

2013-14 NWRT Interim Project Report

1. NWRT Project Number: (e.g. 3-13-09)
2. Project Title: Surveillance for aquatic invasive species in the Canadian Arctic
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4. Summary:

Although most aquatic invasive species introductions have occurred in temperate latitudes where there is the greatest shipping activity, the combination of global warming, resource exploitation and the resulting increase in Arctic shipping activity are expected to increase the risk of non-native species introductions to Arctic waters in the near future. Given that Canada has the longest coastline in the world, the majority of which is located in Arctic waters, this region is at high risk. Within Canada, it is not known how many aquatic invasive species (AIS) or even native species exist in Arctic waters, as few systematic surveys have been conducted in this region of the country. As part of the Canadian Aquatic Invasive Species Network (CAISN), surveys of estuarine and coastal marine biota in major Arctic ports (expected to be at highest risk for introduction of AIS are now being conducted. This research is part of a national program to develop a database on occurrence of aquatic invasive species and to aid in rapid detection of high risk invaders in key ports across Canada. The program combines traditional taxonomic with modern molecular genetic analyses to establish the complement of non-native and native species present in all four aquatic coasts in Canada. Arctic surveys were conducted in the ports of Churchill, MB and Iqaluit, NU in 2011-12 and in Deception Bay, QC and Steensby Inlet (port for proposed Mary River Mine), NU in 2012-13. Baseline field surveys of the zooplankton and benthic invertebrate fauna in these ports along with collection of geo-referenced information about the location and environmental setting (water salinity, temperature, depth, clarity, bottom type and sediment characteristics) were conducted using a combination of sampling methods under ice, by boat, diving and from shore to maximize the diversity and numbers of organisms encountered. Samples were preserved for later identification in the lab. Lab identifications and analyses are underway and have continued through 2013-14. The species inventory created through this study will provide a baseline from which to monitor for the presence of foreign species that may be introduced through future shipping activity. Early detection of such species can allow for mitigation before the problem spreads and becomes unmanageable.

5. Project Objectives:

The objective of this project is to develop an inventory of existing biota and environmental conditions in areas of the Arctic with the highest risk for introduction by exotic species with the goals of: 1) establishing a baseline for further monitoring and early detection of aquatic invasive species and 2) providing environmental data and information on species composition that will allow for the modeling of future risks associated with climate change and shipping activity in the Canadian Arctic. Surveys of estuarine and coastal marine biota over the past 2 years have focused on major Arctic ports since these areas are expected to be at highest risk for introduction of aquatic invasive species. Specific objectives for 2013-14 were to complete identifications of organisms collected at high risk ports in the 2011 and 2012 field seasons for comparison to historical species lists and identification of any new species. The project objectives are on track; field programs to address these objectives were completed between

2011- 2012; associated lab work and compilations of historical information in 2013-14 are well on track and nearing completion. Three of the four ports have The first primary publication from initial results of this work was completed and submitted for publication in the journal Aquatic Invasions in December 2013 (Goldsmith, J, K.L. Howland and P. Archambault. *Establishing a baseline for early detection of non-indigenous species in ports of the Canadian Arctic*).

6. Materials and Methods:

Open water surveys for marine invertebrates at each of 4 ports (Churchill, MB, Iqaluit and Steensby Inlet, NU and Deception Bay, QC) port were conducted in a 2 week period during July - August (2011 and 2012) and with a team of 5 biologists/field technicians/divers and a team of 4-6 locally hired guides and boats (Figure 1). Field surveys of biota and collection of environmental information were conducted using a combination of sampling methods by boat, diving and from shore (quadrat clearings, cores, manual collection, video and photographs along with water quality profiles and secchi depth) to maximize the diversity and numbers of organisms encountered. Sampling depths ranged from just adjacent to the shoreline to a maximum depth of 20 m at low tide. The majority of samples were preserved in 5% buffered formalin and shipped south for sorting, taxonomic identification and enumeration (Benthic ecology lab at Université du Québec à Rimouski, Institut des Sciences de la Mer de Rimouski (UQAR/ISMER)). Subsamples of representative taxa and one replicate of each of the 3 deepest zones per transect were preserved in ethanol (2012 only) for genetic barcoding.

All samples are currently being identified to the lowest taxonomic level possible (to species ideally) and information is being stored in a database. Any new or uncertain species are being verified by independent labs with expertise in the given taxonomic group of interest. An exhaustive literature review has been completed and from this a comprehensive historical species list for high risk Arctic ports and the surrounding regions has been compiled. This list is being used to develop an easily searchable biodiversity database that is currently under construction. The inventory of existing biota found in each port is being compared with the above-described historical species lists to identify new records using a protocol of cross referencing that includes published and grey literature from our historical database, together with global biodiversity databases and information on invasion history and non-indigenous species connected to Arctic ports through shipping. This information is used to infer if new species are likely to represent range expansions, improved survey effort or possible introductions in a particular area.

7. Project Schedule: Provide an updated project schedule as per 4.0 of the NWRT application. Indicate if project is on schedule, including any changes.

Project coordination (proposals, consultations, communication and preparation), field equipment procurement, maintenance, preparation, shipping, arranging logistics, administration (budget management, contracts, purchasing, travel arrangements) Note field portion of this step completed: Nov. 1, 2011-March 31, 2014 – on schedule

Invertebrate sample analysis and identification: Sep16, 2012 – March 31, 2014 – on schedule, expected completion end of March

Final reports to NWMB and HTAs/LNUK (for 2012-13 funding): Sep. 1-Sep. 30, 2013 - completed on schedule

Interim reports to NWMB and HTAs/LNUK (for follow-up 2013-14 work): Jan 1, 2012-Jan 15, 2013 on schedule, plain language reports delayed slightly – should be ready for distribution by end of February 2014 (translations still needed).

Final reports to NWMB and HTAs/LNUK: Sep. 1 – Sep. 30, 2014

8. Preliminary results/discussion:

We successfully sampled 6 transects in the Ports of Churchill, Deception Bay and Steensby Inlet and 5 transects in the Port of Iqaluit during the open water season for invertebrates as detailed in our 2012-13 final report.

All port survey samples are now being sorted and identified to the lowest feasible taxonomic level by a team of trained taxonomists at UQAR/ISMER. Core samples taken from the ports of Churchill, Iqaluit and Deception Bay have been completed (n~80/port). Core samples from Steensby Inlet, along with quadrat samples from each port are presently being sorted and identified and are expected to be completed by March 2014. The results below are only on samples identified to date. Complete results for all ports will be available for the final report in September 2014.

The surveys in the ports of Iqaluit (Iq), Churchill (Ch) and Deception Bay (DB), resulted in the identification of 222 benthic taxa between the three ports, of which 14.9% were not previously recorded within a given port, while 8.1% (18 taxa, mostly Polychaeta), were not previously recorded from the larger surrounding regions of each port. A total of eight species (3.6%) were records found for the first time in Canadian Arctic waters. The most widely represented phylum was Annelida (Polychaeta) in all three ports (Ch=56.2%, DB=48.3%, Iq= 44.8%), followed by Arthropoda (Crustacea) (Ch=13.5%, DB=17.9%, Iq= 26.4%) and Mollusca (Ch=12.4%, DB=21.4%, Iq= 19.5%) The three ports had 9.9% of common shared taxa (mostly Polychaetes).

Results to date were presented at presented at the Canadian Conference for Fisheries Research (January 2013, Windsor), Quebec-Ocean annual meeting (November 2013), the International Conference on Aquatic Invasive Species (April 2013, Niagara Falls), the Canadian Aquatic Invasive Species Network Annual General Meeting (May 2013). Project results have also been reported to CBC North (June 2013, Inuktitut:

<http://www.cbc.ca/player/News/Canada/North/ID/2389690507/?page=2> , English version:

<http://www.cbc.ca/player/News/Canada/North/ID/2389549103/>), Nunatsiaq News (November 2013,

http://www.nunatsiaqonline.ca/stories/article/65674arctic_waters_increasingly_vulnerable_to_for_eign_species/) and to the Circumpolar Biodiversity Monitoring Program. As mentioned above, the first primary publication from initial results of this work was completed and submitted for publication in the journal Aquatic Invasions in December 2013; a copy of this publication will be provided to the NWMB once it has been published.

9. Reporting to communities/resource users: Provide an updated schedule of consultations as per 5.2 of the NWRT application. Indicate any status or changes to schedule.

Consultations and reporting are on schedule as described in our application. Community consultations to describe project plans and discuss concerns/answer question with Salluit, QC; and Iqaluit, Igloodik, Hall Beach and Pond Inlet, NT were conducted during May 2012 prior to initiation of sampling in these areas and following distribution of translated project outlines and letters explain our proposed research. Presentations and meetings were also held with the

Nunavut Research Institute, Igloolik and Nunavut Arctic College, Iqaluit. Regular communication by phone fax and email was used to coordinate with communities prior to initiation of the project and informal meetings were held with HTA representatives to coordinate hiring and logistics prior to initiation of summer field work in July/August. Project methodology and preliminary results have been incorporated into posters and presentations which were given to all communities identified above and a plain language project report was written and distributed to communities and relevant organizations in June 2013. A plain language booklet about the project has also been completed submitted for translation. This will printed and distributed to communities and relevant organizations within the next 2 months.