

*Expanded abstract*

## Seasonal differences in the distribution and movements of muskoxen (*Ovibos moschatus*) in northeastern Alaska.

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Patterns of distribution and movements of a re-established muskox (*Ovibos moschatus*) population were examined during 1987–90. The study area was located on coastal plain of the Arctic National Wildlife Refuge (ANWR) in northeastern Alaska. I hypothesized that muskoxen wintered in the same areas in consecutive years, that distribution differed between winter and summer, and that home range size and movements were smaller in winter than in summer. The distribution of animals was documented by direct observation of radio-collared muskoxen in 1987–1990. Seasonal movements were determined from locations of satellite radio-collared cow muskoxen from fall 1987 to spring 1990. Each year, an average of 21 radio-collared cows and 3 radio-collared bulls were followed, and 1 to 5 of the collared cows also carried satellite radio-collars (Harris *et al.*, 1990; Reynolds, 1989). Data presented are preliminary results of an on-going study.

In winter (Nov.–Feb.), the Sadlerochit River in the center of the study area was used by the largest number (70–100) of muskoxen during the 3 years of the study. This river had been used by muskoxen during the past 2 decades in winter and in summer (Jingfors, 1980; Reynolds *et al.*, 1987; Robus, 1981; Roseneau and Warbelow, 1974). The Kongakut River to the east was

also an important wintering area for 40–50 muskoxen every year. Mixed-sex muskox groups of muskoxen first wintered in the Kongakut in 1987–88, although bull groups had been seen in this location in winter for at least the past decade. (Reynolds *et al.*, 1987). Muskoxen also wintered each year between Pokok Bay and the Niguanak River, an area which was used during the past decade in winter and summer (Reynolds *et al.*, 1987). To the west, muskoxen wintered in the hills south of Camden Bay and between the east and west forks of the Tamayariak River, along bluffs and creeks near Red Hill on the Canning River, near the mouth of Marsh Creek and in hills near the Nularvik River. Numbers of animals observed in and near drainages varied from year to year indicating that not all individuals wintered in the same location each year.

About 30 muskoxen spent the summer along the Sadlerochit River in 2 of the 3 years, but in 1989, less than 10 animals were seen on this river during summer. Other animals wintering on the Sadlerochit River moved west to the west fork of the Tamayariak River and the Canning River delta for most of the summer. In earlier years, muskoxen remained along this drainage throughout the summer (Jingfors, 1981; Robus 1981). Muskoxen wintering on the

Kongakut River moved west to summer on the Aichilik, Niguanak and Jago rivers. Muskoxen wintering in the western part of the ANWR coastal plain spent the summer between the Canning River delta and the forks of the Tamariak River or moved westward out the refuge during summer.

In winter, satellite radio-collared cow muskoxen remained in small home ranges (about 16–35 km<sup>2</sup>) and made no long distance movements (>12 km in 36 h or less) from November to February. By contrast, in summer, muskoxen moved more and had significantly larger home ranges ( $T = 7.2$ ,  $df = 16$ ,  $P < 0.01$ ,  $N = 6$  summer, 12 winter). Long distance movements were most frequently made in mid to late June, after break-up of river ice and coincident with the leafing out of willows along major river drainages as animals moved from winter to summer ranges. The decrease in home range size and movements by muskoxen in winter indicated that muskoxen were less active in winter than in summer. These data fit the hypotheses proposed by Klein and Bay (1990) that muskoxen minimize foraging requirements and maximize energy conservation in winter. By contrast, larger home ranges and longer distances moved in summer indicated that muskoxen were maximizing forage intake. Shifts in feeding locations in summer also took advantage of changing plant phenology in localized areas (Gutherie, 1984). In summer, muskoxen must optimize foraging efficiency to meet the high nutrient and energy demands of growth, lactation, increased locomotion and the buildup of body reserves (Thing *et al.*, 1987; White *et al.*, 1987). By seasonal shifts in distribution, movements, and activity, this energetically conservative species can live year-round on the ANWR coastal plain, exploiting a winter environment which is not currently used by other large mammals.

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