



## **Reindeer grazing and climate change affects vegetation structure in the Swedish mountains**

Tage Vowles (1), Leif Klemendtsen (2), Ulf Molau (1), and Robert G. Björk (2)

(1) Department of Biological and Environmental sciences, University of Gothenburg, Gothenburg, Sweden, (2) Department of Earth Sciences, University of Gothenburg, Gothenburg, Sweden

There is substantial evidence indicating that arctic and alpine landscapes are undergoing distinct changes in plant community structure, presumably brought about by increasing temperatures and a prolonged snow-free season. However, recent studies have revealed that grazing by large herbivores can inhibit a climate-driven shrub expansion and plant community change. In northern Fennoscandia reindeer grazing has helped to shape the vegetation patterns since the last glacial period and is an important factor to consider in the understanding of how a changing climate will affect tundra ecosystems.

This project examines the effects of reindeer grazing by revisiting fenced exclosures constructed in 1995. The exclosures were erected at four sites with different grazing intensities situated along the Scandinavian mountain range (from 61°30' to 68°30'). At three of the four sites, three fenced and three control (ambient conditions) plots (25×25 m each) were established in alpine tundra and in mountain birch forest, respectively. In the fourth site only tundra plots were established. In 2011/12 we used the same methodology as in the original 1995 inventories to determine the species composition, canopy height, and percentage cover of the shrub, field and bottom layers in the plots. In the birch forest, the tree layer was also estimated by determining species composition, cover, height, diameter, and individual density.

Our results show that on the tundra, tall shrub cover has increased at our fenced-in plots over the past 16 years, whereas in ambient plots the response varies between sites. Low shrubs, too, have increased over time, yet showing no significant treatment effect. Graminoids, on the other hand have decreased overall, but significantly more in fenced-in plots. Furthermore, the shrub canopy height has increased significantly over time with implications for albedo and snow trapping effects. Bryophyte cover was significantly larger in ambient plots than in fenced-in plots on the tundra which affects summer soil temperatures (which were consistently higher in ambient plots).

A great deal of data still needs to be processed but these preliminary results indicate that vegetation composition in the Swedish mountain range is changing rapidly and that large herbivore grazing has a substantial part to play in shaping these changes.