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

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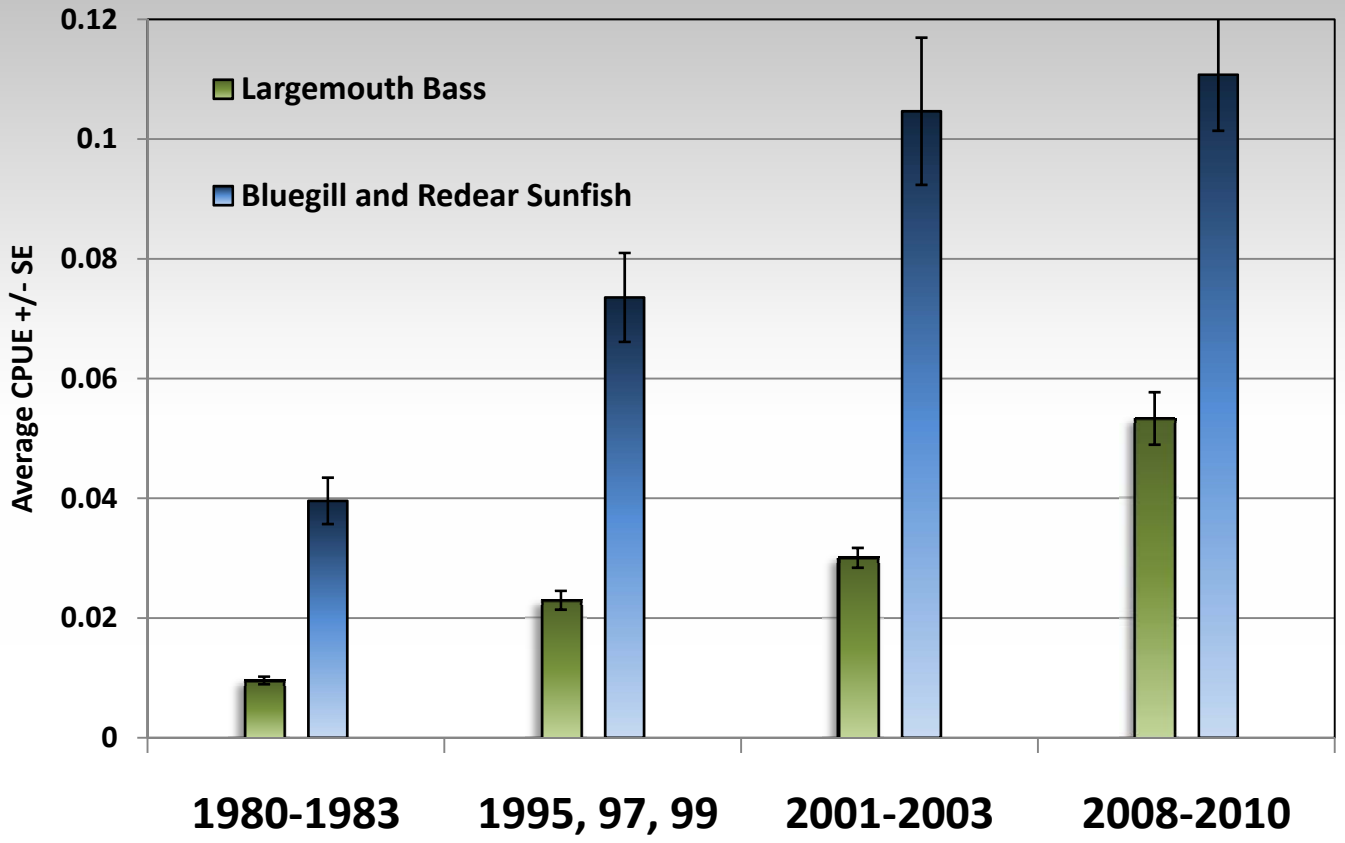
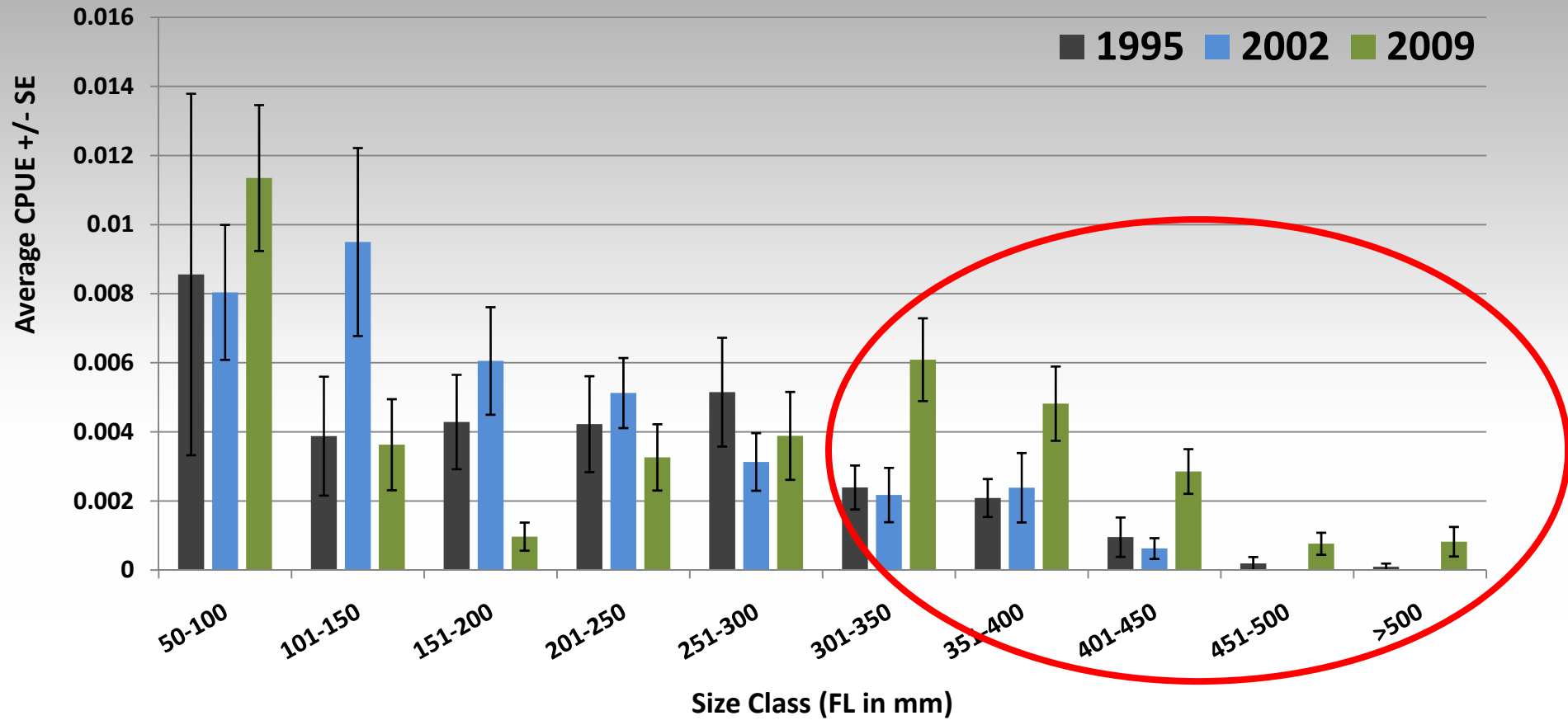
…On the rise

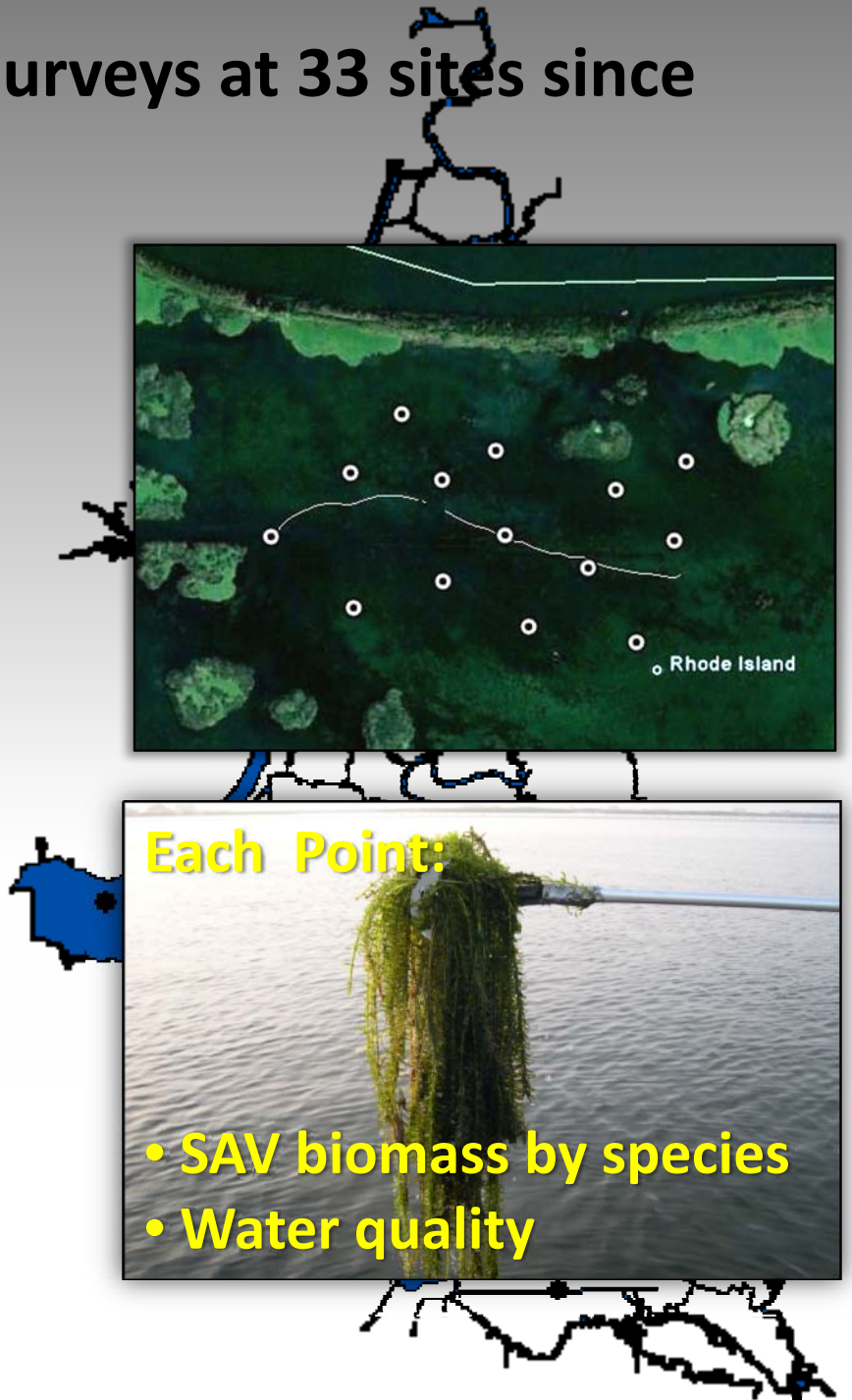


- **HOW** is the population changing?
  - Size structure?
- **WHAT** favors abundance?
  - Increased submerged aquatic vegetation (SAV)?
- **DIET??**

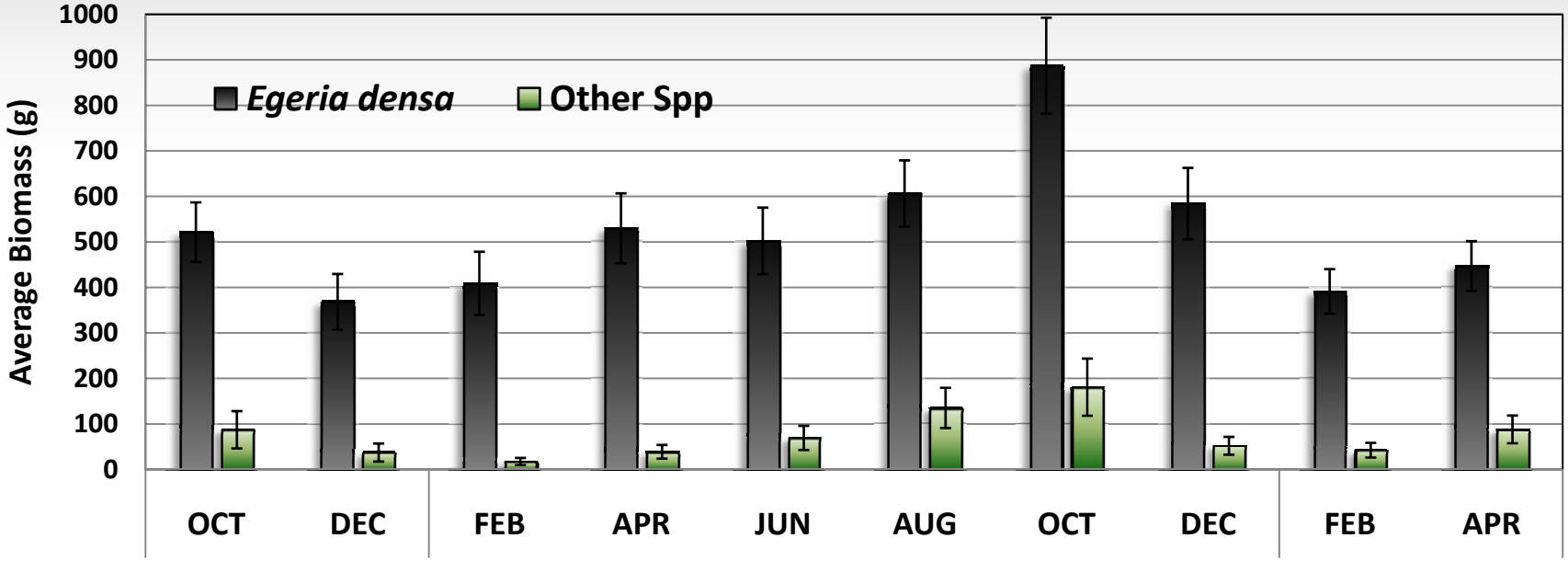
Size distributions between years: April of '95, '02, '09



Bimonthly fish & vegetation surveys at 33 sites since October 2008



Submerged Aquatic Vegetation (SAV)



Does SAV biomass help explain largemouth abundance?

- Small bass (≤ 125mm) *vs.* Larger bass (> 125mm)

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

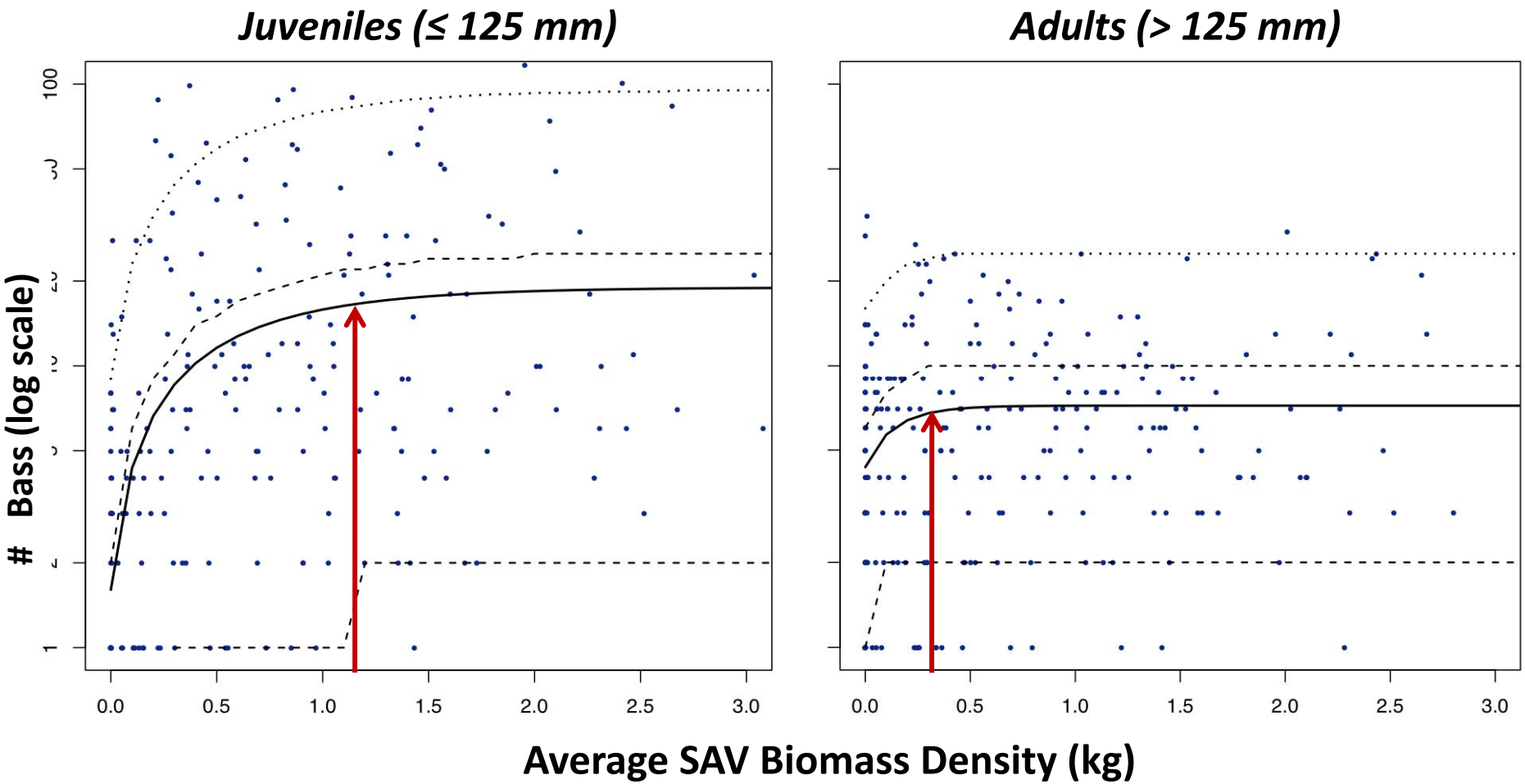
Linear Models

		Juveniles (≤ 125mm)		Adults (>125 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



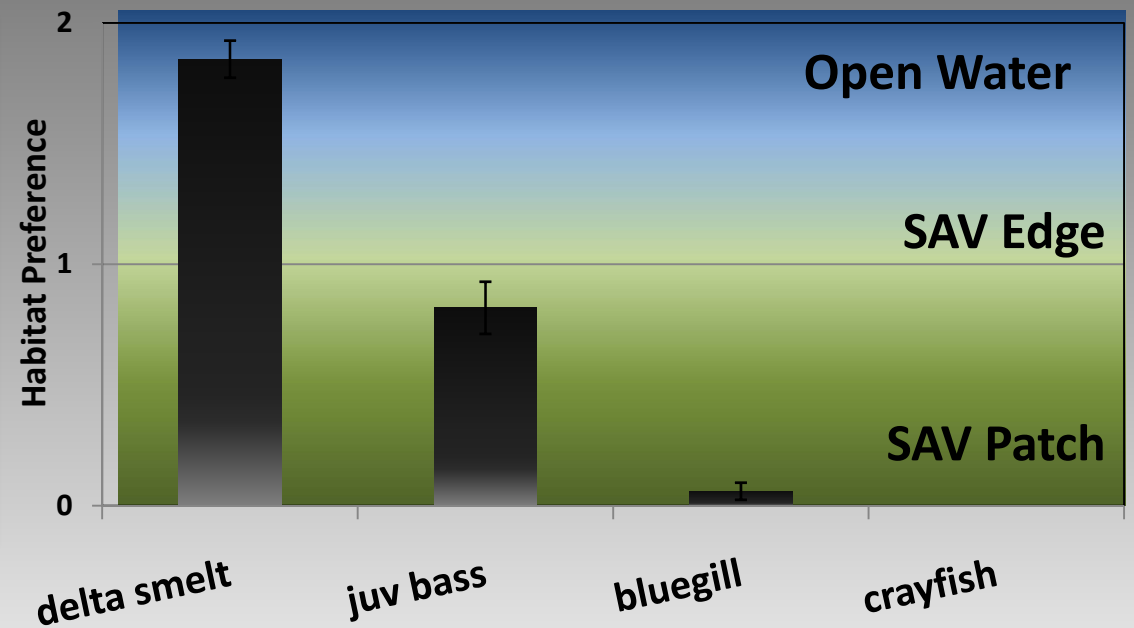
1. Both life stages have strong INITIAL response to SAV
2. Adults need a lot LESS SAV before their density reaches a plateau

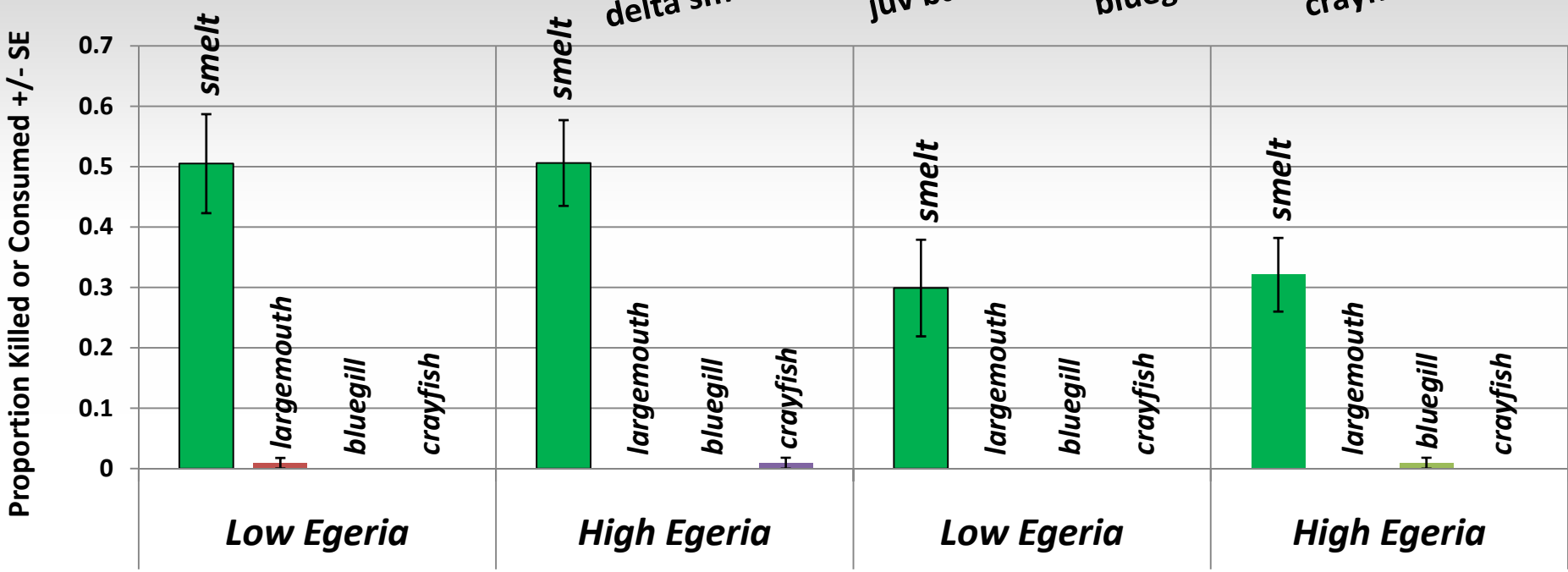
From the field to the lab:

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

2. Additional effects of turbidity?

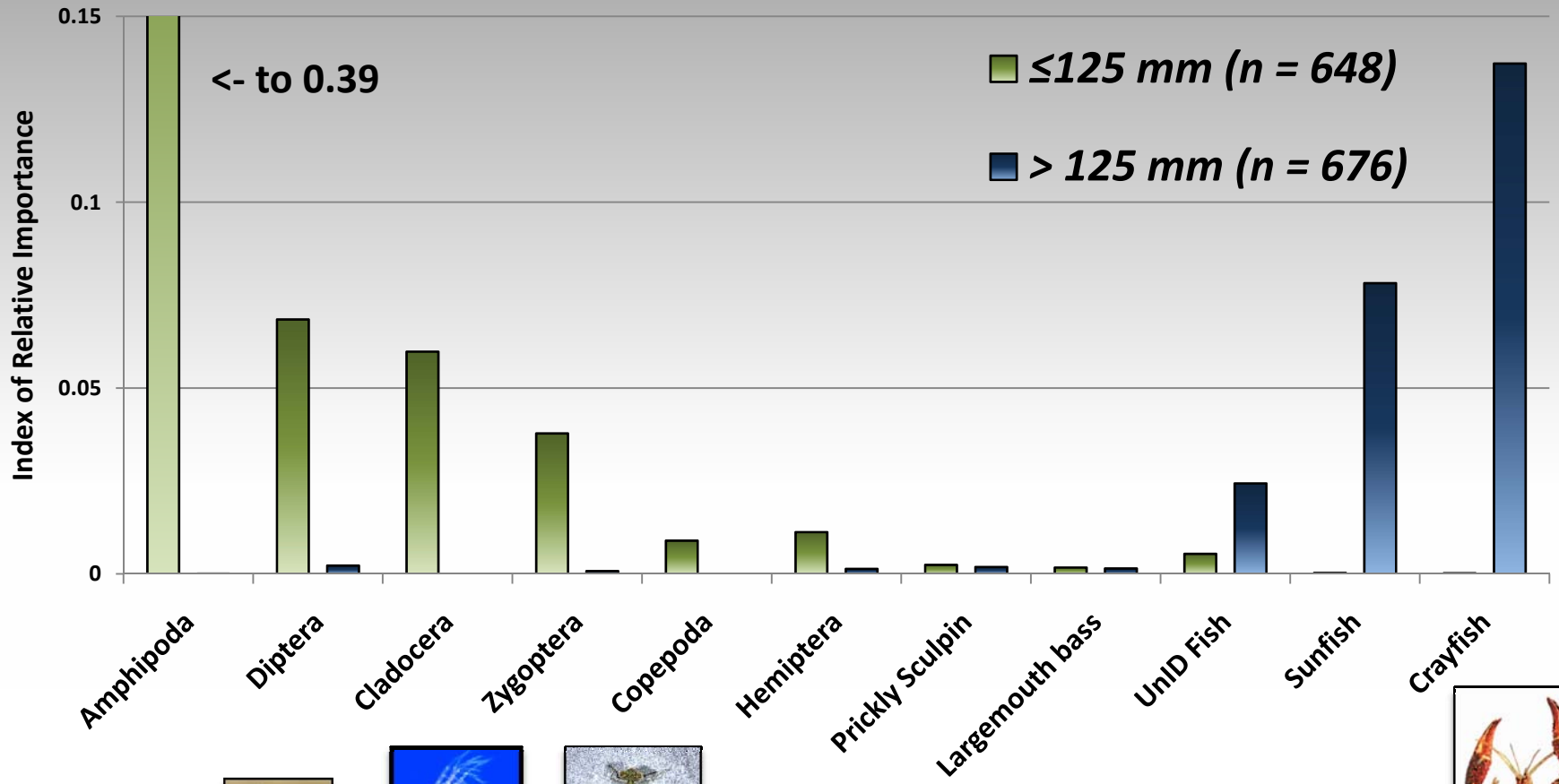
12 Replicates Each Combination:		*Egeria* Biomass Density	
		Low	High
Turbidity	Clear		
	Turbid		


Habitat Preference
2
1
0
Open Water
SAV Edge
SAV Patch
delta smelt
juv bass
bluegill
crayfish


Proportion Killed or Consumed +/- SE
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
smelt
largemouth
bluegill
crayfish
Low Egeria
High Egeria
Low Egeria
High Egeria

Diet Composition in the Field:

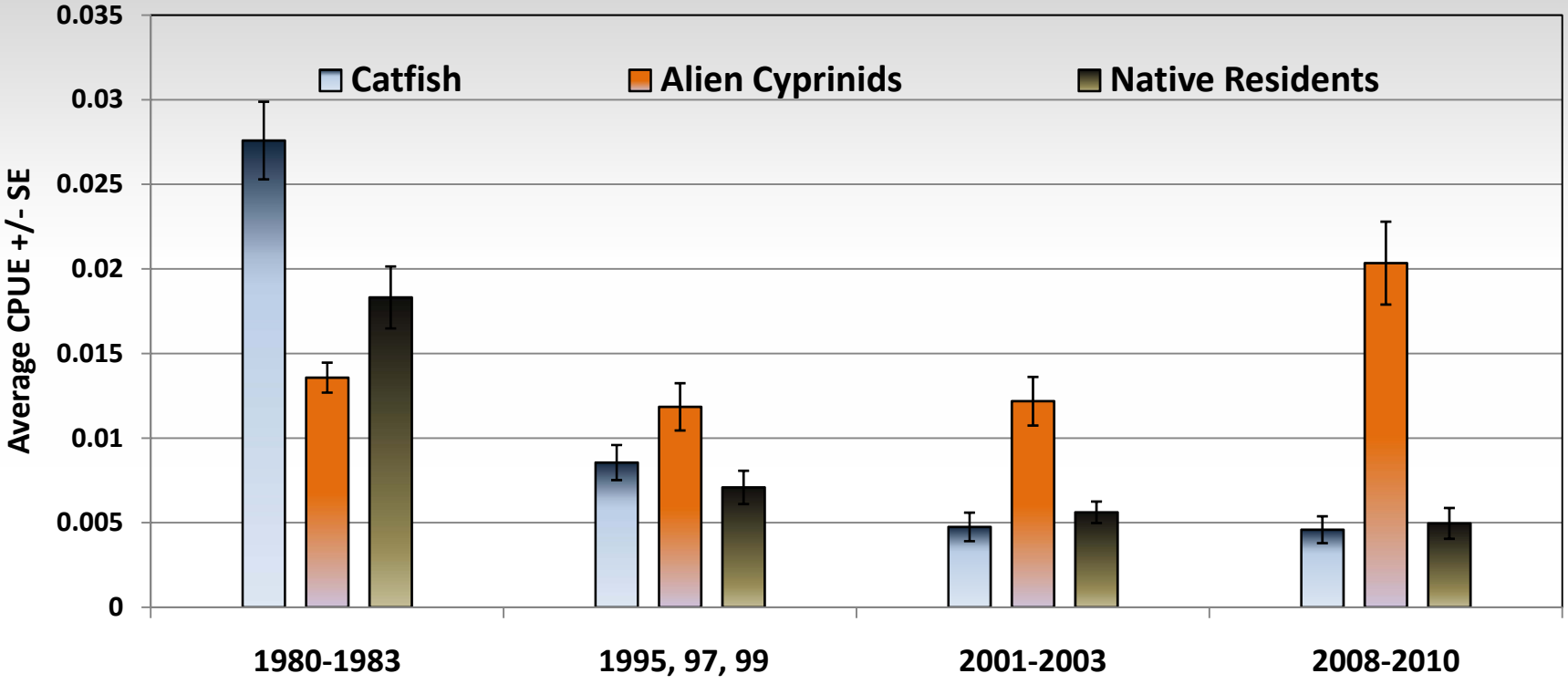
October 2008 – August 2009



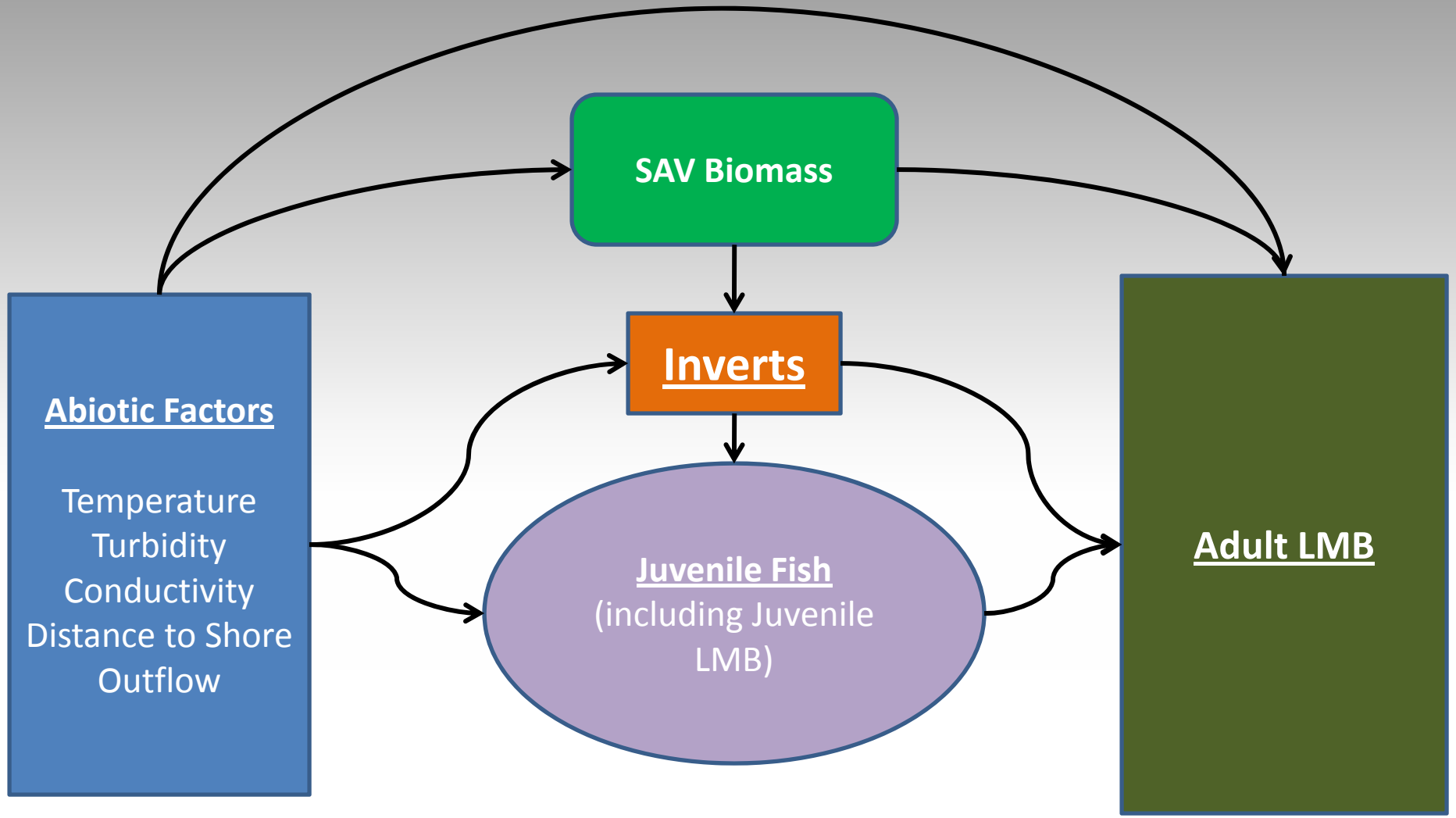
Conclusions and Upcoming Work

- *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



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