Disentangling the drivers of plant-pollinator interactions

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Introduction

Ecological interactions are a central component of biodiversity.

However, ecologists still fail to predict plant-pollinator interactions.

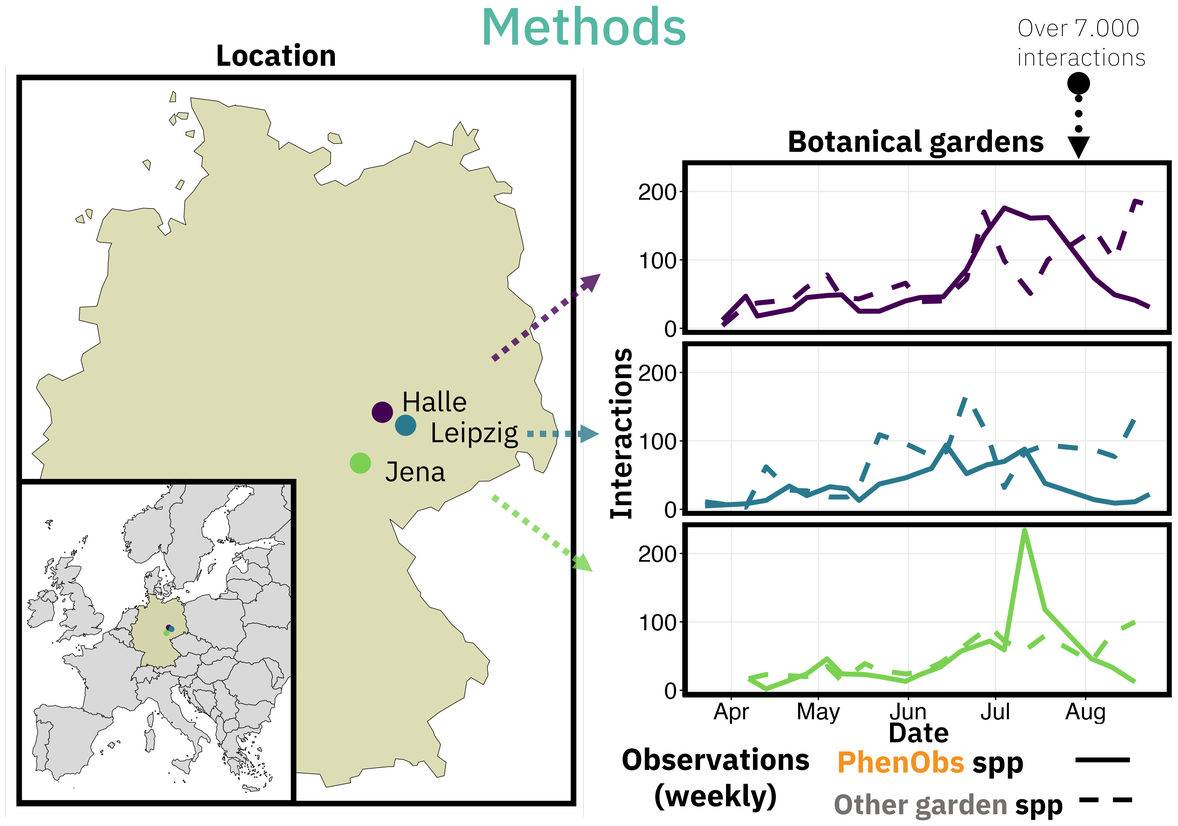
Some of the main mechanisms that influence interaction probability are species abundances, phenology and trait matching.

The goal of this work is to improve our mechanistic understanding by exploring how different drivers influence plant-pollinator interactions in semi-controlled environments like botanical gardens.

Questions addressed

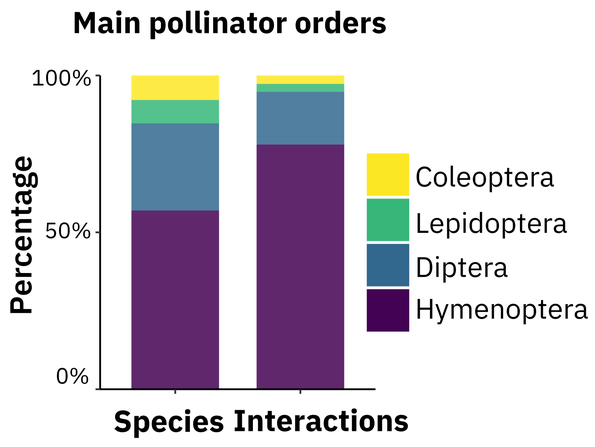
1. How does community-level specialization change over time, and how is this influenced by variations in floral and pollinator abundance?
2. How do pollinator visitation rates respond to different drivers?
3. Is weekly flower abundance sufficient to explain plant-pollinator pairwise interactions?

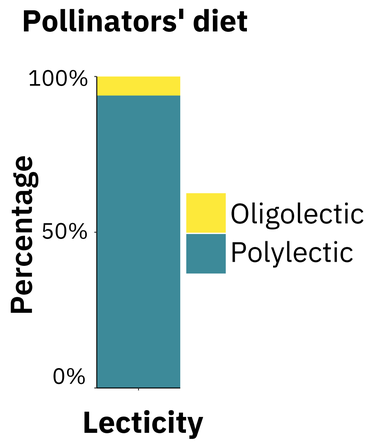
Methods



Floral and pollinator abundances were recorded weekly at each sampled species. The selected species are herbaceous species also monitored in the PhenObs project (~80 species).

The study contains ~1900 unique interactions from 230 pollinator and 392 plant species.





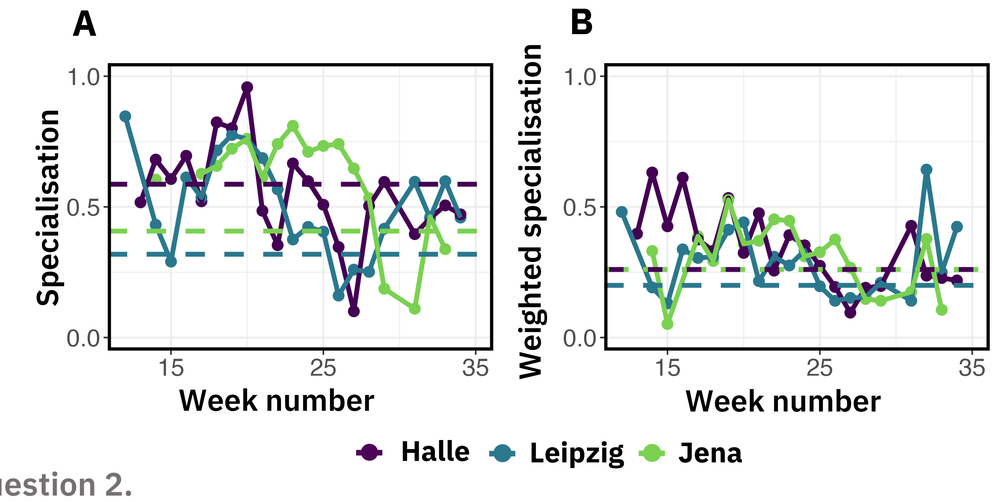
Analyses

1. We explored weekly plant and pollinator specialisation (d') and evaluated how abundances and time impact our understanding of specialisation at the community level.
2. We evaluated with generalized linear mixed models how floral abundances, pollinator abundances and temperature influence visitation rates in the three gardens.
3. We investigated if the number of interactions across species was proportional to weekly floral abundance through randomised sampling.

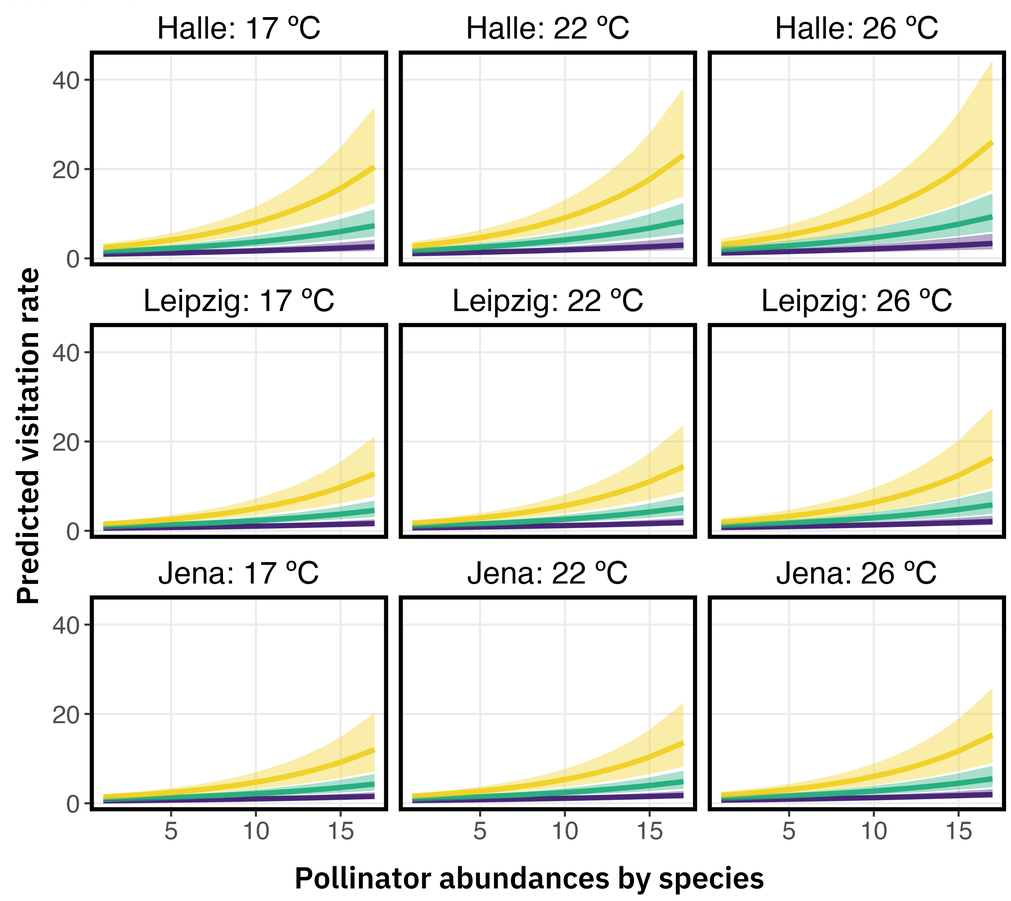
Results

Question 1.

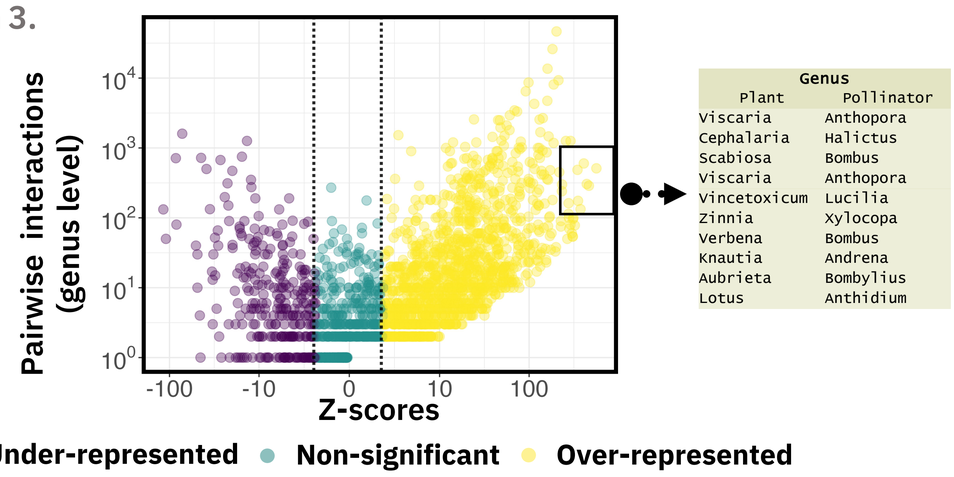
Weekly pollinator specialization without (**A**) and with floral abundance (**B**):



Question 2.



Question 3.



Conclusions

1. Plant and pollinator specialisation shows a strong temporal component. Interaction networks are not enough for describing species ecological roles and species abundances are needed.
2. Plant and pollinator abundances are strong predictors of visitation rates and their activity is modulated by temperature.
3. Floral abundances only predict a minor fraction of pairwise interactions, highlighting the prevalence of pollinator feeding preferences despite a wide diet breadth.

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MARTIN-LUTHER-UNIVERSITÄT HALLE-WITTENBERG
PHENOBS Botanical Gardens as a Global Phenological Observation Network