RRS James Clark Ross

JR17003a Cruise Report

Larsen-C Benthos

Benthic biodiversity under Antarctic ice-shelves – baseline assessment of the seabed exposed by the 2017 calving of the Larsen-C Ice Shelf

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Katrin Linse & the scientists of Larsen-C Benthos

British Antarctic Survey Cruise Report

Falkland Islands – Eastern Antarctic Peninsula – Prince Gustav Channel – Falkland Islands

Report of *RRS James Clark Ross* cruise JR17003a, February-March 2018

BAS Archive Reference Number: ES*/*/201x/*

March 2018

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Summary

On 12 July 2017, the Larsen-C Ice Shelf calved the largest iceberg originating from the Antarctic Peninsula ever recorded (Fig.1). As A68 moves north, it will leave an area of 5,800 km^2 of seabed newly exposed to open-marine conditions. Much of this area has very likely remained ice-covered for centuries and may have been covered since the last inter-glacial period. The calving of A68 offers a unique and short-lived scientific opportunity to establish a fundamental research programme to address questions around the mobility and colonisation capacity of benthic marine species. Such a programme would address fundamental questions relating to the sustainability of polar continental shelves under climate change, the processes by which benthic populations migrate, the extent to which benthic organisms act as a biological carbon sink, and the degree to which the distribution of marine benthos can be used to interpret past responses to climate change in various systems. To enable us to exploit this rare opportunity, it is essential that assessment of the benthic system is achieved in the 2017/18 austral summer before significant colonisation begins.

To date, the research community has not been sufficiently flexible, or able, to exploit opportunities associated with rapidly changing ice shelves in order to answer key scientific questions such as those above. Biodiversity was not studied until respectively 5 and 12 years after the retreats of Larsen-A & B ice shelves, by which time substantial colonisation had already taken place, and so significant questions about the pre-existing ecosystems remain unanswered. Generating a baseline description of biodiversity, benthic community composition and trophic structure at the very earliest opportunity after A68's calving will allow, for the first time important data to be generated, which will assist in developing a mechanistic understanding of the major processes that lead to colonisation, species' turnover and energy flow. These will be key to producing predictions of the benthic systems response to future impacts on further ice-shelf collapse.

Our governing hypothesis is:

H: "Until the calving of the Larsen-C iceberg, A68, the benthic fauna on the seabed beneath ice shelf has likely comprised oligotrophic assemblages resembling deep-sea Weddell Sea assemblages. The calving of A68, and the exposure of the seabed it covered to open-marine and sea-ice conditions will initiate a rapid colonisation by new species that will transform the benthic ecosystem significantly within 3-5 years."

Testing this hypothesis, including through follow up cruises from the international community will allow us to determine the baseline, sequence, rate and degree of colonisation, understand the mechanisms of transport of these benthic species, and the sequence of their colonisation. This will allow us to improve fundamental understanding about the resilience of polar continental shelf ecosystems, improve interpretations of marine sediment records, and support effective ecosystem management regulation. We will deploy trawls, corers, cameras, salinity and depth sensors, and echo-sounders to measure mid-water zooplankton assemblages and map the seabed terrain to:

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) agreed in October 2016 to protect areas newly revealed by ice shelf retreat or collapse, as Special Areas for Scientific Study for a minimum of 10 years, allowing scientific research to proceed in the absence of other human activities such as fishing. The area exposed by the calving of A68 was designated as a Special Area in October 2017 and is the first to benefit from this agreement, thus providing a unique opportunity for the international science community.

Objectives

- **Objective 1:** Sample and characterize macro- and mega-faunal biodiversity in the benthic community below A68; Faunal collection and appropriate sample fixation for taxonomic identification, molecular genetic and genomic analyses of phylogeography, evolutionary history and metagenomics. Characterisation of assemblages formerly under A68 and their spatial distribution at a range of scales in relation to distance from the former ice front. Faunal community analysis from photo and video imagery with taxonomic identification validated with physical specimen samples.

- **Objective 2:** Assess the initial benthic trophic structure and carbon flow below A68. 1) Sample fixation appropriate for food web analysis (natural isotopes $\delta^{13}C$, $\delta^{15}N$ and $\delta^{34}S$) of macro- and megafauna, and food sources such as plankton and organic matter in the sediment. 2) In-vivo ^{13}C uptake experiments of infaunal meio- and macrofauna in multicorer-tube microcosms.

- **Objective 3:** Document and describe the pre-collapse system to provide a springboard for future studies and grant opportunities. Archiving of pre-collapse samples will be vital.

Biological and environmental data will be analysed with multivariate statistics and compared to assemblages and ecosystems reported from the SO shelf, slope and deep-sea, especially those from Larsen-A/B and the bathyal and abyssal Weddell Sea.

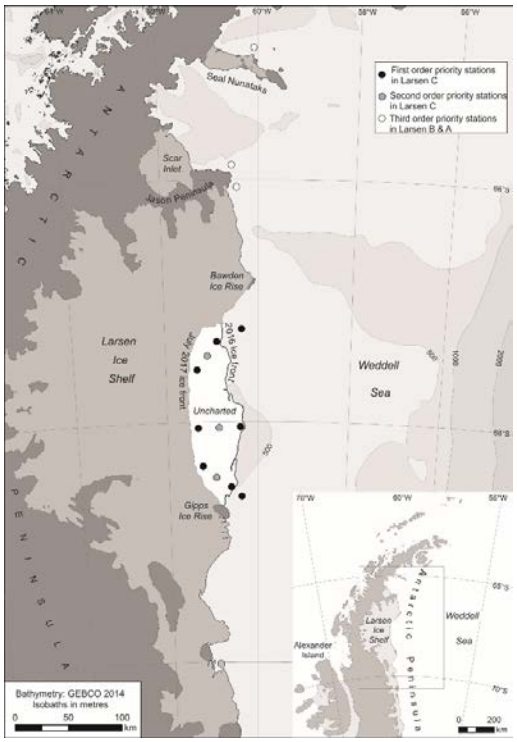

Fig. 1. Map of proposed stations for work in Larsen-C, B&A during JR17003a.

Funding

Cruise JR17003a was part of NERC Urgency grant NE/R012296/1. Individual invited scientists from BAS, University of Aberdeen and the SCAR AntEco Programme were externally funded for travel and preparation costs and then supported by BAS whilst on board the ship.

Sea-ice maps during Expedition

For JR17003a Dr Andrew Fleming (MAGIC at BAS) had set up an automated ESA-satellite images transfer to PSO and Master for new published images of the eastern Antarctic Peninsula as well as delivered composite images of the research area for planning purposes.

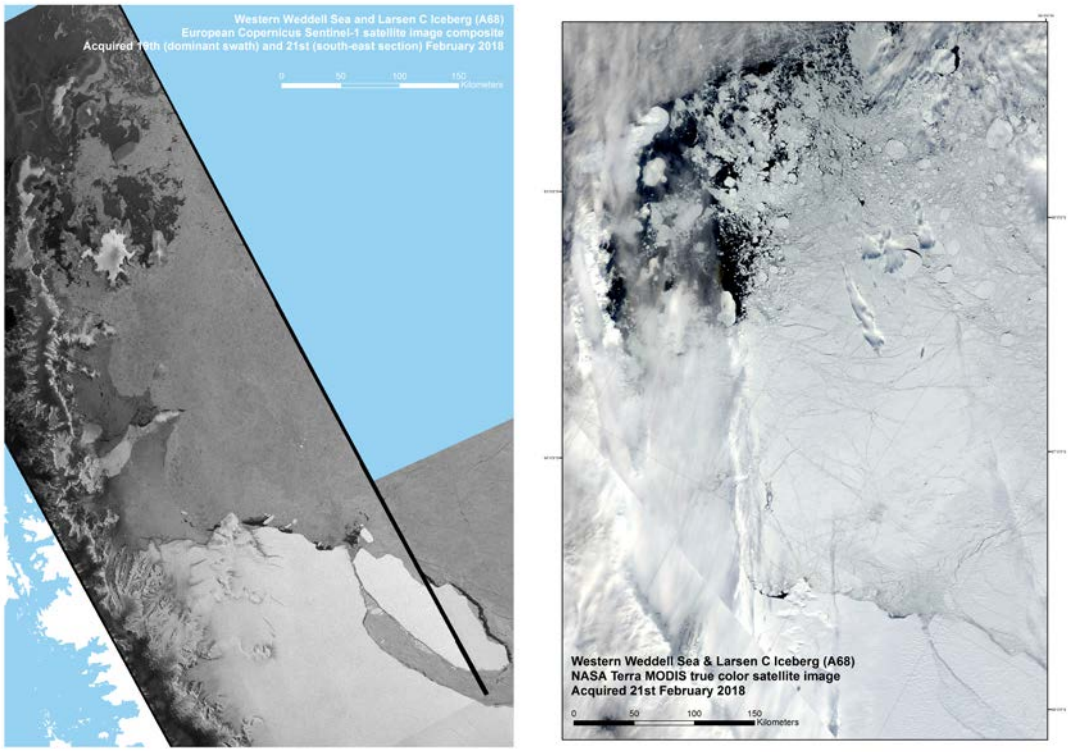

Fig. 2. Composite satellite images for research area acquired 19th to 21st February 2018 from ESA (left) and MODIS from Nasa (right).

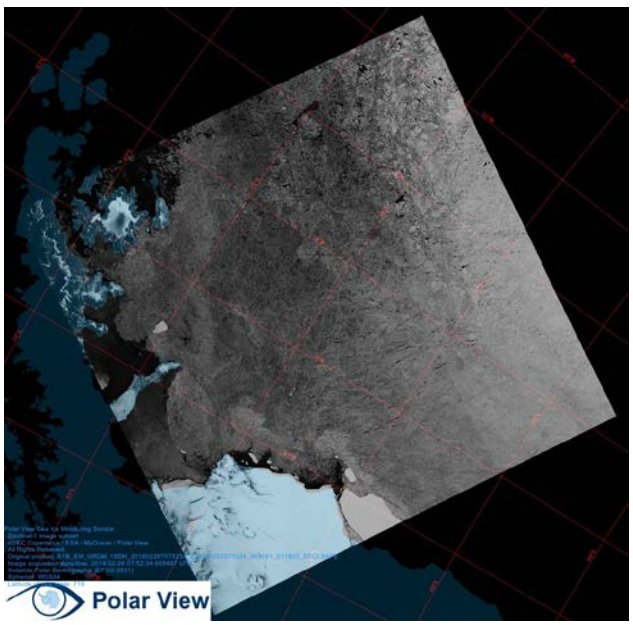

Fig. 3. Images of research area showing open water along norther end of Larsen-C.

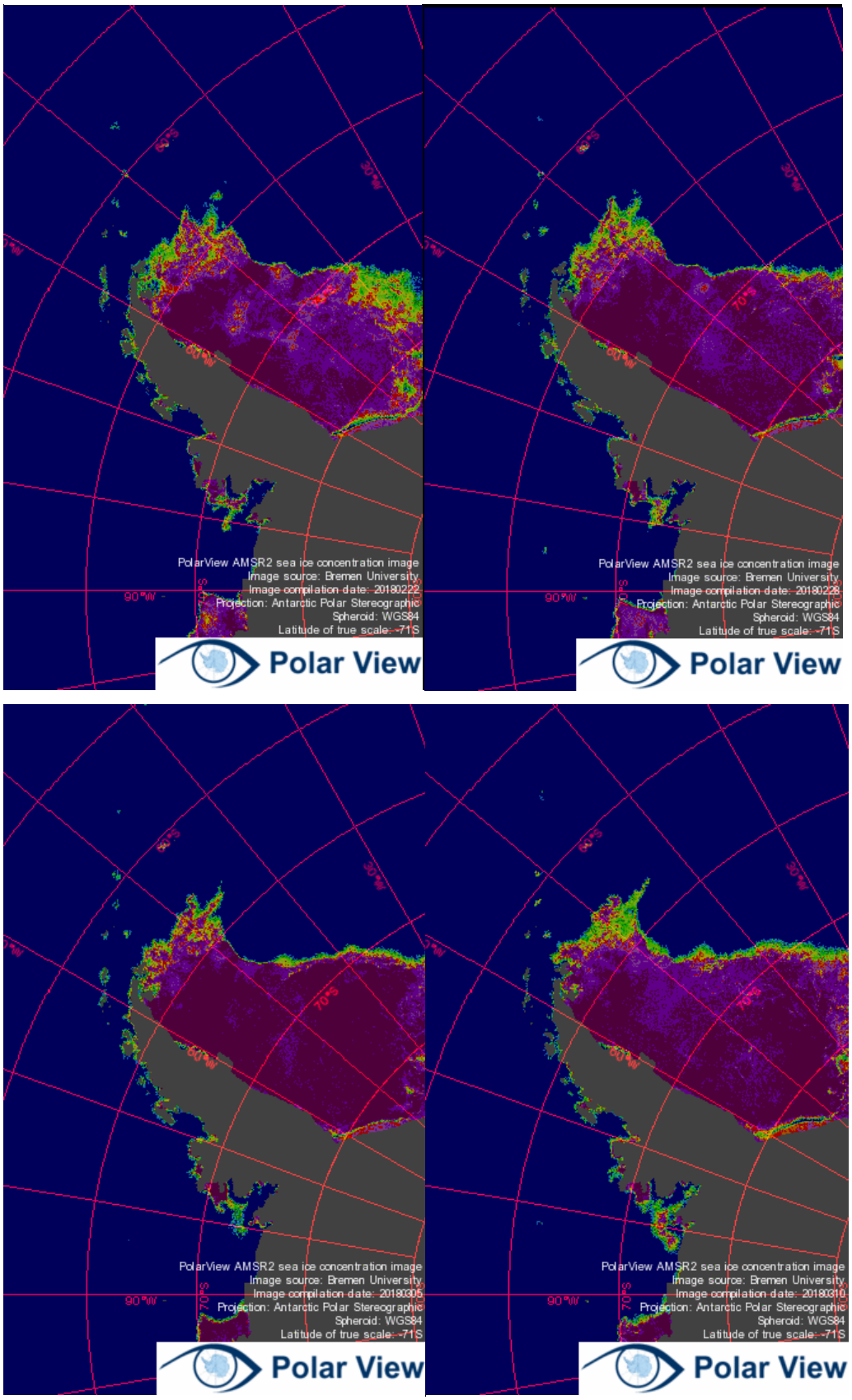

Fig. 4. Polar View AMSR2 sea-ice concentration images of 22nd Feb to 10th Mar 2018.

Contingency plan

Larsen-C Benthos (JR17003a) is a British Antarctic Survey (BAS) led expedition linked with the NERC-funded urgency grant NE/R012296/1 “Benthic biodiversity under Antarctic ice-shelves – baseline assessment of the seabed exposed by the 2017 calving of the Larsen-C Ice Shelf” and undertaken in conjunction with a UK national grant applicant team and an international team of scientists from the Scientific Committee for Antarctic Research (SCAR) AntEco research programme. The expedition will take place on board the BAS research ship the RRS James Clark Ross in early 2018 under the cruise number JR17003a. The FCO have permitted sampling following the PEA protocol on the Eastern Antarctic Peninsula to enable contingency stations.

As JR17003a is targeting a research area of high risk to be effected by adverse sea-ice conditions that can deny access to the proposed research area, contingency plans will be in place for different scenarios:

The general plans are to sail as far south as assessed as safe by the Master of the vessel:

1) Reach Larsen-C and work as proposed
2) Reach Larsen-B area only and amend project plans to sample first proposed Larsen-B stations, then further repeat stations in Larsen-B of previous AWI cruises to continue with the succession studies there
3) Reach Larsen-A area only and amend project plans to sample first proposed Larsen-A station, then further re-peat stations in Larsen-A of previous AWI cruises to continue with the succession studies there
4) Not reach Larsen area, so work would focussed on sites north of Larsen selected following a benthic biodiversity knowledge review in biodiversity.aq (Fig. 2).

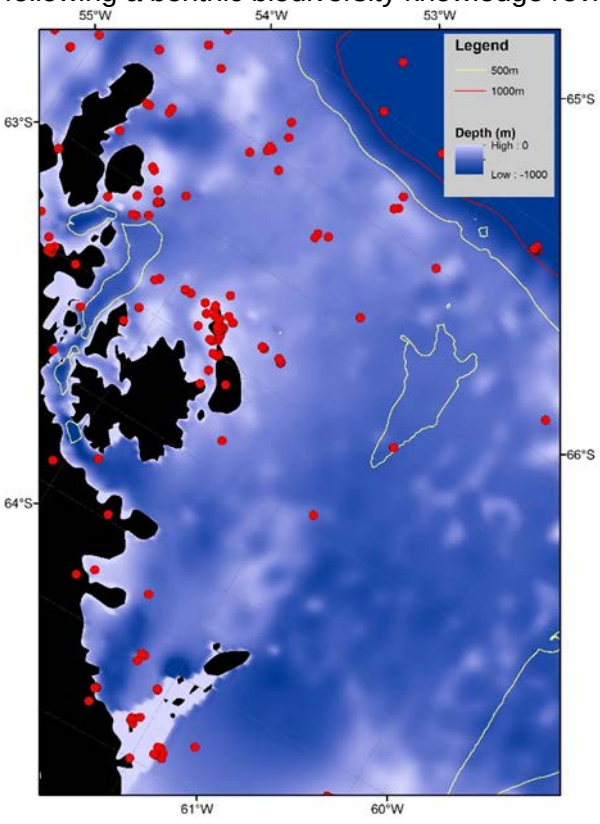

Fig. 5. Red points represent specimen records of benthic species reported to biodiversity.aq.

After encountering thick, multi-year pack-ice with tilted and re-frozen floats forming high press-ice ridges on 27th February and only 8 nautical mile progress within 24h on 28th

February, the decision was made to abandon the goal to reach Larsen-C as this target had become unachievable within the given timeframe of the expedition. A contingency meeting of the science team was called and the contingency work area was decided as the Prince Gustav Channel (Fig. 3), which southern entrance became free of an ice-shelf connection when Larsen-A disintegrated in the early 1990ies.
The contingency sites were planned for Duse Bay as a sheltered bay influenced by local glaciers (stations 1-3), Prince Gustav Channel (PGC) South (stations 4-6), PGC Mid (stations 7-12), PGC North (station 10) and Entrance of Duse Bay (station 11).

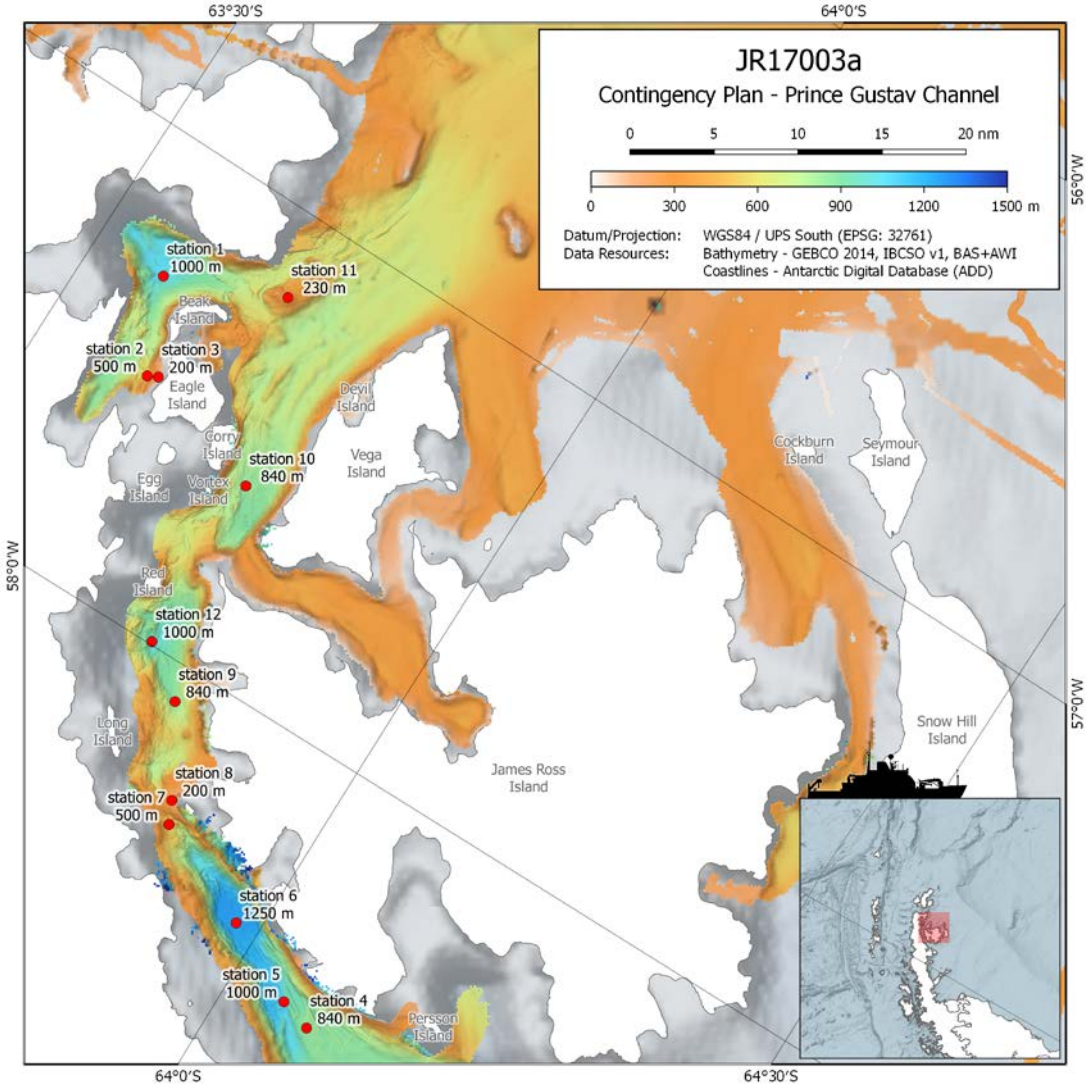

Fig. 6. Contingency work area and proposed stations in Prince Gustav Channel

Summary narrative for JR17003a

The following calendar view (Tab. 1) gives a simplified overview of JR17003a splitting the days into one of three groups. Originally JR17003a had been scheduled with 8 days of transit each to reach Larsen-C and 10 days of science on site. Because of schedule changes caused by unforeseeable events on previous cruises, JR17003a was cut back to 6 days of transit each and 7 days of science on site. As JR17003a had to abandon the goal to reach Larsen-C on 28th February, 8 day were available to science in contingency area Prince Gustav Channel; 3 days were impacted by repairs to the 30 t winch which prohibited AGT, C-EBS and MUC deployments. Several planned locations for science stations were impacted by moving pack-ice or cancelled because of pack-ice cover.

Table 1. Calendar view of activities during JR17003a.

	Mob/de-mob		Transit		Sampling		
	Monday	Tuesday	Wednesd	Thursday	Friday	Saturday	Sunday
Feb-18						17	18
Feb-18	19	20	21	22	23	24	25
Mar-18	26	27	28	1	2	3	4
Mar-18	5	6	7	8	9	10	11
Mar-18	12	13					

The following is a more detailed day-to-day narrative of cruise events (Tab. 2). To avoid confusion with event logs that form the most detailed narrative, times are given in UTC. On cruise JR17003a, local time was always UTC -3.

Table 2. Day-to day narrative of JR17003a

Time	Wind (kts)	Air pressure	Air °C	Comment
09/03/2018 20:00	21	997	1.99	On Transit to Stanley FIPASS (ETA morning 12th March). 9 am Science meeting in officer's bar with update on BOLs, BioBOLs, packing and cleaning. Day spent with packing of boxes and samples, demobilisation of marine equipment etc. 1 pm cruise photo taken on Monkey Island by BBC NHU drone. 6 pm End of Cruise Dinner.
08/03/2018 20:00	10	993	-11.04	The 200 m site was covered by pack-ice but the 400 m sites was ice-free and near iceberg A57A (11x5 nm in size). Science with CTD and SUCS was planned for 9:30 start, but delayed as the German Polar Research Vessel came by for a brief ship passing visit. Science resumed 13:00 with CTD and SUCS (event 58), then proceed to 650 m site (7 miles away). This site was not reached as covered by heavy and tidally influence pack ice that stopped JCR's progress for 5 hours and finished the science deployments for JR17003a.
07/03/2018 20:00	11	985	-6.67	At 6 am the site PGC North was covered in fast mooving pack-ice. Decision was taken by PSO to proceed to Duse Bay (~22 miles away) to finish the 200 m and 500 m sites with MUC, AGT and C-EBS deployments. Previous SUCS deployments had shown that the seaflor was covered by soft sediments, so MUC deployment were going ahead. The 500 m site was reached after ~7.5 hours of steaming through

				pack-ice and newly formed sea-ice. The cold sea temperatures caused JCR's seawater intake to stop working and made sieving of sampling in the web lab extremely challeging as sea water was bucketed in from the fire hose on deck. Both sites had successfull MUC, AGT and C-EBS deployments.
06/03/2018 20:06	22	985	-12.18	PSO and Master agreed to proceed overnight to a 200 m and 400 m site North of the entrace to Prince Gustav Channel and past the pack ice to be able to enter Antarctic Sound latest Friday 9.3. in the morning for 12.3. ETA Stanley. Resume PGC South 1250 m at 6 am with AGT. Then proceed by daylight and without pack-ice cover over shallow and narrow area in PGC to site PGC Mid 800 m. Proceed with deployments of CTD, SUCS, AGT, EBS, MUC (successful), CTD, MUC (unsuccessful) and finish PGC Mid. Transit to site PGC North 800 m over night. Changed work day to 6 am until 10 pm to compensate for times unable to use MUC, C-EBS and AGT while pump of 30t winch was repaired. AME and deck crew changed shift arrangments; scientists watched work hours as not all involved in all gear work.
05/03/2018 20:00	28	990	-13.21	Resumed PGC South 800 m site with two MUCs (both failed, one landing on rock and tumpling over, one hit hard surface), successful AGT. Proceed to 1250 m site at PGC South: 2 successful MUCs, followed by C-EBS and CTD.
04/03/2018 20:00	15	996	-10.69	After night on DP north of pack ice field commence science 6 am with SUCS (PGC S 200 m, PGC 500 m), then steam southwards to assess ice situation in Roehss Bay, continue science off Cape Obelisk with SUCS at 500 m, CTD and MUC at 656 m, and MUC and EBS at 800m. 19:30 resume science for day and steam to overnight DP position north of pack ice field.
03/03/2018 20:00	13	990	-8.66	Arrival at Prince Gustav Channel South sites; starting 6:30 with 800 m site CTD near to pack ice edge followed by Bongo. SUCS deployment delayed as winch monitor had cold issues over night. After warming of monitor science commenced and 800 m SUCS commenced followed by swath survey of 500 m to 200 m areas to find and map SUCS transects. Drone flight to assess lead through pack ice to open water pool followed by JCR steaming through pack ice. 15:30 science meeting in UIC. SUCS commenced at 800 m and 500 m sites. 19:30 end of over the side" science and start of swath survey to map 200 m sites and area/extent of open water area."

02/03/2018 20:00	26	984	-8.56	Duse Bay, top of eastern Antarctic Peninsula: Conclude from 6 am 500 m site CTD, BONGO, SUCS.Issues with 30t winch changes sciences plans. Proceed to 200 m site for CTD, BONGO, SUCS. MUC, AGT and C-EBS to be done after winch repair. Opportunistic 300 m and 400 m SUCS transects. Opportunistic swath surveys adding to exsisting coverage. Proceed to Prince Gustav Channel South sites overnight.
01/03/2018 20:00	34	979	-8.28	Arrived Duse Bay 1000 m site 11:30, start station work CTD, BONGO, SUCS, AGT, EBS, 2x MUC. AGT net froze while hosed down hanging to remove mud. Water on top of MUC cores started freezing on deck. Swath to extend current lines until late evening. Overnight in deep water of bay.
28/02/2018 20:00	4	981	-0.92	Progress southwards over 24h by 7:30 about 8 miles; followed by discussion with JCR Master Tim Page on achievability to reach Larsen-C in the area previsouly covered by iceberg A68 and return safely to Stanley in the time given to JR17003a. We agreed that this would not be possible as Larsen-C was still more than 200 miles away and only 16 days left until scheduled ETA in Stanley remained. 8:00 phone call with BAS Cambridge office to notify about the decision to turn the vessel around and proceed to contiguency 4 area around James Ross Island. 15:00 science meeting to discuss site planning for Prince Gustav Channel.
27/02/2018 20:00	8	993	-6.21	Passage through pack ice is continuing, 20 mile progress by mid morning since entering heavier pack afternoon before. Change of course to new water lead when encountering thicker pack ice with no water leads. In evening encountered thick multi-year pack ice floats (4-5 m thickness), tilted floats refrozen to thick pressice ridges and ice fields with press ice ridges to the horizon.
26/02/2018 20:00	16	992	-8.97	Passage to Larsen C. First pack ice floats 2am, encountered grounded tabluar icebergs around lunchtime and progressed to steam southwards through pack ice fields with water leads. Occasional ramming of ice.
25/02/2018 20:00	15	987	1.65	On transit to Larsen-C. 8:00 passing Clarence and Elephant Island; 10:30 Cold weather talk by doctor; 15:00 PI meeting; 19:00 BBC NHU talk.
24/02/2018 20:00	16	993	5.26	On Transit to Larsen-C. Opportunistic swath. 10:30 Fire drill - crew and scientists involved; 13:00 Cruise planning meeting - Master, officers, engineers, Bosun & Sci Ops, AME, PSO
23/02/2018 20:00	12	1013	9.16	2 am CTD for sound velocity profile followed by swath calibrations. Transit to James Ross Island. AGT, EBS & MUC science meetings
22/02/2018	16	1015	12.84	Mare Harbour, resume bunkering (from 9:00). JCR

20:00				departs Mare Harbour at 15:00 heading for James Ross Island. Opportunistic swath started.
21/02/2018				Mare Harbour, bunkering (9:00-18:00). AME gear
20:00	29	1001	13.06	mobilisation continues. PI and Science party meetings
20/02/2018				Mobilisation tasks. Crew change GC to TP; JCR
20:00	18	1011	11.75	departs FIPASS at 19:00 heading for Mare Harbour
19/02/2018				Mobilisation tasks. 21:30 last science party arrive on
22:00	19	997	7.97	JCR
18/02/2018				Join JCR at FIPASS 14:00. Familiarisation and start of mobilisation tasks. Larsen-C boxes from science
22:00	11	985	11.38	containers.
17/02/2018				
22:00	15			Main science party arrive in Falklands 19:00

Cruise Track

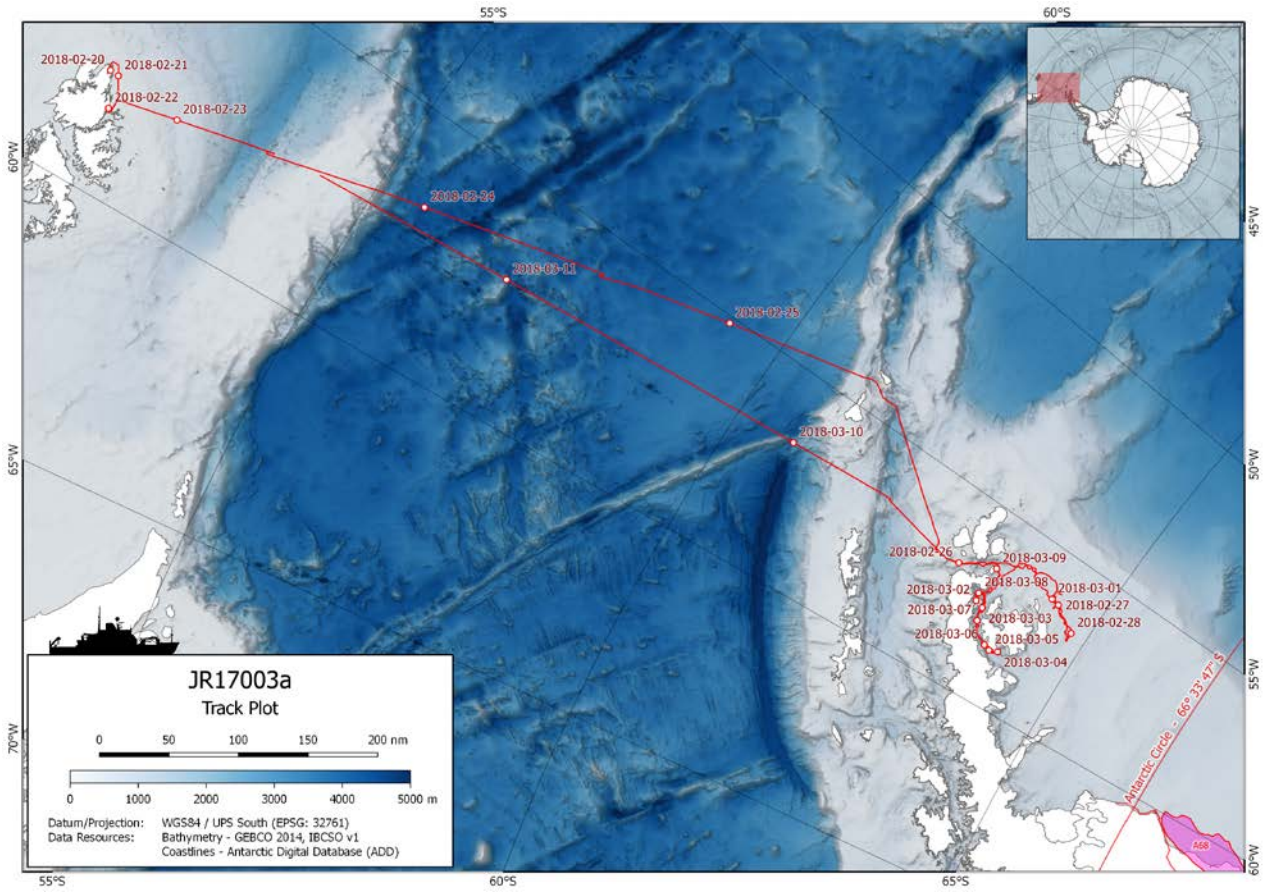

Fig. 7. Cruise track of JR17003a

Personnel

Officers and crew for JR17003a

PAGE, Timothy S	Master
HIPSEY, Christopher W	Chief Officer
BELLIS, Robert J	2nd Officer
O′DONNEL, Colin M	3rd Officer
CHAPMAN, Matthew C	Ex 3rd Officer
NEWSOM, John M	ETO Comms
LLOYD, GJ	Chief Engineer
BEHRMANN, Gert	2nd Engineer
LITTLE, Amanda	3rd Engineer
MURRAY, Euan R	4th Engineer
BIGGS, Thomas E	Deck Engineer
AMNER, Stephen P	ETO
TURNER, Richard J	Purser
TOMKINSON, Alicia	Doctor
PECK, David J	Bosun/Sci' Ops
BOWEN, Albert Martin	Bosun
HERNANDEZ, Francisco J	Bosun's Mate
SMITH, Sheldon T	SG1A
ENGLISH, Samuel	SG1A
WAYLETT, Graham L	SG1A
NEILANDS, Martins	SG1A
PECK, Daelyn R	SG1A
WALE, Gareth M	MG1
HENRY, Glyndor N	MG1
WALTON, Christopher I	Chief Cook
FILEVA, Zhivka A	2nd Cook
GREENWOOD, Nicholas R	Snr Steward
WINTON, Brian G J	Steward
LIDDY, John SC	Steward
RAY, Charlotte J	Steward

Scientific Party

LINSE, Katrin	PSO, British Antarctic Survey
APELAND, Bjoerg	AME SDA, British Antarctic Survey
BEECHAM, Dan	BBC Natural History Unit
BRANDT, Angelika	Senckenberg Research Institute, Frankfurt
CLARK, Will	AME, British Antarctic Survey
DAHLGREN, Thomas	University of Gothenburg
DAVIES, Carwyn	AME SDA, British Antarctic Survey
DREUTTER, Simon	Alfred Wegener Institute, Bremerhaven
GRANT, Susanna M	British Antarctic Survey
GLOVER, Adrian	Natural History Museum UK
FIELDING, Sophie	British Antarctic Survey
FEDERWISCH, Luisa	Alfred Wegener Institute, Bremerhaven
MACKENZIE, Melanie	Museum Victoria, AUS
MACSWEEN, Kirsten	University of Aberdeen
MAKELA, ANNI	University of Aberdeen
POLFREY, Scott	AME, British Antarctic Survey
QUIRK, Sean	AME, British Antarctic Survey
REID, William	University of Newcastle
ROBST, Jeremy	IT, British Antarctic Survey
SMITH, Aisling	ReDS SDA Lab Manager, British Antarctic Survey
VANREUSEL, Ann	University of Ghent
VENABLES, Hugh	British Antarctic Survey
TRATHAN, Phil	British Antarctic Survey
WHITE, Elisabeth	BBC Natural History Unit
WHITTLE, Rowan	BBC Natural History Unit

Abbreviations: PSO, Principal Scientific Officer; ReDS, Research Development and Support; AME, Antarctic and Marine Engineering; IT, Information Technology; SDA, RRS Sir David Attenborough

Fig. 8. *Cruise participants. Photograph by BBC NHU drone (Liz White, Dan Beecham).*

Project Reports:

1. Agassiz Trawl (AGT)

Rowan Whittle, Katrin Linse, Angelika Brandt, Thomas Dahlgren, Luisa Federwisch, Adrian Glover, Susie Grant, Mel Mackenzie, Will Reid, Aisling Smith

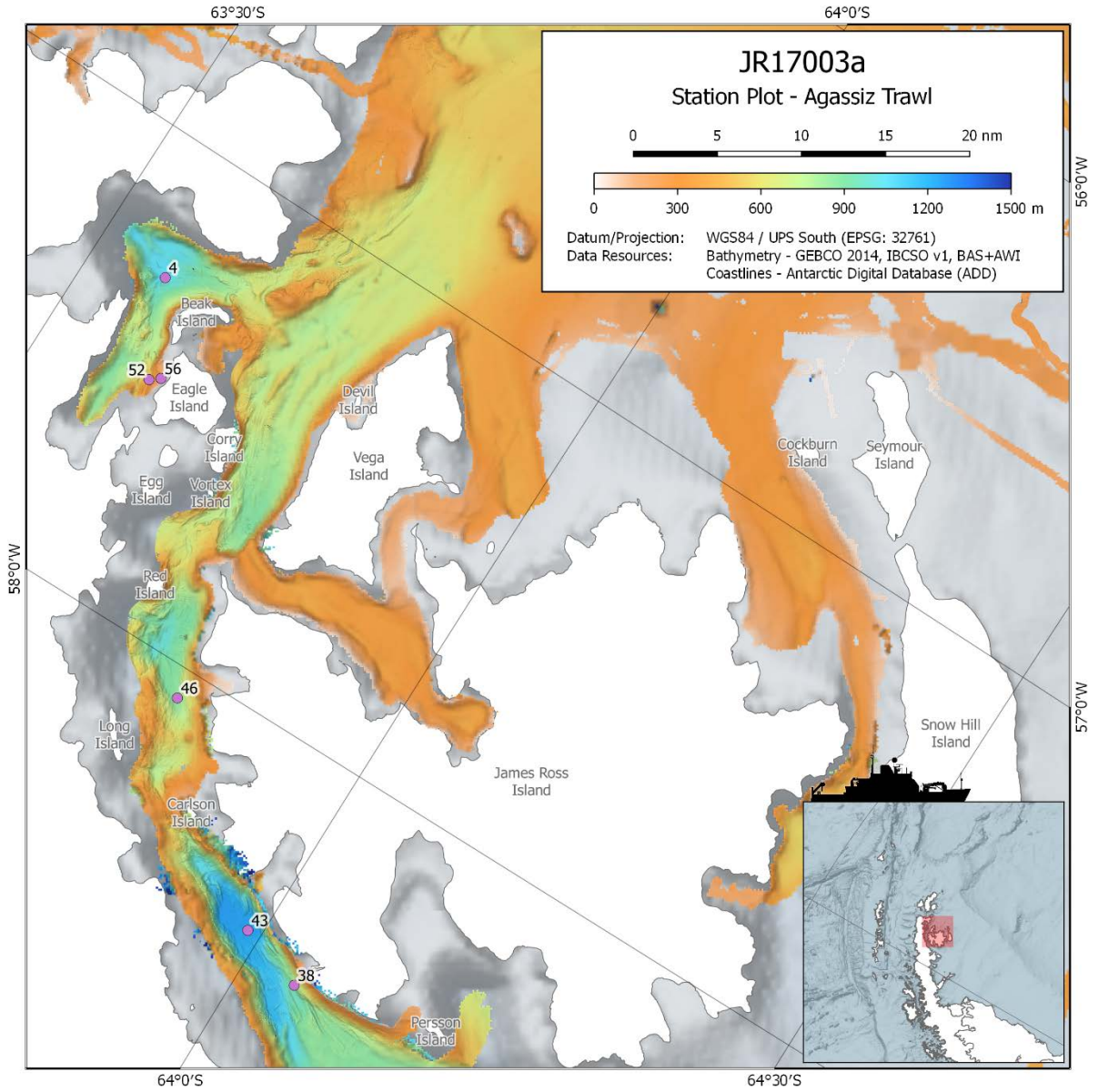

Fig. 9 Locations of AGT events

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. Pack-ice cover and topography permitting, each site comprised up to three trawls (200 m, 500 m, 800m/1000 m) and an additional deep trawl in the three Prince Gustav Channel (PGC) basins but only in Duse Bay the three trawling depth were achieved. The 200m and 500m stations in PGC were too influenced by boulders to deploy the AGT.

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 5-10 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.

In total, there were 6 AGT deployments. These were at 3 sites: Duse Bay, Prince PGC South and PGC Mid.

Preliminary results

During the expedition, only the AGTs of events 4, 38, 43, 46 and 52 were sorted, counted and identified on board, AGT event 56 was fixed in bulk. In total 5043 benthic specimens and 46 kg of wet weight belonging to 13 Phyla and 20 classes were collected and counted from these AGT catches (Table 3, Fig. 10).

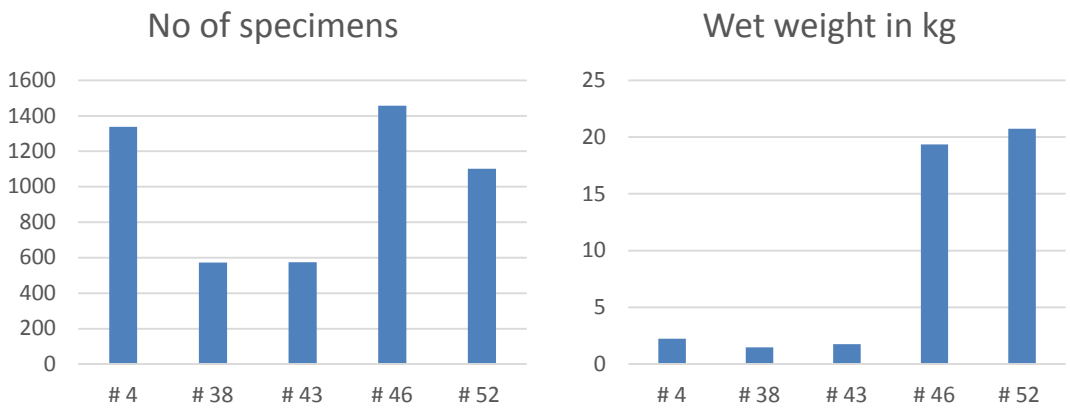

Fig. 10. Numbers of individuals and wet weight collected by AGT for higher taxa

Table 3. Phyla and higher taxa present in AGT samples

		Site	Duse Bay 1000m	PGC South 800m	PGC South 1200m	PGC mid 850m	Duse Bay 500
Phylum	Class	Order/Event	# 4	# 38	# 43	# 46	# 52
Annelida	Polychaeta		269	3	4	2	2
	Clitellata					1	1
Arthropoda	Malacostraca	Decapoda		6		1	30
		Euphausiacea		3			
		Amphipoda	2	8		37	23
		Isopoda	3	4		19	2
		Mysidacea		6		4	8
	Pycnogonida		402	247	11	133	123
Brachiopoda				1	2	1	
Bryozoa			2	4	1	3	
Cephalorhyncha	Priapulida		9				
Chordata	Actinopteri		1			2	5
	Ascidiacea			9	7	54	41
Cnidaria	Anthozoa	Actinaria				2	26
		Alcyonacea	2	4	2	8	1
		Pennatulacea					1
		indet	42	5			
	Hydrozoa		7	23	14	3	1
Echinodermata	Asteroidea		3		2	18	9
	Crinoidea		1	12		3	6
	Echinoidea			13	1	700	2
	Holoturoidea		28	51	104	48	5
	Ophiuroidea		493	153	422	310	276
Hemichordata					1	2	450
Mollusca	Bivalvia		24	4		3	27
	Gastropoda		14		1	12	5
	Polyplacophora					5	
	Scaphopoda						20
Nemertea			3				7
Porifera	Demospongiae		28			17	
	Hexactinellida			5	3	27	9
	indet		4	11		42	17
Sipuncula							5

1.1. Crustacea

Angelika Brandt

In total 155 Crustacea (Malacostraca) were sampled during the JR 17003a (Larsen-C) expedition east of the Antarctic Peninsula with the AGT representing a minimum of 18 species. Numbers of individuals (63) were highest at the shallowest station 52 and lowest at the deepest station 4 (5 individuals) (Tab. 4, Fig. 11), numbers of species were highest at station 46 and lowest at station 4. Interestingly, though numbers of individuals were highest at station 52 only 6 species were sampled at this station.

Numbers of species represent minimum, these might increase when the material is properly identified using taxonomic literature for comparisons.

Table 4: Numbers of individuals and species samples during the JR 17003a expedition by means of the AGT.

stations	**4**	**38**	**46**	**52**
depth max. (m)	1052	868	877	495
individuals	5	27	60	63
species	4	10	15	6

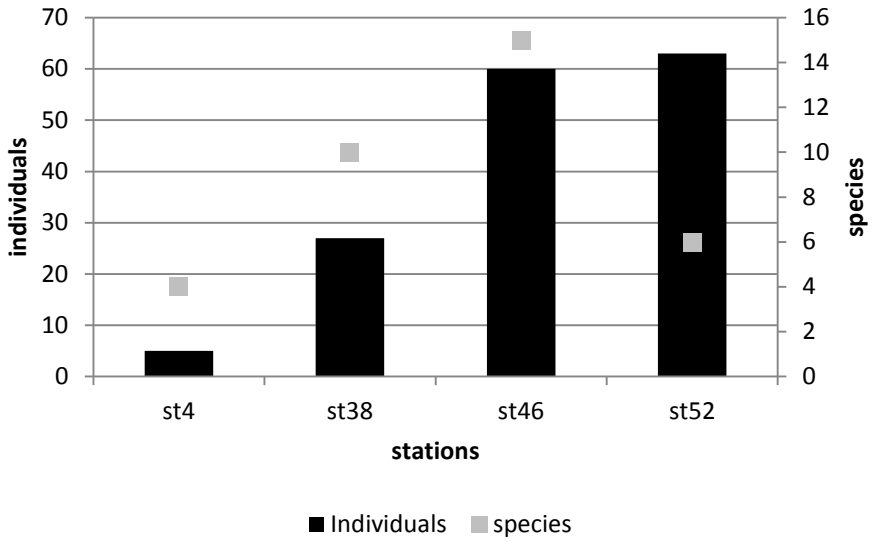

Fig. 11: Numbers of individuals and species of AGT stations.

Three species of Decapoda have been sampled, these were *Nematocarcinus lanceopes* Spence Bate, 1888, *Chorismus antarcticus* (Pfeffer, 1887), and *Notocrangon antarcticus* (Pfeffer, 1887). Euphasiacea only occurred with three individuals of *Euphausia superba* Dana, 1850. Peracarida were most speciose and occurred with taxa of the Mysida, Amphipoda and Isopoda. One species of Mysida, possibly of Boreomysis Sars, 1869. Within the Amphipoda, Lysiannassoidea occurred with 1 species, Epimeriidae with one species of the subgenus *Epimeria* (*Drakepimeria*) d'Uekem d'Acoz and Verheye 2017, Oedicerotidae with one, Stegocephalidae with one and Eusiridae with four species (*Eusirus antarcticus* Thomson, 1880, *Rhachotropis antarctica* K.H. Barnard, 1932, *Eusirus propeperdentatus* Andres, 1979 and *Eusirus giganteus* Lörz & Brandt, 2002). Isopoda

were sampled with one species of the Australarcturellidae (*Doliciscus* cf. *diana*), at least two species of the Antarcturidae, *Antarcturus* cf. *spinacoronatus*, and *Litarcturus* sp., Munnopsidae occurred with three species, *Munneurycope* sp. *Notopais* sp. and *Echinozone* sp..

The figure 12 shows a species of the Amphipoda, Epimeriide, *Epimeria* (*Drakepimeria*) sp. and figure 13. mancas of an antarcturid isopod on an octocoral.

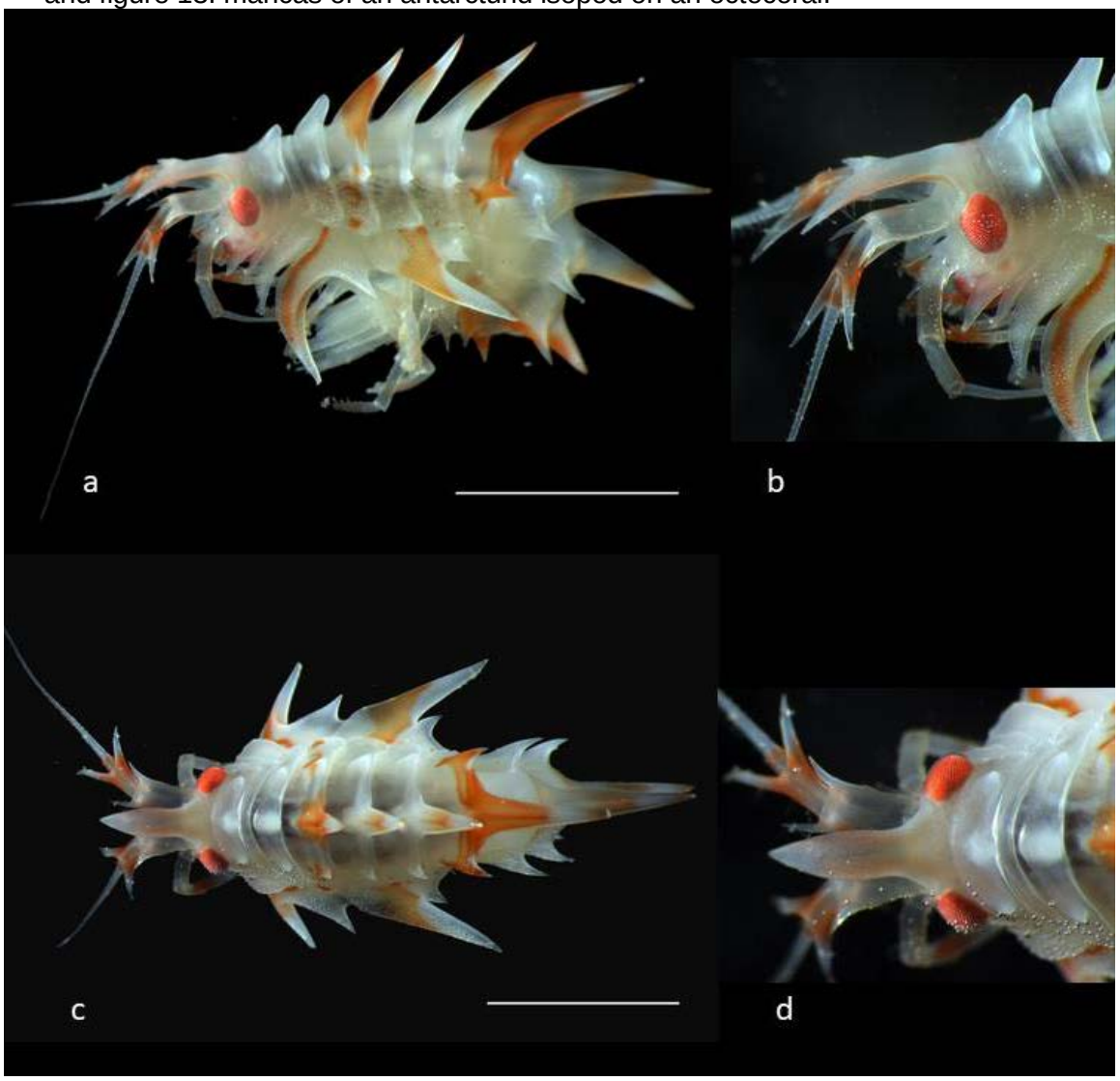

Fig. 12: *Epimeria* (*Drakepimeria*) sp. a, lateral view: b, head in lateral view; c, dorsal view; d, head in dorsal view. Scale bar 2mm. © Adrian Glover, Thomas Dahlgren.

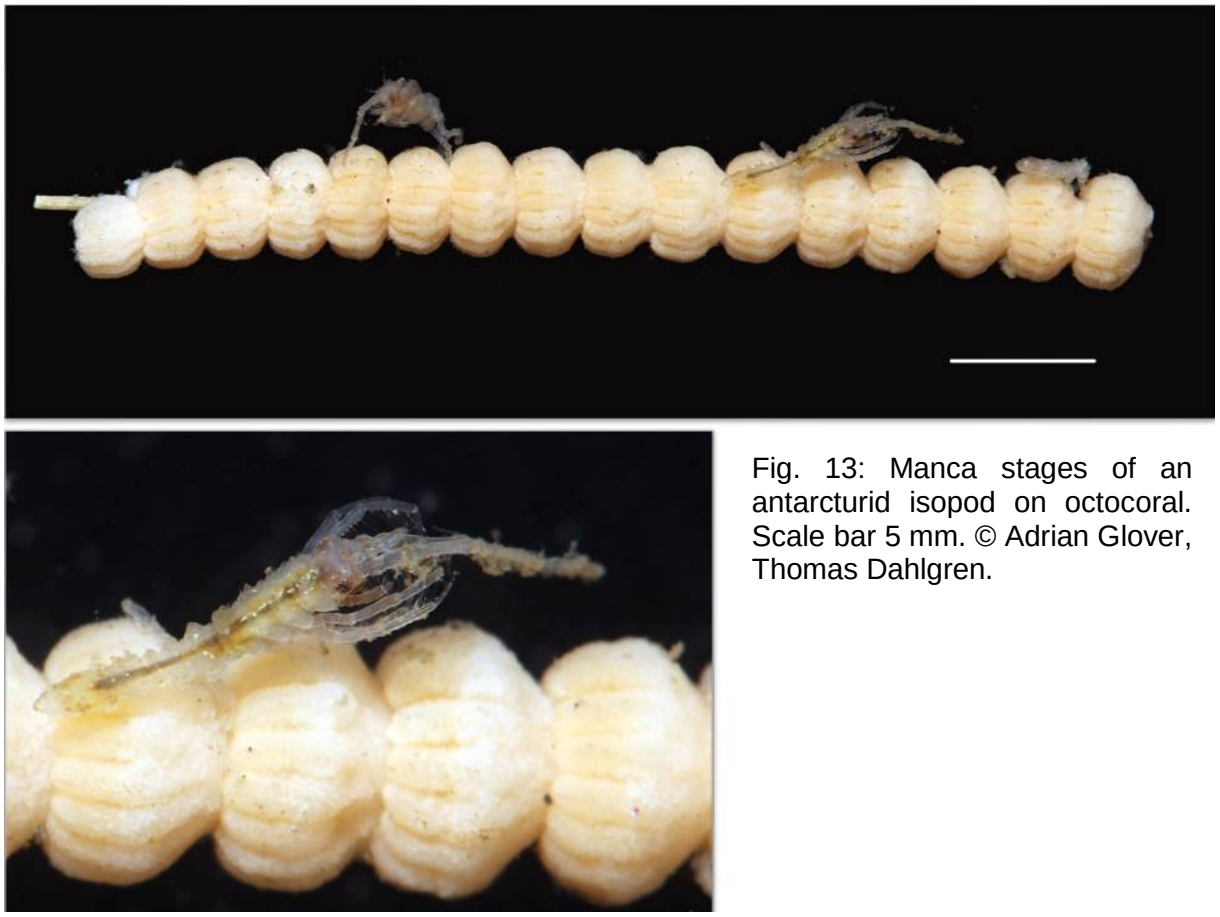

Fig. 13: Manca stages of an antarcturid isopod on octocoral. Scale bar 5 mm. © Adrian Glover, Thomas Dahlgren.

1.2. Holothuria

Melanie Mackenzie

Aims

The pre-cruise hypothesis that biological material collected from below iceberg A68's former position may mimic species from much deeper Antarctic environments (such as that in the adjacent Weddell Sea) suggested potential for retrieval of holothuroids and other echinoderms during sampling on JR17003A. With this likely outcome I joined the Larsen C Benthos team as a holothuroid (sea cucumber) taxonomist to identify species found during this first rapid-response survey of under-ice communities, and to compare these samples to species found in previous surveys of the Weddell Sea (e.g. JR275) and other Antarctic and deep-sea/abyssal environments. A secondary aim (as part of the contingency for not reaching Larsen C) was to assess areas earmarked for potential fishing, and determine whether we should push for their protection if a presence of VME taxa was discovered. 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. While holothuroids themselves are not classified as VME species, 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 (e.g. JR15005 assessment of South Orkney Islands ecosystem).

Despite having to abandon the initial brief to get to Larsen C (and contingency plans to get to potential fishing grounds and Larsen A and B) due to heavy pack-ice and unfavourable winds,

we were able to reach scientifically important areas in Duse Bay and Prince Gustav channel, off James Ross Island to the north of the Antarctic Peninsula. Parts of James Ross Island have been previously covered by the Larsen A ice-sheet, with the southern entrance of Prince Gustav channel ice-covered until the early 1990s. Previous examination of under-ice shelf communities 5 and 12 years after exposure have shown different patterns of colonisation, with likelihood of some deep-water holothuroid species (e.g. *Protelpidia murrayi* and *Elpidia glacialis*) benefiting from the trophic regime shift after the ice-shelf collapse (Gutt *et al*, 2011).

At this new site my aim remained to collect and identify holothuroid species, record any associations and habitats, assist other scientists with sampling and processing, and to ensure methods of preservation were of a standard high enough for lodgement in appropriate institutions for further taxonomic and molecular studies into the future. Assistance was also provided with selecting and processing holothuroid specimens to be used in Dr Will Reid's food web analysis project. Dr Reid generally took samples from lateral muscle bands post-photography. Processing of the whole AGT catch allowed little time for identification of holothuroid material on board, so preliminary identification of specimens during the expedition will be followed up by more thorough examination post-cruise when the specimens are sent to Museums Victoria. Any new species will be described in taxonomic papers and voucher specimens will then be lodged in collections at the British Antarctic Survey, Natural History Museum, Museums 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.

Collection Methods

Holothuroid specimens were collected using two main benthic sampling methods – an Agassiz Trawl (AGT) and an epi-benthic sledge (EBS). The majority of EBS samples (and one AGT sample) were bulk fixed and will be examined back at Museums Victoria. Additional holothuroid species such as *Bathyplotes bongraini* and a number of suspension-feeding dendrochirotids seen on SUCS footage, were not always recovered in AGT samples indicating that this is not a true representation of all holothuroid fauna at this site. Specimens captured on underwater camera were seen sitting crawling along the seafloor, buried in the seafloor with tentacles extended into water column, perched on urchin spines, rocks, corals or bryozoans, or attached to hard substrate.

Preliminary Results

Sampling indicates at least 5 of the holothuroid orders are represented in the area with 370 Holothuroids (in 63 lots) sampled on-board during the expedition. Four orders (Apodida, Dendrochirotida, Elasipodida and Molpadida) were represented in the AGT samples.
Greatest diversity was seen at the 800m site in Duse Bay (Ev46) with ~ 11 different morpho-species from 3 different orders seen. Greatest abundance (104 specimens) was seen at the deep (1250m) Prince Gustav channel site (Ev43), with this station sample dominated by the elasipod c.f. *Rhipidothuria racovitzai* representing 82 of the 104 specimens collected. Despite this dominance by one species there were still 3 orders and ~9 morpho-species represented at the station.

Elasipodida species were also sighted in the EBS samples (bulk still to be processed) and an additional species of Synallactida (formerly Aspidochirotida) was sighted on the Shallow Underwater Cameras (along with additional Elasipodida and Dendrochirotida). At this early/superficial stage of assessment, species appear to be similar to Weddell Sea species, and as such I would hypothesise that two additional orders - Holothuriida (e.g. *Mesothuria*) and *Persiculida* (e.g. *Pseudostichopus*) could also be found in future surveys of the area.

Table 5: Holothuroids sampled by AGT during JR 17003a expedition.

Station	**4**	**38**	**43**	**46**	**52**
Target depth (m)	1000	800	1250	800	500
No. of individuals collected	28	51	104	66	5
No. of Orders	3	2	3	3	1
Orders represented	Elasipodida, Molpadida, Dendrochirotida	Elasipodida, Dendrochirotida	Apodida, Elasipodida, Dendrochirotida	Apodida, Elasipodida, Dendrochirotida	Dendrochirotida
Morpho-species	~3	~8	~9	~11	~2

*Note: station 56 was also an AGT but was bulk fixed due to time constraints.

Samples by Station

All IDs are superficial/preliminary only. Specimens sub-sampled by Dr Will Reid for food-web analysis are represented by (*).

Station 4 (1000m): Dendrochirotida: Paracucumidae (*Paracucumis turricata*), Elasipodida: Elpidiidae (*Protelpidia murrayi**), Molpadia: Molpadidae (*Molpadida violacea**)

Station 38 (800m): Dendrochirotida: Cucumariidae* (~7 morpho-species), Elasipodida: Elpidiidae (*Rhipidothuria racovitzai)**

Station 43 (1250m): Apodida: Chiridotidae (c.f. *Sigmodota magnibacula*, Chiridota),* one additional Apodid morpho-species, Dendrochirotida: Cucumariidae (~4 morpho-species), Elasipodida: Elpidiidae (*Protelpidia murrayi*)*, (*Rhipidothuria racovitzai)**.

Station 46 (800m): Apodida (1 morpho-species), Dendrochirotida: Cucumariidae (*Heterocucumis steineni**, *Staurocucumis liouvillei*, Staurocucumis turqueti, Trachythyone bouvetensis*), Dendrochirotida: Psolidae (Psolus sp x 2),* and ~3 extra Dendrochirotid morpho-species, Elasipodida: Elpidiidae (*Rhipidothuria racovitzai**)

Station 52 (800m): Dendrochirotida: Cucumariidae (*Echinopsolus charcoti*) plus an additional Dendrochirotid morpho-species.

Fig. 14: Sample of diversity of holothuroids collected by AGT during JR 17003a expedition Clockwise from top right*: Rhipidothuria racovitzai, Molpadia violacea, Protelpidia murrayi, Staurocucumis liouvillei, Psolus sp.* Not to scale.

Processing & Photography

Specimens could at best only be split into basic morphotype groups during initial processing; however live colour photos of specimens and associations were taken by Dr Rowan Whittle (and other photographers) where possible using different camera systems. Few specimens were relaxed enough post-trawl to extend their tentacles but photos can still give an indication of live and colour and contracted 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 48 hours in ethanol), some 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. More accurate identification of material sent to Museum Victoria will involve sampling the remnant skeletal elements (ossicles) from specimen tentacles and body wall. Samples will be cleared for observation using commercial bleach and examined under a compound microscope or SEM.

Of note is that elasipod specimens seen in the EBS cod-end overflow (c.f. *Rhipidothuria racovitzai*) appeared to be very well preserved compared to those collected in the AGT here or during previous surveys, and all specimens seemed to benefit from the colder water temperatures providing they didn't freeze immediately on deck or sit out for a long time during processing.

Fig 15: *Rhipidothuria racovitzai* collected by EBS during JR 17003a expedition

Author Note: There have been numerous revisions of higher level Holothuroid taxonomy over the last 10 years, the most recent large-scale revision being the phylogenetic work of Miller et al 2017 which split the order Aspidochirotida into a number of groups. This should be kept in mind for any comparison with data presented in earlier cruise reports (e.g. Weddell Sea 2012 - JR275 and South Orkneys 2016 - JR15005)

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1.3. Polychaeta, including EBS ones

Adrian Glover, Thomas Dahlgren

Introduction

The objective for the Polychaeta team on the JR17003a cruise was to collect the highest-quality samples possible for taxonomic, systematic, phylogenetic and phylogeographic study with the overall aim to test the hypothesis of recent emergence of a deep-sea fauna onto the Weddell Sea shelf following the last glacial maxima (LGM). A secondary goal was to place the biodiversity of the Weddell Sea shelf in an Antarctic and global context.

The focus on polychaetes will allow us to compare samples and material with the extensive collections from the BIOPEARL project in the Amundsen and Scotia Seas, which included large scale DNA analysis (Brasier et al., 2016; Brasier et al., 2017) and the largest identified collection of polychaetes ever undertaken in Antarctic waters (Neal et al., 2017). Glover and

Dahlgren also have an extensive collection and analysed samples from abyssal locations in the central Pacific, which will be used for comparative purposes.

With the impossibility of reaching the Larsen C area, the original cruise objective, efforts focused on the Prince Gustav Channel (PGC) in an area that had been previously covered by an ice shelf as recently as 1995 (Cooper et al., 1997). Samples were obtained from a variety of locations in the PGC that included some areas close to or covered by ice shelf in 1995, and some samples from areas further north (e.g Duse Bay) that have probably been uncovered for a much longer period.

An excellent set of samples were taken following the methods below, and preliminary results are highlighted in the following sections.

Methods

Polychaete collection

Our methods in general followed the live-sorting 'cold-chain' protocol outlined in detail in Glover et al. (2016). In summary, the approach is geared towards collecting extremely high-quality well-preserved individual specimens that have been photographed while alive. All types of sampling equipment are used, the emphasis is on collecting from as wide a variety of gears as possible to increase the taxonomic sampling of diversity.

The collection of a high-quality sample set is highly complementary to any other quantitative comparative studies (for example collection of replicate samples by epibenthic sledge or multi-core).

We collected samples, typically mud or washed animals, from the Aggasiz Trawl (AGT), Multi-corer (MUC) and Epibenthic Sledge (EBS).

Sub-samples of these gear samples were carefully washed in cold filtered seawater (CFSW) on 300 micron sieves with the sieves held underwater during washing. This reduces damage to the animals. Following Glover et al., (2016) specimens were picked from the sieve residue and cleaned in CFSW and relaxed in Magnesium Chloride solution prior to photography.

Images were taken with Canon EOS600D cameras either with 100mm Macro lens or through a Leica MZ7.5 microscope with SLR camera mount. Lighting was from two Canon 430EX strobe units in both cases.

Fixation of all samples was in 80% non-denatured ethanol in water. The use of 80% rather than the commonly-used 96% ethanol reduces damage to the specimens from becoming brittle.

Environmental DNA (eDNA) trials

We also took water samples from the CTD for environmental DNA (eDNA) trials. 5L of bottom-water was taken from 3 sites and filtered on a 0.7µm GFF filter paper. The filter paper was then frozen at -80°C. An additional control sample was taken using 5L of milliQ water from the ships milliQ system.

Results and Discussion

795 polychaete specimens were picked through the cold-chain protocol (Glover et al., 2016), from 34 different families (Table 1). 223 macro photographs were taken, and 426 microscope camera images, of specimens ranging in size from more than 10cm in length to less than 1mm.

Table 6. Polychaete families and numbers recovered for live sorting from the JR17003a cruise to Prince Gustav Channel area.

Family	AGT	EBS	MUC	Grand Total
Acrocirridae		4		4
Ampharetidae		2		2
Aphroditidae	1			1
Cirratulidae	10	12	18	40
Dorvilleidae	5	3	9	17
Flabelligeridae	2	2		4
Glyceridae		5		5
Hesionidae	2	5	3	10
Lumbrineridae	7	4	1	12
Maldanidae	17	5	2	24
Myzostomidae	1			1
Nephtyidae	9	4		13
Oligochaeta	6		3	9
Opheliidae	7	19	1	27
Orbiniidae	3		3	6
Oweniidae		22	51	73
Paraonidae	1	2	7	10
Phyllodocidae	1	2	1	4
Polychaeta (bulk fixed)	247	114		361
Polynoidae	17	28	1	46
Protodrillidae		1		1
Sabellidae	1	1		2
Scalibregmatidae	19	2		21
Sigalionidae	2			2
Sipuncula	4	2	5	11
Sphaerodoridae		7	11	18
Spionidae	1			1
Sternaspidae	35	9	4	48
Syllidae	9		2	11
Terebellidae	2			2
Tomopteridae	1			1
Trichobranchidae	1			1
Grand Total	**413**	**259**	**123**	**795**

Preliminary observations are of a high abundance, low diversity system which is consistent with the hypothesis of a habitat that has recently become available since ice-shelf collapse. Further analysis will be required to species level to place the diversity observations in a broader context.

In terms of phylogenetic understanding, this will have to wait until genetic data have been gathered, but at a very general level at least, there is no obvious similarity to an abyssal fauna.

Broadly-speaking the polychaetes fell into two size classes. The larger 'megafaunal' animals were recovered mostly from AGT and EBS trawls that included tube-dwelling animals such as large maldanid worms and sabellids, as well as predator/scavengers such as the nephtyds

and polynoids (Figure 1).

On the 300 µm sieved sediment fraction, many small macrofauna-sized polychaetes were also found living within the sediments, including burrowing paraonid and cirratulids and opheliids to name some of the taxa. Examples are given in Figure 2.

Fig. 16. Larger ‘megafaunal’ sized polychaetes recovered from the AGT and EBS surveys in Prince Gustav Channel. Image credit: A Glover and T Dahlgren.

Fig. 17. Smaller ‘macrofaunal’ sized polychaetes recovered from the EBS, MUC and AGT surveys in Prince Gustav Channel. Image credit: A Glover and T Dahlgren.

Further Analysis

Samples are being returned to the Natural History Museum in London. Funding has been obtained from the University of Gothenburg for a PhD student project that will enable analysis of a portion of the material. Emphasis will be placed on building the first DNA-taxonomy based library of information on the Weddell Sea shelf polychaetes and examining the role of climate change and ice shelf collapse on the ecosystems of the area.

Recommendations

Support from the ship and technicians was excellent throughout. The only major problem encountered was the lack of chilled seawater flowing on the back deck. The water being used was from the ship’s firehose system, which is warmed considerably compared to sea surface temperatures. For example, after one hour of continuous running we measured this temperature to be 18°C compared to sea surface temperature of -1.72°C and air temperature of -10°C. We measured this on one other occasion after further running and found it to be ~8°C when running more slowly and with air temperature of -13°C.

The temperature of the seawater system in the lab was fine (same as sea surface) but there was no obvious way to run this out onto the back deck in the sufficient volumes needed. In addition, when the vessel was surrounded by ice the seawater system had to be turned off to avoid freezing of the system and could not be used.

As the organisms we are bringing back in the samples are used to constant temperature of approximately -2°C this is a significant issue for any bulk sieving of sediments and animals on the back deck. The higher temperatures can lead to destruction of the sample if for example DNA-preservation is a priority. When the ship is in sea-ice, chilled seawater is mostly not possible, which prevents any live animal work.

Acknowledgements

We are grateful to the Principal Scientific Officer Dr Katrin Linse for the invitation to collaborate on the project and the support during the cruise.

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1.4. Porifera

Luisa Federwisch

A total of 72 sponge samples have been collected from the AGT catches, plus one additional one which was hanging on the frame of the EBS at station #05. Some examples are shown in Fig. 18. The majority of the collected sponges belonged to the class Demospongiae. The class Hexactinellida (glass sponges) was represented by only few individuals and small pieces. Most of the sponge samples have been weighed (wet weight) and photos taken with a size standard. Of the 73 sponge samples, 41 have been subsampled for different projects as appropriate (Table 7).

Table 7: Overview of numbers of sponge samples per station and number of individuals (Ind.) subsampled for different projects.

Event #	Location	Gear	Sponge samples (IDs)	Sub-sampled IDs	Ind. for micro-biomes	Ind. for inverte-brates	Ind. for stable isotopes	Ind. for Si/O isotopes	Ind. for ultra-structure
04	Duse Bay, 1000 m	AGT	6	1		3	3		
05	Duse Bay, 1000 m	EBS	1	0					
38	PGC South, 800 m	AGT	6	1		1	1	1	1

43	PGC South, 1250 m	AGT	2	1		1	1	1	
46	PGC Mid, 850 m	AGT	51	36	10	41	14	3	7
52	Duse Bay, 500 m	AGT	7	2		3		1	1
56	Duse Bay, 200 m	AGT	*catch fixed unsorted - no obvious sponges observed*						

Ten individuals belonging to three different demosponge species (three specimens each) and one hexactinellid species (*Rossella* cf. *nuda*) were subsampled for analysis of their microbiomes (i.e. the microbial communities associated with the sponges). They were all collected at station #46 (Prince Gustav Channel Mid, 850 m). Three replicate samples of about 1 cm3 were cut from each sponge with a sterile scalpel, rinsed in sterile filtered seawater and frozen at -80 °C. Control samples were taken of the mud from the AGT catch (3 replicates; although the amount of mud in the catch was limited), bottom water from the CTD rosette sampler at this station and the water used for cleaning and sorting the animals (pumped from the ship's hull). The mud samples were frozen at -80 °C, as well, whereas the water (4 L) was filtered and the filter frozen (see Chapter 6.1 on CTD water sampling for details). The microbiome samples will be analysed in collaboration with Ute Hentschel (GEOMAR, Germany) and the results will be added to a project on Antarctic sponge microbiomes, which so far comprises several hexactinellid species from the eastern Weddell Sea.

49 sponges, collected at five stations, were subsampled for molecular analysis of invertebrates living in the sponge tissue. Three replicates of about 1 cm3 were cut from each specimen using a sterile scalpel and transferred into Eppendorf tubes with 96 % ethanol. They were stored at -20 °C and will be analysed by Rachel Downey (Australian National University).

19 sponges from four different stations were subsampled for stable isotope analysis (carbon and nitrogen) as part of the food web studies conducted by Will Reid. For that, one sample of about 1-3 cm3 was cut from each sponge and frozen at -80 °C.

For the study of silicon and oxygen isotopes in sponge spicules, six suitable specimens from four stations were chosen. Five of these sponges were hexactinellids (Hexactinellida, Lyssacinosida, Rossellidae) and one was a highly silicifying Tetillid (Demospongiae, Tetractinellida, Tetillidae). Small pieces were cut from the upper part of the sponges, close to the osculum, and dried for several days. The samples will be analysed in collaboration with Andrea Abelmann at AWI, Germany, together with filtered bottom water samples from the same stations. The results will be added to an already existing data set on silicon and oxygen isotopes in hexactinellid sponges from the eastern Weddell Sea.

In order to study the ultrastructure of sponge tissue (i.a. in comparison to the microbiome), nine sponges from three stations were subsampled. The project focusses on hexactinellid sponges of which three individuals of different species could be sampled, but six demosponges were sampled for comparison at one of the stations. One or two pieces of each sponge were fixed in 10 % Formalin (exchanged after one day) and stored at +4 °C. The samples will be analysed in collaboration with Sally Leys (University of Alberta, Canada).

To ensure proper identification of all sponge species, the majority of sponge samples was fixed in 96 % ethanol and stored at -20 °C. A few large individuals were dried in a warm and well-aerated room. The samples will be sent to Dorte Janussen at the Senckenberg Research Institute and Natural History Museum, Germany, for taxonomic analysis.

Fig. 18: Examples of collected sponge specimens: (a) ID0019, St.4, (b) ID0015, St. 5, (c) ID0105, St. 38, (d) ID0282, St. 46, (e) ID0303, St. 46, (f) ID0346, St. 46, (g) ID0350, St. 46, (h) ID0353, St. 46, (i) ID0385, St. 46.

1.5. Foodwebs - *William Reid, Sophie Fielding, Adrian Glover, Luisa Federwisch*

Stable isotopes of carbon and nitrogen are commonly used to assess trophodynamics in marine ecosystems. They provide information about what has been integrated into an animal's tissue from their diet. They provide a means for tracing energy flow and assessing trophic structure. There were two aims of the food web work: (1) to elucidate sources of production sustaining the benthic macrofauna; and (2) provide an overview of the trophic structure of the benthic community living in the Prince Gustav Channel and Duse Bay.

The sources of production sustaining the benthic food web were collected using the CDT, Bongo net, MUC and AGT. These sampling techniques allow the collection of pelagic and benthic trophic endmembers. The CDT collected surface waters (5 m depth) for filtering particulate organic matter (POM). Between 3 and 5 litres of water were filtered at each station through a GF/F 25mm ashed filter paper. One CTD bottle was filtered at each station where water was collected onto duplicate filter papers. The Bongo net was also used to sample the water column using 100 and 200 µm nets. These were filtered onto GF/F 25mm ashed filter paper. The samples largely consisted of krill faecal pellets. All GF/F filters were frozen at -

80ºC. The stable isotope values of the benthic end-member was assessed using sediment samples collected by the MUC. A single core was sectioned in the following intervals: 0-1 cm, 1-2 cm, 2-3cm, 3-4cm, 4-5 cm, 5-7 cm, 7-10 cm. Duplicate samples were collected at each site where a core was made available with the exception of Duse Bay 1000m station. The sediment was stored in glass vials at -80ºC. Finally, an unexpected catch of shallow water seaweed appeared in the AGT during event 46 were also sampled. The seaweed will have broken away and sunk into the basins of Prince Gustav Channel. This may also provide an important food source for the benthic fauna. All seaweed samples were stored in ziplock bags and frozen at -80ºC.

Macrofauna were collected using the EBS and the AGT; although the majority of the samples were collected with the AGT. The EBS was used to collect additional samples of macrofaunal that were also sampled by the AGT. Macrofauna were collected during seven sampling events (4, 34, 38, 41, 42, 43, 46) in Prince Gustav Channel and Duse Bay. The work focused between approximately 800 and 1260m. The AGT was initially sorted into the lowest possible taxonomic groups. Macrofauna were selected for sampling based on a visual inspection of catch. The aim was sample a combination of the most abundant and high biomass groups. Individuals were either frozen whole or a piece of tissue were dissected from the individual. Additional samples were provided from the EBS catches were individuals were in good condition for dissecting. The samples were then frozen at -80ºC.

The following taxonomic groups were sampled: Actinopteri, Anthozoa, Ascidiacea, Asteroidea, Bryzoa, Crinoidea, Echinoidea, Holothuroidea, Hydrozoa, Malacostraca, Ophiuroidea, Polychaeta, Porifera and Pycnogonida. The samples will require identification but are traceable back to the original sorted groups. A proportion of the samples have been photographed before dissection to aid with identification. Those individuals that have been dissected were placed in ziplock bags and preserved with the rest of the sorted group. The Polychaeta samples have also been sampled for DNA by Dr Adrian Glover (Natural History Museum) and Dr Thomas Dahlgren (University of Gothenburg). The Porifera were shared with Luisa Federwisch (Alfred Wegener Institute, Bremerhaven) who took samples from the same samples for DNA and taxonomic analysis. A summary of the samples collected can be found in Table 8.

On return to the UK, funding will be sought to analyse the food web samples for carbon and nitrogen stable isotope analysis. The plan is to submit a NERC Life Sciences Mass Spectrometry proposal in time for the Autumn 2018 deadline.

Table 8: Number of samples per taxonomic group collected using the EBS (*) and AGT for food web studies.

Taxon	**Event**						
	4	**34***	**38**	**41***	**42***	**43**	**46**
Actinopteri	2	1	0	0	0	0	0
Anthozoa	4	0	1	0	0	1	0
Ascidiacea	0	0	3	0	0	3	5
Asteroidea	4	0	0	0	0	2	7
Bryzoa	0	0	0	0	0	0	4
Crinoidea	0	0	2	0	0	0	2
Echinoidea	0	0	3	0	0	0	6
Holothuroidea	6	2	6	5	0	6	11
Hydrozoa	0	0	1	0	0	0	0
Malacostraca	0	4	6	1	0	0	11
Ophiuroidea	9	3	12	0	0	7	11

Polychaeta	12	5	6	6	7	14	1
Porifera	3	0	1	0	0	1	15
Pycnogonida	12	6	2	0	0	2	10

2.

2. Camera- Epibenthic Sledge (C-EBS)

Angelika Brandt, Katrin Linse

Seven camera-epibenthic sledge deployments were taken during the JR 17003a expedition (Figure 19, Appendix 5).

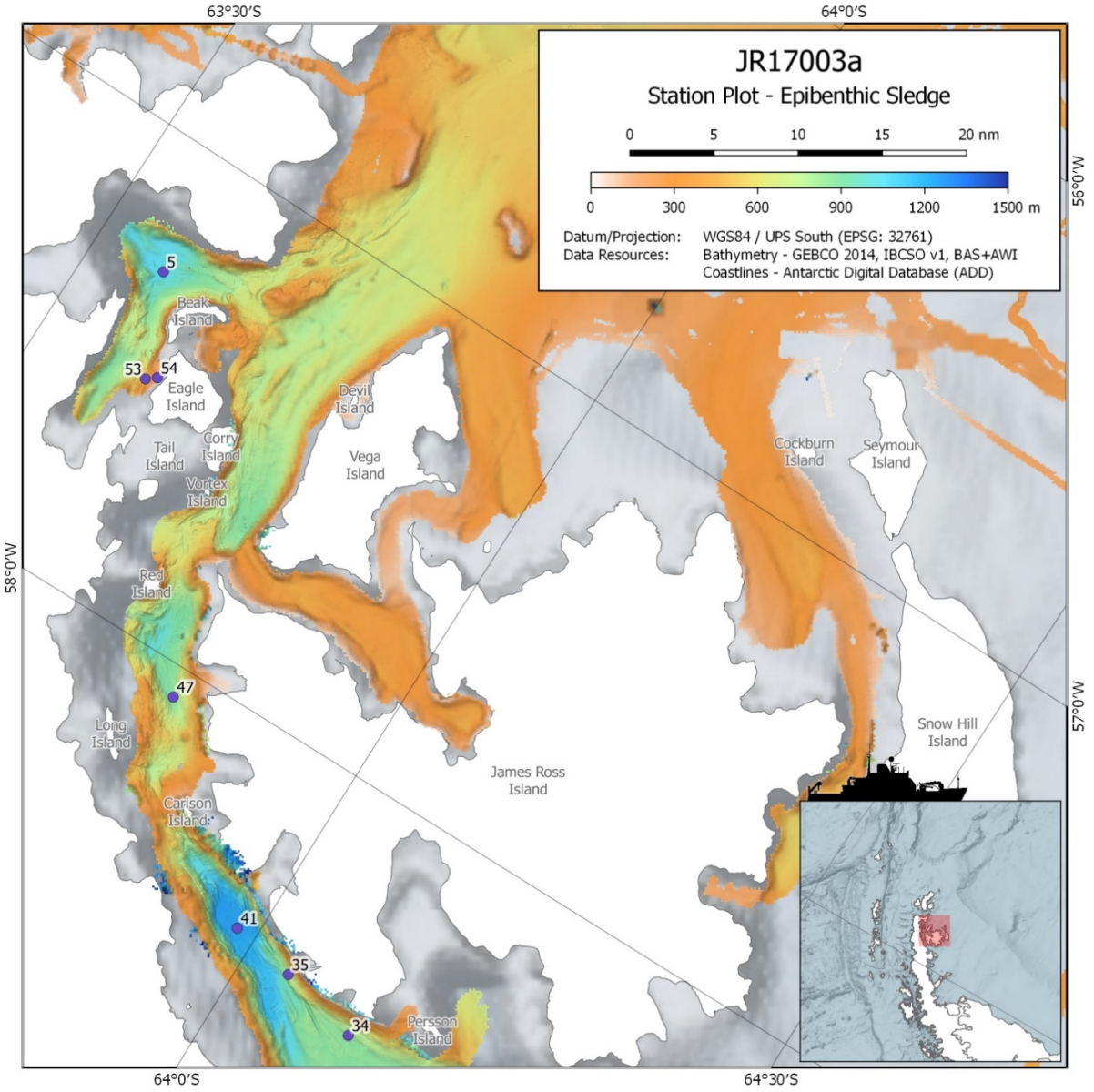


Figure 19: Station map of all C-EBS stations (produced by Simon Dreutter).

The C-EBS (Figure 20) 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.

Figure 20: The C-EBS is going to be deployed. © Angelika Brandt.

A single C-EBS was deployed at those stations were substrate allowed and drop stones were not prevalent. 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 C-EBS was trawled for 10 min on the seabed on each of the seven events it was deployed (Figure 19, Appendix 5).

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 to six hours. Ethanol was changed once for all sub-fractions. Additionally, after every deployment, all sensor and video data were downloaded from the internal hard drives and memory cards.
Due to sampling at the end of the expedition and short time availability, sorting of samples to major taxonomic groups could not be performed on board.

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.

Brenke, N., 2005. An Epibenthic Sledge for Operations on Marine Soft Bottom and Bedrock. Marine Technology Society Journal 39, 10-21.

3. Multicorer (MUC)

Katrin Linse, Aisling Smith, Anni Makela, Kirsten MacSween, Ann Vanreusel, Will Reid, Rowan Whitte

Twelve Multicorer deployments were taken during the JR 17003a expedition (Figure 21, Appendix 6).

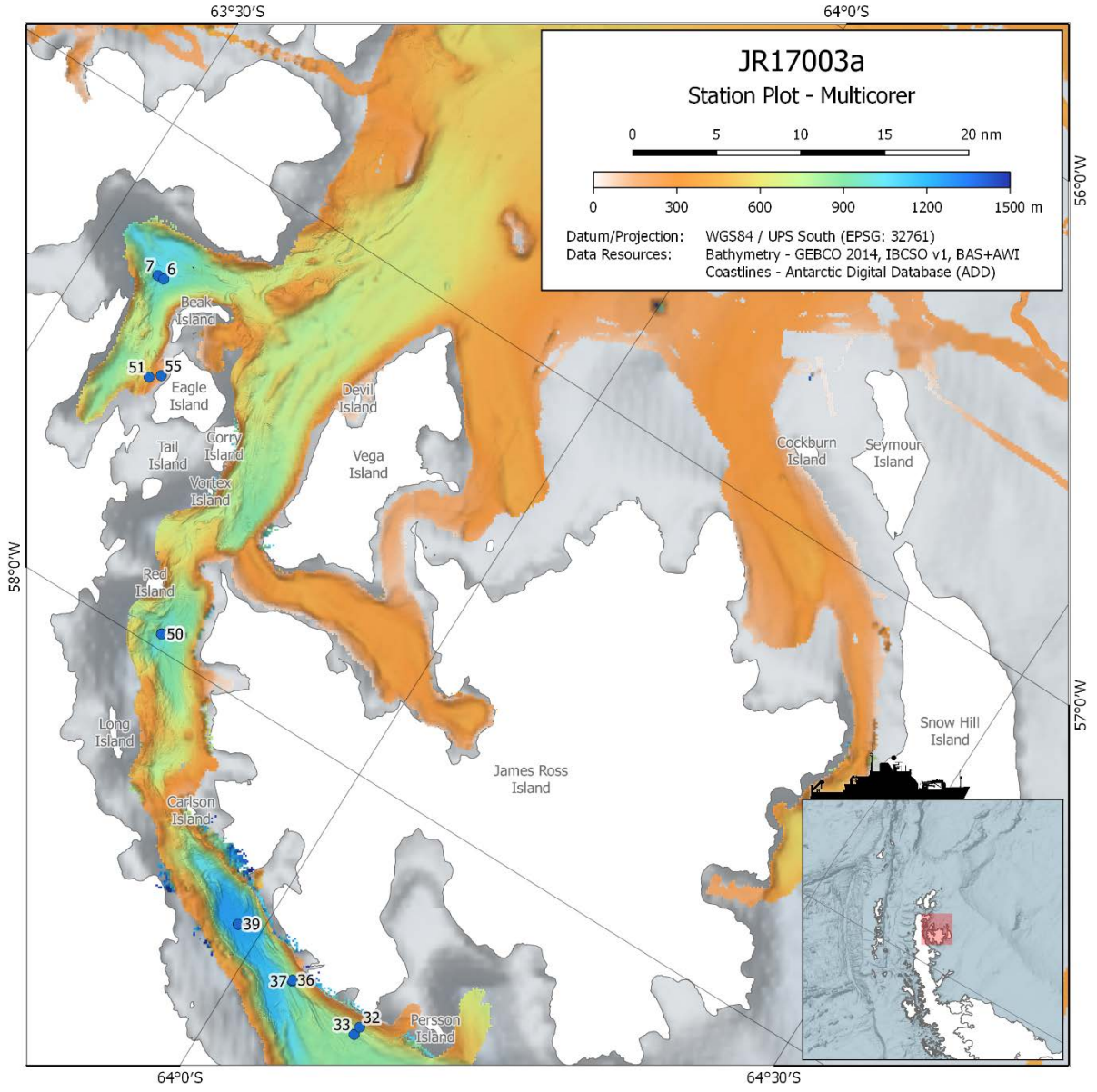


Fig. 21 Locations of MUC events

The BAS Oktopus 12-core multicorer was deployed at sites when the SUCS deployments indicated that the sediment would be suitable for soft sediment sampling. The science team agreed to deploy 2 MUCS per site and the distribution of cores between the different groups followed at sites agreed as shown below in Table 9.

Table 9. Pre-deployment distribution agreement for of MUC cores

MUC-1	Purpose	Person	**MUC-2**		
1	microplastics	KL	13		
2	sediment grain size	RW/KL	14		
3	porewater	KL	15	eDNA	AG
4	microplastics	KL	16	isotopes, C/N , org C	WR
5	isotopes, C/N , org C	WR	17	microbial DNA	WR
6	microbial DNA	WR	18	Meiofauna	AV
7	Meiofauna	AV	19	Pigment	AV
8	Pigment	AV	20	Macrofauna	AG
9	eDNA	AG	21	Macrofauna	AG
10	Macrofauna	AG	22	Macrofauna	AG
11	Macrofauna	AG	23	Macrofauna	AG
12	Macrofauna	AG	24	Macrofauna	AG

Preliminary results

Eight of the twelve MUC deployments were successful and yielded corers with sediment suitable for analyses (Table 10) while the events 32, 36, 37, and 50 were unsuccessful. In events 32 and 37 the sediment turned out to hard to core, in event 36 the corer showed evidence of falling to the side after landing on a boulder and in event 50 the cause is unknown. On arrival on deck, the cores were removed from the MUC, placed into their holders, their sediment height measured and distributed to/labelled for the different groups for their individual treatment (Table 10).

Table 10. Distribution of MUC cores for analysis

Event	Site	Segment	Segment depth (cm)	Analysis
55	Duse Bay 200m	1	25	Sediment (RW)
55	Duse Bay 200m	2	25	eDNA, Macrobio (AG)
55	Duse Bay 200m	3	23	X
55	Duse Bay 200m	4	15	X
55	Duse Bay 200m	5	24	Meiobio (AV)
55	Duse Bay 200m	6	18	X
55	Duse Bay 200m	7	23	X
55	Duse Bay 200m	8	x	x
55	Duse Bay 200m	9	X	X
55	Duse Bay 200m	10	X	X
55	Duse Bay 200m	11	X	X
55	Duse Bay 200m	12	X	X
51	Duse Bay 500m	1	33	eDNA, Macrobio (AG)
51	Duse Bay 500m	2	32	Meiobio (AV)
51	Duse Bay 500m	3	33	eDNA, Macrobio (AG)
51	Duse Bay 500m	4	38	Sediment (RW)

51	Duse Bay 500m	5	36	Microplastics (KL)
51	Duse Bay 500m	6	26	Meiobio (AV)
51	Duse Bay 500m	7	34	X
51	Duse Bay 500m	8	35	X
51	Duse Bay 500m	9	30	X
51	Duse Bay 500m	10	35	Meiobio (AV)
51	Duse Bay 500m	11	34	Meiobio (AV)
51	Duse Bay 500m	12	36	X
48	PGC Mid 1000m	1	21	eDNA, Macrobio (AG)
48	PGC Mid 1000m	2	16	X
48	PGC Mid 1000m	3	19	X
48	PGC Mid 1000m	4	19	Meiobio (AV)
48	PGC Mid 1000m	5	25	Meiobio (AV)
48	PGC Mid 1000m	6	29	Meiobio (AV)
48	PGC Mid 1000m	7	32	Microplastics (KL)
48	PGC Mid 1000m	8	32	eDNA, Macrobio (AG)
48	PGC Mid 1000m	9	32	Microbio (WR)
48	PGC Mid 1000m	10	32	Sediment (RW)
48	PGC Mid 1000m	11	X	X
48	PGC Mid 1000m	12	X	X
40	PGC S 1250m	2	26	eDNA, Macrobio (AG)
40	PGC S 1250m	3	28	Meiobio (AV)
40	PGC S 1250m	4	33	Microplastics (KL)
40	PGC S 1250m	1	17	eDNA, Macrobio (AG)
40	PGC S 1250m	5	30	Meiobio (AV)
40	PGC S 1250m	6	26	Microbio (WR)
40	PGC S 1250m	7	23	Unused
40	PGC S 1250m	8	22	Microplastics (KL)
40	PGC S 1250m	9	X	X
40	PGC S 1250m	10	X	X
40	PGC S 1250m	11	X	X
40	PGC S 1250m	12	X	X
39	PGC S 1250m	1	27	Microplastics (KL)
39	PGC S 1250m	2	23	Microbio (WR)
39	PGC S 1250m	3	27	Meiobio (AV)
39	PGC S 1250m	4	28	Sediment (RW)
39	PGC S 1250m	6	16	Microplastics (KL)
39	PGC S 1250m	7	25	Meiobio (AV)
39	PGC S 1250m	8	26	KL
39	PGC S 1250m	12	X	X
39	PGC S 1250m	11	X	X
39	PGC S 1250m	5	27	KL
39	PGC S 1250m	9	28	eDNA, Macrobio (AG)
39	PGC S 1250m	10	27	eDNA, Macrobio (AG)
33	Off Cape Obelisk 800m	1	10	Microbio (WR)

33	Off Cape Obelisk 800m	2	13	C-uptake exp/SOSC (AM)
33	Off Cape Obelisk 800m	5	X	C-uptake exp/SOSC (AM)
33	Off Cape Obelisk 800m	4	X	C-uptake exp/SOSC (AM)
33	Off Cape Obelisk 800m	3	12	eDNA (AG), Meibio (AV)
33	Off Cape Obelisk 800m	6	X	C-uptake exp/SOSC (AM)
33	Off Cape Obelisk 800m	7	X	C-uptake exp/SOSC (AM)
33	Off Cape Obelisk 800m	8	X	C-uptake exp/SOSC (AM)
33	Off Cape Obelisk 800m	9	X	C-uptake exp/SOSC (AM)
33	Off Cape Obelisk 800m	10	X	X
33	Off Cape Obelisk 800m	12	X	X
33	Off Cape Obelisk 800m	11	X	X
7	Duse Bay 1000m	1	33	Meiobio (AV)
7	Duse Bay 1000m	2	20	
7	Duse Bay 1000m	3	34	
7	Duse Bay 1000m	4	33	
7	Duse Bay 1000m	5	36	Microplastics (KL)
7	Duse Bay 1000m	6	32	Isotope (WR)
7	Duse Bay 1000m	7	30	Meiobio (AV)
7	Duse Bay 1000m	8	31	
7	Duse Bay 1000m	9	13	
7	Duse Bay 1000m	10	30	
7	Duse Bay 1000m	11	34	
7	Duse Bay 1000m	12		
6	Duse Bay 1000m	1	13	Macrobio (AG)
6	Duse Bay 1000m	2	26	Meiobio (AV)
6	Duse Bay 1000m	3	22	Macrobio (AG)
6	Duse Bay 1000m	4	26	Meiobio (AV)
6	Duse Bay 1000m	5	12	Macrobio (AG)
6	Duse Bay 1000m	6	9	Macrobio (AG)
6	Duse Bay 1000m	7	28	Macrobio (AG)
6	Duse Bay 1000m	9	38	Sediment (RW)
6	Duse Bay 1000m	10	34	Pore Water (KL)
6	Duse Bay 1000m	11	34	Macrobio (AG)
6	Duse Bay 1000m	8	30	Isotope (WR)
6	Duse Bay 1000m	12	x	

3.1. C-experiments

Anni Makela, Kirsten MacSween
Project lead: Professor Ursula Witte (u.witte@abdn.ac.uk)

Introduction and project aims

The original research plan was to assess the initial sediment carbon flow below the A68 ice shelf through isotope tracing experiments and sediment community oxygen consumption (SCOC) measurements. It was hypothesised that the seafloor habitat below the A68 has been an extremely oligotrophic environment with very little organic carbon available to benthic consumers, and therefore the sediment community carbon turnover would be very low, similar to oligotrophic deep Weddell Sea sites. The isotope taking experiments would have provided significant baseline assessment of the contributions of respiration and assimilation by bacteria and macrofauna to the overall sediment nutrient cycling, quantifying the sediment community organic matter processing rates. Due to heavy ice conditions, the expedition did not reach the Larsen C area, and a contingency plan was initiated. This plan involved measuring carbon flow in two contrasting 500 m sites at Duse Bay (oligotrophic site) and Prince Gustav Channel (mesotrophic site), off James Ross Island in the eastern Antarctic Peninsula. The regions were previously covered by the Larsen A ice sheet, with the southern entrance of Prince Gustav Channel being ice covered until early 1990s. Unfortunately, due to failed multicorer (MUC) deployment at stations 4 and 49 and rocky bottom in the Duse Bay making MUC sampling impossible, the comparison between two sites was abandoned and only one sediment incubation experiment was performed at station 33 at Cape Obelisk. The aim of the experiment was to measure the total sediment carbon turnover and to quantify the flow of particulate organic carbon through respiration and benthic consumer uptake during the isotope tracing experiment.

Methods

Bottom water for topping up sediment cores after water exchange was collected from the CTD rosette at each site where a sediment incubation experiment 1) was conducted or 2) was expected but not performed due to MUC failure (Table 11). The bottom water oxygen concentration was measured with a Winkler ttration immediately after recovery and the results were compared to those obtained from the CTD. After the CTD deployment, 6 sediment cores were collected from a MUC deployment at station/even 33 (815 m), sealed with air-tight lids, topped up with the previously collected bottom water and incubated in a dark and temperature controlled room at 4°C during the experiments. An additional core was colelcted and sliced for porosity measurements at 0-1, 1-2, 2-3 and 3-5 cm intervals. During the first 48 hours, 100 ml water sample was removed from the cores every 6 hours to measure the oxygen concentration using Winkler titration. After 2 days, 10.3 mg of ^{13}C-^{15}N labelled phytoplankton (*Thalassiosira nordenskioeldii*) was added to three cores to initiate the isotope tracing experiment. Three cores acted as controls with no algal addition. The isotope tracing experiment took place over 4 days, during which water samples for nutrient analysis and dissolved inorganic carbon measuremetns were collected every 24 h, as well as overlying water for the oxygen concentration determinations. After 4 days, the sediment in the cores was sliced. Half of each slice for the 0-5 cm layers was frozen in -80°C for phospholipid fatty acid analysis at 1-2 cm intervals, whereas the other half was sieved with a 500 µm mesh sieve to obtain sediment fauna, which were preserved in a 4% seawater-formalin solution for later isotope tracer uptake analysis. Entire 5-10 cm and 10-15 cm sediment slices were collected for the sediment infauna. Dissolved inorganic carbon, nutrient, faunal and sediment samples will be transported back to University of Aberdeen for analysis after the cruise.

Table 11. Water collected from CTD deployments to top-up incubation cores

Date	Event number	Depth (m)	Bottom water oxygen concentration (µmol l^{-1}) WINKLER	Bottom water oxygen concentration (µmol l^{-1}) CTD	Use of water
23.02.1018	1	2443	196 ± 5	176	Winkler test run, water discarded
02.03.2018	9	496	310 ± 4	305	MUC failure, water discarded
04.03.2018	31	685	315	298	Water used to top-up cores curing incubation experiment
06.03.2018	49	989	316 ± 3	301	MUC failure, water discarded

Preliminary observations

All samples collected during the isotope tracing experiments will be analysed later so no carbon flow experiment results are available. Even at 815 m there were several large epifaunal individuals trapped in the sediment cores. Oxygen consumption during the experiments was low.

It should be noted that the bottom water oxygen concentration measured with Winkler titration was generally 15-20 µmol l^{-1} higher than the measurements obtained from the CTD at each station where water was collected. A CTD oxygen probe calibration is therefore recommended.

3.2. Meiofauna sampling

Ann Vanreusel

Samples were collected with a multicorer (MUC), type OCTOPUS at three deep stations (800, 1000 and 1250m) along a north-south gradient in the Prince Gustave Channel (PGC) and along a bathymetric transect in Duse bay (200, 500 and 1000m) (Table 12). At each station 1 to 4 cores from up to two different MUC deployments were collected (diameter of 10 cm). From each undisturbed core the overlying water was siphoned off over a 32 µm sieve and preserved with the surface sediment samples. The sediment of each core was sliced per 2 cm up to 8 cm. Each slice was cut in two equal parts of which one part was collected in a 250 ml vial and fixed with 4% formaldehyde (prepared with filtered seawater). The other half was put in plastic bags and frozen at -80°C. Samples fixed in 4 % formaldehyde will be processed in the lab according to standard procedures for Meiofauna extraction, after estimation of the sediment volume to allow standardization. Also samples first needs to be sieved over a 1mm sieve to remove stones and to separate macrofaunal individuals which was in some stations abundantly present. This 1 mm fraction will be counted and weighted for macrofauna to relate the presence of potential larger bioturbators present in the samples to the Meiofauna community composition and vertical profiles. The frozen samples will be used

for multiple purposes including pigment concentrations, TOC and TN, granulometry, biomarker analysis, molecular identification of bulk Meiofauna (NGS) or individual barcoding of specific specimens.

Overall the samples will be used to test the following specific research hypotheses:

1. Differences in historical and present ice conditions, glacier impact, surface productivity and hydrodynamics along the channel results in major differences in seafloor conditions and its associated fauna in three adjacent deep basins.
2. The Meiofauna of the PGC deep basins are more similar to adjacent shelf fauna than to bathyal fauna from the Weddell sea
3. There is a significant change in Meiofauna communities within Duse bay from the potentially ice impacted shallow parts towards the possibly more sheltered deepest point of the basins which is expected to act as a carbon sink.

Table 12. List of samples processed for Meiofauna

Date	Event	Area	depth (m)	latitude (S)	longitude (W)	# cores	UGent numbers
1/03/2018	6	Duse bay	1000	63.57557	57.29855	2	1A, 1B
1/03/2018	7	Duse bay	1000	63.56889	57.29919	2	1C, 1D
4/03/2018	33	PGC off obelisk Cape	800	64.13119	58.50451	1	2A
5/03/2018	39	PGC South	1250	63.97651	58.42942	2	3A, 3B
5/03/2018	40	PGC South	1250	63.97658	58.42954	2	3C, 3D
6/03/2018	48	PGC mid	1000	63.76125	57.96736	2	4A, 4B
7/03/2018	51	Duse Bay	500	63.61546	57.49913	4	5A, 5B, 5C, 5D
7/03/2018	55	Duse Bay	200	63.62481	57.48192	3	6A, 6B, 6C

4. Shallow-water camera system (SUCS)

Susie Grant, Rowan Whittle, Luisa Federwisch, Katrin Linse, Mel Mackenzie, Will Reid

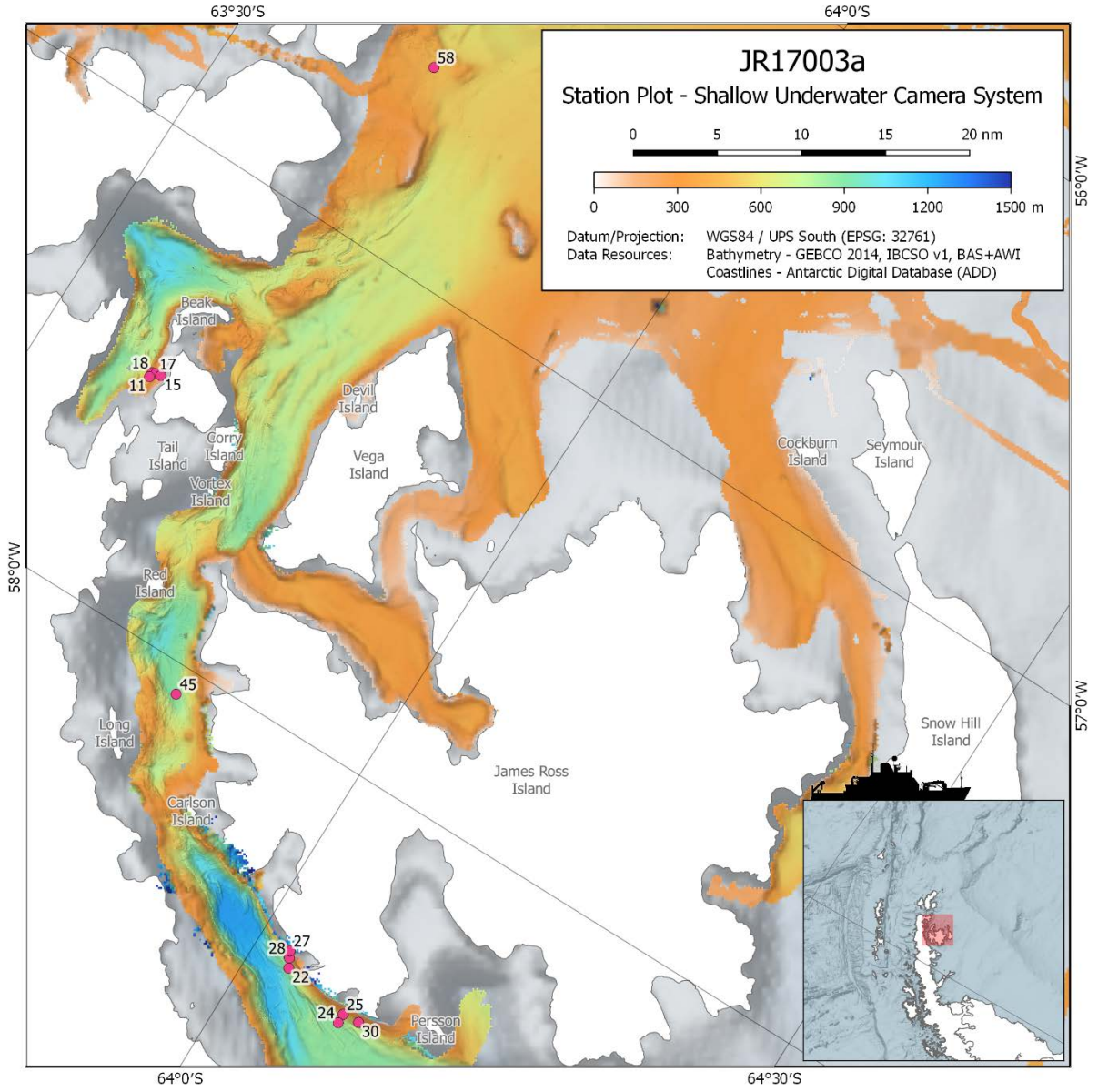


Fig. 22 Locations of SUCS events

SUCS setup

The SUCS for JR17003a 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.

The SUCS includes 1000 m of fibre-optic cable, allowing operation to approximately 900m depth. A GoPro camera can also be fixed adjacent to the main UW-housing in its own 1000m depth-rated housing. The LabView interface together with the fibre-optic upgrade enables high- resolution photo stills (2448 x 2050) and video footage (720 x 480) to be taken simultaneously.

Using SUCS during JR17003a

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.
The SUCS was deployed at 12 stations (ranging in depth from 200 m to 800 m), according to weather and accessibility due to ice conditions. The SUCS was used extensively during the time when heavier gear could not be operated due to problems with the 30t winch, allowing coverage of a wider range of depth stations (Table 13). On one occasion SUCS deployment was delayed because of very cold temperatures (-15°C) affecting the backlight of the winch monitor screen. This was resolved by re-routing the image output to an alternative monitor, and using a portable heater for subsequent deployments.

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. Duplicates of each photo were taken with different light levels, to allow distinguishing of different features. At two locations the three transects were not fully completed because of icebergs in close vicinity to the ship or problems with gear. Additional photos were sometimes taken during the 10 m relocation if the camera showed a good view, however these photos will not be included in subsequent analysis. Short videos using the SUCS camera were taken at some transect points or during relocations. The mounted GoPro video camera attached to the camera frame was also used to record the entire event (for events 24, 28 and 56 only). 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.

SUCS images and video were also used to assess the suitability of the substrate at each location for subsequent deployments of the AGT, EBS and MUC.
During each SUCS deployment, general notes were made on the substrate type, observed taxa and dominant communities. Preliminary characterisations and example photographs for each station are given below.

Table 13. SUCS deployments at each site and depth

Date	Event No.	Site name	Depth[1]	Latitude[2]	Longitude[2]	Number of transects / photos
02/03/18	11	Duse Bay	500 m	-63.6154	-57.4976	3 / 30
02/03/18	15	Duse Bay	200 m	-63.6243	-57.4821	3 / 30
02/03/18	17	Duse Bay	300 m	-63.619	-57.4848	3 / 30
02/03/18	18	Duse Bay	400 m	-63.6154	-57.4869	3 / 30
03/03/18	22	Prince Gustav Channel - South	800 m	-64.0412	-58.4526	3 / 26
03/03/18	24	Prince Gustav Channel - Cape Obelisk	800 m	-64.111	-58.4995	3 / 30
03/03/18	25	Prince Gustav Channel - Cape Obelisk	500 m	-64.1108	-58.4777	3 / 30
04/03/18	27	Prince Gustav Channel - South	200 m	-64.0333	-58.4185	3 / 30
04/03/18	28	Prince Gustav Channel - South	500 m	-64.0363	-58.4328	3 / 30
04/03/18	30	Prince Gustav Channel - Cape Obelisk	400 m	-64.128	-58.4750	3 / 30
06/03/18	45	Prince Gustav Channel - mid	850 m	-63.8044	-58.0632	3 / 29
08/03/18	58	Andersson Island	500 m	-63.6846	-56.5787	3 / 30

[1]General station depth – see event log for depths along all transects
[2] Coordinates for start of the first transect (action recorded as 'on the bottom')

Event 11 – Duse Bay (500 m)

Substrate: soft sediment/mud.
Characterized by an abundance of small ophiuroids buried in the mud, with larger ophiuroids on the surface.
Other fauna observed: amphipods, decapods, demosponges (large, yellow green), swimming crinoids, ascidians (orange, and blue specimens - *Molgula pedunculata*?), umbelulla, asteroids, tunicates (long white stalked compound), anemones, large holothurians (*Bathyplotes bongrani, Protelpidia murrayi*), white shelled gastropod, pycnogonids, worms, icefish (*Cryodraco antarcticus*) and krill in the water column.

Event 15 – Duse Bay (200 m)

Substrate: mud with some coarser sediments, presence of small dropstones with associated fauna.

Characterized by abundance of deposit feeders.
Other fauna observed: worms, small buried ophiuriods, larger ophiuroids on surface, large ascidians, crinoids (pink), gorgonians, bryozoans (grouped and leaf shaped), pencil urchins, several sponge species, pycnogonids, asteroids, anemones, large hydroids, possible small white bivalves, octocorals, possibly compound ascidians, sabellid worms and icefish (*Cryodraco antarcticus*).

Event 17 – Duse Bay (300 m)

Substrate: Mud
Characterised by small and large ophiuroids,
Other fauna observed: sponges, bryozoans, ascidians, possible corals, bivalves, small crustaceans.

Event 18 – Duse Bay (400 m)

Substrate: Mud
Characterised by small and large ophiuroids
Umbellula, crinoids, large pycnogonids, large polychaetes, sponges, ascidians, asteroids, icefish. Worm/other burrows.

Event 22 – Prince Gustav Channel South (800 m)

Substrate: Mud with coarse gravel, compacted, smaller and larger boulders present.
Characterised by a high abundance of benthic fauna, particularly large ophiuroids. Ophiuroids at this locality were epifaunal rather than infaunal.
Other fauna observed: ophiuroids, asteroids including large yellow thin armed starfish (and *Labidiaster*?), gorgonians (*Thouarella*?), several types of sponge (demosponges), ascidians (*Molgula*?), pycnogonids, worms, hydroids, icefish, holothurians, stalked ctenophore, crinoids, bryozoans and ascidians. Large amount of organic matter, fish and krill in the water column.

Event 24 – Prince Gustav Channel Cape Obelisk (800 m)

Substrate: Coarse mud with dropstones, some large with abundant fauna on them, possibly a strong current.
Characterised by large ophiuroids.
Other fauna observed: large and small ophiuroids, small pycnogonids, some crustaceans, ascidians (long compound, orange, and stalked) octocorals, asteroids, holothurians, icefish, crinoids, anemones, hydroids, antarcturids, *Thouarella* gorgonians, demosponges, possible pteropod in video clip, shrimps, bryozoans. Lots of organisms in the water column, including fish in and between transects.

Event 25 – Prince Gustav Channel Cape Obelisk (500 m)

Substrate: Coarse mud, small to medium sized dropstones
Characterised by abundant fauna, large ophiurioids, crinoids and gorgonians.
Other fauna observed: Large and small ophiuroids, some infuanal in the sediment, gorgonians (*Thouarella*), crinoids, yellow deomosponges, sponges, pycnogonids, polychaetes, holothurians, hydroids, pencil urchins, shrimps, fish, sabellid worms, flatworm, stalked ascidians, *Chemidocarpa* (orange ascidian), asteroids, Polychaetes (*Flabellid*?).

Event 27 – Prince Gustav Channel Cape South (200 m)

Substrate: gravel and stones, some sandy areas, some boulders.
Characterised by many stones and boulders with associated organisms.
Other fauna observed: large epifaunal ophiuroids, crinoids, bryozoans, urchins (*Sterechinus*), gorgonians including *Thouarella* (many in some places), *Chemidocarpa*, hydroids, sponges and demosponges, asteroids, stalked ascidians.

Event 28 – Prince Gustav Channel South (500 m)

Substrate: rocks with soft sediment on top, some gravel in sandy mud
Characterised by high abundance of holothurians, crinoids, scaleworms.
Other fauna observed: large ophiuroids, arms of smaller ones in sediment, abundant crinoids, holothurians, asteroids, pycnogonids, a gastropod, worms, gorgonian - *Thouarella*, sponges, scaleworms, sabellid worms, bryozoans, benthic ctenophore, stalked ascidian, pink soft coral, fish, urchins.

Event 30 – Prince Gustav Channel Cape Obelisk (400 m)

Substrate: Soft sediment with small dropstones and boulders
Characterised by organisms on dropstones.

Big epifaunal ophiuroids, infaunal ophiuroids with arms sticking out of sediment, anemones, branching bryozoans, crinoids, yellow asteroids, pycnogonids, hydroids, sponges and demosponges, big polychaetes, *Notocrangon*, gorgonians (some fan shaped, *Thouarella*), asteroids, pencil urchin, sea urchins, holothurians (Cucmariidae, *Bathyplotes*), stalked ascidians, solitary ascidians (large - *Chemidocarpa*?) and abundant fauna in the water column including abundant krill.

Event 45 – Prince Gustav Channel – mid (850 m)

Substrate: gravel and small stones, covered with sediment. Some small dropstones
Characterised by
Other fauna observed: sponges, compound ascidians, other ascidians, demosponges, pycnogonids, ophiuroids – intermediate size and less abundant than at other stations, benthic ctenophore, bryozoans, hydroids, siphonophore, holothurians, asteroid, fish.

Event 58 – Andersson Island (500 m)

Substrate: mud
Characterised by infaunal ophiuroids.
Epifaunal and infaunal ophiuroids, bryozoans, sponges, krill in water column, ctenophores, small pycnogonids, icefish, anemones, sponges, holothurians on hydrozoans and bryozoans, compound ascidians, sea urchins, shrimp, small bryozoans, crinoids during transect move.

5. Bongo

Sophie Fielding, Will Reid, …

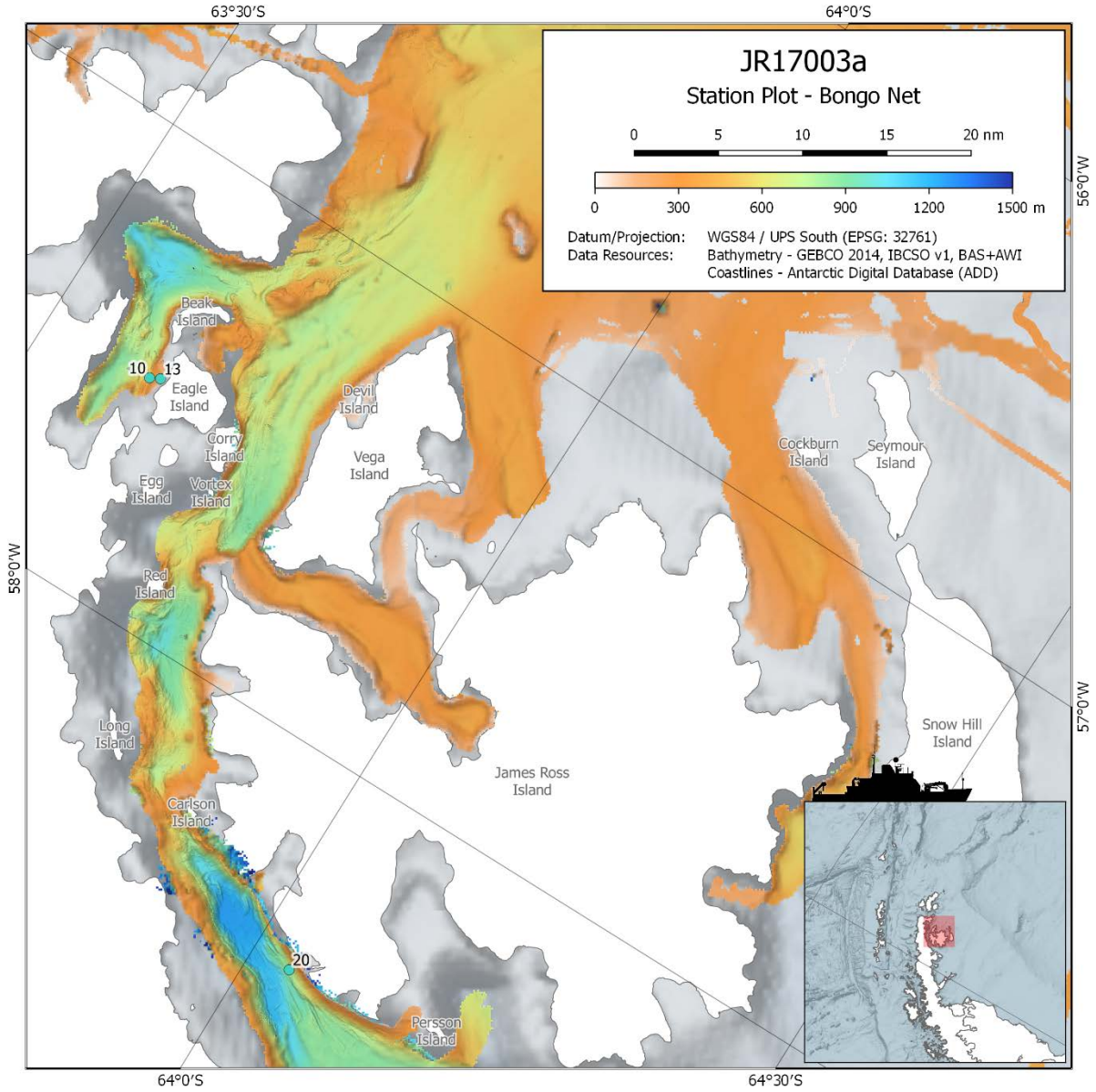


Fig. 23 Locations of Bongo events

Aim: Sample the pelagic foodweb, for isotope analysis and diversity where relevant.

Method: The bongo was fitted with a 100 µm and 200 µm mesh nets. Where possible it was deployed to 200m, in shallower waters it was 150m. The sample was either preserved in formalin or filtered onto an ashed GFF for isotope analysis.

Comments: Through a combination of weather (winds 25-30 knots) and a winch failure there were only 3 bongos undertaken, 2 in Duse Bay and 1 in Prince Gustav Channel. All samples were very small. The first sample from Duse Bay was preserved. The second two samples were filtered onto ashed GFFs and frozen at -80C. A cursory examination of the samples indicated some copepods, a siphonophore (and several bladders) in the third sample, but mostly krill fecal pellets.

Table 14. Catch fate of Bongo net samples

Event No	Site Name	Water depth (ea600-depth)	Net Max Depth	Catch Fate
10	Duse Bay 500m	500.4	210	Formalin
10	Duse Bay 500m	500.4	210	Formalin
10	Duse Bay 500m	493.31	210	Formalin
13	Duse Bay 200m	202.62	150	Filtered for isotopes/frozen
13	Duse Bay 200m	203.23	150	Filtered for isotopes/frozen
13	Duse Bay 200m	203.83	150	Filtered for isotopes/frozen
20	Prince Gustav 1	796.62	200	Part filtered for isotopes and frozen
20	Prince Gustav 1	803.22	200	Part filtered for isotopes and frozen
20	Prince Gustav 1	805.14	200	Part filtered for isotopes and frozen

6. CTD deployment and data acquisition

Hugh Venables, Luisa Federwisch, Sophie Fielding

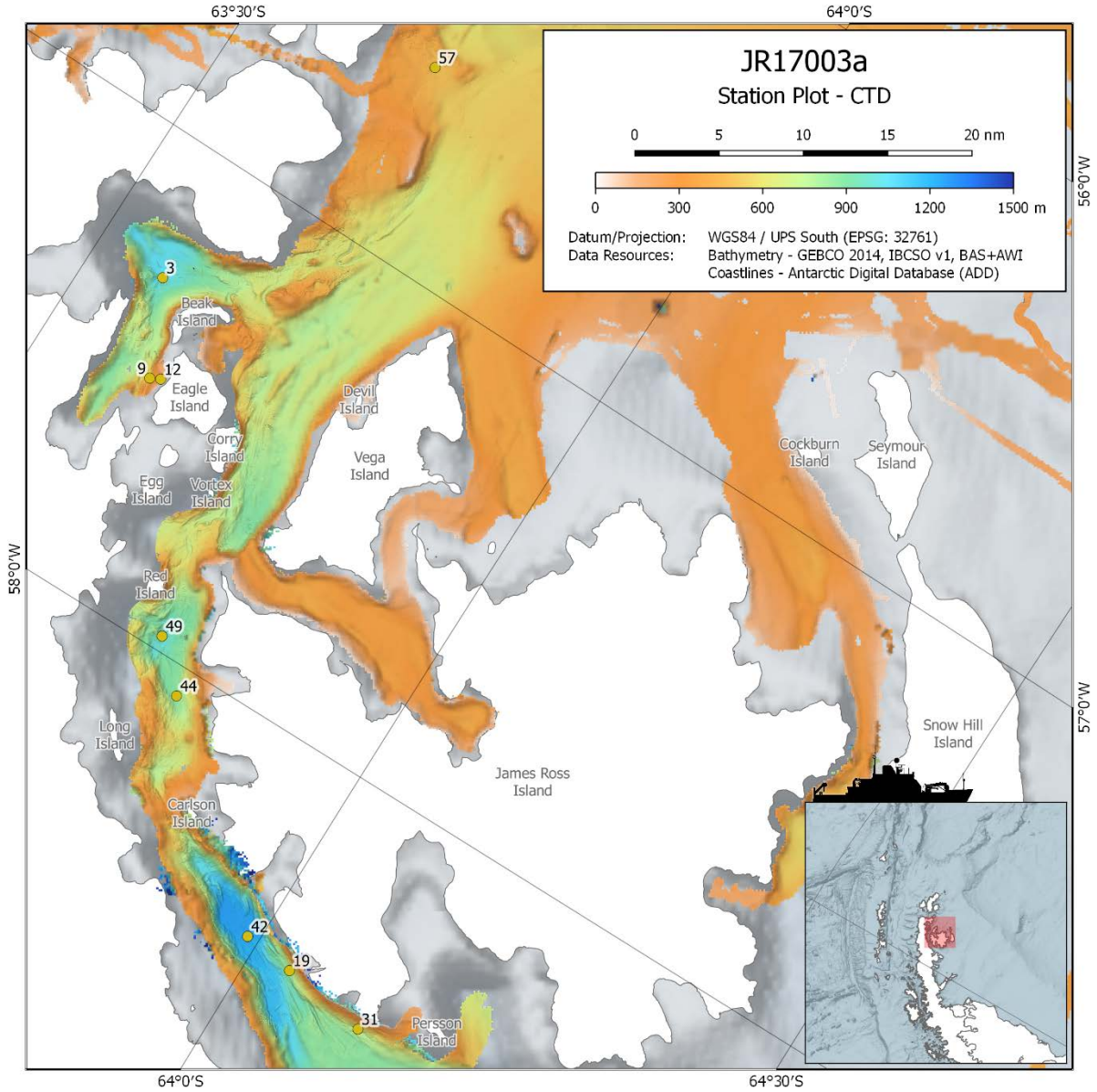


Fig. 24 Locations of CTD events

Introduction

A Conductivity-Temperature-Depth (CTD) unit was used to vertically profile the water column. 9 casts were carried out in total. CTD positions are included in Appendix 4. CTD profiles were numbered by event number.

CTD instrumentation and deployment

An SBE32 carousel water sampler, holding 24 12-litre niskin bottles, an SBE9Plus CTD and an SBE11Plus deck unit were used. The SBE9Plus unit held dual SBE3Plus temperature and SBE4 conductivity sensors and a *Paroscientific* pressure sensor. An SBE35 Deep Ocean Standards Thermometer makes temperature measurements each time a bottle is fired, and time, bottle position and temperature are stored, allowing comparison of the SBE35 readings

with the CTD and bottle data. Additional sensors included an altimeter, a fluorometer, an oxygen sensor, a photosynthetically active radiation (PAR) sensor and a transmissometer. The altimeter returns real time accurate measurements of height off the seabed within approximately 100m of the bottom. This allows more accurate determination of the position of the CTD with respect to the seabed than is possible with the Simrad EA600 system, which sometimes loses the bottom or reverts to default values (approximately multiples of 500m) and, in deep water, often returns depths that are several tens of metres different from the true bottom depth. A fin attached to the CTD frame reduced rotation of the package underwater. The CTD package was deployed from the mid-ships gantry on a cable connected to the CTD through a conducting swivel.
CTD data were collected at 24Hz and logged via the deck unit to a PC running Seasave version 7.22.3 (Sea-Bird Electronics, Inc.), which allows real-time viewing of the data. The procedure was to start data logging, deploy the CTD, then stop the instrument at 10m wireout, where the CTD package was left for at least two minutes to allow the seawater-activated pumps to switch on and the sensors to equilibrate with ambient conditions. On a couple of occasions the pumps were late to turn on, due to seawater freezing onto the CTD at deployment (air temperatures down to -15˚C), with the package lowered to 50m for the initial soak on one of these occasions.
After the 10m soak, the CTD was raised to as close to the surface as sea conditions allowed and then lowered to within 10m of the seabed. In calm conditions the CTD was taken to 5m off the seabed to improve the water sampling for benthic biologists. Bottles were fired on the upcast, where the procedure was to stop the CTD winch, hold the package *in situ* for a few seconds to allow sensors to equilibrate, and then fire a bottle. The CTD was left at this depth for ≈10 seconds to allow the SBE35 temperature sensor to take readings over 8 data cycles. The sensor averages these readings to produce one value for each bottle fire. If duplicate bottles were fired at any depth the SBE35 does not take readings unless there is a 20 second gap between firings. The unit needs time to recharge between firings but can cope with two in succession.
For temperature below -13˚C water in the Niskin bottles was freezing during recovery, leading to either no water coming out of the outflow or the flow stopping after about a quarter of a litre. Sampling was delayed to allow thawing in the annexe but the was a clear risk of fractionation or other issues with the sampled water.

Data acquisition and preliminary processing

The CTD data were recorded using SeaSave version 7.22.3, which created four files:
JR17003a_[NNN].hex hex data file
JR17003a_[NNN].XMLCON ascii configuration file containing calibration information
JR17003a_[NNN].hdr ascii header file containing sensor information
JR17003a_[NNN].bl ascii file containing bottle fire information

where NNN is the CTD number (column 1 in Table 2.5.1).

The SBE Data Processing *Data_cnv* was used to convert the hex file to ascii. *Align* was then used to account for the time lag of the oxygen sensor, with data being advanced by 5 seconds. *Cell thermal mass* module was then used to remove the conductivity cell thermal mass effects from the measured conductivity. This re-derives the pressure and conductivity, taking into account the temperature of the pressure sensor and the action of pressure on the conductivity cell. The output of this process is an ascii file, named as *JR17003a_[NNN]_align_ctm.cnv*.

SBE35 high precision thermometer

Data from the SBE35 thermometer were uploaded after every cast using the *SeaTerm* program. Once the readings had been written to an ascii file, the file was opened and the

contents checked to make sure the correct number of readings had been stored. The memory of the SBE35 was then cleared using the '*samplenum=0*' command. To check that the memory was clear, the command '*ds*' was entered, which displays the number of data points stored in the instrument's memory. This number should be 0. The date and time are also shown by the *ds* command and these should be checked and corrected if needed.

Salinity samples

Salinity samples were taken from deep areas with little salinity gradient and the mixed layer depth. However, attempts to run the samples were initially delayed by fluctuating lab temperatures (linked to very cold conditions outside and ship heating changes) and then thwarted by a faulty salinometer. Although used successfully on JR17003 and with no changes since, the readings were too low (1.8 5xxx rather than 1.9 99xx) and rose rapidly when the pumps were switched off, as happens when very cold water is run through where heat exchange is ongoing in the cells. The lab temperature was however stable at 21.5˚C and the water was at this temperature (bath temperature 24 ˚C, same temperatures as for JR17003). When left, the reading appeared to stabilise at 1.9 7xxx, still too low. No obvious reasons for this were found and it was repeatable over several tests.
Following problems on JR17003 of salt crystals building up around the tops of the bottles some testing was done and this could be replicated if the bottle cap was put on with seawater in it or the bottle not wiped, whether the bottle was upside down or the right way up. Seawater droplets on the bottle dried in situ rather than running down the bottle so are not the cause of the salt build up around the cap (for upside down bottles). Post-processed bottles with seawater in but no stopper also showed salt build up if placed upside down, making this a bad option (and the cap gets wet). The procedure of wiping the neck and mouth of the bottle and the cap (if it needed rinsing at all), placing a dry stopper in the bottle and leaving upside down worked for about half the bottles, with the others showing salt buildup over time, most likely linked to expansion-related leaking through the stopper. The argument for upside down bottles being so they have to be turned to be run on the salinometer and to distinguish which bottles have samples but leaving them the right way up appears better, so long as processed bottles are not then put upside down to distinguish them.

CTD data processing

Further processing of CTD data was carried out in Matlab using existing programs, predominantly written by Mike Meredith and Karen Heywood, with modifications by numerous others, and further significant changes made on JR177 and JR307. Further significant changes, mostly generalising the code to reduce the number of adjustments needed between cruises were made on JR17003a and described below. The processing routines were split into two subsets: those that could be carried out in the absence of salinity calibration data and those that required the *JR17003a_master.xls* file containing the salinometer readings. The first subset of programs was run following each CTD cast and allowed a visual check of the data to ensure that the instruments were working correctly. The second subset was run for those CTDs for which salt samples had been collected, following the salinity analysis. The first subset of Matlab routines applied to the CTD data is as follows:

• *CTDvarn* allows users to define directory paths, file naming conventions, the order and presence of variable output in the seabird .cnv files and which variables should be processed at each step during the processing, thereby avoiding the need to edit the following scripts for standard changes between cruises and CTD setups.

• *ctdreadGEN* invokes the *cnv2mat* routine written by Rich Signell to read in the *JR17003a _NNN_align_ctm.cnv* file (cruise_NNN_fileappend.cnv with the constituent parts defined in CTDvarn). Data are stored in Matlab arrays and named accordingly. Latitude and longitude are now written into the file during data capture. The output file is of the form

JR17003a_ctd_NNN.red (it was .cal but confusing to have the rawest data looking like calibrated data).
• *editctdGEN* reads in *JR17003a_ctd_NNN.red* and removes the 10m soak prior to the CTD cast, through finding the minimum pressure after the soak and asking for user confirmation after displaying the full pressure plot for the cast. For unusual casts there is then the option to manually enter a scan count for the start of a cast or edit out pressure spikes. Data collected at the end of the upcast when the CTD was out of the water is removed graphically by selecting bad conductivities when the package is out of the water, these going wrong before pumps are switched off and at pressures either side of zero depending on pressure sensor offsets. The selected data points are set to NaN for all scientific sensors. Primary and secondary conductivity are also despiked using the interactive editor at the same time, with the option to edit the temperature profiles and T/S plots (where small conductivity spikes can be more obvious). Selected data points are set to NaN. These points are also set to NaN for PAR, fluorescence, oxygen and transmission. Output is *JR17003a_ctd_NNN.edt*.
batchGEN.m then runs:
• *deriveGEN (what was the second half of salcalapp)* loads *JR17003a_ctdNNN.edt* (no interpolation done as seems a bad idea, so .edt rather than .int) and calculates salinity, potential temperature and σθ, σ2 and σ4 as per the UNESCO 1983 algorithms by invoking the routines sw*_salt*, *sw_ptmp* and *sw_pden*. θ and salinity are calculated for both the primary and secondary sensors, whilst σ is calculated using primary temperature and conductivity. Output is *JR17003a_ctd_NNN.var*.
• *splitcastGEN* reads in *JR17003a_ctd_NNN.var* and splits the downcast and upcast into *JR17003a_ctd_NNN.var.dn* and *JR17003a_ctd_NNN.var.up*. As the pressure profile has been checked, this can be safely done using the maximum pressure.
• *fallrateGEN* was added on JR307 (after retrospectively being applied to JR161 and JR177 data and JR299 through mstar processing). It is a matlab version of the seapath loopedit script. It has to be run after the initial soak is removed as it removes any datapoint on the downcast where pressure is less than one previously recorded or if the fall rate is <0.25 ms^{-1}. Loopedit flags such points (excluding the initial soak if set to) but these flags were not subsequently used in the processing and often did erroneously include the initial soak. This process results in smoother density profiles with fewer apparent overturns. Input and output is *JR17003a_ctd_NNN.var.dn* – it is not run on the upcast as it will remove bottle stops.
• *gridctdGEN* reads in both *JR17003a_ctd_NNN.var.dn* and *JR17003a_ctd_NNN.var.up*, and averages the data into 2dbar bins. Data are padded with NaNs to 5999dbar, thereby ensuring that arrays for all CTDs are the same size. Outputs are *JR17003a_ctd_NNN.2db.mat* and *JR17003a_ctd_NNN.2db.up.mat*.
• *fill_to_surf* was not run. It allows any missing data at the surface to be filled with values from the next non-NaN line. This should only be carried out where the upper water column is well mixed. Missing values for the time stamp and PAR are left as NaNs. The output file is the same as the input file.
• *ctdplotGEN* reads in *JR17003a_ctd_NNN.2db.mat* and plots profiles of θ and salinity (both primary and secdondary), density, fluorescence, transmission, oxygen and PAR. Plots are output for the entire CTD depth, for only the upper 200m of the cast and the lower 150m. These plots are saved as png files and printed.

The second subset of Matlab programs is as follows: [these have not been generalised but it wouldn't be hard to do so]
• *makebot17003a* reads in *JR17003a_ctdNNN.ros*, *JR17003a_ctdNNN.BL* and *JR17003a_ctdNNN.int*, and extracts CTD pressure, temperature (1 & 2), conductivity (1 & 2), transmission, fluorescence, oxygen and PAR for each bottle fired. It also calculates the standard deviation for pressure, temperature and conductivity, and writes a warning to the screen if those for temperature and conductivity are greater than 0.001. Salinity and potential temperature are calculated from both primary and secondary temperature and conductivity using *ds_salt* and *ds_ptmp*. Results are saved in *JR17003abotNNN.1st*.

• *readsal17003a* extracts salinity calibration data from *JR17003a_master.xls* and reads in *JR17003abotNNN.1st*. Data from duplicate salinity samples are stored in *niskinsalts.mat*, and if the standard deviation of these samples is >0.002, a warning is written to the screen. Output is *JR17003asalNNN.mat*.
• *addsal17003a* reads in *JR17003abotNNN.1st* and *JR17003asalNNN.mat*, and stores all salinity information in *JR17003abotNNN.sal*.
• *setsalflag17003a* loads *JR17003abotNNN.sal* and flags those bottles with high standard deviations for temperature and conductivity. Output would be *JR17003abotNNN.sal* but it wasn't run, this filtering being taken into the *_decide* scripts to allow adjustments of thresholds
• *sb35read17003a* loads *JR17003asbeNNN.asc*, *JR17003abotNNN.1st* and *JR17003a_ctdNNN.cal*, and plots SBE35 temperature minus CTD temperature (1 & 2) for a visual check. The SBE35 data are saved in *JR17003a_botNNN.sb35* and SBE35 temperature minus CTD temperature is saved in *tempcals.all.mat*. This script must be run prior to *salcal17003a*.
• *salcal17003a* loads *JR17003abotNNN.sal*, *JR17003a_ctdNNN.int* and *tempcals.all.mat*, and uses sample salinities and SBE35 temperatures to calculate conductivity offsets for both CTD sensors. All offsets are stored in *salcals.all.mat*. Plots of temperature and conductivity offsets are output to the screen.
• *tempcal_decide and salcal_decide* read in *tempcals.all.mat* and *salcals.all.mat*, and plots primary and secondary temperature and conductivity minus SBE35 temperature and conductivity calculated from the salinity samples. This allows determination of any offsets that should be applied to calibrate the CTD sensors. Temperature offsets are needed first for the back-calculation of conductivity from bottle samples. The two offsets for each sensor should be checked to make sure they remove differences between the sensors as well as fit them to the calibration values available.
• Once this second subset of programs has been run the offsets found in calibrations are entered into *salcalapp*, which is then run again. Any required temperature or conductivity offset is applied here, and salinity, θ, and σ are recalculated, all with _cal appended to variable names. Offset data are saved in *JR17003abotNNN.cal*. All programs following *salcalapp* must then be re-run with versions including the _cal variables. There are currently different versions but these could easily be merged with options for filename endings and CTDvarn column. Calibration is done to conductivity before the fallrate script as this allows further changes to either calculation of salinity or how to deal with package effects on the profile to be applied to calibrated data.

CTDvarn.m:

```
dir_sb='C:\hjv\JR17003a\ctd\sbproc\';
dir_out='C:\hjv\JR17003a\ctd\procMB\';
dir_plots='C:\hjv\JR17003a\ctd\plots\';

cruise='JR17003a';
sb_fileadd='_align_ctm'; %expecting cruise_nnn_sb_fileadd.cnv

addpath('C:\hjv\mtlab\seawater')%set path
addpath('C:\hjv\Code\matlab_codes')

%want a code for each section of a script, so that script can find the
%matching column (rather than hard-coded column number, allows columns to
%be added or removed

%Variable names set in table below, some script editing needed if these are
%changed (temp1/2, cond1/2, press)
columnuse={'variable_name' 'seabird_output_position' 'want_to_read'
'plus_derive' 'edit_vars' 'ctd_plot'};
```

```
varnames={
            'scan'   1    1   1   0   0
    'time_elapsed'   2    1   1   0   0
           'press'   3    1   1   0   0
           'temp1'   4    1   1   1   0
           'temp2'   5    1   1   1   0
           'cond1'   6    1   1   1   0
           'cond2'   7    1   1   1   0
     'oxygen_ml_l'   8    1   1   1   0
   'oxygen_umol_l'   0    1   1   1   0
        'oxygen_V'  10    1   1   1   0
  'oxygen_umol_kg'   9    1   1   1   3
       'BeamTrans'  15    1   1   1   2
             'alt'  12    1   1   0   0
      'fluor_ug_l'  13    1   1   1   1
           'pumps'  14    1   1   0   0
            'flag'  19    1   1   0   0
            'par'   16    1   1   1   4
            'par2'   0    1   1   1   0
       'PressTemp'  11    1   1   0   0
         'nitrate'   0    1   1   1   0  %want it if present, but not on
CTD
         'latscan'  17    1   1   0   0
         'lonscan'  18    1   1   0   0
         'salin1'   -1    0   1   0   0  %derived parameters
         'salin2'   -1    0   1   0   0
         'potemp1'  -1    0   1   0   0
         'potemp2'  -1    0   1   0   0
         'sig0'     -1    0   1   0   0
         'sig2'     -1    0   1   0   0
         'sig4'     -1    0   1   0   0
         'depth'    -1    0   1   0   0
         'salin1_cal'   -1    0   0   0   0   1  %calibrated parameters
         'salin2_cal'   -1    0   0   0   0   1
         'potemp1_cal'  -1    0   0   0   0   1
         'potemp2_cal'  -1    0   0   0   0   1
         'sig0_cal'     -1    0   0   0   0   1
         'sig2_cal'     -1    0   0   0   0   1
         'sig4_cal'     -1    0   0   0   0   1
         'temp1_cal'    -1    0   0   0   0   1
         'temp2_cal'    -1    0   0   0   0   1
         'cond1_cal'    -1    0   0   0   0   1
         'cond2_cal'    -1    0   0   0   0   1

        } ;

     %make 1/0 vector of whether sensor is present (column2>0) and variable
wanted (column 3~=0)
     sv=size(varnames);
     vp=zeros(sv(1),1);
     vpd=zeros(sv(1),1);
     for iv=1:sv(1)
         vp(iv)=(varnames{iv,2}*varnames{iv,3})>0;
         vpd(iv)=(varnames{iv,2}*varnames{iv,4})~=0;  %including derived
variables
     end

iic=find(strcmp(columnuse,'cal_var')); %ensure looking at right column
sv=size(varnames);
     vpp=zeros(sv(1),1);
```

```
     for iv=1:sv(1)
         vpc(iv)=(varnames{iv,2}*varnames{iv,iic})~=0;  %including
calibrated
     end
```

Example extra code related to CTDvarn.m:

```
CTDvarn

infile=strcat('',dir_out,'',cruise,'_ctd_',aaa,'.var')
upfile=strcat('',dir_out,'',cruise,'_ctd_',aaa,'.var.up')
dnfile=strcat('',dir_out,'',cruise,'_ctd_',aaa,'.var.dn')

for iv=1:length(vpd) %temporary down
    if vpd(iv)==1
       eval([varnames{iv,1},'dn=',varnames{iv,1},'(1:imaxprs);']);
    end
end

varl=''; %save up
for iv=1:length(vpd)
    if vpd(iv)==1
       varl= [varl,' ',varnames{iv,1},];
    end
end
eval(['save ',upfile,' names gtime lat lon ',varl,])
```

CTD		Month	Day	Time	Latitude	Longitude	Depth	Bottom salinity	Bottom temperature	Minimum altimeter
	Start	2	23	05:11:07	-53 26.83	-57 38.18				
1	Bottom	2	23	05:56:21	-53 26.85	-57 38.18	2446	34.71	1.72	6.5
	End	2	23	06:40:41	-53 27.00	-57 38.24				
	Start	3	1	14:30:41	-63 34.29	-57 17.91				
3	Bottom	3	1	14:52:10	-63 34.39	-57 17.79	1035	34.54	-1.84	11.1
	End	3	1	15:23:20	-63 34.52	-57 17.62				
	Start	3	2	09:12:01	-63 36.93	-57 29.92				
9	Bottom	3	2	09:25:02	-63 36.93	-57 29.92	500	34.48	-1.64	4.4
	End	3	2	09:44:07	-63 36.93	-57 29.92				
	Start	3	2	13:50:48	-63 37.51	-57 29.26				
12	Bottom	3	2	13:57:53	-63 37.51	-57 29.26	205	34.41	-1.65	6.1
	End	3	2	14:10:31	-63 37.51	-57 29.26				
	Start	3	3	10:04:16	-64 02.47	-58 27.16				
19	Bottom	3	3	10:22:53	-64 02.47	-58 27.16	793	34.53	-1.84	9.7
	End	3	3	10:49:18	-64 02.47	-58 27.16				
	Start	3	4	17:17:40	-64 07.63	-58 29.03				
31	Bottom	3	4	17:45:09	-64 07.73	-58 29.07	686	34.53	-1.85	10.4
	End	3	4	18:08:09	-64 07.81	-58 29.01				
	Start	3	6	13:10:26	-63 48.27	-58 03.80				
44	Bottom	3	6	13:28:55	-63 48.27	-58 03.80	852	34.48	-1.77	5
	End	3	6	13:57:27	-63 48.27	-58 03.80				
	Start	3	6	22:35:33	-63 45.67	-57 58.04				
49	Bottom	3	6	22:57:17	-63 45.67	-57 58.04	976	34.48	-1.77	6
	End	3	6	23:25:08	-63 45.67	-57 58.04				
	Start	3	8	16:13:03	-63 41.08	-56 34.73				
57	Bottom	3	8	16:24:13	-63 41.08	-56 34.73	457	34.5	-1.36	9.6
	End	3	8	16:33:56	-63 41.08	-56 34.73				

6.1 Water sampling

Luisa Federwisch

At five stations, bottom water samples (4 L) were collected from the CTD rosette sampler for analysis of silicon (Si) and oxygen (O) isotopes, as well as microbial communities in

comparison to collected sponges. The water was filtered through 0.2 µm Sterivex polycarbonate filters (Durapore, Millipore) using a single glass filtration unit and a vacuum pump (Fig. 25). The filters were folded into ethanol-sterilized aluminum foil and frozen at -80 °C for later molecular analysis of microbes. For Si/O isotope analysis, 2 L of the filtered water were filled into acid-washed plastic bottles and stored at +4 °C.
Suitable sponges for Si and O isotope analysis could be collected at four of the stations, but for microbiome analysis enough sponge material could only be collected at one station (Table 15; see also Chapter 1.4). The respective water samples will be analysed in collaboration with Andrea Abelmann (AWI, Germany). Filters will be analysed in collaboration with Ute Hentschel (GEOMAR, Germany).

Table 15: Overview of collected water samples and filters for Si/O isotope and microbiome analysis, respectively. Samples will only be analysed for stations where suitable sponges could be collected (PGC = Prince Gustav Channel).

Event #	Location	Water	Filter	Sponges collected for analysis
09	Duse Bay, 500 m	1	0	Si/O isotopes
12	Duse Bay, 200 m	1	1	-
19	PGC South, 800 m	1	1	Si/O isotopes
42	PGC South, 1250 m	1	1	Si/O isotopes
44	PGC Mid, 850 m	1	1	Si/O isotopes, microbiomes

Fig. 25: Setup of filtration unit for analysis of silicon and oxygen isotopes as well as microbial communities in the bottom water (photo: Luisa Federwisch).

6.2. Vertical profiles of Chlorophyll-*a*

Sophie Fielding

Aim: Profile water column productivity at each benthic station.
Method: Chlorophyll-*a* samples were taken at 8 CTD stations at 5, 20, 50, 75, 100 and 200m depth. 500ml water samples were filtered through 25mm Whatmann GFF glass fibre filters (Table 16). Filters were placed in vials and stored in the -80°C freezer for analysis in Cambridge.

Table 16. Sample log of Whatmann filters.

Time	Event No	Site name	Bottle No	Filter No.	Vol filter (ml)
01/03/2018 14:51	3	Duse Bay 1000m	17	1	500
01/03/2018 14:51	3	Duse Bay 1000m	15	2	500
01/03/2018 14:51	3	Duse Bay 1000m	14	3	500
01/03/2018 14:51	3	Duse Bay 1000m	11	4	500
01/03/2018 14:51	3	Duse Bay 1000m	9	5	500
01/03/2018 14:51	3	Duse Bay 1000m	8	6	500
02/03/2018 09:22	9	Duse Bay 500m	19	7	500
02/03/2018 09:22	9	Duse Bay 500m	17	8	500
02/03/2018 09:22	9	Duse Bay 500m	15	9	500
02/03/2018 09:22	9	Duse Bay 500m	13	10	500
02/03/2018 09:22	9	Duse Bay 500m	11	11	500
02/03/2018 09:22	9	Duse Bay 500m	10	12	500
02/03/2018 13:57	12	Duse Bay 200m	14	13	500
02/03/2018 13:57	12	Duse Bay 200m	12	14	500
02/03/2018 13:57	12	Duse Bay 200m	10	15	500
02/03/2018 13:57	12	Duse Bay 200m	8	16	500
02/03/2018 13:57	12	Duse Bay 200m	6	17	500
02/03/2018 13:57	12	Duse Bay 200m	4	18	500
03/03/2018 10:20	19	PGC South 800m	20	19	500
03/03/2018 10:20	19	PGC South 800m	18	20	500
03/03/2018 10:20	19	PGC South 800m	15	21	500
03/03/2018 10:20	19	PGC South 800m	13	22	500
03/03/2018 10:20	19	PGC South 800m	11	23	500
03/03/2018 10:20	19	PGC South 800m	9	24	500
04/03/2018 17:43	31	PGC Cape Obelisk 800m	19	25	500
04/03/2018 17:43	31	PGC Cape Obelisk 800m	17	26	500
04/03/2018 17:43	31	PGC Cape Obelisk 800m	15	27	500
04/03/2018 17:43	31	PGC Cape Obelisk 800m	13	28	500
04/03/2018 17:43	31	PGC Cape Obelisk	11	29	500

		800m			
04/03/2018 17:43	31	PGC Cape Obelisk 800m	10	30	500
05/03/2018 23:06	42	PGC South 1250m	23	31	500
05/03/2018 23:06	42	PGC South 1250m	21	32	500
05/03/2018 23:06	42	PGC South 1250m	18	33	500
05/03/2018 23:06	42	PGC South 1250m	16	34	500
05/03/2018 23:06	42	PGC South 1250m	14	35	500
05/03/2018 23:06	42	PGC South 1250m	12	36	500
06/03/2018 13:27	44	PGC mid 800m	19	37	500
06/03/2018 13:27	44	PGC mid 800m	17	38	500
06/03/2018 13:27	44	PGC mid 800m	15	39	500
06/03/2018 13:27	44	PGC mid 800m	13	40	500
06/03/2018 13:27	44	PGC mid 800m	11	41	500
06/03/2018 13:27	44	PGC mid 800m	9	42	500
06/03/2018 22:57	49	PGC mid 1000m	17	43	500
06/03/2018 22:57	49	PGC mid 1000m	15	44	500
06/03/2018 22:57	49	PGC mid 1000m	13	45	500
06/03/2018 22:57	49	PGC mid 1000m	11	46	500
06/03/2018 22:57	49	PGC mid 1000m	9	47	500
06/03/2018 22:57	49	PGC mid 1000m	7	48	500

7. Underway navigational data

Hugh Venables

Instrumentation and data collection

Navigational data were collected continuously throughout the cruise. Instrumentation was as follows:
Sperry Mk 37 Model D Gyrocompass
Seatex GPS (Seapath 307)

Hull-mounted Simrad EA600 Hydrographic 12kHz Echosounder (transducers located approximately 5m below the water level).

Navigational data were collected every second, whilst the bathymetric data were logged every 10 seconds.

Processing

Navigational data were processed in Unix (ssh pstar@jrlc, pw pstar) and Matlab using modified versions of programs developed by Mike Meredith. Data were initially read into the Unix system, then transferred to Matlab, where the bulk of the processing was carried out. Directory structures are written in to follow the pattern of the data being stored in parallel directories from the code (../../stream/daily_file relative to the code) for both unix and matlab scripts.

Unix

get_nav Calls the scripts *get_gyro*, *get_seatex* and *get_tsshrp*, which invoke the *listit* command to retrieve 24 hours (day of year must be given as three figure number, e.g. 059) of gyrocompass, Seatex and tsshrp (heave, pitch and roll) data. Data are saved in subdirectories 'gyro', 'seatex', and 'tsshrp' as *gyro.NNN*, *seatex.NNN* and *tsshrp.NNN*, where NNN is the jday. The updated version of listit is sourced from /users/dacon/projects/scs/bin

get_ea600 Invokes the *listit* command to retrieve 24 hours of EA600 data. Data are saved as *ea600.NNN*.
get_em122 Invokes the *listit* command to retrieve 24 hours of under-ship swath data. Data are saved as *em122.NNN*. Although obviously just a small subset of the total swath data, this is generally more accurate and less noisy than EA600 data but with the same ease of use and therefore worth logging.

Matlab

load_daily.m Reads in navigation files output by the Unix processing (above) by calling the following functions:
• *load_daily_gyro*: reads in text file *gyro.NNN* and writes data to Matlab structure array. Data are flagged, such that any variable with flag ≠ 50 are poor, and thus discarded. Output is *gyro/gyroNNN.mat*.
• *load_daily_seatex*: reads in text file *seatex.NNN* and writes data to Matlab structure array. Data are flagged, such that any variable with flag ≠ 50 are poor, and thus discarded. Output is *seatex/seatexNNN.mat*.
• *load_daily_tsshrp*: reads in text file *tsshrp.NNN* and writes data to Matlab structure array. Data are flagged, such that any variable with flag ≠ 50 are poor, and thus discarded. Output is *tsshrp/tsshrpNNN.mat*.

For a quick visual check, the program then plots seatex data, gyrocompass heading, and pitch and roll.

plot_seatex_all Plots entire cruise track. Loads *seatexNNN.mat* for all jdays and GEBCO bathymetry data.

loadea600 Reads in *ea600.NNN* and stores data in Matlab structure array. Saves *ea600_NNN.mat*
loadem122 Reads in *em122.NNN* and stores data in Matlab structure array. Saves *em122_NNN.mat*

cleansim500 Loads *ea600_NNN.mat.* It plots ea600 data (with em122 data underneath if present) and asks for minimum and maximum values for initial cleaning (defaults 0 and 15000). Data outside these limits and set to NaNs. Interpolation and spike removal have been removed as data are still not clean and spike removal was incomplete. Data are then cleaned using an interactive editor written on JR299 using the inpolygon function to speed the process relative to two-point rectangular boxes. Gaps are left as gaps. Output is *ea600_NNNclean.mat*.

8. Underway Oceanlogger and meteorological data *Hugh Venables*

Instrumentation and data collection
Surface ocean and meteorological data were logged continuously throughout the cruise. Ocean data were collected from the ship's uncontaminated seawater supply, whilst instruments on the forward mast measured the meteorological data. Instruments were as follows:

Oceanlogger
• SeaBird Electronics SBE45 CTD
• Wet Labs WSCHL fluorometer
• Transmissometer
• Two sea surface temperature probes at the inlet

Both surface ocean and meteorological data were collected at 5 second intervals.

Processing
Initial processing was carried out in Unix, which generated files that could be further processed in Matlab.

Unix
get_underway Calls the scripts *get_oceanlog*, *get_anemom*, which invoke the *listit* command to retrieve 24 hours of underway data. Output files are *oceanlog.NNN*, *anemom.NNN*, where NNN is the jday. The updated version of listit is sourced from /users/dacon/projects/scs/bin

Matlab
loadunderway Calls functions *loadoceanlog* and *loadanemom* to read *oceanlog.NNN* and *anemom.NNN*. Data are stored in structure arrays and saved as *oceanlogNNN.mat* and *anemomNNN.mat*. The program then calls the function *cleanoceanlog*, which sets unrealistic values to NaNs, uses *dspike* to remove large spikes in conductivity, housing (CTD) temperature and remote (hull) temperature. Linear interpolation is used to fill data gaps. Data from periods of flow >1.5 l/min or <0.4 l/min are also set to NaNs, as are data from 5 minutes after a drop in flow to allow variables to return to normal. Surface ocean data are further cleaned using an interactive editor if necessary (conductivity first), which allows manual removal of remaining bad data from flow changes and spikes. Salinity is then calculated using *ds_salt* and the interactive editor is used to remove spikes and flier points. The output is *oceanlogNNNclean.mat*.
plot_oceanlog_daily Loads *oceanlogNNNclean.mat* and *seatexNNN.mat*, calculates 1 minute averages and plots maps of sea surface temperature, salinity and fluorescence. Bathymetry data from GEBCO are included in the plots. Output files are *oceanlog_navNNN.mat* and *oceanlog_navNNN_1minave.mat*.
plot_oceanlog_all Loads *oceanlog_navNNN_1minave.mat* for all jdays and plots sea surface temperature, salinity and fluorescence for the entire cruise track. Bathymetry data from GEBCO are included in the plots.
underwayAll Loads *oceanlogNNNclean.mat*, *anemomNNN.mat* and *oceanlog_navNNN.mat*, and appends all data to a master file.

Ice and underway water supply

Due to the need to retract the intake hose when in ice, the underway water supply was off for much of the cruise, leading to much absent data. This, together with a faulty salinometer (see CTD section) meant that no underway samples were analysed.

9. Bathymetry

Simon Dreutter

Most of the Antarctic seas where never surveyed by swath bathymetry systems. Therefore, seabed topography data is often unreliable and depth information is insufficient for navigation. During JR17003a, bathymetric mapping was conducted at all times to extend our knowledge on seafloor topography in the research area and to feed this data into global bathymetric databases like the General Bathymetric Chart of the Oceans (GEBCO) and the International Bathymetric Chart of the Southern Ocean (IBCSO). Additionally, the acquired bathymetry combined with archive data from the BAS and the AWI was used for detailed station planning for other research activities during the cruise, as available satellite altimetry data does not give the sufficient resolution and reliability.

The main task of the bathymetry work was to operate the multibeam echosounder (MBES) Kongsberg EM122 on board RRS James Clark Ross (JCR), including calibration and correction of the data for environmental circumstances (sound velocity, systematic errors in bottom detection, etc.), the post processing and cleaning of the data, the data management, as well as on-site map creation.

Technical description

The bathymetric data was collected with the hull-mounted MBES Kongsberg EM122. The EM122 is a full ocean depth swath bathymetry system operating at a nominal frequency of ~12 kHz (ranging from 10.5 to 13 kHz within the four different transmit sectors). On JCR, the EM122 transducer arrays are arranged in a flush Mill's cross configuration of 8 m (transmit unit) by 8 m (receive unit) to achieve an angular beam accuracy of 1° by 1°. The combined motion, position, and time data comes from a Kongsberg Seapath system and the signal goes directly into the Processing Unit (PU) of the MBES to do real-time motion compensation in Pitch, Roll, and Yaw in the range of +/-10°. With a combination of phase and amplitude detection algorithms the PU computes the water depth from the returning backscatter signal.

The system can cover a sector of up to 150° (75° from nadir), resulting in a swath coverage of ~6.5 times the water depth. As outer beams at higher beam angles tend to give lower quality results, the swath angle was usually reduces to 130° - 140° (65° - 70° from nadir), resulting in a reasonable coverage of 5.5 times the water depth. The across track resolution of the system is determined by the maximum number of discrete beams per ping (432 equidistant soundings) and the along track resolution depends on the triggering setup as other hydroacoustic system were used during the cruise.

Data acquisition and processing

Data acquisition was carried out throughout the entire cruise, starting the 22th of February 2018 outside Mare Harbour on the Falkland Islands and ended the 11th of March before reaching Port Stanley.

Where possible, cruise tracks were planned parallel to existing bathymetric data and the surveys were performed to extend already mapped regions. Due to the short time frame for scientific activities and the low manoeuvrability in sea ice, no extensive large scale surveys were conducted during JR17003a. Yet, shorter survey lines in uncharted waters were run frequently in order to find potential sites for the biological sampling program.

For data acquisition, the Kongsberg SIS (Seafloor Information System) software was used. It processes and logs the collected data, applies all corrections and defined filters, and finally displays the resulting depths on a geographical display. The recorded data was stored in 60 min blocks in the Kongsberg *.all format. Subsequent data processing was performed using Caris HIPS and SIPS. The data editing revealed a good data quality of the EM122 with very little rejected beams. Yet, during ice breaking, the quality of the data showed severe deterioration as ice and air bubbles accumulate under the transducers and interfere with the acoustic pulses.

For generating maps, the data were exported to Quantum GIS in the GeoTIFF raster format.

Sound velocity profiles

For best survey results with correct depths, output from the various CTD (Conductivity, Temperature, Depth) casts were used to measure the water sound velocity in the different depths. These profiles were applied in SIS. This is essential, as the acoustic signal travels down the water column from the transducer to the seafloor and back to the surface through several different layers of water masses with each a different sound velocity. The sound velocity is influenced by density and compressibility, both depending on pressure, temperature, and salinity. Wrong or outdated sound velocity profiles lead to refraction errors and reduced data quality.

The CTD measures conductivity, temperature, and depth in the water column while it is lowered to the seafloor. From these parameters, the sound velocity is calculated.

The sound velocity profiles obtained by the CTD were immediately processed and applied within Kongsberg SIS for correct beamforming during the survey. 10 CTD stations were used for sound velocity correction during the expedition (see Fig. 26).

For underway data acquisition during transits, modelled sound velocity profiles were extracted from the World Ocean Atlas (WOA09).

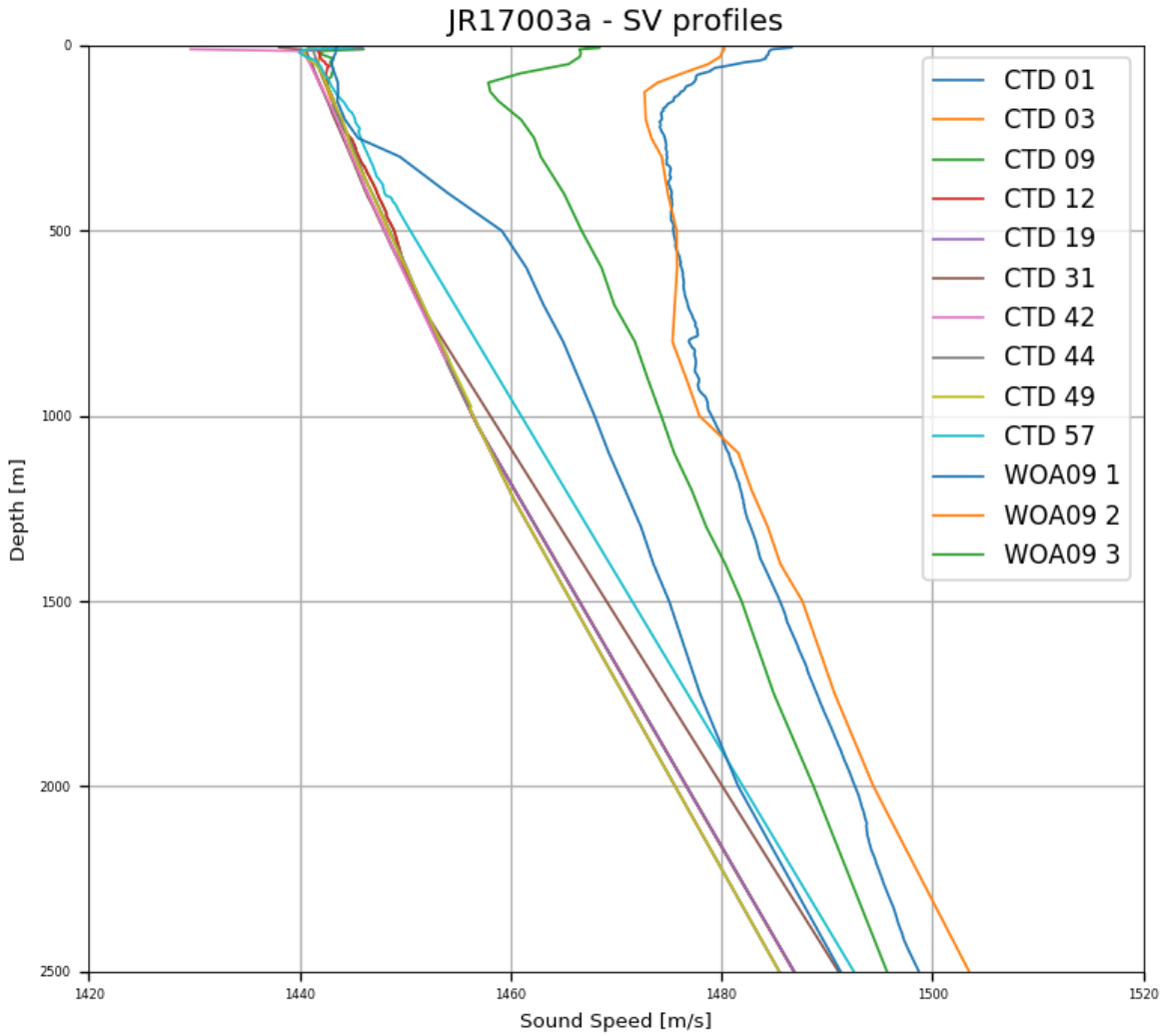


Fig. 26: Sound Velocity Profiles used during JR17003a (all profiles are virtually extended to 12000 m water depth for Kongsberg SIS to accept them)

Calibration

A calibration of the MBES was conducted at the beginning of the cruise to confirm the correctness of the applied installation values in the system. The calibration procedure was conducted at 7 kts ship's speed at a depth of around 2500 to 1500 m. During calibration of the MBES all other acoustic devices were switched off. For calibrating the roll offset, two profiles in opposite direction on even ground had to be surveyed. The pitch offset calibration required two profiles on the same track, but in opposite direction on a slope or clearly defined object. The heading offset calibration needed two profiles parallel to each other but in opposite direction covering an obstacle in between. The values were checked within Caris HIPS. The following calibration angles were determined and set in SIS:

Table 17: Angular offsets within the MBES survey system as determined during the JR17003a patch test

Calibration	Patch Test 2014	SIS Setting	Correction	Final Setting
Roll	+0.2°	+0.2°	-0.03°	+0.17°
Pitch	+0.1°	+0.1°	0°	+0.1°
Yaw	-1.4°	0°	-1°	-1°

Figure 27 gives an overview over the calibration site. Furthermore, a more detailed calibration report was written and copied to the ship's server.

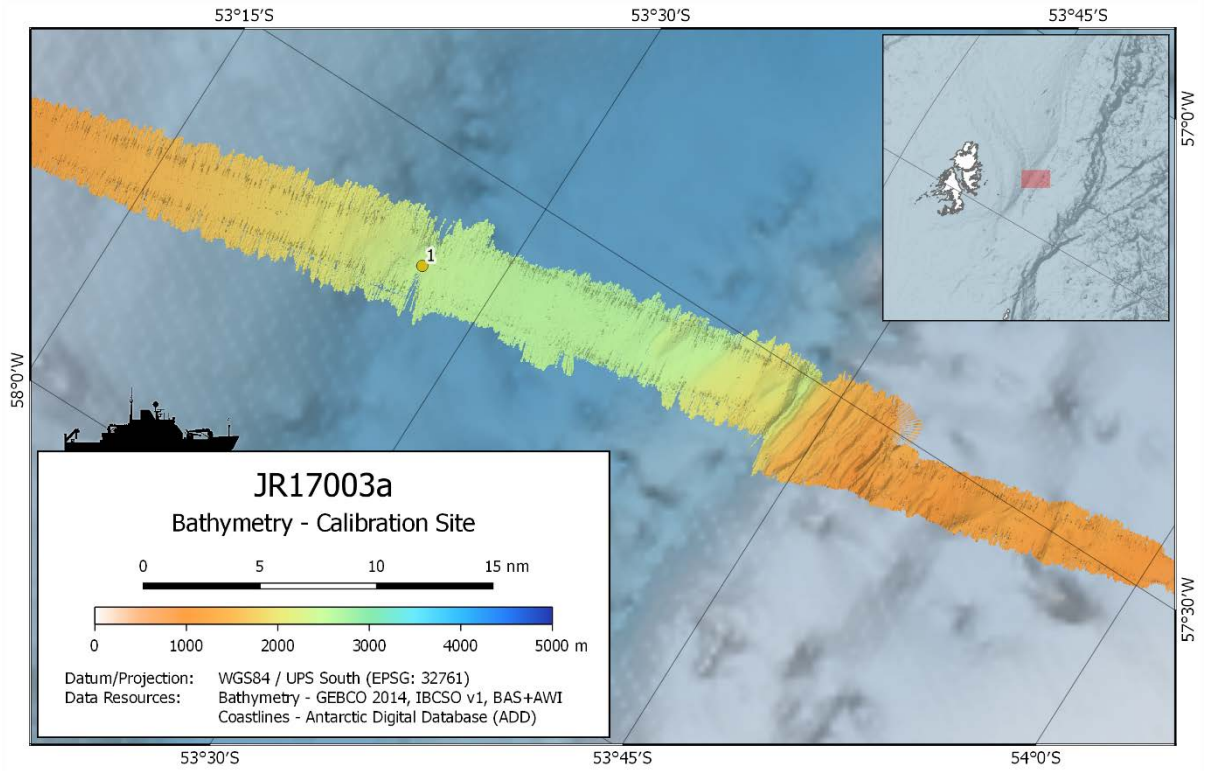


Fig. 27: Map of the EM122 calibration site. Station 1 in the map is the position of the initial CTD cast for sound velocity correction.

Preliminary results

As mentioned, the EM122 was operated during the entire cruise. This resulted in two long transit lines across the Drake Passage that will be added to the global bathymetric dataset. Figure 28 shows an overview of the bathymetry data collected during JR17003a.

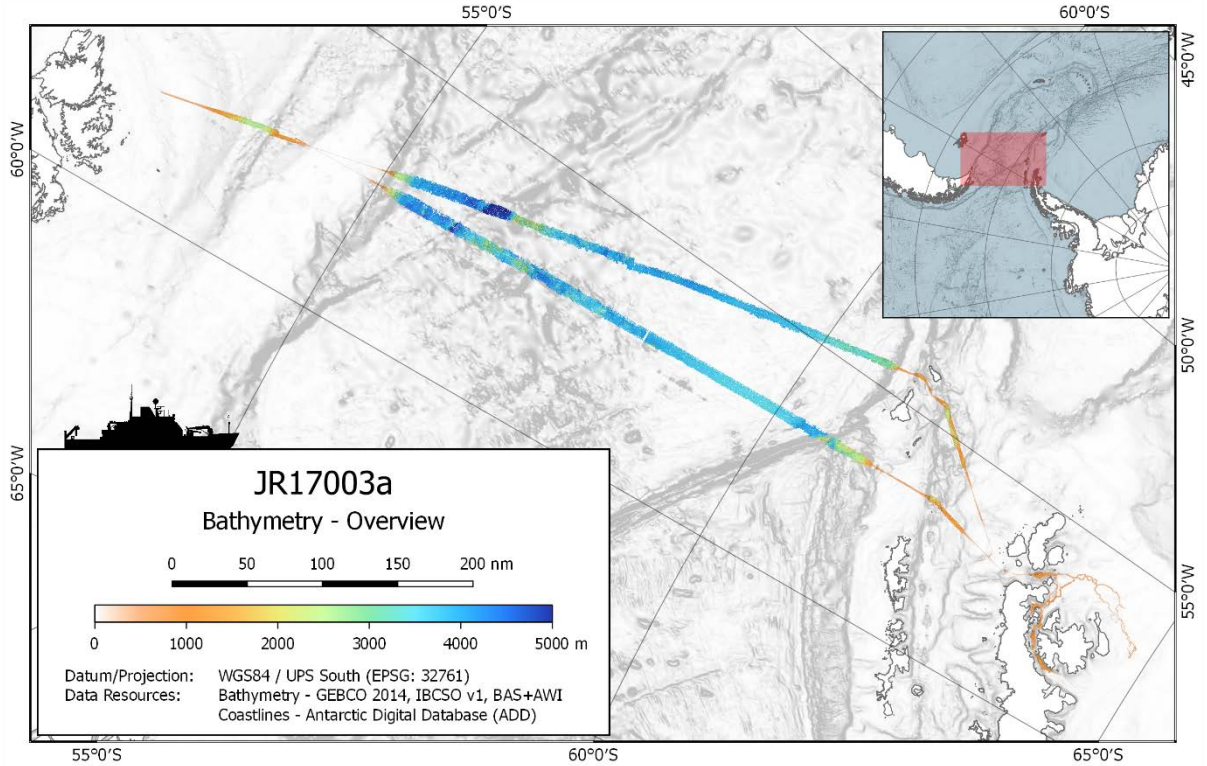


Fig. 28: Map of the collected bathymetry data.

The data collected in the Prince Gustav Channel is shown in Figure 29. Four dedicated survey stations were conducted for sampling station planning and to fill gaps in the existing dataset. In addition, transit tracks were planned so that JCR was sailing on the edge of charted areas to assure save navigation in the rough terrain of the area, but still extend the existing bathymetry with the swath echosounder towards the edges of the channel.

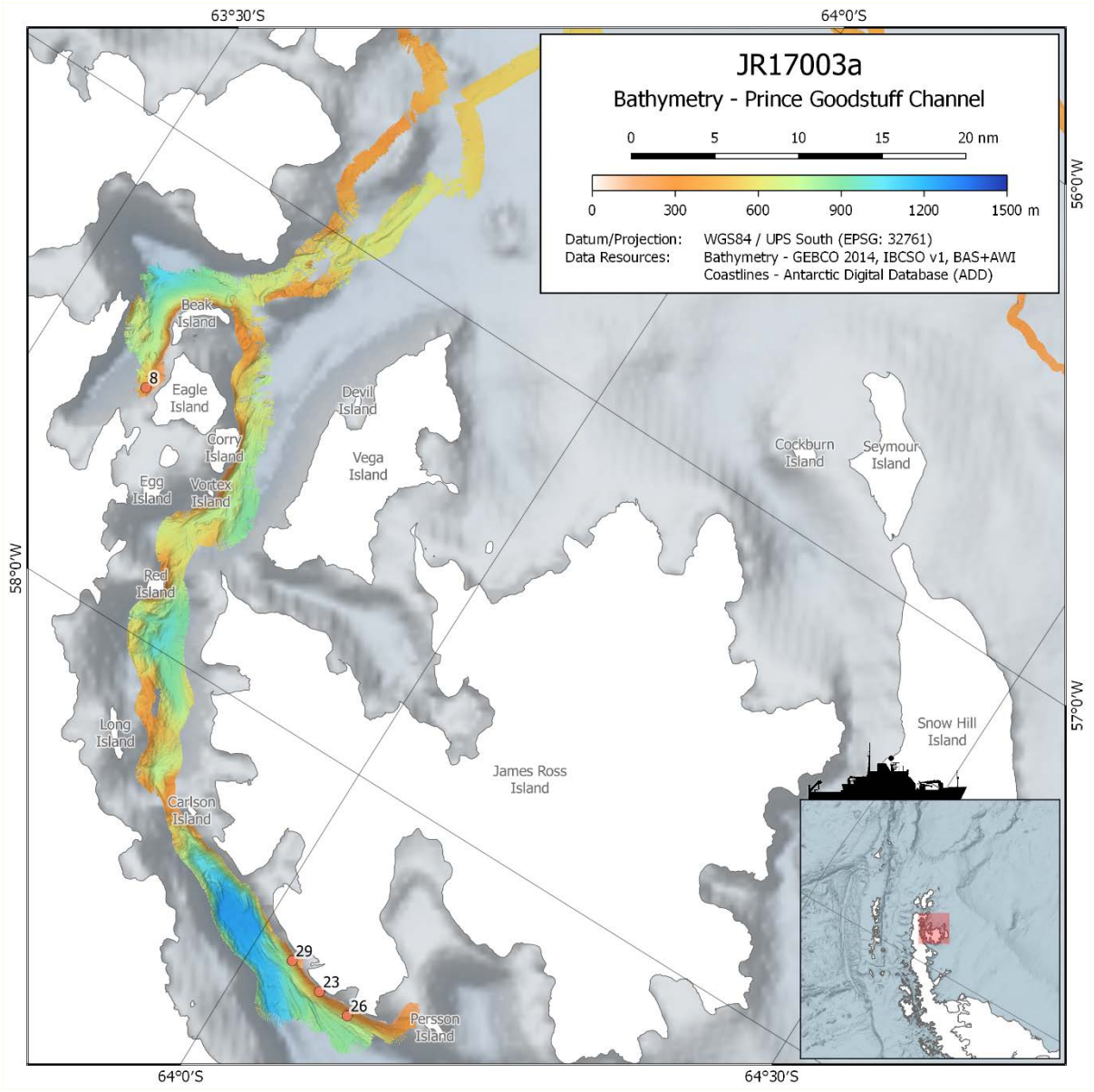


Fig. 29. Map of the collected bathymetry in the main research area. The station markers point to locations were dedicated MBES surveys were conducted to add up to the existing dataset or for specific station planning purposes in uncharted areas of the channel.

Issues and improvements

Some issues in the bathymetry setup on JCR were identified during the cruise. These shall be listed here along with some recommendations for improvements.

First, the EM122 on JCR has no built in C keel probe for measuring the water sound velocity at the transducer. Instead, the closest value from the current SV profile is taken. Especially in melt water conditions rapid changes in SV in the upper water column can occur which deteriorates the beam forming quality of the MBES.

To overcome this lag, a script was written which takes the underway data from the Ocean Logger and feeds it into SIS. In order to use the script, a serial input in SIS was configured on COM4 and a serial loop from COM3 to COM4 was set up. The script will send the serial message to COM3 and SIS will then pick it up on COM4. The sent message fits to the Micro SV&T (C+T) format in SIS and is sent with a Baudrate of 9600.

The script was placed in ‘C:\Users\Operator\Documents’ and is called ‘JCR_c_kell.py’. It can be run from any location on the SIS PC by opening a command line shell, navigate to the scripts location and run it with ‘python JCR_c_kell.py’. All dependencies were installed on the PC.
It shall be noted that the use of this script only makes sense, if the Ocean Logger is switched on and gives reasonable values. There are some routines in the program that will check eg. the flow rate, but the MBES operator should be aware of the concept. In sea ice conditions, the bridge might turn off the Ocean Logger and the script will be sending the last SV value until the Ocean Logger is running again. If the script is started with the Ocean Logger being switched off, it will send the default values, which can be changed at the beginning of the script.
In those cases, it might be useful to change the source for the c keel value from SENSOR back to PROFILE in the SIS Sound Speed tab. However, as long as the Ocean Logger is running fine, it is definitely worth a try using this script to increase the data quality.

The second issues it the automated conversion from the CTD raw data to Kongsberg .asvp files. When a CTD station is performed, the CTD will usually be lowered to 10 m until the sensor readings align and give decent quality. Then the device will be heaved to 0 m and then the actual cast is performed. In one occasion during JR17003a, the CTD had to be lowered to 50 m in order to warm up and the readings of this precast gave very strange results. However, the conversion script will still consider those readings during bin averaging which results in unfortunate jumps in the SV profiles in the upper water column.
One way to avoid this is by restarting logging and overwriting the initial CTD raw file once the warm up phase is done. Other than that, it might be better to do the conversion manually to set the number of readings to be ignored in the beginning of the file.
Another improvement would be a smaller bin average. Currently a 5 m bin average is used for the conversion. This is sometimes necessary, as SIS only allows a maximum of 1000 values in the SVP. Yet, the 5 m bin average might occasionally not resolve the local changes in the upper water column and therefore the EM122 might give decreased quality in the raytracing of the individual beams.

All in all the EM122 performed very well during JR17003a. The SIS PC needed a restart once due to some network problems. Other than that, the system ran without any breakdowns or major bottom detection mistakes. An exception were the periods of active ice breaking and ship turns after station work. But these issues were to be expected as bubbles and ice under the transducer usually cause false sounding results.

10. Marine Mammals and birds

Phil Trathan, Hugh Venables, Susie Grant

Introduction

As a complement to the other scientific work being carried out during JR17003a, visual observations of higher-predators were undertaken from the ship. To be compatible with ship-based active acoustic data collection during daylight, there was an emphasis on recording feeding diving predators. Having said that, all flying birds were also recorded.

Aims

The main aim of this study was to record air-breathing predators to obtain an overview of possible foraging areas, relative abundance and predator aggregations across the main transit and survey station areas. Assemblages of predators will be analysed for spatial cross correlation with acoustically-detected prey aggregations from ship-based transducers. A further objective for these observations was to record pack-ice seal haulout sites as these may be of relevance to future seal-tagging programmes of work.

Methods

Transect observations

Standard seabirds at sea methodology was used to carry out observations of flying birds, penguins and marine mammals (hereafter known collectively as predators unless there is the need to distinguish otherwise). All transect observations were made from outside on one or other of the bridge wings; the choice of either the port or starboard wing was dependent upon weather and glare. Scanning for predators was done with the naked eye in the forward quadrant (Figure 30). Each individual or group of predators was identified, counted and recorded in one of two distance bands (1: 0 – 300 m; 2 > 300 < 2000 m) that ran parallel to the ship track and were measured from the side of the ship (Figure 30). Cetaceans in particular, but occasionally groups of penguins and pinnipeds as well, were recorded when spotted on the other side as well, but were noted as being outside of the observed transect and this area was not actively scanned and priority was given to recording predators within the survey area. The local time (UTC-3; ship time) of each observation was recorded to the nearest minute, when the predator was first observed; electronic records were subsequently reported in UTC. A calibrated measuring stick was used to estimate distance from the side of the ship, based upon observer eye level and the length of the observer's arm.

All predators were sighted by eye and where necessary, identified using high quality binoculars. Identification was made to species level or where there was doubt, to genus or a lower taxonomic level. Floating material such as animal remains, were also recorded. Whenever it was considered that light was poor, for example at dawn or dusk, observations ceased. Animal activity was recorded as shown in Table 18.

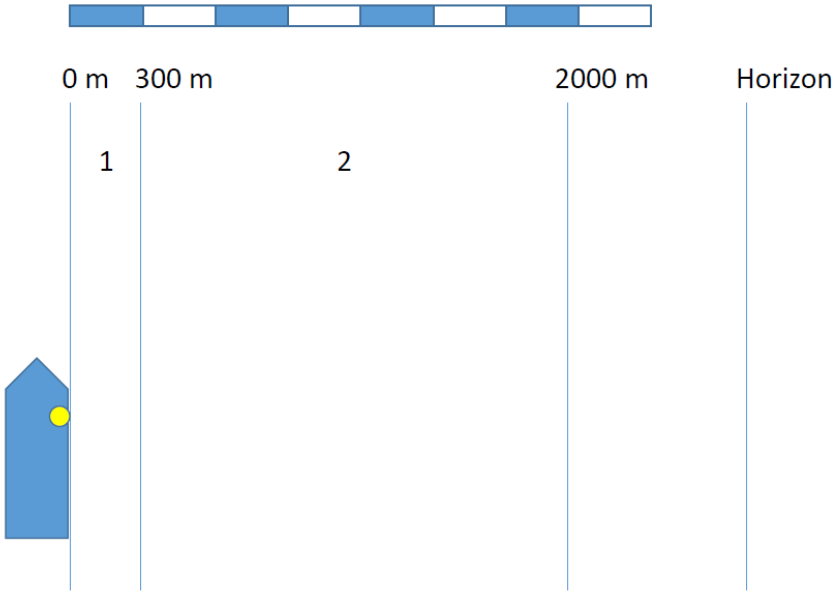


Figure 30: Distance bands as measured from the side of the ship for all predator observations

Whilst en passage between the Falkland Islands and the tip of the Peninsula, observations were made by Phil Trathan and Hugh Venables, with occasional assistance from Susie Grant. Generally the task was divided between observing and recording, with rotation every 20 minutes. Once in ice, and given the low frequency of predators, observation and recording was usually undertaken by a single person. This made best use of available observing capacity, but ensured individuals did not become too cold as rotation generally occurred every 15-20 minutes. Whilst in ice, low mist often reduced visibility to less than 200 m and observations were not carried out.

Table 18. Behaviour codes used during JR17003a

Type of predator	**Description**
Flying birds	Flying
	Sitting on water
Penguins	Resting / preening on surface
	Actively swimming
	On ice
Pinnipeds	Resting on surface
	Actively swimming
	On ice
Cetaceans	Actively feeding
	Actively swimming

Basic weather conditions (cloud cover, sun glare, sea ice, precipitation and visibility) were estimated visually by the observer at the start of each observation period. If these changed

drastically during the observation period, this was noted. The time of each observation period will allow the meteorological observation data recorded by the bridge Officers to be assimilated with the data set. Wind speed and direction, and vessel speed recorded by the ship's underway system (data feeds from anemometer-wind-speed, anemometer-wind-dir and emlog-vhw-velocity-f/a respectively) can be matched with the data set.

Ship-following animals (notably some species of flying birds) were recorded, although care was taken to avoid double-counting when possible. Ship observations were not undertaken when the ship was stationary, although there were periods when the ship was moving at a slower speed due to reduced visibility.

Station observations

Occasional observations were undertaken at all benthic sampling stations. At some stations benthic sampling began before dawn or was completed after dusk, in which case predator observations were not undertaken. For each observation, the species and number of individuals were recorded. Activity was recorded as above (Table 18).

Summary of observations

Species list

The species observed during JR17003a are shown in Table 19.

Table 19. Species observed during JR17003a

Flying seabirds	Penguins	Seals	Cetaceans
Antarctic Shag	Adélie Penguin	Antarctic Fur Seal	Killer Whale
Antarctic Tern	Chinstrap penguin	Crabeater Seal	Fin Whale
Prion sp	Emperor Penguin	Weddell Seal	Humpback Whale
Brown skua sp	Magallenic Penguin	Leopard Seal	Minke Whale
South Polar Skua			
Dominican Gull			
Cape Petrel			
Diving Petrel sp			
Northern Giant Petrel			
Southern Giant Petrel			
Giant Petrel sp			
Grey Petrel			
Snow Petrel			
Soft-plumaged Petrel			
White-chinned Petrel			
Black-bellied Storm Petrel			
Grey-backed Storm Petrel			
Wilson's Storm Petrel			
Great Shearwater			
Sooty Shearwater			
Southern Fulmar			
Black-browed Albatross			
Grey-headed Albatross			
Light-mantled Sooty Albatross			
Southern Royal Albatross			
Wandering Albatross			

Observation metadata

A summary of each observation period was recorded with start and end date and time, the name of each transect, or station, brief weather observations and the names of the observers. Each observation period was assigned a unique observation id which was a sequential number starting at 1. Each individual sighting record can be linked to the metadata record through the time field.

Observation data

The data set has been checked to ensure records are complete, species names are consistent and all columns contain valid values. The comments field contains a variety of information about the individual observations.

Records that were noted when official observing was not taking place (during breaks or whilst not on transect or station) can be identified by having “y” in the out_of_transect field. All

records that were on the opposite side of the ship to the observers were noted as being outside of the transect by having “y” in the out_of_transect field.

Table 20. Observation periods on transects

Date	Start_time_UTC	End_time_UTC	Duration	Transect	Transect_name
23/02/2018	13:54:00	14:54:00	01:00:00	T001	North-South transect
23/02/2018	15:35:00	16:55:00	01:20:00	T002	North-South transect
23/02/2018	16:55:00	17:55:00	01:00:00	T003	North-South transect
23/02/2018	17:55:00	18:35:00	00:40:00	T004	North-South transect
23/02/2018	18:35:00	19:55:00	01:20:00	T005	North-South transect
24/02/2018	09:00:00	09:30:00	00:30:00	T006	North-South transect
24/02/2018	09:30:00	10:30:00	01:00:00	T007	North-South transect
24/02/2018	11:00:00	12:20:00	01:20:00	T008	North-South transect
24/02/2018	12:20:00	13:20:00	01:00:00	T009	North-South transect
24/02/2018	15:30:00	21:20:00	06:00:00	T010	North-South transect
25/02/2018	09:00:00	10:00:00	01:00:00	T011	North-South transect
25/02/2018	11:00:00	12:00:00	01:00:00	T012	North-South transect
25/02/2018	12:30:00	13:30:00	01:00:00	T013	North-South transect
25/02/2018	13:50:00	14:55:00	01:05:00	T014	North-South transect
25/02/2018	15:35:00	17:50:00	02:15:00	T015	North-South transect
25/02/2018	19:50:00	20:50:00	01:00:00	T016	North-South transect
26/02/2018	08:50:00	10:30:00	01:40:00	T017	North-South transect
26/02/2018	11:00:00	12:00:00	01:00:00	T018	North-South transect
26/02/2018	12:20:00	13:20:00	01:00:00	T019	North-South transect
26/02/2018	13:20:00	13:40:00	00:20:00	T020	North-South transect
26/02/2018	13:40:00	15:00:00	01:20:00	T021	North-South transect
26/02/2018	15:45:00	20:30:00	03:30:00	T022	North-South transect
27/02/2018	09:00:00	10:30:00	01:30:00	T023	North-South transect
27/02/2018	11:00:00	12:30:00	01:30:00	T024	North-South transect
27/02/2018	15:30:00	17:00:00	01:30:00	T025	North-South transect
28/02/2018	09:00:00	19:00:00	10:00:00	T026	North-South transect
28/02/2018	19:15:00	20:50:00	01:40:00	T027	South-North transect

Table 21. Observation periods on stations

Date	Start_time_UTC	End_time_UTC	Duration	Station	Station_name
01/03/2018	11:30:00	12:15:00	00:45:00	S001	South-North transect
02/03/2018	09:00:00	10:00:00	01:00:00	S002	Duse Bay
03/03/2018	09:45:00	10:30:00	00:45:00	S003	Prince Gustav Channel
03/03/2018	15:30:00	16:00:00	00:30:00	S004	Prince Gustav Channel
04/03/2018	09:15:00	09:45:00	00:30:00	S005	Prince Gustav Channel
04/03/2018	20:15:00	20:45:00	00:30:00	S006	Prince Gustav Channel
05/03/2018	09:15:00	09:45:00	00:30:00	S007	Prince Gustav Channel
06/03/2018	09:40:00	10:10:00	00:30:00	S008	Prince Gustav Channel
06/03/2018	16:00:00	16:30:00	00:30:00	S009	Prince Gustav Channel
07/03/2018	17:00:00	17:30:00	00:30:00	S010	Duse Bay
07/03/2018	17:30:00	18:00:00	00:30:00	S011	Duse Bay

Preliminary summary of results

Just over 25.5 hours of observing were made on transect and 6.5 hours of observations were carried out whilst on station. Whilst on transect long periods of poor visibility precluded observations. From all observations, 4 species of cetacean, 4 species of seal and 4 species of penguin were observed, while 25 species of flying seabird were recorded.

11. BBC NHU

Elizabeth White, Dan Beecham

Aims of BBC filming

The BBC Studios Natural History Unit were appointed as Media Partners for the Larsen C expedition with the aim of covering activities for a number of BBC productions, including the following:

- Earth from Space (working title) due for broadcast on BBC One in autumn 2018 / Spring 2019. This 4-part series connects the epic and spectacular world we see from above, with real 'on the ground' stories. The focus of interest was the break-up of the Larsen C iceberg A68 and the challenge of reaching such a remote and challenging destination.
- Frozen Planet 2 (working title) is currently being commissioned as a follow up from Blue Planet 2. This series focuses on all the 'cold' regions of the planet, their fragility and how they are changing. The aim for this filming was to begin to document the story of life beneath the A68 iceberg (both in terms of wildlife and scientific endeavour) with a view to returning in subsequent years as the sea bed changes.
- News / outreach – as media partners for the expedition, the BBC agreed to supply shots of the ship in ice (including drone) as well as interview material that could be broadcast on news platforms during / after the cruise.

Personnel & equipment involved

Elizabeth White is a former research biologist (she was a scientists on JR100 in 2004!) who has worked for the BBC Natural History Unit for 14 years as a Director / Producer for wildlife films.

Dan Beecham was a former cameraman / diver for Save Our Seas Foundation before joining the BBC Natural History Unit as Bursary cameraman on the series Blue Planet 2.

They brought with them an array of filming equipment with which to document the expedition including: RED Dragon camera for synch / documentary filming, DJI Phantom 4 and DJI Inspire 2 drones for filming the aerial perspective, and small cameras like the DJI Osmo and GoPro systems for covering timelapse and small gimbal moves.

BBC Media partners: Director Elizabeth White and Cameraman Dan Beecham pose with the Red Dragon camera and the DJI Inspire 2 drone.

Filming achieved
The team were able to cover various aspects of the expedition, in terms of science, interviews with key personnel and logistic operations as detailed below. We also filmed, edited and submitted back to the UK a short interview with PI Katrin Linse. Although the mission to Larsen C was aborted, we hope that this footage will still be useful in both the Earth from Space and Frozen Planet productions.

Interviews & synch work
Interviews were carried out with Katrin Linse at various points in the expedition, documenting the challenges of working in Antarctica, the mission undertaken and the difficult decision to turn back. Further interviews were also carried out with Chief Office Chris Hipsy focusing on the challenges of navigating a ship through ice and the role of the ships crew in facilitating science in Antarctic regions. Actuality filming on the bridge also stretched to 'handovers' between the Captain and Chris.

Actuality of science
Documentary filming was carried out of a range of science activities including deployment of the CTD, SUCS camera and Agassiz trawl, processing of samples and watching the SUCs feed.

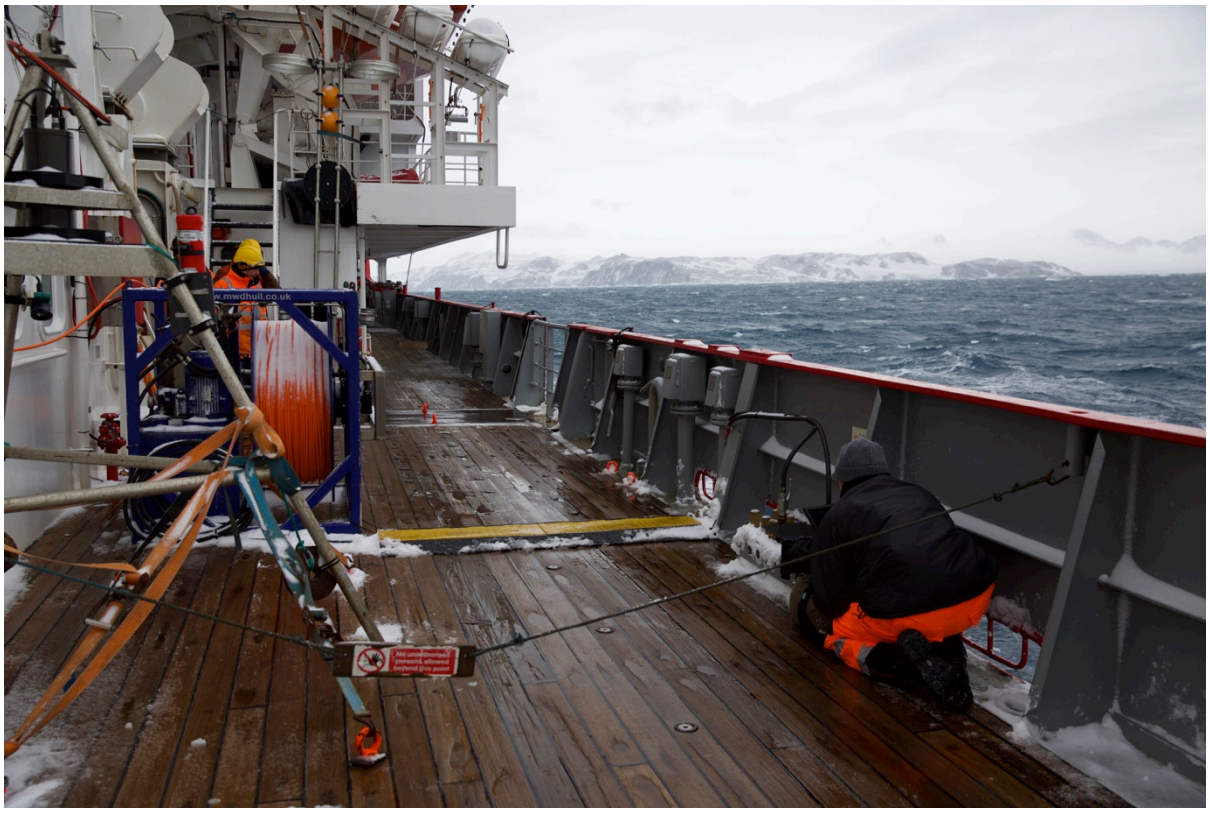
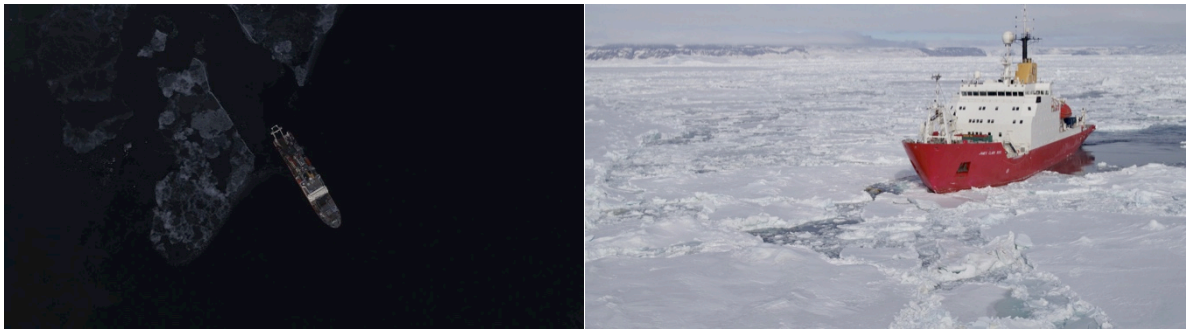


Photo: cameraman Dan Beecham filming deployment activities on the starboard deck in cold and snowy conditions!

Drone imagery of ship in ice
A key aim of our filming activities was to film the ship transiting through the ice and add a

sense of scale to the landscape. Wind conditions were not suitable every day (the drone can only fly in winds of less than 10 knots) however 24 successful deployments of the drone were made. This allowed us to capture imagery in a range of different light conditions, and sea states from light brash ice to very heavy pack.

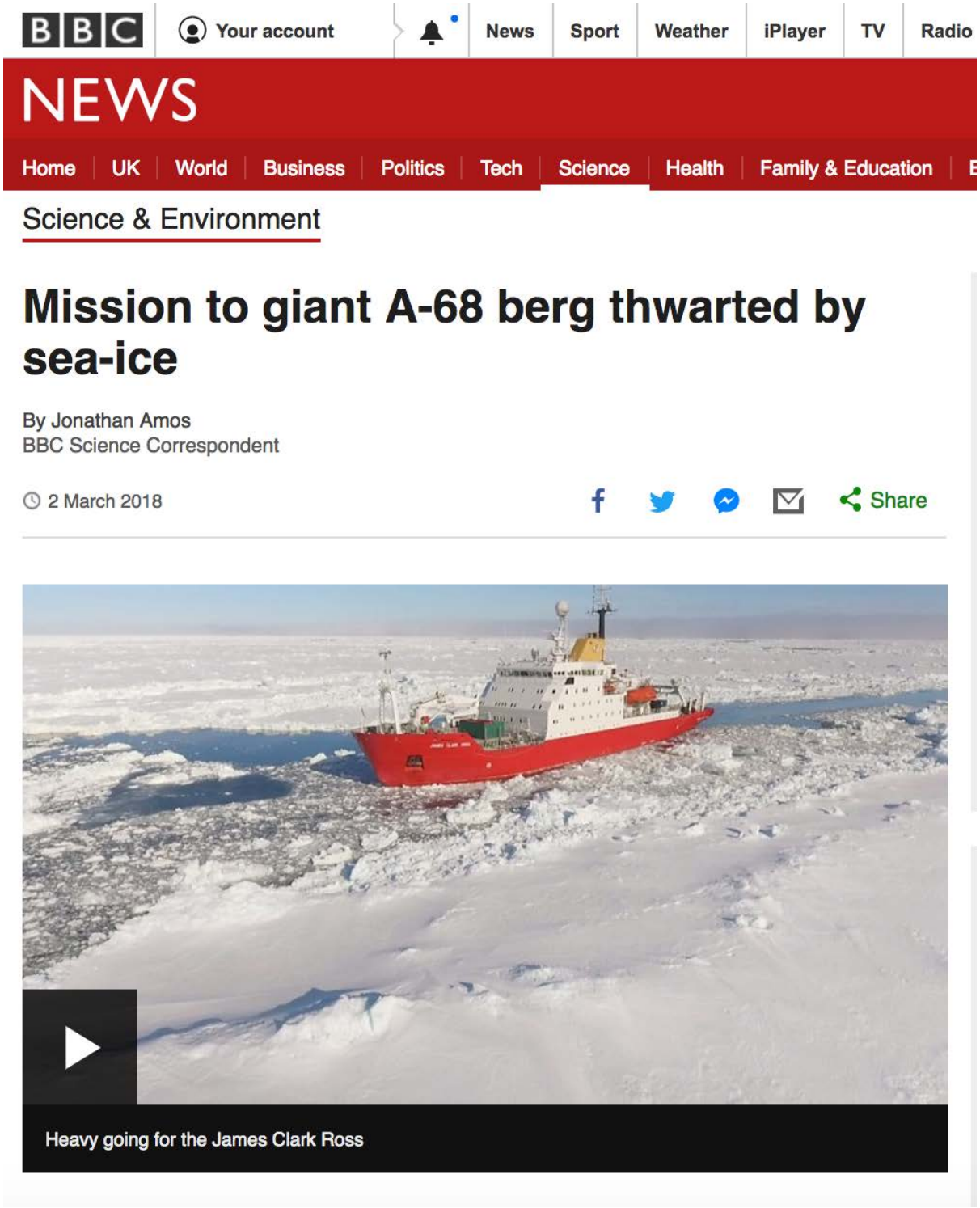
A key shot required was a very high 'zoom' down to reveal the ship that could be linked with satellite photographs, and so regular lat/long positions were sent back to the office in the hope of finding a suitable weather window and location to do this. As yet, we have not heard whether any of these satellite images successfully captured the ship, however we did achieve some iconic imagery by flying the drone at its maximum height of 500m.



Left: still image of the ship trawling in light sea ice in the Prince Gustav Channel taken by the DJI Inspire 2 drone. Right: low angle drone shot as JCR works through sea ice.

10.3.4 News package

On the morning of 1st March we shot and edited an interview with Katrin Linse and provided a short news package for the BAS to put out as part of their Press Release regarding the abandonment of reaching Larsen C. This was picked up by various news organisations, including the BBC's Jonathan Amos who wrote a piece for the Science and Environment section, including the video footage.



BBC news article featuring a short clip of the ship in sea ice and Katrin Linse interview.

Acknowledgements
We would like to thank PI Katrin Linse, Master Tim Paige, Chief Officer Chris Hipsy and all the scientists and crew involved in the expedition to Larsen C. Everyone has been so helpful and accommodating and it has been a real pleasure to document your work.

12. Outreach report

Susie Grant, Rowan Whittle, Huw Griffiths, Layla Batchellier*, Athena Dinar**

**not on board*

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.

There was significant media interest in the cruise before departure and during the cruise, particularly when the decision was made to turn back from the Larsen C Ice Shelf. The BAS Press Office issued two press releases (12th Feb and 2nd March), which resulted in over 850 individual media items.

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. Tweets using the #LarsenCBenthos hashtag were re-tweeted widely.

Activities also included posts on the BAS Facebook page and blog posts on the BAS website. In addition an 'NHM Live' link to the Natural History Museum from the JCR occurred on 9th March to a large public audience. Media activities also resulted from the BBC Natural History Unit being on board the ship, including posts on the BBC news website.

The team produced three 'Ship Blogs' which appeared on the BAS website, and were widely publicised on Twitter. These provided information on the science project as well as personal points of view, for example on the experience of BAS staff going to sea for the first time, a perspective from an Australian collaborator and from the BAS marine engineering team.

Communications plan to highlight the Larsen-C Benthos project

Science lead from BAS: Dr Katrin Linse

January 2018

Summary

This communications plan is designed to highlight the Larsen-C Benthos project during the 2017/18 season. The project aims to document the biodiversity in the benthic community under the previous site of A68. This will create a baseline for understanding what lives beneath ice shelves in Antarctica and how the marine life responds to dramatic environmental change, such as a major calving event. It will also enable scientists to study how biodiversity changes over time in the region to assess whether there are unique ecosystems, which may become extinct with future climate change as the ice shelves retreat.

Dr Katrin Linse and a research team from nine institutes will depart on the RRS James Clark Ross (21 Feb-13 March). The expedition is supported by a NERC Urgency Grant. The team will spend three weeks documenting the biodiversity in the surface, water column and seafloor using trawls, bongo nets and towed camera systems. In addition, they will survey the seafloor using swath bathymetry to map its topography.

A crew from BBC NHU (Elizabeth White – Director and Dan Beecham – Camera operator) will be aboard filming for two major series – working titles Earth from Space (2019) and a possible sequel to Frozen Planet (2021).

Key messages

- BAS is leading an important expedition to investigate the hidden ecosystem under Antarctic ice shelves, so quickly after a calving event. This is the first look at what lives on the seafloor beneath ice shelves in Antarctica.
- The team hopes to generate a baseline assessment before the newly exposed marine environment changes and new species begin to colonise the area

- Understanding what lives beneath Antarctic ice shelves and how this changes over time is essential to discover how this marine ecosystem will respond to environmental change in a climate-sensitive region
- The area is protected by CCAMLR for 10 years, prohibiting commercial fishing. This area is the first to benefit from an international agreement in 2016 by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), to designate Special Areas for Scientific Study in newly-exposed marine areas following the collapse or retreat of ice shelves across the Antarctic Peninsula region. The agreement came following a European Union proposal to CCAMLR, led by BAS scientists Dr Susie Grant and Dr Phil Trathan

Date	**Activity**	**Who/Status**
October	Draft a press release announcing the cruise and the research aims	Done
January	Create Comms plan for promoting the Larsen-C project	Done
January	Create a digital comms plan to highlight cruise and project	**Layla** – to action in January and share with other research institutes in Feb
January	Contact BAS staff going on cruise to discuss digital media plan and assets we could gather	**Layla**
12 February	Issue Press Release announcing the cruise departure and the research aims. "This week…" Make short film for digital channel + media	**Athena/Layla**
February	Email all comms people at the institutes with researchers involved in the cruise – share the comms plan and Press Release	**Athena**
During the cruise:		
	Blogs: written by the research team for BAS websites. To be promoted on social media. 1) Meet the Scientific Team 2) Journey to Larsen C 3) Scientific content – about the trawls and other science on board	Rowan/Susie to send content to Layla/Huw
	Video: to share on social media: -60 second science -Go pro time-lapse of lab work and of the trawl on the deck -Short clips with researchers explaining what they are doing eg. what they are looking at through the microscope, what they are finding as they are sorting through the trawl, core work etc	**Susie** to send during the cruise – content for say 3-5 posts a week

	For social media: images of 'science in action' for all partners' social media channels. Examples: - Sorting through the trawl samples in the labs - microscope work - studying sea ice maps - deploying the multi-corer - studying core samples - deploying the trawl net	**Susie** to send photos with brief explanation to **Layla** and **Huw**
	For social media: images telling the story of the cruise for all partners' social media channels. Examples: - Any wildlife spotted from the ship - Weather on the ship - Ship instrument dashboard indicating conditions	**Susie** to send photos with brief explanation to **Layla** and **Huw** JCR webcam stills to show the progress of the ship?
	News footage: 'Interviews, drone etc.' collected by BBC for BAS comms team to give to News outlets	**Susie** as point of contact. **Phil** to manage crew on board
9 March	Live link up with Darwin Centre at Natural History Museum, London at 3pm. **Huw Griffiths** will be at NHM on the day	**Rowan** – Testing the line
12 March	Live link up with schools for British Science Week	**Athena/Layla** and **Susie** Cut off for feasibility 1st March – potential to arrange for 12th @ 9:30-12:30
	Blog answering pre-submitted Science Week questions	**Layla** to send questions to **Susie**

Cruise Participants are as follows:

Name	**Institute**
Katrin Linse	BAS
Phil Trathan	BAS
Rowan Whittle	BAS
Sophie Fielding	BAS
Will Reid	UoNewcastle
Adrian Glover	NHM
Anni Makela	UoAberdeen
Luisa Federwisch	AWI
Kirsten MacSween	UoAberdeen
Angelika Brant	Sekenberg
Simon Dreutter	AWI

Ann Vanreusel	UoGhent
Melanie Mackenzie	Museum Victoria
Thomas Dahlgren	UoGothenburg
Hugh Veneables	BAS
Susie Grant	BAS
James Smith	BAS
Scott Polfrey	BAS
Bjoerg Apeland	BAS
Carwyn Davies	BAS
Jeremy Robst	BAS
ETS Will Clark	BAS
Aisling Smith	BAS
Sean Quirk	BAS
Elizabeth White	BBC NHU
Dan Beecham	BBC NHU

Twitter
@BAS_News
#LarsenCBenthos → ***include in all tweets***
#LarsenC
#A68
#Antarctica
#marinebiology

Facebook profiles
Museums Victoria
Newcastle University
University of Aberdeen
University of Southampton
Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research
Senckenberg
University of Gothenburg

Collaborators Twitter handles:
@dr_will_reid
@adrg1
@melkmack
@susie_hailey
} On the cruise
@mucofloris
@griffiths_huw
@museumsvictoria
@NHM_London
@UniofNewcastle
@aberdeenuni
@unisouthampton
@AWI_Media
@Senckenberg
@ResearchUGent
@uniofgothenburg

Website: https://www.bas.ac.uk/project/larsen-c-benthos/

Examples of social media posts, posts will be generated/adapted when blog material is available:

Facebook	**Twitter**	**Timing**
Taking advantage of the opportunity presented by the huge calving event, the Larsen C Benthos project is looking at what lies on the newly exposed seafloor. Follow us for updates on the upcoming expedition.	Now giant #A68 berg has calved #LarsenCBenthos project goes this month to see what animals live under an ice shelf. Follow us for updates on the upcoming expedition.	Just before cruise departs
The Larsen C Benthos team are ready to embark on their cruise aboard the RRS James Clark Ross to get the first look at what was living beneath the Larsen C iceberg (A68)	The #LarsenCBenthos team embark on their cruise on the RRS James Clark Ross to get the first look at life beneath the #LarsenC iceberg #A68 #Antarctica	Photo with the crew on the/by the JCR when they are about to depart
The Larsen C Benthos project is studying the marine life exposed by the calving of A68. This will provide a baseline for investigations into how ecosystems may respond to environmental change.	Studying the marine life exposed by the calving of #A68 will provide a baseline for investigations into how ecosystems may respond to environmental change #LarsenCBenthos #Antarctica	
Chance to hear BAS Scientist Rowan Whittle speak about her recent expedition on the Larsen C during a "Nature Live Talk" on 9th March at the Darwin Centre, Natural History Museum	Hear BAS Scientist Rowan Whittle speak about her recent expedition #LarsenCBenthos during a "Nature Live Talk" on 9th March at the Darwin Centre	

Written by **Layla Batchellier** & **Athena Dinar** in the British Antarctic Survey Press Office. Contact details as follows: Athena Dinar amdi@bas.ac.uk ; Layla Batchellier laytch@bas.ac.uk

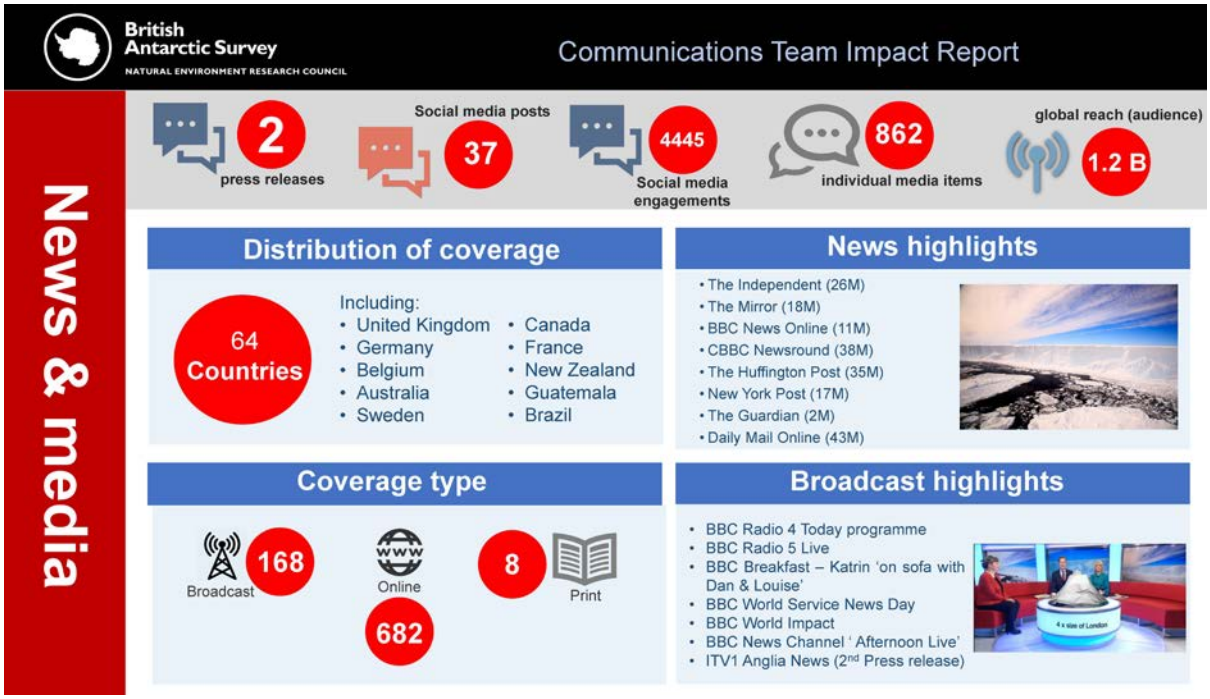


Fig. 31. Impact report of Larsen-C outreach by 5th March

13. Antarctic Marine Engineering Report

Scott Polfrey, Will Clark, Bjoerg Apeland, Carwyn Davies, Sean Quirk

AME Mech Report

The majority of deployments on this cruise were seabed deployments, for imaging, coring or benthic sample collection. This required heavy use of the coring warp, with significant downtime occurring from 02/03 to 03/03 due to a mechanical defect of the 30T winch system. Furthermore, serious damage was noted to the first ~300m of cable, although this was identified following the last deployment and thus did not reduce science time.

Agassiz Trawl (AGT) – 6 deployments

The AGT was deployed successfully several times. On two deployments, however, the cod end of the net became entangled with the towing bridle. On both of these deployments, a sample was still collected, however weighting of the cod end may reduce the chances of this occurring in future.

Epibenthic Sledge (EBS) – 7 deployments

The EBS was deployed with the additional Deep Water Camera System (DWCS) affixed. During build, there was significant difficulty in obtaining a satisfactory cable routing – in particular proper mechanical protection to the cables given the potentially destructive nature of trawled deployments. To resolve this, a steel reinforced hose was used as ducting from the camera position to the battery housing to protect the cables.

An additional problem was the lack of proper support for cable ends where attached to the camera and lights. New mountings would be required to fully resolve this issue. It was noted that the cable terminations were in very poor condition, most probably due to improper attention to detail during cleaning. One of the lasers, used for scaling, was found to be defective despite successful bench testing.

Aditionally, attachment of the nets was a very time consuming process and not one well suited to poor weather at sea. Whilst being acceptable for pre-deployment build, had a net required changing between deployments it could have proved challenging.

On one deployment on 04/03, vessel speed during deployment was insufficient to avoid several turns of cable accumulating on top of the sledge, having reached the sea bed. One of these turns became caught on a lifting lug atop the sledge, leading to it being towed sideways. A sample was still collected. In discussion with the bridge, deployment speed was increased from the time of the sledge coming to rest on the sea bed to avoid a recurrence of this problem. Working in ice made it especially difficult to manage this at times, however.

Shallow Underwater Camera System (SUCS) – 15 deployments, 2 failures

The SUCS system was a mainstay of the cruise, proving to be dependable and able to be deployed when mechanical failures prevented use of the coring warp.
A modification was, however, required before the first station, as the bearings in the winch drive motor exhibited signs of extreme wear. Therefore the decision was taken to run the winch from a ship hydraulic circuit. This did cause some synchronisation issues with the levelwind system, however provided a great improvement in working conditions due to reduced noise.

Issues noted during deployment included icing of the lens – not unexpected with deployment temperatures dropping below -15 degrees at times. Cold weather also affected the performance of the monitor, which required re-warming for an early morning deployment. Overnight storage in the warmed bottle annex, and addition of a heater atop the winch resolved this issue. An unknown software issue on the 06/03 necessitated an early recovery of the system during the third transect, although the issue was subsequently resolved by a full reboot of both PC and deck box. At this stage the deck box had been powered on for several days which may have been a contributory factor.

Oktopus Multicorer (MUC) – 12 deployments, 3 failures

The MUC was deployed at several sites, generally functioning acceptably, although the extreme cold at deployment time caused issues with freezing latches and drain holes. The known problem of the damping cylinder seizing occurred more than once, although removing the bottom bolt and defrosting the cylinder with hot water cleared the blockage.

Two failed deployments were deemed to be because of a rocky sea bed – on once occasion the whole frame showed evidence of having been inverted on the sea bed. This was assessed to be because of an uneven landing site. The other failure returned to the surface with chipped and fractured tube ends, again indicative of a rocky site.

Bongo net – 3 deployments

The bongo was deployed when atmospherics allowed – wind speed was consistently high. Concerns over the nets freezing and becoming brittle led to the nets being rolled and lashed to the top rings after each deployment. Some downtime was experienced due to a winch defect 06/03, preventing a deployment.

AME Maintenance Notes

EBS Maintenance:

- New cables for DWCS
- o Connections corroded and bent.
- New O-ring for DWCS Housing
- One of the LASER’s are not working
- 3D Print CTD Brackets for better fit
- Maybe develop an easier way to fit and connect the nets. Too many bolts to do.

SUCS:

- Winch down due to broken bearing. Bearing must be changed.

GENRAL:

Should take photos for future reference, manuals, and Maximo

14. Laboratory Report

Aisling Smith

The Chief Officer, Christopher Hipsey, handed over the JCR Laboratory spaces to the P.S.O. on the 22nd of February 2018. All spaces were in order with small queries and requests being dealt with before final sign off on the following day. It was noted that the seal on the Prep Lab spill kit was missing, the kit was removed, checked and returned with a valid seal in good time.

Risk assessment and COSHH packs were prepared for each Lab and made available to all users. A master copy of all paperwork for planned lab work was stored in the main Lab near the door. Signage for each lab was prepared to display the chemical hazard types present in each room and on the front of each Chemical Hazard Cabinet. Orientation training was provided where needed and the Lab manager was satisfied that all users were competent in the methods being undertaken.

Fume hoods in the Labs was checked over with the Deck Engineer, associated flow rate readings were up to date. The location of the Prep Lab fume hood was less favourable than the Main Lab fume hood due to its very close proximity to the door. Signage for the lab was generally observed to be out of date or faded and it is suggested that it be renewed.

The Laboratory manager met with the Doctor on board and discussed emergency plans for spills and provided a copy of all SDS sheets and discussed possible injuries pertaining to the work planned. The Doctor made the decision to request a pre-cruise briefing on the chemicals list of subsequent cruises. A walk around of the lab was conducted and the Doctor offered to include the emergency shower and eyewash station in the monthly checks in the absence of a lab manager on board.

During the first AGT trawl it was noticed that the temperature of the Fire pump water source was in excess of 10 degrees warmer than the ambient sea surface temperature. The quality of the benthic organisms due to the temperature change was raised as a serious concern by the scientists. The smaller volume hoses that are often used are form the same water sources, so all on deck seawater sources are impacted. The unfiltered seawater tap had to be used on deck, but this source is prone to freezing in the ice and volume is low. It is suggested that some provision for the requirement of cold seawater be considered for biological cruises. On freezing of the unfiltered seawater tap it was necessary to bring snow from the deck area onto the sorting table in the wet lab to try to keep the temperature at an acceptable level.

Use of PPE was consistent throughout the cruise by all in the science team and good practice was observed. Wet weather gear was acceptable for use in the wet lab and on deck. Lab coats were used for preparing hazardous chemicals in the lab. Gloves were worn by all handling equipment/specimens and a hazardous lab consumables UN grade bin was available.

Issues were had by many whilst filling out the BOL forms, many reported glitches in the form, from odd formatting errors to crashing and failing to save work and corrupted files. Parts of the forms were found to be confusing even with the guide. Lab manager would like to initiate a small talk about the requirement of BOLs and BioBols as part of the cruise training and orientation so that people are aware before sampling commences of the level of detail required at the end of the cruise.

15. IT Engineer's Report

Jeremy Robst

14.1. Data Logging / SCS

The SCS server and data logging systems worked well throughout the cruise, with no additional logging events apart from the start & stop occurring.

Time & Date (GMT)	Event
2018/02/18 14:58	ACQ restarted, newleg run (**Leg: 20180218**)
2018/02/12	ACQ restarted, end of leg

14.2. Other systems

The other systems on board – the JRLB unix fileserver, SABRIS systems and ESX server all worked without any serious issues.

14.3 Event Logging

An old laptop was rebuilt as JR-EVENTLOG-L1 to be used for realtime eventlogging by scientists monitoring equipment. Typically this will be in the UIC, next to the winch driver for deployments of things like the AGT and EBS.

16. Data management Report

Sophie Fielding, Jeremy Robst, Katrin Linse, Phil Trathan, Hugh Venables

Data storage

All data recorded by instrumentation linked to the ship's network were recorded directly to respective folders within /data/cruise/jcr/2018021 8/ and additional folders were created within /data/cruise/jcr/2018021 8/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:

ADCP
AGT
BONGO
CTD
CTD_chlorophylls
CTD Bottles (auto-generated)
EBS
EK60
EM122
MUC
MUC_corelog
PSO diary
SUCS

Event numbers

Event numbers were assigned to equipment deployments by the officers on watch and were assigned sequentially when completing the bridge event log. 58 separate events were recorded Appendix 1).

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 – PDC data management plan

In line with NERC grant requirements as Data Management plan was set up in cooperation and agreement with the PDC.

Data Management Plan Template

****To be completed by Data Centre with successful Grant Holders within 3 months of the Start Date of the Award (do NOT submit this form with Proposals)****

Project Information

Project Name	Benthic biodiversity under Antarctic ice-shelves – baseline assessment of the seabed exposed by the 2017 calving of the Larsen-C Ice Shelf
Project Number (NERC PIs only)	
Grant Reference	NE/R012296/1
Principal Investigator	Dr Katrin Linse

Organisation

Nominated Data Centre	PDC
Data Centre Contact	Katy Buckland
Project Data Contact	
Please specify any other team members with responsibility for data	Trathan, Griffiths, Fielding, Glover, Jamieson, Witte, Reid

Roles and Responsibilities

The UK Polar Data Centre (PDC) together with the PI are responsible for ensuring compliance to the NERC data policy. The PDC will offer support to the PI for any queries they have regarding the policy and managing their data.

PI **Linse** will manage the project in liaison with Co-Is and PPs, and ensure overall delivery. Co-I **Trathan** will be responsible for vertebrate diversity assessments and policy interactions, Co-I **Griffiths** for the imagery analyses and Co-I **Fielding** for the bio-acoustic and plankton data. Co-Is **Glover** and **Witte** and named researcher **Reid** will be responsible for MUC and isotope analyses.

PI Linse is responsible for ensuring that the data management plan is followed and that all data and accompanying metadata are submitted to the PDC by the end of the project for long-term curation.

Data Management Plan Template

Data Generation Activities

Aims & methodology:

This project will examine the biological communities formerly under the iceberg A68 in the western Weddell Sea. Iceberg A68 calved from the Larsen-C ice shelf in July 2017, and sampling the benthic biological communities in the first austral summer after this major calving will provide a unique baseline for undisturbed under-ice-shelf communities.

To document the faunal baseline under Larsen-C, we will deploy trawls (epibenthic sledge, Agassiz trawl, bongo net), mega-corer, towed camera systems, CTD, and single and multi-beam echosounders at each station. As the seabed under A68 is uncharted, areas around the proposed stations will be surveyed by swath bathymetry to map seafloor topography. With our holistic sampling approach we will collect information on the assemblage structure, biodiversity and abundance of the in-, epi-, and suprabenthic meio-, macro- and megafauna.

As JR17003a is targeting a research area of high risk to be effected by adverse sea-ice conditions that can deny access to the proposed research area, contingency plans will be in place for different scenarios:
The general plans are to sail as far south as assessed as safe by the Master of the vessel:
1) Reach Larsen-C and work as proposed
2) Reach Larsen-B area only and amend project plans to sample first proposed Larsen-B stations, then further repeat stations in Larsen-B of previous AWI cruises to continue with the succession studies there
3) Reach Larsen-A area only and amend project plans to sample first proposed Larsen-A station, then further re-peat stations in Larsen-A of previous AWI cruises to continue with the succession studies there
4) Not reach Larsen area, so work would focussed on sites north of Larsen selected following a benthic biodiversity knowledge review in biodiversity.aq

New data:

- Cruise metadata from SME 17_512;
  - Cruise Summary
  - Cruise Report
  - Event log
- All shipboard raw data
- Set of processed hydroacoustics
- In situ images and video
- Net samples and core samples
- Benthic fauna presence/absence/density and geophysical data obtained from samples and image analysis
- Bird and mammal obs

All digital data will be within 1TB in volume.

After successful collection of samples, a future grant (to be applied for) will cover:

- Molecular barcoding sequences of marine invertebrates
- Isotope data (foodweb and experiments)
- Analysis of images and video

Data Management Plan Template

In-Project Data Management Approach

Throughout the project it is expected that data (where they are in electronic format) will be backed up on secure systems so that hardware failure and/or malicious attack on the data and/or systems will not cause a permanent loss.

Image data generated by the SUCS and DWCS, as well as associated environmental data, will be stored on RAID-enabled disk systems during the cruise, and during subsequent data processing and analysis, with copies held at BAS. Upon cruise completion, all data will be copied to the BAS Unix system. Data will not exceed 1TB.

The data will be delivered to the PDC before the end of the project. The PDC will store these data in it's own area on the BAS SAN, which is secure and regularly backed up.

Metadata and Documentation

While measurements are being made, the necessary metadata to enable their use and re-use will be recorded to the best of the scientists abilities and should document how, where and who generated the data (including analysis and processing steps). Metadata and any associated documentation will be submitted at the same time as the accompanying datasets.

Metadata will be made accessible through the PDCs Discovery Metadata System, the NERC Data Catalogue Service and the Antarctic Master Directory.

Data Quality

It is expected that data being supplied by the PIs will have been suitably quality checked.

All data analysis will be carried out using nationally or internationally recognised methodologies, where possible. The researcher will ensure that the methodology is documented, and monitor and maintain procedural and analytical reproducibility using replicates and standards where possible. Any corrections or processing of data must be documented.

The PDC will perform their own quality assurance checks on the data and metadata to ensure everything is in order.

Please be aware that some journals are now requiring DOIs to be issued to datasets before papers are published. As a result of this, should you wish to publish any papers in any such journal before the intended data delivery date, then the Polar Data Centre will have to receive such data earlier so we can make it available and assign it a DOI.

Exceptions or Additional Services

Data Management Plan Template

Any exceptional expectations of Data Centres (for example exceptional volume of data or complexity) - funding for which should be included within the project's Directly Incurred costs and explained within the Justification of Resources attachment;

Data Management Plan Information

Authors	
Created Date	
Last revision date	
Version Number	1
Approved by PI/PM	
Approved by (Data Centre)	
Data Owner / IPR	NERC, OGL v3

Datasets

New Datasets

Digital Information

Enter a brief description of the activities that will produce the data

Dataset Description	Contact	Data Volume	Data Format	Issues	Delivery Date	Embargo Date	Reuse Scenario	Preservation Plan
Dataset description	*Dataset contact name*			*Any issues with the data, e.g. legal, access, retention etc*	*Date expect to receive data*	*No more than 2 years after delivery*		*e.g. Keep indefinitely, Do not keep etc, including destination data centre (if not owning DC)*
Cruise summary	K Linse		Docx or pdf		2 weeks after cruise	none		BODC
Cruise report	K Linse		Docx or pdf		6 months after cruise	none		BODC
JCR Event Logs	S Fielding		Docx or pdf		2 weeks after cruise	none		Keep indefinitely at the PDC – to be inputted into the marine metadata portal
Hydroacoustic bathymetric data (suite of data including EM122 and ADCP – exact instruments will be confirmed on the cruise)	S Fielding		**Raw EM122** .all **Processed EM122** Caris project and associated files .xyz of cleaned accepted soundings **Raw ADCP** .ENS, .ENS, .ENX, .N1R, .STA, .VMO, .LOG		2 weeks after cruise with cruise digital data back-up delivery via IT cruise support for copy to BAS Unix system	none	Further international cruises to this area will appreciate the bathymetric information for navigation	Keep indefinitely at the PDC. Set of data (processed by AWI) to be provided to PDC when available.

			ADCP Calibration Files .txt - ADCP calibration command files of settings used. **Raw TOPAS** .raw **Processed TOPAS** .segy					
Hydroacoustic biological data (EK60)	S Fielding		**Raw EK60** .raw, .bot, .idx **EK60 Calibration Files** .txt		2 weeks after cruise	2 years		Keep indefinitely at the PDC
Physical sample database	K Linse		Microsoft Access	Software slow on L drive – will use personal computer and back up manually daily	2 weeks after cruise	none	Taxonomic comparisons, biological analyses	Keep indefinitely – held by the PDC via oracle. Local copy held by scientist.
In situ images and video	K Linse				2 weeks after cruise	2 years	Succession analysis of ice shelf colonisation	Keep indefinitely at the PDC
CTD data	H Venables		**Raw Data** Various formats **Calibration documents of sensors deployed on CTD**		2 weeks after cruise	none	Oceanographic analyses of region	Raw data held by the PDC, any processed data held by BODC

			.pdf					
Bird and mammal observations			Excel spreadsheet					Keep indefinitely at the PDC

Hardcopy Records

Enter a brief description of the activities that will produce the data

Dataset Name	Contact	Data Volume	Data Format	Issues	Delivery Date	Preservation Plan
Name of dataset	*Dataset contact name*			*Any issues with the data, .e.g. legal, access, retention etc*	*Date expect to receive data*	*e.g. Keep indefinitely, Do not keep etc*
Sample book	*K. Linse*	*1 A4 notebook*	*Handwritten records. Preferably scanned as a backup back in Cambridge.*		*Back in UK with JCR, then kept with K Linse until samples fully analysed*	*Keep long-term – to be held by K. Linse, but catalogued by archives.*
Paper Logs	*S. Fielding*	*1 A4 Binder*	*Paper, handwritten records. Scanned and digitised back in Cambridge by PDC. (e.g. LADCP Logs, Salinity Calibration Logs, CTD Logs, Topas Settings Logs)*		*2 weeks after the cruise, to be scanned and digitised.*	*Keep long term and catalogued with the archives. Scientists may keep paper copies if required otherwise PDC will be custodian.*

Physical Collections & Samples

Enter a brief description of the activities that will produce the data

Dataset Name	Contact	Data Volume	Data Format	Issues	Delivery Date	Preservation Plan
Name of dataset	*Dataset contact name*			*Any issues with the data, .e.g. legal, access, retention etc*	*Date expect to receive data*	*e.g. Keep indefinitely, Do not keep etc*
AGT net samples	K Linse		Specimens in fixative		JCR return summer 2018	Keep long-term; send to collaborators for taxonomic identifications; after publications selected fauna will be housed at NHM

EBS net samples	K Linse		Cod end samples (unsorted specimens) in fixative		JCR return summer 2018	Keep long-term; send to collaborators for taxonomic identifications; after publications selected fauna will be housed at NHM
Bongo net samples	S Fielding		Cod end samples (unsorted specimens) in fixative		JCR return summer 2018	Keep long-term; send to collaborators for taxonomic identifications; after publications selected fauna will be housed at NHM
CTD water bottle samples	H Venables		Water samples in vials		JCR return summer 2018	Used for sample destructive O18 analysis
MUC core C experiment	U Witte, Aberdeen		Core samples (unsorted specimens) in fixative		JCR return summer 2018	Used for sample destructive altered isotope analysis for C-uptake study
MUC core C experiment	A Glover, NHM London		Core samples (unsorted specimens) in fixative		JCR return summer 2018	Keep long-term; send to collaborators for taxonomic identifications; after publications selected fauna will be housed at NHM
Selected benthic and pelagic specimens	W Reid, Newcastle		Selected, specimens in fixative or frozen		JCR return summer 2018	Used for sample destructive natural isotope analysis for C-uptake study
Gravity core samples	J Smith		GC cores in segments		JCR return summer 2018	Keep long-term

Third Party/Existing Datasets

Dataset Name	Contact	Location	Contents	Estimated Size	Responsibility	Licence Issues	Comments
Name of dataset	*Name of contact for dataset*	*Where is it stored*	*Brief Description*		*Who is responsible for sourcing the dataset*		*Any additional information (e.g. licence or use restrictions?)*

Acknowledgements

We would like to acknowledge and thank Andrew Fleming for providing automated email service of updated POLAR VIEW satellite maps directly to Master and PSO for planning purposes, and John Turner and Cat Murphy (Rothera meteorologist) for providing weather forecasts for the local area. We would also like to acknowledge the outstanding support from the crew and technicians aboard RRS James Clark Ross.

Appendices

Appendix 1: Bridge Event Log

Time	Event	Lat	Lon	Comment
08/03/2018 18:48		63.6896	56.5821	Vessel off DP. Relocating to station 12
08/03/2018 18:44	58	63.6894	56.5817	SUCS recovered to deck
08/03/2018 18:36	58	63.6894	56.5817	Transect complete. Commence recovery of SUCS
08/03/2018 18:14	58	63.6882	56.5811	Move complete. Commence next SUCS transect at 0.2kts
08/03/2018 18:00	58	63.6874	56.5807	Transect complete. Vessel moving 100m
08/03/2018 17:40	58	63.6864	56.5802	Move complete. Commence next SUCS transect at 0.2kts
08/03/2018 17:27	58	63.6857	56.5798	Transect complete. Vessel moving 100m
08/03/2018 17:07	58	63.6847	-56.579	SUCS on bottom. Commence transect at 0.2kts
08/03/2018 16:55	58	63.6847	56.5788	SUCS deployed
08/03/2018 16:36	57	63.6847	56.5789	CTD recovered to deck
08/03/2018 16:24	57	63.6847	56.5788	CTD stopped at depth 457m. Commence recovery
08/03/2018 16:09	57	63.6847	56.5788	CTD deployed
08/03/2018 08:57		63.6894	56.6336	Vessel on DP @ edge of pack ice; standing by for SUCS deployment
07/03/2018 22:14		63.6252	57.4857	Vessel off DP
07/03/2018 22:05	56	63.6256	-57.489	AGT recovered
07/03/2018 21:52	56	63.6253	57.4862	AGT wire out 300m; commenced recovery
07/03/2018 21:50	56	63.6252	-57.485	AGT @ bottom (225m)
07/03/2018 21:43	56	63.6249	57.4824	AGT deployed
07/03/2018 21:41	56	63.6249	-57.482	Commenced AGT deployment
07/03/2018 21:22	55	63.6248	57.4819	MultiCorer recovered
07/03/2018 21:13	55	63.6248	57.4819	Commenced recovery of MultiCorer

07/03/2018 21:12	55	-63.6248	-57.4819	MultiCorer on bottom (224m)
07/03/2018 21:04	55	-63.6248	-57.4819	MultiCorer deployed
07/03/2018 20:43	54	-63.626	-57.4915	EBS recovered. Vessel moved back to start of 200m transect
07/03/2018 20:31	54	-63.6258	-57.4893	Commenced recovery of EBS
07/03/2018 20:26	54	-63.6254	-57.4863	Commenced EBS trawl @ 1kt for 5 mins (wire out 300m)
07/03/2018 20:24	54	-63.6253	-57.4855	EBS on bottom (234m)
07/03/2018 20:17	54	-63.6249	-57.4828	EBS deployed
07/03/2018 20:13	54	-63.6248	-57.4821	Commenced EBS deployment
07/03/2018 20:11		-63.6248	-57.4821	Vessel on DP @ station 3
07/03/2018 19:51		-63.6171	57.511	Vessel off DP and relocating to 200m site
07/03/2018 19:50	53	-63.6171	-57.5109	EBS recovered
07/03/2018 19:28	53	-63.6166	-57.5067	Commenced recovery of EBS
07/03/2018 19:23	53	-63.6162	-57.5038	Commenced EBS trawl @ 1kt for 5 mins (wire out 750m)
07/03/2018 19:18	53	-63.6159	-57.5018	EBS on bottom (wire out 512m)
07/03/2018 19:05	53	-63.6155	-57.4985	EBS deployed
07/03/2018 19:03	53	-63.6155	-57.4982	Commenced EBS deployment
07/03/2018 18:44		-63.6154	57.498	Vessel in position for EBS
07/03/2018 18:30		-63.6169	-57.5111	Vessel repositioning on DP to start of transect
07/03/2018 18:27	52	-63.6169	-57.5111	AGT recovered to deck
07/03/2018 18:09	52	-63.6167	-57.5085	AGT off bottom
07/03/2018 17:59	52	-63.6165	-57.5064	Trawl complete. Commence recovery
07/03/2018 17:54	52	-63.6161	-57.5035	Commence tow at 1.0kts for 5 mins (wire out 750m)
07/03/2018 17:49	52	-63.6159	-57.5019	Speed reduced to 0.5kts
07/03/2018 17:48	52	-63.6159	-57.5014	AGT on bottom (wire out 505m)
07/03/2018 17:45	52	-63.6157	-57.4998	Speed increased to 1.0kts

07/03/2018 17:33	52	- 63.6154	- 57.4977	AGT deployed. Speed 0.3kts
07/03/2018 17:21		- 63.6155	- 57.4976	Vessel in position for AGT
07/03/2018 17:11		- 63.6157	- 57.5015	Vessel repositioning on DP to start of transect
07/03/2018 17:10	51	- 63.6157	- 57.5013	Multicorer recovered to deck
07/03/2018 16:58	51	- 63.6155	- 57.4991	Commence recovery of Multicorer
07/03/2018 16:57	51	- 63.6155	- 57.4991	Multicorer on bottom (wire out 504m)
07/03/2018 16:32	51	- 63.6154	- 57.4979	Multicorer deployed
07/03/2018 16:31		- 63.6154	- 57.4977	Vessel on DP at station 2
07/03/2018 08:45		- 63.7594	- 57.6664	Site 10 unworkable due to ice conditions. Vessel off DP and proceeding to Duse Bay
07/03/2018 04:06		- 63.7486	- 57.5919	Vessel on DP in vicinity of station 10 to assess/monitor ice conditions
07/03/2018 00:36	50	- 63.7612	- 57.9674	Multicore recovered on deck
07/03/2018 00:35	50	- 63.7612	- 57.9674	Multicore at surface
07/03/2018 00:15	50	- 63.7612	- 57.9674	Multicore off the bottom
07/03/2018 00:14	50	- 63.7612	- 57.9674	Multicore on the bottom 990m
06/03/2018 23:53	50	- 63.7612	- 57.9674	Multicore deployed
06/03/2018 23:52	50	- 63.7612	- 57.9674	Multicore off the deck
06/03/2018 23:48		- 63.7613	- 57.9674	Finish mechanical downtime
06/03/2018 23:36		- 63.7612	- 57.9674	Start mechanical downtime due to bongo net winch
06/03/2018 23:26	49	- 63.7612	- 57.9674	CTD recovered on deck
06/03/2018 23:25	49	- 63.7612	- 57.9674	CTD at surface
06/03/2018 22:57	49	- 63.7612	- 57.9674	CTD @ depth (977m); commenced recovery
06/03/2018 22:31	49	- 63.7612	- 57.9674	CTD deployed
06/03/2018 22:29	49	- 63.7612	- 57.9674	CTD off deck
06/03/2018 22:15	48	- 63.7612	- 57.9674	MultiCorer recovered
06/03/2018 21:53	48	- 63.7612	- 57.9674	Commenced recovery of MultiCorer

06/03/2018 21:51	48	- 63.7613	- 57.9674	MultiCorer on bottom (984m)
06/03/2018 21:26	48	- 63.7612	- 57.9674	MultiCorer deployed
06/03/2018 21:12		- 63.7611	- 57.9675	Vessel on DP @ station 12
06/03/2018 20:32		- 63.8122	- 58.0769	Vessel off DP and relocating to station 12
06/03/2018 20:12	47	- 63.8121	- 58.0767	EBS recovered
06/03/2018 19:36	47	- 63.8095	- 58.0723	Commenced recovery of EBS
06/03/2018 19:26	47	- 63.8074	- 58.0687	Commenced EBS trawl @ 1kt for 10 mins (wire out 1300m)
06/03/2018 19:17	47	- 63.8062	- 58.0667	EBS @ bottom (wire out 855m)
06/03/2018 18:57	47	- 63.8049	- 58.0639	EBS deployed
06/03/2018 18:46		- 63.8047	- 58.0636	Vessel stopped in position for EBS
06/03/2018 18:31		- 63.8117	-58.072	Vessel repositioning on DP to start of transect for EBS
06/03/2018 18:30	46	- 63.8117	-58.072	AGT recovered to deck
06/03/2018 18:09	46	- 63.8106	- 58.0706	AGT off bottom
06/03/2018 17:53	46	- 63.8093	- 58.0691	Trawl complete. Commence AGT recovery
06/03/2018 17:48	46	- 63.8082	- 58.0677	Commence trawl at 1.0kts for 5 mins (wire out 1300m)
06/03/2018 17:38	46	- 63.8068	- 58.0661	AGT on bottom (wire out 860m)
06/03/2018 17:13	46	- 63.8046	- 58.0636	AGT deployed
06/03/2018 16:47		- 63.8045	- 58.0634	Vessel stopped in position for AGT
06/03/2018 16:34		- 63.8091	- 58.0689	Vessel repositioning on DP to start of transect for AGT
06/03/2018 16:33	45	- 63.8091	- 58.0689	SUCS recovered to deck
06/03/2018 16:18	45	- 63.8091	- 58.0689	Commence recovery of SUCS
06/03/2018 16:13	45	- 63.8091	- 58.0689	Vessel stopped due to problem with SUCS
06/03/2018 15:48	45	- 63.8079	- 58.0675	Move complete. Commence next SUCS transect at 0.2kts
06/03/2018 15:32	45	- 63.8071	- 58.0665	SUCS transect complete. Vessel moving ahead 100m
06/03/2018 15:14	45	- 63.8063	- 58.0654	Move complete. Commence next SUCS transect at 0.2kts

06/03/2018		-	-	
14:57	45	63.8054	58.0644	SUCS transect complete. Vessel moving ahead 100m
06/03/2018		-	-	
14:35	45	63.8044	58.0633	SUCS at the bottom
06/03/2018		-	-	
14:20	45	63.8044	58.0633	SUCS redeployed
06/03/2018		-	-	
14:19	45	63.8044	58.0633	SUCS at surface
06/03/2018		-	-	
14:12	45	63.8044	58.0633	SUCS deployed
06/03/2018		-	-	
14:11	45	63.8044	58.0633	SUCS off the deck
06/03/2018		-	-	
13:59	44	63.8044	58.0633	CTD recovered on deck
06/03/2018		-	-	
13:57	44	63.8044	58.0633	CTD at surface
06/03/2018		-	-	
13:27	44	63.8045	58.0633	CTD stopped at 854m
06/03/2018		-	-	
13:00	44	63.8044	58.0633	CTD deployed
06/03/2018		-	-	
12:58	44	63.8044	58.0633	CTD off the deck
06/03/2018		-	-	
12:53		63.8045	58.0633	Vsl on DP
06/03/2018		-	-	
11:06		63.9917	58.4107	Vsl off DP
06/03/2018		-	-	
10:54	43	63.9916	58.4113	AGT recovered
06/03/2018		-	-	
10:01	43	63.9892	58.4198	Commenced recovery of AGT
06/03/2018		-	-	
09:55	43	63.9881	58.4225	Commenced AGT trawl @ 1kt for 5mins (wire out 1900m)
06/03/2018		-	-	
09:41	43	63.9864	58.4254	AGT on bottom (~1261m)
06/03/2018		-	-	
09:07	43	63.9834	58.4278	AGT deployed
06/03/2018		-	-	
09:06	43	63.9833	58.4279	Commenced AGT deployment
06/03/2018			-	
08:36		-63.983	58.4274	Vessel on DP for 1250m AGT deployment
05/03/2018		-	-	
23:42	42	63.9885	58.4367	CTD recovered on deck
05/03/2018		-	-	
23:41	42	63.9885	58.4367	CTD at surface
05/03/2018		-	-	
23:07	42	63.9885	58.4367	CTD at depth 1240m
05/03/2018		-	-	
22:42	42	63.9885	58.4367	CTD deployed
05/03/2018		-	-	
22:41	42	63.9885	58.4367	CTD off deck

05/03/2018 22:08	41	63.9884	58.4366	EBS recovered
05/03/2018 21:17	41	63.9842	58.4341	Commenced recovery of EBS
05/03/2018 21:07	41	63.9816	58.4325	Commenced EBS trawl @ 1kt for 10 mins (wire out 1900m)
05/03/2018 20:54	41	63.9798	58.4314	EBS on bottom (wire out 1257m)
05/03/2018 20:23	41	63.9768	58.4296	EBS deployed
05/03/2018 20:21	41	63.9766	58.4296	Commenced EBS deployment
05/03/2018 19:52	40	63.9766	58.4295	MultiCorer recovered
05/03/2018 19:26	40	63.9766	58.4296	Commenced recovery of MultiCorer
05/03/2018 19:25	40	63.9766	58.4296	MultiCorer @ bottom (wire out 1219m)
05/03/2018 18:50	40	63.9765	58.4295	Mulicorer deployed. Vessel moved ahead 10m
05/03/2018 18:22	39	63.9765	58.4294	Multicorer recovered to deck
05/03/2018 17:54	39	63.9765	58.4294	Commence recovery of Multicorer
05/03/2018 17:52	39	63.9765	58.4294	Multicorer on bottom (wire out 1243m)
05/03/2018 17:21	39	63.9765	58.4295	Multicorer deployed
05/03/2018 16:18		63.9766	58.4301	Vessel on DP at station 6 (1250m)
05/03/2018 15:26		64.0903	58.4655	Vessel rerouting to station 6 due to station 5 ice conditions
05/03/2018 15:04		64.0594	58.4782	Vessel off DP. Proceeding to station 5
05/03/2018 15:00	38	64.0594	58.4782	Trawl recovered on deck
05/03/2018 14:58	38	64.0593	58.4781	Trawl at surface
05/03/2018 14:40	38	64.0579	58.4776	Trawl off the seabed
05/03/2018 14:24	38	64.0566	58.4771	Commence haul
05/03/2018 14:23	38	64.0564	-58.477	Reduce speed to 0.3kn for trawl
05/03/2018 14:18	38	64.0551	58.4765	Completed deployment
05/03/2018 14:09	38	64.0537	-58.476	Agassiz trawl on the seabed
05/03/2018 13:47	38	64.0516	58.4752	Agassiz trawl deployed

05/03/2018		-	-	
13:45	38	64.0515	58.4751	Agassiz trawl off the deck
05/03/2018		-	-	
13:20	37	64.0515	58.4751	Multicore recovered on deck
05/03/2018		-	-	
13:19	37	64.0515	58.4751	Multicore at surface
05/03/2018		-	-	
12:53	37	64.0514	58.4751	Multicore at the bottom 844m
05/03/2018		-	-	
12:30	37	64.0515	58.4751	Multicore deployed
05/03/2018		-	-	
12:28	37	64.0515	58.4751	Multicore off the deck
05/03/2018		-		
12:15		64.0514	-58.475	Vsl repositioned for multicore deployment
05/03/2018		-	-	
11:54	36	64.0511	58.4727	Multicorer recovered on deck
05/03/2018		-	-	
11:53	36	64.0511	58.4727	Multicorer at surface
05/03/2018		-	-	
11:29	36	64.0511	58.4727	Multicorer at seabed 822m
05/03/2018		-	-	
11:06	36	64.0511	58.4727	Multicorer deployed
05/03/2018		-	-	
11:05	36	64.0511	58.4727	Multicorer off the deck
05/03/2018			-	
10:34	35	-64.051	58.4726	EBS recovered
05/03/2018		-	-	
09:59	35	64.0493	58.4674	Commenced recovery of EBS
05/03/2018		-	-	
09:48	35	64.0476	58.4619	Commenced EBS trawl @ 1kt for 10 mins (wire out 1200m)
05/03/2018		-	-	
09:39	35	64.0466	58.4599	EBS @ bottom
05/03/2018		-	-	
09:17	35	64.0449	58.4571	EBS deployed
05/03/2018		-		
09:15	35	64.0448	-58.457	Commenced EBS deployment
05/03/2018			-	
08:46		-64.045	58.4573	Vessel on DP @ 800m EBS site
05/03/2018		-	-	
08:15		64.0737	58.4929	Vessel off DP to proceed to science station
04/03/2018		-	-	
22:58		64.0724	58.4939	Vessel on DP at overnight stand by position
04/03/2018			-	
22:10		-64.124	58.4996	Vessel off DP and relocating to overnight standy by position
04/03/2018		-	-	
22:08	34	64.1243	58.4994	EBS recovered
04/03/2018		-	-	
21:30	34	64.1273	58.4994	Commenced recovery of EBS
04/03/2018		-	-	
21:20	34	64.1284	58.5051	Commenced EBS trawl @ 1kt for 10 mins (wire out 1200m)

04/03/2018 21:13	34	-64.1285	58.5065	EBS @ bottom (EA120 depth ~ 845m)
04/03/2018 20:52	34	-64.1297	58.5084	EBS deployed
04/03/2018 20:51	34	-64.1297	58.5085	Commenced EBS deployment
04/03/2018 20:13	33	-64.1311	58.5045	MultiCorer recovered
04/03/2018 19:55	33	-64.1312	58.5045	Commenced recovery of MultiCorer
04/03/2018 19:54	33	-64.1312	58.5045	MultiCorer @ bottom (wire out 842m)
04/03/2018 19:32	33	-64.1303	58.5045	MultiCorer deployed
04/03/2018 19:27		-64.1305	-58.504	Vessel on DP
04/03/2018 19:16		-64.1327	58.4836	Vessel off DP and relocating to 800m coring site
04/03/2018 19:14	32	-64.1326	58.4836	MultiCorer recovered
04/03/2018 18:58	32	-64.1321	-58.484	Multicorer off bottom
04/03/2018 18:56	32	-64.1321	58.4841	Commence hauling multicorer
04/03/2018 18:55	32	-64.1321	-58.484	Multicorer on bottom (wire out 700m)
04/03/2018 18:34	32	-64.1315	58.4844	Multicorer deployed
04/03/2018 18:08	31	-64.1302	58.4834	CTD recovered to deck
04/03/2018 17:43	31	-64.1288	58.4844	CTD stopped at depth 688m. Commence recovery
04/03/2018 17:13	31	-64.1269	58.4838	CTD deployed
04/03/2018 17:00		-64.1266	58.4824	Vessel on DP for test CTD
04/03/2018 16:48		-64.1331	-58.473	Vessel off DP. Relocating for CTD
04/03/2018 16:42	30	-64.133	-58.473	SUCS recovered to deck
04/03/2018 16:33	30	-64.133	-58.473	SUCS transect complete. Commence recovery of SUCS
04/03/2018 16:14	30	-64.1318	58.4735	Move complete. Commence next SUCS transect at 0.2kts
04/03/2018 16:10	30	-64.131	58.4739	SUCS transect complete. Commence move ahead 100m
04/03/2018 15:53	30	-64.13	58.4742	Move complete. Commence next SUCS transect at 0.2kts
04/03/2018 15:50	30	-64.1291	58.4746	SUCS transect complete. Commence move ahead 100m

04/03/2018		-	-	
15:31	30	64.1279	58.4751	SUCS on bottom. Commence transect at 0.2kts
04/03/2018		-	-	
15:20	30	64.1274	58.4753	SUCS deployed
04/03/2018		-	-	
15:06	29	64.1274	58.4752	Vessel on DP at station 5 (500m contour) SWATH suspended
04/03/2018		-	-	
13:28	29	64.0413	58.4371	Vsl off DP. Resuming SWATH survey
04/03/2018		-	-	
13:27	28	64.0413	58.4371	SUCS recovered on deck
04/03/2018		-	-	
13:26	28	64.0413	58.4371	SUCS at surface
04/03/2018		-	-	
13:18	28	64.0412	58.4371	Commence SUCS recovery
04/03/2018		-	-	
11:50	28	64.0363	58.4328	SUCS on the bottom
04/03/2018		-	-	
11:38	28	64.0364	58.4328	SUCS deployed
04/03/2018		-	-	
11:37	28	64.0363	58.4328	SUCS off the deck
04/03/2018		-	-	
11:34	28	64.0364	58.4327	Vsl on DP for 500m SUCS
04/03/2018		-	-	
10:41		64.0377	58.4237	Vessel off DP and relocating to next SUCS site
04/03/2018		-	-	
10:40	27	64.0377	58.4235	SUCS recovered
04/03/2018		-	-	
10:36	27	64.0378	58.4235	Completed transect 3. Commenced recovery
04/03/2018			-	
10:14	27	-64.037	58.4216	Move completed. Commenced transect 3
04/03/2018		-	-	
10:08	27	64.0362	58.4209	Completed transect 2. Moving 100m ahead
04/03/2018		-	-	
09:49	27	64.0352	58.4201	Move completed. Commenced transect 2
04/03/2018		-	-	
09:42	27	64.0343	58.4194	Completed transect 1. Moving 100m ahead
04/03/2018		-	-	
09:21	27	64.0333	58.4185	SUCS @ bottom; commenced transect 1
04/03/2018		-	-	
09:14	27	64.0332	58.4185	SUCS deployed
04/03/2018			-	
08:59		-64.033	58.4203	Vessel on DP (200m site)
04/03/2018				
08:46		-64.026	-58.434	Vessel off DP and relocating to science station
04/03/2018		-	-	
06:02		64.0266	58.4337	Vessel on DP in the vicinity of station 4 awaiting instruction
04/03/2018		-	-	
02:58		64.0898	58.5033	Vessel off DP. Relocating due to ice conditions
04/03/2018			-	
01:44	26	-64.091	58.5005	Vsl on DP. End of swath survey

03/03/2018 22:32	26	-64.1161	-58.4785	Vessel off DP for SWATH survey
03/03/2018 22:22	25	-64.1161	-58.4785	SUCS recovered
03/03/2018 22:13	25	-64.1158	-58.4784	Completed transect 3. Commenced recovery
03/03/2018 21:51	25	-64.1146	-58.4782	Move completed. Commenced transect 3
03/03/2018 21:45	25	-64.1137	-58.478	Completed transect 2. Moving 100m ahead
03/03/2018 21:26	25	-64.1126	-58.4779	Move completed. Commenced transect 2
03/03/2018 21:20	25	-64.1118	-58.4778	Completed transect 1. Moving 100m ahead
03/03/2018 21:00	25	-64.1108	-58.4778	SUCS @ bottom; commenced transect 1
03/03/2018 20:51	25	-64.1108	-58.4777	SUCS deployed
03/03/2018 20:49		-64.1108	-58.4777	Vessel on DP to commence 500m SUCS survey
03/03/2018 20:28		-64.1156	-58.4984	Vessel off DP and relocating to 500m SUCS site
03/03/2018 20:26	24	-64.1156	-58.4984	SUCS recovered
03/03/2018 20:12	24	-64.1156	-58.4984	Completed transect 3. Commenced recovery
03/03/2018 19:53	24	-64.1146	-58.4987	Move completed. Commenced transect 3
03/03/2018 19:46	24	-64.1137	-58.4993	Completed transect 2. Moving 100m ahead
03/03/2018 19:29	24	-64.1128	-58.4995	Move completed. Commenced transect 2
03/03/2018 19:23	24	-64.112	-58.4995	Completed transect 1. Moving 100m ahead
03/03/2018 19:05	24	-64.111	-58.4995	SUCS @ bottom; commenced transect 1
03/03/2018 18:50	24	-64.111	-58.4996	SUCS deployed
03/03/2018 18:30	23	-64.1099	-58.4995	Vessel on DP at station 5. SWATH survey ended
03/03/2018 17:48	23	-64.0802	-58.4646	Vessel off DP. SWATH resumed
03/03/2018 17:20	23	-64.0798	-58.4652	Vessel stopped on DP for drone launch. SWATH suspended
03/03/2018 15:42	23	-64.0465	-58.4617	Vessel off DP. Commence SWATH survery
03/03/2018 15:39	22	-64.0464	-58.4617	SUCS recovered to deck
03/03/2018 15:24	22	-64.0452	-58.4602	Commence recovery of SUCS

03/03/2018 13:43	22	-64.0412	-58.4526	SUCS at the bottom
03/03/2018 13:25	22	-64.0412	-58.4526	SUCS deployed
03/03/2018 13:24	22	-64.0412	-58.4527	SUCS off the deck
03/03/2018 12:32	21	-64.0412	-58.4527	SUCS recovered on deck
03/03/2018 12:31	21	-64.0412	-58.4527	SUCS at the surface. Did not go to depth
03/03/2018 12:14	21	-64.0412	-58.4527	SUCS deployed
03/03/2018 12:13	21	-64.0412	-58.4527	SUCS off the deck
03/03/2018 11:30	20	-64.0412	-58.4527	Bongos recovered on deck
03/03/2018 11:29	20	-64.0412	-58.4527	Bongos at the surface
03/03/2018 11:15	20	-64.0412	-58.4527	Bongo at 200m. Commence recovery
03/03/2018 11:05	20	-64.0412	-58.4527	Bongo nets deployed
03/03/2018 11:03	20	-64.0412	-58.4527	Bongo nets off the deck
03/03/2018 10:50	19	-64.0412	-58.4527	CTD recovered
03/03/2018 10:21	19	-64.0412	-58.4527	CTD @ depth (793m); commenced recovery
03/03/2018 09:57	19	-64.0412	-58.4527	CTD deployed
03/03/2018 09:56	19	-64.0412	-58.4527	Commenced CTD deployment
03/03/2018 09:40		-64.0413	-58.4506	Vessel on DP at station 4
02/03/2018 21:25		-63.6177	-57.4977	Vessel off DP and proceeding to next science station
02/03/2018 21:22	18	-63.6177	-57.4977	SUCS recovered
02/03/2018 21:15	18	-63.6177	-57.4974	Transect 3 completed. Commenced recovery of SUCS
02/03/2018 20:54	18	-63.6172	-57.4951	Move completed. Commenced transect 3
02/03/2018 20:47	18	-63.6168	-57.4933	Completed transect 2. Moving 100m ahead
02/03/2018 20:27	18	-63.6163	-57.4909	Move completed. Commenced transect 2
02/03/2018 20:24	18	-63.616	-57.4894	Completed transect 1. Moving 100m ahead
02/03/2018 20:03	18	-63.6154	-57.487	SUCS @ bottom; commenced transect 1

02/03/2018 19:53	18	-63.6154	-57.487	SUCS deployed
02/03/2018 19:51		-63.6156	-57.4875	Vessel on DP at next SUCS site. (400m)
02/03/2018 19:34		-63.6205	-57.4959	Vessel off DP and relocating to next SUCS site
02/03/2018 19:32	17	-63.6205	-57.4959	SUCS recovered
02/03/2018 19:26	17	-63.6204	-57.4954	Commenced recovery of SUCS
02/03/2018 19:07	17	-63.6201	-57.4932	Move complete. Commenced next SUCS transect at 0.2kts
02/03/2018 19:04	17	-63.62	-57.4918	SUCS transect completed. Vessel moving ahead 100m
02/03/2018 18:41	17	-63.6196	-57.4888	Move complete. Commence next SUCS transect at 0.2kts
02/03/2018 18:35	17	-63.6193	-57.4869	SUCS transect complete. Vessel moving ahead 100m
02/03/2018 18:17	17	-63.619	-57.4848	SUCS on bottom. Commence transect at 0.2kts
02/03/2018 18:12	17	-63.619	-57.4849	SUCS deployed
02/03/2018 18:09	16	-63.619	-57.4849	SUCS recovered to deck (test)
02/03/2018 18:07	16	-63.619	-57.4849	SUCS deployed (test)
02/03/2018 17:48		-63.6189	-57.4842	Vessel on DP at 300m contour
02/03/2018 17:25		-63.6257	-57.4924	Vessel off DP. Commence move to 300m contour
02/03/2018 17:24	15	-63.6257	-57.4924	SUCS recovered to deck
02/03/2018 17:19	15	-63.6257	-57.4923	SUCS transect complete. Commence recovery
02/03/2018 17:01	15	-63.6255	-57.4903	Move complete. Commence next SUCS transect at 0.2kts
02/03/2018 16:54	15	-63.6253	-57.4885	SUCS transect complete. Vessel moving ahead 100m
02/03/2018 16:33	15	-63.6249	-57.4861	Move complete. Commence next SUCS transect at 0.2kts
02/03/2018 16:27	15	-63.6246	-57.4843	SUCS transect complete. Vessel moving ahead 100m
02/03/2018 16:08	15	-63.6243	-57.4821	SUCS on bottom. Commence SUCS transect at 0.2kts
02/03/2018 16:03	15	-63.6243	-57.4821	SUCS deployed
02/03/2018 16:00	14	-63.6243	-57.4821	SUCS recovered to deck (camera problem)
02/03/2018 15:59	14	-63.6243	-57.4821	SUCS deployed

02/03/2018		-	-	
15:57		63.6243	57.4821	Vessel stopped in position for SUCS
02/03/2018		-	-	
15:42		63.6251	57.4877	Commence move on DP 300m astern for SUCS
02/03/2018		-	-	
15:37	13	63.6251	57.4877	Bongo net recovered to deck
02/03/2018		-	-	
15:29	13	63.6251	57.4877	Bongo net stopped at 150m. Commence recovery
02/03/2018		-	-	
15:23	13	63.6251	57.4877	Bongo net deployed
02/03/2018		-	-	
14:12	12	63.6251	57.4877	CTD recovered on deck
02/03/2018		-	-	
14:10	12	63.6251	57.4877	CTD at surface
02/03/2018		-	-	
13:56	12	63.6252	57.4877	CTD stopped at 200m
02/03/2018		-	-	
13:46	12	63.6252	57.4877	CTD deployed
02/03/2018		-	-	
13:43	12	63.6251	57.4877	CTD off deck
02/03/2018		-	-	
13:31		63.6251	57.4874	Vsl on DP at 200m station
02/03/2018		-	-	Vsl off DP repositioning to 200m station due to winch power
13:11		63.6156	57.4988	pack
02/03/2018		-	-	
12:57		63.6156	57.4989	Vsl in position for multicore deployment
02/03/2018		-	-	
12:44		63.6168	57.5092	Vessel repositioning for multicore work
02/03/2018		-	-	
12:43	11	63.6168	57.5092	SUCS recovered on deck
02/03/2018		-	-	
12:42	11	63.6168	57.5092	SUCS at surface
02/03/2018		-	-	
12:35	11	63.6168	57.5091	Commence recovery of SUCS
02/03/2018		-	-	
11:03	11	63.6154	57.4977	SUCS on the bottom
02/03/2018		-	-	
10:54	11	63.6154	57.4977	SUCS deployed
02/03/2018		-	-	
10:31		63.6155	57.4986	Vessel moved 50m astern for SUCS deployment
02/03/2018		-	-	
10:28	10	63.6155	57.4987	Bongo nets recovered
02/03/2018		-	-	
10:17	10	63.6155	57.4987	Bongo nets @ 210m; commenced recovery
02/03/2018		-	-	
10:08	10	63.6155	57.4987	Bongo nets deployed
02/03/2018		-	-	
09:45	9	63.6155	57.4987	CTD recovered
02/03/2018		-	-	
09:22	9	63.6155	57.4986	CTD @ depth (496m); commenced recovery

02/03/2018 09:08	9	- 63.6155	- 57.4986	CTD deployed
02/03/2018 09:06	9	- 63.6155	- 57.4986	Commenced CTD deployment
02/03/2018 08:55		- 63.6153	- -57.498	Vessel on DP @ Station 2 (500m)
02/03/2018 08:15		- 63.5758	- 57.3822	Vessel off DP to relocate from overnight standby position to station 2
02/03/2018 01:06	8	- 63.6168	- 57.5197	Swath survey completed
01/03/2018 22:56	8	- -63.569	- 57.3006	Swath survey commenced
01/03/2018 22:55		- 63.5689	- 57.2993	Vessel off DP to commence SWATH survey
01/03/2018 22:53	7	- 63.5689	- 57.2992	MultiCorer recovered
01/03/2018 22:31	7	- 63.5689	- 57.2992	MultiCorer @ bottom (~1039m); commenced recovery
01/03/2018 22:06	7	- 63.5689	- 57.2992	MultiCorer deployed
01/03/2018 22:05	7	- 63.5689	- 57.2992	Commenced MultiCorer deployment
01/03/2018 21:35		- 63.5684	- 57.3008	Vessel on DP. Standing by for next MultiCorer deployment
01/03/2018 21:26		- 63.5756	- 57.2986	Vessel on DP to reposition due to ice
01/03/2018 21:23	6	- 63.5756	- 57.2986	MultiCorer recovered
01/03/2018 21:00	6	- 63.5756	- 57.2986	MultiCorer @ bottom; commenced recovery
01/03/2018 20:30	6	- 63.5756	- 57.2986	MultiCorer deployed
01/03/2018 20:28	6	- 63.5756	- 57.2986	Commenced deployment of MultiCorer
01/03/2018 20:00	5	- 63.5756	- 57.2986	EBS recovered
01/03/2018 19:32	5	- 63.5755	- 57.2931	EBS off bottom
01/03/2018 19:14	5	- -63.575	- 57.2895	Commenced recovery of EBS
01/03/2018 19:05	5	- 63.5744	- -57.284	Commence trawl at 1.0kts for 10 mins (1600m wire out)
01/03/2018 18:53	5	- 63.5741	- 57.2808	EBS on bottom (1050m)
01/03/2018 18:26	5	- 63.5735	- 57.2759	EBS deployed. Ship speed 0.3kts
01/03/2018 18:24	5	- 63.5734	- 57.2756	Commence deploying EBS
01/03/2018 18:07		- 63.5736	- 57.2772	Vessel stopped in position for EBS

01/03/2018 17:41		-63.5771	-57.3088	Commence move on DP joystick to EBS deployment site
01/03/2018 17:40	4	-63.5771	-57.309	AGT recovered to deck
01/03/2018 17:08	4	-63.5767	-57.3059	AGT off bottom
01/03/2018 16:43	4	-63.5762	-57.3011	Commence recovery of AGT. Ship speed 0.3kts
01/03/2018 16:33	4	-63.5755	-57.2951	Commence trawl at 1.0kts for 10mins (1600m wire out)
01/03/2018 16:23	4	-63.5752	-57.2921	AGT on bottom (1060m). Ship speed 0.5kts
01/03/2018 15:55	4	-63.5747	-57.2869	AGT deployed. Ship speed 0.3kts
01/03/2018 15:53	4	-63.5746	-57.2866	Commence deploying AGT
01/03/2018 15:24	3	-63.5753	-57.2936	CTD recovered to deck
01/03/2018 14:51	3	-63.5731	-57.2965	CTD stopped at 1035m. Commence recovery
01/03/2018 14:28	3	-63.5714	-57.2988	CTD deployed
01/03/2018 14:26	3	-63.5714	-57.2987	CTD off the deck
01/03/2018 14:23	3	-63.5719	-57.2978	Vsl on DP
01/03/2018 00:30		-64.3666	-56.3528	Drone recovered
01/03/2018 00:25		-64.3689	-56.3523	Drone deployed
28/02/2018 18:52		-64.6612	-56.6801	Commenced series of drone deployments
27/02/2018 23:24		-64.8037	-56.8789	Drone recovered
27/02/2018 23:13		-64.7975	-56.8796	Drone deployed
27/02/2018 20:00		-64.8066	-57.0726	Drone recovered
27/02/2018 19:46		-64.8086	-57.0784	Drone deployed
27/02/2018 19:42		-64.8087	-57.0802	Drone recovered
27/02/2018 19:29		-64.8073	-57.0982	Drone deployed
27/02/2018 19:14		-64.8078	-57.1151	Drone recovered
23/02/2018 12:50	2	-53.792	-57.557	Swath calibration survey complete
23/02/2018 07:05	2	-53.4634	-57.6301	Vessel commenced SWATH calibration survey

23/02/2018 06:48		-53.45	-57.6374	Vessel off DP. Proceeding to SWATH calibration site
23/02/2018 06:42	1	-53.45	-57.6374	CTD recovered to deck
23/02/2018 05:55	1	- 53.4474	- 57.6363	CTD stopped at depth 2454m. Commence recovery
23/02/2018 05:09	1	- 53.4471	- 57.6363	CTD deployed
23/02/2018 05:00		- 53.4474	- 57.6357	Vessel on DP at CTD location

Appendix 2: AGT event log

Time	Lat	Lon	Event	Site	Depth	Action
07/03/2018 22:03	-63.62557	-57.48859	56	Duse Bay 200m	188	On deck
07/03/2018 21:57	-63.62544	-57.48747	56	Duse Bay 200m	198	Off ground
07/03/2018 21:54	-63.62538	-57.48693	56	Duse Bay 200m	201	End trawl
07/03/2018 21:52	-63.62531	-57.48627	56	Duse Bay 200m	205	Start trawl
07/03/2018 21:52	-63.6253	-57.48618	56	Duse Bay 200m	205	On ground
07/03/2018 21:45	-63.62493	-57.48274	56	Duse Bay 200m	216	Off deck
07/03/2018 18:22	-63.61685	-57.51085	52	Duse Bay 500m	420	On deck
07/03/2018 18:09	-63.6167	-57.50847	52	Duse Bay 500m	442	Off ground
07/03/2018 17:59	-63.61648	-57.50636	52	Duse Bay 500m	447	End trawl
07/03/2018 17:54	-63.61614	-57.50349	52	Duse Bay 500m	483	Start trawl
07/03/2018 17:48	-63.61586	-57.50143	52	Duse Bay 500m	490	On ground
07/03/2018 17:33	-63.61539	-57.49768	52	Duse Bay 500m	495	Off deck
06/03/2018 18:30	-63.81169	-58.072	46	PGC mid 850m	835	On deck
06/03/2018 18:09	-63.81058	-58.07064	46	PGC mid 850m	844	Off ground
06/03/2018 17:53	-63.80932	-58.06911	46	PGC mid 850m	0	End trawl
06/03/2018 17:48	-63.80815	-58.06771	46	PGC mid 850m	867	Start trawl
06/03/2018 17:32	-63.80603	-58.06523	46	PGC mid 850m	870	On ground
06/03/2018 17:17	-63.80493	-58.06395	46	PGC mid 850m	877	Off deck
06/03/2018 10:55	-63.99162	-58.41116	43	PGC South 1200m	1270	On deck
06/03/2018 10:27	-63.99042	-58.41568	43	PGC South 1200m	1275	Off ground
06/03/2018 10:00	-63.98897	-58.42026	43	PGC South 1200m	0	End trawl
06/03/2018 09:55	-63.98811	-58.42253	43	PGC South 1200m	1271	Start trawl
06/03/2018 09:55	-63.98811	-58.42253	43	PGC South 1200m	1271	End trawl
06/03/2018 09:41	-63.98639	-58.42535	43	PGC South 1200m	1267	On ground

06/03/2018 09:06	-63.98332	-58.42787	43	PGC South 1200m	1282	Off deck
05/03/2018 15:01	-64.05937	-58.47814	38	PGC South 800m	739	On deck
05/03/2018 14:39	-64.05778	-58.47756	38	PGC South 800m	736	Off ground
05/03/2018 14:23	-64.05644	-58.47704	38	PGC South 800m	0	End Trawl
05/03/2018 14:18	-64.05515	-58.47654	38	PGC South 800m	868	Start Trawl
05/03/2018 14:09	-64.05378	-58.47601	38	PGC South 800m	787	On Ground
05/03/2018 13:47	-64.05155	-58.47515	38	PGC South 800m	859	Off deck
01/03/2018 17:29	-63.57716	-57.30894	4	Duse Bay	983	On deck
01/03/2018 17:08	-63.57668	-57.30586	4	Duse Bay	982	Off ground
01/03/2018 16:43	-63.57617	-57.30127	4	Duse Bay	997	End trawl
01/03/2018 16:33	-63.57554	-57.29537	4	Duse Bay	1081	Start trawl
01/03/2018 16:22	-63.57517	-57.29184	4	Duse Bay	1080	AGT on ground
01/03/2018 15:54	-63.57465	-57.28677	4	Duse Bay	1081	AGT off deck

Appendix 3: Bongo event log

Time	Latitude	Longitude	Event	Site	Depth	Net Depth	Comment
03/03/2018 11:30	-64.0412	-58.4527	20	Prince Gustav 1000m	805	200	On deck At bottom Sample full of siphonophore bladders, 1 krill larvae (superba), copepods and fecal pellets
03/03/2018 11:15	-64.0412	-58.4527	20	Prince Gustav 1000m	803	200	
03/03/2018 11:05	-64.0412	-58.4527	20	Prince Gustav 1000m	797	200	Off deck
02/03/2018 15:37	-63.6251	-57.4877	13	Duse Bay 200m	204	150	On deck
02/03/2018 15:29	-63.6251	-57.4877	13	Duse Bay 200m	203	150	At bottom
02/03/2018 15:23	-63.6251	-57.4877	13	Duse Bay 200m	203	150	Off deck
02/03/2018 10:17	-63.6155	-57.4987	10	Duse Bay 500m	493	210	At bottom
02/03/2018 10:08	-63.6155	-57.4987	10	Duse Bay 500m	500	210	On board
02/03/2018 10:08	-63.6155	-57.4987	10	Duse Bay 500m	500	210	Off Deck

Appendix 4: CTD event log

Time	Lat	Lon	Event	Site	Depth	CTD depth	Comment
06/03/2018 13:57	-63.8044	-58.0633	44	PGC mid 850m	880	854	On deck
06/03/2018 13:27	-63.8045	-58.0633	44	PGC mid 850m	901	854	At bottom
06/03/2018 13:00	-63.8044	-58.0633	44	PGC mid 850m	894	854	In water
05/03/2018 23:41	-63.9885	-58.4367	42	PGC South 1200m	0	1230	On deck
05/03/2018 23:06	-63.9885	-58.4366	42	PGC South 1200m	0	1230	At bottom
05/03/2018 22:43	-63.9885	-58.4367	42	PGC South 1200m	0	1230	In water
04/03/2018 18:08	-64.1302	-58.4834	31	PGC off Cape Obelisk	646	685	On deck
04/03/2018 17:43	-64.1288	-58.4844	31	PGC off Cape Obelisk	776	685	At bottom
04/03/2018 17:13	-64.1269	-58.4838	31	PGC off Cape Obelisk	659	685	In water
03/03/2018 10:49	-64.0412	-58.4527	19	PGC South 800m	802	793	On deck
03/03/2018 10:20	-64.0412	-58.4527	19	PGC South 800m	803	793	At bottom
03/03/2018 09:57	-64.0412	-58.4527	19	PGC South 800m	808	793	In water
02/03/2018 14:10	-63.6251	-57.4877	12	Duse Bay 200m	203	205	On deck
02/03/2018 13:57	-63.6251	-57.4877	12	Duse Bay 200m	202	205	At bottom
02/03/2018 13:46	-63.6251	-57.4877	12	Duse Bay 200m	203	205	In water
02/03/2018 09:44	-63.6155	-57.4987	9	Duse Bay 500m	499	496	On deck
02/03/2018 09:44	-63.6155	-57.4987	9	Duse Bay 500m	499	496	On deck
02/03/2018 09:22	-63.6155	-57.4986	9	Duse Bay 500m	498	496	At bottom
02/03/2018 09:08	-63.6155	-57.4986	9	Duse Bay 500m	496	496	In water
01/03/2018 15:24	-63.5753	-57.2936	3	Duse Bay 1000m	1079	1035	On deck
01/03/2018 14:51	-63.5731	-57.2965	3	Duse Bay 1000m	1078	1035	At bottom
01/03/2018 14:27	-63.5713	-57.2988	3	Duse Bay 1000m	1078	1035	In water
23/02/2018 06:44	-53.45	-57.6374	1	Swath calibration	2480	2454	On deck

23/02/2018 05:54	-53.4474	-57.6363	1	Swath calibration	2475	2454	At bottom
23/02/2018 05:09	-53.4474	-57.6363	1	Swath calibration	2475	2454	In water

Appendix 5: EBS event log

Time	Lat	Lon	Event	Site	Depth	Action
07/03/2018 20:43	-63.626	-57.4915	54	Duse Bay 200m	166	On deck
07/03/2018 20:34	- 63.6259	- 57.4902	54	Duse Bay 200m	175	Off ground
07/03/2018 20:31	- 63.6258	- 57.4893	54	Duse Bay 200m	179	End trawl
07/03/2018 20:26	- 63.6254	- 57.4863	54	Duse Bay 200m	203	Start trawl
07/03/2018 20:24	- 63.6253	- 57.4855	54	Duse Bay 200m	209	On ground
07/03/2018 20:16	- 63.6249	- 57.4826	54	Duse Bay 200m	216	Off deck
07/03/2018 19:51	- 63.6171	-57.511	53	Duse Bay 500m	397	On deck
07/03/2018 19:37	- 63.6168	- 57.5086	53	Duse Bay 500m	436	Off ground
07/03/2018 19:28	- 63.6166	- 57.5067	53	Duse Bay 500m	445	End trawl
07/03/2018 19:23	- 63.6162	- 57.5038	53	Duse Bay 500m	470	Start trawl
07/03/2018 19:18	- 63.6159	- 57.5018	53	Duse Bay 500m	487	On ground
07/03/2018 19:01	- 63.6154	-57.498	53	Duse Bay 500m	497	Off deck
06/03/2018 20:13	- 63.8121	- 58.0768	47	PGC mid 850m	846	On deck
06/03/2018 19:51	- 63.8107	- 58.0743	47	PGC mid 850m	864	Off ground
06/03/2018 19:36	- 63.8095	- 58.0723	47	PGC mid 850m	872	End trawl
06/03/2018 19:26	- 63.8074	- 58.0687	47	PGC mid 850m	874	Start trawl
06/03/2018 19:17	- 63.8062	- 58.0667	47	PGC mid 850m	875	On ground
06/03/2018 18:56	- 63.8048	- 58.0638	47	PGC mid 850m	877	Off deck
05/03/2018 22:08	- 63.9884	- 58.4366	41	PGC South 1200m	31	On deck
05/03/2018 21:39	- 63.9861	- 58.4353	41	PGC South 1200m	0	Off ground
05/03/2018 21:17	- 63.9842	- 58.4341	41	PGC South 1200m	0	End trawl
05/03/2018 21:07	- 63.9816	- 58.4325	41	PGC South 1200m	0	Start trawl
05/03/2018 20:54	- 63.9798	- 58.4314	41	PGC South 1200m	33	On ground

05/03/2018 20:23	63.9768	-58.4296	41	PGC South 1200m	0	Off deck
05/03/2018 10:33	-64.051	-58.4725	35	PGC South 800m	0	On deck
05/03/2018 10:14	-64.05	-58.4697	35	PGC South 800m	738	Off ground
05/03/2018 09:58	64.0491	-58.4669	35	PGC South 800m	727	End trawl
05/03/2018 09:48	64.0477	-58.4619	35	PGC South 800m	787	Start trawl
05/03/2018 09:39	64.0466	-58.4599	35	PGC South 800m	0	On ground
05/03/2018 09:17	64.0449	-58.4571	35	PGC South 800m	785	Off deck
04/03/2018 22:09	64.1241	-58.4995	34	PGC off Cape Obelisk	0	Off ground
04/03/2018 21:45	64.1265	-58.4982	34	PGC off Cape Obelisk	825	Off ground
04/03/2018 21:30	64.1273	-58.4994	34	PGC off Cape Obelisk	850	End trawl
04/03/2018 21:20	64.1284	-58.5051	34	PGC off Cape Obelisk	843	Start trawl
04/03/2018 21:13	64.1285	-58.5065	34	PGC off Cape Obelisk	920	On ground
04/03/2018 20:53	64.1296	-58.5084	34	PGC off Cape Obelisk	860	Off deck
01/03/2018 19:58	63.5756	-57.2985	5	Duse Bay	1043	On deck
01/03/2018 19:32	63.5755	-57.2931	5	Duse Bay	1082	Off ground
01/03/2018 19:16	63.5751	-57.2902	5	Duse Bay	1081	End trawl
01/03/2018 19:06	63.5745	-57.2846	5	Duse Bay	1079	Start trawl
01/03/2018 18:54	63.5741	-57.2811	5	Duse Bay	1077	On ground
01/03/2018 18:26	63.5735	-57.2759	5	Duse Bay	1066	off deck

Appendix 6: MUC event log

Time	Lat	Lon	Event	Site	Depth	Action
07/03/2018 21:21	-63.6248	-57.4819	55	Duse Bay 200m	219	On Deck
07/03/2018 21:14	-63.6248	-57.4819	55	Duse Bay 200m	219	freed
07/03/2018 21:14	-63.6248	-57.4819	55	Duse Bay 200m	219	Pull out
07/03/2018 21:12	-63.6248	-57.4819	55	Duse Bay 200m	219	On bottom
07/03/2018 21:10	-63.6248	-57.4819	55	Duse Bay 200m	220	50m off bottom
07/03/2018 21:04	-63.6248	-57.4819	55	Duse Bay 200m	219	Off deck
07/03/2018 17:10	-63.6157	-57.5015	51	Duse Bay 500m	493	On Deck
07/03/2018 16:59	-63.6155	-57.4991	51	Duse Bay 500m	499	Freed
07/03/2018 16:59	-63.6155	-57.4991	51	Duse Bay 500m	499	Pull out
07/03/2018 16:57	-63.6155	-57.4991	51	Duse Bay 500m	499	On bottom
07/03/2018 16:55	-63.6155	-57.4991	51	Duse Bay 500m	499	50m off bottom
07/03/2018 16:40	-63.6154	-57.4982	51	Duse Bay 500m	501	Off deck
07/03/2018 00:35	-63.7612	-57.9674	50	Prince Gustav Channel 1000m	1001	On deck
07/03/2018 00:16	-63.7612	-57.9674	50	Prince Gustav Channel 1000m	1001	Freed
07/03/2018 00:15	-63.7612	-57.9674	50	Prince Gustav Channel 1000m	1001	Pull out
07/03/2018 00:14	-63.7612	-57.9674	50	Prince Gustav Channel 1000m	1001	On bottom
07/03/2018 00:12	-63.7612	-57.9674	50	Prince Gustav Channel 1000m	1001	50m off bottom
06/03/2018 23:52	-63.7612	-57.9674	50	PGC mid 1000m	1003	Off deck
06/03/2018 22:14	-63.7612	-57.9674	48	Prince Gustav Channel 1000m	1001	On Deck
06/03/2018 21:53	-63.7612	-57.9674	48	Prince Gustav Channel 1000m	1001	Coming up
06/03/2018 21:53	-63.7612	-57.9674	48	Prince Gustav Channel 1000m	1001	Pull out
06/03/2018 21:51	-63.7613	-57.9674	48	Prince Gustav Channel 1000m	1001	On bottom
06/03/2018 21:26	-63.7612	-57.9674	48	Prince Gustav Channel 1000m	1001	Off deck

05/03/2018 19:51	-63.9766	-58.4295	40	Prince Gustav Channel South 1250m	0	On Deck
05/03/2018 19:23	-63.9766	-58.4296	40	Prince Gustav Channel South 1250m	29	Pull out
05/03/2018 19:21	-63.9766	-58.4295	40	Prince Gustav Channel South 1250m	0	On bottom
05/03/2018 19:20	-63.9766	-58.4295	40	Prince Gustav Channel South 1250m	0	50m off bottom
05/03/2018 18:51	-63.9766	-58.4295	40	Prince Gustav Channel South 1250m	0	off deck
05/03/2018 18:19	-63.9765	-58.4294	39	Prince Gustav Channel South 1250m	1246	On Deck
05/03/2018 17:54	-63.9765	-58.4294	39	Prince Gustav Channel South 1250m	29	Pull out
05/03/2018 17:52	-63.9765	-58.4294	39	Prince Gustav Channel South 1250m	0	On bottom
05/03/2018 17:51	-63.9765	-58.4294	39	Prince Gustav Channel South 1250m	0	50m off bottom
05/03/2018 17:21	-63.9765	-58.4295	39	Prince Gustav Channel South 1250m		Off deck
05/03/2018 13:19	-64.0515	-58.4751	37	Prince Gustav Channel South	949	On Deck
05/03/2018 12:55	-64.0515	-58.4751	37	Prince Gustav Channel South	825	Pull out
05/03/2018 12:53	-64.0514	-58.4751	37	Prince Gustav Channel South	821	On bottom
05/03/2018 12:51	-64.0515	-58.4751	37	Prince Gustav Channel South	824	50m off bottom
05/03/2018 12:29	-64.0515	-58.4751	37	Prince Gustav Channel South	820	Off deck
05/03/2018 11:53	-64.0511	-58.4727	36	Prince Gustav Channel South	857	On Deck
05/03/2018 11:31	-64.0511	-58.4727	36	Prince Gustav Channel South	812	pull out
05/03/2018 11:29	-64.0511	-58.4727	36	Prince Gustav Channel South	797	On bottom
05/03/2018 11:26	-64.0511	-58.4727	36	Prince Gustav Channel South	806	50m off
05/03/2018 11:06	-64.0511	-58.4727	36	Prince Gustav Channel South	854	Off deck
04/03/2018 20:12	-64.1311	-58.5045	33	Off Cape Obelisk	828	On Deck
04/03/2018 19:55	-64.1312	-58.5045	33	Off Cape Obelisk	868	Pull out
04/03/2018 19:53	-64.1312	-58.5045	33	Off Cape Obelisk		on bottom
04/03/2018 19:50	-64.1312	-58.5045	33	Off Cape Obelisk	872	50m off bottom
04/03/2018 19:30	-64.1303	-58.5046	33	Off Cape Obelisk	840	Off deck

04/03/2018 19:12	-64.1326	-58.4837	32	Off Cape Obelisk	652	On Deck
04/03/2018 18:59	-64.1321	-58.484	32	Off Cape Obelisk	677	Free of bottom
04/03/2018 18:57	-64.1321	-58.484	32	Off Cape Obelisk	657	pull out
04/03/2018 18:55	-64.1321	-58.484	32	Off Cape Obelisk	795	Drop
04/03/2018 18:51	-64.1321	-58.484	32	Off Cape Obelisk	739	50m off
04/03/2018 18:34	-64.1315	-58.4844	32	Off Cape Obelisk	704	off deck
01/03/2018 22:34	-63.5689	-57.2992	7	Duse Bay	1052	coming up
01/03/2018 22:32	-63.5689	-57.2992	7	Duse Bay 1000m	1043	pull out
01/03/2018 22:30	-63.5689	-57.2992	7	Duse Bay 1000m	1043	on bottom
01/03/2018 22:28	-63.5689	-57.2992	7	Duse Bay 1000m	1047	50m off
01/03/2018 22:06	-63.5689	-57.2992	7	Duse Bay 1000m	1045	Off deck
01/03/2018 21:03	-63.5755	-57.2986	6	Duse Bay 1000m	1048	Freed
01/03/2018 21:00	-63.5756	-57.2986	6	Duse Bay 1000m	1081	Pull out
01/03/2018 20:59	-63.5756	-57.2986	6	Duse Bay 1000m	1040	On bottom
01/03/2018 20:54	-63.5756	-57.2986	6	Duse Bay 1000m	1079	50m off
01/03/2018 20:30	-63.5756	-57.2986	6	Duse Bay 1000m	1075	Off deck

Appendix 7: SUCS event log

Time	Event	Site	Action	Photo	Lat	Lon	Depth
08/03/2018 18:44	58		on deck		-63.6894	56.58173	490
08/03/2018 18:44	58		out of water		-63.6894	56.58173	490
08/03/2018 18:36	58		Off the bottom		-63.6894	56.58174	490
08/03/2018 18:35	58		photo	P30C	-63.6894	56.58173	490
08/03/2018 18:35	58		photo	P30B	-63.6894	56.58173	
08/03/2018 18:35	58		photo	P30A	-63.6893	56.58172	490
08/03/2018 18:33	58		move 10m		-63.6893	56.58167	490
08/03/2018 18:33	58		photo	P29C	-63.6892	56.58166	490
08/03/2018 18:33	58		photo	P29B	-63.6892	56.58165	490
08/03/2018 18:33	58		photo	P29A	-63.6892	56.58164	490
08/03/2018 18:31	58		move 10m		-63.6892	56.58162	490
08/03/2018 18:31	58		photo	P28D	-63.6891	56.58162	490
08/03/2018 18:31	58		photo	P28C	-63.6891	56.58161	490
08/03/2018 18:31	58		photo	P28B	-63.6891	56.58161	490
08/03/2018 18:31	58		photo	P28A	-63.6891	56.58161	491
08/03/2018 18:29	58		move 10m		-63.689	56.58156	491
08/03/2018 18:28	58		photo	P27D	-63.689	56.58156	491
08/03/2018 18:28	58		photo	P27C	-63.689	56.58154	491
08/03/2018 18:28	58		photo	P27B	-63.689	56.58153	491
08/03/2018 18:28	58		photo	P27A	-63.689	56.58153	491
08/03/2018 18:27	58		move 10m		-63.6889	56.58151	491
08/03/2018 18:27	58		photo	P26C	-63.6889	-56.5815	491
08/03/2018 18:26	58		photo	P26B	-63.6889	56.58149	491
08/03/2018 18:26	58		photo	P26A	-63.6889	56.58147	491
08/03/2018 18:25	58		move 10m		-63.6888	56.58143	
08/03/2018 18:25	58		photo	P25C	-63.6888	56.58143	491
08/03/2018 18:24	58		photo	P25B	-63.6888	56.58143	491
08/03/2018 18:24	58		photo	P25A	-63.6888	56.58142	491

08/03/2018 18:23	58	move 10m		-63.6887	-56.5814	491
08/03/2018 18:23	58	photo	P24C	-63.6887	-56.5814	491
08/03/2018 18:23	58	photo	P24B	-63.6887	-56.58139	491
08/03/2018 18:22	58	photo	P24A	-63.6887	-56.58138	491
08/03/2018 18:21	58	move 10m		-63.6886	-56.58133	
08/03/2018 18:21	58	photo	P23C	-63.6886	-56.58132	491
08/03/2018 18:21	58	photo	P23B	-63.6886	-56.58132	491
08/03/2018 18:20	58	photo	P23A	-63.6886	-56.58132	491
08/03/2018 18:19	58	move 10m		-63.6885	-56.58128	491
08/03/2018 18:19	58	photo	P22C	-63.6885	-56.58128	491
08/03/2018 18:18	58	photo	P22B	-63.6885	-56.58127	491
08/03/2018 18:18	58	photo	P22A	-63.6885	-56.58127	491
08/03/2018 18:17	58	move 10m		-63.6884	-56.58123	491
08/03/2018 18:17	58	photo	P21C	-63.6884	-56.5812	491
08/03/2018 18:17	58	photo	P21B	-63.6884	-56.58119	491
08/03/2018 18:15	58	photo	P21A	-63.6883	-56.58114	491
08/03/2018 18:01	58	move 100 m		-63.6875	-56.58078	489
08/03/2018 17:58	58	photo	P20B	-63.6874	-56.58067	488
08/03/2018 17:58	58	photo	P20A	-63.6873	-56.58066	488
08/03/2018 17:57	58	move 10m		-63.6873	-56.58062	488
08/03/2018 17:57	58	photo	P19C	-63.6873	-56.58061	488
08/03/2018 17:56	58	photo	P19B	-63.6873	-56.58061	488
08/03/2018 17:56	58	photo	P19A	-63.6873	-56.5806	488
08/03/2018 17:55	58	move 10m		-63.6872	-56.58058	489
08/03/2018 17:55	58	photo	P18C	-63.6872	-56.58057	487
08/03/2018 17:54	58	photo	P18B	-63.6872	-56.58056	487
08/03/2018 17:54	58	photo	P18A	-63.6871	-56.58056	487
08/03/2018 17:53	58	move 10m		-63.6871	-56.58053	486
08/03/2018 17:53	58	photo	P17C	-63.6871	-56.58052	486
08/03/2018 17:52	58	photo	P17B	-63.6871	-56.58052	491
08/03/2018 17:52	58	photo	P17A	-63.687	-56.58052	486

08/03/2018 17:51	58	move 10m		-63.687	-56.58051	
08/03/2018 17:51	58	photo	P16C	-63.687	-56.5805	488
08/03/2018 17:51	58	photo	P16B	-63.687	-56.5805	485
08/03/2018 17:50	58	photo	P16A	-63.687	-56.58049	485
08/03/2018 17:49	58	move 10m		-63.6869	-56.58042	485
08/03/2018 17:49	58	photo	P15D	-63.6869	-56.58041	485
08/03/2018 17:49	58	photo	P15C	-63.6869	-56.58041	485
08/03/2018 17:49	58	photo	P15B	-63.6869	-56.5804	485
08/03/2018 17:48	58	photo	P15A	-63.6868	-56.5804	485
08/03/2018 17:47	58	move 10m		-63.6868	-56.58037	485
08/03/2018 17:47	58	photo	P14C	-63.6868	-56.58037	485
08/03/2018 17:47	58	photo	P14B	-63.6868	-56.58037	484
08/03/2018 17:46	58	photo	P14A	-63.6867	-56.58036	486
08/03/2018 17:46	58	move 10m		-63.6867	-56.58036	
08/03/2018 17:45	58	photo	P13C	-63.6867	-56.58035	484
08/03/2018 17:45	58	photo	P13B	-63.6866	-56.58033	484
08/03/2018 17:45	58	photo	P13A	-63.6866	-56.58032	484
08/03/2018 17:44	58	move 10m		-63.6866	-56.5803	
08/03/2018 17:43	58	photo	P12C	-63.6866	-56.58029	
08/03/2018 17:43	58	photo	P12B	-63.6865	-56.58029	484
08/03/2018 17:43	58	photo	P12A	-63.6865	-56.58028	484
08/03/2018 17:42	58	move 10m		-63.6865	-56.58026	483
08/03/2018 17:42	58	photo	P11C	-63.6865	-56.58023	483
08/03/2018 17:41	58	photo	P11B	-63.6865	-56.58021	483
08/03/2018 17:41	58	photo	P11A	-63.6865	-56.58019	483
08/03/2018 17:26	58	move 100 m		-63.6857	-56.57981	480
08/03/2018 17:26	58	photo	P10C	-63.6856	-56.5798	480
08/03/2018 17:26	58	photo	P10B	-63.6856	-56.57979	480
08/03/2018 17:26	58	photo	P10A	-63.6856	-56.57979	480
08/03/2018 17:24	58	move 10m		-63.6855	-56.57975	480
08/03/2018 17:24	58	photo	P09C	-63.6855	-56.57974	480

08/03/2018 17:24	58	photo	P09B	-63.6855	-56.57974	480
08/03/2018 17:24	58	photo	P09A	-63.6855	-56.57973	479
08/03/2018 17:22	58	move 10m		-63.6854	-56.57968	479
08/03/2018 17:22	58	photo	P08C	-63.6854	-56.57967	479
08/03/2018 17:22	58	photo	P08B	-63.6854	-56.57965	479
08/03/2018 17:22	58	photo	P08A	-63.6854	-56.57964	479
08/03/2018 17:21	58	move 10m		-63.6853	-56.5796	
08/03/2018 17:20	58	photo	P07D	-63.6853	-56.57959	478
08/03/2018 17:20	58	photo	P07C	-63.6853	-56.57958	478
08/03/2018 17:20	58	photo	P07B	-63.6853	-56.57958	478
08/03/2018 17:19	58	photo	P07A	-63.6853	-56.57957	478
08/03/2018 17:18	58	move 10m		-63.6852	-56.57951	477
08/03/2018 17:18	58	photo	P06C	-63.6852	-56.5795	477
08/03/2018 17:18	58	photo	P06B	-63.6852	-56.57949	477
08/03/2018 17:17	58	photo	P06A	-63.6852	-56.57949	477
08/03/2018 17:16	58	move 10m		-63.6851	-56.57944	
08/03/2018 17:16	58	photo	P05D	-63.6851	-56.57943	477
08/03/2018 17:16	58	photo	P05C	-63.6851	-56.57942	476
08/03/2018 17:15	58	photo	P05B	-63.6851	-56.57941	476
08/03/2018 17:15	58	photo	P05A	-63.685	-56.5794	476
08/03/2018 17:12	58	move 10m		-63.6849	-56.57928	476
08/03/2018 17:12	58	photo	P04C	-63.6849	-56.57926	476
08/03/2018 17:12	58	photo	P04B	-63.6849	-56.57925	476
08/03/2018 17:11	58	photo	P04A	-63.6849	-56.57924	476
08/03/2018 17:10	58	move 10m		-63.6848	-56.57918	477
08/03/2018 17:09	58	photo	P03C	-63.6848	-56.57913	476
08/03/2018 17:09	58	photo	P03B	-63.6847	-56.57912	476
08/03/2018 17:08	58	photo	PO3A	-63.6847	-56.57912	476
08/03/2018 17:05	58	move 10m		-63.6847	-56.57889	477
08/03/2018 17:05	58	photo	P02B	-63.6847	-56.57886	477
08/03/2018 17:04	58	photo	P02A	-63.6847	-56.57883	477

08/03/2018 17:03	58	move 10m		-63.6846	-56.57875	477
08/03/2018 17:03	58	photo	P01C	-63.6846	-56.57874	477
08/03/2018 17:03	58	photo	P01B	-63.6846	-56.57873	477
08/03/2018 17:02	58	photo	P01A	-63.6846	-56.57873	477
08/03/2018 17:02	58	on the bottom		-63.6846	-56.57873	477
08/03/2018 16:54	58	In the Water		-63.6847	-56.57881	477
08/03/2018 16:53	58	out of water		-63.6847	-56.57881	477
08/03/2018 16:52	58	In the Water		-63.6847	-56.57881	477
08/03/2018 16:50	58	off deck		-63.6847	-56.57881	477
06/03/2018 16:17	45	OFF THE BOTTOM		-63.8091	-58.06888	
06/03/2018 16:05	45	photo	P29A	-63.8088	-58.06852	0
06/03/2018 16:04	45	move 10 m		-63.8087	-58.06846	
06/03/2018 16:04	45	photo	P28C	-63.8087	-58.06845	863
06/03/2018 16:04	45	photo	P28B	-63.8087	-58.06843	862
06/03/2018 16:03	45	photo	P28A	-63.8087	-58.06841	826
06/03/2018 16:02	45	move 10 m		-63.8086	-58.06834	863
06/03/2018 16:02	45	photo	P27C	-63.8086	-58.06832	855
06/03/2018 16:02	45	photo	P27B	-63.8086	-58.06831	877
06/03/2018 16:02	45	photo	P27A	-63.8086	-58.06829	0
06/03/2018 16:00	45	move 10 m		-63.8086	-58.06822	864
06/03/2018 16:00	45	photo	P26C	-63.8085	-58.06821	0
06/03/2018 16:00	45	photo	P26B	-63.8085	-58.0682	874
06/03/2018 15:59	45	photo	P26A	-63.8085	-58.06818	915
06/03/2018 15:58	45	move 10 m		-63.8085	-58.0681	
06/03/2018 15:58	45	photo	P25C	-63.8085	-58.06809	
06/03/2018 15:58	45	photo	P25B	-63.8084	-58.06808	870
06/03/2018 15:57	45	photo	P25A	-63.8084	-58.06806	865
06/03/2018 15:56	45	move 10 m		-63.8084	-58.06801	
06/03/2018 15:56	45	photo	P24C	-63.8083	-58.068	848
06/03/2018 15:56	45	photo	P24B	-63.8083	-58.06799	872
06/03/2018 15:55	45	photo	P24A	-63.8083	-58.06797	896

06/03/2018 15:54	45	move 10 m		-63.8083	-58.06787	865
06/03/2018 15:54	45	photo	P23C	-63.8082	-58.06784	865
06/03/2018 15:53	45	photo	P23B	-63.8082	-58.06781	867
06/03/2018 15:53	45	photo	P23A	-63.8082	-58.06779	867
06/03/2018 15:52	45	move 10 m		-63.8081	-58.06771	845
06/03/2018 15:51	45	photo	P22C	-63.8081	-58.0677	868
06/03/2018 15:51	45	photo	P22B	-63.8081	-58.06769	868
06/03/2018 15:51	45	photo	P22A	-63.8081	-58.06768	868
06/03/2018 15:50	45	move 10 m		-63.8081	-58.06761	865
06/03/2018 15:49	45	photo	P21C	-63.808	-58.06759	872
06/03/2018 15:49	45	photo	P21B	-63.808	-58.06758	868
06/03/2018 15:49	45	photo	P21A	-63.808	-58.06754	868
06/03/2018 15:31	45	move 100m to next transect		-63.8071	-58.06647	
06/03/2018 15:31	45	photo	P20C	-63.8071	-58.06646	875
06/03/2018 15:31	45	photo	P20B	-63.8071	-58.06645	873
06/03/2018 15:31	45	photo	P20A	-63.8071	-58.06644	875
06/03/2018 15:29	45	move 10 m		-63.807	-58.06638	875
06/03/2018 15:29	45	photo	P19B	-63.807	-58.06636	863
06/03/2018 15:29	45	photo	P19A	-63.807	-58.06634	875
06/03/2018 15:27	45	move 10m		-63.8069	-58.06627	873
06/03/2018 15:27	45	photo	P18C	-63.8069	-58.06626	875
06/03/2018 15:27	45	photo	P18B	-63.8069	-58.06625	873
06/03/2018 15:27	45	photo	P18A	-63.8069	-58.06623	875
06/03/2018 15:26	45	move 10 m		-63.8069	-58.06618	871
06/03/2018 15:25	45	photo	P17B	-63.8068	-58.06615	865
06/03/2018 15:25	45	photo	P17A	-63.8068	-58.06614	
06/03/2018 15:24	45	move 10 m		-63.8068	-58.06606	875
06/03/2018 15:24	45	photo	P16C	-63.8068	-58.06604	
06/03/2018 15:23	45	photo	P16B	-63.8067	-58.06603	
06/03/2018 15:23	45	photo	P16A	-63.8067	-58.06602	875
06/03/2018 15:22	45	move 10 m		-63.8067	-58.06594	875

06/03/2018 15:22	45	photo	P15C	63.8067	-58.06593	
06/03/2018 15:22	45	photo	P15B	63.8067	-58.06592	875
06/03/2018 15:21	45	photo	P15A	63.8066	-58.06591	875
06/03/2018 15:20	45	move 10 m		63.8066	-58.06582	875
06/03/2018 15:20	45	photo	P14B	63.8066	-58.0658	875
06/03/2018 15:20	45	photo	P14A	63.8066	-58.06579	
06/03/2018 15:18	45	move 10 m		63.8065	-58.06571	875
06/03/2018 15:18	45	photo	P13C	63.8065	-58.06569	875
06/03/2018 15:18	45	photo	P13B	63.8065	-58.06569	
06/03/2018 15:18	45	photo	P13A	63.8065	-58.06568	
06/03/2018 15:16	45	move 10 m		63.8064	-58.06561	876
06/03/2018 15:16	45	photo	P12C	63.8064	-58.0656	876
06/03/2018 15:16	45	photo	P12B	63.8064	-58.06559	876
06/03/2018 15:16	45	photo	P12A	63.8064	-58.06557	
06/03/2018 15:15	45	move 10 m		63.8063	-58.06551	874
06/03/2018 15:14	45	photo	P11C	63.8063	-58.06546	
06/03/2018 15:14	45	photo	P11B	63.8063	-58.06545	
06/03/2018 15:14	45	photo	P11A	63.8063	-58.06545	876
06/03/2018 14:57	45	move 100m to next transect		63.8054	-58.06447	
06/03/2018 14:57	45	photo	P10B	63.8054	-58.06446	
06/03/2018 14:57	45	photo	P10A	63.8054	-58.06445	0
06/03/2018 14:55	45	move 10 m		63.8054	-58.06437	
06/03/2018 14:55	45	photo	P09B	63.8053	-58.06434	
06/03/2018 14:55	45	photo	P09A	63.8053	-58.06433	877
06/03/2018 14:54	45	move 10 m		63.8053	-58.06427	877
06/03/2018 14:53	45	photo	P08B	63.8053	-58.06426	
06/03/2018 14:53	45	photo	P08A	63.8053	-58.06424	877
06/03/2018 14:52	45	move 10m		63.8052	-58.06418	877
06/03/2018 14:52	45	photo	P07B	63.8052	-58.06414	
06/03/2018 14:51	45	photo	P07A	63.8052	-58.06413	877
06/03/2018 14:50	45	move 10 m		63.8051	-58.06408	878

06/03/2018 14:50	45	photo	P06B	-63.8051	-58.06406	
06/03/2018 14:50	45	photo	P06A	-63.8051	-58.06405	0
06/03/2018 14:49	45	move 10 m		-63.805	-58.06398	
06/03/2018 14:49	45	photo	P05B	-63.805	-58.06397	878
06/03/2018 14:48	45	photo	P05A	-63.805	-58.06396	878
06/03/2018 14:47	45	move 10m		-63.805	-58.06391	874
06/03/2018 14:47	45	photo	P04B	-63.8049	-58.06389	878
06/03/2018 14:46	45	photo	P04A	-63.8049	-58.06388	
06/03/2018 14:43	45	move 10 m		-63.8048	-58.06367	880
06/03/2018 14:42	45	photo	P03B	-63.8047	-58.06365	
06/03/2018 14:42	45	photo	P03A	-63.8047	-58.06364	864
06/03/2018 14:40	45	move 10 m		-63.8046	-58.06352	
06/03/2018 14:39	45	photo	P02B	-63.8046	-58.06349	847
06/03/2018 14:39	45	photo	P02A	-63.8046	-58.06347	879
06/03/2018 14:37	45	move 10 m		-63.8045	-58.06333	0
06/03/2018 14:37	45	photo	P01B	-63.8045	-58.06332	880
06/03/2018 14:36	45	photo	P01A	-63.8044	-58.06329	880
06/03/2018 14:36	45	on bottom		-63.8044	-58.06329	
06/03/2018 14:20	45	in the water		-63.8044	-58.06331	880
06/03/2018 14:17	45	bringing back up		-63.8044	-58.06332	880
06/03/2018 14:12	45	in the water		-63.8044	-58.0633	880
04/03/2018 16:42	30	back on deck		-64.133	-58.47302	
04/03/2018 16:33	30	OFF THE BOTTOM		-64.133	-58.47301	448
04/03/2018 16:32	30	photo	P30C	-64.133	-58.47301	
04/03/2018 16:32	30	photo	P30B	-64.133	-58.47301	447
04/03/2018 16:32	30	photo	P30A	-64.133	-58.47302	
04/03/2018 16:31	30	move 10 m		-64.1329	-58.47305	
04/03/2018 16:31	30	photo	P29C	-64.1329	-58.47305	483
04/03/2018 16:30	30	photo	P29B	-64.1329	-58.47305	451
04/03/2018 16:30	30	photo	P29A	-64.1329	-58.47305	447
04/03/2018 16:29	30	move 10 m		-64.1328	-58.4731	

04/03/2018 16:28	30	photo	P28B	64.1328	-58.4731	
04/03/2018 16:28	30	photo	P28A	64.1328	58.47311	
04/03/2018 16:27	30	move 10 m		64.1327	58.47314	569
04/03/2018 16:27	30	photo	P27C	64.1327	58.47315	471
04/03/2018 16:27	30	photo	P27B	64.1327	58.47315	
04/03/2018 16:26	30	photo	P27A	64.1327	58.47316	
04/03/2018 16:25	30	move 10 m		64.1326	58.47318	
04/03/2018 16:25	30	photo	P26C	64.1326	58.47318	443
04/03/2018 16:25	30	photo	P26B	64.1326	58.47318	
04/03/2018 16:24	30	photo	P26A	64.1326	58.47319	
04/03/2018 16:23	30	move 10 m		64.1325	58.47321	0
04/03/2018 16:23	30	photo	P25C	64.1325	58.47322	
04/03/2018 16:23	30	photo	P25B	64.1325	58.47323	460
04/03/2018 16:22	30	photo	P25A	64.1324	58.47324	
04/03/2018 16:21	30	move 10 m		64.1324	58.47327	
04/03/2018 16:21	30	photo	P24C	64.1324	58.47328	450
04/03/2018 16:21	30	photo	P24B	64.1324	58.47328	469
04/03/2018 16:20	30	photo	P24A	64.1323	58.47328	0
04/03/2018 16:20	30	move 10 m		64.1323	58.47329	
04/03/2018 16:19	30	photo	P23C	64.1323	-58.4733	
04/03/2018 16:19	30	photo	P23B	64.1323	58.47331	
04/03/2018 16:19	30	photo	P23A	64.1323	58.47332	
04/03/2018 16:17	30	move 10 m		64.1321	58.47338	0
04/03/2018 16:17	30	photo	P22C	64.1321	58.47339	0
04/03/2018 16:17	30	photo	P22B	64.1321	-58.4734	0
04/03/2018 16:17	30	photo	P22A	64.1321	58.47341	0
04/03/2018 16:16	30	move 10 m		-64.132	58.47346	0
04/03/2018 16:15	30	photo	P21C	-64.132	58.47346	
04/03/2018 16:15	30	photo	P21B	-64.132	58.47347	
04/03/2018 16:15	30	photo	P21A	64.1319	58.47348	
04/03/2018 16:10	30	move 100m to next transect		-64.131	58.47385	458

04/03/2018 16:09	30	photo	P20A	-64.131	-58.47385	457
04/03/2018 16:08	30	move 10 m		-64.1309	-58.47388	486
04/03/2018 16:08	30	photo	P19B	-64.1309	-58.47388	472
04/03/2018 16:08	30	photo	P19A	-64.1309	-58.47388	
04/03/2018 16:07	30	move 10 m		-64.1308	-58.4739	457
04/03/2018 16:06	30	photo	P18B	-64.1308	-58.4739	457
04/03/2018 16:06	30	photo	P18A	-64.1308	-58.47391	0
04/03/2018 16:05	30	move 10 m		-64.1307	-58.47396	
04/03/2018 16:05	30	photo	P17B	-64.1307	-58.47397	
04/03/2018 16:04	30	photo	P17A	-64.1307	-58.47397	437
04/03/2018 16:04	30	move 10 m		-64.1307	-58.47398	456
04/03/2018 16:03	30	photo	P16B	-64.1307	-58.47399	455
04/03/2018 16:03	30	photo	P16A	-64.1306	-58.47399	
04/03/2018 16:02	30	move 10 m		-64.1306	-58.47401	517
04/03/2018 16:01	30	photo	P15B	-64.1305	-58.47402	479
04/03/2018 16:01	30	photo	P15A	-64.1305	-58.47403	454
04/03/2018 16:00	30	move 10 m		-64.1305	-58.47406	479
04/03/2018 16:00	30	photo	P14B	-64.1304	-58.47407	460
04/03/2018 15:59	30	photo	P14A	-64.1304	-58.47407	454
04/03/2018 15:58	30	move 10 m		-64.1304	-58.4741	473
04/03/2018 15:58	30	photo	P13C	-64.1304	-58.47411	453
04/03/2018 15:58	30	photo	P13B	-64.1304	-58.47411	
04/03/2018 15:58	30	photo	P13A	-64.1303	-58.47413	
04/03/2018 15:57	30	move 10 m		-64.1303	-58.47415	0
04/03/2018 15:56	30	photo	P12C	-64.1303	-58.47416	0
04/03/2018 15:56	30	photo	P12B	-64.1303	-58.47416	
04/03/2018 15:56	30	photo	P12A	-64.1302	-58.47418	
04/03/2018 15:55	30	move 10 m		-64.1302	-58.47419	
04/03/2018 15:54	30	photo	P11C	-64.1302	-58.47419	
04/03/2018 15:54	30	photo	P11B	-64.1302	-58.47419	0
04/03/2018 15:54	30	photo	P11A	-64.1301	-58.4742	

04/03/2018 15:49	30	move 100m to next transect		-64.1291	-58.47457	471
04/03/2018 15:49	30	photo	P10C	-64.1291	-58.47457	480
04/03/2018 15:49	30	photo	P10B	-64.1291	-58.47458	478
04/03/2018 15:48	30	photo	P10A	-64.1291	-58.4746	
04/03/2018 15:47	30	move 10 m		-64.129	-58.47465	
04/03/2018 15:47	30	photo	P09B	-64.1289	-58.47466	
04/03/2018 15:46	30	photo	P09A	-64.1289	-58.47466	497
04/03/2018 15:45	30	move 10 m		-64.1288	-58.4747	
04/03/2018 15:45	30	photo	P08B	-64.1288	-58.47471	
04/03/2018 15:44	30	photo	P08A	-64.1288	-58.47471	489
04/03/2018 15:43	30	move 10 m		-64.1287	-58.47476	
04/03/2018 15:43	30	photo	P07B	-64.1286	-58.47477	494
04/03/2018 15:43	30	photo	P07A	-64.1286	-58.47478	
04/03/2018 15:42	30	move 10 m		-64.1286	-58.47479	0
04/03/2018 15:42	30	photo	P06C	-64.1286	-58.4748	478
04/03/2018 15:41	30	photo	P06B	-64.1285	-58.47481	
04/03/2018 15:41	30	photo	P06A	-64.1285	-58.47481	
04/03/2018 15:40	30	move 10 m		-64.1285	-58.47483	
04/03/2018 15:40	30	photo	P05B	-64.1284	-58.47485	
04/03/2018 15:39	30	photo	P05A	-64.1284	-58.47486	492
04/03/2018 15:38	30	move 10 m		-64.1284	-58.4749	
04/03/2018 15:38	30	photo	P04B	-64.1283	-58.4749	489
04/03/2018 15:38	30	photo	P04A	-64.1283	-58.47491	490
04/03/2018 15:37	30	move 10 m		-64.1283	-58.47492	496
04/03/2018 15:36	30	photo	P03B	-64.1282	-58.47494	509
04/03/2018 15:36	30	photo	P03A	-64.1282	-58.47495	0
04/03/2018 15:34	30	move 10 m		-64.1283	-58.47493	
04/03/2018 15:33	30	photo	P02B	-64.1281	-58.47501	
04/03/2018 15:33	30	photo	P02A	-64.1281	-58.47502	496
04/03/2018 15:32	30	move 10 m		-64.1281	-58.47502	511
04/03/2018 15:32	30	photo	P01B	-64.128	-58.47503	

04/03/2018 15:32	30		photo	P01A	-64.128	-58.47503	488
04/03/2018 15:31	30		on bottom		-64.128	-58.47504	496
04/03/2018 15:20	30	Cape Obelisk	in the water		-64.1274	-58.4753	
04/03/2018 13:26	28		on deck		-64.0413	-58.43713	
04/03/2018 13:26	28		out of water		-64.0413	-58.43714	
04/03/2018 13:17	28		Off the bottom		-64.0412	-58.43708	483
04/03/2018 13:17	28		photo	P30D	-64.0412	-58.43705	483
04/03/2018 13:16	28		photo	P30C	-64.0412	-58.43703	479
04/03/2018 13:16	28		photo	P30B	-64.0412	-58.437	
04/03/2018 13:16	28		photo	P30A	-64.0412	-58.43699	484
04/03/2018 13:14	28		move 10m		-64.0411	-58.43691	487
04/03/2018 13:14	28		photo	P29C	-64.0411	-58.43687	457
04/03/2018 13:13	28		photo	P29B	-64.0411	-58.43685	475
04/03/2018 13:13	28		photo	P29A	-64.041	-58.43683	484
04/03/2018 13:12	28		move 10m		-64.041	-58.43674	
04/03/2018 13:11	28		photo	P28C	-64.0409	-58.43673	476
04/03/2018 13:11	28		photo	P28B	-64.0409	-58.43672	489
04/03/2018 13:11	28		photo	P28A	-64.0409	-58.43671	
04/03/2018 13:10	28		move 10m		-64.0409	-58.43661	
04/03/2018 13:09	28		photo	P27C	-64.0408	-58.43658	487
04/03/2018 13:09	28		photo	P27B	-64.0408	-58.43657	
04/03/2018 13:09	28		photo	P27A	-64.0408	-58.43656	483
04/03/2018 13:08	28		move 10m		-64.0408	-58.43646	
04/03/2018 13:07	28		photo	P26C	-64.0408	-58.43644	486
04/03/2018 13:07	28		photo	P26B	-64.0407	-58.43643	
04/03/2018 13:07	28		photo	P26A	-64.0407	-58.43642	473
04/03/2018 13:05	28		move 10m		-64.0407	-58.43633	490
04/03/2018 13:05	28		photo	P25C	-64.0407	-58.43632	
04/03/2018 13:05	28		photo	P25B	-64.0406	-58.43631	
04/03/2018 13:05	28		photo	P25A	-64.0406	-58.4363	470
04/03/2018 13:03	28		move 10m		-64.0405	-58.43623	

04/03/2018 13:03	28	photo	P24C	-64.0405	-58.43621	
04/03/2018 13:03	28	photo	P24B	-64.0405	-58.43619	477
04/03/2018 13:03	28	photo	P24A	-64.0405	-58.43617	485
04/03/2018 13:01	28	move 10m		-64.0404	-58.43598	477
04/03/2018 13:00	28	photo	P23C	-64.0404	-58.43599	426
04/03/2018 12:59	28	photo	P23B	-64.0404	-58.43598	
04/03/2018 12:59	28	photo	P23A	-64.0404	-58.43597	
04/03/2018 12:58	28	move 10m		-64.0403	-58.43587	467
04/03/2018 12:58	28	photo	P22C	-64.0403	-58.43585	
04/03/2018 12:57	28	photo	P22B	-64.0403	-58.43583	
04/03/2018 12:57	28	photo	P22A	-64.0403	-58.4358	485
04/03/2018 12:56	28	move 10m		-64.0402	-58.4357	
04/03/2018 12:55	28	photo	P21C	-64.0402	-58.43569	
04/03/2018 12:55	28	photo	P21B	-64.0402	-58.43567	499
04/03/2018 12:55	28	photo	P21A	-64.0402	-58.43565	
04/03/2018 12:42	28	move 100 m		-64.0393	-58.43459	457
04/03/2018 12:42	28	photo	P20D	-64.0393	-58.43456	450
04/03/2018 12:41	28	photo	P20C	-64.0392	-58.43455	449
04/03/2018 12:41	28	photo	P20B	-64.0392	-58.43454	468
04/03/2018 12:41	28	photo	P20A	-64.0392	-58.43452	461
04/03/2018 12:40	28	move 10m		-64.0391	-58.43446	475
04/03/2018 12:39	28	photo	P19C	-64.0391	-58.43445	
04/03/2018 12:39	28	photo	P19B	-64.0391	-58.43443	446
04/03/2018 12:39	28	photo	P19A	-64.0391	-58.43442	
04/03/2018 12:38	28	move 10m		-64.0391	-58.43435	
04/03/2018 12:38	28	photo	P18C	-64.0391	-58.43433	452
04/03/2018 12:37	28	photo	P18B	-64.0391	-58.4343	
04/03/2018 12:37	28	photo	P18A	-64.0391	-58.43427	462
04/03/2018 12:36	28	move 10m		-64.039	-58.43417	
04/03/2018 12:36	28	photo	P17C	-64.039	-58.43416	
04/03/2018 12:35	28	photo	P17B	-64.039	-58.43414	

04/03/2018 12:35	28	photo	P17A	-64.039	-58.43413	
04/03/2018 12:34	28	move 10m		-64.0389	-58.43405	450
04/03/2018 12:33	28	photo	P16C	-64.0389	-58.43403	474
04/03/2018 12:33	28	photo	P16B	-64.0389	-58.43402	455
04/03/2018 12:33	28	photo	P16A	-64.0389	-58.434	
04/03/2018 12:31	28	move 10m		-64.0388	-58.43388	
04/03/2018 12:31	28	photo	P15C	-64.0388	-58.43386	486
04/03/2018 12:31	28	photo	P15B	-64.0388	-58.43385	477
04/03/2018 12:31	28	photo	P15A	-64.0388	-58.43383	467
04/03/2018 12:29	28	move 10 m		-64.0387	-58.43377	
04/03/2018 12:29	28	photo	P14C	-64.0387	-58.43376	463
04/03/2018 12:29	28	photo	P14B	-64.0387	-58.43376	454
04/03/2018 12:29	28	photo	P14A	-64.0386	-58.43376	455
04/03/2018 12:28	28	move 10m		-64.0386	-58.43372	458
04/03/2018 12:27	28	photo	P13C	-64.0386	-58.43371	440
04/03/2018 12:27	28	photo	P13B	-64.0386	-58.4337	
04/03/2018 12:27	28	photo	P13A	-64.0386	-58.43369	486
04/03/2018 12:25	28	move 10m		-64.0385	-58.43364	461
04/03/2018 12:25	28	photo	P12C	-64.0385	-58.43362	476
04/03/2018 12:25	28	photo	P12B	-64.0385	-58.43362	459
04/03/2018 12:24	28	photo	P12A	-64.0384	-58.43362	491
04/03/2018 12:23	28	move 10m		-64.0384	-58.43362	
04/03/2018 12:23	28	photo	P11C	-64.0384	-58.43362	
04/03/2018 12:23	28	photo	P11B	-64.0383	-58.43362	491
04/03/2018 12:22	28	photo	P11A	-64.0383	-58.43362	477
04/03/2018 12:09	28	move 100 m		-64.0374	-58.43361	
04/03/2018 12:09	28	photo	P10C	-64.0373	-58.43361	
04/03/2018 12:09	28	photo	P10B	-64.0373	-58.43361	509
04/03/2018 12:08	28	photo	P10A	-64.0373	-58.43362	
04/03/2018 12:07	28	move 10m		-64.0372	-58.43355	
04/03/2018 12:07	28	photo	P09C	-64.0372	-58.43355	498

04/03/2018 12:07	28	photo	P09B	-64.0372	-58.43354	
04/03/2018 12:06	28	photo	P09A	-64.0372	-58.43353	
04/03/2018 12:05	28	move 10m		-64.0371	-58.43348	
04/03/2018 12:05	28	photo	P08C	-64.0371	-58.43347	507
04/03/2018 12:05	28	photo	P08B	-64.0371	-58.43346	507
04/03/2018 12:04	28	photo	P08A	-64.0371	-58.43345	506
04/03/2018 12:02	28	move 10m		-64.037	-58.43338	
04/03/2018 12:02	28	photo	P07B	-64.037	-58.43336	507
04/03/2018 12:02	28	photo	P07A	-64.037	-58.43334	505
04/03/2018 12:01	28	move 10m		-64.0369	-58.43328	507
04/03/2018 12:00	28	photo	P06C	-64.0369	-58.43326	498
04/03/2018 12:00	28	photo	P06B	-64.0369	-58.43325	
04/03/2018 12:00	28	photo	P06A	-64.0369	-58.43323	511
04/03/2018 11:59	28	move 10m		-64.0368	-58.43315	
04/03/2018 11:58	28	photo	P05C	-64.0368	-58.43315	508
04/03/2018 11:58	28	photo	P05B	-64.0368	-58.43314	508
04/03/2018 11:58	28	photo	P05A	-64.0368	-58.43314	476
04/03/2018 11:57	28	move 10m		-64.0367	-58.43311	556
04/03/2018 11:57	28	photo	P04C	-64.0367	-58.4331	509
04/03/2018 11:56	28	photo	P04B	-64.0367	-58.43309	510
04/03/2018 11:56	28	photo	P04A	-64.0367	-58.43307	
04/03/2018 11:55	28	move 10 m		-64.0366	-58.433	
04/03/2018 11:55	28	photo	P03C	-64.0366	-58.43298	512
04/03/2018 11:54	28	photo	P03B	-64.0366	-58.43296	505
04/03/2018 11:54	28	photo	P03A	-64.0366	-58.43295	515
04/03/2018 11:53	28	move 10m		-64.0365	-58.43291	
04/03/2018 11:53	28	photo	P02C	-64.0365	-58.43292	512
04/03/2018 11:52	28	photo	P02B	-64.0365	-58.43293	
04/03/2018 11:52	28	photo	P02A	-64.0364	-58.43293	
04/03/2018 11:50	28	move 10m		-64.0364	-58.43285	524
04/03/2018 11:50	28	photo	P01C	-64.0363	-58.43283	508

04/03/2018 11:50	28	photo	P01B	64.0363	-58.43282	
04/03/2018 11:50	28	photo	P01A	64.0363	-58.43281	489
04/03/2018 11:49	28	on the bottom		64.0363	-58.43281	517
04/03/2018 11:37	28	In the Water		64.0364	-58.43276	534
04/03/2018 10:39	27	ON DECK		64.0377	-58.42348	173
04/03/2018 10:36	27	OFF THE BOTTOM		64.0378	-58.42349	173
04/03/2018 10:35	27	photo	P30B	64.0377	-58.42343	
04/03/2018 10:35	27	photo	P30A	64.0377	-58.42337	
04/03/2018 10:33	27	move 10 m		64.0377	-58.42322	168
04/03/2018 10:33	27	photo	P29B	64.0377	-58.42319	
04/03/2018 10:32	27	photo	P29A	64.0377	-58.4231	166
04/03/2018 10:30	27	move 10 m		64.0376	-58.42287	170
04/03/2018 10:30	27	photo	P28B	64.0376	-58.42285	
04/03/2018 10:30	27	photo	P28A	64.0376	-58.42283	
04/03/2018 10:27	27	move 10 m		64.0376	-58.42254	155
04/03/2018 10:27	27	photo	P27B	64.0376	-58.4225	
04/03/2018 10:27	27	photo	P27A	64.0376	-58.42247	
04/03/2018 10:26	27	move 10 m		64.0375	-58.42241	164
04/03/2018 10:25	27	photo	P26B	64.0375	-58.42225	
04/03/2018 10:25	27	photo	P26A	64.0375	-58.42222	
04/03/2018 10:23	27	move 10 m		64.0375	-58.42204	
04/03/2018 10:23	27	photo	P25B	64.0375	-58.42203	
04/03/2018 10:23	27	photo	P25A	64.0375	-58.42203	146
04/03/2018 10:21	27	move 10 m		64.0374	-58.422	
04/03/2018 10:21	27	photo	P24B	64.0374	-58.422	153
04/03/2018 10:21	27	photo	P24A	64.0373	-58.42199	155
04/03/2018 10:20	27	move 10 m		64.0373	-58.42191	
04/03/2018 10:20	27	photo	P23B	64.0373	-58.42189	150
04/03/2018 10:19	27	photo	P23A	64.0373	-58.42183	149
04/03/2018 10:18	27	move 10 m		64.0372	-58.42177	156
04/03/2018 10:17	27	photo	P22B	64.0372	-58.42177	

04/03/2018 10:17	27	photo	P22A	-64.0372	-58.42176	
04/03/2018 10:15	27	move 100m to next transect		-64.0371	-58.42169	
04/03/2018 10:14	27	photo	P21B	-64.037	-58.42164	
04/03/2018 10:14	27	photo	P21A	-64.037	-58.42163	157
04/03/2018 10:08	27	move 100m to next transect		-64.0362	-58.42094	
04/03/2018 10:07	27	photo	P20B	-64.0362	-58.42091	
04/03/2018 10:07	27	photo	P20A	-64.0362	-58.4209	
04/03/2018 10:06	27	move 10 m		-64.0361	-58.42084	
04/03/2018 10:05	27	photo	P19B	-64.0361	-58.42083	180
04/03/2018 10:05	27	photo	P19A	-64.036	-58.42081	
04/03/2018 10:04	27	move 10 m		-64.036	-58.42075	173
04/03/2018 10:04	27	photo	P18B	-64.036	-58.42074	174
04/03/2018 10:03	27	photo	P18A	-64.0359	-58.42073	
04/03/2018 10:02	27	move 10 m		-64.0359	-58.42068	
04/03/2018 10:02	27	photo	P17B	-64.0359	-58.42067	173
04/03/2018 10:02	27	photo	P17A	-64.0359	-58.42066	
04/03/2018 10:00	27	move 10 m		-64.0358	-58.42061	
04/03/2018 10:00	27	photo	P16B	-64.0358	-58.4206	188
04/03/2018 10:00	27	photo	P16A	-64.0357	-58.4206	
04/03/2018 09:58	27	move 10 m		-64.0357	-58.42053	174
04/03/2018 09:58	27	photo	P15A	-64.0357	-58.42052	
04/03/2018 09:56	27	move 10 m		-64.0357	-58.42051	200
04/03/2018 09:56	27	photo	P14B	-64.0355	-58.42039	
04/03/2018 09:55	27	photo	P14A	-64.0355	-58.42038	191
04/03/2018 09:54	27	move 10 m		-64.0354	-58.42032	
04/03/2018 09:53	27	photo	P13B	-64.0354	-58.4203	176
04/03/2018 09:53	27	photo	P13A	-64.0354	-58.42029	
04/03/2018 09:52	27	move 10 m		-64.0354	-58.42031	183
04/03/2018 09:52	27	photo	P12B	-64.0353	-58.42025	176
04/03/2018 09:51	27	photo	P12A	-64.0353	-58.42023	186
04/03/2018 09:51	27	move 10 m		-64.0354	-58.42026	186

04/03/2018 09:50	27	photo	P11A	-64.0352	58.42016	182
04/03/2018 09:42	27	move 100m to next transect		-64.0344	58.41946	182
04/03/2018 09:42	27	photo	P10A	-64.0343	58.41941	
04/03/2018 09:40	27	move 10 m		-64.0343	58.41934	
04/03/2018 09:40	27	photo	P09B	-64.0343	58.41933	
04/03/2018 09:40	27	photo	P09A	-64.0342	58.41933	
04/03/2018 09:39	27	move 10 m		-64.0342	58.41932	
04/03/2018 09:38	27	photo	P08C	-64.0342	58.41924	
04/03/2018 09:38	27	photo	P08B	-64.0342	58.41923	
04/03/2018 09:37	27	photo	P08A	-64.0341	58.41921	180
04/03/2018 09:36	27	move 10 m		-64.0341	58.41916	
04/03/2018 09:36	27	photo	P07B	-64.0341	58.41916	
04/03/2018 09:36	27	photo	P07A	-64.034	58.41914	184
04/03/2018 09:35	27	move 10 m		-64.034	58.41913	174
04/03/2018 09:35	27	photo	P06D	-64.034	58.41909	
04/03/2018 09:34	27	photo	P06C	-64.034	58.41908	
04/03/2018 09:33	27	photo	P06B	-64.0339	58.41905	192
04/03/2018 09:32	27	photo	P06A	-64.0338	58.41899	173
04/03/2018 09:31	27	move 10 m		-64.0338	58.41893	
04/03/2018 09:31	27	photo	P05B	-64.0338	58.41891	
04/03/2018 09:31	27	photo	P05A	-64.0338	58.41891	
04/03/2018 09:29	27	move 10 m		-64.0337	58.41887	
04/03/2018 09:29	27	photo	P04C	-64.0337	58.41885	
04/03/2018 09:29	27	photo	P04B	-64.0337	58.41883	
04/03/2018 09:28	27	photo	P04A	-64.0336	58.41881	
04/03/2018 09:25	27	move 10 m		-64.0335	58.41868	179
04/03/2018 09:25	27	photo	P03B	-64.0335	58.41866	
04/03/2018 09:25	27	photo	P03A	-64.0335	58.41865	185
04/03/2018 09:24	27	move 10 m		-64.0334	58.41859	0
04/03/2018 09:23	27	photo	P02B	-64.0334	58.41858	175
04/03/2018 09:23	27	photo	P02A	-64.0334	58.41857	

04/03/2018 09:22	27		move 10 m		-64.0334	-58.4186	192
04/03/2018 09:21	27		photo	P01B	-64.0333	-58.41848	
04/03/2018 09:21	27		photo	P01A	-64.0333	-58.41849	
04/03/2018 09:20	27		on bottom		-64.0333	-58.4185	177
04/03/2018 09:13	27	Prince Gustav Channel South 200m	in the water		-64.0332	-58.41849	182
03/03/2018 22:22	25		ON DECK		-64.1161	-58.47849	531
03/03/2018 22:21	25		OUT THE WATER		-64.1161	-58.4785	527
03/03/2018 22:12	25		OFF THE BOTTOM		-64.1158	-58.47843	517
03/03/2018 22:12	25		photo	P30C	-64.1158	-58.47842	525
03/03/2018 22:12	25		photo	P30B	-64.1158	-58.47842	531
03/03/2018 22:12	25		photo	P30A	-64.1157	-58.47842	526
03/03/2018 22:10	25		move 10 m		-64.1157	-58.47841	513
03/03/2018 22:10	25		photo	P29B	-64.1157	-58.47841	520
03/03/2018 22:10	25		photo	P29A	-64.1156	-58.4784	526
03/03/2018 22:08	25		move 10 m		-64.1156	-58.47839	
03/03/2018 22:08	25		photo	P28B	-64.1155	-58.47838	524
03/03/2018 22:08	25		photo	P28A	-64.1155	-58.47837	526
03/03/2018 22:07	25		move 10 m		-64.1155	-58.47836	531
03/03/2018 22:06	25		photo	P27B	-64.1154	-58.47836	531
03/03/2018 22:06	25		photo	P27A	-64.1154	-58.47836	516
03/03/2018 22:04	25		move 10 m		-64.1153	-58.47835	
03/03/2018 22:04	25		photo	P26B	-64.1153	-58.47834	521
03/03/2018 22:04	25		photo	P26A	-64.1153	-58.47834	517
03/03/2018 22:02	25		move 10 m		-64.1152	-58.47832	
03/03/2018 22:02	25		photo	P25B	-64.1152	-58.47831	518
03/03/2018 22:02	25		photo	P25A	-64.1152	-58.47831	511
03/03/2018 22:01	25		move 10 m		-64.1151	-58.4783	
03/03/2018 22:00	25		photo	P24B	-64.1151	-58.4783	520
03/03/2018 22:00	25		photo	P24A	-64.1151	-58.4783	518
03/03/2018 21:58	25		move 10 m		-64.115	-58.47828	519
03/03/2018 21:57	25		photo	P23D	-64.115	-58.47827	516

03/03/2018 21:57	25	photo	P23C	64.1149	-58.47827	507
03/03/2018 21:57	25	photo	P23B	64.1149	-58.47826	517
03/03/2018 21:56	25	photo	P23A	64.1149	-58.47826	520
03/03/2018 21:55	25	move 10 m		64.1148	-58.47825	520
03/03/2018 21:55	25	photo	P22B	64.1148	-58.47825	518
03/03/2018 21:55	25	photo	P22A	64.1148	-58.47824	519
03/03/2018 21:53	25	move 10 m		64.1147	-58.47823	520
03/03/2018 21:53	25	photo	P21B	64.1147	-58.47823	505
03/03/2018 21:53	25	photo	P21A	64.1147	-58.47823	518
03/03/2018 21:44	25	move 100 m		64.1137	-58.47804	499
03/03/2018 21:43	25	photo	P20B	64.1137	-58.47803	500
03/03/2018 21:43	25	photo	P20A	64.1137	-58.47802	530
03/03/2018 21:42	25	move 10 m		64.1136	-58.47801	
03/03/2018 21:42	25	photo	P19B	64.1136	-58.47801	510
03/03/2018 21:42	25	photo	P19A	64.1136	-58.47801	513
03/03/2018 21:41	25	move 10 m		64.1135	-58.478	
03/03/2018 21:40	25	photo	P18B	64.1135	-58.47799	516
03/03/2018 21:40	25	photo	P18A	64.1135	-58.47799	512
03/03/2018 21:39	25	move 10 m		64.1134	-58.47798	497
03/03/2018 21:39	25	photo	P17B	64.1134	-58.47798	497
03/03/2018 21:39	25	photo	P17A	64.1134	-58.47798	497
03/03/2018 21:37	25	move 10 m		64.1134	-58.47796	
03/03/2018 21:37	25	photo	P16B	64.1133	-58.47795	511
03/03/2018 21:37	25	photo	P16A	64.1133	-58.47794	500
03/03/2018 21:35	25	move 10 m		64.1132	-58.47793	
03/03/2018 21:35	25	photo	P15B	64.1132	-58.47793	500
03/03/2018 21:35	25	photo	P15A	64.1132	-58.47792	516
03/03/2018 21:34	25	move 10 m		64.1131	-58.47792	
03/03/2018 21:33	25	photo	P14C	64.1131	-58.47792	509
03/03/2018 21:33	25	photo	P14B	64.1131	-58.47792	500
03/03/2018 21:33	25	photo	P14A	64.1131	-58.47791	501

03/03/2018 21:32	25	move 10 m		-64.113	-58.4779	508
03/03/2018 21:32	25	photo	P13C	-64.113	-58.4779	527
03/03/2018 21:31	25	photo	P13B	-64.113	-58.4779	500
03/03/2018 21:31	25	photo	P13A	-64.113	-58.4779	500
03/03/2018 21:30	25	move 10 m		-64.1129	-58.47789	501
03/03/2018 21:30	25	photo	P12C	-64.1129	-58.47788	502
03/03/2018 21:29	25	photo	P12B	-64.1129	-58.47788	501
03/03/2018 21:29	25	photo	P12A	-64.1129	-58.47788	508
03/03/2018 21:28	25	move 10 m		-64.1128	-58.47787	500
03/03/2018 21:28	25	photo	P11C	-64.1128	-58.47787	
03/03/2018 21:28	25	photo	P11B	-64.1128	-58.47786	500
03/03/2018 21:27	25	photo	P11A	-64.1128	-58.47786	500
03/03/2018 21:19	25	move 100 m		-64.1118	-58.47779	505
03/03/2018 21:19	25	photo	P10B	-64.1118	-58.47779	507
03/03/2018 21:19	25	photo	P10A	-64.1118	-58.47779	509
03/03/2018 21:17	25	move 10 m		-64.1117	-58.47779	508
03/03/2018 21:17	25	photo	P09B	-64.1117	-58.47779	510
03/03/2018 21:17	25	photo	P09A	-64.1117	-58.47779	508
03/03/2018 21:15	25	move 10 m		-64.1116	-58.47776	502
03/03/2018 21:15	25	photo	P08C	-64.1116	-58.47776	507
03/03/2018 21:14	25	photo	P08B	-64.1116	-58.47777	497
03/03/2018 21:14	25	photo	P08A	-64.1115	-58.47777	506
03/03/2018 21:13	25	move 10 m		-64.1115	-58.47776	492
03/03/2018 21:13	25	photo	P07B	-64.1115	-58.47776	489
03/03/2018 21:12	25	photo	P07A	-64.1114	-58.47775	516
03/03/2018 21:11	25	move 10 m		-64.1114	-58.47776	
03/03/2018 21:10	25	photo	P06B	-64.1113	-58.47776	
03/03/2018 21:10	25	photo	P06A	-64.1113	-58.47776	507
03/03/2018 21:09	25	move 10 m		-64.1113	-58.47776	507
03/03/2018 21:09	25	photo	P05C	-64.1112	-58.47776	504
03/03/2018 21:09	25	photo	P05B	-64.1112	-58.47777	

03/03/2018 21:08	25	photo	P05A	-64.1112	-58.47777	506
03/03/2018 21:07	25	move 10 m		-64.1111	-58.47775	
03/03/2018 21:06	25	photo	P04B	-64.1111	-58.47776	489
03/03/2018 21:06	25	photo	P04A	-64.1111	-58.47776	511
03/03/2018 21:05	25	move 10 m		-64.111	-58.47775	
03/03/2018 21:04	25	photo	P03B	-64.111	-58.47775	506
03/03/2018 21:04	25	photo	P03A	-64.111	-58.47775	510
03/03/2018 21:03	25	move 10 m		-64.1109	-58.47775	504
03/03/2018 21:02	25	photo	P02B	-64.1109	-58.47775	491
03/03/2018 21:02	25	photo	P02A	-64.1109	-58.47775	501
03/03/2018 21:01	25	move 10 m		-64.1108	-58.47774	490
03/03/2018 21:01	25	photo	PO1B	-64.1108	-58.47775	
03/03/2018 21:00	25	photo	P01A	-64.1108	-58.47775	507
03/03/2018 21:00	25	on bottom		-64.1108	-58.47775	
03/03/2018 20:51	25	in the water		-64.1108	-58.47772	
03/03/2018 20:26	24	ON DECK		-64.1156	-58.4984	
03/03/2018 20:11	24	OFF THE BOTTOM		-64.1156	-58.49838	
03/03/2018 20:11	24	photo	P30C	-64.1155	-58.49838	
03/03/2018 20:11	24	photo	P30B	-64.1155	-58.49838	816
03/03/2018 20:11	24	photo	P30A	-64.1155	-58.49837	814
03/03/2018 20:10	24	move 10 m		-64.1155	-58.49836	
03/03/2018 20:09	24	photo	P29C	-64.1154	-58.49835	
03/03/2018 20:09	24	photo	P29B	-64.1154	-58.49835	814
03/03/2018 20:09	24	photo	p29A	-64.1154	-58.49835	
03/03/2018 20:07	24	move 10 m		-64.1153	-58.49835	832
03/03/2018 20:07	24	photo	P28B	-64.1153	-58.49835	
03/03/2018 20:07	24	photo	P28A	-64.1153	-58.49835	815
03/03/2018 20:07	24	move 10 m		-64.1153	-58.49835	815
03/03/2018 20:06	24	photo	P27C	-64.1152	-58.49836	813
03/03/2018 20:05	24	photo	P27B	-64.1152	-58.49836	
03/03/2018 20:05	24	photo	P27A	-64.1152	-58.49836	813

03/03/2018 20:04	24	move 10 m		-64.1151	-58.49834	813
03/03/2018 20:03	24	photo	P26B	-64.1151	-58.49834	849
03/03/2018 20:03	24	photo	P26A	-64.1151	-58.49833	
03/03/2018 20:02	24	move 10 m		-64.1151	-58.49832	
03/03/2018 20:02	24	photo	P25B	-64.115	-58.49832	
03/03/2018 20:01	24	photo	P25A	-64.115	-58.49833	832
03/03/2018 20:00	24	move 10 m		-64.115	-58.49844	853
03/03/2018 20:00	24	photo	P24B	-64.115	-58.49848	
03/03/2018 20:00	24	photo	P24A	-64.1149	-58.49851	815
03/03/2018 19:58	24	move 10 m		-64.1149	-58.49866	817
03/03/2018 19:58	24	photo	P23B	-64.1149	-58.49868	816
03/03/2018 19:58	24	photo	P23A	-64.1149	-58.4987	
03/03/2018 19:56	24	move 10 m		-64.1148	-58.49871	816
03/03/2018 19:56	24	photo	P22B	-64.1148	-58.49871	
03/03/2018 19:56	24	photo	P22A	-64.1147	-58.49871	
03/03/2018 19:54	24	move 10 m		-64.1147	-58.4987	819
03/03/2018 19:54	24	photo	P21B	-64.1147	-58.4987	
03/03/2018 19:54	24	photo	P21A	-64.1147	-58.4987	
03/03/2018 19:45	24	move 100 m		-64.1137	-58.49932	827
03/03/2018 19:45	24	photo	P20B	-64.1137	-58.49933	
03/03/2018 19:45	24	photo	P20A	-64.1137	-58.49933	
03/03/2018 19:43	24	move 10 m		-64.1137	-58.49945	
03/03/2018 19:43	24	photo	P19C	-64.1136	-58.49945	832
03/03/2018 19:43	24	photo	P19B	-64.1136	-58.49947	833
03/03/2018 19:43	24	photo	P19A	-64.1136	-58.49948	832
03/03/2018 19:42	24	move 10 m		-64.1136	-58.49954	833
03/03/2018 19:42	24	photo	P18B	-64.1136	-58.49955	828
03/03/2018 19:42	24	photo	P18A	-64.1136	-58.49956	834
03/03/2018 19:40	24	move 10 m		-64.1135	-58.49955	828
03/03/2018 19:40	24	photo	P17B	-64.1135	-58.49954	
03/03/2018 19:40	24	photo	P17A	-64.1135	-58.49954	828

03/03/2018 19:39	24	move 10 m		-64.1134	-58.49952	828
03/03/2018 19:39	24	photo	P16B	-64.1134	-58.49953	828
03/03/2018 19:39	24	photo	P16A	-64.1134	-58.49953	833
03/03/2018 19:37	24	move 10 m		-64.1133	-58.49955	829
03/03/2018 19:37	24	photo	P15B	-64.1133	-58.49955	833
03/03/2018 19:37	24	photo	P15A	-64.1133	-58.49955	
03/03/2018 19:36	24	move 10 m		-64.1133	-58.49954	
03/03/2018 19:36	24	photo	P14C	-64.1132	-58.49954	829
03/03/2018 19:35	24	photo	P14B	-64.1132	-58.49954	829
03/03/2018 19:35	24	photo	P14A	-64.1132	-58.49954	832
03/03/2018 19:35	24	move 10 m		-64.1132	-58.49954	
03/03/2018 19:34	24	photo	P13C	-64.1132	-58.49954	829
03/03/2018 19:34	24	photo	P13B	-64.1131	-58.49954	829
03/03/2018 19:34	24	photo	P13A	-64.1131	-58.49953	829
03/03/2018 19:33	24	move 10 m		-64.1131	-58.49954	829
03/03/2018 19:32	24	photo	P12B	-64.1131	-58.49954	
03/03/2018 19:32	24	photo	P12A	-64.113	-58.49954	
03/03/2018 19:31	24	move 10 m		-64.113	-58.49954	834
03/03/2018 19:31	24	photo	P11C	-64.1129	-58.49954	833
03/03/2018 19:30	24	photo	p11B	-64.1129	-58.49954	829
03/03/2018 19:30	24	photo	P11A	-64.1129	-58.49955	
03/03/2018 19:23	24	move 100 m to next transect		-64.112	-58.49954	
03/03/2018 19:22	24	photo	P10B	-64.112	-58.49954	
03/03/2018 19:22	24	photo	P10A	-64.112	-58.49954	832
03/03/2018 19:20	24	move 10 m		-64.1119	-58.49952	
03/03/2018 19:20	24	photo	P09B	-64.1119	-58.49952	
03/03/2018 19:20	24	photo	P09A	-64.1118	-58.49952	831
03/03/2018 19:19	24	move 10 m		-64.1119	-58.49952	
03/03/2018 19:18	24	photo	P08C	-64.1118	-58.49952	831
03/03/2018 19:18	24	photo	P08B	-64.1117	-58.49952	834
03/03/2018 19:18	24	photo	P08A	-64.1117	-58.49953	831

03/03/2018 19:17	24	move 10 m		-64.1117	-58.49954	
03/03/2018 19:16	24	photo	P07B	-64.1117	-58.49954	831
03/03/2018 19:16	24	photo	P07A	-64.1116	-58.49954	831
03/03/2018 19:14	24	move 10 m		-64.1116	-58.49954	831
03/03/2018 19:14	24	photo	P06B	-64.1115	-58.49954	831
03/03/2018 19:14	24	photo	P06A	-64.1115	-58.49954	831
03/03/2018 19:13	24	move 10 m		-64.1115	-58.49953	831
03/03/2018 19:12	24	photo	P05B	-64.1114	-58.49953	831
03/03/2018 19:12	24	photo	P05A	-64.1114	-58.49953	831
03/03/2018 19:11	24	move 10 m		-64.1114	-58.49953	831
03/03/2018 19:10	24	photo	P04B	-64.1113	-58.49954	831
03/03/2018 19:10	24	photo	P04A	-64.1113	-58.49954	
03/03/2018 19:09	24	move 10 m		-64.1112	-58.49954	831
03/03/2018 19:08	24	photo	P03B	-64.1112	-58.49954	831
03/03/2018 19:08	24	photo	P03A	-64.1112	-58.49955	831
03/03/2018 19:07	24	move 10 m		-64.1111	-58.49954	
03/03/2018 19:07	24	photo	P02B	-64.1111	-58.49955	
03/03/2018 19:06	24	photo	P02A	-64.1111	-58.49955	831
03/03/2018 19:05	24	move 10 m		-64.111	-58.49954	
03/03/2018 19:05	24	photo	P01B	-64.111	-58.49954	
03/03/2018 19:04	24	photo	P01A	-64.111	-58.49955	
03/03/2018 19:04	24	on bottom		-64.111	-58.49955	831
03/03/2018 18:50	24	in the water		-64.111	-58.49954	830
03/03/2018 15:38	22	ON DECK		64.0464	-58.4617	810
03/03/2018 15:26	22	OFF THE BOTTOM		-64.0453	-58.46032	
03/03/2018 15:18	22	moving 100m to next transect		-64.0449	-58.45979	818
03/03/2018 15:10	22	move 10 m		-64.0446	-58.45921	834
03/03/2018 15:10	22	photo	P26C	-64.0445	-58.45917	827
03/03/2018 15:10	22	photo	P26B	-64.0445	-58.45915	833
03/03/2018 15:10	22	photo	P26A	-64.0445	-58.45911	826
03/03/2018 15:08	22	move 10 m		-64.0444	-58.45898	

03/03/2018 15:08	22	photo	P25C	-64.0444	-58.45896	829
03/03/2018 15:08	22	photo	P25B	-64.0444	-58.45893	
03/03/2018 15:08	22	photo	P25A	-64.0444	-58.45889	
03/03/2018 15:07	22	move 10 m		-64.0445	-58.45902	836
03/03/2018 15:06	22	photo	P24C	-64.0443	-58.45868	827
03/03/2018 15:06	22	photo	P24B	-64.0443	-58.45866	824
03/03/2018 15:05	22	photo	P24A	-64.0443	-58.45863	824
03/03/2018 15:05	22	move 10m		-64.0443	-58.45872	832
03/03/2018 15:05	22	photo	P23C	-64.0442	-58.45852	
03/03/2018 15:04	22	photo	P23B	-64.0442	-58.45845	
03/03/2018 15:04	22	photo	P23A	-64.0442	-58.45843	817
03/03/2018 15:03	22	move 10 m		-64.0443	-58.45877	
03/03/2018 15:02	22	photo	P22B	-64.0441	-58.4582	815
03/03/2018 15:01	22	photo	P22A	-64.044	-58.4581	827
03/03/2018 15:01	22	move to next transect		-64.0439	-58.45785	809
03/03/2018 15:00	22	photo	P21C	-64.0439	-58.45796	
03/03/2018 14:59	22	photo	P21B	-64.0439	-58.45792	
03/03/2018 14:59	22	photo	P21A	-64.0439	-58.45787	
03/03/2018 14:58	22	photo	P20C	-64.0439	-58.45784	
03/03/2018 14:57	22	photo	P20A	-64.0439	-58.45785	809
03/03/2018 14:48	22	move 10 m		-64.0437	-58.45752	818
03/03/2018 14:47	22	photo	P18C	-64.0437	-58.45759	
03/03/2018 14:47	22	photo	P18B	-64.0437	-58.45757	815
03/03/2018 14:46	22	photo	P18A	-64.0437	-58.45752	818
03/03/2018 14:45	22	move 10 m		-64.0436	-58.45743	
03/03/2018 14:45	22	photo	P17B	-64.0434	-58.45708	812
03/03/2018 14:45	22	photo	P17A	-64.0436	-58.4574	817
03/03/2018 14:44	22	move 10 m		-64.0436	-58.45733	813
03/03/2018 14:43	22	photo	P16C	-64.0436	-58.45728	816
03/03/2018 14:43	22	photo	P16B	-64.0435	-58.45727	825
03/03/2018 14:43	22	photo	P16A	-64.0435	-58.45726	821

03/03/2018 14:41	22	move 10 m		-64.0435	-58.45713	822
03/03/2018 14:41	22	photo	P15D	-64.0435	-58.45716	818
03/03/2018 14:41	22	photo	P15C	-64.0434	-58.45708	812
03/03/2018 14:41	22	photo	P15B	-64.0434	-58.45706	
03/03/2018 14:40	22	photo	P15A	-64.0434	-58.45704	
03/03/2018 14:39	22	move 10 m		-64.0434	-58.45695	
03/03/2018 14:39	22	photo	P14D	-64.0434	-58.45693	813
03/03/2018 14:38	22	photo	P14C	-64.0434	-58.4569	810
03/03/2018 14:38	22	photo	P14B	-64.0433	-58.45688	
03/03/2018 14:38	22	photo	P14A	-64.0433	-58.45685	
03/03/2018 14:37	22	move 10 m		-64.0433	-58.45676	810
03/03/2018 14:36	22	photo	P13C	-64.0432	-58.45673	810
03/03/2018 14:36	22	photo	P13B	-64.0432	-58.45671	
03/03/2018 14:35	22	photo	P13A	-64.0432	-58.45668	
03/03/2018 14:34	22	move 10 m		-64.0431	-58.45653	811
03/03/2018 14:33	22	photo	P12C	-64.0431	-58.45651	812
03/03/2018 14:33	22	photo	P12B	-64.0431	-58.45649	
03/03/2018 14:33	22	photo	P12A	-64.0431	-58.45648	811
03/03/2018 14:31	22	move 10 m		-64.043	-58.45634	
03/03/2018 14:31	22	photo	P11C	-64.043	-58.45633	
03/03/2018 14:31	22	photo	P11B	-64.043	-58.45632	809
03/03/2018 14:31	22	photo	P11A	-64.043	-58.45633	810
03/03/2018 14:07	22	move 100 m		-64.0421	-58.45457	
03/03/2018 14:06	22	photo	P10C	-64.0421	-58.45449	803
03/03/2018 14:06	22	photo	P10B	-64.0421	-58.45447	
03/03/2018 14:05	22	photo	P10A	-64.042	-58.45439	799
03/03/2018 14:03	22	move 10 m		-64.042	-58.45431	
03/03/2018 14:03	22	photo	P09C	-64.042	-58.45425	804
03/03/2018 14:03	22	photo	P09B	-64.042	-58.45423	
03/03/2018 14:02	22	photo	P09A	-64.042	-58.4542	
03/03/2018 14:01	22	move 10 m		-64.0419	-58.45409	800

03/03/2018 14:01	22	photo	P08C	64.0419	-58.45407	
03/03/2018 14:00	22	photo	P08B	64.0419	-58.45406	
03/03/2018 14:00	22	photo	P08A	64.0419	-58.45405	
03/03/2018 13:59	22	move 10 m		64.0418	-58.45393	807
03/03/2018 13:58	22	photo	P07D	64.0418	-58.45386	801
03/03/2018 13:58	22	photo	P07C	64.0418	-58.45389	799
03/03/2018 13:58	22	photo	P07B	64.0418	-58.45386	
03/03/2018 13:57	22	photo	P07A	64.0417	-58.45382	
03/03/2018 13:56	22	move 10 m		64.0417	-58.45373	793
03/03/2018 13:56	22	photo	P06C	64.0417	-58.4537	802
03/03/2018 13:56	22	photo	P06B	64.0417	-58.45367	799
03/03/2018 13:55	22	photo	P06A	64.0417	-58.45365	
03/03/2018 13:55	22	move 10 m		64.0416	-58.4536	805
03/03/2018 13:54	22	photo	P05E	64.0416	-58.45359	
03/03/2018 13:54	22	photo	P05D	64.0416	-58.45354	798
03/03/2018 13:53	22	photo	P05C	64.0416	-58.45348	
03/03/2018 13:53	22	photo	P05B	64.0416	-58.45345	790
03/03/2018 13:53	22	photo	P05A	64.0416	-58.45342	
03/03/2018 13:51	22	move 10 m		64.0415	-58.45333	794
03/03/2018 13:51	22	photo	P04C	64.0415	-58.45331	791
03/03/2018 13:51	22	photo	P04B	64.0415	-58.45329	797
03/03/2018 13:51	22	photo	P04A	64.0415	-58.45326	
03/03/2018 13:47	22	move 10 m		64.0414	-58.45309	
03/03/2018 13:47	22	photo	P03C	64.0414	-58.45307	780
03/03/2018 13:47	22	photo	P03B	64.0414	-58.45304	798
03/03/2018 13:47	22	photo	P03A	64.0414	-58.45301	
03/03/2018 13:45	22	move 10m		64.0414	-58.45286	782
03/03/2018 13:45	22	photo	P02D	64.0458	-58.46094	
03/03/2018 13:45	22	photo	P02C	64.0413	-58.45284	772
03/03/2018 13:45	22	photo	P02B	64.0413	-58.45282	
03/03/2018 13:44	22	photo	P02A	64.0413	-58.45279	

03/03/2018 13:44	22		move 10 m		-64.0413	-58.45277	
03/03/2018 13:43	22		photo	P01C	-64.0412	-58.45265	
03/03/2018 13:42	22		photo	P01B	-64.0412	-58.45264	775
03/03/2018 13:42	22		photo	P01A	-64.0412	-58.45263	788
03/03/2018 13:41	22	on the bottom			-64.0412	-58.45264	
03/03/2018 13:25	22		in the water		-64.0412	-58.45263	783
03/03/2018 12:31	21		back on deck		-64.0412	-58.45271	784
03/03/2018 12:14	21		in the water		-64.0412	-58.45268	791
02/03/2018 23:02			SUCS PC Clock Reset		-63.7092	-57.44092	585
02/03/2018 21:22	18		on deck		-63.6177	-57.49766	402
02/03/2018 21:22	18		out of water		-63.6177	-57.49768	401
02/03/2018 21:14	18		Off the bottom		-63.6177	-57.49744	
02/03/2018 21:14	18		photo	P30B	-63.6177	-57.4974	399
02/03/2018 21:14	18		photo	P30A	-63.6177	-57.49736	407
02/03/2018 21:12	18		move 10m		-63.6176	-57.4972	
02/03/2018 21:12	18		photo	P29B	-63.6176	-57.49717	406
02/03/2018 21:12	18		photo	P29A	-63.6176	-57.49714	402
02/03/2018 21:10	18		move 10m		-63.6176	-57.49699	405
02/03/2018 21:10	18		photo	P28B	-63.6176	-57.49696	400
02/03/2018 21:10	18		photo	P28A	-63.6176	-57.49692	398
02/03/2018 21:09	18		move 10m		-63.6175	-57.49679	397
02/03/2018 21:08	18		photo	P27C	-63.6175	-57.49676	409
02/03/2018 21:08	18		photo	P27B	-63.6175	-57.49674	403
02/03/2018 21:08	18		photo	P27A	-63.6175	-57.4967	407
02/03/2018 21:07	18		move 10m		-63.6175	-57.49656	407
02/03/2018 21:06	18		photo	P26B	-63.6175	-57.49654	397
02/03/2018 21:06	18		photo	P26A	-63.6175	-57.49651	405
02/03/2018 21:05	18		move 10m		-63.6174	-57.49636	410
02/03/2018 21:04	18		photo	P25C	-63.6174	-57.49633	409
02/03/2018 21:04	18		photo	P25B	-63.6174	-57.49629	396
02/03/2018 21:04	18		photo	P25A	-63.6174	-57.49626	408

02/03/2018 21:03	18	move 10m		-63.6174	-57.49611	401
02/03/2018 21:02	18	photo	P24C	-63.6174	-57.49608	406
02/03/2018 21:02	18	photo	P24B	-63.6173	-57.49604	407
02/03/2018 21:02	18	photo	P24A	-63.6173	-57.49601	411
02/03/2018 21:01	18	move 10m		-63.6173	-57.49587	411
02/03/2018 21:00	18	photo	P23B	-63.6173	-57.49584	417
02/03/2018 21:00	18	photo	P23A	-63.6173	-57.49582	405
02/03/2018 20:59	18	move 10m		-63.6173	-57.49569	
02/03/2018 20:59	18	photo	P22C	-63.6173	-57.49567	415
02/03/2018 20:58	18	photo	P22B	-63.6173	-57.49564	412
02/03/2018 20:58	18	photo	P22A	-63.6173	-57.49562	409
02/03/2018 20:56	18	move 10m		-63.6172	-57.49539	399
02/03/2018 20:56	18	photo	P21C	-63.6172	-57.49539	399
02/03/2018 20:56	18	photo	P21B	-63.6172	-57.49534	407
02/03/2018 20:55	18	photo	P21A	-63.6172	-57.4953	412
02/03/2018 20:47	18	move 100 m		-63.6167	-57.4933	406
02/03/2018 20:47	18	photo	P20C	-63.6167	-57.49328	
02/03/2018 20:46	18	photo	P20B	-63.6168	-57.49326	407
02/03/2018 20:46	18	photo	P20A	-63.6168	-57.49324	403
02/03/2018 20:45	18	move 10m		-63.6167	-57.49313	410
02/03/2018 20:45	18	photo	P19C	-63.6167	-57.4931	406
02/03/2018 20:44	18	photo	P19B	-63.6167	-57.49306	
02/03/2018 20:44	18	photo	P19A	-63.6167	-57.49302	404
02/03/2018 20:43	18	move 10m		-63.6167	-57.49288	413
02/03/2018 20:43	18	photo	P18C	-63.6167	-57.49285	412
02/03/2018 20:42	18	photo	P18B	-63.6166	-57.49282	413
02/03/2018 20:42	18	photo	P18A	-63.6166	-57.49278	411
02/03/2018 20:41	18	move 10m		-63.6166	-57.49266	403
02/03/2018 20:41	18	photo	P17B	-63.6166	-57.49263	414
02/03/2018 20:40	18	photo	P17A	-63.6166	-57.4926	402
02/03/2018 20:39	18	move 10m		-63.6166	-57.49242	411

02/03/2018 20:39	18	photo	P16C	63.6166	-57.4924	402
02/03/2018 20:38	18	photo	P16B	63.6166	-57.49235	417
02/03/2018 20:38	18	photo	P16A	63.6166	-57.49231	416
02/03/2018 20:37	18	move 10m		63.6165	-57.49221	406
02/03/2018 20:37	18	photo	P15B	63.6165	-57.49219	406
02/03/2018 20:37	18	photo	P15A	63.6165	-57.49216	409
02/03/2018 20:35	18	move 10m		63.6165	-57.49203	401
02/03/2018 20:35	18	photo	P14B	63.6165	-57.49201	411
02/03/2018 20:35	18	photo	P14A	63.6165	-57.49199	403
02/03/2018 20:33	18	move 10m		63.6165	-57.49183	
02/03/2018 20:33	18	photo	P13E	63.6164	-57.49181	408
02/03/2018 20:33	18	photo	P13D	63.6164	-57.49178	415
02/03/2018 20:33	18	photo	P13C	63.6164	-57.49174	408
02/03/2018 20:32	18	photo	P13B	63.6164	-57.49172	410
02/03/2018 20:32	18	photo	P13A	63.6164	-57.49169	414
02/03/2018 20:31	18	move 10m		63.6164	-57.49155	
02/03/2018 20:31	18	photo	P12C	63.6164	-57.49153	410
02/03/2018 20:31	18	photo	P12B	63.6164	-57.49151	408
02/03/2018 20:30	18	photo	P12A	63.6164	-57.49148	409
02/03/2018 20:29	18	move 10m		63.6164	-57.49132	
02/03/2018 20:29	18	photo	P11C	63.6164	-57.4913	408
02/03/2018 20:29	18	photo	P11B	63.6164	-57.49127	416
02/03/2018 20:28	18	photo	P11A	63.6164	-57.49124	412
02/03/2018 20:23	18	move 100 m		63.6159	-57.4893	400
02/03/2018 20:23	18	photo	P10B	63.6159	-57.48928	417
02/03/2018 20:23	18	photo	P10A	63.6159	-57.48925	407
02/03/2018 20:21	18	move 10m		63.6159	-57.48909	405
02/03/2018 20:21	18	photo	P09D	63.6159	-57.48907	408
02/03/2018 20:21	18	photo	P09C	63.6159	-57.48904	412
02/03/2018 20:20	18	photo	P09B	63.6159	-57.48902	404
02/03/2018 20:20	18	photo	P09A	63.6159	-57.48899	401

02/03/2018 20:19	18	move 10m		63.6158	-57.4888	411
02/03/2018 20:18	18	photo	P08C	63.6158	57.48877	
02/03/2018 20:18	18	photo	P08B	63.6158	57.48874	403
02/03/2018 20:18	18	photo	P08A	63.6158	-57.4887	411
02/03/2018 20:16	18	move 10m		63.6158	57.48853	410
02/03/2018 20:16	18	photo	P07C	63.6158	57.48848	
02/03/2018 20:15	18	photo	P07B	63.6157	57.48845	404
02/03/2018 20:15	18	photo	P07A	63.6157	57.48842	413
02/03/2018 20:14	18	move 10m		63.6157	57.48829	411
02/03/2018 20:14	18	photo	P06C	63.6157	57.48826	409
02/03/2018 20:13	18	photo	P06B	63.6157	57.48823	404
02/03/2018 20:13	18	photo	P06A	63.6157	-57.4882	409
02/03/2018 20:12	18	move 10m		63.6157	57.48805	405
02/03/2018 20:11	18	photo	P05A	63.6157	57.48799	407
02/03/2018 20:10	18	move 10m		63.6156	57.48781	404
02/03/2018 20:09	18	photo	P04B	63.6156	57.48776	406
02/03/2018 20:09	18	photo	P04A	63.6156	57.48773	410
02/03/2018 20:08	18	move 10m		63.6156	57.48759	405
02/03/2018 20:07	18	photo	P03B	63.6156	57.48756	404
02/03/2018 20:07	18	photo	P03A	63.6156	57.48754	405
02/03/2018 20:05	18	move 10m		63.6155	57.48724	407
02/03/2018 20:04	18	photo	P02C	63.6155	57.48722	
02/03/2018 20:04	18	photo	P02B	63.6155	57.48719	406
02/03/2018 20:04	18	photo	P02A	63.6155	57.48717	410
02/03/2018 20:02	18	move 10m		63.6154	57.48698	408
02/03/2018 20:02	18	photo	P01C	63.6154	57.48696	408
02/03/2018 20:02	18	photo	P01B	63.6154	57.48696	410
02/03/2018 20:01	18	photo	P01A	63.6154	57.48696	404
02/03/2018 20:01	18	on the bottom		63.6154	57.48696	404
02/03/2018 19:53	18	In the Water		63.6154	57.48696	408
02/03/2018 19:32	17	on deck		63.6205	57.49586	292

02/03/2018 19:31	17	out of water		-63.6205	-57.49587	294
02/03/2018 19:26	17	Off the bottom		-63.6204	-57.49543	295
02/03/2018 19:26	17	photo	P30C	-63.6204	-57.4954	292
02/03/2018 19:25	17	photo	P30B	-63.6204	-57.49537	294
02/03/2018 19:25	17	photo	P30A	-63.6204	-57.49534	294
02/03/2018 19:24	17	move 10m		-63.6204	-57.4952	293
02/03/2018 19:24	17	photo	P29C	-63.6204	-57.49517	
02/03/2018 19:24	17	photo	P29B	-63.6204	-57.49514	296
02/03/2018 19:23	17	photo	P29A	-63.6204	-57.49508	294
02/03/2018 19:22	17	move 10 m		-63.6204	-57.49493	298
02/03/2018 19:22	17	photo	P28B	-63.6204	-57.4949	295
02/03/2018 19:21	17	photo	P28A	-63.6204	-57.49486	295
02/03/2018 19:20	17	move 10m		-63.6204	-57.49473	293
02/03/2018 19:20	17	photo	P27C	-63.6204	-57.49471	296
02/03/2018 19:20	17	photo	P27B	-63.6204	-57.49468	295
02/03/2018 19:19	17	photo	P27A	-63.6204	-57.49464	294
02/03/2018 19:18	17	move 10m		-63.6203	-57.49452	295
02/03/2018 19:18	17	photo	P26C	-63.6203	-57.49449	295
02/03/2018 19:18	17	photo	P26B	-63.6203	-57.49446	296
02/03/2018 19:18	17	photo	P26A	-63.6203	-57.49443	296
02/03/2018 19:17	17	move 10m		-63.6203	-57.49431	295
02/03/2018 19:16	17	photo	P25C	-63.6203	-57.49429	
02/03/2018 19:16	17	photo	P25B	-63.6203	-57.49426	295
02/03/2018 19:16	17	photo	P25A	-63.6203	-57.49423	297
02/03/2018 19:14	17	move 10m		-63.6203	-57.49404	297
02/03/2018 19:14	17	photo	P24B	-63.6203	-57.494	296
02/03/2018 19:14	17	photo	P24A	-63.6203	-57.49397	298
02/03/2018 19:13	17	move 10m		-63.6202	-57.49384	297
02/03/2018 19:12	17	photo	P23C	-63.6202	-57.4938	297
02/03/2018 19:12	17	photo	P23B	-63.6202	-57.49374	297
02/03/2018 19:12	17	photo	P23A	-63.6202	-57.49374	297

02/03/2018 19:11	17	move 10m		-63.6202	-57.49362	299
02/03/2018 19:11	17	photo	P22B	-63.6202	-57.49359	298
02/03/2018 19:10	17	photo	P22A	-63.6202	-57.49356	298
02/03/2018 19:09	17	move 10m		-63.6202	-57.49336	299
02/03/2018 19:08	17	photo	P21B	-63.6202	-57.49333	298
02/03/2018 19:08	17	photo	P21A	-63.6202	-57.49331	298
02/03/2018 19:00	17	move 100 m		-63.6199	-57.49116	303
02/03/2018 19:00	17	photo	P20C	-63.6199	-57.49111	306
02/03/2018 19:00	17	photo	P20B	-63.6199	-57.49109	306
02/03/2018 19:00	17	photo	P20A	-63.6199	-57.49106	302
02/03/2018 18:58	17	move 10m		-63.6198	-57.49091	
02/03/2018 18:58	17	photo	P19B	-63.6198	-57.49088	301
02/03/2018 18:58	17	photo	P19A	-63.6198	-57.49084	305
02/03/2018 18:56	17	move 10m		-63.6198	-57.49068	304
02/03/2018 18:56	17	photo	P18C	-63.6198	-57.49063	306
02/03/2018 18:56	17	photo	P18B	-63.6198	-57.49061	303
02/03/2018 18:56	17	photo	P18A	-63.6198	-57.49057	304
02/03/2018 18:54	17	move 10m		-63.6198	-57.49043	307
02/03/2018 18:54	17	photo	P17C	-63.6198	-57.49041	304
02/03/2018 18:54	17	photo	P17B	-63.6198	-57.49038	304
02/03/2018 18:54	17	photo	P17A	-63.6198	-57.49035	305
02/03/2018 18:53	17	move 10m		-63.6197	-57.49024	307
02/03/2018 18:53	17	photo	P16D	-63.6197	-57.49022	307
02/03/2018 18:52	17	photo	P16C	-63.6197	-57.49019	
02/03/2018 18:52	17	photo	P16B	-63.6197	-57.49017	306
02/03/2018 18:52	17	photo	P16A	-63.6197	-57.49015	306
02/03/2018 18:50	17	move 10m		-63.6197	-57.48997	307
02/03/2018 18:50	17	photo	P15C	-63.6197	-57.48994	308
02/03/2018 18:50	17	photo	P15B	-63.6197	-57.48991	306
02/03/2018 18:50	17	photo	P15A	-63.6197	-57.48988	307
02/03/2018 18:49	17	move 10m		-63.6197	-57.48976	307

02/03/2018 18:49	17	photo	P14B	63.6197	-57.48973	
02/03/2018 18:48	17	photo	P14A	63.6197	-57.4897	306
02/03/2018 18:47	17	move 10m		63.6197	-57.48957	
02/03/2018 18:47	17	photo	P13B	63.6197	-57.48955	
02/03/2018 18:47	17	photo	P13A	63.6197	-57.48952	307
02/03/2018 18:45	17	move 10m		63.6196	-57.48929	
02/03/2018 18:45	17	photo	P12B	63.6196	-57.48926	
02/03/2018 18:45	17	photo	P12A	63.6196	-57.48923	308
02/03/2018 18:43	17	move 10m		63.6196	-57.4891	307
02/03/2018 18:43	17	photo	P11B	63.6196	-57.48908	307
02/03/2018 18:43	17	photo	P11A	63.6196	-57.48904	308
02/03/2018 18:34	17	move 100 m		63.6193	-57.48686	307
02/03/2018 18:34	17	photo	P10B	63.6193	-57.48683	
02/03/2018 18:34	17	photo	P10A	63.6193	-57.48681	309
02/03/2018 18:32	17	move 10m		63.6193	-57.48665	
02/03/2018 18:32	17	photo	P09D	63.6193	-57.48663	
02/03/2018 18:32	17	photo	P09C	63.6193	-57.4866	308
02/03/2018 18:32	17	photo	P09B	63.6192	-57.48656	308
02/03/2018 18:31	17	photo	P09A	63.6192	-57.48653	306
02/03/2018 18:31	17	move 10m		63.6192	-57.48641	
02/03/2018 18:30	17	photo	P08B	63.6192	-57.48638	306
02/03/2018 18:30	17	photo	P08A	63.6192	-57.48633	306
02/03/2018 18:28	17	move 10m		63.6192	-57.4861	302
02/03/2018 18:28	17	photo	P07B	63.6192	-57.48607	304
02/03/2018 18:27	17	photo	P07A	63.6192	-57.48603	306
02/03/2018 18:26	17	move 10m		63.6192	-57.48592	301
02/03/2018 18:26	17	photo	P06C	63.6192	-57.48589	303
02/03/2018 18:26	17	photo	P06B	63.6191	-57.48586	
02/03/2018 18:25	17	photo	P06A	63.6191	-57.48583	301
02/03/2018 18:24	17	move 10m		63.6191	-57.48569	
02/03/2018 18:24	17	photo	P05C	63.6191	-57.48566	

02/03/2018 18:24	17	photo	P05B	-63.6191	-57.48563	300
02/03/2018 18:24	17	photo	P05A	-63.6191	-57.48559	300
02/03/2018 18:22	17	move 10m		-63.6191	-57.48543	
02/03/2018 18:22	17	photo	P04B	-63.6191	-57.48541	
02/03/2018 18:22	17	photo	P04A	-63.6191	-57.48539	299
02/03/2018 18:21	17	move 10m		-63.6191	-57.48526	299
02/03/2018 18:21	17	photo	P03B	-63.6191	-57.48522	299
02/03/2018 18:20	17	photo	P03A	-63.6191	-57.48518	299
02/03/2018 18:20	17	move 10m		-63.6191	-57.48511	299
02/03/2018 18:19	17	photo	P02A	-63.6191	-57.48508	299
02/03/2018 18:18	17	move 10m		-63.619	-57.48487	299
02/03/2018 18:17	17	photo	P01B	-63.619	-57.48484	
02/03/2018 18:17	17	photo	P01A	-63.619	-57.48485	299
02/03/2018 18:17	17	on the bottom		-63.619	-57.48484	299
02/03/2018 18:12	17	in the water		-63.619	-57.48486	299
02/03/2018 18:12	17	in the water		-63.619	-57.48486	299
02/03/2018 18:08	16	back on deck		-63.619	-57.48489	299
02/03/2018 18:08	16	back on deck		-63.619	-57.48489	299
02/03/2018 18:08	16	back on deck		-63.619	-57.48489	299
02/03/2018 18:07	16	in the water		-63.619	-57.4849	299
02/03/2018 18:07	16	In the Water		-63.619	-57.48487	299
02/03/2018 17:24	15	on deck		-63.6257	-57.49239	173
02/03/2018 17:19	15	Off the bottom		-63.6257	-57.49235	168
02/03/2018 17:18	15	photo	P30B	-63.6257	-57.49233	168
02/03/2018 17:18	15	photo	P30A	-63.6257	-57.49232	169
02/03/2018 17:17	15	move 10m		-63.6257	-57.49224	170
02/03/2018 17:16	15	photo	P29B	-63.6257	-57.4922	170
02/03/2018 17:16	15	photo	P29A	-63.6257	-57.49217	170
02/03/2018 17:15	15	move 10m		-63.6257	-57.49208	171
02/03/2018 17:15	15	photo	P28B	-63.6257	-57.49205	
02/03/2018 17:15	15	photo	P28A	-63.6257	-57.49202	172

02/03/2018 17:14	15	move 10m		-63.6257	-57.49185	
02/03/2018 17:13	15	photo	P27B	-63.6257	-57.49182	173
02/03/2018 17:13	15	photo	P27A	-63.6257	-57.49179	173
02/03/2018 17:12	15	move 10m		-63.6256	-57.49169	
02/03/2018 17:12	15	photo	P26A	-63.6256	-57.49165	174
02/03/2018 17:11	15	move 10m		-63.6256	-57.49153	174
02/03/2018 17:11	15	photo	P25A	-63.6256	-57.49149	173
02/03/2018 17:09	15	move 10m		-63.6256	-57.49134	
02/03/2018 17:09	15	photo	P24B	-63.6256	-57.49131	174
02/03/2018 17:09	15	photo	P24A	-63.6256	-57.49129	175
02/03/2018 17:08	15	move 10m		-63.6256	-57.49116	
02/03/2018 17:07	15	photo	P23B	-63.6256	-57.49112	
02/03/2018 17:07	15	photo	P23A	-63.6256	-57.49109	176
02/03/2018 17:05	15	move 10m		-63.6255	-57.49078	178
02/03/2018 17:04	15	photo	P22B	-63.6255	-57.49074	185
02/03/2018 17:04	15	photo	P22A	-63.6255	-57.49068	178
02/03/2018 17:02	15	move 10m		-63.6255	-57.4905	
02/03/2018 17:02	15	photo	P21D	-63.6255	-57.49043	180
02/03/2018 17:01	15	photo	P21C	-63.6255	-57.49039	181
02/03/2018 17:01	15	photo	P21B	-63.6255	-57.49036	
02/03/2018 17:01	15	photo	P21A	-63.6255	-57.49034	181
02/03/2018 16:53	15	move 100 m		-63.6253	-57.48847	
02/03/2018 16:52	15	photo	P20C	-63.6253	-57.48842	210
02/03/2018 16:52	15	photo	P20B	-63.6253	-57.4884	213
02/03/2018 16:52	15	photo	P20A	-63.6253	-57.48836	196
02/03/2018 16:51	15	move 10m		-63.6253	-57.48822	
02/03/2018 16:51	15	photo	P19C	-63.6253	-57.48819	
02/03/2018 16:50	15	photo	P19B	-63.6252	-57.48811	
02/03/2018 16:50	15	photo	P19A	-63.6252	-57.48808	198
02/03/2018 16:48	15	move 10m		-63.6252	-57.48792	200
02/03/2018 16:48	15	photo	P18C	-63.6252	-57.48785	

02/03/2018 16:47	15	photo	P18B	63.6252	-57.48775	
02/03/2018 16:47	15	photo	P18A	63.6252	-57.48772	201
02/03/2018 16:45	15	move 10m		63.6251	-57.48756	
02/03/2018 16:45	15	photo	P17C	63.6251	-57.48752	203
02/03/2018 16:45	15	photo	P17B	63.6251	-57.48749	202
02/03/2018 16:44	15	photo	P17A	63.6251	-57.48745	203
02/03/2018 16:43	15	move 10m		63.6251	-57.48735	203
02/03/2018 16:43	15	photo	P16B	63.6251	-57.48733	
02/03/2018 16:43	15	photo	P16A	63.6251	-57.4873	204
02/03/2018 16:42	15	move 10m		63.6251	-57.48717	205
02/03/2018 16:42	15	photo	P15B	63.6251	-57.48712	208
02/03/2018 16:41	15	photo	P15A	63.6251	-57.48709	206
02/03/2018 16:40	15	move 10m		63.6251	-57.48698	216
02/03/2018 16:40	15	photo	P14B	63.6251	-57.48696	207
02/03/2018 16:40	15	photo	P14A	-63.625	-57.48692	207
02/03/2018 16:39	15	move 10m		-63.625	-57.48678	208
02/03/2018 16:38	15	photo	P13B	-63.625	-57.48676	208
02/03/2018 16:38	15	photo	P13A	-63.625	-57.48673	209
02/03/2018 16:36	15	move 10m		-63.625	-57.4865	211
02/03/2018 16:36	15	photo	P12C	-63.625	-57.48647	211
02/03/2018 16:36	15	photo	P12B	-63.625	-57.48644	211
02/03/2018 16:36	15	photo	P12A	-63.625	-57.48641	211
02/03/2018 16:34	15	move 10m		63.6249	-57.48625	212
02/03/2018 16:34	15	photo	P11B	63.6249	-57.48623	212
02/03/2018 16:33	15	photo	P11A	63.6249	-57.48618	213
02/03/2018 16:26	15	move 100 m		63.6246	-57.48426	
02/03/2018 16:26	15	photo	P10B	63.6246	-57.4842	221
02/03/2018 16:26	15	photo	P10A	63.6246	-57.48417	221
02/03/2018 16:24	15	move 10m		63.6246	-57.48402	222
02/03/2018 16:24	15	photo	P09C	63.6246	-57.48398	222
02/03/2018 16:24	15	photo	P09B	63.6246	-57.48395	223

02/03/2018 16:24	15	photo	P09A	-63.6246	-57.48393	222
02/03/2018 16:22	15	move 10m		-63.6245	-57.48377	222
02/03/2018 16:22	15	photo	P08C	-63.6245	-57.48374	222
02/03/2018 16:22	15	photo	P08B	-63.6245	-57.48371	222
02/03/2018 16:22	15	photo	P08A	-63.6245	-57.48366	222
02/03/2018 16:21	15	move 10m		-63.6245	-57.48358	223
02/03/2018 16:20	15	photo	P07B	-63.6245	-57.48354	222
02/03/2018 16:20	15	photo	P07A	-63.6245	-57.48351	223
02/03/2018 16:19	15	move 10m		-63.6245	-57.48341	222
02/03/2018 16:19	15	photo	P06B	-63.6245	-57.48338	222
02/03/2018 16:19	15	photo	P06A	-63.6245	-57.48332	222
02/03/2018 16:17	15	move 10m		-63.6245	-57.48318	223
02/03/2018 16:17	15	photo	P05C	-63.6245	-57.48316	224
02/03/2018 16:17	15	photo	P05B	-63.6245	-57.48313	
02/03/2018 16:17	15	photo	P05A	-63.6245	-57.48311	224
02/03/2018 16:15	15	move 10m		-63.6244	-57.48291	224
02/03/2018 16:15	15	photo	P04D	-63.6244	-57.48288	226
02/03/2018 16:14	15	photo	P04C	-63.6244	-57.48281	
02/03/2018 16:14	15	photo	P04B	-63.6244	-57.48278	224
02/03/2018 16:14	15	photo	P04A	-63.6244	-57.48275	
02/03/2018 16:12	15	move 10m		-63.6244	-57.48261	
02/03/2018 16:12	15	photo	P03C	-63.6244	-57.48259	224
02/03/2018 16:12	15	photo	P03B	-63.6244	-57.48256	224
02/03/2018 16:12	15	photo	P03A	-63.6244	-57.48252	224
02/03/2018 16:11	15	move 10m		-63.6243	-57.48238	225
02/03/2018 16:10	15	photo	P02C	-63.6243	-57.48235	
02/03/2018 16:10	15	photo	P02B	-63.6243	-57.48232	224
02/03/2018 16:10	15	photo	P02A	-63.6243	-57.48229	225
02/03/2018 16:08	15	move 10m		-63.6243	-57.48213	225
02/03/2018 16:08	15	photo	P01B	-63.6243	-57.48214	225
02/03/2018 16:07	15	photo	P01A	-63.6243	-57.48213	225

02/03/2018 16:07	15		on the bottom		-63.6243	-57.48213	225
02/03/2018 16:02	15	Duse Bay	In the Water		-63.6243	-57.4821	224
02/03/2018 15:58	14		out of water		-63.6243	-57.48208	225
02/03/2018 15:57	14	Duse Bay	In the Water		-63.6243	-57.48208	225
02/03/2018 12:43	11		ON DECK		-63.6168	-57.50918	430
02/03/2018 12:34	11		OFF THE BOTTOM		-63.6168	-57.5091	426
02/03/2018 12:34	11		photo	P30D	-63.6168	-57.50905	434
02/03/2018 12:33	11		photo	P30C	-63.6168	-57.50901	
02/03/2018 12:33	11		photo	P30B	-63.6168	-57.50898	
02/03/2018 12:33	11		photo	P30A	-63.6168	-57.50894	434
02/03/2018 12:31	11		move 10 m		-63.6167	-57.50879	453
02/03/2018 12:31	11		photo	P29C	-63.6167	-57.50877	
02/03/2018 12:31	11		photo	P29B	-63.6167	-57.50874	431
02/03/2018 12:31	11		photo	P29A	-63.6167	-57.5087	438
02/03/2018 12:29			move 10 m		-63.6167	-57.50852	
02/03/2018 12:29	11		photo	P28C	-63.6167	-57.50848	
02/03/2018 12:29	11		photo	P28B	-63.6167	-57.50845	429
02/03/2018 12:28	11		photo	P28A	-63.6167	-57.50841	441
02/03/2018 12:27	11		move 10 m		-63.6167	-57.50827	430
02/03/2018 12:27	11		photo	P27C	-63.6167	-57.50824	
02/03/2018 12:27	11		photo	P27B	-63.6167	-57.50821	439
02/03/2018 12:26	11		photo	P27A	-63.6167	-57.50818	446
02/03/2018 12:25	11		move 10 m		-63.6166	-57.50799	435
02/03/2018 12:25	11		photo	P26C	-63.6166	-57.50796	439
02/03/2018 12:24	11		photo	P26B	-63.6166	-57.50791	441
02/03/2018 12:24	11		photo	P26A	-63.6166	-57.50786	439
02/03/2018 12:23	11		move 10 m		-63.6166	-57.50772	446
02/03/2018 12:22	11		photo	P25C	-63.6166	-57.5077	
02/03/2018 12:22	11		photo	P25B	-63.6166	-57.50767	442
02/03/2018 12:22	11		photo	P25A	-63.6166	-57.50764	444
02/03/2018 12:20	11		move 10 m		-63.6166	-57.50745	439

02/03/2018 12:20	11	photo	P24B	63.6166	-57.50742	446
02/03/2018 12:20	11	photo	P24A	63.6166	-57.50738	
02/03/2018 12:19	11	move 10 m		63.6166	-57.50726	
02/03/2018 12:18	11	photo	P23C	63.6166	-57.50723	
02/03/2018 12:18	11	photo	P23B	63.6165	-57.5072	442
02/03/2018 12:18	11	photo	P23A	63.6165	-57.50716	449
02/03/2018 12:16	11	move 10 m		63.6165	-57.50697	
02/03/2018 12:16	11	photo	P22C	63.6165	-57.50695	
02/03/2018 12:16	11	photo	P22B	63.6165	-57.50692	
02/03/2018 12:16	11	photo	P22A	63.6165	-57.50689	451
02/03/2018 12:14	11	move 10 m		63.6165	-57.50668	
02/03/2018 12:13	11	photo	P21B	63.6164	-57.5066	452
02/03/2018 12:12	11	photo	P21A	63.6164	-57.50653	452
02/03/2018 12:11	11	photo (not transect)	21E	63.6164	-57.50641	
02/03/2018 12:11	11	photo (not transect)	21D	63.6164	-57.5063	454
02/03/2018 12:09	11	photo (not transect)	21C	63.6164	-57.50606	455
02/03/2018 12:08	11	photo (not transect)	P21B	63.6163	-57.50585	456
02/03/2018 12:08	11	photo (not transect)	21A	63.6163	-57.50576	458
02/03/2018 12:00	11	move 100 m		63.6162	-57.50437	464
02/03/2018 11:59	11	photo	P20C	63.6162	-57.50434	474
02/03/2018 11:59	11	photo	P20B	63.6162	-57.50432	
02/03/2018 11:59	11	photo	P20A	63.6161	-57.5043	466
02/03/2018 11:58	11	move 10 m		63.6161	-57.50416	
02/03/2018 11:57	11	photo	P19C	63.6161	-57.50414	478
02/03/2018 11:57	11	photo	P19B	63.6161	-57.50412	468
02/03/2018 11:57	11	photo	P19A	63.6161	-57.50409	467
02/03/2018 11:56	11	move 10 m		63.6161	-57.50393	472
02/03/2018 11:55	11	photo	P18B	63.6161	-57.50387	471
02/03/2018 11:55	11	photo	P18A	63.6161	-57.50384	477
02/03/2018 11:54	11	move 10 m		63.6161	-57.50368	
02/03/2018 11:53	11	photo	P17C	63.6161	-57.50365	473

02/03/2018 11:53	11	photo	P17B	-63.6161	-57.50361	526
02/03/2018 11:53	11	photo	P17A	-63.6161	-57.50357	518
02/03/2018 11:52	11	move 10 m		-63.616	-57.50339	478
02/03/2018 11:51	11	photo	P16C	-63.616	-57.50337	479
02/03/2018 11:51	O11	photo	P16B	-63.616	-57.50334	481
02/03/2018 11:51	11	photo	P16A	-63.616	-57.50331	475
02/03/2018 11:50	11	move 10 m		-63.616	-57.50317	481
02/03/2018 11:49	11	photo	P15B	-63.616	-57.50314	479
02/03/2018 11:49	11	photo	P15A	-63.616	-57.5031	481
02/03/2018 11:48	11	move 10 m		-63.616	-57.503	484
02/03/2018 11:48	11	photo	P14D	-63.616	-57.50298	485
02/03/2018 11:48	11	photo	P14C	-63.616	-57.50295	482
02/03/2018 11:48	11	photo	P14B	-63.616	-57.50292	479
02/03/2018 11:47	11	photo	P14A	-63.616	-57.50286	480
02/03/2018 11:46	11	move 10 m		63.6159	-57.5027	
02/03/2018 11:45	11	photo	P13C	63.6159	-57.50265	483
02/03/2018 11:45	11	photo	P13B	63.6159	-57.50263	
02/03/2018 11:45	11	photo	P13A	63.6159	-57.5026	487
02/03/2018 11:44	11	move 10 m		63.6159	-57.5025	485
02/03/2018 11:44	11	photo	P12C	63.6159	-57.50248	484
02/03/2018 11:43	11	photo	P12B	63.6159	-57.50244	493
02/03/2018 11:43	11	photo	P12A	63.6159	-57.50241	486
02/03/2018 11:42	11	move 10 m		63.6159	-57.50222	491
02/03/2018 11:42	11	photo	P11B	63.6159	-57.50222	487
02/03/2018 11:41	11	photo	P11A	63.6159	-57.5022	501
02/03/2018 11:25	11	move 100 m		63.6157	-57.50005	496
02/03/2018 11:25	11	photo	P10D	63.6157	-57.50014	
02/03/2018 11:24	11	photo	P10C	63.6157	-57.50011	
02/03/2018 11:24	11	photo	P10B	63.6157	-57.50008	
02/03/2018 11:24	11	photo	P10A	63.6168	-57.50918	430
02/03/2018 11:23	11	move 10 m		63.6156	-57.4999	496

02/03/2018 11:22	11	photo	P09C	63.6156	-57.49987	497
02/03/2018 11:22	11	photo	P09B	63.6156	-57.49984	497
02/03/2018 11:22	11	photo	P09A	63.6156	-57.4998	498
02/03/2018 11:21	11	move 10 m		63.6156	-57.49966	498
02/03/2018 11:21	11	photo	P08C	63.6156	-57.49963	498
02/03/2018 11:20	11	photo	P08B	63.6156	-57.49961	497
02/03/2018 11:20	11	photo	P08A	63.6156	-57.49957	498
02/03/2018 11:19	11	move 10 m		63.6156	-57.49942	498
02/03/2018 11:18	11	photo	P07C	63.6156	-57.49938	498
02/03/2018 11:18	11	photo	P07B	63.6156	-57.49935	496
02/03/2018 11:18	11	photo	P07A	63.6156	-57.49932	498
02/03/2018 11:16	11	move 10 m		63.6156	-57.49915	499
02/03/2018 11:16	11	photo	P06C	63.6156	-57.49912	499
02/03/2018 11:16	11	photo	P06B	63.6155	-57.49908	498
02/03/2018 11:16	11	photo	P06A	63.6155	-57.49905	500
02/03/2018 11:14	11	move 10 m		63.6155	-57.49888	
02/03/2018 11:14	11	photo	P05D	63.6155	-57.49885	
02/03/2018 11:14	11	photo	P05C	63.6155	-57.49881	494
02/03/2018 11:13	11	photo	P05B	63.6155	-57.49878	
02/03/2018 11:13	11	photo	P05A	63.6155	-57.49875	499
02/03/2018 11:11	11	move 10 m		63.6155	-57.49851	502
02/03/2018 11:11	11	photo	P04B	63.6155	-57.49848	493
02/03/2018 11:11	11	photo	P04A	63.6155	-57.49845	498
02/03/2018 11:09	11	move 10 m		63.6155	-57.4983	
02/03/2018 11:09	11	photo	P03C	63.6155	-57.49827	499
02/03/2018 11:09	11	photo	P03B	63.6155	-57.49823	498
02/03/2018 11:08	11	photo	P03A	63.6155	-57.4982	498
02/03/2018 11:07	11	move 10 m		63.6154	-57.49805	
02/03/2018 11:07	11	photo	P02C	63.6154	-57.49801	
02/03/2018 11:06	11	photo	P02B	63.6154	-57.49795	500
02/03/2018 11:06	11	photo	P02A	63.6154	-57.4979	499

02/03/2018 11:05	11		move 10 m		-63.6154	-57.49782	498
02/03/2018 11:05	11		photo	P01C	-63.6154	57.49776	490
02/03/2018 11:04	11	Duse Bay	photo	P01B	-63.6154	-57.4977	500
02/03/2018 11:04	11	Duse BAy	photo	P01A	-63.6154	57.49769	
02/03/2018 11:03	11	Duse Bay	on bottom		-63.6154	57.49769	498
02/03/2018 10:59	11	Duse Bay	in the water		-63.6154	57.49768	498

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