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EVALUATION OF MULTI-DECADAL CHANGES IN THE NEKTON COMMUNITY OF THE LOWER BRAZOS RIVER: POTENTIAL INFLUENCE OF FRESHWATER INFLOW

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University of Houston- Clear Lake
Importance of Gulf Coast Estuaries

• Commercial harvesting supports economy (Zimmerman et al. 2002)

• Fish assemblages are indicators of water quality (Araujo et al. 2000)
Riverine Deltaic Estuary

- Brazos estuary is unique
- Highly dynamic system
- Complex, fluctuating species assemblages
Study Objectives

• Relationship of freshwater inflow on:
  o Salinity
  o Water quality
  o Available habitat
  o Nekton community

• Needed for adaptive management
Data Collections Methods

• Review of Past Studies on lower Brazos River
  o Biological: bottom trawl collections
  o Hydrological: mean daily and monthly flow
  o Water quality: temperature, salinity, dissolved oxygen

• New Data collection on lower Brazos River
Nekton Studies – Brazos River

• Johnson (1977) – TPWD
  o Inventory lower Brazos nekton monthly; 1973-1974

• Emmitte (1983)- Dow Chemical
  o Inventory lower Brazos nekton; 1982
Sampling Approach – New Data

- Sampled 4 of Johnson’s sites each month for 1 year
- Water Quality:
  - YSI multiprobe data logger: Temp, DO, Sp. Cond., Salinity, pH and depth
  - Turbidimeter: water clarity (NTU)
- Hydrology
  - USGS gage at Rosharon
- Fish Collection: Otter trawls, supplemented with other methods
Data Analysis

- Graphical comparisons of hydrology, species numbers and abundance
- Used IHA (Index of Hydrological Alteration = IHA) to evaluate long term trends in hydrology
- Multivariate Cluster Analysis: relation to species similarity with sites and times
Current Study Results
Salinity by River Km

![Graph showing salinity by river km with data points]
PCO1 (69.4% of total variation)

PCO2 (21% of total variation)

Normalise
Resemblance: D1 Euclidean distance

Site

Water Temp (°C)
Salinity (psu)
D.O.(mg/L)
Depth (m)

0.6
11.7
21.5
42.4
0.6
11.7
21.5
42.4
Physiochemical Sample Similarity

Normalisation: D1 Euclidean distance

RKM
0.6
11.7
21.5
42.4
Physiochemical Site Similarity

Normalise
Resemblance: D1 Euclidean distance

Site

0.6
11.7
21.5
42.4
Spot
Bay anchovy
Atlantic croaker
Brown shrimp
White shrimp
Sand seatrout
Gulf menhaden
Striped anchovy
Blue catfish
Silver perch
Abundant Taxa MDS

Transform: Log(X+1)
Resemblance: S17 Bray Curtis similarity

Site

2D Stress: 0
Transform: Log(X+1)
Resemblance: S17 Bray Curtis similarity

2D Stress: 0.13
Number of Nekton Taxa by Month and Site

Site KM
- 0.6
- 11.7
- 21.5
- 42.4
Nekton Presence Assemblage Similarity

Transform: Presence/absence
Resemblance: S17 Bray Curtis similarity

RKM
0.6
11.7
21.5
42.4
Comparison with Past Studies

- Hydrologically different
- Effort and duration varied

- Current study: 4 sites, 0.6-42.4 RKM, 3 replicates; 12 months; 144 total tows
- Johnson 1973-5: 5 sites, 0.6-42.4 RKM, 2 replicates; 24 months; 240 tows
- Emmittte 1982: 4 sites, 3 – 9.5 RM, 16 tows; 12 months (quarterly), no replicates
Daily Average Flow by Year

Year
Daily Average Flow (cfs)

6844 (med)
3083 (25th)
10470 (75th)
Average No. Taxa by Study

Study
- Emitte 1983
- Johnson 1977
- Present

<table>
<thead>
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<th>No. Taxa</th>
<th>KM</th>
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<tbody>
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<td>Symphurus mysteriosus</td>
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</table>

Note: The table shows species counts across different locations.
Discussion

- Decreased peak Brazos River freshwater inflows
- Flow regime impacts lower river nekton communities more so than upper reaches
- Greatest diversity at the mouth of river


Thanks to all who helped!