POPULATION ESTIMATES FOR PEARY CARIBOU AND MUSKOXEN ON BANKS ISLAND IN 1982

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INUVIK, NWT

1985

File Report No. 49

ABSTRACT

Only two population estimates of Peary caribou and muskoxen on Banks Island had been attempted during the 10 years prior to this survey. These surveys suggested that caribou numbers remained relatively stable over this period, while muskoxen underwent a rapid increase. The muskox estimates were the more reliable of the two; prior to the survey described here, caribou were estimated at 9-10,000 and muskoxen at 18-20,000. The present survey was a first attempt at a thorough reconnaissance of Banks Island followed by a stratified transect survey with more intensive coverage of concentrations of both caribou and muskoxen. The rlying was done at an optimum time of the year for observing both species. Survey conditions were ideal, and the entire project was conducted in the shortest possible time (10 days). Results suggest that in July 1982 there were 7233 ± 806 and 9393 ± 1054 non-calf of the year caribou and muskoxen, respectively, on Banks Island.

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INTRODUCTION

Surveys performed by Urquhart (1973) and Vincent (1979, 1980) provide the most reliable estimates of Peary caribou (Rangifer tarandus pearyi) and muskoxen (Ovibos moschatus) on Banks Island. Both authors achieved complete coverage of the island, although no attempt was made to allocate survey effort according to the distribution of caribou and muskox. Also, Vincent encountered poor observability of caribou during his surveys, a result mainly of the season (late winter) and the type of survey aircraft (De-Havilland Twin Otter). Urquhart estimated 11-12,000 caribou and 3,800 muskoxen in 1972, while approximately 8 years later Vincent estimated 8-9,000 caribou and 18-20,000 muskoxen. Estimates prior to Urquhart are considerably lower for both species, but these rely almost entirely on casual observations; therefore, their precision is questionable. However, it appears that both caribou and muskoxen have undergone substantial population increases during the last 50 years.

In response to this population increase, especially that of muskoxen, the NWT Wildlife Service and the Inuvialuit of Banks Island have intensified active management programs for both caribou and muskoxen.

There exists a concern that muskoxen may eventually have a deleterious effect on caribou if, at these high densities, they increasingly overlap with caribou habitat use and forage selection. Caribou are the traditional mainstay of the Inuvialuit and are the preferred species.

Enhancement management, such as organized harvest of muskoxen and monitoring of the subsistence harvest of caribou, demands that population data, including a reliable estimate of numbers, be current. This study was designed to estimate the populations of Peary caribou and muskoxen on Banks Island using a reconnaissance of the entire island, followed by intensive strip transect surveys of concentrations of both species detected in the reconnaissance.

MATERIALS AND METHODS

This study was conducted in July over the whole of Banks Island, with the major base of operations being Sachs Harbour (Fig. 1). July was decided upon as an optimum period because the light coloured Peary caribou would be readily visible against the snow-free ground and the likelihood of good flying weather would be the greatest. My original intention was to perform two separate surveys, one for each species. Preliminary reconnaissance would indicate areas of caribou and muskox concentration. I would then survey at high coverage (e.g., 25%), using strip transects, the areas where caribou were concentrated and exclude regions of the island where caribou were sparsely distributed or absent altogether. Immediately following the caribou survey, I planned an entire island muskox survey, wherein certain regions of exceptionally high muskox density would receive higher coverage (50%) than the remainder of the island (25%).

Reconnaissance was conducted along flight lines drawn on 1:250,000 topographic maps. A Cessna 185 aircraft flying at 120 m agl and an airspeed of approximately 170 kph was used during the entire study. Two observers were seated in the left and right rear seats of the aircraft, and a recorder/navigator in the right front. During the reconnaissance, the observers recorded all caribou and muskoxen sighted both inside and outside a 400 m wide strip on both sides of the aircraft, the edge of the strip being marked by strips of tape on the wingstruts (Norton-Griffiths 1978).

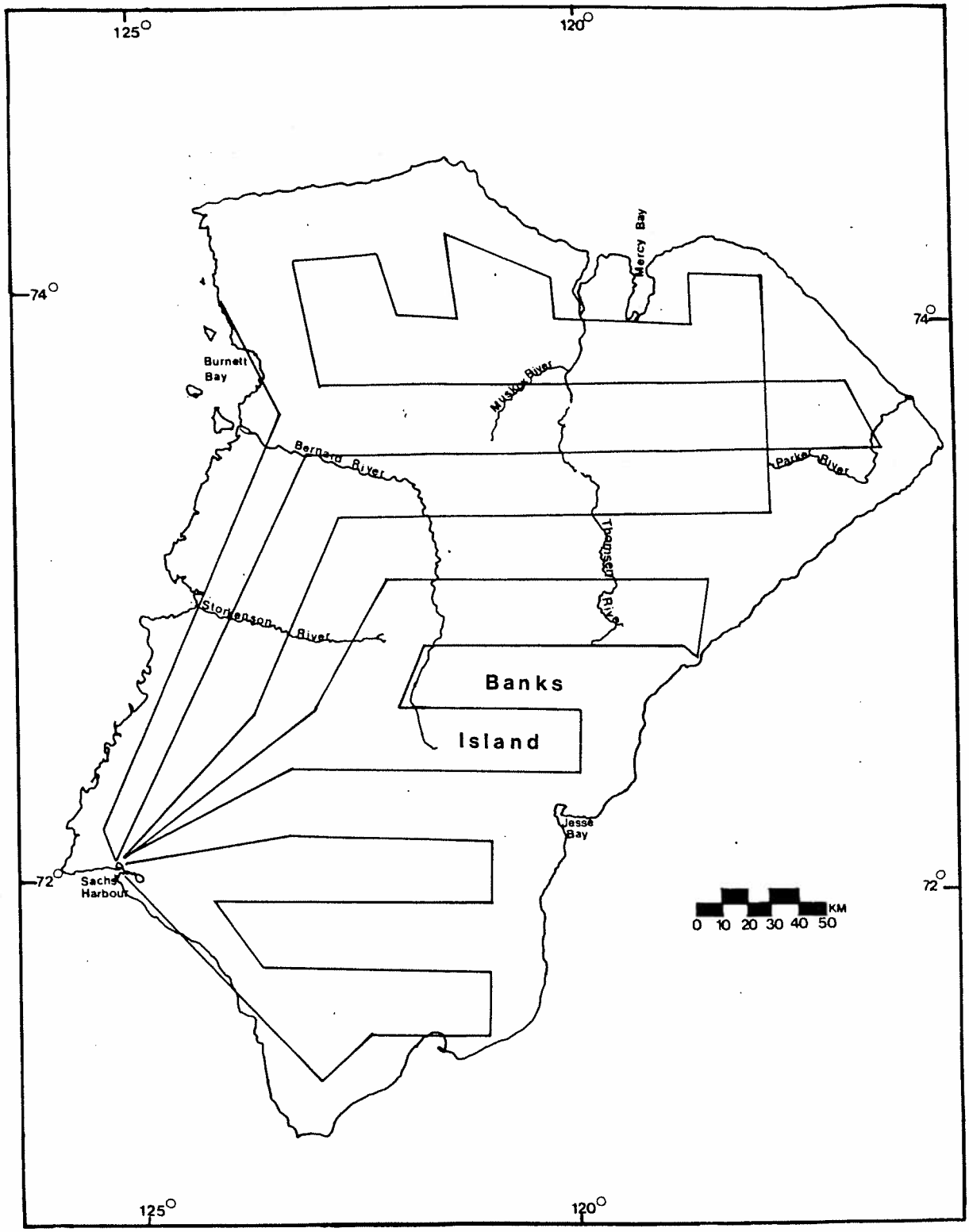

Figure 1. Reconnaissance flight lines over Banks Island during caribou and muskox survey in July 1982.

All sightings were recorded on the topographic maps by the recorder/navigator. When all reconnaissance was completed, the distribution of these plotted sightings was examined to determine the limits of caribou and muskox concentrations (hereafter called strata) on Banks Island.

During the reconnaissance, observability of caribou was good because their white winter pelage was still present. They were distributed over almost the entire island at varying densities. I, therefore, decided that, like muskoxen, coverage of nearly the entire island was a necessity for caribou, and decided to combine both surveys with stratification based on the observed densities of both caribou and muskoxen. Because of the good observability I also increased the strip width to 875 m on either side of the aircraft, resulting in fewer transects within each stratum.

Once the strata had been determined, transects were drawn within each stratum on 1:250,000 topographic maps. Spacing of transects varied depending on the coverage desired for each stratum. Coverage varied directly with density (12.5%, 25% or 50%). Each observer recorded all sightings of caribou and muskoxen within the strip on his respective side of the aircraft.

The population estimate for each species was determined by extrapolating from the total count within the strip area for each stratum to the total stratum area. The estimates for each stratum were then combined resulting in an estimate for Banks Island. Variance estimates for each stratum and the combined estimate were calculated using Jolly's (1969) method 2.

RESULTS

The reconnaissance was conducted during 2-4 July and the strip transect surveys during 4-10 July. Clear skies and warm temperatures (15°-18°C) characterized much of the survey period. Smoke from forest fires on the mainland reduced visibility to 10-12 km at the north end of Banks Island for the first few days of the field period.

Approximately 22 hours of flying effort were devoted to the reconnaissance, with the island being systematically covered in blocks from south to north (Fig. 1). The highest density of caribou, mainly cows with newborn calves, was located in the northwest portion of the island, in an area between Bernard River and the north coast (Table 1, Fig. 2). Caribou, once again mainly cows with newborn calves, were also concentrated in the high, rolling terrain immediately west of Jesse Bay. Approximately 3,600 and 1,600 non-calf caribou are estimated to have been in these areas, respectively. Only the extreme north-central and northeast regions of Banks Island appeared to be almost devoid of caribou. These areas were subsequently disregarded when delimiting survey strata (see Materials and Methods).

Muskox densities were highest in the lower reaches of the Thomsen and Muskox River Valleys (Table 2, Fig. 2). A smaller concentration of muskoxen was also found in the northeast region of Banks Island centered about Parker River. Approximately 3,600 and 2,000 non-calf muskoxen are estimated to have been in these areas, respectively. Muskoxen were distributed at a lower density

Table 1. Strata characteristics and caribou observations during stratified transect survey in 1982.

	Thomsen River	N.W. Banks Island	Central and South Banks Island	Strata combined
N	58	43	461	562
n	35	11	47	93
Z(km^2)	3232	5520	55755	64507
z	1962	1539	6489	9990
c	50%	25%	12.5%	--
y	79	893	519	1491
R	0.04	0.58	0.08	0.15
Y	133	3204	3896	7233
Var(Y)	832	383716	611268	650416
SE(Y)	29	619	782	998
CV	0.216	0.193	0.201	0.14

N = maximum number of transects
n = number of transects surveyed
Z = stratum area
z = area counted, km^2
c = coverage during transect survey
y = caribou counted
R = caribou density/km^2
Y = population estimate
Var(Y) = population variance
SE(Y) = standard error
CV = coefficient of variance

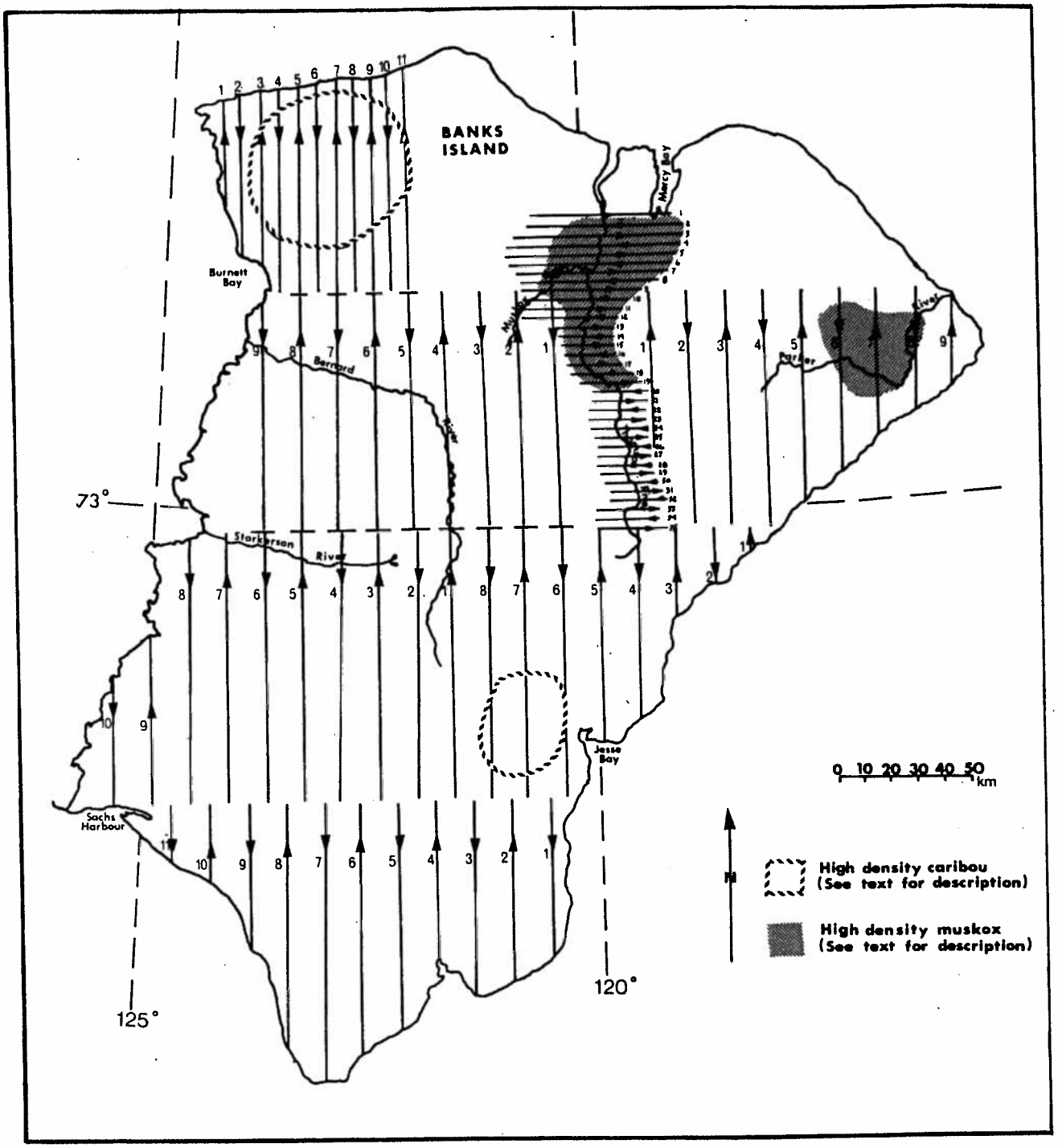

Figure 2. Areas of high caribou and muskox density and transect locations with indicated flight direction.

Table 2. Strata characteristics and muskox observations during stratified transect survey in 1982.

	Thomsen River	N.W. Banks Island	Central and South Banks Island	Strata combined
N	58	43	461	562
n	35	11	47	93
Z(km^2)	3232	5520	55755	64507
z	1962	1539	6489	9990
c	50%	25%	12.5%	--
y	1815	230	711	2756
R	0.93	0.15	0.08	0.27
Y	2990	825	5577	9393
Var(Y)	53581	74406	983403	1111390
SE(Y)	231	273	782	1054
CV	0.077	0.331	0.201	0.11

N = maximum number of transects
n = number of transects surveyed
Z = stratum area
z = area counted, km^2
c = coverage during transect survey
y = caribou counted
R = caribou density/km^2
Y = population estimate
Var(Y) = population variance
SE(Y) = standard error
CV = coefficient of variance

throughout the remainder of the island and, similar to caribou, were least common in the flat, wet, central third of the island drained by the Thomsen, Bernard and Storkerson Rivers.

On the basis of the observed densities of caribou and muskoxen and logistical considerations, three strata were established (Fig. 3): northwest Banks Island, Thomsen and Muskox River valleys and the remainder of the island. These strata received 25%, 50% and 12.5% coverage, respectively.

Approximately 43 hours of flying effort were allocated toward transect surveys within the three strata. A total of 1,791 caribou and 2,756 muskoxen were observed in all strata, which extrapolates to 7,233 (S.E.=998) non-calf caribou and 9,393 (S.E.=1,054) non-calf muskoxen on Banks Island. Average group size was highest in the strata having the highest density of each species (Table 3). Group size ranged from 1-42 and 1-40 for caribou and muskoxen, respectively, over the entire island. A group was difficult to define when a single individual was sighted over a short distance (i.e., 100 m) from several closely spaced individuals. In this study, such a case was considered as two separate groups. In the majority of cases, however, both caribou and muskox were clumped enough that group definition was not difficult.

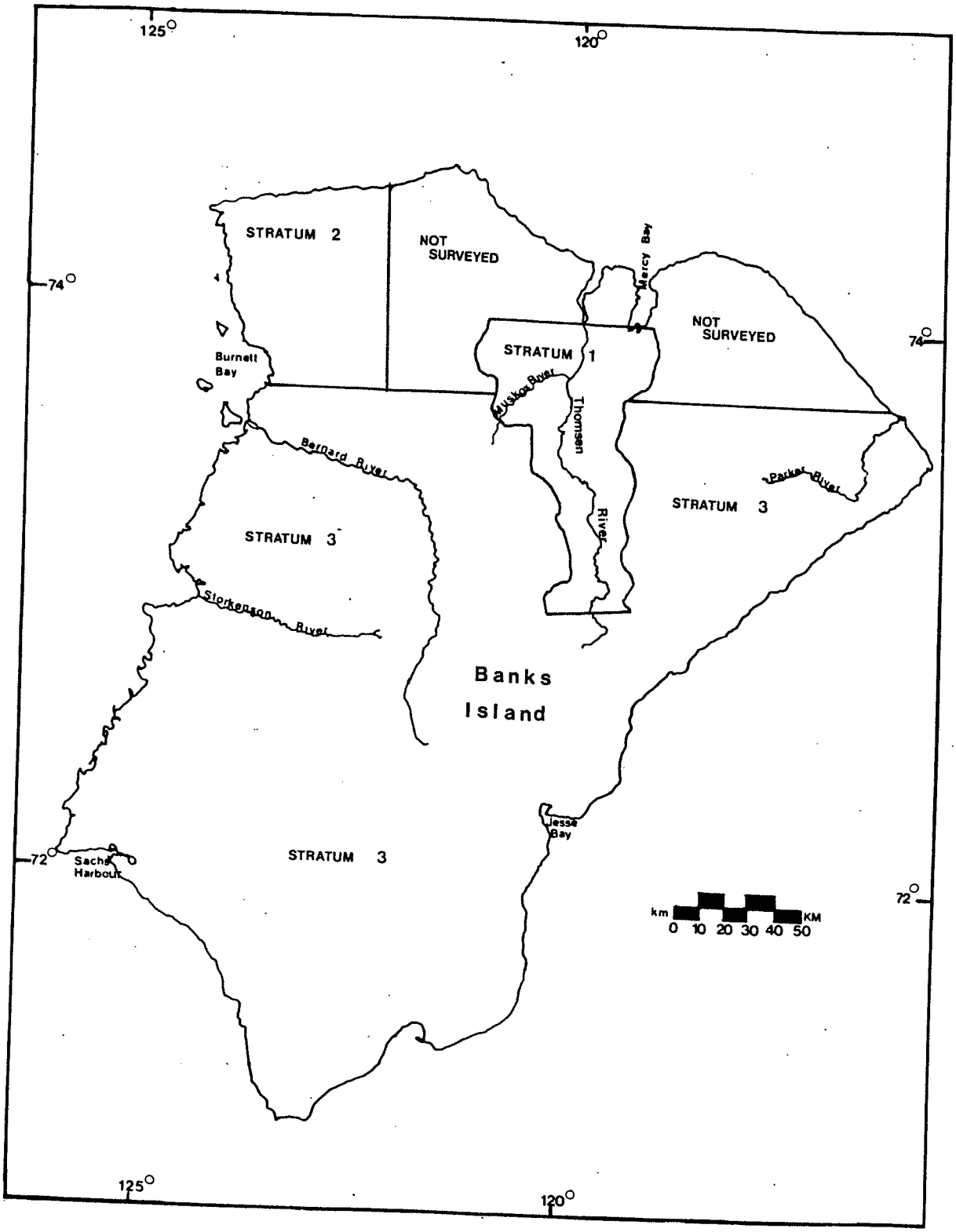

Figure 3. Locations of Strata 1-3.

Table 3. Average group size and density of non-calf caribou and muskoxen in each stratum.

	N.W. Banks Island	Thomsen River	Central and South Banks Island
Caribou			
$\bar{x}$ group size	6.4±2.5(n=141)	2.8±1.7(n=28)	2.7±1.7(n=171)
density	0.58	0.04	0.08
Muskox			
$\bar{x}$ group size	4.5±2.2(n=51)	6.4±2.5(n=286)	4.8±2.2(n=145)
density	0.15	0.93	0.08

DISCUSSION

Caribou

The results for caribou are in general agreement with the few extensive surveys of caribou on Banks Island. In July, Urquhart (1973) found a major concentration of caribou, mainly cows with newborn calves, in the northwest section of the island between the north coast and Burnett Bay. He also recorded a concentration of caribou, once again mainly cows with newborn calves, in the area immediately west of Jesse Harbour. Few caribou were seen by Urquhart in the Thomsen and Muskox River Valleys. In contrast to Urquhart, we did not see a concentration of caribou in the vicinity of Mercy Bay on the north coast.

The population estimate of this study is close to Vincent's (1980) tentative conclusion of 8-9,000 caribou on Banks Island. Although Urquhart estimated a population of 11-12,000 caribou in 1972, he evidently was including calves of the year in his estimate. If I were to include calves of the year, my estimate for July 1982 would be in the vicinity of 10,000 caribou. Also, Urquhart did not state confidence limits, which introduces the possibility of considerable overlap between his overall estimate (adults plus calves) and that of the present study.

Muskox

The population estimate for muskoxen on Banks Island is much lower than that determined by Vincent and Gunn (1981), who arrived at 18-20,000 non-calf muskoxen for the entire island. Major

differences occur between their results and those of this study in both distribution and densities. Two large areas where Vincent indicated high concentrations of muskoxen, namely the mountainous, north-central region of the island and the Parker River drainage in the northeast, appeared to contain far fewer muskoxen during this study. After extensive reconnaissance, I was confident enough in the lack of muskoxen that I excluded this north-central region from the strip transect surveys.

Strict comparisons between Vincent's (1980) densities in his three "post-survey strata" for the north half of Banks Island (0.73, 6.2 and 4.9/km^2), and his 1979 south-half density are all considerably higher than the overall density for all of Banks Island in this study (0.27/km^2). Thus, Vincent not only describes muskoxen being more widely distributed, but it also appears that the densities of muskoxen in roughly the same areas on Banks Island were higher in March 1979 and 1980 than July 1982.

No apparent evidence of severe muskox mortality was observed during the present study. Carcasses were noted during the survey, especially in the lower Muskox and Thomsen River valleys. Approximately 30 carcasses were seen altogether, with the majority being in the aforementioned areas. After the survey was completed, we returned to the Muskox and Thomsen Rivers and examined carcasses near which we could land. The seven carcasses examined varied from very recent death (1 week) to probably 1.5 years ago. Most were in an advanced state of decay, thus I was not able to discern the condition of the animal or possible cause

of death. The one recent death was in poor condition as evidenced by the pink, gelatinous marrow.

Thomas (pers. comm.) believes that aerial detection of carcasses may not necessarily be a reliable indicator of high mortality in muskoxen. Many carcasses could go unnoticed because of blending with the ground or the locations where animals died (often narrow draws and creek bottoms). Thomas found that in 1974 the marked die-off of muskoxen on Melville Island did not manifest itself by an inordinate number of carcasses observable from the air or even in ground searches of the area.

Reasons for the apparent decline of muskoxen on Banks Island remain unclear. Both the 1979-80 and 1982 surveys were extensive enough, and free from obvious biases, to dispell any serious doubt about either. The observers in both surveys either had experience in aerial surveys or were local people experienced at visually locating caribou and muskoxen on Banks Island.

It is not likely that behaviour of muskoxen, such as south to north movement between 1979 and 1980, could have resulted in a double counting of animals (Tener 1965, Jingfors 1980), although this cannot be rejected categorically. Muskoxen are reported to cross Prince of Wales Strait between Banks and Victoria Island, but the number of animals involved remains unknown. The possibility exists, therefore, that muskoxen from Banks Island, especially in the high density area around the Parker River, could have migrated to Victoria Island.

ACKNOWLEDGEMENTS

Thanks go to Evelyn Krutko, NWT Wildlife Officer, and Les Raddi of Sachs Harbour for their reliable observing and recording during this entire study. Jeff Mahoney, Aklak Air Ltd., provided proficient piloting during the study. Numerous residents of Sachs Harbour provided help and displayed extra interest during our work, especially Floyd Sidney, Ernest Poliak, and Peter Esau. Graham Baird, NWT Wildlife Officer, provided assistance during the carcass examination after the survey was completed. Ron Graf and Ray Case, Department of Renewable Resources, adapted and tested the survey technique for Banks Island.

PERSONAL COMMUNICATIONS

Thomas, Don. Canadian Wildlife Service, Edmonton, Alberta

LITERATURE CITED

Jingfors, K. 1980. Habitat relationships and activity patterns of a reintroduced muskox population. Unpubl. M.Sc. thesis, Univ. of Alaska, Fairbanks, Alaska.

Jolly, G.M. 1969. Sampling methods for aerial censuses of wildlife populations. E. Afr. Agric. For. J. 34: 46-49.

Norton-Griffiths, M. 1978. Counting animals. Serengeti Ecological Monitoring Programme Handbook No. 1.

Tener, J. 1965. Muskoxen in Canada. Can. Wildl. Serv. Monog. Queen's Printer, Ottawa. 166 pp.

Urquhart, D.R. 1973. Oil exploration and Banks Island Wildlife. NWT Game Manage. Div. unpubl. rep. Yellowknife, NWT.

Vincent, D. 1979. South Banks Island muskox/caribou survey. NWT Wildl. Serv. unpubl. rep. Tuktoyaktuk, NWT.

Vincent, D. 1980. North Banks Island muskox/caribou survey. NWT Wildl. Serv. unpubl. rep. Tuktoyaktuk, NWT.

Vincent, D. and A. Gunn. 1981 Population increase of muskoxen on Banks Island and implication for competition with Peary caribou. Arctic 34(2): 175-179.

Appendix A. Transect data for Banks Island caribou and muskox survey 1982.

Transect number	Length (km)	Area (km^2)	Muskox count	Caribou count	Density muskox	Density caribou
Stratum 1						
1	57.9	101.4	111	0	1.09	0.0
2	57.9	101.4	163	0	1.61	0.0
3	58.5	102.4	161	1	1.57	0.01
4	57.4	100.4	147	0	1.46	0.0
5	53.7	94	72	3	0.77	0.03
6	51.6	90.3	61	0	0.68	0.0
7	44.6	78	51	5	0.65	0.06
8	40.1	70.2	90	2	1.28	0.03
9	40.1	70.2	57	6	0.81	0.09
10	40.1	70.2	166	4	2.36	0.06
11	39.5	69.2	136	0	1.97	0.0
12	44.6	78	73	0	0.94	0.0
13	44.6	78	102	1	1.31	0.01
14	22.3	39	97	0	2.49	0.0
15	22.3	39	44	0	1.13	0.0
16	22.3	39	26	1	0.67	0.03
17	22.3	39	5	2	0.13	0.05
18	22.3	39	1	1	0.03	0.03
19	22.3	39	24	0	0.62	0.0
20	22.3	39	31	0	0.79	0.0
21	22.3	39	31	1	0.79	0.03
22	22.3	39	29	0	0.74	0.0
23	22.3	39	2	2	0.05	0.05
24	22.3	39	32	0	0.82	0.0
25	22.3	39	1	2	0.03	0.05
26	22.3	39	15	1	0.38	0.03
27	22.3	39	44	0	1.13	0.0
28	22.3	39	15	21	0.38	0.54
29	22.3	39	5	0	0.13	0.0
30	22.3	39	2	13	0.05	0.33
31	22.3	39	21	1	0.54	0.03
32	22.3	39	0	6	0.0	0.15
33	22.3	39	0	2	0.0	0.05
34	22.3	39	0	0	0.0	0.0
35	22.3	39	0	10	0.0	0.26

Appendix A continued

Transect number	Length (km)	Area (km^2)	Muskox count	Caribou count	Density muskox	Density caribou
Stratum 2						
1	46.9	82	0	0	0.0	0.0
2	64.9	113.5	0	11	0.0	0.10
3	69.3	121.3	2	20	0.02	0.16
4	83.3	145.9	40	109	0.27	0.75
5	85.0	148.8	30	43	0.20	0.29
6	87.3	152.7	77	153	0.50	1.00
7	87.3	152.7	49	147	0.32	0.96
8	87.3	152.7	10	133	0.07	0.87
9	87.3	152.7	21	175	0.14	1.15
10	89.1	156	0	56	0.0	0.36
11	91.6	160.3	1	46	0.01	0.29
Stratum 3						
1	66.9	117	19	5	0.16	0.04
2	82.5	144.3	14	2	0.10	0.01
3	98.1	171.6	2	4	0.01	0.02
4	98.1	171.6	0	5	0.0	0.03
5	98.1	171.6	35	6	0.20	0.03
6	98.1	171.6	8	37	0.05	0.22
7	97.5	170.6	42	9	0.25	0.05
8	97.5	170.6	26	10	0.15	0.06
9	96.5	168.9	0	15	0.0	0.09
10	32.9	57.5	39	0	0.68	0.0
11	96.9	169.6	83	4	0.49	0.02
12	100.0	173.2	18	8	0.10	0.05
13	97.3	170.2	19	34	0.11	0.20
14	97.8	171.2	13	36	0.08	0.21
15	81.1	142	10	18	0.07	0.13
16	69.1	121	46	1	0.38	0.01
17	53.5	93.6	35	0	0.37	0.0
18	46.9	82	15	8	0.18	0.10
19	17.8	31.2	0	0	0.0	0.0
20	8.8	15.4	0	1	0.0	0.06
21	22.3	39	0	3	0.0	0.08
22	35.3	61.8	0	19	0.0	0.31
23	80.5	140.8	6	66	0.04	0.47
24	91.1	159.5	0	32	0.0	0.20
25	113.5	198.7	2	50	0.01	0.25
26	113.5	198.7	0	22	0.0	0.11
27	113.5	198.7	0	6	0.0	0.03
28	113.7	199	0	2	0.0	0.01
29	113.7	199	0	1	0.0	0.01
30	113.7	199	18	1	0.09	0.01

Appendix A continued

Transect number	Length (km)	Area (km^2)	Muskox count	Caribou count	Density muskox	Density caribou
Stratum 3 continued						
31	113.7	199	34	1	0.17	0.01
32	112.6	197	59	0	0.30	0.0
33	58.6	102.5	46	0	0.45	0.0
34	71.7	125.4	4	0	0.03	0.0
35	54.2	94.9	1	0	0.01	0.0
36	66.9	117	9	6	0.08	0.05
37	76.3	133.6	3	41	0.02	0.31
38	82.1	143.7	0	7	0.0	0.05
39	73.0	127.7	8	0	0.06	0.0
40	96.2	168.3	4	0	0.02	0.0
41	105.7	185	15	6	0.08	0.03
42	118.0	206.5	57	5	0.28	0.02
43	103.7	181.4	16	0	0.09	0.0
44	60.9	106.5	3	0	0.03	0.0
45	33.7	58.9	1	0	0.02	0.0
46	24.3	42.5	1	0	0.02	0.0
47	11.4	20	0	0	0.0	0.0