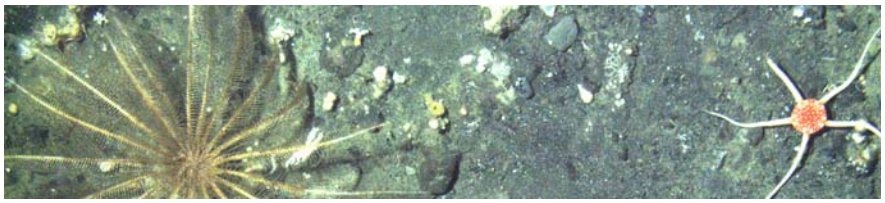
JR262 & JR260a

South Georgia, Oct-Nov 2011

Science cruise report

Cruise report *JR262 & 260a* **R RS *James Clark Ross***

South Georgia continental shelf region, *October and November 2011*



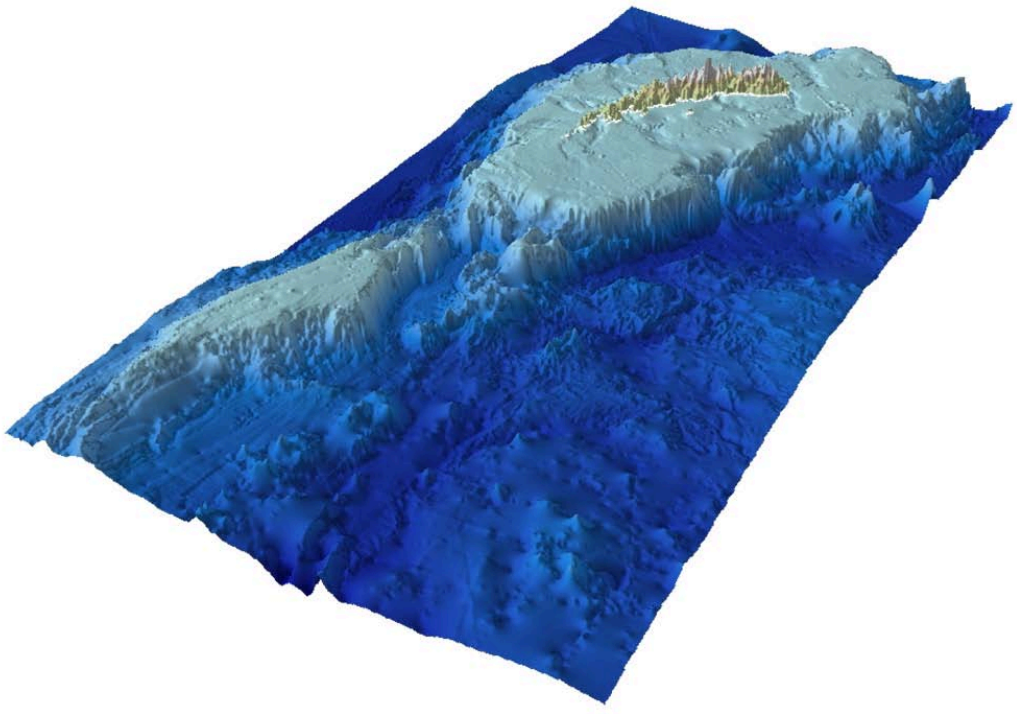
Mapping benthic biodiversity of the South Georgia continental shelf

Project 18-019 of the Darwin Initiative

British Antarctic Survey, Natural Environment Research Council, Madingley Rd, Cambridge, UK

Contents

	Page
1. Summary	4
2. List of personnel	5
3. Timetable of events	6
4. Introduction	7
5. Potential and realised sample regime	9
6. ICT	12
7. Underway data	
7.1 Underway navigation data	13
7.2 Ocean logger and meterological data	14
8. Acoustics	14
9. Gear & deployments	17
10. prokaryote sampling	19
11. benthos sampling	
11.1 Megabenthos diversity (Agassiz trawl)	23
11.2 Megabenthic trophic structure	24
11.3 Megabenthic density & distribution (camera work)	25
11.4 Macrobenthos (Epibenthic sledge)	27
13. Benthic taxon specialism	
13.1 Asteroidea	27
13.2 Ophiuroidea	28
13.3 Serolid & Antarcturid isopoda	33
13.4 Pycnogona	37
13.5 Octopus	38
14. Photographic support	40
15. Principal project partner report	42
16. Mooring buoy recovery/deployment [JR260a]	44
17. Acknowledgements	47
18. Appendices –event logs	47



1. Summary

The Island of South Georgia has long been an internationally recognised hotspot for populations of seals, penguins and albatrosses, and their principal prey, krill. A recent collation and synthesis of historical work has also revealed that the continental shelf surrounding it is the richest location for its size in the Southern Ocean and that many of these species are endemic, at their range edges and/or rare. However the South Georgia shelf is potentially under threat from climate warming, alien species introductions, fishing, tourism and other threats. The cruise JR262 is the first polar project of the Darwin Initiative and its aim is to threefold. 1) to assess, using multiple apparatus types and molecular methods, benthic biodiversity of the least known areas from inner shelf to shelf break (see Hogg et al 2011); 2) to quantify change over the terminal moraines left behind marking the maximum advance of ice during the last glaciation (see Graham et al 2008); and finally to map distributions, densities and rarity of species and habitat types to provide the scientific underpinning for marine protected areas. The cruise uses similar spatial sampling structure, apparatus and observers to a previous one to Marguerite Bay, West Antarctic Peninsula allowing strong comparability. This report details the main cruise of Darwin project 18-019 in Oct/Nov 2011 which is collaborative between British Antarctic Survey, Government of South Georgia and South Sandwich Islands and the Shallow Marine Surveys Group of the Falkland Islands.

The science cruise JR262 brings together a team spanning four continents, multiple universities, institutes and disciplines to study the biology of the seabed from microbes to megafauna and from sites hundreds of meters apart to hundreds of kilometers apart. This team included expertise on a variety of specific taxa and even included novel apparatus specifically designed for cruise JR262. We report on the nature and distribution of the areas investigated which we tried to characterise using SWATH, acoustics, Agassiz trawl (AGT), epibenthic sledge (EBS), Shelf underwater Camera System (SUCS), box core and Conductivity Temperature Depth (CTD) deployments. We estimate this to be the most comprehensive sampling programme to ever take place around this key locality in the Southern Ocean and to be the only occasion in which many areas have ever been sampled. Our report shows where we sampled, what apparatus we used with what protocol and some very preliminary results and perspectives.

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2. List of personnel

2.1 Scientific and technical

D.K.A. Barnes	BAS	Chief Scientist
P. Brewin	SMSG	Benthic ecologist
A. Cordingley	BAS	Rothera Marine Biologist
J. Doemel	Bochum Uni	Molecular ecologist
P. Enderlein	BAS	Moorings biologist and engineer
S. Fielding	BAS	Acoustician
C. Held	AWI	Molecular ecologist
O. Hogg	BAS	Biogeographer
A. Janosik	Auburn Uni	Molecular ecologist
M.L. Jimenez	UNIS	Bacterial biologist
V. Laptikovsky	SMSG	Benthic ecologist
D. Pearce	BAS	Bacterial biologist
M. Preston	AME	AME (electronic engineer)
J. Robst	BAS	ICT (Computing engineer)
C.J. Sands	BAS	Molecular ecologist
G. Stowasser	BAS	Trophic biologist

BAS = British Antarctic survey, AME = Antarctic and marine engineering section, ICT = Information communications technology section, AWI = Alfred Wegner Institut, Germany, SMSG = Shallow Marine Surveys Group, Falkland Islands, UNIS = University of Svalbard, Norway,

2.2 Ship's compliment

R.G.P. Chapman	Master	J.J. McGowan	SG1
J. Cox	Ch Off	C. Mullaney	SG1
S. Evans	2nd Off	C.J Leggett	SG1
B. Thompson	3rd Off	J.P. O'Duffy	SG1
C.A. Waddicor	ETO (Coms)	S. Penny	SG1
J. Roberts	Cadet	A.J. Estibeiro	SG1
H. Taylor	Cadet	M.A. Robinshaw	MG1
H. Williams	Cadet	I.B. Herbert	MG1
D. Cutting	Ch Eng	K.A.Walker	Cook
G. Collard	2nd Eng	P.G. Molloy	2nd Cook
A.J.W. Hardy	3rd Eng	K. Weston	Sr Stwd
S.J. Eadie	4th Eng	J. Newall	Stwd
S.A. Wright	Deck Eng	D.W. Lee	Stwd
N.J. Dunbar	ETO (Eng)	T.R. Patterson	Stwd
J.S. Gibson	Purser	J.M. Rudd	Doctor
G.M. Stewart	Bosun		
D.G. Jenkins	Bosun's Mate		

3. Timetable of events

	Site(s)
21-22nd Oct – Mobilisation	
24th Oct – Leave Mare Harbour; Emergency drills	
27-29th Oct – Bird Island; cargo, pax	
30th Oct – KEP; cargo, pax	
31st Oct – KEP, transit to Stromness harbour	
1st Oct – Gear tests at Stromness, transit to sites, first research deployments	32,31
2nd Oct – Deployments (North shelf), transit, deployments (NE shelf)	24,23,20
3rd Oct – Deployments (NE shelf), transit, deployments (SE shelf)	21,22,33
4th Oct – Transit, deployments (SE shelf), transit, deployments (inner S shelf)	34,35, 12.2
5th Oct – Transit, Bird Island	
6th Oct – Transit, deployments (South shelf), transit	12,12.1
7th Oct – Deployments (South shelf), transit, deployments	36,15,14
8th Oct – Deployments (South shelf), transit, deployments	13,11,10,9
9th Oct – Transit to mooring buoy P3, recovery, transit	
10th Oct – Transit, deployments	3,2,1
11th Oct – Transit to mooring buoy P2, recovery, transit to Shag Rocks	SR1
12th Oct – Deployments, transit to buoy WCMB	SR1,SR2,SR3
13th Oct – Transit to KEP, deployments, KEP	CB1,CB2
14-15th Oct – Transit to Signy	
16-17th Oct – Signy Island; cargo, pax	
18th Oct – Signy Island hut relief, transit to sites, deployments	SY1
19th Oct – Deployments, transit to Falkland Islands	SY2, SY3
20-22nd Oct – Transit to Falkland Islands	

4. Introduction

The archipelago of South Georgia represents one of the largest, most isolated landmasses and continental shelf areas in the Southern Ocean. At ~ 54ºS 37ºW, South Georgia lies ~1800 km to the east of the South American continental shelf and forms the most northerly extent of the Scotia Arc mountain chain (figure 1). The region bisects the Antarctic Circumpolar Current (ACC), with the South ACC Front transporting nutrients and organisms (e.g. Krill) from the Antarctic Peninsula, and the Polar front (PF) passing approximately 300km to the north.

The combination of early separation from the continental land mass, a large shelf area, its high degree of geographic isolation and the proximity of nutrient rich currents represent important catalysts in the evolution of a biologically rich and distinct island, and identify South Georgia as a potentially important locality for marine biodiversity and endemism.

Figure 1: Atlantic sector of the Southern Ocean with South Georgia identified by the red arrow.

Approached in two phases this project was designed to establish baseline data on the macro- and mega-benthic biodiversity of the continental shelf and slope around the South Georgian archipelago. The work aims to identify key (endemic) species and biodiversity hotspots and utilise data to formulate management strategies for the conservation of biodiversity in the South Georgia Maritime Zone.

The first phase of this study marked the first attempt to map the marine biodiversity of this, or indeed any southern polar archipelago. To date, with funding from the UK Government's Darwin Initiative, this has involved the collation and cataloguing of more than 24,000 historic records mapped into a fully spatially referenced database. These records comprise over 1,800 species, representing a comprehensive review of over 125 years of polar exploration.

Analysis of these initial findings reveal South Georgia as the most speciose region of the Southern Ocean yet recorded, with species richness across some phyla greater than reported from Northern polar, temperate and even some tropical localities (see Hogg et al 2011). High levels of endemism

amongst some phyla (see Table 1) highlight the islands global significance whist a dominance of species at the edges of their geographical ranges suggest many species at South Georgia may exist at the edge of their thermal tolerance limits. One of the most marked features of marine biodiversity on the South Georgian Shelf however is in its sampling bias. The vast majority of benthic sampling (which probably constitutes about two thirds of all species which occur at South Georgia and a much greater proportion of its endemics) has taken place to the North of the island, especially around the inlets of Cumberland Bay and the surrounding areas (see figure 2).

Table 1: Levels of endemism, and the proportion of species occurring at their northern and southern range limits at South Georgia, from Hogg et al (2011)

Phylum	% Endemism	% Northern limit	% Southern limit
Bryozoa	**55.6%**	**21.3%**	**8.3%**
Cnidaria	**44.2%**	**51.9%**	**3.9%**
Mollusca[1]	**45.9%**	**40.0%**	**13.3%**
Crustacea[2]	**23.7%**	**29.0%**	**7.2%**
Chordata[3]	**8.5%**	**8.5%**	**12.8%**
Porifera[4]	**2.7%**	**17.6%**	**4.0%**

Recorded across six selected phyla (figures calculated from the ~ 834, 800 records of known species distribution held within SCARMarBIN). Due to either insufficient data collected at South Georgia or insufficient data held within SCARMarBIN some phyla from table 1 are omitted. Under sampled classes within included phyla are also omitted from analysis with such phyla denoted by the following suffixes to show the inclusion of: **1.** Bivalves and Gastropods; **2.** Malacostraca, Maxillopods and Pycnogonids; **3.** Fish only; **4.** Demosponges only.

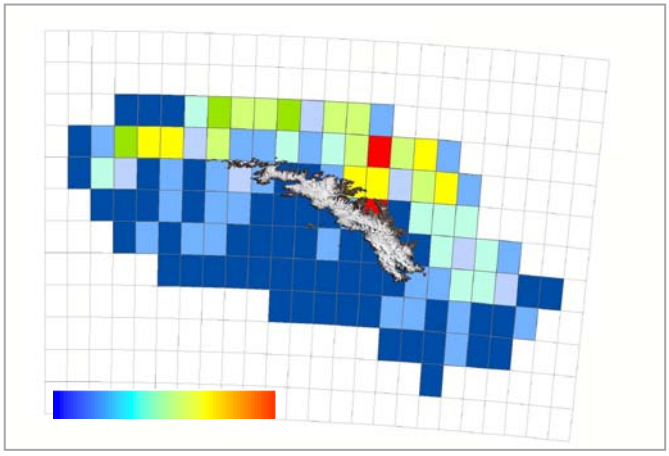


Figure 2: Distribution of sampling intensity recorded in 0.25 x 0.25˚ grid squares across the South Georgia Shelf

Building on this broad foundation of biodiversity data the current cruise, JR262, marks the second phase of this project. Linking expertise in the UK and Falkland Islands with those from Germany and The United States, the central aim of this research cruise is to reduce the paucity in our knowledge of South Georgia's marine biodiversity. With a more

complete understanding of South Georgia's faunal structure it is intended that this research will better establish the status of the benthic biodiversity of the continental shelf and slope waters around the island. As such it can be used as a framework to assess current threats (e.g. South Georgia surface waters are amongst the fastest warming on Earth), identify conservation priorities, and monitor future biogeographical changes.

To establish meaningful Marine Protected Areas requires a strong knowledge and understanding of the biodiversity structure present. As the vast majority of species known from South Georgia are benthic a key priority for the sampling were the areas from which fewest samples had previously been taken (see Fig 2 dark blue areas). Thus the planned sample regime for the JR262 cruise was highly skewed towards the Southern shelf. On the basis of historic records we planned a series of sites spanning the southern shelf of South Georgia, the area to the east of Shag Rocks and intended to take some comparative samples in the South Orkney Islands if time and weather conditions permitted. The intention was that sampling from JR262 would make proposed MPAs more scientifically sound, easier to design monitoring and management plans for.

However we also had several other scientific goals encompassed within this sample regime. In addition to ‘filling biodiversity white spots’ it is also intended to undertake sampling transects across known moraine fields, thought to mark the extent of the last glacial maximum (identified by Graham et al 2008). With sites inside these moraines being potentially just a few thousand years old in comparison with those outside being hundreds of thousands of years old sampling should provide insights into historic recolonisation. The moraines themselves should consitute quite a different habitat and so provide contrasts between habitat richness and community composition whilst also being historically important areas for fisheries. Finally we hoped that a novel camera array (the Shelf Underwater Camera system or SUCS) would allow us to quantify densities, abundances and possibly even some approximate biomass and carbon sequestration data.

The science we actually carried out, samples we took and sites we visited actually resembled the planned itinerary fairly closely but the weather, mechanical issues and other tasks for the vessel meant that the realised samples did slightly differ.

5. Potential and realised sample regime

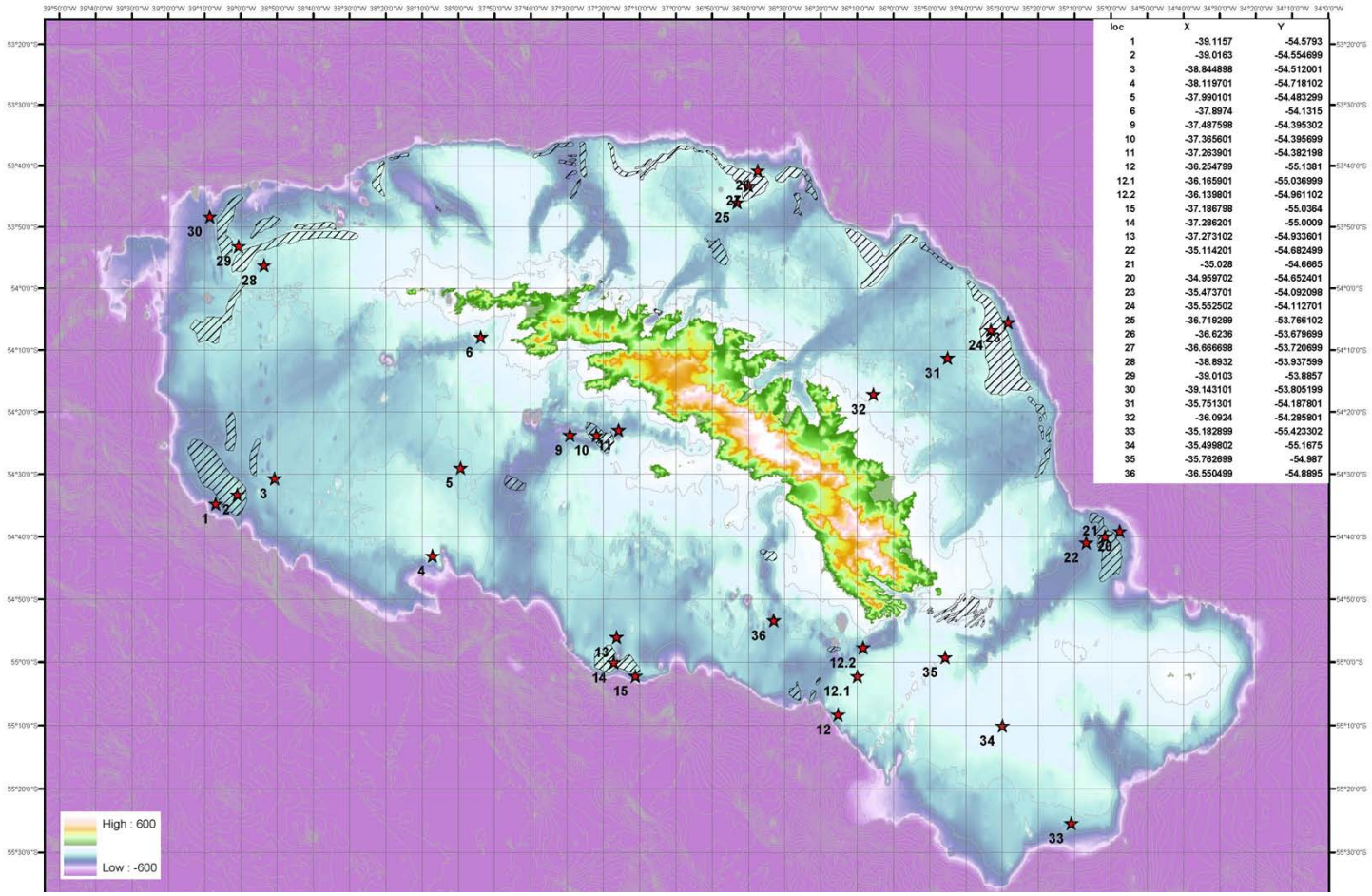
The distribution of planned sites was based on the combination of historically least sampled areas (see Hogg et al 2011) and the position of the moraines (see Graham et al 2008). The number of sites was determined on the basis of 11 days science time divided by the expected time taken for each deployment of each gear. By using multiple apparatus we intended to investigate organisms across several orders of magnitude in size from bacteria through larger meiobenthos to megabenthos such as giant stone crabs and volcano sponges. Realised sample regimes often omit sites, add others and use different suites of equipment due to limitations imposed by weather, equipment malfunction and changes to scheduling of other activities planned for the ship. The sample plan was to sample

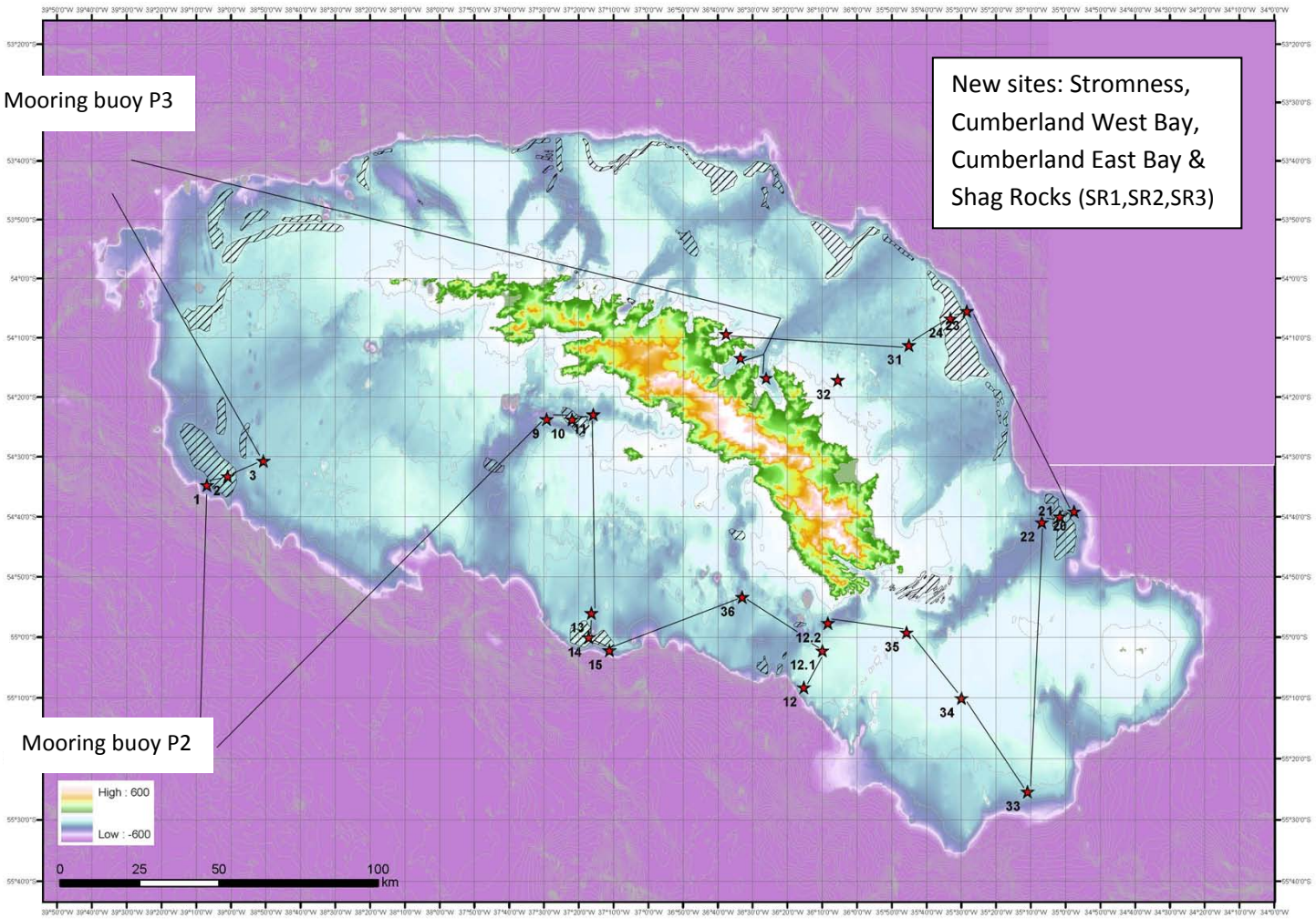
Between 150-350 m depth:
Agassiz trawl (AGT): 3 stations at each of 3 sites (tens to hundreds of km apart)
Shelf Underwater Camera System (SUCS): 6-12 photos of 0.5m^2 per site.
Epibenthic sledge (EBS): occasional
Conductivity Temperature Depth (CTD): 1 at each major sample area (eg per 3 sites)
Box Core (BC): 1 at each major sample area (eg per 3 sites)

We started sampling across the transect of sites 32,31,24 and 23 in the North Central shelf as this was the first point at which the aft deck of the ship was clear enough to launch and recover our apparatus. All sites planned for the Southern part of the shelf were sampled with the exception of sites 4,5 and 6 (See Fig. 3). That we were able to sample so many of the Southern sites was due to having moderate to good weather and sea conditions throughout that time. Recovering a mooring bouy (as part of JR260a) positioned us ideally to attempt sampling at Shag Rocks which we were able to do but this took time away from other planned sites at least partly explaining our failure to visit the North West South Georgia shelf sites (25-30 see Fig. 3). We then needed to call in at King Edward Point research station to both drop off and pick up pax which provided opportunity to deploy the SUCS at some Cumberland East Bay and Cumberland West Bay areas.

Following the sampling at South Georgia and Shag Rocks one days science time was spent sampling around the South Orkney Islands (south of Coronation Island) using a similar protocol as a source of reference and contextual information.

Fig. 3 Sample regime planned (top) and realised (bottom) around the island of South Georgia.





6. ICT

6.1 Personal Computers

No problems were encountered with the personal computers used during this cruise. The wireless LAN in the UIC was useful for connecting personal laptops to the ships network. A second wireless network in the conference room would be very useful for cruises such as this which have a large number of staff in transit to bases.

6.2 Netware

JRNA ran without any faults and no work was required during the cruise.

6.3 Unix

An extra 6TB of RAID6 and mirrored disk was added to the unix fileserver (JRLB). No problems were encountered with the unix systems.

6.4 SCS logging system / Data logging

v4.5.1.1063 of the SCS logging system was used during the cruise.

Date / Time	Event / Reason
2011/10/22 13:22	A new leg was created and datalogging started
2011/10/22 19:27	ACQ was restarted due to JRLB reboot to add new disk
2011/10/30 19:10	ACQ was restarted (whilst alongside KEP) to complete procedure to add new disk to JRLB
2011/10/30 18:10 – 2011/10/30 22:58	Oceanlogger had problems reading one set of sensors on foremast and didn't output anything
2011/11/13 08:04 – 2011/11/13 13:58	Oceanlogger had problems reading one set of sensors on foremast and didn't output anything

Table 2 : Data acquisition events.

6.5 EM122/Seapath

The EM122 generally performed well during the cruise, however on several occasions the EM122 SIS software stopped updating the gridded depth display in the Geographical survey window. It was still logging data correctly (and updating the helmsman display). It was necessary to restart the SIS software to get the display back. Also at one point the EM122 stopped outputting depth data to the SCS and it was necessary to reboot the workstation.

The Seapath appeared to overheat and shutdown at one point during the cruise – after the Seapath recovered the EM122 need power cycling (via the remote power button in the cabinet) before it would receive Seapath data correctly.

Currently direct plotting from the EM122 to the HP1055CM+ plotter is not possible because the HP universal printer driver needs a direct network connection to the plotter; however the EM122 workstation is on the restricted data LAN and so cannot have this. Printing is possible via JRLB but wastes paper as the computer cannot auto rotate the plot so this has been disabled.

6.6 Plotters

Early in the cruise the main HP1055CM+ plotter started dripping cyan ink; the replacement plotter was brought into service but found to have the same problem. Mark Preston (AME engineer) dismantled the HP1055CM+ plotter and put a lot of effort into cleaning out the cyan ink (which was in most plotter compartments). During this process we discovered the rubber rings connecting the ink tubes to the printheads had perished, especially the on the cyan printhead and this was causing the plotter to drip ink. A replacement piece of tubing was found of the correct size and the cyan printhead ring replaced which successfully brought the plotter back into service. Whilst hopefully this should last the current season, both plotters (5 & 10 years old) should have a full HP service and cleaning once back in the UK and possible one needs to be replaced.

6.7 Network No problems reported.

7. Underway data

7.1 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 320+)

GPS NMEA

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

7.2 Ocean logger and meterological data

Instrumentation and data collection

Surface ocean and meteorological data were logged continuously throughout the cruise. Ocean data were collected from the ship's uncontaminated seawater supply, whilst 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.

Twice the oceanlogger crashed with problems reading one set of sensors on the foremast. The updated code needs to handle the situation when one set of sensors is unable to be read but the other set can be read; AME are producing a fix.

8. Acoustics

8.1 Acoustic Instrumentation

1) EM122 Swath bathymetry, 2) EK60 biological echosounder, 3) ADCP current profiler

8.2 Introduction

The EM122 and EK60 were run continually through JR262 to collect information on the seabed to create an acoustic habitat characterisation of the South Georgia shelf. The ADCP was run to provide information on water currents.

8.3 System setups

Sound Synchronisation Unit

The sound synchronisation unit (SSU) was used to interface all acoustic instruments together during shelf work. With the EM122 operating in dual ping mode it is not possible to ping all instruments together since the ADCP and EK60 would suffer interference (from ringing in the hull) at a constant distance within the data. A new SSU.ini file was created to contain two groups. The EM and EA to operate together, with the EA600 running in passive mode, followed by the EK60 and ADCP in a separate group. These two groupings then pinged alternatively. These settings were used throughout JR262 when on the shelf. When in deep water the EM122 and EA600 were controlled through the SSU with EK60 and ADCP running on internal trigger mode.

EM122 12 kHz multibeam

The EM122 12 kHz multibeam was operated using SIS Seafloor Information System version 3.8. It was operated in two modes; 1) deep water mode where ping mode was set to auto and gridding cell size was 120 and 2) shallow water mode where ping mode was set to shallow and gridding cell size was 10 for on shelf work. Data was saved to 6 folders:

JR262_a	Deep water mode, Falklands to South Georgia (24/10 – 26/10/2011)
JR262_b	Deep water mode, South Georgia environs (09/11 – 14/11/2011)
JR262_c	Opportunistic swath line South Georgia to Signy (14/11 – 16/11/2011)
JR262_d	Opportunistic swath line Signy to Falklands
JR262_sw	Shallow water mode, 31/10/2011 – 02/11/2011
JR262_sw2	Shallow water mode, 02/11/2011 – 09/11/2011
JR262_sw3	Shallow water mode, 10/11/2011 – 13/11/2011

BIST tests were run prior to operating the EM122 and results can be found in em122\common\bist\BIST tests JR262 241011.txt. All tests were passed satisfactorily.

Sounder settings: Max angle port and starboard was set to 55° and max width was set to 20000m. Angular coverage mode was set to manual and beam spacing to high density equidistant HIDENS EQDIST). Dual swath mode was set to dynamic, ping mode varied depending on survey and the FM was disabled. Pitch stabilisation was on and auto tilt off, with along direction set to 0. Yaw stabilisation mode was off and heading filter was medium. The spike filter strength was set to medium, range gate to normal and slope and sector tracking was turned on. The angle from Nadir was 6° and the absorption coefficient source was salinity with a default 35ppt. Mammal protection Tx power level was max and the soft startup ramp time was 0 mins.

Only one sound velocity profile was uploaded during the cruise, this from CTD event number 9.

EK60 biological echosounder

The EK60 is a biological echosounder operating at 3 frequencies (38, 120 and 200 kHz). The EK60 was operated using ER60 software (version 2.2.1). The transducer software was upgraded during the Arctic trials cruise (JRtrials07) and was operating version 070413. GPTs were 009072033fa5 (38 kHz), 00907203422d (120 kHz) and 009072033191 (200 kHz). All data were saved as raw files using the ER60 software to a depth of 1100m in order to store second bottom echoes for classification purposes. All data was stored in JR262 cruise folder. Interference was minimised to solely the Doppler logger through synching using the SSU, but interference was quite substantial from this Doppler logger. Ping rates were governed by water depth (with alternate pinging between EK60 and EM122) but ranged between 2 seconds and 4 seconds.

Due to weather and opportunities the EK60 remained uncalibrated for this cruise – any calibration should be taken from JR260b January 2012 cruise.

EK60 settings

Variable	38 kHz	120 kHz	200 kHz
Salinity	35	35	35
Temperature	10	10	10
Sound velocity (m/s)	1494	1494	1494
Transducer type	ES38	ES120-7	ES200-7
Transceiver serial no.	00907203 3fa5	00907203 422d	00907203 3f91
Transducer depth (m)	0	0	0
Absorption coeff. (dB/km)	9.8	37.4	52.7
Pulse length (ms)	1.024	1.024	1.024
Max power (W)	2000	500	300
2-way beam angle (dB)	-20.7	-20.7	-19.60
Sv transducer gain (dB)	25.50	25.70	27.00
Sa correction (dB)	0	0	0
Angle sensitivity along (deg)	22	21	23
Angle sensitivity	22	21	23

athwart (deg)			
3 dB beam along	7	7	8
3 dB beam athwart	7.10	7.10	7.90
Along offset	0	0	0
Athwart offset	0	0	0

As a result of the system rebuild in the Arctic trials the constants are incorrect. Calibration is vital for this data, as the above are not based on previous calibrations.

ADCP current profiler

A 75 kHz RD Instruments Ocean Surveyor (OS75) ADCP was used during this cruise. The OS75 was controlled using Version 1.42 of the RDI VmDas software. The ADCP was set running with the EK60 in 8m bins water tracking, synched with the SSU. On the 13/11/2011 the ADCP was set in bottom tracking mode with internal trigger in order to collect data suitable to calibrate it.

The ADCP writes files to a network drive that is samba-mounted from the Unix system. The raw data (.ENR and .N1R) are also written to the local PC hard drive. For use in the matlab scripts the raw data saved to the PC would have to be run through the VMDas software again to create the .ENX files. When the Unix system is accessed (via samba) from a separate networked PC, this enables post-processing of the data without the need to move files.

Output files are of the form JR262_XXX_YYYYYY.ZZZ, where XXX increments each time the logging is stopped and restarted, and YYYYYY increments each time the present filesize exceeds 10 Mbyte.

8.4 Survey data

A swath survey was undertaken at each station to establish the seabed topography ready for the Agassiz trawl and camera system. Appendix 1 shows the swath surveys for each site.

9. Gear and deployments

9.1 Agassiz Trawl

The Agassiz Trawl (AGT) used during the cruise was the same we used since JR144. It is the BAS trawl which shows sign of use on the frame, but it works still perfectly fine. It was usually deployed with a ship speed of 0.3 kn, then increased to 0.5 kn, veering the cable with max of 40 m/min up to 1.5 of water depth. The trawling time was 2 to 5 min depending of the amount of catch wanted in the net. After the trawling the AGT was recovered at 30 m/min until the AGT had cleared the seabed. Hauling speed was then increased to 40 m/min. It was used in winds up to 40 kn without any problems, as it is easy to handle on deck.

This was the cruise with the most AGT deployments during a single voyage ever of 104 trawls. During the cruise the AGT net got entangled only once, resulting in an empty net. At no time the AGT got stuck on the seafloor resulting in little wear on the wires. Despite the amount of deployments, the net did not get damaged at all. At one point the rubber mat got ripped and was replaced. Therefore the AGT proved again to be a very reliable sampling device.

9.2 Epibenthic Sledge

The Epibenthic Sledge (EBS) was only used once during this cruise. 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 the EBS was recovered at 30 m/min until the EBS had cleared the seabed. Hauling speed was then increased to 40 m/min. It worked fine and a normal catch was retrieved.

9.3 Shallow Underwater Camera System (SUCS)

The SUCS system was designed for this cruise, to undertake benthic surveys by using low resolution Video footage and high resolution (5 Megapixel) still photos to depth up to 500 meters.

The system was designed by Peter Enderlein according to the specification from Dave Barns 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.

The system developed comprises of three units: 1. the UIC unit of a) the PC with monitor, b) the cable status indicator and c) the deck box, 2. the deck unit with a) the winch with the UW-cable, b) the deck monitor and c) the metering sheave on the mid-ships gantry, 3. the UW-unit of the tripod with a) the UW-housing including the camera, booster and power distribution board, b) the UW-light and c) the USBL pinger.

The UIC units worked all without any problems. The PC had to be rebooted quite often, but this had nothing to do with the PC as such, it was because the system was instable (more see below). The cable status indicator worked throughout fine and the deck box worked reliable apart at one point the power indicator LED light on the deck box broke, but this had no influence on the whole operation.

As the original chosen winch was not suitable for the job, in a last minute effort an old side scan winch from NOC was found and put on board before JCR sailed south. The winch then was modified to take the SUCS cable and slip ring. This worked all fine and we had no problems with the winch. The UW-cable worked fine, but to improve reliability of the system, 100m where taken off, so the overall length of the cable is now in the region of 400m. The SUCS was deployed to depth of up to 330m when there were still about 10 turns on the winch. The deck monitor proofed to be very

useful, as it enabled the winch driver to fine control the SUCS and to land it smoothly on the seabed. Its waterproof housing worked very well as at one point the housing with the monitor was found floating in water in the CTD water bottle annex. The monitor was screwed onto a wooden board, which was made out of scrap wood found on board. The metering sheave was fixed to the aft position on the midships gantry arm and worked very well.

On the UW-tripod 6 RMT8 weights were attached, using short strops and cable ties. This worked very well as it made the UW unit heavy enough to react quickly to the winch operations and to be stable in the water, but it was still light enough to be carried around on deck by 3 people. The camera housing worked very well as well as the LED light; with both units we had no issues at all. The USBL fitted onto a purpose build bracket worked initially fine, but was always flaky and not very reliable. Sonardyne was contacted for support but apart from shadowing issues could not provide any constructive improvements. As the USBL is standing out any way, shadowing was not seen as the most like course for the unreliability of the system. The main cable was found a few times raped around the top brackets, causing minor damage to the outer sheave, but did not seem to have any influence to the camera performance.

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. The software was then modified that after a link break the system recovered by itself after approx. 20 – 30 sec. 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.

After the limitations where detected, as it is impossible to simulate these on a work bench, the surveys became easy to undertake and the SUCS system was successfully used 28 times, including 3 test deployments. We managed to take the first ever UW-photos and video images from several south sides of South Georgia and 4 sites of Signy Island.

10. Prokaryotic biodiversity

10.1 Introduction

In a recent study of benthic-pelagic coupling and sediment-water column interactions on the shelf around Marguerite Bay off the Western Antarctic Peninsula (JR230), it was possible to compare the prokaryote biodiversity over different spatial scales along a transect from the shore to the shelf edge. In this study, we adopted a similar approach to look at spatial scales of prokaryote biodiversity on the South Georgia shelf. A suite of techniques will be used to analyze samples taken across the benthic-pelagic interface around a series of stations around South Georgia (Figure 4).

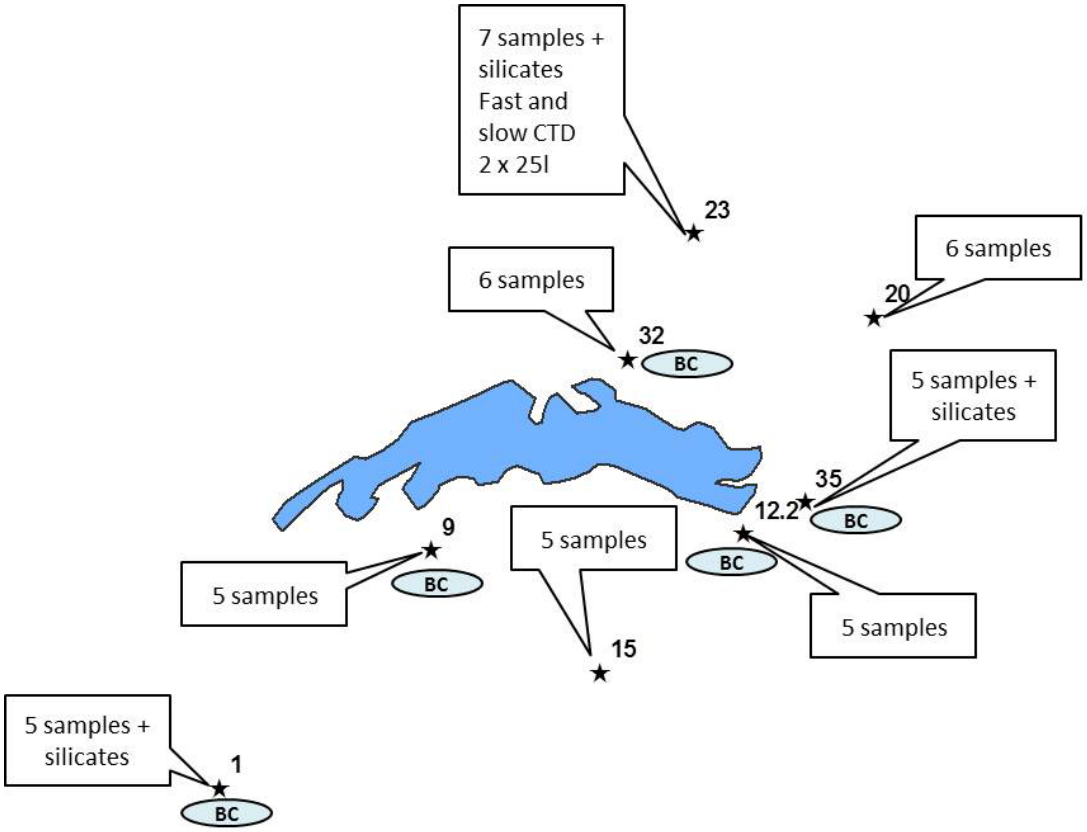


Figure 4. Map of South Georgia showing position of sample sites.

10.2 CTD

Physical profiles were taken during CTD descent (Figure 5a), and the profiles, in conjunction with altimeter data were used to select appropriate sample depths. Two liters of seawater samples were collected at Bottom +10 m, Bottom +20 m, Bottom + 50 m, mid-water (250 m), the chlorophyll maximum (between 10 m and 50 m, depending on the site) and the surface (5 m). Two liters of the water collected were filtered onto 0.2 µm cellulose nitrate filter papers, re-suspended in 5 ml of seawater and centrifuged to produce a pellet for subsequent analysis. Ten milliliters and 25 ml were also filtered onto 0.2 µm polycarbonate discs for cell enumeration. The remainder of the sample was used to pre-rinse the sterile filter apparatus and sample collection bottles.

10.3 Box corer

Sediment samples were collected using a box corer (Figure 5b). The sediment varied considerably in its composition and for this reason samples fell into three categories depending upon location and depth, i) high mud content and low rock content, ii) those with a high number of small rocks in the sediment and iii) anoxic. On each of these occasions mud brought to the surface was collected by coring with a 50 ml Falcon tube, and also into plastic sample bags which could be treated as a combined sample .

Water samples were also taken for: a) Filtration for sediment trap deployments, b) Filtration for photography, c) Silicate analysis, d) Protozoan identification and e) a cell loss on depressurization assay.

Figure 5 a) the CTD and b) Box Corer used.

10.4 Laboratory analysis (UK)

On return to the UK, both benthic (i.e. sediment and sediment contact water) and pelagic (i.e. water) samples will be analyzed for total cell density (DAPI counts). Total community DNA will then be extracted for 454 pyrosequencing analysis to determine prokaryotic community profiles at each of the sites. Where possible organisms will be taken into culture and classified for potential novelty. Sequences from dominant organisms in both the sediment and the water column will be used to construct probes for fluorescence *in situ* analysis of both sets of samples in turn. Functional gene probes will also be used to determine where particular ecosystem functions occur across the profile and to determine whether it is consistent on different spatial scales.

10.5 Conclusions

In total samples were taken at 8 sites (Table 3), consisting of a vertical water profile, filtered down onto 0.2 μm cellulose nitrate filter papers, with two slides at each depth for total cell counts, and 5 sediment samples which comprised a bag of sediment and falcon tube core (Table 4).

Table 3. CTD samples.

Event	Site	CTD log Label	Sple #	Depth	Sple date	Filtration date	Winch rate	Amount filtered
9	32	jr262_002 1	32_1	120	1st nov 2011	1st nov 2011		2
9	32	jr262_002 2	32_2	120	1st nov 2011	1st nov 2011		2
9	32	jr262_002 3	32_3	110	1st nov 2011	1st nov 2011		2
9	32	jr262_002 4	32_4	50	1st nov 2011	1st nov 2011		2
9	32	jr262_002 5	32_5	25	1st nov 2011	1st nov 2011		2
9	32	jr262_002 6	32_6	0	1st nov 2011	1st nov 2011		2
19	23	jr262_003	Fast 1	485 B	2nd nov 2011	2nd nov 2011	60 m/min	2
19	23	jr262_003	Fast 2	485 B	2nd nov 2011	2nd nov 2011	60 m/min	2
19	23	jr262_003 Barrel		485 B	2nd nov 2011	2nd nov 2011	60 m/min	2
20	23	jr262_004 1	silicates	485	2nd nov 2011		4 m/min	2
20	23	jr262_004 2	23_2	485	2nd nov 2011	2nd nov 2011	4 m/min	2
20	23	jr262_004 3	23_3	475	2nd nov 2011	2nd nov 2011	4 m/min	2
20	23	jr262_004 4	23_4	400	2nd nov 2011	2nd nov 2011	13 m/min	2
20	23	jr262_004 5	23_5	350	2nd nov 2011	2nd nov 2011	13 m/min	2
20	23	jr262_004 6	23_6	200	2nd nov 2011	2nd nov 2011	13 m/min	2
20	23	jr262_004 7	23_7	50	2nd nov 2011	2nd nov 2011	13 m/min	2
20	23	jr262_004 8	23_8	5	2nd nov 2011	2nd nov 2011	13 m/min	2
20	23	jr262_004 Barrel		485	2nd nov 2011	3rd nov 2011	4 m/min	2
28	20	jr262_005 1		390	2nd nov 2011	3rd nov 2011	60 m/min	2
28	20	jr262_005 2		390	2nd nov 2011	3rd nov 2011	60 m/min	2
28	20	jr262_005 3		380	2nd nov 2011	3rd nov 2011	60 m/min	2
28	20	jr262_005 4		200	2nd nov 2011	3rd nov 2011	60 m/min	2
28	20	jr262_005 5		10	2nd nov 2011	3rd nov 2011	60 m/min	2
28	20	jr262_005 6		5	2nd nov 2011	3rd nov 2011	60 m/min	2
47	35	jr262_006 1	silicates	122	4th nov 2011			2
47	35	jr262_006 2	35_2	122	4th nov 2011	4th nov 2011		2
47	35	jr262_006 3	35_3	112	4th nov 2011	4th nov 2011		2
47	35	jr262_006 4	35_4	75	4th nov 2011	4th nov 2011		2
47	35	jr262_006 5	35_5	20	4th nov 2011	4th nov 2011		2
47	35	jr262_006 6	35_6	5	4th nov 2011	4th nov 2011		2
54	12.2	jr262_007 1	12.2_1	282	4th nov 2011	6th nov 2011		1
54	12.2	jr262_007 A	12.2_A	282 or 272	4th nov 2011	6th nov 2011		1
54	12.2	jr262_007 B	12.2_B	282 or 272	4th nov 2011	6th nov 2011		1
54	12.2	jr262_007 C	12.2_C	282 or 272	4th nov 2011	6th nov 2011		1
54	12.2	jr262_007 3	12.2_3	200	4th nov 2011	6th nov 2011		2
54	12.2	jr262_007 4	12.2_4	20	4th nov 2011	6th nov 2011		2
54	12.2	jr262_007 5	12.2_5	5	4th nov 2011	6th nov 2011		2
65	36	jr262_008 No samples taken- CTD just for profile record- total depth approx 243 m.						
71	15	jr262_009 1	15_1	264	7th nov 2011	7th nov 2011	35- 60 m/min	2
71	15	jr262_009 2	15_2	254	7th nov 2011	7th nov 2011	35- 60 m/min	2
71	15	jr262_009 3	15_3	200	7th nov 2011	7th nov 2011	35- 60 m/min	2
71	15	jr262_009 4	15_4	20	7th nov 2011	7th nov 2011	35- 60 m/min	2
71	15	jr262_009 5	15_5	5	7th nov 2011	7th nov 2011	35- 60 m/min	2
92	9	jr262_010 2	9_2	305	8th nov 2011	8th nov 2011		2
92	9	jr262_010 3	9_3	295	8th nov 2011	8th nov 2011		2
92	9	jr262_010 4	9_4	200	8th nov 2011	8th nov 2011		2
92	9	jr262_010 5	9_5	50	8th nov 2011	8th nov 2011		2
92	9	jr262_010 6	9_6	5	8th nov 2011	8th nov 2011		2
105	1	jr262_011 1	silicates	255				
105	1	jr262_011 2	1_2	255	10th nov 2011	10th nov 2011		2
105	1	jr262_011 3	1_3	245	10th nov 2011	10th nov 2011		2
105	1	jr262_011 4	1_4	200	10th nov 2011	10th nov 2011		2
105	1	jr262_011 5	1_5	30	10th nov 2011	10th nov 2011		2
105	1	jr262_011 6	1_6	5	10th nov 2011	10th nov 2011		2

Table 4. Box Core samples.

Event	Site	Date	Depth	Sample name
10	32	1st november 2011	120	JR262_32_BC1
48	35	4th november 2011	147	BC2
	12.2	4th november 2011	300	BC3
				BC4
				BC5

11. Benthos sampling

11.1 megabenthic diversity (Agassiz trawl work)

11.1.1 Introduction

South Georgia has been visited numerous times over the past 200 years by commercial ventures (whaling, sealing, fishing) and scientific expeditions. There are many records of specimens taken from the coast and continental shelf areas, but most of these are as bycatch of commercial operations. South Georgian benthos is often thought to be a unique blend of species of both Antarctic origin and Patagonian origin with a good proportion of endemics [ref?], however there have been few efforts at biodiversity surveys, and those that have been conducted have relied on only a handful of samples taken from limited geographic spread of stations. In this expedition we have sampled 22 stations around the South Georgian continental shelf, particularly in the areas to the south and the west where, due to the prevailing weather, fewer samples have been recorded, with three replicate trawls taken at each station. We believe that this is the most thorough sampling of the South Georgian benthos taken to date.

11.1.2 Methods and apparatus

Samples of megabenthos (those specimens retained in a 10 mm^2 mesh net) were collected using an Agassiz trawl (2 m wide). The trawling time was minimised (2 – 5 minutes at 1 knot) as we have found that shorter trawls increase the quality of the samples compared to longer trawls where specimens are often damaged by the increasingly large volume and weight of samples, stones and sediment that bump across the substrate. Trawls were replicated (three trawls at each site) in an attempt to take into account fine-scale patchiness in benthic distributions. Replicate trawls were generally within a few hundred meters of each other. Photographs were taken of many of the specimens and in each case these were allocated unique vial numbers. Specimens were either frozen or preserved in 96% ethanol.

11.1.3 General results

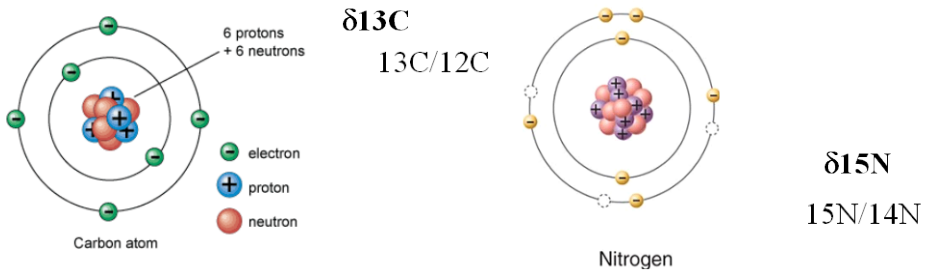
We conducted 66 AGTs from 22 stations around South Georgia (figure 3) and 9 AGTs from the eastern shelf of Shag Rocks [figure??] between the depths of 120 m and 383 m. From these trawls a total of 2121 records were collected, each record containing between 1 and several hundred individuals. The full range of diversity at each station will require assessment of each group by expert taxonomists and molecular work. Some general impressions were that the north eastern most sites (20 – 24) and particularly sites 20 and 23 which are situated on the shelf break, were clean samples with low biomass and diversity. This is perhaps due to iceberg scour, such as the huge (~100 x 50 km) iceberg that lodged on this part of the shelf break in April 2004. On shelf gullies, such as site 9, site 12.2 and site 36 has huge numbers of few species – particularly pycnogonid and ophiuroids. Outside of moraines, on the shelf break, assemblages were orientated around porifera and anthazoa which were obviously used as platforms for other filter feeders such as antarcturid isopods and ophiuroids of the order Gorgonacephalidae. Shag Rocks samples were dominated by bryozoans.

In general the replicate trawls were more similar to each other than they were to other trawls in the transect – although there were still notable difference between replicate trawls indicating a scale of patchiness less than 100 m.

11.2 megabenthic trophic structure

The aim was to study benthopelagic coupling in the foodweb of the South Georgia shelf. Investigating trophic pathways through stable isotope analysis

Fig. 6 *Sampling for stable isotope analysis*



Background:

The use of stable isotopes as dietary tracers is based on the principle that isotopic concentrations of consumer diets can be related to those of consumer tissues in a predictable fashion. It has been extensively applied in the investigation of trophic relationships in various marine ecosystems and has been used to determine feeding migrations in numerous species. The stepwise enrichment of both carbon and nitrogen in a predator relative to its prey suggests that the predator will reflect the isotopic composition in the prey and isotope values can be used to identify the trophic position of species in the food web investigated. Additionally ^{13}C values can successfully be used to identify carbon pathways and sources of primary productivity.

The objective is to identify the trophic position of the dominant benthic species in the South Georgia and Shag Rock shelves and investigate the key links between the pelagic and the underlying benthos. In conjunction with the pelagic data we raised during Discovery 2010 we expect to get a good picture of the energy transfer between the benthos and the pelagic and the importance of the benthos in the diet of pelagic species in South Georgia food web. The samples collected on JR262 will furthermore be used in comparison to a similar study on benthopelagic coupling in the East Bellingshasuen Sea with samples collected during JR230.

Sampling

Whole specimens of invertebrate species were collected from the Agassiz Trawl nets during both day and night hauls. Animals were identified, bagged, labeled and frozen at – 80°C (sample catalogue

see Table). All samples were frozen whole and tissue samples will be taken at BAS at the time when samples are returned to Cambridge. Sediment samples and particulate organic matter (POM) were collected, where possible, once per set of three stations (see Table). Samples were again stored at –80°C prior to analysis in the laboratory. All biochemical analysis will be carried out at BAS, Cambridge and the NERC Mass-spectrometry facility in East Kilbride.

Table 5 Benthic species collected for stable isotope analysis during cruise JR262. For position of sites see map Fig. 3

	Sites								
Groups sampled	23,24,31,32	20-22	33-35	12-12.2	36	13-15	9-11	1-3	SR1-SR3
Sediment	X		X	X			X	X	
Porifera		X	X	X		X	X	X	X
Alcyonaria	X				X	X		X	
Octopoda	X		X	X		X	X	X	
Polychaeta		X		X			X		
Pycnogonida				X			X		
Decapoda		X		X		X		X	X
Mysidacea	X	X		X			X		
Amphipoda				X		X			
Isopoda				X					
Asteroidea	X					X			X
Ophiuroidea	X		X	X	X		X		
Echinoidea	X	X	X	X	X			X	X
Holothuroidea			X						
Crinoidea	X					X	X		X
Ascidiacea			X						
Pisces	X	X	X	X	X	X	X	X	X

11.3 benthic density and distribution (camera work)The SUCS (Shelf Underwater Camera System) had been tested during arctic-North Sea trials during the boreal summer but this had been with a different winch. The borrowed winch need to be adapted somewhat, for example the gearing of the auto-spooler could not be made to align with the different spooling of SUCS cable. Once fully set up the first opportunity for test was at Stromness, but it was decided not to land this on the seabed there because of concern over entanglement (from whaling era cable and debris). The system performed reasonably in the limited test at Stromness but crashed on every landing and take-off from the seabed at site 32. Jeremy was able to adapt the software such that following such crashes it automatically rebooted and later on Peter cut back the length of wire to try to improve the reliability of the system. In the first couple of deployments the USBL 'transponder/ pinger' seemed to perform well giving more accurate positioning data both geographically and for depth but this then became quite inaccurate, despite much tweaking and attempts to use this data was abandoned.

Fig. 7

The first strong data for the SUCS was obtained from station 21 (event 29). The image quality was generally very good (see Fig 7) – even in the low res video. At station 21 the resolution of the stills were sufficient to assess grain size and sorting of the substratum. Identification of most fauna was possible beyond class and many to genus or species e.g. *Sterechinus antarcticus* (Fig 7).

The SUCS and Agassiz gears when both deployed at the same site increase value as the specimens trawled in the Agassiz and identified by closer morphological inspection or ultimately using molecular methods then improve likelihood and confidence of correct identifications of individuals in images. The SUCS can be used to estimate faunal density, biomass and abundance of species which are otherwise hard to assess because of the selectivity of capture by the Agassiz trawl. The SUCS images of the surface of the moraines showed them to be highly rich in mega-epibenthos and that echinoderms tended to dominate (mainly crinoids, echinoids and ophiuroids) the numbers of individuals. Also clearly present were anthozoan and hydrozoans cnidarians, cheilostome bryozoans, demosponges, polychaete annelids, crustaceans, gastropod and cephalopod molluscs, ascidians and fish but it is very likely that representatives of many other groups will become apparent with more detailed analyses. At many sites, such as at the three inner fjordic areas sampled, the SUCS revealed think mud with little epibenthos but did show tracks and may be used to establish burrow density and size frequencies.

The low res video revealed most sites to have patchily dense pelagic amphipods, mysids and euphausids with occasional observations of ctenophores and polychaetes such as *Tomopteris*. A dense krill swarm was encountered and filmed near the surface of site 31 but also seperatly just above the seabed at the same site. Attempts were made to get pelagic photographs but the light was not bright enough for a correctly exposed image and the duration of image capture too slow for fast moving fauna such as krill and mysids.

11.3 macrofauna richness (Epibenthic sledge work)

The Epibenthic Sledge (EBS) is towed with similar protocol to deployments of the Agassiz trawl but requires smooth seabed conditions (ie silt, mud, sand or bedrock) and tends to collect smaller animal sizes than the Agassiz but also retains them in better condition. However it also requires lower sea and wind states to be safely deployed and on JR262 it was just deployed on one occasion – at station 12.1 (event 64). Although it was not planned to be a mainstay apparatus of this cruise we had intended to attempt about 9 deployments; one for each transect across the South Georgia shelf. High winds, swell, lack of suitable substratum (e.g. over moraines) and time constraints prevented further deployments. The deployment that was made appeared to be successful but collected relatively little sediment compared with those made on JR144, JR179 or JR230. The epi- net and supra- net samples were stored separately in 96% ethanol in UN containers and will be analysed back at BAS Cambridge.

14. Benthic taxa specialism

13.1 Asteroidea

Asteroidea (sea stars) are an important part of the South Georgia invertebrate dominated benthos. South Georgia is of particular interest because it located inside the Polar Front and may be acting as a stepping stone along the Scotia Arc. Collection of sea stars at South Georgia provides data from previously un-sampled localities. This is especially important for phylogeographic studies. All asteroid specimens collected were kept and preserved, however specific target species include *Odontaster validus, Acodontaster spp., Porania spp.* and *Labidiaster annulatus.*

Eighteen species of sea stars that were collected by using an Agassiz trawl are immediately identifiable (see list below). Specifically, *Labidiaster annulatus* and *Porania spp.* were sampled most commonly and were most often found on rocky substrates. *Bathybiaster loripes* was abundant at muddy stations. Collected specimens were preserved (i.e. in 96% ethanol or frozen @ -20°C) for morphological and molecular work. Specimens of interest were kindly photographed by C. Held. Specimens were identified by AMJ based on taxonomic keys by Fisher (1940) and Clark (1962). Identification will be verified upon receipt of samples in May 2012.

Post-cruise, specimens will be used to investigate the phylogeographic structure of populations from South Georgia and other collection localities in the Antarctic. Specifically, studies will aim to provide an evolutionary understanding of how marine benthic organisms are genetically structured and physically distributed in the both the sub-Antarctic and the Antarctic. These studies also aim to highlight previously unrecognized biodiversity through the use of molecular and morphological tools. In addition, this information will have direct implications for understanding past and future range shifts of organisms in response to climate change.

Other independent objectives included observing occurrence of species abundance, brooding, development, and living color/morphological variation. For example, a young *Labidiaster annulatus* was photographed because this multi-rayed sea star appears to grow the typical five rays first, followed by adding additional arms. Color of living specimens, which is largely absent to lacking in

much of the primary taxonomic literature was observed in several species and is potentially important for systematic and population questions.

Asteroidea collected in AGT samples during JR262

Acodontaster capitatus S. Atlantic & Antarctica
Acodontaster elongatus S. Atlantic & Antarctica
Acodontaster hodgsoni S. Atlantic & Antarctica
Bathybiaster loripes S. Atlantic & Antarctica
Chitonaster sp. S. Atlantic & Antarctica
Diplasterias brucei S. Atlantic & Antarctica
Henricia sp. S. Atlantic & Antarctica
Labidiaster annulatus S. Atlantic & Antarctica
Leptychaster magnificus S. Atlantic & Antarctica
Luidiaster gerlachei S. Atlantic & Antarctica
Lysasterias sp. S. Atlantic & Antarctica
Odontaster spp. S. Atlantic & Antarctica
Perknaster sp. S. Atlantic & Antarctica
Porania antarctica S. Atlantic & Antarctica
Psilaster charcoti S. Atlantic & Antarctica
Pteraster spp. S. Atlantic & Antarctica
Solaster regularis S. Atlantic & Antarctica
Solaster stimpsoni S. Atlantic & Antarctica

Clark AM (1962) B.A.N.Z. Asteroidea. *British Museum of Antarctic Expedition Research Series B* **9,** 1-143.

Fisher WK (1940) Asteroidea. *Discovery Reports,* **20**, 69-306.

13.2 Ophiuroidea

The ophiuroids are often the most abundant of all groups caught and are certainly the most consistently present in trawls in general. The most conspicuous and abundant taxa were *Ophionotus hexactis*, *Ophiacantha vivipara*, *Ophioperla koehleri* and a species of *Amphiura*. From our previous collections we have found three seemingly endemic but as yet undescribed species of *Amphiura*. It is highly likely that these are amongst our samples and will give us more material to begin formal descriptions. In some samples – usually sites on moraines or on the shelf break, the basket star *Gorgonocephalus chilensis* and its close relative *Astrotoma agassizi* were conspicuous due to their large size. *G. chilensis* in these catches were all much larger than those caught on JR230 in Marguarite Bay. Most of the specimens caught were pink, similar to those smaller Marguarite Bay specimens. One individual from site 1, the western-most site, was bone coloured like *A. agassizi*. Previous collections made by the author on Polarstern cruise ANTXXVII/3 contained bone coloured

G. chilensis from Birdwood Bank, pink individuals from the south-east of South Georgia and a mix from the western shelf of Shag rocks. Preliminary molecular work based on the mitochondrial cytochrome oxidase sub-unit 1 gene suggest a single clade of *G. chilensis* from Antarctica and the Patagonian shelf, and that fits with the general belief of this species, generally found in areas of high currents, producing a dispersing larvae. However, given these morphological observations it would be reasonable to propose some as yet undetected structure between otherwise seemingly disjunct populations. We have conducted some deep genomic sequencing on this species and have several thousand nuclear markers (microsatellites) that we can use to address these questions once adequate funding is secured. *A. agassizi*, on the other hand, appears to be morphologically identical to those we have previously collected from as far south as the Amundsen Sea and south-east Weddel sea. Our recent molecular data support that of Hunter and Halanych (2008) that morphological conservation hides cryptic diversity. We will test the robustness of these cryptic mitochondrial clades using multiple nuclear markers.

Fig 8 various ophiroid species caught around South Georgia

Gorgonocephalus chilensis

Astrotoma agassizi

Ophioperla koehlerie

Ophioperla koehlerie was not caught on the previous BAS cruise to South Georgia (JR144), but was abundant in the samples taken from the Polarstern cruise ANTXXVII/3. It is another clearly identifiable species; of medium size, usually bright red and quite robust. We have O. koehlerie from many locations south of South Georgia and initial mitochondrial screening suggests descrete geographic populations. A BAS student is currently investigating this structure using a novel population genomic approach developed by the author.

Ophiacantha vivipara

Ophiacantha vivipara is extremely common north of the polar front, with South Georgia being its southern most geographic limit. It is quite spiny and has 6 – 8 arms which distinguishes it from *O. pentactis* which has only 5 arms[1]. We observed several individuals with young tightly embracing the disc of the adult.

Ophionotus hexactis

1 We have recently obtained genetic data demonstrating the existence of 6 armed O. pentactis

Ophionotus hexactis is the sister group to the Antarctic species *O. victoriae*. It is clearly identified by having 6 rather than 5 arms. It appears to be more common in shallower (< 200 m) water with a layer of sediment rather than rocky substrates, although it has been collected from hard bottoms albeit in lower numbers. A single specimen was collected from Shag Rocks.

Various *Amphiura* species were present in many trawls, with one species, perhaps *A. belgicae*, particularly abundant in a trawl dominated by it and a pycnogonid of genus *Nymphon*.

Some other distinctive species of note were *Ophiocten dubium* and *Ophiura lymani*.

Ophiura lymani

References:

Hunter RL & Halanych KM, 2008. Evaluating connectivity in the brooding brittle star Astrotoma agassizii across the Drake Passage in the Southern Ocean. Journal of Heredity, 99: 137-148

13.3 Isopod, mysid and decapod crustaceans

Previous sampling efforts, including the ICEFISH expedition with the "Nanthaniel B Palmer" in 2004, retrieved important collections of isopods from the waters around South Georgia and Shag Rocks and conserved them in a way that allowed molecular studies to be carried out. Due to the paucity of sampled sites and the absence of replicates, however, it remained unclear to which degree the results were influenced by the unsystematic choice of trawling sites or if they indeed reflect the situation on the shelves around SG and SR at large. Open questions that the JR262 will allow to be addressed include the faunal inventory of poorly studied groups (Antarcturidae), the true abundance of species that were rare or absent in previous collections (e.g. *Glyptonotus*) and the genetic richness in more abundant species, e.g. *Septemserolis septemcarinata* - a widely distributed species of serolid isopods - which turned out to have strikingly low genetic diversity around South Georgia (Leese, Agrawal & Held 2010), but this result rested on too few sampled sites to be representative.

The value of the JR262 samples will consist in complementing our knowledge of the faunal inventory of the shelf around SG and SR and provide further insight into known species complexes (e.g. *Glyptonotus*, *Antarctomysis*) and finally allow unbiased estimates of genetic richness (*Septemserolis*). *Septemserolis septemcarinata* occured repeatedly in our samples and will complement estimates of connectivity among South Georgia and other subantarctic shallow water habitats (Bouvet, Marion Island).

Glyptonotus appear to be genuinly rare on the South Georgian shelf and its rarity is unlikely to be an artifact related to previously sampled sites or bias due to mesh size. The only three *Glyptonotus* (e.g. Fig 10) in the JR262 samples were juveniles and adult *Glyptonotus* are well above the exclusion size for AGT trawls.

Fig. 10 The 'giant' Antarctic isopod *Glyptonotus*

Decapod shrimps were dominated by *Notocrangon antarcticus*, which occurred in many sampled sites with sometimes high abundance. Lithodid crabs (referred to as stone or king crabs) were also caught occasionally, mostly *Paralomis spinosissima* (Fig. 11). Whilst their abundance never exceeded four per catch, the high prevalence of *Briosaccus callosus*, a rhizocephalan parasite, was striking.

Fig. 12 Mysids were common and abundant in JR262 samples

Mysid shrimps (*Antarctomysis spp*. See Fig. 12) were amongst the most abundant crustaceans in AGT samples and the one EBS trawl. Their definitive identification will have to confirmed by barcoding and

detailed morphological analysis because of the recent discovery of new species within the genus *Antarctomysis* (Held & Eberlein, in prep.).

Antarcturid isopods were well-represented in almost all JR262 trawls. Perhaps due to their semi-sessile style of life, antarcturid isopods are particularly diverse and numerous cryptic species are already known (Held, unpubl.). The current antarcturid taxonomy is not thought to correctly reflect the identity of the species and it is to be expected that species endemic to the South Georgian shelf have been sampled but a final evaluation will have to await detailed analyses. The JR262 samples are therefore particularly valuable in order to assess the role of South Georgia and Shag Rocks in terms of the diversification of antarcturids and shallow water invertebrates in general.

Leese F, Agrawal S, Held C (2010) “Long-Distance Island Hopping Without Dispersal Stages: Transportation Across Major Zoogeographic Barriers in a Southern Ocean Isopod.” NATURWISSENSCHAFTEN 97 (6): doi:10.1007/s00114-010-0674-y.

Fig 13 Anterior of *Antarcturid* isopod, showing ‘combs’ on suspension feeding legs

13.4 Pycnogona

Pycnogonida, better known as sea spiders, were well represented in the samples of JR262. In many ways they are an extraordinary group of marine arthropods. Their "brooding" benthic lifestyle (eggs are carried by the males on their ovigera; Arnaud and Bamber 1987) has been taken as indicative of limited dispersal capacity. However Pycnogonida occur worldwide from shallow water to abyssal depths (Bamber 2007; Park et al. 2007) containing more than 1300 species (Munilla and Soler-Membrives 2008). In the Southern Ocean they are anomalously species richn and has even been described as a centre of pycnogonid geographic dispersal and evolutionary radiation (Fry and Hedgpeth 1969). According to Munilla and Soler-Membrives (2008), genera with most of their species in austral waters are *Ammothea* Leach, 1814; *Austrodecus* Hodgson, 1907; *Colossendeis* Jarzinsky, 1870; *Nymphon* Fabricius, 1794 and *Pallenopsis* Wilson, 1881.

Figure 14 Ammotheid carrying eggs.

South Georgia represents an unusual location within the Southern Ocean as it is a highly isolated, large and old island. The most previous recorded species seem to have very localized distributions and are endemic to this region (Griffith et al. 2011)

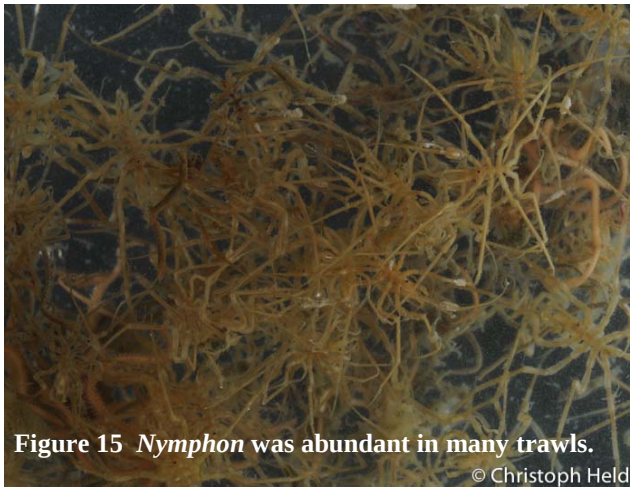


Figure 15 *Nymphon* was abundant in many trawls.

During the cruise a wide range of sea spiders were sampled and were recorded at nearly every station. Often this taxon dominated the catch (in terms of numbers of individuals), such as in soft sediments. These samples include specimens from all genera mentioned above.

The samples are important for further molecular and morphological studies therefore all collected specimens were stored in 96% ethanol.

The data will be used to investigate the phylogeny of the phylum as well as for a detailed view on the phylogeographic structure and population genetic. Additional they will continue and validate previous studies about genetic differentiation (e.g. Arango et al. 2011) and cryptic species (e.g. Krabbe et al. 2010) within the Pycnogonida.

Arango, C. P.; Soler-Membrives A. & Miller K. J. 2011. Genetic differentiation in the circum - Antarctic sea spider Nymphon australe (Pycnogonida; Nymphonidae). – Deep-Sea Research II 58: 212 – 219.

Arnaud, F. & Bamber, R. N. 1987. The biology of Pycnogonida. – Advances in Marine Biology 24: 1–96.

Bamber, R. N. 2007. A holistic re-interpretation of the phylogeny of the Pycnogonida Latreille, 1810 (Arthropoda). – Zootaxa 1668: 295 – 312.
Fry, W. G. & Hedgpeth, J. W. 1969. The Fauna of the Ross Sea. Part 7: Pycnogonida: Colossendeidae, Pycnogonidae, Endeidae, Ammotheidae. – New Zealand Oceanographic Institute Memoir No. 49: 1–139.
Griffiths, H. J.; Arango, C. P.; Munilla, T. & McInnes, S. J. 2011. Biodiversity and biogeography of Southern Ocean pycnogonids. – Ecography 34: 616 – 627.
Krabbe, K., Leese, F., Mayer, C., Tollrian, R. & Held, C. 2010. Cryptic mitochondrial lineages in the widespread pycnogonid Colossendeis megalonyx Hoek, 1881 from Antarctic and Subantarctic waters. – Polar Biology 33: 281–292.
Munilla, T. & Soler-Membrives, A. 2008. Check-list of the pycnogonids from Antarctic and sub-Antarctic waters: zoogeographic implications. – Antarctic Science 21 (2): 1–13.
Park, S.-J., Lee, Y.-S. & Hwang, U. W. 2007. The complete mitochondrial genome of the sea spider Achelia bituberculata (Pycnogonida: Ammotheidae): arthropod ground pattern of gene arrangement. – BMC Genomics 8: 343.

13.5 Octopus

Only two octopod species are known from the shelf of South Georgia: *Pareledone turqueti* (Joubin, 1905) and *Adelieledone polymorpha* (Robson, 1930) **(**Fig 16). Both have been found throughout the entire West Antarctic over a wide depth range (25-640 m and 18-862 m respectively) (Collins, Rodhouse, 2006). Everywhere else they are sympatric with plethora of other eledonin species, which raises the question why octopod fauna is so poor in shallow waters around South Georgia (Yau et al., 2002). Genetic studies have revealed that the radiation of Antarctic *Pareledone* and *Adelieledone* occurred after South Georgia separated from Antarctica with opening of Drake Passage (Strugnell et al., 2008). It suggests that both species found around South Georgia are direct descendants of some "primary species stock" and coexisted there for at least 35 Ma. Likely this coexistence happened without important evolutionary changes because both species are morphologically similar over the rest of West Antarctica as they are in South Georgia, though populations are genetically different even between South Georgia and Shag Rocks. Both relic species are similarly sized, forage on a variety of benthic animals, and occur together in catches of bottom trawls (Yau et al., 2002; Collins & Rodhouse, 2006) which raises a question: How do they share bottom habitats? Usual research hauls by a commercial bottom trawl are 30 min in duration and, at 4 knots, have not provided the answer because they cover such a large area. Typically such trawls cover some 3 - 4 km distance, whereas small – scale sampling with AGT combined with photographs of a particular bottom landscape where octopods were collected are more likely to solve the problem.

During the cruise a total of 88 specimens of both species were collected and frozen, including all ontogenetic stages from juveniles to mature males and females. Preliminary analysis of data on identified specimens and SUCS photographs demonstrated that over muddy bottom with very scarce epi-benthic fauna mostly adult *Adelieledone* were captured (e.g. sites 12.1 and 31); juveniles of this species preferred grounds

with numerous Crinoidea, particularly on moraines (Like site 14). *Pareledone* were met across a variety of habitats, particularly in those with abundant ophiuroids and sea urchins (like sites 20 and 35), though adult *Adelieledone* might also be present in the same catch. Post – cruise, when all collected octopods would be identified, measured, opened, and their sex and maturity assessed, we might produce more detailed account about habitat preference in both species at the different ontogenetic stages, and how it possibly helped them to survive through the Glacial bottleneck.

Collins, M.A., Rodhouse, P.G.K. 2006. Southern Ocean Cephalopods. Advances in Marine Biology, 50: 191-265.

Strugnell, J.M., Rogers, A.D., Prodohl, P.A., Collins, M.A., Allcock, A.L. 2008. The thermohaline expressway: the Southern Ocean as a centre of origin for deep-sea octopuses. Cladistics, 24: 853-860.

Yau, C., Allcock, A.L., Daly, H.I., Collins, M.A. 2002. Distribution of *Pareledone* spp. (Octopodidae, Eledoninae) around South Georgia. Bull.Mar.Sci, 71: 993-1002.

Fig. 16 *Adelieledone polymorpha* (above) and *Pareledone turqueti* (below)

14. Photographic support

Depending on their size, incoming samples during the expedition JR262 were documented using either of three digital camera setups or a combination thereof:

- Nikon D3x fitted with a Micro Nikkor 105mm f/2.8 VR and two externally powered and manually operated Metz flashguns connected to the camera by a split sync cable (Y type)
- Canon 40D fitted with a 60mm Macro f/2.8 using the internal flash or ambient light
- Panasonic LX3 using the internal flash or ambient light

A total of 30GB of pictures of live animals were taken during the expedition and stored as JPEGs or RAW files and catalogued immediately in Adobe Lightroom 3. All pictures derived from the same individual were stacked and keywords assigned to each photo detailing information about the ship event, station number, gear type and individual collection number, information about camera setup, date etc were recorded automatically. The event number is a unique number which refers to the deployments of gear during JR262 and is kept in the ship's event log (see appendix). The individual collection number is a unique number assigned to each specimen or jar of specimens during sorting. Photographed specimens were kept separate for unambiguous identification. On the basis of the collection number alone, it is possible to locate the jar containing the specimens or specimens in the collection and as well as deduce all associated collection metadata (station, date etc.). The inclusion of some of these metadata as keywords assigned to each individual photo was performed to allow for a straightforward way of accessing frequently used queries (e.g. pictures from station X, all pictures of ophiuroids) directly from the collection of pictures without having to query a database first. Keywords containing taxonomic information have been added for some taxa and will continue to be added as feedback from international specialists about the identity of the species comes in. The pictures will eventually be made available to the scientific community by way of the SCAR-MarBin database.

Fig. 17 Tritionid nudibranch (Gastropoda, Mollusca)

Fig 18 photography can be a key aid to identification of charismatic macrofauna, such as a shelled gastropod (above) and sea spider (below)

Fig 19 The brittlestar *Astrotoma agassizi* was one of the largest common species in both Agassiz trawl samples and SUCS images

Fig 20 Cidaroid sea urchins (echinoidea) have many species associated with their

15. Principal Darwin Initiative project partner report

Two members of the Shallow Marine Surveys Group (SMSG) joined the JR262 cruise; Drs Vladimir Laptikhovsky and Paul Brewin. Dr Laptikhovsky has a specialist interest in the Cephaolopoda, and

Dr Brewin has a general interest in benthic community ecology. Based in Stanley, Falkland Islands, both members have an understanding of contemporary biogeographic pattern of a number of benthic and pelagic species of the South Atlantic region.

SMSG leads the shallow water component of the Darwin Initiative project 18-019 (which funded the JR262 cruise). In November 2010, SMSG completed the most comprehensive shallow subtidal and intertidal survey of the South Georgia coast to date, sampling 20 sites along the entire north coast of South Georgia. More than 9000 individuals across more than 300 taxa were collected, and over 400 benthic quantitative photo-quadrat images. Shallow subtidal species inventories will be combined with completed database enhancement (Hogg et al 2011) and data collected in the present study, forming a highly comprehensive view of contemporary biodiversity inventory and pattern of South Georgia shelf. A preliminary comparison of shallow species and species collected during the present survey show that some species may have very wide depth distributions (eg species of Ophiuroidea, Asteroidea, Echinoidea, Nudibranchia, Serolidae), while other species show clear discontinuity (eg species of Amphipoda, Holothuroidea, Crinoidea, Polychaeta, Isopoda, Scleractina, Octocorallia) that may or may not be simply related to habitat type. All taxa will require detailed examination before any comparison can be made, particularly encrusting fauna such as sponges, ascidians and bryozoans.

Participation on the JR262 cruise has greatly enhanced capacity of SMSG personnel. This was the first cruise on the James Clarke Ross for Drs Laptikhovsky and Brewin, and the first time working side-by-side with BAS collaborators Barnes and Hogg. Significantly, participation on this cruise has fostered potential future collaborations with non-BAS participants eg Christoph Held (AWI) and Alexis Janosik (Aubern University) studying South Georgia, Falkland Islands and Southern Patagonia biogeography. A short report of SMSG's participation will be published on their website.

16. Mooring buoy recovery/deployment – JR260a

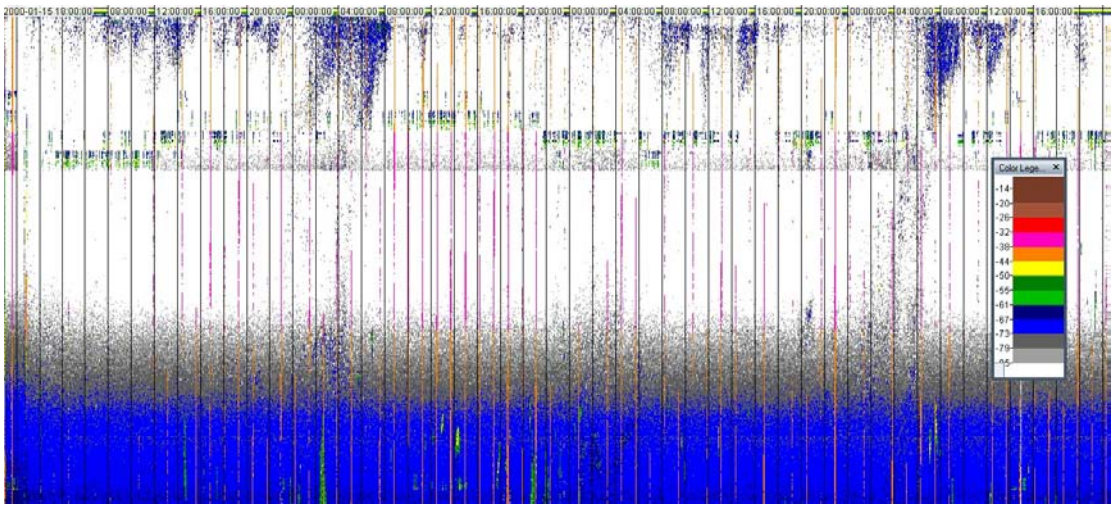
The purpose of this cruise was to recover and redeploy the three Ecosystem moorings early in the season, as these moorings had been in the water for over two years. Last season the moorings could not be turned around as the JCR had no stern gantry, the company maintaining the gantry having damaged it during re-installment. JR260a had three days allocated, in conjunction with JR262 and the opening and first supply of KEP, Bird Island and Signy. JCR left port delayed by 24 hours, due to problems with its freezer. A further 48 hours were lost due to bad weather during Bird Island relief. JR260a successfully recovered all three moorings, but with these time penalties, combined with bad weather at the wrong time and the commitment of opening Signy, there was no time left to redeploy any of the three moorings.

All three moorings were recovered in relatively good conditions and all the releases worked fine after two years in the water. There was slight corrosion on parts of the stainless steel coupling parts, which needs replacing. All the ropes and hardware were still in good condition, but are due to be changed anyway. The scientific instruments worked fine as expected but with different battery performance. For an unknown reason the ADCP on the P2 mooring was not in its holder when we recovered the mooring. It is thought to have disintegrated over time, as it physically could not slip through its bracket as a result of a lip on each side. Interestingly there is something odd about the CTD at P2 as well. The CTD data show some odd values of up to -18m, indicating that the CTD would have been on the surface several times. This seems to be impossible as we would have got some ARGOS messages, telling us that the mooring would have surfaced. So far we have no idea if that correlates to what has happened to the ADCP or not. The lost ADCP was one of the old plastic ADCPs, originally on the deep WCP mooring. The ADCP on the shallow mooring is the same type and is not showing any signs of damage or major ageing.

The WCP has not worked properly again on the WCB mooring. When we downloaded the data there were 39 files on the instrument, but none had any data in them. In order to retrieve the data a memory dump was undertaken, this worked ok, but there was only about 6 weeks of data on the WCP. Data files exist from the deployment on the 27th of December 2009 until 3rd of February.2010 10:24h. However, there was significant noise (expected to be electronic) throughout the data. Based on this we wanted to do a test deployment at Signy whilst at anchor to examine whether this noise would exist on a new deployment. However, when we did a memory test as well a RAM test, both failed as part of the pre-deployment checks. We then tried an on land test deployment which created a file containing complete rubbish. Further tests on the memory and RAM where all unsuccessful and therefore we are under the impression that these are broken and therefore the WCP is no longer in working condition. This is the old unit 004 with our purpose build Titanium housing and the modified transducer head.

P2 mooring at the surface with no ADCP in bracket

WCB mooring after recovery with ADCP and WCP in their places



Screen shot of the WCP data, showing drop outs and noise

Time of events during mooring recoveries:

P2, 3200m sediment trap mooring:

The P2 mooring recovery was started at 16:02:00 on the 09/11/2011 with the signal sent and confirmation received of release signal. At 16:08:00 the mooring was on surface, sighted on Stbd beam. At 16:32:00 the recovery line was connected and by 18:11:00 the mooring was fully recovered on deck.

P3, 3700m sediment trap mooring P3:

The P3 mooring recovery was started at 08:10:00 on the 11/11/2011 in slightly foggy conditions. With the signal sent, the mooring confirmed a release signal with an acoustic range of 7185m. At 08:31:00 the Vessel came off DP, commencing parallel search for mooring. At 11:27:00 ranging for mooring = 4382m, so vessel moved 1000m forward, at 11:44:00 ranging for mooring = 3863m, moving further ahead and at 12:08:00 the buoy was sighted on the surface 2 points off port bow, approx. 150m from V/L. At 12:21:00 the recovery line was connected, and by 14:20:00 the mooring was fully recovered.

shallow water WCB mooring:

The first attempt to recover the WCB mooring was made at 22:13:00 on the 12/11/2011. The wind was gusting with over 30kn, the swell was quite large and it was starting to get dark. After assessing the situation and successfully pinging the mooring, the decision was made that sea conditions would not allow safe recovery of the mooring. A day later the conditions were slightly better with less wind and plenty of daylight available, so the decision was made to recover the mooring and at 20:33:00 on the 13/11/2011 the mooring was successful recovered.

18. Acknowledgements

We would like to thank the captain, officers and crew of the RRS James Clark Ross for all their hard work, effort and skill in enabling us to make so many and such good deployments as well as making the cruise so enjoyable. We would also like to thank BAS IT and AME sections for help with data, computing and electronics on the voyage and in particular to Carl Robinson who helped develop the novel shelf underwater camera system. We also thank Ali Graham and Gwen Newton for helping with Swath data to plan sites. Finally we are most grateful to the Darwin initiative of DEFRA for funding and supporting this work.

19. Appendices

1 swath multibeam maps of actual sample sites; 2 event log details for South Georgia region; 3 event log details for South Orkney region

Appendix 1 – seabed topography, swath

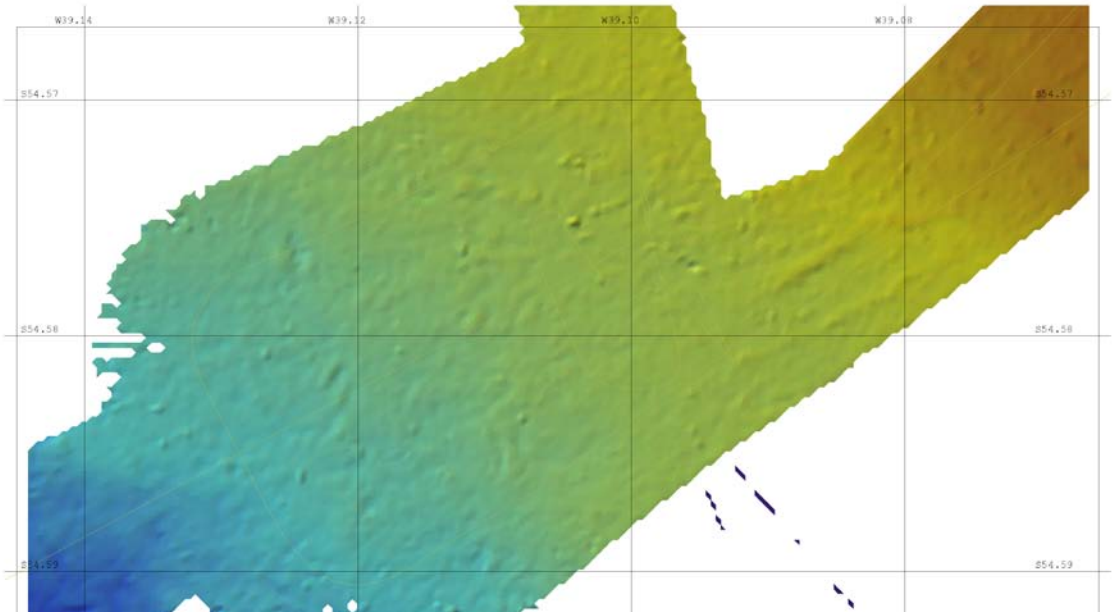


Figure 2: Site 1

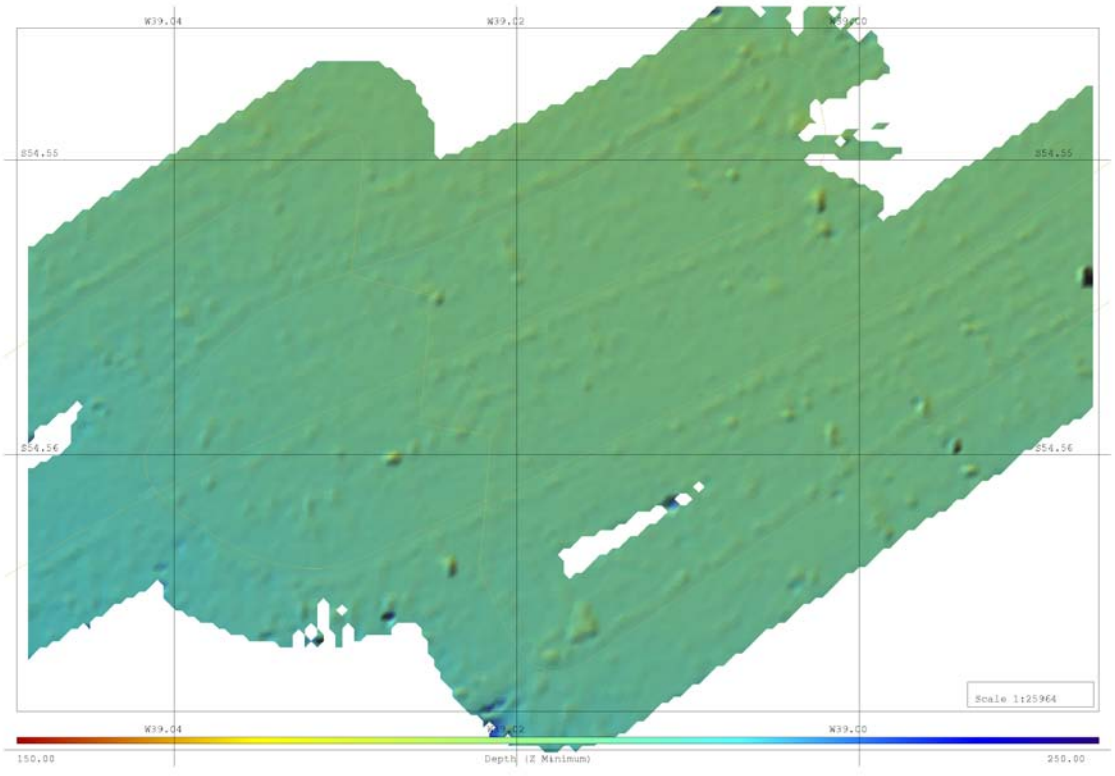


Figure 3: Site 2

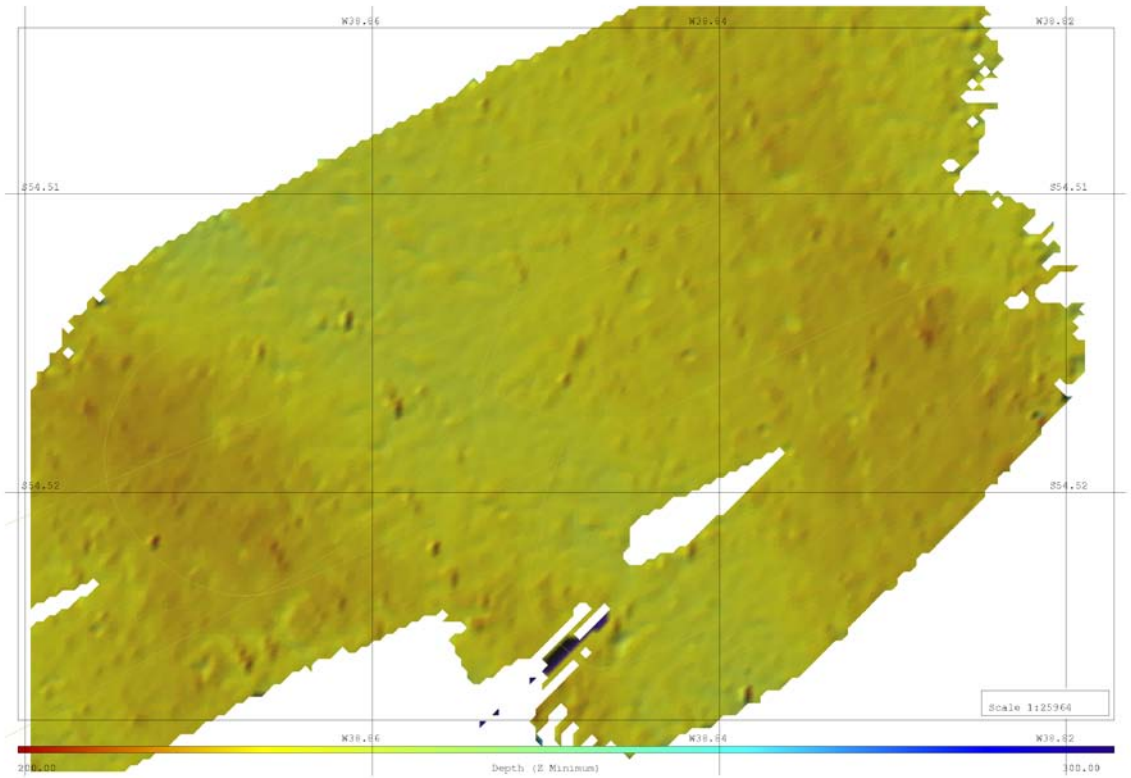


Figure 4: Site 3

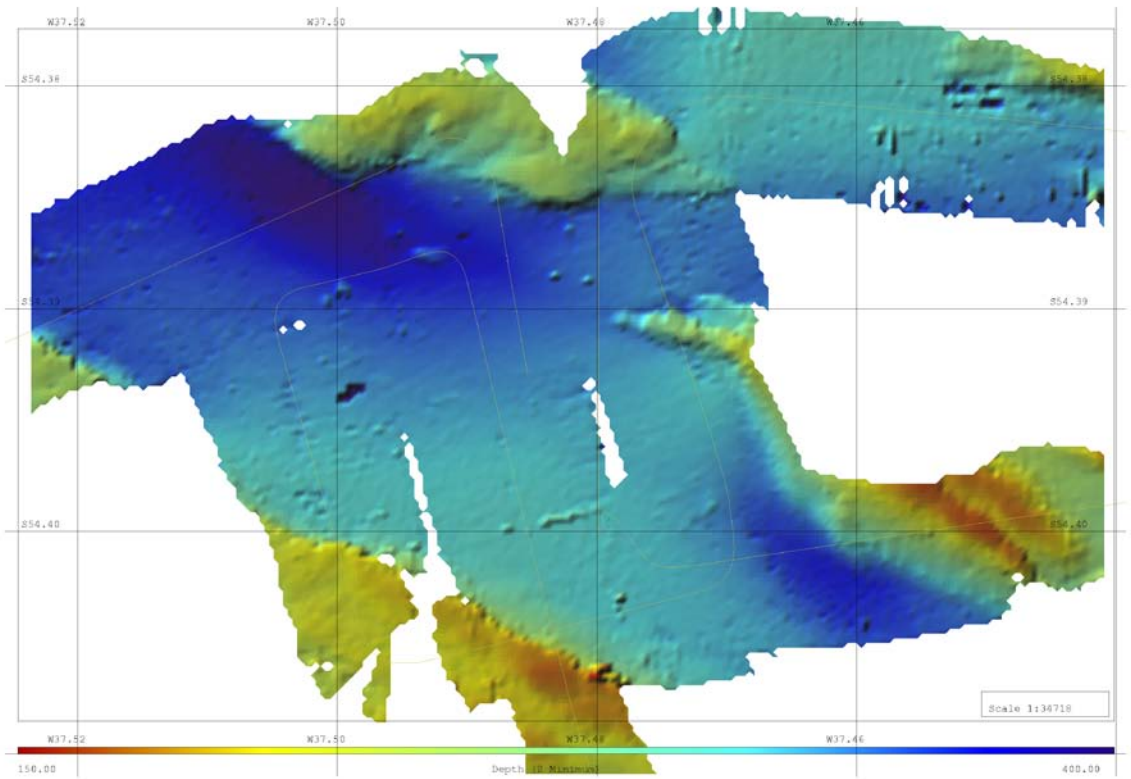


Figure 5: Site 9

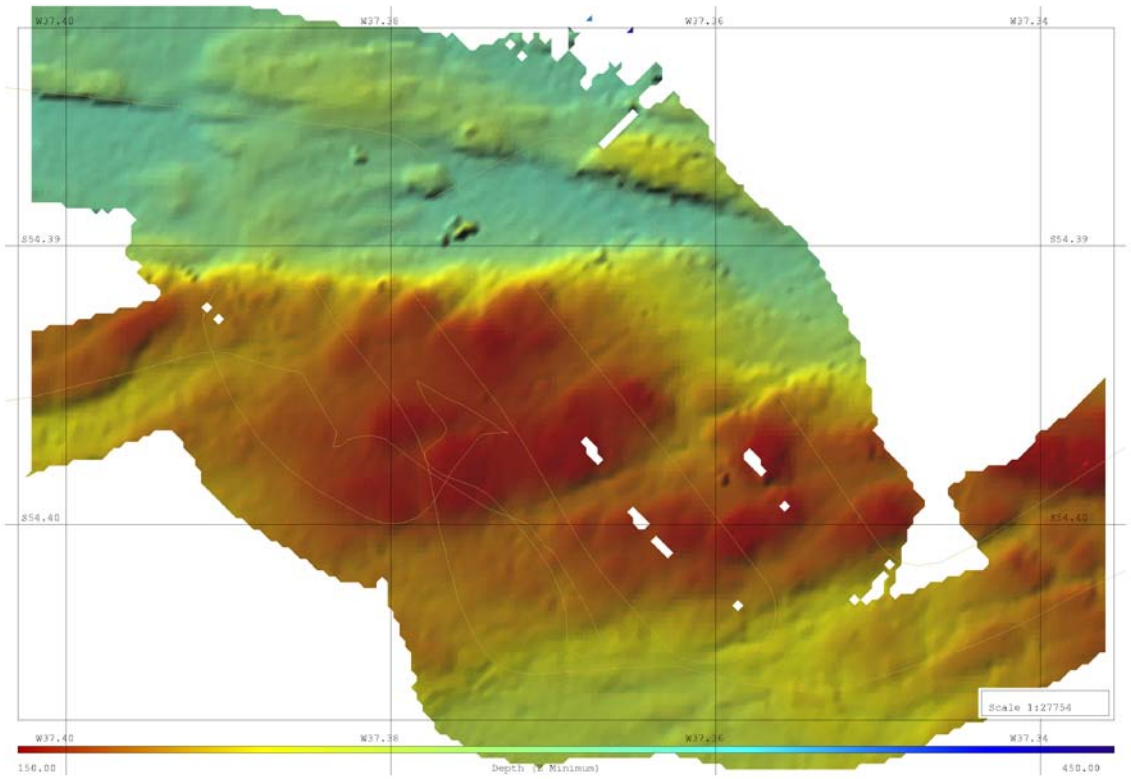


Figure 6: Site 10

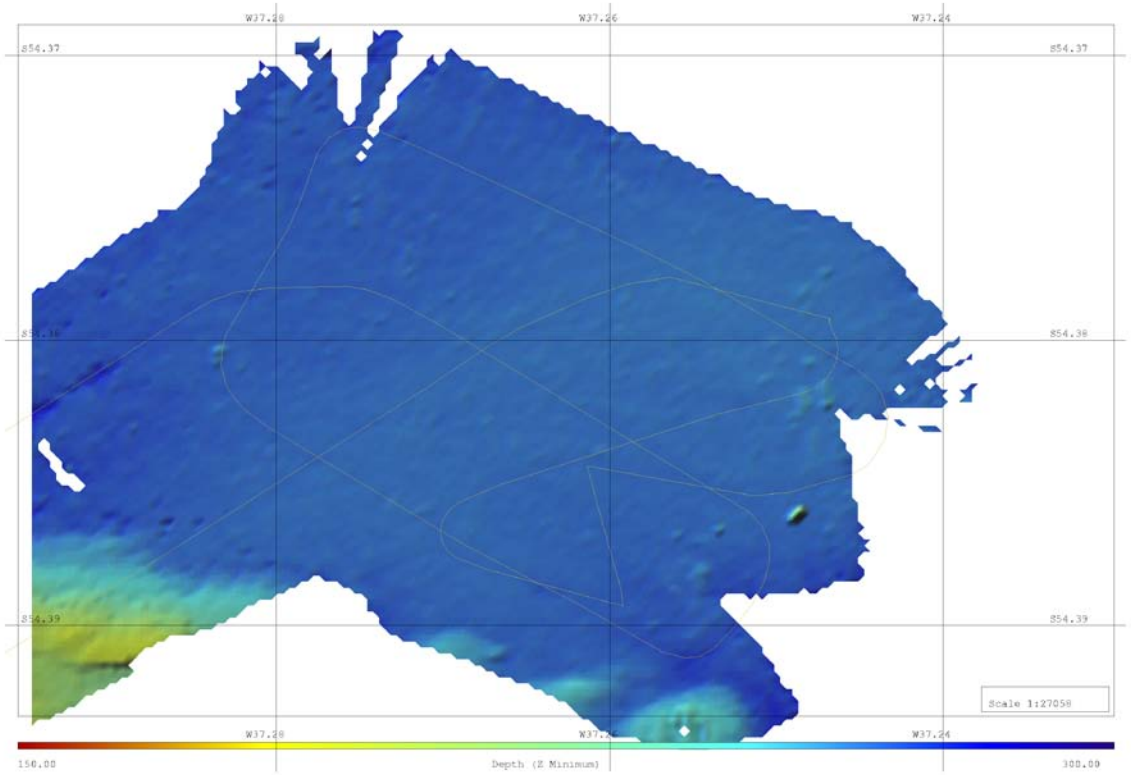


Figure 7: Site 11

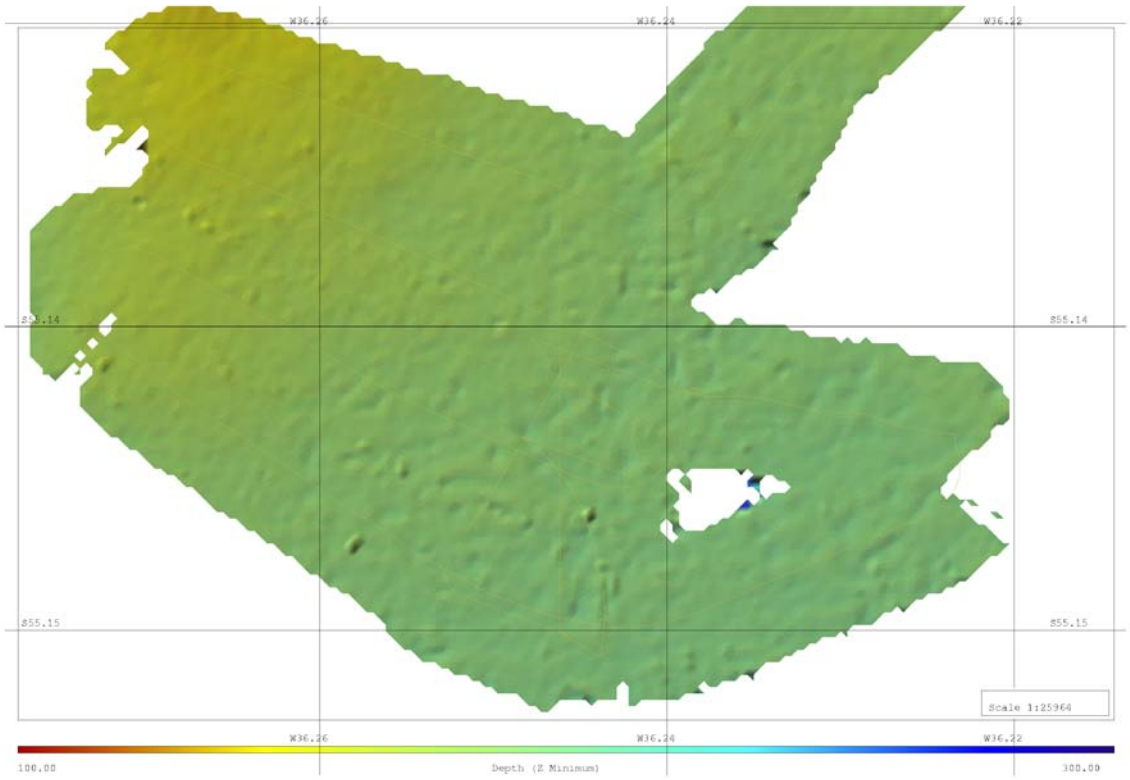


Figure 8: Site 12

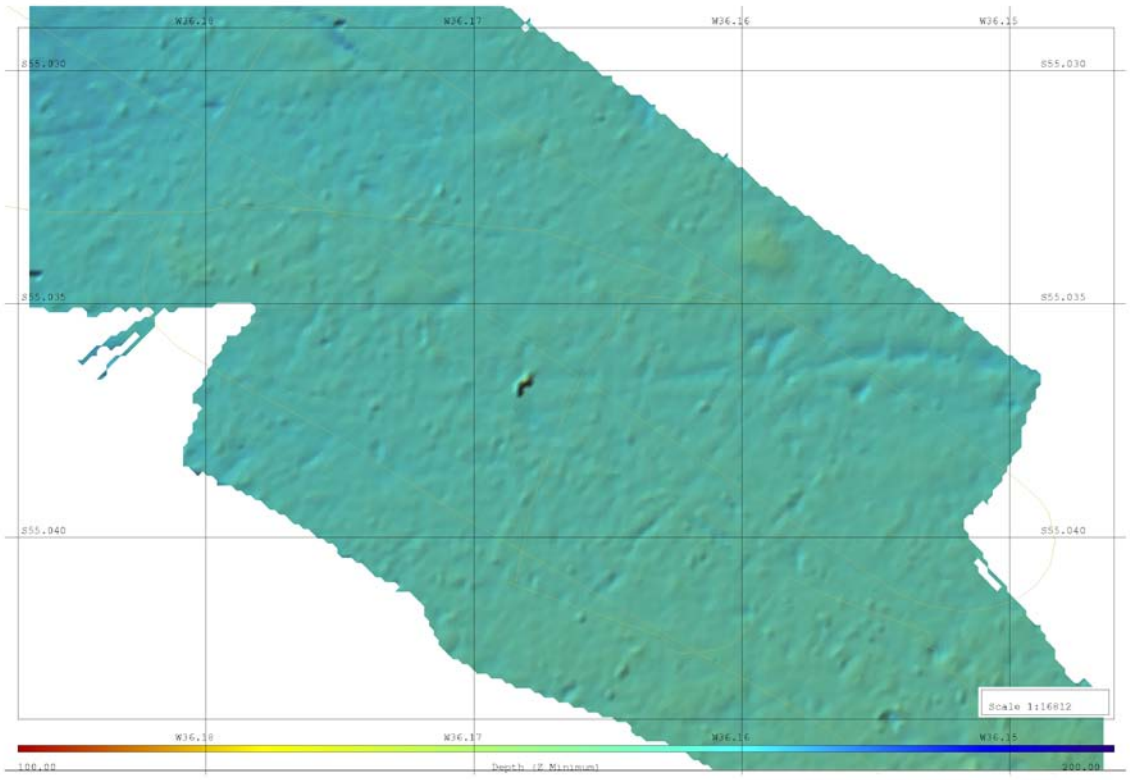


Figure 9: Site 12.1

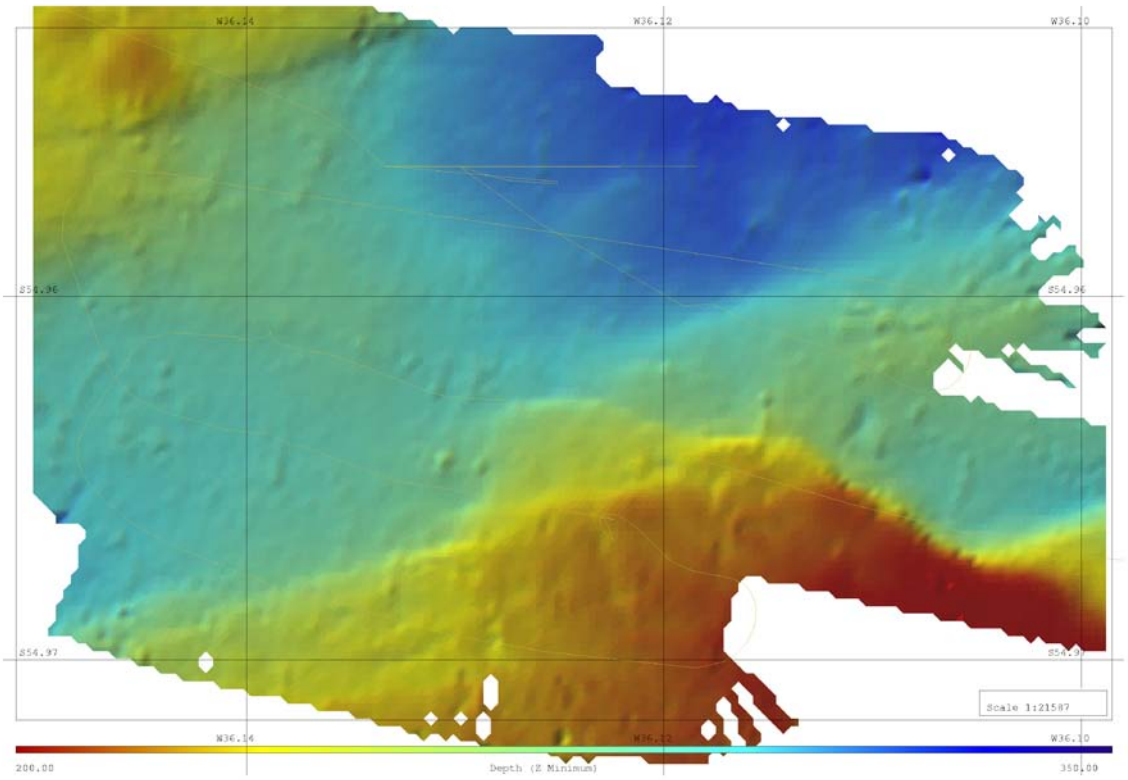


Figure 10: Site 12.2

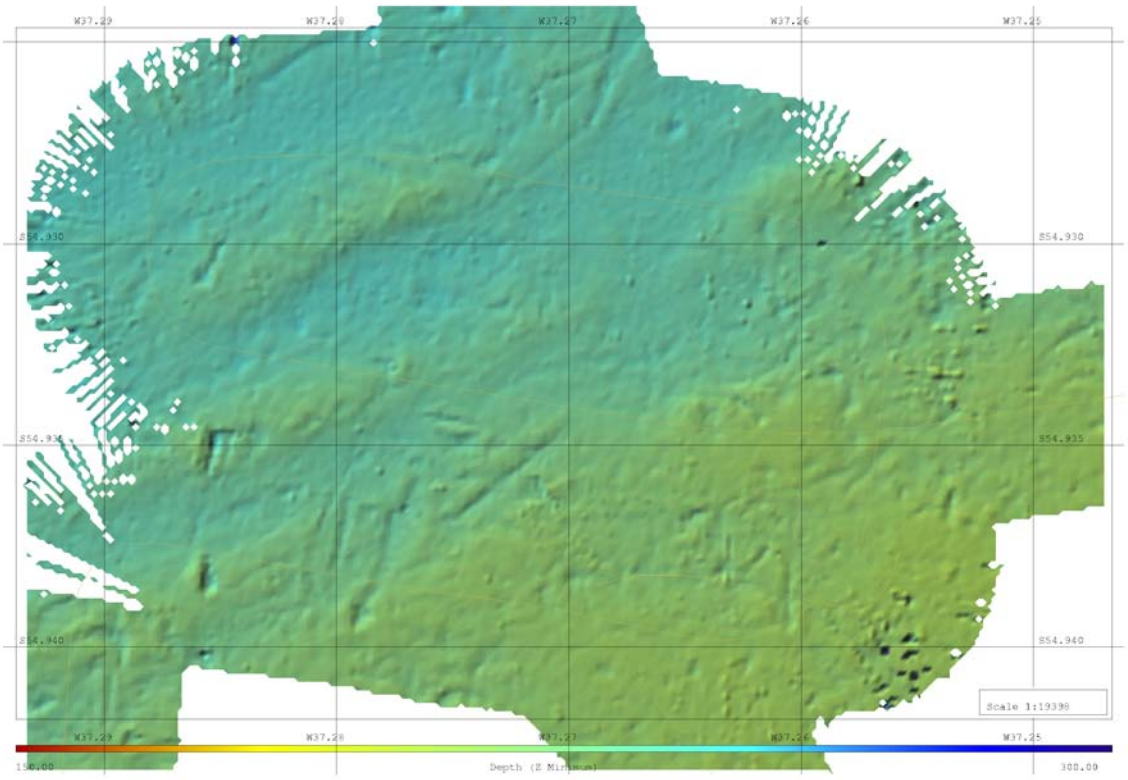


Figure 11: Site 13

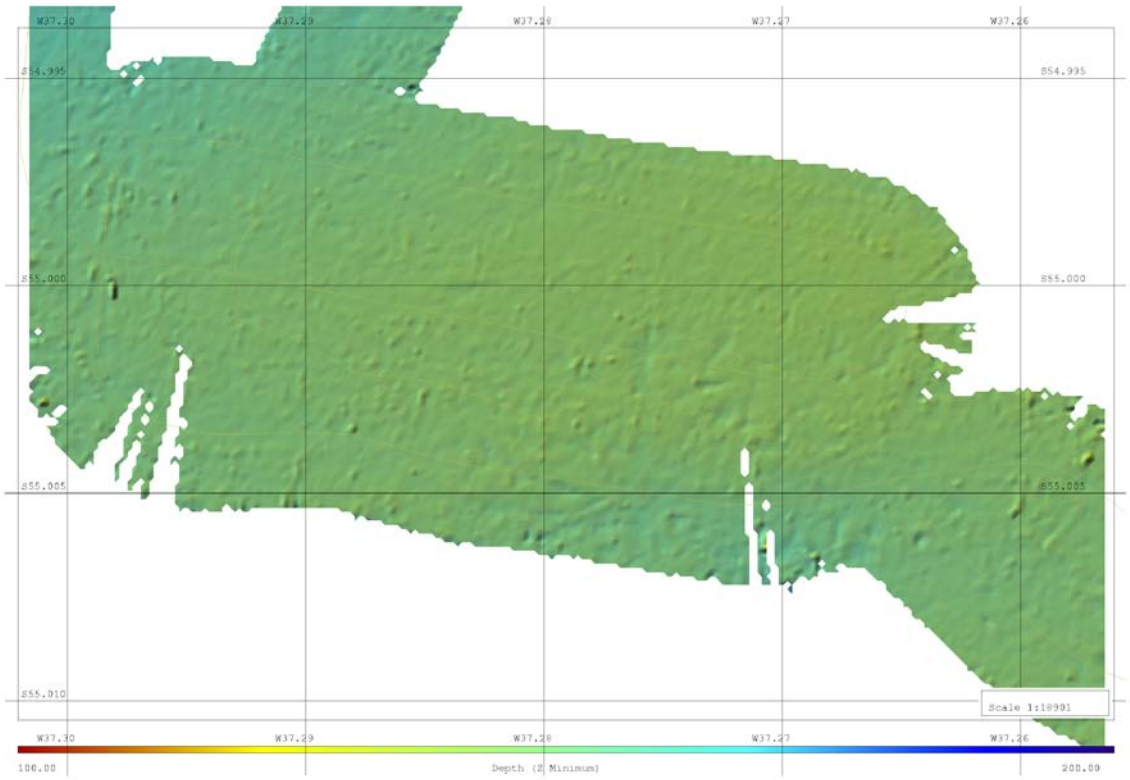


Figure 12: Site 14

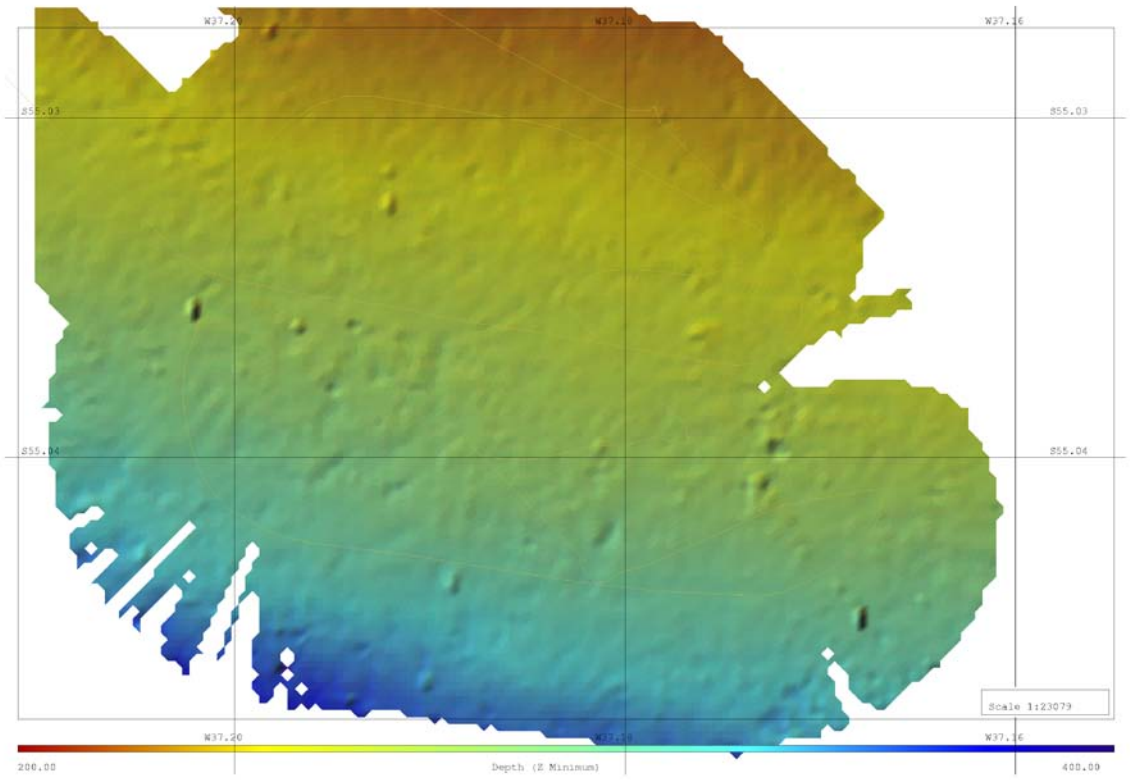


Figure 13: Site 15

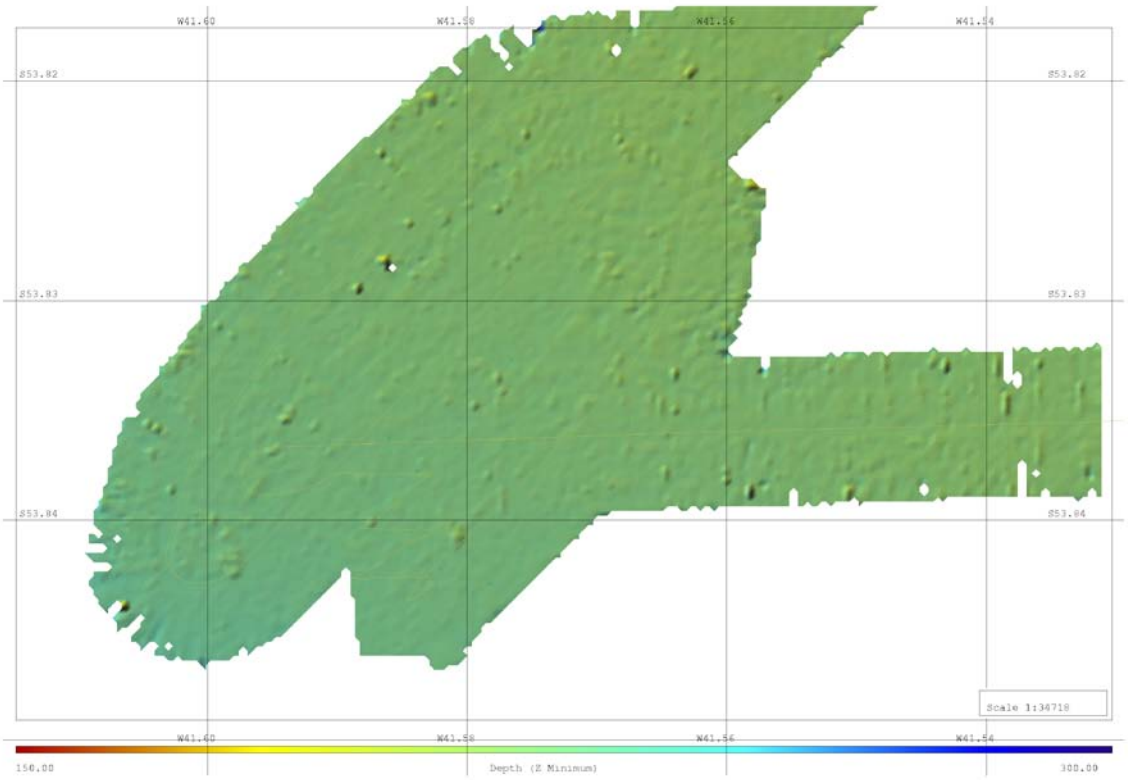


Figure 14: Site 20

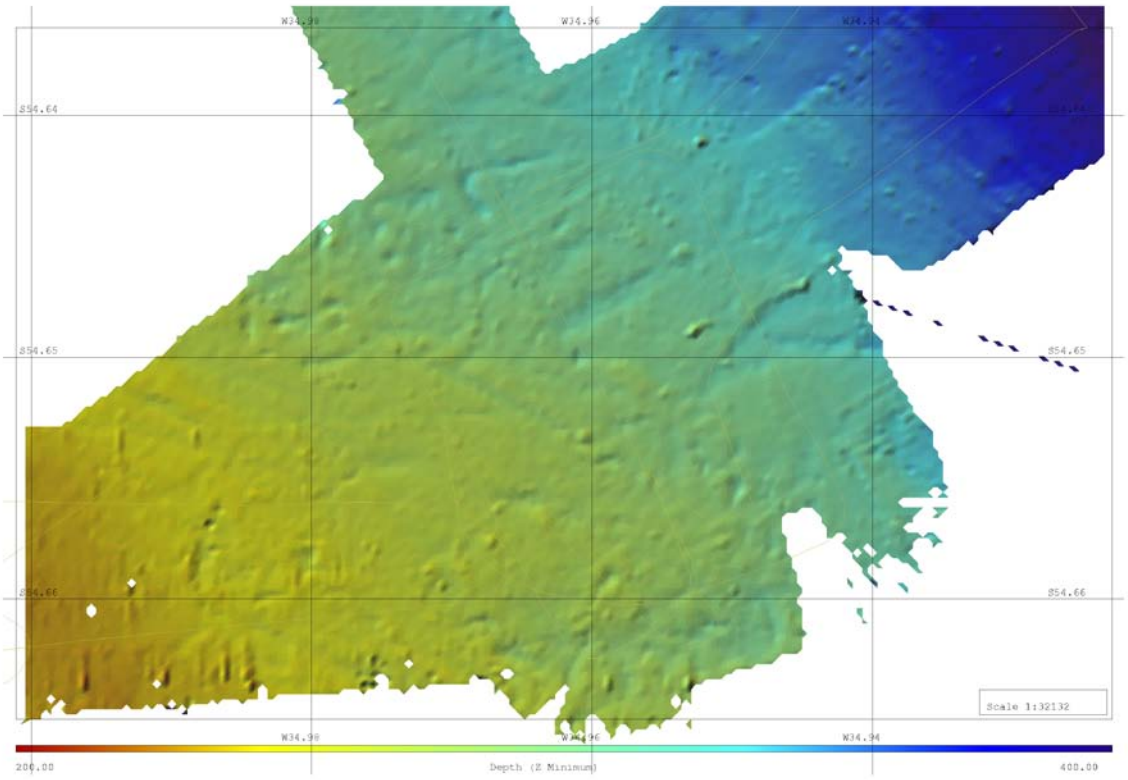


Figure 15: Site 21

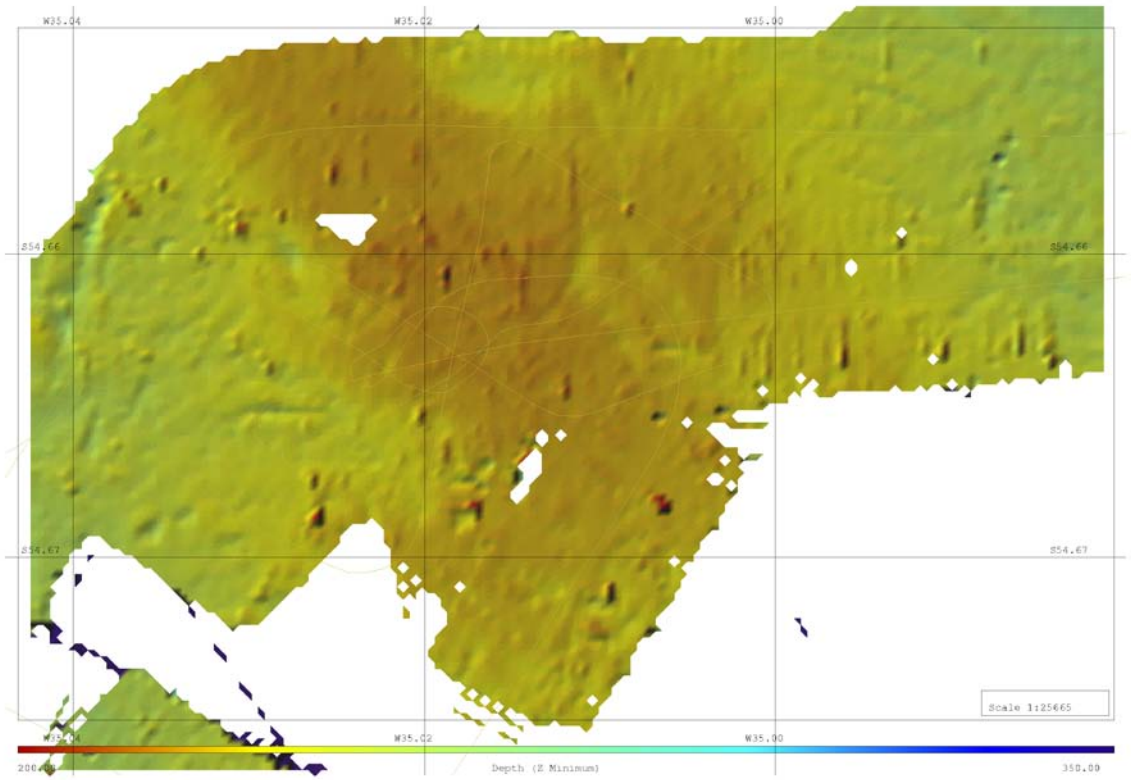


Figure 16: Site 22

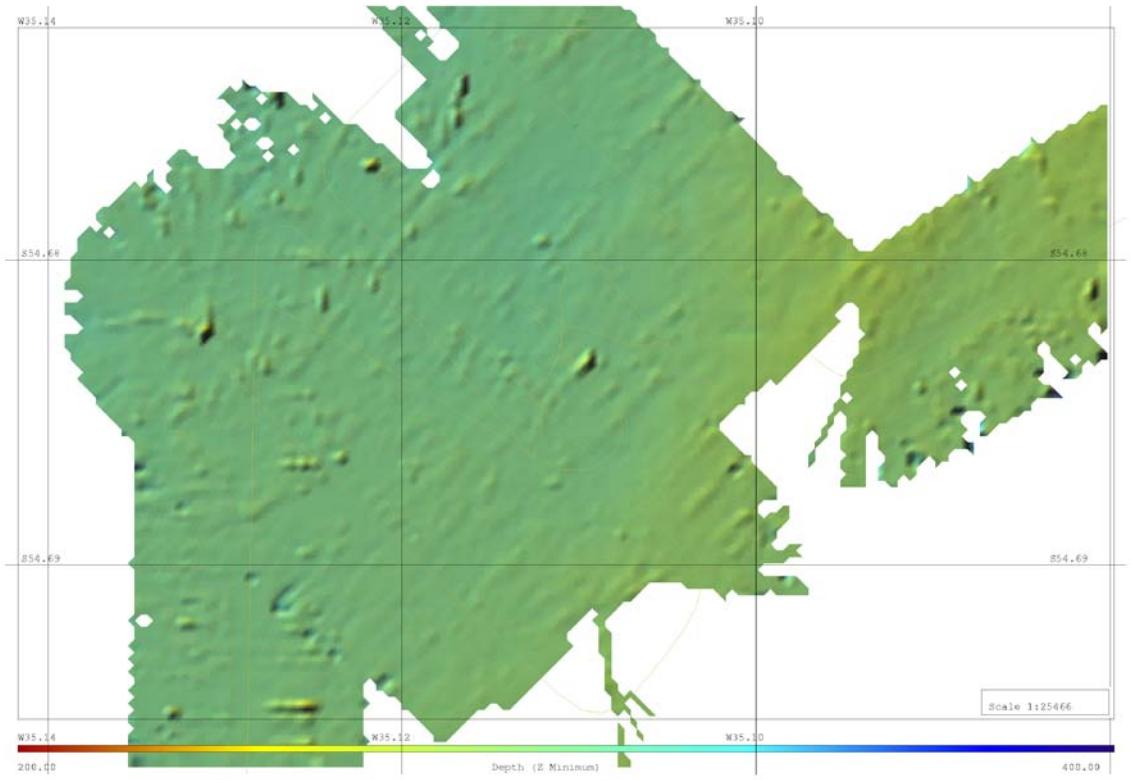


Figure 17: Site 23

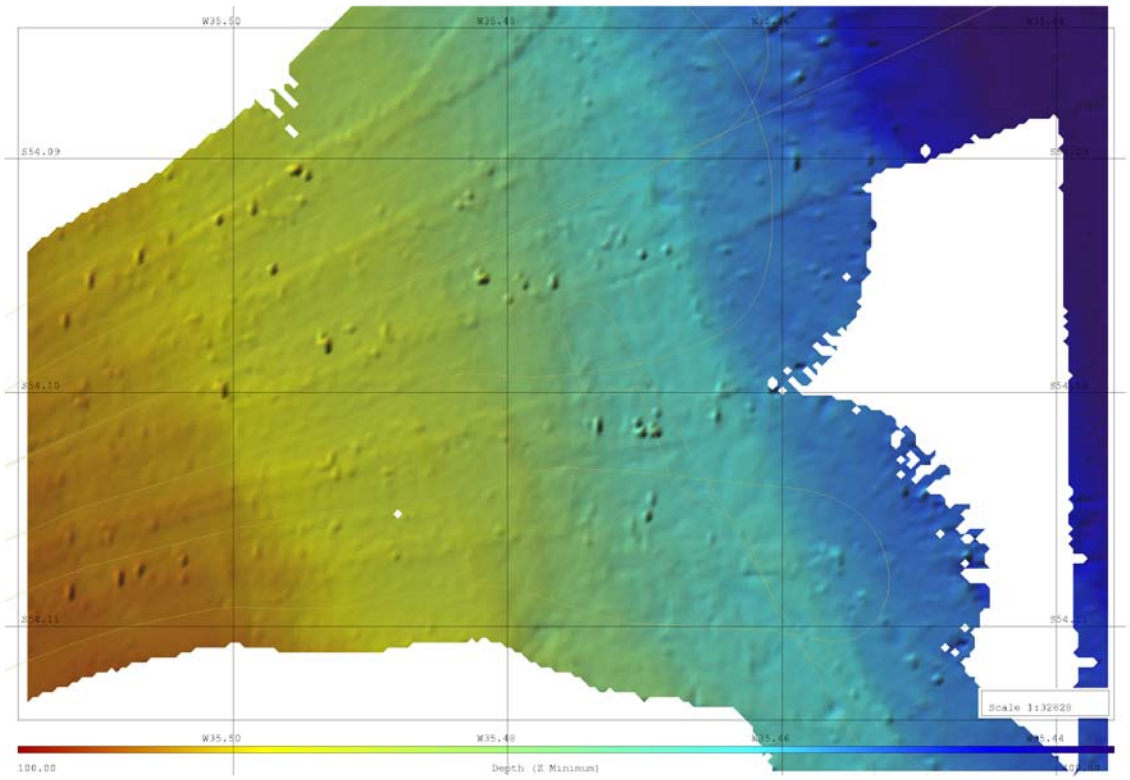


Figure 18: Site 24

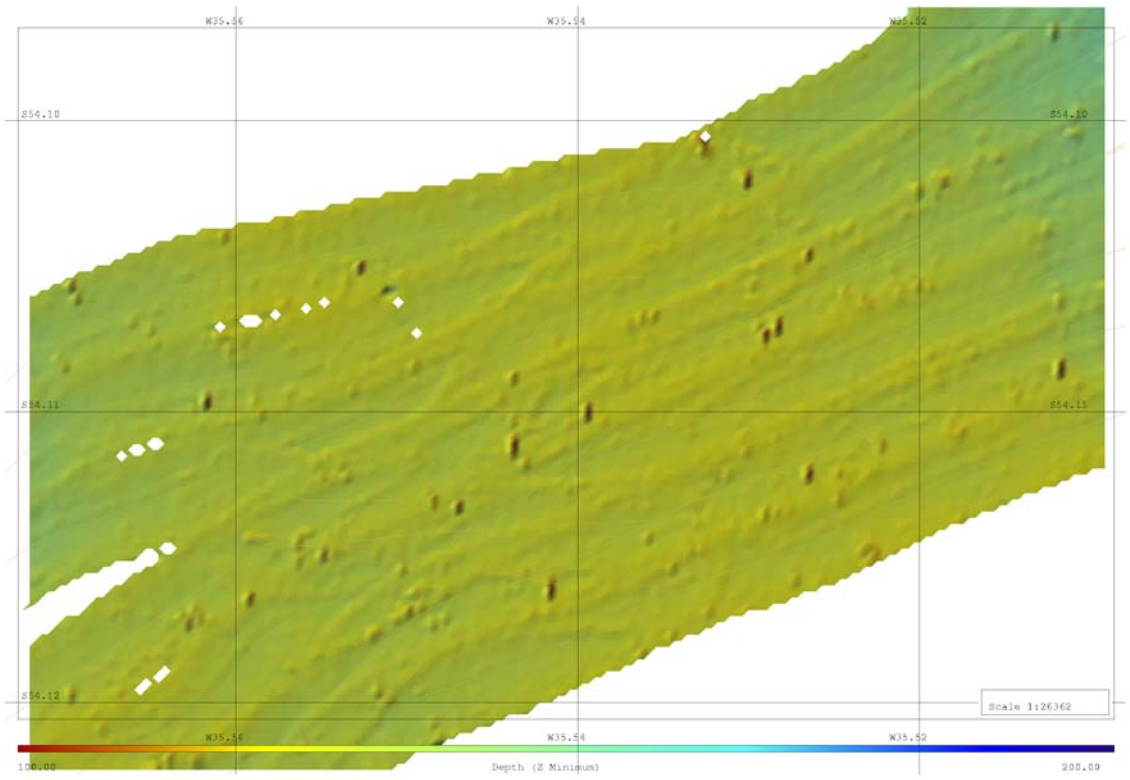


Figure 19: Site 31

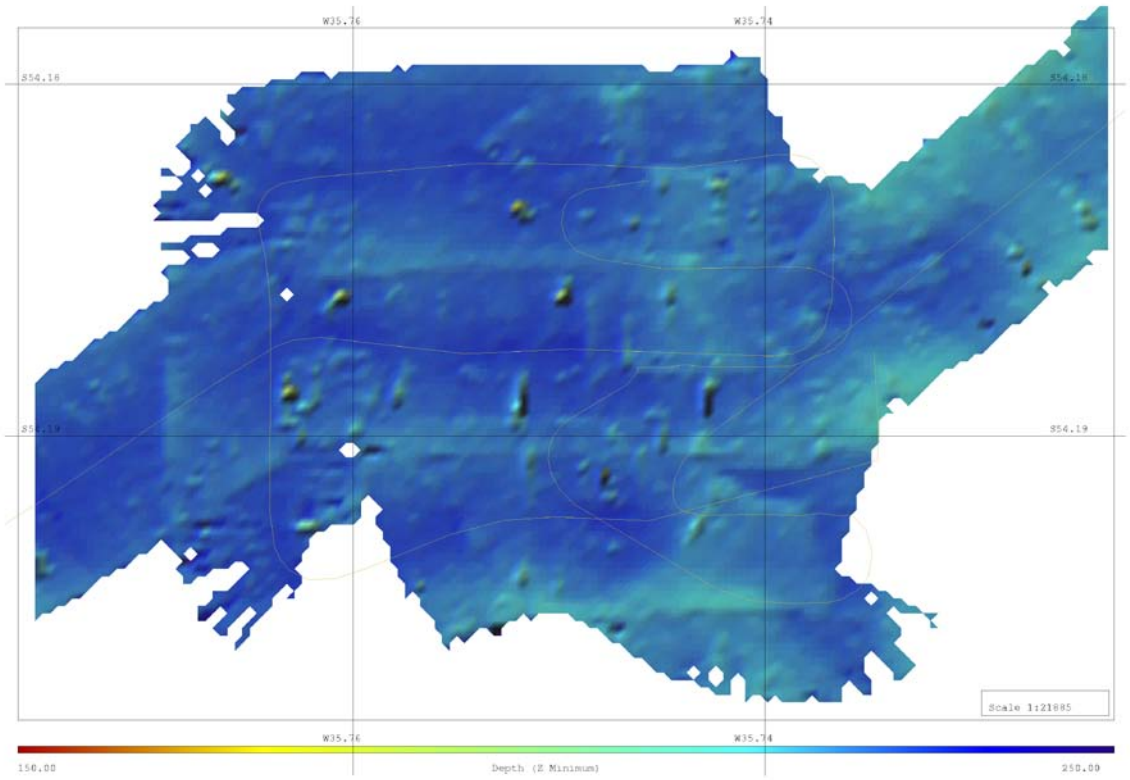


Figure 20: Site 32

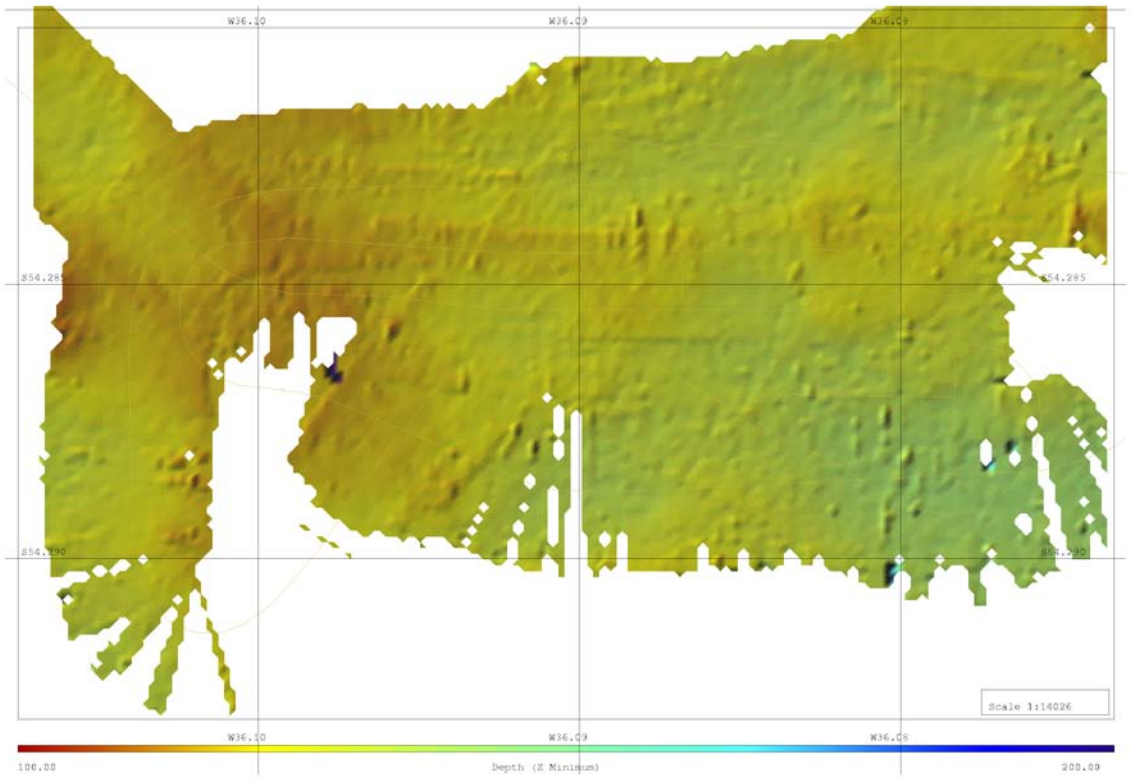


Figure 21: Site 33

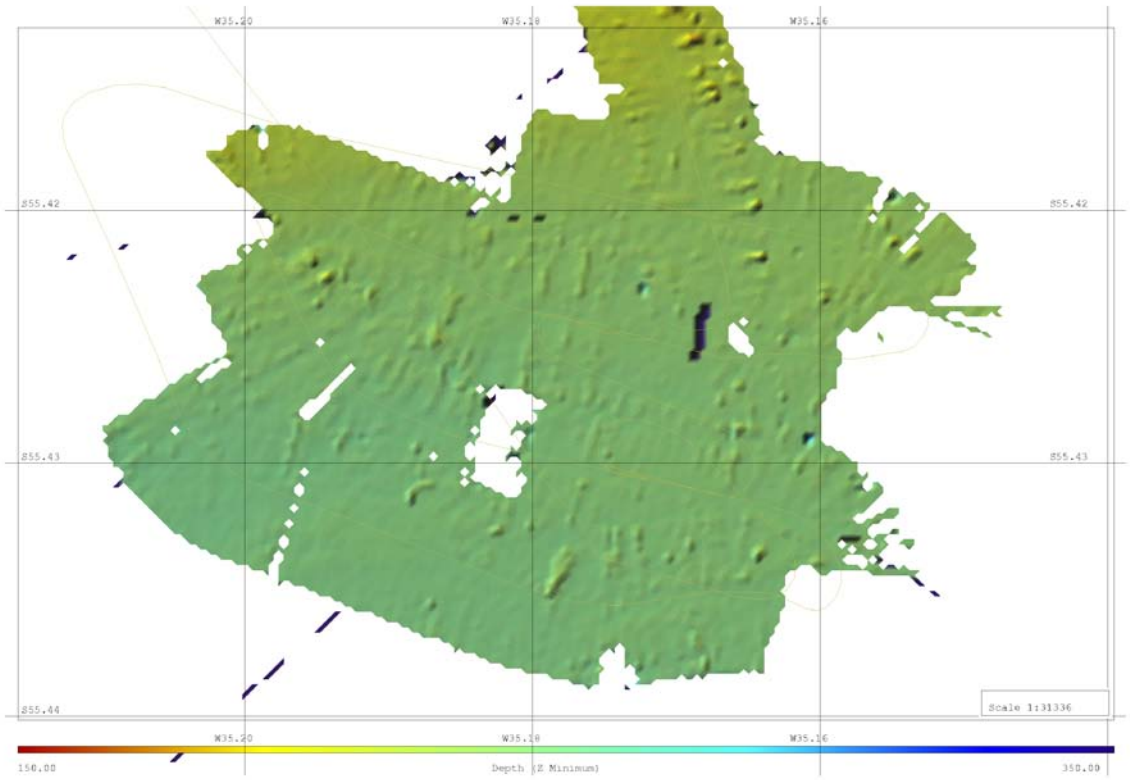


Figure 22: Site 34

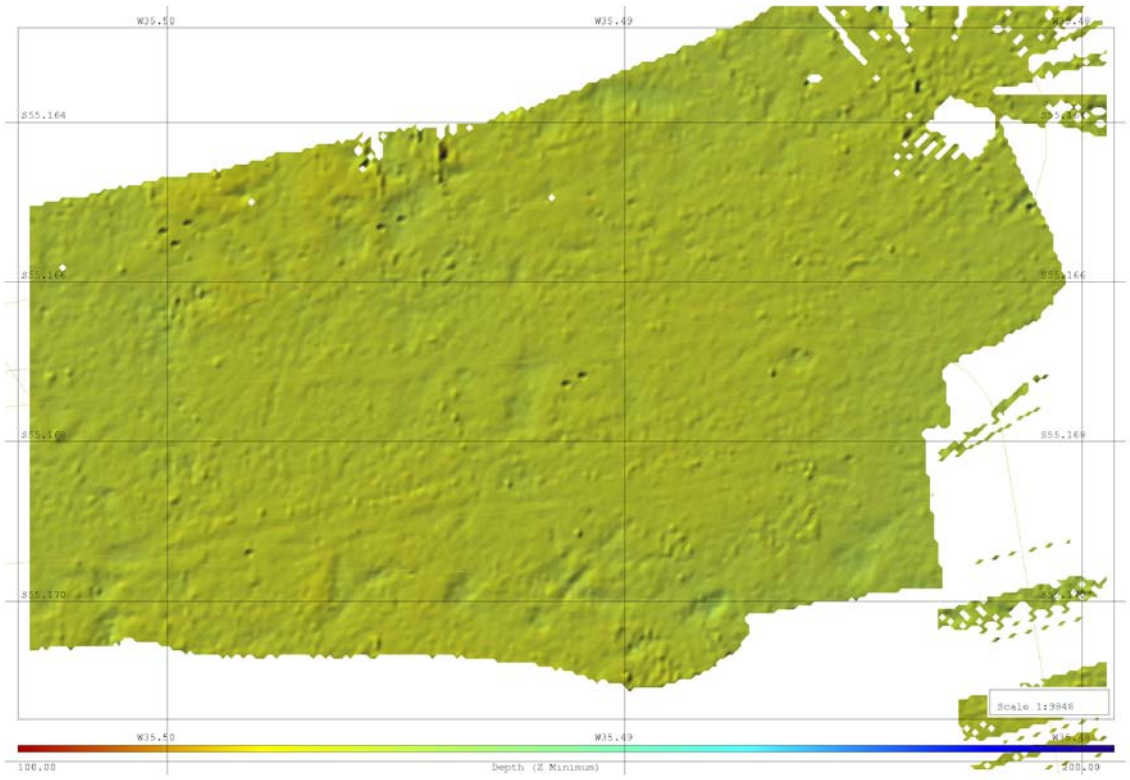


Figure 23: Site 35

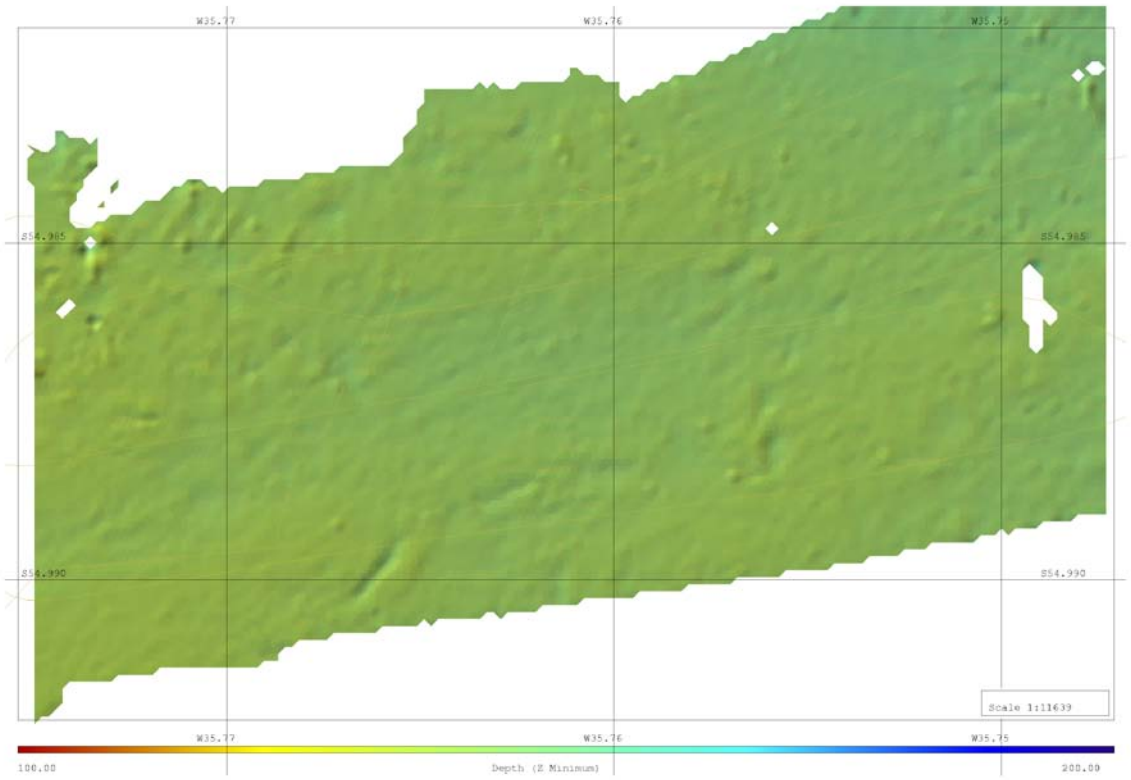


Figure 24: Site 36

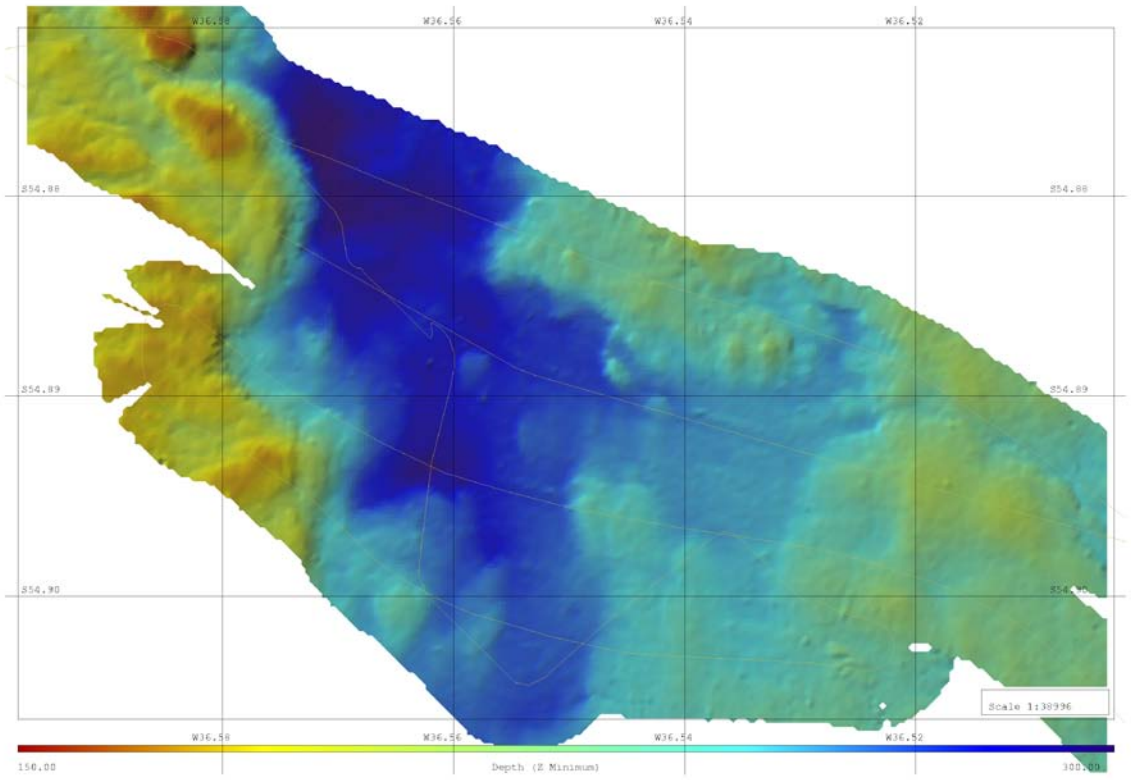


Figure 25: Site SReast

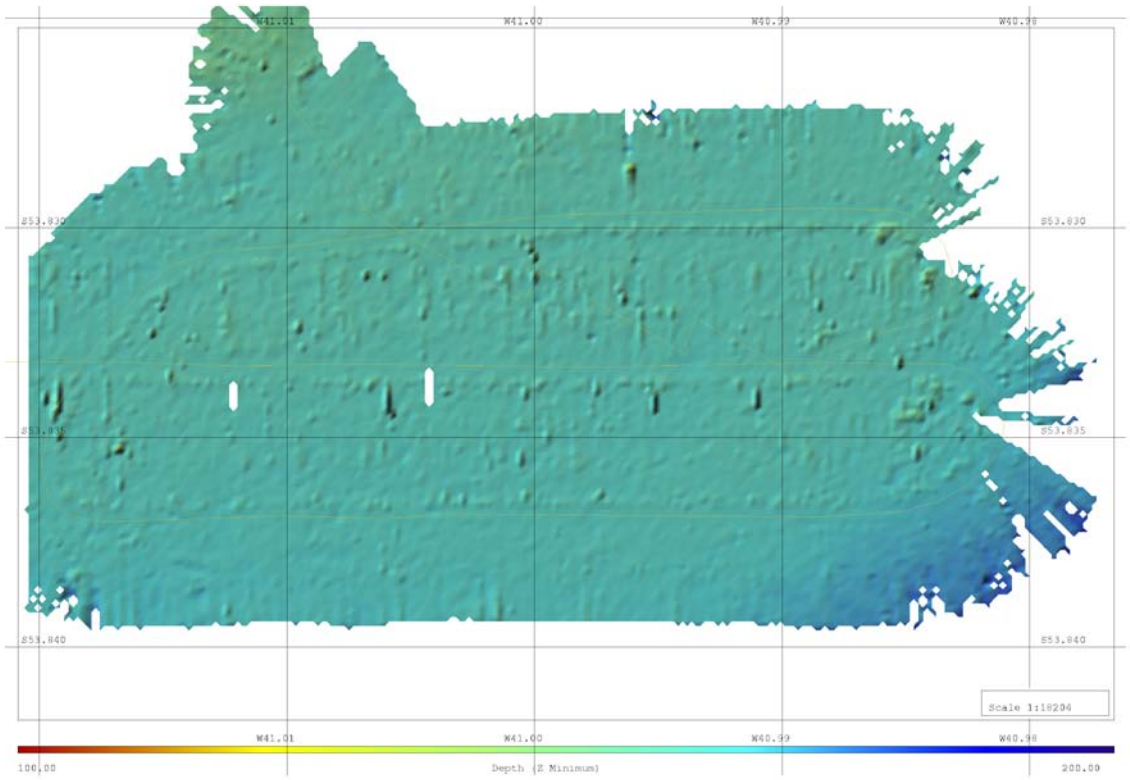


Figure 26: Site SRnorth

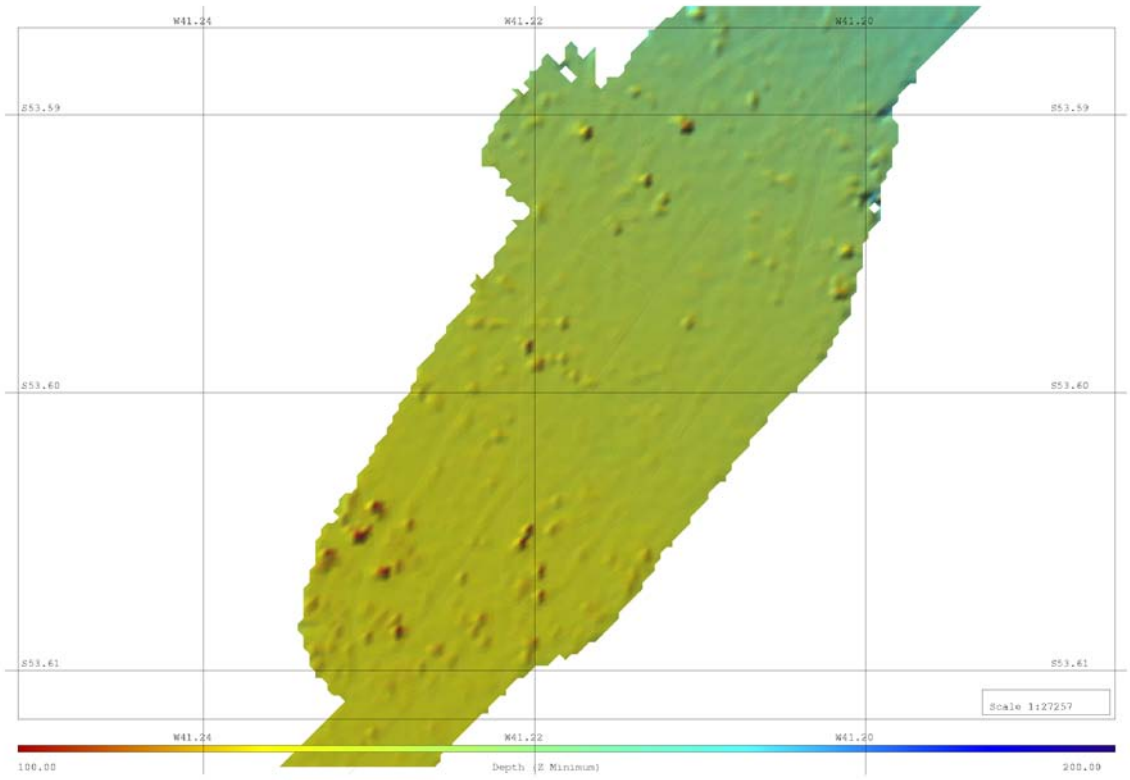


Figure 27: Site SRsouth

Appendix 2 – event log and details
AGT

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
11:59:51 12/11/2011	-53.82971	-41.00648	SR3	121	160.61	22.3	0.46	-2	AGT Recovered
11:55:25 12/11/2011	-53.83000	-41.00556	SR3	121	159.86	23.8	0.58	160	Off Bottom
11:48:21 12/11/2011	-53.83074	-41.00345	SR3	121	163.19	20.6	1.00	240	start Trawl
11:42:11 12/11/2011	-53.83143	-41.00140	SR3	121	161.94	22.8	0.62	166	on Bottom
11:37:00 12/11/2011	-53.83176	-41.00049	SR3	121	162.79	22.7	0.05	5	AGT Deployed
11:17:58 12/11/2011	-53.83114	-40.99935	SR3	120	161.94	22.1	0.44	-59	AGT Recovered
11:13:25 12/11/2011	-53.83145	-40.99843	SR3	120	163.98	21.4	0.52	151	AGT off the bottom
11:08:32 12/11/2011	-53.83182	-40.99729	SR3	120	162.81	20.4	0.95	250	AGT stop trawl
11:03:27 12/11/2011	-53.83248	-40.99536	SR3	120	162.98	20.5	0.58	250	start trawl
11:00:16 12/11/2011	-53.83255	-40.99510	SR3	120	162.55	22.2	0.59	208	AGT on bottom
10:54:27 12/11/2011	-53.83303	-40.99377	SR3	120	164.76	21.1	0.27	-17	AGT Deployed
10:38:21 12/11/2011	-53.83219	-40.99329	SR3	119	163.36	21.7	0.27	-4	AGT Recovered
10:34:00 12/11/2011	-53.83239	-40.99277	SR3	119	164.70	20.4	0.49	159	Off Bottom
10:30:19 12/11/2011	-53.83256	-40.99224	SR3	119	164.06	22.0	1.09	240	stop trawl
10:28:11 12/11/2011	-53.83286	-40.99133	SR3	119	163.64	22.4	0.99	240	start Trawl
10:25:47 12/11/2011	-53.83305	-40.99080	SR3	119		20.7	0.49	165	on Bottom
10:21:03 12/11/2011	-53.83335	-40.98988	SR3	119	163.26	19.7	0.26	-3	AGT Deployed
10:21:03 12/11/2011	-53.83335	-40.98988	SR3	119	163.26	19.7	0.26	-3	AGT Deployed
06:02:34 12/11/2011	-53.83784	-41.58996	SR2	117	228.41	16.4	0.23	2	AGT Recovered

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
05:56:53 12/11/2011	-53.83785	-41.58917	SR2	117	228.15	17.8	0.39	221	AGT off the bottom
05:51:06 12/11/2011	-53.83785	-41.58810	SR2	117	227.21	16.8	1.10	340	start Trawl
05:46:06 12/11/2011	-53.83788	-41.58573	SR2	117	226.36	16.0	0.83	340	start Trawl
05:42:07 12/11/2011	-53.83787	-41.58469	SR2	117	226.19	17.5	0.41	228	on Bottom
05:35:38 12/11/2011	-53.83785	-41.58320	SR2	117	227.93	15.9	0.18	-4	AGT Deployed
05:20:06 12/11/2011	-53.84035	-41.58820	SR2	116		15.3	0.14	-3	AGT Recovered
05:14:08 12/11/2011	-53.84035	-41.58740	SR2	116	229.04	15.7	0.37	224	Off Bottom
05:08:46 12/11/2011	-53.84036	-41.58641	SR2	116	228.28	14.2	1.07	340	stop trawl
05:06:46 12/11/2011	-53.84036	-41.58545	SR2	116	228	18.5	0.87	340	start Trawl
05:03:06 12/11/2011	-53.84037	-41.58451	SR2	116	227.73	15.9	0.46	230	on Bottom
04:55:43 12/11/2011	-53.84041	-41.58287	SR2	116	228		0.33	-8	AGT Deployed
04:36:01 12/11/2011	-53.84262	-41.58859	SR2	115	230	15.8	0.21	-3	AGT Recovered
04:29:54 12/11/2011	-53.84265	-41.58777	SR2	115	230.13	15.6	0.55	229	Off Bottom
04:24:34 12/11/2011	-53.84262	-41.58673	SR2	115	232.16	14.4	1.12	340	stop trawl
04:22:32 12/11/2011	-53.84259	-41.58575	SR2	115	230.15	17.6	1.00	340	start Trawl
04:18:48 12/11/2011	-53.84259	-41.58480	SR2	115	230	17.1	0.59	231	on Bottom
04:11:25 12/11/2011	-53.84256	-41.58317	SR2	115	230.27	17.9	0.28	-11	AGT Deployed
00:19:21 12/11/2011	-53.60353	-41.21374	SR1	113	128	14.6	0.62	-16	AGT on deck
00:14:34 12/11/2011	-53.60322	-41.21334	SR1	113	128.01	18.8	0.61	127	AGT off the bottom
00:10:16 12/11/2011	-53.60281	-41.21288	SR1	113	128.89	20.2	1.06	210	Stop trawl
00:08:13 12/11/2011	-53.60233	-41.21232	SR1	113	128.78	18.7	0.92	210	Start trawl

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
00:05:22 12/11/2011	-53.60193	-41.21184	SR1	113	129.75	19.7	0.40	142	AGT on the bottom
00:00:06 12/11/2011	-53.60138	-41.21116	SR1	113	129	20.4	0.13	-8	AGT deployed
23:12:48 11/11/2011	-53.84035	-41.58740	SR1	112	229.04	15.7	0.37	224	AGT on deck
23:07:54 11/11/2011	-53.59894	-41.21593	SR1	112	131.39	17.6	0.43	121	AGT off the bottom
23:03:24 11/11/2011	-53.59850	-41.21542	SR1	112	132.00	22.0	1.05	210	Stop trawl
22:58:21 11/11/2011	-53.59737	-41.21406	SR1	112	132.83	23.1	0.80	210	Start trawl
22:56:03 11/11/2011	-53.59705	-41.21370	SR1	112	132.30	18.0	0.45	145	AGT on the bottom
22:51:45 11/11/2011	-53.59660	-41.21318	SR1	112	132	21.1	0.43	-5	AGT deployed
22:27:16 11/11/2011	-53.59478	-41.21739	SR1	111	134.08	17.5	0.41	-17	AGT on deck
22:22:22 11/11/2011	-53.59445	-41.21699	SR1	111	134.85	13.6	0.17	124	AGT off the bottom
22:18:31 11/11/2011	-53.59412	-41.21661	SR1	111	134.97	17.7	1.01	210	stop trawl
22:16:24 11/11/2011	-53.59364	-41.21604	SR1	111	137.04	19.8	0.96	210	Start trawl
22:14:21 11/11/2011	-53.59337	-41.21573	SR1	111	140.29	16.6	0.48	158	AGT on the bottom
22:09:18 11/11/2011	-53.59283	-41.21511	SR1	111	142.03	20.5	0.20		AGT deployed
14:40:01 10/11/2011	-54.57619	-39.10378	1	107	278.43	13.0	0.3	400	AGT stop trawl
14:40:01 10/11/2011	-54.57619	-39.10378	1	107	278.43	13.0	0.3	400	AGT off seabed
14:33:47 10/11/2011	-54.57753	-39.10208	1	107	278.35	13.7	1.0	400	AGT start trawl
14:30:50 10/11/2011	-54.57785	-39.10168	1	107	280	14.0		285	AGT on bottom
14:02:53 10/11/2011	-54.57768	-39.09744	1	107	280	12.9	0.29	-7	AGT deployed
13:52:53 10/11/2011	-54.56392	-39.02208	1	106	209.55	14.6	0.35	-10	AGT Recovered
13:43:26 10/11/2011	-54.57986	-39.09427	1	106	274.19	13.6		400	AGT start trawl

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
13:43:26 10/11/2011	-54.57986	-39.09427	1	106	274.19	13.6		400	AGT stop trawl
13:43:26 10/11/2011	-54.57986	-39.09427	1	106	274.19	13.6		400	AGT off seabed
13:40:27 10/11/2011	-54.58024	-39.09375	1	106	274.14	14.3	0.58	287	AGT on bottom
13:33:25 10/11/2011	-54.58099	-39.09268	1	106	275.05	14.8	0.33	10	AGT deployed
11:54:25 10/11/2011	-54.55013	-39.02900	2	104		14.7	0.31	-7	AGT Recovered
11:49:03 10/11/2011	-54.55060	-39.02908	2	104	203.81	16.7	0.30	199	Off Bottom
11:44:12 10/11/2011	-54.55109	-39.02916	2	104	203.62	14.7	0.88	310	stop trawl
11:39:39 10/11/2011	-54.55236	-39.02938	2	104	204.91	15.9	0.75	310	start Trawl
11:32:24 10/11/2011	-54.55390	-39.02961	2	104	206.90	16.6	0.16	25	on Bottom
11:27:15 10/11/2011	-54.55392	-39.02963	site 2	104	207.24	15.5	0.05	-2	AGT Deployed
11:03:54 10/11/2011	-54.55482	-39.02503	site 2	103	209.44	14.5	0.30	-7	AGT Recovered
10:58:21 10/11/2011	-54.55528	-39.02508	site 2	103	205.50	14.1	0.20	204	Off Bottom
10:52:37 10/11/2011	-54.55902	-39.02458	site 2	103	206.69	15.1	0.68	-17	stop trawl
10:47:47 10/11/2011	-54.55724	-39.02537	site 2	103	205.54	15.9	0.99	320	start Trawl
10:44:05 10/11/2011	-54.55782	-39.02547	site 2	103	207.34	15.5	0.48	212	on Bottom
10:28:15 10/11/2011	-54.55902	-39.02458	site 2	103	206.69	15.1	0.68	-17	AGT Deployed
10:18:01 10/11/2011	-54.55935	-39.02151	2	102	205.96	13.9	0.24	-17	AGT on deck
10:11:08 10/11/2011	-54.55993	-39.02158	2	102	206.79	14.9	0.25	213	AGT off the bottom
10:06:24 10/11/2011	-54.56046	-39.02167	2	102	207.71	15.5	0.85	310	stop trawl
10:01:13 10/11/2011	-54.56189	-39.02190	2	102	207.76	15.8	0.92	310	start trawl
09:57:25 10/11/2011	-54.56249	-39.02197	2	102	208.51	13.7	0.50	210	AGT on the bottom

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
09:51:26 10/11/2011	-54.56330	-39.02205	2	102	210.30	14.0	0.36	-4	AGT deployed
06:01:54 10/11/2011	-54.51247	-38.85108	3	99	227.51	13.2		-12	AGT Recovered
05:55:12 10/11/2011	-54.51299	-38.85151	3	99	228.36	13.0	0.30	236	Off Bottom
05:49:52 10/11/2011	-54.51347	-38.85190	3	99	228.17	14.5	0.97	345	Stop Trawl
05:44:45 10/11/2011	-54.51479	-38.85294	3	99	230.70	12.8	0.76	345	Start Trawl
05:41:00 10/11/2011	-54.51530	-38.85334	3	99	229.40	14.9	0.51	232	On Bottom
05:33:23 10/11/2011	-54.51620	-38.85401	3	99	229.97	14.9	0.28	-14	AGT Deployed
05:14:17 10/11/2011	-54.51770	-38.84852	3	98	228.61	13.4	0.31	-5	AGT Recovered
05:08:14 10/11/2011	-54.51816	-38.84884	3	98	228.47	13.7	0.36		Off Bottom
05:03:01 10/11/2011	-54.51867	-38.84912	3	98	227.95	13.8	0.99	345	Stop Trawl
05:00:57 10/11/2011	-54.51920	-38.84947	3	98	228.69	14.7	0.95	345	Start Trawl
04:57:28 10/11/2011	-54.51971	-38.84977	3	98	228.63		0.53	239	On Bottom
04:50:09 10/11/2011	-54.52060	-38.85031	3	98	229.34	13.4	0.28	-6	AGT Deployed
23:37:31 08/11/2011	-54.38830	-37.48677	site 9	96	375.15	24.9		-19	AGT on deck
23:26:40 08/11/2011	-54.38917	-37.48644	site 9	96	369.44	22.9		374	AGT off the bottom
23:21:45 08/11/2011	-54.38971	-37.48630	site 9	96	383.63	21.7		470	stop trawl
23:18:48 08/11/2011	-54.39045	-37.48605	site 9	96	354.68	20.2		470	start trawl
23:15:40 08/11/2011	-54.39088	-37.48592	site 9	96	351.66			349	AGT off the bottom
23:06:04 08/11/2011	-54.39215	-37.48554	site 9	96	342.70	24.5		-0	AGT deployed
22:16:32 08/11/2011	-54.39133	-37.48418	site 9	95	348.49	24.0		-20	AGT on deck
21:56:23 08/11/2011	-54.39295	-37.48370	site 9	95	340	22.7		316	AGT off the bottom

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
21:50:03 08/11/2011	-54.39353	-37.48352	9	95	335.66	26.5		470	stop trawl
21:48:12 08/11/2011	-54.39405	-37.48337	9	95	333.12	23.8		470	start trawl
21:44:21 08/11/2011	-54.39462	-37.48321	9	95	333.32	21.9		332	AGT on bottom
21:36:28 08/11/2011	-54.39569	-37.48290	9	95	326.74	23.6			AGT deployed
21:01:10 08/11/2011	-54.39533	-37.48145	9	94	325	21.4		-16	AGT on deck
20:49:29 08/11/2011	-54.39627	-37.48116	9	94	325	23.2		306	AGT off the bottom
20:42:29 08/11/2011	-54.39693	-37.48097	9	94	324.85	22.8		470	stop trawl
20:39:40 08/11/2011	-54.39768	-37.48073	9	94	324.12	21.4		470	Begin Trawl
20:36:03 08/11/2011	-54.39817	-37.48061	9	94	321.71			331	AGT on the bottom
20:26:09 08/11/2011	-54.39951	-37.48020	9	94	320	22.4		-8	AGT deployed
17:36:40 08/11/2011	-54.39477	-37.38527	site 10	91	185.09	30.7	0.33	-2	AGT Recovered
17:32:15 08/11/2011	-54.39510	-37.38494	site 10	91	181.31	25.3	0.28	169	Off Bottom
17:28:37 08/11/2011	-54.39545	-37.38455	site 10	91	178.79	25.4	0.96	225	stop trawl
17:26:35 08/11/2011	-54.39596	-37.38407	site 10	91	174.98	24.1	0.91	225	start Trawl
17:23:59 08/11/2011	-54.39623	-37.38380	site 10	91	172.29	18.8	0.30	171	on Bottom
17:19:31 08/11/2011	-54.39655	-37.38348	site 10	91	170.05	20.5	0.29		AGT Deployed
16:52:34 08/11/2011	-54.40109	-37.36983	site 10	90	174.96	23.8	0.17	-6	AGT Recovered
16:47:48 08/11/2011	-54.39530	-37.37692	site 10	90	163.41	18.1	0.98	240	Off Bottom
16:42:49 08/11/2011	-54.40191	-37.36900	site 10	90	183.59	23.3	1.06	285	stop trawl
16:40:47 08/11/2011	-54.40242	-37.36850	site 10	90	188.02	23.7	1.05	285	start Trawl
16:37:16 08/11/2011	-54.40276	-37.36816	site 10	90	189.01	25.5	0.40	196	on Bottom

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
16:32:04 08/11/2011	-54.40313	-37.36777	site 10	90	189.27	20.2	0.24		AGT Deployed
15:46:11 08/11/2011	-54.39487	-37.37825	site 10	89	166.44	20.5	0.32	-7	AGT Recovered
15:41:54 08/11/2011	-54.39508	-37.37771	site 10	89	164.23	17.0	0.39	157	Off Bottom
15:37:23 08/11/2011	-54.39530	-37.37692	site 10	89	163.41	18.1	0.98	240	stop trawl
15:32:23 08/11/2011	-54.39596	-37.37481	site 10	89		18.8	0.77	240	start Trawl
15:29:15 08/11/2011	-54.39614	-37.37432	site 10	89	161.01	19.8	0.31	162	on Bottom
15:24:47 08/11/2011	-54.39633	-37.37377	site 10	89	160.75	19.0	0.27	-5	AGT Deployed
11:38:20 08/11/2011	-54.37814	-37.25383	11	86	269.32	16.3		-10	AGT Recovered
11:30:58 08/11/2011	-54.37831	-37.25282	11	86	268.50	14.4		268	Off Bottom
11:24:36 08/11/2011	-54.37845	-37.25171	11	86	269.13	15.3		410	Stop Trawl
11:19:37 08/11/2011	-54.37882	-37.24942	11	86	268.91	10.7		410	Start Trawl
11:15:02 08/11/2011	-54.37899	-37.24826	11	86	272.86	14.5		270	On Bottom
11:07:40 08/11/2011	-54.37922	-37.24678	11	86	295.60	14.2		-7	AGT Deployed
10:31:14 08/11/2011	-54.38815	-37.26624	11	85	271.12	19.2		250	AGT off seabed
10:24:22 08/11/2011	-54.38833	-37.26515	11	85	324.97	20.2		420	AGT stop trawl
10:18:49 08/11/2011	-54.38874	-37.26263	11	85	278.63	21.5		420	AGT start trawl
10:14:50 08/11/2011	-54.38888	-37.26170	11	85	273.04	19.5		272	AGT on bottom
10:06:36 08/11/2011	-54.38915	-37.25995	11	85	279.86	22.2		-14	AGT in water
09:39:15 08/11/2011	-54.38441	-37.26096	11	84	271.53	21.6		-11	AGT Recovered
09:31:12 08/11/2011	-54.38450	-37.25981	11	84	276.67	19.7		268	Off Bottom
09:25:11 08/11/2011	-54.38462	-37.25888	11	84	273.84	25.2		420	Stop Trawl

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
09:20:48 08/11/2011	-54.38483	-37.25680	11	84	272.19	23.9		420	Start Trawl
09:16:33 08/11/2011	-54.38495	-37.25571	11	84	276.71	23.8		276	On Bottom
09:08:46 08/11/2011	-54.38513	-37.25395	11	84	278.61	22.2		-7	AGT Deployed
02:41:56 08/11/2011	-54.92955	-37.26870	site 13	83	244.99		0.30	-5	AGT Recovered
02:35:25 08/11/2011	-54.92997	-37.26808	site 13	83	241.98	13.8	0.33	238	Off Bottom
02:29:34 08/11/2011	-54.93042	-37.26741	site 13	83	242.25	16.0	1.03	360	stop trawl
02:27:34 08/11/2011	-54.93087	-37.26678	site 13	83	243.40	15.5	1.05	360	start Trawl
02:23:21 08/11/2011	-54.93138	-37.26603	site 13	83	243.23	16.0	0.59	232	on Bottom
02:16:00 08/11/2011	-54.93210	-37.26495	site 13	83	240.59	15.7	0.27	-7	AGT Deployed
01:55:55 08/11/2011	-54.93563	-37.26054	site 13	82	215.77	16.7	0.25	-1	AGT Recovered
01:50:06 08/11/2011	-54.93599	-37.26001	site 13	82	215.86	18.4	0.31	210	Off Bottom
01:44:50 08/11/2011	-54.93642	-37.25940	site 13	82	219.90		1.01		stop trawl
01:42:51 08/11/2011	-54.93684	-37.25878	site 13	82	217.08	18.3	1.06	320	start Trawl
01:39:16 08/11/2011	-55.00091	-37.29152	site 13	82	148.73	22.7	0.24	13	on Bottom
01:33:22 08/11/2011	-54.93789	-37.25724	site 13	82	215.10	16.6	0.32	1	AGT Deployed
01:06:19 08/11/2011	-54.93936	-37.26902	site 13	81	218.56	18.8	0.28	-12	AGT Recovered
00:59:42 08/11/2011	-54.93979	-37.26839	site 13	81	215.97	17.7	0.24	209	Off Bottom
00:54:01 08/11/2011	-54.94031	-37.26769	site 13	81	214.72		1.02	320	stop trawl
00:51:55 08/11/2011	-54.94076	-37.26701	site 13	81	214.32	21.4	0.89	320	start Trawl
00:48:07 08/11/2011	-54.94122	-37.26633	site 13	81		18.9	0.49	217	on Bottom
00:41:54 08/11/2011	-54.94186	-37.26542	site 13	81	214.04	19.4	0.30	-4	AGT Deployed

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
22:07:46 07/11/2011	-55.00091	-37.29152	site 14	79	148.73	22.7	0.24	13	AGT Recovered
22:04:25 07/11/2011	-55.00107	-37.29112	site 14	79	147	18.9	0.29	142	Off Bottom
22:00:32 07/11/2011	-55.00121	-37.29048	site 14	79	146.91	21.4	0.98	225	stop trawl
21:58:25 07/11/2011	-55.00152	-37.28962	site 14	79	148.74		0.99	225	start Trawl
21:55:33 07/11/2011	-55.00176	-37.28894	site 14	79	147.09	24.5	0.49	146	on Bottom
21:51:39 07/11/2011	-55.00200	-37.28815	site 14	79	146.59	21.0	0.28	-1	AGT Deployed
21:35:48 07/11/2011	-55.00237	-37.28412	site 14	78	145.91	19.2	0.27		AGT Recovered
21:32:09 07/11/2011	-55.00247	-37.28363	site 14	78	144.86	21.6	0.30	141	Off Bottom
21:28:24 07/11/2011	-55.00176	-37.27148	site 14	78	144.19	20.9	0.40	144	stop trawl
21:26:08 07/11/2011	-55.00277	-37.28196	site 14	78	145.87	20.7	1.06	225	start Trawl
21:23:09 07/11/2011	-55.00296	-37.28115	site 14	78	145	20.1	0.54	150	on Bottom
21:19:00 07/11/2011	-55.00318	-37.28024	site 14	78	144.45	21.5	0.30	-1	AGT Deployed
20:57:15 07/11/2011	-55.00112	-37.27448	site 14	77	144.46	22.0	0.30	-9	AGT Recovered
20:53:35 07/11/2011	-55.00123	-37.27399	site 14`	77	144.63	21.2	0.26	131	Off Bottom
20:49:13 07/11/2011	-55.00140	-37.27318	site 14	77	144.09	21.5	0.96	225	stop trawl
20:47:10 07/11/2011	-55.00160	-37.27228	site 14	77	148.81	21.8	0.85	225	start Trawl
20:43:58 07/11/2011	-55.00176	-37.27148	site 14	77	144.19	20.9	0.40	144	on Bottom
20:39:48 07/11/2011	-55.00196	-37.27059	site 14	77	145.77	20.4	0.30	-3	AGT Deployed
16:59:54 07/11/2011	-55.03017	-37.17808	Site 12	74	237.33	18.6	0.30	-6	AGT Recovered
16:53:38 07/11/2011	-55.03055	-37.17743	Site 15	74	241.52	18.7	0.26	236	Off Bottom
16:47:38 07/11/2011	-55.03199	-37.17492	Site 15	74	244.29	18.6	0.84	370	Stop Trawl

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
16:42:43 07/11/2011	-55.03199	-37.17492	15	74	244.29	18.6	0.84	370	Start Trawl
16:38:34 07/11/2011	-55.03242	-37.17415	15	74	244.15	17.0	0.51	246	On Bottom
16:32:12 07/11/2011	-55.03299	-37.17316	15	74	244.59	16.2	0.32	-3	AgT Deployed
16:12:44 07/11/2011	-55.03566	-37.18267	15	73	280	16.5	0.36	-17	AGT on deck
16:04:23 07/11/2011	-55.03620	-37.18182	15	73	267.23	17.4	0.27	258	AGT clear of seabed
15:57:47 07/11/2011	-55.03667	-37.18101	15	73	280	18.2	1.03	420	AGT stop trawl
15:51:39 07/11/2011	-55.03786	-37.17897	15	73	280	17.6	0.45	420	AGT start trawl
15:49:50 07/11/2011	-55.03803	-37.17865	15	73	280	17.8	0.57	362	AGT on bottom
15:40:27 07/11/2011	-55.03888	-37.17710	15	73	277.11	15.7		-5	AGT Deployed
15:10:56 07/11/2011	-55.03993	-37.18737	15	72	293.01	16.4		-1	AGT Recovered
15:03:31 07/11/2011	-55.04039	-37.18661	15	72		16.2		284	Off Bottom
14:55:51 07/11/2011	-55.04094	-37.18564	15	72	294.34	15.2		460	Stop Trawl
14:50:53 07/11/2011	-55.04193	-37.18395	15	72	301.64	16.2		460	Start Trawl
14:46:23 07/11/2011	-55.04240	-37.18307	15	72	305.24	15.1		315	On Bottom
14:38:14 07/11/2011	-55.04291	-37.18217	15	72	309.62	14.3		-8	AGT Deployed
04:53:42 07/11/2011	-54.88400	-36.56736	Site 36	68	297.16	12.2		-5	AGT Recovered
04:38:26 07/11/2011	-54.88488	-36.56580	Site 36	68	297.68	10.8		270	Off Bottom
04:31:33 07/11/2011	-54.88536	-36.56495	Site 36	68	295.09			425	stop trawl
04:29:30 07/11/2011	-54.88576	-36.56425	Site 36	68	291.30	11.0		425	start Trawl
04:25:18 07/11/2011	-54.88621	-36.56349	Site 36	68	286.46	10.3		289	on Bottom
04:17:51 07/11/2011	-54.88693	-36.56224	Site 36	68	288.97	10.2		2	AGT Deployed

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
03:18:38 07/11/2011	-54.90136	-36.55969	Site 36	67	274.70	11.0		-2	AGT Recovered
03:11:28 07/11/2011	-54.90178	-36.55895	Site 36	67	263.46	10.4		266	Off Bottom
03:05:57 07/11/2011	-54.90209	-36.55840	Site 36	67	263.59	10.4		415	stop trawl
03:02:24 07/11/2011	-54.90270	-36.55736	Site 36	67	263	11.1		415	start Trawl
02:57:32 07/11/2011	-54.90322	-36.55648	site 36	67	271.42	10.2		275	on Bottom
02:49:38 07/11/2011	-54.90396	-36.55516	Site 36	67	276.33	10.0		-4	AGT Deployed
02:10:34 07/11/2011	-54.89731	-36.53467	Site 36	66	258.03	09.6	0.33	-10	AGT Recovered
02:03:34 07/11/2011	-54.89774	-36.53397	Site 36	66	257.66	11.0	0.40	254	Off Bottom
01:58:16 07/11/2011	-54.89812	-36.53329	Site 36	66	256.77	11.8	0.95	370	stop trawl
01:55:07 07/11/2011	-54.89875	-36.53219	Site 36	66	252.24	11.4	0.85	370	start Trawl
01:50:37 07/11/2011	-54.89924	-36.53135	Site 36	66	247.85	11.1	0.55	246	on Bottom
01:43:41 07/11/2011	-54.89990	-36.53019	36	66	243.53	10.5	0.33	-1	AGT Deployed
21:20:43 06/11/2011	-55.03393	-36.16512	Site 12.1	63	163.22	12.2	0.31		AGT Recovered
21:16:28 06/11/2011	-55.03404	-36.16454	Site 12.1	63	163.30	09.7	0.28	157	Off Bottom
21:12:00 06/11/2011	-55.03420	-36.16383	Site 12.1	63	162.24	12.6	0.98	243	stop trawl
21:08:54 06/11/2011	-55.03454	-36.16237	Site 12.1	63	163.02	11.0	1.18	243	start Trawl
21:05:51 06/11/2011	-55.03470	-36.16152	Site 12.1	63	160.57	10.4	0.51	165	on Bottom
21:01:09 06/11/2011	-55.03492	-36.16048	Site 12.1	63	161.63	09.9	0.18	-5	AGT Deployed
20:18:26 06/11/2011	-55.04104	-36.16832	Site 12.1	62	162.36	10.0	0.28	-5	AGT Recovered
20:14:01 06/11/2011	-55.04116	-36.16772	Site 12.1	62	162.31	10.2	0.43	159	Off Bottom
20:10:03 06/11/2011	-55.04131	-36.16706	Site 12.1	62	161.81	10.9	1.08	240	stop trawl

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
20:05:37 06/11/2011	-55.04173	-36.16501	Site 12.1	62		10.6	1.07	240	start Trawl
20:02:40 06/11/2011	-55.04187	-36.16424	Site 12.1	62	161.48	09.2	0.38	162	on Bottom
19:57:40 06/11/2011	-55.04209	-36.16315	Site 12.1	62		09.3	0.28	-10	AGT Deployed
19:08:28 06/11/2011	-55.04090	-36.15808	Site 12.1	61	161.86	07.4	0.27	1	AGT Recovered
19:04:00 06/11/2011	-55.04101	-36.15756	Site 12.1	61	162.39	08.4	0.32	147	Off Bottom
19:00:05 06/11/2011	-55.04123	-36.15675	Site 12.1	61	161.05	09.3	1.12	240	stop trawl
18:56:04 06/11/2011	-55.04164	-36.15491	Site 12.1	61	161.53	08.1	0.96	240	start Trawl
18:52:57 06/11/2011	-55.04180	-36.15413	Site 12.1	61	160.53	08.3	0.58	165	on Bottom
18:48:17 06/11/2011	-55.04199	-36.15320	Site 12.1	61	160.76	07.3	0.43	-3	AGT Deployed
16:11:49 06/11/2011	-55.14876	-36.25210	site 12	59	194.49	09.2	0.21	-13	AGT Recovered
16:06:24 06/11/2011	-55.14893	-36.25136	Site 12	59	197.46	10.4	0.39	192	Off Bottom
16:02:08 06/11/2011	-55.14910	-36.25055	Site 12	59	194.96	10.4	1.02	300	Stop Trawl
15:57:03 06/11/2011	-55.14959	-36.24821	Site 12	59	196.91	10.4	0.77	300	Start Trawl
15:53:23 06/11/2011	-55.14979	-36.24728	Site 12	59	198.56	11.4	0.50	199	On Bottom
15:47:53 06/11/2011	-55.15001	-36.24614	Site 12	59	196.22		0.17	-10	AGT Deployed
15:09:49 06/11/2011	-55.14368	-36.24801	SIte 12	58		10.8	0.33	-5	AGT Recovered
15:04:35 06/11/2011	-55.14383	-36.24729	SIte 12	58	194.59	09.8	0.27	187	Off Bottom
15:00:29 06/11/2011	-55.14395	-36.24676	Site 12	58	190.09	09.3	0.60	300	Stop Trawl
14:55:58 06/11/2011	-55.14435	-36.24486	SIte 12	58	195.21	11.1	1.03	300	Start Trawl
14:49:22 06/11/2011	-55.14469	-36.24307	SIte 12	58		10.1	0.55	201	On Bottom
14:42:49 06/11/2011	-55.14489	-36.24218	Site 12	58	196.37	10.6	0.50	-2	AGT Deployed

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
14:14:48 06/11/2011	-55.14041	-36.24755	SIte 12	57	188.11	10.8	0.45	-8	AGT Recovered
14:09:25 06/11/2011	-55.14056	-36.24681	SIte 12	57	187.84	09.7	0.27	194	Off Bottom
14:04:30 06/11/2011	-55.14073	-36.24601	Site 12	57	187.69	11.4	0.88	300	Stop Trawl
13:59:18 06/11/2011	-55.14124	-36.24362	Site 12	57	193.01	10.6	0.92	300	Start Trawl
13:54:44 06/11/2011	-55.14146	-36.24259	Site 12	57	196.93	09.9	0.30	199	On Bottom
13:49:17 06/11/2011	-55.14161	-36.24186	Site 12	57	194.24	11.3	0.46	-7	AGT Deployed
21:14:54 04/11/2011	-54.95643	-36.13313	Site 12.2	53		18.0		-1	AGT Recovered
21:07:25 04/11/2011	-54.95648	-36.13204	Site 12.2	53	307.65	20.0		299	Off Bottom
21:00:00 04/11/2011	-54.95655	-36.13082	Site 12.2	53	311.99	21.0		480	stop trawl
20:55:03 04/11/2011	-54.95667	-36.12845	Site 12.2	53	317.42	21.8		480	start Trawl
20:50:46 04/11/2011	-54.95672	-36.12728	Site 12.2	53	319.16	20.8		330	on Bottom
20:42:24 04/11/2011	-54.95683	-36.12529	Site 12.2	53	320.23			-4	AGT Deployed
20:14:03 04/11/2011	-54.95799	-36.12585	Site 12.2	52	316.54	21.9		-8	AGT Deployed
20:06:21 04/11/2011	-54.95832	-36.12488	Site 12.2	52	313.82	22.3		309	Off Bottom
19:59:33 04/11/2011	-54.95863	-36.12390	Site 12.2	52	315.03	23.8		470	stop trawl
19:54:34 04/11/2011	-54.95931	-36.12179	Site 12.2	52		25.4		470	start Trawl
19:49:30 04/11/2011	-54.95961	-36.12089	Site 12.2	52	319.21	18.1		325	on Bottom
19:42:44 04/11/2011	-54.96011	-36.11936	Site 12.2	52		22.5		-2	AGT Deployed
18:55:52 04/11/2011	-54.96381	-36.13889	Site 12.2	51				-7	AGT Recovered
18:48:51 04/11/2011	-54.96403	-36.13792	Site 12.2	51	295.78	20.9		294	Off Bottom
18:43:44 04/11/2011	-54.96413	-36.13724	Site 12.2	51	298.03	20.2		430	stop trawl

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
18:38:53 04/11/2011	-54.96460	-36.13507	Site 12.2	51	293.39	22.6		430	start Trawl
18:33:46 04/11/2011	-54.96480	-36.13418	Site 12.2	51	292.04	22.8		296	on Bottom
18:25:43 04/11/2011	-54.96502	-36.13308	Site 12.2	51	289.45	20.2		-5	
18:23:51 04/11/2011	-54.96507	-36.13283	Site 12.2	51	287.88	20.8		-17	stop trawl
10:17:26 04/11/2011	-54.98979	-35.77350	Site 35	45		11.1	0.36	-3	AGT Recovered
10:13:55 04/11/2011	-54.98974	-35.77298	Site 35	45	137.45	09.7	0.23	131	Off Bottom
10:11:25 04/11/2011	-54.98972	-35.77266	Site 35	45	138.05	10.7	0.17	200	Stop Trawl
10:08:55 04/11/2011	-54.98965	-35.77156	Site 35	45	137.36	09.3	0.90	200	Start Trawl
10:05:26 04/11/2011	-54.98960	-35.77030	Site 35	45	138.46	12.5	0.52	140	On Bottom
10:01:01 04/11/2011	-54.98954	-35.76929	Site 35	45	135.97	11.2	0.41	-7	AGT Deployed
09:30:11 04/11/2011	-54.98445	-35.76447	35	44	138.97	14.2	0.21	-13	AGT Recovered
09:26:13 04/11/2011	-54.98445	-35.76389	SIte 35	44	140.00	13.7	0.31	132	Off Bottom
09:22:26 04/11/2011	-54.98444	-35.76320	SIte 35	44	139.91	17.2	0.91	210	Stop Trawl
09:20:11 04/11/2011	-54.98440	-35.76209	SIte 35	44	139.38	18.8	0.62	210	Start Trawl
09:17:54 04/11/2011	-54.98439	-35.76153	SIte 35	44	139.14	15.4	0.49	146	On Bottom
09:12:59 04/11/2011	-54.98436	-35.76048	Site 35	44	139.54	23.6	0.35	-10	AGT Deployed
08:25:30 04/11/2011	-54.98724	-35.76338	site 35	43	142.39	21.7	0.40	-12	AGT Recovered
08:21:19 04/11/2011	-54.98716	-35.76279	Site 35	43	141.57		0.21	136	Off Bottom
08:17:55 04/11/2011	-54.98710	-35.76221	SIte 35	43	142.30		1.08	210	Stop Trawl
08:12:50 04/11/2011	-54.98683	-35.75976	SIte 35	43	142.55	33.9	0.77	210	Start Trawl
08:10:43 04/11/2011	-54.98676	-35.75921	SIte 35	43	143.17	24.1	0.47	147	On Bottom

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
08:05:24 04/11/2011	-54.98665	-35.75804	Site 35	43	141.83	28.7	0.28	-14	AGT Deployed
04:17:12 04/11/2011	-55.16906	-35.48778	Site 34	42		33.6	0.17	-2	AGT Recovered
04:13:53 04/11/2011	-55.16900	-35.48731	Site 34	42	128.01		0.33	126	Off Bottom
04:09:39 04/11/2011	-55.16893	-35.48648	Site 34	42	131.43		0.99	200	stop trawl
04:07:39 04/11/2011	-55.16885	-35.48549	Site 34	42	128.92		1.24	200	start Trawl
04:04:52 04/11/2011	-55.16875	-35.48467	Site 34	42		32.8	0.07	134	on Bottom
04:00:19 04/11/2011	-55.16867	-35.48366	Site 34	42	130.99	08.5	0.21	-1	AGT Deployed
03:20:04 04/11/2011	-55.16711	-35.48769	Site 34	41		21.8	0.02	-1	AGT Recovered
03:16:36 04/11/2011	-55.16705	-35.48722	Site 34	41	126.88		0.38	129	Off Bottom
03:12:42 04/11/2011	-55.16696	-35.48642	Site 34	41	127.66	42.1	0.90	195	stop trawl
03:10:41 04/11/2011	-55.16688	-35.48545	Site 34	41	126.84		1.21	195	start Trawl
03:07:56 04/11/2011	-55.16678	-35.48467	Site 34	41	128.70	16.8	0.63	133	on Bottom
03:03:40 04/11/2011	-55.16668	-35.48368	Site 34	41	128.72	25.8	0.25	-2	AGT Deployed
01:58:00 04/11/2011	-55.16645	-35.48904	Site 34	40	129.41	23.6	0.24		AGT Recovered
01:54:50 04/11/2011	-55.16643	-35.48860	Site 34	40	126.57	24.9	0.33	119	Off Bottom
01:50:39 04/11/2011	-55.16635	-35.48781	Site 34	40	126.99		1.20	192	stop trawl
01:45:36 04/11/2011	-55.16612	-35.48537	Site 34	40		26.0	1.12	192	start Trawl
01:42:56 04/11/2011	-55.16601	-35.48463	Site 34	40	127.56	20.9	0.65	129	on Bottom
01:37:27 04/11/2011	-55.16645	-35.48904	Site 34	40	129.41	23.6	0.24	-3	AGT Deployed
21:45:15 03/11/2011	-55.43371	-35.17521	Site 33	39		29.5	0.44	-12	AGT Recovered
21:37:42 03/11/2011	-55.43387	-35.17415	Site 33	39	250.94	28.9	0.39	241	Off Bottom

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
21:32:12 03/11/2011	-55.43403	-35.17323	Site 33	39	250.93	26.4	1.08	375	Stop Trawl
21:26:50 03/11/2011	-55.43439	-35.17076	Site 33	39	249.53	26.9	0.75	375	Start Trawl
21:22:49 03/11/2011	-55.43456	-35.16973	Site 33	39	248.87	27.0	0.62	210	On Bottom
21:17:34 03/11/2011	-55.43477	-35.16848	Site 33	39	247.78	34.6	0.11	10	AGT Deployed
20:48:30 03/11/2011	-55.43011	-35.17438	Site 33	38	245.96	29.8	-0.02	-14	AGT Recovered
20:41:54 03/11/2011	-55.43025	-35.17345	Site 33	38	245.73	27.7	0.18	240	Off Bottom
20:36:31 03/11/2011	-55.43039	-35.17257	Site 33	38	245.49	30.8	0.95	370	Stop Trawl
20:31:30 03/11/2011	-55.43078	-35.17021	Site 33	38	244.59	34.7	0.85	370	Start Trawl
20:28:01 03/11/2011	-55.43091	-35.16929	Site 33	38	246.44	35.1	0.61	255	On Bottom
20:18:37 03/11/2011	-55.43119	-35.16727	Site 33	38	246.02	29.1	0.40	-10	AGT Deployed
19:46:01 03/11/2011	-55.42476	-35.17384	Site 33	37	243.77	25.2	0.39	-19	AGT Recovered
19:38:22 03/11/2011	-55.42492	-35.17270	Site 33	37	249.33	27.5	0.04	221	Off Bottom
19:33:12 03/11/2011	-55.42507	-35.17191	Site 33	37	244.65	27.9	1.17	360	Stop Trawl
19:28:48 03/11/2011	-55.42536	-35.16978	Site 33	37	248.90	28.4	0.59	360	Start Trawl
19:24:52 03/11/2011	-55.42552	-35.16874	Site 33	37	243.99	29.6	0.52	240	On Bottom
19:17:29 03/11/2011	-55.42577	-35.16709	site33	37		27.3	0.24	-11	AGT Deployed
12:54:02 03/11/2011	-54.68256	-35.11816	Site 22	36	307.97	25.6		-14	AGT Recovered
12:45:31 03/11/2011	-54.68351	-35.11683	Site 22	36	306.95	28.9		307	Off Bottom
12:40:45 03/11/2011	-54.68401	-35.11613	Site 22	36	307.55	34.4		449	Stop Trawl
12:35:01 03/11/2011	-54.68519	-35.11438	Site 22	36		31.4		450	Start Trawl
12:29:29 03/11/2011	-54.68583	-35.11346	Site 22	36	305.78	33.1		308	On Bottom

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
12:22:00 03/11/2011	-54.68647	-35.11260	Site 22	36		27.9		-9	AGT Deployed
11:54:20 03/11/2011	-54.67878	-35.11075	Site 22	35	311.10	34.7		-15	AGT Recovered
11:45:57 03/11/2011	-54.67963	-35.10950	Site 22	35	309.22	32.5		294	Off Bottom
11:40:41 03/11/2011	-54.68020	-35.10868	Site 22	35	306.07			450	Stop Trawl
11:34:18 03/11/2011	-54.68151	-35.10684	Site 22	35	304.12	36.9		450	Start Trawl
11:29:38 03/11/2011	-54.68206	-35.10598	Site 22	35	306.19	31.7		305	On Bottom
11:21:21 03/11/2011	-54.68276	-35.10493	Site 22	35	301.08	26.1		-9	AGT Deployed
10:47:02 03/11/2011	-54.68150	-35.11298	Site 22	34		34.7		-9	AGT Recovered
10:38:53 03/11/2011	-54.68201	-35.11219	Site 22	34	309.73	28.7		301	Off Bottom
10:33:49 03/11/2011	-54.68231	-35.11176	Site 22	34	308.28	27.7		450	Stop Trawl
10:28:11 03/11/2011	-54.68346	-35.11011	Site 22	34	305.41	30.8		450	Start Trawl
10:23:57 03/11/2011	-54.68396	-35.10936	Site 22	34	303.38	31.8		305	On Bottom
10:15:02 03/11/2011	-54.68484	-35.10805	Site 22	34	303.89	30.6		-13	AGT Deployed
08:44:01 03/11/2011	-54.66692	-35.03485	site 21	33	245.48	24.6	0.36	-3	AGT Recovered
08:38:04 03/11/2011	-54.66721	-35.03408	site 21	33	245.08	22.9	0.26	225	Off Bottom
08:32:37 03/11/2011	-54.66748	-35.03339	site 21	33	246.12		1.21	355	stop trawl
08:27:36 03/11/2011	-54.66827	-35.03141	site 21	33	242.63		0.99	355	start Trawl
08:23:14 03/11/2011	-54.66869	-35.03037	site 21	33	241.44	27.5	0.49	232	on Bottom
08:16:01 03/11/2011	-54.66923	-35.02901	site 21	33	239.40	27.0	0.45	-1	AGT Deployed
07:40:38 03/11/2011	-54.65768	-35.01083	site 21	32		14.2	0.31	2	AGT Recovered
07:34:55 03/11/2011	-54.65791	-35.01007	site 21	32	228.57		0.31	224	Off Bottom

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
07:29:25 03/11/2011	-54.65819	-35.00927	site 21	32	227.90	18.3	1.17	350	stop trawl
07:24:25 03/11/2011	-54.65887	-35.00719	site 21	32	228.56	24.9	0.94	350	start Trawl
07:19:12 03/11/2011	-54.65930	-35.00603	site 21	32	229.90	22.6	0.58	196	on Bottom
07:13:02 03/11/2011	-54.65971	-35.00477	site 21	32	228.73	21.7	0.30	-2	AGT Deployed
06:16:44 03/11/2011	-54.66094	-35.03028	site 21	31	242.15	16.9	0.39	-3	AGT Recovered
06:10:32 03/11/2011	-54.66121	-35.02946	site 21	31	235.82		0.33	227	Off Bottom
06:04:50 03/11/2011	-54.66153	-35.02860	site 21	31	236.58	20.2	0.92	350	stop trawl
05:59:46 03/11/2011	-54.66222	-35.02651	site 21	31	238.21	17.6	1.12	350	start Trawl
05:55:50 03/11/2011	-54.66254	-35.02556	site 21	31	236.02	18.8	0.51	235	on Bottom
05:48:18 03/11/2011	-54.66308	-35.02406	site 21	31	231.44	23.7	0.44	6	AGT Deployed
23:04:57 02/11/2011	-54.65167	-34.95128	Site 20	27	310.72	10.5		-11	AGT Recovered
22:55:16 02/11/2011	-54.65241	-34.95082	Site 20	27		10.6		330	Off Bottom
22:49:56 02/11/2011	-54.65288	-34.95053	Site 20	27		07.4		450	Stop Trawl
22:44:48 02/11/2011	-54.65424	-34.94966	Site 20	27		13.2		450	Start Trawl
22:40:47 02/11/2011	-54.65481	-34.94931	Site 20	27	304.36	10.9		315	On Bottom
22:32:02 02/11/2011	-54.65589	-34.94865	Site 20	27	301.84	10.4		-11	AGT Deployed
22:10:28 02/11/2011	-54.65483	-34.95560	Site 20	26	289.25	10.9		-18	AGT Recovered
22:02:28 02/11/2011	-54.65546	-34.95523	Site 20	26	292.49	08.0		260	Off Bottom
21:55:55 02/11/2011	-54.65605	-34.95490	Site 20	26	290.08	09.2		440	Stop Trawl
21:50:10 02/11/2011	-54.65752	-34.95392	Site 20	26	286.92	08.8	0.95	440	Start Trawl
21:46:40 02/11/2011	-54.65798	-34.95361	Site 20	26	287.12	08.5		309	On Bottom

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
21:39:51 02/11/2011	-54.65867	-34.95319	Site 20	26	293.53	09.3		33	AGT Deployed
21:01:11 02/11/2011	-54.65292	-34.97056	Site 20	25	275.28	12.6		-10	AGT Recovered
20:53:49 02/11/2011	-54.65354	-34.97040	Site 20	25	273.77	12.9		273	Off Bottom
20:48:31 02/11/2011	-54.65404	-34.97026	Site 20	25		14.1		405	Stop Trawl
20:43:16 02/11/2011	-54.65548	-34.96983	Site 20	25	271.57	14.0		405	Start Trawl
20:39:25 02/11/2011	-54.65604	-34.96966	Site 20	25	271.38	12.4		280	On Bottom
20:31:52 02/11/2011	-54.65702	-34.96935	Site 20	25	271.92	13.5		-9	AGT Deployed
15:38:01 02/11/2011	-54.09700	-35.47620	site 23	24	258.19	19.8	0.23	-0	AGT Recovered
15:31:25 02/11/2011	-54.09754	-35.47585	site 23	24	260.58	17.4	0.33	263	Off Bottom
15:26:05 02/11/2011	-54.09809	-35.47553	site 23	24	264.18	19.9	1.03	400	stop trawl
15:21:05 02/11/2011	-54.09940	-35.47471	site 23	24		22.8	0.80	400	start Trawl
15:16:39 02/11/2011	-54.09982	-35.47442	site 23	24	266.11	21.1	0.30	272	on Bottom
15:09:54 02/11/2011	-54.10033	-35.47405	site 23	24		22.2		-3	AGT Deployed
14:42:52 02/11/2011	-54.09981	-35.47038	site 23	23	289.94	14.7		-2	AGT Recovered
14:35:25 02/11/2011	-54.10040	-35.47002	site 23	23	285.24	12.2		282	Off Bottom
14:28:13 02/11/2011	-54.10111	-35.46961	site 23	23	286.35	13.6		432	stop trawl
14:23:10 02/11/2011	-54.10242	-35.46881	site 23	23		17.0	0.14	432	start Trawl
14:18:00 02/11/2011	-54.10320	-35.46833	site 23	23	286.18	18.7		279	on Bottom
14:11:24 02/11/2011	-54.10389	-35.46791	site 23	23	288.32	20.8		-1	AGT Deployed
13:51:52 02/11/2011	-54.10580	-35.46262	site 23	22	292.55	19.3	0.05	-2	AGT Recovered
13:44:37 02/11/2011	-54.10637	-35.46222	site 23	22	292.21	16.6		282	Off Bottom

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
13:37:28 02/11/2011	-54.10707	-35.46182	site 23	22	292.22	18.0		450	stop trawl
13:32:27 02/11/2011	-54.10838	-35.46100	site 23	22	293.82	16.1		450	start Trawl
13:28:09 02/11/2011	-54.10901	-35.46060	site 23	22	299.25	14.0		330	on Bottom
13:20:04 02/11/2011	-54.10993	-35.46001	site 23	22		14.1		-8	AGT Deployed
13:01:13 02/11/2011	-54.11175	-35.45697	site 23	21	300.96	16.0		-8	AGT Recovered
12:38:32 02/11/2011	-54.12346	-35.43732	site 23	21		15.6	0.15	2	AGT Deployed
09:16:42 02/11/2011	-54.11592	-35.54081	site 24	18	127.09	15.5	0.28	-19	AGT Recovered
09:12:33 02/11/2011	-54.11593	-35.54024	site 24	18	126.94	18.3	0.26	117	off bottom
09:09:03 02/11/2011	-54.11591	-35.53961	site 24	18	127.24	17.4	0.93	190	stop trawl
09:04:45 02/11/2011	-54.11593	-35.53757	site 24	18	127.76	13.2	0.94	190	start Trawl
09:00:57 02/11/2011	-54.11592	-35.53621	site 24	18	132.70	12.8	0.52	135	on bottom
08:54:34 02/11/2011	-54.11594	-35.53492	site 24	18	126.12	14.2	0.19	-17	AGT deployed
08:17:26 02/11/2011	-54.11304	-35.55553	Site 24	17	131.10	14.9	0.16	-8	AGT Recovered
08:13:35 02/11/2011	-54.11304	-35.55498	Site 24	17	130.97	14.2	0.27	127	Off Bottom
08:10:36 02/11/2011	-54.11302	-35.55453	site 24	17	131.54	15.1	0.99	190	Stop Trawl
08:05:00 02/11/2011	-54.11301	-35.55192	site 24	17	129.92	17.9	0.57	190	Start Trawl
08:03:27 02/11/2011	-54.11304	-35.55152	site 24	17	130.08	16.2	0.50	137	On Bottom
07:58:09 02/11/2011	-54.11302	-35.55044	Site 24	17	134.01	19.7	0.25	-13	AGT Deployed
07:21:00 02/11/2011	-54.10536	-35.53793	Site 24	16	125.83	15.4	0.25	-9	AGT Recovered
07:17:00 02/11/2011	-54.10536	-35.53733	Site 24	16	131.14	14.1	0.18	122	Off Bottom
07:13:00 02/11/2011	-54.10536	-35.53649	Site 24	16	125.14	14.9	0.92	190	Stop Trawl

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
07:08:00 02/11/2011	-54.10532	-35.53419	site 24	16	131.72	15.7	0.57	190	Start Trawl
07:06:00 02/11/2011	-54.10531	-35.53374	Site 24	16	126.77	16.2	0.57	115	On Bottom
07:01:38 02/11/2011	-54.10532	-35.53287	Site 24	16	126.98	14.8	0.37	-14	AGT Deployed
23:38:30 01/11/2011	-54.19223	-35.74302	Site 31	13	228.84	21.2	0.26	-12	AGT recovered
23:32:00 01/11/2011	-54.19223	-35.74208	Site 31	13	228.45	19.5	0.33	225	off bottom
23:26:00 01/11/2011	-54.19223	-35.74094	Site 31	13	229.22	23.4	1.00	345	stop tow
23:21:00 01/11/2011	-54.19223	-35.73856	Site 31	13	230.08	22.3	0.99	345	start tow
23:17:00 01/11/2011	-54.19219	-35.73745	Site 31	13	230.60	20.7	0.49	227	on bottom
23:11:33 01/11/2011	-54.19226	-35.73620			229.86	23.8	0.24	1	deployed AGT
22:35:45 01/11/2011	-54.18802	-35.74584	Site 31	12	232.21	22.0	0.43	-7	AGT recovered
22:30:00 01/11/2011	-54.18804	-35.74502	Site 31	12	231.54	24.1	0.21	215	off bottom
22:24:30 01/11/2011	-54.18798	-35.74408	Site 31	12	229.50	25.3	0.94	345	stop tow
22:19:30 01/11/2011	-54.18804	-35.74168	Site 31	12	228.85	24.2	1.05	345	start tow
22:15:30 01/11/2011	-54.18801	-35.74060	Site 31	12	231.25	22.9	0.59	224	on bottom
22:09:00 01/11/2011	-54.18802	-35.73908	Site 31	12	229.15	17.9	0.34	-8	deployed AGT
21:38:00 01/11/2011	-54.18237	-35.74423	Site 31	11	228.11	18.5	0.33	-14	AGT recovered
21:32:00 01/11/2011	-54.18237	-35.74340	Site 31	11	227.20	23.0		215	off bottom
21:27:00 01/11/2011	-54.18233	-35.74262	Site 31	11	227.39	22.7	0.99	330	stop tow
21:25:00 01/11/2011	-54.18232	-35.74069	Site 31	11	227.86	25.6	0.69	226	start tow
21:21:30 01/11/2011	-54.18232	-35.74069	Site 31	11	227.86	25.6	0.69	226	on bottom
21:15:15 01/11/2011	-54.18232	-35.73932	Site 31	11	227.15	24.4	0.40	9	deployed AGT

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
15:10:50 01/11/2011	-54.28700	-36.08334	Site 32	6	134.97	32.0	0.32	-21	AGT Recovered
15:04:51 01/11/2011	-54.28702	-36.08249	Site 32	6	135.66	32.9	0.35	107	Off Bottom
14:59:28 01/11/2011	-54.28701	-36.08145	Site 32	6	134.77	27.1	0.93	210	stop trawl
14:54:42 01/11/2011	-54.28701	-36.07938	Site 32	6	134.15	31.3	0.57	208	Start Trawl
14:52:55 01/11/2011	-54.28702	-36.07892	Site 32	6	134.27	27.9	0.49	139	On Bottom
14:49:03 01/11/2011	-54.28702	-36.07828	Site 32	6	137.37	37.0	0.06		AGT Deployed
13:56:08 01/11/2011	-54.28243	-36.08385	Site 32	5	129.20	29.8	0.24	5	AGT Recovered
13:52:26 01/11/2011	-54.28244	-36.08330	Site 32	5	129.07	23.5	0.22	142	Off Bottom
13:49:48 01/11/2011	-54.28242	-36.08292	Site 32	5	130.11	35.6	0.71	195	Stop Trawl
13:44:00 01/11/2011	-54.28244	-36.08039	site 32	5	127.60	23.1	0.59	191	Start Trawl
13:42:45 01/11/2011	-54.28245	-36.08009	Site 32	5	128.09	25.1	0.54	146	On Bottom
13:38:11 01/11/2011	-54.28245	-36.07928	Site 32	5	130.19	24.7	-0.08	-10	AGT Deployed
12:34:35 01/11/2011	-54.28437	-36.08682	Site 32	4	124.51	27.5	0.27	-16	AGT Recovered
12:30:05 01/11/2011	-54.28439	-36.08617	Site 32	4	123.10	23.2	0.27	133	Off Bottom
12:27:25 01/11/2011	-54.28437	-36.08574	Site 32	4	125.43	31.5	1.01	180	Stop Trawl
12:21:35 01/11/2011	-54.28438	-36.08306	Site 32	4	124.08	29.3	0.49	180	Start Trawl
12:19:36 01/11/2011	-54.28438	-36.08257	site 32	4	122.64	27.5	0.42	109	On Bottom
12:16:46 01/11/2011	-54.28438	-36.08207	Site 32	4	120.66	27.0	-0.02	12	AGT Deployed

EBS

Time	Latitude	Longitude	Station	event no.	Depth	Wind	Speed	Cable length	Action	User
22:13:34 06/11/2011	-55.03291	-36.17885	12.1	64	164.25	12.7	0.26	-14	EBS on deck	sucs
22:07:29 06/11/2011	-55.03291	-36.17760	12.1	64	164.24	11.3	0.77	240	EBS off bottom	sucs
22:04:48 06/11/2011	-55.03291	-36.17760	12.1	64	164.24	11.3	0.77	240	EBS stop trawl	sucs
21:54:09 06/11/2011	-55.03319	-36.17254	12.1	64	163.85	12.1	1.00	240	EBS start trawl	sucs
21:52:28 06/11/2011	-55.03323	-36.17174	12.1	64	164.69	12.3	1.09	182	EBS on seabed	sucs
21:47:16 06/11/2011	-55.03335	-36.16925	12.1	64	163.64	13.2	1.06	-7	EBS deployed	
Summary	**55.033 S,**	**36.175 W**	**12.1**	**64**	**164 m**					

SUCS

Time	Station Name	Event Number	Latitude	Longitude	Water depth (m)	Action
06:53:19 13/11/2011	CB2	123	-54.22491	-36.55801	231.96	Cumberland East Bay
06:45:19 13/11/2011	CB1	122	-54.22491	-36.55801	231.96	Cumberland West Bay
15:13:02 10/11/2011	1	108	-54.57518	-39.10499	274.20	shelf break SW
08:40:03 10/11/2011	2	101	-54.56388	-39.02208	209.62	Moraine SW
06:29:20 10/11/2011	3	100	-54.51244	-38.85112	228.13	Inside moraine SW
18:55:45 08/11/2011	9	93	-54.40000	-37.48003	321.87	Outer south canyon
11:55:51 08/11/2011	11	87	-54.37809	-37.25422	269.37	inner shelf canyon
11:55:51 08/11/2011	10	88	-54.37809	-37.25422	269.37	canyon moraine
23:08:27 07/11/2011	13	80	-54.94215	-37.26443	214.35	Inner moraine south shelf break
23:08:27 07/11/2011	13	80	-54.94215	-37.26443	214.35	Inner moraine south shelf break
17:11:41 07/11/2011	15	75	-55.03009	-37.17817	235.90	South shelf break

Time	Station Name	Event Number	Latitude	Longitude	Water depth (m)	Action
07:09:03 07/11/2011	36_1	70	-54.87205	-36.58556	166.43	Midshelf South canyon top
05:14:34 07/11/2011	36	69	-54.88388	-36.56757	297.40	Midshelf canyon bottom
17:20:39 06/11/2011	12.1	60	-55.04243	-36.15275	162.95	Outer shelf SE
12:27:14 06/11/2011	12	56	-55.14187	-36.24072	193.57	Shelf break SE
17:00:20 04/11/2011	12.2B	50	-54.96600	-36.12282	231.08	sucs on canyon side
10:52:52 04/11/2011	35	47	-54.98982	-35.77376	138.81	Mid shelf SE
10:52:52 04/11/2011	12.2	49	-54.98982	-35.77376	138.81	Inner shelf SE
04:23:00 03/11/2011	Site 20	30	-54.65573	-34.97009	271.31	East shelf break up
03:42:00 03/11/2011	Site 20	30	-54.65597	-34.96956	272.15	East shelf break
03:31:00 03/11/2011	Site 20	30	-54.65597	-34.96953	272.35	East shelf break
02:47:00 03/11/2011	Site 21	29	-54.66642	-35.02835	245.09	East shelf up
02:16:00 03/11/2011	Site 21	29	-54.66653	-35.02814	242.69	East shelf
01:19:00 03/11/2011	Site 21	29	-54.66657	-35.02803	242.59	East shelf
01:45:00 02/11/2011	Site 31	14	-54.18243	-35.72607	224.41	Mid shelf North up
00:24:00 02/11/2011	Site 31	14	-54.19224	-35.74329	228.15	Mid shelf North
17:00:00 01/11/2011	Site 32	8	-54.28699	-36.08375	133.21	Inner shelf North up
16:37:00 01/11/2011	Site 32	8	-54.28697	-36.08373	137.11	Inner shelf North
16:16:00 01/11/2011	Site 32	7	-54.28701	-36.08373	133.34	Inner shelf North up
15:42:00 01/11/2011	Site 32	7	-54.28700	-36.08351	135.16	Inner shelf North
01:54:00 01/11/2011	Stromness test	3	-54.15869	-36.69351	85.64	Stromness up
01:39:00 01/11/2011	Stromness test	3	-54.15868	-36.69353	85.44	Stromness
01:37:00	Stromness	2	-	-36.69352	85.45	SUCS recovered

Time	Station Name	Event Number	Latitude	Longitude	Water depth (m)	Action
01/11/2011	test		54.15866			
01:25:00 01/11/2011	Stromness test	2	-54.15866	-36.69351	85.44	SUCS deployed

Appendix 3 South Orkney deployments

AGT

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
21:42:00 19/11/2011	-60.92181	-45.77944	SY3	139	231.37	19.2	0.29	-19	AGT Recovered
21:34:48 19/11/2011	-60.92238	-45.77901	SY3	139	232.09	19.2	0.32	231	AGT off seabed
21:29:06 19/11/2011	-60.92287	-45.77867	SY3	139	234.52	21.5	1.02	372	AGT stop trawl
21:25:57 19/11/2011	-60.92365	-45.77807	SY3	139	236.10	21.5	0.51	372	AGT start trawl
21:22:41 19/11/2011	-60.92408	-45.77774	SY3	139	238.06	21.3	0.57	244	AGT on bottom
21:16:28 19/11/2011	-60.92489	-45.77711	sy 3	139	239.27	22.2	0.29	-2	AGT Deployed
20:50:10 19/11/2011	-60.91363	-45.75128	SY3	138	237.63	20.0	0.36	-14	AGT Recovered
20:50:10 19/11/2011	-60.91363	-45.75128	SY3	139	237.63	20.0	0.36	-14	AGT deployed
20:43:28 19/11/2011	-60.91418	-45.75108	SY3	138	239.30	20.8	0.26	230	AGT off seabed
20:37:41 19/11/2011	-60.91470	-45.75090	SY3	138	240.84	25.6	1.00	370	AGT stop trawl
20:34:29 19/11/2011	-60.91552	-45.75059	SY3	138	240	22.5	0.34	370	AGT start trawl
20:31:18 19/11/2011	-60.91595	-45.75045	SY3	138	242	26.0	0.39	245	AGT on bottom
20:23:40 19/11/2011	-60.91694	-45.75008	SY3	138	245.15	19.8	0.42	-12	AGT deployed
20:10:33 19/11/2011	-60.92047	-45.75111	SY3	137	248.33	24.1	0.30	-18	AGT Recovered
20:02:46 19/11/2011	-60.92112	-45.75115	SY3	137	250.24	24.0	0.28	239	AGT off seabed
19:57:00 19/11/2011	-60.92166	-45.75116	SY3	137	250.91	25.6	1.07	380	AGT stop trawl

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
19:54:47 19/11/2011	-60.92224	-45.75114	SY3	137	252.00	21.0	0.49	380	AGT start trawl
19:51:27 19/11/2011	-60.92271	-45.75117	SY3	137	250.30	25.1	0.53	255	AGT on bottom
19:43:51 19/11/2011	-60.92368	-45.75117	SY3	137	251	25.1	0.36	-13	AGT deployed
19:41:28 19/11/2011	-60.92384	-45.75111	SY3	136	250.93	20.1	0.36	-4	AGT Recovered
19:35:39 19/11/2011	-60.92432	-45.75094	SY3	136	251.43	23.4	0.36	221	AGT off seabed
19:29:27 19/11/2011	-60.92488	-45.75075	SY3	136	252.33	19.2	1.04	381	AGT stop trawl
19:26:48 19/11/2011	-60.92557	-45.75051	SY3	136	251.93	22.6	0.63	381	AGT start trawl
19:23:48 19/11/2011	-60.92598	-45.75037	SY3	136	255	20.4	0.49	263	AGT on bottom
19:17:24 19/11/2011	-60.92684	-45.75007	SY3	136	253.43	22.2	0.30	6	AGT deployed
12:45:33 19/11/2011	-60.71714	-45.49639	SY2	132	262.94	13.8		-21	AGT Recovered
12:30:46 19/11/2011	-60.71771	-45.49420	SY2	132	265.60	23.6		259	Off Bottom
12:23:55 19/11/2011	-60.71803	-45.49304	SY2	132	272.67	29.2		420	Stop Trawl
12:21:42 19/11/2011	-60.71832	-45.49191	SY2	132		25.3		420	Start Trawl
12:17:07 19/11/2011	-60.71856	-45.49095	SY2	132`	282.03	28.6		280	On Bottom
12:09:14 19/11/2011	-60.71886	-45.48977	SY2	132	281.82	25.4		-10	AGT deployed
11:13:15 19/11/2011	-60.69041	-45.53076	SY2	131	232.42	03.0	0.30	-4	AGT Recovered
11:07:17 19/11/2011	-60.69090	-45.53084	SY2	131	233.49	00.7	0.32	225	AGT off seabed
11:01:29 19/11/2011	-60.69150	-45.53092	SY2	131	234.78	06.3	1.03	350	AGT stop trawl
10:58:55 19/11/2011	-60.69213	-45.53103	SY2	131	235.50	10.6	0.50	350	AGT start trawl
10:56:37 19/11/2011	-60.69245	-45.53108	SY2	131	235	07.0	0.55	265	AGT on bottom
10:47:12 19/11/2011	-60.69361	-45.53128	SY2	131	233.79	04.6		-18	AGT deployed

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
10:02:27 19/11/2011	-60.70377	-45.50919	SY 2	130		32.0		-5	AGT Recovered
10:02:27 19/11/2011	-60.70377	-45.50919	SY 2	130		32.0		-5	AGT Recovered
09:55:36 19/11/2011	-60.70435	-45.50930	SY 2	130		27.2		253	Off Bottom
09:50:10 19/11/2011	-60.70487	-45.50937	SY 2	130	263.41	24.9		380	stop trawl
09:45:03 19/11/2011	-60.70629	-45.50961	SY 2	130		27.4		380	start Trawl
09:41:21 19/11/2011	-60.70682	-45.50973	sy 2	130	258.65	27.3		263	on Bottom
09:33:43 19/11/2011	-60.70779	-45.50993	Sy 2	130	261.06	23.9		-0	AGT Deployed
20:08:01 18/11/2011	-60.92519	-45.23610	SY1	126	276.93	23.6	0.45	-13	AGT Recovered
20:00:11 18/11/2011	-60.92571	-45.23685	SY1	126	278.71	23.0	0.39	267	Off Bottom
19:54:40 18/11/2011	-60.92615	-45.23749	SY1	126	277.57	23.0	0.95	400	Stop Trawl
19:52:32 18/11/2011	-60.92662	-45.23819	SY1	126	277.77	24.1	0.26	400	Start Trawl
19:48:50 18/11/2011	-60.92707	-45.23880	SY1	126		21.1		280	On Bottom
19:40:39 18/11/2011	-60.92793	-45.24005	SY1	126	277.67	20.4	1.06	-11	AGT deployed
19:16:01 18/11/2011	-60.93171	-45.22899	SY1	125	275	18.1		-14	AGT Recovered
19:07:05 18/11/2011	-60.93228	-45.22999	SY1	125	278			270	AGT off seabed
19:01:40 18/11/2011	-60.93267	-45.23067	SY1	125	279	19.8	1.06	400	AGT stop trawl
18:56:35 18/11/2011	-60.93371	-45.23250	SY1	125	280	20.0		400	AGT start trawl
18:53:23 18/11/2011	60.93404	-45.23308	SY1	125	278	19.5	0.52	280	AGT on bottom
18:46:09 18/11/2011	60.93479	-45.23434	SY1	125	275	19.6	0.55	-2	AGT deployed
18:20:56 18/11/2011	60.93947	-45.22687	SY 1	124	288.75	17.6		-3	AGT Recovered
18:13:37 18/11/2011	60.93994	-45.22766	Sy 1	124		16.6		279	Off Bottom

Time	Latitude	Longitude	Station Name	Bridge event number	Water depth	Wind speed	Speed	Cable length	Action
18:07:00 18/11/2011	60.94045	-45.22853	sy 1	124	288.64	18.6		430	stop trawl
18:01:57 18/11/2011	60.94153	-45.23037	Sy 1	124	283.24	17.2	0.14	430	Start trawl
17:57:18 18/11/2011	60.94209	-45.23131	Sy 1	124	283.54	14.0	0.14	283	on Bottom
17:50:06 18/11/2011	60.94283	-45.23258	Sy 1	124		13.2		15	AGT Deployed

SUCS

Time	Station Name	Bridge Ev Num	Latitude	Longitude	Water depth (m)	Action
18:15:09 19/11/2011	SY3	135	-60.92768	-45.76234	254.21	West South Orkneys
14:24:00 19/11/2011	SY2 mountain	134	-60.71283	-45.50927	153.72	Normana Strait mountain
13:00:11 19/11/2011	SY2	133	-60.71711	-45.49641	262.84	Normana strait
20:30:19 18/11/2011	SY1	127	-60.92510	-45.23599	275.99	East South Orkneys

CTD

Time	Event Number	Latitude	Longitude	Depth (EA600)	Cable Out	Station	Comment
22:26:18 18/11/2011	128	60.92464	-45.23532	274.80	8	SY1	CTD on deck
22:22:35 18/11/2011	128	60.92465	-45.23532		5	SY1	Bottle 6 at 5 m
22:22:06 18/11/2011	128	60.92465	-45.23533	274.97	5	SY1	Bottle 5 at 5 m
22:20:38 18/11/2011	128	60.92464	-45.23533	275.90	30	SY1	Bottle 4 at 30 m
22:17:23 18/11/2011	128	60.92463	-45.23534	275.01	150	SY1	Bottle 3 at 150m
22:14:18 18/11/2011	128	60.92463	-45.23533	275.97	245	SY1	Bottle 2 at 245 m
22:13:03 18/11/2011	128	60.92464	-45.23533	275.53	255	SY1	Bottle 1 255m
22:11:34 18/11/2011	128	60.92463	-45.23535	276.91	248	SY1	Paused
22:05:25	128	60.92463	-45.23534	274.68	3	SY1	At surface, on way

Time	Event Number	Latitude	Longitude	Depth (EA600)	Cable Out	Station	Comment
18/11/2011							down to 250 m
22:02:19 18/11/2011	128	60.92462	-45.23534	275.10	10	SY1	CTD 10m on way down
22:00:34 18/11/2011	128	60.92462	-45.23534	274.97	-4	SY1	CTD lifted

Box Core

Time	Bridge event	Depth	Latitude	Longitude	Comment
23:05:10 18/11/2011	129	278.06	60.92467	-45.23531	Box core on deck. Misfired, large proportion of mud lost as leaving sea.
22:55:47 18/11/2011	129	274.92	60.92467	-45.23531	CTD returning
22:53:17 18/11/2011	129	274.71	60.92466	-45.23531	Corer on bottom
22:45:40 18/11/2011	129	275.05	60.92467	-45.23531	Box core deployed
22:42:52 18/11/2011	129	275.43	60.92468	-45.23532	Box core on deck, SY1 Signy station