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***North Baffin Caribou Fall Composition/Demographic Survey,  
2016***

Interim and Final Report to the Nunavut Wildlife Management Board

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**NORTH BAFFIN CARIBOU FALL DEMOGRAPHIC COMPOSITION SURVEY,  
SEPTEMBER 2016**

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### **Summary**

Between September 18 and 22, 2016, we flew a demographic composition survey of caribou, based at the Mary River mine site. We covered areas from Milne Inlet and the Tugaat River in the north to Steensby Inlet and the Isortoq River in the south. We found and classified 202 caribou in 25 groups. Calf-cow ratio was 56 calves per 100 cows, which is lower than in 2015 but still reflective of fall calf-cow ratios for stable to increasing populations. For Baffin Island caribou, actual calf recruitment through spring composition surveys will be necessary in order to confirm population trend.. The bull-cow ratio dropped from 96 bulls per 100 cows in 2015 to 46 bulls per 100 cows in 2016, which is likely not low enough to impact whether all breeding females can be impregnated. The drop in bull-cow ratio is typical for a population with bull-only harvest, which was implemented on Baffin Island with a Total Allowable Harvest of 250 bull caribou in August 2015. Further composition surveys, including spring composition and surveys on central and south Baffin Island, will provide better context and more complete information for evaluating the status and trend of Baffin Island caribou and allow co-management partners to make sound decisions.

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## **Introduction**

Caribou on Baffin Island are currently at low densities, which has been confirmed by local knowledge, Inuit qaujimagatuqangit, and recent aerial surveys. In February and March 2014, Baffin Island, ancillary islands, and the northern third of the Melville Peninsula were stratified and surveyed with a combination of ground searches and aerial survey (Campbell et al. 2015). The survey estimated 3,462-6,484 caribou (95% CI) over the survey area, including the Melville Peninsula. In the North Baffin strata, the estimate was 159-622 caribou (95% CI). Additional monitoring was required to track the status and trends of the population, so a series of demographic surveys monitoring calf-cow ratios and bull-cow ratios in spring and fall was implemented for north, south, and central areas of Baffin Island. Composition surveys provide herd composition information vital to wildlife management (McCullough 1994, Bender 2006). Results of the fall 2015 composition survey for North Baffin were encouraging, with high calf-cow ratios and sufficient bull-cow ratios to ensure cows were bred, but continued monitoring was required to ensure that fall 2015 was not anomalous and to determine the more meaningful calf-cow ratios in spring (Pretzlaw 2016).

## **Objectives**

The primary objective of the 2016 fall composition study was to monitor trends in fall productivity of Baffin Island caribou to:

- 1) Determine the vigor of the population based on demographic composition; i.e. what proportion of the population are young bulls, old bulls, cows, and calves.
- 2) Determine the trajectory of productivity of the population based on the demographic composition; and with spring composition results, determine if the population is increasing or decreasing based on calf recruitment.
- 3) Build a database with which to estimate the current population trend through demographic modeling, utilizing all demographic composition data to project trend from the 2014 population estimate.
- 4) Inform on management discussions regarding current TAH levels.

## **Study Area:**

The Baffin Island complex, incorporating all of Baffin Island and proximal islands including Prince Charles Island and excluding the areas of glaciers and ice fields, covers an estimated 543,746 square kilometers. Baffin Island is the largest Island in Canada and fifth largest Island in the world. Relief varies from expansive lowlands near sea level exemplified by the great plain of the Koukdjuak, to the mountains of the North and South Baffin reaching elevations of 1,963 meters and 2,147 meters above sea level respectively. The northeastern fifth of Baffin Island is within the Arctic Cordillera ecozone while the remainder of the Baffin Island complex is wholly within the northern arctic ecozone (**Figure 1**).

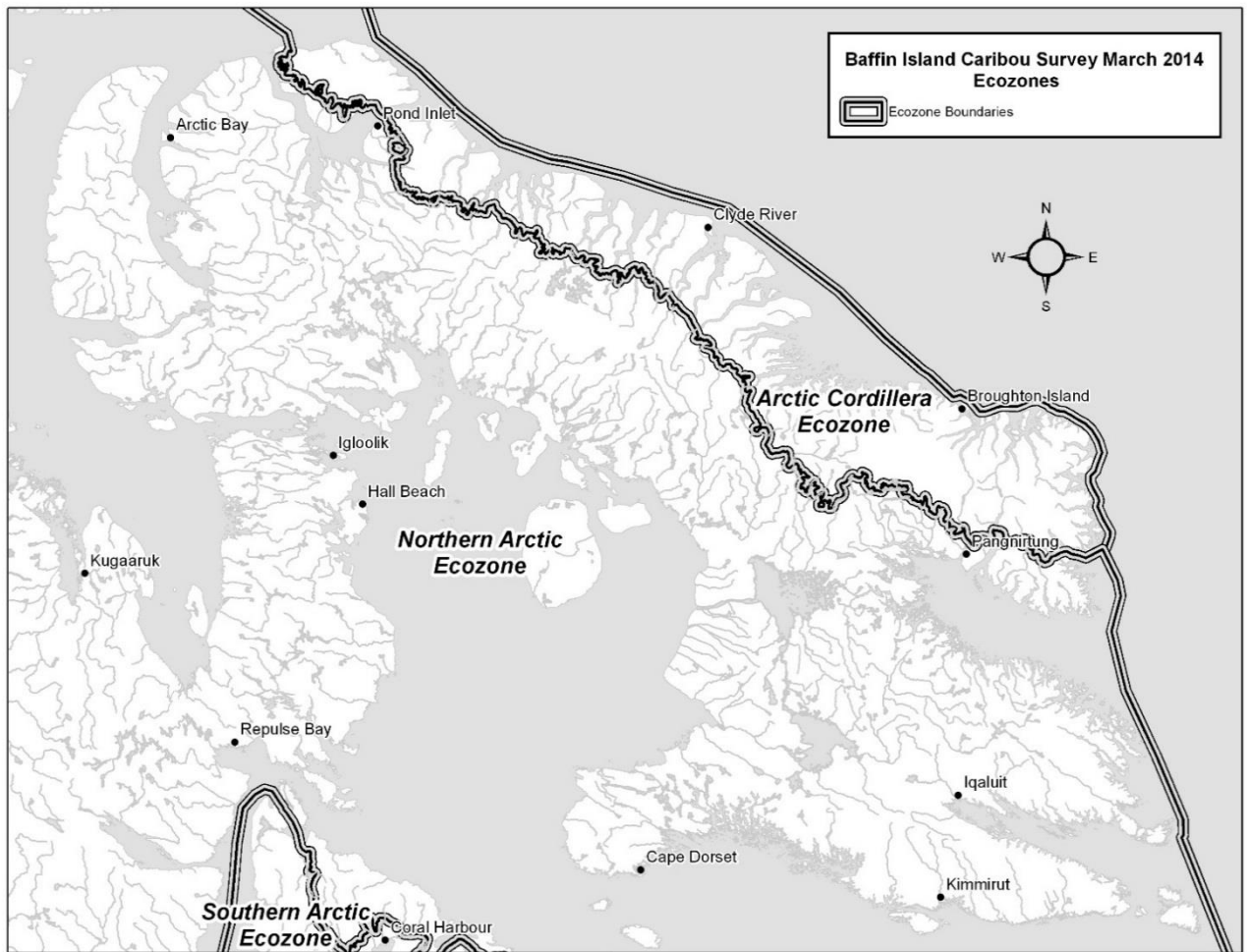


Figure 1. Ecozones of Baffin Island and proximal islands, and northern Melville Peninsula, Nunavut (after Environment Canada, 1995).

### Methods

The survey was based at the Mary River mine site (Baffinland Iron Mines, Inc.), which provided access to core caribou areas. These were determined based on local knowledge and IQ (DOE 2013, 2014, 2015a, 2015b, Jenkins and Goorts 2013), as well as previous survey observations (Jenkins 2008, Campbell et al. 2015) and telemetry locations (Jenkins 2008). The routes and target areas were assessed and adjusted each day with the help of the two observers from Pond Inlet. We covered many of the same areas as the 2015 composition survey, but weather limited our coverage in some areas, particularly along the north coast. We were able to check some areas not covered in 2015 along the Isortoq River south of Isortoq Lake. All tracks and observations were recorded on a handheld Garmin Montana 650 GPS unit.

We used an A-star helicopter, flying approximately 90 m (300') above ground on a serpentine route in areas where caribou were expected to be encountered. We flew at approximately 90-180 km/h with faster speeds in uniform snow-covered terrain where sightability was excellent, and slower speeds in difficult terrain, patchy snow cover, and areas with old caribou sign. When we encountered fresh tracks, we followed them until we found caribou, except in some cases where the tracks led into fog or across extensive snow-free areas and we were not able to follow them. When caribou were encountered, we increased altitude to reduce disturbance, circled to ensure other caribou associated with the group were not missed, and classified the sex and age of all caribou group if possible. If we

were uncertain about the classification, we then made one rapid low level pass to confirm sex and age for all individuals. Caribou sex and age based on physical characteristics (antler configuration and size, body size, presence of vulval patch). We classified caribou as calves, cows, mature bulls, and immature bulls.

## Results

We flew 19.6 hours over 3 days (Sept. 18, 21, 22, 2016), covering 2,788 km. Survey conditions varied from clear skies to overcast with flurries but visibility was generally good to excellent. Snow cover was almost complete in high elevation areas of the plateau north of Mary River and almost absent in low elevations along Angajurjualiik Lake and Steensby Inlet (Figure 1). Most of the survey area was patchily covered with 50-80% snow cover, which made tracking and spotting difficult and several groups were certainly missed. However, we still found and classified 25 groups of caribou, totaling 202 individuals. Sex and age composition is indicated in Table 1.

Table 1. Sex and age composition of caribou groups encountered Sept. 18-22, 2016, in the North Baffin study area.

Demographic Group	Number Seen
Cows	94
Calves	54
<i>Calves/100 cows</i>	<i>57</i>
Immature Bulls	14
Mature Bulls	32
Total bulls	46
<i>Bulls/100 cows</i>	<i>49</i>
Total observed	202

## Discussion

Composition surveys provide an index of population health and productivity that can guide management decisions. Fall calf-cow ratios do not indicate recruitment of calves into the population, but, combined with recruitment metrics determined in the spring, they can help us determine when most mortality occurs for calves. Bull-cow ratios can help determine whether enough bulls are present to ensure cows are impregnated and indicate different survival rates for bulls and cows. They should especially be monitored where sex-selective harvest regimes are in place. Composition surveys only provide distribution information for the areas that are flown, which are typically those places most likely to have caribou, and they only provide a minimum count of caribou, not an abundance estimate. The abundance and distribution information they do provide can still be useful at the reconnaissance level for designing other survey and sampling programs. The demographic information provided by composition surveys can be used to construct and calibrate demographic models for populations, but these models have not been constructed for Baffin Island caribou because too much of the required survival and reproduction information is currently missing (Gunn and Russel 2008, Boulanger et al. 2011, Boulanger and Adamczewski 2015, Pretzlaw 2016).

Calf-cow ratios are highest in the spring just after parturition and decrease over the year. For a herd that is stable to increasing, calf-cow ratios drop from 70-90% during the calving season to 50-70% at the end of the summer, further decreasing to 30-50% in the following spring (Walsh et al. 1995, Tobey 2001, Gunn et al. 2005, Adamczewski et al. 2009). Adequate calf recruitment is required for populations to persist or increase. During the fall 2016 survey, we observed 57 calves per 100 cows, slightly lower than the 71 calves per 100 cows seen in fall 2015 (Pretzlaw 2016). Both calf-cow ratios are within the range expected for fall calf-cow ratios in a stable to increasing population (Tobey 2001, Gunn et al. 2005, Adamczewski et al. 2009), but overwinter mortality has not been accounted for. It is

also important to consider how declining adult survival can also provide an inflated calf-cow ratio, and adult female survival is also key to population growth (Boulanger et al. 2011).

Bull-cow ratios provide information on differential survival of adult males and females. Although adult female survival and recruitment can largely drive population dynamics (Gunn et al. 2006, Adamczewski et al. 2009, Boulanger et al. 2009), males can influence recovery of herds under some situations (Myysterud et al. 2002, Holand et al. 2006). There are generally fewer bulls in populations with a selective bull harvest (Bergerud 1971, Williams and Fournier 1996), like the caribou on Baffin Island, which have had a selective bull-only harvest since August 2015. There typically need to be 40 bulls per 100 cows to ensure that cows are bred when caribou are evenly distributed across their ranges (Tobey 2001). In fall 2015, the bull to cow ratio for North Baffin was 93 bulls to 100 cows, very high relative to other populations with sex-selective harvest (Pretzlaw 2016). In fall 2016, the bull to cow ratio was 49 bulls to 100 cows, still above the threshold where herd productivity is believed to be affected, but much lower than last fall when no bull-only harvest was in place.

Basing from the mine camp at Mary River, with a helicopter that was already on site, allowed us to efficiently cover core caribou ranges despite poor weather. We directly observed and classified 64% of the caribou in the North Baffin study area, based on the 2014 estimate. Although we did not cover as much area as the 2015 survey (which covered 4,068 km in 28 hours of flight time), we still sampled the core caribou areas and located almost as many caribou as the 204 seen in 2015. The serpentine route targeting important areas appears to be more efficient for finding groups than a standard transect survey – a spring 2008 transect survey over the study area located 47 caribou in 50 hours of flying (Jenkins 2008), although the transect survey had less information available to stratify areas or concentrate search effort, and the number of caribou in North Baffin may have changed in the 8.5 years since it was flown.

### **Acknowledgements**

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### **Literature Cited**

Adamczewski, J., J. Boulanger, B. Croft, D. Cluff, B. Elkin, J. Nishi, A. Kelly, A. D'Hont, and C. Nicolson. 2009. Decline in the Bathurst caribou herd 2006-2009: a technical evaluation of field data and modelling. Government of the Northwest Territories Department of Environment and Natural Resources, Yellowknife, NT. 105 pp.

Bender, L. C. 2006. Uses of herd composition and age ratios in ungulate management. *Wildlife Society Bulletin* 34(4):1225-1230.



- Bergerud, A. T. 1971. Hunting of stag caribou in Newfoundland. *Journal of Wildlife Management* 35(1):71-75.
- Boulanger, J., and J. Adamczewski. 2015. Simulations of harvest and recovery for the Bathurst caribou herd, with annual variation. Government of the Northwest Territories Department of Environment and Natural Resources. File Report 145. 53 pp.
- Boulanger, J., A. Gunn, J. Adamczewski, and B. Croft. 2011. A data-driven demographic model to explore the decline of the Bathurst caribou herd. *Journal of Wildlife Management* 75: 883-896.
- Campbell, M., J. Goorts, D. S. Lee, J. Boulanger, and T. Pretzlaw. 2015. Aerial abundance estimates, seasonal range use, and demographic affiliations of the barren-ground caribou (*Rangifer tarandus groenlandicus*) on Baffin Island – March 2014. Government of Nunavut, Department of Environment Report 01-2015, Iqaluit, NU. 179 pp.
- Department of Environment (DOE). 2013. Working together got Baffin Island caribou. Workshop Report (August 2013). Government of Nunavut Department of Environment, Iqaluit, NU. 17 pp.
- Department of Environment (DOE). 2014. Working together got Baffin Island caribou. Workshop Report (November 2014). Government of Nunavut Department of Environment, Iqaluit, NU. 34 pp.
- Department of Environment (DOE). 2015a. Community and Hunter and Trapper Organization consultations on Baffin Island caribou (December 2013-January 2014). Government of Nunavut Department of Environment, Iqaluit, NU. 42 pp.
- Department of Environment (DOE). 2015b. HTO consultations on Baffin Island Caribou Management Plan. Government of Nunavut Department of Environment, Iqaluit, NU. 24 pp.
- Department of Environment (DOE). 2016. Baffin Island Caribou Management Plan. Government of Nunavut Department of Environment, Iqaluit, NU. 24 pp.
- Gunn, A., J. Boulanger, and J. Williams. 2005. Calf survival and adult sex ratio in the Bathurst herd of barren-ground caribou 2001-2004. Government of the Northwest Territories Department of Environment and Natural Resources. Manuscript Report 163. 99 pp.
- Gunn, A., F. L. Miller, S. J. Barry, and A. Buchan. 2006. A near-total decline in caribou on Prince of Wales, Somerset, and Russell islands, Canadian Arctic. *Arctic* 59(1):1-13.
- Gunn, A., and D. Russell, eds. 2008. Monitoring Rangifer herds (population dynamics) manual. CircumArctic Rangifer Monitoring and Assessment (CARMA) Network. Available: [http://www.caff.is/images/Organized/CARMA/Resources/Field\\_Protocols/demographymanual42.pdf](http://www.caff.is/images/Organized/CARMA/Resources/Field_Protocols/demographymanual42.pdf)
- Holand, Ø., R. B. Weladji, K. H. Røed, H. Gjøstein, J. Kumpula, J.-M. Gaillard, M. E. Smith, M. Nieminen. 2006. Male age structure influences females' mass change during rut in a polygynous ungulate: the reindeer (*Rangifer tarandus*). *Behavioural Ecology and Sociobiology* 59: 682-688.
- Jenkins, D. A. 2008. Space use and movement patterns of North Baffin caribou. Interim report, December 2008. Government of Nunavut Department of Environment, Pond Inlet, NU. 11 pp.
- Jenkins, D., and J. Goorts. 2013. Baffin Island caribou consultations, 2012. Government of Nunavut Department of Environment, Consultation report, Pond Inlet, NU. 86 pp.
- McCullough, D. R. 1994. What do herd composition counts tell us? *Wildlife Society Bulletin* 22:295-300.

Mysterud, A., T. Coulson, and N. C. Stenseth. 2002. The role of males in the dynamics of ungulate populations. *Journal of Animal Ecology* 71: 907-915.

Pretzlaw, T. 2016. 2015 Government of Nunavut North Baffin caribou fall composition/demographic survey. Government of Nunavut Department of Environment final report to Baffinland Iron Mines, Pond Inlet, NU, 5 pp.

Tobey, B. 2001. Caribou management report, Game Management Unit 13 and 14B. Pages 90-105 in: C. Healy, ed. Alaska Department of Fish and Game, Project 3.0, Juneau, AK.

Walsh, N. E., B. Griffith, and T. R. McCabe. 1995. Evaluating growth of the Porcupine caribou herd using a stochastic model. *Journal of Wildlife Management* 59: 262-272.

Williams, T. M., and B. Fournier. 1996. Summary of spring classification surveys of the Bathurst caribou herd. Government of the Northwest Territories Department of Resources, Wildlife and Economic Development, Manuscript Report 92, Yellowknife, NT. 60 pp.

### **Community consultation / Reporting**

A field summary report will be prepared and sent to NWMB and HTOs by February 2017. A comprehensive file report summarizing the results of this survey and corresponding Central and North Baffin caribou composition surveys will be written and submitted to the NWMB, Baffin HTOs, QWB and NTI by June 2018 following multiple composition assessments. This project will be discussed during future HTO consultations to gather advice from local hunters and elders, help identify high-grade areas to fly during aerial population assessments, and to discuss the implications of the results and how they can inform management decisions and the setting of a TAH.

### **Project Schedule**

<b>Activity</b>	<b>Start Date</b>	<b>Completion</b>	<b>Status</b>
Fall Composition	September 2016	September 2016	Complete
Report Current Status	February, 2017	February, 2017	Complete
Consultations	March 2017	Sept. 2017	On Going
Final Report	February 2017	February 2017	Complete