

The frequency of antlerless females among Svalbard reindeer

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Abstract: The distribution of females with no, one and two antlers was recorded during July 1994 in Svalbard reindeer, *Rangifer tarandus platyrhynchus*, and compared with 1974 data from Reimers (1993) and Larsen (1977). On Reinsdyrflya, 50% of the females were antlerless, 16% one antlered and 34% two antlered. In Nordenskiöld Land, 2% of the females were antlerless, 1% one antlered and 97% two antlered. These percentages have not changed since Reimers' study in 1974 in Reinsdyrflya ($\chi^2 = 1.16$, $P > 0.05$) and Nordenskiöld Land ($\chi^2 = 1.69$, $P > 0.05$). The reason for the high frequency of antlerless females on Reinsdyrflya is not understood.

Key words: *Rangifer tarandus*, *R. t. platyrhynchus*, antler.

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Introduction

Reindeer and caribou (*Rangifer tarandus*) are the only species in the cervid family where both sexes develop antlers. However, antlerless females have been observed in various sub-species, areas and populations, and some populations have been observed to have significant variations over time with regards to antler frequency (see review by Reimers, 1993). Although *Rangifer* male antler cycle is under endocrine control (Lincoln & Tyler, 1992; Lincoln & Tyler, 1994), both antler size and the shedding pattern are influenced by nutrition (Wika, 1980; Lincoln & Tyler, 1994). However, the control of the *Rangifer* female antler cycle is not clear.

This paper accesses the relative numbers of female Svalbard reindeer (*R. t. platyrhynchus*) with and without antlers from two regions of Svalbard.

Observations of antler status were made for Reinsdyrflya and Nordenskiöld Land (Fig. 1) during July 1994, when the growing antler are in velvet. These observations were compared to observations from earlier studies from the same two regions including 1988 from Severinsen (pers. comm., unpubl.). For the purposes of discussion, Larsen's (1977) and Severinsen's (pers. comm., unpubl.) observations on antler status from a third region, Nordaustlandet (Fig. 1), are considered. Possible determinants of female antler status are discussed.

Materials and methods

The study was conducted on Reinsdyrflya (79 - 80°N) and four valley systems on Nordenskiöld Land (78°N); Adventdalen, Sassendalen, Colesdalen

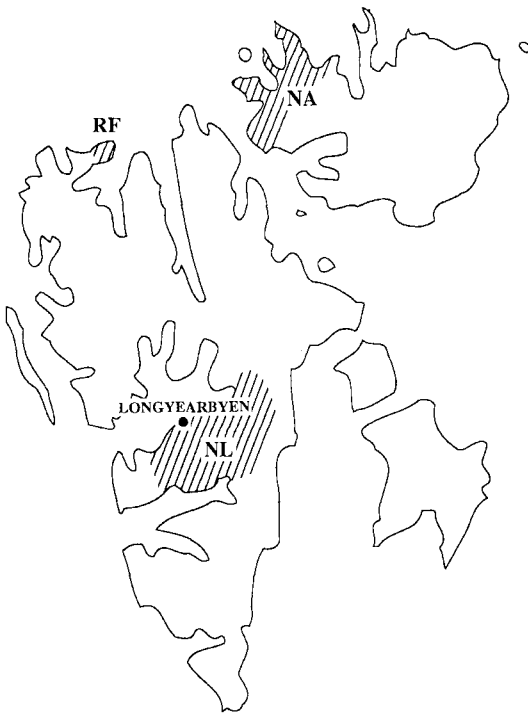


Fig. 1. Map over study areas: Nordenskiöld Land (NL), Reinsdyrflya (RF), and Nordaustlandet (NA).

and Semmeldalen/Reindalen (Fig. 1, Table 1). Field work was conducted from the ground in July, 1994. Reindeer were categorized according to sex and age (calves and 1 yr+), and the presence/absence of antlers was recorded through direct observations of free ranging individuals. Sex was determined by watching reindeer while they urinated.

Chi-square analysis was used to examine the difference in frequency of antler distribution in Nordenskiöld Land and Reinsdyrflya within and

between years. Fisher's exact test was performed to adjust for having only one degree of freedom. However, the *P*-value was so similar to the Pearson's *P*-value that the latter was chosen. The expected values were rounded off to the nearest whole number. JMP™ statistical package version 3.02 was used for statistical calculations.

Results and discussion

We found no significant change between the three antler categories on Reinsdyrflya from earlier studies starting in 1974 (Reimers, 1993) to our own 1994 study (Table 2 and 3). Unpublished data from 1988 (Severinsen, pers. comm.) supports this observation. In August 1988, 49% of the females on Reinsdyrflya were antlerless (Severinsen, pers. comm., unpubl. data). In 1994, the presence of antlerless females in Nordenskiöld Land was minute (2%), and no significant change has occurred in the distribution of the three antler categories since Reimers's 1974 study (Reimers, 1993) (Table 2 and 3). On Nordaustlandet, all females observed in 1974 (Larsen, 1977) and 1994 (Severinsen, pers. comm., unpubl. data) were antlered (Table 3). The data from the present and other studies indicate a stable frequency in the antler distribution among female reindeer in the three regions. This suggests a persistent factor, or set of factors, present to maintain the high level of antlerless and one antlered females on Reinsdyrflya, and likewise, two antlered females in the other two regions.

Among the several possible hypotheses for what may determine antler development, we have considered two; nutrition and genetics: H1: Plant biomass will determine antler status. We looked at the literature on summer pastures for a comparison of

Table 1. Characteristics of Nordenskiöld Land Adventdalen (AD), Colesdalen (CD), Semmel/Reindalen (S/RD), and Sassendalen (SD), Reinsdyrflya and Nordaustlandet.

	Nordenskiöld Land				Reinsdyrflya	Nordaustlandet
	AD	CD	S/RD	SD		
Area size (km ²) ¹	150	94	361	193	350	3000
Population estimate in 1994	400	400	600	560	300	300
Density (animals/km ²) ²	2.7	4.3	1.7	2.9	0.9	0.1

¹ Area corresponding to the vegetation cover below 250 m a.s.l. for Nordenskiöld Land and Reinsdyrflya and area not covered by ice on Nordaustlandet.

² Density (abundance) of reindeer in relation to suitable habitat. Data on area and number of reindeer on Nordenskiöld Land from Tyler and Hindrum (pers. comm.). Data from Nordaustlandet on area size from Staaland & Punsvik (1980). Population size and range quality in Nordaustlandet from Hindrum *et al.* (1995). Own observations from Reinsdyrflya.

Table 2. Chi-square test for number of female reindeer with no, one and two antlers on Reinsdyrflya and in Nordenskiöld Land, Svalbard, 1974 (Reimers, 1993) and 1994.

Antler status	Reinsdyrflya		Nordenskiöld Land ¹	
	1974	1994	1974	1994
Unantlered	52	22		
1 antler	12	7	10	7
2 antlers	46	15	187	245
χ^2	1.16		1.69	
Degrees of freedom	2		1	
Significance level	0.56		0.19	

¹ Females with no antler or one antler are pooled.

Table 3. The frequency of female reindeer with two, one and no antlers on Nordenskiöld Land, Reinsdyrflya and Nordaustlandet, Svalbard, 1974, 1988 and 1994.

Area	Year	n	Female (%) with		
			2 antlers	1 antler	No antler
Nordenskiöld Land	1974 ¹	194	95	1	4
	1988 ²		97	1	2
	1994	252	97	1	2
Reinsdyrflya	1974 ¹	110	42	11	47
	1988 ²				49
	1994	44	34	16	50
Nordaustlandet	1974 ³	82	100		
	1993 ²		100		

¹ Data from Reimers (1993).

² Information from Severinsen (pers. comm).

³ Data from Larsen (1977).

the three regions. Nordenskiöld Land represents an area with dense biomass cover (Punsvik *et al.*, 1980). During summer months, the valleys in this area offer a rich variety of herbs, grasses, mosses and bushes. Reinsdyrflya represents an area with medium biomass cover, dominated by mosses and grasses (Sævre, 1982). Nordaustlandet is clearly the area with lowest biomass cover, with a few herbs and monocotyledons available for pasture (Staaland & Punsvik, 1980). Reindeer exposed to the lowest plant biomass, Nordaustlandet, all carried two antlers. It appears that plant biomass gradient does not determine antler status. However, the possibility remains that other differences in range properties exist among the three regions that are involved in their respective differences in female reindeer antler status.

H₂: Genetic differences in sub-populations determine antler status. It has been suggested that reindeer from different populations on Svalbard (Reinsdyrflya, Edgeøya/Barentsøya and Nordaustlandet) have separate gene pools (Staaland & Røed, 1985). The population of reindeer on Svalbard was hunted to near extinction by 1925. It is possible that a population «bottle-neck» at that time caused a genetic drift in the population on Reinsdyrflya. Reinsdyrflya is inhabited by a relatively isolated population, and the trait of antlerless females could have developed due to genetic drift.

It is also conceivable that a variable selection pressure leads to the observed antler status in the different regions. However, we have no data to discuss what the selection pressure is or how it could conceivably act on the reindeer.

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