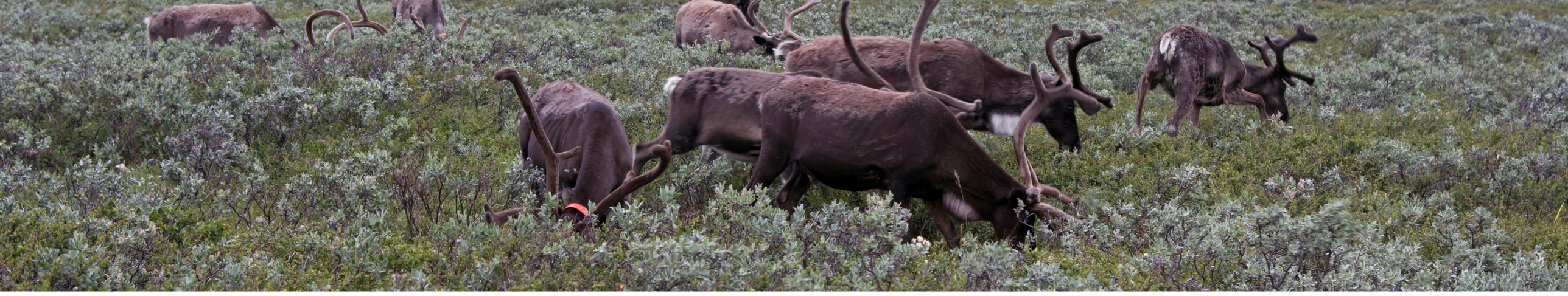

How reindeer grazing affects oroarctic mire vegetation?

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Background

- Reindeer modify tundra vegetation and soil processes, and reindeer grazing can inhibit climate change-induced tundra shrub expansion.
- Effects of reindeer grazing are not well known in wet tundra habitats like ***peat accumulating mires***.
- We compared grazed and non-grazed mires and effects of 13-year experimental exclusion of reindeer, expecting grazing impacts to have dissipated. We further expected that reindeer exclusion has enhanced the growth and flowering of willows (*Salix lapponum*).

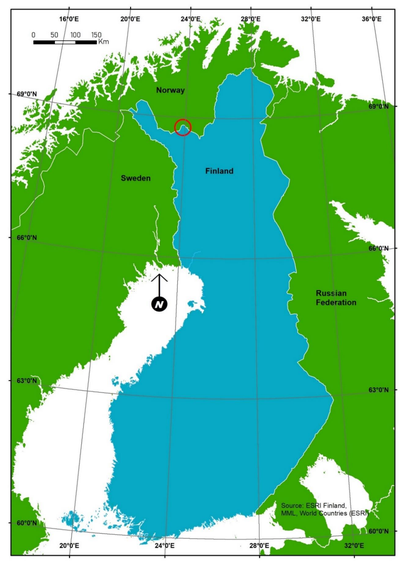

Figure 1. The experiment was carried out at ten separate fens near the border of Finland and Norway (68° 49' N, 23° 49' E).

The Jauristunturit study area

- Ten separate fens near the border of Finland and Norway (68° 49' N, 23° 49' E, 450-510 m asl.) as study sites.
- In the mid-1950s, three-meter high reindeer fence was built along the Finnish-Norwegian border.
- The Finnish side is grazed mainly in summer.
- The Norwegian side is used as a winter range, but in the winter, reindeer feed mainly on lichens on dry habitats. Use for summer grazing has been prohibited since late-1950s.
- One characteristic feature of the studied fens is the abundance of *Salix lapponum*, a willow species subject to summer grazing by reindeer.

Exclosure experiment

Grazing treatments are:

1) free reindeer grazing that mainly takes place in summer (FI),
2) exclusion of reindeer grazing since 2002 (FI), and
3) no reindeer grazing since late-1950's (NO).

- Vegetation plot data sets were collected and heights of *S. lapponum* measured in 2002, 2006 and 2015
- The catkin production of *S. lapponum* in response to grazing pressure was studied in 2015

Plant community structure

- We used the 2015 pin-point cover data to compare the abundances of plant groups between grazing treatments and found a significant effect of grazing treatment on overall cover of bryophytes and *Eriophorum* spp.
- On average, cover of bryophytes was greatest and cover of cottongrasses lowest in non-grazed subplots.

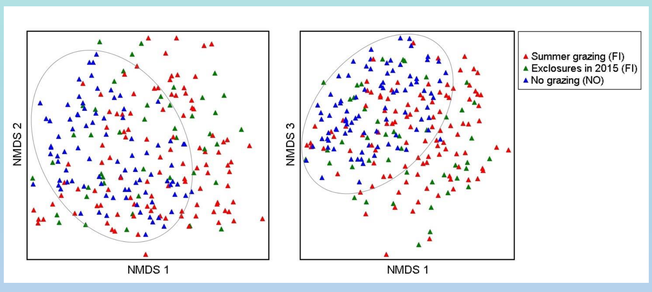

Figure 2. A 3-dimensional NMDS ordination based on Wisconsin transformed subplot-level vegetation data from 2002 and 2015 showed some distinction between non-grazed Norwegian subplots and all subplots in Finland. **This mainly reflected differences in shrub cover**. Data from exclosures in 2002 and summer-grazed plots in 2015 were combined as one group (Summer grazing (FI)).

Changes in willow height and cover over time

- As expected, grazing treatment had a significant effect on *S. lapponum* height and *Salix* spp. cover
- In 2015, downy willows (*S. lapponum*) were significantly higher in exclosures and non-grazed plots compared to freely summer-grazed plots.

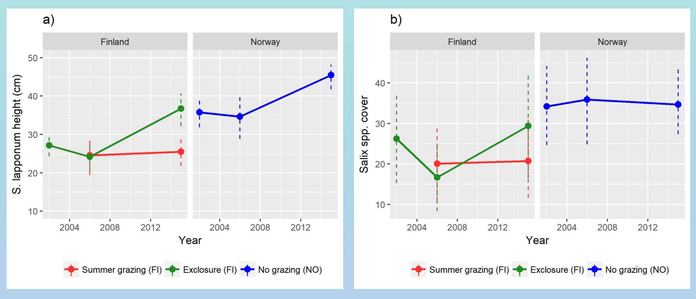

Figure 3. The effect of grazing treatment on a) *Salix lapponum* height and b) *Salix* ssp. cover over the study period.

Catkin production of *S. lapponum*

- Flowering female plants were significantly more abundant and had heavier and more frequent catkins in exclosures and non-grazed plots compared to summer-grazed plots.

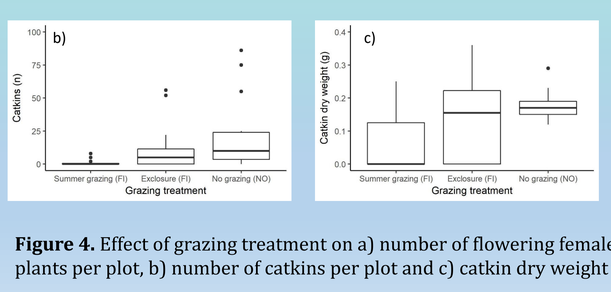

Figure 4. Effect of grazing treatment on a) number of flowering female plants per plot, b) number of catkins per plot and c) catkin dry weight (g).

Discussion and conclusions

- In oroarctic mires, reindeer summer grazing affects particularly *S. lapponum* stands and bryophyte cover
- Growth and flowering of willows enhanced after a 13-year exclusion of reindeer
- ***Overall, oroarctic mires are resilient to the effects of reindeer grazing***
- Reindeer grazing may alter carbon cycling in mires via impact on shrub abundance, but the long-term role of mammal herbivory in mire ecosystems is still uncertain

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