

Does grazing influence growth of the reindeer lichen *Cladina mitis*?

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Objectives

Reindeer (*Rangifer tarandus* spp.) commonly use areas dominated by lichen mats for winter habitats. Dependent on lichen richness, 40 - 70% of the winter diet consists of variable proportions of *Cetraria nivalis*, *Cladina mitis* and *C. stellaris*. Areas with poor snow cover on Norwegian wild reindeer ranges are commonly dominated by these lichens and it is often this lichen grazing resource which restricts the carrying capacity.

Where the lichen grow in the microhabitat depends on the duration of snow cover, and how fast they grow depends on the precipitation and moisture regime in the snow free period. When moist they grow from the top but rot at the bottom. Young, small individuals grow fast, about 20% per year, but they taper off as the mat becomes thicker. When fully grown, they grow and rot at the same speed and no net gain in size is made. How these lichens get their moisture: dew and frequent light rainfall versus infrequent, but heavy rainfall, influence biomass stabilization. In coastal climates in Norway pure mats of *Cladina mitis* have standing biomasses of 1100 gDM (Dry Matter)/m², in continental climates, lichen mats have up to 1800 gDM/m².

Grazing by reindeer works in two different manners. Heavy grazing tends to clip the mat, but light grazing tends to thin it. To measure the growth of grazed mats I set up an experiment where the two grazing effects are simulated separately, and report here some results from the *Cladina mitis* tests, one of the most preferred species.

Methods

Samples of about 10 gDM were separated out from a *Cladina mitis*-mat, and placed in round trays with a bottom size 0.9 dm². The most rotten bottom part was carefully removed. Care was taken not to alter the density of the lichen, to avoid influencing the conditions of growth or decomposition. Three treatments were applied — each in five parallels.

- (1) Untreated: As above, weight was 10.69 ± 2.48 gDM, this corresponds to 1188 ± 276 gDM/m².
- (2) Clipped: Top, about 50% of original weight removed by clipping, resulting weight 5.85 ± 1.20 gDM, this corresponds to 649 ± 133 gDM/m².
- (3) Thinned: Regular removal of lichen individuals to about 50% weight. Resulting weight 4.42 ± 0.50 gDM, this corresponds to 491 ± 55 gDM/m².

Trays were left to grow in \pm natural microhabitats in an experimental field in the low alpine region 980 m at the Dovre mountains, Norway (62°16'N, 9°36'E).

Trays were brought in the lab and weighed (dried at 30°C) at the start and end of the snow free period with a standardized procedure starting in May 1979. Correcting factors for water content at 30°C is obtained from parallels, dried at 70°C, repeated each time.

Results

For comparison I have recalculated weight data on a relative basis (Fig. 1). I used data from weighings in May, so that new growth over the years appear. There is a clear tendency shown, however, that rotting causes weights to decrease over the winter.

I found a significant difference between treatments. Clipping causes the growth to be less than untreated samples, whereas thinning causes it to be higher. The most probable explanation is thought to be that clipping removes a greater part of the living material. Compared to untreated samples the rotting thus becomes relatively higher. The reason thinning improves growth may be that the light conditions will be better for the growth of the remaining lichen individuals.

Consequences for management

Management practices try to stabilize reindeer populations in several rather small separated ranges in Norway. Calculations of carrying capacity are based upon reserves of lichen grazings and the average yearly removal of lichen by one animal (Gaare & Skogland 1980). These data for lichen growth will help refine the algorithm. We also try to use them to define and describe what an optimally used lichen pasture should look like.

One may also find them interesting when hypothesizing on the reasons for population variations: To make simulation models over decades and centuries of the reindeer - lichen interaction, like the one presented at the 1st International Reindeer/Caribou Symposium by «Buda Himimi McPapescwa», closer to life (Bunnell *et al.* 1975).

References

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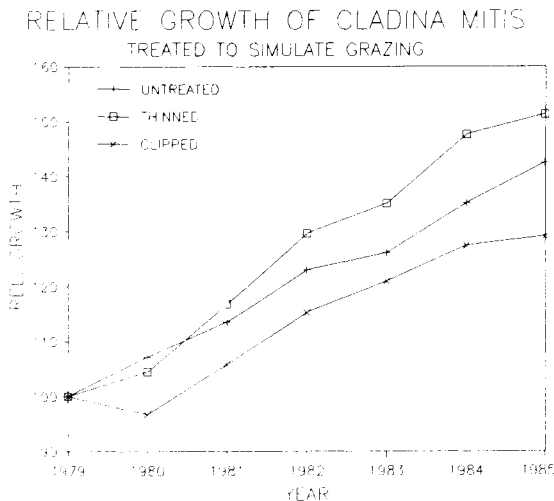


Fig. 1. Relative growth of 5 parallel samples of *Cladina mitis*. Average weight of untreated samples were 11 g DM, clipped 6 g DM and thinned 4.5 g DM, all at to 100 to facilitate comparison.