Thank you, next: partner turnover elevates benefits of mutualism for an ant-tended plant

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Abstract

Introduction

Mutualisms are species interactions where all participants benefit, leading to higher individual fitness and increased population growth rates. They are among the most widespread species interactions (Bronstein, 1994; Chamberlain et al., 2014; Frederickson, 2013), but can deteriorate into commensalism or parasitism (Bahia et al., 2022; Mandyam and Jumpponen, 2014; Rodriguez-Rodriguez et al., 2017; Song et al., 2020; Thrall et al., 2007). Mutualisms are considered more context dependent than other species interactions (Chamberlain et al., 2014; Frederickson, 2013), meaning the magnitude and sign of interaction strength are often determined by environmental conditions and species' identities.

Mutualism is defined at the level of a species pair (+/+), but these interactions are embedded within multi-species communities. Growing evidence suggests that pairwise interactions are poor predictors of the net effects of multi-species mutualism Afkhami (2014); Palmer et al. (2010). A focal mutualist may interact with multiple guilds of partner types (e.g., plants that interact with pollinators, seed dispersers, soil microbes, and ant defenders) or with multiple partner species within the same guild (e.g., plants visited by multiple pollinator species). Even within a mutualist guild, partner species often differ in the amount or type of goods or services they provide, making partner identity an important source of contingency in mutualism **?**. Whether and how partner diversity modifies the demographic effects of mutualistic interactions remain open questions within relevance in applied settings such as agriculture (Rogers et al., 2014), restoration (cite), and pest management (cite).

There are multiple mechanisms by which partner diversity can influence the net benefits accrued by a focal mutualist, mirroring the mechanisms by which, at a larger scale of organization, biodiversity can influence ecosystem function (BEF chapter). When there is a consistent hierarchy of fitness effects – a consistent ranking of best to worst mutualists – a more diverse sample of the partner community may be more likely to include the best partner Frederickson (2013). When this leads to the fitness of a focal mutualist interacting with multiple partners being equal to the fitness of a focal mutualist interacting with only the highest quality partner, sampling effect can explain the positive effects of partner diversity Batstone (2018).

Methods

Results

Discussion

Conclusion

Acknowledgments

Data and Code Availability

Appendix A: Additional Methods and Parameters

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Tables

Figure legends