The temporal assembly of plant-pollinator networks following restoration

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Abstract

The structure of networks is related to ability of communities to maintain function in the face of species extinction. Understanding network structure and how it relates to network disassembly, therefore, is a priority for system-level conservation biology. We explore the assembly of plant-pollinator communities on native plant restorations in the Central Valley of California. The assembling communities are paired with unrestored field margins (controls) and mature (non-assembling) hedgerows. We determine whether there are change points in the assembly of the communities where the network undergoes significant reorganization. We are also ask how are the individual species changing their interaction patterns? What does this mean for the topology/resilience of the network? We also attempted to adapt a financial model to mutualistic networks. Our biggest difficulty with this approach was to translate the price term to mutualistic systems. We explored a range of approaches, such as number of visits a species performs. However, it seems that financial systems cannot be easily translated to mutualistic systems. In addition, we used a Changing Point Detection Algorithm to assess weather the different communities went through a critical reorganization on their interaction patterns. We were able to identify some changing points in the communities, and also to explore some general patterns commonly used to describe ecological networks. For example, on the network level, networks become increasingly modular and less nested, whereas on the species level, species become more specialized, as resources become more reliable.

Keywords: changing points, temporal networks, hedgerows, species interactions

Introduction

- The structure of networks is related to ability of communities to maintain function in the face of species extinction.
- A key restoration aim is to facilitate assembly of robust networks; thus it is critical to study how restoration influences the assembly of plant-pollinator interactions.
- few theories about how networks assemble, preferential attachment
- To date, only two field studies have examined how networks assemble over time, often using space for time gradients.
- Olesen *et al.* (2008) was investigated day-to-day, temporal assmebly of a plant-pollinator network within a season, taking advantage of the extreme seasonality of pollinator communities in Greenland. Olesen *et al.* (2008) found that within a season, the network assembly was similar to preferential attachment. New species tended to interact predominantly with already well-connected species, likely because these species are either more abundant or more temporally persistent.
- Studying primary succession along a glacier foreland, Albrecht *et al.* (2010) found a similar pattern where nestedness, a pattern of interactions where a generalist core interacts with both specialist and generalist species, increased as the community aged.
- Even non-succesional temporal dyanmics suggest a stable core of generalsits persiss despite high turnover of peripheral species (Fang & Huang, 2012; Díaz-Castelazo *et al.*, 2010; Alarcón *et al.*, 2008).
- In contrast to the ordered notion of netowrk build-up described by perferential attachment, assembly may be punctated by significant reorganizations of interactions.

For example, as new species are added, resident species may change their interaction parteners to minimize competition, or go extinct if they are unable to persist with more competing species.

Materials & Methods

Study sites and collection methods

Results

Discussion

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