

Notes

Morphology of Female Woodland Caribou, *Rangifer tarandus caribou*, in Saskatchewan

W. JAMES RETTIE

Department of Biology, University of Saskatchewan, 112 Science Place, Saskatoon, Saskatchewan S7N 5E2 Canada
Present address: Northeast Science & Information Section, Ontario Ministry of Natural Resources, Ontario Government Complex, Highway 101 East, P.O. Bag 3020, South Porcupine, Ontario P0N 1H0 Canada

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I obtained morphological measurements from captured female Woodland Caribou in central Saskatchewan. I found that only girth was a good predictor of body mass in adult animals. I also determined that Woodland Caribou from Saskatchewan, though similar in size and mass to alpine Woodland Caribou in Yukon, are larger than migratory Woodland Caribou and smaller than forest dwelling Woodland Caribou from western Alberta and Yukon.

Key Words: Woodland Caribou, *Rangifer tarandus caribou*, morphology, Saskatchewan.

Body sizes and body masses of subspecies and populations of *Rangifer tarandus* (Eurasian Reindeer and North American Caribou) vary considerably (e.g., Dauphiné 1976; Thomas 1982; Reimers 1983; Chan-McLeod et al. 1995) in response to a wide range of climatic and other environmental conditions (Skogland 1983; Reimers 1983). In North America, there is also a high degree of morphological variation within the Woodland Caribou subspecies (*R. t. caribou*). The best described populations of Woodland Caribou are those in Yukon (Gauthier and Farnell 1986; Kuzyk et al. 1999) and in Québec and Labrador (Parker 1981; Huot 1989). However, the subspecies has a more or less continuous distribution across northern Canada and the variations in climate, topography, and plant and animal communities across the range of the subspecies might be expected to favour different body sizes and masses in different areas. In particular, Skogland (1983) argued that morphology was density-dependent and related to the factors limiting population growth. Both Skogland (1983) and Chan-McLeod et al. (1999) reported that female *R. tarandus* that had reproduced successfully were significantly lighter the following winter than those that had not. Here, I present the first description of Woodland Caribou from central Saskatchewan and a discussion of their morphology relative to limiting factors.

Study Area and Methods

As part of research into population dynamics (Rettie and Messier 1998) and behaviour (Rettie and Messier 2000, 2001), I captured 43 female Woodland Caribou in central Saskatchewan (approximately 54° N to 55°30' N and 104° W to 109° W). All animals were

captured in winter (dates between 13 December and 14 March) between March 1992 and January 1995. At the time of capture I used a flexible steel tape to measure the following parameters from most animals: total body length, body length to base of tail, girth (all to the nearest cm), mandible, and metatarsal lengths (to the nearest 5 mm). Methods followed those of Dauphiné (1976), modified for application to live animals. I measured body mass to the nearest kilogram for ten animals using an electronic load scale (Senstek, Saskatoon, Saskatchewan) suspended from a tripod or beneath a helicopter. I also extracted a tooth from most animals for aging. Further details on capture and aging appear in Rettie and Messier (1998). Animal capture and handling procedures followed animal care protocol number 920092 of the University of Saskatchewan.

Using natural log transformed values from the eight adult animals for which I had complete sets of data as well as body mass, I applied a stepwise multiple linear regression to assess the relationship of body measurements to body mass ($p = 0.05$ to enter, $p = 0.10$ to exit) and then applied the resulting equation to the morphometric data for all animals. I then tested for differences in calculated body mass for adult females that were accompanied by a calf at time of capture and those that were without a calf. All statistical analyses were conducted using SPSS for Windows Version 10.0.7 (SPSS Inc. 2000).

Results and Discussion

I had morphometric data from 34 adult animals (>31 months old at time of capture) and from three yearlings (19-22 months old at time of capture). The summary statistics for all measurements appear in

TABLE 1: Morphological measurements and actual and calculated body mass of adult female Woodland Caribou in central Saskatchewan.

Parameter	<i>n</i>	mean ± 1 sd	range
Actual body mass	9	131 ± 16 kg	96 – 156 kg
Calculated body mass*	32	118 ± 17 kg	96 – 160 kg
Body length to base of tail	33	191 ± 13 cm	165 – 217 cm
Total body length	33	206 ± 13 cm	177 – 230 cm
Metatarsal length	30	43.0 ± 1.4 cm	41.0 – 46.0 cm
Shoulder to hoof tip	15	115 ± 7 cm	102 – 126 cm
Girth	32	129 ± 11 cm	115 – 154 cm
Mandible length	32	31.4 ± 1.8 cm	28.0 – 35.0 cm

* Body mass kg calculated using the equation arising from the regression analysis: $e^{1.76 \ln \text{Girth} - 3.78}$

TABLE 2: Morphological measurements and actual body mass of yearling female Woodland Caribou in central Saskatchewan.

Parameter	<i>n</i>	mean ± 1 sd	range
Actual body mass	1	98 kg	
Body length to base of tail	3	172 ± 3 cm	170 – 1175 cm
Total body length	3	185 ± 3 cm	182 – 1188 cm
Metatarsal length	3	41.7 ± 0.6 cm	41.0 – 142.0 cm
Girth	3	113 ± 3 cm	110 – 1116 cm
Mandible length	3	28.2 ± 2.0 cm	26.0 – 130.0 cm

Tables 1 (adult animals) and 2 (yearling animals). When compared to Yukon Woodland Caribou, the animals in Saskatchewan are almost as tall at the shoulder (115 cm vs. 116 cm), are the same girth (129 cm), but are not as long (191 cm vs. 206 cm) as the alpine animals measured by Kuzyk et al. (1999). Saskatchewan caribou are smaller than forest dwelling Woodland Caribou from Yukon (Kuzyk et al. 1999) and from western Alberta (Gauthier and Farnell 1986) in all comparable parameters.

From the regression analysis, I concluded that only girth was significantly related to body mass ($p = 0.04$, $r^2 = 0.78$). I used the resulting equation, where girth is measured in cm:

$$\text{calculated body mass (kg)} = e^{(1.76 \ln \text{Girth} - 3.78)}$$

to calculate body mass for all adult animals for which I had girth measurements. The calculated body mass values appear in Table 1. Figure 1 shows the relationship between girth and body mass and its 95% prediction interval. Untransformed data are presented in the figure while analyses were based on natural log transformed data. The wide prediction interval in Figure 1 suggests that further sampling is required to reduce uncertainty in the girth-body mass relationship. The relationship is particularly weak for smaller girths where the relationship is influenced by a single observation. Though the summarised measurements present a reference point for future studies on morphological variation in Woodland Caribou, the prediction of body mass from body measurement and the equation pre-

sented should be made cautiously (Cattet et al. 1997). Finally, I did not detect a difference in calculated body mass between adult animals with and without a calf-at-heel at time of capture (t -test, $t = 0.30$, $df = 30$, $p = 0.76$).

Skogland (1983) argued that body sizes in *R. tarandus* were density-dependent, the larger body size

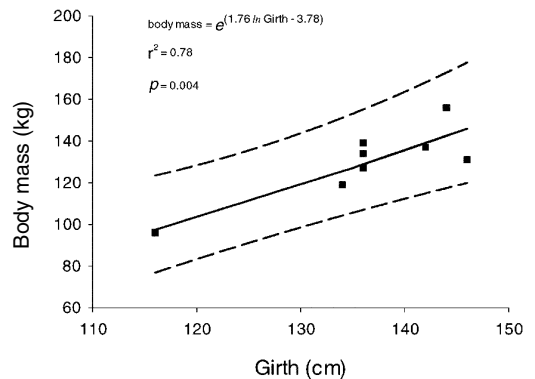


FIGURE 1. Relationship between girth (cm) and body mass (kg) for adult female Woodland Caribou in Saskatchewan. Solid line represents the equation derived through multiple linear regression; dashed lines represent the 95% prediction interval of the equation. Filled squares represent data used to derive the equation.

in North American Caribou being attributed to their low densities, a consequence of limitation by predation rather than by food resources. Amongst Woodland Caribou populations, the George River Caribou Herd in Quebec and Labrador is food limited and contains the smallest individuals (Parker 1981; Huot 1989). The body sizes of Woodland Caribou in Saskatchewan are larger than George River Herd animals and support the argument that Saskatchewan populations are not food limited (Rettie and Messier 1998). As with the larger animals in Caribou populations in western Alberta and Yukon (Edmonds 1988; Kuzyk et al. 1999), predation is the likely proximate limiting factor for Saskatchewan Woodland Caribou populations (Rettie and Messier 1998).

Skogland (1983) also suggested that predator induced constraints on lifetime reproductive success led to larger body size in North American Caribou by delaying reproductive maturity in favour of increased somatic growth. However, yearling female Woodland Caribou in Saskatchewan were not only pregnant (Rettie and Messier 1998) but larger than both adult Reindeer (Skogland 1983) and adult migratory Woodland Caribou (Huot 1989). Relative to observations in Norway, there does not appear to be a trade off being made between reproduction and somatic growth. Instead, Saskatchewan Woodland Caribou appear able to mature as yearlings and still achieve large adult body sizes. My failure to detect differences in body mass between reproductive classes may represent a lack of difference, result from a poor predictive ability of my equation for body mass, or be a consequence of inter-annual variation as reported by Chan-McLeod et al. (1999).

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