Relating community composition, abundance, growth, and condition of aquatic macrofauna to watershed land use and shoreline alteration in Chesapeake Bay.

Matthew S. Kornis, Denise Breitburg, Lori A. Davias, Keira Heggie, Heather Soulen, Rochelle D. Seitz, Donna M. Bilkovic, Richard Balouskus, Timothy E. Targett, Ryan S. King, Steve Giordano, Jim Uphoff Jr., and John M. Jacobs

Smithsonian Institution

WILLIAM & MARY VIMS
VIRGINIA INSTITUTE OF MARINE SCIENCE
SCHOOL OF MARINE SCIENCE

MARYLAND DEPARTMENT OF NATURAL RESOURCES

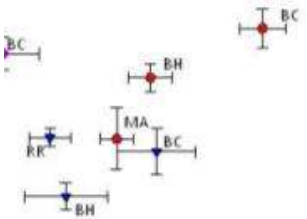
BAYLOR UNIVERSITY

Ongoing Research

• Nearshore macrofauna community composition and abundance

• Fish growth rate and condition

• Predator/Prey Interactions in Native vs. *P. australis* marshes



• Stable isotope signatures

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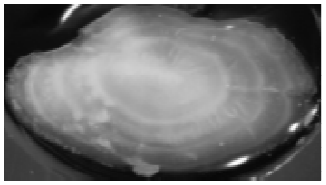

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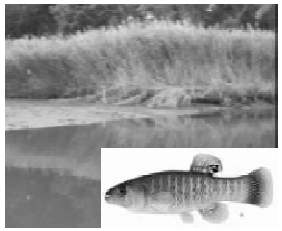

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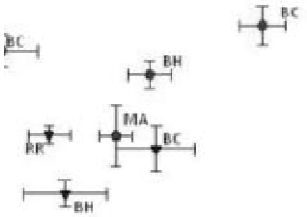

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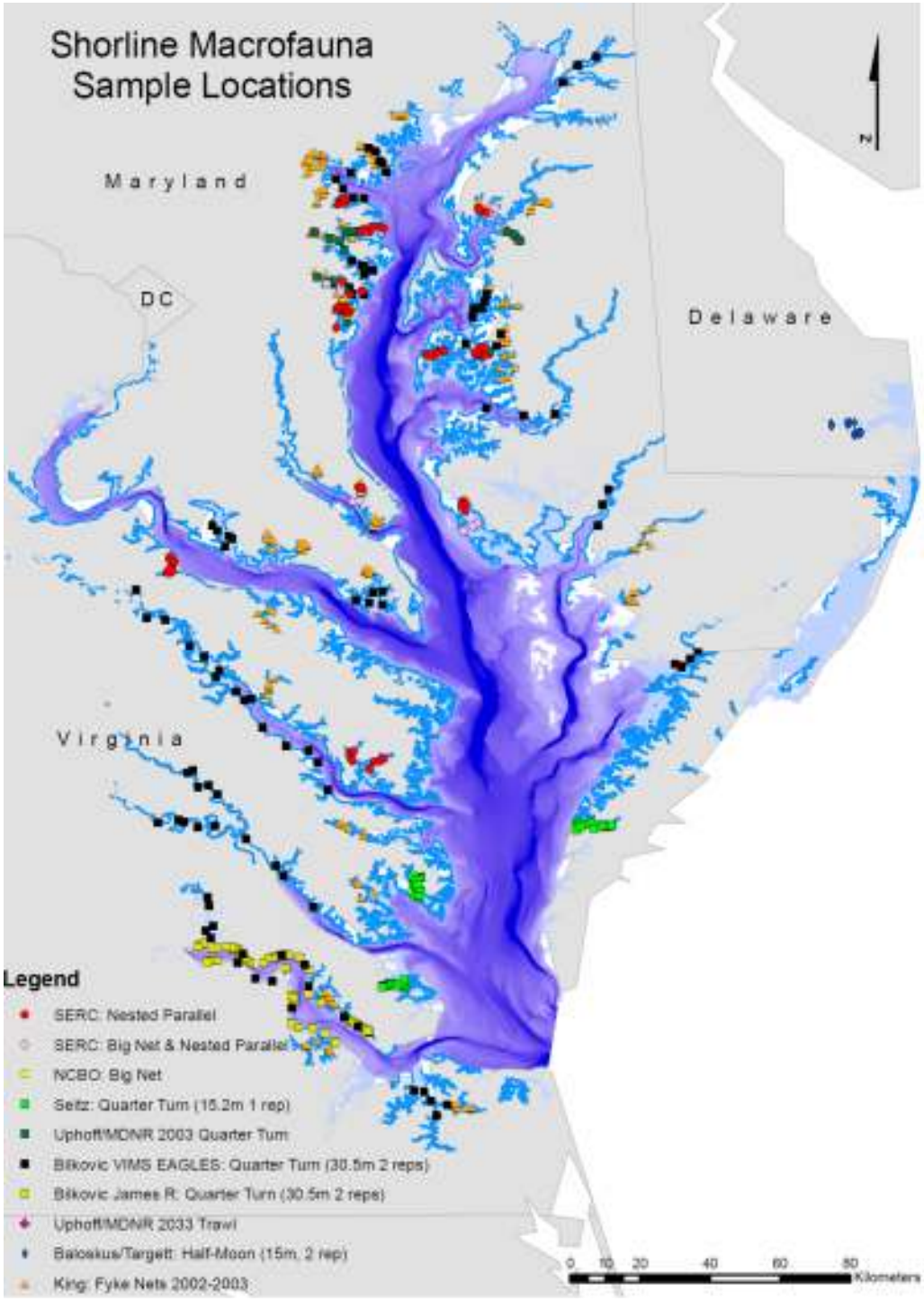


Community Composition and Abundance

43 Subestuaries

694 samples

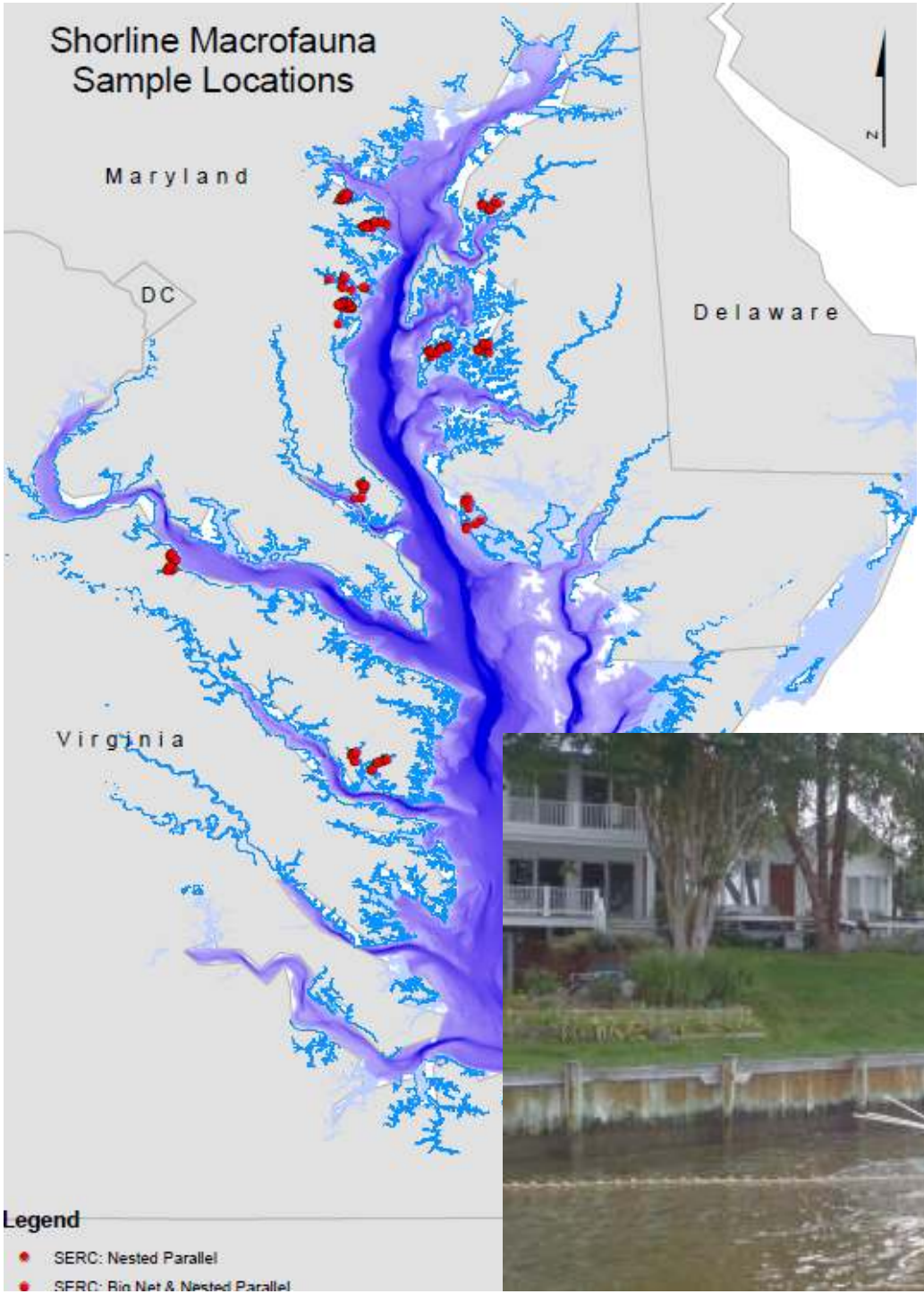
> 730,000 individuals enumerated

6 sampling techniques
- Fyke (passive)
- 5 seine types

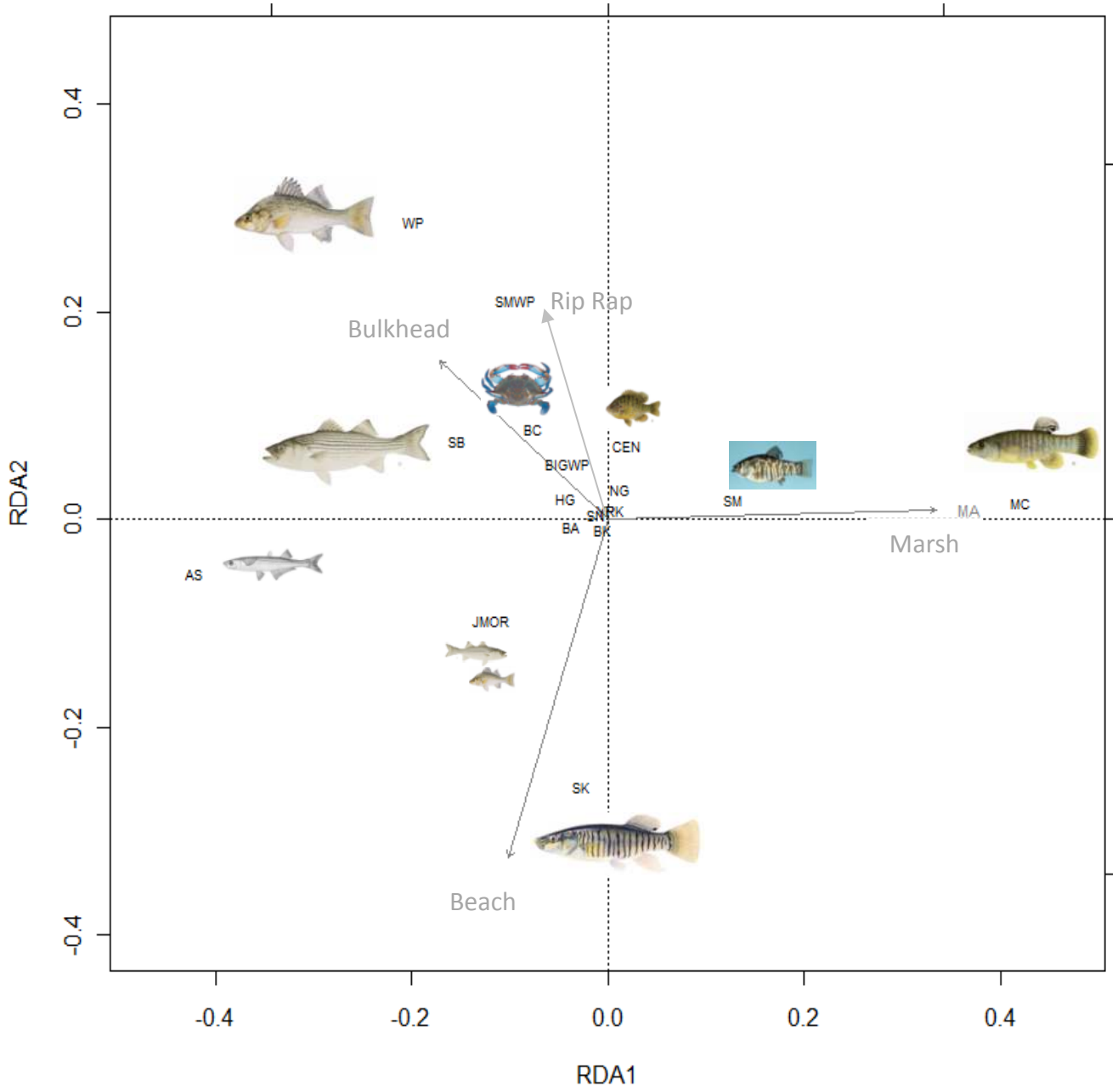
Contributors

Denise Breitburg (SERC)
Rochelle Seitz (VIMS)
Donna Bilkovic (VIMS)
Richard Baloskus/Tim Targett (U-Delaware)
Ryan King (Baylor U, formerly of SERC)
Steve Giordano & David Bruce (NOAA CBO)

Focus on SERC Sites



Shoreline Alteration Reduces Prey Refuge w/n 3m of shore



Key Differences Between Land/Water Interface and Nearshore Zone

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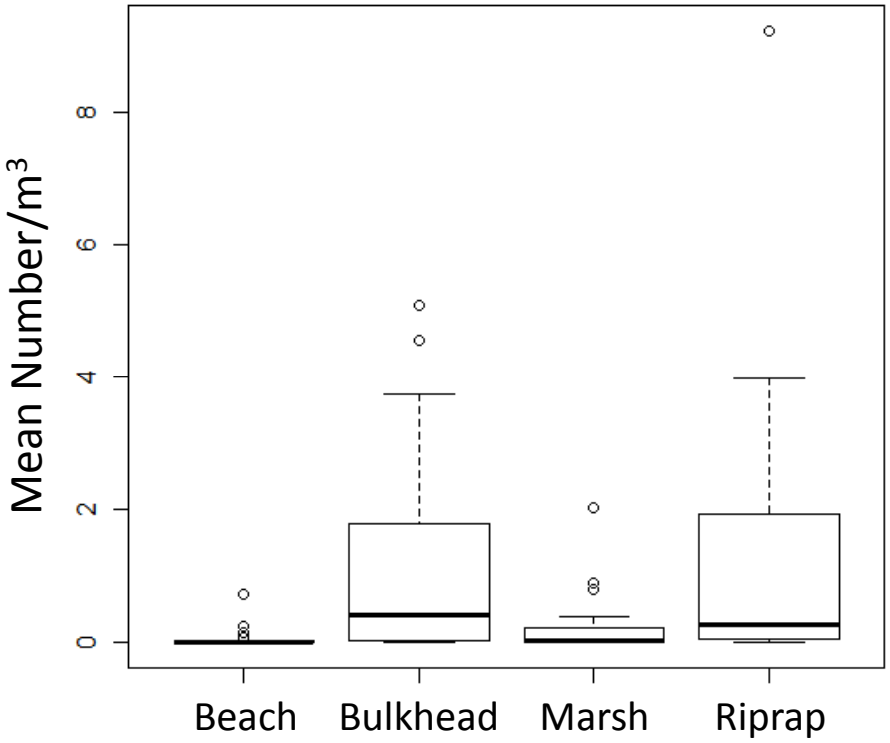

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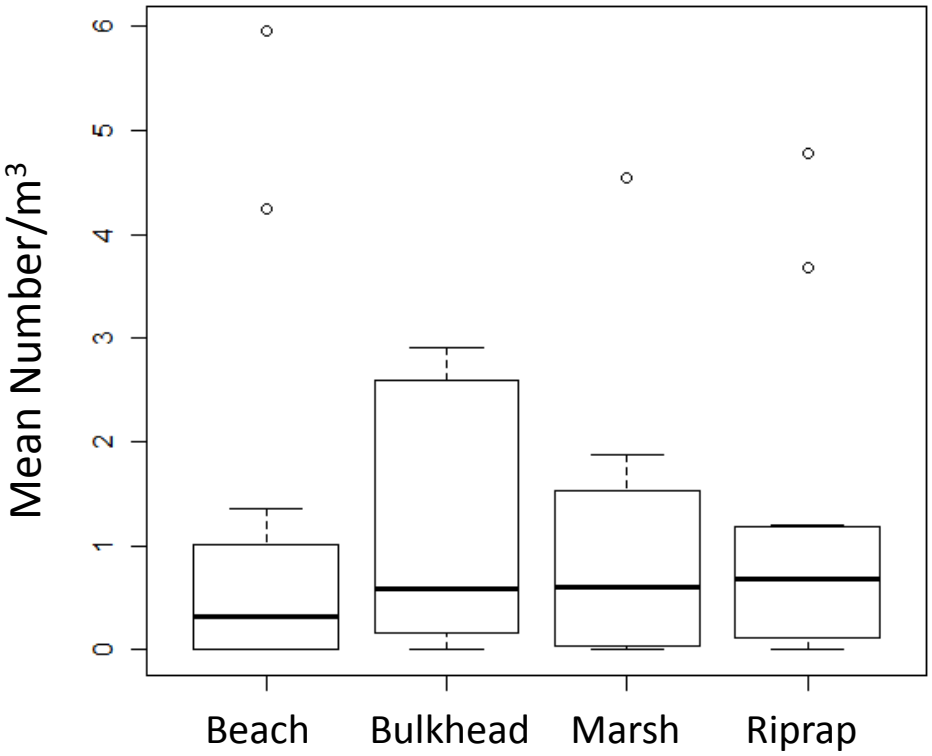
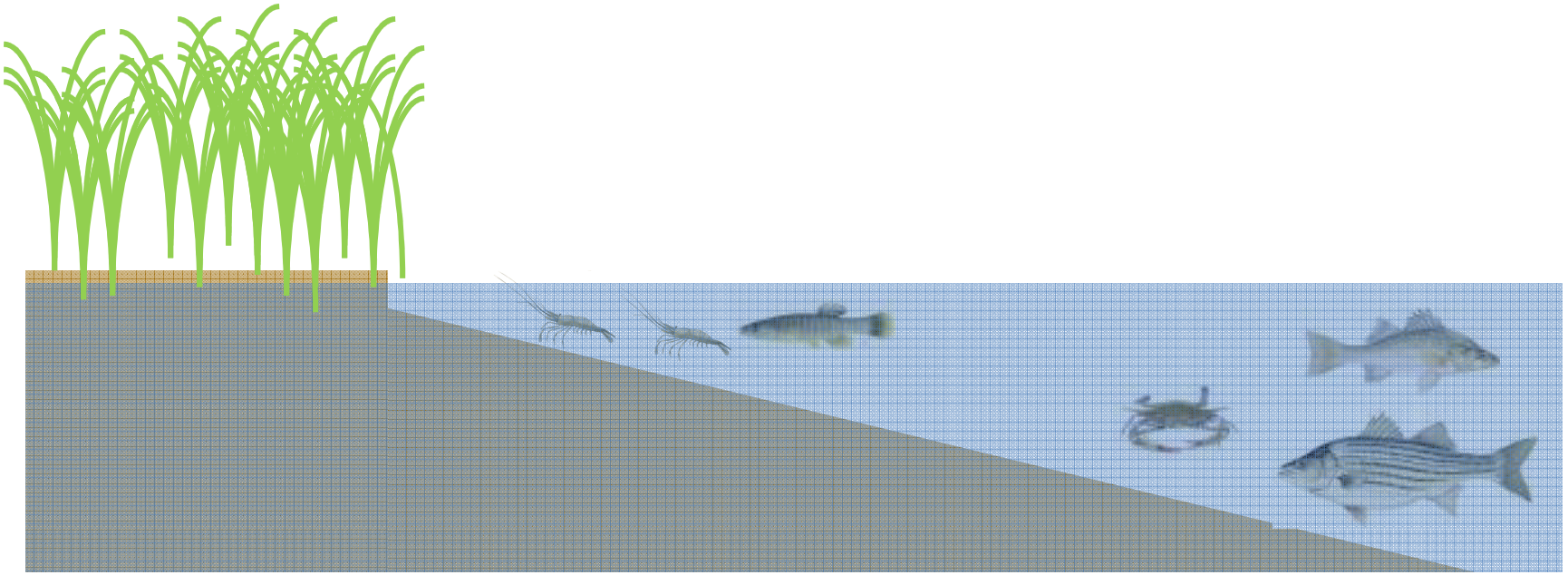
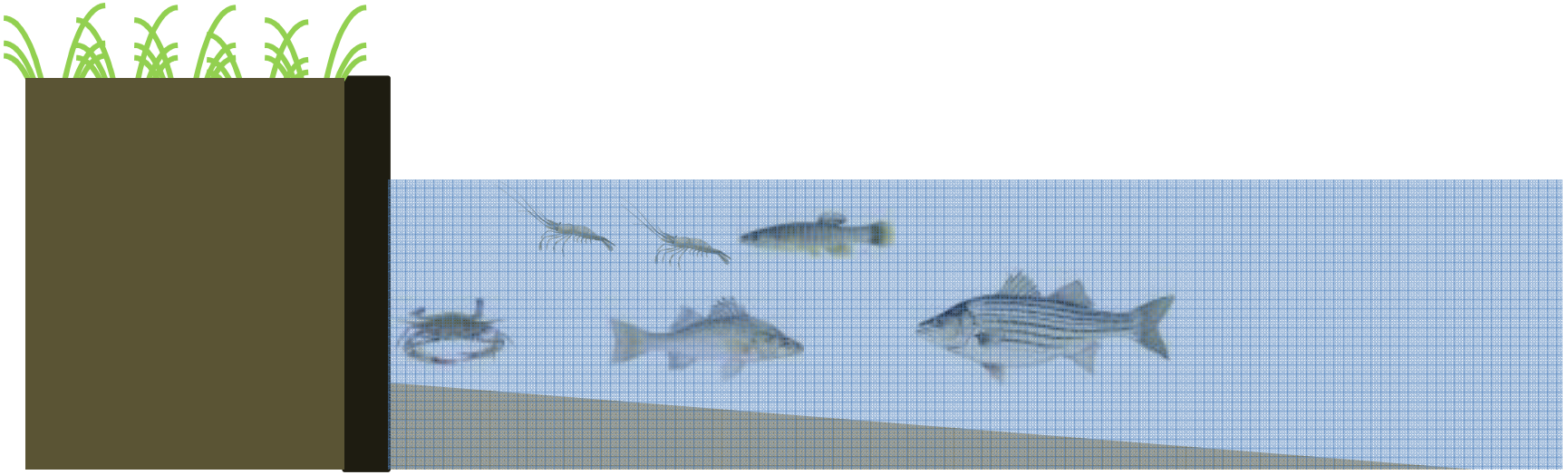
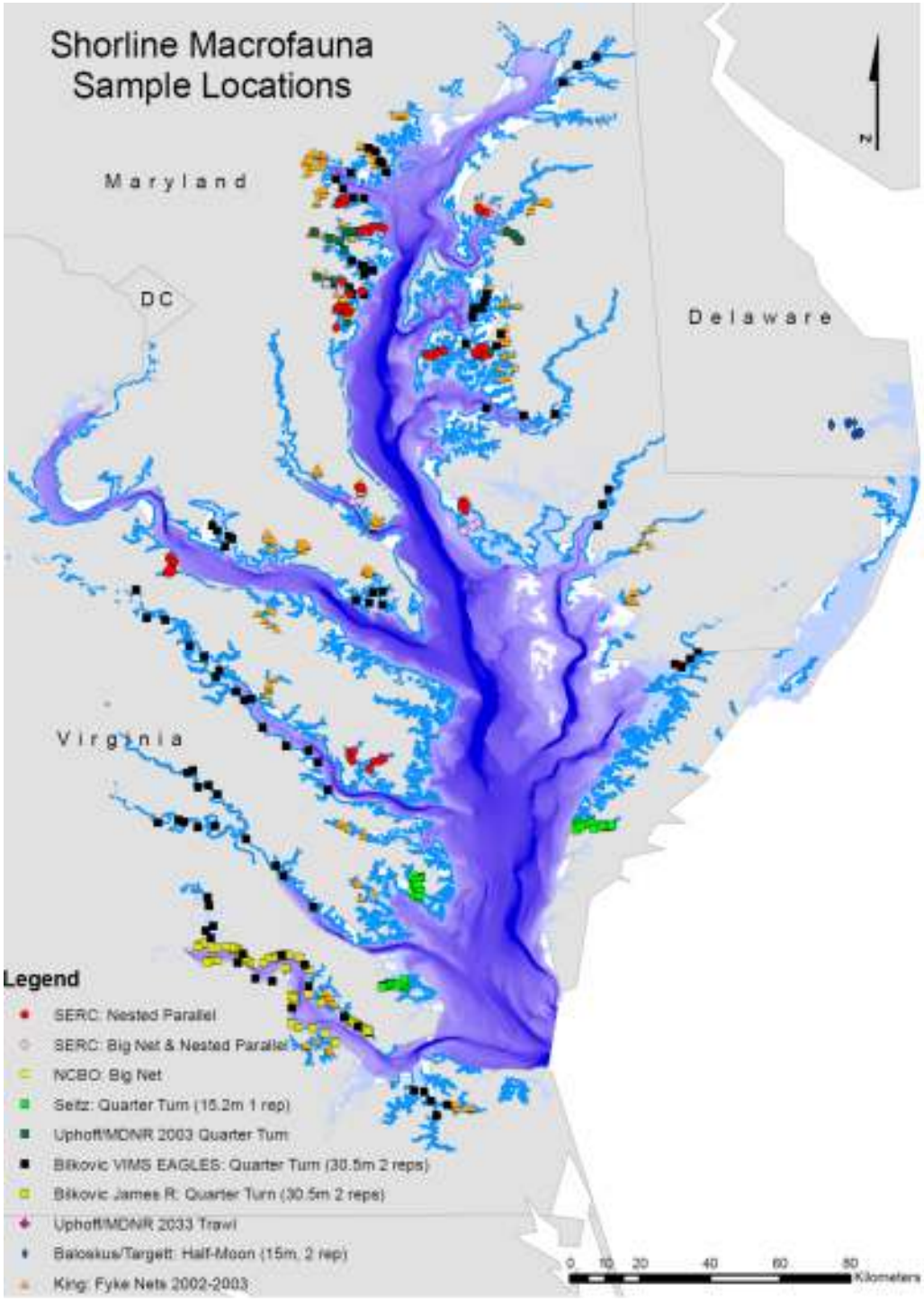


Shoreline Alteration Diminishes Prey Refuge





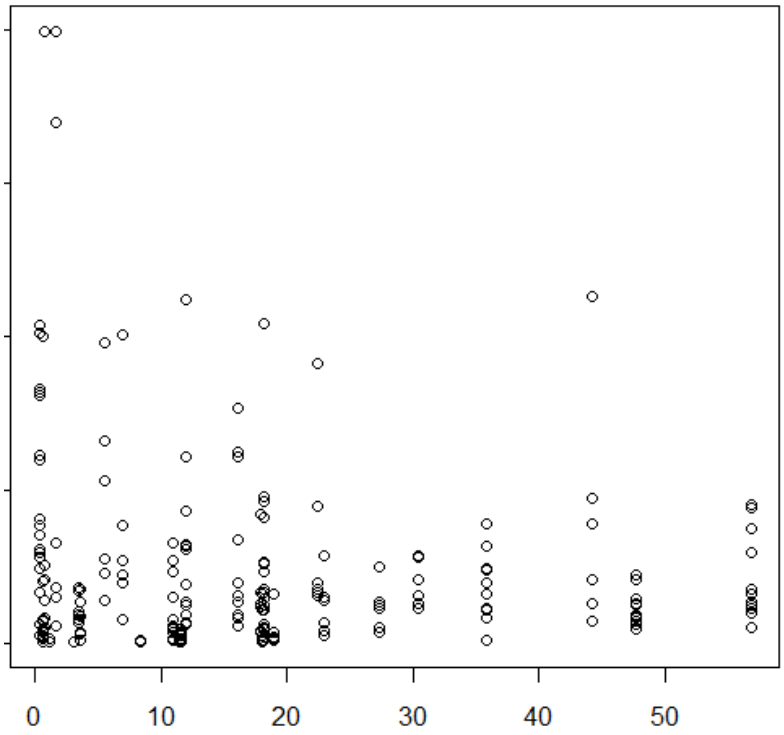


Preliminary Trends With Land Use

Species Abundance and % Cropland

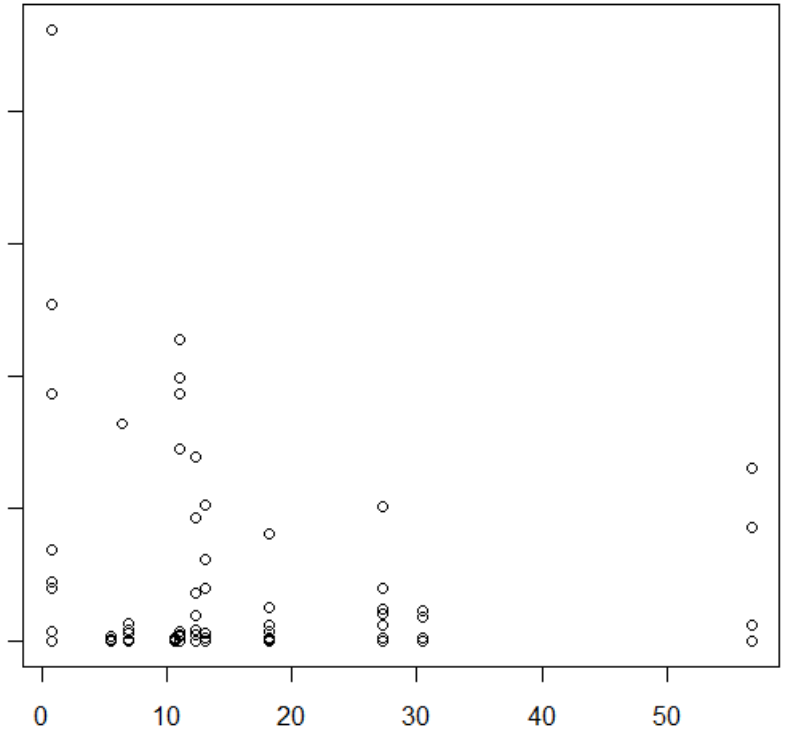
Number / Sample

Fyke Nets



% Agriculture

Seine Nets



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Species Abundance and % Cropland

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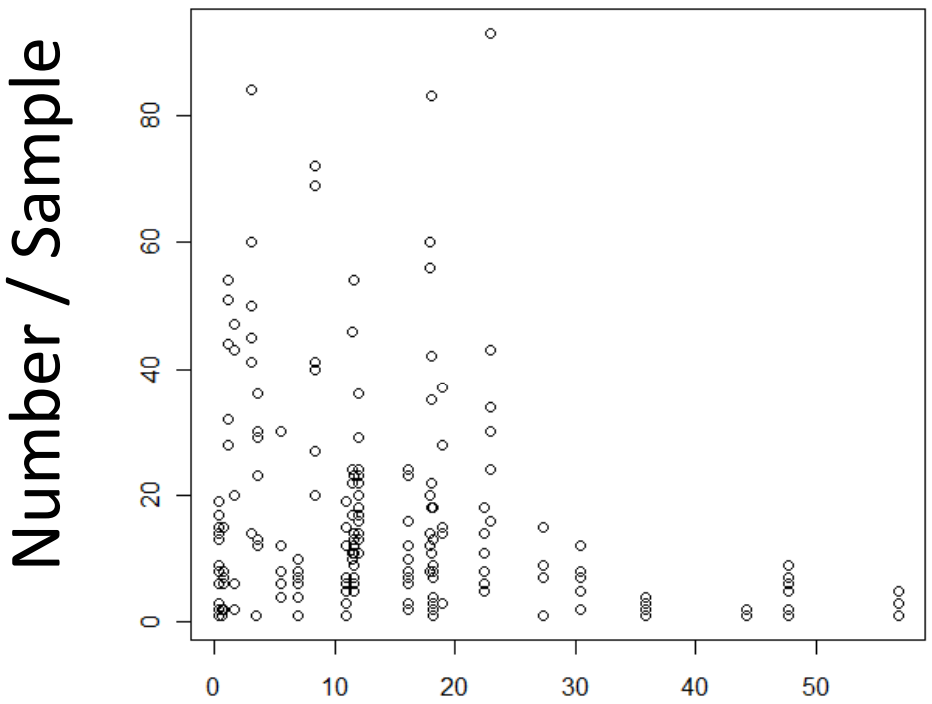
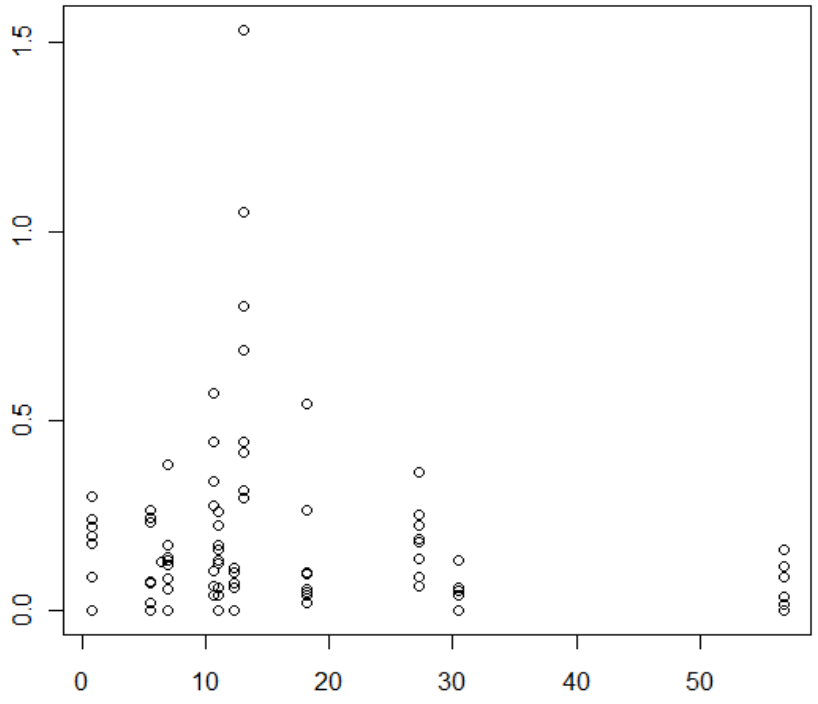


Seine Nets



Species Abundance and % Cropland

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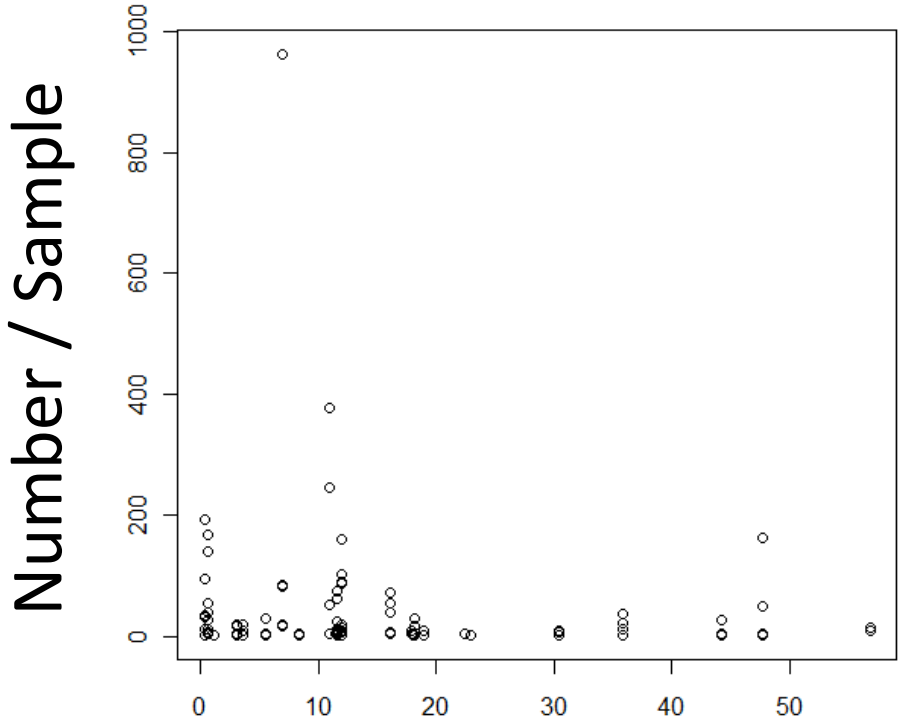
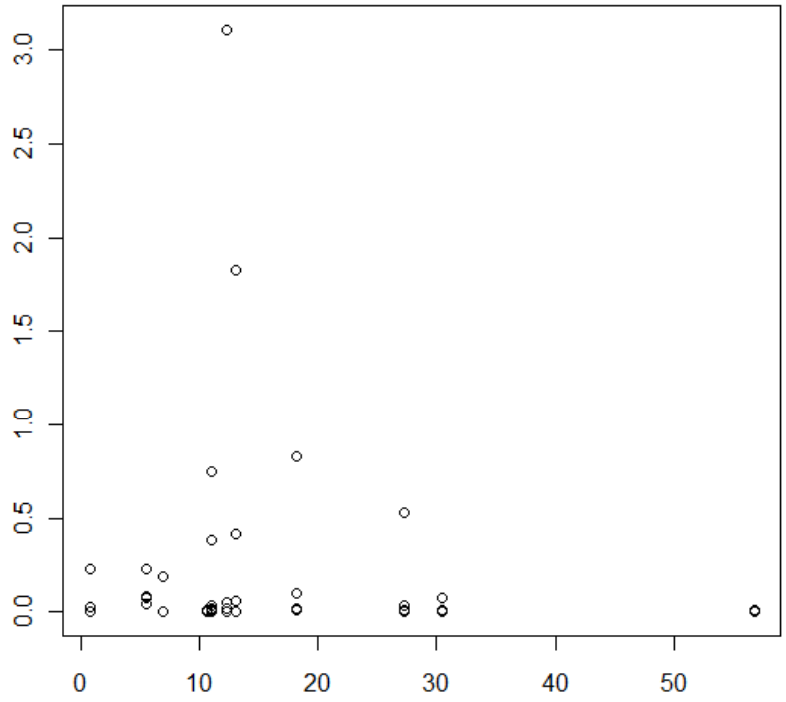


Seine Nets



Potential Covariates

- Landscape Scale
  - Salinity
  - Subestuary area
  - Substrate composition
  - Wave action
  - SAV

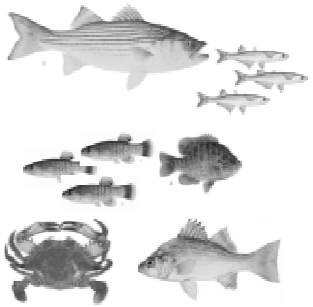
- Site Scale
  - Tidal stage
  - Depth
  - DO
  - Temperature
  - Turbidity

- Design
  - Sampling Method
  - Year

Multiple Regression Analysis

Response	Sig. Predictors	Land Use?	Shoreline Habitat?

Ongoing Research



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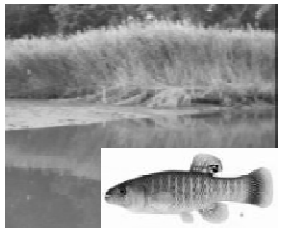

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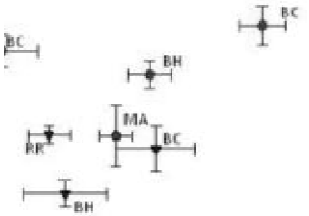

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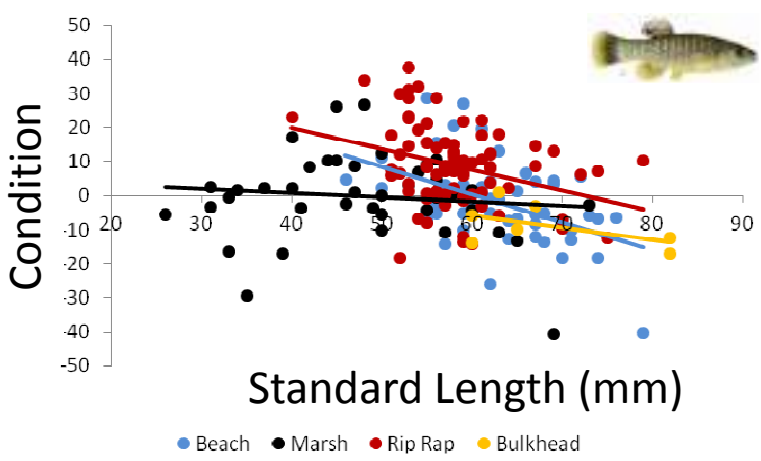
South River



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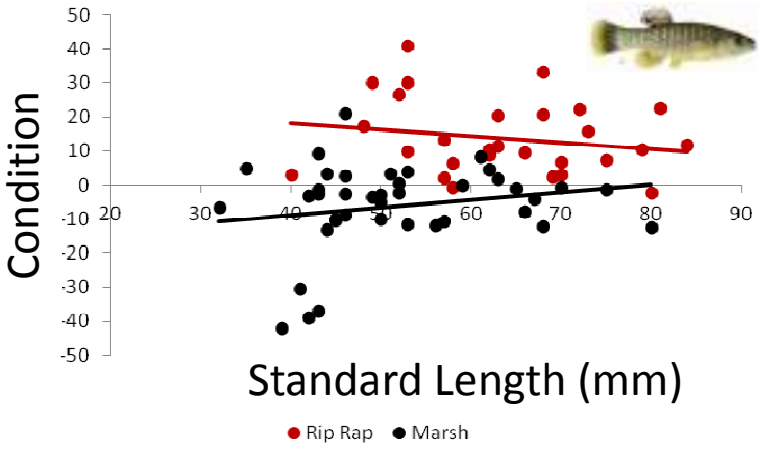
Patapsco River



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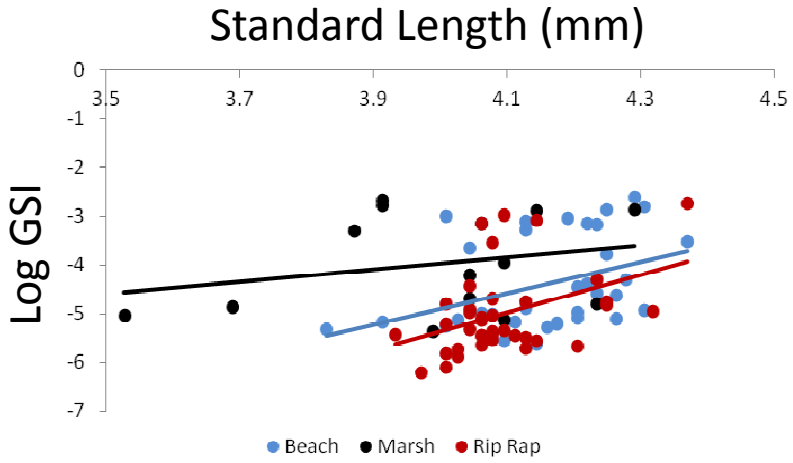

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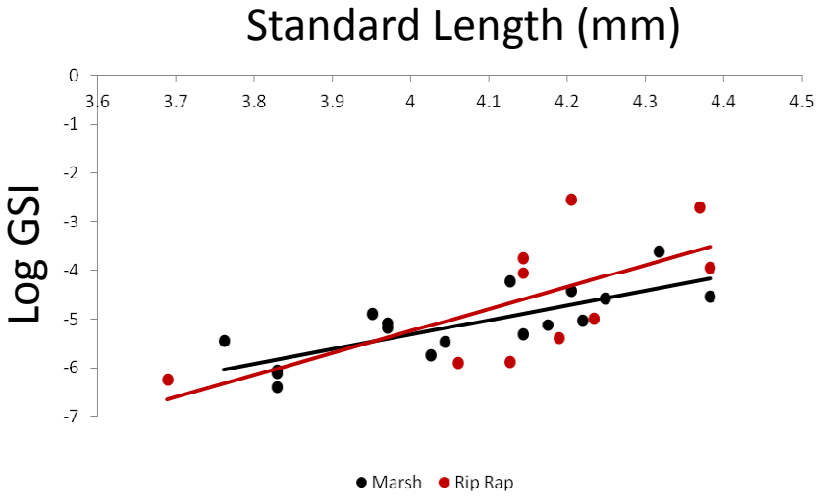

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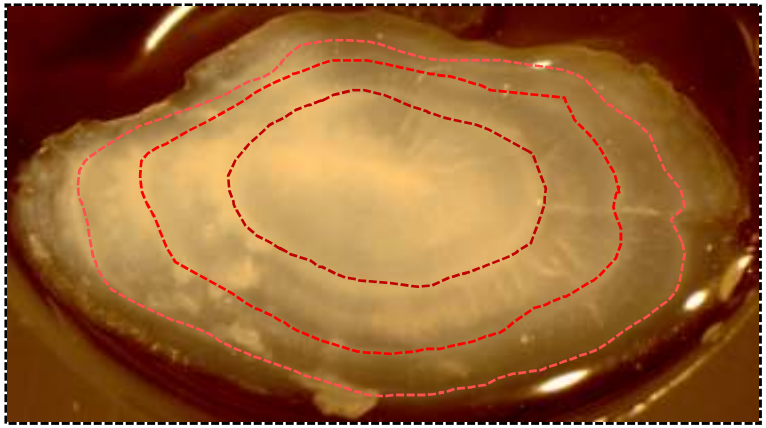
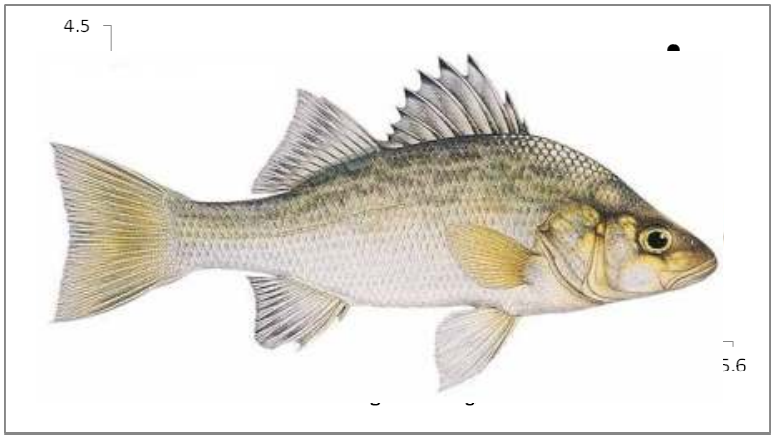
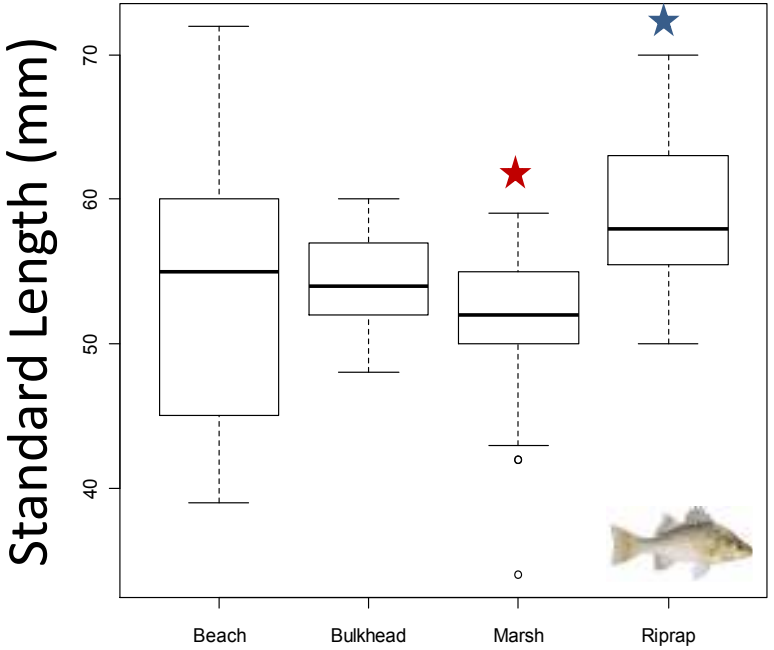
Growth Rates at Different Shoreline Types

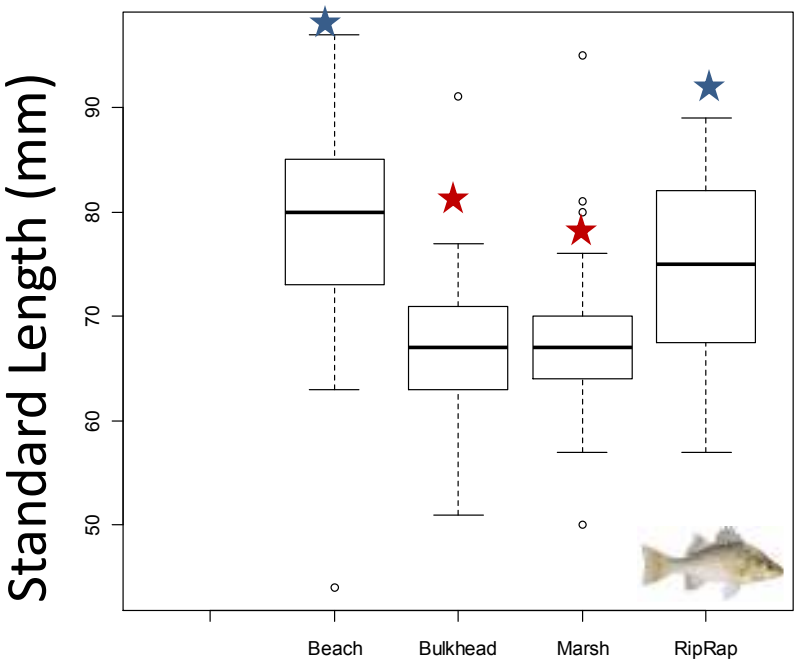




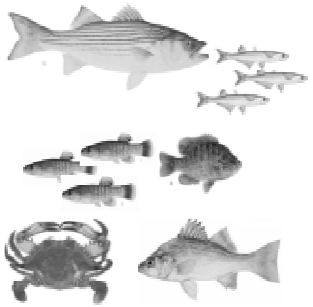
Magothy River



Rhode River



Ongoing Research



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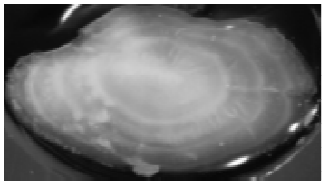

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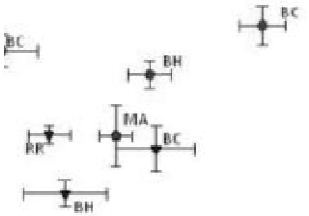

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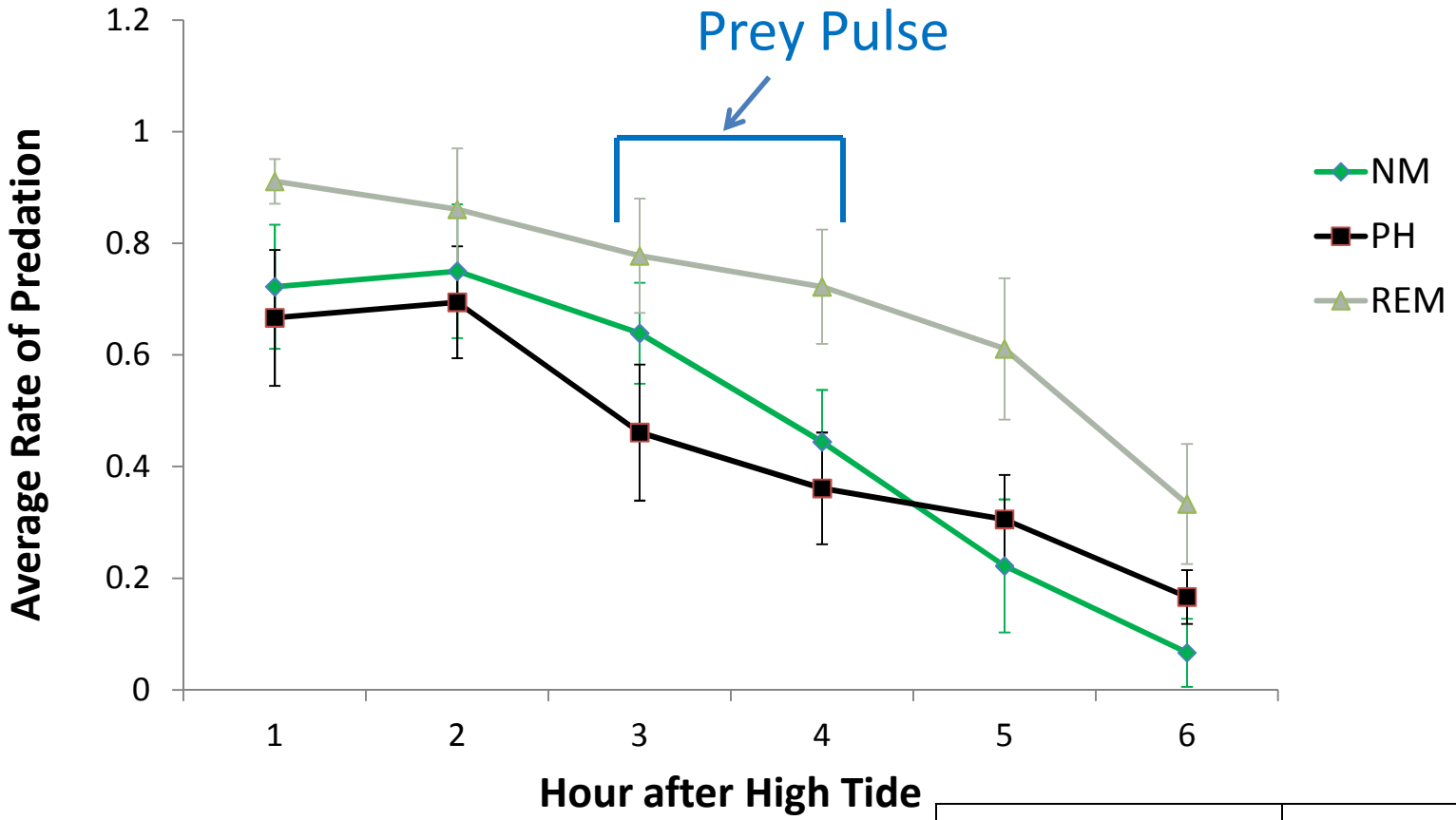
Predator/Prey Interactions in Native vs. *P. australis* marshes

Native

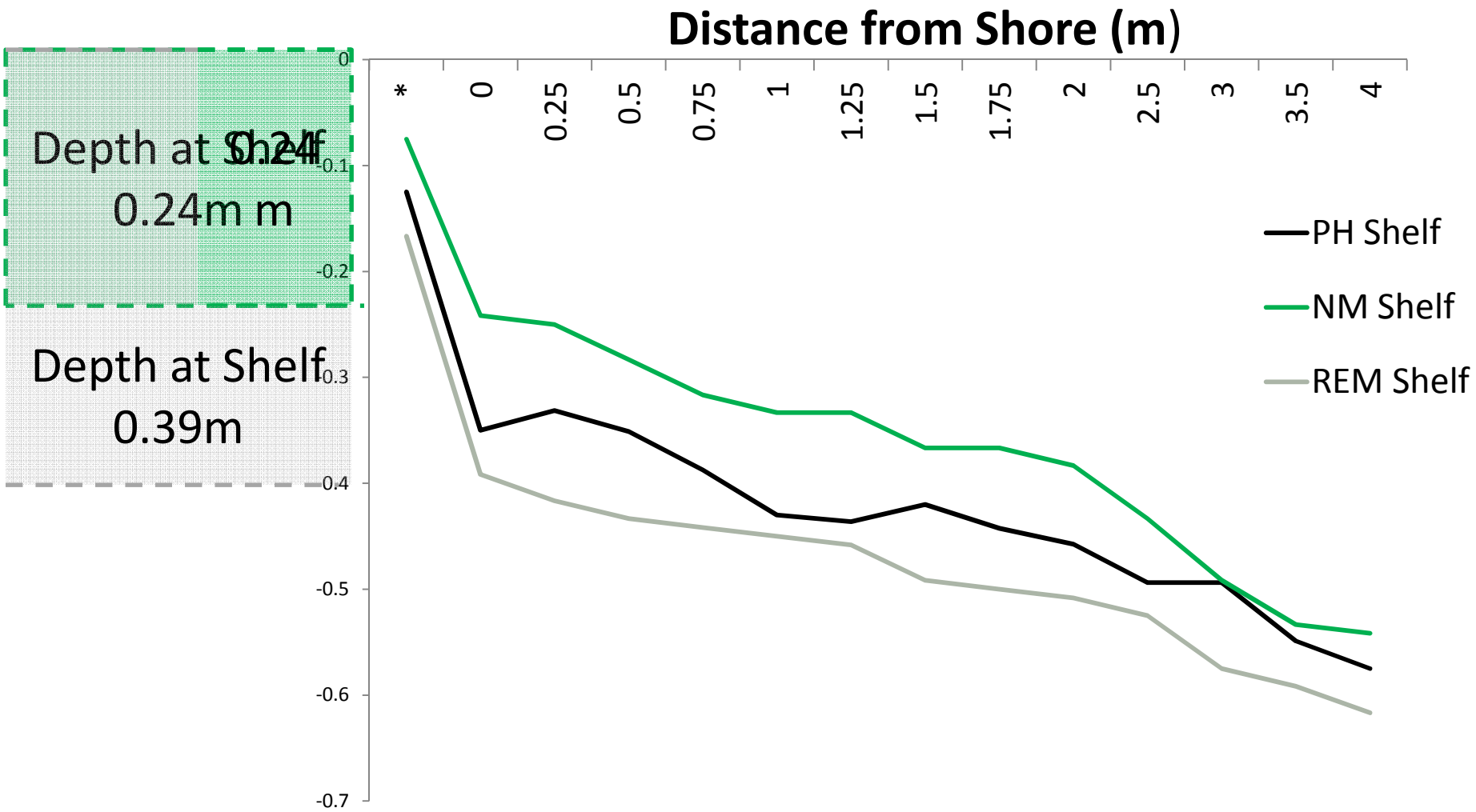
Phragmites

Predation Rates – Tethering Experiment

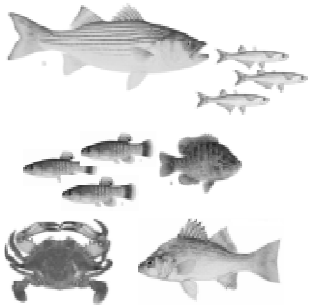


	p value
site X hour	0.5207
site	< 0.0001
hour	< 0.0001

Shallow Water Habitat Reduced At *Phragmites* Marshes



Ongoing Research



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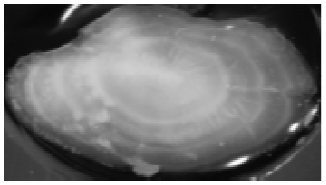

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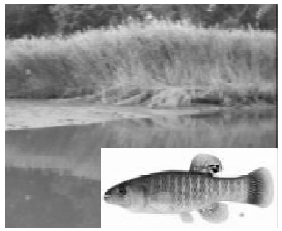

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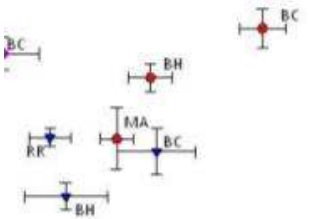

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Small-Scale Differences in Stable Isotope Signatures

Lead by Lori Davias

<u>Mummichog</u>

Abundant marsh benthivores with small home ranges

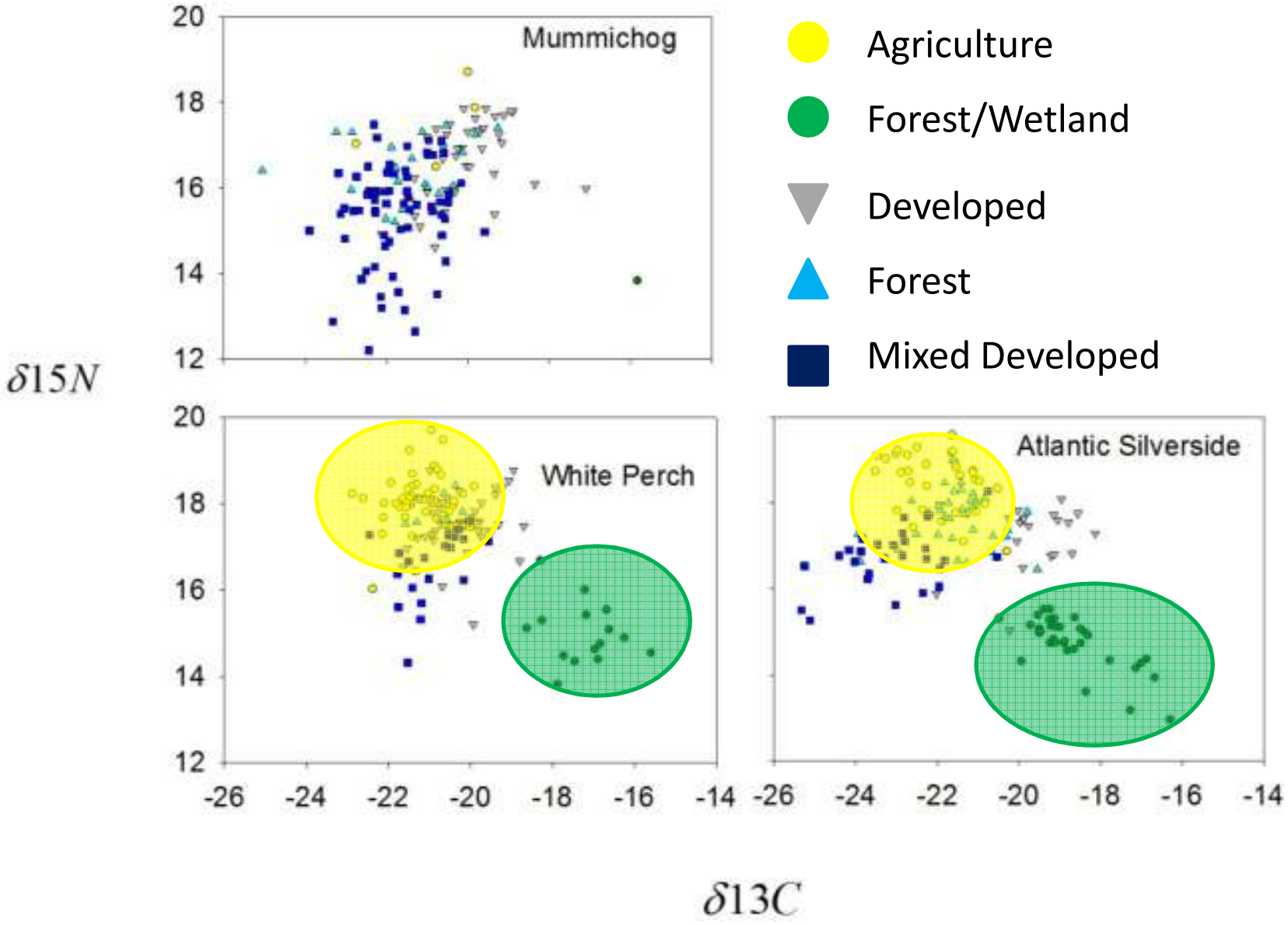
<u>Atlantic Silverside</u>

Schooling ominvore with small home ranges.

<u>White Perch</u>

Semi-anadromous with small home ranges. Undergoes ontogenetic diet shift from invertebrates to fish. Adults likely feed on previous two species.

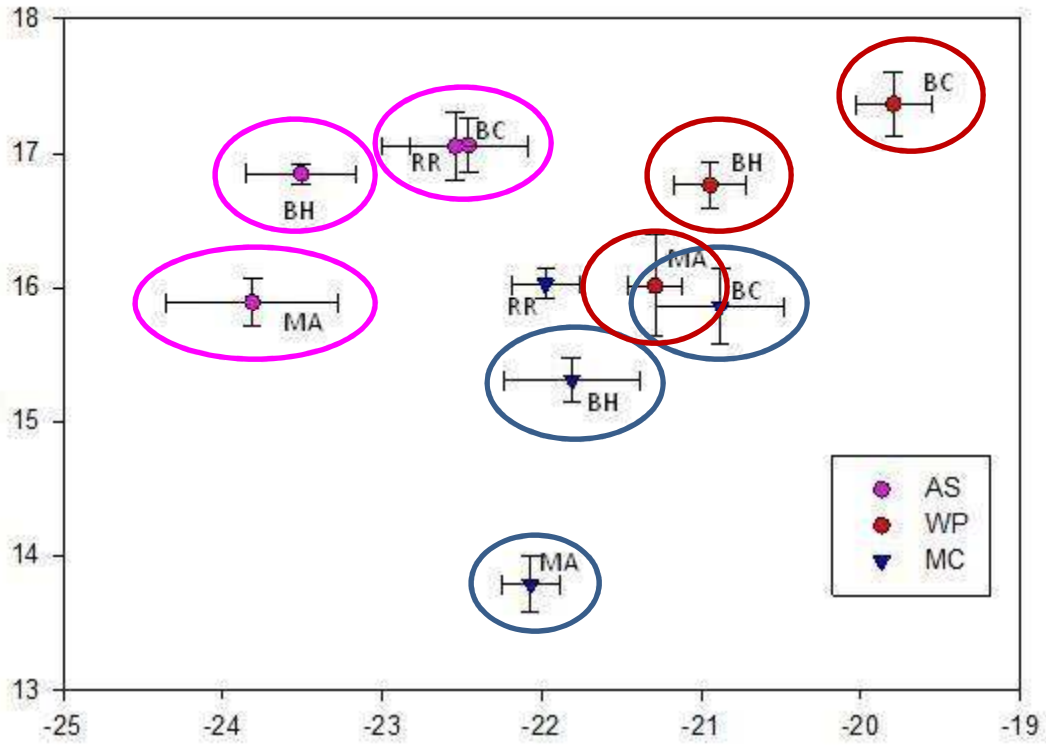
Isotopic Data Separates By Subestuary



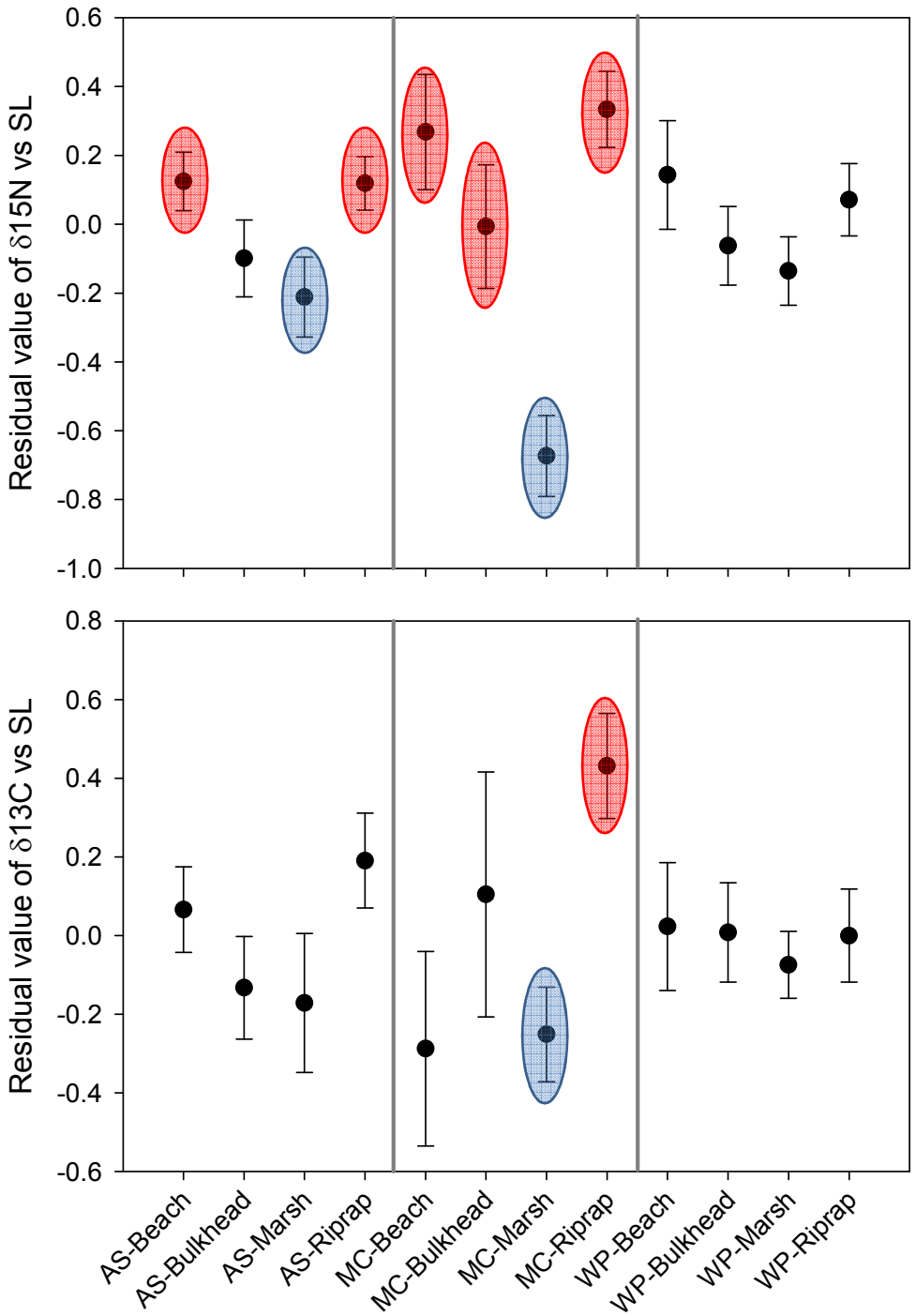
Isotopic Data Separate By Habitat Type Over Small Spatial Scales

South River

δ15N



δ13C


Residual value of δ15N vs SL
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
Residual value of δ13C vs SL
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
AS-Beach
AS-Bulkhead
AS-Marsh
AS-Riprap
MC-Beach
MC-Bulkhead
MC-Marsh
MC-Riprap
WP-Beach
WP-Bulkhead
WP-Marsh
WP-Riprap

Take Home Points

- Shallow water habitat valuable as prey refuge; hardened shoreline types and *Phragmites* invasion diminsh these zones

- Land use may affect macrofauna, likely by impacting water quality

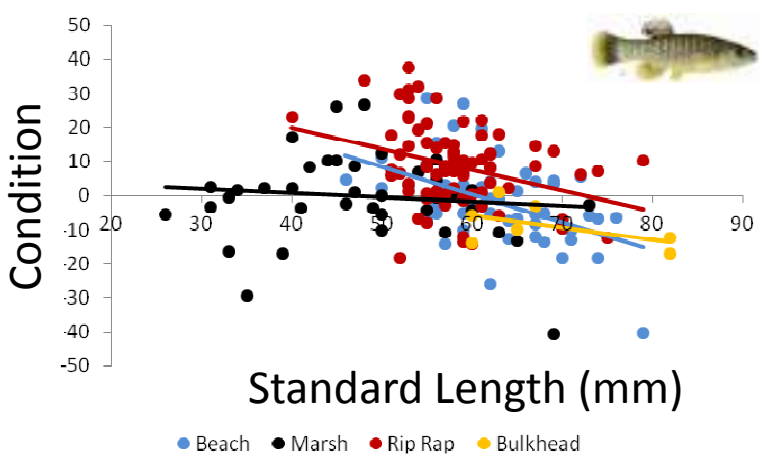
- Stable isotopes not only vary by subestuary, but may vary by shoreline habitat over small scales

Email: kornism@si.edu

SLIDES BELOW ARE FOR POTENTIAL QUESITONS

Shoreline Alteration May Affect Prey Condition & GSI

South River



$p < 0.0001$

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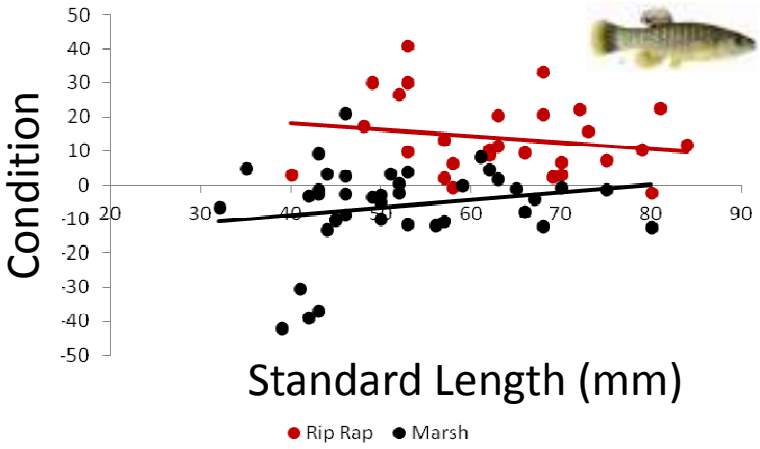

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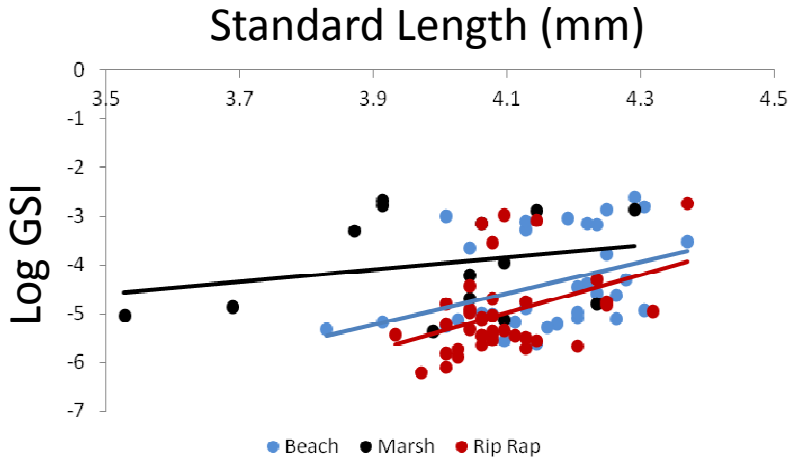

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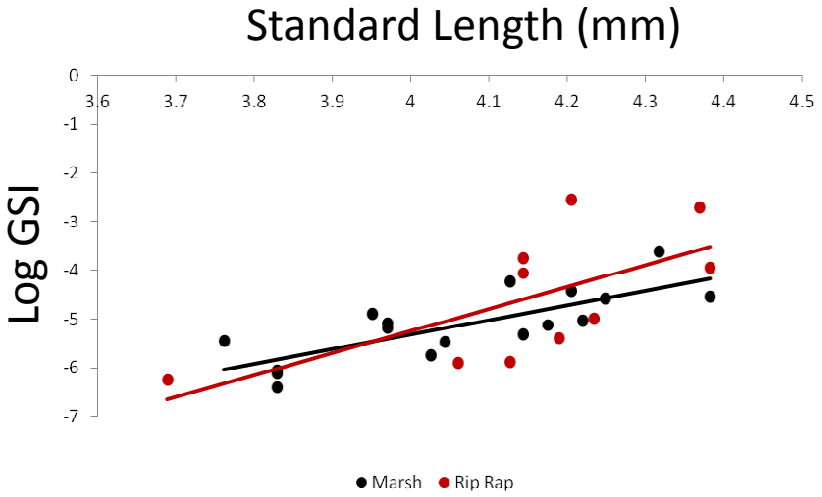

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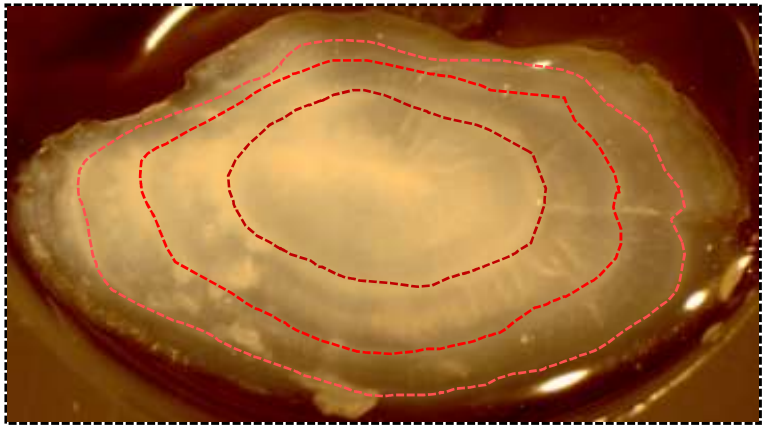

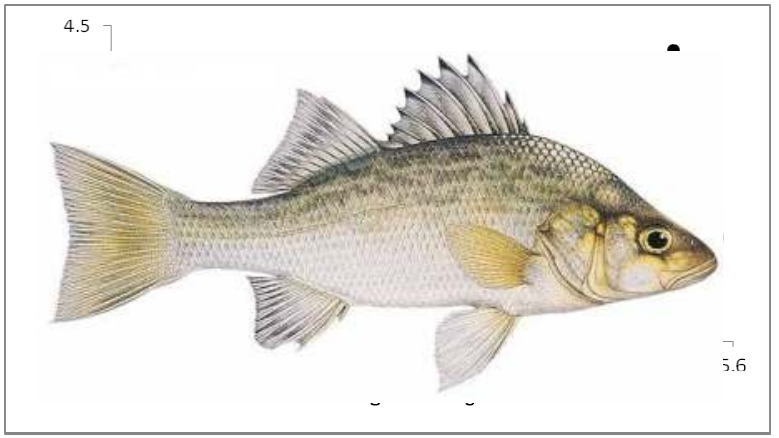

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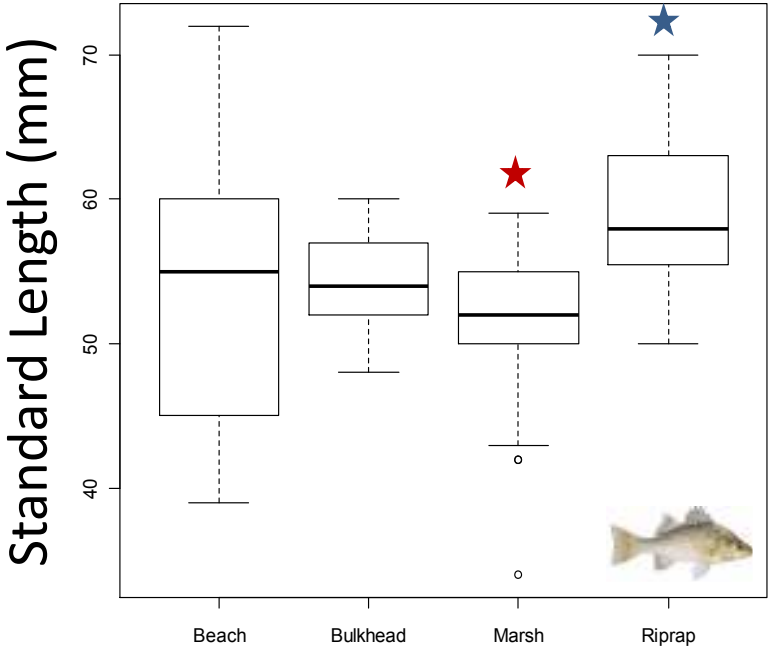

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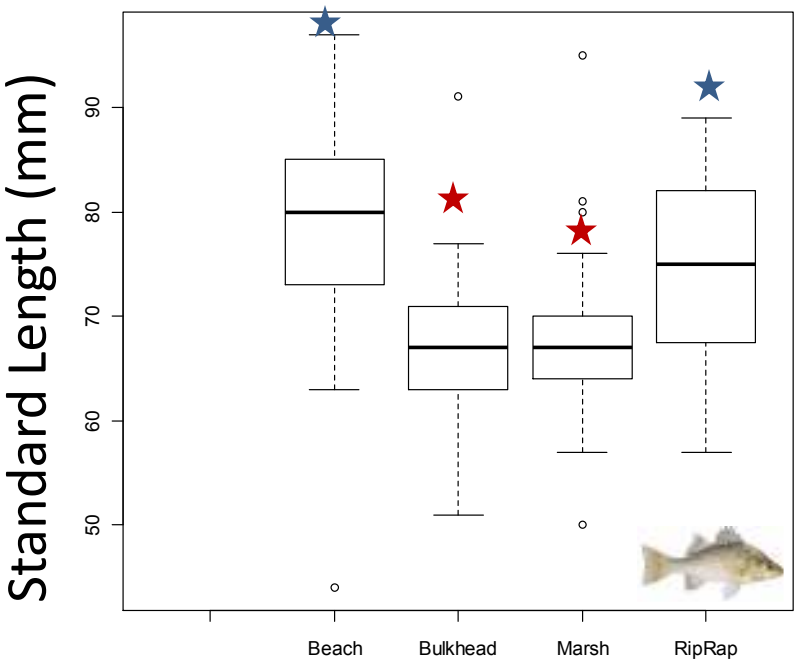

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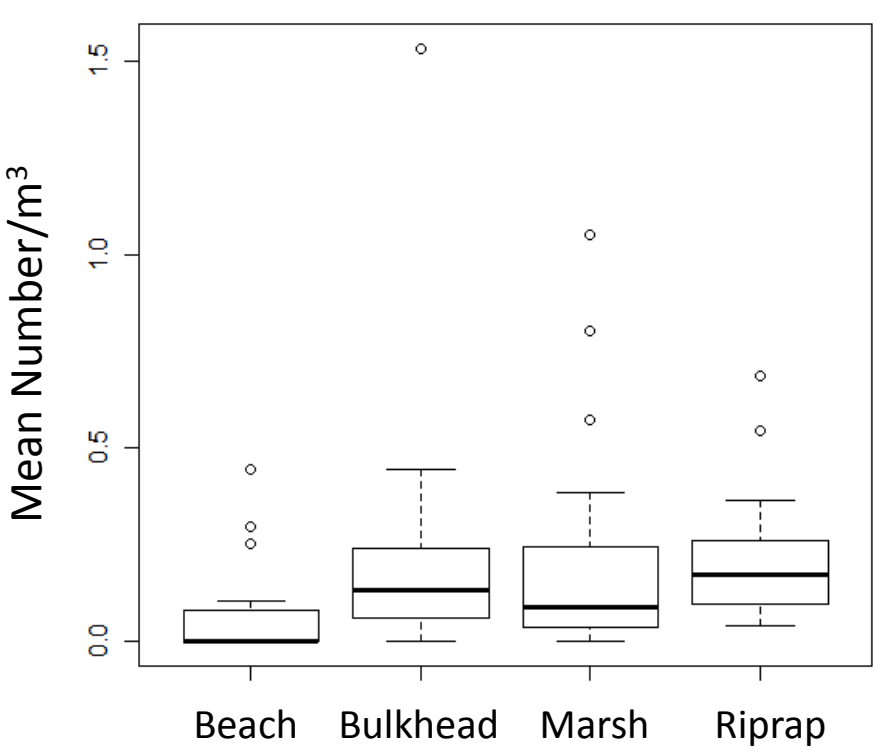

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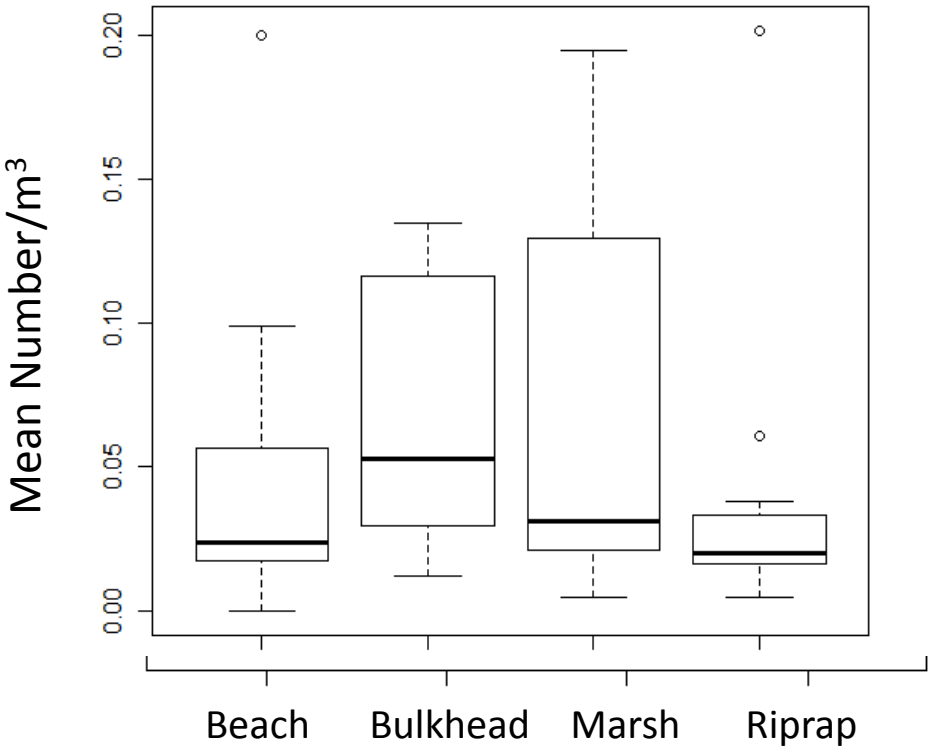
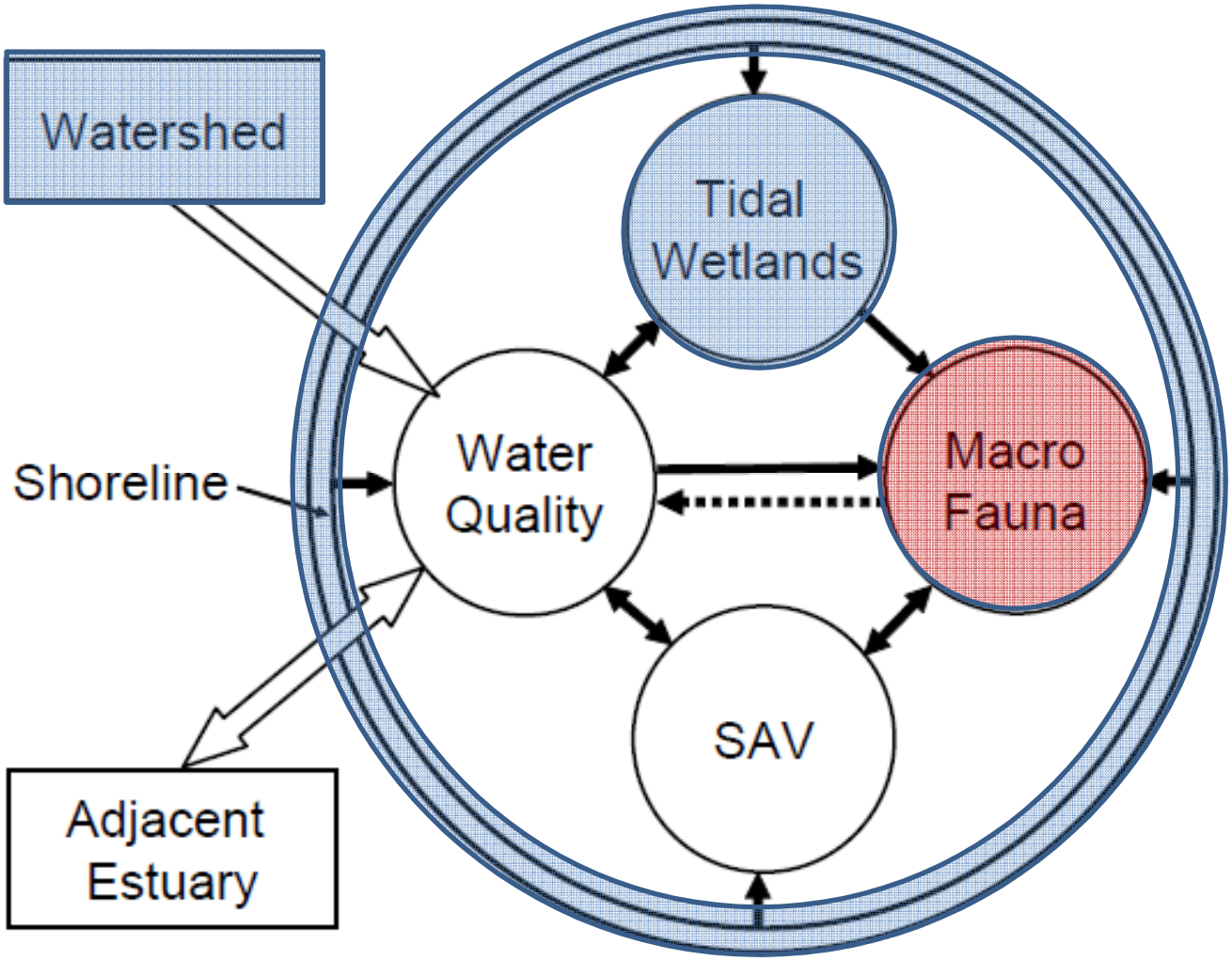
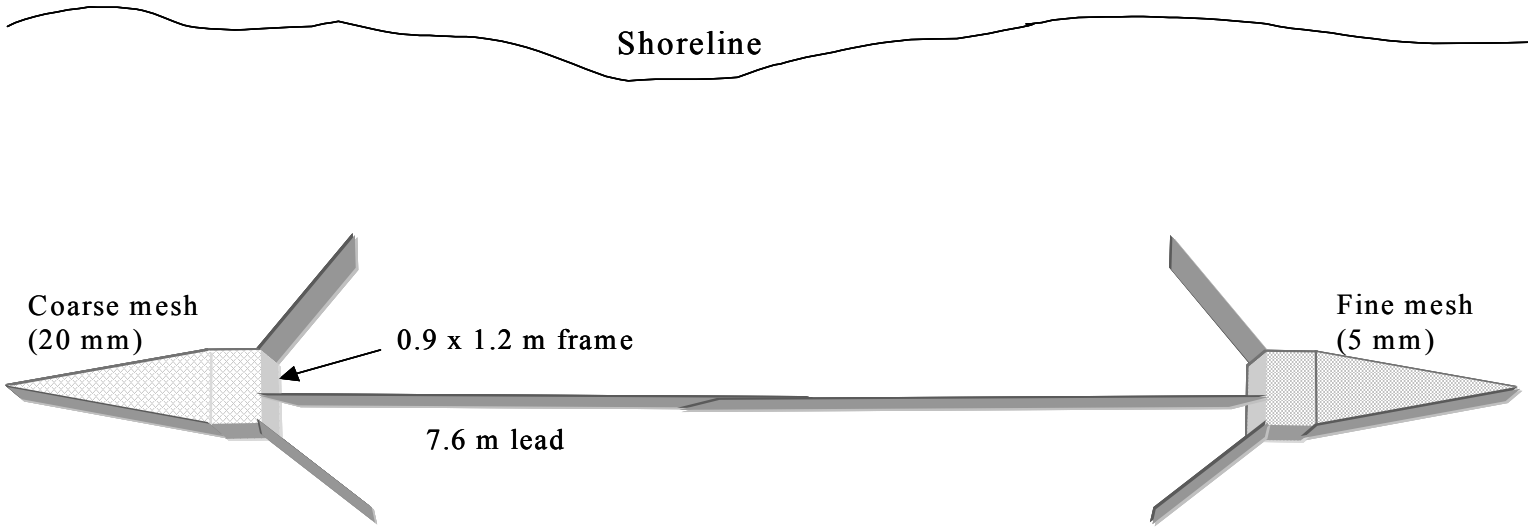


Interactions at the Land-Water Interface



Sampling Methods



Prey Availability