

Final Project Report to NWMB – October 2020

1. **NWRT Project Number:** 3-19-08
2. **Project Title:** Cumberland Sound beluga and bowhead photo-id and genetic mark-recapture analysis
3. **Project Leader:** Cortney Watt, Fisheries and Oceans Canada, 501 University Crescent, Cortney.Watt@dfo-mpo.gc.ca, 204-983-5103

4. **Summary:**

The purpose of the project was to use Unmanned Aerial Systems (UAS) to collect high-resolution aerial photographs of Cumberland Sound beluga and bowhead whales for the development of photo-identification catalogues to assess abundance, body condition, and calving rates. Photo-identification has been used extensively to study the Bering-Chukchi-Beaufort (BCB) population of bowhead whales and findings from field work conducted in Cumberland Sound in 2017 and 2018 have shown that photo-id is a promising method for studying Cumberland Sound beluga. The development of a photo-id catalogue could provide a cost-effective way to monitor Cumberland Sound beluga on an ongoing basis, without relying so heavily on manned aerial surveys which are expensive and logistically difficult to perform. The project also continued efforts to collect biopsy samples from bowhead whales in Cumberland Sound for use in developing updated abundance estimates of Eastern Canada-West Greenland (EC-WG) bowhead whales using genetic mark-recapture methods.

As a result of commercial whaling, both the Eastern Canada-West Greenland bowhead whale population and the Cumberland Sound beluga population experienced significant declines. While the bowhead population has been recovering, the Cumberland Sound beluga population remains depleted in comparison to historical levels. Continued monitoring is required to allow DFO to update advice on population status, sustainable harvest, and habitat conservation of EC-WG bowhead whales and Cumberland Sound beluga.

5. **Project Objectives:**

The specific objectives of the proposed project, as outlined in the original proposal to NWMB, were to:

- Collect high-resolution aerial photographs of Cumberland Sound beluga whales for the development of a photo-identification catalogue to assess abundance and body condition.
- Collect high-resolution aerial photographs of bowhead whales to develop a photo-id catalogue.

- Collect bowhead biopsy samples for use in genetic mark-recapture abundance estimates of the EC-WG bowhead population.

6. Materials and Methods:

Research methods did not change substantially from the research design detailed in the project proposal. From 7-27 August 2019 the field team conducted boat-based field work in Cumberland Sound to collect skin biopsy samples from bowhead whales and aerial photographs of bowhead and beluga. Biopsy samples were collected using crossbows and bolts equipped with floats and 40mm biopsy tips. Photographs were collected using a small quadcopter UAS, the DJI Phantom 4 Pro and DJI Phantom 3. Fieldwork consisted of day-trips from Pangnirtung, using a 27-foot aluminum boat equipped with two 150 horsepower motors, operated by Ricky Kilabuk. UAS photographs of belugas are being analysed to determine re-sightings of unique individuals between 2017, 2018, and 2019. Bowhead biopsy samples are being analysed for genetic mark-recapture analysis to update abundance estimates of the EC-WG bowhead population. UAS photographs of bowheads are being analysed to identify unique individuals and within year re-sights, and measurements are being conducted to assess population structure and body condition. Two previously trained Nunavut beneficiaries (Ricky Kilabuk and Eric Kilabuk) were employed as integral members of the 2019 field team.

7. Results:

Overall, weather conditions were excellent and field work was completed as planned. In total, >1000 beluga UAS photographs, >2500 bowhead UAS photographs, and 102 bowhead biopsy samples were collected. Specific dates and locations of day trips in Cumberland Sound are shown in Figure 1.

Initial analyses of the Clearwater Fiord beluga photos from previous years indicates that approximately 43% of adult whales are identifiable with markings from hunting and natural sources. At least nine whales were photographed and identified in two separate years, and three whales were photographed every year from 2017-2019 (Figure 2). Group sizes ranged from 1-16 whales with an average group size of 3.7 whales. Approximately 4% of the population were classified as calves (1-3 years old), and 3% as neonates. Using mark-recapture abundance estimation for the Cumberland Sound beluga population, based on 2017 and 2018 data, six recaptures yielded an abundance estimate of 593 whales.

Preliminary analysis of UAS photographs of bowhead whales have identified 186 different whales photographed in 2019, with 21 of the whales sighted on multiple days. Preliminary mark-recapture analysis of bowheads identified in photographs taken in 2019 produced an estimate of 1,144 (95% CI: 767-1,708) bowheads in the Cumberland Sound study area during the 2019 field season. Length measurements were obtained from 52 whales. Length measurements obtained from 2016 to 2019 indicate that bowheads summering in Cumberland Sound are primarily juvenile or

sub-adult whales. Further measurements will be used to measure body condition for comparison with whales from the BCB bowhead population. Examples of bowhead photos taken in 2019 are shown in Figures 3 and 4.

8. Discussion/Management Implications:

Genetic analyses of tissue samples from bowhead whale biopsies have been delayed, but are on track for completion in fall 2020. Once complete, genetic data will be used to produce an updated population abundance estimate, as well as an abundance estimate for bowhead whales summering in Cumberland Sound. The genetic and photographic mark-recapture abundance estimates for Cumberland Sound will be compared to determine if abundance estimates produced from the two methods are comparable and if so, a new abundance estimate will be developed.

Field work conducted in 2019, and preliminary analyses confirms the use of photo-id as a promising method for monitoring the Cumberland Sound beluga population. The quality of the photos is adequate to determine the age class and body condition of whales and to identify individual whales based on unique scars and markings. A detailed analysis that will incorporate the photographic recaptures from 2017, 2018, and 2019 is underway, but the preliminary analysis including just 2017 and 2018 photographs, suggests this estimate aligns with aerial survey estimates for beluga whales seen at the surface in Clearwater Fiord. This may indicate that adjustment factors to account for diving whales need to be improved. Continued monitoring will be required to update and improve estimates over time.

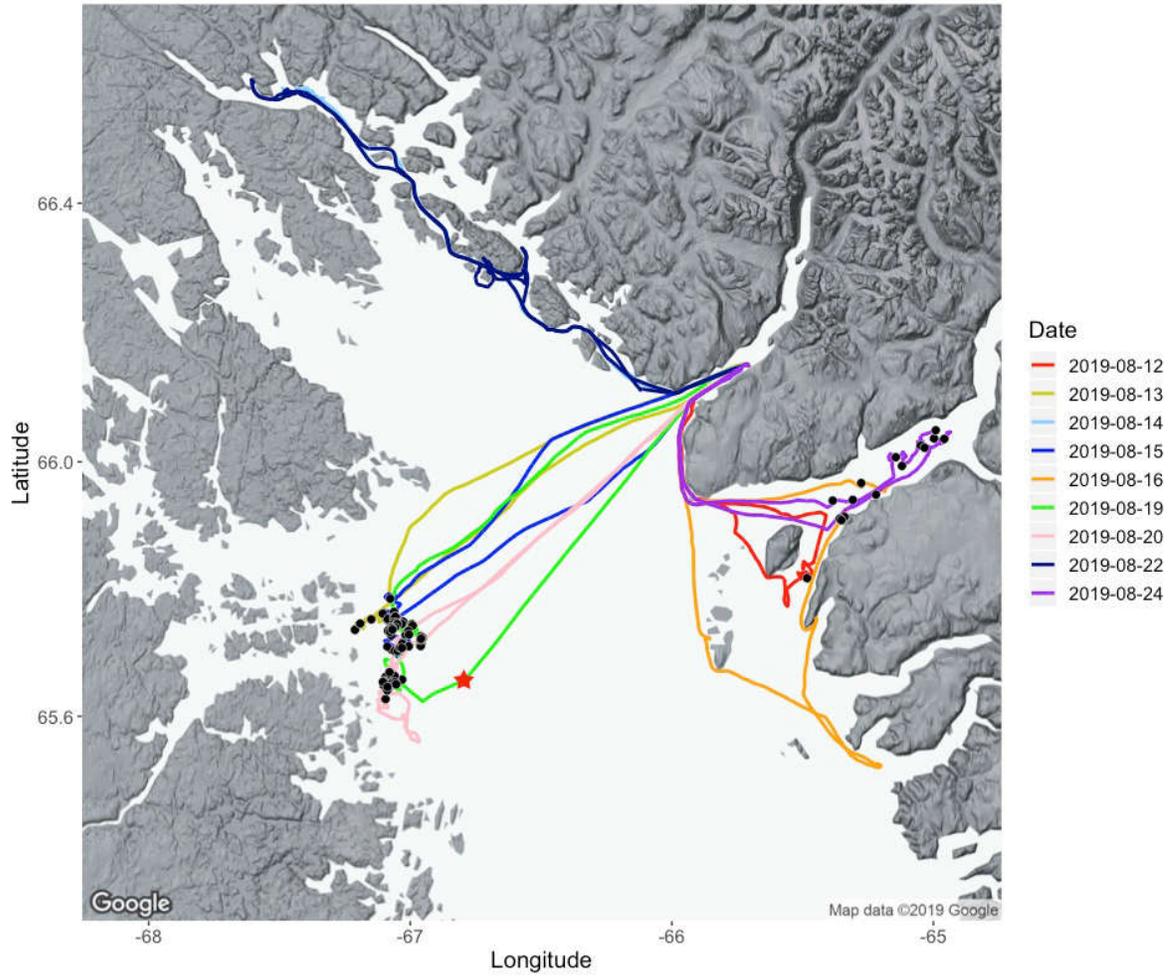


Figure 1. GPS tracks for Cumberland Sound bowhead and beluga field work in August 2019. Black circles are the locations where bowhead biopsy samples were collected.



Figure 2. Beluga whale photographed on 18 August 2017 (top), 11 August 2018 (middle), and 22 August 2019 (bottom) in Clearwater Fjord, Cumberland Sound.



Figure 3. Bowhead mother and calf photographed in north-west Cumberland Sound on 13 August 2019.



Figure 4. Bowhead whale photographed in north-west Cumberland Sound on 15 August 2019.

9. Report by Inuit participants:

The Pangnirtung Hunters and Trappers Association reported through email that they were very happy with the work Ricky Kilabuk did on this project and are happy that he can conduct the work. They wanted to extend a good job on the project and noted the dedication to the project by Ricky and all involved.

10. Reporting to Communities/Resource Users:

Schedule of Consultations with Pangnirtung HTO

Consultation	Date	Type	Status/Changes
Before Research	Nov 2018	Email correspondence proposing project and requesting support. This was followed up by an in-person meeting with the HTO.	Completed
During Research	Aug 2019	In person meetings with HTO manager before and during field work to update on field research activities.	Completed
Completion of Research	Fall/Winter 2019/2020	In person meeting to discuss findings from previous field season and to propose work for the coming year.	Completed January 2020