

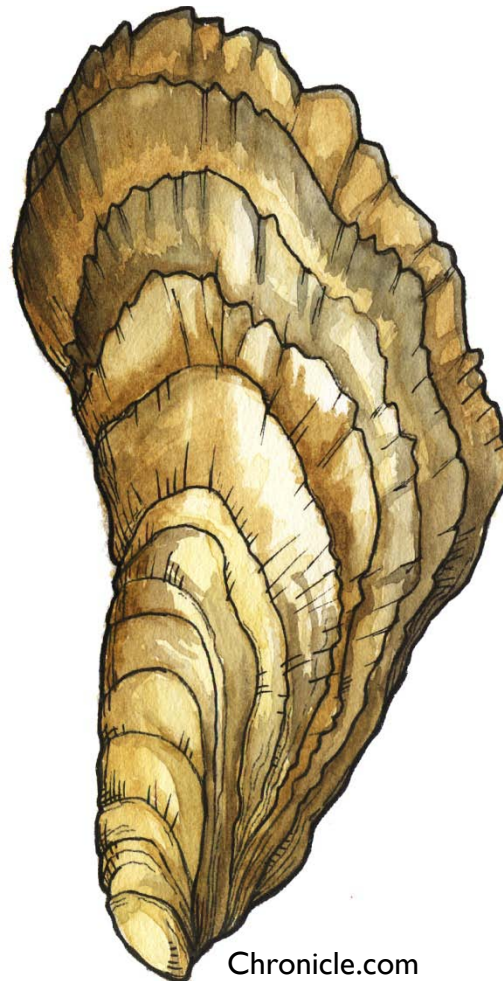


Ecosystem Services of Oyster Reefs

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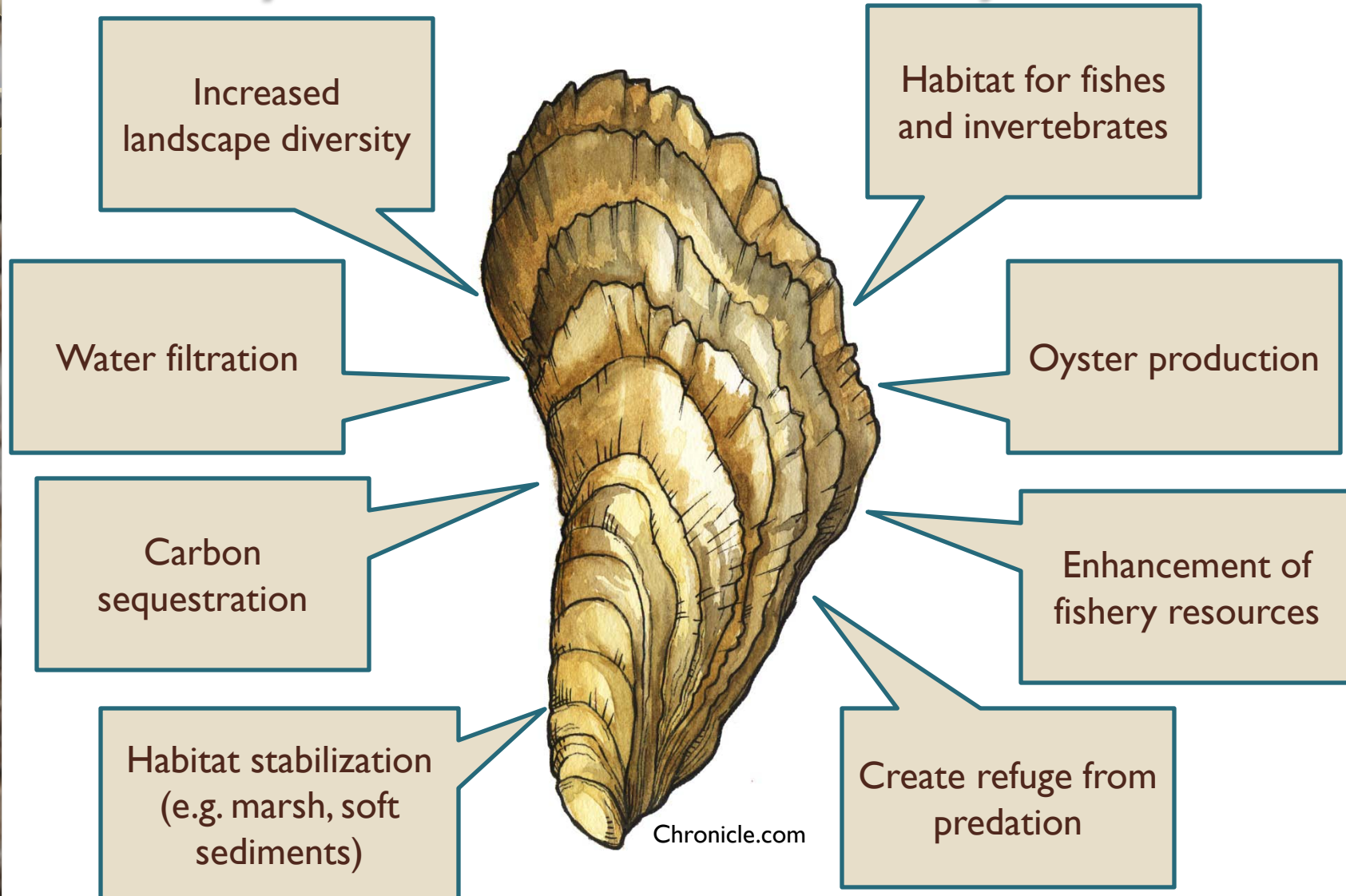
Ecosystem services of oysters

- Oysters provide benefits to human health and well-being

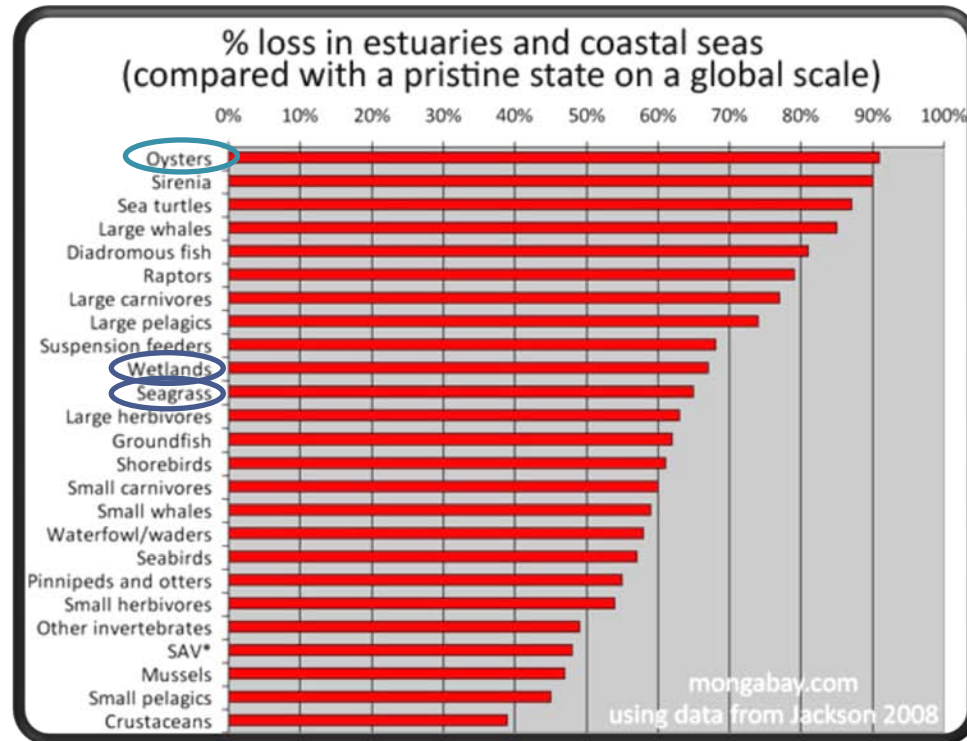



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Ecosystem services of oysters



- Oyster reefs are one of the most threatened marine habitats on earth
 - Estimates of 85-91% loss globally



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- Oyster reefs are one of the most threatened marine habitats on earth
 - Estimates of 85-91% loss globally
 - Habitat loss due to:
 - Shell dredging
 - Nutrient pollution
 - Coastal development
 - Altered river flows
 - Disease
 - Loss of oyster habitat = loss of beneficial services for humans and the environment



Ecosystem services of oysters:

Three case studies

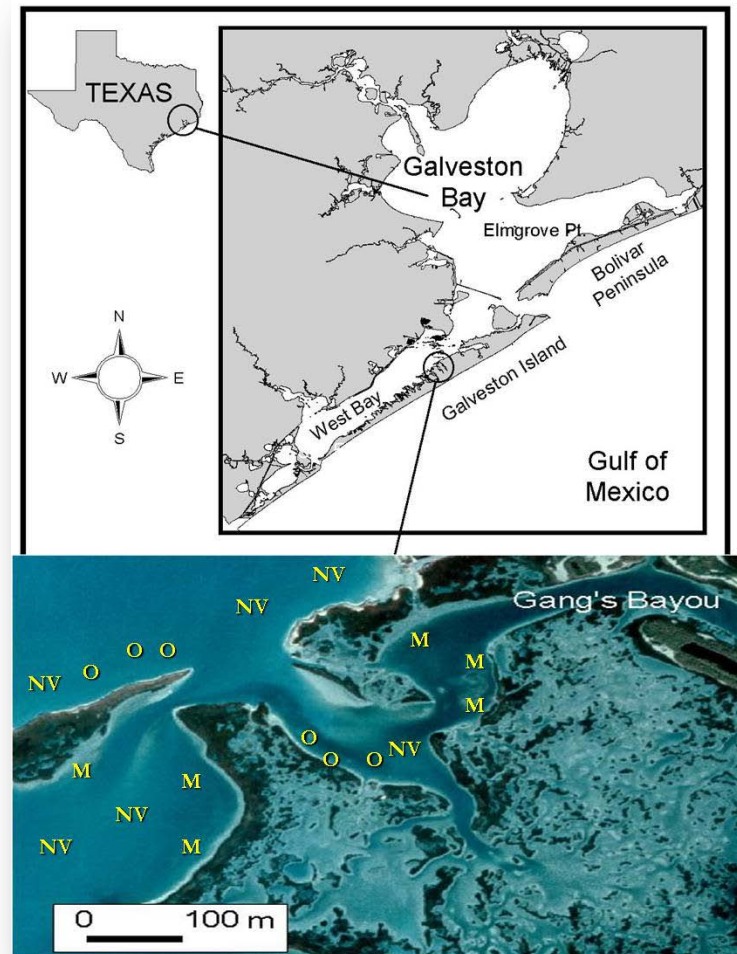
Case Study 1: Oyster reefs as habitat for fish and invertebrates

Case Study 2: Oyster reef complexity influences habitat use

Case Study 3: Oysters as nutrient regulators

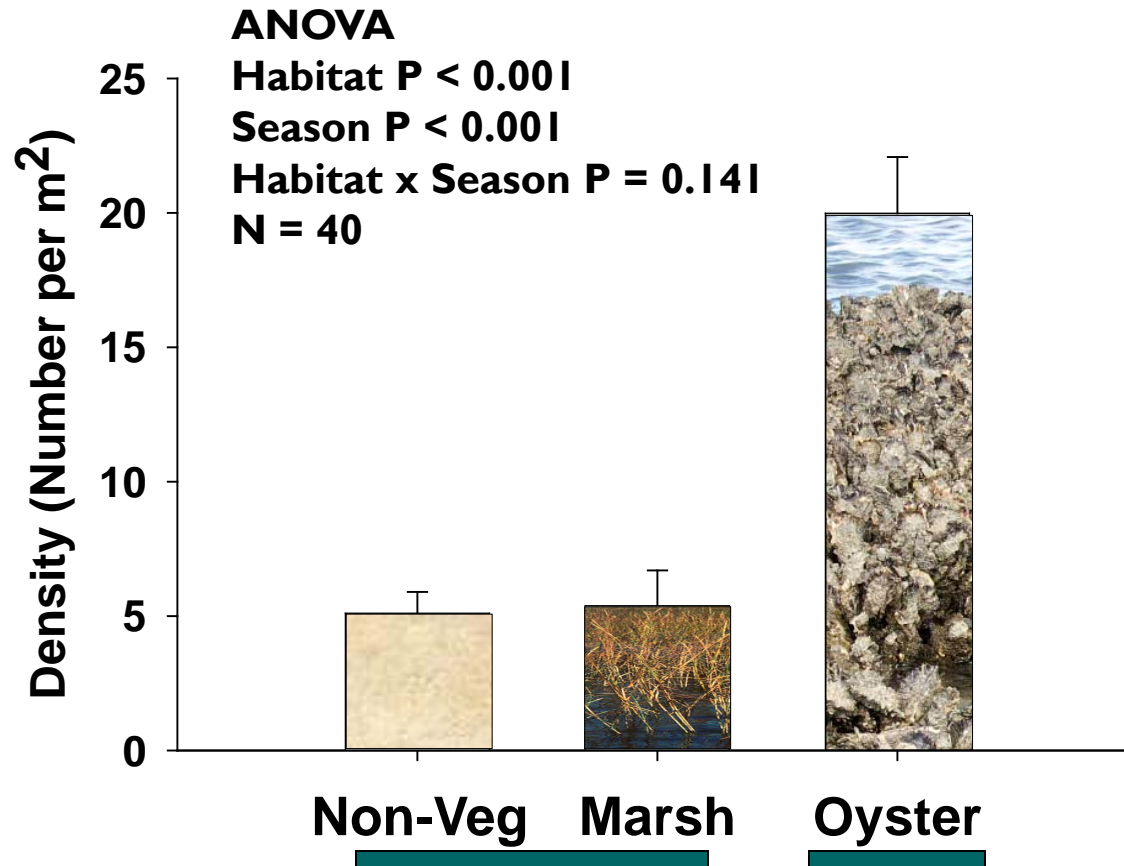
Oysters as habitat: Case study I

- Experimental design
 - Habitat type:
 - Intertidal Oyster
 - Marsh Edge
 - Nonveg Bottom
 - 10 drop samples in each per season (N=40 per habitat)

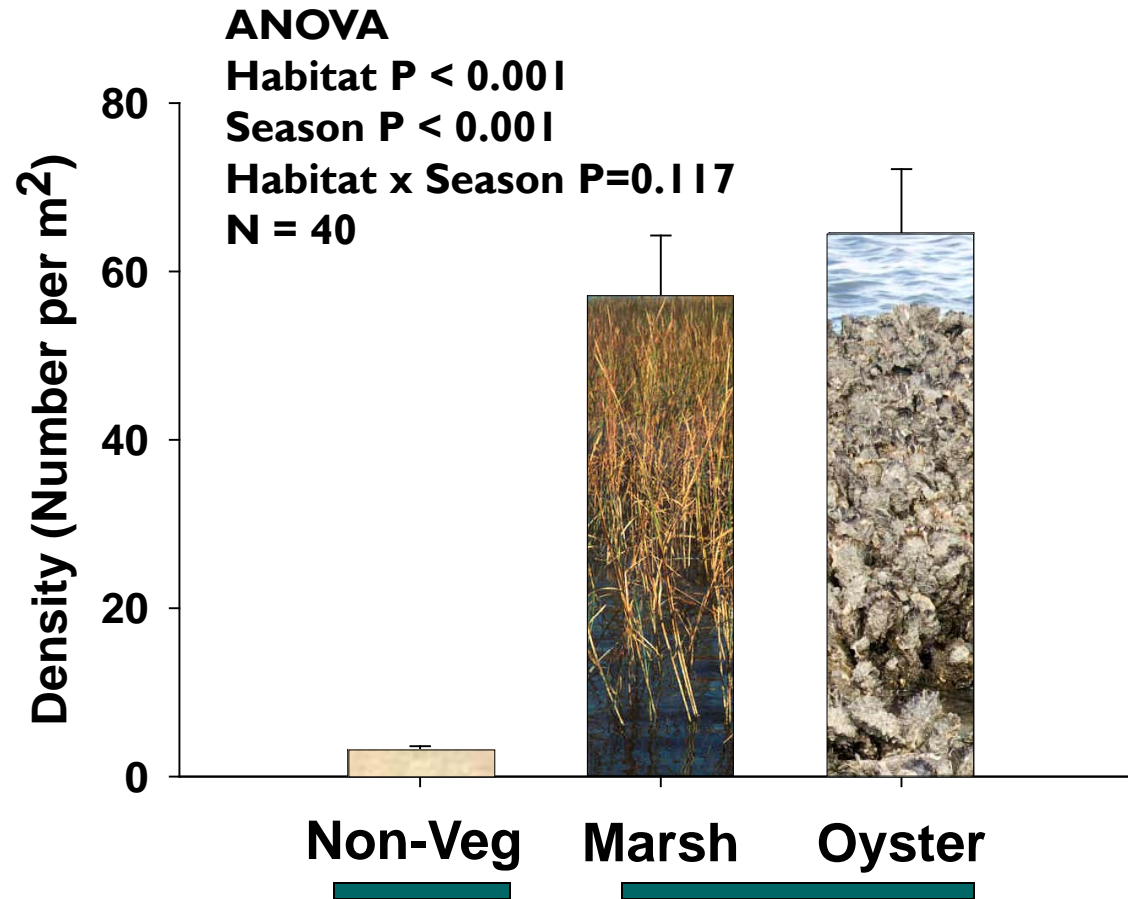


Stunz, G.W., T.J. Minello, L. Rozas. 2010. Relative value of oyster reef as habitat for estuarine nekton in Galveston Bay, Texas. *Marine Ecology Progress Series* 406:147-159.

Overall finfish densities



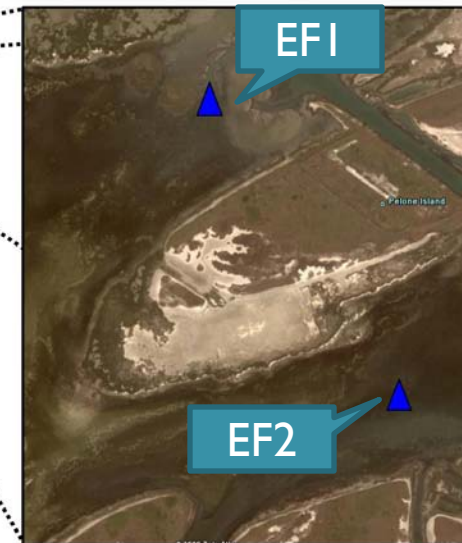
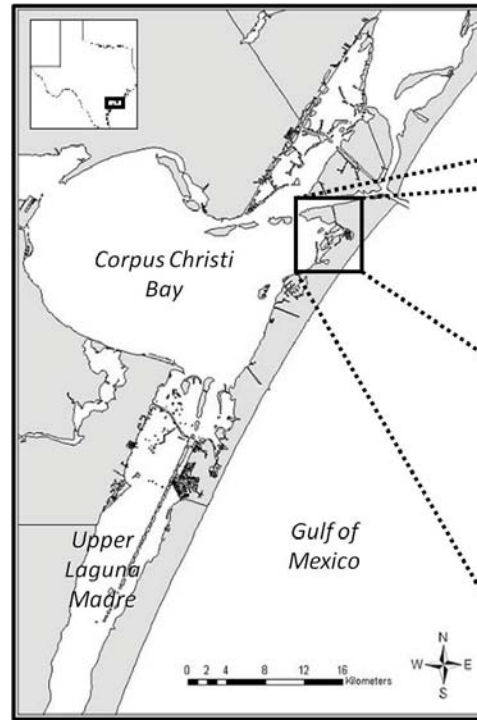
Overall decapod crustacean densities



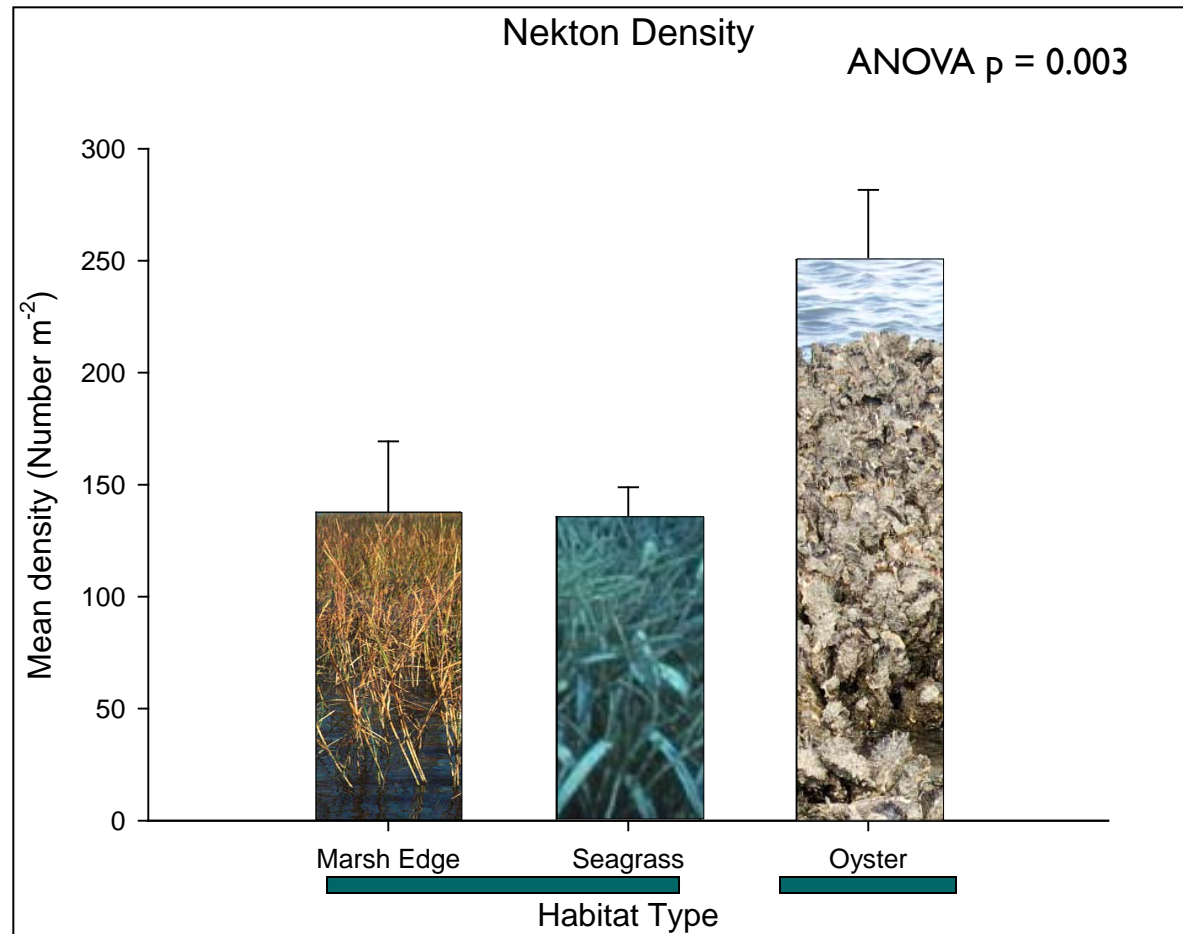
Stunz et al. (2010)

Oysters as habitat, continued

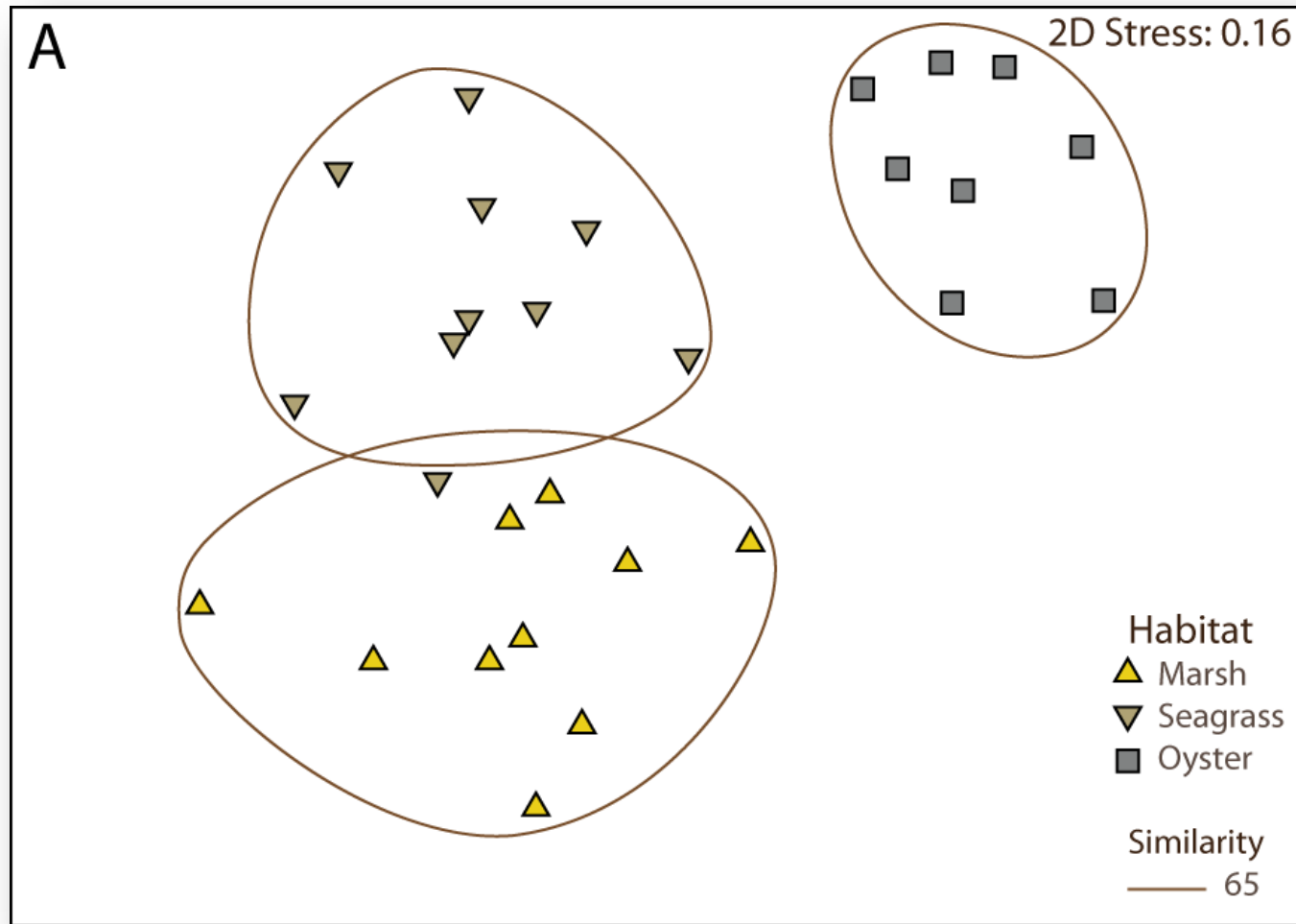
- 2 sites
 - 15 plots
 - 85 days in field
 - Drop sampler
- Also sampled:
 - 20 seagrass
 - 20 marsh edge



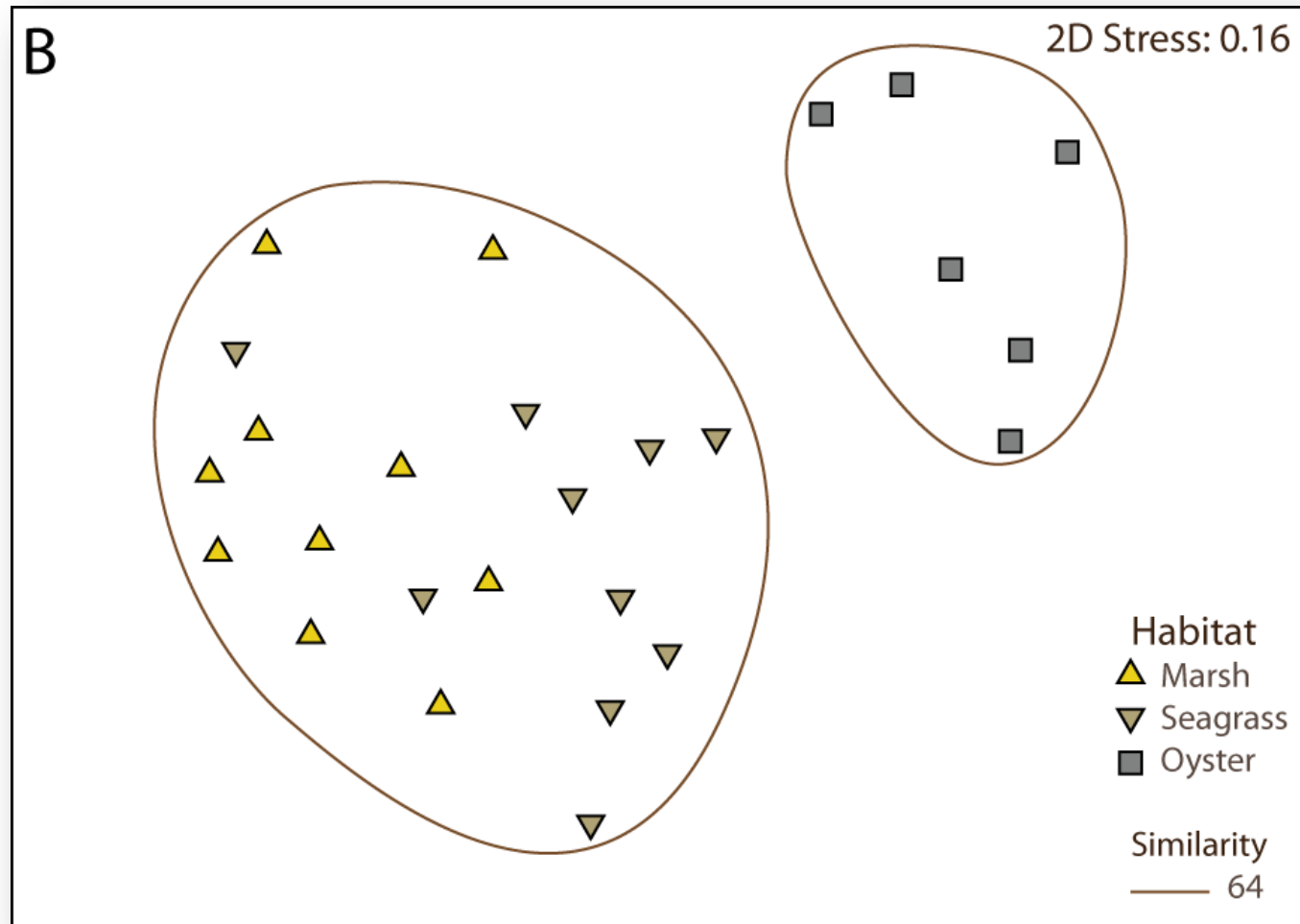
Overall nekton density



Analysis of community composition: Spring



Analysis of community composition: Fall





Conclusions – Oysters as habitat

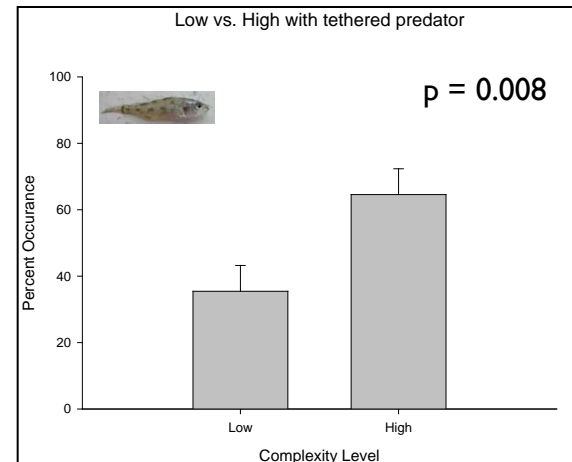
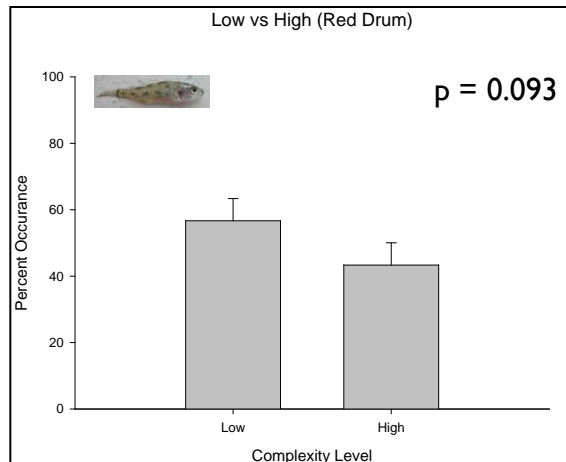
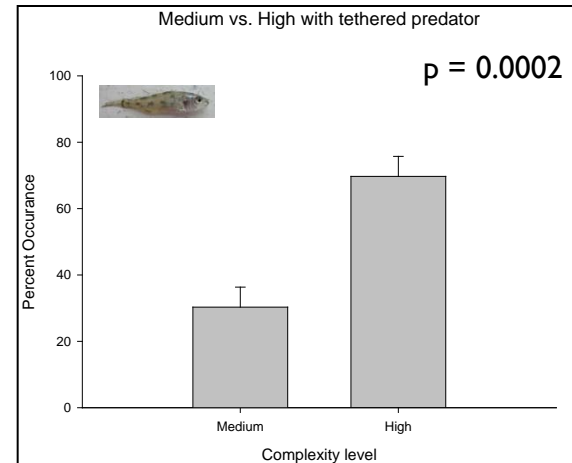
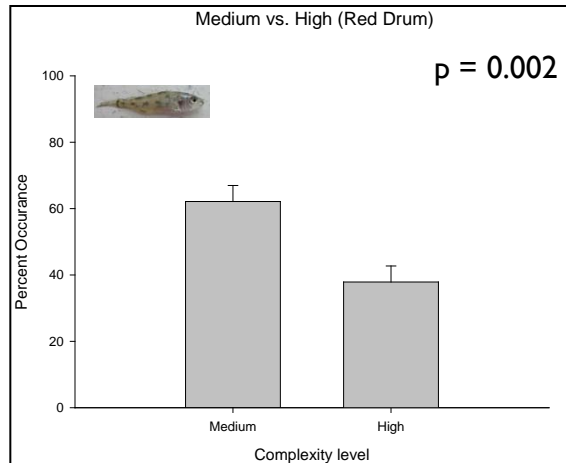
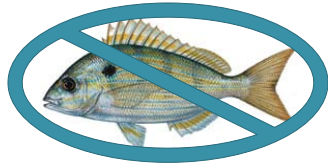
- Intertidal oyster reef supported high levels of finfish and decapod crustacean productivity
- Oyster reef may be critical habitat for many estuarine species
 - Different species are utilizing oyster reef habitat than seagrass or marsh edge habitats

Effects of reef complexity on habitat use: Case study 2

- 4 levels of oyster complexity:
 - None, low, medium, high
 - 2 per tank
 - 10 reps of each pair
- 2 predator treatments:
 - Pinfish, no pinfish
- 3 red drum per tank
 - Location recorded every 30 min for 5 hours



Results





Conclusions – reef complexity

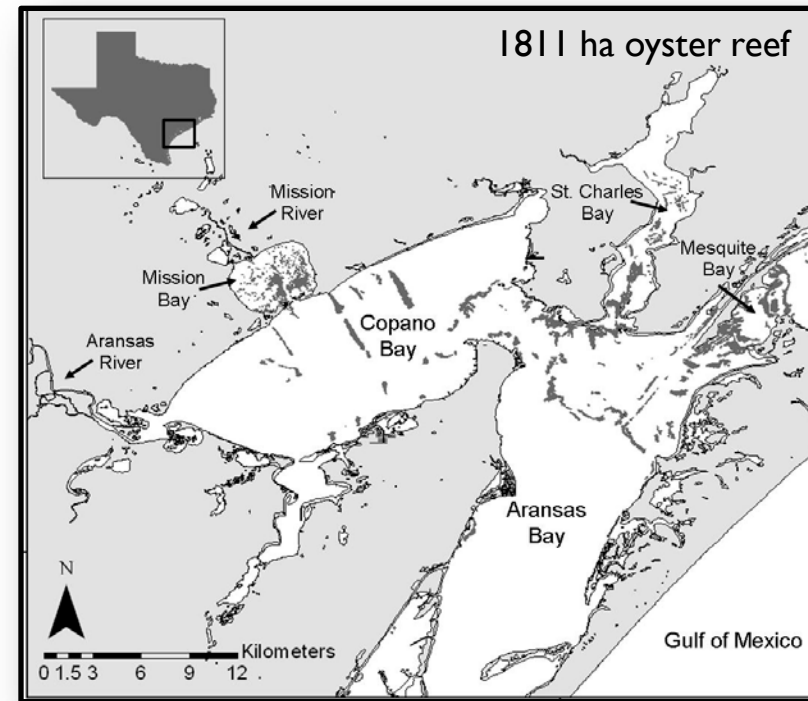
- Increased habitat complexity (structure) may offer protection from predation

Future work

- Assigning economic values to reefs in terms of habitat use
- How does complexity affect these values?

Oysters as nutrient regulators: Case study 3

- Study period 2007-8
- 10 reefs sampled per month with TPWD
- Measurements:
 - 20 live oysters per site (shell length and biomass)
 - Dead shell (>25 mm)
 - Chl-a, nutrients, TSS



Mission-Aransas Estuary

Yoskowitz et al. (in prep)



Oysters as nutrient regulators: Case study 3

- Calculated the service of nutrient regulation by focusing on nitrogen
 - Replacement cost methodology - what would it cost to engineer the same service?
 - Pennsylvania DEP estimate: \$2.33 a pound for nitrogen removal via wastewater treatment plant (nutrient trading)
- Other methods also available such as willingness-to-pay and hedonic pricing

Yoskowitz et al. (in prep)



Bio-Physical Results

- Average oyster size was 70 mm x 35 mm
- We estimate 25% live oysters based on monthly sampling
- Nitrogen removal is via Chlorophyll-a
- Filtration rates calculated at 16.6 ml/individual/minute
- Clearance rate of N was calculated to be 3.6 ug/individual/min

Yoskowitz et al. (in prep)



Valuation Results

- Given the areal extent of the reef (1811 ha) and the estimated number of live oysters (1.8 billion)
 - Reefs within the Mission-Aransas Estuary have the potential to clear 7.1 million pounds of N per year
- Given the replacement cost per pound of N removal (\$2.33)
 - The potential yearly benefit provided by the oyster reefs for N removal is:
\$15.8 million

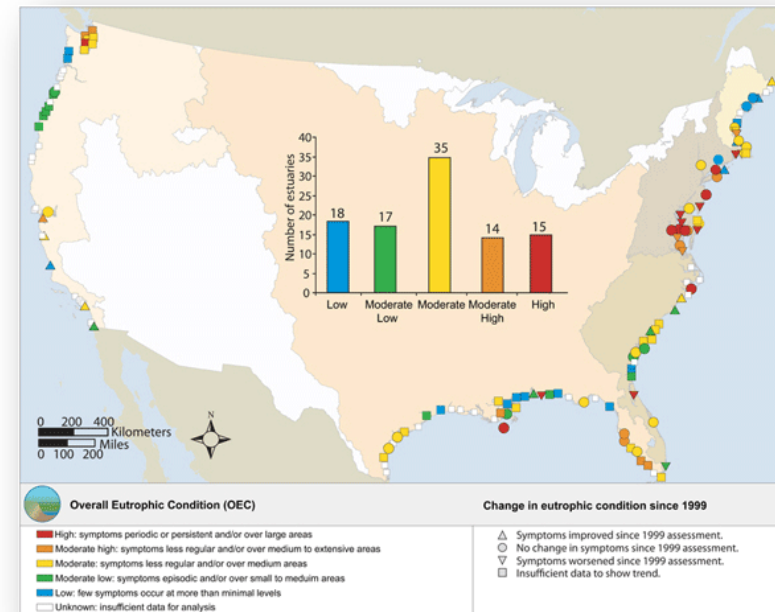
Yoskowitz et al. (in prep)

Implications of nutrient regulation

- High nutrient levels can cause estuarine eutrophication
 - Can lead to algal blooms, hypoxia/anoxia, SAV loss
- Oysters can play an important role in nutrient regulation
 - Represents significant economic & ecological benefit



EFFECTS OF NUTRIENT ENRICHMENT IN THE NATION'S ESTUARIES:
A Decade of Change



Overall eutrophic condition of estuaries

