

Application: Foxe Basin bowhead telemetry, photo-id, and biopsy collection

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Nunavut Wildlife Research Trust (2024-2025)

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Final Project Report to NWMB – September 2025

1. **NWRT Project Number:** NWRT-2024-0000000003
2. **Project Title:** Foxe Basin bowhead telemetry, photo-id, and biopsy collection
3. **Project Leader:** Brent Young, Brent.Young@dfo-mpo.gc.ca, 204-323-0364; Steve Ferguson, Steve.Ferguson@dfo-mpo.gc.ca; Fisheries and Oceans Canada, 501 University Crescent, Winnipeg, MB, R3T 2N6
4. **Summary:**

The 2024 field season conducted in Foxe Basin was the third consecutive field season of bowhead research in Foxe Basin, based out of Igloolik NU. The project consisted of four main components: 1) drones collected high resolution aerial photographs of bowhead whales, for the development of a photo-identification (photo-id) catalogue; 2) crossbows were used to collect small biopsy samples consisting of both skin and blubber to contribute to updated population abundance estimates, 3) satellite tags were deployed to track whale movements and dive behaviour, and 4) ocean measurements (e.g. water conductivity, temperature, and depth) and zooplankton samples were collected near whales to put location data in an ecological context to understand feeding ecology.

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. Updated data on bowhead movements is necessary to continue to monitor habitat-use, to detect any changes in movement patterns, to assess risk of ship strikes, and to help in planning future research activities.

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
- Deploy satellite transmitters on bowhead whales to track movements
- Collect ocean measurements (e.g. water conductivity, temperature, depth, and zooplankton sampling) near whales to put location data in an ecological context

6. Materials and Methods:

The methods used for the work in Foxe Basin were the same as those outlined in the project proposal; however, due to ice conditions in Foxe Basin, whales were difficult to access and only 5 out of 19 available satellite tags could be deployed. Twelve of the remaining tags were later deployed by Dr. Sarah Fortune (Dalhousie University) and her team conducting bowhead research in Cumberland Sound in August. Pangnirtung HTO had previously approved the deployment of Satellite tags by Sarah's team, and they were consulted again before the deployment of these additional tags. In addition to community support, amendments were made to our Animal Use Protocol (AUP) and to our License to Fish for Scientific Purposes (LFSP).

As planned, this project hired six Nunavut beneficiaries as part of the field team. Of these six individuals, three had been hired in past field seasons, and two (Todd King Ammaaq and Travis Qaunaq) have now been on the field team for all three field seasons. All members received in-field training on safe use and maintenance of crossbows for biopsy collection from bowhead whales, procedures for sub-sampling tissues for lab analysis, protocols for scientific sampling and storage, and discussions on the proper techniques for approaching whales given the various research objectives. Travis and Todd had also attended the "Camera community-based Arctic marine mammal studies" workshop in Cambridge Bay and acquired the Transport Canada Small RPAS "Basic" certification for flying drones.

7. Results:

The field work in Foxe Basin was carried out between June 23-July 3, 2024 by a research team consisting of community members from Igloolik, members from Fisheries and Oceans Canada (DFO), University of Manitoba, and Dalhousie University. An in-person meeting with the HTA board was held on June 21 to introduce the field team, discuss all project plans, plan the contracts with the local boat captains and field assistants, and address any concerns or answer questions.

The floe edge in 2024 was made up of mainly rotten ice, preventing the use of the ice as a platform for biopsy and tagging. Thus, all work was conducted from the boats. Seventeen transdermal satellite tags were deployed using the ARTS in 2024 (5 in Foxe Basin, 12 in Cumberland Sound). Data from the whales tagged in 2024 will add to an already impressive data set from this project (Figure 1). One tag from the 2022 tagging season is still functioning, which means it has lasted for over 3 years (1173 days and counting). This is likely the longest ever recorded movement data set for a bowhead whale. Planned analyses of telemetry data includes investigation of movements by females in relation to reproductive cycles, bowhead use of Hudson Strait in winter in relation to year-round ice breaker activity, and memory in migration patterns.

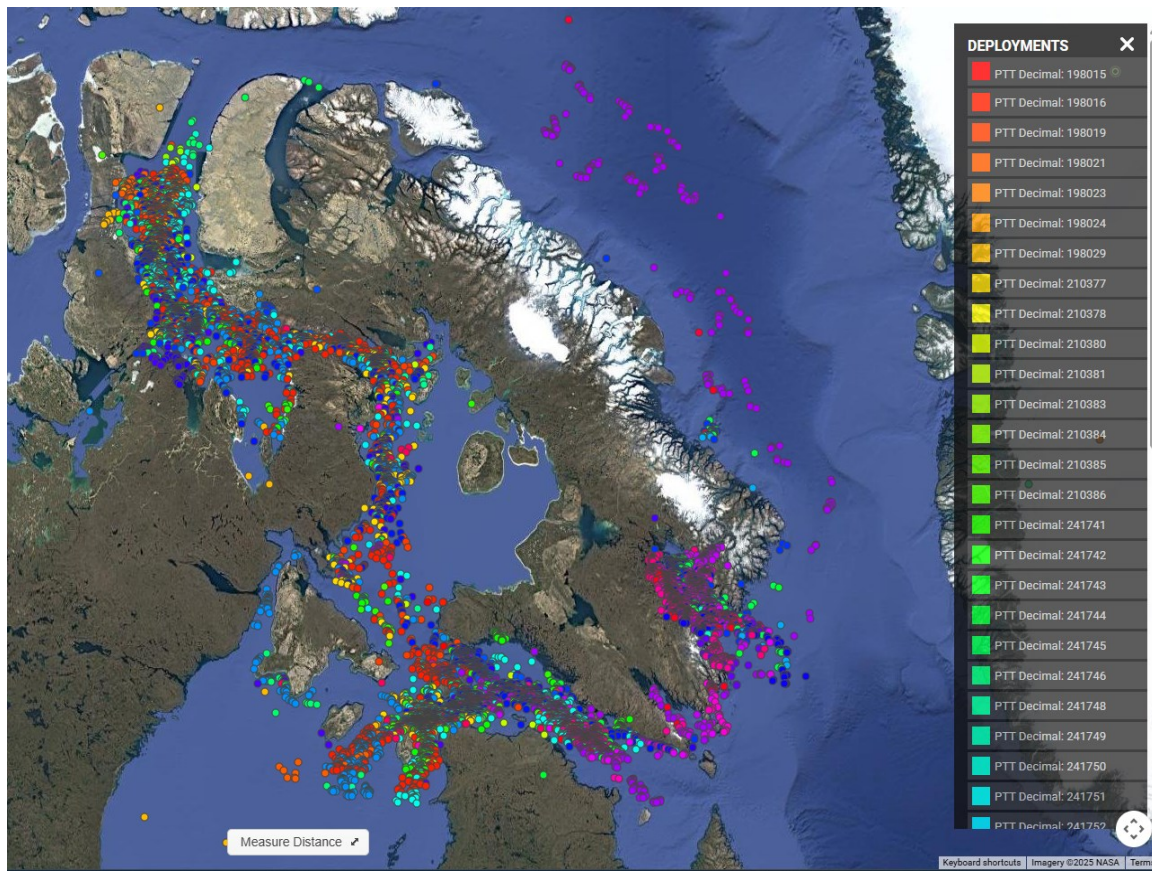


Figure 1. All locations of bowhead whales tagged in Foxe Basin and Cumberland Sound from 2022 to 2024. Each colour represents an individual whale. Locations are all high quality locations from June 2022 to July 2025.

Twelve skin biopsies were collected from Foxe Basin in 2024 and have been analysed to determine genetic sex (6 males, 6 females), while further genetic analyses will identify individuals using microsatellites, and then incorporated into future genetic mark-recapture abundance estimates. The most recent estimates using this method, estimated the ECWG bowhead population to be 5173 (CI: 3436–7788) individuals (Biddlecombe et al. 2023). Future estimates that make use of the recent samples collected in Foxe Basin and other locations should be more representative of the wide range of this population.

Over 650 drone photos and videos were taken in Foxe Basin in 2024. From data collected in Foxe Basin in 2022 and 2023 we have added over 250 bowhead encounters to our database, with approximately 155 of these whales considered sufficiently 'marked' to be re-identifiable in other years. Our entire bowhead photo ID catalogue now includes 1019 bowhead encounters with 559 individuals considered to be marked. The next step in the photo-id process will be identifying re-captures between years. Drone photographs of bowheads taken in Cumberland Sound were measured to

investigate body condition. Comparisons of body condition between age-classes followed natural progressions in morphology, with younger age-classes, including calves ($n = 3$, 42.47 ± 3.71 SD), yearlings ($n = 2$, mean = 47.14 ± 2.19 SD), and juveniles ($n = 265$, 33.13 ± 2.72 SD) having higher mean body condition compared to subadults ($n = 167$, 31.94 ± 2.03 SD) and adults ($n = 26$, 31.61 ± 1.75 SD) (Figure 2).

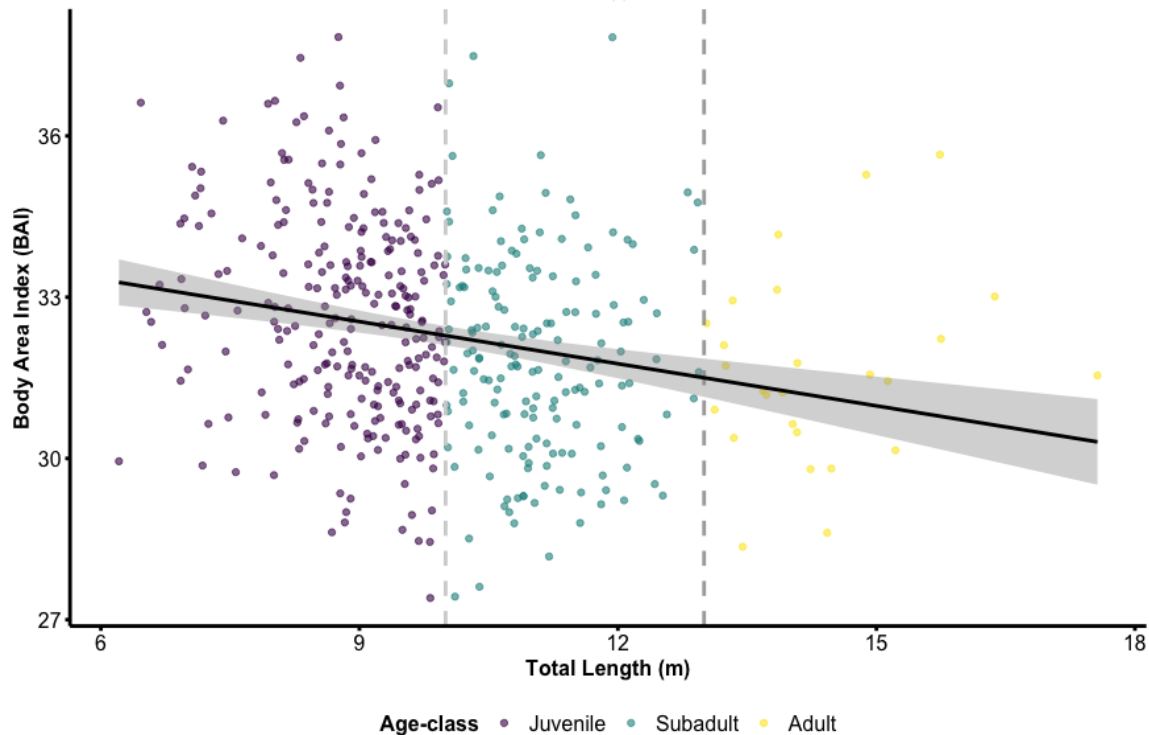


Figure 2. Body condition (Body area index (BAI)) as a function of total length (TL, m) fitted to the data using a negative linear regression ($y = 34.897 - 0.261 * x$, $R^2 = 0.054$) in black (gray area is the 95% CI). The length cutoffs between subadults and juveniles at 10.0 and between adults at 13.0 m are shown as light and dark grey dashed lines respectively.

A total of 21 oceanographic stations were completed and 17 of those were done while bowhead whales were sighted in the area. From these stations, 17 samples were saved for bomb calorimetry, 23 for microscopy and 9 for DNA metabarcoding. Initial observations of the towed samples would suggest that the biomass is more concentrated closer to the seabed than the surface, and there is little biomass at the surface. Two surface tows along the floe edge yielded the lowest biomass of any tow done during the sampling period. However, it should be noted that a higher sampling frequency would be needed to confirm this spatial pattern.

8. Discussion/Management Implications:

The results from this research project will provide valuable insights, with management implications in a number of different areas. For example, telemetry data has provided recent movement data, which is important in the context of increased shipping and ice-breaking activities. Biopsy samples and the photo-ID catalogue will contribute to

updated population abundance estimates (genetic and photographic mark-recapture). Current estimates of the population size are important in understanding the current population trajectory – is the ECWG population continuing to increase towards pre-commercial whaling numbers, or has the population reached a plateau at a lower carrying capacity? Drone photographs, which are being used to assess body condition through measurement of Body Area Index (BAI) have provided baseline body condition data. Observed changes in body condition over time is a good indicator of population health and would be apparent before changes are observed in population abundance.

The data collected as part of this research project, including previous work in both Foxe Basin and Cumberland Sound have provided insight into population segregation, with important implications for management, but also for study design. Epigenetic ageing of biopsy samples, and length measurements from drone photographs, has confirmed that the majority of bowheads that use Cumberland Sound and Foxe Basin, our two main study areas, are younger whales (juveniles and sub adults) with relatively few adults and very few very old individuals. For a recovering population, it may make sense that most of the population would be young. However, the telemetry data shows that very few of the tagged bowheads travel to Baffin Bay, along the east coast of Baffin Island or Greenland. The combination of mostly young whales in our sample, few movements to the Baffin Bay area in our telemetry data, and previously documented population segregation, provide a clear need for expanding or shifting field research efforts to achieve better representation of the entire population.

9. Report by Inuit Participants:

In 2024, 6 local Inuit participants were employed as boat captains and field assistants. Two of the participants, Todd King Ammaaq and Travis Qaunaq, have been part of the field team from 2022 through 2024, and received training on flying drones through a DFO-led initiative in Cambridge Bay and acquired the Transport Canada Small RPAS “Basic” certification for flying drones.

During their time on the project Travis and Todd have provided their thoughts on the research:

“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.”

“I enjoy being a part of the bowhead project and being a boat captain and working with all the team!”

“I like working with you guys doing the research at first I joined the crew for walrus biopsy back in 2020 and I’ve been with the crew since I join them for walrus work cause as a hunter I wanted to know what the impact changes throughout the years and before the shipping starts around Steensby inlet and I wanted to learn on what can be done to try and prevent it from dramatic changes.”

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We feel that having Travis and Todd return to work on the bowhead research each year is a testament to the success of the project and our cooperative relationship. We have also 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:

Schedule of Consultations with Igloolik HTA and Hall Beach HTA

Consultation	Date	Type	Status/Changes
Before Research	Winter 2024	Email correspondence proposing project and requesting support.	Completed- Igloolik and Sanirajak HTAs
Before Research	Winter 2024	In-person meeting with the HTA board	Completed- Igloolik and Sanirajak HTAs
During Research	June/July 2024	In person meeting with HTA prior to field work activities commencing.	Completed- Igloolik. We have also provided ongoing updates of the bowhead movements since the completion of the field trip to the following community HTO/As: Igloolik, Sanirajak, Coral Harbour, Iqaluit, Kugaaruk, Rankin Inlet, Taloyoak, Arctic Bay, Clyde River, Kimmirut, Kinngait, Naujaat, Pangnirtung, Pond Inlet, and Qikiqtaruaq.
Completion of Research	March 2025	Email field report after field season	Completed- English and Inuktitut versions were emailed to the following community HTO/As: Igloolik, Sanirajak, Coral Harbour, Iqaluit, Kugaaruk, Rankin Inlet, Taloyoak, Arctic Bay, Clyde River, Kimmirut, Kinngait, Naujaat, Pangnirtung, Pond Inlet, and Qikiqtaruaq.