

# Ecological drivers of hysteranthous flowering vary across taxonomic scale in the North American cherries (*Prunus* spp.) or Aridity and pollinator attraction drive hysteranthous flowering in the North American cherries (*Prunus* spp.)

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## To do:

1. Full genus analyses with ordinal model (Got alot of the way there in FNA.R)
2. check prunocerasus analyses
3. Figure out phylogeny issues
4. Quantify hysteranth in biologically pollinated taxa or summarize families it is present in. Off the top of my head for N.A. taxa the Rosaceae, Magnoliaceae, Fabacieae, Cornaceae, Annonaceae, Ericaceae.

## Introduction

Generally speaking, hysteranth is unique and common in temperate forest. Seems functional. The most common, and well tested, explanation is that is hysteranth evolved for wind-pollination. However that doesn't explain its prevalence in biotically pollinated taxa. Quote some statistic based new phyt paper. Tests of the function on hysteranth in biotically pollinated taxa are exceedingly rare in the literature,, but may be critial for predicting species responses to global change.

While direct tests are limited, investegation of hysteranth benefit from a rich theoretical literature and several hypotheses have emerge.

Review them briefly and make predictions

1. Drought adaptation: (could be plastic or selected) aridity in range
2. insect visaibility: floral morphology
3. Null functionality early flowering. Fruit size or phenology
4. Phylogeny may also matter

While each hypothesis generates testible predictions there are several methodological challenges.

1. Unmeasured species difference compensate for measure traits
2. data quality based on expert opinion

These issues could be over come with:

1. character deconstruction
2. detailed quantitative measurements of flower leaf sequence phenology

We do this:

1. Coarse analyses of the flower-leaf sequences of North American *Prunus* species and their hypothesis relevant traits based on published data
2. Higher resolution inquiry of the flower-leaf sequences and associated character traits based on our own measurements from a century worth of herbaria samples on a section of the *Prunus* subgenus *Prunocerasus* the American plums

## Methods

### 0.1 Descriptions of the genus, and section

Say why they are ideal for this analyses

### 0.2 Genus level analyses

Data source

Methods for analysis

### 0.3 Section level analyses

Methods for herbaria measurements

Methods for analysis

## Results

## Discussion

There will probably be things about taxonomic scale. I.e attraction showing up at the genus but not section level. Major discussion of why.

Pollinator attraction and drought tolerance are a suite of traits and we only measured one axis of them and even with character deconstruction this could matter

Mechanistic experiments would still be useful, ie does water limitation influence FLS plasticity

## Figures

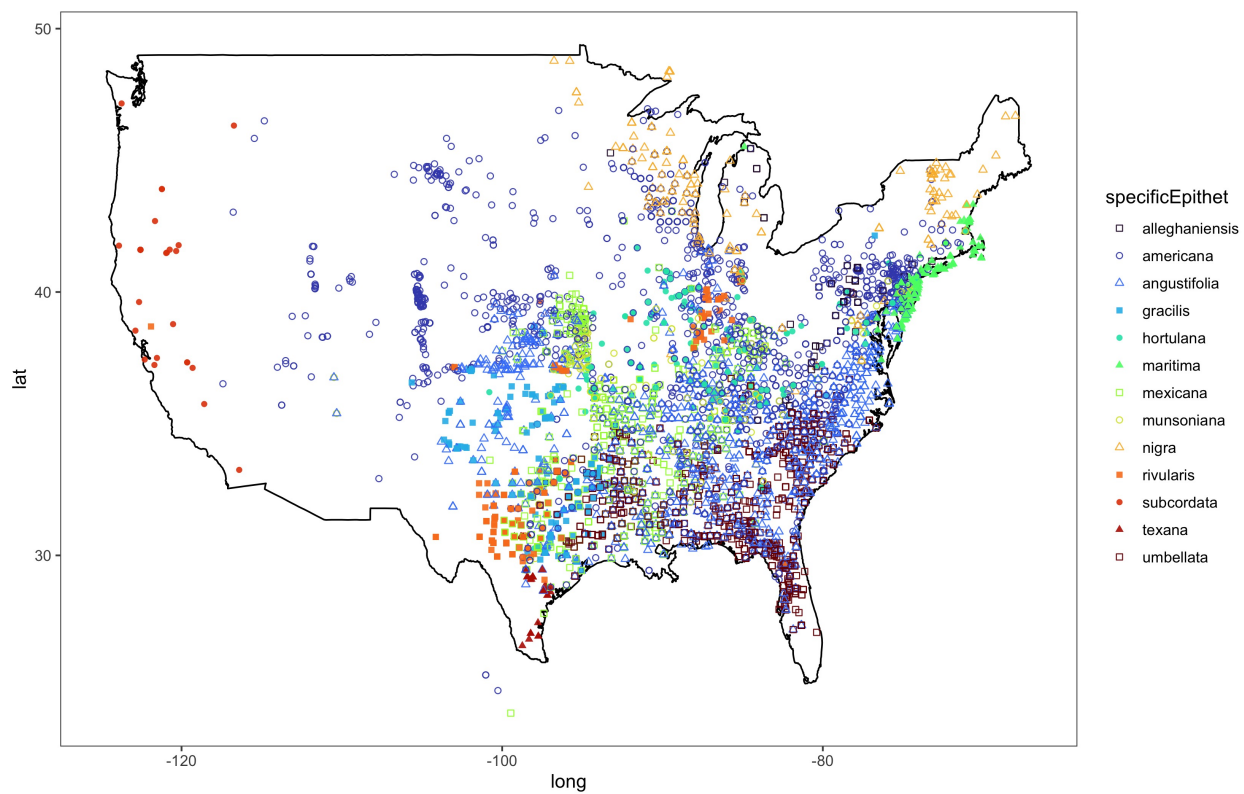


Figure 1: Map to show where data come from and to point out the two never hysternanthy species are highly endemic

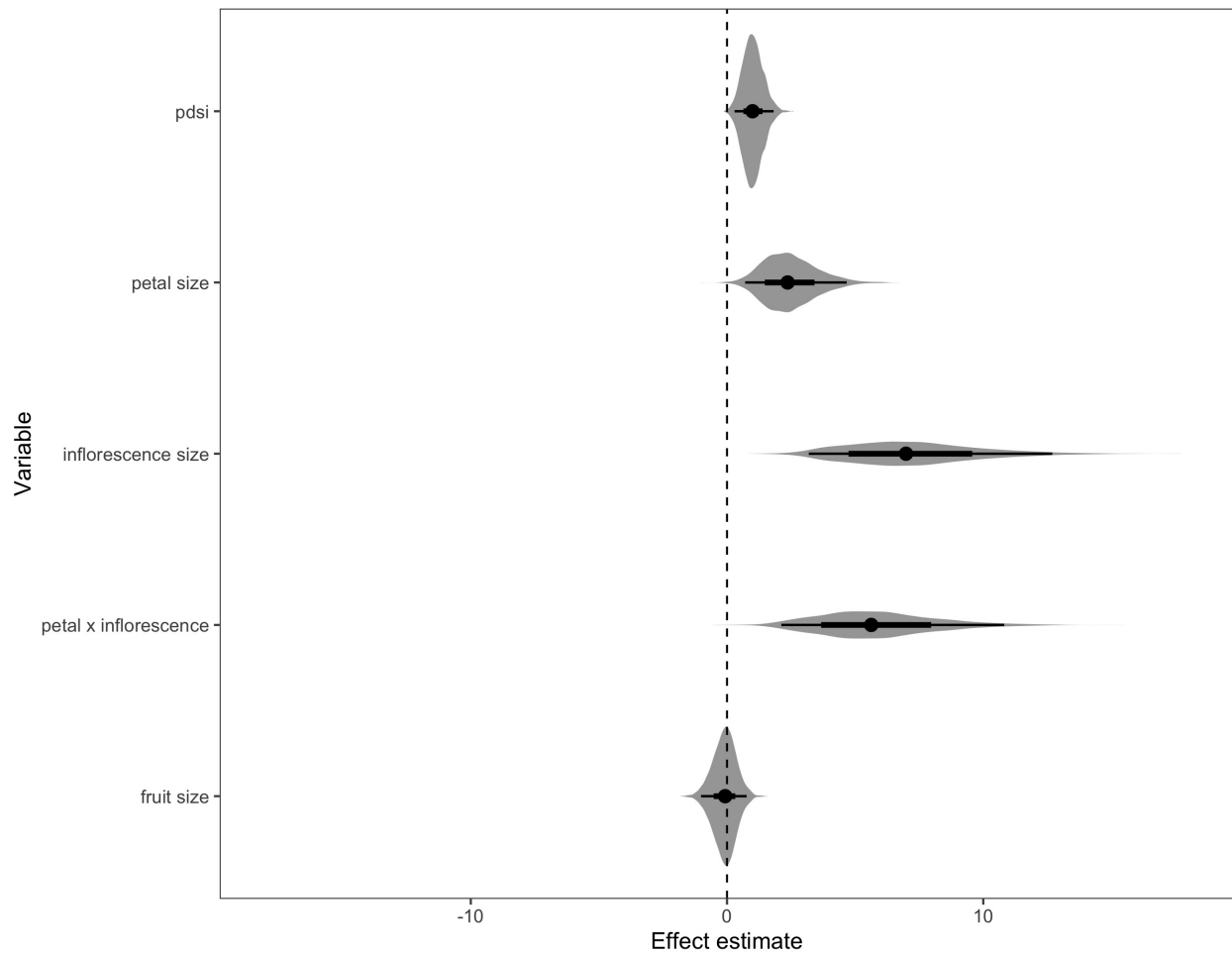


Figure 2: From the full genus analysis: Positive is less hysteranthus so aridity increases ihysteranthus, flower size decreases (ie smaller flowers- more hysteranthous) and no relationship with fruit size

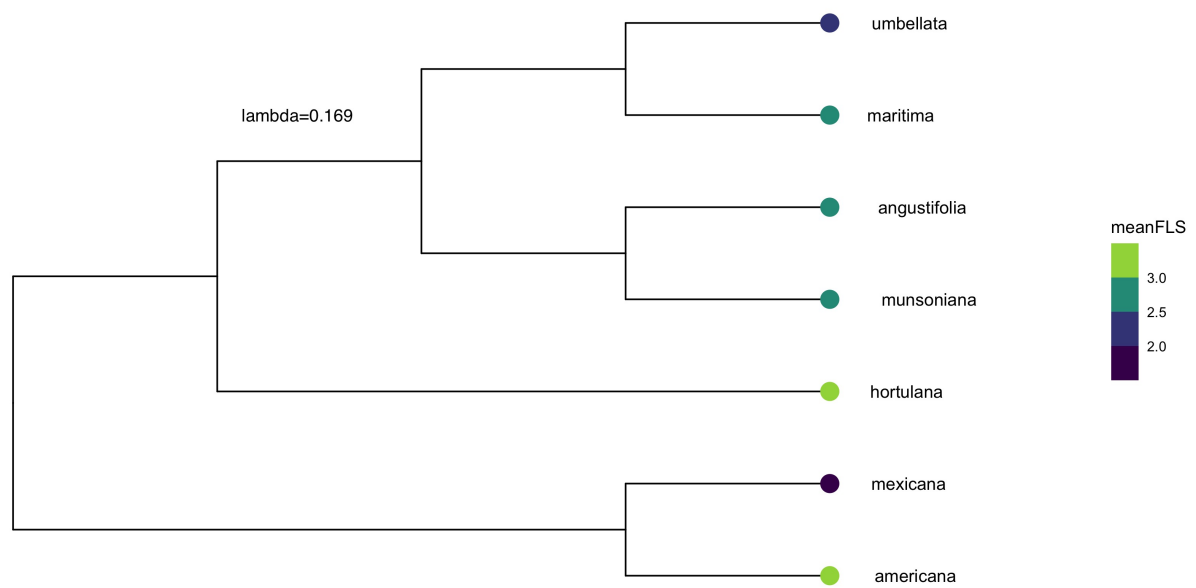


Figure 3: place holder for the phylgenies

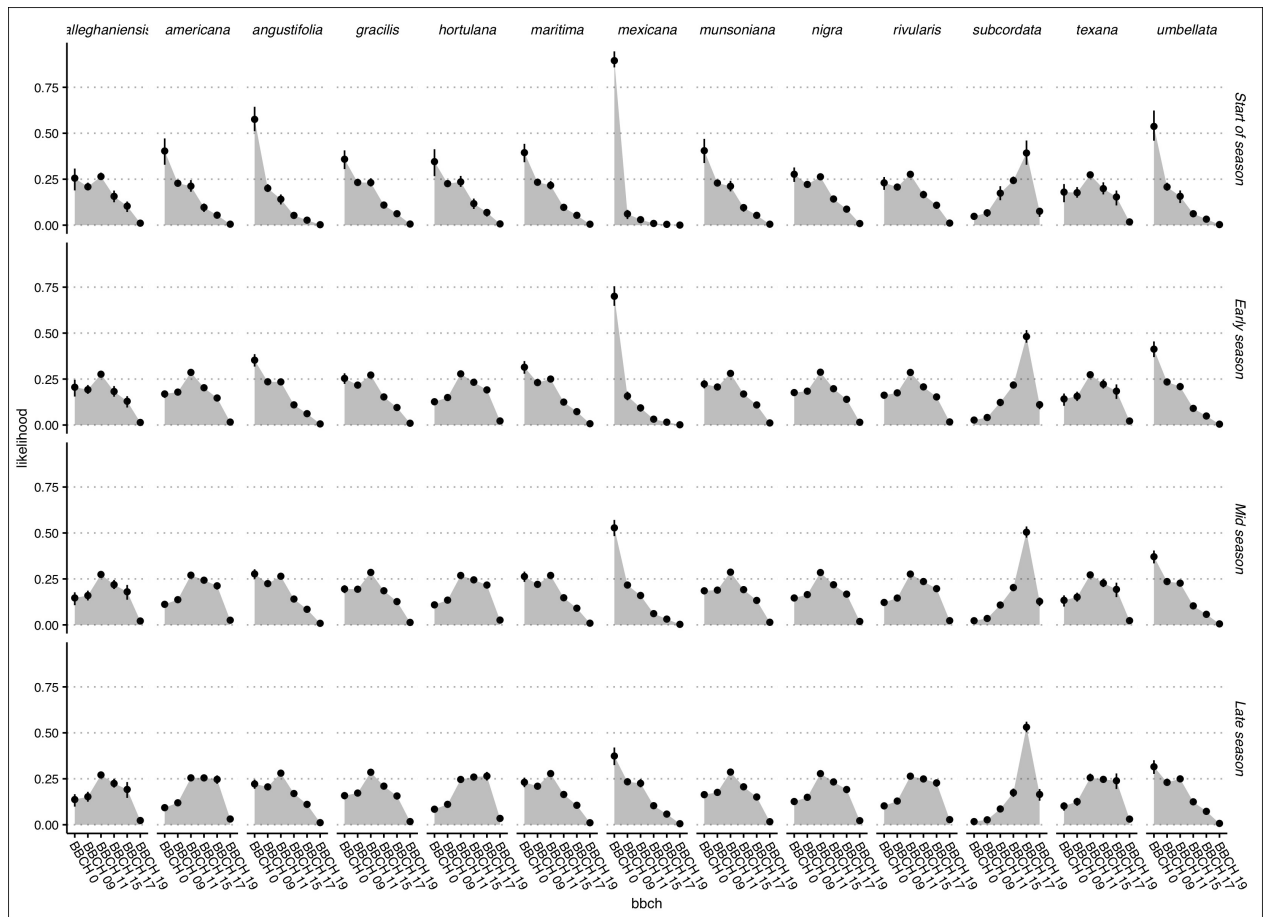


Figure 4: Likelihood of hysteranthry throughout the flowering season for each species in *prunocerasus*

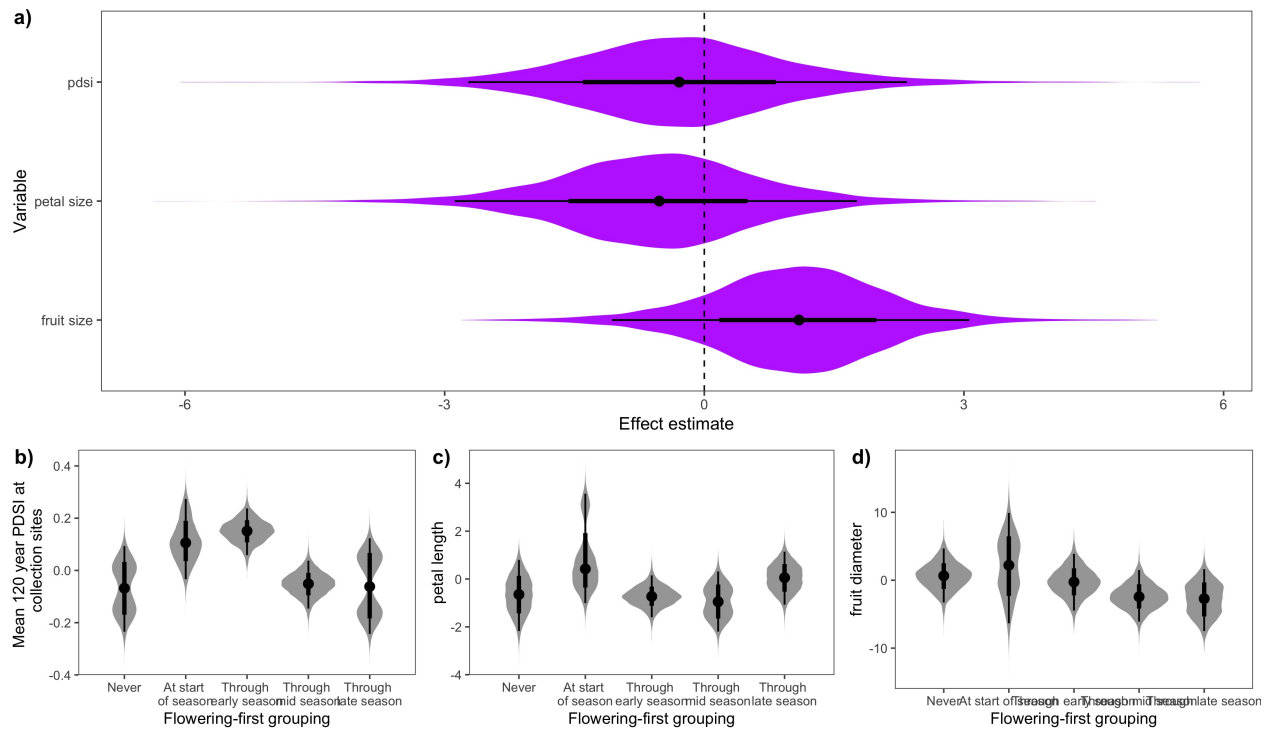


Figure 5: Effect estimates. Why are they so different in prunucerasus? 1. measurement error model increases uncertainty. 2. outliers have stronger influence. 3. Maybe too closely related (all flower to some degree while leave are developing)



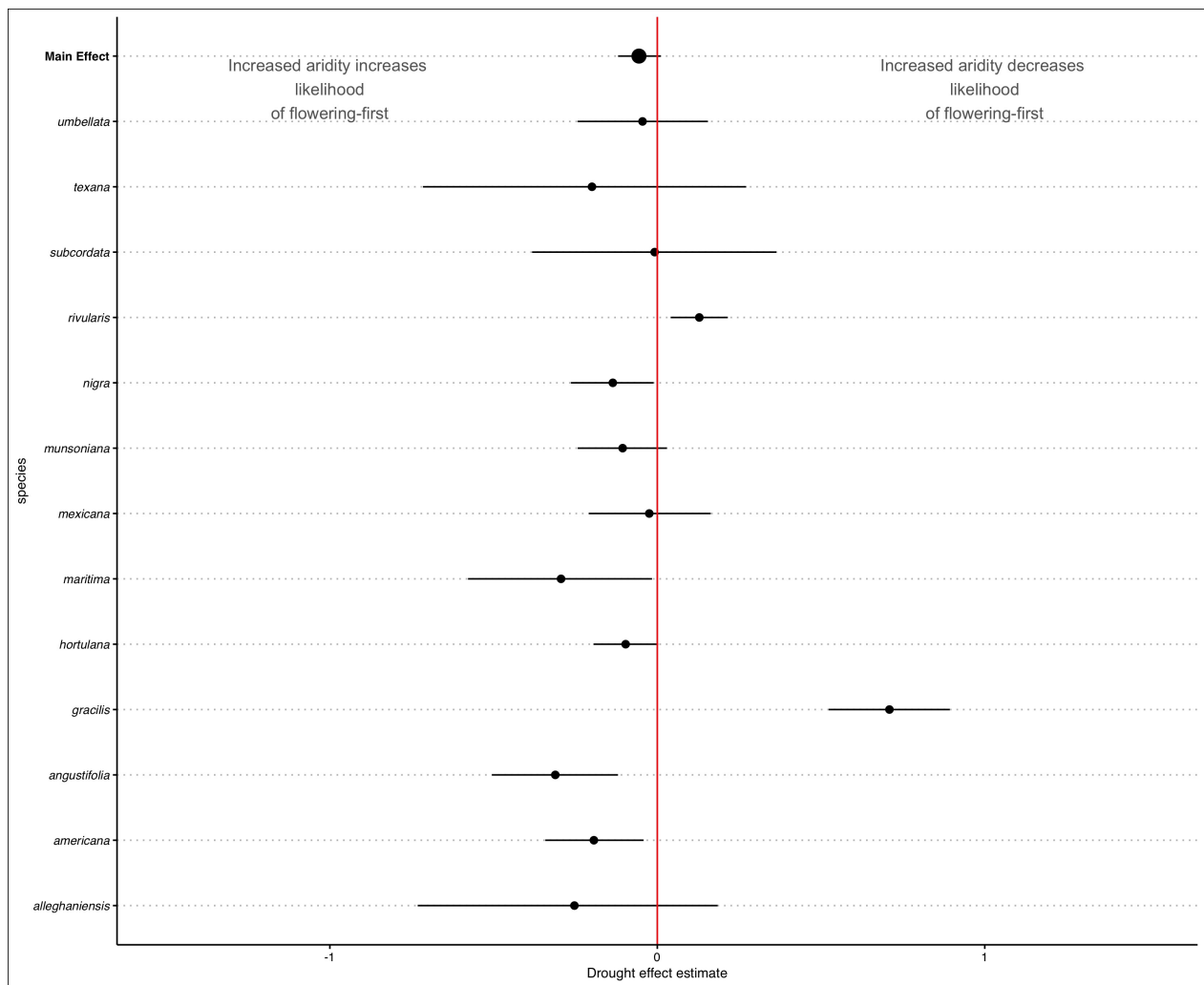


Figure 6: Hysteranthly more likely in drought years (negative values). Need to remake thsi figure in bayesplot