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Changes in ground-dwelling carabid communities and their interactions with the microbiota of selected soil compartments along an Alpine elevational gradient

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Global warming is affecting Alpine habitats through an increase in temperature above the global average. Such rapid environmental change may affect biotic interactions and thus ecosystem stability and functionality; however, these processes in mountain soils 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 investigate the diversity of ground-dwelling carabid beetle species and selected body traits. We also analysed the microbiota of the beetles and other soil-associated compartments to understand the complex interactions and co-occurrences of microbial communities in alpine soils.

On 12 grazed pastures (3 replicate sites every 500 m of altitude), we set up pitfall traps for an entire growing season and emptied them every two weeks. Nearly 6000 individuals were captured and morphologically identified to species, with body length, wing development and sex recorded. In addition, 182 carabid beetles were collected by hand, and used for microbial

community analysis by next-generation sequencing. For comparison, microbiota analyses were also performed on soil, rhizosphere, nematode, collembola, earthworm and vertebrate faecal samples.

Community composition and diversity of carabids changed significantly with elevation, but not in a linear pattern. Especially the prokaryotic communities in carabid beetles showed trophic related patterns. Compared to the other soil-associated compartments, bacterial and fungal alpha and beta diversity in carabids was very low and few taxa were shared. Our data confirm ecological patterns along elevation and provide a first insight into the complex interactions between soil, faunal and microbial players.