CRUISE REPORT FOR THE HUDSON MISSION HUD 2008-037

Leg 1: Sept 28-Oct 6, Leg 2 : Oct 7-Oct 13, Leg 3 : Oct 14-Oct 21

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Objectives

The main objectives of the mission were:

- to obtain synoptic fall observations of the hydrography and the distributions of nutrients, phytoplankton, zooplankton and bacteria along three sections on the Scotian Shelf and one in Cabot Strait, i.e. to carry out the fall Atlantic Zone Monitoring Programme (AZMP).
- to retrieve moorings along a section (SS-B) across the slope waters of the central Scotian Shelf, to deploy moorings along the extension of the Halifax Section and to take hydrographic profiles and collect water samples at mooring stations. This part of the programme is in collaboration with members of the UK RAPID-WAVE (West Atlantic Variability Experiment) programme.

Additional objectives were:

- to carry out hydrographic, chemical and biological sampling at stations in the Gully and Roseway Basin and at stations along a transect across the NE Channel
- to measure the underwater light field (1-2 times per day) and measure levels of CDOM (coloured dissolved organic material)

- to monitor temperature, salinity and *in vivo* phytoplankton fluorescence continuously in the near surface (using a flow-through system)
- to deploy an APEX profiling float in the slope waters (>2000 m) off Banquereau Bank
- to examine the vertical distribution of mesozooplankton at depths of up to 1000 m beyond the shelf-break
- to investigate the vertical distribution of macroplankton (e.g. krill) in NE Channel, the shelf basins, the Gully and Cabot Strait
- to sample using the MVP (Moving Vessel Profiler) between stations on the BBL , HL and NE Channel sections
- to record acoustic backscattering along the ship's track
- to deploy/recover moorings at HL2
- to identify and enumerate birds during transit between stations and lines
- to collect and preserve water samples for analysis of carbon dioxide levels and to measure dissolved oxygen and pH at AZMP stations
- to make VLOPC drops at stations of the main monitoring lines
- to retrieve 'whale listening' moorings in Shortland and Haldiman canyons
- to deploy drifters off Cape Breton and Newfoundland, north of the Cabot Strait line
- to collect stage V *Calanus finmarchicus* at their overwintering depths to measure lipid content

Summary of mission accomplishments and problems encountered

All of the stations of the main AZMP lines were sampled, so that the first major objective, the core AZMP sampling, was successfully completed. All but one of the moorings on the SSB line were successfully recovered and all of the moorings planned for the Halifax Line extension were successfully deployed, and the hydrographic and water sampling were carried out, so that the second major objective was also successfully completed. Additional stations were sampled as required by the additional objectives stated above and all objectives were achieved, although one station planned for Jordan Basin was not sampled, because of an incident that caused a delay early in the second leg of the trip (see below).

During the first leg of the cruise the mooring work in the slope waters of the Halifax Line was done in collaboration with the scientists from the UK "RAPID" programme. Accompanying CTD profiles were collected and water sampling was also carried out along with some biological net sampling. A report of this work is given in Appendix A.

Early during the second leg of the cruise, as the CTD was being brought in from a deployment at HL2, the package was pulled up through the block. The cable broke and the CTD fell to the bottom in 150 m of water. The position was marked, and the CTD was eventually retrieved some 2 months later by a commercial company using an unmanned submersible. This accident was caused by the fact that relatively few members of the crew had enough training or experience in driving the winch used to deploy and retrieve this piece of gear and at the time of the incident an inexperienced crew member was being trained on the job. The clearance is very limited getting the CTD in through the doors and on board, and it requires very precise coordination between

bringing in both the cable and the boom extension at the same time. It is our understanding that Coastguard does not recognize the degree of skill/experience required, so that crew members who do become adept at this may be switched to other ships, or to other duties, to the detriment of the scientific programme, not to mention causing a substantial expense in financial terms. Following the loss of the CTD the ship continued with other activities, while the technical operations team back at BIO put together a new CTD package. The ship returned to Dartmouth to pick this up, but the new package could not be fitted with an oxygen sensor, since there were none available. Thus, there were no continuous profiles of oxygen concentration during the second and third legs of the mission.

The second leg of the mission was to the western Scotian Shelf and Northeast Channel, and sampling was along the Browns Bank and PS line. There was also sampling along the shelf portion of the Halifax section, for which the stations in the slope waters had been sampled on the first leg. The PS (Peter Smith) Line was run in order to examine the flux of nutrients into and out of the Gulf of Maine via this route (no project report provided). As well as standard AZMP sampling, on these three lines the MVP (Moving Vessel Profiler), fitted with an LOPC (Laser Optical Plankton Counter), was towed between adjacent stations. At each station there were vertical LOPC drops using a second borrowed device, so that there could be a comparison between the number of particles counted by each sampling method. Also during this leg of the cruise, samples of stage V *C. finmarchicus* were collected for lipid analysis (see report by Catherine Johnson below).

The third leg of the mission was to the eastern Scotian Shelf, the Gully and Cabot Strait. The deployment of drifters north of the Cabot Strait line was carried out in support of a project lead by Peter Smith (no project report provided) and “whale-listening” moorings in Shortland and Haldiman canyons were recovered in support of a project of a graduate student from Dalhouise University (see report by Hilary Moors below). In addition to the AZMP sampling along the Cabot Strait and Louisbourg Lines, 4 stations were sampled in the central Gully and Gully mouth.

Throughout the cruise, except in the Marine Protected Are of the Gully, acoustic backscatter signals were collected at two frequencies to determine the vertical distribution and abundance of macrozooplankton (see report by Norman Cochrane below) and when the ship was under way, during the daylight hours, a survey for pelagic birds was carried out from the bridge (see report by Karel Allard below).

Summary bridge log for the Hudson mission 2006-052

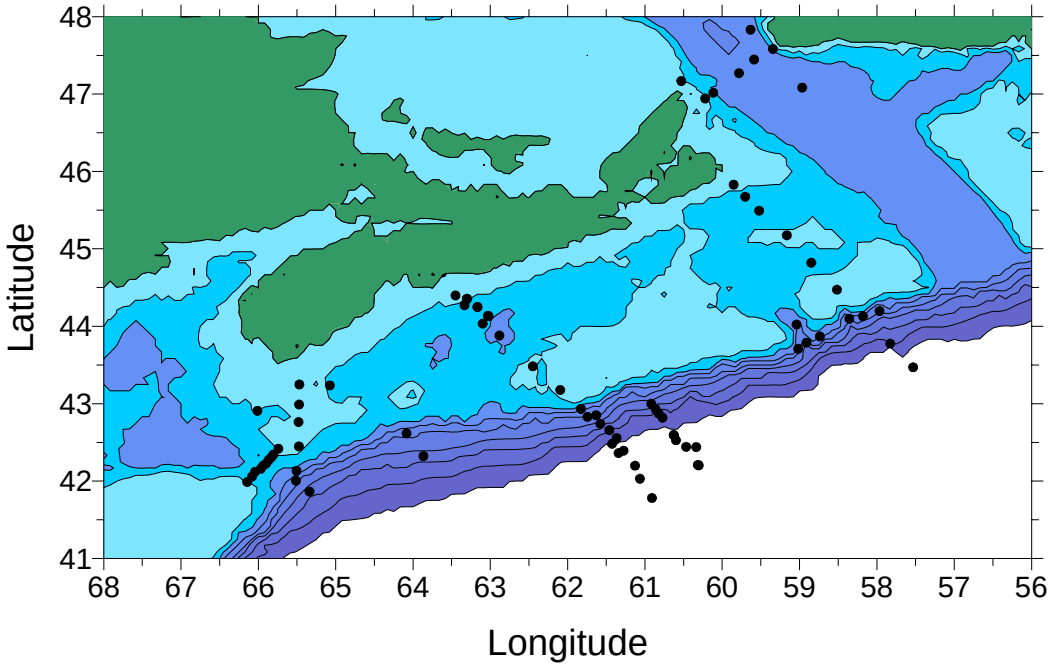
Date	Time	Event	Staion name	Lat (Deg)	Long (Deg)	Sounding	Activity
28-Sep-08	1906	1	**HL2**	44.27	-63.32	228	RING NET 1 - 1
28-Sep-08	1918	2	**HL2**	44.27	-63.33	162	RING NET 1 - 2
28-Sep-08	1937	3	**HL2**	44.26	-63.33	156	RING NET 1 - 3
28-Sep-08	1956	4	**HL2**	44.26	-63.34	150	CTD 1
29-Sep-08	1523	5	**SSB-0**	43.00	-60.92	795	MOORING BCX HOOKED
29-Sep-08	2000	6	**SSB-2**	42.82	-60.77	2788	MOORING BZ ABOARD
29-Sep-08	2022	7	**SSB-2**	42.82	-60.77	2656	CTD 2
30-Sep-08	0010	8	**BUOY-3**	42.59	-60.63	3190	CTD 3
30-Sep-08	0505	9	**SSB-0**	42.98	-60.90	1874	CTD 4
30-Sep-08	0731	10	**SSB-1**	42.92	-60.83	2221	CTD 5
30-Sep-08	1820	11	**BUOY-B4**	42.44	-60.34		RECOVERY BUOY
30-Sep-08	2111	12	**SSB-5**	42.21	-60.32		RECOVERY BUOY B-5
30-Sep-08	2307	13	**POS-2**	42.20	-60.30	4032	CTD 6
01-Oct-08	0501	14	**B4**	42.44	-60.47	3574	CTD 7
01-Oct-08	1120	15	**SSB-3**	42.60	-60.63	3200	RECOVERY MOORING B-3
01-Oct-08	1333	16	**M1667**	42.53	-60.60		RECOVERY MOORING M1667
01-Oct-08	1634	17	**M1666**	42.87	-60.82		RECOVERY MOORING M1666
01-Oct-08	2201	18	**HL11**	41.78	-60.91	4331	CTD 8
02-Oct-08	0418	19	**HL10**	42.03	-61.06	3985	CTD 9
02-Oct-08	1440	20	**RS6**	42.16	-61.07	3796	DEPLOYED MOORING RS6
02-Oct-08	1902	21	**RS5**	42.39	-61.28	3393	DEPLOYED MOORING RS5
02-Oct-08	2203	22	**HL9**	42.20	-61.14	3794	MULTINET 1
02-Oct-08	2328	23	**HL9**	42.20	-61.13	3794	CTD 10
03-Oct-08	0436	24	**HL8**	42.36	-61.34	3345	MULTINET 2
03-Oct-08	0600	25	**HL8**	42.36	-61.35	3318	CTD 11
03-Oct-08	1106	26	**RS4**	42.56	-61.37	2800	DEPLOYED MOORING RS4
03-Oct-08	1400	27	**RS3**	42.66	-61.46	2302	DEPLOYED MOORING RS3
03-Oct-08	1622	28	**RS2**	42.74	-61.58		RELEASE TESTING
03-Oct-08	1639	29	**RS2**	42.74	-61.58		RELEASE TESTING
03-Oct-08	1740	30	**RS2**	42.74	-61.58		DEPLOYED MOORING RS2
03-Oct-08	1953	31	**RS1**	42.85	-61.63	1126	DEPLOYED MOORING RS1
03-Oct-08	2120	32	**HL6**	42.83	-61.74	1186	MULTINET 3
04-Oct-08	0131	33	**HL7**	42.48	-61.43	2696	MULTINET 4
04-Oct-08	1551	34	**SSB-1**	42.93	-60.86		GRAB TO DRAG FOR MOORING
05-Oct-08	2005	35	**OTN3**	44.13	-63.02	172	RECOVERY MOORING OTN3
05-Oct-08	2159	36	**OTN2**	44.25	-63.17	162	RECOVERY MOORING OTN2
06-Oct-08	0141	37	**HL2**	44.27	-63.32	176	RING NET 2 - 1
06-Oct-08	0203	38	**HL2**	44.27	-63.32		RING NET 2 - 2
06-Oct-08	0219	39	**HL2**	44.26	-63.31	176	RING NET 2 - 3
06-Oct-08	0303	40	**HL2**	44.26	-63.31	147	CTD 12
06-Oct-08	1106	41	**OTN1**	44.35	-63.30	110	RECOVERY MOORING OTN1
06-Oct-08	1321	42	**CARIOCA BUOY**	44.03	-63.10	187	RECOVERY CARIOCA BUOY
07-Oct-08	1332	43	**BEDFORD BASIN**	44.70	-63.64	66	LOPC TEST
07-Oct-08	1345	44	**BEDFORD BASIN**	44.70	-63.65	67	MVP TEST TOW
07-Oct-08	1605	45	**HL1**	44.40	-63.45	82	RING NET 2-1
07-Oct-08	1624	46	**HL1**	44.40	-63.45	82	CTD 13
07-Oct-08	1722	47	**HL1**	44.40	-63.45		MVP TOW 1
07-Oct-08	1850	48	**HL2**	44.27	-63.32	149	RING NET 4 - 1, 4 - 2
07-Oct-08	1907	49	**HL2**	44.27	-63.32	145	RING NET 4 - 3
07-Oct-08	1931	50	**HL2**	44.27	-63.32	146	**CTD 14 (CTD LOST)**
07-Oct-08	2204	51	**HL2**	44.27	-63.31	139	LOPC 1
07-Oct-08	2242	52	**HL2**	44.25	-63.30	161	BIONESS 1
07-Oct-08	2355	53	**HL2**	44.28	-63.33	161	MVP TOW 2
08-Oct-08	0333	54	**HL3**	43.88	-62.88	264	LOPC 2
08-Oct-08	0402	55	**HL3**	43.88	-62.88	264	RING NET 5 - 1
08-Oct-08	0422	56	**HL3**	43.88	-62.88	264	RING NET 5 - 2
08-Oct-08	0512	57	**HL3**	43.89	-62.89	264	MVP TOW 3

08-Oct-08	0841	58	**HL4**	43.48	-62.45	88	RING NET 6 - 1
08-Oct-08	0857	59	**HL4**	43.48	-62.45	86	LOPC 3
08-Oct-08	1155	60	**HL3**	43.87	-62.87	264	BIONESS 2
08-Oct-08	1309	61	**HL3**	43.91	-62.91	263	BIONESS 3
08-Oct-08	2238	62	**BBASIN**	44.69	-63.62	68	**CTD 15 (NEW CTD PACKAGE)**
09-Oct-08	0140	63	**HL2**	44.27	-63.32	168	CTD 16
09-Oct-08	0431	64	**HL3**	43.88	-62.88	265	CTD 17
09-Oct-08	0726	65	**HL4**	43.48	-62.45	86	CTD 18
09-Oct-08	0801	66	**HL4**	43.48	-62.45	86	MVP TOW 4
09-Oct-08	1043	67	**HL5**	43.18	-62.10	102	RING NET 7 - 1
09-Oct-08	1058	68	**HL5**	43.18	-62.09	103	RING NET 7 - 2
09-Oct-08	1114	69	**HL5**	43.17	-62.09	98	CTD 19
09-Oct-08	1142	70	**HL5**	43.18	-62.09	97	LOPC 4
09-Oct-08	1212	71	**HL5**	43.19	-62.10	97	MVP TOW 5
09-Oct-08	1407	72	**HL5A**	42.93	-61.82	519	CTD 20
09-Oct-08	1510	73	**HL5A**	42.93	-61.82	412	LOPC 5
09-Oct-08	1600	74	**HL5A**	42.93	-61.82	412	RING NET 8 - 1
09-Oct-08	1631	75	**HL5A**	42.93	-61.82	412	RING NET 8 - 2
09-Oct-08	1641	76	**HL5A**	42.93	-61.82	412	RING NET 8 - 3
09-Oct-08	1724	77	**HL5A**	42.93	-61.83	516	MVP TOW 6
09-Oct-08	1846	78	**HL6**	42.83	-61.75	1089	RING NET 9 - 1
09-Oct-08	1942	79	**HL6**	42.08	-61.76	1080	CTD 21
09-Oct-08	2045	80	**HL6**	42.86	-61.77	1007	LOPC 6
09-Oct-08	2354	81	**HL7**	42.48	-61.43	2675	RING NET 10 - 1
10-Oct-08	0107	82	**HL7**	42.48	-61.43	2675	CTD 22
10-Oct-08	1245	83	**RL6**	42.32	-63.87	1896	CTD 23
10-Oct-08	1447	84	**RL6**	42.35	-63.85	1896	MULTINET 5
10-Oct-08	1650	85	**RL6**	42.38	-63.85	1896	LIGHT METER 1
10-Oct-08	1856	86	**RL5**	42.62	-64.08	931	MULTINET 6
10-Oct-08	1948	87	**RL5**	42.62	-64.08	939	MULTINET 7
10-Oct-08	2205	88	**RL5**	42.62	-64.08	947	CTD 24
11-Oct-08	0440	89	**BBL7**	41.87	-65.35	1829	CTD 25
11-Oct-08	0635	90	**BBL7**	41.88	-65.32	1829	MULTINET 8
11-Oct-08	0806	91	**BBL7**	41.89	-65.32	1829	RING NET 11 - 1
11-Oct-08	0934	92	**BBL7**	41.86	-65.34	1829	MVP TOW 7
11-Oct-08	1101	93	**BBL6**	42.00	-65.51	1016	RING NET 12 - 1
11-Oct-08	1220	94	**BBL6**	42.02	-65.51	930	CTD 26
11-Oct-08	1327	95	**BBL6**	42.02	-65.50	840	LOPC 7
11-Oct-08	1403	96	**BBL6**	42.01	-65.49	899	MULTINET 9
11-Oct-08	1543	97	**BBL6**	42.00	-65.52	899	MULTINET 10
11-Oct-08	1628	98	**BBL6**	42.00	-65.52	899	LIGHT METER 2
11-Oct-08	1657	99	**BBL6**	41.99	-65.51	899	MVP TOW 8
11-Oct-08	1801	100	**BBL5**	42.13	-65.50	185	CTD 27
11-Oct-08	1853	101	**BBL5**	42.13	-65.50	207	RING NET 13 - 1
11-Oct-08	1917	102	**BBL5**	42.13	-65.51	175	MVP TOW 9
11-Oct-08	2120	103	**BBL4**	42.45	-65.48	102	RING NET 14 - 1
11-Oct-08	2133	104	**BBL4**	42.45	-65.48	96	RING NET 14 - 2
11-Oct-08	2156	105	**BBL4**	42.45	-65.48	96	CTD 28
11-Oct-08	2230	106	**BBL4**	42.45	-65.48	103	LOPC 8
12-Oct-08	0111	107	**PS2**	42.34	-65.81	200	CTD 29
12-Oct-08	0110	108	**PS3**	42.30	-65.84	214	RING NET 15 - 1
12-Oct-08	0138	109	**PS3**	42.30	-65.84	213	CTD 30
12-Oct-08	0240	110	**PS5**	42.23	-65.90	238	CTD 31
12-Oct-08	0343	111	**PS6**	42.20	-65.94	220	RING NET 16 - 1
12-Oct-08	0416	112	**PS6**	42.20	-65.93	220	CTD 32
12-Oct-08	0519	113	**PS7**	42.16	-65.97	221	CTD 33
12-Oct-08	0651	114	**PS9**	42.06	-66.08	90	CTD 34
12-Oct-08	0749	115	**PS10**	41.99	-66.14	94	RING NET 17 - 1
12-Oct-08	0808	116	**PS10**	41.99	-66.15	92	CTD 35
12-Oct-08	0829	117	**PS10**	41.99	-66.16	92	LOPC 9
12-Oct-08	0852	118	**PS10**	41.99	-66.14	92	MVP TOW 10
12-Oct-08	1004	119	**PS8**	42.12	-66.04	203	CTD 36

12-Oct-08	1038	120	**PS8**	42.12	-66.05	209	LOPC 10
12-Oct-08	1102	121	**PS8**	42.12	-66.06	205	RING NET 18 - 1
12-Oct-08	1134	122	**PS8**	42.12	-66.05	201	MVP TOW 11
12-Oct-08	1300	123	**PS4**	42.27	-65.87	227	RING NET 19 - 1
12-Oct-08	1330	124	**PS4**	42.27	-65.87	227	CTD 37
12-Oct-08	1402	125	**PS4**	42.27	-65.86	227	LOPC 11
12-Oct-08	1417	126	**PS4**	42.27	-65.86	226	LIGHT METER 3
12-Oct-08	1456	127	**PS4**	42.26	-65.87	228	BIONESS 4
12-Oct-08	1614	128	**PS4**	42.27	-65.87	229	MVP TOW 12
12-Oct-08	1744	129	**PS1**	42.42	-65.74	100	CTD 38
12-Oct-08	1802	130	**PS1**	42.41	-65.74	102	LOPC 12
12-Oct-08	1821	131	**PS1**	42.41	-65.74	102	RING NET 20 - 1
12-Oct-08	1945	132	**BBL4**	42.45	-65.48	102	MVP TOW 13
12-Oct-08	2145	133	**BBL3**	42.76	-65.48	103	RING NET 21 - 1
12-Oct-08	2153	134	**BBL3**	42.76	-65.48	104	RING NET 21 - 2
12-Oct-08	2214	135	**BBL3**	42.77	-65.49	107	CTD 39
12-Oct-08	2246	136	**BBL3**	42.75	-65.35	107	MVP TOW 14
13-Oct-08	0018	137	**BBL2**	42.66	-65.47	113	RING NET 22 - 1
13-Oct-08	0036	138	**BBL2**	42.66	-65.47	113	CTD 40
13-Oct-08	0110	139	**BBL2**	42.99	-65.47	115	LOPC 13
13-Oct-08	0124	140	**BBL2**	42.99	-65.47	114	MVP TOW 15
13-Oct-08	0320	141	**BBL1**	43.25	-65.48	59	RING NET 23 - 1
13-Oct-08	0032	142	**BBL1**	43.25	-65.47	67	CTD 41
13-Oct-08	0813	143	**BCCJ**	42.91	-66.01	156	CTD 42
13-Oct-08	0928	144	**BCCJ**	42.89	-66.03	152	BIONESS 5
13-Oct-08	1413	145	**RL1**	43.24	-65.08	164	BIONESS 6
13-Oct-08	1537	146	**RL1**	43.22	-65.04	159	BIONESS 7
13-Oct-08	1605	147	**RL1**	43.25	-65.06	159	CTD 43
14-Oct-08	0925	148	**HL2**	44.26	-63.33	154	BIONESS 8
14-Oct-08	2207	149	**M1705**	44.35	-63.31	101	DEPLOY MOORING M1705
14-Oct-08	2310	150	**M1706**	44.25	-63.17	167	DEPLOT MOORING M1706
15-Oct-08	0003	151	**M1707**	44.13	-63.03	169	DEPLOT MOORING M1707
15-Oct-08	1859	152	**CSL1**	46.96	-60.22	74	CTD 44
15-Oct-08	1992	153	**CSL1**	46.95	-60.22	75	LOPC 14
15-Oct-08	1941	154	**CSL1**	46.94	-60.22	74	RING NET 24 - 1
15-Oct-08	2108	155	**CSL3**	47.10	-59.99	338	RING NET 25 - 1
15-Oct-08	2142	156	**CSL3**	47.10	-59.97	346	CTD 45
15-Oct-08	2225	157	**CSL3**	47.10	-59.95	359	LOPC 15
15-Oct-08	2254	158	**CSL3**	47.08	-58.97	349	BIONESS 9
16-Oct-08	0205	159	**DRIFT SITE 1**	47.17	-60.58	180	CTD 46
16-Oct-08	0243	160	**DRIFT SITE 1**	47.19	-60.58	176	DROP NORTH 1
16-Oct-08	0251	160B	**DRIFT SITE 1**	47.19	-60.58	176	DROP NORTH 2
16-Oct-08	0316	161	**DRIFT SITE 1**	47.16	-60.63	186	DROP WEST 1
16-Oct-08	0318	161B	**DRIFT SITE 1**	47.17	-60.63	186	DROP WEST 2
16-Oct-08	0348	162	**DRIFT SITE 1**	47.14	-60.57	175	DROP SOUTH 1
16-Oct-08	0351	162B	**DRIFT SITE 1**	47.14	-60.57	175	DROP SOUTH 2
16-Oct-08	0407	163	**DRIFT SITE 1**	47.17	-60.53	175	DROP EAST 1
16-Oct-08	0410	163B	**DRIFT SITE 1**	47.17	-60.53	175	DROP EAST 2
16-Oct-08	0854	164	**DRIFT SITE 2**	47.83	-59.64	329	CTD 47
16-Oct-08	0915	165	**DRIFT SITE 2**	47.83	-59.58	321	DROP CENTRE
16-Oct-08	0934	166	**DRIFT SITE 2**	47.83	-59.60	343	DROP WEST 1
16-Oct-08	0935	166B	**DRIFT SITE 2**	47.83	-59.60	348	DROP WEST 2
16-Oct-08	0955	167	**DRIFT SITE 2**	47.84	-59.59	309	DROP NORTH 1
16-Oct-08	0957	167B	**DRIFT SITE 2**	47.84	-59.59	307	DROP NORTH 2
16-Oct-08	1014	168	**DRIFT SITE 2**	47.83	-59.57	288	DROP EAST 1
16-Oct-08	1016	168B	**DRIFT SITE 2**	47.83	-59.57	288	DROP EAST 2
16-Oct-08	1029	169	**DRIFT SITE 2**	47.82	-59.58	341	DROP SOUTH 1
16-Oct-08	1030	169B	**DRIFT SITE 2**	47.82	-59.58	343	DROP SOUTH 2
16-Oct-08	1203	170	**CSL6**	47.58	-59.34	269	CTD 48
16-Oct-08	1236	171	**CSL6**	47.58	-59.36	289	LOPC 16
16-Oct-08	1307	172	**CSL6**	47.58	-59.37	308	RING NET 26 - 1
16-Oct-08	1428	173	**CSL5**	47.43	-59.56	480	CTD 49

16-Oct-08	1508	174	**CSL5**	47.44	-59.58	480	LIGHT METER 4
16-Oct-08	1533	175	**CSL5**	47.45	-59.59	478	LOPC 17
16-Oct-08	1606	176	**CSL5**	47.45	-59.59	478	RING NET 27 - 1
16-Oct-08	1815	177	**CSL4**	47.27	-59.78	424	RING NET 28 - 1
16-Oct-08	1822	178	**CSL4**	47.27	-59.78	424	RING NET 28 - 2
16-Oct-08	1857	179	**CSL4**	47.27	-59.77	466	CTD 50
16-Oct-08	1935	180	**CSL4**	47.27	-59.76	467	LOPC 18
16-Oct-08	2025	181	**CSL4**	47.26	-59.77	464	BIONESS 10
16-Oct-08	2309	182	**CSL2**	47.02	-60.12	180	RING NET 29 - 1
16-Oct-08	2333	183	**CSL2**	47.01	-60.11	178	CTD 51
16-Oct-08	2359	184	**CSL2**	47.00	-60.10	178	LOPC 19
17-Oct-08	0628	185	**LL1**	45.83	-59.85	92	CTD 52
17-Oct-08	0651	186	**LL1**	45.83	-59.86	76	LOPC 20
17-Oct-08	0710	187	**LL1**	45.83	-59.85	86	RING NET 30 - 1
17-Oct-08	0828	188	**LL2**	45.66	-59.70	125	RING NET 31 - 1
17-Oct-08	0841	189	**LL2**	45.66	-59.70	130	RING NET 31 - 2
17-Oct-08	0902	190	**LL2**	45.66	-59.70	123	CTD 53
17-Oct-08	0925	191	**LL2**	45.67	-59.70	123	LOPC 21
17-Oct-08	1046	192	**LL3**	45.49	-59.52	130	LOPC 22
17-Oct-08	1106	193	**LL3**	45.50	-59.53	124	CTD 54
17-Oct-08	1143	194	**LL3**	45.50	-59.54	120	RING NET 32 - 1
17-Oct-08	1422	195	**LL4**	45.16	-59.18	104	RING NET 33 - 1
17-Oct-08	1438	196	**LL4**	45.17	-59.17	106	CTD 55
17-Oct-08	1459	197	**LL4**	45.17	-59.17	104	LOPC 23
17-Oct-08	1510	198	**LL4**	45.18	-59.17	104	LIGHT METER 5
17-Oct-08	1737	199	**LL5**	44.82	-58.85	219	CTD 56
17-Oct-08	1807	200	**LL5**	44.82	-58.84	245	LOPC 24
17-Oct-08	1835	201	**LL5**	44.82	-58.85	245	RING NET 34 - 1
17-Oct-08	2043	202	**LL6**	44.48	-58.51	62	RING NET 35 - 1
17-Oct-08	2058	203	**LL6**	44.47	-58.51	67	CTD 57
17-Oct-08	2124	204	**LL6**	44.47	-58.52	67	LOPC 25
18-Oct-08	0322	205	**LL9**	43.47	-57.53	3900	CTD 58
18-Oct-08	0647	206	**LL9**	43.47	-57.53	3900	MULTINET 11
18-Oct-08	0810	207	**LL9**	43.47	-57.53	3900	RING NET 36 - 1
18-Oct-08	0915	208	**LL9**	43.47	-57.53	3900	DEPLOYED APEX FLOAT #3272
18-Oct-08	1426	209	**DALHOUSIE 1**	44.20	-57.97	1553	RECOVERED 'HALDIMAND' MOORING
18-Oct-08	2030	210	**DALHOUSIE 2**	44.10	-58.36	1646	RECOVERED 'SHORTLAND' MOORING
18-Oct-08	2125	211	**LL7**	44.13	-58.18	692	MULTINET 12
18-Oct-08	2237	212	**LL7**	44.12	-58.19	625	RING NET 37 - 1
18-Oct-08	2322	213	**LL7**	44.11	-58.19	625	RING NET 37 - 2
19-Oct-08	0021	214	**LL7**	44.13	-58.18	663	CTD 59
19-Oct-08	0111	215	**LL7**	44.13	-58.19	663	LOPC 26
19-Oct-08	0348	216	**LL8**	43.78	-58.83	1924	LOPC 27
19-Oct-08	0422	217	**LL8**	43.78	-57.83	1708	CTD 60
19-Oct-08	0655	218	**LL8**	43.78	-57.83	1708	RING NET 38 - 1
19-Oct-08	0804	219	**LL8**	43.78	-57.83	1708	MULTINET 13
19-Oct-08	1211	220	**SG23**	43.87	-58.74	1091	CTD 61
19-Oct-08	1317	221	**SG23**	43.86	-58.75	980	MULTINET 14
19-Oct-08	1734	222	**GULD3**	44.02	-59.04	570	RING NET 39 - 1
19-Oct-08	1805	223	**GULD3**	44.02	-59.04	570	CTD 62
19-Oct-08	1857	224	**GULD3**	44.05	-59.04	938	BIONESS 11
19-Oct-08	2109	225	**GULD4**	43.81	-58.91	1850	MULTINET 15
19-Oct-08	2241	226	**GULD4**	43.79	-58.91	2334	CTD 63
20-Oct-08	0103	227	**SG28**	43.71	-59.01	778	RING NET 40 - 1
20-Oct-08	0151	228	**SG28**	43.71	-59.02	732	CTD 64
20-Oct-08	1621	229	**HL2**	44.27	-63.32	152	CTD 65
20-Oct-08	1703	230	**HL2**	44.27	-63.33	170	RING NET 41 - 1

STATIONS VISITED ON THE HUDSON 2008-037 MISSION



PSL = Peter Smith (NE Channel) Line
BC = Browns Channel
*BBL = Browns Bank Line
RL = Roseway Line
*HL = Halifax Line
SSL = Loder/Brit Slope water CTDs/Moorings
GUL = Gully
SC = Shortland Canyon
HC = Haldiman Canyon
*LL = Louisbourg Line
*CSL = Cabot Strait Line
D STNS = Drifter stations

* Main AZMP lines

Routine AZMP sampling procedures

1. CTD profiles: CTD profiles were collected at all stations. As well as recording temperature, depth and salinity, the CTD was also equipped with an *in situ* fluorometer to examine the vertical distribution of phytoplankton, an oxygen sensor (during leg 1 only), and with Niskin bottles. Water samples were collected at all or selected depths at all AZMP stations and stations in Roseway Basin, the Gully and in the slope waters off the Central Scotian Shelf along the SS-B line. These were used to determine: dissolved oxygen, extracted chlorophyll, nutrients, bacterial biomass and algal taxonomy. Winkler oxygen titrations and salinity determinations were carried out for the water samples collected at all depths below 250 m at stations of the SS-B line and at selected depths at other stations. pH measurements were made at all depths and samples were collected for the determination of dissolved CO2. POC, PON and HPLC pigment samples and samples for determination of absorption spectra were also taken at the surface. (Total number of profiles taken = 65)
2. VLOPC drops: VLOPC (Vertical Laser Optical Plankton Counter) profiles to the bottom or 300 m were taken to examine the vertical distribution of plankton "particles" on the HL, LL and CSL lines. (Total stations sampled = 27)
3. Vertical net tows: At the AZMP stations, a 200 μm mesh ring net was towed vertically to collect mesozooplankton. Tows were to the bottom, or 1000 m. Vertical ring net tows using a 76 μm mesh were taken on the Halifax Line. (Total number of vertical net tow stations = 41)
4. BIONESS tows: 1 in the Gully, 2 in Emerald Basin, 2 in Roseway Basin, 2 at HL2, 2 in Cabot Strait, 1 in the NE Channel and one in the chaneel to the north of Browns Bank. (Total stations sampled =11)
5. MULTI-NET tows: 6 off the western Scotian Shelf, 4 off the central Scotian Shelf, 2 in the Gully region, 3 off the eastern Scotian Shelf. (Total stations sampled = 15)

Water sampling depths and ID numbers for CTD profiles

CTD	EVENT	STN	ID_TAG	DEPTH	CTD	EVENT	STN	ID_TAG	DEPTH
1	4	**HL2**	**337001**	151	31	110	**PS5**	**337390**	201
1	4	**HL2**	**337002**	101	31	110	**PS5**	**337391**	175
1	4	**HL2**	**337003**	80	31	110	**PS5**	**337392**	150
1	4	**HL2**	**337004**	59	31	110	**PS5**	**337393**	125
1	4	**HL2**	**337005**	49	31	110	**PS5**	**337394**	100
1	4	**HL2**	**337006**	39	31	110	**PS5**	**337395**	75
1	4	**HL2**	**337007**	29	31	110	**PS5**	**337396**	60
1	4	**HL2**	**337008**	19	31	110	**PS5**	**337397**	50
1	4	**HL2**	**337009**	10	31	110	**PS5**	**337398**	40
1	4	**HL2**	**337010**	2	31	110	**PS5**	**337399**	31
2	7	**SS-B2**	**337011**	2779	31	110	**PS5**	**337400**	21
2	7	**SS-B2**	**337012**	2703	31	110	**PS5**	**337401**	10
2	7	**SS-B2**	**337013**	2449	31	110	**PS5**	**337402**	2
2	7	**SS-B2**	**337014**	2199	32	112	**PS6**	**337403**	201
2	7	**SS-B2**	**337015**	2001	32	112	**PS6**	**337404**	175
2	7	**SS-B2**	**337016**	1400	32	112	**PS6**	**337405**	150
2	7	**SS-B2**	**337017**	800	32	112	**PS6**	**337406**	126
2	7	**SS-B2**	**337018**	302	32	112	**PS6**	**337407**	101
2	7	**SS-B2**	**337019**	249	32	112	**PS6**	**337408**	75
2	7	**SS-B2**	**337020**	100	32	112	**PS6**	**337409**	60
2	7	**SS-B2**	**337021**	80	32	112	**PS6**	**337410**	50
2	7	**SS-B2**	**337022**	60	32	112	**PS6**	**337411**	40
2	7	**SS-B2**	**337023**	51	32	112	**PS6**	**337412**	30
2	7	**SS-B2**	**337024**	40	32	112	**PS6**	**337413**	20
2	7	**SS-B2**	**337025**	31	32	112	**PS6**	**337414**	10
2	7	**SS-B2**	**337026**	20	32	112	**PS6**	**337415**	3
2	7	**SS-B2**	**337027**	11	33	113	**PS7**	**337416**	200
2	7	**SS-B2**	**337028**	2	33	113	**PS7**	**337417**	175
3	8	**SS-B3**	**337029**	3294	33	113	**PS7**	**337418**	150
3	8	**SS-B3**	**337030**	2951	33	113	**PS7**	**337419**	125
3	8	**SS-B3**	**337031**	2700	33	113	**PS7**	**337420**	101
3	8	**SS-B3**	**337032**	2451	33	113	**PS7**	**337421**	76
3	8	**SS-B3**	**337033**	2200	33	113	**PS7**	**337422**	61
3	8	**SS-B3**	**337034**	2001	33	113	**PS7**	**337423**	50
3	8	**SS-B3**	**337035**	1401	33	113	**PS7**	**337424**	40
3	8	**SS-B3**	**337036**	801	33	113	**PS7**	**337425**	31
3	8	**SS-B3**	**337037**	301	33	113	**PS7**	**337426**	20
3	8	**SS-B3**	**337038**	250	33	113	**PS7**	**337427**	10
3	8	**SS-B3**	**337039**	99	33	113	**PS7**	**337428**	2
3	8	**SS-B3**	**337040**	80	34	114	**PS9**	**337429**	91
3	8	**SS-B3**	**337041**	60	34	114	**PS9**	**337430**	76
3	8	**SS-B3**	**337042**	50	34	114	**PS9**	**337431**	60
3	8	**SS-B3**	**337043**	39	34	114	**PS9**	**337432**	50
3	8	**SS-B3**	**337044**	30	34	114	**PS9**	**337433**	40
3	8	**SS-B3**	**337045**	20	34	114	**PS9**	**337434**	30
3	8	**SS-B3**	**337046**	9	34	114	**PS9**	**337435**	20
3	8	**SS-B3**	**337047**	2	34	114	**PS9**	**337436**	10
4	9	**SS-B0**	**337048**	1906	34	114	**PS9**	**337437**	3
4	9	**SS-B0**	**337049**	1400	35	116	**PS10**	**337438**	84
4	9	**SS-B0**	**337050**	801	35	116	**PS10**	**337439**	76
4	9	**SS-B0**	**337051**	301	35	116	**PS10**	**337440**	61
4	9	**SS-B0**	**337052**	250	35	116	**PS10**	**337441**	50
4	9	**SS-B0**	**337053**	100	35	116	**PS10**	**337442**	40
4	9	**SS-B0**	**337054**	81	35	116	**PS10**	**337443**	30
4	9	**SS-B0**	**337055**	59	35	116	**PS10**	**337444**	21
4	9	**SS-B0**	**337056**	49	35	116	**PS10**	**337445**	10
4	9	**SS-B0**	**337057**	38	35	116	**PS10**	**337446**	2

4	9	**SS-B0**	**337058**	30	36	119	**PS8**	**337447**	200
4	9	**SS-B0**	**337059**	19	36	119	**PS8**	**337448**	175
4	9	**SS-B0**	**337060**	8	36	119	**PS8**	**337449**	151
4	9	**SS-B0**	**337061**	3	36	119	**PS8**	**337450**	125
5	10	**SS-B1**	**337062**	2285	36	119	**PS8**	**337451**	100
5	10	**SS-B1**	**337063**	2000	36	119	**PS8**	**337452**	75
5	10	**SS-B1**	**337064**	1402	36	119	**PS8**	**337453**	60
5	10	**SS-B1**	**337065**	799	36	119	**PS8**	**337454**	50
5	10	**SS-B1**	**337066**	301	36	119	**PS8**	**337455**	40
5	10	**SS-B1**	**337067**	251	36	119	**PS8**	**337456**	30
5	10	**SS-B1**	**337068**	99	36	119	**PS8**	**337457**	20
5	10	**SS-B1**	**337069**	80	36	119	**PS8**	**337458**	10
5	10	**SS-B1**	**337070**	60	36	119	**PS8**	**337459**	2
5	10	**SS-B1**	**337071**	50	37	124	**PS4**	**337460**	200
5	10	**SS-B1**	**337072**	39	37	124	**PS4**	**337461**	125
5	10	**SS-B1**	**337073**	30	37	124	**PS4**	**337462**	151
5	10	**SS-B1**	**337074**	21	37	124	**PS4**	**337463**	124
5	10	**SS-B1**	**337075**	10	37	124	**PS4**	**337464**	101
5	10	**SS-B1**	**337076**	3	37	124	**PS4**	**337465**	75
6	13	**SS-B5**	**337077**	4182	37	124	**PS4**	**337466**	60
6	13	**SS-B5**	**337078**	3394	37	124	**PS4**	**337467**	50
6	13	**SS-B5**	**337079**	3000	37	124	**PS4**	**337468**	41
6	13	**SS-B5**	**337080**	2501	37	124	**PS4**	**337469**	30
6	13	**SS-B5**	**337081**	2008	37	124	**PS4**	**337470**	19
6	13	**SS-B5**	**337082**	1506	37	124	**PS4**	**337471**	10
6	13	**SS-B5**	**337083**	1001	37	124	**PS4**	**337472**	3
6	13	**SS-B5**	**337084**	250	38	124	**PS1**	**337473**	91
6	13	**SS-B5**	**337085**	100	38	124	**PS1**	**337474**	75
6	13	**SS-B5**	**337086**	80	38	124	**PS1**	**337475**	61
6	13	**SS-B5**	**337087**	39	38	124	**PS1**	**337476**	51
6	13	**SS-B5**	**337088**	20	38	124	**PS1**	**337477**	40
6	13	**SS-B5**	**337089**	4	38	124	**PS1**	**337478**	29
7	14	**SS-B4**	**337090**	3698	38	124	**PS1**	**337479**	20
7	14	**SS-B4**	**337091**	3599	38	124	**PS1**	**337480**	10
7	14	**SS-B4**	**337092**	3450	38	124	**PS1**	**337481**	3
7	14	**SS-B4**	**337093**	3299	39	135	**BBL3**	**337482**	99
7	14	**SS-B4**	**337094**	3151	39	135	**BBL3**	**337483**	80
7	14	**SS-B4**	**337095**	2601	39	135	**BBL3**	**337484**	61
7	14	**SS-B4**	**337096**	1999	39	135	**BBL3**	**337485**	50
7	14	**SS-B4**	**337097**	1401	39	135	**BBL3**	**337486**	39
7	14	**SS-B4**	**337098**	798	39	135	**BBL3**	**337487**	31
7	14	**SS-B4**	**337099**	298	39	135	**BBL3**	**337488**	20
7	14	**SS-B4**	**337100**	250	39	135	**BBL3**	**337489**	10
7	14	**SS-B4**	**337101**	101	39	135	**BBL3**	**337490**	3
7	14	**SS-B4**	**337102**	77	39	135	**BBL3**	**337491**	3
7	14	**SS-B4**	**337103**	55	40	138	**BBL2**	**337492**	106
7	14	**SS-B4**	**337104**	50	40	138	**BBL2**	**337493**	81
7	14	**SS-B4**	**337105**	40	40	138	**BBL2**	**337494**	61
7	14	**SS-B4**	**337106**	31	40	138	**BBL2**	**337495**	51
7	14	**SS-B4**	**337107**	21	40	138	**BBL2**	**337496**	40
7	14	**SS-B4**	**337108**	10	40	138	**BBL2**	**337497**	31
7	14	**SS-B4**	**337109**	3	40	138	**BBL2**	**337498**	21
8	18	**HL11**	**337110**	4483	40	138	**BBL2**	**337499**	10
8	18	**HL11**	**337111**	3606	40	138	**BBL2**	**337500**	3
8	18	**HL11**	**337112**	3401	40	138	**BBL2**	**337501**	3
8	18	**HL11**	**337113**	3001	41	142	**BBL1**	**337502**	56
8	18	**HL11**	**337114**	2503	41	142	**BBL1**	**337503**	51
8	18	**HL11**	**337115**	2003	41	142	**BBL1**	**337504**	41
8	18	**HL11**	**337116**	1494	41	142	**BBL1**	**337505**	31
8	18	**HL11**	**337117**	996	41	142	**BBL1**	**337506**	20
8	18	**HL11**	**337118**	251	41	142	**BBL1**	**337507**	10
8	18	**HL11**	**337119**	100	41	142	**BBL1**	**337508**	3

8	18	**HL11**	**337120**	50	41	142	**BBL1**	**337509**	3
8	18	**HL11**	**337121**	40	42	143	**BCCJ**	**337510**	147
8	18	**HL11**	**337122**	30	42	143	**BCCJ**	**337511**	100
8	18	**HL11**	**337123**	10	42	143	**BCCJ**	**337512**	80
8	18	**HL11**	**337124**	3	42	143	**BCCJ**	**337513**	61
9	19	**HL10**	**337125**	4140	42	143	**BCCJ**	**337514**	51
9	19	**HL10**	**337126**	3850	42	143	**BCCJ**	**337515**	40
9	19	**HL10**	**337127**	3600	42	143	**BCCJ**	**337516**	30
9	19	**HL10**	**337128**	3449	42	143	**BCCJ**	**337517**	20
9	19	**HL10**	**337129**	3299	42	143	**BCCJ**	**337518**	10
9	19	**HL10**	**337130**	3149	42	143	**BCCJ**	**337519**	3
9	19	**HL10**	**337131**	2601	43	147	**RL1**	**337520**	159
9	19	**HL10**	**337132**	1999	43	147	**RL1**	**337521**	101
9	19	**HL10**	**337133**	1400	43	147	**RL1**	**337522**	79
9	19	**HL10**	**337134**	800	43	147	**RL1**	**337523**	59
9	19	**HL10**	**337135**	300	43	147	**RL1**	**337524**	49
9	19	**HL10**	**337136**	250	43	147	**RL1**	**337525**	40
9	19	**HL10**	**337137**	101	43	147	**RL1**	**337526**	30
9	19	**HL10**	**337138**	80	43	147	**RL1**	**337527**	20
9	19	**HL10**	**337139**	59	43	147	**RL1**	**337528**	10
9	19	**HL10**	**337140**	50	43	147	**RL1**	**337529**	3
9	19	**HL10**	**337141**	39	44	152	**CSL1**	**337530**	73
9	19	**HL10**	**337142**	30	44	152	**CSL1**	**337531**	60
9	19	**HL10**	**337143**	20	44	152	**CSL1**	**337532**	50
9	19	**HL10**	**337144**	10	44	152	**CSL1**	**337533**	40
9	19	**HL10**	**337145**	3	44	152	**CSL1**	**337534**	31
10	23	**HL9**	**337146**	3915	44	152	**CSL1**	**337535**	21
10	23	**HL9**	**337147**	3599	44	152	**CSL1**	**337536**	11
10	23	**HL9**	**337148**	3451	44	152	**CSL1**	**337537**	2
10	23	**HL9**	**337149**	3300	44	152	**CSL1**	**337538**	2
10	23	**HL9**	**337150**	3148	45	156	**CSL3**	**337539**	334
10	23	**HL9**	**337151**	2600	45	156	**CSL3**	**337540**	151
10	23	**HL9**	**337152**	2000	45	156	**CSL3**	**337541**	99
10	23	**HL9**	**337153**	1400	45	156	**CSL3**	**337542**	80
10	23	**HL9**	**337154**	800	45	156	**CSL3**	**337543**	61
10	23	**HL9**	**337155**	300	45	156	**CSL3**	**337544**	50
10	23	**HL9**	**337156**	249	45	156	**CSL3**	**337545**	40
10	23	**HL9**	**337157**	99	45	156	**CSL3**	**337546**	31
10	23	**HL9**	**337158**	78	45	156	**CSL3**	**337547**	20
10	23	**HL9**	**337159**	61	45	156	**CSL3**	**337548**	10
10	23	**HL9**	**337160**	52	45	156	**CSL3**	**337549**	3
10	23	**HL9**	**337161**	42	45	156	**CSL3**	**337550**	3
10	23	**HL9**	**337162**	30	46	159	**DRIFTER 1**	**999999**	NO BOTTLES
10	23	**HL9**	**337163**	21	47	164	**DRIFTER 2**	**999999**	NO BOTTLES
10	23	**HL9**	**337164**	9	48	170	**CSL6**	**337552**	263
10	23	**HL9**	**337165**	3	48	170	**CSL6**	**337553**	201
11	25	**HL8**	**337166**	3422	48	170	**CSL6**	**337554**	148
11	25	**HL8**	**337167**	3149	48	170	**CSL6**	**337555**	99
11	25	**HL8**	**337168**	2601	48	170	**CSL6**	**337556**	80
11	25	**HL8**	**337169**	2001	48	170	**CSL6**	**337557**	60
11	25	**HL8**	**337170**	1401	48	170	**CSL6**	**337558**	49
11	25	**HL8**	**337171**	800	48	170	**CSL6**	**337559**	40
11	25	**HL8**	**337172**	298	48	170	**CSL6**	**337560**	29
11	25	**HL8**	**337173**	249	48	170	**CSL6**	**337561**	21
11	25	**HL8**	**337174**	99	48	170	**CSL6**	**337562**	11
11	25	**HL8**	**337175**	80	48	170	**CSL6**	**337563**	2
11	25	**HL8**	**337176**	60	48	170	**CSL6**	**337564**	2
11	25	**HL8**	**337177**	49	49	173	**CSL5**	**337565**	469
11	25	**HL8**	**337178**	40	49	173	**CSL5**	**337566**	300

11	25	**HL8**	**337179**	30	49	173	**CSL5**	**337567**	200
11	25	**HL8**	**337180**	21	49	173	**CSL5**	**337568**	150
11	25	**HL8**	**337181**	9	49	173	**CSL5**	**337569**	100
11	25	**HL8**	**337182**	3	49	173	**CSL5**	**337570**	81
12	40	**HL2**	**337183**	141	49	173	**CSL5**	**337571**	61
12	40	**HL2**	**337184**	100	49	173	**CSL5**	**337572**	51
12	40	**HL2**	**337185**	79	49	173	**CSL5**	**337573**	40
12	40	**HL2**	**337186**	60	49	173	**CSL5**	**337574**	30
12	40	**HL2**	**337187**	50	49	173	**CSL5**	**337575**	21
12	40	**HL2**	**337188**	39	49	173	**CSL5**	**337576**	11
12	40	**HL2**	**337189**	31	49	173	**CSL5**	**337577**	2
12	40	**HL2**	**337190**	20	49	173	**CSL5**	**337578**	2
12	40	**HL2**	**337191**	10	50	179	**CSL4**	**337579**	460
12	40	**HL2**	**337192**	3	50	179	**CSL4**	**337580**	300
13	46	**HL1**	**337193**	86	50	179	**CSL4**	**337581**	201
13	46	**HL1**	**337194**	59	50	179	**CSL4**	**337582**	150
13	46	**HL1**	**337195**	49	50	179	**CSL4**	**337583**	100
13	46	**HL1**	**337196**	40	50	179	**CSL4**	**337584**	79
13	46	**HL1**	**337197**	30	50	179	**CSL4**	**337585**	61
13	46	**HL1**	**337198**	20	50	179	**CSL4**	**337586**	50
13	46	**HL1**	**337199**	11	50	179	**CSL4**	**337587**	41
13	46	**HL1**	**337200**	3	50	179	**CSL4**	**337588**	30
13	46	**HL1**	**337201**	3	50	179	**CSL4**	**337589**	20
14	50	**HL2**	**999999**	Rosette Lost!	50	179	**CSL4**	**337590**	11
15	62	**BBasin**	**999999**	No Bottles	50	179	**CSL4**	**337591**	2
16	63	**HL2**	**337202**	133	50	179	**CSL4**	**337592**	2
16	63	**HL2**	**337203**	101	51	183	**CSL2**	**337593**	165
16	63	**HL2**	**337204**	80	51	183	**CSL2**	**337594**	151
16	63	**HL2**	**337205**	59	51	183	**CSL2**	**337595**	100
16	63	**HL2**	**337206**	50	51	183	**CSL2**	**337596**	80
16	63	**HL2**	**337207**	40	51	183	**CSL2**	**337597**	60
16	63	**HL2**	**337208**	30	51	183	**CSL2**	**337598**	50
16	63	**HL2**	**337209**	20	51	183	**CSL2**	**337599**	40
16	63	**HL2**	**337210**	10	51	183	**CSL2**	**337600**	30
16	63	**HL2**	**337211**	3	51	183	**CSL2**	**337601**	20
16	63	**HL2**	**337212**	3	51	183	**CSL2**	**337602**	10
17	64	**HL3**	**337213**	261	51	183	**CSL2**	**337603**	3
17	64	**HL3**	**337214**	202	52	185	**LL1**	**337604**	3
17	64	**HL3**	**337215**	101	52	185	**LL1**	**337605**	84
17	64	**HL3**	**337216**	81	52	185	**LL1**	**337606**	80
17	64	**HL3**	**337217**	60	52	185	**LL1**	**337607**	60
17	64	**HL3**	**337218**	50	52	185	**LL1**	**337608**	52
17	64	**HL3**	**337219**	40	52	185	**LL1**	**337609**	41
17	64	**HL3**	**337220**	30	52	185	**LL1**	**337610**	30
17	64	**HL3**	**337221**	20	52	185	**LL1**	**337611**	21
17	64	**HL3**	**337222**	11	52	185	**LL1**	**337612**	10
17	64	**HL3**	**337223**	3	52	185	**LL1**	**337613**	2
17	64	**HL3**	**337224**	3	52	185	**LL1**	**337614**	2
18	65	**HL4**	**337225**	73	53	190	**LL2**	**337615**	112
18	65	**HL4**	**337226**	61	53	190	**LL2**	**337616**	100
18	65	**HL4**	**337227**	50	53	190	**LL2**	**337617**	80
18	65	**HL4**	**337228**	41	53	190	**LL2**	**337618**	61
18	65	**HL4**	**337229**	30	53	190	**LL2**	**337619**	50
18	65	**HL4**	**337230**	20	53	190	**LL2**	**337620**	41
18	65	**HL4**	**337231**	11	53	190	**LL2**	**337621**	30
18	65	**HL4**	**337232**	3	53	190	**LL2**	**337622**	20
18	65	**HL4**	**337233**	3	53	190	**LL2**	**337623**	11
19	69	**HL5**	**337234**	94	53	190	**LL2**	**337624**	3
19	69	**HL5**	**337235**	80	53	190	**LL2**	**337625**	3
19	69	**HL5**	**337236**	60	54	193	**LL3**	**337626**	108

19	69	**HL5**	**337237**	50	54	193	**LL3**	**337627**	102
19	69	**HL5**	**337238**	40	54	193	**LL3**	**337628**	81
19	69	**HL5**	**337239**	29	54	193	**LL3**	**337629**	61
19	69	**HL5**	**337240**	19	54	193	**LL3**	**337630**	50
19	69	**HL5**	**337241**	10	54	193	**LL3**	**337631**	41
19	69	**HL5**	**337242**	3	54	193	**LL3**	**337632**	30
19	69	**HL5**	**337243**	3	54	193	**LL3**	**337633**	20
20	72	**HL5A**	**337244**	531	54	193	**LL3**	**337634**	11
20	72	**HL5A**	**337245**	250	54	193	**LL3**	**337635**	3
20	72	**HL5A**	**337246**	101	55	196	**LL4**	**337636**	99
20	72	**HL5A**	**337247**	81	55	196	**LL4**	**337637**	81
20	72	**HL5A**	**337248**	60	55	196	**LL4**	**337638**	60
20	72	**HL5A**	**337249**	50	55	196	**LL4**	**337639**	50
20	72	**HL5A**	**337250**	40	55	196	**LL4**	**337640**	40
20	72	**HL5A**	**337251**	30	55	196	**LL4**	**337641**	30
20	72	**HL5A**	**337252**	19	55	196	**LL4**	**337642**	21
20	72	**HL5A**	**337253**	10	55	196	**LL4**	**337643**	10
20	72	**HL5A**	**337254**	3	55	196	**LL4**	**337644**	3
20	72	**HL5A**	**337255**	3	55	196	**LL4**	**337645**	3
21	79	**HL6**	**337256**	1017	56	199	**LL5**	**337646**	228
21	79	**HL6**	**337257**	501	56	199	**LL5**	**337647**	201
21	79	**HL6**	**337258**	255	56	199	**LL5**	**337648**	150
21	79	**HL6**	**337259**	99	56	199	**LL5**	**337649**	101
21	79	**HL6**	**337260**	79	56	199	**LL5**	**337650**	80
21	79	**HL6**	**337261**	60	56	199	**LL5**	**337651**	61
21	79	**HL6**	**337262**	50	56	199	**LL5**	**337652**	50
21	79	**HL6**	**337263**	41	56	199	**LL5**	**337653**	39
21	79	**HL6**	**337264**	31	56	199	**LL5**	**337654**	31
21	79	**HL6**	**337265**	21	56	199	**LL5**	**337655**	20
21	79	**HL6**	**337266**	10	56	199	**LL5**	**337656**	10
21	79	**HL6**	**337267**	3	56	199	**LL5**	**337657**	2
21	79	**HL6**	**337268**	3	56	199	**LL5**	**337658**	2
22	82	**HL7**	**337269**	2773	57	203	**LL6**	**337659**	57
22	82	**HL7**	**337270**	2000	57	203	**LL6**	**337660**	50
22	82	**HL7**	**337271**	1500	57	203	**LL6**	**337661**	42
22	82	**HL7**	**337272**	1001	57	203	**LL6**	**337662**	30
22	82	**HL7**	**337273**	751	57	203	**LL6**	**337663**	20
22	82	**HL7**	**337274**	499	57	203	**LL6**	**337664**	9
22	82	**HL7**	**337275**	250	57	203	**LL6**	**337665**	2
22	82	**HL7**	**337276**	102	57	203	**LL6**	**337666**	3
22	82	**HL7**	**337277**	80	58	205	**LL9**	**337667**	3777
22	82	**HL7**	**337278**	59	58	205	**LL9**	**337668**	3000
22	82	**HL7**	**337279**	50	58	205	**LL9**	**337669**	2000
22	82	**HL7**	**337280**	40	58	205	**LL9**	**337670**	1500
22	82	**HL7**	**337281**	30	58	205	**LL9**	**337671**	1001
22	82	**HL7**	**337282**	20	58	205	**LL9**	**337672**	501
22	82	**HL7**	**337283**	11	58	205	**LL9**	**337673**	252
22	82	**HL7**	**337284**	3	58	205	**LL9**	**337674**	100
23	83	**RL6**	**337285**	3	58	205	**LL9**	**337675**	80
23	83	**RL6**	**337286**	1879	58	205	**LL9**	**337676**	61
23	83	**RL6**	**337287**	1502	58	205	**LL9**	**337677**	50
23	83	**RL6**	**337288**	1000	58	205	**LL9**	**337678**	40
23	83	**RL6**	**337289**	501	58	205	**LL9**	**337679**	30
23	83	**RL6**	**337290**	256	58	205	**LL9**	**337680**	20
23	83	**RL6**	**337291**	99	58	205	**LL9**	**337681**	11
23	83	**RL6**	**337292**	80	58	205	**LL9**	**337682**	3
23	83	**RL6**	**337293**	60	59	214	**LL7**	**337683**	653
23	83	**RL6**	**337294**	50	59	214	**LL7**	**337684**	501
23	83	**RL6**	**337295**	40	59	214	**LL7**	**337685**	249
23	83	**RL6**	**337296**	30	59	214	**LL7**	**337686**	101
23	83	**RL6**	**337297**	20	59	214	**LL7**	**337687**	81
23	83	**RL6**	**337298**	10	59	214	**LL7**	**337688**	59

24	88	**RL5**	**337299**	3	59	214	**LL7**	**337689**	50
24	88	**RL5**	**337300**	940	59	214	**LL7**	**337690**	41
24	88	**RL5**	**337301**	500	59	214	**LL7**	**337691**	30
24	88	**RL5**	**337302**	251	59	214	**LL7**	**337692**	20
24	88	**RL5**	**337303**	100	59	214	**LL7**	**337693**	10
24	88	**RL5**	**337304**	79	59	214	**LL7**	**337694**	3
24	88	**RL5**	**337305**	61	59	214	**LL7**	**337695**	3
24	88	**RL5**	**337306**	50	60	217	**LL8**	**337696**	2894
24	88	**RL5**	**337307**	41	60	217	**LL8**	**337697**	2001
24	88	**RL5**	**337308**	31	60	217	**LL8**	**337698**	1501
24	88	**RL5**	**337309**	19	60	217	**LL8**	**337699**	1000
24	88	**RL5**	**337310**	10	60	217	**LL8**	**337700**	500
24	88	**RL5**	**337311**	3	60	217	**LL8**	**337701**	251
25	89	**BBL7**	**337312**	1849	60	217	**LL8**	**337702**	101
25	89	**BBL7**	**337313**	1502	60	217	**LL8**	**337703**	80
25	89	**BBL7**	**337314**	1000	60	217	**LL8**	**337704**	61
25	89	**BBL7**	**337315**	502	60	217	**LL8**	**337705**	51
25	89	**BBL7**	**337316**	250	60	217	**LL8**	**337706**	40
25	89	**BBL7**	**337317**	101	60	217	**LL8**	**337707**	31
25	89	**BBL7**	**337318**	80	60	217	**LL8**	**337708**	21
25	89	**BBL7**	**337319**	61	60	217	**LL8**	**337709**	11
25	89	**BBL7**	**337320**	49	60	217	**LL8**	**337710**	3
25	89	**BBL7**	**337321**	41	60	217	**LL8**	**337711**	3
25	89	**BBL7**	**337322**	31	61	220	**SG23**	**337712**	925
25	89	**BBL7**	**337323**	19	61	220	**SG23**	**337713**	501
25	89	**BBL7**	**337324**	10	61	220	**SG23**	**337714**	250
25	89	**BBL7**	**337325**	3	61	220	**SG23**	**337715**	101
25	89	**BBL7**	**337326**	3	61	220	**SG23**	**337716**	79
26	94	**BBL6**	**337327**	767	61	220	**SG23**	**337717**	60
26	94	**BBL6**	**337328**	748	61	220	**SG23**	**337718**	50
26	94	**BBL6**	**337329**	500	61	220	**SG23**	**337719**	39
26	94	**BBL6**	**337330**	251	61	220	**SG23**	**337720**	30
26	94	**BBL6**	**337331**	100	61	220	**SG23**	**337721**	21
26	94	**BBL6**	**337332**	80	61	220	**SG23**	**337722**	11
26	94	**BBL6**	**337333**	60	61	220	**SG23**	**337723**	3
26	94	**BBL6**	**337334**	50	62	223	**GULD3**	**337724**	446
26	94	**BBL6**	**337335**	40	62	223	**GULD3**	**337725**	251
26	94	**BBL6**	**337336**	29	62	223	**GULD3**	**337726**	150
26	94	**BBL6**	**337337**	20	62	223	**GULD3**	**337727**	100
26	94	**BBL6**	**337338**	9	62	223	**GULD3**	**337728**	80
26	94	**BBL6**	**337339**	3	62	223	**GULD3**	**337729**	59
26	94	**BBL6**	**337340**	3	62	223	**GULD3**	**337730**	50
27	100	**BBL5**	**337341**	191	62	223	**GULD3**	**337731**	41
27	100	**BBL5**	**337342**	191	62	223	**GULD3**	**337732**	30
27	100	**BBL5**	**337343**	150	62	223	**GULD3**	**337733**	20
27	100	**BBL5**	**337344**	101	62	223	**GULD3**	**337734**	10
27	100	**BBL5**	**337345**	80	62	223	**GULD3**	**337735**	3
27	100	**BBL5**	**337346**	60	63	226	**GULD4**	**337736**	2258
27	100	**BBL5**	**337347**	49	63	226	**GULD4**	**337737**	2260
27	100	**BBL5**	**337348**	40	63	226	**GULD4**	**337738**	1500
27	100	**BBL5**	**337349**	30	63	226	**GULD4**	**337739**	999
27	100	**BBL5**	**337350**	20	63	226	**GULD4**	**337740**	502
27	100	**BBL5**	**337351**	10	63	226	**GULD4**	**337741**	250
27	100	**BBL5**	**337352**	3	63	226	**GULD4**	**337742**	102
28	105	**BBL4**	**337353**	3	63	226	**GULD4**	**337743**	79
28	105	**BBL4**	**337354**	96	63	226	**GULD4**	**337744**	59
28	105	**BBL4**	**337355**	80	63	226	**GULD4**	**337745**	49
28	105	**BBL4**	**337356**	60	63	226	**GULD4**	**337746**	40
28	105	**BBL4**	**337357**	49	63	226	**GULD4**	**337747**	30
28	105	**BBL4**	**337358**	40	63	226	**GULD4**	**337748**	19
28	105	**BBL4**	**337359**	31	63	226	**GULD4**	**337749**	9
28	105	**BBL4**	**337360**	20	63	226	**GULD4**	**337750**	2

28	105	**BBL4**	**337361**	10	64	228	**SG28**	**337751**	721
28	105	**BBL4**	**337362**	2	64	228	**SG28**	**337752**	501
28	105	**BBL4**	**337363**	2	64	228	**SG28**	**337753**	250
29	107	**PS2**	**337364**	192	64	228	**SG28**	**337754**	99
29	107	**PS2**	**337365**	175	64	228	**SG28**	**337755**	80
29	107	**PS2**	**337366**	150	64	228	**SG28**	**337756**	60
29	107	**PS2**	**337367**	126	64	228	**SG28**	**337757**	50
29	107	**PS2**	**337368**	101	64	228	**SG28**	**337758**	41
29	107	**PS2**	**337369**	76	64	228	**SG28**	**337759**	29
29	107	**PS2**	**337370**	60	64	228	**SG28**	**337760**	20
29	107	**PS2**	**337371**	50	64	228	**SG28**	**337761**	9
29	107	**PS2**	**337372**	40	64	228	**SG28**	**337762**	3
29	107	**PS2**	**337373**	31	65	229	**HL2**	**337763**	151
29	107	**PS2**	**337374**	21	65	229	**HL2**	**337764**	100
29	107	**PS2**	**337375**	11	65	229	**HL2**	**337765**	80
29	107	**PS2**	**337376**	3	65	229	**HL2**	**337766**	61
30	109	**PS3**	**337377**	201	65	229	**HL2**	**337767**	50
30	109	**PS3**	**337378**	175	65	229	**HL2**	**337768**	39
30	109	**PS3**	**337379**	150	65	229	**HL2**	**337769**	32
30	109	**PS3**	**337380**	125	65	229	**HL2**	**337770**	20
30	109	**PS3**	**337381**	100	65	229	**HL2**	**337771**	10
30	109	**PS3**	**337382**	76	65	229	**HL2**	**337772**	3
30	109	**PS3**	**337383**	59					
30	109	**PS3**	**337384**	50					
30	109	**PS3**	**337385**	41					
30	109	**PS3**	**337386**	31					
30	109	**PS3**	**337387**	20					
30	109	**PS3**	**337388**	11					
30	109	**PS3**	**337389**	3					

Multi-frequency Acoustics HUDSON 2008-037

Norman Cochrane

Objective:

The objective was to acquire simultaneous acoustic backscatter at 12 & 200 kHz affording the potential of delineating the water column presence and concentration of macrozooplankton while using multiple wavelengths to distinguish macrozooplankton backscatter from that of fish.

Equipment:

Two DataSonics DFT-210 scientific echosounders were used in conjunction with HUDSON's ram-mounted EDO 323B transducer (12 kHz) and a FURUNO 200-B transducer (200 kHz) hull-deployed by way of the GP lab stand-pipe. A 12-bit custom digitizer logged echosounder data to PC hard drive together with ancillary time and navigation data. This equipment operated autonomously during at-sea portions of the cruise.

Procedure:

Multifrequency backscatter was logged at a rate of 1 ping/10s. For a portion of the cruise (Files 2 – 11 & 20 – 23) the sounders transmitted at the identical logging rate (1 ping/10s). For the remainder of the cruise (Files 12 – 19) the sounders were transmitted at 1 ping/2s to enable more continuous bathymetric

data input to the Moving Vessel Profiler (MVP), the resultant backscatter data stream being decimated by a factor of 5 for logging again at a 1 ping/10s rate. Acoustic pulse lengths were 2 ms at 12 kHz and 5 ms at 200 kHz. Demodulated echosounder output levels were digitized at 5 kHz/channel to maximum ranges of 818 ms 2-way travel time (about 610 m depth including transducer draft). The extended logged depth range was chosen to maximize information about mesopelagic fish distributions in the Gully and on the Continental Slope. An acoustic noise sample with echosounder transmitters turned-off was collected at the beginning of the cruise with the vessel alongside.

Results:

Several problems plagued the backscatter collection although a fair quantity of useful data was recovered. The acoustic data logging behaved erratically through the first 2/3 of the cruise, the hardware apparently intermittently dropping a high order data bit during randomly-occurring extended time periods. This same problem adversely affected bathymetric data recovery for the MVP. The intermittent source could not be definitively located, the problem disappearing while the vessel was in-port only to recur later at-sea. The PDMA-32 digital interface board was finally replaced for File 20 and subsequent acquisitions. The problem did not recur. An additional problem arose when the acoustic equipment was turned-off frequently by the scientific personnel to facilitate shipboard use of 12 kHz acoustic releases and then, inadvertently, not turned back-on for considerable lengths of time afterwards. Finally, a back-up ping trigger battery failed during one of the switched-off periods causing the trigger unit to lose its custom internal programming and preventing the sounders from operating during the Gully MPA portion of the survey. Alternative power for the trigger unit must be arranged if similar equipment configurations and operational procedures are utilized in the future.

Recorded files 7 & 9 contained no acoustic data and were not retained. Acoustically blank sections at the beginning or ends of Files 4, 5, 6, 8 & 10 were also eliminated in the archived data. Short blank sections in the middle of Files 5 & 23 were retained. File 16 contains a time break starting at ping 901 (1st file ping is #1).

FILE #	TIME (ADT)	LOCATION
1	16:15 Sep. 26 – 16:20 Sep. 26	44 40.90 N 63 36.83 W
		Noise sample alongside at BIO
2	21:58 Sep. 26 – 21:58 Sep. 27	At: 44 40.90 N 63 36.83 W
		Alongside at BIO
3	21:58 Sep. 27 – 21:57 Sep. 28	To: 43 56.28 N 62 49.31 W
		BIO south on Halifax Line to central Emerald Basin (HL3)
4	21:58 Sep. 28 – 15:49 Sep. 29	To: 42 49.51 N 60 46.50 W
		HL3 to deep water east of HL6
5	15:42 Sep. 30 – 21:55 Sep. 30	To: 42 12.58 N 60 18.29 W
		NE of HL8 (limited area)
6	21:56 Sep. 30 – 07:32 Oct. 01	To: 42 35.64 N 60 37.95 W
		NE of HL8 to east of HL7
7	No file	
8	01:34 Oct. 03 – 06:05 Oct. 03	To: 42 30.26 N 61 22.39 W
		Near HL7
9	No file	

10	06:14 Oct. 05 – 21:53 Oct. 05	To: 44 19.41 N 63 25.55 W
		West of HL5 – HL3 – HL1
11	21:55 Oct. 05 – 14:26 Oct. 06	To: 44 40.90 N 63 36.83 W
		Near HL2 – HL2A – BIO
12	20:09 Oct. 06 – 20:10 Oct. 07	To: 44 15.78 N 63 18.81 W
		BIO to HL2
13	20:10 Oct. 07 – 16:34 Oct. 08	To: 44 40.90 N 63 36.83 W
		HL2 south to HL4 then north to BIO
14	16:41 Oct. 08 – 16:41 Oct. 09	To: 42 50.35 N 61 45.68 W
		BIO south on Halifax Line to HL6
15	16:41 Oct. 09 – 16:41 Oct. 10	To: 42 37.10 N 64 05.04 W
		HL6 south to HL7 then west to Roseway Line (RL6) then north to RL5
16	16:41 Oct. 10 – 22:51 Oct. 11	To: 42 18.17 N 65 49.93 W
		RL5 – break – BBL7 north to BBL4 then west to Fundian Channel
17	22:51 Oct. 11 – 22:51 Oct. 12	To: 43 04.26 N 65 28.81 W
		Fundian Channel west to tip Georges Bank – BBL4 – north of BBL2
18	22:52 Oct. 12 – 22:52 Oct. 13	To: 43 52.90 N 64 15.82 W
		North of BBL2 – BBL1 – west then east to RL1 – Shelburne – east
19	22:52 Oct. 13 – 10:17 Oct. 14	To: 44 40.90 N 63 36.83 W
		North of LaHave Basin eastward to HL2 then north to BIO
20	11:45 Oct. 14 – 11:45 Oct. 15	To: 46 06.54 N 59 37.99 W
		BIO – near HL2 – Louisbourg Line (LL1) – eastward around CB Island
21	11:45 Oct. 15 – 11:45 Oct. 16	To: 47 26.20 N 59 34.15 W
		E of CB – CSL1 – CSL3 – NW – NE north of CS Line – CSL6 – CSL5
22	11:45 Oct. 16 – 11:45 Oct. 17	To: 45 10.13 N 59 10.23 W
		CSL5 west along Cabot Strait Line to CSL2 – LL1 then south to LL4
23	11:45 Oct. 17 – 10:29 Oct. 18	To: 44 11.68 N 57 57.84 W
		Louisbourg L. (LL4) - LL9 then to east of LL7 in Haldimand Canyon

File names: HA0837xx.dat
Data format: Header + 2 ch x 4090 pts/ch @ 5 kHz/ch (special)

Carbon dioxide biogeochemistry preliminary report for October 2008 cruise in Scotian Shelf

Fei Zhou

Oceanic acidification through the anthropogenic CO_2 due to fossil fuel has become significant and has been a focus recently. The Scotian Shelf is controlled by the North Atlantic Current, the Labrador Current, and the outflow of the Gulf of St. Lawrence. Therefore, a long-term trend in CO_2 in the Scotian Shelf may reflect the trend in a larger spatial scale. During this two-week cruise, we collected water samples from Scotian Shelf for inorganic carbon biogeochemistry research dissolved inorganic carbon (DIC), alkalinity (Alk), and pH measurement. Dissolved oxygen (DO) was measured for the sea surface and bottom. It was also measured at 250 m depth which is considered within the oxygen minimum zone in the subsurface waters. Water samples for ^{18}O isotope measurement in seawater were collected.

Altogether, four transects were sampled. They are HL, BBL, CL, and LL. For HL transect, 8 stations were sampled for all 5 parameters. For BBL transect, 7 stations were sampled for 5 parameters. However, for stations BBL-4, 5, 6, and 7, some layers were skipped for ^{18}O sample collection. For CL transect, 6 stations were sampled. For LL transect, 7 stations were sampled for all 5 samples; Station LL-3# was only sampled for DO measurement. Besides, there were 3 other stations sampled for DO measurement. They are RL-1#, PS-1# and 4#, respectively.

For summary, there were 294 water samples collected for pH, DIC/Alk measurement. 281 water samples were collected for seawater ^{18}O measurement. 78 water samples were collected for DO measurement.

Overall, pH value in the inner shelf is much lower than outer shelf stations. When we compare different transects, for inner shelf stations, pH at LL-1# surface water is much higher than HL-1# and BBL-1#. The reason may be that it is more influenced by Gulf of St Lawrence water. For CS transect, surface water at station CS-6# has the lowest pH value. This is due to the significant influence of freshwater from Newfoundland Island and is also consistent with the much lower salinity.

Imaging of copepods for lipid analysis – Catherine Johnson

Objective: Collect and photograph individual *Calanus finmarchicus* fourth and fifth copepodid stages to estimate lipid content.

Significance: Estimates of copepod lipid content and length and associated surface temperatures and chlorophyll concentrations at the stations will be used to parameterize lipid accumulation relationships for use in an individual based model of *C. finmarchicus* population dynamics.

Methods and Outcome: Samples were collected with either vertical ring net, BIONESS, or HydroBIOS MultiNet at the stations listed below. Zooplankton were rinsed from the nets and diluted in cold seawater, then kept on ice until they were sorted for imaging. Individual copepods were sorted, transferred into depression slides, and photographed using a Wild M5 microscope equipped with a trinocular head and a Nikon Coolpix 995 digital camera. Estimates of copepod length and lipid content will be made using image analysis software.

Table XX. Number and location of imaged *C. finmarchicus*

Stn	Event	Gear	Net	Lat	Lon	Date	Local Time	Depth	CVs	CIVs
HL2	52	BIONESS	2	44.246	63.297	7-Oct-08	19:35	158-100	19	0
HL3	61	BIONESS	2	43.912	62.908	8-Oct-08	10:10	260-200	26	0
HL3	61	BIONESS	4	43.912	62.908	8-Oct-08	10:10	50-0	31	0
HL5	68	ring		43.177	62.096	9-Oct-08	7:40	50-0	31	1
HL5A	75	ring		42.927	61.822	9-Oct-08	12:50	50-0	1	0
RL5	85	HydroBIOS	1	42.620	64.080	10-Oct-08	16:00	400-0	42	0
RL5	85	HydroBIOS	2	42.620	64.080	10-Oct-08	16:00	600-400	23	0
BL6	97	HydroBIOS	1	41.998	65.518	11-Oct-08	12:30	600-400	64	0
BL4	104	ring		42.451	65.424	11-Oct-08	18:30	50-0	49	1
PS4	127	BIONESS	6	42.257	65.868	12-Oct-08	11:15	225-100	32	0
PS4	127	BIONESS	8	42.257	65.868	12-Oct-08	11:15	30-0	30	1
BL3	133	ring		42.762	62.481	12-Oct-08	18:45	50-0	40	1

BC	144	BIONESS	6	42.899	65.998	13-Oct-08	6:30	150-100	33	0
BC	144	BIONESS	8	42.899	65.998	13-Oct-08	6:30	30-0	32	0
RL1	146	BIONESS	2	42.220	65.044	13-Oct-08	12:35	160-115	29	1
RL1	146	BIONESS	4	42.220	65.044	13-Oct-08	12:35	60-0	31	0

GENERAL RESULTS FROM 2008 FALL SCOTIAN SHELF SURVEY (FALL AZMP)

Karel Allard

See 2007 Pelagic Bird Survey summary by Carina Gjerdrum for information on project rationale and survey protocol.

A total of 1835 km of ocean track were surveyed from 28 September – 21 October. In total, I encountered a total of 2474 birds within the survey transect (Table 1).

The most abundant species observed during the trip were the Greater Shearwater (57.5%), Herring Gull (9.1%) and Northern Gannet (7.6%), respectively. During this survey Northern Fulmar accounted for 2.9% of total individual observations. Overall results were similar to those obtained in 2007. Cory's Shearwaters were mostly encountered at or beyond the continental shelf margin. Greater Shearwaters were also relatively abundant in these waters and also in the waters of the Cabot Strait. Dovekies were encountered late in the cruise in the Cabot Strait and in small numbers near the Scotian Gully. Storm-petrels were encountered mostly during the first two weeks of the survey and almost not at all during the final week. Large numbers of Pomarine Jaegers were observed in waters near the Scotian Gully. Both South Polar and Great Skuas were observed during the cruise. Although further analyses of the data are required to confirm the impression, large numbers of juvenile Herring Gulls appeared to be concentrated in this same area.

A number of other birds were observed opportunistically, outside of the survey transect. These include : American Pipit (2), American Redstart (1), Baltimore Oriole (7), Black-and-white Warbler (2), Blackburnian Warbler (2), Black-throated Green Warbler (1), Cedar Waxwing (5), Dark-eyed Junco (3), Downy Woodpecker (1), Hooded Warbler (3), Iceland Gull (1), Lesser Black-backed Gull (1), Magnolia Warbler (1), Manx Shearwater (1), Mourning Dove (2), Northern Flicker (1), Ovenbird (3), Peregrine Falcon (3), Philadelphia Vireo (1), Pine Siskin (70), Purple Finch (1), Razorbill (3), Red-breasted Nuthatch (1), Red-eyed Vireo (1), Sharp-shinned Hawk (1), Snow Bunting (1), Song Sparrow (2), White-crowned Sparrow (3), White-throated Sparrow (5), White-winged Crossbill (3), White-winged Scoter (27), Yellow-breasted Chat (2), Yellow-rumped Warbler (3).

ACKNOWLEDGEMENTS

I would like to thank personally DFO and the Canadian Coast Guard for making this survey possible. In particular, I would like to thank DFO scientists and staff and Coast Guard officers and personnel aboard for a truly rewarding and memorable experience.

Table 1. Numbers of birds observed within the 300m-wide transect during fall 2007 and 2008 AZMP Scotian Shelf surveys.

Family	Species	2007	2008
Procellariidae	Northern Fulmar	123	71
	Cory's Shearwater	11	46
	Greater Shearwater	1339	1422
	Sooty Shearwater	11	1
	Audubon's Shearwater	0	1
	Unidentified shearwater	0	3
Hydrobatidae	Leach's Storm-petrel	41	53
	Wilson's Storm-petrel	2	6
	Unknown Storm-petrel	12	112
Sulidae	Northern Gannet	54	188
Anatidae	Common Eider	4	0
	Long-tailed Duck	1	6
	Surf Scoter	4	0
	White-winged Scoter	1	0
	Black Scoter	0	12
	Unknown duck	3	0
Scolopacidae	Red Phalarope	1	0
	Red-necked Phalarope	0	5
	Unknown Phalarope	17	10
Laridae	Pomarine Jaeger	13	42
	Parasitic Jaeger	0	3
	Unknown Jaeger	4	2
	Great Skua	0	2
	South-polar Skua	0	1
	Unknown Skua	2	0
	Herring Gull	32	225
	Great Black-backed Gull	24	79
	Laughing Gull	1	1
	Black-legged Kittiwake	24	106
	Unknown tern	0	2
	Unknown gull	39	14
Alcidae	Dovekie	22	22
	Common Murre	3	0
	Atlantic Puffin	24	11
	Unknown auk	3	2
Other	Pine Siskin		10
	Double-crested Cormorant		7
	Common Loon		4
	Peregrine Falcon		3
	Osprey		1
	Yellow-breasted Chat		1
Total number observed within transect		1815	2474
Total km of ocean track surveyed		1295	1835

Vocal behavior and foraging ecology of northern bottlenose whales (*Hyperoodon ampullatus*) in the Gully, Nova Scotia

Hilary Moors, PhD Candidiate (supervised by Dr. Hal Whitehead)

Purpose of Attending Cruise

To collect two autonomous acoustic recording devices (pop-up hydrophones; PU) from the Shortland and Haldimand submarine canyons, and to conduct marine mammal observations throughout the trip (particularly when in the Gully MPA, Shortland and Haldimand submarine canyons.

Description of Activities

Two PU's were deployed in the Shortland, and Haldimand submarine canyons (see: "Deployment Coordinates", Table 1) along the 1400-1500 m contour June 19-23 2008. The purpose of the deployment was to record whale vocalizations, particularly Northern bottlenose whale (Hyperoodon ampullatus) echolocation clicks, and underwater noise within the canyons over the summer months. These recordings will be used to monitor bottlenose whale presence/absence over space and time, and to examine the effects of ship noise on presence/absence of the whales. Recoveries of these two systems occurred October 18 2008 onboard the CCGS Hudson (Table 1).

For each recovery attempt, the vessel traveled to the deployment coordinates. Once at the deployment coordinates, a transducer and hydrophone were lowered over the side of the vessel and below the water surface. Acoustic signals ("Global Hello" and "Individual Hello") were then played to the PU to establish communication with the PU and to confirm identity of the unit. After the PU responded acoustically to the signal and was individually identified, an individually distinct acoustic release signal ("Burn Command") was played to the unit and initiation of the release mechanism (a current through an exposed 'burn wire') was confirmed with a specific acoustic signal emitted by the PU. The PU's are equipped with a radio beacon that emits 148.15 mHz signal and strobe light that starts blinking upon initiation of the release mechanism. Once the release mechanism is started, the water surface and radio was monitored for signs of the PU.

The first PU retrieval (in Halimand Canyon) occurred without any problems. Communication was established with the PU within minutes of arriving at the station and the unit surfaced 42 minutes after the release mechanism was initiated (Table 2). There were some difficulties establishing clear communication with the PU during the retrieval with the second system (in Shortland Canyon). Loud noise produced by the ship in addition to wave noise made it difficult to hear PU responses. It was initially thought that the burn mechanism for the second PU was initiated at 13:22, however, after the PU did not surface within an hour (roughly, by 14:20), the transducer and hydrophone were placed in the water again to determine if the system was still on bottom. After sending acoustic signals it was confirmed that the system was still on bottom, however, the response was weak and the ship had drifted a mile away from the deployment location. The ship returned to the deployment coordinates and clear communication was established with the hydrophone at 16:20. The burn command was played until there were several clear responses from the PU, and the system surfaced 45 minutes after the clear responses to the burn command were received.

Both PU's surfaced within a few hundred meters of the vessel. The radio beacons and strobe lights were worked on both systems retrieved. Once the PU's were located at the surface, the vessel motored to the PU location and grappling hooks and a crane were used to hoist the system onto the foredeck. The duration of the entire recovery process once at the deployment location ranged from 57-250 minutes (Table 2).

Marine mammal observations were conducted during daylight hours when the vessel was in transit. A record of the observation effort and marine mammal sightings can be obtained from the excel file: WhaleWatchingDataSheetsOct2008.xls.

Table 1. The deployment and recovery coordinates, and the recovery date and time for the five pop-up hydrophone (Pop-Up ID) recovery attempts.

Pop-Up ID	Deployment Coordinates	Recovery Coordinates	Recovery Date/Time
Shortland Canyon	44°05.982' N, 58°21.309' W	44°05.863' N, 58°21.409' W	Oct 18 2008, 17:30
Haldimand Canyon	44°11.933' N, 57°57.890' W	44°11.790' N, 57°57.947' W	Oct 18 2008, 11:27

Table 2. Signal (Global Hello, Individual Hello and Burn Command) attempts and time of PU responses, the time at which the pop-ups were identified (spotted/heard) at the surface, the time that the pop-ups were retrieved and placed onboard the vessel, and whether or not the radio beacon and strobe light were working for each of the four successful pop-up hydrophone (Pop-Up ID) recovery attempts.

Pop-Up Location/ ID	Global Hello signal response		Individual Hello signal response		Burn Command signal response		Time of ID at surface	Time of retrieval	Radio working?	Strobe working?
	No. of Attempts	Time of Response	No. of Attempts	Time of Response	No. of Attempts	Time of Response				
Shortland Canyon (PU 032) – 1st attempt	2	13:21	2	13:21	2	5	Did not surface	-	-	-
Shortland Canyon (PU 032) – 2nd attempt	10	16:20	5	16:26	15	16:36	17:21	17:30	YES	YES
Haldimand Canyon (PU 092)	10	10:30	1	10:31	2	10:32	11:14	11:27	YES	YES

APPENDIX A

CCGS HUDSON FALL CRUISE 2008
REPORT ON THE RECOVERY AND DEPLOYMENT OF RAPID-WAVE MOORINGS IN THE SCOTIAN SLOPE-RISE 28 SEPTEMBER-6 OCTOBER 2008

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INTRODUCTION

This cruise is the fourth RAPID-WAVE cruise in the area of the Scotian Slope/Rise. WAVE, which stands for West Atlantic Variability Experiment, is a NERC funded project to study the variability of the Meridional Overturning Circulation in the Northwest Atlantic. The three previous cruises took place in 2004, 2006 and 2007. In August 2004, 6 lander Bottom Pressure Recorder (BPR) moorings and 5 MicroCAT moorings were deployed in a line across the shelf break south of St. John's, New Foundland. This line was designated Line A (see report of RRS Charles Darwin cruise CD160). A second line, called line B, was deployed east of Halifax, Nova Scotia. Lines A and B were almost identically instrumented. Additionally, John Loder, from the Bedford Institute of Oceanography (BIO) in Dartmouth, Nova Scotia, deployed two MicroCAT/RCM near bottom moorings in line B. Recovery of these two lines in July-August 2006 was full of difficulties, with losses of 8 MicroCAT moorings and 6 lander BPRs (see report of RRS Discovery cruise D308). As a result, line A was abandoned. In

line B, 4 lander BPRs and 2 MicroCAT/BPR moorings were redeployed. To try to prevent further mooring losses in the future, a joint project agreement was clinched with BIO in early 2007 to return to the Halifax line in 2007 and turn the MicroCAT/BPR moorings around, as we all as to check on some of the lander BPRs. To that effect, a cruise took place in September/October 2007. The cruise was a complete success (see report of CCGS Hudson Fall Cruise HUD07045).

The present cruise constituted the first leg of the CCGS Hudson BIO Fall Cruise 2008 (HUD08037) and had two main objectives:

1. Recover the old RAPID-WAVE line B in its entirety. All gear in this line was to be returned to the National Marine Facilities in Southampton, except for 9 SBE MicroCATs and 2 Casabel beacons that had been acquired with RAPID-WAVE funding.
2. Deploy a new array of 6 BPR/ADCP/CTD moorings along the BIO Halifax line, located southwest of the old line B.

LINE B RECOVERY

Operations started on 29-09-2008 and ended on 1-10-2008. The whole line was recovered except for a lander BPR on site B1. It is possible to communicate acoustically with this BPR, but, for unknown reasons, it does not release. We will try to recover it again Recoveries were as follows.

BPRs

SITE	LATITUDE (N)	LONGITUDE (W)	DATE & TIME ON BOARD (Z)	DEPTH (m)	INSTRUMENT TYPE
B0	42 59.90	60 54.58	29-09-2008, 15:14	1822 (unc.)	BPR/RL22
B1	42 55.662	60 51.631	Not recovered	2212 (unc.)	BPR/RL21
B2	42 49.115	60 46.426	29-09-2008, 20:00	2702 (unc.)	BPR/RL09
B3	42 35.7685	60 37.7509	01-10-2008, 11:45	3190 (unc.)	BPR/TRL01
B4	42 26.47	60 28.24	30-09-2008, 18:20	3653 (unc.)	BPR/RL14
B5	42 12.56	60 18.79	30-09-2008, 21:45	4102 (unc.)	BPR/TRL02

Drag line for B1 lander BPR.

We made three attempts at recovery the BPR lander in site B1. The first attempt took place on 29-09-2008 between 16:00 Z and 17:30 Z. The second and third failed attempts were carried out on 30-09-2008 between 10:00 Z and 11:00 Z and between 11:49 Z and 13:26 Z. On 04-10-2008 we returned to site B1 to drag for the BPR. A re-fix of the lander's position gave the coordinates: 42 55.6326 N, 60 51.7537 W. A schematic of the drag line used can be seen in the accompanying figure below. New attempts at releasing were made while waiting for dragging between 14:00 Z and 17:00 Z.

After three unfruitful trials, more than 2000 meters of wire, the one tonne weight and the acoustic release were all lost and the drag line operations terminated at around 22:00 Z.

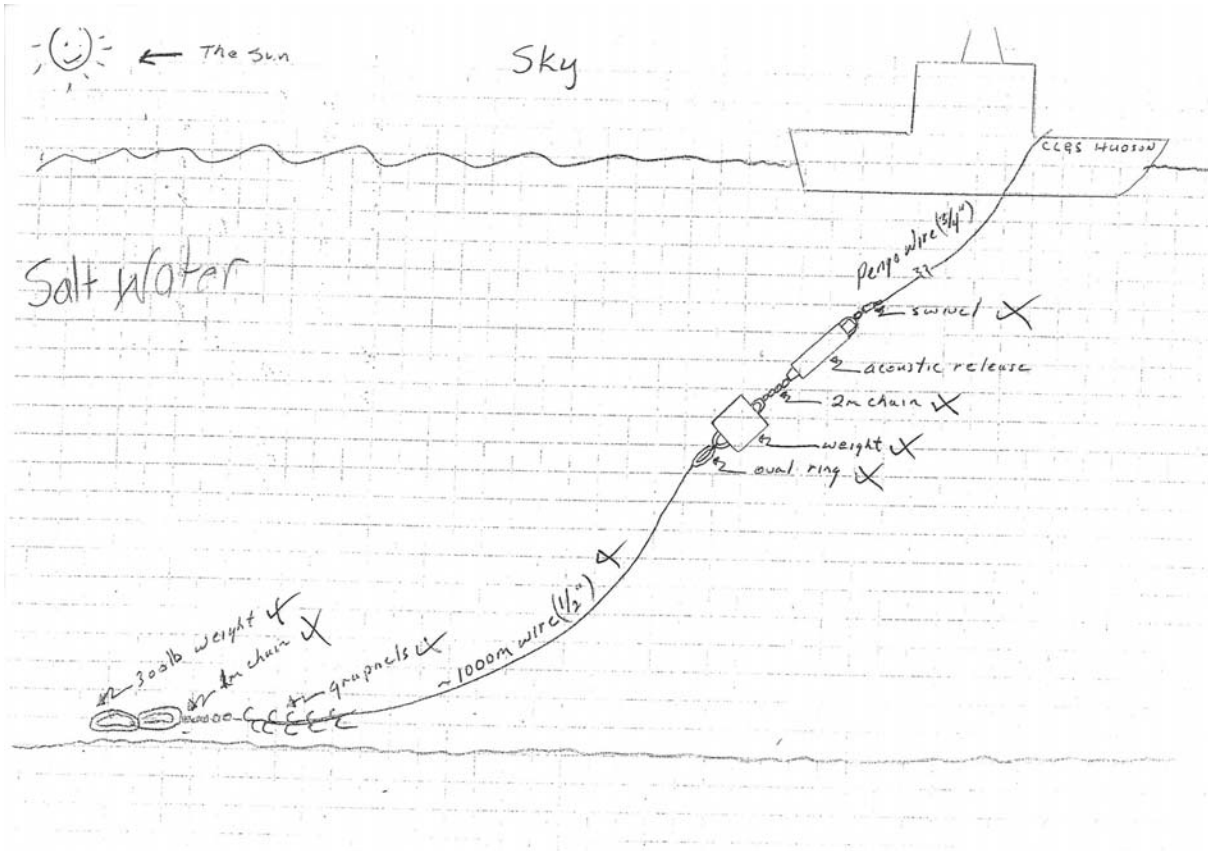


Figure 1: "Artistic" impression of drag line by Jay Barthelotte (BIO).

National Marine Facilities Division MicroCAT and RCM Moorings

By John Wynar

Introduction

This was to be a recovery only operation of moorings B3 and B5 and the final year that NMFD personnel would be involved. The vessel sailed from Halifax on the 28th September 2008 and arrived at the work area the following day. All times below are in GMT.

B5 Mooring Recovery

The vessel was on the B5 site late on the afternoon of the 30th September. Interrogation of the acoustic release (AR861 s/n: 250) was made with TT301 deck unit, s/n: 56.

Acoustic release s/n: 250
Arm command ranges: 4228m, *4196m, 4155m, 4087m – mooring ascending*.

Release command sent: **20.10**
Range obtained: **4237m**
Ascent rate: **68m/min**
On the surface: **20.57**
Water depth: **4120m (uncorr.)**
Recovered: **21.45**

Recovery was carried out over the starboard bow using a crane and deck winch. The mooring was streaming out to port and the recovery line was clear. The line was grappled and recovery proceeded.

The data from the SBE37 microcats were downloaded and given a quality check. The instruments were found to have complete and satisfactory data sets. Listed below are the errors between the instrument time and real (taken from the GPS) time:

SBE37#3710
Instrument time: 15.00.11 at 14.58.00 – 2 min, 11 sec fast.

SBE37#3714
Instrument time: 15.23.01 at 15.21.00 – 2 min, 01 sec fast.

SBE37#3681
Instrument time: 15.44.42 at 15.43.00 – 1 min, 42 sec fast.

SBE37#3713
Instrument time: 16.03.46 at 16.02.00 – 1 min, 46 sec fast.

SBE37#3682
Instrument time: 16.25.06 at 16.23.00 – 2 min, 06 sec fast

They were then re-programmed for a calibration cast on the ship's CTD.

B3 Mooring Recovery

Recovery of the B3 mooring began on the morning of the 1st September with the interrogation of the acoustic release. This was initially hindered by interference from the ship's echo sounder which was transmitting on 12kHz. With the sounder turned off a request was made to the O.O.W. not to use the bow thruster at this time as this was creating noise and making it impossible to receive telemetry from the release. This done, the release was successfully ranged, armed and commanded to release.

Acoustic release s/n: 686
Arm command ranges: **3371m, *3236m, 3280m – mooring ascending***
Release command sent: **10.37**
Range obtained: **3365m**
Ascent rate: **88m/min**
On the surface: **11.02**

Water depth: **3190m (uncorr.)**
Recovered: **11.58**

Recovery proceeded as above, although tangling was more of a problem than previously. The topmost buoyancy pack (attached by a chain) had become entangled with itself incurring a delay while this was addressed. Later on a more serious entanglement occurred involving buoyancy and no fewer than 3 tensioned lines returning to the water. During recovery one of the microcats (#3675) suffered an impact on the side of the ship. Subsequent inspection and data checking after the calibration cast did not reveal any damage.

A recommendation might be to move away from chaining buoyancy spheres together and instead to fix them rigidly using flat stainless steel bar.

After downloading and quality checking their data, the microcats were prepared for the calibration cast as above. Timing errors are given below:

SBE37#3709
Instrument time: 14.08.14 at 14.06.00 – 2 min, 14 sec fast.

SBE37#3675
Instrument time: 14.32.00 at 14.30.00 – 2 min fast.

SBE37#3680
Instrument time: 13.44.46 at 13.43.00 – 1 min, 46 sec fast.

SBE37#3676
Instrument time: 13.42.00 at 13.40.00 – 2 min fast.

RCM11#421
DSU (#14386) time: 13.26.49 at 13.41.00 – 14 min, 11sec slow.

No estimation of instrument timing error was possible because the unit's battery had been exhausted for some time. On examination of the data set after downloading it was found that the instrument had stopped recording on the 11th February 2008. This indicated a fault with the battery which was manufactured by "A1Marketing".

Calibration Casts and Acoustic Test

For the calibration cast all nine SBE37's were fitted to the ship's CTD frame and lowered to approximately 4470m. They were programmed identically a follows:

not logging: waiting to start at 01 Oct 2008 22:00:00
sample interval = 60 seconds
samplenumber = 0, free = 233016
do not transmit real-time data
do not output salinity with each sample

do not output sound velocity with each sample
store time with each sample
number of samples to average = 4
reference pressure = 0.0 db
serial sync mode disabled
wait time after serial sync sampling = 30 seconds
internal pump is installed

At each bottle stop the winch operator was instructed to hold the CTD for about 15 minutes. This was to allow the instruments time to record several values for later comparison to the CTD data set.

Acoustic Release Codes

S/N	250	686
MODE	B	B
ARM	14A7	160D
RELEASE	1455	1655
RELEASE WITH PINGER	1456	1656
PINGER ON	1447	1647
PINGER OFF	1448	1648
DIAGNOSTIC	1449	1649

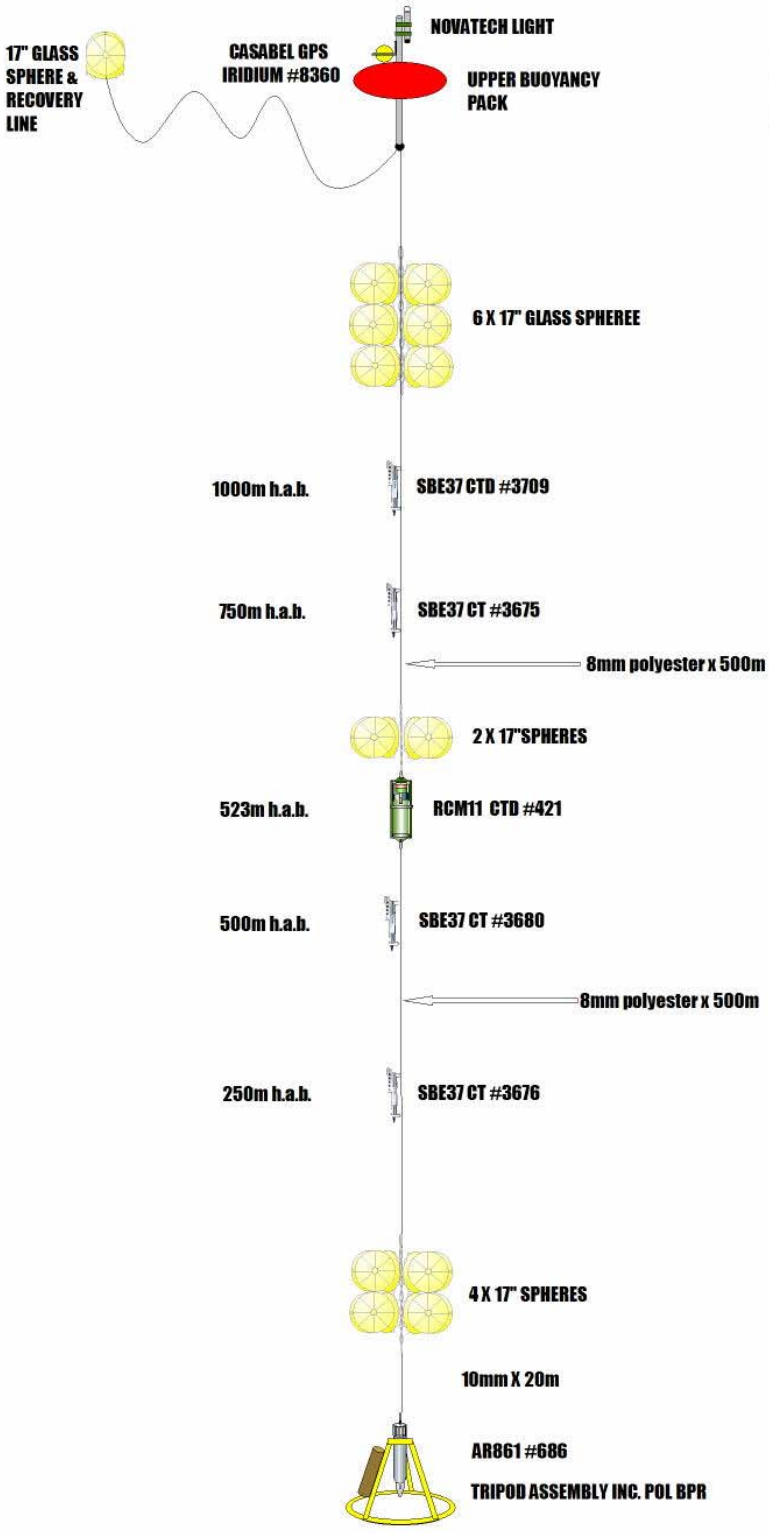
Table 1

RCM11 Channel Assignment

CHANNEL	PARAMETER	RANGE	SERIAL No.
1	REFERENCE	N/A	868
2	CURRENT SPEED	0-300cm/s	477
3	HEADING	0-360°	N/A
4	TEMPERATURE	-3.01 to 5.92°C	1790
5	CONDUCTIVITY	0-74mS/cm	124
6	PRESSURE	0-60MPa	980

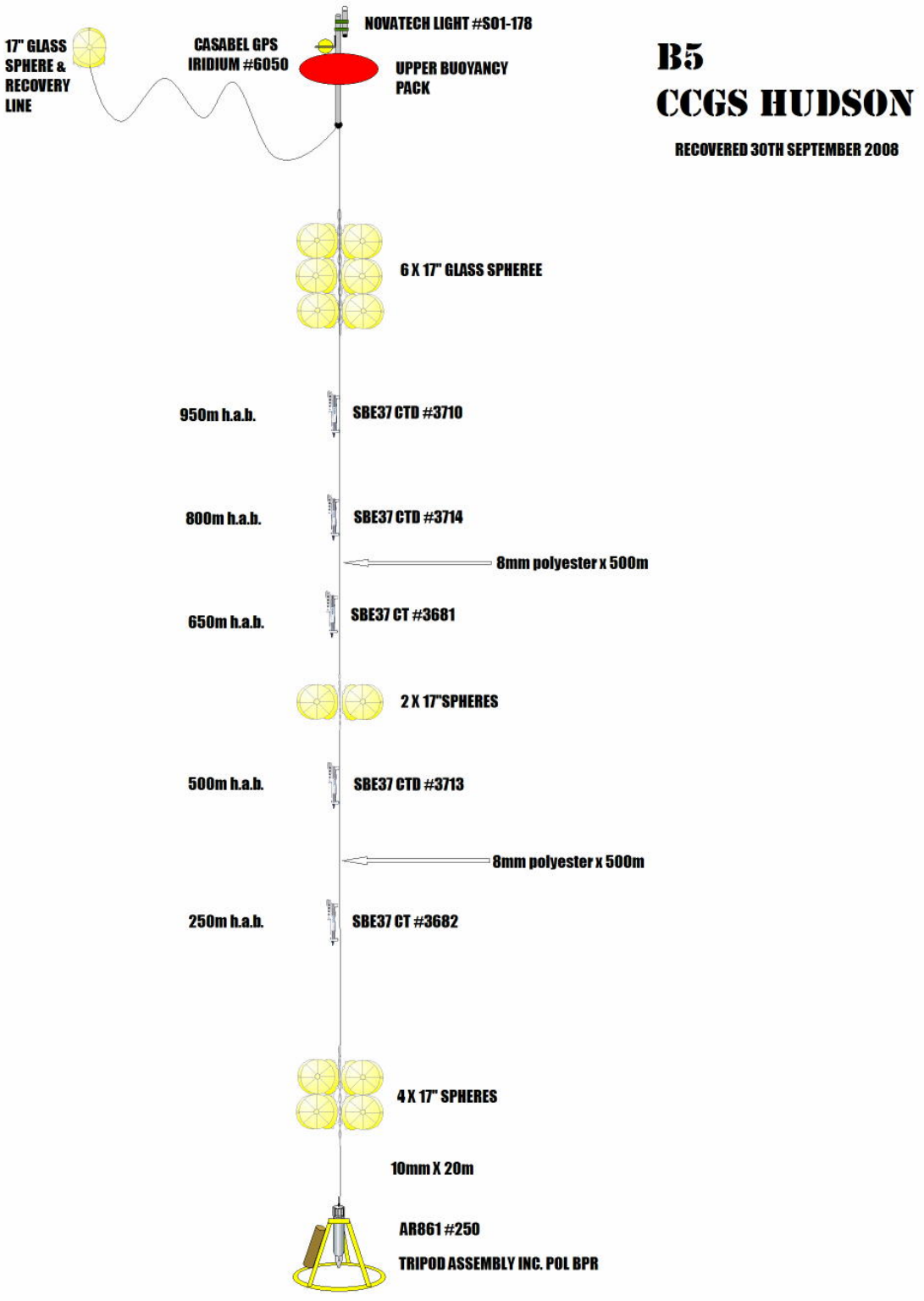
Table 2

Note: The current meter had been set for a "burst mode"120 minute sampling interval.



B3
CCGS HUDSON

RECOVERED 1ST OCTOBER 2008


17" GLASS SPHERE & RECOVERY LINE
CASABEL GPS IRIDIUM #6050
NOVATECH LIGHT #S01-178
UPPER BUOYANCY PACK
B5
CCGS HUDSON
RECOVERED 30TH SEPTEMBER 2008
6 X 17" GLASS SPHEREE
950m h.a.b.
SBE37 CTD #3710
800m h.a.b.
SBE37 CTD #3714
8mm polyester x 500m
650m h.a.b.
SBE37 CT #3681
2 X 17"SPHERES
500m h.a.b.
SBE37 CTD #3713
8mm polyester x 500m
250m h.a.b.
SBE37 CT #3682
4 X 17" SPHERES
10mm X 20m
AR861 #250
TRIPOD ASSEMBLY INC. POL BPR

HALIFAX LINE DEPLOYMENTS

The deployment of the new RAPID-WATCH-WAVE line took place between 02-10-2008 and 03-10-2008. The determination of adequate deployment sites ahead of the cruise was greatly helped by use of new multi-beam bathymetric data of the area of Mohican Channel Scotian Slope kindly provided to John Loder by the Geological Survey of Canada. Our most sincere gratitude to D. C. Campbell, D. J. W. Piper, D. C. Mosher, and K. Jenner for making these data available to us.

The table below summarises the RAPID-WATCH deployments.

SITE	LATITUDE (N)	LONGITUDE (W)	DATE & TIME AT BOTTOM	DEPTH (m)	MOORING TYPE
RS1	42 50.9592	61 37.8552	03-10-2008, 20:08 Z	1116 (cor.)	Short
RS2	42 44.2637	61 34.6121	03-10-2008, 18:22 Z	1703 (cor.)	Short
RS3	42 39.4975	61 27.7026	03-10-2008, 14:32 Z	2286 (cor.)	Short
RS4	42 33.3551	61 22.1421	03-10-2008, 11:50 Z	2773 (cor.)	Short
RS5	42 23.5656	61 16.5677	02-10-2008, 19:51 Z	3407 (cor.)	Short
RS6	42 09.8114	61 04.2213	02-10-2008, 15:15 Z	3892 (cor.)	Long

Notes. "RS" in the mooring site names stands for "RAPID-Scotian". Positions were calculated from M-Cal triangulations (see SEANAV's website http://www.seanav.com/). All times record the moment when the mooring anchor hit bottom (except for RS6, for which the bridge position for anchor on water is given). Depths are corrected using Carter tables.

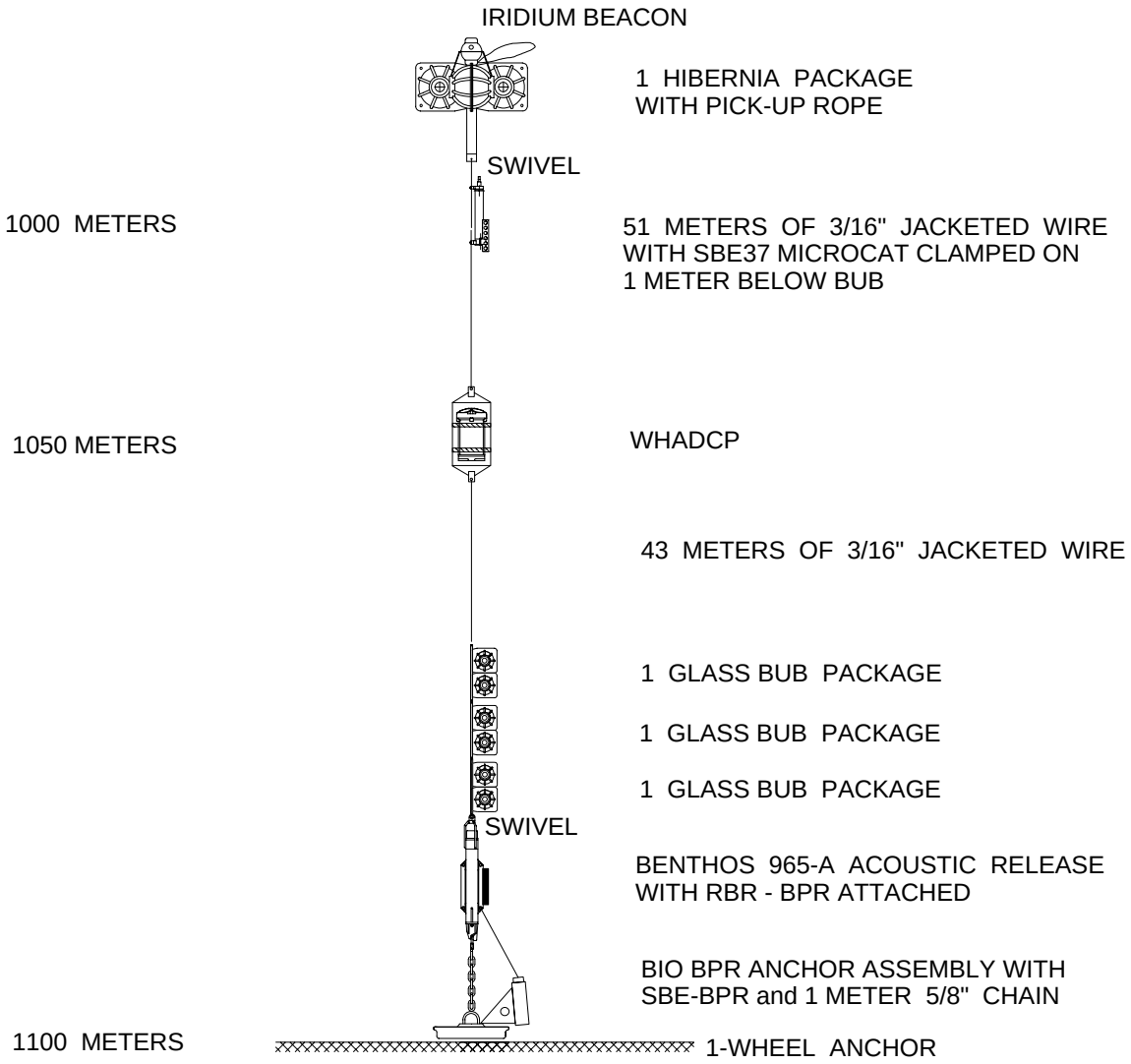
The following table includes the serial number of all the instruments, beacons and releases deployed in the RS line. Mooring schematics can be also be found in the pages below.

	RS1	RS2	RS3	RS4	RS5	RS6
Casabel Iridium beacon	12948990	12154420	12949990	2155420	2152420	2153420
Aanderaa Seaguard		33				
Aanderaa RCM8		No				1039
Aanderaa RCM11		595				
Aanderaa Seaguard		20				
SBE37 MicroCAT	6437	6434	6436	6468	1696	6433
SBE37 MicroCAT						6435
SBE37 MicroCAT						4617
SBE37 MicroCAT						6432
SBE37 MicroCAT						1785
SBE37 MicroCAT						6467
WHADCP	11432	10942	11433	11089	11431	10941
Benthos 965-A	809	807	40083	44302	40081	40080

acoustic release	9.5 kHx D/E	11.5 kHz D	9 kHz H/ E	13.5 kHz D	8.5 kHz E	
RBR BPR DR-1050	14581					14580
SBE53 BPR	50	49	48	47	46	45
POL RAPID LANDER						TRL04

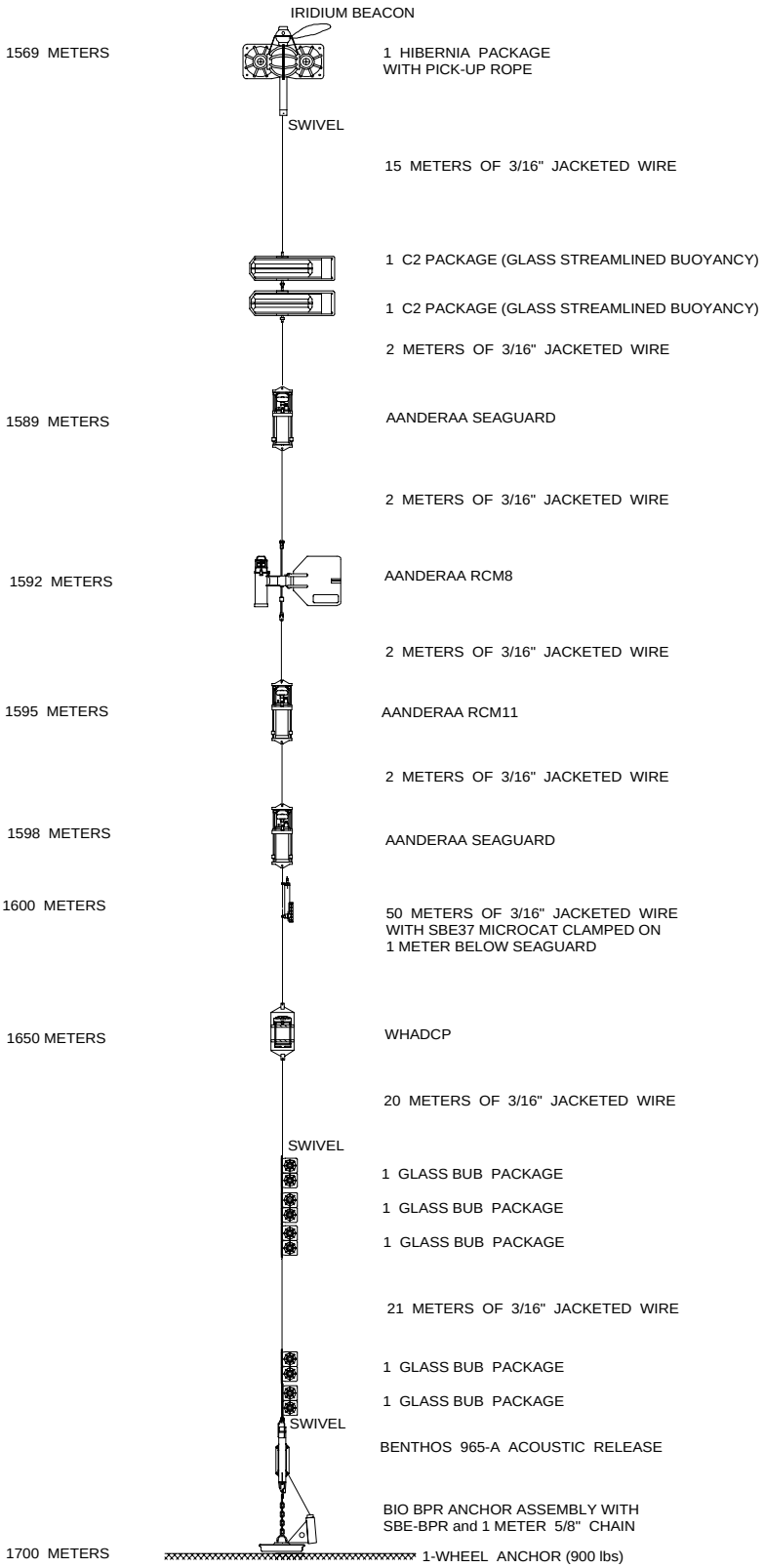
MOORING # 1696 RS1 LODER/POL SCOTIAN SLOPE OCT 2008

Revised Sept 11, 2008



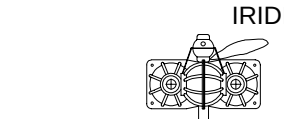
MOORING # 1697 RS2 LODER/POL SCOTIAN SLOPE OCT 2008

Revised Sept 11, 2008



MOORING # 1698 RS3 LODER/POL SCOTIAN SLOPE OCT 2008

Revised Sept 11, 2008



IRIDIUM BEACON

1 HIBERNIA PACKAGE
WITH PICK-UP ROPE

SWIVEL

2200 METERS

51 METERS OF 3/16" JACKETED WIRE
WITH SBE37 MICROCAT CLAMPED ON
1 METER BELOW BUB

2250 METERS

WHADCP

43 METERS OF 3/16" JACKETED WIRE

1 GLASS BUB PACKAGE

1 GLASS BUB PACKAGE

1 GLASS BUB PACKAGE

SWIVEL

BENTHOS 965-A ACOUSTIC RELEASE

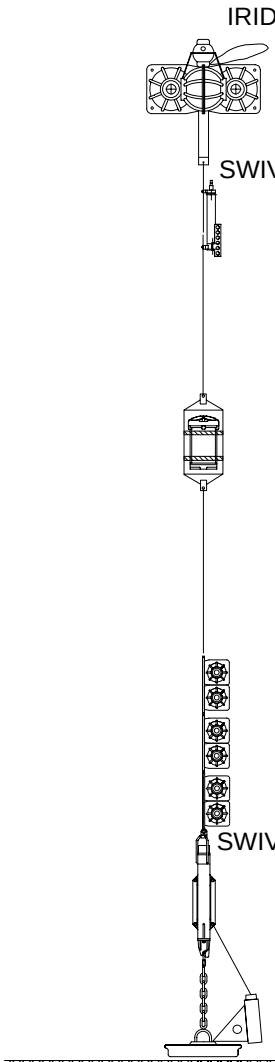
BPR ANCHOR ASSEMBLY WITH
SBE-BPR and 1 METER 5/8" CHAIN

2300 METERS

1-WHEEL ANCHOR

MOORING # 1699 RS4 LODER/POL SCOTIAN SLOPE OCT 2008

Revised Sept 11, 2008



IRIDIUM BEACON

1 HIBERNIA PACKAGE
WITH PICK-UP ROPE

SWIVEL

2700 METERS

51 METERS OF 3/16" JACKETED WIRE
WITH SBE37 MICROCAT CLAMPED ON
1 METER BELOW BUB

2750 METERS

WHADCP

43 METERS OF 3/16" JACKETED WIRE

1 GLASS BUB PACKAGE

1 GLASS BUB PACKAGE

1 GLASS BUB PACKAGE

SWIVEL

BENTHOS 965-A ACOUSTIC RELEASE

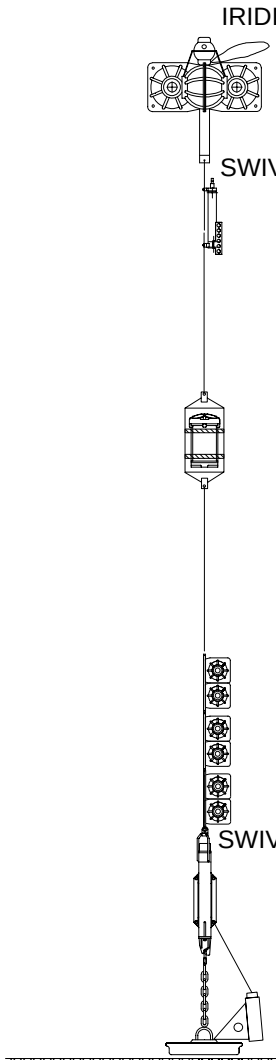
BPR ANCHOR ASSEMBLY WITH
SBE-BPR and 1 METER 5/8" CHAIN

2800 METERS

1-WHEEL ANCHOR

MOORING # 1700 RS5 LODER/POL SCOTIAN SLOPE OCT 2008

Revised Sept 11, 2008



IRIDIUM BEACON

1 HIBERNIA PACKAGE
WITH PICK-UP ROPE

SWIVEL

3300 METERS

51 METERS OF 3/16" JACKETED WIRE
WITH SBE37 MICROCAT CLAMPED ON
1 METER BELOW BUB

3350 METERS

WHADCP

43 METERS OF 3/16" JACKETED WIRE

1 GLASS BUB PACKAGE

1 GLASS BUB PACKAGE

1 GLASS BUB PACKAGE

SWIVEL

BENTHOS 965-A ACOUSTIC RELEASE

BPR ANCHOR ASSEMBLY WITH
SBE-BPR and 1 METER 5/8" CHAIN

3400 METERS

1-WHEEL ANCHOR

MOORING # 1701 RS6 LODER/POL SCOTIAN SLOPE OCT 2008

Revised Sept 11, 2008