Comparison of body composition and growth potential in two related island populations of caribou

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Body growth in *Rangifer* is governed by the complex interaction of environmental factors and genetic potential. The relative importance of nutrition in different seasons is difficult to partition, but studies have shown that both summer and winter nutrition can influence mature body size. We undertook a study of winter nutrition, body growth and body composition of two genetically related populations of barren ground caribou (*R. tarandus groenlandicus*) on Coats and Southampton Islands in Hudson Bay, Canada. The Southampton Island population was introduced in 1967 using caribou transplanted from Coats Island. Temporally paired collections of adult females and calves were carried out on the two islands in fall (October - November) 1983, and late winter (March - April) 1983 and 1984 (adults=54, calves =10).

Analysis of plant fragments in rumen contents revealed that lichens were a major component of the fall (67%) and late winter (46 - 49%) diet on Southampton Island. Lichens were less important in the fall on Coats Island (36%) and were a minor component in late winter, 12% and 2% in 1983 and 1984 respectively. Dietary prevalence of lichens reflected differences in availability. In the Dryas-lichen community lichen biomass was eight times greater on Southampton Island. Deeper snow in late winter 1984 was correlated with a lower representation of lichens in the diet on Coats Island. Diet quality was determined by analysing acid detergent fibre and nitrogen concentration in rumen contents. Caribou on Southampton Island were able to maintain a higher quality winter diet because of a greater availability of lichens.

The greater severity of the second winter was reflected in lower values for all fat depots. In both winters depth of back fat, mass of kidney fat and percentage femoral fat were lower for Coats Island females. Based on comparing late winter with fall gastrocnemius muscle weights, muscle was catabolized to a greater extent during the second winter. For Coats Island, the fall to late winter difference was —6.5% and —13% for the first and second winters; for Southampton Island females it was —4% and —10% respectively. Coats Island caribou attempted to compensate for low winter diet quality by increasing the volume of digesta in the reticulorumen. Late winter full reticulorumen weight was 19 - 21% of whole body weight on Coats Island and only 10 - 12% on Southampton Island. Body composition was similar in the fall on both Islands, except that females on Coats Island tended to be slightly fatter. Calves on Coats Island depleted virtually all fat depots by late winter in both years, with femoral fat levels of 2% and 0% in 1983 and 1984 respectively; muscle was catabolized to the extent of 28% and 39%. For the single calf collected on Coats Island in late winter 1983, gastrocnemius muscle weight was 26% greater than the mean found for four calves collected on Coats Island in the fall, and some dissectable fat still remained in the carcass (0.69 kg).

Analysis of linear measurements of adult females showed that caribou on Coats Island were smaller than Southampton Island caribou. Calves collected on Coats Island were also smaller than the calf collected on Southampton Island. Caribou on Coats Island acheived less of their growth potential than genetically related caribou on Southampton Island. Population dynamics also differed, with sporadic high winter mortality occurring on Coats Island, but no reported deaths due to starvation on Southampton Island. On Coats Island overwinter losses occurred at different densities and hence were density independent, resulting from snow accumulation and a sparse food supply. As caribou density increases on Southampton Island we predict that grazing will reduce lichen availability (a density dependent process), leading to an ecological state similar to Coats Island.