Submitted Abstract

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Abstract

Global warming is assumed to restructure mountain insect communities in space and time. Theory and observations along climate gradients predict that insect abundance and richness, especially of small-bodied species, will increase with increasing temperature. However, the specific responses of single species to rising temperatures, such as spatial range shifts, may weaken such prediction, asking for intensive monitoring of real-world communities over time. Here, we examined the temporal and spatial change in wild bee communities and its drivers along two largely well-protected elevational gradients (alpine grassland vs. prealpine forest), each resampled within the last decade. Along both gradients, we detected clear upward shifts in bee communities, with cold-adapted bumblebee species reacting particularly sensitive, demonstrating the speed with which mobile organisms can respond to climatic changes. Mean annual temperature (MAT) was identified as the main driver of species richness in both regions. Accordingly, and in large overlap with expectations under climate warming, we detected an increase in bee richness and abundance, and an increase of small-bodied species in low- and mid-elevations along the grassland gradient. While changes in upward shifts, species richness, abundance and body size in the prealpine forest gradient were partly consistent with the alpine grassland system, they were generally weaker, which could be due to a much less severe warming trend than in the alpine grassland system or due to the variable and possibly confounding effect of canopy cover. Our study highlights the use of accurate assessed abundance data revealing rapid changes in bee communities over only one decade. We conclude, that in well-protected temperate regions, small-bodied bees may initially profit from warming temperatures, by getting more abundant and diverse.