

# **Nunavut Wildlife Management Board Final Project Report - September 30, 2023**

**1. NWRT Project Number:** NWRT-0000000010

**2. Project Title:** Community-based research on walrus distribution and stock structure

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**4. Summary:**

Atlantic walruses (*Odobenus rosmarus rosmarus*) occur as two genetically distinct populations in the eastern Canadian Arctic. In the southern portion of their range, walrus in Hudson Bay, Foxe Basin and Hudson Strait belong to the Central Arctic population. For management purposes, the Central Arctic population is divided into three stocks: Foxe Basin, Hudson Bay-Davis Strait (which is shared with Greenland), and South and East Hudson Bay. Stock divisions are based on distribution and seasonal movements, growth patterns, trace elements, and contaminant profiles. However, uncertainty surrounding these stock divisions requires additional data on movements, distribution, and genetics.

Our proposed research is focused on the Central Arctic walrus population, and our main scientific objective is to determine whether current population and stock designations are appropriate via: 1) deploying satellite tags for movement analysis; and 2) collecting tissues (e.g., skin and blubber via biopsy and tusks from hunted animals) for trace elements, and genetics analysis. Our other main objective is to build science capacity in the North through training of research assistants and community-based monitoring personnel in walrus-harvesting communities. Inuit communities in the study area hunt walrus year-round for food and other products such as ivory, and also benefit economically by transferring some of their hunt quota to limited sport hunts by non-Inuit. A solid understanding of walrus stock structure throughout the region is necessary to properly manage walrus hunts, and Inuit involvement in this process, particularly in the design and implementation of scientific research, is a priority of DFO's walrus research program. The proximity of walrus haul-out sites to Foxe Basin and northern Hudson Bay communities make walrus an ideal species to develop community-based research and monitoring. This proposal seeks funding for local research assistant salaries after demonstrating successful completion of community-led walrus field work in four Foxe Basin and Hudson Bay communities (Coral Harbour, Naujaat, Sanirajak, and Igloolik) in 2020 and 2021.

## **5. Project Objectives:**

Our main scientific objective is to address uncertainties in the current stock definitions of walrus from the Central Arctic population that is distributed across Hudson Bay, Foxe Basin, and Hudson Strait using three general approaches: satellite telemetry, tissue microchemistry, and genetics.

Satellite telemetry will provide detailed, short-term movement data, while microchemistry data (e.g., trace elements and stable oxygen isotopes) will reflect long-term (lifetime) individual movement chronologies. Genetics data will reflect population structure and allow us to infer the level of relatedness of individuals within and among stocks. Together, these data will inform the degree of mixing, if any, between currently defined stocks, and allow for updating of stock delineations where appropriate.

Another main objective is to increase scientific research capacity among Inuit/Northern collaborators, and to increase local community involvement in DFO's walrus research program. Specifically, we would like to engage Inuit/Northern researchers in our field work and community-based sampling programs. We would like to hire and train local research assistants who contribute to study design, and who direct and carry out field work objectives on their own. Similarly, we would like to contract community-based monitors to coordinate hunter sample collections in walrus-harvesting communities. This proposal expands on a community-based walrus monitoring program implemented in Sanirajak in 2018, and further developed through 2019-21, and expanded to include Coral Harbour in 2020 and 2021. Local research assistants from Coral Harbour hired via the HTO and supported logistically by DFO also conducted walrus field work independently in 2020, collecting over 100 biopsies. This field work model was expanded in 2021 to include Coral Harbour, Naujaat, Sanirajak, and Igloolik, with local research assistants successfully collecting biopsies (~165 walrus total from the four communities) and deploying satellite tags (6 walrus total).

## **6. Materials and Methods:**

We propose an innovative research program that incorporates both core (e.g., satellite telemetry and genetics) and innovative approaches (e.g., trace elements) to collect data on walrus movements, distribution, and population structure. These data will be used to assess current stock definitions. We are planning all field work in 2022 to be community-led with remote logistical support from DFO researchers based in Winnipeg. Field work is planned in four communities in northern Hudson Bay and Foxe Basin (Coral Harbour, Naujaat, Sanirajak, and Igloolik) located near walrus haul-out sites. Local HTOs will determine when and where to focus research efforts based on Inuit Qaujimagajatuqangit/Traditional Knowledge.

Satellite telemetry and biopsy collection: Limpet model satellite tags (Wildlife Computers) will be deployed onto the upper back of walruses using crossbows. Walruses in water will be slowly approached by boat, and tags will be surface-mounted using a 4-cm metal dart that will anchor the tag below the tough skin into

the blubber upon contact (goal: 40 tagged walrus in total, with efforts focused on Walrus Island south of Coral Harbour, where a majority of the Hudson Bay-Davis Strait stock is found during summer). Skin biopsies will be collected using a Dan Inject CO<sub>2</sub> gun to fire biopsy darts at walrus, with a goal of up to 150 per site (i.e., 600 total). Biopsies will be collected and placed in a portable -80oC freezer that will also be used to ship samples to DFO in Winnipeg. All required field equipment (e.g., satellite tags, crossbows, CO<sub>2</sub> guns, biopsy darts, portable freezers, etc) will be readied in Winnipeg and shipped to respective community HTO/As prior to scheduled field work. Contracts for hiring local research assistants will also be in place prior to scheduled field work.

Sample collection from hunted walrus: Tissues, organs, and structures (e.g., tusks, stomachs, livers, muscle, etc) will be collected from harvested animals using a community-based sample collection approach. Well before the open-water season when the bulk of the walrus hunt is conducted, sample kits prepared by DFO researchers in Winnipeg will be shipped to the respective community HTO/As. In this program, walrus samples are purchased directly from hunters who fill the sample kits during animal butchering. Our anticipated total sample size ranges from 10-25 animals from each community.

Sample and data analysis: A suite of microchemistry (e.g., trace element and oxygen isotopes) and genetics analyses will be conducted on collected tissues. Lifetime profiles of concentrations and stable isotope ratios of over 30 trace elements (e.g., lead, strontium) and oxygen will be measured in annual dentine growth layers of walrus tusks. Trace elements are of geologic origin, and underlying biogeochemical processes impart regionally unique baseline concentrations and isotope ratios of elements. These characteristics are ultimately reflected in animal tissues, and can thus be used to infer their movements and distribution within and between regions with different baseline values. Tusks are an ideal structure for this type of study because they are laid down incrementally in annual growth layers throughout an animal's lifetime, and can therefore be profiled to reconstruct long-term, chronological movement and distribution histories that span much longer time periods than telemetry studies. Previous studies have indicated sufficient regional variation in baseline trace element characteristics to discern distribution differences of walrus. Tusks will be sectioned longitudinally to expose dentine, which will be drilled from annual growth layer groups using a micromill (DFO, Winnipeg). A micromill allows sampling at very fine spatial scales (e.g. 300 µm widths), which will allow for annual layers to be sampled at annual and even sub-annual resolution. Trace element analyses will be conducted on dentine, as well as skin, via inductively coupled plasma mass spectrometry (ICPMS) at the University of Manitoba, while oxygen isotope analysis will be conducted at the University of Western Ontario. Mixed effects, time series, and Bayesian stable isotope mixing models will be used to tease apart differences among individuals and stocks.

Genetics analysis will be conducted at the University of Copenhagen on approximately 80 muscle samples collected from harvested walrus (and from biopsied skin in cases where additional samples are needed). Nuclear and mitochondrial DNA will be extracted and entire genomes will be sequenced. 10-20 samples from both Hudson Bay and Foxe Basin will be analysed, with 1-2 samples from each region selected for very high-quality genomic analysis.

## 7. Project Schedule:

<b>Output or Step</b>	<b>Start Date</b>	<b>End Date</b>	<b>Status/Changes</b>
Contact HTOs of focal communities	has been ongoing since 2018; letter sent in Jan 072022 to go over summer 2022 plans	N/A	All communities with whom we wanted to work as part of this NWRT proposal were contacted in early January 2022, with follow up virtual meetings in late winter and early spring. Sanirajak never responded due to staffing issues at the HTO office.
Meeting with HTOs	Feb 2022 to ongoing	N/A	In-person meetings were held with the HTOs in Coral Harbour and Igloodik.
Set-up contracts for research assistants and sample collection	April/2022	Jun/2022	Completed.
Conduct field work and sample collection	Aug/2022	Oct/2022	Completed
NWMB Interim Report	15 Dec 2022	15 Dec 2022	Completed.
NWMB Interim Financial Report	15 Dec 2022	15 Dec 2022	Completed.
NWMB Final Project Report	30 Sep 2023	-	Completed. Same as Interim Report since it outlines field work success and all samples and telemetry data collected are being retained for analysis at the end of the project in 2024-25.

## 8. Preliminary Results/Discussion:

Three of four communities (Naujaat, Igloodik, and Coral Harbour) all successfully completed field programs on walrus in 2022. Sanirajak, which had participated the

previous year, was completely out of contact due to issues with filling the HTO manager position. All necessary equipment was shipped to the respective HTO/As by early August, and contracts to pay local research assistant salaries were approved and in place in time for scheduled field work. HTA/Os in each of the four communities selected two research teams comprising two boats, with one captain and two research assistants each (for a total of six hires per community). Many of the researchers from 2021 returned for 2022, although some in the community of Coral Harbour complained that they should be paid daily rates of \$2500 for boat rental.

- All three communities collected biopsies, reaching a total of about 150. These are currently being held in HTA/O freezers until reliable shipping that keeps them frozen can be arranged. All biopsies were collected from walrus in water using boats.
- In the biggest success of the field season, the team from Coral Harbour deployed 13 satellite tags onto walrus around Walrus Island. Tags were deployed in August and transmitted for up to close to four weeks. Tracks of tagged animals will be included in the final project report.
- Coral Harbour additionally deployed two stationary cameras at haulout sites on Walrus Island. The stationary cameras were solar-powered and programmed to take photos every 15 minutes. The photographs have not yet been received from the community but will be included in the final report, along with initial findings regarding patterns in walrus haul out numbers.

### 9. Reporting to Communities/Resource Users:

<b>Consultation</b>	<b>Date</b>	<b>Type</b>	<b>Status/Changes</b>
Before Research	January to August 2022	Emails, Phone calls. In-person meetings with Coral Harbour and Igloolik.	Completed.
During Research	August to October 2022	Daily texts with multiple field team members as they practiced with biopsy equipment and conducted field work.	Completed.
Post Research	October to present 2022	Emails and phone calls with HTO/As.	Completed. In-person visits took place in Naujaat (March), Igloolik (March and June), and Coral Harbour (March and September).

