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Understanding Ecology of Atlantic Rangia
Toward Better Management of Freshwater Inflows

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Introduction
• Atlantic Rangia, Rangia cuneata, is an oligohaline clam that is native to the northern Gulf of Mexico.
• Atlantic Rangia is one of the primary indicator species for establishing freshwater inflow regimes in multiple Texas estuaries (Johns, 2012).
• Galveston Bay historically has been the leading fishery resource in Texas, contributing to approximately one third of the state’s commercial fishing income (Lester et al., 2002).
• The main objective of this study was to examine the potential influences of salinity and freshwater inflow on Atlantic Rangia abundance and health.
• Results of this study will help resource managers better estimate and establish freshwater inflow regimes in the Trinity River Estuary.

Study Area
Figure 1. Map of study area, Trinity Bay, Texas.

Methods
• Ten study sites throughout the delta (Fig 1).
• Installed on-site gear continuously (every 15 min) monitors salinity, temperature, conductivity, water depth and atmospheric pressure. Gear maintained and data retrieved monthly (Fig 2a).
• Atlantic Rangia and sediment sampled quarterly (total of six events).
  o Hand sampling: 1 m² Quadrat (3 replicates) (Fig 2b).
  o Clam rake 30 second pull (3 replicates) (Fig 2c).
  o Sediment samples for percent fines analysis (Fig 2d & 2e).
• Lab Analysis
  o 20 Rangia from each site measured (length, width, and height) (Fig 2f).
  o 10 Rangia from each site weighed for health assessment (meat index).

Results
Figure 3. Historic freshwater inflow from Trinity River (USGS gage at Romayor # 08066500) and summary of Atlantic Rangia results from past and current studies. Inflow chart shows general trend of increasing flows and studies show concomitant increase in meat index (MI) through time.

Conclusion
• In general, throughout the Trinity River Delta, Atlantic Rangia health (as measured by meat index) increases as freshwater inflow increases.
• Preliminary analysis suggests that abundance and proportion of live Atlantic Rangia didn’t appear to vary directly with salinity or percent fines.
• Abundance and proportion of live Atlantic Rangia is likely a result of a combination of many factors including (but not limited to) salinity, sediment type, localized water velocity, sedimentation, and water depth (Parnell et al., 2011).

Ongoing and Future Work
• Shell-sectioning of individual clams from each site and trip to visualize:
  1) Annual growth increments to estimate age-length relationship by site and year (Fig 6).
  2) Daily growth increments (thin-sectioning) to observe the effect of salinity, temperature and other conditions on daily growth (von Leesen, 2014).
• Hydrodynamic modeling in the Trinity River Delta using publicly available (freshwater inflows, tide regime) and acquired data (salinity, barometric pressure and water surface elevation) (Fig 7).

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Literature Cited

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Figure 2. EIH staff and students conducting field and lab work.

Figure 4. Atlantic Rangia abundance shown by graduated symbols where n is the total number of clams per site throughout the study. Green area on the pie chart represent live clams while gray area represent dead, but whole, clams.

Figure 5. A) Freshwater discharge and salinity at the upstream gage (USGS gage at Wallisville # 8067452) during current study shows two distinct periods in terms of inflows amount and salinity (dry period with tan panel and wet period in light blue panel). B) The average meat index (MI) by site and period.

Figure 6. Low-speed diamond wheel saw used for shell sectioning.

Figure 7. EIH staff measuring water surface elevation using DGPS.