Project acronym: CHEMOTYPE

Project title: Chemotypic plasticity in northern grass-endophyte populations

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Discipline: Earth Sciences & Environment: Ecosystems & Biodiversity

Station(s): Arctic Station (Greenland/Denmark), Toolik Field Station (USA)

Climate mediated introduction of new herbivorous insect species impose key challenges for arctic plant species, where an increasing number of studies uncover detrimental consequences for arctic plants encountering novel pest insects following climatic changes. A central problem of rapid invasions is that chemical defenses of endemic plant species may not be adapted to cope with invasive insect pests. We are using the perennial grass Festuca rubra and its endophytic fungus Epichloë festucae for studying the chemical defense of the grass-endophyte symbiosis in arctic habitats and elucidating its resistance against impending invasive insect herbivores expanding towards northern latitudes due to ongoing climatic changes. We collected wild red fescue populations in most northern habitats and will analyze them for their alkaloid levels, corresponding to the latitude of Kevo Sub-Arctic Research Station, Finland to elucidate (1) the circumpolar distribution of grass endophytes, (2) the frequency of endophyte infection in red fescue plants and (3) whether alkaloid profiles in northern latitudes are driven by vertebrate herbivory. Besides targeted alkaloid quantifications, we aim to apply High Resolution Mass Spectrometry to characterize the metabolic fingerprint of endophyte infected red fescue, which allows us to identify metabolic pattern specific for arctic red fescue plants. These metabolite pattern monitored across the next decades will reveal global change-mediated shifts in plant metabolism and, in our case, defense metabolites. Furthermore, a continuous sampling over the next decades will unravel whether global change selects for endophyte symbiosis in red fescues.