CRUISE REPORT

HUDSON 2013037

SCOTIAN SHELF

AZMP TRANSECTS +

Sept 21st – Oct 9th, 2013

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CRUISE NARRATIVE

Highlights

Area Designation:	NAFO Regions: 5Ze, 4X, 4W, 4Vs, 4Vn, 3Pn, 3Ps Extent: 41^{o} 51'N - 47^{o} 35'N; 054^{o} 49'W - 067^{o} 25'W
Expedition Designation:	HUD2013037 or 18HU13037 (ISDM format)
Chief Scientist:	Mr. Andrew Cogswell Ocean Ecosystem Science Division Marine Ecology Section Department of Fisheries and Oceans Bedford Institute of Oceanography PO Box 1006 Dartmouth, NS, Canada B2Y 4A2 Andrew.Cogswell@dfo-mpo.gc.ca
Ship:	CCGS Hudson (call sign - CGDG) Oceanographic research vessel
Ports of Call:	September 21st, 2013 Depart BIO Dartmouth, NS September 30th, 2013 – Crew exchange, North Sydney, NS ~5 hrs (9 am to 2 pm ADT) October 9th, 2013 Return BIO, Dartmouth, NS
Cruise Dates:	Leg 1: Sept 21st – Sep 30th Leg 2: Sept 30th – Oct 9th

Mission Summary

Overview

The first leg of the mission began in Halifax on Sept 21st, 2013 and ended when science staff were exchanged in North Sydney on Sept 30th. Completion of the exchange marked the beginning of the mission's second leg, ending in Halifax on the morning of Oct 9th. The CCGS Hudson logged ~2920 nm during the 18 day mission and AZMP science staff conducted 250 separate operations at ~100 planned stations (Figure 1). Table 1 breaks down the operations by sampling gear for each leg of the trip. The table also points to figures which display the deployment locations for each gear type. Each of these figures (2-5 & 9-11) is accompanied by a table of coordinates detailing each deployment of that gear type.

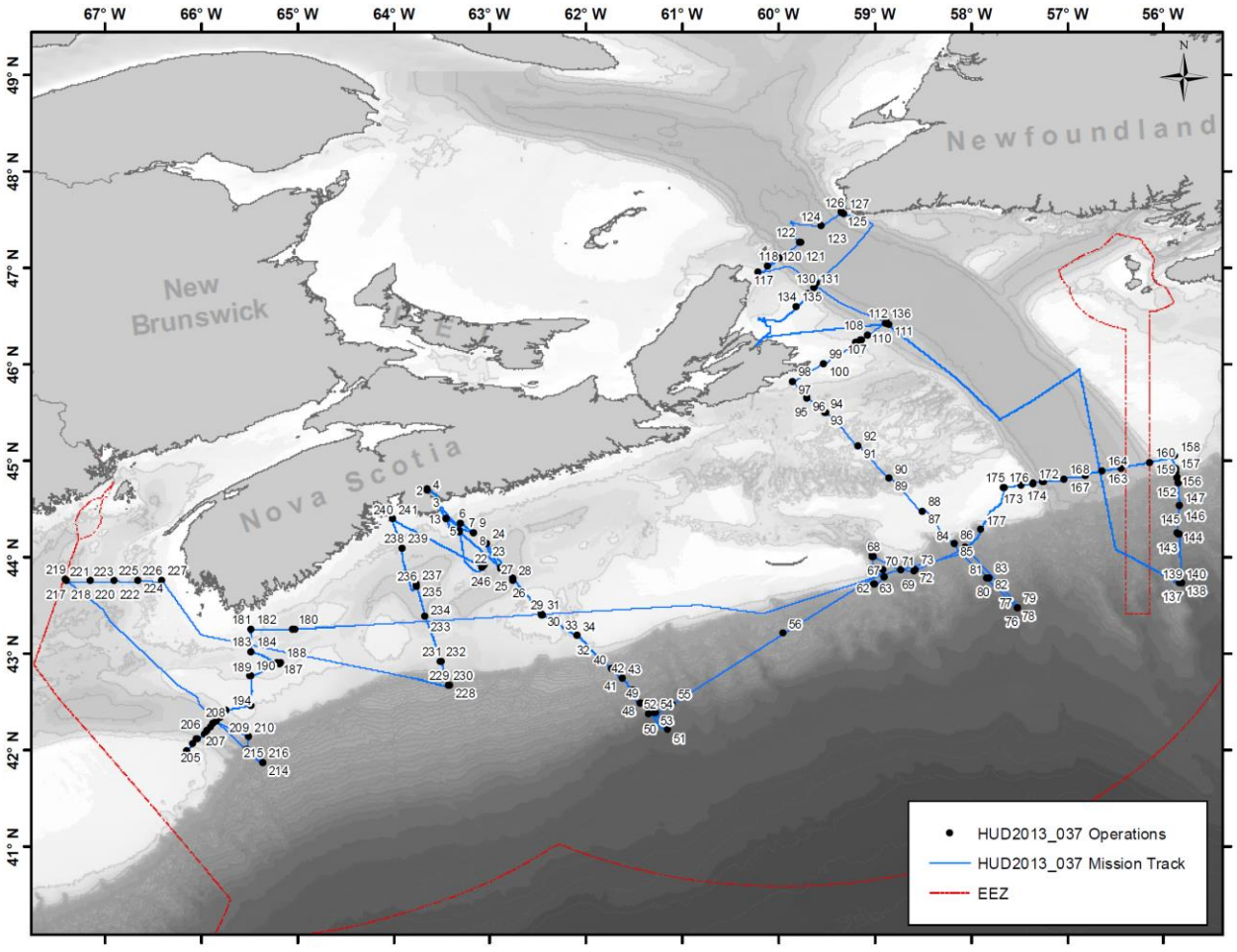


Figure 1. The locations for all 250 events during the HUD2013037 AZMP Fall survey.

Table 1. Summary of operations during the HUD2013037 AZMP Fall survey.

Leg	Operation	# of Operations	Figure
1	CTD	49	2
	Vertical Ring Net	46	3
	Bioness	7	4
	Multi-Net	10	5
	Mooring Recovery	11	9
	Mooring Deployment	3	9
	Argo Float Deployment	2	10
	MVP	5	11
2	CTD casts	51	2
	Vertical Net Tows	46	3
	Bioness	8	4
	Multi-Net	7	5
	Argo Float Deployments	2	10
	MVP tows	2	11

During the 18 day mission, ~7 full days were directly attributable to field operations (Table 2 – MVP, Vertical Net Tows, BIONESS, Multi-Net and CTD) and the remaining 11 days were attributable to a combination of steaming time, station keeping and gear preparation (Table 2). During steaming, the vessel mounted Acoustic Doppler Current Profiler (ADCP) was in operation and was collecting data throughout the trip. The Moving Vessel Profiler (MVP) also collected CTD, Fluorometer and Laser Optical Plankton Counter (LOPC) data during selected steams.

Table 2. Break down of operational time by gear type during the mission.

Gear	Time Allocated (hrs)
MVP	~50
CTD	~48
Vertical Net Tows	~32
Mooring Deployments/Retrievals	~20
Multi-Net	~13
BIONESS	~ 8
ARGO	~1

Mission Participants

Table 3. List of science staff aboard the HUD2013037 Fall AZMP mission.

Name	Affiliation	Responsibility
Anstey, Carol	DFO (MAR – OESD)	Sample processing, nutrient/oxygen analysis
Barthelotte, Jay	DFO (MAR – PCSD)	Mooring Technician
Beck, Matthew	DAL (student of John Cullen)	CTD computer operation, meta-data entry
Britten, Greg	DAL (student of Mike Dowd)	CTD computer operation, meta-data entry
Cogswell, Andrew	DFO (MAR – OESD)	Chief Scientist, CTD computer operation, meta-data entry
Hebert, Dave	DFO (MAR – OESD)	CTD computer operation
Hartling, Adam	DFO (MAR – PCSD)	CTD operations
Lemay, Jonathan	DAL (student of Helmuth Thomas)	DIC and ^{13}C collection and analysis
Perry, Tim	DFO (MAR – OESD)	Sample processing
Ringuette, Marc	DFO (MAR – OESD)	Zooplankton Biologist, zooplankton sampling
Ryan, Robert	DFO (MAR – OESD)	CTD operations
Spry, Jeff	DFO (MAR – OESD)	Zooplankton, sample processing, data flow
States, George	DFO (MAR – PCSD)	MVP
Toms, Brad	EC-CWS	Seabird and Marine Mammal Observer
Ryan, Pierre	EC-CWS	Seabird and Marine Mammal Observer

DFO: Department of Fisheries and Oceans Canada
MAR-OESD: Maritimes - Ocean Ecosystem Science Division
MAR-PCSD: Maritimes - Program Coordination and Support Division
EC-CWS: Environment Canada - Canadian Wildlife Service
DAL: Dalhousie University

Objectives

There were 16 objectives defined in the Form B submitted prior to sailing (below). Table 4 describes whether each of the objectives was met along with any relevant supporting commentary. A number of stations were added during the trip that may or may not support objectives listed below and are included under the heading "Additional Unplanned".

Primary Planned

1. Obtain Fall observations of the hydrography and distribution of nutrients, phytoplankton and zooplankton at standard sampling stations along "**core**" Atlantic Zone Monitoring Program sections within the Maritimes Region (**Contact Mr. Andrew Cogswell** - http://www.bio.gc.ca/science/monitoring-monitorage/azmp-pmza-eng.php.).

Additional Planned

2. Recover deep water mooring from the slope waters of the Halifax Section and conduct hydrographic profiles and collect water samples at mooring stations. This part of the programme is in collaboration with (and hence partially funded by) the *UK RAPID-WAVE (West Atlantic Variability Experiment)* programme (**Contact Dr. John Loder** - http://noc.ac.uk/science-technology/climate-sea-level/rapid-watch/rapid-wave).
3. Conduct BIONESS sampling along the Halifax section at HL-3.3 at an area known for a dense scattering layer that causes the Autonomous Underwater Vehicle, run by the Ocean Tracking network, which surveys this line as continuously as possible, to detect a false bottom and return prematurely to the surface (**Contact Dr. Dave Hebert)**
4. Recover and deploy 3 *Ocean Tracking Network (OTN)* moorings at inner shelf stations of the Halifax Section and conduct hydrographic profiles and collect water samples at mooring stations (**Contact Dr. Dave Hebert** - http://www.dfo-mpo.gc.ca/science/publications/article/2011/07-19-11-eng.html).
5. Deploy CARIOCA buoy near HL_02 which makes hourly measurements of sea-surface temperature, salinity, chlorophyll-a, and pCO_2. This buoy provides data for projects investigating the carbon cycle on the Scotian Shelf under the direction of the Department of Oceanography at Dalhousie University (**Contact Dr. Helmuth Thomas -** http://oceanography.dal.ca/person/Helmuth_Thomas.html)
6. Recover 1 Autonomous Multichannel Acoustic Recorder (AMAR) from the Gully Marine Protected Area (MPA) and 2 more along the eastern Scotian Slope between the Gully MPA and Haldimand Canyon in support of a *SPERA project investigating bottlenose whale migration patterns* and conduct hydrographic profiles and collect water samples at mooring stations (**Contact Dr. Hilary Moors-Murphy** - http://www.mar.dfo-mpo.gc.ca/e0008208).
7. Recover 2 moorings from St. Anns Bank in support of project funded through *DFO Health of the Oceans Initiative* via the Oceans and Coastal Management Division in an effort to further describe oceanographic conditions within the St. Anns Bank Area of Interest and conduct hydrographic profiles and collect water samples at mooring stations (**Contact Dr. Dave Hebert** - http://www.mar.dfo-mpo.gc.ca/e0010385)
8. Collect nutrients and hydrography across the Northeast Channel as part of *NERACOOS Cooperative Agreement,* (**Contact Dr. Peter Smith** - http://www.neracoos.org/).
9. Carry out hydrographic, chemical and biological sampling at stations in the Gully in support of Gully MPA monitoring initiatives by Oceans (**Contact Dr. Dave Hebert -** http://www.mar.dfo-mpo.gc.ca/Gully-MPA)

10. Carry out hydrographic, chemical and biological sampling across the mouth of the Laurentian Channel, the western shelf break of the Grand Banks and across LaHave Basin. Each of these transects has been proposed to enhance our understanding of hydrographic phenomenon in these areas in support of current modelling efforts (**Contact Dr. Dave Hebert**).
11. Conduct Bioness sampling at Roseway Line station 1 and provide samples to Dalhousie University to assist with teaching efforts (**Dr. Chris Taggart -** http://www.phys.ocean.dal.ca/~taggart/About%20Chris.htm)
12. Carry out hydrographic, chemical and biological sampling at the Roseway Line station 1, very near the northeast corner of *an International maritime Organization (IMO) Area To Be Avoided (ATBA)*. This area is known for a seasonally high abundance of the endangered North Atlantic Right Whale (**Contact Dr. Erica Head** - http://www.rightwhale.ca/rosewayatba_e.php, http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=780).
13. Carry out hydrographic, chemical and biological sampling at stations along the *Gulf of Maine North Atlantic Time Series section (GNATS)*. The GNATS project was eventually funded by NASA (2006 to 2009) but includes physical and biological oceanographic data from 1998 to 2010. The survey was run out of the Bigelow Laboratory for Ocean Science under the direction of Dr. Barney Balch. Data from this survey will enhance our understanding of hydrographic and biological phenomenon in the Gulf of Maine while providing an additional year of data for the GNATS survey (**Contact Dr. Dave Hebert** - http://www.bigelow.org/news/news_2009/gnats-study-shows-evidence-of-climate-change-in-gulf-of-maine/).
14. Collection of DIC, alkalinity and ^{13}C samples in support of research contributing to MEOPAR theme 2.2. A Dalhousie university student will collect the samples from the Rosette (~1L per depth) and process them shore side (**Contact Dr. Helmuth Thomas -** http://meopar.ca/theme-2-2/).
15. Additional station occupations in support of AZOMP (**Dr. Blair Greenan** - http://www.bio.gc.ca/science/monitoring-monitorage/azomp-pmzao/azomp-pmzao-eng.php).
16. Deployment of ARGO floats (**Contact Dr. Denis Gilbert &/or Dr. Igor Yashayaev** - http://www.bio.gc.ca/science/monitoring-monitorage/azomp-pmzao/argo-eng.php).

Additional Unplanned

17. MVP transects, while part of the plan B, were not specifically included in the objectives section of the Form B. Planned MVP tows were modified during the mission to gather data that may assist with modelling efforts both across the Laurentian Channel and along the Scotian slope across the mouths of Haldimand, Shortland and the Gully canyon systems (**Contact Dr. Dave Hebert**).
18. Identify and enumerate birds during the transits between stations and sections. This was an objective that had been specifically mentioned in Form B's from previous missions that had accidentally not been included in this survey's Form B (**Contact Ms. Carina Gjerdrum –** Environment Canada / Canadian Wildlife Service**).**
19. Nearing the conclusion of the mission, it became evident that there would some

time available for additional occupations prior to arriving in Halifax. As such, it became apparent that the ship's course would take it near the recently designated Sambro Bank *Vazella* closure area. We worked with the Dr. Ellen Kenchington, Kevin MacIassac and Camille Lirette to design 2 Bioness tows that would traverse over areas of known *Vazella pourtalesi* concentrations. In addition, a single CTD and vertical net tow was collected from the same area (**Contact Mr. Andrew Cogswell**)

20. Just prior to departure, AZMP was approached by OTN and asked if we could assist with the retrieval of a mooring ~12 nm north of CSL_04 (**Contact Mr. Andrew Cogswell)**.

Table 4. Status of objectives upon completion of the mission.

Objective	Status	Comments
1	Complete	All core AZMP stations were sampled in accordance with standard protocols.
2	Incomplete	The lost RAPID mooring (M_1746 or RS_05) was not retrieved.
3	Complete	A single BIONESS was deployed at HL_03.3
4	Complete	All three OTN moorings were successfully recovered and redeployed.
5	N/A	The CARIOCA buoy was not returned to BIO from the company performing maintenance in time for the mission.
6	Complete	All three Acoustic AMAR moorings were recovered.
7	Complete	Both moorings were recovered for HOTO.
8	Complete	All NERACOOS occupations completed
9	Complete	All Gully occupations completed
10	Complete	Additional stations added near Sydney Bight called Livingston Shoal (LS). Added to assist in modelling efforts south of St. Paul Island in the Cabot Strait.
11	Complete (Revised)	Two BIONESS, accompanying CTD and Vertical Net Tow conducted at revised coordinates within the Right Whale Area to Be Avoided (RATBA).
12	Complete	
13	Complete	All five GNATS stations were occupied.
14	Complete	Water samples for DIC and ^{13}C were taken by Mr. Jonathan Lemay (Dalhousie University).
15	Partially Complete	Stations HL_08 and HL_09 were occupied but HL_10 and HL_11 were not.
16	Complete	NOVA floats deployed for ARGO program at LL_08 and LL_09 as well as SPB_11 and SPB_10
17	Partially Complete	Some MVP tows were competed, but an operational error ceased operations prematurely.
18	Complete	A summary of bird and marine mammal sightings has been provided by EC staff for this report.
19	Complete	Samples have been provided to Dr. Kenchington's lab.
20	Incomplete	The surface buoy for the OTN mooring could not be located and the mooring could not be retrieved.

Summary of Activities

CTD summary

Narrative

As summarized in Table 1, there were a total of 100 CTD casts during the mission (Figure 2 and Table 5). Appendix 1 provides the Seasave instrument configuration file that details the sensors deployed on the rosette frame during HUD2013037.

A number of problems were encountered during the first few CTD deployments of the mission. During the second CTD deployment of the mission at OTN_02 (Event 9) it became apparent that the Chelsea fluorometer was not transmitting data due to a broken wire in the cable. This was fixed and worked properly for the remainder of the mission. During Event 9 issues with the plumbing was causing spiky returning data from the primary sensor package. The plumbing problem was fixed and the problem did not persist. It was also determined that the primary T/C cables were reversed. In consultation with Seabird, the option for processing this data was to output the T/C frequencies and apply the calibrations external to Se3asave and import the temperature/conductivity data back into Seasave for further processing. Due to these changes, a revised configuration file (Appendix 1 - HUD2013037B) was created and utilized throughout the remainder of the mission starting on HL_01 (Event 13). During the transfer of primary and secondary sensor packages and their reconnection, the tubing attaching the pump to the sensors was not connected. For this reason, Event 19 (HL_3) had to be redone during Event 21. The CTD sensor packages worked well for the remainder of the mission.

The depths where rosette bottles were fired was determined using nominal depths determined during previous missions or extracted as the average of the General Bathymetric Chart of the Oceans (GEBCO) and CHS raster layers depths underlying each planned CTD cast using ArcGIS10.1. On occasion, because of differences between pre-determined nominal depths and sounding data while on the ship, the bottle firing depths were adjusted on the fly and reflected in the CTD deck sheets which can be made available upon request.

Upon conclusion of the mission, the CTD data were consolidated and provided to the Ocean Data Information Section (ODIS) and properly archived.

Water Samples for Chemical Analyses

Station specific rosette bottle firing depths and water collections for chemical analysis can be found by referring to the CTD deck sheet binder and/or water chemistry sampling document prepared upon the conclusion of the mission and provided to ODIS. Table 5 highlights CTD casts where water collections were made.

Photosynthetically Active Radiation Sensor (PAR)

The Biospherical Instruments PAR (irradiance) sensor was deployed on the rosette only when the maximum depth was ~less than or equal to 300 m. The CTD casts for which it was deployed are noted in Table 5.

Lowered Acoustic Doppler Current Profiler (LADCP)

Lowered ADCP data was collected during 25 CTD profiles (Table 5). Both upward and downward looking 300 kHz TRDI Workhorse Sentinel ADCPs were installed on the CTD frame.

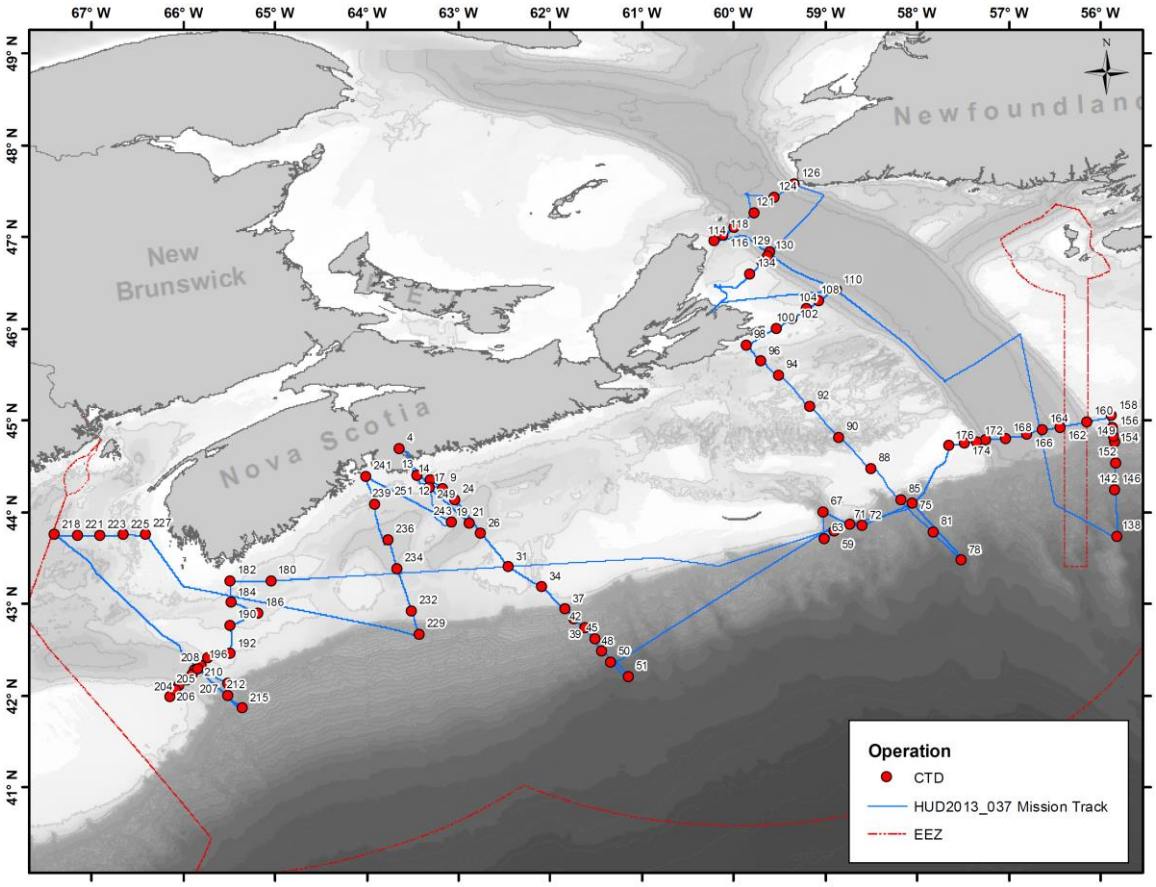


Figure 2. Locations for the 100 CTD casts during HUD2013037 AZMP Fall survey. Each cast is labelled with the consecutive mission event.

Table 5. CTD casts during the HUD2013037 AZMP Fall survey. The coordinates provided are in decimal degrees and reflect the ship's position at the time of deployment as recorded using the meta-data logger CAROL.

#	Event	Station	Date	Julian Day	Slat (DD)	Slon (DD)	Sounding (m)	LADCP	PAR	Water Collected
1	4	HL_0	21-Sep	264	44.6935	-63.6439	72	X	X	
2	9	OTN_02	21-Sep	264	44.2508	-63.1671			X	
3	12	HL_01	21-Sep	264	44.4004	-63.4500	75		X	
4	13	HL_01	22-Sep	265	44.4000	-63.4509	75		X	X
5	14	OTN_01	22-Sep	265	44.3485	-63.3039	120		X	
6	17	HL_02	22-Sep	265	44.2597	-63.3119	140		X	X
7	19	HL_03	22-Sep	265	43.8804	-62.8805	256		X	X
8	21	HL_03	22-Sep	265	43.8800	-62.8815	256		X	
9	24	OTN_03	22-Sep	265	44.1339	-63.0333	164		X	
10	26	HL_03.3	22-Sep	265	43.7629	-62.7519	197		X	X
11	31	HL_04	22-Sep	265	43.4003	-62.4577	85		X	X
12	34	HL_05	23-Sep	266	43.1811	-62.0888	93		X	X
13	37	HL_05.5	23-Sep	266	42.9395	-61.8311	555	X		X
14	39	HL_06	23-Sep	266	42.8316	-61.7324	1050	X		X
15	42	HL_06.3	23-Sep	266	42.7364	-61.6138	1639	X		X
16	45	HL_06.7	23-Sep	266	42.6187	-61.5118	2260	X		X
17	48	HL_07	23-Sep	266	42.4750	-61.4307	2852	X		X
18	50	HL_08	24-Sep	267	42.3636	-61.3410	3300	X		X
19	51	HL_09	24-Sep	267	42.2060	-61.1471	4200	X		X
20	59	GULD_04	25-Sep	268	43.7910	-58.8967	1945	X		X
21	63	SG_28	25-Sep	268	43.7093	-59.0059	850	X		X
22	67	GULD_03	26-Sep	269	44.0014	-59.0190	400	X		X
23	71	SG_23	26-Sep	269	43.8608	-58.7248	1100	X		X
24	72	GulSho	26-Sep	269	43.8459	-58.5914	1200	X		
25	75	ShoHald	26-Sep	269	44.0979	-58.0555	1506	X		
26	78	LL_09	26-Sep	269	43.4701	-57.5197	3633	X		X

27	81	LL_08	27-Sep	270	43.7787	-57.8208	2800	X		X
28	85	LL_07	27-Sep	270	44.1295	-58.1711	835	X		X
29	88	LL_06	27-Sep	270	44.4714	-58.5017	65		X	X
30	90	LL_05	27-Sep	270	44.8096	-58.8473	256		X	X
31	92	LL_04	27-Sep	270	45.1497	-59.1675	90		X	X
32	94	LL_03	27-Sep	270	45.4901	-59.5103	147		X	X
33	96	LL_02	28-Sep	271	45.6490	-59.7019	135		X	X
34	98	LL_01	28-Sep	271	45.8200	-59.8522	100		X	X
35	100	STAB_01	28-Sep	271	45.9970	-59.5294	54		X	X
36	102	STAB_02	28-Sep	271	46.1075	-59.3631	59		X	X
37	104	STAB_03	28-Sep	271	46.2189	-59.2003	82		X	X
38	108	STAB_04	28-Sep	271	46.3002	-59.0693	148		X	X
39	110	STAB_05	28-Sep	271	46.4175	-58.8764	375		X	X
40	114	CSL_01	28-Sep	271	46.9495	-60.2097	75		X	X
41	116	CSL_03	29-Sep	272	47.1019	-59.9893	325		X	X
42	118	CSL_02	29-Sep	272	47.0143	-60.1079	170		X	X
43	121	CSL_04	29-Sep	272	47.2624	-59.7745	465			X
44	124	CSL_05	29-Sep	272	47.4332	-59.5502	462			X
45	126	CSL_06	29-Sep	272	47.5780	-59.3383	261		X	X
46	129	LS_04	29-Sep	272	46.8386	-59.5999	370			
47	130	LS_03	29-Sep	272	46.7874	-59.6316	318			
48	133	LS_02	30-Sep	273	46.7266	-59.6862	150			
49	134	LS_01	30-Sep	273	46.5960	-59.8173	53		X	
50	138	SPB_11	01-Oct	274	43.7279	-55.8195	4400	X		X
51	142	SPB_10	02-Oct	275	44.2396	-55.8403	2850	X		X
52	146	SPB_09	02-Oct	275	44.5309	-55.8357	2170	X		X
53	149	SPB_08	02-Oct	275	44.7598	-55.8393	1055	X		X
54	152	EH_04	02-Oct	275	44.8223	-55.8517	804	X		X
55	154	EH_03	02-Oct	275	44.8794	-55.8663	315		X	X
56	156	EH_02	02-Oct	275	44.9187	-55.8719	170		X	X
57	158	EH_01	02-Oct	275	45.0467	-55.8808	80		X	X

58	160	BP_01	03-Oct	276	44.9814	-56.1435	218		X	X
59	162	BP_04	03-Oct	276	44.9218	-56.4435	375			X
60	164	BP_05	03-Oct	276	44.8940	-56.6314	397			X
61	166	BANQ_B6	03-Oct	276	44.8446	-56.8054	414			X
62	168	BANQ_B5	03-Oct	276	44.8029	-57.0292	416			X
63	170	BANQ_B4	03-Oct	276	44.7809	-57.2469	391			X
64	172	BANQ_B3	03-Oct	276	44.7592	-57.3508	70		X	X
65	174	BANQ_B2	03-Oct	276	44.7424	-57.4761	55		X	X
66	176	BANQ_B1	03-Oct	276	44.7208	-57.6568	30		X	X
67	180	RL_01	05-Oct	278	43.2493	-65.0413	155		X	X
68	182	BBL_01	05-Oct	278	43.2486	-65.4790	54		X	X
69	184	BBL_02	05-Oct	278	43.0090	-65.4773	112		X	X
70	186	RATBA_01	05-Oct	278	42.8919	-65.1825	150		X	X
71	190	BBL_03	05-Oct	278	42.7610	-65.4853	96		X	X
72	192	BBL_04	05-Oct	278	42.4530	-65.4808	98		X	X
73	194	PS_01	05-Oct	278	42.4082	-65.7294	92		X	X
74	195	PS_02	05-Oct	278	42.3286	-65.7995	194		X	X
75	196	PS_02	05-Oct	278	42.3283	-65.7996	194		X	X
76	198	PS_04	05-Oct	278	42.2692	-65.8683	212		X	X
77	200	PS_06	05-Oct	278	42.1884	-65.9282	215		X	X
78	202	PS_08	05-Oct	278	42.1102	-66.0398	195		X	X
79	204	PS_10	05-Oct	278	41.9804	-66.1405	85		X	X
80	205	PS_09	05-Oct	278	42.0610	-66.0795	90		X	X
81	206	PS_07	05-Oct	278	42.1603	-65.9611	185		X	X
82	207	PS_05	05-Oct	278	42.2299	-65.9005	207		X	X
83	208	PS_03	05-Oct	278	42.2892	-65.8297	210		X	X
84	210	BBL_05	05-Oct	278	42.1286	-65.5038	200		X	X
85	212	BBL_06	06-Oct	279	41.9991	-65.5103	1065	X		X
86	215	BBL_07	06-Oct	279	41.8594	-65.3527	1850	X		X
87	218	GNATS_05	07-Oct	280	43.7500	-67.3973	190		X	X
88	221	GNATS_04	07-Oct	280	43.7471	-67.1482	171		X	X

89	223	GNATS_03	07-Oct	280	43.7474	-66.8987	136		X	X
90	225	GNATS_02	07-Oct	280	43.7520	-66.6477	113		X	X
91	227	GNATS_01	07-Oct	280	43.7558	-66.4036	70		X	X
92	229	LHB_06	08-Oct	281	42.6650	-63.4267	1075	X		X
93	232	LHB_05	08-Oct	281	42.9160	-63.5062	160		X	X
94	234	LHB_04	08-Oct	281	43.3816	-63.6693	202		X	X
95	236	LHB_03	08-Oct	281	43.6953	-63.7613	240		X	X
96	239	LHB_02	08-Oct	281	44.0858	-63.9048	145		X	X
97	241	LHB_01	08-Oct	281	44.3890	-64.0076	40		X	X
98	243	SAM_03	08-Oct	281	43.8933	-63.0733	170		X	X
99	249	HL_02	09-Oct	282	44.2590	-63.3096	142		X	X
100	251	HL_01	09-Oct	282	44.3980	-63.4512	83		X	X

Biological Program

Narrative

The biological program conducted as part of cruise HUD2013037, with some modifications, was a continuation of studies began in pre-AZMP years to describe the large-scale (spatial and temporal) variability in plankton biomass, productivity and biogenic carbon inventories on the Scotian Shelf.

The program currently consists of essentially 3 elements:

1. phytoplankton biomass/primary productivity measurements ,
2. mesozooplankton sampling program , and
3. dissolved organic carbon measurements

Table 2 provides a review of the stations where water samples were taken from rosette bottles for elements 1 and 3 above. The mesoplankton sampling program is described below in more detail in a summary provided by M. Ringuette and J. Spry. This is followed by a short description of the dissolved organic carbon measurements conducted by Jonathan Lemay of the Dalhousie University CO_2 group.

The ultimate aim of these studies is twofold:

1. to provide a description of the inventories of biogenic carbon, their turnover rates and variability in space and time as part of Ocean Ecosystem Science Division's (OESD) continuing climate studies, and
2. to provide a description of plankton life-cycles and productivity on the Scotian Shelf and its influence or contribution to ecosystems in support of OESD's ecosystem-related research.

Mesozooplankton Sampling

Prepared by: M. Ringuette and J. Spry

The goal of the Fall AZMP cruise for the zooplankton group is to describe the state of the mesozooplankton community on the Scotian shelf and in the adjacent slope waters before the beginning of the winter season. Plankton collections using fine mesh nets are used to estimate the abundance and biomass of the zooplankton community.

Overall, we sampled at 86 different stations resulting in 121 analyzable zooplankton collections (See Remarks/Comments and Figures 3-5 and Table 6 for details). We used a large array of sampling gear allowing us to efficiently sample different size spectra. A conical ring net of 202 μm mesh size with an aperture of 75 cm in diameter (filtering ratio 1:5) equipped with a KC Denmark flowmeter was towed vertically from the bottom to the surface at each station where the water column does not exceed 1000 m in order to estimate the mesozooplankton community abundance and biomass. Content of the cod end was preserved in 2% buffered formaldehyde.

A conical ring net of 76 μm mesh and 30 cm diameter, also with a 1:5 filtering ratio, was towed vertically only at shelf Halifax Section stations (from 1 to 6). This serves the same purpose of quantifying zooplankton community composition and abundance, but targets the smaller taxa of the mesozooplankton community and the younger developmental stages, including eggs and nauplii. Content of the cod end was preserved in 2% buffered formaldehyde. Refer to Figure 3 for a visual representation of all conical ring net deployment locations.

The Bioness targets larger and faster swimming organisms like krill. The Bioness frame carries multiple nets (up to 10) with a 0.25 m^2 square mouth opening net and mesh size (240 - 202 μm). The unit was towed at a nominal 3 knots speed, sent to the bottom, and brought back to surface closing nets on its way back, thus making a long oblique tow and taking samples at discrete strata. Content of the cod ends were preserved in 2% buffered formaldehyde. Extra stations were occupied within the Right Whale Area to be Avoided Area in Roseway Basin and the 'Sambro Bank' *Vazella* closed area of Emerald Basin for external research programs. Figure 4 provides a visual representation of all Bioness deployment locations.

The Multi-Net is a 0.25 m^2 square mouth opening with 5 nets of 202 μm mesh size which was towed vertically from 1000 m (or bottom) and closing nets during the ascent at 800 m, 600 m, 400 m and 200 m and then to the surface. Particularly in the Fall, the aim is to describe the vertical and spatial distribution of the overwintering *Calanus finmarchicus* population. Content of the cod ends were preserved in 2% buffered formaldehyde. Figure 5 provides a visual representation of all Multi-Net deployment locations.

Remarks/Comments

A single Multi-Net tow (Event 60 – GULD_04) encountered issues and was retrieved to be subsequently re-deployed as Event 61. In addition, a single Bioness tow (Event 27 – HL_03.3) had a net misfire and was retrieved and redeployed as Event 28. Finally, a single 200 μm vertical ring net tow touched bottom during Event 119 (CSL_04) and was redeployed as Event 120. Therefore, in total there were in fact 124 total zooplankton collection activities, of which 121 could be utilized for analysis.

The Bioness winch cable spooler was a recurring problem and was not always functioning properly. Operations had to be stopped occasionally and the cable re-spooled "manually" in order to preserves the integrity of the cable. This caused unduly long sampling times (and filtered volumes) for some strata, rendering comparisons among strata more complicated. The addition of some metering capability for cable deployment and its speed would improve our physical control of the towing procedure and hopefully, improve quality of the sampling.

The Multi-Net winch cooling system seems inadequate. In particular at the last station water flowing in and out of the "Cooler" was the same temperature despite a smell of highly heated metal. Maybe there was blockage in the cooling jacket; which has happened in the past. Otherwise, the winch seemed to work well for most of the mission. cruise.

Finally, 2 Multi-Net tows (at HL_08 and HL_09) that are typically completed during AZMP Fall surveys were not. The Multi-Net tows at HL_08 and HL_09 were not

included as part of the HUD2013037 mission plan. Despite broad dissemination of the mission plan prior to departure, this oversight was not discovered. In addition, while occupying both stations HL_08 and HL_09, it was recognized by the Chief Scientist that the mission was at risk of falling behind schedule. As a result, a decision was made by the Chief Scientist to drop biological sampling at these two stations. While these stations are not within the scope of "core" AZMP activities, they do represent a significant long term effort to catalogue and quantify mesozooplankton communities in offshore waters where important water mass interactions are known to occur. In the future, efforts will be made to mitigate the loss of Multi-Net tows. It has been suggested that discussions occur prior to departure to confirm planned Multi-Net locations and, where possible, communicate from sea (e-mail or phone) when planned Multi-Net deployments might be affected.

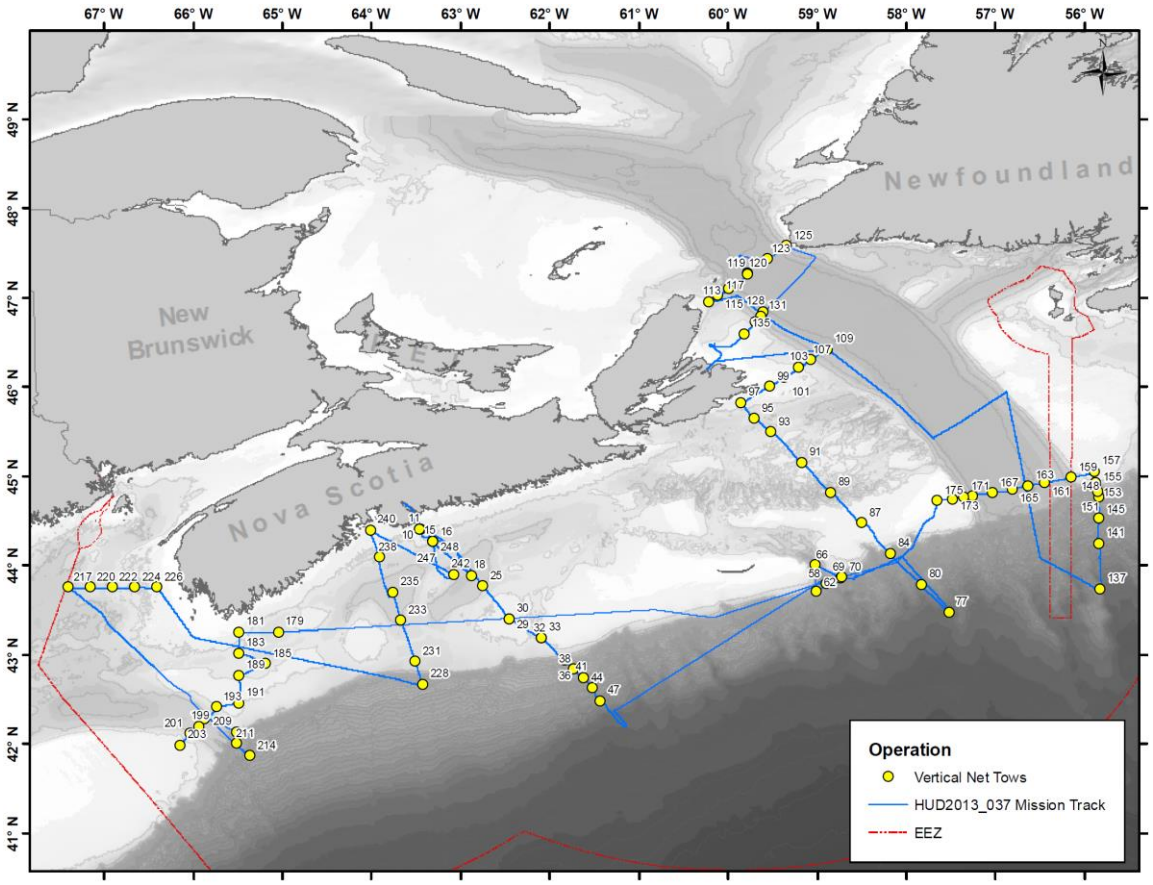


Figure 3. Locations for the 92 vertical ring net tows during HUD2013037 AZMP Fall survey. In total, there were 8 - 76 µm mesh tows and 84 – 200 µm mesh tows. Each tow is labelled with the consecutive mission event.

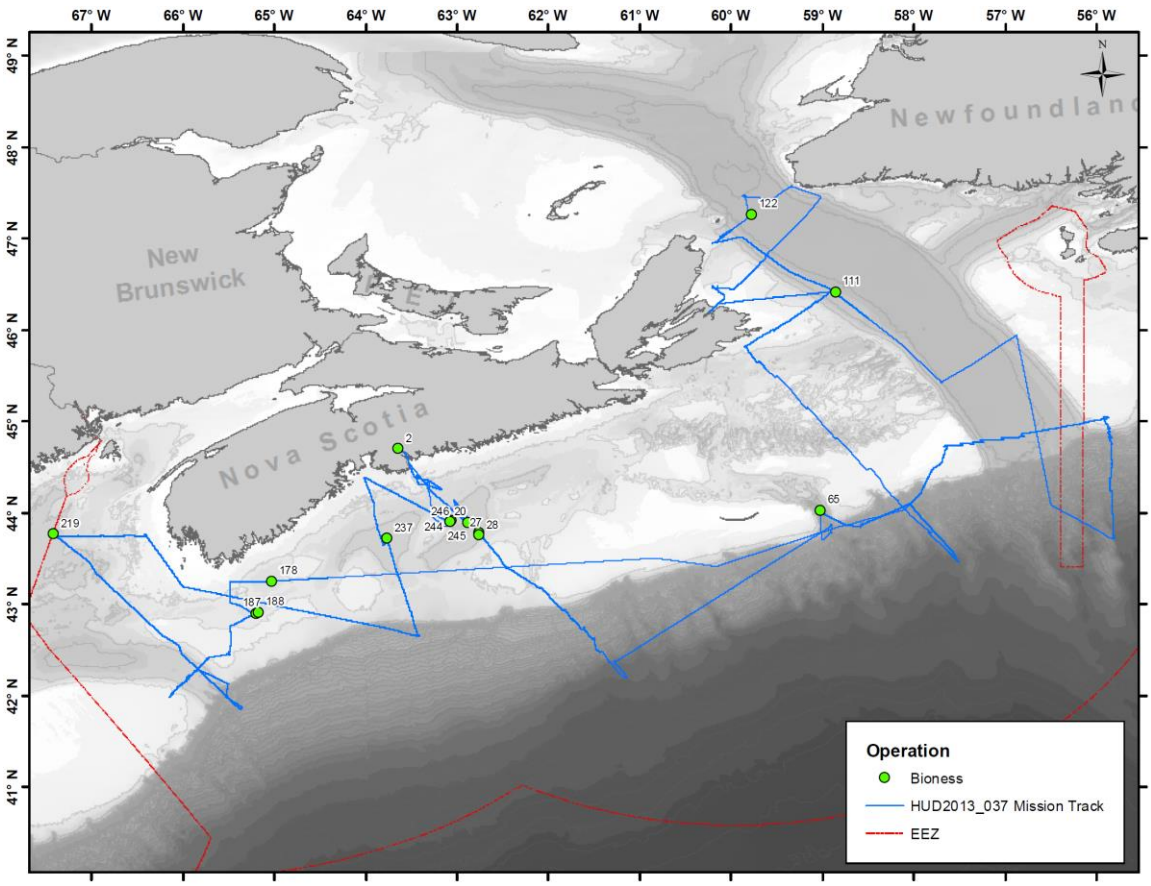


Figure 4. Start locations for the 15 Bioness tows during HUD2013037 AZMP Fall survey. Each tow is labelled with the consecutive mission event.

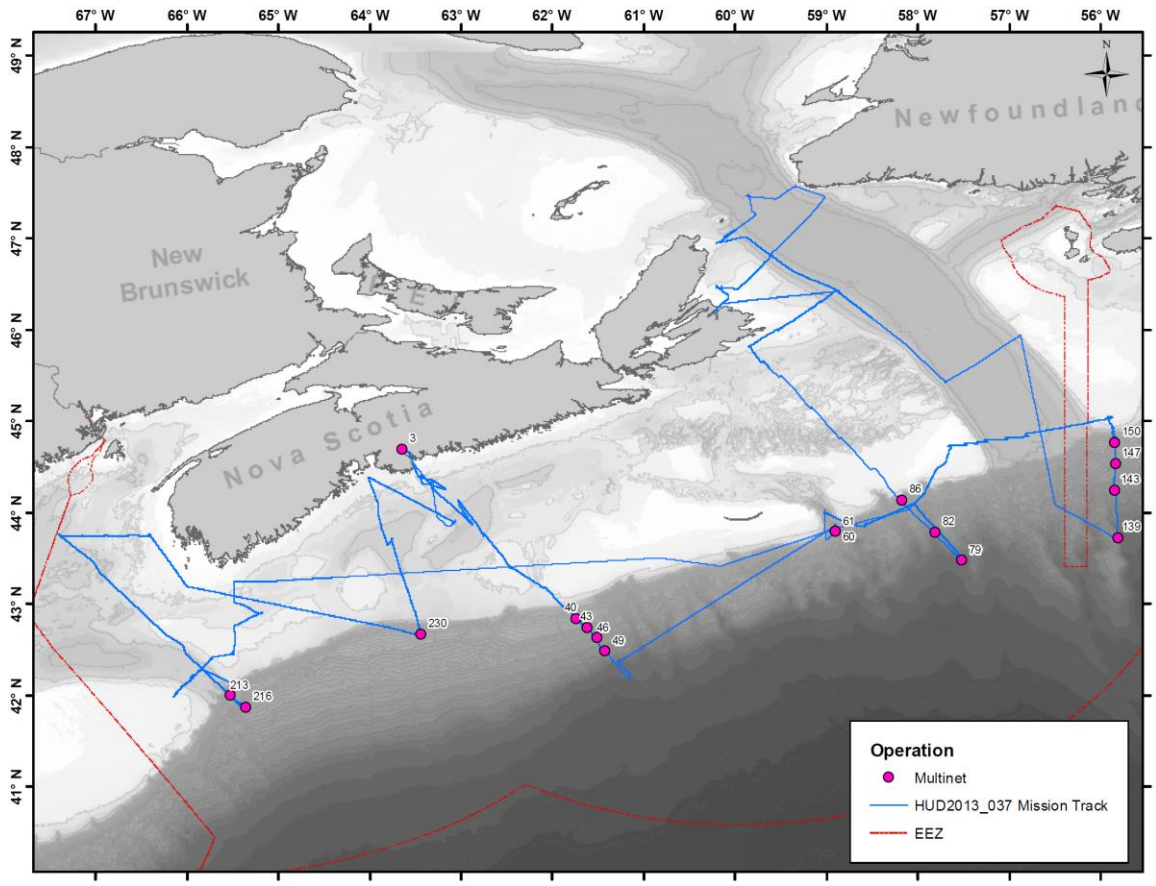


Figure 5. Locations for the 17 Multi-Net tows during HUD2013037 AZMP Fall survey. Each tow is labelled with the consecutive mission event.

Table 6. Zooplankton collection activities during the HUD2013037 AZMP Fall survey. The coordinates provided are in decimal degrees and reflect the ship's position at the time of deployment as recorded using the meta-data logger CAROL. Bolded rows represent activities that had to be re-done.

#	Event	Date	Julian Day	Station	Operation	Ring Net Mesh Size (µm)	Slat (DD)	SLong (DD)
1	2	21-Sep	264	HL_0	Bioness		44.6941	-63.6415
2	3	21-Sep	264	HL_0	Multi-Net		44.6924	-63.6422
3	10	21-Sep	264	HL_01	Ring net	200	44.4000	-63.4496
4	11	21-Sep	264	HL_01	Ring net	76	44.3991	-63.4514
5	15	22-Sep	265	HL_02	Ring net	200	44.2667	-63.3092
6	16	22-Sep	265	HL_02	Ring net	76	44.2609	-63.3106
7	18	22-Sep	265	HL_03	Ring net	200 & 76	43.8795	-62.8786
8	20	22-Sep	265	HL_03	Bioness		43.8872	-62.8826
9	25	22-Sep	265	HL_03.3	Ring net	200	43.7630	-62.7516
10	**27**	**22-Sep**	**265**	**HL_03.3**	Bioness		**43.7733**	**-62.7508**
11	28	22-Sep	265	HL_03.3	Bioness		43.7520	-62.7556
12	29	22-Sep	265	HL_04	Ring net	200	43.3985	-62.4516
13	30	22-Sep	265	HL_04	Ring net	76	43.3993	-62.4538
14	32	22-Sep	265	HL_05	Ring net	200	43.1798	-62.0885
15	33	23-Sep	266	HL_05	Ring net	76	43.1815	-62.0879
16	35	23-Sep	266	HL_05.5	Ring net	200	42.9389	-61.8301
17	36	23-Sep	266	HL_05.5	Ring net	76	42.9393	-61.8311
18	38	23-Sep	266	HL_06	Ring net	200 & 76	42.8314	-61.7332
19	40	23-Sep	266	HL_06	Multi-Net		42.8318	-61.7324
20	41	23-Sep	266	HL_06.3	Ring net	200	42.7334	-61.6161
21	43	23-Sep	266	HL_06.3	Multi-Net		42.7357	-61.6164
22	44	23-Sep	266	HL_06.7	Ring net	200	42.6188	-61.5166
23	46	23-Sep	266	HL_06.7	Multi-Net		42.6205	-61.5107
24	47	23-Sep	266	HL_07	Ring net	200	42.4749	-61.4331
25	49	23-Sep	266	HL_07	Multi-Net		42.4784	-61.4183

26	58	25-Sep	268	GULD_04	Ring net	200	43.7896	-58.8994
27	**60**	**25-Sep**	**268**	**GULD_04**	Multi-Net		**43.7878**	**-58.8991**
28	61	25-Sep	268	GULD_04	Multi-Net		43.7872	-58.9007
29	62	25-Sep	268	SG_28	Ring net	200	43.7088	-59.0003
30	65	25-Sep	268	GULD_03	Bioness		44.0247	-59.0222
31	66	25-Sep	268	GULD_03	Ring net	200	44.0001	-59.0195
32	69	26-Sep	269	SG_23	Ring net	200	43.8599	-58.7302
33	70	26-Sep	269	SG_23	Ring net	200	43.8609	-58.7256
34	77	26-Sep	269	LL_09	Ring net	200	43.4701	-57.5202
35	79	26-Sep	269	LL_09	Multi-Net		43.4701	-57.5168
36	80	27-Sep	270	LL_08	Ring net	200	43.7805	-57.8303
37	82	27-Sep	270	LL_08	Multi-Net		43.7819	-57.8132
38	84	27-Sep	270	LL_07	Ring net	200	44.1300	-58.1718
39	86	27-Sep	270	LL_07	Multi-Net		44.1306	-58.1732
40	87	27-Sep	270	LL_06	Ring net	200	44.4715	-58.5021
41	89	27-Sep	270	LL_05	Ring net	200	44.8101	-58.8497
42	91	27-Sep	270	LL_04	Ring net	200	45.1500	-59.1688
43	93	27-Sep	270	LL_03	Ring net	200	45.4903	-59.5112
44	95	28-Sep	271	LL_02	Ring net	200	45.6503	-59.7009
45	97	28-Sep	271	LL_01	Ring net	200	45.8204	-59.8514
46	99	28-Sep	271	STAB_01	Ring net	200	46.0006	-59.5305
47	101	28-Sep	271	STAB_02	Ring net	200	46.1093	-59.3614
48	103	28-Sep	271	STAB_03	Ring net	200	46.2190	-59.2003
49	107	28-Sep	271	STAB_04	Ring net	200	46.3003	-59.0723
50	109	28-Sep	271	STAB_05	Ring net	200	46.4194	-58.8804
51	111	28-Sep	271	STAB_05	Bioness		46.4076	-58.8523
52	113	28-Sep	271	CSL_01	Ring net	200	46.9499	-60.2094
53	115	29-Sep	272	CSL_03	Ring net	200	47.1006	-59.9901
54	117	29-Sep	272	CSL_02	Ring net	200	47.0187	-60.1093
55	**119**	**29-Sep**	**272**	**CSL_04**	Ring net	**200**	**47.2691**	**-59.7810**
56	120	29-Sep	272	CSL_04	Ring net	200	47.2650	-59.7777

57	122	29-Sep	272	CSL_04	Bioness		47.2626	-59.7703
58	123	29-Sep	272	CSL_05	Ring net	200	47.4309	-59.5515
59	125	29-Sep	272	CSL_06	Ring net	200	47.5792	-59.3395
60	128	29-Sep	272	LS_04	Ring net	200	46.8374	-59.6027
61	131	29-Sep	272	LS_03	Ring net	200	46.7899	-59.6255
62	132	30-Sep	273	LS_02	Ring net	200	46.7279	-59.6880
63	135	30-Sep	273	LS_01	Ring net	200	46.5950	-59.8162
64	137	01-Oct	274	SPB_11	Ring net	200	43.7294	-55.8279
65	139	02-Oct	275	SPB_11	Multi-Net		43.7231	-55.8140
66	141	02-Oct	275	SPB_10	Ring net	200	44.2397	-55.8306
67	143	02-Oct	275	SPB_10	Multi-Net		44.2393	-55.8503
68	145	02-Oct	275	SPB_09	Ring net	200	44.5296	-55.8307
69	147	02-Oct	275	SPB_09	Multi-Net		44.5311	-55.8306
70	148	02-Oct	275	SPB_08	Ring net	200	44.7606	-55.8418
71	150	02-Oct	275	SPB_08	Multi-Net		44.7602	-55.8402
72	151	02-Oct	275	EH_04	Ring net	200	44.8210	-55.8528
73	153	02-Oct	275	EH_03	Ring net	200	44.8805	-55.8690
74	155	02-Oct	275	EH_02	Ring net	200	44.9194	-55.8708
75	157	02-Oct	275	EH_01	Ring net	200	45.0484	-55.8810
76	159	03-Oct	276	BP_01	Ring net	200	44.9806	-56.1416
77	161	03-Oct	276	BP_04	Ring net	200	44.9196	-56.4410
78	163	03-Oct	276	BP_05	Ring net	200	44.8906	-56.6305
79	165	03-Oct	276	BANQ_B6	Ring net	200	44.8468	-56.8072
80	167	03-Oct	276	BANQ_B5	Ring net	200	44.8069	-57.0273
81	169	03-Oct	276	BANQ_B4	Ring net	200	44.7804	-57.2501
82	171	03-Oct	276	BANQ_B3	Ring net	200	44.7603	-57.3510
83	173	03-Oct	276	BANQ_B2	Ring net	200	44.7424	-57.4771
84	175	03-Oct	276	BANQ_B1	Ring net	200	44.7188	-57.6553
85	178	05-Oct	278	RL_01	Bioness		43.2506	-65.0195
86	179	05-Oct	278	RL_01	Ring net	200	43.2497	-65.0407
87	181	05-Oct	278	BBL_01	Ring net	200	43.2493	-65.4790

88	183	05-Oct	278	BBL_02	Ring net	200	43.0090	-65.4790
89	185	05-Oct	278	RATBA_01	Ring net	200	42.8920	-65.1821
90	187	05-Oct	278	RATBA_01	Bioness		42.8944	-65.1985
91	188	05-Oct	278	RATBA_01	Bioness		42.9044	-65.1709
92	189	05-Oct	278	BBL_03	Ring net	200	42.7603	-65.4814
93	191	05-Oct	278	BBL_04	Ring net	200	42.4504	-65.4815
94	193	05-Oct	278	PS_01	Ring net	200	42.4096	-65.7378
95	197	05-Oct	278	PS_04	Ring net	200	42.2697	-65.8670
96	199	05-Oct	278	PS_06	Ring net	200	42.1899	-65.9295
97	201	05-Oct	278	PS_08	Ring net	200	42.1100	-66.0304
98	203	05-Oct	278	PS_10	Ring net	200	41.9812	-66.1412
99	209	05-Oct	278	BBL_05	Ring net	200	42.1290	-65.5018
100	211	05-Oct	278	BBL_06	Ring net	200	41.9993	-65.5097
101	213	06-Oct	279	BBL_06	Multi-Net		41.9921	-65.5205
102	214	06-Oct	279	BBL_07	Ring net	200	41.8597	-65.3540
103	216	06-Oct	279	BBL_07	Multi-Net		41.8617	-65.3515
104	217	07-Oct	280	GNATS_05	Ring net	200	43.7497	-67.3936
105	219	07-Oct	280	GNATS_05	Bioness		43.7630	-67.4062
106	220	07-Oct	280	GNATS_04	Ring net	200	43.7493	-67.1451
107	222	07-Oct	280	GNATS_03	Ring net	200	43.7490	-66.8962
108	224	07-Oct	280	GNATS_02	Ring net	200	43.7503	-66.6481
109	226	07-Oct	280	GNATS_01	Ring net	200	43.7516	-66.3998
110	228	08-Oct	281	LHB_06	Ring net	200	42.6639	-63.4159
111	230	08-Oct	281	LHB_06	Multi-Net		42.6655	-63.4295
112	231	08-Oct	281	LHB_05	Ring net	200	42.9159	-63.5010
113	233	08-Oct	281	LHB_04	Ring net	200	43.3797	-63.6683
114	235	08-Oct	281	LHB_03	Ring net	200	43.6952	-63.7598
115	237	08-Oct	281	LHB_03	Bioness		43.7120	-63.7602
116	238	08-Oct	281	LHB_02	Ring net	200	44.0858	-63.9027
117	240	08-Oct	281	LHB_01	Ring net	200	44.3890	-64.0091
118	242	08-Oct	281	SAM_03	Ring net	200	43.8932	-63.0743

119	244	08-Oct	281	SAM_03	Bioness		43.8939	-63.0735
120	245	08-Oct	281	SAM_04	Bioness		43.9078	-63.0618
121	246	08-Oct	281	SAM_03	Bioness		43.8947	-63.0689
122	247	09-Oct	282	HL_02	Ring net	200	44.2606	-63.3096
123	248	09-Oct	282	HL_02	Ring net	76	44.2600	-63.3095
124	250	09-Oct	282	HL_01	Ring net	200 & 76	44.4000	-63.4517

Dissolved Carbon Sampling

Prepared by: J. Lemay – Dalhousie University

The Dalhousie CO_2 group's objective on the AZMP Fall 2013 cruise was to continue work on piecing together an inter-annual time-series of carbon in the Scotian Shelf region. Standard procedures were followed for gathering water samples throughout the water column at selected stations. This is used to determine and construct depth profiles of dissolved inorganic carbon (DIC) and alkalinity (A_T). ^{13}C samples were also collected in tandem with DIC/A_T samples. We had planned to install our equipment to measure surface CO_2, however there were some difficulties with the ships temperature and salinity sensors in the forward lab and the equipment was not useable. From the data generated by the DIC/A_T samples, carbon cycling and ocean acidification on the Scotian Shelf are able to be assessed. The purpose of the ^{13}C samples is to provide information on the biological mediation of carbon.

Sampling methods involved collecting water samples for DIC and ^{13}C from our 4 main transects of interest: Halifax Line (HL), Louisburg Line (LL), Cabot Straight Line (CSL), and Browns Bank Line (BBL). The first 7 stations of the HL were sampled, with station 2 being done a second time at the end of the cruise. Water was collected from stations 1-6 on the LL, 1-6 on the CSL, and 1-5 on the BBL. The reason water was not collected for all stations were due to a lack of sample bottles. Once water samples were collected they were poisoned with HgCl to kill off any organisms, and then placed away in storage until the end of the cruise. Overall 130 water samples were collected from the HL, 55 from the LL, 69 from the CSL, and 45 from the BBL. All stations combined totalled 299 water samples.

^{224}Ra counts were also conducted on the cruise as a side project but did not involve samples from the 2013 AZMP fall cruise. The ^{224}Ra measurements were done with a RaDeCC, and provide knowledge on the diffusive exchange of DIC, nutrients, and O_2 along the sediment water interface.

Pelagic Seabird and Marine Mammal Observations

Seabird Survey Report
21 September – 9 October, 2013
Canadian Wildlife Service, Environment Canada
Prepared by: Carina Gjerdrum carina.gjerdrum@ec.gc.ca
Observers: Pierre Ryan (Leg 1), Brad Toms (Leg 2)

Background

The east coast of Canada supports millions of breeding marine birds as well as migrants from the southern hemisphere and northeastern Atlantic. In 1969, R.G.B. Brown and P. Germain initiated what was then considered the first "modern" pelagic seabird survey—PIROP (*Programme intégré de recherches sur les oiseaux pélagiques*)—based on a systematic technique and computer database. The program was operated by the Canadian Wildlife Service (CWS) of Environment Canada and supported by the large DFO (Department of Fisheries and Oceans) oceanographic fleet based in eastern Canada. Much of our current knowledge of the marine birds of these areas is based on the PIROP surveys. However, data are limited beyond the mid-1980s. In 2005, CWS reinvigorated the pelagic seabird monitoring program with the goal of identifying and minimizing the impacts of human activities on birds in the marine environment. Since 2005, a scientifically rigorous protocol for collecting data at sea and a sophisticated geodatabase have been developed, relationships with industry and DFO to support offshore seabird observers have been established, and over 100,000 km of ocean track have been surveyed by CWS trained observers. These data are now being used to identify and address threats to birds in their marine environment.

Methods

Seabird and marine mammal surveys were conducted from the port side of the bridge of the Hudson during the Fall Scotian Shelf AZMP between 21 September and 9 October, 2013. Surveys were conducted while the ship was moving at speeds greater than 4 knots, looking forward and scanning a 90° arc to one side of the ship. All birds observed on the water within a 300m-wide transect were recorded, and we used the snapshot approach for flying birds (intermittent sampling based on the speed of the ship) to avoid overestimating abundance of birds flying in and out of transect. Distance sampling methods were incorporated to address the variation in bird detectability. Marine mammal observations were also recorded, although surveys were not specifically designed to detect marine mammals. Details of the methods used can be found in the CWS standardized protocol for pelagic seabird surveys from moving platforms.

Results

Seabird sightings

We surveyed 1396 km of ocean track between 21 September and 9 October, 2013. A total of 463 birds were observed in transect from 6 families (Table 6). Overall, bird densities were low, averaging 1.0 birds/km^2 (ranging from 0 - 76 birds/km^2). The highest

densities of birds were observed over shelf waters off the coasts of Yarmouth and Sydney, on Brown's Bank, in the LaHave Basin, and further offshore in the Gully MPA, and in slope waters south of Banquereau and St. Pierre Bank (Figure 6a).
Great Shearwater were the most commonly observed species, accounting for 17% of the observations (Table 6), and were seen primarily off the coast of Yarmouth, in the Gully MPA, and in the deep water off St. Pierre Bank (Figure 6b). Great Shearwater breed in the southern hemisphere and spend their non-breeding season in the waters off NS. Most will have left the area by November. Northern Fulmar were also relatively common and were seen throughout the survey area (Table 6, Figure 6b). The bulk of the fulmar population breeds in Arctic and sub-Arctic colonies, but it is unknown whether the individuals observed during this survey also comprised of non-breeding individuals, and from which area they came. Storm-Petrels comprised 35% of the observations, with an even split between the Leach's, which breed in the millions in NL and NS, and the Wilson's, which are visitors from the southern hemisphere. Most were observed in the deep water basins or off the shelf break (Figure 6c). Northern Gannet made up 16% of the observations (Table 6) and all were observed relatively close to shore (Figure 6d). These individuals are likely from breeding colonies in NL and QU, moving south for the winter. The largest flock of birds observed was 50 phalaropes on the northern edge of Browns Bank where they have moved from Arctic breeding grounds (Figure 6d).

Marine Mammal sightings

Just 86 marine mammals were recorded during the surveys (Table 7). Common Dolphin accounted for most of the observations, and were observed east of Sydney, in the LaHave Basin, and on Browns Bank (Figure 7a). Three Atlantic White-sided Dolphin were observed in the Laurentian Channel. The Long-finned Pilot Whales were observed in deep water at the shelf break and in the Gully MPA, a single Fin Whale was identified east of Sydney, and one Minke Whale at the western edge of Browns Bank (Figure 7b). A total of 6 cetaceans could not be identified (Table 7).

Gully MPA

Surprisingly, very few sightings occurred in the Gully MPA. A total of 28 birds were counted within the survey transect and 10 marine mammals (Table 8). Bird sightings included Great Shearwater, Northern Fulmar, Leach's and Wilson's Storm-Petrels, Great Black-backed Gull, and an unidentified Skua species (Table 8; Figure 8a-c). The only marine mammals observed within the Gully MPA were a pod of Long-finned Pilot Whales (9 individuals) and 1 unidentified cetacean (Figure 8d).

Table 6. List of bird species observed during the seabird survey on the Fall Scotian Shelf AZMP, between 21 September and 9 October, 2013.

Family	Species	Latin	Number observed in transect	Total number observed
Diomedeidae	Unidentified Albatross	Diomedeidae	0	1
Procellariidae	Great Shearwater	*Puffinus gravis*	79	157
	Northern Fulmar	*Fulmarus glacialis*	35	89
	Cory's Shearwater	*Calonectris diomedea*	6	8
	Unidentified Shearwater	*Puffinus* or *Calonectris*	4	15
	Manx Shearwater	*Puffinus puffinus*	1	4
Hydrobatidae	Leach's Storm-Petrel	*Oceanodroma leucorhoa*	66	102
	Unidentified Storm-Petrel	Hydrobatidae	64	126
	Wilson's Storm Petrel	*Oceanites oceanicus*	31	41
Sulidae	Northern Gannet	*Morus bassanus*	76	180
Phalacrocoracidae	Double-crested Cormorant	*Phalacrocorax auritus*	0	3
	Unidentified Cormorant	*Phalacrocorax*	0	1
Scolopacidae	Unidentified Phalarope	*Phalaropus*	53	217
	Red Phalarope	*Phalaropus fulicaria*	1	2
Laridae	Great Black-backed Gull	*Larus marinus*	17	44
	Herring Gull	*Larus argentatus*	9	30
	Lesser Black-backed Gull	*Larus fuscus*	6	6
	Pomarine Jaeger	*Stercorarius pomarinus*	3	6
	Great Skua	*Stercorarius skua*	1	7
	Unidentified Skua	*Stercorarius*	1	1
	Unidentified Jaeger	*Stercorarius*	0	3
	Black-legged Kittiwake	*Rissa tridactyla*	2	8
	Unidentified Gull	Laridae	0	105
	Long-tailed Jaeger	*Stercorarius longicaudus*	1	2
	Glaucous Gull	*Larus hyperboreus*	0	1
	Ring-billed Gull	*Larus delawarensis*	0	1
Alcidae	Razorbill	*Alca torda*	3	4
	Unidentified Murre	*Uria*	2	2
	Atlantic Puffin	*Fratercula arctica*	0	2
	Dovekie	*Alle alle*	1	1
	Unidentified Auk	Alcidae	1	1
	Black Guillemot	*Cepphus grylle*	0	1
	Thick-billed Murre	*Uria lomvia*	0	1
Total			**463**	**1172**

Table 7. List of marine mammals observed during the seabird survey on the Fall Scotian Shelf AZMP, between 21 September and 9 October, 2013.

Species' name	Latin	Total number observed
Common Dolphin	*Delphinus delphis*	42
Long-finned Pilot Whale	*Globicephala melas*	17
Unidentified Dolphins	Delphinidae	16
Unidentified Cetaceans	Cetacea	6
Atlantic White-sided Dolphin	*Lagenorhynchus acutus*	3
Fin Whale	*Balaenoptera physalus*	1
Minke Whale	*Balaenoptera acutorostrata*	1
Total		**86**

Table 8. List of birds and marine mammals observed in the Gully Marine Protected Area on Sept 25, 2013.

Species	Latin	Number observed in transect
Great Shearwater	*Puffinus gravis*	8
Northern Fulmar	*Fulmarus glacialis*	2
Unidentified Storm-Petrel	Hydrobatidae	8
Leach's Storm-Petrel	*Oceanodroma leucorhoa*	6
Wilson's Storm Petrel	*Oceanites oceanicus*	1
Great Black-backed Gull	*Larus marinus*	2
Unidentified Skua	*Stercorarius*	1
Total bird sightings		**28**
Long-finned Pilot Whale	*Globicephala melas*	9
Unidentified Cetaceans	Cetacea	1
Total marine mammal sightings		**10**

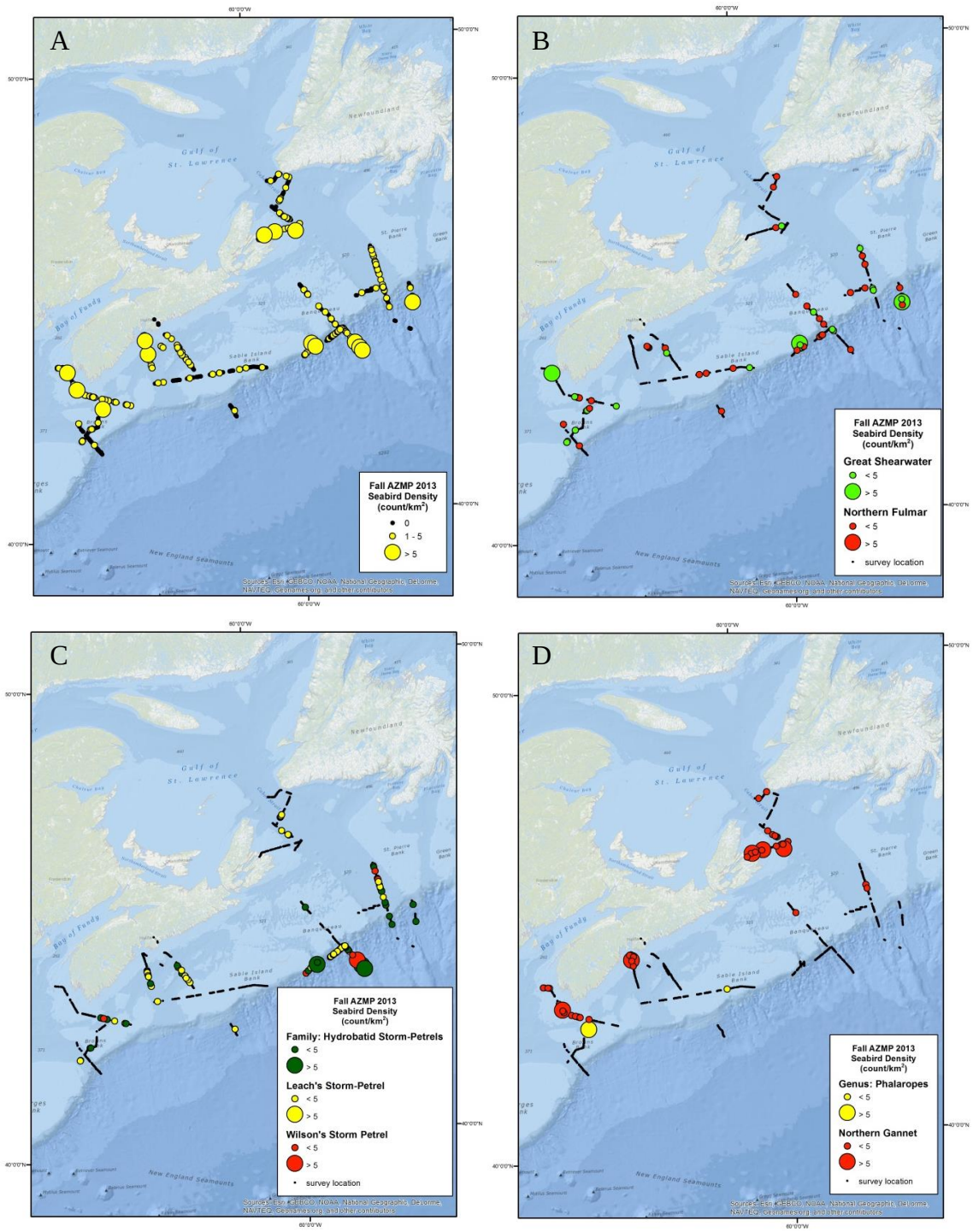


Figure 6. Density of A) total birds; B) Great Shearwater and Northern Fulmar; C) storm-petrels, and D) Northern Gannet and phalaropes observed during the Fall AZMP, 21 September – 9 October, 2013.

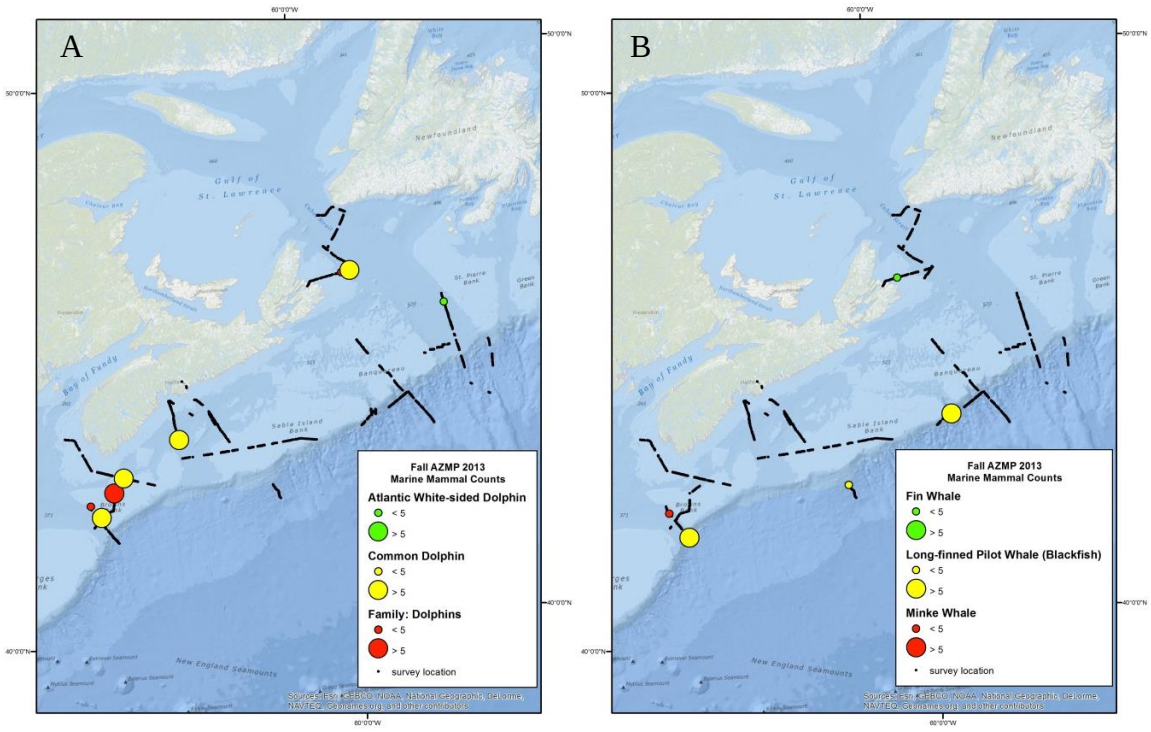


Figure 7. Counts of A) dolphins and B) whales during the Fall AZMP, 21 September – 9 October, 2013.

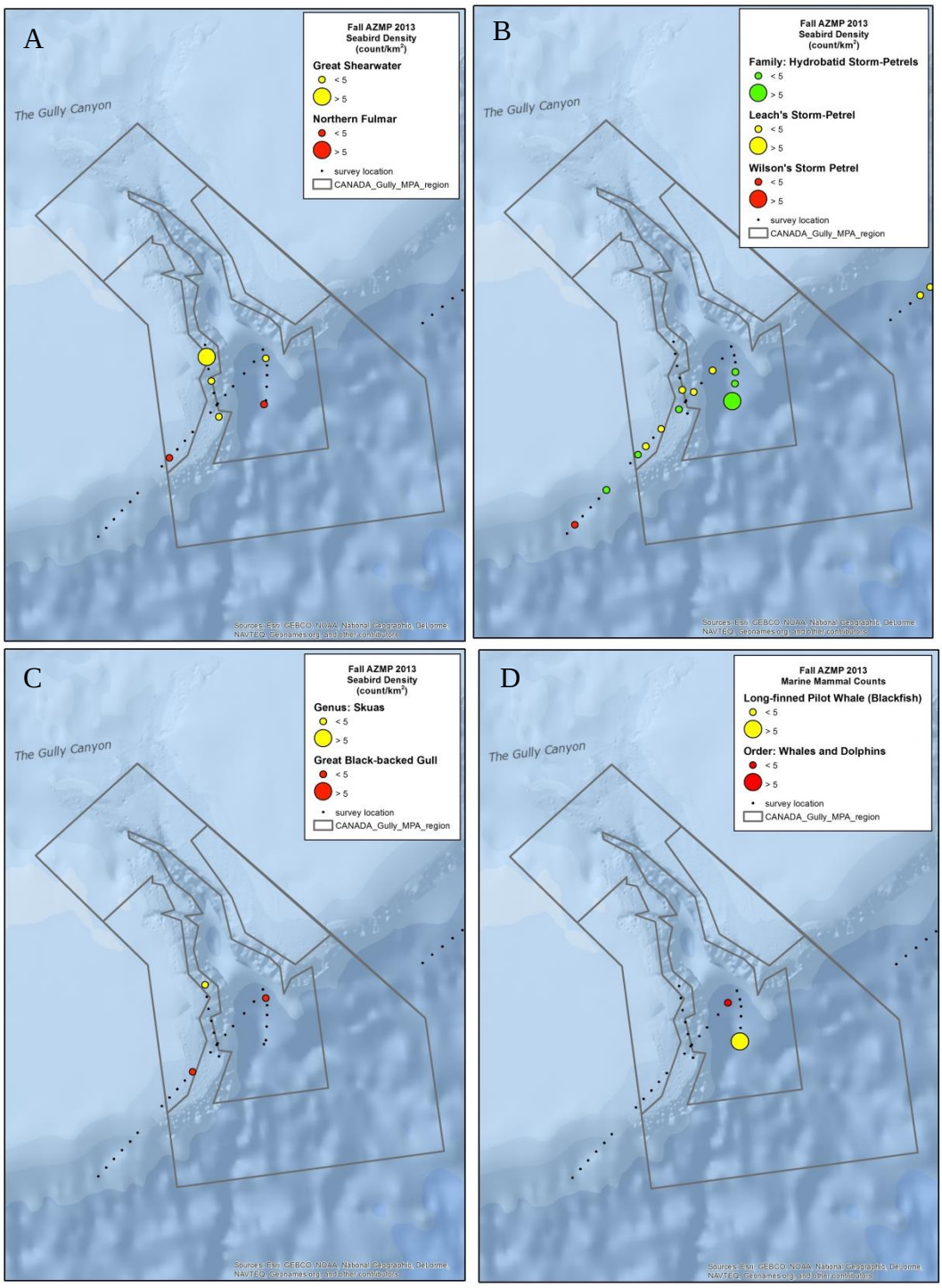


Figure 8. Density of A) Great Shearwater and Northern Fulmar; B) Storm-Petrels; C) Gulls and Skua; and D) counts of marine mammals observed in the Gully Marine Protected Area on Sept 25, 2013.

Mooring Operations

Prepared by: Jay Barthelotte
Division: Program Coordination and Support (PCSD)

Narrative

During the 2013 Fall AZMP mission, vessel time for other programs was provided to conduct oceanographic mooring operations. These activities included deployment, recovery and drag operations. With support from the officers and crew of the CCGS Hudson, the technologists conducting these activities were Jay Barthelotte and Adam Hartling from Ocean Physics, PCSD, Science Branch. Figure 9 and Table 9 provide a summary for mooring deployment and recovery activities for each program during the HUD2013037 Fall AZMP mission. The CCGS Hudson searched for an OTN mooring in Cabot Strait but was unable to locate the mooring. This operation was not considered an official "Event" and is therefore not included in Table 9.

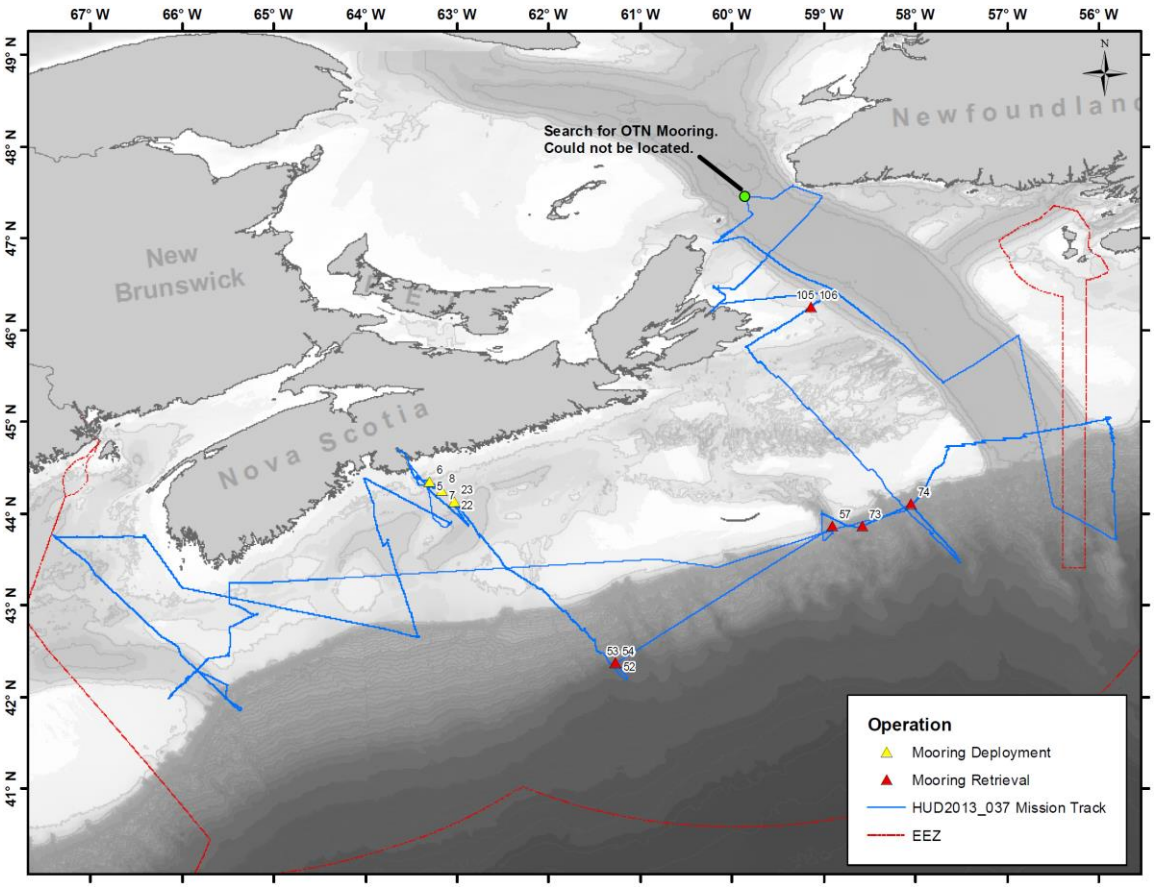


Figure 9. The location for each mooring operation during HUD2013037. Refer to Table 9 for more details.

Table 9. List of mooring operations conducted during the first leg of HUD2013037. The coordinates provided below are in decimal degrees and represents the ship's position at the time of the operation.

Date	JDay	Event	Operation	Station	Mooring Name	Slat (DD)	SLong (DD)	Comments	Program
21-Sep	264	5	Recovery	OTN_01	M_1846	44.3500	-63.3033		
21-Sep	264	6	Deployment	OTN_01	M_1854	44.3483	-63.3043		
21-Sep	264	7	Recovery	OTN_02	M_1847	44.2524	-63.1675		Near OTN – Dave Hebert
21-Sep	264	8	Deployment	OTN_02	M_1855	44.2504	-63.1671		
22-Sep	265	22	Recovery	OTN_03	M_1848	44.1306	-63.0325		
22-Sep	265	23	Deployment	OTN_03	M_1856	44.1338	-63.0329		
24-Sep	267	52	Acoustic Release	RS_05	M_1746	42.3740	-61.2714	Unsuccessful	RAPID Watch – John Loder
24-Sep	267	53	Dragging	RS_05	M_1746	42.3764	-61.2802	Unsuccessful	
24-Sep	267	54	Dragging	RS_05	M_1746	42.3758	-61.2789	Unsuccessful	
25-Sep	268	57	Recovery	MidGul	M_1849	43.8661	-58.9112		Cetacean Acoustic Moorings – Hilary Moors Murphy/ Norman Cochrane
26-Sep	269	73	Recovery	GulSho	M_1850	43.8637	-58.5824		
26-Sep	269	74	Recovery	ShoHald	M_1851	44.1005	-58.0527		
28-Sep	271	105	Recovery	STAB_MOOR	M_1845_surface	46.2549	-59.1430		St. Anns Bank – HOTO Eddy Kennedy
28-Sep	271	106	Recovery	STAB_MOOR	M_1845_sub-surface	46.2524	-59.1382		

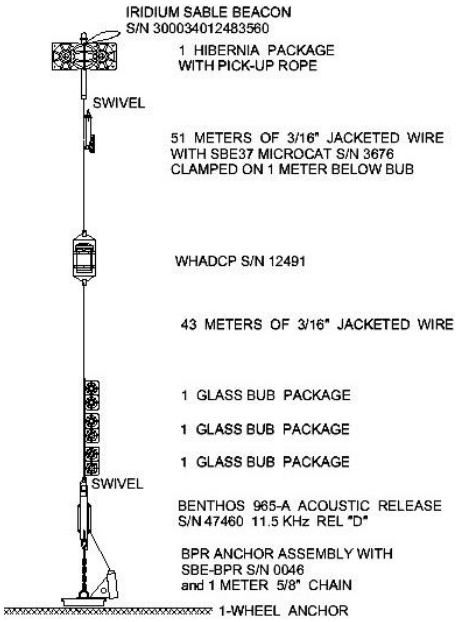
Rapid – Watch Program

A half day was allocated for the attempt recovery of mooring M1746 (RS_05). This mooring was originally deployed in September 2009 and an attempted recovery in December 2010 was unsuccessful. Just after its original deployment, it was noted that communication with the acoustic release was lost. This prevented us from performing a mooring location survey and left us with some doubt for a successful recovery in December 2010. On September 24, 2013 we arrived early at the site and could not communicate with the acoustic release of the mooring. With only the anchor drop position and some knowledge of the water current and direction for that site, two drag operation attempts were performed in hopes of snagging the stranded mooring. Since the mooring is only 100 m high (from the ocean floor) in a water depth of 3400m, this was a huge challenge with unfavourable odds to successfully snag the mooring with a large shipboard winch and only 8000 m of drag wire, weight and grapnels. Unfortunately, both drag operation attempts failed to recover the mooring. The second drag operation resulted in a severe tangling of the last two sections of 1000 m drag wire and the drag grapnels during recovery. This required an additional 4 hours to untangle and recover the drag wire assembly.

Drag wire weight

Drag wire tangled

Mooring M1746 (RS_05)



ARGO Float Deployments

Contributions by: Denis Gilbert, Bernie Petolas, Dave Hebert & Adam Hartling

Narrative

During the mission there were 4 NOVA float deployments for the ARGO program, 2 at the end of the Louisbourg Section (LL_08 and LL_09) and 2 at the end of the St. Pierre Bank Section (SPB_10 and SPB_11) (Figure 10). Table 10 provides deployment details.

Two of the floats deployed at the end of the Louisbourg Section on September 28th (Table 10) reported housekeeping metadata within 30 minutes of being deployed; however, only one of the two returned a DAY 0 ascent profile (SN 091 – Table 10). Neither float SN 090 or SN 091 reported a profile on DAY 10 (October 7th). As well, neither float deployment at the end of the St. Pierre Bank Section on October 2nd returned a DAY 0 profile (SN 087 and SN 088). SN 088 did report on DAY 10 (October 12th) but SN 087 did not report on day 10 (October 13th).

As of November 6th, only SN 088 (deployed at SPB_11) is still regularly reporting data (DAY 20 & 30). This is a disappointing result. As such, technicians have been tasked to perform a number of Bluetooth and iridium communication checks on the remaining NOVA float inventory at BIO.

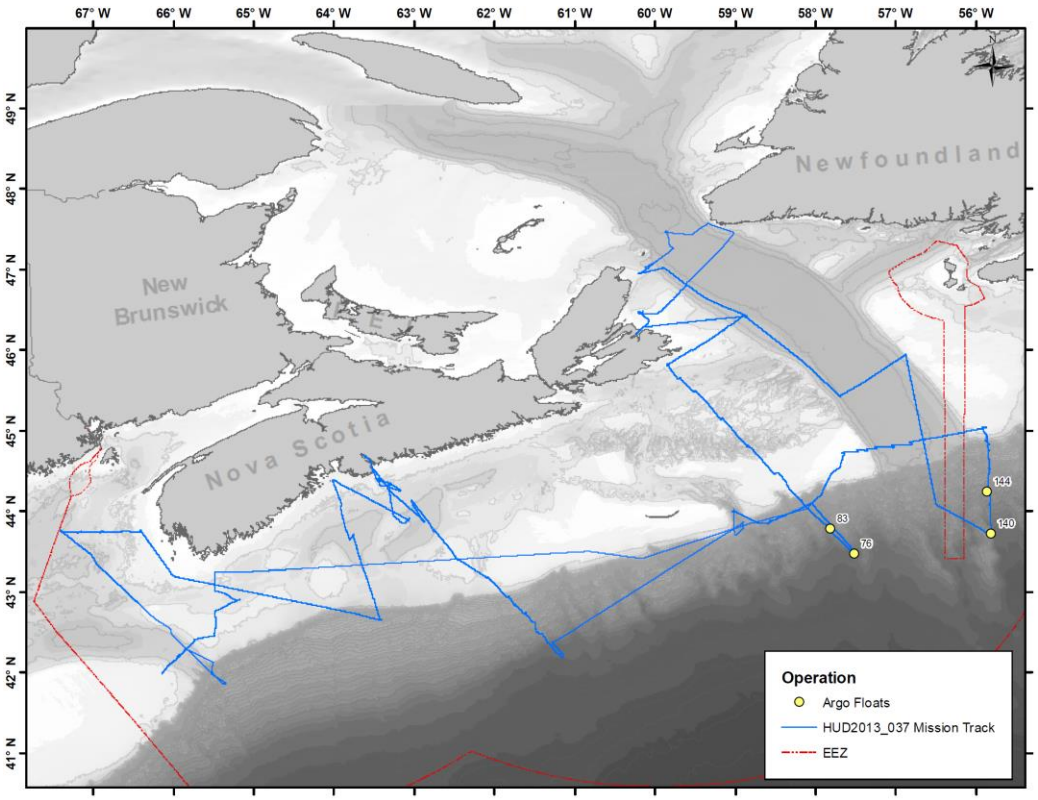


Figure 10. The locations for each NOVA float deployment during HUD2013037. Refer to Table 10 for more details.

Table 10. Deployment details for NOVA float deployments during HUD2013037. The coordinates provided below are in decimal degrees and represent the ship's position at the time of deployment.

Date	JDay	Event	Station	Magnet Removed (UTC)	Float Deployed (UTC)	Plugs Removed	IMEI #	Serial Number	Slat (DD)	Slong (DD)
26-Sep	269	76	LL_09	1822	1823	Y	300234060841870	SN 091 113C5A	43.4714	-57.5198
27-Sep	270	83	LL_08	0510	0555	Y	300234060848860	SN 090 113C61	43.7820	-57.8119
02-Oct	275	140	SPB_11	0248	0250	Y	300234060532350	SN 088 113EE6	43.7221	-55.8147
02-Oct	275	144	SPB_10	0941	0942	Y	300234060541180	SN 087 113C58	44.2457	-55.8571

Underway Sampling

Vessel Acoustic Doppler Current Profiler

Prepared by: Adam Hartling
Division: Program Coordination and Support (PCSD)

Hudson is equipped with a Teledyne RDI Ocean Surveyor II vessel mounted acoustic Doppler current profiler (ADCP) system consisting of a 75 kHz phased array transducer assembly mounted in a well in the ship's hull and a deck unit and computer located in the forward lab. Data was collected for the duration of the mission beginning on September 21st, 2013 at 15:10 UTC and ending October 9th, 2013 at 13: 27 UTC.

The transducer assembly is mounted on a ram penetrating the ship's hull that can be lowered if necessary. Transducer remained in the retracted position for the duration of the cruise. It was determined during sea acceptance testing that lowering the transducer did not affect the operation of the system. The transducer is located approximately 6m below the waterline.

The system is capable of collecting bottom track data to 1000 m and profile data to 650 m. Setup includes 100-8 m bins. The Ocean Surveyor was set to operate in the narrow band single ping mode with 3 sec ensemble time. Position, heading, pitch and roll data is provided by the ADU5 attitude determination unit at a 1 Hz rate. Ships gyro heading data is connected directly to the OSII deck unit. The Ocean Surveyor also includes a temperature sensor for sound speed calculations. The gyrois the primary heading.

WinADCP software package used monitor profile data in real time. WinADCP is set to display times series of short-term averaged profile and attitude data. VmDas Software package used to deploy OSII and log raw data, VmDas option files, intermediate and processed files. Data back-up on external hard-drive. Data back-up includes only raw data and VmDas option files.

All NMEA strings are logged during data collection. The gyro heading is included in the raw data. Raw data is processed in real time for a short term average of 30 sec and a long term average of 300 sec.

A significant increase in the noise floor is caused by bow thrusters while on station, during high sea states, or during travel at speeds in excess of 12 knots in rough conditions. The increase in noise floor results in a significant decrease in data quality and reduction in profile range.

Navigation and Bathymetry

The navigation system onboard CCGS Hudson consists of differential GPS receiver and navigation software. The receiver is one of many NMEA feeds into a multiplexer that provides all the NMEA strings to a PC on the bridge. The PC running the navigation software, then rebroadcasts the NMEA strings to distribution units in the computer room, which provide many output lines for the working labs. The resulting broadcast navigation strings are ~ 1 Hz. The navigation data are then logged at specified intervals on a PC. For this cruise the navigation was logged approximately every second.

The Knudson 12 kHz sounder was utilized in transit and during mooring activities. At CTD stations, the echo sounder system used for collecting bathymetric data consisted of a 12 KHz Raytheon PTR echo sounder that created an analog trace on a Raytheon Line Scan Recorder in the winch room. The transducer beam width is 15 degrees. The sweep rate of the recorder was adjusted throughout the course of data collection to aid in identifying the bottom signal. One transducer is positioned on a Ram that can be lowered or raised depending on conditions. When the ram is up, the waterline to transducer offset is 6 m. When the ram is down, the offset is 8 m.

Moving Vessel Profiler (MVP)

For the first deployment of the Brooke Ocean MVP 200 (Event 55 – Figure 11 and Table 11) the free fall fish housed an AML CTD (SN 8586), a Wetlab Fluorometer (SN 2317) and a Brooke Ocean Technology (BOT) Laser Optical Plankton Counter (LOPC) and was towed at 10-12 kts. At the end of Event 55, the deck unit lost communication with the CTD and LOPC. As a result, the CTD was replaced with AML SN 7799 and the LOPC was replaced by the BIO LOPC (no serial number available). After this sensor swap, the system collected and stored streaming free fall CTD, fluorometer and LOPC data at regular intervals.

The new software utilized to view the streaming LOPC data during the mission continually crashed when it attempted to access the NMEA data stream. It was difficult to say exactly why this occurred aboard the ship. The result unfortunately, is that all streaming LOPC output files from the fish do not contain a time stamp. This will make the job of combining LOPC and CTD data more difficult and it is hoped that this can be resolved prior to the next mission for which this gear is required.

The system worked without incident until the early morning of October 4th when the MVP moved from the relatively deep waters of the Scotian Slope to the shallow waters of Sable Bank. During the transition to shallower shelf waters, the Knudson soundings were sporadic and were creating an inconsistent “pseudo-sea floor” from which the fish keeps a 10 m altitude above. At roughly 1100 UTC, the fish touched the sea floor for approximately 10 seconds. There was an inexperienced operator at the controls, so the contact went un-noticed. Deck staff reported that some of the MVP cable had jumped the drum and was lodged between the drum and an acrylic guard. This caused a significant cable abrasion and meant that the MVP was grounded for the remainder of the mission.

In the future, all staff expected to operate the MVP in concert with the Knudson sounder will be instructed on deployment and recovery procedures prior to sailing to reduce the potential for possible bottom contact.

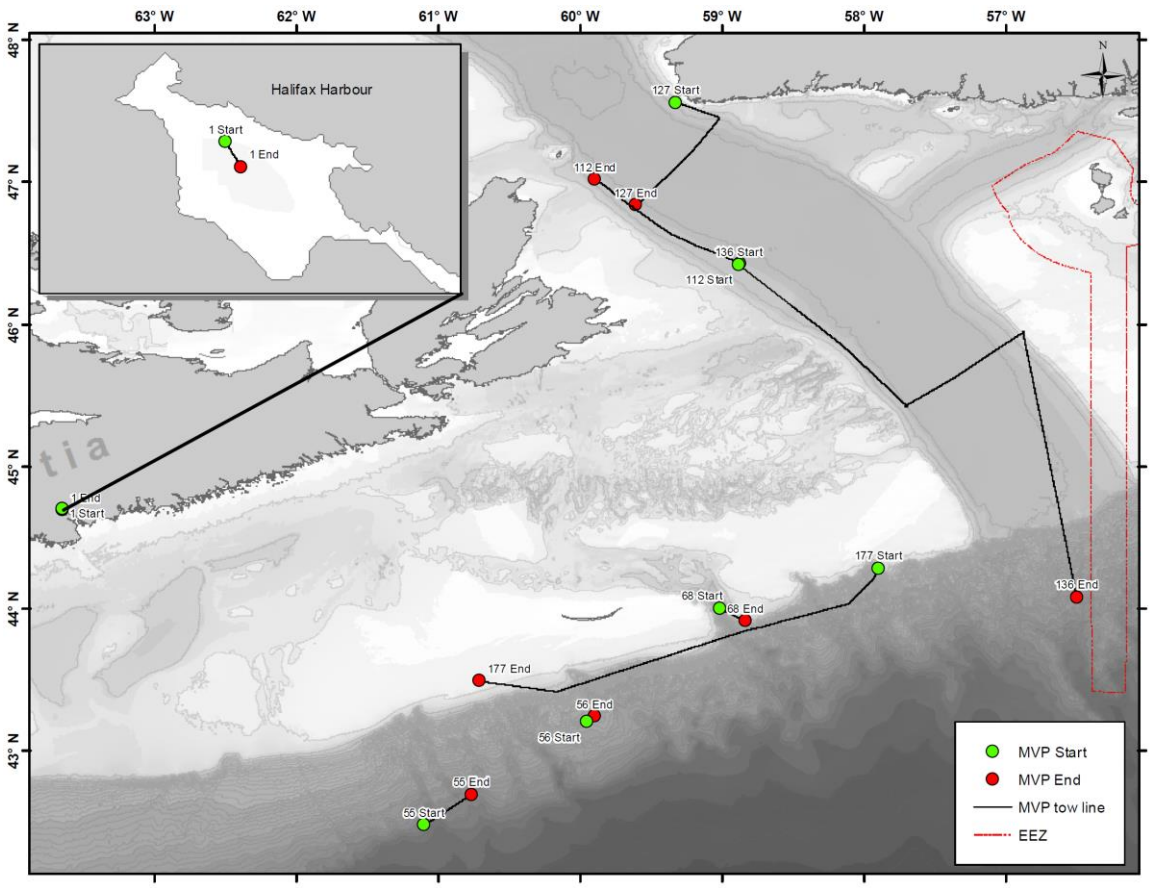


Figure 11. Start and end locations for MVP tows during the HUD2013037 mission.

Table 11. MVP deployment and recovery details from HUD2013037.

#	Date	JDay	Event	SLat_start	Slong_Start	SLat_Stop	SLong_Stop
1	21-Sep	264	1	44.7015	-63.6459	44.6947	-63.6413
2	25-Sep	268	55	42.4722	-61.1008	42.6882	-60.7641
3	25-Sep	268	56	43.2025	-59.9472	43.2368	-59.8967
4	26-Sep	269	68	44.0015	-59.0157	43.9102	-58.8347
5	28-Sep	271	112	46.4295	-58.8700	47.0210	-59.8931
6	29-Sep	272	127	47.5646	-59.3222	46.8402	-59.6036
7	30-Sep	273	136	46.4219	-58.8825	44.0797	-56.4976
8	03-Oct	276	177	44.2815	-57.8972	43.4871	-60.7070

Meterological Measurements

Copied from: Ross Hendry

The officer of the watch enters standard meteorological data into the ship's log book (not the science log book) at regular intervals. On occasion we have transcribed these logged values for local scientific use but there is no standard protocol for doing this.

Since April 2003 Environment Canada (EC) has maintained an AXYS Technologies Inc. Automated Volunteer Observing Station (AVOS) on board Hudson that measures a suite of meteorological variables. Data are stored on an EC-maintained personal computer on board Hudson. Normally these measurements are automatically forwarded at regular intervals onto the Global Telecommunication System (GTS) of the World Meteorological Organization. The GTS data then become available at http://www.sailwx.info/shiptrack/shipposition.phtml?call=CGDG but there are significant data gaps which include the entire period of HUD2009015.

Wind speed and direction are operationally monitored with a Young Model 05103 Wind Monitor, (R. M. Young Company, MI, USA) mounted on the starboard side of the upper platform on Hudson's antenna mast at an estimated elevation of 25 m above sea level. The Wind Monitor is connected to a Young Model 06206 Marine Wind Tracker located on the bridge. The Marine Wind Tracker provides NMEA $WIMWV (Wind Speed and Angle) strings which are captured, time-stamped, and logged at 1-second intervals by the Geological Survey of Canada's (GSC) Survey Suite navigation logging system.

Wind direction reported by the Wind Monitor is the direction relative to the ship's heading from which the wind is blowing, zero degrees when the wind is on the bow and increasing clockwise when viewed from above. The manufacturer of the Model 05103 Wind Monitor notes that the wind direction potentiometer has a 5° dead band between 355 and 360 degrees. In the Hudson installation the NMEA output directions actually show a dead band between approximately 175 and 180 degrees.

Additional information is needed to convert the wind measurements from a ship reference frame to a geographic reference frame. Relative wind direction is converted to geographic direction by adding the ship's heading. Ship's heading information is provided by a Raytheon Marine Standard 20 Gyro Compass System as NMEA $HEHDT (Heading – True) strings. Wind speed and direction in a geographic reference frame are then computed by the vector addition of the wind velocity in the ship reference frame and the ship's velocity. The ship's true course and speed are provided by the Ashtech ADU5 attitude determination and real-time DGPS positioning system (Section B5) as NMEA $GPVTG strings (Track Made Good and Ground Speed). These additional NMEA strings are also captured at 1-second intervals by the Survey Suite system.

Meta-data Collection

As usual, all shipboard activities were recorded by ship's personnel in the bridge log which is later transcribed into digital format by science staff. For this mission, and in addition to the bridge log, the meta-data program CAROL (developed by Dave Mckeown) was utilized to capture the time (UTC) at which various activities were conducted. Throughout the mission, in water, on bottom and on deck times were recorded with other general comments depending on the deployment type. Utilizing a Microsoft Access based executable developed by Robert Benjamin (Ocean Data Information Section - ODIS), at the end of each day CAROL logs were amalgamated and imported into a "general" table in Access, along with the accompanying navigation data (NMEA) captured by on board NRCAN Regulus navigation systems. The navigation data was then linked to meta-data records via the UTC and the now geo-referenced meta-data was plotted using GIS.

Meta-data collected in this manner is a more accurate description of shipboard activities than bridge logs and requires direct input from science staff. While it is clear that the CAROL logging software has limited flexibility, meta-data collection made it easier to create near real-time summaries of daily activities and has proved its usefulness for future missions. All HUD2013037 CAROL meta-data have been provided to ODIS for long term storage with all other mission meta-data.

The 2014 spring AZMP survey will attempt to utilize E-log for meta-data capture. E-log is a web based logging system that will allow users to put operational activities online in a chronological fashion from nearly anywhere on the ship. A representative from AZMP will work with ODIS to develop an E-log template that is hoped will serve as a launching point for meta-data collection standards for other oceanographic programs in Maritimes Region.

APPENDICES

Appendix 1. CTD configuration file.

PSA file: C:\CTD_ACQUISITION\2013037HUD\Seasave.psa

Date: 09/22/2013

Instrument configuration file:
C:\CTD_ACQUISITION\2013037HUD\ctddata\HUD2013037B.con

Configuration report for SBE 911plus/917plus CTD

Frequency channels suppressed : 0
Voltage words suppressed : 0
Computer interface : RS-232C
Deck unit : SBE11plus Firmware Version >= 5.0
Scans to average : 1
NMEA position data added : Yes
NMEA depth data added : No
NMEA time added : No
NMEA device connected to : deck unit
Surface PAR voltage added : No
Scan time added : No

1) Frequency 0, Temperature

Serial number : 5083
Calibrated on : 3-Feb-2009/27-Feb-2013
A : 3.68121239e-003
B : 5.97296004e-004
C : 1.51601263e-005
D : 2.12176036e-006
F0 : 2984.759
Slope : 0.99998900
Offset : -0.0003

2) Frequency 1, Conductivity

Serial number : 3562
Calibrated on : 28-Jan-2009/27-Feb-2013
G : -1.02223546e+001
H : 1.24814450e+000
I : -1.22887508e-003
J : 1.38992106e-004
CTcor : 3.2500e-006
CPcor : -9.57000000e-008

Slope : 1.00037000
Offset : 0.00047

3) Frequency 2, Pressure, Digiquartz with TC

Serial number : 51403/MOD12P-0105
Calibrated on : 14-Feb-2013/31-Dec-1992
C1 : -3.862588e+004
C2 : 2.784220e-001
C3 : 1.405780e-002
D1 : 3.882400e-002
D2 : 0.000000e+000
T1 : 3.062824e+001
T2 : -1.732800e-004
T3 : 4.723800e-006
T4 : 3.333000e-009
T5 : 0.000000e+000
Slope : 0.99988568
Offset : -1.52401
AD590M : 1.142000e-002
AD590B : -9.117000e+000

4) Frequency 3, Temperature, 2

Serial number : 2298
Calibrated on : 11-Feb-2009/25-Feb-2013
A : 3.68121321e-003
B : 6.00290488e-004
C : 1.63021970e-005
D : 2.27807569e-006
F0 : 2913.251
Slope : 1.00005800
Offset : -0.0006

5) Frequency 4, Conductivity, 2

Serial number : 1873
Calibrated on : 07-Jan-2009/25-Feb-2013
G : -4.00329765e+000
H : 5.23096529e-001
I : -8.37010780e-004
J : 7.01470956e-005
CTcor : 3.2500e-006
CPcor : -9.57000000e-008
Slope : 1.00050500
Offset : -0.00111

6) A/D voltage 0, Altimeter

Serial number : 49559
Calibrated on : 18-Feb-2010
Scale factor : 15.000
Offset : 0.000

7) A/D voltage 1, Fluorometer, Chelsea UV Aquatracka

Serial number : 088172
Calibrated on : 19-Jan-2010
A : 0.007834
B : 0.022965

8) A/D voltage 2, Oxygen, SBE 43

Serial number : 430133
Calibrated on : 21-Jan-2012
Equation : Sea-Bird
Soc : 3.75900e-001
Offset : -6.40700e-001
A : -3.67740e-003
B : 1.71130e-004
C : -2.66800e-006
E : 3.60000e-002
Tau20 : 1.83000e+000
D1 : 1.92634e-004
D2 : -4.64803e-002
H1 : -3.30000e-002
H2 : 5.00000e+003
H3 : 1.45000e+003

9) A/D voltage 3, Oxygen, SBE 43, 2

Serial number : 430042
Calibrated on : 13-Dec-2011
Equation : Sea-Bird
Soc : 4.14100e-001
Offset : -5.05000e-001
A : -2.86950e-003
B : 2.08540e-004
C : -3.38800e-006
E : 3.60000e-002
Tau20 : 1.79000e+000
D1 : 1.92634e-004
D2 : -4.64803e-002
H1 : -3.30000e-002
H2 : 5.00000e+003
H3 : 1.45000e+003

10) A/D voltage 4, PAR/Irradiance, Biospherical/Licor

Serial number : SPQA5064-/0002-PN90310-CH1
Calibrated on : 20-Mar-2013/17-Apr-1998
M : -0.77322200
B : -3.53659100
Calibration constant : 4.69000000
Multiplier : 1.00000000
Offset : 0.00000000

11) A/D voltage 5, Fluorometer, WET Labs WETstar

Serial number : WSCD-987P
Calibrated on : 18-Aug-2003
Blank output : 0.052
Scale factor : 71.428

12) A/D voltage 6, User Polynomial

Serial number : 372
Calibrated on :
Sensor name : Optode 4330F - O2 D-Phase
A0 : 0.00000000
A1 : 1.00000000
A2 : 0.00000000
A3 : 0.00000000

13) A/D voltage 7, User Polynomial, 2

Serial number : 372
Calibrated on :
Sensor name : Optode 4330F - O2 Temp
A0 : 0.00000000
A1 : 1.00000000
A2 : 0.00000000
A3 : 0.00000000

Scan length : 37

Serial Data Output:
Output data to serial port: YES
Seconds between updates: 0.00000000
Port = COM5
Baud rate = 19200
Parity = N
Data bits = 8
Stop bits = 1

Variables:
Digits Variable Name [units]
------ --------------------
0 Scan Count
4 Depth [salt water, m]
4 Pressure, Digiquartz [db]
4 Descent Rate [m/s]

Mark Variables:
Variables:
Digits Variable Name [units]
------ --------------------
0 Scan Count
4 Depth [salt water, m]
7 Conductivity [S/m]
5 Salinity, Practical [PSU]

Shared File Output:
Output data to shared file: YES
File name:
C:\Metering Sheave\shared.dat
Seconds between updates: 0.50000000
Variables:
Digits Variable Name [units]
------ --------------------
0 Scan Count
2 Pressure, Digiquartz [db]
2 Altimeter [m]

TCP/IP Output:
Raw data:
Output raw data to socket: NO
XML wrapper and settings: NO
Seconds between raw data updates: 0.00000000
Converted data:
Output converted data to socket: YES
XML format: NO
Seconds between converted data updates: 0.50000000
Variables:
Digits Variable Name [units]
------ --------------------
0 Depth [salt water, m]
2 Temperature [ITS-90, deg C]
2 Salinity, Practical [PSU]

SBE 11plus Deck Unit Alarms
Enable minimum pressure alarm: NO
Enable maximum pressure alarm: NO

Enable altimeter alarm: NO

SBE 14 Remote Display

Enable SBE 14 Remote Display: NO

PC Alarms

Enable minimum pressure alarm: NO
Enable maximum pressure alarm: NO
Enable altimeter alarm: NO
Enable bottom contact alarm: NO
Alarm uses PC sound card.

Options:

Prompt to save program setup changes: YES
Automatically save program setup changes on exit: NO
Confirm instrument configuration change: YES
Confirm display setup changes: YES
Confirm output file overwrite: YES
Check scan length: NO
Compare serial numbers: NO
Maximized plot may cover Seasave: NO