# Aphid Farm: Relating Temperature Dependent Life History Traits to Species Interactions

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Can the temperature dependence of individual life history traits be used to predict outcomes of competition and consumer-resource interactions?

Many studies have examined temperature dependent responses of populations and species interactions, but few have empirically linked them to the underlying individual mechanisms

**Predictions**: Ectothermic herbivores should have greater temperature dependence of life history traits than the plants they consume, destabilizing consumer-resource interactions and affecting competition

**Population Effects** 

## **Individual Effects**





Higher Growth Rates **Density Dependence** Rate of Plant Death **Maximum Population Size** 



Fitness Differences



## **Study System**

### *Per capita* Parameters

Measured the above life history traits for both species using clip cages







Aphis nerii



**Climate Control Chambers** 17°C 20°C 23°C 26°C

#### **Population Dynamics and Competition**

Seeded and censused populations of each species alone and in competition until plant death

## **Theoretical Framework for Negative Correlation of Feeding Rates with Maximum Population Size**



Feeding Rate

Time

## **Experimental Results**



Temperature (C)

Temperature (C)

Temperature dependence of this single life history trait predicts one aspect of population dynamics, creating a more complex model will likely result in reasonable predictive power

## **Next Steps**

- Model interactions between individual traits, population dynamics, and species interactions at the  $\bullet$ community level
- Expand community to more realistic field setting with more species and fluctuating temperatures  $\bullet$

| Acknowledgements   | <b>References</b><br>Amarasekare, P. (2015). Effects of temperature on consumer-resource interactions. Journal of Animal Ecology 84: 665-679.   |
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