

Dissertations

Ronny Aanes successfully defended his Dr.scient. thesis in terrestrial ecology in January, 2002 at Institute of Biology, University in Trondheim (NTNU), Norway. The title was: *Spatio-temporal dynamics in Svalbard reindeer* (*Rangifer platyrhynchus*). Opponents were Prof. Jean Michel Gaillard, University of Lyon, and Prof. Rolf Anker Ims, University of Tromsø. Advisors has been Prof. Bernt-Erik Sæther from NTNU and Prof. Nils Are Øritsland (retired from Norwegian Polar Institute-NPI).



Ronny Aanes (b. 1968) is a biologist having his MSc. (1994) from NTNU where he studied the predator-prey relationship between red fox and roe deer. He worked on a pilot project on red fox before he was employed at the Directorate for nature management in Norway. In 1996/97 he joined a research expedition to Antarctica studying sea birds for the Norwegian institute of nature research. In 1998 the NPI and Norwegian Research Council funded a project on Svalbard to study the effects of climatic variation on reindeer – vegetation interactions. Aanes was given a 3-year contract as a research fellow at NPI's Svalbard office in Longyearbyen.

The climate in high-arctic areas have changed more rapidly compared to the global average. It is hence expected that climate signals may be detected in these ecosystems at a higher rate and before other ecosystems (*e.g.* in temperate areas). Aanes utilized three existing time series from Svalbard reindeer to evaluate the importance of climatic variation and plant growth on the observed fluctuations in reindeer numbers in these populations.

Ronny Aanes is now holding a permanent position as a research ecologist at the NPI. He is currently involved in external funded research projects that study effects of climate change on vertebrates along a latitudinal gradient, and population dynamics of Svalbard reindeer and semi-domesticated reindeer in Norway.

Papers included in the thesis are:

1. **Aanes, R., Sæther, B-E. & Øritsland, N.A.** 2000. Fluctuations of an introduced population of Svalbard reindeer: the effects of density dependence and climatic variation. – *Ecography* 23: 437-443.
2. **Solberg, E.J., Strand, O., Jordhøy, P., Aanes, R., Loison, A., Sæther, B-E. & Linnell, J.D.C.** 2001. Effects of density-dependence and climate

on the dynamics of a Svalbard reindeer population. – *Ecography* 24: 441-451.

3. **Aanes, R., Sæther, B-E., Smith, F.M., Cooper, E.J. Wookey, P.A. & Øritsland, N.A.** 2002. The Arctic Oscillation predicts effects of climate change in two trophic levels in a high-arctic ecosystem. – *Ecology Letters* 5: 445-454.
4. **Aanes, R., Sæther, B.-E., Solberg, E.J., Aanes, S., Strand, O. & Øritsland, N.A.** 2003. Synchrony in Svalbard reindeer population dynamics. – *Canadian Journal of Zoology* 81: 103-110.

Abstract: Much focus in current population ecology is concentrated on processes and mechanisms generating temporal and spatial patterns in populations. Within the context of temporal density fluctuations it is paramount to understand the relative importance of density dependence and stochastic factors. Research on the spatial dimension in population dynamics, on the other hand, explore mechanisms that can explain why some populations have synchronized dynamics. This thesis focuses on population dynamics of Svalbard reindeer in time and space, and utilizes long-term series of abundance monitoring from three different populations. Using an autoregressive (AR) modelling approach the presence of density dependence, both direct and delayed, were examined in one introduced population observed during the growth phase and one population having a nearly stationary density distribution. The impact of environmental variation on the population dynamics was explored in these populations by including climate as a variable in the AR models. In accordance with previous findings in large herbivores the combined effects of density dependence and stochastic factors govern the population dynamics of Svalbard reindeer. Nevertheless, the dynamics in the introduced population was more dependent on climatic conditions than on density. This study also shows a strong impact on plant growth and Svalbard reindeer population dynamics forced by variations in the Arctic Oscillation (AO) which influence local climate. Both plant growth and Svalbard reindeer population growth rate were negatively related to the AO index. This suggests that if the observed warming continues in the northern hemisphere it will have a strong impact on ecosystem functioning in the high arctic. Finally, analysis of spatial autocorrelation in population growth rates in the three studied populations shows that climatic forcing are likely a synchronizing agent in Svalbard reindeer while dispersal apparently have negligible effects.

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