ABUNDANCE AND DISTRIBUTION OF MUSKOXEN ON NORTHWESTERN VICTORIA ISLAND

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ABSTRACT

To document the distribution and abundance of muskoxen (Ovibos moschatus) on northwestern Victoria Island, a stratified transect survey was flown between 8-17 August, 1983. The total number of muskoxen counted was 2172; 885 on transect and 1287 off transect. The mean density was 0.10 muskoxen/km^2, resulting in a population estimate of 6430 ± 498 (S.E.). High and medium density areas included Richard Collinson Inlet (.39 muskoxen/km^2), Minto Inlet (.23 muskoxen/km^2), and Natkusiak Peninsula (.15 muskoxen/km^2). Mean herd size was 7.3 ± 3.9 (S.D.), and was apparently unrelated to strata density. The proportion of calves counted from the air represented 15.6% (51/317) of the total number of muskoxen classified (296/1896), and the proportion of lone bulls 4.9% of the total observed (106/2172). A ground composition survey at Richard Collinson Inlet in April 1984 included only 47 muskoxen with 3 calves (6.4%) and it was apparent that muskoxen were wintering elsewhere. Differences with previous population estimates are discussed and related to possible changes in muskox distribution. An increase in the quota for Natkusiak Peninsula (Hadley Bay) and a change in the management areas for Holman are recommended.

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INTRODUCTION

Historical information on muskox distribution and abundance on Victoria Island is sparse and only recently have surveys confirmed the importance of the island to the species. In 1980, the first systematic survey of muskoxen on Victoria Island was done as part of a proposal by the Polar Gas Project to extend a pipeline route across western Victoria Island (Jakimchuk and Carruthers 1980). Three-quarters of the estimated 12,000 muskoxen were found on the northern and western portion of Victoria Island.

There are currently three muskox management zones on northwestern Victoria Island. Two zones (B-2-2 and B-2-3) have a combined quota of 110 muskoxen that are used by residents of Holman for subsistence hunting as well as for sport hunting. In recent years, hunters from Holman have reported increasing numbers of muskoxen and expressed fears that competition may occur between muskoxen and caribou (Rangifer tarandus). While interspecific competition remains a difficult concept to study, documentation of current muskox densities on northwestern Victoria Island would assist in the detection of potential problems. Basic muskox population data from this area are also needed to evaluate the potential impacts of proposed developments, including tanker traffic through Prince of Wales Strait.

Reported here are the results of a stratified transect survey of muskoxen on northwestern Victoria Island. The survey was originally planned for March 1983 as part of a NOGAP (Northern Oil and Gas Action Program) project, but had to be postponed until August due to aircraft problems and inclement weather. As a result, survey costs were covered from internal funding by the Department of Renewable Resources.

METHODS

I used a Helio-Courier aircraft on tundra tires to fly a stratified transect survey of muskoxen on northwestern Victoria Island. Transect lines were 2.0 km wide, aligned north-south, and located at 20-km intervals in areas of low muskox density (stratum A) and at 5- or 10-km intervals in medium or high density areas (strata B, C and D; Fig. 1). Stratification was based on previous information on muskox distribution and abundance obtained from surveys in 1980 (Jakimchuk and Carruthers 1980) and in 1981 and 1982 (R. Decker pers. comm.).

The 1 km strip on either side of the aircraft was marked with 2-m lengths of blue cord attached to a wire stretched from an eye-bolt on the fuselage to one on the wing. Strip width was marked and checked in a manner similar to that used in an earlier muskox survey on southeastern Victoria Island (Jingfors 1984). Survey altitude was approximately 300 m agl and airspeed was maintained at 160 kph.

The pilot acted as navigator and marked the observations on 1:250,000 scale topographical maps. Two observers in the rear continuously searched for and counted total numbers of muskoxen, either as on or off transect. The number of calves (3-4 months old) were counted whenever possible. The information was transmitted on a Sigtronics 4-way intercom system and recorded on data sheets by the front-seat passenger who also acted as an observer. The pilot and front-seat observer usually spotted muskoxen first and obtained initial counts that were checked against the counts given by the observers in the rear.

Transect data were transcribed daily on summary sheets and descriptive statistics were calculated on an Apple II Plus computer using a census data program based on Jolly (1969), method 2. A polar planimeter was used to

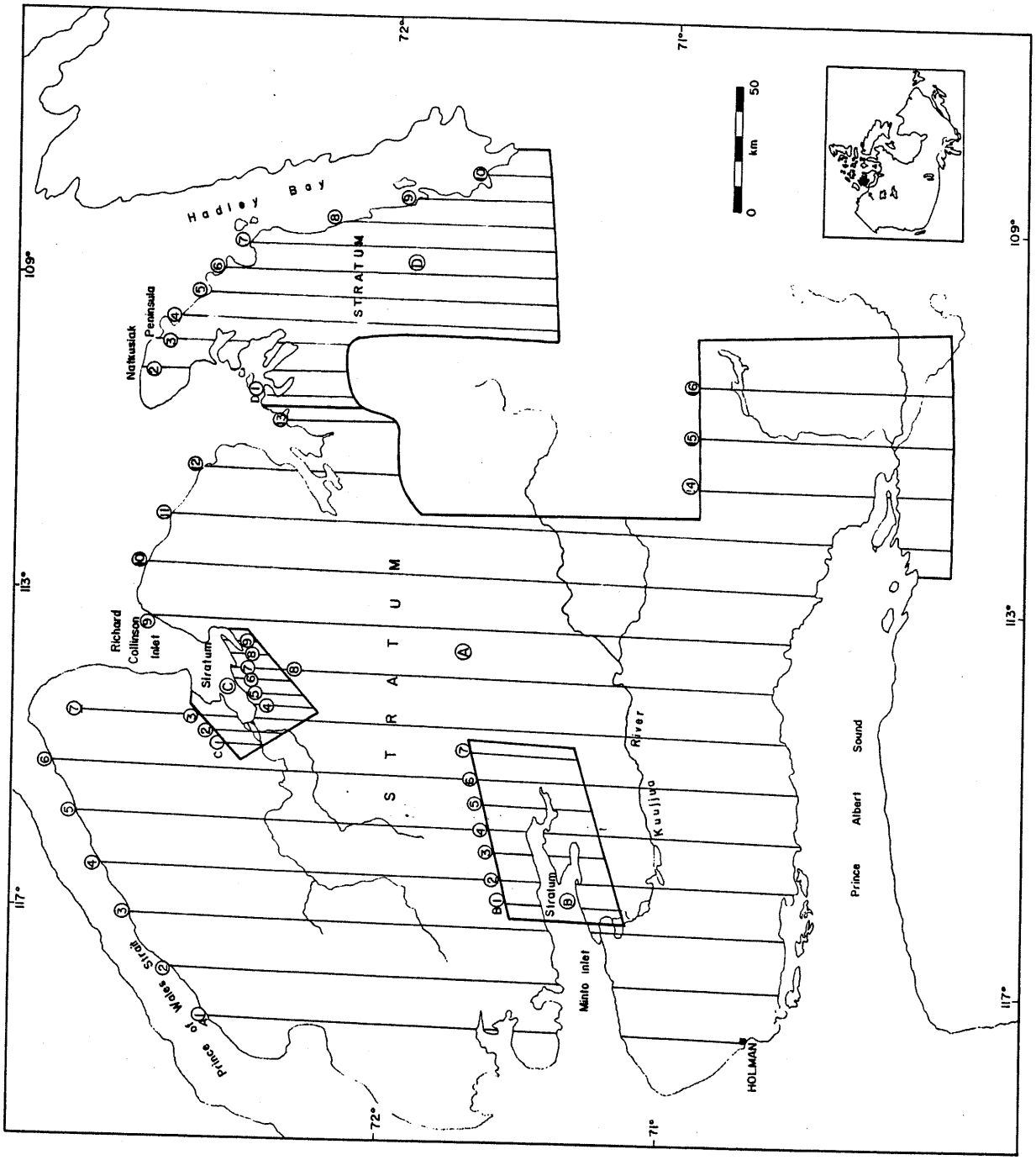

Figure 1. Transect lines and strata boundaries during a muskox survey on northwestern Victoria Island, August 1983.

calculate survey area.

I returned to Richard Collinson Inlet in April 1984 during a wildlife survey on snowmachines along Prince of Wales Strait. The Richard Collinson Inlet area was found to have a high density of muskoxen during the aerial survey and in April 1984, the muskoxen were observed through zoom spotting scopes (20-60X) to classify them as adults, 3-year olds, 2-year olds and short-yearlings.

RESULTS

Aerial Survey

A total of 55 hours were flown between 8-17 August, 1983. About 30 hours were flown on transects (n=41) totalling 4265 km, which represented a mean coverage of 11.3% (8531 km^2) of the survey area (75,360 km^2).

The total number of muskoxen counted was 2172; 885 on transect and 1287 off transect (Appendix A). The weighted mean density in the survey area was 0.10 muskoxen/km^2 and the corresponding population estimate was 6430 $\pm$ 498 (S.E.) muskoxen (Table 1). The highest densities were found around Richard Collinson Inlet (stratum C: 0.39 muskoxen/km^2). Minto Inlet (stratum B) and Natkusiak Peninsula (stratum D) had medium densities of muskoxen (0.23 and 0.15 muskoxen/km^2, respectively), while the remainder of northwestern Victoria Island had a relatively low muskox density (0.06 muskoxen/km^2; Table 1, Fig. 2). The muskoxen observed were relatively evenly distributed within each stratum (Fig. 2), resulting in a precise estimate with a low coefficient of variation (C.V.= 8%). Coverage was proportional to animal density and ranged from 9.7% in stratum A to 29.4% in stratum C.

Mean herd size, based on 283 herds observed and excluding 106 lone bulls, was 7.3 $\pm$ 3.9 (S.D.), with a range of 2-29 (Table 2). There was no correlation between mean herd size and strata density ($P>0.05$). Lone bulls represented 4.9% (106/2172) of all muskoxen observed. Including lone bulls, single-sex groups and mixed-sex groups for which classification was attempted from the air, the proportion of calves to total classified was 15.6% (296/1896). Between strata, calf percentages varied from 14.4% in the low density area to 16.4 and 18.7% in the higher density areas (Table 2).

Table 1. Estimated numbers of muskoxen, by stratum, on northwestern Victoria Island, August 1983.

Stratum	Density (muskoxen/km²)	Population estimate (±S.E.)	Coeff. of variation	Coverage[a] (%)
A. NW Victoria	0.06	4070±470	0.12	9.7
B. Minto Inlet	0.23	615±63	0.10	19.3
C. Richard Collinson Inlet	0.39	460±82	0.18	29.4
D. Natkusiak Peninsula	0.15	1280±127	0.10	18.6
Weighted Means Total	0.10	6430±498	0.08	11.3

[a]Proportion of stratum area sampled

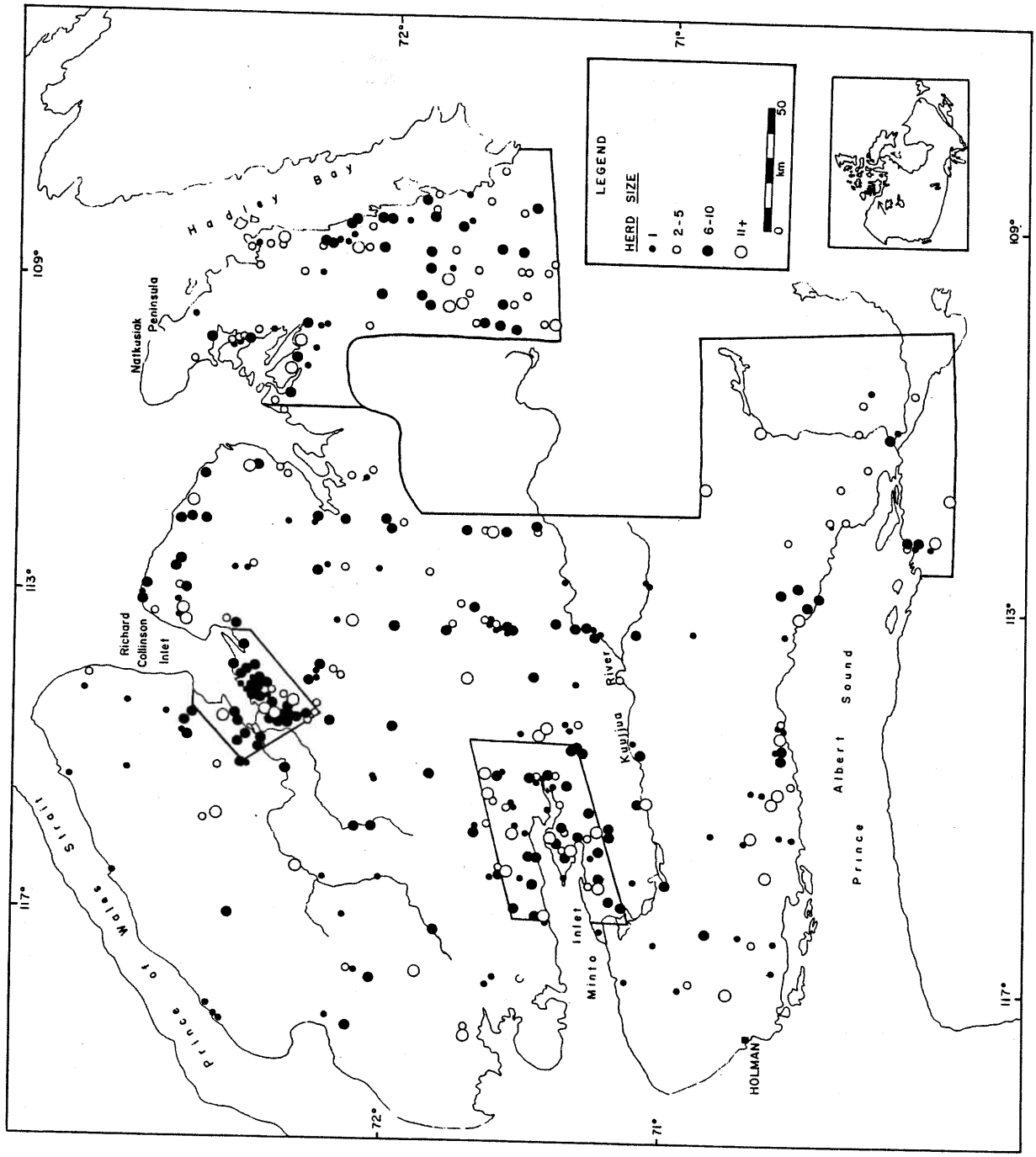

Figure 2. Distribution of muskox herds on northwestern Victoria Island, August 1983.

Table 2. Muskox herd characteristics, by stratum, on northwestern Victoria Island, August 1983.

Stratum	Herd size Mean±SD(n)	Herd size Range	Lone bull/ total(n)	Calf/ total(n)[a]
A. NW Victoria Island	7.4±4.1(136)	2-21	6.3%(1080)	14.4%(951)
B. Minto Inlet	8.7±5.4(40)	2-29	4.6%(370)	18.7%(299)
C. Richard Collinson Inlet	6.9±2.7(36)	2-13	1.9%(263)	16.4%(250)
D. Natkusiak Peninsula	6.4±3.0(69)	2-15	3.7%(459)	15.4%(396)
Weighted Means	7.3±3.9(283)		4.9%(2172)	15.6%(1896)

[a]Includes only muskoxen in herds, and lone bulls, that could be positively identified.

Ground Survey

An attempt was made to do ground composition counts of muskoxen from snowmachines between 7-8 April 1984 in the Richard Collinson Inlet area as part of a wildlife survey along Prince of Wales Strait (Jingfors and Adjun, in prep.). We covered part of the high density area delineated, and observed only 47 muskoxen in 9 herds. Mean herd size was 5.2 ± 3.3 (S.D.). Three calves ("short-yearlings") were seen, which represented 6.4% of the total (Appendix B). None of the herds ran when approached to within 0.5 km by snowmachines, and viewing conditions were excellent.

The snow in most areas around Richard Collinson Inlet was relatively shallow, about 20 cm deep, and consisted of an upper crust (3-4 cm) of harder, wind-packed snow on top of loosely packed depth hoar ("pukak" - Pruitt, 1959). There were no signs of icing in the snow cover at the time of the survey. Most feeding craters examined contained willow (Salix spp.) leaves, Dryas leaves, and various graminoids (primarily Carex spp.).

DISCUSSION

Survey Conditions

The large size of the survey area precluded any reconnaissance flights prior to the systematic survey. However, survey effort corresponded reasonably well with muskox density in the different strata resulting in a precise estimate with a low coefficient of variation. An area in the central eastern portion (Fig. 1) was not surveyed as a result of logistical problems.

Muskoxen were easily visible during most of the survey, particularly compared to caribou, and I do not believe detection was a problem. Some fog was encountered in the north end of the survey area during 4 of 8 days of flying. On part of one transect (A7), flight altitude was reduced to between 100 m and 200 m agl to avoid the fog. The fog occurred at high elevations in the low density area where muskoxen were not abundant. Thus, it is unlikely that large numbers of muskoxen were missed.

Counting error was likely quite low as a result of the small mean herd size (7.3). Herd counts were made by both front and rear seat observers and if discrepancies were found, the herd was circled once and another count made. With the exception of large herds (>15 animals), and in cases where tight bunching occurred, calves were generally easy to count. However, calf counts from the air should be considered as low estimates of productivity as the only consistently accurate method is composition counts from the ground.

Population Characteristics

The population estimate of 6430 muskoxen on northwestern Victoria Island is lower than the estimate provided by Jakimchuk and Carruthers for approximately the same area during their 1980 survey (9540 muskoxen; Table 3). Coverage was less intensive during their survey but included all portions of northwestern Victoria Island (cf. Fig. 1). Their overall muskox density for that area (strata A and B; see Jakimchuk and Carruthers 1980) was 0.12 muskoxen/km^2 as compared with 0.10 muskoxen/km^2 found in this study. It appears that muskox numbers on northwestern Victoria Island have not increased since 1980 but, rather, decreased or at best remained stable. The 1980 survey included most of Victoria Island and few muskoxen were found on the southern and eastern portion of the island (0.02 and 0.04 muskoxen/km^2, respectively). During a survey of southeastern Victoria Island in March 1983 (Jingfors 1984), I estimated about twice as many muskoxen as did Jakimchuk and Carruthers in 1980.

It is possible that some distributional changes have occurred that may partly explain differences in population estimates. Muskox distribution during this survey agreed well with what was found by Jakimchuk and Carruthers (1980) and by Decker (pers. comm.), but with one important exception. I did not find as high densities of muskoxen north and east of Prince Albert Sound as was found in the previous surveys. Some muskoxen around Prince Albert Sound may have moved further east and thus become part of the population surveyed in March 1983 (Jingfors 1984). An effort to investigate the extent of seasonal movements by muskoxen would facilitate interpretation of the survey results.

An overall density of 0.08 - 0.10 muskoxen/km^2 would result in an estimate of about 10,000 muskoxen for southeastern and northwestern Victoria

Table 3. Summary of muskox survey information from northwestern Victoria Island.

Year(Mon.)	Survey type[a]	Population est.(C.V.)	Coverage	Total Count	Lone bull/ total(n)	Calf/ total(n)	Herd Size Mean±S.D.	Herd Size Range	Reference
1983 (Aug)	Tr	6430 (8%)	11.3%[b]	2172	4.9%(2172)	15.6%(1896)	7.3±3.9	2-29	This study
1982 (Aug)[c]	Re	---	---	967	6.2% (967)	10.3% (922)	5.9±3.2	2-15	Decker(unpubl. data)
1981 (Aug)	Re	---	---	1948	7.7%(1948)	14.9%(1861)	7.9±4.8	2-31	Decker(unpubl. data)
1980 (Aug)	Tr	9540(14%)[d]	6.3%	971	?	27.4% (421)[e]	7.1±1.2	?	Jakimchuk and Carruthers(1980)
1979 (Mar)	Re	---	---	453	?	?	10.3±7.4	2-25	Boxer(1980)
1976 (Jul)	Re	---	---	183	?	16.4% (183)	?	?	Spencer(1976)

[a]Refers to transect(Tr) and reconnaisance(Re) surveys

[b]Represents mean coverage

[c]Primarily observations from Natkusiak Peninsula (Stratum D; Fig. 1)

[d]Calculated based on Jolly Method 2 from strata A and B (See Jakimchuk and Carruthers, 1980)

[e]Excludes lone bulls

Island. Muskox distribution and abundance on other parts of the island have been less thoroughly documented. Storkerson Peninsula, in the northeast, has never been systematically surveyed. Muskoxen occur there, but probably only in low densities (Jingfors and Kaomayok 1984). Jakimchuk and Carruthers (1980) also found low densities on southwestern Victoria Island (0.02 muskoxen/km^2). This is consistent with Poole (1984) who found only 0.01 muskoxen/km^2 in that area in March 1983. Thus, existing information suggests that the entire muskox population on Victoria Island currently ranges between 11,000 and 12,000 animals.

Calf counts obtained from the air in this survey (15.6%) were similar to those made by Decker in August 1981 and by Spencer in July 1976 (Table 3). As discussed earlier, aerial calf counts tend to underestimate true productivity or recruitment. In March 1983, I estimated 16.1% calves ("short-yearlings") from the air (Jingfors 1984). During subsequent ground surveys, I found short-yearlings to represent 20.3% of the total classified. The low count obtained by Decker in 1982 (10.3%; Table 3) was primarily from Natkusiak Peninsula. The count from that area in 1983 was 15.4% (Table 2) or almost identical to the overall calf count (15.6%) for the entire survey area (Table 3). Jakimchuk and Carruthers (1980) estimated 27.4% calves which seems unusually high; the count was based on only about half of all muskoxen observed on transect and lone bulls were not included in the total.

The low proportion of calves observed during the ground survey in Richard Collinson Inlet should be interpreted with caution due to the small sample size (n=47; Appendix B). Many fewer muskoxen were present in the area in April than during the previous summer, and it seems that most animals were wintering elsewhere.

Mean summer herd sizes have remained fairly consistent on northwestern

Victoria Island (Table 3). In March 1979, Boxer (1980) found a mean herd size of 10.3 which is consistent with higher winter group sizes reported from other areas (Tener 1965, Spencer and Lensink 1970, Miller et al. 1977). During the spring survey of southeastern Victoria Island, I found a mean herd size of 10.5 (Jingfors 1984). In summer, and particularly during the rut, herds fracture into smaller groups and lone bulls are commonly seen in the vicinity of those smaller groups. In this survey, lone bulls represented 4.9% of all muskoxen observed (Table 3). In comparison, lone bulls only constituted 0.3% of the total in March on southeastern Victoria Island (Jingfors 1984).

Management

There are currently three management areas on northwestern Victoria Island (B-2-1,B-2-2, and B-2-3). Two of these (B-2-2 and B-2-3) have a combined quota of 110 muskoxen allotted to Holman. Part of this quota is used for sport hunting. In 1982/83, the total harvest was at least 50 animals, of which 19 were taken by sport hunters. By April 1984, 23 tags had been issued for the 1983/84 season, but the total harvest is not yet known. The third zone, B-2-1(Hadley Bay), covers Natkusiak Peninsula and has a quota of 8 animals. The quota is alloted to Cambridge Bay, but has not been used since 1977 due to the remoteness of the area and the availability of muskoxen closer to Cambridge Bay.

The current, combined quota for Holman represents about 2.1% of the population estimate for strata A, B, and C (110/5145). Considering our present knowledge of muskox population dynamics, a quota of 2-3% of estimated population size seems a reasonable target for sustaining a safe, allowable

harvest level. There is currently no local demand for an increased quota as both subsistence use and sport hunting can be accommodated under the existing quota.

While hunters from Cambridge Bay have not recently used their quota on Natkusiak Peninsula, there is future potential for combination sport hunts (muskoxen and polar bear) in this area. The current muskox population could safely support an increased quota of 30 muskoxen, or 2.3% of the stratum estimate (30/1280).

Current distributional information does not support the existence of two distinct management areas (B-2-2 and B-2-3) for Holman. Hunters there do not allocate their harvest according to the management areas, nor were they, until very recently, aware of the existence of specific management areas for muskoxen. The need for simplifying and explaining current regulations is evident.

The recently completed review of existing muskox management regulations in the Kitikmeot Region was made to better meet local needs, while maintaining safe allowable harvest levels that can be sustained over a number of years. The survey results reported here were the source of recommendations for adjusting quotas and management areas on northwestern Victoria Island.

RECOMMENDATIONS

1. The current quota of 110 muskoxen for Holman should be maintained (2.1% of population estimate). Zones B-2-2 and B-2-3 should be combined into one management area and expanded to include most of the northwestern part of Victoria Island (Strata A, B and C; Fig.1)

2. The quota in B-2-1 (Hadley Bay) should be increased from 8 to 30 muskoxen (2.3% of estimate for stratum D) to support future efforts by Cambridge Bay to initiate combination sport hunts in the Hadley Bay area. No change in management area is necessary.

3. Renewed efforts should be made to collect muskox harvest information from Holman. A local wildlife guardian should be encouraged to issue, and keep track of, tags used by both local hunters and sport hunters. Information collected should include sex and age characteristics of the harvested muskoxen.

4. A stratified transect survey of northwestern Victoria Island should be repeated in 1986. In the interim, another ground classification count should be attempted in an area closer to Holman to examine demographic characteristics of a hunted sub-population.

5. The seasonality of annual movements by muskoxen requires further investigation to facilitate interpretation of aerial survey results. Attempts should be made to place radio transmitters on 20-40 adult muskoxen, preferably from different herds and in areas where seasonal movements are of particular interest, e.g., near Prince of Wales Strait, at the head of Prince Albert Sound or northwest of Cambridge Bay.

ACKNOWLEDGEMENTS

I wish to thank Assistant Wildlife Officer Colin Adjun (Coppermine) for his keen eyes throughout the aerial survey, despite long hours of flying. Colin also took part in the ground classification survey. Noah Akhiatak and Joseph Haluksit from Holman acted as observers during different parts of the aerial survey as did Assistant Regional Superintendent Roger Binne. Thanks also to our trusty pilot, Warren Wright (Nahanni Air), for his excellent flying and unfailing navigational ability. Doug Stern drafted the figures and Anne Gunn provided helpful comments to improve the final draft.

PERSONAL COMMUNICATIONS

Decker, R. Department of Renewable Resources, Government of the NWT, Yellowknife, NWT.

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Appendix A. Numbers of Muskoxen, Including Calves, Observed on Northwestern Victoria Island, August 1983

Transect Number	Transect area(km^2)	On transect		Off transect	
		Left	Right	Left	Right
Stratum A (9.7% coverage)					
A 1	352.0	21	2	6	3
2	441.0	10	1	20	19
3	488.6	0	10	23	12
4	459.5	3	15	0	26
5	480.0	27	0	38	15
6	525.0	32	4	5	46
7	457.5	37	1	63	20
8	390.0	17	9	28	0
9	515.6	35	13	58	41
10	535.0	16	13	45	38
11	576.0	47	15	56	42
12	150.0	12	4	18	11
13	87.5	0	0	0	3
14	206.0	18	6	16	3
15	206.0	20	0	16	9
16	206.0	5	0	0	3
Totals	6075.7	300	93	392	291
Stratum B (19.3% coverage)					
B 1	60.0	15	9	8	30
2	62.5	3	10	42	7
3	70.0	10	7	18	12
4	70.0	3	9	28	8
5	88.5	1	18	16	6
6	87.5	15	6	36	2
7	86.0	0	13	8	26
Totals	524.5	47	72	156	91

Appendix A. (Cont'd)

Transect Number	Transect area(km²)	On transect Left	On transect Right	Off transect Left	Off transect Right
Stratum C (29.4% coverage)					
C 1	30.0	6	10	10	0
2	35.0	7	0	0	0
3	75.0	13	37	15	28
4	46.5	9	0	6	30
5	48.5	10	11	6	1
6	49.0	1	7	9	28
7	40.0	7	11	0	0
8		(not flown)			
9	25.0	0	6	0	0
Totals	349.0	53	82	46	87
Stratum D (18.6% coverage)					
D 1	77.5	9	0	2	0
2	97.5	15	1	11	3
3	115.0	1	25	0	12
4	300.0	25	28	5	4
5	156.0	7	12	32	9
6	263.6	16	6	14	15
7	244.0	32	18	27	13
8	169.0	17	10	29	7
9	110.0	10	1	8	23
10	49.0	5	0	0	10
Totals	1581.6	137	101	128	96
Survey Totals	8530.8	537	348	722	565

Appendix B. Age and Sex Composition of Muskoxen Classified from the Ground, Richard Collinson Inlet, 7-8 April 1984.

	Herd Size	Adult		3-yr old		2-yr old		Short-yearling[a]
		M	F	M	F	M	F	
	4	1	3	0	0	0	0	0
	3	0	2	1	0	0	0	0
	5	0	2	0	0	0	2	1
	9	0	7	0	0	0	0	2
	6	4	2	0	0	0	0	0
	2	2	0	0	0	0	0	0
	12	7	3	0	0	0	2	0
	2	0	2	0	0	0	0	0
	4	0	4	0	0	0	0	0
Total	47	14	25	1	0	0	4	3
Proportion (%)		29.8	53.2	2.1	0	0	8.5	6.4

[a]Refers to muskoxen 10-11 months old.