Macroalgae in Maryland’s Coastal Bays

Coastal Fisheries Program
January 5, 2011
Macroalgae in Coastal Bays

- Macroalgae naturally occurs
- Increases in macroalgae biomass related to eutrophication

Can macroalgae be used as an indicator of the health of MD’s coastal bays?
Complication

• Many other factors influence macroalgae abundance and composition, including:
  • Light
  • Temperature
  • Grazers
  • Currents
  • Freshwater input
  • Phytoplankton dynamics
  • Nutrient uptake rates
MDNR’s Coastal Fisheries Program

• Trawl
  • 20 sites / month
  • April – October
  • 16’ trawl

• Seine
  • 19 sites / month
  • June, September
  • 100’ seine
Regions

- Assawoman
- Isle of Wight
- St. Martin
- Sinepuxent
- Newport
- Chincoteague
Macroalgaes Estimation

• Began monitoring in 2006
• Measure total volume
• Estimate percentage of type
• Calculate specific volume
Macroalgae Abundance

1. Abundance by region
   • Where was macroalgae most abundant?
   • Which types of macroalgae were most abundant?

2. Abundance over time
   • Did abundance change over time?
   • Did abundance of each type change over time?

Red    Green    Brown    Yellow-Green
Most Abundant Macroalgae

**TRAWL**

- **Agardhiella** (50%)
  - Agardh’s Red Weed
- **Gracilaria** (28%)
  - Graceful Red Weed
- **Ulva** (11%)
  - Sea Lettuce
- **Chaetomorpha** (5%)
  - Green Hair Algae

**SEI NE**

- **Agardhiella** (43%)
  - Agardh’s Red Weed
- **Gracilaria** (23%)
  - Graceful Red Weed
- **Cladophora** (13%)
  - Green Tufted Seaweed
- **Chaetomorpha** (8%)
  - Green Hair Algae
1. Abundance by Region: TRAWL

- Newport (2)
- Chincoteague (8)
- Sinepuxent (3)
- St. Martin (2)
- Assawoman (3)
- Isle of Wight (2)
1. Abundance by Region: SEI NE

- **Isle of Wight (3)**
- **St. Martin (1)**
- **Assawoman (3)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Newport (2)</th>
<th>Chincoteague (6)</th>
<th>Sinepuxent (3)</th>
<th>Isle of Wight (3)</th>
<th>St. Martin (1)</th>
<th>Assawoman (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Red and Green Macroalgae

Northern Bays: Commercial & recreational development, marinas, harbors
2. Abundance Over Time

• Does mean macroalgae volume change by year and month?

• ANOVA, Tukey pairwise comparisons

• Log transform if necessary (seine)
Mean volume is greater in years 2008-2010
Log mean volume is the same between years
Macroalgae in Maryland's Coastal Bays

<table>
<thead>
<tr>
<th>Month</th>
<th>Mean Volume (l)</th>
<th>SEINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jun</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jul</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aug</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sep</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mean volume is the same between months

Log mean volume is the same between months
Trawl Data by Month and Type

- Red volume remains the same.

- Green volume is significantly greater in Apr-Jun than the rest of the year.
Summary

• **Abundance by Region**
  • Macroalgae is most abundant in the northern bays.
  • Red macroalgae (*Agardhiella* and *Gracilaria*) accounts for most total volume.

• **Abundance over Time**
  • Mean volume increased in 2008.
  • Mean green macroalgae volume is significantly higher in Apr-Jun.
Macroalgae as an Indicator

- Determine if there is a relationship between abundance and...
  - Nutrient levels
  - Water quality
  - Chl a
  - Light attenuation

- Physical processes (currents, tides, storms, freshwater input)
Considerations

• Greater abundances of macroalgae may be beneficial (habitat for fish and crabs)...good or bad?
• Because of uncertainties, may not be realistic to use macroalgae to ‘grade the bays.’
• However, continued monitoring will allow us to identify what changes are regular and seasonal vs ‘unusual.’ (Lavery et al. 1991)