

Coastal Eutrophication and the Productivity of Clams and Oysters

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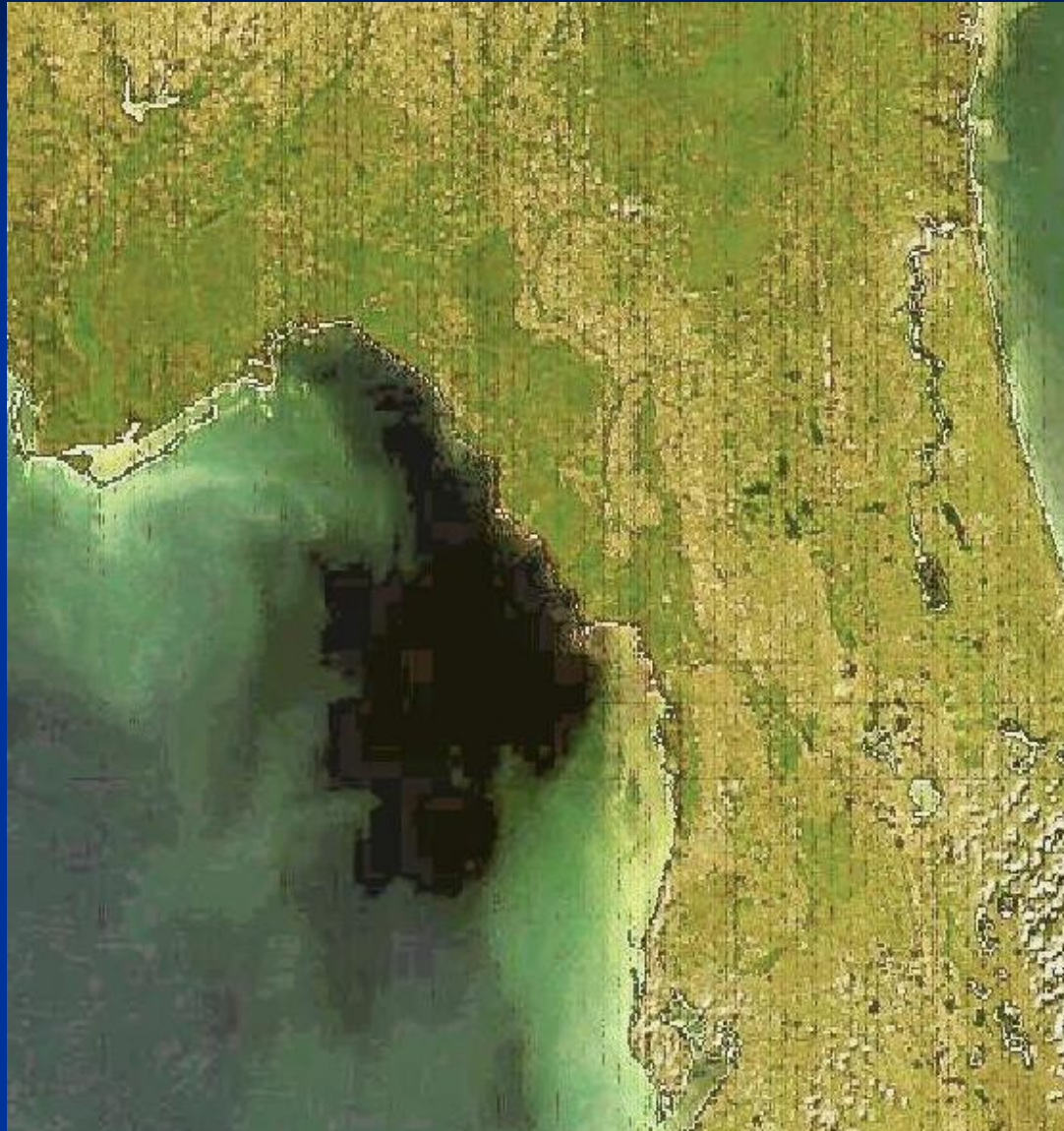
Eutrophic – “Well fed” (Greek)

Oligotrophic – “Little food” (Greek)

Process of eutrophication:

‘multifaceted term generally associated with increased productivity, structural simplification of biotic components’ (Wetzel 1983)

Suwannee River Plume – Broad regional impact



Major Questions

Are changes in nutrient load from the Suwannee River related to the abundance and composition of plankton in the surrounding coastal waters?

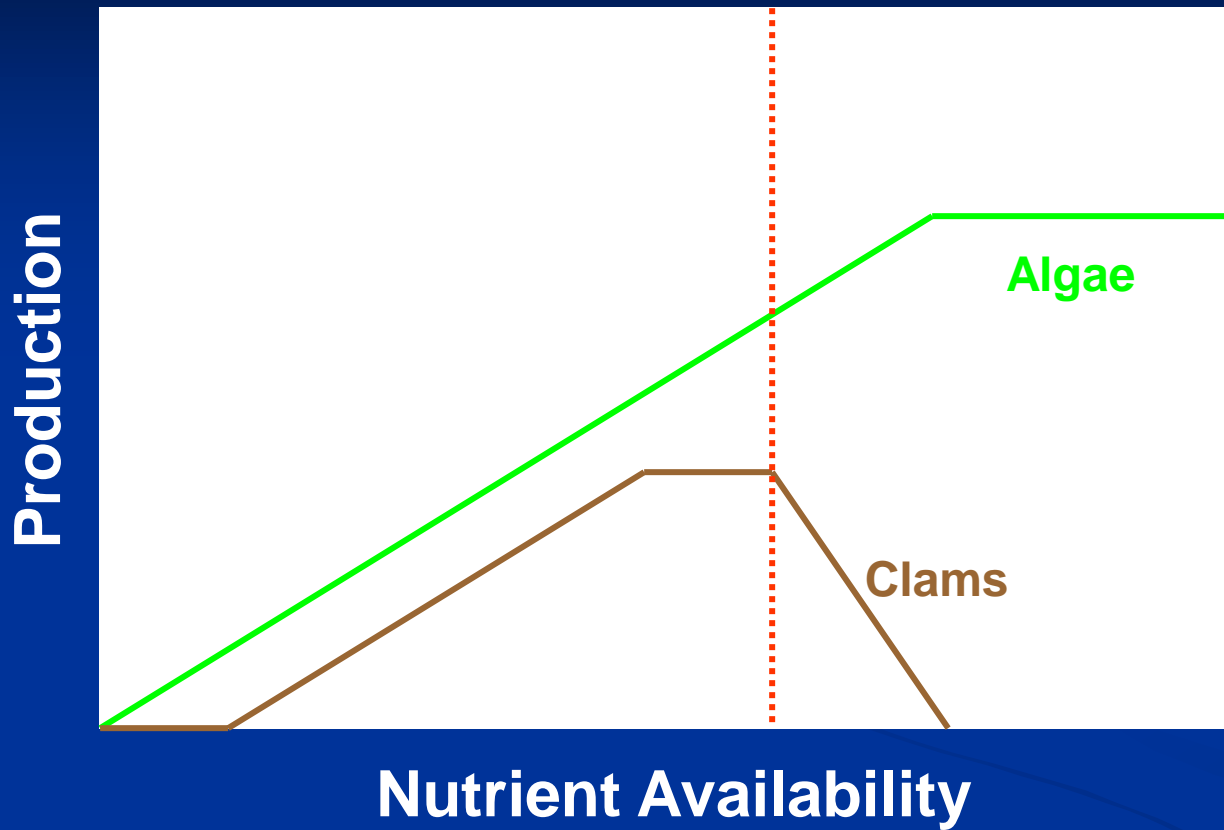
Is the productivity of clams and oysters correlated to the abundance and composition of plankton?

Significance

**Defining regions and periods of
maximum production potential**

**Determining carrying capacity of
production areas**

**Evaluating risks to productivity
from harmful algal blooms**



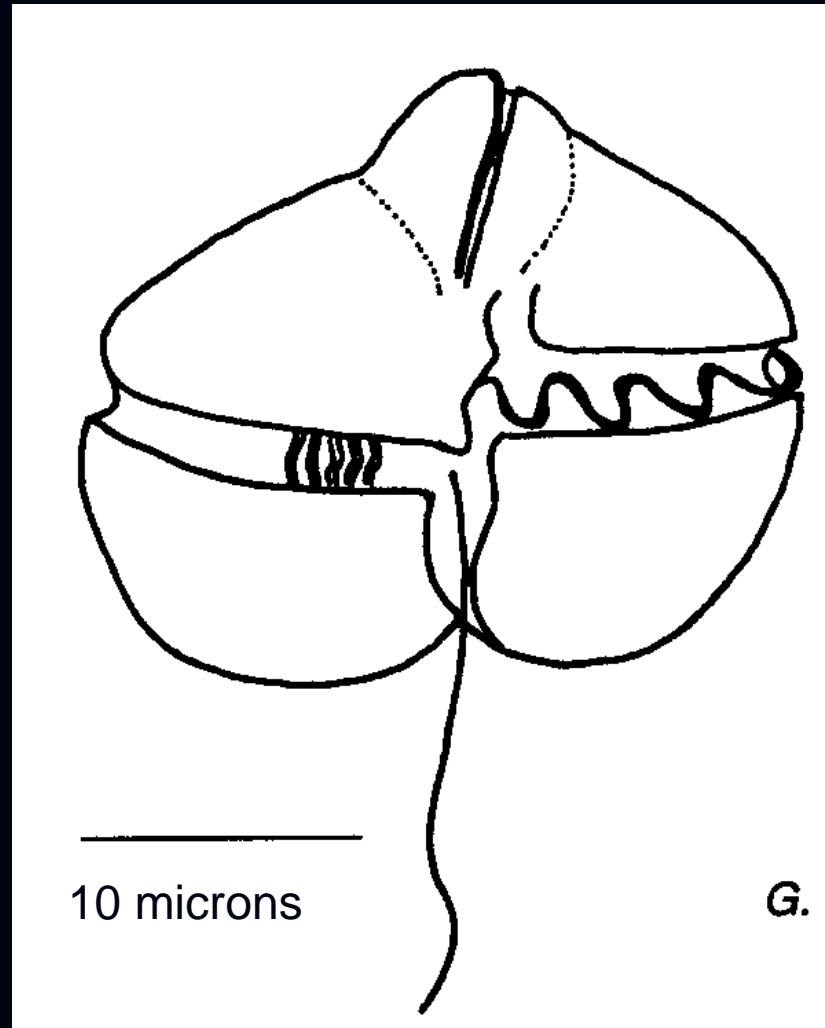
Food Availability
Food quality

Anoxia/hypoxia
Toxic algae
Poor food quality



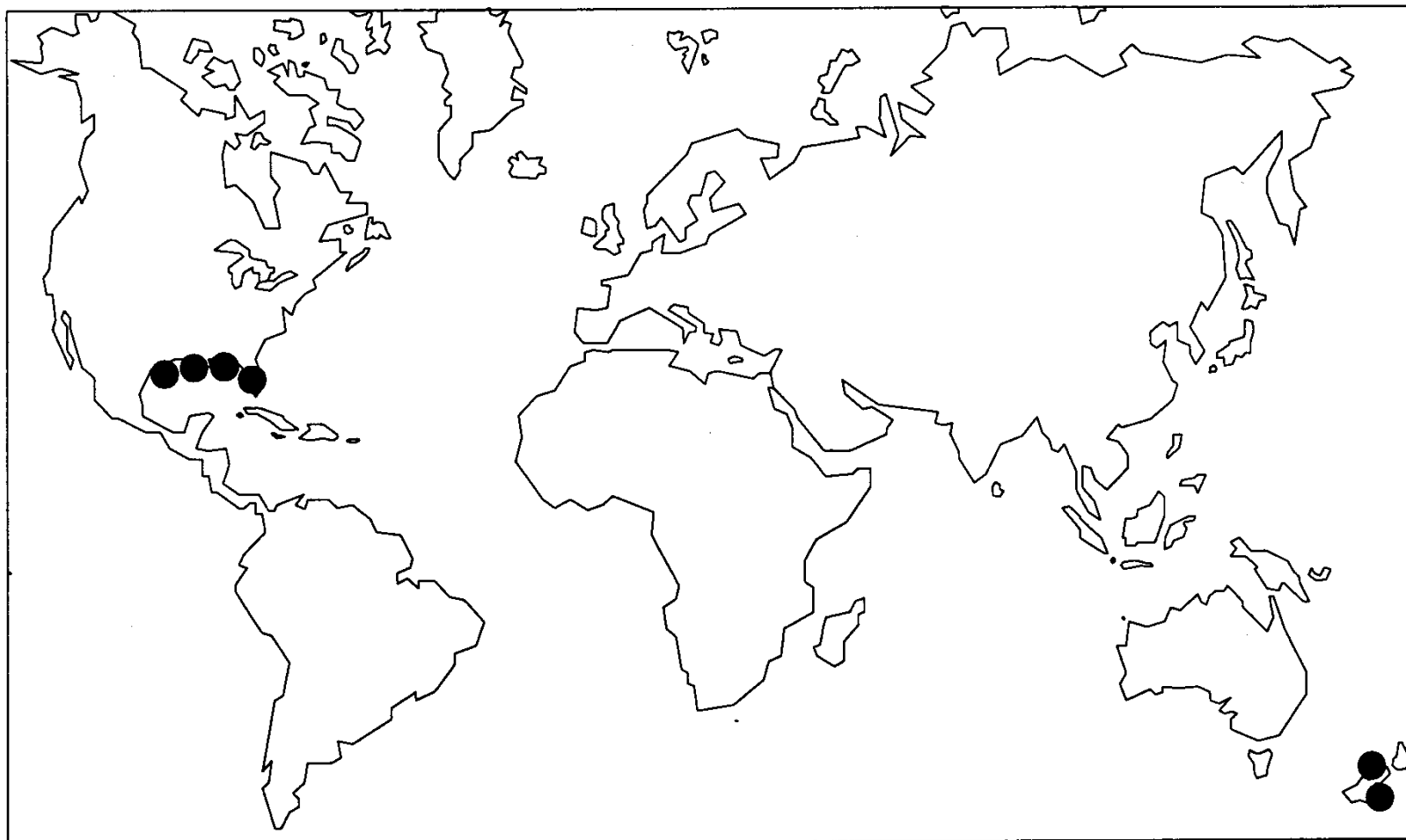
@ PJS Franks

Karenia breve – *Gymnodinium breve*



Neurotoxic Shellfish Poison – NSP - brevetoxin
Karenia breve – *Gymnodinium breve*

● NSP



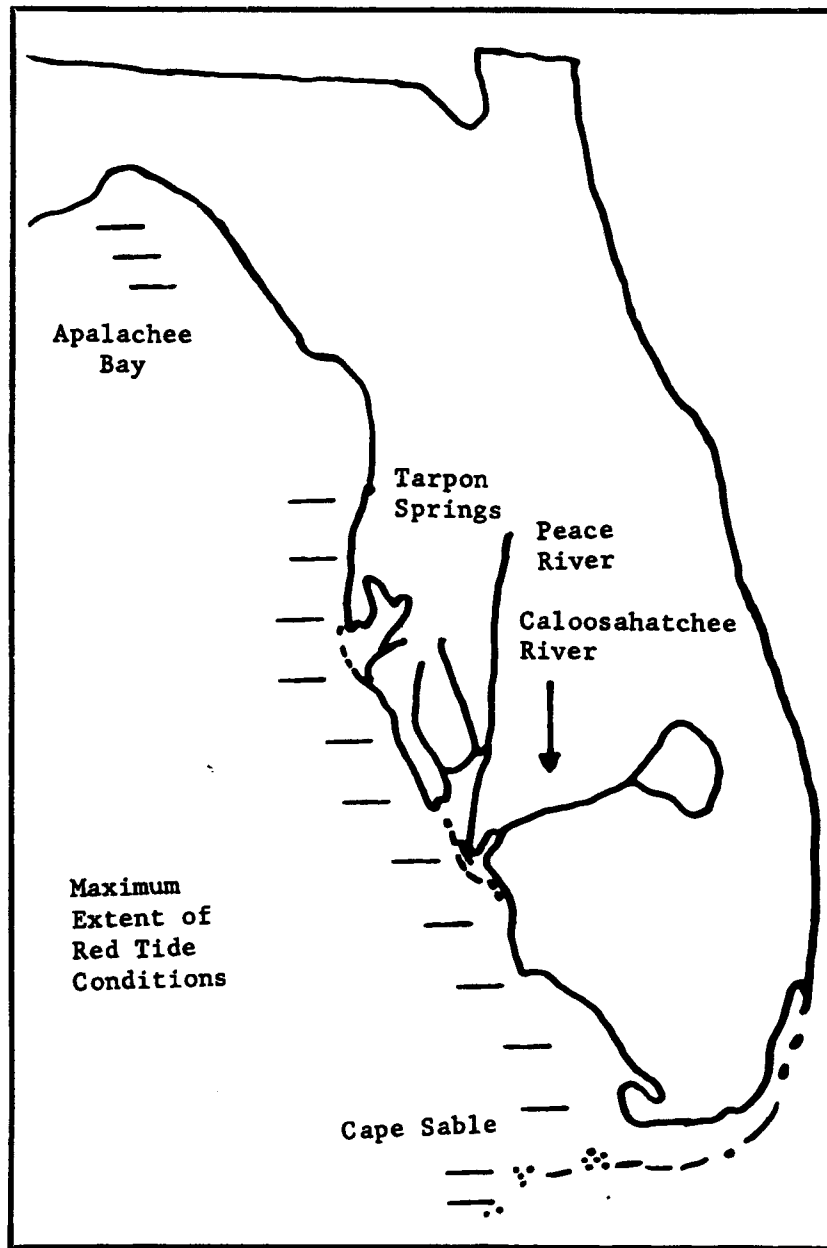
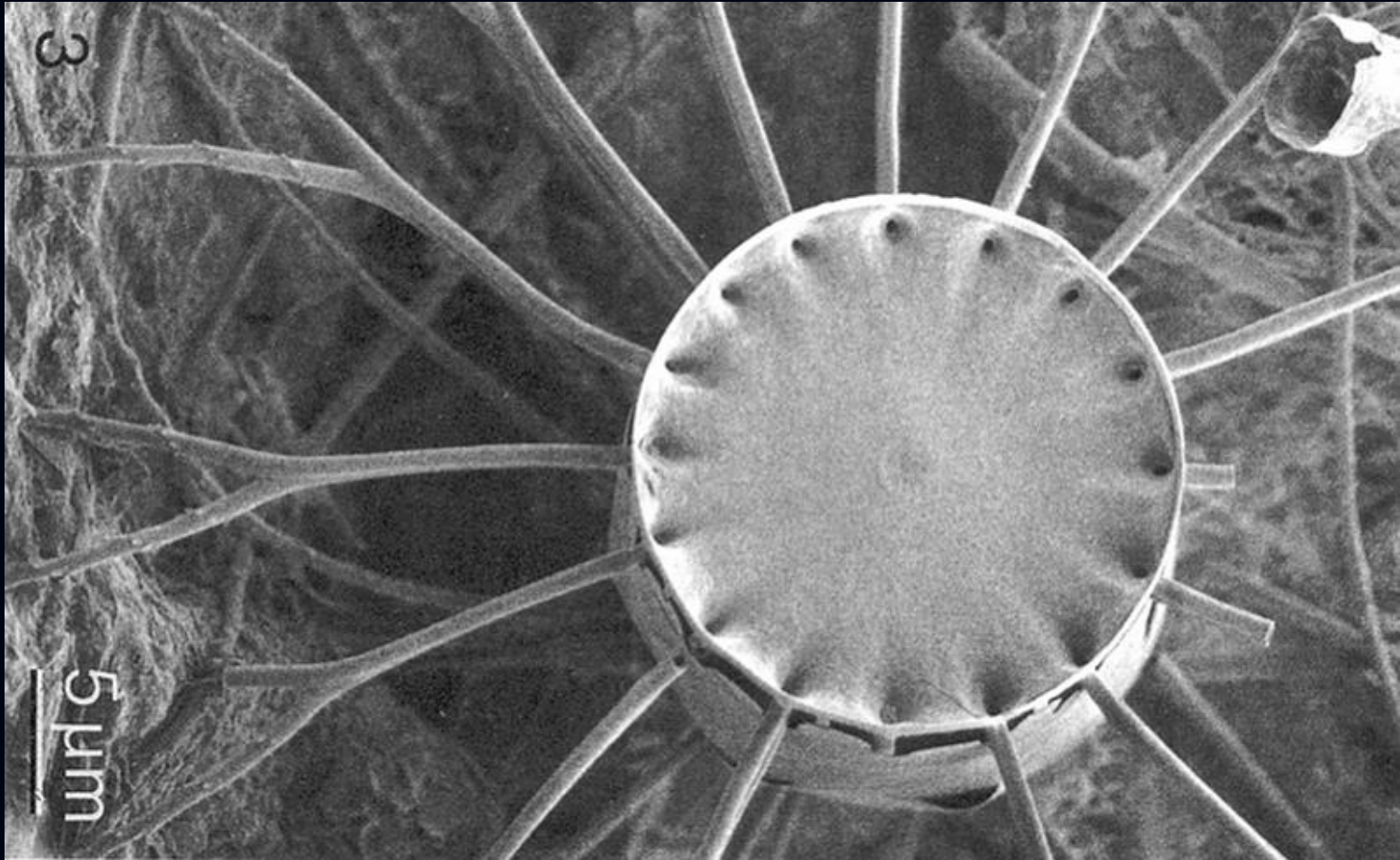
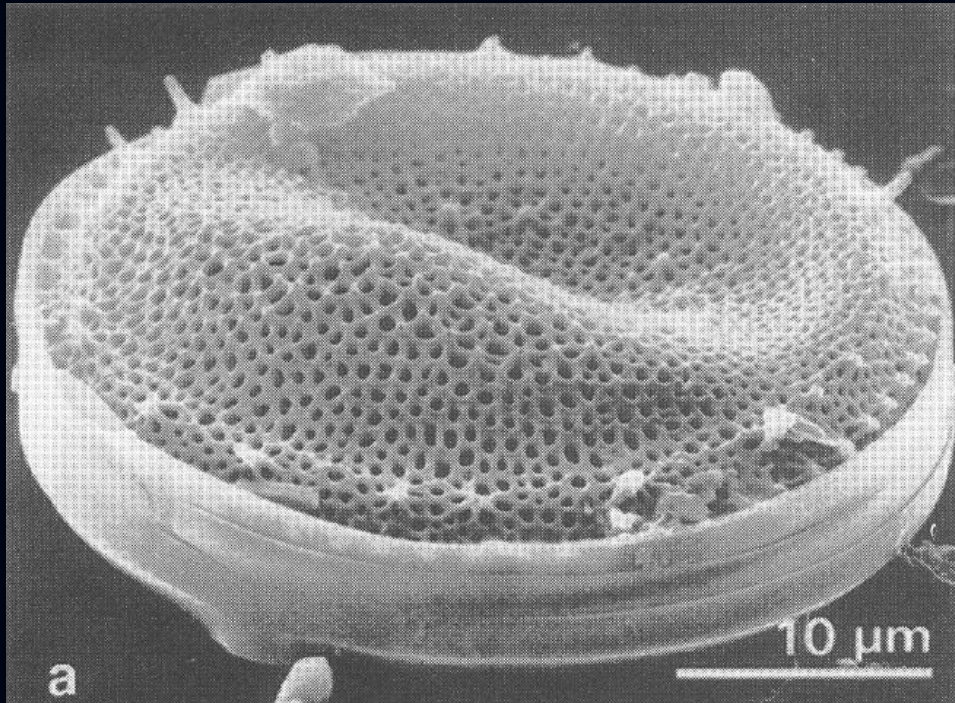


Figure 3. Known areas of Red Tide conditions.

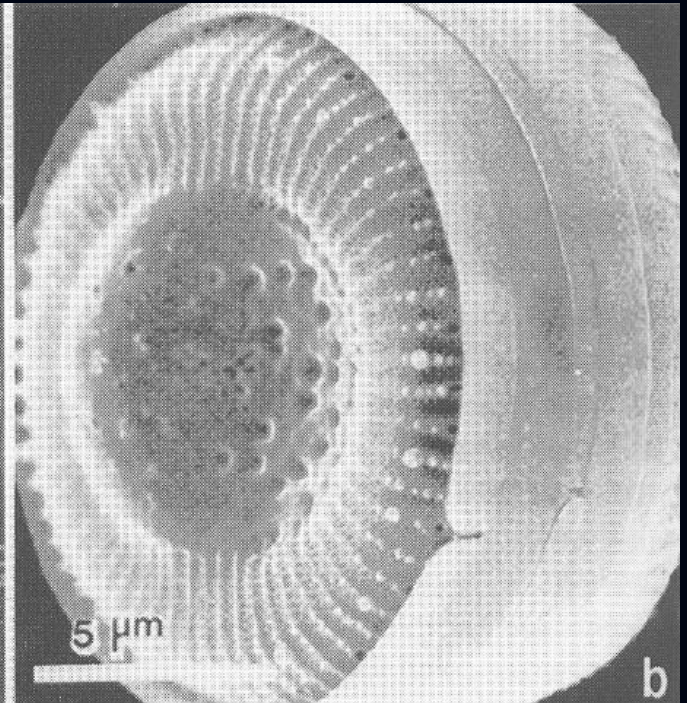


Bacteriastrum

Centric Diatoms



Thalassiosira lacustris



Cyclotella striata

Major Questions

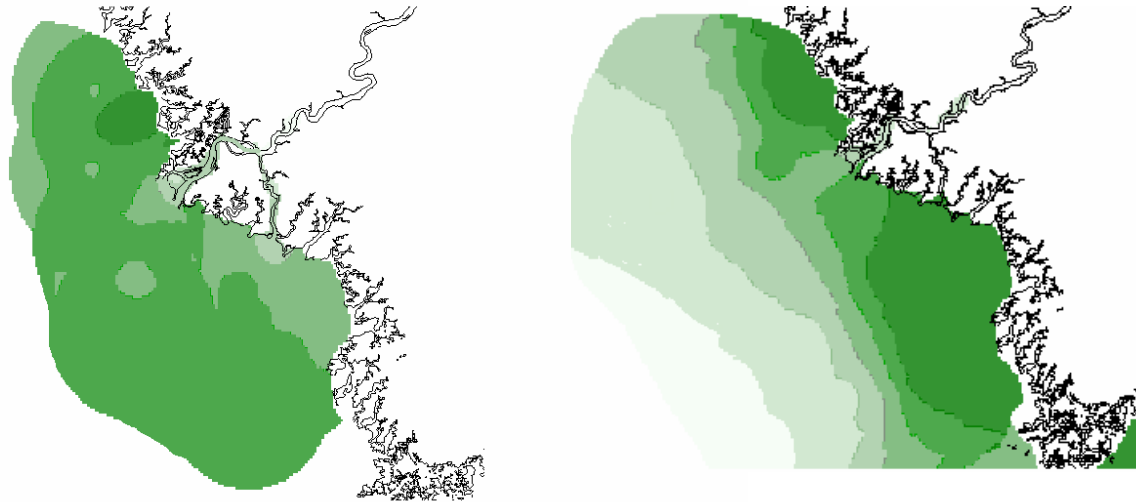
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Mean Phytoplankton Biomass Estimated by Chlorophyll a

1996-1997

1999-2001



Chlorophyll a
($\mu\text{g chl a} / \text{L}$)

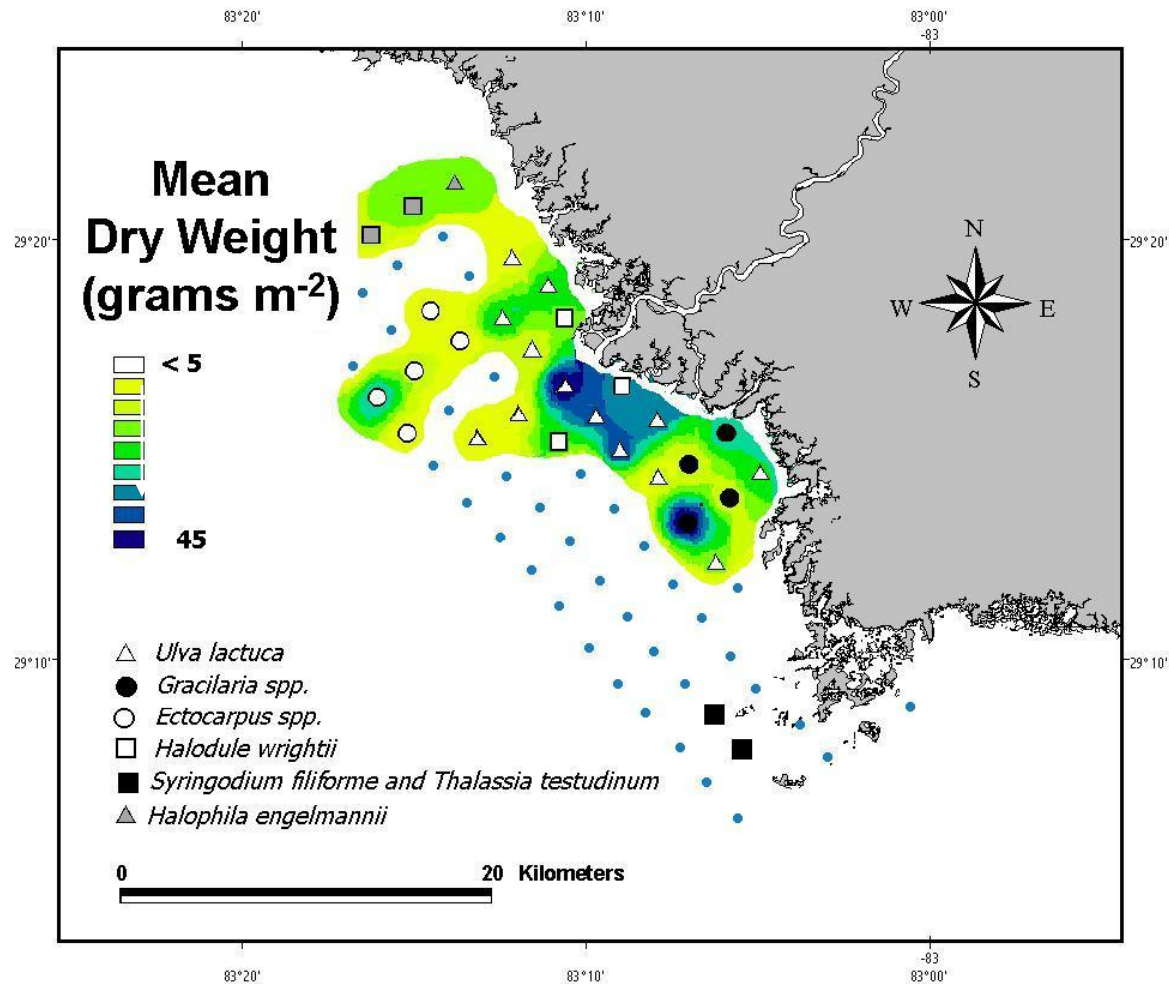
2 \longrightarrow 40



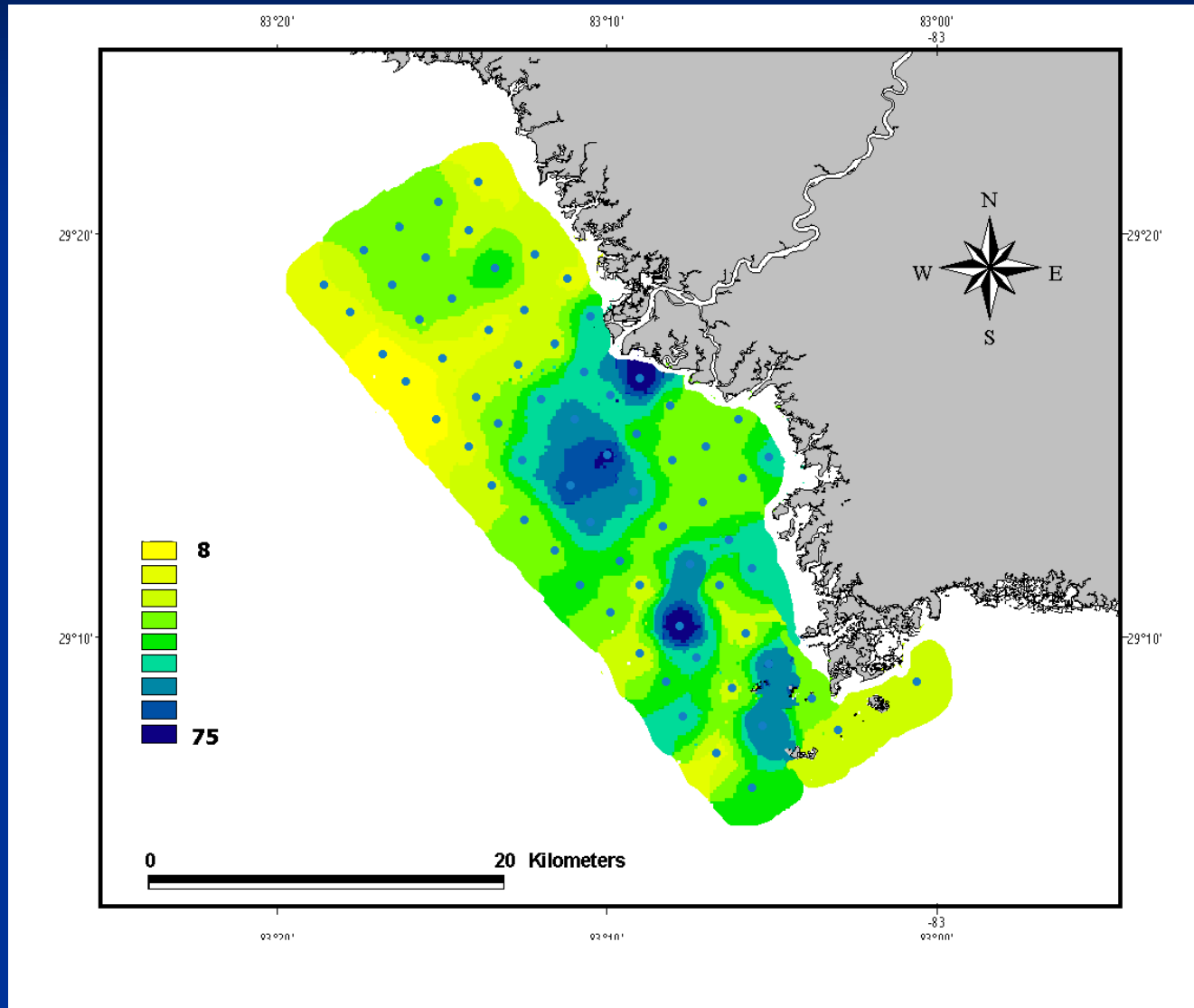
Effects of Nutrient Loading on the Phytoplankton Community

Date	Reef chl mg / m ³	Nearshore chl mg / m ³	TN Load g N / sec	TP Load g P / sec	Flow Level
1998-1999	17.8 (12)	9.8 (4)	323 (153)	34.6 (28)	Medium-High
1999-2000	10.9 (9)	3.4 (2)	112 (21)	9.9 (4)	Low
2000-2001	9.8 (7)	3.8 (2) ***	130 (61)	11.9 (8)	Low

Macroalgal Biomass Distribution Spring 2000 and 2001



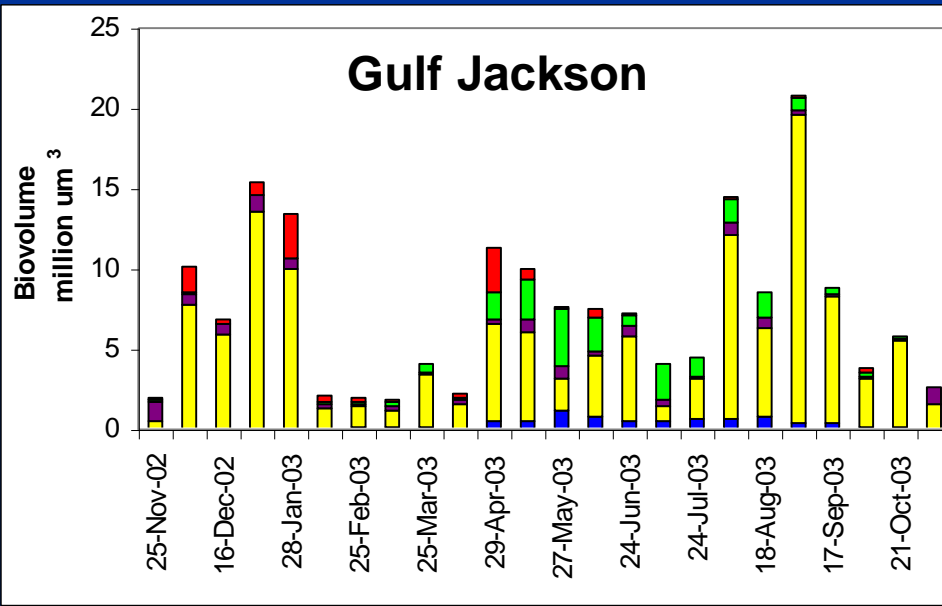
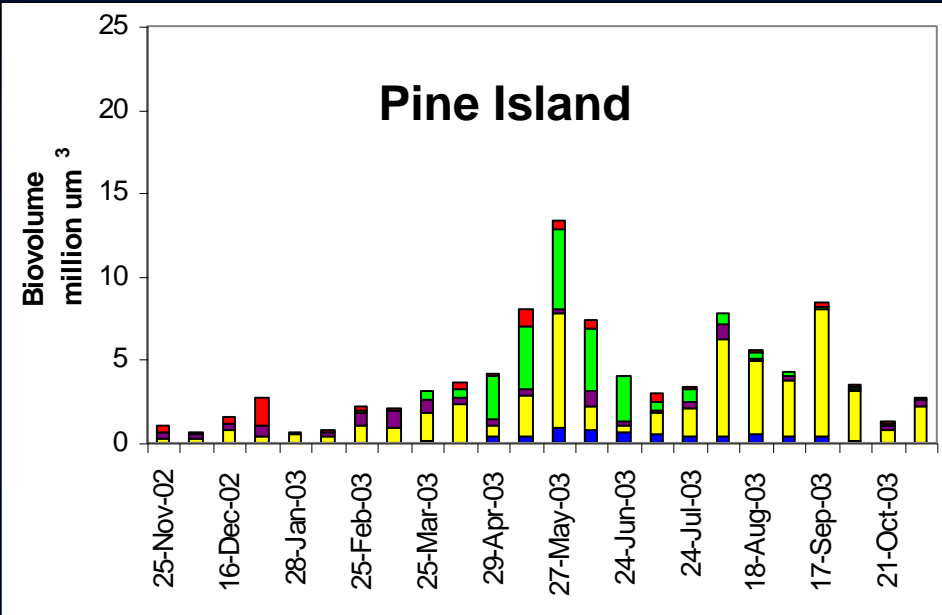
Distribution of Sediment Chlorophyll Spring 2000 and 2001



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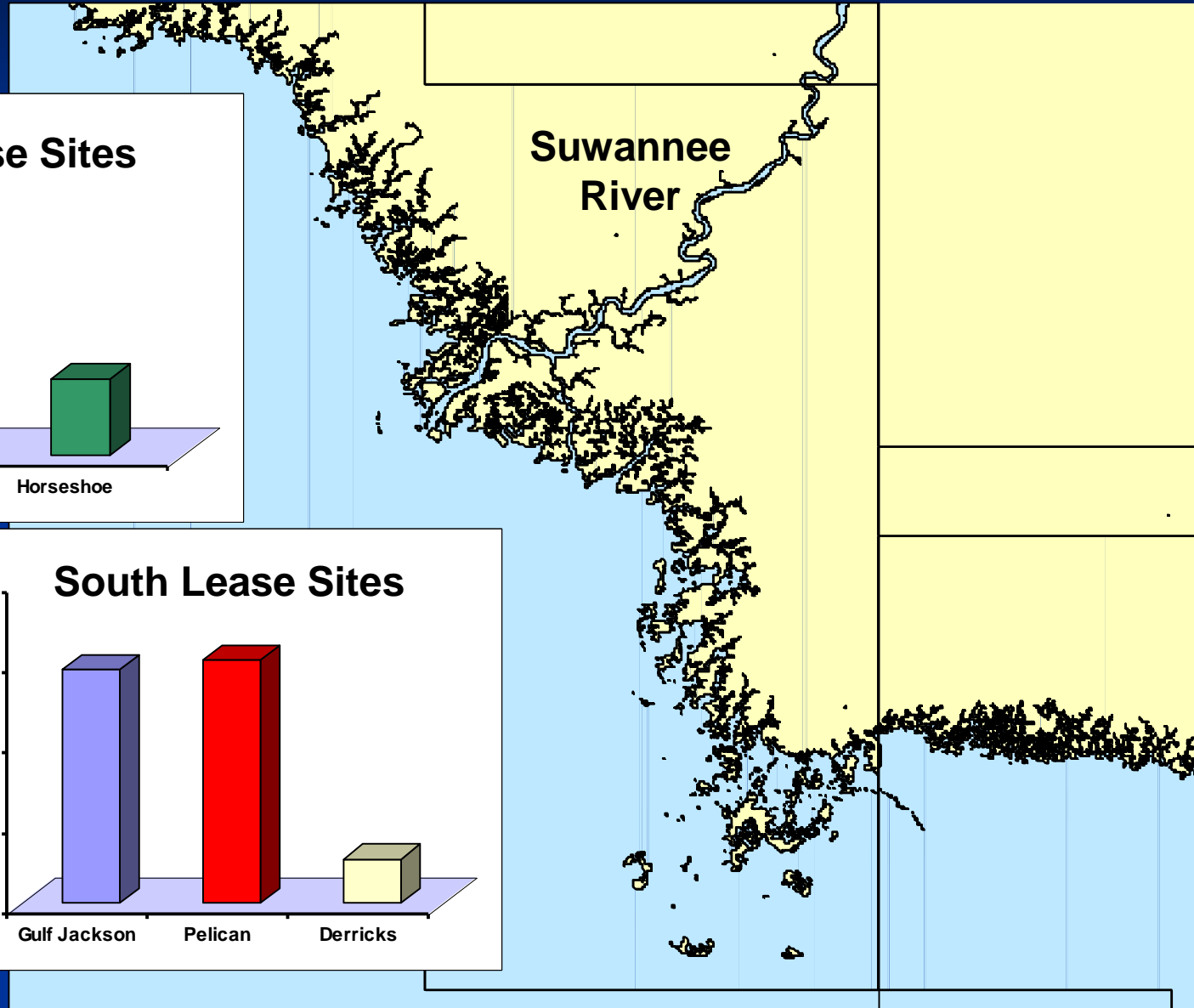
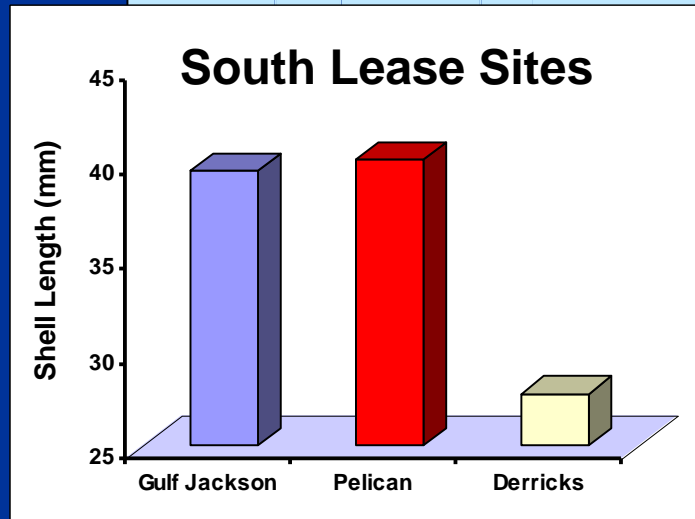
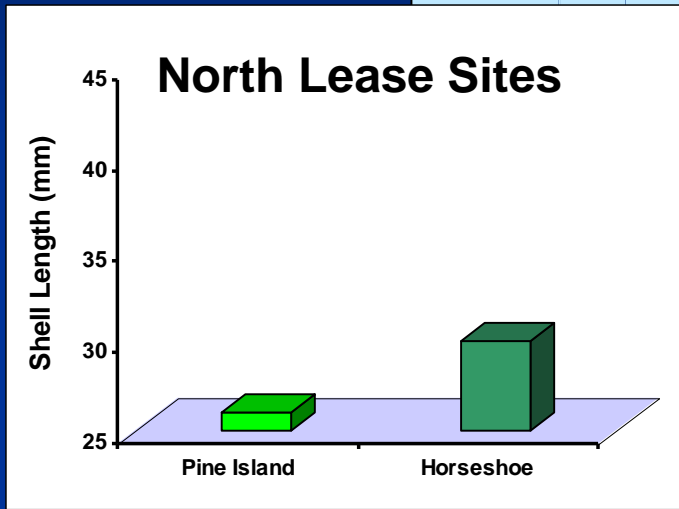
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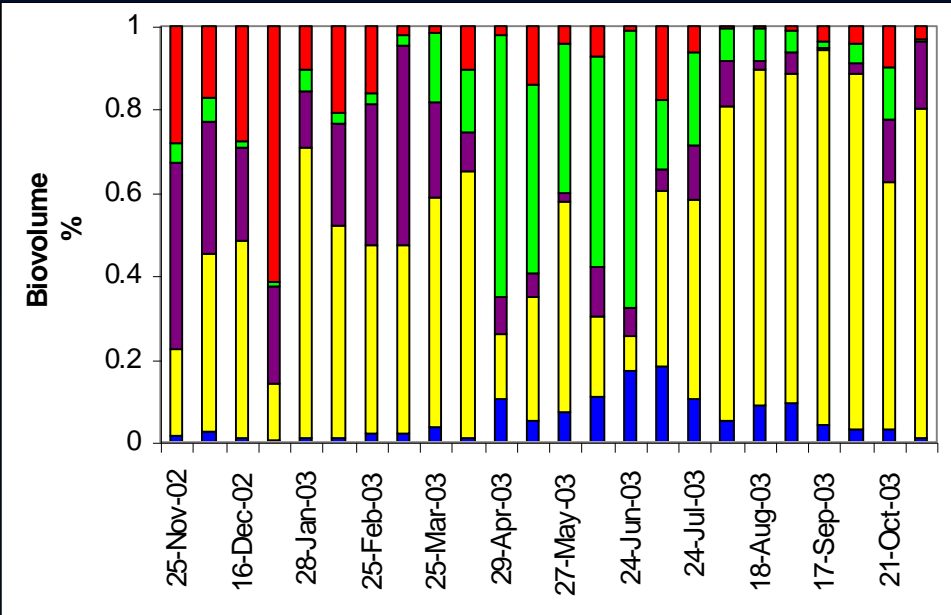


- Dinoflagellates
- Chlorophytes
- Phytoplankton
- Diatoms
- Cyanobacteria

Clam Size by Region

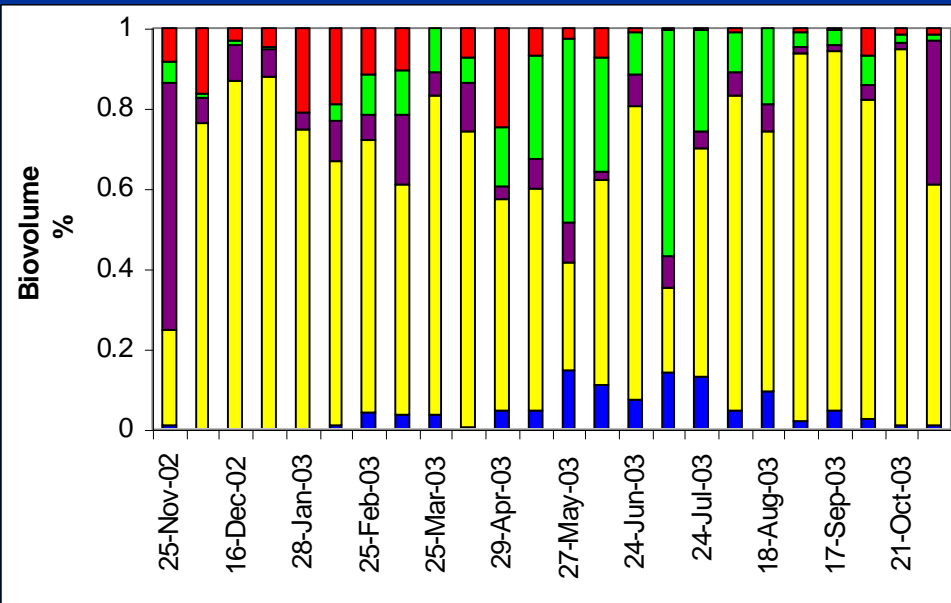
Fall Out-planting with 1-yr Grow-out





Pine Island

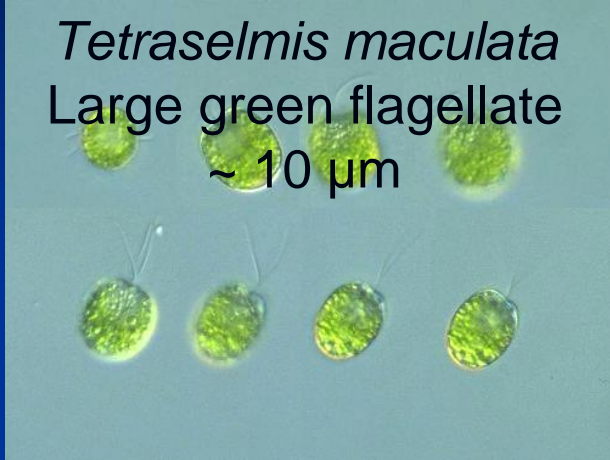
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- Phytoflagellates
- Diatoms
- Cyanobacteria



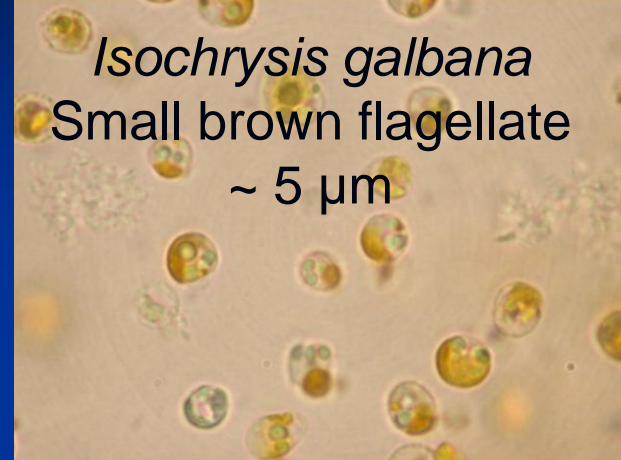
Gulf Jackson

Feeding studies – Selection and rates

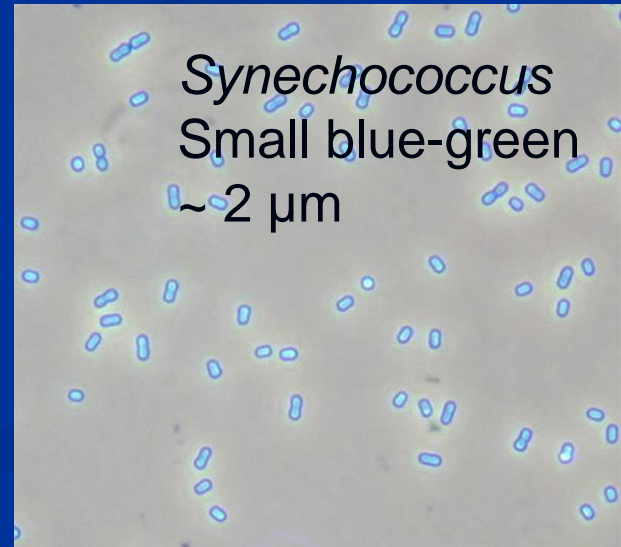
Tetraselmis maculata
Large green flagellate
~ 10 μm



Isochrysis galbana
Small brown flagellate
~ 5 μm

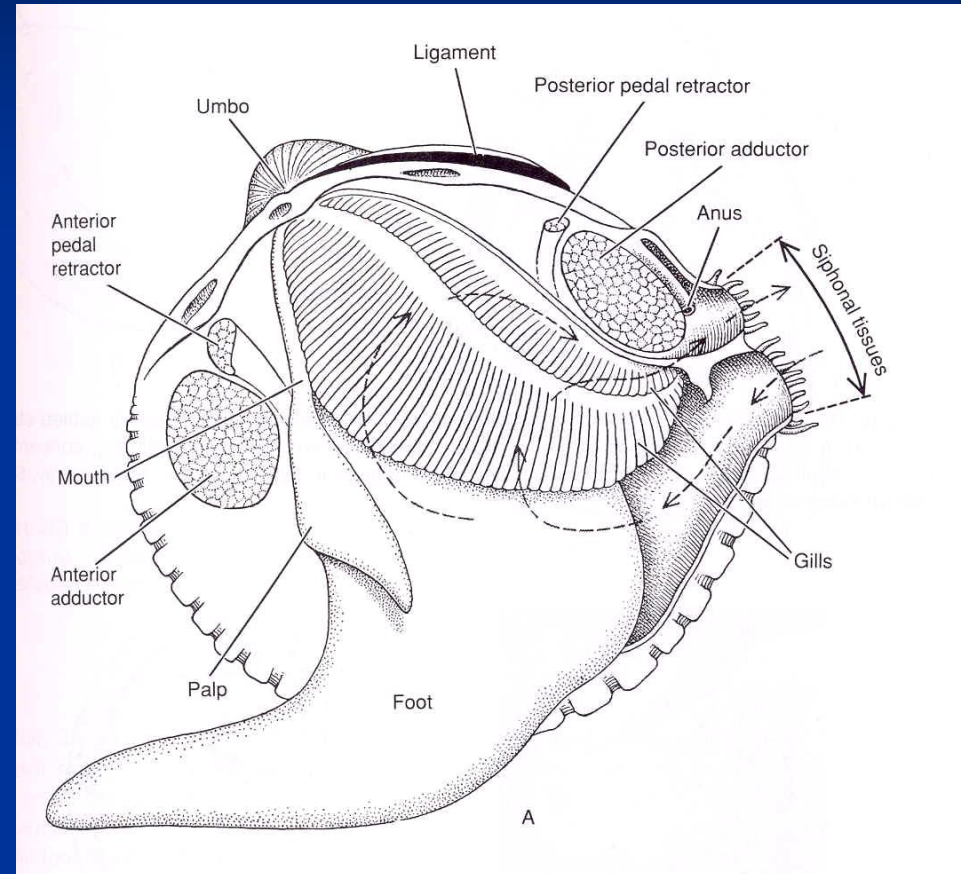


Synechococcus
Small blue-green
~ 2 μm



Algae Selection

- *Tetraselmis* = *Isochrysis* > *Synechococcus*
- Clams more selective at 20°C than at 30°C
- More selective at lower concentrations (10^5 cells/mL) than at “bloom” concentrations (10^6 cells/mL)



Future Plans

**Complete quantitative analyses and
model formulations**

Generate peer-reviewed publications

**Develop EDIS publications for information
transfer to user groups**