Comparison of caribou physical characteristics from Yukon and neighboring caribou herds.

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Abstract: Data on seven external body measurements of caribou from six woodland and two barren-ground caribou herds from Yukon, Alaska, Alberta and British Columbia were compared. Comparisons between females in the fall and winter and mature males in the fall revealed that (1) barren-ground Porcupine caribou were consistently smaller than caribou from other herds, (2) British Columbia and Alberta caribou tended to be larger than Yukon caribou, or the Alaskan caribou studied, (3) central Yukon caribou were intermediate in body size, (4) no difference was found between Yukon «mountain» and «woodland» type caribou in body size, and (5) the barren-ground Fortymile caribou were more similar in physical characteristics to Yukon woodland or mountain caribou than to those of the barren-ground Porcupine herd. These data support Banfield's (1961) view of a gradient of decreasing physical size from the northern British Columbia — Alberta herds through the Yukon mountain or woodland herds to the northern barren-ground herds.

Key words: caribou, body measurement, barren-ground caribou, mountain and woodland caribou, taxonomy

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Introduction

Banfield (1961) identified two subspecies of caribou (*Rangifer tarandus*) in Yukon, the «woodland» or «mountain» caribou (*R. t. caribou*) in the south, and the barren-ground caribou (*R. t. groenlandicus*) (also referred to in the literature as *R. t. granti*) in the north. He further suggested that caribou of the central and northern Yukon mountains were integrades between the larger northern British Columbia (B.C.) and southern Yukon caribou and the smaller barren-ground caribou. The size of external body parts of caribou should therefore show a declining gradation from southern (Alberta — B.C.) herds through to northern barren-ground herds (Fortymile, Porcupine), with southern and central Yukon herds intermediate to those two extremes.

Little information has been presented subsequent to Banfield's work to either support or reject his view of intergradation. The advent of more efficient capture techniques and access to previously remote areas has allowed the collection of more detailed information on the distribution and physical characteristics of Yukon and neighboring caribou herds to test Banfield's intergradation hypothesis (Alaska Department of Fish and Game, unpublished data; Farnell, 1982; Farnell and Russell, 1984; Gauthier and Theberge, 1985; Larsen, 1980; Yukon Wildlife and Fisheries Branch, unpublished data). We report data on body measurements of caribou gathered from four Yukon *R. t. caribou* herds and one *R. t. groenlandicus* herd as well as data from two *R. t. caribou* herds in western Alberta and B.C. and one *R. t. groenlandicus* herd in Alaska.

Study area and methods

The names and location of herds were taken as given from the researchers reporting on them (Fig. 1). For data on the Fortymile, Porcupine and Carcross herds we have relied on the generosity of researchers from those areas. The Fortymile and Porcupine herds are classified as *R. t. groenlandicus* following Youngman (1975). The remaining herds are considered *R. t. caribou*. We have divided *R. t. caribou* herds into «woodland» or «mountain» types on the basis of winter range use, with «mountain» type herds using boreal forest ranges (Bergerud, 1978; Edmonds and Bloomfield, 1984; Farnell, 1982; Farnell and Russell, 1984; Gauthier, 1984; Hatler, 1983; Larsen, 1980). Based on this criterion, the Western Alberta, Carcross and Finlayson herds are classed as «woodland» demes, the Burwash and Wernecke herds as «mountain» demes, and the Spatsizi herd as an intergrade.

Age, sex and seasonal differences are often reflected in body measurements, and we therefore classified data according to those categories. We grouped seasons into summer, fall, winter and spring, but have sufficient data to report only on mature females in the fall and winter and mature males in the fall. We defined «mature» as an animal of reproductive age (>=2 years of age for females and >=3 to 4 years of age for males).

Seven measurements were recorded for animals live-captured among the herds (Table 1) but not all data were collected in the same manner nor were all standard body measurements collected consistently from all herds. For most herds, data were collected for only selected age and sex groups (Figs. 2 and 3). Table 1 shows the sample sizes for each herd according to season, age and sex. We recognise that sample sizes for each herd when classed by the given categories are relatively small, and that the use of external physical characteristics in distinguishing among subspecies is potentially biased by the effect of environmental factors (for example, nutritional regimes) on body size. We urge that the results be treated as preliminary and therefore with caution. Descriptive statistics were calculated for each variable according to herd, season, age and sex, and were tested for differences using analysis of variance and the studentized maximum modulus test (Sokal and Rohlf, 1981).

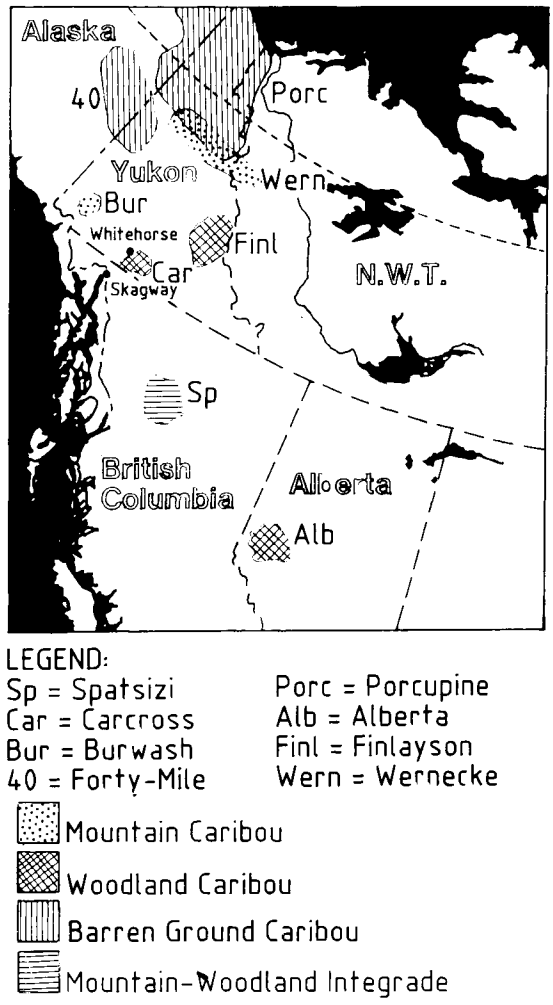

Fig. 1. Locations and designations of caribou herds used for comparisons of body size characteristics.

Results and discussion

Five major features are evident (Table 1; Figs. 2, 3). First, Porcupine caribou (*R. t. groenlandicus*), which comprise the northernmost herd, are consistently smaller in external physical measurements than any of the other herds measured. Second, the southernmost herds (Western Alberta, Spatsizi), tend to be larger in most physical measurements than Yukon caribou. Third, Yukon *R. t. caribou* of the central and northern mountains tend to be intermediate in size between the larger caribou of the southern herds and the smaller northern barren-ground caribou. This result supports Banfield's (1961) view that the caribou of the central and northern Yukon mountains are intergrades between the

Table 1. Summary statistics of caribou body size characteristics according to season, sex and herd.

Season	Sex	Herd	Heart girth (cm)			Total length (cm)			Hind foot length (cm)			Shoulder height (cm)			Chest height (cm)			Min. neck circumference (cm)			Weight (kg)		
			N	Mn[1]	SE[2]	N	Mn	SE	N	Mn	SE	N	Mn	SE	N	Mn	SE	N	Mn	SE	N	Mn	SE
Fall	Female	Porcupine	9	119.3	2.81	9	177	4.37	10	53.28	0.58	9	104.4	1.44	9	59.00	1.14	0			10	88.9	3.34
		Carcross	16	127.4	1.23	15	208.5	2.02	11	55.56	1.00	6	119	1.59	6	69.83	2.63	0			15	132.3	2.78
		Burwash	24	122.7	1.13	25	204.6	4.49	11	56.27	0.30	12	115	0.69	12	80.00	1.21	19	52.47	1.76	21	116.9	3.87
		Spatsizi	10	133.5	1.72	10	203.5	2.65	10	58.60	1.02	10	117.8	1.84	0			10	58.20	1.49	1	154	
		Fortymile	19	121.1	0.92	20	196.4	1.38	20	57.95	0.48	2	112	3.00	0			17	51.18	0.81	6	110.7	3.54
Winter	Female	Wernecke	8	122.8	1.81	8	203	2.66	2	48.00	5.00	0			0			7	50.57	1.31	5	110.8	5.29
		Finlayson	23	133.6	1.78	22	216.6	3.65	23	57.71	0.53	15	115.9	2.17	21	67.48	1.82	0			0		
		West Alberta	10	134.8	3.04	10	222.9	2.56	0			10	130.4	1.36	0			0			0		
Fall	Male	Porcupine	10	128.6	1.55	13	194.9	2.29	13	57.75	0.62	11	112.1	1.46	11	63.45	0.94	0			13	125.5	3.54
		Carcross	4	159	3.70	4	246.8	6.16	3	62.23	0.72	2	127	0.00	2	70.00	4.00	0			4	206.5	5.56
		Burwash	8	135.5	4.31	8	214.1	9.00	0			0			0			5	70.40	5.54	8	176.8	12.33
		Fortymile	5	136.4	3.67	5	215.6	5.09	6	64.50	0.56	0			0			5	62.80	1.66	0		

1. Mn=Mean 2. SE=Standard Error

southern *R. t. caribou* and northern *R. t. groenlandicus*. Fourth, when comparisons were made between «mountain» and «woodland» types at relatively the same latitude, no consistent differences were found. Fifth, Fortymile caribou, classed as *R. t. groenlandicus*, appear more similar to *R. t. caribou*, particularly the Burwash animals, than they do to the other barren-ground herd (Porcupine) with which they were compared. This degree of physical difference between the Fortymile and Porcupine herds is unexpected given reports of migration and intermingling of large numbers of animals had taken place between the herds as suggested by Skoog (1968). In spring 1957 an estimate of 30000 animals of the Fortymile herd migrated northward with the Porcupine herd, and in spring 1964 a large portion of the Fortymile herd once again moved north with Porcupine caribou. Such large-scale intermingling should preclude findings of significant differences on physical characteristics between the two herds. However, more recent radio telemetry work indicates that intermingling between the herds commences post-rut (Whitten and Cameron, 1982). While the two herds may share winter ranges in some years, individuals of each herd tend to return to their respective calving grounds (Farnell and Russell, 1984).

Regarding the close relationship between Fortymile and Burwash caribou, during the 1880's and 1890's, the majority of an apparently much larger Fortymile herd ranged farther east and southeast than during later periods and extended as far as the Whitehorse-Skagway area (Skoog, 1968). A large movement of caribou occurred again in 1924 along the summit of the coast range above Skagway and were observed near Whitehorse, at a time when east-central Alaska herds were thought to be at peak numbers (Murie, 1935). In 1936 Fortymile caribou apparently migrated southeast and wintered near Kluane Lake (Rand, 1945). It may be that caribou of southwest Yukon are remnant herds of a once much larger Fortymile herd migrating through southwest Yukon. The available data suggest that Fortymile herd caribou are more closely related in body size characteristics to the Burwash and Carcross caribou than to the Porcupine animals.

Whether the differences in body measurements among herds are phenotypic or genotypic in origin will require more detailed comparisons

Physical Measurement	Mature Females–Fall South → North					Mature Females–Winter South → North			Mature Males–Fall South → North			
Heart Girth	1 Sp	2 Car	3 Bur	4 40	5 Porc	1 Alb	2 Finl	3 Wern	1 Car	3 Bur	2 40	4 Porc
Total Body Length	3 Sp	1 Car	2 Bur	4 40	5 Porc	1 Alb	2 Finl	3 Wern	1 Car	3 Bur	2 40	4 Porc
Hind Foot Length	1 Sp	4 Car	3 Bur	2 40	5 Porc		1 Finl	2 Wern	2 Car		1 40	3 Porc
Shoulder Height	2 Sp	1 Car	3 Bur	4 40	5 Porc	1 Alb	2 Finl		1 Car			2 Porc
Chest Height		2 Car	1 Bur		3 Porc				1 Car			2 Porc
Minimum Neck Circumference	1 Sp		2 Bur	3 40						1 Bur	2 40	
Weight	1 Sp	2 Car	3 Bur	4 40	5 Porc				1 Car	2 Bur		3 Porc

Fig. 2. Ranking of caribou herds according to sex and season for each physical measurement. Legend: Sp=Spatsizi, Car=Carcross, Bur=Burwash, 40=Fortymile, Porc=Porcupine, Alb=Alberta, Finl=Finlayson, Wern=Wernecke.

1. Numbers above the herd names indicate the rank order for each variable from largest (1) to smallest (5).
2. If herds are not joined by a line, they are statistically different at P=0.05. In a few instances, no lines are present indicating insufficient data to test for significance. Dotted lines are used in a few instances to join herds which are not statistically different.

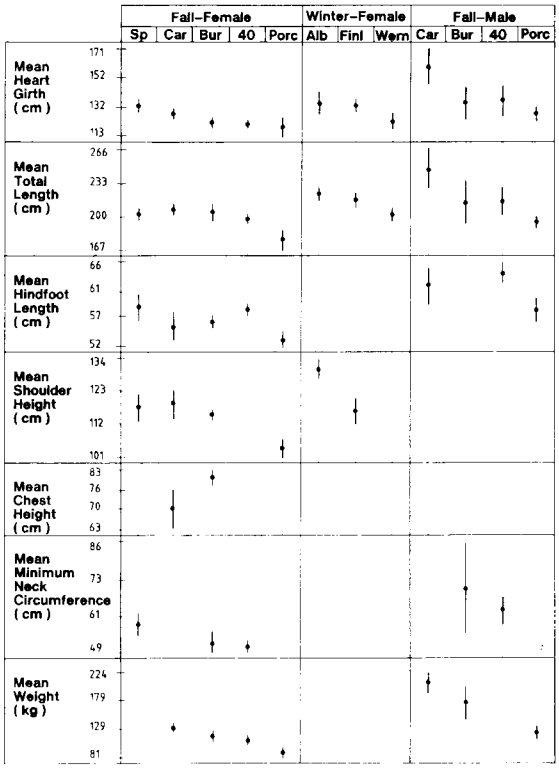

Fig. 3. Chart of summary statistics of caribou body size characteristics.

using techniques which assess genetic relatedness. The time is long past due for an extensive taxonomic study of herds within the zone of intergradation.

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