Nearshore Pink Shrimp Densities and Habitat Limitations in Biscayne Bay: A Saptiotemporal Analysis of 10 Years of Data

Ian C. Zink[1,2], Joan A. Browder[2], Diego Lirman[1], Joseph E. Serafy[1,2]

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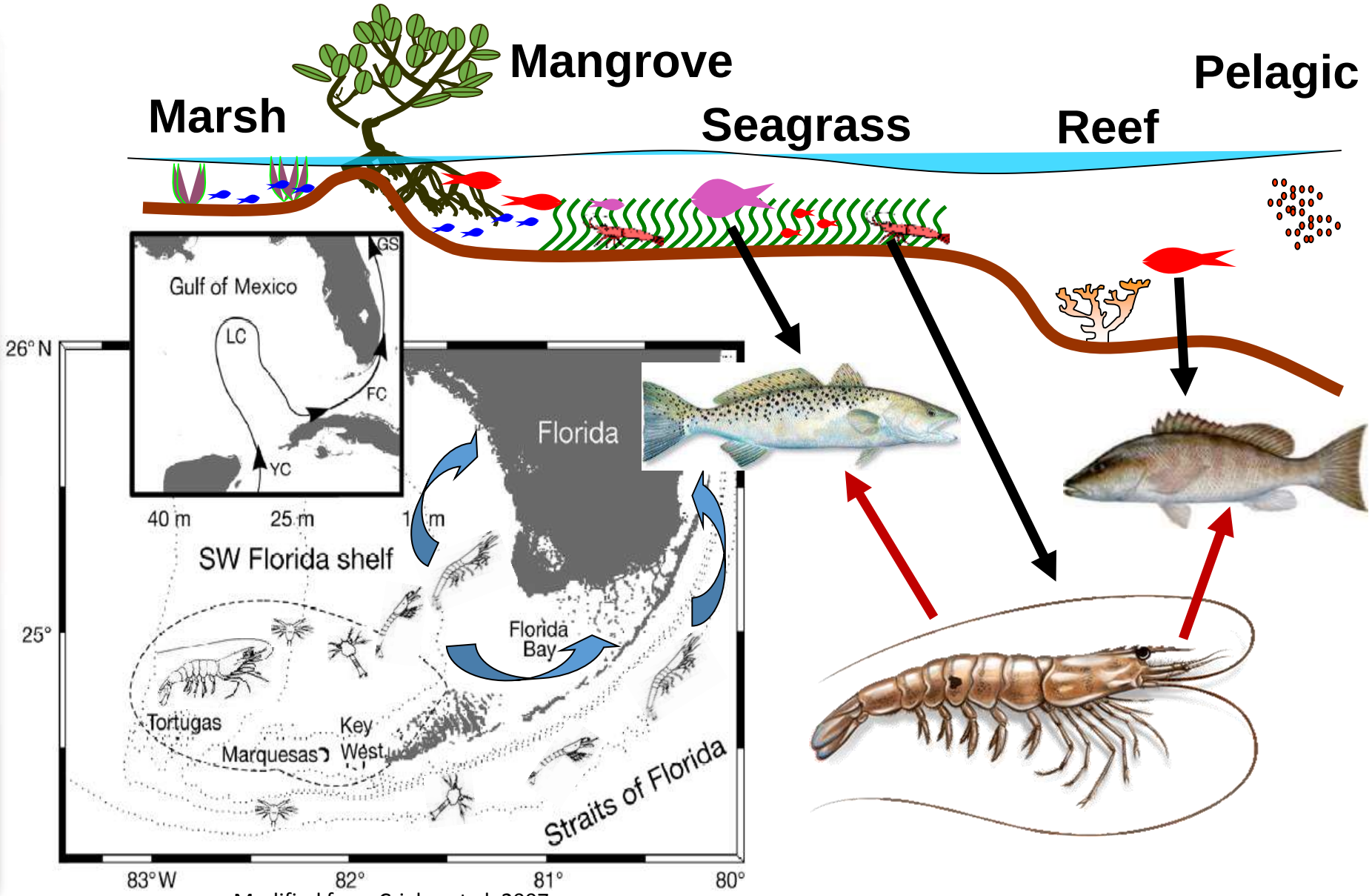
[1] University of Miami, Coral Gables, FL

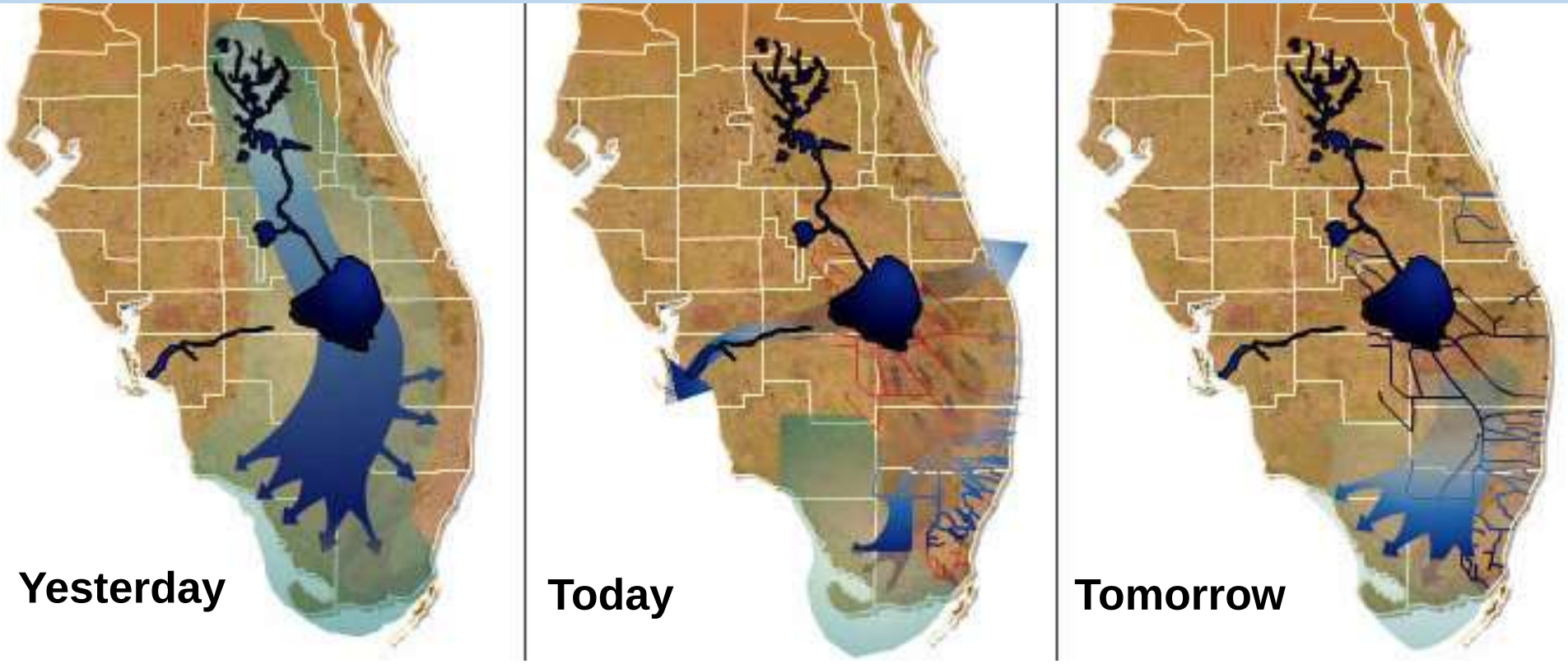
[2]NOAA NMFS SEFSC, Miami, FL

Pink Shrimp: *Farfantepenaeus duorarum*



Modified from Criales et al. 2007

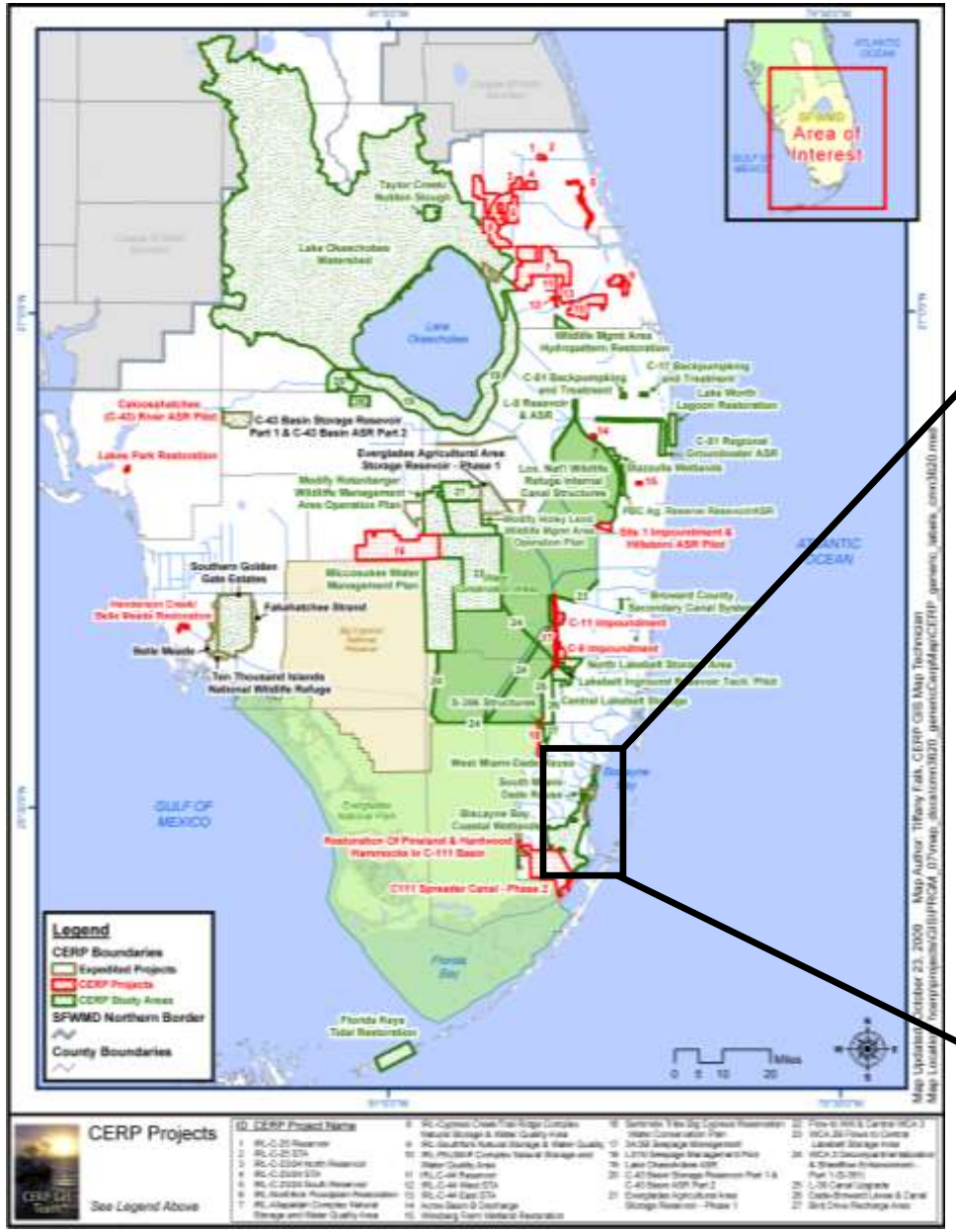
Comprehensive Everglades Restoration Plan (CERP)

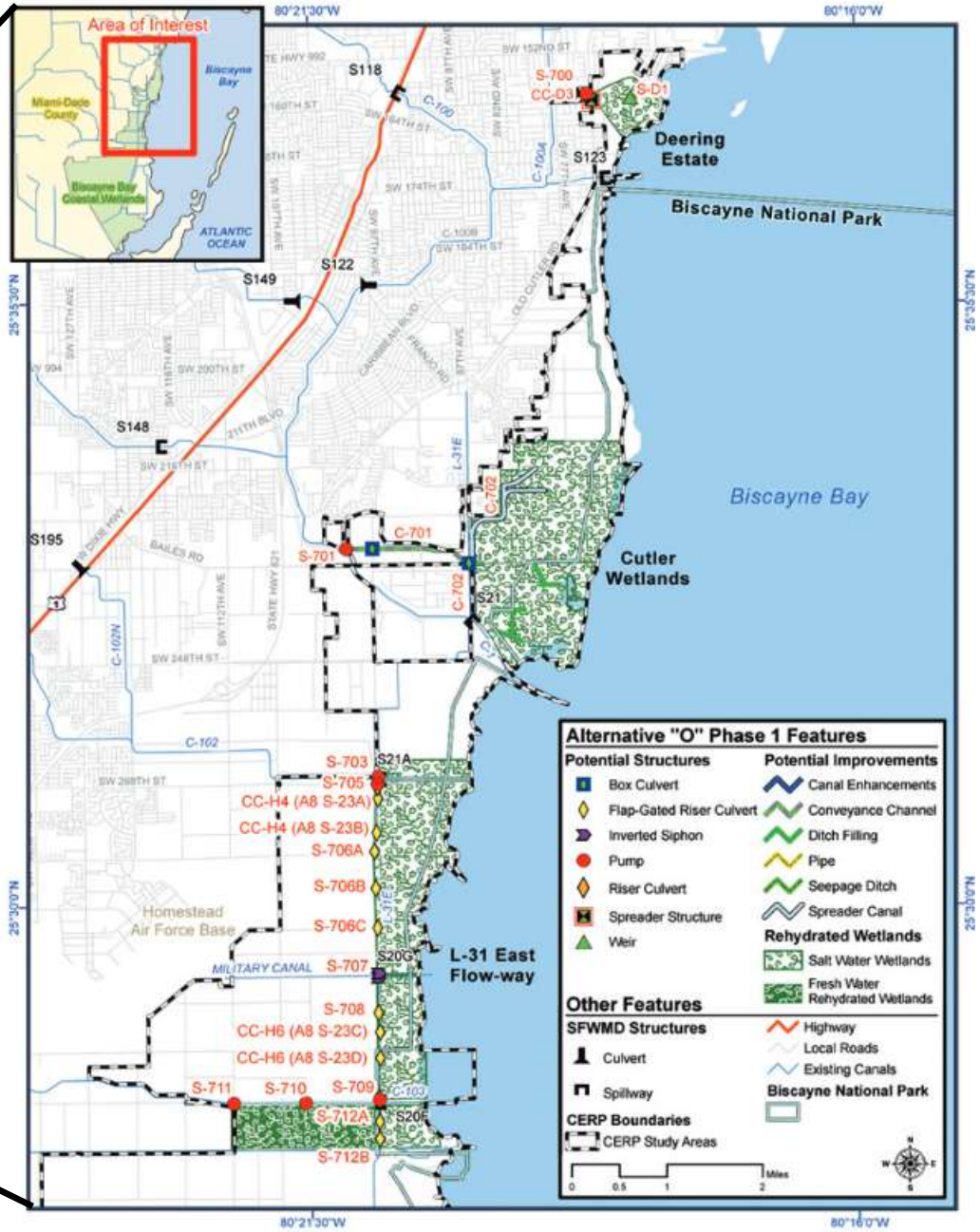


Biscayne Bay Salinity Interim Goal: "…**reestablish common mesohaline to oligohaline conditions** in mainland near shore zones, and **reduce the frequency and rapidity of salinity fluctuations** derived from pulse releases of fresh water from canals." RECOVER 2008

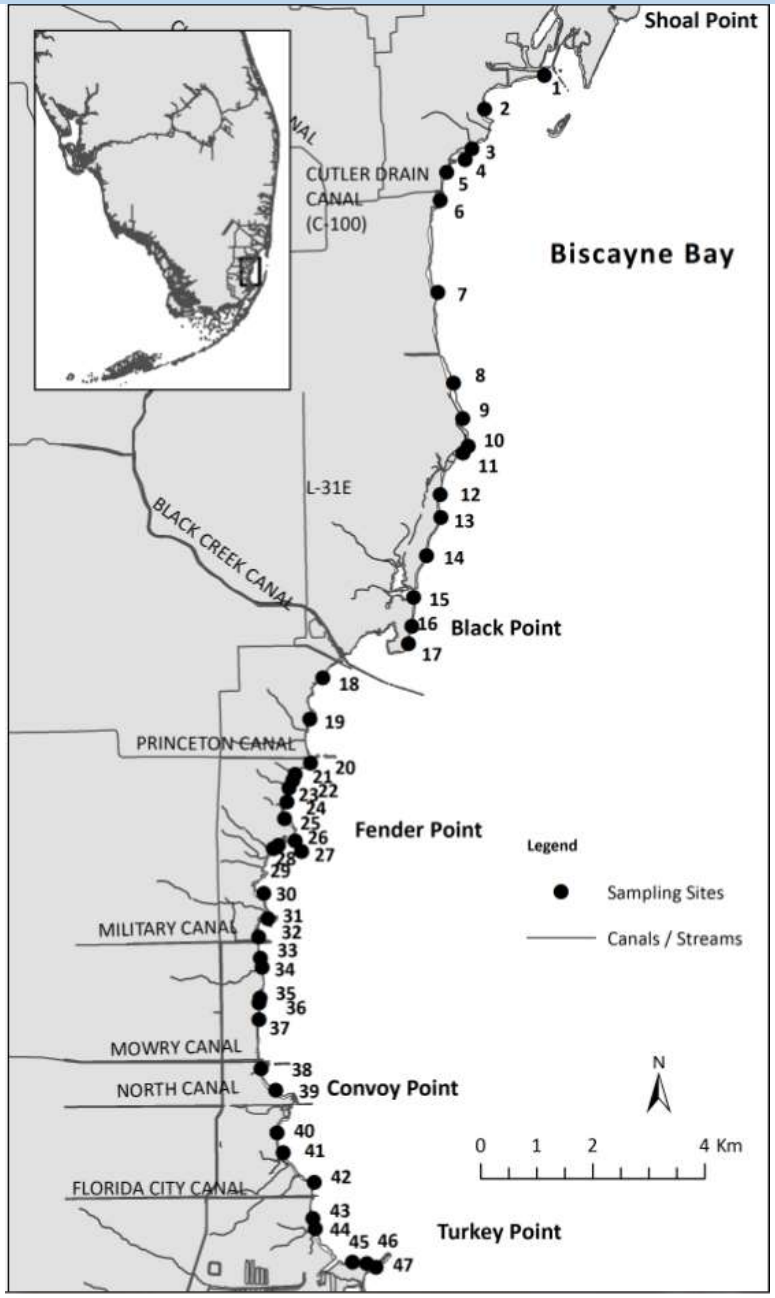
Biscayne Bay Pink Shrimp Abundance Interim Goal: "…increase juvenile pink shrimp density at peak abundance during **the August-October period in optimal habitat (seagrass)….2 m^{-2}** in nearshore optimal habitat from Shoal Point to Turkey Point…" RECOVER 2005

Biscayne Bay Coastal Wetlands Project (BBCWP)





Biscayne Bay Epifuanal Survey: 10 Yrs (2005-2014)



FIELD: Water Temperature (°C), Salinity (ppt), Water Depth (m), Sediment Depth (m), Species Specific Submerged Aquatic Vegetation (SAV) % Cover, SAV Canopy Height (cm), Epifaunal Community In Triplicate

LABORATORY: Sorting, Identification, Carapace Length (CL: mm), Total Length (TL: mm), Sex, Database Compilation, Quality Control

Study Objectives:

1) Establish baseline juvenile pink shrimp density trends (pre-restoration)

2) Identify environmental factors that limit juvenile pink shrimp density

3) Quantify spatiotemporal trends in juvenile pink shrimp densities

Analyses were conducted with $\alpha = 0.10$

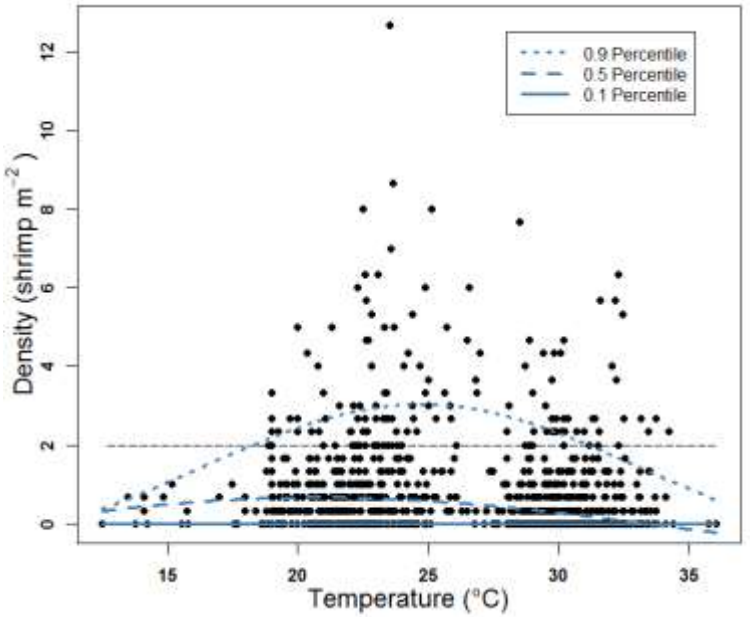
Results: Quantile Regression

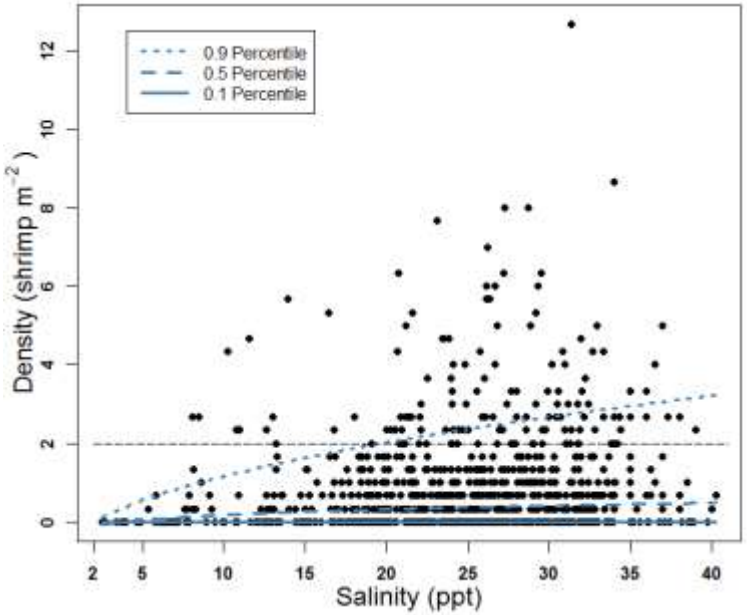
Temperature: Quadratic

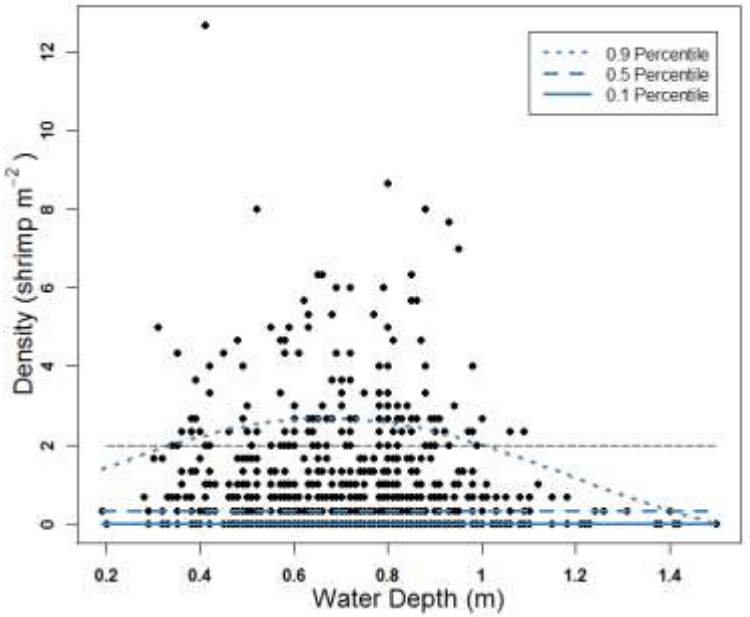
Salinity: Log-Linear

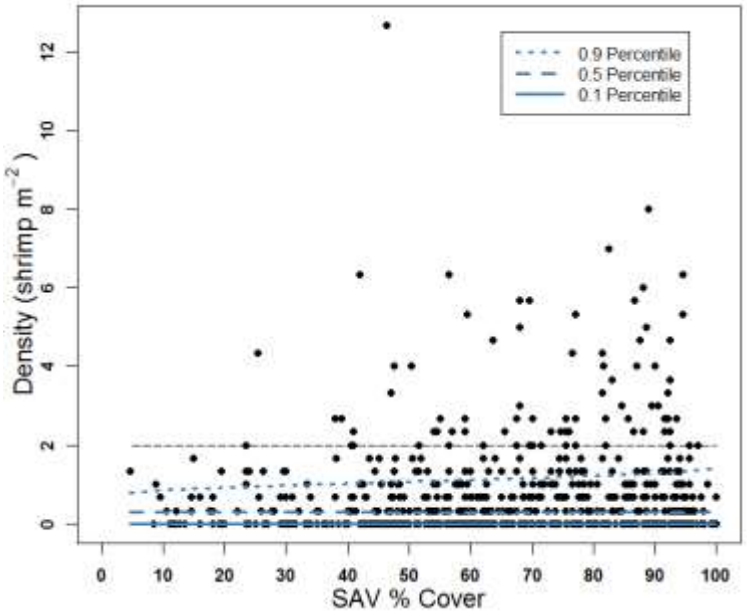
Water Depth: Quadratic

SAV % Cover: Linear



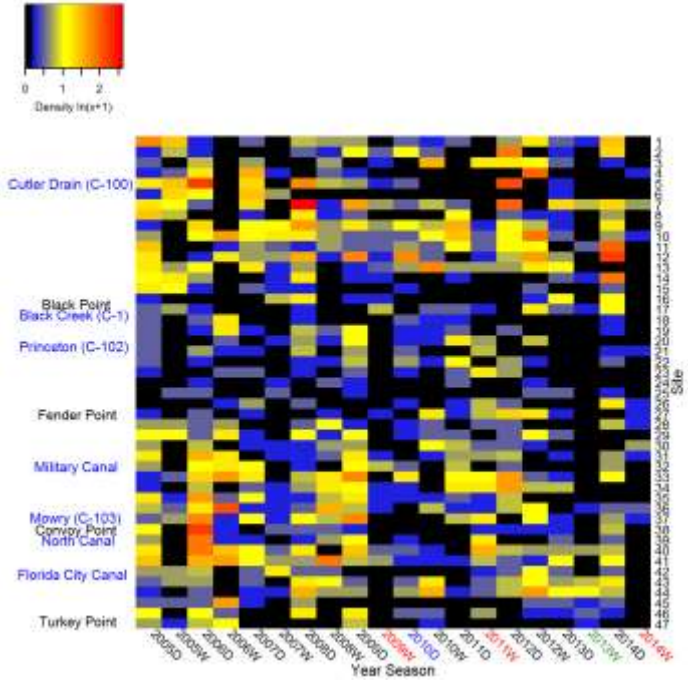


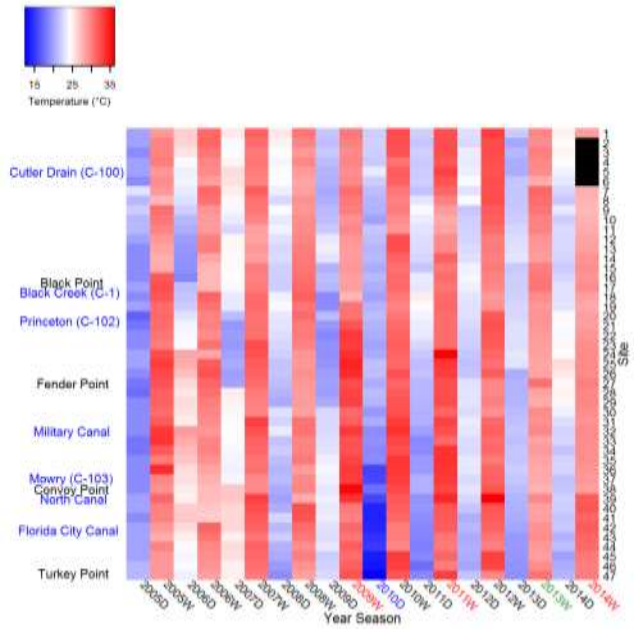


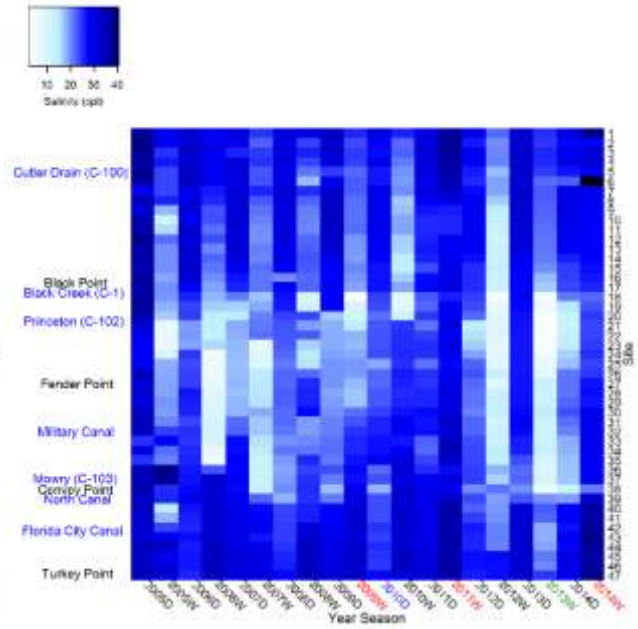


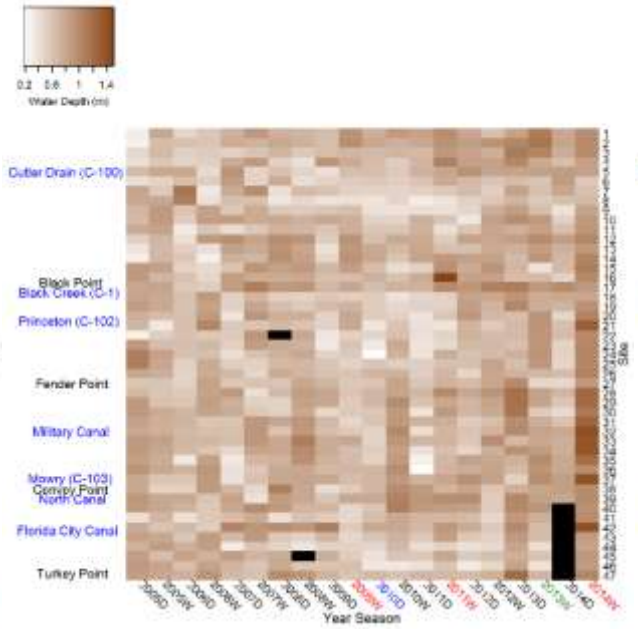
Results: Spatiotemporal Density and Habitat Trends

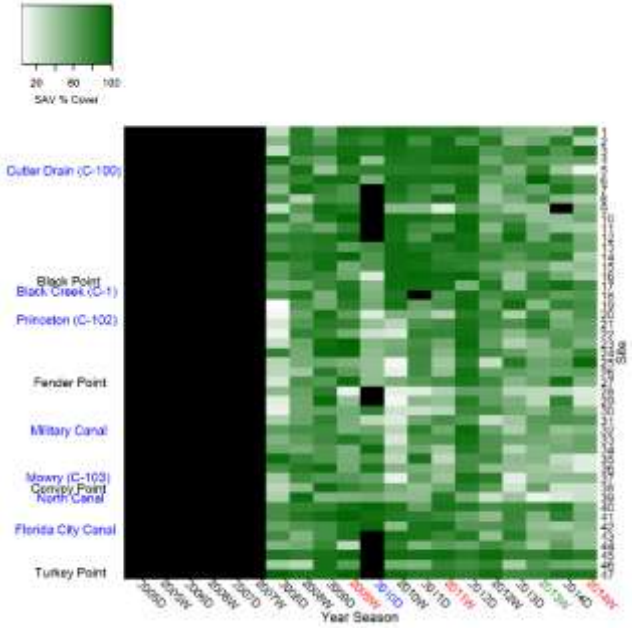
- **Wet Avg. Density: 0.61 ± 1.06 m^{-2}**
- **Dry Season Avg. Density: 1.11 ± 1.49 m^{-2}**
- **Significant season and year effects** (PERMANOVA)
- **12.2 % of observations >2 shrimp m^{-2}** (n = 114, N = 940)
- **5% year-seasons (2006D) not sig. diff. from 2 shrimp m^{-2}**
- **14.9% of sites (n=7) not sig. diff. from 2 shrimp m^{-2}**



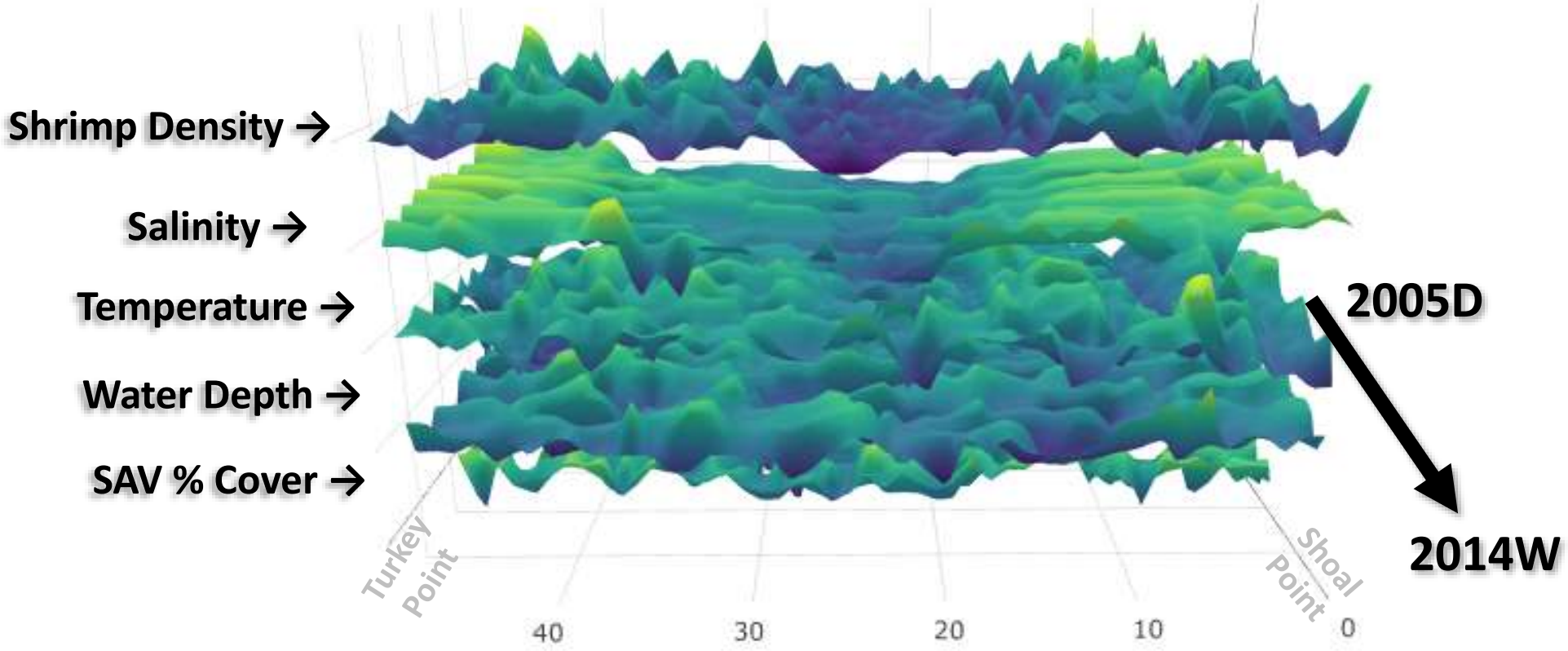






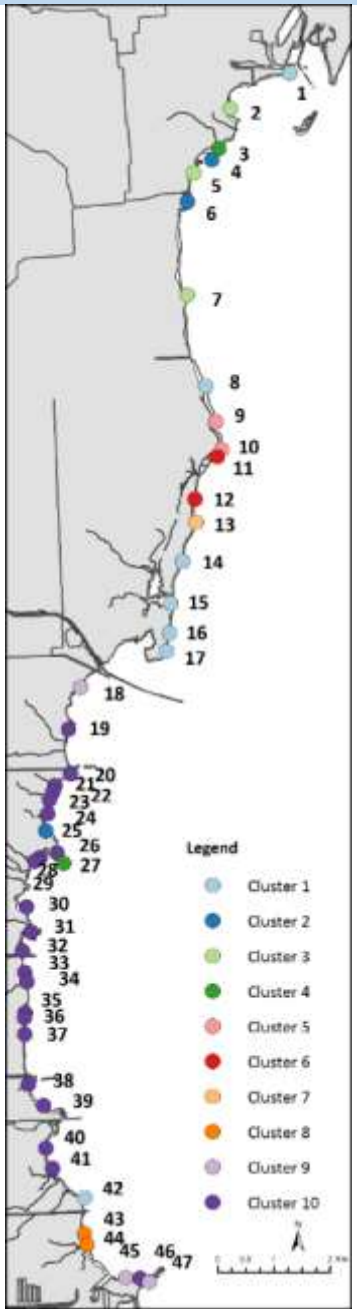


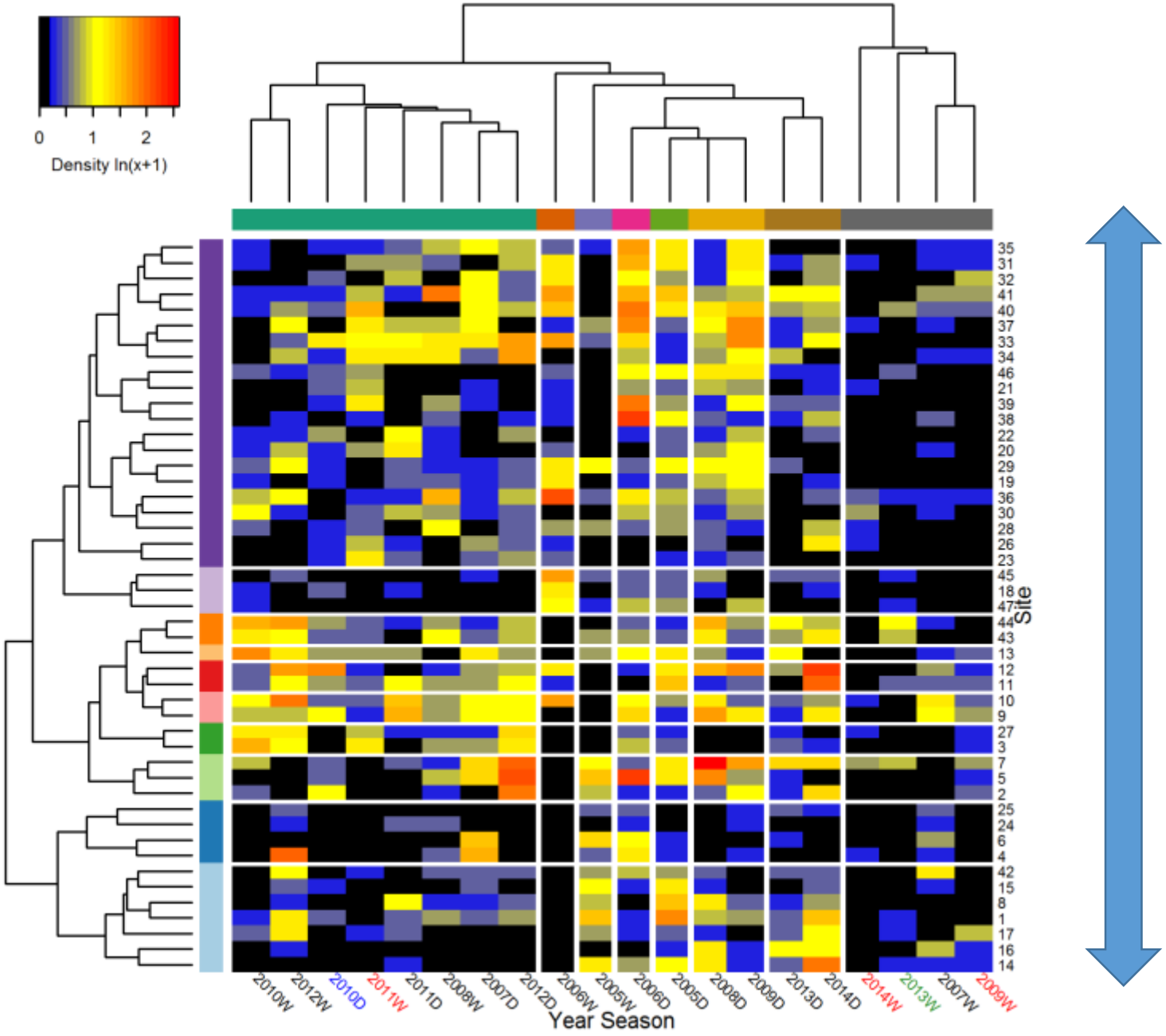
Results: Procrustean Analyses



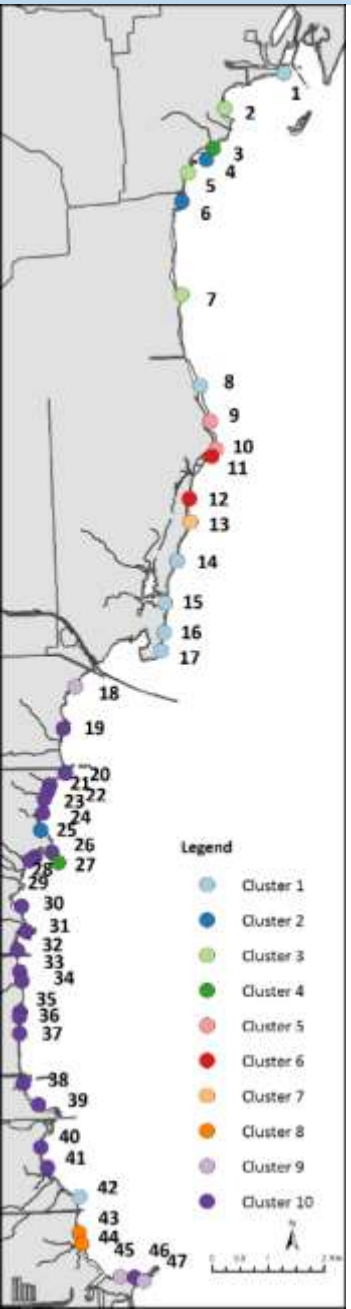
	$m^2_{X,Y}$	r	r^2	p value
Temperature	0.713	0.536	0.287	< 0.0001
Salinity	0.772	0.478	0.228	< 0.0001
Water Depth	0.718	0.531	0.282	0.0019
SAV % Cover	0.819	0.425	0.181	0.0792

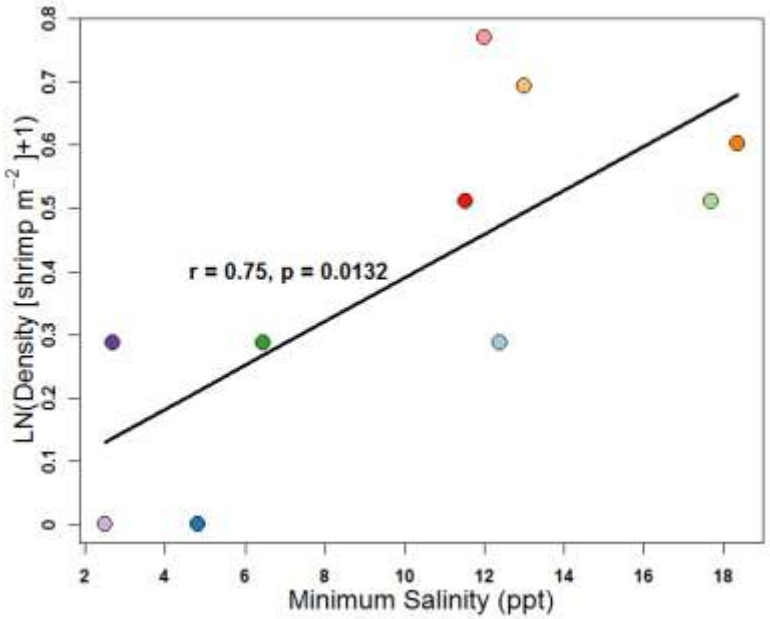
Results: Spatiotemporal Density Hierarchical Clusters

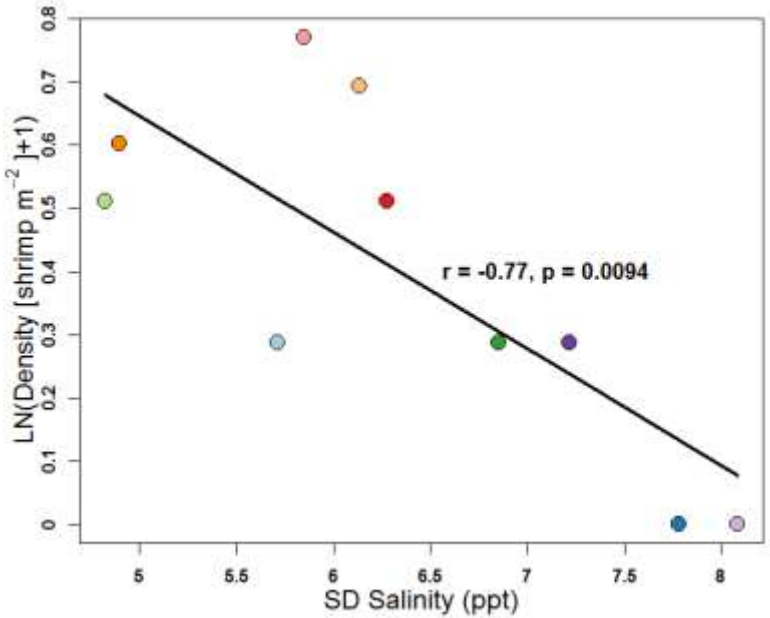


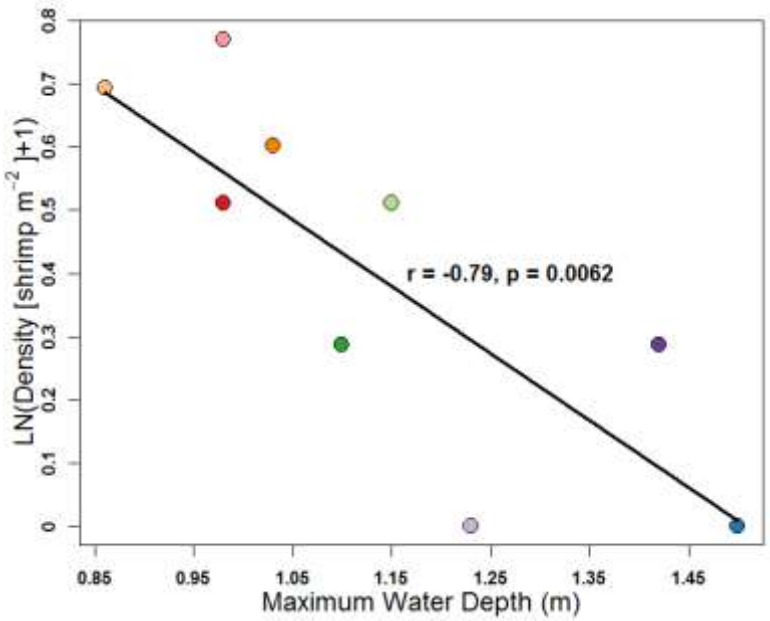


Results: Site Clusters' Correlations

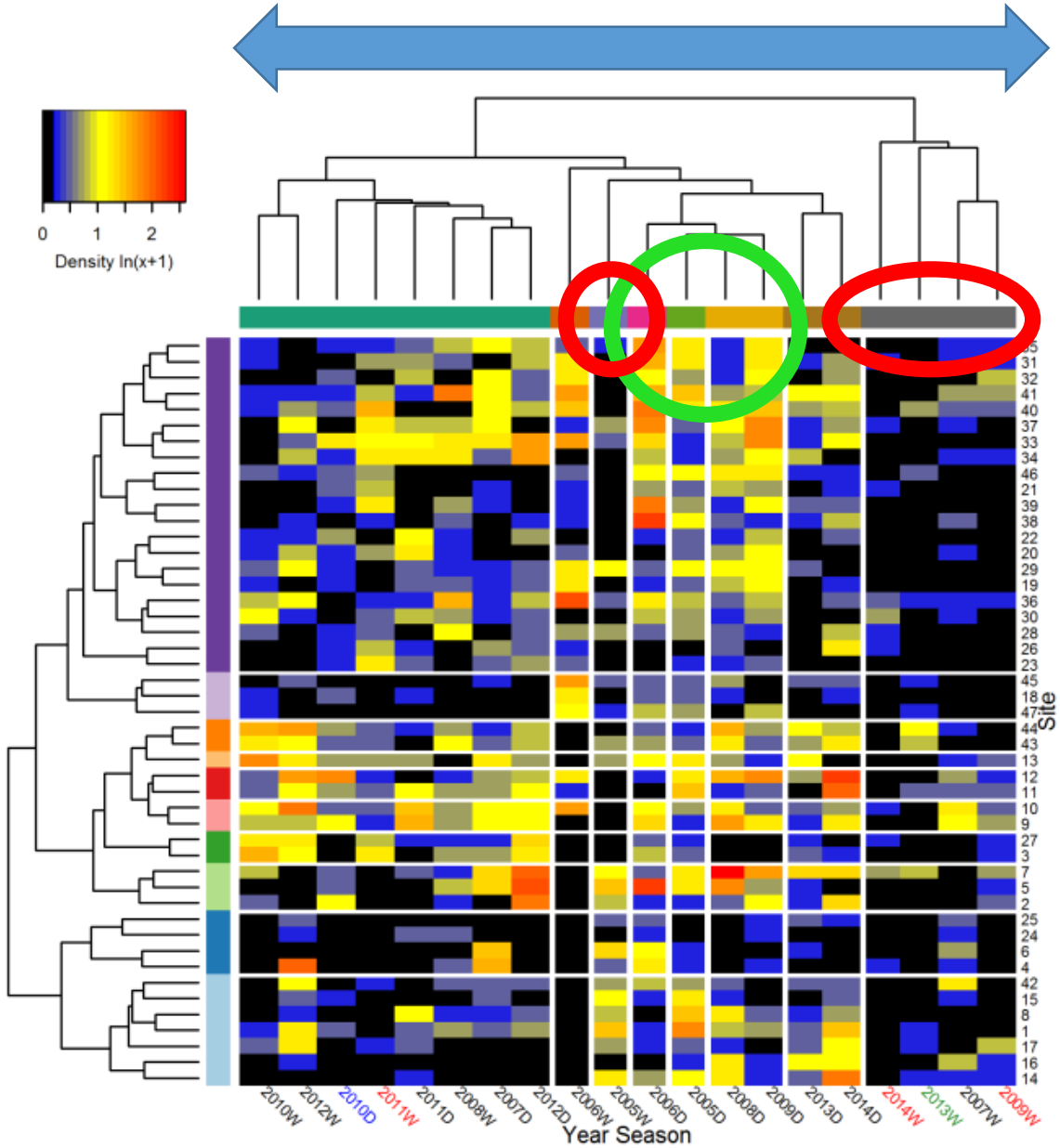




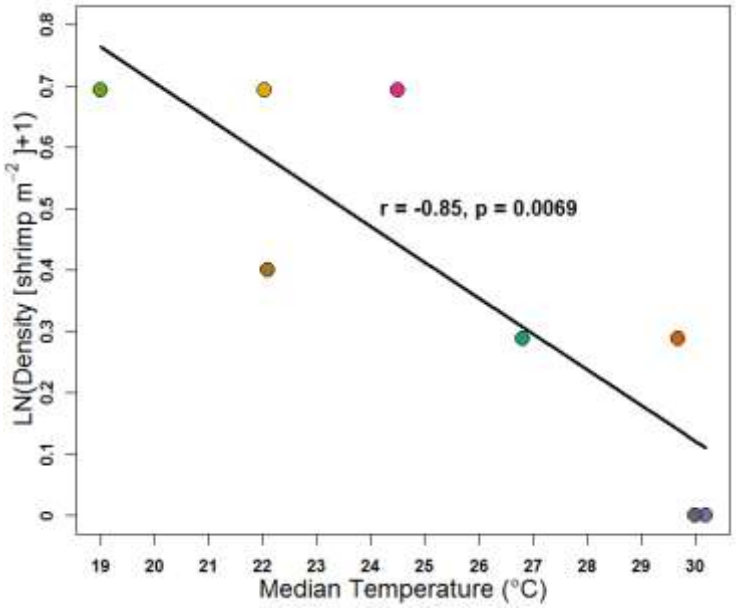


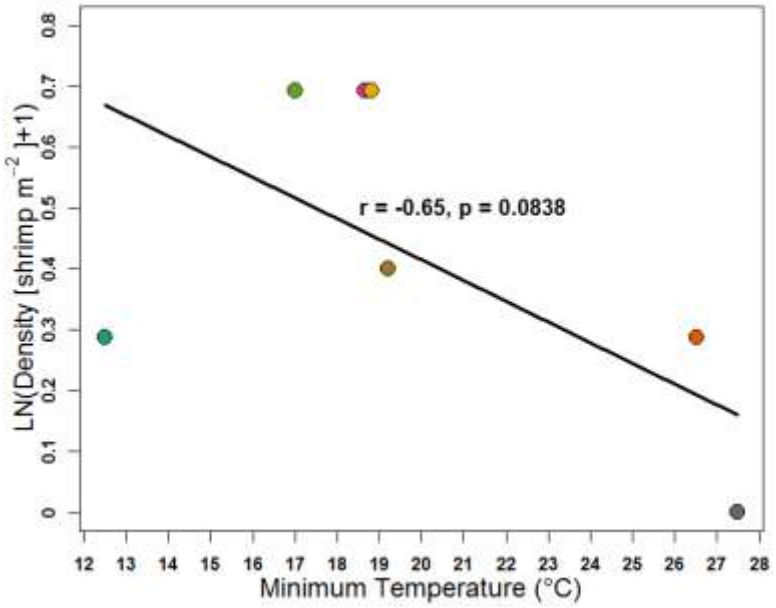


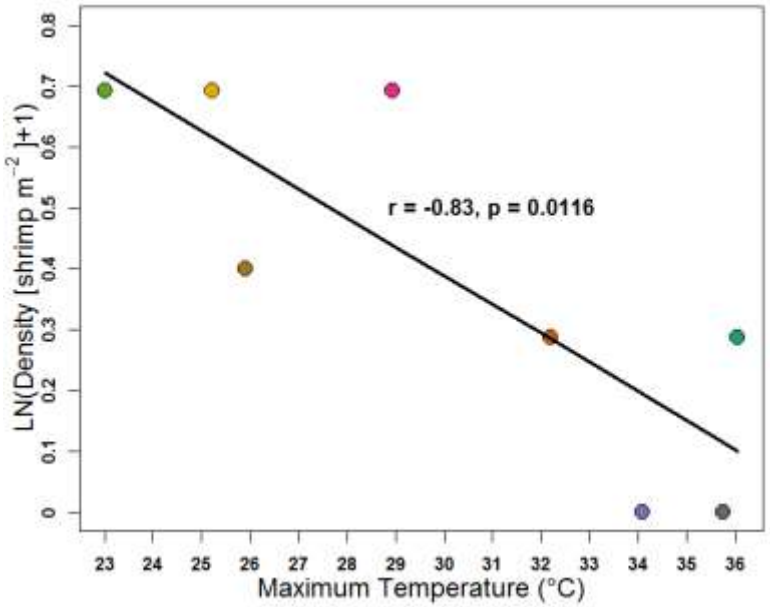
Results: Year-Season Clusters' Correlations

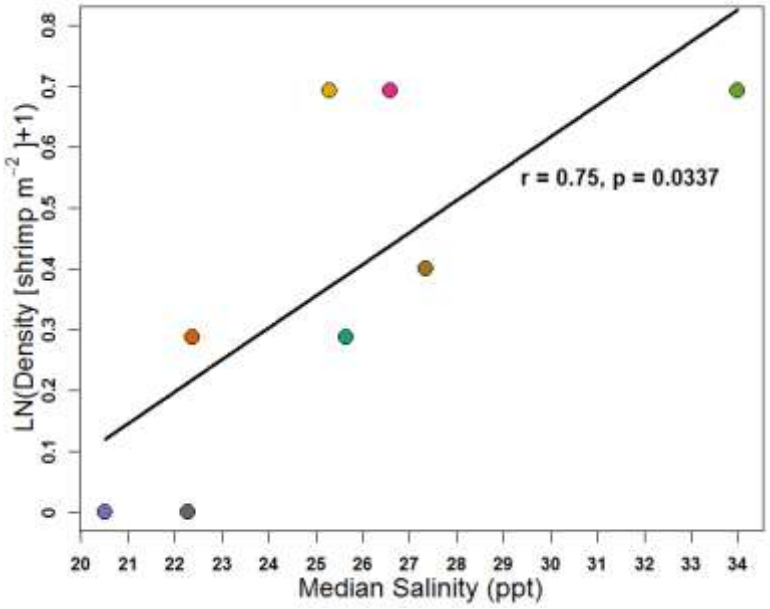


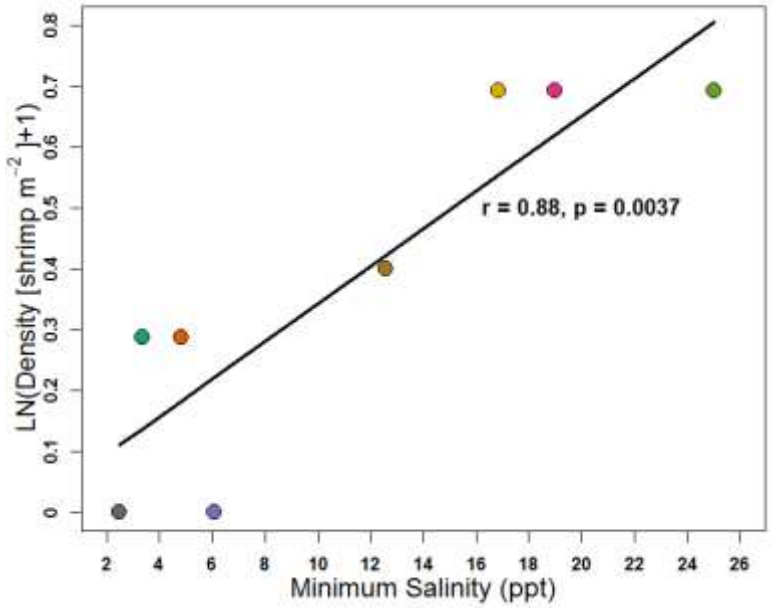
Results: Year-Season Clusters' Correlations

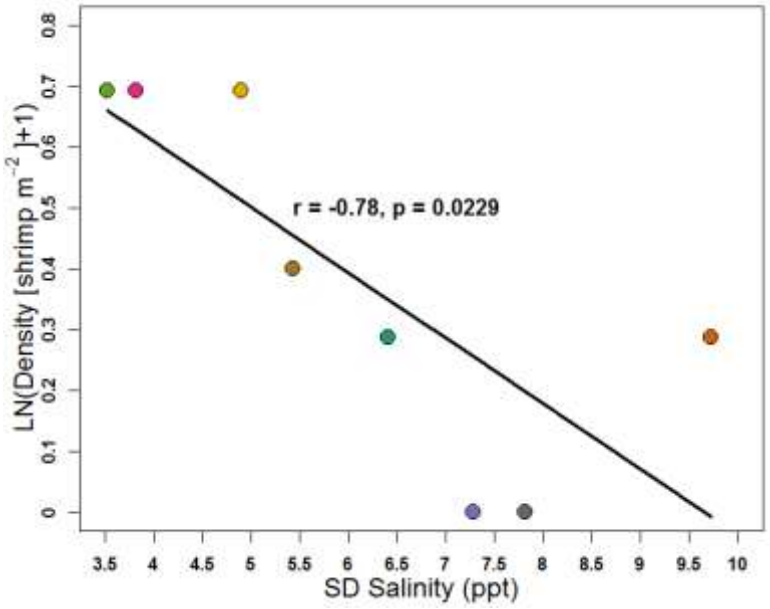












Conclusions and Implications: CERP Adaptive Management

- Pink shrimp density higher in dry season
  - ➢ Present Interim Goal focus is wet season (i.e., late summer/early fall): change focus to dry season?
- Shrimp densities are presently below target (for the most part…)
  - ➢ Canal Zone: salinity stability yielding increased in SAV cover: direct and indirect density improvements?
- Will mesohaline shoreline target improve pink shrimp abundance?
  - ➢ Expansion of mesohaline conditions could ***negatively*** impact pink shrimp abundance **if mesohaline <10 ppt** but reductions of **hypersalinity** and **extreme salinity variability** should ***positively*** impact abundance
- Pink shrimp believed to exhibit (species-specific) seagrass association
  - ➢ Pink shrimp limited by total SAV % cover, not individual seagrass spp.

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