WEST-CENTRAL B.C. CARIBOU RESEARCH PROJECT

PROGRESS REPORT

November 1983 - June 1986

by

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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.

Until recently, population estimates and seasonal habitat use of the woodland caribou in west-central British Columbia were primarily based on irregularly conducted population surveys and on anecdotal information. 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 are:

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.

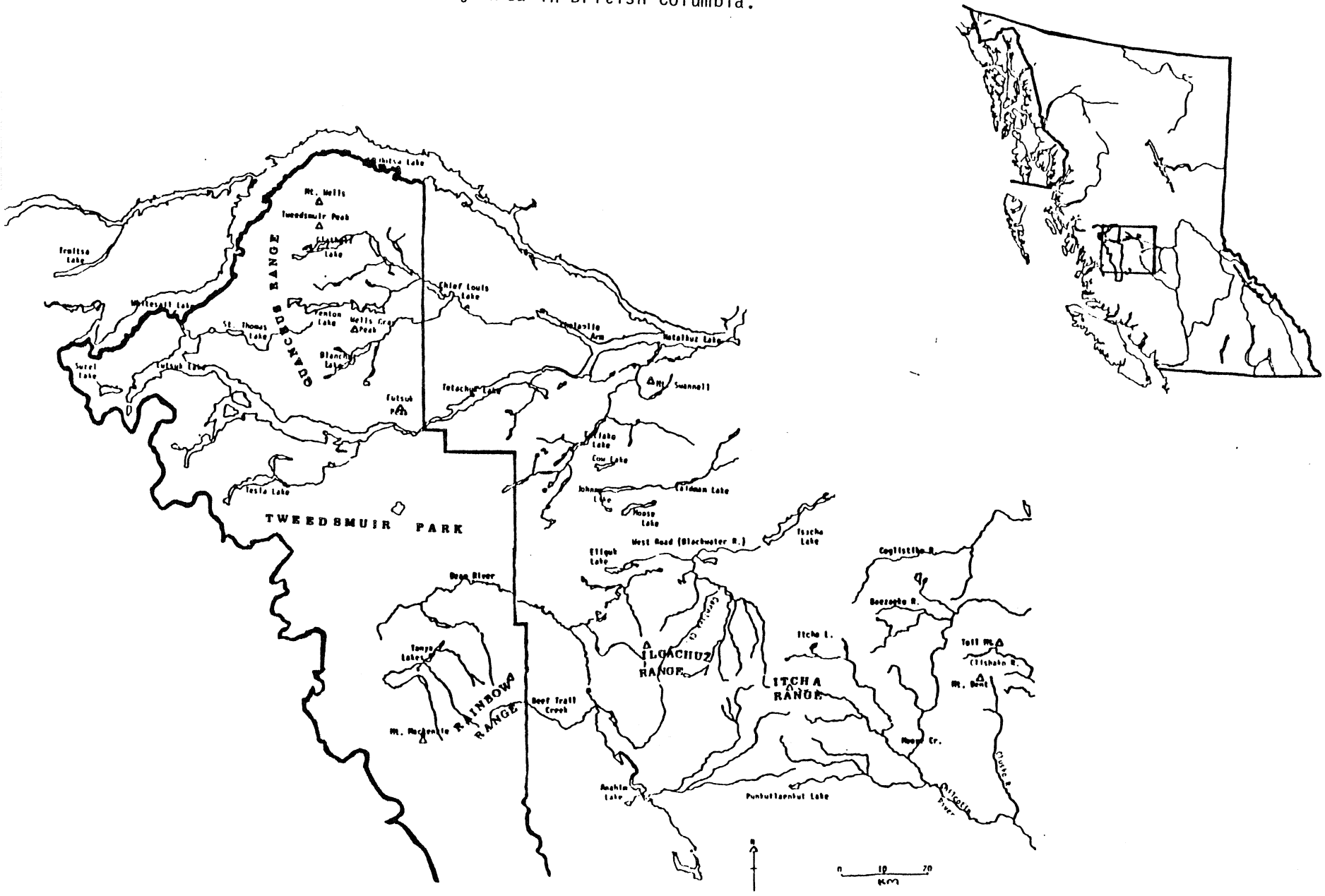
This report presents the results of the data collected prior to and during the first year of the West Central BC Caribou Study. Because the study is in progress, results and interpretations reported here are preliminary only.

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 Very Dry Southern Sub-Boreal Spruce subzone (SBSa) occurs at lower elevations (<1300 - 1500m) 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 Natalkuz 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 SBSa subzone. The ESSF zone occurs at higher elevations (>1200m) and alpine tundra occurs above the ESSF in the Fawnie Mountains and

Fig. 1. Location of study area in British Columbia.



the mountains of northern Tweedsmuir Park.

METHODS

A total of 40 caribou (19 in Tweedsmuir-Entiako, 21 in the Itcha-Ilgachuz-Rainbows) were radiocollared between 1982 and 1984. Animals were located approximately monthly from November 1983 to December 1985 (Tweedsmuir-Entiako) and from November 1984 to December 1985 (Itcha-Ilgachuz-Rainbows); weekly from January to March 1986 and biweekly from April to June 1986. Habitat types and elevations were noted and locations were plotted on 1:100,000 scale maps to determine movements.

An index of average daily movement was determined by dividing the distance travelled between two consecutive locations by the number of days between the two locations. The index was averaged for all caribou relocations during the time period. Values were excluded from the calculation when the period between locations exceeded 45 days.

Winter locations were plotted onto forest cover type maps to determine utilization of different forest cover types by caribou. Availability of forest cover types was determined by plotting 1800 random points onto forest cover maps. Differences between the use and availability of individual forest cover types were tested by the chi-squared technique (Neu et al. 1974) at $p=.10$. Only cover types with more than five caribou locations were included in this analysis.

Low elevation winter ranges of both the Itcha-Ilgachuz and Tweedsmuir-Entiako caribou were visited biweekly following telemetry flights in January-March 1986. Tracks made the day of the investigations were followed and

the distance travelled in each habitat type, number of feeding sites and species present at each feeding site were recorded. In mid- February 1986, feeding sites in the alpine on the north side of the Ilgachuz Mountains were also investigated. All feeding site data for January-March were combined. Data from tracks followed for more than 500 caribou steps were used to quantify number of craters and arboreal lichen feeding sites in each habitat type and types of vegetation present at each feeding site.

Snow depth, number of crusts, caribou sinking depth and observer sinking depth were recorded to assess the difficulty of movement in different habitat types.

Fecal samples were collected biweekly from each study area from January to March 1986 and opportunistically during the rest of the study. Samples from the summer were analyzed for fecal nitrogen content as an index of diet quality. A composite sample from each collection was sent to Wildlife Habitat Lab., Washington State University, to be analyzed for diet composition by fecal fragment analysis. Fall and winter samples have not yet been analyzed.

Population data for the Itcha, Ilgachuz and Rainbow caribou were combined because of a small sample size of radiocollared cows in the Rainbow Mountains. Also, mixing of Rainbow and Ilgachuz caribou in the Ilgachuz Mountains during the calf recruitment survey in March 1986 made it impossible to determine independent recruitment rates for the two groups of caribou from the sample counted. Population censuses of the Itcha-Ilgachuz-Rainbow area were conducted in June when most cows were present in the alpine in post-calving aggregations. A bull : cow ratio, determined during the fall counts was applied to the June count to obtain a total population estimate. Animals in the Tweedsmuir-Entiako area were not censused.

Pregnancy rate of Itcha-Ilgachuz-Rainbow caribou was determined from a sample of 16 females trapped in the northern Ilgachuz in April 1986. Blood samples were collected and serum progesterone levels were used to determine whether the females were pregnant.

Calf production (1985 and 1986) for both radiocollared and unmarked cows was determined by helicopter survey in mid- June. Locations of animals during calving were plotted and fidelity to calving areas between years was examined. Ground surveys assessing early calf survival and causes of calf mortality were conducted during calving season and throughout the summer in the Itcha Mountains. A calf count was conducted in October 1985 to determine survival over the summer and in mid March 1986 to determine calf recruitment into the population for that year.

Adult mortality rate was determined from the proportion of radiocollared caribou dying between April and March of the following year. Mortality rates from April 1984 to March 1985 and April 1985 to March 1986 were averaged to determine the average annual mortality rate.

RESULTS

OBJECTIVE I. SEASONAL RANGE, HABITAT USE AND FOOD HABITS

Seasonal Movements

Itcha-Ilgachuz-Rainbows: During winter 1984-1985, radiocollared cows of the Itcha-Ilgachuz were found primarily in low elevation forests to the east and southeast of the Itcha Mountains (Fig. 2). One caribou wintered on the north slope of the Ilgachuz Mountains. All Rainbow caribou were above treeline in the

Rainbow Mountains. By April, radiocollared cows began moving toward the Itcha and Ilgachuz mountains (Figs. 2) where they calved at high elevations in June (Figs. 3). Rainbow caribou did not move between winter and summer ranges.

During the first week in October, seven of the Itcha–Ilgachuz radiocollared caribou were found at high elevation in the alpine whereas the other six had moved into lower elevation forested areas. By November, most of the Itcha–Ilgachuz caribou had migrated east to the headwaters of the Baezaeko River and southeast to the area near Punkutlaenkut Creek and three of the four radiocollared Rainbow caribou had moved to the north side of the Ilgachuz Mountains (Fig. 3).

Itcha–Ilgachuz radiocollared cows wintered in forested areas further east and southeast and at lower elevations than they had in the previous year (Fig. 4). Two of the three Rainbow caribou wintering in the northern Ilgachuz stayed in forested areas at lower elevations in early winter then moved up into higher elevation alpine habitat in late winter (Fig. 11).

Late snowmelt appeared to influence the timing and pattern of spring migration in 1986. Caribou started moving back to the mountains in May 1986 (Fig. 12). Most animals moved into the pass between the Itcha and Ilgachuz mountains where there was relatively less snow than in the other areas adjacent to the mountains, before proceeding into high elevation alpine areas in the Itcha and Ilgachuz mountains to calve (Figs. 5,11).

By late May, two of the three radiocollared Rainbow caribou in the Ilgachuz had moved back to the Rainbows along with two animals radiocollared in the Ilgachuz in April 1986. All Rainbow caribou were present in the Rainbows during calving in June 1986.

Fig. 2. Locations of radio-collared female caribou in the Itcha-Ilgachuz-Rainbow area during the winter and during the spring migration, December 1984 - May 1985.

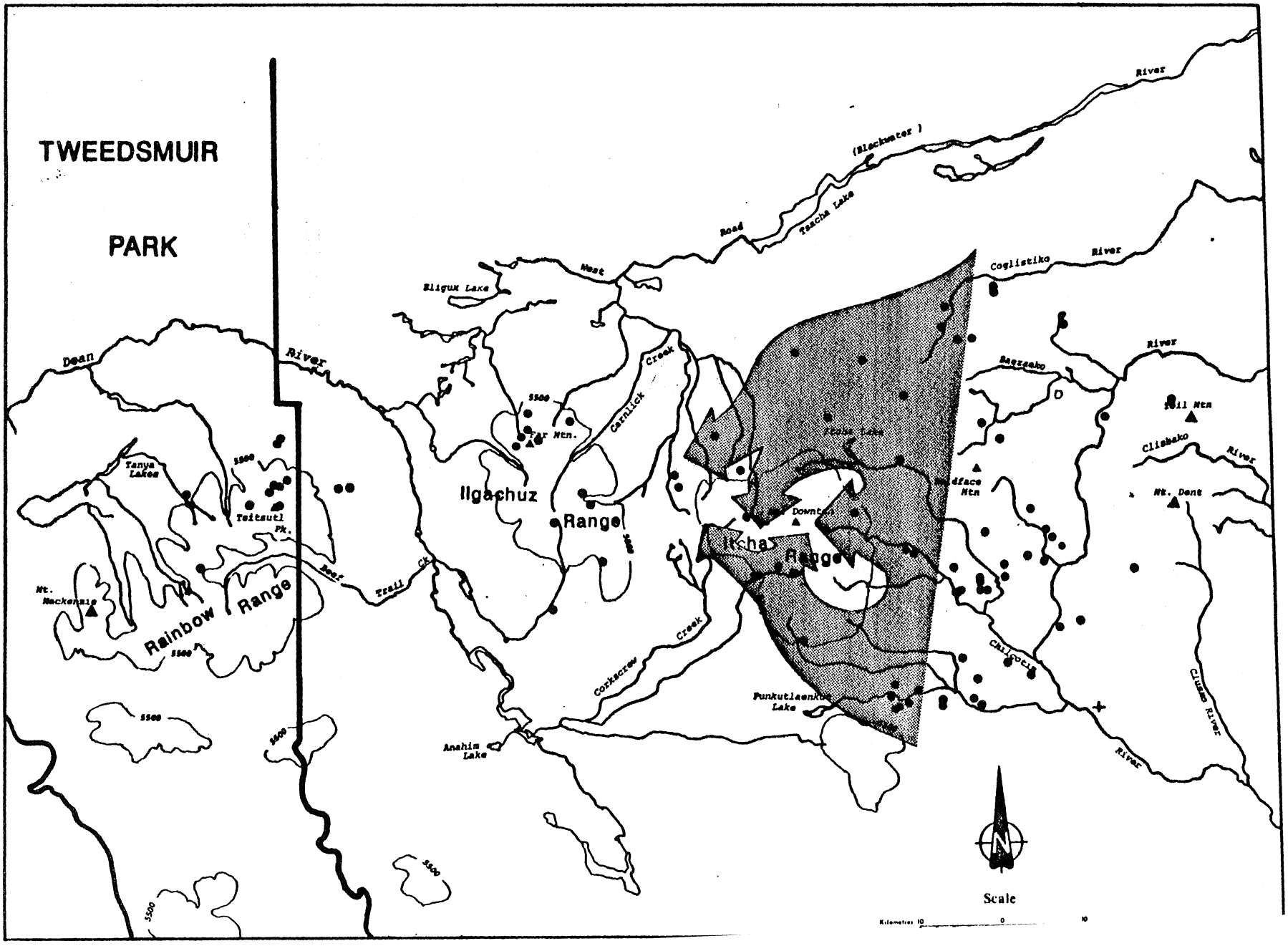


Fig. 3. Locations of radio-collared female caribou in the Itcha-Ilgachuz-Rainbow area during the summer and during the fall migration, June - November 1985.

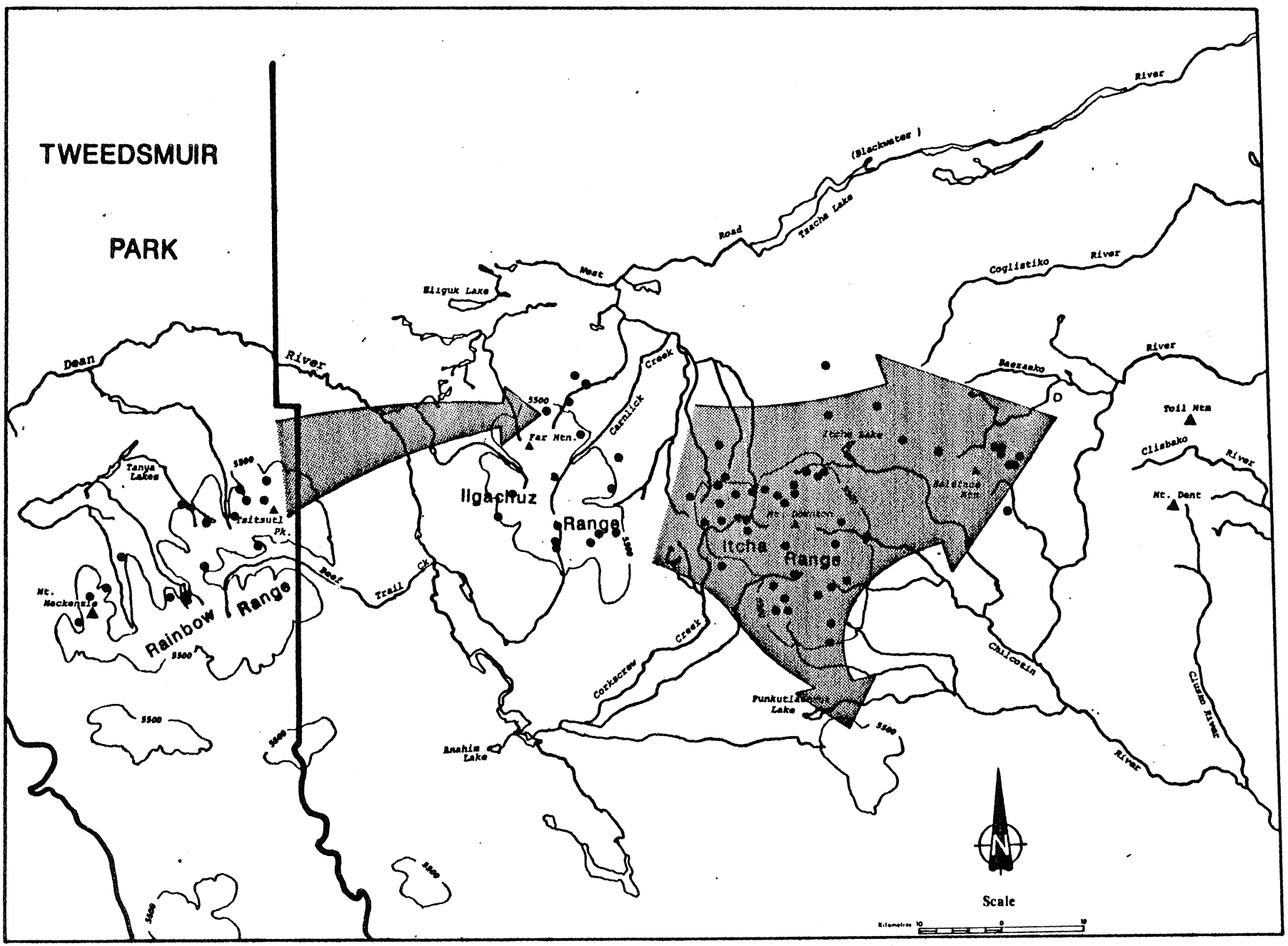


Fig. 4. Locations of radio-collared female caribou in the Itcha-Ilgachuz-Rainbow area during winter, December 1985 - April 1986.

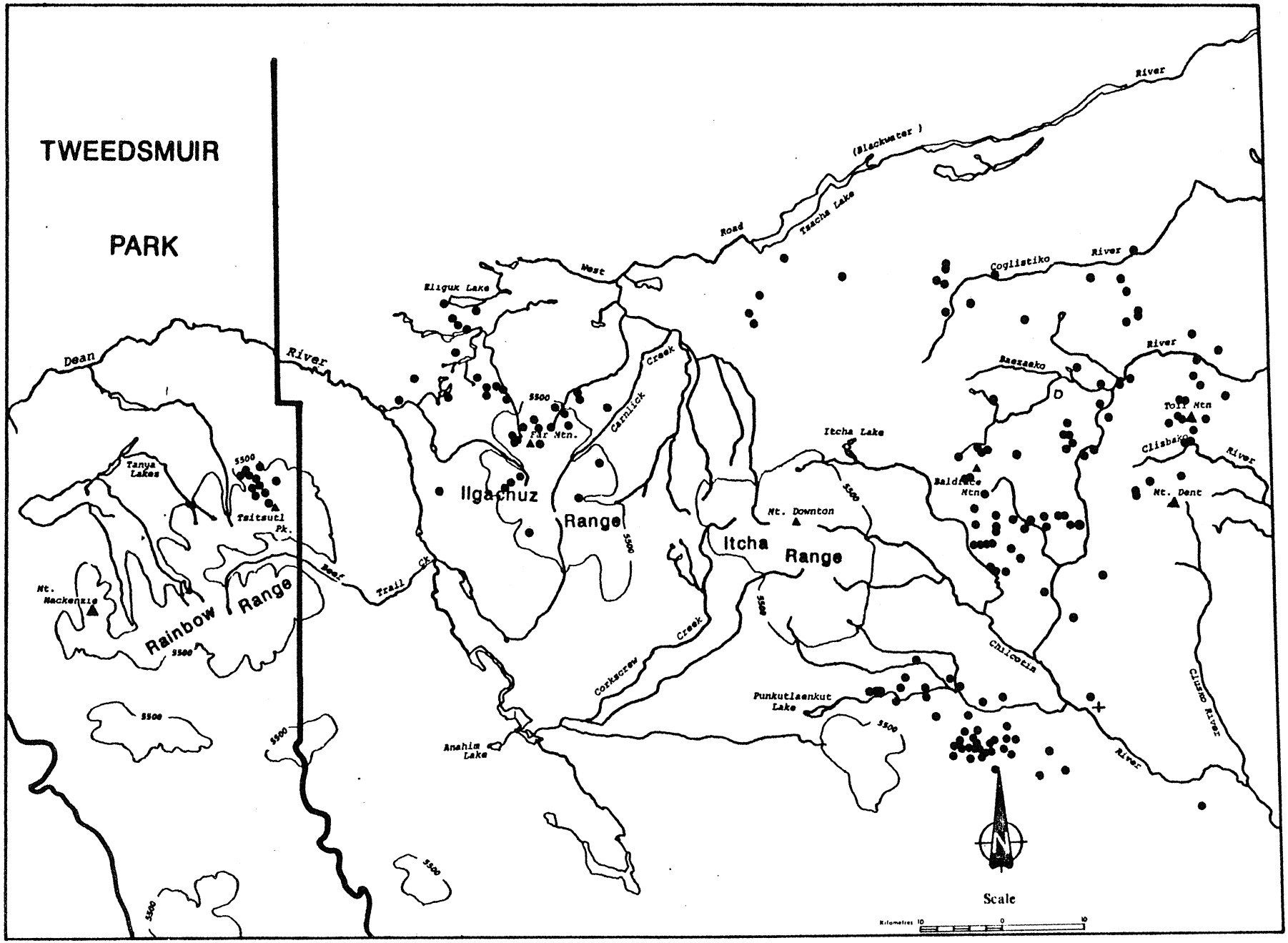


Fig. 5. Locations of radio-collared female caribou in the Itcha-Ilgachuz-Rainbow area during spring migration and early summmer, May - June 1986.

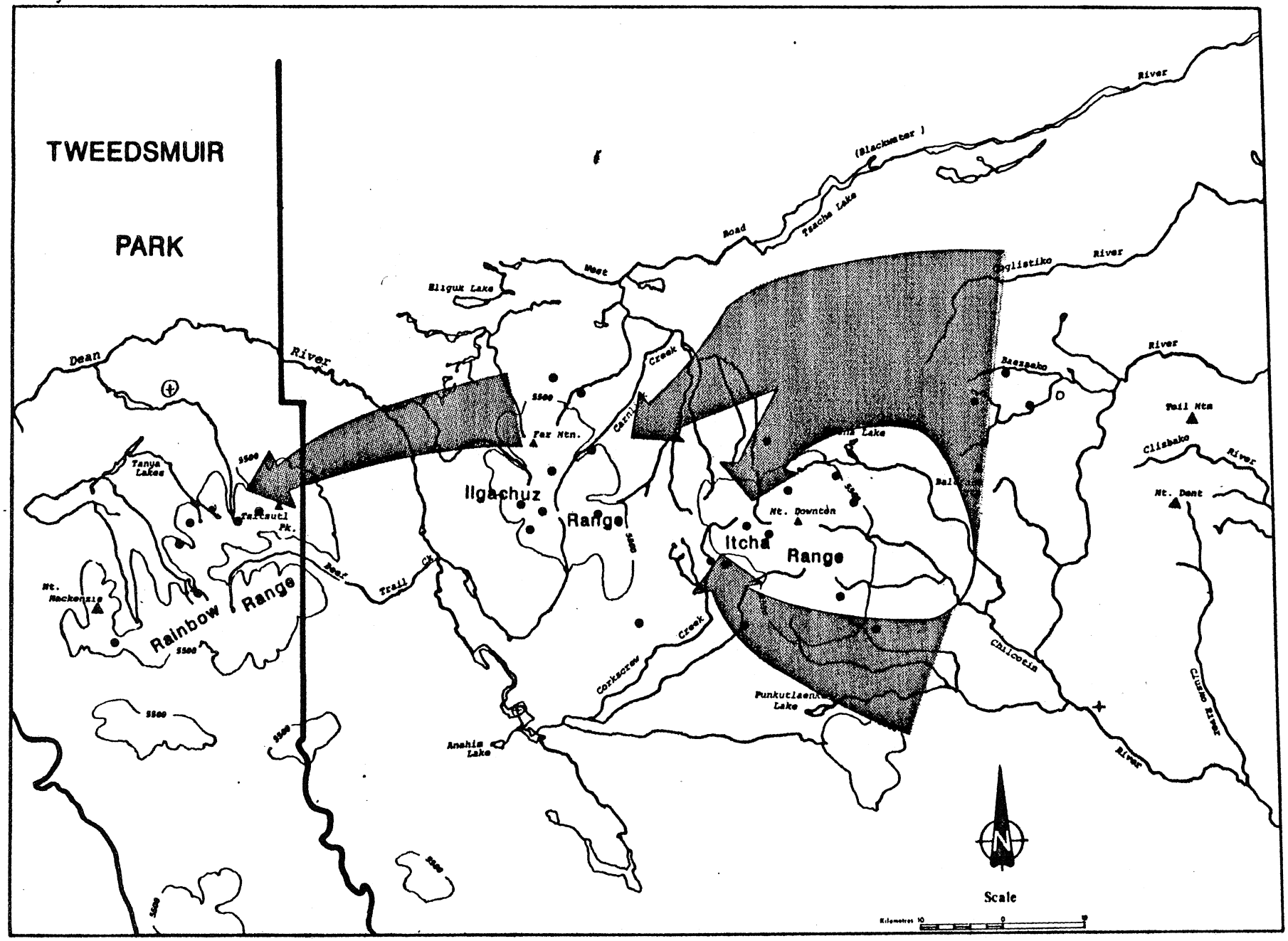


Fig. 6. Locations of radiocollared female caribou in the Tweedsmuir-Entiako area during the winter and during spring migration, December 1984 - May 1985.

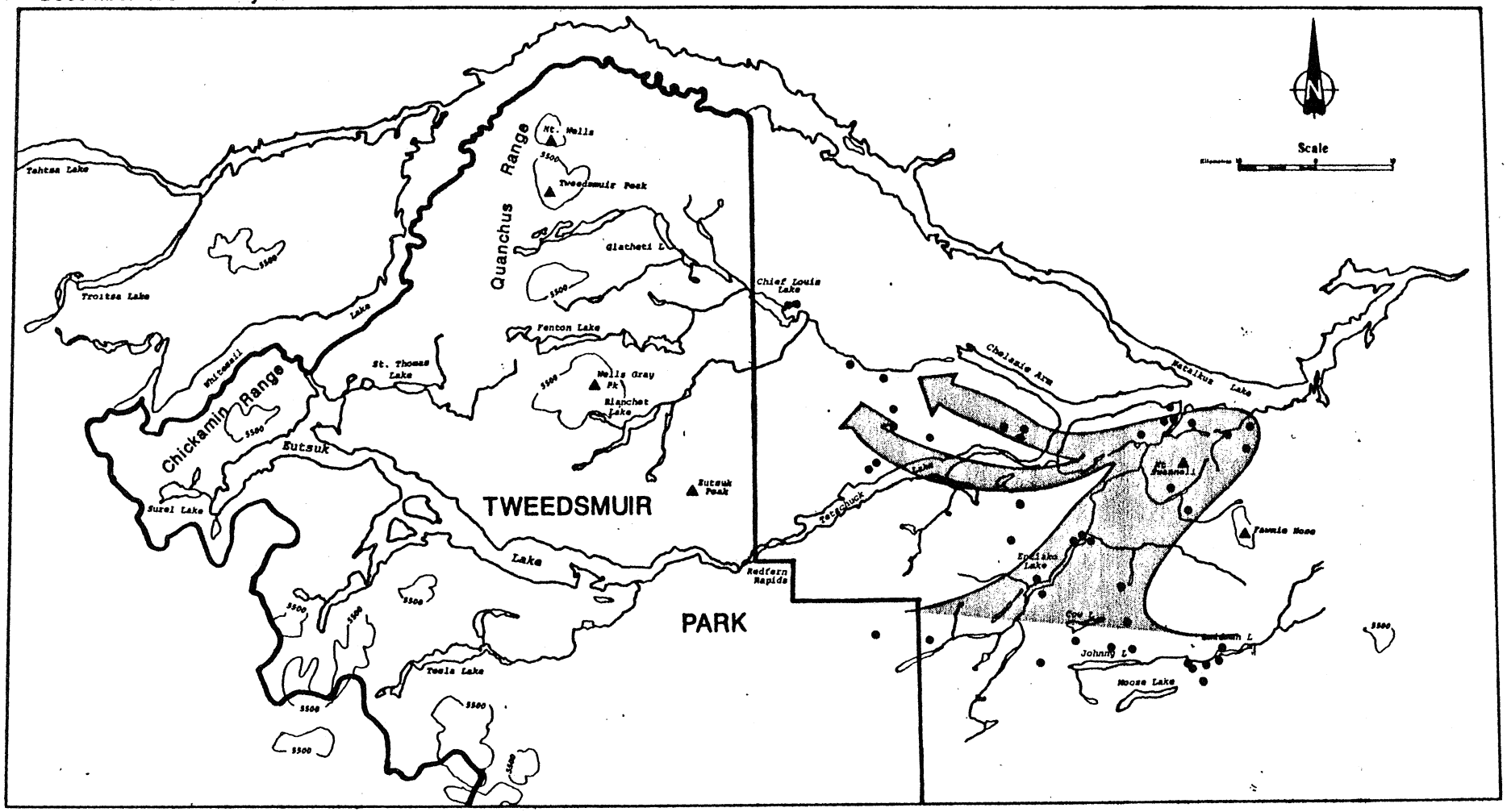


Fig. 7. Locations of radiocollared female caribou in the Tweedsmuir–Entiako area during the summer and during fall migration, June – November 1984.

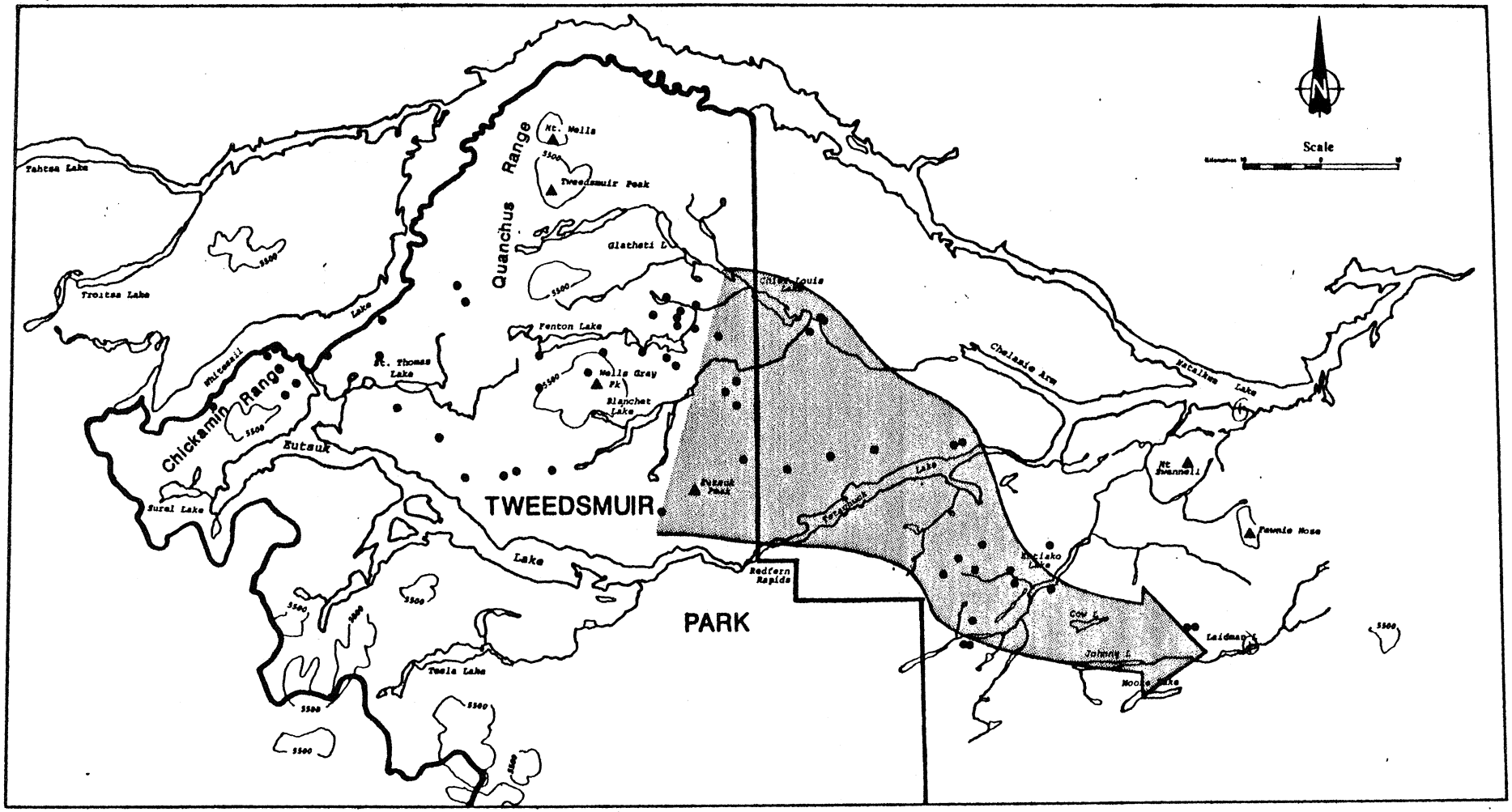


Fig. 8. Locations of radiocollared female caribou in the Tweedsmuir–Entiako area during the winter and during the spring migration, December 1984 – May 1985.

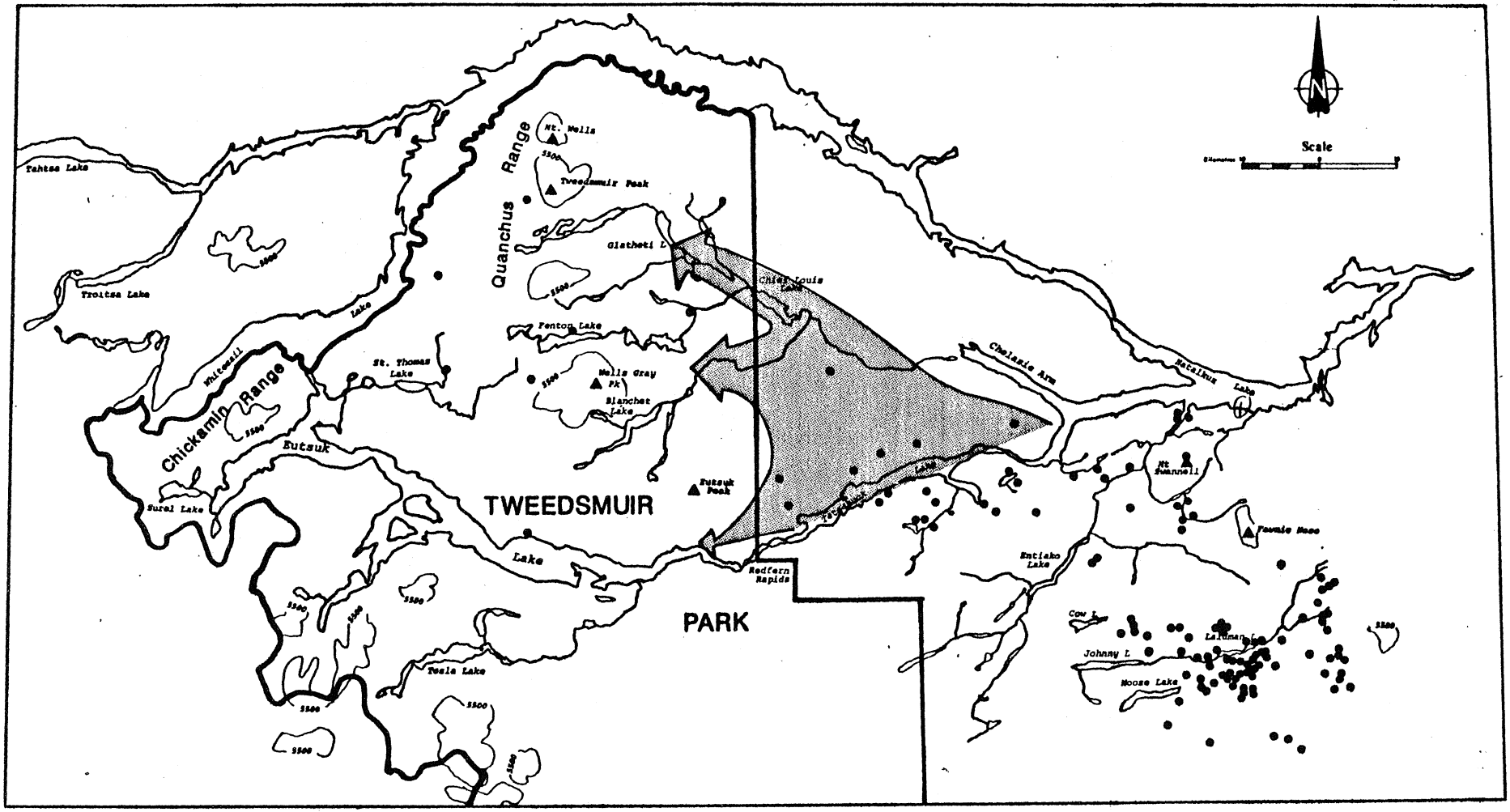


Fig. 9. Locations of radiocollared female caribou in the Tweedsmuir–Entiako area during the summer and during the fall migration, June – November 1985.

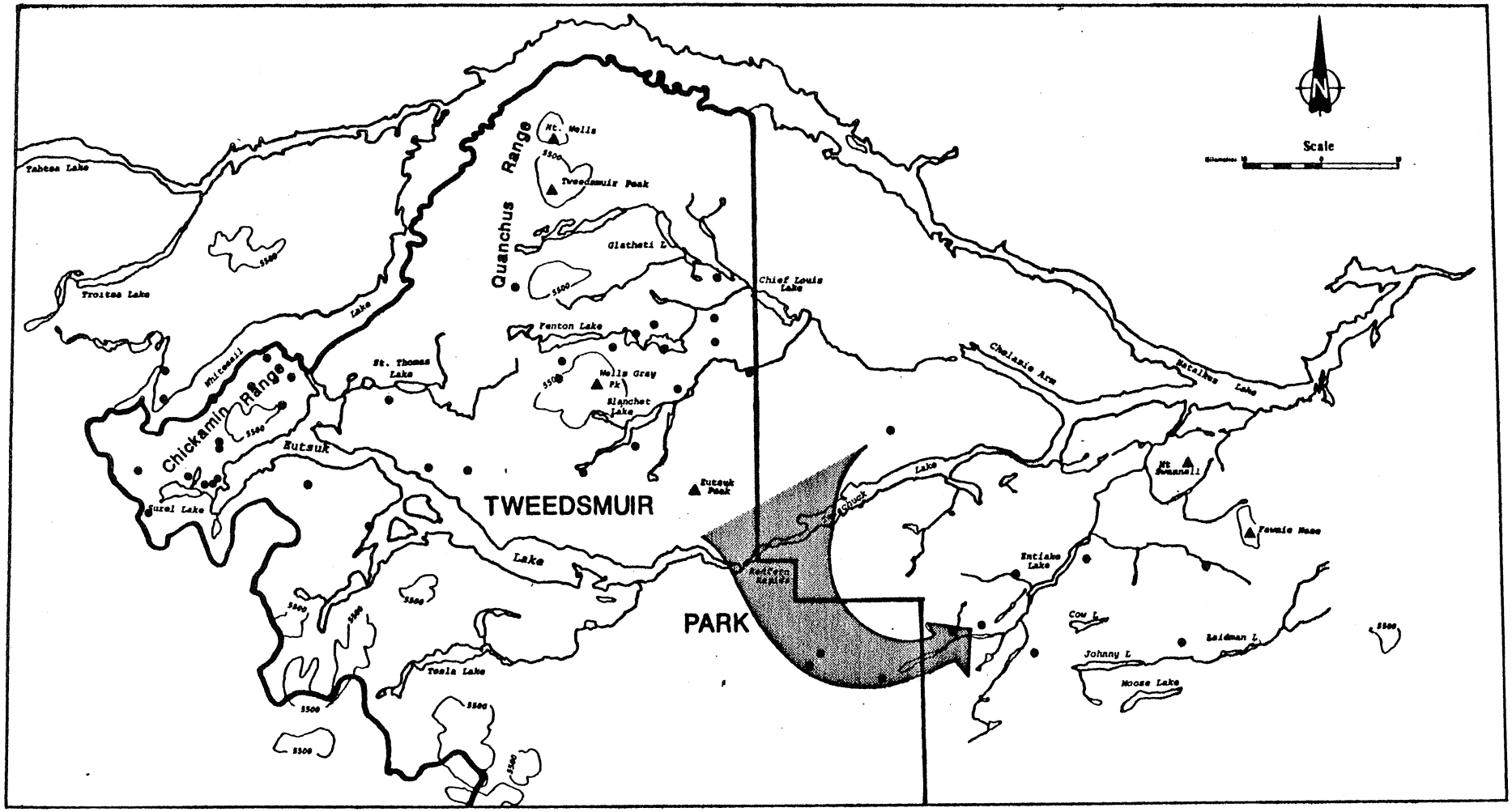


Fig. 10. Locations of radio-collared female caribou in the Tweedsmuir-Entiako area during the winter, spring migration and early summer, December 1985 - June 1986.

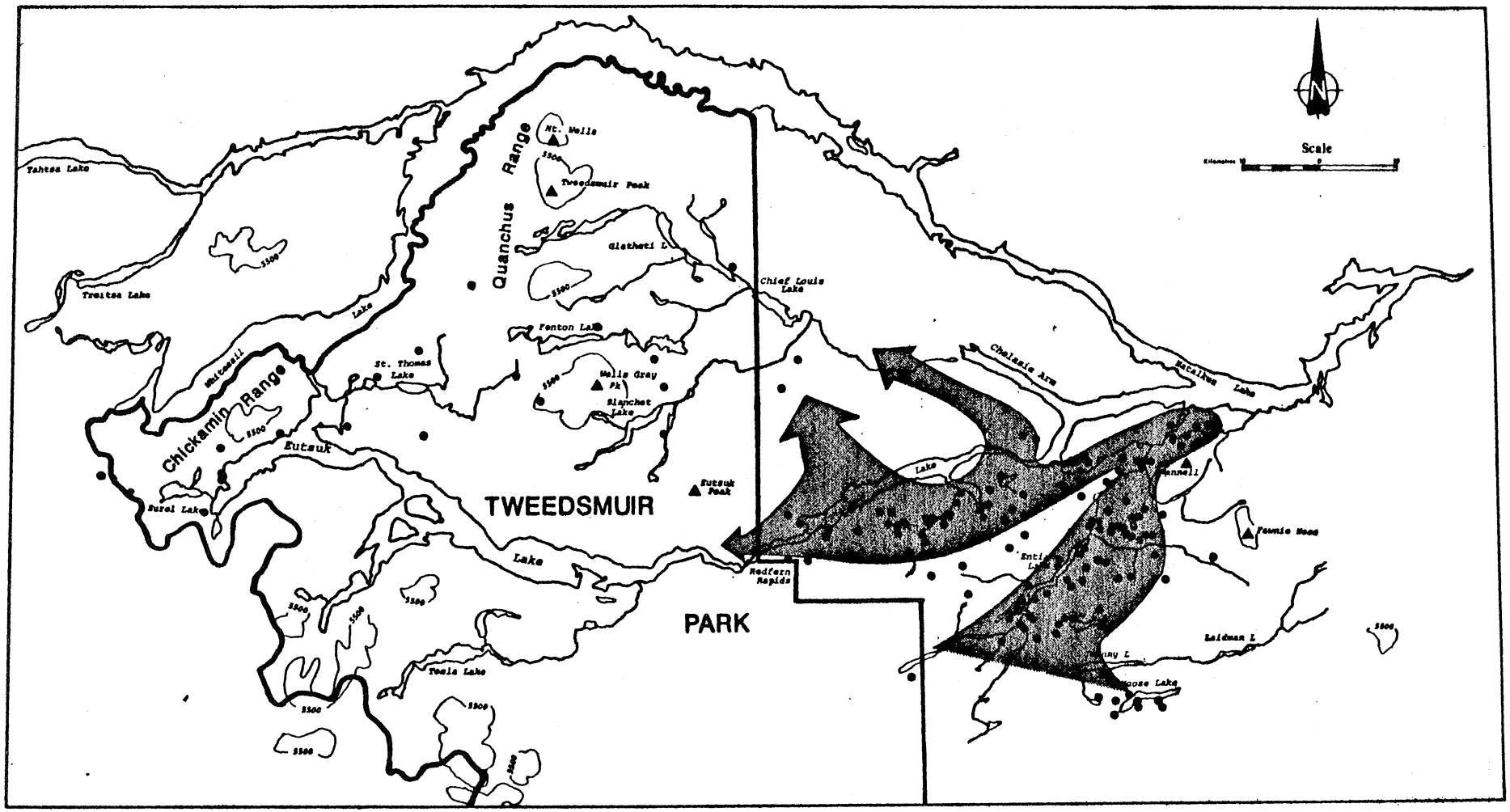


Fig. 11. Altitudinal movements of radiocollared caribou in the Itcha-Ilgachuz, Rainbow and Tweedsmuir-Entiako areas, November 1983 - June 1986.

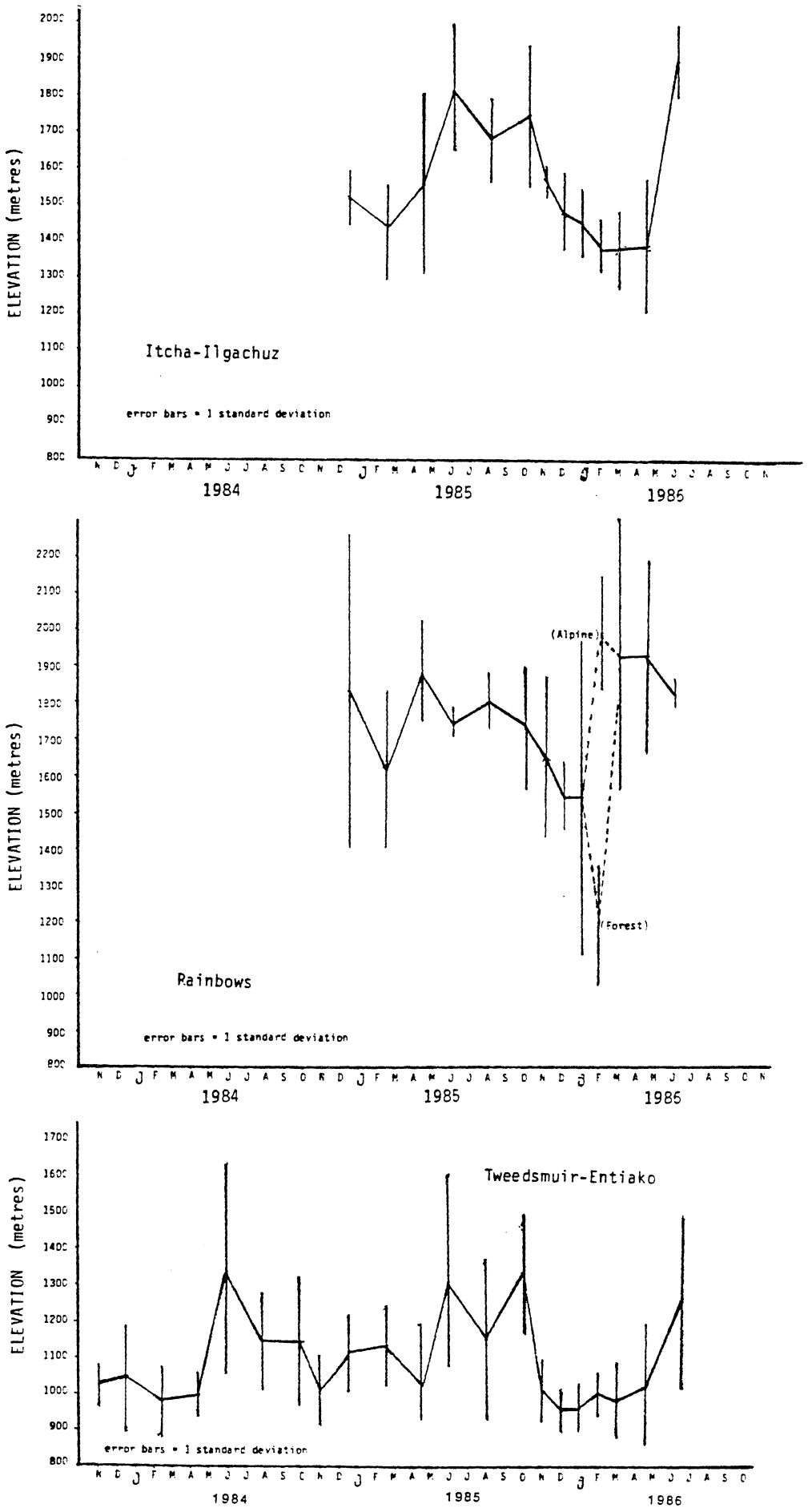
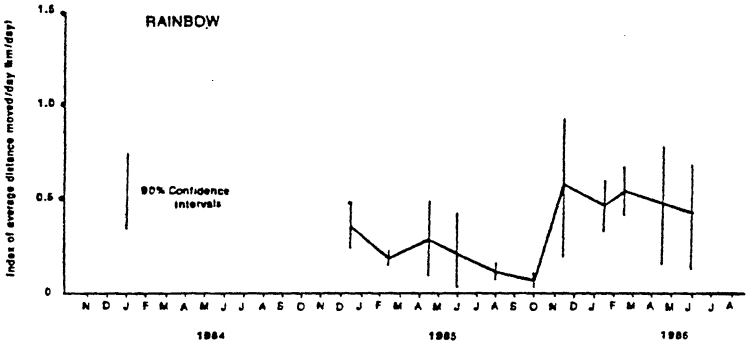
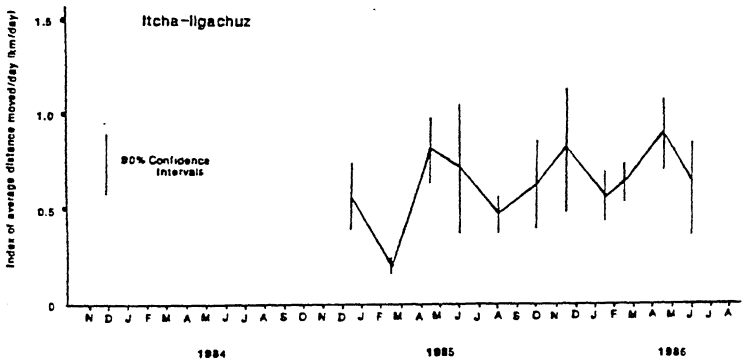
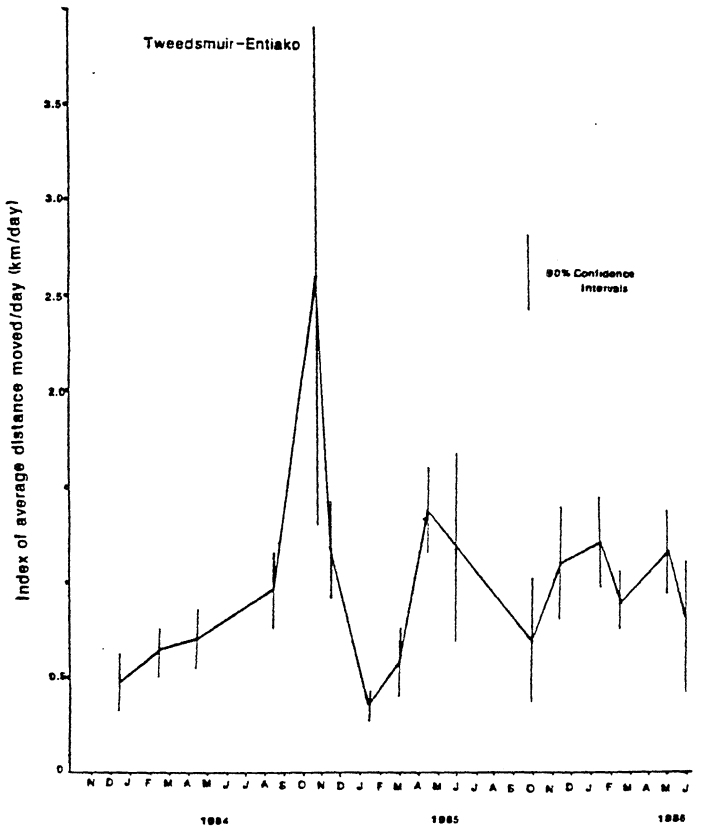


Fig. 12. Index of average daily movements of radiocollared caribou in the Itcha–Ilgachuz, Rainbow and Tweedsmuir–Entiako areas, November 1983 – June 1986.







Tweedsmuir-Entiako: During the winter 1983/84, radiocollared cows wintered in the Entiako-Laidman Lake area (Fig. 6). Spring migration in 1984 appeared to follow areas of high snow melt. In March animals moved north to the pine forests at the mouth of the Entiako River before moving west to cross Tetachuck Lake near Bryan Arm and the mouth of Aslin Creek. Animals summered in northern Tweedsmuir Park at higher elevations in alpine and subalpine habitat (Figs. 7,11). Fall migration began in late October and early November 1984 (Figs. 7,12) as animals began moving south and east towards Tetachuck Lake. Crossing appeared to take place along the length of the lake.

During the winter of 1984/85, radiocollared caribou were found primarily in the Laidman Lake area (Fig. 8). Movement back towards northern Tweedsmuir Park occurred between late February and early April 1985. Spring migration in 1985 differed from spring migration in 1984 in that 70% of the radiocollared animals did not first move northeast to the mouth of the Entiako River. Snowmelt was more widespread in 1985 than in 1984 allowing animals to move directly northwest to Tetachuck Lake and into Tweedsmuir Park using snow-free areas. Animals concentrated on the south shore of Tetachuck Lake before crossing. During calving 3 of the 13 radiocollared caribou were found above timberline whereas the rest were found in lower elevation and subalpine forested areas. In early October 1985, animals were found in higher elevation forests and above timberline (Fig. 9). Fall migration began in late October and by mid November 10 of the 11 animals located had crossed Tetachuck Lake in the vicinity of Redfern Rapids (Fig. 9).

In 1985-86, caribou wintered primarily in the Entiako Lake area (Fig. 10). In mid-March, caribou moved northeast to snow-free areas at the mouth of the Entiako River before moving west to cross Tetachuck in late April and May. By

mid-June, all animals were across Tetachuck Lake and all but one were found scattered throughout northern Tweedsmuir Park.

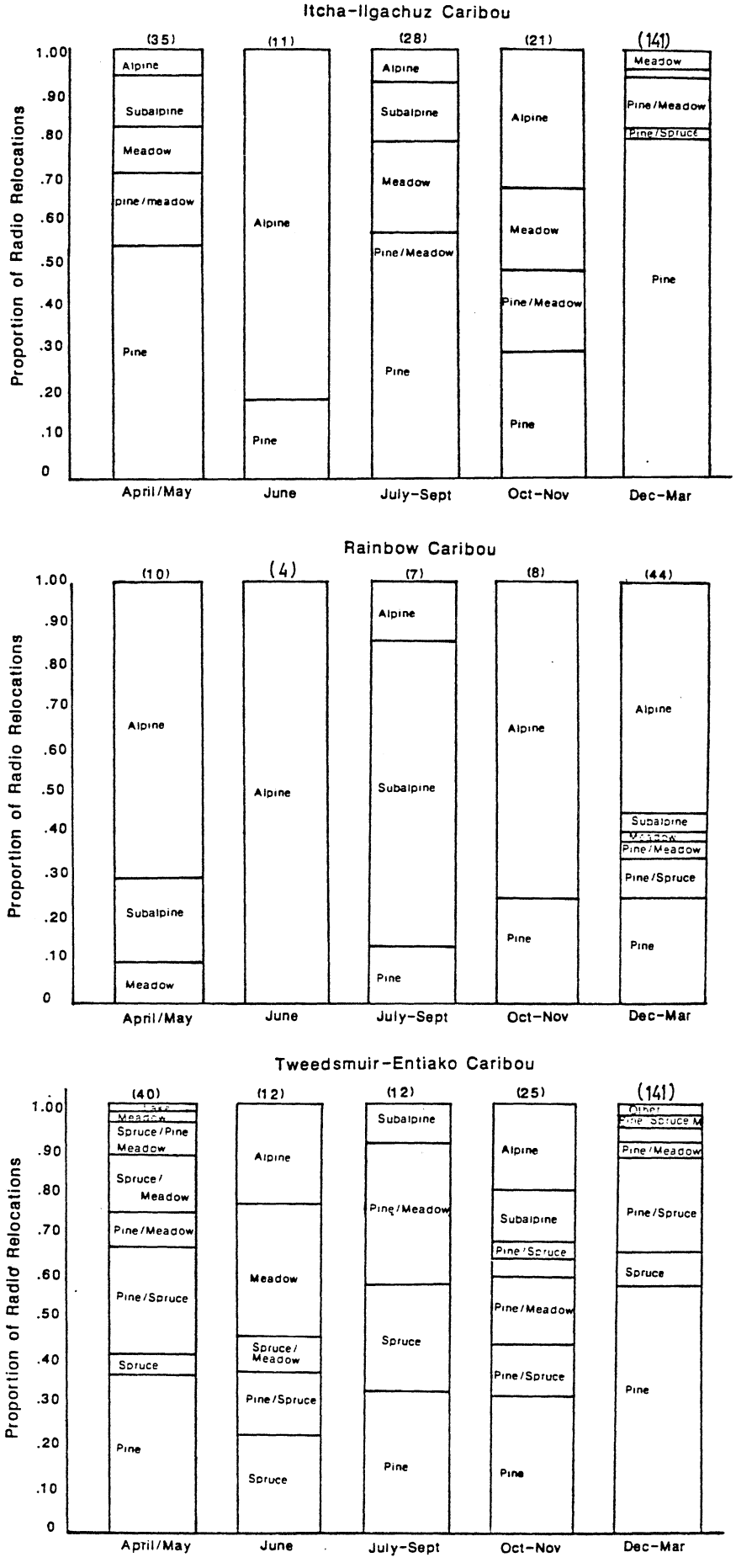
Habitat Use (April 1985 - May 1986)

Itcha/Ilgachuz: In early spring (April/May) radiocollared cows were using lower elevation pine forests and meadows (Fig. 13). By calving time in June, 10 of the 13 adult female caribou were in high elevation alpine habitat in the Itcha and Ilgachuz mountains and formed large post-calving aggregations (20-200 animals). Caribou were found in high elevation alpine habitat and adjacent subalpine forests in early summer but by late summer, caribou were also using pine forests and meadows at lower elevations. During October, radiocollared cows were found in the alpine, subalpine and pine forests and pine/meadow complexes close to timberline. By November, animals were moving away from the mountains and were using lower elevation meadows and pine forests. In late winter (Dec. - March) caribou were found primarily in low elevation pine forests to the east and southeast of the Itcha Mountains. Use of meadows during the winter 1985-86 was low.

Rainbows: The radiocollared caribou primarily used high elevation alpine and subalpine habitat in the Rainbow Mountains throughout most of the spring, summer and fall (Figs. 11,13). By November, three of the four radiocollared cows had moved from the Rainbows to the alpine and subalpine areas on the north side of the Ilgachuz Range. In January and February, one of the three caribou that had moved to the Ilgachuz and the one remaining in the Rainbows spent their time in the alpine whereas the other two caribou wintered in the lower elevation forests and forest/meadow complexes to the north of the Ilgachuz Mountains. One animal was found as far north as Eliguk Lake. At the end of March, all three of the animals in the northern Ilgachuz Mountains were using alpine habitat.

Tweedsmuir/Entiako: By late spring radiocollared cows had started to migrate to calving areas and were moving into northern Tweedsmuir Park through

Fig. 13 Proportion of Radiocollared caribou locations in each habitat type in the Itcha-Ilgachuz, Rainbow and Tweedsmuir-Entiako areas, April 1985 - March 1986.



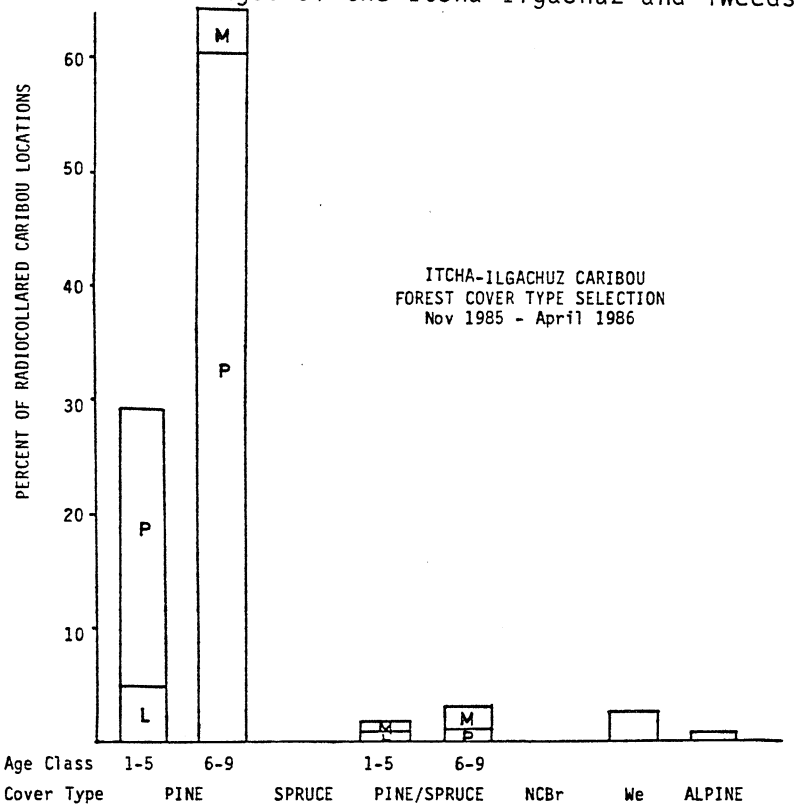
low elevation forests adjacent to the Chelaslie and Blanchet Rivers and along the northern shore of Eutsuk Lake (Fig. 13). During calving in June, most animals were in forested and meadow habitat but some were found in high elevation alpine areas in the Chikamin Range. Towards the end of the summer, animals were using lower elevation pine or spruce forests and associated meadows. In early October 5 of 12 radiocollared cows were associated with large prerutting groups in the alpine in the Quanchus Range. Others were found in the subalpine and forested or forest/meadow habitats. By mid-November, most animals had crossed Tetachuck Lake and were using pine forests or forest/meadow complexes. During the winter, the caribou were concentrated in the Entiako Lake area and were primarily using forested habitats.

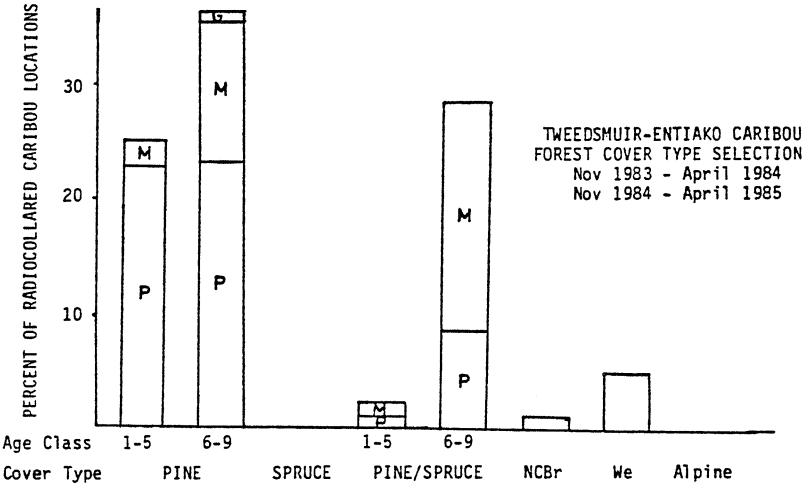
Winter Range - Forest Cover Type Use

Itcha-Ilgachuz: During the winter of 1985/86, Itcha-Ilgachuz caribou were primarily found in mature pine stands on poor sites (Fig. 14). Proportionate use of forest cover types by caribou differed significantly ($p<.001$) from the availability distribution (Figs. 14,15). Caribou were found to use disproportionately more mature pine stands on poor sites than was available. Use of immature pine stands on both low and poor sites was less than expected as was use of wetland areas.

Tweedsmuir-Entiako: Data for the winters 1983-84 and 1984-85 were combined and compared to the winter of 1985-86 (Fig. 14). During both time periods, caribou used primarily pine stands (mature and immature) on poor and medium sites (Fig. 14). Both distributions differed significantly from the availability distribution (1983-85, $p=.013$; 1985-86, $p<.001$). During both the winters of 1983-84 and 1984-85 and the winter of 1985-56, caribou were using disproportionately less immature pine stands on poor sites. All other habitat types

Fig. 14. Forest cover type use by caribou (% of radiocollared caribou locations) in the winter ranges of the Itcha-Ilgachuz and Tweedsmuir-Entiako caribou.





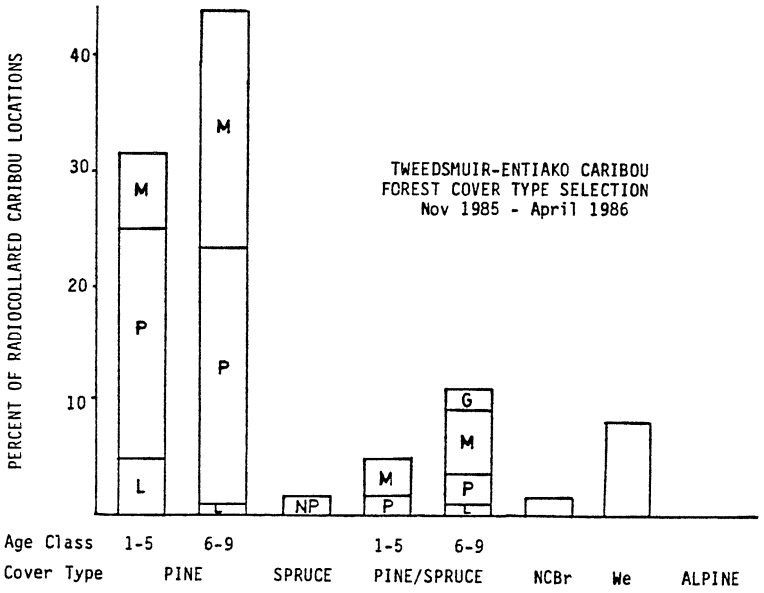
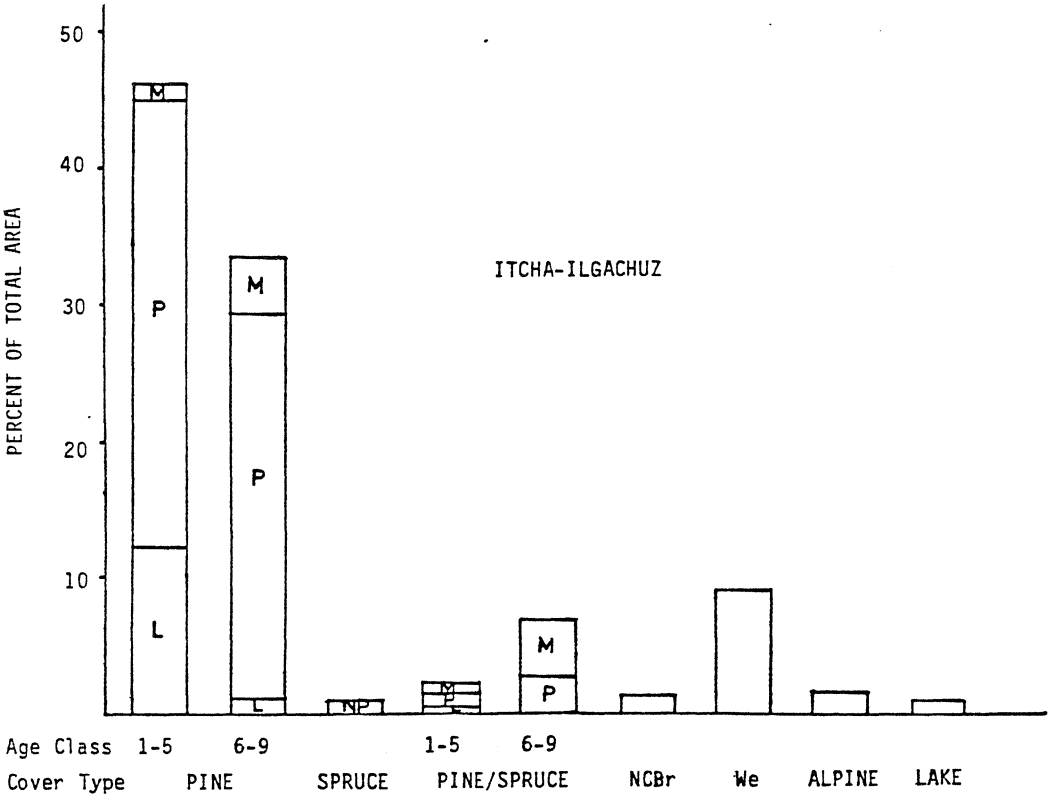
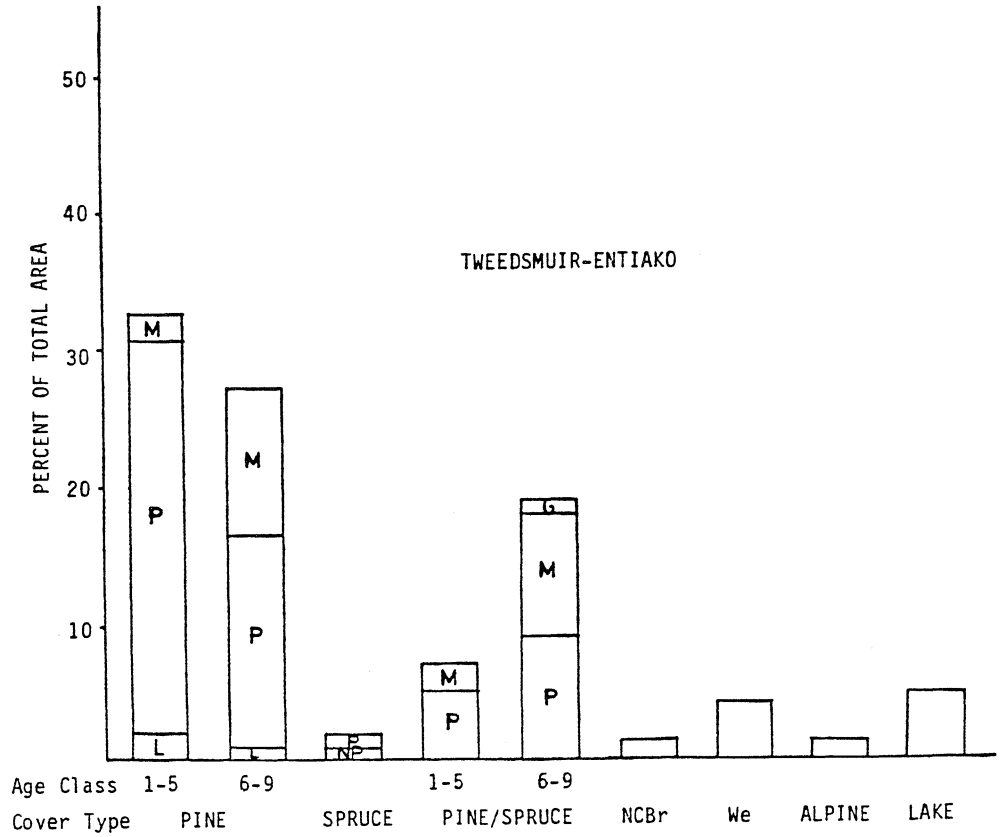


Fig. 15. Forest cover type availability (% of total area) in the winter ranges of the Itcha-Ilgachuz and Tweedsmuir-Entiako caribou.





were used in proportion to the availability.

Winter Site Investigations (January-March 1986)

Habitat use: Both the Itcha/Ilgachuz and Tweedsmuir/Entiako caribou spent most of their time in forested habitat (Fig. 13). In the winter range of the Itcha/Ilgachuz caribou, most use of forested habitat is in pine forest. Spruce is present only in the wetter areas surrounding meadows. In the winter range of the Tweedsmuir/Entiako caribou, spruce occurs along lakes, creeks and other wetter sites and is therefore used to a greater extent by these caribou than the Itcha/Ilgachuz caribou.

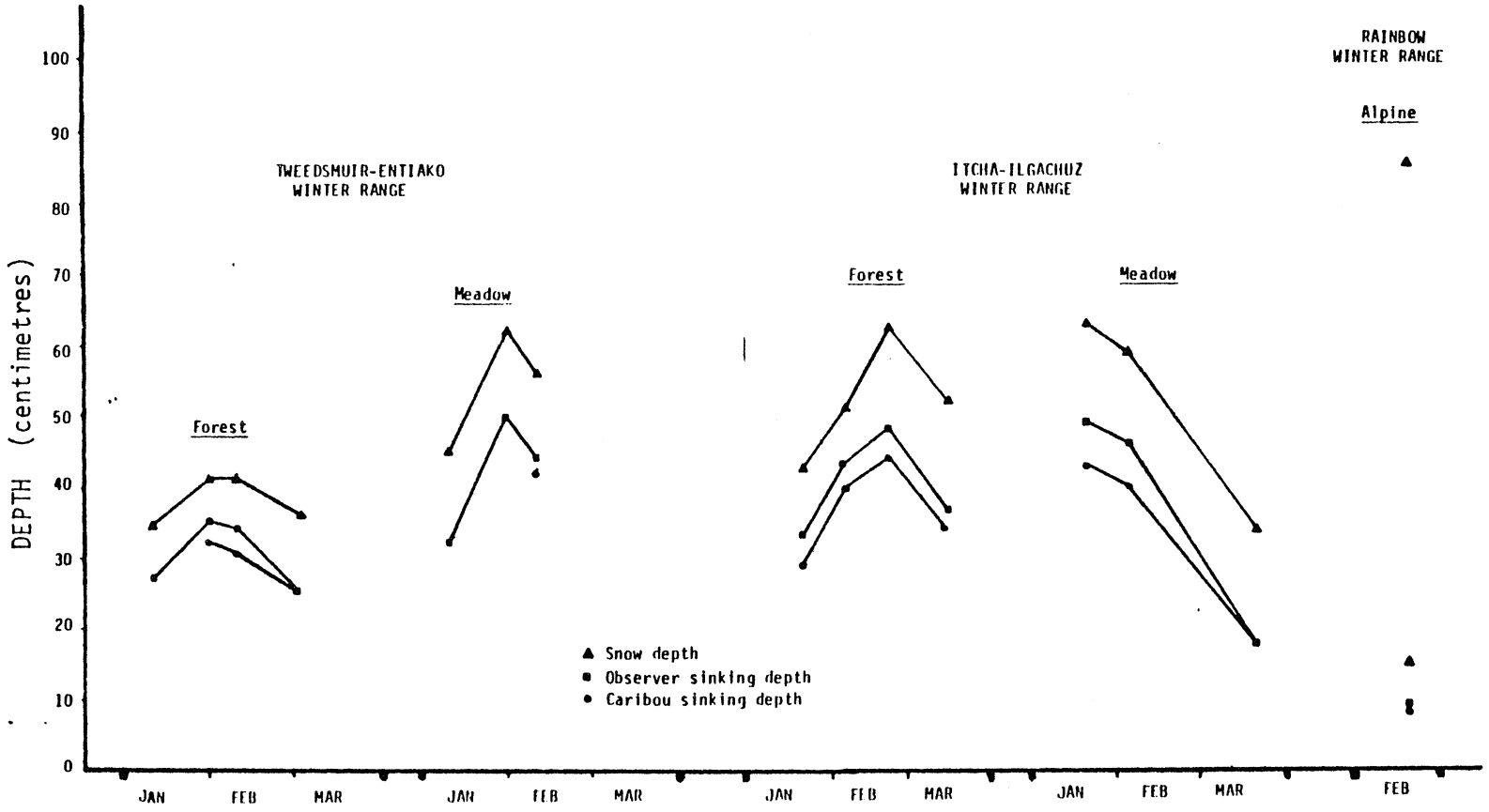
Use of lakes is much greater for the Tweedsmuir/Entiako caribou than for the Itcha/Ilgachuz caribou. Few lakes are present in the winter range of the Itcha/Ilgachuz caribou although many large meadows occur.

Most feeding sites occurred in forested habitats in both areas suggesting that forested areas are important in the feeding ecology of the caribou. Use of meadows was low in both areas. On several occasions, caribou walked around the periphery of a small meadow rather than crossing it. In large meadows where snow was deep, caribou generally followed old trails and cratered in areas that had been previously cratered. Caribou in the Itcha/Ilgachuz area used meadows for cratering for terrestrial lichens to a greater extent in previous winters than in this winter (D. Hebert, pers comm).

Snow Conditions

Several snowfalls in January and February resulted in an overall increase in snow depth over that time period in both areas (Fig. 16). However, by March snow depth had decreased due to settling. Only snow depth in large meadows in

Fig. 16. Pattern of snow accumulation and caribou and observer sinking depth from January - March 1986, in the Itcha-Ilgachuz, Tweedsmuir-Entiako and Rainbow winter ranges.



the winter range of the Itcha/Ilgachuz animals decreased over the 3 months. Snow accumulation was greater in meadows than in forests and sinking depth of both caribou and observer increased with snow depth.

In the alpine on the north side of the Ilgachuz, snow accumulation was very low due to heavy wind action. In areas where snow did accumulate it was well compacted resulting in minimal sinking depths of both caribou and observer.

Snow conditions in logged areas were not assessed since caribou were not using any areas adjacent to any clearcuts.

Feeding Sites

In pine forests in both the Tweedsmuir-Entiako and Itcha-Ilgachuz areas, caribou feeding activity primarily involved cratering for terrestrial lichens (Tables 1,2). In both areas, craters made up 80% of the feeding sites with terrestrial lichens contained in almost 100% of the craters. Terrestrial lichens present include Cladonia sp., Stereocaulon sp., Cladina sp. and Peltigera sp.. Mosses, bearberry, grasses, crowberry and Sheperdia were also present in some feeding sites. Grass appeared to be the only item other than terrestrial lichen that was eaten to any great extent.

Arboreal lichens present in the study area consisted mostly of Bryoria sp. All arboreal lichen feeding was on Bryoria sp. in all stand types.

In the spruce forest and the spruce/meadow complexes in the Entiako Lake area, feeding was primarily on arboreal lichens. Some cratering was observed, primarily for grasses.

In the Itcha/Ilgachuz wintering area, caribou were not observed to feed in the pine/spruce forests. In the Entiako area, cratering and arboreal lichen feeding

Table 1. Percentage of feeding site types investigated (cratering vs. arboreal feeding) in each habitat type in the winter ranges of the Itcha-Ilgachuz and Tweedsmuir-Entiako caribou, January - March 1986.

Itcha/Ilgachuz caribou winter range

Habitat	% cratering	% arboreal feeding	# sites investigated
Pine	78	22	308
Pine/Spruce	-	-	0
Meadow	100	0	84

Tweedsmuir/Entiako caribou winter range

Habitat	% cratering	% arboreal feeding	# sites investigated
Pine	79	21	348
Spruce	0	100	3
Pine/Spruce	49	51	39
Spruce/meadow	3	97	33
Meadow	0	100	3
Lake	100	0	17

Table 2. Proportion of Craters investigated in each habitat type in the low elevation wintering areas of the Itcha-Ilgachuz caribou (I-I) and of the Tweedsmuir-Entiako caribou (T-E) and in the high elevation wintering areas of the Itcha-Ilgachuz and Rainbow caribou (Ilg), containing specific vegetation types, January - March 1986.

	Pine (T-E)	Pine (I-I)	Pine/ Spruce (T-E)	Spruce/ Meadow (T-E)	Meadow (I-I)	Lake (T-E)	Alpine (Ilg)
No. Craters	275	241	20	1	84	17	27
Vegetation present							
Arctostaphylos uva-ursi	.30	.06	.11				.37
Betula glandulosa					.05		.15
Carex sp.			.05		.20		
Empetrum nigrum		.12	.05				
Grass sp.	.03	.16	.11	1.00	.01	.24	.85
Ice/Slush					.88		
Juniperus sp.		.03					
Ledum groenlandicum			.16				
Moss sp.	.23	.11	.11				.75
Salix sp.					.07	.77	
Sheperdia canadensis	.03	.05					
Terrestrial lichens	.99	.98	.89				1.00
Vaccinium sp.		.01					

were equally common in pine/spruce stands. Again terrestrial lichens were the most frequently found item in craters and Bryoria sp. were consumed at all arboreal lichen feeding sites.

Cratering on lakes in the Entiako area and in meadows in the Itcha/Ilgachuz wintering area was mainly for slush and free water. Some craters in the meadows contained sedges and willows but feeding on willows appeared to be minimal.

Terrestrial lichens were present in all craters investigated in the alpine on the north side of the Ilgachuz (Table 2). However, terrestrial lichens were not as abundant in this area as they were in lower elevation forests. Snow depth was minimal and large areas were bare making terrestrial feeding easy.

Preliminary results from site investigations conducted during this winter field season (1985/86) suggest that in the winter, caribou are primarily found in pine stands on poor sites cratering for terrestrial lichens. Terrestrial lichens are most abundant in dry open forests. Therefore, much of the important caribou winter habitat may not be in merchantable timber. Site investigations next winter will determine whether caribou crater in these areas of greater terrestrial lichen abundance, or whether they choose areas with favorable snow conditions for cratering and movement. Hypotheses and tests are presented in the West-Central B.C. Caribou/Forestry Research Project Working Plan for 1986/87.

Diet Quality and Food Habits

Fecal samples collected in the summer from the Itcha Mountains were analyzed for fecal nitrogen. Data for fecal nitrogen and fecal fragment analysis of winter samples are not yet available.

During calving in early June, diet quality was comparable to late winter diet quality (Fig. 17). By late June and late July, diet quality had increased. Fecal nitrogen levels of the Itcha Mountain caribou are lower than those of the Quesnel Highland caribou (Seip and Hebert 1985) for the months sampled.

During mid-winter (February) 1985, caribou fed primarily on terrestrial and arboreal lichens (Fig. 18). In early June, lichens made up less of a component of the diet and in mid-July terrestrial and arboreal lichens combined made up only 25% of the diet. Grasses almost doubled in importance as the summer progressed. Sedges/rushes and shrubs also increased in importance through the summer.

Calving Areas

Calving areas of radiocollared cows were based on relocations during the June calf production surveys. Because some calf production surveys were conducted up to two weeks following the peak of calving (first week of June), actual calving sites were not located. Of the 11 animals located in the Itcha-Ilgachuz Mountains in both 1985 and 1986, 8 were found on the same mountain range in both years whereas the other 3 were found in the Itchas in one year and in the Ilgachuz in the other year (Fig. 19). Whether these animals calved in different areas each year, or moved to the new area following calving is not known. Radiocollared caribou in the Rainbow Mountains calved in the Rainbow Mountains in both years (Fig. 19). Most of the Itcha-Ilgachuz-Rainbow caribou calved at high elevations above treeline. However, some caribou appeared to have calved in the pass between the Itchas and Ilgachuz below treeline. Ground surveys in the Itcha Mountains during the calving period in early June 1986 did not account for the number of animals present in the Itcha Mountains during surveys conducted later in the summer.

Fig. 17. Index of diet quality measured by % fecal nitrogen levels in fecal samples collected from Itcha-Ilgachuz caribou, February - July 1985.

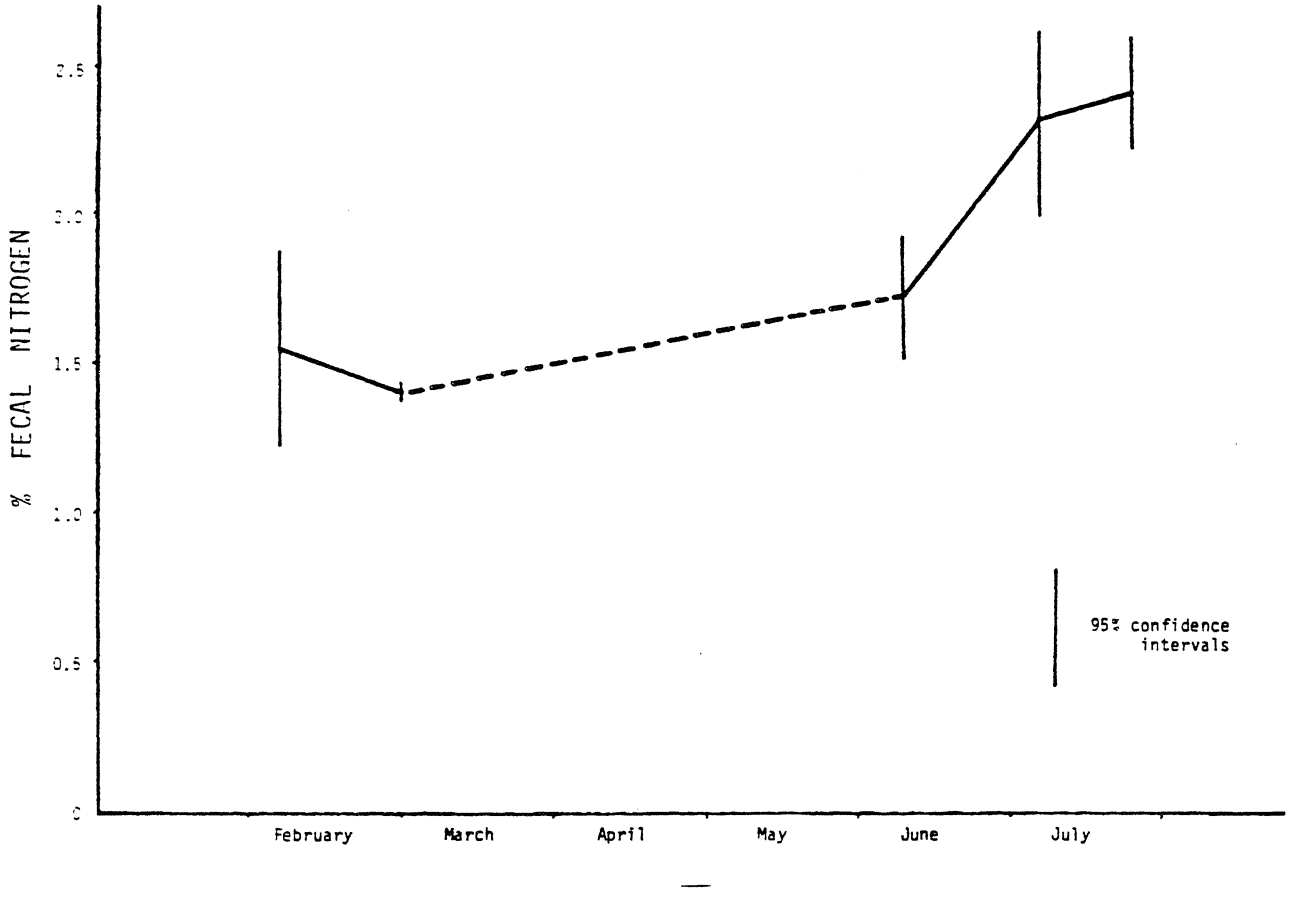


Fig. 18. Food habits of Itcha-Ilgachuz caribou (February - July 1985) determined by fecal fragment analysis.

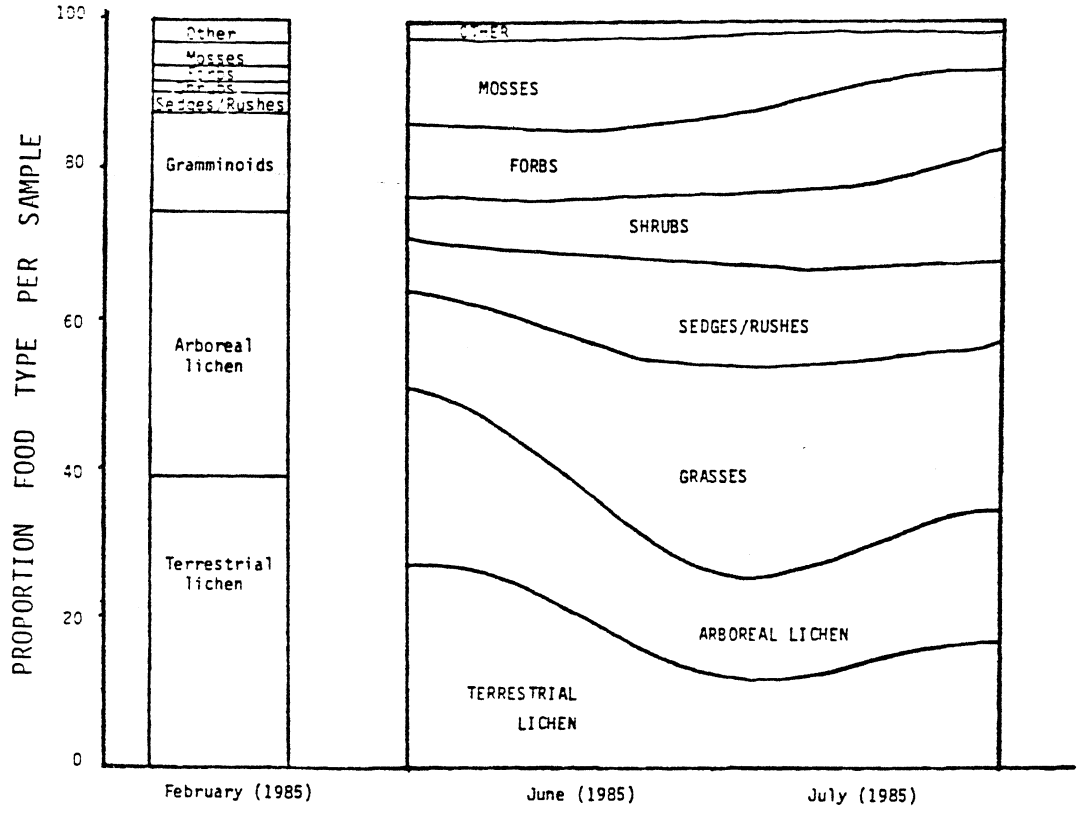
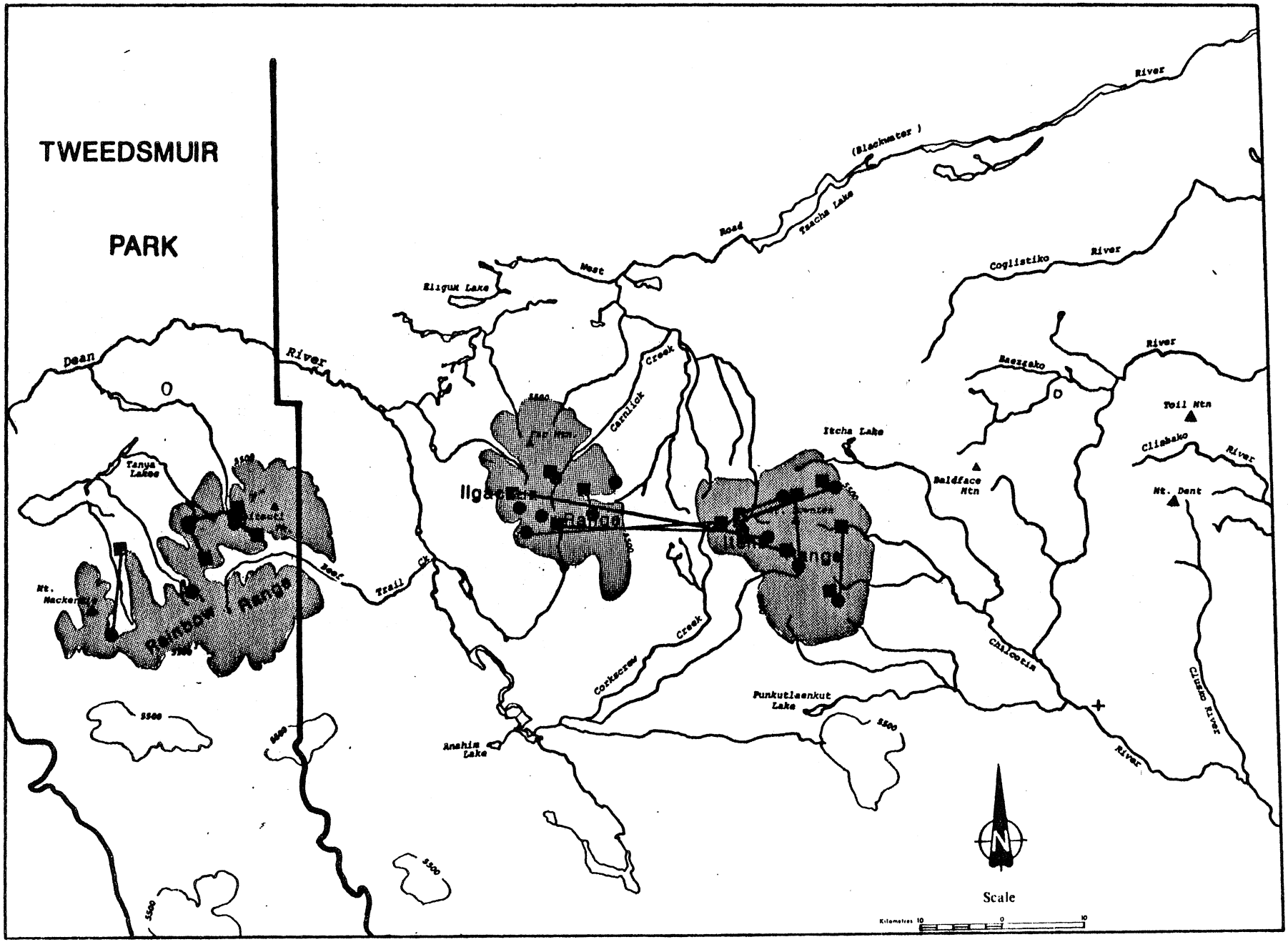


Fig. 19 Location of radio-collared female caribou in the Itcha-Ilgachuz-Rainbow area during calving surveys in June 1985 and 1986.



■ Caribou location during 1985 calving survey
● Caribou location during 1986 calving survey

In northern Tweedsmuir Park, some exchange between calving areas occurred between the Quanchus and Chikamin ranges over the last 3 years but most caribou were found in the same general area in all 3 years (Fig. 20). Radiocollared cows were found above treeline in alpine habitat and below treeline in subalpine forests and forest/meadow complexes. Most of the cows with calves in both 1985 and 1986 were found in the alpine.

OBJECTIVE II. POPULATION DYNAMICS

Historical Population Trend

Lack of consistently collected and reliable data prior to the late 1970's makes it difficult to determine historical population trends for both areas. Reliability of survey counts is questionable, especially for the Tweedsmuir-Entiako herd since it has been observed from the present radiocollar studies that caribou spend much of their time throughout the year in forested habitat. Groups present in open areas (i.e. meadows, alpine) represent only a portion of the total number and the proportion of the animals present in these open areas may vary from year to year. Therefore, increases and decreases detected between counts cannot necessarily be interpreted as increases and decreases in the population.

Historical population data for both areas have been summarized by Bergerud (1978), Hatter (1979) and Stevenson and Hatler (1985).

Very few data are available on the Itcha-Ilgachuz-Rainbow caribou prior to the late 1970's. It appears that caribou existed in the area at a population level of at least 100-200 animals from the early 1900's through to the 1970's. Population surveys starting in 1977 showed a dramatic increase in number of animals counted over the following 8 years (Table 3). High calf recruitment during

Fig. 20 Location of radio-collared female caribou in Northern Tweedsmuir Park during calving surveys in June 1984, 1985, 1986.

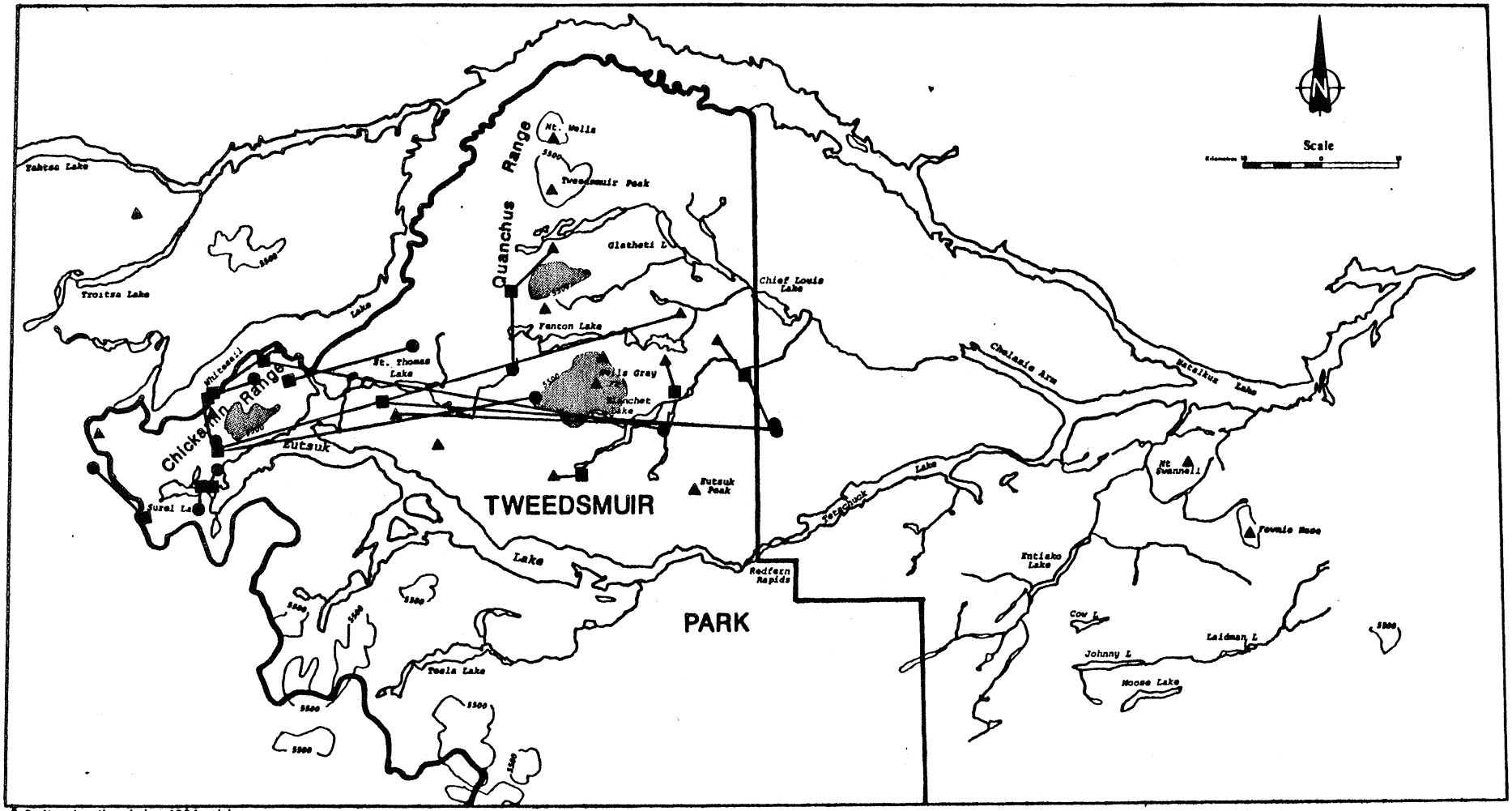


Table 3. Number of caribou cows, calves and bulls counted during aerial surveys conducted in the Itcha-Ilgachuz and Tweedsmuir-Entiako areas between April 1977 and March 1985.

	CALVES	COWS*	BULLS	UNCLASSIFIED	TOTAL
Itcha/Ilgachuz					
April 1977	32	95	11	100	238
Feb 1978		11		48	59
June 1978	5	13		92	110
Oct 1978				72	72
Nov 1978	117	190	46		353
June 1979	45	45		172	262
Nov 1979	10	36	82	385	513
June 1980				240	240
Nov 1981	62	14	58	341	475
June 1982	197	395	119		711
April 1983	61			182	243
May 1983	32			130	162
June 1983	186			524	710
Oct 1983			64	287	351
Feb 1984	18	45			63
June 1984	157	349			506
July 1984	187		107	481	775
Oct 1984	20	122	25		167
Oct 1984	40	227	67		334
Mar 1985	24	80	9		113
Tweedsmuir/Entiako					
March 1982				368	368
July 1982	21	48	21	79	169
Aug 1984	8	48			56

* includes yearlings

those years suggests a true population increase, however refinement of census techniques also contributed to the increase in the number of animals counted. There are currently at least 1400 animals.

Caribou numbers in the Tweedsmuir-Entiako area were low during the 1940's (Bergerud 1978). The herd increased to a peak of 500-1000 animals sometime during the mid-1960's then declined to a low population level of 200 in the mid-1970's (Hatter 1979). The decline in the late 1960's and early 1970's was most likely due to overhunting (Bergerud 1978,Hatter 1979). However, increased wolf predation may have augmented the decline (Hatter 1979).

Hatter (1979) suggests a "recovery" phase in the late 1970's based on high calf recruitment and low estimated adult mortality. Currently the population is estimated at 500 animals based on a count of 368 animals in the alpine of the Fawnie Mountains in March 1982. Low calf recruitment and moderate adult mortality suggests that the population may presently be stable or declining.

Population Size

A total of 1063 animals were counted and classifed in the alpine in the Itcha and Ilgachuz Mountains during the June 18, 1985, censuses (Table 4). Of the 17 radiocollared animals located during the survey, 14 were visible in the alpine bringing the corrected population estimate of cows, calves and yearlings to 1225. A bull : cow ratio later determined during the rut was applied to the June cow estimate to estimate the number of bulls in the population (120). The total population estimate for all sex and age classes was 1345 animals. The bull : cow ratio determined during the rut surveys appeared to be too low resulting in a low estimate of the number of bulls in the population (D. Hebert, pers. comm.). Population size of the Itcha-Ilgachuz herd is estimated to be close to 1400

Table 4. Number of caribou cows, calves and bulls counted during aerial surveys conducted in the Itcha-Ilgachuz-Rainbow and Tweedsmuir-Entiako areas, June 1985 - June 1986.

	CALVES	COWS*	BULLS	TOTAL
Itcha/Ilgachuz/Rainbows				
June 1985	287	721	58	1063
Oct 1985**	46	182	30	258
Mar 1986	83	277	51	411
June 1986	307	702	63	954
Tweedsmuir/Entiako				
June 1985	9	28	0	37
Oct 1985	10	114	31	155
Mar 1986	8	81	0	89
June 1986	6	26	0	26

* includes yearlings
** Itcha/Ilgachuz only

Table 5. Percent of female radiocollared caribou that were pregnant in the Itcha-Ilgachuz-Rainbow area based on serum progesterone levels.

Itcha/Ilgachuz/Rainbow caribou (April 1986)

Age Group	% Pregnant	Sample size
Adults (> 22 months)	100	11
Yearlings (22 months)	0	3
Calves (10 months)	0	2

animals. In June 1986, 118 caribou were counted in the Rainbow Mountains. Although all of the radiocollared cows present (6) were sighted during the survey, the proportion of males present above treeline was not known. The number of animals in the Rainbow Range is therefore estimated to be between 150 and 200 animals; and in the Itcha-Ilgachuz-Rainbow Mountains combined, between 1500 and 1600 animals.

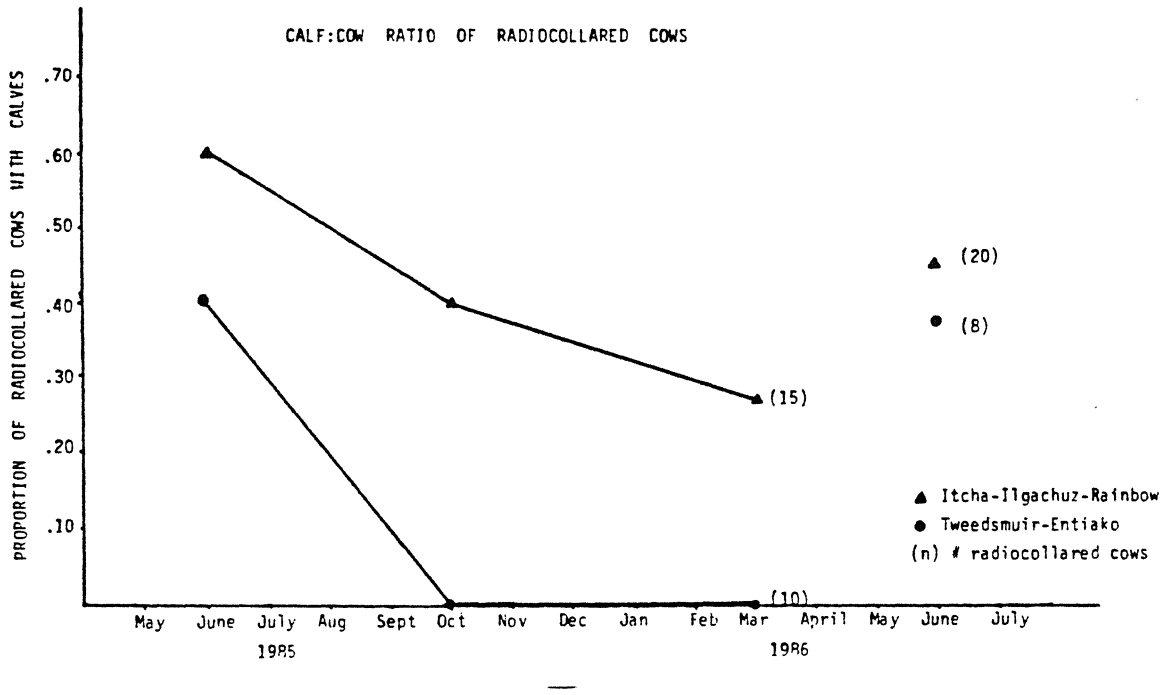
A total count for the Tweedsmuir-Entiako herd was not conducted this year. During the fall calf survival count, 154 animals were counted but in mid-March 1982, 368 animals were counted in the alpine in the Fawnie Mountains (Marshall 1985).

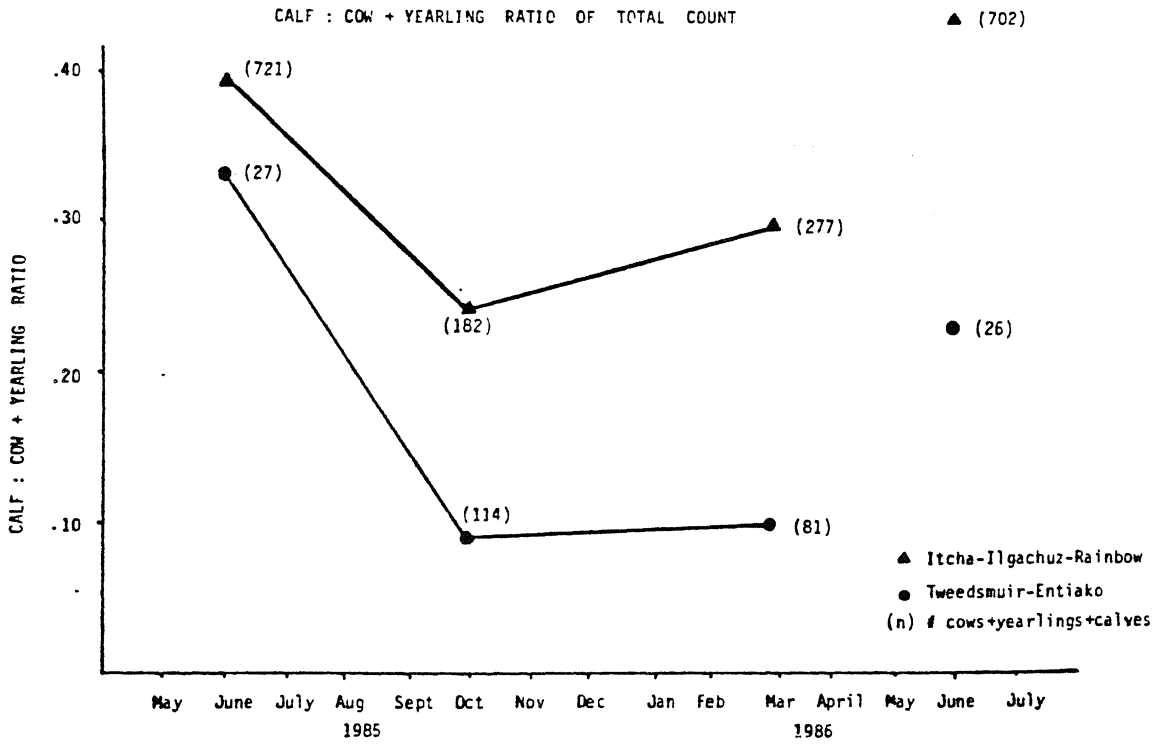
Calf Production and Survival

Pregnancy rate of cows of the Itcha-Ilgachuz-Rainbow mountains was 100% for adult females in 1986 (Table 5). However, during the June calf counts in 1985 and 1986, 40-60% of the radiocollared caribou did not have surviving calves. Calf production of radiocollared cows of the Itcha-Ilgachuz-Rainbow herd was similar to that of the Tweedsmuir-Entiako herd in both 1985 ($p>.10$) and 1986 ($p>.10$) (Fig. 21). By fall 1985, 67% of the calves of the radiocollared caribou in the Itcha-Ilgachuz-Rainbow herd survived while none of the calves in the Tweedsmuir-Entiako area survived.

Calf recruitment into the population was high for the Itcha-Ilgachuz-Rainbow caribou but low for the Tweedsmuir/Entiako caribou (Fig. 21). During the March 1985 calf recruitment counts, calves made up 20% of the total population of the Itcha-Ilgachuz-Rainbow caribou whereas calves made up 9% of the total population of the Tweedsmuir-Entiako caribou (Table 3).

Fig. 21. Proportion of adult female caribou with calves during surveys in June, October and March in the Itcha-Ilgachuz-Rainbow and Tweedsmuir-Entiako areas, June 1985 - June 1986.





In both the Itcha/Ilgachuz and Tweedsmuir/Entiako areas the majority of calf mortality occurred during the summer. In the Rainbows, calf mortality occurred during the winter. Seven dead calves were found in the Itcha Mountains during extensive ground investigations in June and July. Five of the dead calves were located at sites of concentrated eagle activity and two had been almost totally consumed by eagles. One of the three partially eaten calves had been found abandoned the previous day. Of the two remaining mortalities, one was killed by a group of three wolves and one was found dead beside its mother.

Adult Mortality

In the Tweedsmuir/Entiako areas, 6 of the 18 caribou collared in 1983 and 1984 died between April and October (Table 6). Two of the caribou died early in the summer and were autopsied during the calf count. One caribou may have been killed by a grizzly bear and scavenged by wolves and the other may have been killed by wolves. Cause of death was difficult to determine since little remained of either caribou.

One of the remaining three mortalities occurred in the spring in 1985 and the other two during the fall of 1985 but none were detected until January 1986. Collars from the fall mortalities were retrieved in June, 1986, and therefore cause of death was not determined. The radiocollar from the spring 1985 mortality was recovered during the March 1986 calf recruitment count but remains of the caribou were not found.

Of the 19 caribou with functioning radiocollars in the Itcha-Ilgachuz-Rainbow herd, three died in 1985 and 1986. All three mortalities occured in June and July. One animal was probably killed by wolves; cause of death of the other two caribou was unknown. The average annual mortality rate

Table 6. Causes of mortality of adult female radiocollared caribou in the Tweedsmuir-Entiako and Itcha-Ilgachuz-Rainbow areas between July 1984 and July 1986.

DATE	CAUSE OF DEATH
Tweedsmuir/Entiako	
July-Sept 1984	unknown
April 1985	unknown
May/June 1985	prob. bear kill, scavenged by wolves
May/June 1985	prob. wolf kill
Oct 1985	unknown
Oct 1985	unknown
Itcha/Ilgachuz/Rainbows	
June 1985	unknown, scavenged by bear
June 1986	wolf kill
July 1986	scavenged by eagles (found limping 3 weeks previously)

Table 7. Average annual mortality rate of radiocollared female caribou in the Itcha-Ilgachuz-Rainbow and Tweeds-Entiako areas between April 1984 and March 1986 determined by averaging the proportion of radiocollared animals dying during the periods of April 1984 - March 1985 and April 1985 - March 1986.

Area	Average annual Mortality rate (April 1984 - March 1986)	Sample size
Itcha-Ilgachuz-Rainbow	.03	19
Tweedsmuir-Entiako	.18	18

for the Tweedsmuir-Entiako caribou between April 1984 and March 1986 was 18% (Table 6). The average annual adult mortality rate for the Itcha-Ilgachuz-Rainbow caribou between April 1984 and March 1985 was 3% (Table 7).

Predator Activity

Information on predator activity was collected opportunistically and therefore is only used as an indicator of presence of different predator species.

During the summer ground surveys on the Itcha Mountains, eagles were present throughout the field season. Concentrated eagle activity in a particular area usually indicated there was a dead calf in the vicinity. On one occasion, an immature golden eagle was observed attacking a calf which was separated temporarily from its group suggesting that some calf mortality in the Itcha Mountains may be due to eagle predation.

Wolves were sighted in the alpine in June 1985 on four occasions. In one case, a calf was killed by a group of three wolves. Coyotes were sighted three times and a wolverine was sighted near treeline in the northeastern Itchas during the June 18, 1985 helicopter survey. No bear sign was noted in the alpine area. In August 1986, a group of three wolves were spotted stalking a group of caribou in the Itcha Mountains (M. King, pers. comm.).

During winter 1985-86, the only observations of wolf sign were in the Entiako Lake area in early February when a wolf-killed moose was found. Fresh wolf tracks were spotted on the north shore of Eutsuk Lake in late January. At least four wolves were shot in the Tetachuck Lake area and several had been trapped. Wolverine tracks were noted in both winter ranges and coyote tracks were noted frequently in the winter range of the Itcha/Ilgachuz herd.

In May, 1986 three wolves (one young male, one young female, one adult female) were shot near Whitetop Mountain, approximately 10 miles west of the Itcha Mountains.

CONCLUSIONS

1. During the winter, caribou in both areas used pine forests extensively and fed primarily on terrestrial lichens. Entiako caribou also used spruce and pine/spruce mixtures for arboreal lichen feeding.

2. In winter, caribou in both areas were found in lower elevation forests. In early summer during calving the Tweedsmuir–Entiako caribou were found in alpine and forested habitats within Tweedsmuir Park whereas the Itcha/Ilgachuz and Rainbow caribou were found primarily in the alpine. In the late summer the Itcha–Ilgachuz caribou were also using lower elevation meadows and forests.

3. High calf recruitment and low adult mortality of caribou in the Itcha–Ilgachuz–Rainbow area support recent data indicating that the population is increasing.

4. Low calf recruitment and moderate adult mortality of caribou in the Tweedsmuir/Entiako area suggest that the population may be stable or declining.

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