JR140 Acoustic Report

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Introduction

The EK60 has now been in use on JCR since 2003 and operation has tended to become routine. Only brief details will be given here of general operating procedures as most settings are the same as those used in cruises JR96, JR100 and JR116. The EK60 was run during the passage from Rothera to Signy, Signy to South Georgia and then for the WCB survey off South Georgia.

The EK500 was re-installed for this cruise to drive a 120 kHz transducer mounted looking upwards in the towfish (further details are provided later in this report).

SSU settings.

The ER60 was run without EM120 swath bathymetry. The Simrad SSU was used with EK60 and EA600 pinging together within the same group. Ping interval was set at 2.0 seconds throughout.

Acoustic calibration

An acoustic calibration was carried out at Rosita Harbour, South Georgia on 2 January 2006. Standard ER60 calibration procedures were used as documented for previous cruises. Calibration conditions were reasonable and no problems were encountered. Each frequency was calibrated with standard copper spheres and a pulse duration of 1 ms. A CTD was conducted prior to the start of calibration and a sound velocity profile is shown in Table 1.

After calibration the values for the echo-sounder settings were automatically loaded into the ER60 (Table 2).

A summary sheet for all calibrations of the EK60 shows that the 38 kHz transducer has remained remarkably stable since installation (Figure 1). The 120 kHz transducer showed a marked fall in calibrated transducer gain over the first couple of years. Since then there is a suggestion that the value is oscillating around a mean transducer gain of ~ 21 dB.

Problems

Few problems with the system have been detected. The machine only crashed a couple of times during the cruise, however, no significant loss of logging time occurred.

Shallow water interference on 120 kHz was consistently detected through out the cruise (see acoustic notes, appendix 1 for times). This appeared when water depth was shallower than about 250 m. The interference was still present when 120, 38, 200 and 12 kHz frequencies (EA600 and EK60) were set to passive. Finally after the WCB the

problem was traced to the Doppler log used by the ship. Switching off the log completely removed the problem. (Figure 2)

Strong interference on all 3 frequencies was noted during the WCB phase of the cruise. This took the form of strong spikes at varying depths and different times on each frequency (Figure 2). Investigation of this noise suggested that it may have been linked to use of the USBL system which was used during RMT fishing. During the day the USBL system was left powered up with the probe retracted but the gate value open. The noise spikes disappeared after 23:40 on 31 December 2005 about when the USBL was powered down. However, later tests undertaken by switching USBL on were unable to recreate the noise spikes seen during the WCB. The source of this noise there remains unresolved.

EK500 report

Mobilisation

On 20th Dec 2005, the tow fish was mobilised onto the JCR. The tow fish and cradle were installed next to the PES winch, located on the starboard side, forward of the accommodation. Wooden spacers were tied to the winch drum and the tow cable (UOR cable and faring) wound onto the drum. The slip ring and step-down transformer were installed on the aft end of the drum. The deck cable, for the tow fish transducer and depth sensor was run from the PES winch to UIC room, entering the UIC room through a gland located to the left and above the EK60 PC. The PES winch and davit were tested whilst alongside at Rothera.

The 200 KHz single beam transducer installed in the tow fish was swapped with a 120 KHz single beam transducer (serial number: 29886 Part no. 312-062416.3), provided by the Fisheries Research Service (FRS), Aberdeen

An EK500 transceiver, screen, logging PC and depth sensor display were installed in the UIC room. The 200 KHz processing card was swapped for a 120 KHz, again provided by FRS, (ser no.10132 part no. 382-074984).
Note: During dry tests the depth sensor increased noise on the EK500 echogram. This did not occur when the tow fish was submerged.

The transducer mounting angle was changed from 61 deg to 20 deg from the vertical, this reduced the surface acoustic dead zone from 6.8 m to 2.2 m (see Everson and Bone, 1986). Stainless steel support bars within the tow fish prevented the transducer being turned to intermediate angles.

Operation

The towfish was successfully test deployed on
The tow fish was successfully deployed for transects w2.1 to w4.2 inclusive. Mean tow speed was 10 knots and mean tow fish depth was 25 m. Marginal weather conditions prevented deployment for transects w1.1 and w1.2.

Acoustic data were broadcast on the AUI network connection from the EK500 transceiver, converted to BNC and stored locally on the logging PC using Sonardata

echolog500, running under Windows NT. These .ek5 files were stored locally and transferred using zip discs. Two transects of .ek5 data had a total size of approximately 80 MB.

These data were copied to:

\\Jcr-ek60ws-d1\data\JR140 ek6\WCB transect x\Tow fish WCB transect x
and
\\samba\ek6\JR140 ek6\WCB transect x\Tow fish WCB transect x

Note: There are insufficient cores in the tow cable to use a split beam transducer.

Calibration

The 120 KHz single beam transducer was calibrated on 2nd January 2006. The transducer was mounted pointing vertically downwards and calibration frame was mounted on the tow fish. A standard copper 120 KHz sphere was used. Calibration lines were extended until the first tape mark was approximately 1 m from the electric winch, along the extension pole. Cable control settings for maximum single target strength were Starboard=968, Port=976, Nose=977.

The EK500 transceiver was configured to calculate the NASC s_A. These data were broadcast on the serial port, connected to the logging PC and viewed in hyperterminal. This gave a mean s_A measured of 1158 (10 observations, s_A theory was 1132).

Calibration results

Old TS transducer gain= 23.3 dB	New TS transducer gain- 20.9 dB
Old Sv transducer gain= 23.3 dB	New Sv transducer gain- 20.9 dB

Recommendations:

1. Track the tow fish using a USBL beacon.
2. Take spare faring. May allow a deeper tow – how much cable remained on the PES winch drum for a 25 m depth, 10 knot deployment.
3. Add EK500 logging PC to ship's network.

References

Everson, I. and Bone D.G. (1986). Detection of Krill (*Euphausia Superba*) near the sea surface: Preliminary results using a towed upward-looking echo-sounder. British Antarctic Survey Bulletin, 72, 61-70.

Figure 1: Summary of calibration results for EK60. Note that effective Sa transducer gain is sum of TS transducer gain and Sa correction. Full results are available in 'master calibration summary.xls'. Note that 200 kHz results are only shown for split beam transducer installed in 2003.

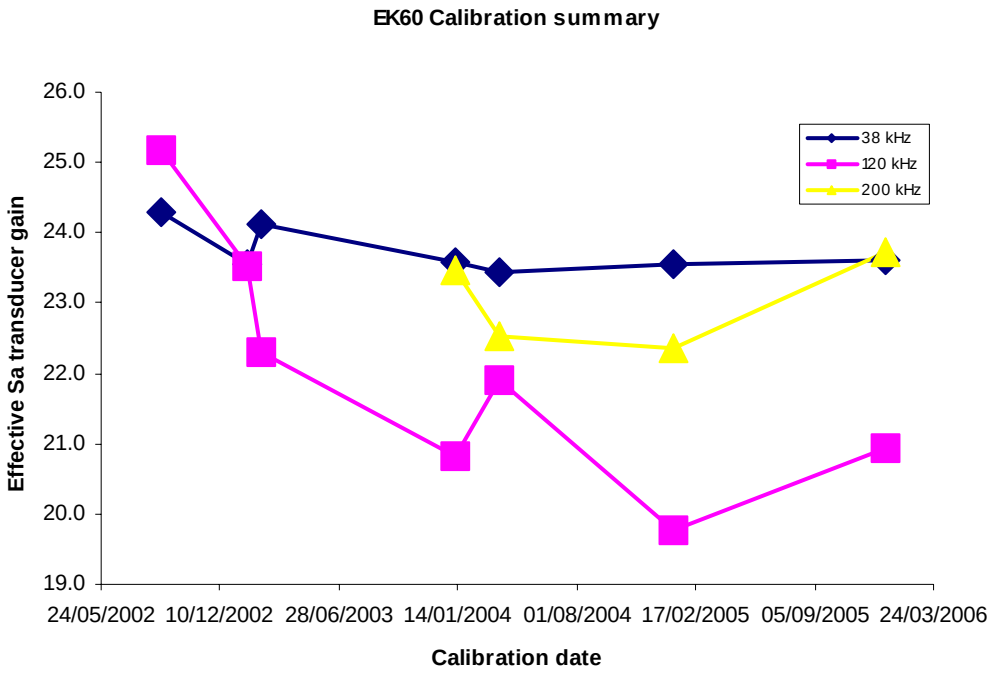
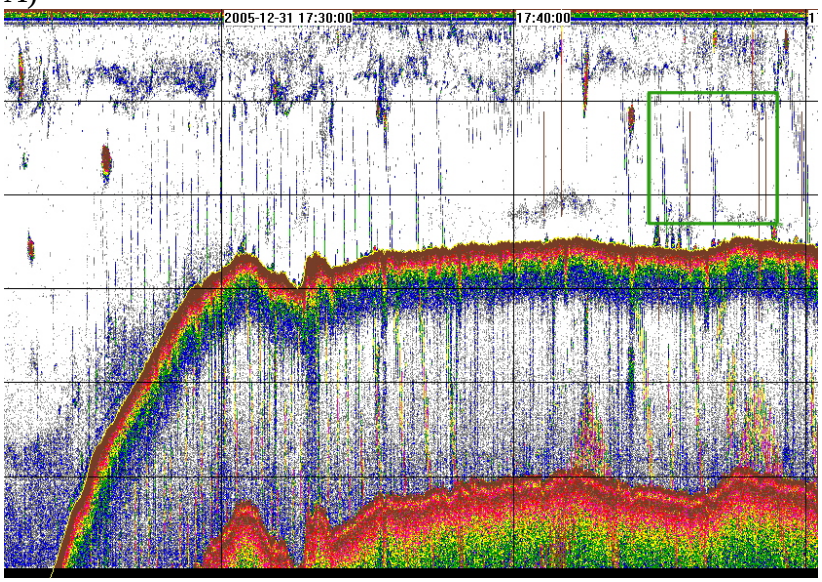


Figure 2: Shallow water noise detected during WCB. A) 120 kHz echogram from transect W3.2 in WCB. Blue vertical streaks are from Doppler log. Echogram from green box expanded in inset (B) which shows blue Doppler log noise and the brown/red vertical bars which are unidentified noise (Sv >30 dB). The background noise threshold is –80 dB.

A)



B)

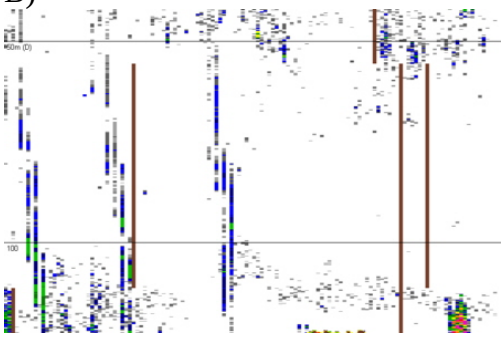


Table 1: Sound velocity profile taken in Rosita Harbour, 2 January 2006-01-07
Bottom line shows mean values used in EK60 calibration

Temp ©	Salinity	Depth (m)	Sound velocity (m/s)
1.50	35.14	5	1456.2
1.83	34.09	10	1456.3
0.85	33.86	15	1451.7
0.78	33.86	20	1451.5
0.75	33.86	25	1451.4
0.75	33.86	30	1451.5
1.08	34.11		1453.1

Table 2:

Echosounder settings used before and after calibration on 2 January 2006.

FREQUENCY	38 kHz	120 kHz	200 kHz
PING INTERVAL	1.0	1.0	1.0
SOUND VELOCITY calibration setting	1453.0	1453.0	1453.0
ABSORPTION calibration setting	10.07	26.27	39.80
TRANSMIT POWER	2000	500	300
PULSE LENGTH	1.024	1.024	1.024
BANDWIDTH	2425	3026	3088
SAMPLE INTERVAL	0.186	0.186	0.186
THEORETICAL TS OF SPHERE	-33.80	-40.40	-44.90
OLD GAIN	24.14	20.23	22.68
MEASURED TS	-33.50	-38.76	-46.18
CALIBRATED GAIN	**24.24**	**21.31**	**24.01**
TRANSDUCER DATA 2-WAY BEAM ANGLE	-20.70	-20.70	-19.60
old SA CORRECTION	-0.58	-0.45	-0.32
CALIBRATED SA CORRECTION	-0.64	-0.38	-0.28
DEFAULT -3dB BEAMWIDTH ARHW.	7.1	7.98	6.7
CALIBRATED -3dB BEAMWIDTH ATHW.	**6.91**	**7.71**	**6.32**
DEFAULT -3dB BEAMWIDTH ALONG	7.1	7.89	7.2
CALIBRATED -3dB BEAMWIDTH ALONG	**6.94**	**7.73**	**6.22**
default ATHWARTSHIP OFFSET	0.02	-0.23	-0.02
default FORE - AFT OFFSET	-0.05	0.05	-0.13
ATHWARTSHIP OFFSET	**0.03**	**-0.10**	**-0.16**
FORE - AFT OFFSET	**-0.03**	**-0.14**	**0.14**
NOISE WITH TRANSDUCER CONNECTED	-108	-151	-132

Appendix 1 – Acoustic Notes – JR140

29 December 2005

Transect W1.1 started at 06:00 (L) on 29 December with typical core box weather. Ship rolling and periodically enough to throw papers on floor. Quality of acoustics is poor. Weather deemed unsuitable for tow fish.

XBT deployed while ship steaming at 6 knots at start of transect. Acoustics improved once ship up to 10 knots. Captain Elliot suggests that due to amount of leeway, ie reduced at 10 knots.

Acoustics drop out significantly each time ship slows to 6 knots for XBT.

Second transect (W1.2) some strong targets at 17:36 on 29/12/05, 18:03,

After second transect ended, changed power on 38 khz from 2 kw to 1kw to see if reduces 120 and 38 noise in shallow water.

RMT8 fishing

First RMT fished after detecting couple of targets and returning to them. Net monitor output not being recorded to SCS. When net returned to surface, top net (net 2) ripped from mouth to cod end. Net 1 had no liner!

Replaced net 2 with new net. Trialled and fished relatively low density swarm. Krill caught and measured.

Net monitor info appears to have been logged locally onto net monitor PC. Files are: 05363232735.dat & 05363213238.dat

30 January 2005.

38 kHz power changed to 2 kw at 08:33 (Z) on operation menu of EK60.
08:46 (Z) deploying towfish at 0.5 knots.
08:49 (Z) tow fish deployed to 30 m depth while at 0.5 knots. Now speeding up to 6 knots.
09:23 (Z) ship now at 10 knots and towfish depth 23 – 24 m.
Tow fish appeared on 38 kHz sounder until up above 8 knots. Everything logging well.

Insertion point of towfish cable (ie point at which it goes through surface) looks as if it is just behind bow wave.

Checked clocks on sounders at 09:48 (Z). EK500 1 second slower than GPS. EK60 4 seconds slower than GPS. No changes made.

11:03 (Z) tow fish picking up things near surface, depth of fish = 23.4 - 24.4 m

12:25 (Z) fishing vessel (actually fishing) on port side.

Recovered tow fish after transect W2.1 just to check all ok. Tightened bolts on nose cone. Replaced in water. Ship travelling at 12 .3 knots to next transect. Tow fish at 19 – 21 m at this speed. Wire out similar to previous transect. Very noisy at surface. Bridge notified that should only do 10 knots with fish in water

Transect W2.2 started at 15:23. Tow fish in water and settled at 23.5 m with speed 10 knots.

Getting significant interference on 120 kHz in shallow water (ie about 150 m deep). This is a false bottom at 20 m and 40 m. Switched off tow fish for a minute at 15:39. This is cause of false bottom. Other shallow interference shows as rising flecks like electrical noise. 15:52 – bridge sounder (EA600) switched off but made no difference. Also tried changing ping rate but still appearing although on different parts of chart.

Looks as if can phase 120 towfish interference by changing ping rate (say to 2.1 s) for a couple of pings. This shifted it below bottom. (15:58 Z). Interference on 120 kHz effectively disappears at 16:50 when water depth beyond 300 m.

Lots of targets between 16:30 and 17:00 (Z). This is shelf break region 53 46.92 S 38 35.40 W to 53 45.86 S 38 35.43 W.

Tow fish at 23.9 m (14:58 Z).

More good targets at 17:52, 17:55 and 18:08 (53 33.61, 38 40.06 – 53 30.93, 38 40.20). Just on shelf break side of deep CTD station (well within 5 miles at least).

31 December 2005-12-30
Phased ek500 round at 09:02 (Z). Noted that time on EK500 says 07:07:12 while er60 says 09:07:06. So ek500 is nearly 2 hours too slow. Was this the case yesterday???????

EK60 had been switched off when I came in this morning. Clock program said the time had been updated by 90 seconds. Need to check that still running proper settings.

Noise on 120 and 200 kHz still there in shallow water. Switched both 38 and 200 off. Still on 120. Checked EA600 synchronized with EK60. Yes, changing ping rate changes both machines. Switched towfish off – makes no difference. Turned EA600 to passive. Still there. So what is it!!!!!!!!Character changing as depth changed from 100 m.

Tow fish running cleanly at 25.0 m (11:28 Z)

This pm – have classified the noise spikes for files D20051231-T134559.ek6 to D20051231_164231.ek6 as noise regions and exported the region file to JR140_wcb3.1&3.2_noise_spikes.evr. However because noise spikes are at different times on each frequency only 120 kHz spikes are correctly removed!

Conditions have deteriorated somewhat, we 20 knots from west. This is causing significant drop out on 38 kHz although ship motion is very muted. Could be due to Captains leeway theory!!!

Tow fish now towing at 23.5 m and trace somewhat noisey (17:13 Z).

1 January 2006

Happy New Year

Looks as if we haven't had any of those large red spikes during the night. Tried turning off all the frequencies on the ek60 at 08:50 (Z), still getting the blue vertical lines type noise particularly on 120 kHz even when 120, 38 and 200 kHz are all in passive mode.

09:21 (Z) Tow fish looking good at 23 m depth and nice clean trace.

Determined that the red spiked noise seemed to stop at 23:40 (Z) on 31 December. That is straight after last RMT and Pat Cooper switched the USBL off completely at that point. Switched USBL on at 14:05 (Z) on 1 Jan 2006 but so far no sign of any noise. Probe has been put flush with hull (yesterday during day it was retracted although gate valve was still open)

Problem with echo from tow fish appearing as bottom on 120 KhZ (17:20 to 18:10). Phased round when noticed.

Rosita Harbour – 17:00 (L). Anchored for the night. Peter setting up calibration equipment. Trying to find source of noise on ek60 120 kHz transducer. Switched all 3 EK60 transducers to passive – still there. Then added EA600

2 January 2006-01-02
10:20 (Z) – CTD for sound velocity
CTD software produces svp file that is used for EM120. This produces T, S and sv at 5 m intervals. Just the job.

38 kHz defaults

24.14, -0.58 correction

Event Log

Time	Event	Lat	Lon	Comment	User
03/01/2006 03:28		-53.5105	-37.8453	Deep water mooring slipped from stern. Depth 1331m. End of science vessel proceeding toward Punta Arenas	bridge
03/01/2006 02:50		-53.4964	-37.8397	Commence deployment of mooring.	bridge
03/01/2006 02:48		-53.4961	-37.8395	Ship in position for deployment of deep mooring.	bridge
03/01/2006 01:02		-53.7953	-37.9368	Mooring released. Depth on EA 600 318mts	bridge
03/01/2006 00:51		-53.7921	-37.9386	Commenced deployment	bridge
03/01/2006 00:45		-53.7918	-37.9387	Ship in position for deployment of shallow mooring.	bridge
03/01/2006 00:06		-53.7718	-38.0672	Buoy not surfaced proceeding to the next station	bridge
02/01/2006 23:32		-53.7719	-38.0672	Ship in position for pop up west. Hydrophone deployed.	bridge
02/01/2006 22:32		-53.8706	-37.8799	Buoy not surfaced. Proceeding to pop up west.	bridge
02/01/2006 22:09		-53.8705	-37.8798	Ship moved closer and hydrophone redeployed. Buoy position 063T x 110 metres.	bridge
02/01/2006 21:55		-53.8702	-37.8838	Ship in position for pop up east. Hydrophone deployed.	bridge
02/01/2006 19:18		-54.017	-37.438	Towfish calibration completed.	bridge
02/01/2006 17:27		-54.017	-37.4381	Towfish deployed for calibration.	bridge
02/01/2006 10:34		-54.017	-37.438	CTD recovered.	bridge
02/01/2006 10:21		-54.0171	-37.4381	CTD deployed for calibration checks.	bridge
02/01/2006 09:00		-54.0171	-37.4381	Commence calibration activities in Rosita Harbour.	bridge
01/01/2006 18:45		-53.8509	-37.5947	Vessel through final transect point. Now en route to Rosita Harbour.	bridge
01/01/2006 13:47		-53.1605	-37.9656	XBT deployed.	bridge
01/01/2006 12:39		-53.3334	-37.9076	XBT deployed.	bridge
01/01/2006 11:31		-53.5148	-37.8471	XBT deployed.	bridge
01/01/2006 10:26		-53.6911	-37.7877	XBT deployed. Waypoint 9.	bridge
01/01/2006 09:19		-53.8665	-37.7286	Commence transect at waypoint 4.1S course 349T 10 knots. XBT deployed.	bridge
01/01/2006 04:10		-53.3608	-38.0823	CTD Back on deck. Vessel moving off to next station.	bridge
01/01/2006 03:47		-53.3607	-38.0822	CTD Held at 1000m. Commence recovery.	bridge
01/01/2006 03:31		-53.3608	-38.0822	CTD deployed to approx 1000m	bridge
01/01/2006 03:24		-53.3607	-38.0821	Vessel on station 41 for CTD.	bridge

01/01/2006 01:01		-53.7155	-37.9649	CTD recovered	bridge
01/01/2006 00:57		-53.7155	-37.9649	ctd @ 120m	bridge
01/01/2006 00:55		-53.7155	-37.9649	CTD deployed.	bridge
01/01/2006 00:45		-53.7155	-37.9651	V/L on station 39	bridge
31/12/2005 23:58		-53.6169	-38.037	RMT net recovered.	bridge
31/12/2005 23:25		-53.6171	-38.0038	RMT net deployed. Course 271T	bridge
31/12/2005 22:41		-53.5725	-38.0131	Ship heading back south along transect.	bridge
31/12/2005 21:51		-53.6789	-37.9762	Resume transect seeking more targets.	bridge
31/12/2005 21:35		-53.6884	-37.994	RMT net recovered.	bridge
31/12/2005 21:15		-53.6847	-37.9718	RMT net deployed. Target in position 53 41.1S 037 58.5W	bridge
31/12/2005 19:33		-53.8892	-37.9069	Ship back on transect line heading 349T at 10 knots seeking targets.	bridge
31/12/2005 19:18		-53.8989	-37.9088	Towfish recovered.	bridge
31/12/2005 19:10		-53.8898	-37.9075	End of transect. Waypoint 3.2S.	bridge
31/12/2005 14:48		-53.1843	-38.1404	Commence transect at waypoint 3.2N	bridge
31/12/2005 13:21		-53.2192	-38.4493	XBT deployed. End of transect.	bridge
31/12/2005 12:14		-53.3956	-38.392	XBT deployed	bridge
31/12/2005 11:06		-53.5724	-38.3353	XBT deployed.	bridge
31/12/2005 10:03		-53.7451	-38.2793	XBT completed	bridge
31/12/2005 10:01		-53.7488	-38.2781	XBT abandoned	bridge
31/12/2005 08:59		-53.9161	-38.2233	First XBT failed another deployed.	bridge
31/12/2005 08:55		-53.929	-38.22	Start of transect waypoint 3.1S XBT deployed	bridge
31/12/2005 08:45		-53.9469	-38.2104	Increasing speed to 10 knots heading for the start of the transect	bridge
31/12/2005 08:43		-53.9472	-38.2104	Commence deployment of tow fish	bridge
31/12/2005 05:07		-53.6093	-38.6403	Vessel off station moving slowly towards start of acoustic run for 06:00	bridge
31/12/2005 03:02		-53.6088	-38.6393	CTD recovered	bridge
31/12/2005 02:37		-53.6088	-38.6392	CTD at 1011m	bridge
31/12/2005 02:15		-53.6087	-38.6396	CTD deployed	bridge
31/12/2005 02:02		-53.6088	-38.6394	V/L on station 29	bridge
31/12/2005 01:21		-53.5427	-38.6744	RMT net recovered.	bridge
31/12/2005 00:35		-53.5142	-38.6573	RMT net deployed. Course 194T	bridge

30/12/2005 22:27		-53.4316	-38.6946	On station for CTD. Heading 187T. Water depth 3001 metres.	bridge
30/12/2005 21:24		-53.2892	-38.7519	RMT net recovered.	bridge
30/12/2005 20:34		-53.2605	-38.7446	RMT net deployed. Target in position 53 16.1S 038 44.6W	bridge
30/12/2005 20:08		-53.2614	-38.7488	Ship back on transect. Heading 170T seeking targets.	bridge
30/12/2005 19:56		-53.2398	-38.752	Towfish recovered.	bridge
30/12/2005 19:45		-53.2409	-38.7521	End of transect. Ship passes waypoint 2.2N	bridge
30/12/2005 15:24		-53.9604	-38.5263	Vessel at south end start point of transect 2.1S	bridge
30/12/2005 13:46		-54.0038	-38.8168	XBT deployed. End of transect.	bridge
30/12/2005 12:37		-53.8259	-38.871	XBT deployed.	bridge
30/12/2005 11:27		-53.6455	-38.9277	XBT deployed.	bridge
30/12/2005 10:23		-53.4738	-38.9809	XBT completed	bridge
30/12/2005 10:20		-53.4642	-38.9839	XBT deployed at WP 29	bridge
30/12/2005 09:23		-53.31	-39.0312	Vessel proceeding at 10knots course 170T	bridge
30/12/2005 09:16		-53.2943	-39.0354	XBT completed increasing speed to 10 knots monitoring tow fish wire	bridge
30/12/2005 09:11		-53.2863	-39.0378	Start of transect waypoint 2.1N XBT in the water	bridge
30/12/2005 09:10		-53.2846	-39.0382	At 6 knots for deployment of XBT	bridge
30/12/2005 08:56		-53.2562	-39.0428	Increasing speed to 8 knots	bridge
30/12/2005 08:48		-53.2472	-39.0427	Starting to increase speed to 6 knots	bridge
30/12/2005 08:46		-53.2472	-39.0432	Commence deployment of tow fish	bridge
30/12/2005 08:37		-53.2462	-39.0489	Turning ship in preparation for acoustic run.	bridge
30/12/2005 05:10		-53.4938	-39.2511	Vessel off station moving slowly towards start of acoustic run for 06:00	bridge
30/12/2005 04:34		-53.4938	-39.2513	CTD Recovered to deck due to problems with CTD wire.	bridge
30/12/2005 03:39		-53.4937	-39.251	CTD Being recovered to deck	bridge
30/12/2005 03:34		-53.4937	-39.251	CTD Being deployed to approx 1000m	bridge
30/12/2005 03:27		-53.4937	-39.2509	Vessel on station for CTD at waypoint 19	bridge
30/12/2005 01:12		-53.863	-39.1527	RMT net recovered.	bridge
30/12/2005 00:42		-53.8437	-39.1474	RMT net deployed. Course 181T	bridge
29/12/2005 23:49		-53.8456	-39.1439	CTD recovered after being deployed to 273metres.	bridge
29/12/2005 23:16		-53.8435	-39.1424	V/L on station 17	bridge
29/12/2005 22:49		-53.8519	-39.2091	Proceeding to CTD station.	bridge

29/12/2005 22:41		-53.859	-39.206	RMT net recovered.	bridge
29/12/2005 21:33		-53.8305	-39.1469	RMT net deployed. Course 223T	bridge
29/12/2005 20:06		-54.0181	-39.0898	Resume transect from south to north RMT net rigged seeking targets.	bridge
29/12/2005 19:09		-54.0339	-39.0889	End of transect. Ship passes waypoint 1.2S	bridge
29/12/2005 14:50		-54.0514	-39.1069	Commence second transect. Waypoint 1.2N	bridge
29/12/2005 13:39		-53.3392	-39.6045	XBT deployed. End of transect. Waypoint 1.1N	bridge
29/12/2005 12:25		-53.5233	-39.5494	XBT deployed	bridge
29/12/2005 11:18		-53.6938	-39.4985	XBT abandoned	bridge
29/12/2005 11:14		-53.6999	-39.4974	XBT deployed	bridge
29/12/2005 10:04		-53.8766	-39.4447	Complete deployment of XBT at WP40.	bridge
29/12/2005 09:02		-54.0459	-39.3943	XBT completed increase speed to 10 knots.	bridge
29/12/2005 08:56		-54.0564	-39.391	Commence transect. Speed 6 knots for XBT. Course 350T.	bridge
29/12/2005 00:51		-53.7925	-38.0334	Tow fish recovered	bridge
28/12/2005 23:58		-53.7853	-37.9333	Tow fish deployed	bridge
28/12/2005 23:25		-53.7949	-37.9389	Mooring recovered.	bridge
28/12/2005 23:10		-53.7981	-37.9422	Recovery line attached. Commence recovery.	bridge
28/12/2005 23:08		-53.799	-37.9422	v/l makes approach on mooring bouy	bridge
28/12/2005 23:03		-53.8012	-37.9413	Buoy surfaced one point to port.	bridge
28/12/2005 23:01		-53.8012	-37.9413	Both releases fired	bridge
28/12/2005 22:58		-53.8012	-37.9415	Ship in position for recovery of second mooring.	bridge
28/12/2005 22:35		-53.7946	-37.9346	Mooring recovered.	bridge
28/12/2005 22:21		-53.7975	-37.9343	Recovery line attached. Commence recovery.	bridge
28/12/2005 22:04		-53.8001	-37.9334	Buoy surfaced two points to starboard.	bridge
28/12/2005 21:59		-53.8	-37.9334	Ship moved back downwind for recovery.	bridge
28/12/2005 21:20		-53.7986	-37.9358	On position over shallow mooring. Commence acoustics.	bridge
28/12/2005 21:08		-53.8003	-37.9318	CTD recovered after being deployed to 200 metres.	bridge
28/12/2005 20:53		-53.8004	-37.9316	CTD deployed near core box shallow mooring site. 304 metres from deployment position.	bridge
28/12/2005 19:16		-54.0339	-38.0693	Pop up buoy did not surface. No communication established. Task abandoned. Ship proceeding to core box shallow mooring site.	bridge

28/12/2005 18:35		-54.0338	-38.0692	Hydrophone deployed	bridge
28/12/2005 18:34		-54.0338	-38.0691	Vessel Stopped in DP in position 200m from Bird Island Pop Up Buoy	bridge
27/12/2005 00:33		-60.2729	-45.2626	Mooring landed on seabed. Hydrophone recovered. Clear to depart.	bridge
27/12/2005 00:00		-60.2728	-45.2626	Mooring released. Depth on EA 600 3872mts	bridge
26/12/2005 22:51		-60.2729	-45.2627	Commence deployment of mooring. Depth on EA 600 3980mts	bridge
26/12/2005 21:43		-60.2949	-45.2559	Mooring released. Depth on EA 600 3410mts	bridge
26/12/2005 19:52		-60.2938	-45.2568	Commence deployment of mooring. Depth on EA 600 3437mts	bridge
26/12/2005 18:44		-60.3647	-45.3355	CTD on deck vessel moving to moorings station.	bridge
26/12/2005 17:57		-60.3647	-45.3356	CTD at 2467m commmence recovery	bridge
26/12/2005 17:13		-60.3647	-45.3358	CTD deployed to approx 2500m	bridge
26/12/2005 17:05		-60.3647	-45.3356	Vessel On Station for CTD 4 depth 2500m	bridge
26/12/2005 16:26		-60.3152	-45.2828	CTD Recovered to deck.	bridge
26/12/2005 15:27		-60.3152	-45.2826	PO Held at 3031- Commence recovery	bridge
26/12/2005 14:32		-60.3144	-45.2817	CTD deployed	bridge
26/12/2005 14:23		-60.3145	-45.2816	V/L on station 3000m	bridge
26/12/2005 14:05		-60.3145	-45.2816	CTD Recovered to deck.	bridge
26/12/2005 12:52		-60.2937	-45.2563	ctd @ 3523m	bridge
26/12/2005 11:45		-60.2937	-45.2565	CTD Deployed to 3468m	bridge
26/12/2005 11:38		-60.2936	-45.2564	V/L on station	bridge
26/12/2005 11:12		-60.2728	-45.2625	CTD recovered.	bridge
26/12/2005 09:56		-60.2728	-45.2626	CTD held at 3930m wire out. Commence recovery.	bridge
26/12/2005 08:49		-60.2728	-45.2623	CTD being lowered to 3800m	bridge
26/12/2005 08:45		-60.2728	-45.2623	CTD deployed	bridge
26/12/2005 08:37		-60.2728	-45.2622	On station for CTD 1 depth 3875m	bridge