

*Expanded abstract*

## Differences in the sex and age composition of two muskox populations and implications for male breeding strategies

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Muskox (*Ovibos moschatus*) breeding behaviour is centred on a harem of cows and sub-adults with a dominance hierarchy among adult bulls and a dominant herd bull breeding most cows during the August rut (Tener 1965, Smith 1976 and Gray 1987). Herd sizes even during the rut are not uniform but vary geographically. Herds tend to be larger at lower latitudes (Tener 1968, Gray 1987) in response to larger patches of forage plants and possibly greater threats of predation. In turn, male breeding strategies will be influenced by herd size.

In August 1988, I obtained large samples of muskox sex and age composition as part of ongoing management studies from southeast Victoria Island and on the nearby mainland (the Queen Maud Gulf area - QMGulf). The first hypothesis is that smaller herds are expected on Victoria Island because the distribution of muskoxen on the small dispersed sedge meadows would promote intra-group forage competition which, together with the lack of predators would favour the smaller herds. The second hypothesis is that fewer bulls would occur as singles or in bachelor herds during the rut on Victoria Island because distribution of the population among many small herds favours the opportunities for herd bulls. Muskoxen on QMGulf use large extensive sedge meadows and

are exposed to predators although the level of interactions is unknown.

### Methods

I classified calves, yearlings, 2-year-olds and 3-year-bulls on the basis of body size, guard length and horn development. I tested hypotheses concerning the distribution of the sex-age classes and location with Chi-square procedures. Differences in social unit sizes and age-sex ratios were examined by Kolmogorov-Smirnov two group and Mann-Whitney procedures.

I use the terms social unit to refer to any solitary or aggregation of muskoxen that were separated by at least an arbitrary distance of 250 m from the nearest muskoxen. Single bulls are bulls that remained at least 250 m from the nearest herd even though on occasion they may have galloped toward another social unit in response to the helicopter. Bachelor groups were groups without cows and mixed herds were herds with cows and subadults and usually one or more adult bull. Adult muskoxen were aged 3 years or older and sub-adult refers to muskoxen aged 2 years or younger.

### Results

I classified 1,462 and 1,479 muskoxen on Victoria and QMGulf between 6 and 13 August,

1988. Aggressive and courtship sequences of behaviour were evidence that the rut had started. The mean size was 10.23 +/- 4.44 (S.D.) for the 138 mixed sex herds on Victoria Island which was significantly larger than the mean size of 19.19 +/- 9.52 (S.D.) of 68 mixed sex herds on QMGulf. Bachelor groups were similar in size between the two areas (Mann Whitney U = 000, df = 1, p>0.05).

The distribution of social units (single bulls, bachelor groups and mixed herds) varied significantly between the two areas (X = 119.31, df = 2, p<0.05). The proportion of single bulls (35.2% vs 17.1%; Z = -6.8, p<0.05) and bachelor groups (23.6% vs 4.6%; Z = -0.0, p<0.05) of all social units were significantly higher on QMGulf than on Victoria Island.

The distribution of the sex-age classes differed significantly between the two study areas (X = 76.7, df = 5, p<0.05). Herds on Victoria had significantly higher sub-adult to ratios than herds on QMGulf (Kolmogorov-Smirnov D max = 0.46, df=2, p<0.05).

The overall sex ratio of adult bulls to adult cows in the total population was 0.61 on Victoria and 0.66 on QMGulf. Within the mixed-sex herds, the ratio of adult bulls to 100 adult cows differed between the two areas. The larger herds on QMGulf had more adult cows (9.6) but more adult bulls (3.6) and the resulting sex ratio was 39:100. On Victoria Island, the smaller mixed herds had on average 3.9 cows and 1.9 bulls and an adult sex ratio of 52:100. The frequency distribution of the adult sex ratio within the mixed herds was significantly different between the two study areas (Kolmogorov-Smirnov D max = 0.23, df = 2, p<0.05). On Victoria Island, more herds than expected had only one adult bull compared to the larger herds on QMGulf.

## Discussion

The hypotheses for smaller herds and fewer single bulls or bachelor groups on Victoria Island were supported. The assumption was that a greater number of smaller herds offered more adult bulls the chance to be herd bulls and fewer bulls would remain as bachelors. A higher proportion of bulls (52%) thus have the potential to breed (as herd bulls) on Victoria. But, the lower proportion of bulls on QMGulf (17%) with the potential to breed have indi-

dually a higher breeding potential as there were more cows per herd.

Bulls are more able to defend themselves against predators and thus presumably do not have the same need as cows and subadults to use larger herds as an anti-predator strategy. The larger bodies and consequent greater forage requirements together with more antagonistic behaviour would also support the tendency for the bachelor groups to be small and a similar size between the two areas.

The risks of injury from combat between adult bulls (Wilkinson and Shank 1981) and the consequences of the greater energy expenditure (Gunn *et al* 1989) in the more competitive context of larger herds may be reduced by two alternate strategies. Bulls could opt to invest energy in dispersal and searching for less contested breeding opportunities (Smith 1989). Alternatively, bulls could remain on the periphery of the herds waiting for the herd bull to be distracted. This "sneak" strategy would also offer an opportunity for the cows to be exerting mate selection. Cows do attempt to leave the herd and that bulls other than the herd bull do attempt to breed success seems to be rare (unpubl. data). The exclusion of bulls on the periphery of the herd if they were 250 m away but orientated to the herd was rare and involved only few instances. More rigorous behavioural studies would test the idea advanced here that the breeding strategies of muskoxen are flexible and reflect the relationship between herd size and distribution of the bulls within the social organisation of the population. The relationship between herd size, intra-herd competition and habitat patch size is, however, a still untested assumption.

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