

**SUMMARY OF THE 1994 POST CALVING AND RUT SURVEY  
FOR THE ITCHA-ILGACHUZ MOUNTAINS  
CARIBOO REGION**

by  
James A. Young

Wildlife Branch  
Ministry of Environment Lands and Parks  
Cariboo Region

January 1997

## SUMMARY OF THE 1994 POST CALVING AND RUT SURVEY FOR THE ITCHA-ILGACHUZ MOUNTAINS, CARIBOO REGION

JAMES A YOUNG, Wildlife Branch, BC Environment, Ste. 400, 640 Borland Street,  
Williams Lake, BC V2G 4T1

**Abstract:** To monitor population trend, sex ratio and calf recruitment within the Itcha-Ilgachuz Mountains caribou population, two aerial total count surveys were undertaken in 1994. The post calving survey was conducted on June 21 and the autumn rut survey was completed on October 17, following methods similar to previous surveys. Total count (1136), cow (618) and calf (293) estimates from the June survey were similar to results obtained from surveys undertaken since 1989. The estimated calf/cow (19/100) and bull/cow (14/100) ratios obtained during the autumn survey were lower than results obtained from surveys undertaken during the period of population increase observed in the late 1970's and early 1980's. Both the observed (14/100) and corrected (25/100) bull/cow ratios were below the provincial management objective of 35 bulls/100 cows post season. A post calving population of 1618 caribou and a late October population of 1369 caribou were estimated from both surveys and indices developed from previous telemetry work. Population trend and recruitment statistics suggest caribou numbers are currently stable.

**Key Words:** autumn rut survey, caribou, Itcha-Ilgachuz Mountains, population composition, post calving survey, *Rangifer*, total count.

---

### INTRODUCTION

During winter woodland caribou (*Rangifer tarandus caribou*) in the Itcha-Ilgachuz Mountains forage on terrestrial and arboreal lichens which are abundant within old pine forests throughout the area. Clear-cut timber harvesting of mature pine forests can negatively impact winter habitat of caribou by reducing or eliminating their forage supply. As such, understanding the relationship between reductions in the availability of suitable habitat through clear-cutting and changes in caribou numbers is required. To monitor the relative abundance and composition of the caribou population within the Itcha-Ilgachuz Mountains two aerial surveys were undertaken in 1994. The objectives of the post-calving June survey were to measure relative abundance of the breeding female component and early calf production. The objective of the October rut survey was to estimate sex composition and calf recruitment. These estimates were intended to provide population trends that can be compared to previous and future surveys for the same area.

I wish to acknowledge Pat Dielman, John Youds and Chris Schmid for serving as observers during the surveys. Ian Hatter, Herb Langin, Debbie Cichowski and John

Youds reviewed a previous draft of this report. Funding for this project was provided by the Corporate Resource Inventory Initiative (CRII).

## **SURVEY AREA**

The Itcha-Ilgachuz Mountains are located within west central British Columbia within the Western Chilcotin Uplands Ecoregion. This ecoregion is located in a rainshadow area to the lee of the Kitimat Ranges. Gently rolling alpine areas are associated with shield volcanoes which are common within this subregion. Cold moist summers and moderate snow in winter characterizes the climate. The survey area is of moderate size (approximately 765 square kilometers) located within Management Unit 5-12 (Figure 1). The survey area is comprised primarily of two biogeoclimatic subzones; the Alpine Tundra zone and the Englemann Spruce Subalpine Fir, very dry, very cold subzone.

## **METHODS**

A Bell 206 Jet Ranger was employed for both surveys using the total count technique (Simpson et. al. 1993). The surveys were restricted to high strata habitats, where under the proper conditions, animal sightability is high. This included the Itcha Flats wetland complex, alpine and adjacent parkland habitat and the larger wetlands between the Itcha and Ilgachuz Mountains. Mountain complexes were flown in a counter clockwise manner so that observers on the left side of the aircraft could scan the open habitat for caribou. The observer in the back right-hand seat provided additional coverage when necessary, particularly in the flatter terrain. Several of the larger plateaus required more than one pass (see flight map for details).

The June 21 flight included pilot Nick Konecny, Jim Young (navigator), Pat Dielman (rear left) and John Youds (rear right). A total of 8.2 hours were flown with approximately 3 hours required to survey each mountain area. Observing conditions were good with clear skies and a few snow patches on north aspects at higher elevations. Caribou were classified into the following categories; bull, cow, yearling bull, yearling cow and calf. Adequate time and effort was allowed to classify all observed animals.

The October 17 flight included pilot Nick Konecny, Jim Young (navigator), Pat Dielman (rear left) and Chris Schmid (rear right). A total of 8.0 hours were flown with approximately 3 hours required to survey each mountain area. Observing conditions were poor to moderate with 100% high overcast, a temperature of  $-2^{\circ}\text{C}$  and snow cover varying between 10 centimeters on the southwest sides of the mountains to no snow on the northeast sides and a type of mottled snow in between. These snow conditions made observing animals more difficult than normal, especially when in small groups. Caribou were classified into the following categories; Class III Bull (mature bull), Class II (medium bull), cow and calf. Due to the difficulty with classifying large groups of caribou, both male and female yearlings were included in the cow classification.



The following attributes, adapted from Simpson et. al. (1993), were used to classify individual animals:

Class I Bulls: large, heavy beamed antlers  
(Mature Bull) antlers often have many points and palmated brow tine  
body size  
testicles or penis sheath  
lack of vulva patch

Class II Bulls: antlers larger than females and smaller than Class III  
(Medium Bulls) body size  
testicles or penis sheath  
lack of vulva patch

Class I Bull: small antlers  
(Yearling Bull) lack of vulva patch  
short face

Females: small antlers  
black vulva patch  
presence of calf or yearling  
short face for yearlings

Calf: body size  
dark bodies  
lack of antler development  
proximity to adult

A simple model, adapted from Cichowski (1990), was utilized to generate post calving and post hunting season population estimates. Cichowski (1989) undertook a telemetry study of caribou in west central BC between April 1985 and March 1988. From her three June flights within the Itcha and Ilgachuz Mountains a sightability correction factor of 1.43 (28 of 40 radio-collared cows observed) for cows was obtained. Using this index an estimate of post calving cow (including male and female yearlings) and calf numbers was produced from observations during the June survey. The post calving adult bull population was estimated by applying the October bull/cow ratio to the corrected number of female caribou in June and adding the number of bulls harvested (with an additional 10% crippling loss). The numbers noted above for female caribou include both yearling male and female caribou. As not all censuses attempted to classify yearlings, to account for them the average annual calf survival for radio-collared cows obtained by Cichowski was used ( $9/50 = 18$  calves/100 cows) and subtracted from the initial corrected female caribou total to provide for an improved cow estimate and a yearling estimate. The post hunting season population estimate assumed no summer cow or yearling mortality and utilized the same estimate obtained for the post calving period. The adult bull and calf population estimates were obtained by applying the October bull/cow and calf/cow ratios

to the estimated total number of female caribou (which included yearlings) reported for June. Population growth rates were calculated using the formula  $\lambda = (N_t / N_0)^{1/t}$  where  $\lambda$  is the finite rate of increase,  $N_t$  is the number of caribou in year  $t$ ,  $N_0$  is the number of caribou in the initial year and  $t$  is the number of years between  $N_0$  and  $N_t$  (Caughley, 1977).

## RESULTS

### Post Calving Survey

During the June 21 flight a total of 1136 caribou were observed; 618 cows, 293 calves, 123 bulls, 67 yearling cows, and 35 yearling bulls. The observed calf/100 cow ratio was 47 and the percentage calves was 26%. The observed yearling/100 cow ratio was 16.

**Table 1: Caribou Observed June 21, 1994**

| Area Surveyed     | Total Classified | Cows       | Calves     | Bulls      | Yearling Cows | Yearling Bulls |
|-------------------|------------------|------------|------------|------------|---------------|----------------|
| Itcha             | 253              | 119        | 47         | 62         | 10            | 15             |
| Ilgachuz          | 883              | 499        | 246        | 61         | 57            | 20             |
| <b>Total Area</b> | <b>1136</b>      | <b>618</b> | <b>293</b> | <b>123</b> | <b>67</b>     | <b>35</b>      |

### Autumn Rut Survey

During the October 17 flight a total of 440 caribou were observed; 331 cows, 63 calves, 24 mature bulls and 22 medium bulls. Yearling male and female caribou were included within the cow classification. The observed calf/100 cow ratio was 19 and the percentage calves was 14%. The observed bull/cow ratio was 14/100.

**Table 2: Caribou Observed October 17, 1994**

| Area Surveyed     | Total Classified | Cows       | Calves    | Mature Bulls | Medium Bulls |
|-------------------|------------------|------------|-----------|--------------|--------------|
| Itcha             | 348              | 264        | 45        | 19           | 20           |
| Ilgachuz          | 92               | 67         | 18        | 5            | 2            |
| <b>Total Area</b> | <b>440</b>       | <b>331</b> | <b>63</b> | <b>24</b>    | <b>22</b>    |

### 1994 Post Calving Population Estimate

Utilizing the population model, the post calving population estimate for 1994 was:

|                     |      |
|---------------------|------|
| Total Caribou       | 1618 |
| Number of Cows      | 845  |
| Number of Calves    | 419  |
| Number of Bulls     | 169  |
| Number of Yearlings | 185  |

Due to the methods used to produce these values no confidence interval can be placed around the individual estimates.

### **1994 Post Season Population Estimate**

Utilizing the population model, the post season population estimate for 1994 was:

|                     |      |
|---------------------|------|
| Total Caribou       | 1369 |
| Number of Cows      | 845  |
| Number of Calves    | 196  |
| Number of Bulls     | 143  |
| Number of Yearlings | 185  |

When yearlings are included (and assuming a 50/50 split of males and females), these estimates provide for a post-season bull/cow ratio of 25/100. Due to the methods used to produce these values no confidence interval can be placed around the individual estimates.

### **Survey Costs**

Helicopter rental costs totaled \$8016.97 for both surveys. Wildlife staff involvement for pre-planning, survey and report completion approximate 25 person days.

### **DISCUSSION**

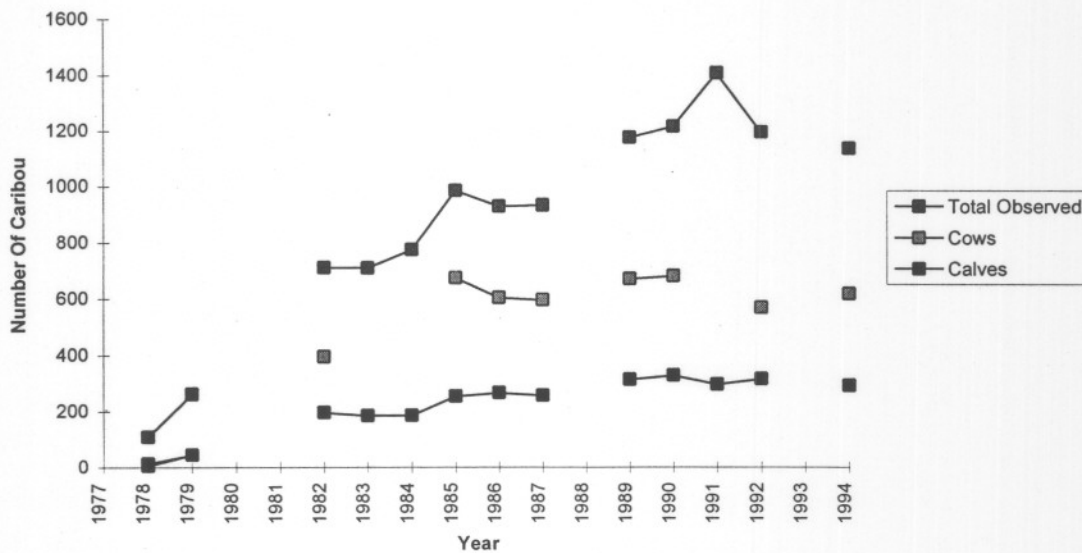
Prior to the late 1970's caribou inventory within the Itcha-Ilgachuz Mountains was conducted at the reconnaissance level primarily in conjunction with moose surveys. This resulted in incomplete total count surveys and minimal classification of animals encountered. Bergerud (1978) stated that the herd was a maximum of 400 animals during the mid 1970's based on a survey in 1973 and annual harvest records. Surveys undertaken during the late 1970's and early 1980's by Regional Wildlife Staff were summarized by Smith and Hebert (1986). During that period they observed a dramatic increase in caribou numbers with a total count in the autumn of 1979 recording 513 animals, and then in the spring of 1982, 711 animals were observed during a post calving survey. During the mid 1980's Cichowski (1990) undertook a detailed telemetry study within the Itcha, Ilgachuz and Rainbow Mountains. She continued to observe an increase in the population with 985 caribou seen during a post calving survey in 1985. In the late 1980's and early 1990's Regional Wildlife Staff continued to survey the population with the largest total count to date occurring during a post calving survey in 1991 which observed 1408 caribou.

Since 1977 numerous surveys have been undertaken with varying objectives making the Itcha-Ilgachuz population one of the most surveyed caribou herds in British Columbia. As experience was gained, objectives were refined with varying classification schemes.

Survey timing evolved, eventually to focus within three time periods; post calving in June, October rut and March late winter surveys. A summary of surveys from these three time periods follows with implications to the 1994 surveys and population management. For surveys which occurred during the mid 1980's only caribou that were observed without the aid of telemetry are reported.

### Post Calving Survey Trends

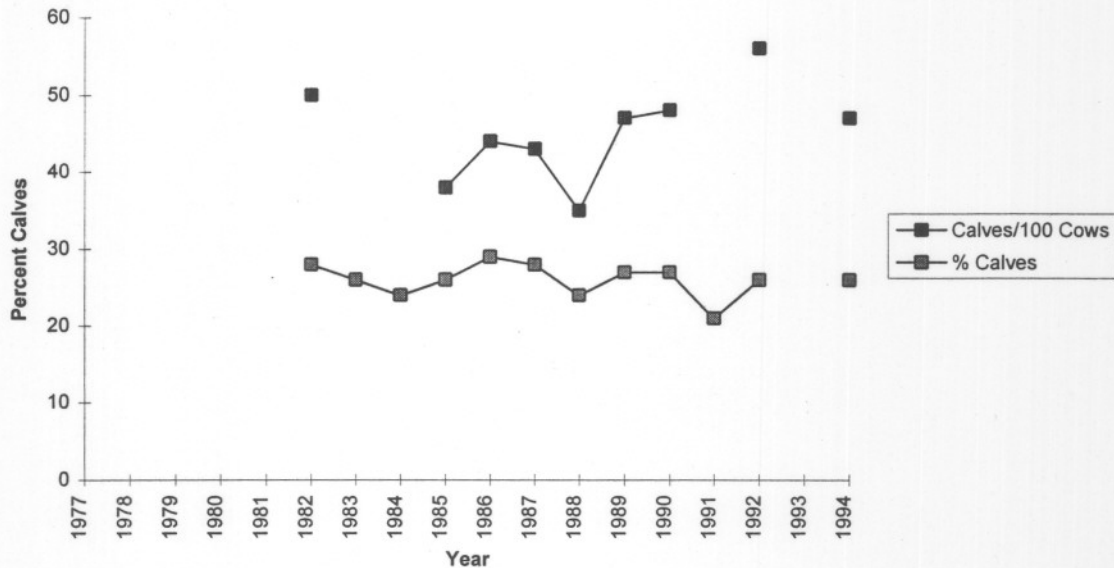
Post calving surveys have provided the best opportunity for total population counts and calf production estimates. Unfortunately male caribou are not always in the alpine in June and may be under represented during the spring surveys. Figure 2 depicts the results of surveys over the past 17 years illustrating the total number of caribou counted, as well as, the number of cows and calves observed. These data suggest the population dramatically increased during the late 1970's and early 1980's leveling off during the mid 1980's to early 1990's. It should be noted, however, that the two surveys which took place in the late 1970's, were exploratory in nature, and occurred in early June prior to the completion of calving. The 1991 survey undertaken in mid July resulted in the largest count to date. The large number of animals reported for that year can be explained by the late survey which resulted in a larger proportion of bulls being counted which are normally not observed. However, as several very large groups were encountered, it was difficult to classify all but calf caribou.



**Figure 2. Summary of Caribou Post Calving Surveys For the Itcha-Ilgachuz Mountains Detailing The Total Number of Caribou, Cows and Calves Observed**

Figure 3 summarizes calf recruitment obtained during post calving surveys. The ratio of calves/100 cows fluctuated between 35 and 56 depending on the year of survey. The percentage calves was less variable with values ranging between 21 and 28%. Ignoring the late surveys (July 7, 1984, July 26, 1988, and July 12, 1991) for which there would

likely have been additional calf mortality, the remaining nine surveys occurred between June 16 and June 27, and had calf percentages ranging between 26 and 29 suggesting very consistent calf production between years. For years where numerous unclassified animals were recorded no ratio was reported. The 1994 survey results are consistent with trends observed during previous surveys.



**Figure 3: Summary of Caribou Post Calving Surveys For the Itcha-Ilgachuz Mountains Detailing Calf Ratios**

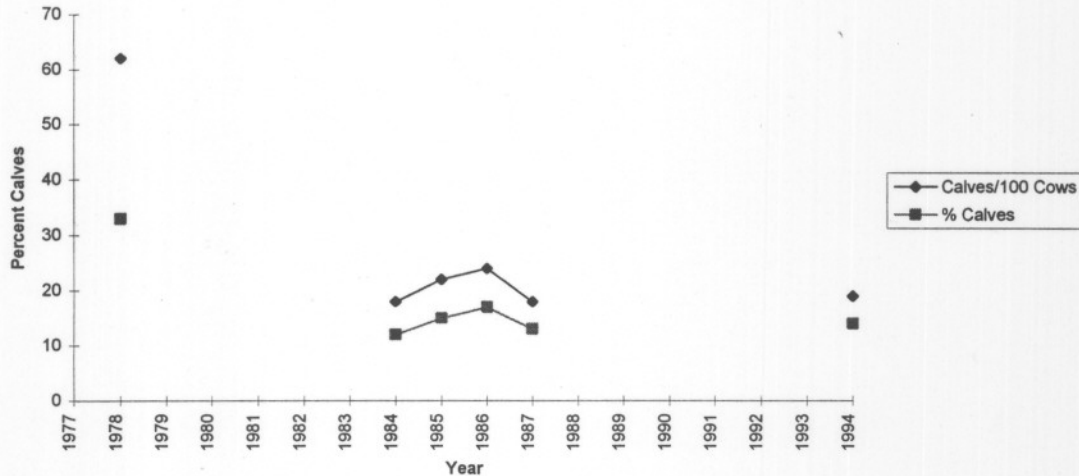
For several of these surveys calf production was likely underestimated for the observed caribou, primarily as a result of yearlings being included within the cow count. Cichowski (1990) found that the calf/cow ratio of all adult female caribou counted to be significantly different (greater) for cows that were found in alpine habitat (high strata) than for cows that were in lower elevation forested habitat suggesting the obtained calf/cow ratios were inflated. However, there were no observed differences in calf/cow ratios between radio collared cows using different habitats but this comparison had a much smaller sample. During her three year study 70% (28/40) of radio collared caribou were observed in the alpine of the Itcha and Ilgachuz Mountains during June surveys.

Another bias that must be considered is that caribou from the Rainbow Mountains, although only a small proportion of the total population, mix with animals in the Itcha-Ilgachuz Mountains. When only surveying the Itcha-Ilgachuz Mountains there is presently no method of determining what proportion of the population is in the Rainbows.

#### Autumn Rut Survey Trends

Since 1978 nine autumn surveys have occurred with the objective of determining calf recruitment, bull/cow ratios or both. Figure 4 illustrates high summer calf survival during 1978 and reduced survival in the mid 1980's consistent with the increase in caribou

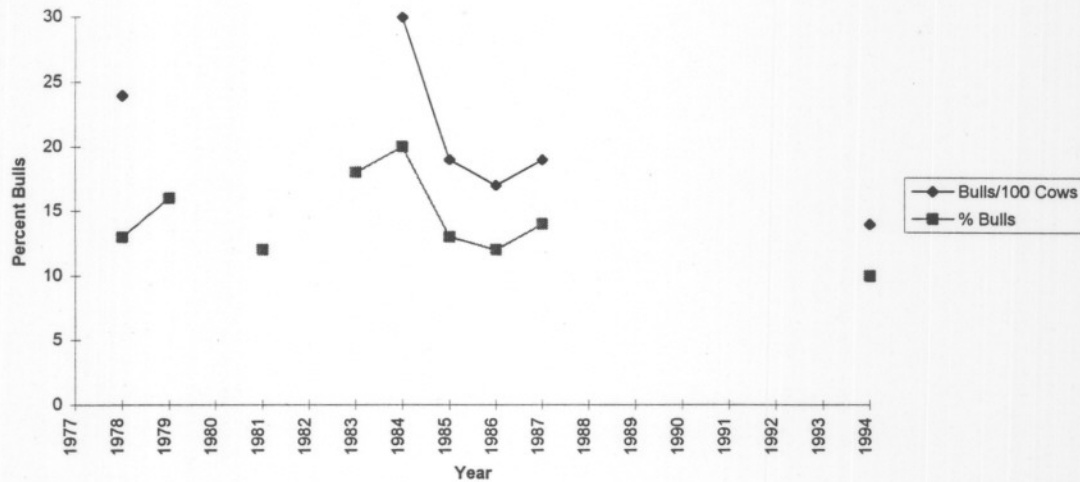
numbers observed during post calving surveys. The ratios obtained this year were consistent with values observed during the latest surveys which occurred during the mid 1980's. Bergerud (1992) suggests that in order to maintain a stable woodland caribou population, recruitment, at 6-9 months-of-age, must be a minimum of 25-26 calves/100 females or percent calves of the population must reach 15-16 percent to balance natural mortality of adults. Based on these suggested minimum requirements it would appear that the Itcha-Ilgachuz caribou population may be declining. However, this is not supported by the 1994 survey results or population estimates.



**Figure 4: Summary Of Caribou Rut Surveys For The Itcha-Ilgachuz Mountains Detailing Calf Ratios**

During the rut surveys, animal groups can be too large to classify completely resulting in female and male yearling caribou being included in the cow component. This in turn, results in observed calf/100 cow ratios being biased downward. During years when numerous animals were not classified no ratio was reported. In northern B. C. Hatler (1987) found that female caribou with calves were less likely than those without calves to be present in rut concentration areas. He also observed that calf abundance was inversely related to group size. However, during October surveys in the Itcha-Ilgachuz-Rainbow Mountains Cichowski (1990) found no differences between the proportion of cows with calves above treeline and the proportion of cows with calves below treeline in either the total sample or the radio-collared sample.

Figure 5 summarizes the existing information regarding observed bull/cow ratios. The limited data suggests a possible decline in the bull/cow ratio during the mid 1980's. The 1994 ratio was the lowest recorded to date. However, the ratios were biased since both male and female yearling caribou were included in the cow component. Furthermore, this years survey revealed that there were approximately as many mature bulls (age >3 years) in the population as medium bulls (age 2 & 3 years). At this time we have no estimate of the possible bias with the estimated bull/cow ratios as previous telemetry work did not investigate male caribou ecology.



**Figure 5: Summary Of Caribou Rut Surveys For The Itcha-Ilgachuz Mountains Detailing Observed Bull Ratios**

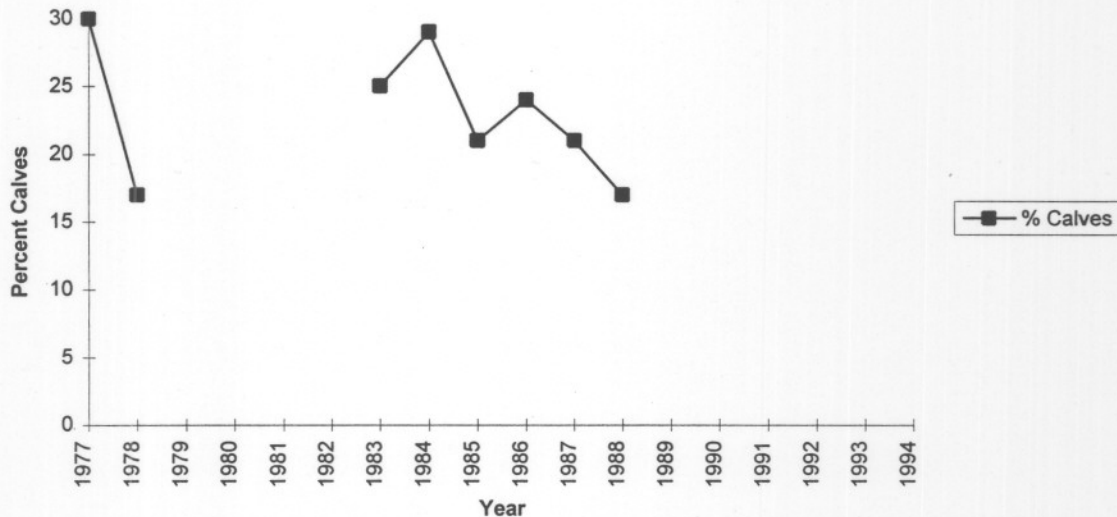
### Late Winter Survey Trends

Although a late winter survey was not completed in 1994 a summary of previous surveys is included to provide as complete a review of the status of the caribou population as possible. Several surveys were undertaken in the late 1970's and mid 1980's, providing estimates of late winter calf recruitment into the population. These data show high recruitment in the early 1980's declining to 17% calves by the completion of the last survey in 1988 (Figure 6). This value just exceeds the required 15-16 percent calf recruitment estimated by Bergerud (1992) to stabilize population growth. The trend in recruitment is consistent with the increase in total caribou numbers observed during the post calving surveys. Cichowski's (1990) winter surveys in the mid 1980's found no differences in the proportion of radio-collared cows with calves in the alpine compared to the proportion of radio-collared cows with calves below treeline. However, when comparing the total classification sample the proportion of cows with calves in the alpine was greater than the proportion of cows with calves in the lower elevation forest habitat. As such, the ratios obtained during these late winter surveys may over estimate calf recruitment.

### Population Growth Trends

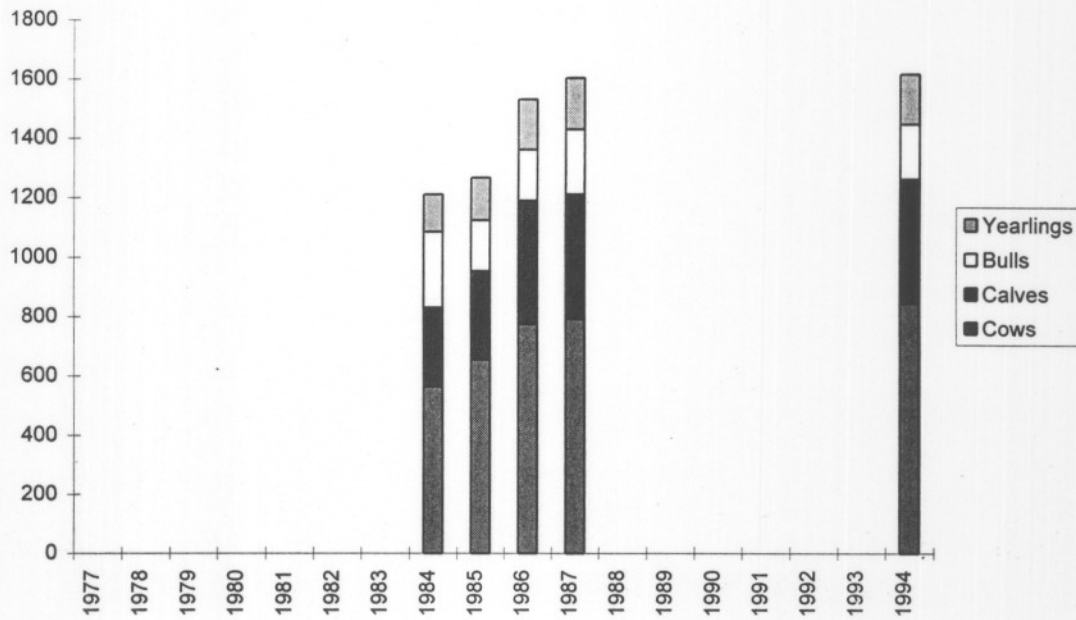
As there are a limited number of years in which both spring and fall surveys were undertaken, post calving and late October population estimates can only be produced for five years (Figures 7 and 8). From 1984 to 1987 the population appeared to grow rapidly (post calving total numbers:  $\lambda = 1.098$ , cows:  $\lambda = 1.120$ ; late October total numbers:  $\lambda = 1.094$ ). Annual population trends from 1987 to 1994 are unknown, although the overall trend appears to be stable to slightly increasing (post calving total numbers:  $\lambda = 1.001$ , cows:  $\lambda = 1.009$ ; late October total numbers:  $\lambda = 1.005$ ). As annual sightability

correction factors varied from 1.18 to 1.62, the individual yearly sightability correction factor were used to generate population estimates for 1985, 1986 and 1987; however, for 1984 and 1994 the three year average of the sightability correction factors was utilized. Calves/100 cows in June is not a very useful statistic for management purposes since calves die at a high and often variable rate between birth and autumn. Calves/100 cows in October is a more useful statistic (Bergerud 1992). Therefore the fall population estimates likely give a better representation of population growth than the June values.

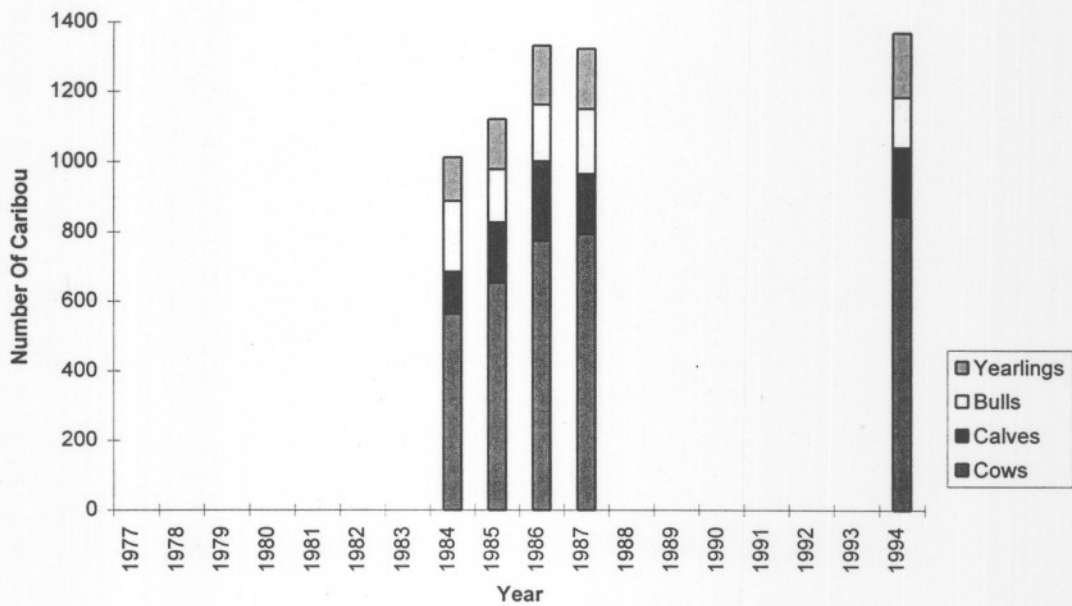


**Figure 6: Summary Of Late Winter Caribou Surveys For The Itcha-Ilgachuz Mountains Detailing Percent Calves Of The Total Number Encountered**

Bergerud (1992) suggests that for woodland caribou populations that space out within available habitat, to avoid predation, the stabilizing density is 0.064 animals per square kilometer. This is supported by his review of twenty-four herds which showed a mean density of 0.06 caribou per square kilometer. His review found that for these twenty-four herds, population trends were towards the overall mean in twenty-one cases and away in seven cases. Using a maximum home range of 4500 square kilometers (zones of low to high use identified by Cichowski, unpublished data) for the population, the Itcha-Ilgachuz caribou herd (1369 animals) has a density of approximately 0.30 animals per square kilometer. Based on Bergerud's review this herd has an abnormally high density. If population growth in 1994 was towards the stabilizing density suggested by Bergerud, then the population would be declining. However, this is not supported by the 1994 survey results nor the population estimates.



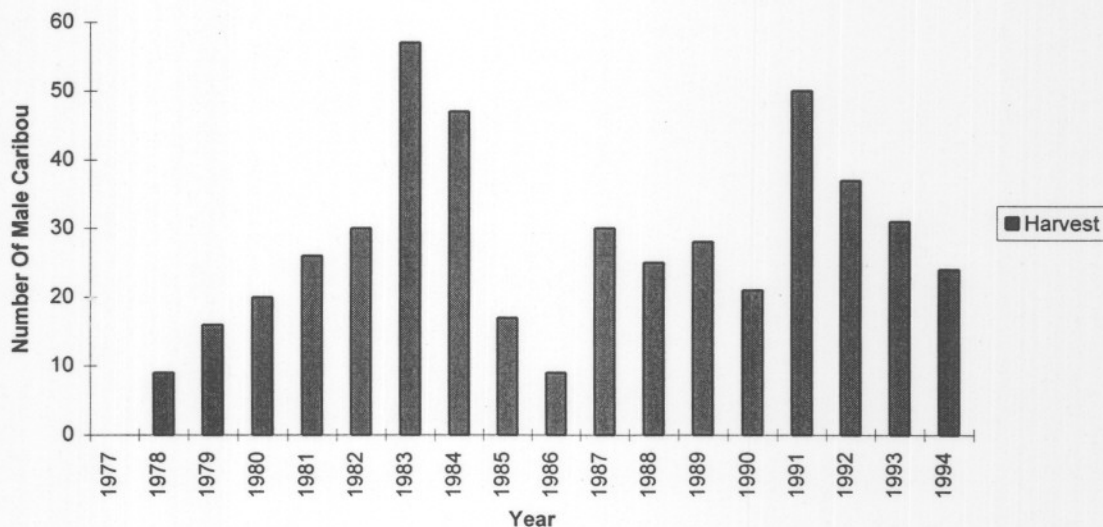
**Figure 7: Summary Of Caribou Post Calving Population Estimates, By Year, For The Itcha-Ilgachuz Mountains**



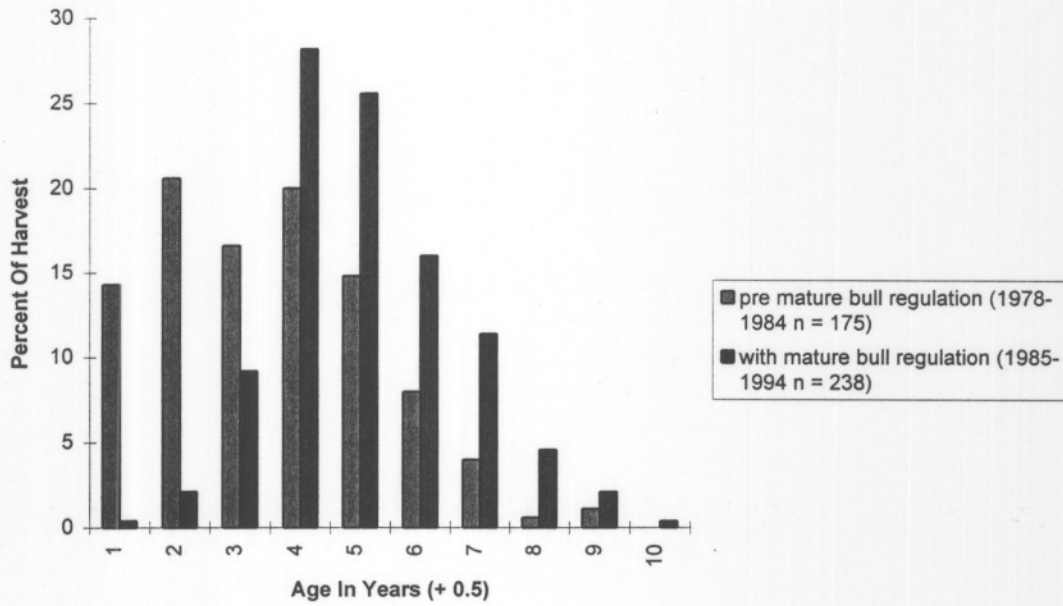
**Figure 8: Summary Of Caribou Late October Population Estimates By Year For The Itcha-Ilgachuz Mountains**

### **Implications To Future Harvest Management**

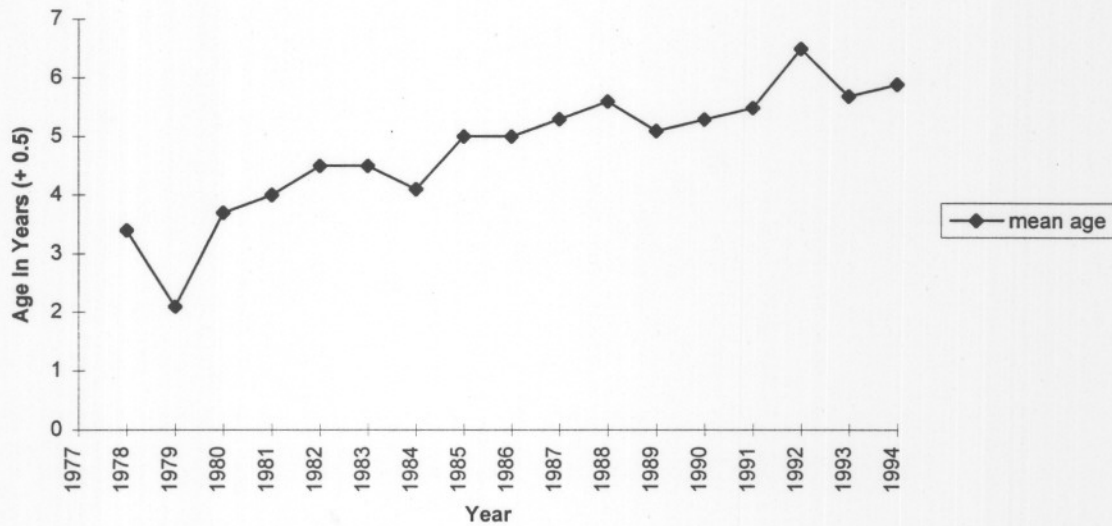
During the late 1970's and early 1980's caribou harvest within the Itcha-Ilgachuz Mountains steadily increased, due partly to improved access within the area. With the introduction of the mature bull season in 1985 the number of bulls shot annually was temporarily reduced and the average age of males shot has increased (Figures 9 and 10). Following this regulation change there has been no observed decline in the average age of animals shot (Figure 11) and the October survey confirms that a component of mature bulls still remain in the population. Nonetheless, of concern is the estimated low bull/cow ratio of 25 bulls/100 cows which was derived from the late October population estimate (Figure 12). All guide-outfitters are presently on a quota system; either administrative guidelines or annual quotas. The present limited entry cow harvest is small (3/year) with minimal impact on the breeding population at this time. Population modeling is required to determine options that would allow for increasing the bull/cow ratio while at the same time maintaining total caribou numbers.



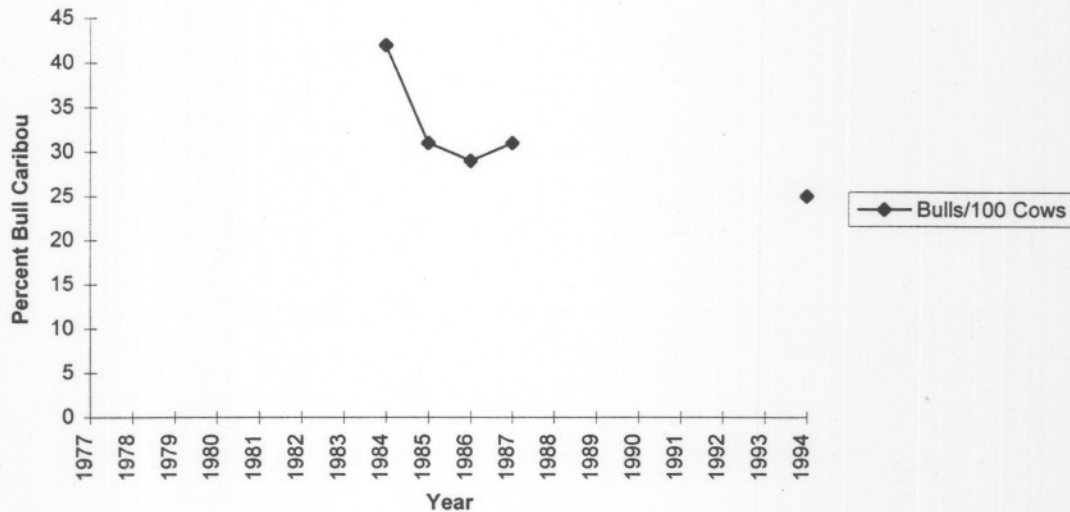
**Figure 9: Summary Of The Male Caribou Harvest From The Itcha-Ilgachuz Mountains (Mature Bull Regulation Introduced In 1985)**



**Figure 10: Age Class Distribution Of Harvested Male Caribou From The Itcha-Ilgachuz Mountains, Comparing Harvest Before And After Introduction Of The Mature Bull Regulation**



**Figure 11: Summary Of The Mean Age Of Male Caribou Harvested From The Itcha-Ilgachuz Mountains**



**Figure 12: Estimated Caribou Bull/Cow Ratios For The Itcha-Ilgachuz Mountains Using Values Obtained From Late October Population Estimates**

## CONCLUSIONS

- During the 1994 post calving survey a total of 1136 caribou were observed which included 618 cows, 293 calves, 123 bulls and 102 yearlings. The observed calf/100 cow ratio was 47.
- During the 1994 fall rut survey a total of 440 caribou were observed which included 331 cows, 63 calves and 46 bulls. The observed calf/100 cow ratio was 19 and the observed bull/100 cow ratio was 14.
- Using a simple population model, and data from both surveys, post calving (1618) and late October (1369) population estimates were obtained for the Itcha-Ilgachuz Mountains caribou herd.
- The Itcha-Ilgachuz Mountains caribou population appears to have remained relatively stable, at its present level, since 1987.
- Both the observed (14) and corrected (25) bull/100 cow ratios were below the provincial target of 35 bulls per hundred cows post season.

## RECOMMENDATIONS

- Future survey efforts should continue with both spring and autumn surveys conducted within the same year.

- The Rainbow Mountains should be included in future surveys.
- Surveys should be undertaken at least every other year.
- Population modeling should be undertaken to predict the consequences of maintaining the present harvest strategy on bull/cow ratios.
- Review the possibility of harvesting bull caribou with the 5-Point Bull regulation.

#### LITERATURE CITED

Bergerud, A.T. 1978. The status and management of caribou in British Columbia. B. C. Fish and Wildlife Report. 150pp.

Bergerud, A. T. 1992. Rareness as an antipredator strategy to reduce predation risk for moose and caribou. Pages 1008-1021 *in* D. R. McCullough and R.H. Barrett, (ed). Proceedings of Wildlife 2001: Populations. Elsevier Applied Sciences. London.

Smith, T. R. and D. Hebert. 1986. Caribou in the Itchas and Ilgachuz: a summary of harvest, inventory and other information. Unpublished Report, Wildlife Branch, Williams Lake, B. C. 85pp.

Caughley, G. 1977. Analysis of vertebrate populations. John Wiley & Sons. Toronto. 234pp.

Cichowski, D.B. 1989. Seasonal movements, habitat use and winter feeding ecology of woodland caribou in west central British Columbia. Msc. Thesis, Univ. of B. C., Vancouver. 142pp.

Cichowski, D. B. 1990. Population parameters of caribou in west central British Columbia. Pages 26-33 *in* D. Hebert, ed. Proceedings of the caribou workshop. November, 1988, Williams Lake, B. C. 74pp.

Hatler, D.F. 1987. Perspectives on inventory of caribou in British Columbia. Spatsizi Association for Biological Research rep. No. 4, Wildlife Report No. R-14, MOEP, Victoria, B. C. and SABR, Smithers, B. C. 93pp.

Simpson, K., Hatler, D., Stroman, J., Hatter, I. and J. P. Kelsall. 1993. Aerial inventory of large mammals in British Columbia, a manual. (draft). Unpublished report, Wildlife Branch, Victoria, B. C. 162pp.

**APPENDIX 1: POST CALVING SURVEY RESULTS**

**ITCHA MOUNTAINS CARIBOU SURVEY - JUNE 21 1994**

| sighting #       | tot. in group | # bulls   | # cows     | # yrlg bulls | # yrlg cow | # calves  | other |
|------------------|---------------|-----------|------------|--------------|------------|-----------|-------|
| 1                | 11            | 9         |            | 2            |            |           |       |
| 2                | 16            | 14        |            | 2            |            |           |       |
| 3                | 2             | 1         |            | 1            |            |           |       |
| 4                | 12            | 9         |            | 3            |            |           |       |
| 5                | 2             |           | 1          |              |            | 1         |       |
| 6                | 8             |           | 6          |              | 1          | 1         |       |
| 7                | 4             |           | 2          |              |            | 2         |       |
| 8                | 4             |           | 2          |              |            | 2         |       |
| 9                | 2             |           | 2          |              |            |           |       |
| 10               | 2             |           | 1          |              |            | 1         |       |
| 11               | 2             |           | 2          |              |            |           |       |
| 12               | 3             |           | 2          |              |            | 1         |       |
| 13               | 44            |           | 29         |              | 2          | 13        |       |
| 14               | 3             |           | 3          |              |            |           |       |
| 15               | 2             |           | 2          |              |            |           |       |
| 16               | 2             |           | 1          |              |            | 1         |       |
| 17               | 4             |           | 2          |              |            | 2         |       |
| 18               | 11            |           | 9          |              | 2          |           |       |
| 19               | 12            |           | 11         |              | 1          |           |       |
| 20               | 5             | 3         |            | 2            |            |           |       |
| 21               | 3             |           | 1          |              | 2          |           |       |
| 22               | 37            |           | 25         |              | 2          | 10        |       |
| 23               | 2             |           | 1          |              |            | 1         |       |
| 24               | 19            |           | 11         |              |            | 8         |       |
| 25               | 4             |           | 2          |              |            | 2         |       |
| 26               | 23            | 18        | 2          | 3            |            |           |       |
| 27               | 10            | 8         |            | 2            |            |           |       |
| 28               | 2             |           | 1          |              |            | 1         |       |
| 29               | 2             |           | 1          |              |            | 1         |       |
| <b>Tot. Car.</b> | <b>253</b>    | <b>62</b> | <b>119</b> | <b>15</b>    | <b>10</b>  | <b>47</b> |       |

**ILGACHUZ MOUNTAINS CARIBOU SURVEY - JUNE 21 1994**

| sighting # | tot. in group | # bulls | # cows | # yrlg bulls | # yrlg cow | # calves | other |
|------------|---------------|---------|--------|--------------|------------|----------|-------|
| 1          | 64            |         | 38     |              | 2          | 24       |       |
| 2          | 4             |         | 3      |              | 1          |          |       |
| 3          | 3             |         | 1      |              |            | 2        |       |
| 4          | 2             |         | 1      |              |            | 1        |       |
| 5          | 8             |         | 4      |              |            | 4        |       |
| 6          | 147           |         | 92     |              | 7          | 48       |       |
| 7          | 2             |         | 1      |              |            | 1        |       |
| 8          | 1             |         | 1      |              |            |          |       |
| 9          | 2             |         | 1      |              |            | 1        |       |
| 10         | 1             |         | 1      |              |            |          |       |

| sighting #   | tot. in group | # bulls    | # cows     | # yrlg bulls | # yrlg cow | # calves   | other              |
|--|---------------|------------|------------|--------------|------------|------------|--------------------|
| 11   | 8             | 2          | 3          |              | 3          |            |                    |
| 12   | 8             |            | 4          |              |            | 4          |                    |
| 13   | 4             |            | 2          |              |            | 2          |                    |
| 14   | 1             |            | 1          |              |            |            |                    |
| 15   | 1             |            |            |              | 1          |            |                    |
| 16   | 18            |            | 10         |              |            | 8          |                    |
| 17   | 1             |            | 1          |              |            |            |                    |
| 18   | 4             |            | 2          |              | 1          | 1          |                    |
| 19   |               |            |            |              |            |            | 1 unclass. goat    |
| 20   | 5             |            | 3          |              |            | 2          |                    |
| 21   | 16            |            | 10         |              |            | 6          |                    |
| 22   |               |            |            |              |            |            | 2 unclass. goats   |
| 23   |               |            |            |              |            |            | 4 Rams/1 Ewe       |
| 24   | 11            |            | 7          |              |            | 4          |                    |
| 25   | 1             |            | 1          |              |            |            |                    |
| 26   |               |            |            |              |            |            | 1 unclass. goat    |
| 27   | 29            | 17         | 4          | 7            | 1          |            |                    |
| 28   |               |            |            |              |            |            | goats/4 adlt/3kids |
| 29   | 88            | 4          | 59         |              | 5          | 20         |                    |
| 30   | 172           |            | 98         |              | 9          | 65         |                    |
| 31   | 2             |            | 1          |              |            | 1          |                    |
| 32   | 9             |            | 4          |              | 2          | 3          |                    |
| 33   | 4             |            | 4          |              |            |            |                    |
| 34   | 20            | 15         |            | 5            |            |            |                    |
| 35   | 2             |            | 1          |              |            | 1          |                    |
| 36   | 138           | 19         | 78         | 5            | 12         | 24         |                    |
| 37   | 6             |            | 3          |              |            | 3          |                    |
| 38   | 2             |            | 1          |              |            | 1          |                    |
| 39   | 3             |            | 2          |              |            | 1          |                    |
| 40   | 24            |            | 16         |              | 1          | 7          |                    |
| 41   | 2             |            | 2          |              |            |            |                    |
| 42   | 26            | 2          | 18         | 2            | 4          |            |                    |
| 43   | 2             | 2          |            |              |            |            |                    |
| 44   | 14            |            | 7          |              | 2          | 5          |                    |
| 45   | 26            |            | 14         |              | 5          | 7          |                    |
| 46   | 2             |            |            | 1            | 1          |            |                    |
| <b>Tot. Car.</b>   | <b>883</b>    | <b>61</b>  | <b>499</b> | <b>20</b>    | <b>57</b>  | <b>246</b> |                    |
| Tot.   | goats         |            |            |              |            |            | 11                 |
| Tot.   | sheep         |            |            |              |            |            | 5                  |
| <b>TOTAL CARIBOU FOR BOTH THE ITCHA &amp; ILGACHUZ MOUNTAINS</b> |               |            |            |              |            |            |                    |
|  | <b>1136</b>   | <b>123</b> | <b>618</b> | <b>35</b>    | <b>67</b>  | <b>293</b> |                    |

**APPENDIX 2: LATE OCTOBER SURVEY RESULTS**

**ITCHA MOUNTAINS CARIBOU SURVEY - OCTOBER 17 1994**

| Group #           | Total      | Mat Bull  | Imm Bull  | Cow        | Calf      | Other        |
|-------------------|------------|-----------|-----------|------------|-----------|--------------|
| 1                 |            |           |           |            |           | 1 Bull Moose |
| 2                 | 7          |           | 1         | 5          | 1         |              |
| 3                 |            |           |           |            |           | 2 Bull Moose |
| 4                 | 1          |           |           | 1          |           |              |
| 5                 | 70         | 4         |           | 54         | 12        |              |
| 6                 | 18         |           |           | 13         | 5         |              |
| 7                 | 48         | 6         | 6         | 35         | 1         |              |
| 8                 | 43         | 1         | 3         | 32         | 7         |              |
| 9                 | 25         | 2         | 1         | 19         | 3         |              |
| 10                | 42         | 2         | 4         | 33         | 3         |              |
| 11                | 29         | 1         |           | 24         | 4         |              |
| 12                | 3          |           |           | 2          | 1         |              |
| 13                | 9          |           | 1         | 5          | 3         |              |
| 14                | 9          |           |           | 8          | 1         |              |
| 15                | 5          |           |           | 4          | 1         |              |
| 16                | 17         | 1         | 2         | 14         |           |              |
| 17                | 22         | 2         | 2         | 15         | 3         |              |
| <b>Total Car.</b> | <b>348</b> | <b>19</b> | <b>20</b> | <b>264</b> | <b>45</b> |              |
| Total             | Moose      |           |           |            |           | 3 Bulls      |

**ILGACHUZ MOUNTAINS CARIBOU SURVEY - OCTOBER 17 1994**

| Group #          | Total     | Mat Bull | Imm Bull | Cow       | Calf      | Other            |
|------------------|-----------|----------|----------|-----------|-----------|------------------|
| 1                | 4         |          |          | 3         | 1         |                  |
| 2                |           |          |          |           |           | 2 Cow Moose      |
| 3                |           |          |          |           |           | 1 Goat           |
| 4                | 2         |          |          | 1         | 1         |                  |
| 5                |           |          |          |           |           | 2 Cow Moose      |
| 6                | 38        | 2        |          | 29        | 7         |                  |
| 7                | 23        | 2        | 1        | 18        | 2         |                  |
| 8                | 17        | 1        |          | 12        | 4         |                  |
| 9                | 8         |          | 1        | 4         | 3         |                  |
| 10               |           |          |          |           |           | 2 Unclass. Moose |
| <b>Tot. Car.</b> | <b>92</b> | <b>5</b> | <b>2</b> | <b>67</b> | <b>18</b> |                  |
| Tot.             | Moose     |          |          |           |           | 6 Moose          |
| Tot.             | Goat      |          |          |           |           | 1 Goat           |

**TOTAL CARIBOU FOR BOTH THE ITCHA & ILGACHUZ MOUNTAINS**

|                   |            |           |           |            |           |  |
|-------------------|------------|-----------|-----------|------------|-----------|--|
| <b>Grand Tot.</b> | <b>440</b> | <b>24</b> | <b>22</b> | <b>331</b> | <b>63</b> |  |
|-------------------|------------|-----------|-----------|------------|-----------|--|

| APPENDIX 3: SUMMARY OF CARIBOU POST CALVING SURVEYS FOR THE ITCHA-ILGACHUZ MOUNTAINS |      |                |      |        |       |           |              |                 |          |                  |
|--|------|----------------|------|--------|-------|-----------|--------------|-----------------|----------|------------------|
| Day/Mth  | Year | Total Observed | Cows | Calves | Bulls | Yearlings | Unclassified | Calves/100 Cows | % Calves | Comments         |
|  | 1977 |                |      |        |       |           |              |                 |          |                  |
| 1-Jun  | 1978 | 110            | 13   | 5      |       |           | 92           |                 |          |                  |
| 8-Jun  | 1979 | 262            | 45   | 45     |       |           | 172          |                 | 0        |                  |
|  | 1980 |                |      |        |       |           |              |                 |          |                  |
|  | 1981 |                |      |        |       |           |              |                 |          |                  |
| 16-Jun   | 1982 | 711            | 395  | 197    | 119   |           |              | 50              | 28       |                  |
| 22-Jun   | 1983 | 710            |      | 186    |       |           | 524          |                 | 26       |                  |
| 7-Jul  | 1984 | 775            |      | 187    | 107   |           | 481          |                 | 24       |                  |
| 18-Jun   | 1985 | 985            | 675  | 255    | 55    |           |              | 38              | 26       |                  |
| 25-Jun   | 1986 | 929            | 605  | 267    | 57    |           |              | 44              | 29       |                  |
| 18-Jun   | 1987 | 933            | 597  | 258    | 78    |           |              | 43              | 28       |                  |
| 26-Jul   | 1988 | 670            | 461  | 161    | 48    |           |              | 35              | 24       | Only Itcha Mtns. |
| 23-Jun   | 1989 | 1175           | 672  | 314    | 132   |           | 44           | 47              | 27       |                  |
| 27-Jun   | 1990 | 1215           | 682  | 330    | 183   | 4         | 16           | 48              | 27       |                  |
| 12-Jul   | 1991 | 1408           |      | 298    | 16    |           | 1094         |                 | 21       |                  |
| 17-Jun   | 1992 | 1194           | 569  | 317    | 219   | 48        | 41           | 56              | 26       |                  |
|  | 1993 |                |      |        |       |           |              |                 |          |                  |
| 21-Jun   | 1994 | 1136           | 618  | 293    | 123   | 102       |              | 47              | 26       |                  |

| APPENDIX 4: SUMMARY OF CARIBOU LATE OCTOBER SURVEYS FOR THE ITCHA-ILGACHUZ MOUNTAINS |      |                |      |        |       |              |                 |          |                |         |
|--|------|----------------|------|--------|-------|--------------|-----------------|----------|----------------|---------|
| Day/Mth  | Year | Total Observed | Cows | Calves | Bulls | Unclassified | Calves/100 Cows | % Calves | Bulls/100 Cows | % Bulls |
|  | 1977 |                |      |        |       |              |                 |          |                |         |
| 2-Nov  | 1978 | 353            | 190  | 117    | 46    |              | 62              | 33       | 24             | 13      |
| 27-Nov   | 1979 | 513            | 36   | 10     | 82    | 385          |                 |          |                | 16      |
|  | 1980 |                |      |        |       |              |                 |          |                |         |
| 4-Nov  | 1981 | 475            | 14   | 62     | 58    | 341          |                 |          |                | 12      |
|  | 1982 |                |      |        |       |              |                 |          |                |         |
| 15-Oct   | 1983 | 351            |      |        | 64    | 287          |                 |          |                | 18      |
| 25-Oct   | 1984 | 334            | 227  | 40     | 67    |              | 18              | 12       | 30             | 20      |
| 18-Oct   | 1985 | 210            | 142  | 31     | 27    |              | 22              | 15       | 19             | 13      |
| 10-Oct   | 1986 | 429            | 304  | 73     | 52    |              | 24              | 17       | 17             | 12      |
| 21-Oct   | 1987 | 509            | 372  | 66     | 71    |              | 18              | 13       | 19             | 14      |
|  | 1988 |                |      |        |       |              |                 |          |                |         |
|  | 1989 |                |      |        |       |              |                 |          |                |         |
|  | 1990 |                |      |        |       |              |                 |          |                |         |
|  | 1991 |                |      |        |       |              |                 |          |                |         |
|  | 1992 |                |      |        |       |              |                 |          |                |         |
|  | 1993 |                |      |        |       |              |                 |          |                |         |
| 17-Oct   | 1994 | 440            | 331  | 63     | 46    |              | 19              | 14       | 14             | 10      |

**APPENDIX 5: SUMMARY OF LATE WINTER SURVEYS FOR THE ITCHA-ILGACHUZ MOUNTAINS**

| Day/Mth | Date | Total Observed | Unclassified Adult | Calves | Unclassified | % Calves |
|---------|------|----------------|--------------------|--------|--------------|----------|
| 1-Apr   | 1977 | 238            | 106                | 32     | 100          | 30       |
| 17-Feb  | 1978 | 59             | 49                 | 10     |              | 17       |
|         | 1979 |                |                    |        |              |          |
|         | 1980 |                |                    |        |              |          |
|         | 1981 |                |                    |        |              |          |
|         | 1982 |                |                    |        |              |          |
| 18-Apr  | 1983 | 243            | 182                | 61     |              | 25       |
| 14-Feb  | 1984 | 63             | 45                 | 18     |              | 29       |
| 13-Mar  | 1985 | 113            | 89                 | 24     |              | 21       |
| 18-Mar  | 1986 | 220            | 167                | 53     |              | 24       |
| 14-Mar  | 1987 | 155            | 122                | 33     |              | 21       |
| 10-Mar  | 1988 | 101            | 84                 | 17     |              | 17       |
|         | 1989 |                |                    |        |              |          |
|         | 1990 |                |                    |        |              |          |
|         | 1991 |                |                    |        |              |          |
|         | 1992 |                |                    |        |              |          |
|         | 1993 |                |                    |        |              |          |
|         | 1994 |                |                    |        |              |          |

| <b>APPENDIX 6: POST CALVING CARIBOU POPULATION ESTIMATES</b> |               |      |        |       |           |
|--|---------------|------|--------|-------|-----------|
| Year   | Tot. Estimate | Cows | Calves | Bulls | Yearlings |
| 1977   |               |      |        |       |           |
| 1978   |               |      |        |       |           |
| 1979   |               |      |        |       |           |
| 1980   |               |      |        |       |           |
| 1981   |               |      |        |       |           |
| 1982   |               |      |        |       |           |
| 1983   |               |      |        |       |           |
| 1984   | 1210          | 564  | 267    | 255   | 124       |
| 1985   | 1267          | 653  | 301    | 170   | 143       |
| 1986   | 1532          | 774  | 416    | 172   | 170       |
| 1987   | 1603          | 793  | 418    | 218   | 174       |
| 1988   |               |      |        |       |           |
| 1989   |               |      |        |       |           |
| 1991   |               |      |        |       |           |
| 1992   |               |      |        |       |           |
| 1993   |               |      |        |       |           |
| 1994   | 1618          | 845  | 419    | 169   | 185       |

**APPENDIX 7: LATE OCTOBER CARIBOU POPULATION ESTIMATES**

| Year | Tot. Estimate | Cows | Calves | Bulls | Yearlings |
|------|---------------|------|--------|-------|-----------|
| 1977 |               |      |        |       |           |
| 1978 |               |      |        |       |           |
| 1979 |               |      |        |       |           |
| 1980 |               |      |        |       |           |
| 1981 |               |      |        |       |           |
| 1982 |               |      |        |       |           |
| 1983 |               |      |        |       |           |
| 1984 | 1012          | 564  | 121    | 203   | 124       |
| 1985 | 1121          | 653  | 174    | 151   | 143       |
| 1986 | 1333          | 774  | 227    | 162   | 170       |
| 1987 | 1324          | 793  | 172    | 185   | 174       |
| 1988 |               |      |        |       |           |
| 1989 |               |      |        |       |           |
| 1991 |               |      |        |       |           |
| 1992 |               |      |        |       |           |
| 1993 |               |      |        |       |           |
| 1994 | 1369          | 845  | 196    | 143   | 185       |

**APPENDIX 8: SUMMARY OF MEAN AGE AND NUMBER OF MALE CARIBOU SHOT BY YEAR**

| Year | Harvest | mean age |  |  |  |  |  |
|------|---------|----------|--|--|--|--|--|
| 1977 | 0       |          |  |  |  |  |  |
| 1978 | 9       | 3.4      |  |  |  |  |  |
| 1979 | 16      | 2.1      |  |  |  |  |  |
| 1980 | 20      | 3.7      |  |  |  |  |  |
| 1981 | 26      | 4        |  |  |  |  |  |
| 1982 | 30      | 4.5      |  |  |  |  |  |
| 1983 | 57      | 4.5      |  |  |  |  |  |
| 1984 | 47      | 4.1      |  |  |  |  |  |
| 1985 | 17      | 5        |  |  |  |  |  |
| 1986 | 9       | 5        |  |  |  |  |  |
| 1987 | 30      | 5.3      |  |  |  |  |  |
| 1988 | 25      | 5.6      |  |  |  |  |  |
| 1989 | 28      | 5.1      |  |  |  |  |  |
| 1990 | 21      | 5.3      |  |  |  |  |  |
| 1991 | 50      | 5.5      |  |  |  |  |  |
| 1992 | 37      | 6.5      |  |  |  |  |  |
| 1993 | 31      | 5.7      |  |  |  |  |  |
| 1994 | 24      | 5.9      |  |  |  |  |  |

**APPENDIX 9: AGE DISTRIBUTION OF HARVESTED MALE CARIBOU**

| Age In Years (+ 0.5) | Pre Mature Bull Reg. (1978-1984 n=175) | With Mature Bull Reg. (1985-1994 n=238) |
|----------------------|--|---|
| 1                    | 14.3                                   | 0.4                                     |
| 2                    | 20.6                                   | 2.1                                     |
| 3                    | 16.6                                   | 9.2                                     |
| 4                    | 20                                     | 28.2                                    |
| 5                    | 14.8                                   | 25.6                                    |
| 6                    | 8                                      | 16                                      |
| 7                    | 4                                      | 11.4                                    |
| 8                    | 0.6                                    | 4.6                                     |
| 9                    | 1.1                                    | 2.1                                     |
| 10                   | 0                                      | 0.4                                     |