

Final Project Report to NWMB – September 2023

- 1. NWRT Project Number:** NWRT-0000000008
- 2. Project Title:** Foxe Basin bowhead telemetry, photo-id, and biopsy collection
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4. Summary:

The proposed project took place in Foxe Basin, based out of the community of Igloolik. The three main components of the project were: 1) drones used to collect high resolution aerial photographs of bowhead whales, for the development of a photo-identification (photo-id) catalogue; 2) crossbows used to collect small biopsy samples consisting of both skin and blubber to contribute to updated population abundance estimates, and 3) up to 15 satellite tags deployed, to track whale movements.

Unique scars and markings captured in the photographs allow for individual whales to be identified and tracked over time through subsequent sightings. The development of a photo-id catalogue will contribute to our overall understanding of important life history traits and will provide measures of body condition, growth rates, calving intervals, and abundance. The continued collection of biopsy samples is important for providing new samples needed for updating genetic mark-recapture abundance estimates as well as understanding diet. Updated data on bowhead movements is necessary to continue to monitor habitat-use including dive behaviour, to detect any changes in movement patterns and diet, and to help in planning future research activities. Prior to this work, bowhead whales in Foxe Basin were last tagged in 2013.

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 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; and
- Deploy satellite transmitters on bowhead whales to track movements.

6. Materials and Methods:

The methods used for biopsy collection and drone work in Foxe Basin were the same as those outlined in the project proposal, the only difference being that all work was carried out from the community of Igloolik.

A small rotary wing drone was used to collect high resolution photographs of whales for development of a photo-id catalogue. When whales are sighted, the operator launched the drone and took photographs and video from directly above the whales (typically flown at an altitude of 20 m). Due to the small size of the drone, the whales were generally not disturbed by the presence of the drone.

Whales are approached by locally-hired boats to a distance between about 5 to 20 m and biopsy samples are obtained using crossbows with special bolts (arrows) equipped with biopsy tips. After the whale is hit, these bolts bounce back into the water, with a small piece of skin in the tip, and they float until they are retrieved. A Styrofoam float/stopper prevents the bolt from penetrating any deeper than 4 cm. The biopsy samples are very small – less than 5 grams each.

Bowheads were approached to a distance of about 6 to 11 m and an Aerial Rocket Tag System, or ARTS, was used to deploy the satellite tags. The ARTS is a pressurized launcher ‘powered’ pneumatically by a SCUBA tank that deploys subdermal satellite tags (transdermal SPLASH tags, Wildlife Computers). Tags were deployed at 9-11 bar pressure with lower pressure used at shorter distances. Tags were targeted at the middle of the back, with the body of the tag embedding in the blubber and the antenna protruding from the skin surface. Deployment of suction CATS tags via pole was also attempted if whales were close enough.

Three Nunavut Beneficiaries (Todd King Ammaaq, Levi Qaunaq, and Travis Qaunaq) were employed as boat captains and field assistants and were trained in the use of crossbows for collecting biopsy samples and boat captains gained experience in close approach to bowheads for deploying satellite tags.

7. Results:

The field work in Foxe Basin was carried out between June 19-July 7, 2022 by a research team consisting of members from Fisheries and Oceans Canada, University of Manitoba, Wildlife Conservation Society Canada, and community members from Igloolik. An in-person meeting was held once arrived in Igloolik to present the project and discuss field plans with the HTA board in late June (Figure 1).



Figure 1. Meeting with the Iqloolik HTA board prior to conducting bowhead whale field work (June 20, 2022)

Tagging and biopsy were done from both boats and floe edge, with the latter allowing for minimal disturbance to the whales (as they were not pursued or chased). The thin ice formation over the previous winter in the study area resulted in a zone of thin ice that was several kilometers wide, preventing access to the solid floe edge. This allowed bowheads to enter the sea ice and easily find breathing holes, thereby making it difficult to access whales for field operations. Successful tagging and biopsy attempts from the floe edge were in locations adjacent to leads where animals tended to move in and out of the ice. CATS tag deployment attempts using the pole from a boat were unsuccessful.

Overall, 16 transdermal satellite tags were deployed using the ARTS, including both SPOT and SPLASH tags (Figure 2). Satellite telemetry data indicated all of the tagged whales left the study area on 6 July 2022 via Fury and Hecla Strait, indicating the termination of field work had been well timed. As of 1 September 2023, six of the satellite tags deployed in 2022 were still transmitting location data (Figure 3; Figure 4).

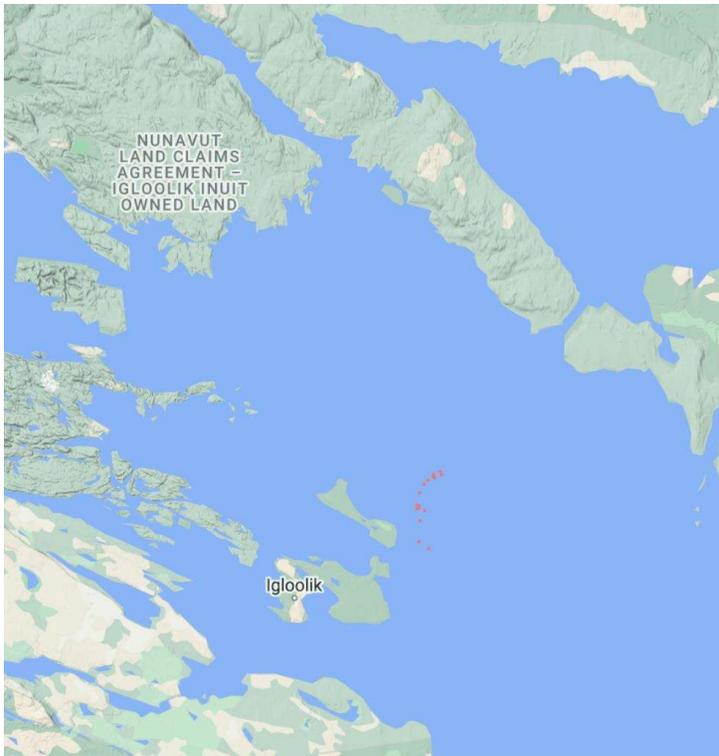


Figure 2. Locations of the 16 satellite tag deployments onto bowhead whales, June 28-July 3, 2022.

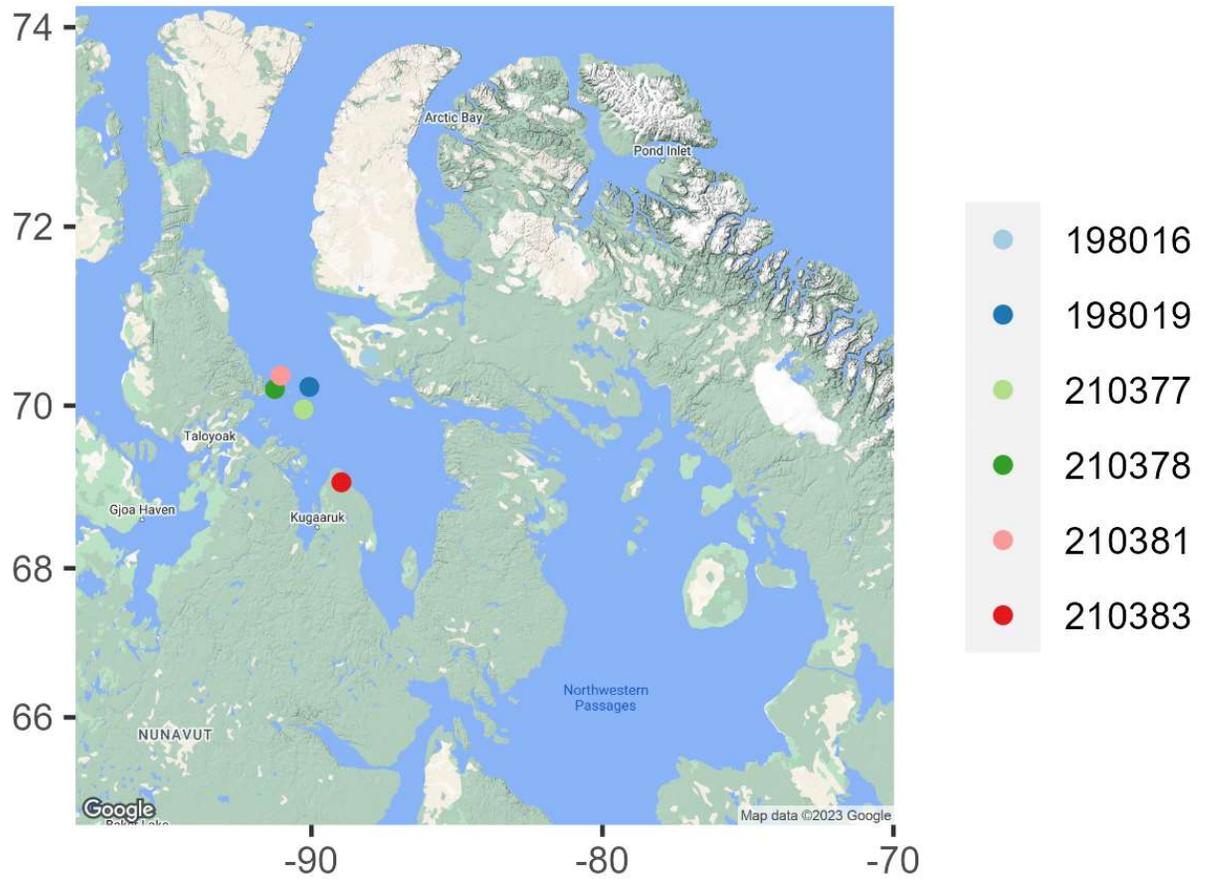


Figure 3. Last locations of 6 transdermal satellite tags deployed in June/July 2022 that are still transmitting as of September 1, 2023

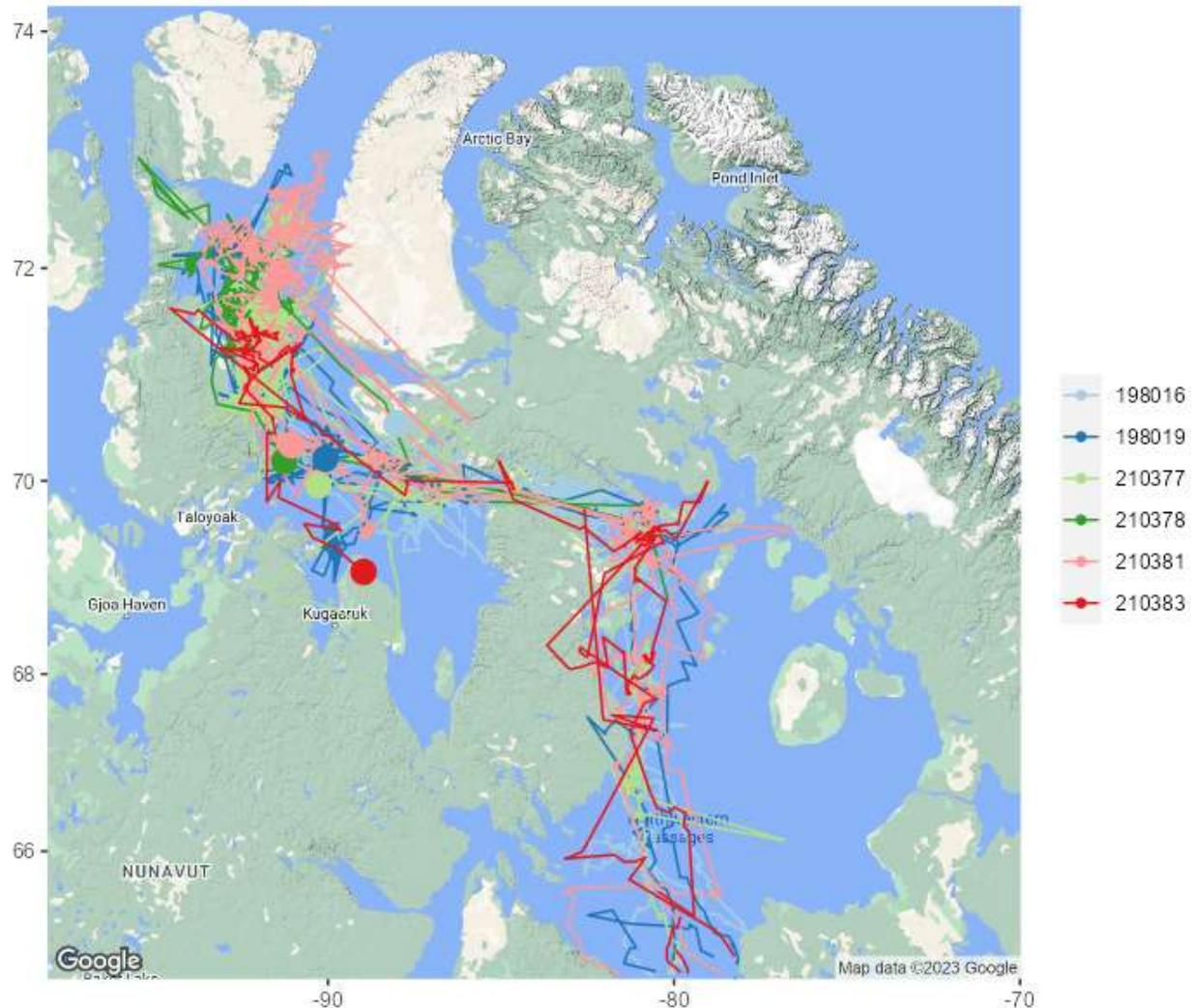


Figure 4. Track lines and last locations of 6 transdermal satellite tags deployed in June/July 2022 that are still transmitting as of September 1, 2023

Skin biopsy samples, many with blubber, were collected from 46 bowheads. These samples have been analysed using the newly developed epigenetic ageing method, and are in the process of being analysed for stable isotope and fatty acid biomarkers to assess diet, and microsatellite DNA analysis, to be used in future genetic mark-recapture abundance estimates.

Over the 12 days of field work, collection of drone imagery for photo-identification studies included over 1500 files of still photographs and videos. Initial processing of photos has been completed and 160 different individuals were identified in photos. The bowhead whale photo ID catalogue now includes images of 817 bowheads, though this does not account for re-sighting of individuals in multiple years (Figure 5; Figure 6).



Figure 5. A bowhead whale mom and calf, photographed in Foxe Basin on 1 July 2022.



Figure 6. An example of a highly marked bowhead whale, photographed in Foxe Basin on 2 July 2022.

8. Discussion/Management Implications:

We consider the 2022 field work in Foxe Basin to be a success and are already gaining great insight into the Eastern Canada – West Greenland bowhead whale population. Bowhead whale movement updates have been shared with project partners and nearby community HTO/As regularly on an ongoing basis. Early analysis of bowhead movement data suggests a possible change in seasonal migration patterns that may be related to changing ice conditions and relative risk of killer whale predation in different parts of their range. More in depth analysis is needed to understand and quantify this potential change. Detecting this type of change would not be possible without a long-running telemetry data set.

The biopsy samples collected in Foxe Basin in 2022 will be a valuable contribution towards future genetic mark-recapture abundance estimates as prior to 2022, biopsy samples had not been collected from Foxe Basin bowheads since 2013. Continually adding new samples, from a variety of locations, to mark-recapture abundance estimation is important for tracking trends in abundance over time (Biddlecombe et al., 2023).

The biopsy samples are also being used in diet studies and epigenetic ageing studies, both of which could have important management implications. Updated diet studies could provide insight into potential changes in diet related to warming, while the ability to estimate ages using biopsy samples will inform on age structure of the population and allow for assessments of body growth and condition at different life stages. Similarly, the 160 whales photographed in Foxe Basin in 2022 have been added to our photo-id catalogue which is being used to identify individual whales, assess population structure, and measure whale body condition changes over time. If we detect that whales are in poor body condition, it could be an early sign of a future decrease in abundance, which would have important management implications. Methods to improve morphometric measurements are being developed and studies to assess body condition are currently underway.

9. Report by Inuit participants:

The field work conducted in 2022 relied heavily on local Inuit participants. The three local team members were employed as boat captains and field assistants. They assisted in this project in a variety of capacities including providing use of their boat, driving their boats and approaching the whales safely, and learning and performing the biopsy and subsampling procedures.

One of the 2022 field assistants provided this quote:

“I think the research is important to see if there’s changes in the migration routes and health of the bowhead’s. I’m ok with working with southerners so both sides can benefit off the project.”

Two of the three participants returned for the 2023 bowhead field season which we feel is a testament to the success of the project. We also have had several communications

with the members of the HTA board in Igloolik who have all been very supportive of the project continuing.

10. Reporting to Communities/Resource Users:

| Consultation | Date | Type | Status/Changes |
|------------------------|----------------|--|--|
| Before Research | Winter 2022 | Email correspondence proposing project and requesting support. | Completed |
| During Research | June/July 2022 | In person meetings with HTA before and during field work to update on field research activities. | Completed in Igloolik only. Meeting with HTA board on June 20, 2022. We have also provided 17 updates on the tagged whale movements between July 21, 2022 to May 26, 2023 to the following community HTO/As (Igloolik, Sanijarak, Coral Harbour, Iqaluit, Kugaaruk, Rankin Inlet, and Taloyoak), the field team, and other project partners. We will continue providing regular updates until the tags stop working. |
| Completion of Research | March 2023 | Email field report after field season | Completed- English and Inuktitut versions were emailed to the following community HTO/As (Igloolik, Sanijarak, Coral Harbour, Iqaluit, Kugaaruk, Rankin Inlet, and Taloyoak), the field team, and other project partners. |

Literature cited:

Biddlecombe, B.A., Ferguson, S.H., Heide-Jørgensen, M.P., Gillis, D.M. and Watt, C.A., 2023. Estimating abundance of Eastern Canada-West Greenland bowhead whales using genetic mark-recapture analyses. *Global Ecology and Conservation*, 45, p.e02524.