

NWRT Project Number: 2-10-13

Project Title: Aerial Survey Population Monitoring of Polar Bears in Foxe Basin

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Summary

The GN and its partners initiated the Foxe Basin polar bear aerial survey project in 2008 to develop a research alternative to physical mark-recapture. Because they are less invasive, aerial surveys are more consistent with Inuit beliefs than capture-based studies and additionally provide a rapid and efficient tool for polar bear population monitoring. As the final field research component of this project, we completed a comprehensive, helicopter-based survey of the Foxe Basin subpopulation during the late summer, 2010. Similar to 2009, we used a combination of coastal and inland transects and multiple sampling techniques during the survey. Over the 8-week study period, we documented 1,003 polar bears, with the highest concentrations observed on eastern Southampton Island and adjacent islands (e.g., White and Vansittart Islands) as well as islands in northern Foxe Basin (e.g., Rowley and the Spicer Islands). Standardized encounter rates were greatest along coastal transects and inland transects near the coast. Preliminary analyses with the 2010 data indicate that observations declined predictably with increasing distance from the aircraft, suggesting a strongly supported detection function. Analyses are ongoing and will yield an updated population estimate for Foxe Basin, examine year-to-year consistency in aerial survey-derived population estimates, and provide information about the late summer distribution of polar bears. The Foxe Basin abundance estimate is anticipated in summer, 2011.

Project Objectives

With the completion of the 2010 aerial survey, field work in FB has concluded and initial project objectives have been accomplished.

- 1) Develop and implement an aerial survey to reliably estimate polar bear abundance in Foxe Basin during the late summer, ice-free season. (Completed, 2009 and 2010).
- 2) Derive aerial survey-based abundance estimates for the Foxe Basin subpopulation (In progress, anticipated completion by summer, 2011).

- 3) Assess polar bear distribution in Foxe Basin during the late summer ice-free season, particularly with respect to environmental variables (In progress, anticipated completion in 2012).

Materials and Methods

Survey methods in 2010 were similar to protocols used during the 2009 field season. The study site was divided into multiple strata based on proximity to the coastline, including a high density coastal zone (land within 500 m of the coast) and 3 inland strata: a moderate density zone (land within 5 km of the coast), a low density stratum (land 5 – 15 km from the closest shoreline), and very low density zone (land 15 – 50 km from the closest coast). We sampled these strata by flying systematically spaced inland transects (10 km intervals) oriented perpendicular to the shore and coastal transects following the shoreline, allocating sampling effort such that higher density areas were more intensively sampled. Transects extended across the width of large islands, and we completed total counts on a sample of small islands. We simultaneously collected both double observer and distance sampling data from the helicopter (206L) survey platform, flying at an above ground level altitude of ~400 ft and a groundspeed of ~160 km / hr. Polar bear locations and flight paths were recorded via GPS, and we documented sex and age class, body condition, group size, weather conditions, and habitat parameters for each sighting.

However, there were some noteworthy methodological changes during 2010: 1) Coats and Mansel Islands, located in southern Foxe Basin, were pooled with other large islands and transects were extended across their width during 2010; 2) the ratio of transects extending 5 km, 15 km and 50 km inland increased to 3 : 2 : 1, such that relative sampling intensity increased in the low and very low density inland strata; 3) Quebec was excluded from the 2010 survey, given that only 2 bears were observed there during 2009 and similar conditions were reported in 2010; and 4) the few ice floes in FB during late summer, 2010, were comprehensively surveyed; an ice stratum will not be included in 2010 distance sampling analyses.

Project Schedule

The final year of aerial survey field work in Foxe Basin was conducted during August – October, 2010. We remain on schedule to complete population analyses and present an updated Foxe Basin abundance estimate by summer, 2011.

Output or Steps	Start Date	End Date
Fuel caching and logistics preparations for 2010 Foxe Basin aerial survey (completed)	1 March 2010	1 August 2010
2010 Foxe Basin aerial survey field work (completed)	10 August 2010	3 October 2010

Population analyses, survey technique evaluation, and report preparation	1 October 2010	Fall 2011
Foxe Basin community consultations: Presentation of final survey results	Fall 2011	Winter 2011-12
Distribution analyses to identify late summer core areas in Foxe Basin and potential conflict 'hotspots'	Ongoing	Ongoing
Preparation of peer-reviewed articles	Ongoing	Ongoing

Preliminary Results and Discussion

We conducted a comprehensive aerial survey of the Foxe Basin subpopulation from August 11 through October 3, 2010. Although inclement weather provided significant scheduling and logistical challenges, we were able to complete the survey, in its entirety, during the late summer window. Over the nearly 8-week study period, we flew more than 40,000 km, including ~5,700 km and ~15,100 km along planned coastal and inland (including large islands) transects, respectively (Figure 1). We recorded 1,003 polar bears, comprised of 790 adult and subadults and 213 cubs (Figure 2), and documented an overall mean litter size of 1.47 (SD: 0.51, n=145). Mean litter sizes were 1.53 (SD: 0.57, n = 80) and 1.39 (SD: 0.50, n=65) for estimated cubs of the year (COY) and yearlings, respectively. By comparison, we observed 816 bears and larger mean litter sizes in 2009.

Patterns in polar bear distribution documented during 2010 were generally consistent with 2009 results. The highest concentrations of bears were observed in central Foxe Basin (eastern Southampton Island and Vansittart Island, White Island, and adjacent islands) as well as northern Foxe Basin (Rowley Island, Koch Island, and the Spicer Islands; Figure 2). Conversely, relatively few bears were spotted along Hudson Strait and the Bowman Bay region (western Baffin Island). Total observations and standardized encounter rates were greatest along transects in the coastal, large island, and moderate density inland strata, although bears were observed across all strata (Figures 3 and 4). Large numbers of bears were also documented on small offshore islands. Polar bears estimated as adult males were most commonly observed along coastal transects and on large islands, whereas family groups and estimated adult females were distributed more evenly with respect to the coastline (Figures 3 and 4).

As expected, polar bear observations decreased as distance from the flight path increased (Figure 5). The shape of these sightings distance data suggests that we will be able to fit a robust detection function during distance sampling analyses. Interestingly, however, the shape of the 2010 distance data differs substantially from the shape of the distance data collected during 2009, indicating that the 2010 detection function will be quite different. In particular, the 2010 histogram maintained a broader shoulder; in other words, sightings in 2010 were relatively constant to nearly 1 km from the flight path, while observations declined more quickly with increasing distance from the aircraft in 2009. Similarly, the 2010 histogram had a

longer tail, meaning that we recorded bears at greater distances from the aircraft this year (e.g., 12 bears spotted at distances of >2 km from the flight path). We hypothesize that these differences are attributable to greater observer experience, different observer teams, and perhaps different sighting conditions in high density areas. Notably, however, detections near the aircraft (i.e., at and near the flight path) were very consistent between 2009 and 2010.

Foxe Basin aerial survey analyses remain ongoing. An updated abundance estimate and associated project report will be completed in summer, 2011. Subsequent distribution analyses will identify core (high density) regions and evaluate environmental determinants of polar bear distribution. Pending the results of distribution analyses, aerial surveys focused in core areas could be used as an index in future monitoring of the Foxe Basin subpopulation.

Community Reporting

Meeting or Action	Date
Preliminary Consultations: All communities within Foxe Basin boundaries (Cape Dorset, Chesterfield Inlet, Coral Harbour, Hall Beach, Igloodik, Kimmirut and Repulse Bay), Rankin Inlet, KIA, and Ukkusiksalik NP. Written reports sent to Baker Lake.	Spring 2006 - Winter 2008
Distribution of written interim reports (2008 research season) to all stakeholders.	January 2009
Interim Consultations in all FB communities.	Winter – Spring 2009
Distribution of written interim reports (2009 research season) to all stakeholders.	January 2010
Interim community consultations and informal reporting with HTO representatives.	Late summer, 2010
Interim written reports distributed to all stakeholders.	January 2011
Final project reports and community consultations.	Fall – Winter 2011-12