EMRWB RESEARCH FUND 2023-2024 REPORT:
INVESTIGATING POLAR BEAR ECOLOGY IN THE EEYOU MARINE REGION

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IN COLLABORATION WITH: THE EEYOU MARINE REGION WILDLIFE BOARD, REGIONAL CREE TRAPPERS' ASSOCIATION, & COMMUNITIES OF WASKAGANISH, EASTMAIN, WEMINDJI AND CHISASIBI

PROJECT SUMMARY

In community consultations, polar bears were identified as a high research priority following observed changes in abundance and habitat use along the coast. Polar bears are important predators in arctic and subarctic systems and their behaviour and distribution on the landscape can have large impacts on plant, animal, and human communities. Globally, polar bears are threatened by rapidly changing environmental conditions that reduce sea ice habitat which is critical to polar bear movement and foraging.

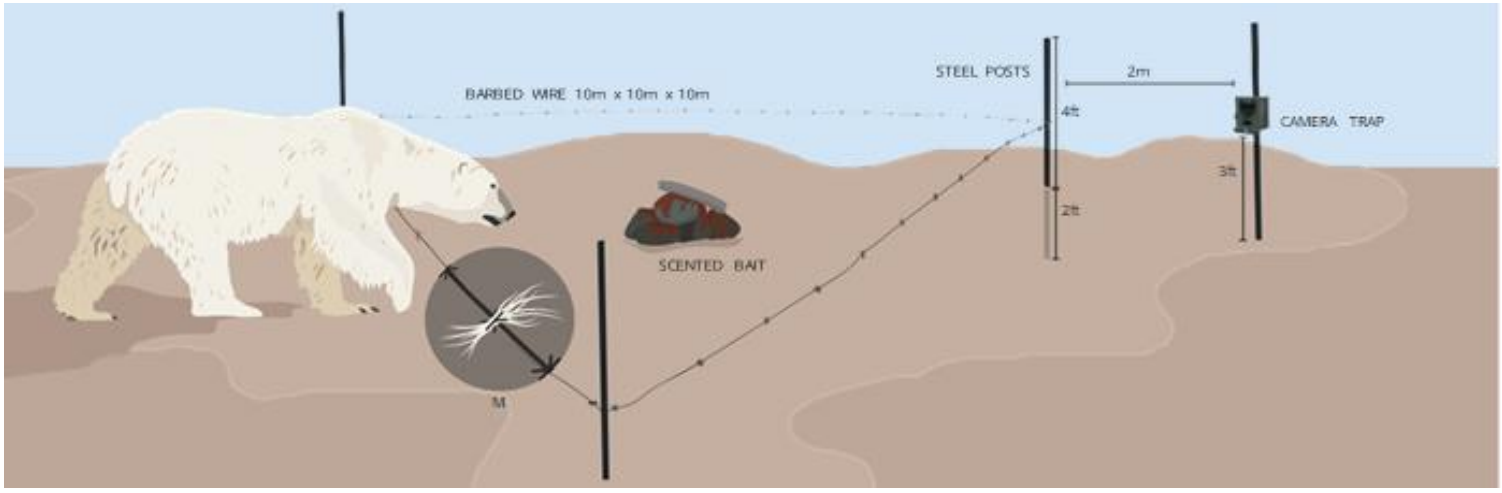
At the southern edge of global polar bear range, polar bears in James Bay and the Eeyou Marine Region (EMR) are particularly vulnerable to warming conditions but little information is available about their population. Past studies summarizing trends in polar bear subpopulations worldwide suggest that these bears may be genetically distinct from the Southern Hudson Bay (SH) management unit they are managed in, but updated information is needed. The James Bay bears have access to potential boreal prey items that are unavailable to populations farther north, and the importance of these species in James Bay polar bear diet is unknown. Understanding the possible genetic distinctions of James Bay bears from SH bears, as well as their distribution, diet, and body condition in the EMR is a key component to future conservation and management decisions.

To collect baseline information on the polar bears in the EMR, we launched a field-based polar bear research program in 2021 with the communities of Waskaganish, Eastmain, Wemindji and Chisasibi. We used non-invasive hair snare and camera trap sampling methods to gather information about polar bear genetics, diet, body condition and distribution.

In 2021-2023, Alexandra Langwieder and 4 Cree community field teams deployed 37 sampling stations across 400km of eastern James Bay to collect hundreds of hair samples and polar bear observations. In the field, teams collected field observations of polar bears, dens, and other wildlife species. The information collected will contribute to polar bear management and wildlife monitoring in the EMR and will answer community and academic questions about polar bear ecology in James Bay.

The EMR faced considerable forest fires in 2023 which caused the project to be interrupted in July. Community teams continued work as they judged safe throughout the summer with Waskaganish and Eastmain sampling occurring as usual and Wemindji being the most disrupted due to fire locations. Unfortunately, this meant that the Twin Islands, a location of high polar bear density in previous years, was unsampled in 2023. Fieldwork in Chisasibi was disrupted by both fires and challenges with local field team coordination. However, 45 samples were collected from all communities and camera traps remained functional all summer. How the bears were affected by fires is unknown but will be explored using detections at sampling stations in different smoke conditions.

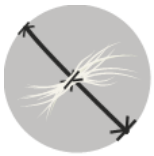
Objectives	Progress & Achievements
Continue gathering polar bear hair samples and photos from offshore, nearshore and mainland habitats in eastern James Bay – *disrupted by forest fires*	○ Deployed 33 sampling stations across 400km of eastern James Bay with 4 community field teams ○ Collected 45 polar bear hair samples and >100 polar bear observations
Engage Cree youth as field assistants in the project – *disrupted by forest fires*	○ Hired a Cree undergraduate student, Brian Audla-Tooktoo, as a field assistant for the summer. In the field, Brian joined community teams to deploy sampling stations and collect samples. In the lab, Brian entered camera trap data and built maps to investigate patterns of polar bear distribution on the coast in relation to black bears
Collect polar bear food items in the EMR to begin stable isotope analyses of diet – *disrupted by forest fires*	○ Community field teams collected a variety of samples from across the Bay including mussels, kelp, berries, vegetation, as well as muscle samples from harvested species donated by land users including fish, caribou, moose, beaver, and goose
Determine genetic relationship between James Bay bears and the rest of the Southern Hudson Bay subpopulation	○ Genetic distances between areas within the Southern Hudson Bay management unit are similar to genetic distances between different subpopulation management units ○ Bears sampled around Charlton Island and Waskaganish are the most genetically unique
Begin Cree Knowledge interviews with community members	○ Interviewed 6 community members in Wemindji and 1 community member in Waskaganish about their experience and knowledge of polar bears in the region ○ Planned additional interviews for summer 2024 in all four communities



MATERIAL & METHODS

We used hair snare and camera trap sampling stations deployed on offshore islands, nearshore islands, and some mainland habitat. These methods collect hair samples and photographs which provide information on polar bear genetics, diet, body condition and habitat use. Sampling station locations were determined through consultation with tallymen to avoid proximity to areas of human occupation. In 2023, we deployed 33 sampling stations for 8 weeks in July, August, and September.

HAIR SNARES



Hair snares gather hair samples from polar bears as they pass over a barbed wire to investigate a scented bait. The bait does not provide food to the bears. Later, field teams return to collect the hair. Hair samples provide information on genetics which allows us to track individual bears across the study area within and between years, understand the relatedness between individuals, and compare the bears in James Bay to bears sampled in Hudson Bay. The hair samples also provide information on polar bear diet through stable isotopes which indicate what prey an individual has been feeding on and where the food items came from.

CAMERA TRAPS

Camera traps are frequently used in wildlife research to document animal presence. In this study, photos are used to detect polar bear presence at the hair snares and assess their body condition. Body condition is an important indicator of polar bear health and future survival, particularly in the summer season when they experience extreme fasting as they wait for the sea ice to freeze. To evaluate polar bear body condition, we used a standardized polar bear Fatness Index developed by Stirling et al. (2008)* which scores bears from skinny to very fat. Cameras also captured information about wolves, black bears, foxes, waterfowl, other bird species, and caribou herds on different islands.

*Stirling, I., Thiemann, G. W., & Richardson, E. 2008. Quantitative support for a subjective fatness index for immobilized polar bears. The Journal of Wildlife Management, 72:568-574.

CREE KNOWLEDGE INTERVIEWS

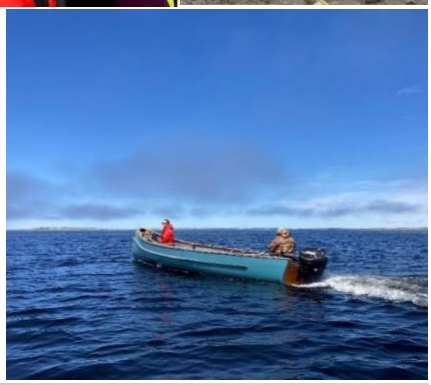
Cree Knowledge interviews in Waskaganish and Wemindji were conducted in October 2023. With our interview questions and workshop ideas, we are hoping to effectively document Cree Knowledge of polar bears in a way that can be used by the EMRWB in future reporting.

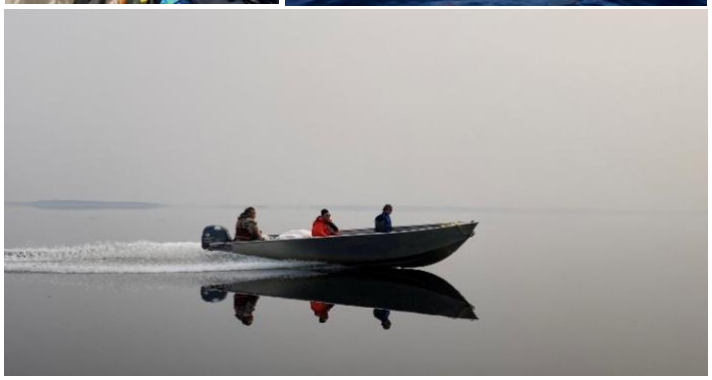
COMMUNITY FIELD TEAMS

Cree community teams are essential to the success of this project. Teams deployed hair snares, programmed camera traps, as well as collected hair samples and maintained sampling stations throughout the sampling period.

Most team members from previous years returned to the project for 2023 which facilitated local leadership. Harry Erless, Dinah Hester, and Bernard Diamond led work in Waskaganish, Wilfrid Cheezo led work in Eastmain, Henry Stewart, Ernie Hughboy and Cody Mark led work in Wemindji, and Steven Bobbish led work in Chisasibi. Additional team members were hired in each community as needed. CTA-EMR Local Officers coordinated teams and field logistics in each community except Eastmain. Field teams were compensated according to rates set by the CTA and most team members completed between 10 and 16 days of work on the project.

Alexandra Langwieder, Catherine Geoffroy (research coordinator), and Brian Audla-Tooktoo (undergraduate research assistant) travelled to each community to deploy the first stations and collect the first samples with each team, but teams deployed subsequent stations and collected samples independently as the field season progressed. Due to forest fires, the McGill team was evacuated two weeks into the summer and community teams carried out the work independently.





2023 RESULTS:
Polar Bear Genetics

In 2023 we received the genetic results from the 2022 samples. To genotype individual bears, we used a standard panel of 24 microsatellites at the University of Alberta Molecular Biology Facility to ensure comparability between previously handled bears in other subpopulations. We identified 29 individuals from the 2022 samples, 15 males and 14 females. In 2021 and 2022 we have identified a total of 62 individuals.

We were unable to obtain genotypes from approximately 50-70% of samples. This was likely related to samples being exposed to the elements on the barbed wire between sample collections combined with small quantities of hair in each sample. In 2023, due to forest fires, stations were unchecked for 3-4 weeks at a time and poor genotyping success is expected for these samples.

In 2022 we received access to the Southern Hudson Bay subpopulation database from Ontario Ministry of Natural Resources and Forestry (OMNRF) to match bears identified in the EMR with previously captured bears in Southern Hudson Bay. We found several matches to bears that were biopsy sampled by the OMNRF team on the Twin Islands in 2022. We also found matches within the EMR study that showed movements between adjacent islands as well as longer distance movements between Twin Islands and Charlton Island (Figure 1).

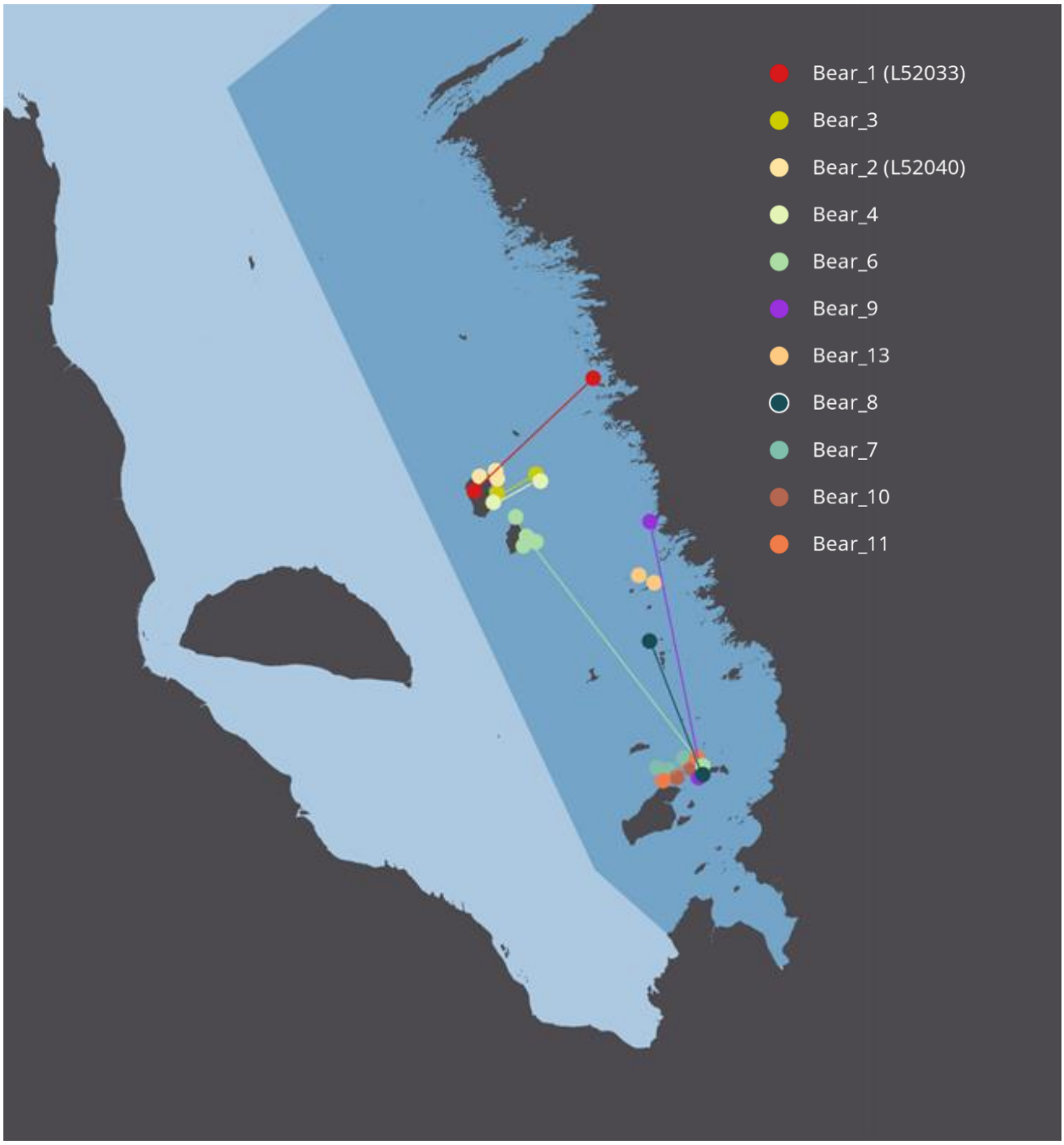


Figure 1. Using a panel of 11 microsatellites, hair samples were genotyped and used to identify individual presence at sampling stations. Eleven individuals were genetically recaptured within the EMR between 2021 and 2022. Two bears were sampled first by the EMR project and then by the Ontario Ministry of Natural Resources and Forestry (OMNRF) later in the summer during biopsy darting work on the Twin Islands (Bear_1 and Bear_2). The farthest movement detected was a male bear that was first sampled on South Twin Island and then on Strutton Island, over 100 km to the south, approximately 20 days later (Bear_6).

Differentiation of EMR polar bears

Analysis of genetic data from this project and previously handled polar bears from the Southern Hudson Bay (SHB) subpopulation revealed genetic structuring by subregion within the greater SHB subpopulation (Figure 2). Bears sampled at the southern extent of the EMR near Charlton Island showed high genetic distance (Nei's distance; Table 1) from all other subregions including North EMR (near Twin Islands), Southwest James Bay (near Akimiski Island), Northwest James Bay (near Cape Henrietta Maria) and the Ontario Hudson Bay coast. These within-subpopulation distances are comparable to between-subpopulation distances found by Paetkau et al. (1995)* in early subpopulation genetic structuring work. Genetic relationships were investigated in a Discriminate Analysis of Principle Components, a method that identifies and describes clusters of individuals based on genetic similarity. Preliminary results suggest that these distances have increased over time since the 1980s and additional analyses of sea ice conditions and connectivity in the James Bay-Hudson Bay complex are underway.

*Paetkau, D., Calvert, W., Stirling, I., & Strobeck, C. 1995. Microsatellite analysis of population structure in Canadian polar bears. Molecular ecology, 4:347-354.

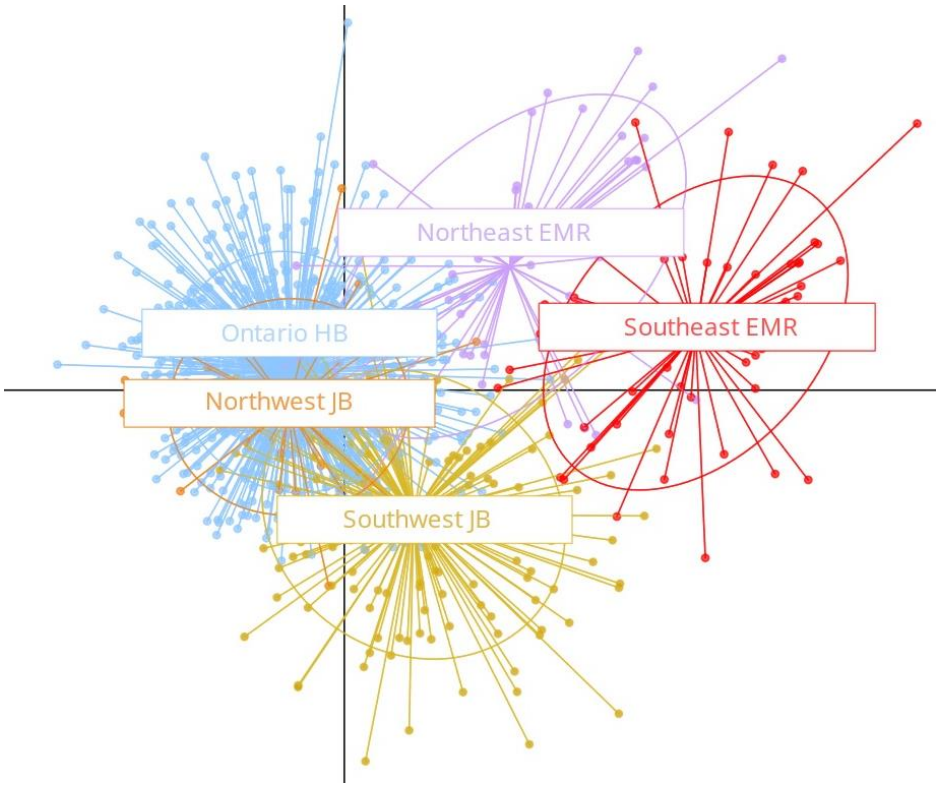


Figure 2. Genetic clusters of individual polar bears from Discriminant Analysis of Principle Components (DAPC). Data from bears captured in 1980 – 2022 and bears' hair sampled in the EMR in 2021-2022.

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Table 1: Paired genetic distances (Nei's distance) for subregions in James Bay and Hudson Bay – data from 1980 through 2022

	Ontario Hudson Bay	Northwest James Bay	Southwest James Bay	Northeast EMR
Northwest James Bay	0.038			
Southwest James Bay	0.045	0.062		
Northeast EMR	0.095	0.102	0.071	
Southeast EMR	**0.201**	**0.198**	**0.121**	**0.094**

Exploring occurrence of other species

In 2023, pictures taken from trail cameras in 2021 and 2022 were scored to identify where other species, including caribou, black bear, red fox, and wolves, occur in the EMR. This exploratory work, done by Roxanne Tremblay, Brian Audla-Tooktoo, and Tanis Short, allowed to assess the co-occurrence of polar bears and black bears in EMR in 2021 and 2022 (Figure 3) and the presence of predators other than polar bears in 2021 and 2022 (Figure 4) and of caribou in 2021 (Figure 5).

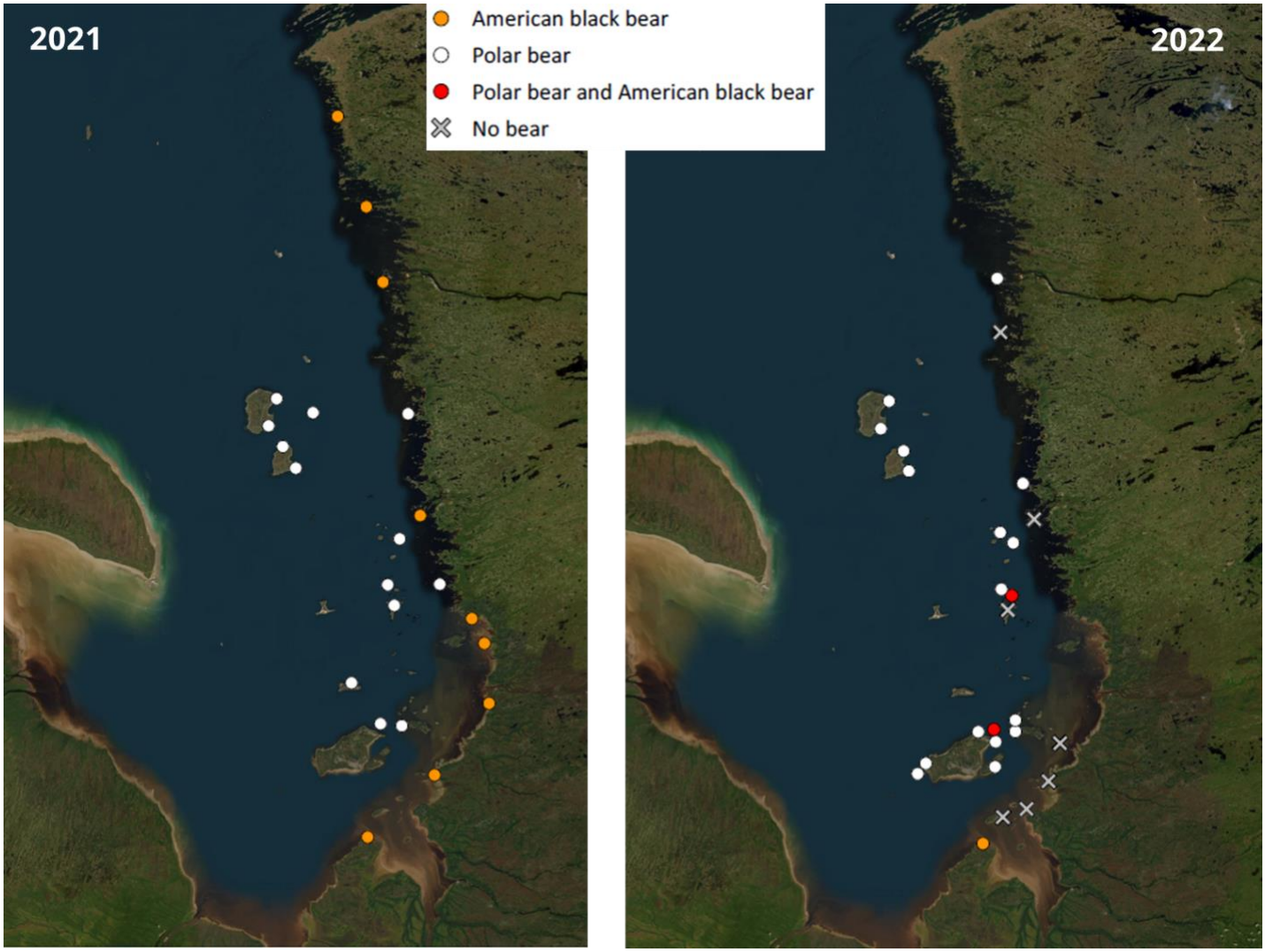


Figure 3. Sampling stations where polar bears (in white), black bears (in orange), and both species (in red) were detected in 2021 and 2022.

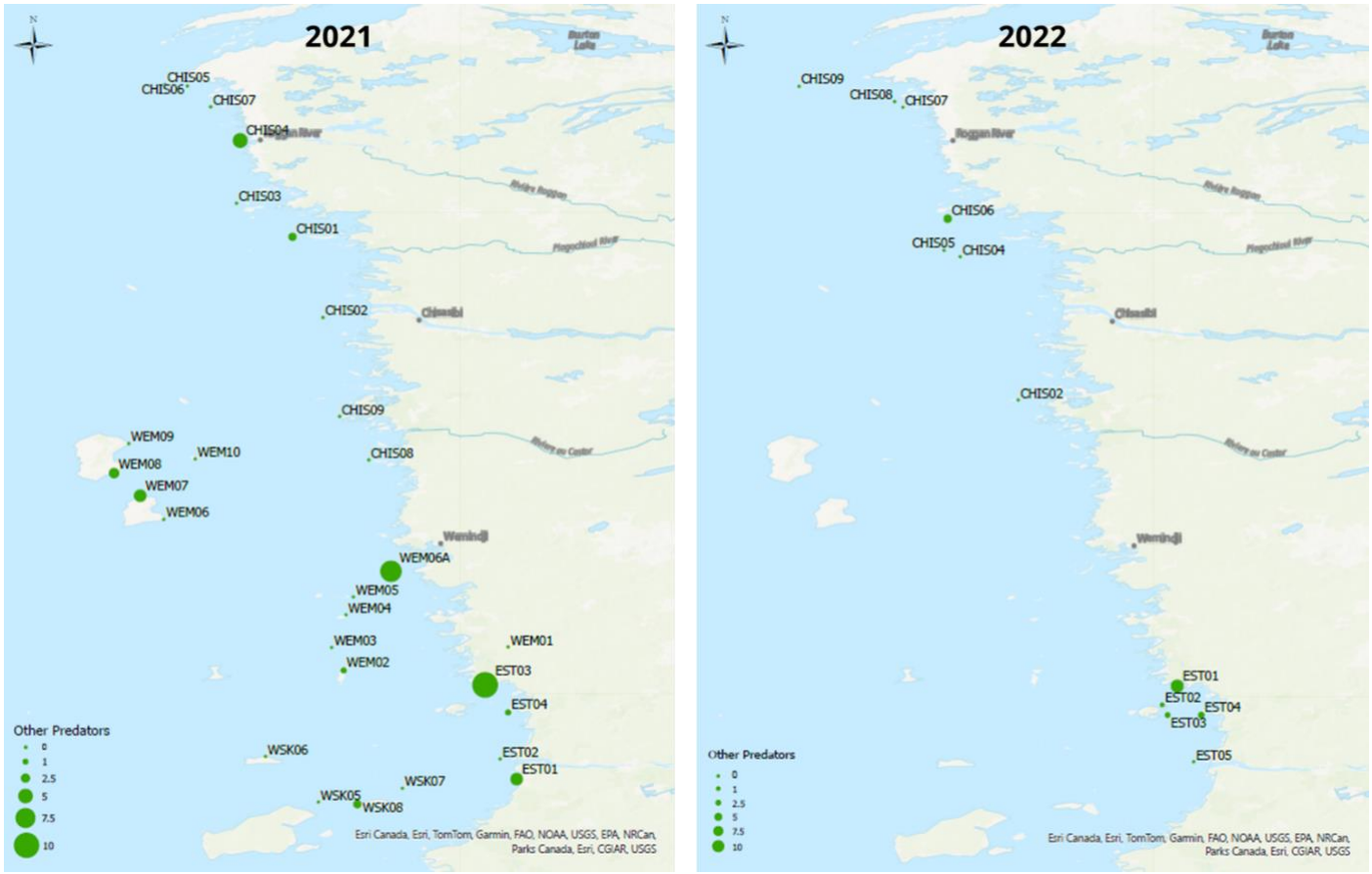


Figure 4. Sampling stations where predators other than polar bear, including fox and wolf, were detected in 2021 and 2022. Each station is sized according to the number of individuals detected, ranging from 0 to 10.

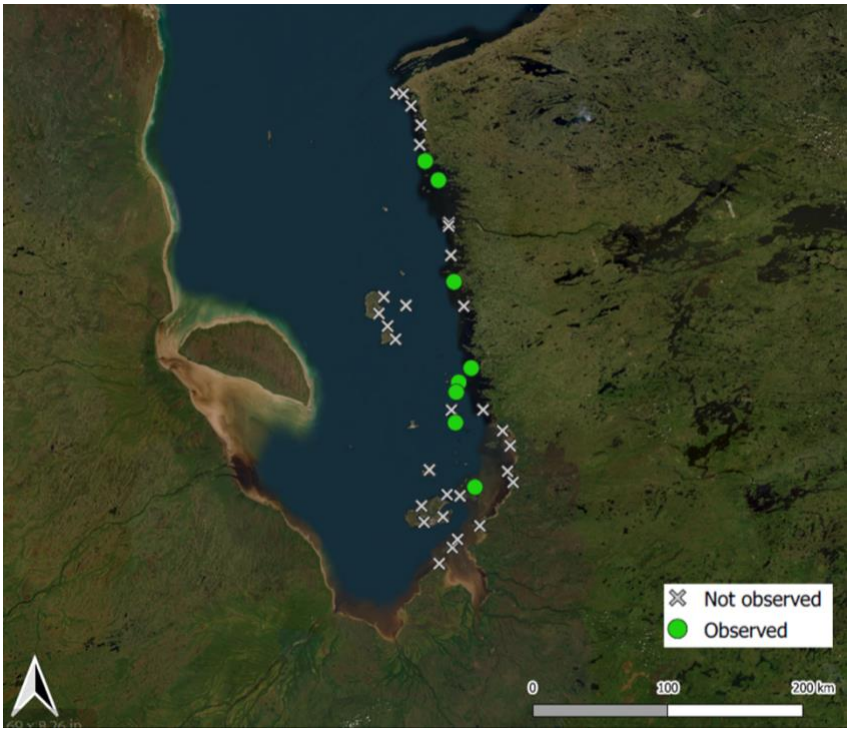


Figure 5. Sampling stations where caribou were observed in 2021.

Cree Knowledge interviews

Cree Knowledge interviews took place in October 2023 in Wemindji and Waskaganish. Six community members were interviewed in Wemindji, and one was interviewed in Waskaganish. Participation was lower than expected due to unanticipated tragedies in the communities leading to many potential interviewees being unavailable. Interview activities were led by Alexandra Langwieder, Manuelle Landry-Cuerrier, Samantha Delisle, George Natawapineskum and Sanford Diamond.

Interviews focused on three activities: mapping, proportional piling, and timelines. In the first activity, participants mapped polar bear activities along the coast as well as environmental conditions (open sea ice, etc.) and other species of interest (e.g. places where seals are frequently seen). Proportional piling is a method that involves asking participants to place a pile of beans on images according to the proportion of observations of that image. In this exercise, participants identified the proportion of polar bear observations that were in various body conditions on a visual scale. Participants also identified polar bear diet using images of a James Bay food web. In the timeline activity, participants tracked changes in environmental conditions, polar bear activity, Cree use of the coast, and other species over time.

Additional interviews in Waskaganish, Eastmain, Wemindji and Chisasibi are planned for summer and fall 2024 according to participant availability. Data will become available to the EMRWB as it is digitized and validated by participants.

COMMUNICATION

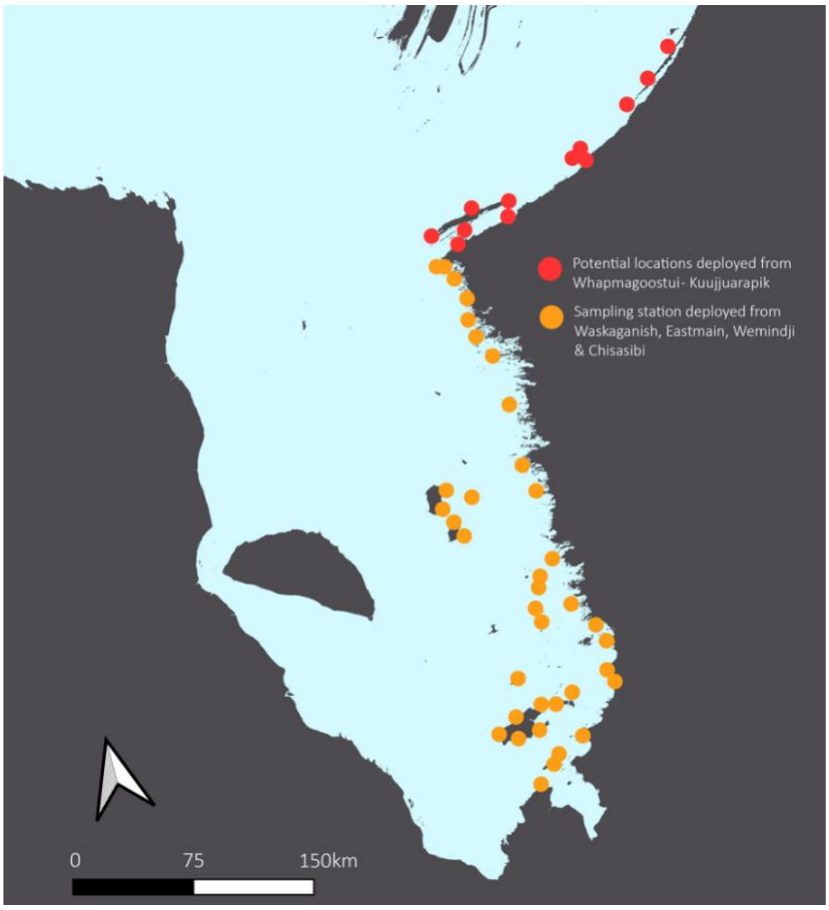
In 2023 the polar bear distribution and body condition results of the project were presented through infographics, oral presentations, and posters.

- Pamphlet for community members in the EMR sharing results, audience: general public
- Polar Bear Technical Committee oral presentation by Alexandra Langwieder, audience: polar bear researchers and managers (from both northern communities and government) across Canada
- Polar Bear Range States Meeting of the Parties 2023 oral presentation by Alexandra Langwieder, audience: polar bear scientists and managers from across the circumpolar Arctic
- Anguvigaq Annual Board Meeting oral presentation by Alexandra Langwieder, audience: community representatives from all Nunavik communities
- EMRWB Annual board Meeting oral presentation by Alexandra Langwieder, audience: community and regional organization representatives from Eeyou Istchee
- NMRWB Annual board Meeting oral presentation by Catherine Geoffroy, audience: community and regional organization representatives from Nunavik

Through these presentations, the project has received highly positive feedback from local, national, and international polar bear management organizations. Presentations of the results to date for the Regional Cree Trappers' Association, local Cree Trappers' Associations, and each community Chief and Council are being scheduled in 2024. Based on its success in previous years, the project received additional funding from the World Wildlife Fund, Polar Bears International, and Polar Knowledge Canada for 2024-2025.

EXPANDING TO WHAPMAGOOSTUI AND KUUJJUARAPIK

Following the Polar Bear Technical Committee Meeting in January 2023, the Nunavik Marine Region Wildlife Board (NMRWB) expressed interest in expanding the project to Inuit communities in Nunavik. This would allow communities in the Cree-Inuit overlap zones to gather local data on polar bears which can contribute to this project as well as ongoing government monitoring efforts and regional wildlife management decision making. Data from hair sampled in the Cree-Inuit overlap zones would contribute to our understanding of polar bear movement, distribution and foraging ecology throughout the EMR.



In February 2024, James Bay field team leaders George Natawapineskum and Cody Mark as well as Alexandra Langwieder and Catherine Geoffroy, led a two-day workshop with community members from Whapmagoostui and Kuujjuarapik to discuss polar bear research priorities in the area and determine interest in starting a pilot project in summer 2024 (Figure 6). Participants were enthusiastic about the potential of this work and interested in joining field teams. The group planned a project budget to apply for funding through the NMRWB and EMRWB which was secured in spring 2024. Work will be led by CTA-EMR Local Officer Robert Fireman from Whapmagoostui and by Anguvigaq Harvest Monitoring Manager, Raymond Mickpegak, from Kuujjuarapik.

Figure 6: Map showing potential sites in Whapmagoostui/Kuujjuarapik for summer 2024 (in red).

CONCLUSIONS AND NEXT STEPS

We found that the sampling station design presented here continues to be an effective method to collect both hair samples and photographs of polar bears in the EMR and is an appropriate tool for use in community-based polar bear monitoring.

Genetic analyses using the 2021 and 2022 data suggest that polar bears in the EMR are genetically different from bears on the Ontario James Bay and Hudson Bay coasts. Genetic distances appear to have increased within the Southern Hudson Bay management unit over time. Information on historic sea ice trends is needed from both Cree Knowledge Interviews and archival mapping data to understand the history of connectivity between regions and whether this may be driving genetic differences.

Communication of this work through conferences and presentations has led to additional funding opportunities from Polar Bears International. Given the success of the teams in James Bay, the project is in process of expanding into the Cree-Inuit overlap zones of eastern Hudson Bay and training additional community members in the field sampling methods. This would allow us to track bears that potentially move along the coast between regions.

Cree Knowledge interviews are underway and will provide valuable insights into polar bears and the James Bay coastal system. The next steps in this work are to complete a fourth field season in summer 2024 with returning community field teams, run a pilot field season in the Cree-Inuit overlap zones and continue to investigate polar bear genetic relationships in the EMR.

ACKNOWLEDGMENTS

We want to thank all land users from Waskaganish, Eastmain, Wemindji and Chisasibi for their leadership and participation in the project: Ghislain Bobbish, Kyler Bobbish, Steven Bobbish, Wilfred Cheezo, James Harold Cloutier, Bernard Diamond, Daniel Diamond, Harry Erless, Henry Erless, Dinah Ester, James Georgekish, Devin-Ross House, Ernie Hughboy, Roger Jolly, Kevin Lameboy, Cody Mark, Jeremy Matches, Barry Miniquaken, Mason Moses, Munroe Salt, Stephanie Salt, John E. Sam, Kevin Sam, Andrew Snowboy, Jackie Snowboy, Raymond Snowboy, Ronnie Snowboy, Rupert Snowboy, Tristan Snowboy, Henry Stewart, Justin Weistche, Steve Whiskeychan, and Dwayne Wischee-Salt. We also want to thank Sanford Diamond, George Natawapineskum, John Lameboy, Robert Fireman, Raymond Mickpegak, Angela Coxon, Félix Boulanger, Natasha Loutit, and Stephanie Varty for their valuable help with coordinating activities.