Coevolution in a warming world: an experimental test of the geographic mosaic of coevolution

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According to the geographic mosaic theory of coevolution (GMTC), coevolution varies with abiotic and biotic environmental factors. We assessed this hypothesis using experimental plant-butterfly coevolution and by testing the effects of temperature and the presence of mutualistic bumblebees on co-divergence during six generations of selection. Butterflies are mutualistic by pollinating plants and antagonistic by ovipositing on plants from which caterpillars feed. We found unique plant-butterfly coevolutionary trajectories in response to abiotic and biotic factors: plants evolved strong herbivore resistance when exposed to either bumblebee presence or elevated temperatures, while their combination led to less strong plant-resistance evolution and the evolution of butterfly-foraging traits. We provide experimental proof for the GMTC and show rapid divergent coevolution to the combination of local abiotic and biotic conditions.