

Project acronym: FESTUCA

Project title: Genetic diversity in northern grass-endophyte populations

Project leader: Marjo Helander, University of Turku, Finland

Discipline: Life Sciences & Biotech

Station(s): Faroe Islands Nature Investigation (FINI, Faroe Islands), Toolik Field Station (USA), Kluane Lake Research Station (Canada)

We are using perennial grass *Festuca rubra* and its systemic, via seeds transmitted, endophytic fungus *Epichloë festucae* for studying co-evolutionary processes and adaptation to changing climate. *F. rubra* has wide, circumpolar distribution and populations are commonly found in harsh arctic environments. With previous INTERACT-TA funding, members of our research team have documented geographic variation in frequencies of endophyte infection in Europe. For further estimating genetic diversity and adaptive potential in the symbiotic *Festuca*-*Epichloë* system in arctic areas, we will use the samples from Western North American arctic and the Faroe Islands to determine whether these areas are potential sources of genetic variation.

Locations of the stations will provide ideal sampling sites to study genetic diversity especially in light of postglacial colonization. From Faroe Islands we will sample populations from areas that have been suggested to be ice-free in order to estimate whether these areas have unique haplotypes originating from their potential glacial survival. We will sample 10-20 populations from each region ($n=30-50$ per population) and transport them to Finland for further studies.

Population parameters of the collection sites will also be recorded (coordinates, altitude, population size, density and surrounding plant community). This data also enables comparing genetic patterns with environmental variables using landscape genetics approaches. We will use our previously developed microsatellite markers (cpSSR for *F. rubra* and nuclear SSR for *Epichloë*) to quantify genetic diversity in both species using standard population genetic methods. Furthermore, we are developing genomic resources for studying differentiation in candidate genes with potential adaptive significance (alkaloid production and flowering time), and these samples would be a valuable addition for these comparisons. In addition to quantifying endophyte infection status of each plant, we can determine ploidy level of *F. rubra* and alkaloid production of the endophytes with our collaborators in Salamanca, Spain. The collected material will also be vegetatively propagated and used in experiments field and common garden experiments.