Phoebe Gordon, Colorado College
Pablo Gutierrez-Fonseca, University of Vermont
Boyce Drummond, Colorado College

Mayfly (Genus: *Neohagenulus)* food resource shift after hurricanes may increase rate of ecological recovery

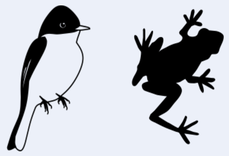
Introduction

Climate change: Frequency of intense hurricanes increases

Cause: Strong winds from hurricanes

Effect 1: Canopy defoliation/opening; leaf litter burst followed by diminished leaf litter in stream

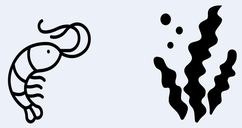
Effect 2: More sunlight reaches the stream



Predicted result: Terrestrial population and ecosystem-level rebound due to increased energy transfer

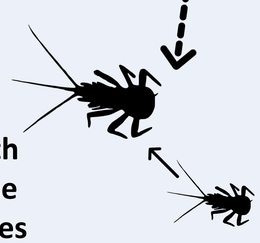
Result: Mayfly larvae grow faster when they feed on algae rather than leaf litter

Effect 3: Increased algae growth from sunlight



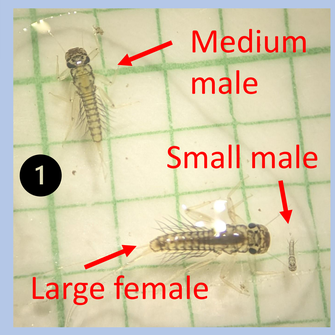
Confounding effect: Shrimp competition may affect mayfly readiness to eat algae (direct and indirect)

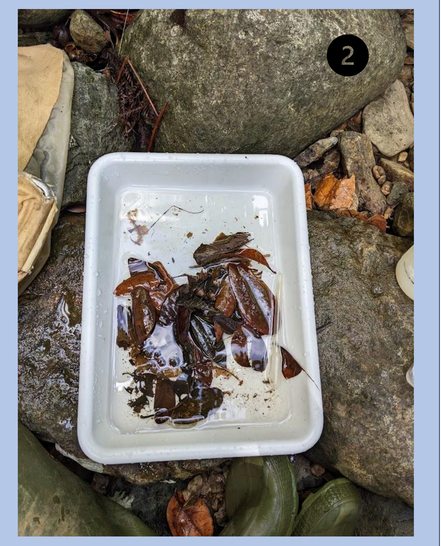
Hypothesis: Mayflies eat more algae and their growth rates increase because algae is more nutritious than leaves



Methods

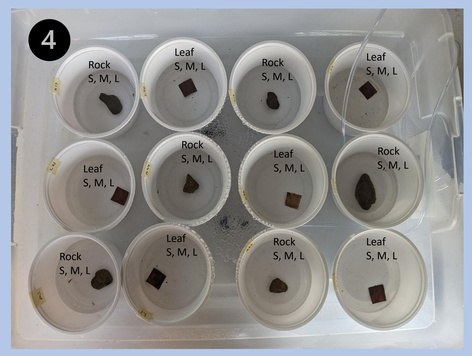
- Collect *Neohagenulus* mayflies from Sonadora creek (Photo 2, 5)
- Separate mayflies into small (<2 mm), medium (2-4mm), and large (>4mm) (Photo 4)
- Starve for 24 hours
- Photograph and place one of each size class into enclosure with leaf or rock (Photo 1, 4)
- Photograph again after 3 days of treatment
- Measure using ImageJ (Photo 3), calculate growth rate





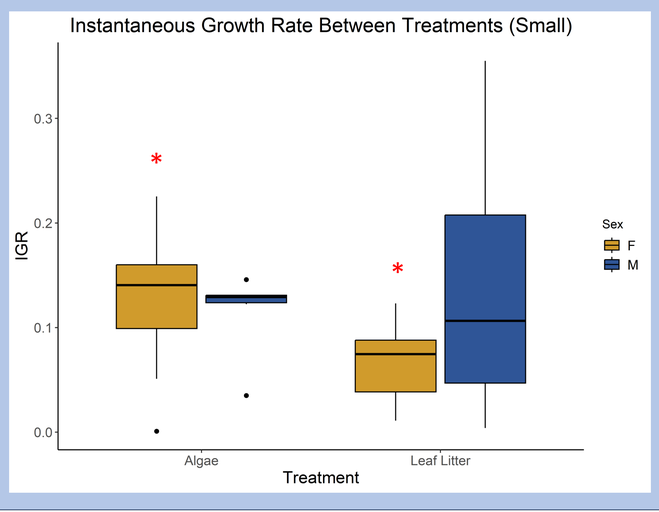
$$IGR = \frac{\ln\left[\frac{Initial\ Weight}{Final\ Weight}\right]}{Time\ (Days)}$$

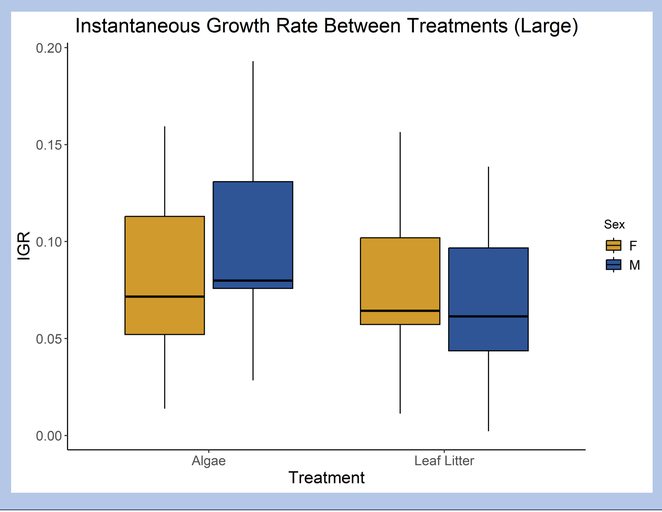
$$Weight = a * L^b$$



Results

Growth rate was higher in algae-fed individuals of the small, female group ($p = 0.0006$). The same trend is visible, but not statistically significant, for large males and females ($p > 0.05$).





Implications

- If *Neohagenulus* mayflies grow faster when eating algae, it may be the case that they will have a faster rate of secondary production after hurricanes, when more light is reaching the stream to bolster algae growth.
- This could help the ecosystems (terrestrial and aquatic) rebound more quickly after defoliation events, which occur after hurricanes and droughts.
- Mayflies may be an important factor in Puerto Rico's post-disaster rebound.

Ramírez, A., Meza-Salazar, A., Gómez, J., Gutiérrez-Fonseca, P., & Sánchez, J. (n.d.).
Hurricane-induced changes in mayfly assemblage structure and trophic dynamics in a
tropical island stream.Macias, N. A., Colón-Gaud, C., Duggins, J. W., & Ramírez, A. (2014). Do omnivorous shrimp influence mayfly nymph life history traits in a tropical island stream? *Revista de Biología Tropical*, *62*, 41. https://doi.org/10.15517/rbt.v62i0.15777
Ramírez, A., & Gutiérrez-Fonseca, P. E. (2014). Http://www.scielo.sa.cr/scielo.php?script=sci_abstract&pid=S0034-77442014000600011&lng=en&nrm=iso&tlng=es. *Revista de Biología Tropical*, *62*, 155–167.
Rosas, K. G., Colón-Gaud, C., & Ramírez, A. (2020). Trophic basis of production in tropical headwater streams, Puerto Rico: An assessment of the importance of allochthonous resources in fueling food webs. *Hydrobiologia*, *847*(8), 1961–1975. https://doi.org/10.1007/s10750-020-04224-y

Funding was obtained through the REU Site program at El Verde Field Station, North Carolina State University, NSF-grant number DBI-2050805.