Recovery of Galveston Bay Saltmarsh Nekton Communities after Hurricane Harvey

Jenny W. Oakley*, Cory Scanes, Mandi Gordon, and George Guillen

Environmental Institute of Houston, University of Houston-Clear Lake, Houston TX

*Oakley@uhcl.edu

Introduction

- Coastal saltmarshes provide nursery habitat for many estuarine dependent species.
- They are also home to a species of particular interest – Saltmarsh Topminnow (*Fundulus jenkinsi*), an ESA candidate species.
- This mini-study is an extension of a population distribution, abundance and habitat utilization study for the Saltmarsh Topminnow.
- Hurricane Harvey resulted in wide-spread flooding in the Houston Area.
- We intensified sampling at two index sites in Galveston Bay to examine the impacts of disturbance on the saltmarsh nekton communities.
- The primary objective of this special-study was to evaluate the recovery of saltmarsh nekton communities following a record flood event.
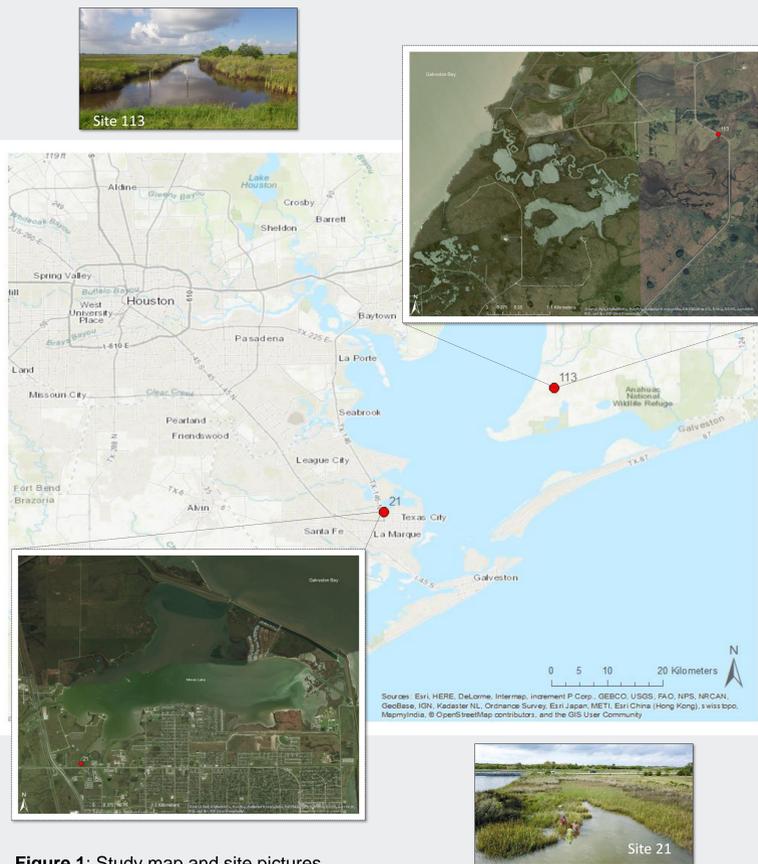
Study Area

Figure 1: Study map and site pictures.

Methods

- 2 index sites in Galveston Bay – (Figure 1)
- Sampled from February – December 2017
- Pre-flood sampled every two months
- Post-flood sampled every two weeks
- Ambient Conditions – Water depth (m), salinity (psu), dissolved oxygen (mg/L), temperature (C), secchi depth (m), vegetation community.
- Nekton Sampling – (Figure 2)
  - 15' Minnow Seine (3 reps, 10m ea)
  - Breder Trap (3 reps, overnight soak) * Not included in analysis for this poster

Figure 2: Nekton collection methods a) minnow seine, b) Breder trap

Results

Environmental

- Immediately following the Hurricane Harvey flood event, salinities recorded at sites 21 (1.16 psu) and 113 (0.47 psu) were exceptionally low.
- Both sites experienced increases in water level with complete inundation of the saltmarsh habitats (Figure 3).
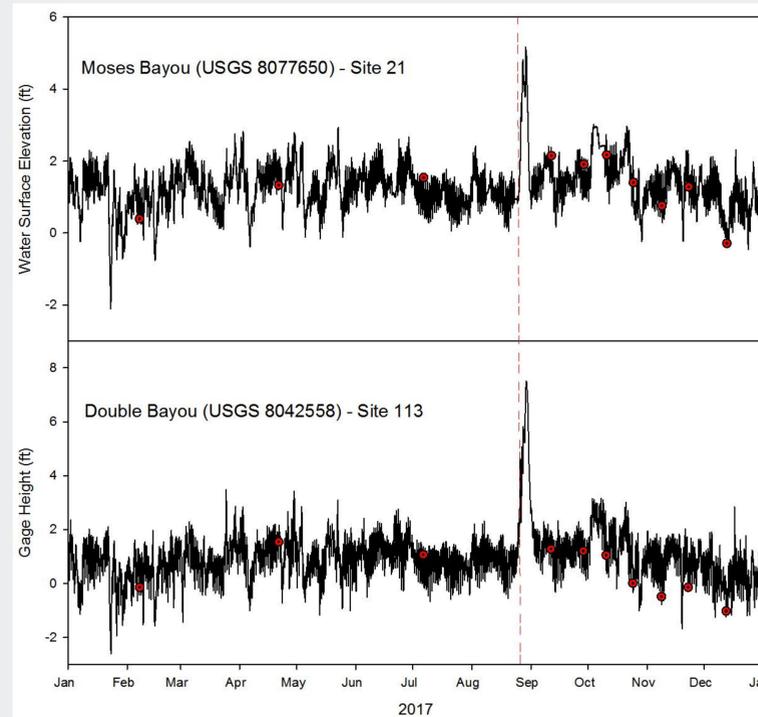

Figure 3: USGS water level data for 2017, illustrating the flood event following Hurricane Harvey's Landfall on August 25, 2017 (red dashed line) with sampling events plotted as red circles.

Nekton Community

- A total of 61,234 individuals from 44 different species were collected for the analysis for this poster.
- Abundance (and richness) decreased immediately following the flood disturbance (Figure 4a).
- Decreased abundance post disturbance was primarily driven by the grass shrimp, *Palaemonetes pugio*.
- Diversity (and evenness) increased immediately following the flood disturbance (Figure 4b).
- Community shows signs of returning to pre-disturbance structure over the four months of post-disturbance sampling (Figure 5).
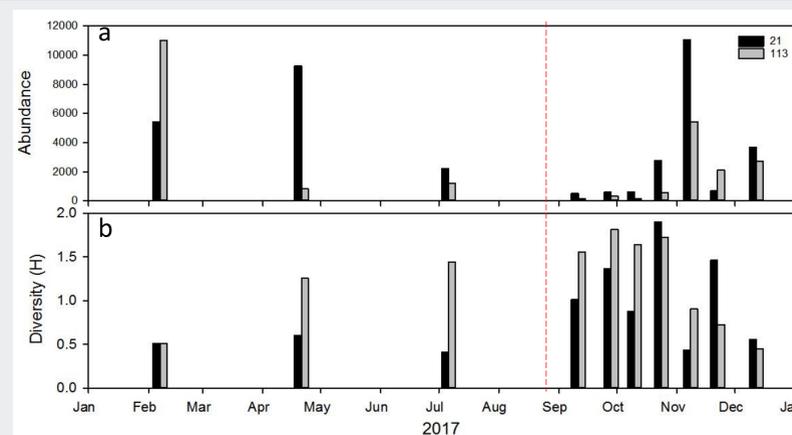

Figure 4: a) Abundance and b) Shannon Weiner diversity of catch by sampling event at sites 21 (black bars) and 113 (grey bars).
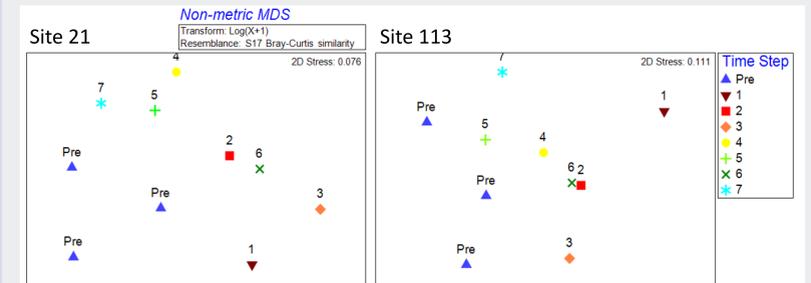

Figure 5: nMDS plots of nekton communities by site and sampling event. Events prior to flood (blue triangles) and time step of each event following the flood (1=first event post-flood, etc.).

Discussion

- Reduced abundance and increased diversity of a saltmarsh nekton community were documented following a flood disturbance event.
- These differences can be largely attributed to a reduced catch in the numerically dominant *P. pugio* following the event leading to higher diversity and evenness, despite reduced number of taxa (Magurran 2004).
- Due to the large scale of the event there were no reasonable refugia for marine species, while freshwater species were displaced into estuarine saltmarsh habitats.
- Large disturbance events such as hurricanes (tidal surge) and floods have been shown to impact saltmarsh nekton communities inversely but in both cases *P. pugio* have been shown to be drivers of these community changes (Piazza and Peyre 2009).
- Community structure showed signs of recovery within 4 months post-disturbance, agreeing with other studies that suggest estuarine environments are highly resilient to short-term, natural disturbance events (Paperno et al. 2004, Waide 1991).
- Natural seasonal shifts can make it difficult to discern cause and effect of disturbance to saltmarsh nekton community structure.

Conclusions

- This study illustrated the impacts of a major flood disturbance event on saltmarsh nekton communities.
- Short-term but large-scale natural disturbance events (such as hurricanes and floods) impact saltmarsh nekton communities differently, but in both cases these ecosystems are generally resilient and quick to recover.

Future Work

- Continue to monitor saltmarsh nekton communities along the central to upper Texas Coast
- Investigate long-term trends in community structure at site 21 (using historic data) to tease out seasonal recruitment patterns and variability to better understand the impacts of the flood disturbance.

Literature Cited

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