

A close-up photograph of a tree branch in bloom. The branches are covered with clusters of delicate, pinkish-purple flowers. Interspersed among the flowers are several large, vibrant orange and yellow autumn leaves. The background is a clear, bright blue sky.

Synchrony Update: April 2021

April 6, 2021

Research Questions:

1. How has the phenology of different trophic levels changed over time and are there differences across suites of interactions?

2. Are the observed trends in shifts in interactions similar using data from single- species studies, or should we be using biologically relevant paired species data?

The model:

Species intercept model:

$$\hat{doy} = \alpha_{sp_i} + \beta(year_i)$$

$$\alpha_{sp_i} \sim N(\mu_a, \sigma_a)$$

$$\beta_{sp_i} \sim N(\mu_b, \sigma_b)$$

$$doy_i \sim N(\hat{doy}, \sigma_i)$$

Species intercept & studyid model:

$$\hat{doy} = \alpha + \alpha_{study_i} + \alpha_{sp_i} + \beta(year_i)$$

$$\alpha \sim N(\mu_a, \sigma_a)$$

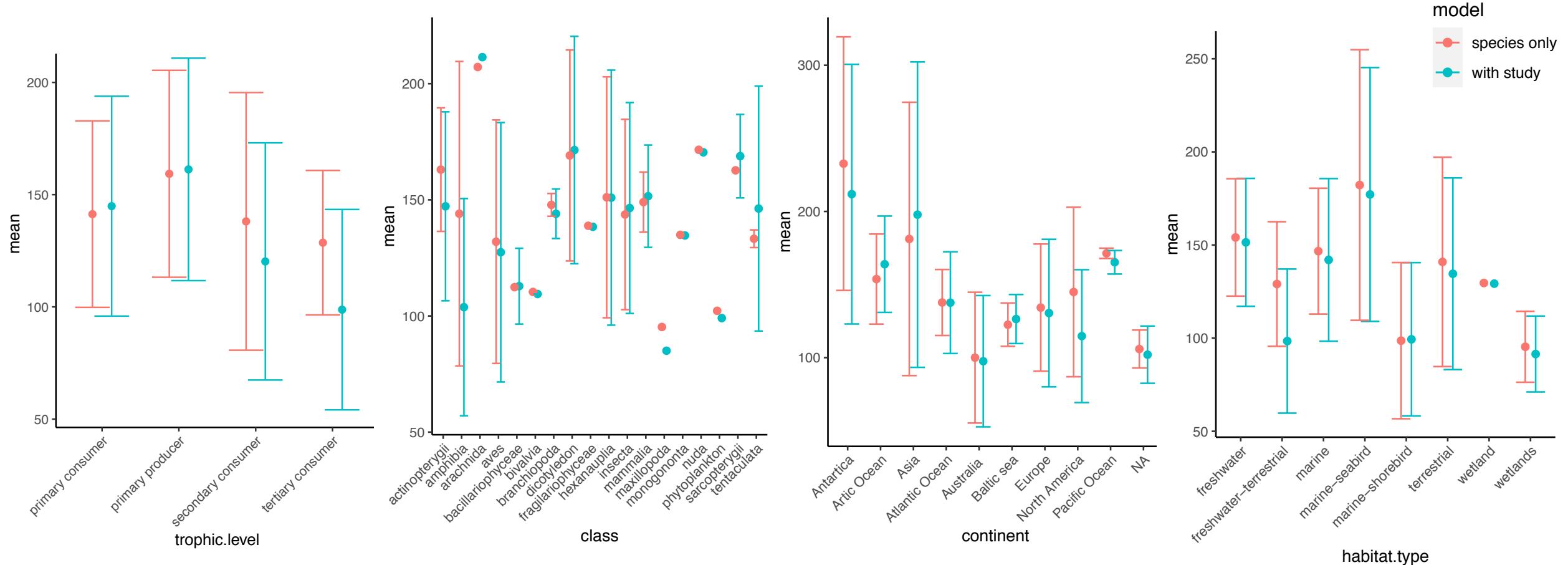
$$\alpha_{study_i} \sim N(\mu_{study}, \sigma_{study})$$

$$\alpha_{sp_i} \sim N(\mu_{sp}, \sigma_{sp})$$

$$\beta_{sp_i} \sim N(\mu_b, \sigma_b)$$

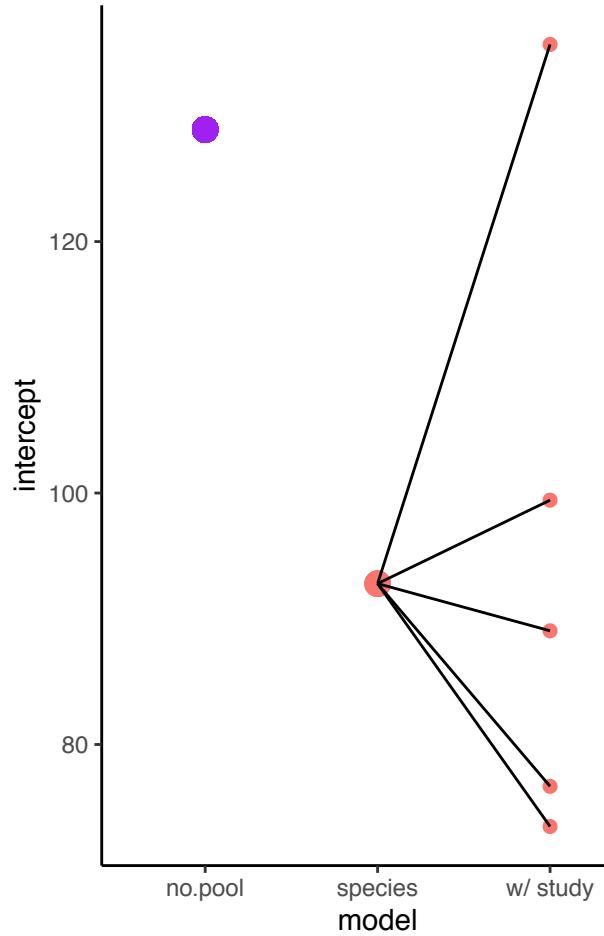
$$doy_i \sim N(\hat{doy}, \sigma_i)$$

Visualizing the effects of species pooling and study:

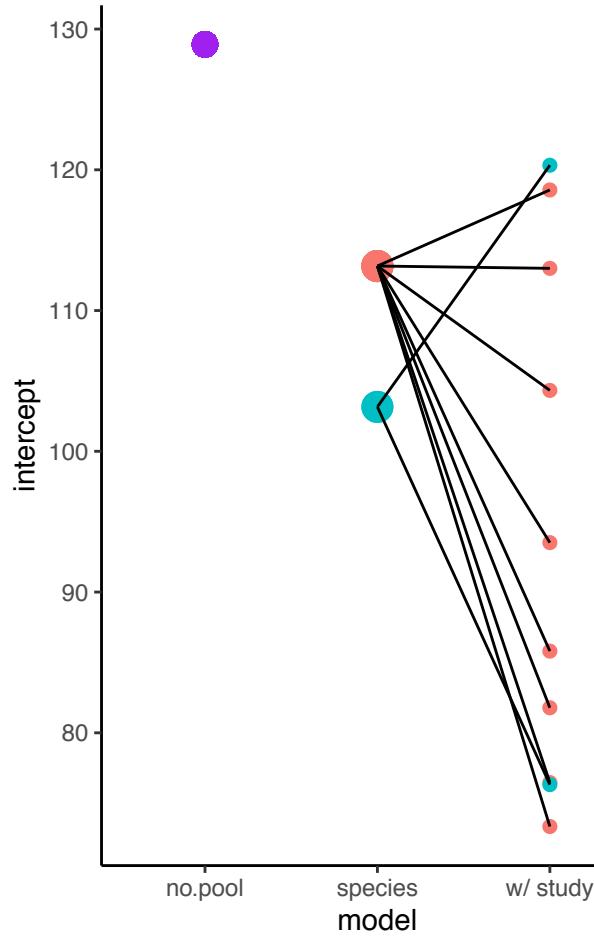


Visualizing the effects of species pooling and study:

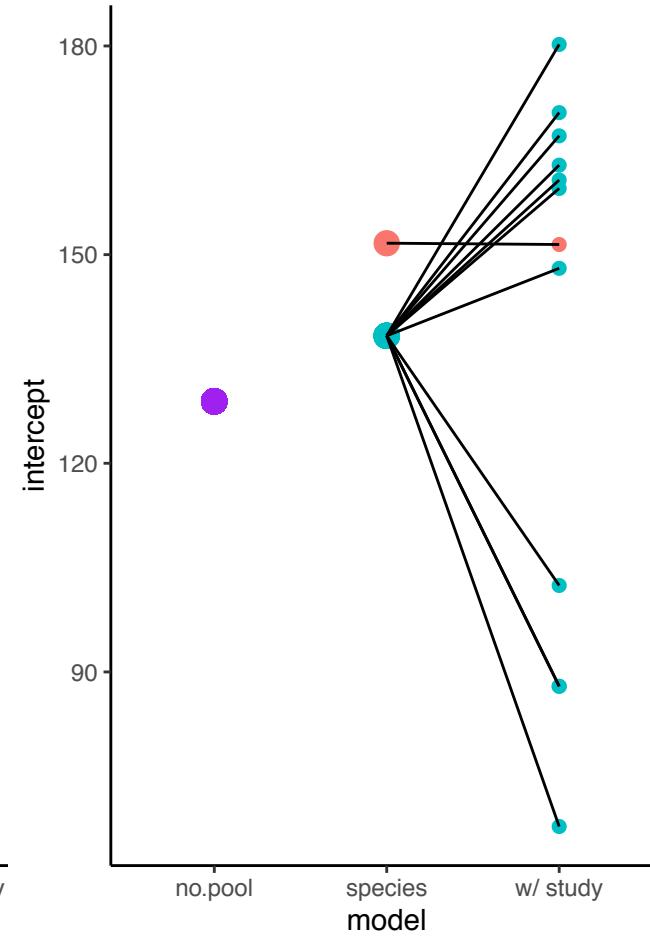
European common frog:



Barn Swallow:



Great tit:

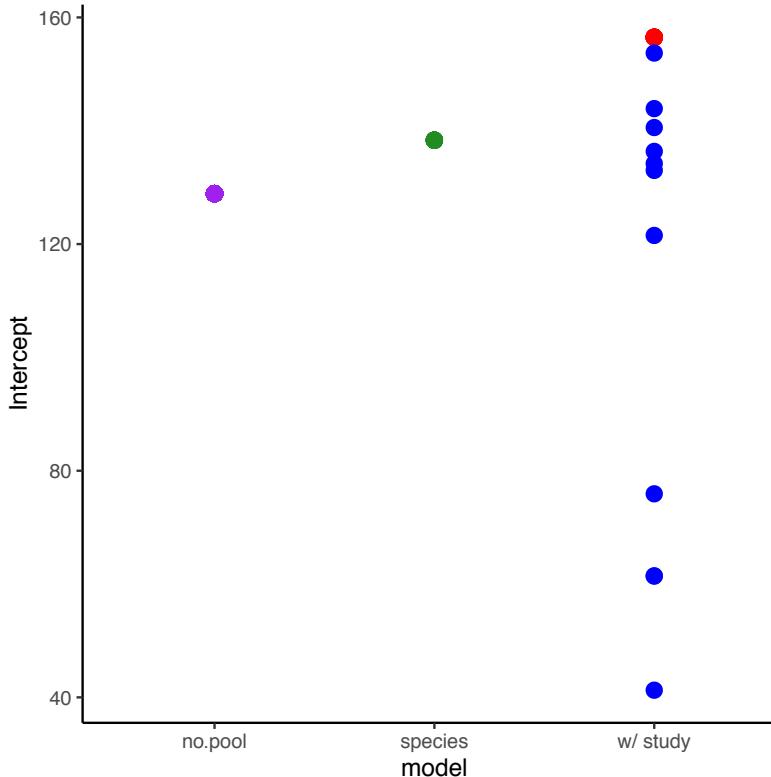


phenophase

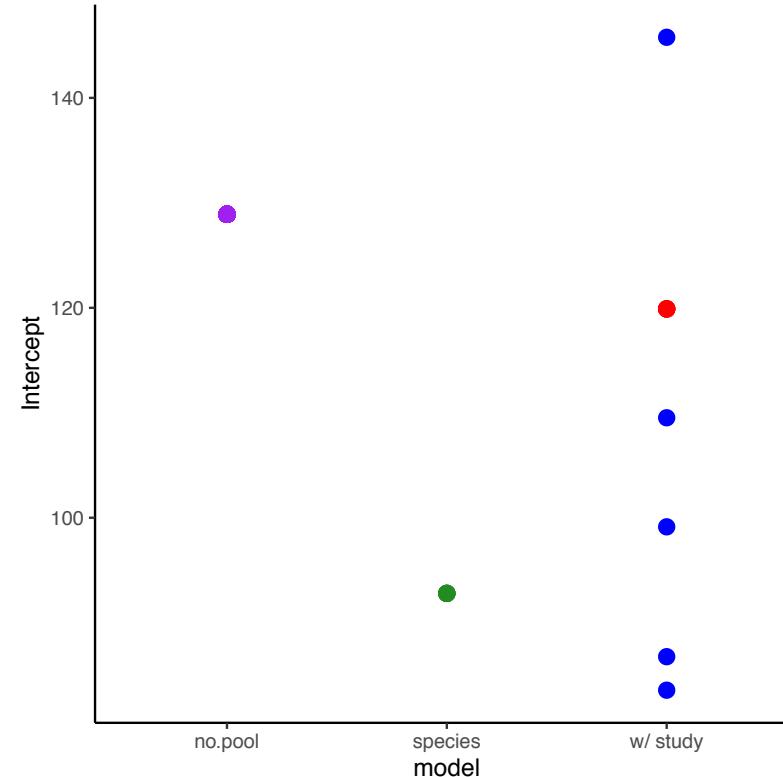
- first appearance
- reproduction

Visualizing the effects of species pooling and study:

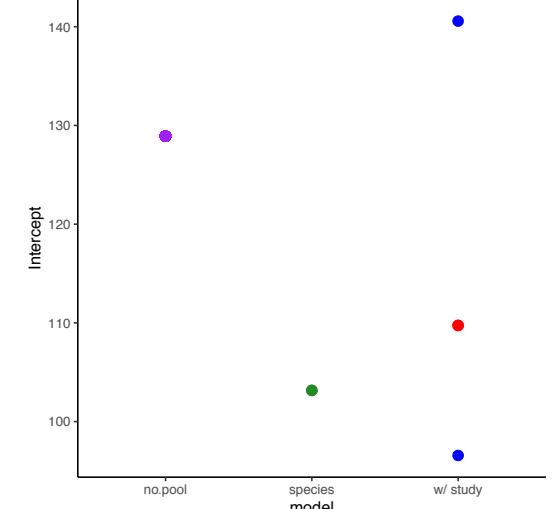
Parus major – reproduction



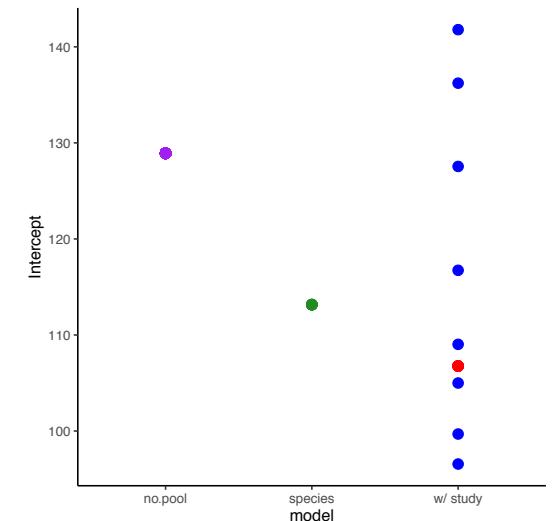
Rana temporaria – first appearance



Hirundo rustica – first appearance



Hirundo rustica – reproduction



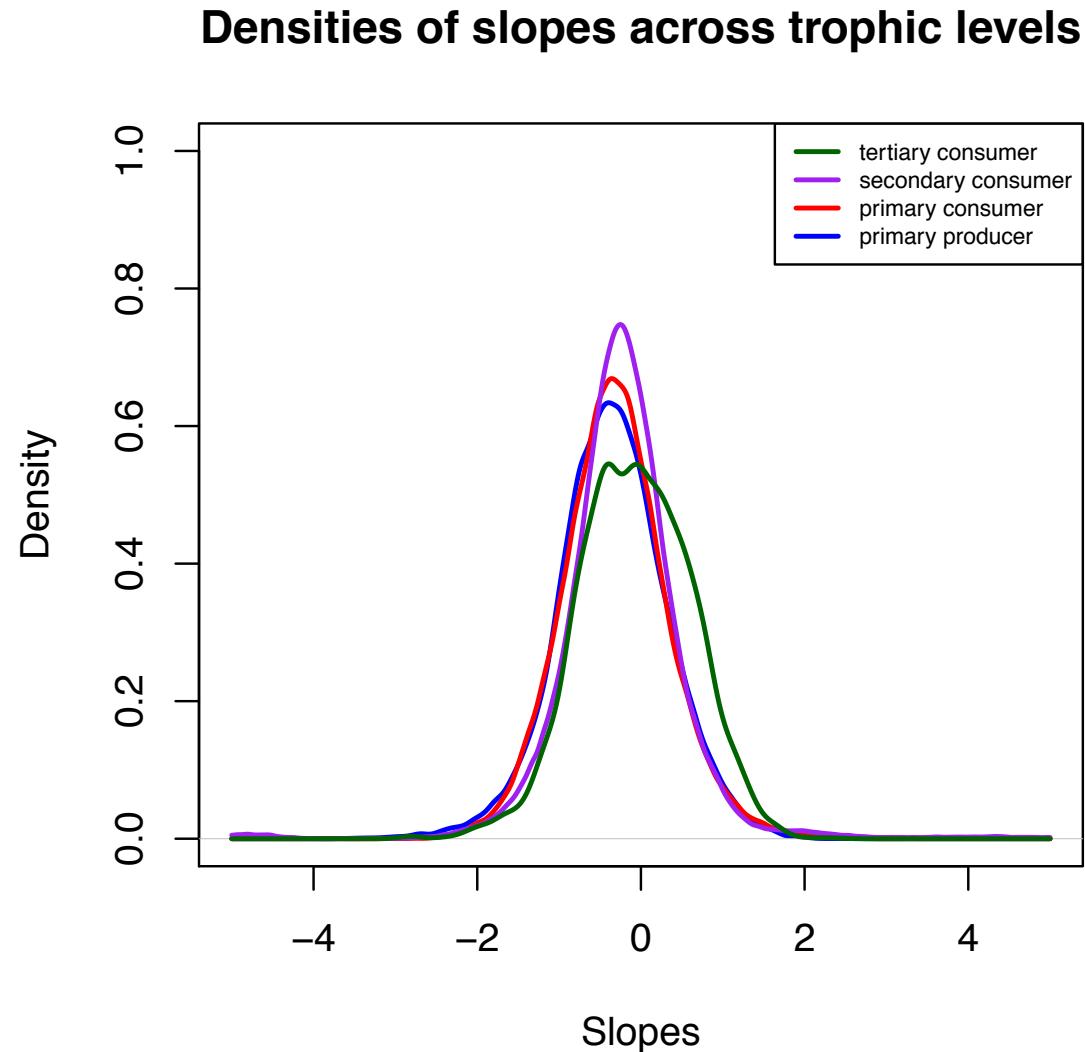
Purple – Intercept from no pooling model

Green – Species intercept from partially pooled model

Red – Species intercept + grand mean

Blue – Study intercept + grand mean

Posterior densities for different trophic levels:



The difference in synchrony for known vs. random species pairs:

- Single species data was assigned as either a consumer or resource and assigned to commonly studied interactions
- 100 random pairs of single species data was generated within groups of interactions
- 1000 samples were taken from the posterior

The difference in synchrony for known vs. random species pairs:

