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The response of ants to climate change

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Abstract

Ants (Hymenoptera: Formicidae) are one of the most dominant terrestrial organisms worldwide. They are hugely abundant, both in terms of sheer numbers and biomass, on every continent except Antarctica and are deeply embedded within a diversity of ecological networks and processes. Ants are also eusocial and colonial organisms-their lifecycle is built on the labor of sterile worker ants who support a small number of reproductive individuals. Given the climatic changes that our planet faces, we need to understand how various important taxonomic groups will respond; this includes the ants. In this review, we synthesize the available literature to tackle this question. The answer is complicated. The ant literature has focused on temperature, and we broadly understand the ways in which thermal changes may affect ant colonies, populations, and communities. In general, we expect that species living in the Tropics, and in thermally variable microhabitats, such as the canopy and leaf litter environments, will be negatively impacted by rising temperatures. Species living in the temperate zones and those able to thermally buffer their nests in the soil or behaviorally avoid higher temperatures, however, are likely to be unaffected or may even benefit from a changed climate. How ants will respond to changes to other abiotic drivers associated with climate change is largely unknown, as is the detail on how altered ant populations and communities will ramify through their wider ecological networks. We discuss how eusociality may allow ants to adapt to, or tolerate, climate change in ways that solitary organisms cannot and we identify key geographic and phylogenetic hotspots of climate vulnerability and resistance. We finish by emphasizing the key research questions that we need to address moving forward so that we may fully appreciate how this critical insect group will respond to the ongoing climate crisis.

Keywords: ants, climate change, eusociality, heat tolerance, nest thermoregulation, ant communities, ecologica

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