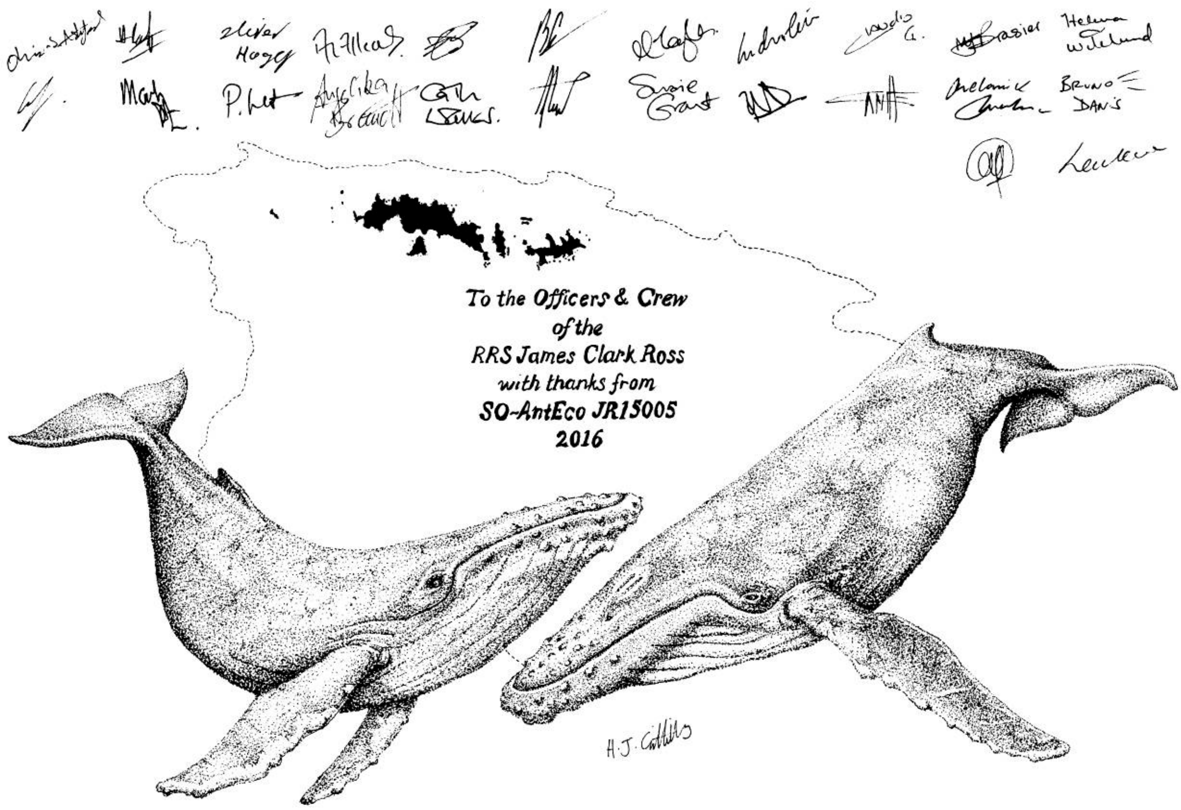
RRS James Clark Ross

JR15005 Cruise Report



SO-AntEco

South Orkneys - State of the Antarctic Ecosystem

RRS James Clark Ross JR15005 Cruise Report

South Orkneys - State of the Antarctic Ecosystem

Huw Griffiths & the scientists of SO-AntEco

British Antarctic Survey Cruise Report

Falkland Islands – Signy – King Edward Point – Falkland Islands

Report of *RRS James Clark Ross* cruise JR15005, February-March 2016

BAS Archive Reference Number: ES*/*/2015/*

This report contains initial observations and conclusions. It is not to be cited without the written permission of the Director, British Antarctic Survey.

March 2016

Contents

Summary

The South Orkney Islands is a small archipelago located in the Southern Ocean, 375 miles north-east of the tip of the Antarctic Peninsula. The seafloor around the South Orkney Islands has been shown to be an area with exceptionally high biodiversity. The marine animals there represent approximately one fifth of all species recorded for the entire Southern Ocean.

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) closed all finfish fisheries around the South Orkney Islands in 1989, and in 2009 they established the South Orkney Islands Southern Shelf Marine Protected Area (SOISS MPA), the first MPA located entirely within the High Seas anywhere on the planet.

SO-AntEco (JR15005) is a British Antarctic Survey (BAS) led expedition undertaken in conjunction with an international team of scientists from the Scientific Committee for Antarctic Research (SCAR) AntEco research programme. The team includes participants from nine different countries and 16 institutes. The expedition took place on board the BAS research ship *RRS James Clark Ross* in early 2016.

The SO-AntEco expedition investigated the diversity of life both inside and outside the SOISS MPA region in order to better understand the distribution and composition of the seafloor communities around the islands. We undertook a research cruise that explored the different seafloor habitats to investigate whether different environments supported different communities of animals. Improving our understanding of the distribution of animals, such as corals and sponges, which are vulnerable to fishing and other human impacts, will help us to manage the region's natural resources in the future.

Objectives

- To find and identify seafloor animals from around the South Orkney Islands and to name and describe any species new to science.
- To detect any significant differences between the types of species and numbers of animals in different habitats.
- To identify species that are indicative of specific habitat types to help with future habitat mapping.
- To map all vulnerable species found and to report their presence and distribution to relevant stakeholders such as CCAMLR.

Funding

Cruise JR15005 was part of the Biodiversity, Evolution and Adaptation team of the Environmental Change and Evolution Programme (BAS). Two NERC Collaborative Gearing Scheme (CGS) proposals funded the attendance of Cath Waller, Laura Robinson, Helena Wiklund, Madeline Brasier and Michelle Taylor. Individual invited scientists from the SCAR AntEco Programme were externally funded for travel and preparation costs and then supported by BAS whilst on board the ship.

Summary narrative for JR15005

The following calendar view gives a simplified overview of JR15005 splitting the days into one of four groups. Of the 20 days originally allocated to science, 16.6 days were used for science with 26.3 hours lost to bad weather and the rest lost to logistics.

Mobilisation/ Demobilisation	Passage plus logistics	Bathymetric survey	Benthic biology

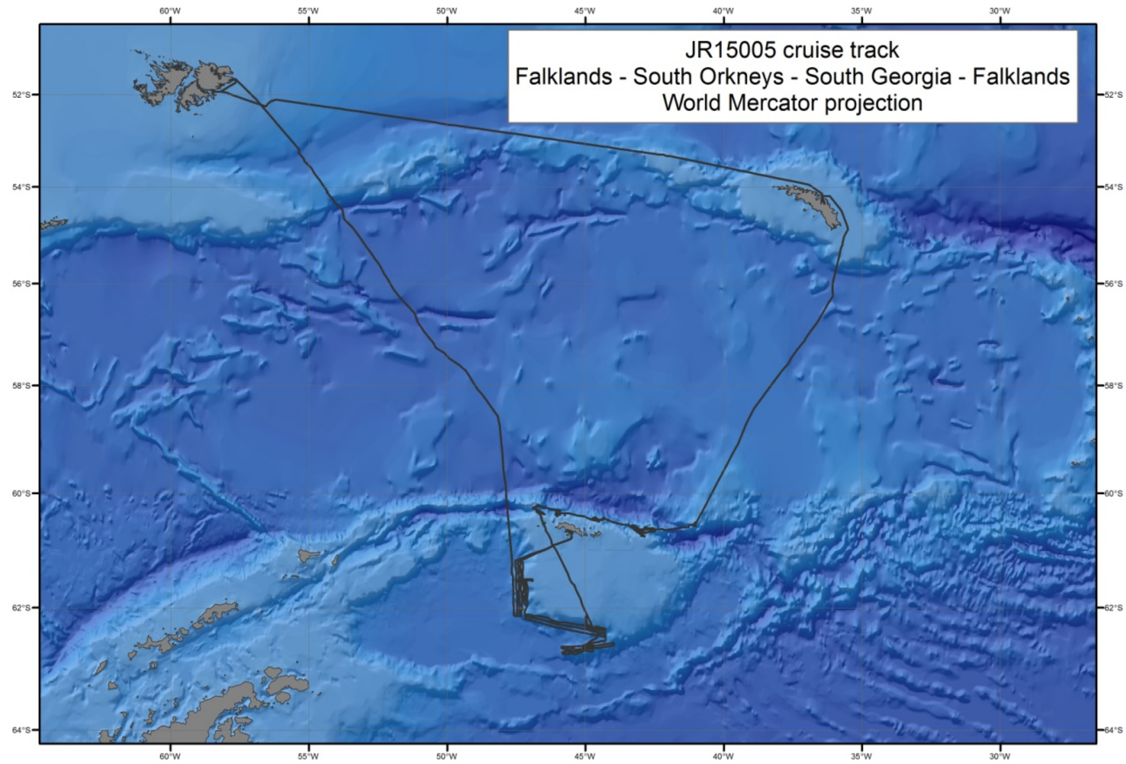
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Feb 2016	22	23	24	25	26	27	28
March 2016	29	1	2	3	4	5	6
	7	8	9	10	11	12	13
	14	15	16	17	18	19	20
	21	22	23	24	25	26	27
	28						

The following is a more detailed day-to-day narrative of cruise events. To avoid confusion with event logs that form the most detailed narrative, times are given in UTC. On cruise JR15005, local time was always UTC -3.

Day	**Date**	**Narrative**
Mon	22/02	Main science party arrive in Falklands at 19:00.
Tues	23/02	Ashore on Falklands. JCR at Mare Harbour.
Weds	24/02	Join JCR at FIPASS 14:00. Mobilisation tasks.
Thurs	25/02	Mobilisation tasks. JCR departs FIPASS at 22:30 heading for Signy.
Fri	26/02	Passage from Falklands to Signy. Opportunistic swath survey plus kelp recovery.
Sat	27/02	Passage from Falklands to Signy. Opportunistic swath survey. Biology gear familiarisation work. Science meeting plus presentations. Kelp watch.
Sun	28/02	Passage swath survey and start (12:00) of the dedicated swath survey part 1 of the western margin of the South Orkney continental block. Kelp watch.
Mon	29/02	Finish western margin swath survey part 1 (03:00). Arrive at Signy 11:00 and disembark pax and stores. Depart Signy (16:00) for hut resupply and then back to Signy (22:00). Shallow water biology test station (22:30). Proceed back to western margin swath survey part 2.
Tues	01/03	Western margin swath survey part 2 commences 05:00. Run north-south swath transects all day.
Weds	02/03	Western margin swath survey concludes. Biology work (West) starting at 10:00 at 500 m depth. Start 750 m station.
Thurs	03/03	Biology area (West) – conclude 750 m, 900 m, 1000 m and 1500 m stations.
Fri	04/03	Biology area (West) – conclude 2000 m station. Southern margin swath survey commences at 10:00 for 36 hours
Sat	05/03	Southern margin swath survey until 20:00. Proceed to next biology area (South) – 500 m station
Sun	06/03	Biology area (South) – conclude 500 m, 750 m, 900 m and 1000 m stations.
Mon	07/03	Southern margin spur swath from 02:00 until 19:30. Commence biology (South area) 1000 m, 1500 m and 2000 m stations.
Tues	08/03	Recommence southern margin spur swath survey at 07:15 for 7 hours. Proceed to biology area 2a for 2000 m station at 16:00 and then 1500 m. Proceed to next biology area (North West) on the northern South Orkney continental margin
Weds	09/03	Arrive 10:00 at 800 m station in Monroe Trough (North West area). Issue with CTD winch briefly delays science. Proceed to 500 m site at northern end of Monroe Trough.
Thurs	10/03	Biology area (North west) – conclude 500 m, 750 m and 900 m station and start 1000 m station.
Fri	11/03	Biology area (North west) – conclude 1000 m and 500 m station and start 750 m station. Trawling winch issues in the evening delays science by around 8 hours.
Sat	12/03	Biology area (North west) – conclude 750 m station and transit (08:15) to North area arriving at 20:00. Swath survey of Karlsen Rock on passage to aid future ship navigation. Start biology area (North) 500 m station.
Sun	13/03	Biology area (North) – conclude 500 m, 1000 m, 900 m stations and start 750 m station
Mon	14/03	Biology area (North) – conclude 750 m, 1500 m and 2000 m stations.

Day	Date	Narrative
		Begin transit to North East area at 17:30 arriving at 23:00.
Tues	15/03	Biology area (North East) – conclude 500 m, 750 m and 900 m stations.
Weds	16/03	Biology area (North East) – conclude 1000 m, 500 m and 750 m stations.
Thurs	17/03	Conclude 1500 m and 2000 m stations in the North East area and begin transit to Bruce Bank at 22:00
Fri	18/03	Arrive at Bruce Bank area at 08:30. Commence Bruce Bank 500 m and 750 m stations.
Sat	19/03	Return to and conclude Bruce Bank 500 m station in deteriorating conditions. Decision made to finish science at 12:00 and start passage towards South Georgia to pick up JCR doctor. Kelp recovered.
Sun	20/03	Passage from Bruce Bank to South Georgia. Kelp recovered. Arrive in Cumberland Bay at 23:45 and wait.
Mon	21/03	Boat transfer of JCR Doctor at 09:00 and after brief group photo by glacier, kelp collection, depart Cumberland Bay at 11:00. Opportunistic swath survey started.
Tues	22/03	Passage from South Georgia to Falklands.
Weds	23/03	Passage from South Georgia to Falklands.
Thurs	24/03	Passage from South Georgia to Falklands interrupted by poor weather. Hove to most of the day.
Fri	25/03	Slow transit towards Mare Harbour. Pick up pilot at 12:00 and arrive at 13:00. Demobilisation tasks.
Sat	26/03	Demobilisation tasks. Four of the science party were meant to depart the JCR at 15:00 with LanChile but flights were cancelled.
Sun	27/03	Demobilisation tasks
Mon	28/03	Demobilisation tasks
Tues	29/03	Main science meant to depart the JCR on MOD flights but flights cancelled.

Cruise Track



Personnel

Officers and crew for JR15005

STEVENS, Ralph A	Master
PAGE, Timothy S	Chief Officer
RACKETE, Carola	2nd Officer
CROOKES, Waveney A	3rd Officer
SEDDON, Huw JE	Ex 3rd Officer
GLOISTEIN, Michael EP	ETO Comms
MACDONALD, Neil C	Chief Engineer
BEHRMANN, Gert	2nd Engineer
MANNION, Christopher J	3rd Engineer
LAUGHLAN, Marc	4th Engineer
THOMAS, Craig GL	Deck Engineer
AMNER, Stephen P	ETO
TURNER, Richard J	Purser
OSBORNE, Timothy A	Doctor
PECK, David J	Bosun/Sci' Ops
BOWEN, Albert Martin	Bosun
DALE, George A	Bosun's Mate
SMITH, Sheldon T	SG1A
HERNANDEZ, Francisco J	SG1A
ENGLISH, Samuel	SG1A
HOWARD, Alan S	SG1A
WAYLETT, Graham L	SG1A
WALE, Gareth M	MG1
HERBERT, Ian B	MG1
PRATT, John	Chief Cook
COCKRAM, Colin C	2nd Cook
JONES, Lee J	Snr Steward
GREENWOOD, Nicholas R	Steward
RAWORTH, Graham	Steward
MORTON, Rodney	Steward

Scientific Party

GRIFFITHS, Huw J	PSO, British Antarctic Survey
ALLCOCK, A Louise	National University of Ireland, Galway
ASHFORD, Oliver S	University of Oxford
BLAGBROUGH, Hilary J	ReDS, British Antarctic Survey
BRANDT, Angelika	Universität Hamburg
BRASIER, Madeleine J	University of Liverpool / Natural History Museum UK
DANIS, Bruno	Université Libre de Bruxelles
DOWNEY, Rachel V	Senckenberg Research Institute, Frankfurt

ELÉAUME, Marc P	Muséum National d'Histoire Naturelle
ENDERLEIN, Peter	AME, British Antarctic Survey
GRANT, Susanna M	British Antarctic Survey
GHIGLIONE, Claudio	University of Siena / Italian National Antarctic Museum
HOGG, Oliver T	University of Southampton / British Antarctic Survey
LENS, Peter CD	IT, British Antarctic Survey
MACKENZIE, Melanie K	Museum Victoria, AUS
MACFEE, Carson	AME, British Antarctic Survey
MOREAU, Camille VE	Université Libre de Bruxelles
PRESTON, Mark	AME, British Antarctic Survey
ROBINSON, Laura F	University of Bristol
RODRIGUEZ, Estefania	American Museum of Natural History
SPIRIDONOV, Vassily	P.P. Shirsov Institute of Oceanology
TATE, Alexander J	PDC, British Antarctic Survey
TAYLOR, Michelle I	University of Oxford
WALLER, Catherine L	University of Hull
WIKLUND, Helena	Natural History Museum, UK

Abbreviations: PSO, Principal Scientific Officer; ReDS, Research Development and Support; AME, Antarctic and Marine Engineering; IT, Information Technology; PDC, Polar Data Centre.

Cruise participants. Photograph by Richard Turner.

Project Reports:

1. Agassiz Trawl (AGT)

Huw Griffiths, Angelika Brandt, Bruno Danis, Camille Moreau, Cath Waller, Claudio Ghiglione, Estefania Rodriguez, Helena Wiklund, Hilary Blagbrough, Laura Robinson, Louise Allcock, Madeleine Brasier, Marc Eléaume, Melanie Mackenzie, Michelle Taylor, Oliver Ashford, Oliver Hogg, Peter Enderlein, Rachel Downey, Susie Grant, Vassily Spiridonov

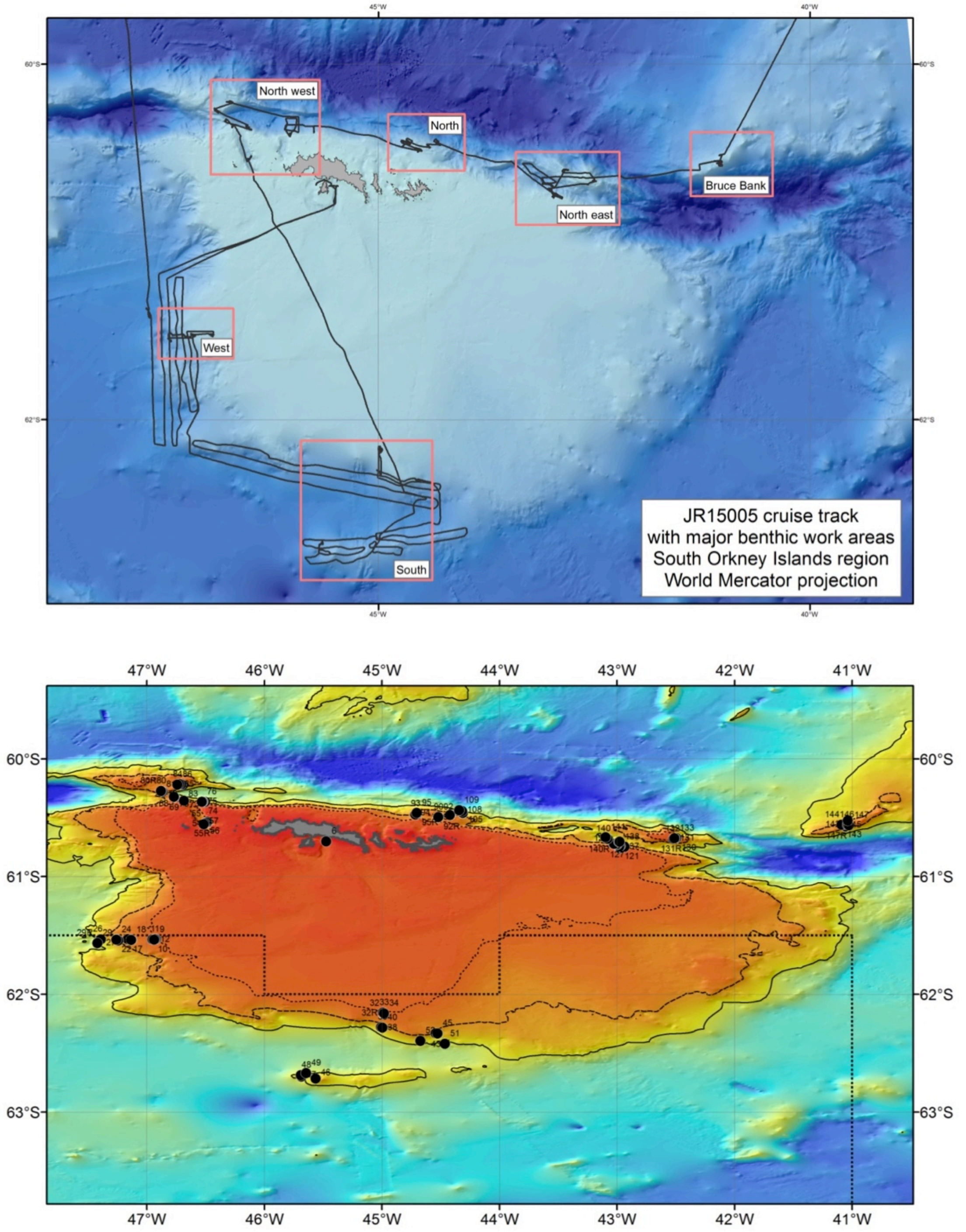


Figure 1.1. Top: Locations of six major sampling sites. Bottom: Precise AGT locations for JR15005.

Our apparatus, an Agassiz trawl (AGT), was used to sample animals approximately 1 cm and larger in length, which comprise the larger macro- and megafauna, but did capture some smaller animals as well. Weather and topography permitting, each station comprised three replicate trawls at shallower depths (500 m, 750 m, and 1000 m) followed by at least one trawl at the deeper depths (1500 m and 2000 m).

Our Agassiz trawl used a mesh size of 1 cm and had a mouth width of 2 m. At each station the seabed topography was examined prior to trawl deployment using multibeam sonar (swath) and where possible, the shallow underwater camera system (SUCS). The deployment protocol was standardised. While the AGT was lowered, the ship had to compensate for the wire lowering speed of 45 m.min-1 by steaming at 0.3 knots until the AGT reached the seabed and at 0.5 knots until the full trawling wire length was put out. The full trawling cable length we used was 1.5 times the water depth. The net was then trawled at 1 knot for 10 minutes. With the ship stationary, the AGT was hauled at 30 m.min-1 in order to avoid damaging the gear. When the AGT had left the seafloor, the hauling speed was increased to 45 m.min-1 and the ship speed to 0.3 knots.

On board, samples were photographed as total catch and hand-sorted into groups varying from Phylum to species level collections. The wet-mass (biomass) of the different taxa was assessed by using calibrated scales (with accuracy and resolution of 0.001 kg). Animals were either preserved in 96% ethanol, RNA later, 4% formalin or frozen at –20°C or –80°C.

In total, there were 81 AGT deployments. These were clustered at six locations: West, South, North West (subdivided into two sites: North West and North West Trough), North East, North, and Bruce Bank. There was also a test deployment off Signy.

Preliminary results

One of the first analyses done after the AGT catches were sorted and fixed was to count the number of phyla present in the catch in order to assess the richness at Phylum level of the trawled area (Table 1.1). Total numbers of phyla varied between one and 13. Fourteen of the trawls contained ten or more phyla. Three of the deployments failed to catch any animals at all. Two of these were due to technical problems with the net. One empty net (Event 56) appeared to have functioned correctly but contained no animals; later inspection of the SUCS (shallow underwater camera system – see Section 4) and DWCS (deep water camera system on the epibenthic sled – see Section 3) showed very few signs of macro or megafaunal life.

Echinoderms were found in 75 out of 78 successful trawls and were found at all sampled depths in all geographic areas (Table 1.1). Annelid worms, sponges, cnidarians, chordates (fish, salps and ascidians) and arthropods were all found in over 75% of trawls.

Cephalorhyncha (priapulans) were only reported from a single trawl. One remarkable find was the presence of the recently described “phylum” Dendrogramma at events 109 and 140 (both at 2,000 m in the North and North East sites).

The most numerous phylum of animals caught was Annelida - the annelid worms - with 15,310 individual animals caught. Both echinoderms and arthropods had high numbers of individual specimens recorded with 9,634 and 4,056 respectively. Nemerteans, molluscs and sponges totalled ~2,000 individuals each. Sponges accounted for over 60 kg of wet mass and were the highest mass of animals recorded. The other two phyla with high wet weights were echinoderms (33 kg) and annelids (23 kg).

Table 1.1. Distribution of phyla caught by the AGT. Replicates at each station have been combined.

Region	Depth	Annelida	Arthropoda	Brachiopoda	Bryozoa	Cephalorhyncha	Chordata	Cnidaria	Ctenophora	Dendrogramma	Echinodermata	Foraminifera	Hemichordata	Miscellaneous	Mollusca	Nematoda	Nemertea	Platyhelminthes	Porifera	Sipuncula	Total
Signy	200	■	■		■		■				■				■					■	7
Bruce Bank	500	■	■		■		■	■			■		■	■	■				■		10
	750	■	■				■	■			■			■					■		7
North	500	■	■		■		■	■			■				■		■	■	■		10
	750	■	■		■		■	■			■		■		■				■		9
	1000	■	■		■		■	■			■			■	■				■		9
	1500	■	■		■		■	■			■			■	■				■		9
	2000		■		■		■	■		■	■										6
North East	500	■	■	■	■		■	■			■		■	■	■		■		■		12
	750	■	■		■		■	■			■		■		■		■		■	■	11
	1000	■	■	■	■		■	■			■		■	■	■		■	■	■	■	14
	1500	■	■		■		■	■			■				■				■		8
	2000	■	■		■		■	■		■	■				■		■		■		10
North West	500	■	■		■		■	■			■		■	■	■		■	■	■	■	13
	750	■	■	■	■	■	■	■			■				■		■		■	■	12
	1000	■	■				■	■			■				■						6
NW Trough	750	■	■		■		■	■			■			■	■		■		■		10
	750																				
South	500	■	■	■	■		■	■			■			■	■			■	■		11
	750	■	■		■		■	■			■				■				■		8
	1000	■	■		■		■	■			■			■	■		■		■		10
	1500	■	■		■		■	■			■								■		7
	2000	■	■		■		■	■			■			■	■	■			■		10
West	500	■	■		■		■	■			■	■		■	■		■		■		11
	750	■	■		■		■	■			■	■		■	■		■		■		11
	1000	■	■		■		■	■			■			■	■		■		■	■	11
	1500				■		■		■		■								■		5
	2000	■	■					■	■		■	■		■	■		■		■		10
	Total	25	26	4	24	1	26	25	2	2	27	3	6	15	23	1	13	4	24	6	

The trawl with the highest total number of individual animals (corrected to a 1200 m trawl length) was Event 63 at 500 m in the North with over 9,300 individuals (Figure 1.2). This coincided with the highest total wet weight of animals, 17.8 kg (mostly annelid worms). In general, the deeper stations had lower total numbers of animals and lower total biomass. The biomass of the North East region was dominated by sponges (Figure 1.3).

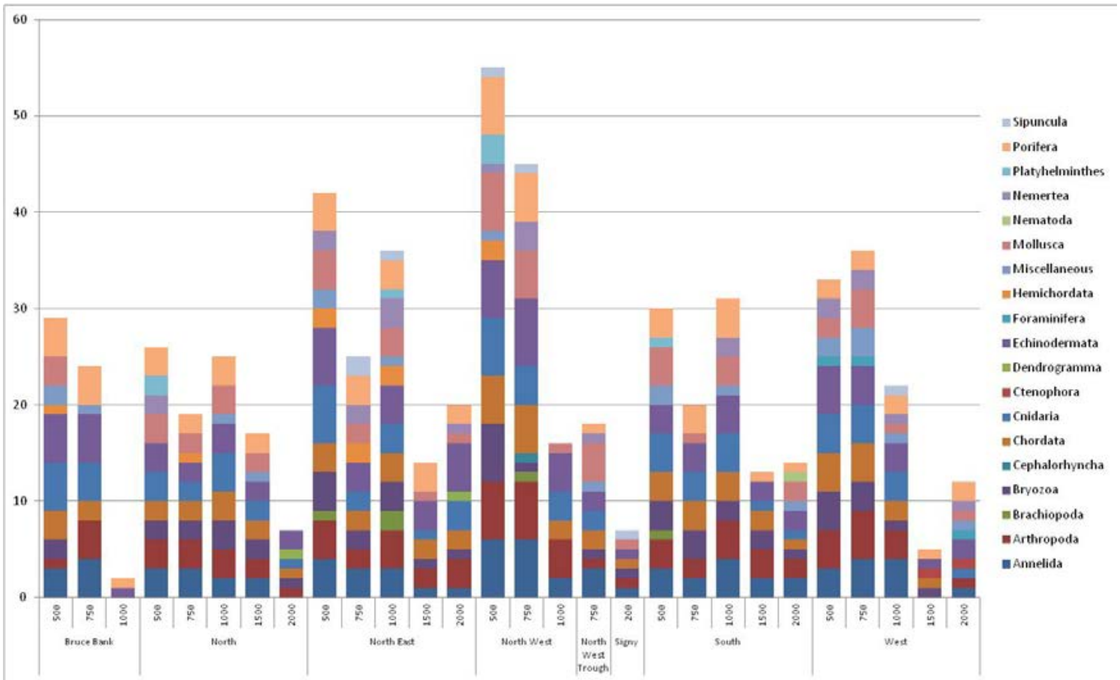


Figure 1.2. Mean numbers of animals from each location (corrected to a 1200 m^2 area).

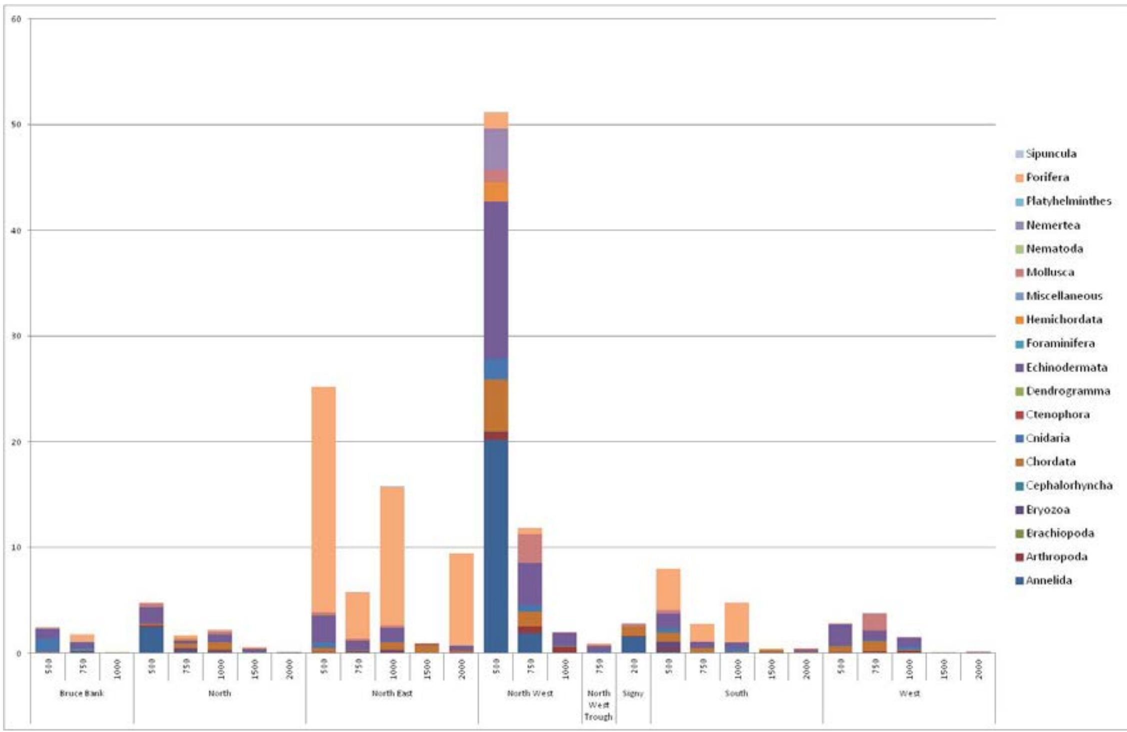


Figure 1.3. Mean wet weight (kg) of animals from each location (corrected to a 1200 m^2 area).

2. Rauschert dredge

Claudio Ghiglione, Angelika Brandt, Pete Enderlein, Hilary Blagbrough, Vassily Spiridonov, Huw J. Griffiths

During the cruise samples were collected using, for the first time in the area, a Rauschert dredge (Figures 2.1, 2.2) (Rauschert, 2006; Stransky 2008). This gear is designed to catch small epibenthic animals and it is equipped with a 500 µm mesh net (Lörz et al., 1999; Rehm et al., 2006).

Fine-mesh sampling by a Rauschert dredge has already been shown to provide a large number of new records and species of molluscs in the Ross Sea (Schiaparelli et al., 2014; Ghiglione et al., 2013, 2016).

The Rauschert dredge was deployed, in total, at 30 different stations (Appendix 2, Figure 2.3) attached to the Agassiz Trawl (AGT) with 5 meters of cable and with a trawling velocity of approximately 1 knot. The dredge was trawled for 10 minutes along the seabed at each station at depths ranging between 500 and 2000 m. In a limited number of areas it was not possible to deploy the dredge because there was a lot of big stones and the risk of loss or serious damage to gear would have been too high. The decision whether to deploy the Rauschert dredge was made after the photographic survey with the SUCS and also after the number of rocks in the first AGT deployment was known.

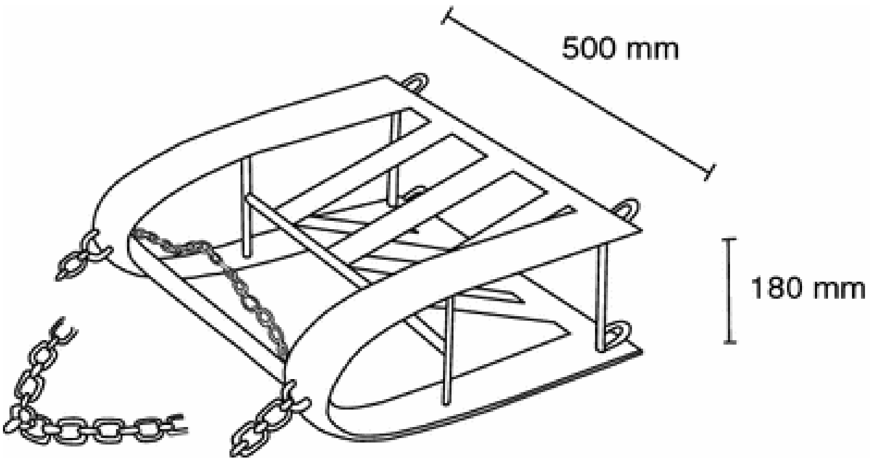


Figure 2.1. Rauschert dredge (from Rehm et al., 2006)

On the deck each sample was sieved (300 µm) with cold sea water and immediately fixed in the laboratory in 96% pre-cooled ethanol and kept in a freezer at -20 °C for possible future DNA extraction. Samples with a lot of sediment were rolled gently every day to ensure proper fixation.

Figure 2.2. Left: Rauschert dredge (left) compared to the Agassiz (centre of deck) on the JCR (© Claudio Ghiglione). Right: Size of the dredge (© Laura Robinson).

Due to the high amount of sediment the small fraction collected was not examined on the ship during the expedition and therefore no preliminary results are reported here. In a small number of cases some larger specimens were removed immediately from the samples after retrieval and kept in different vials/pots (see Appendix 2).

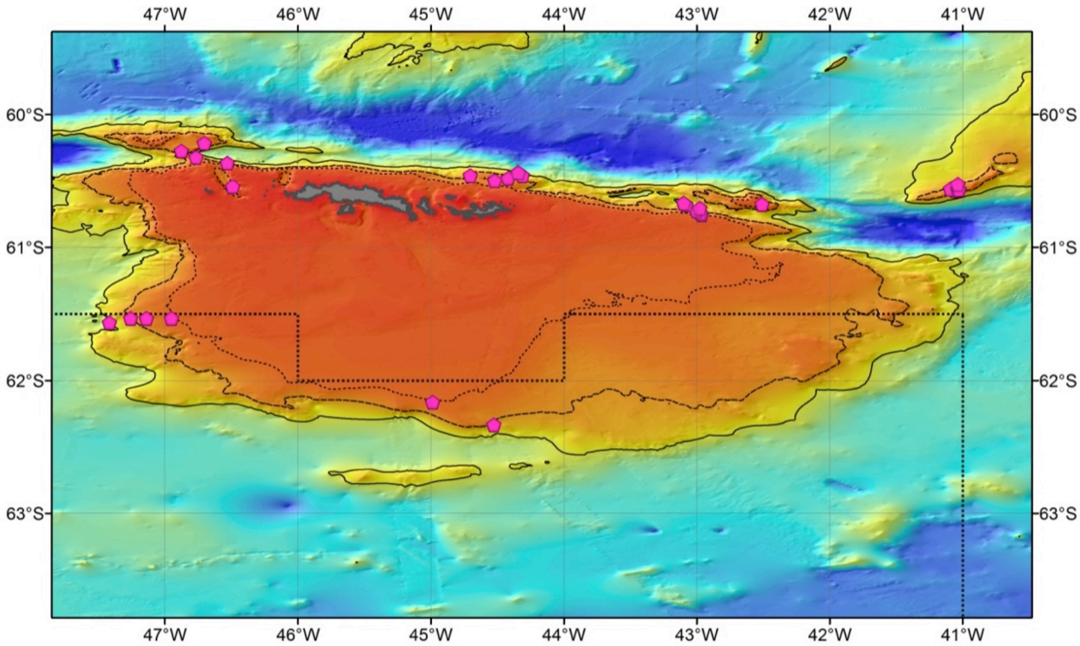


Figure 2.3. Locations map of the Rauschert dredge samples

All the material from the Rauschert dredge sampling events will be studied after the cruise at British Antarctic Survey (BAS) in Cambridge or at the Italian National Antarctic Museum (MNA), Section of Genoa, to answer a wide range of biological questions. These include investigations of phylogenetic relationships of taxa (evolutionary research) as well as faunal analyses and analyses of community composition (systematics and ecology).

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3. Epi-benthic Sledge (EBS)

Angelika Brandt, Oliver Ashford, Madeleine Brasier, Oliver Hogg, Peter Enderlein, Huw Griffiths

The EBS is a proven apparatus designed for sampling small epibenthic and suprabenthic macrofauna at any depth and on any substrate. The EBS is equipped with supra- and epi-benthic samplers of 1 m width and 33 cm height with attached plankton nets of 500 µm and a cod end of 300 µm as described by Brandt and Barthel (1995) and Brenke (2005). A mechanical opening-closing device prevents entry of pelagic fauna during heaving. Additionally, the EBS carries a deep-water camera system (DWCS) and a CTD which measures data on temperature, pressure and conductivity.

A single EBS was deployed at each depth station, where weather and substrate allowed. As trawled gear never hits the same spot when repeating a station (Brattegard and Fosså, 1991), pseudo-replicate samples were not taken during this expedition. The EBS was trawled for 10 min on the seabed on each of the 13 occasions it was deployed (Figure 3.1, Appendix 1). In total, the operation time of each deployment ranged between 45 minutes to 3 hours, depending on water depth. As the haul lengths varied, the data presented here are standardised to 1200 m² hauls for comparative analysis.

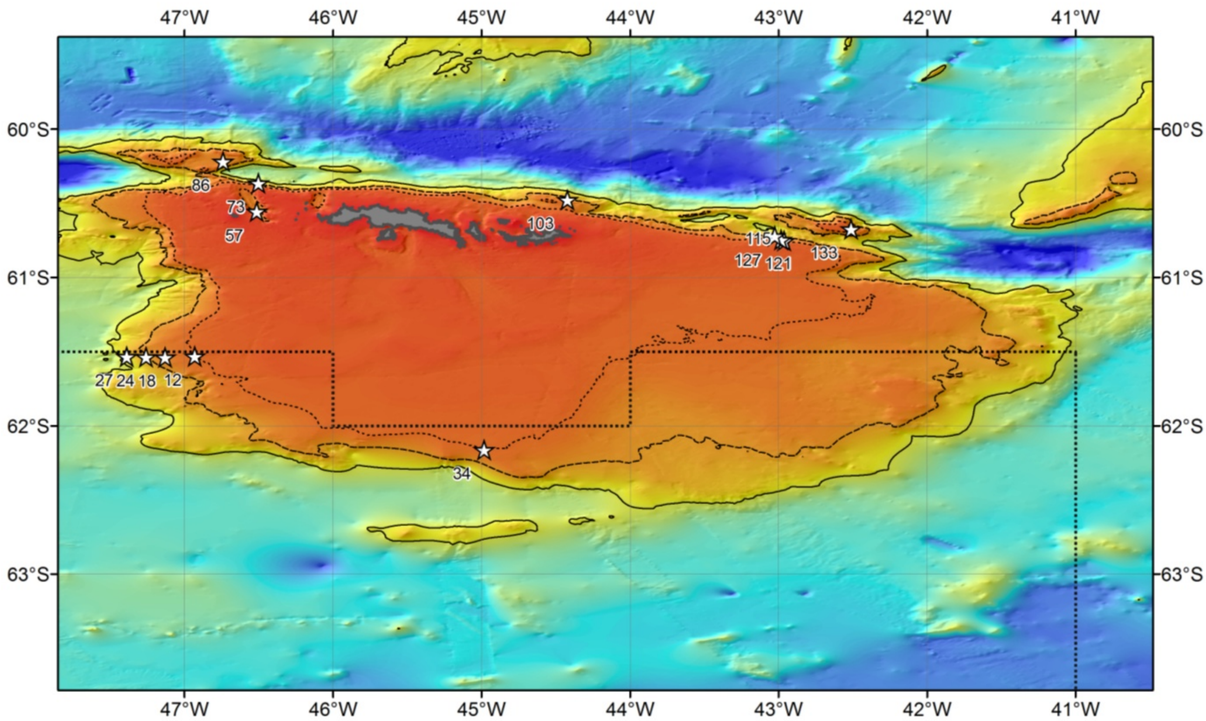

Figure 3.1. EBS sampling locations for JR15005.

Table 3.1. Sorted EBS samples from JR15005. Numbers of sorted taxa (uncorrected values - raw numbers).

Event	12	12	18	24	27	27	34	57	73	103	115	121	127	133	
Net	S	E	S	S	E	S	S	S	S	S	S	S	S	S	
Vial ID	249	248	360	482	501	500	744	1059	1523	2151	2496	2599	2775	2866	Tot
Polychaeta	41	918	16	60	12	1	17	22	135	1	1	7	2	13	**1246**
Oligochaeta		1													**1**
Isopoda	10	84	3	20	16		17	1	1		1	4		12	**169**
Cirripedia			5												**5**
Copepoda (har)		1					5							1	**7**
Copepoda (cala)	45	200	3	13	14	2	22	3	19	2	1	2		23	**349**
Amphipoda	6	123	6	79	37	1	68		95	2	6	34	12	216	**685**
Cumacea	1	38		6	4			3	4			1		3	**60**
Decapoda			3			1									**4**
Leptostraca		1													**1**
Euphausiacea					3										**3**
Mysidacea	3	4							1		8				**16**
Ostracoda	5	52	5	19	6		14		2	1		23		8	**135**
Tanaidacea	2	20		6	2			1						2	**33**
Nematoda		48		1			2		3		1				**55**
Bivalvia	9	69	8	28	32	1	9	3	5		3	6		9	**182**
Gastropoda	30	242	9	27	38	2	7	13	1	1	6	7		23	**406**
Aplacophora	4	50		1			10		1						**66**
Scaphopoda		1		13	11										**25**
Sipunculida		1		3					2						**6**
Asteroidea	1	3			1		1				1	2		1	**10**
Echinoidea	1				1							1			**3**
Holothuroidea	13	101		3					8			2			**127**
Ophiuroidea	1	9		4	11		10	1	1		2	9	5	1	**54**
Pantopoda	1	11	3	6			1				1				**23**
Hydrozoa	1								1						**2**
Anthozoa		46	3	2			6			1		4		8	**70**
Coronata											2				**2**
Bryozoa	5	81	1		1		2				3	1	12	5	**111**
Foraminifera		16													**16**
Komokiacea														2	**2**
Brachiopoda													1		**1**
Nemertini		10		11	1									1	**23**
Porifera		1	1				2				5	22	2		**33**
Platyhelminthes		2													**2**
Ascidiacea							1								**1**
Total	**179**	**2133**	**66**	**302**	**190**	**8**	**194**	**47**	**279**	**8**	**41**	**125**	**34**	**328**	**3934**

Abbreviations: har, Harpacticoida; cala, Calanoida; S, Supranet; E, Epinet; Tot, Total.

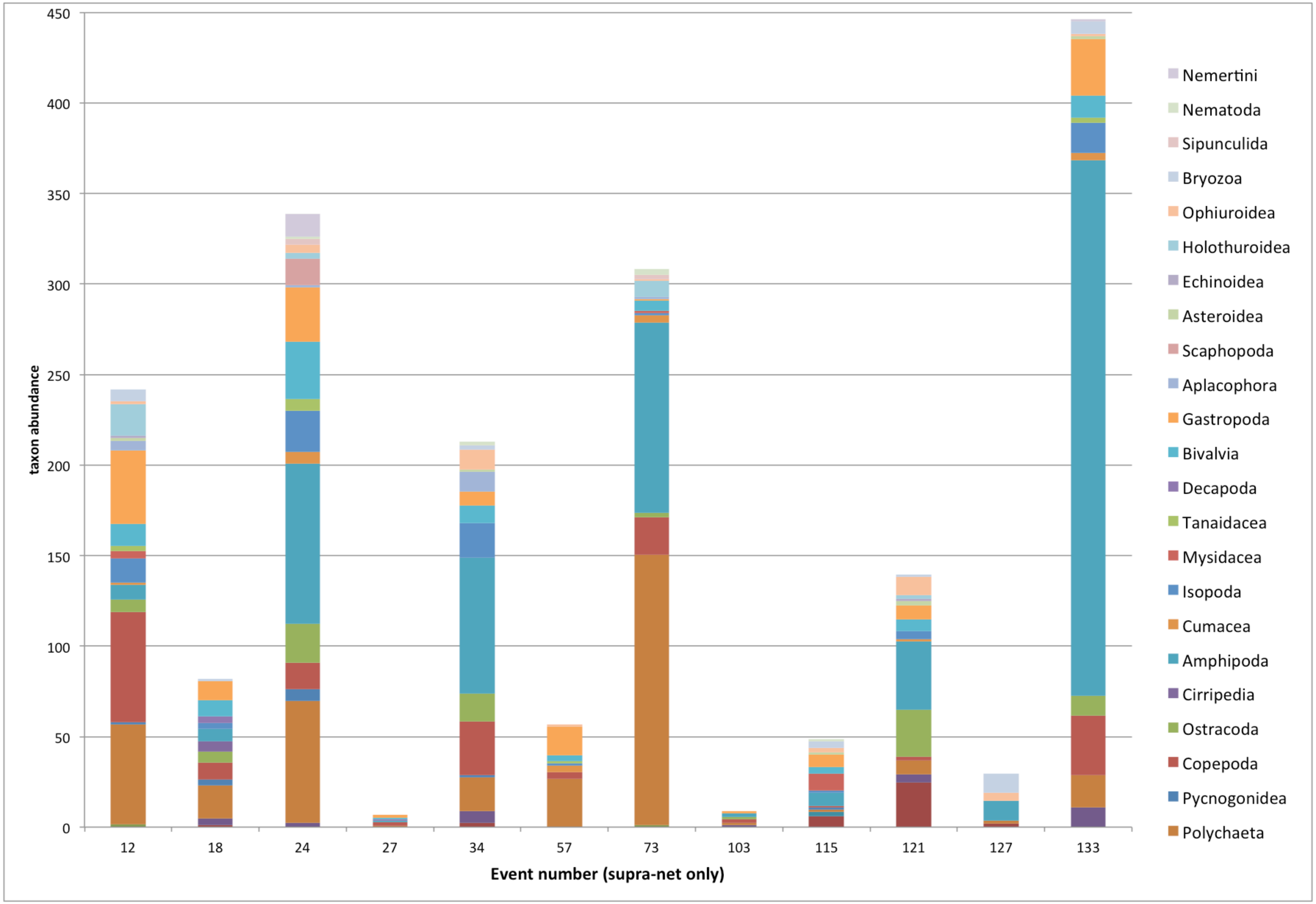

Figure 3.2. Abundance of taxa in the Supranet for each event. Only taxa which have been found more than once are included. Data are standardized to 1200 m^2 area.

On deck, the supra- and epi-nets were washed down into the cod ends using cold seawater. The cod ends were then transferred into iced seawater, gently sieved, and immediately transferred into chilled (-20°C) 96% ethanol. Samples were stored in a -20°C freezer for at least 48 h to reduce degradation of DNA for subsequent genetic studies. During this time, samples were gently rolled every three hours and, after 12 hours, the ethanol was changed if the quantity of material was sufficient to warrant it. Additionally, after every deployment, all sensor and video data were downloaded from the internal hard drives and memory cards.

After this 48-hour period, initial sorting of the samples to major taxonomic groups was carried out in the ship's laboratories using stereomicroscopes. During sorting, samples were kept on ice in order to avoid DNA decomposition (Riehl et al., 2014).

On board, the supranet samples, as well as two epinet samples, were sorted to higher-taxon level. In total 3934 individuals of 36 taxa were sorted and preliminarily identified. Of the five most frequently occurring taxa, Polychaeta was most numerous with 1246 individuals so far, followed by Amphipoda with 685, Gastropoda with 406, Copepoda with 369, and Isopoda with 169 individuals (Table 3.1).

Figure 3.2 illustrates the taxa counted at the different events, however, only taxa are included which have been found more than once in the EBS supra-net samples. Data in Figure 3.2 are standardized to 1200 m^2 swept area. Rank abundance of taxa from supra-net hauls only, standardised to 1200 m^2, (Figure 3.3), shows Amphipoda to be the most frequently occurring taxon in the supranet samples, followed by Polychaeta, Copepoda, Gastropoda and Bivalvia.

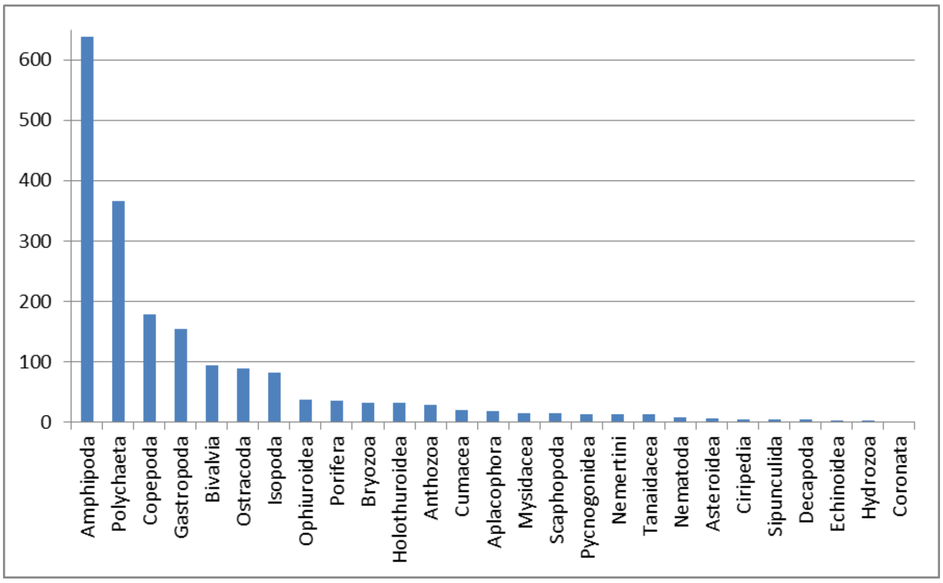

Figure 3.3. Rank abundance of taxa from supranet hauls only (standardised to 1200 m^2).

References

Brandt, A., Barthel, D. (1995) An improved supra-and epibenthic sledge for catching Peracarida (Crustacea, Malacostraca). *Ophelia* 43, 15-23.

Brattegard, T., Fosså, J. (1991) Replicability of an epibenthic sampler. *Journal of the Marine Biological Association of the United Kingdom* 71, 153-166.

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Riehl, T. Brenke, N., Brix, S.B., Driskell, A., Kaiser, S., Brandt, A. (2014) Field and laboratory methods for DNA studies on deep-sea isopod crustaceans. *Polish Polar Research* 35(2), 203-224.

4. Shallow underwater camera system (SUCS)

Louise Allcock, Huw Griffiths, Susie Grant, Cath Waller, Marc Eléaume, Peter Enderlein, Oliver Hogg, Rachel Downey, Helena Wiklund, Melanie Mackenzie

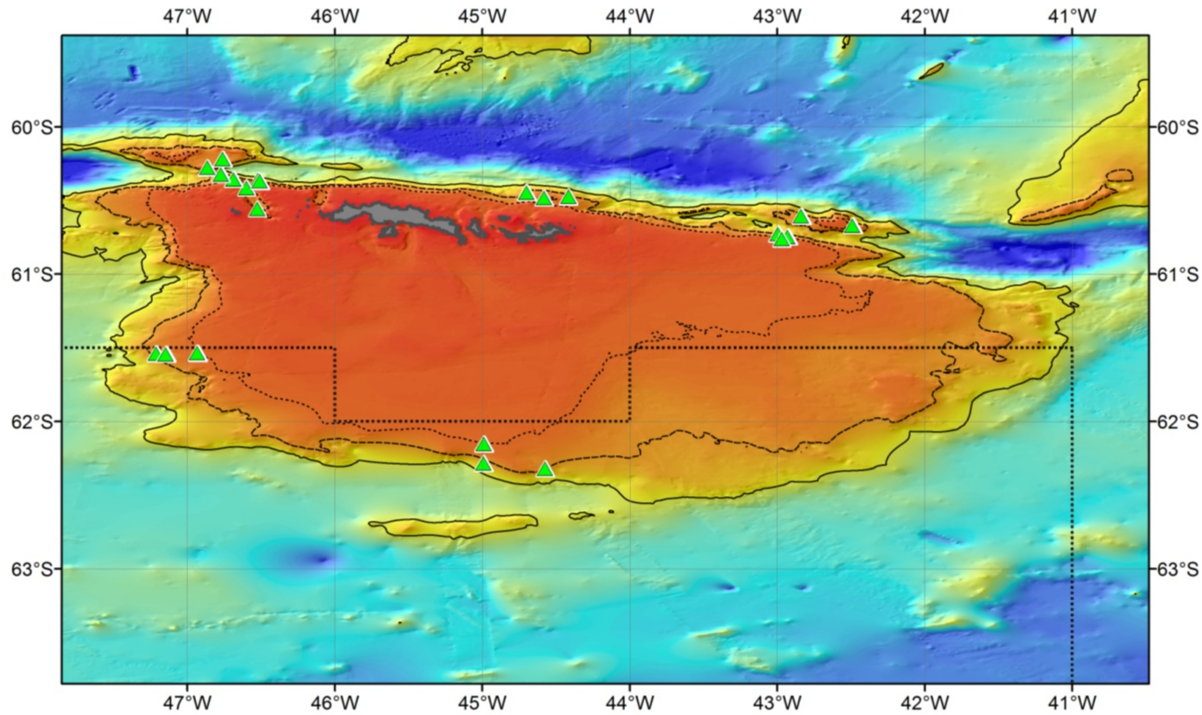


Figure 4.1. SUCS sampling locations for JR15005.

SUCS setup

During summer 2014 the SUCS (shallow underwater camera system) was upgraded, replacing the pre-existing coax cable with a fibre-optic system. The main aim of this upgrade was to rectify an issue whereby the software frequently crashed as a result of sudden changes in tension on the data cable (caused mainly be landing the system on the sea bed or through the roll of the ship in rough weather). Additional benefits to the new cable also included an increase in the system's depth rating from 300 m to 1000 m, higher definition video, and a higher resolution, live colour feed.

The SUCS for JR15005 comprised three units:

1. The UIC unit consisting of (i) the PC with monitor, (ii) the cable metering sheave indicator and (iii) the deck box.

2. The deck unit consisting of (i) the winch, (ii) UW-cable, (ii) the deck monitor and (iii) the metering sheave on the mid-ships gantry.

3. The UW-unit of the tripod consisting of (i) the UW-housing including the camera, booster

and power distribution board, (ii) the UW-light, (iii) the USBL pinger, and (iv) GoPro camera with 1000 m depth-rated housing.

New components to the SUCS system for 2014 included 1000 m of fibre-optic cable, fibre-optic connections at both the deck box and camera housing end, new 1000 m depth rated glass for the camera housing, and a slip-ring to accommodate separate power and fibre-optic cables. A further addition to the system (first implemented during JR308) is a GoPro camera fixed adjacent to the main UW-housing in its own purpose built 1000m depth-rated housing.

The modification of the LabView code together with the fibre-optic upgrade enabled high-resolution photo stills (2448 x 2050) and video footage (720 x 480) to be taken simultaneously for the first time.

Using SUCS during JR15005

The SUCS can be used to estimate faunal density, biomass and species abundance of the benthos, which is otherwise difficult to achieve because of the selectivity and semi-quantitative nature of capture by the AGT. In addition it gives an overview of the conditions of the underwater landscape. The SUCS and Agassiz gears, when both deployed at the same site, increase the value of the data obtained. This is because specimens trawled in the latter and identified by detailed morphological inspection or using molecular methods improve the likelihood and confidence of correct identifications of individuals seen in the SUCS images.

Where weather permitted, the SUCS was deployed at 500 m, 750 m and just shallower than 1000 m depth (the latter being its max operating depth). Normal protocol involved three consecutive photo transects, the direction of which was determined by the bridge according to wind direction (to allow the ship to sit comfortably in dp), each 100 m apart, with each complete transect consisting of 10 photos, themselves each 10 m apart. At some locations the three transects were not completed because of rising weather or icebergs in close vicinity to the ship. “In between” photos were occasionally taken during the 10 m relocation if the camera touched bottom and revealed interesting communities, however these were not included in subsequent analysis. The mounted GoPro video camera attached to the camera frame was used to record the entire event. While this footage is not easy to analyse quantitatively, because of the distorting effects of the fisheye lens and the wider field of view, it complements that of the main SUCS and can be used to help characterise the seabed.

Table 4.1. SUCS deployments at each depth and site, including event numbers and details of number of transects undertaken and photos recorded (Ev# / # of transects / # of photos)

Site / Depth	500 m	750 m	950 m
West	Ev8 / 3 / 29	Ev14 / 3 / 30	Ev20 / 3 / 30
South	Ev35 / 3 / 21	Ev36 / 3 / 30	Ev42 / 2 / 20
North West Trough	Ev60 / 1 / 10	Ev58 / 1 / 5	
North West	Ev64 / 2 / 20 Ev78 / 3 / 30	Ev67 / 3 / 30 Ev87 / 2 / 20	Ev72 / 3 / 30
North	Ev89 / 1 / 10	Ev99 / 3 / 30	Ev97 / 3 / 31
North East	Ev111 / 3 / 30 Ev129 / 3 / 30	Ev117 / 3 / 30 Ev135 / 3 / 30	Ev123 / 3 / 31

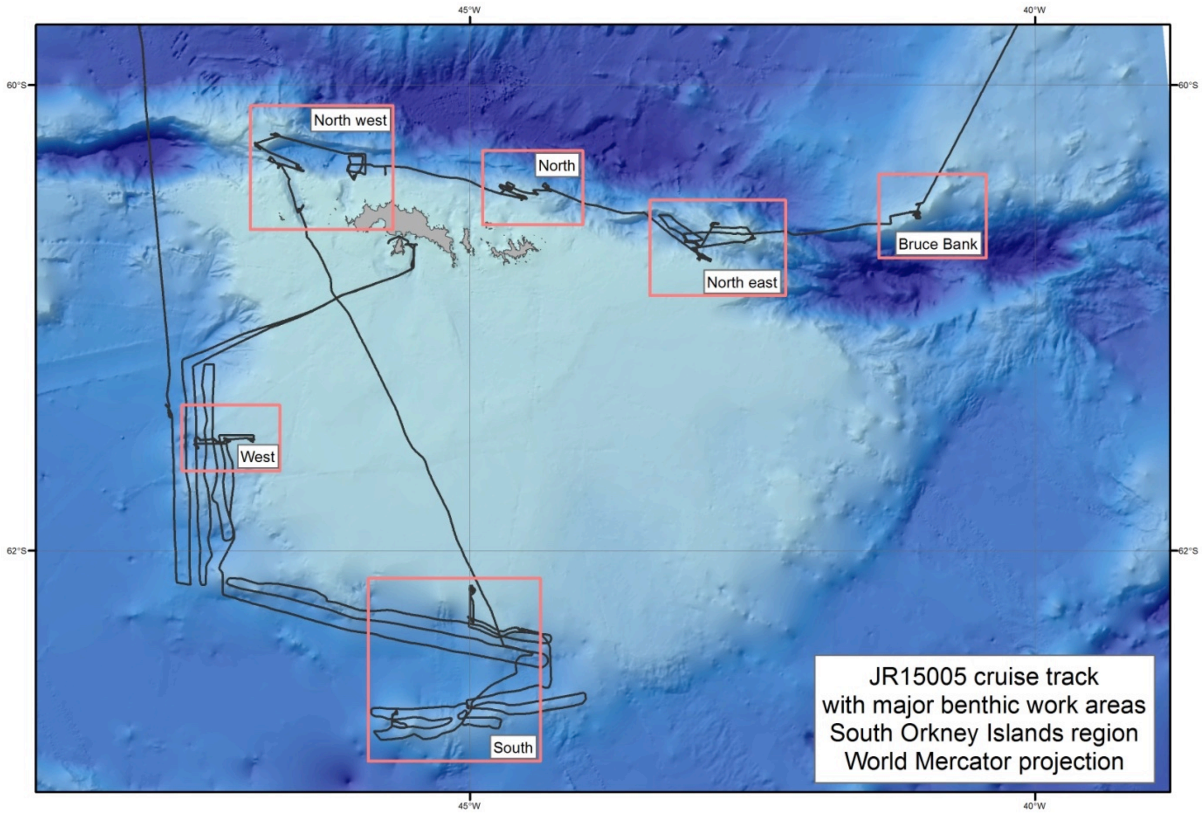
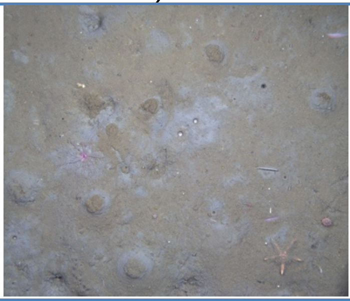
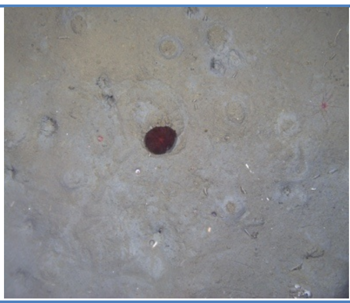


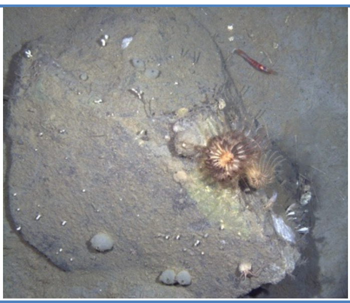
Figure 4.2. Regional map of JR15005 sampling and photographic locations

REPRESENTATIVE SUCS IMAGES FROM EACH EVENT

EVENT 8 **West – 500 m**	Mud bottom, with echinoderms (cucumbers, starfish and urchins) the dominant macrofauna.

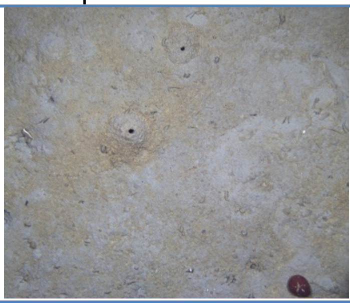




EVENT 14 **West – 750 m**	Mud bottom, with infaunal cucumbers, and intermittent rocks with epifauna.

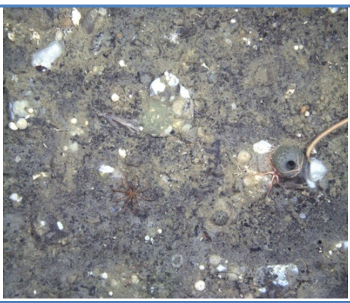


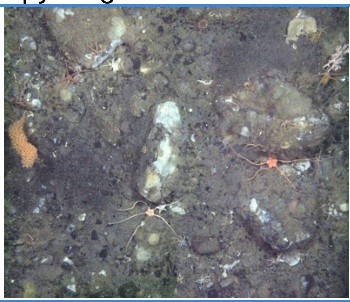
EVENT 20 **West – 900 m**	Mud bottom with urchins and shrimp





EVENT 35 **South – 500 m**	Mixed substrate with mud and small rocks with occasional sponges and octocorals and mobile epifauna, e.g., ophiuroids and pycnogonids.





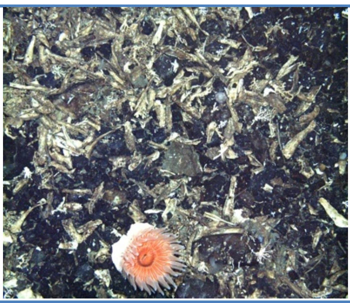
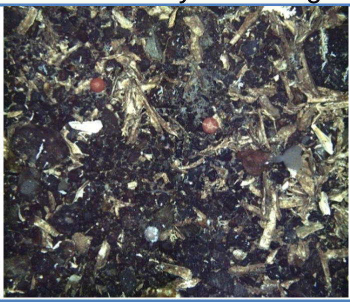
EVENT 36
South – 750 m

Gravel and small boulders with encrusting epifauna. Starfish dominate mobile fauna.



EVENT 42
South – 900 m

Substrate of barnacle plates, with anemones, ascidians, and a diversity of coral groups.

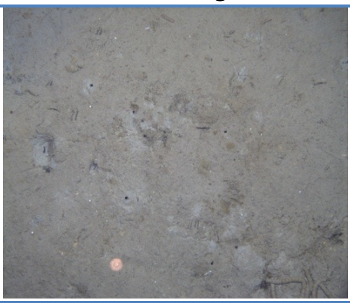

EVENT 58
North West Trough – 750 m

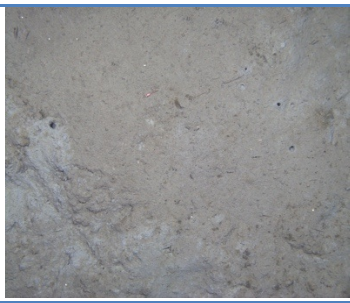
Mud with little visible macrofauna



EVENT 60
North West Trough – 500 m

Mud with little visible macrofauna

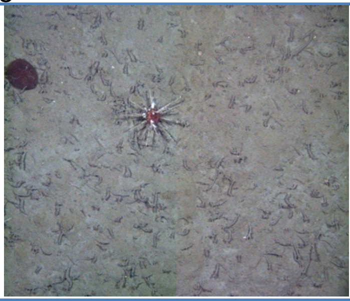




EVENT 64
North West – 500 m

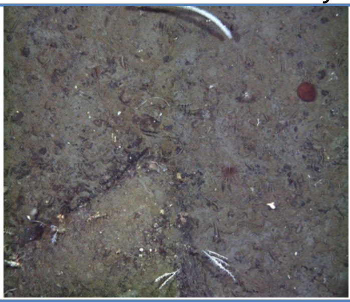
Mud with worm tubes, pycnogonids and urchins.





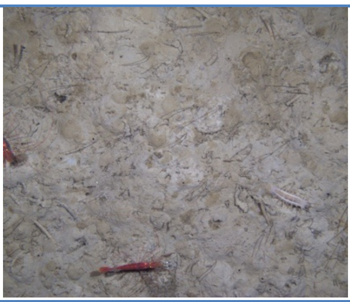
EVENT 67
North west – 750 m

Mud with worm tubes, pycnogonids, and urchins. Occasional rocks with bryozoans and corals.


EVENT 72
North West – 900 m

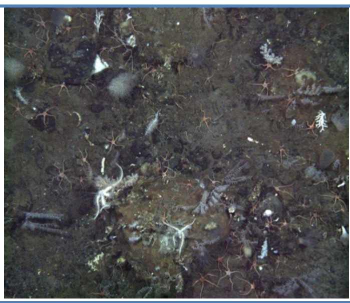
Mud, with worm tubes, solitary hydroids, sea cucumbers and shrimps.



EVENT 78
North west – 500 m

Gravel, sand and rocks, with octocorals, bryozoans and anemones and mobile echinoderms.





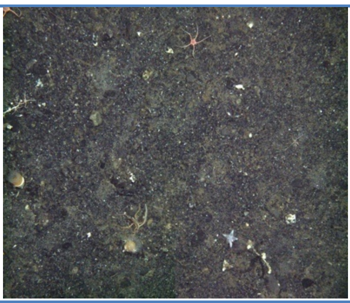
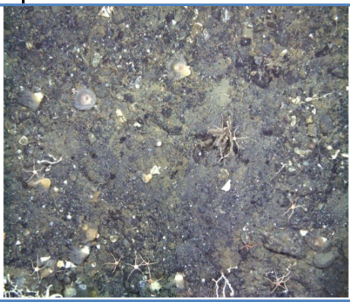
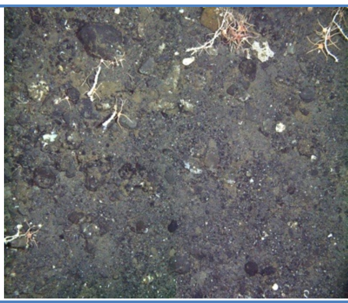
EVENT 87
North West – 750 m

Mud with worm tubes, pycnogonids and urchins.



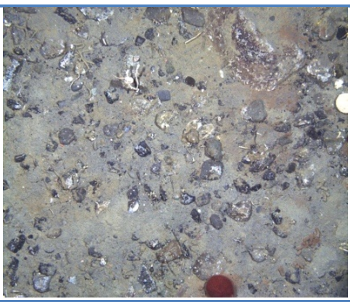
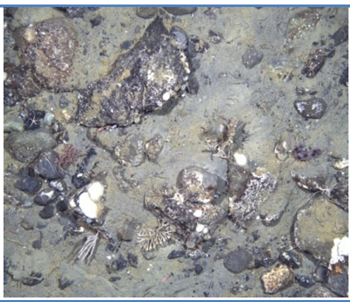
EVENT 89
North - 500 m

Gravel and sand, with cupcorals, octocorals and ophiuroids.

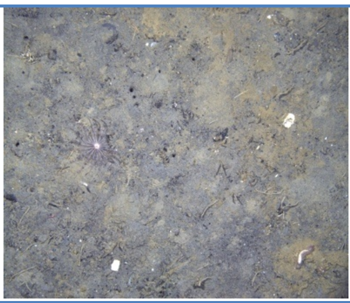
EVENT 97
North – 900 m

Sand with stones and rocks, with bryozoans and octocorals.


EVENT 99
North – 750 m

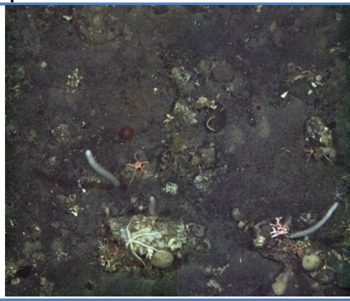
Sand with small stones, with bryozoans and occasional octocorals.


EVENT 111
North East – 500 m

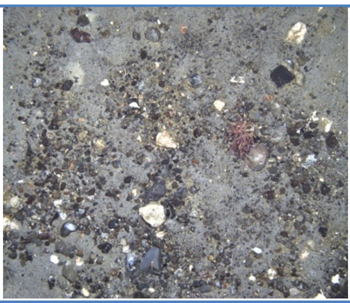
Gravel and small rocks, with large and small sponges, bryozoans, octocorals and cup corals.

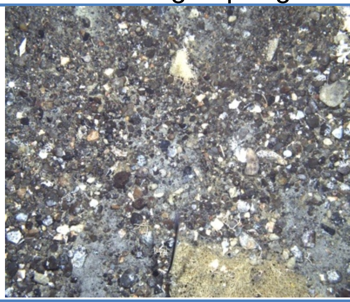




EVENT 117
North East – 750 m

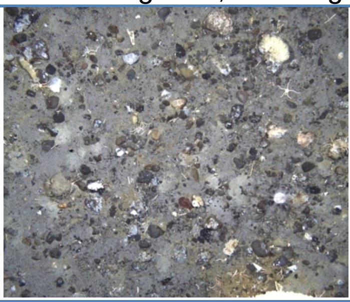
Gravel, with bryozoans and occasional large sponges





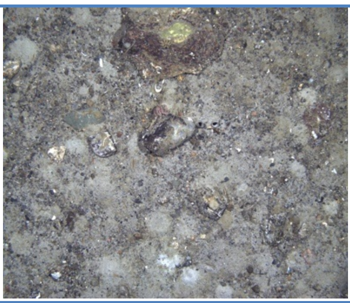
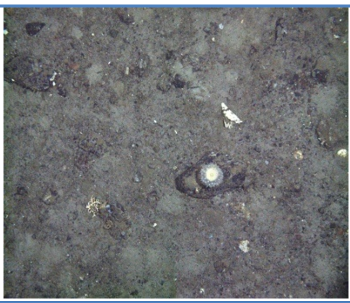
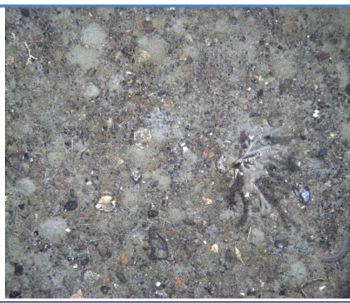
EVENT 123
North East – 900 m

Sand and gravel, with large and small sponges


EVENT 129
North East – 500 m

Sand and small rocks, with bryozoans, anemones, and octocorals.

EVENT 135
North East – 750 m

Sand and rocks and large boulders, with bryozoans and corals.



5. Polychaete diversity

Madeleine Brasier, Helena Wiklund

Aims

Previous collaborations between the polychaete research group at the UK Natural History Museum (NHM UK) and British Antarctic Survey have led to an accumulation of diversity and biogeographic records of Antarctic polychaetes. Morphological and genetic analyses of these polychaetes have uncovered new species as well as allopatric and sympatric cryptic species. The collection of polychaetes on JR15005 will complement this research and increase the biogeographic coverage of the samples with the potential to investigate the genetic diversity and connectivity between Antarctic regions. Furthermore, sampling within and around the South Orkney MPA could provide insight into the abundance and distribution of Serpulidae polychaetes that are currently listed as VME taxa. Our main aims during JR15005 were to live sort and photograph polychaetes collected in the Agassiz Trawl (AGT) and Epi-Benthic Sledge (EBS) subsample, identify them to family level and, when possible, assign them to morphospecies. The resulting preliminary abundance and diversity data of polychaetes within the sampling area are presented here, while a more detailed account will be provided after further study on land.

Figure 5.1. Some of the polychaete morphotypes photographed onboard.

Methods

Polychaetes were collected using both the AGT and EBS. Only a small subsample was taken from the epi-net of some of the EBS samples for live sorting on board. All polychaetes were sorted into morphotypes, most of which were identified to at least family level whenever possible, and photographed using a Canon EOS 700D mounted on a Leica MZ7 stereo microscope (Figures 5.1, 5.2). Whenever polychaetes were found in association with another taxa this was noted, including the species name and JR15005 ID number of the associated taxa. All specimens were preserved in 96% ethanol for future morphology and DNA analyses.

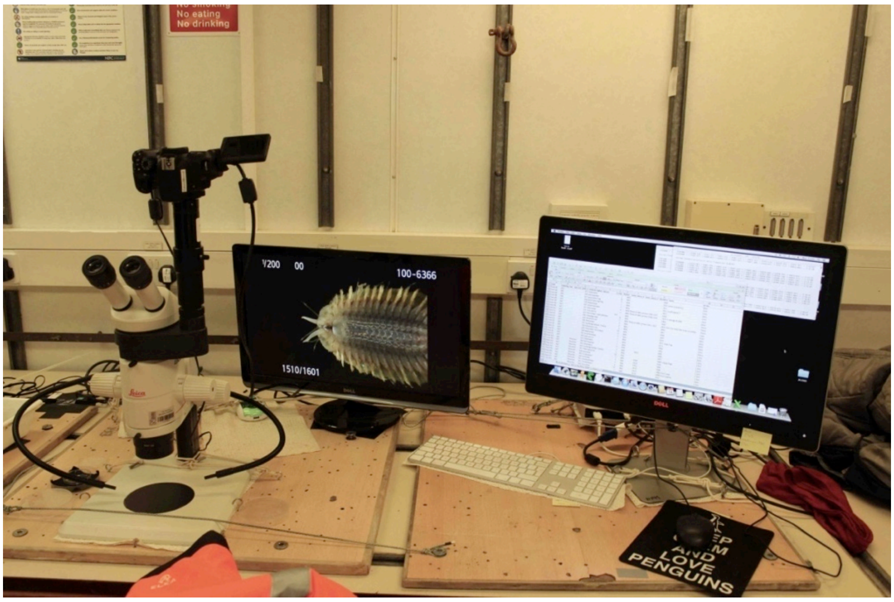


Figure 5.2. Camera setup with Canon EOS 700D mounted on a Leica MZ7 stereo microscope.

Preliminary findings

Polychaetes were found in 25 of the 28 AGT sampled stations, absent only at 2000 m depth in the North, at 750 m depth in the North West Trough and at 1500 m depth in the West regions. In total, around 15,000 annelids were caught with the AGT. However, there were large amounts of tubes, and the main bulk of these was discarded after subsampling, leaving about 2000 annelid specimens preserved from the AGT. Upon the completion of sampling, an estimated species number was calculated from the number of morphotypes photographed. Thus our estimate of species number is very conservative and we expect to uncover more species in later sorting and additional DNA analyses back at the Natural History Museum. There is also a higher number of species expected from the EBS and Rauschert dredge samples that have not been sorted on board.

Polychaetes from 28 families were recorded from the live sorting, in total 1369 specimens. A rough species identification based on live photographs gave 82 morphospecies, see Table 5.1. In addition, some samples were bulk fixed and number of individuals were estimated, this was mainly spirorbid serpulids on floating kelp, and a large number of mud tubes containing both ampharetid polychaetes and nemerteans. These, together with some annelid taxa that are not currently covered by the polychaete group, are listed in Table 5.2.

Table 5.1. Number of individuals and morphospecies in families.

Family	# individuals	# morphospecies
Ampharetidae	66	5
Amphinomidae	9	1
Aphroditidae	114	2
Capitellidae	6	2
Cirratulidae	4	2
Dorvilleidae	7	2
Eunicidae	28	2
Euphrosinidae	1	1
Flabelligeridae	22	3
Glyceridae	5	1
Hesionidae	7	1
Lumbrineridae	17	1
Maldanidae	172	3
Nephtyidae	6	1
Nereididae	63	4
Onuphidae	20	2
Paraonidae	6	2
Phyllodocidae	43	7
Polychaeta	25	unknown
Polynoidae	219	15
Sabellidae	65	2
Scalibregmatidae	22	1
Serpulidae	13	3
Sphaerodoridae	2	1
Spionidae	25	2
Sternaspidae	101	1
Syllidae	55	5
Terebellidae	214	9
Trichobranchidae	3	1
Tube worms	29	unknown
	1369	82

Table 5.2. Bulk fixed material and Annelida groups not currently covered by the polychaete group.

Taxa	# individuals
Echiura	5
Hirudinea	4
Serpulidae	400
Sipuncula	7
Tubes	895
	1372

The polychaete family Polynoidae was most abundant (excluding Serpulidae on kelp and yet uncounted possible Ampharetidae in tubes) and also most species rich, with 219 specimens and at least 15 morphotypes (Figure 5.3).

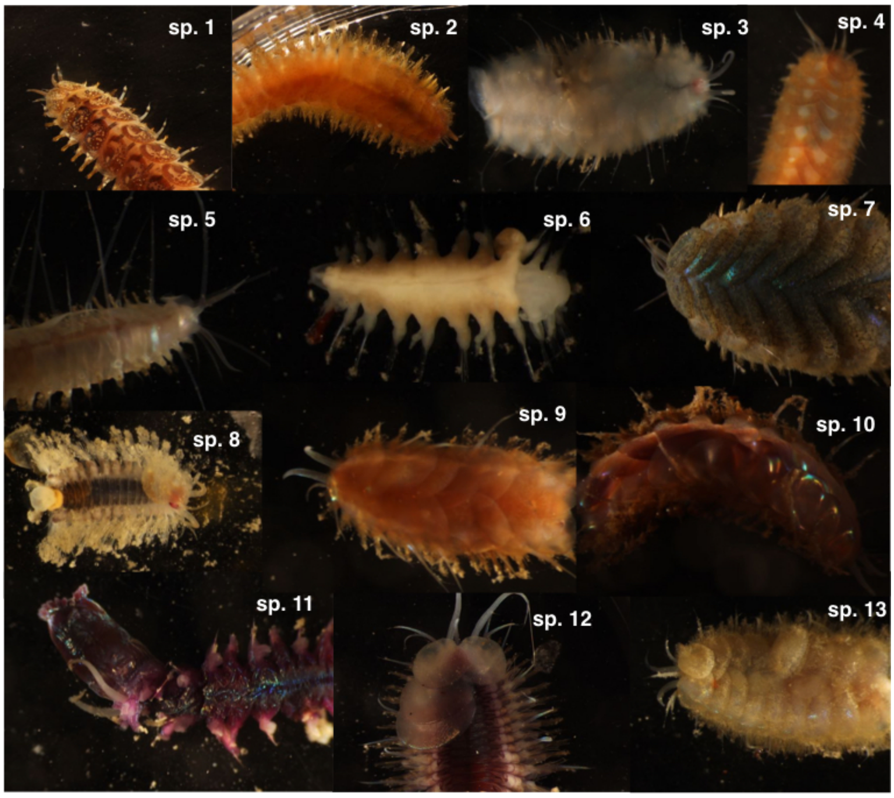


Figure 5.3. Thirteen of the 15 morphotypes in the family Polynoidae.

The most abundant polychaete association found during JR15005 was a Polynoidae morphospecies found on several octocorals species (Figure 5.4). These polynoids were only collected in AGT deployments where octocorals were also recovered. Thus it is likely that there is a significant relationship between them. Previous studies investigating this relationship from other regions have described these polychaetes as obligate symbionts. We are hoping to secure funding to DNA barcode these individuals to genetically determine the number of species found on these octocorals as well as the level of connectivity between the localities in which they were collected. The use of compound specific stable isotope analysis to define the trophic level of these polynoids would also provide insight into the functional relationship between the individual polychaetes and their host. Most polynoids are classed as predator scavengers so they could be acting as cleaner species or protecting the octocorals from predation by other taxa.

Figure 5.4. Polynoidae sp. associated with octocoral.

The polychaete family Serpulidae is listed as a VME taxon as the tubes may form reef-like habitats and might constitute a structure for other organisms to inhabit. On this cruise only three morphospecies of Serpulidae were recorded and, apart from large aggregations of spirorbins on floating kelp, they were solitary specimens on hard substrates (Figure 5.5).

Figure 5.5. Serpulid species collected at 500 m depth.

One species new to science was discovered on board, a species in the genus *Ophryotrocha*, family Dorvilleidae. However, more new species are expected when the collected material is studied in more detail on land using light microscopes, SEM and molecular data.

6. Holothuroids

Melanie Mackenzie

Aims

With the JR15005 SO-AntEco cruise focus on vulnerable marine ecosystem (VME) taxa, I joined the team as a holothuroid (sea cucumber) taxonomist to identify species found in the region. VME taxa, as defined by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), are chiefly slow-growing, habitat-forming or other niche groups such as sponges, corals and chemosynthetic communities. Holothuroids themselves are not classified as VME indicator species, however they are a visible and often dominant component of many Antarctic and sub-Antarctic benthic habitats, and are often found in association with VME taxa. In this assessment of the South Orkney Islands ecosystem, my chief aim was to collect and identify holothuroid species, record any associations and habitats (particularly for holothuroid species found in association with important VME indicator groups), and to ensure methods of preservation were of a standard high enough for lodgement in appropriate institutions for further taxonomic and molecular studies. Preliminary identification of specimens during the expedition will be followed by more thorough examination post-cruise when the specimens are sent to Museum Victoria. Any new species will be described in taxonomic papers and voucher specimens will be lodged in collections at British Antarctic Survey, the Natural History Museum, Museum Victoria, and other institutions as appropriate. The use of deployed camera systems (SUCS) to image-capture habitats and species, along with photography of live and preserved specimens, will help to build identification guides for more accurate field and laboratory identification.

Due to their relative abundance and size, holothuroid specimens were also used in projects by other cruise scientists. This included samples taken from detritus feeding holothuroids (Aspidochirotida and Elasipodida) to see whether isotope analysis revealed decapods in their diet (Vassily Spiridonov), and coelomic fluid taken from Elpidiidae as part of an assessment of pH levels in Antarctic echinoderms (Bruno Danis and Camille Moreau). A kelp project run by Cath Waller in conjunction with JR15005 also captured holothuroids. Kelp from the Falkland Islands included Dendrochirotida (Cucumariidae) burrowing in the holdfast along with a small number of worm-like Apodida. Sea cucumbers were not found on the floating kelp caught on the way to the South Orkney Islands and close to South Georgia.

Collection Methods

Holothuroid specimens were collected from the three benthic sampling methods – Agassiz Trawl (AGT), Rauschert dredge, and epi-benthic sledge (EBS).

In the more barren regions (e.g. along the slope of the western plateau of the South Orkney Islands) the AGT collected mostly larger benthic species of holothuroid e.g. aspidochirotids and elasipodids (with more seen on camera) along with a small number of apodids and dendrochirotids. The large numbers of burrowing dendrochirotid sea cucumbers seen on camera were not always reflected in the AGT catch. The smaller gelatinous elasipod species such as *Rhipidothuria racowitzi* Hérouard, 1901 were often difficult to detect in the catch, being translucent and sometimes masked by detritus. Holothuroid hotspots are highlighted in Figure 6.1 below.

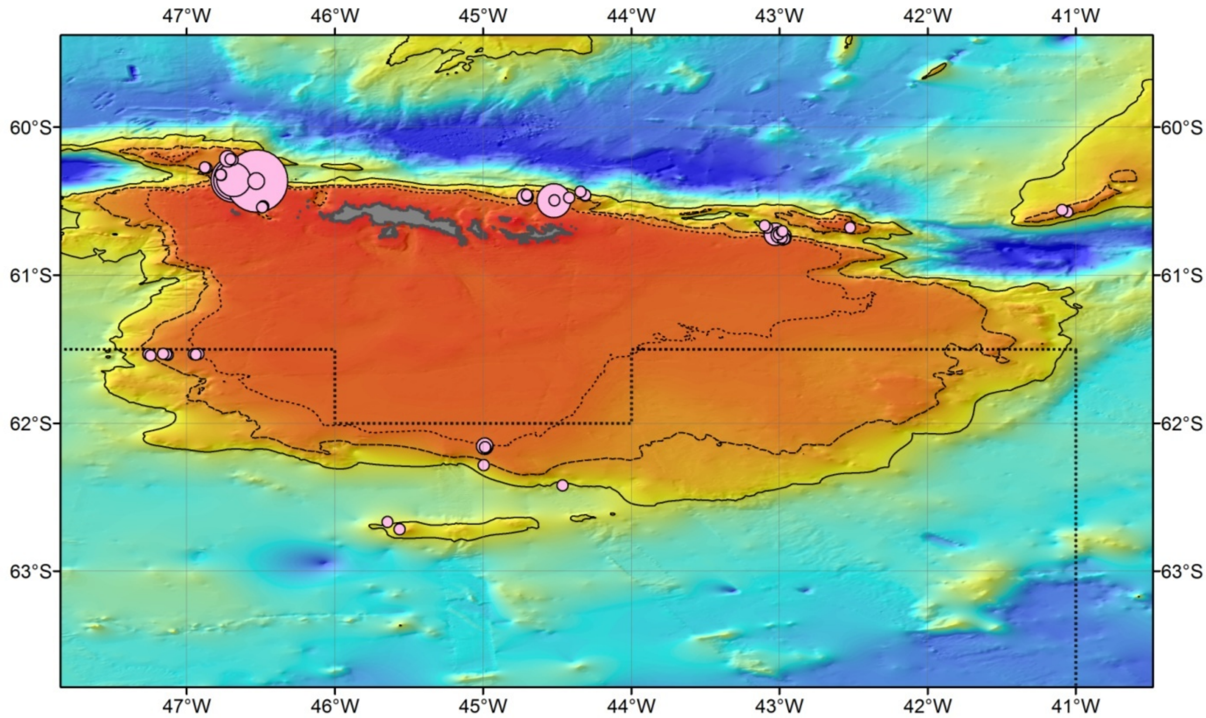


Figure 6.1. Relative holothuroid abundance showing a hotspot in the North West at 1000 m.

Suspension-feeding dendrochirotids were always attached to rocks, corals, bryozoans or pencil urchins. The latter three associations (Figure 6.3) were of particular interest with hosts being from the VME list. Of these the most common associations seen were *Echinopsolus* (Cucumariidae) and *Psolus* (Psolidae) species living on pencil urchins (Echinoidea: Cidaroida). There had also been an expectation of association with sponges (as was the case in the Weddell Sea on JR275), however this was not noted, perhaps due to the comparatively smaller size of many of the sponges and/or the fragility of larger sponge samples.

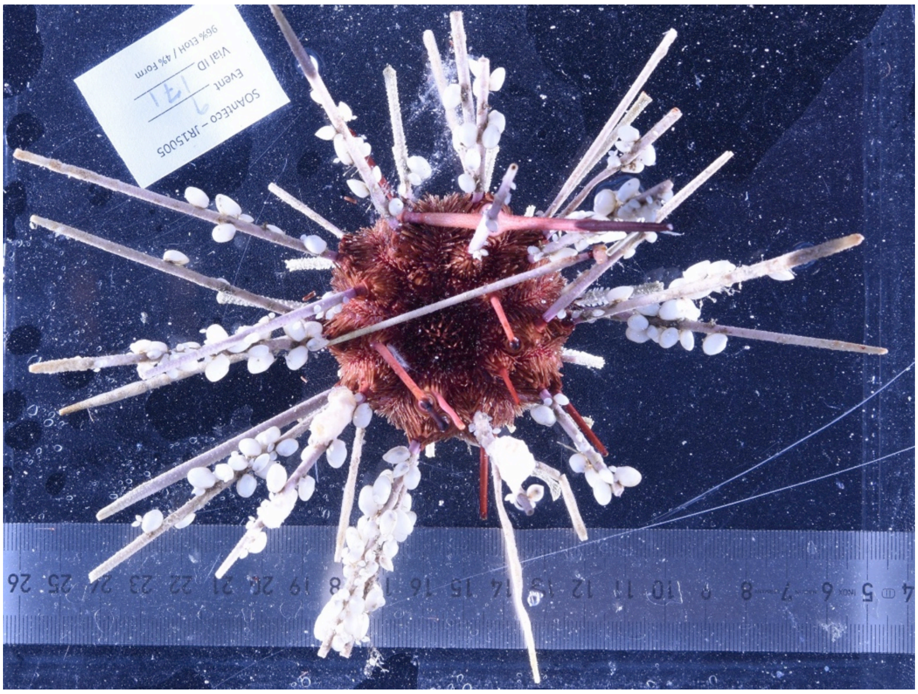


Figure 6.2. Dendrochirotid holothuroids and bivalves living on pencil urchin spines. Photo: Claudio Ghiglione.

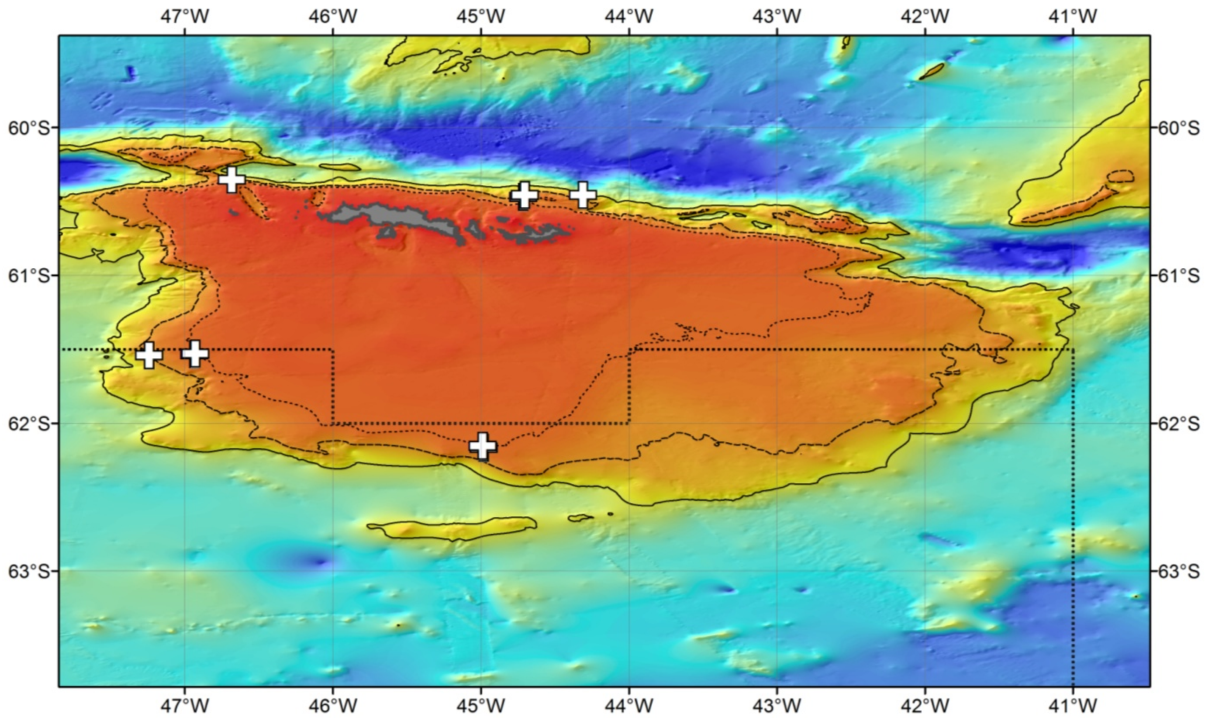


Figure 6.3. Location of holothuroid associations with VME indicator species.

The Rauschert dredge was deployed alongside the AGT at a number of stations in the hope that it would collect a smaller amount of better-preserved specimens (i.e. specimens not crushed by the weight of the larger AGT net contents). Where there was time to process both samples together, similar holothuroids to those found in the AGT were found in the Rauschert, including some associated with pencil urchins. The EBS with its mesh size of 500 µm collected smaller, more delicate specimens (mostly Dendrochirotida and Apodida) though some of the smaller Elpidiidae (Elasipodida) were also collected in good condition, and only a selection of these samples were rough-sorted on board (see Chapter 3). More specimens, including some potentially new to science are expected to be found after full sorting of the EBS and Rauschert dredge material, and after thorough examination of all specimens back at Museum Victoria. Shallow Underwater Camera System (SUCS) images (Figure 6.4) captured the presence of large species (which was also reflected in the trawls). Some of the larger species of Aspidochirotida and Elasipodida may be identifiable through further examination of footage from the SUCS along with the GoPro deployed with this system and a digital underwater video camera system (DWCS) attached to the EBS.

Figure 6.4. Examples of SUCS images showing the largest Antarctic holothuroid, the aspidochirotid *Bathyplotes bongraini* (Vaney, 1914) and an elasipodid sea pig *Protelpidia murrayi* (Théel, 1879).

It is unlikely that the burrowing sea cucumbers (not collected by the trawl) will be identifiable beyond Order level (Dendrochirotida) from footage, though some examples of the burrowing cucumariid *Echinopsolus charcoti* (Vaney, 1906) were found in the trawl.

Preliminary processing and Photography

As there were two scientific shifts, specimens could at best only be split into basic morphotype groups during initial processing, however live colour photos of specimens and associations were taken where possible by a variety of scientific personnel using different camera systems (Figure 6.5). Few specimens were relaxed enough post-trawl to extend their tentacles but photographs can still give an indication of live colour and size. Samples were fixed in 95% ethanol for further morphological and molecular analysis. Ample amounts of ethanol were used to ensure complete coverage, as concentration is expected to drop to

75-85% during transit due to the water content of specimens. Post-fixation (allowing for at least 24 hours in ethanol), many of the specimens were examined under a stereomicroscope and notes taken on identifying features such as tube foot and tentacle arrangements, dimensions, colour, skin texture etc. Specimen lots were split as required, given initial identifications (to order, family, genus or species level), and also photographed to build up the bank of 'live' vs 'preserved' photos of Antarctic holothuroids.

Figure 6.5. Tube feet of *Echinopsolus* species (left) allowing it to cling to the spines of a VME pencil urchin (upper right). Commonly found on the same urchin as *Psolus* species (lower right). Photos: Mel Mackenzie

More accurate identification of material sent to Museum Victoria will involve sampling the remnant skeletal elements (ossicles) from specimen tentacles and body wall (Figure 6.6). Samples will be cleared for observation using commercial bleach and examined under a compound microscope or SEM.

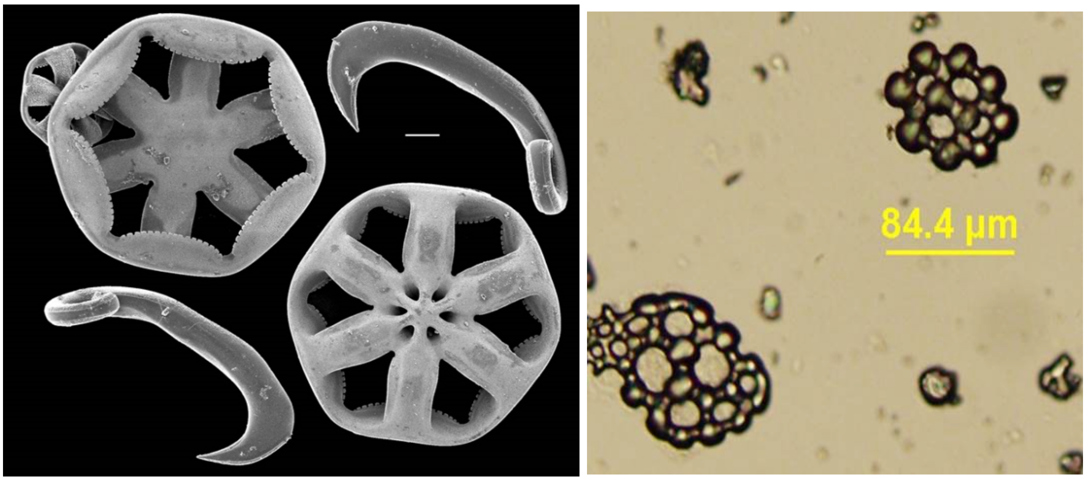


Figure 6.6. Holothuroid ossicles visible via SEM (Photo: Didier VandenSpiegel) or under a compound microscope (Photo: Melanie Mackenzie).

Preliminary Results

In total, 1157 holothuroid specimens were collected from 59 AGT samples (with Rauschert and EBS material still being processed). Relative abundance of holothuroids collected from AGT nets on JR15005 shows that greatest abundance occurred in Events 74 and 75 (~ 1000 m depth) in the North West region of the South Orkney Islands (Figure 6.1). Highest counts of individuals were found among the Elasipodida at ~1000 m and Dendrochirotida at ~ 500 m (Table 6.1).

Table 6.1. Holothuroids captured in AGT samples at each target depth

Target Depth (m) Order	500	750	1000	1500	2000	Total
Apodida*	31	8	27			**66**
Aspidochirotida	15	11	65	13	1	**105**
Dendrochirotida	298	67	44	9	9	**427**
Elasipodida	5	31	449		3	**488**
Molpadida	2	5				**7**
To be identified	61	2	1			**64**
Total	**412**	**124**	**546**	**22**	**13**	**1157**

*Apodida is used here for consistency with WoRMS (World Registry of Marine Species) database

7. Biodiversity of Asteroidea

Camille Moreau, Bruno Danis

Background

The South Orkney Islands and surrounding areas are thought to be a centre of diversification for many benthic groups including sea stars (Moreau et al., submitted). Using an extensive database of 14,000 georeferenced records informed at species level, it was found that 69 species had previously been reported around the South Orkney Islands representing ~23% of currently described species from the Southern Ocean *sensu lato* (Moreau et al., 2015).

Objectives

Sea stars (Echinodermata: Asteroidea) were collected during the JR15005 expedition to the South Orkneys as part of a census exercise carried out inside and outside an MPA (Marine Protected Area). The specific objectives were (i) to contribute to this exercise through the identification of the collected specimens (to the finest taxonomic resolution possible), (ii) to document the checklist with macro-photographic pictures (see, e.g., Figure 7.1), and (iii) to prepare subsamples for future DNA/RNA sequencing. Some of the specimens will be used for population genetic meta-analysis in order to delineate connectivities between various regions of the Southern Ocean and some will be used to give a better understanding of Asteroidea phylogeny.

Finally, a subset of the specimens was kept frozen for trophic ecology studies (using stable isotope analyses), which will be carried out in a later phase.

Preliminary results

In total, 609 specimens of sea stars were collected from 54 deployment locations using either an Agassiz trawl (AGT) or a Rauschert dredge (RD). Specimens were photographed alive when possible before preservation in 96% ethanol or being frozen at -20°C. Specimens were examined in more detail after preservation to try to identify specimens at genus level.

Sixty specimens were sub-sampled in RNA-later for development of genetic markers.

A first examination of ethanol preserved specimens allowed us to identify a total of 37 unique morphotypes representing all seven orders of the class Asteroidea. A more thorough identification will be carried out at the Université Libre de Bruxelles (ULB) using both morphological taxonomy and molecular tools (DNA barcoding of the Cytochrome Oxidase I gene) in order to confirm preliminary results. We provide a checklist of species previously reported in the South Orkneys and indicate which genera were identified during JR15005 (Table 7.1).

Table 7.1. Checklist of South Orkney Island Asteroidea species from previous reports. An asterisk indicates that the genus was found during JR15005.

Order	Family	Genus	Species	Scientific name
Brisingida	Brisingidae	*Odinella**	*nutrix*	*Odinella nutrix*
Forcipulatida	Asteriidae	*Anasterias*	*pedicellaris*	*Anasterias pedicellaris*
		Cryptasterias	*turqueti*	*Cryptasterias turqueti*
		*Diplasterias**	*brandti*	*Diplasterias brandti*
			brucei	*Diplasterias brucei*
		Kenrickaster	*pedicellaris*	*Kenrickaster pedicellaris*
		*Lysasterias**	*adeliae*	*Lysasterias adeliae*
			perrieri	*Lysasterias perrieri*
		*Notasterias**	*armata*	*Notasterias armata*
			bongraini	*Notasterias bongraini*
			pedicellaris	*Notasterias pedicellaris*
		Psalidaster	*mordax*	*Psalidaster mordax*
	Heliasteridae	*Labidiaster**	*annulatus*	*Labidiaster annulatus*
			radiosus	*Labidiaster radiosus*
	Stichasteridae	*Cosmasterias*	*lurida*	*Cosmasterias lurida*
		Granaster	*nutrix*	*Granaster nutrix*
		Smilasterias	*scalprifera*	*Smilasterias scalprifera*
			triremis	*Smilasterias triremis*
Notomyotida	Benthopectinidae	*Cheiraster**	*gerlachei*	*Cheiraster (Luidiaster) gerlachei*
			hirsutus	*Cheiraster (Luidiaster) hirsutus*
			planeta	*Cheiraster (Luidiaster) planeta*
Paxillosida	Astropectinidae	*Astropecten*	*brasiliensis*	*Astropecten brasiliensis*
		*Bathybiaster**	*loripes*	*Bathybiaster loripes*
		Leptychaster	*kerguelenensis*	*Leptychaster kerguelenensis*
		*Macroptychaster**	*accrescens*	*Macroptychaster accrescens*
		*Psilaster**	*charcoti*	*Psilaster charcoti*
	Ctenodiscidae	*Ctenodiscus*	*australis*	*Ctenodiscus australis*
	Luidiidae	*Luidia*	*clathrata*	*Luidia clathrata*
	Porcellanasteridae	*Eremicaster*	*crassus*	*Eremicaster crassus*
			vicinus	*Eremicaster vicinus*
	Pseudarchasteridae	*Pseudarchaster*	*discus*	*Pseudarchaster discus*
Spinulosida	Echinasteridae	*Henricia**	*obesa*	*Henricia obesa*
			studeri	*Henricia studeri*
		*Rhopiella**	*hirsuta*	*Rhopiella hirsuta*
Valvatida	Asterinidae	*Kampylaster**	*incurvatus*	*Kampylaster incurvatus*
	Ganeriidae	*Cuenotaster*	*involutus*	*Cuenotaster involutus*
		Cycethra	*verrucosa*	*Cycethra verrucosa*
		Ganeria	*falklandica*	*Ganeria falklandica*
		*Perknaster**	*aurorae*	*Perknaster aurorae*
			densus	*Perknaster densus*
			fuscus	*Perknaster fuscus*
	Goniasteridae	*Ceramaster*	*grenadensis*	*Ceramaster grenadensis*
			patagonicus	*Ceramaster patagonicus*
		*Chitonaster**	*trangae*	*Chitonaster trangae*
		Hippasteria	*falklandica*	*Hippasteria falklandica*
			phrygiana	*Hippasteria phrygiana*
		*Notioceramus**	*anomalus*	*Notioceramus anomalus*
		Pergamaster	*incertus*	*Pergamaster incertus*
	Odontasteridae	*Acodontaster**	*capitatus*	*Acodontaster capitatus*
			conspicuus	*Acodontaster conspicuus*
			elongatus	*Acodontaster elongatus*
			hodgsoni	*Acodontaster hodgsoni*
		*Odontaster**	*meridionalis*	*Odontaster meridionalis*
			penicillatus	*Odontaster penicillatus*
			validus	*Odontaster validus*

	Poraniidae	*Glabraster**	*antarctica*	*Glabraster antarctica*
	Solasteridae	*Crossaster*	*penicillatus*	*Crossaster penicillatus*
		*Lophaster**	*gaini*	*Lophaster gaini*
		*Paralophaster**	*antarcticus*	*Paralophaster antarcticus*
		*Solaster**	*regularis*	*Solaster regularis*
Velatida	Korethrasteridae	*Peribolaster*	*folliculatus*	*Peribolaster folliculatus*
			macleani	*Peribolaster macleani*
		*Remaster**	*gourdoni*	*Remaster gourdoni*
	Pterasteridae	*Diplopteraster*	*verrucosus*	*Diplopteraster verrucosus*
		*Hymenaster**	*crucifer*	*Hymenaster crucifer*
			praecoquis	*Hymenaster praecoquis*
			sacculatus	*Hymenaster sacculatus*
		*Pteraster**	*affinis*	*Pteraster affinis*
			stellifer	*Pteraster stellifer*

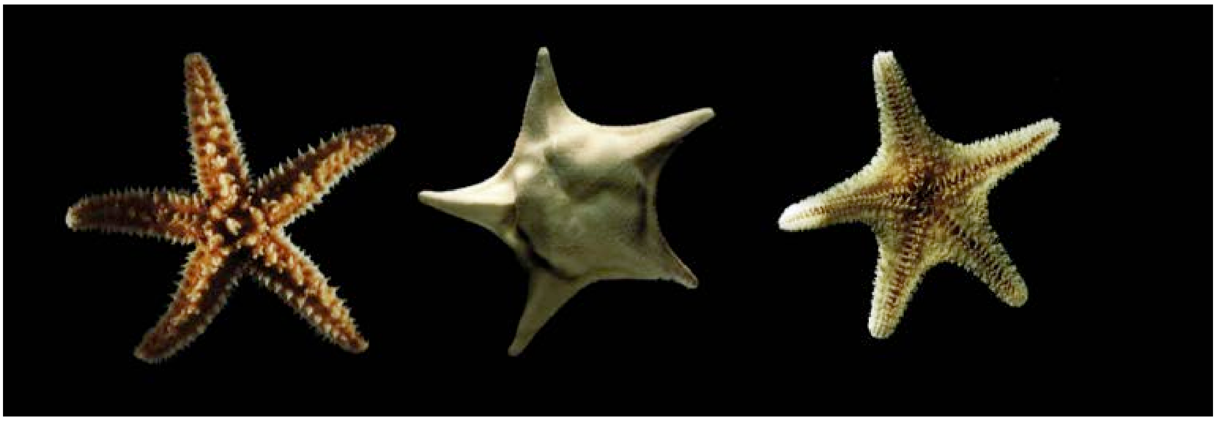


Figure 7.1. Examples of specimens collected during JR15005. From left to right: *Notasterias* sp., *Acodontaster conspicuus*, and *Chitonaster trangae*.

Twenty-three genera have been identified with a good level of confidence and at least two genera are newly reported from South Orkney Islands: *Myxaster* sp. (Figure 7.2) and *Tremaster* sp. (Figure 7.2). This number is likely to be an underestimation as some specimens could not be identified to genus level.

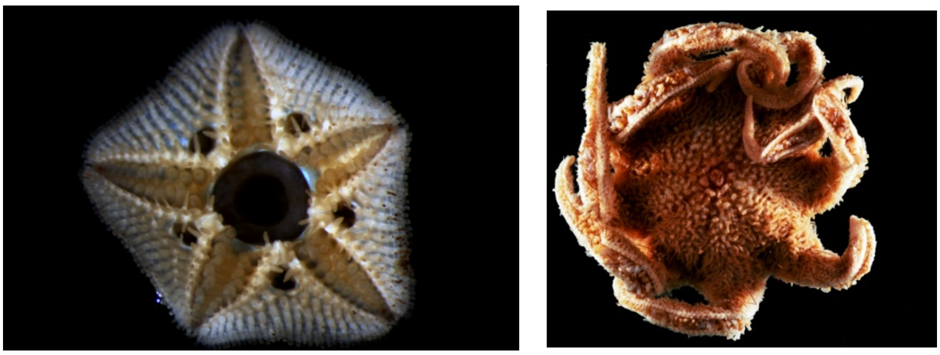


Figure 7.2. Oral view of *Tremaster* sp. (left) and aboral view of *Myxaster* sp. (right) both newly-reported from the sampling area.

Preliminary results indicate (Figure 7.3) that the abundance of Asteroidea in the South Orkney Islands is highest in the North.

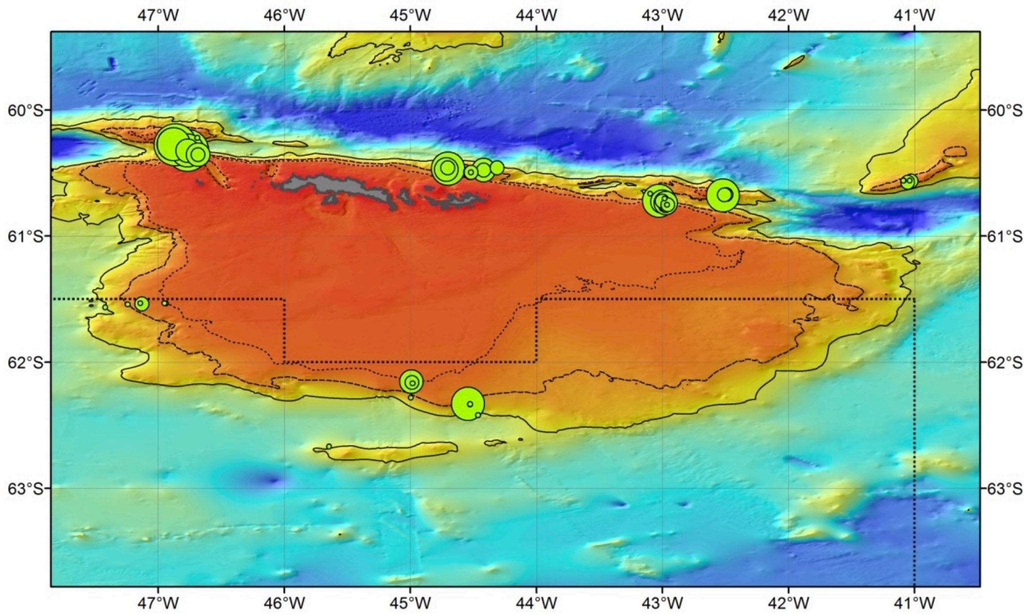


Figure 7.3. Counts of sea stars collected during the JR15005 cruise with symbol size relative to abundance.

References

Moreau, C., Saucède, T., Jossart' Q., Agüera, A., Brayard, A., Danis, B. (submitted) Reproductive strategy as a piece of the biogeographic puzzle: a case study using Antarctic sea stars (Echinodermata, Asteroidea).

Moreau, C., Agüera, A., Jossart, Q., Danis, B. (2015) Southern Ocean Asteroidea: a proposed update for the Register of Antarctic Marine Species. *Biodiversity Data Journal* 3, p.e706.

8. Crinoidea

Marc Eléaume

Objectives

Crinoids from the South Orkney Islands have never been studied in detail. This cruise therefore provides a good opportunity to describe species diversity and richness of the area and the distribution patterns of crinoids. The collected specimens will complement the extensive circumpolar crinoid collections held by MNHN and will give insight into gene fluxes between crinoid populations on a circumpolar scale. RNA-later samples will be used to design new genetic markers in order to solve deep nodes in the crinoid phylogeny.

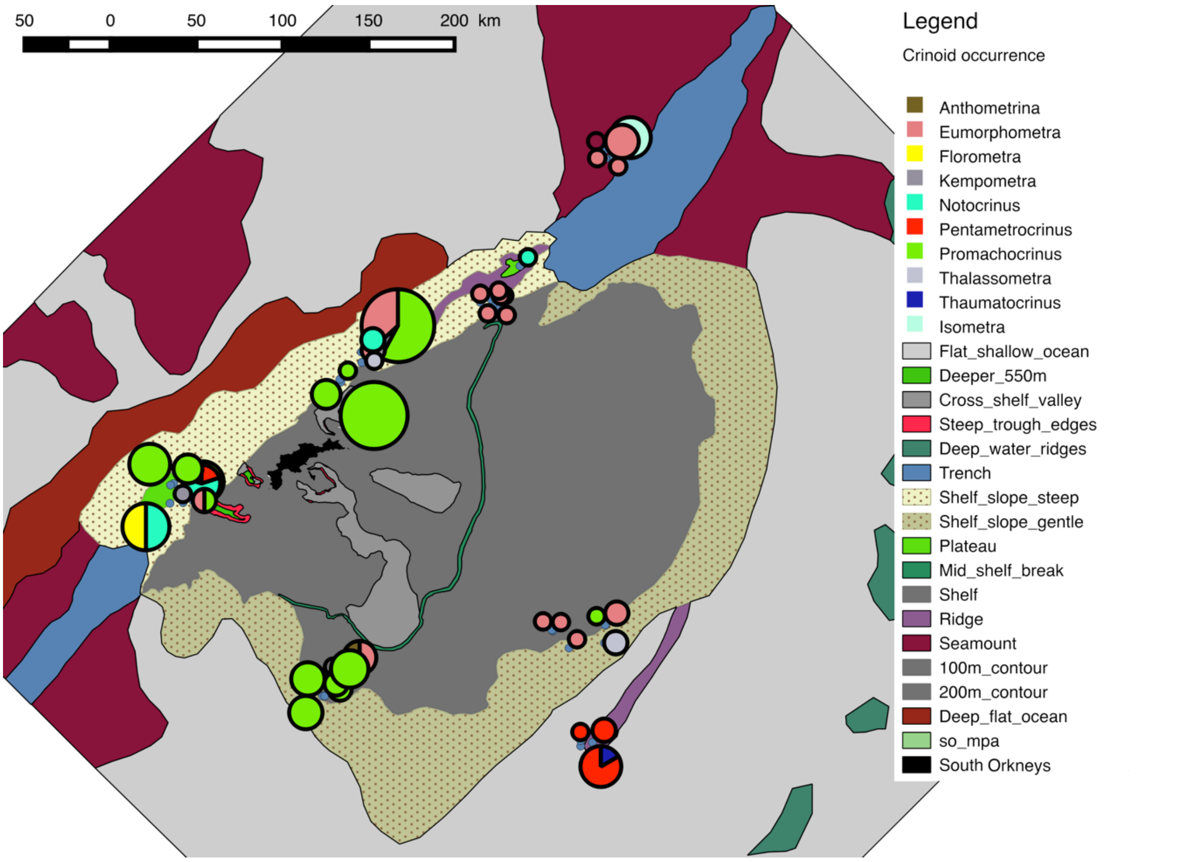


Figure 8.1. Crinoid species occurrence as observed from the catches during SO-AntEco. The map also displays the various habitats explored.

Methods

Crinoids were collected using an Agassiz trawl and using a Rauschert dredge attached to the Agassiz. All samples were sorted and either preserved in ethanol 96% and kept for the length of the cruise at -20°C, or preserved in RNA-later at +4°C.

Results

During SO-AntEco, 136 specimens were collected representing at least 10 species in 10 genera and 4 families (Table 8.1). In total, 108 specimens were preserved in 96% ethanol and 28 in RNAlater (Table 8.2).

Of the 10 species collected, two species, one Pentametricrinidae and one Thalassometridae, are thought to be new.

The most abundant species was *Promachocrinus kerguelensis* (Table 8.1) with 61 specimens collected. *Eumorphometra* (28) and *Notocrinus mortenseni* (10) were also fairly abundant. However, specimens attributed to *Eumorphometra* probably represent a complex of different species that needs a more thorough analysis.

Distribution patterns

Kempometra grisea is known from the South Shetland Islands at a depth of 830 m (Clark and Clark, 1967). *Kempometra grisea* was also collected from the Bransfield Strait (unpublished) at similar depths, confirming its presence in the South Shetlands area. We here extend its geographical distribution to the South Orkneys.

Notocrinus mortenseni is known from the Peninsula area including Bransfield Strait and the Shetlands. Here we extend its geographical distribution to the South Orkneys.

Anthometrina adriani is a circumpolar species restricted to the high Antarctic and not found off sub-Antarctic islands. In the South Orkney Islands, we collected a single specimen, which contrasts greatly with East Antarctica, for example, where only *P. kerguelensis* is more abundant.

Florometra mawsoni is circumpolar in distribution and is also found off sub-Antarctic islands. Although this species is generally very abundant, we only collected four specimens around the South Orkney Islands.

The genus *Isometra* is circumpolar in distribution and extends as far north as Uruguay. The genus only contains brooding species that don't seem to disperse very well. It has been shown that within one nominal species, *Isometra graminea*, several COI lineages can be detected, each related to a different locality. Here, the species could not be determined with certainty and molecular work will be necessary.

Table 8.1. Number of specimens of Crinoidea collected during SO-ANTeco cruise.

Event	*Anthometrina*	*Eumorphometra*	*Florometra*	*Kempometra*	*Notocrinus*	*Pentametrocrinus*	*Promachocrinus*	*Thalassometra*	*Thaumatocrinus*	unidentified	*Isometra*	*Total*
9	1	2								1		**4**
10										1		**1**
15							5					**5**
16							2					**2**
17							2					**2**
21							2					**2**
22							3			1		**4**
23							4					**4**
32		1										**1**
33		1										**1**
40		1										**1**
43		2										**2**
45							1					**1**
46						2						**2**
48						5			1			**6**
49						1						**1**
52								1		1		**2**
62		1					1					**2**
68				4			1			1		**6**
69		1			3	1						**5**
70				1								**1**
79			4		4							**8**
83							3					**3**
85							6					**6**
93							3					**3**
94							16					**16**
95							1					**1**
100		7		1			11					**19**
101		1		1								**2**
105								1				**1**
109					2							**2**
113		1										**1**
119										1		**1**
120		1										**1**
124		1										**1**
132					1							**1**
138R		1										**1**
140R		1										**1**
142											6	**6**
142R		1										**1**

143R		1										**1**
145R		4										**4**
148R										1		**1**
Total	1	28	4	7	10	9	61	2	1	7	6	**136**

Table 8.2. RNA-later preserved list of specimens.

VIAL_ID	GENUS	SPECIES	STORAGE
191	*Eumorphometra*		RNA LATER
192	*Eumorphometra*		RNA LATER
609	*Eumorphometra*		RNA LATER
672	*Eumorphometra*		RNA LATER
823	*Eumorphometra*		RNA LATER
842	*Eumorphometra*		RNA LATER
973	*Thaumatocrinus*		RNA LATER
1018	unidentified		RNA LATER
1302	*Promachocrinus*	*kerguelensis*	RNA LATER
1303	*Kempometra*	*grisea*	RNA LATER
1304	*Kempometra*	*grisea*	RNA LATER
1340	unidentified		RNA LATER
1341	*Kempometra*	*grisea*	RNA LATER
1408	*Promachocrinus*	*kerguelensis*	RNA LATER
1409	*Eumorphometra*		RNA LATER
1411	*Notocrinus*	*mortenseni*	RNA LATER
1484	*Kempometra*	*grisea*	RNA LATER
2111	*Eumorphometra*		RNA LATER
2112	*Eumorphometra*		RNA LATER
2113	*Eumorphometra*		RNA LATER
2120	*Eumorphometra*		RNA LATER
2121	*Kempometra*	*grisea*	RNA LATER
2256	*Notocrinus*	*mortenseni*	RNA LATER
2257	*Notocrinus*	*mortenseni*	RNA LATER
2529	unidentified		RNA LATER
2573	*Eumorphometra*		RNA LATER
2921	*Eumorphometra*		RNA LATER
3035	*Eumorphometra*		RNA LATER

Bathymetric distribution (Table 8.3)

Specimens were mostly collected at depths of 500-2000 m.

Promachocrinus kerguelensis was collected at depths of 750-1000 m. This species is eurybathic and extends from the shoreline to below 2000 m. It occurs in great abundance at shallower depths of around 500 m.

Kempometra grisea seemed to be restricted to a narrow depth range at approximately 750 m in the South Orkney Islands. This is similar to what has been seen previously in the South Shetlands, where it was first collected, and in the Bransfield Strait.

Notocrinus mortenseni was collected at all investigated depths. The specimens collected at 2000 m appear to differ, i.e. they potentially represent a new species of the genus.

Thalassometra sp. seemed to be restricted to depths greater than 1500 m.

Habitat distribution (Table 8.4)

Half of the specimens were collected from the « shelf slope steep » habitat. They were also well represented on the « Plateau » and « Shelf » habitats, but mainly because of the dominance of *P. kerguelensis* in these habitats.

Kempometra grisea was only found on « shelf slope steep » confirming its very narrow niche.

Pentametrocrinidae (*Pentametrocrinus* and *Thaumatocrinus*) were both mainly found in the « Flat shallow ocean » habitat.

Isometra was restricted to seamount areas at shallow depths.

Conclusions

The crinoids collected during the SO-AntEco expedition tend to indicate that the assemblages in this area contrast to those found in East Antarctica, Weddell Sea and Bransfield Strait. *Florometra mawsoni* and *Anthometrina adriani* tend to be less abundant, *Notocrinus virilis* seems absent, and *Notocrinus mortenseni,* despite being the third-most abundant crinoid species, is relatively rare. Most of the specimens from the South Orkney Islands were smaller than those observed in other areas.

Table 8.3. Bathymetric distribution of collected crinoids.

Genus	500	750	1000	1500	2000	(vide)	Total
Anthometrina	1						1
Eumorphometra	7	16	1	1	1	2	28
Florometra	4						4
Kempometra		7					7
Notocrinus	5	3			2		10
Pentametrocrinus		1	1	6	1		9
Promachocrinus	1	30	30				61
Thalassometra				1		1	2
Thaumatocrinus				1			1
unidentified	2	2	2	1			7
Isometra	6						6
Total	**26**	**59**	**34**	**10**	**4**	**3**	**136**

Table 8.4. Abundance of crinoids in each habitat.

Genus	Flat shallow ocean	Plateau	Ridge	Shelf	Shelf slope gentle	Shelf slope steep	Seamount	Total
Anthometrina				1				1
Eumorphometra				7	1	14	6	28
Florometra		4						4
Kempometra						7		7
Notocrinus		5				5		10
Pentametrocrinus	6		2			1		9
Promachocrinus		9		19		33		61
Thalassometra					1	1		2
Thaumatocrinus	1							1
unidentified				3	1	2	1	7
Isometra							6	6
Total	**7**	**18**	**2**	**30**	**3**	**63**	**13**	**136**

9. Crustacea (Malacostraca) sampled with the Agassiz trawl during the expedition SO-AntEco

Angelika Brandt, Oliver Ashford, Vassily Spiridonov

Peracarida

Within Crustacea, Peracarida occurred most frequently in the Agassiz trawl (AGT). Examples of some species are illustrated (Figure 9.1).

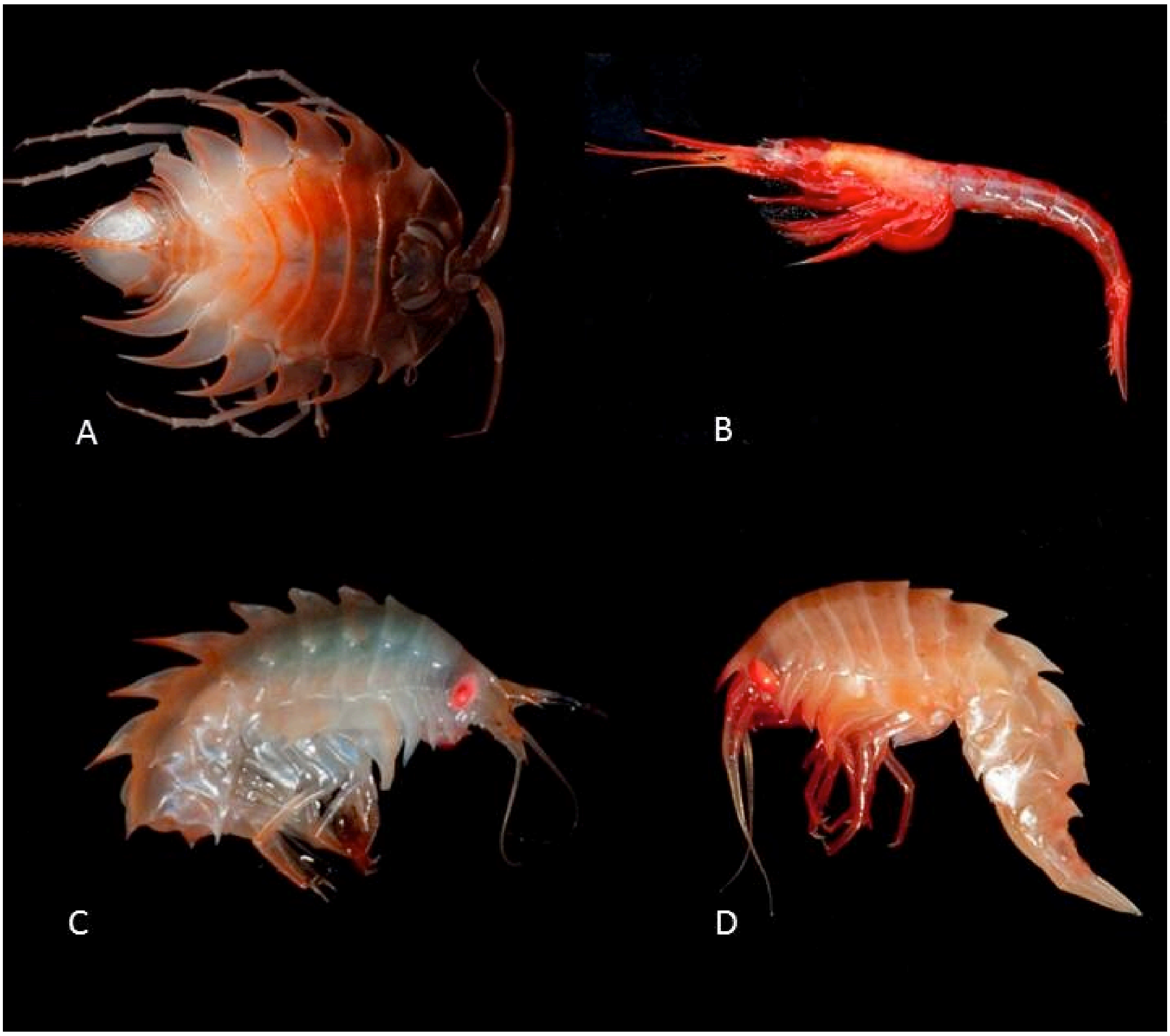


Figure 9.1. Images of some Southern Ocean peracarid species as examples. A, *Ceratoserolis trolobitoides*; B, *Acanthomysis* cf. *ohlinii*; C, *Epimeria reproi*, D. *Epimeria similis*. All images by C. Waller.

Amphipoda

In total, 459 amphipods were sampled by the Agassiz trawl. Due to material and time constraints onboard, not all of these specimens could be identified to species. Of those identified further than order (167 specimens), a total of 20 families, 12 genera and 11 species were recognized (Table 9.1). The remaining individuals await identification under more amenable conditions. The five most abundant families identified were Epimeriidae (30 specimens), Eusiridae (28 specimens), Oedicerotidae (24 specimens), Lysianassidae (22 specimens) and Ampeliscidae (20 specimens). It should be noted that, because of its large mesh size, the Agassiz trawl is not an optimal sampling device for peracarid crustaceans. In fact, a large proportion of individuals sampled were only collected because associations with other larger organisms (sponges and corals, for example) meant that they were not lost through the mesh of the net.

Isopoda

From the 382 isopod specimens sampled with the AGT not all could be identified to species level, due to time constraints between replicate AGT sampling. From those identified to species level, a total of 24 species from 20 genera and 14 isopod families are reported with Antarcturidae and Serolidae being most prevalent (Table 9.1). The antarcturid species *Acantharcturus acutipeon* Schultz, 1978 occured most frequently with 28 individuals, followed by the cirolanid *Natatolana oculata* (Vanhöffen, 1914) with 25 individuals. Seventeen individuals of *Ceratoserolis meridionalis* (Vanhöffen, 1914) were recorded, as were 14 specimens of the idoteid isopod *Edotia oculopetiolata* Sheppard, 1957. Three other species were represented by more than five individuals in the samples: *Ceratoserolis trilobitoides* (Eights, 1833) with seven individulas, and *Dolichiscus meridionalis* (Hodgson, 1910) and *Antarcturus hodgsoni* Richardon, 1913 each with six individuals.

Mysida

Mysida did not occur very frequently in the AGT samples, but at least three genera were recognized: *Amblyops* and *Acanthomysis* (Mysidae) as well as *Hansenomysis* (Petalophthalmidae). The largest species has been identified as *Acanthomysis* cf. *maxima*.

Cumacea

Cumacea was only represented by the families Leuconidae (*Leucon* sp.) and Nannastacidae (*Campylaspis* sp.) in the AGT samples.

Tanaidacea

No Tanaidacea were sampled by the AGT, likely because, on average, they are very small.

Euphausiacea

Antarctic krill (*Euphausia superba*) was occasionally found in the AGT samples, and this could be due to capture of this pelagic crustacean in the water column during recovery of the trawl. However, we observed schools and swarms of krill swimming rapidly near the seabed during the SUCS deployment of events 72, 129 and 135 (depth range 500 – 900 m) while moving the camera between photo locations (Figure 9.2). These observations confirm that, as in other areas (Gutt and Siegel, 1994; Clarke and Tyler, 2008), adult krill are benthopelagic on the shelf and slope of the South Orkney Islands.

Decapoda

Decapoda was represented by only three species of caridean shrimps. The most commonly occurring (but only at depths below 700 m) species was *Nematocarcinus lanceopes*. *Notocrangon antarcticus*, the crangonid species known to be widespread and abundant elsewhere in the Antarctic, occurred unexpectedly rarely and generally above 700 m. We report only the second record of *Eualus amandae* Nye, Copley & Linse, 2013 (Fig. 9.3) which was recently described from the South Sandwich Islands area (Nye et al., 2013). Around the South Orkney Islands, *E. amandae* occurred in comparable frequencies to f *N. antarcticus* in a very similar depth range. More details are provided in Section 10.

Figure 9.2. Swarm of Antarctic krill (*Euphausia superba*) near bottom at depth about 900 m during SUCS event 72.

Figure 9.3. *Eualus amandae*, female, AGT 46.

Table 9.1. Preliminary checklist of 72 species of Crustacea sampled during the expedition JR 15005.

CLASS	ORDER	FAMILY	GENUS	SPECIES
Maxillopoda	Calanoida	Calanidae	gen.	sp.
	Pedunculata	fam.	gen.	sp.
	Harpacticoida	fam.	gen.	sp.
	Siphonostomatoida	Pennellidae	*Sarcotretes*	sp.
Malacostraca	Amphipoda	Acanthonotozomellidae	gen.	sp.
		Amathillopsidae	gen.	sp.
		Ampeliscidae	*Ampelisca*	sp.
		Ampeliscidae	*Ampelisca*	cf. *richardsoni*
		Ampeliscidae	*Byblis*	sp.
		Amphilochidae	gen.	sp.
		Caprellidae	gen.	sp.
		Corophiidae	gen.	sp.*
		Corophiidae	*Haplocheira*	sp.*
		Cyphocarididae	*Cyphocaris*	sp.
		Epimeriidae	*Epimeria*	*inermis*
		Epimeriidae	*Epimeria*	*reoproi*
		Epimeriidae	*Epimeria*	*similis*
		Epimeriidae	*Epimeria*	*georgiana*
		Epimeriidae	*Epimeria*	*robustoides*
		Eusiridae	*Rhachotropis*	sp.

		Eusiridae	*Rhachotropis*	*antarctica*
		Eusiridae	*Eusirus*	sp.
		Eusiridae	gen.	sp.
		Iphimediidae	gen.	sp.
		Iphimediidae	*Anchiphimedia*	*dorsalis*
		Ischyroceridae	gen.	sp.
		Leucothoidae	gen.	sp.
		Lysianassoidea incertae sedis		
		Maeridae	gen.	sp.
		Melphidippidae	*Melphidippa*	*antarctica*
		Oedicerotidae	gen.	sp.
		Oedicerotidae	*Oediceroides*	*calmani*
		Pagetinidae	*Pagetina*	*genarum*
		Phoxocephalidae	gen.	sp.
		Pleustidae	gen.	sp.
		Stegocephalidae	*Parandania*	*boecki*
	Cumacea	Leuconidae	*Leucon*	sp.
		Nannastacidae	*Campylaspis*	sp.
	Isopoda	Aegidae	*Aega*	cf. *antarctica*
		Antarcturidae	*Antarcturus*	*hodgsoni*
		Antarcturidae	*Antarcturus*	*acutipleon*
		Antarcturidae	*Antarcturus*	*acutipleon*
		Antarcturidae	*Antarcturus*	*hempeli*
		Antarcturidae	*Litarcturus*	*antarcticus*
		Austrarcturellidae	*Dolichiscus*	*meridionalis*
		Cirolanidae	*Natatolana*	*oculata*
		Dajidae	*Zonophryxus*	*quinquedens*
		Idoteidae	*Edotia*	*oculopetiolata*
		Joeropsididae	*Joeropsis*	*curvicornis**
		Munnidae	*Munna*	sp.
		Munnopsidae	*Vanhoeffenura*	sp.
		Munnopsidae	*Munnopsurus*	cf. *giganteus*
		Munnopsidae	*Notopais*	cf. *spicatus*
		Paranthuridae	*Paranthura*	*antarctica*
		Plakarthriidae	*Plakarthrium*	*punctatissimum*
		Pseudidotheidae	*Pseudidothea*	*scutata*
		Serolidae	*Ceratoserolis*	*meridionalis*
		Serolidae	*Ceratoserolis*	*trilobitoides*
		Serolidae	*Frontoserolis*	*bouvieri*
		Serolidae	*Serolis*	cf. *arntzi*
		Sphaeromatidae	*Exosphaeroma*	*lanceolatum*
		Sphaeromatidae	*Ischyromene*	*eatoni*
	Mysida	Mysidae	*Amblyops*	sp.
		Mysidae	*Antarctomysis*	*maxima*

		Mysidae	*Antarctomysis*	*ohlinii*
		Petalophthalmidae	*Hansenomysis*	sp.
	Euphausiacea	Euphausiidae	*Euphausia*	*superba*
	Decapoda	Crangonidae	*Notocrangon*	*antarcticus*
		Hippolytidae	*Eualus*	*amandae*
		Hymenosomatidae	*Halicarcinus*	*planatus**
		Nematocarcinidae	*Nematocarcinus*	*lanceopes*
		Trichopeltariidae	*Peltarion*	*spinulosum**

*Found on kelp in Falkland Islands

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10. Studies on distribution and biology of decapod crustaceans

Vassily Spiridonov

The decapod species collected in the cruise could be easily identified in the field and therefore preliminary processing and biological study of the material was possible including analysis of vertical distribution, habitat preferences, reproductive biology and feeding.

Preliminary processing of the material

Specimens of caridean shrimps collected in the AGT samples were identified to species level, counted, and weighed. Sex and carapace length (CL) were recorded for most specimens. In non-damaged shrimps, the total length was also measured from the anterior margin of the orbit to the tip of telson. Samples were fixed either in ethanol or in 4% formalin; the latter will be used for determination of gonad maturity stage and diet composition. Tissues of all specimens of the rare species of *Eualus amandae*, 12 specimens of *Notocrangon antarcticus*, and 12 specimens of *Nematocarcinus lanceopes* were also subsampled (pleopods) and fixed in 96% ethanol for molecular genetic studies. All specimens of *E*. *amandae* and most of those species sampled for molecular work were photographed to record variation in coloration.

Eight specimens of *N*. *lanceopes* were fixed in 10% formaldehyde + 10% acetic acid solution for histological study of the gonads.

To study the relative trophic position of the three decapod species, small subsamples of muscular tissue from the abdomen were prepared for stable isotope analysis of carbon and nitrogen. They were frozen in Eppendorf tubes at -20°C. Collected material includes 37 specimens of *N*. *lanceopes* of different sizes from different localities and depths, nine specimens of *N*. *antarcticus*, and five specimens of *E*. *amandae*. As reference groups, we used mysids (six specimens of *Antarctomysis* spp., four specimens of *Amblyops tattersalli,* and three specimens of *Hansenomysis* sp.), all of which are likely to be primary consumers of suspended organic matter, holothurians (four specimens of *Scotoplanes* sp.) and tube-dwelling polychaetes (four specimens) as possible detritus feeders, and krill (one specimen of *Euphausia superba*) and salps (two specimens of *Salpa* sp.) as possible phytoplankton feeders. Further work on the material will make it possible to test the hypothesis that *N. lanceopes* preferentially feeds on detritus (as shown for other *Nematocarcinus* species, i.e. Burukovsky, 2009) in contrast to the predatory behavior exhibited by other shrimps.

Besides this, SUCS images taken at random at all stations where the camera was deployed were processed to assess shrimp habitats (sediments, microtopography, presence of sessile epifauna) and enumerate shrimp species (and for comparison purposes other crustaceans and pycnogonids). EBS video was screened to make quantitative estimates of shrimps on the sea bottom. The duration for which the EBS is towed on the sea floor is known from the EBS camera system (which has a time stamp) and hence the towed distance can be calculated from the ships speed. By counting a recording the presence of shrimps on the video, shrimp density can be calculated. A shrimp census was conducted for all EBS tows except events 57 and 86. In the first case, video showed that the sledge was hauled on its side for most of its track, while in the second case constant suspension of sediments during towing prevented any observations being made.

Preliminary results: occurrence and vertical distribution of caridean shrimps

The three species found in the present survey differed in their vertical distribution. *Notocrangon antarcticus* and *Eualus amandae* occurred both in low numbers and few sites (Figure 10.1). *Notocrangon antarcticus* has the shallowest distribution and was extremely scarce below 650 m, and not recorded below 900 m. *Eualus amandae* occasionally occurred from 440 to 880 m, while single specimens were also captured at 909 – 1312 m depth (Figure 10.1; Tables 10.1, 10.2). *Nematocarcinus lanceopes* was the most abundant and deep-living species. It was not found shallower than 657 m, and was most abundant and frequent at 909 – 1312 m. The species was also common in deeper waters (Figure 10.1; Table 10.3).

At almost every site where *N*. *lanceopes* was recorded in the trawl catches, and where the SUCS or EBS with its video system (DWCS) were deployed, we were able to count this species in underwater images or in video transects (Figures 10.2, 10.3). These data will be statistically processed to analyze distribution patterns and obtain quantitative estimates of abundance in particular habitats. No other decapods species were recorded with certainty in the images or video except for one case of *N*. *antarcticu*s. This confirms the relative rarity of the latter species in the study area.

Preliminary discussion

Even though the analysis of the results is not complete, it appears that the species composition and abundance of the decapod fauna of the South Orkney Islands differ from other Antarctic areas that have been studied. Compared to the eastern Weddell Sea (Arntz and Gorny, 1991), *N*. *antarcticus* is less common, the other common Antarctic species *Chorismus antarcticus* is not found in the sampled depth range at all, while the apparently rare species (known so far only from the South Sandwich Islands area – Nye et al., 2013) *E*.

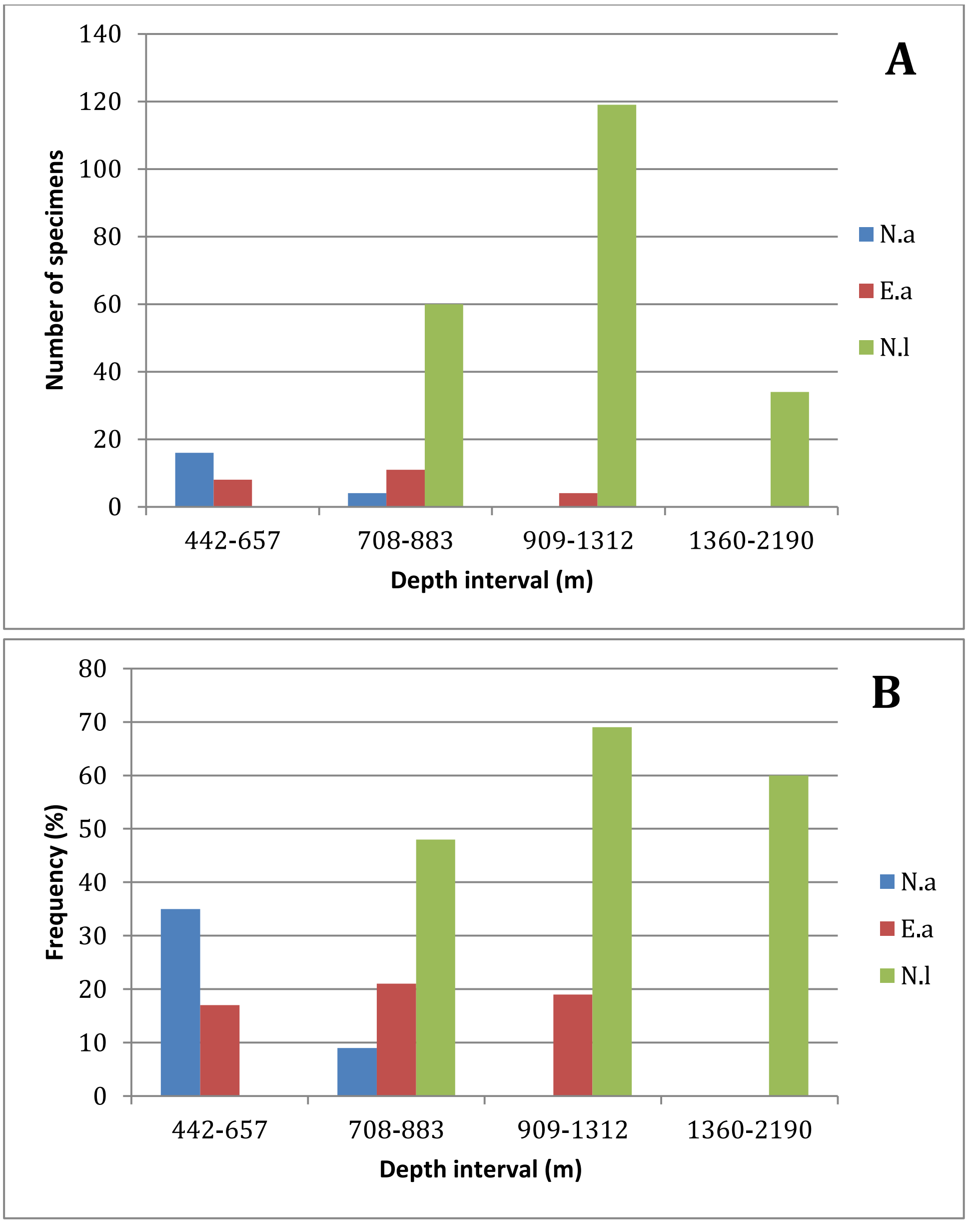

Figure 10.1. Number of collected specimens (A) and frequency of occurrence (B) in particular depth intervals for *Notocrangon antarcticus* (N.a), *Eualus amandae* (E.a), and *Nematocarcinus lanceopes* (N.l) in the SO-AntEco survey.

amandae occurs throughout the area albeit with low frequency. Although direct comparison with the trawl and underwater photography data (Gutt et al., 1991) from the eastern Weddell Sea is complicated, abundance appears to be lower in the South Orkney Islands area. This indicates significant regional peculiarities in decapod species composition and abundance in the continental and insular regions of the Antarctic.

Table 10.1. Occurrence of *Notocrangon antarcturus* in AGT catches on the South Orkney Plateau during JR15005; CZ – Coastal zone; Av – average number of shrimps per haul; n – number of hauls.

Area	Depth range (m)	Frequency (%)	Specimens / haul	Av (SD)	Size range (CL, mm)	n
CZ	235-243	100	3	3	8.0-12.0	1
West	517-564	67	0-4	1.3 (1.51)	9.5-19.0	6
	708-844	33	0-3	0.7 (1.21)	12.0-19.0	6
	>900	0	0	0		13
North	442-657	29	0-2	0.4 (0.63)	9.0-12.0	14
	708-883	0	0			14
	>900	0	0	0		17
Bruce Bank	622-651	0	0	0		3
	770-881	0	0	0		3
Entire area	442-657	35	0-4	0.6 (0.99)	9.0-19.0	23
	708-844	9	0-3	0.2 (0.65)	12.0-19.0	23

Table 10.2. Occurrence of *Eualus amandae* in AGT catches on the South Orkney Plateau during JR15005; Av – average number of shrimps per haul; n – number of hauls.

Area	Depth range (m)	Frequency (%)	Specimens / haul	Av (SD)	Size range (CL, mm)	n
West	517-564	0	0	0		6
	708-844	17	0-1	0.2 (0.41)	10.5 mm	6
	969-1182	14	0-2	0.3 (0.76)	8.6-9.0	7
	1600-2279	0	0	0		7
North	442-657	29	0-5	0.6 (1.34)	7.5-10.0	14
	708-883	21	0-4	0.6 (1.33)	7.2-11.5	14
	909-1312	22	0-1	0.22 (0.44)	7.0-10.0	9
	1360-2190	0	0	0		8
Bruce Bank	622-651	0	0	0		3
	770-881	33	0-1	0.3 (0.58)	No data	3
Entire area	442-657	17	0-5	0.3 (1.07)	7.5-10.0	23
	708-883	21	0-4	0.5 (1.08)	7.2-11.5	23
	909-1312	19	0-1	0.25 (0.57)	7.0-10.0	16
	1360-2190	0	0	0		15

Table 10.3. Occurrence of *Nematocarcinus lanceopes* in AGT catches on the South Orkney Plateau during JR15005; Av – average number of shrimps per haul; n – number of hauls.

Area	Depth range (m)	Frequency (%)	Specimens / haul	Av (SD)	Size range (CL, mm)	n
West	517-564	0	0	0		6
	708-844	50	0-2	0.7 (0.81)	17.0-29.0	6
	969-1182	43	0-4	1.1 (1.57)	21.5-33.2	7
	1600-2279	57	0-8	2.7 (3.25)	17.5-34.0	7
North	442-657	0	0	0		14
	708-883	46	0-26	3.8 (7.99)	15.5-31.0	14
	909-1312	89	0-57	12.3(20.41)	16.5-34.5	9
	1360-2190	62.5	0-7	1.9 (2.36)	25.0-30.0	8
Bruce Bank	622-651	0	0	0		3
	770-881	67	0-2	1.0 (1.0)	21.0-30.0	3
Entire area	442-657	0	0	0		23
	708-883	48	0-26	2.6 (6.34)	15.5-31.0	23
	909-1312	69	0-57	7.4 (16.0)	16.5-34.5	16
	1360-2190	60	0-8	2.3 (2.73)	17.5-34.0	15

Figure 10.2. *Nematocarcinus lanceopes* by the SUCS. Event 14.

Figure 10.3. *Nematocarcinus lanceopes* recorded in an EBS video transect. Event 73.

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11. South Orkney Island Porifera

Rachel Downey

Objectives and methodological protocols

On cruise JR15005, the main objective was to collect all sponge specimens, as they are VME (vulnerable marine ecosystem) indicator species, and identify them to the highest taxonomic resolution. Morphotypes from each event were sub-sampled for later histological and spicule preparation in 96% ethanol. Sub-samples of key morphotypes were also taken for future genetic analyses to complement the morphological taxonomy, and were frozen at -20 °C.

Several additional methodological protocols were employed in order to improve our knowledge about sponge bacterial communities, natural products, stable isotopes, biochemistry and silica biomineralisation. Clean laboratory procedures were used to sub-sample for bacterial activity, which were frozen at -20 °C. Sponge morphotypes with weights greater than 1 kg were kept frozen for later natural product analysis. Sub-samples of stable isotopes were collected and frozen at -20 °C to assess trophic levels of major morphotypes at each station. Sub-samples were also taken for biochemistry, which will be used to study proteasome structure and activity on Antarctic sponges. Key morphotypes were sub-sampled for silica isotopes, which can be used to better understand biomineralisation and in the development of geochemical proxies.

Preliminary results and processing of samples

In total, 2,183 specimens of sponges were collected from 63 deployments of the AGT and RD (Table 11.1). Of these specimens, 536 sponges were sub-sampled for taxonomy and 151 sponges were sub-sampled for genetics. Demosponges dominated at the South Orkney Islands, with 413 (77%) specimens found in total for this expedition. Identification below class level is not possible, due to the complexity of sponge identification, which requires histological and spicule preparation.

Thirty-four species have been previously identified from the South Orkney Islands (OBIS, 2016), and once samples are processed for taxonomy, it is believed that this number will increase with the sampling from this expedition.

Biomass (wet weight) of sponges varied greatly over the South Orkney region, with the lowest levels of biomass found at the West station (0.23 kg), with the highest levels found at the North West station (47.93 kg).

Future Processing

One hundred and forty-three sponges were sub-sampled for biosilicification and samples will be processed at the University of Bristol in the Earth Sciences Department (Kate Hendry).

One hundred and forty-two sponges were sub-sampled for stable isotopes and five sponges were sub-sampled for biochemistry, which will be processed at the P.P. Shirshov Institute of Oceanology, Russian Academy of Sciences in Moscow (Vassily Spiridonov).

Twenty-two sponges were sub-sampled for bacterial activities and these will be processed at the Université Libre de Bruxelles, Belgium (Bruno Danis).

Natural Products

Seven demosponge samples are suitable for natural product procedures. Nineteen hexactinellid samples are suitable for natural product procedures. If found to be suitable for natural products analysis, an institute will be chosen to process these samples once they have returned to the UK.

Table 11.1. Numbers of sponge specimens and wet biomass for each area of the South Orkneys

Area	Event nos.	No. of specimens	Biomass (kg)	Depth zones (m)
Bruce bank	142-148	49	0.916	500-1000
North	90-105	118	0.699	500-1500
North East	112-138	1632	47.93	500-2000
North West	54-85	194	1.826	500-750
South	21-52	162	8.656	500-2000
West	9-29	28	0.23	500-1000

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12. Sea anemones *sensu lato* (Cnidaria: Anthozoa: Actiniaria, Ceriantharia and Corallimorpharia)

Estefanía Rodríguez

Introduction

Hexacorals (Cnidaria, Anthozoa) are important components of macrobenthic communities in the Southern Ocean in terms of biomass and as part of the suspension-feeder communities that dominate some habitats. Sea anemones *sensu lato* comprise members of the orders Actiniaria (sea anemones *sensu stricto*), Ceriantharia (tube anemones), Corallimorpharia (mushroom anemones), and Zoanthidea (mat anemones). The most recent taxonomic and biogeographic reviews of the Southern Ocean identified 116 species of the order Actiniaria (Rodríguez and Fautin, 2014). The other sea anemone orders are understudied and represent by only 13 species (Ceriantharia, one species; Corallimorpharia, six species; Zoanthidea, six species).

Here an overview of the diversity of sea anemones *sensu lato* collected during JR15005 to the South Orkneys Islands is provided.

Methods

Sea anemones were collected with the Agassiz trawl and the Rauschert dredge. Specimens were sorted into morphotypes and relaxed in cold seawater (4°C) with menthol crystals for 1-12 hours; sea anemones were photographed alive and relaxed (Figure 12.1). Small pieces of tissue from selected specimens were preserved in 96% ethanol and RNALater for molecular analysis; specimens were subsequently fixed in 4-10% seawater-buffered formalin.

Figure 12.1. Living specimens of *Hormathia lacunifera* and *Actinostola* sp 2.

Preliminary results

Nineteen species of sea anemones, comprising 100 specimens (91 Actiniaria, three Ceriantharia, and six Corallimorpharia) were collected (Table 12.1). The most abundant species collected were the actiniarians *Bolocera kerguelensis*, *Hormathia lacunifera*, *Epiactis georgiana,* the symbiotic *Isosicyonis alba* and the corallimorpharian *Corallimorphus profundus*. Other species collected represent new records for the area. Morphotypes Actiniaria sp. 4 and sp. 5 potentially represent undescribed species. Detailed studies of the collected material will be carried out at the American Museum of Natural History.

Table 12.1. Collected specimens of sea anemones (Actiniaria, Ceriantharia, and Corallimorpharia).

Order	Species	# specimens	# event
Actiniaria	Actiniaria sp. 1	1	61
	Actiniaria sp. 2	1	62
	Actiniaria sp. 3	4	80
	Actiniaria sp. 4	3	70
	Actiniaria sp. 5	1	91
	Actiniaria sp. 6	1	91
	Actiniaria sp. 7	1	91
	Actiniaria sp. 8	1	146
	Actinostola sp. 1	1	62
	Actinostola sp. 2	5	146,147
	Bolocera kerguelensis	8	11,15,17,61,144,145,146
	Epiactis georgiana	19	61,142,147
	Halcampella fasciata	3	17,29,31,
	Hormathia lacunifera	5	9,22,23,32,132
	Isosicyonis alba	25	55,61,62,63,79,93,95,126,132
	Liponema multiporum	1	93
	Sicyonis sp. 1	11	80,81,126
Ceriantharia	Ceriantharia sp. 1	3	69,70
Corallimorpharia	*Corallimorphus profundus*	6	113,142,145,147

References

Rodríguez E, Fautin DG (2014) Hexacorallia. In: De Broyer C, Koubbi P, Griffiths HJ, Raymond B, Udekem d'Acoz Cd', et al. (eds.). *Biogeographic Atlas of the Southern Ocean. Scientific Committee on Antarctic Research, Cambridge* 113-116

13. Cephalopods

Louise Allcock

Cephalopods are abundant in the Southern Ocean and play a key ecosystem role as food for higher predators. In particular, octopus diversity has been shown to be extremely high and the Southern Ocean has been shown to be a cradle of evolution for deep-sea octopus species worldwide (Strugnell et al., 2008). In heavily fished areas such as Elephant Island, octopus abundance appears to be persistently elevated possibly as a result of an ecosystem shift following over exploitation of fin-fish stocks (Vecchione et al., 2009).

During JR15005 55 cephalopods were captured. These comprised one oegopsid squid (*Alluroteuthis antarcticus*), two cirrate octopuses (*Cirroctopus glacialis* Robson), and 52 benthic octopuses. The latter represented seven species in four genera (Table 13.1)

Table 13.1. Benthic octopus species captured during JR15005.

Species	No of specimens captured	Capture locations
Adelieledone polymorpha (Robson, 1930)	22	South, West, North, North East, North West
Pareledone aequipapillae Allcock, 2005	5	South, North East, North West
Pareledone cornuta Allcock, 2005	4	South, North East, North West
Pareledone panchroma Allcock 2005	6	North, North West
Pareledone turqueti (Joubin, 1905)	10	South, North, North East, North West, Bruce Bank
Thaumeledone peninsulae Allcock et al. 2004	4	North, North East
Muusoctopus rigbyae (Vecchione et al., 2009)	1	North

These species are a subset of those found off the Antarctic Peninsula and associated islands nearby islands and for the most part they are species with either a eurybathic or deep depth distribution. Other species around the Antarctic Peninsula are known from the depths fished here. Their absence in our captures may simply be due to limited sampling or their distribution may not extend to this region. Nonetheless, species known to be less abundant in other regions, e.g., *Thaumeledone peninsulae* (Figure 13.1) and *Pareledone panchroma* were captured.

Figure 13.1. *Thaumeledone peninsulae* Allcock et al. 2004.

As expected, the majority of specimens was captured in the Agassiz Trawl, with just two specimens captured by the Rauschert Dredge. Octopuses were more abundant at shallower depths as might be expected from their foraging requirements and were most abundant in the North and North West sites. Generally, within the MPA, abundance appears to be low (Table 13.2), which may reflect the more pristine habitat compared to northern areas that have been subjected to fishing pressure in the past. However, overall catch numbers are low, as is expected fishing with an AGT, so caution is required in this interpretation.

Table 13.2. Average number of octopuses per Agassiz trawl by depth and region. -- indicates an absence of trawls at that depth in that region.

Depth	South	West	North West	North	North East	Bruce Bank
500	1	0.33	3.67	3	0.33	0.5
750	0.33	0.33	0.5	0	0	0
1000	0	1	0.33	2	1	--
1500	0	0	0	0.5	0	--
2000	0.5	0	--	0	0	--

Further work

Tissue samples in 96% ethanol were taken from 52 specimens. These will be used for ongoing molecular projects examining species delimitation in this rapidly evolution group of benthic octopuses, and for phylogenetic studies examining the evolution of the class Cephalopoda.

References

Vecchione M, Allcock L, Piatkowski U, Strugnell J (2009). *Benthoctopus rigbyae*, n. sp., a new species of cephalopod (Octopoda; Incirrata) from near the Antarctic Peninsula. *Malacologia* 51, 13-28.

Strugnell JM, Rogers AD, Prodöhl PA, Collins MA, Allcock AL (2008). The thermohaline expressway: Antarctica as a centre of origin for deep-sea octopuses. *Cladistics* 24, 853-860.

14. Coral VMEs

Michelle Taylor

Corals (hard corals, soft corals, black corals etc) are listed in the Annex of the International Guidelines for the Management of Deep-Sea Fisheries in the High Seas (FAO, 2009) as habitats / communities that have characteristics making them vulnerable marine ecosystems (VMEs).

Unfortunately Davies and Guinotte (2011) global Scleractinia habitat suitability modelling work does not extend to the South Orkneys. However, considering all octocoral groups together, the plateau on which the South Orkneys are found and the drop off to the north would appear to be suitable habitat (Figure 14.1). Within octocoral groups, Calcaxonia, Holaxonia, Alcyoniina and Sessiliflorae are predicted to have suitable habitat across this area (Yesson et al., 2012).

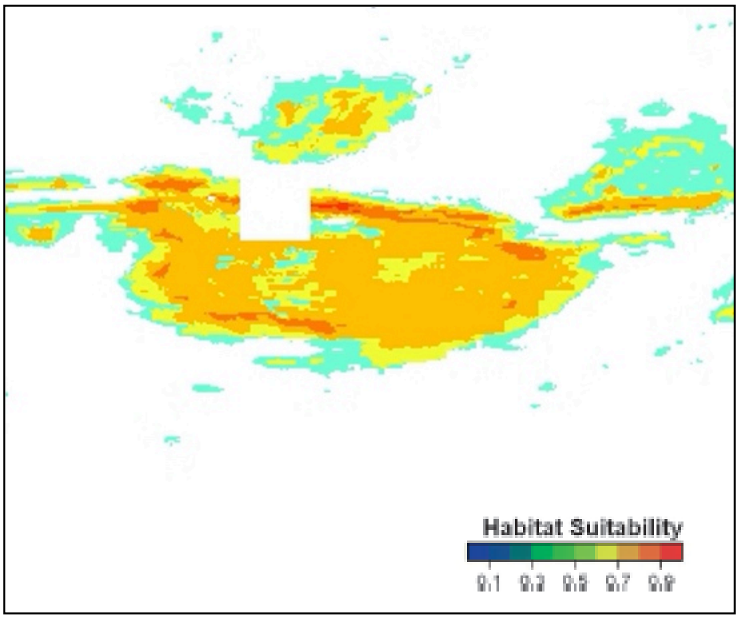

Figure 14.1. Octocoral habitat suitability modelling from Yesson et al., 2012.

Corals were collected from the 107 trawls (AGT and Rauschert dredges - see Sections 1 and 2) undertaken (Table 14.1).

Stylasteridae and Scleractinia (if alive) had genetic sub-samples taken and their skeletons were then preserved for biogeochemical analysis. Identifications of these specimens are on-going.

Table 14.1. Corals collected on SO-AntEco (Feb-Mar 2016)

Taxa	No. of lots	No. of individual colonies
Octocorallia (soft corals)	330	642
Scleractinia (hard corals)	55	56
Stylasteridae (lace corals)	51	64

Whilst on board, the Octocorallia specimens collected were identified to the highest taxonomic level possible. Twenty-seven different species of octocoral were collected, four of which are new to science (an additional species of *Thouarella* is currently being described from South Georgia) (Table 14.2). The most common species was the Primnoidae *Dasystenella acanthina*. This specimen was collected in sufficient quantity for future population genetic work.

Table 14.2. Octocoral species list.

Octocoral species from SO-AntEco	
Muricea sp.	*Primnoella* sp. nov.
Anthomastus sp.	*Thouarella andeep*
Inflatocalyx infirmata	*Thouarella antarctica*
Chryosogorgiidae sp. nov.	*Thouarella brucei*
Primnoisis sp.	*Thouarella crenelata*
Unidentified Isididae	*Thouarella koellikeri*
Bayergorgia vermidoma	*Thouarella variabilis*
Convexella magelhaenica	*Thouarella* sp. nov.
Convexella sp. nov.	*Rosgorgia inexspectata*
Dasystenella acanthina	*Rosgorgia* sp. nov.
Fannyella keukenthali	Unidentified Plexauridae 1
Fannyella mawsoni	Unidentified Plexauridae 2
Onogorgia nodosa	Unidentified stoloniferous coral
Primnoella chilensis	

It would appear that the Yesson et al. (2012) predictions of suitable habitat to the north and south of South Orkneys holds true. Further CPUE analysis will delve into this further.

References

Davies, A.J., Guinotte, J.M. (2011) Global Habitat Suitability for Framework-Forming Cold-Water Corals. *PLoS ONE* 6, e18483.

FAO (2009) Report of the technical consultation on International Guidelines for the Management of Deep-Sea Fisheries in the High Seas, Rome . In: *FAO Fisheries and Aquaculture Report* 881 pp.

Yesson, C., Taylor, M.L., Tittensor, D.P. *et al.* (2012) Global habitat suitability of cold-water octocorals. *Journal of Biogeography* 39, 1278–1292.

15. VME scleractinian and stylasterid corals

Laura Robinson

Introduction

One of the groups identified as a VME indicator taxon is Scleractinia (also known as stony corals). Scleractinian (stony) corals have been found from the surface of the ocean down the abyssal plains, with abundances greater in the upper 2,000 m than the deeper ocean. Habitat suitability modelling relates modern coral distributions to food supply, environmental factors including carbonate chemistry and seawater oxygen concentration, as well as to seafloor bathymetry and substrate. However testing these models is difficult with the current state of knowledge as there are few systematic surveys that have documented both presence and absence in an environmental context. Likewise calcified stylasterid corals distributions are poorly documented, and the controls on their distribution remain to be determined.

Collections

Samples on JR15005 were collected using the AGT and Rauschert Dredge (Appendix 3). Subsamples were taken stored in ethanol for genetic analyses, and the remaining material was weighed, bleached, dried, photographed and frozen organised by event number for shipping. Preliminary identification was undertaken for Scleractinia. Stylasterids will be identified in the future,

Future work

The samples collected in JR15005 will be identified to species level where possible. In association with previously published data, genetic analysis and with environmental parameters the coral distribution data will be used to carry out a number of activities that will better inform habitat suitability models, as well as projections of future vulnerabilities.

16. Acid-Base physiology in two classes of echinoderms (Asteroidea and Holothuroidea)

Bruno Danis, Camille Moreau

Background and objectives

Due to increasing atmospheric carbon dioxide concentration, the chemistry of the oceans is slowly changing towards more acidic conditions. Polar oceans are particularly affected due to their low temperature, low carbonate content and mixing patterns, for instance upwellings. Calcifying organisms within these oceans are expected to be highly impacted by this acidification. In particular, echinoderms are hypothesized to be very sensitive due to their high magnesium calcite skeleton. However, tolerance to ocean acidification in metazoans is first linked to their acid-base regulation capacities of the extracellular fluids. Very little information on these is available to date for Antarctic echinoderms and inference from temperate and tropical studies needs support.

In this study, we investigated the acid-base status of various species of sea stars and sea cucumbers in order to identify (dis)similarities in acid-base regulation systems as compared with tropical and temperate echinoderms.

Methodology

Specimens (n=17) were immediately treated after collection by Agassiz Trawl (AGT) during the JR15005 cruise to the South Orkneys. The sea star species collected include *Macroptychaster sp.*, *Bathybiaster loripes*, *Psilaster* sp., *Lysaster* sp., *Labidiaster annulatus*, and *Hymenaster* sp. Holothurian species include *Bathyplotes* sp. and *Protelpidia murrayi*.

At each sampling site, *in situ* parameters (temperature, salinity and oxygen saturation) were obtained with a CTD connected to a carousel of 24 water Niskin bottles. Seawater samples for pH, alkalinity (AT) and DIC (Dissolved Inorganic Carbon: concentration and carbon isotopic signature) measurements were obtained from three different Niskin bottles at each site.

pH and electromotive force (emf) were measured immediately after sampling with a Metrohm pH-meter (826 pH mobile, combined glass electrode Metrohm 6.0228.010). Salinity and temperature were also measured simultaneously with the pH measurement using a salinometer Multi 340i (WTW, Germany). The DIC samples were prepared following the method of Gillikin et al. (2007). For AT, 2 ml of water were transferred upon collection into a

PP tube and $HgCl_2$ added (7%). AT of the seawater will be determined by means of a potentiometric titration method back in the Marine Biology Lab in Brussels.

Immediately after collection of the specimens, the coelomic fluid was collected with a syringe and a needle through the tegument. The air-free syringes were then kept on ice until further measurement. For all specimens, pHT (pH-CF) and total alkalinity (AT-CF) were measured in the coelomic fluid (CF). DIC (DIC-CF) will be measured when samples are back at the Marine Biology Lab, Brussels.

Preliminary results

In order to complete the available information on echinoderm acid-base physiology, a total of 17 specimens, from eight species were collected at 10 different stations (Table 16.1), at depths ranging from 478 to 2100 m.

Initial measurements were carried out onboard RV James Clark Ross for electromotive force (emf), pH, and alkalinity (AT) in CF. AT in seawater and DIC in both CF and seawater need to be measured in our facilities. Samples were prepared accordingly.

Table 16.1. Samples collected for A-B physiology and initial measurements for electromotive force (mV), pH and alkalinity (AT, $mmol.kg^{-1}$)) in the coelomic fluid of Asteroidea and Holothuroidea

ID	Event	Vial	Depth	mV	pH	AT
Macroptychaster	80	1635	478	-14,20	7,10	2,257
Bathyplotes sp.	132	2818	495	-32,60	7,59	2,968
Bathyplotes sp.	132	2817	495	-34,80	7,61	3,048
Bathybiaster loripes	61	1064	517	-31,10	7,41	3,951
Psilaster sp.	61	1065	517	-42,00	7,60	2,092
Lysaster sp.	61	1066	517	-5,90	6,94	2,520
Labidiaster annulatus	33	669	560	-37,20	7,54	1,883
Bathyplotes sp.	91	1846	617	-34,50	7,45	2,269
Bathybiaster loripes	38	752	733	-28,50	7,37	2,176
Protelpidia murrayi	84	1775	804	-26,30	7,29	2,624
Protelpidia murrayi	84	1776	804	-33,50	7,44	2,668
Protelpidia murrayi	84	1783	804	-33,60	7,42	2,341
Protelpidia murrayi	84	1784	804	-30,90	7,41	2,100
Protelpidia murrayi	74	1526	1180	-26,10	7,31	1,642
Protelpidia murrayi	74	1527	1180	-26,30	7,29	1,829
Protelpidia murrayi	75	1550	1210	-33,60	7,39	1,063
Hymenaster sp.	49	980	2100	-38,20	7,53	2,129

17. Dead carbonate material

Laura Robinson

Introduction

Calcifying groups such as scleractinians and stylasterids leave behind a post mortem fossil record. Previous work in the Drake Passage has indicated that stony corals migrate across Frontal regions in response to changing climate. Whilst we expect to see temporal population changes off South Orkney, we do not yet know whether they will be synchronised with the changes observed in the west, or whether they response to more local changes. Even less is known about the history of other calcifying organisms.

Collections

Samples of dead 'sub-fossil' calcifiers on JR15005 were collected using the AGT and Rauschert Dredge (Appendix 3). Samples were dried, photographed and divided into categories (solitary scleractinian, colonial scleractinian, stylasterid, bivalve, gastropod, barnacle etc) and given sub-sample numbers (Appendix 3). They were then stored by event number and frozen for shipping.

Future work

Sub-fossil samples will be dated either using 14C or U-Th dating to establish the ages of sub-fossil corals to establish how long they have lived off South Orkney. We will also analyse the geochemical signals in the skeletal remains to establish how environmental conditions (e.g. temperature, pH and nutrient utilisation) have changed off South Orkney Island during the time that corals have inhabited the area. Combining environmental and population data will give us a historic context for our interpretation of the modern coral distributions as well as indicate how populations of calcifiers are likely to change in the future.

18. Kelp - CGS103

Cath Waller, Huw Griffiths

Introduction

Floating rafts of kelp are a major and highly visible feature of the waters surrounding the Falkland Islands and in the sub-Antarctic. It has been shown that these rafts are a mechanism of dispersal for epiflora and fauna, which can be carried great distances (Frazer et al., 2008). Smith (2002) suggests that there may be up to 70 million kelp rafts in the Southern Ocean north of the Polar Front (PF) at any one time. No study has yet examined the waters south of the PF, even though kelp rafts are often observed in this region (authors, personal observations).

During transit to the benthic survey work undertaken on JR15005 we surveyed and sampled the kelp raft fauna between the Falkland Islands and the South Orkney Islands, a potential colonization pathway for animals entering Antarctica.

Methods

The work was carried out on the southbound leg of the cruise and on an ad hoc basis during the northbound journey. It involved the scientific team working in half hour shifts as observers spotting kelp rafts from the bridge (during daylight hours). Where practicable, when kelp was sighted, the officers and crew manoeuvred the ship into position and caught the kelp using a grapple hook (and ship's crane if necessary). The kelp was taken to the wet lab where any epifauna and flora were recorded and preserved (ethanol or frozen). Where possible, the species found were identified by the team of invited expert scientists taking part in the main cruise; remaining unidentified material will be identified by collaborators on return to the UK.

Results and Discussion

Four samples of *Macrocystis pyrifera* were collected and sampled from the intertidal at Stanley for baseline data. During the southbound leg of the cruise three kelp rafts (all *M. pyrifera*) were spotted and logged. In addition, one raft (*Durvillaea antarctica*) was collected (Table 18.1).

On the return northbound leg eight further rafts were spotted but not recorded in the database (six of these in the immediate vicinity of South Georgia). Two rafts (*Macrocystis pyrifera* and *Himantothallus grandifolius*) were completely or partially recovered (i.e. only part of the raft was sampled). See also Figure 18.1.

Table 18.1. Date, time, lat and long of Kelp Events recorded in the bridge log

Time	Event	Lat	Lon	Action	Comment
20/03/2016 19:00	152	-54.88	-35.51	Kelp on board	resuming passage.
20/03/2016 18:55	152	-54.88	-35.514	Kelp spotted	manoeuvring for recovery.
19/03/2016 10:10	149	-60.52	-41.04	Kelp recovered	
27/02/2016 11:50		-56.90	-50.89	Kelp spotted	Small piece of kelp stem
27/02/2016 11:40		-56.89	-50.95	Kelp spotted	Small fragment <1m
26/02/2016 11:35		-53.42	-55.18	Spotted kelp	small fragment seen by LA
26/02/2016 18:35	3	-54.25	-54.15	No sign of kelp	continuing down navtrack.
26/02/2016 18:15	3	-54.25	-54.15	Kelp sighted	manoeuvring to relocate.
26/02/2016 16:51	2	-54.11	-54.34	Kelp recovered onboard	ship continuing down navtrack.
26/02/2016 16:50	2	-53.73	-54.77	Ship stopped alongside kelp.	bridge
26/02/2016 16:35	2	-54.11	-54.33	Kelp spotted	bringing ship round for recovery.

In total, three species of kelp were collected: *D. antarctica, M. pyrifera* and *H. grandifolius*. The kelp species with the highest number of epibionts and endobionts (including numbers of species) was *D. antarctica* (Figure 18.2). Preliminary analysis found that there were at least 18 species from nine phyla present on a single raft.

Discussion

The sample *of D. antarctica* collected was complete i.e. included the holdfast (root mass). This was the part of the plant that contained the majority of the taxa found. The sample was covered in high densities of goose barnacles (*Lepas* sp., Figure 18.3). Blankley (1985) reported that the goose barnacle, *Lepas fascicularis* attained a capitulum length of 27 mm in 45 days, or about 0.6 mm/day. Using this rate, we estimate that the kelp had been afloat for approximately 16-20 days. The sample of *M. pyrifera* collected from South of 60^{o} had no fauna associated with it. It appeared to be fresh with no decay and new growth clearly visible at the tips. This poses an interesting question as to its origin as there are no reports of this species south of South Georgia (Griffiths and Waller, 2016).

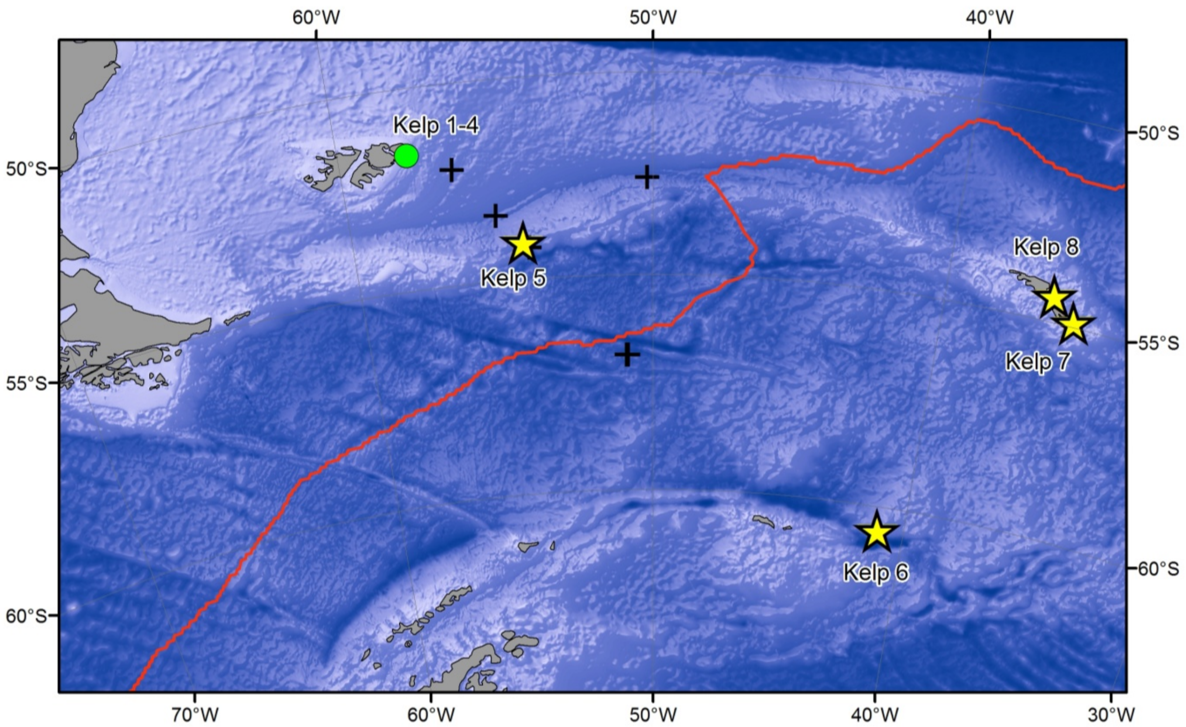

Figure 18.1. Locations of kelp rafts sampled. Stars = recovered kelp, crosses = observed kelp, circle = shore collected kelp (Stanley), red line = Polar Front.

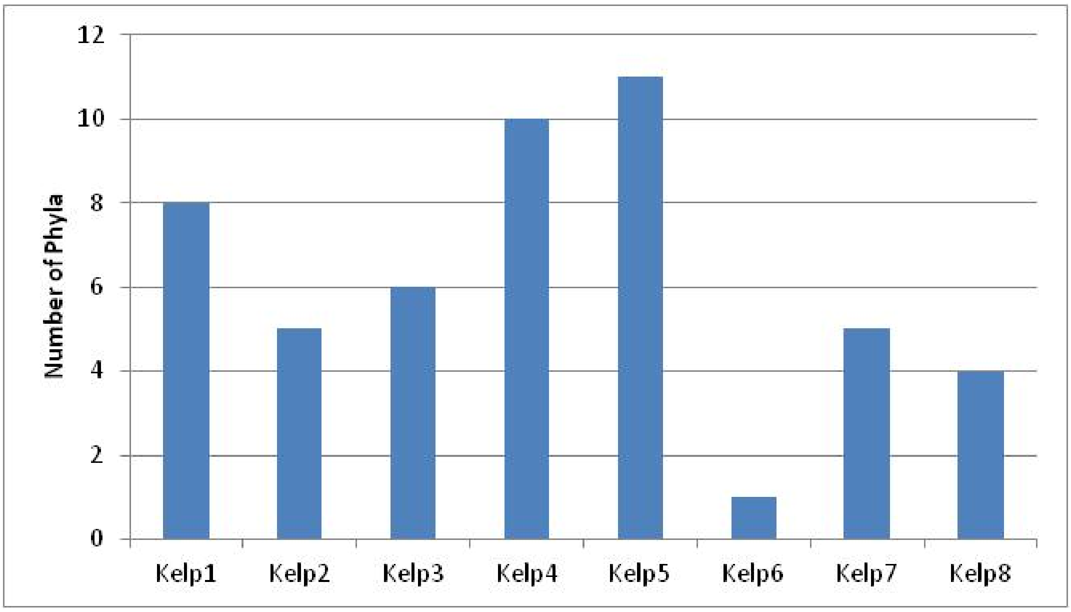

Figure 18.2. Counts of epifaunal phyla found on each sample.

Figure 18.3. Goose barnacles, *Lepas* sp., on *Durvillaea antarctica*.

Table 18.2. Preliminary species list of host kelp and macrofauna present.

PHYLUM	CLASS	ORDER	FAMILY	GENUS	SPECIES
Ochrophyta	Phaeophyceae	Fucales	Durvillaeaceae	*Durvillaea*	*antarctica*
Ochrophyta	Phaeophyceae	Fucales		*Macrocystis*	*pyrifera*
Ochrophyta	Phaeophyceae	Fucales		*Himantothallus*	*grandifolius*
Mollusca	Bivalvia			*Gaimardia*	*trapesina*
Cnidaria	Anthozoa				
Arthropoda	Maxillopoda	Pedunculata		*Lepas*	
Mollusca	Bivalvia				
Mollusca	Gastropoda	Incerta sedis	Nacellidae	*Nacella*	
Bryozoa					
Porifera	Demospongiae				
Arthropoda	Malacostraca	Amphipoda	Caprellidae		
Cnidaria	Hydrozoa				
Arthropoda	Malacostraca	Isopoda	Joeropsididae	*Joeropsis*	*curvicornis*
Arthropoda	Pycnogonida	Pantopoda			
Arthropoda	Ostracoda				
Arthropoda	Malacostraca	Amphipoda	Eusiridae		
Chordata	Actinopteri				
Arthropoda	Malacostraca	Isopoda	Munnidae		
Annelida	Polychaeta	Phyllodocida	Polynoidae		
Annelida	Polychaeta	Phyllodocida	Nereididae		
Annelida	Polychaeta	Phyllodocida	Syllidae		
Annelida	Polychaeta	Sabellida	Serpulidae		

Annelida	Polychaeta	Terebellida	Terebellidae
Echinodermata	Holothuroidea	Dendrochirotida	Cucumariidae
Echinodermata	Holothuroidea	Apodida	
Platyhelminthes			
Arthropoda	Malacostraca	Amphipoda	
Arthropoda	Malacostraca	Amphipoda	Ischyroceridae

References

Blankley WO (1985) Extreme r-selection in *Lepas fasicularius* within the Natal offshore fouling community. *South African Journal of Science* 81(11), 701.

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19. South Orkney Islands Southern Shelf Marine Protected Area (MPA)

Susie Grant

The South Orkney Islands Southern Shelf MPA (Figure 18.1) was designated by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) in 2009. It covers an area of 94,000 km^2, in which all types of commercial fishing are prohibited. This was the first MPA in the world to be established entirely within the high seas, and it remains the only such area to have been designated by CCAMLR to date. The MPA is designed to contribute towards the conservation of biodiversity in CCAMLR Subarea 48.2, and to protect representative examples of a range of pelagic and benthic habitats.

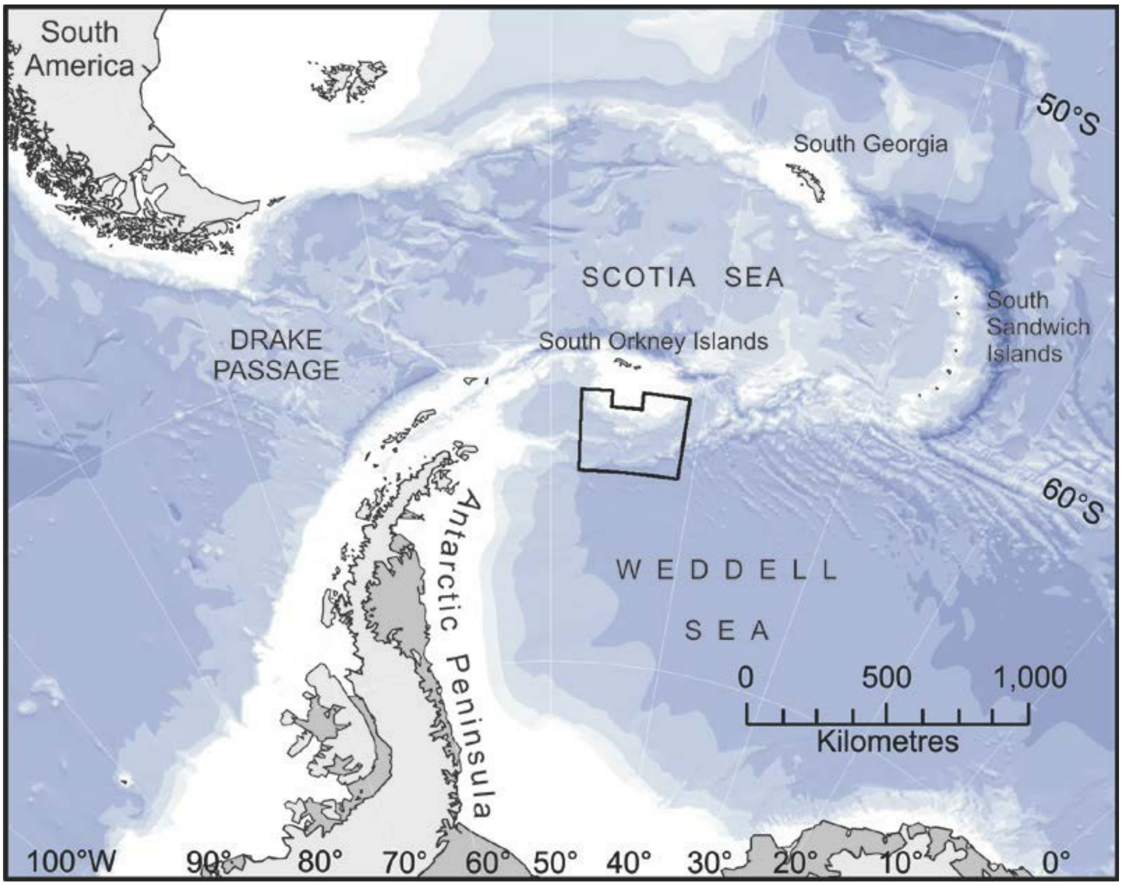

Figure 19.1. Location of the South Orkney Islands Southern Shelf MPA. Sampling was undertaken both inside and outside the MPA, as required by the MPA Research and Monitoring Plan agreed by CCAMLR.

CCAMLR has agreed a Research and Monitoring Plan for the South Orkneys MPA (CCAMLR, 2014), identifying scientific activities that will help to inform and support the management of the MPA, and provide new information to evaluate the extent to which its conservation objectives are being achieved. The Research and Monitoring Plan highlights the need to compare the status of features within the MPA with those outside. It also encourages the initiation of research outside the boundaries of the MPA that may contribute to the wider planning process for MPA Planning Domain 1 (Western Antarctic Peninsula and Southern Scotia Sea).

A major aim of the SO-AntEco cruise was to address the following objective of the MPA Research and Monitoring Plan:

> "Undertake field campaigns to better understand selected benthic habitats, and the biodiversity within those habitats, in relation to the geomorphic zones both inside and outside the MPA".

The results of targeted sampling both inside and outside the MPA will assist in determining whether the existing geomorphic classification for this region (Dickens et al, 2014) provides a reasonable proxy for benthic communities. Information on species diversity, assemblage composition, abundance and habitat zonation along the shelf break will improve understanding of habitats both inside and outside the MPA. This will make an important contribution to the development of an updated MPA Report for the South Orkney Islands, as well as the MPA review scheduled for 2019.

Vulnerable Marine Ecosystems

In addition to the MPA, CCAMLR affords special protection to benthic habitats that are identified as particularly vulnerable to the effects of bottom fishing. Vulnerable Marine Ecosystem (VME) taxa were agreed by CCAMLR (2009a) to include those that:

(i) significantly contribute to the creation of a complex three-dimensional structure;

(ii) create a complex surface by clustering in high densities;

(iii) change the structure of the substratum (e.g. sponge spicule mats)

(iv) provide substrata for other organisms

(v) are rare or unique

Twenty seven taxonomic groups classified as 'VME Indicator Organisms' are listed in the VME Taxa Classification Guide (CCAMLR, 2009b), including sponges, soft corals, stony corals, hydrocorals, gorgonians, pterobranchia, ascidians, bryozoans, stalked crinoids, euryalida and cideroida.

CCAMLR Conservation Measure 22-07 (2013) defines a 'VME indicator unit' as one kilogram of VME indicator organisms. A VME Risk Area is notified where 10 or more VME indicator units are recovered from a 1200m section of line. These guidelines are designed for VME encounters during long-line fishing, and CCAMLR does not set out separate guidelines for VMEs encountered during the course of fisheries-independent research.

The CCAMLR VME Workshop (2009) recommended that CCAMLR Members develop mechanisms for acquiring non-fisheries research information from national programs and to provide information that could be useful for identifying potential VME areas. Jones & Lockhart (2011) proposed an equivalent density threshold of VME indicator units standardised to a 1200m^2 swept trawl area (i.e. 10 kg/1200 m^2) that could be used to identify VMEs during research trawling. The results from this cruise will be useful in furthering the development of such equivalent mechanisms, in collaboration with CCAMLR Members.

Eleven VME sites have previously been registered around the South Orkney Islands (Jones and Lockhart, 2011), all of which are shallower than 500 m depth. The SO-AntEco cruise aimed to document further VME sites if encountered, based on data from both towed gear and the SUCS. Our sampling stations targeted areas within the fishable depth range for long-lining (500 m to 2000 m), thus focusing on areas more likely to be impacted by fishing than those in the shallower shelf areas.

The process for identification of VMEs requires the provision of data to the CCAMLR Secretariat, and submission of a notification to the CCAMLR Working Group on Ecosystem Monitoring and Management (WG-EMM) for review. Notifications should include:

i) General information (vessel name(s) and dates of data collection)

ii) VME location (start and end positions of all gear deployments and/or observations, maps of sampling locations, underlying bathymetry or habitat and spatial scale of sampling, depth(s) sampled)

iii) Sampling gears used at each location.

iv) Additional data collected (multibeam bathymetry, oceanographic data such as CTD profiles, current profiles, water chemistry, substrate types recorded at or near those locations, other fauna observed, video recordings, acoustic profiles etc.)

v) Supporting evidence (rationale, analysis, and justification to classify the indicated areas as VMEs).

vi) VME taxa (details of all VME taxa observed, including their relative density, absolute density, or number of organisms if possible)

Reporting to CCAMLR

The findings of the SO-AntEco cruise will be of significant interest to CCAMLR, and will have direct application in the future conservation and management of this region. Products to be submitted to CCAMLR include:

- i) Summary report on cruise activities and preliminary findings (based on this cruise report) to be submitted by the UK to CCAMLR WG-EMM – July 2016
- ii) Paper on VME notifications to be submitted by the UK to CCAMLR WG-EMM – July 2016
- iii) VME notification datasets to be provided to CCAMLR Secretariat
- iv) MPA Report submitted to CCAMLR Scientific Committee & Commission, including detailed results from this cruise – July/October 2017.
- v) Paper on the use of data from scientific trawling and camera systems in the detection of VMEs (cruise publication, when available)
- vi) Paper on the use of geomorphic classifications for the South Orkney Islands as a proxy for benthic communities (cruise publication, when available)

The South Orkney Islands MPA is due to be reviewed in 2019. Outcomes from this cruise will provide an important basis for the development of scientific advice to inform alternative or updated management strategies as part of this review. Such advice will be provided via the UK Foreign and Commonwealth Office Polar Regions Department, to the CCAMLR delegations of the UK and the European Union.

Initial findings suggest that habitats to the south of the islands (within the MPA) are likely to be less vulnerable to the impacts of bottom fishing, in contrast to those in the north (which are currently unprotected). An updated management regime could therefore allow long-line fishing within the current MPA boundaries (maintaining the restriction on krill fishing), and implement new zones to the north where bottom fishing would be limited (but krill fishing allowed). In addition, new information on geomorphic zones (including from updated multibeam bathymetry obtained during this cruise) and their suitability as proxies for benthic communities will allow updated analyses on the extent to which different habitat types are represented within the existing MPA boundaries.

Work is also ongoing to develop a system of MPAs for the Western Antarctic Peninsula & Southern Scotia Sea (Domain 1) planning region. This project is being coordinated by Chile and Argentina, in cooperation with the UK and other CCAMLR Members. Data from this cruise may also be incorporated into MPA planning analyses across this wider region.

This cruise is an important demonstration of the UK commitment to improving understanding of the Scotia Sea ecosystem, to inform fisheries management and conservation in this region. The international collaboration mobilised by the SO-AntEco project is particularly valuable, as an example of how CCAMLR research and monitoring commitments can be achieved through a community effort.

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20. Broader Impact

Susie Grant, Huw Griffiths, Louise Allcock, Helena Wiklund, Hilary Blagbrough

Public engagement and education

As part of our cruise preparation, we developed a Comms Plan to set out priorities and actions for communicating our science to a range of audiences whilst on board the JCR, as well as before and after the cruise. This plan was shared with our collaborators, and BAS guidelines for using social media were also provided to everyone in the team.

We aimed to engage as widely as possible with audiences including:

- Stakeholders, e.g. SCAR, BAT, EPB, UK Polar Network
- Groups such as APECS, Women in Polar Science, Polar Educators International
- CCAMLR
- NGOs, e.g. WWF, ASOC, AOA
- All collaborators' institutes
- The public, with a focus on schools

Our activities included Twitter updates, blog posts on the BAS website, additional blog posts on individual collaborators' websites, and '60-second science' videos. Activities focused specifically on schools included talks/visits before the cruise and follow- up visits afterwards, and a successful schools Q&A session undertaken via Twitter.

We posted regular Twitter updates from @BAS_News, on topics including science activities and new discoveries, weather, life on the ship, wildlife and scenery. Several members of the science team were also active on Twitter using individual accounts, and this combined effort reached a broad network of the scientific community, stakeholders, NGOs, schools and the general public. All tweets using the #SOAntEco hashtag appeared automatically on a sidebar of our project webpage. These were re-tweeted widely, including by groups and individuals with very large audiences such as NERC, MBARI, Women in Polar Science, and CBeebies. Videos, living and working photos and macro photographs of the animals we collected were particularly popular. The #SOAntEco hashtag had an audience of over one million twitter users, based upon recorded impressions (Table 19.1).

The team produced five 'Ship Blogs' which appeared on the BAS website, and were widely publicised on Twitter. These provided a range of information on the science project as well as personal points of view, for example on the experience of a PhD student going to sea for the first time, and on what it's like to work on night shifts.

Table 20.1. Tweet impressions for SoAntEco.

Twitter user	Impressions	Engagements	Retweets	Media views	Likes
BAS_News	294,525	7,200	738	9,600	1,000
Mel Mackenzie	71,823	1,619	121	554	227
Louise Allcock	108,282	3,543	280	3,082	530
Helena Wiklund	92,244	1,753	227	625	324
Susie Grant	111,059	3,186	240	1,085	513
Maddie Brasier	38,030	1,237	87	453	178
Bruno Danis	21,598	200	29	54	33
#SOAntEco	>1,000,000		>1,500		

Figure 20.1. Tweet data from twitter analytics associated with the SOAntEco hashtag.

We produced two '60-second science' videos which appeared on the BAS YouTube channel, focusing on the Shallow Underwater Camera System (SUCS) and on 'sea pig' sea cucumbers.

During UK Science Week (11-20 March), we invited schools to send us their questions on Antarctic deep sea science and life on board the ship, using @BAS_News on Twitter. Six team members worked on answering the questions, and this was published as a blog on the BAS website. We had a very positive response from schools who engaged with this initiative.

@BAS_News received this tweet from Diva Amon, a US-based researcher known for her science communication skills:

Diversity and capacity building

Building capacity is a key goal of the AntEco programme. Early career scientists made up one third of the scientific complement, with specific mentoring in place, and working shifts arranged to allow mentor/mentee pairs to work together.

Technical skills. All cruise participants helped prepare and deploy the range of gears, yielding a highly competent team with increased knowledge for future expeditions. Team member Hilary Blagbrough is part of the BAS ReDS team skills exchange programme. Collaborating, as a geologist, with the core team of biologists, Hilary led the nightshift, bringing the highest standards of laboratory skills and practices to the ship.

Overseas participation increased the diversity of the knowledge base on board, and allowed scientists from British Antarctic Survey to interact with a range of CCAMLR nations. Ten overseas scientists represented eight non-UK countries.

Female scientists made up over 50% of the scientific complement and took leading roles associated with gear deployment, shift leadership and lab management, and mentoring. Commitment to equal opportunities is a priority to STEM in general, however scientific excellence was the driver behind the inclusion of all cruise participants.

21. Multibeam bathymetry (Kongsberg EM122) equipment report

Alex Tate

As outlined in the cruise report summary, there were a number of reasons for collecting multibeam bathymetry data on JR15005. The BAS geology and geophysics group had 5 days of dedicated ship time to undertake a bathymetric survey of the western and southern margins of the South Orkney continental plateau and there was also a requirement to do small scale site surveys of the various areas visited for benthic biology work. Finally, there was the long-term attempt to collect opportunistic bathymetric data while on passage. Overall the primary aim was achieved with data collected from 2500 m – 1000 m depth on the western and southern margins and every biology site visited has bathymetric data to accompany the trawl, camera and oceanographic information.

The EM122 multibeam equipment performed well throughout the cruise with the exception of some minor issues with the Seafloor Information System (SIS) software, through which the EM122 is run. The following sections describe the surveys, brief results, operational settings, processing routines and issues encountered on JR15005.

Survey Information

EM122 survey details are summarised (Table 21.1, Figure 21.1). There were many breaks in the multibeam acquisition between the timeframes listed due to the ship being stationary (scientific deployment, hove to etc), crossing over previously swathed areas or for safety of navigation in shallow waters (bridge request). These extra details can be found in the dedicated EM122 event log. Files consist of a maximum of one hour of data.

Survey descriptions and initial results

Survey jr15005_a – This passage survey acquired mostly new data and was run in fair conditions with good data collected as a result. It served no particular in-cruise purpose but will be added to the Polar Data Centre multibeam catalogue after the cruise and used for future cruise planning purposes.

Survey jr15005_b – This constituted the target area for the dedicated bathymetric survey of the western and southern margin of the South Orkney plateau which was undertaken in several chunks (see narrative section) in order to fit in efficiently with benthic biology work. Figure 20.2 shows the additional data acquired and how this has added considerably to the best available bathymetry available in this area (Dickens et al., 2014). The bathymetry of large areas of the continental slope were previously only derived from satellite data and

Table 21.1. EM122 survey details.

Survey name	Timeframe (UTC)	Description	No. of files	Processing notes
jr15005_a	26/02/2016 06:15 28/02/2016 09:01	Passage from the Falkland Islands until just south of the South Orkney trench.	52	All data fully cleaned ping by ping.
jr15005_b	28/02/2016 09:03 19/03/2016 04:00	The major area of interest. Contains dedicated surveys of the western and southern margins of the South Orkney continental shelf as well as more limited passage surveys on the northern margin. Also includes all site survey work undertaken on behalf of the benthic biology science team.	214	All data fully cleaned ping by ping with the exception of lines 0023-0032 and 0139-0143. These lines represent very shallow area and were cleaned in blocks of 50-250 pings.
jr15005_c	19/03/2016 12:06 22/03/2016 18:06	Passage from Bruce Bank to the Falklands via South Georgia. The survey actually ended near Shag Rocks as weather was very poor and the line taken was identical to previous good data.	67	Data were not cleaned on board as they were poor quality and generally contained little new coverage.

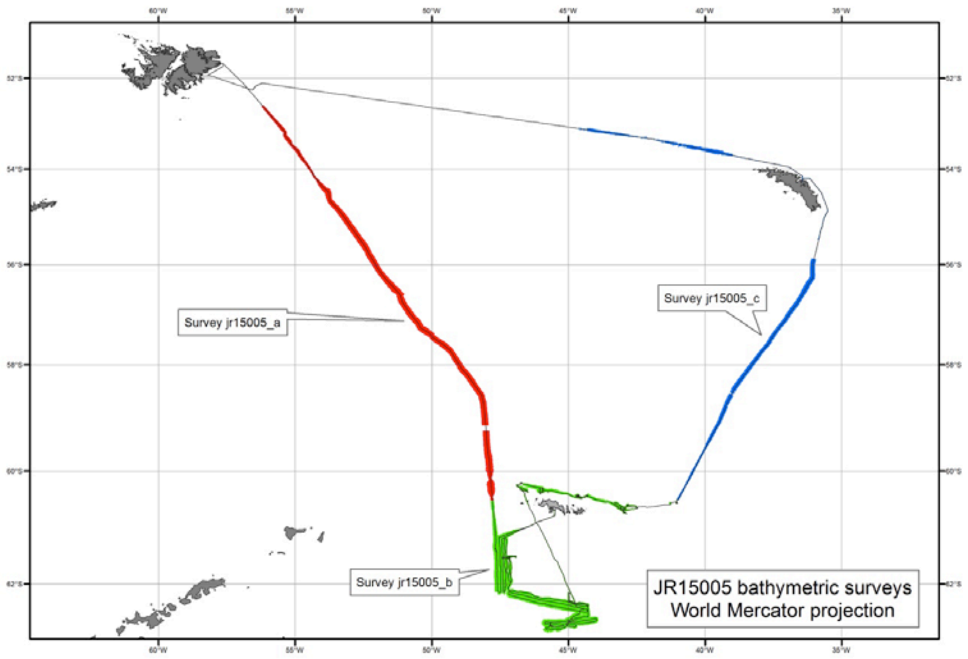

Figure 21.1. The two passage surveys (jr15005_a and c) and the main survey area (jr15005_b)

showed as a smooth transition from 2500m to the shelf edge. The new data shows this smooth transition to be actually a complex series of gullies with potential slip features evident.

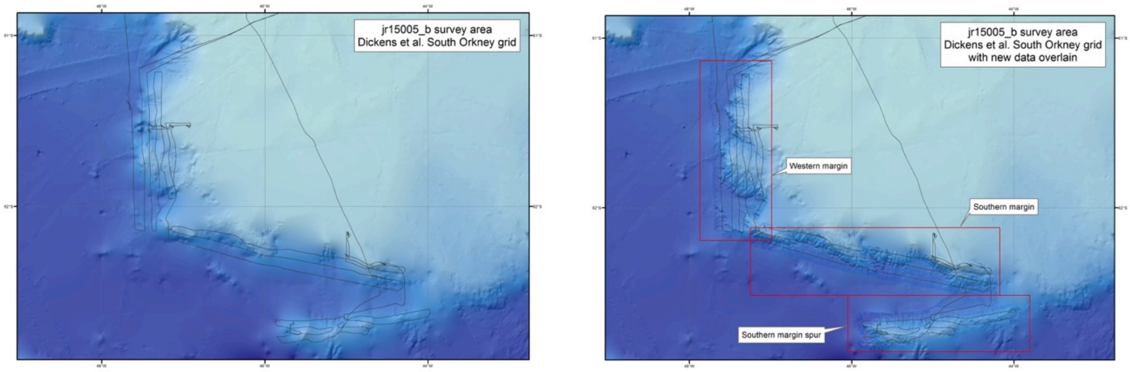

Figure 21.2. The best regional grid (left, Dickens et al., 2014) versus the same grid with the addition of data collected on JR15005 (right).

The western margin was surveyed in good weather, while the southern margin and southern margin spur had slightly worse conditions and more importantly for data quality had both the wind and swell on the beam. Any reduction in speed from 10kns (such as overnight, in mist, near ice etc.) had the effect of increasing leeway which led to increased aeration under the hull which led directly to poor data quality. In this particular survey it was hard to choose another direction as surveying up and down slope would have been incredibly inefficient in terms of area covered. As ever, it would have been great to survey the whole slope from 2500 m to the slope break around 600 m but this would have taken considerably longer than was available and the survey lines undertaken are such that future surveys can easily adjoin to them.

In between dedicated bathymetric surveying the EM122 was used to support site selection for the benthic biology work and this continued after we transited to the northern margin. Some new data was collected in this mode but it was generally in small areas linked together with passage lines with exception of 4-5 hours of survey over the marked location of Karlsen Rock for navigation purposes. The latter was not present (in this location) and a note stating this should be sent to the UKHO.

The data collected around the biology areas can be used in detailed site maps and can be used to corroborate depth values extracted from the EA600 singlebeam echosounder data stream as well as adding to the overall bathymetric catalogue. Weather on the northern margin was variable but tended to deteriorate as time moved on. With little ability to change the direction of survey, data quality suffered from excessive leeway issues especially in the passage to, and survey of, Bruce Bank.

Survey jr15005_c – This passage survey acquired some new data between Bruce Bank and South Georgia but was run for much of the leg with a freshening wind from the port side meaning data quality was poor to very poor. After leaving South Georgia, the prediction of two storms meant a direct cruise track was chosen so new data was collected. This combined with worsening condition meant that the survey was terminated in the Shag Rocks vicinity as very poor data was being collected at this point.

Operational Settings

The EM122 system was run through the Windows based SIS software provided by Kongsberg. Throughout the cruise the EM122 was run in external trigger mode with the ping rate calculated by K-Sync synchronisation unit which worked pretty much flawlessly in the 'Swath' user configuration mode.

SIS creates 'on the fly' grids of the data as it is collected and these are displayed in the geographical window. The creation of these grids requires that a grid size is defined for each new survey which cannot be changed once selected. During this cruise the number of cells in the processing grid was always set to 128*128 and the grid cell size in meters varied from 20 to 30 m for shallow / deep survey areas. Angular coverage mode was set to manual and beam spacing to high density equidistant for the duration of the cruise. The max beam angle was varied from 45° to 62° depending on the sea state, water depth and bathymetry with the max width kept constant at 20,000 m to port and starboard. Pitch stabilisation was set on, yaw stabilisation off, auto tilt off, along direction to 0° and heading filter to medium. Spike filter strength was set to medium, range gate to normal, phase ramp to normal and penetration filter strength to off. Slope and sector tracking were both switched on and the angle from nadir was set to 6°. Salinity was used as the absorption coefficient source with the default value of 35 ppm. Throughout the cruise the mammal protection power level was set to max with a start-up ramp time of 0 mins. The real time data cleaning was set to auto 0 which provided a satisfactory level of automatic flagging of anomalous data points, i.e. many of the bad points were flagged and no automatically flagged points were required to be restored. When cleaning the data using MBSystem (see Data Processing section below) the automatically flagged points are marked as 'sonar' edits and are shown in green.

BIST Tests

The Built In Self Tests (BIST) were carried out twice during the cruise. The first test occurred upon departure from Stanley on the 25th February and was repeated on the 27th March after reaching Mare Harbour. All tests were passed with the results saved as text files in D:/sisdata/common/bist/.

Roll Calibration

Time constraints meant that no roll calibration was performed on the trip but it may be possible to run one afterwards as the ship took a reciprocal course going into and out of the Signy area. There was also no attempt to do a pitch or yaw calibration and all three calibrations should be prioritised in any summer trials cruise.

Import of Sound Velocity Profiles

Sound velocity profiles were acquired from Expendable Bathythermographs (XBTs) deployed sporadically during the cruise (see Appendix 1 for event details) or from CTDs deployed in support of biological work. In general the automatic transfer of CTD/XBT information to the multibeam acquisition machine worked well but there were a few occasions where these files took a long time (~10 mins) to appear. This seems to be a Samba issue as the files were clearly visible from a Linux command line.

Software Crashes

On three occasions during the cruise the SIS software crashed and had to be manually restarted which caused a gap in data acquisition on one occasion. No specific trigger for these crashes was discernible but in previous cruises they all seem to be related to the graphical part of the software. On one occasion restarting SIS threw up multiple errors when connecting to the EM122 itself. However, several further restarts later and it connected fine. There was no necessity to reboot the PC that runs the SIS nor power down the EM122 itself, both of which actions have been required on earlier cruises.

Data processing

Raw data were automatically written to the data drive (D:/sisdata/raw/'survey name') on the Em122 acquisition machine and then a cron job running every 10 minutes copied the data to the path:

/data/cruise/jcr/current/em122/raw/*'survey name'* where current is a symbolic link to the leg id 20160223 (the date the cruise leg started - YYYYMMDD)

Data were processed with MB System v5.4.2202 installed on the Linux virtual server JRLC (full server name is jrlc.jcr.nerc-bas.ac.uk) following the same general procedures detailed in the JR93, JR134, JR168, JR206 and JR259 cruise reports. MB can be setup by typing,

setup mb

setup gmt

GMT (version 5.1.1) is needed for several of the MB System subroutines and is worth setting up at the same time. Type, 'man mbsystem' for an overview of MB.

Copying the data and producing auxiliary files

The perl script *mbcopy_em122* was used to copy raw EM122 data into MB system format and produce auxiliary files. To run the script type,

setup gsd

mbcopy_em122

from a Linux command line. You will be asked several questions regarding the raw data location, the desired location of the copied data and whether you want all the lines copied (type 'n' if you are actively acquiring data and the script will not copy the last hour file as it will not be complete). This information will be stored in a defaults file in your home directory and will not need to be re-typed until you change survey names. Note that the script will check for lines already copied and will ignore these. You can however, force the script to start at a predetermined line number if you do not want the earlier line numbers copied. The script automatically creates a text file of all the raw data copied (named raw_datalist) and creates auxiliary files which help MB speed up functions such as gridding.

Cleaning the data

All (see note below) of the data cleaning was done manually using the mbedit graphical interface. This allows the user to manually flag data in either a ping-by-ping view or as a waterfall view where n number of pings can be viewed together. Detailed editing was done using the ping-by-ping view for each hour file followed by a quick look using the waterfall view to check for any erroneous depth values missed.

Cleaning the data creates two additional files, a .esf file which holds the flagging information and a .par file which contains a whole variety of edits including cleaning and navigation fixes. Navigation data was not a problem during JR15005 so did not need fixing.

Processing the data

The command *mbprocess* takes information from the .par file and processes the .mb59 data to produce a final output file. If the input file is called “data.all.mb59”, the processed file becomes “data.allp.mb59”. *mbprocess* also creates additional auxillary files (.inf, .fnv, .fbt). The command takes the form of:

mbprocess –Iraw_datalist –F-1

A text file containing the names of all the processed data can then be created (proc_datalist on this cruise, i.e. type, ‘ls *.allp.raw.mb59 > proc_datalist’). If at some point the user decides to go back and re-clean the data or edit the navigation for a single file, mbprocess can be run with the same command and it will process only the newly edited files.

To recap the processes and the files they create are:

Input	Process	Output
Data.all.raw	mbcopy	Data.all.raw.mb59
Data.all.raw.mb59	mbdatalist	Data.all.raw.mb59.inf
		Data.all.raw.mb59.fbt
		Data.all.raw.mb59.fnv
Note : The above two processes are combined in the script em122_mbcopy		
Data.all.raw.mb57	mbclean/mbedit	Data.all.raw.mb59.esf
		Data.all.raw.mb59.par
Data.all.raw.mb59	mbnavedit	Data.all.raw.mb59.nve
		Data.all.raw.mb59.par (modified)
Data.all.raw.mb59	mbprocess	Data.allp.raw.mb59
		Data.allp.raw.mb59.inf
		Data.allp.raw.mb59.fbt
		Data.allp.raw.mb59.fnv

Gridding the data

The command *mbgrid* with its associated options produces a user-defined grid for viewing the cleaned swath results. Data were output directly to ArcGIS ascii grids as ArcGIS was the primary software tool used to view the grids. One of the limitations of ArcGIS grids is the need for matching x and y grid resolution values. Hence, with a non-projected grid it was necessary to use identical values in degrees (usually 0.001 or 0.002) that are unequal in real world distance, particularly at high latitudes. The command and some of the more common options used are:

mbgrid -Iproc_datalist (can be ../ etc if in another directory)

-O'grid filename' (naming scheme – 'surveyname_resolution' e.g. jr15005_a_002. A suffix is automatically added)

-R-29/-26/-57/-55 (bounding co-ords, min long/max long/min lat/max lat. **Note that MB will default to the maximum extent of the input files. This is very useful for survey overviews. No –R flag is needed in this case**)

-E0.002/0.002/degrees! (grid resolution; 0.002 degrees in this case. ! forces the resolution by changing the extent slightly if necessary.)

-G4 (Specifies an ArcGIS ascii grid output)

-A2 (produces a grid with bathymetry as negative values)

-F1 (type of filter used; 1=gaussian weighting, 5=sonar footprint)

-C5 (spline interpolation into data free areas, grid resolution x 5 in this case

-M (produces two further grids; one giving the number of beams within each grid cell and the other giving the standard deviation of those beams in each grid cell)

-J (Projection defaults to geographic but see man mbgrid for 1000's of projected systems on offer. –E would then be set to n/n/metres!

Ascii xyz files were also produced from the cleaned data using the command *mblist* and the following options

mblist –Iproc_datalist –F-1 –D3 > survey_name.mbxyz

-D3 is the output format (simple X, Y, Topography [-Z]) and the output text file can be called anything you like. The file suffix 'mbxyz' was used to avoid confusion with Neptune 'xyz' files produced on older cruises.

The mbxyz files can be used as an input to the GMT nearneighbor command or any other gridding software that accepts ascii xyz files.

Generated ascii grid files were converted into ArcGIS binary grids using the ArcGIS tool 'Ascii to raster'. They could then be viewed and manipulated using ArcGIS v10.1 (SP1) and this proved a very useful tool for finding data spikes that needed further cleaning. This was done by both visual inspection of the bathymetric grid and identifying anomalies within the standard deviation grid. In general all survey files that caused standard deviations above 120m within a 0.001 degree grid cell were inspected again and cleaned if necessary. This provided a very robust way to identify spikes and false multiples that had not been seen at the cleaning stage. It was considered that standard deviations lower than 120m could be real in areas of high variability or more likely random noise in the outer beams that would average out in the grid itself.

File Structure

A common file structure was created to hold all the mb data located under

/data/cruise/jcr/201602/work/mb/*'survey_name'*

Each survey_name (e.g. jr15005_a) directory contains processing, grd and mbxyz subdirectories. The processing directory holds all the copied mb59 raw files, the edits and the processed mb59 files. The grd directory holds any GMT grids or ArcGIS ascii grids while the mbxyz directory holds the xyz text output.

22. Antarctic & Marine Engineering

Carson McAfee

LAB Instruments

Instrument	S/N Used	Comments
AutoSal	N	
Scintillation counter	N	
Magnetometer STCM1	N	
XBT	Y	Pre CTD SVP Calibrations

ACOUSTIC

Instrument	S/N Used	Comments
ADCP	N	
PES	N	
EM122	Y	
TOPAS	N	
EK60	N	
EK80	N	
Ksync	Y	
USBL	Y	SUCs Camera.
10kHz IOS pinger	N	
Benthos 12kHz pinger S/N 1316 + bracket	N	
Benthos 12kHz pinger S/N 1317 + bracket	N	
MORS 10kHz transponder	N	

OCEANLOGGER

Instrument	S/N Used	Comments
Barometer1(UIC)	5002	
Barometer1(UIC)	5003	
Foremast Sensors		
Air humidity & temp1	3898	
Air humidity & temp2	3896	
TIR1 sensor (pyranometer)	2993	Not working
TIR2 sensor (pyranometer)	2992	Not working
PAR1 sensor	0127	
PAR2 sensor	0126	
prep lab		
Thermosalinograph SBE45	0016	
Transmissometer	396	
Fluorometer	1100243	
Flow meter	811950	
Seawater temp 1 SBE38	0601	
Seawater temp 2 SBE38	0599	

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

Instrument	S/N Used	Comments
Deck unit 1 SBE11plus	0458	
Underwater unit SBE9plus	0707	
Temp1 sensor SBE3plus	5766	
Temp2 sensor SBE3plus	2705	
Cond1 sensor SBE 4C	2289	
Cond2 sensor SBE 4C	2248	
Pump1 SBE5T	1807	
Pump2 SBE5T	7606	
Standards Thermometer SBE35	0024	
Transmissometer C-Star	CST-846DR	
Oxygen sensor SBE43	0676	
PAR sensor	7274	
Fluorometer Aquatracka	008-249	
Altimeter PA200	163162	
LADCP	15060	Unused On trip
CTD swivel linkage		
Pylon SBE32	0636	
Notes on any other part of CTD e.g. faulty cables, wire drum slip ring, bottles, swivel, frame, tubing etc		CTD Cable termination (at frame) was redone at end of cruise for training.

AME UNSUPPORTED INSTRUMENTS BUT LOGGED

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

End of Cruise Procedure

At the end of the cruise, please ensure that:

- the XBT is left in a suitable state (store in cage if not to be used for a while – do not leave on deck or in UIC as it will get kicked around). Remove all deck cables at end of cruise prior to refit.
- the salinity sample bottles have been washed out and left with deionised water in – please check this otherwise the bottles will build up crud and have to be replaced.

- the CTD is left in a suitable state (washed (including all peripherals), triton + deionised water washed through TC duct, empty syringes put on T duct inlets to keep dust out and stored appropriately). Be careful about freezing before next use – this will damage the C sensors (run through with used standard seawater to reduce the chance of freezing before the next use). Remove all the connector locking sleeves and wash with fresh water. Blank off all unconnected connectors. See the CTD wisdom file for more information. If the CTD is not going to be used for a few weeks, at the end of your cruise please clean all connectors and attach dummy plugs or fit the connectors back after cleaning if they are not corroded.
- the CTD winch slip rings are cleaned if the CTD has been used – this prevents failure through accumulated dirt.
- all manuals have been returned to the designated drawers and cupboards.
- you clean all the fans listed below every cruise or every month, whichever is the longer.

Please clean the intake fans on the following machines:

Instrument	Cleaned?
Oceanlogger	Y
EM120, TOPAS, NEPTUNE UPSs	Y
Seatex Seapath	Y
EM120 Tween Deck	Y
TOPAS Tween Deck	Y

Additional notes and recommendations for change / future work

CTD

CTD gave no problems during cruise.

A request was made by a scientist for CSV processed CTD data. I copied the SVP/Update script and adapted it to process the CTD data and produce a “Basic Processed Data” file, RAW data file (both in CSV) as well as a figure/plot of the CTD main data window. The script for this is on the desktop called “Basic_CTD_Processing”, and runs the same way as the SVP script. It is important to note that I have not changed the SVP/Data Backup script at all, and this script still needs to be run after every cast. The script I made is an “Add-On” for the convenience of the scientists who just want some basic data. Another important thing to note is that I cannot vouch for the accuracy of the processed data! I created my own Seaview script files that processed the data in a manner that made sense to me. The script and relevant folders are located in the CTD PC data folder under the “carson” folder. When the script is run it copy’s the relevant files to the data folder on the server.

At the end of the cruise (25/03/2016) the CTD cable was re-terminated for training purposes. The new termination was completed successfully and is ready for the new cruise. The cable was MEGA tested for cable insulation and passed. The load testing was done with the Bosum Science Operation, with a static load of 2.3 tons for 2 minutes.

LADCP

The LADCP was run on the ship (out water) for training. It is fully operational and ready for new cruise.

AME Storage Cage

Measurements have been taken for new CTD instrument storage boxes.

AME Tape Store

Store has been repacked, with the majority of the spare instrumentation being moved to the same locations as the operational equipment. This will allow a simpler transition when the replacement is needed. Unnecessary equipment was moved down to the cage, and will be taken back to Cambridge when the ship gets back to the UK.

The store still needs a packing list.

Scienticic Mooring Winch

The mooring winch failed during JR15004, and spare parts were ordered for the start of this cruise. The most important part was the communication cable and software. This allowed us to find that the fault was caused by a counter register overflowing. Clearing this register fixed the fault.

Anemometer Junction Box

Circuit for light dimmer has been made, but not tested.

23. Laboratory report

Hilary Blagbrough

The labs were clean and tidy on our arrival. Three microscopes (Wild M5) were set up ready. One of the Wild ‘scopes was in the wet lab and two in the dry lab.

The microscopes were in a sticky condition with salt water contamination in places. They were cleaned and checked ready for use. No other issues were noted at this time. One of these microscopes was later found to have a faulty focus so was exchanged for a Meiji EM2. Another Meiji with integral light system was installed in the dry lab. This second one was used only two or three times during most of the cruise but was extensively used for holothuroid identification towards the end of the cruise.

Users generally do not clean their ‘scopes after work so salt water contamination is going to happen and not be cleaned up thoroughly. It is also hard convincing people to put their specimens away instead of leaving them and to tie everything down in case of rough weather. Fortunately nothing was damaged.

The NHM team lashed all their items to the bench and were very conscientious about clearing up.

Items recommended for future cruises:

1. Carboys that don’t leak.
2. Ethanol-proof pens.
3. Jars that don’t leak. A suggestion for one type is cryo-vials to replace eppendorfs. These are self-standing tubes that are large enough to take the water-proof paper labels and have washers so they don’t leak.
4. More pairs of large nitrile gloves.
5. PPE for packing and vermiculite (e.g. more masks etc).
6. A Large quantity of parafilm.

24. IT Report

Peter Lens

Major body of work completed during cruise : powershell and html/PHP code to create and manage dynamic email distribution groups at BAS Cambridge. Also created Office 2016 installation kit and code to provide a GUI to edit a user AD attribute.

20 March 2016 (UTC)
12:32 : repaired WSUS cleanup script

11 March 2016 (UTC)
18:00 : Ashtec power cycled and now producing data, but is junk.
18:11 to 18:23 oceanlogger crash, data lost

8 March 2016 (UTC)
ACQ stopped/started at 03:33 and streams rebuilt

07 March 2016 (UTC)
19:00 : Samba frozen for all Windows Clients. SCS still logging to U: drive
20:46 : Samba restarted using service samba restart
This did not fix samba issues with Windows Clients so rebooted jrlb
Samba failed to start
ACQ re-started without U: drive at 20:57
Found and fixed expired SSL certificates

29 February 2016 (UTC)
day spent at Signy checking systems, updating y drive, cleanup of wsus and sophos

25 February 2016 (UTC)
19:00 : Sailed from Stanley

23 February 2016 (UTC)
00:19 : SCS data acquisition started

25. Data management

Alex Tate

Data storage

All data recorded by instrumentation linked to the ship's network were recorded directly to respective folders within /data/cruise/jcr/20160223/ and additional folders were created within /data/cruise/jcr/20160223/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.

Event logs

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

CTD Bottles (auto-generated)
Shallow Underwater Camera System (SUCS)
Trawled gear (includes Agassiz and Rauschert Dredges plus Epi-benthic sledges)
EM122 multibeam bathymetry
XBT
Kelp observations

Event numbers

Event numbers were assigned to equipment deployments by the officers on watch and were assigned sequentially when completing the bridge event log. 153 separate events were recorded and comprise the following:

Equipment / activity	Number of deployments / times	Comments
Agassiz Trawl (AGT)	81	The Rauschert Dredge was deployed alongside 30 AGTs but they shared event numbers.
Epi-benthic Sledge (EBS)	13	
Shallow Underwater Camera System (SUCS)	21	
Conductivity-Temperature-Depth (CTD)	28	
Expendable Bathythermograph (XBT)	5	
Kelp recovery	5	1 non-recovery

Site identifiers

There were no specific codes given to work stations/sites but there was a division of the major benthic biology work areas into compass points in relation to the South Orkney Islands. In addition, the target depth was appended so work area names looked like, 'South – 1000m'. Such IDs have no particular meaning outside the scope of the cruise and were merely used to more easily sort results but they have been captured in the marine metadata portal. There were no site numbers/ids for any of the non-benthic work.

Data sets and their use

Dataset	Trawl event metadata	
Instruments	**Agassiz Trawl, Rauschert dredge and Epi-benthic sledge**	
Description	Trawl deployment information was vital to correctly work out the length of seabed trawled	
Analogue data	None	
Digital data	Logs Processed	JR15005 Trawled Gear /data/cruise/jcr/20160223/work/data_management/events/
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	Trawl samples and sample metadata
Instruments	**Agassiz Trawl, Rauschert dredge, Epi-benthic sledge and kelp recovery**
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	2 hardback notebooks labelled 'Book of lies I' and 'Book of lies II'. Values from these were then manually entered into a database and then rigorously checked to eliminate errors.
Digital data	The hardback notebooks were photographed and can be found in /data/cruise/jcr/20160223/work/cruise_report/Book of Lies pdf/ Held within a custom Microsoft Access database developed by PSO Huw Griffiths (BAS).
Physical samples	The majority of the samples will be returned to the biological store at BAS with a minority 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 with the exception of coelomic fluid measurements (see below).
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 PSO Griffiths 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. ALLCOCK, A Louise (Cephalopoda, Pennatulacea) ASHFORD, Oliver S (Amphipoda) BRANDT, Angelika (Crustacea) BRASIER, Madeleine J (Polychaeta) DANIS, Bruno (Echinoderms) DOWNEY, Rachel V (Sponges) ELÉAUME, Marc P (Crinoids) GHIGLIONE, Claudio (Molluscs) MACKENZIE, Melanie K (Holothurians) MOREAU, Camille VE (Echinoderms) ROBINSON, Laura F (Dead corals) RODRIGUEZ, Estefania (Anemones) SPIRIDONOV, Vassily (Crustacea) TAYLOR, Michelle I (Corals) WALLER, Catherine L (Kelp) WIKLUND, Helena (Polychaeta)

Dataset	Trawl sample photos	
Instruments	**AGT, EBS, Rauschert Dredge and kelp recovery**	
Description	Still photography was used extensively throughout the cruise to document the state of a trawl just after recovery through to photographing individual specimens after compilation of sample metadata.	
Analogue data	None	
Digital data	Raw	/data/cruise/jcr/20160223/work/scientific_work_areas/Event photos /data/cruise/jcr/20160223/work/scientific_work_areas/Camille and Bruno_Data/Photos/ /data/cruise/jcr/20160223/work/scientific_work_areas/Laura LogFiles/SciencePhotos/

Long term data management	Data will be stored on the SAN at BAS
Other users of the data	All cruise participants

Dataset	Coelomic fluid measurements	
Instruments	**AGT, EBS and Rauschert Dredge**	
Description	Coelomic fluid was collected with a syringe and a needle through the tegument. For all specimens, pHT (pH-CF) and total alkalinity (AT-CF) were measured in the coelomic fluid (CF).	
Analogue data	None	
Digital data	Raw	/data/cruise/jcr/20160223/work/scientific_work_areas/Camille and Bruno_Data
Long term data management	Data will be stored on the SAN at BAS	
Other users of the data	DANIS, Bruno MOREAU, Camille VE	

Dataset	EBS video	
Instrument	**EBS**	
Description	The EBS carried the BAS Deep Water Underwater Camera System (DWCS) on its frame which recorded video coverage for all of the EBS deployments	
Analogue data	None	
Digital data	Raw	/data/cruise/jcr/20160223/work/scientific_work_areas/EBS/DWCS
Long term data management	Data will be stored on the SAN at BAS	
Other users of the data	All cruise participants	

Dataset	EBS CTD	
Instrument	**EBS**	
Description	The EBS carried a Seabird SBE37 CTD attached to the frame to collect conductivity and temperature information	
Analogue data	None	
Digital data	Raw	/data/cruise/jcr/20160223/work/scientific_work_areas/EBS

		/CTD_sbe37/
Long term data management	Data will be stored on the SAN at BAS	
Other users of the data	GRIFFITHS, Huw J	

Dataset	SUCS photos	
Instrument	**SUCS**	
Description	The SUCS frame holds an underwater Prosilica video camera that can be operated in a number of modes. On JR15005 the camera was mainly used to capture still photos when the SUCS frame was at rest on the seabed. See SUCS video dataset for occasional uses of the Prosilica camera in video capture mode.	
Analogue data	None	
Digital data	Raw	/data/cruise/jcr/sucs/'event id'
Long term data management	Data will be stored on the SAN at BAS	
Other users of the data	All cruise participants	

Dataset	SUCS video	
Instrument	**SUCS Prosilica camera and GoPro camera**	
Description	The Prosilica camera was used occasionally to capture video. The SUCS frame holds an optional casing for GoPro video camera and this device was used on most SUCS deployments	
Analogue data	None	
Digital data	Raw	/data/cruise/jcr/sucs/'event id' Prosilica video files (.avi) are in with the still photos. GoPro files (.mp4) are in subfolders labelled GOPRO
Long term data management	Data will be stored on the SAN at BAS	
Other users of the data	All cruise participants	

Dataset	SUCS photo VME analysis
Instrument	**SUCS Prosilica camera**
Description	Counts of Vulnerable Marine Ecosystems (VME) indicator taxa per photo quadrat corrected to a swept area of $1200m^2$.

Analogue data	None	
Digital data	Raw	data/cruise/jcr/20160223/work/scientific_work_areas/VME photo analysis/
Long term data management	Data will be stored on the SAN at BAS	
Other users of the data	All cruise participants	

Dataset	CTD sensor data		
Instruments	**Various sensors on the CTD frame including Niskin bottles**		
Description			
Analogue data	Logs	BAS AME holds paper copies of the CTD sampling logs which need to be scanned at the end of the season.	
Digital data	Logs	Bridge event log, CTD Bottles (produced by a script which reads from .btl files; note that this contains unprocessed values from the sensors).	
	Raw	.asc, .cnv, .ros	/data/cruise/jcr/20160223/ctd
	Processed	.btl, .cnv	/data/cruise/jcr/20160223/ctd
Calibration	None		
Long term data management	Raw and processed data will be stored on the SAN at BAS.		
Other users of the data	DANIS, Bruno MOREAU, Camille VE		

Dataset	CTD bottle chemistry	
Instrument	**CTD – Niskin bottles**	
Description	Seawater collected from Niskin bottles was analysed for pH, alkalinity and dissolved inorganic carbon.	
Analogue data	None	
Digital data	Raw	/data/cruise/jcr/20160223/work/scientific_work_areas/Camille and Bruno_Data/A-B Physiology/
Long term data management	Data will be stored on the SAN at BAS	
Other users of the data	DANIS, Bruno MOREAU, Camille VE	

Dataset	Sound velocity
Instrument	**XBT**
Description	A limited number of XBTs were deployed to gain sound velocity profiles for input into the multibeam echosounder
Analogue data	None
Digital data	Raw /data/cruise/jcr/20160223/xbt
Long term data management	Data will be stored on the SAN at BAS
Other users of the data	TATE, Alexander J

Dataset	Multibeam bathymetry	
Instrument	**EM122**	
Description	Depth data as collected by the Kongsberg EM122 multibeam echosounder.	
Analogue data	None	
Digital data	Logs	EM122 Multibeam Bathymetry
	Raw	.raw /data/cruise/jcr/20160223/
	Processed	/data/cruise/jcr/20160223/scientific_work_areas/em122/mb/ See EM122 section of this report for the details of the processing.
Calibration	None	
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. Teal Riley (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/20160223/scs
Long term	Data will be stored on the SAN at BAS and managed by the Polar

data management	Data Centre.
Other users of the data	All cruise participants

Acknowledgements

We would like to acknowledge and thank Stephanie Jones of BAS logistics for her efforts above and beyond the call of duty in getting Melanie Mackenzie from Australia to the Falkland Islands following a cancelled flight.

Appendices:

Appendix 1: Bridge Event Log

Time	Event	Lat	Lon	Comment
21/03/2016 10:20	153	-54.36273	-36.37295	Kelp recovered
21/03/2016 09:11		-54.28622	-36.47354	off DP
21/03/2016 00:25		-54.28688	-36.47573	on DP
20/03/2016 19:00	152	-54.8839	-35.51616	Kelp on board
20/03/2016 18:55	152	-54.8827	-35.51463	Kelp spotted
20/03/2016 16:07	151	-55.45303	-35.82985	XBT recovered
20/03/2016 16:01	151	-55.46353	-35.83616	Speed reduced to 8kts for XBT deployment.
19/03/2016 22:15	150	-58.54404	-39.01589	XBT finished
19/03/2016 22:08	150	-58.55725	-39.02955	XBT in the water
19/03/2016 22:03	150	-58.56526	-39.03813	slowed down to 8kn for XBT
19/03/2016 12:00		-60.52174	-41.03487	Vessel on passage
19/03/2016 10:10	149	-60.52512	-41.04164	Kelp recovered
19/03/2016 06:15	Comment	-60.52549	-41.05032	Deck secured
19/03/2016 05:57	148	-60.52547	-41.05028	AGT on deck.
19/03/2016 05:53	148	-60.52507	-41.04964	AGT on surface.
19/03/2016 05:26	148	-60.52458	-41.04745	Gear left bottom.
19/03/2016 05:06	148	-60.52402	-41.04423	Commenced hauling.
19/03/2016 04:53	148	-60.52299	-41.03791	Winch stopped
19/03/2016 04:42	148	-60.52241	-41.03549	Gear on bottom.
19/03/2016 04:12	148	-60.52174	-41.03141	AGT left surface.
19/03/2016 04:10	148	-60.52182	-41.03088	AGT off deck.
19/03/2016 04:00	Comment	-60.52181	-41.03072	On DP at 1000m station.
19/03/2016 03:20	Comment	-60.56645	-41.03759	Off DP
19/03/2016 02:59	147	-60.56645	-41.03756	A.G.T. on deck
19/03/2016 02:57	147	-60.56649	-41.0371	AGT on surface.
19/03/2016 02:43	147	-60.56601	-41.03546	A.G.T off the bottom
19/03/2016 02:32	147	-60.56555	-41.03379	Commenced Hauling A.G.T.
19/03/2016 02:18	147	-60.56361	-41.02748	Stopped at 850m
19/03/2016 02:12	147	-60.56319	-41.02627	A.G.T. on bottom
19/03/2016 01:53	147	-60.56298	-41.0231	A.G.T. at surface
19/03/2016 01:50	147	-60.56293	-41.02261	Commenced deployment
19/03/2016 01:48	147	-60.56279	-41.02233	In position to deploy
19/03/2016 01:16	146	-60.56301	-41.04956	Deck secure vessel moving off for next deployment
19/03/2016 01:06	146	-60.56251	-41.04835	A.G.T. on deck
19/03/2016 01:04	146	-60.56243	-41.04809	Net at surface
19/03/2016 00:51	146	-60.56181	-41.04633	A.G.T. off the bottom
19/03/2016 00:39	146	-60.56099	-41.04468	Commenced Hauling A.G.T.

19/03/2016 00:27	146	-60.55932	-41.03915	Stopped at 850m
19/03/2016 00:20	146	-60.56175	-41.04612	A.G.T. on the bottom
19/03/2016 00:00	146	-60.55818	-41.03424	A.G.T. in the water
18/03/2016 23:58	146	-60.55814	-41.03398	Commenced deploy A.G.T.
18/03/2016 23:52	146	-60.55816	-41.03317	Vessel in position to deploy A.G.T
18/03/2016 23:08	145	-60.55972	-41.10329	A.G.T. on deck
18/03/2016 23:06	145	-60.55971	-41.10296	A.G.T. at surface
18/03/2016 22:49	145	-60.55936	-41.10052	AGT off the bottom
18/03/2016 22:38	145	-60.55937	-41.10058	AGT start hauling
18/03/2016 22:28	145	-60.559	-41.09289	AGT start trawling
18/03/2016 22:22	145	-60.55896	-41.09111	AGT on the bottom
18/03/2016 22:00	145	-60.55867	-41.08745	AGT in the water
18/03/2016 21:57	145	-60.55856	-41.08689	AGT start deploy
18/03/2016 21:20	144	-60.56015	-41.10121	AGT on deck
18/03/2016 20:52	144	-60.55973	-41.09651	AGT start hauling
18/03/2016 20:42	144	-60.56019	-41.10121	AGT start trawling
18/03/2016 20:36	144	-60.55884	-41.08931	AGt on the bottom
18/03/2016 20:15	144	-60.55861	-41.08578	AGT in the water
18/03/2016 20:13	144	-60.55852	-41.08553	AGT start deploy
18/03/2016 19:52	143	-60.56073	-41.09896	AGT on board
18/03/2016 19:51	143	-60.56071	-41.09883	AGT surface
18/03/2016 19:32	143	-60.56016	-41.0962	AGt off the bottom
18/03/2016 19:24	143	-60.56019	-41.09632	AGT start hauling
18/03/2016 19:14	143	-60.55896	-41.08977	AGT start trawling
18/03/2016 19:09	143	-60.55876	-41.08843	AGT on the bottom
18/03/2016 18:50	143	-60.55829	-41.08533	AGT left surface.
18/03/2016 18:48	143	-60.55811	-41.08504	AGT off deck.
18/03/2016 18:32	Comment	-60.55813	-41.08442	On station on DP.
18/03/2016 18:10	Comment	-60.55869	-41.02996	Off DP
18/03/2016 17:52	Comment	-60.55868	-41.02998	On station on DP
18/03/2016 17:23	Comment	-60.57157	-41.06769	Off DP
18/03/2016 16:55	142	-60.57146	-41.0659	AGT on deck.
18/03/2016 16:52	142	-60.57133	-41.0654	AGT on surface.
18/03/2016 16:36	142	-60.57158	-41.06285	Gear left bottom.
18/03/2016 16:28	142	-60.57192	-41.06138	Commenced hauling.
18/03/2016 16:17	142	-60.57317	-41.05622	Winch stopped
18/03/2016 16:12	142	-60.57333	-41.05488	Gear on bottom.
18/03/2016 15:51	142	-60.57422	-41.05194	AGT left surface.
18/03/2016 15:49	142	-60.57435	-41.05171	AGT off deck.
18/03/2016 10:05		-60.57526	-41.04973	waiting on weather
18/03/2016 09:45		-60.57525	-41.04988	on DP
17/03/2016 22:40		-60.65392	-43.10793	off DP

17/03/2016 22:29	141	-60.65398	-43.10789	AGT on deck
17/03/2016 21:40	141	-60.65747	-43.10436	AGT off the bottom
17/03/2016 21:10	141	-60.65963	-43.1023	AGT start hauling
17/03/2016 21:00	141	-60.65741	-43.1044	AGT 3000m start trawling
17/03/2016 20:46	141	-60.66381	-43.09772	AGT on the bottom
17/03/2016 20:05	141	-60.66685	-43.09459	AGT in the water
17/03/2016 20:02	141	-60.66682	-43.09461	AGT start deploy
17/03/2016 20:00		-60.66708	-43.09426	AGT repairs finished
17/03/2016 19:35		-60.66706	-43.09431	starting repairs on AGT
17/03/2016 19:28	140	-60.66709	-43.09418	AGT on deck
17/03/2016 18:41	140	-60.66995	-43.09055	Gear left bottom.
17/03/2016 18:09	140	-60.67308	-43.08791	Commenced hauling.
17/03/2016 17:55	140	-60.67641	-43.08411	Winch stopped
17/03/2016 17:39	140	-60.67827	-43.08168	Gear on bottom.
17/03/2016 16:54	140	-60.68101	-43.07647	AGT left surface.
17/03/2016 16:53	140	-60.68108	-43.07628	AGT off deck.
17/03/2016 16:20	Comment	-60.68142	-43.07564	On DP at 2000m station.
17/03/2016 13:50		-60.60674	-43.26855	Commenced swath survey
17/03/2016 10:12		-60.67091	-43.10299	Gantry lashed
17/03/2016 10:05	139	-60.6709	-43.10297	CTD on deck
17/03/2016 09:26	139	-60.67088	-43.10299	CTD 2087m
17/03/2016 08:45	139	-60.67047	-43.10248	CTD in the water
17/03/2016 08:42	139	-60.67045	-43.10241	CTD start deploy
17/03/2016 08:30		-60.67042	-43.10247	start CTD preparations
17/03/2016 06:11	Comment	-60.66693	-43.09801	On DP
17/03/2016 05:07	138	-60.69573	-42.99444	Off DP
17/03/2016 04:55	138	-60.69574	-42.99446	AGT on deck.
17/03/2016 04:53	138	-60.69591	-42.99423	AGT on surface.
17/03/2016 04:14	138	-60.69797	-42.98962	Gear off bottom.
17/03/2016 03:48	138	-60.69939	-42.98627	Commenced hauling.
17/03/2016 03:32	138	-60.70182	-42.98062	Winch stopped
17/03/2016 03:16	138	-60.7033	-42.97726	Gear on bottom.
17/03/2016 02:40	138	-60.70512	-42.97232	A.G.T. at surface
17/03/2016 02:38	138	-60.7053	-42.97205	Commenced deployment A.G.T.
17/03/2016 01:50	137	-60.69774	-43.00056	A.G.T. on deck relocating
17/03/2016 01:48	137	-60.69786	-43.00028	A.G.T. at surface
17/03/2016 01:05	137	-60.69986	-42.99428	A.G.T. off the bottom
17/03/2016 00:37	137	-60.70126	-42.98996	Commenced Hauling A.G.T.
17/03/2016 00:26	137	-60.70265	-42.98485	Stopped at 2344m
17/03/2016 00:13	137	-60.70335	-42.98158	A.G.T. on the bottom
16/03/2016 23:41	137	-60.70506	-42.97597	A.G.T. on surface
16/03/2016 23:38	137	-60.70524	-42.9755	Commenced Deployment A.G.T.

16/03/2016 23:28	136	-60.70561	-42.97409	Gantry secure vessel moving off position for AG.T.
16/03/2016 23:18	136	-60.70588	-42.9739	C.T.D. on deck
16/03/2016 23:16	136	-60.70588	-42.97386	C.T.D. at surface
16/03/2016 22:49	136	-60.70588	-42.9739	CTD 1493m
16/03/2016 22:19	136	-60.70588	-42.97392	CTD start deploy
16/03/2016 22:12		-60.70618	-42.97442	on DP
16/03/2016 21:23		-60.60729	-42.83791	off DP
16/03/2016 21:16	135	-60.60727	-42.83791	SUCS on deck
16/03/2016 21:01	135	-60.60729	-42.83798	SUCS recovery
16/03/2016 20:04	135	-60.6088	-42.83079	SUCS on the bottom 750m
16/03/2016 19:44	135	-60.60889	-42.8303	SUCS deploy
16/03/2016 19:31	134	-60.60889	-42.83031	CTD on deck
16/03/2016 19:14	134	-60.60889	-42.83035	CTD 714m
16/03/2016 18:59	134	-60.60888	-42.83032	CTD in the water
16/03/2016 18:57	134	-60.60891	-42.83028	start CTD deploy
16/03/2016 18:45	Comment.	-60.60891	-42.83035	Swatch survey complete
16/03/2016 16:33	Comment.	-60.6718	-42.52132	Off DP
16/03/2016 16:17	133	-60.67179	-42.5213	EBS on deck.
16/03/2016 16:15	133	-60.67187	-42.52098	EBS on surface.
16/03/2016 16:02	133	-60.67212	-42.51885	EBS left bottom.
16/03/2016 15:52	133	-60.67243	-42.51691	Commenced hauling.
16/03/2016 15:43	133	-60.67293	-42.51228	Winch stopped
16/03/2016 15:38	133	-60.67304	-42.51113	EBS on bottom.
16/03/2016 15:24	133	-60.67311	-42.50848	EBS left surface.
16/03/2016 15:23	133	-60.67312	-42.50827	EBS off deck.
16/03/2016 15:12	133	-60.67313	-42.50813	On DP.
16/03/2016 14:58	133	-60.67877	-42.53851	E.B.S. prepared
16/03/2016 14:34	132	-60.67929	-42.53108	A.G.T. on deck vessel preparing E.B.S.
16/03/2016 14:32	132	-60.67918	-42.53084	A.G.T. at surface
16/03/2016 14:22	132	-60.67859	-42.52948	A.G.T. off the bottom
16/03/2016 14:11	132	-60.67825	-42.52749	Commenced hauling A.G.T.
16/03/2016 14:02	132	-60.67741	-42.5227	Stopped at 750m
16/03/2016 13:54	132	-60.67722	-42.52036	A.G.T. on the bottom
16/03/2016 13:40	132	-60.67669	-42.51802	A.G.T. at surface
16/03/2016 13:39	132	-60.67665	-42.51785	Commenced deployment A.G.T.
16/03/2016 13:30	131	-60.67667	-42.51773	A.G.T. on deck
16/03/2016 13:24	131	-60.67648	-42.51709	A.G.T. at surface
16/03/2016 13:14	131	-60.67622	-42.51558	A.G.T off the bottom
16/03/2016 13:05	131	-60.67571	-42.51415	Commenced Hauling A.G.T.
16/03/2016 12:54	131	-60.67407	-42.50926	Stopped at 750m
16/03/2016 12:49	131	-60.67371	-42.50814	A.G.T. on the bottom
16/03/2016 12:36	131	-60.67322	-42.50605	A.G.T. in water

16/03/2016 12:34	131	-60.6732	-42.50565	Commenced deploy A.G.T.
16/03/2016 12:22	130	-60.67327	-42.50527	A.G.T. on deck vessel stopped
16/03/2016 12:20	130	-60.67323	-42.50496	A.G.T. at surface
16/03/2016 12:08	130	-60.6728	-42.50329	A.G.T. off the bottom
16/03/2016 12:00	130	-60.67261	-42.50197	Commenced Hauling A.G.T.
16/03/2016 11:49	130	-60.67151	-42.4964	Stopped at 750m
16/03/2016 11:45	130	-60.67132	-42.49532	A.G.T. on the bottom
16/03/2016 11:27	130	-60.67084	-42.49203	A.G.T. at surface
16/03/2016 11:25	130	-60.67077	-42.49159	Commenced deployment A.G.T.
16/03/2016 11:17	129	-60.67081	-42.4902	Gantry secure
16/03/2016 11:12	129	-60.6708	-42.49009	SUCS camera on deck
16/03/2016 11:10	129	-60.6708	-42.49005	SUCS camera at surface
16/03/2016 11:01	129	-60.67079	-42.4901	Commenced recovery SUCS
16/03/2016 09:34	129	-60.67037	-42.48183	SUCS start deploy
16/03/2016 09:20		-60.67046	-42.48169	on DP
16/03/2016 08:50		-60.69095	-42.57584	off DP
16/03/2016 08:39	128	-60.69096	-42.57589	CTD on deck
16/03/2016 08:23	128	-60.69095	-42.57585	CTD 553m
16/03/2016 08:10	128	-60.69099	-42.57572	CTD in the water
16/03/2016 08:08	128	-60.69101	-42.57576	start CTD deploy
16/03/2016 08:00		-60.69211	-42.57063	on DP
16/03/2016 06:22	127	-60.71621	-43.03845	Off DP
16/03/2016 06:07	127	-60.71624	-43.03842	EBS on deck.
16/03/2016 06:04	127	-60.71623	-43.03803	EBS on surface.
16/03/2016 05:39	127	-60.71731	-43.03437	EBS left bottom.
16/03/2016 05:24	127	-60.71819	-43.03259	Commenced hauling.
16/03/2016 05:08	127	-60.7209	-43.02643	Winch stopped
16/03/2016 05:00	127	-60.72131	-43.02534	EBS on bottom.
16/03/2016 04:36	127	-60.72261	-43.0224	EBS left surface.
16/03/2016 04:34	127	-60.72265	-43.02205	EBS off deck.
16/03/2016 03:56	126	-60.71874	-43.04383	AGT on deck.
16/03/2016 03:54	126	-60.71881	-43.04359	AGT on surface.
16/03/2016 03:30	126	-60.71972	-43.03984	Gear off bottom.
16/03/2016 03:13	126	-60.72041	-43.03725	Commenced hauling.
16/03/2016 03:02	126	-60.72118	-43.03156	A.G.T. on the bottom
16/03/2016 02:25	126	-60.72207	-43.02286	A.G.T. in the water
16/03/2016 02:23	126	-60.72215	-43.02246	Commenced deployment A.G.T.
16/03/2016 02:20	126	-60.72227	-43.02193	Vessel in position to deploy
16/03/2016 02:00	125	-60.7178	-43.0166	A.G.T. on deck vessel relocating
16/03/2016 01:58	125	-60.71783	-43.01629	A.G.T. at surface
16/03/2016 01:34	125	-60.71889	-43.01285	A.G.T. off the bottom
16/03/2016 01:12	125	-60.7201	-43.00874	Commenced Hauling A.G.T.

16/03/2016 01:02	125	-60.72137	-43.00396	Stopped at 1620m
16/03/2016 00:53	125	-60.72223	-43.00214	A.G.T. on the bottom
16/03/2016 00:27	125	-60.72362	-42.99886	A.G.T. in the water
16/03/2016 00:17	125	-60.72367	-42.99717	Vessel in position to deploy A.G.T.
15/03/2016 23:51	124	-60.72741	-43.01532	A.G.T. on deck
15/03/2016 23:49	124	-60.72736	-43.01499	A.G.T. at surface
15/03/2016 23:38	124	-60.72722	-43.01314	A.G.T off the bottom
15/03/2016 23:10	124	-60.72712	-43.00836	Commenced Hauling A.G.T.
15/03/2016 22:58	124	-60.72715	-43.00224	AGT 1425m
15/03/2016 22:45	124	-60.72738	-42.99898	AGT bottom
15/03/2016 22:27	124	-60.7276	-42.99548	AGt in the water
15/03/2016 22:25	124	-60.72771	-42.99524	AGt start deploy
15/03/2016 22:10	123	-60.72772	-42.99528	SUCS on deck
15/03/2016 21:49	123	-60.72773	-42.99529	SUCS recovering
15/03/2016 20:42	123	-60.72995	-42.9877	SUCS on the bottom 930m
15/03/2016 20:19	123	-60.72998	-42.9877	SUCS start deploy
15/03/2016 20:07	122	-60.72998	-42.9877	CTD on deck
15/03/2016 19:47	122	-60.72996	-42.98771	CTD 896m
15/03/2016 19:26	122	-60.72998	-42.98769	CTD start deploy
15/03/2016 19:17		-60.73005	-42.98776	on DP
15/03/2016 19:08		-60.73858	-42.98957	off DP
15/03/2016 18:44	121	-60.73965	-42.98943	EBS on deck.
15/03/2016 18:42	121	-60.73977	-42.98922	EBS on surface.
15/03/2016 18:24	121	-60.74082	-42.98702	Gear off bottom.
15/03/2016 18:09	121	-60.74209	-42.98516	Commenced hauling.
15/03/2016 17:57	121	-60.74422	-42.98186	Winch stopped
15/03/2016 17:50	121	-60.74458	-42.981	EBS on bottom.
15/03/2016 17:33	121	-60.74562	-42.97908	EBS left surface.
15/03/2016 17:29	121	-60.74587	-42.9786	EBS off deck.
15/03/2016 16:55	120	-60.7392	-42.99002	AGT on deck. Relocating for EBS.
15/03/2016 16:54	120	-60.73925	-42.98991	AGT on surface.
15/03/2016 16:36	120	-60.74047	-42.98812	Gear off bottom.
15/03/2016 16:20	120	-60.74169	-42.98644	Commenced hauling.
15/03/2016 16:08	120	-60.74406	-42.98237	Winch stopped
15/03/2016 16:00	120	-60.74495	-42.9811	Gear on bottom.
15/03/2016 15:40	120	-60.74603	-42.97861	AGT left surface.
15/03/2016 15:38	120	-60.74615	-42.9783	AGT off deck.
15/03/2016 15:14	119	-60.73376	-42.98291	AGT on deck.
15/03/2016 15:12	119	-60.73391	-42.98273	AGT on surface.
15/03/2016 14:53	119	-60.73485	-42.98008	A.G.T. off the bottom
15/03/2016 14:37	119	-60.73581	-42.97757	Commenced Hauling
15/03/2016 14:28	119	-60.73766	-42.97414	Stopped at 1260m

15/03/2016 14:18	119	-60.73875	-42.97229	A.G.T. on the bottom
15/03/2016 13:58	119	-60.73993	-42.96967	A.G.T. at surface
15/03/2016 13:54	119	-60.74018	-42.96895	Commenced Deployment A.G.T
15/03/2016 13:44	119	-60.74023	-42.96876	Vessel in position for A.G.T. deployment
15/03/2016 13:28	118	-60.74092	-42.94802	A.G.T. on deck vessel relocating for next deployment
15/03/2016 13:25	118	-60.7408	-42.94693	Net at surface
15/03/2016 13:03	118	-60.7418	-42.94381	A.G.T. off the bottom
15/03/2016 12:49	118	-60.74252	-42.94161	Commenced hauling
15/03/2016 12:38	118	-60.74422	-42.93692	Stopped at 1260m
15/03/2016 12:31	118	-60.74495	-42.93566	A.G.T. on the bottom
15/03/2016 12:08	118	-60.7458	-42.9321	A.G.T. at surface
15/03/2016 12:07	118	-60.74586	-42.93194	Commenced Deployment A.G.T.
15/03/2016 12:05	118	-60.74598	-42.93164	Vessel in position to deploy A.G.T.
15/03/2016 11:54	117	-60.74649	-42.93096	SUCS on deck
15/03/2016 11:53	117	-60.7465	-42.93095	SUCS at surface
15/03/2016 11:36	117	-60.7466	-42.93114	Commenced Hauling for recovery SUCS
15/03/2016 10:23	117	-60.74701	-42.92262	SUCS on the bottom 810m
15/03/2016 10:05	117	-60.74701	-42.92264	SUCS in the water
15/03/2016 10:03	117	-60.74701	-42.92262	SUCS off the deck
15/03/2016 09:47	116	-60.74699	-42.92262	CTD on deck
15/03/2016 09:30	116	-60.74701	-42.92262	CTD 764m
15/03/2016 09:13	116	-60.74701	-42.9226	CTD in the water
15/03/2016 09:10	116	-60.747	-42.92263	CTD off the deck
15/03/2016 09:02		-60.74741	-42.92277	on DP
15/03/2016 08:41		-60.75246	-42.96987	off DP
15/03/2016 08:24	115	-60.75229	-42.97198	EBS on deck
15/03/2016 08:21	115	-60.75231	-42.97163	EBS surface
15/03/2016 08:09	115	-60.75239	-42.97025	EBS off the bottom
15/03/2016 07:56	115	-60.7523	-42.96839	EBS start hauling
15/03/2016 07:42	115	-60.7528	-42.96154	EBS start trawling 800m
15/03/2016 07:37	115	-60.75272	-42.96079	EBS on the bottom
15/03/2016 07:21	115	-60.75266	-42.95874	EBS in the water
15/03/2016 07:19	115	-60.75276	-42.95826	EBS start deploy
15/03/2016 06:46	114	-60.75334	-42.97612	AGT on deck.
15/03/2016 06:44	114	-60.75324	-42.97581	AGT on surface.
15/03/2016 06:29	114	-60.75311	-42.97324	Gear off bottom.
15/03/2016 06:19	114	-60.75292	-42.97157	Commenced hauling.
15/03/2016 06:06	114	-60.75248	-42.96479	Winch stopped
15/03/2016 06:00	114	-60.75237	-42.96314	Gear on bottom.
15/03/2016 05:43	114	-60.75233	-42.96032	AGT left surface.
15/03/2016 05:41	114	-60.7523	-42.95988	AGT off deck.
15/03/2016 05:04	113	-60.75984	-42.98676	AGT on deck.

15/03/2016 05:02	113	-60.75971	-42.98646	AGT on surface.
15/03/2016 04:48	113	-60.75948	-42.98415	Gear off bottom.
15/03/2016 04:35	113	-60.75918	-42.98266	Commenced hauling.
15/03/2016 04:21	113	-60.75821	-42.97576	Winch stopped
15/03/2016 04:15	113	-60.75781	-42.97433	Gear on bottom.
15/03/2016 04:00	113	-60.75723	-42.97207	AGT left surface.
15/03/2016 03:58	113	-60.75713	-42.97175	AGT off deck
15/03/2016 03:38	112	-60.75708	-42.97152	AGT on deck.
15/03/2016 03:36	112	-60.75705	-42.9712	AGT on surface.
15/03/2016 03:21	112	-60.75632	-42.9691	Gear off bottom.
15/03/2016 03:13	112	-60.75576	-42.96818	Commenced hauling.
15/03/2016 02:58	112	-60.75406	-42.96164	Winch stopped
15/03/2016 02:36	112	-60.75258	-42.95832	A.G.T. in the water
15/03/2016 02:35	112	-60.75246	-42.95819	Commenced deploy A.G.T.
15/03/2016 02:30	112	-60.75219	-42.95757	Vessel in pos'n to deploy A.G.T.
15/03/2016 01:55	111	-60.76401	-42.96917	SUCS camera on deck
15/03/2016 01:54	111	-60.764	-42.96917	SUCS camera at surface
15/03/2016 01:43	111	-60.764	-42.96918	Commenced recovery SUCS camera
15/03/2016 00:22	111	-60.7598	-42.9688	SUCS camera at depth
15/03/2016 00:10	111	-60.7598	-42.96879	SUCS camera at surface
15/03/2016 00:08	111	-60.75981	-42.96879	Commenced deployment SUCS
14/03/2016 23:40	110	-60.75972	-42.96845	C.T.D. on deck
14/03/2016 23:36	110	-60.7598	-42.96842	C.T.D. at surface
14/03/2016 23:24	110	-60.75975	-42.96836	C.T.D. at depth 498
14/03/2016 23:11	110	-60.7597	-42.96831	Commenced deploy C.T.D.
14/03/2016 23:10	110	-60.75973	-42.96834	Vessel in position for C.T.D. deploy
14/03/2016 17:35	Comment.	-60.44693	-44.34435	Commencing Swath survey.
14/03/2016 17:28	109	-60.44489	-44.35632	Off DP
14/03/2016 17:15	109	-60.44488	-44.35629	AGT on deck.
14/03/2016 17:14	109	-60.4448	-44.35623	AGT on surface.
14/03/2016 16:32	109	-60.44141	-44.35474	Gear off bottom.
14/03/2016 15:49	109	-60.4383	-44.3509	Commenced hauling.
14/03/2016 15:37	109	-60.43593	-44.3475	Winch stopped
14/03/2016 15:21	109	-60.43512	-44.3436	Gear on bottom.
14/03/2016 14:36	109	-60.43278	-44.33747	A.G.T. at surface
14/03/2016 14:34	109	-60.43275	-44.33703	Commenced deployment A.G.T.
14/03/2016 14:02	108	-60.4321	-44.33368	A.G.T. on deck
14/03/2016 14:00	108	-60.43204	-44.33334	A.G.T. at surface
14/03/2016 13:15	108	-60.4363	-44.32893	Off the bottom
14/03/2016 12:44	108	-60.4384	-44.32509	Commenced Hauling
14/03/2016 12:34	108	-60.44019	-44.32094	Stopped at 3000m
14/03/2016 12:18	108	-60.44163	-44.31756	A.G.T. on the bottom

14/03/2016 11:36	108	-60.44318	-44.31084	A.G.T. in the water
14/03/2016 11:34	108	-60.44329	-44.31039	Commence deploy A.G.T.
14/03/2016 11:18	107	-60.44354	-44.30949	C.T.D. on deck
14/03/2016 11:15	107	-60.44359	-44.30934	C.T.D. at surface
14/03/2016 10:37	107	-60.44354	-44.30927	CTD 2051m
14/03/2016 09:58	107	-60.44355	-44.30904	CTD in the water
14/03/2016 09:47		-60.44333	-44.3089	on DP
14/03/2016 09:33		-60.46013	-44.3043	off DP
14/03/2016 09:26	106	-60.46011	-44.30427	CTD on deck
14/03/2016 09:25	106	-60.46011	-44.30426	CTD surface
14/03/2016 08:55	106	-60.46009	-44.3043	CTD 1524m
14/03/2016 08:25	106	-60.4601	-44.3043	CTD in the water
14/03/2016 08:21	106	-60.46012	-44.30427	CTD start deploy
14/03/2016 08:17		-60.4601	-44.30432	on DP
14/03/2016 07:58		-60.45428	-44.33116	off DP
14/03/2016 07:51	105	-60.45429	-44.33129	AGT on deck
14/03/2016 07:48	105	-60.45435	-44.33088	AGT surface
14/03/2016 07:20	105	-60.45485	-44.3263	AGT off the bottom
14/03/2016 06:47	105	-60.45565	-44.32094	Commencing hauling.
14/03/2016 06:34	105	-60.45662	-44.31471	Winch stopped
14/03/2016 06:22	105	-60.45717	-44.31151	Gear on bottom.
14/03/2016 05:48	105	-60.45859	-44.30695	AGT left surface.
14/03/2016 05:46	105	-60.4587	-44.30661	AGT off deck.
14/03/2016 05:39	105	-60.45871	-44.30657	Vessel on DP.
14/03/2016 05:17	104	-60.45819	-44.32976	V/L off DP
14/03/2016 05:14	104	-60.4582	-44.32956	AGT on deck.
14/03/2016 05:13	104	-60.45822	-44.3294	AGT on surface.
14/03/2016 04:41	104	-60.45884	-44.3242	Gear off bottom.
14/03/2016 04:14	104	-60.45949	-44.31988	Commenced hauling.
14/03/2016 03:48	104	-60.46136	-44.30997	Gear on bottom.
14/03/2016 03:15	104	-60.46266	-44.30516	AGT left surface.
14/03/2016 03:14	104	-60.46274	-44.305	AGT off deck.
14/03/2016 03:05	104	-60.46278	-44.30497	On DP at 1500m station.
14/03/2016 01:42	103	-60.47148	-44.43109	E.B.S. on deck - vessel relocating to 1500m station
14/03/2016 01:12	103	-60.47328	-44.4275	Commenced Hauling E.B.S.
14/03/2016 00:58	103	-60.47574	-44.42262	E.B.S. stopped at 1100m
14/03/2016 00:51	103	-60.47616	-44.42173	E.B.S. on the bottom
14/03/2016 00:30	103	-60.47754	-44.41957	E.B.S. at surface
14/03/2016 00:28	103	-60.47766	-44.41933	Commenced deploy E.B.S.
14/03/2016 00:18	103	-60.47792	-44.41836	Vessel in position to deploy E.B.S.
13/03/2016 23:42	102	-60.47168	-44.42747	A.G.T. on deck
13/03/2016 23:41	102	-60.47173	-44.42736	A.G.T. at surface

13/03/2016 23:10	102	-60.47377	-44.42373	Commenced Hauling A.G.T.
13/03/2016 22:53	102	-60.47671	-44.41838	AGT on the bottom
13/03/2016 22:33	102	-60.47825	-44.41646	AGT in the water
13/03/2016 22:31	102	-60.47834	-44.41597	AGT start deploy
13/03/2016 22:12	101	-60.47116	-44.42356	AGT on deck
13/03/2016 22:11	101	-60.47125	-44.42349	AGT surface
13/03/2016 21:52	101	-60.47257	-44.42241	AGT off the bottom
13/03/2016 21:42	101	-60.47354	-44.42184	AGT start hauling
13/03/2016 21:32	101	-60.47597	-44.41958	AGT start trawling
13/03/2016 21:25	101	-60.47684	-44.41901	AGT on the bottom
13/03/2016 21:07	101	-60.47826	-44.41809	AGT in the water
13/03/2016 21:04	101	-60.47846	-44.41814	AGT and Rauschert dredge start deploy
13/03/2016 20:49	100	-60.4707	-44.41908	AGT on deck
13/03/2016 20:47	100	-60.47081	-44.419	AGT surface
13/03/2016 20:28	100	-60.47188	-44.41865	AGT off the bottom
13/03/2016 20:18	100	-60.4729	-44.41877	AGT start hieving
13/03/2016 20:08	100	-60.4755	-44.41902	AGT 1100m start trawling
13/03/2016 20:03	100	-60.47625	-44.41913	AGT on the bottom
13/03/2016 19:43	100	-60.47789	-44.41955	AGT in the water
13/03/2016 19:40	100	-60.47809	-44.41963	AGT start deploy
13/03/2016 19:23	99	-60.47479	-44.41586	SUCS on deck
13/03/2016 19:05	99	-60.47358	-44.41369	SUCS hauling for recovery
13/03/2016 17:40	99	-60.47766	-44.41344	SUCS on bottom.
13/03/2016 17:26	99	-60.47763	-44.41326	SUCS left surface.
13/03/2016 17:24	99	-60.47762	-44.41327	SUCS off deck.
13/03/2016 17:16	99	-60.47764	-44.4133	USBL pole extended.
13/03/2016 17:15	98	-60.47764	-44.41327	CTD on deck.
13/03/2016 17:12	98	-60.47766	-44.41326	CTD on surface.
13/03/2016 16:57	98	-60.47766	-44.41323	CTD at depth
13/03/2016 16:40	98	-60.47765	-44.41326	CTD left surface.
13/03/2016 16:39	98	-60.47766	-44.41325	CTD off deck.
13/03/2016 16:34	98	-60.47766	-44.41326	Gantry unlashed.
13/03/2016 16:20	Comment	-60.47859	-44.41219	On DP at 750m station.
13/03/2016 15:06	97	-60.44481	-44.70084	SUCS on deck.
13/03/2016 15:05	97	-60.4448	-44.70086	SUCS on surface.
13/03/2016 14:47	97	-60.44482	-44.70087	Commenced Hauling SUCS for recovery
13/03/2016 13:42	97	-60.44745	-44.69421	SUCS on the bottom
13/03/2016 13:23	97	-60.44751	-44.69412	SUCS camera at surface
13/03/2016 13:22	97	-60.44751	-44.69414	Commence deploy SUCS camera
13/03/2016 13:19	97	-60.44749	-44.69415	Vessel in position on D.P.
13/03/2016 12:53	96	-60.45491	-44.71795	C.T.D. on deck
13/03/2016 12:50	96	-60.4549	-44.71795	C.T.D. on the surface

13/03/2016 12:29	96	-60.45496	-44.71786	C.T.D. on the bottom 1112m
13/03/2016 12:07	96	-60.455	-44.71784	C.T.D. at surface
13/03/2016 12:03	96	-60.45499	-44.71784	Commence deployment C.T.D.
13/03/2016 11:48	95	-60.45494	-44.718	A.G.T. on deck vessel stopped for C.T.D.
13/03/2016 11:46	95	-60.4551	-44.71784	A.G.T. at surface
13/03/2016 11:22	95	-60.45621	-44.71463	A.G.T. off the bottom
13/03/2016 11:05	95	-60.45704	-44.71146	Commenced Hauling A.G.T.
13/03/2016 10:56	95	-60.45815	-44.70704	Stopped at 1500m
13/03/2016 10:55	95	-60.45818	-44.7069	AGT start trawling
13/03/2016 10:48	95	-60.45872	-44.7047	AGT on the bottom
13/03/2016 10:17	95	-60.45978	-44.70026	AGT and Rauschert dredge in the water
13/03/2016 10:14	95	-60.45984	-44.69995	AGT start deploy
13/03/2016 10:08		-60.45996	-44.69935	on DP
13/03/2016 09:51		-60.47602	-44.7279	off DP
13/03/2016 09:41	94	-60.47612	-44.72786	AGT on deck
13/03/2016 09:39	94	-60.47602	-44.72773	AGT surface
13/03/2016 09:17	94	-60.47527	-44.7258	AGT off the bottom
13/03/2016 09:00	94	-60.47472	-44.7241	AGT start heaving
13/03/2016 08:45	94	-60.47266	-44.7182	AGT start trawling
13/03/2016 08:32	94	-60.47158	-44.71553	AGT on the bottom
13/03/2016 08:05	94	-60.46997	-44.71323	AGT in the water
13/03/2016 08:03	94	-60.46988	-44.71304	AGT start deploy
13/03/2016 07:44	93	-60.46983	-44.7128	AGT on deck
13/03/2016 07:41	93	-60.46965	-44.71266	AGT surface
13/03/2016 07:20	93	-60.46882	-44.71149	AGT off the bottom
13/03/2016 06:57	93	-60.4676	-44.70863	Commenced hauling.
13/03/2016 06:45	93	-60.46528	-44.70442	Winch stopped
13/03/2016 06:34	93	-60.46409	-44.7026	Gear on bottom.
13/03/2016 06:04	93	-60.4621	-44.69983	AGT left surface.
13/03/2016 06:02	93	-60.46209	-44.69985	AGT off deck.
13/03/2016 05:50	Comment	-60.46176	-44.69956	Vessel on DP at 1000m station.
13/03/2016 03:35	Comment	-60.49958	-44.53008	Off DP
13/03/2016 03:18	92	-60.49947	-44.52942	AGT on deck.
13/03/2016 03:16	92	-60.49946	-44.52897	AGT on surface.
13/03/2016 03:01	92	-60.49858	-44.52717	Gear off bottom.
13/03/2016 02:54	92	-60.49819	-44.52637	Commenced Hauling A.G.T.
13/03/2016 02:34	92	-60.49492	-44.52056	A.G.T. on the bottom
13/03/2016 02:14	92	-60.49354	-44.51864	A.G.T. at surface
13/03/2016 02:06	92	-60.49306	-44.5177	Commenced deployment A.G.T.
13/03/2016 01:57	92	-60.49266	-44.51741	Vessel in position to deploy
13/03/2016 01:22	91	-60.49949	-44.53232	A.G.T on deck
13/03/2016 01:20	91	-60.49933	-44.53203	A.G.T. on the surface

13/03/2016 00:56	91	-60.49831	-44.52786	Commenced Hauling A.G.T.
13/03/2016 00:46	91	-60.49643	-44.5239	Stopped at 830m
13/03/2016 00:40	91	-60.49595	-44.52255	A.G.T on the bottom
13/03/2016 00:20	91	-60.49492	-44.51973	A.G.T. in the water
13/03/2016 00:19	91	-60.49485	-44.51966	Commenced deployment A.G.T.
13/03/2016 00:12	91	-60.49452	-44.51882	Vessel in position to deploy
12/03/2016 23:42	90	-60.49698	-44.52795	A.G.T. on deck
12/03/2016 23:41	90	-60.4969	-44.52785	A.G.T. at surface
12/03/2016 23:19	90	-60.49607	-44.52414	Commenced Hauling
12/03/2016 23:08	90	-60.4947	-44.51909	Stopped at 790m
12/03/2016 23:03	90	-60.49441	-44.51786	A.G.T. on the bottom
12/03/2016 22:46	90	-60.49385	-44.51483	AGT in the water
12/03/2016 22:44	90	-60.49371	-44.51456	AGT start deploy
12/03/2016 22:30		-60.49328	-44.51131	on DP
12/03/2016 22:08		-60.48297	-44.58037	off DP
12/03/2016 21:57	89	-60.48295	-44.58034	SUCS on deck
12/03/2016 21:47	89	-60.48294	-44.5804	SUCS hauling for recovery
12/03/2016 21:20	89	-60.48304	-44.57892	SUCS on the bottom 500m
12/03/2016 21:09	89	-60.48304	-44.57889	SUCS in the water
12/03/2016 21:06	89	-60.48304	-44.57882	SUCS start deploy
12/03/2016 20:52	88	-60.48302	-44.57883	CTD on deck
12/03/2016 20:40	88	-60.48302	-44.57885	CTD 482m
12/03/2016 20:27	88	-60.48304	-44.57882	CTD in the water
12/03/2016 20:25	88	-60.48303	-44.57883	CTD start deploy
12/03/2016 20:16		-60.48305	-44.57879	on DP
12/03/2016 08:04		-60.21825	-46.75928	off DP
12/03/2016 07:55	87	-60.21827	-46.75927	SUCS on deck
12/03/2016 07:39	87	-60.21826	-46.75929	SUCS recovery
12/03/2016 06:41	87	-60.21893	-46.75445	SUCS on bottom.
12/03/2016 06:23	87	-60.21904	-46.75456	SUCS left surface.
12/03/2016 06:22	87	-60.21902	-46.75455	SUCS off deck.
12/03/2016 06:15	87	-60.21903	-46.7545	USBL extended.
12/03/2016 05:35	86	-60.21902	-46.75444	EBS on deck. Standing by on DP.
12/03/2016 05:32	86	-60.21905	-46.75429	EBS on surface.
12/03/2016 05:10	86	-60.21887	-46.75049	Gear off bottom.
12/03/2016 04:57	86	-60.21872	-46.74835	Commenced hauling.
12/03/2016 04:42	86	-60.2178	-46.74143	Winch stopped
12/03/2016 04:34	86	-60.21748	-46.74018	EBS on bottom.
12/03/2016 04:08	86	-60.21648	-46.73648	EBS left surface.
12/03/2016 04:04	86	-60.21603	-46.73654	EBS off deck.
12/03/2016 03:21	85	-60.21593	-46.73656	AGT on deck.
12/03/2016 03:19	85	-60.21587	-46.73628	AGT on surface.

12/03/2016 03:01	85	-60.21577	-46.73315	Gear off bottom.
12/03/2016 02:46	85	-60.21504	-46.73103	Commenced Hauling A.G.T.
12/03/2016 02:26	85	-60.2135	-46.72335	A.G.T. on the bottom
12/03/2016 02:04	85	-60.21314	-46.71997	A.G.T. in the water
12/03/2016 02:03	85	-60.21311	-46.71942	Commenced Deployment A.G.T
11/03/2016 17:35	84	-60.21474	-46.7137	AGT on deck. Vessel standing by on DP (waiting on weather).
11/03/2016 17:34	84	-60.21463	-46.71358	AGT on surface.
11/03/2016 17:14	84	-60.21456	-46.71088	Gear off bottom.
11/03/2016 17:04	84	-60.21509	-46.70912	Commencing hauling.
11/03/2016 16:47	84	-60.21635	-46.70515	Gear on bottom.
11/03/2016 16:24	84	-60.21716	-46.70183	AGT left surface.
11/03/2016 16:23	84	-60.21718	-46.70175	AGT off deck.
11/03/2016 16:12	83	-60.21729	-46.70132	AGT on deck.
11/03/2016 16:11	83	-60.21734	-46.70123	AGT on surface.
11/03/2016 15:53	83	-60.21818	-46.69869	Gear off bottom.
11/03/2016 15:42	83	-60.21864	-46.69669	Commencing hauling.
11/03/2016 15:23	83	-60.22066	-46.68976	Gear on bottom.
11/03/2016 15:07	83	-60.22102	-46.68712	AGT left surface.
11/03/2016 15:05	83	-60.22115	-46.68692	AGT off deck.
11/03/2016 14:46	82	-60.22124	-46.68683	C.T.D. on deck
11/03/2016 14:44	82	-60.22125	-46.68684	C.T.D. at surface
11/03/2016 14:28	82	-60.22128	-46.68683	C.T.D. on the bottom at 755m
11/03/2016 14:11	82	-60.22128	-46.6868	C.T.D. in water
11/03/2016 14:09	82	-60.22127	-46.68685	Commenced Deployment C.T.D
11/03/2016 14:02	82	-60.22129	-46.6869	Vessel in position on D.P.
11/03/2016 13:07	81	-60.26953	-46.88933	A.G.T. on deck
11/03/2016 13:05	81	-60.26952	-46.88893	A.G.T. at surface
11/03/2016 12:53	81	-60.26959	-46.88684	A.G.T. off the bottom
11/03/2016 12:33	81	-60.27114	-46.87988	Stopped at 730m
11/03/2016 12:27	81	-60.2713	-46.87825	A.G.T. on the bottom
11/03/2016 12:14	81	-60.2718	-46.8762	A.G.T at surface
11/03/2016 12:12	81	-60.27185	-46.87591	Commenced deploy A.G.T.
11/03/2016 11:42	80	-60.26978	-46.88784	A.G.T. on deck
11/03/2016 11:41	80	-60.26985	-46.8877	A.G.T. at surface
11/03/2016 11:29	80	-60.27044	-46.88603	Off the bottom
11/03/2016 11:21	80	-60.2709	-46.88499	Commenced Haul
11/03/2016 11:08	80	-60.27033	-46.88665	Stopped at 750m
11/03/2016 10:51	80	-60.27336	-46.8761	AGT in the water
11/03/2016 10:48	80	-60.27348	-46.87568	AGt & Rauschert dredge deploy
11/03/2016 10:35	79	-60.27366	-46.87577	AGT on deck
11/03/2016 10:33	79	-60.27378	-46.87552	AGT surface
11/03/2016 10:21	79	-60.27426	-46.87371	AGT off the bottom

11/03/2016 10:11	79	-60.27475	-46.87197	AGT end trawling
11/03/2016 10:01	79	-60.27422	-46.87388	AGT start trawling
11/03/2016 09:56	79	-60.27654	-46.8662	AGT on the bottom
11/03/2016 09:41	79	-60.27717	-46.86386	AGT in the water
11/03/2016 09:38	79	-60.27724	-46.86347	AGT start deploy
11/03/2016 09:20	78	-60.27727	-46.86335	SUCS on deck
11/03/2016 09:19	78	-60.27728	-46.86335	SUCS surface
11/03/2016 09:10	78	-60.27727	-46.86334	SUCS start recovery
11/03/2016 08:03	80	-60.27035	-46.88659	On the bottom
11/03/2016 07:40	78	-60.28057	-46.85803	SUCS on the bottom
11/03/2016 07:25	78	-60.27967	-46.85721	SUCS in the water
11/03/2016 07:23	78	-60.27969	-46.85719	SUCS start deploy
11/03/2016 07:05	77	-60.27969	-46.85723	CTD on deck
11/03/2016 06:53	77	-60.27968	-46.85724	CTD at depth
11/03/2016 06:40	77	-60.27969	-46.85722	CTD left surface.
11/03/2016 06:38	77	-60.27968	-46.85723	CTD off deck.
11/03/2016 06:25	77	-60.27984	-46.85645	On DP at 500m station.
11/03/2016 04:35	76	-60.35546	-46.53144	Off DP
11/03/2016 04:19	76	-60.35548	-46.53142	AGT on deck.
11/03/2016 04:17	76	-60.35565	-46.53129	AGT on surface.
11/03/2016 03:49	76	-60.35797	-46.5312	Gear off bottom.
11/03/2016 03:36	76	-60.35907	-46.53139	Commenced hauling.
11/03/2016 03:22	76	-60.3626	-46.53143	Winch stopped
11/03/2016 03:13	76	-60.36383	-46.53159	Gear on bottom.
11/03/2016 02:50	76	-60.36574	-46.53147	A.G.T. at surface
11/03/2016 02:46	76	-60.36608	-46.53128	Commenced deploy A.G.T
11/03/2016 02:42	76	-60.36649	-46.53136	Vessel in position to deploy
11/03/2016 02:08	75	-60.35569	-46.52408	A.G.T. on deck
11/03/2016 02:07	75	-60.35576	-46.52415	A.G.T. at surface
11/03/2016 01:25	75	-60.35925	-46.52524	Commenced Hauling
11/03/2016 01:13	75	-60.36235	-46.52635	Stopped at 1630m
11/03/2016 01:03	75	-60.36383	-46.52691	On the bottom
11/03/2016 00:37	75	-60.36601	-46.52747	A.G.T. in the water
11/03/2016 00:35	75	-60.36617	-46.5275	Commenced deployment A.G.T.
11/03/2016 00:19	75	-60.36693	-46.52738	Vessel in position to deploy A.G.T.
10/03/2016 23:55	74	-60.3573	-46.53675	A.G.T. on deck
10/03/2016 23:54	74	-60.35739	-46.53678	A.G.T. at surface
10/03/2016 23:27	74	-60.35865	-46.53407	Off the bottom
10/03/2016 23:07	74	-60.35874	-46.52913	Commenced Hauling A.G.T.
10/03/2016 22:45	74	-60.36141	-46.52201	AGT on the bottom
10/03/2016 22:21	74	-60.36257	-46.51903	AGT in the water
10/03/2016 22:18	74	-60.36269	-46.51872	AGT start deployment

10/03/2016 21:50	73	-60.36301	-46.51741	EBS on deck
10/03/2016 21:24	73	-60.36344	-46.51319	EBS off the bottom
10/03/2016 21:07	73	-60.36369	-46.50997	EBS start hieving
10/03/2016 20:57	73	-60.36404	-46.50485	EBS start trawling
10/03/2016 20:49	73	-60.36412	-46.50356	EBS on the bottom
10/03/2016 20:25	73	-60.36428	-46.49939	EBS in the water
10/03/2016 20:20	73	-60.36436	-46.49854	EBS start deploy
10/03/2016 19:47	72	-60.36938	-46.50952	SUCS on deck
10/03/2016 19:26	72	-60.36938	-46.50954	SUCS hauling for recovery
10/03/2016 18:01	72	-60.37211	-46.50293	SUCS on bottom.
10/03/2016 17:44	72	-60.3721	-46.50288	SUCS left surface.
10/03/2016 17:43	72	-60.3721	-46.50287	SUCS off deck.
10/03/2016 17:32	71	-60.37208	-46.50285	CTD on deck.
10/03/2016 17:29	71	-60.3721	-46.50283	CTD on surface.
10/03/2016 17:15	71	-60.3721	-46.50284	Commencing recovery.
10/03/2016 17:13	71	-60.3721	-46.50284	CTD at depth
10/03/2016 16:53	71	-60.37209	-46.50284	CTD left surface.
10/03/2016 16:51	71	-60.37211	-46.50282	CTD off deck.
10/03/2016 16:35	71	-60.37211	-46.50287	Vessel on DP at 900m station.
10/03/2016 15:21	70	-60.3303	-46.76865	AGT on deck. Off DP. Relocating vessel to 900m station.
10/03/2016 15:19	70	-60.3295	-46.76857	AGT on surface.
10/03/2016 15:00	70	-60.32656	-46.76985	A.G.T. Off the bottom
10/03/2016 14:49	70	-60.32513	-46.76975	Commenced hauling
10/03/2016 14:39	70	-60.32255	-46.7691	Stopped at 1100m
10/03/2016 14:33	70	-60.32166	-46.76899	A.G.T. on the bottom
10/03/2016 14:15	70	-60.32011	-46.76831	A.G.T. at surface
10/03/2016 14:14	70	-60.32001	-46.76824	Commenced deploy A.G.T.
10/03/2016 14:11	70	-60.3197	-46.76801	Vessel in position to deploy
10/03/2016 13:48	69	-60.32691	-46.77188	A.G.T. on deck vessel relocating to start trawl position
10/03/2016 13:47	69	-60.32685	-46.77181	A.G.T. at surface
10/03/2016 13:28	69	-60.32542	-46.77042	A.G.T. off the bottom
10/03/2016 13:15	69	-60.32411	-46.76974	Commenced Hauling
10/03/2016 13:05	69	-60.32161	-46.76802	Stopped at 1150m
10/03/2016 12:58	69	-60.32074	-46.7674	On the bottom
10/03/2016 12:42	69	-60.31946	-46.76605	A.G.T. at surface
10/03/2016 12:40	69	-60.31928	-46.7658	Commenced deploy A.G.T.
10/03/2016 12:36	69	-60.3191	-46.76501	Vessel in position to deploy
10/03/2016 12:14	68	-60.32765	-46.77496	A.G.T. on deck- vessel relocating to start trawl position
10/03/2016 12:12	68	-60.32747	-46.77494	A.G.T. at surface
10/03/2016 11:57	68	-60.32644	-46.77312	A.G.T. off the bottom
10/03/2016 11:44	68	-60.32526	-46.77127	Commenced hauling

10/03/2016 11:34	68	-60.32305	-46.76838	Stopped at 1100m
10/03/2016 11:27	68	-60.32236	-46.76716	A.G.T. on the bottom
10/03/2016 11:10	68	-60.3208	-46.7657	A.G.T. at surface
10/03/2016 11:08	68	-60.32065	-46.76544	Commenced deploy A.G.T. 750m
10/03/2016 10:41	67	-60.32259	-46.768	SUCS on deck
10/03/2016 10:27	67	-60.32392	-46.77095	SUCS start recovery
10/03/2016 08:51	67	-60.32107	-46.76456	SUCS on the bottom 775m
10/03/2016 08:32	67	-60.32115	-46.76437	SUCS in the water
10/03/2016 08:09	66	-60.32115	-46.76439	CTD on deck
10/03/2016 08:07	66	-60.32115	-46.76438	CTD surface
10/03/2016 07:52	66	-60.32117	-46.76437	CTD 735m
10/03/2016 07:35	66	-60.32116	-46.76428	CTD in the water
10/03/2016 07:33	66	-60.32117	-46.76429	CTD start deploy
10/03/2016 07:29		-60.3211	-46.76425	on DP
10/03/2016 06:54		-60.35757	-46.68571	off DP
10/03/2016 06:47	65	-60.35757	-46.68568	CTD on deck.
10/03/2016 06:45	65	-60.35758	-46.68568	CTD on surface.
10/03/2016 06:37	65	-60.35759	-46.68567	Commencing recovery.
10/03/2016 06:35	65	-60.35756	-46.68571	CTD at depth
10/03/2016 06:23	65	-60.35757	-46.68567	CTD left surface.
10/03/2016 06:21	65	-60.35755	-46.6857	CTD off deck.
10/03/2016 06:03	64	-60.35757	-46.68567	SUCS on deck.
10/03/2016 06:02	64	-60.35759	-46.68569	SUCS on surface.
10/03/2016 05:51	64	-60.35757	-46.6857	Commencing recovery.
10/03/2016 04:30	64	-60.3548	-46.68251	SUCS on bottom.
10/03/2016 04:17	64	-60.3548	-46.68241	SUCS left surface.
10/03/2016 04:16	64	-60.35479	-46.6824	SUCS off deck.
10/03/2016 04:05	64	-60.35488	-46.6826	Gantry unlashed.
10/03/2016 03:39	63	-60.36	-46.68853	AGT on deck. Relocating for SUCS.
10/03/2016 03:36	63	-60.35983	-46.6881	AGT on surface.
10/03/2016 03:24	63	-60.35884	-46.68763	Gear off bottom.
10/03/2016 03:13	63	-60.35802	-46.68703	Commencing hauling.
10/03/2016 02:55	63	-60.3544	-46.68427	Gear on bottom.
10/03/2016 02:39	63	-60.35322	-46.68301	A.G.T. in the water
10/03/2016 02:37	63	-60.35306	-46.6829	Commenced deployment A.G.T
10/03/2016 02:35	63	-60.35291	-46.68285	Vessel in position for deployment A.G.T.
10/03/2016 02:08	62	-60.35924	-46.68831	A.G.T. on deck - relocating to start trawl position
10/03/2016 02:07	62	-60.35916	-46.68824	A.G.T at surface
10/03/2016 01:55	62	-60.35823	-46.68745	A.G.T off bottom
10/03/2016 01:45	62	-60.35745	-46.68688	Commenced Hauling
10/03/2016 01:26	62	-60.35379	-46.68398	A.G.T. on bottom
10/03/2016 01:11	62	-60.35269	-46.68292	A.G.T at surface

10/03/2016 01:09	62	-60.35252	-46.68283	Commenced deployment A.G.T.
10/03/2016 01:02	62	-60.35209	-46.68241	Vessel in position to deploy
10/03/2016 00:30	61	-60.35981	-46.6888	A.G.T. on deck
09/03/2016 23:57	61	-60.35567	-46.68519	Stopped at 790m
09/03/2016 23:50	61	-60.35467	-46.68422	A.G.T on the bottom
09/03/2016 23:37	61	-60.35364	-46.68326	A.G.T. at surface
09/03/2016 23:36	61	-60.35354	-46.68314	Commenced deployment A.G.T.
09/03/2016 23:31	61	-60.35313	-46.6826	A.G.T. at surface
09/03/2016 22:56		-60.35324	-46.68215	on DP
09/03/2016 22:14		-60.41355	-46.59806	off DP
09/03/2016 21:51	60	-60.4134	-46.59804	SUCS on deck
09/03/2016 21:40	60	-60.41454	-46.59893	SUCS recovering
09/03/2016 21:02	60	-60.41398	-46.59836	start SUCS deploy
09/03/2016 21:00	60	-60.41399	-46.59834	SUCS in the water
09/03/2016 20:49	59	-60.41401	-46.59833	CTD on deck
09/03/2016 20:37	59	-60.414	-46.59838	CTD 518m
09/03/2016 20:24	59	-60.41403	-46.59834	CTD in the water
09/03/2016 20:15	59	-60.41383	-46.59815	on DP
09/03/2016 19:10		-60.55782	-46.52348	off DP
09/03/2016 19:02	58	-60.5578	-46.52354	SUCS on deck
09/03/2016 18:47	58	-60.5578	-46.52351	Commencing recovery.
09/03/2016 18:29	58	-60.55741	-46.52333	SUCS on bottom.
09/03/2016 18:15	58	-60.55739	-46.52335	USBL pole extended.
09/03/2016 18:13	58	-60.5574	-46.52336	SUCS in water.
09/03/2016 18:12	58	-60.55739	-46.52335	SUCS off deck.
09/03/2016 17:40	57	-60.5595	-46.52345	EBS on deck. Standing by on DP.
09/03/2016 17:39	57	-60.55947	-46.52326	EBS on surface.
09/03/2016 17:19	57	-60.55822	-46.52091	Gear off bottom.
09/03/2016 17:04	57	-60.55733	-46.51856	Commencing hauling.
09/03/2016 16:54	57	-60.55545	-46.51523	Winch stopped
09/03/2016 16:48	57	-60.55505	-46.51458	EBS on bottom.
09/03/2016 16:31	57	-60.55384	-46.51296	EBS left surface.
09/03/2016 16:30	57	-60.55375	-46.51289	EBS off deck.
09/03/2016 16:01	56	-60.55366	-46.51259	Gear on deck. Standing by on DP.
09/03/2016 16:00	56	-60.55361	-46.51248	Gear on surface.
09/03/2016 15:41	56	-60.55206	-46.51126	Gear off bottom.
09/03/2016 15:27	56	-60.55127	-46.50935	Commencing hauling.
09/03/2016 15:16	56	-60.54868	-46.50649	Winch stopped
09/03/2016 15:09	56	-60.54776	-46.5059	Gear on bottom.
09/03/2016 14:55	56	-60.54667	-46.50508	A.G.T. at surface
09/03/2016 14:52	56	-60.54637	-46.50466	Commenced deployment A.G.T.
09/03/2016 14:48	56	-60.54594	-46.50468	Vessel in position for A.G.T. deployment

09/03/2016 14:08	55	-60.54795	-46.49493	A.G.T on deck vessel relocating to next A.G.T deployment
09/03/2016 14:07	55	-60.54786	-46.49483	A.G.T at surface
09/03/2016 13:48	55	-60.5465	-46.49391	A.G.T. off the bottom
09/03/2016 13:34	55	-60.54498	-46.49335	Commenced Hauling A.G.T.
09/03/2016 13:25	55	-60.5427	-46.49157	Stopped at 1200m
09/03/2016 13:17	55	-60.54185	-46.4903	A.G.T. on the bottom
09/03/2016 13:00	55	-60.54035	-46.48965	A.G.T. at surface
09/03/2016 12:58	55	-60.54016	-46.4896	Commenced Deployment A.G.T.
09/03/2016 12:38	54	-60.53997	-46.48952	A.G.T. on deck vessel stopped
09/03/2016 12:37	54	-60.5399	-46.48947	A.G.T. at surface
09/03/2016 12:19	54	-60.53854	-46.48783	Off the bottom
09/03/2016 12:06	54	-60.53732	-46.48666	Commenced hauling A.G.T.
09/03/2016 11:56	54	-60.5348	-46.48462	Stopped at 1160m
09/03/2016 11:50	54	-60.53406	-46.48381	A.G.T. on the bottom
09/03/2016 11:32	54	-60.53242	-46.48243	A.G.T. in the water
09/03/2016 11:30	54	-60.53224	-46.48225	Commenced deployment A.G.T.
09/03/2016 11:25	53	-60.53197	-46.48182	Gantry lashed and secure
09/03/2016 11:14	53	-60.53199	-46.4818	C.T.D. on deck. Awaiting SUCS winch tests.
09/03/2016 11:12	53	-60.53199	-46.48183	C.T.D. at surface
09/03/2016 10:56	53	-60.53199	-46.48181	C.T.D. on the bottom
09/03/2016 10:39	53	-60.53198	-46.48185	CTD in the water
09/03/2016 10:37	53	-60.53197	-46.48178	CTD start deploy
09/03/2016 10:04	53	-60.52972	-46.47469	on DP
08/03/2016 22:08		-62.39479	-44.69473	off DP
08/03/2016 22:00	52	-62.39487	-44.69432	AGT on deck
08/03/2016 21:58	52	-62.39486	-44.69395	AGT surface
08/03/2016 21:20	52	-62.39414	-44.68737	AGT off the bottom
08/03/2016 20:54	52	-62.39416	-44.68233	AGT start hieving
08/03/2016 20:44	52	-62.39435	-44.67665	AGT start trawling: 2400m
08/03/2016 20:31	52	-62.39444	-44.67277	AGT on the bottom
08/03/2016 20:00	52	-62.39464	-44.6673	AGt in the water
08/03/2016 19:58	52	-62.39463	-44.66697	start AGT deploy
08/03/2016 19:54		-62.39479	-44.66716	on DP
08/03/2016 19:13		-62.41811	-44.48887	off DP
08/03/2016 19:05	51	-62.41812	-44.4889	AGT on deck
08/03/2016 19:03	51	-62.41812	-44.48866	AGT surface
08/03/2016 18:14	51	-62.41853	-44.47994	Gear off bottom.
08/03/2016 17:40	51	-62.41881	-44.47358	Commencing hauling.
08/03/2016 17:29	51	-62.41933	-44.46758	Winch stopped
08/03/2016 17:12	51	-62.4202	-44.46288	Gear on bottom.
08/03/2016 16:33	51	-62.42146	-44.45644	AGT left surface.

08/03/2016 16:30	51	-62.42134	-44.45595	AGT off deck.
08/03/2016 16:25	51	-62.42129	-44.45593	Vessel on DP for AGT deployment.
08/03/2016 07:12		-62.68165	-45.04302	start swath
08/03/2016 07:11		-62.65607	-45.65105	off DP
08/03/2016 07:00	50	-62.65606	-45.65108	CTD on deck
08/03/2016 06:19	50	-62.65608	-45.65108	CTD at depth
08/03/2016 05:36	50	-62.65607	-45.6511	CTD in water.
08/03/2016 05:34	50	-62.65608	-45.6511	CTD off deck.
08/03/2016 05:07	49	-62.65605	-45.65104	AGT on deck.
08/03/2016 05:04	49	-62.65628	-45.65115	Gear on surface.
08/03/2016 04:13	49	-62.66021	-45.64784	Gear off bottom.
08/03/2016 03:45	49	-62.6625	-45.64658	Commencing hauling.
08/03/2016 03:32	49	-62.66567	-45.64528	Winch stopped
08/03/2016 03:15	49	-62.668	-45.645	Gear on bottom.
08/03/2016 02:59	49	-62.66929	-45.64448	A.G.T. at surface
08/03/2016 02:58	49	-62.66937	-45.64439	Commenced deployment A.G.T.
08/03/2016 02:26	49	-62.67198	-45.64436	Vessel in position ready to deploy
08/03/2016 01:40	48	-62.67602	-45.68909	A.G.T. on deck
08/03/2016 00:58	48	-62.67953	-45.68921	A.G.T. off the bottom
08/03/2016 00:37	48	-62.68124	-45.68929	Commenced hauling
08/03/2016 00:20	48	-62.68548	-45.68907	Stopped at 2300m
08/03/2016 00:07	48	-62.68714	-45.68906	A.G.T. on the bottom
07/03/2016 23:35	48	-62.68995	-45.68883	A.G.T. at surface
07/03/2016 23:34	48	-62.69007	-45.68883	Commenced deployment A.G.T.
07/03/2016 23:11	47	-62.69039	-45.68878	A.G.T. on deck- vessel stopped
07/03/2016 22:40	47	-62.69255	-45.68852	AGT off the bottom
07/03/2016 22:20	47	-62.69396	-45.68732	AGT start hieving
07/03/2016 22:10	47	-62.69646	-45.68559	AGT 1951m
07/03/2016 21:59	47	-62.69787	-45.68465	AGT on the bottom
07/03/2016 21:34	47			AGT in the water
07/03/2016 21:32	47	-62.69991	-45.68267	AGT start deploy
07/03/2016 21:26		-62.70034	-45.6825	on DP
07/03/2016 20:57		-62.71254	-45.57428	off DP
07/03/2016 20:51	46	-62.71253	-45.57432	AGT on deck
07/03/2016 20:49	46	-62.7126	-45.57418	AGT surface
07/03/2016 20:22	46	-62.71375	-45.57204	AGT off the bottom
07/03/2016 20:07	46	-62.71368	-45.57217	AGT hieving
07/03/2016 19:57	46	-62.71644	-45.56612	start trawling
07/03/2016 19:48	46	-62.71732	-45.56387	AGT on the bottom
07/03/2016 19:26	46	-62.71862	-45.5605	AGT in the water
07/03/2016 19:23	46	-62.71873	-45.56	AGT start deploy
07/03/2016 19:21		-62.71877	-45.55987	on DP

07/03/2016 18:35	Comment	-62.724	-45.64013	Swath survey complete
07/03/2016 01:37		-62.32719	-44.53738	Vessel moving off position to commence Swath survey
07/03/2016 01:36	45	-62.32719	-44.53738	A.G.T. on deck
07/03/2016 01:12	45	-62.32865	-44.53455	A.G.T. off the bottom
07/03/2016 00:52	45	-62.33003	-44.53244	Commenced Hauling A.G.T.
07/03/2016 00:41	45	-62.33191	-44.52776	Stopped at 1530m
07/03/2016 00:32	45	-62.33288	-44.52622	A.G.T. on the bottom
07/03/2016 00:06	45	-62.33462	-44.52327	Commenced deployment A.G.T.
07/03/2016 00:02	45	-62.33477	-44.52254	Vessel in posittion on D.P.
06/03/2016 23:33	44	-62.328	-44.55804	A.G.T. on deck- vessel relocating for next deployment
06/03/2016 23:06	44	-62.32783	-44.5531	A.G.T. off the bottom
06/03/2016 22:48	44	-62.32831	-44.55034	AGT start heaving
06/03/2016 22:38	44	-62.32783	-44.55192	AGT start trawling
06/03/2016 22:28	44	-62.33013	-44.54176	AGT bottom
06/03/2016 22:06	44	-62.33081	-44.53828	AGT in the water
06/03/2016 22:05	44	-62.33084	-44.53811	AGT start deploy
06/03/2016 21:51	43	-62.33086	-44.53799	AGT on deck
06/03/2016 21:50	43	-62.33084	-44.53788	AGT surface
06/03/2016 21:27	43	-62.33162	-44.53519	AGt off the bottom
06/03/2016 21:07	43	-62.33199	-44.53299	AGT finish trawling
06/03/2016 20:56	43	-62.33321	-44.52757	AGT start trawling
06/03/2016 20:48	43	-62.3337	-44.5256	AGt on the bottom
06/03/2016 20:29	43	-62.33416	-44.52238	AGT in the water
06/03/2016 20:28	43	-62.33418	-44.52235	Start deploy AGT
06/03/2016 20:05		-62.3208	-44.57421	off DP
06/03/2016 19:49	42	-62.32078	-44.57421	SUCS on deck
06/03/2016 19:30	42	-62.32077	-44.57423	SUCS start heaving
06/03/2016 17:59	42	-62.32237	-44.57189	SUCS on bottom.
06/03/2016 17:45	42	-62.32237	-44.57186	USBL extended.
06/03/2016 17:39	42	-62.32237	-44.57185	SUCS in water.
06/03/2016 17:37	42	-62.32237	-44.57185	SUCS off deck.
06/03/2016 17:26	41	-62.32239	-44.57187	CTD on deck.
06/03/2016 17:24	41	-62.32238	-44.57187	CTD on surface.
06/03/2016 17:07	41	-62.32239	-44.57185	CTD at depth
06/03/2016 16:48	41	-62.32239	-44.57185	CTD in water.
06/03/2016 16:46	41	-62.32239	-44.57184	CTD off deck.
06/03/2016 16:35	Comment	-62.32236	-44.57184	Swath complete
06/03/2016 15:07	Comment	-62.30415	-44.8503	Commencing Swath survey.
06/03/2016 15:03	40	-62.2795	-45.00456	AGT on deck
06/03/2016 15:01	40	-62.27956	-45.00428	AGT on surface.
06/03/2016 14:44	40	-62.28061	-45.00231	A.G.T. off the bottom

06/03/2016 14:31	40	-62.28144	-45.00066	Commenced hauling A.G.T.
06/03/2016 14:20	40	-62.2836	-44.99677	Stopped at 1080m
06/03/2016 14:15	40	-62.28403	-44.99563	A.G.T. on the bottom
06/03/2016 13:56	40	-62.28499	-44.99289	A.G.T. deployed
06/03/2016 13:54	40	-62.28497	-44.99301	Stopped on D.P. in position for next A.G.T. deployment
06/03/2016 13:35	39	-62.27463	-45.01684	Vessel off D.P. moving to next deployment position
06/03/2016 13:34	39	-62.27471	-45.01667	A.G.T. on deck-
06/03/2016 13:31	39	-62.27492	-45.01619	A.G.T. at surface
06/03/2016 13:16	39	-62.2757	-45.0137	A.G.T. Off the bottom
06/03/2016 12:52	39	-62.27877	-45.0081	Stopped at 1050m
06/03/2016 12:46	39	-62.27925	-45.00684	A.G.T. on the bottom
06/03/2016 12:31	39	-62.28008	-45.00456	A.G.T. Deployed
06/03/2016 12:28	39	-62.28032	-45.00425	Commenced deployment A.G.T.
06/03/2016 12:15	38	-62.28043	-45.00412	A.G.T. on deck
06/03/2016 11:57	38	-62.28111	-45.00116	A.G.T. off the bottom
06/03/2016 11:45	38	-62.28194	-44.99914	Commenced hauling A.G.T.
06/03/2016 11:34	38	-62.28368	-44.99632	Stopped at 1070 inc. to 0.5
06/03/2016 11:28	38	-62.28381	-44.99517	A.G.T. on the bottom
06/03/2016 11:10	38	-62.2847	-44.99244	Commenced deployment A.G.T
06/03/2016 11:01	37	-62.28465	-44.99225	Gantry lashed and secure
06/03/2016 10:49	37	-62.28469	-44.99219	CTD on deck
06/03/2016 10:31	37	-62.28465	-44.99222	CTD 695m
06/03/2016 10:14	37	-62.28464	-44.99221	CTD in the water
06/03/2016 10:12	37	-62.28463	-44.99216	CTD start deploy
06/03/2016 09:54	36	-62.28467	-44.9922	SUCS on deck
06/03/2016 09:40	36	-62.28466	-44.99218	SUCS start recovery
06/03/2016 08:02	36	-62.28786	-44.98615	SUCS in the water
06/03/2016 08:00	36	-62.28781	-44.98621	SUCS start deploy
06/03/2016 07:57		-62.28783	-44.98628	on DP
06/03/2016 06:15		-62.28781	-44.98626	commencing swath survey
06/03/2016 06:02	35	-62.15228	-44.98927	SUCS on deck.
06/03/2016 06:00	35	-62.15251	-44.98909	SUCS on surface.
06/03/2016 05:48	35	-62.1525	-44.98909	Commencing recovery early owing to proximity to iceberg.
06/03/2016 04:21	35	-62.15513	-44.98434	SUCS in water.
06/03/2016 04:20	35	-62.15511	-44.98439	SUCS off deck.
06/03/2016 03:25	34	-62.15518	-44.98475	EBS on deck.
06/03/2016 03:21	34	-62.15525	-44.98465	EBS on surface.
06/03/2016 03:06	34	-62.15649	-44.98386	E.B.S. Off the bottom
06/03/2016 02:44	34	-62.16064	-44.98182	Stopped at 760m
06/03/2016 02:38	34	-62.1612	-44.9818	E.B.S. On the bottom
06/03/2016 02:20	34	-62.16281	-44.98183	Commenced E.B.S. deployment

06/03/2016 01:06	33	-62.14883	-44.98647	A.G.T. on deck moving to E.B.S deployment position
06/03/2016 00:53	33	-62.14977	-44.98767	A.G.T. off the bottom
06/03/2016 00:32	33	-62.15339	-44.98971	Stopped at 760
06/03/2016 00:27	33	-62.14969	-44.98755	A.G.T. on the bottom
06/03/2016 00:09	33	-62.15564	-44.98977	Commenced deployment A.G.T
05/03/2016 23:48	32	-62.15568	-44.98977	Vessel stopped awaiting next A.G.T deployment
05/03/2016 23:45	32	-62.15577	-44.98932	A.G.T. at surface
05/03/2016 23:33	32	-62.15674	-44.98835	Off the bottom
05/03/2016 23:08	32	-62.16118	-44.98784	Stopped at 780m
05/03/2016 23:05	32	-62.16159	-44.98776	A.G.T on bottom
05/03/2016 22:52	32	-62.16268	-44.98738	AGT in the water
05/03/2016 22:48	32	-62.16292	-44.98717	AGT start deploy
05/03/2016 22:30	31	-62.16311	-44.98721	AGT on deck
05/03/2016 22:29	31	-62.16329	-44.9869	AGT surface
05/03/2016 22:16	31	-62.16424	-44.98614	AGT off the bottom
05/03/2016 22:07	31	-62.16497	-44.98563	start hieving
05/03/2016 21:57	31	-62.1675	-44.98357	AGT 780m
05/03/2016 21:51	31	-62.16795	-44.98316	AGT bottom
05/03/2016 21:40	31	-62.16899	-44.98196	AGT in the water
05/03/2016 21:30	31	-62.16961	-44.98108	start deploy AGT
05/03/2016 20:45		-62.16987	-44.98073	Technical problems midships gantry
05/03/2016 20:36	30	-62.16989	-44.98069	CTD an deck
05/03/2016 20:23	30	-62.16987	-44.98066	CTD 514m
05/03/2016 20:09	30	-62.16987	-44.98068	CTD in the water
05/03/2016 20:07	30	-62.16987	-44.98069	CTD start deploy
05/03/2016 19:58		-62.16991	-44.98059	on DP
04/03/2016 09:05		-61.5519	-47.15262	start swath survey
04/03/2016 08:13		-61.55331	-47.43826	deck secured
04/03/2016 07:30	29	-61.55533	-47.43594	AGT on deck
04/03/2016 07:29	29	-61.55534	-47.43581	AGT surface
04/03/2016 06:45	29	-61.55758	-47.43026	Gear off bottom.
04/03/2016 06:08	29	-61.55991	-47.42583	Commencing hauling.
04/03/2016 05:41	29	-61.56373	-47.41893	Gear on bottom.
04/03/2016 05:01	29	-61.56647	-47.41387	AGT left surface.
04/03/2016 05:00	29	-61.56659	-47.41397	AGT in water.
04/03/2016 04:58	29	-61.56697	-47.41387	AGT off deck.
04/03/2016 04:40	28	-61.56693	-47.41412	CTD on deck. Gantry secured.
04/03/2016 04:35	28	-61.56694	-47.41401	CTD on surface.
04/03/2016 03:59	28	-61.56694	-47.414	CTD at depth
04/03/2016 03:20	28	-61.56695	-47.41407	CTD in water.
04/03/2016 03:19	28	-61.56695	-47.41408	CTD off deck.

04/03/2016 03:12	28	-61.56692	-47.41416	Vessel on DP.
04/03/2016 02:10	27	-61.52602	-47.4026	Vessel re-locating to start position 2000m station
04/03/2016 01:55	27	-61.52602	-47.40257	EBS on deck
04/03/2016 00:22	27	-61.53276	-47.3903	EBS on the bottom
03/03/2016 23:52	27	-61.53456	-47.38824	EBS in water
03/03/2016 23:45	27	-61.53536	-47.38794	Vessel in position for EBS deployment
03/03/2016 22:56	26	-61.52576	-47.40794	AGT on deck- vessel relocating to start position for EBS
03/03/2016 22:55	26	-61.52581	-47.40785	AGT surface
03/03/2016 22:18	26	-61.52731	-47.40429	AGT trawl off the bottom
03/03/2016 21:57	26	-61.52846	-47.4017	AGT end trawling
03/03/2016 21:47	26	-61.53023	-47.39779	AGT start trawling
03/03/2016 21:38	26	-61.53122	-47.39601	AGT bottom
03/03/2016 21:09	26	-61.5331	-47.39174	AGT in the water
03/03/2016 21:06	26	-61.53323	-47.39152	AGT start deploy
03/03/2016 20:54	25	-61.53327	-47.39153	CTD out of the water
03/03/2016 20:54	25	-61.53327	-47.39153	CTD on deck
03/03/2016 20:25	25	-61.53327	-47.39144	CTD 1432m
03/03/2016 19:57	25	-61.53329	-47.39142	CTD in the water
03/03/2016 19:56	25	-61.53327	-47.39139	CTD start deploy
03/03/2016 19:48		-61.53331	-47.39148	on DP
03/03/2016 19:14		-61.53177	-47.27165	off DP
03/03/2016 19:06	24	-61.5318	-47.2716	EBS on deck
03/03/2016 19:02	24	-61.5319	-47.27128	EBS surface
03/03/2016 18:37	24	-61.533	-47.26751	Gear off bottom.
03/03/2016 18:22	24	-61.53383	-47.2654	Commencing hauling.
03/03/2016 18:11	24	-61.53539	-47.26057	Winch stopped
03/03/2016 18:03	24	-61.53592	-47.25911	Gear on bottom.
03/03/2016 17:42	24	-61.53715	-47.25538	EBS in water.
03/03/2016 17:41	24	-61.53721	-47.25527	EBS off deck.
03/03/2016 17:10	23	-61.53742	-47.25466	AGT on deck. Vessel standing by on DP.
03/03/2016 17:08	23	-61.53749	-47.25427	AGT on surface.
03/03/2016 16:45	23	-61.53855	-47.25095	Gear off bottom.
03/03/2016 16:27	23	-61.53967	-47.24828	Commencing hauling.
03/03/2016 16:17	23	-61.54114	-47.24408	Winch stopped
03/03/2016 16:08	23	-61.54157	-47.24276	AGT on bottom.
03/03/2016 15:47	23	-61.54277	-47.23998	AGT left surface.
03/03/2016 15:46	23	-61.54286	-47.23992	AGT in water.
03/03/2016 15:44	23	-61.543	-47.23975	AGT off deck.
03/03/2016 15:40	23	-61.54318	-47.23968	Vessel on DP.
03/03/2016 15:09	22	-61.5298	-47.27061	AGT on deck. Relocating vessel.
03/03/2016 15:08	22	-61.52981	-47.2704	AGT on surface.

03/03/2016 14:43	22	-61.53098	-47.2668	A.G.T. Off the bottom
03/03/2016 14:27	22	-61.53202	-47.26436	Commenced hauling A.G.T.
03/03/2016 14:17	22	-61.53374	-47.26019	Stopped at 1500m
03/03/2016 14:09	22	-61.53442	-47.25851	A.G.T. on bottom
03/03/2016 13:45	22	-61.53087	-47.2672	A.G.T. in water
03/03/2016 13:42	22	-61.53585	-47.25499	Commenced deployment A.G.T
03/03/2016 13:28	21	-61.53586	-47.25491	A.G.T. on deck
03/03/2016 13:17	21	-61.53663	-47.25384	A.G.T. off bottom
03/03/2016 12:44	21	-61.53863	-47.24938	Commencing Hauling A.G.T.
03/03/2016 12:34	21	-61.54054	-47.24562	Stopped veering at 1500m
03/03/2016 12:25	21	-61.54121	-47.24347	A.G.T. on bottom
03/03/2016 11:56	21	-61.54256	-47.23941	Commenced deployment
03/03/2016 11:48	21	-61.54253	-47.2395	Vessel in position for A.G.T Deployment
03/03/2016 11:23	20	-61.53999	-47.21166	Gantry Lashed and secure- proceeding to next A.G.T. deployment position
03/03/2016 11:22	20	-61.54	-47.21167	SUCS on deck
03/03/2016 11:02	20	-61.54002	-47.21162	Commenced recovery SUCS
03/03/2016 08:48	20	-61.54285	-47.20479	SUCS in the water
03/03/2016 08:45	20	-61.54285	-47.20477	SUCS start deploy
03/03/2016 08:28	19	-61.54288	-47.20474	CTD on deck
03/03/2016 08:09	19	-61.54284	-47.20478	CTD 882m
03/03/2016 07:49	19	-61.54284	-47.20475	CTD in the water
03/03/2016 07:47	19	-61.54283	-47.20477	CTD start deploy
03/03/2016 07:44		-61.54282	-47.20483	on DP
03/03/2016 07:16		-61.53285	-47.14182	off DP
03/03/2016 06:48	18	-61.53286	-47.14181	EBS on deck.
03/03/2016 06:45	18	-61.53292	-47.14171	EBS on surface.
03/03/2016 06:28	18	-61.53379	-47.13937	Gear off bottom.
03/03/2016 06:14	18	-61.53475	-47.13736	Commencing hauling.
03/03/2016 06:03	18	-61.53672	-47.13312	Winch stopped
03/03/2016 05:55	18	-61.53687	-47.13173	EBS on bottom.
03/03/2016 05:38	18	-61.53799	-47.12967	EBS left surface.
03/03/2016 05:37	18	-61.53808	-47.1296	EBS in water.
03/03/2016 05:36	18	-61.53815	-47.12954	EBS off deck.
03/03/2016 05:29	18	-61.53819	-47.12942	Vessel on DP for EBS deployment.
03/03/2016 04:46	17	-61.52919	-47.1734	AGT on deck
03/03/2016 04:45	17	-61.52924	-47.17324	AGT on surface.
03/03/2016 04:25	17	-61.53007	-47.17025	Gear off the bottom.
03/03/2016 04:16	17	-61.53032	-47.16869	Commenced hauling.
03/03/2016 04:05	17	-61.53156	-47.16315	Winch stopped
03/03/2016 03:58	17	-61.53182	-47.16133	AGT on bottom.
03/03/2016 03:40	17	-61.53136	-47.15814	AGT left surface.
03/03/2016 03:39	17	-61.53133	-47.15796	AGT in water.

03/03/2016 03:38	17	-61.53132	-47.15779	AGT off deck.
03/03/2016 03:23	16	-61.53131	-47.15744	AGT on deck.
03/03/2016 03:20	16	-61.53126	-47.1569	AGT on surface.
03/03/2016 03:02	16	-61.53112	-47.15377	Commenced Hauling
03/03/2016 02:39	16	-61.53225	-47.14553	Stopped at 1100m
03/03/2016 02:32	16	-61.53262	-47.1437	A.G.T. on bottom
03/03/2016 02:12	16	-61.53322	-47.14034	Commenced deployment A.G.T.
03/03/2016 01:48	15	-61.53325	-47.14011	A.G.T. on deck- vessel stopped in position for next A.G.T Deployment
03/03/2016 01:28	15	-61.53434	-47.13748	A.G.T. Off bottom
03/03/2016 01:17	15	-61.53471	-47.13563	Commenced hauling A.G.T
03/03/2016 01:05	15	-61.53673	-47.13077	Stopped at 1065m
03/03/2016 00:54	15	-61.53768	-47.12919	A.G.T. on bottom
03/03/2016 00:38	15	-61.73073	-47.25578	A.G.T In water
03/03/2016 00:35	15	-61.53816	-47.12585	Vessel in position for deployment A.G.T
03/03/2016 00:02	14	-61.5448	-47.14592	Gantry lashed
02/03/2016 23:52	14	-61.5448	-47.14594	SUCS on deck
02/03/2016 23:36	14	-61.54478	-47.14592	Commenced recovery SUCS
02/03/2016 21:32	14	-61.5456	-47.13695	SUCS in the water
02/03/2016 21:30	14	-61.5456	-47.13694	SUCS start deploy
02/03/2016 21:17	13	-61.54561	-47.13694	CTD on deck
02/03/2016 21:02	13	-61.54563	-47.13697	CTD 713m
02/03/2016 20:44	13	-61.54563	-47.13692	CTD in the water
02/03/2016 20:42	13	-61.54563	-47.13687	CTD start deploy
02/03/2016 20:38		-61.54545	-47.13628	on dP
02/03/2016 19:38		-61.52993	-46.94364	off DP
02/03/2016 19:19	12	-61.53046	-46.94181	EBS on deck
02/03/2016 19:17	12	-61.53041	-46.94149	EBS surface
02/03/2016 19:04	12	-61.53008	-46.9391	EBS off the bottom
02/03/2016 18:54	12	-61.52999	-46.93652	EBS start hauling
02/03/2016 18:44	12	-61.53079	-46.93139	Winch stopped
02/03/2016 18:37	12	-61.5308	-46.93084	EBS on the bottom.
02/03/2016 18:25	12	-61.53067	-46.92928	EBS left surface.
02/03/2016 18:24	12	-61.53064	-46.92907	EBS in the water.
02/03/2016 18:23	12	-61.53065	-46.92885	EBS off deck.
02/03/2016 17:48	11	-61.5307	-46.92648	AGT on deck.
02/03/2016 17:46	11	-61.53068	-46.92622	AGT on surface.
02/03/2016 17:33	11	-61.53073	-46.92387	Gear off bottom.
02/03/2016 17:21	11	-61.53101	-46.92294	Commencing hauling.
02/03/2016 17:10	11	-61.53204	-46.9218	Winch stopped
02/03/2016 17:05	11	-61.53192	-46.92087	AGT on bottom.
02/03/2016 16:52	11	-61.53285	-46.91986	AGT left surface.
02/03/2016 16:51	11	-61.5329	-46.91972	AGT in water.

02/03/2016 16:49	11	-61.53297	-46.91943	AGT off deck.
02/03/2016 16:45	11	-61.53298	-46.91919	On location
02/03/2016 16:18	10	-61.53295	-46.95874	AGT on deck
02/03/2016 16:15	10	-61.53289	-46.95874	AGT on surface.
02/03/2016 16:00	10	-61.53289	-46.95792	AGT off bottom.
02/03/2016 15:42	10	-61.53329	-46.9529	Winch stopped
02/03/2016 15:36	10	-61.53323	-46.95116	AGT on bottom.
02/03/2016 15:22	10	-61.53321	-46.94871	AGT left surface.
02/03/2016 15:21	10	-61.53322	-46.94856	AGT in water.
02/03/2016 15:19	10	-61.53328	-46.94824	AGT off deck.
02/03/2016 14:55	9	-61.5335	-46.94718	A.G.T. on deck
02/03/2016 14:51	10	-61.53369	-46.94657	Commencing hauling.
02/03/2016 14:46	9	-61.53389	-46.94577	A.G.T. off Bottom
02/03/2016 14:37	9	-61.53433	-46.94386	Commenced Hauling A.G.T
02/03/2016 14:20	9	-61.53568	-46.93713	A.G.T. on bottom
02/03/2016 14:05	9	-61.53614	-46.9347	Commenced deployment A.G.T.
02/03/2016 13:45	8	-61.53651	-46.93365	SUCS on deck
02/03/2016 13:33	8	-61.53651	-46.93367	Commenced Hauling SUCS for recovery
02/03/2016 11:04	8	-61.53947	-46.92487	SUCS Camera Deployed
02/03/2016 10:50	7	-61.53944	-46.92491	CTD on deck
02/03/2016 10:34	7	-61.53943	-46.92485	CTD 493m
02/03/2016 10:08	7	-61.53955	-46.92498	CTD in the water
02/03/2016 10:02	7	-61.53956	-46.92498	CTD start deploy
02/03/2016 09:50		-61.54163	-46.91867	vsl on DP
02/03/2016 09:50		-61.54271	-46.91946	end of swath
01/03/2016 07:28		-61.22122	-47.44745	start swath transec
29/02/2016 23:26	6	-60.69783	-45.47551	A.G.T. on deck- vessel proceeding to next Transec position
29/02/2016 23:16	6	-60.69878	-45.47561	A.G.T Off seabed
29/02/2016 23:10	6	-60.699	-45.47573	Hauling commenced
29/02/2016 22:57	6	-60.69954	-45.47313	AGT on the bottom
29/02/2016 22:43	6	-60.69997	-45.47086	AGT surface
29/02/2016 22:41	6	-60.70001	-45.47054	AGT start deploy
29/02/2016 22:36	6	-60.70003	-45.47044	on DP AGT
29/02/2016 22:30	6	-60.69847	-45.47205	turning to deploy AGT
29/02/2016 22:12		-60.69978	-45.57428	off DP
29/02/2016 21:18		-60.69916	-45.5667	on DP Signy Island
29/02/2016 20:25		-60.6923	-45.72344	off DP
29/02/2016 17:12		-60.69225	-45.72373	on DP Foca Cove
29/02/2016 16:05		-60.70016	-45.57521	off DP Signy
29/02/2016 10:30		-60.70024	-45.56905	on DP off Signy Island
29/02/2016 01:40		-61.1945	-47.53874	Swath transec complete vessel proceeding to Signy

28/02/2016 12:20		-61.17567	-47.66725	Commenced Transec
28/02/2016 12:20		-61.17567	-47.66725	commence swath transec
28/02/2016 11:34	5	-61.02706	-47.69366	X.B.T complete proceeding on passage
28/02/2016 11:20	5	-60.99951	-47.69754	Vessel reducing speed for X.B.T deployment
27/02/2016 11:49	4	-56.90636	-50.89981	X.B.T. Complete
27/02/2016 11:36	4	-56.88814	-50.92341	Reduced speed for X.B.T deployment
26/02/2016 18:35	3	-54.25633	-54.15741	No sign of kelp
26/02/2016 18:15	3	-54.25316	-54.15262	Kelp sighted
26/02/2016 16:51	2	-54.11731	-54.34202	Kelp recovered onboard
26/02/2016 16:50	2	-53.73976	-54.77595	Ship stopped alongside kelp.
26/02/2016 16:35	2	-54.11927	-54.32766	Kelp spotted
26/02/2016 12:02	1	-53.47069	-55.1426	X.B.T complete
26/02/2016 11:42	1	-53.43305	-55.17936	X.B.T. Deployed
26/02/2016 11:22	1	-52.92154	-55.7606	Vessel proceeding at reduced speed for X.B.T. deployment

Appendix 2: Rauschert data

Date (dd/mm/yyyy)	Event Number	Max Depth	Phylum or Class found where sorted	Sample unsorted
02/03/2016	10R	533	Arthropoda, Polychaeta, Malacostraca, Bryozoa, Thaliacea, Hydrozoa, Anthozoa, Foraminifera, Echinoidea	
03/03/2016	16R	817	Mollusca, Foraminifera, Asteroidea, Ophiuroidea, Anthozoa, Ascidiacea, Malacostraca, Pycnogonida, Polychaeta	
03/03/2016	22R	1092	Gastropoda, Polychaeta	X
04/03/2016	29R	1976	Polychaeta, Malacostraca, Ophiuroidea, Echinoidea, Asterioidea, Polyplacophora, Gastropoda, Bivalvia, Foraminifera, Porifera, Nemertea	
05/03/2016	32R	530	Cephalopoda, Anthozoa	X
06/03/2016	44R	1012		X
09/03/2016	55R	810	Gastropoda, Anthozoa	X
10/03/2016	69R	837		X
11/03/2016	76R	1312		X
11/03/2016	80R	486		X
11/03/2016	84R	807		X
13/03/2016	92R	631	Demospongiae, Hexatinellidae, Platyhelminthes, Nemertea, Bivalvia, Scaphopoda, Gastropoda, Cephalopoda, Holoturoidea, Ophiuroidea, Echinoidea, Asteroidea, Bryozoa, Ostracoda, Malacostraca, Pycnogonidae, Polychaeta	X
13/03/2016	95R	1149	Anthozoa	X
13/03/2016	101R	858		X
	105R	1483		X
14/03/2016	109R	2190	Echinodermata	X
15/03/2016	114R	632	Anthozoa	X
15/03/2016	119R	867		X
16/03/2016	125R	1139	Asteroidea, Malacostraca	X
16/03/2016	131R	546	Asteroidea, Anthozoa	X
17/03/2016	138R	1674	Porifera, Crinoidea, Malacostraca	X
17/03/2016	140R	2117	Crinoidea, Anthozoa	X
17/03/2016	141R	2167	Asteroidea	X
18/03/2016	142R	651	Corallimorpharia, Anthozoa, Crinoidea, Ophiuroidea	X
18/03/2016	143R	852	Demospongiae, Hexatinellidae, Asteroidea, Holoturoidea, Crinoidea, Anthozoa, Malacostraca, Polychaeta	X
18/03/2016	144R	863		X
18/03/2016	145R	881	Crinoidea, Anthozoa, Polychaeta	X
19/03/2016	146R	625	Demospongiae, Polychaeta, Anthozoa	X
19/03/2016	147R	621	Asteroidea	
19/03/2016	148R	1056	Demospongiae, Crinoidea	X

Appendix 3: Carbonate samples

Event	Region	Depth	JR Sample#	Sample type	dead/Live	nr
6	Signy	242	**143**	Scleractinian, colonial	dead (recent)	1
6	Signy	242	**149**	Scleractinian, colonial	dead	2
6	Signy	242	**153**	Bivalve shells	dead (recent)	14
9	West	525	**186**	Stylasterid	dead (recent)	1 (broken)
9	West	525	**204**	shells	dead	5
9	West	525	**205**	pencil urchin spines	? Live	3
11	West	512	**245**	urchin shell pieces		2
16	West	802	**311**	bamboo coral	live	1
16	West	802	**315**	Scleractinian, solitary	live	1
16	West	802	**318**	Stylasterid	dead	1
17	West	844	**348**	urchin shell pieces	dead	fragments
17	West	844	**349**	pencil urchin spines	? Live	30
21	West	1040	**379**	Scleractinian, solitary	live	1
21	West	1040	**380**	Scleractinian, solitary	live	1
21	West	1040	**381**	Scleractinian, solitary	dead	1
21	West	1040	**382**	urchin shell pieces	dead	fragments
21	West	1040	**383**	pencil urchin spines	? Live	21
21	West	1040	**389**	Stylasterid	dead	1
22	West	1083	**436**	pencil urchin spines	? Live	24
22	West	1083	**438**	urchin shell pieces	dead	fragments
22	West	1083	**439**	gastropod shell	dead	1
23	West	1036	**448**	Scleractinian, solitary	live	1
23	West	1036	**449**	Scleractinian, solitary	live	1
23	West	1036	**450**	Scleractinian, solitary	live	1
23	West	1036	**451**	Scleractinian, solitary	live	1
23	West	1036	**542**	Scleractinian, solitary	live	1
23	West	1036	**453**	Scleractinian, solitary	dead	3
26	West	1484	**487**	Stylasterid	dead recent	1
29	West	1931	**505**	bamboo coral	dead recent	fragments
29	West	1931	**506**	bamboo coral	dead recent	fragments
31	South	533	**570**	Stylasterid	live	1
31	South	533	**589**	stylasterid	live	1
31	South	533	**590**	Scleractinian, solitary	live	1
31	South	533	**591**	Scleractinian, solitary	dead	1
31	South	533	**592**	Scleractinian, solitary	live	1
31	South	533	**592**	Scleractinian, solitary	live	1
31	South	533	**593**	Scleractinian, solitary	live	1
31	South	533	**594**	Scleractinian, solitary	live	1
31	South	533	**595**	Scleractinian, solitary	live	1
31	South	533	**596**	bamboo coral	live	1
31	South	533	**601**	pencil urchin spines	live	3
31	South	533	**602**	gastropod shell	dead	3

32	South	526	**606**	Scleractinian, solitary	live	1
32	South	526	**607**	Stylasterid	dead	6
32	South	526	**610**	Scleractinian, solitary	live	1
32	South	526	**611**	Scleractinian, solitary	live	1
32	South	526	**612**	Scleractinian, solitary	live	1
32	South	533	**613**	Scleractinian, solitary	live	1
32	South	526	**614**	Scleractinian, solitary	live	1
32	South	526	**615**	Scleractinian, solitary	live	1
32	South	526	**646**	Stylasterid	dead	1
32	South	526	**662**	Stylasterid	dead	fragments
32	South	526	**663**	gastropod shell	dead	4
32	South	526	**669**	bryazoa	dead	
33	South	538	**673**	Scleractinian, solitary	live	1
33	South	538	**674**	Scleractinian, solitary	live	1
33	South	538	**675**	Stylasterid	live	1
33	South	538	**735**	stylasterid	dead	1
33	South	538	**736**	Scleractinian, solitary	dead	1
33	South	538	**739**	bryazoa	dead	fragments
33	South	538	**740**	Scleractinian, solitary	dead	1
33	South	538	**741**	pencil urchin spines	live	1
33	South	538	**742**	gastropod shell	dead	2
33	South	538	**743**	Bivalve shells	dead	1
38	South	728	**768-769**	stylasterid	dead	15
38	South	728	**771**	Stylasterid	dead	20
38	South	728	**774**	stylasterid	dead	fragments
38	South	728	**775**	stylasterid	live	2
38	South	728	**776**	stylasterid	live	5
38	South	728	**767**	stylasterid	dead	fragments
39	South	727	**784**	stylasterid	live	20
39	South	727	**793**	stylasterid	live	1
39	South	727	**792**	stylasterid	dead	fragments
40	South	730	**828**	stylasterid	live	1
40	South	730	**829**	Stylasterid	live	1
40	South	730	**830**	stylasterid	live	pieces of one?
40	South	730	**831**	stylasterid	live	1
40	South	730	**832**	stylasterid	live	1
40	South	730	**833**	stylasterid	live	1
40	South	730	**834**	stylasterid	live	1
40	South	730	**835**	stylasterid	live	1
40	South	730	**841**	stylasterid	dead	fragments
43	South	1000	**844**	Stylasterid	live	3 pieces
43	South	1000	**845**	stylasterid	dead	fragments
43	South	1000	**859**	Barnacle plates	dead	many
44	South	991	**867**	Barnacle plates	dead	many

44	South	991	**869**	Stylasterid	dead	many
44	South	991	**882**	Scleractinian, solitary	live	1
44	South	991	**900**	Scleractinian, solitary	live	1
44	South	991	**901**	Scleractinian, solitary	live	1
44	South	991	**902**	Scleractinian, solitary	live	1
44	South	991	**905**	gastropod shell	dead	2
44	South	991	**907**	stylasterid	live	1
44	South	991	**915**	bamboo coral	live	
44	South	991	**904_1**	Scleractinian, solitary	dead	1
44	South	991	**904_2**	Scleractinian, solitary	dead	1
44	South	991	**904_3**	Scleractinian, solitary	dead	1
44	South	991	**904_4**	Scleractinian, solitary	dead	1
44	South	991	**904_5**	Scleractinian, solitary	dead	1
44	South	991	**904_6**	Scleractinian, solitary	dead	1
44	South	991	**904_7**	Scleractinian, solitary	dead	1
44	South	991	**904_8**	Scleractinian, solitary	dead	1
44	South	991	**904_9**	Scleractinian, solitary	dead	2 pieces
44	South	991	**904_10**	Scleractinian, solitary	dead	1
44	South	991	**904_11**	Scleractinian, solitary	dead	1
44	South	991	**904_12**	Scleractinian, solitary	dead	1
44	South	991	**904_13**	Scleractinian, solitary	dead	1
44	South	991	**904_14**	Scleractinian, solitary	dead	1
44	South	991	**904_15**	Scleractinian, solitary	dead	1
44	South	991	**906_1**	Scleractinian, solitary	dead	1
44	South	991	**906_2**	Scleractinian, solitary	dead	1
44	South	991	**906_3**	Scleractinian, solitary	dead	1
44	South	991	**906_4**	Scleractinian, solitary	dead	1
45	South	1027	**919**	Scleractinian, solitary	live	1
45	South	1027	**920**	Scleractinian, solitary	live	1
45	South	1027	**921**	Scleractinian, solitary	live	1
45	South	1027	**924**	Stylasterid	live	2
45	South	1027	**940**	Barnacle plates	dead	many
45	South	1027	**941**	stylasterids	dead	fragments
45	South	1027	**942**	Scleractinian, solitary	dead	2
45	South	1027	**943**	shell	dead	1
48	South	1638	**975**	Scleractinian, solitary	dead	1
49	South	2144	**992**	Bivalve shells	dead	1
52	South	1615	**1017**	Stylasterid	live	4 pieces
52	South	1615	**1027**	Stylasterid	dead	7
54	N West	797	**1030**	Bivalve shells	dead	26
61	N West	495	**1121**	Pencil Urchin spines	live	2
62	N West	502	**1186**	Stylasterid	live	1
63	N West	493	**1265**	bamboo coral	live	1
63	N West	493	**1221**	Scleractinian, solitary	live	1
68	N West	775	**1305**	Stylasterid	dead	1
68	N West	775	**1351**	Stylasterid	dead	1

68	N West	775	**1365**	Stylasterid	dead	10
69	N West	773	**1413**	Stylasterid	live	4 pieces
69	N West	773	**1414_1**	Stylasterid	dead	1
69	N West	773	**1414_2**	Scleractinian, solitary	dead	1
70	N West	775	**1457**	Stylasterid	live	2
70	N West	775	**1458**	Stylasterid	dead	1
70	N West	775	**1470**	Stylasterid	dead	12
70	N West	775	**1513**	Stylasterid	live	1
79	N West	489	**1593**	Scleractinian, solitary	live	1
79	N West	489	**1625_1**	Stylasterid	live	1
79	N West	489	**1625_2**	Brachiopod	dead	1
79	N West	489	**1631**	Scleractinian, solitary	dead	1
79	N West	489	**1632**	Stylasterid	live	1
80	N West	481	**1656**	Stylasterid	dead	1
80	N West	481	**1662**	Scleractinian, solitary	live	1
80	N West	481	**1663**	Scleractinian, solitary	live	1
80	N West	481	**1669**	Stylasterid	live	1
80	N West	481	**1671**	Stylasterid	live	2
80	N West	481	**1686_1**	Scleractinian, solitary	dead	1
80	N West	481	**1686_2**	Scleractinian, solitary	dead	1
80	N West	481	**1686_3**	Scleractinian, solitary	dead	fragment
80	N West	481	**1686_4**	Scleractinian, holdfasts	?	holdfasts from rock
80	N West	481	**1686_5**	Stylasterid	dead	5
81	N West	469	**1702**	Scleractinian, solitary	live	1
81	N West	469	**1729_1**	Scleractinian, solitary	dead	1
81	N West	469	**1729_2**	Scleractinian, solitary	dead	1
81	N West	469	**1729_3**	Scleractinian, solitary	dead	1
81	N West	469	**1729_4**	Scleractinian, solitary	dead	1
81	N West	469	**1729_5**	Scleractinian, solitary	dead	1
91	North	616	**1877**	Gastropod Shell	dead	1
91	North	616	**1898**	Pencil Urchin Spines	live	52
91	North	616	**1876**	Scleractinian, solitary	live	1
91	North	616	**1875**	Scleractinian, solitary	live	1
92	North	581	**1923**	Gastropod Shell	dead	fragments
93	North	1059	**1983**	Gastropod Shell	dead	3
93	North	1059	**1965**	Bamboo coral	live	1
94	North	1003	**2028_1**	Bivalve shells	dead (recent)	1
94	North	1003	**2028_2**	Pencil Urchin Spines	live	1
94	North	1003	**2028_3**	Scleractinian, solitary	dead	1
95	North	1108	**2080**	Scleractinian, solitary	live	1
100	North	831	**2086**	Scleractinian, solitary	live	1
100	North	831	**2087**	Stylasterid	live	1
100	North	831	**2088**	Stylasterid	live	1
100	North	831	**2115_1**	Stylasterid	dead	6
100	North	831	**2115_2**	Scleractinian, solitary	dead	1
100	North	831	**2115_3**	Gastropod Shell	dead	1
100	North	831	**2122**	Stylasterid	live	2

104	North	1430	**2173**	Stylasterid	live	5
104	North	1430	**2174**	Stylasterid	dead	6
105	North	1447	**2204**	Bamboo coral	live	1
105	North	1447	**2205**	Scleractinian, solitary	live	1
105	North	1447	**2220_1**	Stylasterid	live	2
105	North	1447	**2220_2**	Gastropod Shell	dead	1
105	North	1447	**2220_3**	Stylasterid	dead	fragments
105	North	1447	**2220_4**	Scleractinian, solitary	dead	1
105	North	1447	**2221**	Gastropod Shell	dead	1
109	North	1891	**2264**	Scleractinian, holdfasts	?	2

Appendix 4: Scientific staff contact list

GRIFFITHS, Huw J	hjg@bas.ac.uk
ALLCOCK, A Louise	louise.allcock@nuigalway.ie
ASHFORD, Oliver S	oliver.ashford@merton.ox.ac.uk
BLAGBROUGH, Hilary J	hibl@bas.ac.uk
BRANDT, Angelika	abrandt@uni-hamburg.de
BRASIER, Madeleine J	M.Brasier@liverpool.ac.uk
DANIS, Bruno	bruno.danis@ulb.ac.be
DOWNEY, Rachel V	rachel.v.downey@gmail.com
ELÉAUME, Marc P	eleaume@mnhn.fr
ENDERLEIN, Peter	pend@bas.ac.uk
GRANT, Susanna M	suan@bas.ac.uk
GHIGLIONE, Claudio	claudio.ghiglione@riftia.eu
HOGG, Oliver T	olgg@bas.ac.uk
LENS, Peter CD	pcdl@bas.ac.uk
MACKENZIE, Melanie K	mmackenzie@museum.vic.gov.au
MACFEE, Carson	carmca@bas.ac.uk
MOREAU, Camille VE	mr.moreau.camille@gmail.com
PRESTON, Mark	mopr@bas.ac.uk
ROBINSON, Laura F	Laura.Robinson@bristol.ac.uk
RODRIGUEZ, Estefania	erodriguez@amnh.org
SPIRIDONOV, Vassily	vspiridonov@ocean.ru
TATE, Alexander J	ajtate@bas.ac.uk
TAYLOR, Michelle I	michelle.taylor@zoo.ox.ac.uk
WALLER, Catherine L	C.L.waller@hull.ac.uk
WIKLUND, Helena	h.wiklund@nhm.ac.uk