Does response to increased temperature differ among clones of pitcher plant rotifers?

Alex A. Mendelson*, Casey P. terHorst
Department of Biology | California State University, Northridge

Background

When faced with rapid global change, many populations are likely to rely on rapid evolution to avoid extinction.

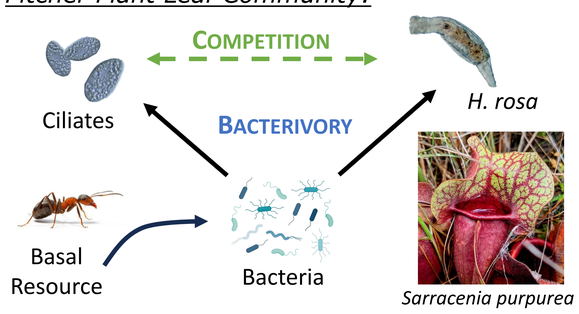
The potential for a population to rapidly adapt to new stressful conditions relies on diversity in individual stress response.

Does response to increased temperature differ among clones of pitcher plant rotifers?

Habrotrocha rosa:

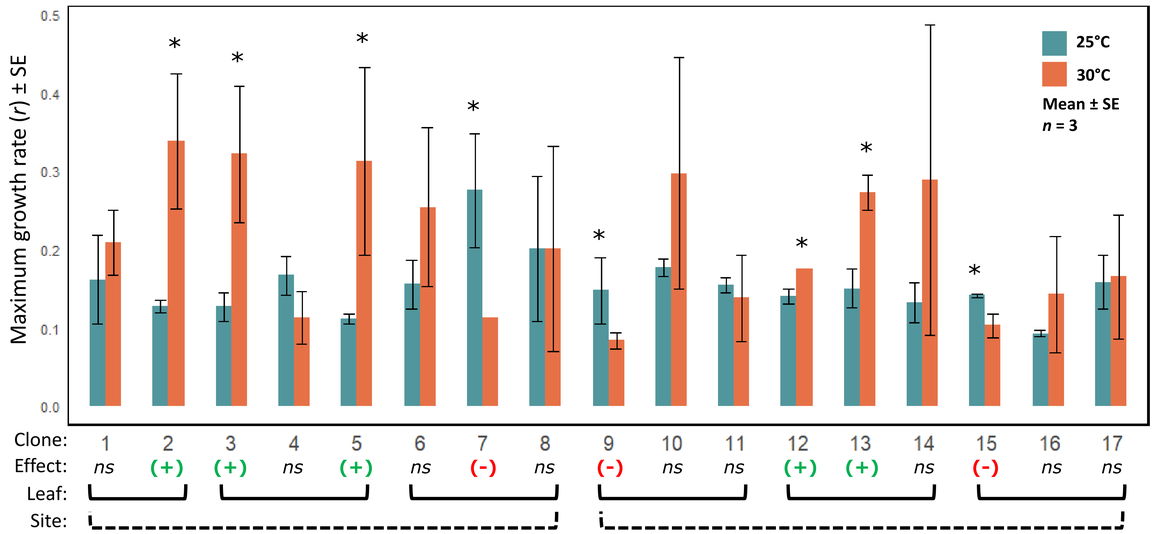
- "Pitcher plant rotifer"
- Filter-feeding bacterivore
- Obligately parthenogenetic (only reproduce asexually)
- Apomixic (offspring are full-clones of their mothers)

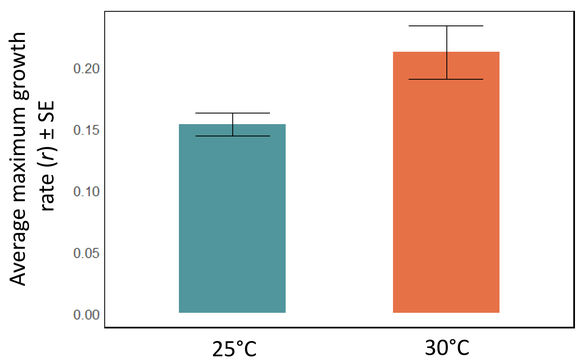
Pitcher Plant Leaf Community:



Results

Response to increased temperature differs among clones





Higher growth rate at higher temperature

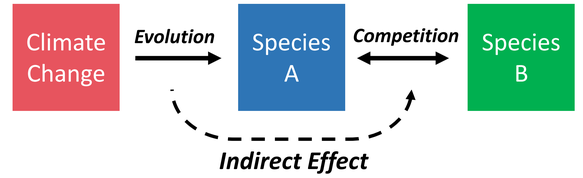
- Maximum growth rate was **higher** at 30°C across all 17 clones (Type III ANOVA: $F_{1,84} = 4.57$, $p = 0.03$)
- **Site** (0.66%), **leaf** (5.40%), and **clone** (2.85%) accounted for a non-trivial amount of total variance

Conclusions

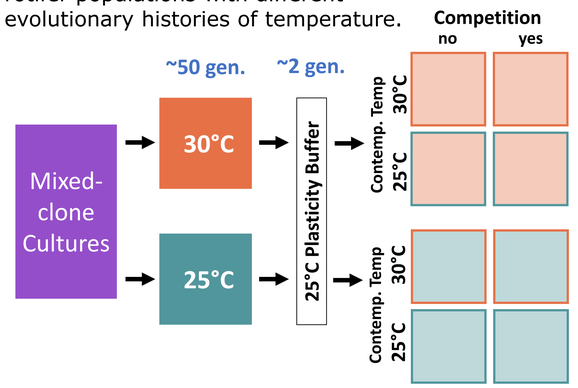
- On average, *H. rosa* grew **faster** at 30°C when compared to 25°C
- **Variance** in response to increased temperature among clones:
  - 5 respond with **increased** *r*
  - 3 respond with **decreased** *r*
  - 9 with no sig. response
- Variation in response unrelated to **space**
  - Site contributed <1% of total variance
- Potential for rapid evolution…?

Next Steps

Indirect effects of climate change on ecology, mediated by evolution, may play an important roll on the trajectory of natural communities.



An ongoing **evolution experiment** aims to compare the competitive ability of rotifer populations with different evolutionary histories of temperature.



Methods

1 Field Collection & Isolation:

- 97 leaf water samples from *Sarracenia purpurea* in the Apalachicola National Forest, FL
- Individuals of *H. rosa* isolated to establish clonal cultures

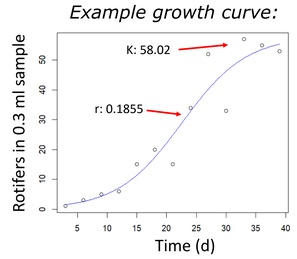
2 Temperature Response Experiment:

- 17 clones grown in constant 25°C and 30°C for 39 d ($n = 3$)
- Clones represent diversity across 2 sites, 3 leaves per site, 3 clones per leaf
- 0.3 ml sample counted every 3 d

3 Data Analysis:

- Maximum growth rate (r) was estimated using a **logistic** model ('growthrates', R)
- The effect of temperature on growth rate was tested using a **linear mixed model** with site, leaf, and clone included as random effects
- To meet assumptions, growth rate was transformed using a negative inverse square root: -1 / sqrt(rate)

Example growth curve:



Acknowledgments

Thank you to Dr. Tom Miller, Mark Harris, Dr. Gilberto Flores, and undergrads Vincent Cannizzaro and Breana Morales.
This project was supported by the Thesis Support Grant from the CSUN Office of Graduate Studies.