

Preface

Prior to graduate school, I was trained as a tropical tree ecologist. During my master's degree, I worked in a lab that studied cricket sex and speciation. Given this history, it almost seems logical that I ended up studying the phylogenetic structure of tropical tree communities both during my PhD and since. I was, and still am, fascinated by how the long history of lineages impacts the present-day structure and dynamics of communities. Uncovering these connections has always been a goal of mine in phylogenetic ecology. However, my phylogenetic ecology research and that of others has often veered away from this important goal. Our tangents have been well intentioned, but they have often used phylogenetic information in a way that is weak at best, or inadvertently misleading at worst. This has delayed a true synthesis of evolutionary history and community ecology and threatens the future of phylogenetic approaches to ecological problems.

This book was framed as an attempt to outline the field of phylogenetic ecology and, more so, to discuss where phylogenetic information can be utilized most effectively in ecology. Phylogenies are powerful pieces of data that can still make a major impact in ecology on topics ranging from conservation to community assembly. Here, I have tried to provide a pathway toward a more robust and interesting phylogenetic ecology. I expect that many readers will not agree with the remedies and critiques I have posed in this book, but I thank them for their consideration of my viewpoint. I expect that many experts in the field will be disappointed that I didn't cover their work in more detail or at all. I apologize in advance for this. It is not meant as a commentary on the importance of their work.

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The fields of ecology, evolution, and biogeography were part of a continuum over a century ago. However, they became more compartmentalized and ultimately midway through the twentieth century the part first divided. There has been a renewed interest in the integration of evolutionary history and ecology, and vice versa. Much of the interest that began more than a century ago until now has been phylogenetic reconstruction in one form or another. This phylogenetic thread connects what is called phylogenetic ecology, and it is the topic of this book.

The use of phylogenetic information in ecology is well often stated as a means to integrate evolutionary history into ecology (Lewander, Hultine, and 2009; Colston and Davies 2002). However, the ways in which phylogenies have been used in ecology are much more diverse. Phylogenies, or more precisely measures of relatedness, were used long before phylogenies as proxies for similarity of species, and a tradition of using phylogenies in this fashion continues to this day in ecology (Hewitt 1999; Hohn 1996; Lewander 2009; Webb 2000). Phylogenies have also been used in ecology for several reasons: from the inferring of historical biogeography (Brooks and Brooks and Wiley 1996; Brooks and McLennan 2001) to the reconstruction of clades and the estimation of lineages to considering phylogenetic independence in comparative analyses (Felsenstein 1985; Harvey and Pagel 2001) to quantifying phylogenetic diversity in order to set conservation priorities (Webb 2000; Colston 2002). The first goal of this book is to guide the reader through the history of phylogenetic ecology. I begin with phylogenetic semi-independence and what comparative methods, despite this not being the first way in which phylogenies were integrated into ecology. I do this and provide a primer on phylogenetic inference at the end of this chapter. I then discuss the history of phylogenetic