

CCGS Amundsen Leg-1 Cruise Report  
-Bay-wide Survey of Hudson Bay-



*On-ice operations from the CCGS Amundsen. A six week bay-wide survey of Hudson Bay from May 25<sup>th</sup> to July 5<sup>th</sup>, 2018. The 40 scientists on board successfully sampled and surveyed 122 stations, both planned and opportunistic, across parts of the northern, western, central, and southern portions of the Bay. These stations included open water and on-ice sampling, as well as sampling operations via Amundsen helicopter, zodiac and barge vessels.*

NGCC • CCGS  
**AMUNDSEN**



UNIVERSITY  
OF MANITOBA



# Leg 1 Chief Scientist Report

## *Summary*

Leg 1 of the 2018 Amundsen cruise was successful. Many of our objectives for the cruise and BaySys project were achieved, barring a few locations in the bay in which we were not able to access due to ice and weather conditions. Overall, data collection and sampling went well, including all on board and remote based (i.e., helicopter; zodiac; barge; and on-ice) operations. The following is a summary of the completed cruise from May 25<sup>th</sup> to July 5<sup>th</sup>, 2018.

Week 1 of the cruise was predominately dedicated to transiting from Quebec City to the Hudson Strait via the Labrador coast. The transit took roughly 6 days and included a 7-hour Search and Rescue (SAR) call on May 30<sup>th</sup>, 2018. During the first 2 days of this transit, we completed Amundsen familiarization and safety tours on board, and emergency alarm and procedures were tested. In addition, safe operations meetings for scientists and Amundsen crew were organized and held during the first week of the cruise. This included safety meetings for sea-ice work, river work, helicopter safety and operations, optical instrument operations, rosette operations, mooring operations, and general water sampling operations. Individual toolbox meetings were held prior to the start of each operation beginning on day 6, and the skippy boat – used for on-ice operations – was also briefly tested during this time. During the first week of Leg 1, general science meetings were scheduled each evening and time allowed for a research presentation from six scientists/students.

The Amundsen crew and scientists shifted to a 24 hour schedule starting on May 31<sup>th</sup>, and continued until the final week of operations. Our first stations were conducted on May 31<sup>th</sup>, 2018, along the entrance into the Hudson Strait. With the need to make up as much time as possible to enter Hudson Bay, the number of stations conducted along the strait was reduced to four. Thereafter, we began extensive station operations across the Bay entrances and used helicopter operations extensively for remote ice stations in areas of heavy ice concentration. This allowed for a much broader area coverage of operations. On June 5<sup>th</sup>, we deployed our first mooring (CMO03) just north of Coates Island, and by June 6<sup>th</sup>, we had entered into Hudson Bay for our first stations on Bay ice (Stn. 16). At station 16, three remote short-term ice instruments were deployed with the intent to be recovered later in the campaign. Prior to our June 7<sup>th</sup> community visit off the shore of Chesterfield Inlet (see below for more details), we conducted the first of three MVP transects along the west coast of Hudson Bay, providing a continuous profile of sea temperature, salinity, and depth, among other measurements.

We spent Week 3 sampling between the coast and the western-most ice edge of Hudson Bay, at that time spaced about 110 nautical miles apart. Two additional MVP transect lines were completed from the coast into the open water, and five river systems were successfully sampled for water via helicopter (i.e., Chesterfield; Wilson; Ferguson; Tha-anne; Thlewiaza). Where possible, land fast ice was also sampled. During this time intensive drone surveys of the coast lines were conducted along with photo surveys of the sea ice edge via the helicopter. The zodiac also proved useful along this coast as two multi-station transects were conducted beginning at the edge of the land fast ice of the Wilson and Thlewiaza Rivers, respectively, and continued out into the open water toward the Amundsen's position. From each of these major river regions, we

positioned stations strategically out from the coast and into the ice edge of the Hudson Bay with intermediate stations in between to provide information across the entire water continuum of from coast, to the sea-ice. Prior to the crew change in Rankin Inlet, we located and recovered the short-term ice station instruments near station 16. On June 14<sup>th</sup>, we arrived in Rankin Inlet for a partial scientist crew change, and due to unfortunate circumstances, needed to change to Captain Gariépy, as Captain LaFrance had to unexpectedly depart for a family emergency.

Week 4 of Leg 1 saw many changes to the overall cruise plan. Originally planning a direct route across the bay in 4 days, we instead found that the ice was still heavily concentrated in this region and that we were unlikely to cross the bay in the proposed amount of time. After 2 days transit (by June 16<sup>th</sup>) we made it to our second mooring station (Stn.29/CMO02) in the north-central region of the bay. After the successful deployment of the mooring and a few operations conducted on board, we were called to respond to a second SAR near Whale Cove, back on the west coast of the bay. This SAR call was completed in 1 day. After completing the call, the decision was made to head south on a direct route towards the Nelson Estuary, and from there to follow the southern coast of the bay to get to the eastern side. During this transit, we stopped at the mooring AN01, but determined that the ice cover remained too high to recover it at the moment. Once arriving at the Nelson Estuary by June 18<sup>th</sup>, the mooring NE02 was recovered and a short nearby station was completed and the Nelson and Hayes Rivers were sampled via helicopter. Navigating the southern coast proved to be more difficult than anticipated, as large, thick, and sediment-laden freshwater ice floes slowed progress. Along with two ice sampling stations in the ice edge, we managed to sample both the Severn, and Winisk Rivers via helicopter. While in this region, the decision to deploy 10 ice beacons was made to track the movement of the ice pack and gain insight into the double gyre current movement in this area of the bay. By the end of week 4, we had completed 34 stations, but needed to come up with a new plan to make it back to the Nelson as we were nearing the end of our allotted time for Leg 1.

At the start of week 5, we decided to head north into the ice pack and towards deeper water in central Hudson Bay. We transited about 150 nm north and conducted stations along a direct route from the southern coast. Once the ice became too thick and concentrated, we began our transect line back south towards the Nelson Estuary. Following our arrival in the Nelson Estuary, we deployed a wave buoy along with an ADCP mooring (June 25<sup>th</sup>). Shortly after the start of our next station operation, we were called for our third SAR at the northern-most part of the bay, just outside Cape Dorset. This SAR response lasted 2.6 days. Following the completion of the call, and our new position north of Coates Island, it was decided that we resample station 15 for an extended time series with and without ice cover. During our transit back towards the Nelson, we recovered the AN01 mooring just north of Churchill, and deployed the CMO01 mooring nearby. In addition to this deployment, we were able to sample the Seal, Knife, and Churchill Rivers all via helicopter.

Once back at the Nelson Estuary, we spent three days (June 29<sup>th</sup> – July 1<sup>st</sup>) doing intensive sampling by zodiac, barge, and helicopter. The winds were high in this region making it difficult to manage all the operations on board smaller vessels, however, we sampled seven stations along the Nelson River transect, three stations along the south transect from the coast to the position of the Amundsen, and three stations along a modified western coast transect using Rosette casts and bucket sampling. In addition, onboard operations were conducted at two locations within the

estuary. On June 29<sup>th</sup>, the helicopter was used to conduct a large scale gridded photo survey of the estuary with the aim to locate beluga pods and visual changes to the water in the estuary, and the following day, it was sent out onto the coastal mud flats to collect sediment samples. The wave buoy and ADCP mooring deployed a few days earlier were recovered before leaving the area on July 1<sup>st</sup>, and heading north towards Churchill to finish the campaign by July 2<sup>nd</sup>. Once back in Churchill we hosted a successful community visit on board (~ 150 people), and held the Knowledge Exchange Workshop for 40 guests.

***Stations Completed = 45***

Nutrient = 22

Basic = 09

Full = 11

Other = 03 (mooring turnover and opportunistic ice-grab sampling)

***Remote Station Completed = 77***

Helicopter = 53

Zodiac & Barge = 24

***Community Visits and the Knowledge Exchange Workshop***

**Chesterfield Inlet Community Visit**

On June 7<sup>th</sup>, the Amundsen anchored offshore, and hosted a community visit with Chesterfield Inlet. We brought 17 members of the community over to the ship via helicopter, including Mayor Simonie Sammurtok, HTO council members, and younger high school graduates interested in ocean sciences. Overall, the visit was very successful. After arriving, they were brought on a tour of the ship, which included seven science stations highlighting some of the many different operations and labs on board. These stations included a visit to the Rosette deployment area and data rooms to learn about oceanography and water sampling. The sea-ice team discuss their operations along with the radiometer, and the benthos and sediment labs were used to showcase and discuss some of the many diverse organisms that have been collected throughout the Bay. The aft labs were used to discuss oil contaminants and optical instruments, and on the foredeck, water chemistry was discussed. Lastly, the community guests were taken to the 600 deck labs to learn about food web sciences, including phytoplankton, nutrient, fish larvae, and adult fish.

Following the tour, the members of Chesterfield were invited inside for lunch in the Officer's mess, followed by a presentation outlining the BaySys project and what it is that we hope to accomplish and learn in Hudson Bay going forward. This presentation was followed by a discussion with the community on what their experiences and the changes they see on the bay each year, including the reduction in the local goose and large beluga populations. Some of the fishermen also noted catching certain species of fish that are rarely seen in this part of the bay.

**Churchill Community Visit and Knowledge Exchange Workshop**

The Churchill community visit took place during the morning of Tuesday, July 3<sup>rd</sup>. For 2 hours, the Amundsen hosted over 100 visitors excited to come on board the ship. They were given a tour of the exterior scientific work stations and instruments, along with the Amundsen

wheelhouse. The on board community tour was self-guided, as specific areas were designated for certain instrument and operation showcasing. Participants from our science teams gave brief presentations of their research and answered many questions from the visitors.

The Knowledge Exchange Workshop was an event held in Churchill, Manitoba on July 2<sup>nd</sup> and 3<sup>rd</sup> 2018. The workshop was co-hosted by the Honourable Jim Carr, Minister of Natural Resources and Dr. Digvir Jayas, Vice President Research and International, the University of Manitoba. The event was attended by over 40 guests, including representatives from: the Government of Canada, the Canadian Senate, Members of Parliament, Fisheries and Oceans Canada, the Canadian Coast Guard, Canada Foundation for Innovation, Manitoba Hydro, Stantec, World Trade Centre - Winnipeg, Churchill Tour Operators Association, Kivalliq Inuit Association, Opaskwayak Cree Nation, Inuit Circumpolar Council Canada, and Oceans North.

The Knowledge Exchange Workshop was about communicating across the various stakeholders in the Arctic, to showcase the different perspectives from science, policy and Indigenous groups. The event was to open up communication channels, and allow for greater understanding of both the challenges and opportunities that we are facing in Hudson Bay and the Arctic.

The workshop included discussions with BaySys researchers and students who were onboard the *CCGS Amundsen* which had just conducted the first ever Hudson Bay wide survey when sea ice was still present and freshwater input was at its spring maximum.

Several keynote presentations were delivered both in the Town of Churchill and onboard the *CCGS Amundsen*. A discussion panel focused on the topic “Climate Change, Industrialization and Globalization: Are we prepared for both the challenges and opportunities?” The panel included representatives from the Inuit Circumpolar Council, the community of Chesterfield Inlet, the Canadian Coast Guard, Fisheries and Oceans Canada and the University of Manitoba. Many of the questions focused on how we can move forward to bring the knowledge gained from science and mobilize it into policy.

Although the workshop was only two days in length the impacts of it will be positive and long lasting:

"The several days you gave us all in Churchill were transformative. The Knowledge Exchange Workshop has been really helpful to me as our Senate Arctic Committee plans our September Arctic tour."

*Senator Patricia Bovey*

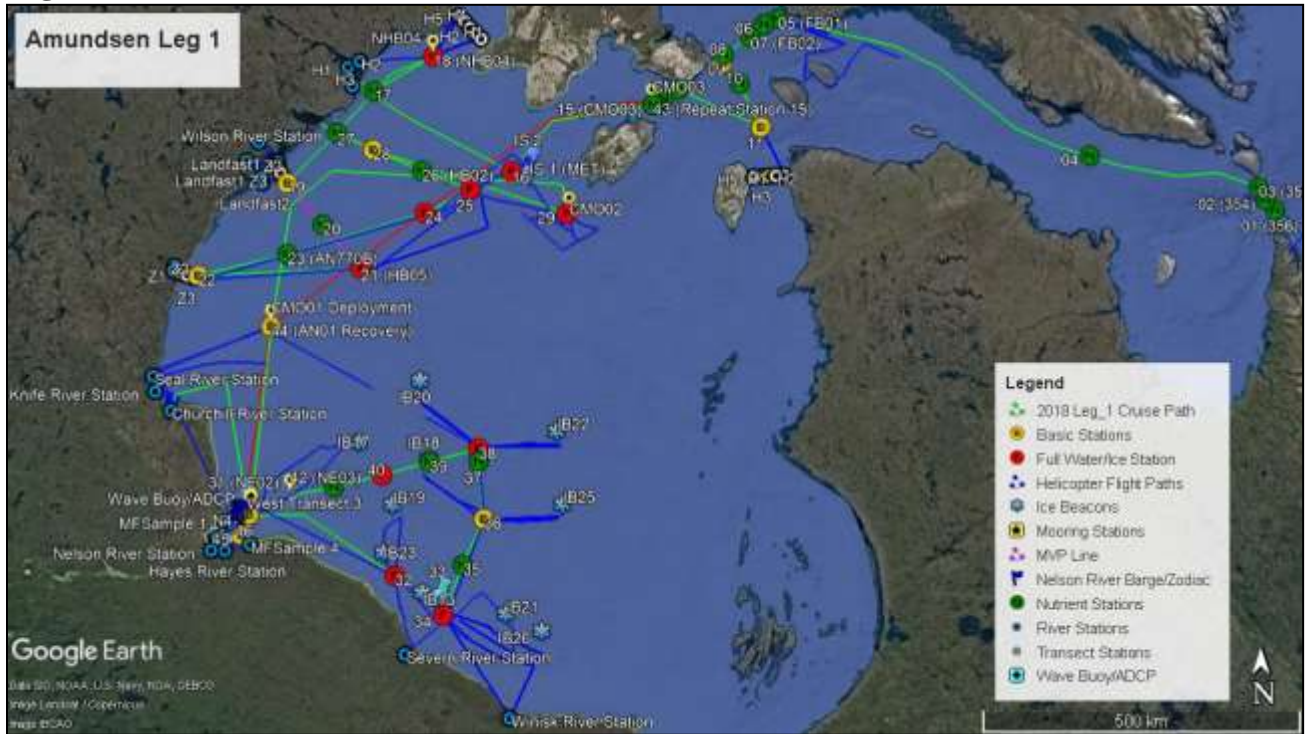
"Thank you for the wonderful days spent in Churchill and aboard the Amundsen, and for the conversations and connections you catalyzed. It was a memorable trip for me, and a reminder of the reasons we do what we do at the CFI."

*Guy Levesque - Vice-President, Programs and Performance, Canada Foundation for Innovation*

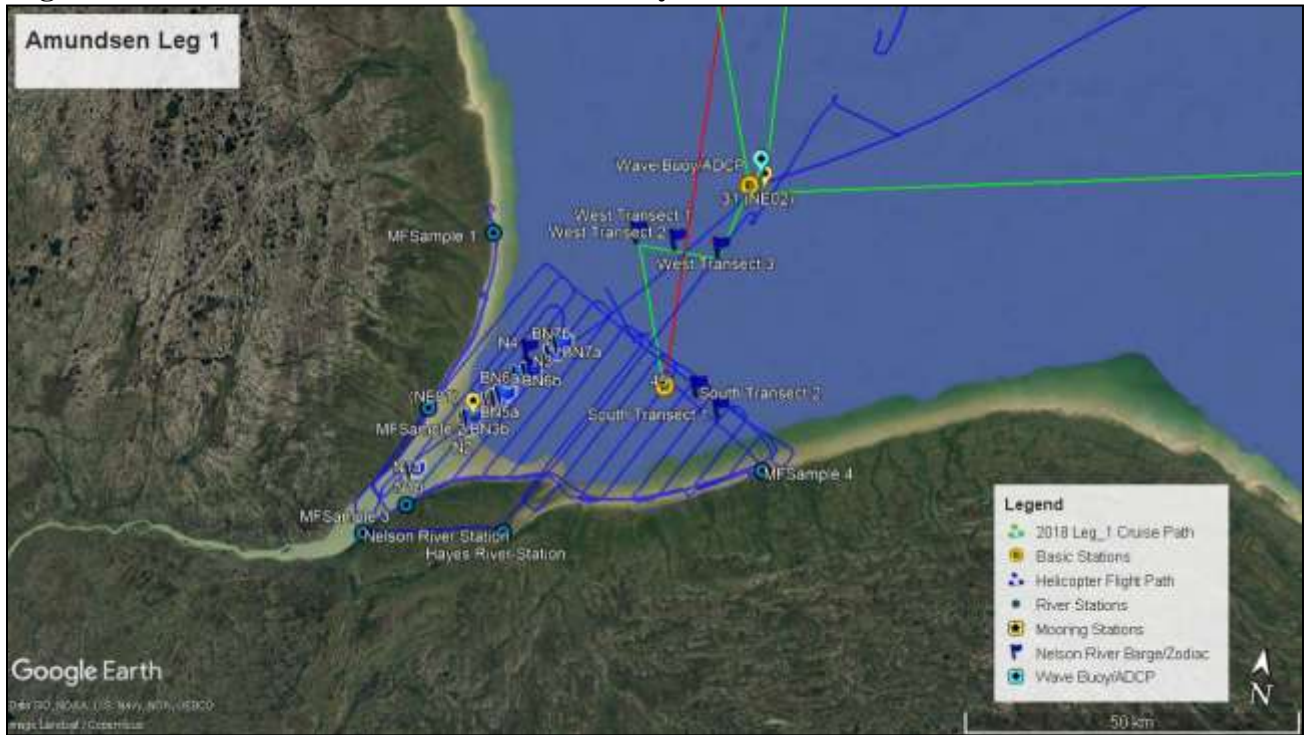
### ***Leg 2a BaySys Component***

With the eastern coast of Hudson Bay inaccessible during Leg 1, we suggested having a particular set of eastern coast rivers sampled via helicopter with the support of the Leg 2a crew and scientists (i.e., Inukjuak; Puvirnituk; Akulivik). Leg 2a is scheduled to travel across the Bay from Churchill to Inukjuak, and then north along the coast towards the Hudson Strait. In addition to river sampling, we are hoping to have scientists collect ice cores opportunistically from the central and eastern side of the bay. The addition of these datasets from Leg 2a will help avoid gaps in the regional distribution of our analyses and results.

### Leg 1\_Amundsen Cruise Track

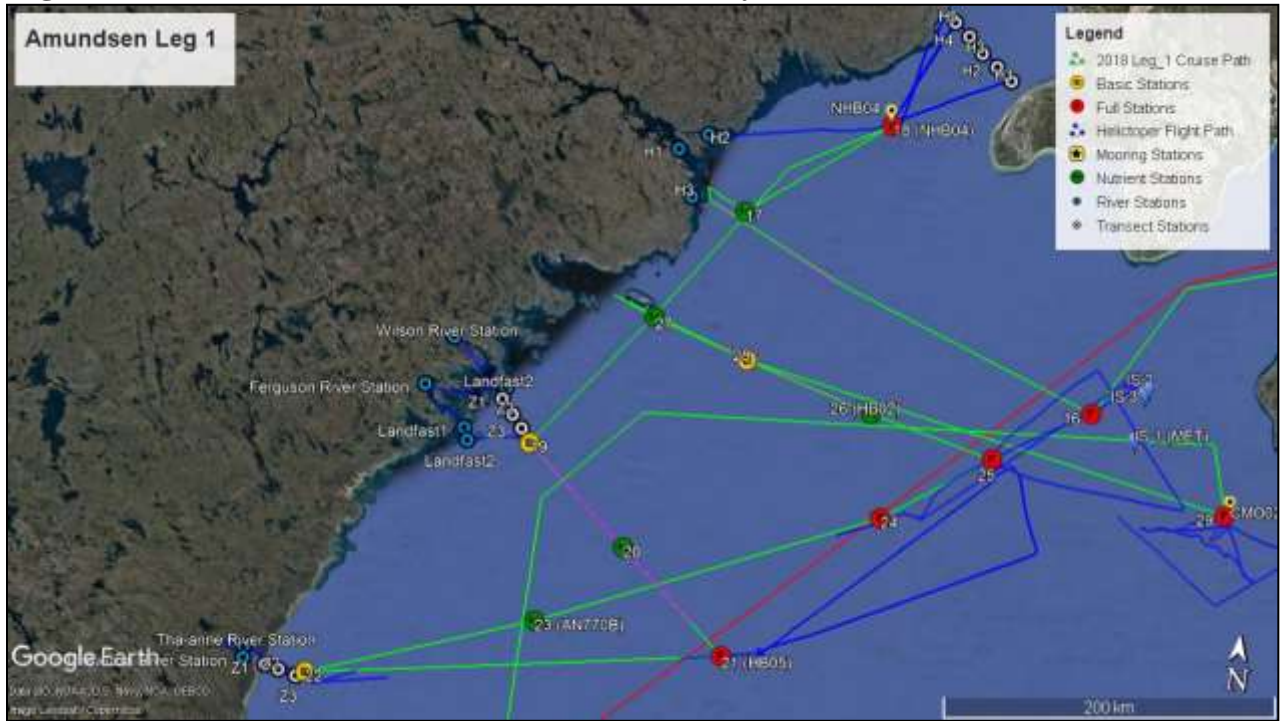


### Leg 1\_Amundsen Cruise Track – Nelson Estuary





**Leg 1\_Amundsen Cruise Track – Western Hudson Bay**



**Leg 1\_Amundsen Cruise Track – Northern Hudson Bay**

