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JAMES CLARK ROSS SCIENCE CRUISE JR60

16-26 March 2001

1. Cruise Objectives:

1. To undertake standard acoustic survey for krill and oceanography to the northwest of South Georgia (DYNAMOE, Year 1; Survey 3).
2. To investigate bottom topography in the vicinity of Shag Rocks to identify locations suitable for bottom trawling
3. To determine whether spawning aggregations of icefish are present in the bays on the northwest of South Georgia in late March.

2. Participants

Inigo Everson (Scientist in Charge), Cathy Goss (Acoustics), Sharon Grant (Physical Oceanography), Mark Preston (ETS & Swath Bathymetry), Andy Barker (ITS).

The following scientists from the BAS South Georgia Project participated in the first part of the cruise: Paul Rodhouse, Mark Belchier, Simon Morley, Therese Mulvey and Judith Dixon.

3. DYNAMOE Survey

Group Leaders: Cathy Goss, Sharon Grant

3.1. Introduction

Every year British Antarctic Survey marine biologists undertake a survey to estimate the biomass of Antarctic krill (*Euphausia superba* Dana) in the waters adjacent to South Georgia. Since 1996 this survey has usually taken place in the middle of the austral summer (December - January) and within two well defined 80 x 100 km areas or 'boxes' which span the continental shelf-break to the north-east and north-west of South Georgia. Following the commencement of Q3 the surveys have been concentrated into the region to the north-west of South Georgia. The surveys are undertaken using a SIMRAD EK500 scientific echo-sounder to conduct acoustic surveys of krill with additional information coming from a frame net, CTD, XBT and near surface water sampling.

3.2. Methods

3.2.1. Survey design

The survey was divided into daytime and night-time operations. During the day two pairs of parallel acoustic transects were sampled. During the night CTD and FNET sampling was undertaken along a line midway between the acoustic transects.

The plan for the survey with positions, approximate start date and time, was prepared in a QuattroPro spreadsheet and is reproduced as Appendix 1. The start times were chosen so that the acoustic transects would be sampled completely in daylight. After dark, the plan called for relocation to a CTD station, foredeck nets (FNETS) and finally a second CTD station, before relocation to start the second day.

3.2.2. Acoustics

The pc and Simrad EK500 clocks were set so that they matched the master clock.. The logging pc is run using an uninterruptible power supply unit. The SonarData software used to run the system is in three parts: EchoLog, EchoConfig and EchoView, icons for each appear on the pc desktop.

EchoLog, the logging module, is self contained and robust, and was used to log telegrams from the EK500 into files on the pc with the start date and time for the name and the extension .ek5. This module automatically opens new files at regular intervals, so, once started, needed no attention, other than to check disk space. EchoLog is started by clicking on the icon, and it begins to log, showing the file name that it is writing to, and the size and data acquisition rate. It will start a new file automatically at pre-set intervals. It is possible to manually trigger the start of a new file, and it helps with processing to start a new one at the moment a transect starts and when it ends, however this is not essential. The waypoints in the plan should be the position where the usable transect starts, i.e. the ship should be travelling at 10 knots and in the direction of the rest of the transect when the waypoint is reached. A written log was kept, noting when anything exceptional happens, e.g. a deviation from the track, a change in ship's speed, and anything at all that might affect the results.

EchoConfig was used to send files of settings (.txt) to the EK500, and also read files of settings in order to record a daily dump of settings. To write menu settings to the echosounder using a previously saved file, a file of all menu settings is loaded. When EchoConfig starts the 'write' button remains greyed out unless EchoLog is running. To read all settings the R* button is used. Settings were initially as used on JR57, except for new alpha values and a new sound speed of 1464m s^{-1} . These were calculated using an average temperature of 3.5°C from an XBT drop on 17 March and a salinity value of 33.78 from the oceanlogger. Excerpts from the file are given in Appendix 2. Echoconfig does not remember the ip address of the EK500, and whenever the program is opened this needs to be entered under file settings: the last '9' needs to be changed to '102'. EK500 /ETHERNET COM. MENU/UDP Port Menu/settings all had to be changed from 2000 to 2200.

EchoView displays groups of .ek5 files, but without modifying them, so that any changes can be made but the raw data are protected. After a day of logging, .ek5 files were backed up onto the second EK500 Workstation, and onto CD after around 3 days. At first Echoview would not read saved settings from the live viewing templates folder, but these were restored by changing the folder name to 'Live Viewing Templates' as described in echoview help.

16 March 2001, the EK500 was not ready to use when switched on. Workstation WS-2 was locked - the krill account normal password and variants including E_superba, didn't work and the administrator password was not known. Cables for the workstations were missing - one later found, but a mouse extension was still missing. Workstation WS-1 was filled up with data from JR58 (13GB), but with an approaching weekend there was no possible contact with anyone at Cambridge to ask if we could delete them. We logged into WS-2 as guest and found JR58 data there, but they were zipped so required cross-checking before deleting. 5

GB were cleared out from WS-1 before the survey. Subsequent transfers of data and settings files were made difficult because of the different user names current on the two workstations.

3.2.3. Nets

FNETs are fished at the surface for anything between 5 and 20 minutes, depending on what plankton is in the water. Their catch supplements the acoustic data, and can be frozen for subsequent analysis.

3.2.4. CTD

3.2.4.1. General

The BAS Seabird911Plus CTD was used during the cruise as the primary physical oceanographic sampling tool. As is standard practice, a test deployment (e001) was carried out on departure from Stanley at position 51° 40.44; 57° 49.87 at 23:12:07, in order to check the bottle firing mechanisms and sensors. It was noted during this cast that there was no altimeter display on the ctd screen. Investigations showed that this was a result of a software setting which had been altered during the previous cruise. The ctd and altimeter functioned perfectly for all further casts.

Four CTD stations were carried out during the course of JR60, at locations previously sampled during the Biosciences division Core Programme. Due to bad weather, it was not possible to carry out station W1.2N during the night of the 18th of March as planned. However, the station was revisited prior to the shag rocks southern swath bathymetry transect on the 24th of March.

3.2.4.2.Salinity

Salinity samples were taken from each bottle fired using the following protocol.

- water was drawn off the niskin bottles immediately after the CTD was brought on deck
- bottles and caps were rinsed 3 or 4 times with the seawater to be sampled
- each bottle was filled to below the neck and the neck dried with paper towels
- plastic inserts were using to seal the bottles and the bakelite caps put on
- having noted the sample bottle numbers on the log sheet each rack was left in the micro-radiation laboratory for at least 24 hours
- samples were then analysed using the autosal.

3.2.5. XBT's

As mentioned above, JR60 is part of the Biosciences Core Programme and was designed to be a sketch of the main program (JR57), to allow inter-annual comparison of krill biomass and physical oceanography. In a full Core Programme, the physics of the waters are measured using an undulating oceanographic recorder which is towed for the entire length of each transect and provides continuous measures of salinity and temperature amongst other things. As this piece of equipment has a large overhead in terms of manpower required to run it effectively, it was decided that the use of expendable bathythermongraphs (xbts) would provide at least some physical information about the transects.

A total of 56 xbt were deployed during JR60 comprising 16 T7 and 40 T5 probes. There were only 6 failures which were mostly likely due a bug in the sippican software which necessitated the machine to be re-booted after every deployment. XBT's were deployed at 2 hour intervals during the transect from Stanley to the Western Core box and then at hourly intervals along the core box transects themselves.

File:U:\bio\pelagic_data\jr060\cruise report\DraftCruiseReportv2.wpd

3.3. Results

3.3.1. Sampling narrative

Sampling the first pair of transects began at 0700 on Sunday 18 March 2001 in a moderate seastate and varying densities of seafog. The sea fog was present throughout the day and meant that the vessel speed between stations during the night had to be reduced. The delay due to the weather meant that we were unable to sample the first deep water CTD station, but there was sufficient time to pass through the waypoint and deploy an XBT.

The vessel then moved to the second pair of transects, commencing sampling at 0730 on 19 March 2001. Both transects were sampled within the appointed time and the vessel then sampled the CTD and FNET stations on the line between the acoustic transects.

At the start of the acoustic transects the swath bathymetry was turned off, and after waiting for the Sounder Synchronisation Unit to settle, the EK500 was switched to active, external trigger, and the bridge turned the EA500 to active, external trigger. The EA and EK were both triggered by the SSU at 2000 milliseconds, although the actual ping interval needs to be checked. XBT drops were carried out every hour.

It was noticed that the ping rate on the SSU had dropped right down to around 1 every 10 secs. It was set to calculate ping rate according to depth, and when the bridge set the range on the EA to 5000 metres the ping rate changed accordingly. After around 2 hours of investigations we located the notice on the wall describing the file needed to fix the SSU to operate for the biosciences cruise. Some of the first transect data were compromised because of the reduced ping rate frequency. The final ping rate was set at one ping per 1.5 seconds.

Swath bathymetry was undertaken along 'dead-heads' and between CTD stations.

The deep CTD station that had been missed out on the night of 18/19 March was sampled during the afternoon of 24 March whilst the vessel was on passage from KEP to Stanley.

The cruise layout is shown in the plan in Figure 1.

On 18 March 2001 2240 GMT, the ship stopped for a CTD and a FNET. The FNET was towed for 10 minutes, with the deck lights off. There was a large krill mark at the station but a Monospecific catch of *Themisto*, around 100ml. 100 *Themisto* had a displacement volume of 8ml.

On 19 March 2001 0200 GMT a mid-point FNET was fished , (There were lots of krill on chart approaching this station). A nearly monospecific catch was made of *Themisto*, in each of 2 20-minute nets, around 200ml. Small numbers of small *Euphausia frigida* and 2 *E. superba* were also caught.

On 19 March 2001 2338 GMT Event 59, an FNET of 30 minutes duration was carried out at the deep station in darkness. 4 *E. superba*, small medusae, algae, especially stuck to medusae, one squid, Chaetognaths, *Tomopteris* were caught

On 20 March 2001 0112 GMT Event 60 an FNET at the mid-station small numbers of *11 E. superba*, 6 less than 30mm *Themisto, Salpa*

The current charts include some shoal ground, marked position approximate, close to the southern end of the last acoustic transect. A small scale survey over this location indicated that no shoal was present there. Details of the survey are shown in Figure ***.

3.3.2. Analysis of Acoustic Data

Acoustic data were analysed using Echoview version 2.10.29, according to the protocol devised during the Workshop held in July 2000 to analyse data from the Synoptic Survey of the Scotia Sea. The analysis differed from that standard in the following ways:

The variable Diff-s-120-38 was displayed with minimum -6 and range 36, and scheme = delta3. Range diff is 2-12 dB. Integration was over 0.1 nautical miles and 250 m. Distance was used because the first transect had an odd ping rate for part of the time.

Table 2 sets out the names of the logged .ek5 files that were grouped in echoview to cover the four acoustic transects. Table 3 sets out the results from the four transects and the final total.

3.4. Conclusions and recommendations

4. Icefish spawning aggregations Group Leader Inigo Everson

4.1. Background

Mackerel icefish, *Champsocephalus gunnari*, concentrate into pre-spawning aggregations during March and April. It is thought that most of the successful spawning takes place within the bays of South Georgia although there is some spawning activity on the shelf. This study was designed to determine whether fish aggregations could be recognised in the bays on the north of South Georgia.

4.2. Survey plan

The Simrad EK500 was used to determine acoustic targets likely to result from the presence of icefish. Information on bottom topography was obtained from Swath bathymetry, these two acoustic systems were operated in sequence mode with the ping rate set by the Swath.

Transects were run through the Bay of Isles and into Sea Leopard Fjord, Possession, Antarctic, Fortuna, Cumberland East and Cumberland West Bays, Leith, Stromness and Husvik Harbours.

4.3. Results

Several acoustic targets were seen which could be caused by icefish. These will be analysed further along with other data from Russian research studies on the South Georgia shelf. (Action: IE, CG)

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The Swath bathymetry provided a series of high quality charts within each of the bays. Copies of these are being provided for the Navigating Officers on BAS ships.(Action: MP)

5. Shag Rocks Bottom topography Group leader Inigo Everson

5.1. Background

Concern has been expressed that, during recent demersal fish surveys, the area of shelf associated with Shag Rocks has been under-sampled relative to that around the mainland of South Georgia. This is because it has been difficult to find suitable trawling sites during the course of the surveys. The presence of Swath bathymetry on JCR permitted a more extensive examination of the seabed than had previously been possible.

5.2. Survey plan.

The study was designed to be opportunistic as the vessel passed in the vicinity of Shag Rocks. Two transect lines were planned, one to pass to the north of Shag Rocks (sampled on the outward voyage) and the other to the south. Sampling was be undertaken in those parts of the track where the water was shallower than 500m.

5.3. Results

The surveyed transects provided good details of bottom topography with a swathe width of approximately two km. These will be examined in conjunction with information arising directly from bottom trawl surveys in the region. (Action: IE, MP, MB)

6. ETS techical report & recommendations Mark Preston, Andy Barker

6.1 CTD

The CTD system was used to complete 5 drops during the duration of the cruise and the system worked faultlessly throughout. The only problem occurred in trying to re configure the display to show the altimeter reading. The altimeter value is normally displayed on the 'status line' at the bottom of the screen however it was found to be missing.

This is changed by going into the cast setup page of the software then going into the MISC X-Y plot parameters, then Status line variables. There are then displayed four Status line columns and altimeter can then be selected/de-selected as desired.

6.2 XBT system

The XBT system was used fairly consistently over the duration of the cruise with 56 number of drops being executed. The system suffered no unknown problems at all. Although the system worked well it has a 'fragile' feel to it. The PC has to be turned off between drops as the XBT card in the PC 'hangs' if the power is not cycled. Initially some operators weren't aware of this and a few casts had to be repeated. It is also known that the XBT card will not function at all if put into a PC faster than a 486. If the PC that is currently used for the system failed, it would be difficult to imagine how it would be replaced as all 'spare' machines on board are Pentium grade or better.

6.3 Oceanlogger

During the cruise JR60 no problems were encountered with the Ocean Logger. The PC, software, and ancillary electronics all worked well. It was noted, right at the end of the cruise that the data was coming in to the SCS at irregular intervals. The PC and ancillary electronics were power cycled and the problem did not re occur. Also towards the end of the cruise the blue gun in the Ocean Logger monitor failed. This didn't effect the data, just made the display look yellow. No action was taken as data wasn't at risk. The Ocean logger is due for replacement this summer and the monitor will be replaced then.

6.4 ADCP

The ADCP was used continuously for the duration of the cruise and worked faultlessly throughout. Noticing that the computer that controls and displays the ADCP data is a 1991 vintage 286, I feel that there is good cause to upgrade this to a more modern machine as the computer must be feeling it's age by now.

6.5 EM120

The EM 120 was run throughout the cruise and gathered data whenever possible. The system worked without fault and at times without an operator for the less critical transects. It should be noted that although the performance of the EM120 is outstanding it can be 'upset' by quite mild sea conditions if the swell comes from a particular direction. Other times the sea can be quite fierce and the data quality excellent. There seems to be an odd combination of swell, course and wind direction that cause degradation of the data.

7. ITS system report & recommendations Andy Barker

7.1 Scientific Computer System v2.3 (SCS)

Apart from one glitch with the GPS_NMEA data stream the SCS system has performed well throughout the entire cruise.

Data was logged correctly to all data streams, except the GPS NMEA. For some unknown reason at ******* The data stream became corrupte and the system continually logged data into the same timestamp. The only solution was to stop logging and then restart logging, this forced the SCS system to write Trimble data into the correct format again. (See Appendix 3)

It should be possible to recreate the Trimble.ACO file as all of the RAW data was logged correctly throughout this period.

7.2 Java Logging System

All Java programs worked throughout the entire cruise.

7.3 Unix Systems

JRUF

JRUF has worked throughout the entire cruise without any problems to report. License file for ArcInfo has been applied for.

JRUB

JRUB (Level C) machine has also worked throughout the entire cruise without any problems.

7.4 Netware Systems

JRNA

Netware Server JRNA has worked throughout the entire cruise, the only problem to report is corrupted user profile, resolved by restoring the profile from Arcserve.

7.5 Multibeam

This cruise has provided an excellent opportunity to get to grips with using the multibeam system, both in data collection and post processing of information.

Mark Preston who spent time on the previous cruise with the Kjeital (Simrad Engineer) has been able to pass on lots of useful tricks of the trade when operating the system. (See Appendix 3 for futher notes)

7.6 SSU Configuration

During JR57 tests were done to see how well the biological echosounder performed with the EM120 active. However, it was decieded that it was not possibleThe SSU has several configuration files in the system, the two we are interested in are a generic file for EM120, Topas, EA500 and EK500 and a file used on Bioscience core programmes.

The file for Bioscience core programme differs from the others as it allows the ek500 to achieve a very fast ping rate, this has been achieved by not being able to coexist with em120 multibeam system.

7.7 Scientific Equipment

7.7.1 CTD

When running a test CTD cast it became apparent that the Altimeter wasn't being displayed to the screen. See Appendix 3.

7.7.2 XBT

Domain failures occurred again, as detailed in AMT 11 report the solution is to reboot the PC between XBT casts.

7.73. Oceanlogger

The oceanlogger appears to be sending data to the SCS in sporadic time intervals, no solution has been found, ETS plan to replace the oceanlogger with a new system in the near future.

8. Acknowledgements

Special thanks to Captain Elliott and the crew and the officer of the *James Clark Ross* for carrying out the study

File:U:\bio\pelagic_data\jr060\cruise report\DraftCruiseReportv2.wpd

FIGURES, TABLES and APPENDICES

Table 1 Acoustic Transect Details				
Transect	**Core Programme Waypoint id**	**Date and time**	**Longitude**	**Latitude**
start 1	**Waypoint_W.1.1.S**	**18 March 2001 0930**	**-54.05530**	**-39.3919**
end 1	**Waypoint_W.1.1.N**	**18 March 2001 1355**	**-53.34720**	**-39.6023**
start 2	**Waypoint_W.2.1.N**	**18 March 2001 1543**	**-53.28700**	**-39.0382**
end 2	**Waypoint_W.2.1.S**	**18 March 2001 2004**	**-53.99400**	**-38.819**
start 3	**Waypoint_W.3.1.N**	**19 March 2001 0930**	**-53.22090**	**-38.449**
end 3	**Waypoint_W.3.1.S**	**19 March 2001 1346**	**-53.92690**	**-38.2203**
start 4	**Waypoint_W.4.1.S**	**19 March 2001 1624**	**-53.86920**	**-37.7279**
end 4	**Waypoint_W.4.1.N**	**19 March 2001 2038**	**-53.16420**	**-37.9643**

Table II Acoustic results from the four transects and the final total

Calculation of weighted density (after Jolly and Hampton)

Transect No.	Transect Length km	Weighting for Transect Length	Transect Density g/m^2	Weighted Density g/m^2	Density Deviation	WfTL^2 * DD^2
1	79.11	0.9882	1.2928	1.2775	212.805	207.8114
2	80.691	1.0079	5.4328	5.4760	109.1565	110.8971
3	79.999	0.9993	45.4413	45.4094	873.8339	872.6077
4	80.42	1.0046	11.3080	11.3596	20.9090	21.1002
Means:	80.0548		15.8687	15.8806	Sum:	101.0347

Mean Weighted Density =	15.8806	g/m^2
Weighted Variance =	101.0347	g/m^2

CV = 63.2900 %

19.7011 upper 95% CI 35.5818

lower 95% CI -3.8205

TS = -38.57

Table III: CTD cast information for JR60

Event number Station	042 W1.2S	058 W3.2N	061 W3.2S	064 W1.2N
JDAY/Time	077 / 22:55:35	078 / 22:30:50	079 / 03:27:22	083 / 13:19:00
Water depth (m) - ea500	294	2499	138	3206
Position (lat; lon)	53° 50.80; 39° 08.60	53° 21.78; 38° 04.95	53° 42.88; 37° 57.96	53° 29.55; 39° 15.15
Bottle number	Wire out / Pressure			
1	**269** / 274	**1000** / 1014	**121** / 124	**1000** / 1007
2	**250** / 254	**800** / 808	**121** / 124	**800** / 809
3	**200** / 202	**600** / 604	**100** / 102	**600** / 608
4	**180** / 183	**400** / 405	**80** / 81	**400** / 404
5	**160** / 163	**250** / 251	**80** / 81	**250** / 252
6	**140** / 142	**100** / 102	**60** / 61	**150** / 153
7	**100** / 105	**80** / 83	**60** / 61	**100** / 101
8	**80** / 79	**60** / 61	**40** / 42	**80** / 83
9	**60** / 61	**40** / 39	**40** / 42	**60** / 61
10	**40** / 40	**30** / 30	**20** / 21	**40** / 42
11	**20** / 21	**20** / 21	**20** / 21	**20** / 21
12	**10** / 10	**10** / 11	**10** / 11	**10** / 11

Table IV: Conductivity Offsets between discrete Samples and CTD measurements

Event number	Station name	Offset	Rejected bottles
042	W1.2S	-0.0016	1,4,9
058	W3.2N	-0.0009	4, 5, 7
061	W3.2S	0.0035	3, 6, 7, 8, 9, 10, 11, 12
064	W1.2S	-0.0008	6, 7, 8, 9, 10, 11, 12

Table V: XBT positions for JR60

Event	Latitude	Longitude	Depth	T5/T7	Filename	Time	Jday	Failed?
2	-51.86133	-55.87717	1176	T5	T5_00002	04:48:24	75	N
3	-52.098	-53.62267	2069	T5	T5_00003	11:05:21	75	N
4	-52.25283	-52.24283	2593	T5	T5_00005	14:59:40	75	N
5	-52.32183	-51.53450	2862	T5	T5_00006	17:02:24	75	N
6	-52.369	-50.84467	3047	T5	T5_00007	18:59:43	75	N
7	-52.45033	-50.14083	3400	T5	T5_00008	20:50:55	75	N
8	-52.53533	-49.36067	3682	T5	T5_00009	22:58:14	75	N
9	-52.61267	-48.60683	3732	T5	T5_00010	01:01:40	76	Y
10	-52.6175	-48.55717	3748	T5	T5_00011	01:08:50	76	N
11	-52.68517	-47.91600	3720	T5	T5_00012	02:57:59	76	Y
12	-52.69117	-47.86100	3770	T5	T5_00013	03:01:01	76	Y
13	-52.69433	-47.83017	3804	T5	T5_00014	03:04:36	76	N
14	-52.77	-47.15533	2864	T5	T5_00015	03:04:36	76	N
15	-52.84817	-46.43750	2663	T5	T5_00016	06:55:03	76	N
16	-52.90717	-45.74567	2699	T5	T5_00017	08:49:10	76	Y
17	-52.9105	-45.71550	2996	T5	T5_00018	08:53:51	76	N
18	-52.984	-44.96000	2395	T5	T5_00019	11:00:49	76	N
19	-53.061	-44.24133	2513	T5	T5_00020	12:54:54	76	N
20	-53.1405	-43.47650	1876	T5	T5_00022	14:55:08	76	N
21	-53.2585	-42.86533	1140	T5	T5_00024	16:58:20	76	N
23	-53.38817	-42.34850	221	T7	T7_00025	18:55:20	76	N
24	-53.52417	-41.81250	211	T7	T7_00026	20:57:04	76	N
25	-53.67183	-41.23533	135	T7	T7_00027	23:10:32	76	N
26	-53.78733	-40.77250	384	T7	T7_00028	00:55:41	77	N
27	-53.92217	-40.23550	1296	T5	T5_00029	03:01:08	77	N
28	-54.05167	-39.72350	847	T7	T7_00030	05:59:15	77	N
29	-54.05517	-39.39100	420	T7	T7_00031	09:28:33	77	N
30	-53.90833	-39.43550	331	T7	T7_00032	10:29:18	77	N
31	-53.74667	-39.48350	1441	T5	T5_00033	11:31:35	77	N
32	-53.51833	-39.55117	1716	T5	T5_00034	12:57:56	77	N
33	-53.41017	-39.58283	3000	T5	T5_00035	13:44:05	77	N
34	-53.29783	-39.24333	4011	T5	T5_00036	15:08:46	77	N
35	-53.29067	-39.03667	3631	T5	T5_00037	15:47:25	77	Y
36	-53.30383	-39.03233	3584	T5	T5_00038	15:52:43	77	N
37	-53.48133	-38.97817	2907	T5	T5_00039	16:58:09	77	N
38	-53.65617	-38.92250	1888	T5	T5_00040	18:02:19	77	N
39	-53.82933	-38.86967	213	T7	T7_00041	19:06:39	77	N
40	-53.97017	-38.82533	202	T7	T7_00042	19:59:00	77	N

41	**-54.02583**	**-39.04767**	**198**	**T7**	**T7_00043**	**21:04:49**	**77**	**N**
42	**-54.02767**	**-39.06217**	**214**	**T7**	**T7_00044**	**21:07:20**	**77**	**N**
46	**-53.49567**	**-39.25017**	**3204**	**T5**	**T5_00045**	**04:15:30**	**78**	**N**
47	**-53.49567**	**-39.04767**	**3774**	**T5**	**T5_00046**	**09:31:44**	**78**	**N**
48	**-53.37833**	**-39.63333**	**2904**	**T5**	**T5_00047**	**10:30:20**	**78**	**N**
49	**-53.55567**	**-38.34000**	**2299**	**T5**	**T5_00048**	**11:37:54**	**78**	**N**
50A	**-53.74117**	**-38.28017**	**243**	**T5**	**T5_00049**	**12:43:24**	**78**	**Y**
50	**-53.74117**	**-38.28017**	**243**	**T7**	**T7_00050**	**12:43:24**	**78**	**N**
51	**-53.88517**	**-38.23367**	**107**	**T7**	**T7_00051**	**13:35:52**	**78**	**N**
52	**-53.87217**	**-38.23367**	**122**	**T7**	**T7_00052**	**16:26:23**	**78**	**N**
53	**-53.69**	**-37.78350**	**116**	**T7**	**T7_00053**	**17:31:48**	**78**	**N**
54	**-53.53733**	**-37.83583**	**678**	**T7**	**T7_00054**	**18:28:15**	**78**	**N**
55	**-53.34817**	**-37.90000**	**2919**	**T5**	**T5_00055**	**19:43:02**	**78**	**N**
56	**-53.18333**	**-37.95850**	**3582**	**T5**	**T5_00056**	**20:35:34**	**78**	**N**

Table VI : EVENTLOG - JR60 Late season acoustic survey (Western core box)

logging started on the 15th March 2001 @ 22:51 GMT

Ended 27th March 2001 @ 11:08 GMT

File location: Q:\JR60\JR60_eventlog.qpw

Event number	Event type	Start: Jday date time (GMT)			End: Jday date time (GMT)			td	Station name	Comments	Start Lat	Start Long.	End Lat.	End Long
1	CTD	74	15 Mar 2001	23:11	74	15 Mar 2001	23:16	3	Test	No altimeter display				
2	XBT	75	16 Mar 2001	04:40	N/A			3						
3	XBT	75	16 Mar 2001	11:08	N/A			3						
4	XBT	75	16 Mar 2001	14:57	N/A			3						
5	XBT	75	16 Mar 2001	17:02	N/A			3						
6	XBT	75	16 Mar 2001	18:58	N/A			3						
7	XBT	75	16 Mar 2001	20:49	N/A			3						
8	XBT	75	16 Mar 2001	22:54	N/A			3						
9	XBT	76	17 Mar 2001	01:00	N/A			3						
10	XBT	76	17 Mar 2001	01:06	N/A			3						
11	XBT	76	17 Mar 2001	02:54	N/A			3						
12	XBT	76	17 Mar 2001	03:00	N/A			3						
13	XBT	76	17 Mar 2001	03:06	N/A			3						
14	XBT	76	17 Mar 2001	04:54	N/A			3						
15	XBT	76	17 Mar 2001	06:54	N/A			3						
16	XBT	76	17 Mar 2001	08:47	N/A			3						
17	XBT	76	17 Mar 2001	08:55	N/A			3						
18	XBT	76	17 Mar 2001	11:00	N/A			3						
19	XBT	76	17 Mar 2001	12:55	N/A			3						
20	XBT	76	17 Mar 2001	14:52	N/A			3		Start of Shag rocks swath bathymetry transect				
21	XBT	76	17 Mar 2001	16:55	N/A			3						
22										No event. Missed number in bridge log				
23	XBT	76	17 Mar 2001	18:53	N/A			3						
24	XBT	76	17 Mar 2001	20:56	N/A			3						
25	XBT	76	17 Mar 2001	23:07	N/A			3						
26	XBT	77	18 Mar 2001	00:53	N/A			3						
27	XBT	77	18 Mar 2001	03:01	N/A			3						
28	XBT	77	18 Mar 2001	04:50	N/A			3		End of Shag rocks swath bathymetry transect				
29	XBT	77	18 Mar 2001	09:28	N/A			3		Start of transect w1.2				
30	XBT	77	18 Mar 2001	10:30	N/A			3						
31	XBT	77	18 Mar 2001	11:31	N/A			3						
32	XBT	77	18 Mar 2001	13:00	N/A			3						
33	XBT	77	18 Mar 2001	13:40	N/A			3						
34	XBT	77	18 Mar 2001	15:04	N/A			3						
35	XBT	77	18 Mar 2001	15:44	N/A			3						
36	XBT	77	18 Mar 2001	16:56	N/A			3						
37	XBT	77	18 Mar 2001	17:58	N/A			3						
38	XBT	77	18 Mar 2001	19:07	N/A			3						
39	XBT	77	18 Mar 2001	19:59	N/A			3						

40	XBT	77	18 Mar 2001	21:00	N/A			3		Failed				
41	XBT	77	18 Mar 2001	21:01	N/A			3						
42	CTD	77	18 Mar 2001	22:56	77	18 Mar 2001	23:25	3	W1.2S					
43	FNE	77	18 Mar 2001	23:38	77	18 Mar 2001	23:53	3						
44	FNE	78	19 Mar 2001	02:01	78	19 Mar 2001	02:26	2		Change to South Georgia time (GMT - 2)				
45	FNE	78	19 Mar 2001	02:27	78	19 Mar 2001	03:00	2						
46	XBT	78	19 Mar 2001	04:14	N/A			2						
47	XBT	78	19 Mar 2001	09:32	N/A			2						
48	XBT	78	19 Mar 2001	10:30	N/A			2						
49	XBT	78	19 Mar 2001	11:36	N/A			2						
50	XBT	78	19 Mar 2001	12:43	N/A			2						
51	XBT	78	19 Mar 2001	13:37	N/A			2						
52	XBT	78	19 Mar 2001	16:24	N/A			2						
53	XBT	78	19 Mar 2001	17:30	N/A			2						
54	XBT	78	19 Mar 2001	18:28	N/A			2						
55	XBT	78	19 Mar 2001	19:37	N/A			2						
56	XBT	78	19 Mar 2001	21:57	N/A			2						
57	XBT	78	19 Mar 2001	22:10	N/A			2						
58	CTD	78	19 Mar 2001	22:26	78	19 Mar 2001	23:25	2	W3.2N					
59	FNE	78	19 Mar 2001	23:38	79	20 Mar 2001	00:04	2						
60	FNE	79	20 Mar 2001	01:10	79	20 Mar 2001	01:42	2						
61	FNE	79	20 Mar 2001	02:41	79	20 Mar 2001	03:15	2	W3.2S					
62	CTD	79	20 Mar 2001	03:28	79	20 Mar 2001	03:50	2						
63	SVP	79	20 Mar 2001	03:55	79	20 Mar 2001	03:59	2		Sound velocity probe for Swath Bathymetry calibration				
		79	20 Mar 2001	18:10	83	24 Mar 2001	11:50	2		Moored at King Edward Point, South Georgia.				
64	CTD	83	24 Mar 2001	13:19	83	24 Mar 2001	14:14	2	W1.2N					

Table VII : TRANSECT LOG - JR60 Late season acoustic (Western core box)

Transect number	Name	Activity	Start Jday	Date	Start time (GMT)	End Jday	Date	End time (GMT)	Stat Lat.	Start lon	End lat.	End lon
T1	W1.1	EK500	77	18 Mar 2001	09:30:00	77	18 Mar 2001	13:55:00				
T2	W2.1	EK500	77	18 Mar 2001	15:43:00	77	18 Mar 2001	20:04:00				
T3	W3.1	EK500	78	19 Mar 2001	09:30:00	77	19 Mar 2001	13:46:00				
T4	W4.1	EK500	78	19 Mar 2001	16:24:00	78	19 Mar 2001	20:38:00				
T5	Owen Shoals	EM120	78	19 Mar 2001	13:50:00	78	19 Mar 2001	20:38:00				
T6	Bay of Isles	EM120/EK500	79	20 Mar 2001	08:31:00							
	Albatross Island		79	20 Mar 2001	09:17:00							
	Sea Leopard Island		79	20 Mar 2001	10:41:00	79	20 Mar 2001	11:26:00				
T7	Possession Bay	EM120/EK500	79	20 Mar 2001	12:28:00	79	20 Mar 2001	13:11:00				
T8	Antarctic Bay	EM120/EK500	79	20 Mar 2001	14:06:00	79	20 Mar 2001	14:55:00				
T9	Stromness Bay	EM120/EK500	79	20 Mar 2001	16:33:00							
	Husvik harbour		79	20 Mar 2001	16:54:00							
	Stromness harbour		79	20 Mar 2001	17:52:00							
	Leith harbour		79	20 Mar 2001	18:05:00	79	20 Mar 2001	19:30:00				
T10	Cumberland West Bay	EM120/EK500	82	23 Mar 2001	14:21:00	82	23 Mar 2001	15:51:00				
T11	Fortuna Bay	EM120/EK500	82	23 Mar 2001	17:06:00	82	23 Mar 2001	18:18:00				