ABUNDANCE AND DISTRIBUTION OF MUSKOXEN IN CENTRAL KEEWATIN, NWT, NOVEMBER 1985

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ABSTRACT

A systematic transect survey for muskoxen was carried out in the central Keewatin between 11 and 13 November 1985. The study area was bounded by Dubawnt Lake in the west, Yathkyed Lake in the east, the Kazan River in the south, and the Kunwak River in the north. A total of 318 muskoxen were observed, 258 on and 60 off transect. From the muskoxen observed on transect we obtained a population estimate of 1262 $\pm$ 563 S.E. muskoxen for the study area. We feel, however, that this estimate is probably high due to the low coverage of the survey and the clumped distribution of the muskox herds. Calves represented 17.9% (57/318) of the muskoxen observed. The mean herd size was 19.75 $\pm$ 23.02 S.D., with a range of 2-65 muskoxen. A quota increase of 20 muskoxen is recommended for Muskox Management Area J/1-1. Further surveys including the north part of the study area and the area north of the Kunwak River are also recommended.

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INTRODUCTION

In late 1983 and early 1984 the Keewatin Wildlife Federation (KWF) requested a muskox quota which could be distributed amongst the coastal communities in the Keewatin. The request was based on the demand for muskox meat primarily by older Inuit who had harvested muskoxen when they were younger and living inland.

No organized muskox surveys had been conducted in the Muskox Management Areas close to the coastal communities (H/1-4 and J/1-1), so no data was available to assess quotas in these areas. However, a survey conducted in 1982 north of Garry Lakes in the Queen Maud Gulf area had documented an expanding population (Gunn and Case 1984). Based on this information a quota increase of 10 muskox tags was granted to KWF in the area north of Garry Lakes (Muskox Management Area H/1-3) (Fig. 1).

Although it was a very long distance, hunters from the coastal communities did travel to the area to hunt muskox (Toews pers. comm.). KWF, however, requested that areas closer to the coastal communities be surveyed to determine if the quota could be moved to a more accessable area. Reports from the Keewatin communities suggested that the number of muskoxen was increasing in the area southwest of Baker Lake.

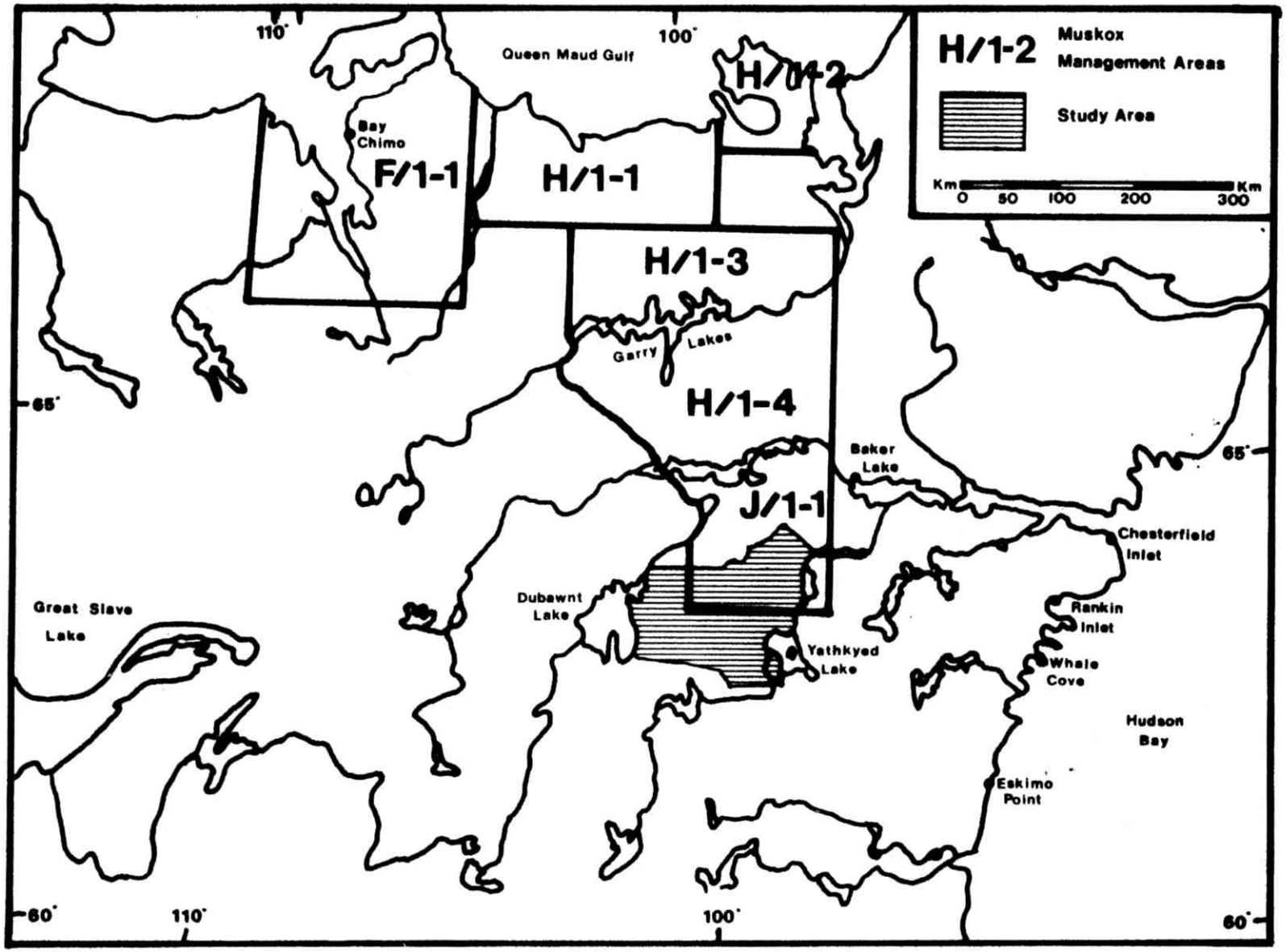

Figure 1. Map of Keewatin Region showing existing Muskox Management Areas and the area surveyed, November 1985.

During the period 11 to 13 November 1985, an unstratified transect survey for muskoxen was conducted in the area between Dubawnt and Yathkyed lakes, South of the Kunwak River and North of the Kazan River (Fig. 1). The objectives were to obtain a current estimate of the number of non-calf muskoxen in the area, to document the current distribution of muskoxen, and to record the productivity of the population.

METHODS

The area to be surveyed was determined from maps prepared by the Department of Renewable Resources in Rankin Inlet based on discussions with local Hunters' and Trappers' Associations (HTAs). These maps indicated areas where hunters had reported seeing muskoxen during the past 10 years. The size of the study area was limited by the funding for the survey, so it was decided to concentrate on the area thought to be the southern and eastern edge of the muskox distribution in the Keewatin. In this way we hoped to delineate the muskox population which could withstand a harvest of at least 10 animals and was most accessible to the coastal communities.

In order to cover the largest area possible an unstratified transect survey was conducted. Based on a muskox survey conducted on Victoria Island in August 1983, we felt coverage of approximately 15% would provide an estimate with reasonable precision. Jingfors (1985) surveyed 9.7% of his low density area and obtained a Coefficient of Variation of 12.0%. Other surveys have not been as precise. A survey conducted south of Queen Maud Gulf in July 1982 covered only 3.4% of the study area and resulted in an imprecise estimate (C.V.=22.9%) (Gunn and Case 1984). Coverage of 9.4% of the low density stratum in March 1983 also resulted in an imprecise estimate (C.V.=30.4%) (Case

and Poole 1985). As we had no information on muskox distribution within the study area we could only hope that the distribution would be relatively even.

The survey was conducted with a Cessna 337 aircraft based out of Baker Lake. Wooden doweling wrapped with black electrical tape was used as wing markers on the struts of the aircraft to delineate the survey strip. These were set up on the ground as described by Norton-Griffiths (1978). Upon the completion of the survey the markers were checked from the air by flying at survey altitude over the runway in Baker Lake. The transect width was determined by using the runway markers on the Baker Lake airstrip. After repeated passes it was determined that the right markers delineated a distance of 1.0 km. while the left markers delineated a distance of 1.28 kms. The transect width of 2.28 kms. was, therefore, used for the calculation of the population estimate.

We flew at an altitude of 185m. (600 ft.) and counted muskoxen within the 2.28 km. wide transect. Muskoxen outside the transect were also recorded. Photographs were taken of any group, on or off transect, over 10 muskoxen. Accurate counts were then obtained from these photographs in the office.

The transects were laid out by randomly selecting one transect in the study area then laying out the remaining transects at 15 km. intervals. The transects were flown

east-west in order to minimize ferry time. If at all possible, ferry flights were flown close to survey altitude east of the study area. In this way we could determine if we were missing any muskox concentrations east of the Kazan River.

The survey crew consisted of three persons for two days of the survey and four persons on the third day. The pilot was responsible for navigating along the transect lines and recording muskox sighting locations on a 1:250,000 map. Observers were in the left rear and right front seats, except on the third day when an observer was also in the right rear seat. The person in the front right seat also recorded any sightings on transect data sheets and photographed the larger herds.

RESULTS

A total of 17 hours and 30 minutes, including ferry time to and from the study area, were flown between 11 and 13 November 1985. Twelve transects totalling 1452 kms. were flown, representing a coverage of 16.8%. The most northerly transect, number 1, was not flown as it was very short and would have required additional ferry time (Fig. 2).

During the survey 262 non-calf muskoxen were observed on and off transect. Of these 212 were on transect and 49 were off (Appendix A). From the muskoxen observed on transect we calculated an estimate of 1262 $\pm$ 563 S.E. muskoxen for the study area (Table 1). The observed density was 0.06 muskox/km^2. All of the muskoxen observed were located in the north-east portion of the study area (Fig. 2). No muskoxen were observed during ferry flights east of the Kazan River. In general they were located on higher, wind swept ground, however, with the snow cover it was difficult to determine the vegetation and in some cases the relief.

In addition to the 212 non-calf muskoxen recorded, 57 calves were counted (Appendix B). This represents 17.9% (57/318) of the total number of muskoxen observed. The mean herd size, based on 16 herds observed, including calves but excluding two lone bulls, was 19.75 $\pm$ 23.02 (S.D.), with a

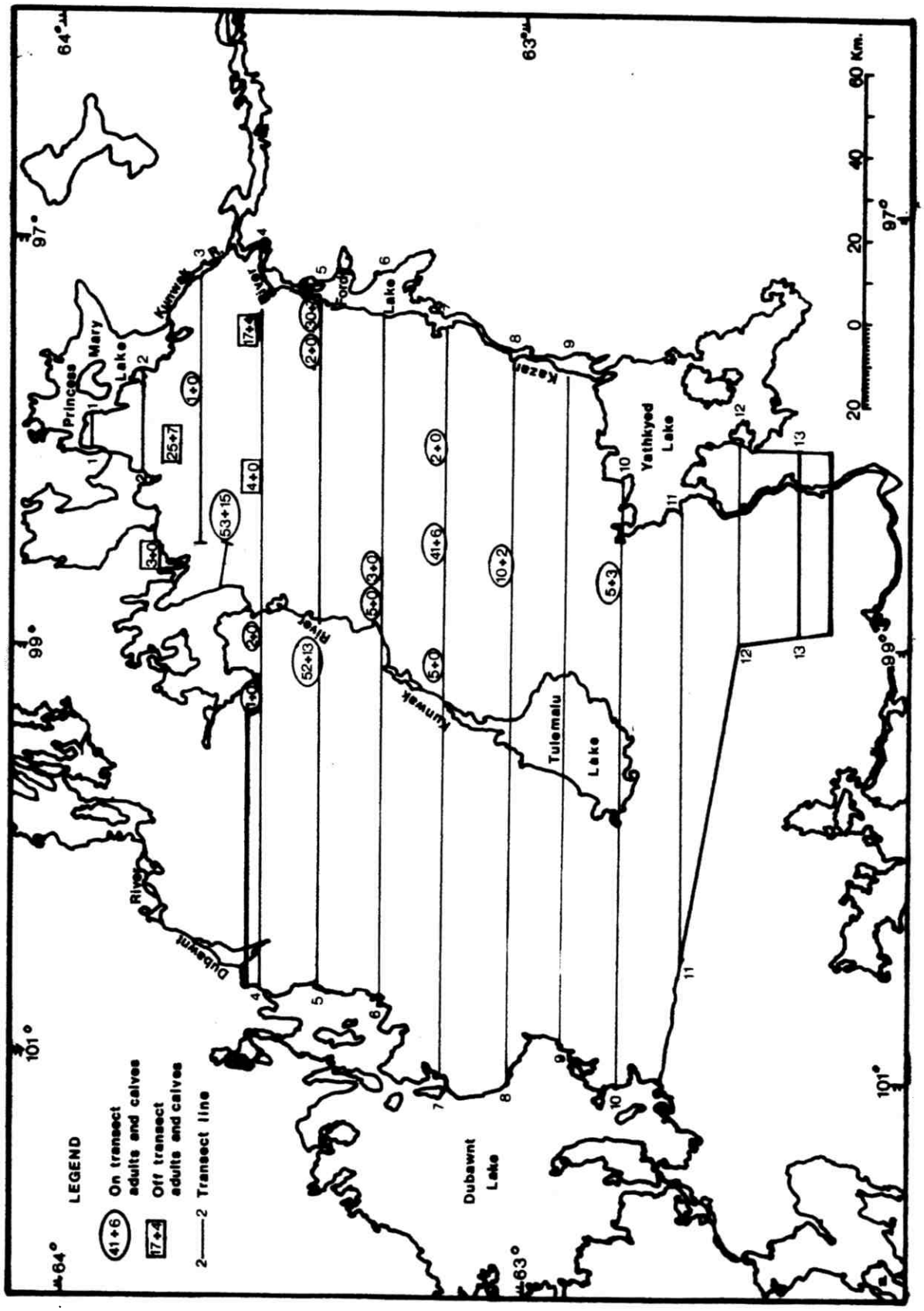

Figure 2. Transect lines and distribution of muskox herds in Central Keewatin, November 1985.

Table 1. Analysis of data from the transect survey of muskoxen in Cental Keewatin, November 1985.

Stratum area - km^2 (Z)	19706
Area surveyed - km^2 (z)	3310
Maximum number of transects (N)	77
Number of transects surveyed (n)	12
Number of muskox counted (y)	212
Population estimate $(Y)_2$	1262
Muskox density - per km^2 (R)	.06
Population variance (Var,Y)	317376
Population standard error (SE,Y)	563
Coefficient of variation (CV)	.446
90% Confidence interval (CI)	±1012

range of 2-68. Lone bulls or bulls in bull only groups made up 4.4% (14/318) of the muskoxen observed.

Two to four photographs were taken of each of six herds. The photographs were taken while the herds were moving to increase the separation between the animals and decrease the chance of missing calves. In all six cases the visual estimate was lower than that obtained from the photographs (Table 2). Overall the visual estimates were 27.4% lower than the photo counts.

Table 2. Comparison of visual and photographic counts of muskox herds observed in the study area, November 1985.

	Visual Count	Photographic Count	Difference (Vis-Photo)	% Difference
	45	68	-23	33.8%
	27	32	-5	15.6%
	20	21	-1	4.8%
	51	65	-14	21.5%
	28	37	-9	24.3%
	25	47	-22	46.8%
TOTALS	196	270	-74	27.4%

DISCUSSION

Survey conditions encountered during this survey were variable. On 11 November we encountered thick ice fog which made navigation impossible. We were forced to return to Baker Lake after flying only two transects (2 and 3). Some ice fog was encountered on the following two days but it was not as thick and we were able to navigate through it. Visibility was reduced somewhat but we were confident that we could see to the edge of the transect.

With the 90-100% snow cover the visibility of muskox was excellent. Some rocks were showing through the snow but not enough to influence muskox identification. Any possible sightings were either checked with binoculars or by deviating from the transect to circle the area.

A number of factors have to be considered when evaluating the estimate obtained by this survey. The lack of precision is illustrated by the relatively high Coefficient of Variation (44.6%). This imprecision is due primarily to the lack of stratification, the low coverage of the survey and the clumped distribution of the muskox herds. Similar imprecision resulted in the low density stratum of a muskox survey conducted south of Queen Maud Gulf (Gunn and Case 1984) which also had low coverage and a clumped herd distribution.

The solution to this problem is stratification and increased survey effort. As mentioned in the methods these were consciously compromised in this survey to allow coverage of a larger area.

No previous estimates have been made for the study area. The figure of 200-300 animals has been used in the past. It was based on incidental observations made between 1978 and 1982 during reconnaisance type surveys for the Northern Land Use Information Series (NLUIS) Program (Decker pers.comm.).

The distribution of muskoxen observed during this survey is essentially the same as that documented by the NLUIS Program. Neither survey located any muskoxen east of the Kazan River. Both NLUIS and the Keewatin HTAs did report sightings southwest of Yathkyed Lake but no muskoxen were observed in the area during this survey possibly due to the low survey coverage.

Two reasons for the apparent lack of range expansion can be surmised. One is that the habitat east and south of the study area is not suitable for muskoxen. The other is that the density of muskoxen in the area has not reached the level which promotes migration. No studies have been conducted on muskox habitat requirements or on the effects of density on dispersal of muskoxen.

A quick comparison with other mainland populations does not provide any insight into this question. The observed

density of 0.06 muskox/km^2 lies between the overall density of 0.17 muskox/km^2 found south of Queen Maud Gulf (Gunn and Case 1984) and the 0.03 muskox/km^2 found north of Great Bear Lake (Case and Poole 1985). Both the latter populations are expanding.

The proportion of calves in the population recorded during this survey (17.9%) is higher than the 16.8% calves found on Banks Island in July 1985 (McLean et al. in prep.), the 15.6% calves found on Victoria Island in August 1983 (Jingfors 1985), and the 13.5% calves found in the Queen Maud Gulf area in July 1982 (Gunn and Case 1985). Dramatic population increases have been documented in all of these areas. This leads us to believe that the muskox population is increasing in the study area as well.

The large average herd size observed is consistant with those recorded by other winter surveys (Case and Poole 1985, Carruthers and Jakimchuk 1981, Kelsall et al. 1971, Miller et al. 1977). This survey is unique, however, in that it was conducted in early winter as opposed to the late winter, suggesting that the large winter herds form prior to November.

The results of the visual - photograph comparisons illustrate the difficulty observers have in accurately determining the number of animals in a large, tightly bunched herd. The results also illustrate the value of spending the effort to obtain good photographs of the herds.

RECOMMENDATIONS

In light of the imprecision of this estimate we chose to be conservative and use the figure of 1000 non-calf muskox for the purposes of evaluating quotas.

A new muskox quota of 20 muskoxen for Muskox Management Area J/1-1 should be allocated to the Keewatin Wildlife Federation for distribution amongst the Keewatin coastal communities of Eskimo Point, Whale Cove, Rankin Inlet, Chesterfield Inlet, and Repulse Bay. No sex distinction need be placed on these tags. This would bring the total quota for area J/1-1 to 23 animals or about 2.3% of the adjusted population estimate.

A stratified survey of the north part of area J/1-1, including the area where most of the muskoxen were observed in 1985, and all of area H/1-4 should be conducted at the soonest opportunity. This would allow us to delineate more accurately the muskox population being harvested and possibly to adjust the quota in area H/1-4 to a level in line with the management areas to the north and south.

ACKNOWLEDGEMENTS

We wish to thank Jim Bennett, from Landa Aviation in Hay River, for his excellent flying and Roger Toews, Renewable Resource Officer, Baker Lake, for his assistance on the final day of the survey. Kim Seto assisted with the drafting. Michael Ivu, of Eskimo Point was scheduled to participate in the survey but was unable to due to a mix up in travel arrangements. Gord Stenhouse gathered and mapped the preliminary distribution data provided by the Keewatin HTAs.

PERSONAL COMMUNICATIONS

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APPENDIX A. Numbers of muskoxen observed in Central Keewatin, November 1985.

Transect Number	Area (km^2)	On Transect Adults + Calves	Off Transect Adults + Calves
1	----------	Not Surveyed	----------
2	56.0	0 + 0	3 + 0
3	142.2	54 + 15	25 + 7
4	407.3	3 + 0	21 + 4
5	366.6	84 + 20	0 + 0
6	371.6	8 + 0	0 + 0
7	406.4	48 + 6	0 + 0
8	396.6	10 + 2	0 + 0
9	362.3	0 + 0	0 + 0
10	355.4	5 + 3	0 + 0
11	239.6	0 + 0	0 + 0
12	106.4	0 + 0	0 + 0
13	101.1	0 + 0	0 + 0
TOTALS	3310.5	212 + 46	49 + 11

APPENDIX B. Herd characteristics of muskoxen observed in Central Keewatin, November 1985.

Herd Number	Herd size (Adults + Calves)
1	3 (bulls)
2	53 + 15
3	25 + 7
4	1 (bull)
5	17 + 4
6	4 (bulls)
7	2 (bulls)
8	1 (bull)
9	52 + 13
10	2 (bulls)
11	30 + 7
12	3 (bulls)
13	5 + 0
14	5 + 0
15	41 + 6
16	2 (bulls)