

Population dynamics of the Taimyr reindeer population

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Abstract: The Taimyr herd of wild reindeer (*Rangifer tarandus tarandus* L.) is one of the three largest herds of wild *Rangifer* in the world, and numbered about 600,000 in 1993. The herd grew continuously from 1959 to 1990, and is now stable due primarily to intensive commercial harvesting along the Khatanga River. Meat from the commercial harvest is processed and sold in population centers in the northern Krasnoyarsk region, particularly Norilsk. The herd has expanded its range to about 1.5 million km², but movements to the southwestern portion of the winter range may have been impeded by pipeline, road and railroad construction, and winter shipping of ore on the lower Yenisey River.

Key words: commercial harvest, density, hunting, industrial development, movements, Russia

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Introduction

The Taimyr population of wild reindeer, the largest in Eurasia, has been studied for about 30 years. Since 1959, 18 censuses have been conducted by the same specialists. The age structure, sex ratio, spatial distribution, migrations, fecundity and rate of population increase have also been studied. In contrast to most herds of caribou in North America, the Taimyr herd is intensively managed for meat production and is commercially harvested. In this paper, we review the population dynamics and movements of the herd in relation to intensive harvest and industrial development.

Population size and harvest

Population size of the Taimyr herd was estimated from aerial surveys flown with fixed-wing aircraft (Antonov AN-2 biplane) during the July period of maximum aggregation from 1959 to 1993. When groups were suitably aggregated, whole groups were photographed in black and white and the entire group was counted. If aggregations were dispersed, group sizes were estimated without photography by extrapolation from line transects flown over the areas covered by the loose aggregations. Sizes of the loose aggregations were estimated independently from two aircraft which flew transects at right angles to each other.

From 1959 to 1993 the Taimyr herd grew from about 100,000 to about 600,000 (Table 1). From 1959 to 1972 the herd was lightly hunted and grew

at a mean annual rate of about 11%. Subsequently, intensive commercial harvest reduced the rate of population growth and eventually stabilized the herd by 1993 (Table 1). Most harvest occurred along the Khatanga River in August and September by commercial hunting cooperatives. Most of the meat was flown to Norilsk by helicopter to be sold or processed into meat products. Despite the annual harvest of 50,000-100,000 wild reindeer from the Taimyr herd, and up to 20,000 domestic reindeer, the Norilsk area is a net importer of meat and meat products. Meat continues to be relatively expensive. Antlers and skins of harvested reindeer have also been sold. Klein & Kolpashchikov (1991) previously discussed aspects of commercial harvesting.

Movements and herd distribution 1959-1993

Movements and distribution of reindeer were documented from aerial surveys in spring, summer and autumn, and from reports of hunters, reindeer herders and others. Some colored visual collars have been deployed at lake and river crossings, but radio-collar technology has not been available.

During the 1950s and 1960s, the herd primarily wintered in the mountain tundra of the central Putorana region south of the Taimyr Peninsula (Fig. 1). As the herd increased it also expanded its range. Beginning in 1970 Taimyr reindeer began to invade the northern portion of Evenkia and reached as far south as 65° N latitude by the late 1980s. The

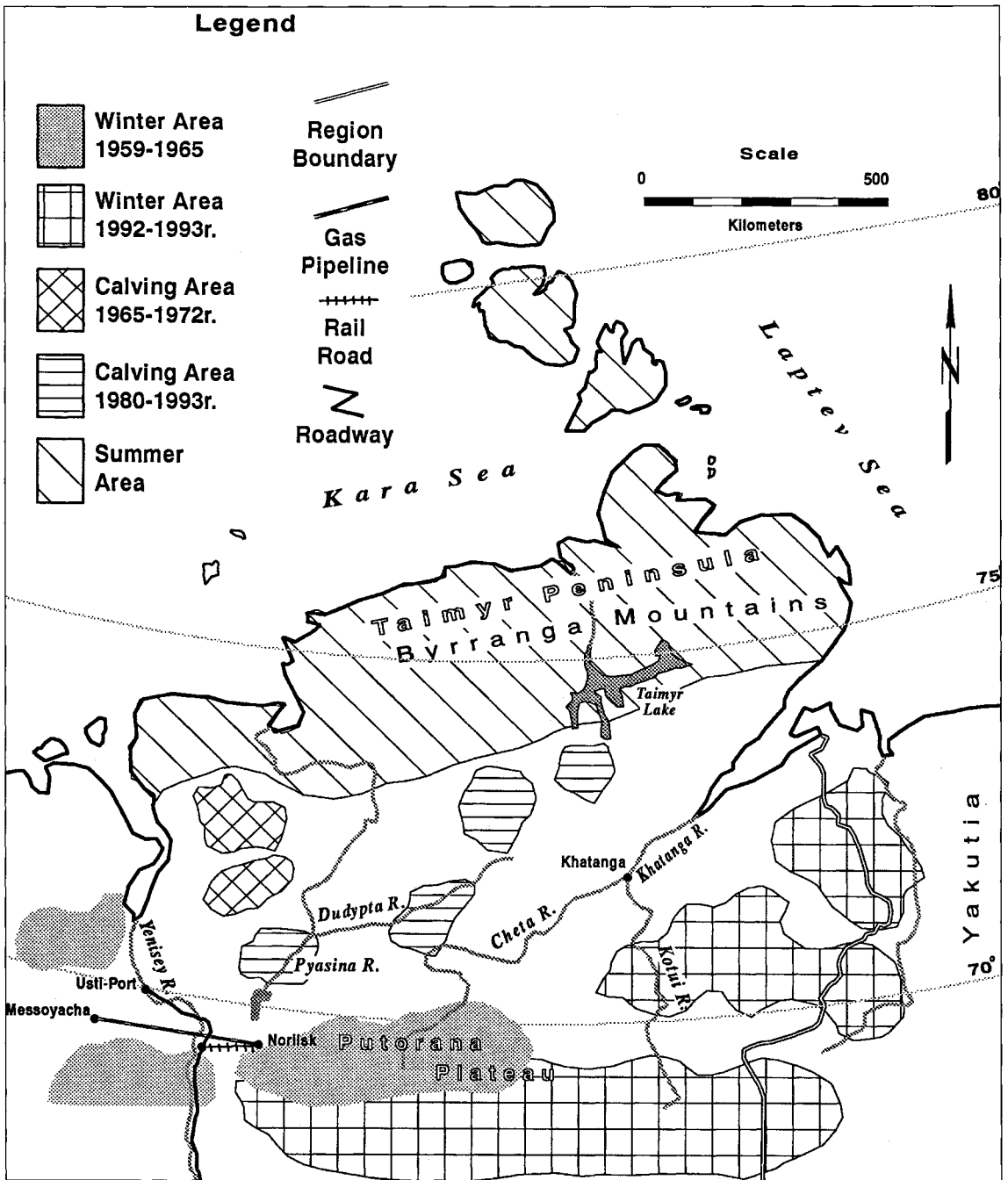


Fig 1. Seasonal ranges of the Taimyr herd.

herd also began to use wintering areas to the southeast, south and southwest of the Putorana Plateau, including northwestern Yakutia and areas along the Yenisey River. However, winter distribution of reindeer may have been influenced during the 1970s by construction of the Messoyacha-Norilsk gas pipeline and other associated pipelines, and roads near Norilsk. In addition, in 1980, winter

shipping of ore from Norilsk began on the lower Yenisey River. Pipelines and roads were constructed without allowance for reindeer passage, and the shipping left open channels in the river ice which resulted in deflection of reindeer movements and direct mortality. As a result, the southwest portion of the winter range may be largely unavailable to the herd. Presently the largest migrations occur in a

Table 1. Population size, rate of increase and harvest of Taimyr wild reindeer, 1959-1993.

Year	Estimated population size ^a (thousands)	Mean annual finite rate of increase (λ) ^b	% Harvested ^c
1959	100	—	—
1966	250	1.14	—
1969	300	1.063	2.8
1972	386	1.088	5.0
1975	449	1.052	8.9
1978	475	1.019	12.3
1980	485	1.01	—
1981	510	1.054	14.5
1982	525	1.03	—
1983	540	1.029	—
1984	575	1.065	15.6
1985	590	1.026	—
1986	595	1.009	15.0
1988	570	0.979	—
1990	625	1.047	15.9
1993	600	0.987	—

^a Data from aerial censuses.

^b Mean annual rate of increase from previous census.

^c Data from harvest estimates primarily during commercial harvesting along Khatanga and Cheta Rivers.

southeast-northwest direction across the Khatanga River basin.

During the 1990s the Taimyr herd was ranging over approximately 1.5 million km², but range size has not expanded as fast as population size, so density has increased. In addition, as herd size increased the calving area has expanded and shifted to the east and southeast (Fig. 1). The shift in calving areas may also have been influenced by acid rain fallout from Norilsk, although in recent years a new calving concentration has occurred along the lower Pyasina River near Norilsk (Fig. 1).

Age and sex structure of the population

Recruitment into the Taimyr herd has remained relatively stable (Table 2) although the mean age of the population became younger in response to the intensive harvesting that began in the early-mid 1970s. Based on cementum age, during 1981-1983 the oldest females were 16-19 years old, but during 1987-1990 the oldest female was 14. After intensive hunting began in the early 1970s, it was rare to find males older than 10 years, although the sex ratio of adults has not changed appreciably (Table 2). The primary sex ratio slightly favors males, but sometime

Table 2. Age structure and sex ratio of the Taimyr wild reindeer, 1972-1993.

Year	July ^a % calves	Aug-Sep ^b % yearlings	Aug-Sep ^b males:100 females > 3 yrs
1972	21	20	42
1975	23	23	53
1978	23	20	43
1980	23	22	53
1981	26	15	50
1982	21	21	56
1983	26	17	63
1984	24	23	53
1985	24	26	45
1986	22	29	53
1988	25	27	45
1990	23	30	56
1993	26	22	40

^a From July census.

^b From age structure of harvest.

Table 3. Fecundity in female wild reindeer harvested from the Taimyr herd in March and April.

Age group	Percent fecund	
	1981-1983 (n = 1,491)	1987-1990 (n = 1,149)
2	46	19
3-6	82	89
7-9	70	87
10+	69	80
mean	75	83

during the first two years of life it begins to favor females.

Fecundity

Fecundity rates in the Taimyr herd were studied by examining harvested females in March and April during 1981-1983 and in 1987-1990. Females usually begin producing calves at age 3, but fecundity in this age class was quite variable (Table 3). The productivity of individual generations of females varies, and many females fail to reproduce each year. Overall, an average female produces about 4-5 calves during her reproductive period, but some produce 10-11. As the population has increased fewer 2-year-olds have been fecund, possibly indicating that nutrition has been suboptimal in recent years (Table 3).

Because the Taimyr herd is very large in relation to numbers of wolves, bears and other predators, the size of the calf cohort in fall is primarily related to variations in the annual fecundity rate particularly among 3-year-olds.

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