

# Grazer Control of Algae Blooms in Ichetucknee Springs



Dina Liebowitz  
University of Florida, NSF IGERT Program

Co-authors: Matthew Cohen, James Heffernan,  
Thomas Frazer, Lawrence Korhnak

# Changing Springs



1978, Jim Stevenson

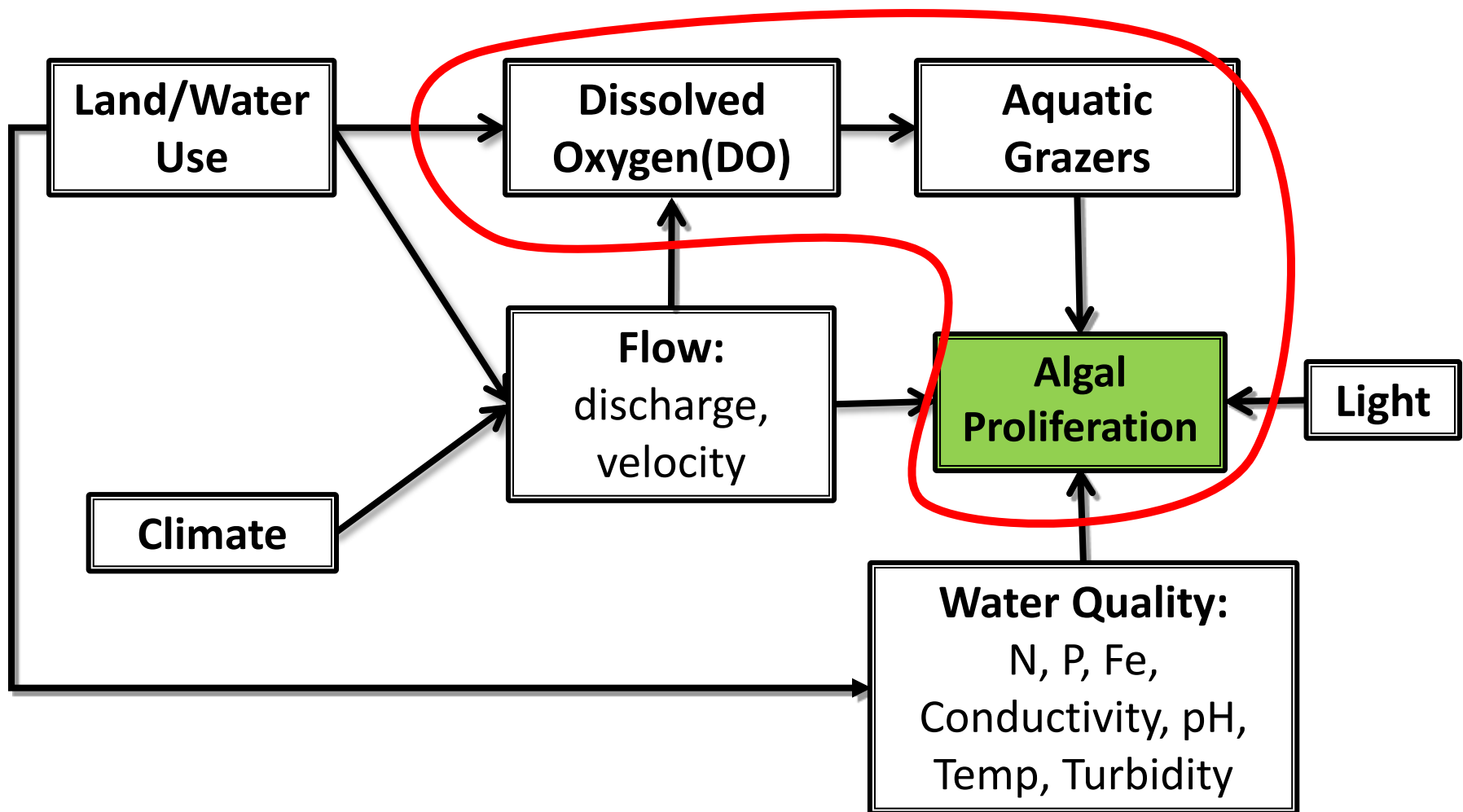


2007, Jill Heinerth



2010, Dina Liebowitz

# Potential Causal Factors



# Objectives

1. Survey the gastropod populations in the Ichetucknee Springs complex.
2. **Conduct field experiments to explore the role of *Elimia floridensis* in controlling algal blooms in Ichetucknee, and find potential biomass thresholds that can be relevant to management.**
3. Define the role of dissolved oxygen (DO) in controlling snail grazing rates

# 1. Survey: Methods



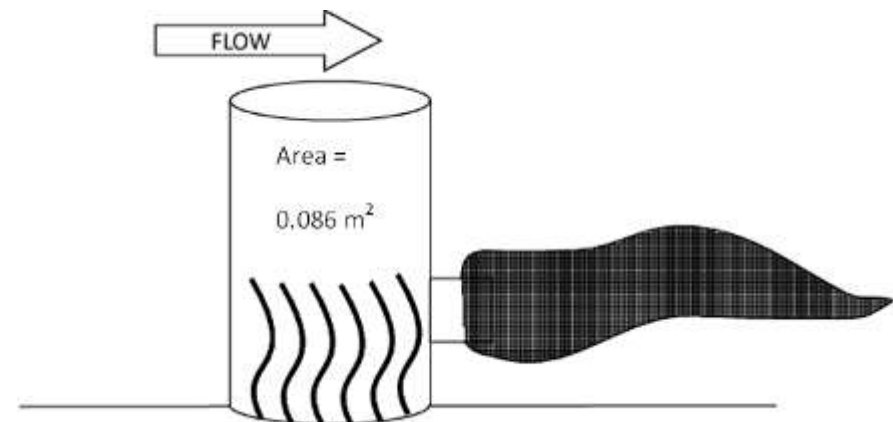
1	Headspring
2	Blue Hole
3	Blue Hole - River
4	Mission
5	Devil's Eye
6	Grassy Flats
7	Mill Pond
8	Mill Pond - River
9	Dampier's landing
10	South Take-out (50 m past dock)

# Methods

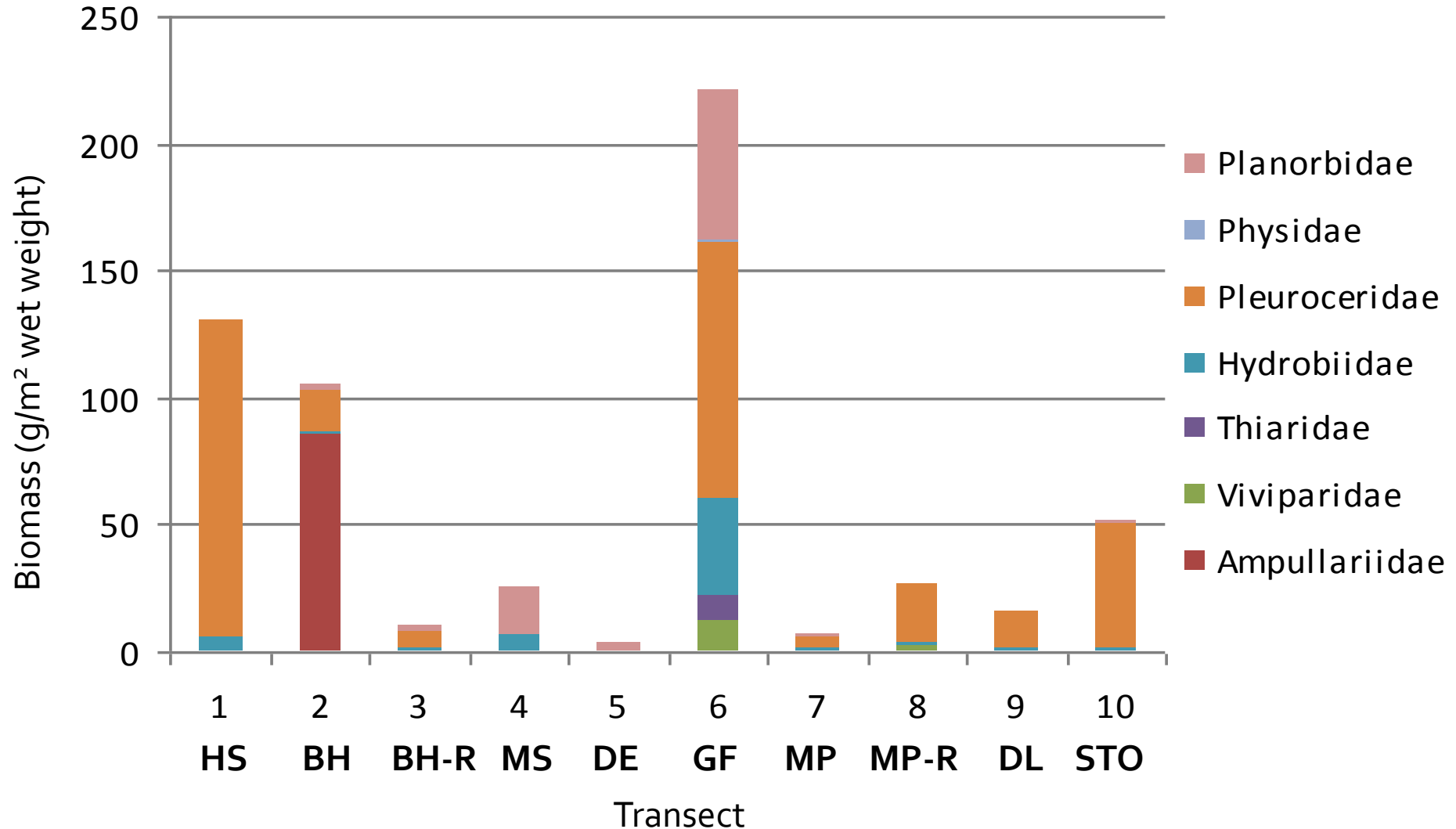
## 1. Environmental Characterization:

- dissolved oxygen (DO),
- conductivity,
- temperature,
- pH,
- canopy cover
- surface velocity
- water depth
- transect width
- NO<sub>3</sub>-N
- SRP
- Braun-Blanquet vegetation cover estimates

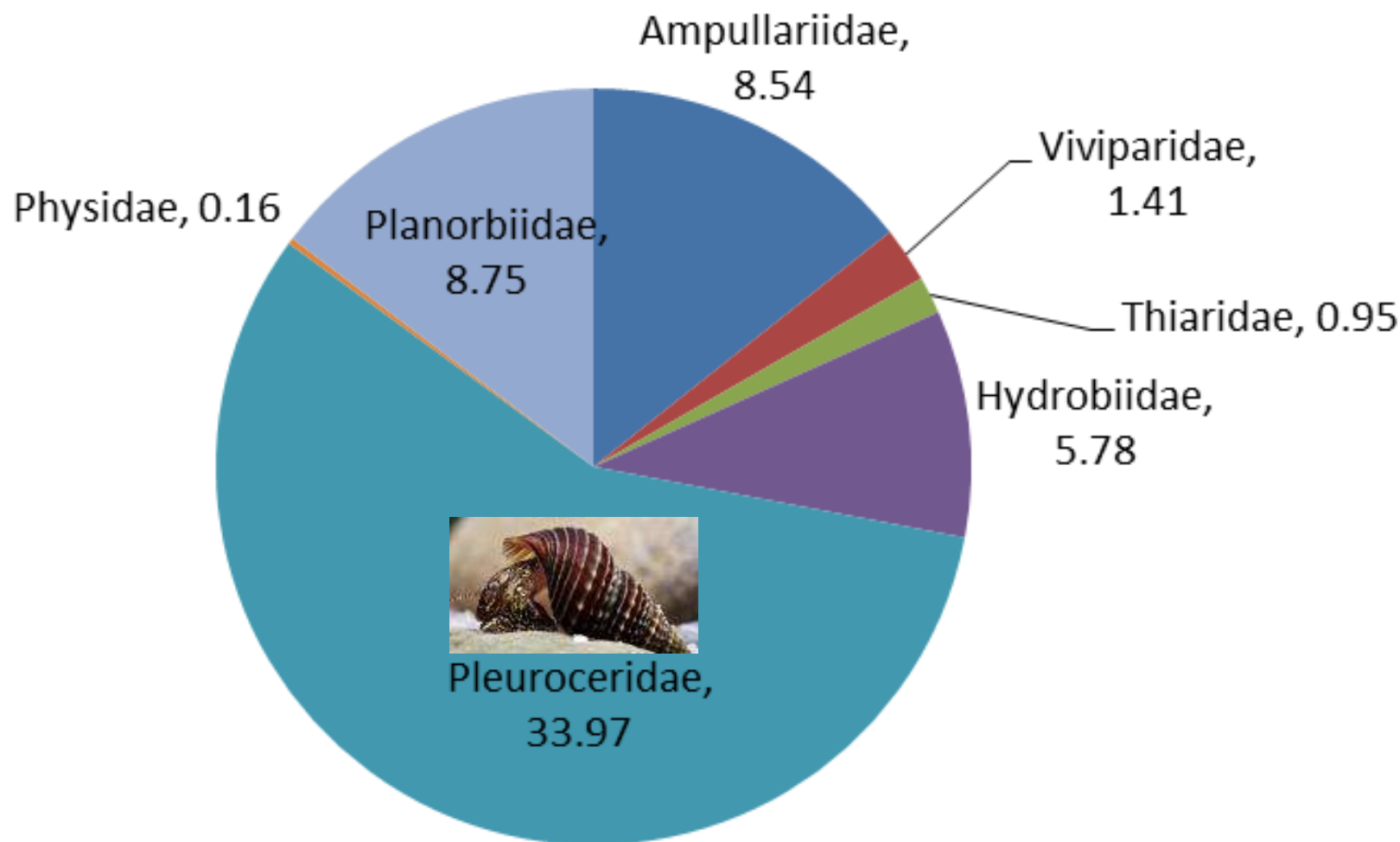
## 2. Biological sampling



# Results: Gastropod distribution

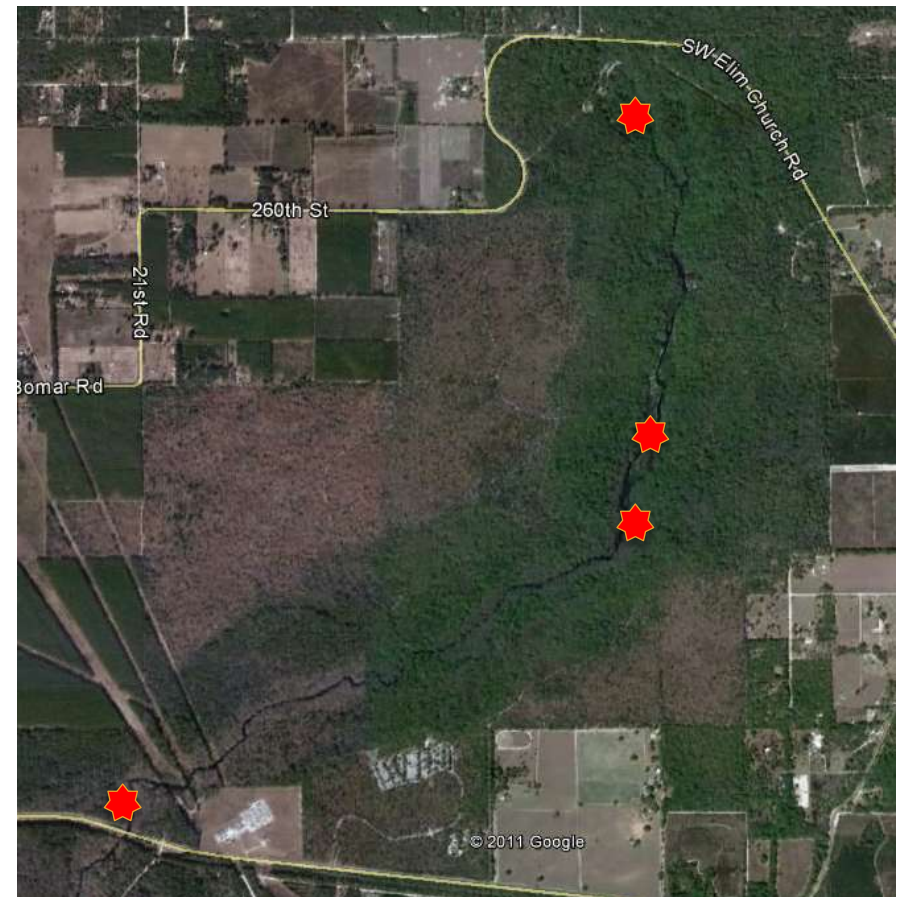


# Results: Gastropod density and diversity



## 2. *In situ* Experiment A: Methods

- Dates: Feb. 4<sup>th</sup> – March 3<sup>rd</sup>, 2011
- Four sites, chosen for representative DO gradients
  1. Headspring
  2. Mill Pond
  3. Grassy Flats
  4. South take-out
- Three treatments:
  1. Grazers excluded
  2. Ambient level/open cage
  3. Grazers enclosed (70 *Elimia floridenses* enclosed, ~300 grams/m<sup>2</sup> wet weight)
- Initial Conditions: low algae
- Environmental parameters



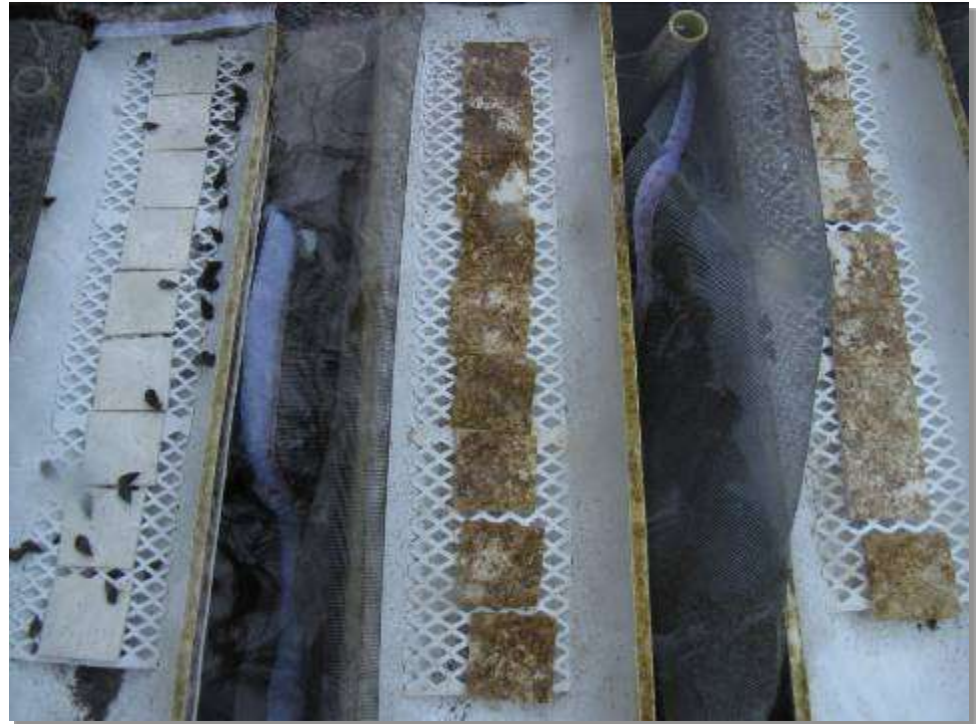




# Results: Headspring

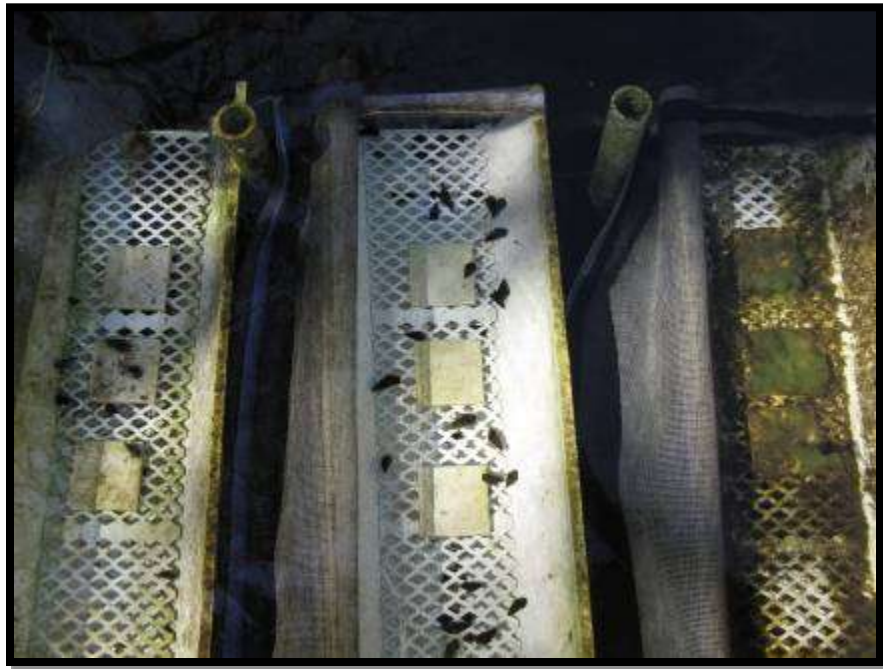


T=0 days



T=3 days

# Results: Headspring



T=12 days

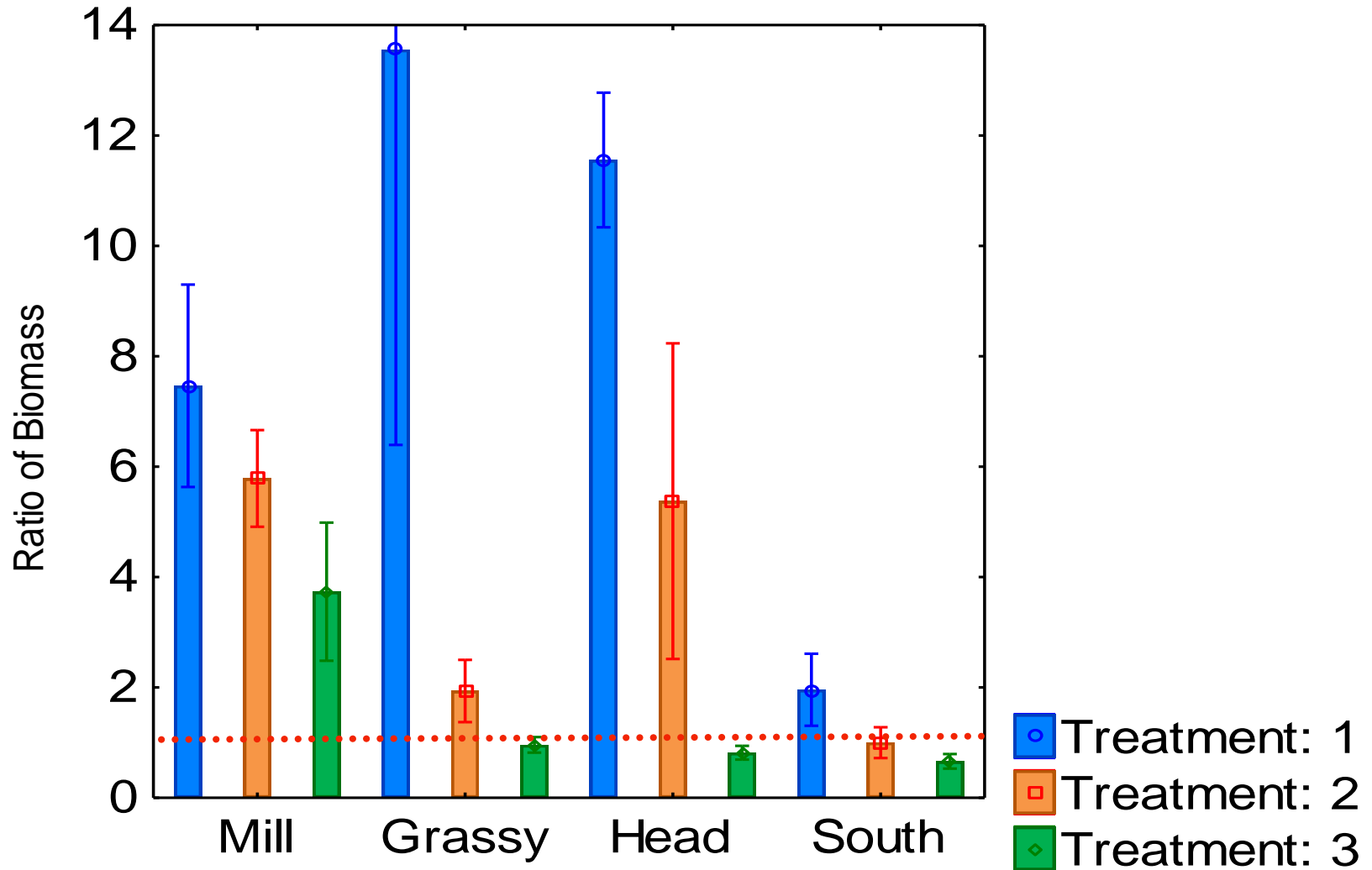


T=30 days

# Headspring: $t=30$ days



# Biomass Ratio (Initial:Final)

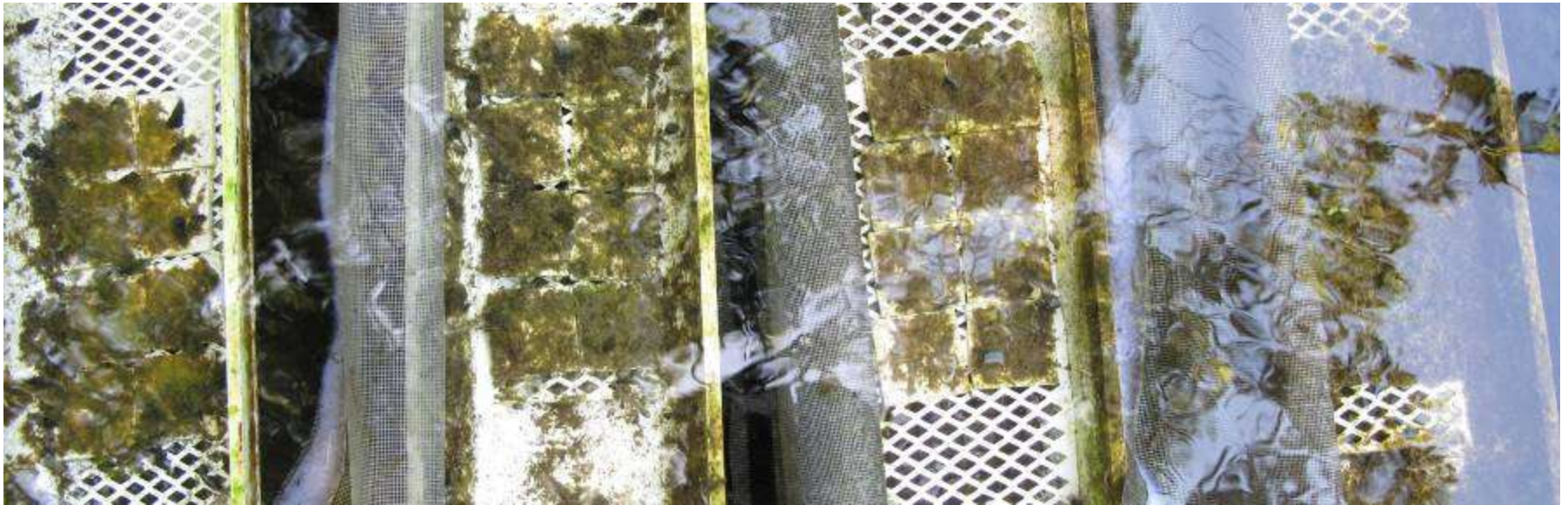


# 3. *In situ* Experiment B: Methods

- Dates: May 13<sup>th</sup> to June 5<sup>th</sup>, 2011
- Three locations
  - Headspring
  - Grassy Flats
  - South Take-out
- Four treatments:
  1. 0 g/m<sup>2</sup> of *Elimia floridensis*
  2. 25 *Elimia floridensis* (~ 105 g/m<sup>2</sup>)
  3. 50 *Elimia floridensis* (~ 215 g/m<sup>2</sup>)
  4. 75 *Elimia floridensis* (~ 330 g/m<sup>2</sup>)
- Initial conditions: High algae

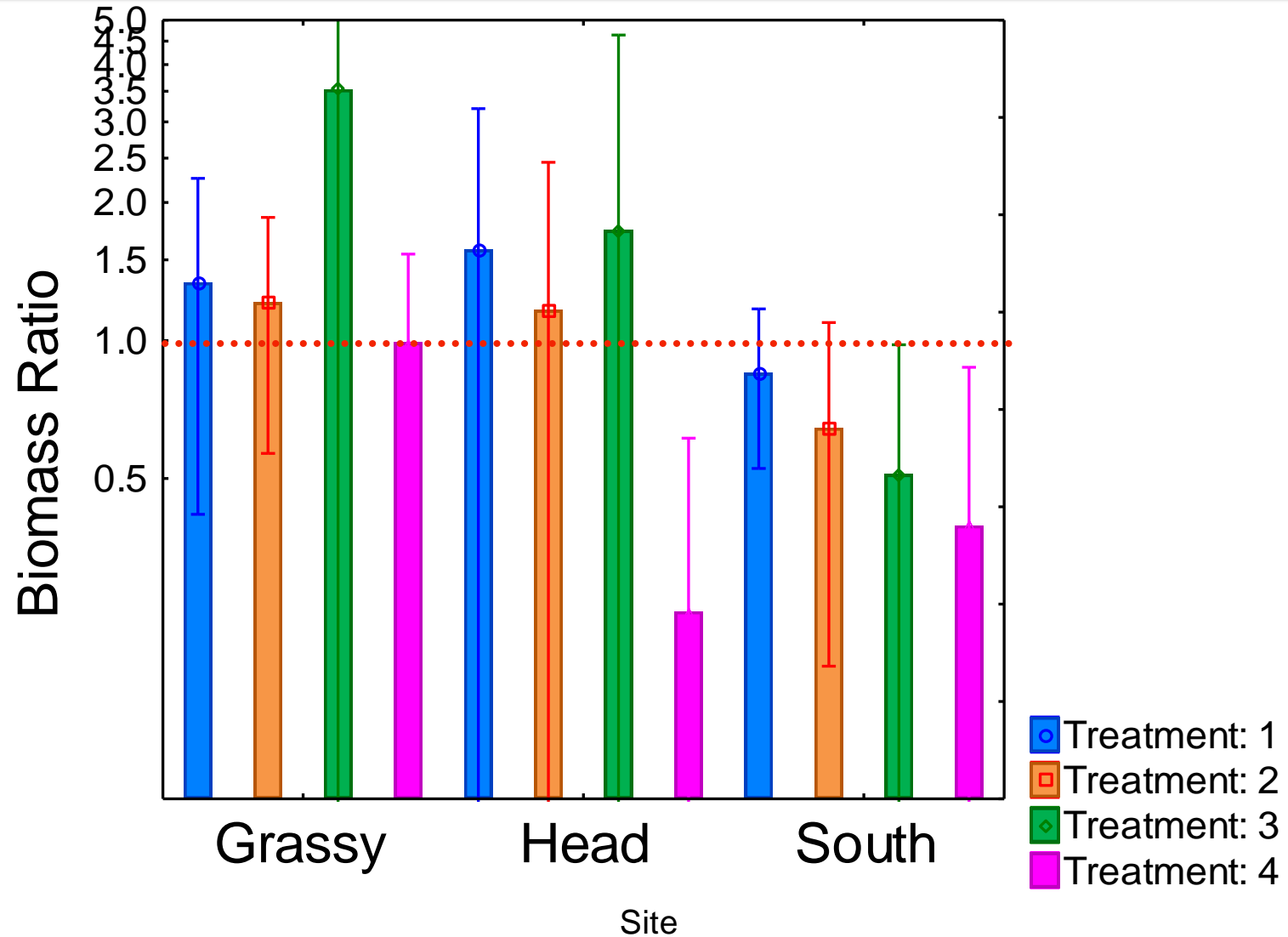


# Results: Headspring



Headspring after 14 days

# Biomass Ratio (Initial:Final)



# 4. DO/grazing experiments



Experimental DO treatments:

- 1) 5.0 mg/L (EPA standards as control)
- 2) 3.0 mg/L (above conventional onset of hypoxia)
- 3) 1.0 mg/L (approaching severe hypoxia, and the approximate level at which *Elimia* in the Ichetucknee springs became inactive)

# Conclusions and Next Steps

- **Grazers in high abundance can control algal accumulation**
  - less effective in hypoxic conditions
- Differences in growth among exclosures: combination of covariates? Varying algal species?
- Potential for alternative states, algae escape densities.
- Next steps:
  - Further statistical analyses of data set for algal growth rates, grazing rates, and biomass thresholds
  - Complete mesocosms experiments for DO effects

# Acknowledgements



**Photo: Lawrence Korhnak**

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- Co-authors: Matthew Cohen  
(advisor), Tom Frazer, James  
Heffernan, Lawrence Korhnak