

To the Reader:

This report was submitted by Dr. Don Miller to the Parks Biologist as an obligation of employment to Parks Branch during the months of August and September, 1977. His first responsibility remained to Dr. A. T. Bergerud's contract for study of caribou in Spatsizi and in other areas of northern and central B. C.

This report is an overview of caribou and their utilization of habitat within Spatsizi, Tweedsmuir and Wells Gray Provincial Parks. It was not intended to be a complete definitive study in itself but is the first effort to compare varying needs of caribou within some of our wilderness parks. It is a valuable contribution to our knowledge of the species in B. C.

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Parks Biologist
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Observations of caribou and caribou environment in northern and southern Tweedsmuir Park and Wells Gray Park in summer of 1977 with comments on related observations in Spatsizi Park during spring.

by

Don Miller

Introduction

This report covers the period of August 1 to September 30, 1977 when I examined caribou ranges in Tweedsmuir and Wells Gray parks. It also includes some observations of Spatsizi Park made between May 22 and July 31 as an employee of the University of Victoria on a Park Service grant to A. Tom Bergerud.

Objectives of my studies in the three provincial parks were:

- (1) To classify all caribou observed.
- (2) To assess season of use by caribou by actual observations of animals and time-specific sign -- summer or winter pellet groups and naturally shed antlers.
- (3) To assess winter forage abundance and use -- primarily terricolous (ground) and corticolous (tree) lichen supplies.
- (4) To assess comparative wolf and grizzly population densities according to number of scats observed per mile traveled -- on foot or horseback.
- (5) To record more pertinent observations of other animals and their sign.

The manner in which each particular study area was viewed depended on information and maps provided by A. Tom Bergerud and on the availability and interest of Fish and Wildlife Service personnel. I am particularly indebted to Dave Hatler and Ralph Ritcey for excellent assistance and hospitality during my travels in their respective districts. The study could not have been accomplished without their unselfish contributions. Many others contributed in one way or another to these studies such as Keith Hodgson in Smithers and Parks Branch staff in the Smithers Office and at the Portage field station, their helpful assistance is gratefully acknowledged. The study would have been undertaken with exceptional hardship without special assistance and interest from Grant Hazelwood, to whom I extend my deepest gratitude.

Study methods and time schedule:

I examined each study area on the ground after a discussion with Fish and Wildlife Service biologists in their districts and, if possible, interviews with Park Service personnel, guides, pilots and local residents. The report of the 1975 Park Service field survey in Tweedsmuir Park (Hazelwood, 1975) was reviewed prior to field activities in the Chikamin and Ilgathus Mountain ranges and found to be very useful. Caribou forage supplies in each study area were assessed as heavy, medium or light loads on the basis of terrestrial and/or arboreal lichen standing crops with comments on the presence of other forage sources. Caribou forage use was also assessed on a scale of heavy, medium or light.

My time schedule on the ground in each study area is shown in Table 1. By virtue of the limited time spent on the ground in each

study area I suggest a degree of caution on generalizations made from this report.

Table 1. Schedule of field observation periods (1977) in caribou ranges of Spatsizi, Tweedsmuir and Wells Gray Provincial Parks.

Date	Provincial Park	Camp Site	Type of caribou range
May 22 to Aug. 1	Spatsizi	Tuaton Lake Fire Flats Caribou Mt. Hyland Post	Spring, Fall, Winter
Aug. 10 to Aug. 17	Tweedsmuir (N)	Glatheli Lake Fenton Lake	Summer & Fall
*Aug. 22 to Aug. 25	Tweedsmuir (S)	Rainbow Lake Far Mt.	Winter
**Sept. 9 to Sept. 13	Wells Gray	Caribou Meadow	Winter, Summer, Fall
Sept. 15 to Sept. 19	Tweedsmuir (N)	Chikamin Mt.	Summer

* Study area east of Tweedsmuir Park boundary in Ilgatchus Mountains.

** Areas examined off MacMurphy and Avola roads were outside Wells Gray Park boundary.

Findings

Spatsizi:

Little will be mentioned about my observations in this park because they will be incorporated into Bergerud's report covering his Park Service grant. Generally the Osborn Caribou were observed as being healthy, large and segregated. Younger age groups appeared well represented. Calving

occurred at upper elevations, tree line and above, among the more rugged, discontinuous mountain ranges in the vicinity of Fire Flats. The winter ranges observed in the northern portion of the park were more continuous, bald-top mountains.

Terrestrial lichen forage supplies were found to be locally abundant and common at high, medium and low elevations. Northern (winter) ranges contained more continuous terrestrial lichen communities and showed more heavy caribou use on alpine sites and in clearings on adjacent treed sites than southern (spring) ranges. Arboreal lichen forage supplies were common although generally of light to medium loads. Heavy arboreal lichen loads were localized and uncommon. The arboreal lichen loads on the winter range were more abundant and showed more use than on the spring and early summer range in the vicinity of Fire Flats and Tuaton Lake.

I was impressed with the size of some terrestrial lichen species observed on the Caribou Mountain winter range. Cetraria islandica, in particular, grew larger there than I've seen on any other range. This species was most abundant among low Betula glandulosa communities (less than one-half meter tall). Cetraria islandica is a preferred caribou forage and is found in subarctic environments from Alaska to Newfoundland. Individual specimens (podetia) of Dactylina species were also very large compared to my previous observations, especially where found among Betula and Salix shrub communities along drainages at tree line.

Stereocaulon spp., primarily S. paschale (I believe), was the surprising dominant among terrestrial lichen communities. This lichen has a higher protein content than either Cladina ("reindeer moss") or Cladonia (cup and horn forms) which have generally been referred to as

the mainstay of caribou winter forage in the past. Stereocaulon has been considered as an increaser in areas supporting heavy caribou use. Stereocaulon spp. can withstand trampling and forage use better than Cladina or Cladonia species. Cetraria nivalis, which was common though only locally abundant, is another lichen that withstands trampling and caribou use well. This species is also an increaser on heavily disturbed sites. Cladonia uncialis was also common and locally abundant in Spatsizi, moreso than on any other range I've seen. Lobaria linita, a lichen I had not identified from other ranges, was locally very abundant in treed ranges and occasionally abundant in forb-bunchgrass communities on Fire Flats.

I did not detect serious overuse of lichen forage supplies in this park except on small clearings among dense subalpine fir and on small raised (and dry) islands among moist and shrubby lowlands on north slope of Caribou Mountain. Terrestrial lichen communities among bog birch stands less than one-half meter tall were also greatly disturbed from caribou cratering activity but, unlike on the small clearings and raised islands, the prostrate lichen podetia were alive and useful. Lichen communities on more open environments appear less likely to survive intensive use and trampling than those among stems of dense bog birch stands.

Invasion of clearings through layering of subalpine fir near tree line on the north slope of Caribou Mountain is currently choking out existing dense terrestrial lichen communities. Wildfire would probably alter these scrub subalpine fir communities in favor of reestablishment of lichens. Terrestrial lichens are generally sparse or non-existent beneath low, dense subalpine fir stands.

Tweedsmuir Park, north-Glatheli and Fenton lakes area:

(1) Caribou observations

Two caribou were observed from August 11 to 17. An adult stag was observed August 11 on a snowpack, north slope Tweedsmuir Peak from the air. On August 13 a lone stag, possibly the same one, was seen through a spotting scope at tree line on the east slope of Tweedsmuir Peak. Another caribou, a young stag, was seen by Mr. and Mrs. Alan Blackwell on August 16 in a meadow among our staked horses by the Fenton Lake cabin. No additional caribou were seen during a 1 hour, early evening flight in a super cub over alpine and meadows between Glatheli and Chief Louis lakes. In 1975, between August 4 and 10 a Park Service field survey crew reported seeing 7 caribou (Hazelwood, 1975). The 1975 survey crew traveled much the same area but covered more of Tweedsmuir Peak (included more alpine and the south slope) where all caribou observations were made.

(2) Caribou range use

Very little old caribou sign was observed and only fresh tracks of a few animals. No concentrated caribou sign was observed, similar to observations of the 1975 survey crew (Hazelwood, 1975). Alan Blackwell, who has guided in this northern portion of Tweedsmuir Park since 1942, reported a decline in the area since 1973 and these data from 1975 and 1977 tend to verify the report. Blackwell (pers. comm.) reported a high in the caribou population in 1955 when he saw bands of up to 300 animals and a total of about 1000 in the survey area.

Observation of five naturally shed stag antlers suggested caribou spent the rut and/or immediate post rut period in the survey

area. The survey party in 1975 reported finding 26 shed antlers, "mainly mature 'bulls'" (Hazelwood, 1975).

I found no naturally shed doe caribou antlers and neither did the 1975 survey party (Hazelwood, 1975). This suggests that little or no calving occurred in the area. However, Blackwell (pers. comm.) mentioned seeing a lot of small, shed caribou antlers on the alpine of Wells Gray Peak. I had not observed alpine on Wells Gray Peak.

(5) Caribou range assessment

Terrestrial lichens were generally uncommon in the area traveled with exception of some clearings at tree line where up to 50 percent of the ground covered was composed of lichens. At tree line maximum the podetia length was one and one-half inches and Cladina mitis pre-dominated. On occasional dry sites below tree line terrestrial lichens were fairly common with Cladonia spp. dominant. Stereocaulon spp. dominated lichen communities on alpine sites. The longest podetia observed was two and one-half inches long in sparse lichen communities located near Homestead Meadow.

Arboreal lichen loads were generally light to medium with the larger loads at upper elevations, about 4500 to 5000 feet. In the Glatheli Lake area arboreal lichens were at 2 to 40 feet heights on 50 to 70 feet tall subalpine fir and spruce. On upper slopes arboreal lichens were at 1 to 50 feet heights on lodgepole pine.

Brown colored Alectoria jubata complex lichens (Edwards, et al. 1960) were most common, about near a ratio of 50:1 compared with light green A. sarmentosa. Foliose lichens, such as Cetraria glauca, were conspicuous only on lower branches near the Glatheli Lake shore.

Arboreal lichens were generally more abundant near lakes and wet meadows. On the Wells Gray Peak slope, where meadows and lakes were more common than on slopes of Tweedsmuir or Michel peaks, arboreal lichen loads appeared greater -- at 3 to 65 feet heights.

The potential vascular plant forage supplies varied on the different mountain peaks observed. In the numerous meadows with shallow lakes on Wells Gray Peak (below tree line to Goodrich Lake) forbs, water sedge (Carex aquatilis) and buckbean (Menyanthes trilobium) were fairly common and abundant. In the meadows by 10 mile camp on Tweedsmuir Peak potential caribou forage of cottongrass (Eriophorum spp.) water sedge, bog birch (Betula glandulosa) and willow (Salix spp.) were common. On the east slope of Michel Mountain at tree line a vast forb meadow interspersed by willow communities occurs as potential caribou forage. The area observed along with the relatively large alpine regions of Tweedsmuir and Wells Gray Peaks appeared to me as good summer, fall and possibly early winter caribou range.

(4) Predators and predation

No wolves or bears were observed and only fresh tracks of a single wolf was seen on Tweedsmuir Peak (alpine). Two, old leached wolf scats were observed in about 42 miles of travel by foot and on horseback. Portions of one or two other wolf scats may have been seen on horse trails but positive identification was uncertain. Bear sign and scats were observed at two locations, one old leached scat by Blackwell's hunter camp site on Glatheli Lake and a group of four very fresh scats (probably grizzly) scattered over a 300 acre site near Homestead Meadow in the Fenton Lake area.

Wolf tracks and scats were present on all trails traveled by the 1975 field survey crew (Hazelwood, 1975). This was a big contrast to what I observed. However, Blackwell (pers. comm.) reported that wolves have declined from the winter of 1973-74 when up to 30 in a pack were seen to a low of only one pack of four seen in the winter of 1976-77. The contrast between wolf sign observations in 1975 and 1977 supports Blackwell's report.

Remains of four caribou were observed in various parts of the area traveled, none of which were from kills of less than 3 years. I could not determine if predation had occurred. The old remains of a horse was also seen.

(5) Other animal observations

Moose sign was scattered in most lowland sights traveled though only one seen from the ground and about five from a super cub. Most meadows, drainages and lakes supported good moose habitat in the form of willow stands. Aspen (Populus tremuloides) was generally tall and in small stands away from lake shores, there have been few wildfires in recent years for reestablishment of this seral species.

No marmots or ground squirrels were observed or heard. Rodent sign, in general, was uncommon in the area traveled. The field survey crew in 1975 reported sightings of five marmots and frequently saw Siberian lemmings and their piles of droppings (Hazelwood, 1975). There was no mention of ground squirrels. The absence of a rodent prey population in 1977 might also have contributed to the absence of wolf sign compared with 1975.

Bird observations were few although sharp-shinned hawks were relatively common. Spruce grouse were fairly common and one group of four willow ptarmigan were seen. Two flocks of geese were observed and several mallards on meadows with shallow lakes between Wells Gray Peak and Goodrich Lake. One brown-headed cowbird seen, this was in contrast to fairly numerous observations of this bird seen by the 1975 field crew (Hazelwood, 1975). I did see a barn swallow, brown creeper, and a boreal chickadee not reported in the bird list by the 1975 field crew.

Tweedsmuir Park, north-Chikamin Mountain Range:

(1) Caribou observed

Ten caribou were observed on Chikamin Mountain and in the pass between Arete Mountain. Three does and a stag were seen in the pass August 17 close to tree line. Two does appeared young, possibly two year olds. All three does were antlered. Six caribou, three does and three fawns, were observed in meadows below tree line on August 18. These animals, seen in groups of four and two, were widely separated on the northwest slope of Chikamin Mountain.

In 1975 the Park Service survey crew had observed 80 caribou in the pass between Chikamin and Arete mountains and an additional 10 on the northwest end of Chikamin Mountain (Hazelwood, 1975). A total of 31 fawns were classified among the total 90 caribou seen. The 1975 survey crew had made their observations almost a month earlier (August 25-30) than I had. Numerous, fresh caribou trails on the northwest slope of Chikamin Mountain suggested that many caribou had recently moved northward prior to my arrival. Neil Blackwell (pers. comm.)

reported seeing 65 caribou this past summer during a flight over the Chikamin Range, most of the caribou were in the pass of Chikamin and Arete mountains.

(2) Caribou range use

Caribou tracks and pellet groups were fairly common in the pass area and up the east slope on the Arete Mountain side to almost 5600 feet elevation. Trails between scrub subalpine fir communities suggested considerable use over the past few years. Fawn tracks were seen in the pass and on the Zinc Bay road to within a few hundred feet of the Whitesail Lake shore.

Intensively used caribou trails were conspicuous on the northwest slope of Chikamin Mountain. Most tracks moved north, downslope. Along one continuous stretch of a caribou trail for almost one and one-half miles I counted 16 fresh (moist) caribou pellet groups. A total of 18 older caribou pellet groups were counted on the same one and one-half mile stretch.

On August 17, three caribou were observed feeding on a steep easterly slope in the pass area during late afternoon. The three animals had been seen bedded down on a snowpack prior to and immediately after their feeding session at an elevation of about 5500 feet. No biting insects were observed during the day, which appeared cool to me when I was stationary but one of the younger animals was seen stamping her hind feet in snowpack and biting at her flank.

I observed little sign of caribou forage use except for some disturbed terrestrial lichen communities and willow twigs stripped bare of leaves.

No naturally shed caribou antlers were found on Chikamin Mountain or on the pass between Arete Mountain. This suggests that the rut probably

does not occur in this area nor calving. Few, if any, young stags winter in the area as well. Apparently the does with fawns move into the area sometime after parturition. No mention of shed caribou antlers was made by the 1975 survey crew (Hazelwood, 1975).

(3) Caribou range assessment

Potential caribou forage of forbs, grasses and sedges were abundant in the pass between Chikamin and Arete mountains, decreasing with elevation above 5400 feet where terrestrial lichens were more abundant. Sedge and grass meadows were more abundant on the northwest slope of Chikamin Mountain than in the pass, especially at lower elevations.

Terrestrial lichen communities were fairly common in alpine though rarely exceeding more than 50 percent of the ground cover. Stereocaulon spp. was most abundant although Cladina mitis was common in protected crevices among rocks. Unbilicaria spp. was common on rocks above 5600 feet elevation.

Arboreal lichens were not common in Chikamin Mountain. Alectoria jubata complex was more common than A. sarmentosa in upper elevations and the latter species was most common near the Whitesail Lake shore. Cetraria glauca, Parmelia spp. and Physia spp. was also fairly common near the lake shore. No caribou use of the arboreal lichen forage supply was detected.

Menzeisia shrubs were common at lower elevations with the forage lichen of Cetraria islandica often growing on the lower branches. This lichen is a preferred caribou forage but I don't know if caribou utilize it when growing on the lower shrub branches. During winter this forage source may be unavailable in snow cover.

(4) Predators and predation

No sign of wolves and only two old bear scats at lower elevation were observed in the Chikamin Mountain Range. No bones or parts of bones were observed either. While predation probably occurs, it apparently is at a low level. Wolves have been seen near the portage in the fall and on islands in Whitesail Lake during summer (Neil Blackwell, pers. comm.) The 1975 field crew reported seeing wolf sign only once, an old scat, and no bear sign (Hazelwood, 1975).

(5) Other animal observations

I observed no moose but found a few recently antler-rubbed trees and moose sign below 4000 feet elevation. No goats were seen, in contrast to 1975 (Hazelwood, 1975).

No marmots were seen, nor ground squirrels although a few burrows were seen near the pass. Several red squirrels were seen at lower elevations. Small rodent sign was sparse, comprised of a few winter dropping piles and grass nests. The 1975 field crew reported seeing one marmot and a few red squirrels (in a different location than I traveled). Rodent sign was apparently much more common in 1975 (Hazelwood, 1975).

Few birds were seen, including 1 Varied Thrush, 2 Gray Jays, 3 Golden-crowned Kinglets, 2 Savannah Sparrows, 3 Water Pipits and a Yellow-bellied Sapsucker. Small flocks of birds, possibly Grey-crowned Rosy Finches, were seen on the Chikamin Mountain glacier during light snow and rain on August 18. An osprey was seen at the Portage when we landed there August 16.

Tweedsmuir Park, south-Far Mountain and Rainbow Lake area:

(1) Caribou observed

Six caribou were observed on Far Mountain, August 23 and 24, three medium to small stags, two adult does and the third believed to be a juvenile doe. All six animals were seen feeding at or above tree line (subalpine fir communities) with the stags lower (55-5600 feet elevation) than the does (57-5800 feet elevation). These caribou were in singles or pairs when sighted, five on the northwest corner of Far Mountain and the sixth in the upper reaches of Rich Creek. All sightings were on the north slope.

Pan Phillips (pers. comm.) reported seeing one yearling caribou during a pack horse trip with two clients over the Itcha Mountains, August 19 to 22, 1977 (starting date not certain). I talked with him in the afternoon of August 22 at Anahim Lake. He also reported seeing quite a few caribou tracks during the trip.

(2) Caribou range use

An abundance of caribou winter pellet groups and frequent signs of disturbed terrestrial lichen communities near tree line beneath bog birch (<1/2 meter tall) and in clearings among scattered subalpine fir stands suggested intensive caribou use in this zone during winter. Observations of summer use were sparse suggesting light caribou use during this season. A few bog birch and willow twigs were stripped of leaves and occasionally the flowering heads of forbs were missing in alpine and tree-line communities. Summer caribou pellet groups were present but relatively scarce.

Caribou have apparently made little use of the good arboreal lichen forage supply located in the continuously treed zone immediately downslope

from the sparse subalpine fir stands at tree line. Few caribou pellet groups (winter or summer) and only scattered disturbance of the tall, dense terrestrial lichen communities among the sparsely treed lodgepole pine (Pinus contorta) stands in the upper elevation zone suggest only occasional use. No caribou use was observed at lower elevations of Far Mountain and around Rainbow Lake although scattered patches of dry ground supported good, tall, lichen communities.

The Far Mountain area of the Ilgatchus Mountains supported caribou year-round but only a half dozen or so remain during the spring, summer, and early fall. Apparently most of the caribou wintering in the Ilgatchus, and probably in the Itcha Mountains as well, leave in the spring prior to calving to summer in the Rainbow Mountains. These migrant caribou return eastward in the fall moving across the Dean River just north of Lessard Lake (Tom Squiness, John Zeigler, pers. comm.) and appear on the alpine of Far Mountain shortly after the first intense cold-snap of about -30°F . (Zeigler pers. comm.). Pan Phillips (pers. comm.) reported seeing numerous caribou during the rut one year in the lower reaches (below tree line) of Rich Creek on the north slope of Far Mountain.

In winter the caribou on Far Mountain have quite reliable movement patterns (Zeigler, pers. comm.). Apparently, wintering caribou bands make little use of treed ranges below tree line, preferring to travel certain routes from one end of the mountain to the other even when disturbed. From reports (Zeigler, pers. comm.) and my observations caribou utilize all segments of the Far Mountain alpine area avoiding only the cliff on the southwest side. Caribou winter pellet groups were observed among rock boulders and on loose (unstable) talus. The deep tarn lake on the north side of the Far Mountain may serve as a trap for unsuspecting caribou

during certain winters, I found the remains (almost complete skeletons) of three caribou within 25 feet of the south shore and less than 150 feet between the outer two. The three appeared to have drowned together during the winter of 1975-76. The carcass of a young bull moose, with naturally shed antlers, was located about 50 feet from one of the outer caribou skeletons. The moose had likely died a year or so earlier than the caribou.

I found three naturally shed stag caribou antlers and one small, possibly a female, shed antler on the alpine of Far Mountain. The three stag antlers were old, either embedded deep in the moss or supporting crustose lichen communities. This suggested that caribou probably rut on Far Mountain or at least used to arrive on the alpine shortly after the rut. The small shed antler was found at the upper limits of sub-alpine fir and was from the previous winter or spring.

(3) Caribou range assessment

A good terrestrial lichen forage supply exists on Far Mountain, especially in a zone among the subalpine fir clearings to the upper limit of bog birch communities. Moderate amounts of terrestrial lichens are scattered over much of the alpine region. Excellent patches of terrestrial lichens were observed on dry knolls and ridges supporting sparse lodgepole pine stands. Dense mats of terrestrial lichens were also seen on the better drained sites at low elevations supporting tall lodgepole pine and spruce.

Excellent arboreal lichen loads (moderate to heavy) were observed among the low, sparse lodgepole pine stands in the uppermost continuously treed zone of Far Mountain. Alectoria jubata complex type

lichens hung in festoons from 8 to 10 inches long at heights from the ground of 1 to 13 feet on trees 20 to 25 feet tall. The dbh of two pines measured in this zone were 8.0 and 9.3 inches. Taller and bigger dbh lodgepole pine were located a short distance downslope with medium arboreal lichen loads from 2 to 40 feet above the ground. The arboreal lichen loads gradually became lighter and farther from the ground, downslope.

Potential forage of forbs and alpine willow occurs in zones on Far Mountain along with bog birch and small amounts of willow. Grasses and sedges are less common and lush on the alpine than at lower elevations. In a muskeg near Rainbow Lake I observed Labrador tea (Ledum groenlandicum), a species usually associated with caribou in more northern latitudes.

(4) Predators and predation

No wolves or bears were observed and only two wolf scats, one fairly fresh, were observed in the 25 or so miles walked on Far Mountain. Both wolf scats were observed on a horse trail at low elevations. One old bear scat was observed along a jeep trail near Rainbow Lake.

Wolves are reportedly uncommon on the alpine of the Ilgatchus Mountain (Zeigler, pers. comm.), but have been reportedly successful chasing caribou in the Itcha Mountains (Vaughn, pers. comm.). There is a possibility that this disparity of wolf winter activities on the two mountains is due to snow machine activity in the Ilgatchus Mountains the past five winters. One wolf has apparently been seen and subsequently shot on Far Mountain when snow machines first reached the Far Mountain alpine. No wolves have been seen or tracked on Far Mountain the past four years (Zeigler, pers. comm.).

Grizzly bears appear in the valley of Rainbow Lake in small numbers during late summer (Zeigler pers. comm.). Each summer farmers in the

Anahim Lake area report some livestock losses to bears. One rancher, Tommy Hall, has never lost livestock to bears but occasionally has lost sheep to coyotes and wolves. Apparently a few grizzlies are shot each year by farmers in the Anahim Lake-Dean River area (Paul Sesson, pers. comm.). Pan Phillips (pers. comm.) reported seeing a grizzly bear during his pack horse trip in the Itcha Mountains this summer. He also reported seeing fresh wolf tracks in the Itcha Mountains during the trip, both large and small tracks.

I found the skulls of three caribou with attached antlers on the alpine of Far Mountain, two were stags and one a doe. One skull with both attached antlers was of a prime stag only a few hundred feet from the three caribou that had apparently drowned in the tarn lake. This could have been the remains of a hunter kill. The doe skull was on an upper bench from the tarn lake and it too could have been a hunter kill. The other skull was a medium-sized stag located near tree line at the northwest end of Far Mountain. Unlike the other two skulls, this one was old and lichen covered.

(5) Other animal observations

No moose were seen although there was considerable moose sign in the Rainbow Lake valley on up to tree line on Far Mountain. Of particular interest to me was the common occurrence of naturally shed moose antlers at tree line. The shed antlers were among the low, subalpine fir stands interspersed with clearings. I counted 18 antlers in about a one mile transect through this clumped subalpine fir zone. John Zeigler (pers. comm.) reported that moose vacate the lowlands in early winter and appear on Far Mountain at tree line. These moose, both cows and bulls, remain in

this low cover area until forced by deep snow to move downslope. Some years moose don't appear in the valleys again until near Christmas.

I heard two marmots and saw one pika among the rocks at the north-west end of Far Mountain. I also saw a hoary marmot at the extreme upper end of Rich Creek. Small rodent sign was sparse on the alpine of Far Mountain.

Not too many birds were observed on Far Mountain but several sightings of sharp-shinned hawks appeared significant among the scattered subalpine fir stands at tree line. These small occipiters are also in the valleys, John Zeigler (pers. comm.) had reported shooting one that was harassing his domestic rabbits which run free at his cabin near Rainbow Lake. Other birds observed were Smith's longspurs and Savannah sparrows at or above tree line; juncos, golden-crowned kinglets, boreal chickadees and spruce grouse on the slope of Far Mountain and barn swallows, rusty blackbirds and Canada geese at Rainbow Lake. Ptarmigan feathers were seen on the alpine area but no birds were observed.

Wells Gray Park - Avola, Caribou Meadow and Battle Mountain:

(1) Caribou observed

No caribou were observed either in the park or on ranges outside the park during September 9-13.

(2) Caribou range use

No concentration of caribou sign was seen except for fresh tracks, pellet groups, beds and antler-rubbed trees on a southeast slope at upper elevations. This caribou sign was adjacent to a rounded and alternate treed and treeless environment with shallow ponds and moist meadows. Other caribou sign was sparse and scattered.

Arboreal lichens were observed at 5 to 8 feet heights from the ground to 40 and 70 feet heights. A vague browse line of arboreal lichens appeared at 10 to 11 feet heights but snow depths could have caused this line. Generally, snow depths reach about 6 feet heights in the area observed (Ritcey, pers. comm.). Terrestrial lichen communities on both the treed and treeless (dry meadow) sites showed occasional disturbance, possibly by caribou. Caribou use of terrestrial lichens in this area would have occurred during snowless or shallow snow seasons.

(2) Caribou range assessment

The arboreal lichen abundance was impressive locally although a great variation from none to heavy loads was observed. At lower elevations Alectoria sarmentosa was prominent and at higher elevations Alectoria jubata complex predominated. Near tree line subalpine fir supported little or no A. jubata complex loads but lower downslope adjacent to moist meadows, lakes and streams this tree species along with spruce supported medium to heavy loads of the same lichen. Excellent A. jubata complex loads were observed on old trees that had survived a burn 25 years previously near the Caribou Meadow cabin. These arboreal lichens on spruce and subalpine fir 60 feet tall grew in up to 9 inch festoons at heights of 8 to 45 feet.

Arboreal lichens were often observed among twig litter beneath and between trees suggesting a considerable amount of wind damage in the area traveled. Caribou probably utilize some of the lichen forage supply dislodged from the upper portions of trees. In the vicinity of Lion Creek at about 5300 feet elevation I was impressed at the heavy loads of Alectoria jubata complex lichens located in the upper 10 to 15 feet tips of stemless snags 60 to 70 feet tall. This potential caribou forage supply would only be made available by wind throws or breaks.

Terrestrial lichen forage supplies were locally abundant though scattered unevenly over treeless and treed environments as well as on the alpine sites. Generally these lichen communities made up less than 5 percent of the ground cover, although in drier portions of large upland meadows the lichen cover amounted to 10-15 percent and on dry upland treed sites. At higher elevations, about 6000 feet, among clearings between stands of subalpine fir terrestrial lichens covered 15-20 percent of the ground cover and as much as 20-25 percent on alpine environments. Stereocaulon spp. predominated terrestrial lichen communities in the alpine Cladonia amaurocraea and to a lesser extent Cetraria islandica predominated in treed environments and Cladonia spp. (possibly C. crispata) predominated on drier portions of treeless meadows. Cetraria islandica was common on treeless meadows but more abundant on the lower branches of shrubs (white laurel and mensiezia) in treed environments.

Large meadows at upper elevations interspersed with occasional shallow ponds offer caribou an attractive summer and fall environment. Most of the caribou sign seen, however, was among the smaller, moist meadows and shallow lakes located at lower elevations. Forbs, grasses, sedges and sparse horsetails are good potential summer, fall, and early winter forage for caribou in these meadow environments.

In winter the caribou apparently move to lower elevations where arboreal lichens are locally abundant, primarily on old-aged spruce but also on lodgepole pine and subalpine fir. It is in these areas where clear-cuts occur and conflicts can arise between resource uses. These old-age stands are probably very important as an arboreal lichen forage source to caribou during early winter or until snow cover becomes dense at upper elevations. The arboreal lichens in the lower elevations are

generally about 5 feet from the ground in medium loads while at upper elevations they are from 7 to 8 feet from the ground and locally at medium to heavy loads. The capacity of the park to support caribou populations is probably closely linked to the amount and quality of arboreal lichen forage available to these animals both in and outside the park. This is a similar conclusion reached with another caribou population existing in a deep snow environment -- Selkirk Caribou. After snow depths each winter have made terrestrial forage supplies unaccessible these caribou have no alternative forage source other than arboreal lichens. At what snow depth terrestrial forage is no longer available to these mountain caribou is unknown but, unlike other woodland caribou and barren-ground caribou, Selkirk Caribou are not known to dig craters in the snow to reach forage beneath. I don't know whether caribou in Wells Gray Park dig craters.

No naturally-shed antlers were observed to suggest where the post rut and calving sites might be. Ritcey (pers. comm.) reported that calving occurs in whatever site the gravid doe might be at the time of parturition suggesting that much depends on the snow melt at that time.

(4) Predators and predation

No wolves or bears were observed. I observed 13 to 14 wolf scats in about 32 miles traveled on foot with eight scats located along pack horse trails of about 3 miles. One bear scat was observed, probably black bear.

Signs of possible predation amounted to observations of bone and hair remains of a moose in a small meadow at 5600 feet elevation and of a recently uprooted mat of vegetation on a small creek bank in a big meadow at about 5700 feet elevation (Bull Valley). One old wolf scat was with the moose

remains and two fresh wolf or possibly coyote scats were on the torn-up turf. Presumably the canine predators were searching for ground squirrels in Bull Valley.

(5) Other animal observations

No moose were seen but three mule deer were observed in a clear-cut about one-half mile downslope from the Avola road Microwave Tower. Moose and deer sign were sparse in the area traveled.

Heard at least three different marmots on Battle Mountain and saw one on the southeast side. One pika also heard on Battle Mountain. A muskrat was seen in the Avola road area.

Bird observations were few but included a Sharp-shinned Hawk at the Avola road Microwave Tower, a Cooper's Hawk (I believe) near the Caribou Meadow cabin and a Pygmy Owl at the highest point of land on the east portion of Battle Mountain. A Red-tailed Hawk, ravens, Gray Jays, Steller's Jay, juncos and White-crowned Sparrows were also seen in the vicinity of the Avola road. I also heard Golden-crowned Kinglets, periodically.

Discussion

There are certain characteristics common to the four caribou populations observed this past summer (See Table 2). Each population has access to large treeless environments either in the form of alpine or meadows at or below treeline. These treeless areas are used primarily during winter in Spatsizi and southern Tweedsmuir (Ilgatchus and Itcha mountains) and during summer in northern Tweedsmuir and Wells Gray.

Terrestrial lichen forage supplies are more abundant and utilized more predominantly by caribou during winter in shallow snow regions while arboreal lichens are more abundant and receive more use in deep snow regions. Generally, snow depths were reportedly shallow in the Caribou Mountain of Spatsizi where terrestrial lichens were most common, and deep in Wells Gray where heavy loads of arboreal lichens occurred. Both terrestrial and arboreal lichens were relatively abundant in certain elevational zones in southern Tweedsmuir but only terrestrial lichens showed much use by caribou. In northern Tweedsmuir however, lichen loads on the ground and in trees were moderate to light and caribou use was light. Presumably caribou in northern Tweedsmuir have moved to more favorable winter ranges from the observed Tweedsmuir, Michel and Wells Gray peaks area. I propose that aerial winter surveys should be conducted in the northern Tweedsmuir Park area in an attempt to locate where this caribou population winters.

The reported decline of caribou in northern Tweedsmuir (Blackwell, pers. comm.) may simply be a shift of range use from previously used sites around Glatheli, Goodrich and Fenton lakes. If a wintering concentration of caribou is found, snow measurements

should be taken and compared with summer observations of relative terrestrial and arboreal lichen abundance on this winter range.

There are many unknowns about each of the caribou populations studied but one of the most intriguing involves movement patterns of caribou between Rainbow Mountains of southern Tweedsmuir and the Ilgatchus-Itcha mountains. It is uncertain where these animals rut and calve and if the movements involve all or only part segments of the population. The field survey crew in 1975 (Hazelwood, 1975) observed a minimum of 24 caribou (maximum of 60) including a few does with fawns but no adult stags. Where do the stags summer? None were seen on Far Mountain in 1977. Where is the main segment of does and fawns or did the 1975 field survey crew see it and few fawns had survived? Numerous skeletal remains of small caribou were reportedly found in the Rainbow Mountains by the 1975 field crew. This southern Tweedsmuir caribou population requires more study.

Movement patterns of caribou summering in the Chikamin Mountain Range are also intriguing. Where do these animals rut and where do they calve? Why is there so little sign of predators and predation in the upper elevations of Chikamin Mountain and in the pass between Arete Mountain? When do the post-calving bands first appear in this northern portion of the Chikamin Mountains? Would a cut trail from Portage to the alpine on the northeast slope of Chikamin Mountain, planned as a youth camp project in 1978, be a potential disturbance hazard for post-calving bands of caribou as well as goats? Both caribou fawns and goat kids were observed in good numbers on Chikamin Mountain by the 1975 field survey crew (Hazelwood, 1975). I would recommend additional study of both

caribou and goat populations in the Chikamin-Arete mountains area and careful consideration of potential human disturbance that may occur if a good access trail is developed to Chikamin Mountain. Apparently little use has been made in recent years of the Zinc Bay mining road for human access to the pass between Chikamin and Arete mountains. However, more human traffic is attracted to the portage than to Zinc Bay and therefore more potential use of a new trail.

I believe caribou populations in Spatsizi and southern Tweedsmuir have adequate winter ranges to support current populations although there are some signs of over used terrestrial lichen communities locally in Spatsizi. Encroachment of some well-used terrestrial lichen communities by subalpine fir regeneration in adjacent clearings, annually reduces carrying capacity to a small extent. Eventually these small clearings may disappear completely unless a disturbance such as wildfire occurs to restore clearings in this elevational zone.

Caribou in Wells Gray apparently rely very heavily on arboreal lichen forage supplies during winter. In early and mid-winter caribou appear to seek arboreal lichen supplies outside the park boundary in an area where lichen-rich spruce stands are in demand by the logging industry. These lichen-rich spruce stands may well be the major factor controlling caribou abundance in Wells Gray and therefore careful consideration should be given to their perpetuation if current caribou numbers are to be maintained.

Table I General comparison of caribou and caribou range in three Provincial Parks

Characteristic	B. C. Provincial Park			Wells Gray
	Spatsizi	Tweedsmuir(N)	Tweedsmuir(S)	
Estimated number of caribou	2100	300	300	300
Movements during rut and calving	Extensive	Moderate	Moderate	Short
Summer movements	Moderate	Moderate	Short or nil	Nil
Winter movements	Short	(Uncertain)	Short (lateral)	Short (vertical)
Winter forage (prime)	Terrestrial	(Uncertain)	Terrestrial	Arboreal
Summer forage (prime)	Shrubs	Shrubs	*Shrubs	Shrubs
	Forbs	Forbs	Forbs	Forbs
	Terr. lichens	Grass-like pls.		
	Grass-like pls.			
Rut	Alpine	Tree line†	(Uncertain)	Treed ranges
Calving	Alpine & Tree line	(Uncertain)	(Uncertain)	Tree line-
Treeless alpine	Large areas	Mod. areas	Mod. areas	Occasional
Large lowland meadows	Present	Present	Occasional	Uncommon
Large tree line meadows	Occasional	Common	Moderate	Common
Relative arboreal lichen abund.	Moderate	Moderate	Abundant	Abundant
Relative terrestrial lichen abund.	Abundant	Mod.-abund.	Mod.-abund.	Mod.-light
Salix spp. forage abund.	Abundant	Moderate	Moderate	Mod. light
<u>Betula glandulosa</u> forage abund.	Abundant	Occasional	Occasional	**None

* Far Mountain area only, known.

** Ritcey reported some Betula glandulosa* in a portion of the park I did not see.

Naturally shed antlers and skulls with or without antlers found on Caribou Mountain, Spatsizi during July 19-24, 1977.

TABLE II

<u>Date</u>	<u>Naturally Shed</u>					<u>Kills</u>				
	<u>Male</u>					<u>Male</u>				
	Sm.	Med.	Lg.	Female	Uncl.	Sm.	Med.	Lg.	Female	Uncl.
July 19	0	3	1	0	0	1	0	0	1	0
July 20	1	3	0	0	0	0	1	1	0	0
July 21	0	0	4	0	1	0	0	1	0	0
July 22	0	3	1	0	0	0	0	2	0	4
July 23	0	2	1	0	0	0	0	0	0	0
July 24	0	3	3	0	0	0	2	2	1	0
TOTAL	1	14	10	0	1	1	3	6	2	4

APPENDIX 1 - Bird Observations made May 28 to July 31, 1977
in or Adjacent to Spatsizi Plateau Wilderness Park

<u>Species</u>	<u>Nesting*</u>
Common loon	
Canada geese	
Mallard	
American Widgeon	
Pintail	
Green-winged teal	
Blue-winged teal	
Shoveler	
Greater scaup	
American goldeneye	
Barrow's goldeneye	
Bufflehead	
Harlequin duck	
Merganser+	
Rough legged hawk	
Golden eagle	
Bald eagle	
Osprey	
Peregrine falcon	
Kestral	E
Spruce grouse	E
Willow ptarmigan	N
Rock ptarmigan	E
Semi-palmated plover	E
Golden plover	E
Kildeer	
Ruddy turnstone	
Wilson snipe	N
Spotted sandpiper	Y
Pectoral sandpiper	E
Solitary sandpiper	E
Greater yellow-legs	

<u>Species</u>	<u>Nesting*</u>
Lesser yellow-legs	E
Least sandpiper	Y
Northern phalarope	E
Herring gull	E
Bonaparte's gull	
Arctic tern	
Short-eared owl	N
Nighthawk	
Rufous hummingbird	
Flicker	
Northern three-toed woodpecker	E
Say's phoebe	N
Olive-sided flycatcher	
Horned lark	N
Tree swallow	E
Cliff swallow	N
Canada jay	Y
Raven	E
Crow	
Black-capped chickadee	
Mountain chickadee	E
Boreal chickadee	E
Red-breasted nuthatch	E
Winter wren	
Robin	N
Hermit thrush	E
Varied thrush	E
Swainson's thrush	E
Townsend's solitaire thrush	
Water ouzel (or dipper)	N
Gray-cheeked thrush	E
Golden-crowned kinglet	E
Ruby-crowned kinglet	E
American (water) pipit	E
Bohemian waxwing	
Northern shrike	Y

<u>Species</u>	<u>Nesting*</u>
Orange-crowned warbler	
Yellow warbler	E
Myrtle warbler	E
Black-poll warbler	E
Northern water-thrush	
Yellow-throat	E
Wilson's warbler	N
American redstart	E
Rusty blackbird	E
Gray-crowned rosy finch	E
Golden-crowned sparrow	N
Savannah sparrow	N
Slate colored junco	N
Tree sparrow	N
White-crowned sparrow	N
Lincoln's sparrow	N
Song sparrow	E
Lapland's longspur	
Smith's longspur	E

*-I feel fairly certain most ducks, Canada geese, golden eagle and osprey nested in Spatsizi but did not list in the table.

N-nest observed

Y-young observed, obviously raised in the area observed

E-expected nesting occurred.

+species of merganser in my notes-currently in possession of A. Tom Bergerud, either American or red-breasted.