

**RE-ESTIMATING THE ABUNDANCE OF THE DAVIS STRAIT POLAR BEAR SUB-
POPULATION VIA GENETIC MARK-RECAPTURE SAMPLING**

INTERIM FIELD REPORT TO

GOVERNMENT OF NUNAVUT, DEPARTMENT OF ENVIRONMENT

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IN FULFILLMENT OF WRP 2017-011

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1. **PROJECT TITLE:** Re-estimating the abundance of the Davis Strait polar bear subpopulation via genetic mark-recapture sampling

2. **PROJECT LEADER:**

GN Department of Environment

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3. **SUMMARY**

The Davis Strait (DS) polar bear subpopulation is shared by Nunavut, Quebec (Nunavik), and Newfoundland and Labrador (Nunatsiavut). The population was first inventoried in the 1970s but likely underestimated because of poor aerial coverage. A comprehensive population study was conducted between 2005-2007 which found the abundance to be approximately 2,158 bears. In recent years, Inuit have indicated that large numbers of bears are creating public safety concerns especially for people going out on the land. Inuit believe that the bears are negatively impacting other wildlife by eating large numbers of young seals, and eggs in bird colonies. There is some uncertainty surrounding the current status of the DS population, in part of known changes to the sea-ice habitat, but it is believed that the population is either stable or has likely been increasing since the last inventory was completed in 2007. Given these factors, the co-management partners were all supporting a new research study between 2017 and 2018. A new 2-year research project was initiated in 2017 to provide updated information on the abundance of bears in DS. This mark-recapture study differs from the previous studies that relied on chemical immobilization of all bears for capture and marking. This study does not involve capture of bears but instead utilizes DNA extracted from tissue samples obtained using biopsy darts to uniquely identify individuals. The sub-population abundance estimate and status will be assessed by means of genetic mark-recapture.

Between 4 August and 11 October, a total of 350 hours between 2 aircraft was spent searching for polar bears in the study area. We encountered 639 bears of various sex and age classes, of which 530 were successfully biopsied. The rate of sampling averaged 2.2 bears per hour of search time. The number of bears encountered during the fall of 2017 was equivalent to approximately 29.2% of the previous 2005-2007 mark-recapture population estimate currently used for harvest management. Litter sizes for cubs of the year and yearlings were similar with 1.5 for each. Until genetic results are available it is impossible to discern how many different individual bears were encountered, or how many recaptures occurred.

4. **PROJECT OBJECTIVES**

Our project objectives are to:

- a) Design and implement a comprehensive survey using genetic biopsy sampling to reliably estimate the abundance of polar bears in DS during the open water season (e.g., Aug – Oct) of 2017, and 2018, taking into consideration the unique aspects of this subpopulation.
- b) Estimate the current population size and composition of the DS polar bear subpopulation.
- c) Compare the new abundance estimate with the previously (2005-07) derived one in-order to gain insight into population trend and status of DS.
- d) Estimate survival and reproductive parameters (to the extent possible) in-order to facilitate population viability analyses.
- e) Evaluate on-shore polar bear distribution (to the extent possible).
- f) Continue to demonstrate the utility of genetic mark-recapture as a less invasive alternative to physical capture for the purpose of population monitoring.

- g) Enhance public participation and provide HTO-designated personnel with training in survey methods.
- h) Foster and enhance cooperation and collaboration with the various jurisdictions and co-management partners by having them participate in field activities.

We completed the first of two field seasons, and all biological field and relevant harvest samples are currently being prepared for genetic analyses by Wildlife Genetics International. The next field season is being planned in cooperation with all current co-management partners.

5. MATERIALS AND METHODS

The sample design was generally similar as the 2005-2007 study by Peacock et al. (2013): we searched the entire DS coastline in Nunavut, Quebec and NL including offshore islands using 2 Bell 206 Long-Ranger (Appendix 1) following daily pre-planned routes, designed to cover the entire area and to avoid a potential directional movement of bears out of the subpopulation area due to helicopter disturbance. Using local information about terrestrial DS polar bear distribution during summer, we also searched at high altitudes and up to 30 km inland. Bears were “marked” by DNA biopsy sampling (Pagano et al. 2014). “Marking” in this study does not involve chemical immobilization and physical marking as was done previously - biopsy darts were used to collect a small skin and fat sample from each bear. These samples are then used to establish a unique identity for each bear based on nuclear DNA fingerprinting methods (Chambers et al. 2014, Jeffreys 2005). Offspring were only darted where it was deemed safe to minimize chances of injuries. In addition, we recorded date, time of sighting, biopsy sample collected or not, biopsy label number, location when bear first seen (latitude, longitude), age class (COY, yearling, subadult, adult), age confidence (low or high), sex, sex confidence, and body condition index (ranked 1-5 from poor to excellent condition, Stirling et al. 2008) of all encountered bears.

We contacted all affected Nunavut HTOs and were only able to get HTO-assigned assistants for field observations from Kimmirut for a few days. All reminders, meetings and phone calls with individuals were unfortunately not fruitful for individuals from Iqaluit and Pangnirtung.

6. PROJECT SCHEDULE – currently project is on schedule

Output or step	Start date (dd/mm/yyyy)	End date (dd/mm/yyyy)
Logistical preparations (fuel, gear order)	Spring 2016, 2017	Spring 2017, 2018
Logistical preparations (fuel caching, cabin preparations, field equipment)	Spring 2017 Spring 2018	Early summer 2017 Early summer 2018
Biopsy darting	Aug 2017 Aug 2018	Oct 2017 Oct 2018
Harvest analyses	Aug 2017	Oct 2018
Analysis of tissue samples	Fall 2017	Spring 2019
Data analysis, preparation of reports and possible peer-reviewed publications	Spring 2019	Spring 2020

7. PRELIMINARY RESULTS AND DISCUSSION

The total number of hours spent searching for polar bears in DS between August 4th and October 11th of 2017 was approximately 280 hours between 2 helicopters. The number of polar bears encountered was 639, of which 530 bears were sampled successfully (Table 1). We had an encounter rate of approximately 2.2 bears/search hour. All bears darted provided sufficient tissue for DNA analyses and fat samples. Most bears that were not sampled were cubs-of-the-year (COYs). The sex and age distribution of polar bears encountered during the 2017 DS survey is provided in Table 1. Overall, there is good representation of offspring in the study sample when proportions are considered. Litter sizes overall for COYs and yearlings were 1.51 and 1.52, respectively.

Bad weather conditions at the tail end of the study prevented us from surveying and sampling Resolution Island.

Table 1. Overview of field sex and age groups of polar bears encountered and sampled during the 2017 Davis Strait field study (Note: data have not been genetically corrected).

Davis Strait Genetic CMR 2017													
	Quebec		subtotal	NL		subtotal	NU		subtotal	TOTAL		PPN	
	Y	N		Y	N		Y	N		Y	N		
COY	11	0	11	16	3	19	13	55	68	40	58	98	0.15336
YRLG	6	0	6	17	0	17	24	26	50	47	26	73	0.11424
ADM	25	1	26	58	3	61	93	2	95	176	6	182	0.28482
ADF	22	1	23	41	1	42	112	14	126	175	16	191	0.2989
SAF	8	0	8	9	0	9	10	0	10	27	0	27	0.04225
SAM	7	0	7	8	0	8	34	1	35	49	1	50	0.07825
U	0	0	0	0	0	0	1	1	2	1	1	2	
2-yr							15	1	16	15	1	16	0.02504
TOTAL	79	2	81	149	7	156	302	100	402	530	109	639	0.99687

(COY-cub of the year; YRLG-yearling; ADM-adult male; ADF-adult female; SAF-subadult female; SAM-subadult male; U-unknown; 2-yr-two-year old)

Less than 10% of all bears encountered were in poor body condition – adults as well as offspring appeared to be well-fed (Table 2). A few bears were observed catching char in streams in Nunavut during the spawning season.

Table 2. Overview of body condition of bears encountered throughout the Davis Strait study area during the 2017 field study.

BCI	Quebec	NL	NU
poor (<3)	0.07	0.09	0.04
average (3)	0.73	0.56	0.8
good (>3.5)	0.2	0.35	0.15

Subjectively, overall density of bears within the study area appears to be fairly decent, and what was expected. However, in order to be able to provide a more detailed inference about

bear density we have to await the completion of the second field season, and the full complement of the population abundance analysis.

8. REPORTING TO COMMUNITIES AND USERS

Community / HTO	Before research	During research	Completion of research
Mayukalik HTA Kimmirut Amaruq HTO Iqaluit Pangnirtung HTA Other co-management partners and collaborators	November 2016	Fall 2017, 2018 in community and during field work Winter 2017, 2018 by correspondence	Fall 2019, in community

The affected communities have been informed and will receive up-dated field reports throughout the year, or in-community briefings when traveling through the region. Community consultations are planned once the study is complete and a final report has been prepared. Final results will also be presented to the respective RWO.

9. ACKNOWLEDGEMENTS

Logistical and financial support for this project was provided by the Government of Nunavut, Environment and Climate Change Canada, World Wildlife Fund Canada, Nunavut Wildlife Management Board, Nunavik Marine Region Wildlife Board, Government of Newfoundland and Labrador, Nunatsiavut Government, Makivik Corporation, Ministère des Forêts, de la Faune et des Parcs Quebec, Torngat Wildlife and Plants Co-Management Board, Parks Canada, Nunavut General Monitoring Program, Polar Continental Shelf Program. Field support was provided by M. Taylor, J. Ware, R. Arsenault, B. Pirie, W. Flaherty, J. Neely, S. Noble, J. Aliqatuqtuq, and D. Dyck in Nunavut. Helicopter pilots G. Hartery, L. Pike, N. Rose, S. Lodge, and S. Sandi ensured crews stayed safe during flight operations throughout the study area. The Northwest Territories Wildlife Care Committee is thanked for their time to provide animal care approval. This research was carried out under a Nunavut Wildlife Research Permit (WRP 2017-011), animal care approval (NWTWCC 2017-003), Inuit Owned Land land-use permit (Q17X005), a Third-Party-Support licence (17-003), a Parks Canada Agency Research and Collection Permit (TMNP-2017-25357), Quebec Scientific Research Permit (2017-06-22-121-10-S-F-N/D-9053_38), and a Nunavik Parcs Licence.

Appendix 1

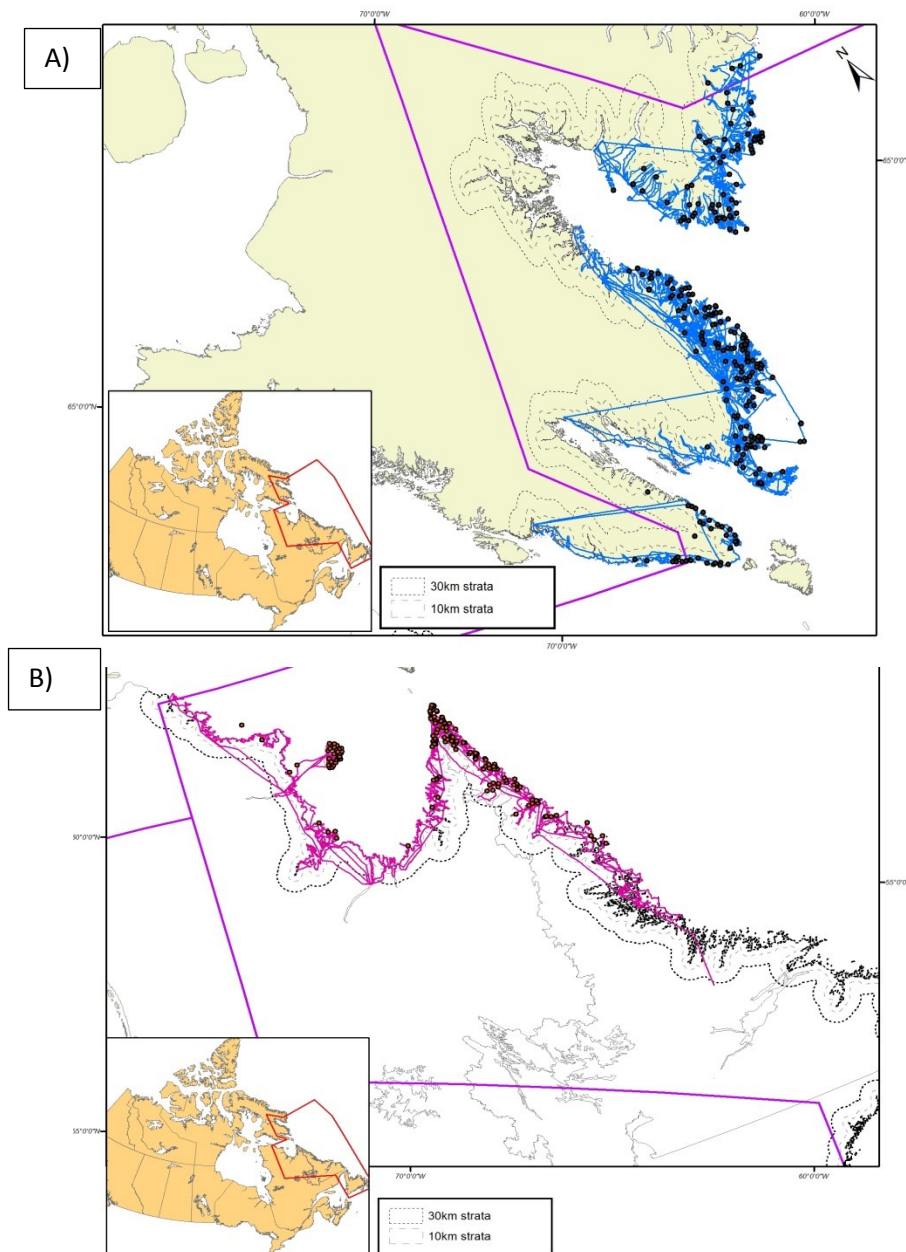


Fig. 1. Overview of polar bear group sightings and the flight paths taken during the 2017 Davis Strait field study. (A) represents searches in Nunavut, whereas (B) denotes searches in Labrador and Quebec. (Note that some of the locations have not been quality-controlled yet).

Appendix 2

LITERATURE CITED

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