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Elevational gradients in phylogenetic structure of ant communities reveal the interplay of biotic and abiotic constraints on diversity

Antonín Macháč

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Annotation:
Incorporating information on species' phylogeny into the framework of conventional community ecology, we illustrate that ant communities situated in lowlands are primarily structured by interspecific competition. In contrast, highland communities are formed by habitat filtering on phylogenetically conserved temperature tolerances. In sum, our study highlights the potential role of niche constraints, environmental temperature, and competition in shaping broad-scale diversity gradients.

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15th Dec 2010
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I hereby declare

that Antonin Machac has substantially contributed to our study

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Specifically, Antonin's contribution comprised

- conducting all the statistical analyses, analyses of community phylogenetic structure, phylogenetic conservatism and GIS inference
- major contribution to the phylogeny reconstruction
- contribution to the interpretation of the results
- minor contribution to the text of the manuscript

On behalf of the co-authors

19th Nov 2010
Harvard University
Cambridge, MA, USA

Milan Janda, Ph.D.

Contents

Elevational gradients in phylogenetic structure of ant communities reveal the interplay of biotic and abiotic constraints on diversity

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ABSTRACT: Central focus of ecology and biogeography is to determine the factors that govern spatial variation in biodiversity. Here, we examined patterns of ant diversity along climatic gradients in three temperate montane systems: Great Smoky Mountains National Park (USA), Chiricahua Mountains (USA), and Vorarlberg (Austria). To identify the factors which potentially shape these elevational diversity gradients, we analyzed patterns of community phylogenetic structure (i.e. the evolutionary relationships among species coexisting in local communities). We found that species at low-elevation sites tended to be evenly dispersed across phylogeny, suggesting that these communities are structured by interspecific competition. In contrast, species occurring at high-elevation sites tended to be more closely related than expected by chance, implying that these communities are structured primarily by environmental filtering caused by low temperatures. Taken together, the results of our study highlight the potential role of niche constraints, environmental temperature, and competition in shaping broad-scale diversity gradients. We conclude that phylogenetic structure indeed accounts for some variation in species density, yet it does not entirely explain why temperature and species density are correlated.

The thesis cannot be published in its entirety here due to copyright issues. The thesis has been published online on the website of the journal *Ecography* (DOI: 10.1111/j.1600-0587.2010.06629.x). The thesis is also available in the Academic Library of the University of South Bohemia (Branisovska 31b , 37005 Ceske Budejovice, Czech Republic) and from the author on request (A.Machac@email.cz).