Predation in Seagrass Beds: The Effects of Predators on Community Structure and Dynamics

Levi S. Lewis
Scripps Institution of Oceanography

and

Todd W. Anderson
San Diego State University

Seagrasses

A Global Crisis for Seagrass Ecosystems

2006

ROBERT J. ORTH, TIM J. B. CARRUTHERS, WILLIAM C. DENNISON, CARLOS M. DUARTE, JAMES W. FOURQUREAN, KENNETH L. HECK JR., A. RANDALL HUGHES, GARY A. KENDRICK, W. JUDSON KENWORTHY, SUZANNE OLYARNIK, FREDERICK T. SHORT, MICHELLE WAYCOTT, AND SUSAN L. WILLIAMS

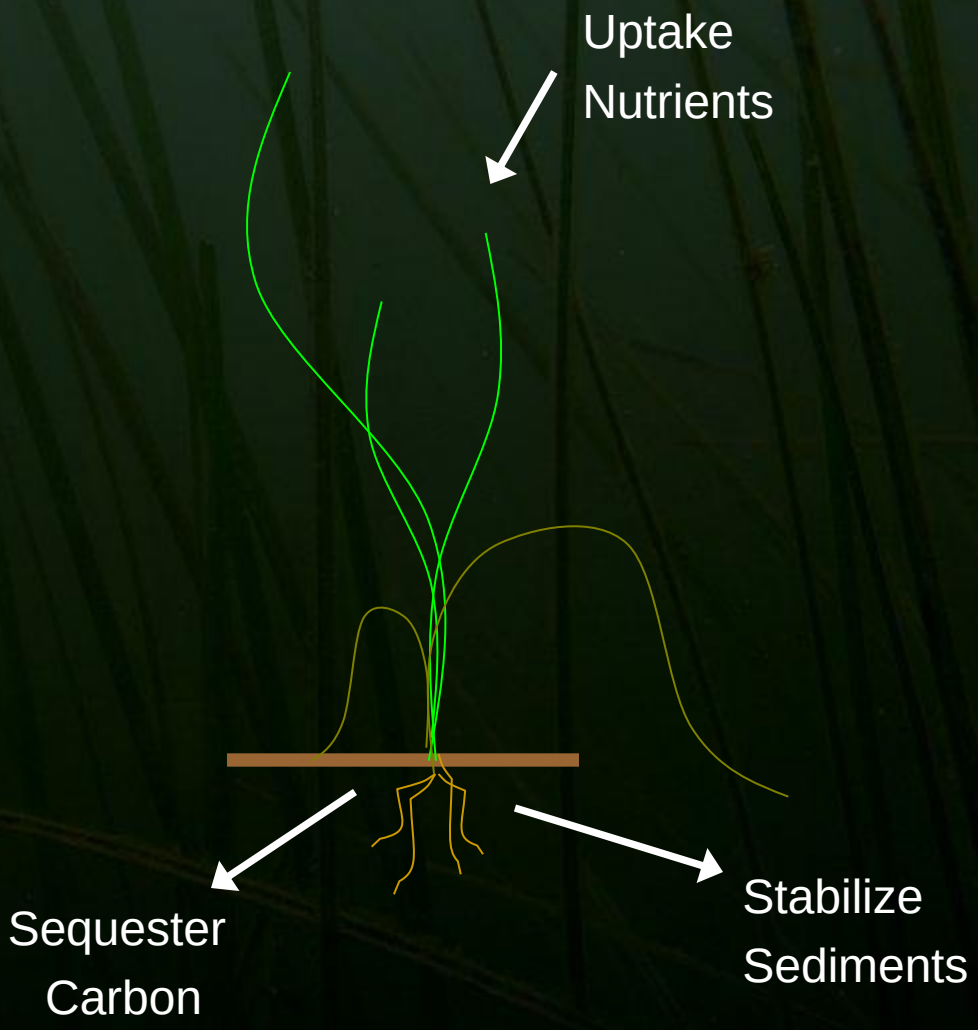
Associations of concern: declining seagrasses and threatened dependent species

2009

A Randall Hughes[1,2*], Susan L Williams[1], Carlos M Duarte[3], Kenneth L Heck Jr[4], and Michelle Waycott[5]

Seagrasses

- Importance
- Trophic Ecology



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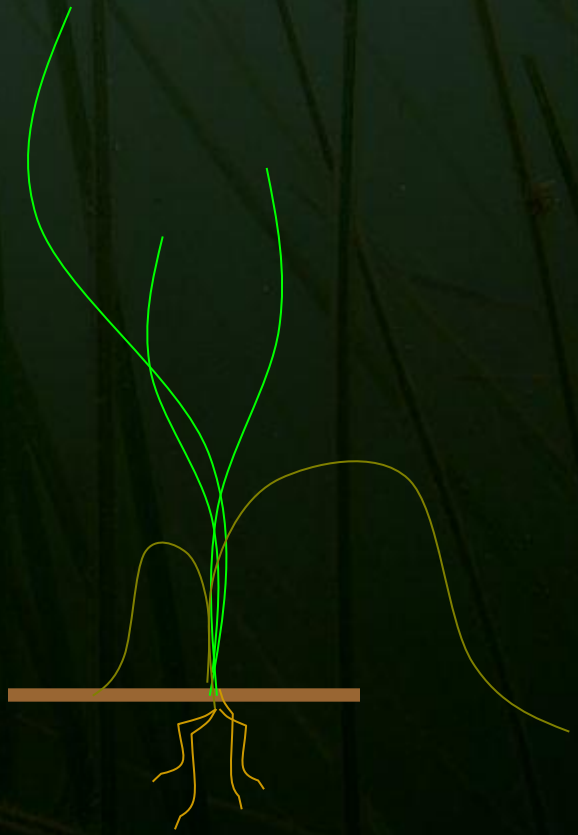

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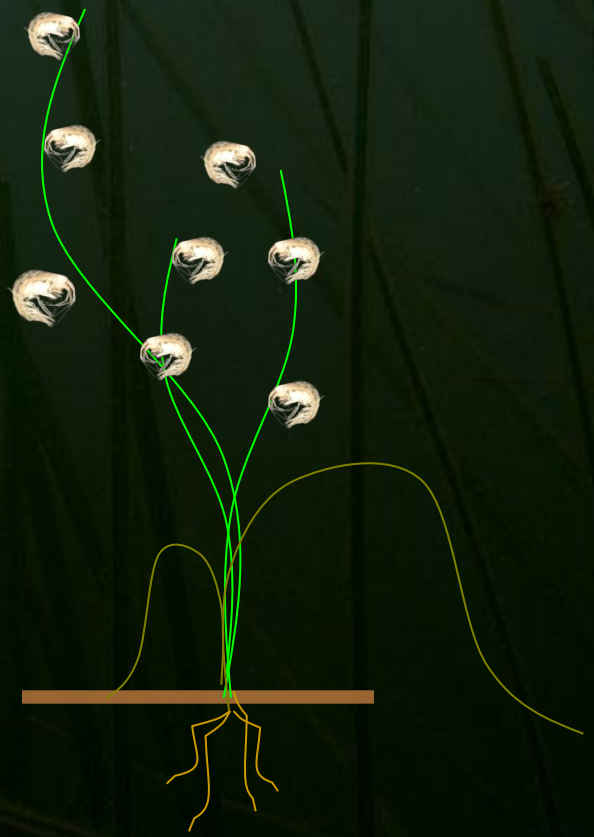

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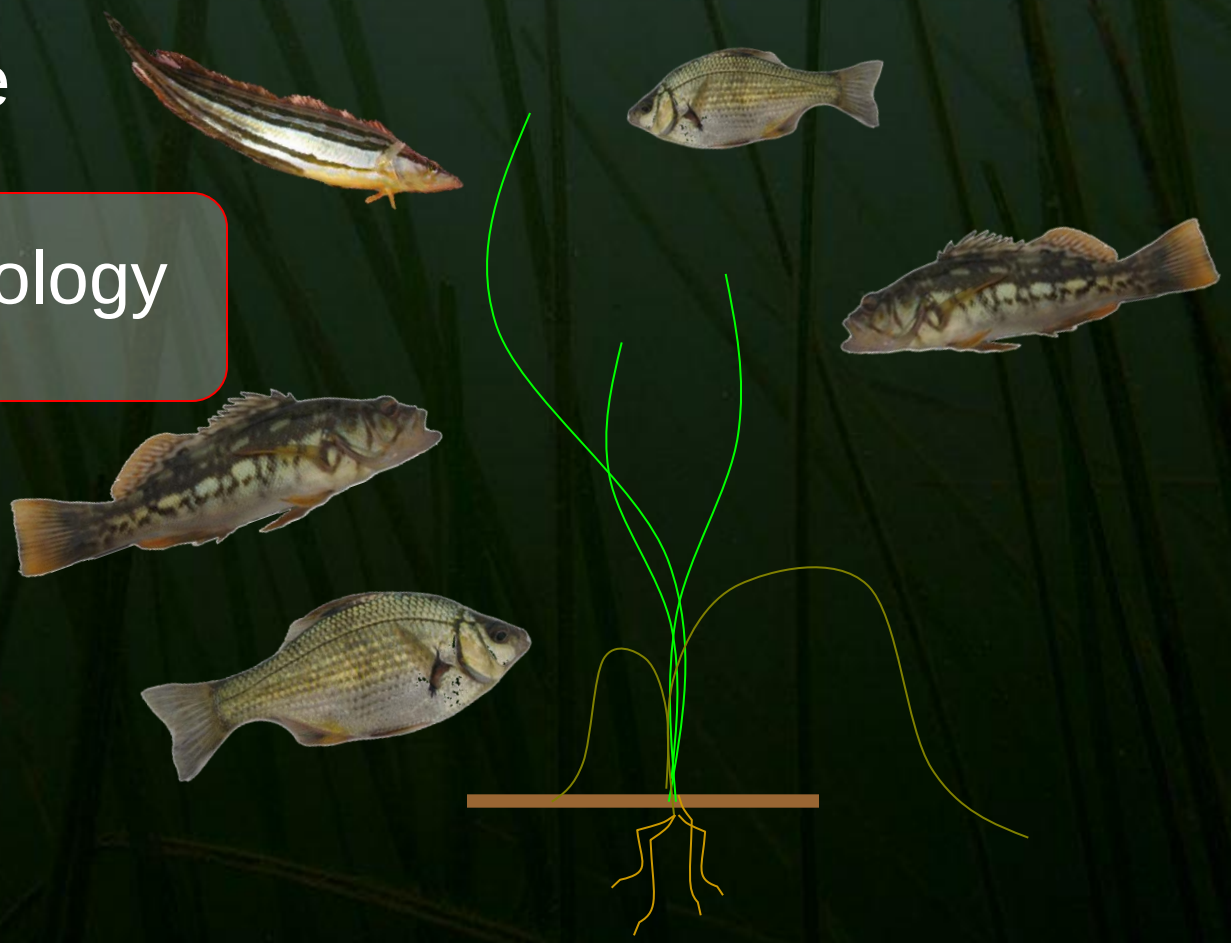

Seagrasses

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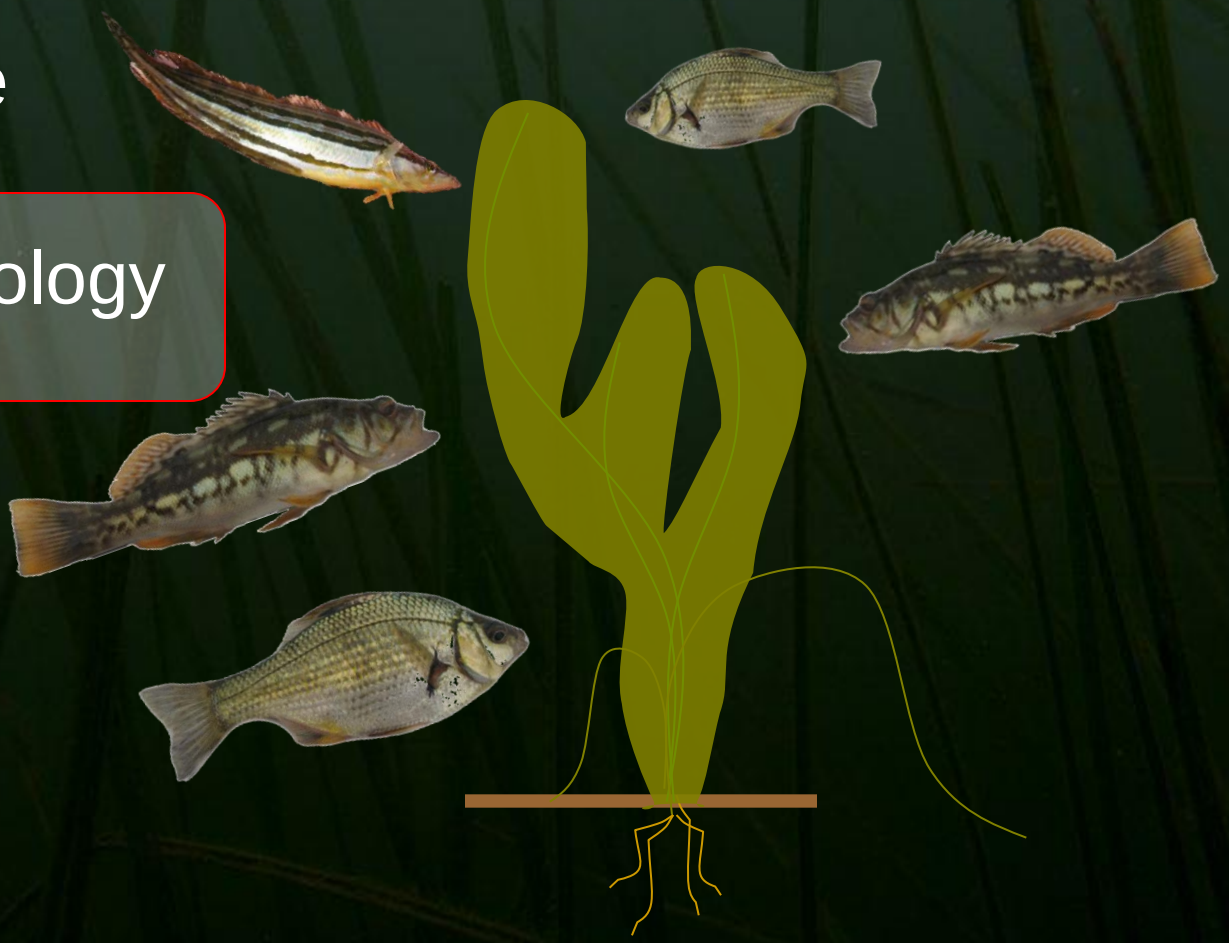


Seagrasses

- Importance
- Trophic Ecology

Research Question

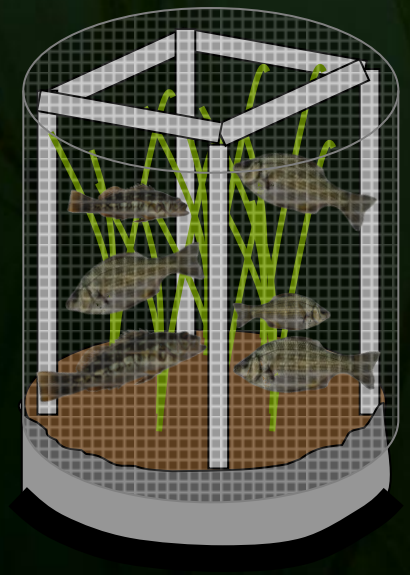
Do manipulations of small predators result in cascading effects that ultimately impact eelgrass performance in San Diego Bay?

Study Site: San Diego Bay

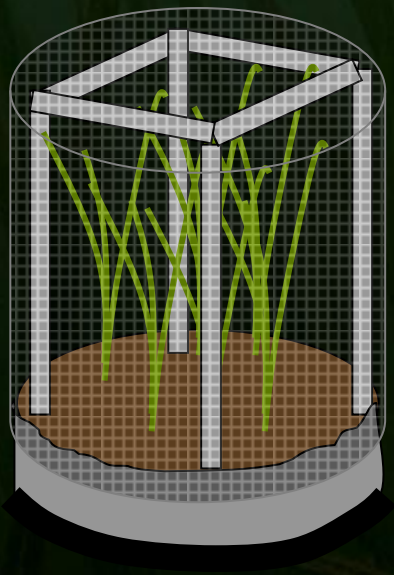
Experimental Design

Treatments:

Predator



No Predator



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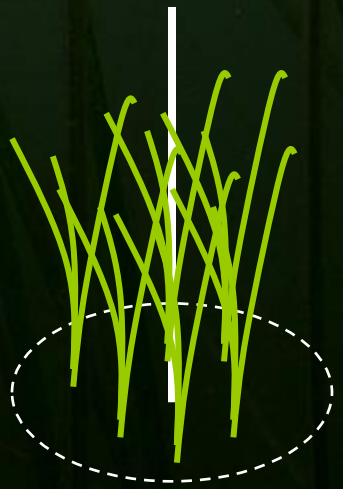
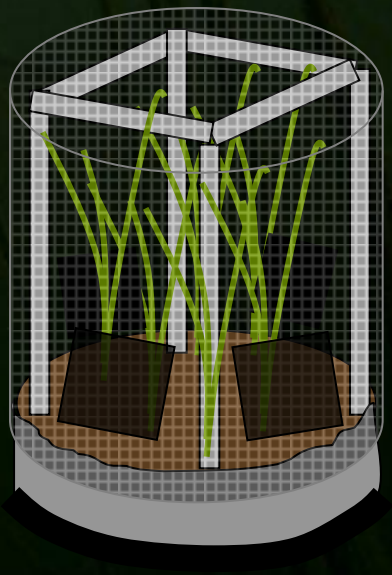


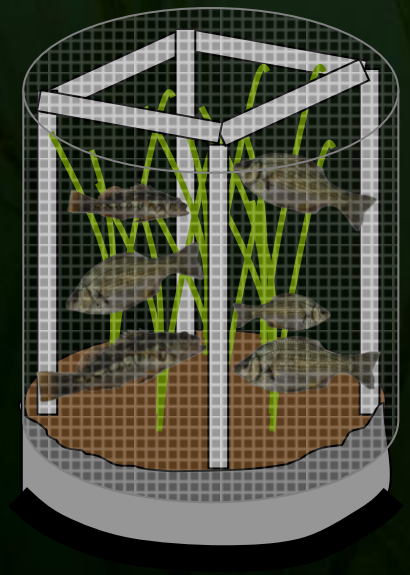
Control



Experimental Design

Treatments:

P



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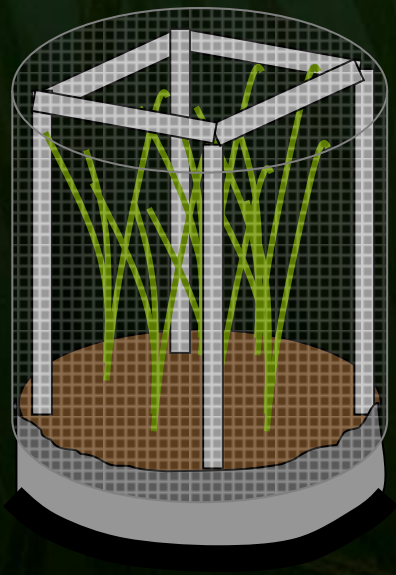
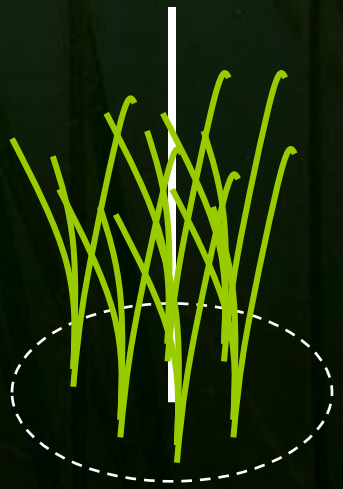
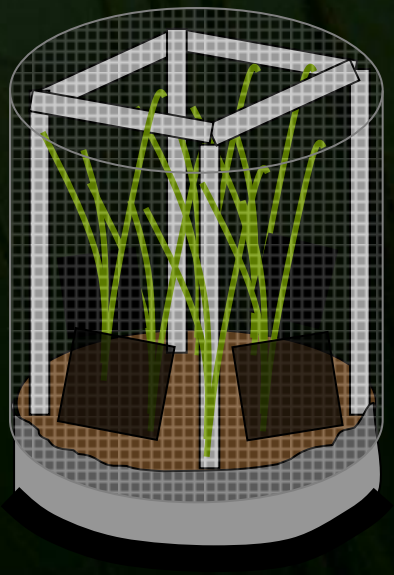


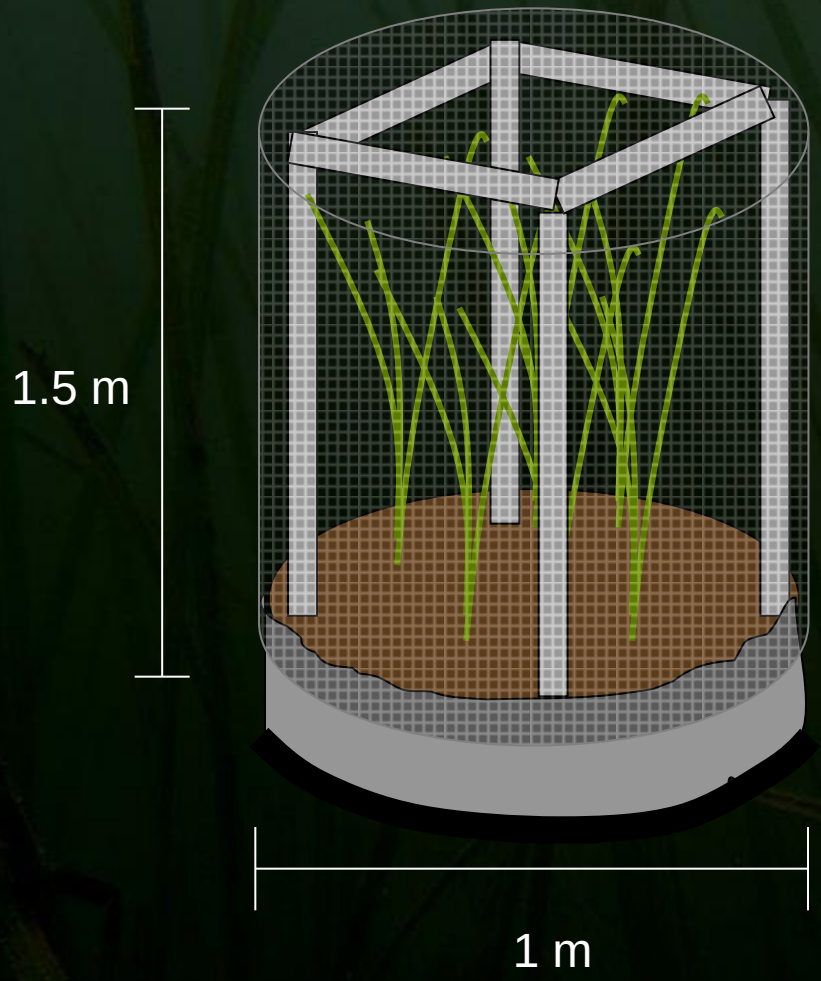
O



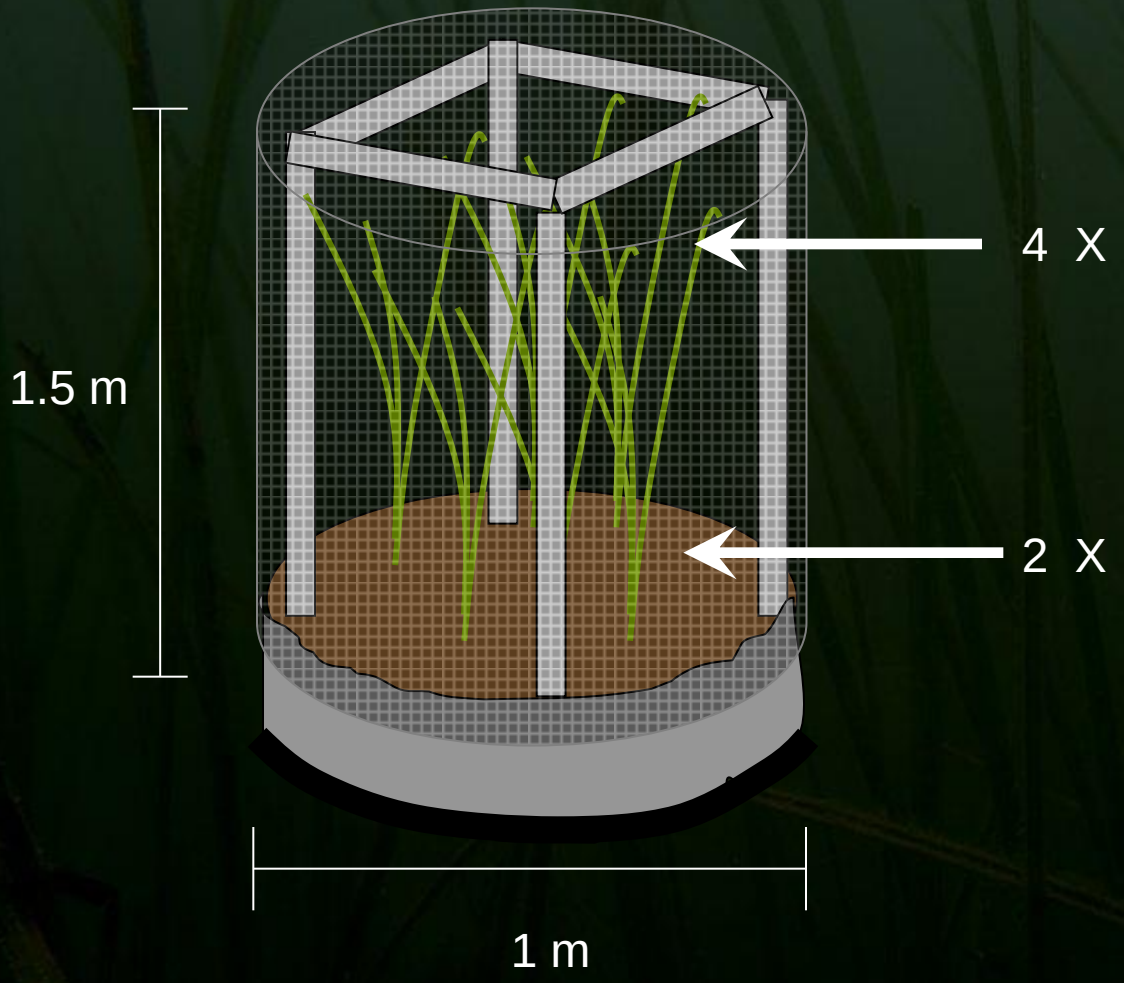
C



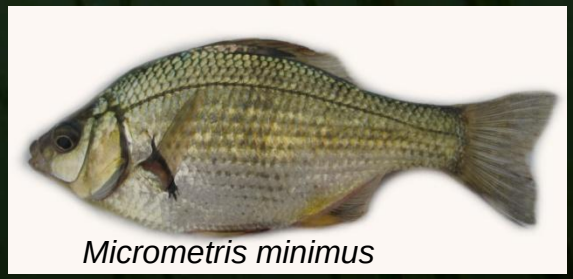
Cage Design



Cage Design



Predator Enclosures



Micrometris minimus

Paralabrax clathratus

Experimental Array

June - August, 2007

Visual Observations

Parameters & Sampling

June - July - Aug

- Invertebrates
  - biomass
- Epiphytic Loads
  - mass, chlorophyll
- Eelgrass
  - leaf production

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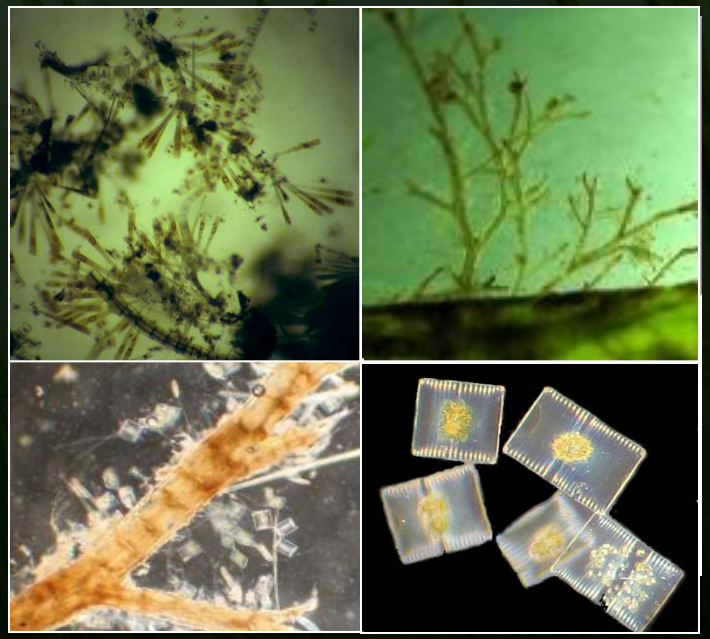

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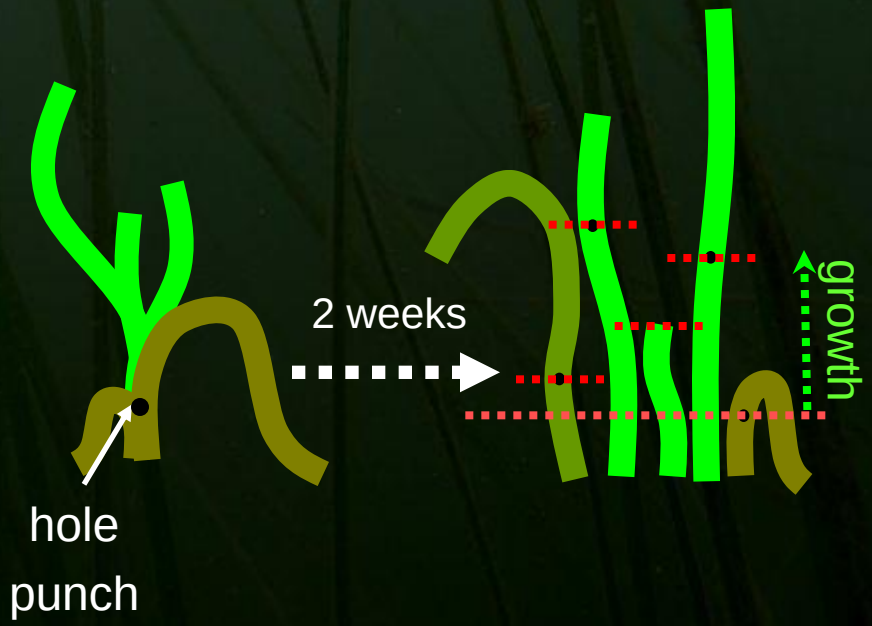
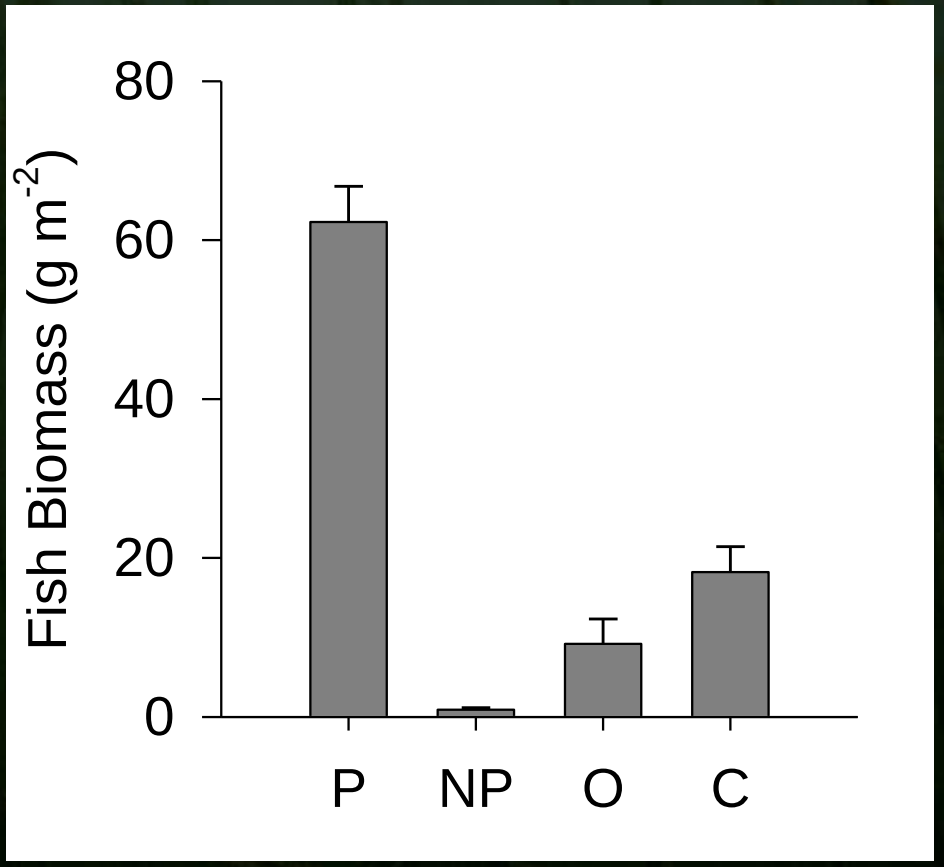
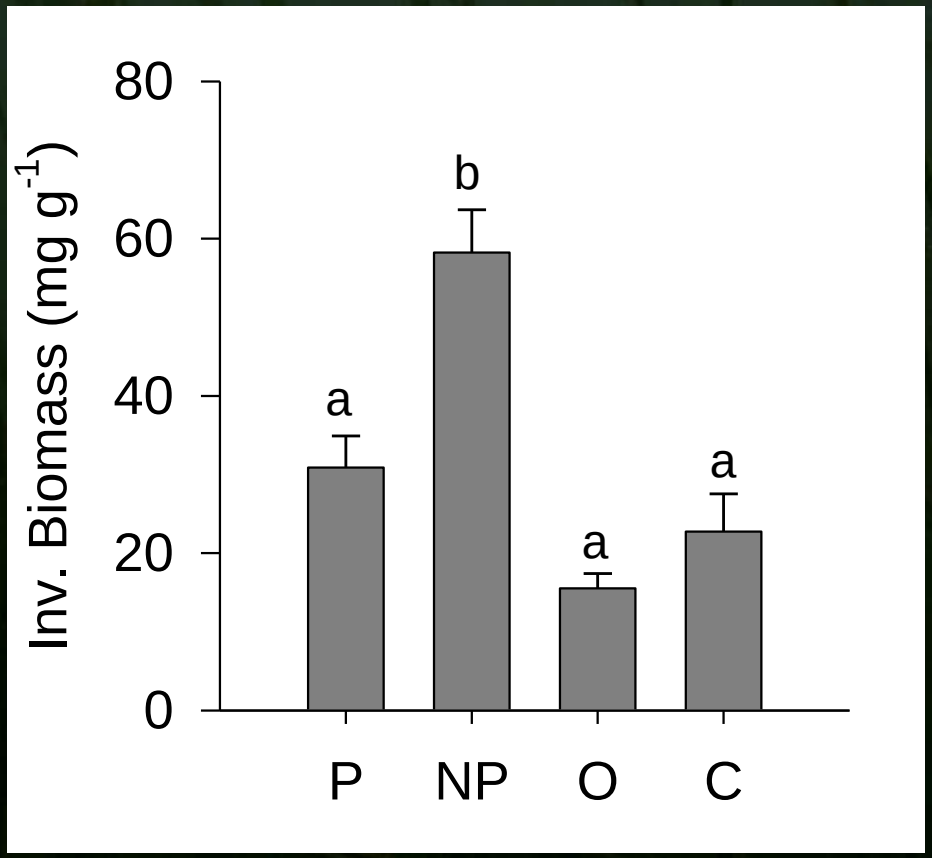


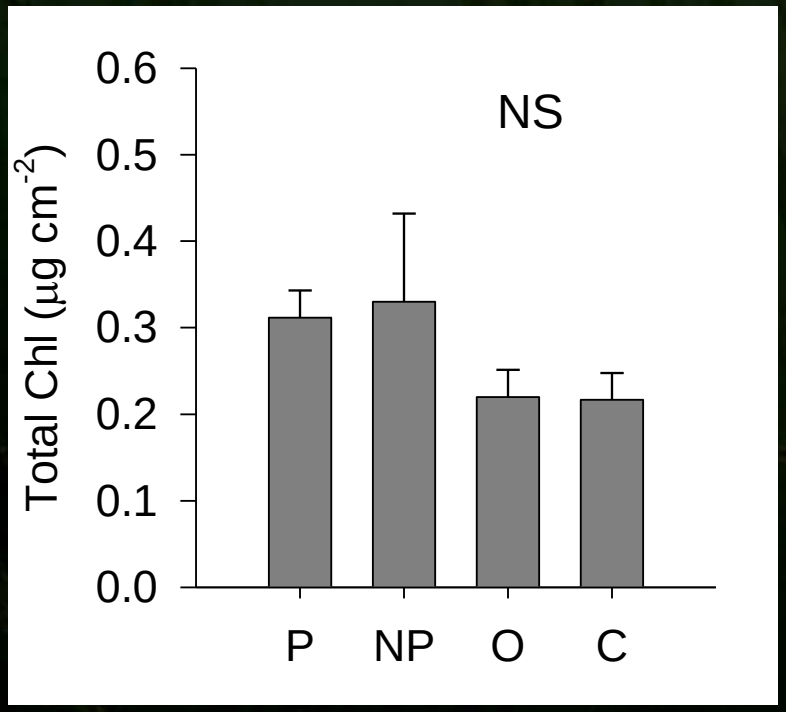
Fish Observations



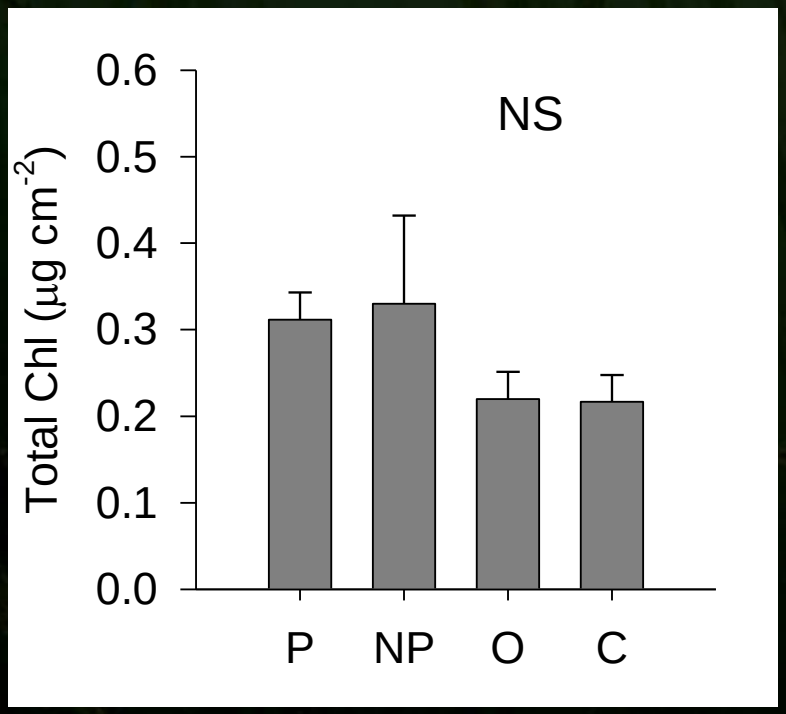
Invertebrates

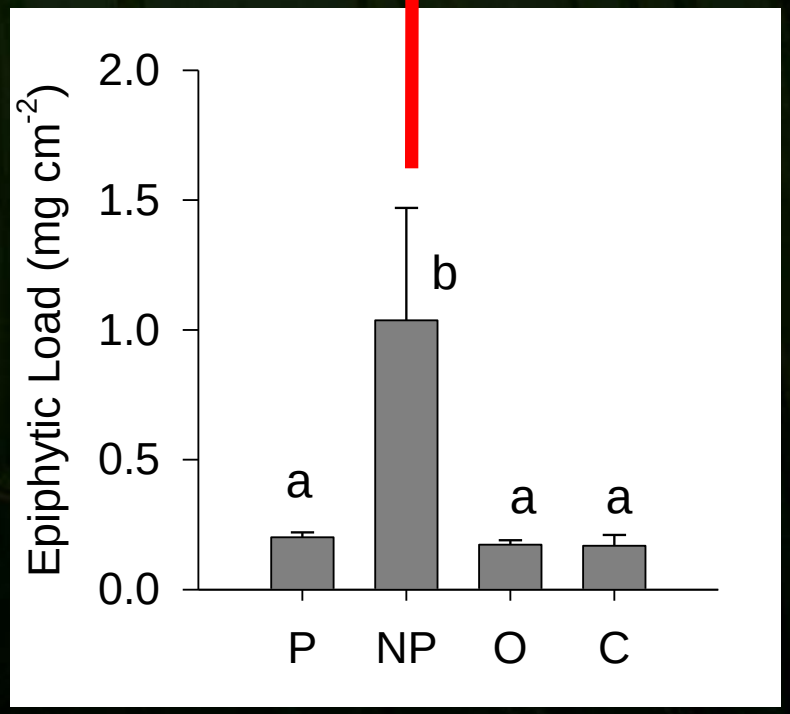


Fouling on Eelgrass Leaves

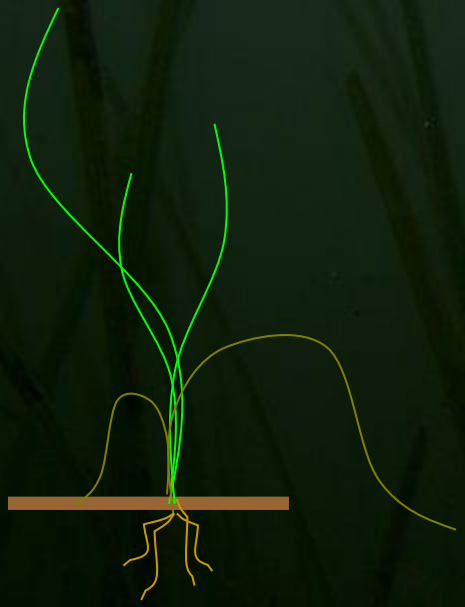


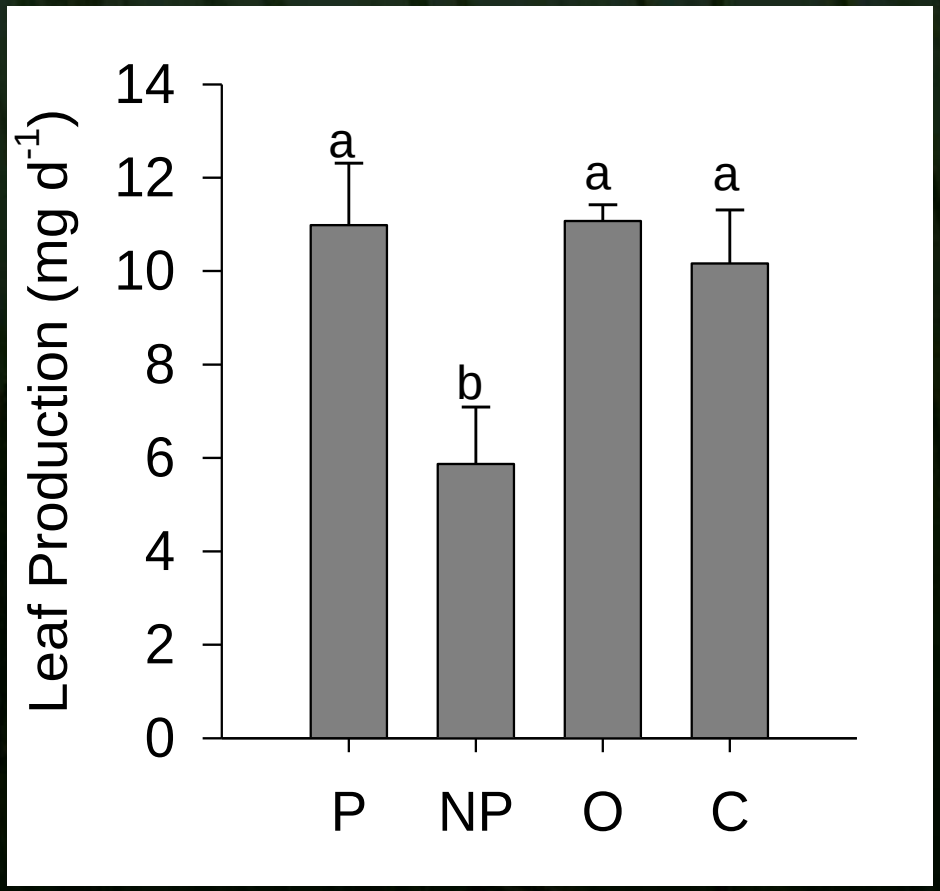
Fouling on Eelgrass Leaves



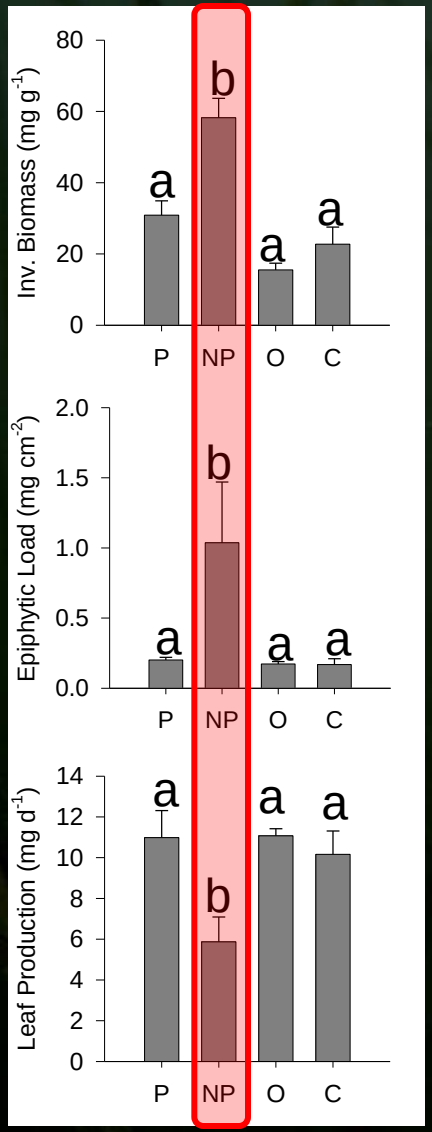


Eelgrass Growth



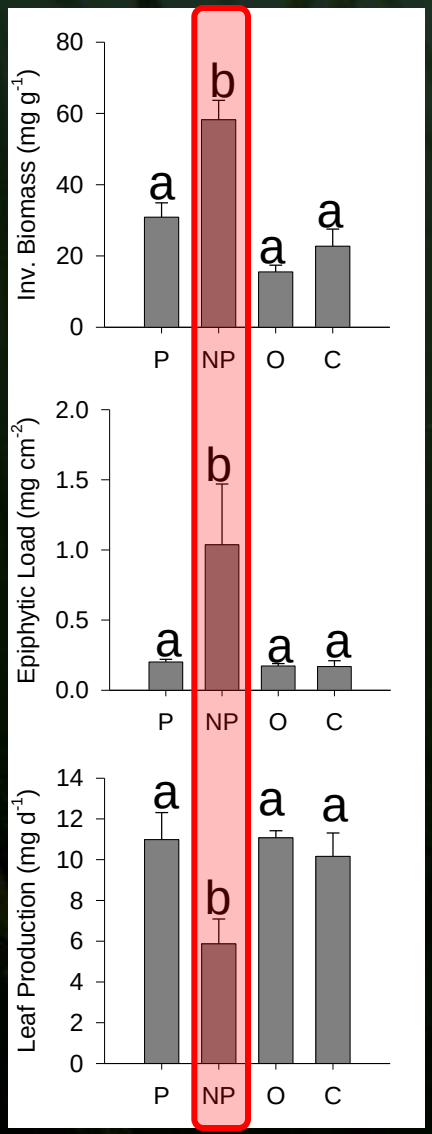


Summary



- Treatments were effective
- Predators had consistent effects
- No cage artifacts
- Exclosures were sig. different
  - (+) invert. biomass
  - (+) epiphytic load
  - (-) eelgrass growth

Summary

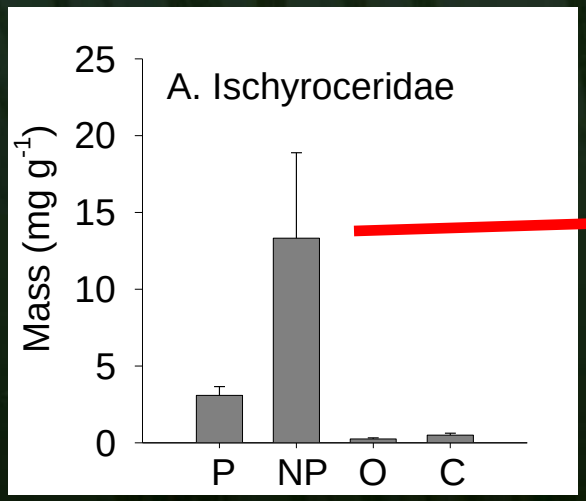


- Treatments effective
- Predator effects all comparable
- No cage artifacts
- Exclosures sig. different
  - (+) invert. biomass
  - (+) epiphytic load
  - (-) eelgrass growth

Why?

Epifauna Effects

Iscyrocerid Amphipod



Epifauna Effects

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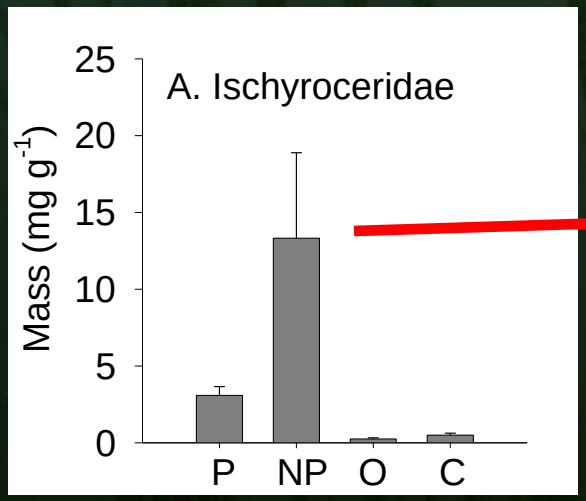
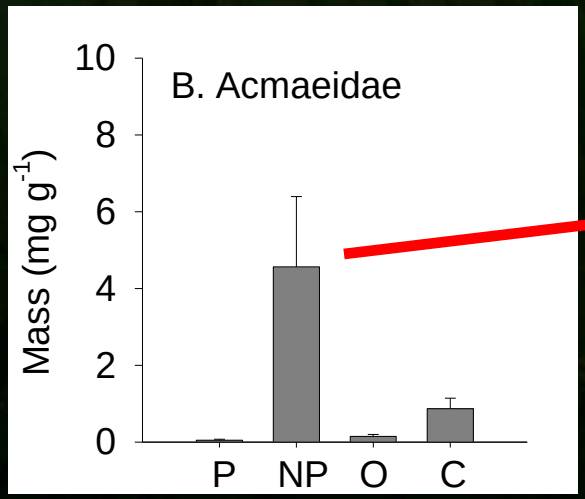
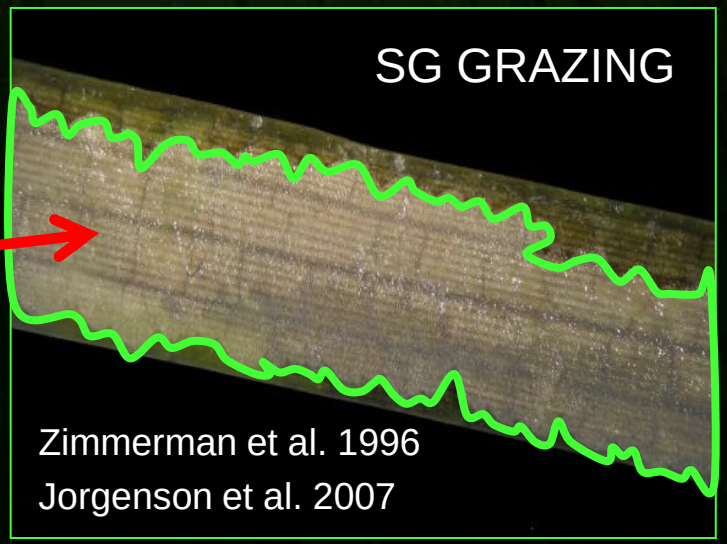


Seagrass Limpet

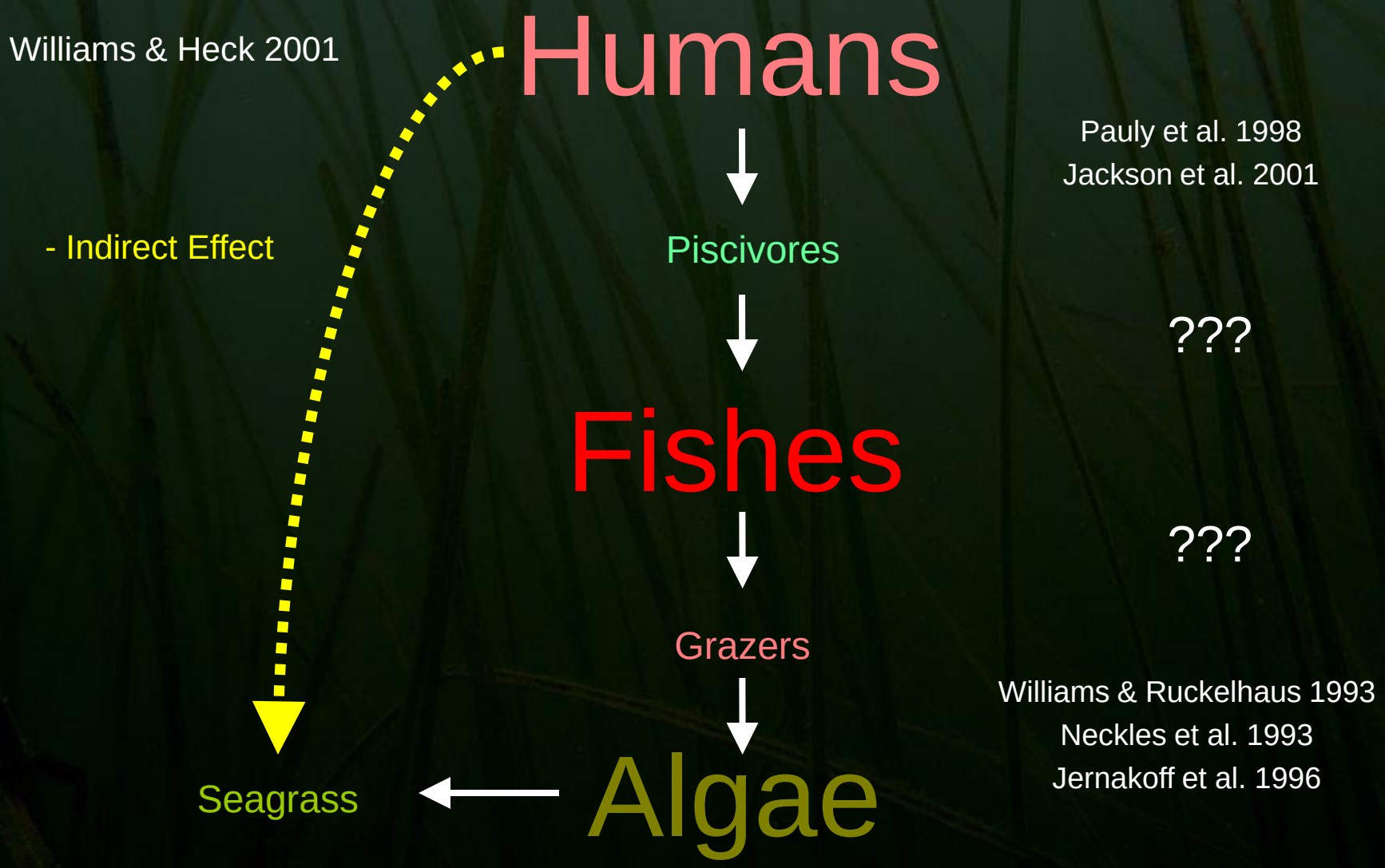




Conclusions

- Fishes affected invertebrate communities
- Grazing & fouling inverts reduced eelgrass growth
- Fishes had positive indirect effects on eelgrass growth

Final Conclusions



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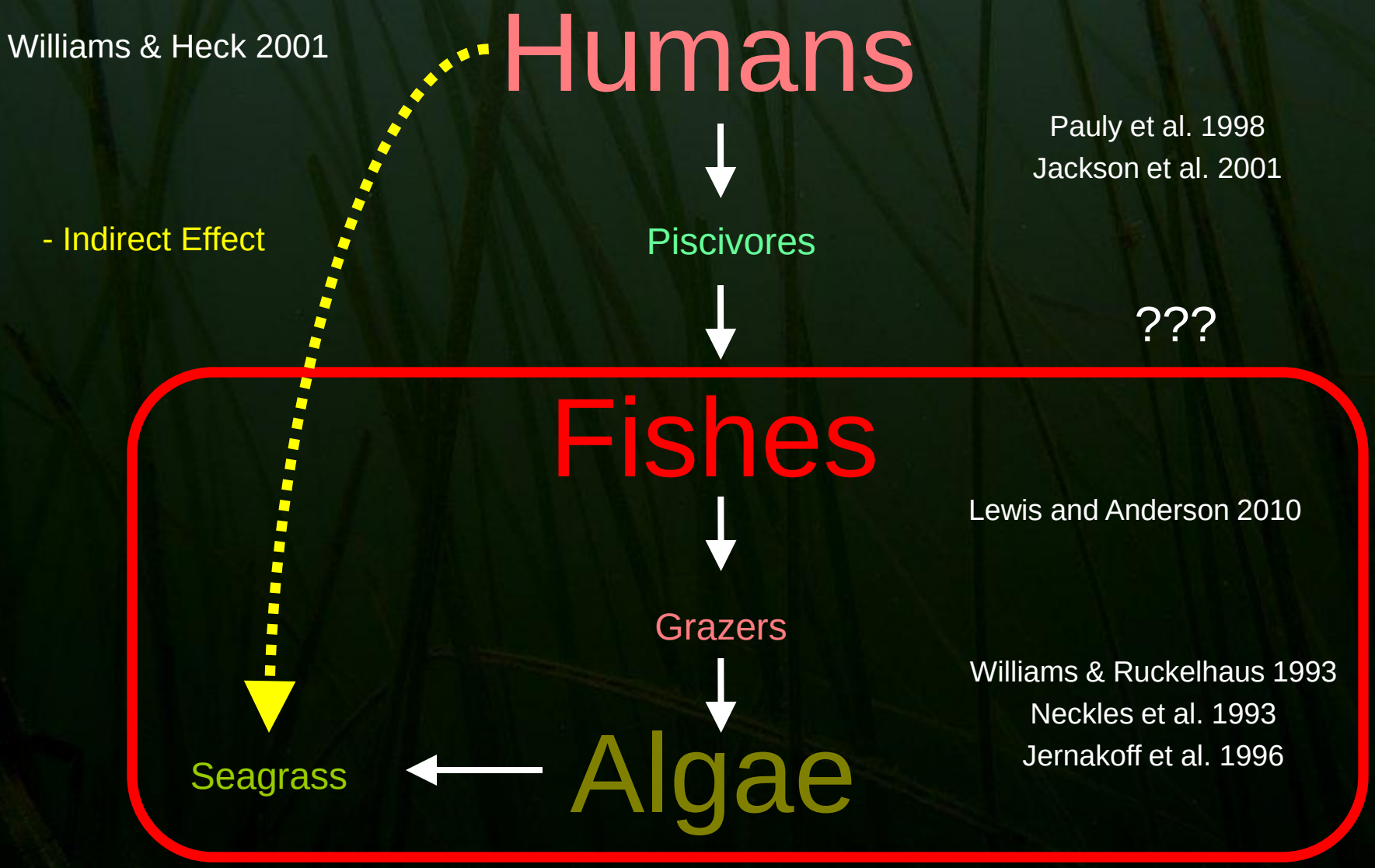


Final Conclusions

Lewis and Anderson 2010

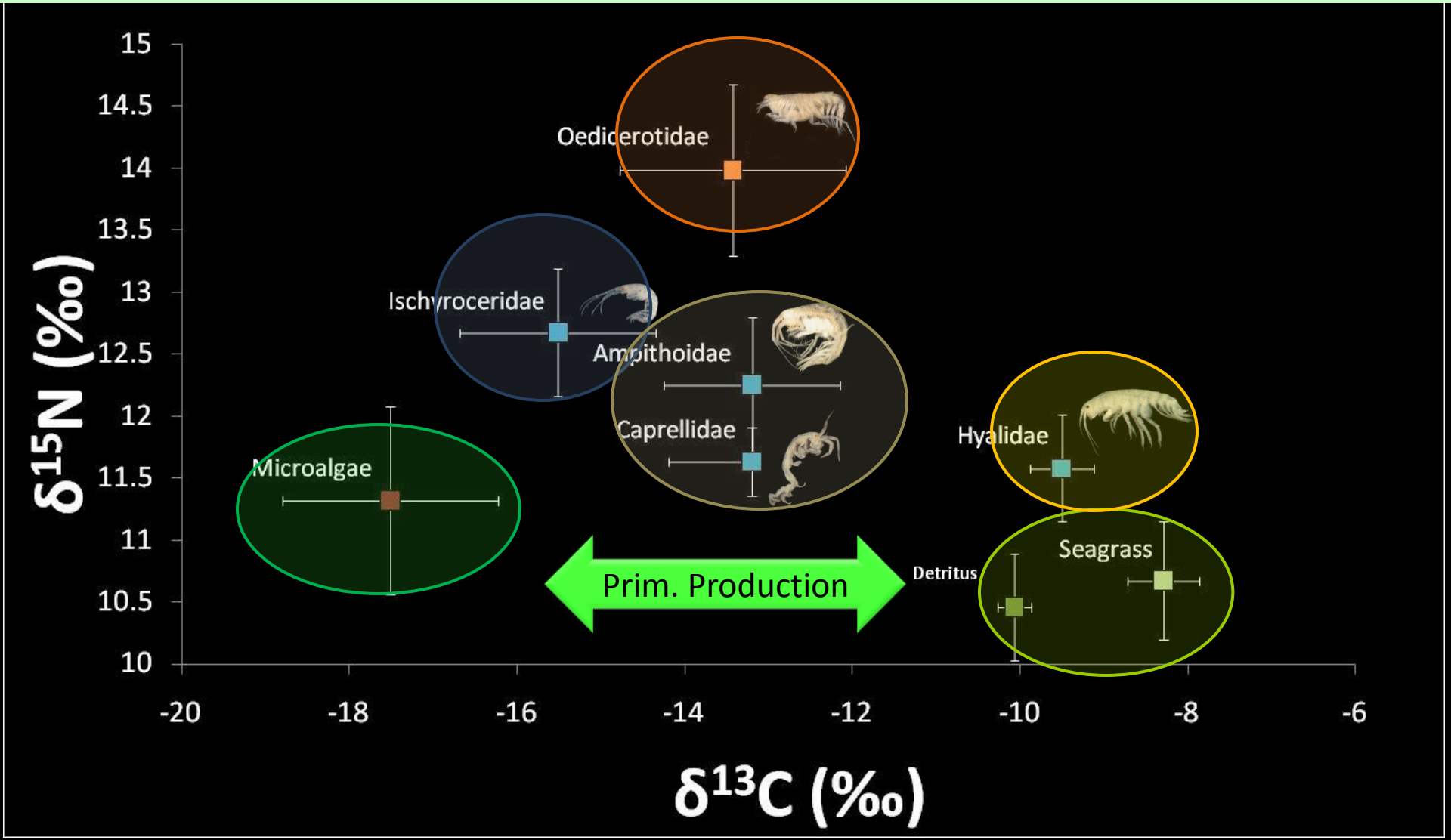
Experiment # 2: Spring 2008
Is these patterns consistent across seasons?

- Similar effects of fishes on limpets and seagrass grazing.
- Complex effects on algal production and seagrass growth.
- May indicate seasonal differences in dynamics.

Functional Diversity and Trophic Structure within the Amphipoda of Seagrass Beds

Farlin, JP[1], Lewis, LS[2], Anderson, TW[1], Lai, CT[1]
[1]San Diego State University, [2]Scripps Institution of Oceanography

Results


15
14.5
14
13.5
13
12.5
12
11.5
11
10.5
10
δ15N (‰)
-20
-18
-16
-14
-12
-10
-8
-6
δ13C (‰)
Oedicerotidae
Ischyroceridae
Ampithoidae
Caprellidae
Microalgae
Hyalidae
Seagrass
Detritus
Prim. Production

Conclusions

- ✓ Significant Functional Diversity (Carbon Isotopes)
- ✓ Significant Trophic Structure (Nitrogen Isotopes)
- ✓Amphipods exhibited significant trophic diversity and should not be considered as functionally redundant.

Funding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Funding


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May 8, 2007
LEVI LEWIS - SDSU
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10,000.00
Recipient of the Environmental Committee
Student Grants for
Research on San Diego Bay

Project Summary

(1) Support for:

1 M.S. Thesis, Levi Lewis (completed summer 2009)
1 Undergrad. Honors Thesis, James Farlin (completed fall 2009)
> 12 undergraduate research assistants and volunteers

(2) Presentations and Awards:

- 2009. **President's Award.** James Farlin. SDSU Res. Symposium
- 2009. **First Place**. James Farlin. CSU State-wide Research Symposium
- 2008. **Deans Award.** Levi Lewis. SDSU Research Symposium
- 2008. **Best Poster**. Levi Lewis. Western Society of Naturalists
- 2008. Levi Lewis. Southern California Academy of Sciences
- 2007. Levi Lewis. Western Society of Naturalists

(3) Manuscripts:

- Lewis and Anderson. *In prep.* Effects of Predators in Seagrass Foodwebs
- Farlin et al. *In review.* Functional Diversity of Amphipods in Seagrass Beds

Thank You