

Rising abundance of largemouth bass in
the littoral zone of Sacramento – San
Joaquin Delta: the role of *Egeria densa*

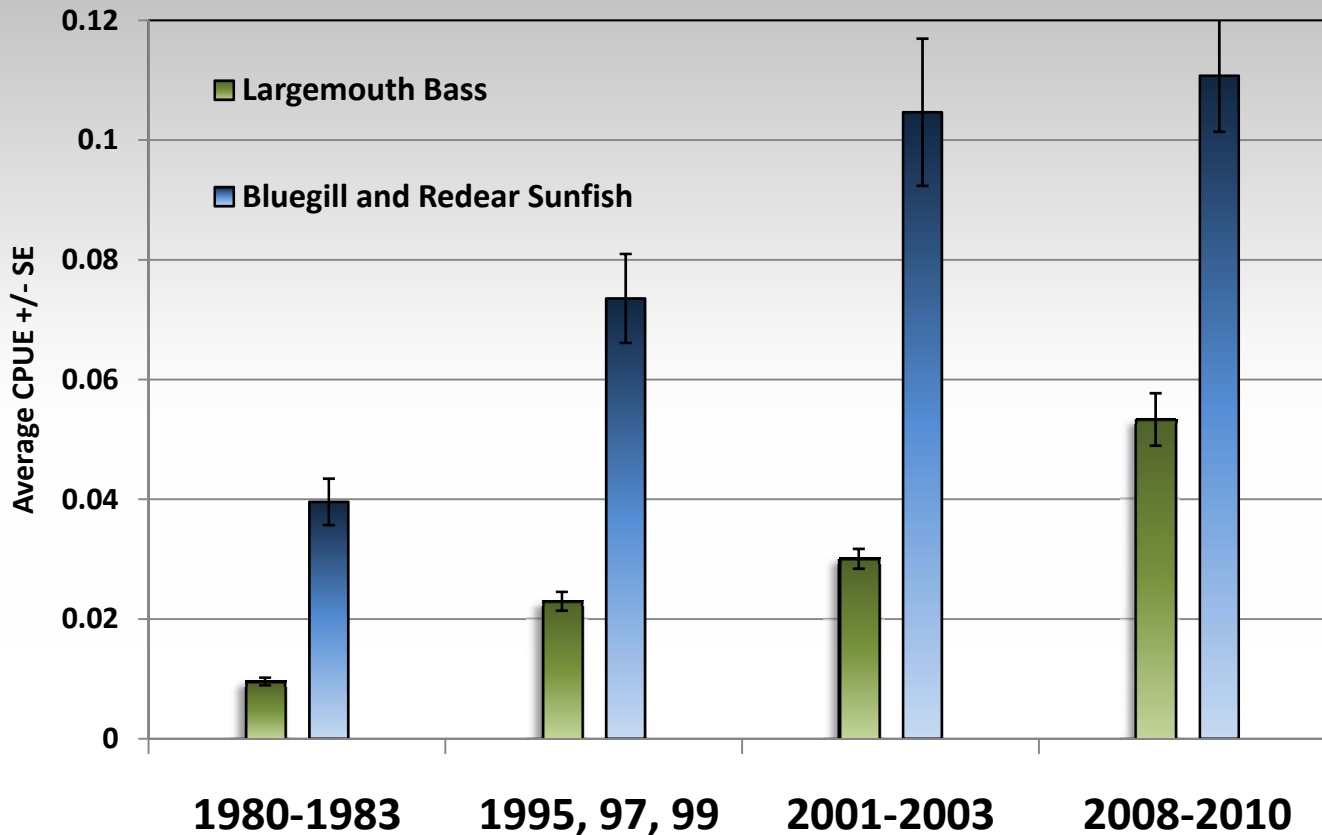


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Carion, Patrick Crain, David J. Harris, Maud C. Ferrari, Erin
Hestir, Maria Santos, Susan Ustin, Peter B. Moyle, Andrew Sih

IEP Workshop, California State University: May 26, 2010

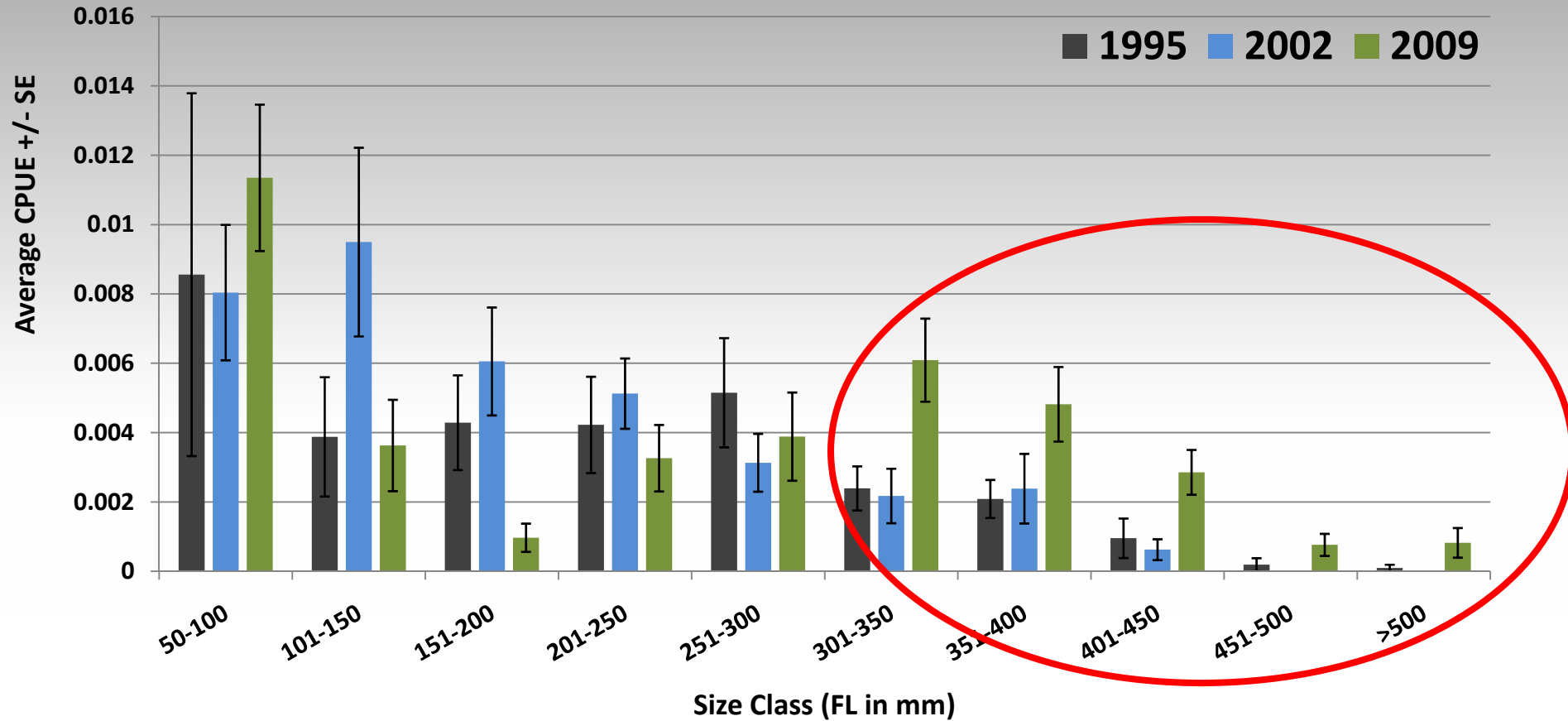


...On the rise

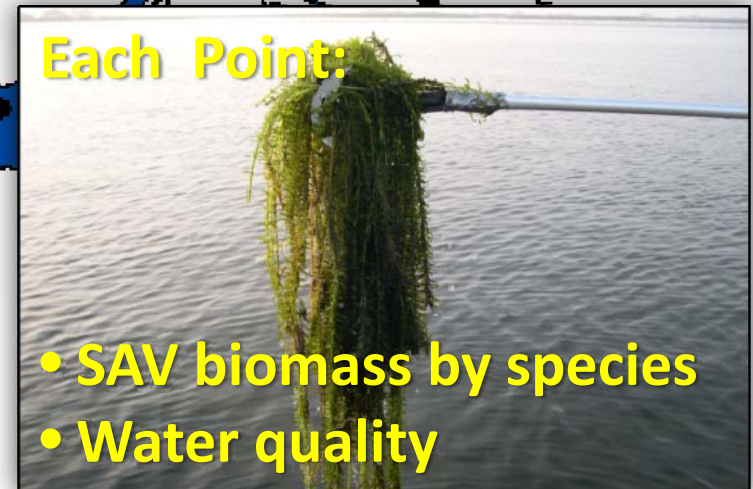


- **HOW** is the population changing?
 - Size structure?
- **WHAT** favors abundance?
 - Increased submerged aquatic vegetation (SAV)?
- **DIET??**

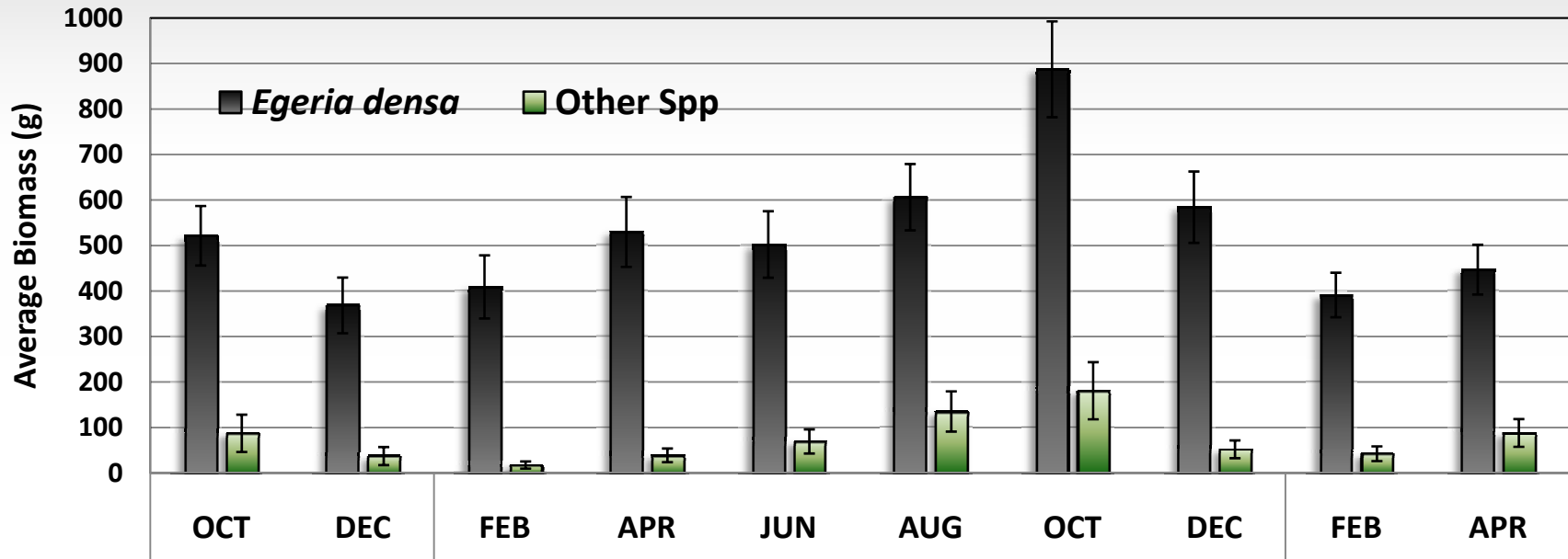
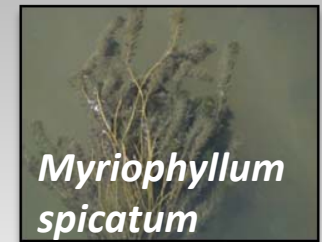
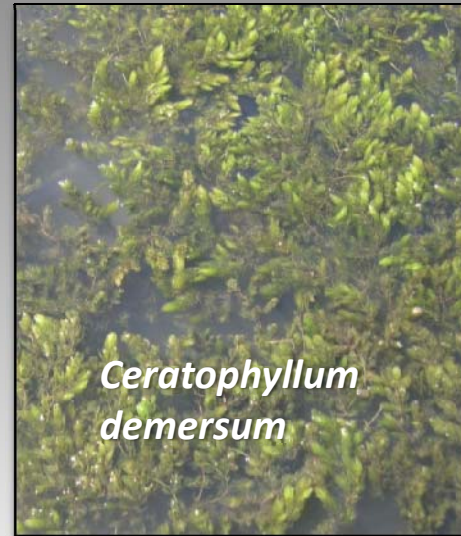
Size distributions between years: April of '95, '02, '09



Bimonthly fish & vegetation surveys at 33 sites since October 2008



Submerged Aquatic Vegetation (SAV)



Does SAV biomass help explain largemouth abundance?

- Small bass ($\leq 125\text{mm}$) vs. Larger bass ($> 125\text{mm}$)



- Generalized linear mixed models (GLMMs)
- Variables:
 - Average SAV biomass
 - Conductivity
 - Temperature
 - Distance to shore
 - Secchi depth
- Compare AIC between models

Linear Models

		Juveniles ($\leq 125\text{mm}$)		Adults ($>125\text{ mm}$)	
		Δ AIC	Effect	Δ AIC	Effect
1	...+ SAV Biomass	-12.3	+	-3.0	-
2	...+ Conductivity	-1.5	ns	0.3	ns
3	...+ Temperature	-5.6	+	-5.7	+
4	...+ Distance to shore	-0.8	ns	-23.2	-
5	...+ Secchi Depth	-1.0	+	-0.8	ns

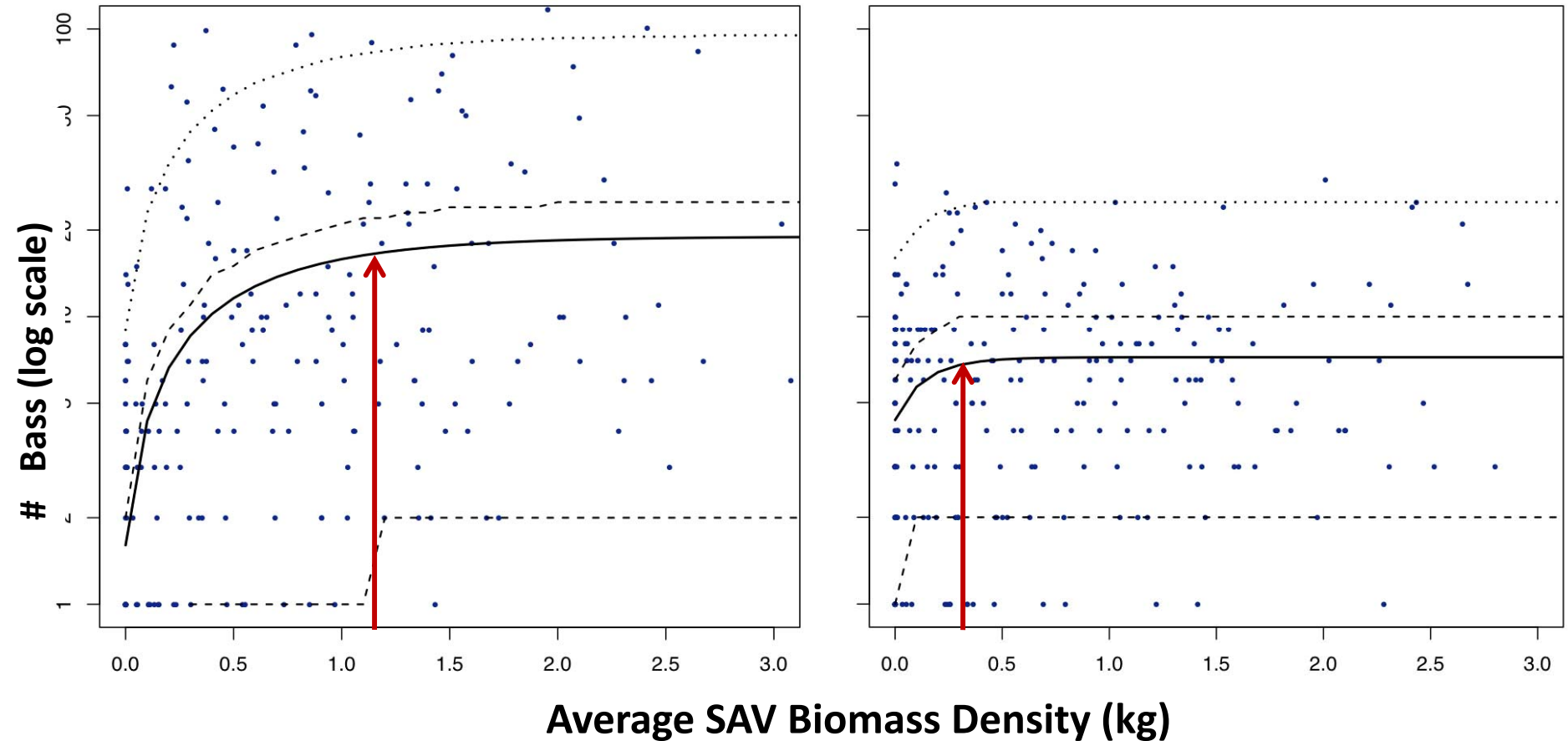
Δ AIC = Reduction in AIC from previous model

Effect = Direction of effect in best model.

Nonlinear Models

Juveniles (≤ 125 mm)

Adults (> 125 mm)



1. Both life stages have strong INITIAL response to SAV
2. Adults need a lot LESS SAV before their density reaches a plateau

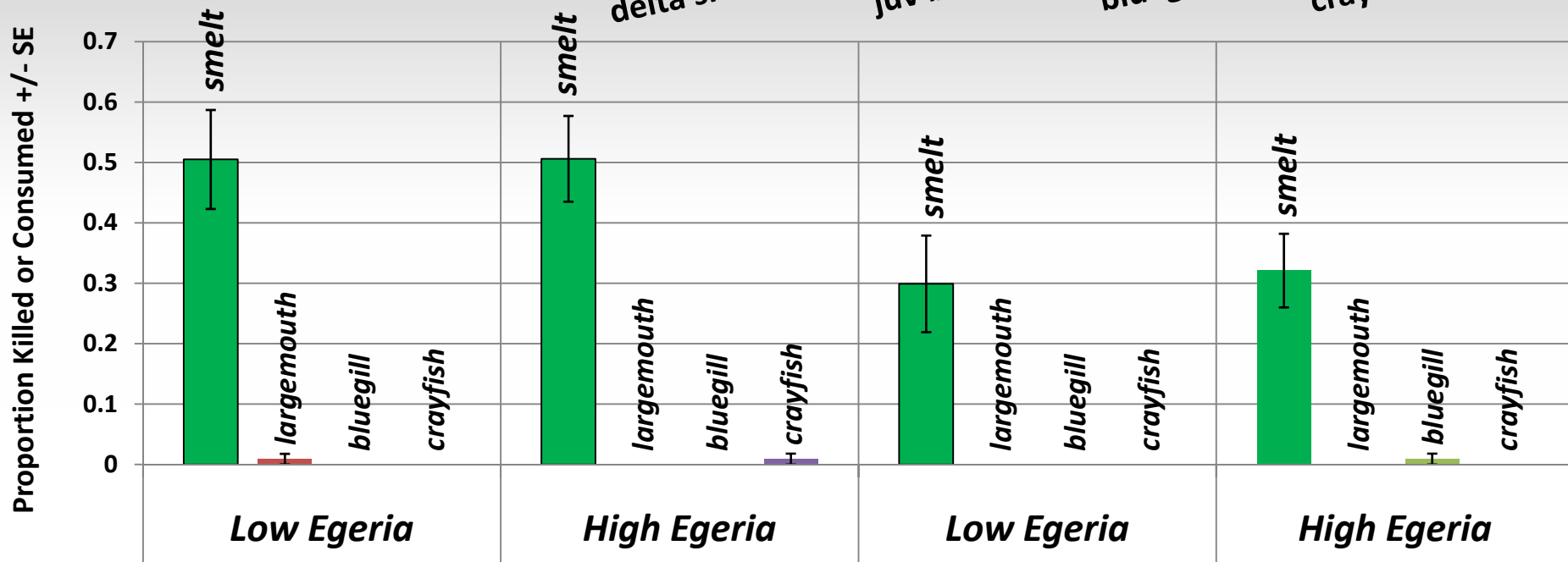
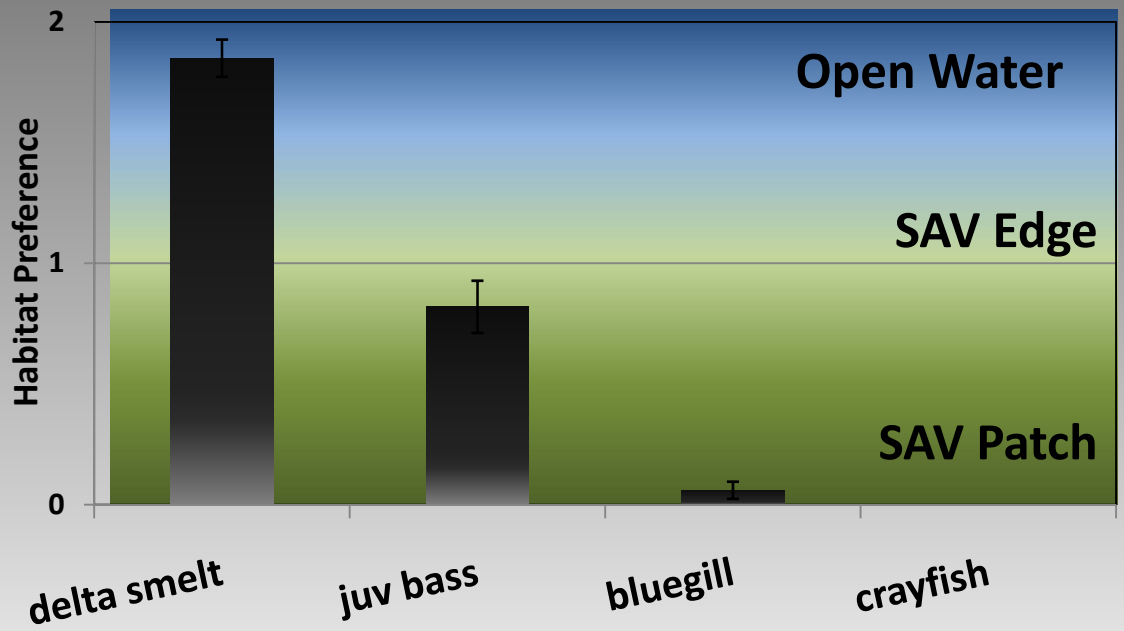
From the field to the lab:

1. Does *Egeria* biomass density affect WHERE adults feed?
 - Prey choice?



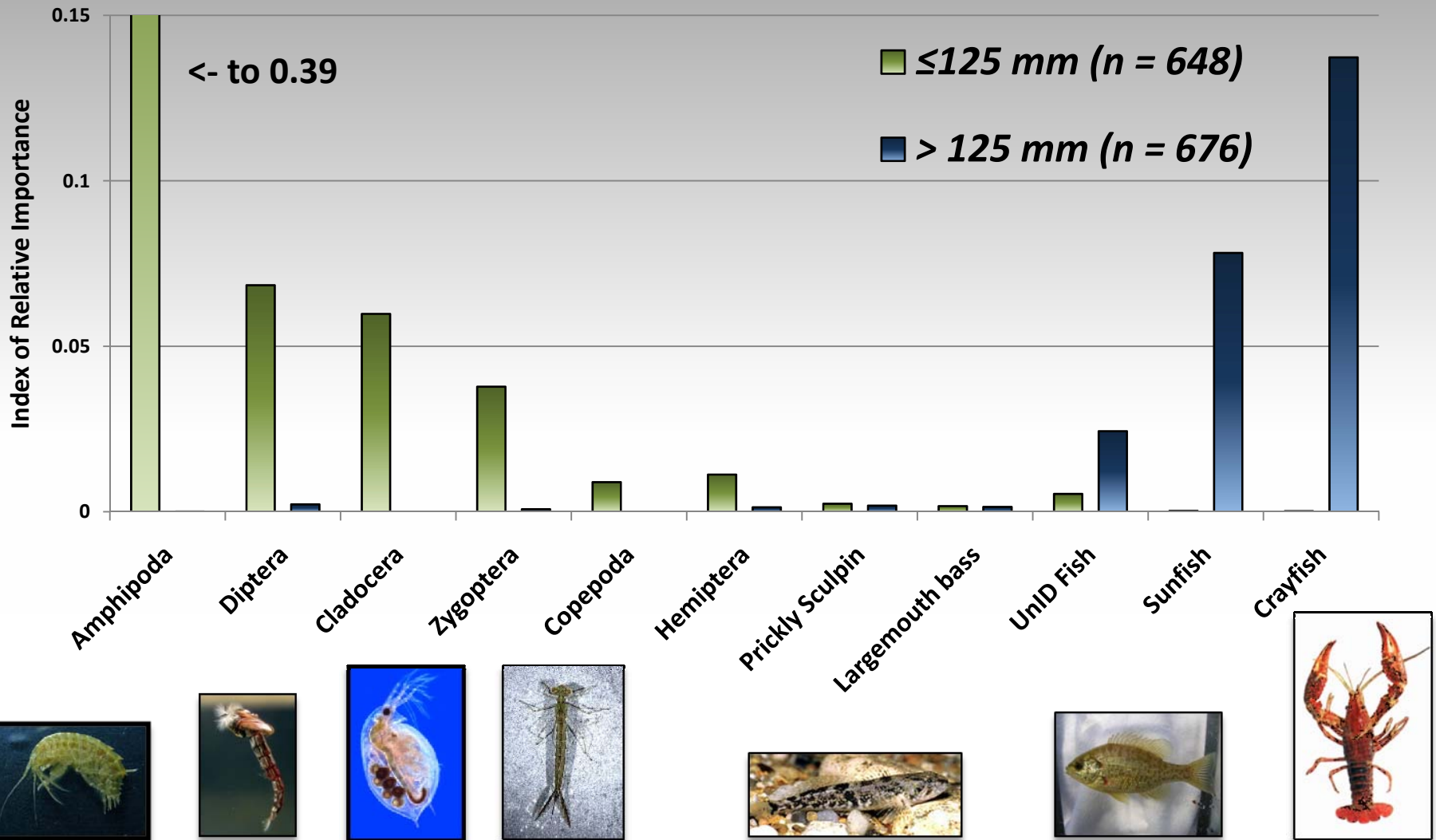
2. Additional effects of turbidity?

12 Replicates Each Combination:		<i>Egeria</i> Biomass Density	
		Low	High
Turbidity	Clear		
	Turbid		



Diet Composition in the Field:

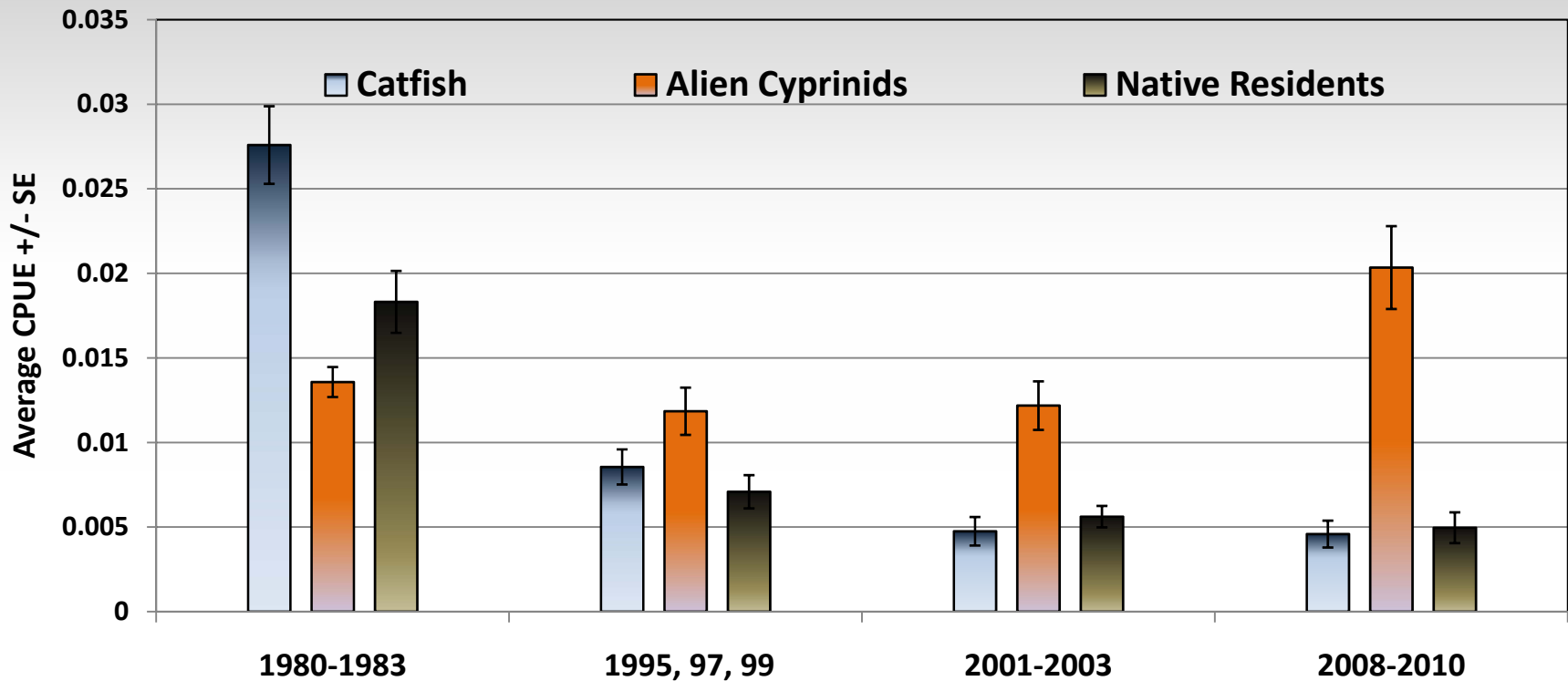
October 2008 – August 2009



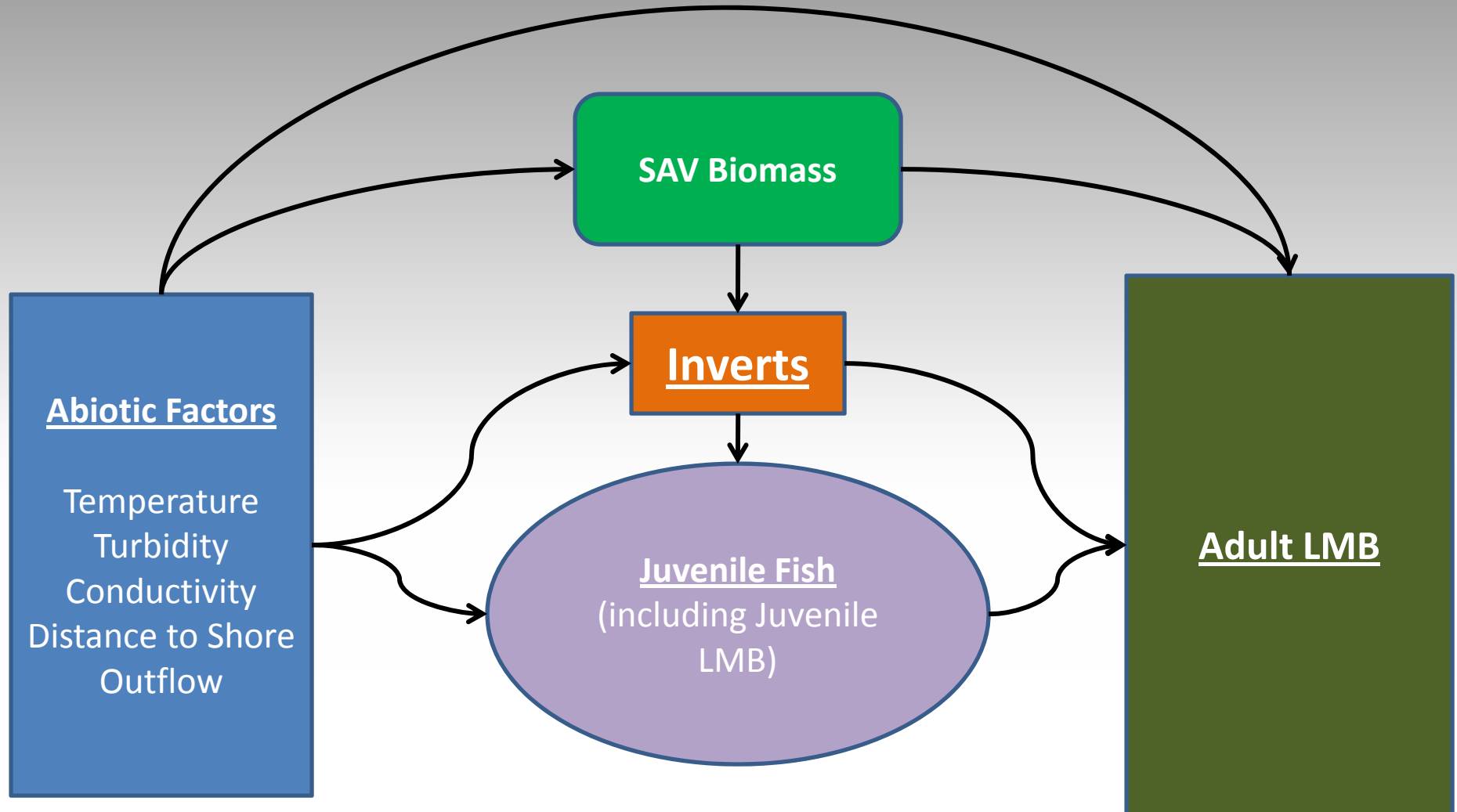
Conclusions and Upcoming Work

- *Egeria densa* promotes bass abundance
 - Juveniles exhibit a stronger response than adults
 - Mescosom studies: turbidity more important to feeding success than *Egeria* density when vegetation is patchy
- Diet sample analyses indicate that nearly all prey come from nearshore habitats
- Continue surveys through October 2010
 - Add new sites in the North Delta
- Conceptual model for the nearshore

The big picture: the full nearshore assemblage



Future Work: Building a conceptual model for the nearshore



Thanks to...

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Diet Sample Analysis

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