

Local, population, community, and ecosystem processes shaping a tropical forest plant community

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For my doctoral dissertation, I developed three chapters exploring ecological processes across various scales of organization. These chapters examine local dynamics shaping species distributions, the preservation of biodiversity within communities, demographic patterns at both population and community levels, and the consequential impact of communities on the structure and function of ecosystems.

Lianas are ubiquitous in tropical ecosystems and constitute a vital component of tropical forest dynamics. Their ecological roles, from canopy structure to nutrient cycling, offer valuable insights into the intricate interplay of organismal interactions shaping these diverse and dynamic ecosystems. By studying lianas, we can test general ecological theory, as well as better understand the specific role of lianas in tropical forests.

In the first chapter, we used coexistence theory to develop four key criteria necessary to assess the influence of local-scale interactions on species population growth rates, to understand diversity maintenance and community structure. We found strong evidence that species coexistence is controlled by deterministic processes, which maintains each species in the community at equilibrium. In the second chapter, we found that more common species had higher population growth and lower relative mortality and recruitment. I also show that increased clonality increased demographic rates. In the third chapter, I show that small individuals having relatively high survival rates, due to copious clonal stem production. I examined the effect lianas had on forest canopy height. In this chapter, I showed that increasing liana density had a negative

effect on canopy height, altering forest structure and reducing tree carbon storage capacity. Thus, increases in liana density reduce forest canopy height, which may affect forest carbon storage capacity.

This dissertation identifies ecological processes underlying tropical forest dynamics, including the processes responsible for the maintenance of diversity and community structure. This dissertation also identifies the diversity of life-history strategies among species and within a community. And the negative effects increasing liana density had on tropical forest structure. With empirical evidence from a liana community, we enhanced prevailing ecological theories focused on tropical trees. This dissertation contributes to a more general understanding of ecological theory and advances our understanding of tropical forest ecology.