Submitted Abstract

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Abstract

A long-standing quest in ecology, with ever-increasing relevance in the face of climate change, is to understand the effects of climate on sexual reproduction and the dynamics of natural populations. Genetic variation enables species to adapt to new environments. Hence, sexual reproduction and the genetic variation it introduces into a population, may be vital for the plants' ability to persist under a changing climate.

According to climate projections, western Norway will be experiencing higher temperatures and more precipitation in the future. A warmer and wetter climate will lead to increased productivity for the vegetation, hence enabling species adapted to a warmer climate to spread up in the mountains. Range-expanding species could have dramatic impacts on alpine plant communities and populations, particularly if they introduce novel features into their newly attained neighborhood. Studying how warming and range-expanding species affect flowering performance is therefore important to understand potential impacts of climate change on plant population persistence and range dynamics.

To test this, we have established a field experiment along a natural precipitation gradient in the mountains of western Norway. In this climate change field experiment we manipulate both temperature and competitive conditions in alpine vegetation, by using open-top chambers and through transplant experiments respectively. To simulate novel species colonizing upland plant communities, we transplanted lowland species with functional traits that are novel to the alpine vegetation into our alpine study sites. This creates interactions between species that have not co-occurred previously, and allows us to investigate the indirect colonization effects of climate on flower production.

Our study shows that alpine plants produce more flowers when they interact with lowland species with novel traits. Warming effects were significantly different between alpine forbs and graminoids. Forbs had a marginally significant decrease in flower production, but we found no apparent effects of warming on flower production in graminoids. Our findings suggest that competitive lowland species may obscure or counteract the warming-effects on flower production, and that sexual reproduction is a priority for alpine plants under increasing pressures from range-expanding species.