

Project descriptions AB-207 summer/autumn 2021 (application deadline 15 Feb 2021)

Title: Biodiversity of myxomycetes (1 student)

Project background: Myxomycetes (slime molds) are a group of fungus-like organisms with an interesting life cycle that includes conspicuous macroscopic plasmodia and fruiting bodies. They live on litter and in soil, where they graze on bacteria and stimulate rates of organic matter decomposition. In Svalbard, only three species have been reported to date. However, many species only live as amoeba in soil and are therefore difficult to detect. Recent investigations using molecular techniques have shown that the diversity of myxomycetes is much higher than previously assumed in temperate locations (e.g. Fiore-Donno et al., Scientific Reports 2016), and we suspect that the same is true in the Arctic.

Aim: Investigate the biodiversity, distribution and seasonality of Svalbard myxomycetes.

Methods: The project can be developed in different directions but will be based on molecular methods. Lab-work (DNA extraction from soil, PCR, preparation for Illumina sequencing) and/or bioinformatic analyses of high throughput sequencing data. Statistical analyses of sequencing data.

Preferred educational background/competences: skills/experience in molecular lab work, bioinformatics or statistics.

Contact information: Anna Vader (anna.vader@unis.no).

Title: Spatial ecology of the Svalbard reindeer (1-2 students)

Subject keywords: Spatial ecology, reindeer, Bjørndalen, landscape diversity, snow cover, vegetation, BIG, Svalbard.

Project background: The Svalbard reindeer is a key species in the Svalbard terrestrial ecosystem linking vegetation growth and predator dynamics. There exists ample information on the annual population dynamics of the reindeer across Svalbard. However, so far, we know very little of their seasonal use across the Svalbard landscape. Hence, through the ecosystem monitoring programme “Bjørndalen Integrated Gradients” (BIG) carried out and maintained by the Department of Arctic Biology at UNIS, reindeer has been counted and marked spatially on a weekly basis since and throughout 2019 and 2020. We expect, that the spatial habitat use of reindeer in Bjørndalen is related to changes in snow cover and vegetation spring emergence. However, so far very little is known of the seasonal spatial habitat use of reindeer on Svalbard. Your project will contribute significantly to our increased knowledge.

Aim: To collect and analyse spatial data on Svalbard reindeer to investigate the spatial distribution of reindeer throughout the year.

Methods: Weekly fieldwork in the reindeer population in Bjørndalen; these data will be combined and analysed together with the data from previous year.

Preferred educational background / competence: Spatial and temporal understanding of population dynamics. Basic knowledge of the statistical software R user interface.

Contact information: Mads Forchhammer (mads.forchhammer@unis.no).

Title: Insulation capacity of moss species and their effect on permafrost thaw (1-2 students)

Subject keywords: Insulation, active layer, permafrost, bryophytes, tundra

Project background: Mosses play an important role in insulating the soil from increasing air temperatures, reducing the impact on the permafrost. As a result of increasing temperatures and precipitation, the vegetation composition in the Arctic is changing. This shift will likely impact the active layer and permafrost underneath, which could lead to a change in the release of greenhouse gases. More information on the impact of individual species is needed to accurately predict the coming changes in the Arctic.

Aim: To reveal the differences in insulating capacity of various moss species and which traits play a major role in insulation of the soil.

Methods: Monocultures of various moss species will be placed on the tundra, followed by monitoring soil temperatures and development of active layer depth. Depending on interest, we can further explore easily measurable bryophyte traits and link these to insulation capacity.

Preferred educational background/competences: Vegetation ecology, experience in microscopy, basic ecological understanding

Contact information: Simone Lang (simonel@unis.no)

Title: Development of permafrost thaw along topographical gradients and its links to vegetation (1-2 students)

Subject keywords: active layer depth, bryophytes, gradients, permafrost, tundra, vascular plants

Project background: Vegetation, especially mosses play an important role in insulating the soil from increasing air temperatures, potentially reducing permafrost thaw, thus leading to a reduced active layer depth (ALT). As of now, we have little knowledge on how the different plant communities on Svalbard affect ALT beneath them, and whether the insulating effects of plant communities change over the growing season. Also, scale is often crucial in identifying drivers in ecological studies, and (a-)biotic drivers at small scale may not be the same as found at larger scales. However, we have little knowledge on how active layer depth develops on a small scale, along gradients with contrasting vegetation and contrasting environmental variables.

Aim: To observe active layer depth spatially and temporally underneath contrasting plant communities during summer.

Methods: The study makes use of four grids in Endalen and at Isdammen, close to Longyearbyen. Each grid covers a gradient in topography, from ridge to late-lying snow, where contrasting plant communities occur. Vegetation composition is known, and in 2020 frost tubes were installed in 80 plots (see <https://www.globe.gov/frosttubeprotocol>). Fieldwork will concentrate on weekly measurements of active layer depth (ALT), soil moisture and soil temperature. Depending on interest, biotic trait measurements on plants can be added.

Preferred educational background/competences: Vegetation ecology, basic ecological understanding

Contact information: Simone Lang (simonel@unis.no)

Title: Herbivore-induced disturbances in tundra and their effect on active layer depth (1-2 students)

Subject keywords: active layer, bryophytes, grubbing, tundra, permafrost

Project background:

Bryophytes dominate in wide regions of the Arctic, also presenting the dominant vegetation cover on Svalbard. The layer of bryophytes in moss tundra, with its insulating abilities, is a significant factor in preserving permafrost. Herbivore activity such as goose grubbing may damage and remove parts of the moss layer, and is expected to be a major driver of vegetation shift from moss-dominated to grass-dominated tundra. However, whether this herbivory-induced reduction of moss cover will lead to increases in active layer depth, remains currently unknown. This study will focus on the development of active layer depth below intact vs. disturbed vegetation during summer.

Aim: To monitor the effect of grubbing on active layer depth throughout the summer.

Methods: Development of active layer depth will be monitored over summer in sites with contrasting vegetation in Adventdalen. In each vegetation type, disturbed and undisturbed plots will be monitored. Abiotic variables such as temperature and soil moisture will be measured. Depending on interest, vegetation recordings can be included.

Preferred educational background/competences: Skills in plant taxonomy, basic ecological understanding

Contact information: Simone Lang (simonel@unis.no)