

WEST-CENTRAL BC CARIBOU RESEARCH PROJECT

PROGRESS REPORT

April 1985 - March 1988

SUMMARY OF FEEDING SITE SELECTION, FOOD HABITS  
AND POPULATION PARAMETERS

February 1989

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## INTRODUCTION

Tweedsmuir Park and the area to the east has been identified as a high priority management area for woodland caribou (*Rangifer tarandus caribou*) (Stevenson and Hatler 1985). Two large groups of woodland caribou inhabit this area. In the north, the Tweedsmuir-Entiako caribou summer in the mountainous area of northern Tweedsmuir Park, migrate south across Tetachuck Lake and winter in the lower elevation pine and pine/spruce forests in the Entiako-Laidman Lake area. In the south, caribou summer in the Itcha-Ilgachuz and Rainbow mountains and winter in lower elevation pine forests in the area east and southeast of the Itcha mountains. Several groups of caribou also winter in the alpine/subalpine areas on the north side of both the Rainbow and Ilgachuz mountains.

Because caribou in both areas winter primarily in lower elevation forested areas, potential conflicts with logging were anticipated. Increasing concern over current population status, habitat disturbance by logging and increased accessibility prompted the initiation of studies on radiocollared caribou. Between 1982 and 1984, caribou in both the Tweedsmuir-Entiako area and the Itcha-Ilgachuz-Rainbow area were radiocollared and basic information on habitat use, seasonal movements and population dynamics was collected.

In April 1985, the West Central-B.C. Caribou Study was initiated to investigate the potential effects of logging on caribou in this area. The original studies were expanded to include more intensive investigation of winter range and population parameters. The objectives of the study were:

1. to determine seasonal range, habitat use, and food habits of caribou. This information is necessary to develop logging prescriptions which minimize the detrimental effects of logging on caribou.
2. to determine population size, calf production, calf survival and adult survival so that the current population status and major limiting factors can be determined.

This report presents the results of the data collected on feeding site selection, food habits and population parameters during the three years of the study (April 1985 - March 1988).

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(Public Conservation Assistance Fund); and the National Science and Engineering Research Council of Canada.

## STUDY AREA

The study area is located in the western part of central British Columbia (Fig.1). The southern section extends from the Rainbow Mountains in Tweedsmuir Park east to the Clisbako River and from Punkutlaenkut Lake north to the Blackwater and Coglistiko rivers. A large part of this area lies within the Very Dry Central Montane Spruce subzone (MSd). The Sub-Boreal Spruce (SBS) and Sub-Boreal Pine-Spruce (SBPS) zones occur at lower elevations (<1300 - 1500 meters) and the Engelmann Spruce Subalpine Fir zone (ESSF) occurs at higher elevations (>1650m). Alpine tundra is present in the Itcha, Ilgachuz and Rainbow mountains above the ESSF.

The northern section of the study area extends from the area in and to the west of northern Tweedsmuir Park between Tahtsa and Eutsuk lakes east to Nataalkuz Lake and the Fawnie Mountains and southeast to the Laidman-Moose Lake area. Most of the low to medium elevation sites in this part of the study area are in the SBS and SBPS zones. The ESSF zone occurs at higher elevations (>1200m) and alpine tundra occurs above the ESSF in the Fawnie Mountains and in the mountains of northern Tweedsmuir Park. The western part of northern Tweedsmuir Park and the area to the west consist primarily of the Coastal Western Hemlock (CWH) zone at low elevations and the Mountain Hemlock (MH) or the ESSF zones at higher elevations below the alpine tundra zone.

## METHODS

### Feeding site selection and food habits

A total of 52 adult female caribou (25 in Tweedsmuir-Entiako, 27 in Itcha-Ilgachuz-Rainbow) were radiocollared during the three year study. Animals were located by telemetry from aircraft approximately biweekly from April to November, and weekly from December to March. Locations were plotted on to 1:100 000 map sheets and habitat, aspect and elevation of each location were recorded.

During the winter months, feeding habits of caribou in low elevation forested areas were investigated. The winter range of each caribou population was visited biweekly (alternating weekly) following radiotelemetry flights, and fresh caribou tracks were followed. Distance travelled through each habitat type was measured by the number of steps taken to travel through that habitat. Feeding site type (cratering vs. arboreal lichen feeding) was noted at each feeding site.

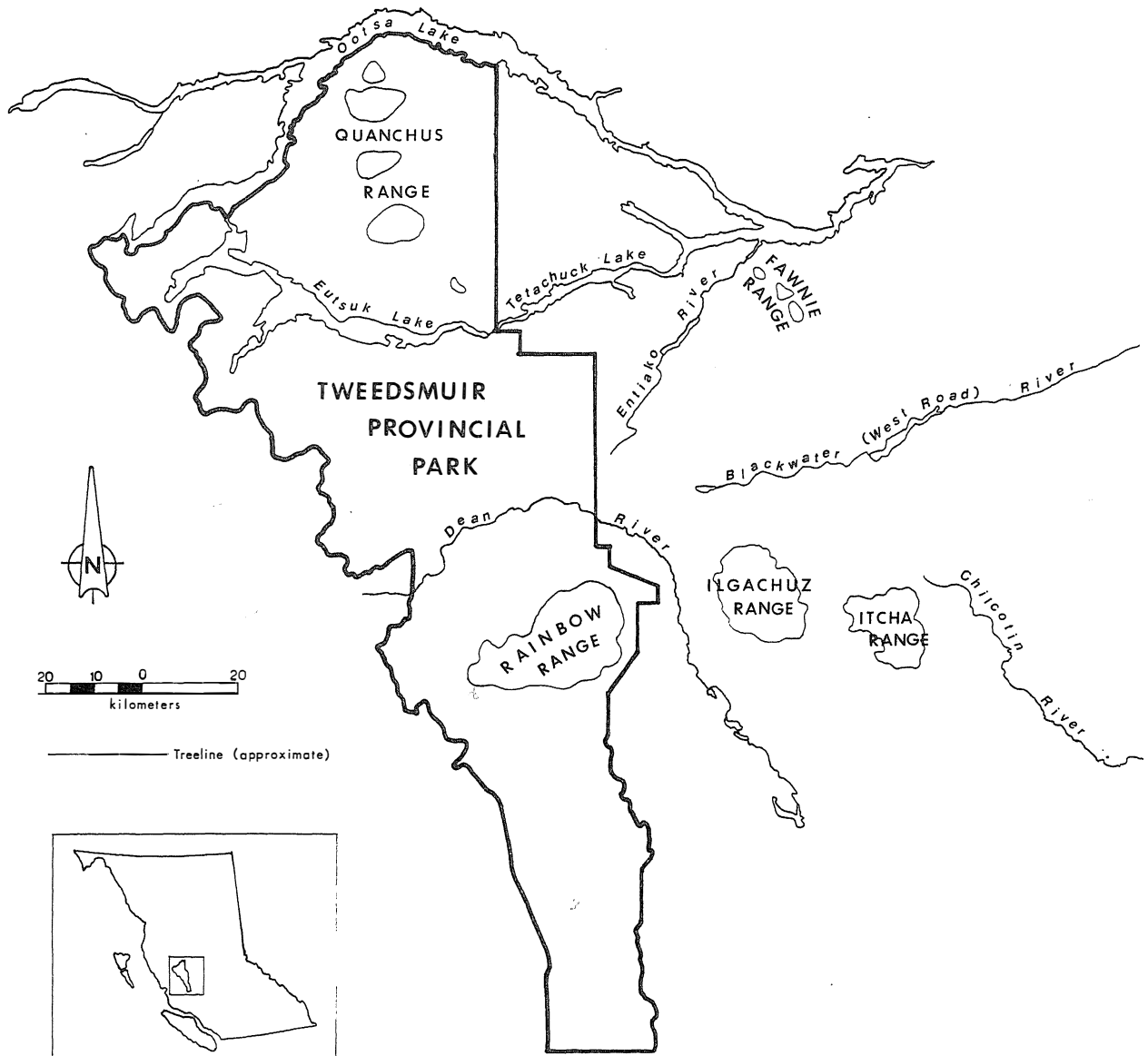


Figure 1. Location of study area.

Cratering sites (C) were compared to pits or non-cratering sites (NCS) dug at 100 step intervals where caribou were walking but not cratering. Non crater sites were compared to craters in order to determine whether snow conditions (snow depth, snow penetrability), lichen presence and/or abundance and canopy closure affected cratering site selection by caribou. Snow depth and snow penetrability were measured at both craters and NCS. Snow penetrability was measured as the distance that a 1 kilogram weight penetrated the snow after being dropped from a height of 1 meter above the snow, divided by the snow depth at the site. Presence and % ground cover of each vegetation type, and canopy cover were also measured for each crater and NCS. Percent ground cover of vegetation types was grouped into 5 classes; absent (0%), trace (<1%), low (2-14%), medium (15-39%) and high (>40%). Canopy cover was visually estimated as very open (<5% canopy cover), open (6-10%), moderately open (11-15%), moderately open - moderately closed (16-20%) and moderately closed (>20%).

Differences between the proportion of craters that contained terrestrial lichens and the proportion of NCS that contained terrestrial lichens was tested by the chi-squared technique. Differences between the distribution of % terrestrial lichen cover classes and % canopy cover classes in craters and NCS were also tested using the chi-squared technique (Neu *et al.* 1974).

To determine snow accumulation in different habitat types over the winter, snow depth was measured at snow stations set up in 3 habitat types (mature pine, immature pine, meadow).

Food habits and food quality were determined through analyses of faecal pellet groups. Faecal samples were collected monthly during the winter (December-March) for each area and opportunistically during the rest of the year. General trends in food habits were determined through faecal fragment analysis. Pellets from 10 samples were pooled and sent to Wildlife Habitat Laboratory, Washington State University for analysis. Percent faecal nitrogen for each of 10 samples collected during each time period are being analyzed by the Faculty of Agriculture, UBC. Faecal data from April 1987 - March 1988 has not yet been analyzed.

#### Population size, calf mortality, adult mortality

Population censuses of the Itcha-Ilgachuz-Rainbow caribou were conducted in June when most caribou cows were present in the alpine in post-calving aggregations. A correction factor of the total number of radiocollared cows/ number of radiocollared cows spotted above treeline was multiplied by the number of cows counted above treeline in the June censuses to determine the number of cows in the population. Few bull caribou were present above treeline during the June census, therefore a bull:cow ratio was determined from the fall counts and applied to the number of cows present in June to obtain a total population estimate of bulls.

Less than 50% of the radiocollared animals in the Tweedsmuir-Entiako area are present above treeline at any one time during the year; therefore, an estimate of the population size was attempted during the fall counts when approximately half the population was present in rutting areas above treeline. Alpine areas in the Quanchus Range were censused and the correction factor of the total number of radiocollared cows/ number of radiocollared cows spotted above treeline was applied to the census to estimate the size of the population. Population estimates were calculated for the October 1986 and October 1987 surveys.

Pregnancy rate of the Itcha-Ilgachuz-Rainbow and Tweedsmuir-Entiako caribou was determined from a sample of 41 adult female caribou. Blood samples collected were analyzed for serum progesterone levels to determine whether the females were pregnant.

Calf production for both radiocollared and unmarked cows was determined by helicopter survey in mid-June. Ground surveys assessing early calf survival and causes of calf mortality were conducted during the first three weeks of calving in the Itcha Mountains. A calf count was conducted in October to determine survival over the summer and another calf count was conducted in mid March to determine calf recruitment into the population for the year. Trends in calf survival were based on calves associated with the radiocollared female sample. The calf:cow ratio for each survey was calculated as the number of radiocollared caribou cows with calves during the survey - the number of radiocollared caribou cows known to be alive in June. Adult bull harvest rates were estimated by dividing the number of adult bulls harvested into the estimated number of adult bulls in the population. In the Itcha-Ilgachuz-Rainbow population, the estimated number of adult bulls was calculated by multiplying the bull:cow ratio (in October) by the corrected number of cows from the June census and adding the number of bulls harvested. In the Tweedsmuir-Entiako area, the number of adult bulls was calculated by multiplying the radiocollared caribou cow correction factor by the number of bulls counted in the Quanchus Mountains above treeline.

Adult mortality rate was calculated as the proportion of radiocollared caribou dying between April and March of the following year. Causes of adult mortality were determined by necropsying radiocollared animals that had died. Adult mortality rate was based on the mortality rate of radiocollared animals. Calf recruitment rate was based on percent calves present in the surveys conducted in March (above and below treeline).

## RESULTS

### Winter snow accumulation

Snow accumulation in all 3 habitat types (wetland, immature and mature pine) increased steadily between December and February then remained relatively constant through February and March in both 1986/87 and 1987/88 (Fig.2). Snow depths in the mature and immature pine stands were approximately equal and between 10 and 15 centimeters less than in the wetland. Less snow accumulated in the Moore Creek area in the winter of 1987/88 than in the winter of 1986/87. On average, snow accumulation at the snow stations in the wetland in 1987/88 was 30 centimeters less than in 1986/87 for the same time period. Snow depths in March 1988 were lower than snow depths in December 1986.

### Winter feeding sites

In the Itcha-Ilgachuz-Rainbow and Tweedsmuir-Entiako caribou winter ranges, 70-80% of feeding site types in pine forests consisted of craters (Table 1). Pine/spruce stands were used primarily for arboreal lichen feeding in the Itcha-Ilgachuz-Rainbow caribou winter range but in the Tweedsmuir-Entiako caribou winter range, pine/spruce stands were used for both arboreal lichen feeding and cratering. Spruce stands in the Entiako area were used exclusively for arboreal lichen feeding. In all forested habitat types combined, craters made up 78% of the feeding site types in the Itcha-Ilgachuz-Rainbow winter range and 61% of the feeding site types in the Tweedsmuir-Entiako winter range. Feeding sites in open habitats such as wetlands, lakes and fescue/lichen meadows consisted of cratering sites only.

Terrestrial lichens were the most frequently occurring vegetation type found in craters in all forest types combined (Table 2). *Cladonia* sp., *Cladina* sp. and *Stereocaulon* sp. combined were found in 99% of all craters in pine forests in the Itcha-Ilgachuz-Rainbow area and in 100% of all craters in pine forests in the Tweedsmuir-Entiako area. Of the terrestrial lichens present, *Cladina* sp. were most common. Terrestrial lichens were not as prevalent in the non-crater sites. Of the NCS in all forest types combined, 33% contained terrestrial lichens in the Tweedsmuir-Entiako caribou winter range, and 70% contained terrestrial lichens in the Itcha-Ilgachuz-Rainbow caribou winter range. The proportion of craters containing terrestrial lichens was significantly greater ( $X^2$ ,  $p < .05$ ) than the proportion of NCS containing terrestrial lichens for both areas. Also in both areas, terrestrial lichens were found in moderate to high quantities in craters whereas in NCS, terrestrial lichens were absent or found in low to moderate quantities (Fig.3). The distribution of craters in abundance classes of terrestrial lichens was significantly different from the distribution of NCS in the same abundance classes ( $X^2$ ,  $p < .05$ ).

In the Itcha-Ilgachuz-Rainbow caribou winter range, fescue/lichen meadows were heavily used in early winter. The most frequently

## MEAN SNOW DEPTH MOORE CREEK SNOW STATIONS

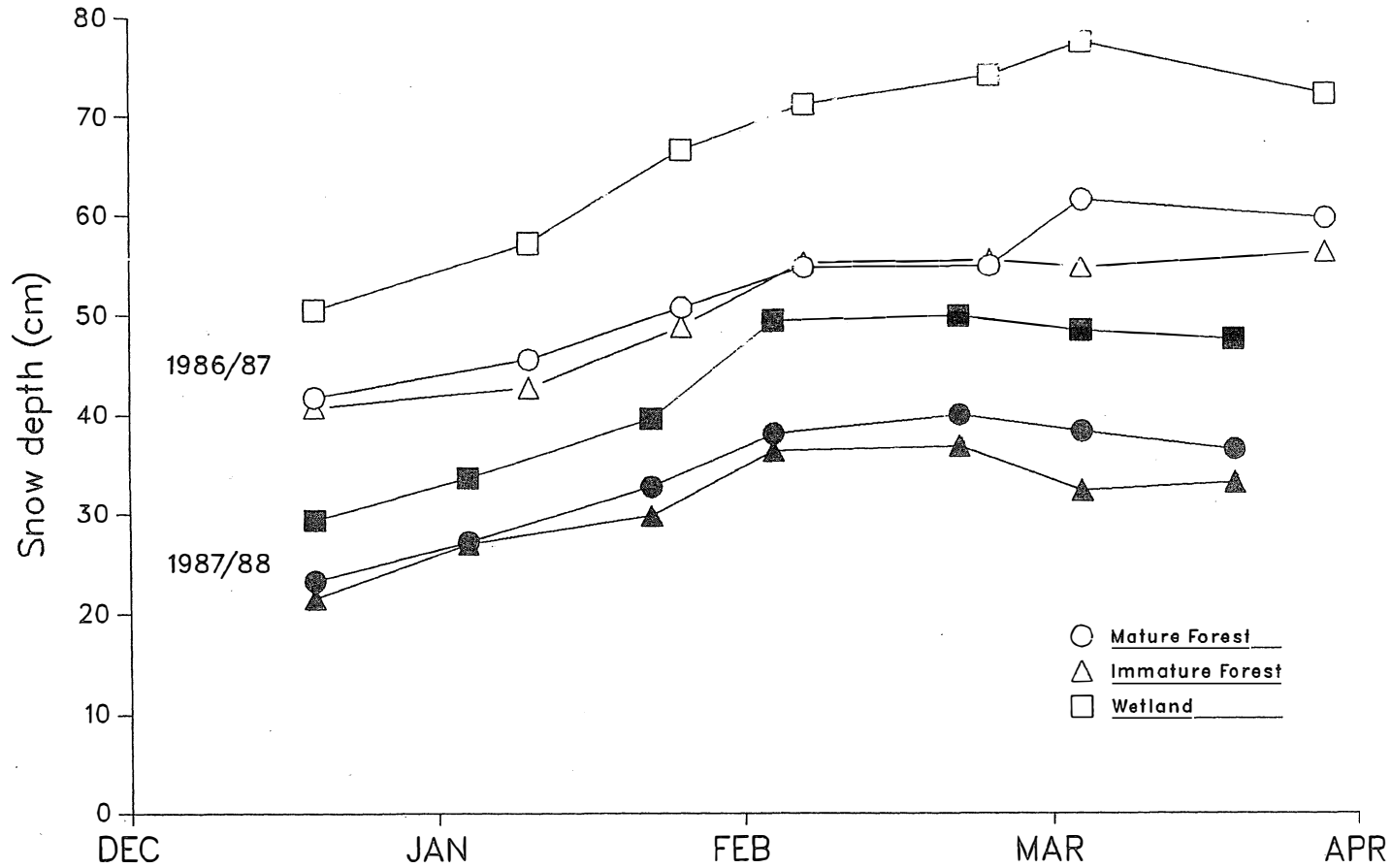


Figure 2. Mean snow depth at snow stations in 3 habitat types (wetland, mature and immature pine stands) in the Itcha-Ilgachuz-Rainbow winter range, December 1986 - March 1987, December 1987 - March 1988.

Table 1. Percent of feeding site types investigated (cratering vs. arboreal lichen feeding) in the winter ranges of the Tweedsmuir-Entiako and Itcha-Ilgachuz-Rainbow caribou, from January-March 1986, December 1986-March 1987, December 1987-March 1988 combined.

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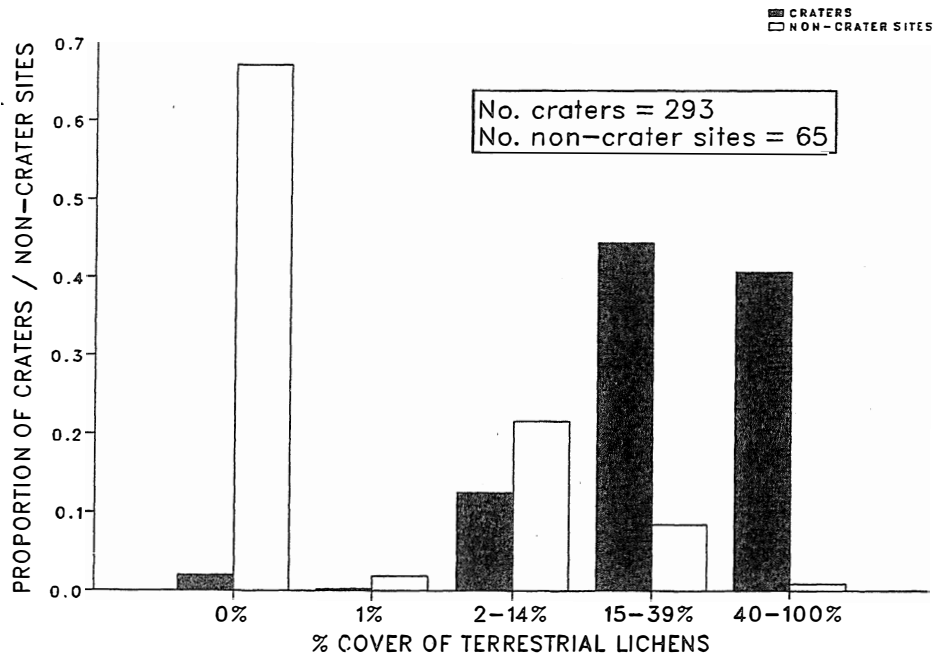
Tweedsmuir/Entiako caribou winter range

<u>Habitat</u>	<u>% cratering</u>	<u>% arboreal feeding</u>	<u># sites investigated</u>
Pine	72	28	816
Spruce	15	85	52
Pine/Spruce	32	68	228
Total Forest	61	39	1096
Forested Wetland	21	79	58
Wetland	0	100	3
Lake/Creek	100	0	52

Itcha/Ilgachuz/Rainbow caribou winter range

<u>Habitat</u>	<u>% cratering</u>	<u>% arboreal feeding</u>	<u># sites investigated</u>
Pine	79	21	1044
Pine/Spruce	10	90	20
Total Forest	78	22	1064
Forested Wetland	10	90	10
Wetland	100	0	120
Fescue-Lichen	100	0	84
Lake/Creek	100	0	14
Alpine	100	0	26





ITCHA-ILGACHUZ-RAINBOWS

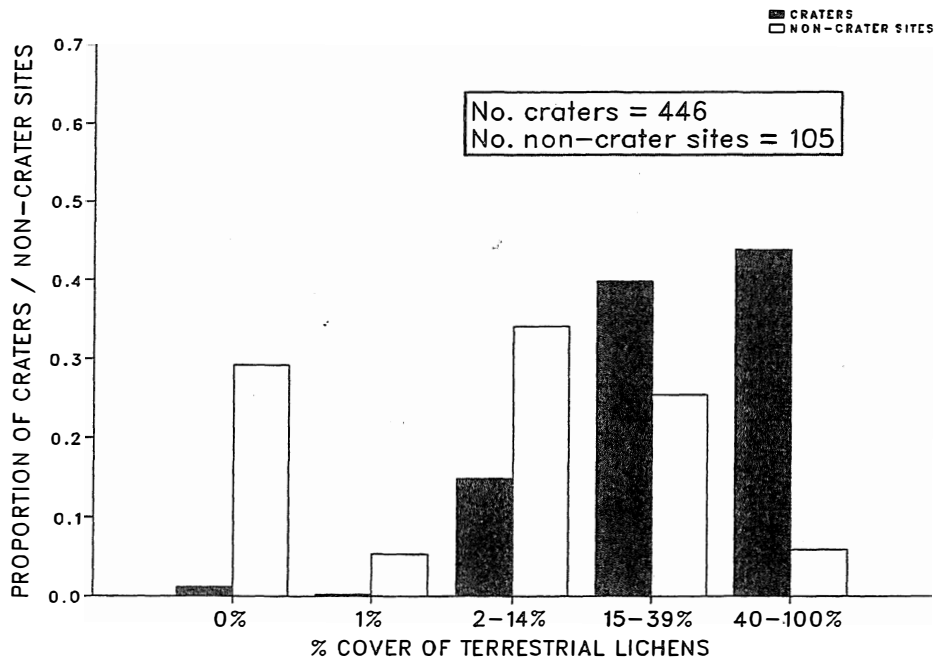


Fig. 3. Proportion of total craters and non-crater sites containing % ground cover classes (0%, 1%, 2-14%, 15-39%, 40-100%) of terrestrial lichens (*Cladonia* sp., *Cladonia* sp., *Stereocaulon* sp. combined) in all forested habitat types combined in the Itcha-Ilgachuz-Rainbow and Tweedsmuir-Entiako winter ranges (December-March, 1986/ 87, 1987/ 88).

occurring vegetation types were terrestrial lichens (contained in 100% of the craters) and grasses (contained in 99% of the craters) (Table 2). Use of wetlands and forested wetlands increased as the winter progressed. Ice and/or free water were present in 85% of the craters in these habitat types in the Itcha-Ilgachuz-Rainbow winter range. The proportion of craters containing sedges was significantly lower than the proportion of NCS containing sedges ( $X$ ,  $p < .05$ ), and the proportion of craters containing ice were significantly greater than the proportion of NCS containing ice ( $X$ ,  $p < .05$ ), suggesting that caribou were probably not cratering for food but for ice or free water in wetlands. Caribou also cratered on or along lakes and creeks in both the Tweedsmuir-Entiako and Itcha-Ilgachuz-Rainbow winter areas (Table 2). These craters almost exclusively contained ice/free water only.

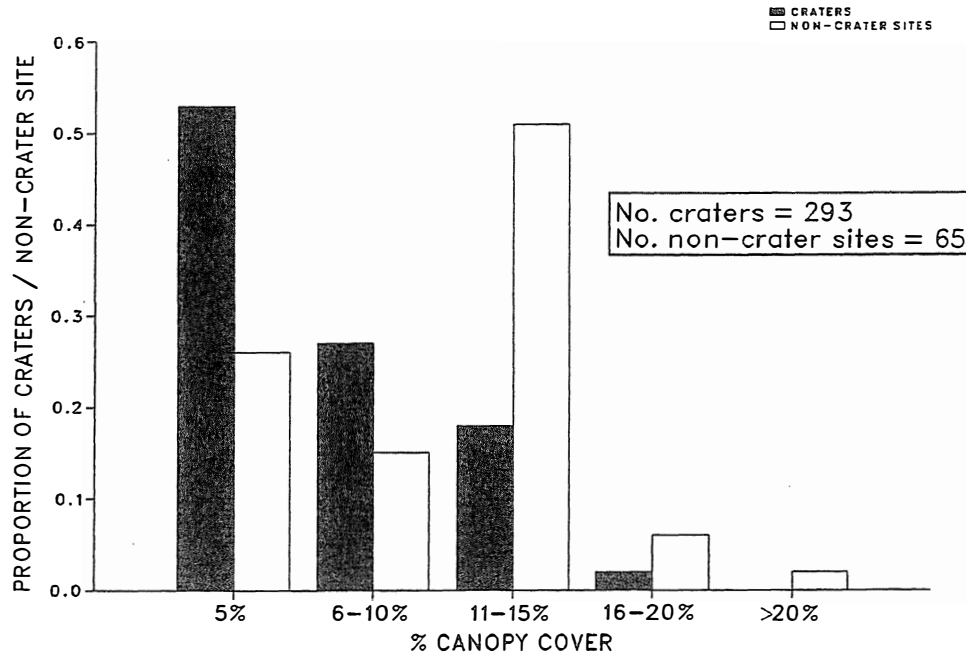
The distribution of craters in canopy cover classes was significantly different from the distribution of NCS in the same canopy cover classes in both the Tweedsmuir-Entiako ( $X$ ,  $p < .05$ ) and Itcha-Ilgachuz-Rainbow ( $X$ ,  $p < .05$ ) winter ranges (Fig.4). Relatively more craters than NCS were found in forested areas with very open (<5% canopy cover) and open (6-10%) canopies whereas relatively more NCS than craters were found in forested areas with less open canopies (11-15%, 16-20%, >20% canopy cover). Interaction between canopy closure and percent ground cover of terrestrial lichens also determined crater site selection (Table 3). Crater sites were found primarily in stands with open canopies and with abundant terrestrial lichens whereas NCS were found in less open stands with low abundance of terrestrial lichens. A three way contingency table will be used to determine the significance of this interaction.

Snow conditions did not appear to affect selection of cratering sites by caribou in the Itcha-Ilgachuz-Rainbow winter range. Both snow depth and snow penetrability varied over the winter (Fig.6,7). In the Tweedsmuir-Entiako winter range, snow depths of craters and NCS were similar in January, but in February and March, snow depth at craters exceeded snow depth at NCS (Fig.5). Snow penetrability decreased in both NCS and craters through the winter in the Tweedsmuir-Entiako area, but snow penetrability at cratering sites exceeded snow penetrability at NCS only during March.

### Food Habits

Terrestrial lichens and arboreal lichens made up 60-70% of the vegetation found in caribou faecal pellets throughout most of the year in the Itcha-Ilgachuz-Rainbow area (Fig.8). In the summer, lichen use decreased and grasses, sedges and forbs made up more than 50% of the vegetation in faecal pellet groups. Conifers, shrubs and mosses were present in low quantities throughout the year. Percent faecal nitrogen values were relatively constant at 1.5% during the fall, winter and spring and increased in the summer to 2.5% (Fig.9). The increase in percent faecal nitrogen corresponded to the greater proportion of grasses, forbs and sedges found in the faecal samples in the summer.

### TWEEDSMUIR-ENTIAKO



### ITCHA-ILGACHUZ-RAINBOWS

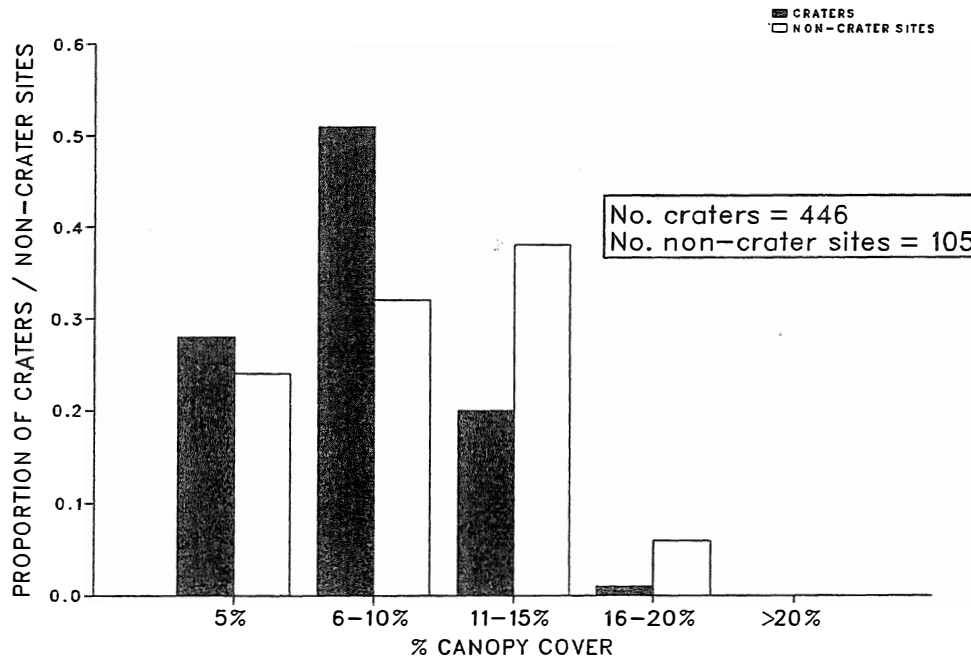
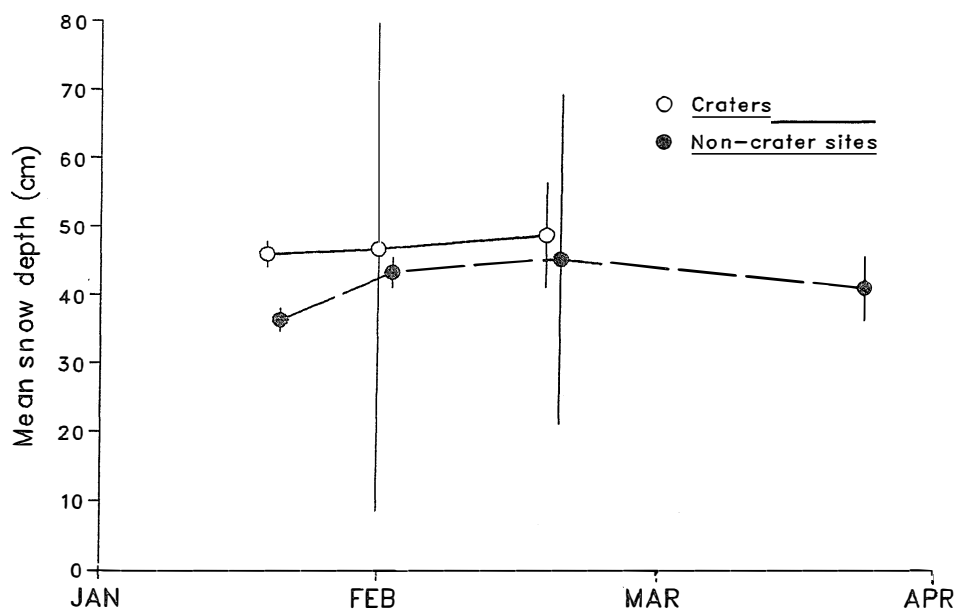


Fig. 4. Proportion of total craters and non-crater sites in % canopy cover classes (<5%, 6-10%, 11-15%, 16-20%, >20% canopy cover) in all forested habitats combined in the Tweedsmuir-Entiako and Itcha-Ilgachuz-Rainbow winter ranges (December 1986 - March 1987, December 1987 - March 1988).

Table 3. Number of craters (C) and non-cratering sites (NCS) containing abundance classes of terrestrial lichens within each canopy closure class in all forested habitat types combined in the Itcha-Ilgachuz-Rainbow and Tweedsmuir-Entiako caribou winter ranges, December 1987 - March 1988.

% canopy closure		% ground cover of terrestrial lichens					Total
		0%	1%	2-14%	15-39%	40-100%	
Itcha-Ilgachuz-Rainbow							
1-5%	C	1	0	15	46	65	127
	NCS	4	3	9	7	2	25
6-10%	C	2	0	30	106	89	227
	NCS	13	4	7	9	1	34
11-15%	C	2	0	15	42	31	90
	NCS	15	3	12	10	0	40
16-20%	C	0	1	0	1	0	2
	NCS	2	0	3	1	0	6
Total	C	4	1	60	195	185	446
	NCS	34	10	31	27	3	105
Tweedsmuir-Entiako							
1-5%	C	1	0	17	69	69	156
	NCS	11	1	2	3	0	17
6-10%	C	0	0	10	38	31	79
	NCS	7	2	0	1	0	10
11-15%	C	0	1	10	22	19	52
	NCS	26	1	5	1	0	33
16-20%	C	0	0	1	1	4	6
	NCS	4	0	0	0	0	4
Total	C	1	1	38	130	123	293
	NCS	48	4	7	5	0	64

## TWEEDSMUIR-ENTIAKO 1987



## TWEEDSMUIR-ENTIAKO 1988

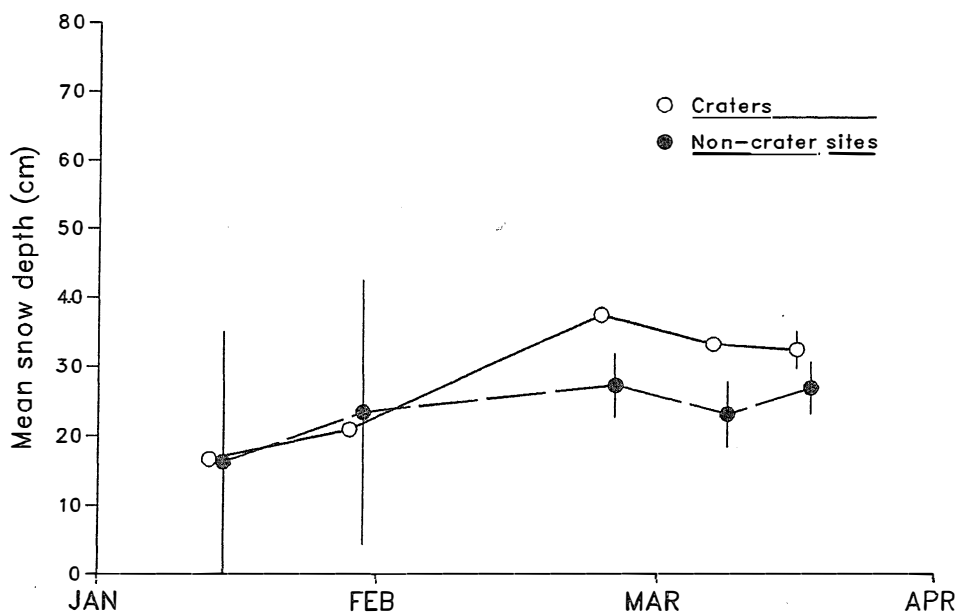
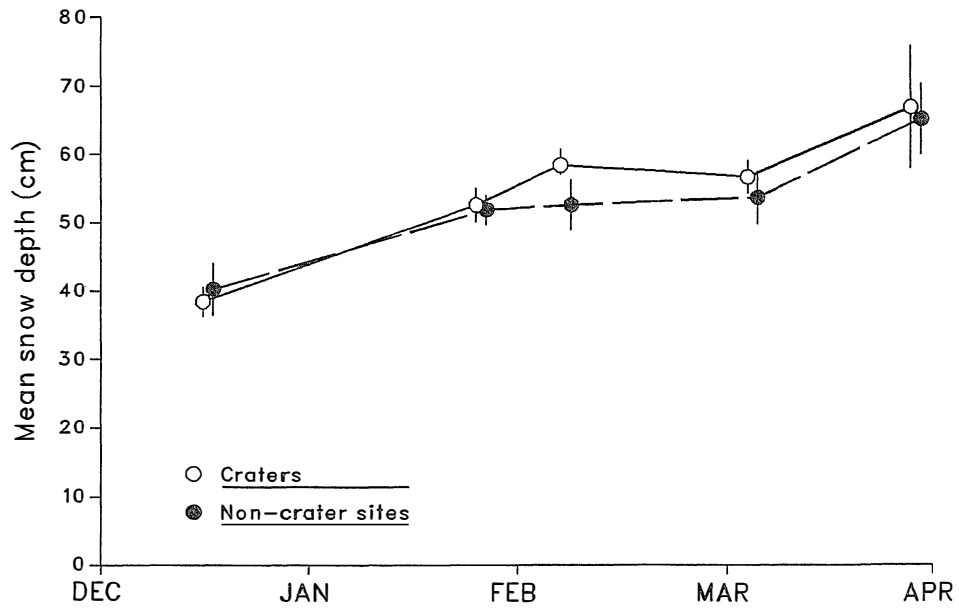


Fig.5. Mean snow depths of craters and non-craters sites over time in all forested habitats combined in the Tweedsmuir-Entiako winter range, January - March 1987, January - March 1988.



ITCHA-ILGACHUZ-RAINBOW 1987/88

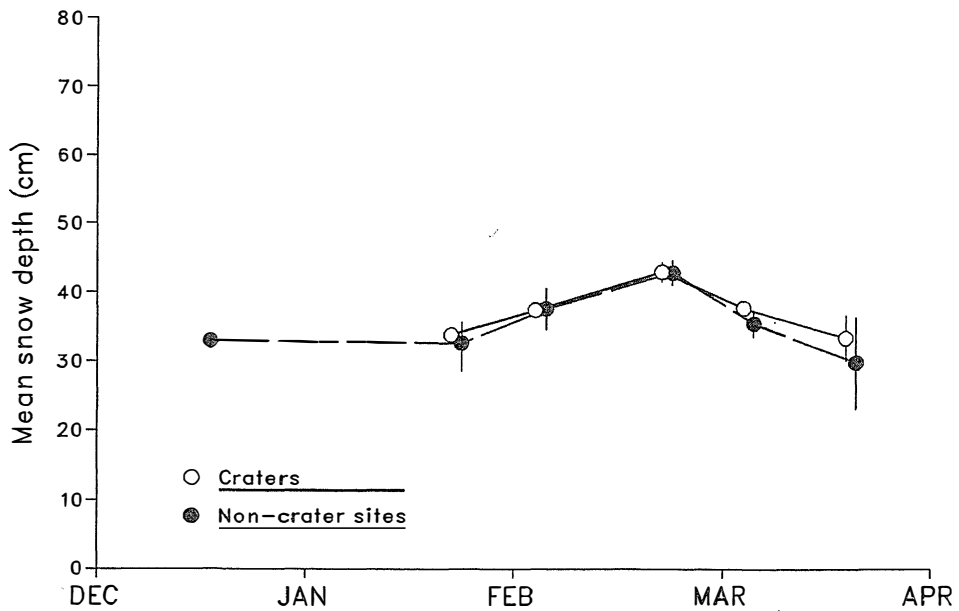
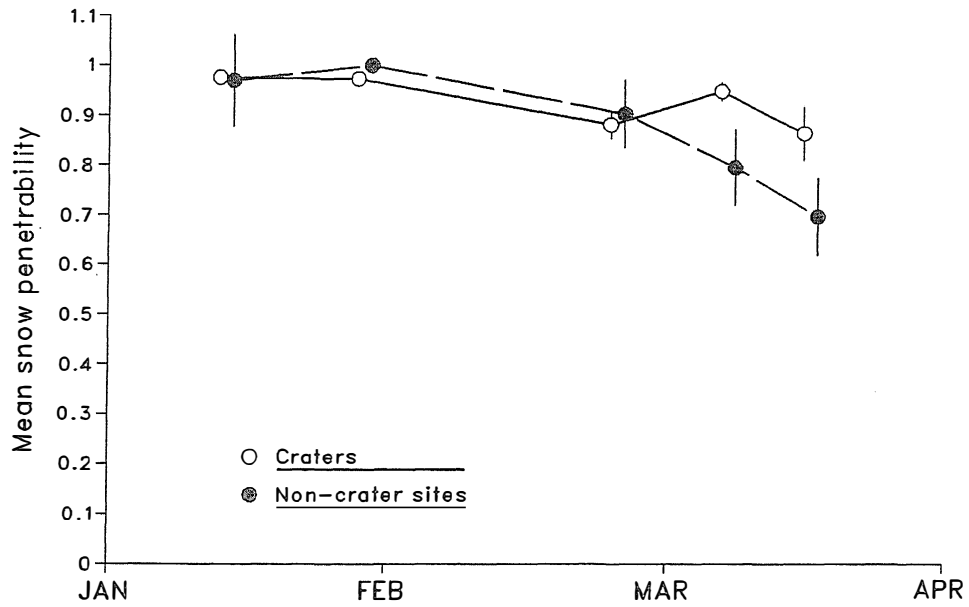


Fig. 6. Mean snow depths of craters and non-crater sites over time in all forested habitat types combined in the Itcha-Ilgachuz-Rainbow winter range, December 1986 - March 1987, December 1987 - March 1988.



ITCHA-ILGACHUZ-RAINBOW 1988

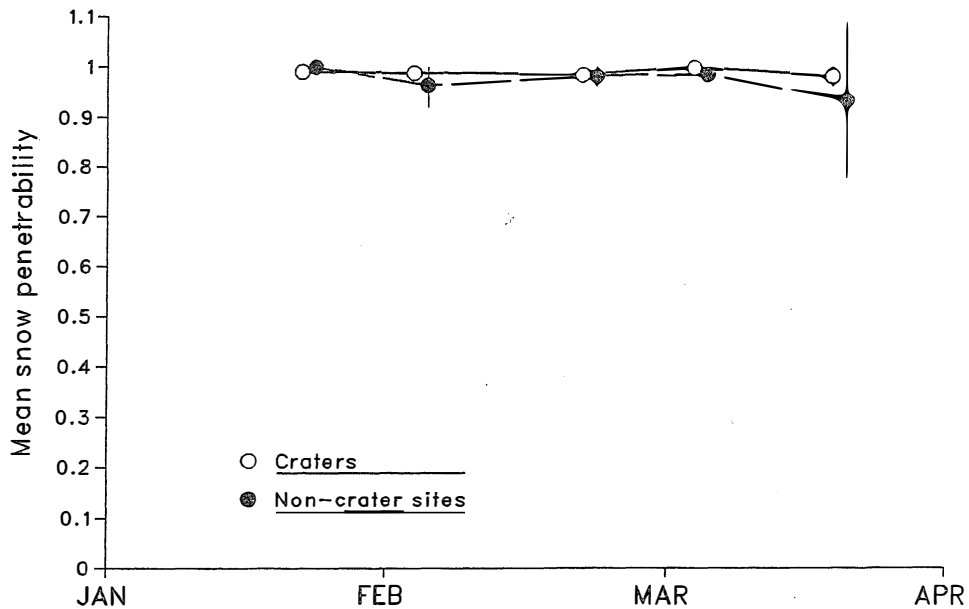


Fig. 7. Mean snow penetrability (weight sinking depth / snow depth) of craters and non-crater sites over time in all forested habitat types combined in the Tweedsmuir-Entiako and Itcha-Ilgachuz-Rainbow winter ranges, December 1987 - March 1988.

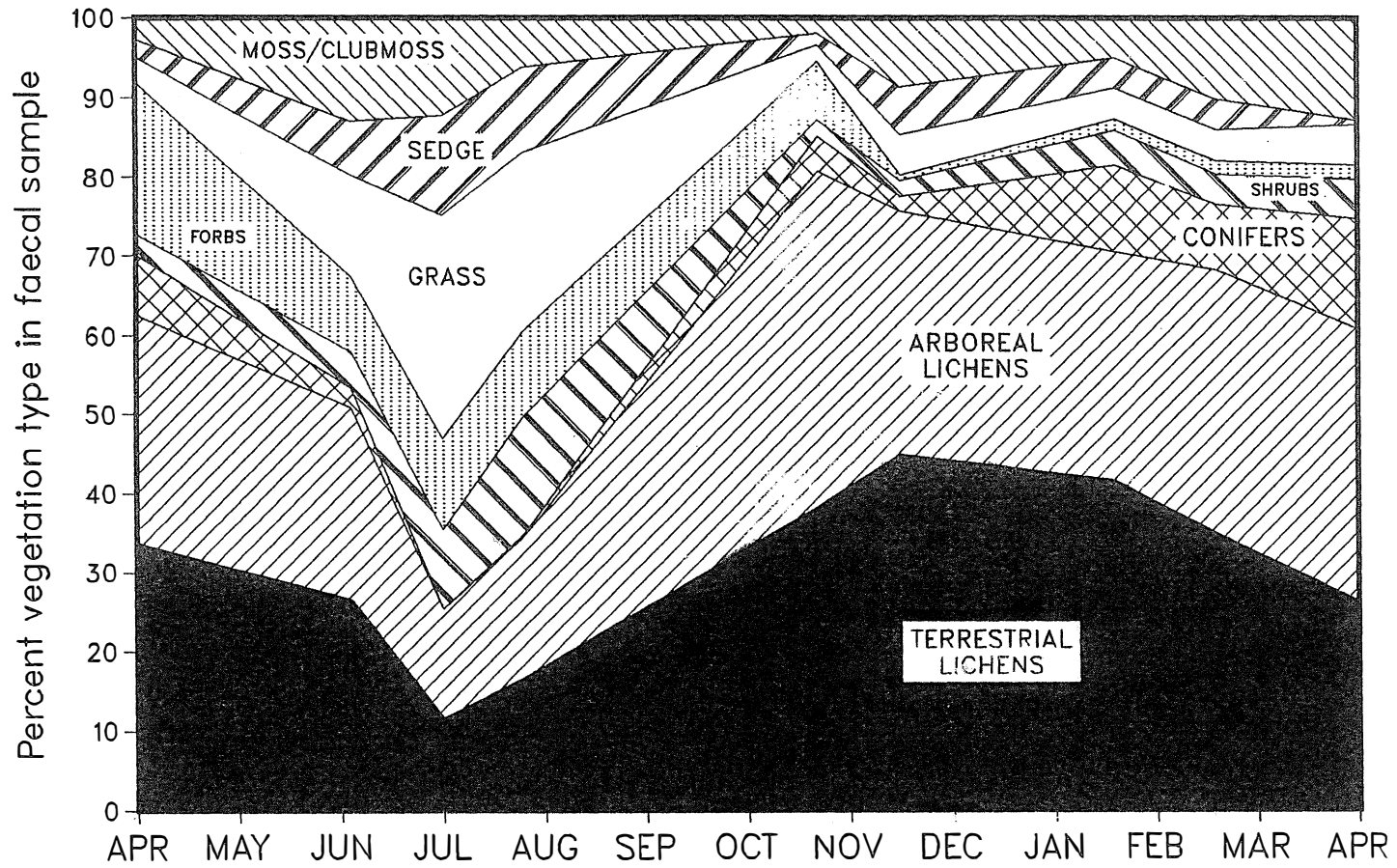


Fig. 8. Food habits of Itcha-Ilgachuz-Rainbow caribou, determined by faecal fragment analysis.

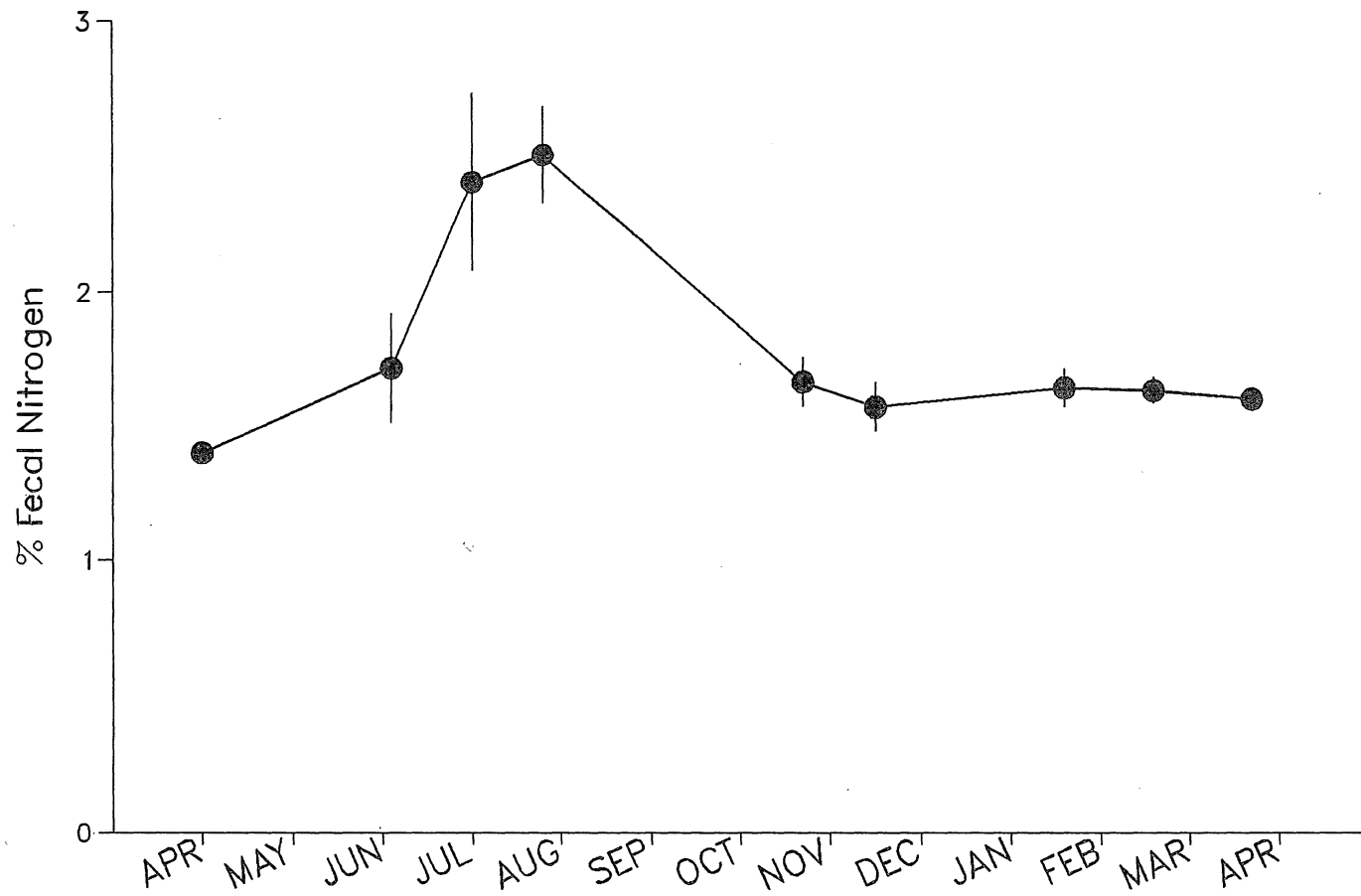


Fig. 9. Index of diet quality measured by % faecal nitrogen levels in faecal samples collected from Itcha-Ilgachuz-Rainbow caribou.

There was little variation in the proportion of each vegetation type and the percent faecal nitrogen of winter faecal samples in both the Tweedsmuir-Entiako and Itcha-Ilgachuz-Rainbow areas in 1985/86 and 1986/87 (Figs.10,11). In general, terrestrial and arboreal lichens were the most abundant vegetation types in faecal samples collected during the winter months. The percentage of grasses, sedges and forbs in faecal samples collected in the Tweedsmuir-Entiako area increased from 7% in early winter to 27% in late winter in 1986/87. In the Itcha-Ilgachuz-Rainbow winter range, the proportion of arboreal lichens in faecal samples was lower and the proportion of mosses and clubmosses was higher in the January sample than in any other sample from the rest of the winter.

#### Population size

Tweedsmuir-Entiako - A total of 104 and 202 animals were counted in alpine areas in the Quanchus Mountains during the October 1986 and 1987 calf surveys respectively (Table 4). Three of the 12 and 7 of the 14 radiocollared caribou were present in the alpine in the Quanchus range in 1986 and 1987. Application of the correction factor ( $1 - \frac{\# \text{ radiocollared animals in the alpine}}{\text{total \# of radiocollared animals}}$ ) to the total number of animals counted in the alpine yielded population size estimates of 416 caribou for October 1986 and 404 caribou for October 1987 in the Tweedsmuir-Entiako area.

Itcha-Ilgachua-Rainbow - During the June censuses of the Itcha-Ilgachuz-Rainbow mountains, 1002, 986 and 8884 cows, yearlings and calves combined were counted and classified above treeline in 1985, 1986 and 1987 respectively (Table 4). Dividing these totals by the proportion of radiocollared females sighted above treeline (1985-15/17, 1986-16/20, 1987-14/20) resulted in estimates of 1136, 1233 and 1263 cows, yearlings and calves combined in June 1985, 1986 and 1987 respectively. The adult bull population was estimated at 213, 200 and 221 bulls in 1985, 1986 and 1987 by applying the October bull:cow ratio to the corrected number of adult female caribou in June. Total population estimates for June 1985, 1986 and 1987 for the Itcha-Ilgachuz-Rainbow caribou are 1349, 1433 and 1484 caribou respectively. The estimate for 1987 was probably low since the Rainbow Mountains were not intensively surveyed. The population estimate for the the caribou in the Rainbow Mountains was derived from a survey conducted on the north side of the Rainbow Mountains in March 1987. A total of 165 animals were counted during the survey. Of the 7 radiocollared Rainbow caribou, 6 were present on the north side of the Rainbow Mountains. Correcting for the proportion of animals not present on the north side of the Rainbow Mountains during the survey yielded 193 animals in March 1987.

#### Calf Production and Survival

Pregnancy rate of adult female caribou in the Itcha-Ilgachuz-Rainbow Mountains was 97% in April 1986, March 1987 and March 1988 combined (Table 5). In June, 45-80% of the radiocollared cows produced viable calves but by October, 6-45% of the radiocollared caribou had

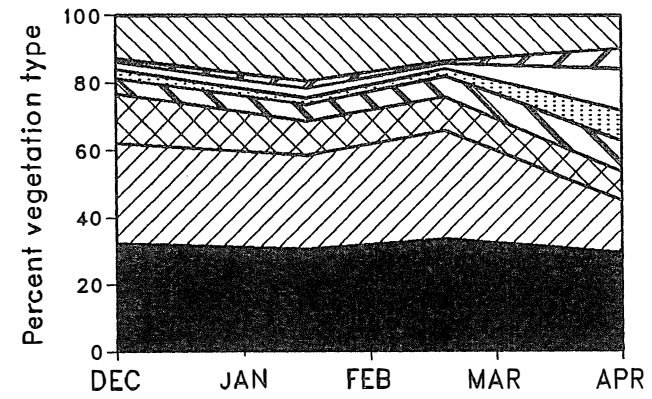
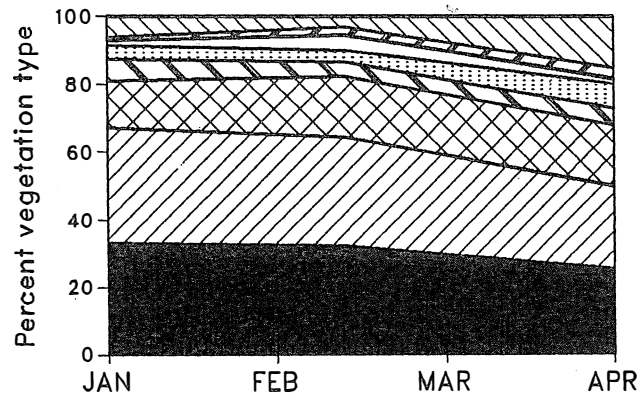
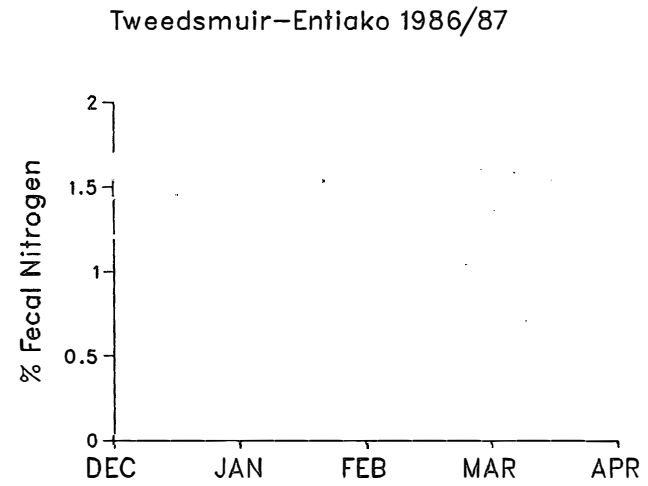
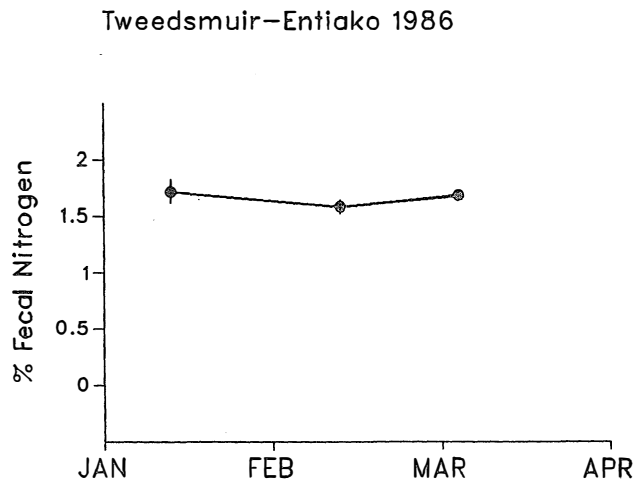


Fig. 10. Index of diet quality (% faecal nitrogen) and food habits of Tweedsmuir-Entiako caribou during the winters of 1985/86 and 1986/87.

Table 4. Number of caribou of each sex/age class counted during aerial surveys in June, October and March in the Tweedsmuir-Entiako and Itcha-Ilgachuz-Rainbow study areas.

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<u>Date</u>	<u>Calves</u>	<u>Cows</u>	<u>Bulls</u>	<u>Total</u>
Tweedsmuir-Entiako				
June 16, 1985	9	28	0	37
October 6, 1985	10	114	31	155
March 19, 1986	8	81		89
June 23, 1986	6	20	0	26
October 7, 1986	13	102	22	137
March 15, 1987	15	135		150
June 16, 1987	14	20	0	34
October 20, 1987	20	192	33	245
March 11, 1988	12	123		135
Itcha-Ilgachuz-Rainbow				
June 18-19, 1985	287	721	58	1063
October 18, 1985	46	187	30	263
March 18, 1986	83	277	51	411
June 25-26, 1986	302	706	61	1069
October 10, 1986	105	407	87	599
March 14-15, 1987	85	407		492
June 18-19, 1987	273	620	78	971
October 21, 1987	82	483	92	657
March 10, 1988	47	338		385

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Table 5. Percent of female radiocollared caribou that were pregnant in the Itcha-Ilgachuz-Rainbow area and in the Tweedsmuir-Entiako area based on serum progesterone levels. Samples from April 1986 (16), March 1987 (21) and March 1988 (13).

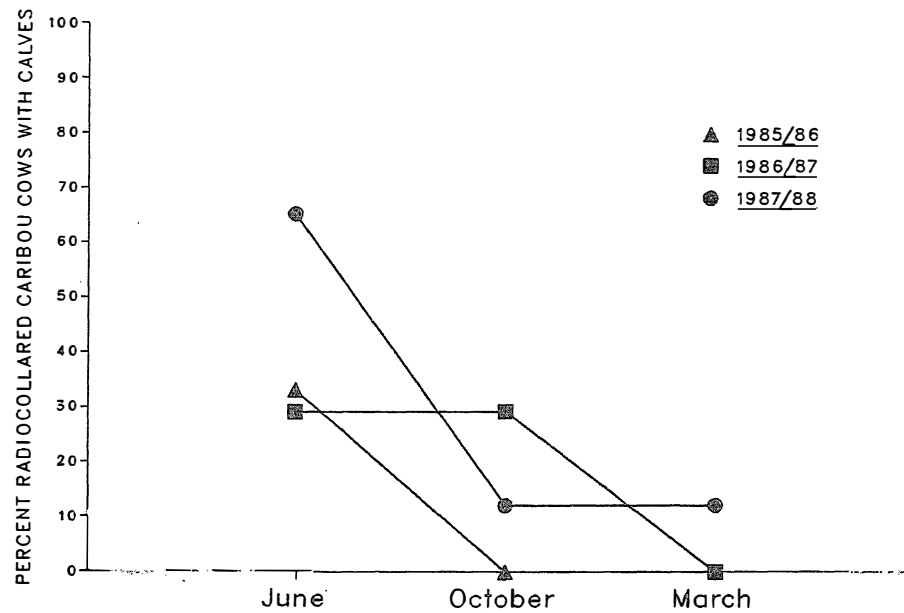
<u>Age Group</u>	<u>% Pregnant</u>	<u>Sample size</u>
Itcha-Ilgachuz-Rainbow*		
Adults (>22 months)	97	34
Yearlings (22 months)	25	4
Calves (10 months)	0	5
Tweedsmuir-Entiako		
Adults (>22 months)	86	7

\*data for 21 samples provided by the Idaho Dept. of Fish and Game

Table 7. Estimated adult male harvest rates in the Tweedsmuir-Entiako and Itcha-Ilgachuz-Rainbow study areas from 1985-1987.

	<u># of adult bulls harvested</u>	<u>estimated # of bulls</u>	<u>harvest rate</u>
Tweedsmuir-Entiako			
October 1985	0	-	0
October 1986	1	88	1.1
October 1987	0	66	0
Itcha-Ilgachuz-Rainbow			
October 1985	19	213	8.9
October 1986	8	200	4.0
October 1987	30	221	13.6

## TWEEDSMUIR-ENTIAKO



## ITCHA-ILGACHUZ-RAINBOW

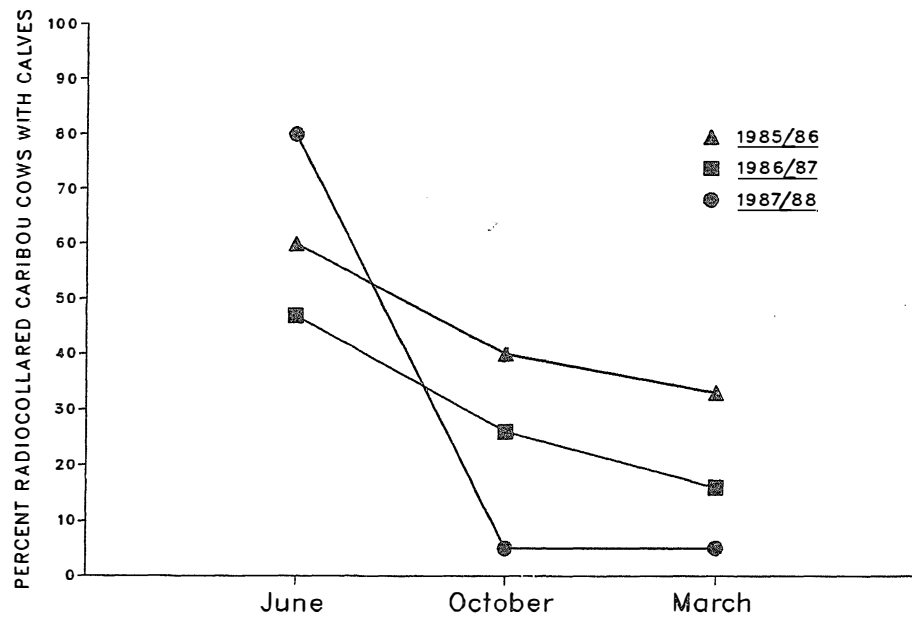


Fig. 12. Percentage of radiocollared caribou cows with calves during June, October and March calf surveys in the Tweedsmuir-Entiako and Itcha-Ilgachuz-Rainbow areas, April 1985 - March 1988.

surviving calves (Fig.12). A large portion of calf mortality occurred between the June and October calf surveys. Although almost 100% of the adult females are pregnant in March/April, only 50% of adult female caribou have surviving calves within 1 week after the peak of calving in early June (Fig.13). By late July, the percentage of adult females with calves is down to 30-40%. Causes of calf mortality range from birth related death to predation by wolves (Appendix 1). The relative impact of each cause of mortality was difficult to determine. Relatively little mortality occurred between the October and March surveys as the proportion of adult radiocollared female caribou with calves varied between 6% and 35%.

In the Tweedsmuir-Entiako area, pregnancy rate of adult female caribou in March 1987 was 86% (Table 5). In June, 25%-65% of the radiocollared caribou cows produced viable calves but by October, most of those calves had disappeared (Fig.12). In 1985/86 and 1986/87, no radiocollared female caribou had a calf surviving until March. In 1987/88, only 2 of the 14 radiocollared caribou had calves surviving until March 1988.

Calf production of all adult female caribou counted during the June censuses was significantly greater for cows that were found in the alpine than for cows that were found below treeline, in both the Tweedsmuir-Entiako and Itcha-Ilgachuz-Rainbow areas (Table 6). In the Tweedsmuir-Entiako area, the radiocollared caribou sample also demonstrated this effect. During the October surveys, the proportion of cows with calves that were found above treeline was not significantly different from the proportion of cows with calves that were found below treeline in either the radiocollared sample or the total sample in both areas. However, in the Tweedsmuir-Entiako area, the proportion of cows with calves above treeline was less than the proportion of cows with calves below treeline in both the radiocollared sample and in all the adult female caribou counted. In the Itcha-Ilgachuz-Rainbow area, the total in March indicated that the proportion of cows with calves in the alpine was greater than the proportion of cows with calves below treeline.

#### Adult Harvest

In the Tweedsmuir-Entiako area, hunting was restricted to adult males and a maximum of 35 licences were sold in 1985, 1986 and 1987. The limited number of licences and poor access into the area contributed to the low harvest rate during those 3 years (Table 7).

In the Itcha-Ilgachuz-Rainbow area, hunting was open for adult male caribou in 1985 but in 1986 and 1987 was limited to adult male caribou with antlers with at least 5 points that were greater than 5 centimeters in length or antler total length of 75 centimeters or greater. The estimated harvest rate varied between 4% and 14% from 1985 to 1987 (Table 7).

# ITCHA MOUNTAINS

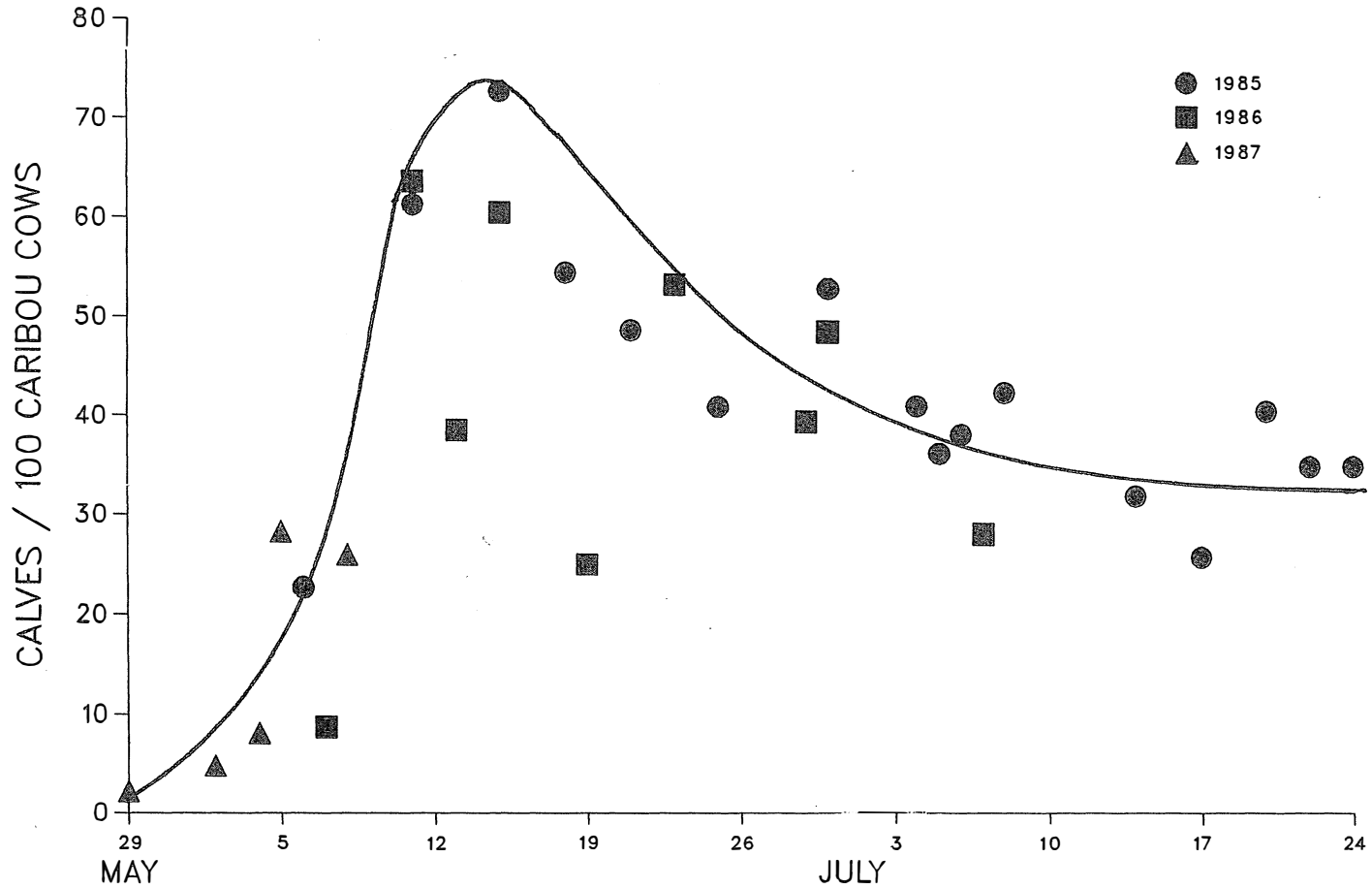


Fig. 13. Percentage of caribou cows with calves during calving season in the Itcha Mountains, 1985, 1986 and 1987.

Table 6. Proportion of caribou cows with calves in the alpine and below treeline in the Tweedsmuir-Entiako and Itcha-Ilgachuz-Rainbow areas from 1985 - 1988 combined. Significance at  $\alpha=.05$ , (N) = number of cows counted.

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DATE	PROPORTION COWS WITH CALVES ALPINE	PROPORTION COWS WITH CALVES BELOW TREELINE	SIGNIFICANCE
<b>RADIOCOLLARED CARIBOU</b>			
Tweedsmuir-Entiako			
June	.933 (15)	.238 (21)	SIG
October	.063 (16)	.222 (18)	NS
March	.000 (0)	.056 (36)	NS
Itcha-Ilgachuz-Rainbow			
June	.625 (48)	.667 (9)	NS
October	.275 (40)	.167 (12)	NS
March	.308 (13)	.135 (37)	NS
<b>TOTAL CARIBOU</b>			
Tweedsmuir-Entiako			
June	.800 (25)	.209 (43)	SIG
October	.096 (343)	.154 (65)	NS
March	.151 (86)	.087 (253)	NS
Itcha-Ilgachuz-Rainbow			
June	.424 (2017)	.233 (30)	SIG
October	.211 (960)	.256 (117)	NS
March	.281 (519)	.137 (503)	SIG

## Mortalities

From April 1985 to March 1988, 12 radiocollared caribou mortalities occurred in the Tweedsmuir-Entiako area and 9 in the Itcha-Ilgachuz-Rainbow area (Table 8). Of the 7 known causes of mortality in the Itcha-Ilgachuz-Rainbow area, 6 were killed by wolves and 1 was poached. Mortality #3 in the Itcha-Ilgachuz-Rainbow area was not due to predation by a large carnivore. In the Tweedsmuir-Entiako area, only 3 of the 12 mortalities were determined. Lack of mortality sensors in radiocollars in most of those instances resulted in a low proportion of the causes of mortalities to be determined. Of the 3 identified causes of mortality, two were predator related and one was caused by an accident. Eighteen of the 21 mortalities occurred between May and October when animals were using summer ranges (Figs.14,15,16).

In the Tweedsmuir-Entiako area the adult mortality rate was 30% in 1985/86 and 1987/88 and 8% in 1986/87 (Table 9). Calf recruitment was 9-10% in all 3 years. In the Itcha-Ilgachuz-Rainbow area, the adult mortality rate increased from 6% in 1985/86 to 20% in 1986/87 and 1987/88 whereas calf recruitment decreased from 20% in 1985/86 to 12 % in 1987/88.

## SUMMARY

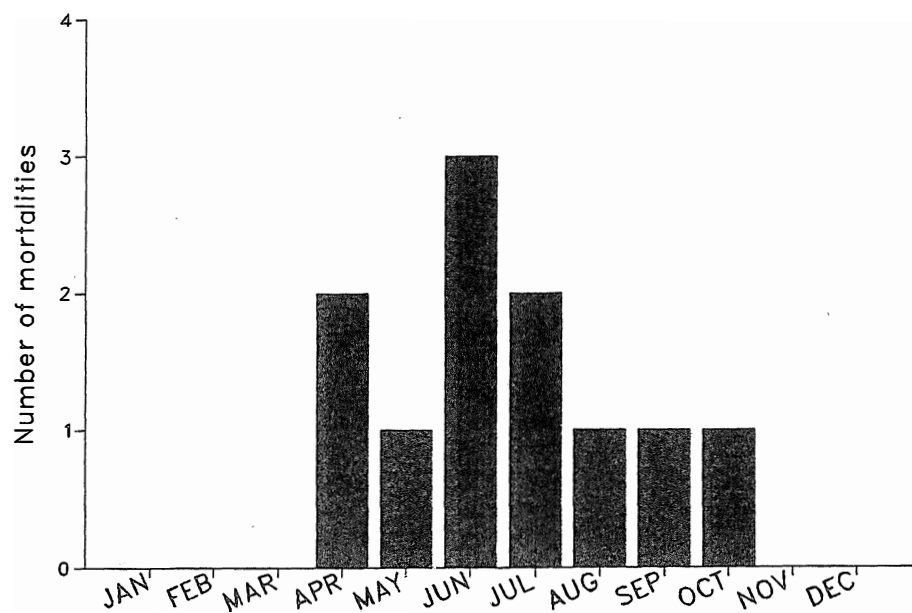
1. In low elevation winter ranges in the Tweedsmuir-Entiako and Itcha-Ilgachuz-Rainbow areas, caribou primarily cratered for terrestrial lichens in pine forests. Feeding site selection was dependent on terrestrial lichen presence and abundance and on canopy cover. Snow conditions did not appear to affect feeding site selection however, statistical analyses have yet to be completed. Arboreal lichen feeding also occurred in pine forests but arboreal lichen feeding was more prevalent in pine/spruce or spruce forests and forested wetlands. Caribou obtained slush/free water in wetlands and to a lesser extent on creeks and in the Tweedsmuir-Entiako area caribou obtained slush/free water on lakes and creeks.
2. The Tweedsmuir-Entiako population size was estimated to be 400-500 caribou. Adult mortality was high in 2 of the 3 years and calf recruitment was low during all 3 years. Adult mortality occurred primarily during the summer. High adult mortality and low calf recruitment suggests that the population is currently declining.
3. The Itcha-Ilgachuz-Rainbow population size was estimated to be between 1400 and 1500 caribou (Rainbows - 200, Itcha-Ilgachuz - 1200-1300). During the 3 year study there was an increase in adult mortality and a decrease in calf recruitment. The primary cause of adult mortality was wolf predation and 90% of the mortalities occurred during the summer/early fall months. Low to

Table 8. Causes of mortality of adult female radiocollared caribou in the Tweedsmuir-Entiako and Itcha-Ilgachuz-Rainbow areas between April 1985 and March 1988. (Chronological numbers of mortalities correspond to locations of mortalities in figs. 15,16).

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<u>NUMBER</u>	<u>DATE</u>	<u>CAUSE OF DEATH</u>
Tweedsmuir/Entiako		
1	April 1985	unknown
2	May 1985	unknown - wolf sign present
3	June 1985	unknown - wolf/bear sign present
4	September 1985	unknown
5	October 1985	unknown
6	July 1986	unknown
7	April 1987	unknown - possible wolf kill
8	June 1987	wolf kill
9	June 1987	bear kill/scavenge
10	July 1987	unknown
11	August 1987	unknown
12	October 1987	accident
Itcha/Ilgachuz/Rainbow		
1	June 1985	unknown - bear scavenge
2	June 1986	wolf kill
3	July 1986	unknown - previously limping
4	September 1986	wolf kill
5	March 1987	wolf kill
6	July 1987	wolf kill
7	July 1987	wolf kill
8	September 1987	wolf kill
9	October 1987	poached

## TWEEDSMUIR-ENTIAKO



## ITCHA-ILGACHUZ-RAINBOWS

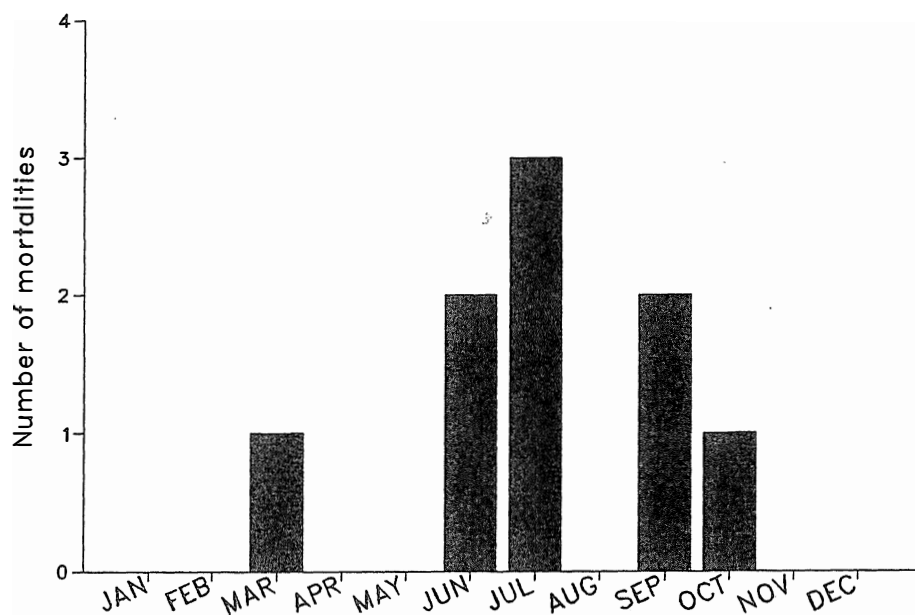


Fig. 14. Monthly distribution of radiocollared caribou mortality in the Itcha-Ilgachuz-Rainbow and Tweedsmuir-Entiako areas from April 1985 - March 1988.

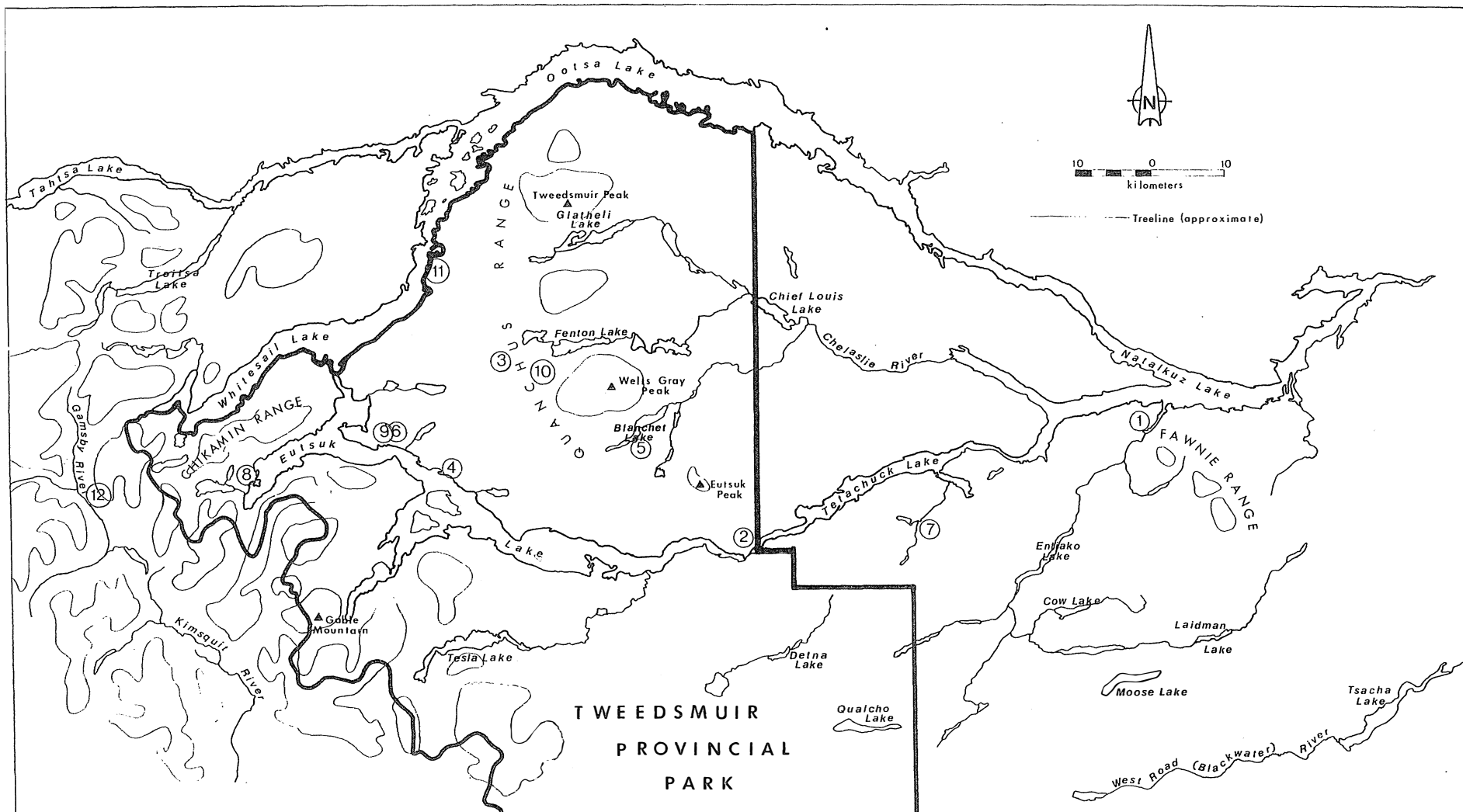


Fig. 15. Locations of radiocollared caribou cow mortalities in the Tweedsmuir-Entiako area, April 1985 - March 1988. (Chronological numbers of mortalities correspond to causes of death in Table 8.)

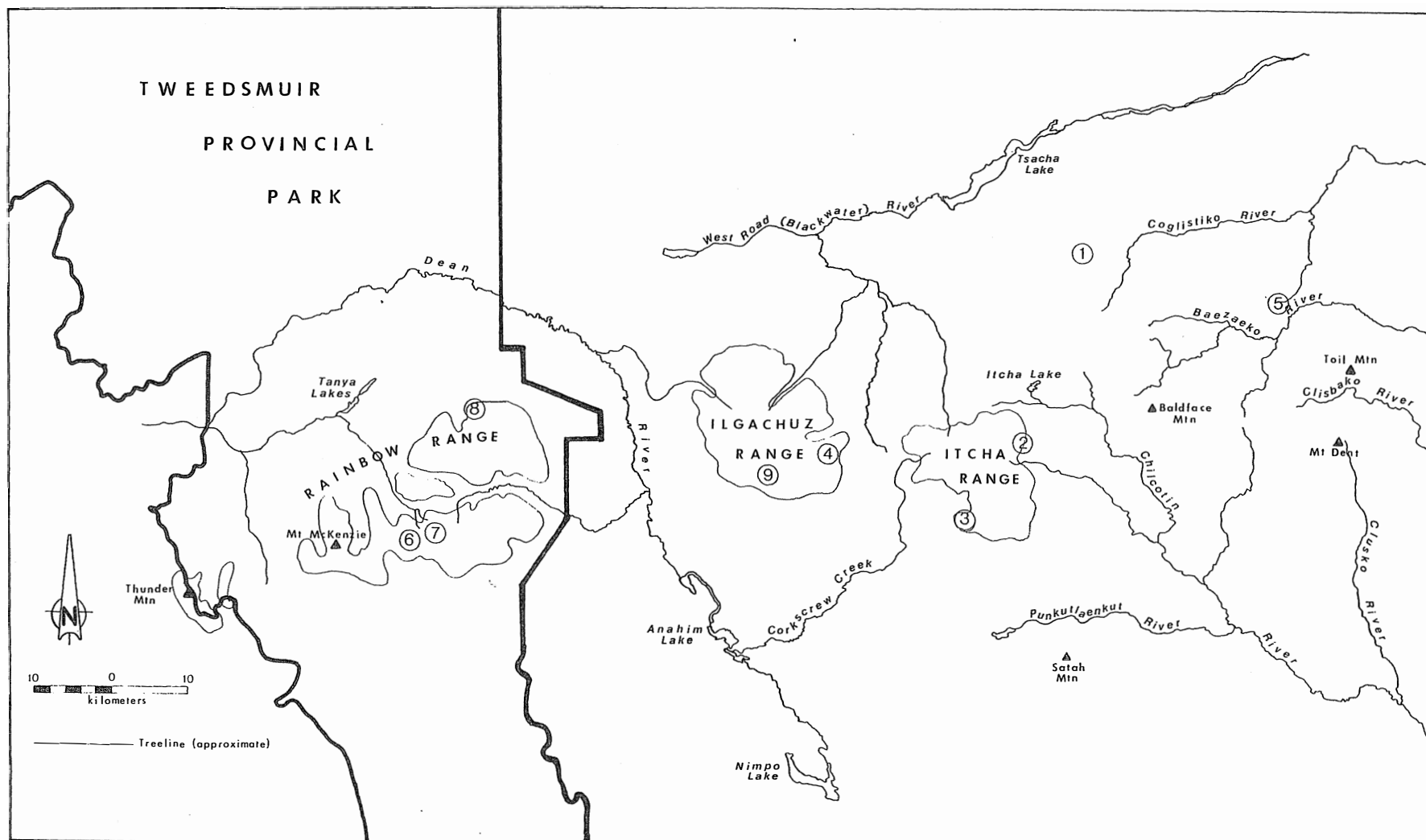


Fig. 16. Locations of radiocollared caribou cow mortalities in the Itcha-Ilgachuz-Rainbow area, April 1985 - March 1988. (Chronological numbers of mortalities correspond to causes of death in Table 8.)

Table 9. Annual adult mortality rates and calf recruitment rates in the Tweedsmuir-Entiako and Itcha-Ilgachuz-Rainbow study areas, 1985/86 - 1987/88. (Adult mortality rate based on radiocollared caribou sample; calf recruitment rate based on total counts (alpine and below treeline) in March). (N) = number of adult radiocollared caribou (mortality); total number of caribou (recruitment).

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	Adult mortality <u>rate</u>	Calf recruitment <u>rate</u>
<b>Tweedsmuir-Entiako</b>		
1985/86	29.4(17)	9.0( 89)
1986/87	8.3(12)	10.0(150)
1987/88	30.0(20)	8.9(135)
<b>Itcha-Ilgachuz-Rainbow</b>		
1985/86	5.6(18)	20.1(411)
1986/87	20.0(20)	17.3(492)
1987/88	20.0(20)	12.2(385)

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moderate adult mortality and moderate calf recruitment suggests that the population is currently stable.

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- Neu, C.W., D.R. Byers and J.M. Peek. 1974. A technique for analysis of utilization-availability data. *J. Wildl. Manage.* 38:541-545.
- Stevenson, S.K. and D.F. Hatler. 1985. Woodland Caribou and their Habitat in Southern and Central British Columbia. Vol. 1. B.C. Ministry of Forests and Lands Manage. Report No. 23, 354p.

Appendix 1. Causes of caribou calf mortality during summer calving ground observations in the Itcha Mountains (June - July) 1985, 1986, 1987.

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<u>Date Found</u>	<u>Cause of Death</u>	<u>Comment</u>
June 25, 1985	Unknown	extensively scavenged by eagles, -no mammalian carnivore sign present
June 26, 1985	Wolf kill	actual kill observed
June 27, 1985	Unknown	possible eagle kill -calf found alone previous day -scavenged by eagles
June 27, 1985	Unknown	emaciated condition -no sign of scavenging -no visible puncture marks -no carnivore sign present
June 27, 1985	Unknown	scavenged by eagles -little left of the carcass
July 6, 1985	Unknown	scavenged by eagles
June 25, 1986	Unknown	emaciated condition -no sign of scavenging -no visible puncture marks -no carnivore sign present
June 30, 1986	Unknown	scavenged by eagles -head missing
June 18, 1987	Probable wolf kill	wolf found feeding on carcass -calf found with broken leg which occurred while still alive -break most likely occurred when chased by wolf
June 19, 1987	Birth related	found beside female -the umbilical cord was wrapped around its waist