**Effects of River Diversions, Restoration, and Salinity on Fishes and Invertebrate Community Structure in Southeast Louisiana Marshes**

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**Abstract**

Salt marshes are productive ecosystems that provide a variety of benefits, including protection from storms, carbon sequestration, nutrient removal, and food and refuge for the juveniles of many recreationally and commercially important species. Despite these benefits, Louisiana is losing marshes at an unprecedented rate of over 40 km² per year, in part due to a lack of sediment supply from freshwater inflow. Several solutions have been proposed to rebuild marshes, including reestablishing the natural hydrology of the Mississippi River and targeted placement of sediment in heavily eroded areas. However, the successional trajectory of fish and invertebrate community structure as it relates to restoration practices and changing salinity patterns due to riverine input, as well as the interactive effects, remains unclear. Here, we present preliminary fish and invertebrate data from marshes near the West Pointe a la Hache siphon. In year 1 of this project, we conducted trawls and suction sampling to quantify the abundance, diversity, and community structure of organisms in a range of natural and previously restored marshes. In years 2 and 3, we anticipate that the siphon will be operational and hypothesize detectable shifts in nektobenthic community structure along both restoration and salinity gradients. These data will provide valuable information for environmental managers to determine best practices for operating diversion structures and marsh restoration methods to maximize fisheries production and will increase our knowledge of anthropogenic impacts, and mitigation efforts, in a rapidly changing ecosystem.

**Introduction**

- Increasing coastal wetland loss represents a significant threat to coastal Louisiana’s natural resources.
- Given that salt marshes provide numerous valuable ecosystem services, ranging from habitat and food sources to serving as a buffer from high energy storm events, maintaining/restoring these areas is a priority.
- Among the many approaches maintaining salt marsh is building marshes using dredge spoil and reintroduction of the Mississippi River to supply freshwater and sediment.
- Here, we present fish and invertebrate data from Year 1 sampling of a 3-year project to determine the interactive impacts of created marshes and Mississippi River water introduction from the West Pointe a la Hache siphon (FIGURE 1).
- In Year 1 (May 2018), the siphon is off providing critical baseline information.
- Future sampling events will be conducted with the siphon on.

**Objectives**

- Examine species composition, relative abundances, and food web structure at created vs. natural marshes.
- Examine species composition, relative abundances, and food web structure in natural marshes along a salinity gradient.

**Trawling**

- To quantify off-marsh fishes and macroinvertebrate abundance, we used a 4.9-m otter trawl towed along each bank for 3 minutes at 2-3 knots
- At each site, 8 trawls were conducted at each created and gradient site (48 total)
- Organisms were identified, measured, counted, and the catch was standardized to CPUE

**Table 1. Mean species CPUE at each site.**

<table>
<thead>
<tr>
<th>Species</th>
<th>PS7</th>
<th>WPH1</th>
<th>WPH2</th>
<th>WPH3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic Stingray</td>
<td>0.0</td>
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<td>0.0</td>
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<tr>
<td>Brown Shrimp</td>
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<tr>
<td>Atlantic Croaker</td>
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</tr>
<tr>
<td>Highfin Goby</td>
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<tr>
<td>Salinity Gradient</td>
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<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Shannon Diversity (+1SE)</td>
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<td>0.0</td>
<td>0.0</td>
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<tr>
<td>Abundance (+1SE)</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

**Suction Sampling**

- To quantify invertebrates and small fishes at the marsh edge, we utilized a Venturi-driven suction sampler
- At sites along the salinity gradient (PS7, WPH2, and WPH1), 10 samples were taken at each site (30 total)
- Organisms were stained, sorted, identified, and counted after return to the lab

**Figure 2.** Multidimensional scaling plot for community structure at each site indicating significant (p<0.001) difference in community structure along the salinity gradient.

**Figure 4.** Benthic invertebrate community composition along the salinity gradient. Significant differences (ANOSIM, p<0.001) exists among sites.

**Acknowledgements**

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