JR260B

British Antarctic Survey

NATURAL ENVIRONMENT RESEARCH COUNCIL

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1. Introduction

1.1 Rationale

JR260b is a 19 day Western Core Box cruise to determine the distribution and biomass of krill just off South Georgia. In addition there was an AFI-CGS “Unravelling the origin of the isotope anomaly in atmospheric N_2O” led by Jan Kaiser (UEA) and a collaborator from the AWI investigating the effects of hypoxia on krill.

1.2 R260b Western Core Box

Since 1981 BAS have undertaken cruises to determine krill biomass as part of the ongoing assessment of the status of the marine ecosystem in the region of South Georgia. This unique time series, known as the “Western Core Box” is part of the Ecosystem Programme contribution to BAS’ national capability. It is comprised of an acoustic grid survey of 8 transects each of 80 km in length, together with associated net and oceanographic sampling and the calibration of the acoustic instrumentation. In addition to the acoustic survey, which covers a wide area but has limited temporal coverage, there are three moorings (one in the Western Core Box and one south and one north of South Georgia) to provide a temporal context. These moorings had been recovered during an earlier cruise (JR260a) at the beginning of the season, a key task of this cruise was to re-deploy these mooring. Finally a series of stratified net samples around the WCB mooring was required to validate the acoustic backscatter series collected by the ADCP and WCP on the WCB mooring. These were undertaken over a 24 hour period to provide information on diurnal variation.

1.3 Scientific Personnel

Sophie Fielding	BAS	PSO, Acoustician
Vsevolod Afanasyev	BAS	AME
Dave Connor	BAS	Data Management
Peter Enderlein	BAS	Equipment
Imke Grefe	UEA	Ocean chemistry
Damien Guihen	BAS	Biological oceanography
Jeremy Robst	BAS	ITS
Ryan Saunders	BAS	Krill/fish biology
Gabi Stowasser	BAS	Bioenergetics
Nelly Tremblay	AWI	Krill biogeochemistry

Table 1 - Scientific Personnel

1.4 JCR Officers and Crew

Chapman, Graham P	Master JCR
Cox, Jo	Chief Offr, JCR
Evans, Simon	2nd Offr JCR
Thompson, Ben	3rd Offr, JCR
Barratt, Tom	3rd Offr, JCR
Waddicor, Charlie	ETO, Comms
Cutting, Dave	Chief Eng, JCR
Collard, Glynn	2nd Eng, JCR
Pickard, Colin	2nd Eng, JCR
Ditchfield, Jim	3rd Eng, JCR
Eadie, Steve	4th Eng, JCR
Wright, Simon	Deck Eng, JCR

Dunbar, Nick	ETO Eng, JCR
Williams, Heather	Cadet
Roberts, John	Cadet
Gibson, Hamish	Purser
Stewart, George	Bosun
Jenkins, Derek	Bosun's Mate
Mullaney, Cliff	SG1
Leggett, Colin	SG1
O'Duffy, John	SG1
McGowan, John	SG1
Estibeiro, Tony	SG1
Robinshaw, Mark	MG1
Ashworth, Matt	MG1
Walker, Keith	Cook
Molloy, Paddy	2nd Cook
Weston, Kenny	Sr Stwd
Newall, Jimmy	Stwd
Lee, Derek	Stwd
Patterson, Tom	Stwd
Rudd, James	Doc

Table 2 - JCR Officers and Crew

1.5 Acknowledgements

Sophie Fielding PSO
This cruise represents the long term time series measurements (WCB) efforts for the ecosystems programme. The cruise was manned by a small number of scientists, who all played their relevant parts with enthusiasm which enabled the objectives of this cruise to be completed. We would like to acknowledge the enthusiasm, interest and hard work of the ships officers and crew in enabling this cruise to be completed successfully. This cruise was part of the LTMS Ecosystems programme component of PSPE and NERC Antarctic Funding Initiative.

1.6 Cruise events summary

Undertaking	Date	Event numbers
Test station	30/12/2011	1 – 7
P3 mooring deployment	31/12/2011	8-13
WCB mooring 24 hr station	01/01/2012	14-20
WCB acoustics, CTD, fishing	02-05/01/2012	21-64
WCB mooring 24 hr station	06/01/2012	65-71
Stromness calibration	07-08/01/2012	72-76
WCB mooring deployment	09/01/2012	78-79
P2 mooring deployment	10/01/2012	83-84
Gully 24 hr station (aborted)	11/01/2012	85-90
Gear Test	12/01/2012	91-94

Table 3 - Cruise Events Summary

1.7 PSO Cruise Diary

26/12/2011

10:30 – ships party join ship and commence mobilisation. Unpacked the two containers and finished at 17:00 to allow science staff to recover from flight

27/12/2011
08:00 – Continue mobilisation alongside at FIPASS. Airfreight of WCP and ADCP arrived.

28/12/2011
08:00 – depart from Stanley FIPASS. Anchor off Gypsy cove. Weather moderate, sunny skies. Complete mobilisation at 11:30 and then head to South Georgia. Wind behind us so making rapid progress to P3.

29/12/2011
10:30 – Ships fire drill, major incident plan evoked, provided a 1.5 hour diversion to the day of passage.

30/12/2011
09:30 – Commenced test station, starting with SUCS system. Had a few computer crashes but performed okay generally. CTD worked fine, Imke collected first samples. Then MOCNESS fired okay (although with some delay on triggers). The pressure sensor is gash, and 5 cod-ends were lost on retrieval. RMT8 practise went well, with all teams getting there. Finished test station around 15:30 and proceeded on towards P3.

31/12/2011
Four acoustic transects across the mooring were undertaken overnight.
05:00 CTD to 1000m
07:00 Commence mooring, with approximately 2 hours prep. Just as the mooring was ready to be deployed a hydraulic oil leak was found from the port seismic boom. This was cleared up and at 10:30 we commenced deployment of the mooring. Finished at 13:00. Triangulate then head off to target fish 18:00 – 22:00. One haul on no targets got a few krill for Nelly.

01/01/2012
New Year celebrations with the ringing of the ships bell by ETO Nic and engineering cadet John started the New Year. Acoustic transects over night (four) before RMT stratified net at the WCB mooring location. Due to the swell the net was fished from 150 to 100 m and then 100 to 50 m to reduce tension on the wire. This was started at 07:30, followed by a CTD for Imke. One acoustic transect was completed before attempting a second RMT stratified haul, which was unfortunately aborted due to a cracked pipe on the stern gantry. Two SUCS deployments were undertaken whilst the stern gantry was being fixed. Few krill were observed in the water column, but many were seen at depth seemingly attracted by the light on the SUCS system.
The gantry was fixed and two more RMT stratified net hauls were undertaken in addition to one more acoustic transect, before breaking off to head to the beginning of the WCB transect 1.1 (southern end)

02/01/2012
The weather has calmed considerably, and the WCB transect commenced at 06:00. Two transects were completed by 16:00 LT and the night was set up for 2 CTDs, 2 stratified RMTs and target fishing. As a result of freshening winds it was decided to complete the two stratified nets before commencing target fishing. The second stratified net (W1.2N) yielded krill for length frequency and no target was fished.

03/01/2012
The morning CTD W1.2N was completed by 03:15 and the ship relocated to start the WCB2.1 transect from the northern end. Acoustic transects proceeded followed by the deep CTD. Then RMT8 stratified, two krill target RMTs that both successfully caught krill and then a further RMT8 stratified haul followed by the shallow CTD preceding the next days transects.

04/01/2012
The ship commenced WCB transect 3.1 from the southern end, all XBTs undertaken. Following on from the transects the night consisted of 2 CTDs (3.2 north and south), 2 stratified RMT8s (at the CTD locations) and 2 target RMT8 hauls, one on the shelf and one off shelf. Large krill catches resulted.

05/01/2012
Last day of the corebox and the weather starting to freshen. Both transects completed in reasonable conditions and a night of target fishing looking for a large swarm to put the RMT8, SUCS and CTD through. Failed to find decent targets. An attempt to fish a swarm only visible in the 120 kHz data (the 38 kHz was obscured by bubbles) was aborted due to tension on the wire.

06/01/2012
The midnight stratified RMT8 was cancelled as a result of swell and the night was spent undertaking acoustic transects. The first stratified net was undertaken at 07:00 and the day was spent alternating between acoustic transects, RMT8 stratified nets and SUCS. The evening ended with a targeted trawl to collect krill for Hugh Fernley W. This caught only enough krill for Nelly to continue her experiments with and we returned to the 24 hour station.

07/01/2012
The stratified net haul started the day, including a large catch of krill to fulfil our 5 kg krill quota for Hugh. After the haul we relocated to Stromness harbour to commence calibration of the echosounders and testing of the MOCNESS. Arriving to stunning views and a pleasant sunny day at Stromness. A CTD was undertaken to calculate the relevant alpha and speed of sound and calibration commenced with the small ES853 from an inflated doughnut anchored against a small boat. The WCP was suspended in test mode from the aft starboard effer crane afterwards, whilst most people got the opportunity for a boat trip around Leith and Husvik. Finally the EK60 calibration was undertaken during the evening, finishing just after midnight.

08/01/2012
The morning commenced at 08:00 with a MOCNESS dip (minus nets) to examine whether the pressure sensor was reading results that could be converted to something sensible. The conclusion after comparison between the pressure reading and wire out was that it was not predictable, and therefore not usable in the current circumstances. After 4 Norwegians were delivered to the ship from KEP on the Pharos through a boat transfer in Stromness harbour. Following on the SUCS was deployed to examine the seabed and potentially ships anchor chain (unsuccessful in this case). The vessel departed Stromness at 14:00 heading east in search of small krill at the commonly fished bank. At 22:00 a krill swarm was fished resulting in a nice sample of subadult krill.

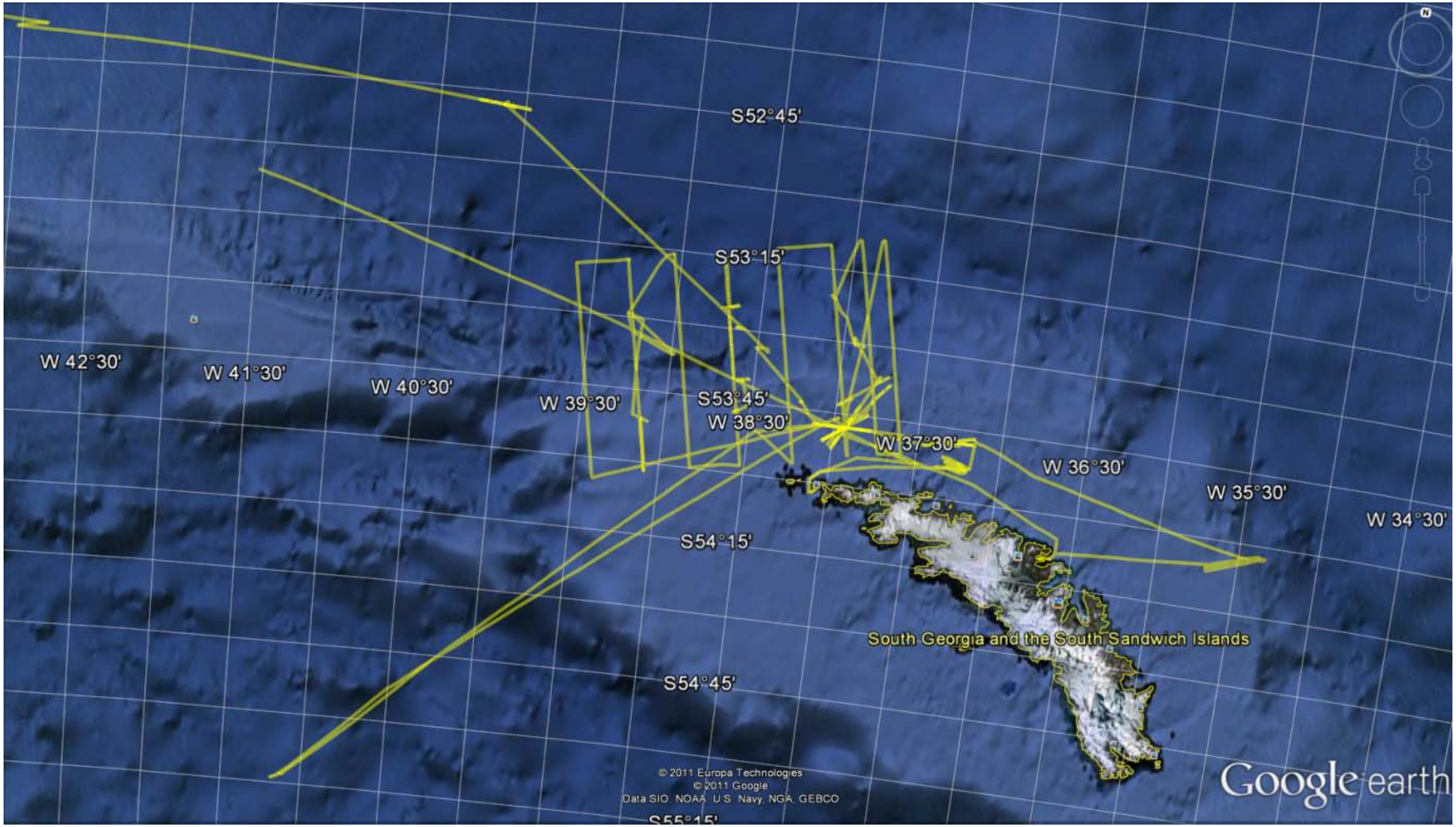
09/01/2012
The ship headed west to the Gully station in preparation for undertaking a 24 hour stratified net series. The ship undertook three transects, before examination of the weather identified that the next couple of days would provide the only certain opportunity for deploying the WCB and P2 mooring. The Gully station was interrupted and the ship headed to the WCB mooring site to deploy the mooring. At 16:30 a CTD was undertaken at the mooring position, before the WCB mooring was deployed. A test EBS followed the mooring deployment to examine the new camera position recently mounted to the EBS frame. A final krill trawl was undertaken before heading to the P2 mooring position (12 hours away).
10/01/2012
We arrived at P2 approximately 11:00. A 1600m CTD was undertaken prior to the mooring deployment. The mooring deployment commenced 14:45 and the ship moved off position to return to the Gully station at 18:00 in thick fog.

11/01/2012
We returned to the Gully station at 09:41 and commenced with an acoustic transect, followed by a SUCS deployment and then a stratified net (200-100,100-0) at the station. Preceding the stratified net the RMT8 was washed due to considerable dead krill within the net. The afternoon comprised of acoustic transects before assessing the conditions for an RMT8 stratified at 18:00. Due to a considerable swell, although not adverse wind, the RMT8 was postponed. The evening was spent looking for a large krill swarm to deploy the SUCS through and the CTD in the swarm and outside. This was located at 22:00 and the SUCS and CTD commenced, although the krill were most ephemeral and disappeared whenever equipment went into the water. The midnight stratified net at the Gully station was abandoned and since the station was now no longer 24 hours, the station was abandoned and the ship relocated to more sheltered waters for some EBS and RMT8 tests in the morning.

12/01/2012
The morning commenced with three RMT8 trials, testing the altimeter in a number of positions to examine clear detection of the seabed. This followed with one EBS trial, before the ship heading to Bird Island to pick up 1 passenger for the return trip to Stanley. The evening was spent target fishing in relatively sheltered waters to the north east of Bird Island. One successful haul of smallish krill completed the work around South Georgia and the ship headed for Stanley at 22:30.

13/01/2012
Lumpy passage to Stanley ongoing.

1.8 Cruise Track



2 Oceanography

David Connor (based on JR245 report from Hugh Venables)

2.1 CTD

2.1.1 Introduction

A Conductivity-Temperature-Depth (CTD) unit was used to vertically profile the water column. **Fourteen** casts were carried out in total, including one test station, six as part of the Western Core Box survey (full depth or 1000m), one prior to the acoustics calibration with the rest at target fishing stations and mooring locations to full depth, 1000m or 1600m. CTD positions are included in Table Ocea.1. CTD profiles were numbered by ship event number.

2.1.2 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 and, in deep water, often returns depths that are several tens of metres deeper than the true bottom location.

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 Win32 version 7.21d (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. The pumps are typically expected to switch on between 30 and 60 seconds after the instrument is deployed, but during JR260B they could take up to 2 ½ minutes to switch on.

After the 10m soak, the CTD was raised to as close to the surface as wave and swell condition allowed and then lowered to within 10m of the seabed or to the maximum depth specified. 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 sensor averages these readings to produce one value for each bottle fire. Short times between firing pairs of bottles led to no SBE35 readings for the second bottle of the pair.

Bottle firing depths were determined by Imke Grefe as required by the Nitrous oxide N_2O project as outlined in section 8. Water samples were taken from five stations with event numbers 003, 016, 026, 035, and 083. Water sample details and identification can be found in section 8.

No salinity calibrations samples were taken.

2.2.3 Data acquisition and preliminary processing

The CTD data were recorded using SeaSave 911plus/917plus Win32 version 7.21d, which created four files:

JR260B[NNN].hex	ascii hex-encoded data file
JR260B[NNN].XMLCON	XML configuration file containing calibration information
JR260B[NNN].hdr	ascii header file containing sensor information
JR260B[NNN].bl	ascii file containing bottle fire information

Table 4 - CTD filenames

where NNN is the CTD event number (column 1 in Table Ocea.1). The output was a file named *JR260[NNN].cnv*. The *Data Conversion* module calculates parameters using the coefficients detailed in Table 2.1 as follows:

Pressure: $$P = C\left(1-\frac{T_0^2}{T^2}\right)\left(1-D\left(1-\frac{T_0^2}{T^2}\right)\right)$$

where *P* is the pressure (dbar), *T* is the pressure period in μsec, $D = D_1 + D_2U$, $C = C_1 + C_2U + C_3U$ and $T_0 = T_1 + T_2U + T_3U_2 + T_4U_3 + T_5U_4$ are calculated from the coefficients detailed in Table Ocea.2, where *U* is the temperature in ˚C.

Conductivity: $$cond = \frac{\left(g + hf^2 + if^3 + jf^4\right)}{10\left(1+\delta t + \varepsilon p\right)}$$

where *cond* is the conductivity in Sm^{-1}, *p* is pressure, *t* is temperature, *δ* = CTcor and *ε* = CPcor. All coefficients are included in Table Ocea.2.

Temperature: $$temp(ITS90) = \frac{1}{\left\{g + h\left[\ln(f_0/f)\right] + i[\ln^2(f_0/f)] + j[\ln^3(f_0/f)]\right\}} - 273.15$$

Where the temperature, *temp*, is measured in ˚C, *g*, *h*, *i* and *j* are coefficients detailed in Table Ocea.2 and *f* is the frequency output by the sensor.

Oxygen: $$oxy = \left(Soc(V + Voffset)\right)e^{Tcor.T}Oxsat(T,S)e^{Pcor.P}$$

where *oxy* is dissolved oxygen in ml/l, *V* is the voltage output from the SBE43 sensor, *Oxsat* is oxygen saturation (ml/l), a function of temperature, *T*, salinity, *S*, and pressure, *P*, and the remaining coefficients are detailed in Table Ocea.2.

PAR: $$PAR = \left(\frac{multiplier.10^9.10^{(V-B)/M}}{C} \right) + offset$$

where *V*, *B*, *M*, *offset*, *multiplier* and *C*, the calibration constant, can be found in Table Ocea.2.

Fluorescence: $$flsc = \frac{slope(10e^{(V/slope\ factor)} - 10e^{VB})}{10e^{V1} - 10e^{Vacetone}} + offset$$

Where *flsc* is measured in µg/l, *V* is the fluorometer output voltage and the remaining coefficients can be found in Table Ocea.2.

Transmission: $$Light\ transmission = M.output\ voltage + B$$

where light transmission is measured in % and *M* and *B* are derived from measured voltages through air and water in light and darkness, and are included in Table Ocea.2.

Time	Event No	Lat	Lon	Wire Out
12/01/2012 02:48	90	-53.87324	-37.22312	215
12/01/2012 02:16	89	-53.8738	-37.22055	202
10/01/2012 14:28	83	-55.21103	-41.11782	1600
09/01/2012 19:50	78	-53.79781	-37.93561	270
07/01/2012 12:30	72	-54.15884	-36.69426	60
05/01/2012 05:35	52	-53.36143	-38.0824	1000
04/01/2012 20:25	47	-53.71407	-37.96568	112
04/01/2012 06:02	41	-53.78512	-38.58324	175
03/01/2012 20:19	35	-53.43141	-38.69462	1000
03/01/2012 05:30	29	-53.49267	-39.25002	1000
02/01/2012 20:28	26	-53.84643	-39.14276	260
01/01/2012 12:21	16	-53.79756	-37.93478	275
31/12/2011 08:25	8	-52.80849	-40.11302	1000
30/12/2011 13:48	3	-52.6347	-42.82203	1000

Table 5 - CTD casts

2.1.4 SBE35 high precision thermometer

Data from the SBE35 thermometer were not downloaded during this cruise.

2.2 Underway data

2.2.1 Underway navigation data

Navigational data were collected continuously throughout the cruise. Instrumentation was as follows:

Ashtec ADU2 GPS: antenna 1 used to determine the ship's position; antennae 2-4 used to determine pitch, roll and yaw.

Ashtec GLONASS GG24 (accurate to ≈15m)

Sperry Mk 37 Model D Gyrocompass

Seatex GPS (Seapath 200)

Hull-mounted Simrad EA600 Hydrographic 12kHz Echosounder (transducers located approximately 5m below the water level). **It must be noted that the datastream is still called 'sim500', so all programs are named according to this, despite the instrument being an EA600.**

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

2.2.1 Ocean logger and meterological data

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

Oceanlogger
SeaBird Electronics SBE45 CTD
Turner Designs 10-AU Fluorometer

Meteorological data
Photosynthetically Active Radiation (PAR) 1, Parlite Quanum Sensor, Kipp & Zonen
Photosynthetically Active Radiation (PAR) 2, Parlite Quanum Sensor, Kipp & Zonen
Solar Radiation 1, Proto1 SPLite, Kipp & Zonen
Solar Radiation 2, Proto1 SPLite, Kipp & Zonen
Air temperature/humidity 1, Chilled Mirror Hygrometer MBW, PM-20251/1, Temperature Sensor Pt100, PM-20252/1
Anemometer (this logs wind speed relative to the ship. At this time there is no datastream for true wind, but this can be calculated from relative wind and navigational data, if required).

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

Problems
The T1/H1 temperature and humidity sensor would report a zero value at length for periods of the cruise. The values always returned during the cruise. The AME report has noted the possible fault.

3. Acoustics

Sophie Fielding, Peter Enderlein

3.1 Acoustic instrumentation

3.1.1 Introduction

The EK60 was run throughout JR260B to collect information on the horizontal and vertical distribution of krill and to derive estimates of krill biomass for the Western Core Box and each 24 hour station.

3.1.2 Aim

Collection of acoustic data to accompany all transects, acoustic surveys, and net tows during the South Georgia survey.
Backup and process the acoustic data

3.1.3 Methods/System specification

Software versions
Simrad ER60 v. 2.2.1
Sonardata Echolog 60 v 4.10.1.6230
Sonardata Echoview v 4.20.59.8698 Live viewing
Sonardata Echoview v 4.20.59.8698 Processing

HASP Dongle BAS3 licensed for base, bathymetry, analysis export, live viewing, school detection and virtual echogram was used to run the echolog and echoview in live viewing mode. The echosounder pc AP10 and the EK60 workstation 2 are integrated into the ship's LAN. ER60 .raw data files were logged to a Sun workstation jrua, using a Samba connection, which is backed up at regular intervals. All raw data were collected to 1000 m. Echolog was run on workstation 2 and wrote compressed files also directly to the Sun workstation via a Samba connection.

Echolog compression settings
Final compression settings used in Echolog for all frequencies were:

1) Power data only (angle data is still available from the raw files)
2) From 0 - 500 m (38 kHz), 0 – 500 (120 kHz) and 0 – 500 (200 kHz) data only (data from greater depths are available from the raw files)
3) Average samples where both Sv below –100 dB and TS below –20 dB
4) Maximum number of samples to average: 50
5) DO NOT use average samples below echosounder detected bottom unless sure of bottom detection

File locations
All raw data were saved in a general folder JR260b\raw, all echolog data were saved in the folder JR260b\ek6. All files were prefixed with JR260. Calibration data were additionally saved to the calibration folder.

EK60 (ER60) settings

The EK60 software was upgraded over the summer and the calibration settings of the transducers either changed or reset. As a result, the EK60 was run from the beginning of the cruise up to the 7th January using some default settings (Table default settings). The EK60 was calibrated on the 7th January 2012, and the calibration applied to the transducers – therefore after January 7th the settings are different. Table calibrated settings lists the settings applied to the EK60 after calibration.

Variable	38 kHz	120 kHz	200 kHz
Ping interval (per sec)	2	2	2
Sound velocity (m/s)	1462	1462	1462
Mode	Active	Active	Active
Transducer type	ES38	ES120-7	ES200-7
Transceiver Serial no.	009072033fa5	00907203422d	009072033f91
Transducer depth (m)	0	0	0
Absorption coef. (dB/km)	10.3802	27.7924	41.1059
Pulse length (ms)	1.024	1.024	1.024
Max Power (W)	2000	500	300
2-way beam angle (dB)	-20.70	-20.70	-19.60
Sv transducer gain (dB)	25.5	25.7	27.0
Sa correction (dB)	0.0	0.0	0.0
Angle sensitivity along	22	21	23
Angle sensitivity athwart	22	21	23
3 dB Beam along	7.0	7.0	8.0
3 dB Beam athwart	7.1	7.1	7.90
Along offset	0	0	0
Athwart offset	0	0	0

Table 6 - EK60 Default Settings

It was thought that the EK60 was controlled through the SSU, under a group EK60&EA600&ADCP. The EK60 was the master, with a ping rate set to 2 seconds. The ADCP was run in water column mode (as a slave with an external trigger). Within this setup the ADCP only pings every other trigger, therefore its resolution is slightly reduced at 1 ping every 4 seconds. There appeared to be some noise on the EK60 that could only be removed by turning the ADCP off, it was decided to leave on. However, during the calibration it was identified that the EK60 was not actually being controlled by the SSU, despite all indications of the SSU (the EK60 data being green and red, instead of grey when not controlled). After the calibration the EK60 was correctly interfaced with the SSU.

SSU settings

EA600	external trigger	Tx pulse	
EK60	external trigger	Calculated	(Set to 2 seconds in ER60 software)
ADCP	external trigger	Tx pulse	(this setting only works if the bottom tracking mode is off)

3.2 EK60 Calibration

An acoustic calibration was carried out in Stromness Harbour, South Georgia on 07/01/2012. The ship was anchored, its movement balanced by minimal DP usage, and all over the side water deposits stopped. The EK60 and EA600 were triggered through the SSU and the ADCP was switched off. Each transducer was calibrated in turn, although all transducers were operating at the time. Standard ER60 calibration procedures were used as documented for previous cruises (the relevant copper sphere was moved through all quadrants of each transducer). In addition the sphere was held on-axis for extra periods of time to enable calibration variables to be determined in Echoview.

A CTD was undertaken on the morning of the calibration. Temperature and salinity were averaged from 6 (depth of the transducers) to 30 m (depth of the calibration sphere) and were 2.43°C and 33.71 PSU resulting in a speed of sound constant of 1462 m/s (Kongsberg software calculation). The speed of sound was updated into the ER60 software.

Each transducer was calibrated at the settings used throughout the cruise. Parameters from the ER60 lobes calibration were updated onto the ER60 software (Table calibrated settings), in addition an Echoview calculation of the calibration was calculated (Table Echoview settings).

Date (dd/mm/yyyy)	07/01/2012	08/01/2012	08/01/2012
Location	Stromness	Stromness	Stromness
Time (GMT)	23:05	00:15	01:30
Frequency (kHz)	38	120	200
GPT serial no	009072033fa5	00907203422d	9072033191
Comments	EA600 on	EA600 on	EA600 on
Water temperature (°C)	2.43	2.43	2.43
Salinity (PSU)	33.71	33.71	33.71
Sound velocity (m/s)	1462	1462	1462
Absorption coeff (dB/km)	10.0433	27.5080	40.6769
Ping rate (sec^{-1})	1	1	1
Transmit Power (W)	2000	500	300
Pulse length (ms)	1.024	1.024	1.024
Bandwidth (kHz)	2.43	3.03	3.09
Sample Interval (m)	0.186	0.186	0.186
Original gain (dB)	25.5	25.7	27.0
Original Sa correction (dB)	0.0	0.0	0.0
Theoretical TS of sphere (dB)	-33.70	-40.70	-44.85
New gain (dB)	25.51	22.15	23.61
New Sa correction (dB)	-0.51	-0.41	-0.22

Table 7 - EK60 Calibrated Settings

Table Echoview settings

Parameter	38kHz	120 kHz	200 kHz
Alpha (dB/km)	10.0433	27.5080	40.6769
Theoretical TS (dB)	-33.70	-40.3	-44.85

TS gain	25.48	22.06	23.64
Sa correction	-0.22	0.55	-0.19

Table 8 - Echoview Settings

Data processing in echoview

Post-processing was undertaken in Echoview. One template EV file was set up using the compressed data files with the following operators.

Variable name	Operator	Operand 1	Operand 2
F resampled even	Resample by number of pings	Fileset 1 Sv raw pings T?	
F bad data	Region bitmap	F resampled even	
F surface bottom	Line bitmap	F resampled even	
F all bad	And	F bad data	F surface bottom
F bad masked	Mask	F resampled even	F all bad
F resample 1 ping	Resample by number of pings	F bad masked	
F resample original	Resample by number of pings	F resample 1 ping	
F dropout range	Data range bitmap	F resample original	
F no dropout	Mask	F bad masked	F dropout range
F noise	Data generator	F no dropout	
F-noise	Linear minus	F no dropout	F noise
F convolute	3x3 convolution	F-noise	
F spike detect	Minus	F-noise	F convolute
F spike mask	Data range bitmap	F spike detect	
F-noise-spike	Mask	F-noise	F spike mask
F-500m	Resample by distance interval	F-noise-spike	

Table 9 - Echoview operators for EV template file

3.2.1 Data coverage

Acoustic transects

Acoustic transects were run at the Western Core Box, Western Core Box mooring location and at a Gully station to to generate information on the vertical distribution of krill over a 24 hour period. Each transect consisted of a 10 nmile run at 10 knots down or upwind (or swell if more influential) with the mid-point as the station. Transect times and names are given in Table Acoustics_transects.

Station	Transect name	Date	Start time (GMT)	End time	Comments
P3	P3_T1	31/12/11	02:59	04:00	Downwind
P3	P3_T2	31/12/11	05:21	06:21	Upwind
P3	P3_T3	31/12/11	06:31	07:33	Downwind
P3	P3_T4	31/12/11	07:37	08:08	U/W break off for mooring
WCB_M	WCB_MT1	01/01/12	03:55	04:56	Downwind
WCB_M	WCB_MT2	01/01/12	05:08	06:32	Upwind
WCB_M	WCB_MT3	01/01/12	06:40	07:41	Downwind
WCB_M	WCB_MT4	01/01/12	07:49	09:10	Upwind
WCB_M	WCB_MT5	01/01/12	12:56	13:40	Upwind
WCB_M	WCB_MT6	01/01/12	13:42	14:47	Downwind

WCB_M	WCB_MT7	01/01/12	22:51	23:52	Downwind
WCB_M	WCB_MT8	02/01/12	01:28	02:11	U/W break off for WCB
WCB	WCB1.1	02/01/12	09:00	13:45	South to North
WCB	WCB1.2	02/01/12	14:54	19:12	North to South
WCB	WCB2.1	03/01/12	09:00	13:41	North to South
WCB	WCB2.2	03/01/12	14:42	19:03	South to North
WCB	WCB3.1	04/01/12	09:00	13:36	South to North
WCB	WCB3.2	04/01/12	14:48	19:07	North to South
WCB	WCB4.1	05/01/12	09:00	13:40	North to South
WCB	WCB4.2	05/01/12	14:17	18:57	South to North
WCB_M	WCB_MT9	06/01/12	02:38	03:41	Downwind
WCB_M	WCB_MT10	06/01/12	03:50	04:50	Upwind
WCB_M	WCB_MT11	06/01/12	04:58	06:03	Downwind
WCB_M	WCB_MT12	06/01/12	06:10	07:11	Upwind
WCB_M	WCB_MT13	06/01/12	07:18	08:26	Downwind
WCB_M	WCB_MT14	06/01/12	08:32	09:32	Upwind
WCB_M	WCB_MT15	06/01/12	12:19	13:19	Downwind
WCB_M	WCB_MT16	06/01/12	18:00	19:00	Downwind
WCB_M	WCB_MT17	06/01/12	19:08	20:09	Upwind
WCB_M	WCB_MT18	06/01/12	22:58	23:58	Downwind
Gully S	GS_T1	09/01/12	10:00	11:02	Downwind
Gully S	GS_T2	09/01/12	11:07	12:05	Upwind
Gully S	GS_T3	09/01/12	12:13	13:14	Downwind
WCB_M	WCB_MT19	09/01/12	14:22	15:23	Downwind
WCB_M	WCB_MT20	09/01/12	15:31	16:31	Upwind
WCB_M	WCB_MT21	09/01/12	16:39	17:41	Downwind
WCB_M	WCB_MT22	09/01/12	17:49	18:48	Upwind
Gully S	GS_T4	11/01/12	12:41	13:41	Downwind
Gully S	GS_T5	11/01/12	18:23	19:23	Downwind
Gully S	GS_T6	11/01/12	19:31	20:35	Upwind
Gully S	GS_T7	11/01/12	23:12	00:12	Downwind

Table 10 - Acoustic Transects

Target fishing

There were three types of RMT8 net strategies: oblique, stratified and target (Table Acoustics_RMT8). Oblique were fished from the surface to 200 m and back to the surface at the WCB stations, stratified were between specified depths, e.g. 200 – 100, and targeted were on krill swarms identified from the EK60. The target fishing used the normal strategy of heading downwind searching for targets. Once found, the ship sails on for ½ mile more and then turns ready to shoot the net.

Table Acoustics_RMT8

Event Num	Date	Net 1 open-closed	Net 2 open-closed	Type	Comments
5	30/12/11	17:01-17:04	17:06-17:09	Test	Discard
6	30/12/11	17:52-17:57	17:58-18:03	Test	Discard
14	01/01/12	00:41-00:51	00:53-00:54	Target	No target some krill caught

15	01/01/12	10:41-11:01	11:07-11:28	Stratified	150-100,100-50
19	01/01/12	21:18-21:39	21:40-22:01	Stratified	150-100,100-50
20	02/01/12	00:38-00:58	00:59-01:20	Stratified	150-100,100-50
27	02/01/12	21:41-22:10	22:11-22:41	Oblique	0-200-0 W1.2S
28	03/01/12	01:08-01:39	01:40-02:11	Oblique	0-200-0 W1.2N
36	03/01/12	22:12-22:45	22:45-23:15	Oblique	0-200-0 W2.2N
37	04/01/12	01:37-01:39	01:41-01:45	Target	Krill
38	04/01/12	02:39-02:44	04:26-04:43	Target	Krill
39	04/01/12	03:56-04:26	21:32-21:53	Oblique	0-200-0 W2.2S
48	04/01/12	21:10-21:32	23:56-00:04	Oblique	0-200-0 W3.2S
49	04/01/12	23:46-23:49	02:29-02:31	Target	Krill
50	05/01/12	02:27-02:29	04:27-04:57	Target	Krill
51	05/01/12	03:55-04:27	04:27-04:57	Oblique	0-200-0 W3.2N
64	06/01/12	01:29-01:33	01:33-01:34	Target	Net 2 aborted due to tension
65	06/01/12	10:33-10:53	10:53-11:27	Stratified	140-100,100-20
67	06/01/12				Net aborted due to incorrect closure
68	06/01/12	16:24-16:44	16:44-17:04	Stratified	150-100,100-20
69	06/01/12	21:20-21:42	21:43-22:13	Stratified	150-100,100-20
70	07/01/12	01:42-01:47	01:48-01:50	Target	Krill
71	07/01/12	03:18-03:38	03:39-03:59	Stratified	150-100,100-20
77	07/01/12	00:59-01:02		Target	Net 2 aborted due to tension
82	10/01/12	02:01-02:04	02:05-02:08	Target	Small krill
86	11/01/12				Net wash
87	11/01/12	16:32-17:03	17:08-17:38	Stratified	180-100,100-20
91	12/01/12	11:20-11:54			Altimeter test
92	12/01/12	12:22-12:40			Altimeter test
93	12/01/12	12:57-13:09			Altimeter test
95	13/01/12	00:08-00:12	00:14-00:18	Target	Small krill

Table 11 - RMT8 log and catch listing

3.2.2 Problems encountered

The EK60 did not crash at all throughout the cruise. The only outstanding issue was the non-integration of the EK60 with the SSU, despite all indications suggesting it was. This can be corrected easily by the user.

3.3 Deployment of the ES853 Echo Sounder

Damien, Sophie Fielding

3.3.1 Introduction

The ES853 echo sounder is a custom designed instrument manufactured by Imagenex (Figure 1). The unit has an acoustic frequency of 120 Hz, sampling to a range of 100 m with 0.5 m bin intervals and is pressure rated to a depth of 1000 m. The onboard transducer has a beam angle of 10° beam angle. The hardware amplifier has a configurable 20 or 40 dB gain option. The echo sounder can be deployed to log to internal memory or to an attached MS Windows based computer using the manufacturer's supplied software. When logging to internal memory, the echo sounder records data to its 2 GB built-in solid state memory card. Depending on the deployment configuration, the unit pings at different rates. When attached to a computer the echo sounder will ping as fast as it is capable, approximately 2 Hz. When set to stand-alone mode and logging to memory, the ping rate is 1 Hz. When in glider mode, a mode used when mounted onboard an iRobot Seaglider, data is logged to memory and the ping rate is 0.25 Hz.

Figure 1 - ES853 echo sounder with serial cable connection.

The echo sounder was deployed in order to collect data needed to test its ability to resolve targets such as krill swarms. It was also necessary to calibrate the echo sounder so that the returned backscatter data can be equated to target strength, an important quantity in the estimation of biomass. An identical echo sounder will form a portion of the payload carried on an iRobot seaglider to be deployed in the upcoming JR255A GENTOO cruise in the Weddell Sea. To understand the data to be collected, it was necessary to collect data in controlled circumstances, where the ships EK60 echo sounder will be used as a comparison during further analysis. The ES853 has a Source Level of 211.1 dB re 1 µPa @ 1m and a Receiver Response of -178.2 dB re 1V/µPa.

3.3.2 Deployment

The echo sounder was deployed on three different platforms but in each case the elements of the system were the same, consisting of a battery pack (with rechargeable NiMH batteries giving a nominal 24V), a power cable with breakout serial interface and the ES853. Changing the mode of the echo sounder or live logging of data on a PC was done through a connection with the serial interface (Figure 2). A 50m extension cable was used repeatedly when the system was exposed or on the back deck, pre deployment. Serial communication with the echo sounder was achieved using the Imagenex software. Upon deployment, the serial connection was established and the mode of the echo sounder changed from *Normal Mode* (which does not log to the ES853 memory) to *Stand Alone*, which samples at a rate of 1 Hz and logs internally. On one occasion, *Glider Mode* was selected to trial the collection of data at 0.25 Hz.

Logged data was downloaded by USB connection with a PC, where the echo sounder's internal memory is mounted as a removable drive requiring no drivers or additional software beyond a modern operating system.

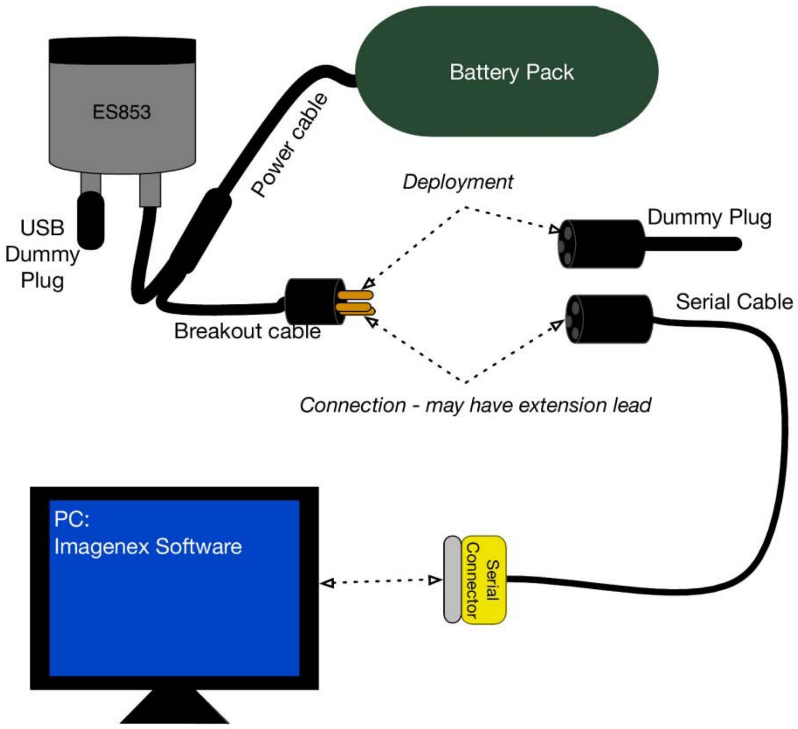


Figure 2 - The deployment configuration of the ES853 system with cables, battery and computer connection.

The echo sounder was deployed 18 times during the cruise (Table 1) and the hardware gain was set at 40 dB in all but the first two cases (Events 12 and 19), during which the gain was 20 dB, and during the calibration at Stromness, where the hardware gain was variable.

Table 12. Deployments of the ES853 during JR260B.

File Name	Data Name	Event	Date	Platform
JR260B_ES000008.853	jr260b_echo1	14	01/01/2012 00:23:00	RMT Cross
JR260B_ES000009.853	jr260b_echo2	19	01/01/2012 21:00:50	RMT Cross
JR260B_ES000010.853	jr260b_echo3	27	02/01/2012 21:27:10	RMT Cross
JR260B_ES000011.853	jr260b_echo4	28	03/01/2012 00:53:55	RMT Cross
JR260B_ES000012.853	jr260b_echo5	36	03/01/2012 22:03:00	RMT Cross

JR260B_ES000013.853	jr260b_echo6	38	04/01/2012 02:25:20	RMT Cross
JR260B_ES000014.853	jr260b_echo7	50	05/01/2012 02:01:45	RMT Cross
JR260B_ES000015.853	jr260b_echo8	51	05/01/2012 03:38:40	RMT Cross
JR260B_ES000016.853	jr260b_echo9	64	06/01/2012 01:15:20	RMT Cross
JR260B_ES000017.853	jr260b_echo10	69	06/01/2012 20:59:00	RMT Cross
JR260B_ES000018.853	jr260b_echo11	70	07/01/2012 00:47:15	RMT Cross
JR260B_ES000019.853	jr260b_echo12	71	07/01/2012 03:04:10	RMT Cross
JR260B_stromness1.853	jr260b_echo_strom_calib	73	07/01/2012 13:40:15	Doughnut
JR260B_ES000020.853	jr260b_echo13	82	10/01/2012 01:50:40	RMT Cross
JR260B_ES000021.853	jr260b_echo14	88	12/01/2012 01:29:05	SUCS Frame
JR260B_ES000022.853	jr260b_echo15	91	12/01/2012 11:09:10	RMT Cross
JR260B_ES000023.853	jr260b_echo16	92	12/01/2012 12:11:30	RMT Cross
JR260B_ES000024.853	jr260b_echo17	95	12/01/2012 23:49:30	RMT Cross

3.3.2.1 ES853 mounted on the RMT cross

The echo sounder system was mounted on the RMT cross during towed net deployments. The battery pack was strapped inside the frame, above the electronics bottle. The cable was strapped in place around the frame and the echo sounder was mounted on a bracket in a position normally occupied by the RMT altimeter. The altimeter was repositioned at the rear of the cross. The echo sounder's transducer was positioned at approximately 45 ° to the crosses orientation, such that it would be facing downwards during towing (Figure 3).

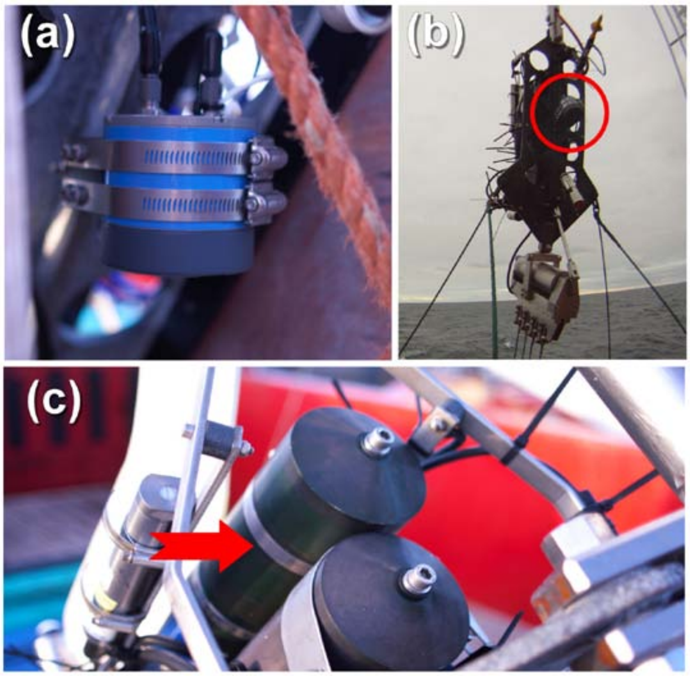


Figure 3 - (a) The echo sounder is shown mounted beneath the RMT cross. (b) The echo sounder's position (circled) is visible during net deployment and recovery. (c) The battery pack (highlighted) is shown strapped above the RMT electronics bottle.

The ship's positional and winch information, along with the depth, pitch and roll of the cross are recorded to the ship's SCS data collection system. This was downloaded for each deployment of the echo sounder onboard the cross.

Before the last deployment of the echo sounder on the RMT cross (Event 95), the echo sounder was repositioned closer to the front of cross, to the position previously occupied by the flow meter and an additional high density plastic bar was added to give the terminals clearance from the cross (Figure 4). The flow meter was moved down the mounting rail, such that the flow was unimpeded. This action was taken because of the presence of a constant, strong and acoustic signal in the near bins of the echo sounder, believed to be the reflection of the pings from the nets bars. This new arrangement allowed for a beam direction slightly ahead of the position of the nets and provides the option for future positioning of the echo sounder facing laterally into krill swarms, rather than vertically downwards.

Figure 4 - The echo sounder is shown in a revised position, occupying the space previously held by the flow meter.

3.3.2.2 ES853 mounted on the SUCS

The echo sounder system was mounted on the SUCS camera frame during a deployment of the camera through a krill swarm (Event 88). The battery pack and cable was strapped to a horizontal support bar of the frame, while the ES853 was mounted to an upright support via a high density plastic bracket (
Figure 5). The depth of the camera is not currently logged, though the amount of cable payed out is recorded to the video image. Not having a log of depth means that the bins cannot be adjusted for real depth.

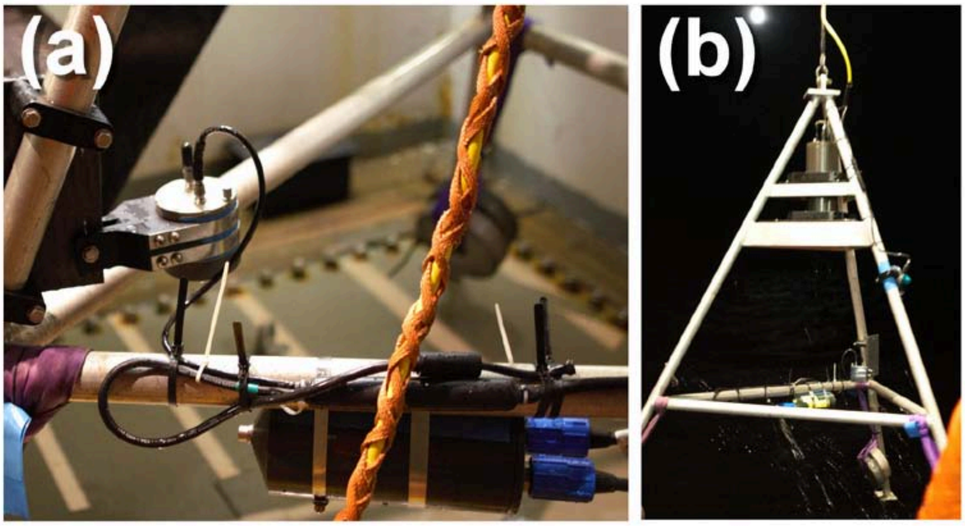


Figure 5 - (a) Echo sounder system mounted on the frame of the SUCS camera. (b) SUCS camera during recovery showing the setup of the echo sounder system.

3.3.2.3 ES853 Calibration in Stromness

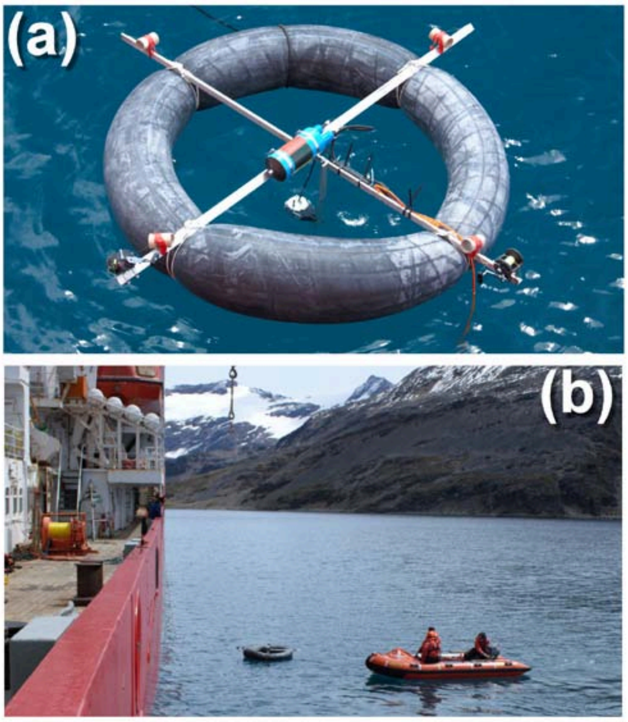


Figure 6 - (a) The doughnut platform with the support cross, fishing lines and echo sounder system. (b) The JCR, doughnut platform and support boat in Stromness Bay.

For calibration of the echo sounder, a small floating platform was constructed. The platform, referred to as ‘The Doughnut’, consisted of an inflatable ring and a cross support with fishing reels, to lower a sphere of known target strength to various depths. The target was kept, as much as possible, within the beam axis. The cross also supported the echo sounder system, with the echo sounder suspended by a beam, facing downwards approximately 10 cm below the surface of the water (Figure 6a). The echo sounder was connected to a ship-based PC via a 50 meter extension cable. The data from the echo sounder was logged to the PC and the hardware gain settings of the echo sounder were changed dynamically using the software interface. Table 2 shows the timing of events during the calibration. All times listed are for 7th January 2012.

Table 13. Sequence of events for ES853 calibration.

Time	Event
13:40:15	Record to computer started - 40db
14:00:00	All ships echo sounders turned off
14:34:40	Start 5 minute record at 40db gain
14:40:00	Start 5 minute record at 20db gain
14:50:30	Switched to 40db gain
14:54:30	Upper target is likely the rope in the water
15:00:00	Start 5 minute record at 40 db gain(target lowered to ~30m)
15:06:00	Start 5 minute record at 20 db gain
15:12:20	Switched to 40db gain
15:14:00	Target lowered to ~40m
15:16:30	Start 5 minute record at 40 db gain
15:22:30	Start 5 minute record at 20 db gain
15:28:30	Switched to 40db gain
15:30:00	Target lowered to ~50m
15:33:00	Start 5 minute record at 40 db gain
15:40:00	Start 5 minute record at 20db gain

15:46:00	Switched to 40db gain
15:50:00	Target lowered to ~60m
15:52:00	Start 5 minute record at 40 db gain
15:58:00	Start 5 minute record at 20 db gain
16:04:50	Switched to 40db gain
16:06:30	Communication with echo sounder lost
16:07:10	Record stop

The target used was a tungsten carbide sphere. Given the conditions in the top 30 m (temperature of 2.43 °C, salinity of 33.71, as measured by CTD), the speed of sound was 1462 m s^{-1} and the α of the sphere was 27.51, at 120 kHz. The target strength (T_S) of the sphere was therefore -39.73 dB.

3.3.2.4 Issues with deployment

Several problems arose during the deployment of the echo sounder system. The most significant of which was the dropout of communications with the unit. As seen in Table 2, communication with the echo sounder was lost at 16:06. This was at the very end of the calibration procedure, thus did not necessitate restarting the calibration. The exact cause of the drop outs is not known as often a reconnection would solve the problem. It is posited that the length of the extension cable pushed the transmission capabilities of the serial connection to its limits.

It was found that even when not logging or connected to a PC, the echo sounder continued to draw power from the battery pack when connected. This resulted in a loss of power between deployments and necessitated the recharging of the battery pack. The remedy for this situation was to disconnect the power cable from the battery pack and to terminate each side with dummy plugs. By isolating the power supply during long periods of dormancy, the charged battery pack was seen to last for many deployments of the echo sounder.

On initial connection to the USB port of the echo sounder, the early onset of corrosion of the pins was observed. The pins were carefully swabbed to remove the oxidized residue and compressed air used to dry the connection. Further remedial action may be required to prevent the deterioration of the situation. Upon completion of the cruise, both the serial and USB ports were treated with compressed air to ensure that they were dry for transit. Once the ship returns to port and stability of a work surface can be assured, the delicate pins of both ports will be inspected and cleaned. The use of silicone grease on the terminals will be considered for future deployments.

There remains an issue where the exact start time of the data acquisition is not known as the echo sounder takes several seconds to respond to a change of mode command. This interval was seen to increase with the introduction of the 50 m extension serial cable and in extreme cases could be up to 10 seconds long.

3.3.3 Data

The data recorded by the echo sounder was successfully recovered and catalogued. An example of the data recorded is shown in Figure 7. This figure depicts the data recorded during Event 38 and is typical of the data collected during RMT hauls. To calculate a backscatter value (S_v), albeit uncalibrated, the hardware gain of 40 dB and the constant C (Source Level + Receiver Response) have been subtracted from the data and Time Varied Gain (TVG) has been added. The strong targets in the first 10 m at the beginning and end of the deployment are the backscatter from the ship as the RMT cross was deployed.

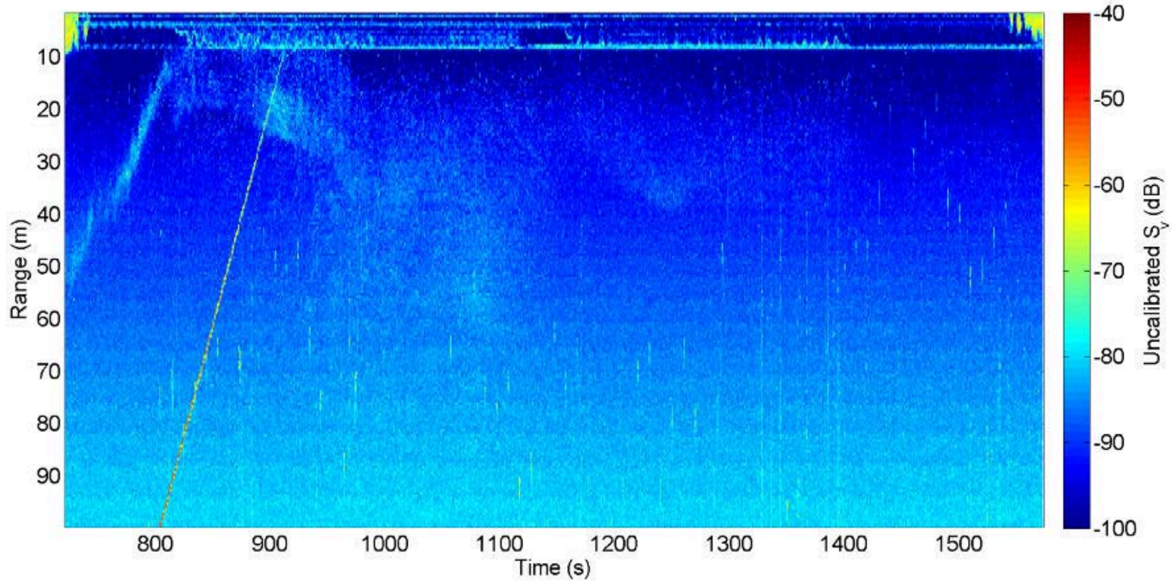


Figure 7. Uncalibrated Sv from Event 38, showing the interval when the echosounder was submerged.

Approximately 90 seconds into the transect, a strong signal appears in the furthest bin and over the next 100 seconds appears through successively higher bins. This was a recurring feature of the deployments and occurred with at regular intervals of about 14 minutes during longer deployments. It is suggested that this is out of phase interference from ship-based echo sounding instruments.

Strong linear patterns were observed in the upper 8 m of the transect. These features, too, were typical of the data collected while echo sounder was deployed on the RMT cross. It is likely that these features were caused by backscatter from the net array. This assertion is strengthened by the near disappearance of the features during the final RTM deployment (Event 95), where the echo sounder was positioned so that the beam was angled slightly forward and thus clear of the nets. Data collected by the EK60 calibrated echo sounder during Event 95 is shown in Figure 8. Swarming krill in the upper depths can be seen.

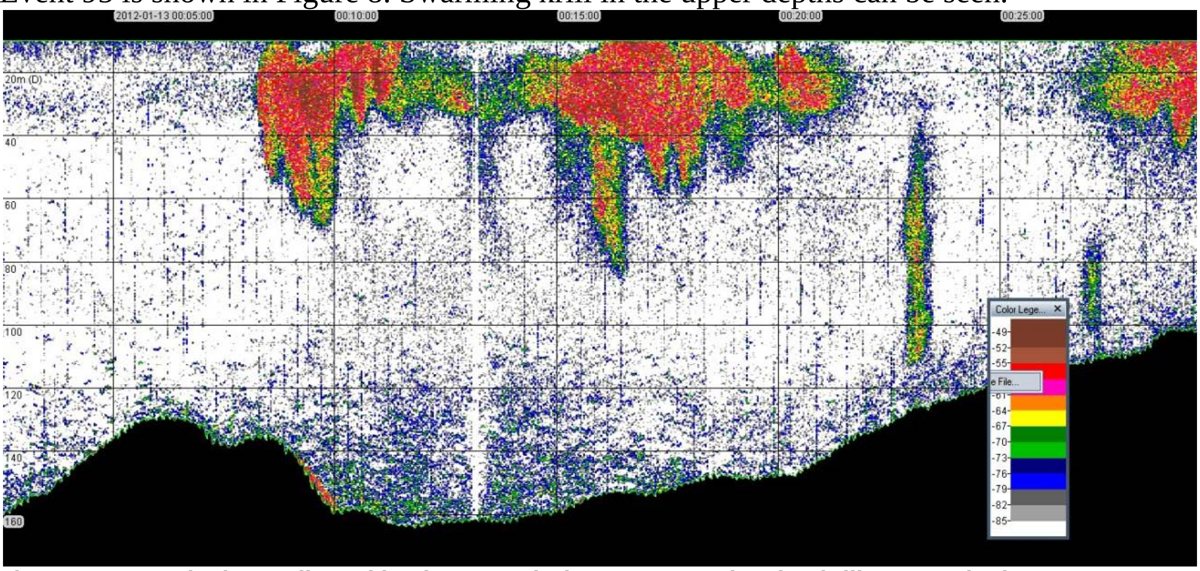


Figure 8. Acoustic data collected by the EK60 during event 95, showing krill swarms in the upper 60 m.

The down-wire net monitor (DWNM) positional data collected by the RMT cross sensors was matched with the timing of the acoustic data. The addition of GPS, roll, pitch, heading and depth data made it possible to export from Matlab files readable by Echoview. An accurate estimate of the position of the cross has not yet been made but for the purposes of development, a rudimentary estimate was made using the depth of the cross and the length of cable payed out. No consideration has yet been given to sagging of the cable under its own weight or the lateral inertia of the net due to drag. The data exported to Echoview allow, through the use of a motion correction and towed body function, the correction of the acoustic data for changes in the orientation and depth of the echo sounder. An example of this is shown in Figure 9. The data displayed in Figure 9 is uncalibrated Sv. It is in this format that the ES853 data, once properly calibrated, will be compared with the acoustic data collected by the ship-based EK60 echo sounder. First analysis shows a reasonable agreement, within a few dB, between the echo sounders. The difference may be addressed when the calibration of the ES853 is applied.

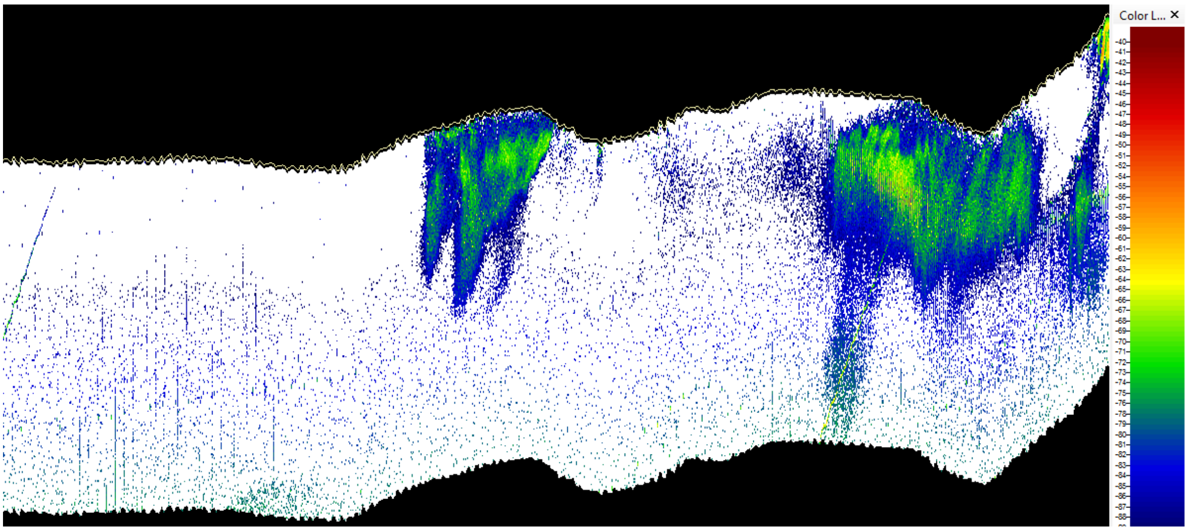


Figure 9. A screen caputre of data visualisation in Echoview after motion correction and depth compensation, using data from Event 95.

The deployment of the echo sounder on the doughnut platform (Event 73) showed that the echo sounder was capable of resolving the tungsten carbide sphere to depths in excess of 60 m. The known target strength of the sphere will be used to calibrate the echo sounder so that the target strength of features observed during RMT cross and glider deployments can be calculated accurately. The raw data collected is displayed in Figure 10. The five darker bands in the figure correspond with the echo sounder applying a gain of 20 dB to the signal, as opposed to the 40 dB gain applied at all other times. The target can be seen progressively lowered through the bins until it disappears from the 20 dB gain while at 63 m. Features such as the anchor rope in the water are also visible at shallow depths at intervals during the time series.

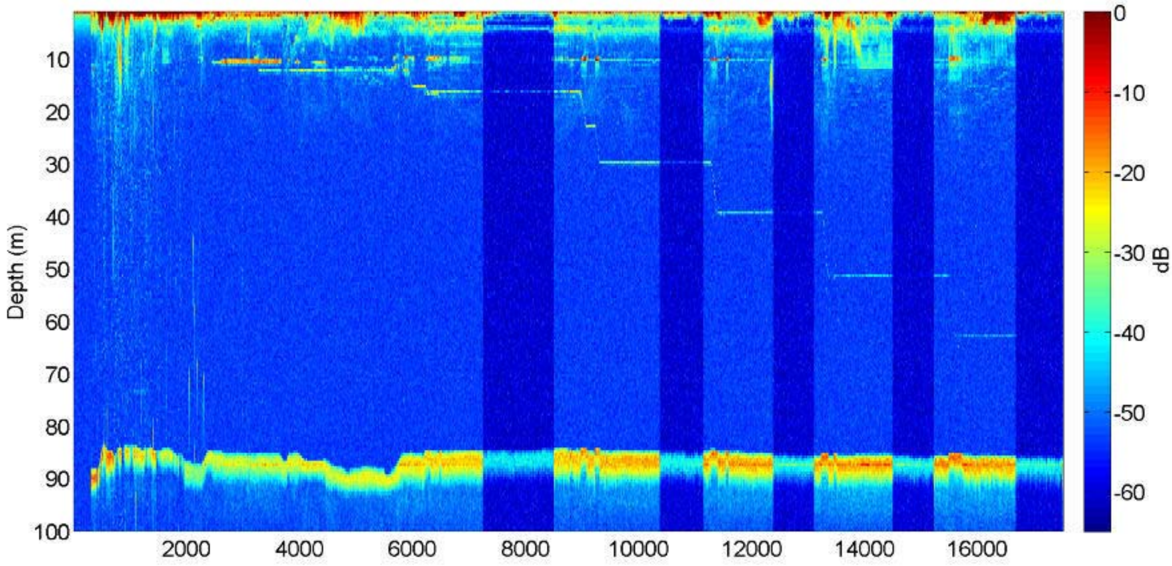


Figure 10. Raw acoustic data collected during calibration of the ES853 in Stromness.

3.3.4 Discussion

The echo sounder generally performed well. Though occasional connection drop outs could not be explained, reconnection of the cables and/or restarting the software generally solved the problem. An important lesson is the draining of the battery even when not actively engaged. The action of disconnecting the battery has solved this issue when dealing with ship-based short term deployments. It remains to be seen, however, how the echo sounder will perform over extended durations, such as onboard the glider.
The positioning of the echo sounder on the RMT cross is of critical importance. The backscatter from the net structure is sufficient to mask the legitimate targets of the first 10 m of range, arguably the most important of the profile as it correlates most strongly with the net catch. The repositioning of the echo sounder to the front of the cross seems to have alleviated this issue, though it remain to be seen in future deployments if the acoustic data corresponds well with the net catch.

Systematic interference of the ship's acoustic instrumentation with the echo sounder is not a major issue as it is easily identified and disregarded.
There is currently little understanding of how the echo sounder performance varies as the voltage of the battery pack declines. It is suggested that further work be carried out to determine if battery voltage significantly impacts target strength. The manufacturer specifies a voltage range of 22 to 32 V DC. As voltage is not logged by the echo sounder, it may be necessary to routinely monitor and charge the battery pack to ensure that it continues to function within normal parameters.

4. Deployment Gear

Peter Enderlein

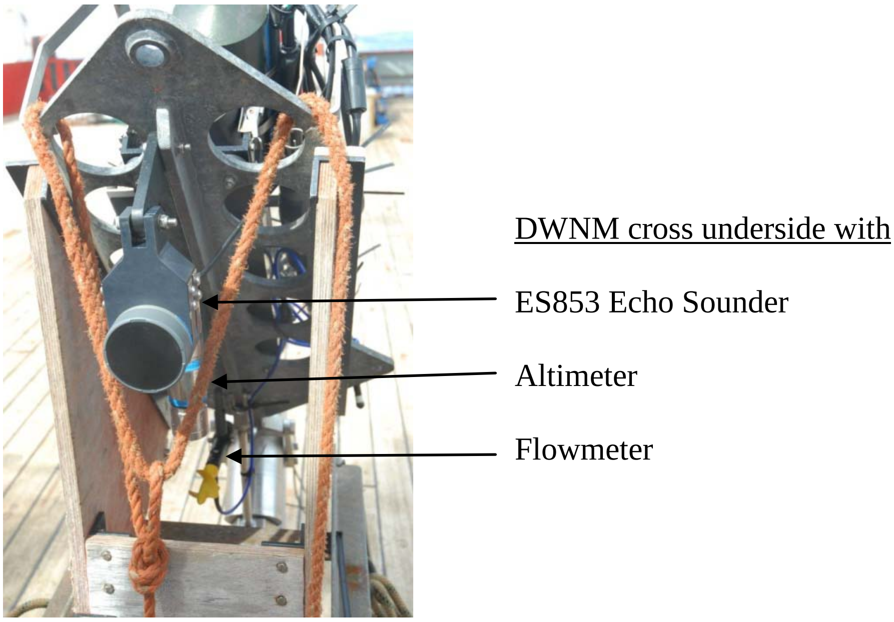
4.1 RMT8 with DWNM sytstem

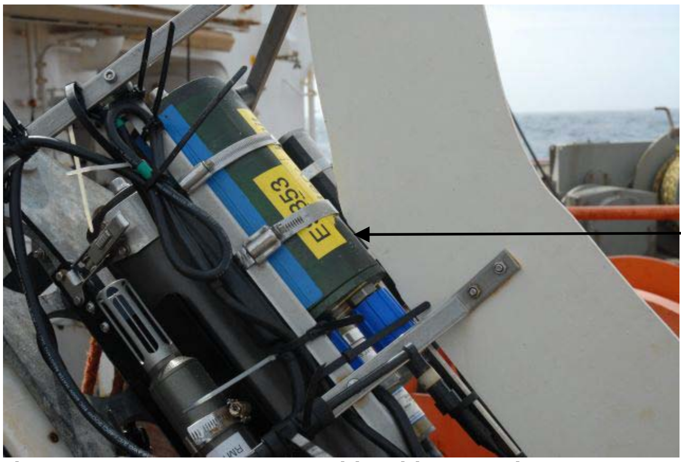
4.1.1 Down Wire Net Monitor

During this cruise the DWNM had been used on the ‘Biological wire’ for the RMT8. As the termination was still the old one from last year a load test to 3.2to was successfully done to ensure the termination was still good.

The system worked very well and we had no problems with either the PC side or the Underwater Unit. To mount the stand alone Echo-sounder ES853 with its battery pack, the Altimeter was mounted further back on the cross, to have space for the ES853 on the Altimeter place. This seems to be working fine, apart that the Altimeter struggled to get constant readings. Therefore the Altimeter was moved back to its original position and the Flowmeter was mounted in the back with the ES853 in the front. This arrangement seems to be the best for all three instruments as they all performed very well in this arrangement.

Figure 11 - DWNM cross underside with ES853 echosounder





DWNM cross top side with

ES853 battery housing mounted

Figure 12 - DWNM cross top side with ES853 battery

4.1.2 RMT8

The RMT8 was deployed 29 times successfully for target fishing and stratified hauls. In worked perfectly fine, apart from one occasion when the port safety shackles linked to the upper part of the side wire was ripped apart during the trawl, leaving the side wire hanging down so it had to be recovered with a hook. The reason why the shackle was ripped apart is still unknown, as this has never happened before.

When pulling in the upper net, on several occasions they cod end clips got caught on the net below resulting in small rips in the nets. These were then repaired. In Stromness the bottom net was then replaced by a brand new net.

4.2 Epibenthic Sledge

The Epibenthic Sledge (EBS) was only used three time this cruise for test purpose. The reason for testing was that the EBS with the new DWCS (deep water camera system), it lights and lasers and a self-contained SBE 37 CTD will be used later in the season without the support from PE.The EBS was deployed with a ship speed of 1 kn, veering the cable with max of 40 m/min up to 1.5 of water depth. It was trawled then for 10 min at 1 kn. After the trawling ship speed was reduced to 0.5 kn and the EBS was recovered at 30 m/min until the EBS had cleared the seabed. Hauling speed was then increased to 45 m/min. During the first two deployments the CTD was not fitted onto the EBS, but for the last deployment the CTD was fitted onto the EBS frame. The first trawls showed that the camera was not the right way around and that the angle had to be changed. Also the lights needed slight adjustment in there angle to avoid dark spots on each bottom side of the video. A test on deck in darkness was conducted to determine if the changes showed improvements. The test was successful and therefore the video images from the last deployment showed a good illuminated area in front of the sledge. The DWCS and the CTD worked fine and are definitive a good upgrade for the EBS.

Figure 13 - CTD mounted on EBS frame on the port back

Figure 14 - Front of EBS with Camera (centre) Lasers (each side of camera) and Lights (on the outsides)

4.3 Shallow Underwater Camera System (SUCS)

The SUCS system was used in the same configuration as previous in the season during JR262. For details about its design and setup please see the cruise report from JR262 and the introduction in the SUCS cruise report.

During this cruise the SUCS performed during the 7 deployments as it did during JR262. In general the system was most stable in water depth of about 150m in calm seas. It became more unstable with increased survey depth and increased ship movements. Any change in the tension of the cable during for example during landing SUCS on the seabed or picking it up, caused the link between the UW camera and the deck unit to crash. Quite often the system recovered by itself after approx. 20 – 30 sec but the PC had to be rebooted on several occasions, when it would not recover by itself. With careful winch handling during landing and recovery by getting the system smoothly on and of the seabed and the self recovery after a link break made the SUCS system a very useful and reliable UW-photo and video system. During this cruise the stand alone Echo sounder ES853 with its battery pack was mounted for several deployments onto the tripod to gather acoustic data.

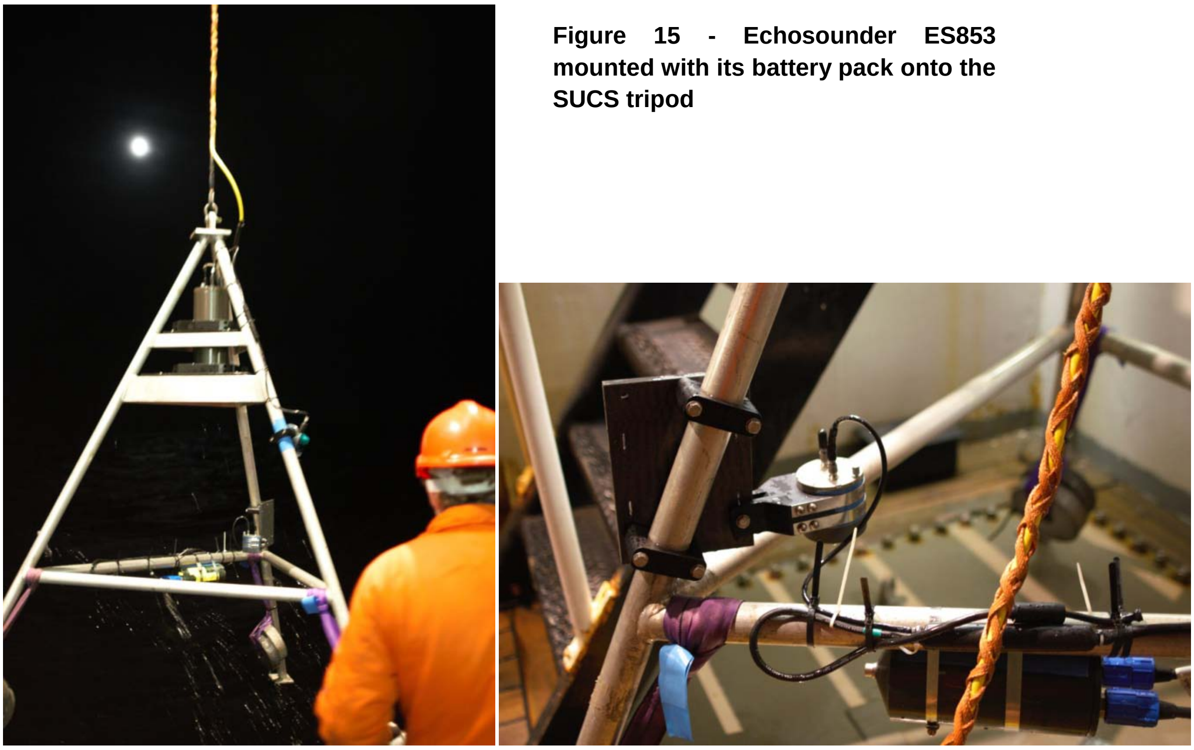


Figure 15 - Echosounder ES853 mounted with its battery pack onto the SUCS tripod

5. Moorings

Peter Enderlein & Sophie Fielding

5.1 General

During JR260B the WCB shallow water mooring and both deep sediment trap moorings were successfully redeployed. All moorings went through major maintenance as all the ropes, shackles and chains were replaced. All moorings were deployed buoy first as was done on the previous cruises. Because of weather conditions both main buoys of the sediment trap moorings where picked up by the main rope and not via a separate cable. This worked fine.

5.2 3200m sediment trap mooring @ P2

It was redeployed on **10.01.12**, the buoy entered the water @ 17:45 GMT and the main weight was cut @ 19:30 GMT at 55.20872S and 41.11114W. To release the main weights a sacrificial rope was used.

Because of the pendulum effect having deployed the mooring buoy first, the mooring was pinged after the deployment to determine its position by triangulation. The ship moved from its position approx. ½ nm first W and then again ½ nm NE and then again ½ nm NW. The positions, water depth, acoustic distance and the calculated radius where:

Table 14 - P2 mooring triangulated location

Position	Time	Triangulation		Latitude	Longitude
P1	19:56	Depth	3115	55.20850	41.11047
		Ping distance	3105		
		Radius	249		
P2	20:13	Depth	3122	55.20300	41.10123
		Ping distance	3279		
		Radius	1002		
P3	20:50	Depth	3131	55.21061	41.09742
		Ping distance	3312		
		Radius	1080		

This gave the following triangulation, with a relative position of **55° 12.4948 S and 41° 06.8459 W** where we believe the 3200m mooring is sitting:

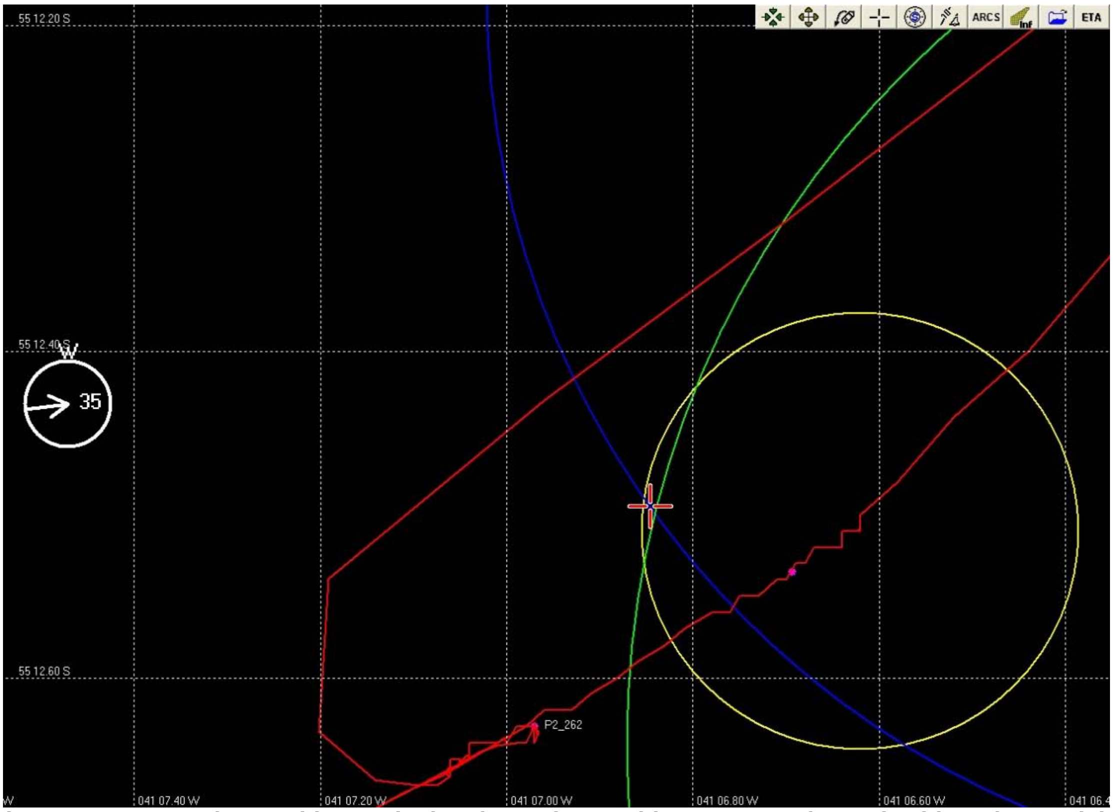


Figure 16 - P2 Mooring position: Calculated mooring position on JCR micropolt with cruise track in purple.

5.3 3700m sediment trap mooring @ P3

The mooring was redeployed on **31.12.11** @ 13:31 GMT with the buoy first again. After the deployment of all the equipment, the weight was finally released at 15:40 GMT at 52.80885S and 40.11142W

Again the mooring was pinged after the deployment to determine its position by triangulation. The ship moved from its position approx. ½ nm first E and then again ½ nm S. The positions, water depth, acoustic distance and the calculated radius where:

Table 15 - P3 mooring triangulated location

Position	Time	Triangulation		Latitude	Longitude
P1	16:15	Depth	3700	52.81055	40.11767
		Ping distance	3841		
		Radius	1027		
P2	16:55	Depth	3700	52.80084	40.10402
		Ping distance	3851		
		Radius	1071		
P3	17:11	Depth		52.80991	40.10187
		Ping distance	3769		
		Radius	484		

This gave the following triangulation, with a relative position of **52° 48.5414 S and 40° 06.3124 W** where we believe the 3700m mooring is sitting:

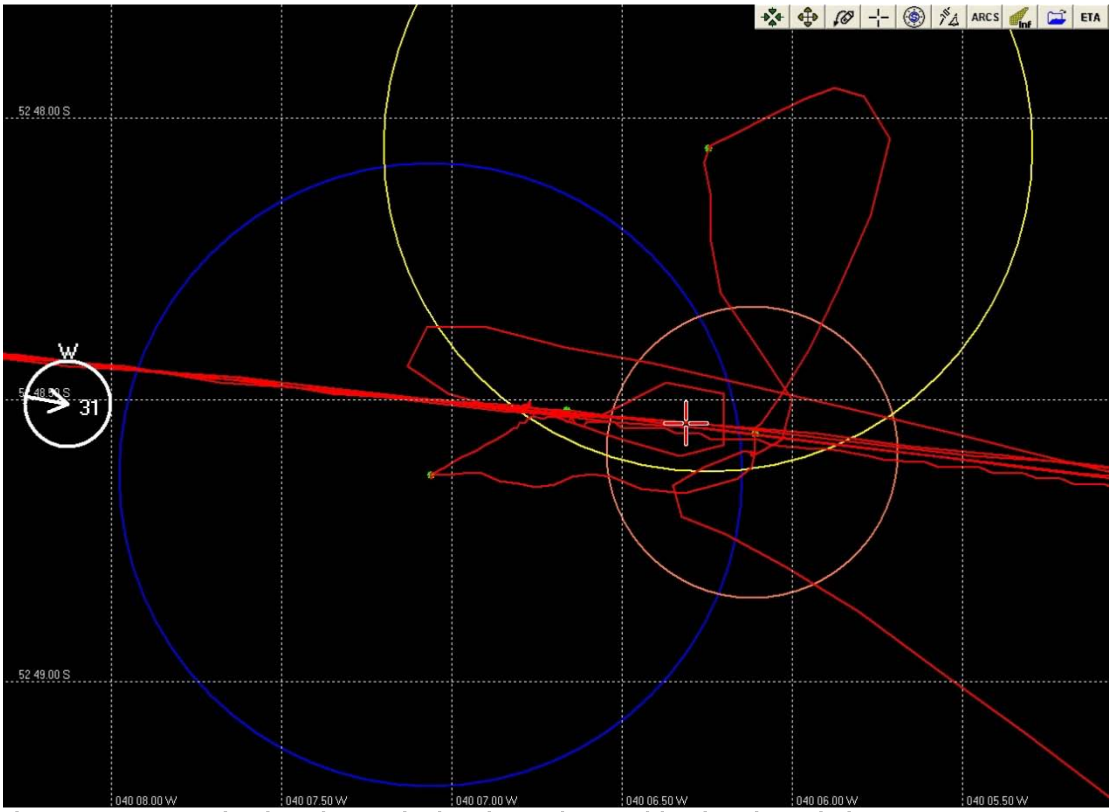


Figure 17 - P3 Mooring location: Calculated mooring position by triangulation.

5.4 Work Carried Out and Setup/Configuration of Moorings

5.4.1 3200m sediment trap mooring @ P2

NOVATEC beacon: R09, Ch B, 159.48 MHz

Acoustic Releases

Acoustic releases: 93 + 573

- new batteries
- tested

ARGOS beacon 335519 replaced by Irmasat beacon 13901110

- new Irmasat beacon 13901110
- tested

NOVATEC Combo beacon: R09-020

- new batteries
- tested

CTD 37 SMP 29579: 2462 on main buoy

- new batteries

- set-up instrument for re-deployment
  - set real time clock to PC clock (p. 28)
  - check instruments is ok and clock is set properly by using "DS"command (p. 27)
  - set-up instrument for "Autonomous Sampling" following the instructions on page 24
  - samplenum=0 automatically makes entire memory available for recording
  - sample interval: 900 sec

NEW ADCP WHS300 : 15548

- replaces the lost one

- set-up instrument for re-deployment
  - erase data (p.16 WinSC)
  - start WinSC for set up instrument
  - set-up instrument
    - Number of bins: 30 (1-128)
    - Bin size (m): 8 (0.2-16)
    - Pings per Ensemble: 10
    - Interval: 15 min
    - Duration: 550 days
    - Transducer depth: 200 m
  - save deployment settings
  - start time: 00:00:01 11.01.12
  - set up ADCP real time clock to PC clock
  - don't verify the compass (needless on a ship)
  - run pre-deployment tests to check instrument

Sediment trap: Parflux No: ML11966-02

- new batteries (14x C – Cells + 1x 9V Block battery)

- **Always disconnect the cable on the Sediment trap first, before unplugging the Computer end!!**

Parflux sediment trap deployment settings:

5.4.1.1 PS2 Sediment Trap Deployment

Schedule Verification

Event 1 of 22 = 01/15/2012 00:00:00

Event 2 of 22 = 02/01/2012 00:00:00
Event 3 of 22 = 02/15/2012 00:00:00
Event 4 of 22 = 03/01/2012 00:00:00
Event 5 of 22 = 04/01/2012 00:00:00
Event 6 of 22 = 05/01/2012 00:00:00
Event 7 of 22 = 06/01/2012 00:00:00
Event 8 of 22 = 07/01/2012 00:00:00
Event 9 of 22 = 08/01/2012 00:00:00
Event 10 of 22 = 09/01/2012 00:00:00
Event 11 of 22 = 10/01/2012 00:00:00
Event 12 of 22 = 11/01/2012 00:00:00
Event 13 of 22 = 12/01/2012 00:00:00
Event 14 of 22 = 12/15/2012 00:00:00
Event 15 of 22 = 01/01/2013 00:00:00
Event 16 of 22 = 01/15/2013 00:00:00
Event 17 of 22 = 02/01/2013 00:00:00
Event 18 of 22 = 02/15/2013 00:00:00
Event 19of 22 = 03/01/2013 00:00:00
Event 20 of 22 = 04/01/2013 00:00:00
Event 21 of 22 = 05/01/2013 00:00:00
Event 22 of 22 = 06/01/2013 00:00:00

Current meter: Aquadopp No A2L - 1792

- new batteries
    - The current meter batteries (lithium) are extremely expensive and those batteries deployed during last season will be returned to the UK with the view to finding a local manufacturer.

```
============================================================
Deployment   : 1792
Start at     : 11/01/2012 00:00:01
Comment:
3200 m mooring at P2
------------------------------------------------------------
Measurement interval  (s) : 900
Average interval      (s) : 60
Blanking distance     (m) : 0.37
Diagnostics interval(min) : N/A
Diagnostics samples       : N/A
Measurement load      (%) : 4
Power level               : HIGH
Compass upd. rate     (s) : 900
Coordinate System         : ENU
Speed of sound      (m/s) : MEASURED
Salinity            (ppt) : 34
File wrapping             : OFF
------------------------------------------------------------
Assumed duration   (days) : 550.0
Battery utilization   (%) : 243.0
Battery level         (V) : 11.4
Recorder size        (MB) : 89
Recorder free space  (MB) : 85.192
Memory required      (MB) : 2.1
Vertical vel. prec (cm/s) : 1.4
Horizon. vel. prec (cm/s) : 0.9
------------------------------------------------------------
Aquadopp Version 1.28
```

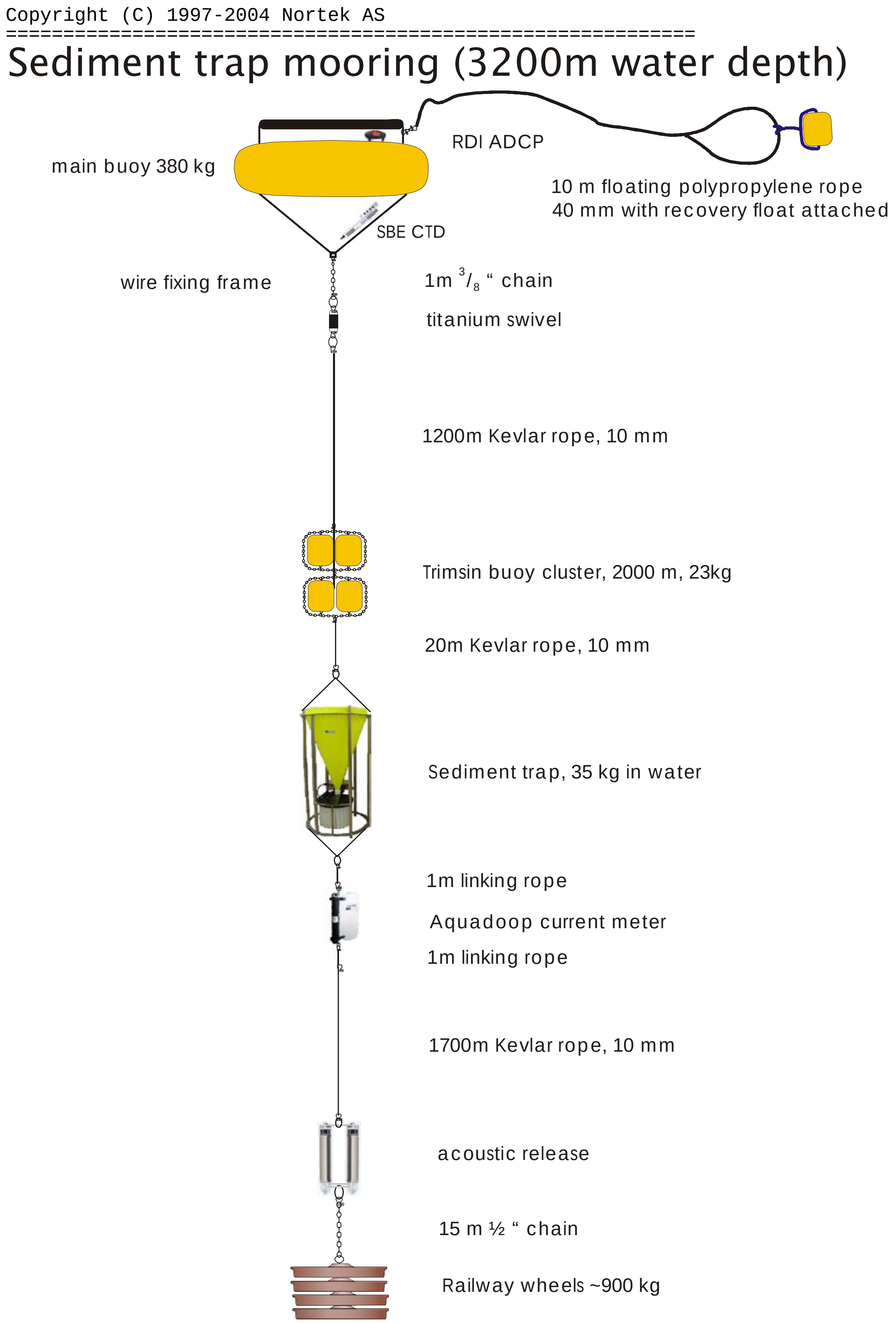


Figure 18 - Sediment trap mooring (3200m) @ P2: design diagram

5.4.2 3700m sediment trap mooring @ P3

NOVATEC beacon: U07-029, Ch A, 154.585 MHz

5.4.2.1 Acoustic Releases

Acoustic releases: 290 + 1022

- new batteries
- tested

Sonar Bell:

- new SonarBell attached to main rope approx. 50-100m above releases

ARGOS beacon 60210 replaced by Irmasat beacon 12098770

- new Irmasat beacon 12098770
- tested

NOVATEC Combo beacon: U07-029

- new batteries
- tested

CTD 37 SMP 43742: 4852 on main buoy

- new batteries

- set-up instrument for re-deployment
    - set real time clock to PC clock (p. 28)
    - check instruments is ok and clock is set properly by using “DS”command (p. 27)
    - set-up instrument for “Autonomous Sampling” following the instructions on page 24
    - samplenum=0 automatically makes entire memory available for recording
    - sample interval: 900 sec

CTD 37 SMP 43742: 4855 at estimated 500 m

- new batteries

- set-up instrument for re-deployment
    - set real time clock to PC clock (p. 28)
    - check instruments is ok and clock is set properly by using “DS”command (p. 27)
    - set-up instrument for “Autonomous Sampling” following the instructions on page 24
    - samplenum=0 automatically makes entire memory available for recording
    - sample interval: 900 sec

ADCP WHS300 – I – UG26: 7522

- new batteries

- set-up instrument for re-deployment
  - erase data (p.16 WinSC)
  - start WinSC for set up instrument
  - set-up instrument
    - Number of bins: 30 (1-128)
    - Bin size (m): 8 (0.2-16)
    - Pings per Ensemble: 10
    - Interval: 15 min
    - Duration: 550 days
    - Transducer depth: 200 m
  - save deployment settings in prepared folder
  - set up ADCP real time clock to PC clock
  - don't verify the compass (needless on a ship)
  - run pre-deployment tests to check instrument

Sediment trap: Parflux No: ML11966-01

- new batteries (14x C – Cells + 1x 9V Block battery)
  - do not remove both batteries at the same time!

- **Always disconnect the cable on the Sediment trap first, before unplugging the Computer end!!**

Parflux sediment trap deployment settings (21 cups)

5.4.2.2 PS3 Sediment Trap Deployment

Schedule Verification

Event 1 of 22 = 01/01/2012 00:00:00
Event 2 of 22 = 01/15/2012 00:00:00
Event 3 of 22 = 02/01/2012 00:00:00
Event 4 of 22 = 02/15/2012 00:00:00
Event 5 of 22 = 03/01/2012 00:00:00
Event 6 of 22 = 04/01/2012 00:00:00
Event 7 of 22 = 05/01/2012 00:00:00
Event 8 of 22 = 06/01/2012 00:00:00
Event 9 of 22 = 07/01/2012 00:00:00
Event 10 of 22 = 08/01/2012 00:00:00
Event 11 of 22 = 09/01/2012 00:00:00
Event 12 of 22 = 10/01/2012 00:00:00
Event 13 of 22 = 11/01/2012 00:00:00
Event 14 of 22 = 12/01/2012 00:00:00
Event 15 of 22 = 12/15/2012 00:00:00
Event 16 of 22 = 01/01/2013 00:00:00

Event 17 of 22 = 01/15/2013 00:00:00
Event 18 of 22 = 02/01/2013 00:00:00
Event 19 of 22 = 02/15/2013 00:00:00
Event 20 of 22 = 03/01/2013 00:00:00
Event 21 of 22 = 04/01/2013 00:00:00
Event 22 of 22 = 05/01/2013 00:00:00

Current meter: Aquadopp No A2L - 1793 at estimated 2000 m water depth

- new batteries
  - The current meter batteries (lithium) are extremely expensive and those batteries deployed during last season will be returned to the UK with the view to finding a local manufacturer.

Aquadopp current meter deployment settings

```
=================================================================
Deployment   : 1793
Start at     : 01/01/2012 00:00:01
Comment:
3700 m mooring at P3
----------------------------------------------------------
Measurement interval  (s) : 900
Average interval      (s) : 60
Blanking distance     (m) : 0.37
Diagnostics interval(min) : 720
Diagnostics samples       : 20
Measurement load      (%) : 4
Power level               : HIGH
Compass upd. rate     (s) : 900
Coordinate System         : ENU
Speed of sound      (m/s) : MEASURED
Salinity            (ppt) : 34
File wrapping             : OFF
----------------------------------------------------------
Assumed duration   (days) : 550.0
Battery utilization   (%) : 258.0
Battery level         (V) : 11.4
Recorder size        (MB) : 89
Recorder free space  (MB) : 87.527
Memory required      (MB) : 3.0
Vertical vel. prec (cm/s) : 1.4
Horizon. vel. prec (cm/s) : 0.9
----------------------------------------------------------
Aquadopp Version 1.28
```

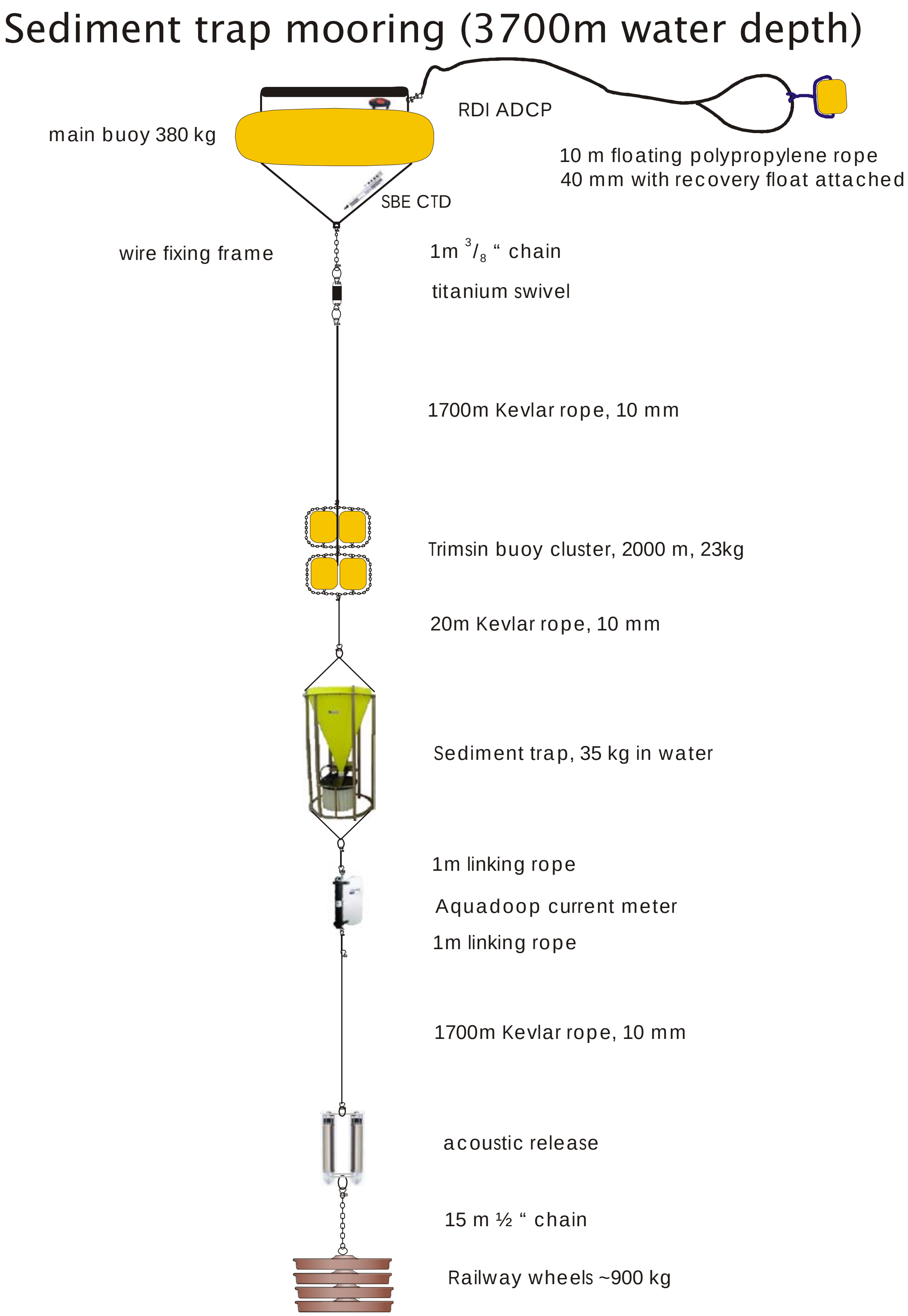


Figure 19 - Sediment trap mooring (3700m) @ P3: design diagram

5.4.3 Shallow water WCB mooring

All hardware was replaced and checked, line lengths are back to 30 m, and a new release was linked in with the old 572 release. All linking bars where new as well as the main U bolt on top of the paired releases.

The mooring was redeployed on **09/01/2012** and the weight was released at **21:09:00 GMT @ 53.79785S and 37.93623W**

NOVATEC beacon R09-021: Ch. C.: **160.725 MHz**

5.4.3.1 Acoustic Releases

5.4.3.2 Work on mooring

Acoustic release 572 & 1218

- new batteries
- tested
- new release 1218 tested

NOVATEC Combo beacon: R09-021

- new batteries
- tested

Sonar Bell

- new SonarBell attached to main rope approx. 10m above releases

ARGOS beacon 35520 replaced by Irmasat beacon 12094770

- new Irmasat beacon 12094770
- tested

WCP

- got new WCP from factory, NO: WCP45
- no firmware update was done as per recommendation from ASL, as we had no chance to calibrate and test it.
- New deployment file: JR260_WCP.mfawcp
- Screen dump under JR260_WCP.doc

CTD 37 SMP 43742: 2463

- new batteries
- 1 screw of Condutivity cell guard sheard off, need to be taken out, best would be swap with an other CTD, 1 screw replaced

Get new CTD, so this one can go for repairs
Get new screw: part NO:30859

- set-up instrument for re-deployment
    - set real time clock to PC clock (p. 28)

- check instruments is ok and clock is set properly by using “DS”command (p. 27)
- set-up instrument for “Autonomous Sampling” following the instructions on page 24
- samplenum=0 automatically makes entire memory available for recording
- sample interval: 240 sec
-

ADCP WHS300 – I – UG26: 2967

- new batteries

- set-up instrument for re-deployment
  - erase data (p.16 WinSC)
  - start WinSC for set up instrument
  - set-up instrument
    - Number of bins: 30 (1-128)
    - Bin size (m): 8 (0.2-16)
    - Pings per Ensemble: 10
    - Interval: 15 min
    - Duration: 550 days
    - Transducer depth: 200 m
  - save deployment settings in prepared folder
  - set up ADCP real time clock to PC clock
  - don’t verify the compass (needless on a ship)
  - run pre-deployment tests to check instrument

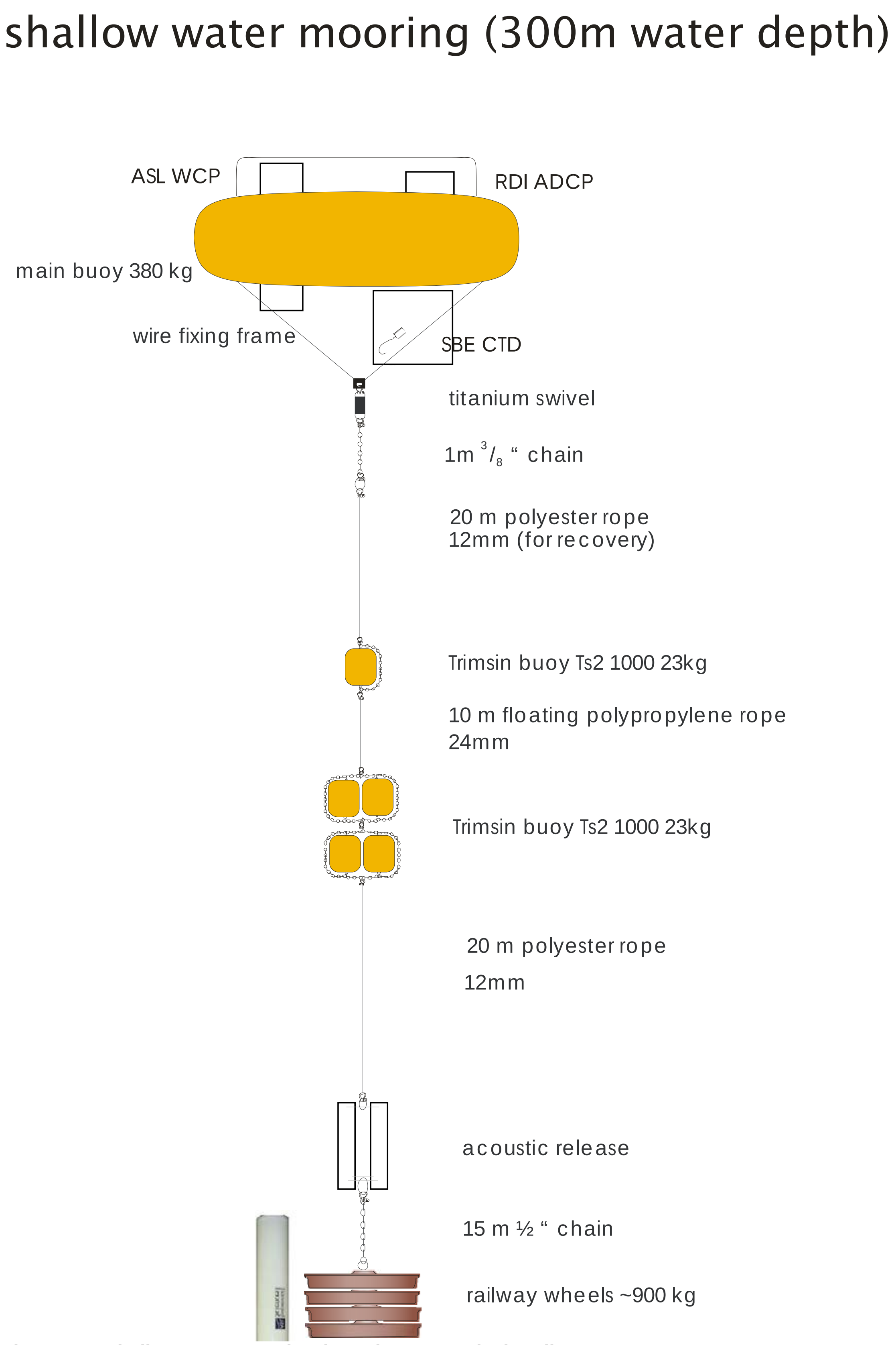


Figure 20 - Shallow water mooring (300m) @ WCB: design diagram

5.5 hardware in general on all three moorings

- The main section of chain, which the Trimsin buoy clusters are attached, replaced on all 3 moorings
- Section of chain connecting the main buoy replaced on all 3 moorings
- Shackles on the main buoy changed on all 3 moorings
- All shackles replaced on all other parts of the moorings
- New eyelinks added to the moorings to increase ease of recovery and deployment of moorings

6. Western Core Box

6.1 Narrative

The Western Core Box (WCB) survey was run in the normal west to east direction. W1.1 was started at the southern end at 09:00 on 2/01/2012. The sea was reasonable and there was little dropout, the weather forecast indicated a nice 4 day window for the WCB in total. XBTs were run (at 6 knots) through the first transect (at 10 knots) and completed. At the end of the second transect (W1.2) a shallow CTD was undertaken followed by both RMT8 stratified hauls at the stations. This was followed by a deep CTD (1000m) before commencing the second (W2.1 and W2.2) set of transects. The deep CTD was undertaken followed by a stratified RMT8. There was then an opportunity for two target hauls, before the shallow stratified haul followed by the shallow CTD then on to the start of W3. The third day followed in a similar fashion to the second with transects, 2 CTDs, 2 stratified nets and 2 target hauls. The fourth day of transects was completed in slightly lumpy seas and freshening winds, but all in all the WCB was completed successfully.

Table 16 - Western Core Box XBT, CDT, and RMT8 Events

ID	Event no	Date	Start time (GMT)	Comment
XBTs				
W1.1	21	02/01/2012	09:00	
W1.1	22	02/01/2012	10:02	
W1.1	23	02/01/2012	11:10	
W1.1	24	02/01/2012	12:31	
W1.1	25	02/01/2012	13:40	
W2.1	30	03/01/2012	09:03	
W2.1	31	03/01/2012	10:11	
W2.1	32	03/01/2012	11:19	
W2.1	33	03/01/2012	12:30	
W2.1	34	03/01/2012	13:41	
W3.1	42	04/01/2012	09:02	
W3.1	43	04/01/2012	10:07	
W3.1	44	04/01/2012	11:16	
W3.1	45	04/01/2012	12:27	
W3.1	46	04/01/2012	13:36	
W4.1	53	05/01/2012	09:00	
W4.1	54	05/01/2012	10:08	
W4.1	55	05/01/2012	11:20	
W4.1	57	05/01/2012	12:33	
W4.1	58	05/01/2012	13:40	
W4.2	59	05/01/2012	14:17	
W4.2	60	05/01/2012	15:28	
W4.2	61	05/01/2012	16:42	
W4.2	62	05/01/2012	17:52	
W4.2	63	05/01/2012	18:57	
CTDs				
W1.2S	26	02/01/2012	20:29	

W1.2N	29	03/01/2012	05:33
W2.2N	35	03/01/2012	20:18
W2.2S	41	04/01/2012	06:02
W3.2S	47	04/01/2012	20:17
W3.2N	52	05/01/2012	05:35

RMT8

W1.2S	27	02/01/2012	21:40
W1.2N	28	03/01/2012	01:04
W2.2N	36	03/01/2012	20:18
Target	37	04/01/2012	01:34
Target	38	04/01/2012	02:37
W2.2S	39	04/01/2012	03:55
W3.2S	48	04/01/2012	21:08
Target	49	04/01/2012	23:34
Target	50	05/01/2012	02:06
W3.2N	51	05/01/2012	03:54
Target	64	06/01/2012	01:23

7. RMT8 Nets

Sophie Fielding, et al.

7.1 Deployments

Three types of RMT8 deployments were undertaken during JR260b. Target trawls on krill swarms identified from the EK60 data. Oblique hauls where RMT8 net 1 was opened at the surface and the net deployed to 200 m before closing the net and vice versa. Finally stratified hauls were used where the net was opened at discrete depth horizons from the bottom upwards. The choice of deployment type depended on the task. Target hauls were made to supply Nelly Tremblay and the WCB team with krill for live incubations, preserved for different projects in Cambridge and for length frequency. Oblique hauls were only undertaken at the Western Core Box CTD positions. In this case one catch was worked up and the other preserved. Finally the stratified hauls were undertaken at the 24 hour stations, each catch was worked up and preserved. In some samples only a subsample was preserved due to the size of the catch.

Table 17 - RMT8 Net events

Event Num	Date	Net 1 open-closed	Net 2 open-closed	Type	Comments
5	30/12/11	17:01-17:04	17:06-17:09	Test	Discard
6	30/12/11	17:52-17:57	17:58-18:03	Test	Discard
14	01/01/12	00:41-00:51	00:53-00:54	Target	No target some krill caught
15	01/01/12	10:41-11:01	11:07-11:28	Stratified	150-100,100-50
19	01/01/12	21:18-21:39	21:40-22:01	Stratified	150-100,100-50
20	02/01/12	00:38-00:58	00:59-01:20	Stratified	150-100,100-50
27	02/01/12	21:41-22:10	22:11-22:41	Oblique	0-200-0 W1.2S
28	03/01/12	01:08-01:39	01:40-02:11	Oblique	0-200-0 W1.2N
36	03/01/12	22:12-22:45	22:45-23:15	Oblique	0-200-0 W2.2N
37	04/01/12	01:37-01:39	01:41-01:45	Target	Krill
38	04/01/12	02:39-02:44	04:26-04:43	Target	Krill
39	04/01/12	03:56-04:26	21:32-21:53	Oblique	0-200-0 W2.2S
48	04/01/12	21:10-21:32	23:56-00:04	Oblique	0-200-0 W3.2S
49	04/01/12	23:46-23:49	02:29-02:31	Target	Krill
50	05/01/12	02:27-02:29	04:27-04:57	Target	Krill
51	05/01/12	03:55-04:27	04:27-04:57	Oblique	0-200-0 W3.2N
64	06/01/12	01:29-01:33	01:33-01:34	Target	Net 2 aborted due to tension
65	06/01/12	10:33-10:53	10:53-11:27	Stratified	140-100,100-20
67	06/01/12				Net aborted due to incorrect closure
68	06/01/12	16:24-16:44	16:44-17:04	Stratified	150-100,100-20
69	06/01/12	21:20-21:42	21:43-22:13	Stratified	150-100,100-20
70	07/01/12	01:42-01:47	01:48-01:50	Target	Krill
71	07/01/12	03:18-03:38	03:39-03:59	Stratified	150-100,100-20
77	07/01/12	00:59-01:02		Target	Net 2 aborted due to

					tension
82	10/01/12	02:01-02:04	02:05-02:08	Target	Small krill
86	11/01/12				Net wash
87	11/01/12	16:32-17:03	17:08-17:38	Stratified	180-100,100-20
91	12/01/12	11:20-11:54			Altimeter test
92	12/01/12	12:22-12:40			Altimeter test
93	12/01/12	12:57-13:09			Altimeter test
95	13/01/12	00:08-00:12	00:14-00:18	Target	Small krill

7.2 Macrozooplankton

Gabriele Stowasser, Sophie Fielding, Ryan Saunders, Peter Enderlein, Nelly Tremblay, Damien O'Gaoithin, Jeremy Robst, David Connor, Imke Grefe and Will Goodall-Copestake

7.2.1 Gear

The RMT8 was used to characterise the macrozooplankton community in the Western Corebox in 200m stratified hauls (Table). Three types of RMT8 deployments were undertaken during JR260b. Target trawls on krill swarms identified from the EK60 data. Oblique hauls where RMT8 net 1 was opened at the surface and the net deployed to 200 m before closing the net and vice versa. Finally stratified hauls were used where the net was opened at discrete depth horizons from the bottom upwards. The choice of deployment type depended on the task. Target hauls were made to supply Nelly Tremblay and the WCB team with krill for live incubations, preserved for different projects in Cambridge and for length frequency. Oblique hauls were only undertaken at the Western Core Box CTD positions. In this case one catch was worked up and the other preserved. Finally the stratified hauls were undertaken at the 24 hour stations, each catch was worked up and preserved. In some samples only a subsample was preserved due to the size of the catch.

7.2.2 Catch sorting and processing

Stratified hauls

For the stratified hauls the total catch was sorted and quantified. Numbers caught and total weight was obtained for each species. For some groups specific identification was not possible and identification will be verified through re-examination in the laboratory in either Cambridge or by consulting colleagues specializing in these taxa outside BAS. All material collected in the second net was preserved in formalin. Specimens of key species found in the Scotia Sea were collected for genetic and energetic studies and preserved at -80°C (Table). Where specimens of the euphausiid *Thysanoessa* sp. were caught, subsamples were collected for collaborator Jaime Farber-Lorda at the University of , Mexico, and preserved at -80°C. All data were recorded in an Excel database.

Targeted hauls

The catch of targeted hauls was sorted and quantified. Where live *Euphausia superba* were caught samples were taken for live incubations and subsamples were frozen at -80°C for genetic and energetic studies. In hauls, where sufficient numbers of *E. superba* were caught, length-frequency data was collected (see chapter on krill length frequency). Krill total length was measured on 100 fresh krill, using the standard BAS measurement from the anterior edge of the eye to the tip of the telson, with measurements rounded down to the nearest mm

(Morris et al. 1988). Maturity stage was assessed using the scale of Makarov and Denys with the nomenclature described by Morris et al. (1988).

Table 18 - RMT Net events

Event Num	Date	Net 1 open-closed	Net 2 open-closed	Type	Comments
5	30/12/11	17:01-17:04	17:06-17:09	Test	Discard
6	30/12/11	17:52-17:57	17:58-18:03	Test	Discard
14	01/01/12	00:41-00:51	00:53-00:54	Target	No target some krill caught
15	01/01/12	10:41-11:01	11:07-11:28	Stratified	150-100,100-50
19	01/01/12	21:18-21:39	21:40-22:01	Stratified	150-100,100-50
20	02/01/12	00:38-00:58	00:59-01:20	Stratified	150-100,100-50
27	02/01/12	21:41-22:10	22:11-22:41	Oblique	0-200-0 W1.2S
28	03/01/12	01:08-01:39	01:40-02:11	Oblique	0-200-0 W1.2N
36	03/01/12	22:12-22:45	22:45-23:15	Oblique	0-200-0 W2.2N
37	04/01/12	01:37-01:39	01:41-01:45	Target	Krill
38	04/01/12	02:39-02:44	04:26-04:43	Target	Krill
39	04/01/12	03:56-04:26	21:32-21:53	Oblique	0-200-0 W2.2S
48	04/01/12	21:10-21:32	23:56-00:04	Oblique	0-200-0 W3.2S
49	04/01/12	23:46-23:49	02:29-02:31	Target	Krill
50	05/01/12	02:27-02:29	04:27-04:57	Target	Krill
51	05/01/12	03:55-04:27	04:27-04:57	Oblique	0-200-0 W3.2N
64	06/01/12	01:29-01:33	01:33-01:34	Target	Net 2 aborted due to tension
65	06/01/12	10:33-10:53	10:53-11:27	Stratified	140-100,100-20
67	06/01/12				Net aborted due to incorrect closure
68	06/01/12	16:24-16:44	16:44-17:04	Stratified	150-100,100-20
69	06/01/12	21:20-21:42	21:43-22:13	Stratified	150-100,100-20
70	07/01/12	01:42-01:47	01:48-01:50	Target	Krill
71	07/01/12	03:18-03:38	03:39-03:59	Stratified	150-100,100-20
77	07/01/12	00:59-01:02		Target	Net 2 aborted due to tension
82	10/01/12	02:01-02:04	02:05-02:08	Target	Small krill
86	11/01/12				Net wash
87	11/01/12	16:32-17:03	17:08-17:38	Stratified	180-100,100-20
91	12/01/12	11:20-11:54			Altimeter test
92	12/01/12	12:22-12:40			Altimeter test
93	12/01/12	12:57-13:09			Altimeter test
95	13/01/12	00:08-00:12	00:14-00:18	Target	Small krill

Table 19 - Location and numbers of invertebrate species sampled in South Georgia waters during cruise JR260B

Project	Species	Event*	Number sampled	Storage
Energetics	*Calycopsis borchgrevinki*	28	2	-80°C
	Calycopsis borchgrevinki	51	7	-80°C
	Chaetognatha spp.	27	10	-80°C
	Chaetognatha spp.	28	5	-80°C
	Cyphocaris sp.	28	1	-80°C
	Diphyes sp.	28	2	-80°C
	Diphyes sp.	36	8	-80°C
	Diphyes sp.	51	1	-80°C
	Euphausia superba	27	20	-80°C
	Euphausia superba	77	20	-80°C
	Euphausia triacantha	14	10	-80°C
	Euphausia triacantha	27	20	-80°C
	Galiteuthis glacialis	27	2	-80°C
	Galiteuthis glacialis	28	4	-80°C
	Galiteuthis glacialis	51	3	-80°C
	Mysidacea spp.	87	21	-80°C
	Parandania boecki	28	7	-80°C
	Polychaeta	28	2	-80°C
	Salpa thompsoni	14	4	-80°C
	Salpa thompsoni	28	18	-80°C
	Salpa thompsoni	36	9	-80°C
	Salpa thompsoni	77	132	-80°C
	Sibogitta sp.	27	7	-80°C
	Sibogitta sp.	28	6	-80°C
	Themisto gaudichaudii	87	50	-80°C
	Themisto gaudichaudii	14	20	-80°C
	Tomopteris sp.	14	38	-80°C
Genetics	*Euphausia superba*	28	75	-80°C
	Euphausia superba	37	50	-80°C
	Euphausia superba	49	50	-80°C
	Euphausia superba	82	100	-80°C
	Euphausia superba	95	50	-80°C
	Euphausia triacantha	27	50	-80°C
	Euphausia triacantha	36	50	-80°C
	Themisto gaudichaudii	27	73	-80°C
	Themisto gaudichaudii	36	50	-80°C
	Themisto gaudichaudii	87	50	-80°C
	Thysanoessa sp.	36	50	-80°C

* For geographical position of Events see table

7.2.3 Energetic study

Food quality has fundamental implications for the ecology of all species and yet few data exist in the literature concerning the energy content of fish and crustaceans from the Southern

Ocean. The energy content of prey is a key factor controlling the structure of food webs as well as behavioural traits such as the proportion of time higher predators may spend foraging versus socialising or resting. The energy density of prey items can vary substantially between species as well as their being differences within species. These variations have been attributed to differences in relative status (size, age, reproductive state) and/or seasonal or geographical differences and influences. The aim during this cruise was to extend our existing sample collection of prominent prey species of the Scotia Sea (e.g. *Themisto gaudichaudii, Salpa thompsoni, E. superba*) and collect specimens from different regions. All specimens taken for energetic analysis are listed in Table.

7.2.5 Genetic study

A further aim during this cruise was to sample multiple krill species for evolutionary genetics research projects based at BAS Cambridge, where DNA would be extracted from the krill and multiple genetic loci PCR amplified and sequenced. The resulting sequence information will be used to start building a multi-gene molecular phylogeny of krill, the aim of which is to resolve the contradictions and weakly resolved nodes that occur in krill molecular phylogenies produced to date. When large sample sizes are available, DNA sequence information will be used for population-genetic historical demography analysis. These analyses generate historical trajectories of krill population size through time that can be compared with existing trajectories for *E. superba* and with paleo-environmental data (e.g. climate change inference) so that we can build up a picture of how krill communities (as opposed to just single species) may have changed in response to glacial-timescale climate change. Several sample-sets of 50-100 specimens of *E. superba* were collected from contrasting areas in Western Corebox waters to test for possible differences in population structure within the same year of recruitment. Furthermore *Themisto gaudichaudii* was sampled for genetic analysis at several stations (Table). In South Georgia waters *T. gaudichaudii* can be an important prey for higher predators, particularly in years of low krill abundance. However, little information exists on their population structure and dynamics in this region and currently no information exists on the molecular phylogeny of this species. Samples were bagged in batches of 25 and frozen at -80°C until further analysis.

7.3 Krill length frequency, maturity stage and shape

7.3.1 Introduction

Antarctic krill (*Euphausia superba*) were sampled to determine the variation in the structure of the population around South Georgia and to provide parameters required in the target strength model for krill biomass estimation.

7.3.2 Methods

Krill samples were taken from RMT8 samples where there were sufficient numbers of krill to select 100 decent state specimens for length frequency, maturity and krill shape photographs. Krill were laid out on blue plastic boards (in pre-drilled grooves) and photographed using a Nikon DX3 with two flash guns on a stand. The same krill were then measured for length and staged. Krill total length was measured, using the standard BAS measurement from the anterior edge of the eye to the tip of the telson, with measurements rounded down to the nearest millimetre (Morris et al. 1988). Maturity stage was assessed using the scale of Makarov and Denys with the nomenclature described by Morris et al. (1988).

7.3.3 Data

Krill length frequency data were input into a spreadsheet on the L drive "JR260b_krill_length_frequencies.xls. The Net event numbers from which krill were measured and whether they were photographed is identified in Table krill_lf with the mean length of those events and the data is displayed in Figure Krill_lf

Table 20 - Krill length frequency

Event Number	Net Number	Photo	Mean Length (mm)
19	1	Y	46.21
20	2	Y	54.81
28	1	Y	52.44
37	1	Y	49
37	2	Y	52.18
38	1	Y	41
38	2	Y	52.7
49	1	Y	53.79
49	2	Y	51.67
50	1	Y	49.04
50	2	Y	48.92
64	1	Y	42.76
70	1	Y	49.64
77	1	Y	37.44
82	1	Y	41.99
95	1	Y	38.36
95	2	Y	37.12

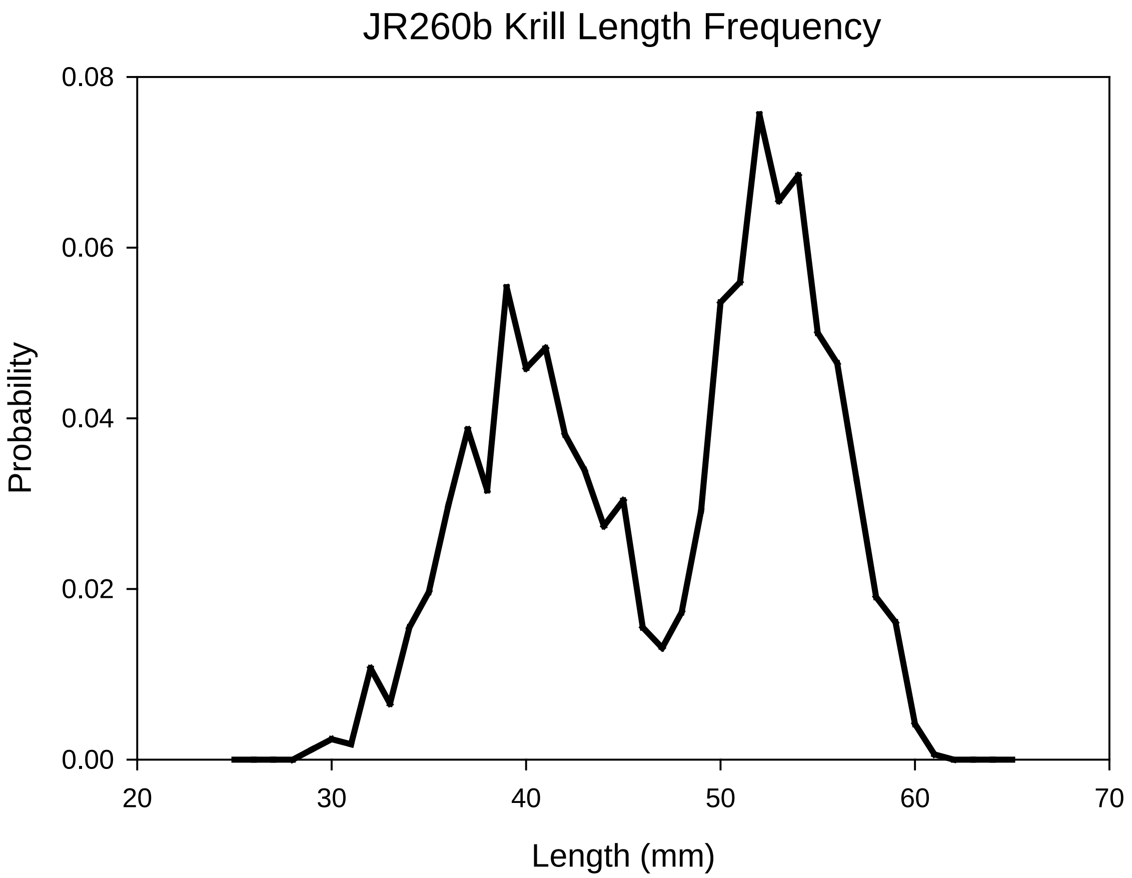


Figure 21 - Krill length probability density function from all stations

7.4 Photography of krill samples

As part of the investigation of length frequency, each sample measured both laterally and dorsally. The photographs were taken for use in the development in a computerised approach to calculating the shape of krill to better inform a krill target strength model.

Krill were arranged on plastic boards in five rows of four. The boards were a medium to dark blue colour, intended to optimize the contrast with the krill bodies. Five grooves were machine-melted into the boards. Melting was preferable to cutting as it reduced the scattering of light from rough edges.

A Nikon D3X with an attach Nikon 60 mm macro lens and Hoya Skylight filter was mounted level, above the board such that the board was almost filling the field of view (Figure 1a). Two magnetically mounted flash guns were positioned low, either side of the board (Figure 1b), approximately 1 m apart and connected to the camera.

The camera was set in Manual mode with an aperture of F25 and an exposure of 1/125.

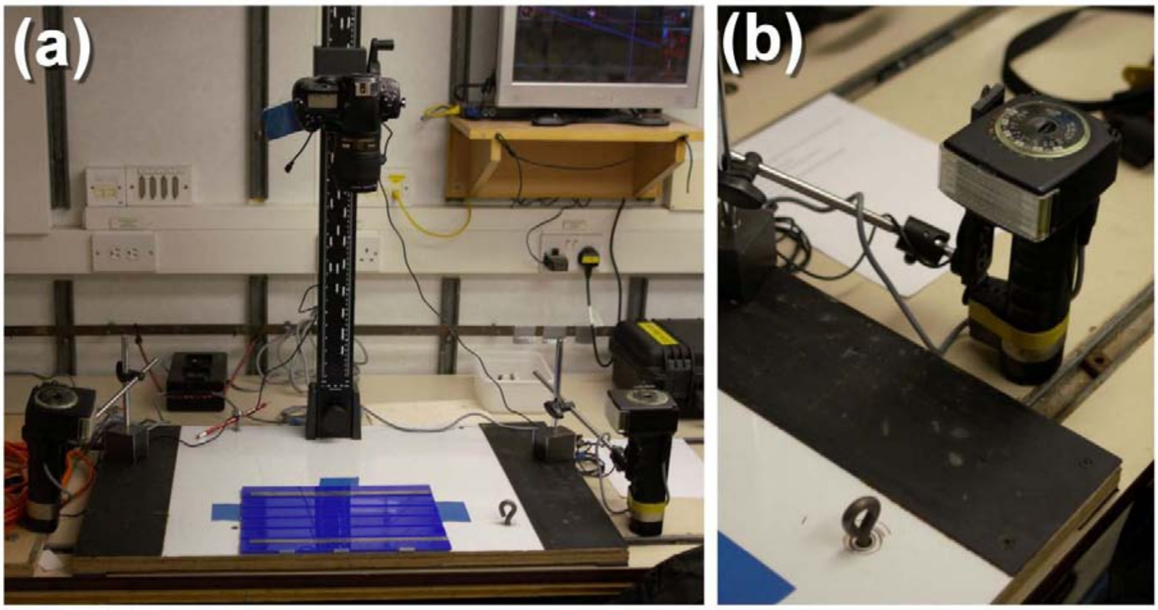


Figure 22. (a) Krill photography setup with magnetically mounted flash guns, camera stand and krill board. (b)

The photos were downloaded directly from the camera, catalogued and renamed to include the cruise number and image sequence. A list of the photographs and details of the associated event number, date etc. is included in Appendix XX.

An example photograph is shown in Figure 2.

Figure 23. Example of lateral view of a typical sample board.

7.5 Tolerance mechanisms and responses of Euphausia superb to hypoxia: a comparison with euphausiid species from three oxygen minimum zones of the Eastern Pacific

8. Shallow Underwater Camera System

SUCS was designed by Peter Enderlein to the specification from Dave Barnes to gain high resolution images of exact areas of benthic habitats. The requirement was to have a single cable design, whereby the cable had to be strong enough to hold the whole UW unit, to power up the UW unit, allow two way communications, the live streaming of low resolution video footage and being able to take high resolution still photos, which have to uploaded back on board for storage. The electronic design of the system was undertaken by Carl Robinson, who had developed a standalone Camera system before with similar components, which reduced the overall electronic design time.

SUCS was successfully deployed during cruise JR262 in October 2011 and it was noted that it had potential to make midwater video observations of krill swarms, as well as seafloor photographs. As a result it was brought onto JR260B with an aim to video krill in the midwater column and at depth. In addition, when opportunities arose, the camera was deployed to the seabed for additional photographs for Dave Barnes.

Table 21 - SUCS events

Event	Date	Time (GMT)	Records	Comments
1	30/12/2011	12:46-13:00	1 video, 2 midwater stills	
2	30/12/2011	13:10-13:30	2 videos, 3 midwater stills	
17	01/01/2012	17:13-17:41	7 videos, 5 midwater stills, 2 seabed stills	
18	01/01/2012	18:09-18:55	5 videos, 1 midwater still, 4 seabed stills	
40	04/01/2012	05:17-05:44	3 videos, 2 seabed stills	
66	06/01/2012	14:19-15:04	7 videos, 7 seabed stills	
76	08/01/2012	16:15-16:41	4 videos	
85	11/01/2012	14:35-15:14	4 videos, 7 seabed stills	
88	12/01/2012	01:33-02:03	3 videos, 4 seabed stills	Dropped through krill swarm

It appeared that the lights of the SUCS system was attracting krill, so whilst krill were observed on the seabed, it is not possible to identify whether they were there, or attracted by the lights. Photo 1 shows krill at the seabed, Photo 2 shows the same seabed image after the lights were switched off for 2 minutes.

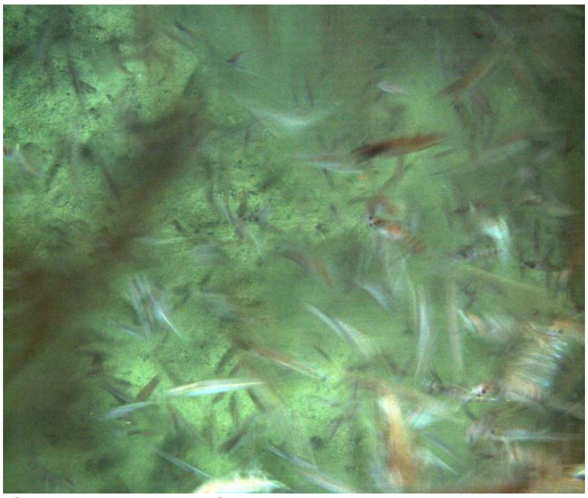


Figure 24 - SUCS Photo 1

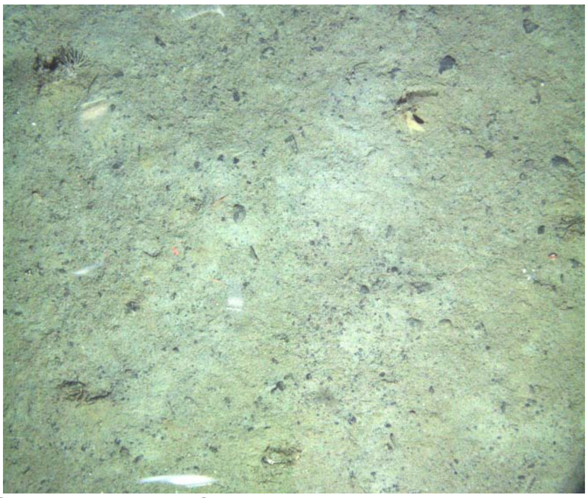


Figure 25 - SUCS Photo 2

The EK60 120 kHz data shows how the krill were drawn down from the scattering layer following the SUCS system.

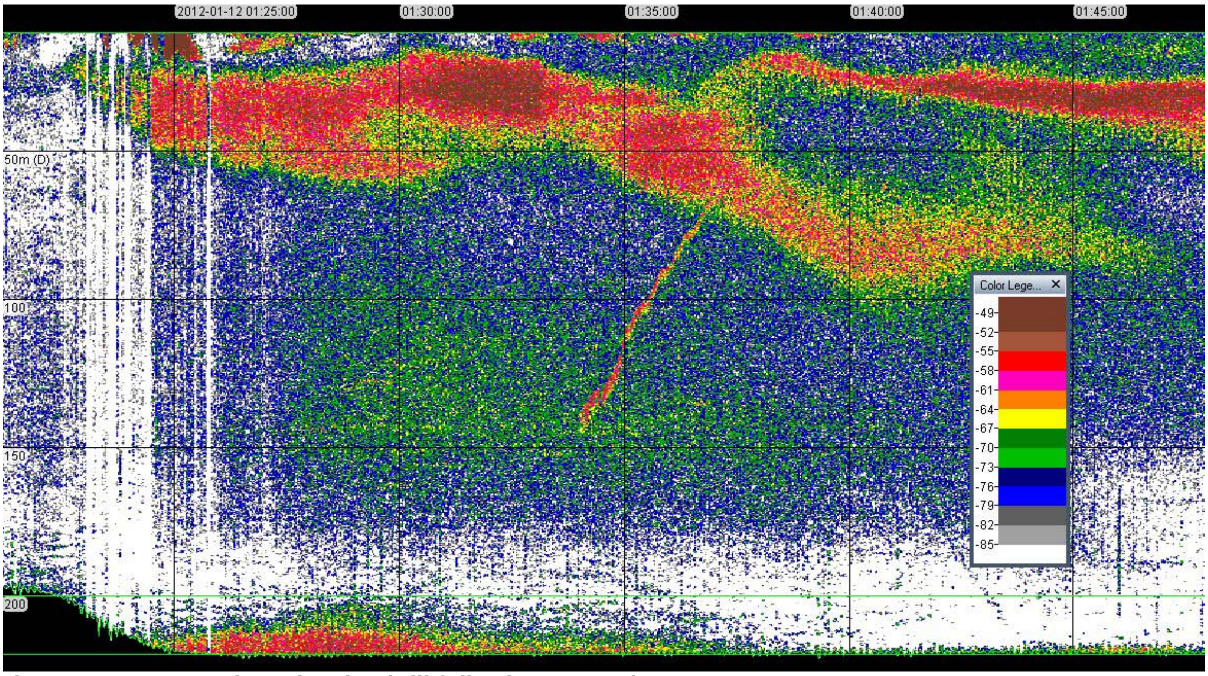


Figure 26 - EK60 120kHz showing krill following SUCS downcast

Prior to the SUCS deployment, there was a large indication that krill were swarming at the seabed below the surface swarm, seen in the EK60 data as a strong scattering layer just above the seabed.

9. Nitrous oxide N_2O: Sampling for stable isotope analysis and continuous concentration measurements in the surface ocean

Imke Grefe, PhD student (University of East Anglia UEA, UK)

Supervisors: Jan Kaiser, Paul Dennis, Alina Marca (UEA, UK), Thomas Röckmann (University Utrecht, Netherlands)

9.1 Background and Objective

Nitrous oxide N_2O is an important greenhouse gas and precursor of ozone depleting substances in the stratosphere. Natural sources of this trace gas are bacterial nitrification and denitrification. Stable isotope signatures can be useful tracers of biological cycling and the excess of the heavy oxygen isotope ^{17}O ($\Delta^{17}O$) in N_2O is a potential tracer of bacterial sources. Measuring the $\Delta^{17}O$ signal in marine samples would help constraining the contribution of the ocean to the global N_2O budget. The Southern Ocean is a highly dynamic area of the global overturning circulation where older water masses are upwelled and new deepwater is generated. This setting allows for sampling of various water masses, which can then be compared for their N_2O stable isotope composition.

Another approach of investigating the role of the oceans is comparing concentrations of dissolved N_2O in the surface ocean with the background signal in the marine air. Air-sea gas exchange calculations give insight in the amount of flux in- and out of the ocean.

9.2 Sampling and Measurements

Water samples for stable isotope analysis were taken from CTD casts on and off the shelf (table 1, figure 1). Five to seven depths were sampled, focussing on changes in the oxygen profile. Enhanced N_2O production from nitrification is expected in zones of lower oxygen concentrations. Isotope signatures of those production regions will be compared to surface samples from 10 m depths. It was also tried to sample different water masses, identified by changes in temperature and salinity. Samples were drawn bubble-free from Niskin bottles in 550 ml glass flasks, allowing the water to overflow three times the sample volume to avoid contamination from the atmosphere. Sample flasks were closed gas-tight with a butyl rubber stopper and aluminium crimp seals. To stop biological activity until analysis, 1 ml of mercuric chloride were added. 1 ml of helium was injected to avoid potentially compromising the seal when water warms up and expands. The gas headspace expands and compresses without building up as much pressure as a liquid.

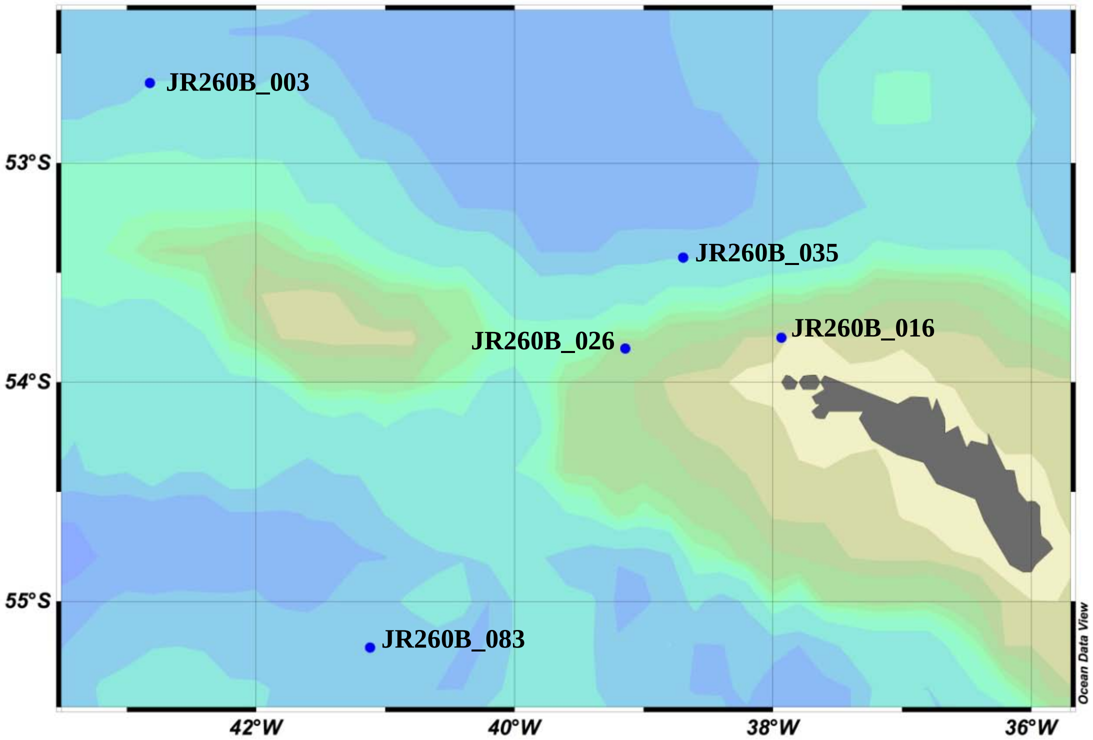


Figure 27 - Map of CTD stations sampled for N_2O stable isotope analysis.

Table 22 - CTD casts sampled for N_2O stable isotope analysis. Each sample consists of three sub-samples, ~ 550 ml each. Samples will be analysed after return of the ship to the UK at the stable isotope lab SIL at the University of East Anglia UEA.

Event	Bottle number	Depth	Sample ID		
JR260B_003	1	1000	JR260B-1	JR260B-2	JR260B-3
	3	300	JR260B-4	JR260B-5	JR260B-6
	5	100	JR260B-7	JR260B-8	JR260B-9
	7	60	JR260B-10	JR260B-11	JR260B-12
	9	10	JR260B-13	JR260B-14	JR260B-15
JR260B_016	1	275	JR260B-16	JR260B-17	JR260B-18
	3	140	JR260B-19	JR260B-20	JR260B-21
	5	80	JR260B-22	JR260B-23	JR260B-24
	7	50	JR260B-25	JR260B-26	JR260B-27
	9	10	JR260B-28	JR260B-29	JR260B-30
JR260B_026	1	260	JR260B-31	JR260B-32	JR260B-33
	3	200	JR260B-34	JR260B-35	JR260B-36
	5	90	JR260B-37	JR260B-38	JR260B-39
	7	50	JR260B-40	JR260B-41	JR260B-42
	9	10	JR260B-43	JR260B-44	JR260B-45
JR260B_035	1	1000	JR260B-46	JR260B-47	JR260B-48
	3	500	JR260B-49	JR260B-50	JR260B-51
	5	200	JR260B-52	JR260B-53	JR260B-54

	7	50	JR260B-55	JR260B-56	JR260B-57
	9	10	JR260B-58	JR260B-59	JR260B-60
JR260B_083	1	1600	JR260B-61	JR260B-62	JR260B-63
	3	1100	JR260B-64	JR260B-65	JR260B-66
	5	700	JR260B-67	JR260B-68	JR260B-69
	8	350	JR260B-70	JR260B-71	JR260B-72
	9	150	JR260B-73	JR260B-74	JR260B-75
	11	50	JR260B-76	JR260B-77	JR260B-78
	13	10	JR260B-79	JR260B-80	JR260B-81

A laser-based N_2O/CO analyser (*Los Gatos Research, Inc.*) was used for measurements of dissolved N_2O in the surface ocean (figure 2). The analyser was connected to an equilibrator (figure 3), as well as to an intake for marine air via a valve board (figure 4). Measurements were alternated between water from the ship's pumped seawater supply, background concentrations in the air and three references, close to ambient concentrations. Measurements were taken at 1 Hz and can therefore resolve small-scale changes in surface ocean concentrations. Saturation and air-sea gas exchange will be calculated from analyser data, temperature in the equilibrator, sea surface temperature and –salinity from the ship's sensors. Raw data from the analyser will be quality controlled (e.g. flushing time of cavity when switching between gases) and drift corrected after post-cruise calibration of the reference gases against primary standards. Initial problems with the analyser's build-in computer freezing up were experienced. Those could be resolved by adjusting a potentiometer on the switching power supply, following emailed instructions of the manufacturer. The analyser was running without further issues from the afternoon of 29 December until the end of the cruise.

Discrete 20 ml samples from the pumped seawater supply were taken and preserved with 3 ml mercuric chloride for analysis with a gas chromatograph connected to an electron capture detector GC-ECD at UEA. Results will be compared to the analyser's measurements.

Figure 28 - N_2O/CO analyser, Los Gatos Research, Inc.

Figure 30 - Percolating packed bed equilibrator, connected to ship's pumped seawater supply in chemistry lab.

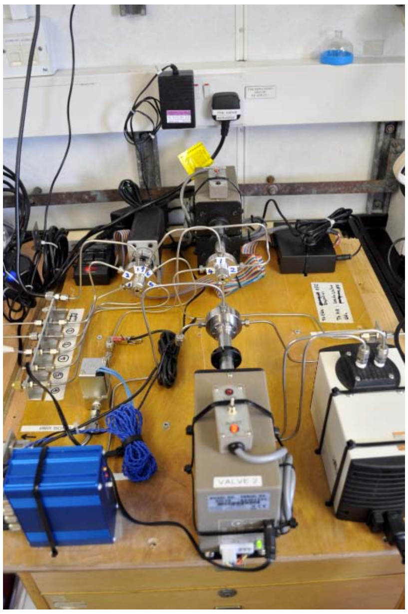


Figure 29 - Valve board, connecting the N_2O/CO analyser to the equilibrator headspace, marine air line and reference gases.

Table 23: Sampling times for 20 ml seawater samples from pumped supply for GC-ECD measurements and subsequent comparison to laser-based N_2O analyser data.

Date	Time (GMT)		Sample ID
	start sampling	stop sampling	
6/1/12	12:20	12:30	JR260B 1a - 1d
6/1/12	16:22	16:30	JR260B 2a - 2d
9/1/12	14:20	14:30	JR260B 3a - 3d
11/9/12	18:43	18:50	JR260B 4a - 4d
11/9/12	20:00	20:05	JR260B 5a - 5d
12/1/12	17:42	17:47	JR260B 6a - 6d
14/1/12	13:45	13:51	JR260B 7a - 7d

10. Technical Support

Vsevolod Afanasyev, Jeremy Robst

10.1 AME Report

Cruise:JR260B Start date:27/11/2011 Finish date:15/01/2012
Name of AME engineer: Vsevolod Afanasyev
Name of principle scientist (PSO): Sophie Fielding

Instrument	**Used ?**	**Comments**
XBT (aft UIC) (PC, I/F box, handgun)	Y	
Scintillation counter (prep lab)		
AutoSal (labs on upper deck) S/N 63360		
AutoSal (labs on upper deck) S/N 65763		
AutoSal (labs on upper deck) S/N 68533		
Portasal S/N 68164		
Magnetometer STCM1 (aft UIC)		
AME workshop PC	Y	

GPS, MRU, Gyro

GPS Furuno GP32 (bridge – port side)	Y	
DGPS Ashtec ADU5 (bridge – port side)	Y	

DGPS, MRU Seatex Seapath (UIC – swath suite)	Y	Seapath overheated – rear fan filter removed.
DGPS Ashtec Glonass GG24 (bridge – starboard side)	Y	
Gyro synchro to RS232 Navitron NT925HDI (UIC – aft)	Y	
TSS HRP (UIC repeater)	Y	

ACOUSTIC

Instrument	Used ?	Comments
ADCP (aft UIC)	Y	
Waterfall Hydrophone (aft UIC)		
EM122 (for'd UIC)	Y	
TOPAS (for'd UIC)		
EPC plotter (used with TOPAS)		
EK60 (mid UIC)	Y	
HP deskjet 1 (used with EK)		
HP deskjet 2 (used with EK)		
SSU (for'd UIC)	Y	
SVP S/N3298 (cage when unused)		
SVP S/N3314 (cage when unused)		
10kHz IOS pinger		
Sonardyne USBL (aft UIC)		

OCEANLOGGER

Instrument	Used ?	Comments
Main logging PC hardware and software	Y	
Barometer (back of logger rack) #V145002 (7/03)	Y	
Barometer #V145003 (7/03)	Y	
TH1, Air humidity & temp (for'd mast) #60599556	Y	Occasionally drops to 0. Self - recovers.
TH2, Air humidity & temp (for'd mast) #60599558	Y	
Thermosalinograph SBE45 (prep lab) #4524698-0016		
Thermosalinograph SBE45 # 4538936-0130	Y	
Thermosalinograph SBE45 #4524698-0018 (7/04)		
Uncontaminated seawater temp SBE38 #		
SBE45 + SBE38 Interface #		
Fluorometer (prep lab)	Y	
Transmissometer C-STAR CST-1399DR	Y	
TIR sensor (pyranometer) (for'd mast) #112993 TIR1	Y	
TIR sensor #112992 TIR2	Y	

OCEANLOGGER – cont.

PAR sensor (for'd mast) #110127 PAR1	Y	
PAR sensor #110126 PAR2	Y	
Flow meter + Transmitter (prep room) #11950	Y	
Uncontaminated seawater temp (transducer space)	Y	

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

Instrument	Used ?	Comments
CTD PC	Y	
Deck unit 1 SBE11plus S/N 11P15759-0458		
Deck unit 2 SBE11plus S/N 11P20391-0502	Y	
Underwater unit SBE9plus #09P15759-0480 Press #67241		
Underwater unit SBE9plus #09P20391-0541 Press #75429		
Underwater unit SBE9plus #09P30856-0707 Press #89973		
Underwater unit SBE9plus #09P35716-0771 Press #93686	Y	
Carousel & pylon SBE32 #3215759-0173		
Carousel & pylon SBE32		

#0248		
Carousel & Pylon 24 Bottle	Y	
CTD swivel linkage	Y	
CTD swivel S/N196115		
CTD swivel S/N196111	Y	

CTD contd – C & T & pumps – please state which primary and secondary

Temp sensor SBE3plus #03P2191	Y	Primary Temp. (Primary – Secondary OK)
Temp sensor SBE3plus #03P4874	Y	Secondary Temp. (Primary – Secondary OK)
Temp sensor SBE3plus #03P2366		
Temp sensor SBE3plus #03P2307		
Temp sensor SBE3plus #03P2705		
Temp sensor SBE3plus #03P2709		
Temp sensor SBE3plus #03P4235		
Temp sensor SBE3plus #03P4302		
Cond sensor SBE4C #041912	Y	Secondary Cond.
Cond sensor SBE4C #042248	Y	Primary Cond.
Cond sensor SBE4C #042222		
Cond sensor SBE4C #041913		
Cond sensor SBE4C #042255		
Cond sensor SBE4C #042289		
Cond sensor SBE4C #042813		
Cond sensor SBE4C #042875		
Pump SBE5T # 54488	Y	Primary pump. CONSTANT OFFSET (PTIMARY-SECONDARY)
Pump SBE5T # 54485	Y	Secondary pump. CONSTANT OFFSET (PTIMARY-SECONDARY)
Pump SBE5T # 52371		
Pump SBE5T # 52395		
Pump SBE5T # 52400		

Pump SBE5T # 53415		

CTD contd

Instrument	Used ?	Comments
Fluorometer Aquatracka MkIII #097324001	Y	
Fluorometer Aquatracka MkIII #088249		
Standards Thermometer SBE35 #3515759-0005		
Standards Thermometer SBE35 # 3527735-0024		
Standards Thermometer SBE35 # 3535231-0047	Y	
Altimeter PA200 #2130.26993	Y	IT PINGS TOO FAST, OCCASIONALLY RESULTING IN FALSE BOTTOM SIGNAL
Altimeter PA200 #7742.163162		
Altimeter PA200 #2130.27001		
Transmissometer C-Star #CST-1279DR	Y	
Transmissometer C-Star #CST-527DR		
Transmissometer C-Star CST 846DR		
Oxygen sensor SBE43 #0242	Y	
Oxygen sensor SBE43 #0245		
Oxygen sensor SBE43 #0620		
Oxygen sensor SBE43 #0676		
PAR sensor #7235	Y	

PAR sensor #7252		
PAR sensor #7274		
PAR sensor #7275		
LADCP #14443		
LADCP #15060		
LADCP #		
LADCP Battery Pack		
AME Laptop (BBTalk)		

CTD contd

Notes on any other part of CTD e.g. faulty cables, wire drum slip ring, bottles, swivel, frame, tubing etc.		

AME UNSUPPORTED INSTRUMENTS BUT LOGGED

Instrument	**Used ?**	**Comments**
EA600 (bridge and UIC remote)	Y	
Anemometer	Y	
Gyro	Y	
DopplerLog	Y	
EMLog	Y	
CLAM winch monitoring system	Y	

At the end of the cruise, please ensure that:

- the XBT is left in a suitable state (store in cage if not to be used for a while – do not leave on deck or in UIC as it will get kicked around). Remove all deck cables at end of cruise prior to refit.
- the salinity sample bottles have been washed out and left with deionised water in – please check this otherwise the bottles will build up crud and have to be replaced.
- the CTD is left in a suitable state (washed (including all peripherals), triton + deionised water washed through TC duct, empty syringes put on T duct inlets to keep dust out and stored appropriately). Be careful about freezing before next use – this will damage the C sensors (run through with used standard seawater to reduce the chance of freezing before the next use). Remove all the connector locking sleeves and wash with fresh water. Blank off all unconnected connectors. See the CTD wisdom file for more information. If the CTD is not going to be used for a few weeks, at the end of your cruise please clean all connectors and attach dummy plugs or fit the connectors back after cleaning if they are not corroded.
- the CTD winch slip rings are cleaned if the CTD has been used – this prevents failure through accumulated dirt.
- the SVP is left in a suitable state (washed and stowed). Do not leave this on deck without a cover for any length of time as it rusts. Stow inside at end of cruise.
- all manuals have been returned to the designated drawers and cupboards.
- you clean all the fans listed below every cruise or every month, whichever is the longer.

Please clean the intake fans on the following machines:

Instrument	Cleaned?
Oceanlogger	N
EM120, TOPAS, NEPTUNE UPSs	N
Seatex Seapath	N
Topas tweendeck	N
EM120 Tween deck	N

Additional notes and recommendations for change / future work

Altimeter

Ping rate is too fast.

10.2 JR260B ICT Cruise Report

13/01/2012 Jeremy Robst

10.2.1 Data Logging Systems

10.2.1.1 SCS

Date / Time	Event
15:19 25/12/2011	New leg started
XX:XX 18(?)/01/2012	Leg finished, new leg started

No problems occurred with the SCS data logging system.

10.2.1.2 Seapath 320 GPS

The Seapath 320 PC crashed on 30 December at 17:04, almost certainly due to overheating – the front panel temperature was reading 51.4 degrees. The filter on the rear fan was removed and the temperature returned to around 45 degrees where it has remained.

10.2.2 Scientific Equipment PCs

10.2.2.1 XBT

A new XBT PC was installed on the previous cruise by Johnnie Edmonston and Julian Klepacki. This is running Windows XP and has a USB interface to communicate with the XBT launcher.

It was slightly modified this cruise; it was given a fixed IP address of 10.104.254.234 (on the Data LAN). A password was set for the xbt account, and the U: drive was mapped to \\jrlb\xbt so data could be logged directly to the leg data location.
The XBT software was configured to store Realtime, Overlay data and Calibration Coefficients to U:\data (a symbolic link to /data/cruise/jcr/current/xbt), and backup data to C:\data. The options to automatically create EDF files and backup data were ticked.
Finally K9NT was installed, the Windows Time service disabled and the Windows Firewall disabled so the PC now synchronises time with the broadcasts from the SCS.

10.2.2.2 SUCS

The SUCS PC was used almost as configured on the JR262 cruise except it was moved onto the Data LAN with a fixed IP address of 10.104.254.37, so the anti-virus could be removed. The Windows time service was stopped and K9NT installed to synchronise with broadcasts from the SCS.

10.2.2.3 MOCNESS

The timezone on the MOCNESS PC was changed to GMT and k9 installed to synchronise with the SCS.

10.2.3 Other Shipboard Computer Systems

No problems were encountered with any of the other shipboard computer systems – the Netware server JRNA, PCs, ESX virtual machine server and Unix fileserver all functioned normally.

10.3 Data Management

David Connor

10.3.1 DPS (Data Processing System)

Some of the data requests on this cruise have been completed by using the DPS utilities. All DPS code is stored on JRLB under /users/dacon/dps/. They are also stored on the cruise work directory for JR260B under data_management.

10.3.1.1 XML Chains

general/bridgetrack.xml – Combines Seatex-gga position information with eventlog entries for the current science cruise. This is exported to KML. This provides quick access to viewing the ships track and events.

JR260B/damien/*.xml – Two DPS chains that satisfy the data requests for Damien O'Gaoithin outline in 10.3.2.

JR260B/imke/*.xml – Six DPS chains that satisfy the data request for Imke Grefe in section 10.3.2

10.3.1.2 Future Recommendations

I think it could be useful if we add a sub-directory in the standard cruise data structure for the dps. It would be useful to have a cruise specific and a cruise non-specific area that are linked together. Some scripts would be useful cruise-to-cruise and others are specifically for serving data requests on that cruise.

10.3.2 Data Requests

Damien O'Gaoithin – British Antarctic Survey

Work Summary: Using ES853 echosounder on various deployed instruments throughtout the cruise. Data request covers geo-referencing the echo sounder (ES853) casts.
Requested data:

- SCS Underway
    - Seatex-gga lat/lon time reference
    - Winch – cable_out + others
    - Gyro - heading

Imke Grefe – UEA

Work Summary: N20 gas analysis of underway water sampling and CTD water sampling.
Requested Data:

- SCS Underway
    - Lat/lon
    - Oceanlogger – sea surfrace temp and salinity – Note: currently uncalibrated
    - Speed, heading
    - Wind + factors for calculating truewind
    - Water depth

- CTD Profiles
    - CTD quick look data – exports of downcast graphs
    - Uncalibrated CTD profiles
    - Calibrated CTD profiles

Nelly Trembley – AWI

Work Summary: respiration rates will be provided by nelly in text files
Requested Data:

- CTD profiles
- Underway data

Appendix A: Krill Image File Reference Table

Image	Date	Event	Net	Board	View
JR260B_krill_image_1.JPG	01/01/2012	19	1	1	Lateral
JR260B_krill_image_2.JPG	01/01/2012	19	1	1	Dorsal
JR260B_krill_image_3.JPG	01/01/2012	19	1	2	Lateral
JR260B_krill_image_4.JPG	01/01/2012	19	1	2	Dorsal
JR260B_krill_image_5.JPG	01/01/2012	19	1	3	Lateral
JR260B_krill_image_6.JPG	01/01/2012	19	1	3	Dorsal
JR260B_krill_image_7.JPG	01/01/2012	19	1	4	Dorsal
JR260B_krill_image_8.JPG	01/01/2012	19	1	4	Dorsal
JR260B_krill_image_9.JPG	01/01/2012	19	1	5	Lateral
JR260B_krill_image_10.JPG	01/01/2012	19	1	5	Dorsal
JR260B_krill_image_11.JPG	01/01/2012	20	2	1	Lateral
JR260B_krill_image_12.JPG	01/01/2012	20	2	1	Dorsal
JR260B_krill_image_13.JPG	01/01/2012	20	2	2	Lateral
JR260B_krill_image_14.JPG	01/01/2012	20	2	2	Dorsal
JR260B_krill_image_15.JPG	01/01/2012	20	2	3	Lateral
JR260B_krill_image_16.JPG	01/01/2012	20	2	3	Dorsal
JR260B_krill_image_17.JPG	01/01/2012	20	2	4	Lateral
JR260B_krill_image_18.JPG	01/01/2012	20	2	4	Dorsal
JR260B_krill_image_19.JPG	01/01/2012	20	2	5	Lateral
JR260B_krill_image_20.JPG	01/01/2012	20	2	5	Dorsal
JR260B_krill_image_21.JPG	03/01/2012	28	1	1	Lateral
JR260B_krill_image_22.JPG	03/01/2012	28	1	1	Dorsal
JR260B_krill_image_23.JPG	03/01/2012	28	1	2	Lateral
JR260B_krill_image_24.JPG	03/01/2012	28	1	2	Dorsal
JR260B_krill_image_25.JPG	03/01/2012	28	1	3	Lateral
JR260B_krill_image_26.JPG	03/01/2012	28	1	3	Dorsal
JR260B_krill_image_27.JPG	03/01/2012	28	1	4	Dorsal
JR260B_krill_image_28.JPG	03/01/2012	28	1	4	Lateral
JR260B_krill_image_29.JPG	03/01/2012	28	1	5	Dorsal
JR260B_krill_image_30.JPG	03/01/2012	28	1	5	Lateral
JR260B_krill_image_31.JPG	03/01/2012	28	1	6	Dorsal
JR260B_krill_image_32.JPG	03/01/2012	28	1	6	Lateral
JR260B_krill_image_33.JPG	04/01/2012	37	1	1	Lateral
JR260B_krill_image_34.JPG	04/01/2012	37	1	1	Dorsal
JR260B_krill_image_35.JPG	04/01/2012	37	1	2	Lateral
JR260B_krill_image_36.JPG	04/01/2012	37	1	2	Dorsal
JR260B_krill_image_37.JPG	04/01/2012	37	1	3	Lateral
JR260B_krill_image_38.JPG	04/01/2012	37	1	3	Dorsal
JR260B_krill_image_39.JPG	04/01/2012	37	1	5	Lateral
JR260B_krill_image_40.JPG	04/01/2012	37	1	5	Dorsal
JR260B_krill_image_41.JPG	04/01/2012	37	1	6	Lateral

JR260B_krill_image_42.JPG	04/01/2012	37	1	6	Dorsal
JR260B_krill_image_43.JPG	04/01/2012	37	2	1	Lateral
JR260B_krill_image_44.JPG	04/01/2012	37	2	1	Dorsal
JR260B_krill_image_45.JPG	04/01/2012	37	2	2	Lateral
JR260B_krill_image_46.JPG	04/01/2012	37	2	2	Dorsal
JR260B_krill_image_47.JPG	04/01/2012	37	2	3	Lateral
JR260B_krill_image_48.JPG	04/01/2012	37	2	3	Dorsal
JR260B_krill_image_49.JPG	04/01/2012	37	2	4	Lateral
JR260B_krill_image_50.JPG	04/01/2012	37	2	4	Dorsal
JR260B_krill_image_51.JPG	04/01/2012	37	2	5	Lateral
JR260B_krill_image_52.JPG	04/01/2012	37	2	5	Dorsal
JR260B_krill_image_53.JPG	04/01/2012	38	2	1	Lateral
JR260B_krill_image_54.JPG	04/01/2012	38	2	1	Dorsal
JR260B_krill_image_55.JPG	04/01/2012	38	2	2	Lateral
JR260B_krill_image_56.JPG	04/01/2012	38	2	2	Dorsal
JR260B_krill_image_57.JPG	04/01/2012	38	2	3	Lateral
JR260B_krill_image_58.JPG	04/01/2012	38	2	3	Dorsal
JR260B_krill_image_59.JPG	04/01/2012	38	2	4	Lateral
JR260B_krill_image_60.JPG	04/01/2012	38	2	4	Dorsal
JR260B_krill_image_61.JPG	04/01/2012	38	2	5	Lateral
JR260B_krill_image_62.JPG	04/01/2012	38	2	5	Dorsal
JR260B_krill_image_63.JPG	04/01/2012	38	1	1	Lateral
JR260B_krill_image_64.JPG	04/01/2012	38	1	1	Dorsal
JR260B_krill_image_65.JPG	04/01/2012	38	1	2	Dorsal
JR260B_krill_image_66.JPG	04/01/2012	38	1	2	Lateral
JR260B_krill_image_67.JPG	04/01/2012	38	1	3	Dorsal
JR260B_krill_image_68.JPG	04/01/2012	38	1	3	Lateral
JR260B_krill_image_69.JPG	04/01/2012	38	1	4	Dorsal
JR260B_krill_image_70.JPG	04/01/2012	38	1	4	Lateral
JR260B_krill_image_71.JPG	04/01/2012	38	1	5	Lateral
JR260B_krill_image_72.JPG	04/01/2012	38	1	5	Dorsal
JR260B_krill_image_73.JPG	05/01/2012	49	1	1	Lateral
JR260B_krill_image_74.JPG	05/01/2012	49	1	1	Dorsal
JR260B_krill_image_75.JPG	05/01/2012	49	1	2	Dorsal
JR260B_krill_image_76.JPG	05/01/2012	49	1	2	Lateral
JR260B_krill_image_77.JPG	05/01/2012	49	1	3	Dorsal
JR260B_krill_image_78.JPG	05/01/2012	49	1	3	Lateral
JR260B_krill_image_79.JPG	05/01/2012	49	1	4	Dorsal
JR260B_krill_image_80.JPG	05/01/2012	49	1	4	Lateral
JR260B_krill_image_81.JPG	05/01/2012	49	1	5	Dorsal
JR260B_krill_image_82.JPG	05/01/2012	49	1	5	Lateral
JR260B_krill_image_83.JPG	05/01/2012	49	2	1	Dorsal
JR260B_krill_image_84.JPG	05/01/2012	49	2	1	Lateral
JR260B_krill_image_85.JPG	05/01/2012	49	2	2	Dorsal
JR260B_krill_image_86.JPG	05/01/2012	49	2	2	Lateral

JR260B_krill_image_87.JPG	05/01/2012	49	2	3	Dorsal
JR260B_krill_image_88.JPG	05/01/2012	49	2	3	Lateral
JR260B_krill_image_89.JPG	05/01/2012	49	2	4	Dorsal
JR260B_krill_image_90.JPG	05/01/2012	49	2	4	Lateral
JR260B_krill_image_91.JPG	05/01/2012	49	2	5	Dorsal
JR260B_krill_image_92.JPG	05/01/2012	49	2	5	Lateral
JR260B_krill_image_93.JPG	05/01/2012	50	1	1	Dorsal
JR260B_krill_image_94.JPG	05/01/2012	50	1	1	Lateral
JR260B_krill_image_95.JPG	05/01/2012	50	1	2	Dorsal
JR260B_krill_image_96.JPG	05/01/2012	50	1	2	Lateral
JR260B_krill_image_97.JPG	05/01/2012	50	1	3	Dorsal
JR260B_krill_image_98.JPG	05/01/2012	50	1	3	Lateral
JR260B_krill_image_99.JPG	05/01/2012	50	1	4	Dorsal
JR260B_krill_image_100.JPG	05/01/2012	50	1	4	Lateral
JR260B_krill_image_101.JPG	05/01/2012	50	1	5	Dorsal
JR260B_krill_image_102.JPG	05/01/2012	50	1	5	Lateral
JR260B_krill_image_103.JPG	05/01/2012	50	2	1	Dorsal
JR260B_krill_image_104.JPG	05/01/2012	50	2	1	Lateral
JR260B_krill_image_105.JPG	05/01/2012	50	2	2	Dorsal
JR260B_krill_image_106.JPG	05/01/2012	50	2	2	Lateral
JR260B_krill_image_107.JPG	05/01/2012	50	2	3	Lateral
JR260B_krill_image_108.JPG	05/01/2012	50	2	3	Dorsal
JR260B_krill_image_109.JPG	05/01/2012	50	2	4	Dorsal
JR260B_krill_image_110.JPG	05/01/2012	50	2	4	Lateral
JR260B_krill_image_111.JPG	05/01/2012	64	2	1	Dorsal
JR260B_krill_image_112.JPG	05/01/2012	64	2	1	Lateral
JR260B_krill_image_113.JPG	05/01/2012	64	2	2	Dorsal
JR260B_krill_image_114.JPG	05/01/2012	64	2	2	Lateral
JR260B_krill_image_115.JPG	05/01/2012	64	2	3	Dorsal
JR260B_krill_image_116.JPG	05/01/2012	64	2	4	Dorsal
JR260B_krill_image_117.JPG	05/01/2012	64	2	4	Lateral
JR260B_krill_image_118.JPG	05/01/2012	64	2	5	Dorsal
JR260B_krill_image_119.JPG	05/01/2012	64	2	5	Lateral
JR260B_krill_image_120.JPG	07/01/2012	70	1	1	Dorsal
JR260B_krill_image_121.JPG	07/01/2012	70	1	1	Lateral
JR260B_krill_image_122.JPG	07/01/2012	70	1	2	Dorsal
JR260B_krill_image_123.JPG	07/01/2012	70	1	2	Lateral
JR260B_krill_image_124.JPG	07/01/2012	70	1	3	Dorsal
JR260B_krill_image_125.JPG	07/01/2012	70	1	3	Lateral
JR260B_krill_image_126.JPG	07/01/2012	70	1	4	Dorsal
JR260B_krill_image_127.JPG	07/01/2012	70	1	4	Dorsal
JR260B_krill_image_128.JPG	07/01/2012	70	1	5	Dorsal
JR260B_krill_image_129.JPG	07/01/2012	70	1	5	Dorsal
JR260B_krill_image_130.JPG	09/01/2012	77	1	1	Dorsal
JR260B_krill_image_131.JPG	09/01/2012	77	1	1	Lateral

JR260B_krill_image_132.JPG	09/01/2012	77	1	2	Lateral
JR260B_krill_image_133.JPG	09/01/2012	77	1	2	Dorsal
JR260B_krill_image_134.JPG	09/01/2012	77	1	3	Dorsal
JR260B_krill_image_135.JPG	09/01/2012	77	1	3	Lateral
JR260B_krill_image_136.JPG	09/01/2012	77	1	4	Dorsal
JR260B_krill_image_137.JPG	09/01/2012	77	1	4	Lateral
JR260B_krill_image_138.JPG	09/01/2012	77	1	5	Dorsal
JR260B_krill_image_139.JPG	09/01/2012	77	1	5	Lateral
JR260B_krill_image_140.JPG	10/01/2012	82	2	1	Dorsal
JR260B_krill_image_141.JPG	10/01/2012	82	2	1	Lateral
JR260B_krill_image_142.JPG	10/01/2012	82	2	2	Dorsal
JR260B_krill_image_143.JPG	10/01/2012	82	2	2	Lateral
JR260B_krill_image_144.JPG	10/01/2012	82	2	3	Dorsal
JR260B_krill_image_145.JPG	10/01/2012	82	2	3	Lateral
JR260B_krill_image_146.JPG	10/01/2012	82	2	4	Dorsal
JR260B_krill_image_147.JPG	10/01/2012	82	2	4	Lateral
JR260B_krill_image_148.JPG	10/01/2012	82	2	5	Dorsal
JR260B_krill_image_149.JPG	10/01/2012	82	2	5	Lateral
JR260B_krill_image_150.JPG	12/01/2012	95	1	1	Dorsal
JR260B_krill_image_151.JPG	12/01/2012	95	1	1	Lateral
JR260B_krill_image_152.JPG	12/01/2012	95	1	2	Dorsal
JR260B_krill_image_153.JPG	12/01/2012	95	1	2	Lateral
JR260B_krill_image_154.JPG	12/01/2012	95	1	3	Dorsal
JR260B_krill_image_155.JPG	12/01/2012	95	1	3	Lateral
JR260B_krill_image_156.JPG	12/01/2012	95	1	4	Dorsal
JR260B_krill_image_157.JPG	12/01/2012	95	1	4	Lateral
JR260B_krill_image_158.JPG	12/01/2012	95	1	5	Dorsal
JR260B_krill_image_159.JPG	12/01/2012	95	1	5	Lateral
JR260B_krill_image_160.JPG	12/01/2012	95	2	1	Dorsal
JR260B_krill_image_161.JPG	12/01/2012	95	2	1	Lateral
JR260B_krill_image_162.JPG	12/01/2012	95	2	2	Dorsal
JR260B_krill_image_163.JPG	12/01/2012	95	2	2	Lateral
JR260B_krill_image_164.JPG	12/01/2012	95	2	3	Lateral
JR260B_krill_image_165.JPG	12/01/2012	95	2	3	Dorsal
JR260B_krill_image_166.JPG	12/01/2012	95	2	4	Dorsal
JR260B_krill_image_167.JPG	12/01/2012	95	2	4	Lateral
JR260B_krill_image_168.JPG	12/01/2012	95	2	5	Dorsal
JR260B_krill_image_169.JPG	12/01/2012	95	2	5	Lateral

Appendix B: CTD Log

Time	Event No	Lat	Lon	Depth	Cable Out	Bottle	Pressure	Temp (CTD)	Sal (CTD)	Comment
30/12/2011 13:48	3	-52.6347	- 42.82203	3192.66	1		-2.4			CTD In Water. File: JR260B_003
30/12/2011 13:50	3	-52.63469	- 42.82169	3192.25						CTD start down
30/12/2011 14:10	3	-52.63471	- 42.82033	3099.82	1000		1012			CTD at bottom.
30/12/2011 14:11	3	-52.6347	- 42.82034	3105.99	1000	1	1013	2	34.7	Bottle fired.
30/12/2011 14:12	3	-52.6347	- 42.82035	3147.09	1000					CTD start up
30/12/2011 14:37	3	-52.63468	- 42.82022	3157.63	-4					CTD out of water. 10 bottles fired.
31/12/2011 08:25	8	-52.80849	- 40.11302	3796.57	-2		-2.4			CTD in water. File: JR260B_008
31/12/2011 08:28	8	-52.80856	- 40.11317	3785.65	5					CTD start down
31/12/2011 08:46	8	-52.80871	- 40.11362	3796.16	1000		1013			CTD at bottom
31/12/2011 08:47	8	-52.80869	- 40.11361	3796.59	1000					CTD start up
31/12/2011 09:04	8	-52.80867	- 40.11361	3785.83	-4					CTD out of water. No bottles fired.
01/01/2012 12:21	16	-53.79756	- 37.93478	301.24	5					CTD in water. File: JR260B_016
01/01/2012 12:25	16	-53.79756	- 37.93462	300.04	6					CTD start down
01/01/2012	16	-53.79754	-	299.46	211					CTD at bottom

12:30			37.93459							
01/01/2012 12:32	16	-53.79754	- 37.93462	302.47	275	1				Bottle fired.
01/01/2012 12:32	16	-53.79754	- 37.93463	300.74	275	2				Bottle fired.
01/01/2012 12:33	16	-53.79754	- 37.93462	301.02	275					CTD start up from bottom
01/01/2012 12:38	16	-53.79756	- 37.93465	300.23	140	3				Bottle fired.
01/01/2012 12:38	16	-53.79755	- 37.93464	300.01	140	4				Bottle fired.
01/01/2012 12:40	16	-53.79755	- 37.93461	300.53	80	5	82.76	0.34		Bottle fired.
01/01/2012 12:41	16	-53.79755	- 37.93462	300.52	80	6				Bottle fired.
01/01/2012 12:42	16	-53.79755	- 37.93462	299.17	50	7	51.5			Bottle fired.
01/01/2012 12:42	16	-53.79755	- 37.93463	299.66	50	8				Bottle fired.
01/01/2012 12:44	16	-53.79756	- 37.93463	301.02	10	9				Bottle fired.
01/01/2012 12:44	16	-53.79755	- 37.93462	300.64	10	10				Bottle fired.
01/01/2012 12:50	16	-53.79755	-37.9346	300.44	-15					CTD on deck. 10 bottles fired.
02/01/2012 20:28	26	-53.84643	- 39.14276	285.41	-3					CTD in water. File: JR260B_026
02/01/2012 20:32	26	-53.84642	- 39.14275	285.8						CTD start down
02/01/2012 20:38	26	-53.84642	- 39.14277	286.38	260					CTD at bottom
02/01/2012	26	-53.84643	-	287.36	260	1				Bottle fired.

20:38			39.14277							
02/01/2012 20:38	26	-53.84643	-39.14277	286.83	260	2				Bottle fired.
02/01/2012 20:39	26	-53.84644	-39.14278	286.38	260					CTD start up from bottom
02/01/2012 20:41	26	-53.84643	-39.14278	286.5	200	3		1.49	34.2	Bottle fired.
02/01/2012 20:41	26	-53.84643	-39.14278	286.5	200	4				Bottle fired.
02/01/2012 20:44	26	-53.84644	-39.14278	287.28	90	5				Bottle fired.
02/01/2012 20:44	26	-53.84644	-39.14278	285.6	90	6				Bottle fired.
02/01/2012 20:46	26	-53.84643	-39.14278	285.71	50	7		1.87	38.83	Bottle fired.
02/01/2012 20:46	26	-53.84643	-39.14278	286.02	50	8				Bottle fired.
02/01/2012 20:48	26	-53.84643	-39.14278	285.6	10	9				Bottle fired.
02/01/2012 20:48	26	-53.84644	-39.14278	286.1	10	10				Bottle fired.
02/01/2012 20:50	26	-53.84645	-39.14281	286.09	-6					CTD on deck. 10 bottles fired.
03/01/2012 05:30	29	-53.49267	-39.25002	3145.38	1					CTD in water
03/01/2012 05:33	29	-53.49267	-39.25023	3145.49	5					CTD start down.
03/01/2012 05:51	29	-53.4927	-39.25115	3147	1000		1015			CTD at bottom.
03/01/2012 05:52	29	-53.49271	-39.25113	3146.85	999					CTD start up

03/01/2012 06:11	29	-53.49277	-39.25119	3147.47	-2					CTD on deck. No bottles fired.
03/01/2012 20:19	35	-53.43141	-38.69462	3496.94	10					CTD in water
03/01/2012 20:21	35	-53.43146	-38.6947	3494.7						CTD down
03/01/2012 20:38	35	-53.43186	-38.69499	3494.5	1000		1013			CTD at bottom - 1005m depth
03/01/2012 20:39	35	-53.43185	-38.69499	3494.78	1000	1	1013	1.71	34.69	Bottle fired. 1005m
03/01/2012 20:39	35	-53.43184	-38.695	3494.43	1000	2	1013	1.71	34.69	Bottle fired. 1005m
03/01/2012 20:40	35	-53.43184	-38.69505	3494.59	1000					CTD start up from bottom
03/01/2012 20:49	35	-53.43185	-38.69524	3494.87	500	3	505.6	2.14	34.59	Bottle fired. 502.8m
03/01/2012 20:49	35	-53.43184	-38.69524	3495.08	500	4	505.6	2.14	34.59	Bottle fired. 502.8m depth
03/01/2012 20:55	35	-53.43185	-38.69521	3495.52	200	5	202.5	1.37	34.26	Bottle fired. 200.9m depth
03/01/2012 20:55	35	-53.43186	-38.69521	3495.44	200	6	202.5	1.37	34.26	Bottle fired. 200.9m depth
03/01/2012 20:59	35	-53.43186	-38.6952	3495.53	50	7	51.8	2.31	33.7	Bottle fired. 51.28m depth
03/01/2012 20:59	35	-53.43185	-38.69521	3496.09	50	8	51.8	2.31	33.7	Bottle fired. 51.28m depth
03/01/2012 21:00	35	-53.43185	-38.69521	3496.17	10	9	11.6	3.1	33.7	Bottle fired. 3.1m depth
03/01/2012 21:01	35	-53.43186	-38.69521	3495.66	10	10	11.6	3.1	33.7	Bottle fired. 11.54m depth
03/01/2012 21:02	35	-53.43184	-38.69524	3496.06	-2					CTD on deck. 10 bottles fired.

04/01/2012 06:02	41	-53.78512	-38.58324	206.78	8					CTD in water
04/01/2012 06:12	41	-53.78516	-38.58342	206.79	19					CTD on deck. No bottles fired.
04/01/2012 20:17	47	-53.71396	-37.96544	133.17	-5					CTD in water
04/01/2012 20:20	47	-53.71398	-37.96551	133.06	1					CTD start down
04/01/2012 20:25	47	-53.71407	-37.96568	132.86	112					CTD at bottom.
04/01/2012 20:25	47	-53.71407	-37.9657	132.91	112					CTD start up
04/01/2012 20:28	47	-51.81414	-55.47956	1229.73						CTD on deck. No bottles fired.
05/01/2012 05:35	52	-53.36143	-38.0824	2661.06	2					CTD in water
05/01/2012 05:38	52	-53.36143	-38.08242	2660.66	2					CTD start down
05/01/2012 05:56	52	-53.36143	-38.08246	2660.59	1000					CTD start up from bottom
05/01/2012 05:56	52	-53.36142	-38.08246	2660.6	1000		1013			CTD at bottom.
05/01/2012 06:14	52	-53.36147	-38.08243	2660.22	-5					CTD on deck. No bottles fired.
07/01/2012 12:30	72	-54.15884	-36.69426	80.06	6					CTD in water
07/01/2012 12:34	72	-54.15883	-36.69427	79.88	7					CTD start down
07/01/2012 12:38	72	-54.15883	-36.69426	80.06	60		60.33			CTD at bottom. Alt: 26.20m
07/01/2012 12:39	72	-54.15883	-36.69425	80.08	55					CTD start up from bottom.

07/01/2012 12:44	72	-54.15883	-36.69426	79.87	8					CTD on deck. No bottles fired.
09/01/2012 19:38	78	-53.79782	-37.93561	297.02	8					CTD in water
09/01/2012 19:39	78	-53.79781	-37.93561	299.22	7					CTD start down
09/01/2012 19:45	78	-53.79781	-37.9356	296.81	270		271			CTD at bottom. Alt: 21
09/01/2012 19:45	78	-53.79781	-37.93559	296.84	270					CTD start up
09/01/2012 19:50	78	-53.79781	-37.93561	297.93	-1					CTD on deck. No bottles fired.
10/01/2012 14:28	83	-55.21103	-41.11782	3146.95	-1					CTD in water
10/01/2012 14:32	83	-55.21095	-41.11778	3146.93						CTD start down
10/01/2012 14:59	83	-55.21051	-41.11627	3150.04	1600					CTD at bottom
10/01/2012 15:01	83	-55.21051	-41.11624	3149.99	1600	1	1623	1.13	34.7	Bottle fired. Depth: 1608
10/01/2012 15:01	83	-55.21051	-41.11624	3149.99	1599	2				Bottle fired w/ 1.
10/01/2012 15:01	83	-55.21051	-41.11625	3149.99	1599					CTD start up
10/01/2012 15:12	83	-55.21055	-41.1162	3150.34	1100	3	1114.9	1.73	34.7	Bottled fired. Depth: 1106
10/01/2012 15:12	83	-55.21054	-41.11621	3150.16	1100	4				Bottle fired w/3.
10/01/2012 15:22	83	-55.21053	-41.11621	3150.23	700	5	710	2.11	34.65	Bottle fired. Depth: 705
10/01/2012 15:22	83	-55.21053	-41.11621	3150.13	700	6				Bottle fired w/ 5.

10/01/2012 15:29	83	-55.21055	-41.1162	3150.3	350	7	355	2.23	34.49	Bottle fired. Depth: 353.5
10/01/2012 15:30	83	-55.21055	-41.1162	3150.27	350	8				Bottle fired w/7.
10/01/2012 15:34	83	-55.21054	-41.11619	3150.24	150	9	153.7	1.22	34.17	Bottle fired. Depth: 152.6
10/01/2012 15:34	83	-55.21053	-41.11619	3150.12	150	10				Bottle fired w/9.
10/01/2012 15:37	83	-55.21054	-41.1162	3150.32	50	11	54.36	1.71	33.8	Bottle fired. Depth: 53.1
10/01/2012 15:37	83	-55.21054	-41.11621	3150.16	50	12				Bottle fired w/11.
10/01/2012 15:39	83	-55.21055	-41.11621	3150.27	10	13	13.8	2.02	33.7	Bottle fired. Depth: 13.7
10/01/2012 15:39	83	-55.21054	-41.11621	3150.33	10	14				Bottle fired w/13.
10/01/2012 15:42	83	-53.87322	-37.22311	240.9	-4					CTD on deck. 14 bottles fired.
12/01/2012 02:16	89	-53.8738	-37.22055	226.1	9					CTD in water
12/01/2012 02:19	89	-53.8738	-37.22055	226.07	7					CTD start down
12/01/2012 02:23	89	-53.87378	-37.22052	225.97	202		204			CTD at bottom: alt: 19
12/01/2012 02:24	89	-53.87378	-37.22051	225.89	202					CTD start up
12/01/2012 02:29	89	-53.8738	-37.22052	226.46	-5					CTD on deck. No bottles fired.
12/01/2012 02:48	90	-53.87324	-37.22312	240.77	-1					CTD in water
12/01/2012 03:01	90	-53.87324	-37.22307	240.31	215		218			CTD at bottom. Alt: 18

12/01/2012 03:01	90	-53.87324	-37.22308	240.66	215					CTD start up
12/01/2012 03:07	90	-53.87322	-37.22311	240.9	-4					CTD on deck. No bottles fired.

Appendix C: CTD Sample Log

Event	Bottle #	Depth	Sample ID	Sample ID	Sample ID
3	1	1000	JR260B-1	JR260B-2	JR260B-3
3	3	300	JR260B-4	JR260B-5	JR260B-6
3	5	100	JR260B-7	JR260B-8	JR260B-9
3	7	60	JR260B-10	JR260B-11	JR260B-12
3	9	10	JR260B-13	JR260B-14	JR260B-15
16	1	275	JR260B-16	JR260B-17	JR260B-18
16	3	140	JR260B-19	JR260B-20	JR260B-21
16	5	80	JR260B-22	JR260B-23	JR260B-24
16	7	50	JR260B-25	JR260B-26	JR260B-27
16	9	10	JR260B-28	JR260B-29	JR260B-30
26	1	260	JR260B-31	JR260B-32	JR260B-33
26	3	200	JR260B-34	JR260B-35	JR260B-36
26	5	90	JR260B-37	JR260B-38	JR260B-39
26	7	50	JR260B-40	JR260B-41	JR260B-42
26	9	10	JR260B-43	JR260B-44	JR260B-45
35	1	1000	JR260B-46	JR260B-47	JR260B-48
35	3	500	JR260B-49	JR260B-50	JR260B-51
35	5	200	JR260B-52	JR260B-53	JR260B-54
35	7	50	JR260B-55	JR260B-56	JR260B-57
35	9	10	JR260B-58	JR260B-59	JR260B-60
83	1	1600	JR260B-61	JR260B-62	JR260B-63
83	3	1100	JR260B-64	JR260B-65	JR260B-66
83	5	700	JR260B-67	JR260B-68	JR260B-69
83	8	350	JR260B-70	JR260B-71	JR260B-72
83	9	150	JR260B-73	JR260B-74	JR260B-75
83	11	50	JR260B-76	JR260B-77	JR260B-78
83	13	10	JR260B-79	JR260B-80	JR260B-81

See section 9 for details on samples

Appendix D: XBT Log

Time	Lat	Lon	Depth	Station	Station	File	Comment
30/12/2011 19:27:00	-52.6567	-42.7446	3033.1	Test	Event 7	File: T5_00002	
02/01/2012 09:10:08	-53.5103	-39.5539	3178.92	WCB 1.1 #1	Event 21	File: T5_00003 (failed computer start), T5_00004	
02/01/2012 10:11:03	-53.8759	-39.4456	302.41	WCB 1.1 #2	Event 22	File: T5_00005 (aborted computer start), T5_00006	
02/01/2012 11:30:29	-53.6813	-53.4928	-39.2512	WCB 1.1	Event 23	File: T5_00007	Launched successfully but incorrect data during drop.
02/01/2012 11:35:30	-53.6691	-39.5071	2153.24	WCB 1.1 #3	Event 23	File: T5_00008	
02/01/2012 12:38:55	-53.5103	-39.5539	3178.92	WCB 1.1 #4	Event 24	File: T5_00009	
02/01/2012 14:39:51	-53.3074	-39.3358	3906.05	WCB 1.1 #5	Event 25	File: T5_00010	
03/01/2012 09:04:58	-53.2937	-39.0363	4569.53	WCB 2.1 #1	Event 30	File: T5_00011, T5_00012	
03/01/2012 09:06:19	-53.2959	-39.0356	4023.61	WCB 2.1 #1	Event 30	File: T5_00013	

03/01/2012 10:06:17	-53.4537	-38.9866	3084.08	WCB 2.1 #2	Event 31	File: T5_00014, T5_00015, T5_00016, T5_00017	Problems with seating launch tube. Would go in and trigger computer start before pin was pulled. Three aborted computer starts before launch
03/01/2012 11:15:31	-53.6305	-38.9323	1420.06	WCB 2.1 #3	Event 32	File: T5_00018, T5_00019	One false start.
03/01/2012 12:29:19	-53.8134	-38.8753	229.4	WCB 2.1 #4	Event 33	File: T5_00020	
03/01/2012 13:32:06	-53.9778	-38.8242	194.57	WCB 2.1 #5	Event 34	File: T5_00021	
04/01/2012 09:00:18	-53.9266	-38.2206	104.52	WCB 3.1 #1	Event 42	File: T5_00022	
04/01/2012 10:10:57	-53.7427	-38.28	236.48	WCB 3.1 #2	Event 43	File: T5_00023	
04/01/2012 11:20:01	-53.5679	-38.3367	2102.11	WCB 3.1 #3	Event 44	File: T5_00024	
04/01/2012 12:31:01	-53.3905	-38.3943	2965.84	WCB 3.1 #4	Event 45	File: T5_00025	
04/01/2012 13:41:35	-53.2132	-38.4511	3770.28	WCB 3.1 #5	Event 46	File: T5_00026	
05/01/2012 09:00:26	-53.1637	-37.9645	3530.9	WCB 4.1 #1	Event 53	File: T5_00027	
05/01/2012 10:13:07	-53.3441	-37.9012	2970.61	WCB 4.1 #2	Event 54	File: T5_00028	
05/01/2012 11:24:32	-53.5245	-37.8441	1384.41	WCB 4.1 #3	Event 55	File: T5_00029	
05/01/2012 12:15:19	-53.6607	-37.7979	135.8	WCB 4.1 #4	Event 56	File: T5_00030	XBT failed during drop. Data very irregular.
05/01/2012 12:20:08	-53.141	-37.8351	3378.35	WCB 4.1 #4	Event 57	File: T5_00031	

05/01/2012 13:46:08	- 53.8731	- 37.7184	112.06	WCB 4.1 #5	Event 58	File: T5_00032	
05/01/2012 14:22:07	- 53.8445	-37.597	114.93	WCB 4.2 #1	Event 59	File: T5_00033	
05/01/2012 15:32:56	- 53.6652	- 37.6585	146.35	WCB 4.2 #2	Event 60	File: T5_00034	
05/01/2012 16:42:15	- 53.4927	- 37.7148	1929.61	WCB 4.2 #3	Event 61	File: T5_00035	
05/01/2012 17:51:53	- 53.3173	- 37.7742	3956.43	WCB 4.2 #4	Event 62	File: T5_00036	
05/01/2012 19:01:18	-53.141	- 37.8351	3378.35	WCB 4.2 #5	Event 63	File: T5_00037	

Appendix E: All Events Log

Time	Event	Lat	Lon	Comment	Station	Event	Type	Gear No
30/12/2011 12:38		-52.63448	-42.82267	V/L on DP				
30/12/2011 12:40		-52.63469	-42.82262	V/L stopped on station				
30/12/2011 12:47	1 (SUCS test)	-52.63472	-42.82257	SUCS deployed for test. Veering to 100m	TEST	1	SUCS	1
30/12/2011 12:49	1 (SUCS test)	-52.63472	-42.82259	Stopped at 100m. Taking photographs			SUCS	
30/12/2011 13:00	1 (SUCS test)	-52.63472	-42.82257	SUCS recovered to deck			SUCS	
30/12/2011 13:12	2 (SUCS test)	-52.63471	-42.82265	SUCS deployed. Veering to 50m	TEST	2	SUCS	2
30/12/2011 13:14	2 (SUCS test)	-52.63467	-42.82267	SUCS stopped at 50m. Taking photo			SUCS	
30/12/2011 13:21	2 (SUCS test)	-52.63469	-42.82264	Veering to 100m			SUCS	
30/12/2011 13:30	2 (SUCS test)	-52.63471	-42.82263	SUCS recovered on deck			SUCS	
30/12/2011 13:48	3 (CTD test)	-52.6347	-42.82203	CTD deployed	TEST	3	CTD	1
30/12/2011 14:09	3 (CTD test)	-52.63469	-42.82031	CTD stopped @ 1000m			CTD	
30/12/2011 14:39	3 (CTD test)	-52.63468	-42.82019	Recovered on deck			CTD	
30/12/2011 15:16	4 (MOCNESS test)	-52.63467	-42.82023	Increase to 2knots for deploying MOCNESS	TEST	4	MOCNESS	1
30/12/2011 15:17	4 (MOCNESS test)	-52.63465	-42.82024	Commence deploying MOCNESS for testing			MOCNESS	
30/12/2011	4 (MOCNESS	-	-42.8267	MOCNESS in the water			MOCNESS	

15:24	test)	52.63466							
30/12/2011 15:27	4 (MOCNESS test)	- 52.63467	-42.82947	MOCNESS deployed veering			MOCNESS	
30/12/2011 15:41	4 (MOCNESS test)	- 52.63465	-42.84227	Wire out 289m commence hauling			MOCNESS	
30/12/2011 15:56	4 (MOCNESS test)	-52.6345	-42.85592	MOCNESS at the surface			MOCNESS	
30/12/2011 16:00	4 (MOCNESS test)	- 52.63449	-42.85955	MOCNESS recovered on deck preparing to deploy RMT 8. Vessel off D.P			MOCNESS	
30/12/2011 16:43	5 (RMT 8 Test)	- 52.63642	-42.89099	Commence deploying RMT 8	TEST	5	RMT	1
30/12/2011 16:45	5 (RMT 8 Test)	- 52.63683	-42.89247	RMT 8 in the water			RMT	
30/12/2011 16:49	5 (RMT 8 Test)	- 52.63702	-42.89623	RMT 8 deployed			RMT	
30/12/2011 17:10	5 (RMT 8 Test)	- 52.63827	-42.91801	Wire out 407m commence hauling			RMT	
30/12/2011 17:24	5 (RMT 8 Test)	- 52.63931	-42.935	RMT 8 at the surface			RMT	
30/12/2011 17:27	5 (RMT 8 Test)	- 52.63952	-42.9385	RMT 8 recovered on deck			RMT	
30/12/2011 17:40	6 (RMT 8 Test 2)	- 52.64084	-42.94927	Commence deploying RMT 8	TEST	6	RMT	2
30/12/2011 17:42	6 (RMT 8 Test 2)	- 52.64118	-42.95121	RMT 8 in the water			RMT	
30/12/2011 17:46	6 (RMT 8 Test 2)	- 52.64142	-42.95652	RMT 8 deployed			RMT	
30/12/2011 17:55	6 (RMT 8 Test 2)	- 52.64226	-42.96656	Wire out 211 commence hauling			RMT	
30/12/2011 18:11	6 (RMT 8 Test 2)	- 52.64389	-42.98579	RMT 8 at the surface			RMT	
30/12/2011	6 (RMT 8 Test 2)	-	-42.99025	RMT 8 recovered on deck			RMT	

18:15		52.64434						
30/12/2011 18:35	6 (RMT 8 Test 2)	- 52.64917	-42.9968	Gantry and deck all secure vessel proceeding to P3				
30/12/2011 19:20	7 (XBT 1)	- 52.65597	-42.77235	Slow to 7 knots for XBT deployment	TEST	7	XBT	1
30/12/2011 19:27	7 (XBT 1)	- 52.65665	-42.74463	XBT deployed			XBT	
30/12/2011 19:33	7 (XBT 1)	- 52.65716	-42.72513	XBT finished increase speed to 2000kw				
31/12/2011 02:59	P3 acoustic transect	- 52.79959	-40.25131	Commence acoustic transect. Heading 096 degrees			AT	1
31/12/2011 04:00	P3 acoustic transect	- 52.81764	-39.97473	completed line turning around to restart the line			AT	
31/12/2011 04:11	P3 acoustic transect	- 52.81792	-39.97572	Restart line heading 276(T)			AT	2
31/12/2011 05:13	P3 acoustic transect	- 52.79964	-40.25289	completed line turning around to restart the line			AT	
31/12/2011 05:21	P3 acoustic transect	- 52.80025	-40.24964	Restart line heading 096(T)			AT	3
31/12/2011 06:21	P3 acoustic transect	- 52.81752	-39.97587	completed line turning around to restart the line			AT	
31/12/2011 06:31	P3 acoustic transect	- 52.81765	-39.97529	Restart line heading 276(T)			AT	4
31/12/2011 07:33	P3 acoustic transect	- 52.80007	-40.25376	completed line turning around to restart the line			AT	
31/12/2011 07:37	P3 acoustic transect	- 52.79937	-40.25351	Restart line heading 096(T)			AT	5
31/12/2011 08:08	P3 acoustic transect	- 52.80702	-40.13997	completed line end of survey			AT	
31/12/2011 08:19		- 52.80844	-40.11282	Vessel stopped on DP				
31/12/2011	8 (CTD 1)	-	-40.113	CTD deployed		8	CTD	2

08:25		52.80849						
31/12/2011 08:46	8 (CTD 1)	- 52.80871	-40.11359	CTD stopped at 1000m			CTD	
31/12/2011 09:06	8 (CTD 1)	- 52.80867	-40.1136	CTD recovered on deck			CTD	
31/12/2011 09:15	8 (CTD 1)	- 52.80865	-40.1136	CTD secure on deck			CTD	
31/12/2011 09:16		- 52.80867	-40.11359	Vessel off DP proceding to mooring site				
31/12/2011 09:43		- 52.81801	-40.05487	Vessel stopped on DP for mooring deployment				
31/12/2011 11:56		- 52.81451	-40.05607	Hydraulic leak fixed. Recharge system.				
31/12/2011 12:08		- 52.81454	-40.05612	Leak occured port seismic boom. Minor spill - contained				
31/12/2011 13:20		- 52.81446	-40.05615	System restored. Test stern gantry				
31/12/2011 13:26	9 (P3 mooring)	- 52.81367	-40.05596	Test satisfactory. Increase speed to 0.2 knots. Commence deployment operation		9	MOORING	1
31/12/2011 13:31	9 (P3 mooring)	- 52.81365	-40.05643	Main buoy deployed			MOORING	
31/12/2011 13:47	9 (P3 mooring)	- 52.81297	-40.05739	Sonarbell deployed			MOORING	
31/12/2011 13:59	9 (P3 mooring)	- 52.81284	-40.05932	SBE CTD deployed			MOORING	
31/12/2011 14:33	9 (P3 mooring)	- 52.81139	-40.07754	Trimson buoy cluster deployed			MOORING	
31/12/2011 14:40	9 (P3 mooring)	- 52.81132	-40.07883	Sediment trap and Aquadoop current meter deployed			MOORING	
31/12/2011 15:37	9 (P3 mooring)	- 52.80895	-40.11061	Mooring streaming astern hanging weight over ready to release			MOORING	

31/12/2011 15:40	9 (P3 mooring)	- 52.80885	-40.11142	Weight released approx EA 600 depth 3800m. Stern Position 52 48.5185(S) 040 06.6632(W) C.O.G 280(T) x 0.5knots. P3 mooring fully deployed			MOORING	
31/12/2011 16:14	10 (Hydrophone)	- 52.81053	-40.11766	Hydrophone deployed 1st triangulation of P3. Drop site brg 060(T) x 500m		10	MOORING	1
31/12/2011 16:15	10 (Hydrophone)	- 52.81055	-40.11767	Hydrophone clear of the water 3841m range of the mooring. Vessel moving to next position for triangulation			MOORING	
31/12/2011 16:38	11(Hydrophone)	- 52.80931	-40.10197	Hydrophone deployed for triangulating		11	MOORING	2
31/12/2011 16:41	11(Hydrophone)	- 52.80929	-40.10202	Hydrophone clear of the water unable to get range. Vessel off D.P relocating for triangulation			MOORING	
31/12/2011 16:52	12 (Hydrophone)	- 52.79995	-40.10108	Vessel on D.P		12	MOORING	3
31/12/2011 16:55	12 (Hydrophone)	- 52.80084	-40.10402	Hydrophone deployed 2nd triangulation of P3. Drop site brg 208(T) x 985m			MOORING	
31/12/2011 16:57	12 (Hydrophone)	- 52.80083	-40.10402	Range for Mooring 3853m Hydrophone recovered. Vessel off D.P relocating next triangulating			MOORING	
31/12/2011 17:07	13 (Hydrophone)	-52.8099	-40.10136	Vessel on D.P				
31/12/2011 17:09	13 (Hydrophone)	- 52.80989	-40.10189	Hydrophone deployed 3rd triangulation of P3. Drop site brg 283(T) x 630m		13	MOORING	4
31/12/2011 17:11	13 (Hydrophone)	- 52.80991	-40.10187	Mooring range 3769m hydrophone recovered			MOORING	
31/12/2011 17:12	13 (Hydrophone)	-52.8099	-40.10185	Vessel off D.P completed triangulation deck secure. Vessel proceeding to WCB mooring				

01/01/2012 00:30	14 (RMT8 - 1)	- 53.55919	-38.44441	V/L ready to deploy RMT8		14	RMT	3
01/01/2012 00:38	14 (RMT8 - 1)	- 53.55892	-38.45427	RMT8 deployed			RMT	
01/01/2012 01:05	14 (RMT8 - 1)	- 53.55845	-38.48767	RMT 8 recovered on deck. V/L proceeding to WCB mooring for acoustic transect			RMT	
01/01/2012 03:55	WCB Mooring acoustic transect	- 53.79819	-38.07709	Commence acoustic transect Hdg 090(T)			AT	6
01/01/2012 04:56	WCB Mooring acoustic transect	- 53.79807	-37.79208	completed line turning around to restart the line			AT	
01/01/2012 05:08	WCB Mooring acoustic transect	- 53.79799	-37.79396	Restart line heading 270(T)			AT	7
01/01/2012 06:32	WCB Mooring acoustic transect	- 53.79776	-38.07828	completed line turning around to restart the line			AT	
01/01/2012 06:40	WCB Mooring acoustic transect	- 53.79751	-38.07615	Restart line heading 090(T)			AT	8
01/01/2012 07:41	WCB Mooring acoustic transect	-53.7978	-37.79382	complete line turning			AT	
01/01/2012 07:49	WCB Mooring acoustic transect	- 53.79839	-37.79509	Restart line heading 270(T)			AT	9
01/01/2012 09:10	WCB Mooring acoustic transect	- 53.79748	-38.07419	Complete transect line slow to 2.5knots to assess suitability of conditions for RMT			AT	
01/01/2012 09:22	WCB Mooring acoustic transect	- 53.79687	-38.09408	Conditions suitable for RMT. Turn to reposition 2nm downwind of mooring site				
01/01/2012 10:32	15 (RMT 8 - 2)	- 53.79793	-37.88701	RMT 8 deployed		15	RMT	4
01/01/2012 11:40	15 (RMT 8 - 2)	- 53.79776	-37.96204	RMT 8 recovered on deck			RMT	
01/01/2012 12:12		- 53.79743	-37.93454	Vessel on D.P				

01/01/2012 12:21	16 (CTD 2)	-53.79756	-37.9348	CTD Deployed		16	CTD	3
01/01/2012 12:25	16 (CTD 2)	-53.79755	-37.93463	CTD Veering to 275m			CTD	
01/01/2012 12:33	16 (CTD 2)	-53.79754	-37.93463	All stopped @ 275m			CTD	
01/01/2012 12:48	16 (CTD 2)	-53.79755	-37.9346	CTD Recovered on deck			CTD	
01/01/2012 12:56	WCB Mooring acoustic transect	-53.79752	-37.9346	Vessel off DP. Commence acoustic transect			AT	10
01/01/2012 13:40	WCB Mooring acoustic transect	-53.79784	-38.07298	Turning to commence transect line			AT	
01/01/2012 14:47	WCB Mooring acoustic transect	-53.7977	-37.79633	completed line turning around to restart the line			AT	
01/01/2012 15:14	WCB Mooring acoustic transect	-53.79784	-37.86848	Ceased acoustic line. Vessel slowed to minimum for steerage ready to deploy RMT 8 waiting for stern gantry leak to be fixed				
01/01/2012 15:20		-53.79796	-37.87364	Vessel on D.P waiting for leak to be fixed				
01/01/2012 17:10	17 (SUCS 1)	-53.79795	-37.87388	Stern gantry leak not fixed commence deploying SUCS		17	SUCS	3
01/01/2012 17:13	17 (SUCS 1)	-53.79796	-37.87387	SUCS deployed Veering EA 600 depth 168m			SUCS	
01/01/2012 17:19	17 (SUCS 1)	-53.79795	-37.87385	SUCS on seabed capturing image			SUCS	
01/01/2012 17:23	17 (SUCS 1)	-53.79795	-37.87386	SUCS clear of the seabed. Move ahead 5 m			SUCS	
01/01/2012 17:25	17 (SUCS 1)	-53.79795	-37.87392	SUCS on the seabed capturing image			SUCS	
01/01/2012 17:29	17 (SUCS 1)	-53.79796	-37.87394	SUCS clear of the seabed moving ahead 5m			SUCS	

01/01/2012 17:31	17 (SUCS 1)	-53.79795	-37.87403	SUCS on the seabed capturing image			SUCS	
01/01/2012 17:34	17 (SUCS 1)	-53.79794	-37.874	SUCS clear of the seabed commence recovery			SUCS	
01/01/2012 17:40	17 (SUCS 1)	-53.79794	-37.87404	SUCS clear of the water			SUCS	
01/01/2012 17:41	17 (SUCS 1)	-53.79793	-37.87397	SUCS recovered on deck			SUCS	
01/01/2012 17:44	17 (SUCS 1)	-53.79793	-37.87452	Vessel off D.P Proceeding the WCB mooring site for SUCS				
01/01/2012 18:05	18 (SUCS 2)	-53.79797	-37.93025	Vessel on D.P for SUCS				
01/01/2012 18:08	18 (SUCS 2)	-53.79824	-37.93011	Vessel all stoped on D.P.				
01/01/2012 18:09	18 (SUCS 2)	-53.79823	-37.93012	Commence deploying SUCS		18	SUCS	4
01/01/2012 18:12	18 (SUCS 2)	-53.79821	-37.93013	SUCS deployed Veering EA 600 depth 284m			SUCS	
01/01/2012 18:21	18 (SUCS 2)	-53.79823	-37.93013	SUCS on the seabed capturing image			SUCS	
01/01/2012 18:27	18 (SUCS 2)	-53.79823	-37.93009	SUCS clear of the seabed moving ahead 5m			SUCS	
01/01/2012 18:30	18 (SUCS 2)	-53.79824	-37.93022	SUCS on the seabed capturing image			SUCS	
01/01/2012 18:38	18 (SUCS 2)	-53.79821	-37.93022	SUCS clear of the seabed moving ahead 5m			SUCS	
01/01/2012 18:41	18 (SUCS 2)	-53.79823	-37.93025	SUCS on the seabed capturing image			SUCS	
01/01/2012 18:45	18 (SUCS 2)	-53.79826	-37.93027	SUCS clear of the seabed commence recovery			SUCS	
01/01/2012 18:54	18 (SUCS 2)	-53.79822	-37.93025	SUCS clear of the water			SUCS	

01/01/2012 18:55	18 (SUCS 2)	-53.79823	-37.93028	SUCS recovered on deck vessel waiting for stern gantry leak to be fixed			SUCS	
01/01/2012 21:03		-53.79769	-37.87812	Gantry leak fixed. V/L off DP preparing for RMT deployment				
01/01/2012 21:07	19 (RMT 3)	-53.79769	-37.8806	Commence RMT deployment @ 2.5kts		19	RMT	5
01/01/2012 21:11	19 (RMT 3)	-53.79789	-37.88555	RMT deployed			RMT	
01/01/2012 21:26	19 (RMT 3)	-53.79776	-37.90255	Commence hauling RMT			RMT	
01/01/2012 22:10	19 (RMT 3)	-53.79771	-37.95326	RMT recovered to deck. Resume accoustic transects			RMT	
01/01/2012 22:51	WCB Mooring acoustic transect	-53.79763	-38.08204	Commence downwind transect run heading 090 deg			AT	11
01/01/2012 23:52	WCB Mooring acoustic transect	-53.79785	-37.79704	Commence upwind transect run heading 270 deg			AT	12
02/01/2012 00:31	20 (RMT 4)	-53.7978	-37.87506	RMT 8 deployed		20	RMT	6
02/01/2012 01:28	20 (RMT 4)	-53.79777	-37.93954	RMT 8 recovered on deck. Continue with acoustic transect			RMT	
02/01/2012 02:11	WCB Mooring acoustic transect	-53.79785	-38.07108	Complete acoustic survey. V/L proceeding to WCB 1.1			AT	
02/01/2012 09:00	WCB1.1	-54.05632	-39.3913	Start transect @ 1.1S. 6 knots for XBT			AT	13
02/01/2012 09:00	21 (XBT1)	-54.05632	-39.3913	XBT deployed at 6 knots		21	XBT	2
02/01/2012 09:03	21 (XBT1)	-54.05146	-39.39307	XBT completed increase to 10 knots			XBT	
02/01/2012 10:02	22(XBT2)	-53.89257	-39.44091	Commence slowing to 6 knots for XBT		22	XBT	3
02/01/2012 10:09	22(XBT2)	-53.8791	-39.4445	XBT deployed at 6 knots			XBT	

02/01/2012 10:11	22(XBT2)	-53.87594	-39.44556	XBT completed increase to 10 knots			XBT	
02/01/2012 11:10	23 (XBT 3)	-53.7174	-39.49285	Commence slowing to 6 knots for XBT		23	XBT	4
02/01/2012 11:19	23 (XBT 3)	-53.70093	-39.4975	XBT Deployed at 6 knots (failed).			XBT	
02/01/2012 11:26	23 (XBT 3)	-53.68938	-39.50095	2nd XBT Deployed at 6 knots			XBT	
02/01/2012 11:28	23 (XBT 3)	-53.68614	-39.50189	XBT completed increase to 10 knots			XBT	
02/01/2012 12:23	24 (XBT 5)	-53.53942	-39.54552	Commence slowing to 6 knots for XBT		24	XBT	5
02/01/2012 12:31	24 (XBT 4)	-53.52352	-39.55015	XBT deployed at 6 knots			XBT	
02/01/2012 12:36	24 (XBT 4)	-53.51549	-39.55258	XBT completed increase to 10 knots			XBT	
02/01/2012 13:34	25 (XBT 5)	-53.36114	-39.5984	Commence slowing to 6 knots for XBT		25	XBT	6
02/01/2012 13:40	25 (XBT 5)	-53.34848	-39.602	XBT deployed at 6 knots			XBT	
02/01/2012 13:45	25 (XBT 5)	-53.34033	-39.60432	Finish Transect 1.1 proceeding to position 1.2N			AT	
02/01/2012 14:54	Transect 1.2N	-53.3198	-39.30285	Commence transect @ 1.2 N @ 10 knots			AT	14
02/01/2012 19:12	WCB Transect 1.2	-54.02398	-39.08931	Complete transect 1.2			AT	
02/01/2012 20:21	26 (CTD1.2S)	-53.84654	-39.14239	V/L on DP for CTD	WCB 1.2S	26	CTD	4
02/01/2012 20:29	26 (CTD1.2S)	-53.84644	-39.14275	CTD 1.2S deployed			CTD	
02/01/2012 20:38	26 (CTD1.2S)	-53.84643	-39.14278	CTD @ 260m			CTD	

02/01/2012 20:52	26 (CTD1.2S)	-53.84644	-39.14278	CTD recovered to deck			CTD	
02/01/2012 21:30		-53.85856	-39.08959	v/l off DP 2nm downwind of 1.2CTDS for RMT				
02/01/2012 21:32	27 (RMT5)	-53.85825	-39.09106	Commence deployment of RMT		27	RMT	7
02/01/2012 21:40	27 (RMT5)	-53.85624	-39.10077	RMT deployed			RMT	
02/01/2012 22:14	27 (RMT5)	-53.8479	-39.13651	Commence hauling RMT			RMT	
02/01/2012 22:50	27 (RMT5)	-53.83961	-39.17463	RMT recovered to deck			RMT	
03/01/2012 01:04	28 (RMT 6)	-53.50498	-39.1902	RMT 8 deployed		28	RMT	8
03/01/2012 02:17	28 (RMT 6)	-53.49189	-39.2551	RMT 8 recovered on deck			RMT	
03/01/2012 05:21		-53.49274	-39.25084	Vessel on DP				
03/01/2012 05:25	29 (CTD 1.2N)	-53.49266	-39.24949	Commence CTD deployment	WCB 1.2N	29	CTD	5
03/01/2012 05:30	29 (CTD 1.2N)	-53.49268	-39.25002	CTD in water soaking			CTD	
03/01/2012 05:33	29 (CTD 1.2N)	-53.49267	-39.25023	CTD deployed veering to 1000m EA600 depth 3145m			CTD	
03/01/2012 05:51	29 (CTD 1.2N)	-53.4927	-39.25116	Wire out 100m commence hauling			CTD	
03/01/2012 06:10	29 (CTD 1.2N)	-53.49277	-39.25115	CTD at the surface			CTD	
03/01/2012 06:11	29 (CTD 1.2N)	-53.49277	-39.25115	CTD recovered on deck			CTD	
03/01/2012 06:20	29 (CTD 1.2N)	-53.49277	-39.25115	CTD secure on deck vessel proceeding to W2.1N to start transect				

03/01/2012 09:00	WCB 2.1 start acoustic transect	- 53.28572	-39.03874	Start transect 2.1 at 2.1N			AT	15
03/01/2012 09:03	30 (XBT6)	- 53.29056	-39.0372	XBT deployed at 6 knots		30	XBT	7
03/01/2012 09:08	30 (XBT6)	- 53.29868	-39.03477	XBT completed increase to 10 knots			XBT	
03/01/2012 09:32	33 (XBT 9)	- 53.36087	-39.0154	XBT completed increase to 10 knots			XBT	FIX
03/01/2012 10:06	31 (XBT7)	- 53.45296	-38.98682	Commence slowing for XBT		31	XBT	8
03/01/2012 10:11	31 (XBT7)	- 53.46331	-38.98358	XBT deployed at 6 knots			XBT	
03/01/2012 10:17	31 (XBT7)	- 53.47336	-38.98025	XBT completed increase to 10 knots			XBT	
03/01/2012 11:16	32 (XBT 8)	- 53.63175	-38.9319	Commence slowing to 6 knots for XBT		32	XBT	9
03/01/2012 11:19	32 (XBT 8)	- 53.63797	-38.92993	XBT Deployed at 6 knots (failed).			XBT	
03/01/2012 11:21	32 (XBT 8)	- 53.64142	-38.92855	XBT deployed at 6 knots			XBT	
03/01/2012 11:26	32 (XBT 8)	- 53.64929	-38.92641	XBT completed increase to 10 knots			XBT	
03/01/2012 12:25	33 (XBT 9)	- 53.80531	-38.87799	Commence slowing to 6 knots for XBT		33	XBT	10
03/01/2012 12:30	33 (XBT 9)	-53.8146	-38.87498	XBT deployed at 6 knots			XBT	
03/01/2012 13:32	34 (XBT 10)	- 53.97745	-38.8243	Commence slowing to 6 knots for XBT		34	XBT	11
03/01/2012 13:41	34 (XBT 10)	-53.9941	-38.81879	XBT deployed at 6 knots			XBT	
03/01/2012 14:42	Transect W 2.2	- 53.96211	-38.52665	Commence 10kt Transect.			AT	16

03/01/2012 19:03	WCB transect 2.2	-53.25482	-38.75079	Complete transect 2.2 relocate to 2.2N CTD site			AT	
03/01/2012 20:10	35 (CTD2.2N)	-53.43164	-38.69418	V/L on DP for CTD 2.2N				
03/01/2012 20:18	35 (CTD2.2N)	-53.43139	-38.69468	CTD deployed	WCB	35	CTD	6
03/01/2012 20:39	35 (CTD2.2N)	-53.43186	-38.69499	CTD @ 1000m			CTD	
03/01/2012 21:04	35 (CTD2.2N)	-53.43183	-38.69521	CTD recovered to deck			CTD	
03/01/2012 21:21		-53.42799	-38.67664	Relocating for RMT Gantry leak identified				
03/01/2012 21:26		-53.42629	-38.67269	V/L off DP				
03/01/2012 21:45	36 (RMT7)	-53.4248	-38.6393	V/L on DP 2nm downwind of CTD2.2N site. Awaiting gantry fix				
03/01/2012 22:01	36 (RMT7)	-53.42444	-38.63935	Gantry fixed V/L off DP prepare for RMT				
03/01/2012 22:10	36 (RMT7)	-53.42473	-38.64765	RMT deployed		36	RMT	9
03/01/2012 23:19	36 (RMT7)	-53.4351	-38.7215	RMT 8 recovered on deck			RMT	
04/01/2012 01:34	37 (RMT 8)	-53.67512	-38.56091	RMT 8 deployed		37	RMT	10
04/01/2012 01:52	37 (RMT 8)	-53.67756	-38.58118	RMT 8 recovered on deck			RMT	
04/01/2012 02:37	38 (RMT 9)	-53.67162	-38.53752	RMT 8 deployed		38	RMT	11
04/01/2012 02:57	38 (RMT 9)	-53.6746	-38.55679	RMT 8 recovered on deck. V/L proceeding to W2.2CTDS			RMT	
04/01/2012 03:09	38 (RMT 9)	-53.67697	-38.56748	RMT secure on deck vessel proceeding to next site for RMT deployment				

04/01/2012 03:51	39 (RMT 10)	-53.769	-38.53272	Commence deployment of RMT8		39	RMT	12
04/01/2012 03:55	39 (RMT 10)	-53.77035	-38.53602	RMT8 deployed veering			RMT	
04/01/2012 04:27	39 (RMT 10)	-53.78184	-38.56755	RMT8 stopped at 318m			RMT	
04/01/2012 04:30	39 (RMT 10)	-53.78297	-38.57065	Commence hauling RMT8			RMT	
04/01/2012 04:52	39 (RMT 10)	-53.79066	-38.59279	RMT at surface			RMT	
04/01/2012 04:56	39 (RMT 10)	-53.79196	-38.59662	RMT recovered to deck			RMT	
04/01/2012 04:58	39 (RMT 10)	-53.79225	-38.59771	RMT secure on deck vessel proceeding to next site for SUCS deployment			RMT	
04/01/2012 05:16		-53.78481	-38.57486	Vessel on DP				
04/01/2012 05:17	40 (SUCS 3)	-53.7847	-38.57489	Commence deployment of SUCS		40	SUCS	5
04/01/2012 05:20	40 (SUCS 3)	-53.78469	-38.57488	SUCS deployed veering EA600 depth 205m			SUCS	
04/01/2012 05:29	40 (SUCS 3)	-53.78469	-38.5749	SUCS on the seabed capturing image			SUCS	
04/01/2012 05:32	40 (SUCS 3)	-53.78468	-38.57487	Commence recovering SUCS			SUCS	
04/01/2012 05:42	40 (SUCS 3)	-53.78468	-38.57483	SUCS at surface			SUCS	
04/01/2012 05:44	40 (SUCS 3)	-53.78471	-38.57491	SUCS on deck vessel moved on DP to CTD site W2.2S			SUCS	
04/01/2012 05:53		-53.78492	-38.58318	Vessel stopped on DP				
04/01/2012 05:58	41 (CTD 2.2S)	-53.78489	-38.58321	Commence CTD deployment	WCB	41	CTD	7

04/01/2012 06:02	41 (CTD 2.2S)	-53.78509	-38.58323	CTD soaking			CTD	
04/01/2012 06:04	41 (CTD 2.2S)	-53.78516	-38.58327	CTD veering EA600 depth 207m			CTD	
04/01/2012 06:08	41 (CTD 2.2S)	-53.78514	-38.58339	CTD stopped at 183m			CTD	
04/01/2012 06:12	41 (CTD 2.2S)	-53.78515	-38.58342	CTD at surface			CTD	
04/01/2012 06:15	41 (CTD 2.2S)	-53.78515	-38.58341	CTD recovered on deck			CTD	
04/01/2012 06:23	41 (CTD 2.2S)	-53.78512	-38.5834	CTD secure off DP proceeding to start of transect W3.1S for 0600			CTD	
04/01/2012 09:00	WCB Transect 3.1	-53.92714	-38.22041	Commence transect 3.1 @ 3.1S			AT	17
04/01/2012 09:00	42 (XBT11)	-53.92714	-38.22041	XBT deployed @ 6 knots		42	XBT	12
04/01/2012 09:02	42 (XBT11)	-53.9238	-38.22134	XBT completed increase to 10 knots			XBT	
04/01/2012 10:03	43 (XBT12)	-53.75852	-38.27544	Commence slowing to 6 knots for XBT		43	XBT	13
04/01/2012 10:07	43 (XBT12)	-53.75074	-38.27787	XBT deployed @ 6 knots			XBT	
04/01/2012 10:08	43 (XBT12)	-53.74748	-38.2787	XBT completed increase to 10 knots			XBT	
04/01/2012 11:06	44 (XBT 13)	-53.59214	-38.32885	Commence slowing to 6 knots for XBT		44	XBT	14
04/01/2012 11:16	44 (XBT 13)	-53.57443	-38.33488	XBT deployed at 6 knots			XBT	
04/01/2012 11:21	44 (XBT 13)	-53.56632	-38.33723	XBT completed increase to 10 knots			XBT	
04/01/2012 12:18	45 (XBT 14)	-53.41334	-38.38668	Commence slowing to 6 knots for XBT		45	XBT	15

04/01/2012 12:27	45 (XBT 14)	- 53.39724	-38.39211	XBT deployed @ 6 knots			XBT	
04/01/2012 12:30	45 (XBT 14)	- 53.39235	-38.39377	XBT completed increase to 10 knots			XBT	
04/01/2012 13:29	46 (XBT 15)	-53.235	-38.44418	Commence slowing to 6 knots for XBT		46	XBT	16
04/01/2012 13:36	46 (XBT 15)	- 53.22244	-38.44844	XBT deployed @ 6 knots			XBT	
04/01/2012 14:48	WCB transect 3.2	- 53.18388	-38.14075	Commence acoustic transect			AT	18
04/01/2012 19:07	WCB transect 3.2	- 53.89151	-37.90606	Transect completed			AT	
04/01/2012 20:11	47 (CTD3.2S)	- 53.71371	-37.96478	V/L on DP for CTD	WCB	47	CTD	8
04/01/2012 20:17	47 (CTD3.2S)	- 53.71396	-37.96544	CTD deployed			CTD	
04/01/2012 20:25	47 (CTD3.2S)	- 53.71407	-37.96566	CTD @ depth 112m			CTD	
04/01/2012 20:30	47 (CTD3.2S)	- 53.71408	-37.96573	CTD recovered to deck			CTD	
04/01/2012 20:35		- 53.71408	-37.96576	VL off DP				
04/01/2012 21:08	48 (RMT11)	-53.7028	-37.9284	RMT deployed		48	RMT	13
04/01/2012 21:33	48 (RMT11)	- 53.71009	-37.9527	Commence hauling RMT			RMT	
04/01/2012 22:01	48 (RMT11)	- 53.71958	-37.98053	RMT recovered to deck			RMT	
04/01/2012 22:09		- 53.72255	-37.98942	All secure on deck. Turn to run downwind for target fishing				
04/01/2012 23:34	49 (RMT 12)	- 53.60796	-37.72414	RMT 8 deployed		49	RMT	14

05/01/2012 00:11	49 (RMT 12)	-53.62161	-37.75446	RMT 8 recovered on deck			RMT	
05/01/2012 02:06	50 (RMT 13)	-53.51014	-37.88537	RMT 8 deployed		50	RMT	15
05/01/2012 02:39	50 (RMT 13)	-53.5083	-37.92286	RMT 8 recovered on deck			RMT	
05/01/2012 03:50	51 (RMT 14)	-53.38896	-38.05328	Commence deploying RMT 8		51	RMT	16
05/01/2012 03:54	51 (RMT 14)	-53.38613	-38.05399	RMT deployed veering			RMT	
05/01/2012 04:29	51 (RMT 14)	-53.36619	-38.07725	Wire out 411m commence hauling			RMT	
05/01/2012 05:00	51 (RMT 14)	-53.35037	-38.10024	RMT 8 at the surface commence recovery			RMT	
05/01/2012 05:05	51 (RMT 14)	-53.34797	-38.10381	RMT 8 recovered on deck. V/L proceeding to W3.2CTDN			RMT	
05/01/2012 05:29	52 (CTD 3.2N)	-53.3615	-38.08196	Vessel on D.P at W3.2N	WCB	52	CTD	9
05/01/2012 05:31	52 (CTD 3.2N)	-53.36152	-38.08204	Commence deploying CTD			CTD	
05/01/2012 05:35	52 (CTD 3.2N)	-53.36144	-38.08238	CTD Soaking			CTD	
05/01/2012 05:38	52 (CTD 3.2N)	-53.36142	-38.08242	CTD deployed Veering EA600 depth 2661m			CTD	
05/01/2012 05:56	52 (CTD 3.2N)	-53.36143	-38.08246	CTD stopped at 1000m			CTD	
05/01/2012 06:13	52 (CTD 3.2N)	-53.36147	-38.08242	CTD at surface			CTD	
05/01/2012 06:15	52 (CTD 3.2N)	-53.36147	-38.08244	CTD recovered to deck			CTD	
05/01/2012 06:24	52 (CTD 3.2N)	-53.36146	-38.08247	Vessel off DP proceeding to start of transect W4.1N for 0900				

05/01/2012 09:00	WCB transect 4.1	-53.16296	-37.96475	Start transect			AT	19
05/01/2012 09:00	53 (XBT16)	-53.16296	-37.96475	XBT deployed at 6 knots		53	XBT	17
05/01/2012 09:07	53 (XBT16)	-53.17455	-37.96043	XBT completed increase to 10 knots			XBT	
05/01/2012 10:04	54 (XBT17)	-53.32803	-37.90722	Commence slowing for XBT		54	XBT	18
05/01/2012 10:08	54 (XBT17)	-53.33604	-37.90405	XBT deployed @ 6 knots			XBT	
05/01/2012 10:14	54 (XBT17)	-53.34551	-37.9007	XBT completed increase to 10 knots			XBT	
05/01/2012 11:12	55 (XBT 18)	-53.50235	-37.8513	Commence slowing for XBT		55	XBT	19
05/01/2012 11:20	55 (XBT 18)	-53.51709	-37.84663	XBT deployed			XBT	
05/01/2012 11:24	55 (XBT 18)	-53.52364	-37.84441	Increase speed to 10 knots			XBT	
05/01/2012 12:23	56 (XBT 19)	-53.68107	-37.79102	Slow to 6 knots for XBT deployment		56	XBT	20
05/01/2012 12:29	56 (XBT 19)	-53.69155	-37.78803	XBT Deployed (failed).			XBT	
05/01/2012 12:33	57 (XBT 19)	-53.69794	-37.78582	2nd XBT Deployed at 6 knots		57	XBT	21
05/01/2012 12:35	57 (XBT 19)	-53.70115	-37.78454	Increase speed to 10 knots			XBT	
05/01/2012 13:32	58 (XBT 19)	-53.85353	-37.73307	Slow to 6 knots for XBT deployment		58	XBT	22
05/01/2012 13:40	58 (XBT 19)	-53.86734	-37.72878	XBT deployed			XBT	
05/01/2012 13:40	Transect 4.1	-53.86734	-37.72878	Transect 4.1 completed			XBT	

05/01/2012 14:13	59 (XBT 20)	-53.86192	-37.59123	Slow to 6 knots for XBT deployment		59	XBT	23
05/01/2012 14:17	59 (XBT 20)	-53.85446	-37.59384	XBT deployed			XBT	
05/01/2012 14:17	Transect 4.2	-53.85446	-37.59384	Commence acoustic transect			AT	20
05/01/2012 15:17	60 (XBT 21)	-53.69586	-37.64737	Slowing down to 6 knots for XBT		60	XBT	24
05/01/2012 15:28	60 (XBT 21)	-53.67602	-37.65472	XBT deployed increasing to 10knots			XBT	
05/01/2012 15:32	60 (XBT 21)	-53.66779	-37.65782	Vessel proceeding at 10knots			XBT	
05/01/2012 16:28	61 (XBT 22)	-53.51702	-37.70654	Slowing down to 6 knots for XBT		61	XBT	25
05/01/2012 16:40	61 (XBT 22)	-53.49645	-37.71335	Slowing down to 6 knots for XBT			XBT	
05/01/2012 16:42	61 (XBT 22)	-53.49316	-37.7146	XBT deployed increasing to 10knots			XBT	
05/01/2012 16:45	61 (XBT 22)	-53.4867	-37.71697	Vessel at 10 knots			XBT	
05/01/2012 16:55	61 (XBT 22)	-53.45932	-37.72658	Vessel at 10 knots			XBT	
05/01/2012 17:52	62 (XBT 23)	-53.31715	-37.77423	XBT deployed increasing to 10knots		62	XBT	26
05/01/2012 18:50	63 (XBT 24)	-53.15996	-37.82836	Slowing down to 6 knots for XBT		63	XBT	27
05/01/2012 18:57	63 (XBT 24)	-53.14834	-37.83238	Completed transect line W4.2N XBT deployed			AT	
05/01/2012 19:02	63 (XBT 24)	-53.13979	-37.83549	XBT complete			XBT	
05/01/2012 19:09		-53.13469	-37.84012	V/L stopped on DP for RMT trial				

05/01/2012 19:36				V/L off DP proceed to WCB mooring site				
06/01/2012 01:23	64 (RMT 15)	- 53.64199	-37.71546	RMT deployed		64	RMT	17
06/01/2012 01:47	64 (RMT 15)	- 53.65448	-37.73226	RMT recovered to deck procceding to WCB mooring position			RMT	
06/01/2012 02:38	WCB Mooring acoustic transect	- 53.74282	-37.82551	Commence acoustic transect	WCB Mooring		AT	21
06/01/2012 03:41	WCB Mooring acoustic transect	-53.8499	-38.05053	completed line turning around to restart the line			AT	
06/01/2012 03:50	WCB Mooring acoustic transect	- 53.84723	-38.0522	Restart line heading 055(T)			AT	22
06/01/2012 04:50	WCB Mooring acoustic transect	- 53.74982	-37.81964	completed line turning around to restart the line			AT	
06/01/2012 04:58	WCB Mooring acoustic transect	- 53.74902	-37.81771	Restart line heading 235 degrees			AT	23
06/01/2012 06:03	WCB Mooring acoustic transect	- 53.84591	-38.05146	completed line turning around to restart the line			AT	
06/01/2012 06:10	WCB Mooring acoustic transect	-53.8462	-38.05371	Restart line heading 055(T)			AT	24
06/01/2012 07:11	WCB Mooring acoustic transect	- 53.74943	-37.81876	Complete line turn to restart			AT	
06/01/2012 07:18	WCB Mooring acoustic transect	- 53.74923	-37.81729	Restart line heading 235 degrees			AT	25
06/01/2012 08:26	WCB Mooring acoustic transect	- 53.84567	-38.05183	Complete line turn to restart			AT	
06/01/2012 08:32	WCB Mooring acoustic transect	- 53.84688	-38.05387	Restart line heading 055(T)			AT	26
06/01/2012 09:32	WCB Mooring acoustic transect	- 53.74953	-37.81941	Complete acoustic survey. Assesing conditions for RMT			AT	
06/01/2012 10:22	65 (RMT 16)	- 53.77631	-37.90393	RMT 8 deployed		65	RMT	18

06/01/2012 11:34	65 (RMT 16)	-53.80953	-37.95293	RMT 8 recovered on deck			RMT	
06/01/2012 11:48	WCB Mooring acoustic transect	-53.81645	-37.96307	Commence acoustic transect			AT	27
06/01/2012 12:12	WCB Mooring acoustic transect	-53.7978	-37.93567	End of transect line. Commence turn			AT	
06/01/2012 12:19	WCB Mooring acoustic transect	-53.86941	-37.99977	Commence downwind transect run			AT	28
06/01/2012 13:19	WCB Mooring acoustic transect	-53.72367	-37.86911	End of transect line. Commence turn			AT	
06/01/2012 13:23	WCB Mooring acoustic transect	-53.71996	-37.86564	Commence upwind transect run			AT	29
06/01/2012 14:03		-53.79772	-37.93671	V/L on DP				
06/01/2012 14:19	66 (SUCS 4)	-53.79779	-37.93565	SUCS deployed veering to depth 312m		66	SUCS	6
06/01/2012 14:29	66 (SUCS 4)	-53.79776	-37.93566	SUCS on bottom taking photo			SUCS	
06/01/2012 14:36	66 (SUCS 4)	-53.79779	-37.93565	SUCS off seabed moving ahead 5m			SUCS	
06/01/2012 14:40	66 (SUCS 4)	-53.79782	-37.93569	SUCS on bottom taking photo			SUCS	
06/01/2012 14:43	66 (SUCS 4)	-53.79781	-37.9357	SUCS off seabed moving ahead 5m			SUCS	
06/01/2012 14:45	66 (SUCS 4)	-53.79782	-37.93574	SUCS on bottom taking photo			SUCS	
06/01/2012 15:03	66 (SUCS 4)	-53.79783	-37.93578	SUCS at the surface			SUCS	
06/01/2012 15:04	66 (SUCS 4)	-53.79783	-37.93578	SUCS recovered to deck			SUCS	
06/01/2012 15:14	66 (SUCS 4)	-53.79784	-37.93579	SUCS secure on deck vessel on DP proceeding 2nm downwind of waypoint for RMT deployment			SUCS	

06/01/2012 15:39	67 (RMT 17)	- 53.76701	-37.91178	Commence deployment of RMT8		67	RMT	19
06/01/2012 15:44	67 (RMT 17)	- 53.76977	-37.91376	RMT8 deployed veering			RMT	
06/01/2012 15:47	67 (RMT 17)	- 53.77182	-37.91539	Commence recovery of RMT8 for re-cocking			RMT	
06/01/2012 15:53	67 (RMT 17)	-53.7757	-37.91852	RMT8 at the surface			RMT	
06/01/2012 15:57	67 (RMT 17)	- 53.77819	-37.92027	RMT8 recovered on deck			RMT	
06/01/2012 16:06	68 (RMT 18)	- 53.78331	-37.92397	Commence re-deployment of RMT8		68	RMT	20
06/01/2012 16:11	68 (RMT 18)	- 53.78586	-37.92565	RMT8 deployed veering			RMT	
06/01/2012 16:25	68 (RMT 18)	- 53.79556	-37.93218	Wire out 225m stopped veering			RMT	
06/01/2012 16:35	68 (RMT 18)	- 53.80159	-37.93709	Commence hauling RMT8			RMT	
06/01/2012 17:08	68 (RMT 18)	- 53.82142	-37.95366	RMT 8 at the surface			RMT	
06/01/2012 17:13	68 (RMT 18)	- 53.82462	-37.9561	RMT 8 recovered on deck			RMT	
06/01/2012 17:42	WCB Mooring acoustic transect	- 53.84842	-37.97735	RMT 8 and deck secure increase to 10 knots resume acoustic transect			AT	30
06/01/2012 17:53	WCB Mooring acoustic transect	- 53.87002	-37.99905	completed line turning around to restart the line			AT	
06/01/2012 18:00	WCB Mooring acoustic transect	- 53.87021	-38.00164	Restart line heading 029T)			AT	31
06/01/2012 19:00	WCB Mooring acoustic transect	- 53.72427	-37.86878	completed line turning around to restart the line			AT	
06/01/2012 19:08	WCB Mooring acoustic transect	- 53.72055	-37.86423	Restart line heading 229(T)			AT	32

06/01/2012 20:09	WCB Mooring acoustic transect	-53.86782	-37.99801	completed line turning around to restart the line			AT	
06/01/2012 20:19	WCB Mooring acoustic transect	-53.8631	-37.99384	Restart line heading 029T)			AT	33
06/01/2012 21:12	69 (RMT19)	-53.7695	-37.90859	RMT deployed		69	RMT	21
06/01/2012 22:21	69 (RMT19)	-53.80698	-37.94394	RMT recovered to deck. Resume accoustic transects			RMT	
06/01/2012 22:58	WCB Mooring acoustic transect	-53.86877	-37.99952	Start transect heading 029deg			AT	34
06/01/2012 23:58	WCB Mooring acoustic transect	-53.72251	-37.86695	Complete acoustic survey. Commence target fishing			AT	
07/01/2012 00:53		-53.61192	-37.77091	V/L on DP. Stern gantry problem				
07/01/2012 01:18		-53.61197	-37.77056	Stern gantry fixed. V/L off DP				
07/01/2012 01:24	70 (RMT 20)	-53.61441	-37.77327	RMT 8 deployed		70	RMT	22
07/01/2012 01:57	70 (RMT 20)	-53.6334	-37.78862	RMT 8 recovered on deck			RMT	
07/01/2012 03:01	71 (RMT 21)	-53.76258	-37.89725	Reduce speed to 2.5 knots for RMT deployment		71	RMT	23
07/01/2012 03:08	71 (RMT 21)	-53.76855	-37.90534	Commence RMT deployment			RMT	
07/01/2012 03:11	71 (RMT 21)	-53.7705	-37.90713	RMT deployed veering			RMT	
07/01/2012 03:28	71 (RMT 21)	-53.7807	-37.91611	Wire out 240m			RMT	
07/01/2012 03:31	71 (RMT 21)	-53.78257	-37.9178	Commence hauling RMT			RMT	
07/01/2012 04:04	71 (RMT 21)	-53.80314	-37.93791	RMT at surface			RMT	

07/01/2012 04:09	71 (RMT 21)	- 53.80628	-37.94107	RMT recovered to deck			RMT	
07/01/2012 04:25	71 (RMT 21)	- 53.81616	-37.95079	RMT 8 and deck secure vessel proceeding to Stromness				
07/01/2012 11:45		- 54.15888	-36.69364	Commence rigging lines for calibration				
07/01/2012 12:21		- 54.15883	-36.69427	Lines rigged boat recovered.				
07/01/2012 12:30	72(CTD)	- 54.15884	-36.69426	CTD Deployed - soaking.		72	CTD	10
07/01/2012 12:34	72(CTD)	- 54.15883	-36.69426	Veering CTD to 60m			CTD	
07/01/2012 12:38	72(CTD)	- 54.15883	-36.69426	CTD at 60m commence hauling.			CTD	
07/01/2012 12:44	72(CTD)	- 54.15883	-36.69426	CTD on deck gantry stowed.			CTD	
07/01/2012 13:40		- 54.15874	-36.69458	JR3 launched				
07/01/2012 13:44	73 (ES853)	- 54.15874	-36.69459	ES853 doughnut in water positioning with JR3.		73	ES853	1
07/01/2012 14:15	73 (ES853)	- 54.15875	-36.69459	JR3 clear of doughnut.			ES853	
07/01/2012 16:13	73 (ES853)	- 54.15878	-36.69462	Completed calibrating commenced recovering.			ES853	
07/01/2012 16:21	73 (ES853)	- 54.15876	-36.69461	ES853 and doughnut recovered.			ES853	
07/01/2012 16:24		- 54.15876	-36.6946	JR3 recovered.			ES853	
07/01/2012 18:41	74 (WCP 1)	- 54.15877	-36.69461	Commence deploying WCP off stbd effer		74	WCP	1
07/01/2012 18:42	74 (WCP 1)	- 54.15878	-36.69461	WCP in the water hanging off the stbd effer			WCP	

07/01/2012 20:58	74 (WCP 1)	-54.15874	-36.69463	WCP recovered to deck			WCP	
07/01/2012 23:06		-54.15883	-36.69467	Sphere centered underneath echosounder. Commencing calibration.			WCP	
08/01/2012 02:14		-54.1588	-36.69466	Calibration finished.			WCP	
08/01/2012 11:25	75 (MOCNESS 2)	-54.1597	-36.6924	Deploy Mocness frame unit		75	MOCNESS	2
08/01/2012 11:56	75 (MOCNESS 2)	-54.15931	-36.692	Mocness frame unit recovered to deck			MOCNESS	
08/01/2012 15:38		-54.15934	-36.69175	Vessel on D.P ready for SUCS				
08/01/2012 16:15	76 (SUCS 5)	-54.15849	-36.69514	Commence deploying SUCS		76	SUCS	7
08/01/2012 16:16	76 (SUCS 5)	-54.15848	-36.69513	SUCS in the water Veering EA 600 depth 64m			SUCS	
08/01/2012 16:25	76 (SUCS 5)	-54.15852	-36.69487	SUCS just above the Seabed			SUCS	
08/01/2012 16:26	76 (SUCS 5)	-54.15853	-36.69487	Vessel moving 10m to Port			SUCS	
08/01/2012 16:29	76 (SUCS 5)	-54.1586	-36.69497	SUCS just above Seabed			SUCS	
08/01/2012 16:33	76 (SUCS 5)	-54.1586	-36.69495	Vessel moving 10m astern			SUCS	
08/01/2012 16:35	76 (SUCS 5)	-54.15865	-36.69483	SUCS just above the Seabed			SUCS	
08/01/2012 16:37	76 (SUCS 5)	-54.15865	-36.69485	Commence recovering SUCS			SUCS	
08/01/2012 16:40	76 (SUCS 5)	-54.15864	-36.69481	SUCS clear of the water			SUCS	
08/01/2012 16:41	76 (SUCS 5)	-54.15865	-36.69482	SUCS recovered on deck			SUCS	

08/01/2012 17:05		-54.15865	-36.69482	Vessel off D.P				
08/01/2012 23:10	Acoustic transect	-54.10158	-35.69321	Commence turn			AT	35
08/01/2012 23:16	Acoustic transect	-54.1145	-35.68598	Turn completed. Commence downwind transect			AT	
09/01/2012 00:21	77 (RMT 22)	-54.05206	-35.39678	V/L on reduced speed ready to deploy. Problem with RMT 8		77	RMT	24
09/01/2012 00:50	77 (RMT 22)	-54.04905	-35.37524	Problem fixed. RMT 8 deployed			RMT	
09/01/2012 01:14	77 (RMT 22)	-54.05221	-35.40102	RMT 8 recovered on deck			RMT	
09/01/2012 01:53		-54.05383	-35.44996	V/L proceeding to Gully station				
09/01/2012 10:00	GS Acoustic Transect	-53.78033	-37.17468	Commence transect heading 255 degrees			AT	36
09/01/2012 11:02	GS Acoustic Transect	-53.82192	-37.44881	Commence turn			AT	
09/01/2012 11:07	GS Acoustic Transect	-53.8218	-37.45134	Commence downwind transect run			AT	37
09/01/2012 12:05	GS Acoustic Transect	-53.77945	-37.18032	Commence turn			AT	
09/01/2012 12:13	GS Acoustic Transect	-53.77845	-37.1733	Commence upwind transect run			AT	38
09/01/2012 13:14	GS Acoustic Transect	-53.82193	-37.44799	Finish GS transect. Proceed to WCB mooring psn			AT	
09/01/2012 14:22	WCB Mooring acoustic transect	-53.79787	-37.7947	Commence transect. Heading 270 degrees			AT	39
09/01/2012 15:23	WCB Mooring acoustic transect	-53.79777	-38.08001	completed line turning around to restart the line			AT	
09/01/2012 15:31	WCB Mooring acoustic transect	-53.79748	-38.07682	Restart line heading 090(T)			AT	40

09/01/2012 16:31	WCB Mooring acoustic transect	-53.79766	-37.79612	completed line turning around to restart the line			AT	
09/01/2012 16:39	WCB Mooring acoustic transect	-53.79822	-37.79149	Restart line heading 270(T)			AT	41
09/01/2012 17:41	WCB Mooring acoustic transect	-53.7974	-38.07676	completed line turning around to restart the line			AT	
09/01/2012 17:49	WCB Mooring acoustic transect	-53.79757	-38.0764	Restart line heading 090(T)			AT	42
09/01/2012 18:48	WCB Mooring acoustic transect	-53.79772	-37.79583	completed line turning around to restart the line			AT	
09/01/2012 18:56	WCB Mooring acoustic transect	-53.79801	-37.79156	Restart line heading 270(T)			AT	43
09/01/2012 19:28	78 (CTD)	-53.79784	-37.93304	Vessel on DP for CTD deployment		78	CTD	11
09/01/2012 19:31	78 (CTD)	-53.79766	-37.93513	Vessel stopped on DP commence deployment of CTD			CTD	
09/01/2012 19:35	78 (CTD)	-53.79774	-37.93537	CTD deployed water depth 296m			CTD	
09/01/2012 19:44	78 (CTD)	-53.79781	-37.93563	CTD stopped at 270m			CTD	
09/01/2012 19:52	78 (CTD)	-53.79782	-37.93561	CTD on deck			CTD	
09/01/2012 20:44	79 (WCB Mooring)	-53.79861	-37.93126	V/L 300m down current of deployment site commence deployment		79	MOORING	2
09/01/2012 20:45	79 (WCB Mooring)	-53.79859	-37.93136	Buoy in water			MOORING	
09/01/2012 21:09	79 (WCB Mooring)	-53.79785	-37.93623	Mooring released - stern position 53			MOORING	
09/01/2012 21:15	79 (WCB Mooring)	-53.79768	-37.93712	Move astern to locate mooring on echo sounders			MOORING	
09/01/2012 21:25	79 (WCB Mooring)	-53.79792	-37.93556	Mooring located on sounders			MOORING	

09/01/2012 22:09	80 (EBS 1)	-53.77199	-38.00084	Vessel on DP for EBS deployment		80	EBS	1
09/01/2012 22:40	80 (EBS 1)	-53.77144	-37.99694	EBS deployed			EBS	
09/01/2012 22:51	80 (EBS 1)	-53.77094	-37.99232	EBS on seabed			EBS	
09/01/2012 23:00	80 (EBS 1)	-53.77059	-37.98815	Commence EBS recovery			EBS	
09/01/2012 23:17	80 (EBS 1)	-53.77037	-37.98552	EBS recovered to deck			EBS	
09/01/2012 23:53	81 (EBS 2)	-53.77031	-37.98548	EBS deployed		81	EBS	2
10/01/2012 00:22	81 (EBS 2)	-53.76966	-37.97791	Commence EBS recovery			EBS	
10/01/2012 00:30	81 (EBS 2)	-53.76956	-37.97679	EBS recovered to deck			EBS	
10/01/2012 01:58	82 (RMT 23)	-53.79711	-38.11069	RMT 8 deployed		82	RMT	25
10/01/2012 02:17	82 (RMT 23)	-53.79785	-38.08918	RMT recovered to deck			RMT	
10/01/2012 02:26		-53.79845	-38.07746	Vessel on passage to P2 mooring				
10/01/2012 14:24	83 (CTD P2)	-55.21106	-41.11781	Vessel all stoped on D.P.		83	CTD	12
10/01/2012 14:29	83 (CTD P2)	-55.21104	-41.11782	CTD Deployed veering to 1600m			CTD	
10/01/2012 15:00	83 (CTD P2)	-55.21051	-41.11625	Wire out 1600m commence hauling			CTD	
10/01/2012 15:40	83 (CTD P2)	-55.21054	-41.11621	CTD at the surface			CTD	
10/01/2012 15:43	83 (CTD P2)	-55.21055	-41.1162	CTD recovered on deck			CTD	

10/01/2012 15:53	83 (CTD P2)	- 55.21112	-41.11844	Gantry and block all secure vessel proceeding 3200m down wind for deployment of P2. Vessel off D.P				
10/01/2012 16:14	84 (P2 mooring)	- 55.21975	-41.16504	Vessel on D.P		84	MOORING	3
10/01/2012 16:19	84 (P2 mooring)	- 55.22047	-41.1632	All stopped on D.P 3200m downwind of P2 ready for deployment			MOORING	
10/01/2012 17:45	84 (P2 mooring)	- 55.22485	-41.15976	Vessel moving 060(T) commence deploying P2			MOORING	
10/01/2012 17:50	84 (P2 mooring)	- 55.22475	-41.15945	Main buoy in the water paying out line			MOORING	
10/01/2012 18:23	84 (P2 mooring)	- 55.21782	-41.13842	Trimson buoy cluster deployed			MOORING	
10/01/2012 18:30	84 (P2 mooring)	- 55.21748	-41.13741	Sediment trap and Aquadoop current meter deployed			MOORING	
10/01/2012 19:30	84 (P2 mooring)	- 55.20872	-41.11114	Weight released position of stern at time of release 55 degrees 12.5235' South 041 degrees 06.6698' West			MOORING	
10/01/2012 19:54	84 (P2 mooring)	- 55.20852	-41.11046	Hydrophone deployed to ping mooring			MOORING	
10/01/2012 19:56	84 (P2 mooring)	-55.2085	-41.11047	Mooring at a range of 3105m corrected depth 3115m			MOORING	
10/01/2012 20:00	84 (P2 mooring)	- 55.20847	-41.11047	Hydrophone recovered			MOORING	
10/01/2012 20:09	84 (P2 mooring)	- 55.20305	-41.10128	Hydrophone redeployed			MOORING	
10/01/2012 20:13	84 (P2 mooring)	-55.203	-41.10123	Mooring at a range of 3279m corrected depth 3122m			MOORING	
10/01/2012 20:15	84 (P2 mooring)	- 55.20305	-41.10115	Hydrophone recovered			MOORING	
10/01/2012 20:47	84 (P2 mooring)	- 55.21062	-41.09746	Hydrophone redeployed			MOORING	

10/01/2012 20:50	84 (P2 mooring)	- 55.21061	-41.09742	Mooring at a range of 3312m corrected depth 3131m			MOORING	
10/01/2012 20:52	84 (P2 mooring)	-55.2106	-41.09743	Hydrophone recovered			MOORING	
10/01/2012 20:56		- 55.21055	-41.09748	Vessel off DP				
11/01/2012 12:41	GS Acoustic Transect	- 53.80041	-37.45416	Commence acoustic transect Hdg 090			AT	44
11/01/2012 13:41	GS Acoustic Transect	- 53.80036	-37.17206	Commence turn			AT	
11/01/2012 13:49	GS Acoustic Transect	- 53.80037	-37.17023	Commence upwind transect run heading 270 deg			AT	45
11/01/2012 14:24		- 53.79996	-37.30743	V/L on DP				
11/01/2012 14:35	85 (SUCS 6)	- 53.80023	-37.31238	SUCS deployed		85	SUCS	8
11/01/2012 14:44	85 (SUCS 6)	- 53.80023	-37.31241	SUCS on seabed capturing image			SUCS	
11/01/2012 14:55	85 (SUCS 6)	- 53.80025	-37.31251	SUCS off seabed moving ahead 5m			SUCS	
11/01/2012 14:58	85 (SUCS 6)	- 53.80025	-37.31257	SUCS on seabed			SUCS	
11/01/2012 14:59	85 (SUCS 6)	- 53.80025	-37.31258	Commence recovery of SUCS			SUCS	
11/01/2012 15:12	85 (SUCS 6)	- 53.80027	-37.31255	SUCS at the surface			SUCS	
11/01/2012 15:14	85 (SUCS 6)	- 53.80026	-37.31256	SUCS recovered on deck			SUCS	
11/01/2012 15:23	85 (SUCS 6)	- 53.80056	-37.31053	Deck secure Vessel off D.P				
11/01/2012 15:47	86 (RMT8 24)	- 53.80054	-37.24289	Commence deploying RMT 8 for a wash		86	RMT	26

11/01/2012 15:52	86 (RMT8 24)	- 53.80066	-37.24833	RMT 8 in the water			RMT	
11/01/2012 16:01	86 (RMT8 24)	- 53.80078	-37.25791	Commence recovering RMT8			RMT	
11/01/2012 16:06	86 (RMT8 24)	- 53.80091	-37.26212	RMT8 at the surface			RMT	
11/01/2012 16:09	86 (RMT8 24)	- 53.80098	-37.26502	RMT8 recovered on deck			RMT	
11/01/2012 16:16	87 (RMT8 25)	- 53.80115	-37.27234	Commence deploying RMT 8		87	RMT	27
11/01/2012 16:19	87 (RMT8 25)	- 53.80117	-37.27507	RMT8 deployed veering			RMT	
11/01/2012 16:42	87 (RMT8 25)	- 53.80147	-37.29931	Wire out 334m commence hauling			RMT	
11/01/2012 17:46	87 (RMT8 25)	- 53.80122	-37.36859	RMT8 recovered on deck			RMT	
11/01/2012 18:04	87 (RMT8 25)	- 53.80056	-37.40601	RMT 8 and deck secure increase to 10 knots resume acoustic transect			RMT	
11/01/2012 18:16	GS Acoustic Transect	- 53.79968	-37.45428	completed line turning around to restart the line			AT	46
11/01/2012 18:23	GS Acoustic Transect	- 53.80015	-37.454	Restart line heading 090(T)			AT	47
11/01/2012 19:23	GS Acoustic Transect	- 53.80035	-37.17367	completed line turning around to restart the line			AT	
11/01/2012 19:31	GS Acoustic Transect	-53.8007	-37.17004	Restart line heading 270(T)			AT	48
11/01/2012 20:35	GS Acoustic Transect	- 53.80014	-37.45157	Complete accoustic transect. Relocate for RMT			AT	
11/01/2012 21:28		- 53.80618	-37.25963	Weather conditions unsuitable for deployment of RMT8 relocate to resume acoustic survey			AT	
11/01/2012	GS Acoustic	-	-37.17279	Resume acoustic transect heading 270			AT	49

21:59	Transect	53.80053		degrees				
11/01/2012 23:05	GS Acoustic Transect	- 53.80021	-37.45138	Commence turn			AT	
11/01/2012 23:12	GS Acoustic Transect	- 53.80072	-37.45527	Commence downwind transect run heading 090 deg			AT	50
12/01/2012 00:12	GS Acoustic Transect	-53.8002	-37.17211	Complete transect line proceeding South to different transect line			AT	
12/01/2012 00:47	Acoustic transect	- 53.88391	-37.17971	Commence upwind transect			AT	51
12/01/2012 01:06		- 53.87027	-37.24036	Swarm spotted. Commence turn				
12/01/2012 01:20		- 53.87308	-37.21852	V/L on DP				
12/01/2012 01:33	88 (SUCS 7)	- 53.87385	-37.22059	SUCS deployed		88	SUCS	9
12/01/2012 01:45	88 (SUCS 7)	-53.8738	-37.22054	SUCS on seabed			SUCS	
12/01/2012 01:52	88 (SUCS 7)	- 53.87379	-37.22051	SUCS off seabed			SUCS	
12/01/2012 01:57	88 (SUCS 7)	- 53.87381	-37.22052	SUCS stopped at 30m			SUCS	
12/01/2012 02:03	88 (SUCS 7)	-53.8738	-37.2205	SUCS recovered to deck			SUCS	
12/01/2012 02:16	89 (CTD)	-53.8738	-37.22055	CTD deployed		89	CTD	13
12/01/2012 02:20	89 (CTD)	- 53.87381	-37.22054	Veering CTD to 200m			CTD	
12/01/2012 02:24	89 (CTD)	- 53.87378	-37.22051	All stopped @ 202m			CTD	
12/01/2012 02:29	89 (CTD)	-53.8738	-37.22049	CTD recovered to deck v/l moving ahead at 1.5 knots on DP			CTD	
12/01/2012		-	-37.22311	V/L stopped on DP				

02:39		53.87322						
12/01/2012 02:52	90 (CTD)	- 53.87324	-37.22309	CTD deployed		90	CTD	14
12/01/2012 02:57	90 (CTD)	- 53.87325	-37.22308	Veering to 220m			CTD	
12/01/2012 03:01	90 (CTD)	- 53.87324	-37.22308	Wire out 215m commence hauling			CTD	
12/01/2012 03:05	90 (CTD)	- 53.87323	-37.2231	CTD at the surface			CTD	
12/01/2012 03:08	90 (CTD)	- 53.87323	-37.22307	CTD recovered on deck			CTD	
12/01/2012 03:19	90 (CTD)	- 53.87327	-37.22311	Gantry and block secure			CTD	
12/01/2012 03:33		- 53.87327	-37.22314	Vessel off D.P carrying out SWATH survey ready for deploying EBS			CTD	
12/01/2012 11:13		- 53.88906	-37.22849	V/L off DP				
12/01/2012 11:19	91 (RMT 26)	- 53.88945	-37.23301	RMT 8 deployed		91	RMT	28
12/01/2012 11:54	91 (RMT 26)	- 53.89204	-37.26924	RMT 8 recovered on deck			RMT	
12/01/2012 12:21	92 (RMT 27)	- 53.89248	-37.32131	RMT 8 deployed		92	RMT	29
12/01/2012 12:38	92 (RMT 27)	- 53.89292	-37.33774	RMT 8 recovered on deck			RMT	
12/01/2012 12:57	93 (RMT 28)	- 53.89237	-37.3531	RMT 8 deployed		93	RMT	30
12/01/2012 13:11	93 (RMT 28)	- 53.89283	-37.3666	RMT 8 recovered on deck			RMT	
12/01/2012 13:49		- 53.88916	-37.22706	V/L on DP				
12/01/2012	94 (EBS 3)	-	-37.22854	Increase speed to 1 knot		94	EBS	3

13:56		53.88961						
12/01/2012 14:00	94 (EBS 3)	- 53.88984	-37.23041	EBS deployed			EBS	
12/01/2012 14:10	94 (EBS 3)	- 53.89035	-37.23504	EBS on seabed			EBS	
12/01/2012 14:20	94 (EBS 3)	- 53.89081	-37.23967	Decrease speed to 0.5 knots. Commence recovery			EBS	
12/01/2012 14:36	94 (EBS 3)	- 53.89092	-37.24335	EBS recovered to deck			EBS	
12/01/2012 14:56		-53.891	-37.24413	Vessel off D.P proceeding to Bird Island				
12/01/2012 21:48		- 53.89926	-37.8524	Resume Science				
12/01/2012 23:59	95 (RMT 29)	- 53.88978	-37.49905	RMT 8 deployed		95	RMT	31
13/01/2012 00:26	95 (RMT 29)	- 53.89013	-37.52518	RMT recovered to deck			RMT	
13/01/2012 00:53		- 53.88733	-37.55449	Vessel all secure on passage to stanley				
15/01/2012 16:08	96 (Sonar bell test)	- 51.97098	-53.23447	Vessel slowing down to deploy Sonar bell		96	SONARBELL	1
15/01/2012 16:13	96 (Sonar bell test)	-51.9685	-53.24321	Vessel on D.P			SONARBELL	
15/01/2012 16:14	96 (Sonar bell test)	- 51.96848	-53.24319	Commence deploying Sonar Bell			SONARBELL	
15/01/2012 16:17	96 (Sonar bell test)	- 51.96846	-53.24321	Sonar Bell deployed EA 600 depth 2122m veering			SONARBELL	
15/01/2012 16:22	96 (Sonar bell test)	- 51.96848	-53.24321	Wire out 150m			SONARBELL	
15/01/2012 16:23	96 (Sonar bell test)	- 51.96847	-53.24321	Veering			SONARBELL	
15/01/2012	96 (Sonar bell	-	-53.24322	Wire out 350m			SONARBELL	

16:29	test)	51.96849						
15/01/2012 16:39	96 (Sonar bell test)	-51.96849	-53.24323	Veering			SONARBELL	
15/01/2012 16:43	96 (Sonar bell test)	-51.96849	-53.24321	Wire out 500m			SONARBELL	
15/01/2012 16:45	96 (Sonar bell test)	-51.9685	-53.24322	Veering			SONARBELL	
15/01/2012 16:50	96 (Sonar bell test)	-51.96849	-53.24322	Wire out 700m			SONARBELL	
15/01/2012 16:53	96 (Sonar bell test)	-51.96848	-53.24323	Veering			SONARBELL	
15/01/2012 16:57	96 (Sonar bell test)	-51.96846	-53.24319	Wire out 850m			SONARBELL	
15/01/2012 17:02	96 (Sonar bell test)	-51.96844	-53.24318	commence hauling sonar bell			SONARBELL	
15/01/2012 17:24	96 (Sonar bell test)	-51.96844	-53.24321	Sonar bell clear of the water			SONARBELL	
15/01/2012 17:27	96 (Sonar bell test)	-51.96846	-53.24322	Sonar bell recovered to deck gantry stowed			SONARBELL	
15/01/2012 17:32	96 (Sonar bell test)	-51.96886	-53.24564	Gantry and deck secure vessel off D.P				
15/01/2012 17:37	96 (Sonar bell test)	-51.96894	-53.25785	Resume passage to Stanley				