on the data. BARNES, David (BAS) BELL, James (CEFAS) PIECHAUD, Nils (University of Plymouth)	

Dataset	**Pelagic Camera imagery and video**
Instrument	**Pelagic Camera**

Description	A pelagic drift camera system, consisting of of a frame with four camera arms and one bait arm, that is suspended from a surface buoy array at 10 m depth. The rig consists of a collapsible aluminium frame, upon which are mounted: • Four Yi 4K cameras with 40 m rated underwater housings. To save memory space on the microSD cards, recordings were made in 2.7k (30 FPS). • One acrylic bait cannister.	
Analogue data	None	
Digital data	Raw	/data/cruise/jcr/20180313/work/scientific_work_areas/pelagic_camera video files (.mp4)
Long term data management	A copy of the metadata and data will be stored on the SAN at BAS with data managed by the Centre for Environment, Fisheries and Aquaculture Sciences.	
Other users of the data	All cruise participants BELL, James (CEFAS)	

Dataset	**CTD sensor data and metadata**	
Instruments	**Various sensors on the CTD frame including Niskin bottles**	
Description	CTDs consisted of the following sensors and 24 niskin bottles that were fired and sampled water for further analysis (see next table for further information on niskin sampling and analyses): • Sea-Bird SBE 3plus (SBE 3P) temperature sensor • Sea-Bird SBE 4C conductivity sensor • Teledyne RDI Workhorse Mariner 300kHz ADCP • Biospherical QCD-905L underwater PAR sensor • Sea-Bird SBE 43 Dissolved Oxygen Sensor • Sea-Bird SBE 35 thermometer • Chelsea Technologies Group Aquatracka III fluorometer • WETLabs C-Star transmissometer	
Analogue data	Logs	BAS PDC holds paper copies of the CTD logs. These have been scanned (.pdf) and can be found in /data/cruise/jcr/20160223/work/scientific_work_area/event_logsheets

Digital data	Logs	/data/cruise/jcr/20160223/work/scientific_work_area/event_logsheets	
	Raw	.asc, .cnv, .ros	/data/cruise/jcr/20160223/ctd
	Calibration	/data/cruise/jcr/20160223/work/scientific_work_area/ctd	
	Processed	.bl, .hdr, .ros, .hex, .XMLCON	/data/cruise/jcr/20160223/ctd/JR17004/
Long term data management	Metadata and a copy of the raw and processed data will be stored on the SAN at BAS and managed by the Polar Data Centre. Raw and processed CTD data will be submitted and accessible from the BODC.		
Other users of the data	All cruise participants.		

Dataset	**CTD bottle samples**
Instrument	**CTD – Niskin bottles**
Description	Seawater collected from Niskin bottles was filtered for Particulate Organic Matter (POM) analysis back in the UK, subject to funding. Filters were stored in the -80C freezer.
Digital data	/data/cruise/jcr/20160223/work/scientific_work_areas/ctd/JR17004/'Site_ID'.btl
Long term data management	Metadata will be stored on the SAN at BAS and managed by the Polar Data Centre. Results of the analyses, subject to funding, will be submitted and made accessible from the PDC.
Other users of the data	STOWASSER, Gabrielle (POM Analysis, BAS)

Dataset	**Expendable Bathythermographs**	
Instrument	**XBT (Sippican T7 and T5 models)**	
Description	A limited number of XBTs were deployed to gain sound velocity profiles for input into the multibeam echosounder.	
Digital data	Log	/data/cruise/jcr/20160223/work/scientific_work_areas

	Raw	/data/cruise/jcr/20180313/xbt
Long term data management	Data will be stored on the SAN at BAS and managed by the Polar Data Centre.	
Other users of the data	HOWARD, Floyd (PDC)	

Dataset	**Multibeam bathymetry**		
Instrument	**EM122**		
Description	Depth data as collected by the Kongsberg EM122 multibeam echosounder.		
Analogue data	None		
Digital data	Logs	JR17001 Bridge Event Log, JR17001 EM122 multibeam	
	Raw	.raw	/data/cruise/jcr/20170223/em122/raw
	Processed	/data/cruise/jcr/20160223/work/scientific_work_area/em122/mb/	
Calibration	A latency calibration was conducted during this survey. Please refer to the relevant section of the cruise report.		
Long term data management	Data will be stored on the SAN at BAS and managed by the Polar Data Centre.		
Other users of the data	All cruise participants. HOWARD, Floyd (UKPDC) EVANS, Daniel (UKHO)		

Dataset	**VMADCP**
Instrument	**Vessel Mounted Acoustic Doppler Current Profiler**
Description	A vessel mounted acoustic Doppler Ocean Surveyor 75 kHz was used during JR17001 to map the distribution and speed of ocean currents beneath the ships path.
Analogue data	Paper logsheets. These have been scanned and can be found in /data/cruise/jcr/20160223/work/scientific_work_area/VMADCP

Digital data	Raw	.enr .ens .enx .log .lta .nr1 .nms .sta .vmo	/data/cruise/jcr/20160223 /adcp
Long term data management	Data will be stored on the SAN at BAS and managed by the Polar Data Centre.		
Other users of the data	All cruise participants		

Dataset	**Sono Vault Mooring**	
Instruments	Devilogic Sono.Vault acoustic recorder and signal analyzer	
Description	Devilogic Sono.Vault acoustic recorder and signal analyzer is designed for long- term recording and monitoring of marine acoustic emissions. The system is able to record acoustic signals continuously with sampling rates up to 96kHz @24bit sample resolution and 196ksps @16bit. The system can also record according to programmable schedule. The total recording capacity is extendable up to 4.4TB. In order to support long-term monitoring with spectral frequencies up to 100 kHz, various triggering and sampling schemes are available. Depending on the sampling rates, the develogic Sono.Vault system is able to record acoustic data continuously for several years. The Sono Vault was deployed on a mooring system designed by AME and will remain in situ until collection in a year's time by the RRS Discovery on DY100.	
Digital data	Logs	Bridge event log
Long term data management	Data will be stored on the SAN at BAS and managed by the Polar Data Centre.	
Other users of the data	JACKSON, Jennifer (BAS)	

Dataset	**Underway data streams**	
Instruments	Various – all logged by NOAA SCS software	
Description	Underway data from a variety of oceanographic, meteorological, navigational and acoustic sources are logged by SCS software on a timescale dependent on the instrument. Some additional sources are available when they are deployed such as the USBL positional device that can be optionally fixed to the SUCS frame.	
Analogue data	None	
Digital data	Raw	/data/cruise/jcr/20180313/scs

Long term data management	Data will be stored on the SAN at BAS and managed by the Polar Data Centre.
Other users of the data	All cruise participants

Acknowledgements

The main reason the cruise was such a success was because of the personnel on boardthe RRS James Clark Ross; the scientists but particularly the technical staff and ship's crew. The science could not have been better supported and the attitude could not have been more focussed towards making the cruise a success. Our partner countries, Tristan da Cunha and St Helena worked with us, ensuring the team collected data to benefit the Islands management priorities for their marine environment. We thank our collaborators for their generous input to the project and look forward to a strengthening of the partnership through the duration of this project.

Appendices

Appendix A1. Summary of gear deployments

A1.1 *Tristan da Cunha*

Time	Event	Lat	Lon	Comment
31/03/2018 16:16	75	-37.0462	-12.3039	Mooring deployed. (Anchor position: 37 02.7702 S 012 18.2118 W)
30/03/2018 19:31	74	-38.4011	-11.8553	RMT8 deployed
30/03/2018 15:17	73	-38.7646	-11.746	SUCS recovered to deck
30/03/2018 11:14	73	-38.7651	-11.7465	SUCS Camera wire parted
30/03/2018 10:56	73	-38.7644	-11.7462	SUCS deployed
30/03/2018 09:29	72	-38.7523	-11.7331	AGT Deployed
30/03/2018 07:59	71	-38.7512	-11.6632	AGT deployed
30/03/2018 06:27	70	-38.7549	-11.7006	AGT deployed
30/03/2018 03:51	69	-38.7023	-11.6509	RMT8 net deployed
30/03/2018 01:15	68	-38.7214	-11.659	RMT8 net deployed
29/03/2018 22:31	67	-38.7174	-11.6492	RMT 8 deployed
29/03/2018 19:06	66	-38.7498	-11.7104	Bongo net deployed

29/03/2018 18:11	65	-38.749	-11.709	SUCS deployed
29/03/2018 17:05	64	-38.7574	-11.6884	SUCS deployed
29/03/2018 16:01	63	-38.7607	-11.6656	SUCS deployed
29/03/2018 15:01	62	-38.7462	-11.6631	SUCS deployed
29/03/2018 14:32	61	-38.7462	-11.6631	CTD deployed
29/03/2018 03:04	60	-38.7348	-11.5501	RMT8 net deployed
29/03/2018 02:20	59	-38.7246	-11.435	XBT deployed
29/03/2018 02:13	58	-38.7224	-11.421	XBT deployed
28/03/2018 21:17	57	-38.7933	-10.609	Deploy RMT8
28/03/2018 19:02	56	-38.7651	-10.5691	SUCS deployed
28/03/2018 17:44	55	-38.7719	-10.5573	SUCS deployed
28/03/2018 16:27	54	-38.7867	-10.5298	SUCS deployed
28/03/2018 15:05	53	-38.778	-10.5091	SUCS deployed
28/03/2018 13:46	52	-38.7869	-10.5216	SUCS deployed
28/03/2018 13:13	51	-38.7873	-10.5208	CTD deployed
28/03/2018 11:46	50	-38.7965	-10.4971	SUCS deployed
28/03/2018 10:25	49	-38.8018	-10.5265	SUCS deployed
28/03/2018 08:56	48	-38.7913	-10.5485	SUCS deployed
28/03/2018 00:50	47	-38.7726	-10.5171	RMT8 net deployed
27/03/2018 21:55	46	-38.7393	-10.494	Launch RMT8
27/03/2018 10:29	45	-38.7898	-10.3074	CTD deployed
27/03/2018 10:21	44	-38.7895	-10.3075	Pelagic camera deployed
26/03/2018 22:09	43	-39.2327	-8.38498	RMT 8 deployed
26/03/2018 19:27	42	-39.2651	-8.16694	SUCS deployed
26/03/2018 15:58	41	-39.2646	-8.06426	SUCS deployed

26/03/2018 13:58	40	-39.4013	-7.81183	XBT deployed
26/03/2018 11:46	39	-39.4552	-7.84275	AGT Deployed
26/03/2018 10:24	38	-39.4768	-7.81569	AGT in water
26/03/2018 09:18	37	-39.4616	-7.79114	SUCS deployed
26/03/2018 07:28	36	-39.4912	-7.80187	SUCS deployed
26/03/2018 06:15	35	-39.4849	-7.82714	SUCS deployed
26/03/2018 03:26	34	-39.4955	-7.7562	RMT8 net deployed
26/03/2018 00:41	33	-39.4955	-7.78985	RMT8 net deployed
25/03/2018 22:34	32	-39.5162	-7.74311	RMT8 deployed
25/03/2018 20:42	31	-39.4624	-7.86499	Bongo net deployed
25/03/2018 19:35	30	-39.4556	-7.80601	SUCS deployed
25/03/2018 18:19	29	-39.4467	-7.82683	SUCS deployed
25/03/2018 16:57	28	-39.4669	-7.83167	SUCS deployed
25/03/2018 16:25	27	-39.4668	-7.83167	CTD deployed
25/03/2018 14:45	26	-39.4668	-7.83167	Pelagic camera deployed
25/03/2018 13:52	25	-39.4699	-7.78733	CTD deployed
25/03/2018 04:34	24	-39.3033	-8.19755	XBT deployed (~1500m)
25/03/2018 02:19	23	-39.3699	-8.1326	Avani Trawl redeployed. Speed slowly increasing to 5.0kts
25/03/2018 02:17	22	-39.3704	-8.13376	Avani Trawl recovered clear of the water
25/03/2018 02:15	22	-39.3709	-8.1349	Avani Trawl deployed
25/03/2018 00:15	21	-39.3284	-8.10142	RMT8 deployed
24/03/2018 22:01	20	-39.2869	-8.0574	RMT 8 deployed
24/03/2018 20:47	19	-39.3035	-8.07972	SUCS deployed
24/03/2018 19:26	18	-39.2952	-8.1331	SUCS deployed
24/03/2018 18:28	17	-39.2794	-8.13045	SUCS deployed

24/03/2018 16:44	16	-39.2796	-8.06928	AGT deployed
24/03/2018 15:03	15	-39.2873	-8.13259	AGT deployed
24/03/2018 14:04	14	-39.279	-8.13013	SUCS deployed
24/03/2018 12:52	13	-39.2761	-8.10451	SUCS deployed
24/03/2018 11:49	12	-39.275	-8.08652	SUCS deployed
24/03/2018 10:36	11	-39.2905	-8.07438	SUCS deployed
24/03/2018 09:40	10	-39.2837	-8.05733	SUCS Deployed
24/03/2018 08:25	9	-39.2829	-8.09924	CTD deployed
24/03/2018 07:38	8	-39.2777	-8.15046	CTD deployed
24/03/2018 04:09	7	-39.262	-8.06988	RMT 8 deployed
23/03/2018 19:38		-39.2204	-7.97847	Vessel off DP and commenced SWATH calibration survey
23/03/2018 17:48	6	-39.2204	-7.9785	CTD deployed
23/03/2018 17:37	5	-39.2204	-7.97854	Pelagic Camera deployed
22/03/2018 13:30	4	-38.2224	-14.5306	XBT deployed
21/03/2018 14:31	3	-39.5994	-19.1129	XBT deployed
16/03/2018 15:28	2	-48.6929	-46.8387	XBT deployed
15/03/2018 16:30	1	-50.3588	-52.7161	XBT deployed

A1.2 *St Helena*

Time	Event	Lat	Lon	Comment
12/04/2018 22:10		-15.6425	-6.8704	VESSEL ENROUTE TO SAINT HELENA
12/04/2018 21:00	131	-15.6422	-6.87079	CTD deployed
12/04/2018 18:46	130	-15.6177	-6.99013	RMT8 deployed
12/04/2018 17:43	129	-15.6434	-6.95862	CTD deployed
12/04/2018 16:20	128	-15.591	-6.98733	Commenced AGT deployment
12/04/2018 12:22	127	-15.69	-6.98261	AGT deployed

12/04/2018 08:17	126	-15.6788	-6.97842	AGT deployed
12/04/2018 05:34	125	-15.768	-6.95286	XBT deployed
12/04/2018 04:56	124	-15.7655	-6.95494	Bongo Net deployed
12/04/2018 02:25	123	-15.6915	-7.0512	RMT8 net deployed
11/04/2018 23:47	122	-15.6921	-7.05074	RMT8 deployed
11/04/2018 19:17	121	-15.6301	-7.0381	RMT8 deployed
11/04/2018 16:18	120	-15.6263	-7.00524	CTD deployed
11/04/2018 12:53	119	-15.5938	-6.9567	AGT deployed
11/04/2018 12:12	118	-15.6069	-6.94584	AGT off bottom
11/04/2018 08:55	117	-15.5925	-6.99427	AVANI Net deployed - Bonaparte seamount
11/04/2018 04:58	116	-15.6413	-6.83541	XBT deployed
11/04/2018 04:52	115	-15.6347	-6.84227	XBT released (failed)
11/04/2018 04:46	115	-15.6295	-6.85129	XBT deployed
11/04/2018 04:05	114	-15.6276	-6.855	Bongo Net deployed
11/04/2018 02:24	113	-15.5698	-6.91557	RMT8 net deployed
10/04/2018 23:32	112	-15.5732	-6.91588	RMT8 deployed
10/04/2018 19:09	111	-15.557	-6.9528	RMT8 deployed (NNE of Bonaparte Seamount)
10/04/2018 17:11	110	-15.6407	-6.95681	AGT snagged on seabed. Vessel moved astern to recover slowly
10/04/2018 16:55	110	-15.639	-6.95852	AGT deployed
10/04/2018 02:38	109	-15.5753	-6.21363	XBT deployed
09/04/2018 23:51	108	-15.5155	-6.32824	Powerpack fixed - downtime finished
09/04/2018 23:40	108	-15.5123	-6.33639	Power pack stopped. Commence downtime
09/04/2018 23:03	108	-15.502	-6.36302	RMT8 deployed
09/04/2018 20:36	107	-15.5003	-6.38179	RMT8 deployed
09/04/2018 12:33	106	-15.536	-5.28935	AVANI trawl deployed. Speed 5.5kts

09/04/2018 08:31	105	-15.6411	-5.3458	XBT deployed
09/04/2018 03:18	104	-16.1906	-5.75741	RMT8 net deployed
09/04/2018 00:35	103	-16.1095	-5.8051	RMT8 net deployed
08/04/2018 19:34	102	-16.0302	-5.84279	RMT8 deployed
08/04/2018 16:52	101	-15.9138	-5.62427	Bongo Net deployed
08/04/2018 15:04	100	-16.0007	-5.61106	CTD deployed
08/04/2018 13:41	99	-15.9136	-5.62437	CTD deployed
08/04/2018 12:12	98	-15.8809	-5.64096	CTD deployed
08/04/2018 10:39	97	-15.8454	-5.70677	CTD Deployed
08/04/2018 09:41	96	-15.8812	-5.69653	Finish downtime - Start 5minute trawl @ 81m
08/04/2018 09:07	96	-15.8803	-5.70123	On bottom @ 81m to test winch
08/04/2018 09:04	96	-15.8802	-5.7015	Deploy AGT - continue downtime due to fault finding
08/04/2018 08:05	95	-15.8547	-5.7307	CTD deployed @ Dawson CTD 1
08/04/2018 04:14	94	-15.9342	-5.78795	RMT8 deployed
08/04/2018 04:11	94	-15.9326	-5.78592	Commenced RMT8 deployment
08/04/2018 01:14	93	-15.9153	-5.76291	RMT8 net deployed
07/04/2018 23:53	92	-15.9797	-5.82277	Bongo deployed at Shovel
07/04/2018 18:45	91	-15.8698	-5.77057	RMT8 deployed
07/04/2018 17:18		-15.8809	-5.7012	Technical issue with winch. Vessel downtime commenced.
07/04/2018 17:12	90	-15.8808	-5.70172	AGT deployed
07/04/2018 14:12	89	-15.9434	-5.77186	CTD deployed
07/04/2018 14:06		-15.9431	-5.77195	SWATH suspended. Vessel on DP at Lighter CTD1
07/04/2018 13:25		-15.9768	-5.82592	Vessel off DP. Resuming SWATH en route to Lighter CTD site
07/04/2018 12:52	88	-15.9769	-5.82592	CTD deployed
07/04/2018 09:30	87	-16.0978	-5.79046	AGT deployed

07/04/2018 08:12	86	-16.1073	-5.72781	CTD Deployed
07/04/2018 06:36	85	-16.0997	-5.78371	CTD deployed
07/04/2018 05:52	84	-16.0997	-5.7837	Bongo Net deployed
07/04/2018 02:36	83	-16.0539	-5.70612	RMT8 net deployed
06/04/2018 22:01	82	-15.9021	-5.60206	RMT 8 deployed
06/04/2018 19:37	81	-15.8505	-5.70987	RMT8 deployed
06/04/2018 18:50	80	-15.8483	-5.71244	Bongo Net deployed. Downtime over and science resumed @ 1847.
06/04/2018 16:13	79	-15.9046	-5.62564	Avani Trawl deployed
06/04/2018 00:12	78	-16.063	-5.88255	CTD deployed
02/04/2018 14:10	77	-29.4097	-9.81039	RMT8 Net deployed
01/04/2018 08:37	76	-34.2988	-11.3789	XBT Deployed

Appendix A2

EM122 Acquisition and Processing

EM122 Acquisition

The initial set-up of the system is the same as outlined in the document 'Using the EM122 Multibeam on an Opportunistic Basis v3.3' provided on the JCR and available on request to the UK Polar Data Centre (polardatacentre@bas.ac.uk). Performance issues encountered with the Kongsberg Seafloor Information System (SIS) and Helmsman software are summarised in Table A2-1.

Table A2-1: Problems encountered with EM122 acquisition software.

Date (UTC)	Issue	Resolution	Observer
14/03/2018 20:31	On the fly gridding stopped on jr17004_a.	Restarted SIS. Started a new survey jr17001_b.	Floyd/Will (AME)
16/03/2018 12:06	Helmsman crash, changing background image.	Restarted Helmsman. Remove background images one at a time.	Floyd
26/03/2018 12:40	SIS Crash when Closing SVP Editor Window	Had too many tear off windows opened. Restarted SIS and made the point to not use as many tear offs in the future.	Floyd/Dan
05/04/2018 23:55	Error when restarting		Floyd/Dan

Date (UTC)	Issue	Resolution	Observer
	SIS/EM122 Transducers. Compatibility problem SIS 4.1.5 - EM122 Recommended (found): RX32:1.1.1 100218 (1.0.0 130507) (1921).		
06/04/2018 10:47	Noisy transducer sectors. Particularly in Starboard. Observed throughout the cruise but particularly bad at certain times.	Emailed Kongsberg support. Provided BIST test at 4 and 10 knots for further advice on what might be the cause (external noise vs. hardware issues). Emailed Neil French the ships marine engineer to check the last time the transducers/hull had been scrubbed. Response from Kongsberg was that there was potentially an issue with the transducer staves that likely requires further investigation. Will forward information onto Neil French to chases further.	Floyd/Dan/Will/Sean
10/04/2018 16:16	SIS PU Status red for 1 minute. 1PPS sync missing.	Restart of SIS fixed the issue.	Floyd
12/04/2018 07:53	1 pps sync missing PU error	Restart of SIS PC fixed the issue. Checked the transducer area – PPS feed cable was quite warm.	Floyd/Dan

During JR17004 the EM122 was run in in parallel with the EA600 12 kHz singlebeam echosounder (which was run in passive mode during em122 acquisition), the vessel mounted acoustic Doppler profiler (VMADCP) and the EK60 with all devices' ping rates being externally triggered and calculated by the Kongsberg Synchronisation Unit (K-Sync). When running VMADCP+EA600+EM122+EK60 concurrently the Opportunisitic Swath + bio KSYNC configuration setup was used.

The python script (JCR_c_keel.py), developed by Simon Druetter, from AWI on JR17003a (the cruise immediately preceding JR17004) was also run during multibeam acquisition to feed live sound velocity and seawater temperature observations from the JCR's Ocean Logger data streams into the EM122 SIS PC through a serial connection (COM4). Further documentation of how the script functions can be found within the script itself. Feeding live surface sound velocity measurements

from the Ocean Logger, rather than taking the c_keel value from the last sound velocity profile applied increases the quality of the beam forming process and the quality of data collected.

In order to run the script the JCR's Ocean Logger must first be running (check with AME Engineer at the start of the cruise) and the following command typed into a session of Windows Powershell on the EM122 SIS PC:

python C:\Users\Operator\Documents\ JCR_c_keel.py

Once this script is running (Figure A-1a) the operator selects SESNOR as the Sound Speed at Transducer in the Sound Speed Tab of SIS's Runtime Parameter window (FigureA2-1b). It is crucial for the operator to note if the Ocean Logger stops running or is blocked as this does not stop the script from running, resulting in incorrect sound-velocity measurements being fed into SIS. The

operator should continuously check the flowrate of the Ocean Logger to ensure that the system is operating correctly.

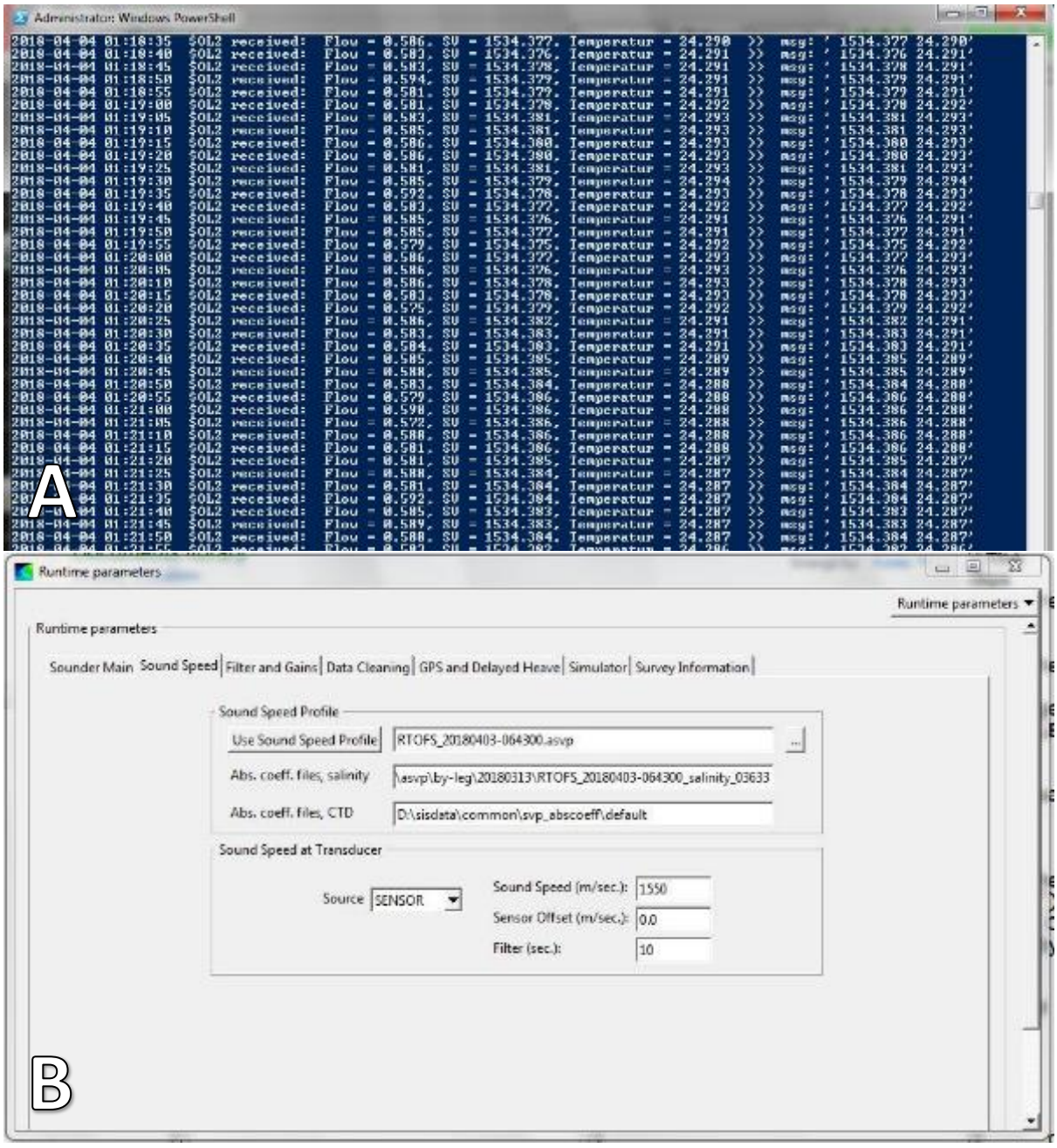


Figure A2-1: a) Screenshot of JCR_c_keel.py running successfully in windows powershell, b) Screenshot of the Sound Speed at Transducer settings selected in SIS.

Several sound velocity profiles (SVPs) were applied within SIS over the course of JR17004 to correct the EM122 data during acquisition (see Table A2-2). Crossing large latitudinal, temperature and salinity gradients (51-24°S) while transiting to research sites coupled with a limited supply of XBT's and insufficient time for regular full ocean CTDs meant that during transit synthetic SVPs were applied to SIS. This was done whenever the surface sound velocity from the Ocean Logger varied by more than 10 ms-1 to the surface sound velocity from the previous SVP. Synthetic SVPs were produced using HydrOffice's Sound Speed Manager v.2018.1.5 software (Gallager, 2018). Please

refer to the section below for a comparison of data processed using synthetic SVPs versus XBT derived SVPs.

Table A2-2: Summary of the sound velocity profiles used on JR17004 to calibrate the EM122 bathymetry data.

Date-Time Applied (UTC)	SVP Source	Comment
14/03/2018 21:01	Synthetic (World Ocean Atlas Database, 2009)	WOA09_20180314_thinned.asvp
15/03/2018 16:44	XBT (T-5)	T5_0001_thinned.asvp (JR17004_BR001_XBT001)
16/03/2018 15:38	XBT (T-5)	T5_00002_thinned.asvp (JR17001_Br002_XBT002)
18/03/2018 00:52	Synthetic (World Ocean Atlas Database, 2009)	WOA09_20180318_thinned.asvp
19/03/2018 09:24	Synthetic (World Ocean Atlas Database, 2009)	WOA09_20180319_thinned.asvp
19/03/2018 15:27	Synthetic (Global Real-Time Ocean Forecast System)	RTOFS_20180319-151948.asvp
20/03/2018 00:56	Synthetic (Global Real-Time Ocean Forecast System)	RTOFS_20180320-004532.asvp
20/03/2018 10:04	Synthetic (Global Real-Time Ocean Forecast System)	RTOFS_20180320-095541.asvp
21/03/2018 14:43	XBT (T-5)	T5_00003_thinned.asvp (JR17004_BR003_XBT003)
22/03/2018 13:44	XBT (T-5)	T5_00004_thinned.asvp (JR17004_BR004_XBT004)
23/03/2018 09:52	Synthetic (Global Real-Time Ocean Forecast System)	RTOFS_20180323-094413.asvp
23/03/2018 19:34	CTD	JR17004_001_thinned.asvp (JR17004_BR006_CTD001)
24/03/2018 10:26	CTD	JR17004_003_thinned.asvp (JR17004_BR009_CTD003)
26/03/2018 14:07	XBT (T-7)	T7_00006_thinned.asvp (JR17004_BR040_XBT006)
27/03/2018 12:42	CTD	JR17004_006_thinned.asvp (JR17004_BR45_CTD006)
29/03/2018 02:37	XBT (T-5)	T5_00008_thinned.asvp (JR17004_BR059_XBT008)
31/03/2018 17:09	Synthetic (Global Real-Time Ocean Forecast System)	RTOFS_20180331-165700.asvp
01/04/2018 07:32	Synthetic (Global Real-Time Ocean Forecast System)	RTOFS_20180401-072400.asvp
01/04/2018 08:52	XBT (T-5)	T5_0009_thinned.asvp (JR17004_BR076_XBT009)
02/04/2018 08:01	Synthetic (Global Real-Time Ocean Forecast System)	RTOFS_20180402-075600.asvp
03/04/2018 06:48	Synthetic (Global Real-Time Ocean Forecast System)	RTOFS_20180403-064300G9:G22.asvp

Date-Time Applied (UTC)	SVP Source	Comment
06/04/2018 04:37	CTD	JR17004_009_thinned.asvp (JR17004_BR078_CTD009)
07/04/2018 08:07	CTD	JR17004_010_Extend009_thinned.asvp (JR17004_BR085_CTD010)
07/04/2018 14:57	CTD	JR17004_013_Extend009_thinned.asvp (JR17004_BR089_CTD013)
08/04/2018 09:58	CTD	JR17004_014_Extend009_thinned.asvp (JR17004_BR095_CTD014)
08/04/2018 13:12	CTD	JR17004_016_extended0009_thinned.asvp (JR17004_BR098_CTD016)
09/04/2018 08:47	XBT (T-5)	T5_00010_thinned.asvp (JR17004_BR105_XBT010)
11/04/2018 18:46	CTD	JR17004_019_thinned.asvp (JR17004_BR120_CTD019)
12/04/2018 22:13	CTD	JR17004_021_thinned.asvp (JR17004_BR131_CTD021)

Surveying conditions in in the South Atlantic Ocean were challenging at times, particularly around Tristan Da Cunha. Since limited hydrographic or scientific mapping had been conducted at some of the seamounts, the master preferred at times to contour around from deep to shallow always remaining within the previous pass' multibeam coverage to ensure the safety of the vessel. While this method ensured overlap of the outer beams it also meant that there was frequent turning, which in areas had occasional adverse impact on data quality and bottom detection, resulting in small holes in the final coverage. Data quality was also adversely impacted by the sea state and swell direction. Data quality was best travelling with and against swell direction. Where appropriate multibeam acquisition surveying into and with the swell with 10-15% overlap of outer beams was favoured.

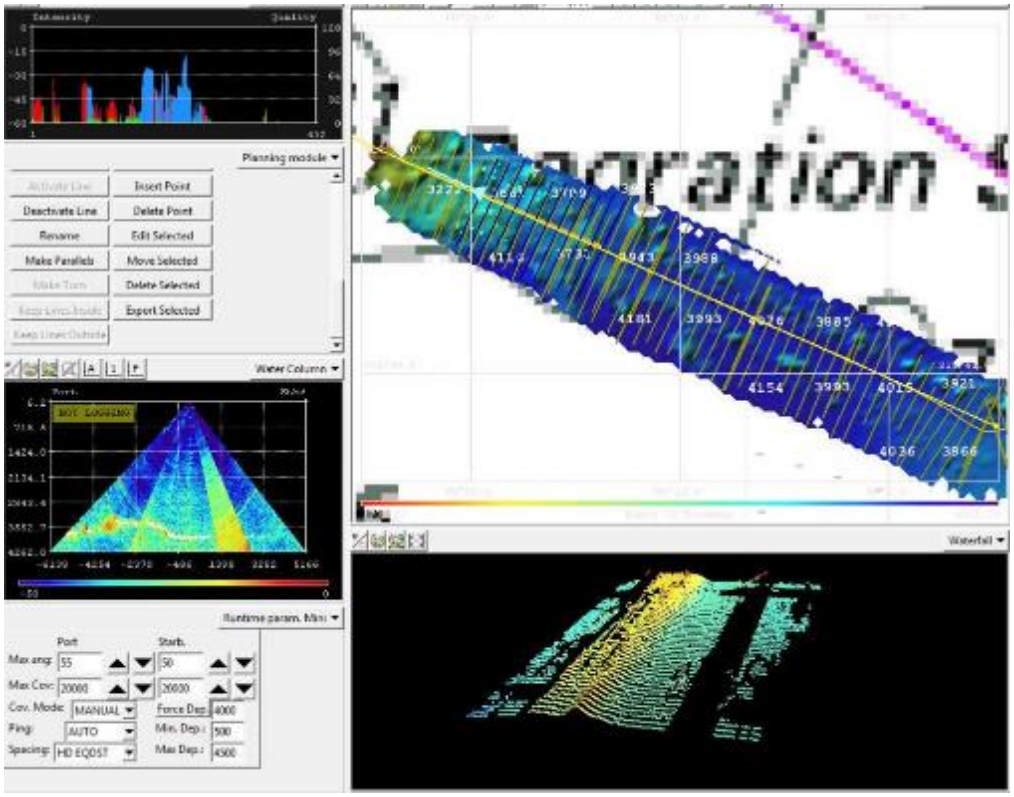


Figure A2-2: Examples of poor sounding quality in the starboard beams seen during JR17004.

Figure A2-2 shows a screenshot taken from SIS as an example of poor data quality collected at times during the cruise. The system intermittently failed to collect data within areas of the starboard side, resulting in gaps within the data. This issue often arose during calm sea conditions suggesting a possible issue with transducer elements in the EM122. Another issue frequently encountered when surveying along contours with very steep slopes, particularly in shallower waters, was the EM122 failing to identify the correct return for the nadir beams when there was strong sidelobe interference, resulting in a 'false return'. This can be seen in the point cloud bathymetry as a steep ridge along the nadir, illustrated in Figure A-3 below, on the south eastern slopes of St Helena.

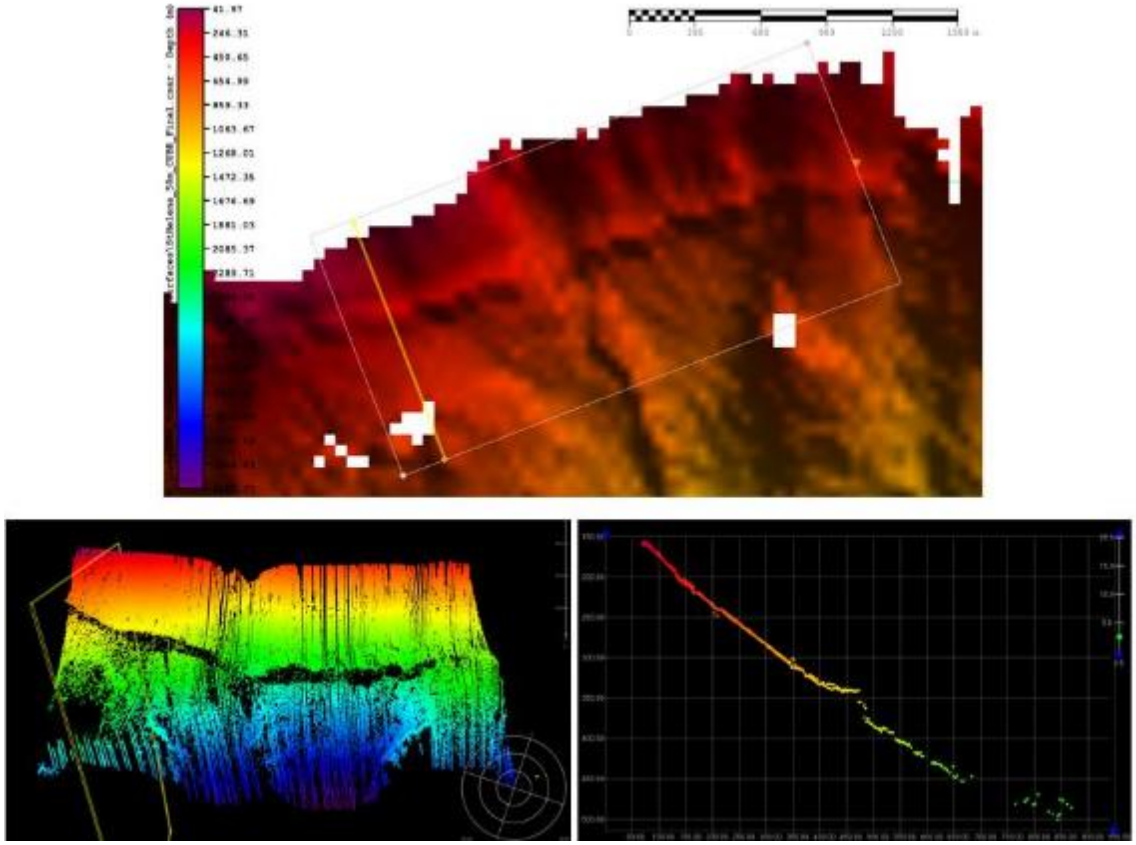


Figure A2-3: Example of the EM122 failing to identify the correct return signal in the nadir, with a ridge effect appearing in the 50m DTM (top image), and the false returns visible in the point cloud when viewed in subset editor (bottom images).

EM122 Latency Calibration

The multibeam system was calibrated for pitch, roll and heading by conducting a patch test during the JR17003a cruise immediately prior to the JR17004 cruise. Given the proximity of the two cruises, the offset values obtained have been used for the JR17004 cruise and the patch test was not repeated.

The patch test did not include a latency test; so, an additional latency calibration was conducted on the JR17004 cruise to check for timing errors in the system. Whilst the JCR's navigation and multibeam systems are synchronised using PPS (Pulse Per Second), the effectiveness of the system should still be tested to ensure it is working correctly.

The test involved running a survey line towards a slope, firstly at 6kts, then repeating the line in the same direction at 12kts. If a timing error is present between the multibeam and navigation system, it should be apparent with a slight offset between the slope positions along the two lines. A location at Yakhont seamount was chosen using contours derived from a GEBCO raster of the area, which suggested a slope gradient sufficient to identify any timing errors. The initial 6kts survey line served as the reconnaissance line to ensure the bathymetry was suitable for conducting the calibration.

Prior to carrying out the test, a deep CTD (JR17004_BR006_CTD001) was taken near the calibration site to ensure an accurate sound velocity profile. The CTD was taken down to a depth of approximately 2500m. Figure A-4 below shows locations of the CTD and calibration lines.

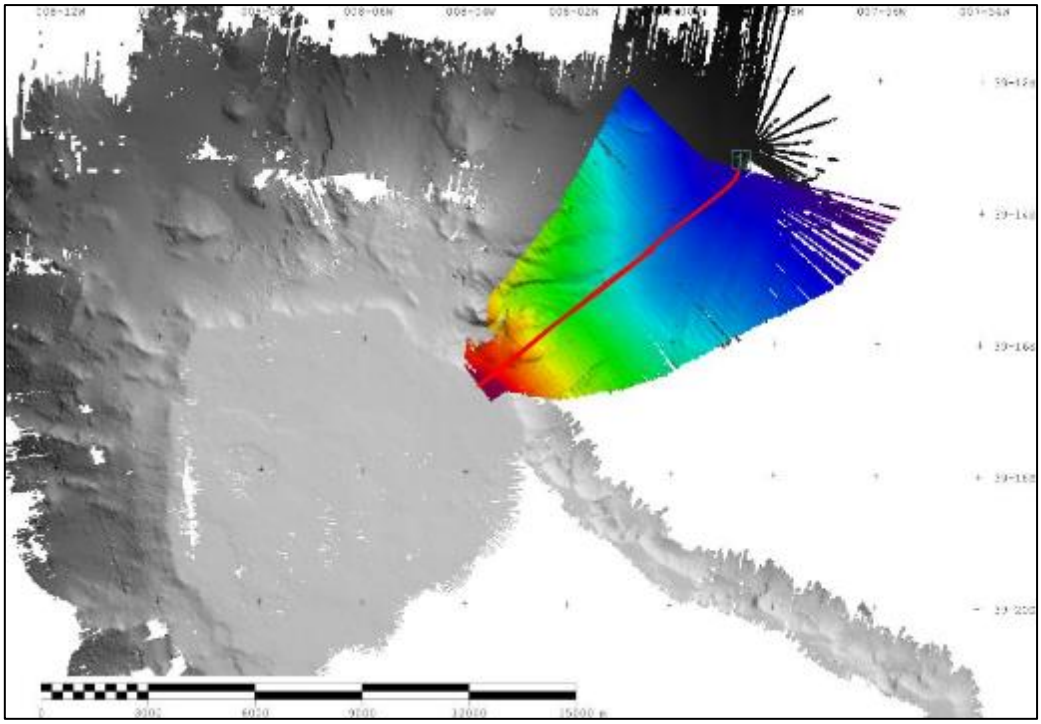


Figure A2-4: Swath data from the calibration line overlaid on the Yakhont seamount bathymetry.

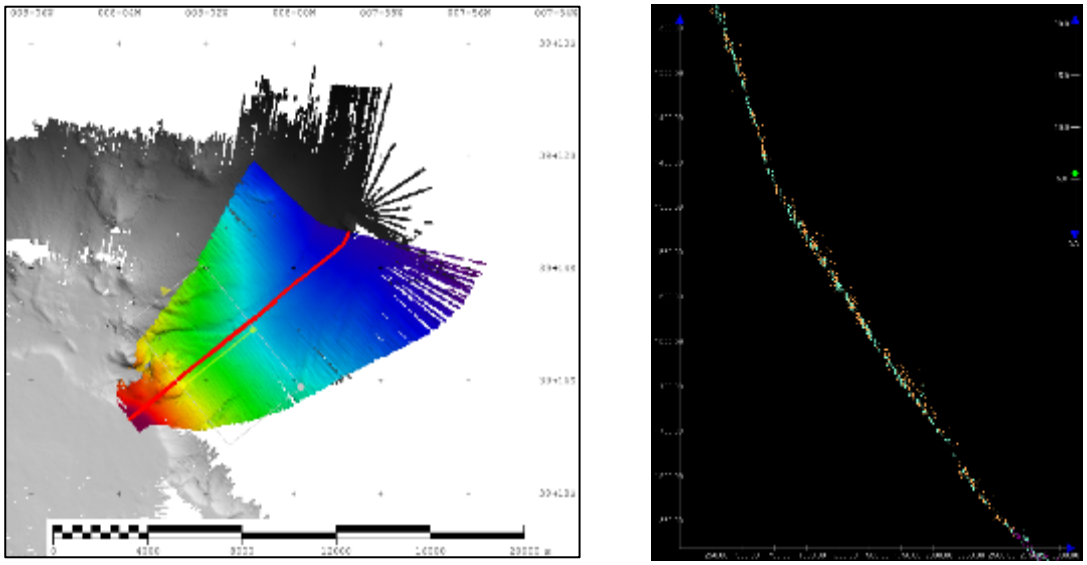


Figure A2-5: 2D ‘slice’ of the 6kt (orange) and 12kt (Blue) lines run over the North-East edge of Yakhont seamount.

The lines were Processed in Caris HIPS and the data checked by viewing the sounding data in subset editor. Figure A2-5 above, shows a 2D ‘slice’ through the sounding along the slope. Analysis of the data suggests no timing error is present in the system.

Caris Hips & Sips v9.1.11 Data Processing

Processing was carried out on Caris HIPS and SIPS v9.1.11, with projects created in the WGS84 World Mercator projected coordinate system. Separate projects were created for each survey area, with raw files imported and converted into the Caris HDCS (Hydrographic Data Cleaning System) data structure. No post processed navigation corrections were applied to the data. All sound velocity

corrections were applied to the data during acquisition in SIS so no further corrections were applied in Caris. The Caris vessel file, required prior to importing the data, was created during the JR17003a cruise by the Alfred Wegener Institute. A small amendment was made to the vessel file to ensure waterline correction was not applied during the data conversion process; as this correction is already applied to the data during acquisition in SIS. The ADMIRALTY TotalTide software shows only a small tidal range at Tristan Da Cunha and St Helena tide gauges (<=1m), so no tidal corrections were applied to the depths; however, as Caris requires a tidal correction be applied to the data prior to merging, a zero-tide file was applied following data conversion.

At each survey location, a Combined Uncertainty and Bathymetry Estimator (CUBE) 'csar' surface was created once the data was imported, using uncertainty values within the vessel file. The CUBE algorithm aims to estimate the most likely depth at a given location, using all the available information about uncertainty within the soundings. The CUBE surface was then used to apply a filter with a standard deviation of 2.0 to remove noise. The filter was only applied within subset editor to ensure the surface was appropriate for filtering. Further manual cleaning was carried out where required, particularly in areas with steep slopes. Geotiffs were exported from the CUBE 'csar' surfaces, once the preliminary cleaning was complete, and used to aid the identification of sites suitable for the shallow underwater camera system.

HydrOffice Sound Speed Manager Synthetic SVP Comparison
Druing JR17004 HydrOffice Sound Speed Manager (Gallager, 2018) was used to generate synthetic SVPs for multibeam correction during transit. This program is one in a suite of free and open source tools called HydrOffice developed in a collaboration led by the Centre for Coastal and Ocean Mapping, University of New Hampshire. Synthetic SVPs were produced using the World Ocean Atlas 2009 and Real Time Ocean Foreacast System oceanographic atlases. For more information on how Sound Speed Manager generates synthetic SVPs please refer to Appendix A of the Sound Speed Manager Documentation: Release 2018.05.

In order to generate the synthetic SVPs the following steps were followed:

File > Input Data > WOA09 or RTOFS > Process > Export Data > Konsgberg

WOA09 requires the database to be downloaded and netcdf files to be extracted to a specific directory as described in the software's installation instructions. RTOFS requires an internet connection while generating the SVP. A series of prompts will ask the user for the UTC date/time, latitude and longitude for the synthetic SVP to be generated. It should be noted that to generate a RTOFS SVP it should be done as close as possible to the date/time the user wants to apply the profile since this oceanographic model provide real time and future forecasts. Thus it seems that the user cannot genereate a hindcast RTOFS SVPs using Sound Speed Manager. This is not an issue for the WOA09. An attempt was made to generate synthetic SVPs using WOA13, however we were unable to download the database in the required format while at sea.

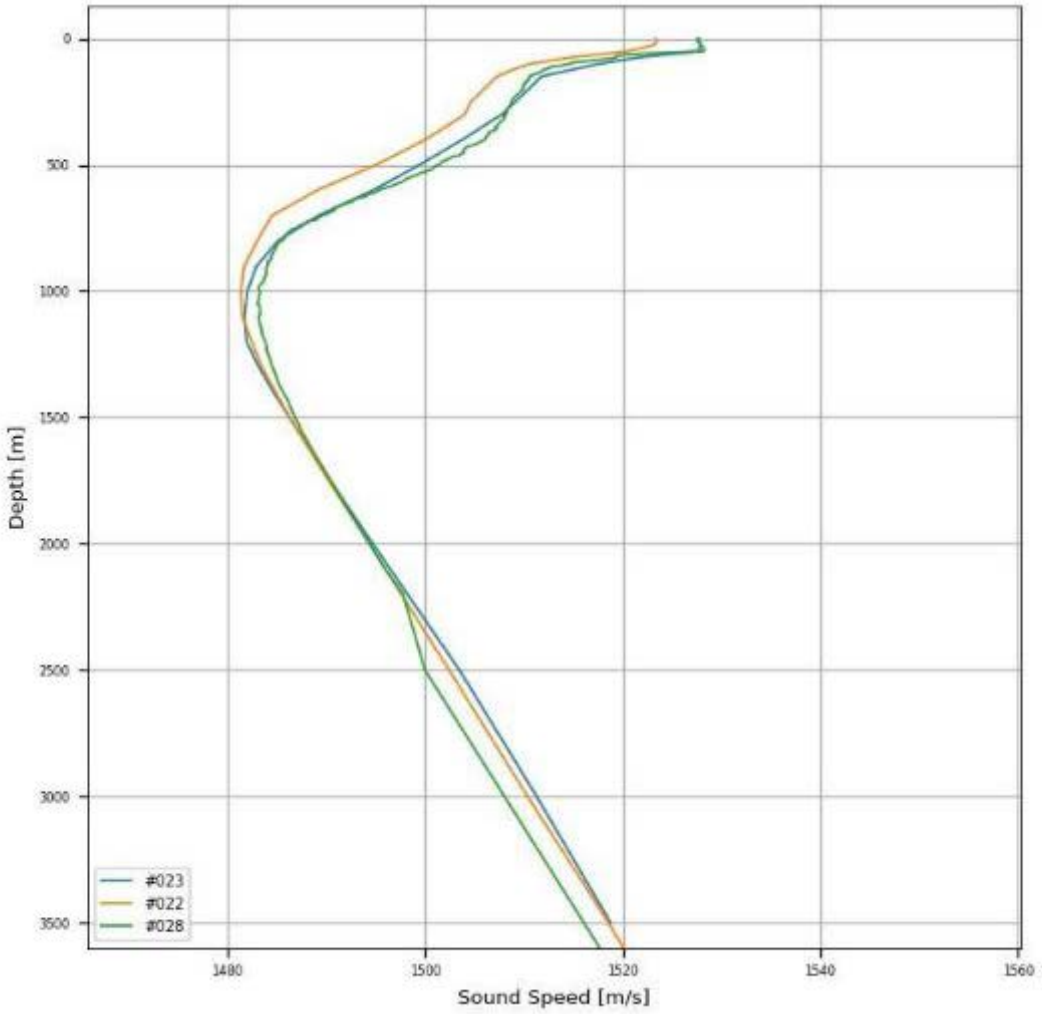


Figure A2-6: Blue = RTOFS synthetic sound velocity profile, Orange = WOA09 synthetic sound velocity profile, Green = JR17004_BR076_XBT009 sound velocity profile.

Table A2-3: Summary of the location and creation time for the synthetic and XBT generated SVPs.

Source	Latitude (DD)	Longitude (DD)	Date-Time (UTC)
WOA09	-11.43431	-34.50222	01/04/2018 08:07:24
RTOFS	-11.43431	-34.50222	01/04/2018 08:07:24
T-5 XBT	-34.29901	-11.37899	01/04/2018 08:36:51

Two synthetic SVPs were generated for the same location and date-time using the two different hydrographic atlases and compared to the SVP generated using a Sippican T-5 model XBT (1830m). Figure A2-6 compares the three SVPs generated and Table A-x summarises their location. It was found that at this location and time the RTOFS synthetic SVP more closely reflected the surface sound velocity as measured by the XBT and the oceanlogger. Because of this RTOFS generated SVPs were generally applied to SIS during transit logging.

The SVPs were also separately applied to the same processed line 222 of jr17004_c using Caris and gridded into separate CUBE surfaces 150m. Caris' Difference Surface tool was used to compare the

difference in depth surfaces generated using the synthetic and XBT derived SVPs. Figure A-7 shows that the RTOFS underestimated the water depth for the centre beams while overestimating for the outer beams while WOA09 exhibited the opposite behaviour. Both synthetic SVPs gridded depth generally within ±3m of the XBT SVP processed depth for this location, an error of <1% total water depth. Further testing should be done in different water depths, latitudes, different oceanographic environments and compared against SVPs generated from full ocean depth CTDs to further assess the quality of this synthetic SVPs generated using this tool. However for mid-latitudinal transits over abyssal plains the synthetic SVPs appear to be a good compromise when there is limited supply of XBTs or time for full ocean depth CTDs and is recommended for future opportunistic multibeam acquisition during transit.

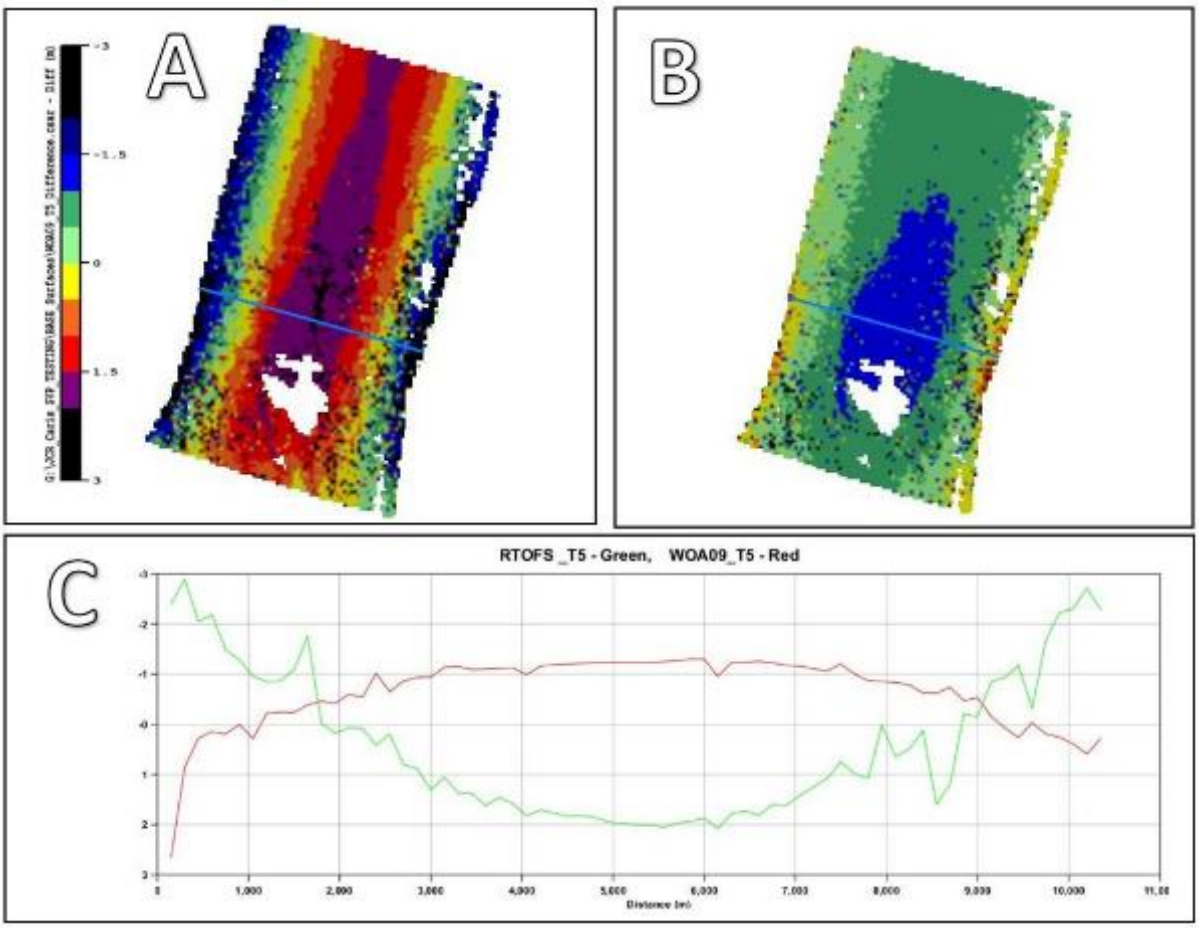


Figure A2-7: a) Depth difference surface of the seabed calculated using the RTOFS derived synthetic SVP relative to the seabed calculated using the XBT derived SVP. b) Depth difference surface of the seabed calculated using the WOA09 derived synthetic SVP relative to the seabed calculated using the XBT derived SVP. c) Comparison of the across track differences in depths from the XBT measured SVP of the RTOFS (green line) and the WOA09 (red line) synthetic SVPs. Blue line in insets (a) and (b) shows the location of the cross-section drawn. The multibeam data used for this comparison was line 222 of survey jr17004_c.

Appendix A3 **AME (Antarctic Marine Engineering) report**

A3.1.Electronics report

LAB Instruments

Instrument	S/N Used	Comments
AutoSal	NO	
Scintillation counter	NO	
XBT	YES	2 failed XBT probes, 14 deployments

ACOUSTIC

Instrument	S/N Used	Comments
ADCP	YES	
PES	NO	
EM122	YES	Possible issues see below
TOPAS	NO	
EK60	YES	Occasional crashing of EK60 GPT's
K-Sync	YES	
Seapath 320+	YES	
USBL	YES	
10kHz IOS pinger	NO	
Benthos 12kHz pinger S/N 1316 + bracket	NO	
Benthos 12kHz pinger S/N 1317 + bracket	NO	
MORS 10kHz transponder	NO	

OCEANLOGGER

Instrument	S/N Used	Comments

Barometer1(UIC)	V145002	
Barometer2(UIC)	V145003	
Foremast Sensors		
Air humidity & temp1	60743897	
Air humidity & temp2	61698922	
TIR1 sensor (pyranometer)	172882	
TIR2 sensor (pyranometer)	172883	
PAR1 sensor	160959	
PAR2 sensor	160960	
prep lab		
Thermosalinograph SBE45	453893-0130	
Transmissometer	846DR	
Fluorometer	1498	
Flow meter	05/811950	
Seawater temp 1 SBE38	3862856-0599	
Seawater temp 2 SBE38	3862856-0601	

CTD (all kept in cage/ sci hold when not in use)

Instrument	S/N Used	Comments
Deck unit SBE11plus	11P15759-0458	
Underwater unit SBE9plus	09P30856-0707	
Temp1 sensor SBE3plus	032705	
Temp2 sensor SBE3plus	035042	
Cond1 sensor SBE 4C	042222	
Cond2 sensor SBE 4C	042255	
Pump1 SBE5T	054488	
Pump2 SBE5T	052371	

Standards Thermometer SBE35	3527735-0024	
Transmissometer C-Star	1399DR	
Oxygen sensor SBE43	432291	
PAR sensor	70688	
Fluorometer	088-216	
Altimeter PA200	10127.244740	
CTD swivel linkage	1961018	
LADCP Master	14897	Master and Slave script reversed cast 012
LADCP Slave	15060	
SBE32 Pylon	0636	
Notes on any other part of CTD e.g. faulty cables, wire drum slip ring, bottles, swivel, frame, tubing etc		7 x long lanyards replaced due to wear. Re-terminated cable less 105m 09/04/2018
No of casts	21	
Max Depth	3068	
Min Depth		

AME UNSUPPORTED INSTRUMENTS BUT LOGGED

Instrument	Working?	Comments
EA600	YES	
Anemometer	YES	
Gyro	YES	
DopplerLog	YES	
EMLog	YES	

CHECK FANS ARE Running Daily

Instrument
Oceanlogger
EM122, TOPAS, NEPTUNE UPSs
Seatex Seapath
EM122 Tween Deck
TOPAS Tween Deck

Intake fans on the following machines:

Instrument	Cleaned?
Oceanlogger	Y
EM122, TOPAS, NEPTUNE UPSs	Y
Seatex Seapath	Y
EM122 Tween Deck	Y
TOPAS Tween Deck	Y

Additional notes and recommendations for change / future work

CTD

Lanyards

7 x long lanyards were replaced on bottles 3, 7, 8, 9, 11, 23 & 24 due to wear around the collar of the bottles. It is likely more will be required to be done when we have sufficient spare nylon on-board. A future suggestion would be to add heat shrink/similar protection around the high wear area on the lanyard to slow down wear.

See below image of wear on lanyard:

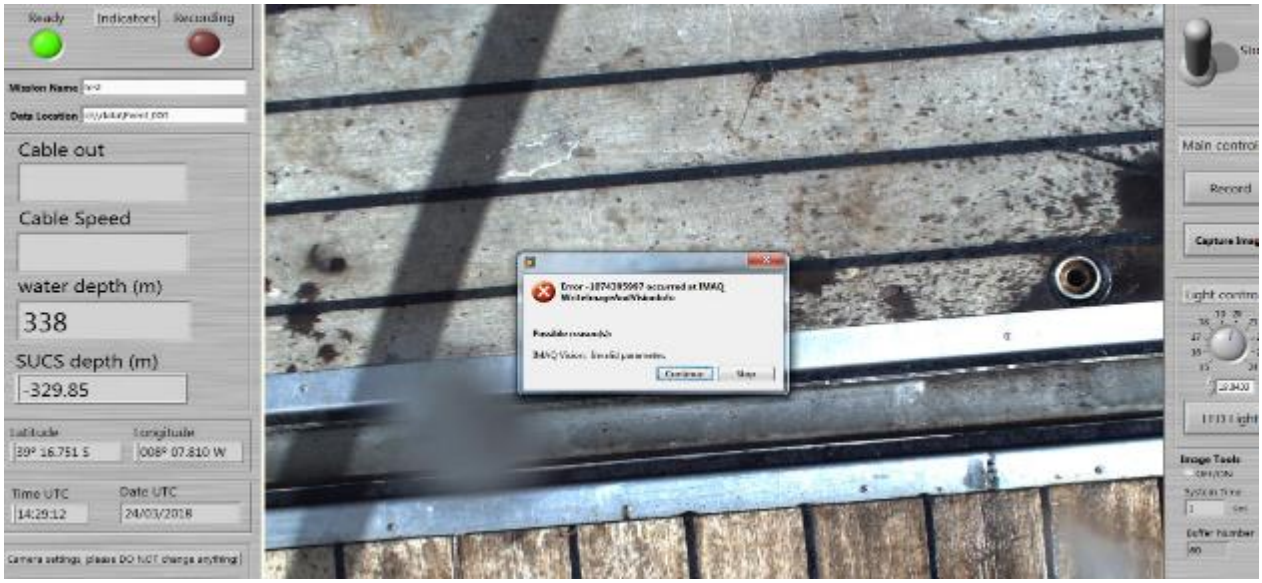
Re-termination

The deck engineer noticed thinning on the cable of 0.3mm present in the winch control room. Approximately 105m of cable was taken off the drum and re-terminated. This was tested and provided 279V output and appears to be working well. A load test was performed on the mechanical termination to approx 2.5Tn. The megger test post splice showed a reading of approx. 2.5MΩ but it is working. It is suspected that the Pig Tail will need replacing with a new one when it arrives onboard. Created an updated CTD re-termination documentation

SUCS

Software

The SUCS LabView software crashed with the following error:-



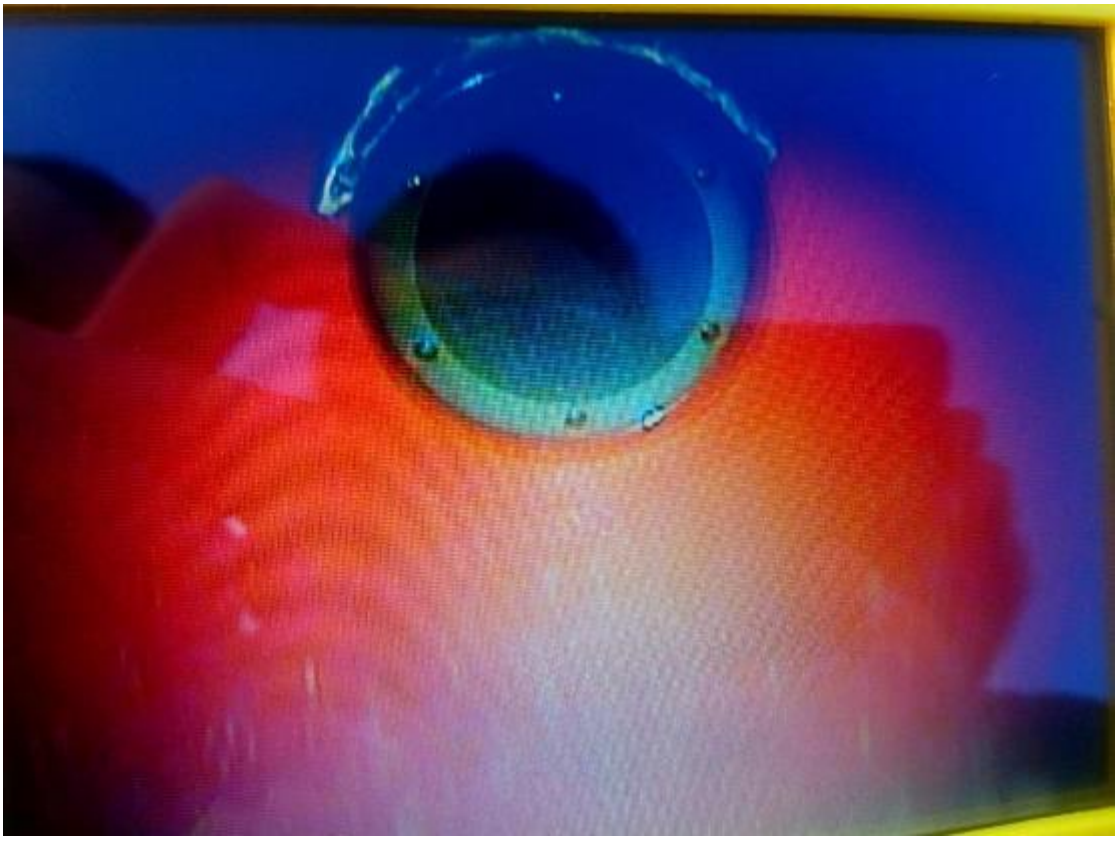
This turned out to be a suspected corrupted file due to bad network transfer on the U:\ drive called sucs.cfg. This file was relocated to an "old" folder and a new one was automatically created on loading of the LabView VI. This has resolved the issue.

Due to inaccuracies in the EA600 depth, the LabView VI has been modified to show both EA600 and EM122 depth alongside each other, so the operators may judge which looks correct.

USBL

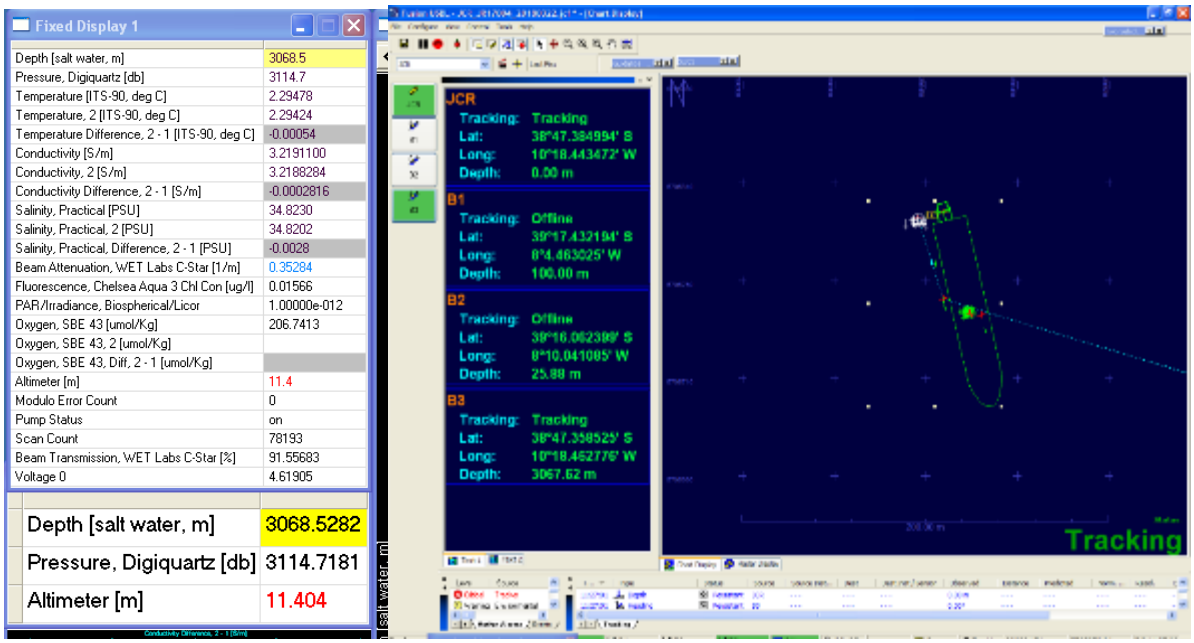
Offsets

Further investigation into the offsets of the vessel provided the discrepancy in depth between the EM122 data and the computed beacon depth from the USBL ranging. This was due to the Navigation Reference Point (NRP) output from the Seapath GPS which is the MRU5+ not the CRP of the vessel. This provides Z value offsets (Up) of -7.105m (taken from Parker report 2014) in the flush position and -9.515m in the extended position. The extended value was obtained with measuring tape between the lock positions for the flush and extended positions which was 2.41m. While in Mare Harbour a quick ROV survey was performed with the USBL pole in the flush position and the USBL head appeared to be flush; see below:- (As we cannot record ROV output electronically, the quality is not great)



Performance

In addition to the previous cruise report, further reliability of the USBL system was achieved with consistent performance down to the 3067m and provided a computed depth within 1.2m of the live CTD depth - without an updated SVP. See below screenshots taken at the same time:-



DP Desk Output

When cleaning out the old files on the Sonardyne PC it was noted that there was a DP desk output. This has been investigated and appears to never have worked. The wiring has been checked and should be correct. The output from Fusion/Ranger should be type HPR418-BCD at 9600 baud rate. A signal booster in the form of 2 x rs485 to rs232 converters was placed in the electrical locker on the boat deck opposite the doc's cabin as initial testing showed that there was an approx 1V signal present on bridge. This signal booster provided an RS-485 signal of sufficient voltage to be read on the bridge but this wasn't able to be read into the DP system. It is suspected that the Kongsberg system may need setup correctly which requires a dialogue to be started to determine input requirements into the DP system.

Vessel Offsets

In Fusion offsets have been added to the setup which allow the mid ship gantry and stern gantry deployed positions to be referenced in the guidance display.

EM122

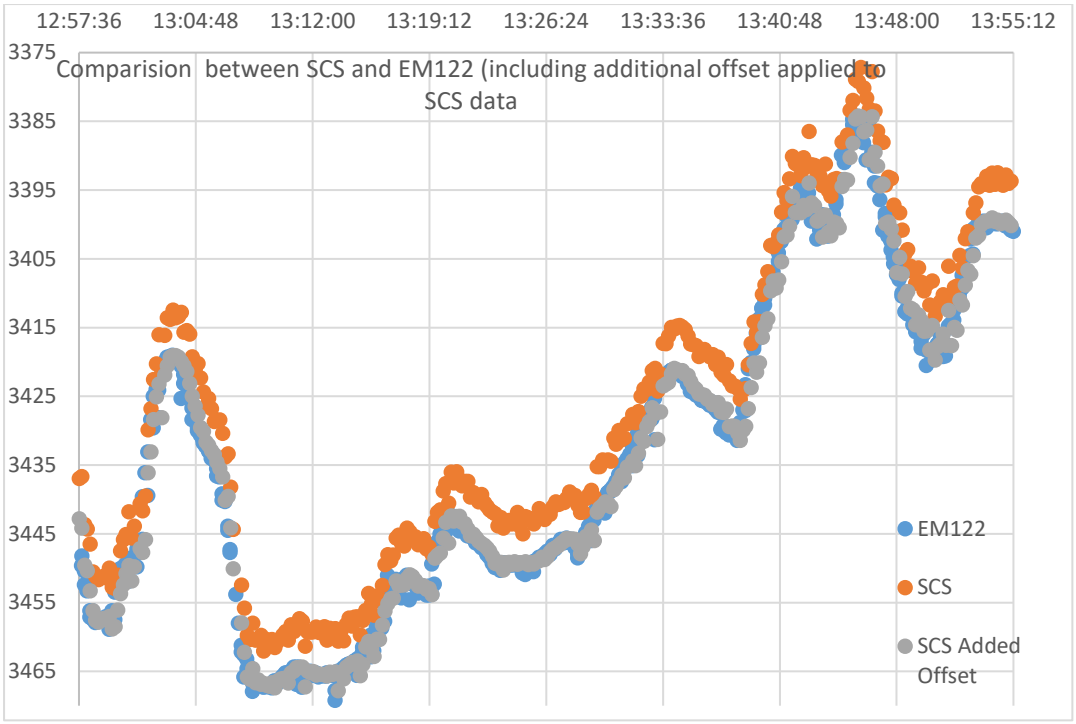
Depth Discrepancy

It was noticed that the EM122 depth on NavMet was different to the depth reported in SIS and Helmsman. This was traced to NavMet not using the EM122 output string correctly – there are two values which need adding together in the NMEA string, which are depth from transducer and transducer depth:

EM122 NMEA output: $KIDPT,4799.49,5.87,12000.0*77

Correct water depth: 4799.49 + 5.87 = 4805.36 m

A small section of EM122 data was taken along with the SCS data and the raw string sent to SCS and the below graph was produced which highlights the difference.



1PPS

The 1PPS signal into the EM122 dropped out several times this was resolved by restarting the SIS PC. The wiring was investigated to check that there was no obvious loose connections all appeared to be connected well. See below images of PC connection and EM122 Cabinet connection of 1PPS connection.

Dead Channels

Some issues with the beams were noticed at the end of the cruise and a dialogue with Kongsberg has been started. According to the Kongsberg engineer there is a lot of “dead” channels. This will need further investigation in Immingham/the Arctic.

NavMet

After continued repeated crashing of the NavMet screens, they have been rewritten as plain HTML pages with a Python backend accessed via asynchronous JavaScript requests.

So far this has been much more stable than the LabView versions and has reduced the network bandwidth per-client from about 4.6 MB/min to just under 0.4 MB/min. A 'Night Mode' has also been implemented, for users who wish to maintain their night vision.

GitLab link: https://gitlab.data.bas.ac.uk/wilcla/PyNavMet

Seapath 320+

The HMI failed terminally after a shipwide power failure on the 3rd April – it would not boot, showing just a 'Blue Screen of Death'. Fortunately the up to date backup was to hand and a system restore was performed which solved the issue in under 10 minutes.

As the UPSs in the acoustic rack are not evenly loaded, the Seapath PU has been moved over to the lesser-loaded UPS. The hope is that the Seapath will keep a fix for as long as possible in another power failure, reducing the restart times. (The HMI remains on the more-loaded UPS, as this is only needed for viewing the data.)

DeepTrekker ROV

The ROV was used three times this cruise:

- In Stanley Harbour, for testing & practice before hull inspection.

- In Mare Harbour for survey of the vessel's hull, at the request of the Master, after working in heavily iced areas. USBL pole position was also observed, to truth Parker Survey information.
- At Tristan da Cunha, when the vessel was on DP in ~33m of water, for viewing of the seabed ecosystem.

The ROV performed well in all three instances. The clear water at Tristan made the work much easier, however with a little concentration it is possible to navigate in areas with reduced underwater visibility.

It was noted that we cannot record the video footage from the ROV – this would be a useful addition to our capability as if, for example, something of interest had been seen on the vessel's hull we would not have been able to send images or footage of this to interested parties. This could be achieved for under £50, so is well worth considering.

Electronics Workshop

An additional monitor was added to the electronics workshop above the soldering workstation. The VGA input is connected the AME PC and can be used to view circuit diagrams, drawings etc while working on a piece of equipment. There is also a DVI cable connected which can be used to connect additional PC's that require working upon/updating. A future suggestion would be to setup a Raspberry Pi (in place behind monitor but with no microSD card) which would allow remote viewing of other systems to the HDMI input.

UPS

After a shipwide power down on the 3rd April, all UPSs have been configured to communicate with their connected equipment.

Most systems are set up to shut down after 30 seconds without power. This is because they rely on external hardware which is not powered (e.g. hull transducers), so there is no need for the logger PCs to stay on – the power is best saved for other equipment on the UPS which does still operate (e.g. USBL or Seapath.)

When setting the UPS's up, the priority was determined to be to protect the computers and equipment, rather than eeking out every last second of data; better to lose 5 minutes by shutting down early than 60 minutes rebuilding the PC.

Computers configured for UPS:

- ADCP
- AME Office PC
- CTD
- EK60 (PU1 & PU2)
- EM122
- K-Sync
- LabView display
- NMEA Splitter
- Ocean Logger
- SCS Display

- TOPAS
- USBL
- XBT

Equipment known to be not configured: (i.e. probably non-exhaustive list)

- CLAM - no UPS (a small rack mount one might be a good idea?)
- Seapath 320+ - no UPS interface software (estimated 5 hours runtime on UPS)
- Lab Temp PC - no UPS

The UPS configuration is fully documented on the Wiki.

Bongo Cable Counter

The bongo cable was modified to add a power on/off switch as the unit appeared to continually discharge. In order to charge this unit the power switch needs to be in on position and the not a power switch pushed in. See below charging switch positions.

USBL Beacon Charging Cupboard

Discussion have been made with the ETO to install a 4 gang plug bar on the top shelf of the cupboard that the USBL beacons are stored in along with a double socket sunk into the desktop. The aim to make up a simple rack to store the beacons on charge rather than using the work surface on top where they could be more likely to be damaged.

A.3.2. *Engineering report*

A.3.2.1. Tristan Da Cunha

Mini Agassiz Trawl (Mini AGT)

The Mini AGT was deployed in total 7 times at the Crawford and R.S.A Seamounts.

During one of the deployments the Mini AGT got stuck to the seabed, resulting in a 4-t tension spike, ripping the nets, and one of the rubber mats. The net was replaced with the spare net, and the rubber mat was also replaced. The ripped net has been mended.

In general the Mini AGT worked fine.

Rectangular Midwater Trawl (RMT8) on the Down Wire Net Monitor (DWNM)

The net was deployed 15 times in total at the Crawford and R.S.A Seamounts. All systems and sensors have been working and is in good order.

The RMT8 was used on the "bio-wire". A new termination was made in December 2017. The termination was re-used and worked reliably.

Bongo Net

The bongo net was deployed in total 2 times at the Crawford and R.S.A Seamounts. One deployment was cancelled due to winch breakdown.

Avani trawl

25.03 – AVANI Deployed. Was aborted due to instrument being halfway under the ship. The AVANI was deployed on the midships gantry, with the boom as far out as possible. This was not enough to stop the AVANI from traversing towards the side of the ship. It was therefore decided to abort the deployment.

SUCS

On the morning of the 30/3/18 we were doing a routine SUCS deployment just off Tristan Da Cuhna at 11:14, weather was good with very little swell. The SUCS was being lifted from the sea bed after taking an image to move onto the next. The winch operator hauled for about 10 seconds before the cable parted and the SUCS camera was lost. The cable parted with 411 meters of cable in the water. We took its last known position and tracked it using its USBL beacon. This was at 380m water depth. At 13:20 we attempted to fish the frame back off the sea bed using offcut cable form the Coring wire we had on board for weight and a selection of large grapple hooks. We also put a USBL beacon on the wire 15m above the last grapple hook. The ship moved over the top of the last known position, laid some cable out and started hauling at 13:53. We managed to hook some of the SUCS cable on a grapple. We hauled all 411 meters of the cable back in using the starboard mooring winch. We got the SUCS camera back on deck in one piece at about 15:17.

An investigation into the cable shows no clear indication as to why it parted. Cable fatigue could possibly have been caused by turns in the cable and the age of the cable could also be a factor, especially with repeated running of the cable through short lifts to and from the seabed at varying depths, which will have a small section of cable repeatedly running through the blocks and sheaves, with the weight being on the same points repeatedly. The cable may have also been overloaded. As

far as I am aware the cable has never been fully run out and inspected. After several deployments the cable often disconnected and the turn are taken out of the top few meters.

The video footage shows the cable parting from the metering block on the gantry. Inspection of the metering block showed no obvious reasons as to the cause of it parting. The block has a small amount of damage from where it has been used to deploy the bongo net on a small steel cable. The SUCS cable was not likely to come into contact with this as it was not on the roller where the cable sits.

SUCS frame weight:	47kg
Additional frame weights:	30kg (3x 10kg)
Camera, cables and lights:	15kg
Overall fame and camera weight:	92kg
Overall fame and camera weight in water:	29.44kg
Safe working load of the winch:	250kg
Total weight of the cable in water:	64kg (1050m)
Total weight of the cable in air:	200kg (1050m)
Weight of cable in water:	24.66kg (411m)

A.3.2.1. St. Helena

Mini Agassiz Trawl (Mini AGT)

On the 10/4/18 at 17:55 we did a shallow mini AGT at Bonaparte sea mount just off St Helena. This was a routine deployment in very good conditions at 110m deep. The swath showed that the sea bed was flat with almost no ululations.

The mini AGT was being towed using the tapered trawl cable which is rated to 5.24 tons safe working load. It had a 5 ton weak link after the swivel. A safety cable was attached to the shackle on the AGT side of the swivel and with a weak link. This was shackled to the back end of the AGT with a large shackle around one of the uprights. After trawling for a few minutes a spike at 2.9 and one at 3.9 tons were seen on the clam, this was then followed by a much larger spike at 4.2 tons. The AGT got stuck for a few minutes, the ship then moved to stern. The AGT came free and the cable was hauled in. The AGT came back in one piece on deck but the frame is heavily bent but will still function. The nets, cables and rubber are all in good condition and can be reused. It is difficult to tell when the weak link and upright gave way but they both worked as expected.

The spare mini AGT will need assembling, weights will need to be purchased for the spare. I will hopefully assemble the spare mini AGT in Immingham at the beginning of May when the ship gets in ready for use in the arctic.

The AGT was fixed up as best as possible and was used for the last 2 days.

Rectangular Midwater Trawl (RMT8) on the Down Wire Net Monitor (DWNM)

The net was deployed 18 times in total around the Bonaparte Seamounts. All systems and sensors have been working and is in good order.

Foam on top bar slid slightly to the side during one deployment. Disassembled top foam, and put foam back to original position.

Bongo

Bongo net deployed 6 times around St. Helena.

The Bongo wire was found to be damaged and ~20m was cut off. The cable was then re terminated but still able to go to 200m water depth. The Bongo worked fine with no issues.

Avani trawl

The AVANI trawl was later deployed of the starboard side using the Aft Effer crane and the Aft mooring winch. It was towed ~5m off the stern. This worked fine.

Appendix A4. ICT (Information Communication Technology) Report

12:22, 13 April 2018 (UTC)
ACQ stopped

09:03, 8 April 2018 (UTC)
Windows DNS issue; reverse zone corruption and not functioning. Saved a copy of the zone file. Edited and cleaned of anything that looked out of place (host without an IP etc)

- Added 5 to serial number (in two places at the top of the file)
- Saved as *.dns
- Restart the DNS Server service
- Clear the DNS cache (right click the JRW-DC-S1 object at the top of the tree in the DNS console)
- Watch event log for successful transfers and event ID 3150

15:05, 5 April 2018 (UTC)
Labview instruments re-written in Python by William Clark so should crash less and includes new features such as night mode. Edit the .CSS file to create your own look. Code stored in git. Old Labview code still available, see link on desktop.

03:00, 4 April 2018 (UTC)
At approx 00:53 the SCS data collection server hit 100% CPU load and stopped logging. Stopped Acquisition and rebooted server. Acquisition started and problem did not re-occur. At 01:00 noticed that could not access VMware console, then could not browse storage datastore1. The VM's then disappeared showing as "unassigned" and even though the VM's were alive in terms of a ping, the services were offline. Reboot jr-esx0 at 01:19. VM's not shutdown gracefully. Problems resolved and datastore1 appears unaffected. No problems to report 2 days later. Cause unknown.

15:25, 3 April 2018 (UTC)
At 12:04:15 the ship went on to emergency power. There was a fuel leak in the engine room and the main engines were shutdown. The IT systems were shut down shortly after that. When power was restored and after confirming that engine room systems were stable the IT systems were brought back online and aquisition started again at 13:38:33

17:48, 31 March 2018 (UTC)

Call into Tristan de Cuhna, 2 hours ashore. Talked with Simon Glass regarding future collaboration with BAS and installation of a rack mount NAS into their "equipment room" which is a 2 rack server room. The NAS should be purchased by developing oceans to store their data.

09:42, 28 March 2018 (UTC)
Issue : Windows 10 updates stuck downloading at 0%
Added the MIME type .esd application/octet-stream
IIS -> Sites -> WSUS Administration Site -> MIME Types
Within a minute of adding that, the Windows 10 client started to download the feature update
No restarts required for the server or the client

16:48, 27 March 2018 (UTC)
Sean Quirk (AME) has resolved an issue with em122 depth reading.
He noticed an approx 6m variable discrepancy between ea600 and em120 data
This was found to be the em122 logged centre beam depth being "water depth relative to the transducer" and not relative to the water surface.
The em122 also outputs an "offset" value which must be added to the depth value to get true water column depth
The datagram output from the em122 and logged by the SCS as RAW is;
Identifier ($KIDPT)
Water depth relative to the transducer, meters (0 to 12000)
Offset from transducer, meters
Maximum range scale in use (always 12000.0)
Checksum (*hh)
End of sentence delimiter (CRLF)
At the end of this cruise the sensor configuration will be adjusted to include the offest in the ACO file.

15:12, 24 March 2018 (UTC)
Clean up of WSUS server. Changed from BITS to FITS traffic (IE no longer at mercy of Packeteer rule for BITS); took 3 days but caught up with updates. Shutdown WSUS and WID services and defrag/optimize both OS and content repo. Shutdown server and removed snapshot. Ran database re-index script.

15:53, 22 March 2018 (UTC)
AMS users report performance issues, rebooted AMS3 server and it ran a disk check for 30 minutes before starting again. Problem resolved.

14:06, 19 March 2018 (UTC)
Dartcom crashed after update and gone into safe mode
Isolated fact that March 2018 security rollup causing the crash
Dartcom needs update to Windows 10, mentioned to Mike Gloistein

19:59, 18 March 2018 (UTC)
Konsberg EA600 all-in-one workstation installed on the bridge (replaces Gigabyte Brix)
Configured OS and connections

01:32, 13 March 2018 (UTC)
ACQ started
Had to restart a few times - TSSHRP had XML errors, but eventually settled down

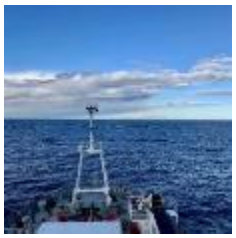
Appendix A5. Summary of Tristan da Cunha tweets

Tweets up to 1 April

For a social media appendix for the cruise report – tweets from Falklands to Tristan for Developing Oceans @DevelopingOcean

March 14th

Heading north-east aboard the RRS James Clark Ross to work with #tristandacuhna and #sainthelena on marine ecosystem management @BAS_News



March 15th

20 bird species before breakfast today, from miniscule #petrels to massive #albatrosses, spotted by Andy Schofield @Natures_Voice

March 16th

Multibeam masters Dan Evans @UKHO_online and Floyd Howard @BAS_News #seabedmapping en route across the #southatlantic

March 16th

Numerous #sei #whale sightings - observer Steph Martin identified this sei blow, photographed by cruise leader Simon Morley on our departure

March 17th

Preparation: Vlad Laptikhovsky & Martin Collins @CefasGovUK examining the diet of #bluenose #warehou during our transit to #tristandacuhna

March 17th

No escape from plastic bags in the vast ocean: we spotted a black browed albatross eating one #marineplastic #oceanlitter @Natures_Voice

March 18th

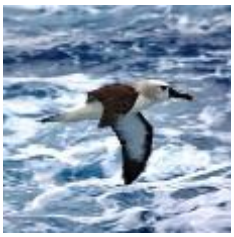
Scary #sundaylunch – a deep sea angler fish previously eaten by #bluenose warehou, photo by Martin Collins @CefasGovUK

March 18th

Preparation: James Bell @CefasGovUK & Nils Piechaud @PlymUni examining #southatlantic #benthos in the RRS James Clark Ross wet lab

March 19th

Bye bye black-browed, hello yellow-nosed; the #albatross species around us are changing as we progress towards #tristandacuhna, photos by Andy Schofield @Natures_Voice



March 19th

Preparation: Paul Brewin & Katie Brigden @SAERI_FI @BAS_News sorting #sponges recovered from #southatlantic benthic samples

March 19th

Tree planting? Think #seabed; superhero #bluecarbon sequesters combat climate change http://crimsonpublishers.com/eaes/pdf/EAES.000521.pdf … @BAS_News @asccc_news

March 20th

Visibility isn't ideal today for the marine bird and mammal observers aboard the RRS James Clark Ross in the #southatlantic @BAS_News @Natures_Voice

March 20th

Preparation: #bluenose warehou diet analysis continues… they don't mind eating gelatinous #salps & #pyrosomes, identified by Will Goodall-Copestake @BAS_News

March 21st

A few days prior to sampling around #tristandacuhna, Rachael Shreeve & Alex Cotton @BAS_News @UCLBIochemEng1 go through net deployment on the RRS James Clark Ross

March 21st

Dave Barnes & Cheps Sands @BAS_News find brittlestars, bryozoans and corals on a #marineplastic fishing net previously recovered from a seamount near #tristandacuhna @NG_PristineSeas

March 22nd

Last full day of transit across the open #southatlantic ocean until we reach our first study site: Yakhont seamount @BAS_News

March 22nd

37 marine #bird species in the #southatlantic so far, and our resident ‘the hangover’ egret who wakes up in a different location every morning @Natures_Voice @BAS_News

March 23rd

Our #southatlantic marine mammal tally of sei whales, fin whales and dusky dolphins gained an exciting addition after a #killerwhale sighting this morning @BAS_News @polarbiome

March 24th

RT: Fieldwork at Yakhont seamount could not have started better with a shark recorded on the pelagic cam

March 24th

Catches from our first two #yakhontseamount #southatlantic nets were dominated by small fish and krill species @BAS_News @CefasGovUK @SAERI_FI

March 24th

Hidden within our first #yakhontseamount #southatlantic net hauls were lobster larvae and a beautiful jewel squid @BAS_News @CefasGovUK @SAERI_FI @gm0hcq

March 25th

Sarah Walmsley @CefasGovUK sorting a fish dominated #yakhontseamount net haul – importantly for #tristandacuhna, #lobster larvae were again recovered

March 25th

Biodiversity thriving on the #yakhontseamount is being non-invasively quantified using a scaled camera system (SUCS), here a #seapen takes centre stage @BAS_News @SAERI_FI

March 26th

Super-sized salps; last night's #yakhontseamount samples included the largest described species of #salp (Thetys vagina) - previously found in our #bluenose diet analysis @BAS_News @CefasGovUK

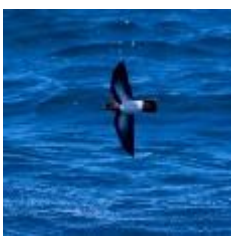
March 27th

Sampling the ocean off #yakhontseamount we recovered an eerie example deep water life, a #gulper eel @BAS_News @CefasGovUK @SAERI_FI

March 28th

Now at #crawfordseamount, we have discovered giant #seaurchins growing like cacti on an underwater volcano, photo Dave Barnes @BAS_News @SAERI_FI

March 28th



Also seen today were little and large: the white-bellied storm #petrel, and with a wingspan 8X longer, the tristan #albatross; photos by Andy Schofield @Natures_Voice @BAS_News

March 29th

Transparent #salp zooplankton - this one from #crawfordseamount - reveal their curious #hearts that periodically pump one direction and then other @BAS_News

March 30th

Rafting on rubbish - lost fishing buoy brings a floating community to #crawfordseamount, photos S Martin & D Barnes @BAS_News @SAERI_FI #marineplastic #oceanlitter #shark

March 30th

#moonrise over the ocean as we leave #crawfordseamount for #tristandacuhna on the next phase of this ecosystem management project @BAS_News @SAERI_FI @CefasGovUK

March 31st

Our last night examining marine life in this #southatlantic region, including #Phronima which has been well represented in most catches

March 31st

#Moonset over #tristandacuhna as we reach today's destination for discussions with our project partners @BAS_News @SAERI_FI @CefasGovUK

March 31st

RRS James Clark Ross off Edinburgh of the Seven Seas #tristandacuhna today @BAS_News

April 1st

Simon Morley @BAS_News and Martin Collins @CefasGovUK updating project partners on our exiting research findings in #tristandacuhna, photo S Martin