

Changes in carabid species distribution, body traits and associated microbiota along an elevational gradient

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Aim:

Climate warming is affecting Alpine habitats through an above-global average increase in temperature. Such rapid environmental change can affect biotic interactions, impacting ecosystem stability and functionality; however, these processes in mountain regions are not well understood. We used an elevation gradient ranging from 1000 to 2500 m a.s.l. as a proxy for climate change to examine the diversity of carabid beetle species, body traits and microbiota.

Methods:

On 12 grazed pasture sites (3 replicate sites every 500 m of altitude), we installed and checked pitfall traps for 24 hours every two weeks throughout the growing season. Almost 6000 individuals were morphologically identified to species, and body length, wing development and sex were noted. In June 2020, 182 carabid beetles were captured by hand, and used for microbial community analysis.

Results:

Community composition, diversity, and the ratio between winged and wingless species of carabid beetles changed significantly with elevation, but not in a linear pattern (ie. highest species biodiversity at 1000 m; lowest diversity and largest body size at 2000 m). Carabids established individual-specific but still elevation-dependent patterns in prokaryotic and fungal communities. Prokaryotic communities were similar below 2000 m but changed at higher elevations and fungal diversity was highest at 2000 m.

Conclusions:

We discuss how changes in species assemblages and body traits may alter the functional role of carabid beetles in mountain ecosystems, and how alterations in their microbiota might impact their ability to adapt to rapid environmental perturbation.