

On March 11th 2011 Anna Olofsson successfully defended her thesis “*Towards Adaptive Management of Reindeer Grazing Resources*” for the Doctor of Philosophy degree in Animal Science at the Swedish University of Agricultural Sciences (SLU), Uppsala, Sweden. Opponent was Professor Rolf Anker Ims, University of Tromsø, Norway and the evaluation committee consisted of Associate Professor Timo Helle, Finnish Forest Research Institute, Rovaniemi, Finland, Associate Professor Jouko Kumpula, Finnish Game and Fisheries Research Institute, Kaamanen, Finland and Associate Professor Peter Udén, SLU, Uppsala, Sweden. Supervisors have been Professor Öje Danell together with Associate Professor Pär Forslund and Professor Birgitta Åhman, all from SLU, Uppsala, Sweden.

Anna Olofsson (b. 1978) has a Bachelor of Philosophy degree in Computational Ecology from the University of Skövde, Sweden. During her undergraduate studies she became interested in ecological dynamics and human-biological system interactions. Her undergraduate thesis was a theoretical work on ecology of biofilm forming bacteria, done in co-operation with the School of Microbiology and Immunology, University of New South Wales, Australia in 2001. Anna Olofsson became involved in reindeer research when she started her PhD studies at SLU in November 2003 attracted to the resource management approaches of the research project and the combination of field and modelling work.

Thesis

Olofsson, A. 2011. *Towards adaptive management of reindeer grazing resources*. Faculty of Veterinary Medicine and Animal Science. Swedish University of Agricultural Sciences, Uppsala. Doctoral diss. – *Acta Universitatis agriculturae Sueciae* nr 2011:16, 67 pp. ISBN 978-91-576-7551-4. ISSN 1652-6880. Available online: <http://epsilon.slu.se/201116.pdf>



This thesis was based on the following papers:

- I. Olofsson, A., Danell, Ö., Forslund, P., & Åhman, B. (2008). Approaches to estimate body condition from slaughter records in reindeer. – *Rangifer* 28: 103-120.
- II. Olofsson, A., Danell, Ö., Åhman, B., Forslund, P. Carcass records of autumn-slaughtered reindeer as indicators of changing grazing conditions. (manuscript)
- III. Olofsson, A., Danell, Ö., Forslund, P., Åhman, B. (*In press*). Monitoring changes in lichen resources for range management purposes in reindeer husbandry. – *Ecological Indicators* (2011), doi:10.1016/j.ecolind.2010.12.015.
- IV. Olofsson, A., Danell, Ö., Forslund, P., Åhman, B. A model of herbivore-pasture dynamics and indicator responses with reference to reindeer husbandry. (manuscript)

Abstract: The thesis aims to create a scientifically founded proposal for improvement of optimal and sustainable use of reindeer pasture resources by an adaptive management approach. Hence, the adaptive management concept is reviewed and discussed with specific reference to reindeer husbandry.

Two potential indicators of changes in the grazing resources of reindeer husbandry were investigated and proposals for how these indicators could be monitored are given. Reindeer body condition, estimated from commercial slaughter data, was suggested as proxy for monitoring pasture condition during the snow-free season. Altogether, 430 000 carcass records from 1994-2007 were analysed, together with additional information on body sizes of 699 reindeer. The results showed that between-year variations in body condition (reflecting pasture conditions) were similar in all animal categories. Accuracy of monitoring could be improved by ensuring that ages of calves are correctly classified, differentiating calves by sex, separating yearlings from older animals, and adjusting data for slaughter date.

Lichen height measurements were suggested for monitoring changes in winter grazing resources. Results from analysing data collected at totally 31 study sites showed that distances between measurement points should exceed 4 m and that 200-2000 points are needed

for detecting changes in lichen height with sufficient statistical power. Large-scale spatial gradients, forest stand structure and moisture levels of lichen also need to be considered.

A dynamic model of the reindeer-pasture system was developed. The model consists of three modules describing lichen dynamics in winter pastures, energy dynamics of reindeer and reindeer population dynamics at herd level. The model appears to capture important empirically known mechanisms of the system and have potential utility, after adaptation to the conditions of individual herding districts, as a tool for interpreting monitoring results and evaluating management actions.

Thesis distribution:

Swedish University of Agricultural Sciences
Department of Animal Nutrition and Management
P.O. Box 7024
SE-750 07 Uppsala, Sweden