

NECK CIRCUMFERENCE OF SHIRAS MOOSE (*ALCES ALCES SHIRASI*) CALVES DURING WINTER

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ABSTRACT: Neck circumference (approximately 15 cm behind the occiput) of 19 male and 14 female moose (*Alces alces shirasi*) calves 6 to 7 months of age were measured on animals captured in North Park (Jackson County) Colorado, during the months of December and January. The tape was pulled snug around the neck but not excessively tight. Male calf necks were larger than females ($P = 0.02$) (for males = 65.6 cm, for females = 60.6 cm). Tolerance limits at the 90% confidence level, which contain at least 95% of the individual neck circumferences, were 49.2 - 82.1 cm for males and 45.9 - 75.6 cm for females.

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Studies to determine parameters such as dispersal and survival often require radio-telemetry monitoring of animals beginning when they are neonates. Radio-collars attached to young animals must be expandable to allow for growth. During a study of moose (*Alces alces shirasi*) in Colorado, it was necessary to construct a collar that could be attached to calves and that would expand until the animals were fully grown. Data on neck circumference of Shiras moose calves, age 6 to 7 months was not available from the literature. Blood *et al.* (1967) provided chest girth measurements of calf moose, Schmitt and Dalton (1987) provided neck measurements of young adult to mature adult moose, and Lankester *et al.* (1993) published neck measurements of calves, but these were for *A. a. americana* and *andersonii*, that are considered larger than *shirasi* (Peterson 1955). Information available to us at the time was used to estimate the circumference of a Shiras calf neck so that an expandable collar could be (and subsequently was) constructed for our study. The purpose of this paper is to contribute to the literature a record of neck circumferences of male and female Shiras moose calves aged 6 to 7 months.

STUDY AREA

The study area (approximately 1,400 km²) comprised the eastern and southern portions of North Park, Colorado, a large open valley surrounded on 3 sides by the continental divide, in the northcentral part of the state. It is approximately 72 km long by 64 km wide, with elevations ranging from approximately 2,400 to about 4,000 m.

METHODS

Thirty-three calf moose aged 6 to 7 months (19 males and 14 females) were captured throughout the study area during December 1991, January 1992, December 1992, and January, 1994. Two methods of capture were used: (1) Carfentanil drug administered with dart guns from the ground or from a helicopter, and (2) net gun fired from a helicopter (Olterman *et al.* 1994).

The neck circumference of each captured calf moose was measured at the smallest diameter point which was approximately 15 cm behind the occiput. The cloth tape was pulled snugly around the neck but not excessively tight. Thus, measurements include compressed hair. Mean circumferences of males and females were compared by unpaired t-tests. Parametric tolerance intervals were constructed assuming that neck circumfer-

ences at a given age for each sex are normally distributed (Dixon and Massey, 1969).

RESULTS AND DISCUSSION

Neck circumference of male and female calves overlapped greatly (Table 1). However, mean neck circumference of males was significantly larger than females ($P = 0.02$). Tolerance limits at the 90% confidence level, which contain at least 95% of the individual neck circumferences, were 49.2 - 82.1 cm for males and 45.9 - 75.6 cm for females.

The North Park moose population (approximately 450 to 550 animals in 1994) is the result of an introduction of 24 animals in 1978 and 1979 (Nowlin 1985, Duvall and Schoonveld 1988) to an area of excellent habitat that had not been impacted by moose. Olterman *et al.* (1994) noted that animals from North Park were in better physical condition (i.e. larger, and appeared to have more fat reserves and better hair coats) compared to animals from Utah and Wyoming. Thus, neck circumferences of Shiras calf moose in poorer physical condition than those in our study may be somewhat smaller than we observed.

Table 1. Neck circumference, approximately 15 cm behind the occiput, of *Alces alces shirasi* calves aged 6 to 7 months.

| Parameter | Neck circumference (cm) | |
|--------------------|-------------------------|-------------|
| | Males | Females |
| N | 19 | 14 |
| \bar{X} | 65.6 | 60.6 |
| SD | 6.4 | 5.4 |
| Range ¹ | 55.9 - 81.3 | 53.3 - 73.7 |

¹Minimum and maximum values can be used as nonparametric tolerance limits (Dixon and Massey 1969). At 90% confidence at least 81% of a population is between the minimum and maximum of a sample of size 19 males and 75% for a sample of size 14 females.

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