Long-term Browsing Impact around Diversionary Feeding Stations for Moose in Southern Norway

Floris M. van Beest[1,2] Hege Gundersen[2] Karen Marie Mathisen[1,3] Jos M. Milner[1] & Christina Skarpe[1]
[1] Faculty of Forestry and Wildlife Management, Hedmark University College, Evenstad, Norway
[2] Centre for Ecological and Evolutionary Synthesis, Department of Biology, University of Oslo, Norway
[3] Department of Wildlife, Fish, and Environmental Studies, Faculty of Forest Sciences, Swedish University of Agricultural Sciences, Umeå, Sweden

Presenting author:
Floris M. van Beest
Floris.vanbeest@hihm.no

Background

Browsing ungulates provided with supplemental feed create a gradient in browsing pressure which is typically greatest near the feeding station and decreases as a function of distance from it[1], but how browsing pressure changes over time is currently unknown. Moreover, high browsing pressure by moose (*Alces alces*) may have indirect effects on ecosystem functioning[2].

Methods

We quantified spatiotemporal changes in browsing pressure of moose on commercial and non-commercial tree species around 30 feeding stations (Fig. 1) after 5-10 years and 15-20 years of winter feeding. Browsing pressure was analyzed as a function of distance from feeding station using GAMM.

Results

Despite 2-3 fold higher faecal pellet group numbers in the vicinity of feeding stations after 15-20 years of feeding, leader stem and lateral twig browsing within 200 m of feeding stations increased only on the commercially valuable Norway spruce (*Picea abies*), a species normally avoided by moose (Figs 2 & 3). Furthermore, leader stem browsing was high up to 1 km from feeding stations for most tree species (~60%) and did not decrease with increasing distance.

Discussion

Our study indicates that as winter feeding continues over time, there is an increased risk of excessive browsing close to feeding stations which may lead to fine-scale resource depletion. Moreover, browsing remained high up to 1 km from feeding stations which can have important economic implications[3] and may negatively impact biodiversity in unproductive boreal forests[4,5].

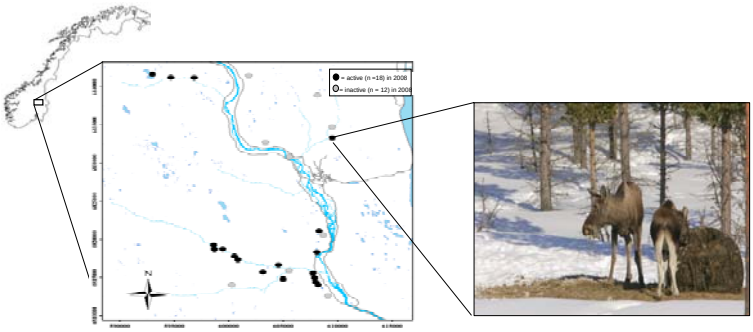

Figure 1

Map of the study area showing the spatial distribution of feeding stations (*n* = 30).

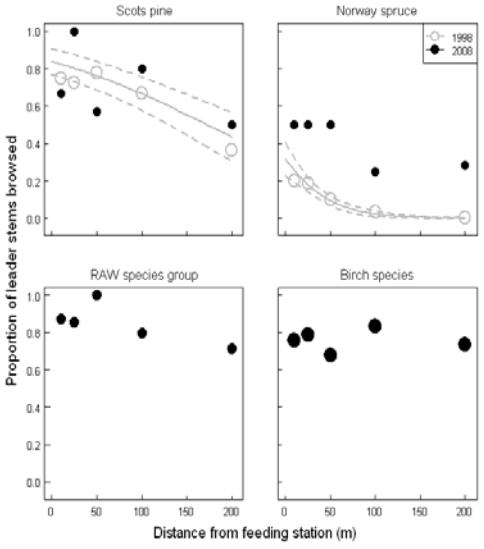

Figure 2

Mean and predicted proportion of species-specific leader stems browsed by moose up to 200 m from feeding stations in 1998 (5-10 years of feeding) and 2008 (15-20 years of feeding). Leader stem browsing on RAW species (Rowan, Aspen & Willow) and birch species (Silver & Downy birch) was not recorded in 1998.

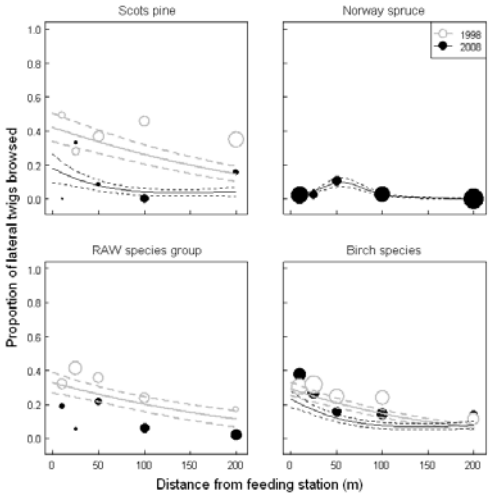

Figure 3

Mean and predicted proportion of species specific lateral twigs browsed by moose up to 200 m from feeding stations in 1998 (5-10 years of feeding) and 2008 (15-20 years of feeding). Lateral twig browsing on Norway spruce was absent in 1998.

References:

[1] Gundersen, H. et al. (2004) Supplemental feeding of migratory moose *Alces alces*: forest damage at two spatial scales. *Wildlife Biology,* **10,** 213-223.

[2] Persson, I. L., et al. (2007) Browse biomass production and regrowth capacity after biomass loss in deciduous and coniferous trees: responses to moose browsing along a productivity gradient. *Oikos,* **116,** 1639-1650

[3] Ward, A. I. et al. (2004) Modelling the cost of roe deer browsing damage to forestry. *Forest Ecology and Managment,* **191,** 301-310.

[4] Suominen, O. et al. (2008) Impact of simulated moose densities on abundance and richness of vegetation, herbivorous and predatory arthropods along a productivity gradient. *Ecography,* **31,** 636-645.

[5] Pedersen, S. et al. (2007) Moose winter browsing affects the breeding success of great tits. *Ecoscience,* **14,** 499-506..

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