Coastal Development Reduces the Quality of Tidal Creeks as Fish Habitat

Justin Krebs, Mark Squitieri, Susan Bell, Carole McIvor
Habitat quality

- Defined as the ability of the habitat to meet a species’ requirements for survival, growth, and reproduction
- Variable over space and time
- Variable among metrics of quality
- Species-specific
Problem facing tidal tributaries

Human population growth

**Impervious surface**

- <10% Natural
- 10-20% Physical and chemical changes
- 20-30% Biological changes

- Holland et al. (2004)
To determine if nekton community structure and condition of common species in tidal tributaries reflect land use patterns in the surrounding watershed.
11 tidal wetlands

LAND USE CLASSES
Reference (Natural)
Urban
Industrial
Artificial (Mosquito)
Sample collection

2007 and 2008
11 tributaries (creek, mosquito ditch)
36 seine samples per tributary
Study approach

Characterize habitat quality of each tidal tributary using nekton

**Community structure**
- Number of species (richness)
- Abundance (fish/10m²)

**Condition**
- Length-weight relationship
- Lipid content
Nekton community

- Collected 56 species from 387 samples
- Nine species made up 85% of all nekton collected
  - Sailfin molly and mosquitofish
  - Grass shrimp
  - Killifishes
  - Silversides
Nekton community

Patterns of abundance were similar among tributaries
Higher richness correlated with higher abundances
Nekton community differed between urban creeks and non-urban tributaries ($p<0.005$, ANOSIM), but not among non-urban tribs ($p>0.30$).

Urban creeks had greater dominance by fewer species and had few grass shrimp.
Abundance of the sailfin molly

• Patterns of abundance seem independent of land use
• Peppermound should be high quality based on density
## Body condition

<table>
<thead>
<tr>
<th>Species</th>
<th>Less-developed</th>
<th></th>
<th></th>
<th></th>
<th>Urban</th>
<th></th>
<th></th>
<th></th>
<th>Industrial</th>
<th></th>
<th></th>
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<th>Mosquito</th>
<th>ANCOVA, p</th>
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<tbody>
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<td>FC</td>
<td>CC</td>
<td>MB</td>
<td>PM</td>
<td>TC</td>
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<td>MM</td>
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<tr>
<td>Sailfin molly</td>
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<td>1.22</td>
<td>1.20</td>
<td>1.12</td>
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<td>5.27</td>
<td>4.75</td>
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<td>5.03</td>
<td>5.33</td>
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<td>5.66</td>
<td>5.21</td>
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<td>Silverside</td>
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Values are LSmean body mass (grams) standardized for length

- Seven of nine species were in lower condition (**10-15% smaller**) or rarely collected from urban tributaries compared to the other sites
- Species from non-urban tributaries were typically average or **higher** condition
- Condition of mosquitofish and diamond killifish was similar across tributaries
• Highest energy reserves in mollies from urban creeks (7-38 mg/g DW)
• Fish from reference creeks were similar to most creeks but lower than urban creeks (3-6 mg/g DW)
• Mollies at two tributaries had consistently low reserves (≤1 mg/g DW)
Conclusions

- Nekton abundance and species richness are similar between urban and non-urban tributaries
- Community structure differs between urban and non-urban tributaries
  Urban tributaries dominated by fewer species and underrepresented by species common in non-urban tributaries
- Despite similarities in abundance and richness, body condition of common species was typically low in urban tributaries
- Body condition of sailfin mollies (based on length-weight) was lowest in urban tributaries, despite the highest energy reserves there
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