DISTRIBUTION AND ABUNDANCE OF CARIBOU AND MUSKOXEN ON NORTHWESTERN VICTORIA ISLAND

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Abstract

In March 1992, I estimated that there were 8900 $\pm$ 820 muskoxen and 170 $\pm$ 54 caribou in Wildlife Management Units B/2-2 and B/2-5. Because the distribution of muskoxen was similar in Wildlife Management Units B/2-2 and B/2-5, B/2-2 is a suitable control against which to evaluate the effect on caribou of removing 900 muskoxen from B/2-5.

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Introduction

Summer muskox surveys in 1980, 1983, and 1989 showed that muskox densities increased during the 1980's and that densities were relatively high near Minto Inlet and Prince Albert Sound (Jakimchuk and Carruthers 1980, Jingfors 1985, Gunn unpublished data). Winter distribution was unknown but was not expected to be very different from summer distribution. The trend in caribou numbers, based on aerial surveys, is unknown because only Jakimchuk and Carruthers reported caribou observations but Holman hunters say that caribou numbers have declined and have been exceptionally rare this winter, 1991-92 (Joe Kuneyuna and Holman residents pers comm). They suggested that caribou are elsewhere. Caribou move relatively large distances during the year but annual distribution and movement patterns remain difficult to generalize (Gunn pers comm). Therefore it is impossible to be certain if changes in caribou density near Holman represent a change in distribution, a change in population size, or a combination of both.

Many people in Holman believe that the high muskox densities near the community are responsible for the low caribou densities and they would prefer to hunt and eat caribou. The Olukhatomiut Hunters and Trappers' Committee (OHTC) proposed regulation changes that would permit 900 muskoxen to be shot near Minto Inlet for commercial sale. By doing so the OHTC hopes to reduce muskox numbers which they believe will result in an increase in caribou density.

The first objective of this survey was to document the winter distribution and abundance of caribou and muskox in the Holman hunting area in order to test the research hypothesis that a reduction in muskox density near Minto Inlet will lead to a subsequent increase in caribou density. The second objective of this survey was to identify an area where muskox density was similar to Minto Inlet so that it could be used as a contemporary control for the removal experiment.

Methods

The census zone (Fig 1) included those parts of Wildlife Management Units (WMU) B/2-2 and B/2-5 (Fig 2) near Minto Inlet and Prince Albert Sound where I expected to find high muskox density. There was no need to survey the entire area of B/2-5 because the research hypothesis depends only on changes near Minto Inlet area where muskox will be removed. The census zone was larger than the high muskox density strata at the head of Minto Inlet that were identified in the past (Fig 4) in case muskox distribution was different in winter than in summer. I divided the census zone, a priori, into 2 strata with the intention of using the results from stratum 1 to define stratum 2, the area with the highest muskox density. Stratum 2 was subsequently resurveyed by interspersing an extra line between each one previously surveyed. High and low density regions within stratum 3 were identified from the census results (Fig 3) in order to describe musk ox distribution but the population estimate was based on the average density across the entire stratum (Table 1).

We flew systematically spaced strip transects where the first survey line in strata 1 and 3 was determined randomly on 24, 25, and 26 March 1992. Flying hight (183 m) and strip width (1 km on each side of the airplane) was standard for muskox surveys (e.g., McLean et al. 1989). Muskoxen and caribou were counted from the left rear seat by Joe Kuneyuna and by myself in the right front seat. Perry Linton flew the Heliocourier at an air speed of 160 km/h. We used a Trimble Navigation Global Positioning System to ensure that sightings of all animals were accurately and precisely recorded. On 26 and 27 March we flew 2 reconnaissance flights (Fig 1) to see if we could find more caribou elsewhere.

The calculation of muskox population size and standard error were based on Jolly (1969) and muskox 'typical' group size calculations, i.e., the group size for which half of the muskoxen are in larger groups and half are in smaller groups, were based on Jarman (1974).

Results and Discussion

There were 8900 ± 820 muskoxen in the census zone divided about equally between WMU B/2-5, strata 1 and 2, and WMU B/2-2, stratum 3 (Table 1). Muskoxen density appears to still be increasing. In the high density area at Minto Inlet densities have increased from 0.2 muskoxen/km^2 in 1983 (Jingfors 1985) to 0.8/km^2 in 1989 (Gunn unpublished data) and 1.0/km^2 in 1992. Throughout the remainder of the 1992 census zone densities were 0.06 muskoxen/km^2 in 1983, 0.13/km^2 in 1989 and 0.2 - 0.4/km^2 in 1992.

Muskox distribution around Minto Inlet differed little from the previous summer surveys (Fig 4). High muskox density on the north central side of Prince Albert Sound was also seen in 1980 and 1983 but I do not know if the 1989 distribution was similar because I did not have access to all of the 1989 data for that area.

Muskoxen were easily seen because we had bright sunshine each day and animals were usually on relatively flat ground with 100% snowcover and few rocks.

Typical group sizes of muskoxen seen on transect were significantly larger ($P < 0.05$) than groups seen off transect in strata 1 and 2 and for all strata combined but the opposite was true for strata 3 (Table 2). Typical muskox group size of 19 with a maximum group size of 40 was typical for this area in winter (Heard 1992).

Based on our count of only 26 caribou in 8 groups (group size ranged between 1 and 5) scattered throughout the census zone (Appendix 1) I estimated that there were only 170 ± 54 caribou in the census zone (Table 3). Densities do not appear to be substantially different from those observed in this area during the summer of 1980 (Jakimchuk and Carruthers 1980) but a quantitative comparison was not possible.

We felt that caribou would have been easily overlooked because their light colour provided little contrast with the background. Even under conditions where caribou were more easily detected and strip widths were narrower observers often missed half of the caribou (Heard 1985). As a guess, I think it would be reasonable to assume that actual caribou densities could be 4 times higher than we recorded.

During the two reconnaissance flights we did not find any areas where caribou density was greater than in the census zone (e.g., at the east end of Prince Albert Sound where there was a concentration in 1980). We saw only 2 groups of 3 and 5 caribou (Fig 1). The 383 muskoxen we observed during those reconnaissance flights were found throughout WMU B/2-5 and at relatively high density near Richard Collinson Inlet as Jingfors (1985) found in 1983.

These results are sufficient to evaluate the proposed removal experiment. In 1992 muskox distribution, densities and absolute numbers near Prince Albert Sound (stratum 3) were similar to Minto Inlet (strata 1 and 2) with a high density pocket of between 1 and 1.6 muskoxen/km^2 surrounded by densities of about 0.2/km^2 (Fig 3) and both areas had a population of about 4-5000 animals (Table 1). Because the hunting quota near Prince Albert Sound (WMU B/2-2) is only 100 (relative to 900 in WMU B/2-5 at Minto Inlet), WMU B/2-2 is a suitable control against which to evaluate the removal experiment (Fig 5).

It is impossible to tell how muskoxen will distribute themselves after removal. Assuming strata 1 and 2 represent the area effected by removal, then the reduction in muskox density, the proposed cause of the cause and effect relationship, will unlikely be detectable after only one year. Removal of 900 muskoxen would leave about 3500 in 1993 assuming a stable population and 3850 if the muskox population is growing at about 8% per year as it did between 1983 and 1989 (4400 x 1.08 - 900). Obviously the change will be easily detected after more annual removals and a larger population decline. No decline in the control area is expected if only 100 animals are shot. A substantial increase in caribou density in the removal area should be easily determined.

Acknowledgements

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Appendix 1. Detailed survey results

Survey results from stratum 1

TRANSECT NUMBER	MUSKOXEN COUNT	CARIBOU COUNT	AREA
1	43	0	137
2	32	0	55
3	39	0	57
4	30	4	135
5	69	0	131
6	3	5	79
7	25	0	160
8	15	0	223
9	34	1	223
10	46	0	223

Survey results from stratum 2

TRANSECT NUMBER	MUSKOXEN COUNT	CARIBOU COUNT	AREA
1	104	2	70
2	78	0	62
3	0	0	55
4	113	0	66
5	56	0	50
6	59	7	63
7	108	0	70
8	51	2	60
9	35	0	55
10	44	0	65
11	29	0	65

Survey results from stratum 3

TRANSECT NUMBER	MUSKOXEN COUNT	CARIBOU COUNT	AREA
1	5	0	108
2	14	0	94
3	12	0	72
4	50	0	66
5	48	3	80
6	57	2	88
7	33	0	90
8	47	0	82
9	41	0	154
10	58	0	134

Table 1. Number and density of muskoxen on northwestern Victoria Island in March 1992

Stratum number	Population Estimate	Density (muskoxen/km^2)	Number of transects surveyed	Number of transects in the stratum	Census zone area (km^2)	Variance of the population estimate
1	2409	0.24	10	64	10207	184264
2	2414	1.01	11	35	2400	79197
3	3964	0.41	10	100	9775	408819

Total population estimate	Cumulative variance	Standard error	Coefficient of variation	Degrees of freedom
8787	672280	820	.09	19

Table 2. Typical muskox group size within each strata

Stratum	On transect		Off transect		All sightings	
	Number of muskoxen	Typical group size (SE)	Number of muskoxen	Typical group size (SE)	Number of muskoxen	Typical size (SE)
1	348	15.3 (.46)	757	18.7 (.32)	1105	17.6 (.27)
2	667	19.2 (.33)	1017	21.3 (.32)	1684	20.5 (.23)
3	365	18.6 (.60)	399	15.4 (.40)	764	17.0 (.36)
Strata combined	1380	18.1 (.26)	2173	19.3 (.21)h	3553	18.8 (.16)

Table 3. Number and density of caribou on northwestern Victoria Island in March 1992

Stratum number	Population Estimate	Density (caribou/km^2)	Number of transects surveyed	Number of transects in the stratum	Census zone area (km^2)	Variance of the population estimate
1	75	0.0073	10	64	9000	1428
2	39	0.0162	11	35	2250	347
3	51	0.0052	10	100	9680	1139

Total population estimate	Cumulative variance	Standard error	Coefficient of variation	Degrees of freedom
165	2916	54	.33	22

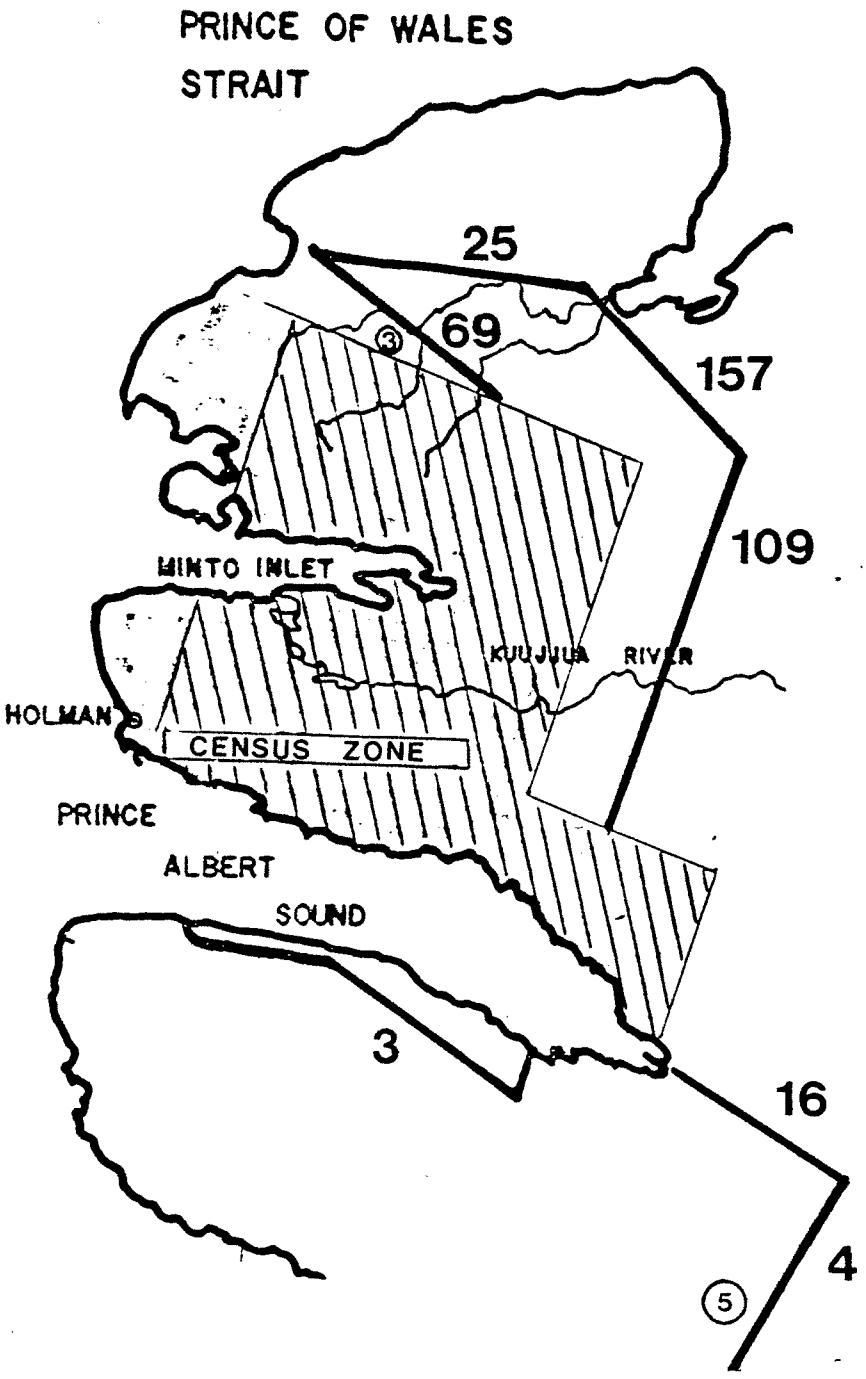

Figure 1. Location of the muskox and caribou census zone and reconnaissance flight lines in March 1992. Circled numbers indicate the number and location of caribou. Numbers not circled represent the total number muskoxen seen on each line segment.

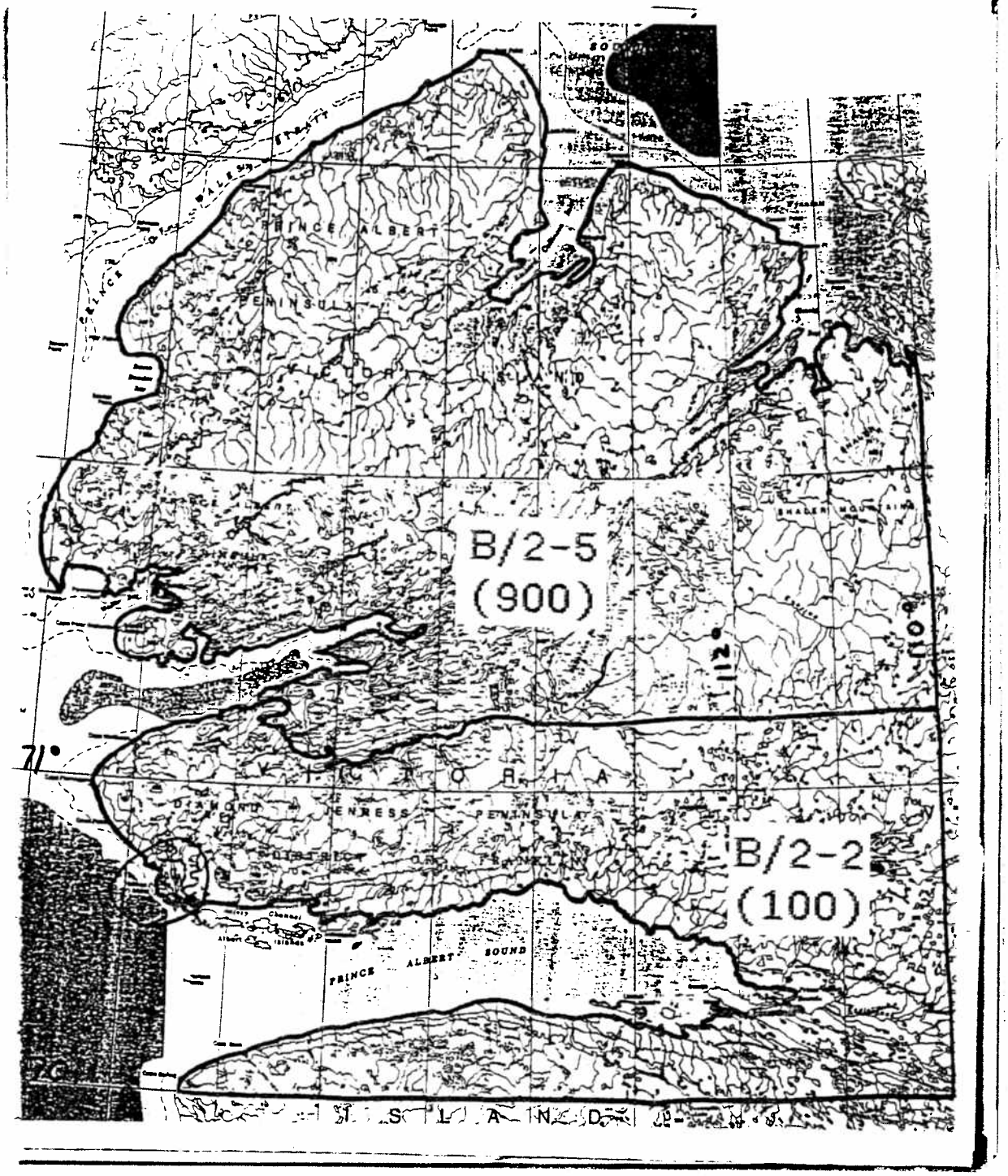

Figure 2. Location of Wildlife Management Units B/2-2 and B/2-5

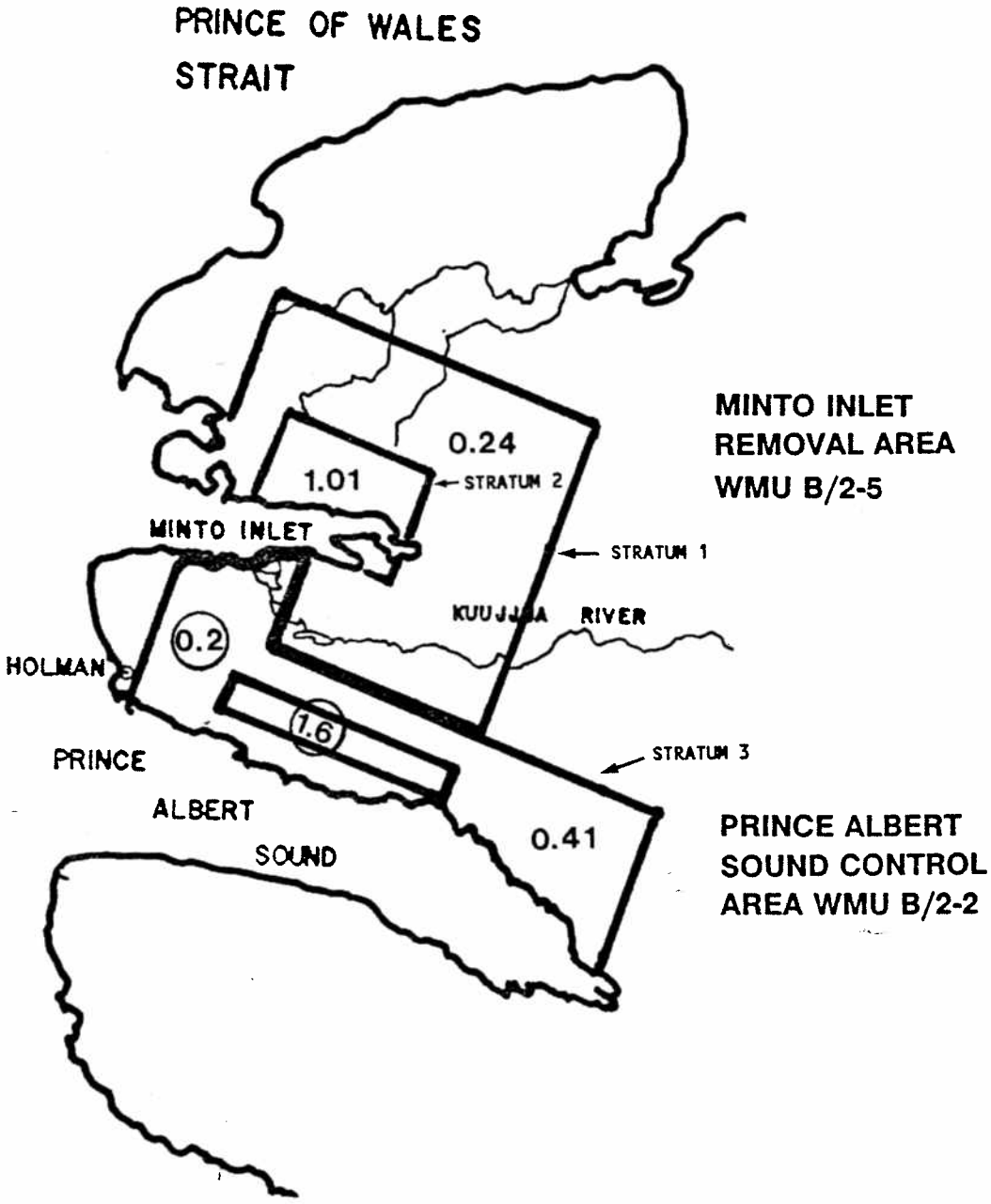

Figure 3. Muskox densities within the three strata surveyed in March 1992. A high density area in stratum 3 had 1.6 muskoxen/km^2 while the average over the remainder of the stratum was 0.2 /km^2.

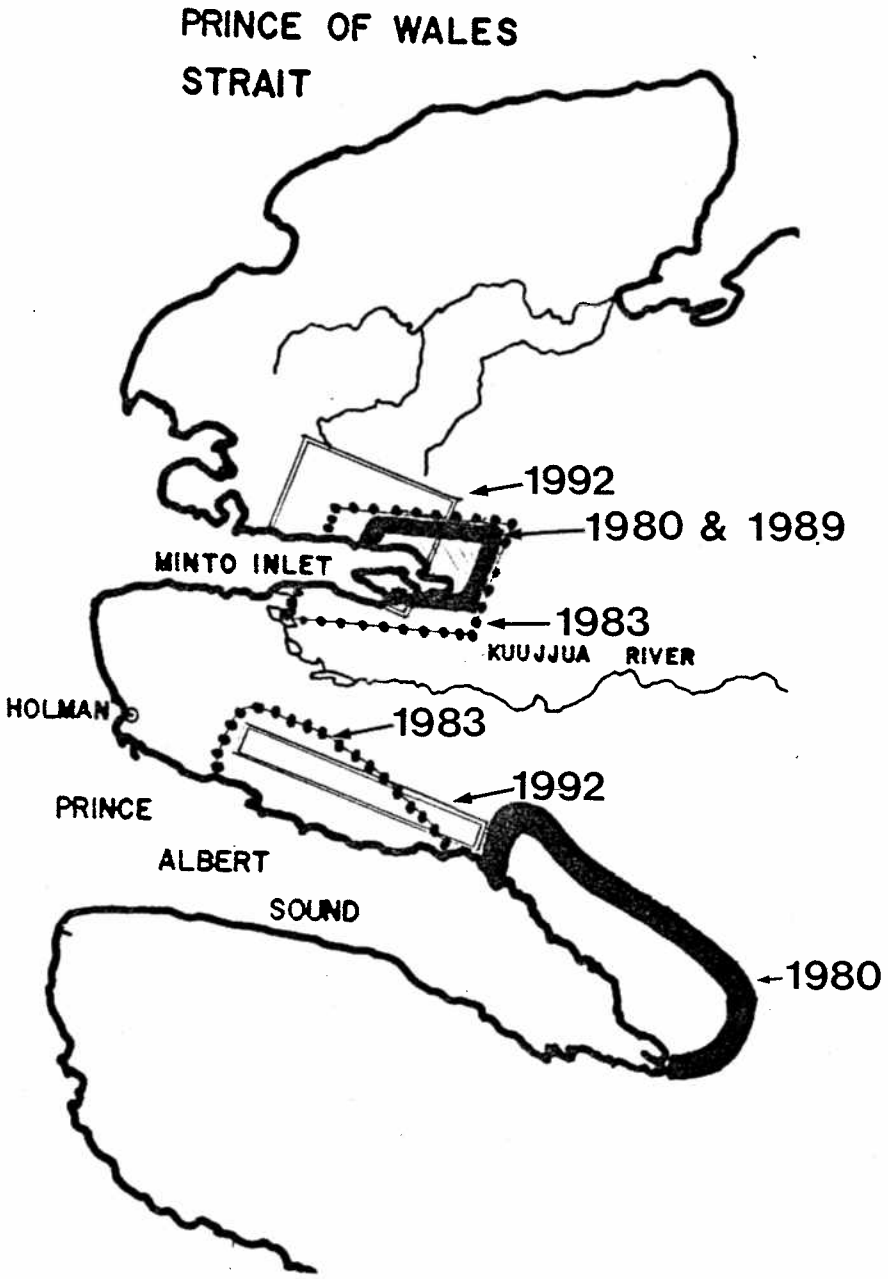

Figure 4. Areas of highest muskox densities observed around Minto Inlet and Prince Albert Sound in 1980, 1983, 1989, and 1992