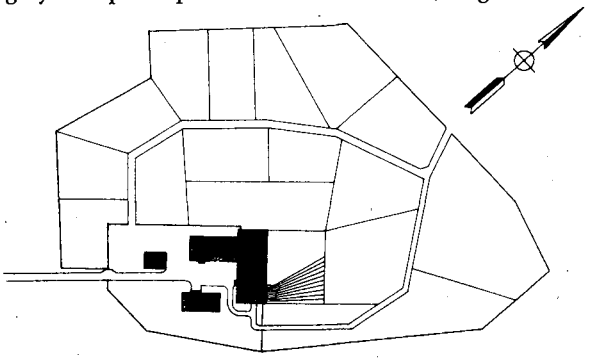
to a polar bear. In addition, there are 9 acres of enclosures outdoors built with 3 m high fences to a very high standard (picture). The new facilities, which cost NOK 35 million (US$ 5 million), have been financed jointly by the Norwegian Ministry of Culture, Education and Research, the Ministry of Agriculture, the Ministry of the Fisheries and the Ministry of the Environment, reflecting the fact that besides basic research and teaching, the Department of Arctic Biology provides information and management advice on issues relating to reindeer husbandry, sealing, whaling and management of fauna in Svalbard.

The new buildings provide excellent facilities for study of Arctic ungulates. In addition to the main paddocks there are special rooms for autopsy, surgery and post-operative care of animals, larger rooms with light- and temperature-control and slatted floors for keeping animals indoors, special semi-indoor paddocks with heated floors (melting snow) in which small groups of animals which need to be caught and handled frequently can be kept.



The Department of Arctic Biology encourages international collahoration in research which will put these new facilities to best use and which will maintain the position of the Department as a world centre for research on Arctic ungulates.

Dissertation

Carl Johan Petersson defended his AgrD thesis *Reindeer herd production- a modelling approach,* at the Swedish University of Agricultural Sciences, Uppsala, Sweden, on December 17, 1993.

He was born in 1950 and grew up in a small village by the coast in the northern part of the Gulf of Bothnia in Sweden. He studied computer sciences for one year at The University of Stockholm, and agronomy, also for one year, at an Agricultural School in 1974 and 1975. In 1982, he graduated as Master of Agronomy at The Swedish University of Agricultral Sciences (SLU).

He joined the Department of Animal Breeding and Genetics, SLU, in 1982, and upto 1985, he worked at the Cattle and Sheep division. During this period he published several papers dealing with lamb survival. He also developed a databank system for the university sheep research herd.

Since 1985 he is working in a reindeer project at the same department. This project deals with reindeer herd production, the aim of which is to develop a dynamic simulation model for reindeer herd, that could be used to optimize the demographic structure with respect to the production capacity of the herd.

During the course of his engagement in reindeer research, he has planned, constructed and applied a recording and production scheme into a tagged herd in Tännäs Sami village located in the southern part of the reindeer area in Sweden. In the thesis, two publications were based on performance data from these recordings.

Abstract

The thesis is based on five publications dealing with matters related to reindeer herd production. In the first publication , *(A comprehensive transition matrix model for projecting production and resource consumption in reindeer herds)*[1] a deterministic herd model was developed for projecting the dynamic changes in reindeer herd size and structure under defined harvest policies. The model distinguishes between females, males and castrates up to an optional number of age-classes. Calves are further classified based

on the age and status (present/absent) of their mother. The yearly cycle is divided up into a maximum of 11 time steps, including five grazing seasons. The model is described in general terms using the Leslie matrix approach in order to suit different computer implementations. The conventional Leslie matrix solution was extended so that nonlinear features and stochastic variation in performance parameters could be considered.

Computational procedures for making detailed economic evaluations of harvest output and herd feed requirements or consumption are given. This general purpose model can be tailored to specific study conditions. An advantage of this is that the sensitivity to necessary approximations can be tested with the general purpose model. The model is intended for use in both research and extension work.

Main driving variables in the model were survival, fertility and removal at slaugther. Survival and fertility, together with live weight, were surveyed in the second publication *(Review of parameters for projection of reindeer herd production in Fennoscandia)*[2]. Survival and fertility affect herd demographic structure. Live weight is an important factor since it affects survival and fertility as well as carcass value. In some cases, data were processed further by fitting curves to them in order to summarize and smooth them in relation to animal age or weight. Due to climate and possible genetic differences influencing production, the herding area in Fennoscandia was divided into four main regions: the Finnmark area, the northern and the southern mountain herding area and the forest herding area in northern Sweden and Finland. Other important factors influencing production, were animal age and period during the reindeer year. The production parameters were assigned to 'conceptual submodels' with which data needed for a specific simulation situation can be generated.

In the third publication, *(Simulated production losses in reindeer herds caused by accidental death of animals)*[3] a dynamic age-structured model was used to simulate the consequences on herd production of losing if an extra animal from a particular age class and season was lost. Herd size was adjusted to 1000 animal and a sex ratio for .75/.25 via slaughter in late autumn. Three harvest strategies wee applied, ranging from extreme calf to adult harvest. Equilibrium herd structure was disturbed with the loss of an extra animal and the consequences in terms of the number of animals slaughtered and kilogram of carcasses produced were followed over a simulation period of 15 years. The loss of a male corresponded to 0.70 to 0.90 times its own carcass weight. Loss of a female decreased herd production by 1.2 to 1.7 times the carcass weight of the lost animal. The highest losses were observed for 4–6 year old females. Loss of a calf reduced herd production by 0.3 to 1.6 times the calf's carcass weight, depending on season of loss and harvest strategy. In general, a loss during winter decreased herd production by 10 to 20 percent more compared with a loss during autumn.

The two last publications *(Causes of variation in growth rate of reindeer calves)*[4] and *(Value of early weight measurements as predictors of body weight at later ages in reindeer)*[5] dealt with performance data from recordings made in a tagged herd in Tännäs Sami village located in the southern part of the reindeer area in Sweden (63°N, 12°E).

Weights of individual reindeer calves were registered on 3 or 4 occasions from the July roundup to the last slaughter roundup in January during each of four consecutive years (1986 to 1989). A total of 10 400 live-weight measurements were made and the relationship between pre-slaughter weight and carcass weight was estimated using data from 109 individuals. Variation in weight and weight gain between weighing occasions was related to sex, number of days in the corral, scale and year. Nonlinear growth curves were fitted to the adjusted weights.

For each sex, smoothed average weights and dispersions, both within and between year, as well as the coefficient of variation were calculated from data generated from the estimated functions. Individual calf weights were shown to be influenced by sex and weighing day within a given roundup and by year. Dressing percentages were also computed.

The results showed that reindeer calves gained between 20 and 25 kg in live body weight from 2 to 6–8 months of age. Male calves were heavier than female calves throughout the period, and their gain in live weight averaged 10 g/day more than that of female calves.

The between-year coefficient of variation was between 1.5 and 7 percentage, with the varia-

tion between years being largest for July and January weights and lowest for September weights.

Growth curves showed that the major increase in weight occurred between. July and September. From September to December/ January the additional increase was only 5 %.

Dressing percentage was influenced by live weight prior to slaughter. A positive relationship between live weight and dressing percentage was shown.

Phenotypic variances in live weight in a reindeer population and repeatabilities of the weights were estimated. The population consisted of 1847 and 1878 unselected male and female calves respectively, for which data from weighings at 2 and 7 months of age were available. All individuals in a selected population, consisting of 469 of the heaviest females, were also weighed at 19 months of age. The data were collected during four successive years, 1986–1989.

Variance in the unselected population was higher between animals than within animals. Repeatability was estimated to be 0.636 for male calves and 0.609 for female calves. In the selected population, within-individual variance was higher than between-animal variance. Repeatabilities were, after correction for the effect of selection, 0.316 (between 2 and 19 months) and 0.548 (between 7 and 19 months).

An indirect selection model for improving female weight at 19 months of age was proposed. Increased weight of the primiparous group will improve their calf production ability. With the model, the number of animals above a certain threshold weight at 19 months of age, could be determined.

[1] *Rangifer* 1994, 14 (1), in press.
[2] *in manuscript.*
[3] *Rangifer* 1992, 12 (3): 143–150.
[4] *Rangifer* 1993, 13 (2): 105–116.
[5] *Rangifer* 1993, 13 (4): 191–201 (this Issue).

Sven Skjenneberg Doctor Honoris Causa

In August 28, 1993, Sven Skjenneberg was conferred the degree of Veterinary Medical Doctor Honoris Causa at the Swedish University of Agricultural Sciences, Uppsala, Sweden.

Sven Skjenneberg has devoted most of his professional life to reindeer and reindeer research. He graduated in 1953 and began his work with reindeer already 1955 working at the State Veterinary Laboratory for Northern Norway. After a short break with Løvens Kemiske Fabrik A/S in Oslo 1966–68, he became Director of the Governmental Reindeer Research Station in Harstad, a position he held until 1978. When the Nordic Council for Reindeer Research was founded in 1980 as an instrument for promotion and co-ordination of research efforts within this field in Finland, Norway and Sweden, and later on also Greenland, Sven Skjenneberg was entrusted with the duties of Secretary, a post he still holds. In addition he has since 1981 acted as scientific editor for the international periodical Rangifer which publishes research results on reindeer, reindeer husbandry and also articles about other arctic ungulates. Due to his very meritorious work this is now an internationally recognized periodical with a sufficient inflow of good quality articles. Thanks to Sven Skjenneberg there is now also an international data base for literature concerning reindeer, reindeer husbandry and adjacent research fields at the Forestry library of the Swedish University of Agricultural Sciences, in Umeå. Sven Skjenneberg has continuously surveyed the literature for this data base.