Project acronym: HotArc

Project title: Do Arctic animals like it hot: a field approach to study plastic and evolutionary determinants of heat tolerance in Arctic insects

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Discipline: Earth Sciences & Environment: Ecosystems & Biodiversity

Station(s): Ny-Ålesund Research Station - Sverdrup (Svalbard/Norway)

The climate is changing rapidly especially in the Arctic, and to cope with these changes, organisms have to adapt. Much of the knowledge we have on responses (or lack thereof) to warmer temperatures in terrestrial insects is based on studies on temperate and tropic species.
Adaptation to high temperatures through evolutionary changes is typically slow and heat tolerance seems evolutionary constrained by genetic trade-offs and lack of adaptive genetic variation. At high latitudes, i.e. in Arctic regions, evolutionary adaptation has been hypothesized to proceed at an even slower pace as developmental time typically is slow and many species will use several years to complete their life cycle. An alternative and potentially fast way of accommodating with changing and stressful environments are through plastic responses, where the physiology of a genotype adaptively responds to a change in the environment. Plastic responses are considered to be important for coping with diurnal and seasonal changes in temperature. However, heat acclimation (plasticity in heat tolerance) typically increases heat tolerance by only a small fraction, e.g. a 10°C increase in environmental temperature increases heat tolerance by 1°C. This questions the adaptive capacity of both evolutionary adaptation and plasticity to increasing temperatures in Arctic insects. In consequence, a large negative impact on biodiversity is also expected – if the characteristics of tropical and temperate insects' thermal biology can be extrapolated to animals adapted to the extreme Arctic environment.