



Aerial Survey of Muskoxen (*Ovibos moschatus*) and Peary Caribou (*Rangifer tarandus pearyi*) on Northwest Victoria Island, April-May 2015

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ABSTRACT

A caribou and muskox strip transect survey was conducted on northwest Victoria Island between April 14th and May 6th, 2015. There were a total of 2,782 adult muskox (and 139 calves) seen on transect in all four strata surveyed yielding a population estimate of $14,547 \pm 2,593$ (95% confidence interval) non-calf muskox for the entire area surveyed. Two Peary caribou and 16 wolves were also observed.

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INTRODUCTION

Muskoxen (*Ovibos moschatus*) and Peary caribou (*Rangifer tarandus pearyi*) are important to Canadian high Arctic communities as a traditional food source and are iconic large mammal species in the region.

Peary caribou were assessed by the Committee on the Status of Endangered Species of Wildlife in Canada (COSEWIC) as Endangered in Canada in May 2004 and legally listed as Endangered under the Federal *Species at Risk Act* in February 2011. Peary caribou were recently reassessed by COSEWIC as Threatened. Peary caribou were assessed and listed under the *Species at Risk (NWT) Act* as Threatened in 2013.

Muskox is a species of local concern. The Olokhaktomiut Hunter's and Trapper's Committee of Ulukhaktok expressed concerns with the muskox populations near their communities, especially with the reports of disease on other areas of Victoria Island and nearby Banks Island (Kutz et al. 2015).

A caribou and muskox strip transect survey was conducted on northwest Victoria Island. The objective of the survey was to update the population estimate for muskox and Peary caribou with the last survey for this region conducted in July 2010 (Davison and Williams 2013). In 2015 the survey timing was changed so that Peary caribou could be counted separately from the Dolphin and Union herd (*R. t. groenlandicus x pearyi*). Peary caribou are found on Victoria Island year round while the Dolphin and Union herd migrates from their winter range on the mainland to summer on Victoria Island. The survey area covers only a portion of the Dolphin and Union herd's summer range, so a total count of that herd was not a goal of previous surveys. Muskoxen summer home ranges are larger than their winter home ranges and as they don't make long-distance seasonal migrations (Tener 1965, Gunn and Fournier 2000), we believe even with the change in survey timing we can compare trends of both muskox and Peary caribou in the study area between surveys.

A survey stratum on the Diamond-Jenness Peninsula, close to the community of Ulukhaktok, was added to the study area in 2015 (stratum D, Figure 1) to address the concerns of local harvesters who have noticed a decrease in the number of muskox in this area.

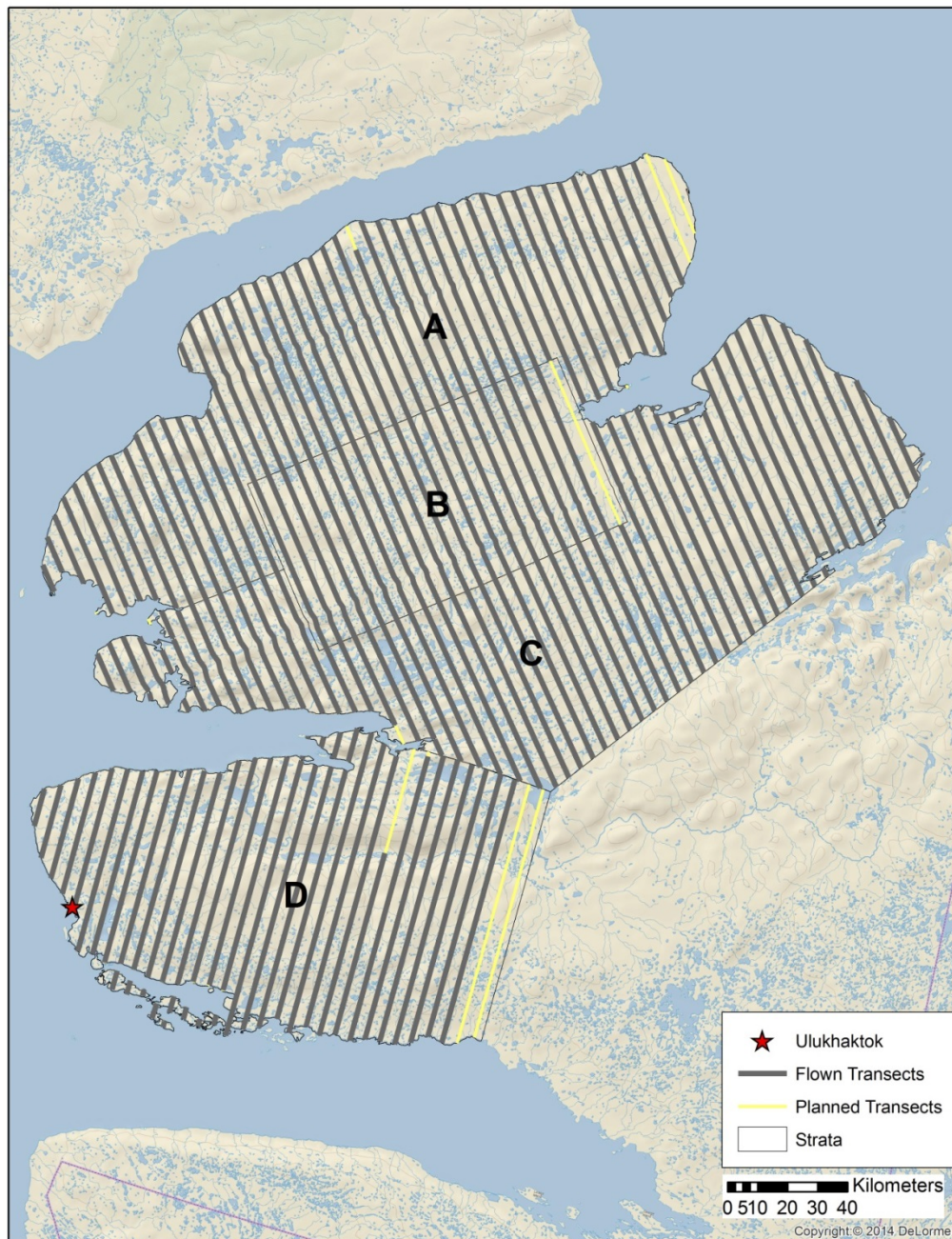


Figure 1. Survey strata and transects showing flown (grey) and planned transects that were not flown (yellow).

METHODS

Survey lines, spaced 5 km apart, were flown with a Pilatus Porter fixed-wing aircraft across the survey strata (Figure 1), for survey coverage of 20%. The survey crew consisted of a pilot, front right-seat recorder/navigator, back left-seat recorder and two to four community observers. Peary caribou and muskoxen within a 500 m strip on each side of the aircraft were considered “on transect”. The strip width was marked by flying at survey altitude over a measured 500 m distance on the ground and marking the aircraft windows. Observations beyond the 500 m markers were considered “off transect”. The survey was flown at an average altitude of 120 m above ground level and at an average speed of 160 km/hour.

Flight lines were saved as GPS track logs and all large mammal observations, on and off transect, were marked and saved to GPS by the recorders. Muskoxen observed were classified as adult or calves. Caribou observed were classified as mature bulls, cows/young bulls, or calves. Mature bulls were identified by their antlers, and cows and young bulls were grouped as distinguishing them from the aircraft is more difficult. Population estimates for adult Peary caribou and muskoxen were calculated using a ratio method for unequal-sized units sampled without replacement (Krebs 1999, *Ecological Methodology*, Version 7.0). Population estimates were only calculated for the adults because of the high variability of yearly productivity and higher mortality rate of animals in their first year. The adults-only population estimation is consistent with previous population estimates allowing trend determinations. A two-tailed *t*-test was used to determine if the population estimates of adult muskoxen and caribou were significantly different than the 2010 estimates (Gasaway et al. 1986).

RESULTS

The survey was conducted between April 14th and May 6th, 2015. The survey was delayed intermittently by weather; survey lines were flown April 14th to 27th and April 29th to May 6th. Between 21-30 April, only 4.9 hours were flown on two partial days due to high winds and blizzard conditions. The total flight time during the survey, including ferry flights, was 100.3 hours but only 54.5 hours were on-transect. Strata and transect lines flown are indicated in Figure 1. Two lines in stratum A, one line in stratum B and two full and a partial line in stratum D were not surveyed, slightly reducing the coverage of those strata from the planned 20% coverage to 19% coverage (Figure 1).

Although it was planned that there would be two observers and a recorder on each side of the aircraft, over the course of the survey, observer availability became an issue. Therefore, during some flights the recorder functioned as a recorder/observer to maintain two observers on both sides. Even with this arrangement we are confident in our sightability and don't believe animals were missed. The majority of the survey was flown with good visibility and ground snow cover made detecting animals easy.

There were a total of 2,782 adult muskox (and 139 calves) seen on transect yielding a population estimate of $14,547 \pm 2,593$ (95% confident interval (CI)) non-calf muskox. Location of muskox observations are indicated in Figure 2. There were 241 groups of muskox seen on-transect and herd size ranged from two to 45 muskoxen. The average group size on-transect was 12 muskox. Summaries of muskoxen observed by stratum are in Table 1. The density of muskox in the total area surveyed was 0.29 adults/km². There were 2,203 adults seen on transect in strata A, B and C giving a combined estimate for these strata of $11,150 \pm 1,867$ (95% CI) and a density of 0.31 adults/km². The density of stratum D was 0.24 adults/km² with 579 adults seen on transect and an estimate of $2,144 \pm 1,141$ (95% CI).

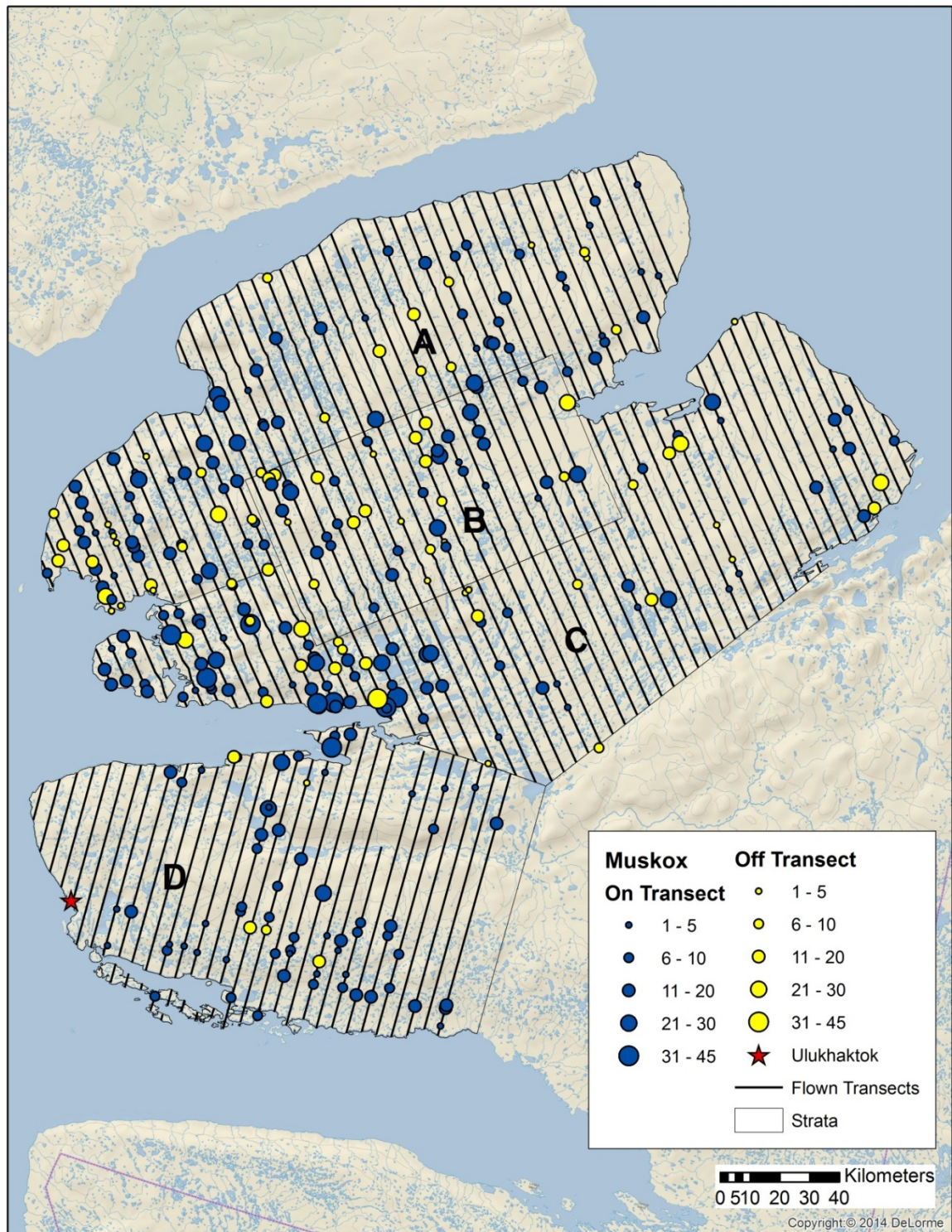


Figure 2. Location of muskox observed on and off transect during the survey.

Table 1. Summary of number of muskox observed on transect during the Northwest Victoria Island survey 2015, and resulting population estimates by survey stratum.

Stratum	Area (km ²)	Transects Sampled	Possible Transects	% Area Sampled	On transect		Adult Population Estimate	95% Confidence Interval	Density Muskox/km ²
					Adult	Calf			
A	14,069.7	53	246	19.22	769	36	4,001	1,065	0.28
B	6,726.4	21	110	18.89	397	33	2,102	758	0.31
C	15,935.1	77	279	19.72	1,037	46	5,259	1,292	0.33
ABC	36,731.2	151	635	19.76	2,203	115	11,150	1,861	0.31
D	13,080.2	31	165	18.42	579	24	2,144	1,141	0.24
Total	49,811.3	182	800	19.1	2,789	139	14,547	2,594	0.29

There was one group of two adult Peary caribou seen in stratum A and no population estimate was calculated due to insufficient data. Sixteen wolves were also observed. The locations of the caribou and wolf observations are indicated in Figure 3.

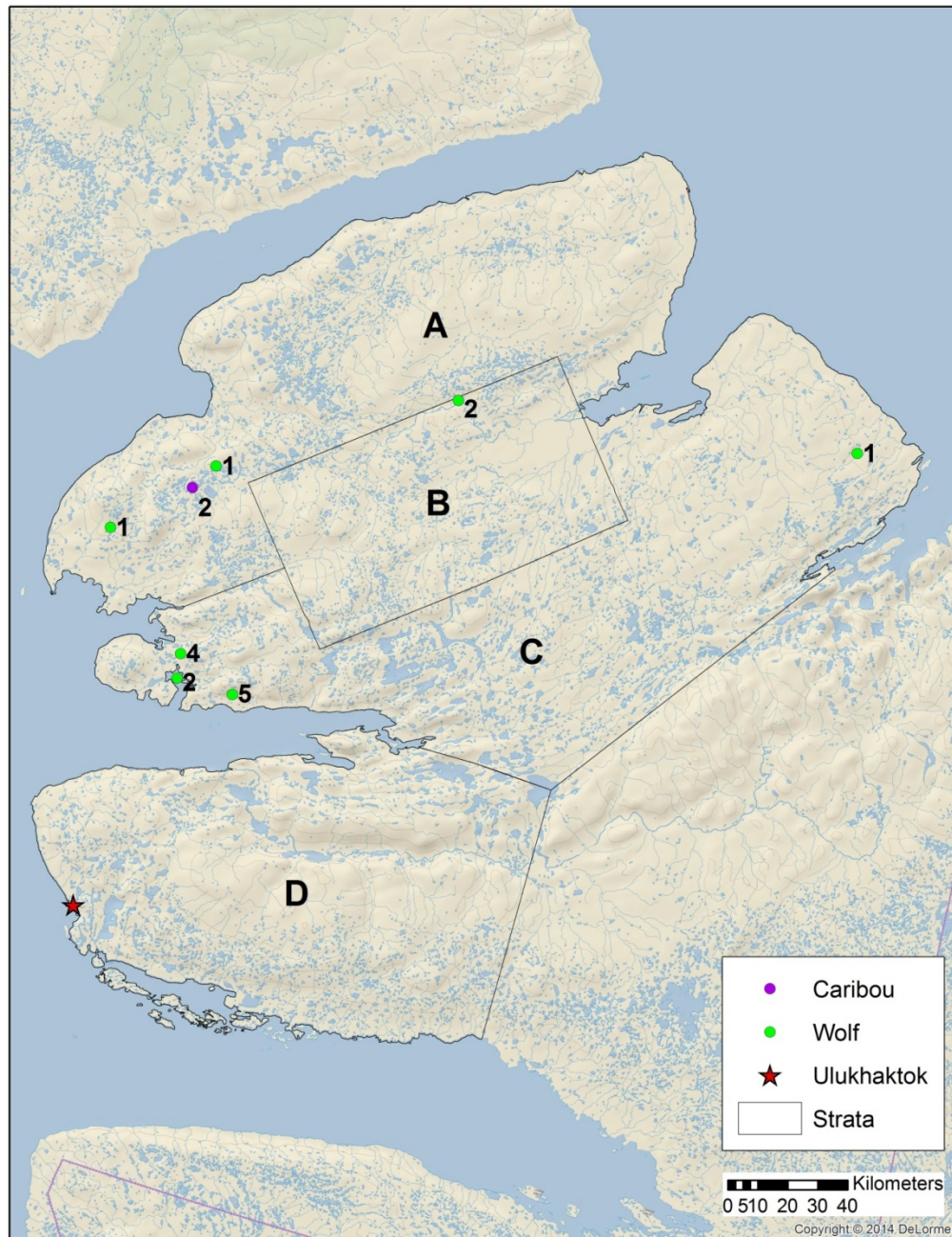


Figure 3. Location and number of Peary caribou and wolves observed during the survey.

DISCUSSION

Stratum ABC show a stable ($t=0.23$, $P<0.05$, $df=130$) number of muskox since the 2010 estimate of $11,442\pm1,637$ (95% CI) adult muskoxen (Davison and Williams 2013) (Figure 4). The density of survey strata ABC together was 0.31 adults/km². The density of stratum D for our survey was 0.24 adults/km². There is no trend information available for stratum D, as this is the first time this area has been surveyed in its entirety and only partially surveyed in 1992 (Heard 1992). The survey strata from the 1992 survey doesn't line up to the strata of this survey but density of the two 1992 strata that overlap with stratum D from this survey were 0.24 and 0.41 muskox/km². Additionally a high density survey stratum on the north side of Minto Inlet found 1.01 muskox/km² (Heard 1992). A survey in 1994 estimated a total of 19,989 (Standard Error 3,786) non-calf muskox in northwest Victoria Island; however, their survey area was slightly larger than ours (Nishi in Fournier and Gunn 1998). A lower muskox density was expected in stratum D based on comments from the community of Ulukhaktok. Comparatively, the density of muskox found on neighbouring Banks Island in summer 2014 of 0.20 adults/km².

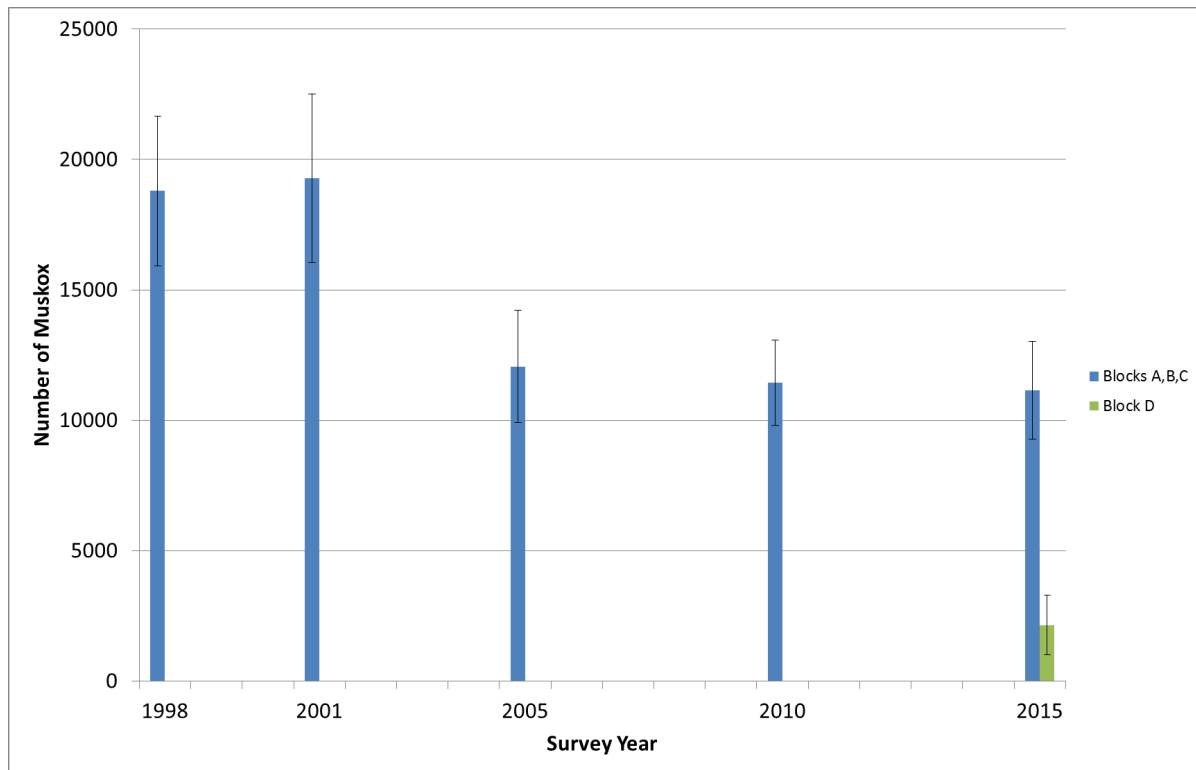


Figure 4. Population estimates for muskox on Northwest Victoria Island over time, with 1998-2010 surveys occurring in summer and the 2015 survey occurring in spring. (From Nagy et al. 2009a, Nagy et al. 2009b, Nagy et al. 2009c, Davison and Williams 2013.)

On the Nunavut side of Victoria Island, muskox population has declined substantially in recent years (LeClerc 2015). Densities of muskox were found to be 0.07 muskox/km² (stratum ranged from 0.06–0.13 muskox/km²) during surveys on the Nunavut side of the island in 2013 and 2014 (LeClerc 2015). Previous surveys had varied in scope, in 1999 a density of 0.5 muskoxen/km² was found on the southeastern part of Victoria Island (Gunn and Patterson 2000, reported in LeClerc, 2015). Dead muskoxen were found on Victoria Island in 2009, 2010 and 2011; mostly on the Nunavut side of the island (Kutz et al. 2015). In summer 2012, dead muskoxen were also reported on Banks Island. Samples from several carcasses were obtained and the bacteria *Erysipolethrix rhusiopathiae* was isolated in 2012 and 2013 (Kutz et al. 2015).

The low number of Peary caribou observed during this survey is unexpected and warrants further investigation. The number of adult Peary caribou estimated in 2010 was 150±104 (95% CI), based on the assumption using past satellite collaring data that during the

summer survey time period Peary caribou would be located in strata A and B (Davison and Williams 2013). An additional 430 ± 214 (95% CI) adult caribou were estimated in stratum C and assumed to be Dolphin and Union caribou (Davison and Williams 2013). As this is the first time that the survey was conducted in the spring, when Dolphin and Union caribou were not in the area, trend analysis was not possible. The number of Peary caribou on the adjacent Banks Island has increased in recent years (Davison et al 2017).

No wolves were observed this survey in the new strata, D. The 16 wolves observed this survey in the other three strata (A, B and C) was similar to number observed in the summer surveys of the same area; 18 adult wolves and one pup were observed in 2010 (Davison and Williams 2013) and 12 wolves were observed in 2005 (Nagy et al 2009c).

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