

Population dynamics of the Central Arctic herd, 1975-1981

K.R. Whitten & R.D. Cameron

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The Central Arctic caribou (*Rangifer tarandus granti*) herd (CAH) ranges on Alaska's Arctic Slope in the vicinity of the Trans-Alaska Pipeline Corridor and Prudhoe Bay Oilfield. In 1975 the CAH was identified as a distinct subpopulation. By 1978, the herd numbered about 4 620 adults; the adult sex ratio was unusually high — a minimum of 1 bull per cow. A census conducted in 1981 indicated continued herd growth to an estimated 6 660 adults, with a decline in the adult sex ratio to about 80 bulls/100 cows. Yearling recruitment averaged 22 % between 1978 and 1981. Actual herd growth was approximately 13 % per year, implying an annual adult loss of 9 %. Factors affecting this high rate of increase are discussed, as are the inherent difficulties in obtaining reliable population data, even from an intensively surveyed caribou herd.

K.R. Whitten & R.D. Cameron, Alaska Department of Fish and Game, 1300 College Road, Fairbanks, Alaska 99701, U.S.A.

1. Introduction

The Central Arctic caribou herd (CAH) inhabits the region surrounding Prudhoe Bay and the Trans-Alaska Pipeline on Alaska's Arctic Slope (Cameron & Whitten 1979). Despite changes in range use patterns resulting from petroleum development (Cameron & Whitten 1980), ample alternative range remains available and the herd is increasing. This report deals with population dynamics of the CAH between 1975 and 1981.

2. Methods

CAH distribution and sex/age composition were examined regularly from 1975 through 1981. All surveys (Cameron & Whitten 1979, 1980) were conducted by helicopter. Groups of less than about 30 caribou were counted directly from the air. Otherwise, we landed nearby and used binoculars or a spotting scope to count and classify caribou. Sex/age classification was based on external genitalia and body size/morphology.

Minimum herd size was estimated during the postcalving period when most of the herd was aggregated in a few large, discrete groups. In 1978, the size of each aggregation was estimated from the air, followed by a direct count from the ground. In 1981, groups were either directly counted or photographed and counted later.

3. Results

3.1. Population composition and productivity

Proportions of males and females varied widely among seasons within each year, and also within a

season between years (Table 1), primarily due to variable distribution of males and females among the count areas. Bulls were generally distributed farther south than cows during all seasons (Cameron & Whitten 1979). Therefore, bulls were underrepresented in surveys of the coastal calving and postcalving ranges. Attempts to obtain an accurate adult sex ratio were also frustrated by anomalies in local caribou distribution. Caribou were often evenly distributed over most of the coastal tundra during fall, but were concentrated along floodplains in the foothills and mountains. Since fall survey routes were along drainages, the southern groups were disproportionately counted; thus, bulls were overrepresented. During fall 1976, for example, 135 bulls/100 cows were observed along the survey route; however, there were 400 bulls/100 cows in the foothills and only 60 bulls/100 cows on the coastal plain. Weighting these ratios according to the estimated proportion of caribou in each area yielded a sex ratio of approximately 100 bulls/100 cows. This unusually high ratio (Bergerud 1978) could have resulted from an influx of caribou from the adjacent Western Arctic and/or Porcupine herds in the late 1960's and early 1970's. If so, the bull: cow ratio should have declined in the mid- to late 1970's as older male cohorts began to die of old age. Indeed, the preponderance of very large bulls observed in 1976 was no longer apparent by 1981. The adult sex ratio in fall 1981 was estimated at 81 bulls/100 cows, and no geographic variation was apparent.

Misclassification of yearlings and young bulls as cows probably occurred during midsummer. However, during

Table 1. Sex and age composition of the Central Arctic caribou herd, 1976—1981.

Year and season	Cows %	Calves %	Yrlgs %	Bulls %	Total
1976					
Postcalving	41	18	6	35	1 389
Rut	36	17	3	44	1 223
Spring	48	16	— ^a	36	889
1977					
Postcalving	41	23	6	30	3 847
Rut	32	20	10	38	628
Spring	56	23	—	21	351
1978					
Calving	44	36	17	1	964 ^b
Postcalving	45	25	7	23	4 043
Rut	36	23	7	34	816
Spring	40	24	—	36	499
1979					
Calving	46	37	11	3	1 923 ^b
Spring	36	18	—	45	1 309
1980					
Calving	45	31	22	2	787
Rut	33	17	6	44	1 728
Spring	37	13	—	50	998
1981					
Calving	46	40	10	4	3 337
Postcalving	39	25	8	28	4167
Rut	41	26	—	33	1 712

^a "Long" yearlings classified as adult cows or bulls.

^b Total includes some unclassified adults.

calving, fall, and spring surveys, smaller groups were classified at close range by helicopter, and sex identification was positive. Results from those surveys provided the best estimates of calf survival. Initial productivity and oversummer survival were high for the 1977—1980 calf cohorts. Overwinter calf survival was excellent from 1977 through 1979 and moderately good in the 1976 and 1980 cohorts (Table 1).

3.2. Population size and rate of growth

The CAH numbered about 5 000 total caribou in mid-summer 1975 (Cameron & Whitten 1979). During postcalving aggregation in 1978, the herd was estimated at 5 300—5 800. No census was attempted in 1979 or 1980.

The total count in summer 1981 was 8 537 caribou, substantially higher than in 1978. Neither the 1978 nor

the 1981 count was an accurate census of the entire herd, however, because caribou dispersed inland were not counted. Difficulty in obtaining accurate composition data and/or the rapid dispersal of postcalving groups into peripheral areas precluded use of either standard or modified aerial photo-direct count-extrapolations (Davis et al. 1979). Thus, total population size could only be subjectively extrapolated. We conservatively estimated 6 000 caribou (4 620 adults) in 1978 and 9 000 (6 660 adults) in 1981.

The nearly 50 % increase in the number of adult caribou in only 3 years can be accounted for by excellent productivity and recruitment. Assuming adult mortality of 7—13 % per year in a lightly exploited population with moderate wolf predation (Bergerud 1978), recruitment would have been between 15 and 28 % per year. Starting with an estimated 4 620 adults and 100 bulls/100 cows in 1978, and assuming 90 bulls/100 cows in 1979 and 80 bulls/100 cows in 1980, the 1981 adult population would have been between 5 926 and 7 244. Similarly, calculating backward from 6 660 adults in 1981 yields 4 246—5 191 adults in 1978. Both sets of calculated values bracket the actual estimates. The 13 % annual increase and 22 % average recruitment in the CAH between 1978 and 1981 indicate annual adult losses of about 9 %.

4. Conclusions

Adult sex ratios in the CAH proved difficult to establish in spite of frequent composition counts based on 5—67 % of the herd. Yearling classification was unreliable; consequently, rates of recruitment were calculated using late winter calf counts. Recruitment was undoubtedly good, and the CAH surely increased between 1975 and 1981. From 1978 to 1981, the observed growth rate of the CAH was about 13 % per year. Potential increase, based on empirical values of mortality, was even higher. Emigration of individual caribou from the study area (Whitten & Cameron, in press) could partially account for the disparity between potential and measured growth. Clearly, accurate rates of mortality, additional data on caribou emigration, and/or more accurate censuses are required to more fully understand dynamics of the CAH.

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