

Abstract

Today increased global warming is a reality and the effects on the diversity, growth of vegetation and distribution of species is expected to be large in the Arctic. The variability in the tundra vegetation makes it difficult to predict the responses within different regions. Thus, the overall aim of this thesis was to describe the species diversity pattern at different spatial scales within the subarctic –alpine valley, Latnjavagge, and to relate varying levels of diversity to biotic and abiotic processes and environmental variables in the landscape. Within the small area of Latnjavagge (12 km²) there was a need for a detailed vegetation map with a resolution in size of previous experimental studies, why the potential of a Colour Infra Red-air photo for a detailed digital vegetation classification was examined (Paper II).

Extensive research at a smaller plot scale on the effects from global warming on the alpine flora has been conducted in Latnjavagge since 1990. Extended knowledge of the present ecosystem structure at landscape level is fundamental for the understanding of the responses in vegetation at a larger scale from Global Change. The relationship between environmental factors and plant community distribution and species diversity was examined in Paper III. The relationship between species diversity and biomass and the relationship between the flowering phenology for a plant community, expressed as a "Phenoscore", and species diversity was studied in Paper IV-V. Despite Latnjavagge's relatively small geographical area its soils had a wide range in chemical properties. At the larger scale, differences in soil moisture, altitude, day of final thaw and pH were most important for the differentiation between plant communities and species distribution. Soil moisture was highly correlated with many of the micro and macro nutrients as the soil moisture determines the rate of weathering and the content of ions mainly reflected solution of lithological components in the runoff water.

The relationship between species diversity and biomass was found to be positive or forming a convex curve depending on the spatial scale of

interest. In the high alpine the species diversity of bryophytes and lichens was positively correlated with vascular plant biomass or height while the relationship was negative at the mid alpine altitude. This implies that in the high arctic, increased growth of vascular plants due to global warming may have a beneficial effect on the survival and growth of the non-vascular plants, generating a positive feedback effect where the non-vascular plants by facilitation expand the realized niches for stress tolerant vascular plant species.

Flowering phenology is important for angiosperms, not only for reproductive success of any particular species or species' populations, but also in terms of functioning of species within plant communities. A significant convex or linear relationship between Phenoscore and species diversity was found where early and late flowering plant communities had lower species diversity. A predicted shift towards a dominance of shrubs and graminoids in the Arctic, at the expense of herbs, may most likely add an indirect climatic impact on the plant community phenology by increasing the relative frequency of early flowering shrubs and late flowering graminoids.

In Paper VI the effects on species diversity of bryophytes and lichens from simulated environmental change was investigated. A general response after five years of experimental manipulation was an impoverishment of the cryptogams and an increased growth of graminoids and dwarf shrubs. The bryophytes were negatively affected by a combination of nutrient enhancement and temperature while the effect on the lichen diversity was negative except from the temperature enhancement where the lichens increased.