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Comparative habitat selection by muskoxen introduced to northeastern Alaska and the Taimyr Peninsula, Russia

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Abstract: Muskoxen *(Ovibos moschatus)* introduced to formerly occupied areas in northeastern Alaska (70°N) in 1969 and 1970, and the Taimyr Peninsula (75°N) in 1974 and 1975 increased in number (exceeding 20 %/ year in the early years following their establishment), and have expaned into available habitats. Vegetation of the two areas share many similarities, although richness of vascular plant species is greater in Alaska (350) than in the Taimyr (230). Seasonal partitioning of range use is similar in both areas with low-lying tussock tundra being used primarily from summer through early to mid-winter. By late winter, when snow accumulation in low areas and on lower slopes of hills limits access to forage, muskoxen concentrate activity on drier ridge tops and river and coastal bluffs with little snow accumulation. Riparian habitats appear to receive greater year round use in Alaska than in the Taimyr.

Key words: muskox, habitat, Siberia, Alaska, introductions

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Introduction

Muskoxen were present in northern Alaska until the late 1800s when the last survivors were killed (Harington, 1970). Muskoxen were reestablished in the wild in Alaska in 1935–36 when animals derived from Greenland were released on Nunivak Island. In 1969 and 1970 a total of 65 muskoxen from the Nunivak population was translocated to northeastern Alaska (70°N) (Klein, 1988). As a result of this introduction, a population was established that now numbers at least 600 and has expanded along the Arctic Coastal Plain and northern foothills of the Brooks Range over 50 km into Canada on the east and to the Sagavanirktok River on the west (Fig. 1). One small disjunct group of muskoxen has apparently established near the Colville River, another 70 km to the west.

In the Taimyr of northwestern Siberia, muskoxen were present into the Holocene until at least 2800 BP (Vereshcagin, 1959). Ten muskoxen from Banks Island in Canada in 1974 and 20 from Nunivak Island in Alaska in 1975 were translocated to the Bikada River region (75°N) of the Taimyr Peninsula (Fig. 1). The population in the Taimyr now numbers about 500 animals and is distributed over 60,000 km^2, with the highest concentrations in the southern drainages of the Byrranga Mountains. The introduced populations in northeastern Alaska

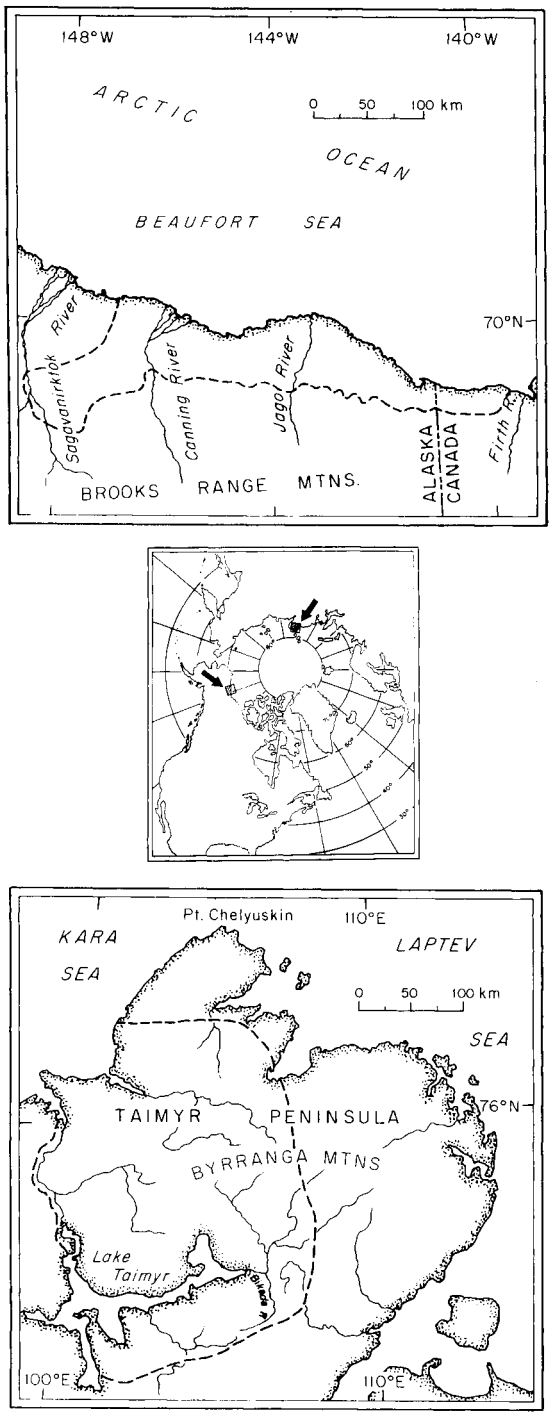

Fig. 1. Location and extent of distribution of introduced muskox populations in northeastern Alaska and the Taimyr Peninsula.

and the Taimyr have increased at rates exceeding 20 % in the early years following their establishment (Jingfors and Klein, 1982; Yakushkin and Barr, 1988) and have expanded into available habitats throughout their distribution. Rates of increase have declined as population densities have increased. In the Taimyr, where muskox densities are highest, their habitats, although further north than those in Alaska, are more continental in location and are sheltered from Arctic Ocean influences by the Byrranga Mountains.

Habitat selection

Seasonal patterns of use of vegetation types in the Taimyr and northeastern Alaska are shown in Table 1. Vegetation of the two areas share many similarities, although richness of vascular plant species is greater in northeastern Alaska (350+ species) (Robus, 1981; O'Brien, 1988; J. Christiansen, pers. com.) than in the Taimyr (230) (Pospelova and Orlov, 1987). Low-lying moist or wet habitats are dominated by *Carex aquatilis* ssp. *stans* and *Eriophorum* spp. (primarily *E. angustifolium* and *E. vaginatum* in Alaska and *E. polystachyon* in the Taimyr) with *Salix pulchra* also abundant. In Alaska, *E. vaginatum* continues to be important in moist areas on slopes and uplands, whereas in the Taimyr *Carex bigelowii* ssp. *arctisibirica* and several grass species are of importance in such sites. *Dryas*-forb communities dominate dry ridge tops and moraine ridges in both areas.

Seasonal partitioning of range use by muskoxen is similar in both areas with low-lying tundra being used primarily from summer through early to mid-winter. By late winter, when snow accumulation in low areas and on lower slopes of hills limits access to forage, muskoxen concentrate activity on drier ridge tops and river bluffs with little snow accumulation. In Alaska, coastal bluffs are also used in winter. Riparian willows, except close to the coast, are more robust and taller growing in Alaska. Microhabitat units, such as rich meadow slopes in small stream valleys and drained lake beds, are heavily used in spring and summer, respectively, where available.

Primary forage types are similar in both the Taimyr and northeastern Alaska and include willows, sedges, grasses, and legumes. Grasses may be somewhat more important in the Taimyr than Alaska. The abundance of legumes in both areas, including a diversity of species, is perhaps unique to arctic areas.

Table 1. Major vegetation types and their seasonal selectivity by muskoxen in the Taimyr and northeastern Alaska (use patterns in Alaska based on Jingfors, 1980; Robus, 1981; O'Brien, 1988; Wilson and Klein, 1991; Biddlecomb and Klein, 1992; and observations by the first author; use patterns in the Taimyr based on Rapota, 1984 and observations by the second and third authors).

Vegetation type	Season of use	Forage value
PRIMARY TYPES		
Dry ridge tops		
Dominated by *Dryas* spp. grasses, and forbs.	Late winter and early spring when snow restricts access to forage in less windblown areas. In summer as insect relief habitat in Taimyr.	Low plant productivity and forage quality, limited distribution.
Moist upland slopes		
Upland polygonal soils dominated by moss and dwarf shrubs with some grasses and sedges.	Occasional use except more heavily used in spring, especially in Taimyr.	Low productivity and forage quality. Limited distribution, especially in Alaska.
Low-lying tussock tundra		
Dwarf shrub-moss-sedge hummocky tundra with *Salix pulchra* and *Eriophorum* spp. abundant.	Winter and spring.	Wide distribution and high forage biomass, moderate quality.
Wet tundra		
Sedge-dominated low-lying tundra, mainly *Eriophorum* spp., *Carex stans (C. aquatilis)*, and *Salix pulchra.*	Important because of its extensiveness but use restricted in summer because of standing water and winter use restricted by snow cover.	Moderate productivity and quality. Total forage biomass high.
Riparian habitats		
Floodpain shrub-graminoid-forb communities. Several willow species, grasses, legumes, and other forbs important.	Summer and autumn heavily used and continuing into early winter. River bluffs with low snow cover important in mid- and late-winter, flood plain becomes unavailable as winter snows accumulate.	High productivity and high quality.
MICROHABITATS		
Meadow slopes		
Stream valleys where *Dryas* spp., *Salix arctica*, grasses, *Carex bigelowii*, and forbs dominate.	Important in spring because of early meltoff of limited snow cover and early greenup, some winter use, especially in Taimyr.	High productivity and high quality.
Drained lake beds		
Dominated by grass and pioneering forbs.	Heavily used in mid-summer where available but of only local importance.	Extremely high productivity and quality beginning about 10 years after drainage.

In the Taimyr, muskoxen make use of mineral licks shown to be rich in sodium (Yakushkin and Orlof, 1986). Although mineral lick use by muskoxen in Greenland (Klein and Thing, 1989) and the Canadian Arctic (Tener, 1954) has been reported, it has not been observed in northeastern Alaska. The Alaska muskox habitats are adjacent to the Arctic Ocean coast, where salt spray on vegetation or the presence of halophytic plants may provide sources of sodium.

Selection of habitats by muskoxen (Table 1) is based first on presence of vegetation types, which are a function of soils available, relief, and microclimate, and secondarily on access in relation to juxtaposition of vegetation types. Low-lying wet areas with a large proportion of surface water are not well used in summer even though sedges of moderate quality are abundant there. In the Taimyr during summer, response to insect harassment has been observed to be a factor in habitat use, although muskoxen are less constrained by insects in their use of habitats than caribou and reindeer (Klein, 1986). In winter, snow cover and its characteristics influence the availability of forage and the energy cost of obtaining it (Wilson and Klein, 1991; Biddlecomb and Klein, 1992).

Habitat selection by the introduced muskox populations in northeastern Alaska and the Taimyr Peninsula as outlined in Table 1 show marked similarities in spite of their wide separation in the polar basin and the latitudinal, climatic, and substrate differences that exist. Use patterns are tied to vegatation types with heavy use made of those vegetation types with high plant productivity. Forage quality seems also to be directly correlated with productivity. Thus, wet sedge tundra with a high aboveground biomass has lower proportional annual vegetative productivity than better drained riparian communities or meadow slopes, and the latter are selected over the former by muskoxen. Snow cover is a major factor governing forage availability. This relationship is a function of terrain relief which directly affects forage availability through the redistribution of snow by wind and indirectly through the effect of varying snow cover on development of the vegetation mosaic (Wilson and Klein, 1991; Biddlecomb and Klein, 1992).

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