Ref.#: Te_46
larissa_beumer@hotmail.com

ABSTRACT

Functional response to snow-ice conditions and changes in diet quality during winter in a high-Arctic ungulate

Larissa Beumer[1] Øystein Varpe[1] Brage B. Hansen[2]
[1]*University Centre in Svalbard, Arctic Biology, Norway,* [2]*Norwegian University of Science and Technology (NTNU), Department of Biology, Centre for Biodiversity Dynamics (CBD), 7491 Trondheim, Norway,*

Snow cover and icing are major determinants of forage accessibility for Arctic herbivores during winter. Associated with current climate change, winter precipitation is anticipated to increase in many Arctic regions, and icing events due to rain-on-snow (ROS) are expected to increase in frequency and spatial extent. Recent evidence suggests this may have severe impacts on herbivore vital rates and population dynamics, but how the animals cope with such changes in conditions through behavioural and dietary responses is not well known. In the study to be presented, we tested predictions derived from optimal foraging theory on how changes in snow-ice conditions during the course of a winter influenced choice of feeding craters and diet quality in a large generalist herbivore, the wild Svalbard reindeer (*Rangifer tarandus platyrhynchus*). Snow-ice conditions over the winter season 2012-13 were measured in reindeer feeding craters that were haphazardly sampled across the landscape, in nearby (1-m) controls, and in fixed control sites located in ridge (i.e. windblown) habitat. Total snow-pack depth (range 2-34 cm) and summed thickness of ice layers within the snow pack (0-5.5 cm) in feeding craters increased linearly with the snow-ice thicknesses measured in the fixed control sites, i.e. reindeer responded to worsening conditions by cratering in deeper snow-packs that included more ice layers. On average, reindeer cratered in sites with less snow, ice and integrated ram hardness (IRH, a measure of the force needed to reach the ground) than the 1-m control but the slopes of the regressions (crater versus control) were less than one, suggesting selectivity for microhabitat with worse snow-ice conditions up to a certain threshold (~10 cm of snow, 0.5 cm of ice, ~250 kgcm IRH in nearby controls) and a reversed selectivity above this threshold. Faecal C:N ratios, i.e. an inverse proxy of diet quality, increased over the course of the winter along with forage accessibility being increasingly restricted. These temporal changes in C:N ratios were best explained by a positive effect of snow depth, while the thin ice layers resulting from a minor ROS event had no statistically significant effect on diet quality. Thus, the study suggests that, during 'normal' winters with little ROS and icing, reindeer feeding behaviour and diet quality are more strongly constrained by total snow-pack depth than ice thickness. Furthermore, the functional response curves to snow-ice conditions indicate a threshold switch in the trade-off between forage accessibility and quality/quantity.