BEVERLY CALVING GROUND SURVEY

JUNE 2 - 14, 1987

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ABSTRACT

In June 1987, a strip transect census in which caribou were counted visually, was conducted on the calving ground of the Beverly caribou herd. We estimated there to be 49,100 ± 2,810 (SE) caribou one year old and older on the calving grounds, 32,500 of which were parturient (pregnant and post-partum) females. That estimate was considerably lower than the corresponding estimate of 45,800 parturient females obtained in 1984. The weather during the calving period was never suitable to carry out an aerial photographic survey, thus an independent estimate of herd size is not available.

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INTRODUCTION

Since 1971, the trend in the size of the Beverly caribou herd has been based on visual strip transect estimates of the number of caribou on the calving ground (Heard 1985) determined every second or third year. The previous census was conducted in 1984 when 58,000 ± 4700 one year old and older caribou were estimated to be on the calving ground. The total herd was estimated at between 250,000 and 420,000 animals and the population was believed to be increasing (Williams and Heard 1986). This report describes the results of the 1987 census.

METHODS

On 2 and 3 June 1987 reconnaissance flights in two Cessna 185's were made over the traditional Beverly calving ground. The area covered by those flights was arbitrary (called the spaghetti reconnaissance), but was based on the location of calving caribou in previous years.

Fifteen systematically spaced reconnaissance transects were flown on 7 June over the entire distribution of calving caribou (Figure 1) as determined by spaghetti reconnaissance. During the systematic reconnaissance, two Cessna 185's were flown 120m above ground level at an airspeed of 160-170 km/hr. Observers recorded all one year old and older caribou seen within a 400m strip on each side of the aircraft. Exact transect end points were established during the flight, where cow density declined to near zero. The western boundary was established where cow density declined and yearlings predominated.

Caribou observations from the systematic reconnaissance were used to divide the calving ground into four strata within which the density of caribou was similar. Those strata were established for visual resurvey and air photo census. The visual resurvey (the stratified census) was carried out on 8 and 9 June. The photographic survey was never attempted because the cloud cover was always too low for photography.

On 9 and 10 June the age, sex and reproductive condition of caribou within each of the four strata was estimated while flying

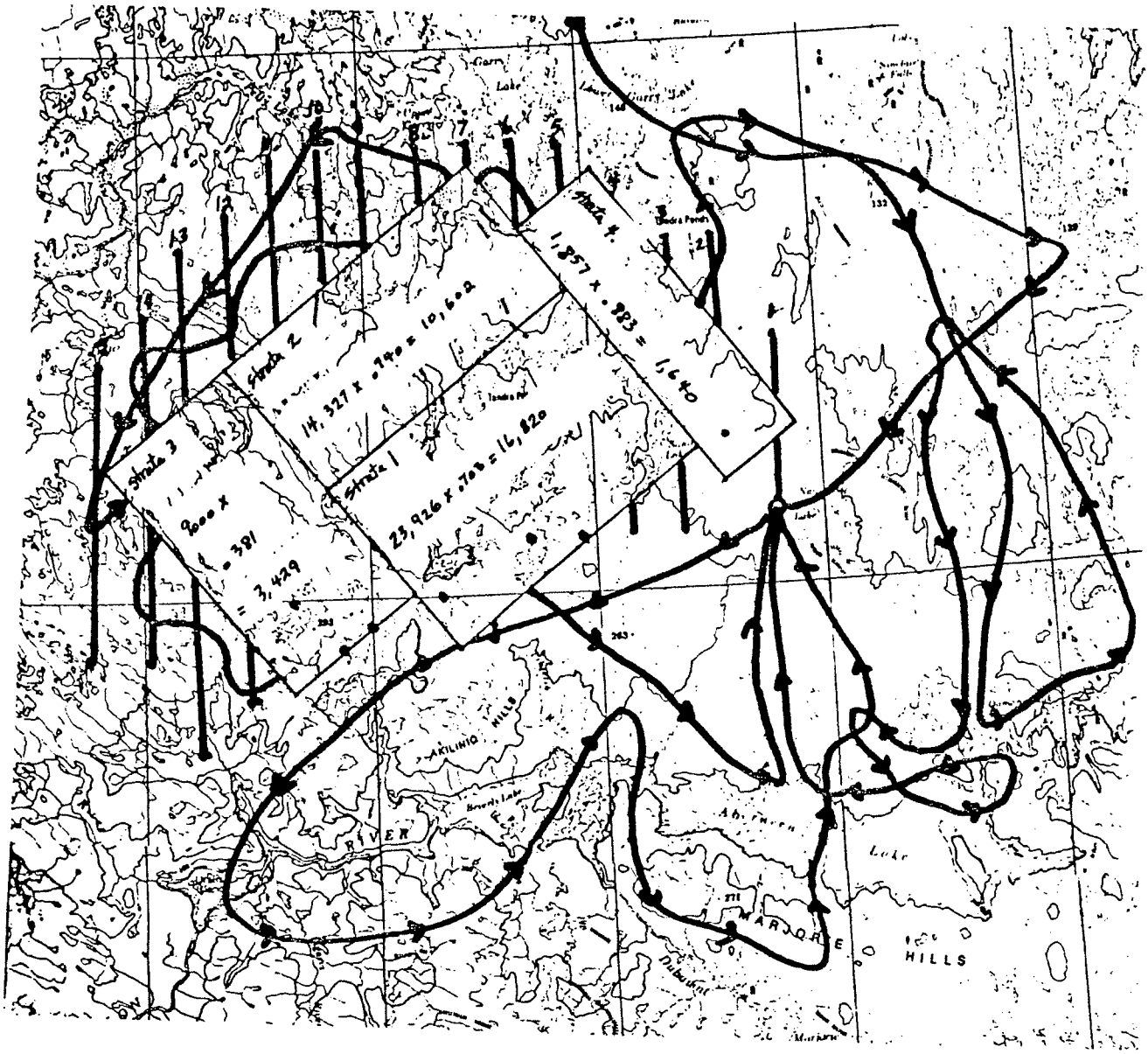

Figure 1. Location of survey strata, population estimates and reconnaissance flight lines on the Beverly calving ground in June 1987.

systematically spaced lines at about 50 m above ground level and 100 km/hr in a Bell 206 helicopter (Figure 2). Caribou were classified as neonates, yearlings, two year old and older males, and two year old and older cows. Parturient (pregnant and post-partum) cows were identified by the presence of an udder or a calf at heel. The number of hard antlers carried by each cow was also recorded. Caribou classified along one transect were considered to be one sample, and the mean and variance of the proportion of parturient females in those samples were determined using the Jackknife technique. The finite population correction factor used in that procedure was equal to the number of caribou classified divided by the stratum population estimate.

The proportion of parturient females was multiplied by the population estimate to obtain an estimate of the number of parturient females in each stratum.

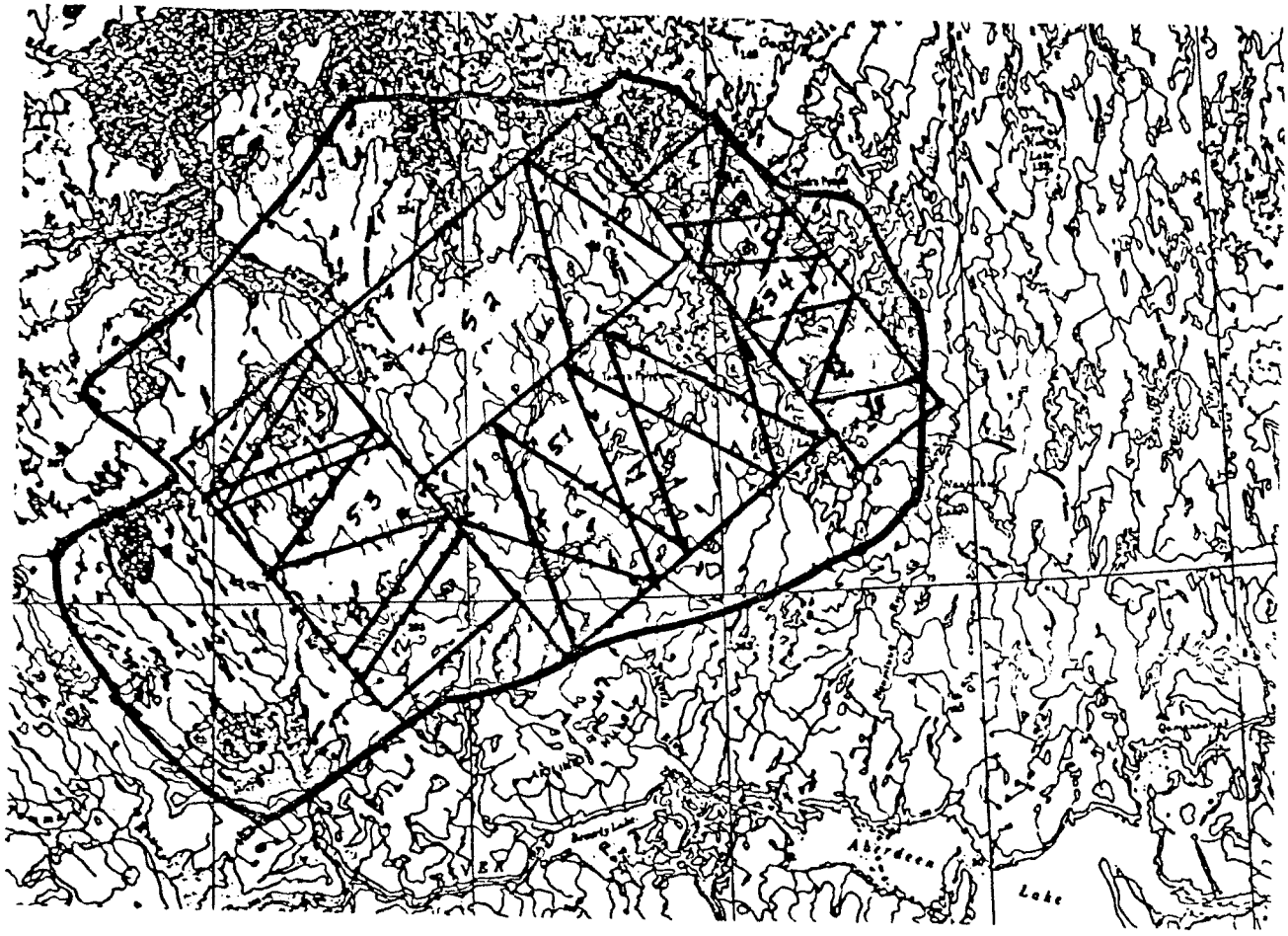

Figure 2. Composition sampling transects on the Beverly calving grounds in June 1987.

RESULTS

The south and east boundaries of the calving ground were clearly determined from the spaghetti reconnaissance data (Figure 1) and the north and west boundaries were based on the systematic reconnaissance data.

The number of one year old and older caribou estimated from the systematic reconnaissance transects was 45,000 ± 2,910 (SE). Four strata were delineated based on caribou densities determined from the systematic reconnaissance survey (Figure 1). About 5,000 (12%) animals, mostly in the southwest, were estimated to be outside the four strata. They were excluded from the stratified census zone because most of them were yearlings.

The stratified census resulted in an estimate of 49,100 ± 2,810 caribou one year old and older.(Table 1). The number of parturient females was estimated at 32,500.(Table 2). Only two sample units were available for stratum 2 because data were lost when a tape recorder malfunctioned.

The estimated proportion of parturient females did not change much as sample size increased (Figure 3). The coefficients of variation (CV's) declined slightly with increasing sample size but did not decline to 0.1, which is considered to be the minimum acceptable level of precision for wildlife surveys (Heard 1985). More samples would be required to determine the relationship between CV and sample size.

Table 1. The estimated number of caribou on the Beverly calving ground based on visual strip transect survey in June 1987.

Stratum	Estimate	Density (caribou/km^2)	Variance	SE	CV
1	23,926	9.27	1110234		.0441
2	14,326	6.97	3671528		.1337
3	9,000	4.69	2904171		.1893
4	1,857	1.46	233845		.2606
Totals	49,109		7919778	2814	.0573

Table 2. The estimated number of parturient female caribou on the Beverly calving ground in June 1987 based on composition and visual transect strip survey.

Stratum	Number of caribou		Proportion Females		Parturient Number	Variance*	SE
1	23,926	x	.7030	=	16,820	10086894	
2	14,327	x	.7398	=	10,599	3084835	
3	9,000	x	.3814	=	3,433	691048	
4	1,857	x	.8826	=	1,639	287430	
Totals					32,491	14150207	3762

* Variance in each stratum is equal to the number of parturient females (the product) squared, times the sum of the squares, of the CV's, of the estimates that were multiplied together to get that product (Heard 1987)
e.g., $16{,}820^2 \times [(.1836)^2 + (.0441)^2]$

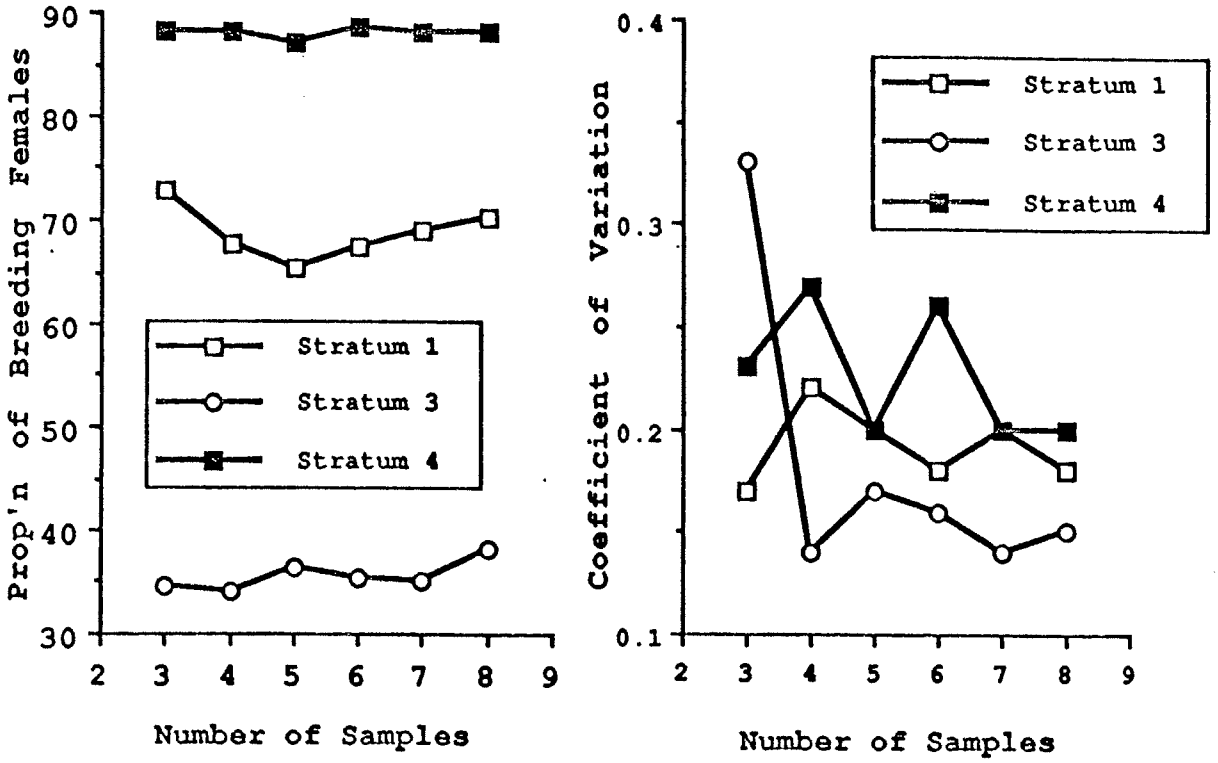

Figure 3. The effect of sample size on the estimate of proportion of parturient females and its coefficient of variation on the Beverly calving ground in 1987.

The proportion of yearlings was highest in the southwest (strata 1 and 3) and lowest in northeast (strata 2 and 4). Parturient females and yearlings made up most of the one year old and older caribou but in stratum 3 there was a relatively large proportion of barren cows (females without udders, Table 3).

Eight wolves and one barren ground grizzly bear were also sighted on the calving ground.

Table 3. Composition of one year and older caribou classified on the Beverly calving ground in June 1987.

Classification	Stratum 1	Stratum 2	Stratum 3	Stratum 4
Parturient cows*				
Calf and 2 antlers	627	82	33	68
Calf and 1 antler	40	1	5	3
Calf and 0 antlers	70	4	1	1
Subtotal	737	87	39	72
Parturient cows*				
Udder and 2 antlers	689	85	149	80
Udder and 1 antler	37	10	38	4
Udder and 0 antlers	36	0	1	1
Subtotal	762	95	188	85
Barren cows				
No udder and 2 antlers	2	0	0	0
No udder and 1 antler	2	0	0	0
No udder and 0 antlers	55	24	105	6
Subtotal	59	24	105	6
Yearlings	556	42	262	14
Bulls	0	0	2	0
Total	2114	248	596	177
Proportion of parturient females	.7030	.7398	.3814	.8826
SE	.1291	.0724	.0576	.1745
CV	.1836	.0979	.1510	.1977

* Jackknife technique (see methods)

DISCUSSION

The 1987 estimate of 49,100 ± 2,810 caribou one year old and older of which 32,500 were estimated to be parturient females was lower than the corresponding visual estimates from 1984 of 57,600 and 45,800 respectively. Because no photographic estimate was available to confirm the visual estimate, no firm conclusion regarding trend was justified. The results indicated a need to resurvey the calving grounds to determine the trend in herd size.

The peak of calving, the day when one half of the calves have been born, appeared to be relatively late in 1987. In strata 1, 2 and 4 about half of the calves were born by June 10, assuming that cows with antlers and an udder, but without a calf, were still pregnant rather than having already lost their calves. In stratum 3 the peak of calving may not yet have been reached by 9-10 June because cows with udders and 2 antlers were much more common than cows with calves (149 vs 38, Table 3). The peak of calving usually occurs by June 7.

Because there were few cows with udders, no antlers and no calves, calf survival appeared to be relatively high. This may have been an artifact of late calving because calves were younger when composition counts were conducted.

ACKNOWLEDGEMENTS

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Appendix 1. Personnel and Itinerary

Personnel

Larry Gray, Robert Mulders, Barnabus Peryouar, Susan Fleck, Ron Graf, Mark Williams

Itinerary for SF, RG and MW only

June 2
Total flying hours: 4.3 (Yk to camp)
Ron Graf, Mark Williams and Susan Fleck departed YK at 1838 heading for Mackay Lake to refuel then on to calving ground camp. Arrived at Mackay Lake 2003, departed at 2103 and arrived at calving ground camp at 2357 (Sand Hill Lake; 65.33 x 99.12), 150 miles from camp ceiling was lowering and last 50 miles was light snow with poor visibility and strong winds from the north.

June 3
Total flying hours: 2.8 (Spaghetti reconnaissance)
Strong winds, blowing and poor visibility for most of the day with partial clearing around 1800. Departed at 1900 for spaghetti recon, with strong winds from the NW and broken overcast, visibility became very bad. Had to land on Aberdeen Lake at 2148, with overcast and snow flurries. The weather was too bad to return to camp or Baker Lake, ended up spending the night in the Cessna on Aberdeen Lake.

June 4
Total flying hours: 0.8 (Aberdeen Lake to camp) Weather day strong winds, blowing snow and low overcast in the morning at Aberdeen Lake. Weather started breaking up, departed at 1201 and went west along Aberdeen Lake back to camp, weather deteriorated within 30 miles of camp. Back at camp drew up maps for systematic recon., stratified survey and photo crew. Susan and crew found the calving area NW of camp. The weather continued to be poor in the afternoon and the forecast the same for tomorrow.

June 5
Total flying hours: 0 (Weather day)
Blizzard conditions today and are forecasted for tomorrow according to Roger Toews from Baker Lake.

June 6
Total flying hours: 0 (Weather day)
Winds still strong from the north with blowing snow. Throughout the afternoon weather seemed to clearing up, possibly a good day tomorrow.

June 7
Total flying hours : 13.3 (Systematic reconnaissance)
Winds moderate from NW, ceiling variable and a forecast for clearing. Contacted Roger in Baker to ask for the air photo plane, should arrive tomorrow night. On transect 10, five wolves were spotted. Throughout the systematic survey, the few calves observed were very small and could not run very well, completed the systematic recon. today.

June 8
Total flying hours: 18.1 (Stratified survey)
The weather was acceptable with 1500 overcast and moderate winds from the NW. Began stratified sampling at 1000 and finished at 2137. A recon. flight was flown south of Ursus Islands, west of Beverly Lake and through Marjorie Hills south of Aberdeen Lake, found only yearlings, this confirmed the calving ground boundaries. Doug unable to come in with chopper due to Omega system failure, he also mentioned that the photo plane would be in Baker Lake in the evening.

June 9
Total flying hours: 9.0 (Stratified survey) 6.2 (Composition)
Started class counts today with overcast, moderate winds from the east and light snow showers. Ivan, Larry and Barnabus took photo maps into Baker Lake for the photo crew. Other crew finished off the remainder of strata 2, 3 and 4 (stratified survey). Began class counts in high stratum #1 at 1134 and completed eight transects in high #1 and three in medium #3, returned to camp at 2058. Picked up 2 calf carcasses approximately 50m apart on transect 11, also sited one wolf and one grizzly on transect five.

June 10
Total flying hours: 8.2 (Composition)
Scattered overcast during the day with moderate winds from the east. Departed by 1047 to do stratum 3 class counts, completed transects 12 - 19 in medium #2 and collected three calf carcasses, back in camp at 1616. Went back out to complete stratum 4 and start stratum 2, completed work at 2248. Two wolves and 2 muskoxen sighted today while doing composition work. Air photo plane left for calving ground but had to return due to poor visibility. Concerned about movement from SW corner of stratum 1 into stratum 3 and possibly north from stratum 1 into stratum 2. The southern borders of stratum 4, north end of stratum 3 and west border of stratum 3 still look o.k.

June 11
Total flying hours: 0 (Weather day)
Very strong winds in the morning with low dark ceiling (1000' overcast). Baker Lake had 500' overcast with freezing rain showers.

June 12
Total flying hours: 0 (Weather day)
No change in weather, got word to Baker that weather was down and unable to use photo plane today.

June 13
Total flying hours: 0 (Weather day)
Area forecast for continuing rain, fog and low overcast. Decided to break camp at soon as weather conditions improve. Sent chopper crew back to Baker since we have run out of time for additional class counts.

June 14
Total flying hours: 4.3 (Camp to Mackay Lake to Yk)
Burned garbage and cleaned up the camp and departed for Yellowknife via Mackay Lake.

Total Survey Hours Flown by two Cessna 185'S
52.6 hours (includes: return trip home, spaghetti and stratified survey).

Total Survey Hours Flown by 206B Jet Ranger
14.3 hours

Appendix 2. Caribou counted on each transect during the systematic reconnaissance survey and the population estimate based on those data for the Beverly caribou calving ground in June 1987.

Transect No.	Area (Km^2)	Caribou Counted
1	27	41
2	32	47
3	48	39
4	56	379
5	64	437
6	64	492
7	72	254
8	72	450
9	72	362
10	80	270
11	72	54
12	80	149
13	91.2	105
14	48	21
15	32	4
Total	910.2	3104

Stratum	Number of caribou	Density	Variance	SE	CV
1	45,049	3.41	8458544	2908	.065
Total	45,049		8458544	2908	.065

Appendix 3. Caribou numbers and areas in the three strata from the systematic reconnaissance survey of the Beverly Caribou calving ground in June 1987.

	Transect No.	Area (Km^2)	Caribou Counted
Stratum 1 ($2605\ km^2$)	3 south	8.4	4
	4 south	25	309
	5 south	40.2	354
	6 south	34	457
	7 south	40.2	163
	8 south	30	340
	9 central	17.2	166
Total		195.0	1793
Stratum 2 ($2123\ km^2$)	6 north	16.8	25
	7 north	32.8	92
	8 north	33	110
	9 north	32.8	169
	10 north	32.8	205
	11 north	17.4	17
Total		165.6	618
Stratum 3 ($1958\ km^2$)	9 south	6.8	25
	10 south	25	55
	11 south	27.6	32
	12 all	42.6	141
	13 all	26.8	55
	14 all	9.8	15
Total		138.6	323

Appendix 4. Stratified survey results from the Beverly caribou calving ground in June 1987.

	Transect No.	Area (km^2)	Caribou Counted
Stratum 1 ($2582\ km^2$)	1	32.4	313
	2	32.4	437
	3	32.4	515
	4	32.4	476
	5	32.4	395
	6	32.4	390
	7	32.4	486
	8	32.4	298
	9	32.4	261
	10	32.4	281
	11	32.4	420
	12	32.4	359
	13	32.4	299
	14	32.4	228
	15	32.4	249
	16	32.4	310
	17	32.4	411
	18	32.4	211
	19	32.4	324
	20	32.4	215
	21	32.4	365
	22	32.4	254
	23	32.4	318
	24	32.4	208
	25	32.4	342
	26	32.4	266
	27	32.4	294
	28	32.4	235
	29	32.4	306
	30	32.4	187
	31	32.4	178
	32	32.4	76
	33	32.4	237
	34	32.4	150
	35	32.4	114
Total		1134.0	10508

Appendix 4. (continued)

	Transect No.	Area (km^2)	Caribou Counted
Stratum 2 ($2056\ km^2$)	1	26	393
	2	26	403
	3	26	325
	4	26	220
	5	26	128
	6	26	122
	7	26	113
	8	26	184
	9	26	265
	10	26	52
	11	26	199
	12	26	197
	13	26	142
	14	26	181
	15	26	51
	16	26	72
	17	26	33
Total		442	3080
Stratum 3 ($1918\ km^2$)	1	26	21
	2	26	13
	3	26	134
	4	26	204
	5	26	190
	6	26	114
	7	26	214
	8	26	123
	9	26	85
Total		234	1098

Appendix 4 (continued)

	Transect No.	Area (km^2)	Caribou Counted
Stratum 4	1	15.4	6
	2	15.4	22
	3	15.4	7
	4	15.4	28
	5	15.4	5
	6	15.4	79
	7	15.4	72
	8	15.4	18
	9	15.4	24
	10	15.4	5
	11	15.4	9
	12	15.4	23
	13	15.4	6
	14	15.4	10
Total		215.6	314

Appendix 5. Composition results from the Beverly caribou calving ground in June 1987.

Transect No.	Number of parturient cows	Number of other caribou
Stratum 1 (fpc=0.91)		
1	132	31
2	254	90
3	115	64
4	278	166
5	84	96
6	266	86
7	159	25
8	211	57
Total	1499	615
Stratum 2 (fpc=0.98)		
25	55	23
26	127	43
Total	182	66

Appendix 5. (continued)

Transect No.	Number of parturient cows	Number of other caribou
Stratum 3 (fpc=0.93)		
12	12	41
13	29	39
14	12	18
15	49	97
16	36	40
17	3	20
18	20	41
19	66	73
Total	227	369
Stratum 4 (fpc=0.90)		
9	16	3
10	11	0
11	39	5
20	1	0
21	33	6
22	34	2
23	23	4
24	0	0
Total	157	20