

Differing thermoregulatory strategies of similar species in the same environment

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As the environment changes, animals have to change too - physiologically and behaviourally - to maintain function and stay alive. The ways in which animals change, and by how much, determines their tolerances for environmental variation, which defines the times and the places when/where they can be successful. In this study, we use miniaturized, animal-borne dataloggers that measure heart rate, body temperature, and activity, to return to the basics of ecology – describing the responses of co-existing species to the environments they occupy. Specifically, we characterize the differences and similarities in physiological and behavioural responses to environmental variation (namely, air temperature, photoperiod, and resource variation) of free-ranging snowshoe hares and North American red squirrels during winter in the northern boreal forest. We demonstrate that, while both species are classified as homeothermic mammals, characterized by high and stable body temperatures, they differ substantially in body temperature patterns, and, as the environment changes, they alter different traits to stay warm. Snowshoe hares remained active in



Snowshoe hare (*Lepus americanus*)
Photo by: A. Spott

North American red squirrel (*Tamiasciurus hudsonicus*)
Photo by: P. Vuori

the cold and dark but adjusted their heart rate and metabolism to stay warm, whereas squirrels avoided the cold by spending more time in the nest, minimizing the necessity of heart rate and metabolic responses. While ecological theory often focuses on extremes and dichotomies, (e.g., small vs. large animals, herbivores vs. carnivores, predator vs. prey, homeotherms vs. heterotherms), our results reveal more subtle and nuanced species differences that show how species living in the same place, at the same time deal with environmental variation in very different ways. These subtle, but important species differences are both a cause and a consequence of their unique ecology, natural history, and their relationships with other species in their environment.