Benthic Survey of the Mudflat at Gloucester's Upper Mill River

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So what is living here since the Pond was released?
Will we find Soft Shell Clams?  
– *Mya arenaria*

- Most important commercial species north of Boston

- Also called:
  - long neck clam
  - steamer
Salinity

- Soft shell clams have shown in other studies\(^1\) a highly significant correlation between salinity and density
- Students at O’Maley School tested the waters salinity

\(^1\) Thelan and Theit. Molluscan Community Recovery Following Partial Tidal Restoration of a New England Estuary
Salinity – May 2009

- Students determined that SALINITY was higher at Washington Street than Dr. Osman Babson Road.
Sediment Type and Size

- Soft shell clams reach their highest densities in muddy sand areas but can be found in muddy, sandy and gravelly bottoms.

- **Where will we find them?**
Random Sampling of Mudflat

- Peat – glass – roots - muddy
LOGISTICS

♦ Water
♦ Mud is HEAVY!
and MUCKY!
Although this Fox had no trouble walking across the mudflat
Walking and Digging in the Muck

VERY CHALLENGING!
The Boat was the way to go!
Benthic Study 2008 thru 2010

Salem Sound Coastwatch – project manager

Working around the edge
Many hands made the work go FAST and FUN!
Washers looked for anything alive?
Recorders

- Identified species and measured clams
Cleaning up

♦ Success thanks to so many volunteers
Identification important

♦ Soft shell Clams – ovate-elongate shape
  – Front end is rounded and back is slightly pointed

♦ Duck Clams – not a filter feeders, but deposit feeders
  – Their long inhalent siphons sweep over the mud, like vacuum cleaners
  – live in muddy bays and quite tolerant of low levels of salinity
  – blackened shells from sulphide-rich sediments
Polychaetes – Clam Worms

- Predators of the Mudflats
Green Crabs –

♦ Predators of the Mudflats
What did we find in 2008?
2008 Transects

- 13 Randomly selected transects
- Started 1 meter from high tide mark
- Then sampled every 5 m
- Anywhere from 5 to 50 m out into the mudflat
- 68 samples collected
2008 Results

♦ Distribution

13 soft shell clams in LOWER
2 YOY in Middle
Aging Soft Shell Clams

Life Table of *Mya arenaria* from Brousseau (1978)

- Apparent that colonization occurred as soon as the tide gate was opened in 2004.

- Upper = 7 clams 3 to 4 years
  - 5 clams two-year class range
  - 1 within the under one-year class

- Middle = BOTH young of the year and still mobile. Movement is limited to the early stages

- After clams are over 12 mm in length become permanently fixed in their burrows (Brousseau)
Soft Shell Clams Population

Extrapolating the 2008 data to the whole habitat

**Estimated** population of 48,626 individuals in the entire upper Mill River study area.

It is important to note large (if not huge) uncertainties as they draw from very low numbers (13 and 2 in the lower and middle areas, respectively).
Duck Clams

- 876,840 *duck clams* are estimated to inhabit the study area

<table>
<thead>
<tr>
<th>Location</th>
<th>Duck clams</th>
<th>Size Range</th>
<th>Average size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower</td>
<td>172</td>
<td>8 to 30 mm</td>
<td>23 mm</td>
</tr>
<tr>
<td>Middle</td>
<td>57</td>
<td>10 to 34 mm</td>
<td>27 mm</td>
</tr>
<tr>
<td>Upper</td>
<td>2</td>
<td>22 and 32 mm</td>
<td>27 mm</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>231</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2008 Results

- Majority of organisms found in Lower Study Area
2009 Transects

- 18 randomly selected transects
- Sampled only the Lower and Middle; not upper
- Started 1 meter from high tide mark
- Randomly selected sites meters 1, 2, 3, 4, 6, 7 into the mudflat
- 76 samples collected
2009 Results

29 Soft Shell Clams

Size Range | Average size
---|---
11 - 76 mm | 48.8 mm

Age Range:

<table>
<thead>
<tr>
<th>Years old</th>
<th>Number</th>
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<tr>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
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<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>less than 1</td>
<td>9</td>
</tr>
</tbody>
</table>
Duck Clams

- Lower = 140
- Middle = 78
- Size Range: 8 to 33 mm
- Average size: 19 - 20 mm
Other Species

- **2008**

<table>
<thead>
<tr>
<th></th>
<th>Nereidae Clam Worms</th>
<th>Oligochaetes</th>
<th>Littorina littorea</th>
<th>Tanaids</th>
<th>Ilyanassa obsoletus</th>
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</thead>
<tbody>
<tr>
<td>Lower</td>
<td>36</td>
<td>17</td>
<td>1</td>
<td>3</td>
<td>26</td>
</tr>
<tr>
<td>Middle</td>
<td>45</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Upper</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Totals</td>
<td>81</td>
<td>24</td>
<td>1</td>
<td>3</td>
<td>28</td>
</tr>
</tbody>
</table>

- **2009**

<table>
<thead>
<tr>
<th></th>
<th>Nereidae Clam Worms</th>
<th>Oligochaetes</th>
<th>Littorina littorea</th>
<th>Tanaids</th>
<th>Ilyanassa obsoletus</th>
<th>Carcinus maenas</th>
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</thead>
<tbody>
<tr>
<td>Lower</td>
<td>18</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Middle</td>
<td>22</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Totals</td>
<td>40</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>5</td>
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</table>

No significant difference – but questions?
Finished until next year - 2010
YES, there is LIFE in the MUDFLAT
Acknowledgements

♦ MA Coastal Zone Management Wetlands Restoration Program and staff
♦ Bruce J. Anderson Foundation
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