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2006 | Expedition Report

CCGS *Amundsen*

LEG 1
ArcticNet
Baffin Bay and Canadian Arctic Archipelago

LEG 2A
ArcticNet
Amundsen Gulf, Beaufort Sea and Canadian Arctic Archipelago

LEG 2B
ArcticNet
Labrador fjords

CCGS *Pierre Radisson*

BaySys/ArcticNet
Hudson Bay

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NGCC • CCGS
AMUNDSEN
BRISE-GLACE DE RECHERCHE CANADIEN
CANADIAN RESEARCH ICEBREAKER

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PART II – PROJECT REPORTS

2006 Expedition Report

The 2006 Expedition Report is a collection of all cruise reports produced by the participating research teams and assembled by the Chief Scientists at the end of their leg. The 2006 Expedition Report is divided into two parts:

Part I provides an overview of the *Amundsen* expedition, the ship track and the stations visited, and a synopsis of operations conducted during each leg. Also included is an overview of the operations conducted during the BaySys expedition on board the CCGS *Pierre Radisson*.

Part II contains the reports submitted by the participating science teams or researchers, with details on the specific objectives of their project, the field operations conducted and methodology used, and in some cases, preliminary results. When results are presented, they show the data as they were submitted at the end of the legs in 2006. The data presented in this expedition report are illustrative only and have not been quality checked, thus parties interested in the results should contact the project leader or the researchers who collected the data.

Project reports in Part II are organized according to research topics. The first project presents the core data and information collected onboard the *Amundsen* (pages 34 to 38). Projects 2 and 3 (pages 39 to 61) cover topics of atmosphere, atmosphere-ocean processes and sea ice. Projects 4 to 6 (pages 62 to 96) cover topics of water column structure, ocean circulation and the physical properties of seawater. Geochemical cycling, biogeochemical processes, and biological productivity are treated in projects 7 to 15 (pages 97 to 152). Seabed mapping and geology are covered in projects 16 and 17 (pages 153 to 192) and finally, reports from projects on international law and navigation in the Arctic presented in projects 18 and 19 (pages 193 to 196).

The 2006 Expedition Report also includes four appendices: 1) the list of stations sampled, 2) the scientific log of activities conducted, 3) a copy of the CTD logbook and 4) the list of participants onboard during each leg.

The core navigation data (NAV) and meteorological information (AVOS) as well as oceanographic data collected using the CTD-Rosette, the Moving Vessel Profiler (MVP), the ship-mounted current profiler (SM-ADCP) and the thermosalinograph (TSG) are available in the Polar Data Catalogue (PDC) at www.polardata.ca.

Following ArcticNet's data policy, research teams must submit their metadata to the PDC and insure that their data are archived on the long-term, but it is not mandatory to use the PDC as a long-term archive as long as a link to the data is provided in the metadata (see www.arcticnet.ulaval.ca/Docs/data-policy for more details on data policy).

Part I – Overview and synopsis of operations

1 Overview of the 2006 ArcticNet Expedition

1.1 Introduction

Understanding the transformation of the Arctic environment is one of the great challenges faced by Canadians and the national and international scientific communities. ArcticNet is a Network of Centres of Excellence of Canada that brings together scientists and managers in the natural, human health and social sciences with their partners from Inuit organizations, northern communities, federal and provincial agencies and the private sector to study the impacts of climate change and modernization in the coastal Canadian Arctic.

Since 2004, ArcticNet researchers have been conducting extensive multidisciplinary sampling programs in the Canadian Arctic using the Canadian research icebreaker CCGS *Amundsen*. The overarching goal of the ArcticNet marine-based research program is to study on a long-term basis how climate induced changes are impacting the marine ecosystem, contaminant transport, biogeochemical fluxes, and exchange processes across the ocean-sea ice-atmosphere interface in the Canadian Arctic Ocean. The knowledge generated from this multi-year program is being integrated into regional impact assessments to help decision makers and stakeholders develop effective adaptation strategies for the changing coastal Canadian Arctic.

The geographic scope of the ArcticNet marine-based research program includes the Beaufort Sea in the western Canadian Arctic, the Canadian Arctic Archipelago and Baffin Bay in the eastern Arctic, and extends into Hudson Bay, Ungava Bay and along the northern Labrador coast.

In 2006, as part of ArcticNet marine-based research program (see Phase 1 projects at www.arcticnet.ulaval.ca/Research/Phase 1), the CCGS *Amundsen* Expedition revisited the sites of major scientific programs in Baffin Bay (NOW Polynya), Beaufort Sea (CASES), Hudson Bay (MERICA) and the Canadian Arctic Archipelago (Figure 1.1).

1.2 Regional settings

1.2.1 Baffin Bay and Nares Strait

Baffin Bay is located between Baffin Island and Greenland and connects the Arctic Ocean and the Northwest Atlantic (Figure 1.2), providing an important pathway for exchange of heat, salt and other properties between these two oceans. In the south, Davis Strait, which is over 300 km wide and 1000 m deep, connects it with the Atlantic but Baffin Bay's direct

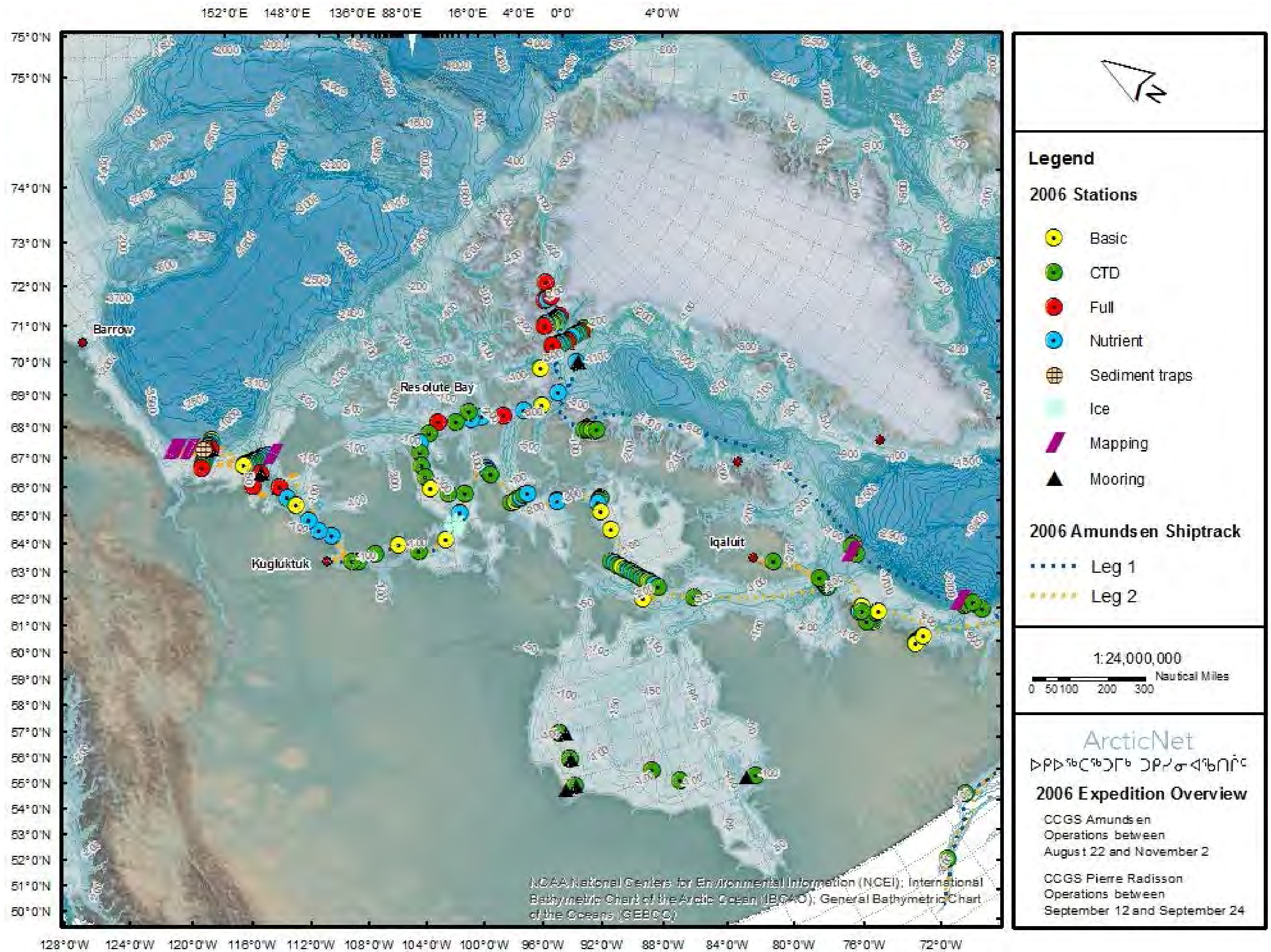

Figure 1.1. Map of the Canadian High Arctic showing the CCGS *Amundsen* ship track and the location of stations for the two legs of the 2006 ArcticNet Expedition. Stations and mooring sites in Hudson Bay were visited by the CCGS *Pierre Radisson* as part of the BaySys expedition.

connection to the Arctic Ocean consists of three relatively small passages through the islands of the Canadian Arctic Archipelago (CAA). One of these passages, Nares Strait, is located between Ellesmere Island and Greenland and includes from south to north: Smith Sound, Kane Basin, Kennedy Channel, Hall Basin and Robeson Channel. Each winter, there is a prolonged period during which land-fast ice arches span the strait at the entrance to Robeson Channel and south of Kennedy Channel. The ice in Nares Strait then becomes land-fast and shuts down southward ice motion. In the past decade, changes to this long-standing pattern of ice conditions have been observed with weaker or absent ice arches in Nares Strait resulting in increased ice flux from the Arctic and reduced amount of ice allowed to reside in the Arctic Ocean to thicken as multi-year ice.

The formation of ice arches in Nares Strait, the input of warm and salty Atlantic water from the West Greenland Current moving northward along the coast of Greenland, and upwellings of warmer waters, all contribute to the creation of a large polynya, a year-round expanse of open waters, in northern Baffin Bay and Smith Sound. The North Water (NOW) Polynya is the largest (~80,000km^2) and most productive polynya in the Canadian Arctic and in addition to the tremendous marine bird resources in this area, it is of significance to many species of marine mammals. The NOW polynya has been the subject of a few ecosystem studies, including the Canadian-led study of the NOW Polynya in 1998.

In Baffin Bay, the *Amundsen* served as a research platform to continue the time series of oceanographic measurements in the NOW Polynya and revisit designated stations along two east-west transects across the bay. This was also the occasion to recover oceanographic moorings deployed during the 2005 Expedition and to re-deploy these moorings for an additional year. Finally, the *Amundsen* sailed further north into Nares Strait to conduct oceanographic sampling in Kane Basin.

1.2.2 Canadian Arctic Archipelago

The Canadian Arctic Archipelago (CAA) is a vast array of islands and channels that lies between Baffin and Ellesmere Islands in the east and Banks Island in the west (Figure 1.3). While transiting through the Northwest Passage, the science teams aboard the *Amundsen* sampled the atmosphere, sea ice and ocean to extend existing time series. This work is aimed at better understanding how the climate, ice conditions and ocean currents and biogeochemistry are changing under the effects of climate change and industrialization. With diminishing sea ice extent and volume in the Arctic, the Northwest Passage may be ice-free and open to navigation during summer in the near future. Seafloor bathymetric data and sub-bottom information were collected while transiting through the Northwest Passage to map the seafloor and identify potential geohazards and obstacles to the safe navigation of this new seaway.

1.2.3 Beaufort Sea and Amundsen Gulf

At the western end of the CAA lies Amundsen Gulf, which widens into the Beaufort Sea past Banks Island (Figure 1.4). The Canadian Beaufort Sea is characterized by a broad shelf onto which the Mackenzie River, the largest river in North America, carries large amounts of freshwater. The mixing of freshwater from the Mackenzie River and Arctic marine waters of the Beaufort Sea establishes an estuarine system over the shelf, with associated inputs of land-derived nutrients and freshwater biota. The Mackenzie Shelf is covered with ice from October until May to early August. Throughout winter, floe rafting at the edge of the landfast ice builds a stamukhi, a thick ice ridge parallel to the coast. Beyond the stamukhi, a flaw polynya stretches along the entire Shelf and widens in summer to form the Cape Bathurst polynya. This polynya hosts two distinct phytoplankton blooms per year, with one peak occurring during spring or early summer, and a second occurring in late summer or fall. This highly productive ecosystem is also exceptional since it provides habitat for some of the highest densities of birds and marine mammals in the Arctic. The Mackenzie Shelf system was extensively studied during the Canadian Arctic Shelf Exchange Study (CASES) in 2003-2004, a Canadian-led international program to understand the biogeochemical and ecological consequences of sea ice variability and change on the complex Mackenzie Shelf ecosystem.

During the 2006 Expedition to the Beaufort Sea, the *Amundsen* followed up on the CASES program (2003-2004) and the 2005 ArcticNet Expedition, to continue looking into the major aspects of the functioning of the Mackenzie Shelf ecosystem as well as retrieving and re-deploying moorings and instruments deployed the previous year.

1.2.4 Northern Labrador

The final leg of the *Amundsen* Expedition (Leg 2b) supported research efforts to address the prevailing concerns of Nunatsiavut Inuit along the northern Labrador coast (Figure 1.6). The Nunatsiavut-Nuluak project focused on three northern Labrador fjords; Nachvak fjord, Saglek fjord and Anaktalak fjord to study the effects of climate change, industrialization (particularly expanding mining/exploration activities) and contaminants on the coastal environments.

1.2.5 Hudson Bay

Hudson Bay is a virtually landlocked, immense inland sea (Figure 1.7) that possesses unique characteristics among the world's oceans: a limited connection with the Arctic and Atlantic Oceans, a low salinity, a high volume of freshwater inputs from numerous rivers that drain central North America, a winter season in which it is completely ice covered while summer is characterized by ice-free conditions. The CCGS *Pierre Radisson* was used in

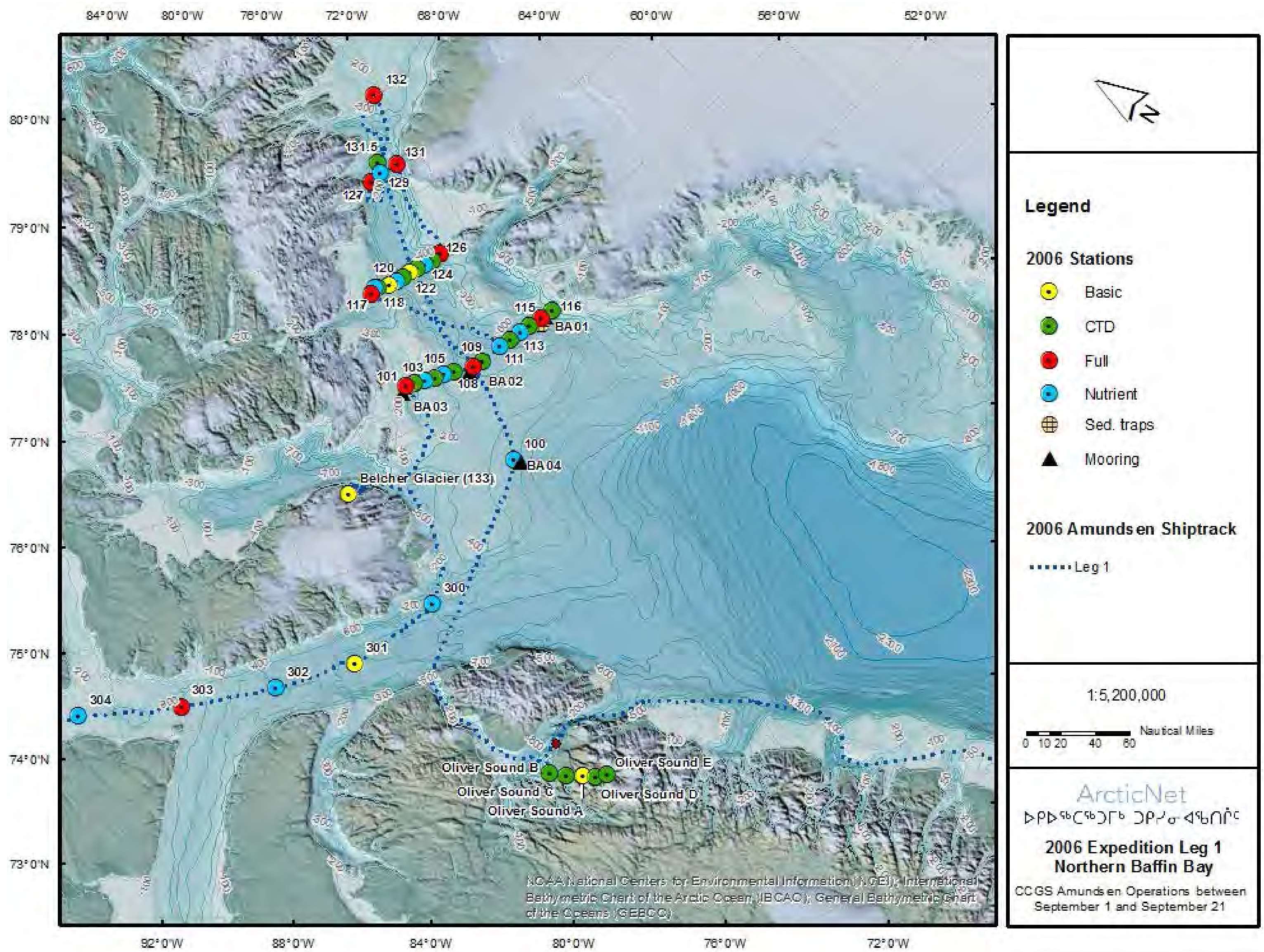

Figure 1.2. Map of northern Baffin Bay, Nares Strait and Lancaster Sound showing the ship track and the location of stations sampled by the CCGS *Amundsen* during the second portion of Leg 1 of the 2006 ArcticNet Expedition. Stations were also visited in the Labrador Sea and Hudson Strait during the first segment of Leg 1 (see Figure 2.1 in Section 2 below).

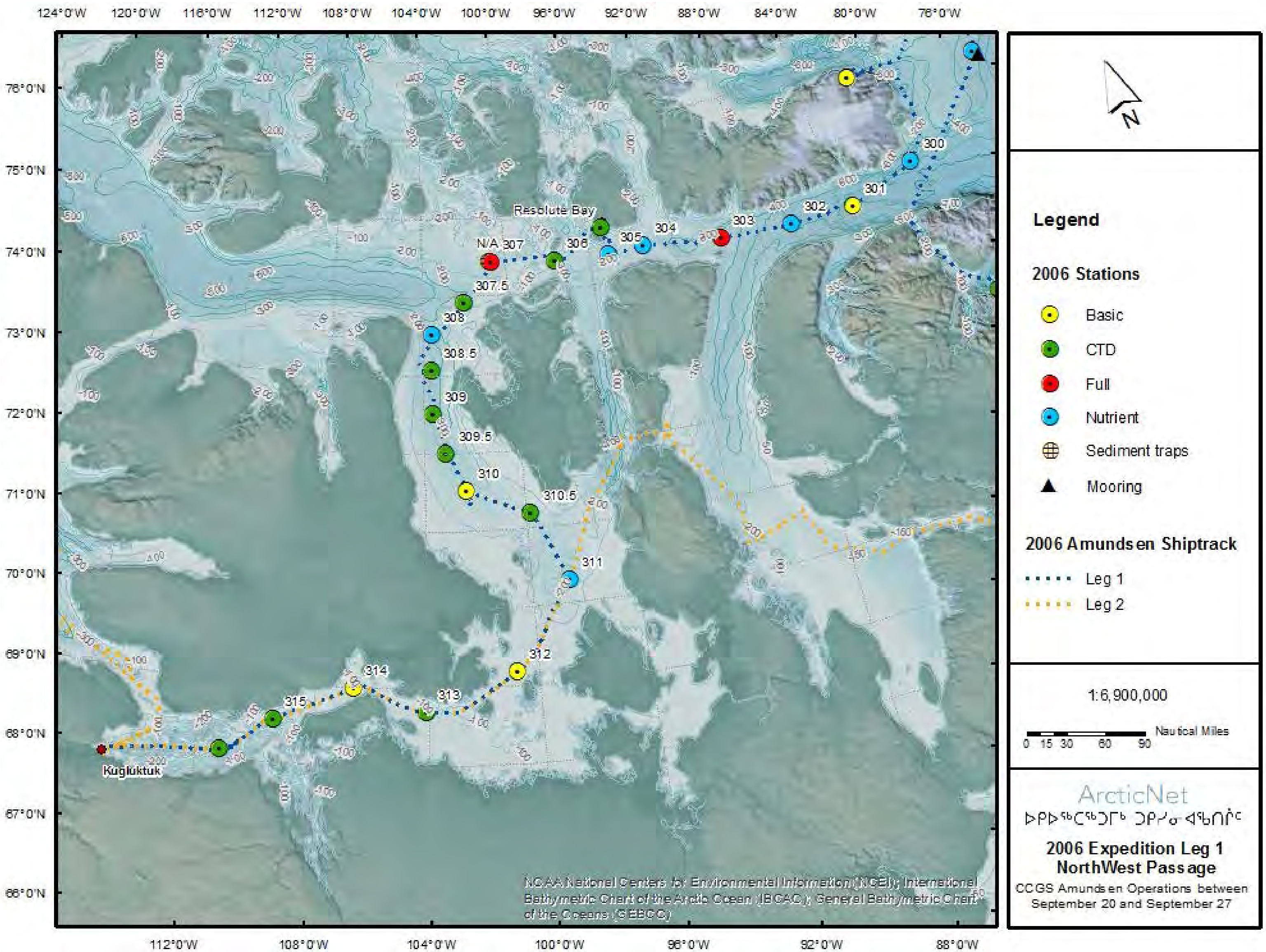

Figure 1.3. Map of the Canadian Arctic Archipelago (Northwest Passage) showing the ship track and the location of stations sampled by the CCGS *Amundsen* during the third portion of Leg 1 of the 2006 ArcticNet Expedition. Not shown on this map is the location of stations visited in the same region on the eastward route during Leg 2a (see Figure 1.5 below).

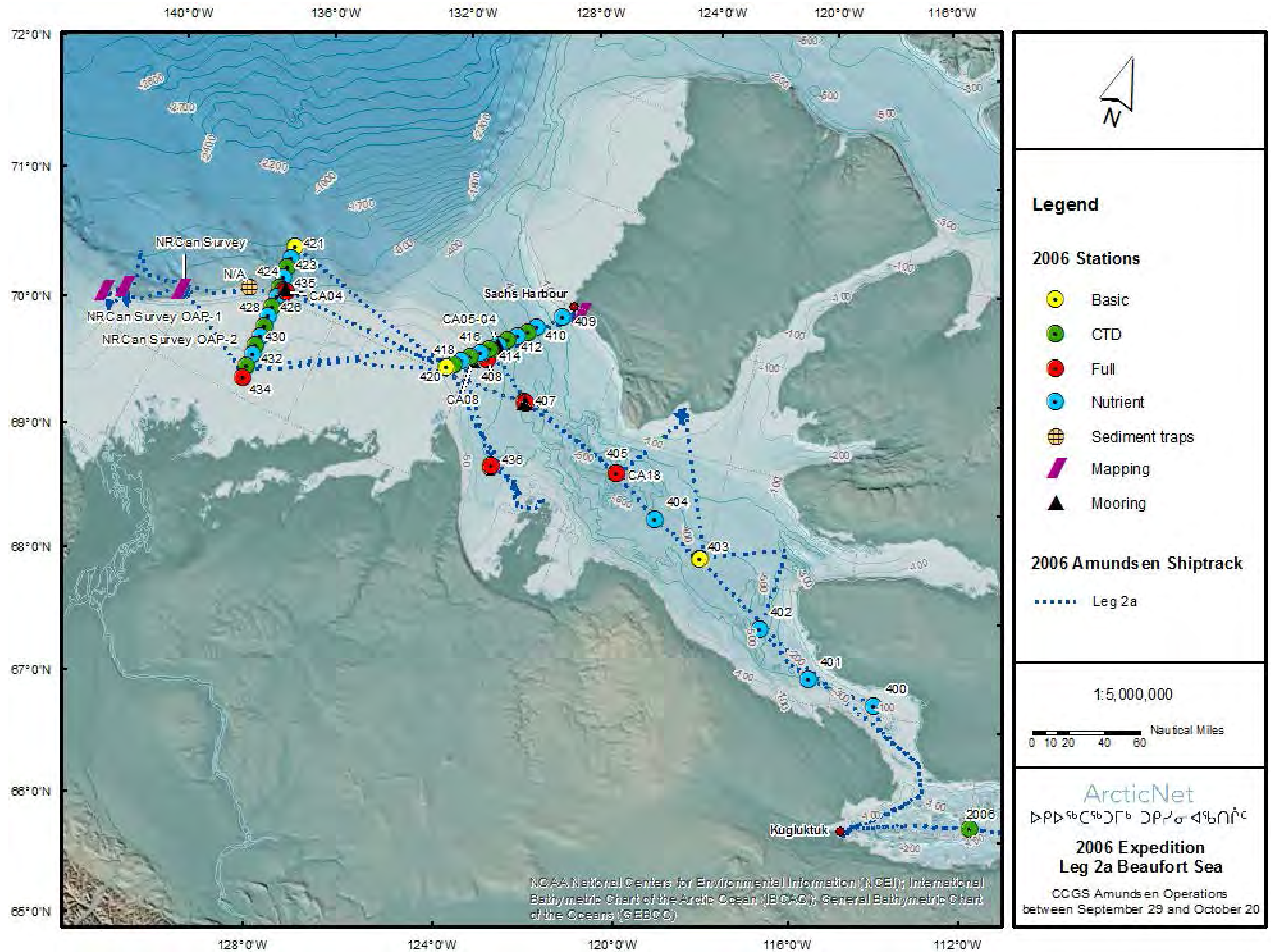

Figure 1.4. Map of the Amundsen Gulf and Beaufort Sea showing the ship track and the location of stations sampled by the CCGS *Amundsen* during the first segment of Leg 2a of the 2006 ArcticNet Expedition.

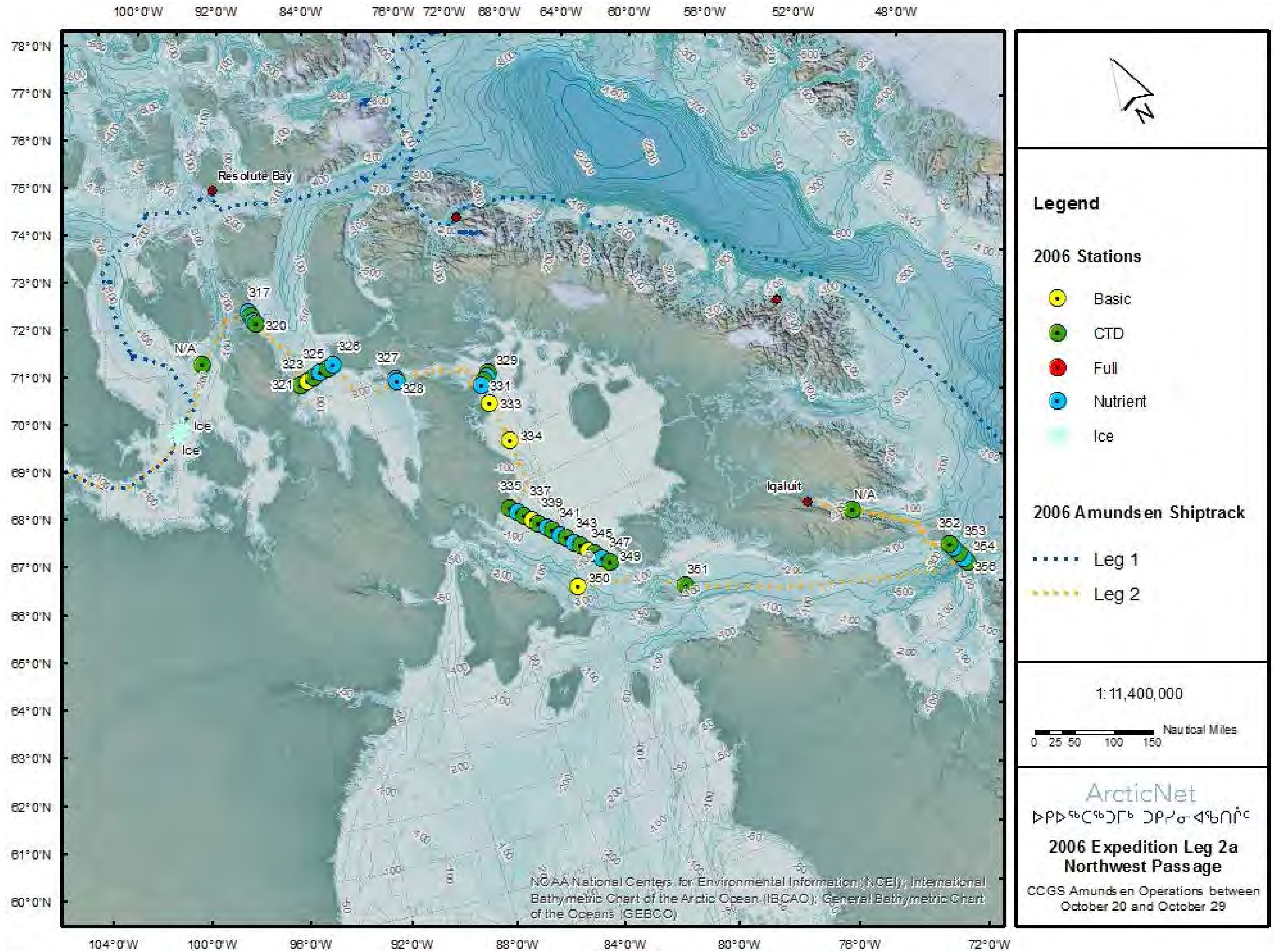

Figure 1.5. Map of the Canadian Arctic Archipelago (Northwest Passage) showing the ship track and the location of stations visited by the CCGS *Amundsen* during the second portion of Leg 2a of the 2006 ArcticNet Expedition.

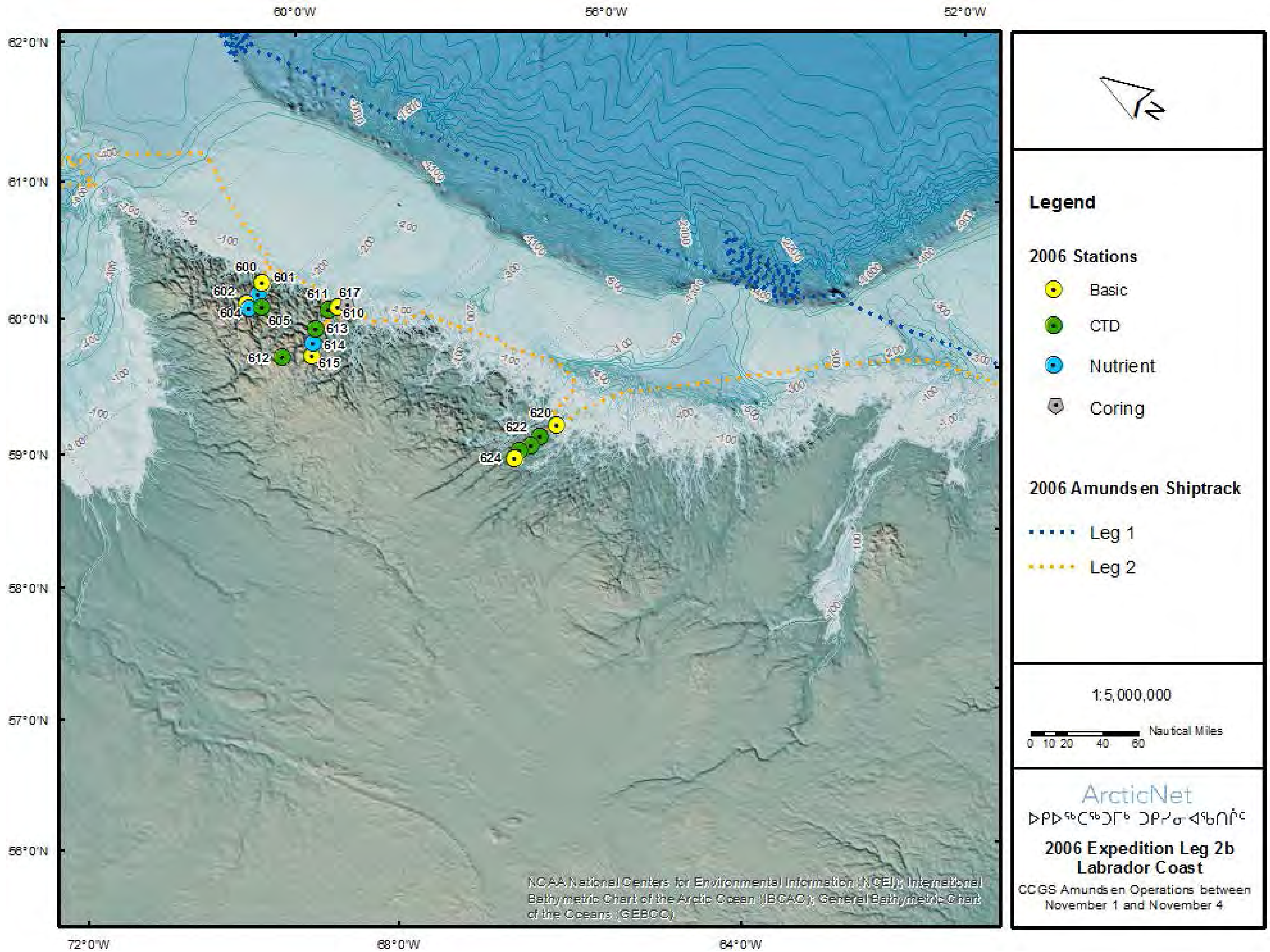

Figure 1.6. Map of the northern Labrador coast and Labrador Sea showing the ship track and the location of stations sampled in three northern Labrador fjords by the CCGS *Amundsen* during Leg 2b of the 2006 ArcticNet Expedition. Also shown on this map is the northward route taken by the *Amundsen* during Leg 1 (see also Figure 2.1 below).

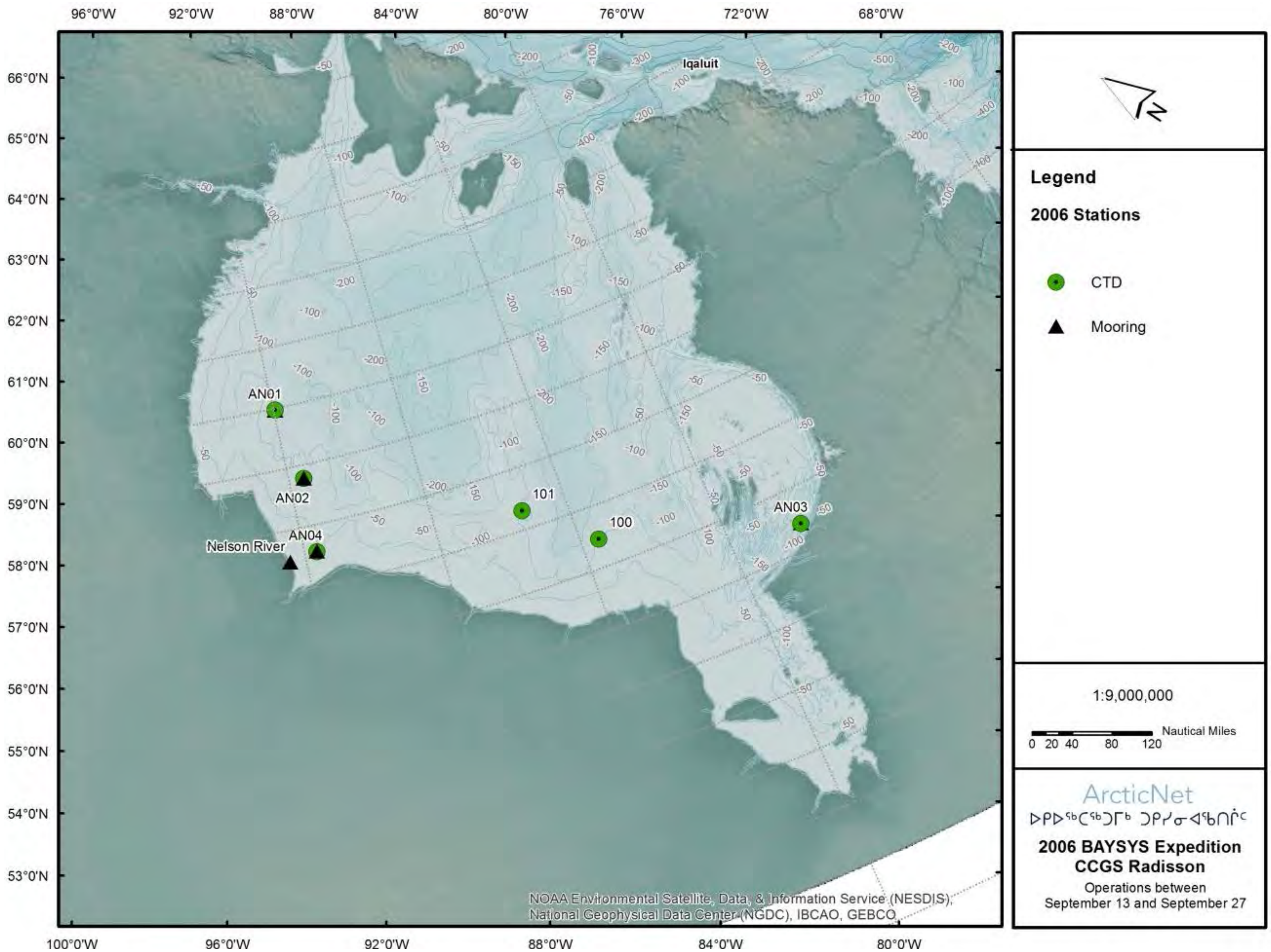

Figure 1.7. Map of Hudson Bay showing the location of stations and mooring sites visited in Hudson Bay by the CCGS *Pierre Radisson* during the BaySys expedition as part of the 2006 ArcticNet Expedition.

Hudson Bay for the BaySys project, a partnership between ArcticNet, the University of Manitoba and Hydro Manitoba. The aim of the 2006 BaySys cruise was to recover and service the four moorings deployed the previous year and to conduct limited sampling at the mooring sites.

1.3 2006 CCGS *Amundsen* Expedition Plan

1.3.1 General schedule

The CCGS *Amundsen* left Quebec City on 22 August 2006 for an 80-day expedition to the Canadian Arctic in support of ArcticNet's marine-based research program. Over 14 000 nautical miles were covered during the Expedition which took the ship from Quebec City to Baffin Bay through the Northwest Passage to the Beaufort Sea then back to its home port in Quebec City. Over 200 stations were planned to sample oceanographic, atmospheric, biological and seabed properties.

Based on the scientific objectives, the expedition was divided into 2 legs. Leg 1 from 22 August to 28 September 2006 took the vessel into the Canadian High Arctic including transit through the Labrador Sea, Baffin Bay and the Northwest Passage. Leg 2 was divided into two segments, with Leg 2a from 28 September to 29 October 2006 dedicated to studies in the Amundsen Gulf and Beaufort Sea region as well as in the Northwest Passage, and Leg 2b focusing on the study of northern Labrador fjords and welcoming the Schools on Board program. The *Amundsen* concluded its annual expedition in Quebec City on 9 November 2006.

1.3.2 Leg 1 – ArcticNet – 22 August to 28 September 2006 – Baffin Bay and Canadian Arctic Archipelago

During transit from Quebec City to Baffin Bay, bathymetric surveys were conducted in the Labrador Sea in the Makkovik Basin. A few days were also dedicated to bathymetric surveys and oceanographic sampling in Oliver Sound and Simirlik National Park located near Pond Inlet before heading to the North Water (NOW) polynya in northern Baffin Bay for mooring operations and oceanographic sampling.

The route through the Northwest Passage to Kugluktuk was sufficiently free of ice that the planned itinerary was modified to go through McClintock Channel rather than through Peel Sound. In the Northwest Passage, sampling was conducted in Lancaster Sound, Viscount Melville Sound, Resolute Bay and Cambridge Bay. Dedicated seabed surveys also took place at Belcher Glacier and Resolute Bay. Leg 1 operations ended in Kugluktuk on 28 September and coincided with a crew change.

1.3.3 Leg 2 – ArcticNet – 28 September to 9 November 2006

Leg 2 was divided into two segments: Leg 2a took place in the Beaufort Sea, then followed an eastward route through the Canadian Arctic Archipelago (Northwest Passage) and Hudson Strait, and ended in Iqaluit. Leg 2b was dedicated to operations in three fjords along the coast of northern Labrador and concluded the year's expedition in Quebec City.

Leg 2a – 28 September to 29 October 2006 – Amundsen Gulf, Beaufort Sea and Canadian Arctic Archipelago

Starting in Kugluktuk on 28 September, Leg 2a took the vessel to the Amundsen Gulf and the Beaufort Sea where mooring operations and oceanographic sampling was conducted until 18 October. A full day was also dedicated to seabed mapping and sub-bottom profiling in partnership with Natural Resources Canada (NRCan). The route back through the Canadian Arctic Archipelago took the *Amundsen* to Bellot Strait, Gulf of Boothia, Fury and Hecla Straits, Foxe basin and Hudson Strait for a series of oceanographic transects. Leg 2a ended in Iqaluit on 29 October.

Leg 2b – 29 October to 9 November 2006 – Labrador fjords

Starting in Iqaluit on 29 October, Leg 2b operations took the *Amundsen* to three fjords located on the northern Labrador coast where oceanographic sampling and seafloor mapping activities were conducted until 4 November for the ArcticNet project *Nunatsiavut Nuluak: Baseline Inventory and Comparative Assessment of Three Northern Labrador Fiord-based Marine Ecosystems*. In Iqaluit, a contingent of students from the Schools on Board program also embarked and made the transit back to Quebec City, where the *Amundsen* concluded its voyage on 9 November.

1.4 2006 CCGS *Pierre Radisson* Expedition Plan

1.4.1 BaySys / ArcticNet – 12 September to 24 September 2006 – Hudson Bay

From 12 to 24 September, the CCGS *Pierre Radisson* visited the sites of oceanographic moorings deployed in Hudson Bay in the previous year (Leg 2 of the 2005 ArcticNet Expedition). Moorings were recovered and re-deployed and oceanographic sampling was conducted near each of the mooring sites.

2 Leg 1 – 22 August to 28 September 2006 – Baffin Bay and Canadian Arctic Archipelago

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2.1 Introduction and objectives

The science program for Leg 1 of the 2006 *Amundsen* Expedition was conducted within the framework of ArcticNet's marine-based research program with the aim of understanding the impacts of climate change in the coastal Canadian Arctic, with operations conducted in the Labrador Sea (Figure 2.1), in northern Baffin Bay and Nares Strait (Figure 2.2) and in the Canadian Arctic Archipelago (Northwest Passage; Figure 2.3).

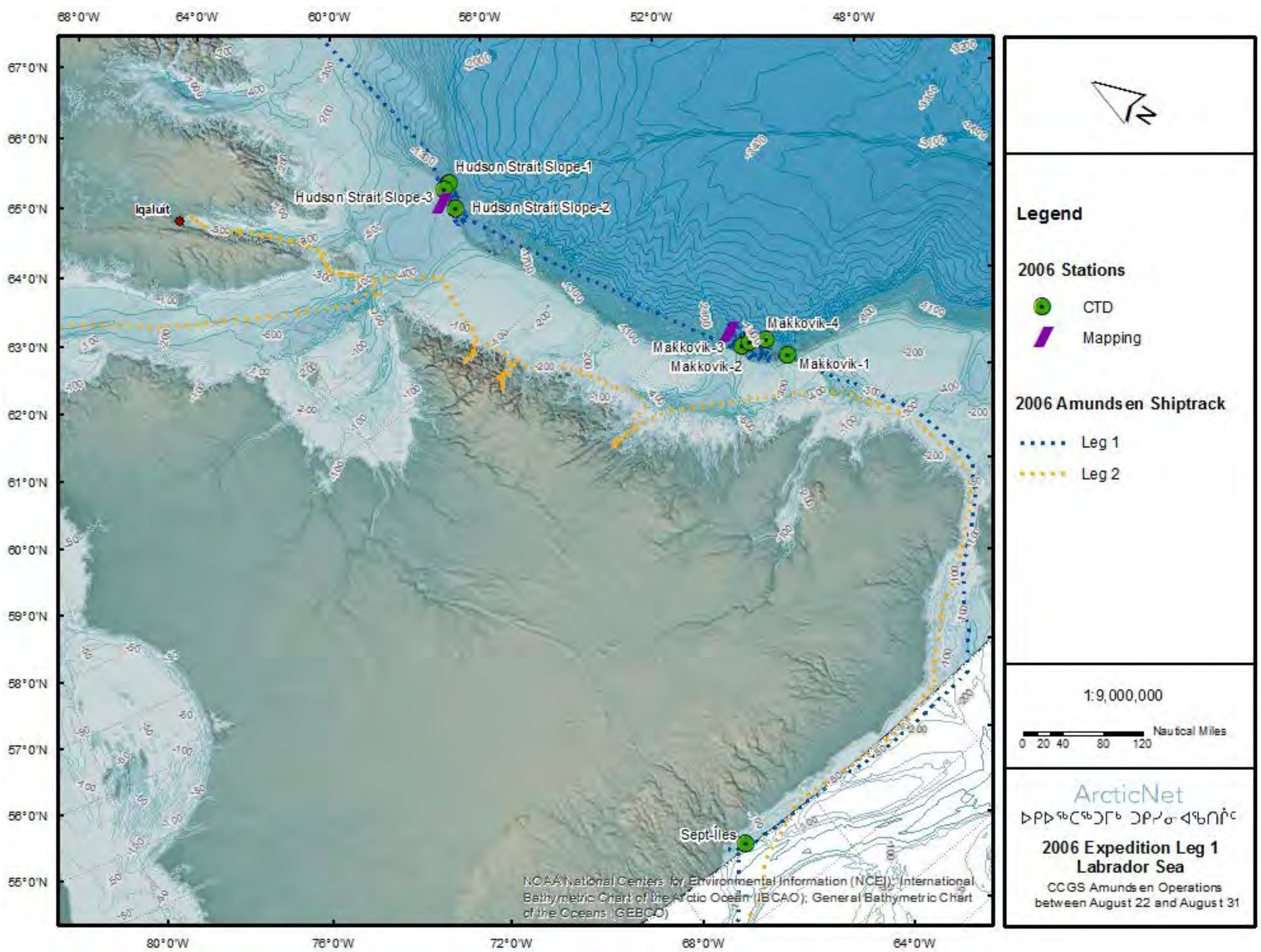

Figure 2.1. Map of the Labrador Sea showing the cruise track and the location of stations sampled in the Labrador Sea and Hudson Strait Slope during the first portion of Leg 1 (22 to 31 August). Also shown is the *Amundsen* cruise track for Leg 2b.

The specific objectives of Leg 1 were to:

- Sample the atmosphere and quantify gas fluxes at the sea ice-seawater-atmosphere interface along the cruise track.
- Conduct oceanographic sampling of water column physico-chemical properties and components of the marine food web at designated stations located along three transects across Baffin Bay and Nares Strait (labeled 100 to 132) including at 4 mooring positions, and at stations in the Northwest Passage (labeled 300 to 316).
- Retrieve, service and re-deploy moorings at key locations in Baffin Bay (BA01, BA02, BA03 and BA04).
- Sample the sediments at designated stations located in Baffin Bay and in the Canadian Arctic Archipelago (Northwest Passage).
- Conduct on-ice operations at Belcher Glacier as well as in the Canadian Arctic Archipelago when ice features of interest are located.
- Obtain seafloor bathymetry and sub-bottom information using the multibeam sonar system along the cruise track and during surveys at specific locations: Makkovik continental margin in the Labrador Sea, Hudson Strait slope, Oliver Sound/Simirlik National Park, Smith Sound, Belcher Glacier and Resolute Bay.

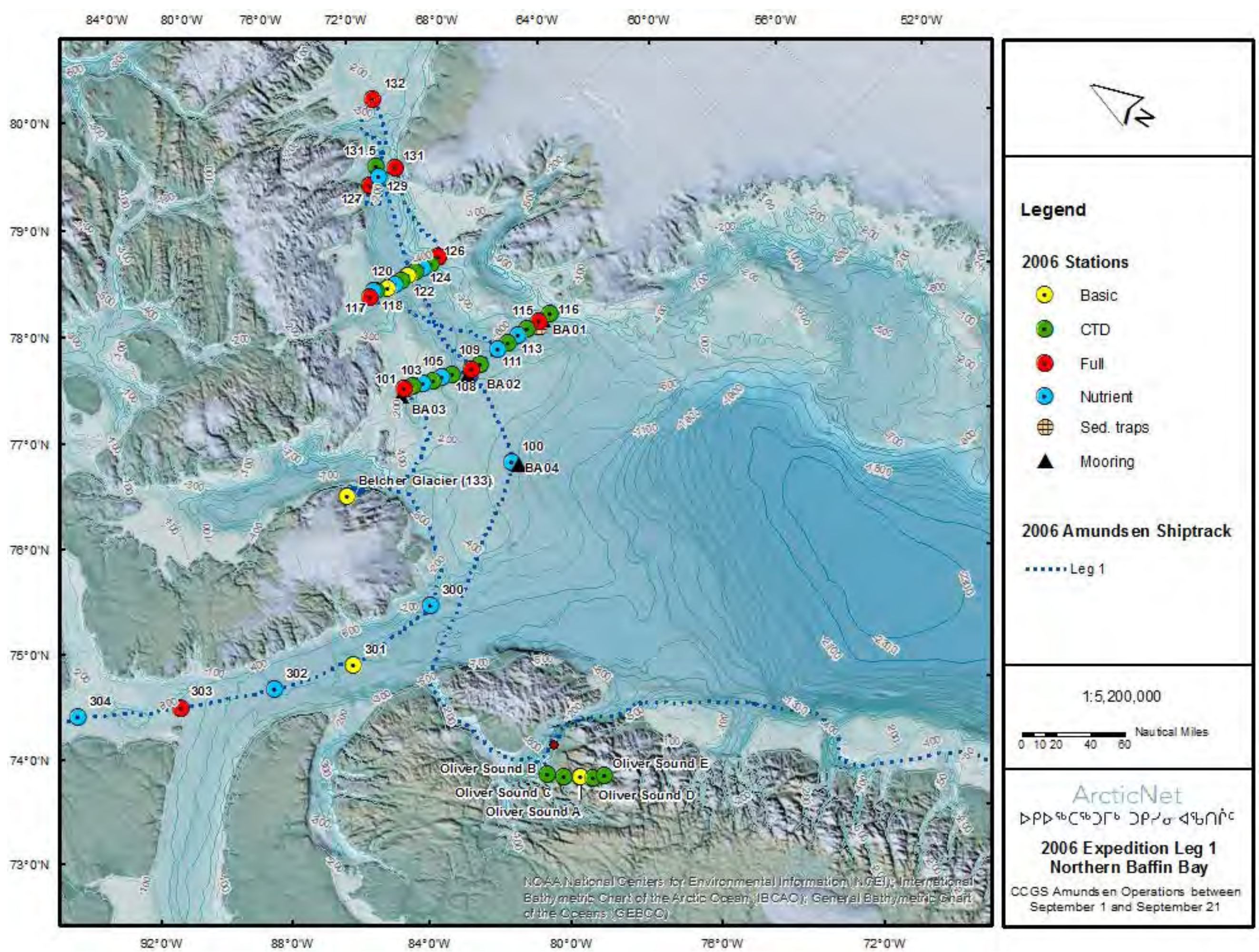

Figure 2.2. Map of northern Baffin Bay and Nares Strait with the location and type of stations sampled from 1 September to 21 September 2006 during Leg 1 of the ArcticNet Expedition onboard the CCGS *Amundsen*.

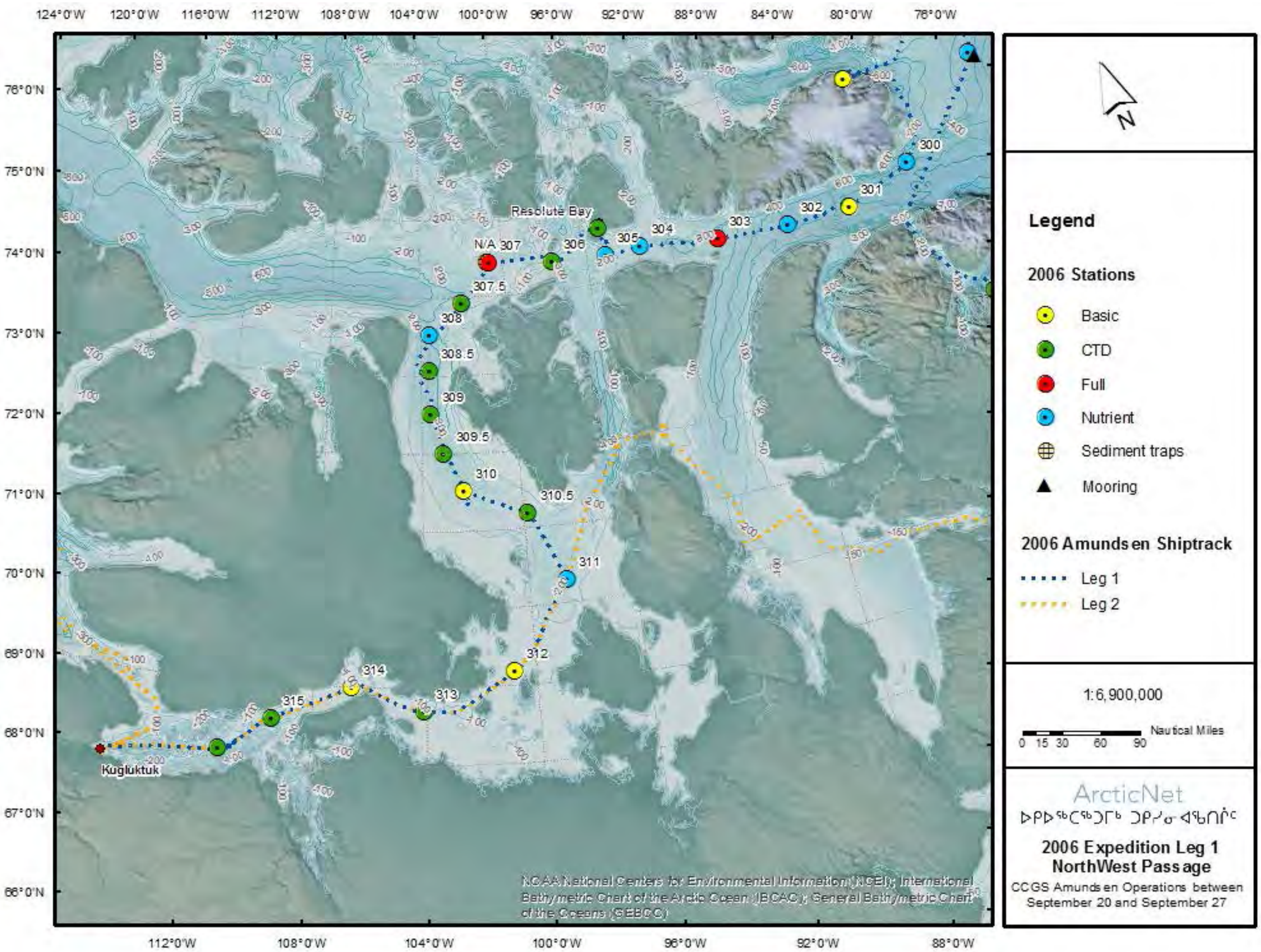

Figure 2.3. Map of the Canadian Arctic Archipelago (westward route through McClintock Channel) showing the location and type of stations sampled from 20 September to 27 September 2006 during Leg 1 of the ArcticNet Expedition onboard the CCGS *Amundsen*.

2.2 Synopsis of operations

This section provides a general synopsis and timeline of operations during Leg 1. Detailed cruise reports provided by onboard participants and including specific objectives, methodology and preliminary results for projects conducted during this leg are available in Part II of this report.

During Leg 1, the *Amundsen* traveled from Quebec City (22 August) to Kugluktuk (28 September) with 76 stations visited and an overall tally of operations and activities as follows:

- 26 CTD only casts
- 88 CTD-Rosette casts
- 16 light and phytoplankton water column profiles, including Secchi disk, PhytoFlash, PNF, and fluorescence profiles.

- 131 plankton tows and trawls, including phytoplankton nets, horizontal and vertical zooplankton net tows, Bioness, Hydrobios and RMT.
- 15 box cores to sample surface sediments
- 4 on-ice sampling operations
- 5 drifting sediments traps
- 8 thorium pumping
- 6 dedicated seafloor bathymetry / sub-bottom profiling surveys
- Two moorings recovered and two deployed in Baffin Bay

An estimate of the relative efforts made towards each of the scientific projects conducted during Leg 1 was computed (Figure 2.4). Note that this estimate does not include activities which were done while the ship was in transit (e.g., bottom mapping, meteorological observations, underway water sampling activities, etc.). It also does not account for tasks which occurred simultaneously (e.g., only the time of launch and retrieval of the Zodiac or helicopter was computed and not the duration of scientific activities conducted aboard the Zodiac and helicopter away from the *Amundsen*). Overall, this estimate is nevertheless useful as an indication of the relative level of time and efforts expended on various activities. A detailed scientific log for all sampling operations conducted during the leg with the positions and depths of the visited stations is available in Appendix 2.

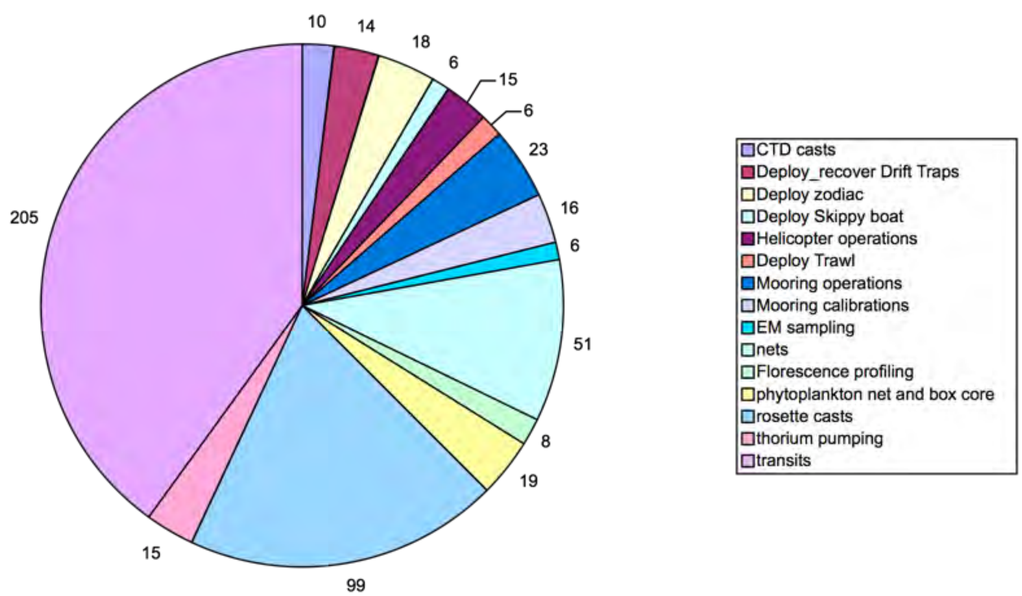

Figure 2.4. Relative amount of effort (in number of hours) spent on scientific activities during Leg 1. The graph does not include activities which are conducted in parallel with other operations.

2.2.1 Weather and ice conditions

The weather was reasonable throughout the cruise although several days of >30 nautical miles an hour winds were encountered in the Baffin Bay / NOW region. Ice conditions in the NOW region of the study were relatively light with 4 to 9 tenths coverage along the Ellesmere side. Within the Northwest Passage, ice conditions were also light with about 2 tenths encountered immediately west of Resolute Bay and small areas of 2 to 7 tenths within the McClintock Channel.

2.2.2 Timeline of operations

The *Amundsen* left Quebec City on schedule on 22 August and sailed to the Labrador Sea to conduct bathymetric surveys on the Makkovik continental margin (27-28 August) and Hudson Strait slope (30-31 August). After completing the surveys, the ship continued north along the coast of Baffin Island for the next block of 24 hours of science operations in Oliver Sound, which included Basic (Rosettes, net tows and trawl and box core) and CTD stations, as well as multibeam and sub-bottom surveys of the seafloor.

Transiting towards Nares Strait, Mooring BA04/Station 100 was visited in the night of 6-7 September. Mooring BA04-05 never surfaced despite the fact that communication could be established with the acoustic releasers. The hypothesis is that the line was hit by ice and that only the bottom part was still on position. A lack of floatation in the upper portion of the line would have prevented the mooring from surfacing. No mooring was re-deployed at the BA04 position. The ship then sailed to mooring BA02-05 (associated with Full Station 108), which was quickly located and successfully recovered in the evening of 7 September.

Thanks to the mild weather and light ice conditions, the ship was on station 131 in Nares Strait on 8 September, then headed for the northernmost station located in Kane Basin. Operations at Full Station 132 took place over 8 and 9 September and began with the launch of the air-ice boat and the Zodiac for ice sampling activities and SCAMP/PhytoFlash measurements away from the *Amundsen*. Drifting sediment traps were then deployed while other operations took place. Unfortunately, the traps had to be retrieved after only 9 hours (instead of the planned 24hrs) because of heavy ice forecasted for Kane Basin. All operations (Rosettes, net tows and trawls, box cores, thorium pumping and optical measurements) at this full station were successfully completed by 13:30 on 9 September and the ship sailed back south for a first short transect between Ellesmere Island and Greenland (Stations 127 to 131). All scientific operations were successful although winds (>30 nm/h) and freezing temperatures made deck operations difficult at Stations 129, 130 and 131. Also, the sediment traps deployed at Station 131 had to be recovered early (i.e. less than 24 h in the water) because they had drifted into Greenland's 3-nm exclusive economic zone.

The transect across the NOW polynya / Smith Sound comprising of stations 117 to 126 was sampled from east (Greenland side) to west (Ellesmere side) from 12 to 14 September. This transect was originally planned to be visited from Ellesmere Island toward Greenland (west to east), but the order was reversed for logistical reasons related to weather and ice conditions and daylight necessary for certain operations (i.e. mooring recoveries and deployments). Weather conditions had improved and ice was generally 1-2 tenths, and all planned oceanographic operations progressed efficiently. The southernmost transect across the NOW polynya (Stations 101-116) began on the Greenland side (CTD Station 116) in the early morning of 15 September. Full Station 115 started with the mooring recovery of BA01-05. The mooring was located and the acoustic releases worked fine, but the line drifted toward the ship with the strong surface currents and there was a significant risk of it getting caught in the propellers. The line was therefore cut and only the upper half of the mooring was recovered. All operations for Station 115 were completed over the next 24 hours, including the deployment and recovery of drifting sediment traps and a Zodiac deployment for SCAMP and Phytoflash measurements. The new mooring BA01-06 was deployed in the afternoon and the *Amundsen* proceeded with Stations 114 to 109 during the night and morning of 17 September. Oceanographic sampling at Full Station 108 went smoothly but the associated mooring BA02 was not redeployed in 2006 (BA02-05 had been recovered on 7 September on the way north).

The final station of the transect, Station 101, was reached in the morning of 18 September and operations began with the deployment of drifting sediment traps. Mooring BA03-05, deployed near Station 101, was interrogated while on station but no response was obtained from the acoustic releases. It was later confirmed that mooring BA03-05 had been released from its anchor at some point during the year, drifted south and been found by an Inuit fisherman in Iqaluit. A new mooring BA03-06 was deployed in the afternoon and the vessel left Station 101 and the NOW region late that evening.

Station 133 near Belcher Glacier was sampled on 19 September and included multibeam and sub-bottom seabed surveys with the *Amundsen* and the *Heron* launch, ice operations and CTD-Rosettes.

The ship entered the Northwest Passage under good weather and light ice conditions. Sampling operations at designated stations in the Northwest Passage (Stations 300-316) were carried out from 20 September until the arrival in Kugluktuk on 27 September. The initial cruise plan was to sail through Peel Sound but light ice and good weather conditions allowed to go via M'Clintock Channel and sample oceanographic Stations 306 to 310 as well as conduct on-ice sampling operations near Stations 307 and 310.

2.3 Chief Scientist's comments

Leg 1 operations were successfully completed by 28 September 2006. Forty scientists participated in Leg 1 and they were supported by 40 Coast Guard crew members. The scientific mission followed the science plan with only a few modifications due to weather and scientific expediency. The major limitation on this leg has been the problems in recovering moorings (see Sections 3 and 12 of Part II below).

A community visit was conducted in Resolute Bay which included a visit from the local school. In total, 60 school kids from grades three to ten participated. These were accompanied by ten teachers making a total of 70 visitors who participated in the tour of the *Amundsen*. In the evening, a group of 12 elders from the community was hosted to have dinner and listen to a presentation on ArcticNet. Both the science teams and the local community elders appreciated the opportunity to find out more about each other and to seek ways in which to continue collaborating in the future. It was a pleasure to host Abraham Kublu as a wildlife observer on Leg 1 as he provided many teams with excellent assistance during his stay onboard.

The Chief Scientist, on behalf of the science participants, would like to thank the Commanding Officer and the officers and crew of the *Amundsen* for their invaluable help during scientific operations and their essential contribution to the success of this cruise.

3 Leg 2a – 28 September to 29 October 2006 – Amundsen Gulf, Beaufort Sea and Canadian Arctic Archipelago

Chief Scientist: Gary Stern[1] (Gary.Stern@dfo-mpo.gc.ca)

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3.1 Introduction and objectives

The science program during Leg 2a of the 2006 *Amundsen* Expedition was centered on ArcticNet's marine-based science program aiming at studying the impacts of climate change in the coastal Canadian Arctic with operations conducted in Amundsen Gulf, the Beaufort Sea (Figure 3.1), the Canadian Arctic Archipelago (Northwest Passage) and Hudson Strait (Figure 3.2).

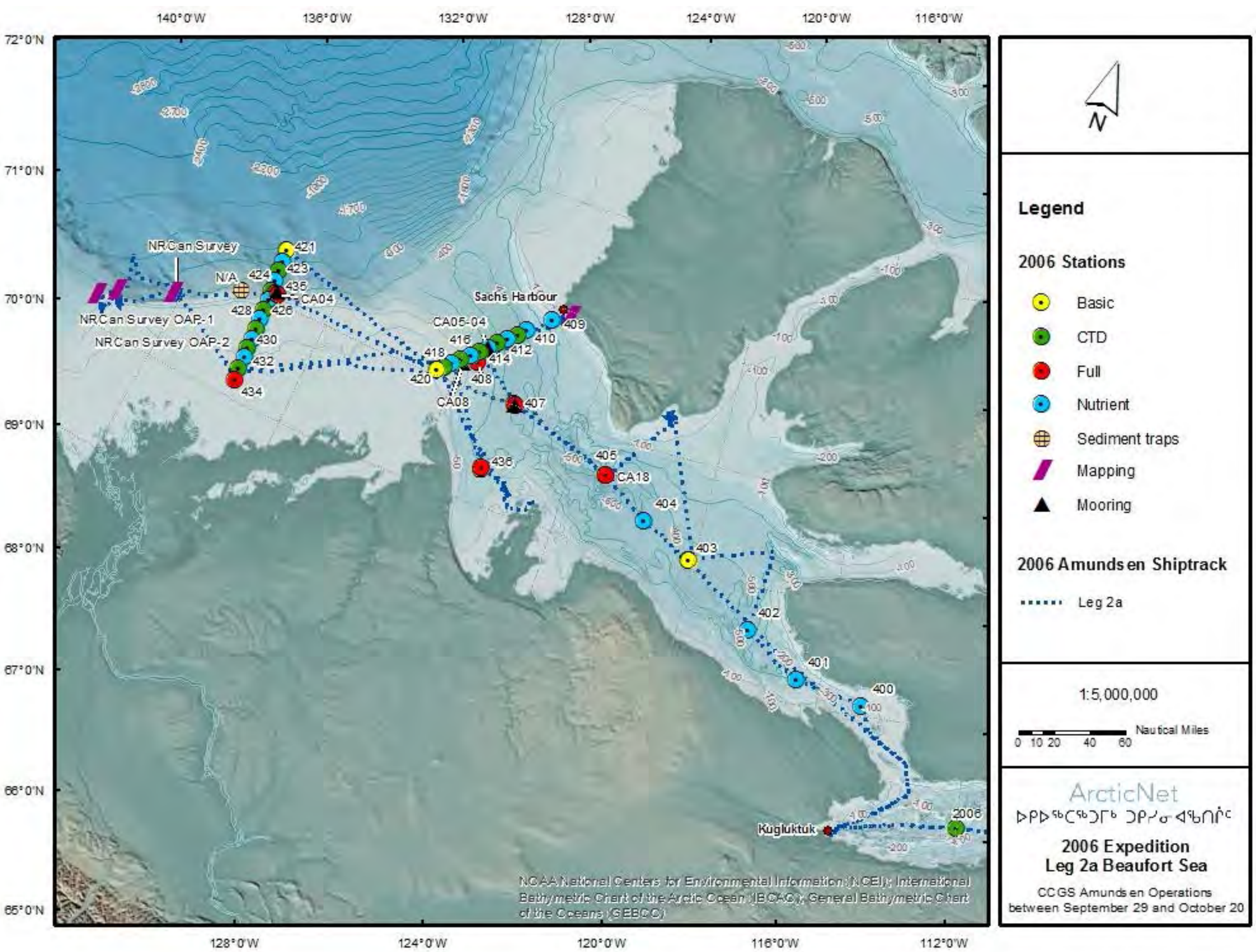

Figure 3.1. map of the Amundsen Gulf and the Beaufort Sea showing the location and type of stations sampled from 29 September to 20 October 2006 during Leg 2a of the ArcticNet Expedition onboard the CCGS *Amundsen*.

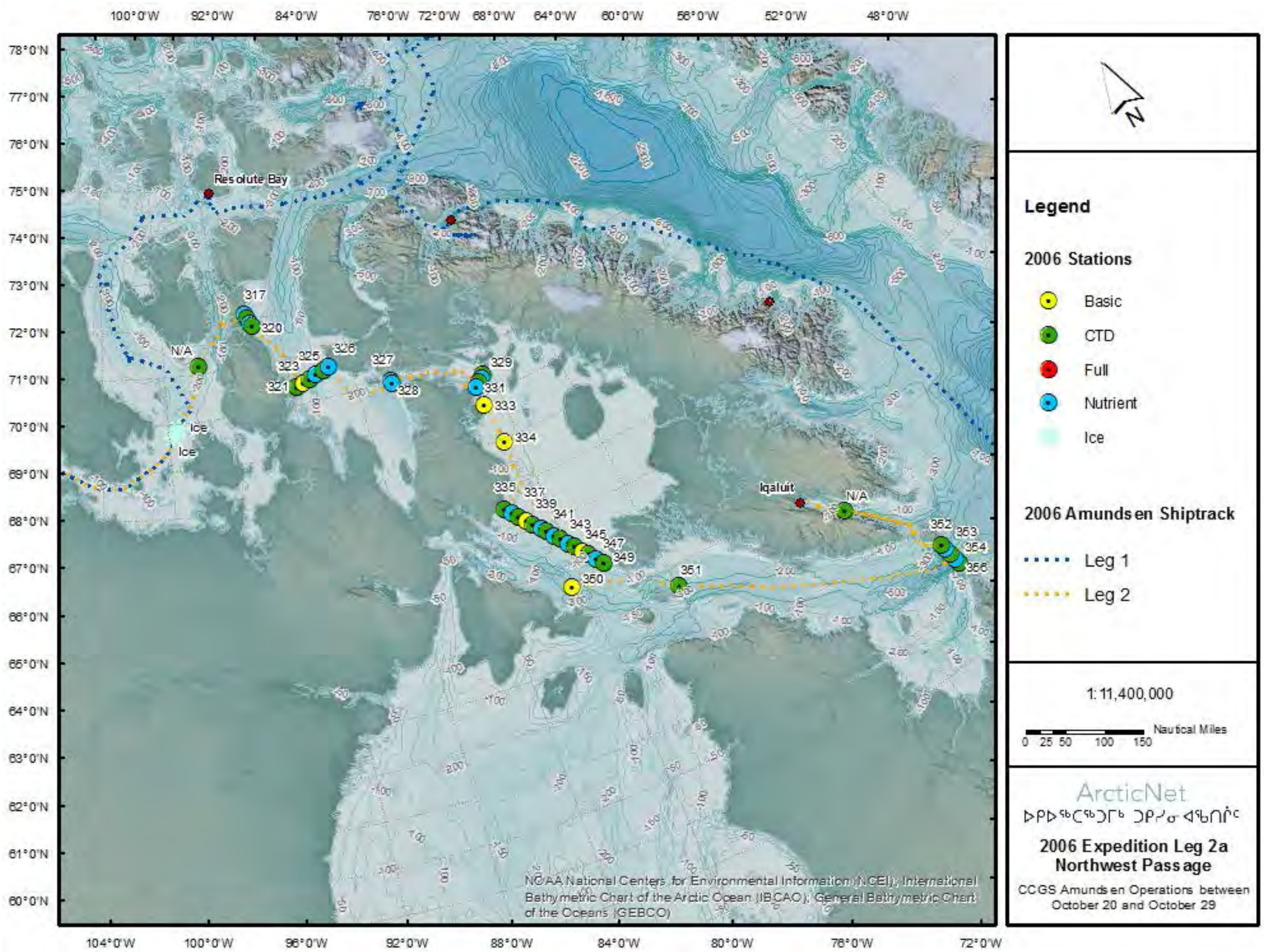

Figure 3.2. Map of the Canadian Arctic Archipelago (eastward route through Bellot Strait, Gulf of Boothia, Fury and Hecla Straits), Foxe Basin and Hudson Strait showing the location and type of stations sampled from 20 October to 29 October 2006 during Leg 2a of the ArcticNet Expedition onboard the CCGS *Amundsen*.

The specific objectives of Leg 2a were to:

- Sample the atmosphere and quantify gas exchanges at the seawater-atmosphere interface.
- Conduct oceanographic sampling of water column for physico-chemical properties and components of the marine food web at designated stations in the Amundsen Gulf and Beaufort Sea (labeled 400 to 436) and in the Canadian Arctic Archipelago (Northwest Passage).
- Recover, service and re-deploy instrumented moorings at key locations in the Amundsen Gulf and the Beaufort Sea (retrieval of CA04-, CA05-, CA08- and CA18-05; re-deployment at CA04-, CA08- and CA18-06).
- Sample the sediments for geology and paleoceanography analyses.
- Obtain seafloor bathymetry and sub-bottom information using the multibeam sonar system along the cruise track and conduct surveys at specific locations: De Salis Bay on Banks Island, Sachs Harbour, the NRCan Ocean Action Plan (OAP) and slump area in the Beaufort Sea.

3.2 Synopsis of operations

This section provides a general synopsis and timeline of operations during Leg 2a, which took place in the Amundsen Gulf, Beaufort Sea, Northwest Passage and Hudson Strait, and ended in Iqaluit. Detailed cruise reports provided by onboard participants and including specific objectives, methodology and preliminary results for projects conducted during this leg are compiled in Part II of this report. A detailed scientific log of all sampling operations conducted during the leg is also available in Appendix 2.

During this Leg, the *Amundsen* traveled from Kugluktuk (28 September) to Iqaluit (29 October) with 87 stations visited and overall tally of operations and activities as follows:

- 27 CTD only casts
- 97 CTD-Rosette casts
- 6 SCAMP profiles
- 11 light and phytoplankton water column profiles, including Secchi disk and PNF profiles.
- 83 plankton tows and trawls, including phytoplankton nets, horizontal and vertical zooplankton net tows, Bioness, Hydrobios and Rectangular Midwater trawl (RMT).
- 13 box cores to sample surface sediments
- 5 drifting short-term sediments traps
- 9 thorium pumping
- One on-ice sampling operation
- 4 dedicated seafloor bathymetry / sub-bottom profiling surveys
- Four moorings recovered and three re-deployed in Beaufort Sea

Over 1800 nautical miles were traveled from Kugluktuk to Iqaluit during which samples were collected at 87 stations, a combination of CTD, Nutrient, Basic (2-6 hours), Full (7-20 hours) and Mooring stations. Seabed mapping using both the *Heron* and the *Amundsen* (EM 300) was carried out at De Salis Bay, Sachs Harbour and the designated NRCan locations in the Beaufort Sea. All mooring retrievals (CA04-05, CA05-05, CA08-05, CA18-05) and deployments (CA04-06, CA08-06, CA18-06) were successful. An attempt to retrieve CA05-04 deployed in 2004 was not successful, and due to time constraints, no attempt was made to retrieve CA14-03. The Kugluktuk loop (first part of Leg 2a) was completed on 19 October.

The return east to Iqaluit was made via Bellot Strait (Figure 3.2) with a total of 45 stations sampled, including the stations on the transect across Hudson Strait (Stations 356-352; Figure 3.2) initially planned for Leg 2b.

3.2.1 Weather and ice conditions

All operations for the Amundsen Gulf and Beaufort Sea region were accomplished even though approximately 2 days were lost to bad weather and daylight had significantly diminished toward to the end of October.

Due to remarkable weather and ice conditions in the Canadian Arctic Archipelago, the decision was made to return east via Bellot Strait, Gulf of Boothia, Fury and Hecla Straits and Foxe Basin (Figure 3.2). This was an unprecedented opportunity of which full advantage was taken.

3.2.2 Timeline of operations

Leg 2a started in Kugluktuk on 28 September after a full science and Coast Guard crew change. Three Nutrient Stations in Amundsen Gulf (400, 401 and 402) were sampled in the morning of 29 September, then the ship sailed north toward Victoria Island to conduct bird and marine mammal wildlife surveys. At Station 403, the usual suite of oceanographic activities at basic stations (CTD-Rosettes, phytoplankton and zooplankton net tows and trawls, and box core) were carried out then the ship sailed for De Salis Bay on the southeast coast of Banks Island for 12 hours of dedicated multibeam and sub-bottom surveys. Between 09:00 and 21:00 on 30 September, the CSL *Heron* launch mapped areas in the shallow inner bay while the *Amundsen* covered areas in the deeper approach to the bay. Operations also included an airphoto and beach survey using the *Amundsen*'s helicopter.

The *Amundsen* sailed next to Full Station 405 / Mooring CA18 and sediment traps were deployed first upon arrival in the early morning of 1 October. The deployment of zooplankton net tows, Rosettes and thorium pumps followed. Mooring CA18-05 was successfully retrieved at 13:00 in light wind and good weather conditions. All operations at Station 405 were completed at 23:00.

Full Station 407 / Mooring CA08 was reached the next morning (2 October) where operations focused on zooplankton net tows (horizontal, vertical and RMT) while the mooring was located. Mooring CA08-05 was successfully recovered at 9:00 and the ship left immediately for Mooring CA05. The remaining activities for this Full station (407) were conducted on the return transit to Kugluktuk two weeks later. Mooring CA05-05 was quickly located and recovered at 16:00, and science operations for Full Station 408 then proceeded over the next 12 hours, including the deployment and recovery of short-term drifting sediment traps.

The next two days (3-4 October) were dedicated to seabed mapping operations near Sachs Harbour. The Sachs Harbour survey with the *Amundsen* was cut short due to a computer and operating software failure on the first day. Re-installing the software and rebooting the system took several hours during which the *Heron* collected enough multibeam data to satisfy the project's objectives. The second day was focused on a shallow water singlebeam (200 KHz) and keel mounted sidescan sonar survey. The survey would have been completed but the weather deteriorated and the *Heron* was recalled to the *Amundsen*. The survey could only be partially completed.

The first portion of the Banks Island-Cape Bathurst transect (Stations 410-414) was conducted in the morning of 5 October, then an attempt was made to recover Mooring CA05-04 deployed in 2004 near Station 414. The attempt was abandoned after a few hours and the *Amundsen* proceeded to sample the rest of the transect (Stations 415-420) which was completed at 06:00 on 6 October.

The next sequence of operations took place over ~36 hours from 6 to 8 October and consisted in oceanographic sampling operations at designated stations along the Beaufort Sea transect (421-434), including Mooring CA04 / Full Station 435 located on the shelf slope between Stations 425 and 426. Mooring CA04-05 was successfully recovered on 7 October at 13:15.

A detour to Franklin Bay was made after completion of Station 433 and Full Station 436 was sampled, mooring equipment was calibrated on land and seabed mapping was conducted in Gillet Bay (Cape Parry). The ship headed back west in the afternoon of 11 October to finish the Beaufort Sea transect (Station 434), re-deploy Mooring CA04-06 and begin the NRCan bottom mapping surveys.

On 12 October, oceanographic sampling of Full Station 435 was carried out and Mooring CA04-06 was successfully re-deployed for another year, although the weather had quickly worsened and stormy weather was forecasted for the next few days. A total of 4.5 days were planned to conduct seabed mapping for NRCan projects at a slump area on the Mackenzie shelf slope and within two priority blocks as part of Canada's Ocean Action Plan (OAP). Bad weather did not allow to get the full allocated time for mapping but with both *Amundsen* and *Heron*, a large portion of the work was completed: the high priority block OAP-1 was completed and the second block was started. The decision was made to move to the Mackenzie slope slump mapping area to wait for the weather to subside. Approximately 12 hours of multibeam survey were successfully conducted on the slump area, completing the NRCan seabed mapping operations in the afternoon of 16 October.

Station 434 (Full) of the Beaufort Sea transect was sampled in the evening of 16 October on the way to Full Station 407. Mooring CA08-06 (associated with 407) was successfully deployed on 18:30 on 17 October under much improved weather conditions, then oceanographic sampling (began two weeks earlier) was completed at 407. CA18-06 was also deployed successfully the next day (18 October) followed by the sampling of three additional oceanographic stations (405, 404 and 403) on the transit back to Kugluktuk, where the *Amundsen* concluded the work for the Amundsen Gulf / Beaufort Sea region on 19 October.

The *Amundsen* began her return eastward through the Northwest Passage on 20 October, with short CTD stations and ice operations in Victoria Strait and the entrance to Peel Sound. With the exceptionally light ice conditions and good weather forecasted, the decision was made to continue via Bellot Strait, Gulf of Boothia, Fury and Hecla Straits and Foxe Basin. The first station on the other side of Bellot Strait (Station 317) was reached around noon on 22 October. Over the next 4 days, a total of 40 oceanographic stations (18 CTD, 16 Nutrient and 6 Basic stations, numbered 317 to 351) were visited and sampled in Gulf of Boothia, Fury and Hecla Straits and Foxe Basin. Sampling operations concluded in the early afternoon of 27 October, and since the ship was traveling through Hudson Strait and was due in Iqaluit only on 29 October, it was decided to conduct the series of CTD-Rosettes for the transect across the strait (Stations 352-356) before heading to port. The *Amundsen* was in Iqaluit on 29 October for the end of Leg 2a and the scheduled science rotation.

3.3 Chief Scientist's comments

Based on the initial objectives outlined in the cruise plan and comments made by the scientists and the officers and crew of the CCGS *Amundsen*, Leg 2a was a resounding success. The successful delivery of this very ambitious schedule was made possible by the exceptional coordination and communication between the science personnel and the Coast Guard officers and crew.

Philip Inuktalik, from Holman Island, was the wildlife observer for the Kugluktuk loop. It was a great pleasure having him on board. Philip quickly developed good relationships with the Science and Coast Guard crew and with great interest and enthusiasm participated in many science activities beyond his wildlife observing responsibilities. Some of these activities included zooplankton collections, Zodiac work (SCAMP profiling), participation in the Sachs Harbour VIP tour. Philip also wrote an interesting dispatch outlining his feelings and experiences on the ship.

Media coverage during Leg 2a was extensive and in all cases the media personnel integrated well with the Science teams and Coast Guard Officers and crew. While constant interviews and filming was sometimes taxing, their presence on the ship was for the most part welcome and very enjoyable.

As Chief Scientist, on behalf of the science personnel, I would like to thank Commanding Officer A. Gariépy and all the officers and crew of the CCGS *Amundsen* for their tremendous dedication, hard work, professionalism and friendship during this cruise. This scientific mission would not have been the complete success it was without their efforts and enthusiasm. Thanks also go to K. Lévesque, ArcticNet ship-based research coordinator, for his help and support during the cruise.

4 Leg 2b – 29 October to 9 November 2006 – Labrador fjords

Chief Scientist: Martin Fortier[1] (martin.fortier@arcticnet.ulaval.ca)
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4.1 Introduction and objectives

Leg 2b was dedicated to operations in northern Labrador as part of the ArcticNet project *Nunatsiavut Nuluak* and welcomed onboard the Schools on Board outreach program involving the participation of the students in scientific operations.

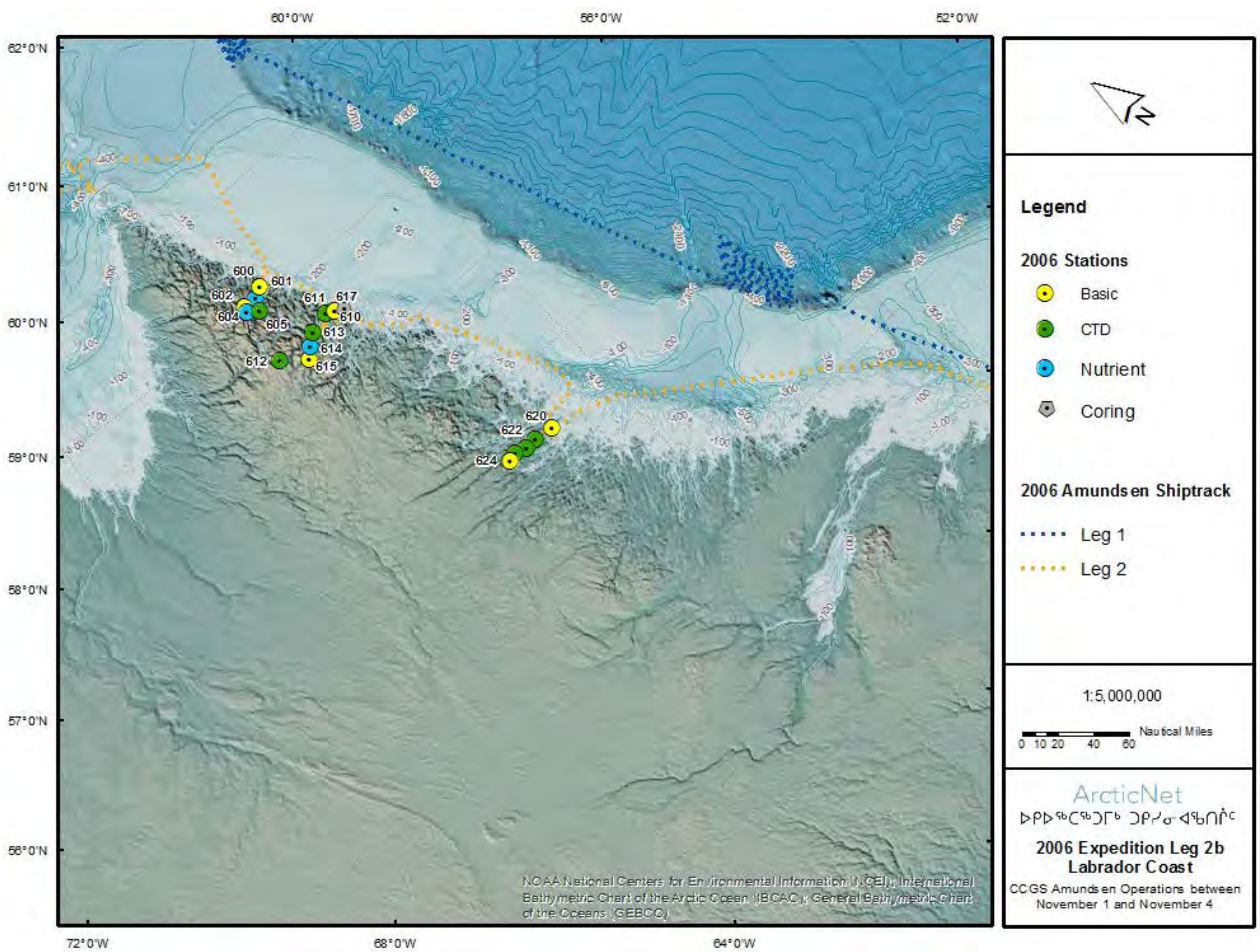

Figure 4.1. Map of the Labrador coast showing the location and type of stations in Nachvak fjord (Stations 600-604), Saglek fjord (Stations 610-617) and Anaktalak Bay (Stations 620-624) sampled from 1 to 4 November 2006 during Leg 2b of the ArcticNet Expedition onboard the CCGS *Amundsen*.

In northern Labrador, concern about the ecological integrity of the marine environment has been expressed in terms of the effects of climate change, of industrialization (modernization, particularly of expanding mining/exploration activities) and contaminants.

The Nunatsiavut Nuluak project was designed to address the predominant concerns of local Inuit as identified through the work of the Nunatsiavut Research Advisor and the Nunatsiavut Government. The project studies three marine ecosystems: Anaktalak Bay (the shipping route to the Voisey's Bay nickel mine), Saglek Bay (an ecosystem recovering from a historical source of PCB contamination) and Nachvak fjord (a pristine ecosystem adjacent to the Torngat Mountains National Park Reserve). The project involves a shore-based research program using a longliner and small boats, and a ship-based research program conducted from the CCGS *Amundsen*.

Nachvak fjord (Figure 4.1, Stations 600-604), located adjacent to the recently established Torngat Mountains National Park Reserve, provides an important reference site for the collection of baseline data on pristine Labrador fjords. A marine monitoring initiative is currently being developed by Parks Canada and the collection of an appropriate set of indicators from Nachvak fjord would enable to carry out a feasibility study for long-term marine monitoring in this region. Multibeam seabed mapping and sub-bottom profiling would provide important information for navigation (very little bathymetric data are available for northern Labrador fjords), substrate and benthic habitat classification, geological evolution and modern marine processes (including erosion, transport and deposition of sediments and slope activity along the steep side walls). Furthermore, climate change has been identified by Labrador Inuit as a significant concern. Current data suggests, however, that Labrador is experiencing climate change at a slower rate than other parts of the North. The addition of a pristine fjord from northern Labrador will act as a reference site for assessing and understanding the effects of future climatic change in the region, as well as providing a basis for integrated regional impact studies (IRIS) within ArcticNet.

Saglek fjord (Figure 4.1, Stations 610-617) is located north of Nain and constitutes the southern boundary of the Torngat Mountains National Park Reserve. In excess of 10 km^2 of sediments in Saglek Bay have been contaminated with PCBs due to erosion from an adjacent military site. The Nunatsiavut Government (formerly the Labrador Inuit Association) collaborated with the Department of National Defence and the Environmental Sciences Group (ESG) to identify the extent and effect of this contamination. While more pelagic and wider ranging species were not affected, there was a high degree of biomagnification in the local benthic-based food chain. An ecological risk assessment indicated that two of the indicator species were at risk of decreased survival and reproduction. Health risks associated with consuming country foods from the area were identified in collaboration with ArcticNet researchers at Université Laval (Dewailly, Ayotte, Furgal) and resulted in the release of a health advisory in the region. Now that the shore-based source of PCBs has been removed, there is a need to develop a long-term monitoring program for Saglek so that future advisories are based on meaningful data. Similar to Nachvak fjord, further multibeam seabed mapping and sub-bottom profiling in Saglek fjord will also provide important information on substrate and benthic habitat classification, geological evolution and modern marine processes (including erosion, transport and deposition of sediments). Our research aims to re-establish baseline data with a view to establishing appropriate indicators for future monitoring. At the same time our research offers the opportunity to investigate the effect of PCBs in the virtual absence of other contaminants.

Anaktalak Bay (Figure 4.1, Stations 620-624) is located south of Nain, and is used extensively by Labrador Inuit for harvesting (both from the water and adjacent shores) and travel by snowmobile and boat. The Voisey's Bay Nickel Company (VBNC) has recently developed a nickel-copper-cobalt mine and mill in the region, which will discharge treated effluent to the head of Anaktalak Bay and use the fjord as its main shipping route. Local Inuit are concerned about the impact of potential spills and shipping on the Anaktalak Bay ecosystem, especially during winter when ice conditions may be disrupted. The Nunatsiavut Government is currently collaborating with the Voisey's Bay Nickel Company (VBNC) on a study to understand the ecological processes of Anaktalak Bay with a view to determining appropriate indicators for long-term monitoring. This research aims to fill identified gaps needed to understand the marine ecosystem of Anaktalak Bay, as well as collect baseline data to test the feasibility of the proposed monitoring program.

The specific objectives for Leg 2b were to:

- Conduct oceanographic sampling of water column for physico-chemical properties and components of the marine food web at designated stations located in the three fjords targeted by the *Nunatsiavut Nuluak* project along the northern Labrador coast.
- Sample the sediments for geology and paleoceanography analyses.
- Obtain seafloor bathymetry and sub-bottom information using the multibeam sonar system along the cruise track and conduct dedicated surveys in the three selected fjords.
- Welcome the Schools on Board outreach program onboard the *Amundsen*.

4.2 Synopsis of operations

This section provides a general synopsis and timeline of operations during Leg 2b, which took place in three fjords along the northern Labrador coast and ended in Quebec City. Detailed cruise reports provided by onboard participants and presenting specific objectives, methodology and preliminary results for projects conducted during this leg are compiled in Part II of this report. A detailed scientific log of all sampling operations conducted during the leg is also available in Appendix 2.

A total of 16 stations were visited during Leg 2b with sampling consisting of CTD profiles, water collection for oxygen and contaminants analyses, nutrient and phytoplankton samples using the Rosette, zooplankton sampling using an oblique Tucker trawl and Hydrobios vertical tows, small box cores for contaminants analyses in sediments, large box cores for palaeoceanographic work, as well as multibeam seabed mapping and sub-bottom profiling. The overall tally of operations and activities was as follows:

- 7 CTD only casts

- 9 CTD-Rosette casts
- 6 SCAMP profiles
- 16 plankton tows and trawls, including horizontal zooplankton net tows and Hydrobios.
- 7 box cores to sample surface sediments.
- One SCAMP profile
- Dedicated seafloor bathymetry / sub-bottom surveys in each fjord.

4.2.1 Timeline of operations

Leg 2b began in Iqaluit on 29 October after the mid-leg science rotation and the *Amundsen* sailed south for the Labrador Coast. The northernmost fjord, Nachvak fjord, was reached in the morning of 1 November and the next 24 hours were dedicated to oceanographic operations at 5 stations located (2 Basic, 2 Nutrient and 1 CTD) from the head to the mouth of the fjord, as well as multibeam and sub-bottom surveys. The *Heron* launch conducted surveys across the shallowest part of the Ivitak sill, in Townley Basin, in Tasiuyak Arm and the narrow passage between the two. The *Amundsen* operations took place between sampling stations and successfully mapped much of Tallek Arm, Koktortoaluk Basin, Ivitin Basin and some complementary lines not previously mapped by the *Matthew* in Outer Basin.

Saglek fjord (Stations 610-617) was visited on 2 and 3 November with 7 oceanographic stations sampled. Mapping was conducted over a 28-hour period from ~09:00 on 2 November to ~13:00 on 3 November. The *Heron* operations focused exclusively on mapping the Southwest Arm, parts of the North and West arms, and Saglek Anchorage. The *Amundsen* mapped between the existing coverage obtained from the *Matthew* in Saglek Bay and the head of the fjord and in St. John's Harbour, a small inlet off Saglek Bay The *Amundsen* operations took place between oceanographic sampling stations.

The third and last fjord, Anaktalak Bay, was reached in the early morning of 4 November with 5 stations sampled over the next 16 hours. A total of 6.5 hours of *Heron* survey time was used to complete the seabed mapping and subbottom profiling of Edwards Cove and adjacent basin on 4 November. At the same time, the *Amundsen* completed survey lines of the outer part of the Edwards Cove basin in between oceanographic station sampling, and mapped the shipping lane during inward and outward transits. In addition, a transit survey was conducted in and out of the harbour of Voiseys Bay Nickel Mine including a section covering the approaches to the mine docking site, and a small harbour survey was completed by the *Heron*.

The *Amundsen* then left for Quebec City where Leg 2b and the annual expedition concluded on 9 November.

4.3 Chief Scientist's comments

All the planned scientific operations were successfully conducted in generally good weather and mild ice conditions, with one day spent in Nachvak fjord, two days in Saglek fjord and one day in Anaktalak Bay.

The students participating in the School on Board programs greatly enjoyed their experience onboard the ship and appreciated being able to help and perform some of the operations along with the scientists.

Leg 2b was considered a success by all participants onboard (scientists and students) and the crew of the *Amundsen*. The Chief Scientist and all scientific personnel would like to thank the Commanding Officer and the officers and crew of the CCGS *Amundsen* for their hard work and collaboration during this cruise.

5 BaySys – 12 September to 24 September 2006 – Hudson Bay

Chief Scientist: Josée Michaud[1] (josee.michaud@arcticnet.ulaval.ca)
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5.1 Introduction and objectives

The BaySys cruise is a collaboration between ArcticNet and Hydro Manitoba and was dedicated to mooring operations in Hudson Bay as part of the project titled *Climate Variability / Change and Marine Ecosystem Resources in Hudson Bay*.

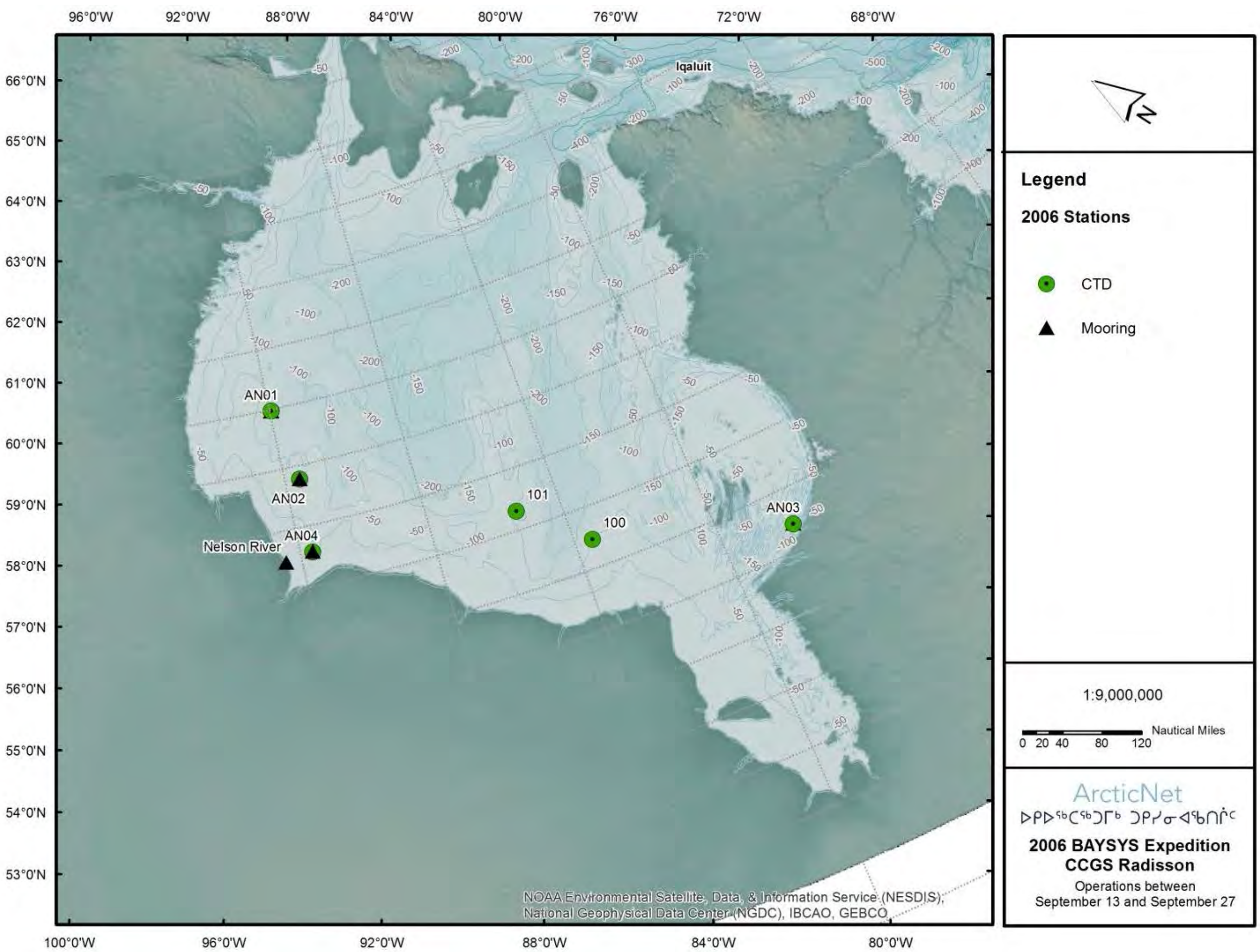

Figure 5.1. Map of Hudson Bay showing the location and type of stations sampled from 12 September to 27 September 2006 during the BaySys expedition carried out onboard the CCGS *Pierre Radisson*.

The specific objectives of the BaySys science cruise were to:

- Retrieve four moorings that were deployed during the ArcticNet 2005 Expedition.
- Deploy four moorings, including a Hydro Manitoba mooring in the Nelson River.

5.2 Synopsis of operations

This section provides a general synopsis and timeline of operations during the BaySys expedition. A detailed scientific log of all sampling operations conducted during the BaySys cruise is available in Appendix 2.

A CTD profile was done prior to the recoveries of the four 2005 moorings (AN01-, AN02-, AN03- and AN04-05) as well as after the deployment of the new moorings (AN01-, AN02-, AN03- and AN04-06). A Tucker net was also performed at the mooring stations, generally after the mooring, as well as at two other stations during the transit to the Churchill area (Figure 5.1, Stations 100-101). On 13 September 2006 on Belcher Islands, 2 RCM-4 (serial no. 4046 and 740) were calibrated but calibration was judged unreliable as it was done pointing towards the magnetic North instead of the geographic North. It was also noticed that the direction of the magnetic pole showed significant variations. Furthermore, due to time constrain on that day, it was impossible to calibrate the ADCP (serial no. 296). Thus these three instruments should be recalibrated upon their recovery in 2007. On 19 September, a RCM-4 (# 4645) and an ADCP (# 0335) were successfully calibrated in the Nelson River area. Detailed information is given in Part II of this report under the Mooring Program report (Section 4).

5.3 Chief Scientist's comments

The Chief Scientist, on behalf of the science participants, wishes to thank the Commanding Officer and the crew of the CCGS *Pierre Radisson* for their invaluable help during scientific operations and their essential contribution to the success of this cruise.

Part II – Project reports

1 Meteorological, oceanographic and navigation data – Legs 1, 2a and 2b

Data analyst: Simon Morisset[1]
Data quality manager: Pascal Guillot[2]
Data coordinator: Colline Gombault[1]

[1] *ArcticNet / Amundsen Science, Pavillon Alexandre-Vachon local 4081, 1045 avenue de la Médecine, Université Laval, Québec, QC, Canada, G1V 0A6, Canada.*

[2] *Québec-Océan / Amundsen Science, ISMER, 310 Allée des Ursulines, C.P. 3300, Rimouski, QC, G5L 3A1, Canada.*

1.1 Introduction

A suite of core data and information is collected during the CCGS *Amundsen's* annual expedition using various systems and instruments. Ship position and navigation data (CNAV and POS-MV) and meteorological information (AVOS, Environment Canada) are collected on a continuous basis. Oceanographic data is collected using a CTD-Rosette, a Moving Vessel Profiler (MVP), a ship-mounted current profiler (SM-ADCP) and an underway thermosalinograph (TSG) system.

The datasets collected are processed, archived and managed by the ArcticNet/*Amundsen* technical and data management team. All variables from the datasets are verified and quality controlled using time series and mapping plots, and spurious data and outliers are flagged. The processed datasets will be archived on the Polar Data Catalogue (PDC) at www.polardata.ca.

1.2 Description of systems and available data

1.2.1 Navigation and ship position information – POS-MV and C-Nav

The *Amundsen* is equipped with a POS-MV (Position and Orientation Systems for Marine Vessels) and a C-Nav DGNSS Precise Point Positioning systems. Both these systems record data continuously, with the POS-MV data having a better resolution and accuracy than the C-Nav data. Thus, C-Nav data are used only when POS-MV data are unavailable for a period of 20 seconds or longer. Both systems use WGS 84 Geographic Coordinates.

Table 1.1. Variables measured by the navigation systems onboard the CCGS *Amundsen*.

Variable	Units
Date	yyyy/mm/dd
Hour UTC	HH:MM:SS
Latitude	deg N
Longitude	deg E
GPS source	POSMV:1 CNAV:0

Variable	Units
Heading	deg N
Roll	deg
Pitch	deg
Heave	m
Track	deg N
Speed	Knt

Three types of datasets are issued from the navigation systems and are available for the two legs of the 2006 *Amundsen* Expedition:

- the complete data
- a 15-minute reduced version
- a ship track

The QA/QC process for the NAV data is described in the README file attached to the archived data on the PDC (CCIN 12447). The README file also includes a data acknowledgement statement and examples for data citations. The full reference for the NAV data is available in the reference section of this project report.

1.2.2 Meteorological information – AVOS (Environment Canada)

An Environment Canada Automated Volunteer Observing Ship (AVOS) system was continuously recording meteorological data on atmospheric pressure, wind speed and direction, air temperature and humidity during the 2006 *Amundsen* Expedition.

Table 1.2. List of meteorological instruments and recorded variables of the AVOS system.

Instrument	Variable	Specifications
Vaisala Digital Barometer – PTB-210	Atmospheric pressure	Range: 50 to 1100 hPa Accuracy: 0.35 hPa Resolution: 0.1 hPa
Young R.M. Anemometer - 05103	Wind speed	Range: 0 to 100 m/s Initial accuracy: 0.3 m/s
	Wind direction	Range: 0 to 360° Initial accuracy: 3°
Rotronic Meteorological – MP10	Air temperature	Range: -40 to 60°C Initial accuracy: 0.2°C
	Humidity	Range: 0 to 100% RH Initial accuracy: 1% RH

The QA/QC process for the AVOS data is described in the README file attached to the archived data on the PDC (CCIN 12518). The README file also includes a data acknowledgement statement and examples for data citations. The full reference for the AVOS data is available in the reference section of this project report.

1.2.3 CTD-Rosette

The *Amundsen*'s CTD-Rosette was used to perform vertical profiles of water column properties and to collect water samples. A description of the instruments and sensors used on the CTD-Rosette and the variables measured, as well as an account of the operations conducted during Legs 1 and 2, are provided in Section 5. The CTD logbook detailing the location, date and time, and depth of CTD-Rosette casts for each leg of the 2006 *Amundsen* Expedition is available in Appendix 3.

The CTD data are available in raw and processed formats on the PDC. The QA/QC process for the CTD data is described in the README file attached to the archived data on the PDC (CCIN 12713). The README file also includes a data acknowledgement statement and examples for data citations. The full reference for the CTD data is available in the reference section of this project report.

1.2.4 Moving Vessel Profiler (MVP)

The Moving Vessel Profiler (MVP) was deployed from the *Heron* launch in Leg 1 as part of seabed mapping operations in Oliver Sound, Belcher Glacier, Resolute Bay and Coronation Gulf. More information on MVP operations can be found in Section 16. The MVP data for 2006 is not managed by the ArcticNet/*Amundsen* data management team and readers interested in this dataset should contact the research team who collected the data (see Project 16 – Seabed mapping).

1.2.5 Ship-mounted current profiler (SM-ADCP)

The *Amundsen* is equipped with a hull-mounted Acoustic Doppler Current Profiler (ADCP) continuously recording current velocity and direction under the ship and along the transit route. Data was collected during Legs 1, 2a and 2b, but datasets are unprocessed.

1.2.6 Underway thermosalinograph (TSG) system

An underway ThermoSalinoGraph (TSG) system was used to continuously record data on surface seawater temperature, salinity, fluorescence and sound velocity along the transit route.

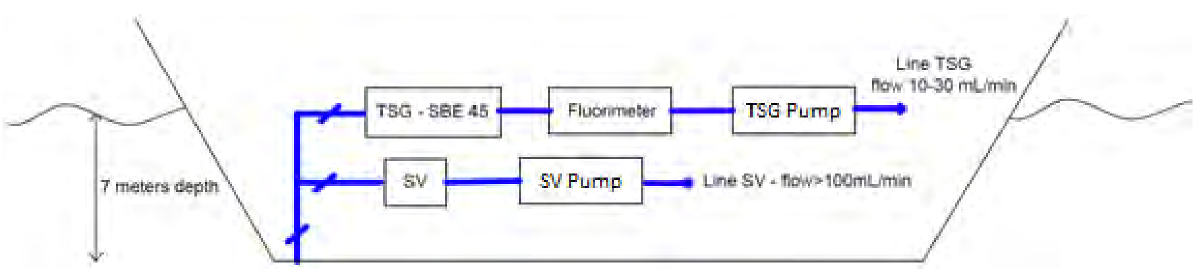

Figure 1.1. Schematic of the configuration of the TSG underway system.

Table 1.3. Instruments and variables measured by the underway TSG system during Legs 1, 2a and 2b of the 2006 *Amundsen* Expedition.

Instrument	Manufacturer	Variable	Specification	
SBE 45 MicroTSG	Sea Bird (SN# 4532465-076)	Temperature	Range (°C) Initial Accuracy (°C) Resolution (°C)	-5 to +35 0.002 0.0001
		Conductivity	Range (S/m) Initial Accuracy (S/m) Resolution (S/m)	0 to 7 0.0003 0.00001
		Salinity (derived value)	Initial Accuracy (psu) Resolution (psu)	0.005 0.0002
WETStar	Wetlabs (SN# 959P)	Fluorescence	Range (µg/l) Initial Accuracy (µg/l)	0.03 to 75 0.03
Smart SV	AML (SN# 4860)	Sound velocity	Range (m/s) Initial Accuracy (m/s) Resolution (m/s)	1400 to 1600 0.05 0.015

No data was recorded by the thermosalinograph during Leg 1 due to issues with the flow through the TSG and the sound velocity sensor did not work throughout the expedition. Periods and regions where the TSG was operational and the post-processed data recovery rates for each sensor are presented for each leg in Table 1.4.

Table 1.4. Periods and regions where the TSG system was operational and processed data recovery for each variable measured for each of the two legs of the 2006 Expedition.

Variable	Period of operation	Total good data (days)	Region(s) of operation [1]	Post-processed data recovery rate [2]
Leg 1				
Temperature	No data	0	-	0%
Salinity	No data	0	-	0%
Fluorescence	No data	0	-	0%
Sound velocity	No data	0	-	0%
Legs 2a and 2b				
Temperature	29 Sept – 7 Nov	34.2	AG, BS, CAA, HS, Lab	81%
Salinity	29 Sept – 7 Nov	34.2	AG, BS, CAA, HS, Lab	81%
Fluorescence	29 Sept – 7 Nov	34.2	AG, BS, CAA, HS, Lab	81%
Sound velocity	No data	0	-	0%

[1] AG = Amundsen Gulf; BS = Beaufort Sea; CAA = Canadian Arctic Archipelago; HS = Hudson Strait; Lab = Labrador Sea and Fjords.
[2] Data recovery rate calculated based on total number of days in each leg: Leg 1 = 38 days, Legs 2a&b = 42 days.

The QA/QC process for the TSG data is described in the README file attached to the archived data on the PDC (CCIN 12715). The README file also includes a data acknowledgement statement and examples for data citations. The full reference for the TSG data is available in the reference section of this project report.

References

Amundsen Science Data Collection. CCGS *Amundsen* Navigation (NAV) data recorded during the annual science expeditions in the Canadian Arctic. [years]. Processed data. Version 1. DOI: 10.5884/12447. Archived at www.polardata.ca: https://doi.org/10.5884/12447. Accessed on [Date].

Amundsen Science Data Collection. CCGS *Amundsen* Navigation (NAV) data recorded during the annual science expeditions in the Canadian Arctic. [years]. Reduced Dataset. Version 1. DOI: 10.5884/12447. Archived at www.polardata.ca: https://doi.org/10.5884/12447. Accessed on [Date].

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Amundsen Science Data Collection. CTD data collected by the CCGS *Amundsen* in the Canadian Arctic. [years]. Processed data. Version 1. DOI: 10.5884/12713. Archived at www.polardata.ca: https://doi.org/10.5884/12713. Accessed on [Date].

Amundsen Science Data Collection. CTD data collected by the CCGS *Amundsen* in the Canadian Arctic. [years]. Raw data. Limited distribution. Accessed from PDC@arcticnet.ulaval.ca, on [Date].

Amundsen Science Data Collection. TSG data collected by the CCGS *Amundsen* in the Canadian Arctic. [years]. Processed data. Version 1. DOI: 10.5884/12715. Archived at www.polardata.ca: https://doi.org/10.5884/12715. Accessed on [Date].

2 Surface meteorology and CO_2 flux – Legs 1 and 2

ArcticNet Phase I – Project 3.1: Ocean-Ice-Atmosphere Coupling and Climate Variability. ArcticNet/Phase 1/Project 3.1.

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2.1 Introduction

The exchange of energy through radiant and turbulent fluxes is an important aspect of boundary layer meteorology. Radiative transfer can be broken down into the shortwave component (controlled by solar radiation and surface reflectance) and the longwave component (controlled by temperature and the composition of the atmosphere/surface). Both of these fluxes are measured by radiometers installed on the tower (see section 2). Turbulent transfer is controlled by sensible heat exchange between the atmosphere/surface and by latent heat exchange through phase changes of moisture. This is measured on the meteorological tower by using sonic anemometers and fast response H_2O and temperature sensors to compute flux via eddy covariance.

The objective of the measurement program is to quantify, in space and time, the rates (and associated variability) in the exchange of energy, momentum and mass (H_2O and CO_2). The objective of the research program, through collaboration with other project researchers, is to better understand the atmosphere's contribution in determining ocean properties (physical, biological, and chemical) through its effect on those oceanic biophysical and biogeochemical processes that are affected by near surface flows of heat, radiation, momentum and CO_2.

The instruments deployed on the CCGS *Amundsen* as part of the surface meteorology and flux program of 2006 (ArcticNet Project 1.1) provide underway information on: (i) bulk meteorology and microclimatology, (ii) detailed information on the air-sea exchange of momentum, heat, radiation and CO_2, and (iii) pertinent near surface and surface sea water (sea ice) properties. The surface fluxes constitute the upper and lower boundary forcing for the ocean and atmosphere, respectively, and therefore they provide a spatial and temporal measure of air-sea coupling across the ArcticNet sampling region.

By monitoring CO_2 concentrations in conjunction with the eddy covariance system, the flux of CO_2 between the ocean and the atmosphere can be measured directly. The magnitude of this flux is determined by the concentration gradient of CO_2 between the atmosphere and the ocean along with the degree of mixing that occurs between the two media (usually a function of sea state). In order to measure the air-sea CO_2 gradient, an on-track pCO_2

system was also operated for the duration of the cruise which measured the amount of dissolved CO_2 in surface seawater.

2.2 Methodology

2.2.1 Micrometeorology and microclimatology

A tower-based eddy correlation flux and weather observing system (or flux tower) was installed on the foredeck of the CCGS *Amundsen* to observe the various components of the surface energy budget and CO_2 exchange. Measurements of bulk air temperature, relative humidity, wind speed and direction were made in conjunction with the eddy correlation system from sensors installed on the flux tower (Figure 2.1 and Table 2.1).

Figure 2.1. Eddy correlation flux and weather observing system (flux tower) located on the foredeck of CCGS *Amundsen*.

Gimbaled radiometers provided a continuous record of surface incoming solar (wavelength range between approximately 0.3 to 3 μm) and long-wave radiation (wavelength range between approximately 3 to 50 μm). A third, non-gimbaled radiometer provided a measure of incident photosynthetically active radiation (PAR; wavelength range between 0.4 and 0.7 μm). The eddy correlation system consisted of fast response sensors to measure of fluctuations in air temperature, water vapour and CO_2 concentration, and wind speed and ship motion along the three principal coordinate axes. Fluctuations in wind speed were measured using two sonic anemometers: a Gill instruments (model R3) and Campbell Scientific (model CSAT3). An infrared gas analyzer (LI-COR, model LI-7500) was used to measure gas concentrations.

Sensor output was routed through data loggers on the tower. A Campbell Scientific CR23X datalogger collected the high-resolution (10 Hz) CO_2 flux data, and was downloaded every

10 minutes by a network interface to a personal computer housed in a forward acquisition container on the foredeck via a local network. A CR1000 datalogger recorded the lower resolution data at 2 (Leg 2) or 3 (Leg 1) second intervals and stored it as one-minute averages. This data was also downloaded to a PC several times per day. Raw output from the eddy correlation system was saved at 10Hz. Other sensors were scanned at 3 s intervals and archived as 1 minute averages. Data from the Gill R8 sonic anemometer was monitored directly to personal computer via the system's RS232 output.

A temperature transducer was mounted on the starboard-side of the foredeck (Figure 2.2) and was obliquely orientated at an incidence angle of approximately 60º. Output from the transducer was measured directly within the acquisition container by data-logger (model CR23X). Sensor output was scanned at 3 seconds intervals and archived as 1 minute averages. Sensors were operational by 10 September and continued to operate during Leg 2a. Sensor maintenance schedule was recorded. Zero and span for the open-path gas analyzer was checked weekly.

Figure 2.2. Position of the Everest infrared transducer installed on foredeck rail of CCGS *Amundsen*.

Table 2.1. Sensors and associated specifications (manufacturers listed below).

Sensor	Variable	Unit	Height (m)[a]	Scan (s)/ Avg (min)	Specs / Accuracy	Ref Fig. 1.1
Wind monitor (RM Young 05103MA or 15106MA)	Horizontal wind speed and direction (ws and wd[b])	m/s; º	8.45 (Leg 1) 14 (Leg 2)	2-3 sec/ 1 min	±0.6 m/s ±3º deg	a
Temperature/relative humidity probe (Vasailla HMP45C212)	Temperature and relative humidity (T and RH)	ºC %	7.53(Leg 1) 13.5 (Leg 2)	2-3 sec/ 1 min	Humidity ±2% 0-90% @ 20ºC ±3% 90-100% @ 20ºC 0.05% RH/ºC Temperature ± 0.1 ºC	c
Pyranometer (Eppley, model PSP)	Incoming shortwave radiation (SW_in)	W/m^2	7.0(Leg 1) 12.5 (Leg 2)	2-3 sec/ 1 min	~±5%	e
Pyrgeometer (Eppley, model PIR)	Incoming longwave radiation (LW_in)	W/m^2	7.0(Leg 1) 12.5 (Leg 2)	2-3 sec/ 1 min	~±10%	d
PAR/Quantum sensor (LI-190)	Photosynthetic Active Radiation PAR	$\mu mol/m^2$	7.6(Leg 1) 13.5 (Leg 2)	2-3 sec/ 1 min	~±5%	b
Multi-axis inertial sensor (MotionPak, Systron Donner)	3D acceleration and angular rate (x,y,z) of tower	º/s g	6.48(Leg 1) 12 (Leg 2)	10 Hz	rate <0.004º/s acc <10 □g	f
Gas Analyzer (LI-COR LI-7500)	CO_2 concentration (ρCO_2)	$\mu mol/ m^3$	7.1(Leg 1) 12 (Leg 2)	10 Hz	RMS noise ±0.1 µmol/mol zero drift 0.1 µmol/mol/ºC gain drift 0.1%/ºC	h

Sensor	Variable	Unit	Height (m)[a]	Scan (s)/ Avg (min)	Specs / Accuracy	Ref Fig. 1.1
	H_2O concentration	mmol/ m^3	7.1(Leg 1) 12 (Leg 2)	10 Hz	RMS noise ±0.14 mmol/mol zero drift 0.3 %/ºC gain drift 0.15%/ºC	h
Wind fluctuations (CSAT3 ultra-sonic anemometer)	3-dimensional wind vector (u,v,w) and sonic temperature (T_{sonic})	m/s ºC	7.15(Leg 1) 12 (Leg 2)	10 Hz	RMS noise ±1mm/s (u,v) RMS noise ±0.05 mm/s (w) offset <4 cm/s	i
Wind fluctuations (Gill R3 ultra-sonic anemometer)	3-dimensional wind vector (u,v,w) speed of sound (SOS)	m/s	7.1(Leg 1) 12 (Leg 2)	10 Hz	RMS noise <1% offset <0.01 m/s SOS < 0.5% accuracy	g
Temperature transducer (Everest infrared transducer, model 4000 ZL)	Surface temperature (T_{srfc})	ºC	1.6 m	3 sec/ 1 min	±0.5 ºC accuracy	Fig 1.2

[a] From deck.
[b] Measured winds are apparent, relative to the ship's speed and course over ground.
LI-COR Instruments, Lincoln NE
The Eppley Laboratories, Newport, RI
Systron Donner Intertial Division, Concord, CA Everest Inrterscience, Inc, Fullerton, CA Campbell Scientific Canada Ltd, Edmonton, AB Gill Instruments, Ltd., UK
Vaisala, Inc., Woburn, MA
RM Young Company, Traverse City, MI

2.2.2 Underway seawater pCO_2

An underway sea water pCO_2 sensor was installed in the forward engine room of the ship and hooked up to the ship's sea water intake (Figure 2.3). This system was designed to continuously measure the dissolved CO_2 content in the sea surface water. The instrument drew water from the ship flow-through system (i.e. the same line that supplies the TH Salinograph). Seawater was filtered to remove particulates (Honeywell water filter model F76S equipped with a 200 micron mesh). and then passed through a gas equilibration chamber. The principal of the pCO_2 measurement is based on the equilibration of carrier air with sea water and subsequent determination of the CO_2 concentration in the carrier air. Temperature correction of the CO_2 concentration will be accomplished following Takahashi et al. (1993).

In this system, a continuous flow of seawater passes through an open system equilibration cell. A fixed volume of air is re-circulated continuously through the system to maintain near equilibrium in terms of gas concentration with the flowing seawater. After circulating through the equilibration cell, the air is passed through an infrared gas analyzer where the CO_2 gas concentration is measured, relative to a dry and CO_2 free reference gas. At the heart of this system is a closed-path infrared gas analyzer (LI-COR model LI7000). The equilibration cell is a membrane contactor (Liqui-Cel, Membrane, Charlotte NC, model, 2.5x8), 0.6 l capacity, with an internal surface of 1.4 m^2 polypropylene membrane (40% porosity).

Water temperature and flow were measured using 22 AWG Type T thermocouple junction and vortex flow meter (Sparling Oval, El Monte CA, model FLP08). Water pressure at the system's intake drives the sea water through the system and into a holding reservoir, from which the water was pumped into the ships wastewater outlet. Nominal water flow through the system was between 30 and 50 ml/s. Output from the gas analyzer, water thermocouples and flow meter were recorded by a data logger (CR1000) with a scan interval of 3 s and archived at 1-min averages. The system's intake filter was normally replaced every 6-10 hours.

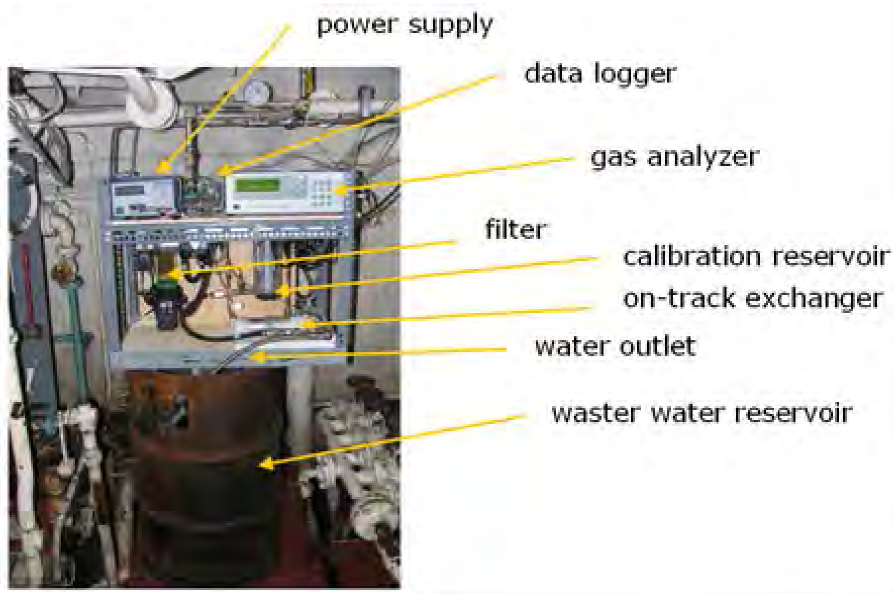

Figure 2.3. Underway pCO_2 system in the forward engine room of the CCGS *Amundsen*.

Differential CO_2 concentration measurements in the system's air loop were made relative to dry- and CO_2-free air. The zero and span of the reference cell were set daily. Nitrogen gas was continually passed through Ascarite II and dessicant (Silica Gell) and into the system's reference cell. Span was set using CO_2 standard (683 ppm±1%). The system will undergo sensitivity tests during the winter of 2006/07.

2.2.3 Data processing

Post processing will be undertaken at the University of Manitoba for:

- data screening and quality control
- computation of true wind speed and direction
- computation of heat, momentum and mass fluxes

2.2.4 *Problems encountered*

During Leg 2a, the Gill sonic anemometer was originally intended to download to the CR23X logger along with the other flux data in order to ensure synchronization, but difficulties were encountered when setting up the system. The Gill data was thus logged independently through a serial port to a computer in the foredeck container. This data will need to be synchronized during post-processing, but in order to ensure that good eddy covariance data was collected, the CSAT anemometer was installed and was synchronized with the rest of the flux data.

Data from the underway pCO_2 system was interrupted from 20 to 22 October (Leg 2a) due to ice jamming the flow through intake.

2.3 Preliminary results

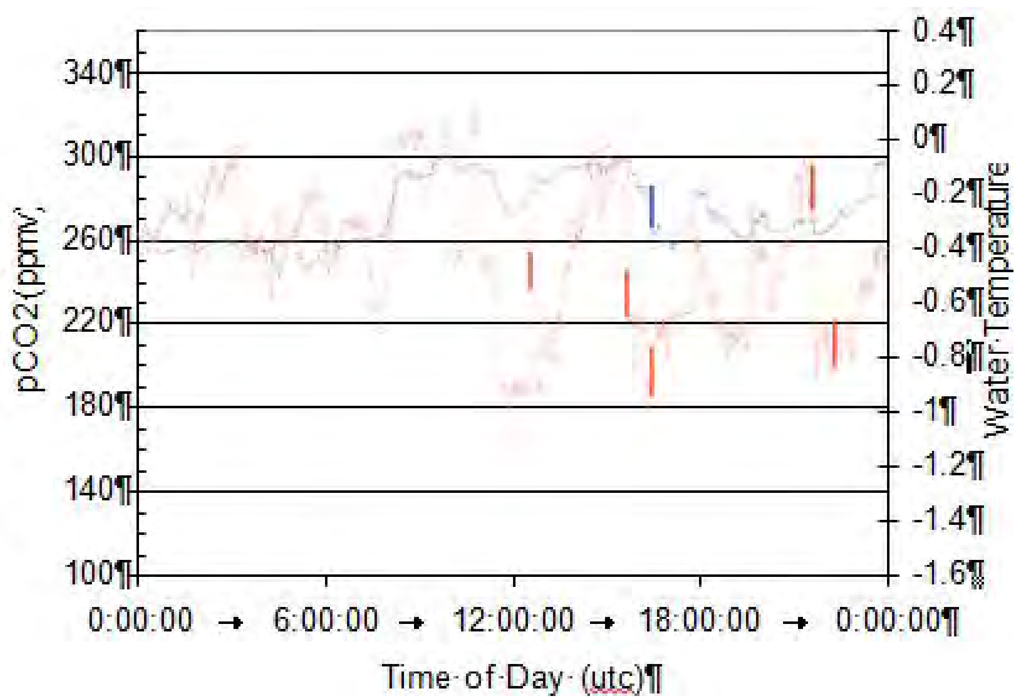

Figure 2.4. Sample (uncorrected) seawater pCO_2 (blue) and water temperature (red) recorded on 24 September 2006 (Leg 1).

References

Takahashi, T., Olafsson, J., Goddard, J.G., Chipman, D.W. and S.C. Sutherland, 1993. Seasonal variation of CO_2 and nutrient salts in the high latitude oceans: a comparative study. *Global Biogeochem. Cycles*, 7 843-848.

3 Sea ice, remote sensing and marginal ice zone – Leg 1

ArcticNet Phase I – Project 1.1: Warming Coastal Seas & Shrinking Sea Ice. ArcticNet/Phase 1/Project 1.1.

ArcticNet Phase I – Project 3.1: Ocean-Ice-Atmosphere Coupling and Climate Variability. ArcticNet/Phase 1/Project 3.1.

Project leader: David Barber[1] (dbarber@cc.umanitoba.ca)

Cruise participants Leg 1: Klaus Hochheim[1], Dustin Isleifson[1], Michael Trachtenberg[1] and David Barber[1]

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3.1 Introduction

Given that ice concentrations are at their seasonal low during the September period, the Marginal Ice Zone group had four good survey opportunities during Leg 1. The objectives of the MIZ group were to:

- Examine the microwave backscatter characteristics of sea ice using a C-band scatterometer and microwave emission of sea ice and water using microwave radiometers at 37 and 89 GHz. These observations were supplemented with coincident on-ice ground confirmation data.
- Examine the use of 1000 and 250 MHz ground penetrating radars (GPRs) to profile the ice floes to determine the extent to which these instruments can be used to characterize ice floes.
- Obtain temperature, salinity and PAR (photosynthetically absorbed radiation) surface profiles (to a depth of 50 m) within the marginal ice zone to better understand the impact of ice cover on the near surface physical and biological marine environment.

3.2 Methodology

3.2.1 Site description

Station stops on Leg 1 included Station 118, the Belcher Glacier, Station 307 and 310. The Belcher Glacier site was used to conduct CTD profiles, the other sites consisted of multi-year ice and on-ice visits. Site maps for each of the multi-year ice sites are shown in Figure 3.1 to 2.3, with location of the GPR transects, the EM Site location, ice-core sample site, auger holes (ice thickness), and sites where CDT and CTD/PAR profiles were conducted.

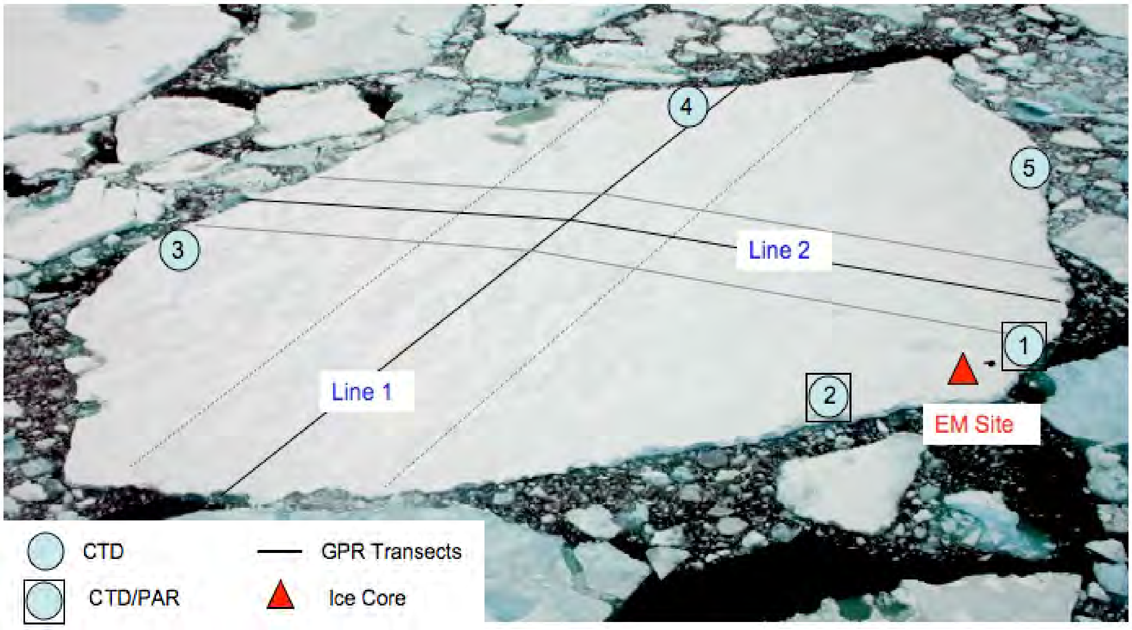

Figure 3.1. Site map of Station 118, multi-year ice floe on 14 September 2006.

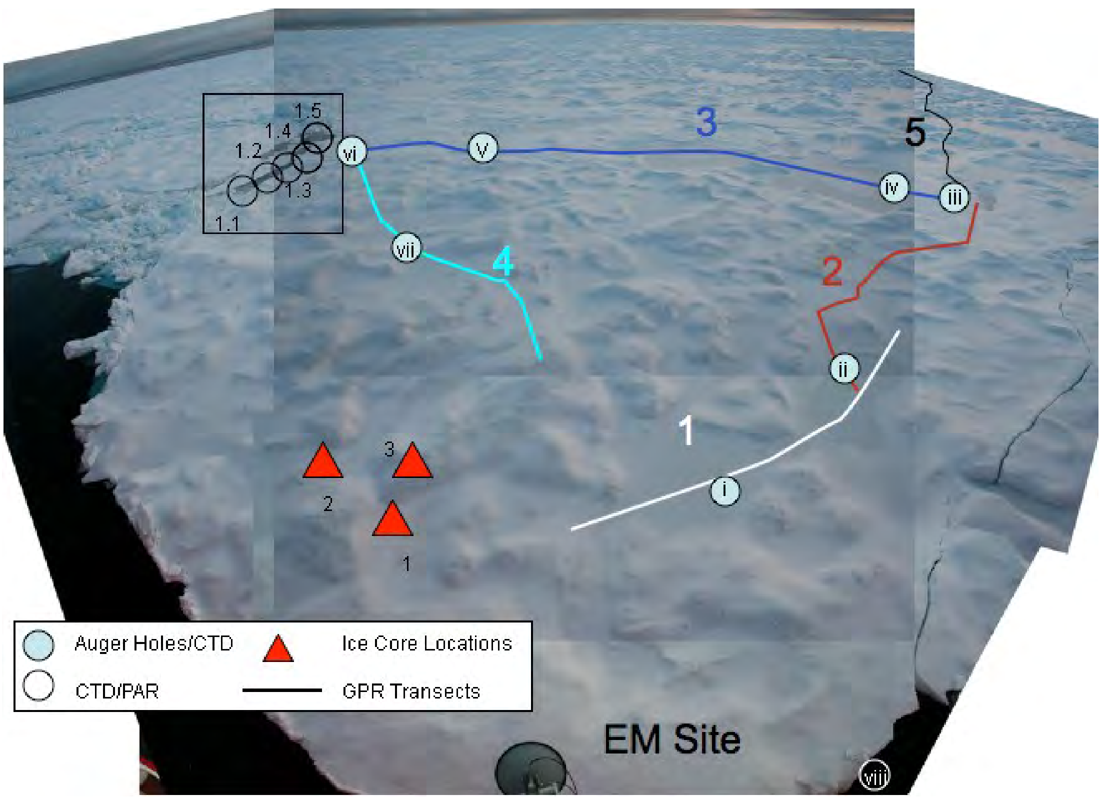

Figure 3.2. Site map of Station 307 on 23 September 2006.

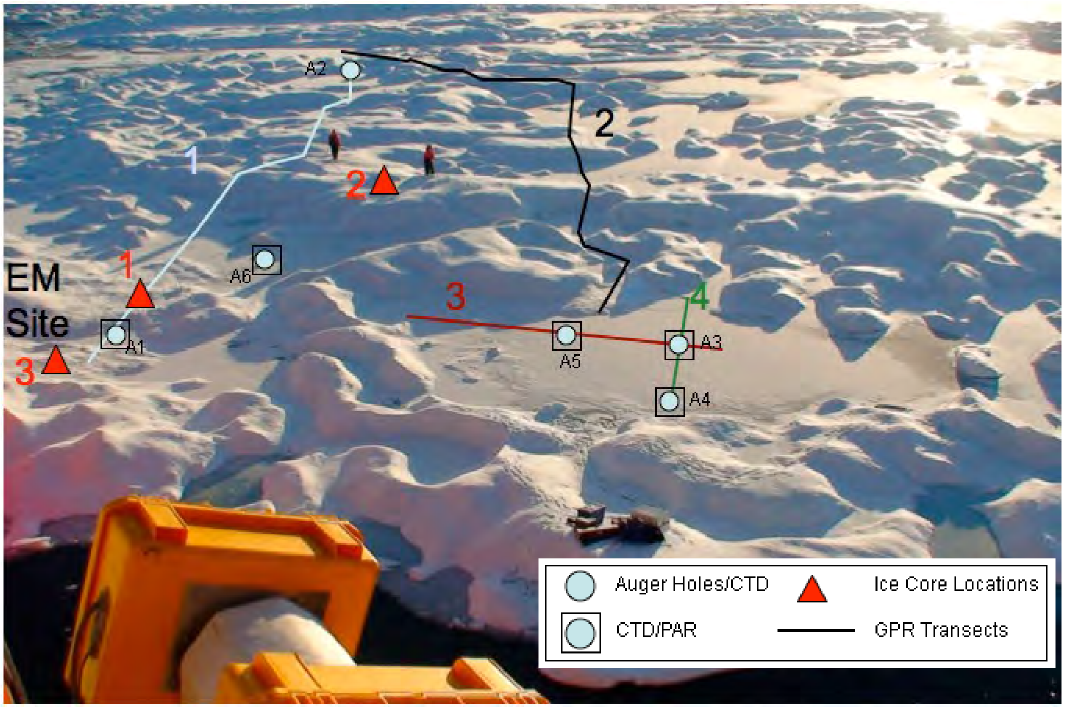

Figure 3.3. Site map of Station 310 in M'Clintock Channel on 25 September 2006.

3.2.2 Scatterometer

The scatterometer was a major part of the electromagnetic sampling program. The scatterometer used on the cruise was a fully polarimetric active monostatic radar system. It operates in C-band with a bandwidth from 5.25 to 5.75 GHz. The device performs a series of scans in a user defined swath in the azimuth and discrete elevation steps. From the data collected an estimate of the normalized radar cross-section (NRCS) can be obtained. Using these radar signatures in conjunction with a physical sampling program, electrical properties of the subject of the scan can be inferred and subsequently verified.

The prime area of interest for the scans was observation of sea ice. Measurements of multiyear ice (MYI), second year ice (SYI), and first year ice (FYI) were performed in several occasions. The FYI was primarily of the grease ice form. Site pictures were taken to aid in characterization of the physical region of interest.

In addition, as a point of interest, several scans of the ocean surface in various sea states were performed. Due to the relative high frequency of the energy there is essentially no penetration into the sea surface and therefore this type of measurement gives information on the surface roughness. Physical sampling of the water is not required, but many pictures of the surface were collected to aid in characterization of the surface. Successful scatterometer scans are listed in Table 3.1. In all cases the assumed height of the scatterometer above the surface was 8 m and this was measured prior to the first scan at Station 132. All other parameters were set to the default as per the manufacturer suggestion.

Table 3.1. Summary of scatterometer data collected during Leg 1 with the location, subject of the measurement, relevant radar parameters, and the filename of the recorded scan.

Station	Site	Subject	UTC	Azimuth	Elevation	Filename
132	1	MYI	09:19	0 – 30	15 – 65	Scan-20060908-211313
127	1	MYI	16:02	0 – 40	20 – 60	Scan-20060910-155638
	1	MYI	16:20	0 – 40	20 – 60	Scan-20060910-161354
	1	MYI	16:59	0 – 40	20 – 60	Scan-20060910-165249
	2	MYI	17:06	0 – 40	20 – 60	Scan-20060910-165941
	2	MYI	17:13	0 – 40	20 – 60	Scan-20060910-170654
118	1	MYI	12:49	0 – 40	20 – 60	Scan-20060914-124258
	1	MYI	13:01	0 – 40	20 – 60	Scan-20060914-125513
	1	MYI	13:18	0 – 40	20 – 60	Scan-20060914-131211
109	1	Ocean Surf	19:57	0 – 60	20 – 65	Scan-20060917-194919
	1	Ocean Surf	20:08	0 – 60	20 – 65	Scan-20060917-195749
	1	Ocean Surf	20:14	0 – 60	20 – 65	Scan-20060917-200618
101	1	Ocean Surf	20:49	0 – 60	20 – 65	Scan-20060918-204034
	1	Ocean Surf	20:57	0 – 60	20 – 65	Scan-20060918-204904
	1	Ocean Surf	21:06	0 – 60	20 – 65	Scan-20060918-205734
	1	Ocean Surf	21:14	0 – 60	20 – 65	Scan-20060918-210602
	1	Ocean Surf	21:22	0 – 60	20 – 65	Scan-20060918-211431
	2	Ocean Surf	00:45	0 – 60	20 – 65	Scan-20060919-003714
	2	Ocean Surf	00:53	0 – 60	20 – 65	Scan-20060919-004542
	3	Ocean Surf	02:29	0 – 60	20 – 65	Scan-20060919-022051
	3	Ocean Surf	02:37	0 – 60	20 – 65	Scan-20060919-022918
	3	Ocean Surf	02:46	0 – 60	20 – 65	Scan-20060919-023748
	3	Ocean Surf	02:54	0 – 60	20 – 65	Scan-20060919-024617
	3	Ocean Surf	03:03	0 – 60	20 – 65	Scan-20060919-025445
	3	Ocean Surf	03:11	0 – 60	20 – 65	Scan-20060919-030314
307	1	MYI	14:34	0 – 40	20 – 60	Scan-20060923-142800
	1	MYI	14:40	0 – 40	20 – 60	Scan-20060923-143416
	1	MYI	14:51	0 – 60	20 – 60	Scan-20060923-144353
	1	MYI	14:59	0 – 60	20 – 60	Scan-20060923-145152
308	1					Scan-20060924-160615
	1					Scan-20060924-161444
	1					Scan-20060924-162312
	1					Scan-20060924-163141
308.5	1	FYI	20:24	0 – 60	20 – 60	Scan-20060924-211655
	1	FYI	20:32	0 – 60	20 – 60	Scan-20060924-212454
	1	FYI	20:40	0 – 60	20 – 60	Scan-20060924-213252
	1	FYI	20:48	0 – 60	20 – 60	Scan-20060924-214048
	1	FYI	20:56	0 – 60	20 – 60	Scan-20060924-214848
	1	FYI	21:04	0 – 60	20 – 60	Scan-20060924-215646
	1	FYI	21:12	0 – 60	20 – 60	Scan-20060924-220447
	1	FYI	21:20	0 – 60	20 – 60	Scan-20060924-221244
310	1	MYI	13:12	0 – 60	20 – 60	Scan-20060925-140446
	1	MYI	13:20	0 – 60	20 – 60	Scan-20060925-141251
	1	MYI	13:28	0 – 60	20 – 60	Scan-20060925-142048
	1	MYI	13:36	0 – 60	20 – 60	Scan-20060925-142849
	1	MYI	13:55	0 – 60	20 – 60	Scan-20060925-144713

Station	Site	Subject	UTC	Azimuth	Elevation	Filename
	1	MYI	14:17	0 – 60	20 – 60	Scan-20060925-150905
	2	FYI	14:49	0 – 60	20 – 60	Scan-20060925-154109
	3	FYI	15:20	0 – 60	20 – 60	Scan-20060925-161234
	4	SYI	15:40	0 – 60	20 – 60	Scan-20060925-163227
	4	SYI	15:48	0 – 60	20 – 60	Scan-20060925-164024
	4	SYI	15:55	0 – 60	20 – 60	Scan-20060925-164823

3.2.3 Radiometer data

The two radiometer units that have been used in previous CEOS Arctic science projects were once again brought aboard the Amundsen for use in this expedition. The two different frequencies, 37 GHz and 89 GHz, were used for the data acquisition.

After being sent back to Radiometerics for repair during the winter, the units were shipped directly to Quebec City for use on Leg 1. Unfortunately, the units were not sent with all of the needed accessories. The power controller needed for both units and the positioner, were not included, and the matter was investigated immediately. It was determined that the company simply forgot to send them, and the missing components were sent immediately to Pond Inlet for pickup en route through the Northwest Passage. After being delayed and not returning to Pond Inlet, the units were sent to Resolute Bay, for pickup after the community visit on 22 September.

Figure 3.4. Photo of the shipboard radiometers.

The units were finally operational on 24-25 September and collected data coincident with the scatterometer observations listed in Table 3.1. When on station, the radiometers were scanning from 30°-70° (from Nadir), in 5° step increments. While in transit, the units were left in a position of 53° (from Nadir). Observations ended on 27 September.

3.2.4 EM - Ground confirmation data

Ground confirmation data was obtained at the sites at which the EM sampling occurred. An ice auger was used to determine ice thickness at select locations, including hummocks and melt ponds. A core barrel was used to obtain 1 or more meter-long sections of ice at each EM site. If snow cover was present, snow samples were also collected.

The main parameters of interest in the ice cores were ice temperature and salinity. In the field a temperature probe was used to measure the temperature of the air, the air-snow interface, and the air-ice interface. Once the ice core was extracted, the temperatures were measured by drilling into the core at 10 cm intervals with a starting point of 5 cm from the top of the ice core. The core was then sliced into 10 cm segments and placed in containers. Once back on the *Amundsen*, the samples were allowed to melt and the conductivity and temperature was measured. The conductivity and temperature in conjunction with well known models will yield the salinity profile of the ice core.

Table 3.2. Summary of ice cores collected at EM sites.

Station	Core Number	Ice Core Location
118	1	Hummock
307	1	Melt Pond
	2	Melt Pond
	3	Hummock
310	1	Hummock
	2	High Hummock
	3	Melt Pond

3.2.5 Ground Penetrating Radar (GPR)

The addition of a GPR (Ground Penetration Radar) system for remote sensing of sea-ice was introduced during Leg 1. This novel use of a GPR system to view the structure of sea-ice on a multiyear floe will give a major insight into the changing physical system in the North. The modeling system is comprised of both a 250 MHz and 1 GHz setup which can be manipulated using Sensors and Software's EKKO_View Delux program. Each antenna configuration has a transmitting and a receiving antenna side by side in a skid plate. These antennae will allow sea-ice to be probed at a finer level than other methods. Point and transect surveys were conducted to correlate GPR data with actual depth and ice content data, which is done by conventional methods.

Many different variations were performed in collecting the GPR data, with both of the operating frequencies examined. The lower frequency system was able to probe much deeper into the ice and gave a good indication as to the ocean-ice interface, though at a low resolution. The higher frequency system was unable to probe as deep as the lower one, but gave a much finer resolution. The specific settings in each of the different frequencies were examined to yield optimal results:

- the time window setting was left at the recommended value of 100 ns (250 MHz) and 25 ns (1 GHz)
- the temporal sampling interval was also left at the recommended value of 0.4 ns (250 MHz) and 0.1 ns (1 GHz)
- the minimum antenna separation (between the transmitter and receiver antennas) is 0.38 m (250 MHz) and 0.15 m (1 GHz)
- the recommended antenna step size was set to 0.05 m (250 MHz) and 0.01 (1 GHz)
- the radar velocity setting on the DVL (digital video logger) was set to 0.165, which is the closest setting to view ice
- a stacking size dependant on the time constraint of the day – a larger size gives a better SNR (signal to noise ratio) but takes longer to acquire

Figure 3.5. Two-person team operating GPR units.

The setup was performed with a two-person team. The first person would lead the group along the intended path and ensure the GPR units were free from obstruction, pull the units with a rope, ensure the units were not running over their own cable, and to lead as best of a strait linear route as possible. The second person would be on the other side of the units, holding slack on the rope, with the excess cable in a backpack, and holding the DVL, as seen in Figure 3.5.

The GPR setup was done on four separate occasions. The first experiment was performed on 8 September. This was done as a “dry run”. The data set was neither confirmed with physical depth measurements from auguring, nor examined thoroughly since it was meant as an introductory setup for the system on the ice, time did not permit collection of ground confirmation data.

The second experiment was performed on 14 September. This exhaustive look at the ice floe (see Figure 3.1) was done with transect observations. Six different transects were created along the floe. Cores were done at several locations, including melt ponds and low lying area to get a benchmark for ice thickness as a way to verify GPR data collected. Unfortunately, the actual ice thickness could not be determined as the ice thickness exceeded the auger length of 4 m. The nature of the slush and water content that was being drilled up gave a feeling the floe in most areas was approximately 5 meters deep. The GPR data though was not able to yield any more information than this as the thickness could not be verified.

The third run of the GPR units took place on 23 September. The ice floe was a very large, with many ponds, and low level hummocks (see Figure 3.2). Five transects were traversed: the first four formed a square shape and the fifth was a long 200 m transect. Parallel and perpendicular orientation of the units was performed to investigate the anisotropy of sea ice.

The 250 MHz antennas used 64 stacks, rather than the conventional 8 or 16, to get a good profile of the ice since time permitted this. The 1000 MHz antennas used 8 stacks, as the higher frequency system took longer to collect the data.

Augering was performed to verify the ice thickness at a number of sites (Figure 3.6). Of the seven auger sites attempted, six of them could be used later to verify thickness, as they were less than 4 meters thick (Table 3.3).

Figure 3.6. Augering performed to correlate GPR data with actual thickness

Table 3.3. Auger holes locations and ice thickness for Station 307.

Location	Thickness (m)
1	3.75
2	3.20
3	3.35
4	3.20
5	2.95
6	3.85
7	>4

The final experiment of the GPR antennas took place on 25 September. Concurrent with EM sampling of the multiyear floe from the *Amundsen*, three main GPR transects were done. Of major interest on this floe were the many melt ponds, some of them under 5 cm thick in the centre, and the odd shaped hummocks scattered over the entire area. To ensure the system was properly configured over the diverse environment, the time zero auto function was run before each data collection. Seven auger holes were drilled (Table 3.4).

Table 3.4. Auger holes locations and ice thickness for Station 310.

Location	Thickness (m)
1	2.55
2	2.55
3	0.15
4	3.15
5	0.10
6	0.10
7	3.85

A very interesting feature on this floe was a melt pond that had a top layer of ice of approximately 11 cm, followed by a water layer of roughly 34 cm. After this layer of water, was another layer of ice 3.5 m thick, for a total thickness of 3.85 m. The 1000 MHz antenna gave a very strong return for the top layer, but not the remainder underneath.

GPR datasets

The data collected at the first two sites (Stations 132 and 118) are not shown below due to the corresponding auger data of thickness not being deterministic of the physical thickness. They can therefore only be used for relative comparison of like floe, and not for a direct comparison between trace and physical thickness. As well, at Stations 307 and 310, more transects and spot measurements were done.

Table 3.5. Traces collection at Station 307 where T: Transect, P: Perpendicular Orientation, A: Auger.

Type of trace	250 MHz	1000 MHz
T1	00	13
T1P	01	14
T2	03	15
T2P	04	16
T3	06	17
T3P	09	18
T4	07	19
T4P	08	20
T5	10	
T5P	11	
A1	02	
A2	05	12

Table 3.6. Traces collection at Station 310 where T: Transect, P: Perpendicular Orientation, A: Auger, H: Hummock, S: Spot, MP: Melt Pond.

Type of trace	250 MHz	1000 MHz
T1	00	00
T1P	02	14
T2	01	01
T2P	03	

Type of trace	250 MHz	1000 MHz
MP1	05	02
MP1’	06	
MP1’P	07	
A1P	08	
A1	09	
A1(45°)	10	
S1	11	
S1P	12	
H1	13	
H1P	14	
A2	15	
A2P	16	
H2	17	
H2P	18	
H3P	20	
H3	21	
A3	22	
A3P	23	
A4	24	
A4P	25	
A5		04
S2		06
S3		07
S4		08
S5		09
A6		14
A6P		15
T3		16
T3P		17

3.2.6 CTD and PAR profiles

CTD profiles were made within the marginal ice zone on 3 dates during Leg 1, in the upper layer of the ocean surface (0-50 m). The Ocean Seven 304 CTD probe measured pressure (dbar), temperature (ºC), conductivity, salinity (mS/cm), and turbidity. The intent was to examine the impact of melting ice on the local marine environment and hence its potential impact on the local marine system. Prior to each CTD cast, the instrument was conditioned at the sea surface for 30 seconds. The instrument was then released by hand at a rate of approximately 20 cm/s to a depth of 50 m. The CTD remained at 50 m depth for 30 seconds before initiating the ascending portion of the cast. The sampling rate of the probe was at set at 8 Hz.

Additional CTD casts were made with a PAR (photosynthetically active radiation) sensor mounted above the CTD probe (Figure 3.7). The PAR sensor measured photosynthetically active radiation in the water column. The intent was to measure light fields under and adjacent to ice floes under various sea ice and cloud cover scenarios as an indicator of potential productivity within different ice regimes, and estimating these on a larger scale using optical and microwave satellite data. The casts with the CTD/PAR sensor combination were modified to obtain appropriate PAR data, as the PAR instrument sampled at one second intervals. A CTD/PAR cast started with the PAR sensor above the water using a 30 second interval (with the CTD in the water for conditioning), followed by a PAR reading immediately below the water surface (note: all samples were obtained over a 30 sec interval). Subsequent PAR readings were made at 5 m intervals, down to 50 m. Depending on ice conditions and thickness, samples were obtained in open water, adjacent to large ice floes, or below ice floes using auger holes.

Figure 3.7. CTD probe with PAR sensor.

__Station 118, North Water (NOW), 14 September__

CTD casts were made in multi-year (MY) pack ice at Site 118 North Water (Figure 3.8). The site had ~9/10 ice concentration. Locations of the profiles are indicated on the site map (Figure 3.1) and data collected at each site is summarized in Table 3.7.

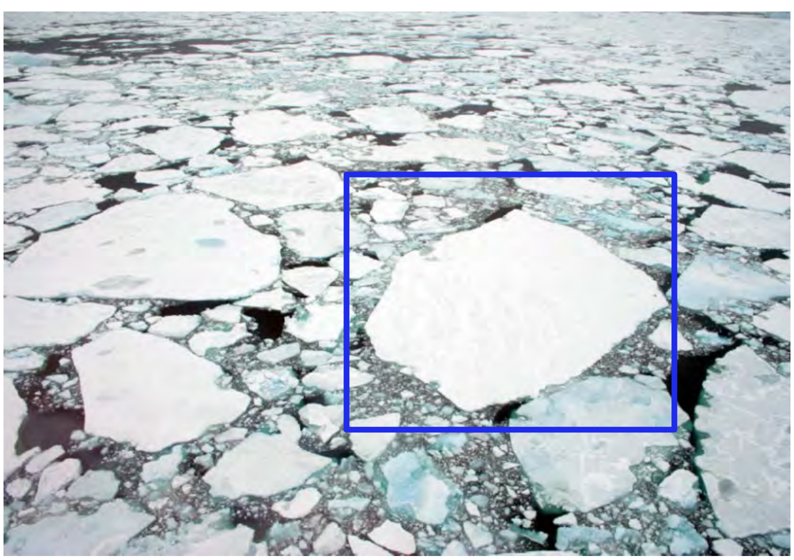

Figure 3.8. Photo at Site 118 in the North Water showing overall ice conditions and floe used for EM site and CTD work.

Table 3.7. List of CTD/PAR casts at Site 118, North Water, on 14 September during Leg 1.

Site_Cast	CTD	PAR	Time (UTC) from	Time (UTC) to	Comments
118_1	x	x	19:06:24 21:08:06	19:16:56 21:15:50	In gap between to large thick MY floes
118_2	x	x	19:20:30 20:56:50	19:30:28 21:04:14	Slushy ice at surface
118_3	x		19:36:55	19:41:17	Some open water at site, 30o angle on rope, note: wind out of the north, ice moving against wind.
118_4	x		19:54:39	19:59:05	
118_5	x		20:05:10	20:16:15	Ice covered

Belcher Glacier, 19 September

CTD surveys were conducted along the terminus of the Belcher Glacier on 19 September (Table 3.8). This data was collected using the skippy boat as the survey platform. No CTD/PAR data was obtained at this site due to time constraints.

Table 3.8. CTD casts obtained at Site 100, Belcher Glacier, on 19 September during Leg 1.

Waypoint	Latitude N	Longitude W	Water Depth (m)
WP_39	75.65014	81.28638	35
WP_40	75.65189	81.28765	100
WP_41	75.65407	81.28961	210
WP_42	75.65597	81.28415	230
WP_43	75.65813	81.28534	233
WP_44	75.65939	81.27962	263
WP_45	75.66207	81.28168	275
WP_46	75.66494	81.2839	265
WP_47	75.66827	81.28046	200
WP_48	75.67118	81.27465	179
WP_49	75.67307	81.27312	123
WP_50	75.67657	81.2578	118
WP_51	75.68102	81.25818	161
WP_52	75.68551	81.25176	47
WP_53	75.69012	81.25702	140
WP_54	75.69474	81.25835	174
WP_55	75.70018	81.25865	60
WP_56	75.70305	81.24368	60
WP_57	75.70772	81.23878	45
WP_58	75.71044	81.23925	12
WP_59	75.68712	81.22367	48
WP_60	75.67883	81.22607	130

Site 307, 23 September

Site 307 was located southwest of Resolute Bay, on a large multi-year ice floe (see Figure 3.2). Six CTD profiles were made through auger holes along the GPR transects (vi – i); 5 CTD/PAR profiles were made along a frozen lead between to large multi-year ice floes (1.1-1.5), and 1 CTD/PAR profile was made at the floe edge (viii) (Table 3.9; note ice thickness in comments column).

Table 3.9. CTD and PAR profiles made at Site 307 on 23 September during Leg 1.

Site Map ID	CTD	PAR	Time UTC from	Time UTC to	Cast	Comment
viii	x	x	16:24:36	16:41:17	1	At ice edge; CAST 1
1.1	x	x	18-31:44	18:44:53	2	along frozen lead, brackish in rubble
1.2	x	x	18:45:24	18:56:18	2	along frozen lead, new ice, grey
1.3	x	x	18:56:29	19:08:11	2	along frozen lead
1.4	x	x	19:08:27	19:19:26	2	along frozen lead
1.5	x	x	19:19:43	19:31:28	2	along frozen lead
vi	x		21:12:35	21:19:56	3	auger hole on GPR transect; 3.85 m
v	x		21:20:45	21:24:42	3	auger hole on GPR transect: 2.95m
iv	x		21:25:53	21:30:10	3	auger hole on GPR transect; 3.2m MP
iii	x		21:30:19	21:34:34	3	auger hole on GPR transect; 3.35m
ii	x		21:35:13	21:39:19	3	auger hole on GPR transect; 3.2m MP
i	x		21:39:54	21:43:55	3	auger hole on GPR transect; 3.75 m
1.5	x	x	21:47:10	21:53:36	4	repeat
1.4	x	x	21:56:52	22:04:04	4	repeat
1.2	x	x	22:02:17	21:14:00	4	repeat

Site 310, M'Clintock Channel, 25 September

Table 3.10. CTD and PAR profiles made at Site 310 in M'Clintock Channel on 25 September during Leg 1.

Site Map ID	CTD	PAR	Time UTC from	Time UTC to	Cast	Comment
OP1	x	x	19:15:07	19:25:39	1	200 south of floe open water
OP2	x	x	19:27:07	19:35:35	2	50m east of floe between 2 floes
A5	x	x	19:53:45	20:04:37	3	thin FY over MP (8cm)
A1	x	x	20:13:28	20:21:05	3	thin FY over MP (8cm)
A6	x	x	20:23:15	20:32:49	3	2.5 m ?
TBD	x	x	20:40:52	20:49:48	3	EM Site hummock
TBD	x	x	20:50:21	20:57:44	3	Melt pond (MP)

Seven CTD/PAR profiles were made through a large ice floe (Table 3.10) and all profiles were made through auger holes (see locations in Figure 3.3). The PAR sensor on this day was attached to the rope with hose clamps. The first two profiles were located on open water. The first three ice profiles were made through a melt pond with a thin layer of ice. The first two profiles had an ice cover of 8 cm, the other holes had an ice cover of approximately 2.5 m. Each of the profiles at this site went to a depth of 48 m, at 5 meter intervals as previously outlined.

3.2.7 Meteorological observations, ceilometer and All-Sky camera

As part of the core sampling program of the research group, regular meteorological observations were conducted. Although the majority of the observations were automated, they were augmented on an opportunistic basis using a human observer. The sampling program involved meteorological observations (Met. Obs.), a ceilometer and an all-sky camera setup.

The meteorological observations were conducted on an hourly basis. Surface meteorological observations were provided by the ship's Automatic Voluntary Observing Ship (AVOS) system. Parameters of interest that were recorded were atmospheric pressure, air temperature, sea surface temperature, relative humidity, absolute wind direction, and wind speed. In addition, the latitude, longitude, ship speed, and ship direction were recorded. It is important to note that when the ship speed is very low (<0.5 knots) the ship direction may not be correct since this parameter is GPS-based and therefore the relative position was used. If the ship was not moving significantly, then the heading may be incorrect. Note that the AVOS was never used for navigational purposes.

In addition to recording AVOS data, manual observations of the sky were performed and cloud types, total cloud amount, opacity, solar disk, present weather, and visibility were recorded. The cloud types observed were defined using a typical cloud description booklet and standard meteorological descriptions. The total cloud amount was created by mentally dividing the sky into eighths and establishing the total cloud cover, while the opacity referred to the percentage of the sky which could not be seen through the cloud. The solar disk referred to the ability to see the sun itself. Present weather was based on simple observation and visibility was documented based on sighting of far off objects and aided by radar measurements from the bridge. Due to the subjective nature of the sky observations, one person generally documented an entire day. Gaps in the data occurred due to the field sampling program when the observers were otherwise occupied. The observations took place from Julian Days 256 to 270.

The ceilometer is a laser-based device measuring the cloud base height. Measurements began on 8 September and ended on 27 September. The purpose of the All Sky camera was to document the current sky conditions, particularly focusing on the presence or absence of clouds. It consisted of a camera stand which directed a camera downward. Underneath the camera was a large reflective dome that reflected the sky from horizon to horizon in the picture. An issue arose with camera settings and therefore the pictures were acceptable only from 13 to 28 September. A Creative Labs camera was operated using time delay video, taking pictures at a rate of one picture every 5 s. Although the sky was observable in the pictures, a higher resolution camera would produce higher quality data.

3.2.8 IR Transducer

Figure 3.9. The IR Transducer, with WebCAM setup.

A LICOR IR transducer was mounted immediately adjacent to the radiometer shed. The sensor measured sea surface temperature. The data were collected on a continuous basis throughout the cruise commencing on 8 September, at a rate of once a minute. The angle of the unit was moved to 55° from the horizontal. Recorded data span the whole leg aside from two small intervals, between 17 and 18 September, and between 22 and 24 September. The reason the data were not recorded is due to the logger previously being able to hold well over six weeks of data, suddenly could only hold a few days at maximum. After this was discovered, more frequent downloads were done to ensure data was always collected, and never purged. The setup can be seen in Figure 3.9, with the WebCAM visible as well.

3.2.9 WebCAM

Figure 3.10. Sample image of ice and sea state from the WebCAM on 25 September during Leg 1.

The Web-Camera was mounted next to the Radiometer shed and IR transducer. It recorded images every 10 seconds, to document presence/absence of ice and relative sea state. Its purpose was to image the area observed by the scatterometer, radiometer and IR transducer. Data was collected each day from 8 through 26 September. A sample image from 25 September is seen in Figure 3.10.

3.3 Preliminary results

3.3.1 Radiometer data

An example of the preliminary data obtained from a scan of a MYI floe is shown in Figure 3.11. Further processing will be conducted for better analysis of the data, including accounting for near field effects of the antenna and statistical averaging.

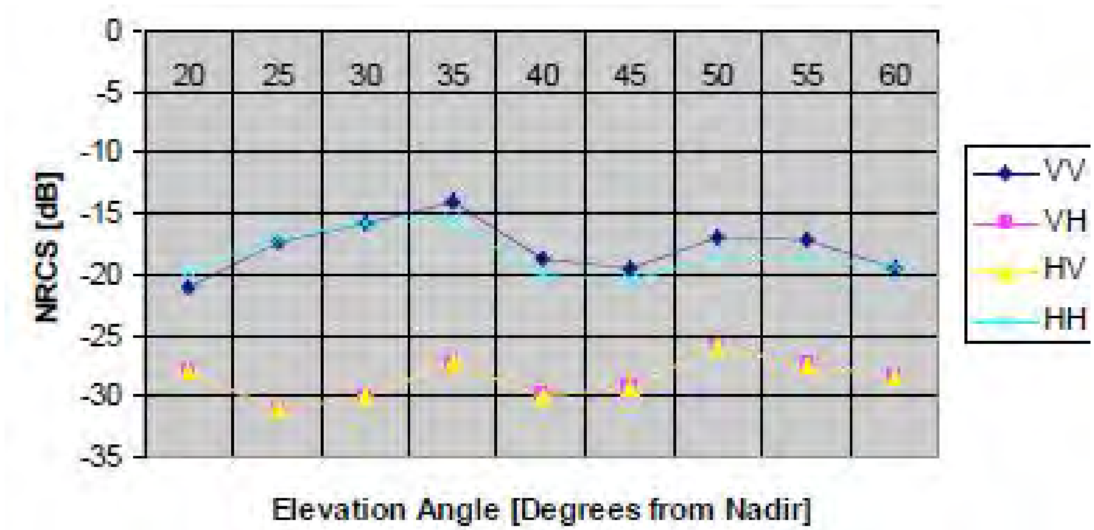

Figure 3.11. Normalized radar cross-section of a Multi-year ice floe performed on 14 September 2006.

3.3.2 EM – Ground confirmation data

Ice cores were taken on hummocks and melt ponds. A sample temperature and salinity profile from a melt pond on a multiyear floe is given in Table 3.11. The ice team managed to successfully land on, and collect data, from a multiyear floe on three occasions. The details of each of the ice cores, including temperature and conductivity profiles, are documented in Icecores_Amundsen2006_Leg1.xls.

Table 3.11. An example of ice core data taken at Station 307 on 23 September during Leg 1.

Station: 307
Core: 1 of 3
Date: 23-Sep-06
Location of Core: Melt Pond
Snow Thickness 2 cm

Field Data		Laboratory Data		
Location	**Temperature[°C]**	**Location**	**Temperature [°C]**	**Conductivity [µS/cm]**
Air	-1.7	Surface Snow	11.3	136.8
Air-Snow Interface	-1.6	0 - 10 cm	10.3	49.1
Snow-Ice Interface	X	10 - 20 cm	21.9	24.8
5 cm	X	20 - 30 cm	19.2	72.1
15 cm	-1.6	30 - 40 cm	18.0	143.3
25 cm	-1.2	40 - 50 cm	10.0	299

Field Data		Laboratory Data		
Location	Temperature[°C]	Location	Temperature [°C]	Conductivity [µS/cm]
35 cm	-1.1	50 - 60 cm	24.7	427
45 cm	-1.1	60 - 70 cm	9.8	715
55 cm	-0.7	70 - 80 cm	20.4	1006
65 cm	-0.5	80 - 90 cm	14.3	837
75 cm	-0.5	90 - 100 cm	11.6	871
85 cm	-0.7	100 - 110 cm	X	X
95 cm	-0.8			
105 cm	-0.8			

3.3.3 CTD profiles and PAR profiles data

Sample profiles are shown for Site 118_2 (Figure 3.12), it should be noted that all CRT/PAR data needs be further processed to take into account variations in rates of descent and ascent per cast.

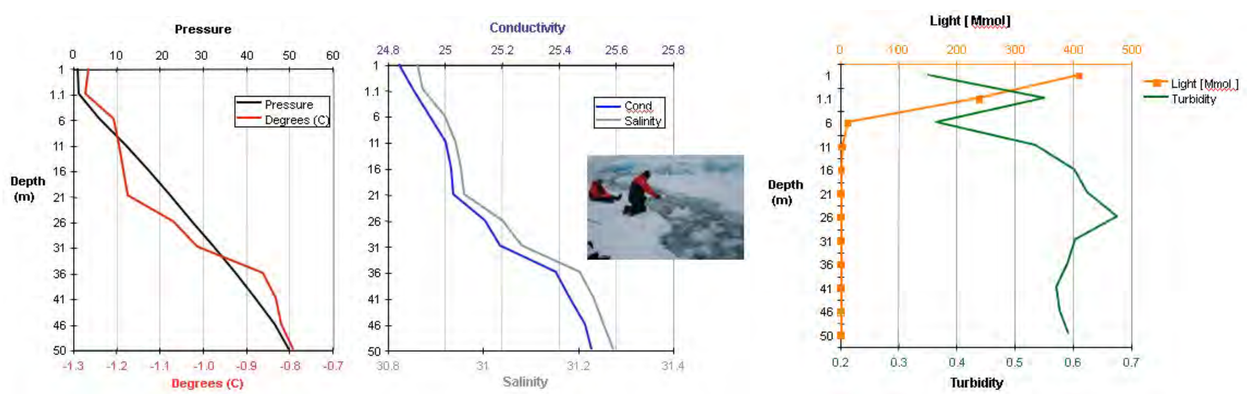

Figure 3.12. Sample CTD and PAR data collected at Site 118_2 in NOW during Leg 1.

4 Mooring program – Legs 1 and 2a (Amundsen) and BaySys (Radisson)

ArcticNet Phase I – Theme 1: Climate Change Impacts in the Canadian High Arctic: a Comparative Study Along the East-West Gradient in Physical and Societal Conditions. ArcticNet/Phase 1/Project 1.1.
ArcticNet Phase I – Theme 3.3: Climate Variability / Change and Marine Ecosystem Resources in Hudson Bay. ArcticNet/Phase 1/Project 3.3.

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Cruise participants BaySys: Luc Michaud[2], Josée Michaud[2], Marc Robitaille[2] and Greg McCullough[4]
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4.1 Introduction

The overarching objective of the ArcticNet Mooring Program, begun in 2004, is to establish long-term oceanographic observatories in Baffin Bay (NOW Polynya region), in the Beaufort Sea and in Hudson Bay (Figure 4.1), to track changes in the physical, biological and geochemical properties of Canadian Arctic and subarctic waters and collect fundamental information to better understand how climate warming is affecting the Arctic.

In 2006, mooring operations were conducted from the CCGS *Amundsen* in Baffin Bay (Leg 1) and in the Beaufort Sea (Leg 2a) from 7 September to 18 October. A third set of ArcticNet mooring operations took place on 12-24 September onboard the CCGS *Pierre Radisson*, which sailed to Hudson Bay to carry out activities of the BaySys program.

The primary objectives of the ArcticNet Mooring Program for 2006 were to:

- Recover and re-deploy the four North Water Polynya (NOW) moorings in northern Baffin Bay (BA01-, BA02-, BA03- and BA04-).
- Recover the four ArcticNet moorings that were deployed in 2005 in the Beaufort Sea (CA04-05, CA05-05, CA08-05 and CA18-05) and re-deploy three of these moorings (CA04-06, CA08-06 and CA18-06).
- Recover and re-deploy the four moorings in Hudson Bay (AN01-, AN02-, AN03- and AN04 (MH)-) as part of the BaySys program, a collaboration between ArcticNet and Hydro Manitoba.

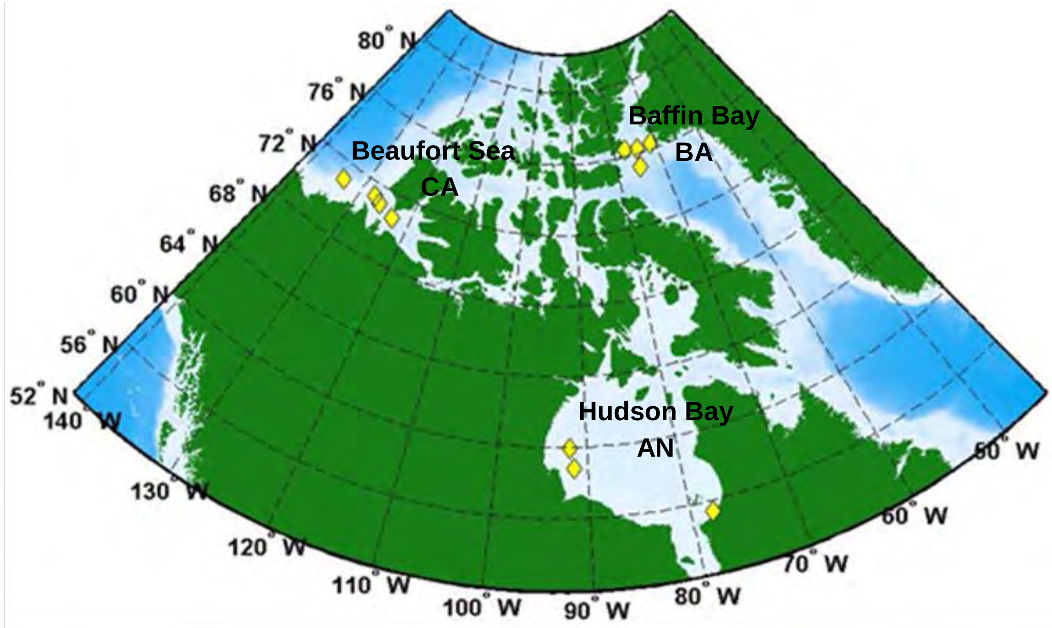

Figure 4.1. Locations of ArcticNet oceanographic moorings. Mooring recoveries and deployments in Baffin Bay (BA) were carried out during Leg 1 of the CCGS *Amundsen* Expedition. Recoveries and deployments in the Beaufort Sea (CA) took place on Leg 2a. Mooring recovery and deployment operations in Hudson Bay (AN) were conducted from the CCGS *Pierre Radisson* as part of the BaySys program.

4.1.1 Regional objectives

The moorings re-deployed in Baffin Bay in 2006 (labeled BA##-06) aim to investigate the particulate organic carbon (POC) fluxes relative to the oceanographic characteristics (current speeds, temperature, salinity, etc.) in the North Water (NOW) Polynya.

The primary objective of the Beaufort Sea moorings re-deployed in 2006 (labeled CA##-06) aim at better understanding the character and causes of variability and change in the Canada Basin. The secondary objective is to improve understanding of the influence of topography on the exchange of waters between the continental shelf and the ocean basin. The Beaufort Sea moorings carried sediment traps to measure the carbon flux and were equipped with ADCP current profilers and CTD sensors to measure associated oceanographic conditions to investigate the fluid dynamics in relation to detrital transport.

The objective of the Hudson Bay moorings redeployed in 2006 (labeled AN##-06) is to study the strength of the anti-cyclonic circulation along the Hudson Bay coast which involves currents very close to shore. The second objective is to investigate the west-east gradient in productivity close to the main rivers.

Table 4.1. ArcticNet moorings deployed in 2006 in Baffin Bay (BA) and the Beaufort Sea (CA) during Legs 1 and 2a of the CCGS *Amundsen* Expedition, and in Hudson Bay (AN) from the CCGS *Pierre Radisson*.

Mooring ID	Area	Rationale	Program	Latitude N	Longitude W	Depth (m)
Baffin Bay						
BA01-06	Baffin Bay East near Greenland	Eastern NOW polynya at the location of Mooring S2 deployed in 1998. Eastern end of ArcticNet Baffin Bay transect visited each year.	ArcticNet	76° 19.692	071° 13.626	670
BA03-06	Baffin Bay West near Ellesmere Island	Western NOW polynya at the location of mooring S5 deployed in 1998. Western end of ArcticNet transect visited each year.	ArcticNet	76° 23.154	077° 24.624	358
Beaufort Sea						
CA04-06	Kugmallit Valley, upper Mackenzie Shelf slope	Enhanced cross-shelf transport during upwelling-favorable surface stress (NE winds), but upwelling not as strong as in the Mackenzie Canyon or near Cape Bathurst. Downward flow of dense water (convection and/or wind-driven downwelling) from the Mackenzie Shelf inducing off-shelf transport of particulate matter. Very strong resuspension events recorded in winter, as for other sites on the slope.	ArcticNet	71° 04.812	133° 37.764	301
CA08-06	Amundsen Gulf West (central)	Center of the Cape Bathurst polynya (Barber and Hanesiak 2004). Very good candidate for the long-term monitoring of particle flux to catch both seasonal and inter-annual variability in marine productivity without large terrigenous inputs characterizing moorings close to the Mackenzie Shelf.	ArcticNet	71° 00.624	126° 03.966	397
CA18-06	Amundsen Gulf East (deepest point)	Location of historical DFO-IOS mooring (Melling & McLaughlin) monitoring the deepest point in Amundsen Gulf. Deep sediment trap (450 m) at this location over 2003-2007 revealed no trend in particle flux signal but strong resuspension.	ArcticNet	70° 39.906	122° 59.556	543
Hudson Bay						
AN01-06	Hudson Bay W north of Nelson R.	Located very close to shore to study the strength of anti-cyclonic circulation along the HB coast and to investigate W-E gradient in productivity close to main rivers. This mooring is part of the BaySys project.	ArcticNet	59° 58.638	091° 56.628	106
AN03-06	Hudson Bay E near Great Whale R.	Same Rationale as AN01-06	ArcticNet	55° 24.438	077° 55.704	130
AN04-06	Hudson Bay W in Nelson R. outer estuary	Same Rationale as AN01-06 and Manitoba Hydro partnership	ArcticNet Manitoba Hydro	57° 34.194	091° 37.704	45

4.2 Methodology

4.2.1 Mooring design and instrumentation

ArcticNet moorings were designed in a taut-line configuration (Figure 4.2). The first instrument deployed close to the surface was a conductivity-temperature (CT) probe with different models of Sea-Bird or Alec instruments being used. Sediment traps located at 100 m and/or 200 m were always attached 5 to 110 m below a current meter on the mooring line. Acoustic Doppler Current Profilers (ADCPs) were deployed at 100 m so they could provide current velocity and direction data from 100 m upwards while classical RCM11 current meter were used at 200 m and 400 m. Tables 4.8 to 4.18 in Section 4.2.5 detail the mooring line design and instrumentation employed on the individual moorings deployed in 2006, but the configuration of the mooring line generally consisted of:

- a top float
- a Conductivity, Temperature and Depth (CTD) probe to record water characteristics
- a Hydrophone – bioacoustics and underwater noises
- RCM 4/7/11 plus Conductivity, Temperature and Depth (CTD) probe to record current velocity and direction and water characteristics
- sediment trap to collect descending sediment for particle flux analysis and accumulation rates
- an Acoustic Doppler Current Profiler (ADCP)
- in-line floatation to balance the weight/ float balance throughout the mooring line
- sediment trap to collect descending sediment for particle flux analysis and accumulation rates
- RCM 4/7/11 plus Conductivity, Temperature and Depth (CTD) probe to record current velocity and direction and water characteristics
- in-line floatation to balance the weight/ float balance throughout the mooring line
- two tandem mooring releases
- an anchor (one to three train wheels)

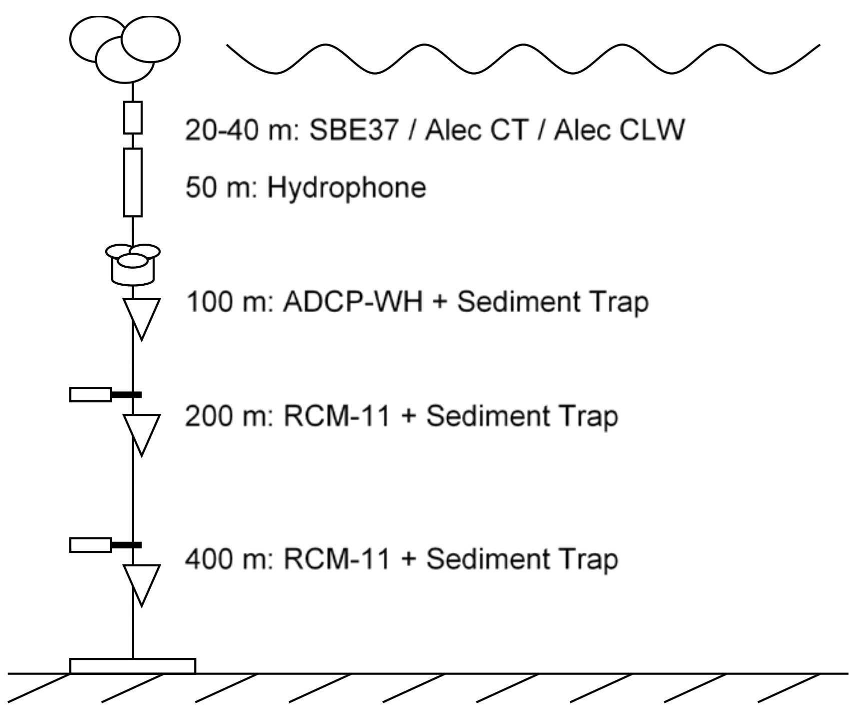

Figure 4.2. Illustration of a typical taut-line ArcticNet mooring.

4.2.2 Mooring equipment calibration and verification

Sensors calibration and validation

The sensors on Aanderaa RCM, SeaBird and JFE-ALEC instruments were calibrated by the manufacturers and were validated by the Université Laval and/or ArcticNet technical team (details on the source and status of calibrations & verifications for all instruments are provided in Boisvert et al. 2010 and Meredyk 2014).

Field verifications of internal compasses

Compass accuracy is essential for current meters deployed near or above the Arctic Circle due to the reduced magnitude of the horizontal component of the earth's magnetic field. It was therefore important to verify internal compasses near the approximate latitude where they were deployed. Care was taken to eliminate all ferrous material in the mooring cages and in the environment when conducting these verifications.

The internal compasses of all ADCPs and current meters needed for the moorings deployed in each of the three regions were verified on shore close to their respective deployment sites (Table 4.2 and 4.3). In addition, the compasses of 2005 mooring equipment recovered in 2006 needed in many cases to be verified again and they were re-tested along with the 2006 instruments.

The compass verification procedure followed standard manufacturer protocols and were conducted with a tilt and rotate jig using a tripod with a spinning top fixture, where the instrument was installed (Meredyk 2014). A Garmin hand-held GPS unit was used to establish a distinct true North sight line from the tripod to a landmark, and the successive instrument direction readings were obtained by rotating the unit relative to this true North direction, in 10-degree increments.

In Baffin Bay, two compass verification sites were selected (Figure 4.3); Belcher Glacier proved inappropriate for compass verifications but the site of Cape Isabella was suitable. It is essential to find another site at a lower latitude to facilitate the logistics of on-shore field activities for Baffin Bay moorings.

At Belcher Glacier, five RCM4 units deployed in 2005 and recovered in 2006 were tested but the compass readings were unstable and it was difficult to obtain a constant value, possibly due to magnetic interference and/or temperature sensor faults induced by sub-zero temperatures (the units were calibrated by the manufacturer for non-arctic conditions). Therefore, a good compass validation of the RCM 4 units was not achieved and a re-testing of these devices would be necessary in 2007.

At the Cape Isabella site, the compasses of three RCM11 (SN# 276, 282 and 283), one RDI ADCP LongRanger (2005 deployment: SN# 3815), one RDI ADCP Workhorse-Sentinel (SN# 3545) and four RCM4 (SN# 2325, 4292, 8570 and 9670) were verified. The theoretical

Magnetic deviation value was 60.58° (NRCan website) and the observed deviation onsite was 61°, a variation of 0.5° from the theoretical value.

None of the ADCPs and current meters deployed in Baffin Bay in 2006 (on Moorings BA01-06 and BA03-06) were recovered in 2007 and thus the results from these verifications are not shown in Table 4.3.

Figure 4.3. 2006 Baffin Bay mooring instrumentation compass verification sites in Belcher Glacier and Cape Isabella.

For the Beaufort Sea region, three compass verification sites were used to test instruments deployed in 2006: DeSalis Bay, Sachs Harbour and Horton River. DeSalis Bay was an excellent site due to the absence of magnetic interference and the proximity to the geographical positions of moorings (Figure 4.4). The theoretical magnetic deviation was 30.22° (NRCan) with a theoretical variance of 3°. The *in-situ* heading variation was recorded as being 2.8°. In DeSalis Bay, the compass of three RCM 4 (SN# 4644, 8572 and 8672) units, two RCM 11 (SN# 271 and 272) units and three RDI ADCP WHS (SN# 3778, 3844 and 7844) units were successfully verified prior to their deployment.

The Sachs Harbour site was also an excellent place for compass verifications in the area of the Beaufort Sea (Figure 4.4 and 4.5). The theoretical magnetic declination was 31.15° (NRCan) while the *in-situ* compass heading was recorded as being 33°, representing a variation of 1.8° from the theoretical value. At Sachs Harbour, one RCM 7 (2005 deployment: SN# 10301), four RCM 11 (2005 deployment: SN#; 2006 deployment: SN# 274) units and two RDI ADCP WorkHorse-Sentinels (2005 deployment: SN# 2645 and 2646) were successfully verified.

The Horton River site also proved satisfactory and one RCM 4 (2005 deployment: SN# 8677), four RCM 11 (2005 deployment: SN# 285, 287 and 290; 2006 deployment: SN# 274) units and two RDI ADCP WorkHorse-Sentinels (2005 deployment: SN# 333) were successfully verified.

Figure 4.4. 2006 Beaufort Sea mooring instrumentation compass verification sites in DeSalis Bay, Sachs Harbour and Horton River.

Figure 4.5. 2006 ArcticNet mooring equipment compass calibration site example (Sachs Harbour), RCM7 installed on calibration stand, relative to protective tent.

The third calibration site was near Kuujjuarapik, Québec (Nunavik) (mag. dev. 19.2°) (Figure 4.6) where on 13 September 2006, the mooring team went on shore (Belcher Islands) and tried to calibrate two Aanderra RCM 4 units (4046, 740), three RCM 7 units (12796, 10306, 10270), two RDI ADCP WorkHorse-Sentinel (300 kHz) units (3045, 23 (ISMR stock)) and one RDI ADCP 1200 kHz unit (2491). The two RCM4 (4046, 740) units were inadequately calibrated (magnetic North used instead of the True North). It was also noticed that the direction of the magnetic pole showed significant variations at this location in 2006. Furthermore, due to time constrains that day, it was impossible to calibrate the RDI ADCP WH-Sentinel (296) and thus, these three instruments should be post-calibrated on the Belcher Islands upon their recovery in 2007.

Additionally, on 19 September 2006, an RCM4 (4645) unit and an RDI ADCP WH-Sentinel (335) were successfully calibrated in the Nelson River area (site location not recorded).

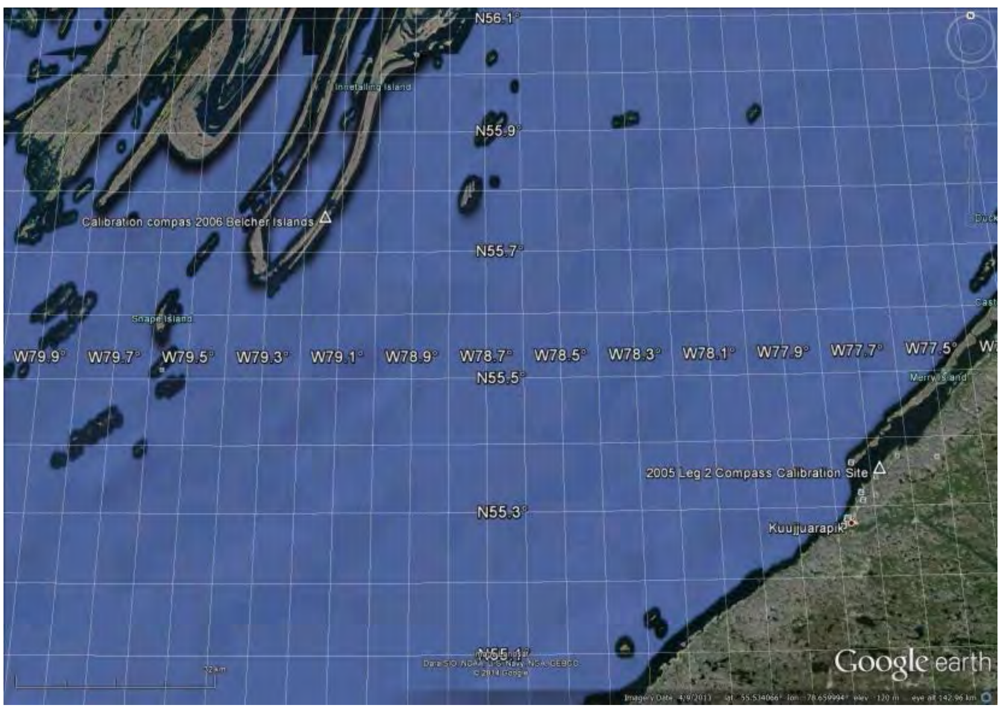

Figure 4.6. 2005 and 2006 ArcticNet mooring compass calibration sites in the Hudson Bay (BaySys Expedition).

Table 4.2. Compass verification field operations conducted in 2005 and 2006 for mooring intruments deployed in 2005 in Baffin Bay and the Beaufort Sea in Leg 1, and in Hudson Bay during Leg 2.

Instrument	SN	Region	Pre-deploy. site	Pre-deploy. date	Pre-deploy. status	Post-recov. site	Post-recov. date	Post-recov. status
Baffin Bay								
RCM4	8214	BA	Pond Inlet	2005	substandard	Belcher Glacier	2006	substandard
RCM4	8859	BA	Pond Inlet	2005	substandard	Belcher Glacier	2006	substandard
RCM4	8572	BA	Pond Inlet	2005	substandard	Belcher Glacier	2006	substandard
RCM4	8672	BA	Pond Inlet	2005	substandard	Belcher Glacier	2006	substandard
RCM4	8673	BA	Pond Inlet	2005	substandard	Belcher Glacier	2006	substandard

Instrument	SN	Region	Pre-deploy. site	Pre-deploy. date	Pre-deploy. status	Post-recov. site	Post-recov. date	Post-recov. status
RCM4	8858	BA	Pond Inlet	2005	substandard	Lost	2006	not available
RCM7	12800	BA	Pond Inlet	2005	substandard	Lost	2006	not available
RCM7	10298	BA	Pond Inlet	2005	substandard	found in Iqaluit	2006	not available
WH-LR	3883	BA	Pond Inlet	2005	substandard	Lost	2006	not available
WH-LR	3815	BA	Pond Inlet	2005	substandard	Cape Isabella	2006	substandard
Beaufort Sea								
WHS	333	BS	Cambridge Bay	2005	substandard	Horton River	2006	not available
WHS	2645	BS	Cambridge Bay	2005	substandard	Sachs Harbour	2006	not available
WHS	2646	BS	Cambridge Bay	2005	substandard	Sachs Harbour	2006	not available
RCM4	8677	BS	Cambridge Bay	2005	substandard	Horton River	2006	not available
RCM11	290	BS	Cambridge Bay	2005	substandard	Sachs Harbour	2006	Good: Rail et al. 2010
RCM11	287	BS	Cambridge Bay	2005	substandard	Sachs Harbour	2006	Good: Rail et al. 2010
RCM11	280	BS	Cambridge Bay	2005	substandard	Horton River	2006	Good: Rail et al. 2010
RCM11	266	BS	Cambridge Bay	2005	substandard	Horton River	2006	Good: Rail et al. 2010
RCM11	273	BS	Cambridge Bay	2005	substandard	Horton River	2006	Good: Rail et al. 2010
RCM7	10301	BS	Cambridge Bay	2005	substandard	Sachs Harbour	2006	Good: Rail et al. 2010
RCM11	289	BS	Cambridge Bay	2005	substandard	Horton River	2006	Good: Rail et al. 2010
RCM11	285	BS	Cambridge Bay	2005	substandard	Sachs Harbour	2006	Good: Rail et al. 2010
Hudson Bay								
RCM4	8850	HB	Kuujjuarapik	2005	substandard	Island near Kuuj	2006	not available
RCM7	12796	HB	Kuujjuarapik	2005	substandard	Island near Kuuj	2006	substandard
RCM7	10306	HB	Kuujjuarapik	2005	substandard	Island near Kuuj	2006	not available
RCM7	10270	HB	Kuujjuarapik	2005	substandard	Island near Kuuj	2006	not available
WHS	3045	HB	Kuujjuarapik	2005	substandard	Island near Kuuj	2006	not available
WHS	23	HB	Kuujjuarapik	2005	substandard	Island near Kuuj	2006	not available
1200KHz ADCP	2491	HB	Kuujjuarapik	2005	substandard	Island near Kuuj	2006	not available

Table 4.3. Compass verification field operations conducted in 2006 for mooring intruments deployed in 2006 from the *Amundsen* in Baffin Bay (Leg 1) and the Beaufort Sea (Leg 2a), and from the *Pierre Radisson* in Hudson Bay during the BaySys expedition.

Instrument	SN	Region	Pre-deploy. site	Pre-deploy. date	Pre-deploy. status
Beaufort Sea					
RCM4	4644	BS	DeSalis Bay	2006	Good : INRS-2010
RCM4	8572	BS	DeSalis Bay	2006	Good : INRS-2010
RCM4	8672	BS	DeSalis Bay	2006	Good : INRS-2010
RCM4	11	BS	DeSalis Bay	2006	Good : INRS-2010
RCM11	271	BS	DeSalis Bay	2006	Good : INRS-2010
RCM11	272	BS	DeSalis Bay	2006	Good : INRS-2010
WHS	3778	BS	DeSalis Bay	2006	Good : INRS-2010
WHS	3844	BS	DeSalis Bay	2006	Good : INRS-2010
WHS	7844	BS	DeSalis Bay	2006	Good : INRS-2010
RCM11	274	BS	Sachs Harbour	2006	Good : INRS-2010
RCM4	8214	BS	Horton River	2006	Good : INRS-2010
Hudson Bay					
RCM4	4640	HB	Belcher Islands	2006	substandard
RCM4	740	HB	Belcher Islands	2006	substandard

Instrument	SN	Region	Pre-deploy. site	Pre-deploy. date	Pre-deploy. status
Beaufort Sea					
WHS	296	HB	not done	na	na
RCM4	4645	HB	Nelson River	2006	Good : INRS-2010
WHS	335	HB	Nelson River	2006	Good : INRS-2010

4.2.3 Mooring recovery and deployment operations

Nine moorings were deployed in 2005 in Baffin Bay, Beaufort Sea and Hudson Bay. Recovery operations for these moorings took place in August, September and October of 2006, and eight moorings were re-deployed. For a detailed list of instruments deployed on each mooring, see INRS technical reports (Simard et al. 2010, Boisvert et al. 2010) and ArcticNet mooring field operations report (Meredyk 2014).

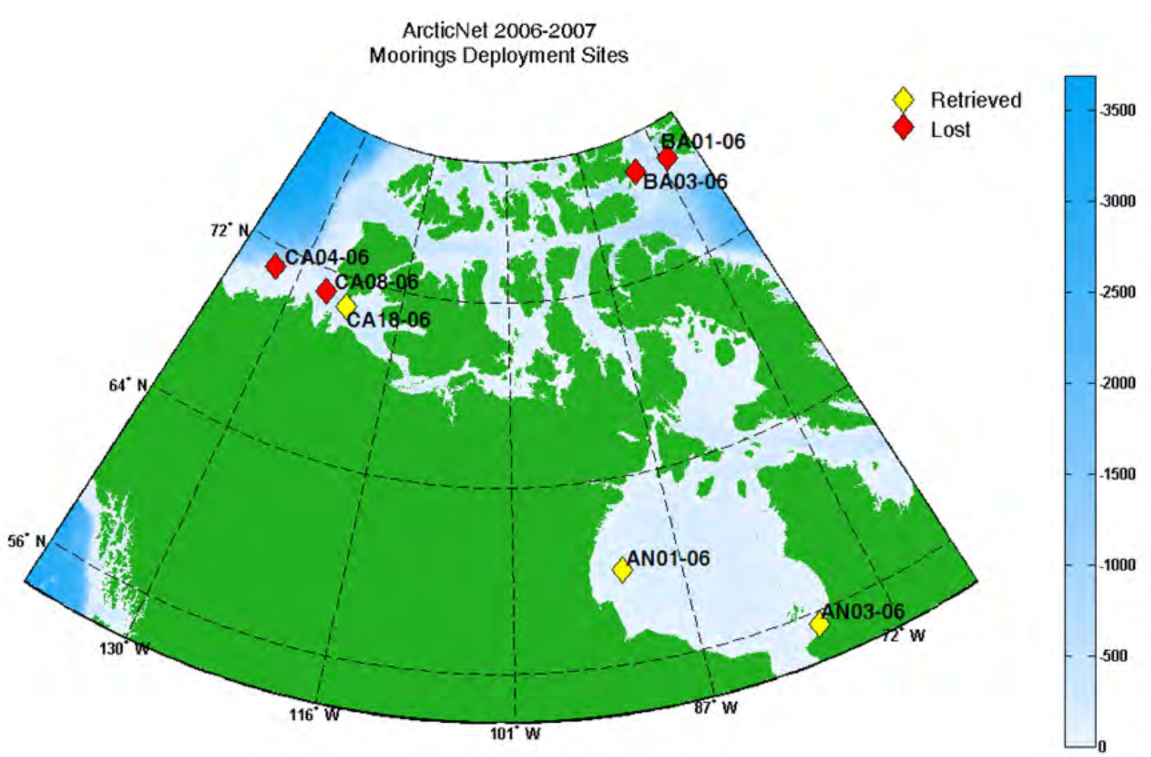

Figure 4.7. ArcticNet mooring operations in the Canadian Arctic and Hudson Bay in 2006.

<u>Baffin Bay (*Amundsen* Leg 1)</u>

In Baffin Bay, the 2006 mooring re-deployments of four NOW moorings (Figure 4.8) didn't proceed as planned. Mooring BA03-05 was found near Iqaluit when the *Amundsen* left port, where it was likely dragged there by an iceberg. Mooring BA01-05 got caught in the dynamic positioning propeller and the mooring was cut in half (the top-half was recovered). Mooring BA04-05 acoustic releases didn't release the mooring even though communication with the releases was successful. The subsequent dragging operations also failed to retrieve the mooring. Mooring BA02-05 was the only successfully recovered 2005 mooring (Table 4.4).

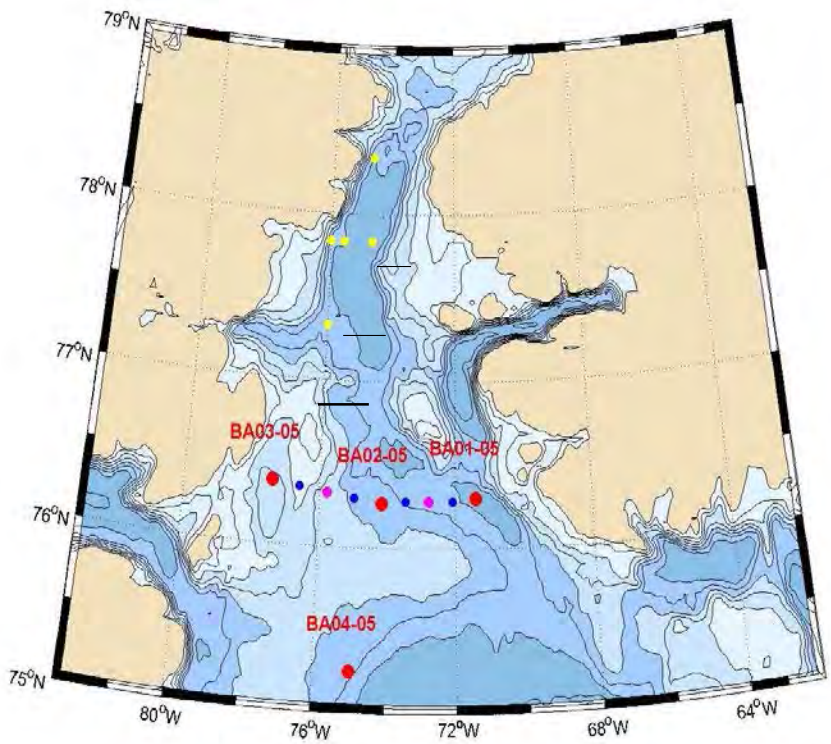

Figure 4.8. Baffin Bay 2006 mooring deployments; Red dots are 2005 mooring sites and blue dots are 1998 mooring sites.

Table 4.4. Summary of ArcticNet 2006 mooring recovery and deployment operations in Baffin Bay, with 2006-2008 recovery results.

Mooring ID	Program	Deployment Year	Recovery Year	Latitude N	Longitude W	Depth (m)
BA01-05	ArcticNet	2005	2006 & 2008 (lower part with ROV)	76° 19.620	071° 11.904	649
BA02-05	ArcticNet	2005	2006	76° 16.056	074° 34.500	444
BA03-05	ArcticNet	2005	LOST	76° 23.028	077° 24.066	358
BA04-05	ArcticNet	2005	LOST	75° 15.216	074° 58.644	475
BA01-06	ArcticNet	2006	LOST	76° 19.692	071° 13.626	670
BA03-06	ArcticNet	2006	LOST	76° 23.154	077° 24.624	358

Beaufort Sea (*Amundsen* Leg 2a)

In the Beaufort Sea in 2006, ArcticNet recovered four moorings deployed during the 2005 expedition and re-deployed two of these moorings, along with deploying CA08-06 (Table 4.5). The weather was good and mooring operations went smoothly. Five unsuccessful grappling efforts were made to try to recover mooring CA14-03 (not attempted) and CA05-04, which were deployed in 2003 and 2004 during the CASES expedition (Figure 4.9).

Last minute mooring design changes (increased buoyancy on instrument cages) were made to the deployed moorings to allow them to come to the surface with greater ease. This was done to avoid difficult recoveries with surrounding pack ice, which can interfere with the safe and effective recovery of mooring.

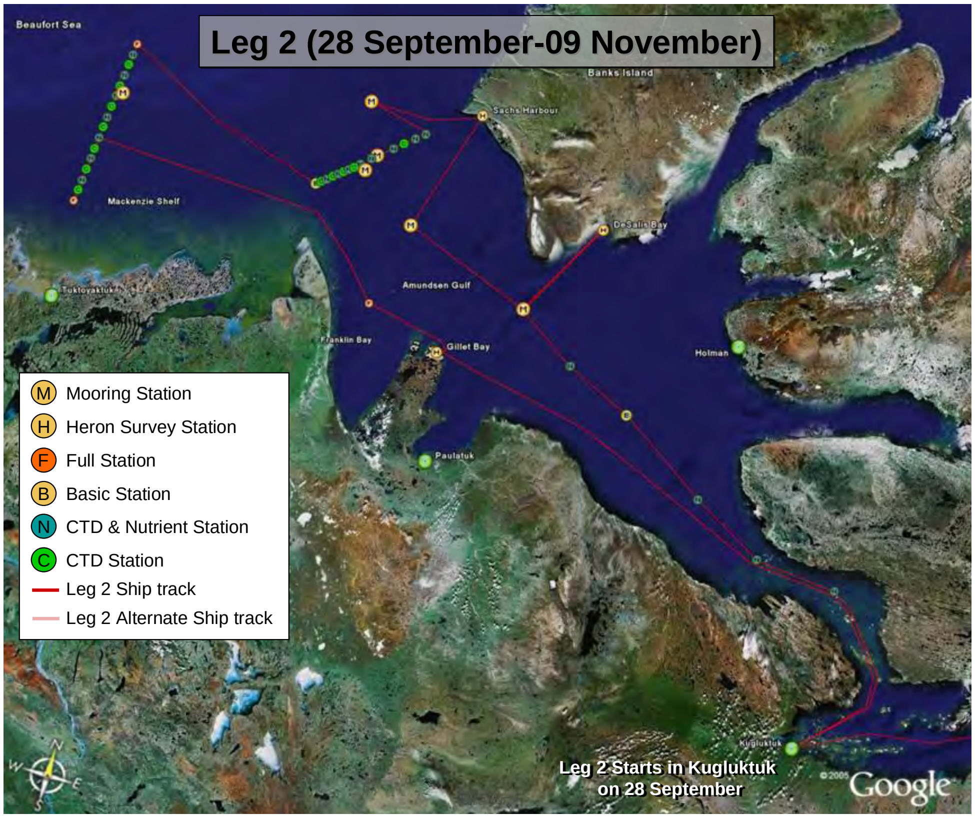

Figure 4.9. 2006 ArcticNet Leg 2a Mission Plan in Amundsen Gulf and Beaufort Sea, including Mooring sites and ship track.

Table 4.5. ArcticNet 2006 mooring recovery and deployment operations in Beaufort Sea during Leg 2a of the Amundsen expedition.

Mooring ID	Program	Deployment Year	Recovery Year	Latitude N	Longitude W	Depth (m)
CA04-05	ArcticNet	2005	2006	71° 4.812	133° 37.752	307
CA05-05	ArcticNet	2005	2006	71° 16.836	127° 32.178	205
CA08-05	ArcticNet	2005	2006	71° 00.408	126° 04.464	397
CA18-05	ArcticNet	2005	2006	70° 39.942	122° 59.298	540
CA04-06	ArcticNet	2006	LOST	71° 04.812	133° 37.764	301
CA08-06	ArcticNet	2006	LOST	71° 00.624	126° 03.966	397
CA18-06	ArcticNet	2006	2007 (1/2 mooring)	70° 39.906	122° 59.556	543

Hudson Bay (BaySys)

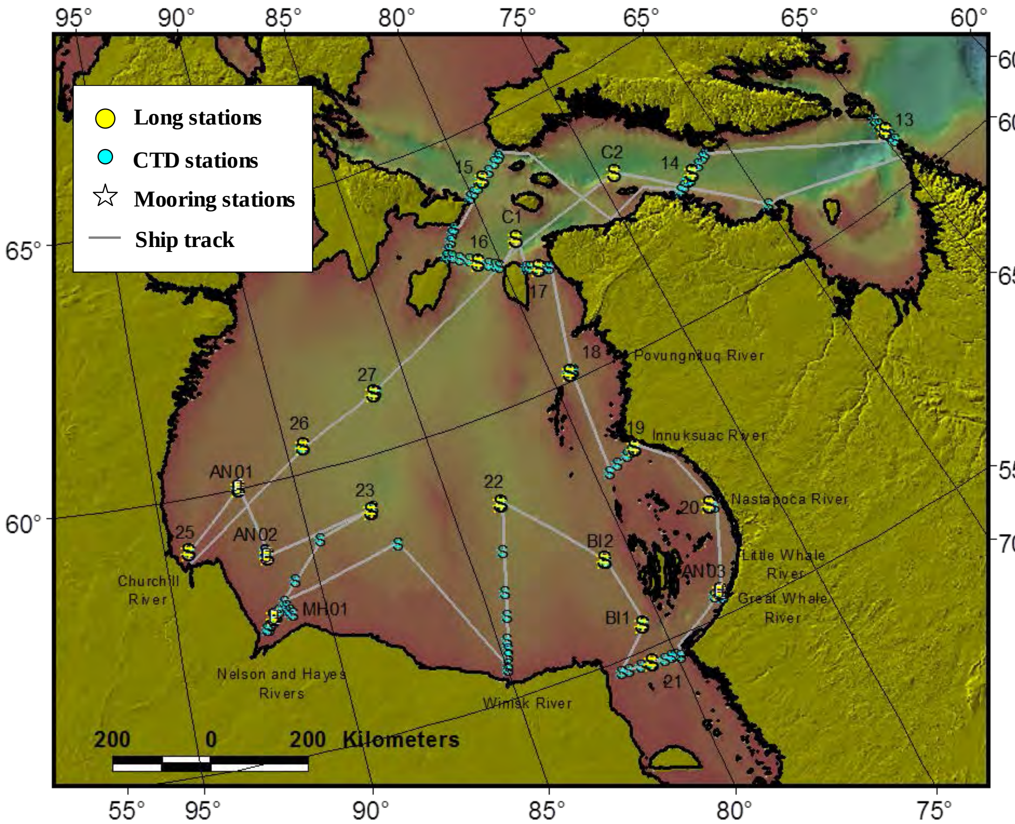

Figure 4.10. Map showing the 2005 ArcticNet Hudson Bay sampling expedition with the locations of ArcticNet moorings recovered and re-deployed in 2006. Map produced by CJ Mundy.

Mooring AN03-05 / -06. Due to difficult weather conditions, this mooring was recovered on 13 September, a day later than initially scheduled. The mooring was quickly recovered at approx. 14:30 UTC after a CTD cast (Station AN03-05). Instruments on this mooring line are listed in Table 4.6. The SBE-37 did not record any data during its yearlong deployment. The two RCM current meters were cleaned and stored for later data reading. Data from the ADCP (belonging to ISMER-UQAR) were downloaded and the instrument was cleaned and stored. The hard drive and the batteries of the Aural hydrophone were replaced and the instrument was prepared to be re-deployed. The Technicap sediment trap appeared to have properly functioned, and the biological samples were recovered and the motor retrieved and cleaned. The data was downloaded, the motor was programmed and the two triggering mechanisms were cleaned and prepared for the next deployment (AN03-06).

Mooring AN01-05 / -06. After the deployment of AN03-06, the ship transited to this next mooring site. After a CTD cast (Station AN01-05), AN01-05 was recovered on 16 September at approximately 20:30 UTC, under good weather conditions. During the recovery it was noticed that the upper part of the mooring, that included an ALEC probe and a buoy, was missing, and that the cable had broken at a weak link (shackle). The other instruments were recovered and cleaned (Table 4.6). Water had infiltrated the recovered ALEC probe (2036) and no data was recovered from this unit. Additionally, the recovered ADCP (3045) was not communicating with the computer and the data, if any recorded, could not be downloaded. The Technicap sediment trap seemed to have functioned properly, except for the last cup which did not rotate on 1 September as programmed. Thus the end date for this sample is until 16 September 2006. This mooring was re-deployed on 22 September (AN01-06) without the Aural Hydrophone.

Table 4.6. List and serial numbers of the instruments recovered on the 2005-06 moorings during the BaySys cruise in Hudson Bay.

Mooring	Instruments	Serial No	Time-date (UTC)	Comments
AN03-05	SBE 37	37sm29101-2424	14:23-13/09/2006	No data
AN03-05	RCM4	8850	14:25-13/09/2006	Last reading 17:09 13-09-2006 UTC
AN03-05	RCM7	12796	14:18-13/09/2006	Last reading 17:13 13-09-2006 UTC
AN03-05	ADCP	23 (ISMER)	14:26-13/09/2006	Belong to Ismer
AN03-05	Aural-hydrophone	382014 (hydrophone)	14:16-13/09/2006	Instrument serial: 20050805-58d7-382014
AN03-05	Technicap-trap	19 (trap)	14:33-13/09/2006	Motor serial: 03199
AN03-05	Acoustic Release	190	14:33-13/09/2006	
AN03-05	Acoustic Release	194	14:33-13/09/2006	
AN01-05	ALEC	684		Lost
AN01-05	ALEC	592	20:36-16/09/2006	Water infiltration, no data
AN01-05	Technicap-trap	03-50	20:39-16/09/2006	Last cup did not turned
AN01-05	ADCP	3045	20:46-16/09/2006	No communication, no data?
AN01-05	Acoustic Release	189	20:49-16/09/2006	
AN01-05	Acoustic Release	196	20:49-16/09/2006	

Table 4.7. 2006 ArcticNet mooring recovery and deployment operations in Hudson Bay as part of the BaySys expedition on the *Pierre Radisson*, with 2007 recovery results.

Mooring ID	Program	Deploy Year	Recovery Year	LAT_DD	LONG_DD	Depth (m)
AN01-05	ArcticNet	2005	2006	59.9778	-91.9437	107
AN02-05	ArcticNet	2005	LOST	58.7821	-91.5232	80
AN03-05	ArcticNet	2005	2006	55.4078	-77.9299	130
AN04-05	ArcticNet / ManitobaHydro	2005	2006	57.5699	-91.6284	45
AN01-06	ArcticNet	2006	LOST	59.9773	-91.9438	106
AN03-06	ArcticNet	2006	2007	55.4073	-77.9284	130
MH01	Manitoba Hydro	2006	?	57.5699	-91.6284	45

Mooring AN02-05. Unfortunately, the two acoustic releases did not respond and it was impossible to recover the mooring. A decision was made to go to the next mooring site and to attempt recovering this mooring with a grapple at a later time. On 21 September, several hours of grappling attempts were unsuccessful and suggest that this mooring may not be at this location anymore.

Mooring AN04-05. It was also impossible to recover this mooring, belonging to Hydro Manitoba. Both acoustic releases did not respond and the numerous grappling attempts of the site were unsuccessful, suggesting that this mooring may not be at this location anymore. Regardless, a CTD cast (AN04-05) was performed at this station.

Nelson River Mooring. On 20 September, a mooring (MH01) belonging to Hydro Manitoba, was deployed at the mouth of the Nelson River from the ship *Strait Signet*.

CTD and Tucker Net tows. Two of the nine CTD casts (AN02-05 and AN04-05) were done using a CTD SBE-25 belonging to the University of Manitoba; the other casts were done using the SBE-25 from Université Laval.

4.2.4 Mooring deployment and recovery methodology

<u>Deployment methodology</u>

In preparation for the deployment, all the instruments were programmed and mounted into their respective frames or floats, and the mooring releases were verified for proper functioning. The mooring was then assembled top-down on the foredeck according to the planned design and instrumentation, and all attachments were double checked.

A Toolbox Meeting with Mooring and Ship's crew was held on the foredeck to identify roles and review safety considerations. The Zodiac was launched (if deemed necessary) and the date and time were recorded at the start of mooring operations.

All components of the mooring were lowered from the deck to the water surface using the A-frame, starting with the top float, until all mooring component were in the water. The Zodiac maintained the mooring line taut as it was deployed to avoid getting the equipment entangled. The final release of the anchor was preceded by the Zodiac releasing its tack of the top float and the confirmation of the correct depth and position for the mooring. The mooring was left to free-fall into position and the time and target location of the last seen position of the top float were noted down.

The vessel verified communications with the acoustic releases and proceeded to 3 triangulation points at ~100 m around the target location to calculate the anchor position using a MatLab® script (Figure 4.11). The resulting triangulated position of the mooring was recorded in the field deployment sheets.

A post-deployment CTD cast was conducted and the CTD profile plots for each mooring site were kept within the field deployment Excel workbook and archived at ArcticNet (Figure 4.12). The foredeck was cleaned and the remaining mooring equipment and cages were secured on the foredeck.

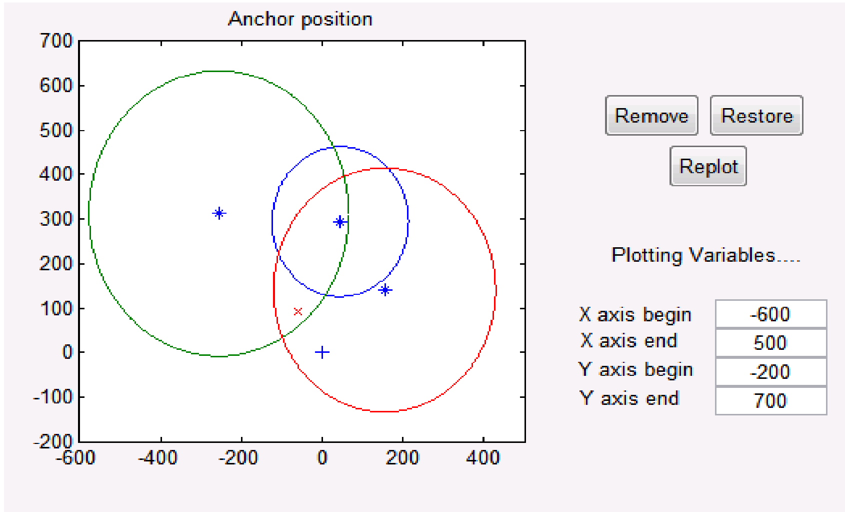

Figure 4.11. Triangulation plot from Mooring BS1-14 obtained using Art's Acoustic Survey Matlab script.

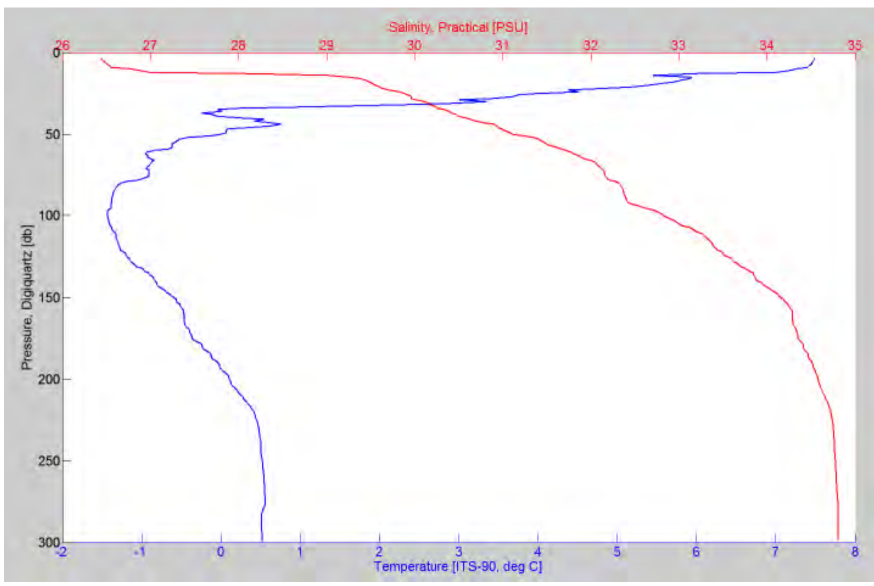

Figure 4.12. Example of temperature and salinity profiles from a CTD-Rosette cast conducted at Mooring BS2-14.

Recovery methodology

A CTD cast was conducted at each mooring site prior to recovery to obtain a profile of water column properties near the mooring while it was still in place. This cast also served to determine possible sensor drift over time for the moored instruments and obtain accurate data on the acoustic properties of the water.

Transducer ranges were taken on the mooring's acoustic releases from several positions around the mooring site to verify approximate location and distance from the ship. When greater accuracy was needed (due to poor visibility or nearby ice), triangulation was done by taking three range fixes from points surrounding the target location: ranges and locations were logged and a program was run to determine the most likely location of the mooring. The ship was then re-positioned down-drift from this location and another range was taken before sending the release code and the release time logged.

When the mooring surfaced, the time and its location (distance and direction from the ship's position) were logged. The Zodiac was launched and hooked onto the top float when all floatation components had reached the surface. The Zodiac then pulled the mooring alongside the ship and hooked it onto the A-frame winch hook. As the sections of mooring were lifted on deck, the time was logged when each instrument came out of the water.

4.2.5 Data recovery and processing

Of the 62 moored instruments deployed in 2005 in the three study regions, 49 were retrieved in 2006 (and 2008 for part of BA01-05) and 13 were lost. All datasets obtained from these instruments have been quality controlled and processed (Rail et al. 2010). Quality control included metadata and calibration coefficients validation, verification of the instruments depth and clock, and the comparison of mooring data with Rosette-CTD data recorded at the mooring sites. Mooring designs and instrumentation for each ArcticNet mooring deployed in 2005 and successfully recovered in 2006 are presented for each region (Baffin Bay, Beaufort Sea and Hudson Bay) along with data recovery results and data processing comments (Tables 4.8 to 4.18).

Baffin Bay

Table 4.8. Mooring design and instrumentation used for Mooring BA01-05 deployed in Baffin Bay in 2005 in Leg 1 and recovered in 2006, with post-processing data recovery rate for each moored instrument.

Region	Baffin Bay	**Latitude N**	76° 19.6209'	**Bottom depth**	649 m
Mooring ID	BA01-05	**Longitude W**	071° 11.9043'		
Deployment Date & Time (UTC)	2005-08-17 04:59	**Recovery Date & Time (UTC)**	2006-09-15 (top half) 2008-09-20 (bottom half)		

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
ORE SS-30 Float	1.0	90.7			
Kevlar 3/8 Line	5.0	91.7			
RCM 4 (SN# 8859)	0.6	96.8	0%	Instrument was not recovered	Rail et al. 2010
Kevlar 3/8 Line	97.0	97.4			
Technicap PPS 3/3 Sediment Trap (SN#03-201 (018))	1.9	194.8	100%	TPM and POC fluxes	Lalande et al. 2009; L. Fortier (U. Laval)
Kevlar 3/8 Line	5.0	196.8			
RCM 4 (SN# 8214)	0.6	201.8	50%	Calibration for Current direction and Conductivity is considered unreliable; Data to be handled with care	Rail et al. 2010
Kevlar 3/8 Line	5.0	202.4			

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
SBE26 Probe (SN# 0371)	1.0	207.4	72%	Reliable data after 29 May 2006	Rail et al. 2010
Kevlar 3/8 Line	62.0	208.4			
ORE SS-30 Float	1.0	270.7			
Kevlar 3/8 Line	75.0	271.7			
RCM 7 (SN# 12800)	0.6	347.1	0%	Corrupted file, no data recovered	Rail et al. 2010
Kevlar 3/8 Line	150.0	347.7			
LR-ADCP (75kHz) Current Meter (SN# 3883)	1.5	498.5		Recovered in 2008; Data processing in progress (as of 2010 report)	Rail et al. 2010
Kevlar 3/8 Line	20.0	500.0			
Technicap PPS 5/2 Sediment Trap (SN# 03-225 (065))	2.0	520.1	0%	Recovered in 2008; Data not found in database	L. Fortier (U. Laval)
Kevlar 3/8 Line	28.0	522.1			
Kevlar 3/8 Line	84.0	550.2			
3*Benthos Floats (17")	1.5	634.6			
Kevlar 3/8 Line	5.0	636.1			
2*IXSEA/OCEANO Acoustic releases	1.6	642.2			
Poly rope 3/4	5.0	642.8			
Chain 1/2	0.7	647.8			
3 Train Wheels	0.5	648.5			

[1] Data recovery rate for processed data based on the time span of reliable data relative to the full deployment period.
[2] TPM = Total particulate matter; POC = particulate organic carbon.

Table 4.9. Mooring design and instrumentation used for Mooring BA02-05 deployed in Baffin Bay in 2005 during Leg 1 and recovered in 2006, with post-processing data recovery rate for each moored instrument.

Region	Baffin Bay	**Latitude N**	76° 16.0573'	**Bottom depth**	444 m
Mooring ID	BA02-05	**Longitude W**	074° 34.4986'		
Deployment Date & Time (UTC)	2005-08-17 22:39	**Recovery Date & Time (UTC)**	2006-09-08 02:01		

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
ORE SS-30 Float	1.0	90.4			
Kevlar 3/8 Line	5.0	95.4			
RCM 4 (SN# 8572)	0.6	100.4	75%	Calibration for Current direction and Conductivity considered unreliable; Data to be handled with care	Rail et al. 2010
Kevlar 3/8 Line	49.0	101.0			
Kevlar 3/8 Line	50.0	150.2			
Technicap PPS 3/3 Sediment Trap (SN# 03-194 (014))	1.9	200.5	100%	TPM and POC fluxes	Lalande et al. 2009; L. Fortier (U. Laval)
Kevlar 3/8 Line	5.0	202.4			
RCM 4 (SN# 8672)	0.6	207.4	0%	Raw data considered unreliable; Data to be handled with care	Rail et al. 2010
Kevlar 3/8 Line	198.0	208.0			
ORE SS-30 Float	1.0	407.0			
Kevlar 3/8 Line	15.0	408.0			

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
LR-ADCP (75kHz) Current Meter (SN# 3815)	1.5	423.1	100%	Dataset is complete and good	Rail et al. 2010
Kevlar 3/8 Line	5.0	424.6			
3*Benthos Floats (17")	1.5	429.6			
Kevlar 3/8 Line	5.0	431.1			
2*IXSEA/ OCEANO Acoustic releases	1.0	436.2			
Poly rope 3/4	0.6	437.2			
Chain 1/2	5.0	437.8			
3 Train Wheels	0.7	442.8			

[1] Data recovery rate for processed data based on the time span of reliable data relative to the full deployment period.
[2] TPM = Total particulate matter; POC = particulate organic carbon.

Table 4.10. Mooring BA03-05 was deployed in Baffin Bay in 2005 during Leg 1 but could not be recovered in 2006.

Region	Baffin Bay	**Latitude N**	76° 23.0255'	**Bottom depth**	358 m
Mooring ID	BA03-05	**Longitude W**	077° 24.0642'		
Deployment Date & Time (UTC)	2005-08-18 22:31	**Recovery Date & Time (UTC)**	Not recovered		

Table 4.11. Mooring BA04-05 was deployed in Baffin Bay in 2005 during Leg 1 but could not be recovered in 2006.

Region	Baffin Bay	**Latitude N**	75° 15.2147'	**Bottom depth**	475 m
Mooring ID	BA04-05	**Longitude W**	074° 58.6469'		
Deployment Date & Time (UTC)	2005-08-21 22:36	**Recovery Date & Time (UTC)**	Not recovered		

Beaufort Sea

Table 4.12. Mooring design and instrumentation used for Mooring CA04-05 deployed in the Beaufort Sea in 2005 and recovered in 2006, with post-processing data recovery rate for each moored instrument.

Region	Beaufort Sea	**Latitude N**	71° 04.8098'	**Bottom depth**	307 m
Mooring ID	CA04-05	**Longitude W**	133° 37.7511'		
Deployment Date & Time (UTC)	2005-09-06 20:21	**Recovery Date & Time (UTC)**	2006-10-07 21:58		

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
2*Viny Top Float	0.0	37.2			
Poly rope 3/4	0.8	37.2			
JFE-ALEC CT Probe (SN# 688)	0.5	38.0	100%	Dataset is complete but mooring line was tilted on 22-25 Feb 2006, affecting all parameters	Rail et al. 2010
Kevlar 3/8 Line	10.0	38.5			
ORE SS-30 Float	0.8	48.5			
Kevlar 3/8 Line	5.0	49.3			
AURAL M1-M2 Hydrophone (SN# wr080309)	1.0	54.3			Y. Simard (UQAR-ISMER)

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
Kevlar 3/8 Line	34.0	55.3			
WH-ADCP (300kHz) Current Meter (SN# 333)	0.5	89.5	100%	Dataset is complete but mooring line was tilted on 22-25 Feb 2006, affecting all parameters	Rail et al. 2010
Kevlar 3/8 Line	10.0	90.0			
Technicap PPS 3/3 Sediment Trap (SN# 03-174 (020))	1.9	100.1	100%	TPM, POC and phytoplankton cell fluxes	Lalande et al. 2009; L. Fortier (U. Laval)
Kevlar 3/8 Line	10.0	102.0			
NIPR Sediment Trap (SN# 98062)	3.0	112.0	100%	TPM and POC fluxes	L. Fortier (U. Laval) CCIN 10477
Kevlar 3/8 Line	10.0	115.0			
ORE SS-30 Float	0.8	125.1			
Kevlar 3/8 Line	75.0	125.9			
NIPR Sediment Trap (SN# 98062?)	3.0	201.3	100%	TPM and POC fluxes	L. Fortier (U. Laval) CCIN 10478
Kevlar 3/8 Line	5.0	204.3			
RCM 11 (SN# 289)	0.6	209.3	99%	Mooring line was tilted on 22-25 Feb 2006, affecting all parameters; Missing data on 20 Aug 2006 and between 29 Sep - 2 Oct 2006; Offset correction applied to salinity data	Rail et al. 2010
Kevlar 3/8 Line	81.0	209.9			
3*Benthos Floats (17")	1.5	291.3			
Kevlar 3/8 Line	5.0	292.8			
2*IXSEA/OCEANO Acoustic Releases	1.0	297.9			
Poly rope 3/4	5.0	299.5			
Chain 1/2	2.0	304.5			
3 Train Wheels	0.5	306.5			

[1] Data recovery rate for processed data based on the time span of reliable data relative to the full deployment period.
[2] TPM = Total particulate matter; POC = particulate organic carbon.

Table 4.13. Mooring design and instrumentation used for Mooring CA05-05 deployed in the Beaufort Sea in 2005 during Leg 1 and recovered in 2006, with post-processing data recovery rate for each moored instrument.

Region	Beaufort Sea	**Latitude N**	71° 16.8356'	**Bottom depth**	201 m
Mooring ID	CA05-05	**Longitude W**	127° 32.1771'		
Deployment Date & Time (UTC)	2005-09-08 04:30	**Recovery Date & Time (UTC)**	2006-10-02 21:54		

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
2*Viny Top Floats	0.0	38.9			
Poly rope 3/4	0.8	38.9			
SBE37 CT Probe (SN# 1697)	0.5	39.7	100%	Spurious Conductivity data on 10 Feb 2006	Rail et al. 2010
Kevlar 3/8 Line	18.0	40.2			
ORE SS-30 Float	0.8	58.3			
Kevlar 3/8 Line	34.0	59.1			

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
WH-ADCP (300kHz) Current Meter (SN# 2645)	0.5	93.3	78%	Reliable data between 9 Sep 2005 and 11 Jul 2006	Rail et al. 2010
Kevlar 3/8 Line	10.0	93.8			
Technicap PPS 3/3 Sediment Trap (SN# 03-192)	3.0	103.8	50%	TPM and POC fluxes	L. Fortier (U. Laval) CCIN 10478
Kevlar 3/8 Line	49.0	106.8			
3*Benthos Floats (13")	2.0	156.1			
Chain 1/2	0.5	158.1			
Kevlar 3/8 Line	10.0	158.6			
RCM 11 (SN# 285)	0.6	168.6	79%	No recorded data for all parameters for 2.7 days overall; Turbidity data to be handled with care (negative values); 40% data recovery for Conductivity	Rail et al. 2010
Kevlar 3/8 Line	10.0	169.2			
SBE26 Probe (SN# 372)	1.0	179.3	100%	Dataset is complete and good	Rail et al. 2010
Kevlar 3/8 Line	5.0	180.3			
3*Benthos Floats (17")	1.5	185.3			
Kevlar 3/8 Line	5.0	186.8			
2*IXSEA/OCEANO Acoustic releases	1.6	192.9			
Poly rope 3/4	5.0	193.5			
Chain 1/2	2.0	198.5			
3 Train Wheels	0.5	201.0			

[1] Data recovery rate for processed data based on the time span of reliable data relative to the full deployment period.
[2] TPM = Total particulate matter; POC = particulate organic carbon.

Table 4.14. Mooring design and instrumentation used for Mooring CA08-05 deployed in the Beaufort Sea in 2005 during Leg 1 and recovered in 2006, with post-processing data recovery rate for each moored instrument.

Region	Beaufort Sea	**Latitude N**	71° 00.4084'	**Bottom depth**	397 m
Mooring ID	CA08-05	**Longitude W**	126° 04.4629'		
Deployment Date & Time (UTC)	2005-09-10 04:06	**Recovery Date & Time (UTC)**	2006-10-02 15:48		

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
4*Viny Top Floats	0.0	39.1			
Poly rope 3/4	0.6	39.1			
SBE37 CT Probe (SN# 3463)	0.0	39.7	0%	No data recorded	Rail et al. 2010
Kevlar 5/16 Line	10.0	39.7			
AURAL M1-2 Hydrophone (SN# wr080309)	1.0	49.8			Y. Simard (UQAR-ISMER)
Kevlar 5/16 Line	5.0	50.8			
ORE SS-30 Float	1.0	55.8			
Kevlar 5/16 Line	35.0	56.8			
WH-ADCP (300kHz) Current Meter (SN# 2646)	1.5	92.0	80%	Reliable data between 10 Sep 2005 and 18 Jul 2006	Rail et al. 2010

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
Kevlar 5/16 Line	10.0	93.5			
Technicap PPS 3/3 Sediment Trap (SN# 03-187 (015))	1.9	103.5	100%	TPM and POC fluxes	Lalande et al. 2009; L. Fortier (U. Laval)
Kevlar 5/16 Line	5.0	105.4			
RCM 4 (SN# 8677)	0.6	110.5	0%	Inconsistent raw data; Data considered unreliable	Rail et al. 2010
Kevlar 5/16 Line	58.0	111.1			
ORE SS-30 Float	1.0	169.4			
Kevlar 5/16 Line	30.0	170.4			
NIPR Sediment Trap (SN# 98062?)	3.0	200.5	100%	TPM and POC fluxes	L. Fortier (U. Laval) CCIN 10476
Kevlar 5/16 Line	5.0	203.5			
RCM 11 (SN# 290)	0.6	208.6	100%	Missing data on 19-20 Jun 2006; Offset correction applied to salinity data	Rail et al. 2010
Kevlar 5/16 Line	10.0	209.2			
Kevlar 5/16 Line	118.0	219.2			
ORE SS-30 Float	1.0	337.8			
Kevlar 5/16 Line	30.0	338.8			
NIPR Sediment Trap (SN# 98062?)	3.0	369.0	100%	TPM and POC fluxes	L. Fortier (U. Laval) CCIN 10476
Kevlar 5/16 Line	5.0	372.0			
RCM 11 (SN# 287)	0.6	377.0	90%	Reliable data between 10 Sep 2005 and 25 Aug 2006; Missing data on 19-22 Jun 2006; Offset correction applied to salinity data	Rail et al. 2010
Kevlar 5/16 Line	5.0	377.6			
3*Benthos Floats (17")	1.5	382.6			
Kevlar 5/16 Line	5.0	384.1			
2*IXSEA/OCEANO Acoustic releases	1.6	390.2			
Poly rope 3/4	5.0	390.8			
Chain 1/2	0.7	395.8			
3 Train Wheels	0.5	396.5			

[1] Data recovery rate for processed data based on the time span of reliable data relative to the full deployment period.
[2] TPM = Total particulate matter; POC = particulate organic carbon.

Table 4.15. Mooring design and instrumentation used for Mooring CA18-05 deployed in the Beaufort Sea in 2005 during Leg 1 and recovered in 2006, with post-processing data recovery rate for each moored instrument.

Region Beaufort Sea		**Latitude N** 70° 39.9400'	**Bottom depth** 540 m
Mooring ID CA18-05		**Longitude W** 122° 59.3000'	
Deployment Date & Time (UTC)	2005-09-12 22:31	**Recovery Date & Time (UTC)** 2006-10-01 19:40	

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
ORE SS-30 Float	1.0	35.9			
Kevlar 3/8 Line	5.0	36.9			
RCM 11 (SN# 280)	0.6	41.9	100%	Oxygen data must be handled with care	Rail et al. 2010

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
Kevlar 3/8 Line	60.0	42.5			
NIPR Sediment Trap	1.9	102.8	100%	TPM and POC fluxes	Lalande et al 2009; L. Fortier (U. Laval)
Kevlar 3/8 Line	5.0	104.7			
RCM 11 (SN# 266)	0.6	109.8	97%	Missing data on 9-20 Jul 2006	Rail et al. 2010
Kevlar 3/8 Line	10.0	110.4			
Kevlar 3/8 Line	10.0	120.4			
ORE SS-30 Float	1.0	130.5			
Kevlar 3/8 Line	66.0	131.5			
NIPR Sediment Trap	3.0	197.8	100%	TPM and POC fluxes	L. Fortier (U. Laval) CCIN 10476
Kevlar 3/8 Line	5.0	200.8			
RCM 11 (SN# 273)	0.6	205.8	100%	Offset correction applied to salinity data	Rail et al. 2010
Kevlar 3/8 Line	188.0	206.4			
Technicap PPS 3/3 Sediment Trap (SN# 03-226)	2.0	395.4	100%	TPM and POC fluxes	L. Fortier (U. Laval) CCIN 10478
Kevlar 3/8 Line	5.0	397.4			
RCM 7 (SN# 10301)	0.6	402.4	87%	Reliable data between 12 Sep 2005 and 14 Aug 2006; Offset correction applied to salinity data	Rail et al. 2010
Kevlar 3/8 Line	122.0	403.0			
3*Benthos Floats (17")	1.5	525.6			
Kevlar 3/8 Line	5.0	527.1			
2*IXSEA/OCEANO Acoustic releases	1.6	533.2			
Poly rope 3/4	5.0	533.8			
Chain 1/2	0.7	538.8			
3 Train Wheels	0.5	539.5			

[1] Data recovery rate for processed data based on the time span of reliable data relative to the full deployment period.
[2] TPM = Total particulate matter; POC = particulate organic carbon.

Hudson Bay

Table 4.16. Mooring design and instrumentation used for Mooring AN01-05 deployed in Hudson Bay in 2005 during Leg 2 and recovered in 2006, with post-processing data recovery rate for each moored instrument.

Region	Hudson Bay	**Latitude N**	59° 58.6696'	**Bottom depth**	107 m
Mooring ID	AN01-05	**Longitude W**	091° 56.6230'		
Deployment Date & Time (UTC)	2005-10-12 22:00	**Recovery Date & Time (UTC)**	2006-09-16 20:49		

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
1*Benthos Float	0.0	11.0			
Poly rope 3/4	0.6	11.0			
JFE-ALEC CT Probe (SN# 684)	0.0	11.6	0%	Instrument was lost	Rail et al. 2010
Kevlar 5/16 Line	12.0	11.6			
2*Viny Floats	0.0				

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
Poly rope 3/4	0.6	23.6			
JFE-ALEC CT Probe (SN# 592)	0.0	24.2	0%	No data was recorded	Rail et al. 2010
Kevlar 5/16 Line	19.0	24.2			
ORE SS-30 Float	1.0	43.2			
Kevlar 5/16 Line	38.0	44.2			
Technicap PPS 3/3 Sediment Trap (SN# 03-128)	1.9	82.2	100%	TPM and POC fluxes	L. Fortier (U. Laval)
Kevlar 5/16 Line	5.0	84.1			
WH-ADCP (300 kHz) Current Meter (SN# 3045)	1.0	89.1	100%	Dataset complete and good	Rail et al. 2010
Kevlar 5/16 Line	5.0	90.1			
3*Benthos Floats (17")	1.5	95.1			
Kevlar 3/8 Line	5.0	96.5			
2*IXSEA/OCEANO Acoustic releases	1.6	102.6			
Chain 1/2	0.7	103.2			
Poly rope 3/4	2.0	103.9			
Chain 1/2	0.6	105.9			
2 Train Wheels	0.5	106.5			

[1] Data recovery rate for processed data based on the time span of reliable data relative to the full deployment period.
[2] TPM = Total particulate matter; POC = particulate organic carbon.

Table 4.17. Mooring AN02-05 was deployed in Hudson Bay in 2005 during Leg 2 but could not be recovered in 2006.

Region	Hudson Bay	**Latitude N**	58° 46.9241'	**Bottom depth** 80 m
Mooring ID	AN02-05	**Longitude W**	091° 31.3911'	
Deployment Date & Time (UTC)	2005-10-12 11:35	**Recovery Date & Time (UTC)**	Not recovered	

Table 4.18. Mooring design and instrumentation used for Mooring AN03-05 deployed in Hudson Bay in 2005 during Leg 2 and recovered in 2006, with post-processing data recovery rate for each moored instrument.

Region	Hudson Bay	**Latitude N**	55° 24.4659'	**Bottom depth** 130 m
Mooring ID	AN03-05	**Longitude W**	077° 55.7939'	
Deployment Date & Time (UTC)	2005-10-01 12:40	**Recovery Date & Time (UTC)**	2006-09-13 14:33	

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
1*Benthos Float	0.0	14.7			
Poly rope 3/4	0.6	14.7			
SBE37 CT Probe (SN# 2424)	0.0	15.3	0%	No data recorded	Rail et al. 2010
Kevlar 5/16 Line	18.0	15.3			
2*Viny float	0.0	33.3			
Poly rope 3/4	0.6	33.3			
RCM 7 (SN# 12796)	0.6	33.9	50%	Calibration for Current direction and conductivity considered unreliable; Data to be handled with care	Rail et al. 2010

Component	Component Length (m)	Component Target Depth (m)	Post-processing Recovery Rate [1]	Comments QA/QC & Data Processing [2]	Data Processing Reference
Kevlar 5/16 Line	14.0	34.5			
ORE SS-30 Float	1.0	48.5			
Kevlar 5/16 Line	5.0	49.5			
AURAL M2 Hydrophone	1.5	54.1			Y. Simard (UQAR-ISMER)
Kevlar 5/16 Line	18.0	56.0			
RCM 4 (SN# 8850)	0.6	74.0	0%	Raw data considered unreliable; Data to be handled with care	Rail et al. 2010
Kevlar 5/16 Line	20.0	74.6			
WH-ADCP (300kHz) Current Meter (SN# 23)	0.6	94.6	85%	Reliable data between 01 Oct 2005 and 22 Jul 2006	Rail et al. 2010
Kevlar 5/16 Line	5.0	95.2			
Technicap PPS 3/3 Sediment Trap (SN# 03-199 (19))	1.9	100.2	100%	TPM and POC fluxes + swimmers and jellyfish	Lalande and Fortier 2011
Kevlar 5/16 Line	15.0	102.1			
Chain 1/2	1.5	117.1			
Kevlar 3/8 Line	5.0	118.5			
2*IXSEA/ OCEANO Acoustic releases	1.6	124.6			
Chain 1/2	0.7	125.2			
Poly rope 3/4	3.0	125.9			
Chain 1/2	0.6	128.9			
2 Train Wheels	0.5	129.5			

[1] Data recovery rate for processed data based on the time span of reliable data relative to the full deployment period.
[2] TPM = Total particulate matter; POC = particulate organic carbon.

4.3 Comments and recommendations

4.3.1 Leg 1 – 22 August to 28 September 2006 – Baffin Bay

A new system to catch the mooring equipment from the fore deck should be put in place to make this more effective and safer. Each instrument should have their own floats, this way, if one float fails there are still enough floats to lift all of the mooring.

4.3.2 Leg 2a – 28 September to 29 October 2006 – Amundsen Gulf and Beaufort Sea

The Horten River calibration site allowed us to verify the magnetic variance on the same day, which is an advantage to determine the best time for calibration operations. At this latitude, the variance within the same day can vary greatly (10° or more), depending on the location and the day during operations (http://www.mar.dfo-mpo.gc.ca/science/ocean/seaice/Publications/hamilton01.pdf).

As mentioned previously, each mooring needs to have enough buoyancy to float up rapidly to the surface. Adding another beacon on the top of each mooring could help in case of acoustics releasers failure.

References

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5 CTD-Rosette, ADCP and thermosalinograph – Legs 1 and 2

ArcticNet Phase I – Theme 1: Climate Change Impacts in the Canadian High Arctic: a Comparative Study Along the East-West Gradient in Physical and Societal Conditions. ArcticNet/Phase 1/Project 1.1.

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5.1 CTD-Rosette

5.1.1 General information

All information concerning the CTD-Rosette casts can be found in the CTD Logbook (Appendix 3), including station and cast numbers, date and time of sampling in UTC, latitude and longitude, bottom and cast depths, as well as comments concerning the cast such as its type and name. A list and description of the sensors equipped on the CTD-Rosette are presented in Table 5.1.

Table 5.1. List of sensors equipped on the CTD-Rosette.

Instrument	Manufacturer	Type/Model	Serial Number	Calibration Date	Max. depth (m)
CTD	SeaBird	SBE-911			6800
Temperature			4204	18 May 2006	
Conductivity			2696	19 May 2006	
Pressure			88911	12 Apr 2005	
Oxygen	SeaBird	SBE-43	0427	27 May 2006	7000
pH	SeaBird	SBE-18	0444	3 July 2006	1200
Nitrates	Satlantic	MBARI ISUS	015	23 Aug 2006	1000
PAR	Biospherical		4664	26 May 2006	
SPAR	Biospherical		20147	31 May 2006	
Fluorometer 1 (Leg 1 only)	Sea Point		2443	7 Aug 2006	
Fluorometer 2	Sea Point		2465	7 Aug 2006	
Transmisometer	WetLab		CST-671DR	16 Jun 2006	
Altimeter	Benthos		1044		

A Rosette sheet was also created for every cast and contained the Niskin bottle distribution among the sampling teams as well as the information recorded in the CTD Logbook. Weather information was also recorded in the Rosette Log and in the meteorological logbook. For every cast, data recorded at the moment of bottle closure were averaged over 10 seconds (3 seconds before bottle closure and 7 seconds after it) and printed in ‘bottle files'. These files also included the bottle position on the Rosette, time and date, pressure, temperature, salinity, transmissivity, chlorophyll fluorescence, oxygen, irradiance and pH measurements. CTD-Rosette casts were classified into 9 categories with usual depths of bottle closure for each team collecting water from the Rosette as follows:

Nutrients (J.-É. Tremblay): chlorophyll maximum, salinity of 33.1, 5, 10, 20, 30, 40, 50, 60, 70, 80, 100, 125, 150, 175, 200, and every 100 m down to the bottom.
Phytoplankton and primary production (M. Gosselin, M. Poulin and C. Michel): salinity of 33.1, 400, 200, 100, 75, 100%, 50%, 30%, 15%, 5%, 1% and 0.2% of light measured with a Secchi disk before the cast.
Microbial diversity (C. Lovejoy): chlorophyll maximum, nitracline, 4 others different depths depending on profiles.
Microbes and particles (J. Deming): 10, 25, 50, 75, 100, 125, 150, 200 and 400 m.
Zooplankton (L. Fortier): 5, 15, 25, 35, 45, 55, 65, 75 and 85 m.
Contaminants (G. Stern): 6, 8, 11, 25, 50, 100, 150, and 200 m.
Mercury (G. Stern): 6, 8, 11, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 150, 200, 250 and 300 m.
Mercury (V. St. Louis): surface, bottom and oxygen minimum.
CTD profile: no bottle closed.

Vertical profiles of every cast including salinity, temperature, oxygen, transmissivity, nutrients, fluorescence and irradiance were plotted.

During Leg 2b, water samples from the Rosette were taken to examine nutrients, contaminants, and phytoplankton taxonomy. Depth of sampling was chosen to provide representative sampling of the entire water column at each station.

Parameter	Depths sampled (approximate, in m below surface)
Contaminants	150, 100, 50, 25, 11, 8, 6
Nutrients	Bottom, every even 20m to 80, 70, 60, 50, 40, 30, 20, 10, 5
Phytoplankton	49, 38, 27, 16, 5
Oxygen	100, 80, 60, 50, 40

5.1.2 Leg 1 – 22 August to 28 September 2006 – Baffin Bay and Canadian Arctic Archipelago

During Leg 1, between 22 August and 28 September, 115 casts were performed and 1845 bottles were closed.

<u>Comments and recommendations</u>

Sensors: Most of the sensors worked well for the entire cruise, except the fluorometers. The first fluorometer recorded spikes on most casts and was changed before cast #037. The second fluorometer had much the same problem which was not resolved despite cleaning then changing the cable. The oxygen sensor showed a delay in the recorded data. The dissolved oxygen discrete samples collected at the Rosette for calibration purposes will help fix that problem.

Bottles: There were problems or incidents with three of the bottles (#1, 24 and another one brought by V. St. Louis' team). One bottle broke when the Rosette hit the ship and one (#13) stopped triggering after cast #034 and did not work properly despite cleaning the whole carousel.

Deck equipment (winch, A-frame, etc.): The Rosette winch created many problems despite multiple attempts to fix it.

Calibration information: Water samples were taken for salinity and dissolved oxygen calibrations. All of the salinity samples were analyzed with the AutoSal analyzer onboard the ship. Dissolved oxygen samples were analyzed by Winkler titration system. Data will be used to adjust the profiles recorded by the CTD sensors.

5.1.3 Leg 2a – 28 September to 29 October 2006 – Amundsen Gulf, Beaufort Sea and Canadian Arctic Archipelago

Leg 2b – 29 October to 9 November 2006 – Labrador fjords

During Leg 2, between 28 September and 9 November 2006, 138 casts were performed and 2424 bottles were closed.

<u>Comments and recommendations</u>

Sensors: Most of the sensors worked well throughout the cruise. One major problem occurred between casts 002 and 003 and it was thought the pump or the oxygen sensor created this problem. Both were cleaned and the oxygen sensor was changed after cast 012 but without any result. The problem was related to damage to the CTD cable. Hence, temperature, salinity and oxygen data were not good for casts 003 to 013, but the data from the pH sensor is good on those casts.

Bottles: One bottle would close intermittently (bottle #13). Six bottles imploded under pressure, two were leaking and three had broken support.

Deck equipment (winch, A-frame, etc.): The winch problem encountered during Leg 1 was fixed.

Calibration information: Water samples were taken for salinity (507 samples) and dissolved oxygen (297 samples) calibration in triplicates at 5 depths on 8 different casts. All of the salinity samples were run on the ship's Autosal analyzer. Dissolved oxygen samples were run with the Winkler titration system. Data will be used to adjust the CTD sensors measurements.

5.2 Preliminary results CTD-Rosette (Leg 2b – Labrador fjords)

CTD profiles were taken at numerous stations in each fjord. Preliminary observation of CTD profiles reveal very high productivity (fluorescence) levels at the head of Nachvak and

Saglek fjords (Figure 5.1 and 4.2), with relatively lower productivity at the mouth of the fjords. Relative to the two northern fjords, Anaktalak Bay had lower productivity and appeared less stratified (Figure 5.3).

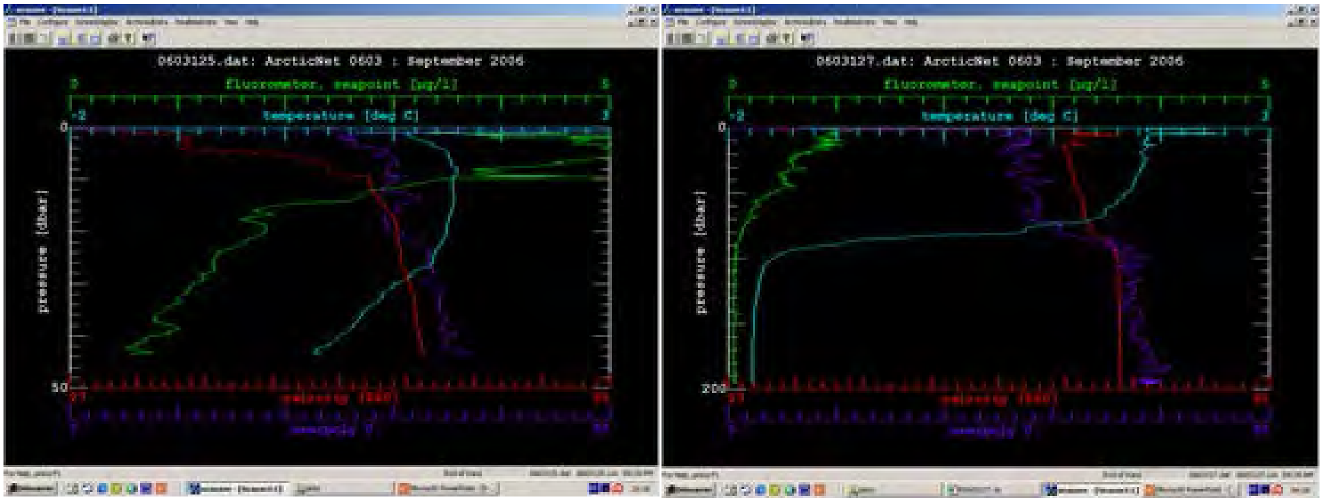

Figure 5.1. CTD profiles taken at Nachvak Fjord head (left panel) and mouth (right panel) in northern Labrador during Leg 2b.

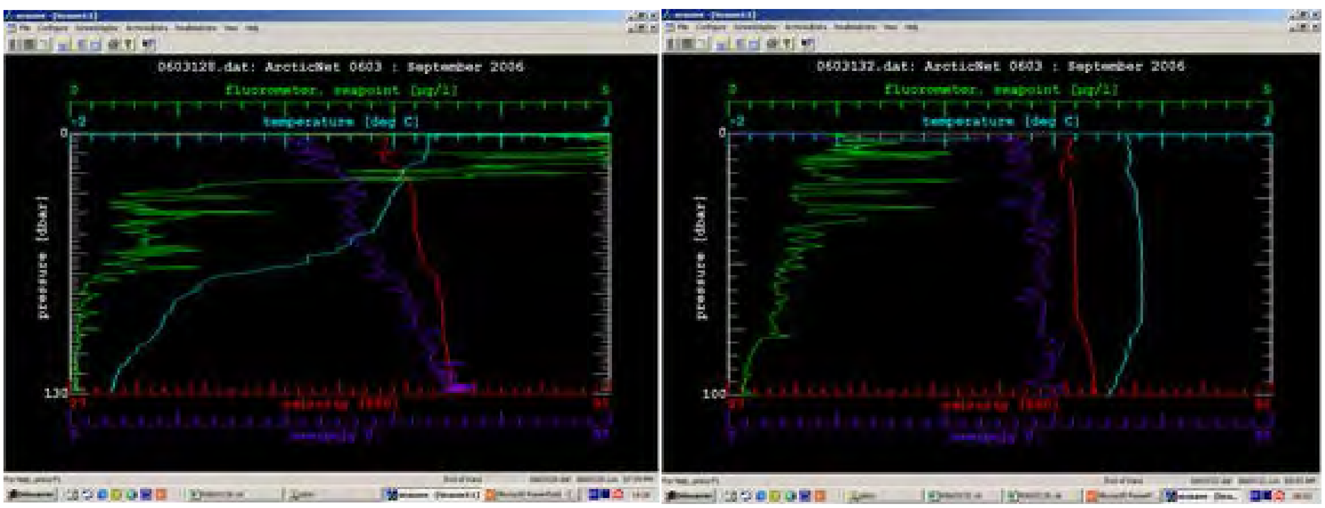

Figure 5.2. CTD profiles taken at Saglek Fjord head (left panel) and mouth (right panel) in northern Labrador during Leg 2b.

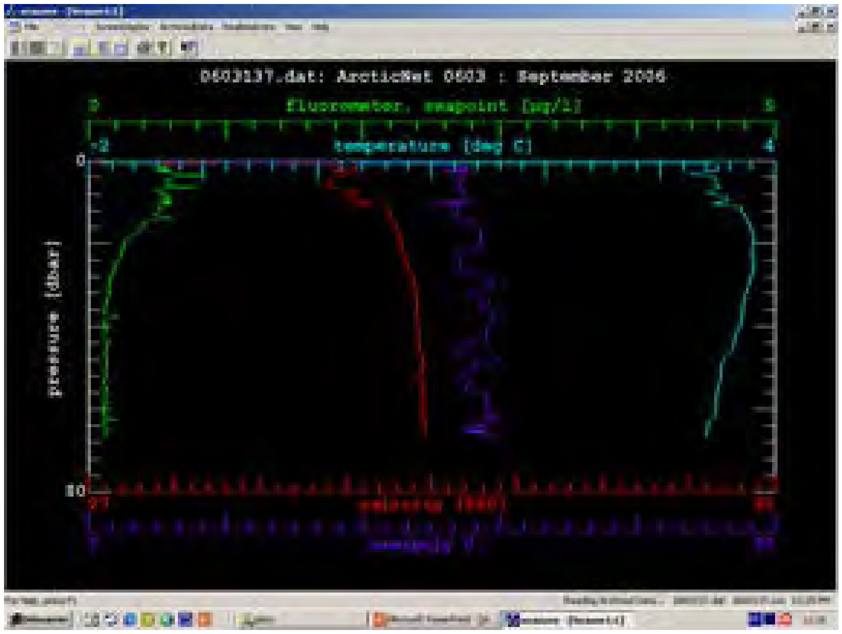

Figure 5.3. CTD profile taken at Anaktalak Bay head in northern Labrador during Leg 2b.

5.3 ADCP and thermosalinograph (TSG)

The ship mounted ADCP was sent to RDInstruments® during dry dock this summer and the problems were expected to be resolved. Preliminary tests done by Y. Gratton at the beginning of Leg 1 were promising and more will be known when analyses begin.

The thermosalinograph started recording on 1 September 2006 but recording stopped around 12 September and was re-started only on 20 September. A password to restrict access was incorporated on the TSG's computer to avoid any other interruption of recording. The recording ended on 8 November 2006 at the end of Leg 2b.

6 Self-Contained Autonomous MicroProfiler (SCAMP) – Legs 1 and 2

ArcticNet Phase I – Theme 1: Climate Change Impacts in the Canadian High Arctic: a Comparative Study Along the East-West Gradient in Physical and Societal Conditions. ArcticNet/Phase 1/Project 1.1.

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6.1 Introduction

There is no precise definition of what we call turbulence. It is generally defined as the rotational, energetic and eddying state of a fluid that disperses material and transforms momentum. The impact of the resulting dissipation influences all scales of ocean dynamic (from the millimetre to the kilometre) and even molecular processes. In consequence, the kinetic energy lost into heat in turbulent events modifies the working of the ocean and must be considered. Mixing in surface waters disperses pollutants, and influences air-sea gas exchanges as well as the growth and physiology of marine organisms (especially the plankton), and ultimately plays a role in the general climate.

Few studies have dealt with turbulent mixing and his impacts for the Arctic Ocean. In the context of global warming, which strongly affects the poles, the importance of this process must be known in order to understand the dynamics of this Northern system.

6.2 Methodology

Turbulence is usually quantified as the rate of loss of kinetic energy per unit mass. The resulting dissipation, denoted by ε (W kg^{-1} or m^2 s^{-3}), ranges from 10^{-10} W kg^{-1} for the abyssal ocean to 10^{-1} W kg^{-1} in the more active regions. The presence of turbulence in the ocean is mainly due to propagating waves at the surface (surface gravity waves) and in the ocean interior (internal waves). When breaking, these waves promote diapycnal mixing and generate large gradients of velocity at small scales (1 mm to 1 cm). The resulting eddies create a strain field that compresses the scalar properties of the water (i.e. temperature and salinity), enhances their gradient and promotes homogenisation. The scalar gradient is then destroyed at a rate χ which is equal, at equilibrium, to the rate of production of the variance by large eddies. While the temperature is considered, χ can easily be inferred by the time average of temperature fluctuations present in the water column as:

$$\chi \propto \overline{\nabla T'}^2$$

with $\overline{\nabla T'}$ the time average of the temperature fluctuations.

In order to measure small temperature fluctuations and hence, the presence of turbulence, a precise profiler was used: the Self Contained Autonomous MicroProfiler or SCAMP (Figure 6.1). The SCAMP is a free fall instrument that can be deployed from small boat. Its accuracy (millimeter) makes it possible to estimate the stability of the water column, as well as the occurrence of mixing and dissipation in various points of the profiles. The microprofiler also measured temperature, salinity, irradiance (PAR sensor) and fluorescence, which can be used to explain the physical and biological dynamic of the water column.

For this project, deployment of the SCAMP and measurements were made from the Zodiac (Figure 6.1) at every full station or whenever weather and logistical conditions permitted it. Sampling far from the *Amundsen* allowed avoiding undesirable background noise. To quantify and qualify turbulent events, several profiles were taken at each sampling station to give a time evolution picture of the processes.

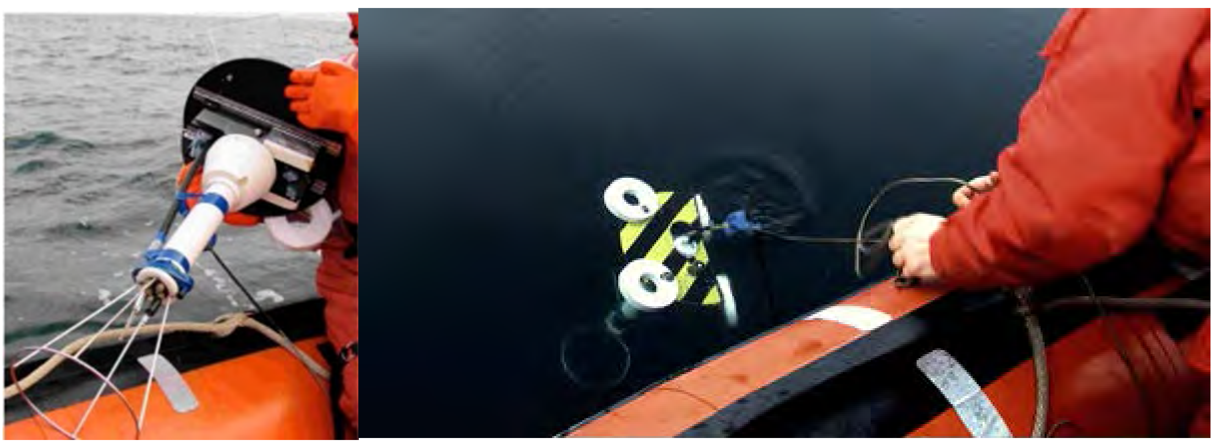

Figure 6.1. The SCAMP deployed from the Zodiac (Photo: Jaime Dawson).

The turbulence measurements could only be done at full stations and one officer was required to drive the Zodiac. For this reason, the sampling could only take place between 08h30 and 19h30. A summary of the basic information for the SCAMP profiles obtained during Legs 1 and 2 are presented in Table 6.1.

During Leg 2, efforts were made to adjust the descent rate of the SCAMP. Since the data was logged in the SCAMP and could only be read once back on the *Amundsen*, the descent rate was adjusted in an iterative process. Floats and weight were added to adjust buoyancy and two outings were required to bring down the descent rate from more than 0.2 cm/s to approximately 0.1 m/s. However, the speed continued to vary from one station to another due to various factors, such as wind conditions, the Zodiac drift speed and the length of cable unrolled. The water density may also have affected the buoyancy and may vary with depth, as seen on Figure 5.4. In general, the descent rate varied between 0.08 and 0.15 m/s after the first two stations.

Table 6.1. Information for SCAMP profiles done during Legs 1 and 2.

Station	Latitude N	Longitude W	Date UTC	Time UTC	# of profiles	Profiling depth (m)
LEG 1						
132	78º59.837	-072º18.714	06/09/09	13h39	3	90
131	78º19.541	-073º14.802	06/09/11	18h30	2	90
126	78º20.717	-073º24.880	06/09/12	17h00	3	80
117	77º22.432	-076º57.619	06/09/14	19h45	3	90
115	76º20.553	-071º12.072	06/09/16	13h00	5	90
101	76º24.630	-077º16.668	06/09/18	12h43	5	90
307	74º25.290	-100º33.131	06/09/23	17h25	5	80
310	71º21.369	-102º10.194	06/09/25	19h25	3	80
LEG 2						
405	70º39.08	-122º56.86	01/10/06	20h38	4	85-88
408	71º15.91	-127º31.04	03/10/06	00h12	5	85-88
414	71º25.27	-127º22.02	05/10/06	16h34	4	30-40
436	70º19.76	-126º22.46	09/10/06	19h25	5	65-70
407	71º00.69	-126º02.82	18/10/06	00h55	5	55-60
334	67º53.00	-80º47.47	25/10/06	11h00	5	55-70
338	66º09.29	-81º19.14	26/10/06	01h15	5	50-65
345	65º05.96	-79º18.36	26/10/06	14h12	4	55-75
350	64º29.96	-80º30.00	27/10/06	00h54	5	52-72
602	59º03.0	-63º51.4	01/11/06	18h30	5	40-50
617	58º20.6	-63º30.9	02/11/06	18h40	3	24-33
624	56º25.3	-62º04.1	04/11/06	15h00	3	33-50

6.3 Preliminary results

Examples of profiles collected with the SCAMP are presented in Figures 5.2 and 5.3. Figure 6.2 (right) shows a typical profile for a calm sea, with practically no turbulence except at the ocean skin where a very thin layer of freshwater is observed. Ice was forming near the station located in Nachvak Fjord (Station 602 in Leg 2b). Figure 6.3 (left) shows an example of a well-mixed water column in Foxe Basin (Station 345 in Leg 2a) where the SCAMP detected very small temperature and salinity variations at high frequency. Figure 6.2 shows how the descent rate varied with depth. More than 500 m of cable were unrolled during that station in Saglek Fjord due to high drifting speed of the Zodiac (Station 617 in Leg 2b).

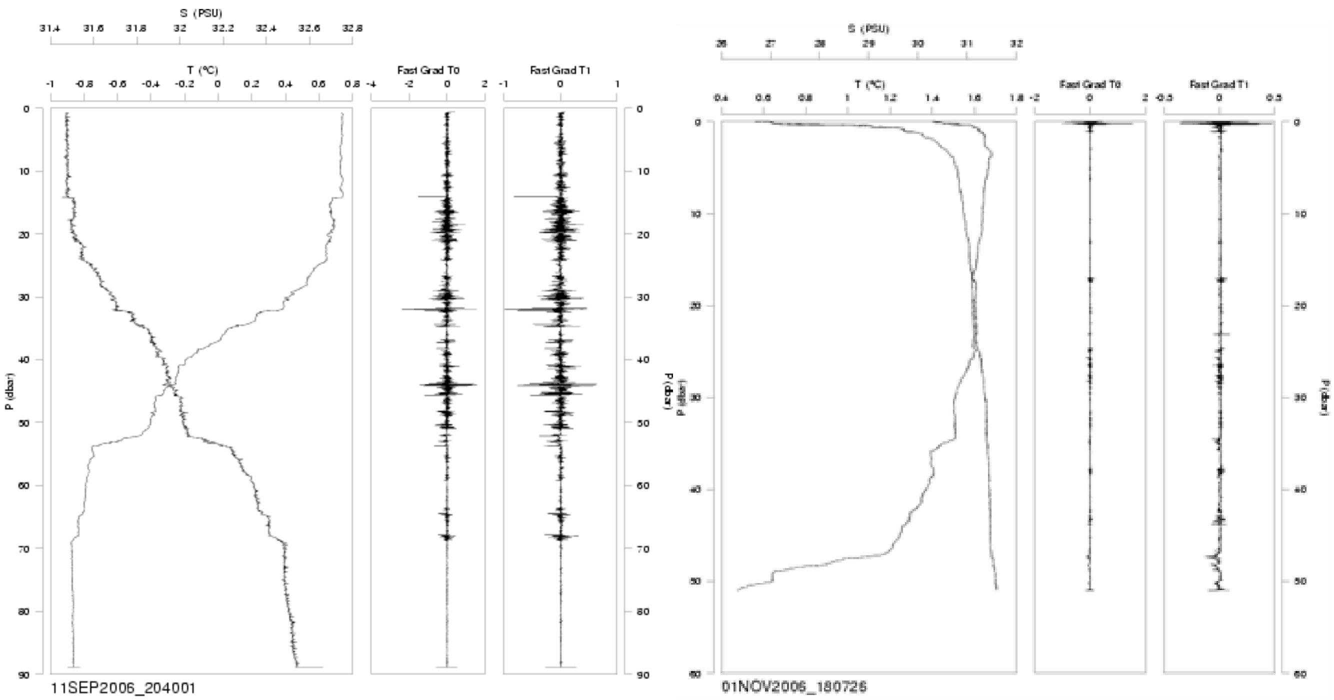

Figure 6.2. Left: Profile recorded on 11 September 2006 during Leg 1. Right: Profile recorded on 1 November 2006 during Leg 2b. In both examples: Left panel: temperature; Middle panel: salinity; right panel: temperature gradient.

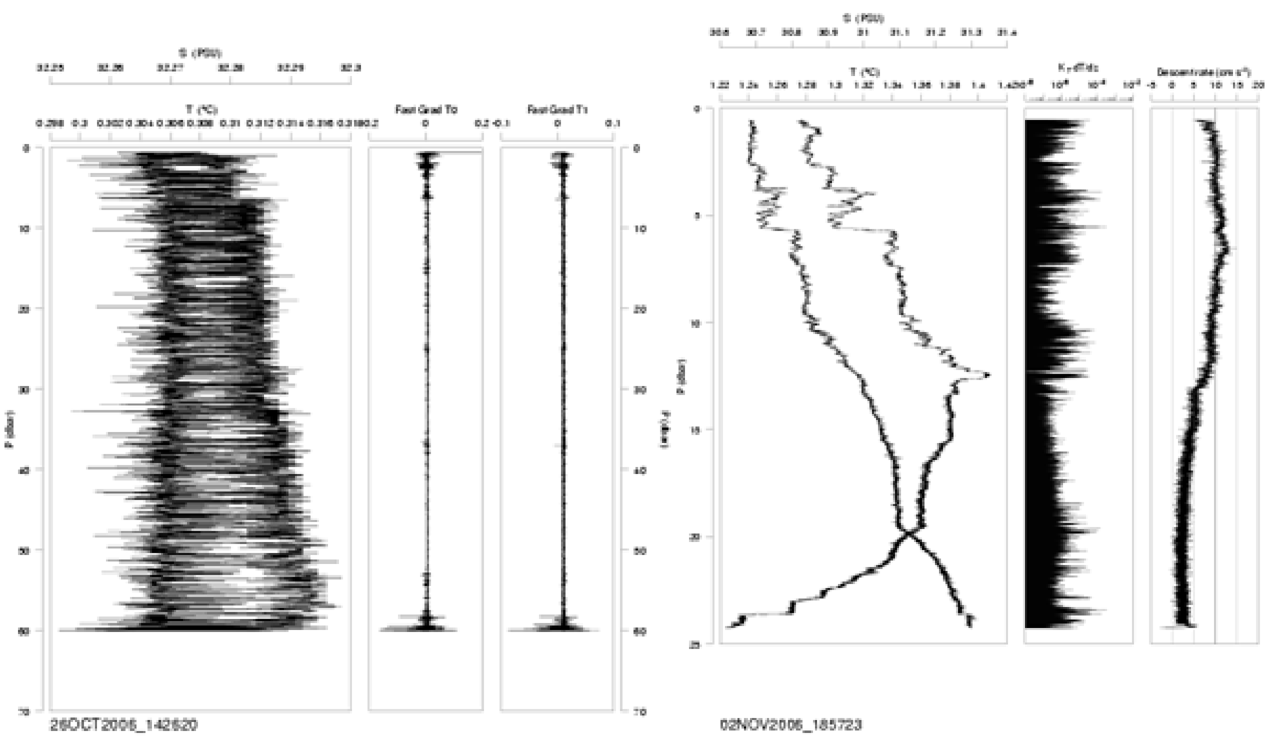

Figure 6.3. Left: Profile recorded on 26 October 2006 during Leg 2a. Right: Profile recorded on 2 November 2006 during Leg 2b. In both examples: Left panel: temperature; Middle panel: salinity; right panel: temperature gradient.

7 Carbon fluxes using drifting sediment traps – Legs 1 and 2a

ArcticNet Phase I – Project 1.4: Marine Productivity & Sustained Exploitation of Emerging Fisheries. ArcticNet/Phase 1/Project 1.4

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7.1 Introduction

According to global circulation models, global warming will continue over the next few decades. This warming will be seen first and most prominently in the Polar Regions, particularly in the Arctic. A better knowledge of the biological pump (the conversion of euphotic zone inorganic carbon into phytoplankton carbon) and its export to deeper waters is needed (Caron et al. 2004).

Traditionally, there are two pathways to describe organic carbon sedimentation in the water column. Phytoplankton carbon can be transferred to higher trophic levels by zooplankton grazing and part of this carbon may be exported as fecal pellets. The primary production that is not used by pelagic herbivores can be exported out of the euphotic zone through sedimentation of intact cells. The first pathway, which is called the retention chain, favours transfer to the pelagic ecosystem while the second pathway (the export chain) leads to food input for the benthic community and potentially to carbon sequestration in the sediments. The carbon reaching the seafloor has to be replaced by a new supply of atmospheric carbon in the surface waters to maintain the equilibrium of the partial pressure of carbon dioxide between the air and the sea (Caron et al. 2004).

The main objectives of this study were to:

- Estimate the sinking export of organic and inorganic material from the euphotic zone
- Determine the microscopic composition of the sedimenting matter.

7.2 Methodology

7.2.1 Leg 1 – 22 August to 28 September 2006 – Baffin Bay and Canadian Arctic Archipelago

Free-drifting short-term particle interceptor traps (FST) were deployed from the ship at three depths below the euphotic zone (50, 100 and 150 m) for 5 to 29 hours at five stations in the NOW region in Baffin Bay (Table 7.1). Of the 10 FST stations (full and mooring stations) originally scheduled, only 5 deployments could be performed. The first two deployments, located in the northern part of the sampling area, had to be retrieved early because of heavy ice condition in Kane Basin (Station 132), and the crossing of the permitted Greenland 3 nautical miles zone (Station 131). These traps were not processed. Heavy ice condition on the Canadian side of NOW polynya also did not permit FST deployment (Stations 127 and 117) and because of tight schedule and logistical problems, mooring Stations 108 (BA 02-05) and 303 were transformed into Basic stations, allowing no time for FST deployment. No deployment was done at station 100 (BA 04-05) because that station was dedicated to mooring retrieval only. One FST was deployed in the Northwest Passage (NWP) (Station 307) but because of the water column was too shallow (151 m) the deepest target depth (150 m) was removed.

Table 7.1. Deployment/recovery and analysis details of the free-drifting particle interceptor traps in the North Water Polynya (NOW) and the Northwest Passage during Leg 1.

Station	Date Sept 2006	Duration (d)	Deployment		Recovery		Depth	Target depths	POC/ PON	DOC/ DON	BioSi	LithoSi	Total Chla	Cells
			Latitude N	Longitude W	Latitude N	Longitude W	(m)	(m)						
100	07	No deployment												
132	08	0.40	79°00.108	72°19.624	79º01'534	72º05.780	224	50-100-150						
131	11	0.21	78°19.518	73º14.389	?	?	277	50-100-150						
127	11	No deployment												
126	12	0.79	77º21.792	73º28.030	77º26.643	73º44.907	314	50-100-150	6	6	6	3	6	3
117	14	No deployment												
115	15	1.21	76º17.218	71º18.793	76º15.117	071º26.117	636	50-100-150	6	6	6	3	6	3
108	17	No deployment												
101	18	0.77	76º23.533	77º21.028	76º23.477	077º23.512	507	50-100-150	6	6	6	3	6	3
303	20	No deployment												
307	23	0.72	74º25.994	100º41.294	74º27.097	102º49.257	151	50-100	4	4	4	2	4	2

The traps consisted of PVC cylinders with an internal diameter of 10 cm and a height/diameter ratio of 7. In order to collect enough material for the analyses, five traps were installed at each depth on the trap line. At the surface, the trap line was attached to a positioning system (ARGOS and radio beacon) and a series of small floats (Viny floats) to minimize vertical motion. During deployment, the traps were filled with deep seawater (200 m) collected at a previous station and filtered through 0.22 µm filter membranes. Upon recovery, the traps were covered with a tight lid and placed vertically in a dark cold room (4ºC) for 8 hours. After allowing the sediment to settle, the supernatant was carefully removed and the bottom volume of the traps was kept for analysis.

At each deployment and for each target depth, the sinking material was analyzed for particulate organic carbon and nitrogen (POC/PON), dissolved organic carbon (DOC) and nitrogen (DON), ^{15}N and ^{13}C stable isotopes (Isotopes), biogenic (BioSi) and lithogenic silica (LithoSi), total chlorophyll *a* and phaeopigments (total chl*a*), exopolymeric substances (EPS), phytoplankton composition and abundance (Cells) and fecal pellet abundance and biovolume (Table 7.1). Furthermore, an extra filtration (Extra) on pre-combusted GF/F 0.25 mm filter was processed and stored at -80°C in case other variables were added.

7.2.2 Leg 2a – 28 September to 29 October 2006 – Amundsen Gulf, Beaufort Sea and Canadian Arctic Archipelago

Free-drifting short-term particle interceptor traps (FST) were deployed from the ship at three depths below the euphotic zone (50, 100 and 150 m) for 12 to 19 hours at five (5) stations in the Beaufort Sea (Table 7.2), except for one station (435) where the material from the 50 m depth was rejected due to strong wave action.

The traps were PVC cylinders with an internal diameter of 10 cm and a height/diameter ratio of 7. In order to collect enough material for the analyses, five traps were installed at each depth on the trap line. At the surface, the trap line was attached to a positioning system (ARGOS and radio beacon) and a series of small floats (Viny floats) to minimize vertical motion. During the deployment, the traps were filled with deep seawater (200 m) collected at a previous station and filtered through 0.2 µm filter membranes. Upon recovery, the traps were covered with a tight lid and placed vertically in a dark cold room (4°C) for 8 h. After allowing the sediment to settle, the supernatant was carefully removed and the bottom volume of the traps was kept for analysis.

At each deployment and for each target depth, the sinking material was analyzed for particulate organic carbon (POC) and nitrogen (PON), dissolved organic carbon (DOC) and nitrogen (DON), ^{15}N and ^{13}C stable isotopes (Isotopes), biogenic (BioSi) and lithogenic silica (LithoSi), total chlorophyll *a* and phaeopigments (total chl *a*), exopolymeric substances (EPS) phytoplankton composition and abundance (Cells) and fecal pellet abundance and biovolume (Table 7.2). Furthermore, an extra filtration (Extra) on pre-combusted GFF 0.25 mm filter was processed and stored at -80°C in case of the addition of other variables.

Table 7.2. Deployment, recovery and analysis details of the free-drifting particle interceptor traps in the Beaufort Sea in October 2006.

Date in	Station	Duration (d)	Deployment		Recovery		Depth	Target depth	POC/PON	DOC/DON	BioSi	LithoSi	EPS	Total chl *a*	Cells	Fecal pellets	Isotopes	Extra
			Latitude	Longitude	Latitude	Longitude	(m)	(m)										
2006-01-10	405	0,79	70°39'225 N	122°58'642 W	70°36'5 N	123°14'6 W	585	50-100-150	6	6	6	3	9	6	3	3	3	-
2006-02-10	408	0,53	71°17'216 N	127°31'163 W	71°15'456 N	127°26'85 W	200	50-100-150	3	6	6	3	9	6	3	3	3	-
2006-09-10	436	0,68	70°19'959 N	126°21'501 W	70°19'470 N	126°33'815 W	250	50-100-150	3	6	6	3	9	6	3	3	3	-
2006-12-10	435	0,75	71°04'680 N	133°33'944 W	70°57'4 N	134°24'5 W	307	100-150	4	4	4	2	6	4	2	2	2	1
2006-17-10	407	0,50	71°00'69 N	126°03'62 W	71°03'96 N	125°48'08 W	404	50-100-150	6	6	6	3	9	6	3	3	3	3

8 Nutrients, nitrogen cycling and ecophysiology of phytoplankon – Legs 1 and 2a

ArcticNet Phase I – Project 1.4: Marine Productivity & Sustained Exploitation of Emerging Fisheries. ArcticNet/Phase 1/Project 1.4

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8.1 Introduction

The Arctic climate displays high inter-annual variability and decadal oscillations that modulate growth conditions for marine primary producers. Much deeper perturbations recently became evident in conjunction with globally rising CO_2 levels and temperatures (ACIA 2004; Comiso 2003). The thickness and extent of Arctic sea-ice decrease rapidly (Johannessen et al. 1999; Rothrock et al. 1999) and the ice-free season is extending both in the Arctic (Laxon et al. 2003) and subarctic (Stabeno & Overland 2001). Models predict further reductions in ice cover (ACIA 2004). These changes entail a greater penetration of light into surface waters, which is expected to bolster phytoplankton production (Rysgaard et al. 1999), food web productivity and CO_2 drawdown by the ocean. At present, phytoplankton production varies by two orders of magnitude across the Canadian Arctic, but the forcing mechanisms are poorly understood and quantified.In the Canadian Archipelago, the productivity of phytoplankton is likely to be limited by light or the supply of allochtonous nitrogen, depending on ice conditions. The supply of allochtonous nitrogen is influenced by climate-driven processes, mainly the large-scale circulation, river discharge, upwelling and regional mixing processes. Over most of the western Arctic, and especially the Beaufort Sea, the concentrations of inorganic nitrogen (i.e. nitrate, nitrite and ammonia) at surface remain low throughout the year and the phytoplankton possibly depend on local recycling and the dissolved organic nitrogen (DON; e.g. urea, amino acids and primary amines) supplied by rivers. A large portion of the phytoplankton biomass is typically located within subsurface chlorophyll maxima (SCM). SCM productivity is possibly in balance with the episodic supply of nitrate across the halocline and/or the supply of ammonium and nitrate by local recycling and nitrification, respectively. Despite the importance of SCM for the food web and CO_2 fluxes, little is known about their structure, turnover and susceptibility to environmental variability and change. The main goals of this project for Legs 1 and 2a were to:

- Establish the horizontal and vertical distributions of phytoplankton nutrients and the influence of different processes (e.g., mixing, upwelling and biological processes) on these distributions

- Characterize the detailed vertical structure of chlorophyll-a with respect to irradiance, nutrient supply and physical structure
- Experimentally assess causal relationships between phytoplankton productivity and the availability of light
- Determine the utilisation of different sources of inorganic and organic nitrogen by phytoplankton and bacteria
- Experimentally assess the relationships between nitrogen concentration, temperature, photosynthesis and the kinetics of nitrogen uptake.

Ancillary objectives were to calibrate the SeaPoint fluorometer and ISUS nitrate probe attached to the Rosette and to test the Phytoflash instrument (Turner) for vertical profiling of photosynthetic competency.

8.2 Methodology

Samples for inorganic nutrients (ammonium, nitrite, nitrate, orthophosphate and orthosilicic acid) were taken at all rosette stations (Table 8.1 for Leg 1 and Table 8.2 for Leg 2a) to establish detailed vertical profiles (Figure 8.1 and 7.2 show vertical sampling resolution). Additional samples for total alkalinity (pH method) and dissolved organic nitrogen (DON), urea and dissolved free amino acids (DFAA) were taken at stations where incubations were performed. Ammonium and DFAA (total) were determined immediately after collection using modifications of the manual fluorometric method (e.g. Holmes et al. 1999). Urea samples were stored frozen and DON samples were preserved with acid and stored in the dark at 4°C for post-cruise determination. The concentrations of nitrate, nitrite, orthophosphate and orthosilicic acid were determined on fresh samples using an Autoanalyzer 3 (Bran+Luebbe) with colorimetric methods adapted from Grasshof (1999). Numerous samples generated by the teams of Stern and Lovejoy were also processed during the cruise.

Table 8.1. List of stations and CTD-Rosette casts sampled and measurements made for nutrients and phytoplankton parameters during Leg 1.

Station	Cast	Date	Time UTC	Latitude N	Longitude W	Nutrients	PAM FiRE	Kinetics (lab)	Light gradient (lab)	Partitioning (deck)
Oliver A	10	09/04/06	13:31	72° 15.156	077° 46.950	X	X			
BA04	18	09/07/06	07:12	75° 16.260	074° 59.262	X	X			
132	25	09/09/06	15:12	79° 00.030	072° 16.632	X	X		X	X
127	29	09/10/06	20:32	78° 17.760	074° 19.920	X				
129	33	09/11/06	07:57	78° 19.488	074° 00.960	X				
130	34	09/11/06	09:16	78° 19.458	073° 37.992	X				
131	36	09/11/06	14:37	78° 19.542	073° 11.172	X	X		X	X
126	43	09/13/06	06:41	77° 20.982	073° 26.682	X	X		X	X
124	45	09/13/06	12:06	77° 20.142	074° 18.522	X				

Station	Cast	Date	Time UTC	Latitude N	Longitude W	Nutrients	PAM FiRE	Kinetics (lab)	Light gradient (lab)	Partitioning (deck)
122	47	09/13/06	18:07	77° 19.902	075° 01.788	X				
120	49	09/13/06	09:20	77° 19.218	075° 42.618	X				
119	50	09/13/06	00:03	77° 19.122	076° 06.012	X				
118	53	09/14/06	09:07	77° 22.392	076° 41.820	X	X		X	X
115	62	09/16/06	14:01	76° 20.970	071° 12.492	X	X	X	X	
113	64	09/17/06	06:08	76° 18.798	072° 14.358	X				
111	66	09/17/06	09:47	76° 18.468	073° 11.352	X				
108	68	09/17/06	16:55	76° 15.102	074° 35.820	X	X	X	X	
105	71	09/17/06	00:19	76° 19.392	075° 48.780	X				
103	73	09/18/06	02:38	76° 21.642	076° 33.882	X				
101	78	09/18/06	19:16	76° 24.372	077° 17.460	X	X	X	X	
300	84	09/20/06	09:29	74° 22.410	079° 58.542	X				
301	85	09/20/06	20:22	74° 07.848	083° 19.620	X				
302	88	09/21/06	08:51	74° 09.048	086° 16.398	X				
303	90	09/21/06	18:11	74° 14.940	089° 39.438	X	X	X	X	
304	91	09/22/06	00:59	74° 21.252	093° 18.972	X				
305	92	09/22/06	03:56	74° 19.752	094° 59.772	X				
307	96	09/23/06	14:57	74° 24.282	100° 34.602	X	X	X	X	
308	101	09/24/06	13:49	73° 30.438	103° 29.160	X				
310	107	09/25/06	12:30	71° 27.480	101° 17.010	X	X			
311	110	09/26/06	07:30	70° 16.332	098° 27.522	X				
314	112	09/27/06	01:00	68° 59.538	106° 35.130	X	X			

Table 8.2. List of sampling stations and measurements during Leg 2a.

Station	Cast	Date	Time UTC	Latitude N	Longitude W	Nutrients	PAM FiRE	Kinetics (lab)	Light gradient (lab)	Partitioning (deck)
400	1	09/29/2006	09:28	69° 05.487	114° 48.315	X				
401	2	09/29/2006	13:02	69° 14.140	116° 36.200	X				
402	3	09/29/2006	16:35	69° 35.740	118° 08.031	X				
403	5	09/30/2006	03:35	70° 06.050	120° 05.760	X	X			
405	8	10/01/2006	12:10	70° 39.222	122° 59.242	X	X	X	X	
408	16	10/03/2006	01:09	71° 15.768	127° 29.931	X	X	X	X	
SH	19	10/04/2006	13:08	71° 52.144	125° 52.144	X	X		X	X
410	20	10/05/2006	10:15	71° 41.966	126° 29.370	X				
412	22	10/05/2006	13:31	71° 33.957	126° 54.444	X				
414	24	10/05/2006	16:50	71° 25.286	127° 22.044	X				
416	26	10/06/2006	02:03	71° 17.519	127° 46.081	X				
418	28	10/06/2006	03:58	71° 09.646	128° 09.850	X				
420	31	10/06/2006	07:48	71° 03.188	128° 30.858	X	X			
421	34	10/06/2006	22:59	71° 28.732	133° 56.905	X	X			

Station	Cast	Date	Time UTC	Latitude N	Longitude W	Nutrients	PAM FiRE	Kinetics (lab)	Light gradient (lab)	Partitioning (deck)
422	36	10/07/2006	08:38	71° 22.195	133° 52.950	X				
424	38	10/07/2006	12:28	71° 10.242	133° 49.383	X				
426	42	10/07/2006	21:00	70° 59.220	133° 45.001	X				
428	44	10/07/2006	23:34	70° 47.415	133° 42.237	X				
430	46	10/08/2006	02:46	70° 35.765	133° 39.332	X				
432	48	10/08/2006	06:10	70° 24.373	133° 36.421	X				
436	51	10/09/2006	13:43	70° 20.127	126° 21.177	X	X		X	X
435	58	10/12/2006	15:34	71° 05.000	133° 33.420	X	X	X	X	
434	65	10/17/2006	02:37	70° 10.860	133° 34.640	X	X		X	X
407	70	10/18/2006	07:30	71° 01.210	126° 00.500	X	X		X	X
404	72	10/18/2006	20:54	70° 20.790	121° 36.050	X				
317	78	10/22/2006	16:49	72° 05.140	093° 54.250	X				
319	80	10/22/2006	19:09	71° 52.960	093° 42.680	X				
322	84	10/23/2006	08:40	70° 24.060	091° 05.950	X	X			
324	86	10/23/2006	13:22	70° 30.100	090° 08.640	X				
326	88	10/23/2006	16:06	70° 36.110	089° 13.530	X				
327	89	10/24/2006	03:52	69° 57.120	085° 45.630	X				
328	90	10/24/2006	05:12	69° 53.030	085° 44.250	X				
330	92	10/24/2006	22:06	69° 19.120	080° 33.000	X				
332	94	10/25/2006	00:14	69° 10.980	080° 59.880	X				
333	95	10/25/2006	02:41	68° 45.940	081° 00.870	X	X			
334	97	10/24/2006	11:12	67° 53.020	080° 47.470	X	X			
336	99	10/25/2006	21:31	66° 25.230	080° 50.630	X				
338	102	10/26/2005	02:30	66° 09.350	081° 19.810	X	X			
340	104	10/26/2005	06:36	65° 52.980	080° 46.930	X				
342	106	10/26/2005	09:09	65° 37.070	080° 16.180	X				
344	108	10/26/2005	11:53	65° 21.830	079° 47.520	X				
346	110	10/26/2005	14:19	65° 06.040	079° 18.660	X	X			
348	112	10/26/2005	19:07	64° 50.110	078° 51.080	X				
350	115	10/27/2006	03:23	64° 29.660	080° 31.220	X	X			

Samples for the natural abundance of ^{15}N and ^{13}C in particulate organic matter were taken at 5 m and in the chlorophyll maximum at stations where incubations were performed (Table 8.1 and 7.2). Volumes ranging from 12 to 20 liters were concentrated to 30 ml in Amicon stirred cells (Millipore) fitted with 0.4-µm, high-throughput cellulose filters. Positive pressure was maintained with high-purity N_2 gas. The condensate was collected in a recipient and the cellulose filters were washed copiously. A final filtration onto pre-combusted GF/F filters was performed and the filters were desiccated at 60°C in a drying oven. These data will be used for nitrogen uptake calculations and to assess the nitrogen status of phytoplankton communities.

The relationship between light and the uptake of C and N by phytoplankton (light-gradient incubations in Table 8.1 and 7.2) from the chlorophyll maximum and the upper mixed layer (5 m) was assessed using dual labelling with stable isotopes of C and N in four light-gradient modules (10 light intensities). Temperature was maintained at in situ levels with a chilling circulator. Samples from all modules were spiked with ^{13}C-bicarbonate; two modules received saturating additions of ^{15}N-nitrate or ^{15}N- ammonium, and the other two trace additions. Incubations were terminated by filtration onto 25-mm GF/F filters. All filters were desiccated at 60°C and stored dry for post-cruise determination of isotopic enrichment and particulate organic carbon and nitrogen.

The partitioning of various nitrogen sources between bacteria and different size classes of phytoplankton was assessed with deck incubations (Table 8.1 and 7.2). Samples from the upper euphotic zone and the chlorophyll maximum were spiked with 15N-nitrate, nitrite, ammonia, urea, alanine or glycine and ^{13}C-bicarbonate. The in situ light field was simulated with combinations of blue and neutral-density filters and temperature was maintained by circulating water from the upper mixed layer. Incubations were terminated by filtration onto pre-combusted GF/F filters after screening of separate aliquots on 20-μm and 5-μm polycarbonate filters (Poretics). An independent total was obtained by filtering another aliquot directly onto GF/F and collecting the filtrate on a 0.2-μm Silver filter. At a subset of stations, the contribution of bacteria to nitrogen uptake was assessed by adding a separate cascade filtration through 0.8-μm polycarbonate filters and 0.2-μm Silver filters. Replicate bottles were incubated with a cocktail of antibiotics and filtered in the same fashion to compare techniques (i.e. metabolic inhibition versus size-fractionation).

The effect of temperature on photosynthesis and the kinetics of ammonium and nitrate uptake were determined in three laboratory incubators maintained at 0, 3 and 6°C with high-capacity chilling circulators. Illumination was provided by sun-simulating fluorescent tubes. For each incubator, bottles were spiked at 6 different concentrations with the target ^{15}N-labelled nitrogen source. The nitrate bottles were also spiked with ^{13}C-bicarbonate.

The effects of incubation treatments (variable nutrient additions, temperature and light conditions) on the photosynthetic characteristics of phytoplankton were assessed by Pulse Amplitude Modulated fluorometry (PAM; Heinz-Walz) and Fast Repetition Rate fluorometry (FiRE; Satlantic). Nitrate data were used to calibrate the ISUS nitrate probe. Calibration of the Rosette fluorometer was achieved by comparing the instrument's output with extracted chlorophyll *a* and PAM data. The Phytoflash system was powered by a CTD (SBE-19) and deployed in self-contained mode from the zodiac (daytime) or the front deck (nighttime).

8.3 Preliminary results

8.3.1 Leg 1 – 22 August to 28 September 2006 – Baffin Bay and Canadian Arctic Archipelago

Chlorophyll fluorescence and the concentrations of silicate, nitrate, phosphate and nitrite along the southern section of the North Water are shown in Figure 8.1. Nutrient concentrations were typically low in the upper mixed layer, reflecting prior utilization by diatoms. The nutrient deficit extended deeper in the west, just east of the sill, presumably reflecting biological consumption upstream in the southbound Arctic outflow. This scenario is consistent with the relatively deep extent of chlorophyll fluorescence in the region. Isopleths were widely spaced on the vertical, which is indicative of a relatively weak density stratification at the onset of wind-driven mixing in autumn. By contrast, isopleths were closely spaced in the east, where the vertical stratification remained strong due to reduced wind exposure.

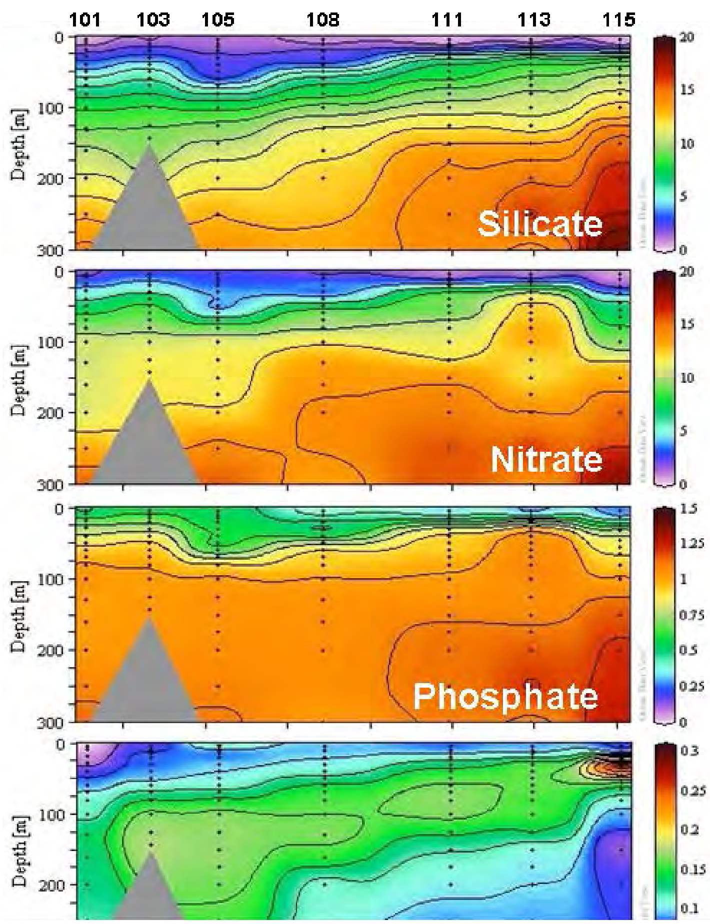

Figure 8.1. Longitudinal sections of silicate, nitrate, phosphate, nitrite (μM) and chlorophyll fluorescence (arbitrary unit) in the upper 300 m of the North Water at ~76.3°N. Note the change of vertical scale on the bottom panel. Black dots mark sampling depths and numbers above the top panel identify the sampling station.

Nitrite concentrations exhibited a ubiquitous subsurface maximum, the top of which tracked the 8 μM silicate isopleth that sloped upward with the halocline toward the east. This configuration suggests that nitrification generally occurred in a 100-150 m thick layer where light could not inhibit nitrifying bacteria or phytoplankton did not have enough light to consume nitrite or compete for ammonium. This is consistent with the vertical separation between the chlorophyll-rich surface layer and the top of the nitrite maximum west of Station 115. At Station 115, however, the nitrite maximum was associated with a very sharp and intense SCM that sat on the nitracline. The steep and shallow nitrite maximum at this location was possibly caused by the release of nitrite after the incomplete reduction of nitrate by light-stressed phytoplankton. This mechanism is hypothesized to provide an electron sink to dissipate excess light energy when phytoplankton is trapped near the surface in cold waters.

8.3.2 Leg 2a – 28 September to 29 October 2006 – Amundsen Gulf, Beaufort Sea and Canadian Arctic Archipelago

Chlorophyll fluorescence and the concentrations of nitrate, nitrite, silicate and phosphate along the section of the Mackenzie River in the Beaufort Sea are shown in Figure 8.2.

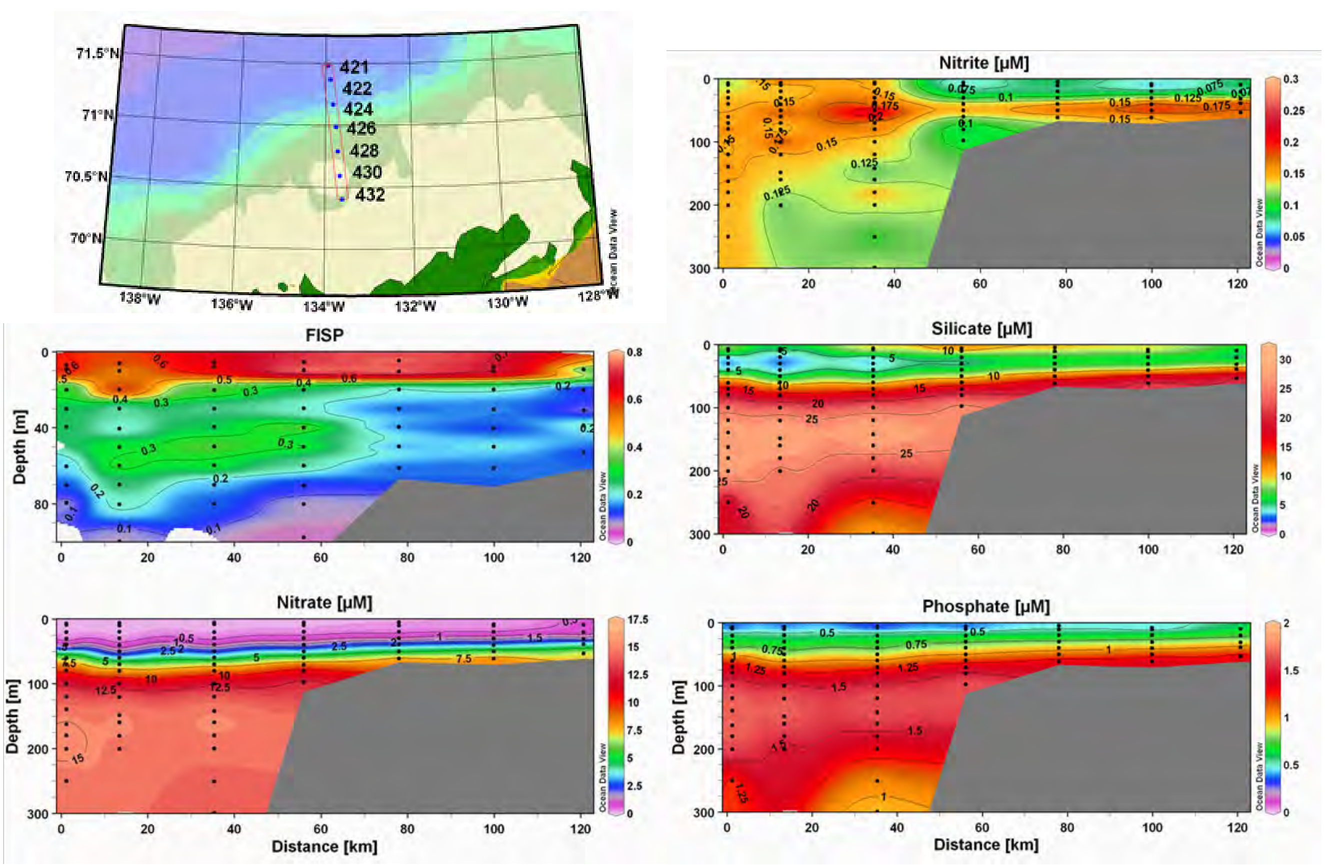

Figure 8.2. Sections of chlorophyll fluorescence (FISP), nitrate, nitrite, silicate and phosphate in the upper 300 m of Beaufort Sea near the Mackenzie River. Note the change of vertical scale for the fluorescence panel. Black dots mark sampling depths and numbers on the map identify the sampling stations, which are shown on the panel from 421 (left) to 432 (right).

Nutrient concentrations were typically low in the upper mixed layer, reflecting prior utilization by diatoms. This scenario is consistent with the relatively deep extent of the chlorophyll fluorescence in the region. The depletion of silicate around 25 m in the northern part of the section may also be an effect of exploitation by diatoms in the subsurface chlorophyll maximum (SCM) since silica is an essential component for their outer membrane.

Nitrite concentrations exhibited a ubiquitous subsurface maximum, the top of which tracked the 8 µM silicate isopleth. This configuration suggests that nitrification generally occurred in a 100-150 m thick layer where light could not inhibit nitrifying bacteria or phytoplankton did not have enough light to consume nitrite or compete for ammonium. This is consistent with the vertical separation between the chlorophyll-rich surface layer and the top of the nitrite maximum. The steep and shallow nitrite maximum at this location was possibly caused by the release of nitrite after the incomplete reduction of nitrate by light-stressed phytoplankton. This mechanism is hypothesized to provide an electron sink to dissipate excess light energy when phytoplankton is trapped near the surface in cold waters.

The low surface concentrations in nitrite on the shelf (Station 426 to 432) may be attributed to utilization by phytoplankton limited in nitrate in this part of the water column. It is also possible to observe that SCM are sat on the nitracline that suppose than cells limited by nitrate tend to follow higher concentration of nutrient rather than high concentration of light in low nutrient environments. The higher chlorophyll concentrations near the shore are probably influenced by the greater accessibility and recycling of the different nutrients in shallow environment than in the deep ocean.

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9 Molecular microbial biodiversity of Arctic seas – Legs 1 and 2a

ArcticNet Phase I – Project 1.4: Marine Productivity & Sustained Exploitation of Emerging Fisheries. [ArcticNet/Phase 1/Project 1.4]

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9.1 Introduction

Microbes are the dominant form of life in oceans and are responsible for carbon and nutrient cycling on a global scale. Because of their small size, the identity of the majority of these organisms is unknown. Recent advances, applying molecular based techniques to probe DNA collected from the sea has revealed surprising diversity of both prokaryotic and eukaryotic microbes in all systems investigated. Our previous data from the North Water, Canada Basin, Beaufort Sea and Norwegian arctic waters has revealed considerable diversity at different depths and among marine systems.

Our first objective was to collect microbial DNA and ancillary data from the highly productive North Water Polynya (NOW), which has a complex physical water column structure and to compare this to contrasting salinity stabilized water columns in the NW passage. The Second objective was to obtain RNA samples from many of the same sites to investigate expression of key genes under different oceanographic conditions. Our initial work in this area will be to compare diversity, relative abundance and expression of bacteria and archaea AmoA genes. This gene is expressed during nitrification of ammonia towards nitrate and codes for a key nitrogen cycling enzyme in the world ocean. The cruise path of the CCGS *Amundsen* on its first leg of 2006 ArcticNet mission was ideal for our objectives. Additional stations were sampled in the Beaufort Sea and the Southern NW passage on Leg 2. The third objective was to conduct short term experiments aboard the vessel to enlarge our understanding of active microbial processes in situ. In particular, a technique known as Stable Isotope Probing (SIP) was used where flow of carbon through active microbial communities can be studied with the incorporation of stable isotopically labeled substrates into biomass and subsequent identification of the microorganisms actively incorporating the label. Recently, this technique has been applied in combination with molecular techniques, retrieving the gene for SS rRNA, which is the standard for the taxonomic identification of microorganisms. The technique is based on the assumption that only actively growing microorganisms will incorporate the molecular label, SIP has the potential of identifying microorganisms responsible for ecologically important biogeochemical reactions in nature. Studies with SIP in combination with molecular analysis of nucleic acids have been successfully applied to bioremediation studies or soil communities and we used the opportunity to test this technique in an open ocean community.

9.2 Methodology

9.2.1 Leg 1 – 22 August to 28 September 2006 – Baffin Bay and Canadian Arctic Archipelago

In total 18 stations were sampled (Table 9.1), 11 of these were Full stations where a total of 20 variables were collected at each station (Table 9.2). Full stations were defined as sites where eight depths were sampled for all variables except RNA where six depths were sampled. An additional six stations were sampled at 2-5 depths for DNA, and microbial biomass. The sampling strategy was to obtain microbial DNA and other biological data from interleaving features and different water masses at each station along with samples in the upper mixed layer, the Chlorophyll maximum and deep temperature maxima and minima. Biologically significant features were identified during the downcast of the CTD. In addition to temperature and salinity, the sampling choices were based on readouts from the oxygen, nitrate, fluorescence, transmissometer and pH probes.

Table 9.1. List of stations sampled by the DNA group in Leg 1.

MMBOAS Stn	Cast #	ArcticNet Stn	Date	Station type	# of depths	Latitude N	Longitude W
Oliver Sound	13	Oliver S-A	2006-09-04	Partial	2	72º 15.36	077º 42.21
Baffin Bay 04	17	BA04-05	2006-09-06	Full	8	75º 16.36	074º 58.68
Nares Strait	21	132	2006-09-09	Full	8	78º 59.73	072º 19.99
NorthWater 127	27	127	2006-09-10	Partial	4	78º 17.10	074º 38.30
NorthWater 129	32	129	2006-09-11	Full	8	78º 19.75	074º 00.87
NorthWater 131	38	131	2006-09-12	Partial	4	78º 19.09	073º 11.19
NorthWater 126	40	126	2006-09-12	Full	8	77º 20.81	073º 25.35
NorthWater 123	46	123	2006-09-13	Full	8	77º 20.48	074º 38.37
NorthWater 119	50	119	2006-09-13	Partial	5	77º 20.17	076º 04.26
NorthWater 118	55	118	2006-09-14	Full	8	77º 20.40	076º 56.94
NorthWater 115	58	115	2006-09-15	Full	8	76º 19.39	071º 10.13
NorthWater 109	67	109	2006-09-17	Full	8	76º 15.28	074º 10.39
NorthWater 101	79	101	2006-09-18	Full	8	76º 22.94	077º 26.63
Belcher Bay	80	Belcher-06	2006-09-19	Partial	3	75º 40.22	081º 15.74
Belcher Jones Sound	82	Belcher-02	2006-09-19	Partial	3	75º 42.70	080º 48.51
Lancaster Sound 301	86	301	2006-09-20	Full	8	74º 07.44	083º 20.69
McClintock N 308	102	308	2006-09-24	Full	8	73º 30.44	103º 28.99
McClintock S 310	108	310	2006-09-25	Replicates	2	71º 29.92	102º 14.48

Table 9.2. Measured variables and number of samples taken in Leg 1.

Type of Sample	Number of samples
DNA (<3 µm)	117
DNA (>3 µm)	117
RNA (<3 µm)	66
RNA (>3 µm)	66
Chl a T	88
Chl a (<3 µm)	88
HPLC Total	22
HPLC (<3 µm)	22
FCM P&G	88
FCM Glut	88
Proist taxonomy FNU	28
Sybr B & A	117
Sybr Virus	117
EFM DAPI Eukuaryotes	117
FISH B & A	88
FISH Eukaryotes	88
TSA-FISH Eukaryotes	22
Live Virus	22
Live Protists	13
Nutrients	88

Samples were taken on an opportunity basis throughout the Leg, including stations in the Northwest Passage. This data will provide valuable information on the diversity and depth distributions of microbes compared to the very productive North Water Polynya. Samples from the Southern McClintock channel from the chlorophyll maximum layer and the top of the nitrate maximum layer will be used for future functional genes studies back at U. Laval. At all stations, one or two depth were sub sampled for enrichment cultures of small protists to be isolated and studied on shore. Samples for live virus studies were also taken from one or two depths at each station as part of an IPY collaboration with C. Brussard (Royal Netherlands Institute for Sea Research, NZOI).

Sampling was aimed at obtaining microbial DNA and RNA along with biomass and taxonomic information. All variables were sampled using standard techniques. Chlorphyll *a* (Chl a), pigment analysis by high pressure liquid chromatography (HPLC). Flow cytometry (FCM) for picoflagellates (FCM P&G) and for Virus (FCM-Glut). Samples for protist identification using fluorescence normarski utermohl (FNU) were taken at 2 depths per station. Microscope slides were made on board for estimating total bacteria plus archaea and virus like particles (Sybr B & A and Sybr virus, respectively). Slides for Epifluorescence microscopy (EFM-DAPI) were also made to estimate abundance of pico and nano plankton. Fluorescence in situ hybridization (FISH) will be applied to bacteria, archaea and eukaryotes (FISH B & A and FISH Eukaryotes, respectively). Tyramide signalling amplification FISH samples are for identifying specific pico-eukaryotes (TSA-FISH). Live virus samples are kept at 2°C until analysis using phytoplankton lawns. Live protists will be sub-cultured in Quebec City. Nutrients (ammonium, nitrite, nitrate, phosphate and silicic acid) were analyzed on board by J.-É. Tremblay's team (U. Laval).

9.2.2 Leg 2a – 28 September to 29 October 2006 – Amundsen Gulf, Beaufort Sea and Canadian Arctic Archipelago

Sampled were taken on an opportunity basis throughout the Amundsen Gulf, the Beaufort Sea, the Gulf of Boothia and the Foxe Basin. The comparison of the different geographical areas will provide valuable information on the diversity and depth distributions of microbes.

In total, 14 stations were sampled (Table 9.3), ten of these were full stations where a total of 19 variables were collected at each station (Table 9.4). Full stations were defined as sites where eight depths were sampled for all variables except RNA where six depths were sampled. An additional 4 stations were sampled at 2-5 depths to extract DNA from the microbial biomass. Our sampling strategy was to obtain microbial DNA and other biological data from specific water masses through the water column with a special focus on the nitricline, the upper mixed layer, the Chlorophyll maximum and deep temperature maxima and minima. Those biologically significant features were identified during the downcast of the CTD. In addition to temperature and salinity, our sampling choices were based on readouts from the oxygen, nitrate, fluorescence, transmissometer and pH probes.

Sampling was aimed at obtaining microbial DNA and RNA along with biomass and taxonomic information. All variables were sampled using standard techniques.

Table 9.3. Stations sampled by the microbial DNA group during Leg 2a.

MMBOAS Stn	Cast #	ArcticNet Stn	Date	Station type	# of depths	Latitude N	Longitude W
Amundsen Gulf	10	405	2006-10-01	Full	8	70º 39.064	122º 56.895
Beaufort Sea 408	18	408	2006-10-02	Full	8	71º 15.299	127º 29.199
Beaufort Sea 413	23	413	2006-10-05	Full	8	71º 29.603	127º 08.748
Beaufort Sea 420	30	420	2006-10-06	Replicates	2	71º 03.173	128º 31.031
Beaufort Sea 421	35	421	2006-10-07	Full	8	71º 28.051	133º 54.474
Franklin Bay	55	436	2006-10-10	Full	8	70º 20.035	126º 26.766
Beaufort Sea 435	60	435	2006-10-13	Full	8	71º 05.031	133º 34.580
Beaufort Sea 437	62	437	2006-10-15	Full	8	70º 37.570	136º 15.210
Beaufort Sea 434	65	434	2006-10-17	Partial	4	70º 10.860	133º 34.640
Beaufort Sea 407	69	407	2006-10-18	Full	8	71º 00.450	126º 03.730
Gulf of Boothia	83	322	2006-10-23	Full	8	70º 24.060	091º 06.070
Foxe Basin 334	97	334	2006-10-25	Partial	4	67º 53.020	080º 47.470
Foxe Basin 338	101	338	2006-10-26	Partial	5	66º 09.980	081º 19.770
Foxe Basin 350	114	350	2006-10-27	Full	8	64º 29.940	080º 30.080

Table 9.4. Variables and number of samples taken during Leg 2a.

Type of samples	Number of samples
DNA (<3 µm)	109
DNA (>3 µm)	109
RNA (<3 µm)	77
RNA (>3 µm)	77
Chl a T	92
Chl a (<3 µm)	89
HPLC Total	23
HPLC (<3 µm)	23
FCM P&G	95
FCM Glut	95
Protist taxonomy FNU	26
Sybr B & A	70
Sybr Virus	70
EFM DAPI Eukaryotes	94
EFM DAPI Bact	25
FISH B & A	90
FISH Eukaryotes	95
TSA-FISH Eukaryotes	25
Nutrients	91

Abbreviations and explanations follow: Chlorophyll *a* (Chl a), pigment analysis by high pressure liquid chromatography (HPLC), Flow cytometry (FCM) for picoflagellates (FCM P&G) and for Virus (FCM-Glut). Samples for protist identification using fluorescence normarski utermohl (FNU) were taken at 2 depths per station. Microscope slides were made on board for estimating total bacteria plus archaea and virus like particles (Sybr B & A and Sybr virus, respectively). Slides for Epifluorescence microscopy (EFM-DAPI) were also made to estimate abundance of pico and nano plankton. Fluorescence in situ hybridization (FISH) will be applied to bacteria, archaea and eukaryotes (FISH B & A and FISH Eukaryotes, respectively). Tyramide signalling amplification FISH samples are for identifying specific pico-eukaryotes (TSA-FISH). Nutrients (ammonium, nitrite, nitrate, phosphate and silicic acid) were analyzed on board by Prof. J.É. Tremblay and students.

9.2.3 Experimental program

SIP (Stable Isotope Probing)

SIP is an elegant tool to resolve the linkage between the structure of populations and their function in an ecosystem. The principal rely on the addition of labelled substrate highly enriched in stable isotopes, such as ^{13}C, to an environmental sample. The denser isotopes are incorporated in the nucleic acids deoxyribose backbone of the organisms utilising the labelled substrate as growth substrate. The denser DNA or RNA is then separated from the light one (non labelled) by caesium chloride (CsCl) density-gradient centrifugation. Finally, once ^{13}C -DNA has been isolated, it can be analysed by various molecular methods allowing the phylogenetic identification of the organisms which assimilated the labelled substrate.

Incubations with ^{13}C–bicarbonate were carried out to study the flow of carbon during the development and decay of a diatom bloom. A mix of surface and deep water was incubated with the presence ^{13}C–bicarbonate. In order to develop a diatom bloom the incubation was carried in the presence of light. After four days in which diatoms effectively bloomed, incubations were placed in the dark to simulate sedimentation out of the photic zone. Over a two-to-four week period, duplicate bottles were periodically filtered for DNA and microscope analysis. The results should provide information on species specific interactions in the flow of carbon through the microbial community.

Several other experiments were also carried out by graduate students. Ramon Terrado (Leg 1) on species specific grazing by small phytoplankton and other protists on dissolved organic matter and bacteria, using both labelled substrate and dilution approaches. Estelle Pedneault (Leg 1) conducted an ANOVA experiment using water from station 301 to test the influence of light on gene expression. It is well known that light is inhibits nitrification by bacteria. The importance of Archaea in oceanic nitrification has only recently been discovered and the objective of the experiment was to measure the light effect on the gene expression of the AmoA gene in near surface and deeper waters.

During Leg 1, three variables were incorporated into the design: 1) the irradiance conditions at the depth of collection, 2) time, with 0, 24 and 48 hour sampling and 3) the effect of light or dark conditions during incubation. Filtration was as for the main RNA analyses. Viruses, total prokaryotic biomass and nutrients were also measured.

9.2.4 Collaborations

Close work was done in collaboration with Prof. A. Rochon's (Theme 1) student É. Potvin (UQAR) who was responsible for box cores and phytoplankton nets throughout the leg. Graduate student L. Delaney sampled surface box cores for HPLC pigments; these will be analyzed at Dalhousie. Samples for DNA and phytoplankton taxonomy were also taken from surface sediment samples and phytoplankton nets, these samples will be analyzed in the laboratory at U. Laval. Details of stations sampled for boxcores and nets taken are given in the Geology Report (Section 16).

9.3 Preliminary results

Since it was not feasible to analyse DNA or RNA on board the ship, results of the DNA and RNA surveys will be known only after extensive laboratory work on shore.

The epifluorescence microscope on board the *Amundsen* was used for counting bacteria, viruses and small flagellates. Counts were done on board within 24 hours of sampling. Viruses were generally ten times more abundant than bacteria and both decreased with depth. The data distribution indicates that a wide variety of different biological systems were sampled.

The access to these data gave us immediate insight different regions sampled (

Figure 9.1, Leg 1 results in left panel and Leg 2a in right panel). The North Water Polynya was dominated by large *Chaetoceros*, whereas the NW Passage sites were dominated by small dinoflagellates and diverse nano- and pico-flagellates.

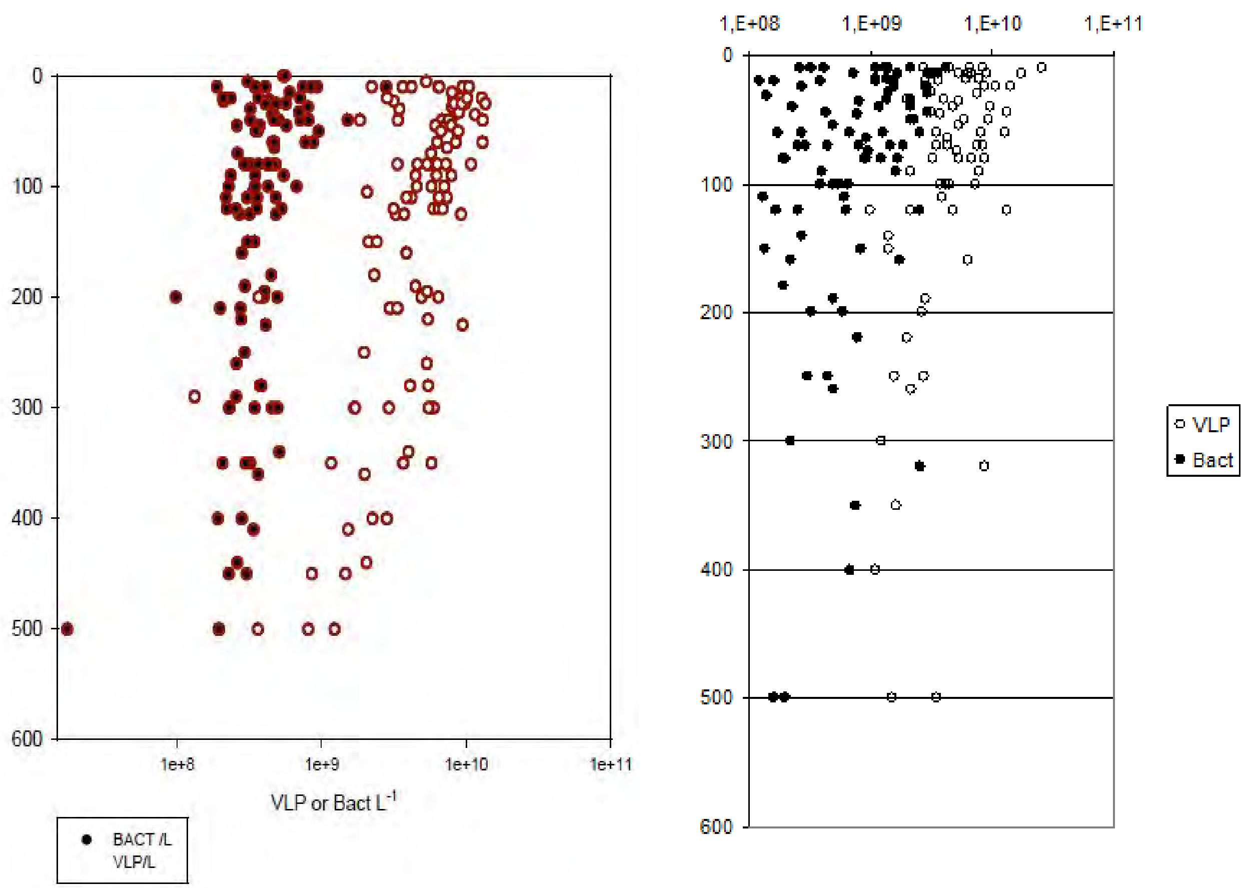

Figure 9.1. Left: Abundance of virus-like particles (VLP) and bacteria from the Canadian Arctic for Leg 1. Counts include all prokaryotes that are stained with the nucleic acid specific fluorochrome, Sybr Gold. Right: Abundance of virus like particles (VLP) and bacteria for Leg 2 (counts include all prokaryotes, that are stained with the nucleic acid specific fluorochrom, Sybr Gold) from the Canadian Arctic. Counts were done on board within 24 hours of sampling.

10 Microbial program - Legs 1 and 2a

ArcticNet Phase I – Project 1.4: Marine Productivity & Sustained Exploitation of Emerging Fisheries. ArcticNet/Phase 1/Project 1.4

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Cruise participants Leg 1: Colleen Evans[1] and Shelly Carpenter[1]
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10.1 Introduction

10.1.1 Leg 1 – 22 August to 28 September 2006 – Baffin Bay and Canadian Arctic Archipelago

The North Water is one of many seasonally ice-free areas, or polynyas, in the Arctic Ocean that experiences high levels of primary production compared to the surrounding ice-covered areas. The samples taken by the Deming Lab Group during Leg 1 were part of a collaborative project with the Cochran Lab Group to examine the export of carbon in two polynyas on river-impacted Arctic shelves and, for comparison, with a non-river impacted polynya. The North Water is our river-free control for the Cape Bathurst Polynya off the Mackenzie River and the Laptev Sea Polynya off the Lena River. Indeed, climate warming may alter the cycling of carbon on Arctic shelves through permanent reductions in ice cover and increases in riverine discharge. These changes may lead to, at least initially, increases in the export of carbon to the slope and deep Arctic basins. As a result, it is critical to characterize present carbon cycling in these, and other, polynyas. In order to do this, geochemical and microbiological analyses were coupled in a joint effort to examine particle flux, the diversity of the microbes associated with these particles and their extracellular enzymatic activity (i.e. the rates at which certain components of the particles are hydrolyzing). Ultimately, this collaboration will allow for a better understanding of the different particle fluxes in river-impacted and river-free polynyas, the diversity of microbial communities associated with these different particle size fractions and origins (terrestrial versus marine), and the associated microbial enzymatic activity. This knowledge will help understand and predict how carbon export may change as the Arctic continues to warm.

10.1.2 Leg 2a – 28 September to 29 October 2006 – Amundsen Gulf, Beaufort Sea and Canadian Arctic Archipelago

During Leg 2a, the team extended its studies of particle flux and associated microbes into the western sector of the Archipelago, including the Mackenzie Shelf and Beaufort Sea regions. The overall aims of this three-year project, supported by the US-NSF Office of Polar Programs, are to determine the current magnitude of particulate carbon sinking from the surface waters of Arctic polynyas, the types of microbes associated with this material, and the potential for their extracellular enzymes to degrade it and thus constrain what reaches the seafloor. These variables impact the ecosystem in terms of food supplies to higher trophic levels, as well as the sequestration of carbon at depth in the ocean: they are expected to change as the Arctic warms. The contrasts between the productive and river-free North Water region, the less productive and river-impacted Mackenzie Shelf region, and the oligotrophic passages in between (that we sampled opportunistically) should provide a wide range of current conditions for us to evaluate. Our collaborative project also includes comparative work in the river-impacted Laptev Sea on the Russian coast (as part of the international NABOS 2005 project), where we may have an opportunity to work again in 2007 (as well as with ArcticNet). Because we are merging specific chemical and microbial approaches on the same samples for the first time, this wide range of environmental conditions is essential to evaluating the success of our efforts and the Arctic-wide import of the processes we are attempting to measure and patterns we may detect.

In each region that we study, patterns in the vertical particle flux are measured by the Cochran team, using a radionuclide approach based on the natural radionuclide thorium (^{234}Th), which sorbs to particulate matter in the ocean. During Leg 2, we continued to collect samples for this analysis, as well as other chemical and microbial analyses, using in situ pumps that are capable of pumping over 300 L of seawater through a set of particle-trapping filters recovered shipboard for the subsequent analyses. The pumps were routinely deployed in surface waters (25 m) and below (100 m), attempting additional depths when possible. Each pump head was fitted with a 70-µm filter to capture large aggregates and their associated microbes and a 1-µm filter to capture the remaining smaller particles and microbes. Pump filters were cut in half, with one half processed for thorium, POC/N and δC^{13} analyses (Cochran lab) and the other half processed in the shipboard laboratory at –1°C to determine microbial diversity and extracellular enzymatic activity (EEA). Because these large-volume in situ pumps have not been use for microbial analyses before, we also collected 10-L seawater samples from Niskin bottles on the CTD-Rosette from the same depths for comparative purposes, concentrating particulate matter of similar size fractions using a conventional in-line filtration approach.

10.2 Methodology

In each polynya, patterns in the vertical particle flux were measured by the team of J. Kirk Cochran using a radionuclide approach employing the natural radionuclide ^{234}Th. Samples for this analysis were collected using large volume *in situ* pumps fitted with a 70 µm and 1 µm filter to represent the 'sinking' and 'suspended' particle fractions, respectively. These filters were also used by the Deming Lab Group to measure the extracellular enzymatic activity (EEA) associated with the different size fractions and the associated microbial diversity. For a methodological comparison for the aforementioned microbiological analyses, the Deming Lab Group also collected similar size fractions of particles using small volume filtration. With all work potentially being done on the same filter sets the export of carbon in the North Water and other polynyas will be better understood and microbes contributing to its attenuation with depth will be identified.

10.2.1 Size fractionation of water samples

In order to obtain different size fractions of particles and associated Bacteria and Archaea, 10 L of water, collected from Niskin bottles, were filtered via a peristaltic pump through an in-line, size-fractionation set-up. Water was pre-filtered during collection from Niskin bottles through a 571 µm Nitex mesh and collected in 10-L cubitainers. In a 0°C cold room, the cubitainers were hooked up to peristaltic pumps and water first filtered through a 60 µm nylon mesh filter, then through a 1 µm polycarbonate filter and finally through 0.22 µm Durapore Sterivex filter. The 571-60 µm fraction is operationally defined as the 'sinking' particulate fraction. The 60-1 µm fraction contained the 'suspended' particles and the 1-0.22 µm fraction contained free-living Bacteria and Archaea. Filtration took between 3 and 6 hours with longer filtration times during Leg 1, where samples were more particle-rich. Upon the completion of filtration, filters were placed in sterile microcentrifuge tubes or capped, in the case of Sterivex filters, and placed immediately at -80°C freezer. This process was done in duplicate for each of a maximum of three depths sampled at each station. Samples were analyzed for Bacterial and Archaeal diversity using T-RFLP and environmental cloning approaches in the University of Washington School of Oceanography labs after completion of the Leg.

10.2.2 Bacterial abundance estimates

From each depth sampled, triplicate 50 ml samples were drawn from each of three cubitainers (separate Niskin bottles) and were fixed with 37% formaldehyde to a final concentration of 2% formaldehyde. Fixed samples were stored at 4°C and will be stained with DAPI and analyzed microscopically at the University of Washington. Subsamples of the particulate material collected on filters and resuspended for EEA purposes were also fixed for subsequent analysis of bacterial abundance to enable scaling EEA to bacterial number.

10.2.3 Extracellular enzymatic activity (EEA)

To estimate enzymatic hydrolysis of organic matter, extracellular enzymatic activity was measured using fluorescently tagged substrate analogs (Huston and Deming, 2002). Protease, chitobiase and carbohydrase activities were estimated using L-leucine 7-amindo-4-methylcourmarin (MCA-Leucine), 4-methylumbelliferyl-N-acetyl-β-D-glucosaminide (MUF-G), and 4-methylumbelliferyl-β-D-glucoside (MUF-B) respectively. Substrates were added to samples at saturating concentrations, determined on board using water from different sampling locations (usually 200 μM). At each station, 10 L of water from each depth was size-fractionated, capturing particles first on a 60-μm nylon mesh filter and then onto a 1-μm polycarbonate filter. Following filtration, filters were resuspended in 50 ml of 0.2 μm filtered seawater from the same depth and station. This solution was then distributed into glass culture tubes in triplicate for each substrate and amended with their respective substrate to a final concentration of 200 μM. Changes in fluorescence in the tubes over incubation time in a –1°C sea-ice bath was measured using a Turner Fluorometer with appropriate optical filter sets installed: with greater EEA, more fluorescent tags are released from the substrate analogs. With the use of a saturating amount of substrate, the resulting EEA rate can serve as proxy for enzyme concentration. Rate ratios among the different types of EEA will be examined for patterns by station, depth and particle size fraction. Residual volumes from the EEA resuspensions were used to inoculate a suite of culturing media designed to favor nitrifying Bacteria and/or Archaea as part of a potential dissertation project by Colleen Evans (Deming lab). EEA was measured at each station and depth sampled, with results obtained shipboard. Results will be compared to future T-RFLP profiles, clone libraries and available environmental data.

10.2.4 Water column chemistry

Water from the Niskin bottles was also collected to estimate chlorophyll *a* concentrations, particulate organic carbon and nitrogen, and suspended particulate matter (SPM) as possible environmental correlates for the microbial variables measured and to obtain a better understanding of particle-related characteristics of the water column. Following sample collection, water was brought back to the 0°C cold room. Duplicate or triplicate 500 ml samples were filtered onto precombusted GF/F filters for both chlorophyll *a* and POC/PON samples for each depth sampled. These filters were folded and placed in precombusted foil pouches, frozen at -20 °C and will be analyzed back at the University of Washington labs. Duplicate to triplicate 2 or 3-L samples were filtered onto precombusted, preweighed GF/C filters for estimation of SPM. These filters were placed in small 47 mm Petri dishes and stored at -20°C. They will be dried and reweighed back at the University of Washington for an estimation of SPM.

10.2.5 In-situ pump samples

Following deployment and recovery of in situ pumps by the Cochran lab, the pump heads containing one large 70 µm Teflon filter and one 1 µm microquartz filter were immediately taken to the 0°C cold room. They were first halved, with one half used by the Deming lab and the other by the Cochran lab. The Deming lab half was cut in half again (two quarters of the total). One quarter was used for EEA measurements, described above, and the other was again quartered (four one-sixteenths). Two of these filter pieces were placed in microcentrifuge tubes and stored at -80°C for DNA analyses upon return to Seattle. Another one was flash frozen in liquid nitrogen and then placed into the -80°C freezer to be used for analyses of RNA upon return to Seattle. The remaining quarter was placed into a microcentrifuge tube and saved for chlorophyll *a* quantification upon return to Seattle. All of these analysis will allow for a comparison between EEA and community diversity obtained via large volume (*in situ* pump) and small volume (in line, peristaltic pump) filtration. If results are comparable, it will simplify procedures in the future, making all measurements on the *in situ* pump filters to obtain a better understanding of the microbial community and activity associated with sinking and suspended particles in the ocean.

10.2.6 Other samples (Leg 2 only)

The work at any one station was intensive for the team but the full suite of samples was obtained and processed for each of seven “regular” stations in the western sector, with two opportunistic (Niskin-only) stations in the Passage (Table 10.2). A test of volume filtered was attempted by deploying two pumps in rapid succession at the same depth at station S (the “slump” station where extensive seafloor mapping was done for several days), with each pump set for a different pumping period. A 2-m ice core from a multi-year ice floe in the Passage was also collected. The ice core was sectioned on site and stored at –20°C for shipment to the University of Washington lab and analysis of microbial content there.

Table 10.1. List of stations sampled during Leg 1, their locations and the samples taken at each by the Deming Lab Group. (N=Niskin Sample, P=In Situ Pump Sample, B=Both Niskin and In Situ Pump).

Station Name	Date	Longitude W	Latitude N	CTD #	Sampling Method (N, P, B)	Filters for DNA	Filters for RNA	Niskin-EEA	Pump-
100	6-Sep-06	074° 56.87	75° 16.58	16	N	x		x	
132	9-Sep-06	072° 01.61	79° 01.29	22	B	x	x	x	x
127	10-Sep-06	074° 45.48	78° 09.51	30	B	x	x	x	x
126	12-Sep-06	073° 24.97	77° 20.72	39	B	x	x	x	x
118	14-Sep-06	076°32.77	77° 21.86	51	B	x	x	x	x
115	16-Sep-06	071° 12.20	76° 19.89	59	B	x	x	x	x
101	18-Sep-06	077° 23.76	76° 22.96	76	B	x	x	x	x
307	23-Sep-06	100° 35.21	74° 23.84	98	N	x		x	
310	25-Sep-06	102° 15.23	71° 29.58	106	N	x		x	

Table 10.2. List of stations sampled during Leg 2a, their locations and the samples taken at each by the Deming Lab Group. For all pump samples, subsamples from the 70- and 1-um filters were processed for ^{234}Th, POC/N, $\delta^{13}C$, DNA, RNA, chlorophyll *a*, and EEA. For all Niskin samples, subsamples were processed for SPM, POC/N, chlorophyll *a*, DNA (> 60, 60–1, 1–0/2 µm) and EEA (> 60 and 60–1 µm).

Station number	Date	Longitude (W)	Latitude (N)	Pump depths (m)	Rosette cast
405	1-Oct-06	122° 56.67	70° 39.20	25, 50*, 100	007
408	2-Oct-06	127° 29.87	71° 15.76	25, 100	017
421	6-Oct-06	133° 56.60	71° 28.73	25, 100	033
436	9-Oct-06	126° 21.07	70° 20.78	25, 100	050
435	12-Oct-06	133° 35.17	71° 04.55	25, 100	057
S	15-Oct-06	136° 17.08	70° 37.49	25, 25*	(none)
434	16-Oct-06	133° 33.56	70° 10.62	10, 25*, 35	061
407	17-Oct-06	126° 02.39	71° 00.78	25, 100	067
Ice floe	21-Oct-06	099° 17.20	69° 51.30	Multi-year ice cored to 2 m	
322	23-Oct-06	091° 06.07	70° 24.09	N.A.	083
338	25-Oct-06	081° 19,85	66° 09.22	N.A.	102

* Pump failed.
N.A. = pumps were not available (packed for transit; Renfro disembarked in Kugluktuk).

10.3 Preliminary results

Most of the samples collected by the Deming Lab Group were analyzed upon return to the University of Washington, but preliminary results from the EEA assays were available onboard.

10.3.1 Leg 1 – 22 August to 28 September 2006 – Baffin Bay and Canadian Arctic Archipelago

In areas with greater chlorophyll, as estimated visibly during filtration and by CTD fluorescence profiles, EEA was also higher, especially at or around the chlorophyll maximum. This increase was visible in the results from each of the enzyme types examined (i.e. protease, chitobiase, etc.). Protease activity was also consistently higher than both carbohydrase and chitobiase activity. Similar results have been found both in the North Water and elsewhere in the Arctic waters, indicating that Arctic bacteria secrete significantly more extracellular proteases than any other enzyme measured, presumably targeting proteins in the particles to which they are attached. We did not, however, find a consistent pattern between stations or depths in EEA in the different size fractions examined. For example, EEA was not always higher in the 60-1 µm size fraction than in the >60 µm size fraction among different stations or at depths within a single station. The additional analyses described above may help to explain why this may be the case.

10.3.2 Leg 2a – 28 September to 29 October 2006 – Amundsen Gulf, Beaufort Sea and Canadian Arctic Archipelago

As during Leg 1, EEA on all three substrates tended to be highest in surface waters compared to depth and in areas with greater chlorophyll, as estimated visibly from filter color and by CTD fluorescence profiles. The station closest to the mouth of the Mackenzie River yielded extremely particle-rich samples but low EEA, suggestive of recalcitrant terrestrial material. Protease activity was always higher than carbohydrase and chitobiase activity, although diverging patterns (less importance for protease) emerged at the near-river station and oligotrophic stations sampled opportunistically in the Northwest Passage. These preliminary results suggest that efforts to differentiate river-impacted Arctic waters from other regions of marine productivity will be fruitful.

11 Thorium radionuclide program – Leg 1

ArcticNet Phase I – Project 1.4: Marine Productivity & Sustained Exploitation of Emerging Fisheries. ArcticNet/Phase 1/Project 1.4

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11.1 Introduction

The polynyas of the Arctic constitute areas of much higher primary productivity than surrounding ice covered areas. Global warming has the potential to change the vertical flux of carbon in these regions by decreasing ice cover and increasing riverine input. This in turn may enhance export of carbon, at least temporarily, to the slope and deeper Arctic waters. In order to understand the expected change in carbon flux and cycling in the future, it is critical to describe present carbon flux patterns in polynyas. This study is a collaborative effort between our group and Jody Deming's group and seeks to improve the understanding of carbon cycling in two river influenced polynyas (Cape Bathurst and Laptev Sea) and one without riverine input (North Water) by combining a radionuclide approach for measuring the vertical flux of carbon and molecular techniques to characterize the microbial community that influence carbon flux.

11.2 Methodology

On Leg 1, the work focused on using radionuclides, particularly ^{234Th}, to measure vertical flux in the North Water Polynya. Thorium has been used to estimate the sinking of particulate carbon in many oceanic settings. ^{234}Th is a short-lived (half-life = 24 d) daughter of ^{238}U with a strong affinity for particle surfaces. As particles sink, the associated ^{234}Th also sinks, creating disequilibrium between thorium and its uranium parent. The disequilibrium between the ^{238}U and ^{234}Th at a given depth can be converted into flux of ^{234}Th through that horizon. Measurement of the POC/^{234}Th ratio then allows the ^{234}Th flux to be converted to a POC flux. This work coupled with the work of J. Deming's group will increase the understanding of vertical carbon flux in the North Water Polynya, as well as the microbes responsible for carbon cycling in the region.

Table 11.1. Stations sampled, their locations, and types of sampling done by the Cochran group. (N=Niskin Sample, P=In Situ Pump Sample, B=Both Niskin and In Situ Pump).

Station Name	Date	Longitude (W)	Latitude (N)	CTDNumber	Sampling Method
100	6-Sep-06	74° 56.87	75° 16.58	16	N
132	9-Sep-06	72° 1.61	79° 1.29	22	B
127	10-Sep-06	74° 45.48	78° 9.51	30	B
126	12-Sep-06	73° 24.97	77° 20.72	39	B
118	14-Sep-06	76° 32.77	77° 21.86	51	B
115	16-Sep-06	71° 12.20	76° 19.89	59	B
101	18-Sep-06	77° 23.76	76° 19.89	76	B
307	23-Sep-06	100° 35.21	74° 23.84	98	N

11.2.1 Total ^{234}Th small volume method

Rosette casts were used to collect water from 8 depths (10, 25, 50, 75, 100, 125, 150, and 200 meters) at each station. Two-liters of water were taken from the Rosette Niskin bottles, returned to the lab, acidified, and allowed to equilibrate for an at least an hour. Acidification of the sample desorbs attached ^{234}Th from the associated particles and to prevents thorium adsorption to the sampling container. The pH of each sample was then raised to ~8.2. $MnCl_2$ and $KMnO_4$ were then added to the samples resulting in a MnO_2 precipitate which the highly particle reactive ^{234}Th adsorbed to. The resulting solution was then filtered through a 25 mm, 1 µm pore filter to collect the MnO_2 precipitate and the associated thorium. The filters were air-dried, mounted, and counted on a RISO beta counter. The results will be used to describe the total ^{234}Th activity at a given depth. Flux of thorium in the water column will be determined from enrichment or depletion of thorium relative to its stably dissolved ^{238}U parent. Thorium flux can then be converted to a POC flux once the POC/^{234}Th ratio is known.

11.2.2 Particulate thorium analysis

Samples used to determine POC/^{234}Th were collected by filtering a large volume (25-200 L) of seawater through in-situ pumps deployed at 25 and 100 m. Seawater passed through two filters, a Teflon and microquartz which collected particles from >70µm and 1-70µm, respectively. Upon pump retrieval these filters were divided in half and split with Deming's group for analyses. Ten punches were taken from the 1 µm pump filter, mounted, and beta counted. In the lab, the Teflon filters were rinsed on to carbon-free 1µm microquartz filters, the filters were then mounted, and beta counted. Particulate organic carbon was determined at the Marine Sciences Research Center of SUNY Stony Brook by running remaining subsamples of the 1µm filter on a CHN Analyzer to determine total particulate carbon and nitrogen.

11.3 Preliminary results

Preliminary results were not available at the end of the cruise. Mounted samples needed to be counted repeatedly over several half-lives of ^{234}Th to separate that radioisotope from any other, longer half-lived, ones that may be present.

12 Phytoplankton and primary production – Legs 1 and 2a

ArcticNet Phase I – Project 1.4: Marine Productivity & Sustained Exploitation of Emerging Fisheries. ArcticNet/Phase 1/Project 1.4

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12.1 Introduction

This research component of ArcticNet focused more specifically on understanding the development of the early fall phytoplankton communities along an east to west environmental gradient in the Canadian High Arctic.

12.1.1 Leg 1 – 22 August to 28 September 2006 – Baffin Bay and Canadian Arctic Archipelago

The general research objective of this study is to determine the environmental variables that govern the primary productivity, biomass, abundance and the species composition of the summer phytoplankton communities in the Canadian High Arctic in the North Water Polynya in Baffin and the Northwest Passage.

12.1.2 Leg 2a – 28 September to 29 October 2006 – Amundsen Gulf, Beaufort Sea and Canadian Arctic Archipelago

This second ArcticNet cruise (Leg 2) mainly targeted the Beaufort Sea region for a period of three weeks. The main goal was to compare the phytoplanktonic communities between the eastern and the western Arctic in terms of algal species composition and abundance and to establish the relationships between the environmental variables and the changes occurring in the abundance, the species composition and the primary production of the arctic planktonic microflora. The following hypotheses will be tested (1) a nutrients gradient from the eastern to the western Arctic will influence the species composition of the phytoplankton, (2) a temperature and salinity gradient from the eastern to the western Arctic will affect the species composition of the phytoplankton, and (3) the summer-fall phytoplanktonic communities of the eastern Arctic are more productive than the ones of the western Arctic.

12.2 Methodology

12.2.1 Leg 1 – 22 August to 28 September 2006 – Baffin Bay and Canadian Arctic Archipelago

Water sampling was conducted with a CTD-Rosette system. All full stations, all mooring stations and some basics stations were sampled. One station was sampled in Oliver Sound (near Pond Inlet), four (4) in the North of the Baffin Bay (118, BA-02 (108), BA- 03 (101), BA-04 (100)), seven (7) in the North Water polynya region (132, 131, 127, 126, 122, 119, 118) and five (5) in the Northwest Passage (301, 303, 307, 310 and 314). Primary productivity was determined at underlined stations. Photic depths (100%, 50%, 30%, 15%, 5%, 1% and 0.2%) were determined with a Secchi disc for 7 stations: Oliver Sound, 100 [BA04-05], 132, 131, 126, 118 and 303. For stations reached during the night, photic depths taken at the same station during ArcticNet 2005 were used. For stations that had not been visited before, photic depths of the nearest station were used. At each station, samples were collected for the analysis of total chlorophyll *a* [Chl *a* total] and fractionated chlorophyll *a* [Chl *a*>5 µm and Chl *a*>20 µm], particulate organic carbon and nitrogen [POC/PON], dissolved organic carbon and nitrogen [DOC/DON], total and dissolved organic carbon [TOC/DOC], dissolved biogenic [BioSi] and lithogenic [LithoSi] silica, exopolymeric substance [EPS], phytoplankton cells [Cells], picoplankton [Pico], heterotrophic bacteria [Bact] and high pressure liquid chromatography of pigments [HPLC]). All the variables will be analyzed in Rimouski (ISMER/UQAR) or in Winnipeg (DFO/MPO) except for Chl *a* and EPS, which were analyzed onboard the *Amundsen*. Sampling sites and analyses performed on seawater are listed in Table 12.1.

Primary productivity was determined following *JGOFS* protocol for simulated *in situ* incubations. Water samples were collected at 7 photic depths (100%, 50%, 30%, 15%, 5%, 1% and 0.2% incident light), inoculated with ^{14}C and incubated on the front deck of the ship for 24 h. After that period, filtrations were performed in the Radvan and scintillation vials stored in the dark at room temperature in the Radvan.

Incident light was also recorded continuously with a PAR (photosynthetically available radiation) sensor located on a flat surface on top of a container in front of the ship, near the incubator. An underwater light and fluorescence profile (PNF-300) was performed at the stations where primary production experiments were conducted.

Table 12.1. List of stations and samples collected by the primary production team during Leg 1.

Date mm/dd/yy	Station #	DOC/ DON	TOC/ DOC	Total Chl a	Chl *a* >5µm	Chl a >20µm	POC/ PON	BioSi	LithoSi	EPS	HPLC >0.7µm	Cells	Pico
09/04/06	Oliver Sound	12	0	16	16	0	6	14	7	0	0	6	0
09/07/06	BA-04 (100)	17	4	16	16	10	5	10	5	21	1	6	10
09/09/06	132	15	4	8	8	5	5	12	6	22	1	6	10
09/10/06	127	19	4	8	8	4	6	12	6	27	1	6	10
09/11/06	131	16	4	7	7	5	5	10	5	21	1	6	10
09/13/06	126	15	4	7	7	4	5	12	6	24	1	6	8
09/13/06	122	21	0	8	8	5	5	10	5	0	0	6	10
09/13/06	119	0	0	9	9	5	5	10	5	0	0	6	10
09/14/06	118	12	4	8	8	5	6	12	6	25	1	6	10
09/16/06	BA-01 (115)	15	4	8	8	4	5	12	6	24	1	6	10
09/17/06	BA-02 (108)	15	4	7	7	5	7	12	6	27	1	6	10
09/18/06	BA-03 (101)	15	4	8	8	5	5	10	5	24	1	6	10
09/20/06	301	21	4	7	7	5	6	12	6	27	1	6	10
09/21/06	303	16	4	8	8	5	6	12	6	27	1	6	10
09/23/06	307	14	4	8	8	5	6	12	6	24	1	6	10
09/25/06	310	15	4	8	8	5	6	12	6	27	1	6	10
09/27/06	314	10	0	7	7	5	7	12	6	18	1	6	10

12.2.2 Leg 2a – 28 September to 29 October 2006 – Amundsen Gulf, Beaufort Sea and Canadian Arctic Archipelago

Water sampling was conducted with a CTD-rosette system at optical depths corresponding to 100%, 50%, 30%, 15%, 5%, 1% and 0.2%, at the deep maximum chlorophyll (Chl max), at the 33.1‰ depth, and at 75 m, 100 m, 250 m and 400 m. Ten stations were visited in the Amundsen Gulf and Beaufort Sea region (403, 405, 408, 411, 420, 421, 436, 435, 434, 407). Total and fractionated chlorophyll (Chl) was measured for each corresponding optical depth at each sampling site while chlorophyll > 20 µm was measured at 50%, 15% and 1% incident light, at the Chl max and at 100 m. Routine analyses performed on seawater are indicated in Table 12.2. Particulate organic carbon (POC) and nitrogen (PON), biogenic (BioSi) and lithogenic silica (LithoSi), exopolymeric substance (EPS) were done at 50%, 15% and 0.2% incident light, at 33.1‰, at the Chl max and at 75 m. Picoplankton and bacteria (Pico/Bact) were done at 50%, 5%, 1% incident light and at Chl max and 100 m. Planktonic cells were collected at 50% and 15% incident light and at Chl max. Dissolved (DOC) and total organic carbon (TOC) were done at 50% incident light and at 33.1‰. Samples for pigment analysis by high pressure liquid chromatography (HPLC) were collected at the Chl max only. In addition, two water depths were sampled at 250 m and 400 m for EPS. At stations 411 and 420, sampling was done at night, therefore, we have estimated the Chl max at an optical water depth corresponding at 1% incident light.

Primary production experiments were conducted at six sampling sites (highlighted in red in the table above) in the western Canadian High Arctic during September-October 2006 (405, 408, 421, 436, 435, 407). Water samples were collected at optical depths (100%, 50%, 30%, 15%, 5%, 1% and 0.2% of incident light), inoculated with ^{14}C and incubated on the front deck of the ship for 24 h, except at the last station where the incubation time was only for 8 h. After the incubation, filtrations were performed in the Radvan and scintillation vials stored in the dark at room temperature in the Radvan.

We also recorded continuously the incident light with a PAR sensor located on a flat surface on top of a container in front of the ship. At almost all stations sampled, we performed underwater light profiles with a PNF.

Table 12.2. List of stations and samples collected in the Amundsen Gulf and Beaufort Sea during Leg 2a in September-October 2006.

Date	Station	DOC/DON	TOC/DOC		Chl*a*		POC/PON	BioSi	LithoSi	EPS	HPLC	Cells	Pico.	Bact.	Prim. Prod.
(mm-dd-yy)	#			Total	>5um	>20um					>0.7 µm				
09-29-06	403	19	8	8	8	5	7	12	6	27	1	6	10	10	-
10/01/06	405	17	8	7	7	3	7	12	6	27	1	6	8	8	14
10/02/06	408	17	8	8	8	5	6	12	6	24	1	6	10	10	14
10/04/06	Sachs Harbour	12	-	-	-	-	-	-	-	-	-	-	-	-	-
10/05/06	411	0	8	6	6	4	7	12	6	27	1	6	8	8	-
10/06/06	420	7	4	6	6	3	5	8	4	12	1	6	6	6	-
10/06/06	421	24	8	6	6	5	5	10	5	21	1	4	10	10	12
10/09/06	436	16	8	8	8	5	7	12	6	27	1	6	10	10	14
10/12/06	435	19	8	8	8	5	7	12	6	27	1	6	10	10	14
10/16/06	434	5	4	7	7	3	3	6	3	12	1	6	6	6	-
10/17/06	407	19	8	8	8	5	6	12	6	24	1	6	10	10	14

13 Zooplankton and ichtyoplankton – Legs 1 and 2a

ArcticNet Phase I – Project 1.4: Marine Productivity & Sustained Exploitation of Emerging Fisheries. ArcticNet/Phase 1/Project 1.4

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13.1 Introduction

The general objective of this team was related to the overarching goal of ArcticNet project 1.4 which is to assess the impact of sea-ice cover reduction and increasing sea temperatures on biological productivity, fisheries resources and marine mammal populations of the coastal Canadian Arctic. Aboard the CCGS *Amundsen*, key indices of ecosystem maturity at the end of the biological production season (September/October) were collected and automated instruments that record all year-long the vertical flux of biogenic matter and marine mammal distribution were re-deployed.

The ArcticNet 2006 expedition consisted mainly of a monitoring cruise following the previous years' Expeditions. Operations during Leg 1 concentrated on the eastern part of the East-West gradient of ArcticNet Theme 1. This included a joint ArcticNet-Parks Canada sampling in Oliver Sound (Baffin Island), intensive science activities in the Baffin Bay/North Water Polynya and constrained ice-dependent sampling in the Northwest Passage.

In Leg 2a, operations conducted during Leg 1 were extended to cover the western part of the East-West gradient of ArcticNet Theme 1. Most of the sampling effort was concentrated in the south-eastern Beaufort Sea. Sampling occurred sporadically as the ship was steaming across the Arctic Archipelago where the exceptional ice free conditions permitted the passage through Fury and Hecla Strait and access to Foxe Basin where zooplankton sampling was carried out at three stations. In Leg 2b sampling program in collaboration with Parks Canada consisted in zooplankton sampling in three fjords of the northern Labrador coast.

The specific field program objectives of the project were to:

- Sample zooplankton / fish using various plankton and fish nets.
- Track zooplankton / fish abundance and distribution with the Echosounder.
- Assess experimentally the respiration rates of the zooplankton community.
- Turnover the automated sediment traps and hydrophones deployed on moorings.

In total, 22 stations were visited for zooplankton and fish sampling. Acoustics EK60 monitoring was done continuously during the course of the Expedition. Five stations were assessed for zooplankton respiration rates. On moorings, 4 automated sediment traps were recovered and 3 were deployed.

13.2 Methodology

13.2.1 Zooplankton and fish sampling

Vertical tows: 4X4 Monster Net and Hydrobios

The 4X4 Monster Net consisted of 4x1 m^2 square nets (2x200 μm mesh and 2x500 μm mesh) equipped with 10 cm diameter net (50 μm) attached to the upper part of the frame and with rigid, semi-closed cod ends for capturing live specimens and flowmeters type TSK (2) & GO (2). Monster Net integrated (bottom-surface) vertical tows for zooplankton were completed at all basic and full stations (16 stations). At each station, one 200μm net as well as the 50μm net were processed and preserved as quantitative tows (Fortier). The other 200μm net was used as a live tow (Fortier or Stern). The two 500 μm nets were processed and preserved for contaminants (Stern). A recurrent problem seemed to affect the two TSK's flowmeters which didn't turn properly many times during Leg 1 (maybe freezing or loose attachments).

The Hydro-Bios (Multi Plankton Sampler; Figure 13.1) was used to stratify water column. It was equipped with opening and closing system, 9 nets (200 μm each) with mouth opening of 0.5 m^2. Hydrobios stratified vertical tows were completed at each full station (9 stations). The mechanical closing system of the Hydrobios worked tightly, but a problem related with the flowmeters still requires examination (no data when immerged). All the Hydrobios samples were processed and preserved as quantitative (Fortier). At chosen stations (2), samples were split to assess the respiration rates (ETS) of the zooplankton community in relation to specific strata (see Section 12.2.3).

Oblique tows: Tucker, Bioness, RMT and Mega-Trawl

The Tucker (Double square net) was equipped with two square nets with an aperture of 1 m^2 each and 500 μm mesh size, as well as a small 10 cm diameter net (50 μm mesh) attached to the upper part of the metal frame. Tucker oblique tows (90 m to surface) were performed twice at basic and full stations when ice conditions allowed (14 stations). For each tow, one net was preserved as quantitative (Fortier) and one net was processed for contaminants (Stern).

The Bioness (Zooplankton Multiple Net Sampling System) was equipped with a system of 9 nets that opened and closed separately with apertures of 1 m^2 and mesh size of 333 μm. It was coupled with a Rosette cast for the assessment of the food resource of fish larvae (18 bottles, two for each sampling layer, 2 X 12 L filtered on a 50 μm mesh. The Bioness stratified oblique tows (90 m to surface) were completed at full stations when ice conditions allowed (6 stations). The mechanical and electronic systems of the Bioness was reliable but its efficiency in catching fish remained low. The sampling strategy of the Bioness coupled with an entire Rosette cast (18 bottles) was highly time-consuming and should be revised. All the Bioness/Rosette samples were processed and preserved as quantitative (Fortier).

The RMT (Rectangular Mid-water Trawl, Figure 13.1) was fitted with a net of 1600 µm mesh size and had mouth opening of 9 m^2. It was used chiefly for catching young fish and amphipods. RMT oblique tows (90 m to surface) were completed twice at full stations when available and ice conditions allowed (6 stations). At station 126, one of the rings on the lower bar of the RMT frame broke and we lost three 25-kg weights. Moreover, this caused a severe rip in the upper part of the net. The RMT was under reparations and could not been deployed at certain stations in Baffin Bay. After the two RMT deployments, one net was processed and preserved for fish larvae (Fortier) and one net was processed for contaminants (Stern).

Figure 13.1. Photos of the recovery of the Hydrobios Multi-Plankton sampler (left) and the deployment of the mid-water trawl (RMT) in Baffin Bay (right).

The Pelagic trawl (Experimental Mid-water Trawl) was fitted with multiple mesh sizes, a flexible mouth opening, as well as depth, fish counting & aperture probes. It was tested to catch adult fish and to validate the EK-60 echosounder. The pelagic trawl was deployed once at station 301 (Lancaster Sound). No adult fish were caught but several fish larvae (>100) got entangled by the trawl. The samples were equally divided between the different teams (Fortier, Gagné, Stern).

In total, 16 stations were sampled in Leg 1 while 26 stations were visited in Leg 2 for zooplankton and fish sampling. Details of net deployments for Legs 1 and 2 are provided in Table 13.1 and 12.2.

Table 13.1. Stations where zooplankton and fish were sampled and processed during Leg 1.

Date	Station			Vertical tows		Oblique tows				ETS	BOSA (n)
	ID	Type	Depth	4X4	Hydrobios	Tucker	Bioness	RMT	Trawl		
04-Sep-06	Oliver Sound	Basic	377	X	X	X		X			94
09-Sep-06	132	Full	241	X	X	X	X	X			0
10-Sep-06	127	Full	556	X	X		ICE				N/A
11-Sep-06	131	Full	440	X	X	X	X	X			37
12-Sep-06	126	Full	331	X	X	X	X	X			6
13-Sep-06	122	Basic	644	X		X					2
13-Sep-06	119	Basic	515	X		X					12
14-Sep-06	118	Full	175	X	X		ICE			X	N/A
15-Sep-06	115 (BA-01)	Full	643	X	X	X	X	N/A			23
17-Sep-06	108 (BA-02)	Basic	451	X		X					14
18-Sep-06	101 (BA-03)	Full	357	X	X	X	X	X		X	35
20-Sep-06	301	Basic	680	X		X			X		87
21-Sep-06	303	Basic	229	X		X					26
23-Sep-06	307	Full	168	X	X	X	X	X			6
25-Sep-06	310	Basic	175	X		X					2
26-Sep-06	314	Basic	70	X		X					N/A
Total		**16**		**16**	**9**	**14**	**6**	**6**	**1**	**2**	**344**

At Full stations, stratified sampling of microzooplankton was also carried out with the CTD-Rosette in combination with the Bioness sampling. At each 10-meter interval from 90 m to the surface, two 12-L bottles served for the collection of water that was passed through 50-µm sieves immediately upon retrieval of the Rosette.

There was an opportunity to deploy the Hydrobios during one of the bottom mapping sessions in the western part of the Beaufort Sea study region and collect samples for a respiration experiment. This extra sampling site was called station Beaufort West (Table 13.2).

Table 13.2. Stations where zooplankton and fish were sampled and processed during Leg 2a and 2b.

Date	Station			Vertical tows		Oblique tows				ETS	BOSA
	ID	Type	Depth	4X4	Hydrobios	Double	Bioness	RMT	Trawl		(n)
29-Sep-06	403	Basic	412	X		X		X			5
1-Oct-06	405	Full	610	X	X	X	X	X			6
2-Oct-06	407	Full	385	X		X		X			34
2-Oct-06	408	Full	190	X	X	X		X			1
5-Oct-06	420	Basic	38	X		X		X			3
5-Oct-06	414	Full	300		X					X	0
6-Oct-06	421	Basic	1118	X		X					0
7-Oct-06	CA-04	Full	275	X	X						0
9-Oct-06	436	Full	246	X	X	X	X	X		X	10
12-Oct-06	435	Full	330	X		X		X			4
14-Oct-06	Beaufort West	Special	295		X					X	0
16-Oct-06	434	Basic	50	X		X					1
17-Oct-06	407	Full	404		X		X			X	2
23-Oct-06	322	Basic	219	X		X		X			9
24-Oct-06	333	Basic	35			X		X			0
25-Oct-06	334	Basic	82	X		X		X			1
25-Oct-06	338	Basic	134	X		X		X			2
26-Oct-06	346	Basic	82	X		X		X			2
26-Oct-06	350	Full	384	X	X	X		X		X	2
28-Oct-06	Frobisher Bay	Special	-						X		60
1-Nov-06	602	Basic	158		X	X					0
1-Nov-06	600	Basic	203		X	X					0
2-Nov-06	615	Basic	135		X	X					0
3-Nov-06	617	Basic	140		X	X					0
4-Nov-06	624	Basic	70		X	X					0
4-Nov-06	620	Basic	88		X	X					0
Total	26			15	14	21	3	13	1	5	142

Comments and recommendations

Rough sea conditions and technical problems prevented the deployment of instruments and the collection of reliable samples at some of the stations. For instance, technical problems with the crane prevented the deployment of the Bioness and Hydrobios at Full station 435 on 12 October (Leg 2a). Often enough, when sea conditions got extreme, the fragile 50 µm mesh nets attached to the Tucker and 4X4 used to tear or be inverted upon recovery. We sampled Full station 407 (Leg 2a) in two steps to save time over the very tight schedule the mission was submitted to. At this station, some of the samplers were deployed on the 2 October and the rest on 7 October.

The nets equipped on the different samplers deteriorated during the course of the ArcticNet 2006 Expedition. On several occasions, rips occurred in the nets during the recovery and securing of the samplers on deck. As a consequence, a lot of time was spent sewing the nets to maintain the quality of the samples collected. Furthermore, the nets were often stained with engine oil while they were stored on the deck. This can have serious consequences for experiments on live organisms. Some way must be found to store the equipment properly between deployments and take precautions with the nets during sampling operations to improve their life span.

13.2.2 Acoustics monitoring (EK60 Echosounder)

Acoustics EK60 monitoring was used to record continuous acoustic data during the course of the Expedition. The echosounder was a multifrequency SIMRAD EK60 (38 kHz, 120 kHz and 200 kHz). The software was the ER60 2.1.1. The recording of the data started on 24 August and the first days were used to perform tests and find the appropriate settings. RAW and HAC files have been recorded simultaneously with a maximum file size of 100 Mo. The EK-60 echosounder maintenance (backup of files) was performed by Pascal Massot (ArcticNet electrotechnician). A repetitor of the EK-60 was also installed in the wheelhouse. However, due to frequent discrepancies between the EK-60 GPS and other GPS, officers on duty preferred to have the M-300 bottom mapping system on the wheelhouse computer screen available for sciences. Corinne Pomerleau (DFO) held a logbook and was in charge of keeping an eye on the EK-60 repetitor to track intriguing features and fish.

13.2.3 Respiration rates of the zooplankton community

The Electron Transfer System (ETS) activity was used as an index of zooplankton respiration rates. Samples were collected at two stations (118 and 101) during Leg 1 (Table 13.1), and at five stations (407, 414, 436 and Beaufort West in the south-eastern Beaufort Sea and station 350 in Foxe channel) during Leg 2 (Table 13.2). Zooplankton samples collected at different depth strata during the day with the Hydrobios (9 nets) were split for taxonomy, biomass determination and ETS essays. A new ETS assay method developed by Båmstedt (2000) was used. Subsamples were size-fractionated with a 900 µm mesh sieve and the 200 µm, 900 µm and >900 µm size classes were homogenized directly with an INT reagent following the protocol of Båmstedt (2000). To convert ETS activity to respiration rate, an R/ETS constant of 1.96 was employed.

<u>Comments and recommendations</u>

Unfortunately, only 7 profiles of respiration rates were conducted over the entire Leg 2. Recurrent problems with the crane and the winch created delays and forced to postpone an experiment more than once. As well, the protocol needs to be improved to reduce the time and energy required to run the experiment.

13.2.4 Recoveries and deployments of moored sediment traps and hydrophones

On oceanographic moorings deployed or re-deployed in Baffin Bay and Beaufort Sea in 2006, 2 automated sediment traps were recovered and 3 were deployed during Leg 1 in Baffin Bay. In Leg 2 in Beaufort Sea, 4 automated sediment traps were recovered and 3 were deployed. Detailed information on mooring operations, including the specifications of the sediment traps recovered and deployed during both Legs, can be found in the Mooring operations report in Section 3.

Leg 1 – 22 August to 28 September 2006 – Baffin Bay and Canadian Arctic Archipelago

Several problems were encountered with moorings operations in the Baffin Bay this year. Only one mooring was recovered out of the four deployed in 2005 and only two lines were re-deployed out of the three initially planned. For recoveries, BA01-05 released fine, but the line drifted under strong surface currents toward the ship and the line got stuck (supposedly) in the propellers. The line was cut and only the upper half of the line was recovered. The top float has been probably hit by ice (Figure 13.2). At BA02-05, the line was finally released and fully recovered. The BA03-05 line was likely hit by an iceberg earlier this year because it was retrieved by an Inuit fisherman in Iqaluit. No answer from the acoustic releasers on position. At BA04-05, no release occurred despite communication with the acoustic releasers. The main hypothesis is that the line was hit by ice and that only a part of it was still on position. A lack of top floatation would then prevent any surfacing. For deployments, BA01-06 and BA03-06 were deployed with less equipment (no hydrophone & one trap missing). BA02-06 was not deployed because of a lack of releasers.

Figure 13.2. Photos of The top float of BA-01-05 likely scraped by ice (left) and the large Technicap PP5 deployed in Greenland water (right).

The ArcticNet mooring program is clearly suffering from various failures with different causes (see Table 13.3). To remedy quickly to the equipment pool collapse, an informal joint ArcticNet-Coast Guard meeting was convened onboard to brainstorm suggestions and recommendations. A more formal mooring council involving ArcticNet NIs will take place during the 3rd ArcticNet Scientific Meeting (Victoria, BC) in December 2006 to build on these field recommendations (schedule for moored sediment traps in 2006-2007 is shown in Table 13.4).

Table 13.3. Status of moored sediment traps and hydrophones after ArcticNet 2006 Leg1.

	Mooring	Date / Time (UTC)	Coordinates		Instrument	
			Latitude	Longitude	Type	Depth
Recovered	BA01 (half-line only)	9/15/06 22:15	76° 20.0' N	71° 12.0' W	Trap PP3 Trap PP5 (lost)	200 450
	BA02	9/7/06 23:25	76° 15.9' N	74° 35.1 W	Trap PP3	200
Total	**2**	**-**	**-**	**-**	**3**	
Not recovered	BA03 (hit by an iceberg)	N/A	N/A	N/A	Hydrophone Trap PP3	90 200
	BA04 (no release)	N/A	N/A	N/A	Trap PP3	200
Total	**2**	**-**	**-**	**-**	**3**	
Deployed	BA01	9/16/06 22:50	76° 19.8' N	71° 13.3' W	Trap PP3 Trap PP5	200 450
	BA03	9/18/06 23:30	76° 24.4' N	77.17.5' W	Trap PP3	200
Total	**2**	**-**	**-**	**-**	**3**	**-**

Table 13.4. Time schedule of 2006-2007 for moored sediment traps in Baffin Bay (Leg 1).

Sample cup #	Open	Close	Collection days
BA01 A 2006-07 Tecnicap PP3			
1	17 Sept., 2006	30 Sept., 2006	14
2	1 Oct., 2006	31 Oct., 2006	31
3	1 Nov., 2006	31 Dec., 2006	61
4	1 Jan., 2007	31 Mar., 2007	90
5	1 Apr., 2007	30 Apr., 2007	30
6	1 May, 2007	15 May, 2007	15
7	16 May, 2007	31 May, 2007	16
8	1 Jun., 2007	15 Jun., 2007	15
9	16 Jun., 2007	30 Jun., 2007	15
10	1 Jul., 2007	15 Jul., 2007	15
11	16 Jul., 2007	31 Jul., 2007	16
12	1 Aug., 2007	15 Aug., 2007	15
BA01 B 2006-07 Tecnicap PP5			
1	16 Sept., 2006	30 Sept., 2006	15
2	1 Oct., 2006	15 Oct., 2006	15
3	16 Oct., 2006	31 Oct., 2006	16
4	1 Nov., 2006	15 Nov., 2006	15
5	16 Nov., 2006	30 Nov., 2006	16
6	1 Dec., 2006	31 Dec., 2006	31
7	1 Jan., 2007	28 Feb., 2007	59
8	1 Mar., 2007	31 Mar., 2007	31
9	1 Apr., 2007	15 Apr., 2007	15
10	16 Apr., 2007	30 Apr., 2007	15
11	1 May, 2007	7 May, 2007	7
12	8 May, 2007	14 May, 2007	7
13	15 May, 2007	21 May, 2007	7
14	22 May, 2007	31 May, 2007	10
15	1 Jun., 2007	7 Jun., 2007	7
16	8 Jun., 2007	15 Jun., 2007	8
17	16 Jun., 2007	22 Jun., 2007	7

Sample cup #	Open	Close	Collection days
18	23 Jun., 2007	30 Jun., 2007	8
19	1 Jul., 2007	7 Jul., 2007	7
20	8 Jul., 2007	15 Jul., 2007	8
21	16 Jul., 2007	22 Jul., 2007	7
22	23 Jul., 2007	31 Jul., 2007	9
23	1 Aug., 2007	7 Aug., 2007	7
24	8 Aug., 2007	15 Aug., 2007	8
BA03 A 2006-07 Tecnicap PP3			
1	19 Sept., 2006	30 Sept., 2006	12
2	1 Oct., 2006	31 Oct., 2006	31
3	1 Nov., 2006	31 Dec., 2006	61
4	1 Jan., 2007	31 Mar., 2007	90
5	1 Apr., 2007	30 Apr., 2007	30
6	1May, 2007	15 May, 2007	15
7	16 May, 2007	31 May, 2007	16
8	1 Jun., 2007	15 Jun., 2007	15
9	16 Jun., 2007	30 Jun., 2007	15
10	1 Jul., 2007	15 Jul., 2007	15
11	16 Jul., 2007	31 Jul., 2007	16
12	1 Aug., 2007	15 Aug., 2007	15

Leg 2a – 28 September to 29 October 2006 – Amundsen Gulf, Beaufort Sea and Canadian Arctic Archipelago

Four moorings were successfully recovered and three redeployed. Upon recovery, the cups containing the samples from the sediment traps were processed according to the protocol that we were given. The three redeployments did not occur immediately after the recovery of the moorings, giving plenty of time to clean the traps and refit them with new cups.

13.3 Preliminary results

13.3.1 Zooplankton and fish sampling

The deployment of the pelagic trawl was highly experimental, time-consuming and remained a tricky operation. On the basis of the 2005 and 2006 trawl deployments, it is strongly recommended that this method be revised. The validation of the EK-60 echosounder would remain incomplete until the technique is refined by experienced personnel onboard. Furthermore, if the goal is to collect fish biomass, coastal communities should be hired during spring/summer since adult Arctic cods were successfully fished by Northerners in spring 2006 for the contaminants team (Stern).

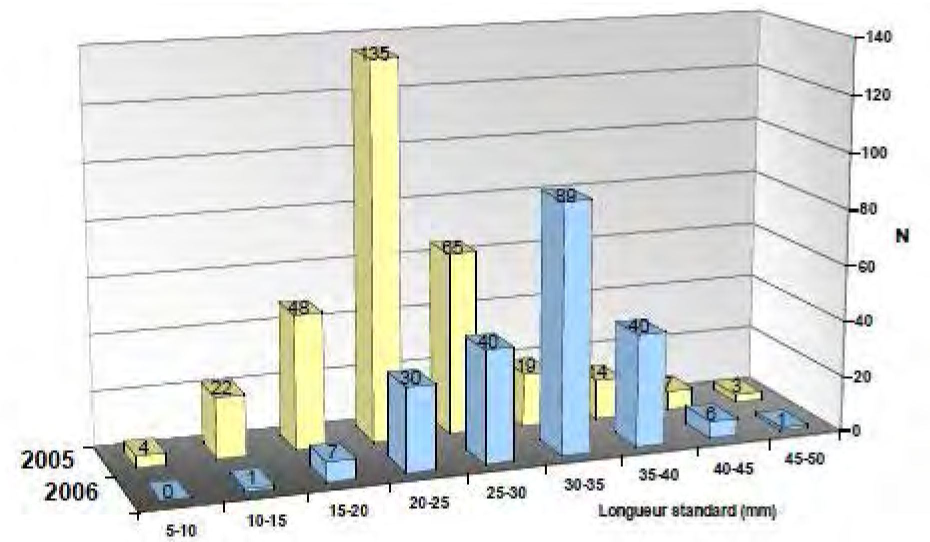

Figure 13.3. Arctic cod (*Boreogadus saida*) length classes from fresh sub-sampling for the Leg 1 of ArcticNet Expeditions in 2005 and 2006.

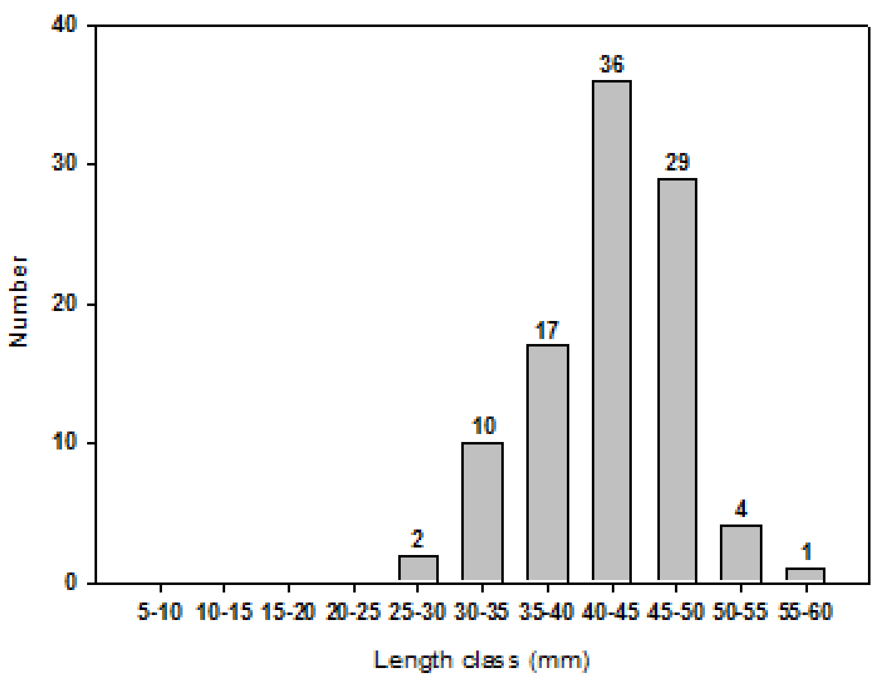

Figure 13.4. Arctic cod (*Boreogadus saida*) length classes from fresh sub-sampling for Leg 2 of the 2005 ArcticNet Expedition.

In Leg 2, the pelagic trawl was deployed once in Frobisher Bay where (as for Leg 1) no adult fish were caught but several juveniles of Arctic cod (60) were collected and preserved in ethanol.During Leg 2b, zooplankton sampling was completed in all three Labrador fjords using an oblique double square (Tucker) net tow and a vertical Hydrobios tow (see Table 13.2 in the Methodology section). Within each fjord, two oblique trawls and two vertical Hydrobios tows were completed: one near the mouth of the fjord and one near the head of the fjord. To date, there is no information available for water column zooplankton in either Nachvak, Saglek or Anaktalak fjords. The sampling completed onboard the *Amundsen* will provide important baseline information in terms of zooplankton taxonomy and diversity within each of the fjords.

13.3.2 Acoustics monitoring

A layer in the first 100 m of the water column occurred almost all the time (Figure 13.5). The echoes, as a general rule, were quite weak (-90 dB to –65 dB) and according to the nets catches, they corresponded in this upper layer to zooplankton such as copepods, amphipods, pteropods and jelly fish.

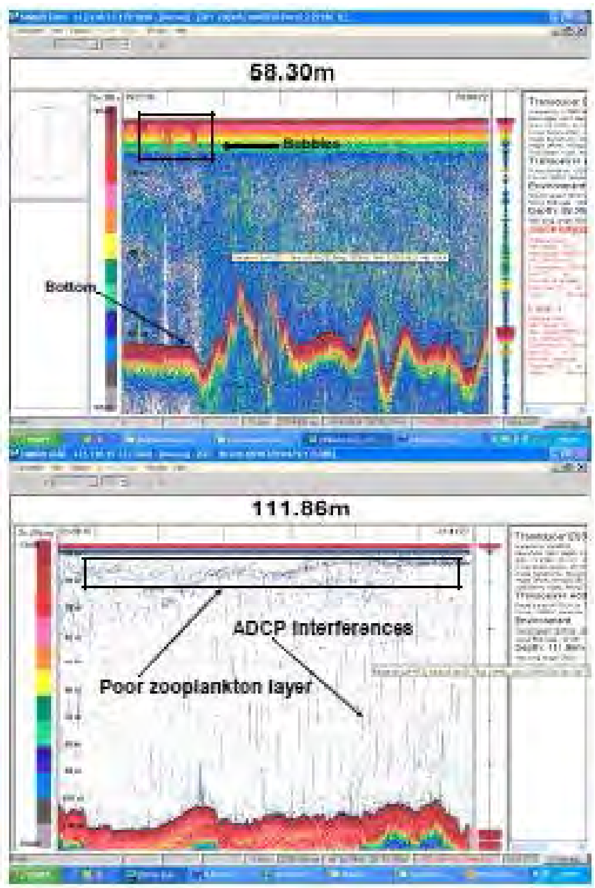

Figure 13.5. Examples of typical EK-60 features, here from Victoria Strait on 26 September 2006.

13.3.3 Respiration rates of the zooplankton community

Typically, respiration in the small size fraction was higher in the near-surface layers, declining sharply with depth. Conversely, the large size fraction showed an increase in respiration with depth. These patterns did not seem to change with day and night samplings. There was a greater variability in the magnitude of community respiration among sites for the large size fraction than for the small size fraction. For example, during Leg 1 at station 118, zooplankton community respiration (µl O_2 m^{-3} h^{-1}) in the small size fraction was lowest in the deeper layers. At station 101, higher levels of respiration in the small size fraction were observed in the water layers above 150 m (Figure 13.6). The large size fraction showed a sharp increase in respiration below 50 m and 80 m at stations 118 and 101, respectively.

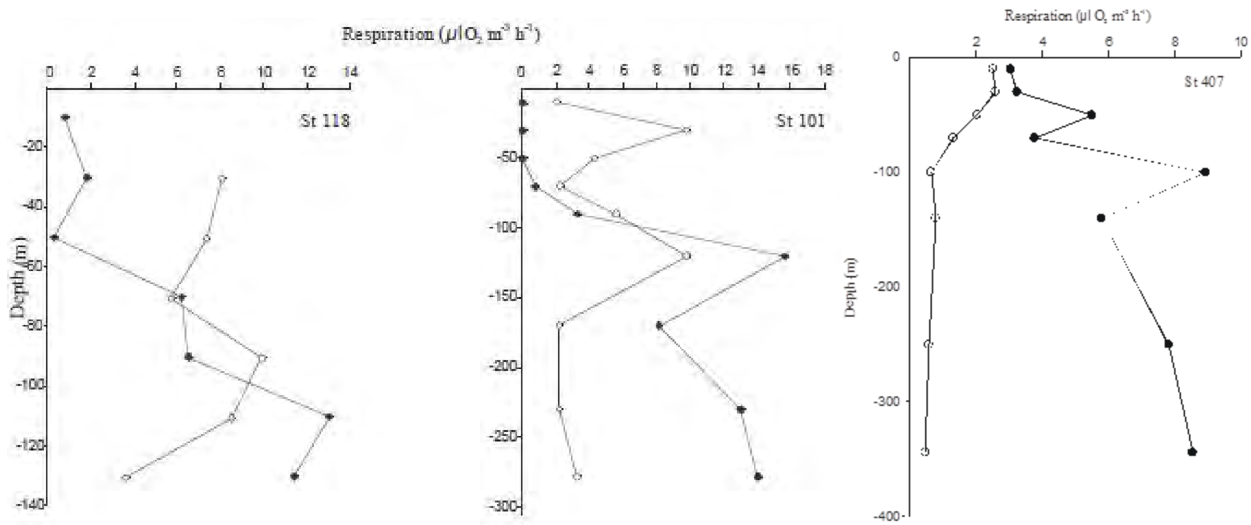

Figure 13.6. Vertical profiles of zooplankton assemblage respiration for small (open dots) and large (black dots) size fractions at stations 118 and 101 during Leg 1 and at station 407 in Leg 2a.

Reference

Båmstedt, U., 2000. A new method to estimate respiration rate of biological material based on the reduction of tetrazolium violet. Journal of Experimental Marine Biology and Ecology, 251(2): 239-263.

14 Contaminants sampling program – Legs 1 and 2

ArcticNet Phase I – Project 1.3 Contaminant Cycling in the Coastal Environment.
ArcticNet/Phase 1/Project 1.3

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14.1 Introduction

This project aims to answer the overriding question of how climate variability in physical forcing and the biogeochemical response to this primary forcing will affect hexachlorohexane (HCH) and mercury(Hg)/methyl mercury (MeHg) contaminant cycling in the Arctic. Ultimately, changes in the delivery and biogeochemical cycling of these contaminants will be related to their levels in fish, marine mammals and the people who consume these tissues as part of their traditional diets. Mercury, which cycles globally in the atmosphere, is deposited uniquely in polar regions through mercury depletion events (MDEs; oxidation of Hg(0) to Hg(II), and these appear highly sensitive to ice and ocean climate variables.

14.1.1 Mercury (Hg) and methyl mercury (MeHg)

Mercury (Hg) has long been known as a neurotoxin, and is emerging as a critical contaminant issue in the Arctic. Although global Hg emissions are declining, marine mammals in certain areas in the arctic have exhibited increasing Hg concentrations during the past two decades. Hg concentrations have been observed in liver of beluga whales from the Beaufort Sea area since 1982, peaking at 29.0 μg/g (wet wt., age corrected; 41.5 μg/g without age correction) in 2002, and remaining as high as 13.5 μg/g in 2002 (consumption guidelines for fish tissue are 0.5 μg/g). Hg behaviour in the environment is still not well understood.

14.1.2 Hexachlorocyclohexane (HCH)

HCHs are a group of pesticides that are used as an insecticidal technical mixture (alpha, beta, and gamma isomers (known commercially as Lindane). Global production was estimated at 10 tons in 1997. HCHs are now ubiquitous in water throughout the northern hemisphere with the highest levels found in the surface layers of pack ice in the Arctic Ocean. Levels in beluga, seal, and polar bear blubber and fat have been found at very high levels. The alpha-isomer is the most prominent in Arctic air, water and soil, and moves northward via cold-condensation, a process whereby the contaminant evades into the atmosphere, drifts with atmospheric currents, and condenses in colder climates where colder temperatures inhibit further evasion. Hence the contaminant accumulates disproportionately in the Arctic. Although less prominent than the alpha-isomer, the beta-isomer has been found at very high levels in marine mammals and human tissues, showing a strong tendency to concentrate up the food web. Although HCH production was largely banned in the 1980s and 90s, they have an estimated half-life of 25 years in water and 8 years in the human body. HCHs are endocrine disrupters, and cause nervous system and reproductive damage, as well as cancer.

14.1.3 Objectives

One of the main objectives in our study and field program was to obtain detailed mass balance and fate studies to formulate a mass balance model for mercury in the Northwest Passage marine system (Legs 1 and 2a) and the Beaufort Sea (Leg 2a). In conjunction with the work being done to quantify vertical and organic material fluxes, such a model will form an interpretive basis for monitoring components of the system and interpreting proxy records. To conduct these mass balance studies, measurements for mercury and HCH contaminants (including speciation of enantiomers α-HCH) were performed on ocean water samples, near surface air, and marine surface sediments. Dissolved organic carbon (DOC) and coloured dissolved organic matter (CDOM) samples were taken to correlate the amount and impact of living matter and light penetration on the concentrations of methyl mercury (MeHg) in the water column. Water, $\delta^{8}O$ and salinity measurements were also be made to distinguish between freshwater sources (runoff and sea-ice melt) such that the relative roles of import of Hg from the drainage basin versus Hg cycling through ice formation and melting can be evaluated.

One focus of the team was the study of variations in mercury levels in the pelagic food web of the coastal Canadian High Arctic with the objective to link physical and biological processes to mercury levels in the food web and to target the pelagic food web biomagnification and bioaccumulation of mercury with stable isotopes and fatty acids. Thus, all biological samples collected were measured for total mercury (THg) and MeHg along with stable isotopes to place organisms into their associated trophic levels.

During Leg 2a, the contaminants team conducted marine sampling for mercury in two geographical regions, each corresponding to separate areas of mercury research. The first region of mercury sampling was the Western Arctic where studies in the Beaufort Sea and Amundsen Gulf were conducted (Figure 14.1). The second region of mercury sampling was in the Eastern Arctic, where studies were conducted in Foxe Basin, Foxe Channel and Hudson Strait (Figure 14.2).

The primary objective for these mercury field studies in Leg 2a was to conduct high-resolution vertical profiles of mercury for the purpose of investigating light-related effects on mercury distribution in the ocean. These profiles were intended to follow up results from the 2003-2004 CASES Expedition which demonstrated depletions of MeHg (the toxic bioaccumulative form of Hg) in surface waters compared to deep waters and suggested seasonal or light related dependencies. To address this objective, two types of sampling approaches were used. The first was designed to measure marine surface water mercury concentrations over the daily light cycle. The second sampling approach was designed to provide a high resolution vertical profile of the ocean water column with respect to mercury species.

The second objective for mercury field studies in Leg 2a was to measure oceanic inflows and outflows of mercury to specific regions of the eastern Canadian Arctic Archipelago. Mercury samples were collected at locations where Arctic Ocean water enters or leaves geographically confined regions of the Canadian Arctic Archipelago, or external non-arctic marine water enters (e.g., Labrador Sea inflow through Hudson Strait). The selected locations were the connection of Fury and Hecla Strait with Foxe Basin, the connection of Foxe Basin with Hudson Strait, and the connection of Hudson Strait with the Labrador Sea. Sampling depths targeted water masses (based on salinity and temperature from the CTD-Rosette) and allowed a representation of mercury movement with horizontal oceanic water mass transport. In addition, the stations selected provide a cross-sectional measurement of mercury within the Straits and their movement between shelf basins. Additional mercury sampling took place along the west-to-east transect in the southern region of Foxe Basin to measure background mercury concentration and distribution in Foxe Basin where very few contaminants studies have been undertaken.

During Leg 2b in the Labrador fjords, the contaminants sampling program focused on the sediments to quantify of contaminants in the sediments over a time series.

14.2 Methodology

14.2.1 Leg 1 – 22 August to 28 September 2006 – Baffin Bay and Canadian Arctic Archipelago

The stations sampled during Leg 1 with date, time and type of sampling are summarized in Table 14.1.

Table 14.1. Summary of stations sampled for contaminant analyses during Leg 1.

Station	Date	Zooplankton			Water		Air
		Monster Net	Tucker	RMT	Lindanes	Mercury	
Oliver S.	04/09/06	x		x			
132	08/09/06	x	x	x	x		X
127	10/09/06	x	x	x	x		X
131	11/09/06	x	x		x		X
126	12/09/06	x	x	x	x		X
122	13/09/06	x	x				
119	13/09/06	x	x				
118	14/09/06				x	x	x
117	14/09/06	x					
115	15/09/06	x	x		x		x
108	17/09/06	x	x		x		x
101	18/09/06	x	x	x	x		x
301	20/09/06	x			x	x	x
303	21/09/06	x	x	x	x		x
307	23/09/06	x	x	x	x	x	x
308	25/09/06				x		x
310	25/09/06	x	x		x		x
314	26/09/06	x	x				

14.2.2 Leg 2a – 28 September to 29 October 2006 – Amundsen Gulf, Beaufort Sea and Canadian Arctic Archipelago

Leg 2b – 29 October to 9 November 2006 – Labrador fjords

On Leg 2, samples were collected in the Beaufort Sea and Amundsen Gulf with mercury sampling conducted at station 405 and the Natural Resources Canada Survey Site (Figure 14.1). In the Eastern Arctic, mercury sampling sites (Figure 14.2) were located along a transect crossing the east side of Fury and Hecla Strait (Stations 330, 331 and 332), the south region of Foxe Basin (stations 338 and 349), Foxe Channel (350), and the east end of Hudson Strait (Stations 353 and 356).

Two types of sampling approaches were used. To measure marine surface water mercury concentrations over the daily light cycle, vertical profiles of total mercury, methyl mercury and ancillary parameters (CDOM/^{18}O/Salinity were collected in the upper 25 m of the water column over a 24-hour period. Samples were collected for unfiltered water and for the dissolved phase. During this 24-hour period, continuous measurements of PAR and full spectral light measurements during the peak period of daylight were made. At the NRCan survey site, high resolution vertical profiles of total (THg) and methyl mercury (MeHg) were collected with replication at 22 depths in a 430 m deep water column, and the highest number of samples per unit of depth in the surface layers. In addition to mercury samples, coloured dissolved organic matter (CDOM), dissolved organic carbon (DOC), δ^{18}O, salinity, and trace element samples were collected.

At the connection points of Fury and Hecla Strait with Foxe Basin (Stations 330, 331 and 332), of Foxe Basin with Hudson Strait (Station 350), and of Hudson Strait with the Labrador Sea (Stations 353 and 356), mercury samples were chosen at depths corresponding to water masses indicated by salinity and temperature measurements from the CTD-Rosette. Sampling also took place along the west-to-east transect in the southern region of Foxe Basin (Stations 338 and 349) to measure the background mercury concentration and distribution in Foxe Basin where very few contaminants studies have been undertaken.

Vertical profiles (36) were collected for HCHs, usually consisting of 10 depths, with the emphasis on the upper water column. Filters and cartridges were frozen and brought back the Freshwater Institute (DFO) for analysis. $^{18}\delta O$ and salinity samples were also collected at each site and depth where HCH samples were taken.

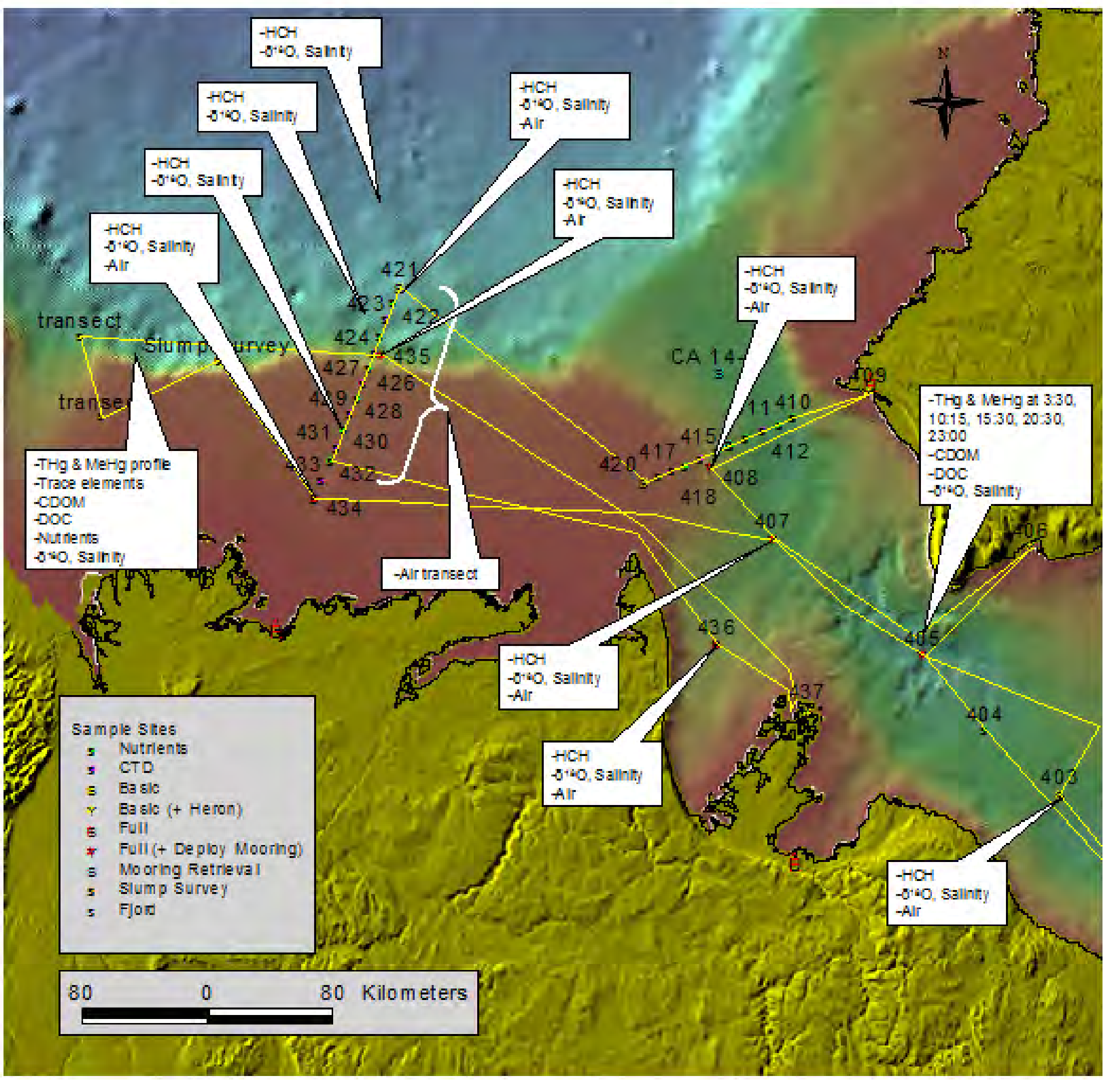

Figure 14.1. Contaminant group sampling in the Beaufort Sea area of Leg 2a.

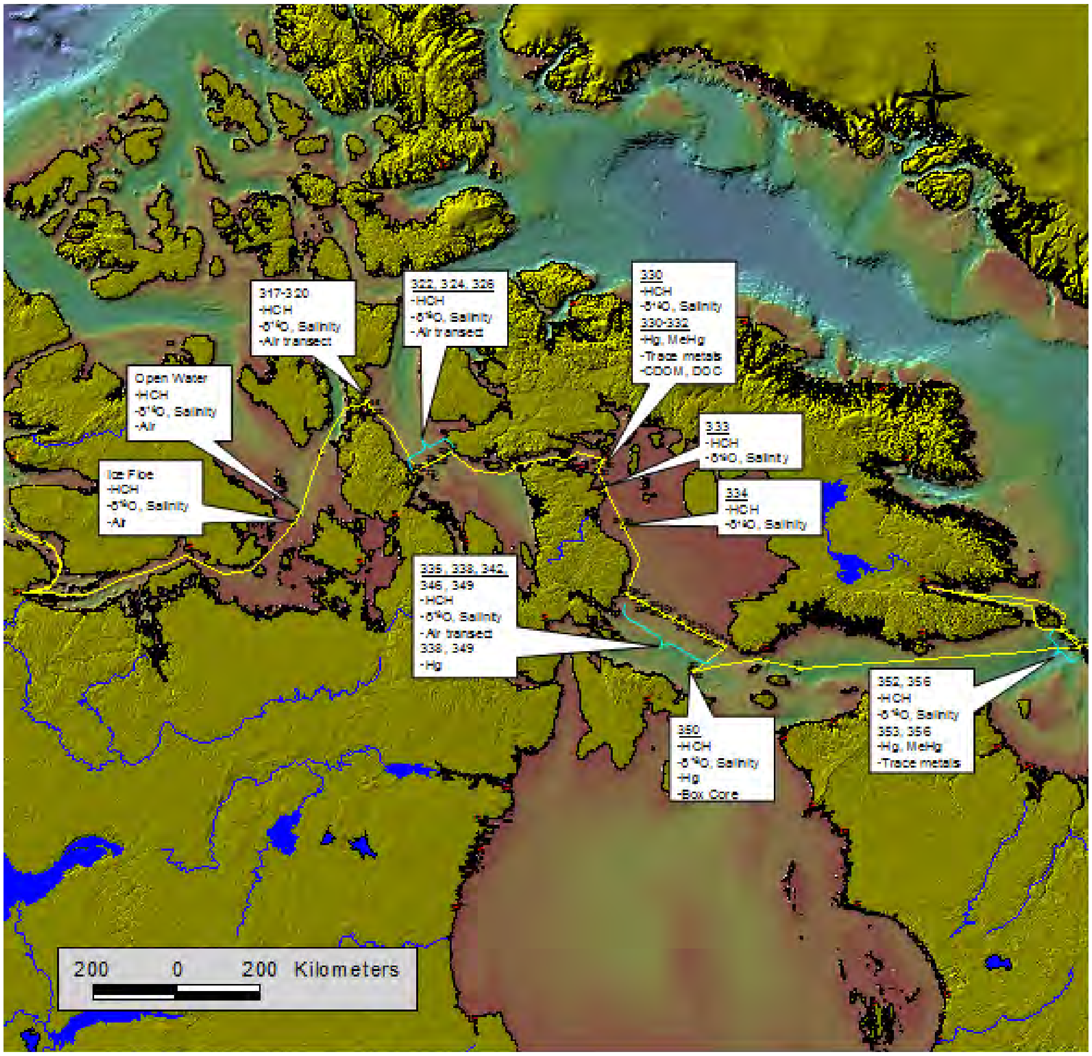

Figure 14.2. Contaminant group sampling in the Northwest Passage, Boothia, and Foxe basin areas of Leg 2a.

14.2.3 Total mercury (THg) and methyl mercury (MeHg)

A detailed water profile was collected using a Niskin bottle and the Rosette at 3 stations: one in the North Water polynya, one in Lancaster Sound and one in Viscount Melville Sound. Samples were collected for each of the following: Trace metals, THg, MeHg, salinity, dissolved organic carbon (DOC), coloured dissolved organic matter (CDOM), nutrients and $\delta^{8}O$.

All Hg and MeHg samples were preserved with hydrochloric acid and will be shipped to the Ultra Clean Trace Elements Lab at the University of Manitoba (total Hg) and the University of Ottawa (MeHg) for analysis.

14.2.4 Low volume water collection for HCHs

A Niskin bottle and the Rosette were used for low volume water collection. Four litre samples were collected at all full and some basic stations as well as some nutrient and CTD stations. Water was collected from ten depths with an emphasis on the upper water column. At the surface and at 2.5 m, a Niskin bottle was used to collect the water, as this was too shallow for the Rosette.

Where feasible, transects across water bodies were collected. In Leg 2, a sample from an ice floe was also taken in an area with high ice cover, and a nearby area with more open-water, to see if the ice was in fact trapping the HCH's underneath.

In the laboratory, water was pumped through glass-fibre filters followed by a solid-phase extraction (SPE;1-g Oasis HLB) cartridge using peristaltic pumps. Salinity and $\delta^{8}O$ samples were collected with each HCH sample.

14.2.5 Air sampling (organic contaminants)

The high volume air sampler was set up to the starboard side of the bow of the ship. Air samples were taken for all full stations, most basic stations, and several transects. Samples were collected by pumping air through a glass fibre filter and polyurethane foam (PUF) plug and will be analyzed for HCH contaminants. Air samples were collected on station and averaged 12-20 hours per sample (Leg 1) and between 3 and 30 hours (Leg 2). Air samples were collected at 13 stations in Leg 1 (Table 14.1) and 14 stations in Leg 2 (Figure 14.1 and 13.2). Filters and PUFs were frozen at -20°C and shipped frozen back to the Freshwater Institute (DFO) for analysis.

14.2.6 Biotic sampling (mercury, stable isotopes)

Biological samples were collected at every basic and full stations along the cruise transect. Various meso- and macro-zooplankton families and fish samples collected with a vertically towed Monster net, a set of 4 adjacent 1-m^2 frame nets, from near the bottom to the surface (mesh size 200 μm and 500 μm; downing at 40 m/min, resting for 1 minute and hauling at 25 m/min) and by trawling an oblique rectangular midwater trawl (RMT 1600 μm) or an oblique Tucker net (2x500 μm) in the surface layer from 100 m to the surface at 2 knots (hauling at 30 m/min). Zooplankton and fish were sorted into families, placed into 30-ml plastic vials and whirlpak bags and frozen until they can be analyzed for THg, MeHg and stable isotopes. Representative sub samples of individual zooplankton families were placed in 4-ml glass vials for stable isotope ^{15}N and ^{13}C analysis. In Leg 1, 16 locations were sampled using a total of 38 tows whereas in Leg 2, 23 sites were sampled for zooplankton.

Total body length (the distance from the front of the head to the tip of the longest uropod) of the individuals of the hyperiid specie *Themisto* sp. (Figure 14.3), a purple amphipod highly distributed throughout the High Arctic was measured to the nearest 0.5 mm. Animals greater than 18 mm were considered adult and smaller than that free living juvenile. The individuals were divided into size classes; 0-10 (newly hatched individuals/Juvenile 1), 11-15 (Juvenile 2), 16-20 (1 year old immatures), 21-30 (individuals of over 2 years old), >30 and whenever possible, separated into different vials as described above.

Figure 14.3. Left panel: *Themisto* sp.; Right panel: zooplankton sorting.

14.2.7 Box core

One box core was collected in Foxe Basin (Station 350) during Leg 2. Bottom sediment was collected to study the sources, distribution and fate of organic matter, as well the behaviour of compounds (i.e. organic contaminants) which are geologically coupled to organic carbon. The core was sectioned into 1-cm slices for the first 10 cm, 2-cm slices for the next 10 cm, and 5-cm slices after that. After homogenizing the section, subsamples were taken for ^{210}Pb dating and for the analysis of carbon, nitrogen, trace metals, stable isotopes, and organic and inorganic contaminants. Samples were frozen at -20°C and will be transported frozen back to the Freshwater Institute for analysis.

During Leg 2b in the Labrador fjords, a small box corer was used onboard the *Amundsen* and the collected cores were processed onboard (Figure 14.4)

Figure 14.4. Box coring for contaminants during Leg 2b in the Labrador fjords.

The cores were sectioned into 1 cm intervals for the top 10 cm, 2 cm intervals for the next 10 cm, and 5 cm intervals for the remainder of the core. For every core, approximately 1 cm or more of sediment from around the edges was discarded to ensure that sediments that may have been smeared by the box core did not become part of the samples being taken. Each sample was homogenized in pre-cleaned 500-ml I-Chem glass jars and subsamples were then placed into smaller containers: 2 vials for $^{210}Pb/^{137}Cs$ dating and C/N/stable isotopes and a small Whirlpak bag for Hg analysis. The remainder of the sample in the I-Chem jar will be analyzed for other contaminants (including PCBs) and archived.

14.3 Preliminary results

Due to space, material and safety constraints, no analyses could be performed while on the ship. All samples were preserved or frozen and were sent to various laboratories for analysis.

15 Biogeochemical cycling of mercury – Leg 1

ArcticNet Phase I – Project 1.3 Contaminant Cycling in the Coastal Environment.
ArcticNet/Phase 1/Project 1.3

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15.1 Introduction

Concentrations of the neurotoxin mono-methylmercury (MMHg) are increasing in many marine mammals of the Canadian Arctic to levels that may be toxic to Northern peoples consuming these animals as part of a traditional diet. The objective of this team was to determine the source of this MMHg to arctic marine foodwebs and continue building on work completed by Ms. Jane Kirk the 2005 ArcticNet expedition. One of the key processes resulting in the contamination of biota with mercury (Hg) is the formation of MMHg from inorganic Hg(II) species which themselves are not as readily bioaccumulated. The methylation of Hg(II) in marine sediments has been shown to take place in various temperate locations, and in freshwater systems it has also recently been demonstrated that Hg can be methylated to MMHg in the hypolimnion.

However, our knowledge of the processes resulting in the formation of MMHg in Arctic marine systems is very limited, and most of the research conducted thus far on the biogeochemical cycling of Hg in the Arctic has focused on atmospheric processes resulting in the deposition of Hg(II), but the link from the deposition of Hg(II) to the formation of MMHg is relatively unknown. Since a high proportion of the total Hg (THg, all forms of Hg in a sample) measured in the lower parts of the water column during ArcticNet 2005 existed in methylated forms as MMHg and dimethylmercury (DMHg, a volatile, toxic form of Hg that can be photolyzed to MMHg), we hypothesize that Hg(II) can be methylated directly in the water column. In other words, we are proposing that the production of methylated Hg species in bottom sediments alone is not enough to result in the concentrations measured in the overlying water column. By using specific stable- isotopes of different forms of Hg as tracers in incubation experiments, we are attempting to measure water column Hg methylation rates to determine if this process is a potential source of Hg contamination to marine organisms in the Canadian Arctic. In addition, we are also measuring background concentrations of a broad range of Hg species: THg, MMHg, DMHg and DGEM (dissolved gaseous elemental mercury) in the water column at all stations where methylation experiments are being conducted. This work will enhance our current understanding of Hg cycling in the Arctic, provide baseline water concentrations and allow us to better predict changes in this cycle as climate change continues to impact the Arctic.

15.2 Methodology

15.2.1 Sample collection

At each station we sampled the water column at three different depths, namely the surface, the bottom of the oxycline and the bottom of the water column, using Teflon- lined Niskin bottles mounted on the ship's Rosette. From each depth we collected water in separate acid-washed Teflon bottles for THg and MMHg analysis using standard ultra- clean procedures such as the "clean hand, dirty hand" protocol. For the purpose of the isotope-addition methylation experiments, water was collected in certified ultra-clean amber boston-round bottles and 1-L glass jugs by twice overfilling each bottle from the bottom – using c-flex tubing – to preserve *in situ* redox conditions. Water for sulfate analysis was also obtained.

Table 15.1. List of stations and depths sampled during Leg 1 and experimental work conducted at each of them.

Station ID	Cast #	Depths Sampled (m)	Work Conducted
Oliver Sound "Station A"	013	358,240,2	Full suite of samples and experiments
Station 132	021	243,210,2	Full suite of samples and experiments
Station 131	038	302,170,3	Ambient Hg sampling (THg, MMHg, DMHg, and DGEM) and incubations for volatile Hg species only
Station 123	046	692,300,4	Full suite of samples and experiments
Station 115	059	673,425,4	Full suite of samples and experiments
Station 101	076	344,225,2	Full suite of samples and experiments
Station 301	087	675,370,3	Full suite of samples and experiments
Station 307	095	158,110,2	Full suite of samples and experiments
Station 310	108	201,90,4	Ambient Hg sampling (THg, MMHg, DMHg, and DGEM) and incubations MMHg production only

15.2.2 Sample processing and experimental procedure

The basic design of the methylation experiments was to add Hg(II) of a specific isotope and measure the concentration of MMHg and DMHg containing that particular isotope of Hg after various incubation times to obtain a time-series of data from which methylation rates could be calculated.

^{198}Hg(II) $\longrightarrow$ MM^{198}Hg + DM^{198}Hg; methylation rate = % of ^{198}Hg added that is converted to MMHg or DMHg per day.

Some samples also received a spike of isotopically-labelled MMHg to monitor the decrease in that species over time from demethylation reactions as well as the production of DMHg from MMHg.

$MM^{199}Hg$ → $^{199}Hg(II)$; demethylation rate = % of $MM^{199}Hg$ lost per day
$MM^{199}Hg$ → $DM^{199}Hg$; methylation rate = % of $MM^{199}Hg$ added that is converted to DMHg per day.

Incubation samples were split into three different series for each depth. One series received a low-level addition of $^{198}Hg(II)$ stable-isotope tracer, a second series received a high-level addition of $^{198}Hg(II)$ stable-isotope tracer and a low-level addition of $MM^{199}Hg$ (to measure demethylation rates). Samples from both of these series were incubated in the dark at 4°C for 0,8,16 and 24 hours, after which times samples were acidified and refrigerated to stop all biotic activity and preserve the sample. Surface samples were also incubated in the presence of light to approximate in situ conditions.

The third incubation series was conducted in 1-L glass jugs amended with high-level additions of both $^{198}Hg(II)$ and $MM^{199}Hg$, and incubated for 24 hours under the same conditions as the other incubation samples (i.e. surface samples in the presence of light, mid and bottom samples in the dark). After 24 hours the samples were purged with a flow of UHP nitrogen and volatile Hg species were trapped on carbotraps for DMHg and gold traps for DGEM. This last experiment will allow us to determine if DMHg can be formed in the water column and if it is predominantly formed from Hg(II) or from MMHg. By measuring a third isotope of Hg (i.e. one that is neither ^{198}Hg nor ^{199}Hg) in the analysis of the traps, we will also be able to measure the background ambient levels of both DMHg and DGEM in the water column. THg and MMHg samples were acidified to 0.2% and 0.4% with HCl and H_2SO_4 respectively, sulfate samples were filtered and all samples were refrigerated.

15.3 Preliminary results

Due to the complex analytical nature of our work, we are not able to analyze any of the samples while on board of the CCGS *Amundsen*. Therefore, we will not obtain any data or results until samples are returned to the Biogeochemistry Lab at the University of Alberta for low-level Hg analysis using various mass-spectroscopy techniques.

16 Seafloor mapping – Legs 1 and 2

ArcticNet Phase I – Project 1.6: The Opening NW Passage: Resources, Navigation, Sovereignty & Security. ArcticNet/Phase 1/Project 1.6
ArcticNet Phase I – Project 1.2: Coastal Vulnerability in a Warming Arctic. ArcticNet/Phase 1/Project 1.2
ArcticNet Phase I – Project 3.7 Nunatsiavut Nuluak: Baseline Inventory and Comparative Assessment of Three Northern Labrador Fiord-based Marine Ecosystems. ArcticNet/Phase 1/Project 3.7

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16.1 Introduction

The study of past sea-level change informs analysis of vertical crustal motion and sea-level rise, helping to improve our ability to project future rates of relative sea-level rise in coastal communities. The geological analysis will be combined with data from a network of continuous GPS receivers and tide gauges at sites such as Ulukhaktok (Holman), Tuktoyaktuk, Alert, Qikiqtarjuaq, and elsewhere to provide much improved estimates of present trends in vertical motion and sea level. The results will contribute to assessment of climate-change impacts and hazards in coastal communities as a basis for designing appropriate adaptation strategies. Through the combination of physical science, social science, and planning approaches to issues of climate-change response, the project is contributing to the development of an Integrated Regional Impact Study (IRIS) under ArcticNet.

The primary objectives of this work were to map the coastal seabed for hydrographic charting, geological interpretation, and benthic habitat characterization using combined multibeam and sub-bottom survey operations. The main objectives of the geological analysis were to identify evidence of the postglacial lowstand shoreline and to support interpretation of sea-level rise from cores in former lakes now converted to marine basins.

Secondary objectives included surveys and interpretation of shoreline evolution and investigations of a shallow, highly-stratified, breached-lake, tidal basin with dense hypersaline water at depth.

16.1.1 Leg 1 – 22 August to 28 September 2006 – Baffin Bay and Canadian Arctic Archipelago

The Ocean Mapping Group (OMG) was onboard Leg 1 to perform seabed mapping as part of its role in the ArcticNet program (Project 1.6). The primary purpose of the mapping was to collect as much bathymetry and sub-bottom information as possible while transiting through the Northwest Passage and between science stations in Smith Sound and northern Baffin Bay. The CSL *Heron*, a survey launch operated by the OMG, was onboard as well to perform mapping operations in support of ArcticNet Projects 1.2 and 1.6.

16.1.2 Leg 2a – 28 September to 29 October 2006 – Amundsen Gulf, Beaufort Sea and Canadian Arctic Archipelago

The dedicated mapping operations for Leg 2 consisted of coastal surveys conducted to support science activities in ArcticNet Project 1.2 addressing questions of sea-level rise and associated coastal change in the western Canadian Arctic, as well as the NRCan funded Ocean Action Plan (OAP) mapping on the Mackenzie Shelf. Both of these projects also satisfied the bathymetry and seabed mapping objectives. Three target sites were identified for detailed mapping and analysis, each of interest to a nearby community:

- Sachs Harbour, NWT, on the southwest coast of Banks Island;
- De Salis Bay on the southeast coast of Banks Island (140 km east of Sachs Harbour);
- Gillett Bay, Cape Parry, NWT (50 km north of Paulatuk).

16.1.3 Leg 2b – 29 October to 9 November 2006 – Labrador fjords

The seabed mapping component of Nunatsiavut Nuluak, on Leg 2b of the 2006 ArcticNet Expedition, was intended to address questions of navigation, seabed bathymetry, marine geology and geohazards, and seabed structure and stratigraphy in three fjord systems of northern Labrador. The cruise plan called for combined multibeam and sub-bottom survey operations in shallow and deeper water using the survey launch *Heron* and the icebreaker *Amundsen* at each of the three sites. This work also contributes to the mapping objectives of ArcticNet Projects 1.2 and 1.6.

The main survey objectives for Nachvak Fjord were to:

- Map shallow sills for safe transit to the inner fjord.
- Map both the deeper basins and as much of a moderate to shallow basin to sample a broad range of fjord habitats for their bathymetric characteristics and multibeam backscatter intensities.
- Profile the fjord subbottom to complement previous surveys and to establish a more complete stratigraphic framework for glacial and postglacial marine sediments.

The information gathered this year in combination with ground-truth data collected by Parks Canada this past summer will be used to generate potential substrate and habitat maps for selected parts of the fjord.

The main survey objectives for Saglek Fjord were to:

- Extend the multibeam mapping to the head and tributary arms of the fjord.
- Map the seabed of Saglek Anchorage, on the south side of Saglek Bay, in support of marine sediment contaminant mapping.
- Profile the fjord subbottom to establish a stratigraphic framework for glacial and postglacial marine sediments.

The information collected will be used to generate a potential substrate map of Saglek Anchorage, which will be helpful in understanding the pattern of contaminant concentrations in the bay, and to map geohazards, specifically underwater slope failures, which potentially can result in reworking of contaminated sediments. Depending on the amount of biological data available from sampling and diving transects, there may be an opportunity to generate a habitat map for the embayment. Likewise, if ground-truth data become available for the entire fjord, or multibeam backscatter-habitat associations are interpolated from Nachvak Fjord, a preliminary habitat map may be generated for Saglek Fjord.

Seabed mapping objectives in Anaktalak Bay were prioritized by the Nunatsiavut partners in Project 3.7. Their specific interest was to map:

- the shipping lanes from the Labrador Sea to Edwards Cove, near the head of Anaktalak Bay, a distance of ~40 km
- Edwards Cove, at the head of the bay, where the Voisey Bay mine camp and wharf are situated.

16.2 Methodology

16.2.1 Equipment

<u>CCGS *Amundsen*</u>

- Kongsberg-Simrad EM300 30 kHz multibeam echosounder
- Knudsen K320R 3.5 kHz sub-bottom profiler.
- Applanix POS/MV 320 motion and orientation sensor
- C&C Technologies CNAV GPS.
- AML Smart Probe surface sound speed probe
- Surface temperature and salinity probe
- Seabird SBE911 CTD, deployed from the Rosette.

<u>CSL *Heron*</u>

- Kongsberg-Simrad EM3002 300 kHz multibeam echosounder
- Knudsen K320B/R 3.5 kHz sub-bottom profiler
- Knudsen K320B 28/200 kHz singlebeam echosounder
- Knudsen K320B 2 x 200 kHz sidescan sounders
- CodaOctopus F185+ motion and orientation sensor
- C&C Technologies CNAV GPS
- Brooke-Ocean Technologies Moving Vessel Profiler 30 (MVP30).
- AML Smart Probe salinity and temperature probe (deployed during Leg 1 on MVP30)
- Optical backscatter probe (deployed during Leg 1 on MVP30).

Figure 16.1. Launching CSL *Heron* in De Salis Bay during Leg 2a.

16.2.2 Logging and processing procedures

<u>CCGS *Amundsen*</u>

Multibeam and sub-bottom profiler collection began shortly after leaving Quebec City. CNAV GPS was logged separately, with this feed of data being augmented by the position, vessel speed, and heading from the POS/MV. Both the multibeam and sub-bottom systems were logged continuously throughout the entire transit, with few interruptions in acquisition during the transit north and through the passage.

The EM300 data were logged in the Kongsberg-Simrad raw format and converted to the OMG format after line completion (new survey lines were automatically generated every half hour). The soundings were cleaned and inspected in near real-time with the three crew members maintaining a 24-hour watch throughout most of the cruise. Backups of the raw and processed data were made every few days on an external USB hard drive (though they were copied to the processing computer in near real-time and mirrored to a second internal hard drive on a nightly basis).

The K320R data were logged in the Knudsen binary format (.keb). Data were converted to OMG format and then backed up in the manner mentioned earlier.

The CNAV data consisted of NMEA strings and were captured to a text file using HyperTerminal, with a new files being created at approximately midnight (GMT) every day. At the end of each day (GMT), these data were backed up to the processing computer and converted to OMG format. The data were then plotted geographically for visual inspection. Raw GPS phase measurements were logged by the CNAV as well, the hope being to post-process the CNAV solutions for increased vertical accuracy. The raw data were logged on a separate PC, located next to the CNAV receiver in the Emergency Generator Room. The PC was controlled via a remote desktop interface in the Acquisition Room.

For surface sound speed, the probe data were logged directly into the EM300 raw data files. Sound speed profiles were collected on either the rosette shack PC. Raw files (collected in binary format) were converted to text files, copied to the processing PC and finally converted to OMG format, at which time the profiles were visually inspected for spurious data points. High resolution CTD casts were decimated to 1-metre bins using a median filter. Profiles were tagged with time and ship's position in real-time. If CTD profiles did not extend to full ocean depth, they were extended using the World Ocean Atlas 2001 before being input to the EM300 logging software. Post-processing of the multibeam soundings with respect to sound speed profiles will be done upon return to UNB.

<u>CSL Heron</u> (Figure 16.1)

Data collected onboard the *Heron* were logged to the PCs onboard the *Heron* and transferred to an external USB hard drive for processing onboard the *Amundsen*. Processing procedures for EM3002 and Knudsen data are identical to those described in the previous section regarding the treatment of data collected by the *Amundsen*.

16.2.3 Mapping procedures and system performance

During transit between stations, coverage from previous transits was loaded into Aldeberan. This allowed the helmsman to steer coverage and build upon the previously collected data. The Heron surveys were completed in freehand fashion with the survey area limits occasionally being plotted in Aldeberan to provide the helmsman with a visual indication of the survey limits.

Leg 1 – 22 August to 28 September 2006 – Baffin Bay and Canadian Arctic Archipelago

Several surveys were accomplished at the following locations during Leg 1. When the Heron was launched for these surveys, the instruments onboard are listed in Table 16.1.

- Makkovik continental margin, Labrador Sea (CCGS *Amundsen*)
- Hudson Strait margin, Labrador Sea (CCGS *Amundsen*)
- Oliver Sound (CCGS *Amundsen* and CSL Heron)
- Smith Sound (CCGS *Amundsen*)
- Belcher Glacier, Devon Island (CCGS *Amundsen* and CSL Heron)
- Resolute Bay, Cornwallis Island (CCGS *Amundsen* and CSL Heron)
- Coronation Gulf (CCGS *Amundsen* and CSL Heron)

Table 16.1. List of instruments onboard the CSL *Heron* sorted by geographic area visited during Leg 1.

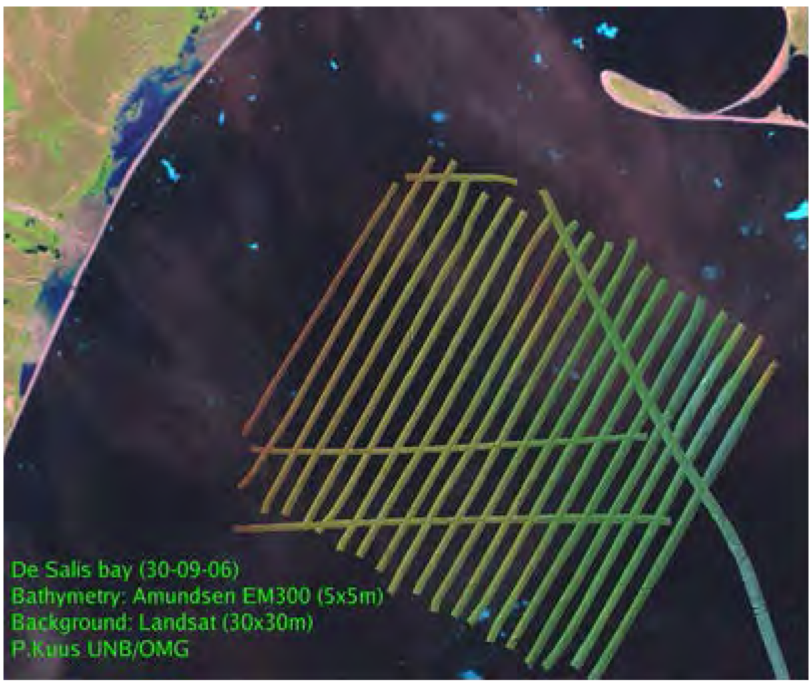
	Oliver Sound	Belcher Glacier	Resolute Bay	Coronation Gulf
EM3002	X	X	X	X
3.5 kHz	X	X	X	X
28 kHz	X	X	X	X
200 kHz (down)	X	X		X
200 kHz (sidescan)	X		X	X
CNAV (raw)	X	X	X	X
MCOM (F180)	X	X	X	X
MVP	X	X	X	X

Data quality was very good in most cases. Other than the two Labrador Sea surveys, survey line running was freehand, with the helmsman steering coverage to maintain overlap between adjacent lines. Insufficient overlap was occasionally a problem in the Resolute Bay data collected by the Heron, leading to small data holidays between some of the survey lines. Preliminary maps of the results are included below. No maps of the Coronation Gulf are available due to the limited amount of time available after the survey.

Leg 2a – 28 September to 29 October 2006 – Amundsen Gulf, Beaufort Sea and Canadian Arctic Archipelago

Two coastal surveys were undertaken at the Banks Island locations of De Salis Bay and Sachs Harbour. Multibeam and sub-bottom surveys were carried out in De Salis Bay between 0900 and 2100 h on 30 September 2006. During the 12-hour deployment, the CSL Heron covered areas in the inner bay while the *Amundsen* covered areas in the approaches to the bay.

- multibeam and sub-bottom surveys by CSL *Heron*.
- multibeam and sub-bottom surveys by CCGS *Amundsen*.
- an airphoto and beach survey by the Amundsen helicopter C-GCHU.



More specifically, the *Heron* performed a series of reconnaissance lines before performing a specific site survey using its EM3002 multibeam. The *Amundsen* conducted a systematic survey grid (Figure 16.2) in the approaches to De Salis Bay concentrating on data collection from the Knudsen K320 sub-bottom profiler.

Figure 16.2. *Amundsen* tracklines during survey of De Salis Bay.

16.3 Preliminary results

16.3.1 Leg 1 – 22 August to 28 September 2006 – Baffin Bay and Canadian Arctic Archipelago

Aside from intermittent ice breaking operations, bathymetry and sub-bottom data were successfully collected during Leg 1. Multibeam data were processed and cleaned for the Makkovik continental margin and Hudson Strait (Figure 16.3), the Oliver Sound Figure 16.4) and Smith Sound (Figure 16.5) and Belcher Glacier data (Figure 16.6). The Resolute Bay data have been partially processed (Figure 16.7). As the Coronation Gulf data were collected the evening prior to crew change, they will be processed upon return to UNB.

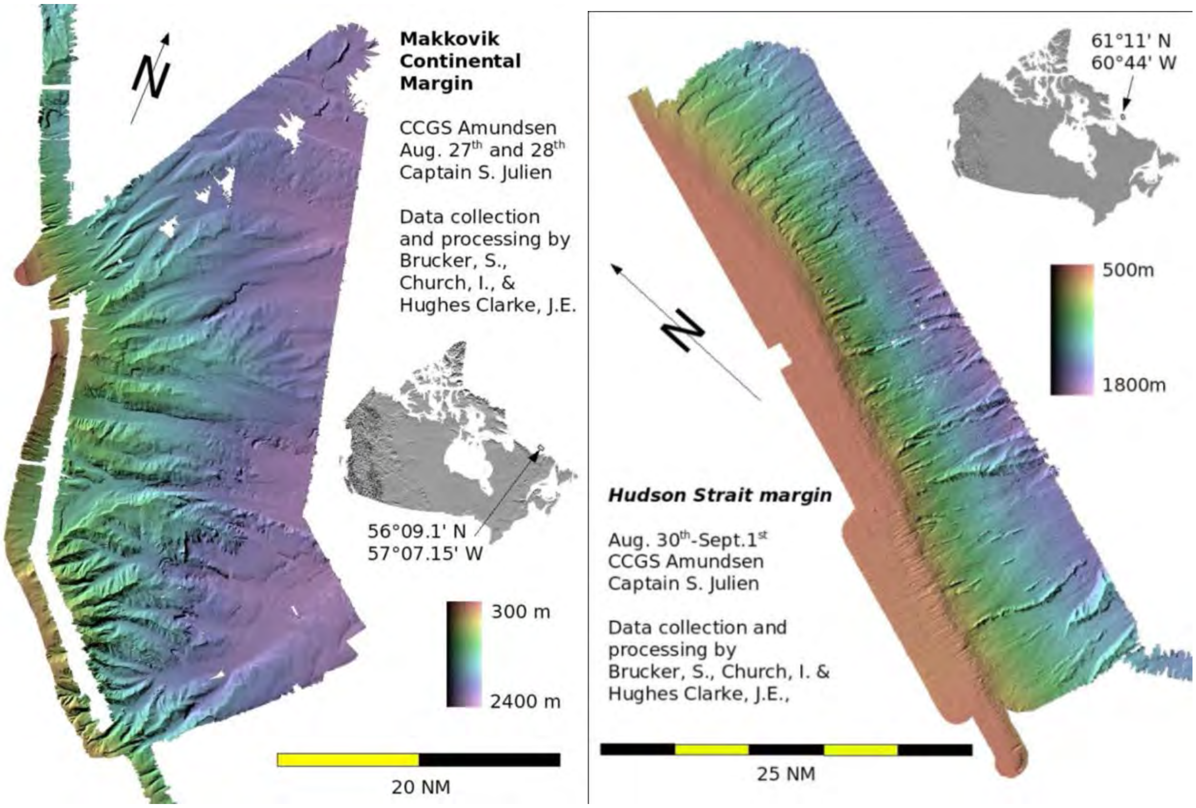


Figure 16.3. Left: Bathymetry of the Makkovik continental margin, Labrador Sea. Right: Bathymetry of the Hudson Strait margin.

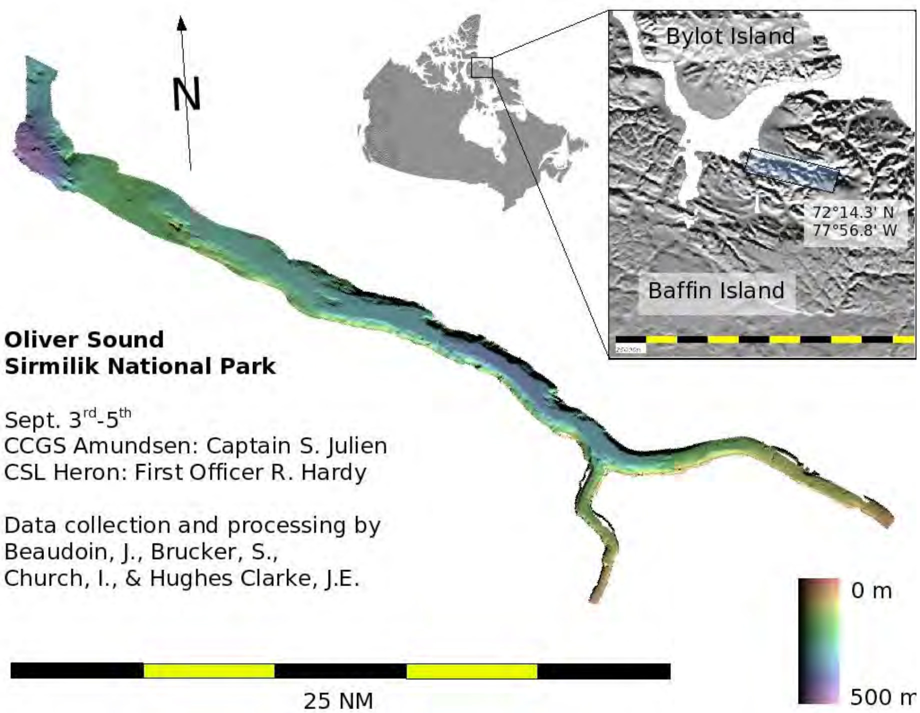


Figure 16.4. Bathymetry of the Oliver Sound Sirmilik National Park.

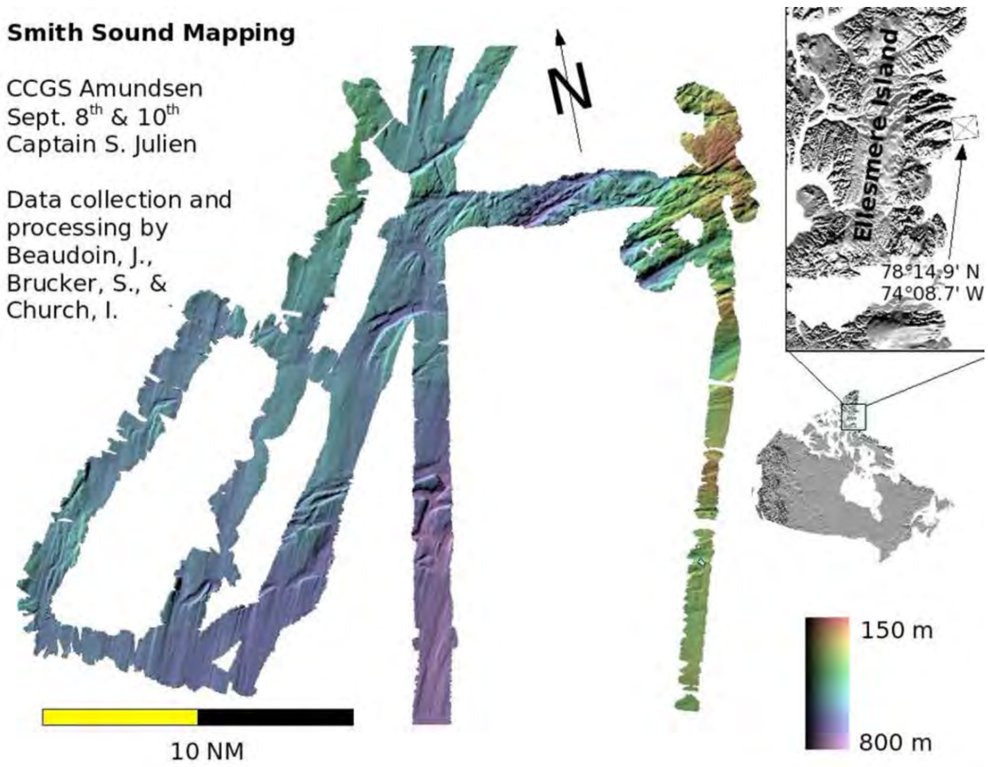


Figure 16.5. Bathymetry of Smith Sound.

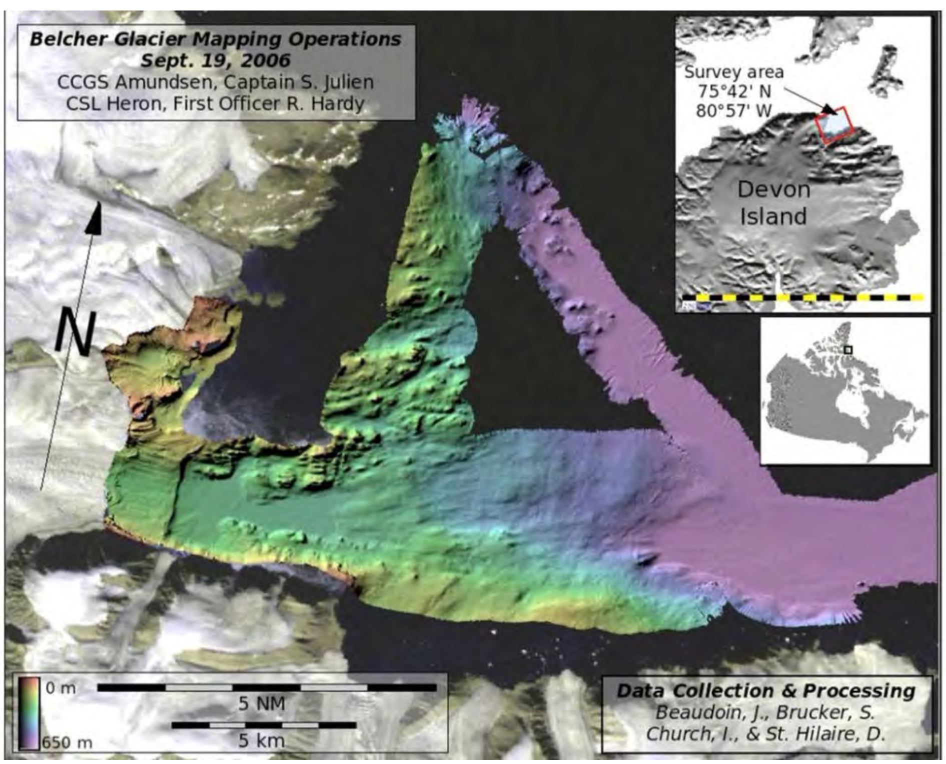


Figure 16.6. Bathymetry of Belcher Glacier.

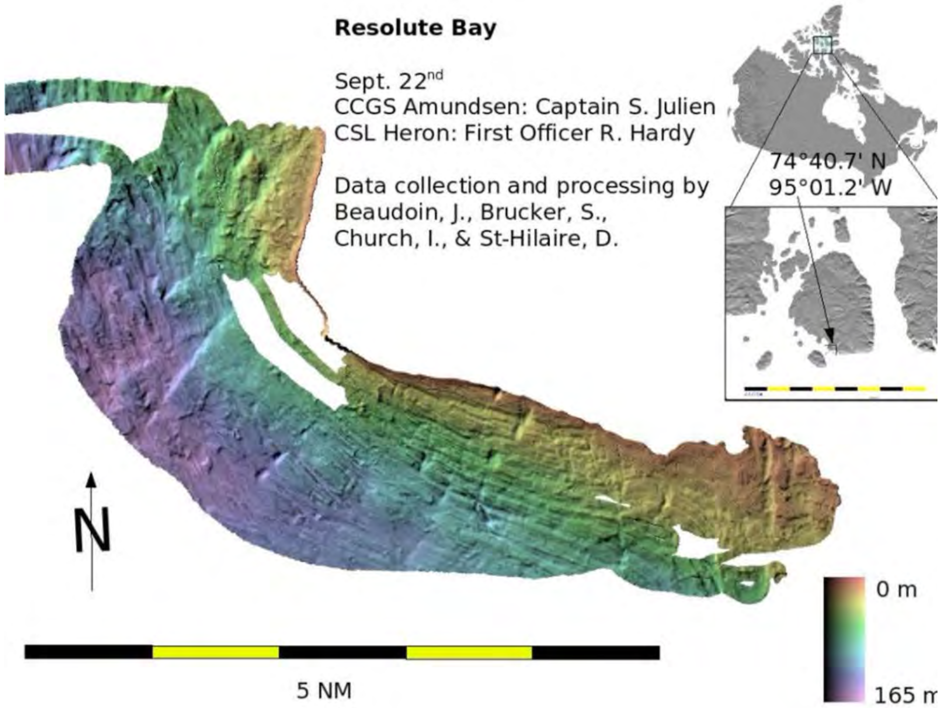


Figure 16.7. Bathymetry of Resolute Bay.

16.3.2 Leg 2a – 28 September to 29 October 2006 – Amundsen Gulf, Beaufort Sea and Canadian Arctic Archipelago

More work was completed in Leg 2a than the proposed new shipping route into Kugluktuk, which was the direct objective of Project 1.6. Aside from the specific survey sites the *Amundsen* mapping instrumentation was constantly running during transit.

De Salis Bay

The 12-hour dedicated survey and mapping operations conducted in De Salis Bay was successful given the limited time allotted and also contributed to the navigation component since the area was previously un-surveyed.

In De Salis Bay, the CSL *Heron* focused its survey in the inner bay, largely inside the prominent spit that built westward from the eastern shoreline. The survey design consisted of an initial stage in which single lines were run across the bay to provide a preliminary view of seabed bathymetry. This was followed by a more systematic survey of two areas where interesting features were identified. One area was located along the southeastern side of the inner bay, where a bench at approximately 10 m water depth was thought to represent the Holocene sea-level lowstand (Figure 16.8).

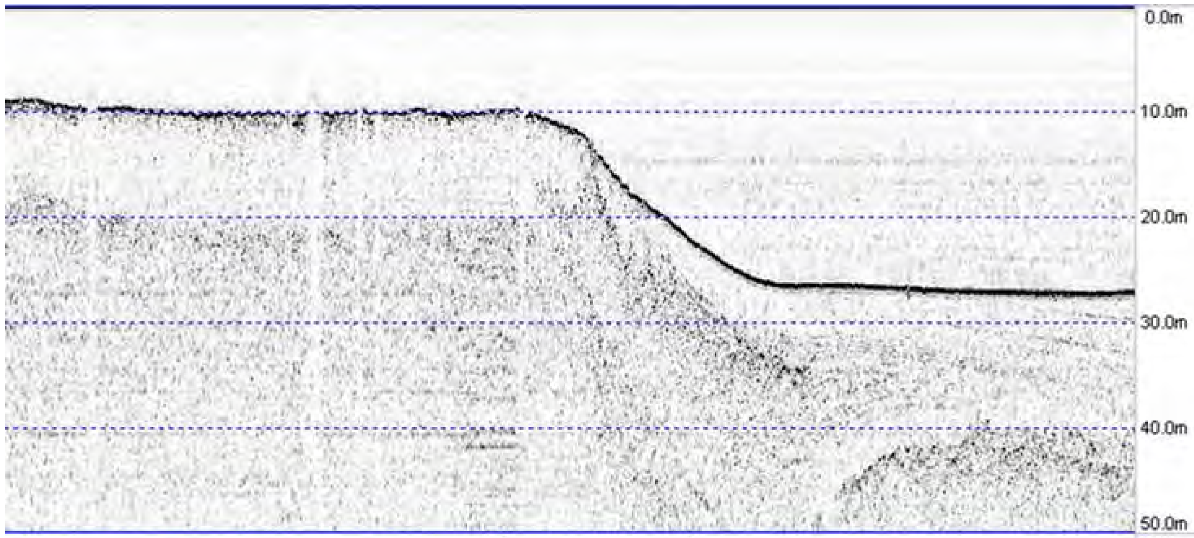


Figure 16.8. Sub-bottom (3.5 kHz) record from *Heron* survey in inner De Salis Bay, showing 10 m terrace in the northeastern part of the bay. Note unconformity on draped glaciomarine sediments, buried slump deposits, and the modern seabed truncating postglacial sediments in the basin.

The surface of the bench was ice scoured and appeared to be acoustically impenetrable, although faint stratification was visible in places (Figure 16.9). The other area of interest was located towards the head of the bay and consisted of a northwest-southeast oriented trench with a central depression over 60 m deep (Figure 16.10). The trench appeared to follow the topographic grain of the adjacent land where Windrum Lagoon and De Salis River valley were prominent features. The sub-bottom profile along the trench floor showed a thick acoustically-stratified unit (20 m), which was interpreted to represent glaciomarine sedimentation during final deglaciation of the bay ca. 10,000 years ago. The profiles also displayed normal faulting throughout the entire glaciomarine sequence in the central depression of the trench (Figure 16.10 right).

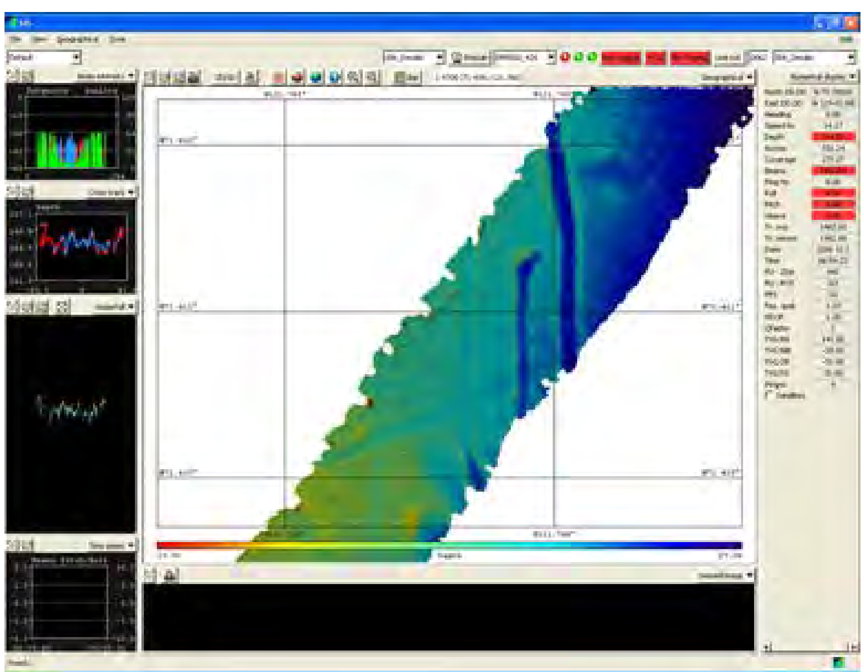


Figure 16.9. Ice-scour on the floor of inner De Salis Bay.

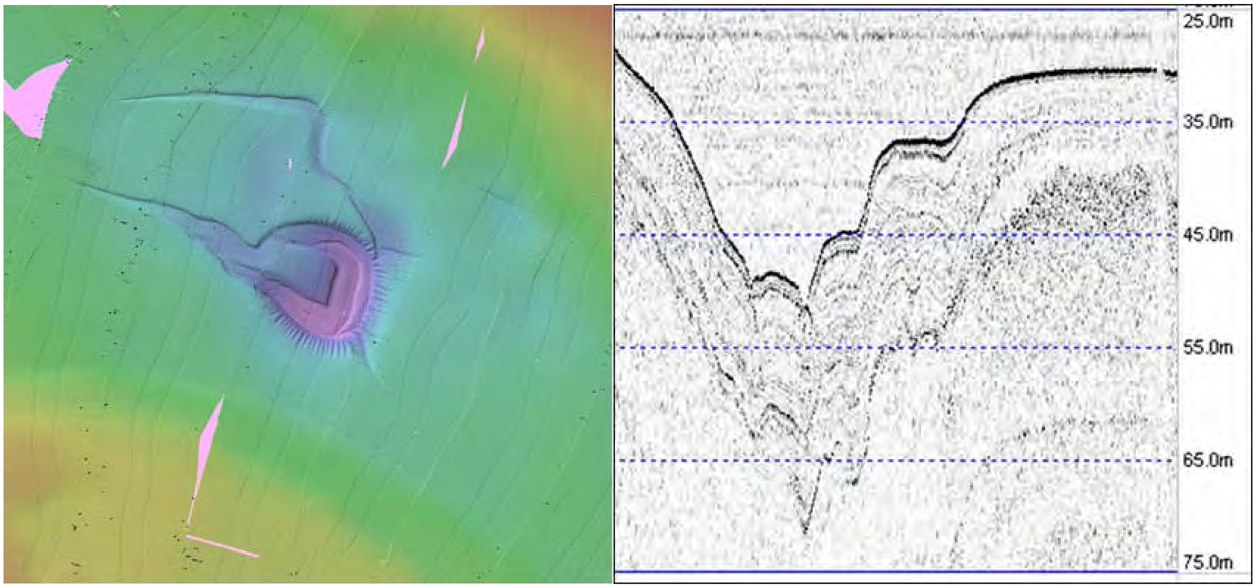


Figure 16.10. Left: Bathymetry of the depression in the floor of inner De Salis Bay. Right: Sub-bottom (3.5 kHz) profile through kettle depression in the floor of inner De Salis Bay, showing draped and faulted glaciomarine deposits.

These faults were coincident with terrace scarps observed discontinuously along the sides of the depression. Together, these data suggest that glaciomarine sediments were laid down on top of a stranded glacial ice block, which melted over time causing subsidence and faulting of the overlying sediment cover. The feature therefore may be best described as a large submarine kettle hole, equivalent to the deep, round kettle lakes on the surrounding landscape of De Salis Bay. Postglacial sedimentation and current action have subtly remodelled the seabed expression of the submarine kettle.

The *Amundsen* surveyed a large area (about 100 km^2) in the outer bay and approaches on a sparse grid with line spacing of approximately 0.25 Nm (Figure 16.2). This was supplemented by three north-south check lines, three east-west check lines, and five north-south lines extending 5 km south of the main survey grid. Additional data were collected on the morning approach and evening departure tracks. The seabed in the survey area shoaled gradually from the southeast to the northwest, with a deeper depression penetrating northward to the vicinity of the spit. Depths also decreased to the east of this depression. Over much of this area, the bottom was interpreted as compact sand, interrupted in places by patches of till outcrop. Whereas extensive ice scour was found in the southeast, scour depressions were much less common in shallower water. The sub-bottom data showed substantial sand thickness and total volume, consistent with the large sand sources in cliffs to the southwest and very extensive sand and gravel beaches surrounding the bay (Figure 16.11).

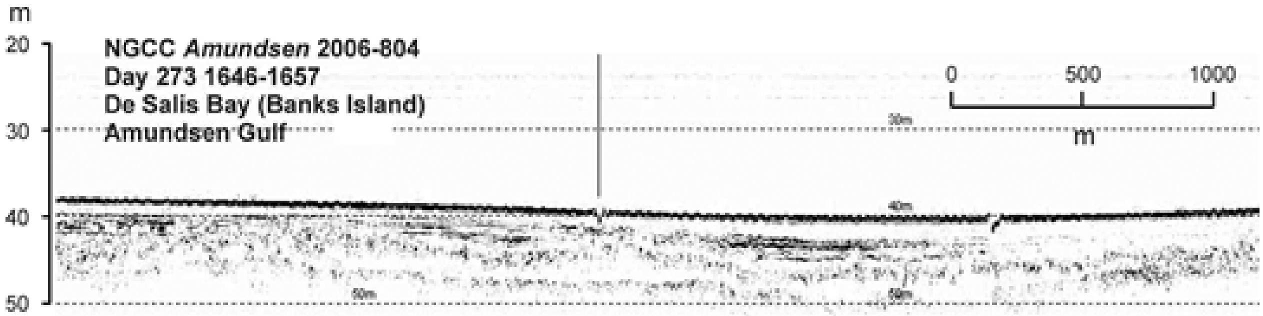


Figure 16.11. Sub-bottom (3.5 kHz) profile from *Amundsen* survey in outer De Salis Bay, showing underlying ice-contact deposits and thick surface unit of sand. Note occasional ice-scour furrows with lateral ridges (one marked by vertical line).

Helicopter C-GCHU (CG358) with pilot M. Fiset flew from the *Amundsen* flight deck and completed an aerial survey and photo reconnaissance of the bay (Figure 16.12). From the eroding cliffs in the southwest, the flight path proceeded clockwise around the bay, following ~24 km of sand and gravel barrier beach along the western and northern shore, a ~5 km section of low bluffs in the northeast corner, and the ~5 km long tombolo and spit extending from the eastern shore toward the middle of the bay. Landings were made at two sites, one on the beach fronting the Sandhill River and the other at a site on the outer part of the spit-tombolo structure extending west into the bay from the eastern shore. Sand samples were collected at both sites (2006804-0017, -0018, -0020) and a sample of peat was collected on the spit (see sample listing in Table 16.2).

Figure 16.12. Helicopter C-GCHU on the beach at Sandhill River, showing patchy dunes cut by sand-gravel washover channels and recent notching of dunes and washover deposits.

Table 16.2. Shore samples from De Salis Bay, Banks Island, NWT.

Station	JD	Date	Time (UTC)	Latitude N	Longitude W	Depth (m)	Description
AMUN 2006804-0017	273	2006-09-30	2012	71.437807	121.796652	-2	brown silty fine sand with rootlets
AMUN 2006804-0018	273	2006-09-30	2018	71.437466	121.796758	-1	grey-brown medium sand
AMUN 2006804-0019	273	2006-09-30	2055	71.408110	121.590337	-1	black compact peat with silt and sand
AMUN 2006804-0020	273	2006-09-30	2105	71.407308	121.592279	-1	grey-brown medium sand

At the Sandhill River site, extensive sandy-gravel outwash deposits extended landward toward the river. Sand (much of it evidently blown seaward from the river channel and floodplain) formed small dunes interspersed between the washover channels and elongated normal to the shore. There was no evidence of river breakout channels or overflow seaward across the beach, indicating that most of the river sediment load continues to be deposited in Windrum Lagoon.

Figure 16.13. Beach-cut section through shore-normal dune between washover channels at Sandhill River beach.

The tombolo and spit structure on the eastern side of De Salis Bay was very large, extending about 5 km westward into the Bay. The northern arm of the tombolo consisted of a prograded sequence of beach ridges (Figure 16.14) similar to the prograded sequence across the north end of Windrum Lagoon. The southern arm of the tombolo appeared to be a transgressive feature with extensive washover and landward migration. This was also the main pathway for westward longshore sediment transport from cliff to the southeast.

Figure 16.14. Large shore-normal frost cracks in prograded beach-ridge sequence in northern arm of tombolo on the east side of De Salis Bay.

Over time, this longshore transport had constructed a large recurved spit structure at the outer end (Figure 16.15). The ridges on the spit were all quite low (<3 m elevation), and most of the area between ridges was filled with sand. A few deeper troughs had accumulated water and organic material, allowing formation of very thin peat. The second landing was made at one such site (Figure 16.16), where sample 0020 was obtained from a 5 cm unit of compact black peat underlying 25 cm of sand.

Figure 16.15. View east from outer end of De Salis Bay spit. Note double-armed tombolo in the distance.

Figure 16.16. View westward along spit, showing location of peat sample (station 20).

Sachs Harbour

The Sachs Harbour survey was only semi-successful. The first day saw the PC failure mentioned below which resulted in the loss of the EM 302 multibeam. After several hours of re-installing software etc., the *Heron* achieved enough data to satisfy the objectives of Project 1.2. The second day was limited to the collection of just 200 KHz singlebeam and keel mounted sidescan in a traditional “hydrographic survey” which were to satisfy both 1.2

and 1.6 bathymetry objectives. The survey would have been completed but the weather deteriorated and the *Heron* was recalled to the *Amundsen*, leaving the area ½ to ¾ complete.

NRCan Ocean Action Plan (OAP) / Slump Survey

The specifics on this project are presented in the Geology cruise report (Section 18 below). Weather did not allow us to get the full 4.5 days of mapping but with both *Amundsen* and *Heron* performing mapping operations a large portion of the work was completed. Again, weather limited the *Heron* operations as well as interfering with the quality of the *Amundsen* data. The Ocean Action Plan work consisted of two main blocks, the high priority box was completed and the 2nd box was started. A decision was made to move to the slump to wait for the weather to subside. The approximately 12-hour survey there turned out to be successful. Surveys are shown in Figure 16.17. Total survey time was 2 days 17 hours, transit between OAP survey and slump was 3 hours 40 min. This should leave approximately 40 hours of carry over time to go back to the OAP block 2 site and complete at the next opportunity.

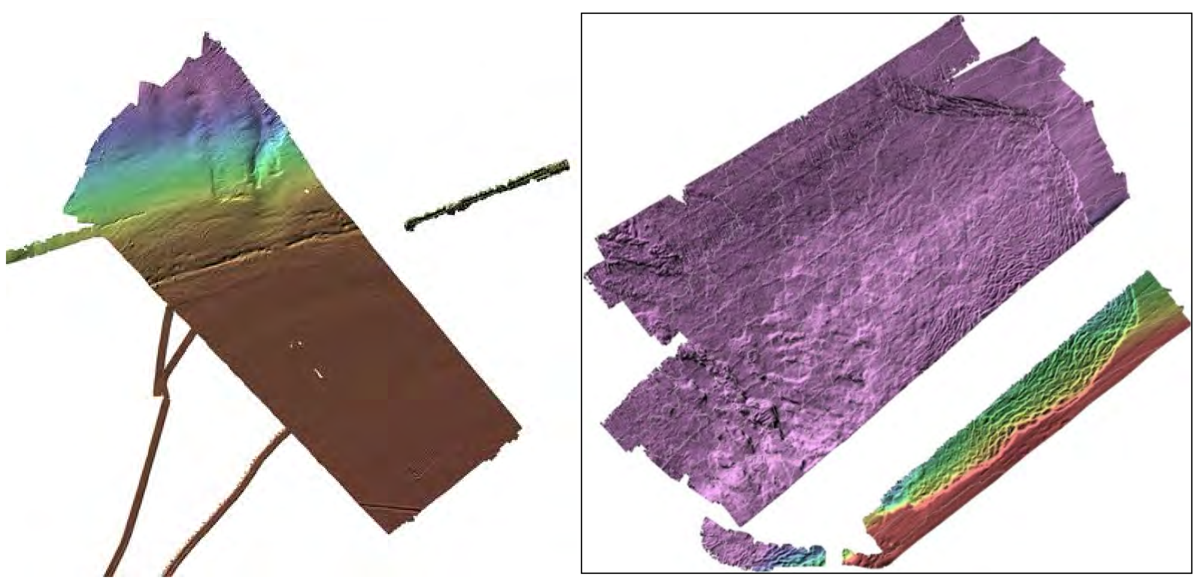


Figure 16.17. Left: Bathymetric map of OAP block P1. Right: Mapping of the slump (Gap in the data was collected during the CASES Leg 8 cruise in 2004).

Shipping lane alternative

The navigation component of Project 1.6 involved investigating new or alternative shipping routes into communities or through the passage. During the 2005 Expedition, a new route from Kugluktuk leading to the south of the islands in Coronation Gulf was started and eventually meeting up with the already surveyed route. Leg 1 saw dedicated time to run surveys lines on the eastern side of the route and during Leg 2, another transit was added to the proposed corridor. Hazardous areas have been identified on the western portion of the route in which dedicated *Heron* time will need to be planned to properly survey those locations and obtain the shallowest depth.

In the Kugluktuk area, the community constructed a breakwater in order to better facilitate improved barge operations, etc. Since this was not on the chart, it was important to be there for 6-12 hours, maybe during a crew change, to position and survey around the edges of this structure so the chart could be updated and a notice to mariners issued. This directly contributes to Project 1.6 navigation objectives.

General transit results

The transit east from Kugluktuk saw some new successes. For the second time, the ship transited through Bellot Strait (1st time was in 2004) and for the first time collected complete EM300 data through the Strait revealing its bathymetric structure. Just a few more passages through there with favorable conditions will give complete coverage of the Strait.

Another success was an ice-free transit through Fury and Hecla Strait. This was also the first time the *Amundsen* traveled through here on route to the first sampling in Foxe Basin. The EM300/K320R revealed interesting topography and sub-bottom that should be built upon in subsequent ice free years during transits East/West.

16.3.3 Leg 2b – 29 October to 9 November 2006 – Labrador fjords

The Labrador mapping program was intense and quite successful. In each of the 3 fjords, there were successful *Heron* deployments and highly productive ship-based EM300 mapping. In Nachvak Fjord, there was little to no EM300 ship-based mapping left to be completed, but significant *Heron* work remains to be conducted in future years.

Nachvak Fjord

Nachvak Fjord, the most northern fjord system, is a 45 km-long glacial trough cut through the Torngat Mountains. The fjord is 2-4 km wide, increasing gradually eastward to Nachvak Bay, which opens to the Labrador Sea. Previous bathymetric and seismic surveys revealed a succession of basins, separated by shallow barriers (Bell and Josenhans 1997; Rogerson et al. 1986). The fjord threshold at the entrance to the fjord is very shallow with an average depth of <50 m and numerous bedrock-cored shoals.

Recent multibeam mapping by CCGS *Matthew* and CSL *Plover* provides substantial coverage of the outer basin of Nachvak Fjord (Figure 16.18), but only limited soundings are available for central and inner parts of the fjord, including the shallow barrier west of Ivitak Cove and the partially submerged moraine ridge across the mouth of Tasiuyak Arm (Bell and Josenhans 1997).

Mapping was conducted over a 24-hour period between 1 and 2 November. The *Heron* operations focused on mapping a 750 m-wide swath across the shallowest part of Ivitak sill (Figure 16.19) and almost complete coverage of Townley Basin, the outer third of Tasiuyak Arm and the narrow passage between the two (Figure 16.19).

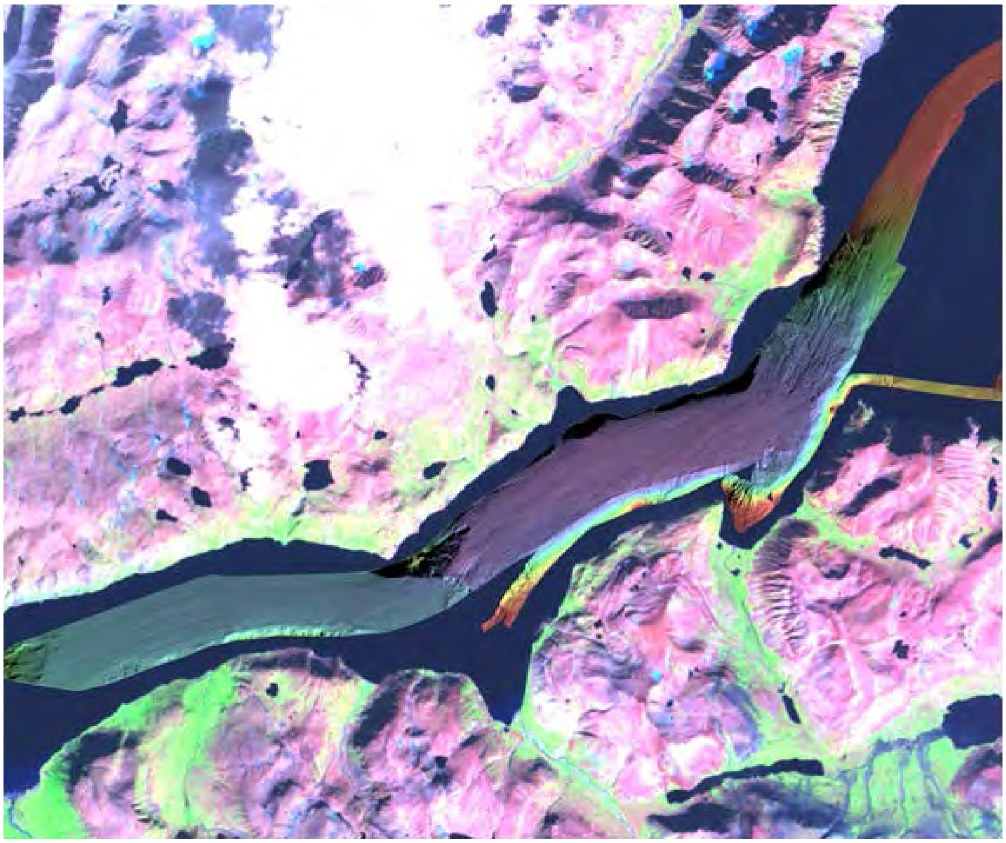


Figure 16.18. Combined bathymetric data from cruises of CCGS *Matthew* and *Amundsen* for Ivitin and Outer basins of Nachvak Fjord superimposed on a Landsat image of the region. The coverage narrows to the west in the vicinity of Ivitak sill. Red colours represent shallower water depths, blue areas are deeper.

The survey was completed in 11 hours and apart from an initial problem with one of the two GPS antennas, which affected heading establishment during the Ivitak sill survey, the mapping went smoothly. The *Amundsen* operations took place between sampling stations and successfully mapped much of Tallek Arm, Koktortoaluk Basin, Ivitin Basin and some complementary lines to the *Matthew* survey in Outer Basin. Outstanding areas for bathymetric mapping in Nachvak Fjord include the inner two-thirds of Tasiuyak Arm and the shallow margin of much of the basin that was exclusively mapped by the *Amundsen* or *Matthew* (Figure 16.18 and 15.19).

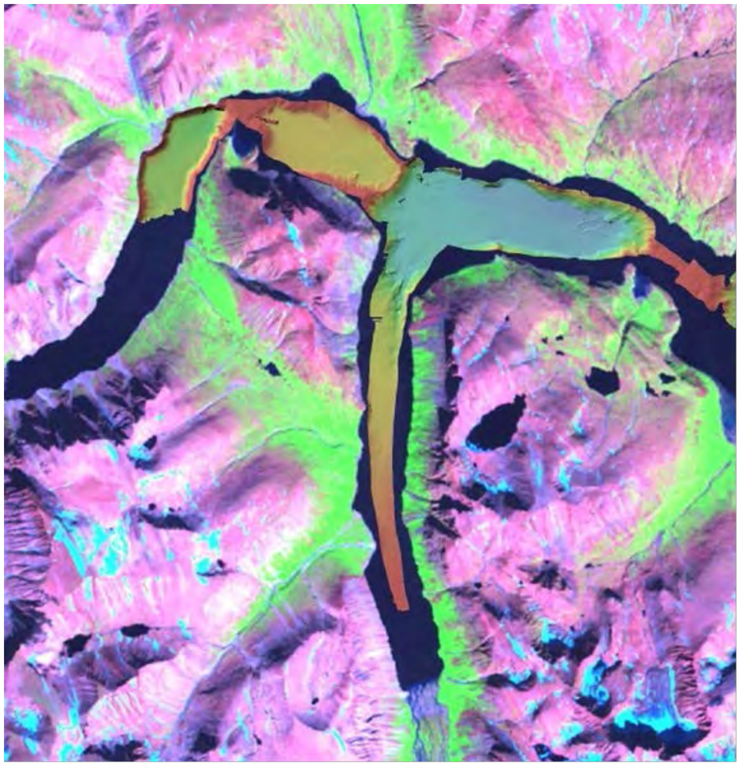


Figure 16.19. Combined bathymetric data for western Nachvak Fjord from CSL *Heron* and CCGS *Amundsen* superimposed on a Landsat image of the region. The *Heron* data is mostly from shallow water depths over Ivitak sill (eastern edge of image) and in basins to the west. Red colours represent shallower water depths, blue areas are deeper. Note the large slope failure visible in the bottom of Ivitin Basin, west of Ivitak sill.

Thick accumulations (5-10 m) of conformable acoustically stratified sedimentary units in the upper part of Tasiuyak Arm and Townley basins (Figure 16.20). These are interpreted to be proglacial and postglacial sediments ranging from interlaminated sand and mud with dropstones to laminated mud (Bell and Josenhans 1997).

Some notable features of the Nachvak survey are: (i) cross-fjord sills and moraines; (ii) slope failures along the steep fjord margins (Figure 16.19); and (iii) thick glacial and postglacial sedimentary sequences (Figure 16.20).

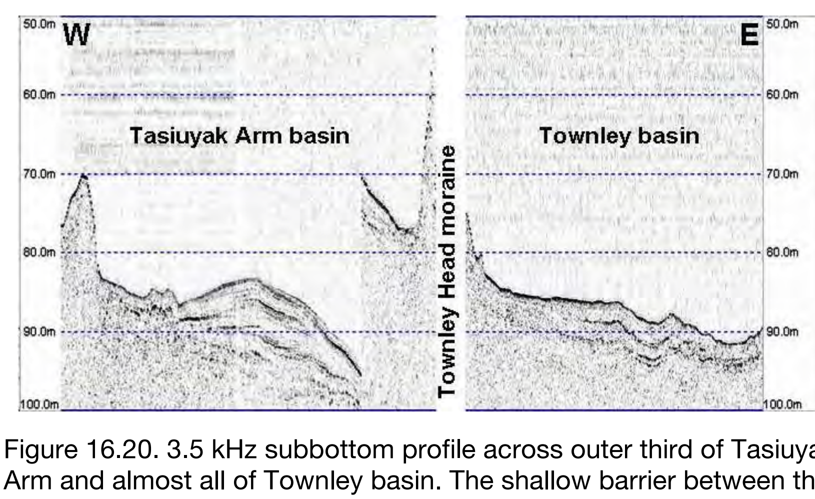


Figure 16.20. 3.5 kHz subbottom profile across outer third of Tasiuyak Arm and almost all of Townley basin. The shallow barrier between the two basins, which is interpreted to be a moraine, is not fully shown on the profile because of vertical scale changes.

Saglek Fjord

Saglek Fjord is a 50 km-long fjord at the southern edge of the Torngat Mountains. It narrows inland from a 13.5 km-wide embayment of the Labrador Sea to a 2 km-wide, steep-walled glacial trough at its head, called Ugjuktok Fjord. A tributary arm complex of the fjord enters from the north and includes West Arm, Southwest Arm (~0.75 km wide) and North Arm (~0.6 km wide). With the exception of Saglek Bay at the mouth of the fjord, where some recent multibeam mapping has been completed by the CCGS *Matthew*, very little is known about the bathymetry and marine geology of Saglek Fjord.

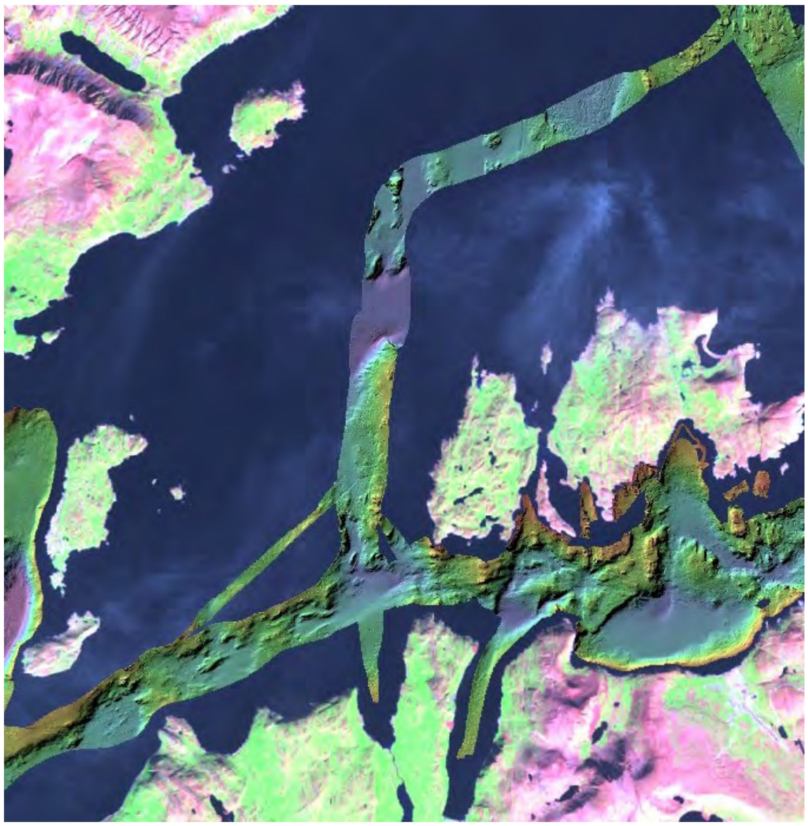


Figure 16.21. Combined bathymetric data for Saglek Bay from cruises of CCGS *Matthew*, CCGS *Amundsen* and CSL *Heron* superimposed on a Landsat image of the region. Saglek Anchorage is the wide embayment to the southeast where sampling of marine sediments for contaminants was undertaken during the *Amundsen* cruise and earlier this summer. Red colours represent shallower water depths, blue areas are deeper.

Mapping was conducted over a 28 hour period from ~0900 on 2 November to ~1300 on 3 November. The *Heron* operations focused exclusively on mapping Southwest Arm, parts of North and West arms, and Saglek Anchorage (Figure 16.21). The *Amundsen* mapped between the existing *Matthew* coverage in Saglek Bay and the head of the fjord and in St. John's Harbour, a small inlet off Saglek Bay (Figure 16.22). The *Amundsen* operations took place between oceanographic sampling stations. Outstanding areas of interest to be mapped in Saglek Fjord are inner North Arm, the shallow margins of outer West Arm, Ugjuktok Fjord, inlets along the south coast of Saglek Bay (e.g. Kyuktok Cove and Torr Bay) and inter-island channels of Saglek Bay.

Slope failures are visible along the steep southern margin of this embayment (Figure 16.21). Three prominent sills or moraines were mapped in the fiord system, one halfway along Ugjuktok Fiord, one just to the west of Pangertok Inlet, and one halfway along West Arm (Figure 16.22). The underwater edge of some fans appears to have been planed to a depth of 12 to 15 m. Whether this may be evidence for lower sea levels in inner Saglek Fjord needs to be addressed through more detailed data analysis.

Figure 16.22. Combined bathymetric data for inner Saglek Fjord from CCGS *Amundsen* and CSL *Heron* superimposed on a Landsat image of the region. Red colours represent shallower water depths, blue areas are deeper.

In the Southwest Arm of Saglek Fjord, the western side of the subbottom profile (Figure 16.23) shows the steep drop-off from the fjord-head delta at 20 m water depth to the deep water basin at 70 m (note change in scale in this part of profile). There appears to be more than 20 m of sediment thickness in this basin. Farther east, the basin terminates against the side of a bedrock rise with irregular relief. The small ridge at the base of the delta foreslope is likely a slump deposit.

Some notable features of the Saglek survey are: (i) cross-fjord sills and moraines (Figure 16.22); (ii) slope failures along the steep fiord margins (Figure 16.21 to 15.26); and (iii) the submarine extension of large alluvial fans along the steep walls of Southwest Arm

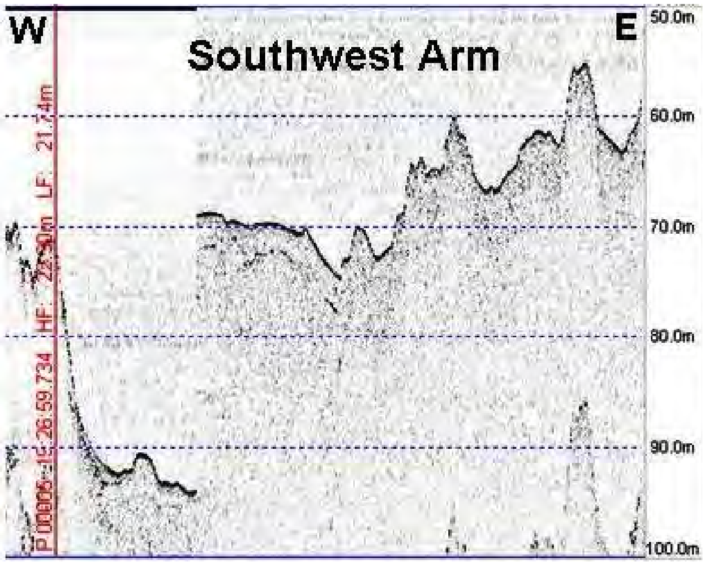


Figure 16.23. 3.5 kHz subbottom profile of Southwest Arm of Saglek Fjord from head to mid arm.

<u>Anaktalak Bay</u>

A total of 6.5 hours of *Heron* survey time was used to complete the seabed mapping and subbottom profiling of Edwards Cove and adjacent basin on 4 November (Figure 16.24). At the same time, the *Amundsen* completed survey lines of the outer part of the Edwards Cove basin in between oceanographic station sampling, and mapped the shipping lane during inward and outward transits of the bay.

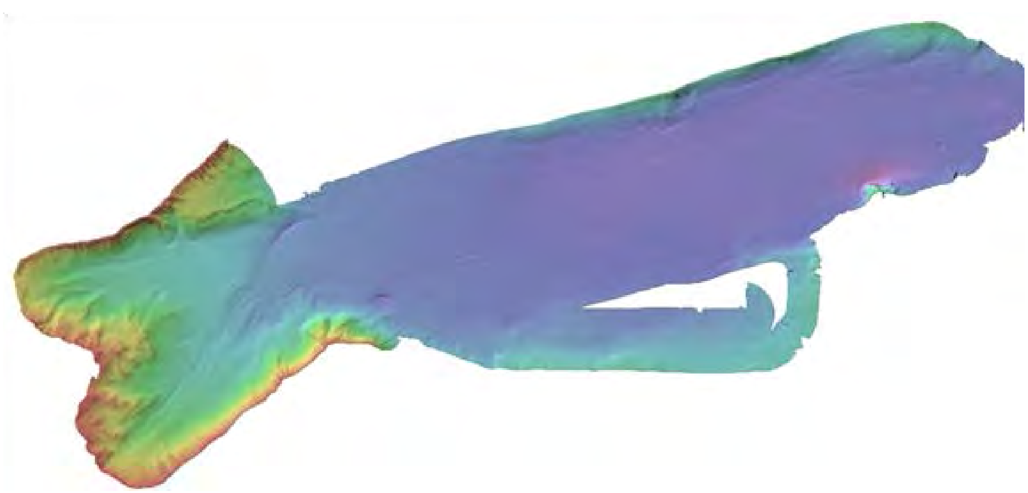
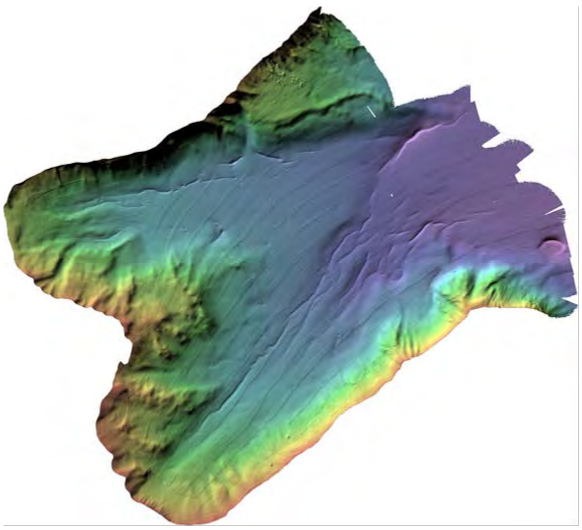


Figure 16.24. Combined bathymetric data for Edwards Cove and inner Anaktalak Bay from CCGS *Amundsen* and CSL *Heron*. Red colours represent shallower water depths, blue areas are deeper.

Submarine slope failures were mapped along shallow margins of Edwards Cove and discontinuous channel-like features were traced eastward from Edwards Cove to the western edge of the main basin. More detailed description of these features awaits further data processing. Two notable features of the Edwards Cove bathymetry are: (i) shallow depth, submarine slump failures, and (ii) discontinuous nonlinear channels descending from shallow water depths hear the head of the cove and extending into the deepest parts of the basin. Further analysis of these features is warranted to understand their origin and significance.



In the harbour of Voiseys Bay Nickel Mine in Antalak Fjord a transit in and out was conducted by the EM300 as well as a section covering the approaches to the mine docking site (Figure 16.25). A small harbour survey was completed by the *Heron*. Future years should see some mapping of the uncharted areas around the mine site.

Figure 16.25. *Heron* EM3002 bathymetric survey of the Harbour for Voisey Bay Nickel Mine.

16.4 Comments and recommendations (Leg 2)

Other than the weather downfalls, the mapping program was successful. Two coastal surveys were started under Projects 1.2 and 1.6 umbrellas in De Salis Bay and Sachs Harbour. De Salis Bay is a work in progress and an additional 12 hours is recommended to complete the work at Sachs Harbour. Staying with coastal navigation, a 6-12 hour period is also recommended in Kugluktuk to position and survey around the new breakwater construction in the harbour, possibly in parallel with a crew change.

The next time the ArcticNet program works in the Beaufort Sea area, the OAP block 2 mapping (and the 40 hours of NRCan time left) should be completed with a dual deployment of the *Heron* and *Amundsen*.

The newly proposed navigation route into Kugluktuk should be followed every time the ship transits west into the community and east out of the community and dedicated time should be planned to have the *Heron* deployed to survey the shallow, possibly hazardous, areas of this route and allow to shift it north or south.

The mapping component of the Labrador project should now focus of significant *Heron* deployments to complete the areas unattainable by the *Amundsen*.

From a logistical point of view, a dedicated *Heron* coxswain would be recommended, possibly a Coast Guard officer or a trained coxswain from the Canadian Hydrographic Service.

Heron: At the Leg 1/Leg 2 transition, a note was made that the *Heron* had electrical issues while onboard the *Amundsen* ("Shore Power"). At the beginning of Leg 2, the ship's electrician examined the situation and determined that the outlet was not sufficient to handle the electrical load required to run the heaters and computers. The problem was rectified within a couple of days by increasing the load size of the fuse. Other issues encountered on the *Heron* were a PC crash which was repaired by the onboard technicians. The primary GPS antenna on the integrated navigation system failed and was rectified by replacing the antenna with a different one from a land-based GPS system we had onboard for another experiment. The last issue was that the sub-bottom profiler on the *Heron* appeared to have failed but after several hours it "mysteriously" started to work again.

Amundsen: The *Amundsen* sonar instrumentation worked very well this year except for its normal weather/ice limitations. One issue that arose was that during a ship power failure, the PCs running the sonars were not connected to a UPS. The shipboard technicians contacted the ship's electrician and upon inspection found that all we needed to do was to get another power bar and plug it in to one of the UPS outlets located in the Acquisition Room.

There was an incident where something happened to all GPS instrumentation onboard the ship (bridges, and ours) and the POS/MV system did not properly recover. It is recommended that this instrument be serviced by the manufacturer before the 2007 field season.

17 Geology and paleontology – Legs 1 and 2b

ArcticNet Phase I – Project 1.6: The Opening NW Passage: Resources, Navigation, Sovereignty & Security. ArcticNet/Phase 1/Project 1.6

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Cruise participants Leg 1: Éric Potvin[1], Sophie Dupré[2], Lisa Delaney[3] and Trecia Schell[3]

Cruise participants Leg 2: Reinhard Pienitz[2], Robbie Bennett[4] and Kasia Zamelczyk-Juhnke[2]

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17.1 Introduction

17.1.1 Leg 1 – 22 August to 28 September 2006 – Baffin Bay and Canadian Arctic Archipelago

Box coring of the upper 50 cm of seafloor sediment was conducted to retrieve the recent sedimentary record and to reconstruct the paleoceanography of the study area (changing currents, perennial vs. seasonal sea ice conditions, etc.). This record will ultimately help to monitor and understand past, present and future climate change in the Canadian Arctic. By investigating paleoclimate variations over the past 100 – 1 000 yBP+, this record of hindcasting events will aid in groundtruthing the weather/climate forecasting models for the future. For longer records of change, the piston core was used to capture 15 000 yBP+ of climate change events.

The goal of the palynology research group was to develop a better knowledge of dinoflagellate cyst assemblages in surface sediment samples from Arctic in relation with sea-surface parameters such as sea-ice cover, salinity and temperatures of the coldest and warmest months. This information will be included in a database that already includes data from the northern North Atlantic, the Arctic and subarctic seas. Another objective was to look at the diversity and distribution of dinoflagellates in the Arctic based on genetic and morphological analyses.

17.1.2 Leg 2a – 28 September to 29 October 2006 – Amundsen Gulf, Beaufort Sea and Canadian Arctic Archipelago

The purpose of the geological sampling during Leg 2a was to address the objectives of the project entitled "Opening the Northwest Passage: Resources, Navigation, Sovereignty, & Security", which contains three main objective which are: 1) compile corridors of precise high resolution bathymetry and seabed geomorphology; 2) improve the mapping of the surficial geological environment of the Canadian Archipelago channels; 3) obtain sediment cores and grabs of the Holocene record for paleoceanographic analyses at optimal sites in the region.

Box core samples were collected to fulfill objectives 2 and 3. Plankton net samples were also collected on behalf of A. Rochon at the University du Québec à Rimouski to fulfill objective 3. Multibeam echosounder and sub-bottom profiler data collection was supported by external funds by NRCan in two main areas (see Section 15 above). The first area was located on the eastern edge of the Mackenzie Trough and was mapped as part of Canada's Ocean Action Plan (OAP). The second area was a large seabed failure or "slump" on the Mackenzie shelf break about 176 km northwest of Tuktoyaktuk. The slump was mapped as part of NRCan's Geoscience for Ocean Management (GOM) program.

17.1.3 Leg 2b – 29 October to 9 November 2006 – Labrador fjords

The objective of the geological sampling on the northern Labrador coast during Leg 2b was to address Inuit concerns regarding the ecological integrity of three marine fjord environments in by providing a better understanding of the effects of climate change and contaminant inputs from recent human activities including mining and shipping.

This research will investigate the impacts of climate change and environmental stresses on three coastal fjord ecosystems in northern Labrador, in the eastern Canadian Subarctic. Using the microfossil (mainly remains of siliceous diatoms) record preserved in sedimentary deposits, the palaeoceanographic study within this project will aim at providing detailed information on the background (baseline) environmental conditions that prevailed prior to the beginning of military, mining and shipping activities within Saglek and Anaktalak fjords that have been subjected to different degrees and types of environmental pollution. This information on baseline conditions will serve as a reference against which we will assess ecological and environmental disturbances brought about by human activities. The addition of a third "pristine" fjord ecosystem from northern Labrador (Nachvak Fjord) will act as a control or reference site for the assessment and understanding of the effects of future climatic change in a region that seems to have experienced climate change at a slower rate than in other parts of the Canadian Arctic (Pienitz et al., ACIA Report 2004; Smol et al., 2005). This third fjord ecosystem, located adjacent to the recently established Torngat Mountains National Park Reserve, will therefore also provide the basic knowledge necessary for integrated regional impact studies (IRIS) within ArcticNet, as well as for new marine monitoring initiatives developed by Parks Canada (Parks Canada, 2005).

17.2 Methodology

17.2.1 Leg 1 – 22 August to 28 September 2006 – Baffin Bay and Canadian Arctic Archipelago

Several proxies of climate change were investigated such as palynology, dinocysts, foraminifera, in addition to lithology, grain size, paleomagnetism, total carbon, ^{14}C age dating and ^{18}O. The cores will be archived in the national collection at BIO-GSC, Atlantic; where they will be MST'ed, split, photographed, described, X-rayed and then subsampled from the working half for further analyses.

Site selection for coring began with seafloor mapping and subsurface lithology profiling to determine that the sampling sites selected contained soft sediments, such as mud, and that the sediments were preferably not disturbed by iceberg scouring or gas venting (Figure 17.1). Box cores were obtained at the sites listed in Table 17.1. From each box core, one push core was taken and measured on board to get an approximate length (

Table 17.2). At each box core location, surface sediment samples were also collected to develop the reference database for modern dinoflagellate cysts and foraminiferal populations in the study area. Phytoplankton samples from photic zone (diatom net 50 µm mesh) were also collected at each boxcore site to document dinoflagellates (motile and cyst stage) population in the water column and for genetic analysis (Table 17.3). Five plankton nets were also taken for surface foraminiferal analysis for GEOTOP/UQAM (Table 17.3). All samples were stored at 4°C with the only exception of samples for genetic analysis which were stored at -80°C. The push cores were stored upright.

Figure 17.1. Box core used onboard the Amundsen in 2006 (Photo: Keith Lévesque).

All samples remained on-board the NGCC *Amundsen* in cold storage until demobilization in Quebec City in November 2006, when they were transported to their designation. The push cores were sent to Halifax-Dartmouth to be subsampled and archived with the National Core Collection Laboratory, Geological Survey of Canada at the Bedford Institute of Oceanography. All samples or subsamples taken for dinoflagellate analysis were sent to UQAR while samples or subsamples of sediments for foraminifera were sent to Dalhousie University and surface water foraminifera to UQAM-GEOTOP.

Table 17.1. Station locations where box cores were taken during Leg 1with information and sample numbers (bottom sediment).

Site	Local area	Date in 2006	Time (Start; End)	Dep th (m)	Latitude N	Longitude W	Samp le type	Samples	Samples # (GSC)
Oliver Sound	Oliver Sound	05-09	01:15;01:33	373	72°15.336	077°47.081	Box	Push core, Surface Dinos& Forams, Benthic organisms	2006-804-001BC
132	Kane Basin	09-09	13:21;13:29	250	78°59.992	072°17.082	Box	Push core, Surface Dinos& Forams	2006-804-002BC
127	Smith Sound/E of Cape Isabella	10-09	22:56;23:25	644	78°08.135	074°50.558	Box	Surface Dinos & Forams	2006-804-003BC
131	Smith Sound/W of Cape Alexander	12-09	02:23;02:34	258	78°19.076	073°12.422	Box	No recovery (3 big rocks…)	2006-804-004BC
119	NOW / E of the North of Clarence Head	13-09	23:12;23:32	527	77°21.026	076°04.896	Box	Push core, Surface Dinos & Forams	2006-804-005BC
118 - 117	NOW / E of the North of Clarence Head	14-09	19:37;19:53	452	77°19.620	076°58.147	Box	Push core, Surface Dinos & Forams	2006-804-006BC
115	Entrance of NOW / W of Cape Atholl	16-09	22:10;22:38	666	76°19.246	071°21.570	Box	Push core Surface Dinos& Forams	2006-804-007BC
108	Entrance of NOW / Betw. Cape Atholl and Clarence Head	17-09	16:11;16:28	448	76° 15.704	074° 37.012	Box	Push core Surface Dinos& Forams	2006-804-008BC
101	Entrance of NOW / E of Clarence Head	18-09	22:00;22:12	311	76° 24.687	077° 17.735	Box	Push core Surface Dinos& Forams	2006-804-009BC
301	Lancaster Sound / N of Borden Peninsula (Baffin Island)	20-09	23:18;23:43	684	74° 09.449	083° 25.326	Box	Push core Surface Dinos& Forams	2006-804-010BC
303	Lancaster Sound-Barrow Strait / N of Cape Crawford and S of Devon Island	21-09	15:05;15:16	229	74° 13.961	089° 39.370	Box	Push core Surface Dinos& Forams	2006-804-011BC
307	Intersection	24-09	01:56;02:04	172	74° 24.001	100° 34.991	Box	Push core Surface	2006-804-

Site	Local area	Date in 2006	Time (Start; End)	Depth (m)	Latitude N	Longitude W	Sample type	Samples	Samples # (GSC)
	Viscount-Melville Sound / M'Clintock Channel							Dinos& Forams	012BC
310	M'Clintock Channel	25-09	19:22;19:32	214	71° 28.922	102° 14.090	Box	Push core Surface Dinos& Forams	2006-804-013BC
312	Victoria Strait/ Queen Maud Gulf	26-09	14:21;14:27	63	69° 09.513	100° 42.157	Box	2 Push cores, 2 Surface Dinos& Forams	2006-804-014BC
314	Dease Strait/ Cambridge Bay	27-09	03:21;03:28	108	68° 59.897	106° 36.199	Box	Push cores, Surface Dinos& Forams	2006-804-015BC

Table 17.2. Push core lengths.

Samples # (GSC)	# of push cores	Measured length (cm)
2006-804-001BC	1	0-35.5
2006-804-002BC	1	0-15.0
2006-804-003BC	1	Not taken
2006-804-004BC	1	No recovery
2006-804-005BC	1	0-31.7
2006-804-006BC	1	0-20.5
2006-804-007BC	1	0-39.0
2006-804-008BC	1	0-34.7
2006-804-009BC	1	0-31.2
2006-804-010BC	1	0-35.2
2006-804-011BC	1	0-19.0
2006-804-012BC	1	0-22.0
2006-804-013BC	2	0-32.2, 0-29.5
2006-804-014BC	2	0-34.0, 0-32.0
2006-804-015BC	2	0-41.5, 0-40.0

Table 17.3. Station locations of plankton nets (50 meters surface water) during Leg 1 with information and sample numbers.

Site	Local area	Date in 2006	Time (Start;End)	Depth (m)	Latitude N	Longitude W	Sample type	Samples	Sample name
Oliver Sound	Oliver Sound	05-09	00:30;00:33 00:36;00:41 00:43;00:46	371	72° 15.297	077°47.166	Plankton net	Dinos (Genetic) Dinos (Cyst) Dinos (Identif.)	OS OS OS
132	Kane Basin	09-09	12:27;12:34 12:36;12:41 12:44;12:49 13:05;13:09	239 240 239 259	78° 59.902 78° 59.885 78° 59.894 78° 59.912	072°15.160 072°15.299 072°15.267 072°17.111	Plankton net	Dinos (Genetic) Dinos (Identif.) Dinos (Cyst) Forams (GEOTOP)	132 132 132 132
127	Smith Sound/E of Cape Isabella	10-09	22:09;22:19 22:17;22:23 22:26;22:34	646 649 650	78° 08.381 78° 08.322 78° 08.261	074°49.417 074°49.434 074°49.521	Plankton net	Dinos (Genetic) Dinos (Identif.) Dinos (Cyst)	127a/b 127 127
131	Smith Sound/W of Cape Alexander	12-09	00:43;00:49 00:52;00:59 01:56;02:00 02:04;02:09	310 298 309 302	78° 19.306 78° 19.328 78° 19.108 78° 19.074	073°14.625 073°14.725 073°13.031 073°13.081	Plankton net	Dinos (Genetic) Dinos (Identif.) Dinos (Cyst) Forams (GEOTOP)	131a/131b 131/131b 131 131

Site	Local area	Date in 2006	Time (Start;End)	Depth (m)	Latitude N	Longitude W	Sample type	Samples	Sample name
126	NOW / W of Cape Parry	12-09	23:02;23:07 23:10;23:15 23:17;23:23 23:25;23:30	317 317 316 314	77° 21.843 77° 21.844 77° 21.840 77° 21.835	073° 25.324 073° 25.322 073° 25.530 073° 25.755	Plankton net	Dinos (Genetic) Dinos (Identif.) Dinos (Cyst) Forams (GEOTOP)	126a/126b 126 126 126
122	NOW / W of Cape Parry	13-09	12:33;12:38 12:43;12:48 12:51;12:56	648 648 649	77° 20.173 77° 20.092 77° 20.091	075° 00.642 075° 00.614 075° 00.633	Plankton net	Dinos (Genetic) Dinos (Identif.) Dinos (Cyst)	122a/122b 122 122
119	NOW / E of the North of Clarence Head	13-09	21:38;21:43 22:47;22:53 22:56;23:02	518 530 529	77° 18.210 77° 21.031 77° 21.032	076° 03.561 076° 03.678 076° 04.349	Plankton net	Dinos (Cyst) Dinos (Genetic) Dinos (Identif.)	119 119a/119b 119
118	NOW / E of the North of Clarence Head	14-09	18:44;18:49 19:03;19:12 19:12;19:19	405 448 444	77° 20.553 77° 19.791 77° 19.949	076° 58.068 076° 58.298 076° 57.815	Plankton net	Dinos (Cyst) Dinos (Genetic) Dinos (Identif.)	118 118a/118b 118
115	Entrance of NOW/ W of Cape Atholl	16-09	14:28;14:33 14:36;14:41 14:43;14:48 14:50;14:56	619 618 618 617	76° 15.329 76° 15.347 76° 15.366 76° 15.392	071° 27.054 071° 26.998 071° 26.972 071° 26.952	Plankton net	Dinos (Genetic) Dinos (Identif.) Dinos (Cyst) Forams (GEOTOP)	115a/115b 115 115 115
108	Entrance of NOW/ Betw. Cape Atholl & Clarence H.	17-09	15:39;15:45 15:49;15:53 15:55;16:00	447 447 447	76° 15.809 76° 15.753 76° 15.735	074° 37.325 074° 37.155 074° 37.160	Plankton net	Dinos (Genetic) Dinos (Identif.) Dinos (Cyst)	108a/108b 108 108
101	Entrance of NOW /E of Clarence Head	18-09	21:22;21:27 21:30;21:35 21:37;21:42 21:44;21:51	330 314 314 313	76° 24.412 76° 24.481 76° 24.531 76° 24.595	077° 17.463 077° 17.569 077° 17.623 077° 17.692	Plankton net	Dinos (Genetic) Dinos (Identif.) Dinos (Cyst) Forams (GEOTOP)	101a/101b 101 101 101
301	Lancaster Sound/N of Borden Peninsula (Baffin Island)	20-09	22:29;22:29 22:33;22:39 22:42;22:50 22:53;23:01	679 679 680 681	74° 09.015 74° 09.041 74° 09.113 74° 09.201	083° 24.369 083° 24.432 083° 24.584 083° 24.806	Plankton net	Dinos (Genetic) Dinos (Identif.) Dinos (Cyst)	301a/301b 301 301
303	ILancaster Snd & Barrow Str./ N of Cape Crawford and S of Devon Isl.	21-09	14:29;14:36 14:38;14:45 14:47; 14:54	230 229 229	74° 13.939 74° 13.943 74° 13.944	089° 39.530 089° 39.488 089° 39.449	Plankton net	Dinos (Genetic) Dinos (Identif.) Dinos (Cyst)	303a/303b 303 303
307	Viscount-Melville Sound / M'Clintock Channel	24-09	01:21;01:27 01:29;01:38 01:41;01:47	171 166 168	74° 24.042	100°34.998	Plankton net	Dinos (Genetic) Dinos(Identif.) Dinos (Cyst)	307(1) 307(2) 307(3) *2006-804-012*
310	M'Clintock Channel	25-09	18:54;19:02 19:02;19:09 19:22;19:32	206 206 206	71° 28.545 71° 28.589 71° 28.922	102° 14.388 102° 14.090 102° 15.219	Plankton net	Dinos (Genetic) Dinos (Identif.) Dinos (Cyst)	310(1) 310(2) 310(3) *2006-804-013*
312	Victoria Strait/ Queen Maud Gulf	26-09	13:54;13:59 14:03;14:08 14:10;14:16	65 64 65	69° 09.483 69° 09.495 69° 09.512	100° 42.631 100° 42.605 100° 42.467	Plankton net	Dinos (Genetic) Dinos (Identif.) Dinos (Cyst)	312(1) 312(2) 312(3) *2006-804-014*
314	Dease Strait/ Cambridge Bay	27-09	02:46;02:52 02:55;03:01 03:04;03:11	111 111 111	68° 59.914 68° 59.873 68° 59.870	106° 35.455 106° 35.479 106° 35.578	Plankton net	Dinos (Genetic) Dinos (Identif.) Dinos (Cyst)	314(1) 314(2) 314(3) *2006-804-015*

17.2.2 Leg 2a – 28 September to 29 October 2006 – Amundsen Gulf, Beaufort Sea and Canadian Arctic Archipelago

Box cores

The box corer (50cm x 50cm x 80cm; Figure 17.1) was used and in most instances, one push core (99.2 mm ID) was taken from each box core sample. Two push cores were taken at some core sites if there was sufficient material and if the sediment sample proved interesting. Surface sediment samples at each box core location were also collected in order to develop reference databases of modern dinoflagellate cysts, and foraminifera populations in the study area. The surface samples will be stored at Dalhousie University and at the Institut des sciences de la mer de Rimouski (ISMER). The box corer used was only one year old and was in good condition. Some damage was sustained to the stainless steel box during Leg 1 due to the corer contacting bedrock. This damage was mostly cosmetic and did not significantly affect the performance of the corer.

The multibeam echosounder and sub-bottom profiler were checked before each box core to ensure that the seabed was suitable for deployment of the corer (i.e. sediment bottom and not bedrock). The locations of the box cores collected during Leg 2 are shown in Table 17.4 and Figure 17.2.

Table 17.4. Station locations where box cores were taken during Leg 2 with information and sample numbers (bottom sediment).

Julian Date	Time UTC	Station No.	Core Number	Latitude N	Longitude W	Depth (m)	Sample Type	Length (cm)	Apparent Penetration
273	8:34	403	2006804-016 BC	70° 05.985	120° 03.254	410	Push core	34	
"	"	"	"	"	"	"	Surface (Forams)	0-1	
"	"	"	"	"	"	"	Surface (Dinos)x2	0-0.5	
279	8:42	420	2006804-021 BC	71° 03.338	128° 31.034	34	Push core	23	
"	"	"	"	"	"	"	Surface (Forams)	0-1	
"	"	"	"	"	"	"	Surface (Dinos)x2	0-0.5	
280	5:06	421	2006804-022 BC	71° 28.310	133° 58.322	1218	Push core	38	
"	"	"	"	"	"	"	Surface (Forams)	0-1	
"	"	"	"	"	"	"	Surface (Dinos)x2	0-0.5	
283	2:59	436	2006804-023 BC	70° 20.390	126° 21.580	254	Push core	40	
"	"	"	"	"	"	"	Surface (Forams)	0-1	
"	"	"	"	"	"	"	Surface (Dinos)x2	0-0.5	
290	4:25	434	2006804-024 BC	70° 12.360	133° 38.760	55	Push core	37	
"	"	"	"	"	"	"	Surface (Forams)	0-1	
"	"	"	"	"	"	"	Surface (Dinos)x2	0-0.5	
296	11:09	322	2006804-025 BC	70° 24.138	091° 04.642	210	Push core	30	
"	"	"		"	"	"	Surface (Forams)	0-1	
"	"	"		"	"	"	Surface (Dinos)x2	0-0.5	
298	5:09	333	2006804-026 BC	68° 45.480	081° 00.280	34	Push core	bulk	minimal
"	"	"	"	"	"	"	Surface (Forams)	0-1	
"	"	"	"	"	"	"	Surface (Dinos)x2	0-0.5	
298	12:10	334	2006804-027 BC	67° 52.710	080° 48.080	86	Push core	18	

Julian Date	Time UTC	Station No.	Core Number	Latitude N	Longitude W	Depth (m)	Sample Type	Length (cm)	Apparent Penetration
"	"	"	"	"	"	"	Surface (Forams)	0-1	
"	"	"	"	"	"	"	Surface (Dinos)x2	0-0.5	
298	4:30	338	2006804-028 BC A	66° 08.060	081° 20.420	135	Push core	28	
"	"	"	2006804-028 BC B	"	"	"	"	31	
"	"	"	"	"	"	"	Surface (Forams)	0-1	
"	"	"	"	"	"	"	Surface (Dinos)x2	0-0.5	
299	16:48	346	2006804-029 BC	65° 06.920	079° 20.920	83	Push core	bulk	minimal
"	"	"	"	"	"	"	Surface (Forams)	0-1	
"	"	"	"	"	"	"	Surface (Dinos)x2	0-0.5	
300	5:58	350	2006804-030 BC A	64° 30.810	080° 32.340	386	Push core	37	
"	"	"	2006804-030 BC B	"	"	"	"	36	
"	"	"	"	"	"	"	Surface (Forams)	0-1	
"	"	"	"	"	"	"	Surface (Dinos)x2	0-0.5	

All samples remained on-board the *Amundsen* in cold storage (4°C) until demobilization at Quebec City, in November 2006. The pushcores will be sent to Halifax-Dartmouth, to be subsampled and archived with Geological Survey of Canada at the Bedford Institute of Oceanography. All samples taken for dinoflagellate analysis will be sent to University of Quebec at Rimouski. Samples of sediment for foraminifera will be sent to Dalhousie University and surface water foraminifera will be sent to University of Quebec at Montreal-GEOTOP.

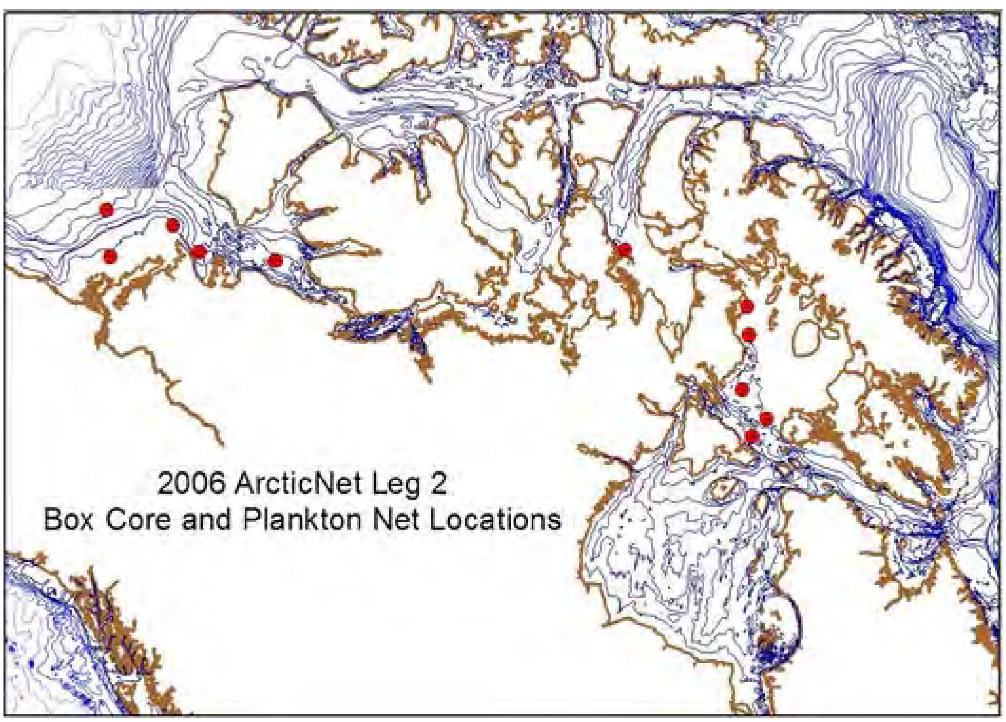


Figure 17.2. Map of box cores and plankton net sites.

Plankton Net Samples

Phytoplankton samples from photic zone (~top 50 meters) were collected at each boxcore site with a small 50µm mesh net to document dinoflagellate (motile and cyst stage) population in the water column and for genetic analysis (Table 17.4). Locations of the plankton net sites are shown in Figure 17.2. All samples were stored at 4°C and will be stored at the University of Quebec at Rimouski by André Rochon.

NRCan Seabed Mapping (See Section 15)

Two main areas were mapped by multibeam echosounder and sub-bottom profiler. Data collection was supported by external funds by NRCan. The first area was located on the eastern edge of the Mackenzie Trough and was mapped as part of Canada's Ocean Action Plan (OAP). The second area was a large seabed failure on the Mackenzie shelf break. This feature was mapped as part of NRCan's Geoscience for Ocean Management (GOM) program. The preliminary geological interpretation of these two survey areas will be presented in this section. Specific details of the survey parameters are included in the ocean mapping report (Section 21) written by the Canadian Hydrographic Service – University of New Brunswick Ocean Mapping Group.

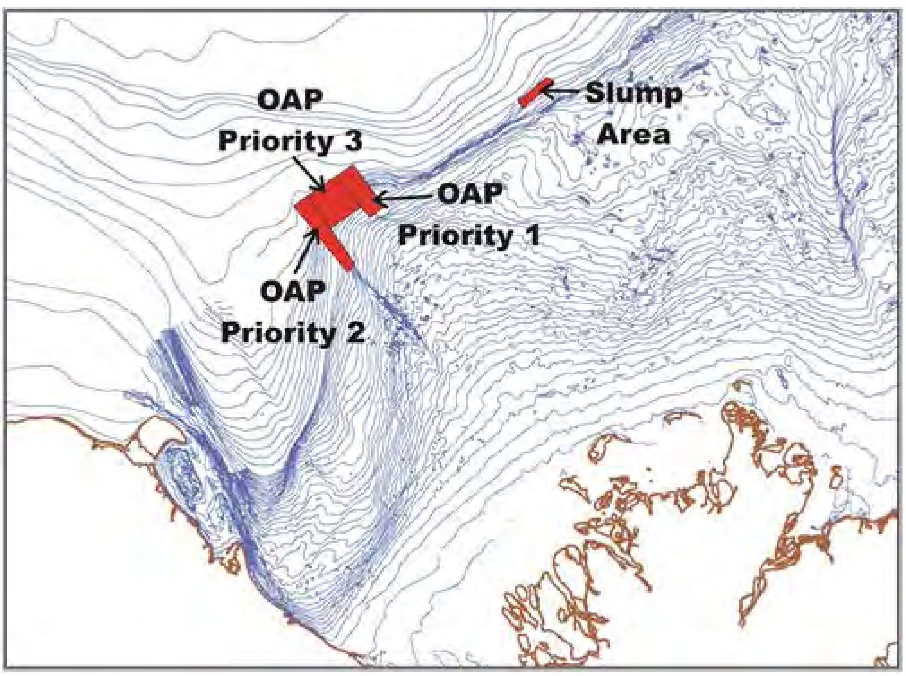


Figure 17.3. NRCan mapping areas.

17.2.3 Leg 2b – 29 October to 9 November 2006 – Labrador fjords

In the three Laborador fjords during Leg 2b, coring site selection has been determined based on both previous seismic surveys of the fjord bottom and on concurrent seabed mapping completed during the recent cruise, to ensure appropriate coring sites (even or flat seabed surface) and highest possible sedimentation rates thus maximizing temporal resolution.

For downcore litho- and biostratigraphic analyses, long sediment cores have been retrieved using box coring techniques (Figure 17.4) to assure integrity of the sedimentary record in the uppermost (most recent) sediments. Once the 50x50cm box corer filled with sediments from the fjord's seafloor was lifted out of the water and positioned on the ships' deck, one or two plastic tubes of different internal diameter (7 cm and 10 cm) were forced through the sediments in order to assure their stratigraphic integrity (Figure 17.4).

Onboard the *Amundsen*, sediment cores were described and photographed, then capped with Styrofoam and kept cool in preparation for transport to the laboratories for further analyses. The internal structure of the sediments will be analysed immediately upon return to Quebec City at the Centre Géoscientifique de Québec and at Institut National de Recherche Scientifique (INRS- Eau, Terre, Environnement).

At the Centre Géoscientifique de Québec, one representative core from each of the sampling sites will be subjected to an X-ray topogramme (Catscan) in order to reveal the detailed internal structure of the sediment record. At the Institut National de la Recherche Scientifique (INRS- Eau, Terre, Environnement), an ITRAX core scanner equipped with digital radiography and XRF multi-element analysis will be used for measurements of variations in the density and chemical element composition along the collected sediment cores. With the combination of optical imaging, high-resolution radiographic density imaging and highly sensitive XRF analysis, very detailed structural variations will be recorded together with the chemical basis for these variations (resolution capacity down to 20 micrometers). All of these analyses are non-destructive measurements and don't compromise the subsequent biostratigraphic analyses along the cores.

Figure 17.4. Box core used in the Labrador fjords in Leg 2b (left) and tubes used to collect push cores for stratigraphy (right)

At Université du Québec à Rimouski (UQAR), the cores will then be analysed for changes in particle-size and loss-on-ignition, and subsampled at identical intervals for fossil diatoms and dinoflagellates. Fossil dinoflagellate assemblages will be examined by a graduate student at Université du Québec à Rimouski under the supervision of Dr. A. Rochon.

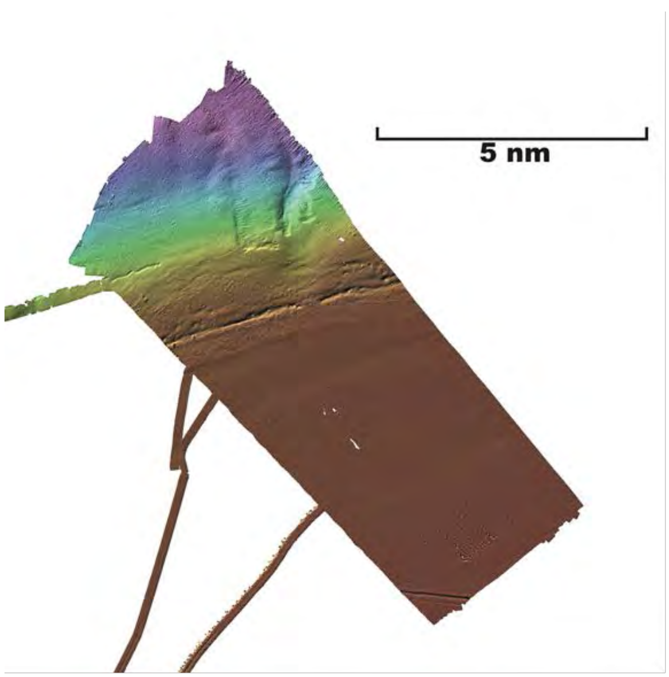
Analyses of biogenic silica content (to determine past diatom and siliceous algal production), as well as analyses of changes in diatom assemblage composition through time will be carried out by Ph.D. student K. Zamelczyk-Juhnke at Université Laval (supervisor Dr. R. Pienitz) using standard techniques (Pienitz et al. 1991; Hay et al. 2003).

17.3 Preliminary results (Leg 2a)

17.3.1 NRCan Ocean Action Plan (OAP)

Through the Ocean Action Plan (OAP), a transect across the Beaufort Shelf from 5 meters to 400 meters is to be a targeted study of the seabed morphology, stratigraphy, benthic ecology, and geotechnical properties of the area. The main goal of this OAP work is to determine the effect of seabed features and processes (i.e. ice scour, gas venting) on benthic ecology. Most of this work will be accomplished using the CCGS Nahidik, however the Amundsen will be used to collect multibeam data in the deeper water (greater than 70 m) areas of the transect. UNB's survey launch Heron was also used in portions of the survey block.

OAP Priority Block 1 (OAP P1) was mapped to completion during the allotted time for NRCan mapping. This area was given the highest priority due to the large amount of benthic samples (box cores and seabed photographs) collected by NRCan. Because of the new multibeam coverage collected by the *Amundsen* and *Heron*, the benthic samples can now be correlated to the shelf-wide OAP transect. OAP P1 was a significant data set (see Figure 17.3) containing several interesting features that revealed useful information on the seabed processes that were active in the area or in the past. Several slope failures were visible in the deeper water portions of the survey block which were located on the continental shelf break and slope.



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igure 17.5. Multibeam data of Ocean Action Plan Priority Block 1.

A large trough ran approximately east-west across the mid-section of the data set. This trough was located at the shelf break and has been interpreted at this point to be an area of extensional failure. It cannot be determined from multibeam and sub-bottom data alone if these failures are active or when they were active in the past. Core samples and radiocarbon dating will be required to determine the age of these features.

In waters shallower than the shelf break, the seabed is dominated by ice scours. The maximum observed active scouring in the Beaufort Sea is at about 55 meters water depth. Since all of OAP P1 is located in water depths greater than 60 meters, it is interpreted that all of the scours in this area were not formed by the present sea ice regime but were created in the past when sea level was lower or by a past, more extreme, sea ice regime. One very large scour was visible in the southern most corner of the survey block. OAP Priority Block 2 (OAP P2) is to be the deep water extension of the actual shelf-wide OAP transect. This area was started during 2006 however only 3 lines were collected on this site due to poor weather. No significant interpretation can be made on this area at this point. There was no data collection in OAP Priority Block 3.

17.3.2 Slump area

During the course of CASES Leg 8 in 2004, a large slope failure feature was imaged by multibeam echosounder and 3.5 kHz sub-bottom profiler. A 3 x 11 km area was mapped during CASES, however due to its large scale; the entire feature could not be imaged during the allotted time set aside to survey the area. This same slope failure feature has been imaged and reported on at least two prior occasions by O'Connor Associates (1981) and Hill, Moran, and Blasco (1982).

Funding from NRCan was provided to ArcticNet to revisit the slump site in 2006 to map the rest of the feature.

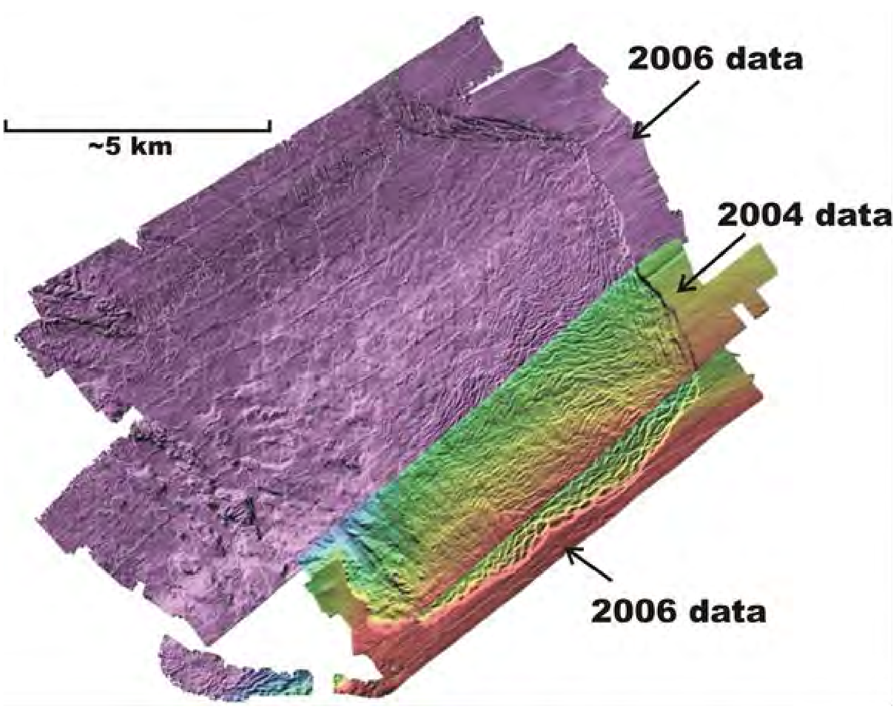


Figure 17.6. Multibeam data of slump area.

The *Amundsen* was able to map the feature for almost 18 hours before it was necessary to move on to the next station. During this time, a very large amount of the slump was imaged however the down-slope extent of the features was still not observed (see Figure 17.6). At this time, a 14 x 10 km section of the slump has been imaged in water depths from about 125 to 600 meters.

The age and origin of the feature is still not certain; however the data collected during 2006 is an excellent data set and will be essential when integrated with future multibeam data and core samples. This data set does however reveal the widespread nature of sediment failure along the Beaufort Slope.

17.4 Preliminary results (Leg 2b)

In the northernmost Nachvak Fiord, two 7 cm-diameter sediment cores were retrieved from one location (station 602; 59°03.42'N, 63°51.72'W) at the western end of the inner Koktortoaluk basin of the fiord, at a depth of 155m. The cores measured 25.5 cm and 28.5 cm in total length (Figure 17.7) and both were composed of an upper 5cm of a watery (loose) pale olive clay that graded into a black olive clay between 5-10 cm core depth. This transitional section was followed by massive black gelatinous (glue-like) clay towards the bottom of the core. Sediment core compaction due to friction on the inner walls of the core tube was in the order of 10 cm in both cores.

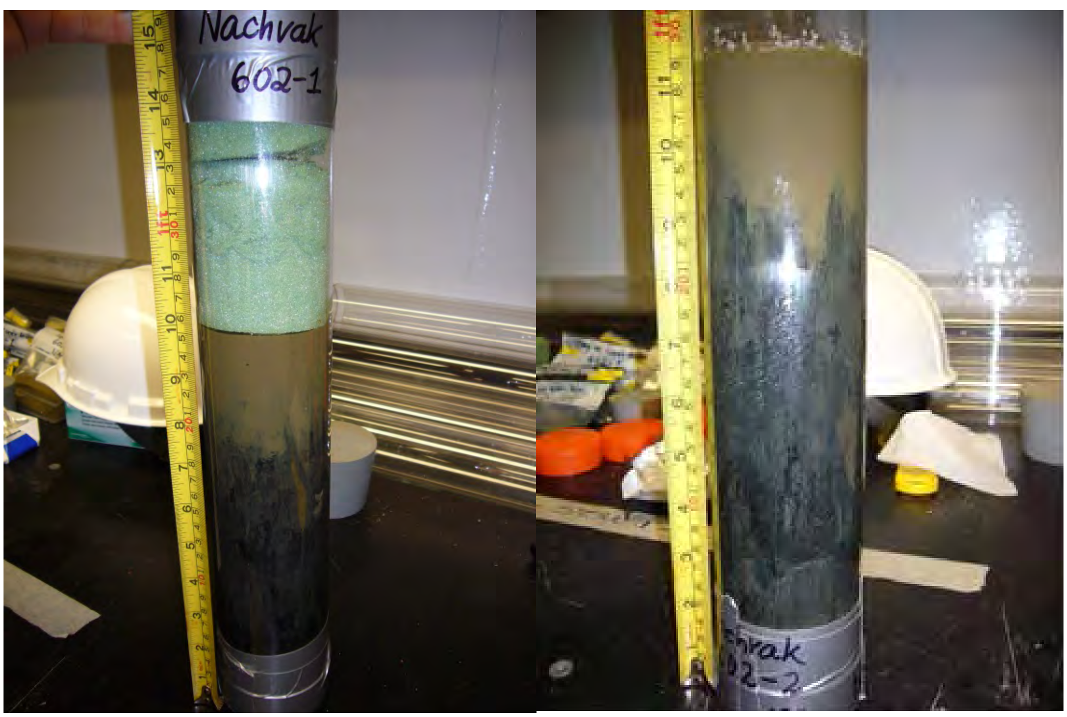


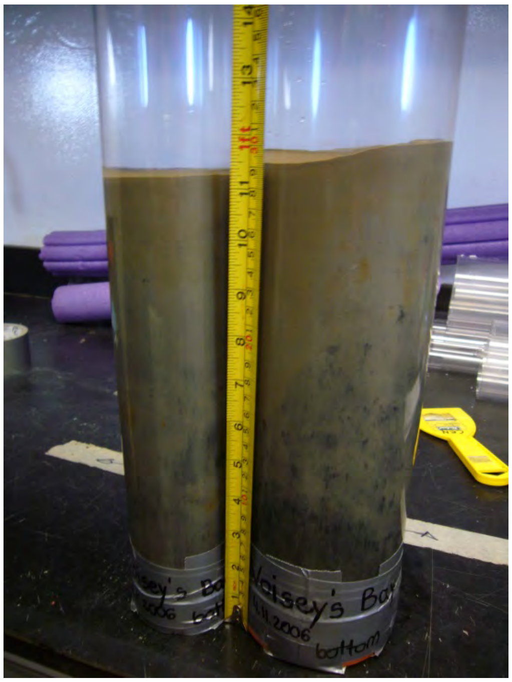
Figure 17.7. Sediment cores collected in Nachvak fjord (Station 602) in northern Labrador during Leg 2b.

In the Saglek Fjord system, two sediment cores (7 cm and 10 cm) were retrieved from two different locations, one from the fjord's head (Ugjuktok Fjord, station 615; 58˚18.67'N, 63˚33.708'W) and the other one from the nearshore area of Saglek Bay (Saglek Anchorage) next to the former U.S. military base and its Long Range Radar Site (station 617; 58˚30.04'N, 62˚41.32'W) at depths of 132 m and 131 m, respectively. The two cores collected at station 615 measured 31 cm (10 cm diameter core tube) and 30 cm (7 cm diameter core tube) in total length (Figure 17.8 left) and were composed of homogeneous and watery pale olive clay in the uppermost 7 cm of the core, followed by a 8 cm-thick transitional zone (16-24 cm core depth) composed of heterogeneous black olive clay, and an increasingly dark (black) gelatinous clay section at the bottom of the cores. Sediment core compaction due to friction on the inner walls of the core tube was in the order of 9-10 cm in both cores.

The two sediment cores taken from the marine bay adjacent to the former military base (station 617; Figure 17.8 right panel) were 28 cm (10cm core tube) and 21.5 cm (7 cm core tube) long. This difference in total length is due to differential core compaction inside the core tubes, which was in the order of 6 cm in the wider and 12.5 cm in the narrower core tube. In the 28 cm-long sediment core, the uppermost 3 cm consisted of homogeneous watery pale olive clay, an approximately 5-6 cm strong middle section composed of dark (black) gelatinous and very compact clay (3-9 cm core depth), and dark olive to black heterogeneous clay in the lowermost section of the core (ca. 9-28 cm core depth).

Figure 17.8. Sediment cores collected in Saglek Fjord system (Stations 615 and 617) in northern Labrador during Leg 2b.

In the southernmost Anaktalak Fjord, two sediment cores (7 cm and 10 cm diameter) were retrieved from one location near the effluent from the Voisey's Bay mining site (Edward's Cove, station 624; 56°25.32'N, 62°4.17'W) at a depth of 70 m. The cores measured 28.7 cm and 30.0 cm in total length (Figure 17.9) and were composed of pale olive clay in the top 10 cm of the core, grading into a heterogeneous dark olive clay (with scattered black spots) between 10-18 cm core depth, and finally an increasingly homogeneous and compact black olive clay in the lowermost 18-30 cm section of the cores. Upon retrieval of these cores, a strong smell (possibly from hydrogen sulphide (H_2S)) and numerous yellowish-orange spots (derived from sulphuric or iron-rich components?) were recognizable in the uppermost section of the cores. Noteworthy is also the abundance of large pebbles and rocks retrieved by the box coring device at this sampling site. Sediment core compaction due to friction on the inner walls of the core tube was in the order of 2 cm (10 cm diameter core tube) and 3 cm (7 cm diameter core tube) in the two cores.



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gure 17.9. Sediment cores collected in Anaktalak Fjord (Stations 624) in northern Labrador during Leg 2b.

17.5 Comments and recommendations (Leg 1 only)

17.5.1 Operation notes

Parks Canada was interested in collecting baseline data from the Oliver Sound area to designate a new national park, Sirmilik National Park. For this purpose, an additional station was done at the beginning of the cruise, and for a general analysis, macro epibenthic organisms were collected and preserved in 95% ethanol for further identification.

Unfortunately, there were a few equipment problems during the first part of Leg 1. At Station 127, sediments were retrieved but in a very small amount and it contained large cobbles. It was decided that no push core were to be taken but a small amount of surface sediment was present. The box core was not redeployed to this site to prevent further equipment damage.

At Station 131, the boxcore sample consisted of three large rocks and no sediment at all. With the help of the acquisition room, the ship was repositioned above a 100 m^2 flat based area on multibeam sonar, but the ship drifted and was unable to remain stationary so this site was not resampled.

Station 126 was deemed not suitable for box coring operation based on the sub-bottom profile which showed it was in an area of outcropping bedrock. The bottom was also not suitable for box coring at Station 122.

At Station 118, multiple iceberg scars showed on the multibeam radar, but no other place was suitable to do a boxcore, although the recovered sediment did not seem to be disturbed.

At Station 303, the surface sediment was very rocky but mud was collected as much as possible and the ship had to be repositioned multiple times (station 131, 119, 115 and 101) to find sediment.

At Station 307, the multibeam surface showed multiple iceberg scours and the sub-bottom profiles were not clear. The boxcore retrieved approximately 25 cm thick olive grey fine-grained sediment.

At Station 310, the multibeam surface showed a few iceberg scours and some other linear features, so a site was chosen slightly off from the main station site in an area of ‘softer’ surface features (mud). Again the sub-bottom profile was not very clear on the nature of the sub bottom. For this deployment, the locking lever was left open properly and the boxcore functioned successfully.

At Station 312, the multibeam surface did not appear to show any evidence of scouring and the sub-bottom profile indicated that there was a translucent layer of surface sediments. The boxcore recovery was successful, 34 cm long and undisturbed. The surface contained abundant biota: brittle stars, scallops, isopods and amphipods, and tiny gastropods. This station deployment was also filmed by the French film documentary crew. The upper 10 cm was a light brownish grey mud, followed by a thick, heavy grey mud, and a thin layer of liquid blackish mud was on the bottom of the boxcore.

At Station 314, both the sub-bottom profile and the multibeam surfaces looked very promising, and we recovered our deepest boxcore yet, undisturbed and 41.2 cm long. There were a few worm tubes on the surface, and possibly several brittle stars (the lighting was poor). The mud was a brownish, olive grey.

17.5.2 Equipment damage

The boxcore equipment was in need of a serious overhaul. Both of the stainless steel boxes were damaged, bent and chipped. The trigger cable and ‘bungee cord’ was becoming frayed and needed to be replaced.

18 Canada's Arctic Waters in International Law and Diplomacy – Leg 2a

ArcticNet Phase I – Project 1.7: Canada's Arctic Waters in International Law and Diplomacy. ArcticNet/Phase 1/Project 1.7

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18.1 Introduction

For decades, Canada has asserted, with varying degrees of clarity, its sovereign right to control activities in the Arctic waters off its northern coast. Canada's claim has not often been put to the test. However, with changing sea-ice conditions and growing international interest in Arctic shipping, Canada's claim to sovereignty and control over the Northwest Passage may soon be subject to serious challenge.

Recent satellite measurements analyzed by the U.S. National Snow and Ice Data Centre have shown that the area covered during the winter by sea-ice was at an all-time low in March 2006, down 300,000 km^2 from the previous year. At this rate, the Arctic could lose all of its sea-ice as early as 2030, potentially changing the way the globe trades. However, any potential benefit to the maritime industry will be counterbalanced by the threat to indigenous cultures, fragile Arctic ecosystems, and Canada's sovereignty and security interests.

The objectives of our Project are threefold:

- To re-evaluate Canada's legal claim to the waters of the Arctic archipelago in light of changing sea-ice conditions and following the conclusion of the 1993 Nunavut Land Claims Agreement.
- To analyze the likely effects of changing sea-ice conditions on the feasibility of maritime navigation through the Northwest Passage, and the likely timeframe before transits become commercially viable. Such reliable predictions are necessary if appropriate timelines for diplomacy, adjudication, equipment procurement and the construction of other infrastructure are to be devised.
- To evaluate the potential for persuading other countries, particularly the United States, to support Canada's claim over the Arctic waters, and to define strategies for achieving this outcome.

18.2 Project output to date

In furtherance of the Project's three principal objectives, the investigators have:

- Organized multidisciplinary workshops across Canada (Vancouver / Feb '05, Iqaluit / April '05, Montreal / Oct '05);
- Participated in a number of conferences and experts meetings on the Arctic, including at Canadian Forces Northern Headquarters in Yellowknife (Nov '05), in Victoria (Feb '06), and in Ottawa (Oct '06);
- Organized a one day international conference in Ottawa in June 2006 on the scientific, legal, diplomatic, security and human (Inuit) dimensions of the debate over the Northwest Passage;
- Provided full funding and supervision for a PhD student (Justin Nankivell, UBC) whose political science thesis analyzes the diplomatic and legal history of the Northwest Passage in an effort to determine why countries have adopted, maintained and/or change their positions concerning the Northwest Passage in the past;
- Written an interdisciplinary paper for *Policy Options* (the journal of the Institute for Public Policy Research) in advance of the Montreal Conference of the Parties to the Framework Convention on Climate Change in Dec. 2005 (David Barber & Michael Byers, with Louis Fortier);
- Published numerous opinion pieces in English and French newspapers, in Canada and abroad;
- Given numerous interviews to media, in Canada and abroad;
- Written an in-depth academic paper soon to be submitted to the *American Journal of International Law*.

18.3 *Amundsen* contribution to the project

The time spent on board the *Amundsen* has furthered the research objectives of the project in a number of significant ways.

- The trip provided us (M. Byers and S. Lalonde) with an opportunity to conduct interviews with Inuit residents of Northwest Passage communities (e.g. Alice Ayalik in Kugluktuk, Joe Immaroitok and Maria Kripanik in Igloolik). These first-hand accounts of life on and near the Northwest Passage are of critical importance to the claim that Canadian sovereignty over the waters of the Arctic archipelago is supported by Inuit use and occupancy.
- Our time on board the *Amundsen* gave us a visual appreciation of the ice conditions in several of the main historical channels of the Northwest Passage during a period (20-29 October 2006) which is outside the traditional shipping season.
- We had the opportunity to do a brief aerial survey of Bellot Strait before the *Amundsen* transited through it – the first ship ever to do so in October. Leopold M'Clintock, despatched by Lady Franklin to search for her husband on King William Island, tried six times to penetrate Bellot Strait during the summer of 1858 before deciding to continue his journey by dogsled. In contrast, when the *Amundsen* sailed through Bellot Strait on 22 October 2006, there was absolutely no ice. Although strong currents and the relative narrowness of the channel will continue to pose a challenge to navigation, the absence of ice has significant implications in terms of the feasibility and seasonal extent of international shipping.

- We also transited Fury and Hecla Strait, which in the past usually contained enough ice to be practically impenetrable to any vessel other than an icebreaker. William Parry spent the summers of 1821 and 1822 waiting for the ice to clear from Fury and Hecla Strait. But though the strait is named after his ships, he never made it through. When the *Amundsen* sailed through the strait on 23 October 2006, it was practically devoid of ice, with only a few pieces of multiyear ice floating about, which the CCG navigators easily avoided.
- While on board the *Amundsen*, we had the opportunity to meet members of the ArcticNet team led by Jason Bartlett involved in the seabed mapping program. Through our discussions, we gained a greater understanding of the feasibility of large ships navigating through the so-called “shallow water” routes of the Northwest Passage in ice-free (or largely ice-free) conditions.
- We also made use of our time on board the ship to conduct interviews with CCG navigators who have considerable Arctic experience. We obtained valuable information that would otherwise have been difficult to access, gleaning critical insight into the essential question of the short and medium term feasibility of shipping through the Northwest Passage.
- We were also given two opportunities (in French and English) to present our research objectives, principal findings and preliminary conclusions to the CCG personnel and ArcticNet scientists on board, and received considerable input and helpful comments from them.
- Finally, our trip on board the *Amundsen* led to a number of opportunities to alert the public to the pressing issues at the heart of our project:
    - Interviews with Doug Struck, a reporter for the *Washington Post* also on board the Amundsen (MB, SL);
    - Interviews with a Vic Pelletier film crew on board for an upcoming RDI television series (MB, SL);
    - Interviews with an independent film crew headed by Louise Lamarre of Concordia University, also on board, for a film on the impact of climate change on the Inuit (MB, SL);
    - An interview with Patrick de Bellefeuille of the French network Météo Média (SL);
    - An interview with CanWest newspapers, resulting in articles in the *Edmonton Journal*, *Vancouver Sun*, and elsewhere (MB);
    - Comment pieces in the *Toronto Star* and London Review of Books (MB).

Our time on board the *Amundsen* has yielded a terrific amount of expert and local information which will be invaluable in completing our project. We thank ArcticNet – and Commanding Officer A. Gariépy and his crew - for this incredible experience.

19 Navigation potential in Canadian Arctic waters – Legs 1 and 2a

ArcticNet Phase I – Project 1.6: The Opening NW Passage: Resources, Navigation, Sovereignty & Security. ArcticNet/Phase 1/Project 1.6

Project leader: Frédéric Lasserre[1]
Cruise participant Leg 1: Sophie Dupré[1]
Cruise participants Leg 2a: Frédéric Lasserre[1] and Sophie Dupré[1]
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19.1 Assessment of opportunities and risks for a risk-averse industry

The aim of these research trips was to evaluate security issues that could prove relevant for a potentially increasing navigation in Canadian Arctic waters. In the general frame of global warming and declining summer ice-cover, the question of the opening of the Northwest Passage and of Canadian Arctic waters to increased shipping by commercial or foreign flag vessels arose and underlines the issue of claimed Canadian sovereignty over these waters. The goals of the two field trips were to:

- Assess the ice-cover extent in situ, and understand better, through talks with navigation officers and scientists on board, the mechanisms of sea ice formation and drift
- Talk to Inuit community members whenever possible so as to get feedback on their perception of possible impact of increasing navigation on their everyday life (Pond Inlet, Kugluktuk, Igloolik, Iqaluit). It proved surprisingly easy to interview them, a possible reflection of their desire to see their point of view listened to and taken into account.
- Evaluate the impact on navigation of a decreasing ice cover, through
    - several discussions with Commanding Officers Julien and Gariépy and other officers regarding navigation techniques, hazards and issues,
    - observation of navigation procedures when crossing iced zones.

This information, not available in any publication and reflecting years of experience, proves very useful for a general understanding of constraints to Arctic navigation, even in the changing context of receding ice cover.

Preliminary results show that:

If ice cover is indeed receding, opening up straits that were usually much more clogged with ice in September and October, there will remain constraints to navigation:

- Strong currents and tides in some locations;
- Southern straits (as opposed to McClure and Prince of Wales Straits) are not very deep and will prevent the passage of larger tankers or cargo ships;

- Ice, especially multi-year ice, can be present in several locations, and even if its concentration can be small (concentrations of multi-year ice ranging from 1/10 to 2/10 in specific areas were found), it still imposes to slow down and to master arctic navigation skills, especially at night, all the more so if a ship is not or poorly ice-strengthened.

The massive glaciers from Greenland, Baffin Island and Ellesmere Island, if warming conditions keep going on, could produce many icebergs that will drift in the Baffin Bay and increase the need for skilled navigation and reduced speed. If the Passage does not provide for a regular and faster route than the Panama route, a lot of its incentive for transit navigation disappears.

The question of the evolution of the Beaufort Sea Gyre also remains a very relevant question: should the permanent ice shelf in the Arctic Ocean begin to disintegrate, would the currents push the huge chunks of multi-year ice into McClure Strait and Amundsen Gulf? This would result in increased navigation hazards. There is scientific controversy as to the likely evolution of these currents in the future, but it makes for another unknown for shipping companies that rely of high statistical probabilities of safe and regular passage to develop new shipping routes.

Complemented by other axes of research on strategies developed by shipping companies (Frédéric Lasserre, Claude Comtois from U. of Montreal and PhD student Caroline Rivard) and on trends in exploration and mining operations in the Arctic (Frederic Lasserre and two MSc students), the information gathered on the *Amundsen* proves very valuable to assess the likelihood of a reportedly awaiting boom of navigation in Canadian Arctic waters. It seems that shipping could certainly increase indeed, especially for local mining and oil & gas exploitation purposes, but probably not so fast as first envisioned by sovereignty analysts.

Appendix 1 - List of stations sampled during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)
Leg 1							
1	Saguenay	CTD	22/Aug/2006	19h45	UTC-4	48°15.507	069°19.652
1	Sept-Îles	CTD	24/Aug/2006	20h42	UTC-4	50°03.235	065°58.247
1	Makkovik-1	CTD	27/Aug/2006	06h08	UTC-4	55°31.009	056°31.818
1	Makkovik-2	CTD	27/Aug/2006	18h18	UTC-4	56°09.755	057°16.289
1	Makkovik-3	CTD	28/Aug/2006	06h19	UTC-4	56°06.922	057°02.174
1	Makkovik-4	CTD	28/Aug/2006	18h19	UTC-4	55°57.104	056°37.006
1	Hudson Strait Slope-1	CTD	30/Aug/2006	06h16	UTC-4	61°26.331	060°22.538
1	Hudson Strait Slope-2	CTD	30/Aug/2006	18h15	UTC-4	61°03.085	060°48.251
1	Hudson Strait Slope-3	CTD	31/Aug/2006	06h20	UTC-4	61°25.388	060°40.254
1	Oliver Sound A	Basic	04/Sep/2006	09h20	UTC-4	72°15.313	077°46.984
1	Oliver Sound B	CTD	04/Sep/2006	20h50	UTC-4	72°24.845	078°44.054
1	Oliver Sound C	CTD	04/Sep/2006	22h19	UTC-4	72°19.539	078°15.279
1	Oliver Sound A	Basic	04/Sep/2006	23h39	UTC-4	72°15.364	077°47.214
1	Oliver Sound D	CTD	05/Sep/2006	03h03	UTC-4	72°11.412	077°27.793
1	Oliver Sound E	CTD	05/Sep/2006	04h21	UTC-4	72°09.627	077°06.440
1	100	Nutrient	06/Sep/2006	22h05	UTC-4	75°16.650	074°56.687
1	BA02	Mooring	07/Sep/2006	21h25	UTC-4	76°16.070	074°34.328
1	131.5	CTD	08/Sep/2006	11h07	UTC-4	78°25.199	073°50.964
1	132	Full	08/Sep/2006	18h15	UTC-4	78°59.624	072°21.137
1	127	Full	09/Sep/2006	23h15	UTC-4	78°17.657	074°35.701
1	129	Nutrient	11/Sep/2006	01h18	UTC-4	78°19.763	074°00.929
1	131	Full	11/Sep/2006	07h19	UTC-4	78°18.877	073°07.765
1	N/A	Sed. traps	12/Sep/2006	09h44	UTC-4	77°21.792	073°28.030
1	126	Full	12/Sep/2006	10h47	UTC-4	77°22.148	073°26.181
1	125	CTD	13/Sep/2006	06h08	UTC-4	77°20.515	073°55.301
1	124	Nutrient	13/Sep/2006	07h05	UTC-4	77°20.638	074°18.046
1	123	CTD	13/Sep/2006	08h55	UTC-4	77°20.583	074°38.489
1	122	Basic	13/Sep/2006	10h30	UTC-4	77°20.782	075°00.713
1	121	CTD	13/Sep/2006	15h06	UTC-4	77°20.256	075°22.399
1	120	Nutrient	13/Sep/2006	16h26	UTC-4	77°20.120	075°40.724
1	119	Basic	13/Sep/2006	19h08	UTC-4	77°20.167	076°04.411
1	118	CTD	14/Sep/2006	01h11	UTC-4	77°21.881	076°32.754
1	118	Nutrient	14/Sep/2006	04h31	UTC-4	77°22.261	076°40.612
1	117	Full	14/Sep/2006	19h03	UTC-4	77°19.791	076°58.298
1	116	CTD	15/Sep/2006	06h57	UTC-4	76°20.047	070°38.519
1	N/A	Sed. traps	15/Sep/2006	08h17	UTC-4	76°17.218	071°18.793
1	BA01	Mooring	15/Sep/2006	16h15	UTC-4	76°19.969	071°11.979
1	115	Full	15/Sep/2006	21h09	UTC-4	76°19.934	071°12.104
1	114	CTD	17/Sep/2006	00h02	UTC-4	76°19.374	071°46.923
1	113	Nutrient	17/Sep/2006	01h14	UTC-4	76°19.009	072°13.429
1	112	CTD	17/Sep/2006	02h54	UTC-4	76°18.516	072°42.405
1	111	Nutrient	17/Sep/2006	04h50	UTC-4	76°18.378	073°13.129
1	109	CTD	17/Sep/2006	10h20	UTC-4	76°15.281	074°10.414
1	108	Full	17/Sep/2006	12h10	UTC-4	76°15.619	074°35.431
1	106	CTD	17/Sep/2006	18h39	UTC-4	76°18.342	075°20.852
1	105	Nutrient	17/Sep/2006	19h36	UTC-4	76°19.478	075°46.882
1	104	CTD	17/Sep/2006	21h14	UTC-4	76°20.421	076°10.806
1	103	Nutrient	17/Sep/2006	22h10	UTC-4	76°21.669	076°33.951
1	102	CTD	17/Sep/2006	23h30	UTC-4	76°22.623	076°59.145
1	N/A	Sed. traps	17/Sep/2006	01h13	UTC-4	76°23.533	077°21.028
1	BA03	Mooring	18/Sep/2006	19h07	UTC-4	76°23.157	077°24.626
1	101	Full	18/Sep/2006	20h25	UTC-4	76°23.477	077°23.512
1	Belcher Glacier (133)	Basic	19/Sep/2006	16h08	UTC-4	75°40.212	081°15.762
1	300	Nutrient	20/Sep/2006	04h31	UTC-4	74°22.341	079°58.200
1	301	Basic	20/Sep/2006	15h25	UTC-4	74°07.471	083°19.397

Appendix 1 - List of stations sampled during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)
1	302	Nutrient	21/Sep/2006	04h01	UTC-4	74°09.224	086°16.265
1	303	Full	21/Sep/2006	09h12	UTC-4	74°14.192	089°40.443
1	304	Nutrient	21/Sep/2006	20h28	UTC-4	74°21.748	093°19.007
1	305	Nutrient	21/Sep/2006	23h26	UTC-4	74°19.748	094°59.774
1	Resolute Bay	CTD	22/Sep/2006	06h20	UTC-4	74°40.912	095°11.482
1	306	CTD	23/Sep/2006	01h51	UTC-4	74°20.946	097°35.026
1	N/A	Sed. traps	23/Sep/2006	07h13	UTC-4	74°25.994	100°41.294
1	307	Full	23/Sep/2006	08h07	UTC-4	74°24.148	100°35.075
1	307.5	CTD	24/Sep/2006	05h38	UTC-4	73°53.965	101°58.879
1	308	Nutrient	24/Sep/2006	08h48	UTC-4	73°30.448	103°29.140
1	308.5	CTD	24/Sep/2006	14h44	UTC-4	73°03.334	103°32.590
1	309	CTD	24/Sep/2006	20h11	UTC-4	72°30.303	103°30.376
1	309.5	CTD	24/Sep/2006	23h14	UTC-4	71°59.542	102°59.880
1	310	Basic	25/Sep/2006	04h47	UTC-4	71°29.693	102°15.379
1	310.5	CTD	26/Sep/2006	01h05	UTC-4	71°09.949	099°45.124
1	311	Nutrient	26/Sep/2006	07h03	UTC-4	70°16.387	098°27.511
1	312	Basic	26/Sep/2006	13h40	UTC-4	69°09.537	100°42.368
1	313	CTD	26/Sep/2006	20h24	UTC-4	68°40.819	103°59.370
1	314	Basic	27/Sep/2006	00h47	UTC-4	68°59.889	106°35.616
1	315	CTD	27/Sep/2006	08h28	UTC-4	68°32.862	109°23.010
1	316	CTD	27/Sep/2006	08h51	UTC-6	68°06.988	111°09.249
Leg 2a							
2a	400	Nutrient	29/Sep/2006	03h24	UTC-6	69°05.484	114°48.277
2a	401	Nutrient	29/Sep/2006	07h08	UTC-6	69°14.170	116°36.040
2a	402	Nutrient	29/Sep/2006	10h45	UTC-6	69°35.760	118°07.960
2a	403	Basic	29/Sep/2006	18h54	UTC-6	70°06.030	120°05.900
2a	405	Full	01/Oct/2006	02h26	UTC-6	70°39.225	122°58.642
2a	CA18	Mooring	01/Oct/2006	13h05	UTC-6	70°39.950	122°59.220
2a	407	Full	02/Oct/2006	04h30	UTC-6	71°00.740	126°04.990
2a	CA08	Mooring	02/Oct/2006	09h00	UTC-6	71°00.440	126°04.450
2a	N/A	Sed. traps	02/Oct/2006	13h45	UTC-6	71°17.216	127°32.163
2a	408	Full	02/Oct/2006	14h14	UTC-6	71°15.911	127°31.023
2a	CA05-05	Mooring	02/Oct/2006	15h58	UTC-6	71°11.906	127°55.240
2a	409	Nutrient	04/Oct/2006	07h04	UTC-6	71°52.142	125°52.099
2a	410	Nutrient	05/Oct/2006	04h15	UTC-6	71°41.950	126°29.340
2a	411	CTD	05/Oct/2006	05h54	UTC-6	71°37.753	126°41.869
2a	412	Nutrient	05/Oct/2006	07h25	UTC-6	71°33.920	126°54.630
2a	413	CTD	05/Oct/2006	09h02	UTC-6	71°29.600	127°08.740
2a	414	Nutrient	05/Oct/2006	10h52	UTC-6	71°25.270	127°22.020
2a	CA05-04	Mooring	05/Oct/2006	13h20	UTC-6	71°25.110	127°23.520
2a	415	CTD	05/Oct/2006	19h15	UTC-6	71°21.700	127°33.240
2a	416	Nutrient	05/Oct/2006	20h04	UTC-6	71°17.510	127°46.060
2a	417	CTD	05/Oct/2006	21h14	UTC-6	71°13.300	127°58.900
2a	418	Nutrient	05/Oct/2006	22h00	UTC-6	71°09.660	128°09.870
2a	419	CTD	05/Oct/2006	22h49	UTC-6	71°06.400	128°20.230
2a	420	Basic	06/Oct/2006	00h32	UTC-6	71°03.081	128°30.327
2a	421	Basic	06/Oct/2006	11h49	UTC-6	71°28.380	133°56.160
2a	422	Nutrient	07/Oct/2006	02h38	UTC-6	71°22.195	133°52.996
2a	423	CTD	07/Oct/2006	04h50	UTC-6	71°16.363	133°51.352
2a	424	Nutrient	07/Oct/2006	06h24	UTC-6	71°10.243	133°49.873
2a	425	CTD	07/Oct/2006	08h12	UTC-6	71°04.130	133°47.170
2a	435	Full	07/Oct/2006	10h43	UTC-6	71°04.450	133°38.830
2a	CA04	Mooring	07/Oct/2006	13h14	UTC-6	71°04.811	133°37.847
2a	426	Nutrient	07/Oct/2006	14h52	UTC-6	70°59.227	133°44.880
2a	427	CTD	07/Oct/2006	16h20	UTC-6	70°52.754	133°43.815
2a	428	Nutrient	07/Oct/2006	17h36	UTC-6	70°47.416	133°42.243

Appendix 1 - List of stations sampled during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)
2a	429	CTD	07/Oct/2006	19h16	UTC-6	70°41.598	133°41.366
2a	430	Nutrient	07/Oct/2006	20h52	UTC-6	70°35.700	133°39.260
2a	431	CTD	07/Oct/2006	22h48	UTC-6	70°29.630	133°37.990
2a	432	Nutrient	08/Oct/2006	00h10	UTC-6	70°24.423	133°36.426
2a	433	CTD	08/Oct/2006	02h07	UTC-6	70°17.080	133°36.025
2a	N/A	Sed. traps	09/Oct/2006	02h53	UTC-6	70°19.959	126°21.501
2a	436	Full	09/Oct/2006	04h50	UTC-6	70°20.806	126°20.861
2a	435	Full	12/Oct/2006	07h25	UTC-6	71°04.396	133°34.949
2a	CA04	Mooring	12/Oct/2006	18h25	UTC-6	71°04.922	133°39.349
2a	N/A	Sed. traps	12/Oct/2006	23h00	UTC-6	70°57.400	134°34.500
2a	N/A	CTD	13/Oct/2006	15h43	UTC-6	70°22.710	137°38.300
2a	N/A	N/A	14/Oct/2006	13h55	UTC-6	70°15.080	138°04.950
2a	NRCan Survey	Mapping	15/Oct/2006	14h44	UTC-6	70°37.700	136°14.600
2a	434	Full	16/Oct/2006	18h20	UTC-6	70°10.610	133°33.400
2a	407	Full	17/Oct/2006	14h52	UTC-6	71°00.550	126°03.520
2a	CA08	Mooring	17/Oct/2006	18h30	UTC-6	71°00.621	126°03.967
2a	CA18	Mooring	18/Oct/2006	11h04	UTC-6	70°39.920	122°59.370
2a	405	CTD	18/Oct/2006	11h51	UTC-6	70°39.620	122°59.780
2a	404	Nutrient	18/Oct/2006	14h55	UTC-6	70°20.790	121°36.040
2a	403	CTD	18/Oct/2006	18h29	UTC-6	70°05.861	120°06.632
2a	2006	CTD	20/Oct/2006	01h28	UTC-6	68°05.040	111°57.560
2a	N/A	CTD	20/Oct/2006	07h40	UTC-5	69°40.660	099°35.987
2a	N/A	CTD	20/Oct/2006	10h30	UTC-5	69°51.300	099°17.200
2a	N/A	CTD	21/Oct/2006	21h23	UTC-5	71°07.292	097°30.070
2a	317	Nutrient	22/Oct/2006	11h50	UTC-5	72°05.140	093°54.260
2a	318	CTD	22/Oct/2006	13h09	UTC-5	71°59.220	093°48.890
2a	319	Nutrient	22/Oct/2006	14h11	UTC-5	71°52.980	093°42.670
2a	320	CTD	22/Oct/2006	15h16	UTC-5	71°48.230	093°37.050
2a	321	CTD	22/Oct/2006	23h48	UTC-5	70°20.940	091°33.980
2a	322	Basic	23/Oct/2006	01h00	UTC-5	70°24.090	091°06.060
2a	323	CTD	23/Oct/2006	07h16	UTC-5	70°26.944	090°38.400
2a	324	Nutrient	23/Oct/2006	08h25	UTC-5	70°30.100	090°08.630
2a	325	CTD	23/Oct/2006	09h54	UTC-5	70°33.180	089°40.410
2a	326	Nutrient	23/Oct/2006	11h10	UTC-5	70°36.230	089°13.690
2a	327	Nutrient	23/Oct/2006	22h07	UTC-5	69°57.080	085°43.910
2a	328	Nutrient	24/Oct/2006	00h14	UTC-5	69°53.040	085°44.300
2a	329	CTD	24/Oct/2006	16h30	UTC-5	69°21.989	080°23.037
2a	330	Nutrient	24/Oct/2006	17h05	UTC-5	69°19.105	080°32.973
2a	331	CTD	24/Oct/2006	18h20	UTC-5	69°15.089	080°45.824
2a	332	Nutrient	24/Oct/2006	19h16	UTC-5	69°10.976	080°59.843
2a	333	Basic	24/Oct/2006	21h46	UTC-5	68°45.920	081°00.840
2a	334	Basic	25/Oct/2006	04h10	UTC-5	67°52.770	080°47.840
2a	335	CTD	25/Oct/2006	15h07	UTC-5	66°32.930	082°08.140
2a	336	Nutrient	25/Oct/2006	16h39	UTC-5	66°25.220	081°50.960
2a	337	CTD	25/Oct/2006	18h09	UTC-5	66°16.870	081°36.910
2a	338	Basic	25/Oct/2006	19h31	UTC-5	66°09.990	081°19.760
2a	339	CTD	26/Oct/2006	00h27	UTC-5	66°00.970	081°05.010
2a	340	Nutrient	26/Oct/2006	01h39	UTC-5	65°52.990	080°46.950
2a	341	CTD	26/Oct/2006	02h54	UTC-5	65°47.080	080°34.870
2a	342	Nutrient	26/Oct/2006	04h10	UTC-5	65°37.050	080°16.880
2a	343	CTD	26/Oct/2006	05h25	UTC-5	65°30.930	080°03.400
2a	344	Nutrient	26/Oct/2006	06h54	UTC-5	65°21.840	079°47.510
2a	345	CTD	26/Oct/2006	08h14	UTC-5	65°14.820	079°32.920
2a	346	Basic	26/Oct/2006	09h12	UTC-5	65°05.960	079°18.320
2a	347	CTD	26/Oct/2006	12h53	UTC-5	64°59.200	079°05.850
2a	348	Nutrient	26/Oct/2006	14h07	UTC-5	64°50.120	078°51.050

Appendix 1 - List of stations sampled during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)
2a	349	CTD	26/Oct/2006	15h36	UTC-5	64°41.070	078°35.070
2a	350	Basic	26/Oct/2006	20h00	UTC-5	64°29.960	080°30.000
2a	351	CTD	27/Oct/2006	13h08	UTC-5	63°32.100	075°50.090
2a	356	CTD	28/Oct/2006	16h32	UTC-5	60°44.540	064°41.800
2a	355	Nutrient	28/Oct/2006	18h02	UTC-5	60°50.966	064°42.732
2a	354	CTD	28/Oct/2006	19h46	UTC-5	61°00.110	064°44.640
2a	353	Nutrient	28/Oct/2006	21h19	UTC-5	61°09.420	064°46.940
2a	352	CTD	28/Oct/2006	23h15	UTC-5	61°15.960	064°48.720
2a	N/A	CTD	29/Oct/2006	11h07	UTC-5	63°03.070	067°23.520
Leg 2b							
2b	601	CTD	01/Nov/2006	08h47	UTC-4	59°02.890	063°37.300
2b	602	Basic	01/Nov/2006	11h27	UTC-4	59°03.420	063°51.740
2b	604	CTD	01/Nov/2006	18h10	UTC-4	59°00.025	063°53.716
2b	600	Basic	01/Nov/2006	22h58	UTC-4	59°06.790	063°25.540
2b	615	Basic	02/Nov/2006	13h48	UTC-4	58°18.770	063°33.860
2b	614	CTD	02/Nov/2006	18h44	UTC-4	58°23.580	063°23.910
2b	613	CTD	03/Nov/2006	00h18	UTC-4	58°29.070	063°13.310
2b	612	CTD	03/Nov/2006	02h49	UTC-4	58°28.320	063°58.020
2b	610	CTD	03/Nov/2006	03h35	UTC-4	58°32.000	062°50.380
2b	611	N/A	03/Nov/2006	04h30	UTC-4	58°31.604	062°41.540
2b	617	Basic	03/Nov/2006	05h26	UTC-4	58°30.030	062°41.377
2b	621	CTD	04/Nov/2006	03h42	UTC-4	56°24.880	061°31.540
2b	622	CTD	04/Nov/2006	04h44	UTC-4	56°24.990	061°43.876
2b	623	CTD	04/Nov/2006	05h35	UTC-4	56°26.860	061°56.240
2b	624	Basic	04/Nov/2006	06h30	UTC-4	56°25.294	062°04.110
2b	620	Basic	04/Nov/2006	18h54	UTC-4	56°23.870	061°12.840
BAYSIS							
HB	AN03	Mooring	13/Sep/2006	13h51		55°24.702	077°55.554
HB	AN03	CTD	14/Sep/2006	18h15		55°24.468	077°55.728
HB	100	CTD	15/Sep/2006	13h40		56°27.582	083°28.140
HB	101	CTD	15/Sep/2006	22h08		57°18.354	085°20.436
HB	AN01	CTD	16/Sep/2006	19h50		59°58.734	091°56.568
HB	AN01	Mooring	16/Sep/2006	20h18		59°58.296	091°56.622
HB	AN02	CTD	17/Sep/2006	20h44		58°46.884	091°31.386
HB	AN02	Mooring	17/Sep/2006	21h00		58°46.926	091°31.392
HB	AN04	CTD	18/Sep/2006	10h17		57°33.792	091°37.758
HB	AN04	Mooring	18/Sep/2006	11h00		57°34.266	091°37.758
HB	Nelson River	Mooring	20/Sep/2006	12h00		57°29.262	092°28.938
HB	AN02	CTD	21/Sep/2006	12h28		58°46.962	091°31.200
HB	AN02	Mooring	21/Sep/2006	12h00		58°46.884	091°31.386
HB	AN01	Mooring	22/Sep/2006	14h43		59°58.632	091°56.622
HB	AN01	CTD	22/Sep/2006	15h59		59°58.692	091°56.472

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
Leg 1																	
1	Saguenay	CTD	22/Aug/2006	19h45	UTC-4	48°15.507	069°19.652	CTD-Rosette ↓	330	260	270	13	16.7	7.4	1011.86	49	0/10
1	Saguenay	CTD	22/Aug/2006	20h04	UTC-4	48°15.556	069°19.650	CTD-Rosette ↑	327	149	270	13	16.7	7.4	1011.86	49	0/10
1	Sept-Îles	CTD	24/Aug/2006	20h42	UTC-4	50°03.235	065°58.247	CTD-Rosette ↓	187	240	310	10	11.9	8.8	1008.88	69	0/10
1	Sept-Îles	CTD	24/Aug/2006	20h55	UTC-4	50°03.257	065°58.212	CTD-Rosette ↑	177	245	303	17	11.6	8.9	1008.96	70	0/10
1	Makkovik-1	CTD	27/Aug/2006	06h08	UTC-4	55°31.009	056°31.818	CTD-Rosette ↓	1533	0	270	6	7.0	N/A	1021.00	92	0/10
1	Makkovik-1	CTD	27/Aug/2006	06h46	UTC-4	55°30.707	056°31.277	CTD-Rosette ↑	1473	358	270	7	7.0	N/A	1021.00	93	0/10
1	Makkovik-2	CTD	27/Aug/2006	18h18	UTC-4	56°09.755	057°16.289	CTD-Rosette ↓	1218	3	120	8	8.3	N/A	1020.4	89	0/10
1	Makkovik-2	CTD	27/Aug/2006	19h03	UTC-4	56°09.164	057°15.594	CTD-Rosette ↑	1241	339	130	10	10.6	N/A	1020.6	82	0/10
1	Makkovik-3	CTD	28/Aug/2006	06h19	UTC-4	56°06.922	057°02.174	CTD-Rosette ↓	1848	320	120	15	8.5	N/A	1018.4	85	0/10
1	Makkovik-3	CTD	28/Aug/2006	06h56	UTC-4	56°06.865	057°01.973	CTD-Rosette ↑	1841	20	135	15	8.8	N/A	1018.0	85	0/10
1	Makkovik-4	CTD	28/Aug/2006	18h19	UTC-4	55°57.104	056°37.006	CTD-Rosette ↓	2268	269	125	17	8.1	N/A	1016.2	93	0/10
1	Makkovik-4	CTD	28/Aug/2006	19h03	UTC-4	55°57.054	056°37.006	CTD-Rosette ↑	2265	239	125	17	7.7	N/A	1016.2	94	0/10
1	Hudson Strait Slope-1	CTD	30/Aug/2006	06h16	UTC-4	61°26.331	060°22.538	CTD-Rosette ↓	1451	155	135	17	8.4	N/A	1016.0	90	0/10
1	Hudson Strait Slope-1	CTD	30/Aug/2006	06h57	UTC-4	61°26.320	060°22.511	CTD-Rosette ↑	1450	155	135	17	8.3	N/A	1016.0	89	0/10
1	Hudson Strait Slope-2	CTD	30/Aug/2006	18h15	UTC-4	61°03.085	060°48.251	CTD-Rosette ↓	1221	159	135	15	8.3	N/A	1016.9	94	0/10
1	Hudson Strait Slope-2	CTD	30/Aug/2006	18h52	UTC-4	61°02.915	060°48.409	CTD-Rosette ↑	1222	128	135	13	8.3	N/A	1017.4	94	0/10
1	Hudson Strait Slope-3	CTD	31/Aug/2006	06h20	UTC-4	61°25.388	060°40.254	CTD-Rosette ↓	623	139	180	6	7.5	N/A	1020.0	95	0/10
1	Hudson Strait Slope-3	CTD	31/Aug/2006	06h46	UTC-4	61°25.347	060°40.020	CTD-Rosette ↑	633	206	200	7	7.3	N/A	1020.7	96	0/10
1	Oliver Sound A	Basic	04/Sep/2006	09h20	UTC-4	72°15.313	077°46.984	Secchi Disk ↓	373	273	305	10	4.2	N/A	995.24	99	0/10
1	Oliver Sound A	Basic	04/Sep/2006	09h24	UTC-4	72°15.293	077°47.014	Secchi Disk ↑	372	244	305	10	4.1	N/A	995.9	99	0/10
1	Oliver Sound A	Basic	04/Sep/2006	09h34	UTC-4	72°15.234	077°47.210	CTD-Rosette ↓	372	296	292	11	4.2	N/A	995.9	99	0/10
1	Oliver Sound A	Basic	04/Sep/2006	10h27	UTC-4	72°15.157	077°46.963	CTD-Rosette ↑	373	297	292	13	4.1	N/A	996.04	98	0/10
1	Oliver Sound A	Basic	04/Sep/2006	10h55	UTC-4	72°15.366	077°46.812	Vertical Net Tow ↓	377	298	292	11	4.0	5.06	996.05	99	0/10
1	Oliver Sound A	Basic	04/Sep/2006	11h15	UTC-4	72°15.331	077°46.641	Vertical Net Tow ↑	372	297	287	11	4.1	4.92	996.18	98	0/10
1	Oliver Sound A	Basic	04/Sep/2006	12h05	UTC-4	72°15.301	077°46.519	Hydrobios ↓	373	300	300	11	4.2	5.01	998.5	96	0/10
1	Oliver Sound A	Basic	04/Sep/2006	12h28	UTC-4	72°15.262	077°46.415	Hydrobios ↑	373	302	300	11	4.3	4.98	998.5	95	0/10
1	Oliver Sound A	Basic	04/Sep/2006	14h54	UTC-4	72°14.928	077°46.279	RMT ↓	362	Var	290	15	5.6	4.82	998.87	88	0/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	Oliver Sound A	Basic	04/Sep/2006	15h07	UTC-4	72°14.980	077°45.997	RMT ↑	371	Var	300	15	5.3	4.92	998.81	88	0/10
1	Oliver Sound A	Basic	04/Sep/2006	15h18	UTC-4	72°14.575	077°45.797	RMT ↓	315	Var	300	15	4.7	4.98	998.8	91	0/10
1	Oliver Sound A	Basic	04/Sep/2006	15h28	UTC-4	72°14.448	077°44.917	RMT ↑	358	Var	310	16	5.6	5.04	998.8	87	0/10
1	Oliver Sound B	CTD	04/Sep/2006	20h50	UTC-4	72°24.845	078°44.054	CTD ↓	474	335	285	15	4.3	5.3	997.99	86	0/10
1	Oliver Sound B	CTD	04/Sep/2006	21h10	UTC-4	72°24.745	078°44.044	CTD ↑	467	278	285	12	4.1	4.5	998.09	85	0/10
1	Oliver Sound C	CTD	04/Sep/2006	22h19	UTC-4	72°19.539	078°15.279	CTD ↓	269	303	295	10	4.3	5.57	998.25	86	0/10
1	Oliver Sound C	CTD	04/Sep/2006	22h31	UTC-4	72°19.533	078°14.856	CTD ↑	280	39	290	9	4.0	5.14	998.17	85	0/10
1	Oliver Sound A	Basic	04/Sep/2006	23h39	UTC-4	72°15.364	077°47.214	CTD-Rosette ↓	372	295	310	11	4.3	4.52	999.9	84	0/10
1	Oliver Sound A	Basic	05/Sep/2006	00h15	UTC-4	72°15.292	077°47.196	CTD-Rosette ↑	376	292	300	9	4.3	4.66	999.8	84	0/10
1	Oliver Sound A	Basic	05/Sep/2006	00h30	UTC-4	72°15.297	077°47.166	Phytoplankton Net ↓	371	306	300	9	4.3	4.7	999.8	87	0/10
1	Oliver Sound A	Basic	05/Sep/2006	00h33	UTC-4	72°15.299	077°47.151	Phytoplankton Net ↑	372	310	300	9	4.2	4.7	999.8	87	0/10
1	Oliver Sound A	Basic	05/Sep/2006	01h15	UTC-4	72°15.336	077°47.081	Box Core ↓	373	301	300	10	4.5	4.71	999.8	86	0/10
1	Oliver Sound A	Basic	05/Sep/2006	01h33	UTC-4	72°15.335	077°47.069	Box Core ↑	372	297	300	10	4.5	4.71	999.8	86	0/10
1	Oliver Sound D	CTD	05/Sep/2006	03h03	UTC-4	72°11.412	077°27.793	CTD ↓	236	356	250	16	4.5	4.73	999.5	86	0/10
1	Oliver Sound D	CTD	05/Sep/2006	03h11	UTC-4	72°11.401	077°27.692	CTD ↑	234	242	250	16	4.5	4.73	999.5	86	0/10
1	Oliver Sound E	CTD	05/Sep/2006	04h21	UTC-4	72°09.627	077°06.440	CTD ↓	127	310	295	11	4.3	4.66	999.7	87	0/10
1	Oliver Sound E	CTD	05/Sep/2006	04h28	UTC-4	72°09.627	077°06.432	CTD ↑	127	301	295	11	4.3	4.66	999.7	87	0/10
1	100	Nutrient	06/Sep/2006	22h05	UTC-4	75°16.650	074°56.687	CTD-Rosette ↓	489	10	350	20	1.9	3.33	1003.2	88	0/10
1	100	Nutrient	06/Sep/2006	22h50	UTC-4	75°16.287	074°56.637	CTD-Rosette ↑	497	350	355	21	2.1	3.35	1003.3	87	0/10
1	100	Nutrient	07/Sep/2006	00h07	UTC-4	75°16.373	074°58.724	CTD-Rosette ↓	485	352	20	11	2.0	3.22	1006.2	89	0/10
1	100	Nutrient	07/Sep/2006	00h51	UTC-4	75°16.183	074°59.929	CTD-Rosette ↑	477	336	350	19	2.0	3.18	1006.5	90	0/10
1	100	Nutrient	07/Sep/2006	02h08	UTC-4	75°16.353	074°58.384	CTD-Rosette ↓	484	347	360	17	2.0	3.15	1006.8	90	0/10
1	100	Nutrient	07/Sep/2006	03h12	UTC-4	75°16.248	074°59.311	CTD-Rosette ↑	485	284	360	15	2.1	2.99	1007.0	89	0/10
1	BA02-05	Mooring	07/Sep/2006	21h25	UTC-4	76°16.070	074°34.328	Mooring BA02-05 Recovered	594	345	335	10	0.5	2.49	1005.36	92	0/10
1	BA02	Mooring	07/Sep/2006	22h30	UTC-4	76°15.944	074°33.992	CTD ↓	460	319	330	10	0.3	2.63	1004.46	93	0/10
1	BA02	Mooring	07/Sep/2006	22h53	UTC-4	76°15.849	074°34.626	CTD ↑	467	276	335	12	0.5	2.59	1004.09	93	0/10
1	131.5	CTD	08/Sep/2006	11h07	UTC-4	78°25.199	073°50.964	CTD ↓	520	320	265	3	-1.3	-0.18	999.29	93	2/10
1	131.5	CTD	08/Sep/2006	11h29	UTC-4	78°25.067	073°51.035	CTD ↑	499	336	230	2	-2.7	-0.31	997.65	97	2/10
1	132	Full	08/Sep/2006	18h15	UTC-4	78°59.624	072°21.137	Skippy Boat Deployed	240	99	220	10	-0.8	N/A	994.7	84	1/10
1	132	Full	08/Sep/2006	18h25	UTC-4	78°59.652	072°20.638	Zodiac Deployed	236	116	220	10	-0.8	N/A	994.7	84	1/10
1	132	Full	08/Sep/2006	18h36	UTC-4	78°59.704	072°20.432	Sediment Traps Deployed	241	293	220	10	-0.8	N/A	994	84	1/10
1	132	Full	08/Sep/2006	19h35	UTC-4	79°00.108	072°19.624	Sediment Traps Deployed (end)	251	241	200	12	-0.9	N/A	994	85	1/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	132	Full	08/Sep/2006	20h00	UTC-4	79°00.184	072°21.113	Skippy Boat + Zodiac Recovered	248	320	210	15	-0.5	N/A	994.2	84	2/10
1	132	Full	08/Sep/2006	20h37	UTC-4	78°59.706	072°19.968	CTD-Rosette ↓	241	200	230	14	-1.0	0.02	994.21	88	2/10
1	132	Full	08/Sep/2006	21h10	UTC-4	78°59.513	072°18.584	CTD-Rosette ↑	240	214	225	16	-1.0	0.01	994.21	91	2/10
1	132	Full	08/Sep/2006	21h37	UTC-4	78°59.506	072°18.527	Horizontal Net Tow ↓	241	128	225	18	-0.7	0.02	994.12	88	2/10
1	132	Full	08/Sep/2006	22h05	UTC-4	79°00.020	072°13.117	Horizontal Net Tow ↑	241	307	225	22	1.1	0.0	993.82	88	2/10
1	132	Full	08/Sep/2006	22h39	UTC-4	79°00.343	072°11.119	Bioness ↓	237	154	215	21	-0.3	0.0	993.81	96	2/10
1	132	Full	08/Sep/2006	23h04	UTC-4	79°00.514	072°09.655	Bioness ↑	218	316	215	22	-0.5	-0.01	993.59	98	2/10
1	132	Full	08/Sep/2006	23h49	UTC-4	79°01.200	072°08.100	RMT ↓	219	Var	210	17	-0.1	0.02	995.72	96	2/10
1	132	Full	09/Sep/2006	00h19	UTC-4	79°01.311	072°06.981	RMT ↑	205	Var	210	19	-0.1	-0.01	995.5	98	2/10
1	132	Full	09/Sep/2006	01h27	UTC-4	79°01.066	072°04.846	Hydrobios ↓	200	210	210	20	0.2	0.04	995.4	98	2/10
1	132	Full	09/Sep/2006	01h42	UTC-4	79°01.097	072°04.216	Hydrobios ↑	199	300	215	21	0.3	0.03	995.5	97	2/10
1	132	Full	09/Sep/2006	02h01	UTC-4	79°01.056	072°04.025	Vertical Net Tow ↓	198	225	215	23	0.4	0.04	993.2	96	2/10
1	132	Full	09/Sep/2006	02h13	UTC-4	79°01.075	072°03.888	Vertical Net Tow ↑	198	310	215	24	0.6	0.07	995.5	95	2/10
1	132	Full	09/Sep/2006	03h10	UTC-4	79°01.296	072°01.855	CTD-Rosette ↓	196	220	215	28	0.9	-0.04	995.7	93	2/10
1	132	Full	09/Sep/2006	03h38	UTC-4	79°01.267	072°01.370	CTD-Rosette ↑	192	220	215	25	0.9	0.02	996.2	92	2/10
1	132	Full	09/Sep/2006	04h45	UTC-4	79°01.534	072°05.780	Sediment Traps Recovered	197	205	225	20	0.8	0.0	994	89	2/10
1	132	Full	09/Sep/2006	05h07	UTC-4	79°01.641	072°05.801	Sediment Traps Recovered (end)	197	266	225	23	0.3	-0.01	994.7	90	2/10
1	132	Full	09/Sep/2006	05h36	UTC-4	78°59.807	072°20.402	CTD-Rosette ↓	242	210	225	23	0.2	-0.07	994.2	90	2/10
1	132	Full	09/Sep/2006	06h04	UTC-4	78°59.771	072°19.879	CTD-Rosette ↑	245	219	225	21	0.0	-0.07	994	92	2/10
1	132	Full	09/Sep/2006	06h33	UTC-4	78°59.728	072°19.499	Thorium Pumping ↓	243	235	225	20	-0.2	-0.09	995.6	91	1/10
1	132	Full	09/Sep/2006	08h12	UTC-4	78°59.742	072°18.452	Thorium Pumping ↑	245	220	215	17	-0.2	-0.11	996.62	87	2/10
1	132	Full	09/Sep/2006	08h40	UTC-4	78°59.720	072°20.572	CTD-Rosette ↓	241	206	215	15	-0.2	-0.14	996.7	86	2/10
1	132	Full	09/Sep/2006	09h24	UTC-4	78°59.711	072°19.449	CTD-Rosette ↑	245	196	215	16	-0.2	-0.16	996.74	86	2/10
1	132	Full	09/Sep/2006	08h26	UTC-4	78°59.757	072°20.821	Secchi Disk ↓	239	208	215	17	-0.2	-0.07	996.62	86	2/10
1	132	Full	09/Sep/2006	08h30	UTC-4	78°59.757	072°20.775	Secchi Disk ↑	242	214	215	17	-0.2	-0.07	996.62	86	2/10
1	132	Full	09/Sep/2006	09h39	UTC-4	78°59.637	072°18.714	Zodiac Deployed (phytoflash + SCAMP)	241	140	235	14	0.0	-0.17	996.85	87	2/10
1	132	Full	09/Sep/2006	10h32	UTC-4	79°00.133	072°17.272	CTD-Rosette ↓	250	209	235	15	-0.3	-0.19	996.81	87	2/10
1	132	Full	09/Sep/2006	11h10	UTC-4	79°00.022	072°16.658	CTD-Rosette ↑	255	219	240	14	-0.3	-0.15	996.86	86	2/10
1	132	Full	09/Sep/2006	11h39	UTC-4	78°59.933	072°16.492	Zodiac Recovered (phytoflash + SCAMP)	251	181	240	14	-0.3	-0.15	996.78	87	2/10
1	132	Full	09/Sep/2006	12h06	UTC-4	78°59.904	072°15.218	Fluorescence ↓	240	230	230	13	0.4	-0.17	999.25	87	2/10
1	132	Full	09/Sep/2006	12h15	UTC-4	78°59.892	072°15.272	Fluorescence ↑	238	230	230	13	-0.2	-0.16	999.26	87	2/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	132	Full	09/Sep/2006	12h27	UTC-4	78°59.902	072°15.160	Phytoplankton Net ↓	239	230	235	13	-0.3	-0.16	999.26	87	2/10
1	132	Full	09/Sep/2006	12h34	UTC-4	78°59.911	072°15.165	Phytoplankton Net ↑	240	230	230	11	-0.3	-0.14	999.25	88	2/10
1	132	Full	09/Sep/2006	12h36	UTC-4	78°59.885	072°15.299	Phytoplankton Net ↓	240	233	230	12	-0.3	-0.14	999.25	88	2/10
1	132	Full	09/Sep/2006	12h41	UTC-4	78°59.895	072°15.308	Phytoplankton Net ↑	240	233	230	12	-0.3	-0.13	999.28	88	2/10
1	132	Full	09/Sep/2006	12h44	UTC-4	78°59.894	072°15.267	Phytoplankton Net ↓	239	235	235	13	-0.3	-0.12	999.32	88	2/10
1	132	Full	09/Sep/2006	12h49	UTC-4	78°59.904	072°15.255	Phytoplankton Net ↑	239	240	240	13	-0.3	-0.12	999.32	88	2/10
1	132	Full	09/Sep/2006	12h52	UTC-4	78°59.904	072°15.215	Phytoplankton Net ↓	240	241	240	12	-0.3	-0.12	999.32	88	2/10
1	132	Full	09/Sep/2006	12h56	UTC-4	79°59.904	072°15.196	Phytoplankton Net ↑	241	240	240	12	-0.3	-0.12	999.32	88	2/10
1	132	Full	09/Sep/2006	13h05	UTC-4	78°59.912	072°17.111	Phytoplankton Net ↓	259	255	250	11	-0.4	-0.11	999.34	90	2/10
1	132	Full	09/Sep/2006	13h09	UTC-4	78°59.902	072°17.132	Phytoplankton Net ↑	259	255	250	11	-0.4	-0.11	999.34	90	2/10
1	132	Full	09/Sep/2006	13h21	UTC-4	78°59.992	072°17.082	Box Core ↓	250	254	265	11	-0.5	-0.16	999.54	92	2/10
1	132	Full	09/Sep/2006	13h29	UTC-4	78°59.902	072°17.042	Box Core ↑	250	252	265	13	-0.5	-0.14	999.54	92	2/10
1	127	Full	09/Sep/2006	23h15	UTC-4	78°17.657	074°35.701	CTD-Rosette ↓	604	7	15	21	-0.4	-1.07	998.49	86	6/10
1	127	Full	10/Sep/2006	00h33	UTC-4	78°16.773	074°40.974	CTD-Rosette ↑	603	20	15	21	-1.1	-1.0	1000.81	92	6/10
1	127	Full	10/Sep/2006	02h13	UTC-4	78°15.194	074°47.882	Thorium Pumping ↓	579	35	15	27	-1.0	-1.1	1001.07	92	6/10
1	127	Full	10/Sep/2006	03h00	UTC-4	78°14.474	074°50.774	Thorium Pumping ↑	580	31	25	25	-1.2	-1.07	1001.14	91	6/10
1	127	Full	10/Sep/2006	03h43	UTC-4	78°13.933	074°55.206	Hydrobios ↓	607	15	30	27	-1.3	-1.08	1001.45	93	6/10
1	127	Full	10/Sep/2006	04h58	UTC-4	78°12.684	075°01.145	Hydrobios ↑	554	17	30	24	-0.5	-1.04	999.4	85	6/10
1	127	Full	10/Sep/2006	05h23	UTC-4	78°12.296	075°02.615	Vertical Net Tow ↓	556	211	30	24	-0.9	-1.07	999.5	85	8/10
1	127	Full	10/Sep/2006	05h51	UTC-4	78°11.844	075°03.942	Vertical Net Tow ↑	574	206	25	16	0	-1.05	1000.3	86	8/10
1	127	Full	10/Sep/2006	06h12	UTC-4	78°11.553	072°05.371	Secchi Disk (Test) ↓	569	43	25	17	0	-1.05	1000.3	86	8/10
1	127	Full	10/Sep/2006	06h16	UTC-4	78°11.553	072°05.371	Secchi Disk (Test) ↑	569	43	25	17	0	-1.05	1000.3	86	8/10
1	127	Full	10/Sep/2006	06h30	UTC-4	78°11.344	075°06.066	CTD (Test) ↓	587	25	25	19	-1.1	-1.06	1000.4	83	8/10
1	127	Full	10/Sep/2006	06h35	UTC-4	78°11.254	076°06.357	CTD (Test) ↑	593	18	25	21	-1.1	-1.06	1000.4	83	8/10
1	127	Full	10/Sep/2006	06h35	UTC-4	78°11.254	075°06.357	CTD (Test) Out	593	18	25	21	-1.1	-1.06	1000.4	83	8/10
1	127	Full	10/Sep/2006	10h50	UTC-4	78°24.118	074°03.814	EM Sampling ↓	468	279	15	18	-1.1	-0.75	1000.84	82	3/10
1	127	Full	10/Sep/2006	11h00	UTC-4	78°23.927	074°03.659	EM Sampling ↑	452	288	15	20	-1.1	-0.75	1000.84	82	3/10
1	127	Full	10/Sep/2006	11h10	UTC-4	78°23.693	074°03.994	EM Sampling ↓	450	280	15	20	-0.8	-0.91	1000.76	82	3/10
1	127	Full	10/Sep/2006	11h18	UTC-4	78°23.464	074°03.316	EM Sampling ↑	461	259	15	18	-0.8	-0.91	1000.76	81	3/10
1	127	Full	10/Sep/2006	11h47	UTC-4	78°25.576	074°06.478	EM Sampling ↓	418	301	20	19	-0.5	-1.00	1000.88	79	3/10
1	127	Full	10/Sep/2006	11h57	UTC-4	78°22.309	074°07.063	EM Sampling ↑	415	292	20	19	-0.5	-1.00	1000.88	79	3/10
1	127	Full	10/Sep/2006	12h03	UTC-4	78°22.270	074°07.143	Secchi Disk ↓	421	271	20	18	-0.9	-0.98	1000.88	81	3/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	127	Full	10/Sep/2006	12h13	UTC-4	78°22.210	074°07.283	Secchi Disk ↑	422	268	20	20	-0.9	-0.98	1000.88	81	3/10
1	127	Full	10/Sep/2006	13h29	UTC-4	78°20.102	074°11.884	CTD-Rosette ↓	508	5	0	15	-1.4	-0.89	1000.77	84	3/10
1	127	Full	10/Sep/2006	14h15	UTC-4	78°19.153	074°14.699	CTD-Rosette ↑	530	21	15	22	-0.8	-0.86	1000.84	80	3/10
1	127	Full	10/Sep/2006	15h38	UTC-4	78°19.043	074°17.537	CTD-Rosette ↓	532	15	15	20	-1.1	-1.04	1000.98	82	3/10
1	127	Full	10/Sep/2006	16h32	UTC-4	78°19.043	074°17.537	CTD-Rosette ↑	546	30	15	22	-1.2	-0.9	1001.2	84	3/10
1	127	Full	10/Sep/2006	19h28	UTC-4	78°10.445	074°41.937	CTD-Rosette ↓	616	34	15	25	-1.4	-0.9	1000.7	90	3/10
1	127	Full	10/Sep/2006	20h00	UTC-4	78°09.982	074°43.436	CTD-Rosette ↑	603	33	15	20	-1.7	-1.00	1001.66	93	3/10
1	127	Full	10/Sep/2006	20h55	UTC-4	78°09.863	074°44.278	CTD-Rosette ↓	600	20	15	26	-1.3	-0.97	1001.45	88	3/10
1	127	Full	10/Sep/2006	21h46	UTC-4	79°08.879	074°47.234	CTD-Rosette ↑	630	15	10	25	-1.5	-0.93	1001.57	89	3/10
1	127	Full	10/Sep/2006	22h09	UTC-4	78°08.381	074°49.417	Phytoplankton Net ↓	646	27	10	26	-1.3	-1.01	1001.28	87	3/10
1	127	Full	10/Sep/2006	22h14	UTC-4	78°08.366	074°49.421	Phytoplankton Net ↑	649	23	10	23	-1.3	-1.01	1001.28	87	3/10
1	127	Full	10/Sep/2006	22h17	UTC-4	78°08.322	074°49.484	Phytoplankton Net ↓	649	25	10	25	-1.3	-1.01	1001.28	87	3/10
1	127	Full	10/Sep/2006	22h23	UTC-4	78°08.280	074°49.511	Phytoplankton Net ↑	650	28	10	25	-1.7	-1.02	1001.23	88	3/10
1	127	Full	10/Sep/2006	22h26	UTC-4	78°08.261	074°49.521	Phytoplankton Net ↓	650	12	10	26	-1.7	-1.02	1001.23	88	3/10
1	127	Full	10/Sep/2006	22h34	UTC-4	78°08.272	075°49.861	Phytoplankton Net ↑	648	19	10	28	-1.6	-1.01	1001.09	87	3/10
1	127	Full	10/Sep/2006	22h56	UTC-4	78°08.135	074°50.558	Box Core ↓	644	29	10	30	-1.7	-1.02	1001.0	86	3/10
1	127	Full	10/Sep/2006	23h25	UTC-4	78°08.032	075°51.333	Box Core ↑	640	22	10	27	-1.9	-1.00	1001.93	89	3/10
1	129	Nutrient	11/Sep/2006	01h18	UTC-4	78°19.763	074°00.929	CTD-Rosette ↓	577	10	360	26	-1.9	0.36	1001.42	93	0/10
1	129	Nutrient	11/Sep/2006	02h01	UTC-4	78°19.443	074°02.770	CTD-Rosette ↑	581	14	360	26	-1.8	0.49	1001.50	88	0/10
1	129	Nutrient	11/Sep/2006	03h02	UTC-4	78°19.753	073°59.707	CTD-Rosette ↓	566	10	10	28	-1.7	0.72	1001.63	91	1/10
1	129	Nutrient	11/Sep/2006	03h57	UTC-4	78°19.493	074°01.089	CTD-Rosette ↑	591	12	10	27	-1.8	1.05	1001.94	88	1/10
1	130	Nutrient	11/Sep/2006	05h01	UTC-4	78°19.466	073°37.564	CTD-Rosette ↓	705	34	20	30	-1.7	0.5	1001.8	79	1/10
1	130	Nutrient	11/Sep/2006	06h00	UTC-4	78°19.448	073°39.758	CTD-Rosette ↑	723	32	25	30	-1.8	1.03	1002.2	81	1/10
1	131	Nutrient	11/Sep/2006	07h06	UTC-4	78°18.898	073°07.783	Secchi Disk ↓	243	21	30	30	-2	1.2	1002	77	1/10
1	131	Nutrient	11/Sep/2006	07h09	UTC-4	78°18.884	073°07.744	Secchi disk ↑	249	13	30	30	-2	1.2	1002	77	1/10
1	131	Full	11/Sep/2006	07h19	UTC-4	78°18.877	073°07.765	CTD-Rosette ↓	248	20	30	33	-2	1.2	1002	77	1/10
1	131	Full	11/Sep/2006	07h58	UTC-4	78°18.833	073°07.553	CTD-Rosette ↑	243	7	30	26	-2	0.98	1002.73	71	1/10
1	131	Full	11/Sep/2006	08h45	UTC-4	78°19.518	073°14.389	Sediment Traps Deployed	277	19	30	29	-2.1	1.14	1002.85	78	1/10
1	131	Full	11/Sep/2006	09h56	UTC-4	78°19.398	073°11.216	CTD-Rosette ↓	333	12	20	28	-2.1	1.10	1002.71	77	1/10
1	131	Full	11/Sep/2006	10h36	UTC-4	78°19.551	073°11.143	CTD-Rosette ↑	314	26	20	30	-2.2	1.14	1002.56	78	1/10
1	131	Full	11/Sep/2006	12h37	UTC-4	78°18.911	073°08.127	PNF ↓	236	108	20	32	-2.3	1.18	1004.99	78	1/10
1	131	Full	11/Sep/2006	12h54	UTC-4	78°18.911	073°08.127	PNF ↑	236	108	20	32	-2.3	1.18	1004.9	78	1/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	131	Full	11/Sep/2006	17h54	UTC-4	78°19.541	073°14.802	Horizontal Net Tow ↓	274	16	20	30	-1.7	1.0	1003	79	1/10
1	131	Full	11/Sep/2006	18h08	UTC-4	78°19.348	073°13.531	Horizontal Net Tow ↑	287	19	20	30	-1.7	1.0	1003	79	1/10
1	131	Full	11/Sep/2006	18h16	UTC-4	78°19.094	073°13.432	Horizontal Net Tow ↓	305	169	20	27	-1.9	1.2	1003	78	1/10
1	131	Full	11/Sep/2006	18h33	UTC-4	78°18.808	073°14.276	Horizontal Net Tow ↑	324	240	20	26	-1.9	1.2	1003	78	1/10
1	131	Full	11/Sep/2006	18h42	UTC-4	78°18.416	073°14.631	Horizontal Net Tow ↓	266	124	20	30	-1.9	1.2	1003	78	1/10
1	131	Full	11/Sep/2006	19h00	UTC-4	78°17.568	073°14.243	Horizontal Net Tow ↑	380	236	20	34	-1.9	1.2	1002.8	74	1/10
1	131	Full	11/Sep/2006	19h20	UTC-4	78°17.126	073°17.458	Bioness ↓	461	340	30	30	-1.6	1.2	1002.8	75	1/10
1	131	Full	11/Sep/2006	19h48	UTC-4	78°17.530	073°20.860	Bioness ↑	368	122	25	33	-2.1	1.2	1002.7	75	1/10
1	131	Full	11/Sep/2006	21h01	UTC-4	78°16.628	073°24.239	Hydrobios ↓	627	191	25	32	-2.3	1.23	1002.6	78	1/10
1	131	Full	11/Sep/2006	22h10	UTC-4	78°16.927	073°25.595	Hydrobios ↑	425	188	25	30	-0.6	1.23	1003.02	75	1/10
1	131	Full	11/Sep/2006	22h28	UTC-4	78°17.047	073°26.281	Vertical Net Tow ↓	437	208	25	31	-0.4	1.22	1003.13	77	1/10
1	131	Full	11/Sep/2006	22h48	UTC-4	78°17.249	073°26.708	Vertical Net Tow ↑	524	219	25	30	-1.4	1.22	1003.08	79	1/10
1	131	Full	11/Sep/2006	23h40	UTC-4	78°19.128	073°10.997	CTD-Rosette ↓	257	15	25	28	-2.6	1.18	1003.02	79	1/10
1	131	Full	12/Sep/2006	00h12	UTC-4	78°19.345	073°11.661	CTD-Rosette ↑	327	15	20	26	-2.2	1.17	1003.01	81	1/10
1	131	Full	12/Sep/2006	00h43	UTC-4	78°19.306	073°14.625	Phytoplankton Net ↓	310	20	20	29	-1.9	1.19	1002.71	81	Bergy
1	131	Full	12/Sep/2006	00h49	UTC-4	78°19.323	073°14.670	Phytoplankton Net ↑	312	24	20	30	-1.9	1.19	1002.71	81	Bergy
1	131	Full	12/Sep/2006	00h52	UTC-4	78°19.328	073°14.725	Phytoplankton Net ↓	298	26	20	28	-2.1	1.21	1002.66	80	Bergy
1	131	Full	12/Sep/2006	00h59	UTC-4	78°19.347	073°14.772	Phytoplankton Net ↑	300	26	20	27	-2.1	1.21	1002.66	80	Bergy
1	131	Full	12/Sep/2006	01h17	UTC-4	78°19.100	073°11.213	CTD-Rosette ↓	270	15	20	25	-2.2	1.24	1002.74	82	Bergy
1	131	Full	12/Sep/2006	01h50	UTC-4	78°19.087	073°12.844	CTD-Rosette ↑	291	15	20	20	-2.3	1.18	1002.70	83	Bergy
1	131	Full	12/Sep/2006	01h56	UTC-4	78°19.108	073°13.031	Phytoplankton Net ↓	309	36	20	21	-2.3	1.18	1002.70	83	Bergy
1	131	Full	12/Sep/2006	02h00	UTC-4	78°19.097	073°13.096	Phytoplankton Net ↑	308	36	20	22	-2.3	1.18	1002.70	83	Bergy
1	131	Full	12/Sep/2006	02h04	UTC-4	78°19.074	073°13.081	Phytoplankton Net ↓	302	42	20	20	-2.3	1.2	1002.61	84	Bergy
1	131	Full	12/Sep/2006	02h09	UTC-4	78°19.033	073°13.034	Phytoplankton Net ↑	296	40	20	25	-2.3	1.2	1002.61	84	Bergy
1	131	Full	12/Sep/2006	02h23	UTC-4	78°19.076	073°12.422	Box Core ↓	258	32	20	28	-2.3	1.21	1002.21	83	Bergy
1	131	Full	12/Sep/2006	02h28	UTC-4	78°19.061	073°12.351	Box Core (at bottom)	258	30	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1	131	Full	12/Sep/2006	02h34	UTC-4	79°19.034	074°12.339	Box Core ↑	262	25	20	26	-2.1	1.18	1002.20	83	Bergy
1	N/A	N/A	12/Sep/2006	09h44	UTC-4	77°21.792	073°28.030	Sediment Traps deployed	307	2	10	16	1.3	2.84	1001.47	72	Bergy
1	126	Full	12/Sep/2006	10h47	UTC-4	77°22.148	073°26.181	Thorium Pumping ↓	312	358	30	12	1.0	2.73	1001.71	75	Bergy
1	126	Full	12/Sep/2006	12h25	UTC-4	77°22.622	073°24.360	Thorium Pumping ↑	317	352	360	17	1.2	2.90	999.66	72	Bergy
1	126	Full	12/Sep/2006	13h56	UTC-4	77°20.717	073°24.880	CTD-Rosette ↓	334	360	130	15	1.4	2.87	1000.48	61	Bergy
1	126	Full	12/Sep/2006	14h25	UTC-4	77°20.800	073°25.272	CTD-Rosette ↑	327	360	130	14	2.2	2.82	1000.56	57	Bergy

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	126	Full	12/Sep/2006	15h31	UTC-4	77°20.815	073°25.345	CTD-Rosette ↓	327	360	130	12	1.6	2.88	1001.04	54	Bergy
1	126	Full	12/Sep/2006	16h07	UTC-4	77°20.934	073°25.878	CTD-Rosette ↑	325	N	140	8	2.5	2.8	1001.4	52	Bergy
1	126	Full	12/Sep/2006	16h48	UTC-4	77°20.759	073°25.661	PNF ↓	329	13	0	0	2.5	2.8	1001.7	49	Bergy
1	126	Full	12/Sep/2006	16h55	UTC-4	77°20.757	073°25.446	PNF ↑	331	357	0	0	2.5	2.8	1001.7	49	Bergy
1	126	Full	12/Sep/2006	17h00	UTC-4	77°20.756	073°25.467	Secchi Disk ↓	331	339	0	0	2.5	2.8	1001.7	49	Bergy
1	126	Full	12/Sep/2006	17h05	UTC-4	77°20.754	073°25.471	Secchi Disk ↑	330	341	0	0	2.5	2.8	1001.7	49	Bergy
1	126	Full	12/Sep/2006	17h54	UTC-4	77°20.914	073°25.664	Horizontal Net Tow ↓	331	2	55	12	1.1	2.8	1002.2	54	Bergy
1	126	Full	12/Sep/2006	18h05	UTC-4	77°21.140	073°25.778	Horizontal Net Tow ↑	334	16	35	14	1.1	2.8	1002.2	54	Bergy
1	126	Full	12/Sep/2006	18h37	UTC-4	77°21.185	073°24.540	Bioness ↓	334	335	35	15	1.1	2.8	1002.2	54	Bergy
1	126	Full	12/Sep/2006	18h57	UTC-4	77°22.119	073°27.453	Bioness ↑	312	342	30	19	1.1	2.8	1002.4	56	Bergy
1	126	Full	12/Sep/2006	19h27	UTC-4	77°21.730	073°26.927	Vertical Net Tow ↓	313	22	25	20	0.8	2.7	1002.8	64	Bergy
1	126	Full	12/Sep/2006	19h39	UTC-4	77°21.730	073°26.927	Vertical Net Tow ↑	316	23	25	20	0.6	2.7	1002.8	75	Bergy
1	126	Full	12/Sep/2006	19h53	UTC-4	77°22.312	073°25.234	RMT ↓	317	24	5	24	0.2	2.7	1002.9	79	Bergy
1	126	Full	12/Sep/2006	20h04	UTC-4	77°22.546	073°24.512	RMT ↑	312	22	5	24	0.2	2.74	1002.96	76	Bergy
1	126	Full	12/Sep/2006	20h35	UTC-4	77°22.364	073°24.574	Hydrobios ↓	311	22	5	21	0	2.83	1003.41	76	Bergy
1	126	Full	12/Sep/2006	20h57	UTC-4	77°22.479	073°24.466	Hydrobios ↑	313	23	5	21	0	2.72	1003.70	75	Bergy
1	126	Full	12/Sep/2006	21h25	UTC-4	77°22.125	073°24.950	Vertical Net Tow ↓	318	355	5	18	0.1	2.82	1003.92	76	Bergy
1	126	Full	12/Sep/2006	21h44	UTC-4	77°22.200	073°24.979	Vertical Net Tow ↑	314	355	10	18	0.2	2.81	1004.04	75	Bergy
1	126	Full	12/Sep/2006	22h15	UTC-4	77°21.810	073°25.140	CTD-Rosette ↓	317	14	0	18	0.3	2.83	1004.19	75	Bergy
1	126	Full	12/Sep/2006	22h50	UTC-4	77°21.976	073°25.237	CTD-Rosette ↑	316	359	5	19	0.4	2.85	1004.29	78	Bergy
1	126	Full	12/Sep/2006	23h02	UTC-4	77°21.843	073°25.324	Phytoplankton Net ↓	317	0	0	18	0.3	2.86	1004.33	77	Bergy
1	126	Full	12/Sep/2006	23h07	UTC-4	77°21.844	073°25.285	Phytoplankton Net ↑	318	355	0	21	0.3	2.86	1004.33	77	Bergy
1	126	Full	12/Sep/2006	23h10	UTC-4	77°21.844	073°25.322	Phytoplankton Net ↓	317	354	0	21	0.3	2.86	1004.33	77	Bergy
1	126	Full	12/Sep/2006	23h15	UTC-4	77°21.842	073°25.436	Phytoplankton Net ↑	317	355	0	21	0.5	2.86	1004.16	75	Bergy
1	126	Full	12/Sep/2006	23h17	UTC-4	77°21.840	073°25.530	Phytoplankton Net ↓	316	355	0	19	0.5	2.86	1004.16	75	Bergy
1	126	Full	12/Sep/2006	23h23	UTC-4	77°21.837	073°25.690	Phytoplankton Net ↑	315	354	0	20	0.5	2.86	1004.16	75	Bergy
1	126	Full	12/Sep/2006	23h25	UTC-4	77°21.835	073°25.755	Phytoplankton Net ↓	314	355	0	20	0.5	2.87	1004.16	75	Bergy
1	126	Full	12/Sep/2006	23h30	UTC-4	77°21.833	073°25.930	Phytoplankton Net ↑	313	353	0	18	0.4	2.88	1004.31	77	Bergy
1	126	Full	13/Sep/2006	00h09	UTC-4	77°21.562	073°25.518	CTD-Rosette ↓	321	359	0	21	0.5	2.89	1004.69	74	Bergy
1	126	Full	13/Sep/2006	00h46	UTC-4	77°21.850	073°25.097	CTD-Rosette ↑	313	354	0	20	0.5	2.88	1004.95	72	Bergy
1	126	Full	13/Sep/2006	01h58	UTC-4	77°20.656	073°25.662	CTD-Rosette ↓	323	5	350	20	0.5	2.87	1005.44	71	Bergy
1	126	Full	13/Sep/2006	02h41	UTC-4	77°20.999	073°26.715	CTD-Rosette ↑	322	356	350	21	0.2	2.88	1005.46	74	Bergy

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	N/A	N/A	13/Sep/2006	04h37	UTC-4	77°26.643	073°44.207	Sediment Traps Recovered	322	345	5	20	-0.3	2.5	1006	78	Bergy
1	N/A	N/A	13/Sep/2006	05h16	UTC-4	77°26.403	073°44.228	Sediment Traps Recovered (end)	314	15	0	19	-0.3	2.5	1006	78	Bergy
1	125	CTD	13/Sep/2006	06h08	UTC-4	77°20.515	073°55.301	CTD ↓	465	10	N	18	0.1	2.4	1007.6	78	Bergy
1	125	CTD	13/Sep/2006	06h28	UTC-4	77°20.391	073°55.637	CTD ↑	493	8	N	21	0.1	2.4	1007.4	81	Bergy
1	124	Nutrient	13/Sep/2006	07h05	UTC-4	77°20.638	074°18.046	CTD-Rosette ↓	705	8	10	24	-0.1	2	1008	80	Bergy
1	124	Nutrient	13/Sep/2006	08h05	UTC-4	77°20.144	074°18.494	CTD-Rosette ↑	695	25	10	20	-0.2	2	1008.2	80	Bergy
1	123	CTD	13/Sep/2006	08h55	UTC-4	77°20.583	074°38.489	CTD-Rosette ↓	697	16	10	17	-0.8	0.59	1008.88	82	Bergy
1	123	CTD	13/Sep/2006	09h41	UTC-4	77°20.377	074°38.095	CTD-Rosette ↑	699	16	10	21	-1.1	-0.05	1009.21	85	Bergy
1	122	Basic	13/Sep/2006	10h30	UTC-4	77°20.782	075°00.713	Vertical Net Tow ↓	644	18	15	24	-1.3	-0.16	1009.30	82	Bergy
1	122	Basic	13/Sep/2006	11h00	UTC-4	77°20.476	075°00.565	Vertical Net Tow ↑	646	16	15	21	-1.1	-0.36	1009.38	82	Bergy
1	122	Basic	13/Sep/2006	11h54	UTC-4	77°19.830	075°01.382	Horizontal Net Tow ↓	643	40	15	24	-1.5	-0.38	1009.7	84	Bergy
1	122	Basic	13/Sep/2006	12h04	UTC-4	77°19.993	075°00.573	Horizontal Net Tow ↑	648	22	15	23	-1.5	-0.38	1009.7	84	Bergy
1	122	Basic	13/Sep/2006	12h33	UTC-4	77°20.173	075°00.642	Phytoplankton Net ↓	648	17	15	22	-1.8	-0.44	1009.75	85	Bergy
1	122	Basic	13/Sep/2006	12h38	UTC-4	77°20.133	075°00.686	Phytoplankton Net ↑	648	29	15	22	-1.8	-0.44	1009.75	85	Bergy
1	122	Basic	13/Sep/2006	12h43	UTC-4	77°20.092	075°00.614	Phytoplankton Net ↓	648	20	15	22	-1.8	-0.43	1009.78	84	Bergy
1	122	Basic	13/Sep/2006	12h48	UTC-4	77°20.100	075°00.564	Phytoplankton Net ↑	648	15	15	22	-1.8	-0.43	1009.78	84	Bergy
1	122	Basic	13/Sep/2006	12h51	UTC-4	77°20.091	075°00.633	Phytoplankton Net ↓	649	18	15	22	-1.8	-0.42	1009.73	84	Bergy
1	122	Basic	13/Sep/2006	12h56	UTC-4	77°20.052	075°00.669	Phytoplankton Net ↑	648	30	20	26	-1.8	-0.42	1009.73	84	Bergy
1	122	Basic	13/Sep/2006	13h05	UTC-4	77°20.071	075°00.747	CTD-Rosette ↓	648	13	15	23	-1.9	-0.41	1009.67	84	Bergy
1	122	Basic	13/Sep/2006	14h04	UTC-4	77°19.906	075°01.814	CTD-Rosette ↑	643	10	10	27	-1.6	-0.28	1009.44	80	Bergy
1	121	CTD	13/Sep/2006	15h06	UTC-4	77°20.256	075°22.399	CTD ↓	579	14	10	24	-1.6	-0.57	1009.92	83	Bergy
1	121	CTD	13/Sep/2006	15h31	UTC-4	77°20.209	075°23.200	CTD ↑	582	13	10	21	-1.7	-0.55	1010.08	82	Bergy
1	120	Nutrient	13/Sep/2006	16h26	UTC-4	77°20.120	075°40.724	CTD-Rosette ↓	564	23	20	22	-1.6	-0.8	1010.1	76	Bergy
1	120	Nutrient	13/Sep/2006	17h21	UTC-4	77°19.776	075°41.488	CTD-Rosette ↑	558	9	10	25	-1.6	-0.9	1010.5	79	Bergy
1	119	Basic	13/Sep/2006	19h08	UTC-4	77°20.167	076°04.411	CTD-Rosette ↓	521	17	20	25	-1.4	-1.00	1011.0	80	1/10
1	119	Basic	13/Sep/2006	20h03	UTC-4	77°19.110	076°06.027	CTD-Rosette ↑	519	18	0	18	-1.7	-0.82	1011.86	83	1/10
1	119	Basic	13/Sep/2006	20h24	UTC-4	77°18.964	076°06.974	Vertical Net Tow ↓	514	15	350	20	-1.8	-0.85	1011.94	80	1/10
1	119	Basic	13/Sep/2006	20h52	UTC-4	77°18.682	076°07.536	Vertical Net Tow ↑	510	16	335	20	-2.4	-0.93	1012.30	84	1/10
1	119	Basic	13/Sep/2006	21h06	UTC-4	77°18.505	076°03.098	Vertical Net Tow ↓	519	11	335	18	-2.6	-0.95	1012.32	84	1/10
1	119	Basic	13/Sep/2006	21h32	UTC-4	77°18.263	076°03.520	Vertical Net Tow ↑	516	5	340	23	-2.2	-0.80	1012.20	85	1/10
1	119	Basic	13/Sep/2006	21h38	UTC-4	77°18.210	076°03.561	Phytoplankton Net ↓	518	358	340	23	-2.2	-0.80	1012.14	84	1/10
1	119	Basic	13/Sep/2006	21h43	UTC-4	77°18.217	076°03.660	Phytoplankton Net ↑	516	5	340	23	-2.2	-0.78	1012.14	84	1/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	119	Basic	13/Sep/2006	21h50	UTC-4	77°18.171	076°03.557	Horizontal Net Tow ↓	515	33	340	22	-2.3	-0.76	1012.15	85	2/10
1	119	Basic	13/Sep/2006	22h07	UTC-4	77°18.190	076°01.419	Horizontal Net Tow ↑	421	54	340	21	-2.5	-0.72	1012.24	84	2/10
1	119	Basic	13/Sep/2006	22h47	UTC-4	77°21.031	076°03.678	Phytoplankton Net ↓	530	353	320	19	-2.5	-1.05	1011.96	86	2/10
1	119	Basic	13/Sep/2006	22h53	UTC-4	77°21.015	076°04.227	Phytoplankton Net ↑	530	16	320	20	-2.5	-1.05	1011.96	86	2/10
1	119	Basic	13/Sep/2006	22h56	UTC-4	77°21.032	076°04.349	Phytoplankton Net ↓	529	14	340	22	-2.7	-1.05	1012.49	86	2/10
1	119	Basic	13/Sep/2006	23h02	UTC-4	77°21.009	076°04.510	Phytoplankton Net ↑	526	15	340	27	-2.7	-1.05	1012.49	86	2/10
1	119	Basic	13/Sep/2006	23h12	UTC-4	76°04.896	076°04.896	Box Core ↓	527	25	355	23	-2.1	-1.10	1012.25	85	2/10
1	119	Basic	13/Sep/2006	23h32	UTC-4	76°05.290	076°05.290	Box Core ↑	530	22	335	15	-1.9	-1.13	1012.41	84	2/10
1	118	CTD	14/Sep/2006	01h11	UTC-4	77°21.881	076°32.754	CTD-Rosette ↓	277	314	0	15	-3.3	-1.08	1013.71	84	3/10
1	118	CTD	14/Sep/2006	01h39	UTC-4	77°22.016	076°33.285	CTD-Rosette ↑	262	318	350	12	-3.0	-0.95	1016.31	80	3/10
1	118	CTD	14/Sep/2006	02h39	UTC-4	77°22.185	076°35.744	CTD-Rosette ↓	236	337	350	17	-2.9	-0.96	1016.57	82	3/10
1	118	CTD	14/Sep/2006	03h18	UTC-4	77°22.058	076°36.326	CTD-Rosette ↑	244	358	350	17	-2.7	-0.95	1017.08	78	3/10
1	118	Nutrient	14/Sep/2006	04h31	UTC-4	77°22.261	076°40.612	CTD-Rosette ↓	255	347	350	12	-3.3	-1.04	1015.13	86	3/10
1	118	Nutrient	14/Sep/2006	05h06	UTC-4	77°22.400	076°41.833	CTD-Rosette ↑	246	358	350	15	-2.9	-1.00	1015.20	86	3/10
1	117	Full	14/Sep/2006	05h34	UTC-4	77°22.851	076°43.855	Thorium Pumping ↓	208	5	350	18	-2.9	-1.00	1015.20	86	4/10
1	117	Full	14/Sep/2006	07h20	UTC-4	77°23.969	076°48.682	Thorium Pumping ↑	195	324	350	16	-3.6	-1.10	1016.7	81	5/10
1	117	Full	14/Sep/2006	07h35	UTC-4	77°23.217	076°49.415	EM Sampling ↓	193	203	335	15	-2.2	-1.1	1016.8	79	5/10
1	117	Full	14/Sep/2006	08h15	UTC-4	77°23.233	076°51.179	EM Sampling ↑	188	220	335	10	-2.2	-1.06	1017.02	80	5/10
1	117	Full	14/Sep/2006	09h05	UTC-4	77°23.588	076°53.676	Skippy Boat Deployed	179	277	345	14	-2.9	-1.05	1017.34	84	5/10
1	117	Full	14/Sep/2006	09h18	UTC-4	77°23.650	076°54.228	Zodiac Deployed	176	251	350	13	-2.9	-1.07	1017.34	84	5/10
1	117	Full	14/Sep/2006	09h43	UTC-4	77°23.448	076°55.897	Vertical Net Tow ↓	173	340	340	12	-2.9	-1.05	1017.42	84	5/10
1	117	Full	14/Sep/2006	09h53	UTC-4	77°23.536	076°55.903	Vertical Net Tow ↑	171	330	345	13	-3.1	-1.04	1017.48	85	5/10
1	117	Full	14/Sep/2006	10h15	UTC-4	77°22.779	076°58.037	Hydrobios ↓	164	345	345	14	-2.1	-1.01	1017.63	84	1/10
1	117	Full	14/Sep/2006	10h28	UTC-4	77°22.777	076°58.051	Hydrobios ↑	164	341	345	11	-2.8	-0.90	1017.58	85	1/10
1	117	Full	14/Sep/2006	10h48	UTC-4	77°22.785	076°58.076	Hydrobios ↓	164	344	345	14	-2.7	-0.86	1017.61	83	1/10
1	117	Full	14/Sep/2006	10h57	UTC-4	77°22.770	076°58.010	Hydrobios ↑	164	346	345	14	-2.5	-0.84	1017.54	82	1/10
1	117	Full	14/Sep/2006	11h25	UTC-4	77°24.834	076°58.548	Zodiac Recovered	161	225	345	13	-2.4	-0.93	1017.44	81	N/A
1	117	Full	14/Sep/2006	11h37	UTC-4	77°24.833	076°58.663	Skippy Boat Recovered	157	205	345	11	-2.4	-0.93	1017.44	81	N/A
1	117	Full	14/Sep/2006	14h29	UTC-4	77°20.483	076°57.179	CTD-Rosette ↓	417	10	20	20	-2.0	-1.07	1019.73	79	1/10
1	117	Full	14/Sep/2006	15h04	UTC-4	77°20.793	076°58.367	CTD-Rosette ↑	560	17	0	18	-1.8	-1.05	1019.78	79	1/10
1	117	Full	14/Sep/2006	15h50	UTC-4	77°21.459	076°58.872	PNF ↓	209	80	0	13	-1.8	-1.01	1019.8	77	1/10
1	117	Full	14/Sep/2006	15h58	UTC-4	77°21.557	076°58.722	PNF ↑	206	80	0	13	-1.8	-1.01	1019.8	77	1/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	117	Full	14/Sep/2006	16h17	UTC-4	77°21.806	076°58.300	CTD-Rosette ↓	202	11	0	11	-1.8	-1.01	1019.8	77	1/10
1	117	Full	14/Sep/2006	16h55	UTC-4	77°22.432	076°57.619	CTD-Rosette ↑	164	54	330	12	-2.6	-1.05	1019.8	82	1/10
1	117	Full	14/Sep/2006	18h44	UTC-4	77°20.553	076°58.068	Zooplankton Net ↓	405	222	330	19	-1.2	-1.11	1019.5	77	1/10
1	117	Full	14/Sep/2006	18h49	UTC-4	77°20.553	076°58.068	Zooplankton Net ↑	382	233	330	18	-1.2	-1.11	1019.5	75	1/10
1	117	Full	14/Sep/2006	19h03	UTC-4	77°19.791	076°58.298	Zooplankton Net ↓	448	26	330	20	-1.2	-1.11	1019.5	75	1/10
1	117	Full	14/Sep/2006	19h12	UTC-4	77°19.949	076°57.814	Zooplankton Net ↑	444	35	330	19	-1.8	-1.08	1019.2	71	1/10
1	117	Full	14/Sep/2006	19h12	UTC-4	77°19.949	076°57.815	Zooplankton Net ↓	444	35	330	19	-1.8	-1.08	1019.2	71	1/10
1	117	Full	14/Sep/2006	19h19	UTC-4	77°19.923	076°58.189	Zooplankton Net ↑	449	166	315	12	-0.9	-1.08	1019.1	70	1/10
1	117	Full	14/Sep/2006	19h37	UTC-4	77°19.620	076°58.147	Box Core ↓	452	167	325	19	-0.5	-1.08	1019	71	1/10
1	117	Full	14/Sep/2006	19h53	UTC-4	77°19.677	076°58.169	Box Core ↑	449	128	335	18	2.1	-1.07	1016.56	63	1/10
1	116	CTD	15/Sep/2006	06h57	UTC-4	76°20.047	070°38.519	CTD ↓	173	327	330	8	0.6	3.11	1010.3	58	N/A
1	116	CTD	15/Sep/2006	07h06	UTC-4	76°20.083	070°38.778	CTD ↑	169	307	325	8	0.8	3.22	1010.3	55	N/A
1	N/A	N/A	15/Sep/2006	08h17	UTC-4	76°17.218	071°18.793	Sediment Traps Deployed	656	336	315	15	0.7	2.69	1007.41	66	Bergy
1	115	Full	15/Sep/2006	10h14	UTC-4	77°19.399	071°10.138	CTD-Rosette ↓	650	344	345	8	0.6	2.6	1006.57	61	Bergy
1	115	Full	15/Sep/2006	10h56	UTC-4	77°19.400	071°10.143	CTD-Rosette ↑	650	345	340	7	0.6	2.6	1006.29	70	Bergy
1	BA01-05	Mooring	15/Sep/2006	16h15	UTC-4	76°19.969	071°11.979	Mooring BA01-05 Partly Recovered	659	52	320	18	1.5	2.6	1006.1	80	Bergy
1	115	Full	15/Sep/2006	21h09	UTC-4	76°19.934	071°12.104	CTD-Rosette ↓	673	307	315	14	1.8	2.5	1004.4	81	Bergy
1	115	Full	15/Sep/2006	21h55	UTC-4	76°19.815	071°12.474	CTD-Rosette ↑	643	314	335	16	1.9	2.46	1004.18	81	Bergy
1	115	Full	15/Sep/2006	22h35	UTC-4	76°19.866	071°11.816	Horizontal Net Tow ↓	672	0	335	21	2.1	2.47	1004.18	80	Bergy
1	115	Full	15/Sep/2006	22h48	UTC-4	76°20.005	071°10.295	Horizontal Net Tow ↑	647	39	330	24	1.9	2.47	1004.14	76	Bergy
1	115	Full	15/Sep/2006	22h57	UTC-4	76°20.122	071°09.638	Horizontal Net Tow ↓	648	347	320	20	1.9	2.47	1004.14	80	Bergy
1	115	Full	15/Sep/2006	23h10	UTC-4	76°20.452	071°08.960	Horizontal Net Tow ↑	625	8	335	22	1.9	2.5	1004	82	Bergy
1	115	Full	15/Sep/2006	23h29	UTC-4	76°20.581	071°08.927	Hydrobios ↓	648	311	320	17	2.1	2.46	1003.89	80	Bergy
1	115	Full	16/Sep/2006	00h02	UTC-4	76°20.500	071°08.960	Hydrobios ↑	625	311	320	15	2.1	2.45	1003.21	78	Bergy
1	115	Full	16/Sep/2006	00h50	UTC-4	76°20.450	071°10.106	Vertical Net Tow ↓	643	347	340	15	2.1	2.46	1003.52	84	Bergy
1	115	Full	16/Sep/2006	01h23	UTC-4	76°20.479	071°09.747	Vertical Net Tow ↑	637	347	340	13	2.3	2.44	1003.52	84	Bergy
1	115	Full	16/Sep/2006	01h46	UTC-4	76°20.470	071°10.715	Bioness ↓	646	280	330	15	2.4	2.24	1003.56	85	Bergy
1	115	Full	16/Sep/2006	02h10	UTC-4	76°20.488	071°13.525	Bioness ↑	663	319	330	16	2.4	2.41	1003.30	81	Bergy
1	115	Full	16/Sep/2006	04h07	UTC-4	76°19.950	071°11.702	CTD-Rosette ↓	672	338	350	11	2.3	2.4	1003	86	Bergy
1	115	Full	16/Sep/2006	04h52	UTC-4	76°19.916	071°11.944	CTD-Rosette ↑	672	358	350	9	2.4	2.4	1004	83	Bergy
1	115	Full	16/Sep/2006	05h12	UTC-4	76°20.158	071°12.485	Thorium Pumping ↓	655	337	0	8	2.5	2.4	1004	83	Bergy
1	115	Full	16/Sep/2006	05h23	UTC-4	76°20.171	071°12.383	Thorium Pumping ↑	655	337	0	8	2.5	2.4	1004	83	Bergy

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	115	Full	16/Sep/2006	05h25	UTC-4	76°20.120	071°12.377	Thorium Pumping ↓	655	345	0	8	2.5	2.4	1004	86	Bergy
1	115	Full	16/Sep/2006	06h44	UTC-4	76°20.409	071°11.777	Thorium Pumping ↑	654	354	Variable	0/5	2.7	2.4	1004.7	87	Bergy
1	115	Full	16/Sep/2006	06h50	UTC-4	76°20.606	071°12.127	Secchi Disk ↓	654	348	100	5	3	2.4	1004.8	85	Bergy
1	115	Full	16/Sep/2006	06h58	UTC-4	76°20.606	071°12.127	Secchi Disk ↑	654	348	100	5	3	2.4	1004.8	85	Bergy
1	115	Full	16/Sep/2006	07h04	UTC-4	76°20.612	071°12.130	CTD-Rosette ↓	654	340	100	5	3	2.4	1004.8	85	Bergy
1	115	Full	16/Sep/2006	07h55	UTC-4	76°20.739	071°12.142	CTD-Rosette ↑	654	346	100	9	2.8	2.47	1005.08	80	Bergy
1	115	Full	16/Sep/2006	09h00	UTC-4	76°20.823	071°12.491	Zodiac Deployed (phytoflash + SCAMP)	653	348	130	7	2.9	2.5	1005.9	88	Bergy
1	115	Full	16/Sep/2006	09h06	UTC-4	76°20.823	071°12.491	CTD-Rosette ↓	653	348	130	7	2.9	2.5	1005.9	88	Bergy
1	115	Full	16/Sep/2006	10h00	UTC-4	76°20.975	071°12.498	CTD-Rosette ↑		339	135	6	3.5	2.5	1005.9	84	Bergy
1	115	Full	16/Sep/2006	10h22	UTC-4	76°20.962	071°12.267	PNF ↓	652	220	135	7	2.7	2.51	1006.09	84	Bergy
1	115	Full	16/Sep/2006	10h29	UTC-4	76°20.958	071°12.375	PNF ↑	652	239	135	6	2.4	2.52	1006.10	83	Bergy
1	115	Full	16/Sep/2006	11h12	UTC-4	76°20.553	071°12.072	Zodiac Recovered (Phytoflash + SCAMP)	654	347	135	6	2.5	2.54	1006.28	83	Bergy
1	115	Full	16/Sep/2006	13h07	UTC-4	76°15.117	071°26.117	Sediment Traps Recovered	617	140	135	5	2.3	2.54	1007.08	87	Bergy
1	115	Full	16/Sep/2006	13h46	UTC-4	76°15.098	071°25.898	Sediment Traps Recovered (end)	617	141	135	5	2.5	2.59	1007.18	87	Bergy
1	115	Full	16/Sep/2006	14h28	UTC-4	76°15.329	071°27.054	Phytoplankton Net ↓	619	315	170	5	2.7	2.61	1007.16	83	Bergy
1	115	Full	16/Sep/2006	14h33	UTC-4	76°15.343	071°27.010	Phytoplankton Net ↑	619	312	170	5	2.7	2.61	1007.16	83	Bergy
1	115	Full	16/Sep/2006	14h36	UTC-4	76°15.347	071°26.998	Phytoplankton Net ↓	618	312	180	5	2.5	2.58	1007.19	84	Bergy
1	115	Full	16/Sep/2006	14h41	UTC-4	76°15.362	071°26.987	Phytoplankton Net ↑	618	310	180	5	2.5	2.58	1007.19	84	Bergy
1	115	Full	16/Sep/2006	14h43	UTC-4	76°15.366	071°26.972	Phytoplankton Net ↓	618	316	170	5	2.6	2.59	1007.24	84	Bergy
1	115	Full	16/Sep/2006	14h48	UTC-4	76°43.599	071°26.966	Phytoplankton Net ↑	617	313	170	5	2.6	2.59	1007.24	84	Bergy
1	115	Full	16/Sep/2006	14h50	UTC-4	76°15.392	071°26.952	Phytoplankton Net ↓	617	313	170	5	2.6	2.6	1007.25	84	Bergy
1	115	Full	16/Sep/2006	14h56	UTC-4	76°15.408	071°26.923	Phytoplankton Net ↑	618	312	170	5	2.6	2.6	1007.25	84	Bergy
1	BA01-06	Mooring	16/Sep/2006	18h42	UTC-4	76°19.695	0 71°13.629	Mooring BA01-06 Deployed	670	N/A	230	3.6	2.1	N/A	1008.13	N/A	N/A
1	115	Full	16/Sep/2006	22h10	UTC-4	76°19.246	071°21.570	Box Core ↓	666	329	0	0	2.0	2.51	1009.65	92	Bergy
1	115	Full	16/Sep/2006	22h38	UTC-4	76°19.306	071°21.359	Box Core ↑	665	334	0	0	1.8	2.58	1009.78	92	Bergy
1	114	CTD	17/Sep/2006	00h02	UTC-4	76°19.374	071°46.923	CTD-Rosette ↓	611	307	0	0	1.5	2.59	1010.32	97	Bergy
1	114	CTD	17/Sep/2006	00h28	UTC-4	76°19.249	071°47.215	CTD-Rosette ↑	611	310	0	0	1.6	2.73	1010.57	98	Bergy
1	113	Nutrient	17/Sep/2006	01h14	UTC-4	76°19.009	072°13.429	CTD-Rosette ↓	552	304	360	5	1.4	2.37	1011.08	98	Bergy
1	113	Nutrient	17/Sep/2006	02h07	UTC-4	76°18.807	072°14.412	CTD-Rosette ↑	544	290	10	6	1.2	2.11	1011.77	99	Bergy
1	112	CTD	17/Sep/2006	02h54	UTC-4	76°18.516	072°42.405	CTD ↓	561	276	10	6	1.2	2.00	1011.74	99	Bergy
1	112	CTD	17/Sep/2006	03h20	UTC-4	76°18.775	072°42.360	CTD ↑	562	255	10	7	1.6	1.96	1012.09	99	Bergy

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	111	Nutrient	17/Sep/2006	04h50	UTC-4	76°18.378	073°13.129	CTD-Rosette ↓	596	157	350	10	0.9	1.5	1012.7	97	Bergy
1	111	Nutrient	17/Sep/2006	05h47	UTC-4	76°18.461	073°11.323	CTD-Rosette ↑	605	171	350	10	0.5	1.5	1013.5	97	Bergy
1	111	Nutrient	17/Sep/2006	05h47	UTC-4	76°19.461	073°11.323	Winch Test ↓	605	171	350	10	0.5	1.5	1013.5	97	Bergy
1	111	Nutrient	17/Sep/2006	06h02	UTC-4	76°18.460	073°10.872	Winch Test ↑	604	159	350	10	0.5	1.5	1013.5	97	Bergy
1	109	CTD	17/Sep/2006	10h20	UTC-4	76°15.281	074°10.414	CTD-Rosette ↓	446	337	350	14	0.9	1.43	1015.35	91	Bergy
1	109	CTD	17/Sep/2006	11h00	UTC-4	76°15.114	074°10.799	CTD-Rosette ↑	452	334	350	14	1.1	1.39	1015.53	86	Bergy
1	108	Full	17/Sep/2006	12h10	UTC-4	76°15.619	074°35.431	CTD-Rosette ↓	444	344	350	18	0.6	1.22	1015.89	90	Bergy
1	108	Full	17/Sep/2006	12h55	UTC-4	76°15.108	074°35.827	CTD-Rosette ↑	444	348	350	13	0.6	1.27	1015.94	89	Bergy
1	108	Full	17/Sep/2006	13h15	UTC-4	76°16.630	074°38.949	Horizontal Net Tow ↓	451	30	340	15	0.5	1.26	1015.74	89	Bergy
1	108	Full	17/Sep/2006	13h28	UTC-4	76°16.768	074°37.478	Horizontal Net Tow ↑	451	29	340	17	0.2	1.18	1016.26	89	Bergy
1	108	Full	17/Sep/2006	13h33	UTC-4	76°16.779	074°36.919	Horizontal Net Tow ↓	451	20	340	17	0.1	1.17	1016.28	89	Bergy
1	108	Full	17/Sep/2006	13h42	UTC-4	76°16.976	074°36.131	Horizontal Net Tow ↑	448	10	330	16	0.1	1.18	1016.38	89	Bergy
1	108	Full	17/Sep/2006	14h01	UTC-4	76°16.390	074°36.699	Vertical Net Tow ↓	450	343	330	16	0.5	1.17	1016.37	88	Bergy
1	108	Full	17/Sep/2006	14h22	UTC-4	76°16.230	074°36.304	Vertical Net Tow ↑	448	341	330	14	0.1	1.21	1016.60	88	Bergy
1	108	Full	17/Sep/2006	14h39	UTC-4	76°16.126	074°36.704	CTD-Rosette ↓	448	346	330	14	0.1	1.22	1016.69	88	Bergy
1	108	Full	17/Sep/2006	15h33	UTC-4	76°15.836	074°37.360	CTD-Rosette ↑	446	347	330	18	0.1	1.22	1016.45	89	Bergy
1	108	Full	17/Sep/2006	15h39	UTC-4	76°15.809	074°37.325	Phytoplankton Net ↓	447	360	330	18	0.1	1.2	1016.39	90	Bergy
1	108	Full	17/Sep/2006	15h45	UTC-4	76°15.755	074°37.206	Phytoplankton Net ↑	445	4	330	18	0.1	1.2	1016.39	90	Bergy
1	108	Full	17/Sep/2006	15h49	UTC-4	76°15.753	074°37.155	Phytoplankton Net ↓	447	348	330	14	0.2	1.2	1016.4	90	Bergy
1	108	Full	17/Sep/2006	15h53	UTC-4	76°15.741	074°37.155	Phytoplankton Net ↑	446	347	330	13	0.2	1.6	1016.4	90	Bergy
1	108	Full	17/Sep/2006	15h55	UTC-4	76°15.735	074°37.160	Phytoplankton Net ↓	447	349	330	13	0.2	1.6	1016.4	90	Bergy
1	108	Full	17/Sep/2006	16h00	UTC-4	76°15.720	074°37.145	Phytoplankton Net ↑	446	352	330	14	0.2	1.6	1016.4	90	Bergy
1	108	Full	17/Sep/2006	16h11	UTC-4	76°15.704	074°37.012	Box Core ↓	448	354	330	16	0.2	1.6	1016.4	90	Bergy
1	108	Full	17/Sep/2006	16h28	UTC-4	76°15.616	074°37.244	Box core ↑	444	343	330	15	0.2	1.6	1016.4	90	Bergy
1	106	CTD	17/Sep/2006	18h39	UTC-4	76°18.342	075°20.852	CTD ↓	382	316	315	11	-0.1	0.4	1016.7	88	Bergy
1	106	CTD	17/Sep/2006	18h55	UTC-4	76°18.327	075°20.880	CTD ↑	381	314	315	10	-0.1	0.4	1016.7	88	Bergy
1	105	Nutrient	17/Sep/2006	19h36	UTC-4	76°19.478	075°46.882	CTD-Rosette ↓	339	331	320	7	0.1	0.2	1016.8	88	Bergy
1	105	Nutrient	17/Sep/2006	20h18	UTC-4	76°19.395	075°48.797	CTD-Rosette ↑	341	328	295	6	-0.1	0.38	1016.71	92	Bergy
1	104	CTD	17/Sep/2006	21h14	UTC-4	76°20.421	076°10.806	CTD ↓	197	348	235	5	-1.2	0.23	1016.5	99	Bergy
1	104	CTD	17/Sep/2006	21h23	UTC-4	76°20.450	076°10.812	CTD ↑	195	328	235	4	-1.0	0.41	1016.34	99	Bergy
1	103	Nutrient	17/Sep/2006	22h10	UTC-4	76°21.669	076°33.951	CTD-Rosette ↓	153	330	215	8	-0.4	0.19	1016.05	99	Bergy
1	103	Nutrient	17/Sep/2006	22h37	UTC-4	76°21.648	076°33.898	CTD-Rosette ↑	153	338	210	6	-0.4	0.29	1016.38	99	Bergy

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	102	CTD	17/Sep/2006	23h30	UTC-4	76°22.623	076°59.145	CTD ↓	243	171	235	10	-0.5	0.09	1015.91	97	Bergy
1	102	CTD	17/Sep/2006	23h42	UTC-4	76°22.599	076°59.029	CTD ↑	243	172	240	10	-0.1	0.11	1016.22	97	Bergy
1	N/A	N/A	17/Sep/2006	01h13	UTC-4	76°23.533	077°21.028	Sediment Traps Deployed	333	287	270	15	-0.1	0.13	1016.45	91	1/10
1	101	Full	17/Sep/2006	02h36	UTC-4	76°23.465	077°18.393	CTD-Rosette ↓	323	259	290	11	-0.1	0.19	1016.04	93	Bergy
1	101	Full	17/Sep/2006	03h13	UTC-4	76°23.324	077°17.980	CTD-Rosette ↑	322	189	270	11	-0.1	0.27	1015.98	93	Bergy
1	101	Full	18/Sep/2006	04h13	UTC-4	76°22.978	077°23.818	CTD-Rosette ↓	348	296	270	14	-0.1	0.2	1015.9	93	Bergy
1	101	Full	18/Sep/2006	04h47	UTC-4	77°22.935	077°23.616	CTD-Rosette ↑	349	292	290	9	0.7	0.1	1016	88	Bergy
1	101	Full	18/Sep/2006	05h39	UTC-4	76°22.687	077°22.078	Bioness ↓	355	230	290	10	0.3	0.3	1016	93	Bergy
1	101	Full	18/Sep/2006	06h00	UTC-4	77°22.869	077°22.525	Bioness ↑	354	130	290	8	0.3	0.3	1016	93	Bergy
1	101	Full	18/Sep/2006	06h24	UTC-4	76°22.807	077°22.186	Vertical Net Tow ↓	356	267	270	8	-0.6	0.1	1016	96	Bergy
1	101	Full	18/Sep/2006	06h46	UTC-4	77°22.831	077°22.260	Vertical Net Tow ↑	355	273	270	10	-0.5	0.1	1016	96	Bergy
1	101	Full	18/Sep/2006	06h59	UTC-4	76°22.822	077°22.362	Vertical Net Tow ↓	357	271	270	12	-0.5	0.1	1016	96	Bergy
1	101	Full	18/Sep/2006	07h19	UTC-4	77°22.900	077°22.298	Vertical Net Tow ↑	353	255	270	12	-0.5	0.1	1016	96	Bergy
1	101	Full	18/Sep/2006	07h34	UTC-4	76°22.687	077°23.300	Horizontal Net Tow ↓	354	289	270	16	0.1	0.1	1015.7	93	Bergy
1	101	Full	18/Sep/2006	07h45	UTC-4	76°22.583	077°23.198	Horizontal Net Tow ↑	355	68	270	12	0.1	0.1	1015.7	93	Bergy
1	101	Full	18/Sep/2006	08h43	UTC-4	76°23.039	077°20.334	Zodiac Deployed (Phytoflash + SCAMP)	341	352	270	10	0.3	0.18	1015.72	90	Bergy
1	101	Full	18/Sep/2006	09h29	UTC-4	76°23.290	077°18.525	Horizontal Net Tow ↓	325	2	270	10	0.3	0.17	1015.64	90	Bergy
1	101	Full	18/Sep/2006	09h40	UTC-4	76°23.669	077°17.938	Horizontal Net Tow ↑	310	3	275	12	0.2	0.16	1015.54	91	Bergy
1	101	Full	18/Sep/2006	10h05	UTC-4	76°23.783	077°17.792	Hydrobios ↓	307	270	270	13	0.3	0.13	1015.56	90	Bergy
1	101	Full	18/Sep/2006	10h26	UTC-4	77°23.771	077°17.783	Hydrobios ↑	309	255	270	11	0.7	0.40	1015.47	89	Bergy
1	101	Full	18/Sep/2006	10h45	UTC-4	76°23.841	077°17.669	RMT ↓	308	0	270	11	0.5	0.31	1015.38	89	Bergy
1	101	Full	18/Sep/2006	10h55	UTC-4	76°24.165	077°17.266	RMT ↑	307	359	260	13	0.3	0.32	1015.27	90	Bergy
1	101	Full	18/Sep/2006	11h05	UTC-4	76°24.155	077°17.274	RMT ↓	307	359	275	11	0.2	0.19	1015.14	90	Bergy
1	101	Full	18/Sep/2006	11h15	UTC-4	77°24.589	077°16.718	RMT ↑	313	359	275	11	0.1	0.21	1015.13	91	Bergy
1	101	Full	18/Sep/2006	11h26	UTC-4	76°24.630	077°16.668	Zodiac Recovered (Phytoflash + SCAMP)	311	0	275	11	0.1	0.16	1015.05	91	Bergy
1	101	Full	18/Sep/2006	11h54	UTC-4	76°24.629	077°16.679	CTD-Rosette ↓	311	270	270	10	0.2	0.18	1014.83	91	Bergy
1	101	Full	18/Sep/2006	12h22	UTC-4	76°24.588	077°16.679	CTD-Rosette ↑	311	270	260	10	0.2	0.12	1014.69	92	Bergy
1	101	Full	18/Sep/2006	13h08	UTC-4	76°24.586	077°16.680	PNF ↓	311	255	260	9	0.7	0.11	1014.56	88	Bergy
1	101	Full	18/Sep/2006	13h16	UTC-4	77°24.558	077°16.636	PNF ↑	313	255	260	9	0.8	0.11	1014.52	88	Bergy
1	101	Full	18/Sep/2006	13h31	UTC-4	76°24.581	077°16.632	Thorium Pumping ↓	312	350	260	10	0.2	0.12	1014.36	91	Bergy
1	101	Full	18/Sep/2006	15h01	UTC-4	77°24.613	077°15.921	Thorium Pumping ↑	298	336	240	10	0.0	0.26	1013.85	92	Bergy

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	101	Full	18/Sep/2006	15h38	UTC-4	76°24.364	077°17.490	CTD-Rosette ↓	309	220	230	8	-0.0	0.21	1013.63	94	Bergy
1	101	Full	18/Sep/2006	16h14	UTC-4	77°24.365	077°17.494	CTD-Rosette ↑	309	219	225	9	0.1	0.18	1013.3	93	Bergy
1	101	Full	18/Sep/2006	17h37	UTC-4	76°22.919	077°25.680	CTD-Rosette ↓	393	292	245	7	0.1	0.1	1012.6	92	Bergy
1	101	Full	18/Sep/2006	18h11	UTC-4	76°23.000	077°25.590	CTD-Rosette ↑	388	177	240	7	0.2	0.2	1012.6	92	Bergy
1	BA03-06	Mooring	18/Sep/2006	19h07	UTC-4	76°23.157	077°24.626	Mooring BA03-06 Deployed	358	N/A	220	5	-0.2	N/A	1012.34	N/A	N/A
1	101	Full	18/Sep/2006	20h25	UTC-4	76°23.477	077°23.512	Sediment Traps Recovered	682	215	0	0	1.0	0.07	1011.42	88	Bergy
1	101	Full	18/Sep/2006	21h22	UTC-4	76°24.412	077°17.463	Phytoplankton Net ↓	330	84	0	0	1.0	0.26	1010.94	87	Bergy
1	101	Full	18/Sep/2006	21h27	UTC-4	76°24.460	077°17.545	Phytoplankton Net ↑	314	65	0	0	1.0	0.26	1010.94	87	Bergy
1	101	Full	18/Sep/2006	21h30	UTC-4	76°24.481	077°17.569	Phytoplankton Net ↓	314	54	0	0	1.0	0.26	1010.94	87	Bergy
1	101	Full	18/Sep/2006	21h35	UTC-4	76°24.522	077°17.613	Phytoplankton Net ↑	314	37	0	0	0.8	0.18	1010.71	88	Bergy
1	101	Full	18/Sep/2006	21h37	UTC-4	76°24.531	077°17.623	Phytoplankton Net ↓	314	35	0	0	0.8	0.18	1010.71	88	Bergy
1	101	Full	18/Sep/2006	21h42	UTC-4	76°24.577	077°17.678	Phytoplankton Net ↑	315	29	0	0	0.8	0.18	1010.71	88	Bergy
1	101	Full	18/Sep/2006	21h44	UTC-4	76°24.595	077°17.692	Phytoplankton Net ↓	313	29	0	0	0.6	0.23	1010.64	89	Bergy
1	101	Full	18/Sep/2006	21h51	UTC-4	77°24.625	077°17.704	Phytoplankton Net ↑	311	30	0	0	0.6	0.23	1010.64	89	Bergy
1	101	Full	18/Sep/2006	22h00	UTC-4	76°24.687	077°17.735	Box Core ↓	311	41	0	0	0.4	0.3	1010.44	89	Bergy
1	101	Full	18/Sep/2006	22h12	UTC-4	76°24.578	077°17.579	Box Core ↑	308	52	0	0	0.5	0.32	1010.21	90	Bergy
1	Belcher Glacier (133)	Basic	19/Sep/2006	16h08	UTC-4	75°40.212	081°15.762	CTD-Rosette ↓	178	245	260	20	7.2	0.54	1011.76	56	Bergy
1	Belcher Glacier (133)	Basic	19/Sep/2006	16h35	UTC-4	75°40.062	081°15.836	CTD-Rosette ↑	228	276	270	10	6.3	0.5	1012	61	Bergy
1	Belcher Glacier (133)	Basic	19/Sep/2006	17h17	UTC-4	75°42.357	081°00.629	CTD ↓	209	297	280	26	4.6	0.47	1011.43	67	Bergy
1	Belcher Glacier (133)	Basic	19/Sep/2006	17h27	UTC-4	75°42.409	081°00.663	CTD ↑	407	282	285	25	4.6	0.47	1011.4	67	Bergy
1	Belcher Glacier (133)	Basic	19/Sep/2006	18h49	UTC-4	75°42.678	081°48.539	CTD-Rosette ↓	627	305	300	19	3.2	0.47	1012.7	81	Bergy
1	Belcher Glacier (133)	Basic	19/Sep/2006	19h38	UTC-4	75°42.568	081°47.863	CTD-Rosette ↑	626	341	300	22	2.9	0.6	1012.40	79	Bergy
1	Belcher Glacier (133)	Basic	19/Sep/2006	20h10	UTC-4	75°39.929	080°34.090	CTD ↓	630	314	295	20	2.3	0.46	1012.40	83	Bergy
1	Belcher Glacier (133)	Basic	19/Sep/2006	20h35	UTC-4	75°39.799	080°34.895	CTD ↑	627	339	305	19	2.3	0.46	1012.65	83	Bergy
1	300	Nutrient	20/Sep/2006	04h31	UTC-4	74°22.341	079°58.200	CTD-Rosette ↓	690	129	110	8	-0.1	1.3	1011.8	99	Bergy
1	300	Nutrient	20/Sep/2006	05h29	UTC-4	74°22.353	079°58.310	CTD-Rosette ↑	690	59	90	8	0.3	1.3	1012.2	99	Bergy
1	301	Basic	20/Sep/2006	10h56	UTC-4	74°10.100	083°34.100	Trawl Net ↓	681	N/A	60	5	0.2	1.07	1013.21	99	Bergy

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	301	Basic	20/Sep/2006	14h36	UTC-4	74°10.513	083°18.549	Trawl Net ↑	693	N/A	60	8	1.3	1.12	1014.45	89	Bergy
1	301	Basic	20/Sep/2006	15h25	UTC-4	74°07.471	083°19.397	CTD-Rosette ↓	675	90	70	6	1.4	1.29	1014.86	89	Bergy
1	301	Basic	20/Sep/2006	16h23	UTC-4	74°07.862	083°19.606	CTD-Rosette ↑	676	75	100	5	1.3	1.3	1015	91	Bergy
1	301	Basic	20/Sep/2006	17h45	UTC-4	74°07.382	083°19.483	Vertical Net Tow ↓	680	185	0	0	1.6	1.2	1015.30	89	Bergy
1	301	Basic	20/Sep/2006	18h20	UTC-4	74°07.468	083°19.836	Vertical Net Tow ↑	674	212	285	8	1.3	1.1	1015.30	90	Bergy
1	301	Basic	20/Sep/2006	19h04	UTC-4	74°07.446	083°20.730	CTD-Rosette ↓	680	244	270	7	1.1	1.1	1015.4	93	Bergy
1	301	Basic	20/Sep/2006	19h48	UTC-4	74°07.702	083°20.883	CTD-Rosette ↑	675	331	270	6	1.0	1.17	1015.5	93	Bergy
1	301	Basic	20/Sep/2006	21h21	UTC-4	74°08.543	083°22.841	CTD-Rosette ↓	678	152	265	7	1.1	1.13	1015.32	92	Bergy
1	301	Basic	20/Sep/2006	22h22	UTC-4	74°08.960	083°24.226	CTD-Rosette ↑	679	168	230	9	1.0	1.08	1015.24	92	Bergy
1	301	Basic	20/Sep/2006	22h29	UTC-4	74°09.015	083°24.369	Phytoplankton Net ↓	679	171	235	9	1.0	1.08	1015.24	92	Bergy
1	301	Basic	20/Sep/2006	22h29	UTC-4	74°09.024	083°24.388	Phytoplankton Net ↑	679	168	235	9	1.0	1.08	1015.24	92	Bergy
1	301	Basic	20/Sep/2006	22h33	UTC-4	74°09.041	083°24.432	Phytoplankton Net ↓	679	168	235	7	1.0	1.08	1015.24	92	Bergy
1	301	Basic	20/Sep/2006	22h39	UTC-4	74°09.090	083°24.528	Phytoplankton Net ↑	680	165	230	9	1.1	1.08	1015.19	91	Bergy
1	301	Basic	20/Sep/2006	22h42	UTC-4	74°09.113	083°24.584	Phytoplankton Net ↓	680	161	230	8	1.2	1.07	1015.22	90	Bergy
1	301	Basic	20/Sep/2006	22h50	UTC-4	74°09.179	083°24.748	Phytoplankton Net ↑	679	162	230	8	1.2	1.07	1015.22	90	Bergy
1	301	Basic	20/Sep/2006	22h53	UTC-4	74°09.201	083°24.806	Phytoplankton Net ↓	681	165	230	9	1.2	1.07	1015.32	90	Bergy
1	301	Basic	20/Sep/2006	23h01	UTC-4	74°09.278	083°24.011	Phytoplankton Net ↑	683	168	230	8	1.2	1.07	1015.37	90	Bergy
1	301	Basic	20/Sep/2006	23h18	UTC-4	74°09.449	083°25.326	Box Core ↓	684	149	230	9	1.0	1.08	1015.42	92	Bergy
1	301	Basic	20/Sep/2006	23h43	UTC-4	74°09.520	083°25.726	Box Core ↑	684	159	230	11	1.2	1.05	1015.31	90	Bergy
1	302	Nutrient	21/Sep/2006	04h01	UTC-4	74°09.224	086°16.265	CTD-Rosette ↓	519	53	230	10	1.1	1.3	1015.10	91	Bergy
1	302	Nutrient	21/Sep/2006	04h52	UTC-4	74°09.055	083°16.379	CTD-Rosette ↑	574	54	245	10	1.1	1.3	1015.10	91	Bergy
1	303	Full	21/Sep/2006	09h12	UTC-4	74°14.192	089°40.443	Secchi Disk ↓	225	314	315	14	0.2	1.04	1016.89	73	Bergy
1	303	Full	21/Sep/2006	09h15	UTC-4	74°14.216	089°40.585	Secchi Disk ↑	225	297	315	12	0.2	1.04	1016.89	73	Bergy
1	303	Full	21/Sep/2006	09h24	UTC-4	74°14.203	089°40.662	CTD-Rosette ↓	224	330	315	10	0.3	1.03	1017.16	75	Bergy
1	303	Full	21/Sep/2006	09h56	UTC-4	74°14.194	089°40.707	CTD-Rosette ↑	227	332	320	10	0.2	1.05	1017.16	77	Bergy
1	303	Full	21/Sep/2006	10h15	UTC-4	74°14.298	089°40.899	Horizontal Net Tow ↓	225	302	320	10	0.2	1.04	1017.21	78	Bergy
1	303	Full	21/Sep/2006	10h26	UTC-4	74°14.170	089°40.584	Horizontal Net Tow ↑	225	36	320	12	0.3	1.03	1017.22	77	Bergy
1	303	Full	21/Sep/2006	10h31	UTC-4	74°14.198	089°40.433	Horizontal Net Tow ↓	227	339	320	12	0.4	0.99	1017.19	72	Bergy
1	303	Full	21/Sep/2006	10h44	UTC-4	74°14.165	089°40.401	Horizontal Net Tow ↑	226	91	320	7	0.4	0.98	1017.17	74	Bergy
1	303	Full	21/Sep/2006	10h55	UTC-4	74°14.167	089°39.816	Vertical Net Tow ↓	226	318	285	11	0.7	0.98	1017.22	72	Bergy
1	303	Full	21/Sep/2006	11h10	UTC-4	74°14.166	089°39.507	Vertical Net Tow ↑	230	331	305	10	0.5	1.07	1017.17	78	Bergy
1	303	Full	21/Sep/2006	12h35	UTC-4	74°13.971	089°39.196	RMT ↓	230	64	305	12	0.2	1.09	1017.45	79	0/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	303	Full	21/Sep/2006	12h45	UTC-4	74°14.084	089°37.901	RMT ↑	231	50	310	12	0.2	1.12	1017.40	79	0/10
1	303	Full	21/Sep/2006	12h54	UTC-4	74°14.154	089°36.918	RMT ↓	235	67	320	12	0.3	1.10	1017.46	76	0/10
1	303	Full	21/Sep/2006	13h03	UTC-4	74°14.245	089°35.865	RMT ↑	236	44	320	12	0.3	1.05	1017.38	75	0/10
1	303	Full	21/Sep/2006	13h34	UTC-4	74°14.118	089°39.816	CTD-Rosette ↓	229	273	280	10	0.5	1.05	1017.49	78	0/10
1	303	Full	21/Sep/2006	14h12	UTC-4	74°13.934	089°39.471	CTD-Rosette ↑	230	256	280	11	0.7	1.19	1017.62	78	0/10
1	303	Full	21/Sep/2006	14h29	UTC-4	74°13.939	089°39.530	Phytoplankton Net ↓	230	306	280	14	0.6	1.19	1017.60	81	0/10
1	303	Full	21/Sep/2006	14h36	UTC-4	74°13.940	089°39.497	Phytoplankton Net ↑	230	312	280	14	0.6	1.19	1017.60	81	0/10
1	303	Full	21/Sep/2006	14h38	UTC-4	74°13.943	089°39.488	Phytoplankton Net ↓	229	309	280	13	0.7	1.19	1017.54	82	0/10
1	303	Full	21/Sep/2006	14h45	UTC-4	74°13.939	089°39.459	Phytoplankton Net ↑	229	307	280	13	0.7	1.19	1017.54	82	0/10
1	303	Full	21/Sep/2006	14h47	UTC-4	74°13.944	089°39.449	Phytoplankton Net ↓	229	315	270	13	0.6	1.21	1017.58	83	0/10
1	303	Full	21/Sep/2006	14h54	UTC-4	74°13.960	089°39.404	Phytoplankton Net ↑	229	308	270	13	0.6	1.21	1017.58	83	0/10
1	303	Full	21/Sep/2006	15h05	UTC-4	74°13.961	089°39.370	Box Core ↓	229	306	300	12	0.6	1.24	1017.64	83	0/10
1	303	Full	21/Sep/2006	15h16	UTC-4	74°13.948	089°39.354	Box Core ↑	231	311	310	14	0.7	1.24	1017.67	80	0/10
1	304	Nutrient	21/Sep/2006	20h28	UTC-4	74°21.748	093°19.007	CTD-Rosette ↓	173	265	270	13	-0.0	0.45	1020.74	78	0/10
1	304	Nutrient	21/Sep/2006	20h58	UTC-4	74°21.609	093°18.645	CTD-Rosette ↑	172	268	270	11	-0.2	0.43	1020.84	79	0/10
1	305	Nutrient	21/Sep/2006	23h26	UTC-4	74°19.748	094°59.774	CTD-Rosette ↓	170	242	230	13	-1.3	-0.15	1020.99	93	0/10
1	305	Nutrient	21/Sep/2006	23h55	UTC-4	74°19.833	094°59.210	CTD-Rosette ↑	140	247	230	10	-1.3	-0.05	1020.94	94	0/10
1	Resolute Bay	CTD	22/Sep/2006	06h20	UTC-4	74°40.912	095°11.482	CTD ↓	150	235	250	8	-0.8	-0.1	1020.80	87	0/10
1	Resolute Bay	CTD	22/Sep/2006	06h26	UTC-4	74°40.880	095°11.552	CTD ↑	150	212	250	8	-0.8	-0.1	1020.80	87	0/10
1	306	CTD	23/Sep/2006	01h51	UTC-4	74°20.946	097°35.026	CTD ↓	132	257	230	5	-3.7	-0.73	1017.26	99	2/10
1	306	CTD	23/Sep/2006	02h00	UTC-4	74°20.914	097°35.115	CTD ↑	132	252	230	5	-3.7	N/A	1017.25	99	2/10
1	N/A	N/A	23/Sep/2006	07h13	UTC-4	74°25.994	100°41.294	Sediment Traps Deployed	151	326	180	11	-4.0	-0.5	1015	99	2/10
1	307	Full	23/Sep/2006	08h07	UTC-4	74°24.148	100°35.075	CTD-Rosette ↓	167	208	165	10	-3.8	-0.6	1014.61	99	2/10
1	307	Full	23/Sep/2006	08h44	UTC-4	74°24.268	100°34.430	CTD-Rosette ↑	165	259	160	10	-3.8	-0.47	1014.29	99	2/10
1	307	Full	23/Sep/2006	09h22	UTC-4	74°24.466	100°29.278	EM Sampling ↓	170	155	185	8	-3.7	-0.66	1014.07	99	2/10
1	307	Full	23/Sep/2006	09h55	UTC-4	74°24.586	100°27.821	EM Sampling ↑	178	169	180	10	-3.3	-0.51	1013.85	99	2/10
1	307	Full	23/Sep/2006	10h21	UTC-4	74°24.244	100°35.419	CTD-Rosette ↓	168	202	165	8	-3.5	-0.61	1013.63	99	2/10
1	307	Full	23/Sep/2006	10h55	UTC-4	74°24.290	100°34.582	CTD-Rosette ↑	166	293	165	9	-3.5	-0.59	1011.11	99	2/10
1	307	Full	23/Sep/2006	11h18	UTC-4	74°24.463	100°33.690	Skippy Boat Deployed	165	256	155	9	-3.8	-0.57	1013.08	99	2/10
1	307	Full	23/Sep/2006	11h26	UTC-4	74°24.535	100°33.405	Zodiac Deployed	166	258	160	9	-3.7	-0.54	1013.08	99	2/10
1	307	Full	23/Sep/2006	11h40	UTC-4	74°24.700	100°33.100	PNF ↓	166	248	160	8	-3.5	-0.53	1013.03	99	2/10
1	307	Full	23/Sep/2006	11h50	UTC-4	74°24.734	100°32.807	PNF ↑	166	248	160	8	-3.5	-0.53	1013.03	99	2/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	307	Full	23/Sep/2006	12h15	UTC-4	74°24.890	100°32.035	Zodiac + Skippy Boat Recovered	166	250	160	8	-3.3	-0.59	1012.83	99	2/10
1	307	Full	23/Sep/2006	13h25	UTC-4	74°25.290	100°33.131	Zodiac Deployed	166	90	160	10	-2.7	-0.66	1012.36	99	2/10
1	307	Full	23/Sep/2006	13h45	UTC-4	74°25.360	100°29.718	Vertical Net Tow ↓	168	234	160	10	-2.7	-0.66	1012.36	99	2/10
1	307	Full	23/Sep/2006	13h54	UTC-4	74°25.398	100°29.623	Vertical Net Tow ↑	168	232	170	10	-2.8	-0.56	1012.37	99	2/10
1	307	Full	23/Sep/2006	14h09	UTC-4	74°25.442	100°29.357	Hydrobios ↓	168	206	170	10	-2.6	-0.54	1012.30	99	2/10
1	307	Full	23/Sep/2006	14h19	UTC-4	74°25.444	100°29.106	Hydrobios ↑	173	193	180	8	-2.5	-0.49	1012.32	99	2/10
1	307	Full	23/Sep/2006	14h33	UTC-4	74°25.352	100°28.314	Horizontal Net Tow ↓	173	Var	180	9	-2.4	-0.52	1012.20	99	2/10
1	307	Full	23/Sep/2006	14h40	UTC-4	74°25.407	100°27.456	Horizontal Net Tow ↑	168	Var	180	8	-2.4	-0.52	1012.15	99	2/10
1	307	Full	23/Sep/2006	15h00	UTC-4	74°25.727	100°26.785	Bioness ↓	163	Var	180	10	-2.1	-0.59	1012.03	99	2/10
1	307	Full	23/Sep/2006	15h22	UTC-4	74°25.840	100°25.624	Bioness ↑	157	Var	180	8	-2.7	-0.60	1011.98	99	2/10
1	307	Full	23/Sep/2006	15h42	UTC-4	74°25.915	100°25.624	Vertical Ring Net ↓	161	106	180	9	-2.3	-0.56	1011.84	99	2/10
1	307	Full	23/Sep/2006	15h44	UTC-4	74°25.928	100°25.614	Vertical Ring Net ↑	161	105	180	9	-2.3	-0.56	1011.84	99	2/10
1	307	Full	23/Sep/2006	15h45	UTC-4	74°25.932	100°25.622	Vertical Ring Net ↓	162	77	180	9	-2.3	-0.56	1011.84	99	2/10
1	307	Full	23/Sep/2006	15h49	UTC-4	74°25.946	100°25.608	Vertical Ring Net ↑	162	112	180	9	-2.3	-0.56	1011.84	99	2/10
1	307	Full	23/Sep/2006	15h50	UTC-4	74°25.952	100°25.606	Vertical Ring Net ↓	163	114	180	9	-2.3	-0.50	1011.80	99	2/10
1	307	Full	23/Sep/2006	15h54	UTC-4	74°25.960	100°25.515	Vertical Ring Net ↑	163	114	180	9	-2.3	-0.50	1011.80	99	2/10
1	307	Full	23/Sep/2006	16h17	UTC-4	74°26.163	100°24.109	Vertical Net Tow ↓	166	98	165	8	-2.1	-0.40	1011.30	99	2/10
1	307	Full	23/Sep/2006	16h30	UTC-4	74°26.306	100°24.644	Vertical Net Tow ↑	165	254	180	9	-2.1	-0.40	1011.30	99	2/10
1	307	Full	23/Sep/2006	16h35	UTC-4	74°26.224	100°25.116	Vertical Net Tow ↓	162	202	180	9	-2.1	-0.4	1011.30	99	2/10
1	307	Full	23/Sep/2006	16h49	UTC-4	74°26.055	100°24.600	Vertical Net Tow ↑	164	26	180	9	-2.1	-0.4	1011.30	99	2/10
1	307	Full	23/Sep/2006	18h22	UTC-4	74°26.544	100°27.536	CTD-Rosette ↓	154	193	180	10	-2.5	-0.6	1011.30	99	2/10
1	307	Full	23/Sep/2006	18h47	UTC-4	74°26.504	100°27.330	CTD-Rosette ↑	151	137	180	6	-2.5	-0.6	1011.30	99	2/10
1	307	Full	23/Sep/2006	19h40	UTC-4	74°23.845	100°35.275	CTD-Rosette ↓	172	182	175	10	-2.5	-0.5	1010.50	99	2/10
1	307	Full	23/Sep/2006	20h00	UTC-4	74°23.836	100°35.065	CTD-Rosette ↑	172	187	180	6	-2.4	-0.51	1010.79	99	2/10
1	307	Full	23/Sep/2006	20h51	UTC-4	74°23.957	100°34.509	CTD-Rosette ↓	168	183	180	7	-2.1	-0.48	1010.44	99	2/10
1	307	Full	23/Sep/2006	21h25	UTC-4	74°23.948	100°33.781	CTD-Rosette ↑	170	185	180	8	-2.2	-0.43	1010.50	99	2/10
1	307	Full	23/Sep/2006	21h56	UTC-4	74°24.241	100°37.174	Thorium Pumping ↓	165	182	185	6	-2.4	-0.63	1010.22	99	2/10
1	307	Full	23/Sep/2006	23h47	UTC-4	74°24.485	100°34.447	Thorium Pumping ↑	167	295	185	5	-2.4	-0.39	1009.93	99	2/10
1	N/A	N/A	24/Sep/2006	00h16	UTC-4	74°27.097	102°49.257	Sediment Traps Recovered	163	15	230	4	-2.6	-0.47	1010.06	99	2/10
1	307	Full	24/Sep/2006	01h21	UTC-4	74°24.056	100°34.991	Phytoplankton ↓	171	244	200	3	-2.8	-0.67	1009.91	99	2/10
1	307	Full	24/Sep/2006	01h27	UTC-4	74°24.046	100°34.999	Phytoplankton ↑	171	254	200	3	-2.8	-0.67	1009.91	99	2/10
1	307	Full	24/Sep/2006	01h29	UTC-4	74°24.042	100°34.998	Phytoplankton ↓	166	258	200	2	-2.9	-0.65	1009.94	99	2/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	307	Full	24/Sep/2006	01h38	UTC-4	74°24.029	100°34.994	Phytoplankton ↑	166	272	200	2	-2.9	-0.65	1009.94	99	2/10
1	307	Full	24/Sep/2006	01h41	UTC-4	74°24.025	100°34.988	Phytoplankton ↓	168	278	180	3	-3.0	-0.58	1009.94	99	2/10
1	307	Full	24/Sep/2006	01h47	UTC-4	74°24.015	100°34.984	Phytoplankton ↑	168	292	180	3	-3.0	-0.58	1009.94	99	2/10
1	307	Full	24/Sep/2006	01h56	UTC-4	74°24.001	100°34.991	Box Core ↓	172	307	200	3	-3.1	-0.57	1009.94	99	2/10
1	307	Full	24/Sep/2006	02h04	UTC-4	74°23.983	100°35.029	Box core ↑	169	306	200	3	-3.1	-0.54	1009.93	99	2/10
1	307.5	CTD	24/Sep/2006	05h38	UTC-4	73°53.965	101°58.879	CTD ↓	130	195	120	5	-2.0	-0.9	1010.1	99	2/10
1	307.5	CTD	24/Sep/2006	05h45	UTC-4	73°53.942	101°58.849	CTD ↑	130	196	140	5	-2.0	-0.9	1010.1	99	2/10
1	308	Nutrient	24/Sep/2006	08h48	UTC-4	73°30.448	103°29.140	CTD-Rosette ↓	327	46	0	0	-1.7	-0.9	1010.71	99	3/10
1	308	Nutrient	24/Sep/2006	09h30	UTC-4	73°30.444	103°29.383	CTD-Rosette ↑	322	142	0	0	-2.2	-0.41	1010.95	99	3/10
1	308	Nutrient	24/Sep/2006	09h58	UTC-4	73°30.443	103°28.958	CTD-Rosette ↓	325	79	30	4	-2.5	-0.48	1011.17	99	3/10
1	308	Nutrient	24/Sep/2006	10h28	UTC-4	73°30.526	103°29.365	CTD-Rosette ↑	323	151	50	4	-2.6	-0.35	1011.41	99	3/10
1	308.5	CTD	24/Sep/2006	14h44	UTC-4	73°03.334	103°32.590	CTD ↓	349	358	350	7	-2.3	-0.98	1012.23	99	9/10
1	308.5	CTD	24/Sep/2006	15h01	UTC-4	73°03.300	103°32.637	CTD ↑	350	58	350	8	-0.9	-0.98	1012.30	99	9/10
1	308.5	CTD	24/Sep/2006	15h35	UTC-4	73°03.293	103°32.166	Skippy Boat Deployed	347	47	340	9	-2.6	-0.86	1012.52	99	9/10
1	308.5	CTD	24/Sep/2006	16h30	UTC-4	73°03.293	103°32.166	Skippy Boat Recovered	347	47	340	9	-2.6	-0.86	1012.52	99	9/10
1	309	CTD	24/Sep/2006	20h11	UTC-4	72°30.303	103°30.376	CTD ↓	279	339	0	11	-1.9	-0.78	1013.14	99	1-3/10
1	309	CTD	24/Sep/2006	20h24	UTC-4	72°30.276	103°30.630	CTD ↑	277	357	0	13	-1.7	-0.78	1013.08	99	1-3/10
1	309.5	CTD	24/Sep/2006	23h14	UTC-4	71°59.542	102°59.880	CTD ↓	240	352	0	14	-1.6	-0.79	1012.4	99	1-3/10
1	309.5	CTD	24/Sep/2006	23h25	UTC-4	71°59.866	102°59.885	CTD ↑	240	5	0	13	-1.5	-0.72	1012.37	99	1-3/10
1	309.5	CTD	24/Sep/2006	23h39	UTC-4	71°59.822	102°59.876	Phytoflash ↓	241	0	5	14	-1.5	-0.53	1012.53	99	1-3/10
1	309.5	CTD	25/Sep/2006	00h53	UTC-4	71°59.451	102°59.986	Phytoflash ↑	238	10	10	12	-1.4	-0.40	1012.52	99	1-3/10
1	310	Basic	25/Sep/2006	04h47	UTC-4	71°29.693	102°15.379	CTD-Rosette ↓	211	35	10	15	-1.2	-0.9	1012.4	94	7/10
1	310	Basic	25/Sep/2006	05h22	UTC-4	71°29.251	102°14.651	CTD-Rosette ↑	211	350	15	15	-1.2	-0.9	1012.4	94	7/10
1	310	Basic	25/Sep/2006	06h28	UTC-4	71°29.474	102°13.435	CTD-Rosette ↓	210	340	15	14	-1.0	-0.6	1012.80	93	7/10
1	310	Basic	25/Sep/2006	07h14	UTC-4	71°28.892	102°12.607	CTD-Rosette ↑	205	275	15	16	-0.9	-0.6	1012.80	93	5/10
1	310	Basic	25/Sep/2006	08h00	UTC-4	71°28.242	102°14.282	EM Sampling ↓	205	245	20	19	0.1	-0.58	1012.95	90	3/10
1	310	Basic	25/Sep/2006	08h54	UTC-4	71°27.371	102°13.032	Zodiac Deployed	200	238	15	17	-0.0	-0.57	1012.98	90	3/10
1	310	Basic	25/Sep/2006	09h05	UTC-4	71°27.120	102°12.657	Zodiac Recovered	202	237	15	16	-0.0	-0.56	1012.99	90	3/10
1	310	Basic	25/Sep/2006	09h14	UTC-4	71°26.925	102°12.408	EM Sampling ↑	203	235	15	17	0.1	-0.48	1013.0	90	3/10
1	310	Basic	25/Sep/2006	10h04	UTC-4	71°25.873	102°10.308	EM Sampling ↓	196	312	30	15	-0.9	-0.22	1013.13	93	3/10
1	310	Basic	25/Sep/2006	10h55	UTC-4	71°24.881	102°09.894	EM Sampling ↑	192	300	30	16	0.1	-0.46	1013.41	89	3/10
1	310	Basic	25/Sep/2006	11h25	UTC-4	71°26.886	102°15.407	Horizontal Net Tow ↓	201	103	30	17	-0.8	-0.54	1013.14	93	3/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	310	Basic	25/Sep/2006	11h36	UTC-4	71°26.573	102°14.492	Horizontal Net Tow ↑	201	87	15	17	-0.9	-0.58	1013.60	92	3/10
1	310	Basic	25/Sep/2006	11h52	UTC-4	71°26.772	102°15.556	Horizontal Net Tow ↓	198	80	20	20	-0.9	-0.54	1013.58	93	3/10
1	310	Basic	25/Sep/2006	12h02	UTC-4	71°26.509	102°14.643	Horizontal Net Tow ↑	200	81	20	19	-1.1	-0.59	1013.85	93	3/10
1	310	Basic	25/Sep/2006	14h21	UTC-4	71°21.420	102°10.160	Vertical Net Tow ↓	176	18	30	18	-2.6	-0.56	1014.55	99	3/10
1	310	Basic	25/Sep/2006	14h32	UTC-4	71°21.369	102°10.194	Vertical Net Tow ↑	177	24	30	18	-2.4	-0.55	1014.66	99	3/10
1	310	Basic	25/Sep/2006	14h43	UTC-4	71°21.194	102°10.314	Vertical Ring Net ↓	181	25	20	18	-2.3	-0.53	1014.76	99	3/10
1	310	Basic	25/Sep/2006	14h48	UTC-4	71°21.172	102°10.290	Vertical Ring Net ↑	181	25	20	18	-2.3	-0.53	1014.76	99	3/10
1	310	Basic	25/Sep/2006	14h50	UTC-4	71°21.162	102°10.286	Vertical Ring Net ↓	180	26	20	16	-2.4	-0.54	1014.78	99	3/10
1	310	Basic	25/Sep/2006	14h56	UTC-4	71°21.133	102°10.251	Vertical Ring Net ↑	180	29	20	16	-2.4	-0.54	1014.78	99	3/10
1	310	Basic	25/Sep/2006	14h58	UTC-4	71°21.112	102°10.263	Vertical Ring Net ↓	181	22	20	18	-2.4	-0.54	1014.78	99	3/10
1	310	Basic	25/Sep/2006	15h04	UTC-4	71°21.068	102°10.261	Vertical Ring Net ↑	181	22	20	18	-2.4	-0.54	1014.78	99	3/10
1	310	Basic	25/Sep/2006	15h11	UTC-4	71°20.842	102°10.587	Vertical Ring Net ↓	175	30	20	16	-2.3	-0.52	1015.02	99	3/10
1	310	Basic	25/Sep/2006	15h16	UTC-4	71°20.805	102°10.598	Vertical Ring Net ↑	176	32	20	16	-2.3	-0.52	1015.02	99	3/10
1	310	Basic	25/Sep/2006	15h18	UTC-4	71°20.795	102°10.609	Vertical Ring Net ↓	174	32	20	16	-2.3	-0.52	1015.02	99	3/10
1	310	Basic	25/Sep/2006	15h24	UTC-4	71°20.712	102°10.665	Vertical Ring Net ↑	174	35	20	16	-2.3	-0.52	1015.02	99	3/10
1	310	Basic	25/Sep/2006	15h51	UTC-4	71°29.940	102°14.495	CTD-Rosette ↓	213	8	20	18	-2.1	-0.6	1015.9	99	N/A
1	310	Basic	25/Sep/2006	16h11	UTC-4	71°29.906	102°14.435	CTD-Rosette ↑	210	343	20	15	-2.1	-0.6	1015.9	99	N/A
1	310	Basic	25/Sep/2006	16h12	UTC-4	71°29.906	102°14.435	500HP Winch Test ↓	210	346	20	17	-2.1	-0.6	1015.9	99	N/A
1	310	Basic	25/Sep/2006	16h22	UTC-4	71°29.906	102°14.435	500HP Winch Test ↑	210	349	20	15	-2.1	-0.6	1015.9	99	N/A
1	310	Basic	25/Sep/2006	18h37	UTC-4	71°28.731	102°15.321	Phytoplankton Net ↓	211	33	20	16	-2.1	-0.6	1015.9	99	N/A
1	310	Basic	25/Sep/2006	18h43	UTC-4	71°28.604	102°15.083	Phytoplankton Net ↑	211	30	20	16	-2.1	-0.6	1015.9	99	N/A
1	310	Basic	25/Sep/2006	18h45	UTC-4	71°28.578	102°15.005	Phytoplankton Net ↓	209	27	20	14	-2.1	-0.6	1015.9	99	N/A
1	310	Basic	25/Sep/2006	18h52	UTC-4	71°28.472	102°14.563	Phytoplankton Net ↑	204	36	20	19	-2.1	-0.6	1015.9	99	N/A
1	310	Basic	25/Sep/2006	18h54	UTC-4	71°28.545	102°14.338	Phytoplankton Net ↓	206	0	20	14	-2.1	-0.6	1015.9	99	N/A
1	310	Basic	25/Sep/2006	19h02	UTC-4	71°28.605	102°14.238	Phytoplankton Net ↑	206	0	20	17	-1.8	-0.4	1016.7	99	N/A
1	310	Basic	25/Sep/2006	19h02	UTC-4	71°28.605	102°14.238	Phytoplankton Net ↓	206	1	20	17	-1.8	-0.4	1016.7	99	N/A
1	310	Basic	25/Sep/2006	19h09	UTC-4	71°28.589	102°14.090	Phytoplankton Net ↑	206	17	20	17	-1.8	-0.4	1016.7	99	N/A
1	310	Basic	25/Sep/2006	19h22	UTC-4	71°28.922	102°15.219	Box Core ↓	214	347	25	17	-1.8	-0.4	1016.7	99	N/A
1	310	Basic	25/Sep/2006	19h32	UTC-4	71°28.895	102°15.091	Box Core ↑	212	17	25	14	-1.8	-0.4	1016.7	99	N/A
1	310.5	CTD	26/Sep/2006	01h05	UTC-4	71°09.949	099°45.124	CTD ↓	138	354	25	17	-0.9	0.73	1015.91	91	0/10
1	310.5	CTD	26/Sep/2006	01h13	UTC-4	71°09.938	099°45.141	CTD ↑	138	353	25	16	-0.8	0.86	1016.04	89	0/10
1	311	Nutrient	26/Sep/2006	07h03	UTC-4	70°16.387	098°27.511	CTD-Rosette ↓	149	11	10	20	-0.4	0.0	1015.3	85	N/A

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	311	Nutrient	26/Sep/2006	07h32	UTC-4	70°16.120	098°27.743	CTD-Rosette ↑	152	20	0	15	-0.4	0.0	1015.3	85	N/A
1	312	Basic	26/Sep/2006	13h40	UTC-4	69°09.537	100°42.368	CTD-Rosette ↓	61	15	0	25	-0.8	0.81	1016.55	87	0/10
1	312	Basic	26/Sep/2006	13h45	UTC-4	69°09.522	100°42.570	CTD-Rosette ↑	61	14	0	25	-0.8	0.81	1016.55	87	0/10
1	312	Basic	26/Sep/2006	14h21	UTC-4	69°09.513	100°42.457	Box Core ↓	63	21	350	20	-0.9	0.84	1016.87	84	0/10
1	312	Basic	26/Sep/2006	14h27	UTC-4	69°09.503	100°42.491	Box Core ↑	63	12	350	20	-0.9	0.84	1016.87	84	0/10
1	312	Basic	26/Sep/2006	13h54	UTC-4	69°09.522	100°42.645	Phytoplankton Net ↓	65	27	0	22	-0.9	0.82	1016.82	86	0/10
1	312	Basic	26/Sep/2006	13h59	UTC-4	69°09.491	100°42.680	Phytoplankton Net ↑	66	28	0	22	-0.9	0.82	1016.82	86	0/10
1	312	Basic	26/Sep/2006	14h03	UTC-4	69°09.490	100°42.649	Phytoplankton Net ↓	65	33	0	23	-0.9	0.82	1016.88	86	Bergy
1	312	Basic	26/Sep/2006	14h08	UTC-4	69°09.483	100°42.631	Phytoplankton Net ↑	65	25	0	23	-0.9	0.82	1016.88	86	Bergy
1	312	Basic	26/Sep/2006	14h10	UTC-4	69°09.495	100°42.605	Phytoplankton Net ↓	64	22	0	25	-0.9	0.83	1016.89	85	Bergy
1	312	Basic	26/Sep/2006	14h16	UTC-4	69°09.512	100°42.467	Phytoplankton Net ↑	65	28	0	25	-0.9	0.83	1016.89	85	Bergy
1	313	CTD	26/Sep/2006	20h24	UTC-4	68°40.819	103°59.370	CTD ↓	106	343	335	21	-0.3	1.68	1020.64	81	0/10
1	313	CTD	26/Sep/2006	20h30	UTC-4	68°40.801	103°59.540	CTD ↑	106	4	340	21	-0.3	1.68	1020.64	81	0/10
1	314	Basic	27/Sep/2006	00h47	UTC-4	68°59.889	106°35.616	CTD-Rosette ↓	110	16	340	18	-0.9	2.21	1022.45	77	0/10
1	314	Basic	27/Sep/2006	01h17	UTC-4	68°59.913	106°36.349	CTD-Rosette ↑	110	360	340	18	-0.9	2.20	1022.35	78	0/10
1	314	Basic	27/Sep/2006	01h37	UTC-4	69°00.081	106°36.588	Horizontal Net Tow ↓	111	108	360	19	-1.0	2.15	1022.33	80	0/10
1	314	Basic	27/Sep/2006	01h48	UTC-4	68°59.962	106°35.718	Horizontal Net Tow ↑	111	97	350	16	-1.1	2.15	1022.23	82	0/10
1	314	Basic	27/Sep/2006	01h54	UTC-4	68°59.906	106°35.528	Horizontal Net Tow ↓	111	104	360	17	-1.2	2.13	1022.20	81	0/10
1	314	Basic	27/Sep/2006	02h04	UTC-4	68°59.820	106°34.659	Horizontal Net Tow ↑	110	89	350	19	-1.2	2.08	1022.16	82	0/10
1	314	Basic	27/Sep/2006	02h20	UTC-4	68°59.750	106°34.571	Vertical Net Tow ↓	108	93	350	20	-1.3	2.05	1022.26	82	0/10
1	314	Basic	27/Sep/2006	02h27	UTC-4	68°59.726	106°34.627	Vertical Net Tow ↑	108	80	350	19	-1.3	2.05	1022.26	82	0/10
1	314	Basic	27/Sep/2006	02h46	UTC-4	68°59.914	106°35.455	Phytoplankton Net ↓	111	81	340	18	-1.2	2.07	1022.33	81	0/10
1	314	Basic	27/Sep/2006	02h52	UTC-4	68°59.873	106°35.490	Phytoplankton Net ↑	111	59	340	18	-1.2	2.07	1022.33	81	0/10
1	314	Basic	27/Sep/2006	02h55	UTC-4	68°59.870	106°35.479	Phytoplankton Net ↓	111	42	350	20	-1.2	2.02	1022.30	80	0/10
1	314	Basic	27/Sep/2006	03h01	UTC-4	68°59.900	106°35.531	Phytoplankton Net ↑	111	20	350	20	-1.2	2.02	1022.30	80	0/10
1	314	Basic	27/Sep/2006	03h04	UTC-4	68°59.918	106°35.578	Phytoplankton Net ↓	111	12	330	20	-1.3	2.02	1022.46	80	0/10
1	314	Basic	27/Sep/2006	03h11	UTC-4	68°59.935	106°35.818	Phytoplankton Net ↑	111	340	330	20	-1.3	2.02	1022.46	80	0/10
1	314	Basic	27/Sep/2006	03h21	UTC-4	68°59.897	106°36.199	Box Core ↓	108	20	340	22	-1.3	1.99	1022.38	78	0/10
1	314	Basic	27/Sep/2006	03h28	UTC-4	68°59.904	106°36.400	Box Core ↑	108	349	340	19	-1.3	1.99	1022.38	78	0/10
1	315	CTD	27/Sep/2006	08h28	UTC-4	68°32.862	109°23.010	CTD ↓	170	18	10	7	-0.1	2.35	1023.29	68	0/10
1	315	CTD	27/Sep/2006	08h36	UTC-4	68°32.861	109°23.146	CTD ↑	170	22	10	7	-0.1	2.35	1023.29	68	0/10
1	316	CTD	27/Sep/2006	08h40	UTC-6	68°06.861	111°09.212	CTD ↓	294	68	75	16	1.3	5.41	1016.01	62	0/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
1	316	CTD	27/Sep/2006	08h51	UTC-6	68°06.988	111°09.249	CTD ↑	294	77	80	17	1.3	5.41	1016.01	62	0/10
Leg 2a																	
2a	400	Nutrient	29/Sep/2006	03h24	UTC-6	69°05.484	114°48.277	CTD-Rosette ↓	160	100	105	11	-2.4	3.94	1009.68	87	0/10
2a	400	Nutrient	29/Sep/2006	04h00	UTC-6	69°05.562	114°48.219	CTD-Rosette ↑	160	116	71	12	-2.5	4.35	1009.54	87	0/10
2a	401	Nutrient	29/Sep/2006	07h08	UTC-6	69°14.170	116°36.040	CTD-Rosette ↓↑	177	99	100	12	-1.7	2.6	1009.1	82	0/10
2a	402	Nutrient	29/Sep/2006	10h45	UTC-6	69°35.760	118°07.960	CTD-Rosette ↓	416	145	110	15	-1.4	2.5	1007.9	94	0/10
2a	402	Nutrient	29/Sep/2006	11h34	UTC-6	69°36.000	118°08.500	CTD-Rosette ↑	415	123	120	15	-2.0	2.7	1007.8	92	0/10
2a	403	Basic	29/Sep/2006	18h33	UTC-6	70°15.570	120°16.770	Secchi Disk ↓↑	415	90	90	20	-0.8	2.9	1006.9	90	0/10
2a	403	Basic	29/Sep/2006	18h54	UTC-6	70°06.030	120°05.900	CTD-Rosette ↓	426	110	100	17	-0.7	2.87	1006.9	87	0/10
2a	403	Basic	29/Sep/2006	19h40	UTC-6	70°06.240	120°05.700	CTD-Rosette ↑	N/A	110	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2a	403	Basic	29/Sep/2006	20h04	UTC-6	70°01.500	120°06.120	Horizontal Net Tow ↓	412	15	125	10	-0.2	2.9	1006.9	76	0/10
2a	403	Basic	29/Sep/2006	20h14	UTC-6	70°01.500	120°06.270	Horizontal Net Tow ↑	430	20	120	10	0.1	2.88	1006.9	75	0/10
2a	403	Basic	29/Sep/2006	20h27	UTC-6	70°01.500	120°29.900	Horizontal Net Tow ↓	415	211	120	20	0.2	2.86	1006.9	75	0/10
2a	403	Basic	29/Sep/2006	20h39	UTC-6	70°01.500	120°29.900	Horizontal Net Tow ↑	415	177	110	20	-0.2	2.83	1006.4	76	0/10
2a	403	Basic	29/Sep/2006	20h55	UTC-6	70°06.080	120°07.720	RMT ↓	412	168	115	20	-0.3	2.78	1006.5	74	0/10
2a	403	Basic	29/Sep/2006	21h11	UTC-6	70°05.900	120°07.360	RMT ↑	412	208	122	20	-0.2	2.65	1006.7	74	0/10
2a	403	Basic	29/Sep/2006	21h35	UTC-6	70°05.980	120°05.430	CTD-Rosette ↓	416	86	130	20	0.1	2.54	1006.5	74	0/10
2a	403	Basic	29/Sep/2006	22h25	UTC-6	70°05.450	120°06.860	CTD-Rosette ↑	415	310	125	15	1.2	2.50	1006.6	72	0/10
2a	403	Basic	29/Sep/2006	23h15	UTC-6	70°05.720	120°05.810	Vertical Net Tow ↓	412	185	115	20	-0.6	2.23	1006.5	80	0/10
2a	403	Basic	29/Sep/2006	23h37	UTC-6	70°05.950	120°06.610	Vertical Net Tow ↑	412	193	110	15	-0.8	2.20	1006.4	82	0/10
2a	403	Basic	30/Sep/2006	00h03	UTC-6	70°06.300	120°05.390	CTD-Rosette ↓	408	70	130	20	-0.1	2.2	1006.5	79	0/10
2a	403	Basic	30/Sep/2006	00h47	UTC-6	70°06.980	120°05.260	CTD-Rosette ↑	408	95	125	17	-0.1	2.1	1006.5	79	0/10
2a	403	Basic	30/Sep/2006	01h34	UTC-6	70°05.985	120°03.254	Box Core ↓↑	410	112	110	16	-0.8	2.0	1006.4	90	0/10
2a	403	Basic	30/Sep/2006	01h56	UTC-6	70°06.037	120°02.947	Phytoplankton Net ↓	411	119	115	20	-0.3	2.0	1006.4	87	0/10
2a	403	Basic	30/Sep/2006	02h04	UTC-6	70°06.024	120°03.080	Phytoplankton Net ↑	411	307	110	21	-0.7	2.0	1006.4	90	0/10
2a	405	Full	01/Oct/2006	02h26	UTC-6	70°39.225	122°58.642	Sediment Traps Deployed	585	270	70	11	2.4	4.3	1009.9	69	0/10
2a	405	Full	01/Oct/2006	02h45	UTC-6	70°39.075	122°58.628	CTD-Rosette ↓	583	70	87	15	0.8	4.2	1009.7	72	0/10
2a	405	Full	01/Oct/2006	03h37	UTC-6	70°39.506	122°57.002	CTD-Rosette ↑	574	53	60	15	0.5	4.3	1009.8	72	0/10
2a	405	Full	01/Oct/2006	04h19	UTC-6	70°38.600	122°58.184	Horizontal Net Tow ↓	610	97	80	18	0.4	4.24	1009.4	74	0/10
2a	405	Full	01/Oct/2006	04h21	UTC-6	N/A	N/A	Horizontal Net Tow ↑	610	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2a	405	Full	01/Oct/2006	04h35	UTC-6	N/A	N/A	Horizontal Net Tow ↓	610	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2a	405	Full	01/Oct/2006	04h39	UTC-6	N/A	N/A	Horizontal Net Tow ↑	610	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
2a	405	Full	01/Oct/2006	04h55	UTC-6	70°38.980	123°00.113	Hydrobios ↓↑	620	55	125	10	0.4	4.24	1009.4	74	0/10
2a	405	Full	01/Oct/2006	06h15	UTC-6	70°39.240	122°59.140	CTD-Rosette ↓↑	607	115	110	15	0.0	4.1	1010.0	72	0/10
2a	405	Full	01/Oct/2006	07h35	UTC-6	70°38.930	122°59.450	Thorium Pumping ↓	618	105	116	16	0.0	4.2	1010.7	70	0/10
2a	405	Full	01/Oct/2006	09h03	UTC-6	70°38.740	123°01.590	Thorium Pumping ↑	618	260	110	15	0.0	4.13	1010.8	70	0/10
2a	405	Full	01/Oct/2006	09h32	UTC-6	70°39.110	122°58.060	PNF ↓	590	205	112	10	0.4	3.98	1010.8	69	0/10
2a	405	Full	01/Oct/2006	09h36	UTC-6	70°39.090	122°58.240	PNF ↑	600	218	100	10	0.4	3.98	1010.8	69	0/10
2a	405	Full	01/Oct/2006	09h50	UTC-6	70°39.050	122°59.420	Secchi Disk ↓	555	2	105	10	1.0	3.84	1011.0	68	0/10
2a	405	Full	01/Oct/2006	09h54	UTC-6	70°39.400	122°59.290	Secchi Disk ↑	604	5	107	10	1.1	3.84	1011.0	68	0/10
2a	405	Full	01/Oct/2006	10h07	UTC-6	70°39.200	122°59.790	CTD-Rosette ↓	607	19	125	10	1.5	3.82	1011.0	67	0/10
2a	405	Full	01/Oct/2006	10h35	UTC-6	70°37.590	123°01.620	CTD-Rosette ↑	600	35	122	10	0.7	3.85	1010.9	70	0/10
2a	405	Full	01/Oct/2006	10h36	UTC-6	70°37.610	123°01.640	CTD-Rosette ↓	602	32	118	10	0.7	3.85	1010.9	70	0/10
2a	405	Full	01/Oct/2006	11h34	UTC-6	70°40.030	123°01.140	CTD-Rosette ↑	560	22	80	10	0.8	4.59	1011	71	0/10
2a	CA18-05	Mooring	01/Oct/2006	13h05	UTC-6	70°39.950	122°59.220	Mooring CA18-05 Recovered	543	284	90	8	0.9	4.8	1011	72	0/10
2a	405	Full	01/Oct/2006	14h36	UTC-6	70°39.072	122°56.870	CTD-Rosette ↓	579	120	135	8	0.0	3.9	1011.2	80	0/10
2a	405	Full	01/Oct/2006	14h35	UTC-6	70°39.080	122°56.860	SCAMP ↓	581	160	160	8	0.0	3.9	1011.2	80	0/10
2a	405	Full	01/Oct/2006	15h32	UTC-6	70°39.104	122°57.322	CTD-Rosette ↑	584	67	130	8	0.0	3.8	1011.4	79	0/10
2a	405	Full	01/Oct/2006	15h55	UTC-6	70°39.120	122°57.803	Vertical Net Tow ↓	586	156	140	10	0.1	3.7	1011.5	79	0/10
2a	405	Full	01/Oct/2006	16h00	UTC-6	70°39.110	122°57.870	Vertical Net Tow ↑	604	130	156	10	-0.1	3.74	1011	80	0/10
2a	405	Full	01/Oct/2006	16h50	UTC-6	70°39.270	122°57.900	Bioness ↓ (canceled)	590	70	163	10	-0.4	4.17	1014	83	N/A
2a	405	Full	01/Oct/2006	16h57	UTC-6	70°39.336	122°57.970	Bioness ↑ (canceled)	587	70	160	9	-0.2	4.3	1011.5	85	N/A
2a	405	Full	01/Oct/2006	17h45	UTC-6	70°39.310	122°57.990	Bioness ↓↑	585	35	116	7	-0.3	4.7	1011.7	70	0/10
2a	405	Full	01/Oct/2006	18h35	UTC-6	70°39.450	122°57.710	RMT ↓	585	180	122	10	-0.1	4.8	1011.6	70	0/10
2a	405	Full	01/Oct/2006	18h52	UTC-6	N/A	N/A	RMT ↑	590	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2a	405	Full	01/Oct/2006	19h45	UTC-6	70°38.540	122°58.040	CTD-Rosette ↓	595	130	120	10	-0.0	4.5	1011	69	0/10
2a	405	Full	01/Oct/2006	20h32	UTC-6	70°38.870	122°58.370	CTD-Rosette ↑	605	65	155	10/15	-0.4	4.55	1011.6	77	0/10
2a	405	Full	01/Oct/2006	21h22	UTC-6	70°36.500	123°14.600	Sediment Traps Recovered	592	170	130	5/10	-0.6	3.78	1011.5	81	0/10
2a	405	Full	01/Oct/2006	22h35	UTC-6	70°39.130	122°58.300	CTD-Rosette ↓	598	75	145	5/10	-0.9	3.99	1011.7	84	0/10
2a	405	Full	01/Oct/2006	23h05	UTC-6	70°39.240	122°57.860	CTD-Rosette ↑	590	106	178	10	-0.7	4.66	1012.5	82	0/10
2a	407	Full	02/Oct/2006	04h30	UTC-6	71°00.740	126°04.990	Horizontal Net Tow ↓↑	385	298	175	5	-0.9	5	1011.1	75	0/10
2a	407	Full	02/Oct/2006	05h10	UTC-6	71°01.200	126°05.468	Vertical Net Tow ↓↑	390	280	157	10	-0.6	5	1011	79	0/10
2a	407	Full	02/Oct/2006	05h55	UTC-6	71°00.800	126°05.120	RMT ↓↑	386	270	173	8	-0.6	5	1011	88	0/10
2a	407	Full	02/Oct/2006	06h31	UTC-6	71°01.220	126°05.250	CTD-Rosette ↓↑	390	165	166	5	-0.0	5	1011	84	0/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
2a	CA08-05	Mooring	02/Oct/2006	09h00	UTC-6	71°00.440	126°04.450	Mooring CA08-05 Recovered	390	194	135	10	-0.6	5.1	1010.4	80	0/10
2a	N/A	N/A	02/Oct/2006	13h45	UTC-6	71°17.216	127°32.163	Sediment Traps Deployed	197	70	180	9	0.7	2.1	1009.8	93	0/10
2a	408	Full	02/Oct/2006	14h14	UTC-6	71°15.911	127°31.023	CTD-Rosette ↓	187	162	180	10	0.5	2.2	1099.9	96	0/10
2a	408	Full	02/Oct/2006	14h28	UTC-6	71°15.846	127°30.656	CTD-Rosette ↑	190	176	180	7	0.5	2.2	1010	97	0/10
2a	CA05-05	Mooring	02/Oct/2006	15h58	UTC-6	71°11.906	127°55.240	Mooring CA05-05 Recovered	194	220	160	8	0.5	2.2	1009.5	97	0/10
2a	408	Full	02/Oct/2006	16h20	UTC-6	71°15.940	127°31.290	Secchi Disk ↓↑	187	130	150	10	0.8	2.1	1009.7	98	0/10
2a	408	Full	02/Oct/2006	16h28	UTC-6	71°15.910	127°31.040	CTD-Rosette ↓↑	190	132	150	10	0.8	2.1	1009.7	93	0/10
2a	408	Full	02/Oct/2006	18h11	UTC-6	71°11.906	127°55.240	Horizontal Net Tow ↓↑	190	244	167	10	0.4	2.1	1009.7	99	0/10
2a	408	Full	02/Oct/2006	18h28	UTC-6	71°11.906	127°55.240	Horizontal Net Tow ↓↑	190	307	181	8	0.9	2.1	1009.7	99	0/10
2a	408	Full	02/Oct/2006	19h08	UTC-6	71°11.906	127°55.240	CTD-Rosette ↓↑	190	195	180	6	1.0	2.1	1009.5	99	0/10
2a	408	Full	02/Oct/2006	20h04	UTC-6	71°15.830	127°29.890	Hydrobios ↓	198	257	200	6	0.8	2.19	1009.5	99	0/10
2a	408	Full	02/Oct/2006	20h15	UTC-6	71°15.850	127°29.870	Hydrobios ↑	197	252	206	3	0.8	2.19	1009.5	99	0/10
2a	408	Full	02/Oct/2006	20h48	UTC-6	71°15.790	127°29.830	CTD-Rosette ↓	198	203	176	3	0.9	2.18	1009.5	99	0/10
2a	408	Full	02/Oct/2006	21h09	UTC-6	71°15.630	127°29.850	CTD-Rosette ↑	198	180	280	4	0.9	2.14	1009.5	99	0/10
2a	408	Full	02/Oct/2006	21h34	UTC-6	71°15.520	127°29.810	Vertical Net Tow ↓	195	203	303	5	1.0	2.13	1009.5	99	0/10
2a	408	Full	02/Oct/2006	21h46	UTC-6	71°15.450	127°29.740	Vertical Net Tow ↑	194	194	312	8	1.0	2.13	1009.5	99	0/10
2a	408	Full	02/Oct/2006	22h06	UTC-6	71°15.480	127°29.490	RMT ↓	199	37	320	10	0.8	2.12	1009.5	99	0/10
2a	408	Full	02/Oct/2006	22h21	UTC-6	71°15.370	127°29.500	RMT ↑	196	88	315	10	0.9	2.12	1009.5	99	0/10
2a	408	Full	02/Oct/2006	22h44	UTC-6	71°15.290	127°29.220	CTD-Rosette ↓	195	203	322	13	0.7	2.13	1009.5	99	0/10
2a	408	Full	02/Oct/2006	23h13	UTC-6	71°15.070	127°28.580	CTD-Rosette ↑	198	202	330	15	1.3	2.17	1009.9	98	0/10
2a	408	Full	02/Oct/2006	23h50	UTC-6	71°15.320	127°30.390	Thorium Pumping ↓	195	66	315	20	-0.8	2.17	1010.0	98	0/10
2a	408	Full	03/Oct/2006	01h31	UTC-6	71°14.257	127°26.849	Thorium Pumping ↑	186	343	300	15	-0.5	2.2	1011.1	90	0/10
2a	N/A	N/A	03/Oct/2006	02h25	UTC-6	71°15.456	127°26.850	Sediment Traps Recovered	203	200	310	20	-0.3	2.1	1011.0	90	0/10
2a	409	Nutrient	04/Oct/2006	07h04	UTC-6	71°52.142	125°52.099	CTD-Rosette ↓↑	100	70	80	15	-3.1	4.2	1012.9	86	0/10
2a	410	Nutrient	05/Oct/2006	04h15	UTC-6	71°41.950	126°29.340	CTD-Rosette ↓↑	400	271	75	22	-1.8	2.6	1009.9	83	0/10
2a	411	CTD	05/Oct/2006	05h54	UTC-6	71°37.753	126°41.869	CTD-Rosette ↓↑	430	200	70	20	-2.2	2.91	1010.6	72	0/10
2a	412	Nutrient	05/Oct/2006	07h25	UTC-6	71°33.920	126°54.630	CTD-Rosette ↓	410	230	64	20	-1.0	2.2	1011.2	75	0/10
2a	412	Nutrient	05/Oct/2006	08h13	UTC-6	71°33.830	126°55.280	CTD-Rosette ↑	428	240	65	20	-1.7	2.20	1011.5	72	0/10
2a	413	CTD	05/Oct/2006	09h02	UTC-6	71°29.600	127°08.740	CTD-Rosette ↓	373	230	50	21	-0.8	1.89	1009.0	75	0/10
2a	413	CTD	05/Oct/2006	09h37	UTC-6	71°29.000	127°08.280	CTD-Rosette ↑	377	275	45	22	1.6	1.83	1011.3	69	0/10
2a	414	Nutrient	05/Oct/2006	10h52	UTC-6	71°25.270	127°22.020	CTD-Rosette ↓	305	217	53	21	-2.5	1.93	1011.3	83	0/10
2a	414	Nutrient	05/Oct/2006	11h44	UTC-6	71°25.110	127°23.520	CTD-Rosette ↑	299	243	55	22	1.5	1.95	1011.9	71	0/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
2a	CA05-04	Mooring	05/Oct/2006	13h20	UTC-6	71°25.110	127°23.520	Grappling Mooring CA05-04 (1st attempt)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2a	CA05-04	Mooring	05/Oct/2006	17h00	UTC-6	71°25.050	127°23.480	Grappling Mooring CA05-04 (4th attempt)	305	285	135	10/15	-0.6	N/A	N/A	N/A	0/10
2a	CA05-04	Mooring	05/Oct/2006	18h16	UTC-6	71°25.300	127°21.890	Hydrobios ↓↑	300	220	140	7	-0.5	1.7	1013.5	74	0/10
2a	415	CTD	05/Oct/2006	19h15	UTC-6	71°21.700	127°33.240	CTD-Rosette ↓↑	230	132	136	10	-0.6	1.8	1013.7	68	0/10
2a	416	Nutrient	05/Oct/2006	20h04	UTC-6	71°17.510	127°46.060	CTD-Rosette ↓	158	108	168	14	-0.8	1.69	1013.8	79	0/10
2a	416	Nutrient	05/Oct/2006	20h32	UTC-6	71°17.570	127°46.480	CTD-Rosette ↑	157	9	143	13	0.4	1.68	1014.1	76	0/10
2a	417	CTD	05/Oct/2006	21h14	UTC-6	71°13.300	127°58.900	CTD ↓	84	64	134	15	-1	1.88	1014.0	74	0/10
2a	417	CTD	05/Oct/2006	21h19	UTC-6	71°13.340	127°59.250	CTD ↑	83	326	140	18	-0.5	1.82	1013.9	72	0/10
2a	418	Nutrient	05/Oct/2006	22h00	UTC-6	71°09.660	128°09.870	CTD-Rosette ↓	65	30	135	16	-1	1.44	1013.9	70	0/10
2a	418	Nutrient	05/Oct/2006	22h16	UTC-6	71°09.750	128°10.660	CTD-Rosette ↑	65	295	130	15	0.2	1.41	1014.3	65	0/10
2a	419	CTD	05/Oct/2006	22h49	UTC-6	71°06.400	128°20.230	CTD ↓	56	11	132	18	-1.4	0.92	1014.0	79	0/10
2a	419	CTD	05/Oct/2006	22h56	UTC-6	71°06.450	128°20.640	CTD ↑	56	347	129	15	-1.4	0.92	1014.0	79	0/10
2a	420	Basic	05/Oct/2006	23h34	UTC-6	71°03.200	128°31.050	CTD-Rosette ↓	41	5	105	15	-1.6	0.04	1014.3	73	0/10
2a	420	Basic	05/Oct/2006	23h54	UTC-6	71°03.418	128°32.280	CTD-Rosette ↑	36	344	100	20	-1.6	0.06	1014.5	70	0/10
2a	420	Basic	06/Oct/2006	00h32	UTC-6	71°03.081	128°30.327	Horizontal Net Tow ↓	36	168	100	15	-1.7	-0.3	1014.7	74	0/10
2a	420	Basic	06/Oct/2006	00h54	UTC-6	71°02.746	128°30.007	Horizontal Net Tow ↑	37	200	105	17	-1.8	-0.3	1014.7	74	0/10
2a	420	Basic	06/Oct/2006	00h56	UTC-6	71°02.739	128°30.295	Horizontal Net Tow ↓	37	205	105	17	-1.8	-0.3	1014.7	74	0/10
2a	420	Basic	06/Oct/2006	01h07	UTC-6	71°02.545	128°31.014	Horizontal Net Tow ↑	38	164	110	22	-1.9	-0.3	1014.8	76	0/10
2a	420	Basic	06/Oct/2006	01h28	UTC-6	71°03.094	128°30.531	Vertical Net Tow ↓	36	125	95	16	-1.9	-0.3	1014.9	75	0/10
2a	420	Basic	06/Oct/2006	01h35	UTC-6	71°03.064	128°30.996	Vertical Net Tow ↑	33	128	110	21	-2	-0.3	1014.9	73	0/10
2a	420	Basic	06/Oct/2006	02h00	UTC-6	71°03.142	128°30.848	CTD-Rosette ↓	35	45	95	21	-2	-0.3	1015.0	72	0/10
2a	420	Basic	06/Oct/2006	02h15	UTC-6	71°03.570	128°31.833	CTD-Rosette ↑	37	315	110	20	-2	-0.3	1015.1	69	0/10
2a	420	Basic	06/Oct/2006	02h33	UTC-6	71°03.776	128°32.480	RMT ↓	36	175	100	18	-1.6	-0.4	1015.1	71	0/10
2a	420	Basic	06/Oct/2006	02h39	UTC-6	71°03.642	128°32.668	RMT ↑	37	163	100	20	-1.6	-0.4	1015.1	71	0/10
2a	420	Basic	06/Oct/2006	03h18	UTC-6	71°03.134	128°30.865	Small Zooplankton Ring Net ↓	33	305	110	14	-0.7	-0.4	1015.0	71	0/10
2a	420	Basic	06/Oct/2006	03h25	UTC-6	71°03.213	128°31.019	Small Zooplankton Ring Net ↑	34	295	100	18	-1.6	-0.4	1015.2	74	0/10
2a	420	Basic	06/Oct/2006	03h38	UTC-6	71°03.214	128°31.047	Box Core ↓	34	270	100	17	-0.7	-0.7	1015.4	73	0/10
2a	420	Basic	06/Oct/2006	03h42	UTC-6	71°03.338	128°31.034	Box Core ↑	34	266	100	18	-0.7	-0.3	1015.4	72	0/10
2a	421	Basic	06/Oct/2006	11h49	UTC-6	71°28.380	133°56.160	PNF ↓	1189	207	43	27	-0.7	2.12	1016.5	87	0/10
2a	421	Basic	06/Oct/2006	11h56	UTC-6	71°28.539	133°56.640	PNF ↑	1143	235	80	24	-1.6	2.2	1016.4	89	0/10
2a	421	Basic	06/Oct/2006	12h14	UTC-6	71°28.086	133°55.606	Secchi Disk ↓	1183	242	80	25	-2.3	2.2	1016.3	92	0/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
2a	421	Basic	06/Oct/2006	12h21	UTC-6	71°28.156	133°55.611	Secchi Disk ↑	1183	276	75	29	-2.2	2.2	1016.7	92	0/10
2a	421	Basic	06/Oct/2006	12h56	UTC-6	71°28.169	133°56.284	CTD-Rosette ↓	1190	287	80	28	-2.0	2.3	1016.8	82	0/10
2a	421	Basic	06/Oct/2006	14h02	UTC-6	71°28.019	133°57.064	CTD-Rosette ↑	1190	275	70	25	-1.5	2.3	1017.4	92	0/10
2a	421	Basic	06/Oct/2006	14h10	UTC-6	71°28.091	133°57.107	Small Zooplankton Ring Net ↓	1180	236	75	18	-0.8	2.3	1017.5	89	0/10
2a	421	Basic	06/Oct/2006	14h19	UTC-6	71°28.214	133°57.265	Small Zooplankton Ring Net ↑	1206	235	70	26	-2.7	2.3	1017.5	93	0/10
2a	421	Basic	06/Oct/2006	14h53	UTC-6	71°28.751	133°56.167	CTD-Rosette ↓	1136	270	70	28	0.1	2.3	1018.0	86	0/10
2a	421	Basic	06/Oct/2006	15h51	UTC-6	71°28.734	133°57.209	CTD-Rosette ↑	1124	284	80	23	-1.3	2.3	1018.1	91	0/10
2a	421	Basic	06/Oct/2006	16h20	UTC-6	71°29.040	133°56.133	Horizontal Net Tow ↓↑	1063	260	77	20	-0.7	2.3	1018.0	88	0/10
2a	421	Basic	06/Oct/2006	16h55	UTC-6	71°28.720	133°56.910	CTD-Rosette ↓	1120	220	88	17	-2.8	2.29	1018.1	93	0/10
2a	421	Basic	06/Oct/2006	18h19	UTC-6	71°28.980	133°57.740	CTD-Rosette ↑	1136	286	74	23	0.0	2.25	1018.8	82	0/10
2a	421	Basic	06/Oct/2006	18h30	UTC-6	71°29.045	133°57.528	Vertical Net Tow ↓	1118	278	62	23	0.0	2.25	1018.8	82	0/10
2a	421	Basic	06/Oct/2006	19h27	UTC-6	71°29.659	133°58.797	Vertical Net Tow ↑	1269	263	70	24	0.2	2.23	1019.1	83	0/10
2a	421	Basic	06/Oct/2006	19h57	UTC-6	71°29.770	133°58.012	Thorium Pumping ↓	1180	272	67	25	-2.2	2.14	1019.4	88	0/10
2a	421	Basic	06/Oct/2006	21h36	UTC-6	71°30.450	134°81.050	Thorium Pumping ↑	1184	173	70	30	-3.7	2.08	1020.2	89	0/10
2a	421	Basic	06/Oct/2006	22h16	UTC-6	71°28.040	133°54.540	CTD-Rosette ↓	1150	262	65	27	-3.7	2.08	1020.2	89	0/10
2a	421	Basic	06/Oct/2006	23h10	UTC-6	71°27.890	133°56.660	CTD-Rosette ↑	1203	325	77	27	-2.5	1.98	1020.9	82	0/10
2a	421	Basic	06/Oct/2006	23h43	UTC-6	71°28.220	133°58.240	Box Core ↓	1220	257	65	27	-4.1	2.03	1020.9	85	0/10
2a	421	Basic	07/Oct/2006	00h06	UTC-6	71°28.307	133°58.322	Box Core ↑	1218	264	65	27	-2.0	2.1	1021.1	83	0/10
2a	422	Nutrient	07/Oct/2006	02h38	UTC-6	71°22.195	133°52.996	CTD-Rosette ↓	1083	283	70	23	-3.2	1.7	1021.7	79	0/10
2a	422	Nutrient	07/Oct/2006	03h47	UTC-6	71°21.911	133°53.920	CTD-Rosette ↑	1060	239	65	17	-3.0	1.8	1022.0	70	0/10
2a	423	CTD	07/Oct/2006	04h50	UTC-6	71°16.363	133°51.352	CTD ↓	790	264	63	22	-2.8	1.39	1021.8	73	0/10
2a	423	CTD	07/Oct/2006	05h28	UTC-6	71°16.426	133°51.544	CTD ↑	789	260	63	22	-2.8	1.39	1021.8	65	0/10
2a	424	Nutrient	07/Oct/2006	06h24	UTC-6	71°10.243	133°49.873	CTD-Rosette ↓	560	265	60	24	-3.2	1.46	1021.8	84	0/10
2a	424	Nutrient	07/Oct/2006	07h20	UTC-6	71°10.102	133°50.162	CTD-Rosette ↑	560	262	51	26	-1.9	1.5	1021.0	82	0/10
2a	425	CTD	07/Oct/2006	08h12	UTC-6	71°04.130	133°47.170	CTD ↓	286	265	60	20	-2.4	2.06	1022.1	76	0/10
2a	425	CTD	07/Oct/2006	08h30	UTC-6	71°06.280	133°37.700	CTD ↑	286	303	72	20	0.6	1.84	1022.1	67	0/10
2a	425	CTD	07/Oct/2006	09h13	UTC-6	71°03.720	133°49.910	CTD ↓	288	265	75	25	-2.6	1.82	1022.1	81	0/10
2a	425	CTD	07/Oct/2006	09h28	UTC-6	71°03.540	133°50.290	CTD ↑	286	260	60	27	-0.0	1.89	1022.1	76	0/10
2a	435	Full	07/Oct/2006	10h43	UTC-6	71°04.450	133°38.830	Hydrobios ↓	278	239	53	20	-1.1	2.11	1023.0	79	0/10
2a	435	Full	07/Oct/2006	11h05	UTC-6	71°04.250	133°39.060	Hydrobios ↑	262	224	56	18	-0.3	1.98	1023.1	76	0/10
2a	435	Full	07/Oct/2006	11h24	UTC-6	71°04.010	133°40.060	Vertical Net Tow ↓	260	237	62	20	-2.0	2.06	1023.2	80	0/10
2a	435	Full	07/Oct/2006	11h40	UTC-6	71°04.060	133°40.510	Vertical Net Tow ↑	258	230	70	20	-3.8	1.97	1023.1	83	0/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
2a	435	Full	07/Oct/2006	12h25	UTC-6	71°04.597	133°38.888	CTD ↓	278	242	70	22	-3.8	2.2	1022.9	81	0/10
2a	435	Full	07/Oct/2006	12h39	UTC-6	71°04.471	133°39.575	CTD ↑	270	273	65	22	-1.1	2.2	1023.4	75	0/10
2a	CA04-05	Mooring	07/Oct/2006	13h14	UTC-6	71°04.811	133°37.847	Mooring CA04-05 Recovered	N/A	62	65	19	-0.2	2.2	1023.6	69	0/10
2a	426	Nutrient	07/Oct/2006	14h52	UTC-6	70°59.227	133°44.880	CTD-Rosette ↓	106	280	80	24	-3.6	2.3	1023.9	83	0/10
2a	426	Nutrient	07/Oct/2006	15h19	UTC-6	70°59.118	133°45.735	CTD-Rosette ↑	111	N/A	80	22	-3	2.3	1024.4	69	0/10
2a	427	CTD	07/Oct/2006	16h20	UTC-6	70°52.754	133°43.815	CTD ↓	70	259	74	23	-3.9	2.4	1024.2	80	0/10
2a	427	CTD	07/Oct/2006	16h27	UTC-6	70°52.741	133°43.968	CTD ↑	70	263	74	23	-3.9	2.4	1024.2	80	0/10
2a	428	Nutrient	07/Oct/2006	17h36	UTC-6	70°47.416	133°42.243	CTD-Rosette ↓	67	257	80	26	-4.8	1.4	1024.1	80	0/10
2a	428	Nutrient	07/Oct/2006	17h51	UTC-6	70°47.424	133°42.455	CTD-Rosette ↑	70	263	80	25	-3.9	1.5	1024.2	79	0/10
2a	429	CTD	07/Oct/2006	19h16	UTC-6	70°41.598	133°41.366	CTD ↓	60	290	61	29	-5	1.6	1024.2	80	0/10
2a	429	CTD	07/Oct/2006	19h28	UTC-6	70°41.525	133°41.390	CTD ↑	60	N/A	61	29	-5	1.6	1024.2	80	0/10
2a	430	Nutrient	07/Oct/2006	20h52	UTC-6	70°35.700	133°39.260	CTD-Rosette ↓	71	275	74	26	-4.3	2.4	1024.1	81	0/10
2a	430	Nutrient	07/Oct/2006	21h09	UTC-6	70°35.530	133°39.580	CTD-Rosette ↑	75	298	65	29	0.0	2.3	1024.1	70	0/10
2a	431	CTD	07/Oct/2006	22h48	UTC-6	70°29.630	133°37.990	CTD ↓	66	260	73	25	-3.9	1.84	1024.1	80	0/10
2a	431	CTD	07/Oct/2006	22h54	UTC-6	70°29.580	133°38.110	CTD ↑	68	280	68	25	-2.6	1.84	1024.1	80	0/10
2a	432	Nutrient	08/Oct/2006	00h10	UTC-6	70°24.423	133°36.426	CTD-Rosette ↓	55	274	70	25	-2.5	0.8	1024.3	84	0/10
2a	432	Nutrient	08/Oct/2006	00h25	UTC-6	70°24.200	133°36.854	CTD-Rosette ↑	0	277	70	24	-2.5	0.5	1024.4	75	0/10
2a	433	CTD	08/Oct/2006	02h07	UTC-6	70°17.080	133°36.025	CTD ↓	54	270	80	28	-3.8	-0.2	1024.3	83	0/10
2a	433	CTD	08/Oct/2006	02h13	UTC-6	70°16.984	133°36.112	CTD ↑	52	260	80	22	-3.8	-0.2	1024.3	83	0/10
2a	N/A	N/A	09/Oct/2006	02h53	UTC-6	70°19.959	126°21.501	Sediment Traps Deployed	245	56	35	14	-4.4	1.7	1032.5	72	0/10
2a	436	Full	09/Oct/2006	04h50	UTC-6	70°20.806	126°20.861	CTD-Rosette ↓	247	288	58	11	-3.6	1.6	1033.3	64	0/10
2a	436	Full	09/Oct/2006	05h29	UTC-6	70°20.672	126°21.421	CTD-Rosette ↑	249	180	50	16	-3.0	1.59	1033.3	64	0/10
2a	436	Full	09/Oct/2006	06h05	UTC-6	70°20.158	126°21.420	Horizontal Net Tow ↓	246	133	23	15	-4.8	1.57	1033.4	69	0/10
2a	436	Full	09/Oct/2006	06h25	UTC-6	70°20.130	126°21.761	Horizontal Net Tow ↑	246	198	20	15	-4.8	1.57	1033.4	69	0/10
2a	436	Full	09/Oct/2006	06h30	UTC-6	70°20.111	126°21.867	Horizontal Net Tow ↓	246	184	40	15	-4.5	1.47	1033.6	69	0/10
2a	436	Full	09/Oct/2006	06h40	UTC-6	70°19.790	126°21.506	Horizontal Net Tow ↑	247	80	40	15	-4.5	1.47	1033.6	69	0/10
2a	436	Full	09/Oct/2006	07h00	UTC-6	70°20.245	126°20.827	Hydrobios ↓	246	230	45	13	-4.8	1.41	1033.3	67	0/10
2a	436	Full	09/Oct/2006	07h27	UTC-6	70°20.182	126°20.779	Hydrobios ↑	247	237	46	16	-2.2	1.4	1033.3	68	0/10
2a	436	Full	09/Oct/2006	07h45	UTC-6	70°20.116	126°21.224	CTD-Rosette ↓	246	250	37	16	-4.4	1.4	1033.5	71	0/10
2a	436	Full	09/Oct/2006	08h26	UTC-6	70°19.780	126°21.660	CTD-Rosette ↑	255	289	50	15	-3.8	1.41	1033.7	67	0/10
2a	436	Full	09/Oct/2006	08h48	UTC-6	70°19.610	126°22.100	Vertical Net Tow ↓	251	210	60	11	-3.4	1.40	1033.7	65	0/10
2a	436	Full	09/Oct/2006	09h04	UTC-6	70°19.620	126°22.420	Vertical Net Tow ↑	252	216	46	13	-5.6	.144	1033.4	67	0/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
2a	436	Full	09/Oct/2006	09h43	UTC-6	70°19.450	126°23.370	PNF ↓	260	195	72	15	-5.4	1.47	1033.4	68	0/10
2a	436	Full	09/Oct/2006	09h46	UTC-6	70°19.460	126°23.570	PNF ↑	252	189	65	16	-5.3	1.57	1033.5	68	0/10
2a	436	Full	09/Oct/2006	09h58	UTC-6	70°19.480	126°23.760	Secchi Disk ↓	250	248	49	14	-5.5	1.63	1033.6	66	0/10
2a	436	Full	09/Oct/2006	10h04	UTC-6	70°19.350	126°24.031	Secchi Disk ↑	251	244	65	15	-4.2	1.64	1033.7	65	0/10
2a	436	Full	09/Oct/2006	10h24	UTC-6	70°20.220	126°21.170	CTD-Rosette ↓	252	284	61	13	-5.2	1.53	1033.4	65	0/10
2a	436	Full	09/Oct/2006	11h00	UTC-6	70°19.880	126°21.930	CTD-Rosette ↑	254	273	31	9	-2.7	1.14	1033.7	62	0/10
2a	436	Full	09/Oct/2006	11h17	UTC-6	70°19.860	126°22.570	RMT ↓	252	188	50	15	-4.8	1.27	1033.7	68	0/10
2a	436	Full	09/Oct/2006	11h30	UTC-6	70°19.850	126°22.480	RMT ↑	253	270	36	11	-5.1	1.27	1033.7	68	0/10
2a	436	Full	09/Oct/2006	11h34	UTC-6	70°19.750	126°22.840	RMT ↓	255	180	40	10	-5.0	1.21	1033.7	68	0/10
2a	436	Full	09/Oct/2006	11h44	UTC-6	70°19.670	126°22.590	RMT ↑	254	325	56	6	-4.9	1.19	1033.7	67	0/10
2a	436	Full	09/Oct/2006	11h54	UTC-6	70°19.591	126°23.097	Small Zooplankton Ring Net ↓	246	230	60	10	-5.2	1.3	1033.7	69	0/10
2a	436	Full	09/Oct/2006	12h07	UTC-6	70°19.620	126°23.220	Small Zooplankton Ring Net ↑	246	232	70	12	-5.2	1.3	1033.7	69	0/10
2a	436	Full	09/Oct/2006	12h31	UTC-6	70°19.600	126°23.210	CTD-Rosette ↓	247	55	70	7	-5.2	1.4	1033.8	68	0/10
2a	436	Full	09/Oct/2006	12h56	UTC-6	70°19.600	126°23.960	CTD-Rosette ↑	246	51	80	9	-5.0	1.3	1033.6	68	0/10
2a	436	Full	09/Oct/2006	13h28	UTC-6	70°19.670	126°22.460	SCAMP ↓	245	137	80	8	-5.0	1.3	1033.5	67	0/10
2a	436	Full	09/Oct/2006	14h08	UTC-6	70°20.390	126°20.720	CTD-Rosette ↓	245	77	55	12	-5.1	1.0	1033.1	70	0/10
2a	436	Full	09/Oct/2006	14h33	UTC-6	70°20.402	126°21.060	CTD-Rosette ↑	246	77	70	7	-5.0	1.5	1033.3	69	0/10
2a	436	Full	09/Oct/2006	15h23	UTC-6	70°20.790	126°22.510	Bioness ↓	249	5	85	12	-4.9	1.6	1033.1	70	0/10
2a	436	Full	09/Oct/2006	15h31	UTC-6	70°21.120	126°22.700	SCAMP ↑	257	67	100	13	-4.6	1.6	1032.9	67	0/10
2a	436	Full	09/Oct/2006	15h50	UTC-6	70°21.110	126°22.970	Bioness ↑	258	2	100	8	-4.8	1.7	1032.9	66	0/10
2a	436	Full	09/Oct/2006	16h05	UTC-6	70°20.820	126°22.447	Thorium Pumping ↓	249	160	102	10	-4.5	1.7	1032.9	67	0/10
2a	436	Full	09/Oct/2006	17h42	UTC-6	70°20.237	126°26.683	Thorium Pumping ↑	249	N/A	102	10	-4.5	1.7	1032.9	67	0/10
2a	436	Full	09/Oct/2006	18h20	UTC-6	70°20.042	126°26.730	CTD-Rosette ↓	260	60	130	14	-4.5	1.7	1032.9	67	0/10
2a	436	Full	09/Oct/2006	18h49	UTC-6	70°20.178	126°26.719	CTD-Rosette ↑	253	80	131	12	-4.6	1.18	1032.0	67	0/10
2a	436	Full	09/Oct/2006	19h16	UTC-6	70°19.470	126°33.815	Sediment Traps Recovered	250	157	140	15	-5.1	1.15	1032.1	65	0/10
2a	436	Full	09/Oct/2006	19h39	UTC-6	70°19.453	126°39.104	Sediment Traps Recovered (end)	251	157	111	13	-4.6	0.78	1032.0	66	0/10
2a	436	Full	09/Oct/2006	21h50	UTC-6	70°20.220	126°21.470	Box Core ↓	254	284	126	17	-5.0	1.78	1031.3	67	0/10
2a	436	Full	09/Oct/2006	21h59	UTC-6	70°20.390	126°21.580	Box Core ↑	254	279	148	16	-5.2	1.38	1031.3	67	0/10
2a	436	Full	11/Oct/2006	16h20	UTC-6	70°39.020	127°12.183	CTD-Rosette ↓	247	47	193	22	1.0	-0.56	996.7	98	0/10
2a	436	Full	11/Oct/2006	16h48	UTC-6	70°39.326	127°12.450	CTD-Rosette ↑	247	345	207	23	1.0	-0.56	996.7	98	0/10
2a	436	Full	12/Oct/2006	04h40	UTC-6	71°04.747	133°33.047	Sediment Traps Deployed	320	199	132	10	-0.6	-0.28	1003.3	99	0/10
2a	436	Full	12/Oct/2006	05h04	UTC-6	71°04.680	133°33.944	Sediment Traps Deployed (end)	314	163	123	8	-0.6	-0.28	1003.3	99	0/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
2a	436	Full	12/Oct/2006	05h19	UTC-6	71°05.250	133°34.612	RMT ↓	330	213	140	8	-0.1	-0.1	1003	99	0/10
2a	436	Full	12/Oct/2006	05h31	UTC-6	71°04.821	133°34.886	RMT ↑	329	110	150	8	-0.1	-0.1	1003	99	0/10
2a	436	Full	12/Oct/2006	05h35	UTC-6	71°04.709	133°34.480	RMT ↓	320	102	150	8	-0.1	-0.1	1003	99	0/10
2a	436	Full	12/Oct/2006	05h50	UTC-6	71°04.844	133°33.126	RMT ↑	330	226	150	10	-0.2	-0.1	1003	99	0/10
2a	436	Full	12/Oct/2006	06h00	UTC-6	71°04.657	133°33.989	Bioness ↓	315	68	180	7	0.3	-0.14	1003	96	0/10
2a	436	Full	12/Oct/2006	06h51	UTC-6	71°04.494	133°34.300	Vertical Net Tow ↓	310	247	172	10	0.5	-0.18	1003.2	95	0/10
2a	436	Full	12/Oct/2006	07h06	UTC-6	71°04.443	133°34.599	Vertical Net Tow ↑	308	257	157	10	0.5	-0.18	1003.2	90	0/10
2a	435	Full	12/Oct/2006	07h25	UTC-6	71°04.396	133°34.949	CTD-Rosette ↓	305	313	168	7	-0.1	-0.17	1002.9	90	0/10
2a	435	Full	12/Oct/2006	08h12	UTC-6	71°04.601	133°35.612	CTD-Rosette ↑	319	75	182	11	0.8	-0.20	1002.9	94	0/10
2a	435	Full	12/Oct/2006	08h34	UTC-6	71°04.560	133°35.940	Horizontal Net Tow ↓	316	311	184	12	0.7	-0.23	1002.9	92	0/10
2a	435	Full	12/Oct/2006	08h43	UTC-6	71°04.420	133°36.740	Horizontal Net Tow ↑	305	143	195	11	0.2	-0.24	1003.1	93	0/10
2a	435	Full	12/Oct/2006	08h50	UTC-6	71°04.360	133°35.830	Horizontal Net Tow ↓	304	64	194	12	0.2	-0.24	1003	93	0/10
2a	435	Full	12/Oct/2006	09h01	UTC-6	71°04.870	133°33.800	Horizontal Net Tow ↑	306	206	184	11	0.3	-0.26	1003.1	94	0/10
2a	435	Full	12/Oct/2006	09h36	UTC-6	71°04.950	133°33.540	CTD-Rosette ↓	333	67	188	8	0.7	-0.30	1003.4	93	0/10
2a	435	Full	12/Oct/2006	10h18	UTC-6	71°04.890	133°34.070	CTD-Rosette ↑	324	73	200	7	1.0	-0.23	1003.6	92	0/10
2a	435	Full	12/Oct/2006	10h59	UTC-6	71°04.650	133°34.500	PNF ↓	325	125	233	8	0.6	-0.22	1001.6	94	0/10
2a	435	Full	12/Oct/2006	11h05	UTC-6	71°04.650	133°34.500	PNF ↑	325	N/A	233	8	0.6	-0.22	1001.5	94	0/10
2a	435	Full	12/Oct/2006	11h20	UTC-6	71°04.330	133°34.250	Secchi Disk ↓	290	N/A	279	10	0.6	-0.22	1004.5	94	0/10
2a	435	Full	12/Oct/2006	11h30	UTC-6	71°04.700	133°34.520	Secchi Disk ↑	293	102	279	9	0.6	-0.22	1004.5	94	0/10
2a	435	Full	12/Oct/2006	11h37	UTC-6	71°04.270	133°34.080	CTD-Rosette ↓	290	130	279	8	0.0	-0.24	1004.6	94	0/10
2a	435	Full	12/Oct/2006	12h14	UTC-6	71°03.880	133°34.610	CTD-Rosette ↑	262	194	310	11	1.1	-0.2	1004.5	92	0/10
2a	435	Full	12/Oct/2006	12h42	UTC-6	71°04.580	133°33.580	Thorium Pumping ↓	297	89	320	22	1.1	-0.2	1004.4	95	0/10
2a	435	Full	12/Oct/2006	14h06	UTC-6	71°02.320	133°36.930	Thorium Pumping ↑	200	115	310	20	0.0	-0.2	1006.4	93	0/10
2a	435	Full	12/Oct/2006	17h02	UTC-6	71°04.725	133°37.226	CTD-Rosette ↓ (canceled)	302	125	295	22	-0.7	-0.45	1011.2	88	0/10
2a	CA04-06	Mooring	12/Oct/2006	18h25	UTC-6	71°04.922	133°39.349	Mooring CA04-06 Deployed	301	130	284	26	2.9	-0.5	1013.3	77	0/10
2a	435	Full	12/Oct/2006	19h32	UTC-6	71°05.033	133°24.580	CTD-Rosette ↓	333	335	279	21	-0.4	-0.4	1013.2	84	0/10
2a	435	Full	12/Oct/2006	20h09	UTC-6	71°04.880	133°34.590	CTD-Rosette ↑	333	335	280	25	-0.6	-0.28	1013.8	83	0/10
2a	N/A	N/A	12/Oct/2006	23h00	UTC-6	70°57.400	134°34.500	Sediment Traps Recovered	300	250	260	22	-0.5	-0.27	1016.5	83	0/10
2a	N/A	N/A	13/Oct/2006	15h43	UTC-6	70°22.710	137°38.300	CTD-Rosette ↓	432	96	260	4	-0.6	0.1	1022.5	85	0/10
2a	N/A	N/A	13/Oct/2006	16h38	UTC-6	70°22.308	137°37.227	CTD-Rosette ↑	436	223	305	4	0.0	0.25	1022.5	82	0/10
2a	N/A	N/A	14/Oct/2006	13h55	UTC-6	70°15.080	138°04.950	Hydrobios ↓	297	305	100	20	0.3	-0.4	1018.8	90	0/10
2a	N/A	N/A	14/Oct/2006	14h15	UTC-6	70°15.390	138°06.060	Hydrobios ↑	304	310	100	20	3.1	-0.17	1018.21	82	0/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
2a	NRCan Survey	N/A	15/Oct/2006	14h44	UTC-6	70°37.700	136°14.600	CTD-Rosette ↓	548	326	120	20	-1.6	0.1	1017.2	95	0/10
2a	NRCan Survey	N/A	15/Oct/2006	15h28	UTC-6	70°37.430	136°16.280	CTD-Rosette ↑	563	353	125	22	-1.6	0.0	1020.5	91	0/10
2a	NRCan Survey	N/A	15/Oct/2006	15h46	UTC-6	70°37.490	136°17.080	Thorium Pumping ↓	572	280	120	22	-1.1	0.0	1020.4	89	0/10
2a	NRCan Survey	N/A	15/Oct/2006	16h28	UTC-6	70°37.408	136°17.668	Thorium Pumping ↑	566	304	125	18	-1.9	-0.12	1020.4	93	0/10
2a	NRCan Survey	N/A	15/Oct/2006	16h32	UTC-6	70°37.385	136°17.673	Thorium Pumping ↓	566	291	125	18	-1.9	-0.12	1020.4	93	0/10
2a	NRCan Survey	N/A	15/Oct/2006	17h45	UTC-6	70°37.150	136°19.004	Thorium Pumping ↑	N/A	319	118	22	-2.2	-0.24	1020.2	97	0/10
2a	NRCan Survey	N/A	16/Oct/2006	11h45	UTC-6	70°36.980	136°24.620	CTD-Rosette ↓	695	314	102	32	-3.8	-0.34	1016.8	96	0/10
2a	NRCan Survey	N/A	16/Oct/2006	12h14	UTC-6	70°36.680	136°25.890	CTD-Rosette ↑	680	297	104	33	-1.4	-0.3	1016.7	85	0/10
2a	434	Full	16/Oct/2006	18h20	UTC-6	70°10.610	133°33.400	CTD-Rosette ↓	46	300	107	28	-2.9	-1.15	1016.4	81	0/10
2a	434	Full	16/Oct/2006	18h45	UTC-6	70°10.594	133°33.626	CTD-Rosette ↑	48	300	103	32	-1.9	-0.98	1016.3	77	0/10
2a	434	Full	16/Oct/2006	18h58	UTC-6	70°10.659	133°33.506	Horizontal Net Tow ↓	50	300	101	31	-1.3	-0.93	1016.5	75	0/10
2a	434	Full	16/Oct/2006	17h09	UTC-6	70°10.504	133°33.630	Horizontal Net Tow ↑	38	300	101	30	-1.3	-0.93	1016.5	70	0/10
2a	434	Full	16/Oct/2006	17h15	UTC-6	70°10.672	133°33.733	Horizontal Net Tow ↓	42	267	110	34	-3.2	-1.02	1016.1	81	0/10
2a	434	Full	16/Oct/2006	19h20	UTC-6	70°10.605	133°34.217	Horizontal Net Tow ↑	39	204	109	31	-3.2	-1.02	1016	81	0/10
2a	434	Full	16/Oct/2006	19h42	UTC-6	70°10.631	133°33.874	Vertical Net Tow ↓	41	294	103	31	-1.9	-1.18	1016.2	77	0/10
2a	434	Full	16/Oct/2006	19h53	UTC-6	70°10.650	133°33.800	Vertical Net Tow ↑	52	275	105	27	-1.8	-1.19	1016.1	78	0/10
2a	434	Full	16/Oct/2006	N/A	UTC-6	N/A	N/A	RMT (canceled - strong winds)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0/10
2a	434	Full	16/Oct/2006	20h37	UTC-6	70°10.880	133°34.660	CTD-Rosette ↓	43	300	98	31	-3.7	-1.25	1016.1	83	0/10
2a	434	Full	16/Oct/2006	20h59	UTC-6	70°10.830	133°35.280	CTD-Rosette ↑	44	307	103	35	-1.2	-1.30	1016.2	76	0/10
2a	434	Full	16/Oct/2006	21h21	UTC-6	70°11.070	133°36.200	Thorium Pumping ↓	43	274	116	32	-3.3	-1.32	1016.1	79	0/10
2a	434	Full	16/Oct/2006	22h53	UTC-6	70°11.990	133°38.070	Thorium Pumping ↑	55	292	107	29	-4.0	-1.30	1016.4	82	0/10
2a	434	Full	16/Oct/2006	23h02	UTC-6	70°12.070	133°38.230	Small Zooplankton Ring Net ↓	45	280	110	24	-4.1	-1.30	1016.3	82	0/10
2a	434	Full	16/Oct/2006	23h13	UTC-6	70°12.210	133°38.480	Small Zooplankton Ring Net ↑	47	282	109	24	-4.1	-1.31	1016.2	82	0/10
2a	434	Full	16/Oct/2006	23h23	UTC-6	70°12.340	133°38.770	Box Core ↓	50	282	107	27	-4.1	-1.31	1016.1	82	0/10
2a	434	Full	16/Oct/2006	23h25	UTC-6	70°12.360	133°38.760	Box Core ↑	55	289	109	25	-4.1	-1.31	1016.1	82	0/10
2a	407	Full	17/Oct/2006	14h52	UTC-6	71°00.550	126°03.520	Zodiac + SCAMP ↓	387	245	125	5	-3.5	1.4	1016.9	87	0/10
2a	407	Full	17/Oct/2006	15h37	UTC-6	71°00.690	126°03.620	Sediment Traps Deployed	394	261	125	5	-3.5	1.4	1016.9	87	0/10
2a	407	Full	17/Oct/2006	15h50	UTC-6	71°01.421	126°02.440	Secchi Disk ↓↑	386	65	60	5	-3.1	1.5	1016.6	84	0/10
2a	407	Full	17/Oct/2006	16h20	UTC-6	71°00.505	126°04.307	CTD-Rosette ↓	382	133	270	2	-2.9	1.4	1016.4	84	0/10
2a	407	Full	17/Oct/2006	17h05	UTC-6	71°00.775	126°02.962	CTD-Rosette ↑	385	189	109	2	-3.2	1.4	1016.3	84	0/10
2a	CA08-06	Mooring	17/Oct/2006	18h30	UTC-6	71°00.621	126°03.967	Mooring CA08-06 Deployed	385	N/A	59	2	-3.0	1.39	1015.6	80	0/10
2a	407	Full	17/Oct/2006	19h25	UTC-6	71°00.685	126°02.816	CTD-Rosette ↓	390	90	18	7	-2.7	1.58	1012.9	81	0/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
2a	407	Full	17/Oct/2006	20h02	UTC-6	71°00.837	126°01.566	CTD-Rosette ↑	393	228	353	5	-2.0	1.95	1015.0	79	0/10
2a	407	Full	17/Oct/2006	20h17	UTC-6	71°01.031	126°02.433	Bioness ↓	395	395	325	8	-3.0	1.96	1014.7	82	0/10
2a	407	Full	17/Oct/2006	20h48	UTC-6	71°00.960	125°58.380	Bioness ↑	396	128	330	7	-3.4	1.94	1014.5	83	0/10
2a	407	Full	17/Oct/2006	21h12	UTC-6	71°01.025	125°57.169	CTD-Rosette ↓	395	253	331	7	-1.7	2.00	1014.1	80	0/10
2a	407	Full	17/Oct/2006	21h47	UTC-6	71°01.159	125°55.502	CTD-Rosette ↑	402	226	330	10	-2	2.00	1014.1	85	0/10
2a	407	Full	17/Oct/2006	22h02	UTC-6	71°01.148	125°54.675	Hydrobios ↓	402	224	325	11	-2	1.99	1013.9	85	0/10
2a	407	Full	17/Oct/2006	22h27	UTC-6	71°01.171	125°53.006	Hydrobios ↑	404	223	333	13	-2	2.04	1013.7	85	0/10
2a	407	Full	17/Oct/2006	23h04	UTC-6	71°00.440	126°03.740	CTD-Rosette ↓	390	218	337	12	-3.5	2.01	1013.4	91	0/10
2a	407	Full	17/Oct/2006	23h35	UTC-6	71°00.570	126°02.120	CTD-Rosette ↑	393	225	335	12	-2.3	1.97	1013.4	87	0/10
2a	407	Full	17/Oct/2006	23h52	UTC-6	71°00.620	126°01.880	Thorium Pumping ↓	393	263	336	12	-2.9	2.01	1013.3	88	0/10
2a	407	Full	18/Oct/2006	01h19	UTC-6	71°01.120	126°00.630	Thorium Pumping ↑	396	277	0	10	-4.1	2.2	1013.1	95	0/10
2a	407	Full	18/Oct/2006	01h32	UTC-6	71°01.250	126°00.510	CTD-Rosette ↓	398	127	346	10	-4.1	2.2	1013.1	95	0/10
2a	407	Full	18/Oct/2006	02h18	UTC-6	71°01.690	125°59.020	CTD-Rosette ↑	394	114	345	14	-5.2	2.3	1012.6	97	0/10
2a	N/A	N/A	18/Oct/2006	03h35	UTC-6	71°03.960	125°48.080	Sediment Traps Recovered	414	240	325	13	-5.2	1.8	1012.4	96	0/10
2a	CA18-06	Mooring	18/Oct/2006	11h04	UTC-6	70°39.920	122°59.370	Mooring CA18-06 Deployed	543	2	336	12	-2.7	2.09	1009.2	92	0/10
2a	405	CTD	18/Oct/2006	11h51	UTC-6	70°39.620	122°59.780	CTD ↓	584	210	286	12	-1.9	2.02	1009.3	88	0/10
2a	405	CTD	18/Oct/2006	12h15	UTC-6	70°39.350	122°59.340	CTD ↑	590	176	299	10	-1.9	2.1	1009.3	87	0/10
2a	404	Nutrient	18/Oct/2006	14h55	UTC-6	70°20.790	121°36.040	CTD-Rosette ↓	464	89	230	25	-3.0	0.2	1009.1	94	0/10
2a	404	Nutrient	18/Oct/2006	15h42	UTC-6	70°20.910	121°35.330	CTD-Rosette ↑	466	72	240	23	-1.7	-0.4	1009.1	81	0/10
2a	403	CTD	18/Oct/2006	18h29	UTC-6	70°05.861	120°06.632	CTD ↓	404	94	268	20	-3.6	0.1	1009.6	90	0/10
2a	403	CTD	18/Oct/2006	18h50	UTC-6	70°05.896	120°06.707	CTD ↑	404	98	260	21	-1.2	0.2	1009.4	84	0/10
2a	2006	CTD	20/Oct/2006	01h28	UTC-6	68°05.040	111°57.560	CTD ↓	226	332	145	14	-2.3	-0.9	1021.05	75	0/10
2a	2006	CTD	20/Oct/2006	01h43	UTC-6	68°05.020	111°57.650	CTD ↑	230	332	140	12	-2.6	-0.9	1021.3	72	0/10
2a	N/A	CTD	20/Oct/2006	07h40	UTC-5	69°40.660	099°35.987	CTD ↓	67	328	59	10	-1.5	-1.05	1022.8	99	6/10
2a	N/A	CTD	20/Oct/2006	07h48	UTC-5	69°40.620	099°36.097	CTD ↑	67	328	54	10	-1.5	-1.05	1022.3	99	6/10
2a	N/A	CTD	20/Oct/2006	10h30	UTC-5	69°51.300	099°17.200	Ice sampling ↓	N/A	N/A	150	10	-0.9	-0.6	1023.0	99	7/10
2a	N/A	CTD	20/Oct/2006	13h28	UTC-5	69°51.300	099°17.200	Ice sampling ↑	N/A	N/A	150	10	-0.9	N/A	1023.0	99	7/10
2a	N/A	CTD	21/Oct/2006	13h34	UTC-5	69°51.480	099°16.740	CTD-Rosette ↓	121	6	150	10	-0.9	-0.6	1023.4	99	8/10
2a	N/A	CTD	21/Oct/2006	13h53	UTC-5	69°51.530	099°16.780	CTD-Rosette ↑	123	36	150	8	-0.2	-0.8	1023.4	99	8/10
2a	N/A	CTD	21/Oct/2006	21h23	UTC-5	71°07.292	097°30.070	CTD ↓	99	347	156	15	-1.2	-1.11	1023.2	99	0/10
2a	N/A	CTD	21/Oct/2006	21h31	UTC-5	71°07.330	097°30.270	CTD ↑	100	2	155	15	0.0	-1.10	1023.1	99	0/10
2a	317	Nutrient	22/Oct/2006	11h50	UTC-5	72°05.140	093°54.260	CTD-Rosette ↓	112	332	155	10	-2.4	-0.93	1020.5	98	0/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
2a	317	Nutrient	22/Oct/2006	12h21	UTC-5	72°05.360	093°55.070	CTD-Rosette ↑	110	35	160	8	-1.7	-0.7	1020.3	96	0/10
2a	318	CTD	22/Oct/2006	13h09	UTC-5	71°59.220	093°48.890	CTD-Rosette ↓	84	350	160	9	-3.1	-0.9	1019.6	98	0/10
2a	318	CTD	22/Oct/2006	13h23	UTC-5	71°59.210	093°49.300	CTD-Rosette ↑	83	0	160	10	-1.7	-0.8	1017.6	98	0/10
2a	319	Nutrient	22/Oct/2006	14h11	UTC-5	71°52.980	093°42.670	CTD-Rosette ↓	100	45	156	15	-3.1	-0.9	1018.9	93	0/10
2a	319	Nutrient	22/Oct/2006	14h38	UTC-5	71°53.150	093°43.290	CTD-Rosette ↑	97	37	180	10	-2.0	-0.9	1019.5	87	0/10
2a	320	CTD	22/Oct/2006	15h16	UTC-5	71°48.230	093°37.050	CTD ↓	91	144	175	9	-3.7	-0.9	1019.4	93	0/10
2a	320	CTD	22/Oct/2006	15h23	UTC-5	71°48.170	093°36.840	CTD ↑	91	161	175	8	-3.7	-0.8	1019.6	94	0/10
2a	321	CTD	22/Oct/2006	23h48	UTC-5	70°20.940	091°33.980	CTD ↓	96	40	162	9	-2.8	-0.34	1018.4	99	0/10
2a	321	CTD	22/Oct/2006	23h56	UTC-5	70°21.020	091°34.130	CTD ↑	95	37	149	11	-2.6	-0.4	1019.04	98	0/10
2a	322	Basic	23/Oct/2006	01h00	UTC-5	70°24.090	091°06.060	CTD-Rosette ↓	222	354	172	11	-1.8	-0.5	1019.2	99	0/10
2a	322	Basic	23/Oct/2006	01h32	UTC-5	70°24.220	091°06.110	CTD-Rosette ↑	230	350	160	13	-0.9	-0.5	1019.1	95	0/10
2a	322	Basic	23/Oct/2006	02h05	UTC-5	70°24.510	091°05.980	Horizontal Net Tow ↓	230	343	170	17	1.0	-0.4	1019.2	88	0/10
2a	322	Basic	23/Oct/2006	02h13	UTC-5	70°24.650	091°06.370	Horizontal Net Tow ↑	231	220	180	16	0.8	-0.4	1018.9	85	0/10
2a	322	Basic	23/Oct/2006	02h24	UTC-5	70°24.710	091°06.530	Horizontal Net Tow ↓	220	297	182	15	-1.9	-0.5	1018.9	93	0/10
2a	322	Basic	23/Oct/2006	02h37	UTC-5	70°24.550	091°07.220	Horizontal Net Tow ↑	222	121	176	16	-2.2	-0.5	1018.8	95	0/10
2a	322	Basic	23/Oct/2006	02h53	UTC-5	70°24.230	091°06.170	RMT ↓	220	216	175	16	-2.0	-0.5	1018.6	95	0/10
2a	322	Basic	23/Oct/2006	03h07	UTC-5	70°23.930	091°06.220	RMT ↑	220	43	175	16	-2.0	-0.5	1018.6	95	0/10
2a	322	Basic	23/Oct/2006	03h14	UTC-5	70°24.010	091°06.070	RMT ↓	222	333	174	16	-1.7	-0.5	1018.7	94	0/10
2a	322	Basic	23/Oct/2006	03h24	UTC-5	70°24.020	091°06.970	RMT ↑	219	206	165	15	-1.6	-0.5	1018.6	93	0/10
2a	322	Basic	23/Oct/2006	03h43	UTC-5	70°24.060	091°05.800	CTD-Rosette ↓	222	150	180	16	-1.8	-0.5	1018.7	94	0/10
2a	322	Basic	23/Oct/2006	04h22	UTC-5	70°24.100	091°05.597	CTD-Rosette ↑	210	210	180	15	-1.5	-0.5	1018.1	94	0/10
2a	322	Basic	23/Oct/2006	04h40	UTC-5	70°24.080	091°06.172	Vertical Net Tow ↓	220	52	174	20	-1.1	-0.5	1018.0	92	0/10
2a	322	Basic	23/Oct/2006	04h50	UTC-5	70°24.130	091°05.920	Vertical Net Tow ↑	210	22	174	20	-1.1	-0.5	1018.0	92	0/10
2a	322	Basic	23/Oct/2006	05h28	UTC-5	70°24.080	091°05.081	Small Zooplankton Ring Net ↓	207	0	190	12	-0.6	-0.2	1018.2	90	0/10
2a	322	Basic	23/Oct/2006	05h45	UTC-5	70°24.080	091°04.961	Small Zooplankton Ring Net ↑	207	1	130	12	-0.6	-0.2	1018.0	90	0/10
2a	322	Basic	23/Oct/2006	06h09	UTC-5	70°24.138	091°04.642	Box Core ↓↑	210	354	171	14	-1.3	-0.4	1018.3	93	0/10
2a	323	CTD	23/Oct/2006	07h16	UTC-5	70°26.944	090°38.400	CTD ↓	126	93	162	21	-1.0	-0.7	1017.9	96	0/10
2a	323	CTD	23/Oct/2006	07h26	UTC-5	70°26.993	090°38.308	CTD ↑	125	25	162	21	-1.0	-0.7	1017.9	96	0/10
2a	324	Nutrient	23/Oct/2006	08h25	UTC-5	70°30.100	090°08.630	CTD-Rosette ↓	132	15	152	23	-1.3	-0.96	1017.5	96	0/10
2a	324	Nutrient	23/Oct/2006	08h50	UTC-5	70°30.480	090°09.600	CTD-Rosette ↑	134	36	154	19	-0.9	-0.94	1018.0	95	0/10
2a	325	CTD	23/Oct/2006	09h54	UTC-5	70°33.180	089°40.410	CTD ↓	164	359	149	24	-1.4	-0.82	1017.9	95	0/10
2a	325	CTD	23/Oct/2006	10h03	UTC-5	70°33.280	089°40.810	CTD ↑	161	3	144	24	1.0	-0.79	1018.2	88	0/10

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Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
2a	326	Nutrient	23/Oct/2006	11h10	UTC-5	70°36.230	089°13.690	CTD-Rosette ↓	86	353	146	25	-2.2	-1.16	1018.2	96	8/10
2a	326	Nutrient	23/Oct/2006	11h36	UTC-5	70°36.930	089°14.920	CTD-Rosette ↑	84	3	142	22	-1.0	-1.16	1018.2	89	8/10
2a	327	Nutrient	23/Oct/2006	22h07	UTC-5	69°57.080	085°43.910	CTD-Rosette ↓ (Calibration)	260	318	95	10	-1.7	-1.24	1018.6	97	3/10
2a	327	Nutrient	23/Oct/2006	22h35	UTC-5	69°57.130	085°44.950	CTD-Rosette ↑ (Calibration)	246	357	98	9	-1.4	-1.14	1018.5	97	2/10
2a	327	Nutrient	23/Oct/2006	22h55	UTC-5	69°57.130	085°45.530	CTD-Rosette ↓	236	12	95	11	-1.3	-1.12	1018.3	97	2/10
2a	327	Nutrient	23/Oct/2006	23h27	UTC-5	69°57.210	085°46.800	CTD-Rosette ↑	197	354	78	11	-1.7	-1.16	1018.1	99	2/10
2a	328	Nutrient	24/Oct/2006	00h14	UTC-5	69°53.040	085°44.300	CTD-Rosette ↓	114	12	92	10	-1.8	-1.2	1018.0	98	1/10
2a	328	Nutrient	24/Oct/2006	00h34	UTC-5	69°53.130	085°44.980	CTD-Rosette ↑	133	18	80	10	-1.6	-1.1	1018.1	97	1/10
2a	329	CTD	24/Oct/2006	16h30	UTC-5	69°21.989	080°23.037	CTD ↓	36	159	180	12	0.7	0.5	1019	99	0/10
2a	329	CTD	24/Oct/2006	16h35	UTC-5	69°22.001	080°22.937	CTD ↑	30	169	180	12	0.7	0.5	1019	98	0/10
2a	330	Nutrient	24/Oct/2006	17h05	UTC-5	69°19.105	080°32.973	CTD-Rosette ↓	58	216	183	11	-0.3	1.64	1018	99	0/10
2a	330	Nutrient	24/Oct/2006	17h28	UTC-5	69°19.133	080.32°923	CTD-Rosette ↑	59	124	183	11	-0.3	1.64	1018	99	0/10
2a	331	CTD	24/Oct/2006	18h20	UTC-5	69°15.089	080°45.824	CTD-Rosette ↓	63	180	182	11	-0.6	0.23	1018.9	99	0/10
2a	331	CTD	24/Oct/2006	18h30	UTC-5	69°15.144	080°45.860	CTD-Rosette ↑	63	200	182	11	-0.6	0.23	1018.9	99	0/10
2a	332	Nutrient	24/Oct/2006	19h16	UTC-5	69°10.976	080°59.843	CTD-Rosette ↓	74	156	200	10	-0.4	0.0	1018.9	99	0/10
2a	332	Nutrient	24/Oct/2006	19h37	UTC-5	69°11.059	080°59.802	CTD-Rosette ↑	74	43	200	10	-0.4	0.0	1018.9	99	0/10
2a	333	Basic	24/Oct/2006	21h46	UTC-5	68°45.920	081°00.840	CTD-Rosette ↓	34	327	201	8	0.4	0.22	1019.1	99	0/10
2a	333	Basic	24/Oct/2006	22h02	UTC-5	68°45.640	081°01.200	CTD-Rosette ↑	35	297	197	8	0.3	0.34	1019.4	99	0/10
2a	333	Basic	24/Oct/2006	22h25	UTC-5	68°45.410	081°01.040	RMT ↓	35	357	198	8	0.1	0.38	1019.5	99	0/10
2a	333	Basic	24/Oct/2006	22h36	UTC-5	68°45.090	081°01.470	RMT ↑	36	186	194	5	0.4	0.38	1019.6	98	0/10
2a	333	Basic	24/Oct/2006	22h58	UTC-5	68°44.430	081°01.620	Horizontal Net Tow ↓	36	211	191	7	0.3	0.42	1019.7	99	0/10
2a	333	Basic	24/Oct/2006	23h05	UTC-5	68°44.020	081°01.050	Horizontal Net Tow ↑	35	15	207	6	0.3	0.43	1017.7	99	0/10
2a	333	Basic	24/Oct/2006	23h12	UTC-5	68°43.970	081°01.000	Horizontal Net Tow ↓	35	340	211	9	0.5	0.43	1019.8	99	0/10
2a	333	Basic	24/Oct/2006	23h24	UTC-5	68°43.450	081°01.100	Horizontal Net Tow ↑	34	338	209	9	0.4	0.41	1019.8	99	0/10
2a	333	Basic	24/Oct/2006	23h48	UTC-5	68°45.830	081°00.860	Small Zooplankton Ring Net ↓	35	52	194	8	0.4	0.37	1019.9	98	0/10
2a	333	Basic	24/Oct/2006	23h56	UTC-5	68°45.580	081°00.290	Small Zooplankton Ring Net ↑	34	12	196	6	0.6	0.3	1020	97	0/10
2a	333	Basic	25/Oct/2006	00h05	UTC-5	68°45.480	081°00.260	Box Core ↓	34	338	214	8	0.7	0.3	1020	97	0/10
2a	333	Basic	25/Oct/2006	00h09	UTC-5	68°45.480	081°00.580	Box Core ↑	34	330	214	8	0.7	0.3	1020	97	0/10
2a	334	Basic	25/Oct/2006	04h10	UTC-5	67°52.770	080°47.840	CTD-Rosette ↓	78	352	239	6	1.2	1.91	1021.3	94	0/10
2a	334	Basic	25/Oct/2006	04h26	UTC-5	67°52.820	080°47.790	CTD-Rosette ↑	78	350	239	6	1.2	1.91	1021	94	0/10
2a	334	Basic	25/Oct/2006	04h40	UTC-5	67°53.000	080°47.900	Horizontal Net Tow ↓	82	N/A	234	8	0.8	1.95	1021.5	93	0/10
2a	334	Basic	25/Oct/2006	04h50	UTC-5	67°59.930	080°47.840	Horizontal Net Tow ↑	82	205	240	6	1.0	1.95	1021.5	93	0/10

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
2a	334	Basic	25/Oct/2006	04h55	UTC-5	67°53.090	080°47.840	Horizontal Net Tow ↓	82	302	230	8	1.0	1.95	1021	93	0/10
2a	334	Basic	25/Oct/2006	05h05	UTC-5	67°53.000	080°47.920	Horizontal Net Tow ↑	82	85	230	8	1.2	1.32	1021.5	91	0/10
2a	334	Basic	25/Oct/2006	05h15	UTC-5	67°53.130	080°47.580	RMT ↓	84	354	233	8	1.4	1.93	1021.6	91	0/10
2a	334	Basic	25/Oct/2006	05h25	UTC-5	67°53.110	080°47.840	RMT ↑	84	104	233	8	1.4	1.93	1021.6	91	0/10
2a	334	Basic	25/Oct/2006	05h45	UTC-5	67°52.990	080°47.840	Vertical Net Tow ↓	82	200	250	9	1.1	1.94	1021.5	93	0/10
2a	334	Basic	25/Oct/2006	06h00	UTC-5	67°52.990	080°47.680	Vertical Net Tow ↑	82	185	250	10	1.1	1.94	1021.5	93	0/10
2a	334	Basic	25/Oct/2006	06h12	UTC-5	67°53.000	080°47.470	CTD-Rosette ↓	82	171	253	10	1.1	1.94	1021.5	92	0/10
2a	334	Basic	25/Oct/2006	06h47	UTC-5	67°53.060	080°46.660	CTD-Rosette ↑	82	154	257	7	1.2	1.9	1021.7	92	0/10
2a	334	Basic	25/Oct/2006	06h35	UTC-5	67°53.060	080°46.910	Small Zooplankton Ring Net ↓	82	176	269	8	1.5	1.9	1021.7	91	0/10
2a	334	Basic	25/Oct/2006	06h50	UTC-5	67°53.060	080°46.630	Small Zooplankton Ring Net ↑	82	177	269	9	1.5	1.9	1021.7	91	0/10
2a	334	Basic	25/Oct/2006	07h10	UTC-5	67°52.711	080°48.082	Box Core ↓↑	86	266	253	6	0.9	1.9	1021.8	92	0/10
2a	335	CTD	25/Oct/2006	15h07	UTC-5	66°32.930	082°08.140	CTD-Rosette ↓	99	274	300	10	-2.6	1.7	1024.3	91	0/10
2a	335	CTD	25/Oct/2006	15h22	UTC-5	66°32.870	082°08.160	CTD-Rosette ↑	101	267	320	10	-2.4	1.8	1024.3	91	0/10
2a	336	Nutrient	25/Oct/2006	16h39	UTC-5	66°25.220	081°50.960	CTD-Rosette ↓	136	282	315	10	-1.9	1.19	1024.5	90	0/10
2a	336	Nutrient	25/Oct/2006	17h06	UTC-5	66°25.270	081°50.450	CTD-Rosette ↑	138	195	306	11	-1.7	1.34	1024.5	89	0/10
2a	337	CTD	25/Oct/2006	18h09	UTC-5	66°16.870	081°36.910	CTD ↓	70	247	309	11	-1.5	1.4	1024.9	90	0/10
2a	337	CTD	25/Oct/2006	18h15	UTC-5	66°16.813	081°36.860	CTD ↑	70	250	309	11	-1.5	1.4	1024.9	90	0/10
2a	338	Basic	25/Oct/2006	19h31	UTC-5	66°09.990	081°19.760	CTD-Rosette ↓	134	285	324	10	-1.8	1.4	1024.9	90	0/10
2a	338	Basic	25/Oct/2006	20h00	UTC-5	66°09.590	081°19.400	CTD-Rosette ↑	135	189	315	8	-1.3	1.48	1025	88	0/10
2a	338	Basic	25/Oct/2006	20h22	UTC-5	66°09.290	081°19.140	Vertical Net Tow ↓	134	87	308	9	-1.1	1.49	1025	87	0/10
2a	338	Basic	25/Oct/2006	20h31	UTC-5	66°09.040	081°19.170	Vertical Net Tow ↑	134	70	316	7	-1.9	1.50	1025	87	0/10
2a	338	Basic	25/Oct/2006	20h15	UTC-5	66°09.310	081°19.130	SCAMP ↓	134	101	309	9	-1.1	1.49	1025	87	0/10
2a	338	Basic	25/Oct/2006	20h48	UTC-5	66°09.850	081°19.300	Horizontal Net Tow ↓	134	342	318	8	-1.9	1.48	1024.9	90	0/10
2a	338	Basic	25/Oct/2006	20h58	UTC-5	66°09.610	081°19.800	Horizontal Net Tow ↑	133	98	313	8	-1.9	1.44	1024.8	90	0/10
2a	338	Basic	25/Oct/2006	21h04	UTC-5	66°09.540	081°19.680	Horizontal Net Tow ↓	134	72	326	8	-17	1.42	1024.9	90	0/10
2a	338	Basic	25/Oct/2006	21h17	UTC-5	66°09.440	081°19.790	Horizontal Net Tow ↑	134	86	341	9	-1.8	1.42	1024.8	91	0/10
2a	338	Basic	25/Oct/2006	21h31	UTC-5	66°09.320	081°19.860	CTD-Rosette ↓	133	261	331	8	-1.7	1.42	1024.7	88	0/10
2a	338	Basic	25/Oct/2006	22h02	UTC-5	66°08.720	081°20.140	CTD-Rosette ↑	135	207	314	8	-1.0	1.46	1024.6	87	0/10
2a	338	Basic	25/Oct/2006	22h08	UTC-5	66°08.670	081°20.150	SCAMP ↑	135	206	314	7	-1.0	1.46	1024.6	87	0/10
2a	338	Basic	25/Oct/2006	22h22	UTC-5	66°08.470	081°20.220	RMT ↓	134	31	319	10	-1.4	1.47	1024.4	88	0/10
2a	338	Basic	25/Oct/2006	22h33	UTC-5	66°08.320	081°20.600	RMT ↑	133	68	336	7	-1.3	1.41	1024.2	88	0/10
2a	338	Basic	25/Oct/2006	22h38	UTC-5	66°08.380	081°20.210	RMT ↓	134	50	335	10	-1.4	1.38	1024.2	88	0/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
2a	338	Basic	25/Oct/2006	22h50	UTC-5	66°08.250	081°20.590	RMT ↑	134	88	345	7	-1.4	1.36	1024.2	88	0/10
2a	338	Basic	25/Oct/2006	22h55	UTC-5	66°08.220	081°20.360	Small Zooplankton Ring Net ↓	135	42	344	10	-1.2	1.33	1024.1	88	0/10
2a	338	Basic	25/Oct/2006	23h10	UTC-5	66°08.080	081°20.320	Small Zooplankton Ring Net ↑	136	49	342	12	-1.4	1.32	1024	87	0/10
2a	338	Basic	25/Oct/2006	23h26	UTC-5	66°08.090	081°20.430	Box Core ↓	136	25	323	10	-1.2	1.33	1024	86	0/10
2a	338	Basic	25/Oct/2006	23h30	UTC-5	66°08.060	081°20.420	Box Core ↑	135	28	326	10	-1.2	1.33	1024	84	0/10
2a	339	CTD	26/Oct/2006	00h27	UTC-5	66°00.970	081°05.010	CTD ↓	147	238	320	7	-1.0	1.1	1023.9	83	0/10
2a	339	CTD	26/Oct/2006	00h37	UTC-5	66°00.930	081°05.030	CTD ↑	147	222	310	7	-0.7	1.1	1023.8	84	0/10
2a	340	Nutrient	26/Oct/2006	01h39	UTC-5	65°52.990	080°46.950	CTD-Rosette ↓	133	291	315	5	-1.1	0.6	1023.8	89	0/10
2a	340	Nutrient	26/Oct/2006	02h05	UTC-5	65°52.990	080°46.670	CTD-Rosette ↑	133	231	328	7	-1.0	0.7	1023.7	90	0/10
2a	341	CTD	26/Oct/2006	02h54	UTC-5	65°47.080	080°34.870	CTD ↓	130	135	297	6	-1.0	0.4	1023.5	90	0/10
2a	341	CTD	26/Oct/2006	03h02	UTC-5	65°47.110	080°34.670	CTD ↑	130	120	287	5	-0.4	0.4	1023.4	87	0/10
2a	342	Nutrient	26/Oct/2006	04h10	UTC-5	65°37.050	080°16.880	CTD-Rosette ↓	113	159	314	6	0.7	0.5	1023.2	91	0/10
2a	342	Nutrient	26/Oct/2006	04h35	UTC-5	65°36.990	080°16.070	CTD-Rosette ↑	114	119	314	6	0.7	0.5	1023.2	91	0/10
2a	343	CTD	26/Oct/2006	05h25	UTC-5	65°30.930	080°03.400	CTD ↓	95	Var	356	8	-1.5	0.5	1023.1	93	0/10
2a	343	CTD	26/Oct/2006	05h31	UTC-5	65°30.880	080°03.340	CTD ↑	95	Var	356	8	-1.5	0.5	1023.1	93	0/10
2a	344	Nutrient	26/Oct/2006	06h54	UTC-5	65°21.840	079°47.510	CTD-Rosette ↓	92	220	348	8	-1.6	0.46	1023	94	0/10
2a	344	Nutrient	26/Oct/2006	07h15	UTC-5	65°21.460	079°47.560	CTD-Rosette ↑	93	334	350	10	-1.4	0.5	1022.8	90	0/10
2a	345	CTD	26/Oct/2006	08h06	UTC-5	65°14.980	079°32.670	CTD ↓	99	4	342	10	-1.3	0.49	1022.5	87	0/10
2a	345	CTD	26/Oct/2006	08h14	UTC-5	65°14.820	079°32.920	CTD ↑	114	340	347	9	-1.3	0.49	1022.5	87	0/10
2a	346	Basic	26/Oct/2006	09h12	UTC-5	65°05.960	079°18.320	SCAMP ↓	84	27	10	9	-1.3	0.48	1022.2	86	0/10
2a	346	Basic	26/Oct/2006	09h19	UTC-5	65°06.040	079°18.670	CTD-Rosette ↓	83	328	6	7	-1.3	0.48	1022.2	86	0/10
2a	346	Basic	26/Oct/2006	09h43	UTC-5	65°05.720	079°19.660	CTD-Rosette ↑	80	269	15	6	-0.9	0.62	1022.1	88	0/10
2a	346	Basic	26/Oct/2006	10h34	UTC-5	65°05.870	079°20.650	Vertical Net Tow ↓	100	22	7	4	-0.9	0.62	1021.6	88	0/10
2a	346	Basic	26/Oct/2006	10h40	UTC-5	65°05.950	079°20.780	Vertical Net Tow ↑	81	269	18	4	-1.2	0.62	1021.6	88	0/10
2a	346	Basic	26/Oct/2006	09h58	UTC-5	65°05.660	079°20.120	Horizontal Net Tow ↓	82	5	3	7	-0.9	0.65	1022.1	88	0/10
2a	346	Basic	26/Oct/2006	10h05	UTC-5	65°05.740	079°20.710	Horizontal Net Tow ↑	87	173	32	3	-1.3	0.65	1022	89	0/10
2a	346	Basic	26/Oct/2006	10h08	UTC-5	65°05.650	079°20.740	Horizontal Net Tow ↓	84	123	26	4	-1.3	0.65	1022	89	0/10
2a	346	Basic	26/Oct/2006	10h17	UTC-5	65°05.820	079°20.440	Horizontal Net Tow ↑	86	276	24	6	-1.63	0.62	1021.9	89	0/10
2a	346	Basic	26/Oct/2006	10h24	UTC-5	65°05.860	079°20.560	SCAMP ↑	97	259	13	6	-1.2	0.60	1021.7	89	0/10
2a	346	Basic	26/Oct/2006	11h03	UTC-5	65°05.180	079°20.010	RMT ↓	89	352	21	4	-0.8	0.62	1021.5	88	0/10
2a	346	Basic	26/Oct/2006	11h10	UTC-5	65°06.510	079°20.370	RMT ↑	78	195	4	4	-1.2	0.60	1021.3	90	0/10
2a	346	Basic	26/Oct/2006	11h18	UTC-5	65°06.550	079°20.580	Small Zooplankton Ring Net ↓	80	255	6	4	-1.2	0.60	1021.3	90	0/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
2a	346	Basic	26/Oct/2006	11h30	UTC-5	65°06.790	079°20.900	Small Zooplankton Ring Net ↑	84	274	9	4	-0.9	0.60	1021	88	0/10
2a	346	Basic	26/Oct/2006	11h44	UTC-5	65°06.870	079°20.900	Box Core ↓	89	188	333	3	-1.2	0.59	1020.9	88	0/10
2a	346	Basic	26/Oct/2006	11h48	UTC-5	65°06.920	079°20.920	Box Core ↑	83	180	50	2	-1.2	0.59	1020.9	88	0/10
2a	347	CTD	26/Oct/2006	12h53	UTC-5	64°59.200	079°05.850	CTD ↓	81	209	77	2	-1.5	0.5	1020.4	87	0/10
2a	347	CTD	26/Oct/2006	12h58	UTC-5	64°59.420	079°05.660	CTD ↑	90	212	115	2	-1.5	0.5	1020.4	87	0/10
2a	348	Nutrient	26/Oct/2006	14h07	UTC-5	64°50.120	078°51.050	CTD-Rosette ↓	133	71	Calm	Calm	-1.3	0.7	1019.9	80	0/10
2a	348	Nutrient	26/Oct/2006	14h31	UTC-5	64°50.560	078°50.670	CTD-Rosette ↑	128	119	69	3	-1.4	0.8	1019.9	79	0/10
2a	349	CTD	26/Oct/2006	15h36	UTC-5	64°41.070	078°35.070	CTD-Rosette ↓	135	105	Calm	Calm	-1.6	0.9	1019.2	83	0/10
2a	349	CTD	26/Oct/2006	15h53	UTC-5	64°41.100	078°35.190	CTD-Rosette ↑	133	117	30	3	-1.8	0.9	1019.5	85	0/10
2a	350	Basic	26/Oct/2006	20h00	UTC-5	64°29.960	080°30.000	SCAMP ↓	385	254	71	7	-1.1	1.05	1018.1	78	0/10
2a	350	Basic	26/Oct/2006	20h03	UTC-5	64°29.990	080°30.080	CTD-Rosette ↓	385	43	105	7	-0.8	0.99	1018.0	77	0/10
2a	350	Basic	26/Oct/2006	20h38	UTC-5	64°29.700	080°30.230	CTD-Rosette ↑	385	2	112	9	-0.1	1.06	1017.8	76	0/10
2a	350	Basic	26/Oct/2006	21h06	UTC-5	64°29.700	080°30.490	Hydrobios ↓	385	12	114	8	-0.7	1.05	1017.5	81	0/10
2a	350	Basic	26/Oct/2006	21h32	UTC-5	64°27.070	080°30.070	Hydrobios ↑	384	22	124	6	-1.0	1.03	1017.4	84	0/10
2a	350	Basic	26/Oct/2006	21h30	UTC-5	64°29.680	080°30.700	SCAMP ↑	384	23	124	7	-1.2	1.03	1017.2	84	0/10
2a	350	Basic	26/Oct/2006	21h49	UTC-5	64°29.680	080°30.720	Vertical Net Tow ↓	385	168	122	7	-1.2	1.03	1017.2	84	0/10
2a	350	Basic	26/Oct/2006	22h09	UTC-5	64°29.680	080°30.950	Vertical Net Tow ↑	385	196	110	10	-2.2	1.06	1016.9	86	0/10
2a	350	Basic	26/Oct/2006	22h24	UTC-5	64°29.660	080°31.230	CTD-Rosette ↓	384	7	116	8	-1.9	1.08	1016.7	85	0/10
2a	350	Basic	26/Oct/2006	23h11	UTC-5	64°29.700	080°31.800	CTD-Rosette ↑	384	306	110	5	-2.1	1.18	1016.3	84	0/10
2a	350	Basic	26/Oct/2006	23h25	UTC-5	64°29.960	080°31.030	Horizontal Net Tow ↓	385	43	132	10	-1.7	1.17	1016.2	84	0/10
2a	350	Basic	26/Oct/2006	23h35	UTC-5	64°30.040	080°31.450	Horizontal Net Tow ↑	385	161	140	8	-2.0	1.11	1016.1	86	0/10
2a	350	Basic	26/Oct/2006	23h40	UTC-5	64°29.960	080°31.350	Horizontal Net Tow ↓	384	107	152	8	-2.1	1.09	1016.1	87	0/10
2a	350	Basic	26/Oct/2006	23h50	UTC-5	64°30.130	080°31.490	Horizontal Net Tow ↑	385	183	141	6	-2.0	1.1	1016.0	86	0/10
2a	350	Basic	27/Oct/2006	00h00	UTC-5	64°30.030	080°31.530	RMT ↓	385	110	140	5	-2.0	1.1	1016.0	86	0/10
2a	350	Basic	27/Oct/2006	00h12	UTC-5	64°30.200	080°31.300	RMT ↑	356	358	154	12	-1.9	1.1	1016.1	91	0/10
2a	350	Basic	27/Oct/2006	00h30	UTC-5	64°30.510	080°31.480	Small Zooplankton Ring Net ↓	386	253	167	8	-1.6	1.1	1015.9	84	0/10
2a	350	Basic	27/Oct/2006	00h45	UTC-5	64°30.960	080°31.960	Small Zooplankton Ring Net ↑	386	228	153	9	-2.3	1.1	1015.9	87	0/10
2a	350	Basic	27/Oct/2006	00h53	UTC-5	64°30.740	080°32.180	Box Core ↓	386	173	145	9	-2.3	1.1	1015.9	87	0/10
2a	350	Basic	27/Oct/2006	00h58	UTC-5	64°30.810	080°32.340	Box Core ↑	386	192	130	8	-2.3	1.1	1015.8	88	0/10
2a	350	Basic	27/Oct/2006	01h15	UTC-5	64°30.840	080°32.690	Box Core ↓	385	138	141	9	-2.3	1.1	1015.6	89	0/10
2a	350	Basic	27/Oct/2006	01h23	UTC-5	64°30.860	080°32.720	Box Core ↑	385	163	137	8	-2.2	1.1	1015.5	88	0/10
2a	350	Basic	27/Oct/2006	02h02	UTC-5	64°30.060	080°30.590	Box Core ↓	388	139	102	9	-2.2	1.0	1015.2	89	0/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
2a	350	Basic	27/Oct/2006	02h07	UTC-5	64°30.080	080°30.710	Box Core ↑	388	169	104	9	-2.2	1.0	1015.2	89	0/10
2a	351	CTD	27/Oct/2006	13h08	UTC-5	63°32.100	075°50.090	CTD-Rosette ↓	353	162	140	12	-0.2	1.1	1013.8	86	0/10
2a	351	CTD	27/Oct/2006	13h26	UTC-5	63°32.330	075°50.270	CTD-Rosette ↑	352	312	142	13	-0.4	1.1	1014.2	87	0/10
2a	356	CTD	28/Oct/2006	16h32	UTC-5	60°44.540	064°41.800	CTD-Rosette ↓	283	235	265	6	-0.7	1.4	1021.6	88	0/10
2a	356	CTD	28/Oct/2006	17h00	UTC-5	60°44.830	064°41.120	CTD-Rosette ↑	304	102	265	6	-0.7	1.4	1021.6	88	0/10
2a	355	Nutrient	28/Oct/2006	18h02	UTC-5	60°50.966	064°42.732	CTD-Rosette ↓	410	164	270	5	-1.2	1.5	1021.7	94	0/10
2a	355	Nutrient	28/Oct/2006	18h50	UTC-5	60°50.808	064°42.550	CTD-Rosette ↑	373	239	270	5	-1.2	1.5	1021.7	94	0/10
2a	354	CTD	28/Oct/2006	19h46	UTC-5	61°00.110	064°44.640	CTD ↓	495	192	282	4	-1.9	1.08	1021.6	97	0/10
2a	354	CTD	28/Oct/2006	20h07	UTC-5	61°00.000	064°45.060	CTD ↑	502	196	282	2	-2.1	1.08	1021.7	98	0/10
2a	353	Nutrient	28/Oct/2006	21h19	UTC-5	61°09.420	064°46.940	CTD-Rosette ↓	397	103	282	3	-2.4	1.17	1021.5	99	0/10
2a	353	Nutrient	28/Oct/2006	22h03	UTC-5	61°08.600	064°52.010	CTD-Rosette ↑	417	354	278	2	-2.5	1.01	1021.4	99	0/10
2a	352	CTD	28/Oct/2006	23h15	UTC-5	61°15.960	064°48.720	CTD-Rosette ↓	291	48	248	1	-1.7	0.89	1020.8	99	0/10
2a	352	CTD	28/Oct/2006	23h36	UTC-5	61°15.750	064°49.840	CTD-Rosette ↑	282	315	195	1	-1.6	0.90	1020.8	99	0/10
2a	N/A	CTD	29/Oct/2006	10h47	UTC-5	63.03°100	067°22.750	CTD-Rosette ↓	450	23	88	16	-1.4	0.88	1020.1	87	0/10
2a	N/A	CTD	29/Oct/2006	11h07	UTC-5	63°03.070	067°23.520	CTD-Rosette ↑	453	339	95	19	-1.4	0.93	1020.1	87	0/10
Leg 2b																	
2b	601	CTD	01/Nov/2006	08h47	UTC-5	59°02.890	063°37.300	CTD-Rosette ↓	168	141	120	5	1.8	1.96	1002.0	84	0/10
2b	601	CTD	01/Nov/2006	09h11	UTC-5	59°02.890	063°37.160	CTD-Rosette ↑	162	141	302	3	1.6	1.96	1002.0	84	0/10
2b	602	Basic	01/Nov/2006	11h27	UTC-5	59°03.420	063°51.740	CTD-Rosette ↓	155	279	213	4	1.5	2.12	1000.7	84	0/10
2b	602	Basic	01/Nov/2006	N/A	UTC-5	N/A	N/A	CTD-Rosette ↑	155	323	213	4	1.5	2.12	1000.7	83	0/10
2b	602	Basic	01/Nov/2006	12h15	UTC-5	59°03.460	063°51.230	Horizontal Net Tow ↓	158	323	Calm	Calm	1.7	1.95	1000.1	81	0/10
2b	602	Basic	01/Nov/2006	12h54	UTC-5	59°03.580	063°51.000	Horizontal Net Tow ↑	163	254	Calm	Calm	1.7	1.95	1000.1	81	0/10
2b	602	Basic	01/Nov/2006	13h20	UTC-5	59°03.329	063°51.483	Hydrobios ↓	158	240	Calm	Calm	1.6	1.92	999.9	82	0/10
2b	602	Basic	01/Nov/2006	13h32	UTC-5	59°03.310	063°51.387	Hydrobios ↑	157	240	Calm	Calm	1.6	1.92	999.8	82	0/10
2b	602	Basic	01/Nov/2006	13h33	UTC-5	59°03.310	063°51.387	Hydrobios ↓	157	240	Calm	Calm	1.6	1.92	999.8	82	0/10
2b	602	Basic	01/Nov/2006	13h47	UTC-5	59°03.298	063°51.222	Hydrobios ↑	157	220	250	3	1.6	2.00	999.4	83	0/10
2b	605	CTD	01/Nov/2006	15h03	UTC-5	58°58.430	063°53.230	CTD ↓	49	115	160	3	1.1	157	998.8	88	0/10
2b	605	CTD	01/Nov/2006	15h09	UTC-5	58°58.430	063°53.220	CTD ↑	50	115	170	3	1.1	1.57	998.8	88	0/10
2b	602	Basic	01/Nov/2006	16h05	UTC-5	59°03.310	063°52.703	Box Core ↓	150	64	Calm	Calm	1.0	1.5	998.4	86	0/10
2b	602	Basic	01/Nov/2006	16h50	UTC-5	59°03.388	063°51.918	Box Core ↑	154	100	85	5	0.9	1.79	998.3	86	0/10
2b	604	CTD	01/Nov/2006	18h10	UTC-5	59°00.025	063°53.716	CTD-Rosette ↓	67	352	Calm	Calm	0.1	1.25	997.4	92	0/10
2b	604	CTD	01/Nov/2006	18h25	UTC-5	59°00.029	063°53.715	CTD-Rosette ↑	67	354	Calm	Calm	0.1	1.25	997.4	92	0/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
2b	600	Basic	01/Nov/2006	22h58	UTC-5	59°06.790	063°25.540	CTD-Rosette ↓	213	97	233	15	0.3	1.88	995.0	99	0/10
2b	600	Basic	01/Nov/2006	23h31	UTC-5	59°05.810	063°25.880	CTD-Rosette ↑	214	115	231	15	0.7	2.08	994.2	95	0/10
2b	600	Basic	01/Nov/2006	23h43	UTC-5	59°06.790	063°25.200	Horizontal Net Tow ↓	203	326	224	13	0.5	2.08	994.2	95	0/10
2b	600	Basic	02/Nov/2006	00h00	UTC-5	59°05.610	063°25.940	Horizontal Net Tow ↑	203	247	240	11	0.3	1.96	994.2	95	0/10
2b	600	Basic	02/Nov/2006	00h15	UTC-5	59°05.570	063°25.830	Hydrobios ↓	210	168	248	17	0.3	1.96	994.2	95	0/10
2b	600	Basic	02/Nov/2006	00h43	UTC-5	59°05.840	063°25.480	Hydrobios ↑	202	150	247	17	1.5	2.07	993.9	87	0/10
2b	600	Basic	02/Nov/2006	01h00	UTC-5	59°05.510	063°25.590	Box Core ↓	209	245	233	17	1.8	2.08	993.8	83	0/10
2b	600	Basic	02/Nov/2006	01h05	UTC-5	59°05.490	063°25.590	Box Core ↑	202	230	230	17	1.4	2.06	993.7	79	0/10
2b	615	Basic	02/Nov/2006	13h48	UTC-5	58°18.770	063°33.860	SCAMP ↓	131	268	221	28	-0.1	1.58	997.8	64	0/10
2b	615	Basic	02/Nov/2006	13h58	UTC-5	58°18.680	063°33.690	CTD-Rosette ↓	132	58	210	14	-0.2	1.6	998.5	65	0/10
2b	615	Basic	02/Nov/2006	14h33	UTC-5	58°18.820	063°33.590	CTD-Rosette ↑	133	44	213	12	1.2	1.66	998.9	59	0/10
2b	615	Basic	02/Nov/2006	14h44	UTC-5	58°18.820	063°33.540	Horizontal Net Tow ↓	134	45	231	12	0.9	1.69	999	62	0/10
2b	615	Basic	02/Nov/2006	14h59	UTC-5	58°18.860	063°33.680	Horizontal Net Tow ↑	133	162	233	18	0.2	1.67	999	64	0/10
2b	615	Basic	02/Nov/2006	15h21	UTC-5	58°18.760	063°33.730	Hydrobios ↓	132	34	216	18	0.4	1.64	999.2	64	0/10
2b	615	Basic	02/Nov/2006	15h45	UTC-5	58°18.820	063°33.710	Hydrobios ↑	132	41	225	13	1.6	1.64	999.5	61	0/10
2b	615	Basic	02/Nov/2006	16h05	UTC-5	58°18.823	063°33.586	Box Core ↓↑	134	42	220	12	1.3	1.65	999.4	61	0/10
2b	614	CTD	02/Nov/2006	18h44	UTC-5	58°23.580	063°23.910	CTD-Rosette ↓	171	42	212	12	0.7	1.5	999.8	69	0/10
2b	614	CTD	02/Nov/2006	19h10	UTC-5	58°23.700	063°23.780	CTD-Rosette ↑	N/A	46	212	12	0.7	1.5	999.8	69	0/10
2b	613	CTD	03/Nov/2006	00h18	UTC-5	58°29.070	063°13.310	CTD ↓	238	66	228	11	0.7	1.5	999.9	70	0/10
2b	613	CTD	03/Nov/2006	00h30	UTC-5	58°29.090	063°13.240	CTD ↑	239	82	212	13	1.7	1.5	999.9	66	0/10
2b	612	CTD	03/Nov/2006	02h49	UTC-5	58°28.320	063°58.020	CTD ↓	82	34	182	13	0.4	1.6	997.6	70	0/10
2b	612	CTD	03/Nov/2006	02h55	UTC-5	58°28.320	062°58.030	CTD ↑	83	30	180	13	0.6	1.6	1000	73	0/10
2b	610	CTD	03/Nov/2006	03h35	UTC-5	58°32.000	062°50.380	CTD ↓	113	345	165	14	0.3	1.6	1000	75	0/10
2b	610	CTD	03/Nov/2006	03h42	UTC-5	58°31.980	062°50.340	CTD ↑	113	148	169	13	0.8	1.7	1000	75	0/10
2b	611	N/A	03/Nov/2006	04h30	UTC-5	58°31.604	062°41.540	Box Core ↓	113	80	239	8	0.5	1.7	1000.1	70	0/10
2b	611	N/A	03/Nov/2006	04h55	UTC-5	58°31.041	062°41.189	Box Core ↑	109	64	225	10	0.5	1.7	1000.1	67	0/10
2b	617	Basic	03/Nov/2006	05h26	UTC-5	58°30.030	062°41.377	CTD-Rosette ↓	131	220	220	10	0.8	1.8	999.9	67	0/10
2b	617	Basic	03/Nov/2006	06h05	UTC-5	58°30.070	062°41.165	CTD-Rosette ↑	130	160	220	10	0.8	1.8	999.9	67	0/10
2b	617	Basic	03/Nov/2006	06h10	UTC-5	58°30.080	062°41.164	Horizontal Net Tow ↓	130	20	227	7	1.9	1.9	1000.1	65	0/10
2b	617	Basic	03/Nov/2006	06h22	UTC-5	58°30.251	062°41.442	Horizontal Net Tow ↑	138	20	227	7	1.9	1.9	1000.1	65	0/10
2b	617	Basic	03/Nov/2006	06h30	UTC-5	58°30.157	062°41.442	Hydrobios ↓	140	107	225	10	0.8	1.8	1000.1	67	0/10
2b	617	Basic	03/Nov/2006	06h42	UTC-5	58°30.169	062°41.407	Hydrobios ↑	136	306	225	10	0.8	1.8	1000.1	67	0/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
2b	617	Basic	03/Nov/2006	06h44	UTC-5	58°30.167	062°41.390	Hydrobios ↓	134	300	221	10	0.8	1.8	1000.1	66	0/10
2b	617	Basic	03/Nov/2006	06h52	UTC-5	58°30.160	062°41.321	Hydrobios ↑	134	105	221	10	0.8	1.8	1000.1	66	0/10
2b	617	Basic	03/Nov/2006	07h45	UTC-5	58°29.963	062°41.345	Box Core ↓	132	66	208	12	0.7	1.8	1000.2	68	0/10
2b	617	Basic	03/Nov/2006	07h55	UTC-5	58°27.480	062°39.860	Box Core ↑	135	86	226	11	1.6	1.8	1000.2	66	0/10
2b	617	Basic	03/Nov/2006	09h27	UTC-5	58°29.370	062°42.160	Box Core ↓	121	57	245	11	1.1	1.73	999.9	64	0/10
2b	617	Basic	03/Nov/2006	09h32	UTC-5	58°29.360	062°42.110	Box Core ↑	122	0	244	11	1.2	1.77	997.6	61	0/10
2b	621	CTD	04/Nov/2006	03h42	UTC-5	56°24.880	061°31.540	CTD ↓	114	90	270	23	-2.4	3.3	1001.7	73	0/10
2b	621	CTD	04/Nov/2006	03h48	UTC-5	56°24.890	061°31.390	CTD ↑	111	130	277	16	-1.7	3.4	1002.2	74	0/10
2b	622	CTD	04/Nov/2006	04h44	UTC-5	56°24.990	061°43.876	CTD ↓	79	96	278	25	-2.0	4.3	1002.8	74	0/10
2b	622	CTD	04/Nov/2006	04h50	UTC-5	56°24.980	061°43.859	CTD ↑	83	119	278	25	-2.0	4.3	1002.8	74	0/10
2b	623	CTD	04/Nov/2006	05h35	UTC-5	56°26.860	061°56.240	CTD ↓	111	54	272	20	-3.0	3.4	1003.1	73	0/10
2b	623	CTD	04/Nov/2006	05h44	UTC-5	56°26.850	061°56.130	CTD ↑	111	110	272	20	-3.0	3.4	1003.1	73	0/10
2b	624	Basic	04/Nov/2006	06h30	UTC-5	56°25.294	062°04.110	CTD-Rosette ↓	60	128	292	9	-3.3	3.5	1004.7	72	0/10
2b	624	Basic	04/Nov/2006	07h00	UTC-5	56°25.349	062°03.857	CTD-Rosette ↑	60	100	292	9	-3.3	3.5	1004.7	72	0/10
2b	624	Basic	04/Nov/2006	07h23	UTC-5	56°25.260	062°04.337	Horizontal Net Tow ↓	50	130	290	10	-3.7	3.46	1006	68	0/10
2b	624	Basic	04/Nov/2006	07h35	UTC-5	56°25.500	062°03.800	Horizontal Net Tow ↑	75	120	280	13	-3.7	3.46	1006	68	0/10
2b	624	Basic	04/Nov/2006	08h00	UTC-5	56°25.280	062°04.050	Hydrobios ↓	70	165	283	15	-3.3	1.58	1006.5	67	0/10
2b	624	Basic	04/Nov/2006	08h00	UTC-5	56°25.290	062°03.930	Hydrobios ↑	70	155	275	11	-2.1	3.3	1006.6	63	0/10
2b	624	Basic	04/Nov/2006	08h45	UTC-5	56°25.148	062°03.881	Box Core ↓	40	127	270	20	-3.6	3.05	1006.6	63	0/10
2b	624	Basic	04/Nov/2006	09h12	UTC-5	56°25.148	062°03.849	Box Core ↑	40	166	254	5	-2.0	3.1	1007.6	62	0/10
2b	620	Basic	04/Nov/2006	17h27	UTC-5	56°23.840	061°12.990	CTD-Rosette ↓	95	129	276	16	-0.8	3.1	1013.4	73	0/10
2b	620	Basic	04/Nov/2006	17h59	UTC-5	56°23.880	061°12.790	CTD-Rosette ↑	94	48	214	17	0.0	3.1	1013.9	71	0/10
2b	620	Basic	04/Nov/2006	18h05	UTC-5	56°23.890	061°12.520	Horizontal Net Tow ↓	88	1	260	20	0.0	3.1	1013.9	72	0/10
2b	620	Basic	04/Nov/2006	18h15	UTC-5	56°23.970	061°12.680	Horizontal Net Tow ↑	88	197	268	20	0.1	3.1	1014	68	0/10
2b	620	Basic	04/Nov/2006	18h29	UTC-5	56°23.860	061°12.940	Hydrobios ↓	87	86	274	20	-1.4	3.08	1014.2	72	0/10
2b	620	Basic	04/Nov/2006	18h40	UTC-5	56°23.850	061°12.920	Hydrobios ↑	87	87	274	20	-1.4	3.08	1014.2	72	0/10
2b	620	Basic	04/Nov/2006	18h41	UTC-5	56°23.850	061°12.920	Hydrobios ↓	88	90	280	18	-1.3	3.0	1014.3	71	0/10
2b	620	Basic	04/Nov/2006	18h45	UTC-5	56°23.860	061°12.870	Hydrobios ↑	88	80	280	18	-1.3	3.0	1014.3	71	0/10
2b	620	Basic	04/Nov/2006	18h46	UTC-5	56°23.860	061°12.870	Hydrobios ↓	88	130	280	18	-1.3	3.1	1014.3	71	0/10
2b	620	Basic	04/Nov/2006	18h54	UTC-5	56°23.870	061°12.840	Hydrobios ↑	89	132	270	17	0.4	3.1	1014.2	66	0/10

Appendix 2 - Scientific log of activities conducted during the 2006 ArcticNet Expedition

Leg	Station ID	Station Type	Local Date	Local Time	UTC to local	Latitude (N)	Longitude (W)	Activity	Depth (m)	Heading (°)	Wind		Air (ºC)	Water (ºC)	Pr Baro	Hum (%)	Ice
											Dir	Speed					
BAYSIS																	
HB	AN03-05	Mooring	13/Sep/2006	13h51		55°24.702	077°55.554	Recovery AN03-05									
HB	Calibration	Calibration	13/Sep/2006	00h21		55°45.306	079°08.670	Calibration Belcher Islands									
HB	AN03-06	Mooring	14/Sep/2006	17h00		55°24.438	077°55.704	Deployment AN03-06									
HB	AN03	CTD	14/Sep/2006	18h15		55°24.468	077°55.728	CTD									
HB	AN03	Trawl	14/Sep/2006	18h49		55°24.450	077°56.304	Tucker trawl									
HB	100	CTD	15/Sep/2006	13h40		56°27.582	083°28.140	CTD									
HB	100	Trawl	15/Sep/2006	19h00		56°27.798	083°27.324	Tucker trawl									
HB	101	CTD	15/Sep/2006	22h08		57°18.354	085°20.436	CTD									
HB	101	Trawl	15/Sep/2006	22h26		57°18.330	085°19.824	Tucker trawl									
HB	AN01	CTD	16/Sep/2006	19h50		59°58.734	091°56.568	CTD									
HB	AN01-05	Mooring	16/Sep/2006	20h18		59°58.296	091°56.622	Recovery AN01-05									
HB	AN01	Trawl	16/Sep/2006	22h05		59°58.560	091°56.922	Tucker trawl									
HB	AN02	CTD	17/Sep/2006	20h44		58°46.884	091°31.386	CTD									
HB	AN02-05	Mooring	17/Sep/2006	21h00		58°46.926	091°31.392	Recovery AN02-05 Failed									
HB	AN04	CTD	18/Sep/2006	10h17		57°33.792	091°37.758	CTD									
HB	AN04	Trawl	18/Sep/2006	10h36		57°34.266	091°37.758	Tucker trawl									
HB	AN04-05	Mooring	18/Sep/2006	11h00		57°34.266	091°37.758	Recovery AN04-05 Failed									
HB	Calibration	Calibration	19/Sep/2006	12h00		57°34.266	091°37.758	Calibration Nelson River									
HB	Nelson River	Mooring	20/Sep/2006	12h00		57°29.262	092°28.938	Deployment Nelson River									
HB	AN02	CTD	21/Sep/2006	12h28		58°46.962	091°31.200	CTD									
HB	AN02	Trawl	21/Sep/2006	12h52		58°46.782	091°31.368	Tucker trawl									
HB	AN02-05	Mooring	21/Sep/2006	12h00		58°46.884	091°31.386	2nd Recovery attempt (grappling) AN02-05									
HB	AN01-06	Mooring	22/Sep/2006	14h43		59°58.632	091°56.622	Deployment AN01-06									
HB	AN01	CTD	22/Sep/2006	15h59		59°58.692	091°56.472	CTD									

Appendix 3 - CTD logbook for the 2006 ArcticNet Expedition

Leg	Cast#	Station	Date UTC	Time Start UTC	Latitude N	Longitude W	Bottom depth (m)	Cast depth (m)	Comments	Rosette Type	Init.
Leg 1											
1	1	Saguenay	2006-08-22	23:43	48° 15.520	069° 19.740	331	310	trans, nit, alt, par unplunged	ctd	mer
1	2	Sept-Iles	2006-08-25	00:41	50° 03.222	065° 58.242	179	167	descent rate unstable	ctd	mer
1	3	Makkovik-1	2006-08-27	10:05	55° 30.990	056° 31.780	1539	1000	none	ctd	mer
1	4	Makkovik-2	2006-08-27	22:16	56° 09.750	057° 16.340	1212	1000	winch overheated, stop around 600 m during upcast	ctd	vl
1	5	Makkovik-3	2006-08-28	10:17	56° 06.920	057° 02.160	1820	1000	nitrate sensor dead	ctd	mer
1	6	Makkovik-4	2006-08-28	22:17	55° 57.110	056° 36.990	2167	1000	mixing of surface water	ctd	vl
1	7		2006-08-30	10:12	61° 26.362	060° 22.454	1463	1000	none	ctd	mer
1	8		2006-08-30	22:14	61° 03.090	060° 48.240	1217	1000	none	ctd	vl
1	9		2006-08-31	10:19	61° 25.399	060° 40.280	619	610	none	ctd	mer
1	10	OliverS.A	2006-09-04	13:31	72° 15.230	077° 47.190	372	358	none	pp+nuts	mer
1	11	OliverS.B	2006-09-05	00:51	72° 24.338	078° 45.047	466	450	none	ctd	cs
1	12	OliverS.C	2006-09-05	02:17	72° 19.530	078° 15.260	267	258	none	ctd	vl
1	13	OliverS.A	2006-09-05	03:38	72° 15.360	077° 47.210	372	358	none	trap+dna+hg	vl
1	14	OliverS.D	2006-09-05	06:58	72° 11.413	077° 27.842	236	211	none	ctd	vl
1	15	OliverS.E	2006-09-05	08:21	72° 09.622	077° 06.425	127	110	none	ctd	vl
1	16	BA04	2006-09-07	02:05	75° 16.620	074° 56.890	489	467	Rosette hit the ship	pp	vl
1	17	BA04	2006-09-07	04:08	75° 16.360	074° 58.680	485	467	Fluorometer unstable	dna	vl
1	18	BA04	2006-09-07	06:07	75° 16.360	074° 58.390	484	467	Fluorometer unstable	nutrients	vl
1	19	BA02	2006-09-08	02:30	76° 15.940	074° 33.950	460	450	none	ctd	cs
1	20		2006-09-08	15:07	78° 25.160	073° 51.020	512	502	none	ctd	cs
1	21	132	2006-09-09	00:39	78° 59.730	072° 19.990	248	243	none	dna + Hg	cs
1	22	132	2006-09-09	07:09	79° 01.300	072° 01.880	193	181	none	particules	vl
1	23	132	2006-09-09	09:35	78° 59.800	072° 20.250	247	243	none	zoo	mer
1	24	132	2006-09-09	12:40	78° 59.730	072° 20.550	241	236	none	pp + cont	mer
1	25	132	2006-09-09	14:30	79° 00.140	072° 17.240	250	242	none	nutrients	mer
1	26	127	2006-09-10	03:14	78° 17.750	074° 35.690	604	278	Rosette back onboard before the end of cast	dna/cont	vl
1	27	127	2006-09-10	03:45	78° 17.100	074° 38.300	602	598	winch problems	dna/cont	vl
1	28	127	2006-09-10	17:28	78° 20.220	074° 11.420	512	502	surface 30 m mixed	pp	cs
1	29	127	2006-09-10	19:28	78° 19.060	074° 17.520	532	522	none	nutrients	cs
1	30	127	2006-09-10	23:28	78° 10.390	074° 42.120	616	610	cast canceled and data lost	particles	vl
1	31	127	2006-09-11	00:55	78° 09.870	074° 44.270	600	602	none	particles	vl
1	32	129	2006-09-11	05:17	78° 19.750	074° 00.870	577	571	none	dna	vl
1	33	129	2006-09-11	07:01	78° 19.740	073° 59.700	566	555	none	nutrients	vl
1	34	130	2006-09-11	08:59	78° 19.450	073° 37.510	705	675	no bottle 21, rope broken	nutrients	mer
1	35	131	2006-09-11	11:17	78° 18.890	073° 07.800	245	239	btl 13 didn't trip	pp + cont	mer
1	36	131	2006-09-11	13:49	78° 19.360	073° 11.180	333	328	none	nutrients	mer
1	37	131	2006-09-12	03:40	78° 19.120	073° 11.010	257	260	Bottle 13 didn't close	zooplankton	vl
1	38	131	2006-09-12	05:14	78° 19.090	073° 11.190	306	302	Bottle 13 didn't close	dna+Hg	vl
1	39	126	2006-09-12	17:53	77° 20.710	073° 24.880	334	325	btl 13 didn't trip	particles	mer
1	40	126	2006-09-12	19:29	77° 20.810	073° 25.350	327	320	btl 13 didn't trip	dna + cont	mer

Appendix 3 - CTD logbook for the 2006 ArcticNet Expedition

Leg	Cast#	Station	Date UTC	Time Start UTC	Latitude N	Longitude W	Bottom depth (m)	Cast depth (m)	Comments	Rosette Type	Init.
1	41	126	2006-09-13	02:14	77° 21.800	073° 25.160	317	312	btl 13 didn't trip	zoo+cont	vl
1	42	126	2006-09-13	04:07	77° 21.540	073° 25.510	321	313	btl 13 didn't trip	pp	vl
1	43	126	2006-09-13	05:57	77° 20.640	073° 25.660	323	319	btl 13 didn't trip	nutrients	vl
1	44	125	2006-09-13	10:06	77° 20.520	073° 55.250	491	484	none	ctd	mer
1	45	124	2006-09-13	11:02	77° 20.610	074° 18.110	705	696	btl 13 didn't trip	nutrients	mer
1	46	123	2006-09-13	12:55	77° 20.550	074° 38.440	697	692	btl 13 didn't trip	dna + hg	mer
1	47	122	2006-09-13	17:05	77° 20.070	075° 00.720	653	645	none	nutrients + pp	cs
1	48	121	2006-09-13	19:06	77° 20.250	075° 22.400	584	575	winch problems	ctd	cs
1	49	120	2006-09-13	20:23	77° 19.900	075° 41.190	563	560	btl 13 didn't trip	nutrients	vl
1	50	119	2006-09-13	23:06	77° 20.170	076° 04.260	526	520	none	nts+pp+dna	vl
1	51	118	2006-09-14	05:11	77° 21.870	076° 32.690	277	261	btl 13 didn't trip	particles	vl
1	52	118	2006-09-14	06:41	77° 22.180	076° 35.730	233	229	btl 13 didn't trip	pp	vl
1	53	118	2006-09-14	08:30	77° 22.260	076° 40.600	255	250	none	nut.	mer
1	54	117	2006-09-14	00:00					not a cast	dna	mer
1	55	117	2006-09-14	18:22	77° 20.400	076° 56.940	417	390	Btl 13 didn't close	dna	mer
1	56	117	2006-09-14	20:16	77° 21.820	076° 58.310	184	173	Btl 13 didn't close	mercury	vl
1	57	116	2006-09-15	10:55	76° 20.030	070° 38.490	174	160	none	ctd	vl
1	58	115	2006-09-15	14:13	76° 19.390	071° 10.130	660	650	Btl 13 didn't close	dna	vl
1	59	115	2006-09-16	01:09	76° 19.920	071° 12.090	673	673	none	part. + Hg	mer
1	60	115	2006-09-16	08:05	76° 19.930	071° 11.980	672	660	Btl 13 didn't close. Problems with winch	zoo +O2	vl
1	61	115	2006-09-16	11:03	76° 20.610	071° 12.120	654	649	Btl 13 didn't close	pp+cont	vl
1	62	115	2006-09-16	13:06	76° 20.820	071° 12.500	653	651	Btl 13 didn't close	nutrients	vl
1	63	114	2006-09-17	04:01	76° 19.370	071° 46.860	613	605	none	ctd	mer
1	64	113	2006-09-17	05:11	76° 19.010	072° 13.290	553	544	btl 13 didn't trip	nutrients	mer
1	65	112	2006-09-17	06:54	76° 18.810	072° 42.360	561	557	none	ctd	mer
1	66	111	2006-09-17	08:50	76° 18.430	073° 12.770	596	586	Btl 13 didn't close. Problems with the winch.	nutrients	vl
1	67	109	2006-09-17	14:19	76° 15.280	074° 10.390	446	440	Btl 13 didn't close	dna	vl
1	68	108	2006-09-17	16:03	76° 15.620	074° 35.410	446	440	Problems with the winch. Btl 13 has closed	nutrients	vl
1	69	108	2006-09-17	18:36	76° 16.130	074° 36.650	448		none	pp+cont	vl
1	70	106	2006-09-17	22:34	76° 18.330	075° 20.780	383	376	none	ctd	mer
1	71	105	2006-09-17	23:33	76° 19.470	075° 46.920	346	339	btl 13 didn't trip	nut.	mer
1	72	104	2006-09-18	01:12	76° 20.420	076° 10.820	197	188	none	ctd	mer
1	73	103	2006-09-18	02:09	76° 21.660	076° 33.900	153	143	btl 13 didn't trip	nut.	mer
1	74	102	2006-09-18	03:21	76° 22.650	076° 59.000	243	236	none	ctd	mer
1	75	101	2006-09-18	06:36	76° 23.470	077° 18.370	324	320	btl 13 didn't trip	pp+cont	mer
1	76	101	2006-09-18	08:10	76° 22.980	077° 23.760	351	344	none	particules+hg	vl
1	77	101	2006-09-18	15:51	76° 24.630	077° 16.670	311	304	Btl 13 didn't close	zooplankton	vl
1	78	101	2006-09-18	19:38	76° 24.370	077° 17.460	309	305	Btl 13 didn't close	nutrients	vl
1	79	101	2006-09-18	21:35	76° 22.940	077° 25.630	393	385	Btl 13 didn't close	dna	cs
1	80	Belcher-6	2006-09-19	20:07	75° 40.220	081° 15.740	180	169	Btl 13 didn't close	nuts+dna	vl
1	81	Belcher-5	2006-09-19	21:09	75° 42.350	081° 00.620	215	209		ctd	vl

Appendix 3 - CTD logbook for the 2006 ArcticNet Expedition

Leg	Cast#	Station	Date UTC	Time Start UTC	Latitude N	Longitude W	Bottom depth (m)	Cast depth (m)	Comments	Rosette Type	Init.
1	82	Belcher-2	2006-09-19	22:46	75° 42.700	080° 48.510	627	625	btl 13 didn't close	nut.dna	mer
1	83	Belcher-3	2006-09-20	00:09	75° 39.930	080° 33.990	630	626	none	ctd	mer
1	84	300	2006-09-20	08:30	74° 22.330	079° 58.250	690	688	none	nutrients	mer
1	85	301	2006-09-20	19:24	74° 07.480	083° 19.430	676	674	none	nuts+pp	vl
1	86	301	2006-09-20	23:03	74° 07.440	083° 20.690	680	672	none	dna	mer
1	87	301	2006-09-21	01:21	74° 08.550	083° 22.830	678	675	none	mercury	mer
1	88	302	2006-09-21	07:57	74° 09.220	086° 16.290	519	516	none	nutrients	vl
1	89	303	2006-09-21	13:24	74° 14.190	089° 40.650	229	219	none	pp	vl
1	90	303	2006-09-21	17:32	74° 14.120	089° 39.780	229	223	none	nut + cont.	vl
1	91	304	2006-09-22	00:28	74° 21.750	093° 18.970	173	165	none	nut	mer
1	92	305	2006-09-22	03:24	74° 19.750	094° 59.770	170	162	btl 13 didn't close	nut	mer
1	93	Resolute Bay	2006-09-22	10:17	74° 40.920	095° 11.430	152	140	none	ctd	vl
1	94	306	2006-09-23	05:47	74° 20.960	097° 35.010	132	125	none	ctd	mer
1	95	307	2006-09-23	12:07	74° 24.150	100° 35.050	167	158	Btle 13 didn't close	pp+hg	vl
1	96	307	2006-09-23	14:22	74° 24.250	100° 35.390	168	159	Btle 13 didn't close	nutrients	vl
1	97	307	2006-09-23	22:21	74° 26.550	100° 27.520	154	144	btl 13 didn't trip	zoo	mer
1	98	307	2006-09-23	23:39	74° 23.840	100° 35.200	172	166	btl 13 didn't trip	particules	mer
1	99	307	2006-09-24	00:52	74° 23.970	100° 34.460	168	163	btl 13 didn't trip	mercury	mer
1	100	307.5	2006-09-24	10:37	73° 53.970	101° 58.860	130	122	none	ctd	vl
1	101	308	2006-09-24	13:49	73° 30.440	103° 29.160	325	318	Btle 13 didn't close	nut + cont.	vl
1	102	308	2006-09-24	14:57	73° 30.440	103° 28.990	325	316	Btle 13 didn't close	dna+O2	vl
1	103	308.5	2006-09-24	19:41	73° 3.3220	103° 32.590	348	338	Problem with the winch	ctd	cs
1	104	309	2006-09-25	01:10	72° 30.2980	103° 30.317	280	270	None	ctd	cs
1	105	309.5	2006-09-25	04:14	71° 59.939	102° 59.877	247	237	None	ctd	cs
1	106	310	2006-09-25	09:44	71° 29.660	102° 15.360	215	205	Btle 13 didn't close	pp+part	vl
1	107	310	2006-09-25	11:28	71° 29.470	102° 13.430	210	202	Btle 13 didn't close	nut+cont	vl
1	108	310	2006-09-25	22:46	71° 29.920	102° 14.476	213	201	Btle 13 didn't close	dna+hg	mer
1	109	310.5	2006-09-26	06:04	71° 09.942	099° 45.125	139	131	none	ctd	mer
1	110	311	2006-09-26	12:02	70° 16.380	098° 27.510	149	144	none	nutrients	vl
1	111	312	2006-09-26	18:34	69° 09.520	100° 42.130	57	53	pH problems	ctd	vl
1	112	313	2006-09-27	01:22	68° 40.810	103° 59.260	106	91	pH problems	ctd	mer
1	113	314	2006-09-27	06:45	68° 59.880	106° 35.570	110	103	pH problems. Btl 13 didn't trip	nut + pp	mer
1	114	315	2006-09-27	14:29	68° 32.850	109° 23.030	170	162	none	ctd	vl
1	115	316	2006-09-28	02:41	68° 06.870	111° 09.240	294	281	none	ctd	mer
Leg 2a											
2a	1	400	2006-09-29	09:28	69° 05.487	114° 48.315	160	154	btl 13 didn't trip	nut	mer
2a	2	401	2006-09-29	13:02	69° 14.140	116° 36.200	177	168	Altimeter didn't work properly	nut	st
2a	3	402	2006-09-29	16:35	69° 35.740	118° 08.031	410	411	btl 13 didn't trip. Ox probe problem	nut	dd
2a	4	403	2006-09-30	00:53	70° 06.042	120° 05.939	417	406	btl 1 closed too soon. Problems with Ox probe. T and S Offset	pp + traps	st

Appendix 3 - CTD logbook for the 2006 ArcticNet Expedition

Leg	Cast#	Station	Date UTC	Time Start UTC	Latitude N	Longitude W	Bottom depth (m)	Cast depth (m)	Comments	Rosette Type	Init.
2a	5	403	2006-09-30	03:35	70° 06.050	120° 05.760	416	392	Variable depths because of strong currents. T, S and Ox offset	nut	st
2a	6	403	2006-09-30	06:00	70° 06.359	120° 05.418	408	407	T, S and Ox offset	dna+cont+traps	st
2a	7	405	2006-10-01	08:47	70° 39.070	122° 56.670	583	575	T,S and Ox offset	part + cont	mer
2a	8	405	2006-10-01	12:10	70° 39.222	122° 59.242	610	592	Winch is shaking frequently. Ox offset. Btl 13 didn't trip.	nut	st/dd
2a	9	405	2006-10-01	16:44	70° 39.487	123° 00.147	594	587	Test on winch before to deploy (Sylvain). Btl 13 didn't trip.	pp + cont	st/dd
2a	10	405	2006-10-01	20:44	70° 39.064	122° 56.895	579	570	Winch problems at downcast. Btl 13 didn't trip.	dna + cont	st
2a	11	405	2006-10-02	01:43	70° 38.560	122° 58.080	595	592	winch problems. T,s,ox offset. btl 13 didn't trip	zoo + cont	mer
2a	12	405	2006-10-02	04:37	70° 39.148	122° 58.329	598	584	winch prob. T,S,Ox offset; btl 13 didn't trip	traps + cont	mer
2a	13	407	2006-10-02	12:31	71° 01.241	126° 05.202	390	380	Btl 8 & 9 exploded. Btl 8, 9 & 22 were replaced. S,T and Ox offset.	CTD	st
2a	14	408	2006-10-02	20:20	71° 15.908	127° 30.997	187	186	CTD without any problem.	CTD	st
2a	15	408	2006-10-02	22:26	71° 15.916	127° 31.032	187	187	btl 13 didn't trip	pp + cont	dd
2a	16	408	2006-10-03	01:09	71° 15.768	127° 29.931	193	187	none	nut	mer
2a	17	408	2006-10-03	02:46	71° 15.814	127° 29.821	197	194	none	part + O2	mer
2a	18	408	2006-10-03	04:43	71° 15.299	127° 29.199	194	186	none	dna	mer
2a	19	409	2006-10-04	13:08	71° 52.144	125° 52.144	108	109	Btl 13 didn't trip. Btl 20 leaked	nutrients	st
2a	20	410	2006-10-05	10:15	71° 41.966	126° 29.370	400	400	none	nutrients	st/dd
2a	21	411	2006-10-05	11:57	71° 37.757	126° 41.818	430	420	none	pp	st/dd
2a	22	412	2006-10-05	13:31	71° 33.957	126° 54.444	410	400	none	nutrients	st/dd
2a	23	413	2006-10-05	15:06	71° 29.603	127° 08.748	373	360	none	dna	st/dd
2a	24	414	2006-10-05	16:50	71° 25.286	127° 22.044	305	299	none	nut + cont	mer
2a	25	415	2006-10-06	01:14	71° 21.715	127° 33.277	238	235	none	ctd	mer
2a	26	416	2006-10-06	02:03	71° 17.519	127° 46.081	158	149	none	nut + o2	mer
2a	27	417	2006-10-06	03:12	71° 13.304	127° 58.936	84	74	none	ctd	mer
2a	28	418	2006-10-06	03:58	71° 09.646	128° 09.850	65	58	none	nut	mer
2a	29	419	2006-10-06	04:46	71° 06.391	128° 20.260	56	47	none	ctd	mer
2a	30	420	2006-10-06	05:31	71° 03.173	128° 31.031	40	33	none	pp + dna	mer
2a	31	420	2006-10-06	07:48	71° 03.188	128° 30.858	42	33	none	nut	mer
2a	32	421	2006-10-06	18:58	71° 28.175	133° 56.165	1196	990	High waves: no surface btl.	pp + cont	st
2a	33	421	2006-10-06	20:57	71° 28.747	133° 56.141	1128	990	Btl 13 didn't trip.	particles	st/dd
2a	34	421	2006-10-06	22:59	71° 28.732	133° 56.905	1120	991	Btl 13 didn't trip.	nut	dd/st
2a	35	421	2006-10-07	04:11	71° 28.051	133° 54.474	1150	1000	btl 13 didn't trip	dna + O2	mer
2a	36	422	2006-10-07	08:36	71° 22.195	133° 52.950	1083	1000	btl 13 didn't trip	nut	mer
2a	37	423	2006-10-07	10:51	71° 16.348	133° 51.136	790	790	No problem	ctd	st
2a	38	424	2006-10-07	12:28	71° 10.242	133° 49.838	560	560	btl 13 didn't trip	nut + cont	st
2a	39	425	2006-10-07	14:17	71° 04.121	133° 47.179	286	272	took water for Kary's traps	ctd	st
2a	40	425	2006-10-07	15:16	71° 03.746	133° 49.868	288	274	No problem	ctd	st
2a	41	435	2006-10-07	18:30	71° 04.600	133° 38.861	285	275	No problem	ctd	st
2a	42	426	2006-10-07	21:00	70° 59.220	133° 45.001	113	98	Btl 13 didn't trip. Btl 20 leaked.	nut + cont	st/dd
2a	43	427	2006-10-07	22:24	70° 52.755	133° 43.790	70	69	No problem. Btl 20 has been changed	ctd	st

Appendix 3 - CTD logbook for the 2006 ArcticNet Expedition

Leg	Cast#	Station	Date UTC	Time Start UTC	Latitude N	Longitude W	Bottom depth (m)	Cast depth (m)	Comments	Rosette Type	Init.
2a	44	428	2006-10-07	23:34	70° 47.415	133° 42.237	67	64	profile start at 7m	nut	mer
2a	45	429	2006-10-08	01:20	70° 41.562	133° 41.345	62	58	profile start at 12m	ctd	mer
2a	46	430	2006-10-08	02:49	70° 35.765	133° 39.332	71	61	profile starts at 10 m; btl 13 didn't trip. Btl 17 leaked.	nut + cont	mer
2a	47	431	2006-10-08	04:44	70° 29.712	133° 37.894	66	58	profile starts at 10 m	ctd	mer
2a	48	432	2006-10-08	06:10	70° 24.373	133° 36.421	62	53	profile starts at 10m; btl 13 didn't trip.	nut	dd
2a	49	433	2006-10-08	08:05	70° 17.094	133° 36.000	66	58	profile starts at 10m	ctd	mer
2a	50	436	2006-10-09	10:54	70° 20.820	126° 20.963	247	240	btl 13 didn't trip. Little S and T offset	part	st
2a	51	436	2006-10-09	13:43	70° 20.127	126° 21.177	246	242	Little offset for S & T, bigger for Oxygen. Btl 13 didn't trip.	Nut	st
2a	52	436	2006-10-09	16:26	70° 20.183	126° 21.228	252	240	Btl 13 didn't trip.	pp	st/dd
2a	53	436	2006-10-09	18:30	70° 19.600	126° 23.212	254	242	Btl 13 didn't trip.	cont	st
2a	54	436	2006-10-09	20:06	70° 20.392	126° 20.734	251	243	btl 13 didn't trip	zoo	mer
2a	55	436	2006-10-10	00:17	70° 20.035	126° 26.766	253	246	btl 13 didn't trip	dna + O2	mer
2a	56		2006-10-11	22:21	70° 39.035	127° 12.194	251	242	btl 13 didn't trip	traps	mer
2a	57	435	2006-10-12	13:36	71° 04.550	133° 34.940	310	299	btl 13 didn't trip	part + cont	st
2a	58	435	2006-10-12	15:34	71° 05.000	133° 33.420	333	313	btl 13 didn't trip	nutrients	st
2a	59	435	2006-10-12	17:35	71° 04.280	133° 34.100	290	279	btl 13 didn't trip	pp	mer
2a	60	435	2006-10-13	01:32	71° 05.030	133° 34.580	333	318	btl 13 didn't trip	dna	st/dd
2a	61		2006-10-13	21:41	70° 22.730	137° 36.390	432	423	btl 13 didn't trip	mercury	mer
2a	62	437?	2006-10-15	20:49	70° 37.670	136° 14.830	548	546	Btl 13 did trip. Nitrate battery low at upcast.	dna	st
2a	63		2006-10-16	17:43	70° 36.890	136° 24.620	693	680	none	traps	mer
2a	64	434	2006-10-17	00:22	70° 10.600	133° 33.400	46	39	no problem	part + cont	dd/st
2a	65	434	2006-10-17	02:37	70° 10.860	133° 34.640	43	35	no problem	dna + nut + pp	st/dd
2a	66	407	2006-10-17	22:15	71° 00.530	126° 04.320	391	384	none	pp + cont	mer
2a	67	407	2006-10-18	01:22	71° 00.670	126° 02.880	397	392	none	particles	mer
2a	68	407	2006-10-18	03:11	71° 01.030	125° 57.120	395	389	none	zoo + o2	st/dd
2a	69	407	2006-10-18	05:03	71° 00.450	126° 03.730	390	381	none	dna	st/dd
2a	70	407	2006-10-18	07:30	71° 01.210	126° 00.500	398	388	none	nut	st/dd
2a	71	405	2006-10-18	17:50	70° 39.650	122° 59.790	591	583	none	ctd	mer
2a	72	404	2006-10-18	20:54	70° 20.790	121° 36.050	464	458	btl 13 didn't trip	nut	mer
2a	73	403	2006-10-19	00:29	70° 05.860	120° 06.670	414	405	none	ctd	mer
2a	74		2006-10-20	07:26	68° 05.020	111° 57.510	226	218	none	ctd	st
2a	75		2006-10-21	12:39	69° 40.660	099° 35.950	75	64	none	ctd	mer
2a	76		2006-10-21	18:34	69° 51.480	099° 16.740	119	110	none	cont	mer
2a	77		2006-10-22	02:20	71° 07.290	097° 30.090	99	90	none	ctd	st/dd
2a	78	317	2006-10-22	16:49	72° 05.140	093° 54.250	112	103	none	nut+cont	mer
2a	79	318	2006-10-22	18:12	71° 59.210	093° 48.950	83	72	none	ctd	mer
2a	80	319	2006-10-22	19:09	71° 52.960	093° 42.680	100	91	none	nut+cont	mer
2a	81	320	2006-10-22	20:16	71° 48.230	093° 37.050	91	82	none	ctd	mer
2a	82	321	2006-10-23	04:47	70° 20.940	091° 33.990	96	87	none	ctd	st
2a	83	322	2006-10-23	05:58	70° 24.060	091° 06.070	222	213	none	dna + part	st
2a	84	322	2006-10-23	08:40	70° 24.060	091° 05.950	222	212	none	nut + cont	st

Appendix 3 - CTD logbook for the 2006 ArcticNet Expedition

Leg	Cast#	Station	Date UTC	Time Start UTC	Latitude N	Longitude W	Bottom depth (m)	Cast depth (m)	Comments	Rosette Type	Init.
2a	85	323	2006-10-23	12:15	70° 26.950	090° 38.540	134	122	none	ctd	mer
2a	86	324	2006-10-23	13:22	70° 30.100	090° 08.640	134	122	none	nut + cont	mer
2a	87	325	2006-10-23	14:52	70° 33.170	089° 40.360	164	154	none	ctd	mer
2a	88	326	2006-10-23	16:06	70° 36.110	089° 13.530	86	74	none	nut + cont	mer
2a	89	327	2006-10-24	03:52	69° 57.120	085° 45.630	236	225	none	nut	st/dd
2a	90	328	2006-10-24	05:12	69° 53.030	085° 44.250	114	108	none	nut	st/dd
2a	91	329	2006-10-24	21:24	69° 22.020	080° 23.400	36	29	none	ctd	st
2a	92	330	2006-10-24	22:06	69° 19.120	080° 33.000	58	50	none	nut + cont	st
2a	93	331	2006-10-24	23:20	69° 15.110	080° 45.830	71	64	none	cont	st
2a	94	332	2006-10-25	00:14	69° 10.980	080° 59.880	77	72	none	nut + cont	st
2a	95	333	2006-10-25	02:41	68° 45.940	081° 00.870	34	26	none	nut + cont	st
2a	96	334	2006-10-25	09:09	67° 52.770	080° 47.990	82	75	none	cont	mer
2a	97	334	2006-10-25	11:12	67° 53.020	080° 47.470	82	77	none	nut + dna	mer
2a	98	335	2006-10-25	20:06	66° 32.920	082° 08.110	99	92	none	cont	mer
2a	99	336	2006-10-25	21:31	66° 25.230	081° 50.630	141	130	Cable got twisted before cast	nut	st
2a	100	337	2006-10-25	23:06	66° 16.880	081° 36.890	70	61	Cable is fine	ctd	st
2a	101	338	2006-10-26	00:29	66° 09.980	081° 19.770	135	124	None	cont + dna	st
2a	102	338	2006-10-26	02:30	66° 09.350	081° 19.810	134	125	None	part + nut	st
2a	103	339	2006-10-26	05:26	66° 00.970	081° 04.990	147	140	None	ctd	st
2a	104	340	2006-10-26	06:36	65° 52.980	080° 46.930	133	126	none	nut	st
2a	105	341	2006-10-26	07:52	65° 47.080	080° 34.930	136	130	none	ctd	st
2a	106	342	2006-10-26	09:09	65° 37.070	080° 16.810	113	107	none	nut + cont	mer
2a	107	343	2006-10-26	10:19	65° 31.010	080° 03.490	95	85	none	ctd	mer
2a	108	344	2006-10-26	11:53	65° 21.830	079° 47.520	93	88	none	nut	mer
2a	109	345	2006-10-26	13:05	65° 14.980	079° 32.670	113	106	none	CTD	mer
2a	110	346	2006-10-26	14:19	65° 06.040	079° 18.660	90	80	none	nut +cont	mer
2a	111	347	2006-10-26	17:50	64° 59.130	079° 05.980	88	76	none	ctd	mer
2a	112	348	2006-10-26	19:07	64° 50.110	078° 51.080	133	120	none	nut + o2	mer
2a	113	349	2006-10-26	20:35	64° 41.070	078° 35.100	135	127	none	cont	mer
2a	114	350	2006-10-27	01:00	64° 29.940	080° 30.080	385	378	none	dna + zoo	st
2a	115	350	2006-10-27	03:23	64° 29.660	080° 31.220	384	379	none	nut + cont	st
2a	116	351	2006-10-27	18:08	63° 32.110	075° 50.090	353	343	none	O2	mer
2a	117	356	2006-10-28	21:30	60° 44.530	064° 41.790	283	280	Lot of current, hard to stabilize	cont	st
2a	118	355	2006-10-28	23:02	60° 50.980	064° 42.730	410	417	Lot of current, hard to stabilize	nut	st
2a	119	354	2006-10-29	00:45	61° 00.100	064° 44.650	495	491	Nitrate battery dead during upcast	ctd	st
2a	120	353	2006-10-29	02:19	61° 09.050	064° 47.400	397	401	Big drift during the cast	nut	st
2a	121	352	2006-10-29	04:13	61° 15.980	064° 48.670	294	273	none	cont	st
2a	122		2006-10-29	15:46	63° 03.100	067° 22.780	449	433	4 bottles exploded	ctd	mer
Leg 2b											
2b	123	601	2006-11-01	13:47	59° 02.900	063° 37.330	162	153	btl 13 didn't trip	ctd + sob	dd/st
2b	124	602	2006-11-01	16:28	59° 03.420	063° 51.720	155	147	none	nut + cont	dd

Appendix 3 - CTD logbook for the 2006 ArcticNet Expedition

Leg	Cast#	Station	Date UTC	Time Start UTC	Latitude N	Longitude W	Bottom depth (m)	Cast depth (m)	Comments	Rosette Type	Init.
2b	125	605	2006-11-01	20:00	58° 58.430	063° 53.230	49	43	none	ctd	st
2b	126	604	2006-11-01	23:10	59° 00.010	063° 53.710	67	60	none	phyto	st
2b	127	606	2006-11-02	03:57	59° 05.520	063° 26.150	213	195	btl 13 didn't trip	nut + phyto	st/dd
2b	128	615	2006-11-02	18:57	58° 18.670	063° 33.708	132	128	btl 13 didn't trip	nut+phy+cont	st
2b	129	614	2006-11-02	23:42	58° 23.569	063° 23.916	171	166	btl 13 didn't trip	ctd + sob	st
2b	130	613	2006-11-03	05:17	58° 29.065	063° 13.322	238	234	none	ctd	st
2b	131	612	2006-11-03	07:47	58° 28.310	062° 58.050	80	80	none	ctd	dd
2b	132	610	2006-11-03	08:34	58° 31.990	062° 50.390	113	103	none	ctd	dd
2b	133	617	2006-11-03	10:31	58° 30.040	062° 41.320	130	129	btl 13 didn't trip	nut+phy+cont	dd
2b	134	621	2006-11-04	08:40	56° 24.880	061° 31.560	114	108	none	ctd	dd
2b	135	622	2006-11-04	09:42	56° 25.000	061° 43.890	79	78	none	ctd	dd
2b	136	623	2006-11-04	10:34	56° 26.830	061° 56.310	111	109	none	ctd	dd
2b	137	624	2006-11-04	11:26	56° 25.320	062° 04.170	70	66	btl 13 didn't trip	nut+phy+cont	dd
2b	138	620	2006-11-04	22:26	56° 23.850	061° 13.000	95	86	btl 13 didn't trip	nut+phy+cont	dd
BaySys											
BaySys		AN03-05	13/09/2006	12:28	55° 24.450	077° 55.710	125		Unique file, cannot see or convert data since no calibration parameters available		
BaySys		AN03-06	14/09/2006	18:15	55° 24.470	077° 55.725	136		sample 6298 to 12034		
BaySys		100	15/09/2006	13:40	56° 27.584	083° 28.140	84				
BaySys		101	15/09/2006	22:08	57° 18.354	085° 20.433	92				
BaySys		AN01-05	16/09/2006	19:50	59° 58.733	091° 56.570	105				
BaySys		AN02	17/09/2006	20:44	58° 46.884	091° 31.387	80		ctd from hydromanitoba		
BaySys		AN04	18/09/2006	10:17	57° 33.790	091° 37.759	62		ctd from hydromanitoba		
BaySys		AN02	21/03/2006	12:28	58° 46.962	091° 31.338	82				

Appendix 4 - List of participants on Legs 1 and 2 of the ArcticNet Amundsen Expedition and on the BAYSIS cruise

Leg	Name	Position	Affiliation	Network Investigator/ Supervisor	Embark Place	Embark Date	Disembark Place	Disembark Date
CCGS *Amundsen*								
Leg 1	Barber, David	Chief scientist-Professor	CEOS, U of Manitoba	Barber, David	Pond Inlet	04-Sep	Kugluktuk	28-Sep
Leg 1	Beaudoin, Jonathan	Research assistant (EM300 team leader)	U of New-Brunswick	Hughes-Clarke, John	Pond Inlet	04-Sep	Kugluktuk	28-Sep
Leg 1	Billy, Yves	Media	ARTE	Media	Pond Inlet	20-Sep	Kugluktuk	28-Sep
Leg 1	Brucker, Steve	Research assistant (Heron operator)	U of New-Brunswick	Hughes-Clarke, John	Quebec City	22-Aug	Kugluktuk	28-Sep
Leg 1	Carpenter, Shelly	Research Technician	U. Washington, Seattle	Deming, Jody	Pond Inlet	04-Sep	Kugluktuk	28-Sep
Leg 1	Carrie, Jesse	Graduate Student	University of Manitoba	Stern, Gary	Quebec City	22-Aug	Kugluktuk	28-Sep
Leg 1	Church, Ian	PhD student	U of New-Brunswick	Hughes-Clarke, John	Quebec City	22-Aug	Kugluktuk	28-Sep
Leg 1	Delaney, Lisa	Graduate Student	Dalhousie	Scott, Dave	Quebec City	22-Aug	Kugluktuk	28-Sep
Leg 1	Dupré, Sophie	Geoscience technician	Laval University	Lajeunesse, Patrick	Quebec City	22-Aug	Kugluktuk	22-Sep
Leg 1	Elverum, Carey	Park Warden	Park Canada	Ouimet, Chantal	Pond Inlet	04-Sep	Pond Inlet	05-Sep
Leg 1	Evans, Colleen	Graduate Student	U. Washington, Seattle	Deming, Jody	Pond Inlet	04-Sep	Kugluktuk	28-Sep
Leg 1	Forest, Alexandre	Graduate Student	Université Laval	Fortier, Louis	Quebec City	22-Aug	Kugluktuk	28-Sep
Leg 1	Gratton, Yves	Research scientist	INRS-ETE	Gratton, Yves	Quebec city	22-Aug	Sept-Iles	24-Aug
Leg 1	Hirschberg, David	Senior Research Scientist	SUNY	Kirk, Cochran	Pond Inlet	04-Sep	Resolute	22-Sep
Leg 1	Hochheim, Klaus	Graduate Student	CEOS, U of Manitoba	Barber, David	Pond Inlet	04-Sep	Kugluktuk	28-Sep
Leg 1	Hughes-Clarke, John	Chief scientist-Professor	U of New-Brunswick	Hughes-Clarke, John	Quebec City	22-Aug	Pond Inlet	05-Sep
Leg 1	Isleifson , Dustin	Graduate Student	CEOS, U of Manitoba	Barber, David	Pond Inlet	04-Sep	Kugluktuk	28-Sep
Leg 1	Kublu, Abraham	Wildlife monitor	Pond Inlet HTO		Pond Inlet	04-Sep	Pond Inlet	20-Sep
Leg 1	Lago, Véronique	Research assistant	INRS-ETE	Gratton, Yves	Quebec City	22-Aug	Kugluktuk	28-Sep
Leg 1	Lavoie, Dany	Cameraman	Global Media	Media	Pond Inlet	04-Sep	Pond Inlet	05-Sep
Leg 1	LeBlanc, Bernard	Research assistant	FWI-DFO	Michel, Christine	Quebec City	22-Aug	Resolute	22-Sep
Leg 1	Lehnherr, Igor	Ph.D. candidate	University of Alberta	St.Louis, Vincent	Quebec City	22-Aug	Kugluktuk	28-Sep
Leg 1	Lovejoy, Connie	Professor	Université Laval	Lovejoy, Connie	Pond Inlet	04-Sep	Kugluktuk	28-Sep
Leg 1	Papakyriakou, Tim	Professor	CEOS, U of Manitoba	Papakyriakou, Tim	Pond Inlet	04-Sep	Kugluktuk	28-Sep
Leg 1	Pedeault, Estelle	Graduate Student	Université Laval	Lovejoy, Connie	Quebec City	22-Aug	Kugluktuk	28-Sep
Leg 1	Pomerleau, Corinne	Graduate Student	Universty of Manitoba	Stern, Gary	Quebec City	22-Aug	Kugluktuk	28-Sep
Leg 1	Potvin, Eric	Undergraduate student	ISMER-UQAR	Rochon, Andre	Quebec City	22-Aug	Resolute	22-Sep
Leg 1	Prost, Richard	Cameraman	ARTE		Pond Inlet	20-Sep	Kugluktuk	28-Sep
Leg 1	Rosenberg, Bruno	Technician	University of Manitoba	Stern, Gary	Pond Inlet	04-Sep	Kugluktuk	28-Sep
Leg 1	Schell, Trecia	Research scientist (Associate)	Dalhousie University	Scott, Dave	Resolute	22-Sep	Kugluktuk	28-Sep
Leg 1	Sévigny, Caroline	Graduate student	INRS-ETE	Gratton, Yves	Quebec City	22-Aug	Kugluktuk	28-Sep
Leg 1	Simard, Mélanie	Technician	UQAR	Gosselin, Michel	Pond Inlet	04-Sep	Kugluktuk	28-Sep
Leg 1	St-Hilaire, Dominique	MSc Student	Memorial	Forbes, Donald	Pond Inlet	04-Sep	Kugluktuk	28-Sep
Leg 1	Terrado, Ramon	PhD Student	Université Laval	Lovejoy, Connie	Quebec City	22-Aug	Kugluktuk	28-Sep
Leg 1	Trachtenberg, Michael	Graduate Student	CEOS, U of Manitoba	Barber, David	Pond Inlet	04-Sep	Kugluktuk	28-Sep
Leg 1	Tremblay, Jean-Eric	Professor	Université Laval	Tremblay, Jean-Eric	Pond Inlet	04-Sep	Kugluktuk	28-Sep

Appendix 4 - List of participants on Legs 1 and 2 of the ArcticNet Amundsen Expedition and on the BAYSIS cruise

Leg	Name	Position	Affiliation	Network Investigator/ Supervisor	Embark Place	Embark Date	Disembark Place	Disembark Date
Leg 1	Vanderklippe, Nathan	Journalist	Global Media	Media	Pond Inlet	04-Sep	Pond Inlet	05-Sep
Leg 1, Leg 2a	Gagnon, Jonathan	PhD student	Université Laval	Tremblay, Jean-Eric	Quebec City	22-Aug	Kugluktuk	19-Oct
Leg 1, Leg 2a	Martin, Johannie	MSc student	Université Laval	Tremblay, Jean-Eric	Quebec City	22-Aug	Stays for Leg 2	19-Oct
Leg 1, Leg 2a	McFadden, Laurel	Research assistant	Pomona college	Christine Michel	Quebec City	22-Aug	Kugluktuk	19-Oct
Leg 1, Leg 2a	Proteau, Kary	Garduate Student	UQAR	Poulin, Michel	Quebec City	22-Aug	Kugluktuk	19-Oct
Leg 1, Leg 2a	Rail, Marie-Emmanuelle	Rosette Technician	INRS-ETE	Gratton, Yves	Quebec City	22-Aug	Iqaluit	29-Oct
Leg 1, Leg 2a	Renfro, Alisha	Graduate Student	SUNY	Kirk, Cochran	Pond Inlet	04-Sep	Kugluktuk	19-Oct
Leg 1, Leg 2a, Leg 2b	Blondeau, Sylvain	Sea Technician	Université Laval	Amundsen/ Quebec-Ocean	Quebec City	22-Aug	Stays for Leg 2	09-Nov
Leg 1, Leg 2a, Leg 2b	Darnis, Gérald	Graduate Student	Université Laval	Fortier, Louis	Quebec City	22-Aug	Stays for Leg 2	09-Nov
Leg 1, Leg 2a, Leg 2b	Letourneau, Louis	Technician	Université Laval	Fortier, Louis	Quebec City	22-Aug	Quebec City	09-Nov
Leg 1, Leg 2a, Leg 2b	Massot, Pascal	Sea Technician	Université Laval	Amundsen/ Quebec-Ocean	Quebec City	22-Aug	Quebec City	09-Nov
Leg 2a	Bell, Trevor	Professor	Memorial University	Bell, Trevor	Kugluktuk	28-Sep	Sachs Harbour	03-Oct
Leg 2a	Bennett, Robbie	Geoscience technician	Natural Resources Canada	Blasco, Steve	Kugluktuk	28-Sep	Iqaluit	29-Oct
Leg 2a	Brière, Daniel	Media/cameraman	PVP		Kugluktuk	19-Oct	Iqaluit	29-Oct
Leg 2a	Brohy, Audrey	Media	Media		Kugluktuk	28-Sep	Kugluktuk	19-Oct
Leg 2a	Bujold, Simon	Media	PVP		Kugluktuk	19-Oct	Iqaluit	29-Oct
Leg 2a	Byers, Michael	Professor	University of British Columbia	Byers, Michael	Kugluktuk	19-Oct	Iqaluit	29-Oct
Leg 2a	de Bellefeuille, Patrick	Media	Météo Média		Kugluktuk	28-Sep	Kugluktuk	19-Oct
Leg 2a	Deming, Jody	Professor	U. Washington, Seattle	Deming, Jody	Kugluktuk	28-Sep	Iqaluit	29-Oct
Leg 2a	Forbes, Donald	Professor	Memorial University	Forbes, Donald	Kugluktuk	28-Sep	Sachs Harbour	03-Oct
Leg 2a	Galand, Pierre	Post-Doc	Université Laval	Lovejoy, Connie	Kugluktuk	28-Sep	Iqaluit	29-Oct
Leg 2a	Hare, Alex	Graduate student	University of Manitoba	Stern, Gary	Kugluktuk	28-Sep	Iqaluit	29-Oct
Leg 2a	Inuktalik, Philip	Wildlife Observer	Holman HTC		Holman, NT	29-Sep	Kugluktuk	19-Oct
Leg 2a	Laliberté, Élie	Media	PVP		Kugluktuk	19-Oct	Iqaluit	29-Oct
Leg 2a	Lalonde, Suzanne	Professor	Université de Montréal	Lalonde, Suzanne	Kugluktuk	19-Oct	Iqaluit	29-Oct
Leg 2a	Lamarre, Jules	Media	PVP		Kugluktuk	19-Oct	Iqaluit	29-Oct
Leg 2a	Lamarre, Louise	Media	PVP		Kugluktuk	19-Oct	Iqaluit	29-Oct
Leg 2a	Laserre, Frédéric	Professor	Université Laval		Kugluktuk	19-Oct	Iqaluit	29-Oct
Leg 2a	Lebans, Jim	Media	CBC	Quirks and Quaks	Kugluktuk	28-Sep	Sachs Harbour	03-Oct
Leg 2a	Lemay, Lilianne	Media	Météo Média		Kugluktuk	28-Sep	Kugluktuk	19-Oct
Leg 2a	Millaire, Michel	Media	Météo Média		Kugluktuk	28-Sep	Kugluktuk	19-Oct
Leg 2a	Potvin, Marianne	Graduate Student	Université Laval	Lovejoy, Connie	Kugluktuk	28-Sep	Iqaluit	29-Oct
Leg 2a	Poulin, Michel	Research Scienitst	CMN	Poulin, Michel	Kugluktuk	28-Sep	Kugluktuk	19-Oct
Leg 2a	Robert, Dominique	PhD Student	Université Laval	Fortier, Louis	Kugluktuk	28-Sep	Iqaluit	29-Oct
Leg 2a	Stern, Gary	(Chief Scientist) Research Scientist	Freshwater Institute, DFO	Stern, Gary	Kugluktuk	28-Sep	Iqaluit	29-Oct

Appendix 4 - List of participants on Legs 1 and 2 of the ArcticNet Amundsen Expedition and on the BAYSIS cruise

Leg	Name	Position	Affiliation	Network Investigator/ Supervisor	Embark Place	Embark Date	Disembark Place	Disembark Date
Leg 2a	Struck, Doug	Journalist	Washington Post	Media	Kugluktuk	19-Oct	Iqaluit	29-Oct
Leg 2a	Veillette, Julie	PhD Student	Université Laval	Lovejoy, Connie	Kugluktuk	28-Sep	Iqaluit	29-Oct
Leg 2a, Leg 2b	Bartlett, Jason	Hydrographer (EM300 team leader)	DFO	Hughes-Clarke, John	Kugluktuk	28-Sep	Quebec City	09-Nov
Leg 2a, Leg 2b	Cartwright, Doug	Research assistant (Heron operator)	U of New-Brunswick	Hughes-Clarke, John	Kugluktuk	28-Sep	Quebec City	09-Nov
Leg 2a, Leg 2b	DeLaronde, Joanne	Technician	Freshwater Institute, DFO	Stern, Gary	Kugluktuk	28-Sep	Quebec City	09-Nov
Leg 2a, Leg 2b	Dumont, Dany	PhD Student	INRS-ETE	Gratton, Yves	Kugluktuk	28-Sep	Quebec City	09-Nov
Leg 2a, Leg 2b	Else, Brent	Graduate Student	CEOS, U of Manitoba	Papakyriakou, Tim	Kugluktuk	28-Sep	Quebec City	09-Nov
Leg 2a, Leg 2b	Kuus, Pim	MSc student	U of New-Brunswick	Hughes-Clarke, John	Kugluktuk	28-Sep	Quebec City	09-Nov
Leg 2a, Leg 2b	Leitch, Dan	Graduate student	University of Manitoba	Stern, Gary	Kugluktuk	28-Sep	Quebec City	09-Nov
Leg 2a, Leg 2b	Levesque, Keith	Ship-based research coordinator	ArcticNet Inc.	ArcticNet Central	Kugluktuk	28-Sep	Quebec City	09-Nov
Leg 2a, Leg 2b	Michaud, Luc	Ship Equipment Manager	Université Laval	Amundsen/ Quebec-Ocean	Kugluktuk	28-Sep	Quebec City	09-Nov
Leg 2a, Leg 2b	Robitaille, Marc	Sea technician	Université Laval	Amundsen/ Quebec-Ocean	Kugluktuk	28-Sep	Quebec City	09-Nov
Leg 2a, Leg 2b	Thanassekos, Stéphane	PhD Student	U. Laval	Gratton, Yves	Kugluktuk	28-Sep	Quebec City	09-Nov
Leg 2b	Aaluk, Emelia	S on Board Student	Qiqirtaq Ilihakvik	Schools on Board	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Baikie, Gary	Visitor Experience coordinator	Parks Canada	Reimer, Ken	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Barber, Lucette	S on Board coordinator	ArcticNet, U of Manitoba	Schools on Board	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Bell, Trevor	Professor	Memorial University	Bell, Trevor	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Bergeron, Gaétan	Media	CBC		Nain	05-Nov	Quebec City	09-Nov
Leg 2b	Bussière, Guylaine	Media	CBC		Nain	05-Nov	Quebec City	09-Nov
Leg 2b	Collin, Pascale	S on Board coordinator	ArcticNet, U of Manitoba	Schools on Board	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Dallaire, Sarah-Julie	S on Board Student	Le Petit Seminaire de Quebec	Schools on Board	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Dawson, Jaime	Communications Officer	ArcticNet Inc.	ArcticNet Central	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Drouin, Roger	S on Board Teacher	Quebec	Schools on Board	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Ford, Ernie	Wildlife Observer from Nain	Nunatsiavut government	Reimer, Ken	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Fortier, Martin	(Chief Scientist) Executive Director	ArcticNet Inc.	ArcticNet Central	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Ikkusek, Leah	Media	Okalatiget Society	Biasutti, Marina	Iqaluit	29-Oct	Nain	05-Nov
Leg 2b	Jaw, Lisa	S on Board Student	Peter Pitseolak High School	Schools on Board	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Knight, Tom	Research Scientist	Parks Canada	Reimer, Ken	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Kuszel, Samantha	S on Board Student	Brookfield High School	Schools on Board	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	McIntosh, Aimee	Inuk student	Nunatsiavut	Biasutti, Marina	Iqaluit	29-Oct	Nain	05-Nov
Leg 2b	Metcalfe, Leroy	Technical Manager	Sikumiut Environmental Management Ltd.	Reimer, Ken	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Murphy, Paul	Media	Okalatiget Society	Biasutti, Marina	Iqaluit	29-Oct	Nain	05-Nov
Leg 2b	Nadeau, Janet	S on Board Teacher	Ottawa	Schools on Board	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Pienitz, Reinhard	Professor/ Research Scientist	Université Laval	Pienitz, Reinhard	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Potentier, Ginette	S on Board Student	Glenlyon Norfolk School	Schools on Board	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Pottle, Tim	Undergraduate student	Memorial University	Reimer, Ken	Iqaluit	29-Oct	Quebec City	09-Nov

Appendix 4 - List of participants on Legs 1 and 2 of the ArcticNet Amundsen Expedition and on the BAYSIS cruise

Leg	Name	Position	Affiliation	Network Investigator/ Supervisor	Embark Place	Embark Date	Disembark Place	Disembark Date
Leg 2b	Rathbone, Rachel	S on Board Student	Churchill High School	Schools on Board	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Reimer, Ken	Director ESG/Research Scientist	Environmental Sciences Group, RMC	Reimer, Ken	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Sheldon, Tom	Research Assistant	Environmental Sciences Group, RMC	Reimer, Ken	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Vaillancourt, Mathieu	S on Board Student	Ecole Secondaire Cardinal-Roy	Schools on Board	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Wade, Sarah	S on Board Teacher	Gjoa Haven	Schools on Board	Iqaluit	29-Oct	Quebec City	09-Nov
Leg 2b	Zamelczyk-Juhnke, Kasia	Graduate student	Université Laval	Pienitz, Reinhard	Iqaluit	29-Oct	Quebec City	09-Nov
CCGS *Pierre Radisson*								
BaySys	Michaud, Luc	Ship Equipment Manager	Université Laval	Amundsen/ Quebec-Ocean	Kuujjuarapik	12-Sep	Churchill	23-Sep
BaySys	Michaud, Josée	Chief Scientist	Université Laval	Amundsen/ Quebec-Ocean	Kuujjuarapik	12-Sep	Churchill	23-Sep
BaySys	Robitaille, Marc	Technician	Université Laval	Amundsen/ Quebec-Ocean	Kuujjuarapik	12-Sep	Churchill	23-Sep
BaySys	Ehn, Jens		U. Manitoba		Churchill	17-Sep	Churchill	23-Sep
BaySys	Granskog, Matts		U. Manitoba		Churchill	17-Sep	Transfer to *Strait Signet*	19-Sep
BaySys	McCullough, Greg		HydroManitoba		Churchill	17-Sep	Transfer to *Strait Signet*	19-Sep