Tidal Creeks As Nekton Habitat in the Tampa Bay Estuary

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Tampa Bay Estuary Program
Environmental Protection Commission Hillsborough County
Tampa Bay Water
Southwest Florida Water Management District
Environmental Management Department Manatee County Government
USGS science for a changing world
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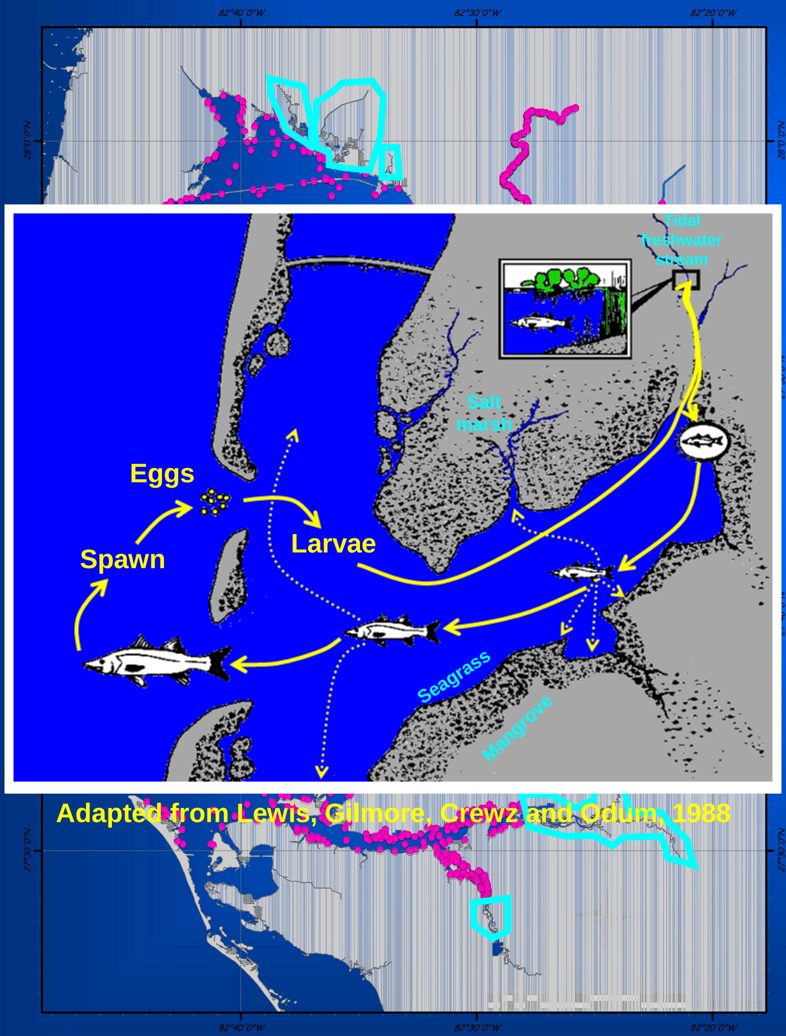
Pinellas County
Florida Fish and Wildlife Conservation Commission

The Tidal Tributary "Knowledge Gap"

FWRI/FIM sites in Tampa Bay, 2008



- Tidal tributaries are not a "strata" in the FWRI/FIM sampling design and are therefore "undersampled"
- Tidal tributaries have long been suspected to be Essential Fish Habitat (EFH) for young-of-the-year (YOY) common snook

Tidal tributaries studied by FWRI/FIM

- Manatee River/Gamble Creek
  - SWFMWD funded
  - 2005
- Tampa Bay Estuary Program Tidal Tributary Initiative
  - Pinellas County Environmental Fund (PCEF)
  - Many players
  - 2006
- State Wildlife Grant
  - 2007

Objectives of Tidal Tributary Studies that FWRI/FIM has been involved with

- Characterize fisheries resources of Tampa Bay tidal tributaries
- Determining effects of various habitat parameters on fisheries resources in Tampa Bay tidal tributaries
- Develop a Tidal Tributary Management Strategy based on study results
- Communicate results to managers and the public
  - Preservation
  - Restoration

Sampling method

- 9.1-m-long, 3.2-mm-mesh, center-bag seine
- Set from raft along shorelines
  - Samples 10 m^2
  - Collects small nekton (<100mm)

Taxa ranking for each tidal tributary study

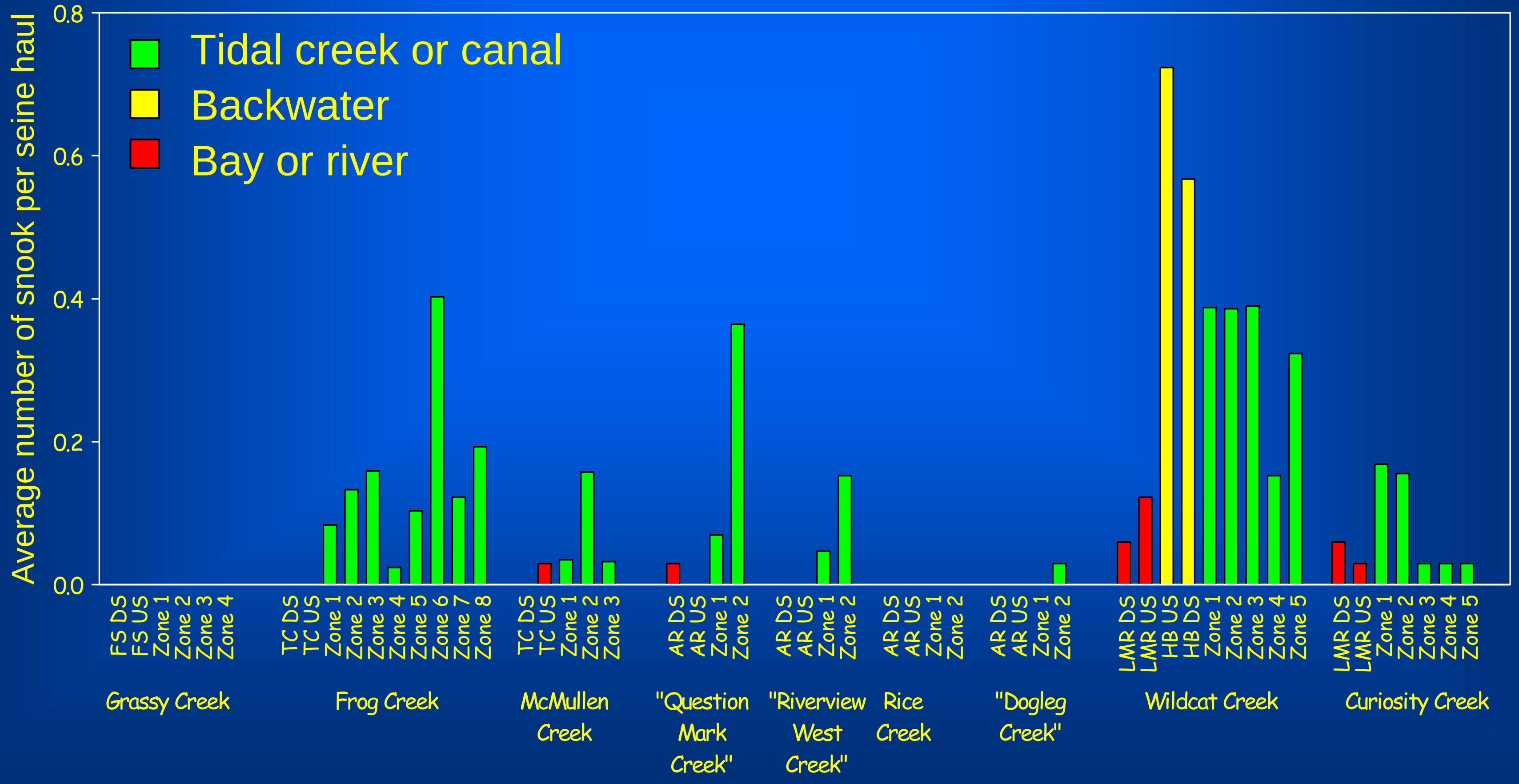
Common name	PCEF [1] Rank	PCEF [1] CPUE	GC [1] Rank	GC [1] CPUE	SWG [1] Rank	SWG [1] CPUE	LMR [2] Rank	LMR [2] CPUE
Rainwater killifish	1	2.5486	6	1.3667	1	1.7313	7	1.1119
Daggerblade grass shrimp	2	2.2563	5	1.5074	5	1.0204		
Menidia silversides	3	1.8539	9	0.9465	2	1.5096	1	3.5694
Eastern mosquitofish	4	1.5751	1	3.7752	9	0.8608	12	0.5568
Hogchoker	5	1.3792	2	3.1507	15	0.4162	6	1.1296
Clown goby	6	1.2798	4	1.8765	11	0.6220	8	1.1033
Sailfin molly	7	1.1391	3	1.8835	3	1.3072	17	0.4158
Naked goby	8	0.6051	7	1.1057	19	0.2556	10	0.6051
Striped mullet	9	0.5826	11	0.5755	20	0.2528	19	0.3423
Eucinostomus mojarras	10	0.5338	24	0.0705	4	1.2329	3	2.2214
…								
Blue crab	14	0.3454	12	0.5252	14	0.4609	21	0.2722
…								
Common snook	16	0.3022			12	0.5610	16	0.4233
…								
Spot	29	0.0914			22	0.2298	9	0.6138

Taxa not worked up during LMR study

[1] 9.1-m raft seine
[2] 21.3-m boat seine

Common Snook: Abundance Inside vs. Outside

- Catch-per-unit-effort (CPUE) of juvenile common snook is 2–36 × greater in tidal creeks
- High economic ($342/fishing trip or >$510 M/year) and ecological importance

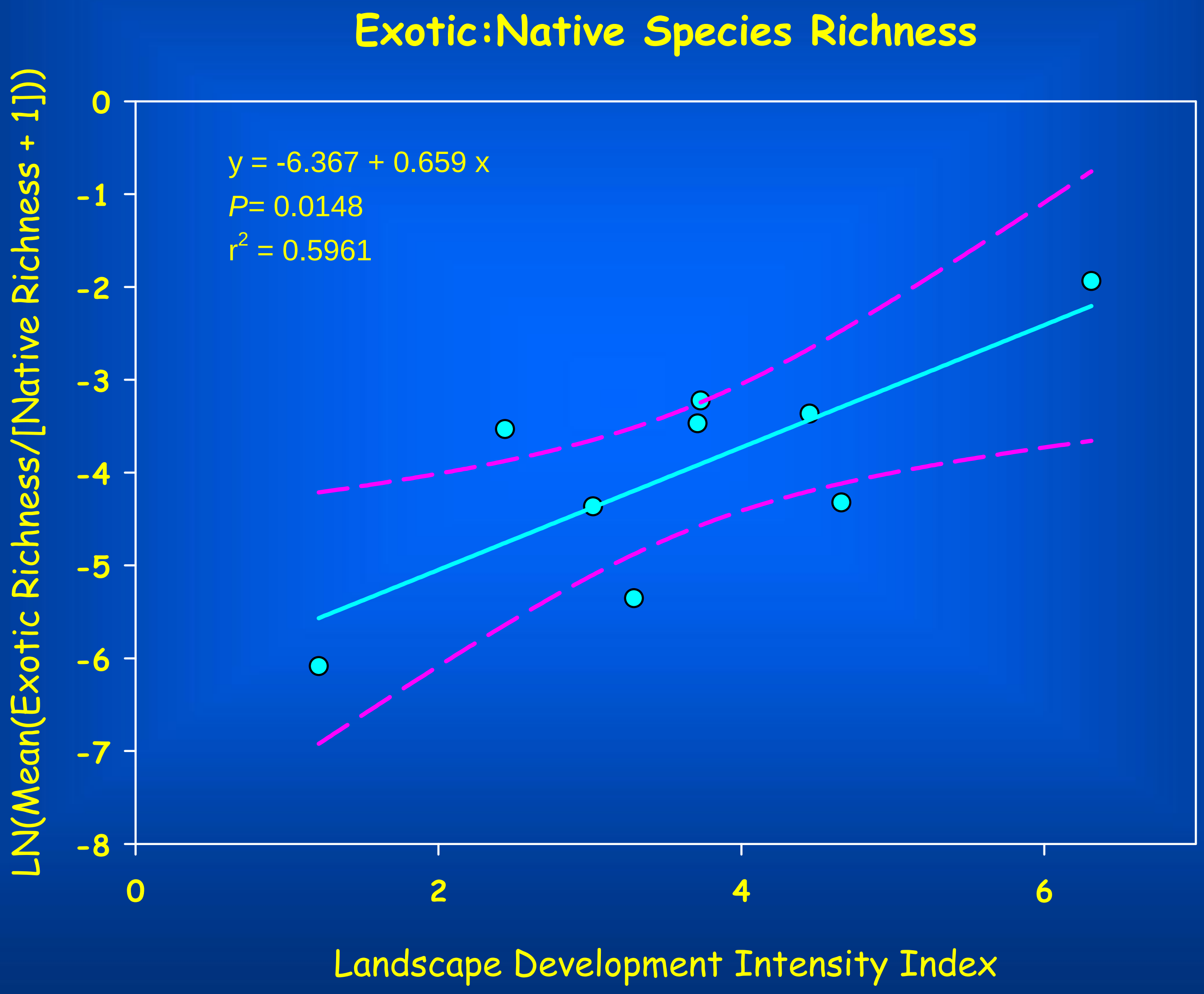


Non Native (Exotic) Taxa

Common name	PCEF [1] Rank	PCEF [1] CPUE	GC [1] Rank	GC [1] CPUE	SWG [1] Rank	SWG [1] CPUE	LMR [2] Rank	LMR [2] CPUE
Tilapias	26	0.1095	15	0.2575	29	0.0980	49	0.0356
Pike killifish	27	0.1063			26	0.1536	42	0.0553
Sailfin catfish	56	0.0094	27	0.0398			80	0.0052
Blackchin tilapia	58	0.0094			54	0.0112	87	0.0030
Walking catfish	73	0.0029						
Swordtails	74	0.0029						
Black acara	75	0.0029						
Mayan cichlid					35	0.0610		
Blue tilapia					56	0.0074		
Jack dempsey							108	0.0009
Cichlids					41	0.0417	107	0.0009

[1] 9.1-m raft seine
[2] 21.3-m boat seine

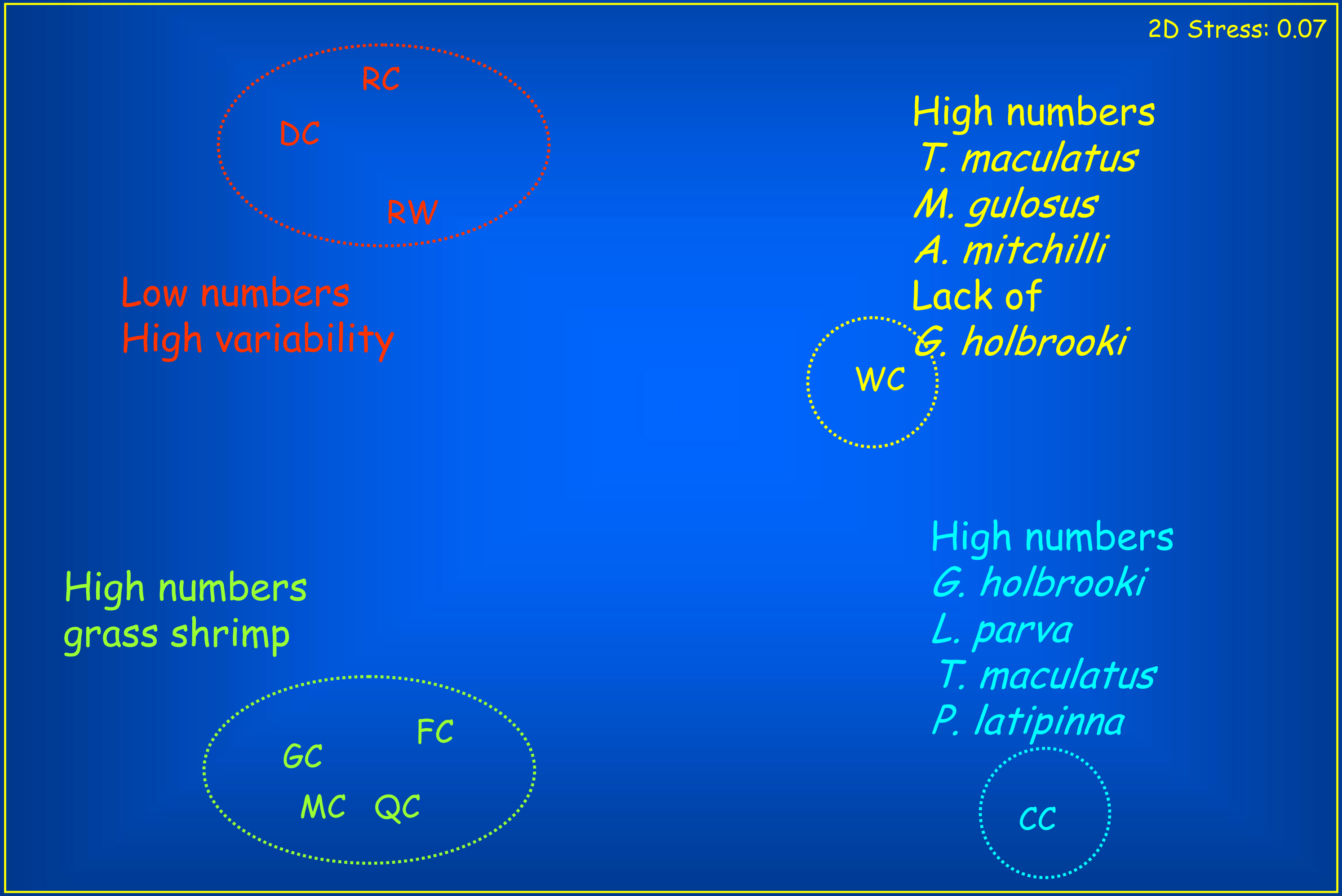
Non Native (Exotic) Taxa - An indicator of alteration?



Creek vs. Creek – Community Analysis

- H_0: No difference in nekton community between tidal creeks
  - ***Rejected H_0*** (Global R = 0.473, *P* = 0.001)
  - Creek difference was greater than monthly difference (Global R = 0.406, *P* = 0.001)

Creek vs. Creek - Community Analysis



MDS based on 2-way ANOSIM R values (creek and month as factors)

Inside vs. Outside - Community Analysis

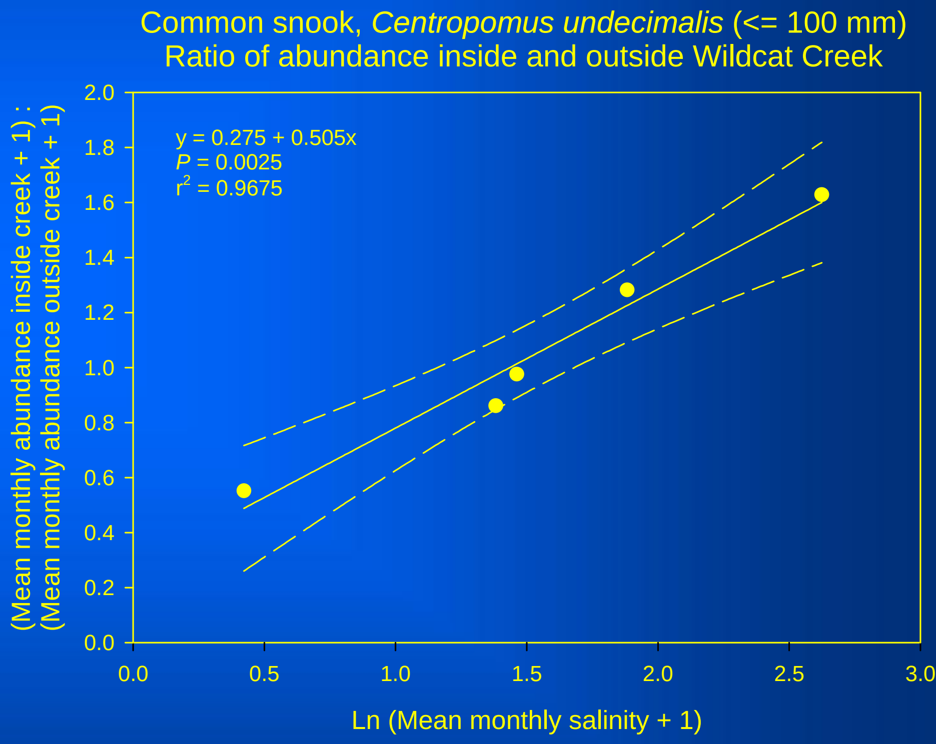
- H_0: No difference between nekton community inside and outside creeks
  - ***Rejected H_0*** for all creeks at $P < 0.05$
  - Inside and outside communities generally overlapped
  - Abundance:
    - Total abundance was generally significantly greater outside than inside
    - Most individual species showed no significant difference in abundance between inside and outside
    - Majority of individual species that showed a significant difference were more abundant outside than inside
  - Taxon Richness:
    - Generally significantly greater inside than outside

Correlation of Biotic Pattern with Physicochemical Variables

- H_0: No correlation between nekton community and physicochemical variables
  - ***Rejected H_0***
  - pH was 'best' single variable ($\rho = 0.599$, $P = 0.001$) – reflecting biological activity?
  - pH, temperature, and salinity combined gave the highest correlation ($\rho = 0.657$, $P = 0.001$)
  - No correlation between community (structure, richness, or abundance) and indices of watershed development (LDI or % imperviousness)

Movement Between Creeks and Adjacent Habitats

- H_0: No change in ratio of abundance within a creek to abundance outside a creek as salinity (and therefore possibly flow) changes
  - ***Rejected H_0 for Common Snook***
  - ***Generally accepted H_0*** (~90% of regressions)



Dietary Analysis

- H_0: No difference in diet composition (% volume) between tidal creeks and adjacent habitat
  - *Accepted H_0* for *L. parva* and *T. maculatus* (only species tested)
- H_0: No difference in diet composition (% volume) between tidal creeks
  - ***Rejected H_0*** for *L. parva, Menidia* spp., and *T. maculatus*
  - *Accepted H_0* for *C. undecimalis* (but a large portion was unidentified fish)

Conclusions and Management Implications

- Many species use tidal creeks in addition to adjacent habitats
- Differences in community structure were found (in order of significance)
  - between creeks
  - seasonally
  - inside vs. outside
- Creeks/backwaters are EFH for common snook
  - Occupy a diverse range of creek types
  - Imperative to maintain hydrological connections into creeks, avoid fragmentation
  - Protect/restore habitat mosaics so different life stages of common snook do not overlap

Need for Tidal Tributary Monitoring

- Current fishery-independent monitoring in Tampa Bay (>150 samples/month) does not include smaller tidal tributaries and backwater areas
- The economic and ecological importance of common snook alone warrants a monitoring program
- Monitoring
  - would improve annual estimates of abundance for YOY common snook
  - would allow general status of tidal creeks to be tracked over time
  - could be seasonal (July – January) to address common snook

Ongoing and Future Tidal Tributary Work

- Identify funding to establish a tidal tributary monitoring program
- Examine aspects of nekton function (condition, growth, fecundity, mortality) in tidal tributaries
  - Of specific importance is the degree to which YOY common snook in tidal tributaries contribute to adult populations ("source" or "sink")
    - Otolith microchemistry
    - Pit tagging
    - Daily aging of otoliths