POLAR BEAR ECOLOGY IN THE EEYOU MARINE REGION

Proposed MSc project by Alexandra Langwieder
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Alex is a Master's student interested in doing a thesis project that addresses northern community research priorities and contributes to wildlife monitoring in the EMR. She has previous field research experience studying migratory birds and polar bears in Nunavut, salmon in BC, bison in Saskatchewan and is excited to apply this experience to community-based ecological research in Eeyou Istchee.

MURRAY HUMPHRIES

Murray Humphries is a Professor of Wildlife Biology at McGill University and Academic Director of McGill's Centre for Indigenous Peoples' Nutrition and Environment. He supervises several graduate students conducting research in Eeyou Istchee and Nunavik under the project Wildlife Environmental Change and Local Indigenous Food Systems.

PROJECT INTRODUCTION

In the *Eeyou Istchee Coastal Community Voices on Wildlife Research Priorities for the Eeyou Marine Region*, communities identified interests in studying polar bear ecology in the EMR. Polar bears are important top predators in arctic and sub-arctic systems and, as such, their population structure and distribution can have impacts on other species and human communities. The Southern Hudson Bay subpopulation in the EMR is, as the southern-most population of polar bears in the world, experiencing rapid environmental changes and is threatened by reduced sea ice habitat and the associated increased fasting periods (Molnar et al. 2020).

Studies on the Southern Hudson Bay subpopulation have focused on investigating body condition related to sea ice decline (Obbard et al. 2006; 2016), population abundance (Obbard et al. 2015; 2018) and movement on the sea ice (Obbard & Middel, 2012) which clearly illustrate the subpopulations vulnerability to changing environmental conditions. However, bears sampled in these studies have been captured almost exclusively on the northern Ontario coast of Hudson Bay despite the management unit of Southern Hudson Bay extending across James Bay into Eeyou Istchee and Nunavik.

The data obtained from bears captured within James Bay have suggested that James Bay polar bears may be genetically and spatially distinct from Southern Hudson Bay bears (Crompton et al. 2008; Viengkone et al. 2018). Bears collared on Akimiski Island have showed significantly different movement patterns than bears captured on the Ontario Hudson Bay coast, remaining almost entirely within James Bay compared to far-ranging movements of the Ontario bears (Obbard and Middel, 2012). If the bears in James Bay are indeed a distinct subpopulation, current management units and conservation strategies may need to be re-evaluated.

Wildlife research on polar bears has often involved live-capturing bears using helicopter and chemical immobilization. While this can obtain in-depth information about individuals and provides an opportunity to deploy tracking devices, communities in the EMR have expressed preference for non-invasive methods (*Eeyou Istchee Coastal Community Voices...* 2019). The proposed project we outline here uses Cree Knowledge as well as hair snares, camera traps and denning surveys to investigate the ecology of polar bears in the EMR.

Hair snares allows us to non-invasively gather tissue samples to genetically identify individuals and study their diet through stable isotope signatures. Individual genetic identities can be used to estimate population structure and density while stable isotope signatures provide information on where and what bears are foraging on. Camera traps deployed at hair snare locations can be used to quantify bear body condition as well as gather fine-scale environmental and biodiversity data. Cameras also provide an opportunity to identify mother bears with cubs and improve the hair snare configuration over time. Hair snares and camera traps are widely used to study grizzly and black bear genetics, population density and diet (Lamb et al. 2016; Gardner et al. 2010) and have been applied to polar bear research on contaminants, diet and hormones (Weisser et al. 2016).

Identifying denning sites is critical to understanding key polar bear habitat in the EMR. Active maternal dens can be identified by their physical characteristics (excrement, hair, freshly disturbed earth/snow and tracks) and then marked on a map using GPS. Opportunistic hair samples may be gathered at these sites. Characterizing the habitat surrounding denning sites could also allow us to remotely identify other denning habitat in the EMR using aerial photographs (Durner, Amstrup and Ambrosius 2001). These surveys can be done by aircraft or on the ground.

RESEARCH OBJECTIVES:

a). Gather information about polar bear ecology through interviews with Cree Knowledge holders.
b). Collect information on polar bear genetics, diet and body condition using hair snares and camera traps.
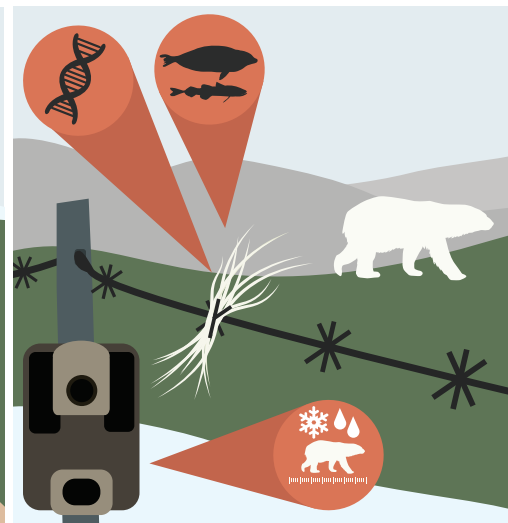c). Identify maternal denning locations in the EMR.

METHODS

INTERVIEWS WITH KNOWLEDGE HOLDERS

LOCATING DENNING HABITAT

HAIR SNARES AND CAMERA TRAPS

FIELDWORK

We propose that hair snaring and camera trapping take place over 4-6 week periods at key times of the year for polar bear life history events. These times would include the early spring when mothers and cubs leave maternity dens and all polar bears are hunting in preparation for the ice-free summer fasting period, the fall when samples will tell us what the bears have been doing during this fasting period, and the late winter when samples will give information on the winter diet and habitat use. The importance of islands for polar bears during the ice and ice-free periods is of particular interest. Cree Knowledge interviews will take place either in-person or virtually throughout the summer.

Due to the vast size of the EMR and the in-depth knowledge land users have of polar bear behaviour and ecology, community involvement will be key to the project. Involvement could be through deploying traps, guiding researchers on the land, collecting hair samples and memory cards from camera traps, or participating in interviews or focus groups discussing polar bear ecology. For activities on the land, training will be provided and, in all cases, community members will be compensated for their time and efforts. Compensation amounts will be set according to recommendations from the EMRWB and regional CTA.

PROPOSED PROJECT TIMELINE

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WINTER/ SPRING 2021	To identify areas of polar bear activity and potential trapping locations, we will consult coastal tallymen and review previous polar bear observation data from the CTA and EMRWB. Sampling locations will be chosen based on their accessibility at multiple times in the year in order to gather information on polar bears throughout the year. Aerial surveys for active maternal dens will be conducted opportunistically during the spring.
SUMMER 2021	Once the priority sampling locations are confirmed, hair snares and camera traps will be deployed with field support from land users. The researcher will train EMR Officers and land users to deploy traps and collect samples. Interviews with knowledge holders will be conducted throughout the summer and will build on previous collection of Cree Knowledge of polar bears in the EMR. Themes that emerge from interviews and previous work can direct research questions and hypotheses as the project progresses.
FALL 2021	Fall trapping period. Samples will be sent for analysis and the results from spring trapping will be compiled.
WINTER 2022	Winter trapping period. Follow up interviews may be conducted to add participants or re-visit previous participants.
SPRING/ SUMMER 2022	Spring trapping period. Presenting preliminary results to communities and local organizations through oral presentations and visual materials (pamphlets, infographics, videos, etc.).
FALL 2022	Fall trapping period. Completing lab analyses and compiling results.
WINTER 2023	Winter trapping period. Compiling results of both field seasons and working on thesis.
SUMMER 2023	Writing final thesis and reports for communities.
FALL 2023	Presenting final project to communities and the EMRWB and regional CTA and submitting thesis. Helping organize how the project may continue in the future.

POTENTIAL DELIVERABLES

COLLECTION OF CREE KNOWLEDGE ABOUT POLAR BEARS

MAP OF POLAR BEAR DENS IN EMR
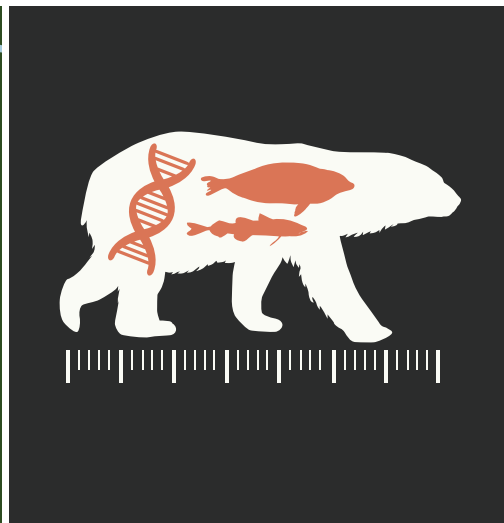
POLAR BEAR GENETIC IDENTITIES, DIET AND BODY CONDITION

RESULTS

Through this project we aim to determine the distinction of James Bay polar bears, describe their diet and use of coastal and island habitats throughout the year, and estimate their population size.

Cree Knowledge of polar bears will provide valuable information on polar bear behaviour and diet as well as historical records of polar bear habitat use in the area and the cultural importance of polar bear to the Crees of Eeyou Istchee. The results of the hair sampling will provide further information on the bears' diets and movement patterns in the region, particularly at times of the year where observations are reduced. Camera trap photos will provide information on body condition and behaviour as well as document microclimate and biodiversity across the study area throughout the year. Data on maternal den locations will provide insight into important denning habitats in the EMR.

The methods developed in this project can be used to monitor many species across Eeyou Istchee and the project provides an opportunity to build these tools in a way that facilitates their use by Cree entities like the EMRWB and CTA in the future.

The success of this project will depend on the involvement of land users whose participation, both in the field and in interviews, will contribute immensely to understanding polar bear ecology in James Bay and the EMR. Interested land users will have opportunity to be trained and hired in the field which helps facilitate continued monitoring after Alex finishes her master's program.

Results will be shared with communities and partner organizations (the EMRWB and CTA) throughout the project via presentations, written reports and posters or other visual material.

SUPPORT RECEIVED TO DATE

This project has received support from the Eeyou Marine Region Wildlife Board as well as the regional Cree Trappers Association (see letter of support attached). While living in Waskaganish this spring, Alex has recieved support from the local CTA as well as the tallyman and families of Charlton Island to proceed in this research. In the next steps this spring, Alex will meet with coastal tallymen in Eastmain, Wemindji and Chisasibi to determine their support of this research. The project is financially supported by generous contributions from the regional CTA and EMRWB as well as funding from the Natural Sciences and Engineering Research Council of Canada and the Ouranos organization.