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The Ecology of Fear: Colonization and Oviposition in Aquatic Systems [poster]

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The Ecology of Fear: Colonization and Oviposition in Aquatic Systems

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Introduction

- Amphibians and aquatic invertebrates have complex life histories that link aquatic and terrestrial food webs. It has been suggested that amphibian reproduction is an important source of carbon to some aquatic systems. Movement of organisms across the aquatic-terrestrial habitat boundary can represent important subsidies to the receiving habitat. Subsidies are organisms, nutrients, or detritus that cross habitat boundaries and are consumed, and these allochthonous inputs can affect food web structure. Predators can alter subsidies by consuming organisms that would otherwise move across habitat boundaries. Predator induced shifts in habitat selection are a well known non-lethal effect in aquatic systems. In certain aquatic beetles, mosquitoes and frogs, the chemical cues of a predator can trigger avoidance behavior and fewer eggs are oviposited in pools. Inputs called active subsidies involve these behavioral choices of habitat selection.
- We hypothesized that presence of a predator will decrease active subsidies from the terrestrial system. However, passive allochthonous inputs like leaf litter fall involuntarily and should be unaffected by predation risk. Thus predation risk should shift the relative importance of these active and passive aquatic subsidies.

Our Goals

1. Test whether the presence of predators alters oviposition by treefrogs and colonization by diverse community of aquatic insects
2. Quantify predator-induced shifts in energy and carbon as potential changes in subsidies
3. Evaluate the relative amount of energy and carbon from active and passive sources to determine if changes in colonization and oviposition are important to aquatic systems.

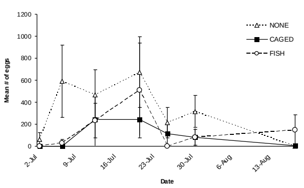
Methods

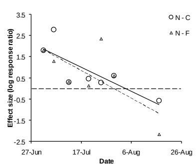
- 30 mesocosms in old fields: VCU Rice Center and Harrison Lake National Fish Hatchery in Charles City Co., VA.
- Mesocosms: 1136 L stock tanks filled with pond water and leaf litter (300 g)
- Treatments: no fish (control), 3 Blue-spotted Sunfish, 3 caged fish
- Predator cages allow chemical cues from fish to enter the water but prevent consumption of colonists
- Searched for treefrog eggs after nights with rainfall, photographed and counted using Image J software
- Invertebrates and passive allochthonous inputs collected by draping mesh under the water's surface for 2 or 3 days
- Aquatic invertebrates were grouped to morphospecies and length and dry weight measured
- Passive allochthonous inputs: deciduous leaf litter, pine needles, woody stems and bark, and terrestrial invertebrates
- Measured ash weight using a muffle furnace, AFDM and % organic matter calculated
- Energetic content (cal/g) of inputs quantified using a Semi-micro Calorimeter

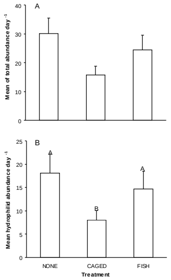
Results

Some Active Inputs Are Affected By Predators

- *Hyla chrysoscelis* and *Hyla cinerea* show a 71% predator avoidance effect, this effect decreased with time
- Hydrophilid beetles were less abundant in caged predator treatments
- The difference in oviposition and colonization translated into fewer calories and ash free dry mass of active inputs

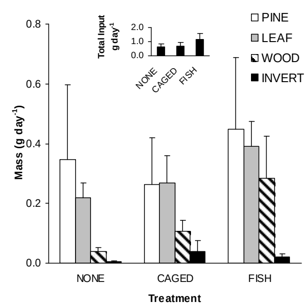


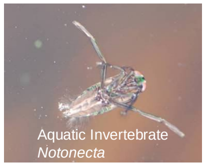


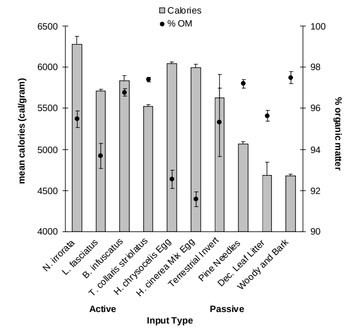


Passive Inputs Are Large & Energy and Carbon Content of Inputs Differ

- Passive allochthonous inputs were very large - more than double active amounts
- Passive allochthonous inputs were variable and not affected by predation risk
- Active inputs contained higher calories and percent organic matter than passive allochthonous inputs

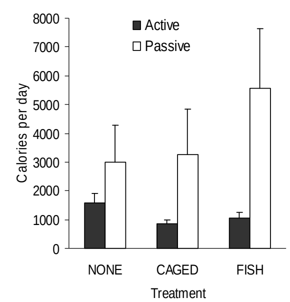


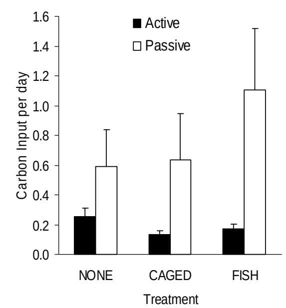


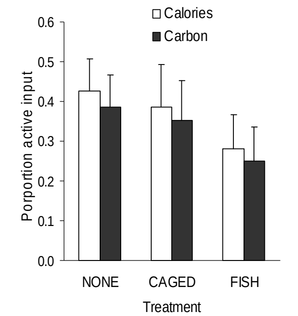


Overall Energy and Carbon Inputs Are Not Affected By Predators

- Passive inputs contributed larger amounts of calories and carbon to our aquatic system
- The proportion of active to all inputs did not differ across the levels of predation risk







Conclusions

- Although it has been speculated that active inputs contribute a significant source of carbon and energy, our study shows that in open pool aquatic systems, passive allochthonous inputs contribute larger amounts of carbon and energy
- In this study, there is an effect of predators on habitat selection in organisms with complex life cycles, but predators are not significantly affecting overall carbon and energy inputs to mesocosms

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