Introduction: Use of Videos

Eliza Moore – Senior Environmental Scientist
Narragansett Bay Commission
What....

• Benthic video surveys to track benthic community, habitat structure, and general observations over time.
• Started in 2014
Where ....

• Providence River Estuary – the headwaters of Narragansett Bay – Rhode Island

• Three permanent transects
Why ....

• The Narragansett Bay Commission owns and operates two major wastewater treatment facilities in Rhode Island.
Why ....

• The Narragansett Bay Commission owns and operates two major wastewater treatment facilities in Rhode Island.
• Nitrogen reduction required ~$41 million in upgrades to facilities.
• Monitoring to demonstrate the water quality impacts of investment
Why ....

• Monitoring benthic conditions for observable impacts of nitrogen reduction.
  — Indicator species
  — Evidence of biological activity

Amphipod tube mats – indicative of excess organic matter, adequate DO levels

Tunneling megafauna – adequate DO levels
Why ....

• Benthic video monitoring is part of a comprehensive water quality monitoring program:
  – Fixed-site (buoy and dock station) Monitoring
  – Water Column Profiles
  – Surface Mapping
  – River & Bay Bacteria
  – River & Bay Nutrient Monitoring
  – Water Clarity
  – Phytoplankton Monitoring

• Sound science to support management decisions

• Stimulate further research
Sampling Design and Execution
Eliza Moore – Narragansett Bay Commission
Preparation

• Three permanent transect areas designated non-randomly
  • Edgewood - low flushing, poor water quality
  • Bullock Reach - fixed-site monitoring buoy collecting water quality data
  • Sabin - in between, includes a shoal area on opposite side of channel
• Limited potential to extrapolate over larger region, but targets key areas of interest
Execution

• SeaViewer camera on custom in-house built-sled
• Scale lasers added at the end of 2017
• No lights, but possible in the future
• Transects each approximately 1 km long
• Depth varies ~ 2-6 meters
• Aim for monthly surveys, achieve ~ quarterly
Data Management

• Folders to organize videos by year, labeled with date and transect name
• Screenshots saved with date and transect name
  — Keyword tagging???
• Data in Excel
  — Analysis using R in development
What worked well, and what didn’t …

• Establishing permanent transects was essential!
  — Structured approach >> haphazard exploration
• Stimulated further research!
  — NBC has limited resources for this work
  — Many partners now doing similar or complimentary monitoring in the area
  — Spurred conversation and greater attention
Quick Reminder…

• Purpose
  – Monitor for ecological response to nitrogen reduction efforts of wastewater treatment facilities
    • Improved dissolved oxygen conditions?
    • Reduced organic loading?

• Approach
  – SeaViewer camera on sled, towed along three permanent transects monthly to quarterly
Approach

- Windows Media Player – Video playback
- CMECS Details
  - Data entry in Excel
  - Substrate Component and Biotic Component focus
  - Modifiers:
    - Co-Occurring Elements
Approach

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    • Associated Taxa
**Approach**

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    - Associated Taxa
    - Percent Cover
    - Community Successional Stage (Infaunal Status)

<table>
<thead>
<tr>
<th>Biotic Subclass</th>
<th>Biotic Group</th>
<th>Biotic Community</th>
<th>Percent Cover/Modifier</th>
<th>Infaunal Status</th>
<th>Algae Raft (sp unknown)</th>
<th>Attached Algae</th>
<th>Ulva Raft</th>
<th>Attached Ulva</th>
<th>Gracilaria Raft</th>
<th>Attached Gracilaria</th>
<th>Attached Gracilaria Ciliates</th>
<th>Associated Gracilaria Ciliates</th>
<th>Small Burrowing Fauna (2 mm)</th>
<th>Larger Burrowing Fauna</th>
<th>Dratoco Felt</th>
<th>Ticks and Tails</th>
<th>Small Tube-boring Fauna</th>
<th>Larger Tube-boring Fauna</th>
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<tbody>
<tr>
<td>Soft Sediment Fauna</td>
<td>Mobile Mollusks on Soft Sediment</td>
<td>Nassarius Bed</td>
<td>Sparse</td>
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Approach

• CMECS Modifications
  — Visibility score
Approach

• CMECS Modifications
  — Visibility score
  — New elements as needed (e.g.)
    • Leaf Debris
    • *Grateloupia* Rafts, Attached
Results

• Analysis in R and Excel
• Repeat transect sampling
  — Successfully building a long-term monitoring dataset
• Few, long transects
  — Difficult to separate temporal change from spatial variability
  — More, shorter transects (randomized?) would be ideal
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• Difficult to determine “biotopes”
  — Too much detail captured?
  — Need to whittle down to meaningful groups

“Small-med surface burrowers/tube builders occasionally with algae rafts/beds, boring sponge, diatom felt, epifauna (Crepidula, mudsnails, crabs), small tube-building fauna, small-med surface burrowers/tube builders, sponges on sandy mud/muddy sand”

13 LONG biotopes?
What worked, and what didn’t …

• **Data Entry**
  — What to do with images with no clear dominant?
  — Finding CMECS surprisingly subjective…

• **Data Analysis**
  — Visibility score – limit analysis to comparable footage

• **Overall** – Videos are excellent outreach tools, regardless of data analysis!