Submitted Abstract

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Abstract

Anthropogenic climate change is a threat to biodiversity with alpine plant communities being especially vulnerable. Warming gives lowland species, the opportunity to colonise the alpine and create no-analog plant communities. Importantly, the functional identity of the lowland species may be novel to alpine communities and thus introduce novel biotic interactions. Most lowland species are more competitive than alpine species indicating that alpine species could potentially be outcompeted under future climate conditions. Climate scenarios predict regional changes in precipitation in addition to warming, which raises the additional question how warming effects interact with different precipitation regimes. In our study, we focus on the diversity of alpine plant communities and how different aspects of diversity change under climate warming. For instance, species richness decreases with elevation due to adverse environmental conditions in the alpine compared to lower altitudes. Under climate warming, richness has been shown to increase in alpine systems due to colonization by species from lower altitudes. However, what effects these colonizers may have on the diversity of the original alpine communities in addition to warming is poorly understood and studied. Previous findings, however, indicate a possible response lag for the community compositions richness.

I order to shed light on this knowledge gap, our study uses an innovative experimental approach to simulate the predicted climate warming combined with novel biotic interactions in the field. The experiment is conducted at the four alpine sites in the Vestland climate grid in Norway. Our sites are located along a precipitation gradient ranging from 1000-3500 mm/year. We use open top chambers (OTCs) for warming. To test for functional rather than species identity novelty in the alpine community, we transplanted three lowland species with functional traits new to the alpine vegetation (novel trait species), and three lowland species with functional traits similar to the new alpine vegetation (extant trait species). We collected plant community data in a full-factorial design of these experimental treatments including control plots without warming and/or transplants in 2018, 2020. We will collect these data once more this summer and analyse them test the following hypothesis:

We expect warming to reduce diversity in the alpine communities.

New neighbours will have a general negative impact on the diversity due to enhanced competition.

Novel trait species will reduce diversity more than extant trait species.

Along the precipitation gradient we expect that the warming effects decrease and competition effects increase.