

Nunavut Wildlife Research Trust Fund

Interim Report

2010/2011

Project Number: 3-10-10

Project Title: Multi-species Stock Assessment Surveys of NAFO Division 0A, 0B and Canadian Shrimp Fishing Area 3 – A Three-year Plan

Year 1: Survey of NAFO Division 0A

Summary:

The 2010 Multi-species Stock Assessment Surveys of NAFO Division 0A and Shrimp Fishing Area 1 were successfully completed. Ice covered much of the northern survey area but at least two sets were taken in all but 1 stratum. In all 31 of the 90 stations were sampled. In southern 0A and SFA1 all sets allocated to the survey area were collected. Samples were also collected for a variety of other research programs interested in the area.

Introduction:

The 2010 Multi-species survey is Year 1 of 3 for this multi-year proposal. This work extends the survey series for Greenland Halibut which began in 1999 and for shrimp which began in 2006. In this year the area of interest was NAFO 0A and SFA1. Funding for this survey came through the partnership of six agencies: the Nunavut Wildlife Management Board; the Nunavut Department of Environment (Fisheries and Sealing Division) and CanNor Development Agency; Nunavut Tunngavik Inc.; Nunavut Exploratory Fishery Fund (an industry sponsored research fund); and Fisheries and Oceans Canada.

Project Objectives:

The primary objectives are as follows:

1. Collect the data required to establish age structure, estimate population abundance, biomass, and recruitment of Greenland Halibut;
2. Collect the data required to establish age structure, estimate population abundance, biomass, and recruitment of northern and striped shrimp;
3. Record numbers caught and collect length and weight data on all other commercial species caught, to allow calculation of abundance, biomass, and size structure of these species;

4. Record numbers and collect weight data on all non-commercial species caught, to allow calculation of abundance and biomass of these species;
5. Collect additional data and biological samples as time permits (e.g. lengths for bycatch, maturity information, coral and sponge samples, other special requests);
6. Collect oceanographic data at each fishing station;
7. Collect oceanographic data at standard stations previously established.

Materials and Methods:

A stratified random survey design based on water depth was used to sample the study areas. Fishing sets were assigned within strata and based on stratum size, using a buffered random design (Kingsley et al 2004). Each stratum had approximately one set per 750 square km (about 220 sq. nautical miles). Each stratum had a minimum of 2 stations, regardless of size.

Two types of trawl gear were used. For continuity with previous data collections stations in Div. 0A were sampled using the Alfredo trawl and in SFA1 with the Cosmos trawl. Environmental data was collected with a trawl mounted Seabird CTD (conductivity, temperature, depth) during each set. The trawl was monitored with a Marport MBAR receiving geometry information from Scanmar and Marport spread sensors and a Furuno Trawleye.

Three study areas were surveyed in 2010. For Greenland Halibut the standard Southern 0A survey area was allocated 91 sets and the Northern 0A survey area was allocated 90 sets. For the SFA1 shrimp survey area 22 sets were allocated. Three standard CTD transects were located in these areas; one in northern 0A and two in southern 0A. Ice prevented sampling of the northern transect but oceanographic data (temperature, salinity and chlorophyll by depth) was collected along the southern lines with a Seabird SBE-19plus CTD fitted with a flow-through fluorometer.

Results:

The Canadian scientific crew, Tim Siferd, Martin Curtis and Kevin Hedges of DFO C&A, Robert Ennis, Len Mansfield and Paul Beck of St John's, Newfoundland assembled in Iqaluit on October 13th. The crew flew to Ilulissat, Greenland on an Air Nunavut charter, where we were met by the seventh member of the scientific crew Parnuna Egede of the Greenland Institute of Natural Resources (GINR) and boarded the GINR research vessel Paamiut.

The Paamiut departed Ilulissat on October 15th. Prior to departure it was known that ice would become a problem in completing the northern survey area with the potential of disrupting the sampling of the southern area. It was decided to complete the northern most sets in the southern survey area before proceeding to the northern survey area. Sampling began with the first set taken on October 17th. Fifteen sets were completed in the southern survey area then we moved to the north on the 19th.

Ice of untrawlable density covered the majority of the northern survey area by October 19th (see map below). In all, successful sets sampled 31 of the 90 allocated stations. This included at least 2 sets taken in all but one stratum in the survey area. This will allow for a partial estimate of biomass to be produced for the area.

In the northern survey area in the strata off the mouth of Lancaster Sound we experience large areas of soft mud bottom dominated by *Ombellula* sp. sea pens up to 2.5m in length. Large numbers of the sea pen came up on many of the tows. It appears to be an area which meets the criteria for a Vulnerable Marine Ecosystem and should be examined further prior to extensive trawling in the area.

The northern survey area was completed on October 23rd. The CTD transect planned for the northern survey area could not be completed because of ice coverage.

Sampling resumed in the southern survey area on October 24th. All 91 Greenland halibut sets allocated in the survey design were taken as were the 22 sets allocated to the shrimp survey in SFA1.

Samples collected for other studies were:

Vonda Wareham. DFO Newfoundland and Labrador. All corals and sea pens encountered during the study were collected and returned to Winnipeg. Vonda is planning an aging study of the sea pens so that growth might be determined for these species. Corals and sea pens are two groups of structure forming organisms identified as important in regards to Vulnerable Marine Ecosystems and MSC certifications. This work helps support C&A's commitment to these internal and external interests to the fisheries.

Phil Sargent. Memorial University. Several specimens of Velutinid snails found in the catch were collected.

Pierre Richard. DFO C&A. Whale sightings were recorded during the cruise by the crew. Bottle Nose whales were a common visitor when near the 1000m depth contour. For the first time two Sperm whales were sighted near the ship in southern 0A.

Megan Best. DFO Maritimes. Sponge samples were collected from all sets for identification of sponge to as low a taxonomic level as possible. Sponge is a group of structure forming organisms identified as important in regards to Vulnerable Marine Ecosystems and MSC certifications. This work helps support C&A's commitment to these internal and external interests to the fisheries.

John Nelson. DFO Pacific. 96 Arctic and Polar Cod were sampled in three locations over the two surveys areas. The study is looking into the genetic differences of these two cod species.

Further analysis of the data from the cruise will produce population and other indices that will be included in the final report.

Discussion:

The survey in 2010 was successfully completed as far as the ice conditions would allow. Initial impressions of the catch were that the Greenland Halibut numbers were as high as or better than in 2008 with the average fish size larger than previously observed. There were also more small halibut of the 1+ year classes than seen in previous surveys. This bodes well for future good recruitment to the fishery.

Management Implications:

The survey data continues the monitoring of the fisheries for Greenland halibut and northern shrimp in NAFO 0A. The information is critical to making informed management decisions on stock status; the impact fishing is having on the stocks and the adjustment of TACs. The collection of information on other potentially commercial organisms during the survey also supplies co-managers information necessary to evaluate exploratory fishing requests in the area.

Reporting to Communities/Resource Users:

The project summary reported here will be translated into Inuktitut and copies in both languages will be sent to each HTA adjacent to the study area.

A non-technical summary of the data presented at the 2011 NAFO Scientific Council and Northern Shrimp Advisory Committee meetings will be prepared and translated for distribution to the NWMB and the adjacent community HTA's.

References:

Kingsley, M.C.S., P. Kanneworff and D.M. Carlsson. 2004. Buffered random sampling: a sequential inhibited spatial point process applied to sampling in a trawl survey for northern shrimp *Pandalus borealis* in west Greenland waters. ICES Journal of Marine Science 61: 12-24.

Table 1. Raw catch taken during the 2010 multi-species assessment survey of NAFO 0A and SFA1.

Set	Date	Survey Area	Gear	Depth (m)	Note	Raw Catch Weight (kg)		
						Turbot	Shrimp	Other
1	17-Oct	Southern 0A	Alfredo	932		113.45	0	67.22
2	17-Oct	Southern 0A	Alfredo	550		38.4	0.28	2.37
3	17-Oct	Southern 0A	Alfredo	1319		146.57	0	8.34
4	17-Oct	Southern 0A	Alfredo	1445		128.5	0	44.37
5	17-Oct	Southern 0A	Alfredo	912		191.55	0	3.75
6	17-Oct	Southern 0A	Alfredo	1131		97.4	0	4.2
7	18-Oct	Southern 0A	Alfredo	445		10.26	0.3	4.59
8	18-Oct	Southern 0A	Alfredo	511	Unsuccessful			
9	18-Oct	Southern 0A	Alfredo	741		57.9	0	2.03
10	18-Oct	Southern 0A	Alfredo	780		72.7	0	1.1
11	18-Oct	Southern 0A	Alfredo	946		143.9	0	1.35
12	19-Oct	Southern 0A	Alfredo	1045		138	0	4.18
13	19-Oct	Southern 0A	Alfredo	1251		164.9	0	13.75
14	19-Oct	Southern 0A	Alfredo	1413		67.8	0	12.12
15	19-Oct	Southern 0A	Alfredo	1348		90.64	0	26.12
16	19-Oct	Northern 0A	Alfredo	1345		54.96	0	15.52
17	19-Oct	Northern 0A	Alfredo	1144		314.92	0	6.24
18	19-Oct	Northern 0A	Alfredo	904		80.5	0	2.98
19	19-Oct	Northern 0A	Alfredo	643	Unsuccessful			
20	19-Oct	Northern 0A	Alfredo	709		34	0	1.23
21	19-Oct	Northern 0A	Alfredo	753	Unsuccessful			
22	20-Oct	Northern 0A	Alfredo	1044		228.31	0	3.68
23	20-Oct	Northern 0A	Alfredo	947		97.35	0	3.99
24	20-Oct	Northern 0A	Alfredo	1077		177.87	0	7.39
25	20-Oct	Northern 0A	Alfredo	1245		59.1	0	4.23
26	20-Oct	Northern 0A	Alfredo	1286		70.7	0	12.62
27	20-Oct	Northern 0A	Alfredo	1173		274.5	0	12.66
28	20-Oct	Northern 0A	Alfredo	1440		39.75	0	13.17
29	20-Oct	Northern 0A	Alfredo	1460		57.9	0	12.47
30	21-Oct	Northern 0A	Alfredo	1357		88.1	0	54.95
31	21-Oct	Northern 0A	Alfredo	1476		133.47	0	24.32
32	21-Oct	Northern 0A	Alfredo	1261		130.55	0	20.73
33	21-Oct	Northern 0A	Alfredo	1095		137.78	0	4.68
34	21-Oct	Northern 0A	Alfredo	947		78.15	0	3.99
35	21-Oct	Northern 0A	Alfredo	749		61.65	0	0.61
36	21-Oct	Northern 0A	Alfredo	698		34.93	0	10.66
37	22-Oct	Northern 0A	Alfredo	618		15.85	0	7.3
38	22-Oct	Northern 0A	Alfredo	559		20.95	0.46	11.25
39	22-Oct	Northern 0A	Alfredo	504	Unsuccessful			
40	22-Oct	Northern 0A	Alfredo	534	Unsuccessful			
41	22-Oct	Northern 0A	Alfredo	491		17.93	1.08	10.87
42	22-Oct	Northern 0A	Alfredo	426		7.35	0.69	17.43

43	22-Oct	Northern 0A	Alfredo	457		6.15	1.35	23.58
44	22-Oct	Northern 0A	Alfredo	487		11.35	1.54	19.03
45	22-Oct	Northern 0A	Alfredo	629		171.75	0.38	5.87
46	22-Oct	Northern 0A	Alfredo	792		56.74	0	6.6
47	22-Oct	Northern 0A	Alfredo	681	Unsuccessful			
48	22-Oct	Northern 0A	Alfredo	677		28.8	0	5.48
49	22-Oct	Northern 0A	Alfredo	826		36.55	0	64.16
50	22-Oct	Northern 0A	Alfredo	1118		224.4	0	10.74
51	23-Oct	Northern 0A	Alfredo	1429		69.4	0	44.11
52	23-Oct	Southern 0A	Alfredo	758		44.3	0	6.14
53	23-Oct	Southern 0A	Alfredo	497		35.15	0.34	9.71
54	23-Oct	Southern 0A	CTD	1546				
55	23-Oct	Southern 0A	CTD	1311				
56	23-Oct	Southern 0A	CTD	1024				
57	23-Oct	Southern 0A	Cosmos	680				
58	23-Oct	Southern 0A	CTD	345				
59	23-Oct	Southern 0A	CTD	190				
60	23-Oct	Southern 0A	Alfredo	749		40.57	0	1.21
61	23-Oct	Southern 0A	Alfredo	677		104.25	0	6.18
62	23-Oct	Southern 0A	Alfredo	903		174.2	0	5.99
63	23-Oct	Southern 0A	Alfredo	1207		302.5	0	6.95
64	24-Oct	Southern 0A	Alfredo	1411		98.5	0	28.01
65	24-Oct	Southern 0A	Alfredo	1425		72.25	0	24.03
66	25-Oct	Southern 0A	Alfredo	1107		1256.75	0	277.18
67	25-Oct	Southern 0A	Alfredo	467		15.03	0.62	352.86
68	25-Oct	Southern 0A	Alfredo	552		27.85	0	1.3
69	25-Oct	Southern 0A	Alfredo	1109	Unsuccessful			
70	25-Oct	Southern 0A	Alfredo	1070		227	0	53.86
71	25-Oct	Southern 0A	Alfredo	688		32.95	0	2.03
72	25-Oct	Southern 0A	Alfredo	1449		58.9	0	24.81
73	25-Oct	Southern 0A	Alfredo	1150		353.7	0	399.67
74	25-Oct	Southern 0A	Alfredo	1460		19.6	0	25.2
75	25-Oct	Southern 0A	Alfredo	578		32.79	0.24	18.68
76	25-Oct	Southern 0A	Alfredo	540		12.85	0	3.02
77	25-Oct	Southern 0A	Alfredo	468		16.71	2.05	7.18
78	26-Oct	Southern 0A	Alfredo	1371		120.62	0	2.67
79	26-Oct	Southern 0A	Alfredo	1371		36.65	0	7.57
80	26-Oct	Southern 0A	Alfredo	925		494.85	0	7.4
81	26-Oct	Southern 0A	Alfredo	708		153.2	0.3	370.2
82	26-Oct	Southern 0A	Alfredo	877		207.2	0	2.73
83	26-Oct	Southern 0A	Alfredo	454		11.13	2.66	18.84
84	26-Oct	Southern 0A	Alfredo	1096		417	0	8.51
85	26-Oct	Southern 0A	Alfredo	1359		49.05	0	24.49
86	27-Oct	Southern 0A	Alfredo	499		15.44	0.23	3.57
87	27-Oct	Southern 0A	Alfredo	588		61.95	4.6	27.92
88	27-Oct	Southern 0A	CTD	152				
89	27-Oct	Southern 0A	CTD	701				
90	27-Oct	Southern 0A	CTD	976				
91	27-Oct	Southern 0A	CTD	1067				

92	27-Oct	Southern 0A	CTD	1350			
93	27-Oct	Southern 0A	CTD	1595			
94	27-Oct	Southern 0A	Alfredo	729	130.1	0.21	275.97
95	27-Oct	Southern 0A	Alfredo	871	467.6	0	6.95
96	27-Oct	Southern 0A	Alfredo	1038	258.25	0	7.53
97	28-Oct	Southern 0A	Alfredo	1448	36.6	0	11.87
98	28-Oct	Southern 0A	Alfredo	1288	117.3	0	17.92
99	28-Oct	Southern 0A	Alfredo	1331	21.84	0	12.46
100	28-Oct	Southern 0A	Alfredo	663	98.65	0.55	3.96
101	28-Oct	Southern 0A	Alfredo	1018	303.45	0	14.29
102	28-Oct	Southern 0A	Alfredo	737	134.7	1.32	11.69
103	28-Oct	Southern 0A	Alfredo	439	29.38	0.89	4.78
104	29-Oct	SFA1	Cosmos	658	0	0	175.67
105	29-Oct	Southern 0A	Alfredo	565	10.72	0.63	50.3
106	29-Oct	Southern 0A	Alfredo	530	Unsuccessful		
107	29-Oct	Southern 0A	Alfredo	540	22.77	1.47	11.01
108	29-Oct	SFA1	Cosmos	529	9.25	1.45	11.36
109	29-Oct	Southern 0A	Alfredo	514	15.3	1.54	11.63
110	29-Oct	SFA1	Cosmos	452	3.35	2.54	3.44
111	29-Oct	Southern 0A	Alfredo	781	31.45	0	12.83
112	29-Oct	Southern 0A	Alfredo	899	54.65	0	4.47
113	29-Oct	Southern 0A	Alfredo	584	19.75	0.57	22.67
114	30-Oct	SFA1	Cosmos	712	12.15	0	18.88
115	30-Oct	Southern 0A	Alfredo	779	84.7	0	174.17
116	30-Oct	Southern 0A	Alfredo	1054	265.99	0	19.08
117	30-Oct	Southern 0A	Alfredo	992	206.65	0	2.03
118	30-Oct	Southern 0A	Alfredo	926	141.95	0	1.25
119	30-Oct	Southern 0A	Alfredo	1482	26.7	0	37.06
120	30-Oct	Southern 0A	Alfredo	1453	29.5	0	58.09
121	30-Oct	Southern 0A	Alfredo	1501	Unsuccessful		
122	30-Oct	Southern 0A	Alfredo	1432	34.1	0	156.37
123	31-Oct	Southern 0A	Alfredo	1477	19.99	0	25.56
124	31-Oct	Southern 0A	Alfredo	1157	138.17	0	30.11
125	31-Oct	SFA1	Cosmos	477	11.95	2.94	11.31
126	31-Oct	Southern 0A	Alfredo	542	108.45	0.25	44.13
127	31-Oct	SFA1	Cosmos	542	2.14	4.2	5.55
128	31-Oct	Southern 0A	Alfredo	644	165.68	0.1	10.26
129	31-Oct	Southern 0A	Alfredo	1314	52.1	0.02	6.09
130	31-Oct	Southern 0A	Alfredo	1410	13.25	0	17.67
131	31-Oct	SFA1	Cosmos	658	31.6	0.47	18.54
132	01-Nov	SFA1	Cosmos	329	8.39	38.8	29.92
133	01-Nov	SFA1	Cosmos	319	1.17	71.98	13.06
134	01-Nov	SFA1	Cosmos	269	2.73	62.8	13.1
135	01-Nov	SFA1	Cosmos	398	16.34	26.53	24.12
136	01-Nov	SFA1	Cosmos	287	0.26	426.99	25.02
137	01-Nov	Southern 0A	Alfredo	446	Unsuccessful		
138	01-Nov	Southern 0A	Alfredo	431	32.25	0.11	11.66
139	01-Nov	Southern 0A	Alfredo	1238	27.9	0	17.06
140	02-Nov	SFA1	Cosmos	357	2.6	1659.03	13.71

141	02-Nov	SFA1	Cosmos	416		13.32	1.62	45.05
142	02-Nov	SFA1	Cosmos	643		61.05	0.04	7.97
143	02-Nov	Southern 0A	Alfredo	638		109.15	0	8.92
144	02-Nov	Southern 0A	Alfredo	1042		150.25	0	9.74
145	02-Nov	Southern 0A	Alfredo	799	Unsuccessful			
146	02-Nov	Southern 0A	Alfredo	963		414.73	0	17.14
147	02-Nov	SFA1	Cosmos	636		52.3	0.03	13.58
148	03-Nov	Southern 0A	Alfredo	854		76.25	0	6.21
149	03-Nov	Southern 0A	Alfredo	1237		54.75	0	7.93
150	03-Nov	Southern 0A	Alfredo	1355	Unsuccessful			
151	03-Nov	Southern 0A	Alfredo	1358		15.07	0	39.82
152	03-Nov	Southern 0A	Alfredo	1271		53.55	0	17.78
153	03-Nov	Southern 0A	Alfredo	1233		41.8	0	13.51
154	03-Nov	Southern 0A	Alfredo	1048		148.8	0	6.83
155	03-Nov	Southern 0A	Alfredo	846		153.02	0	131.61
156	03-Nov	Southern 0A	Alfredo	823		145.54	0	22.15
157	04-Nov	SFA1	Cosmos	696		47.05	0.42	12.03
158	04-Nov	Southern 0A	Alfredo	670		49.25	0	5.87
159	04-Nov	SFA1	Cosmos	749		13.5	0	12.79
160	04-Nov	Southern 0A	Alfredo	714		42.8	0.2	19.93
161	04-Nov	Southern 0A	Alfredo	780		71.9	0	159.6
162	05-Nov	SFA1	Cosmos	717		13.7	0	9.85
163	05-Nov	SFA1	Cosmos	665		17.19	0.18	7.64
164	06-Nov	Southern 0A	Alfredo	648		37	0	4.83
165	06-Nov	SFA1	Cosmos	645		18.25	3.55	4.76
166	06-Nov	Southern 0A	Alfredo	645		18.63	0.71	2.19
167	06-Nov	SFA1	Cosmos	563		12.3	0.47	65.62
168	06-Nov	Southern 0A	Alfredo	561		17.5	0.2	101.97

2010 DFO Multi-species Assessment Survey Successful Set Locations

