POPULATION GROWTH AND MOVEMENT PATTERNS OF THE NELCHINA CARIBOU HERD

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ABSTRACT--The Nelchina caribou herd of south central Alaska has reached two peaks in the last 100 years, one in the mid-1800's and another in the early 1960's. The herd declined for about 70 years following the first peak, and then increased at a geometric rate from 1947 to 1962. As caribou (*Rangifer tarandus granti*) numbers increased, the frequency of shifts in range use and seasonal splitting increased, and the herd expanded its range. Conversely, as numbers decreased, the area occupied by the herd contracted toward the traditional calving area. The time between successive population peaks plus a relatively small area of occupancy no doubt allowed optimum recovery on many previously overused ranges. At the present time the population is declining. Distribution and movement patterns can be used as indicators of the relative abundance of caribou herds.

The Nelchina herd of south central Alaska ranges over the Copper River and Upper Susitna River basins and adjacent mountains. This is a diversified area of rugged, glacier-capped mountains, rolling uplands and broad forested plains. Four mountain ranges form the herd boundaries: the Alaska Range on the north, the Chugach Mountains on the south, the Talkeetna Mountains on the west and the Wrangell Mountains on the east. Calving occurs on the eastern slopes of the Talkeetna Mountains. Like other herds of Alaskan caribou (*Rangifer tarandus granti*) movements of the Nelchina herd center on traditional calving grounds regardless of population status. This herd is not isolated from neighboring populations and has at times shared winter ranges with portions of the Delta, Fortymile, McKinley and Mentasta herds. This paper describes the population changes and spatial relationships of this caribou herd from the mid-1800's to the present time.

PROCEDURES

Between 1948 and 1958, the U. S. Fish and Wildlife Service provided regular caribou census data to the Territorial Government. After Alaska achieved statehood in 1959, the responsibility for caribou research was assumed by the State of Alaska Department of Fish and Game.

Population estimates were obtained by aerial transect sampling from 1948 to 1955 (Watson and Scott, 1956), by extrapolation from 1956 to 1961 (Skoog, 1968), by aerial stratified random sampling in 1962 (Siniff and Skoog, 1964) and by aerial photo-direct count techniques in 1967 (Hemming and Glenn, 1968).

For the period prior to 1948, information concerning the general distribution of the Nelchina herd was gleaned from the literature and from interviews with long-time bush pilots, guides and local residents. In recent years seasonal movements were recorded by aerial surveys at monthly intervals. The location, direction of movement, trail patterns and approximate numbers of caribou were recorded on topographic maps at a scale of

1:250,000. Annual movements were determined by summarizing data from monthly surveys.

RESULTS AND DISCUSSION

Even though the historical record is fragmentary, it was possible to piece together the early population status and range of the herd. Sometime between 1848 and 1885, the herd was very abundant and ranged from the Talkeetna Mountains eastward over the entire Copper River Basin (Skoog, 1968). Suitable winter habitat must have been well saturated with caribou because even marginal areas, such as the Chitina River Valley that regularly receives heavy accumulations of snow, were utilized (Glenn and Abercrombie, 1899; Allen, 1900; Rohn, 1900). By 1885 only a few caribou moved as far as the Chitina and Copper River Valleys (Allen, 1900). At the turn of the century it was obvious that the herd was decreasing, and the remaining animals were found in ever closer proximity to the Talkeetna Mountains (Glenn and Abercrombie, 1899; Glenn, 1900; Mendenhall, 1900; Osgood, 1901).

The status of the Nelchina herd during the early 1900's is somewhat confusing because of the seasonal influx of caribou from the then abundant McKinley and Fortymile caribou herds (Skoog, 1968). However, remnants of the Nelchina herd apparently remained mostly within the Talkeetna Mountains from 1900 to 1945 (Osgood, 1901; Capps, 1927; Alaska Game Commission, 1925-1948). The first aerial count was made in November, 1948, but the accuracy was questionable due to uneven distribution of caribou and the inexperience of observers. Initial tallies resulted in a population estimate of 4,500 to 5,000 animals. However, continued refinement of aerial census techniques in the succeeding seven years revealed that the original estimate probably accounted for only about one-half of the animals present. Extrapolation backward from 1955 to 1948 yielded a revised population estimate of about 10,000 caribou for 1948 (Watson and Scott, 1956).

In 1950 the herd occupied an area of about 16,000 km^2 (10,000 mi^2) and had begun to increase (Table 1).

TABLE 1.--Population estimates of the Nelchina caribou herd.

Year	Herd size**	Source
1948	10,000	Watson and Scott, 1956
1956*	45,000	Watson and Scott, 1956
1957	48,000	Skoog, 1968
1958	53,000	Skoog, 1968
1959	59,000	Skoog, 1968
1960	64,000	Skoog, 1968
1961	69,000	Skoog, 1968
1962*	71,000	Siniff and Skoog, 1964
1967*	46,000	Hemming and Glenn, 1968

*Years when census was conducted.
**All estimates exclude calves.

The cow-calf segment began to split seasonally into two or more groups after 1955. In succeeding years the range of the herd expanded as numbers increased, and by 1960 the herd utilized an area of about 52,000 km^2 (20,000 mi^2). As a result of field studies in 1961 and 1962 Skog (1963a) stated, "The range is beginning to show signs of deterioration and

there is some indication that carrying capacity has been reached."

Shifts in winter range use became increasingly common while areas of summer use remained essentially unchanged. Signs of emigration were observed each winter from 1962 to 1965 (Skoog, 1963a; Skoog, 1963b; Skoog, 1964; Lentfer, 1965; McGowan, 1966; Glenn, 1967). The annual distance traveled by the Nelchina herd increased from 600 km to 1,580 km (370 mi to 980 mi) between 1955 and 1964 (Skoog, 1968).

The census of 1967 revealed that the population had started to decline. Even though no census has been completed since 1967, field studies have suggested a continuous downward trend.

In order to analyze the relationship between caribou numbers and patterns of movement, I constructed a population growth curve (Fig. 1). The size of the Nelchina herd

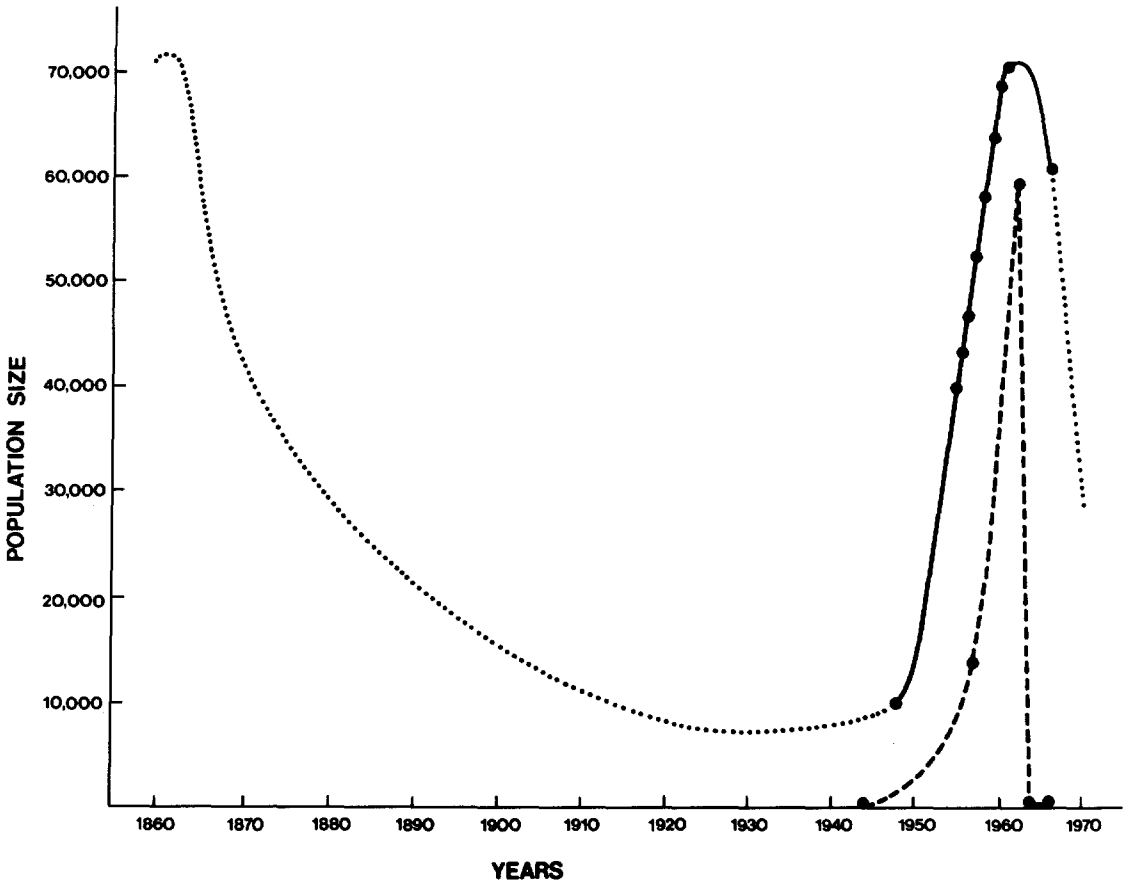

Fig. 1.—Population growth of the Nelchina caribou herd. The solid line represents documented population growth. The dotted line represents assumed population growth. *Lower curve*, population growth curve (dashed line) of the St. Matthew Island reindeer herd (from Klein, 1968).

in the mid-1800's could not be determined. However, due to the similarities of herd distribution in the 1860's and 1960's, i.e., caribou saturated suitable habitat in the Copper and Susitna River basins during both periods (Figs. 2 and 3), it was assumed that total numbers must have been quite similar.

One of the most interesting aspects of the population growth curve is the time between

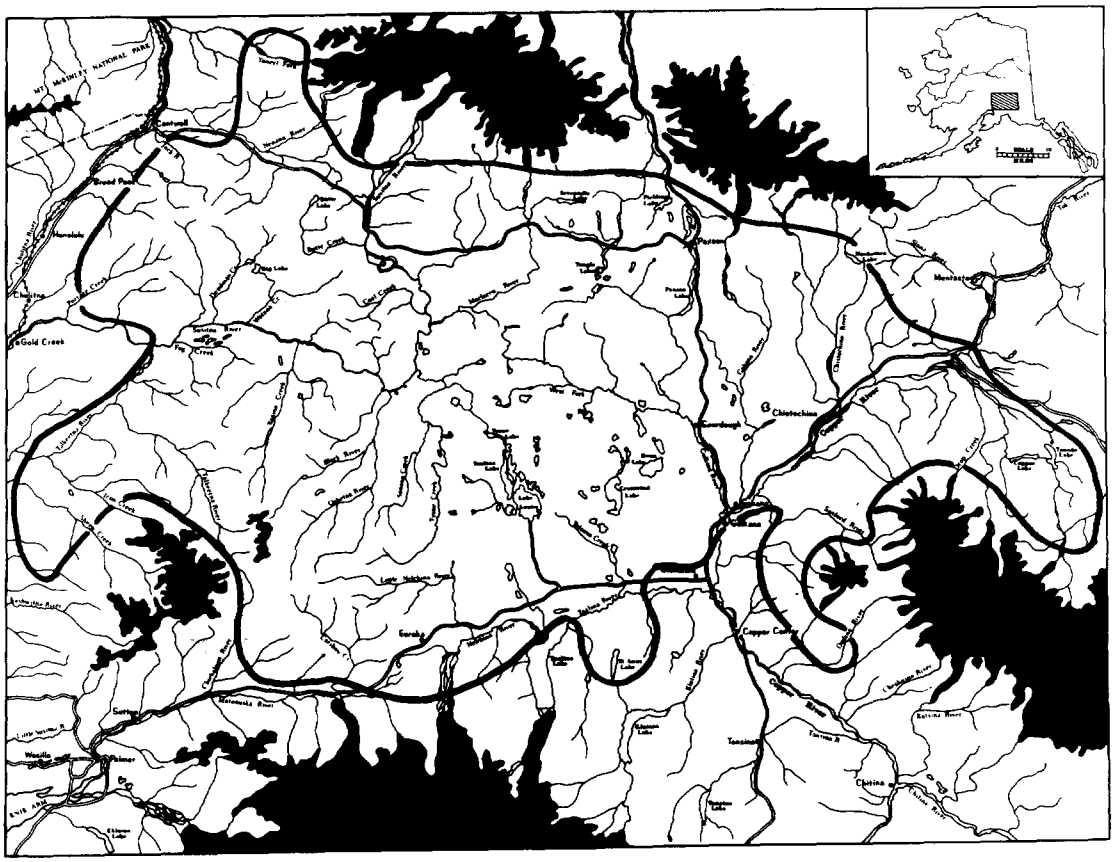

Fig. 2.——Range of the Nelchina caribou herd 1960-1970.

the two peaks. In the lower portion of the curve the population was relatively small and vast portions of the Copper River Basin were unoccupied by caribou (Fig. 4). With caribou distribution restricted for over 50 years, major portions of the range undoubtedly recovered from previous periods of heavy use. Palmer and Rouse (1945) concluded that 20 to 40 years are required for depleted lichen ranges to return to a robust condition.

Caribou appear to be unique among cervids in demonstrating oscillations with a time periodicity approaching 100 years. This is not to imply that caribou have a fixed cycle frequency. Any caribou population may be subject to random environmental factors that could cause the oscillations of the population to vary in both wavelength and amplitude. For example, the seasonal influx of large numbers of caribou from the McKinley and Fortymile herds in the early 1900's may have delayed the increase of the Nelchina herd by altering plant succession on portions of its range. Such shifts into vacant ranges of adjacent populations have also occurred in other areas. The Porcupine caribou herd of the eastern Brooks Range shifted into the range of the Arctic caribou herd in the early 1900's (Harrison, 1908; Porsild, 1945). This occurred at a time when the Arctic herd was greatly reduced and remained throughout the year in a small portion of the western Brooks Range (Birch, pers. comm.; Skoog, 1968). Around 1920 the Porcupine herd shifted eastward and later as the Arctic herd increased it expanded into the central Brooks Range again (Hemming, 1971).

With vast areas of productive caribou habitat, population growth and dispersal can proceed for long periods of time. In areas where the total available habitat is limited, initial

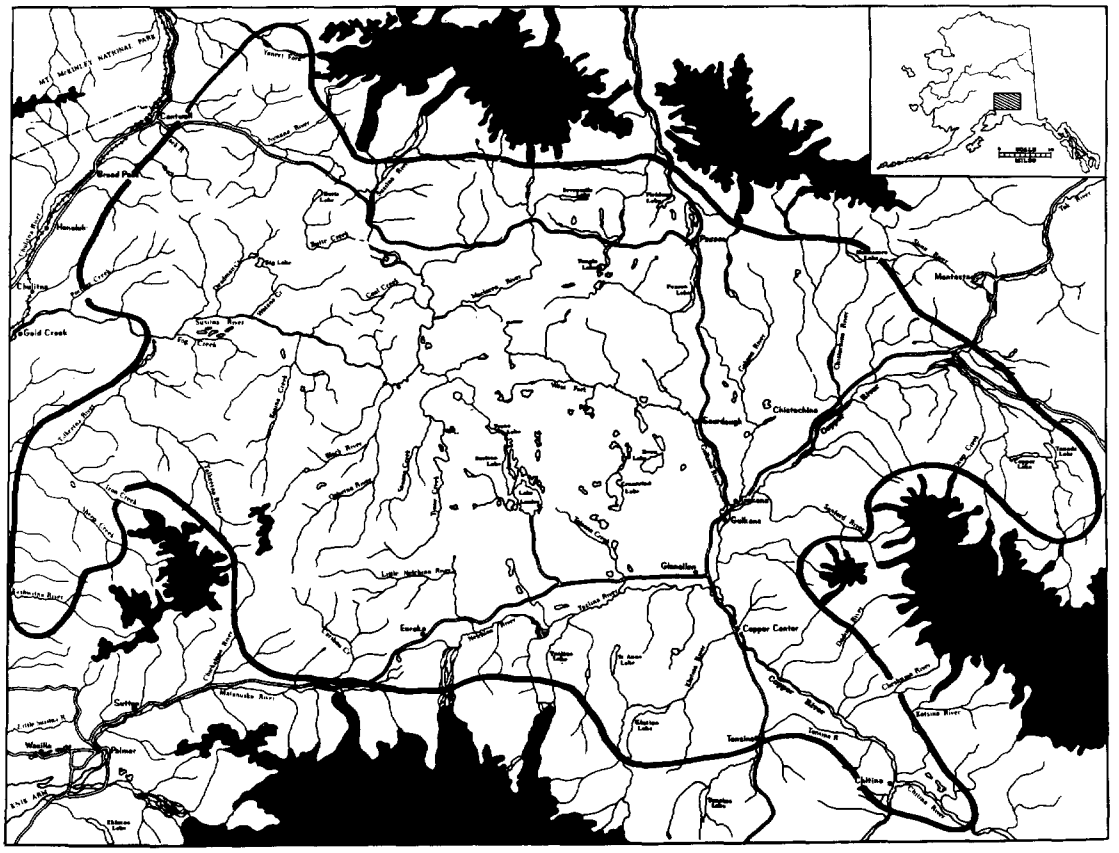

Fig. 3.—Approximate range of the Nelchina caribou herd 1848-1885. Prepared from descriptions of Glenn and Abercrombie (1899), Allen (1900), Rohn (1900) and Skoog (1968).

population growth can be expected to be quite similar to that of caribou herds with more open ranges, as suggested in Figure 1. However, if saturation time is short because of small areas of suitable habitat and rigid boundaries, social and feeding pressures can be relieved only temporarily by mechanisms of seasonal segregation, dispersal and emigration.

A classic example of the response of reindeer to a restricted range was described by Klein (1968) from his studies of an introduced reindeer population on St. Matthew Island in the Bering Sea.

St. Matthew Island has a land area of only 332 km^2 (128 mi^2) compared with the Copper River-Upper Susitna River basins that encompass over 52,000 km^2 (20,000 mi^2) and the latter contains many potential overflow areas. Twenty-nine reindeer were introduced to St. Matthew Island in 1944. The herd reached a peak of 6,000 in the summer of 1963 and a die-off the following winter reduced the herd to 50 animals. The St. Matthew reindeer population growth curve (Fig. 1) illustrates the similarity of initial herd growth with that of the Nelchina herd. A similar pattern of population growth and decline was reported on the Pribilof Islands by Scheffer (1951).

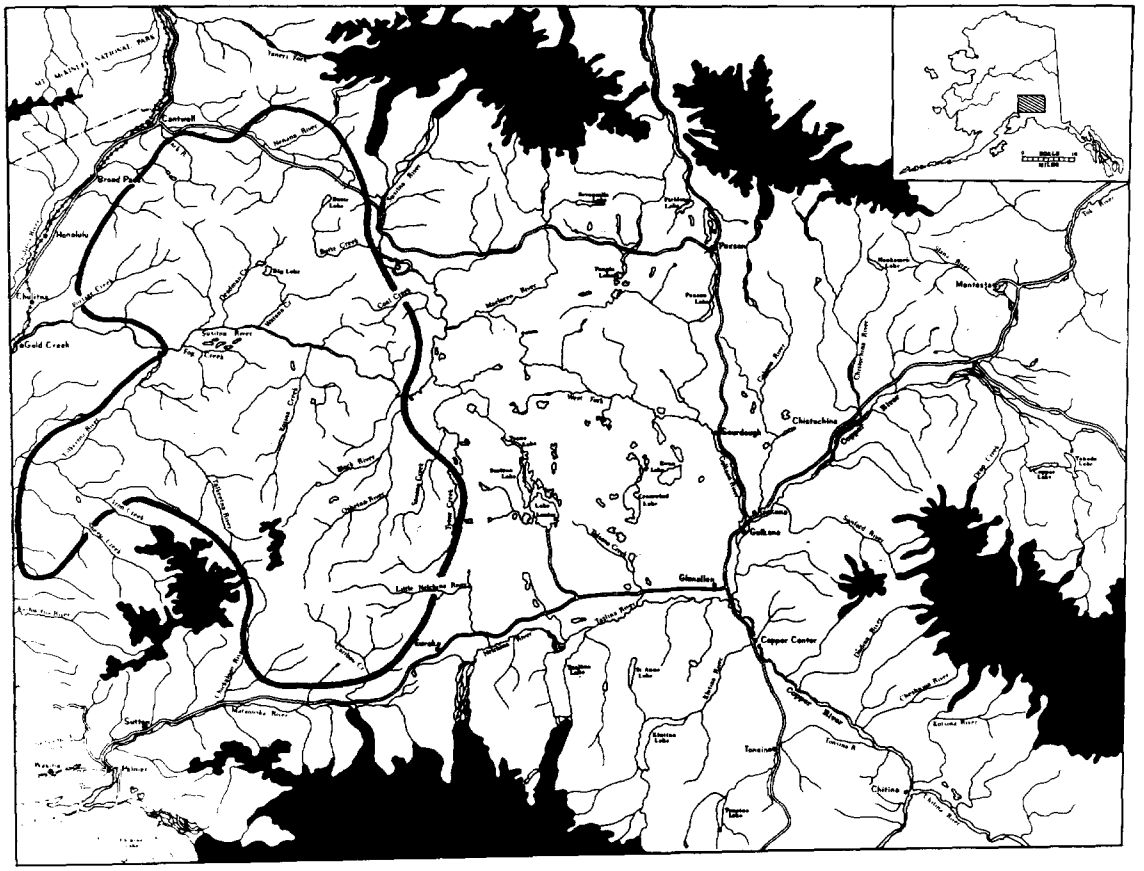

Fig. 4.——Approximate range of the Nelchina caribou herd 1900-1945. Prepared from descriptions of Glenn (1900), Mendenhall (1900), Osgood (1901), Capps (1927) and Alaska Game Commission (1925-1948).

CONCLUSIONS

Movements of the Nelchina caribou herd during the most recent period of increase and decrease support the hypothesis that caribou have become adapted to alpine and arctic tundra habitat through the mechanism of long-term oscillation and flexible 'home range' that allows adequate time for recovery of slow-growing forage species between periods of caribou abundance.

The ultimate size reached by a caribou herd depends on the amount of suitable habitat available and the status of adjacent populations, e.g., if the Delta, Fortymile and McKinley caribou herds would have had abundant populations in the early 1960's, the Nelchina herd may not have reached a peak of 69,000 animals.

The nomadic habit of caribou is of value in taking it from areas where food is scarce and thereby increasing its chances of finding areas where food is abundant. The mechanisms of emigration and dispersion function adequately where unlimited alternative food sources are available. The ability to move has an extremely important modifying influence on population growth. However, when range carrying capacity is exceeded, the population begins to decline as we have observed twice in the Nelchina herd during the last 100 years.

Assuming the Nelchina herd is typical of other herds on the Alaska mainland, the total range occupied by a herd during any given year should reflect the relative abundance of the population.

The current decline of the Nelchina herd appears inevitable and natural, but the developments of man may control the magnitude of oscillations and movements in the future.

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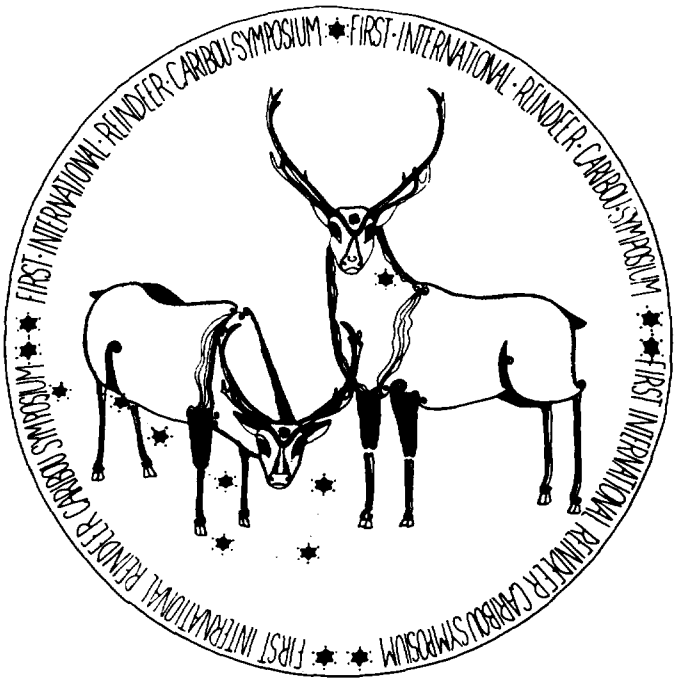

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