FGCU projects in the Estero Bay Watershed

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FLORIDA GULF COAST UNIVERSITY

Projects and scope

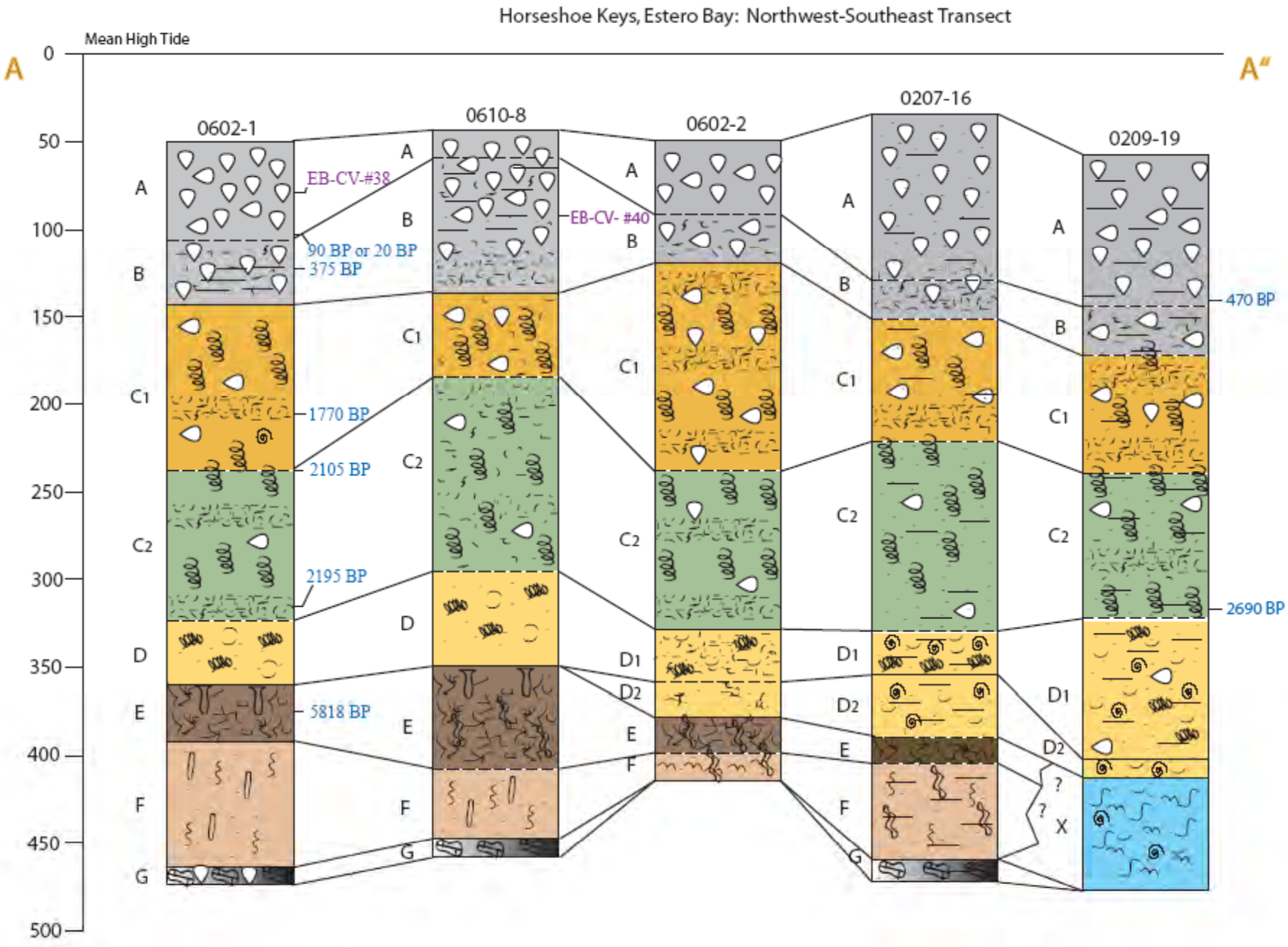
- FGCU has taken a leadership role in focusing on environmental education, research and outreach.
- Geological time scale – current
- Ecological – Organismal
- Large scale – small scale
- Scientific – Pedagogical
- Several posters that talk about several of these projects in detail
- Vester Marine Field Station – Estero Bay Resource (www.fgcu.edu/vestermarine)

Estero Bay: Holocene History of Estuarine Development

M. Savarese & S. Linsin Wohlpart

Project investigates the history of the bay, its geomorphologic development, the timing of barrier island formation, and the role of vermetiform gastropod – oyster reef development in that history.

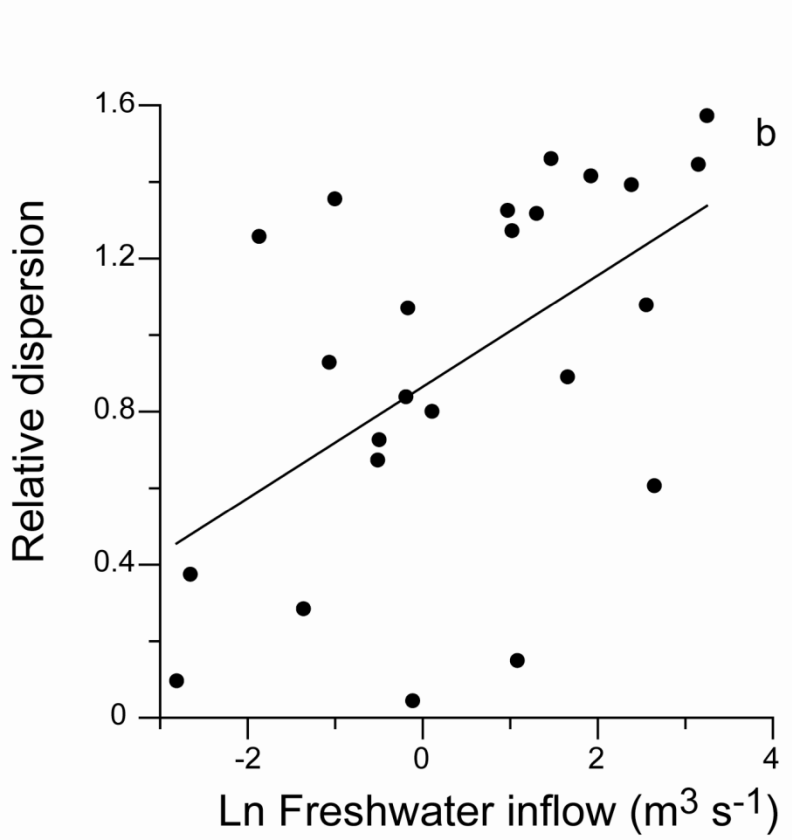
Coring Sediments / Sediment Stratigraphy


Horseshoe Keys, Estero Bay: Northwest-Southeast Transect
Mean High Tide
A
A"
0
50
100
150
200
250
300
350
400
450
500
0602-1
0610-8
0602-2
0207-16
0209-19
EB-CV-#38
EB-CV- #40
90 BP or 20 BP
375 BP
1770 BP
2105 BP
2195 BP
5818 BP
470 BP
2690 BP
A
B
C1
C2
D
D1
D2
E
F
G
?
?
X

Findings

1. Marine transgression floods region between 5900 – 3100 ybp.
2. Reef development leads to progradation and formation of coastal geomorphology during late Holocene.
3. Reefs exhibit succession that tracks the estuary development through late Holocene.
4. Oyster reef development is restricted to times of modest SLR.
5. The inner bay margins of Estero Bay formed early in the transgression and has remained stable ever since.
6. Barrier island formation was critical to estuary development.
7. Southern region of Estero Bay formed as a deltaic floodplain.

Freshwater Inflow vs. Disturbance

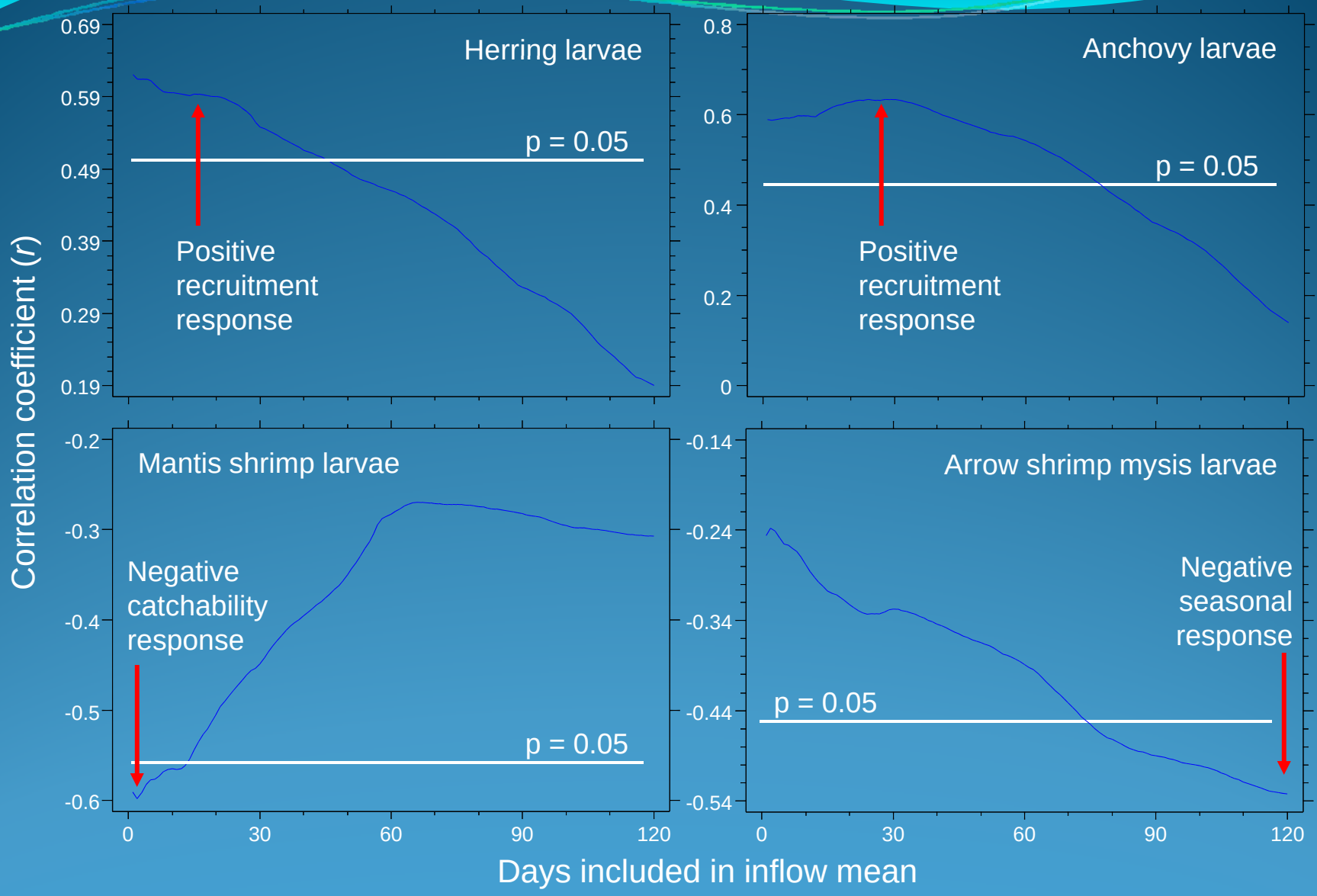


Increased dispersion indicates high variance in community structure among replicate samples and has been used as an indicator of ecosystem disturbance.

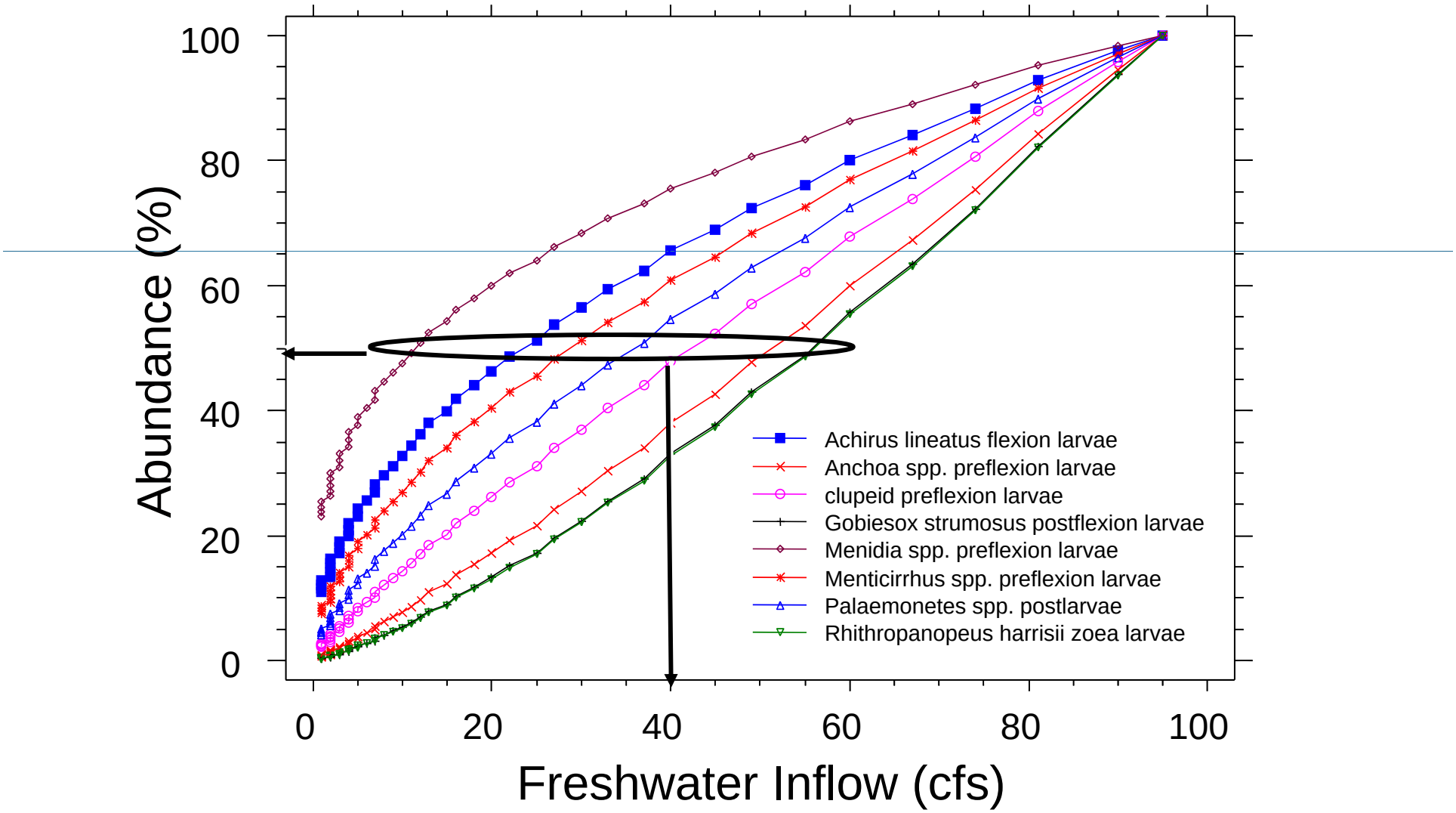
Dispersion positively related to inflow suggesting inflow may disturb community structure of oyster-reef organisms.

Tolley, SG, AK Volety, M Savarese, L Walls, C Linardich & EM Everham III. 2006. Impacts of salinity and freshwater inflow on oyster-reef communities in Southwest Florida. *Aquatic Living Resources* 19:371 387

Zooplankton responses to freshwater inflow



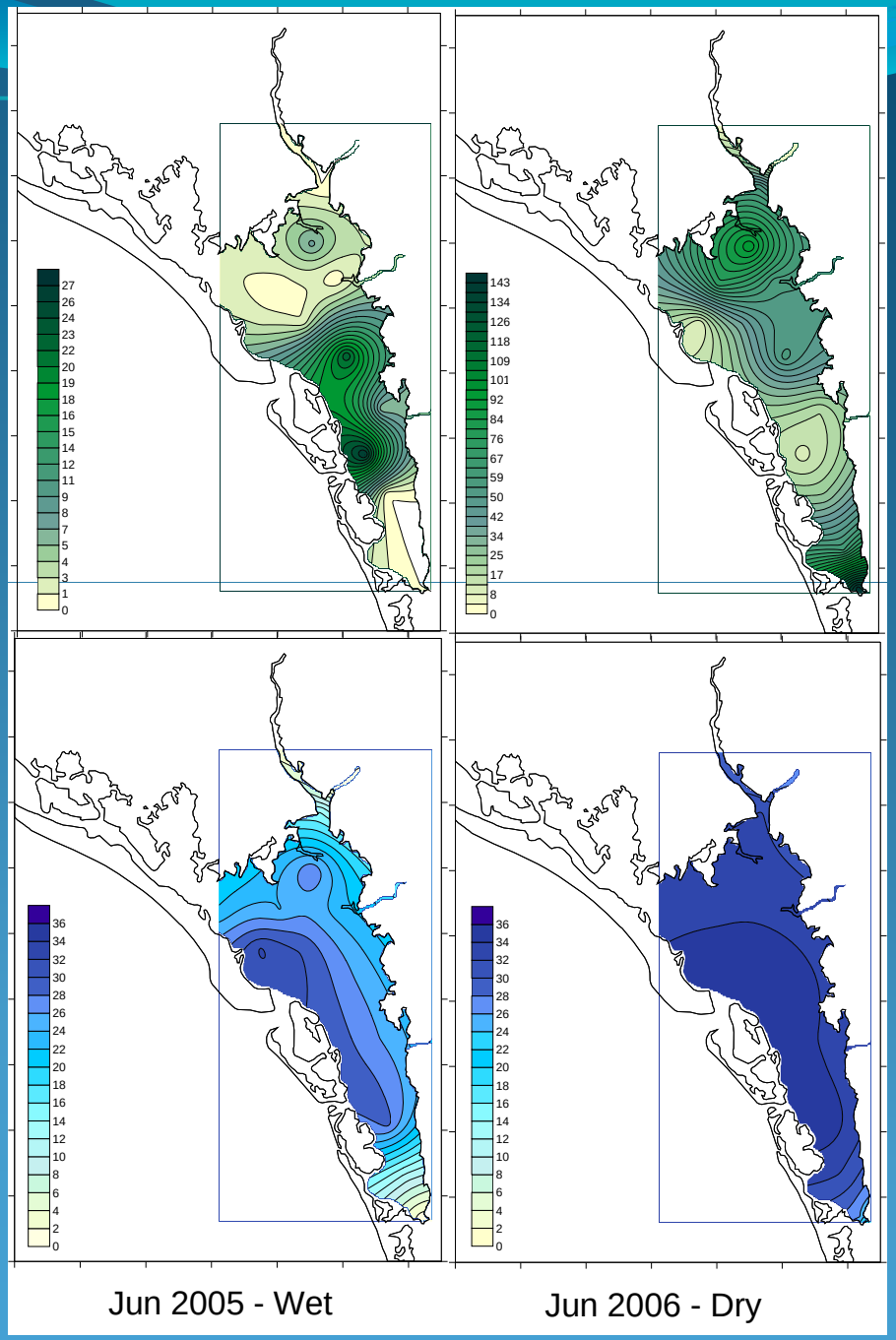
Tolley, SG, EB Peebles, SE Burghart, B Bachelor, J Evans & J Nelson. 2007. Freshwater inflow and utilization of the estuarine tributaries of Estero Bay. Report to the South Florida Water Management District, 227 pp.


Abundance (%)
100
80
60
40
20
0
0
20
40
60
80
100
Freshwater Inflow (cfs)
Achirus lineatus flexion larvae
Anchoa spp. preflexion larvae
clupeid preflexion larvae
Gobiesox strumosus postflexion larvae
Menidia spp. preflexion larvae
Menticirrhus spp. preflexion larvae
Palaemonetes spp. postlarvae
Rhithropanopeus harrisii zoea larvae

Oyster-Reef Recruitment

Downstream displacement of mud crab larvae away from oyster reefs during the wet season

Potential for spatial disconnect between larval supply and settlement habitat



Trophic Transfer and Habitat Use of Oyster (*Crassostrea virginica*) Reefs in Southwest Florida Using Stable Isotope Analysis: Are Oyster Reefs Used for Refuge, Food or Both?

- The objective of this study is to examine whether reef-resident species use the oyster reefs just as a refuge and feeding area, are directly feeding on the oysters themselves, or are engaging in both activities using stable isotope signatures.
- Stable carbon and nitrogen isotopes were used to establish food sources of the different species found on the oyster reefs

Trophic Transfer and Habitat Use of Oyster (*Crassostrea virginica*) Reefs in Southwest Florida Using Stable Isotope Analysis: Are Oyster Reefs Used for Refuge, Food or Both?

- Preliminary results from all sampling dates suggest that at both Hendry Creek and Estero River sites reef resident species are using the oyster reefs mainly as a refuge and rely on other food sources associated with the reefs but do not directly consume the oysters themselves.
- We only looked at resident species and analyzed smaller specimens so transient species and/or larger specimens may show differences in the use of the oyster reef as a food source.

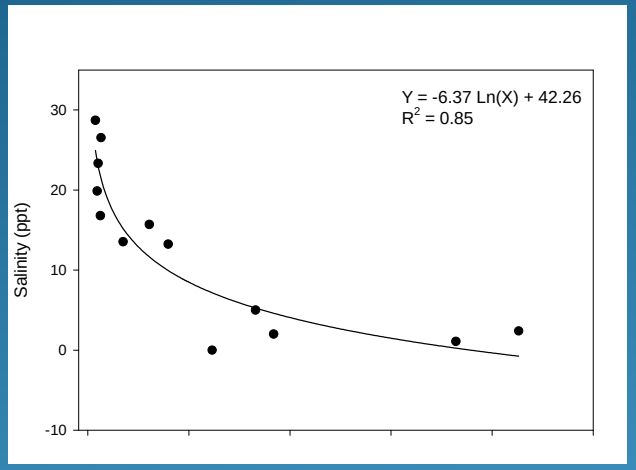
Trophic Transfer from oyster reefs to predatory fish

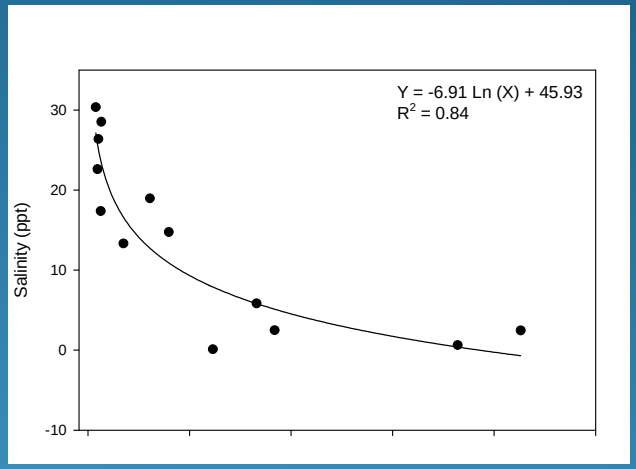
- Study site: Estero Bay, Florida
- 318 fish of 12 different species were captured for gut content analysis using a permitted gill net
- Gut contents included 23 food item categories.
- Gut content analysis was conducted using Lima-Junior et al (2001).
- Importance Index: 45.5% of the diet of predatory fish in Estero Bay exclusively to oyster dwelling organisms. The top species in this category are Xanthidae (42%) and Petrolisthes armatus (3.5%).

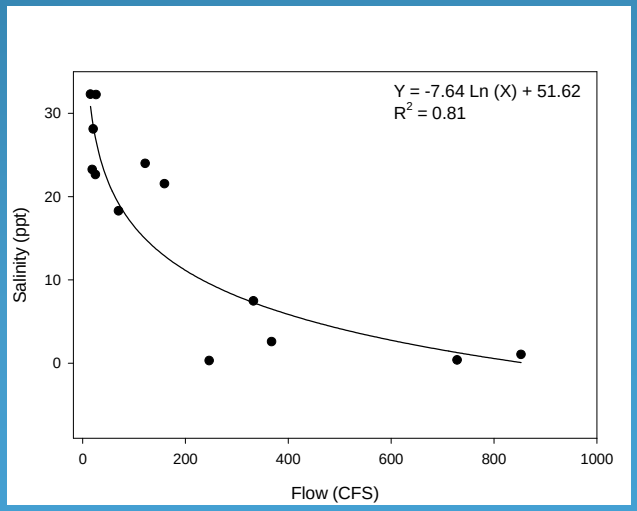
Oyster responses – FW inflows

- **Establish the relation between freshwater inflows and salinities in Hendry / Mullock Creek (altered estuary) and Estero Rivers (un-altered estuary).**
- **Examine the temporal and spatial relationships between salinities in Estero Bay tributaries and oyster responses.**
- **Recommend target freshwater inflows that would sustain and enhance oyster populations in Hendry and Estero Rivers.**

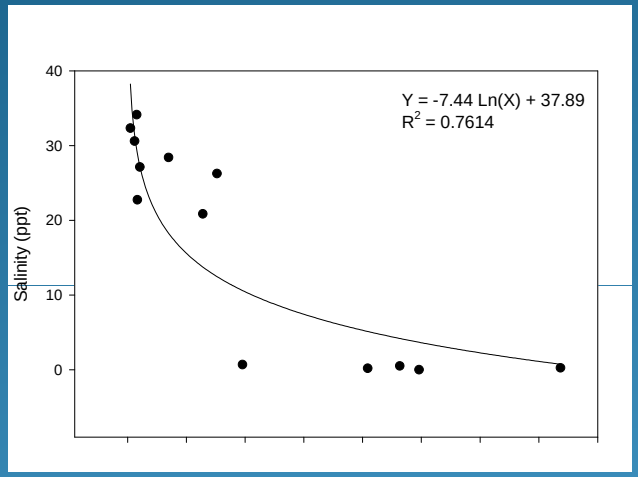
Hendry / Mullock Rivers

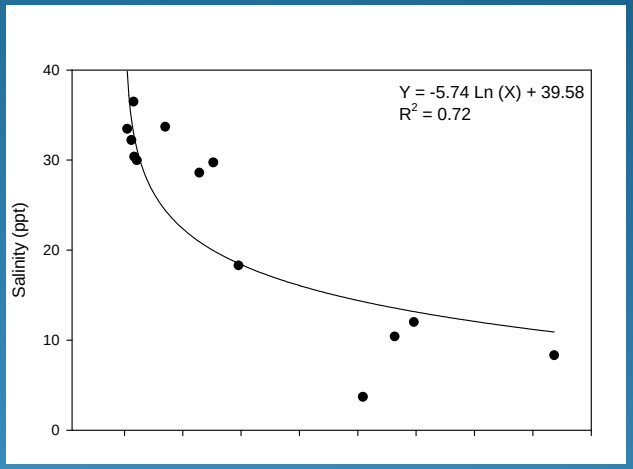


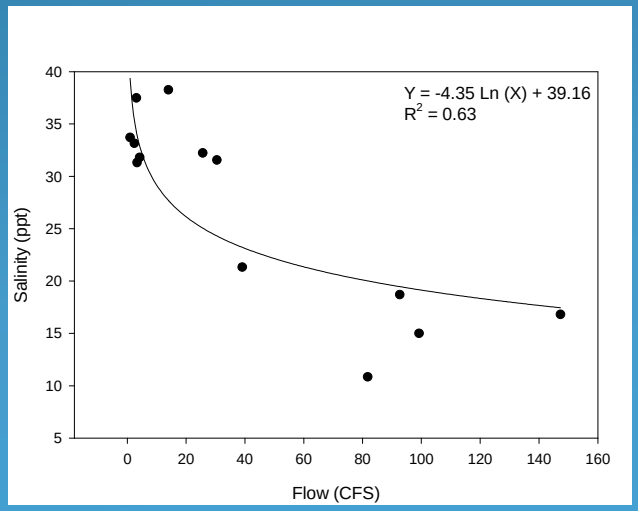




Estero River







Results

- Significant relationship exists between flows from Hendry / Mullock, and Estero Rivers and salinities in these systems (R2 = 81-84%) and in Estero River (69 – 76%).
- Flows below 300 cubic feet per second (CFS) in Hendry / Mullock Rivers and below 50 CFS in Estero River will result in salinities that are favorable to oysters.

Other Studies

- Interactions between green mussels and oysters
- Salinity, temperature tolerance; other stressors on green mussels.
- Uptake and depuration of brevetoxins in shellfish
- Oyster reef / sea grass / mangrove restoration.
- Nutrient transfer and fluxes in various habitats (e.g. sea grasses)
- Mercury transfer from inshore – offshore – risk assessment

Watershed Council
Southwest Florida Watershed Council, Inc.
P.O. Box 61063, Fort Myers, FL 33906-1063
www.swfwc.org

Lee County Government
Southwest Florida
Environmental Labs

Using stable δN^{15} ratios to help differentiate nitrogen sources within a residential community and initiatives to improve the East Mullock Drainage District

Nora Egan Demers
Associate Professor of Biology and Interdisciplinary Studies
Florida Gulf Coast University
Ft. Myers, Florida

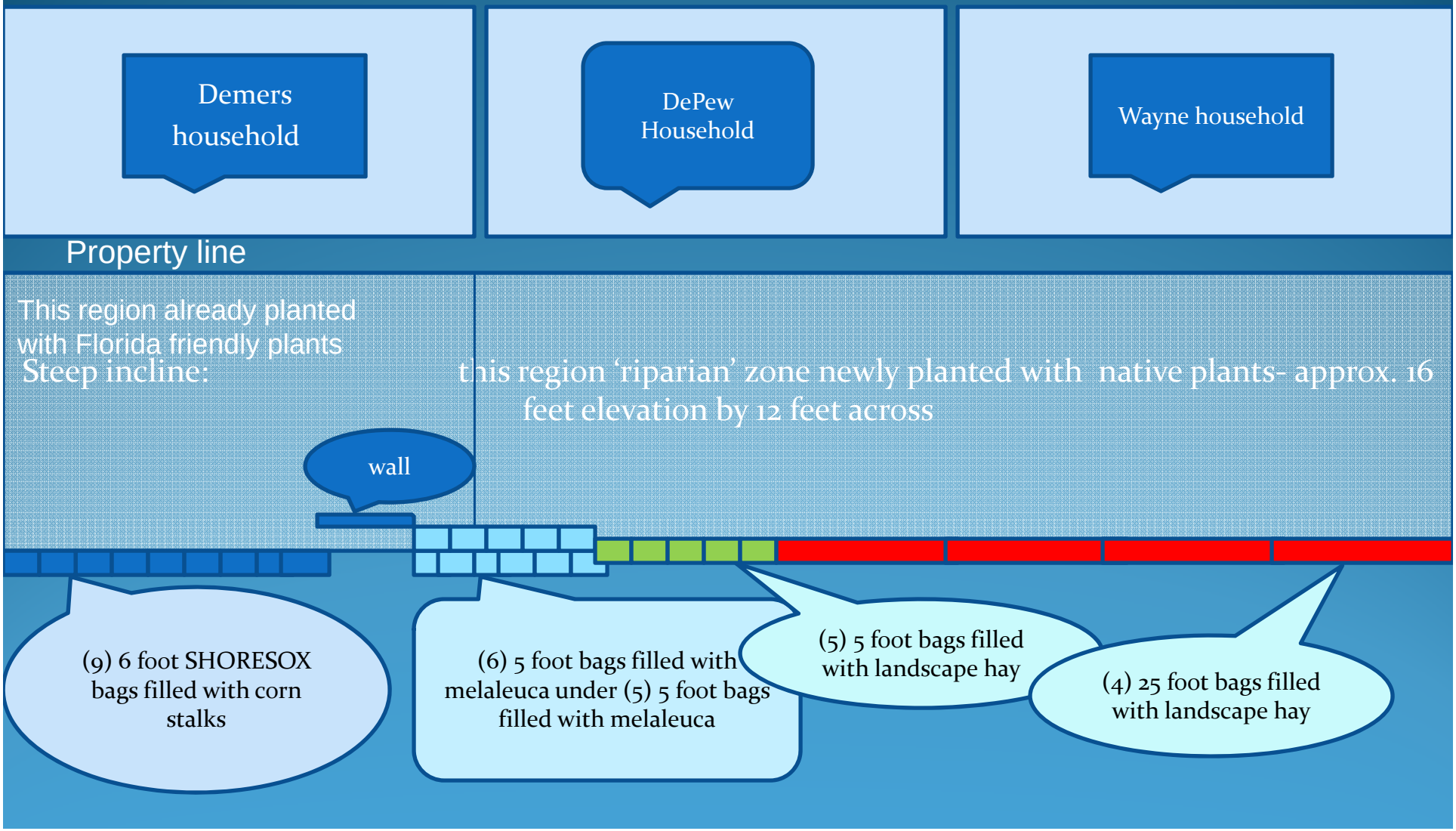
Report to the Estero Bay Agency on Bay Management

September 14, 2009

Shoreline Stabilization- East Mullock Drainage District Habitat Restoration Project- Demers

SHORESOX installed May-July, 2009

Plants installed June-August, 2009



"A Journey Down the Corkscrew Watershed"

An educational curriculum designed to enhance non-science major understanding of local ecosystems and ecology, key environmental issues, and sustainability

- Activity-based Learning
- Lab and Field-based Activities
- Nature Journal and Reflective Exercises
- Off-campus Field Excursions (from headwaters of watershed to estuarine areas)
- Final Project focus on Sustainability

Poster Title:

A Journey Down the Corkscrew Watershed:
An Activity-Based Curriculum Focused on Sustainability

David Patrick James Green
Department of Marine & Ecological Sciences

Collaborators

- Abeels, Griffith, Demers, Goncalves, Green, Linsin, Loh, Rumbold, Savarese, Tolley…