Title:

Asynchronous migration of plants and butterflies: will butterflies choose new host plants from higher elevations?

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Abstract:

The world is currently facing rising temperature, forcing species to track their optimal climatic niche, such as by migrating towards higher elevations. However, asynchronous range shifts of species like sessile plants and flying insects could alter current biotic interactions, leading to yet unpredicted population and community dynamics.

Along elevation gradients, during warming, migrating insects are expected encounter novel host plants, leading to two potential scenarios: i) insects can develop on closely related host plant species, leading to unexpected increased herbivore pressure on alpine plants, ii) insects cannot survive on alpine species, and are therefore constrained to track the slow upward movement of their host plants.

Using field common gardens and climate-controlled laboratory experiments, we studied the preference and performance of two low-elevation butterflies, *Melitaea celadussa* and *Zygaena filipendulae*, on their current host plants, *Plantago lanceolata* and *Lotus corniculatus*, and their potential novel alpine host species, *Lotus alpinus* and *Plantago atrata*, respectively.

We found that both butterfly species preferred to oviposit and feed on their current host plants, while the performance of caterpillar did not differ between host plants. Moreover, wing area and the ability to produce a second generation within a year were reduced when caterpillars developed on alpine plants.

While our results indicate that butterflies are able to oviposit and grow on alpine plants, their preferences are still directed toward the low-elevation plant. Furthermore, by altering both the life cycle and the phenotype of butterflies, novel host plants can potentially drive novel adaptative responses of butterflies during climate warming.