Economic Impacts of Oyster Reef Restoration

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Introduction

Why are oysters important?

❖ Keystone species
❖ Improve water quality
  ▪ Remove nitrogen from water column
  ▪ Filter feeders that remove suspended sediment
  ▪ Support growth of Submerged Aquatic Vegetation
❖ Habitat to other species
  ▪ Increase biodiversity
  ▪ Provide fish for commercial and recreational fishing
Background

Oyster Decline

- ~0.1% of oysters left in the bay

Disease

- “Dermo” - warm-season parasite
- “MSX” - high salinity parasite

Harvesting

- Hand Tonging and Dredging
  - Habitat Loss
  - Decline in commercial harvest
Background

Restoration Site: Choptank River Complex

- Maryland tributaries- Harris creek River, Tred Avon River, and Little Choptank River
- About 564 acres designated for the reef restoration sites
- $47.61 million investment in restoration
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Project Design

- Creating factsheets for the public that convey the economic impacts of reef restoration.
  - Based on topics: project overview, communities affected and more
  - Goal: To simplify complex data, population measures, and forecasts for the public
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Socio-economic Benefits of restoration

Biophysical Structure
- Oyster reef with spat on old shells

Ecological Processes
- Ecopath w/ Ecosim
  - Biomass Production

Ecosystem Services
- Clearer water
- More habitat
- More food
- Increased biodiversity

Benefits
- Enhanced commercial & recreational fishing
- More nutrients removed

Economic Impacts
- Commercial catch revenue
- Increase in jobs
- More recreational fishing
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### References

Organized references from the 38 species about life history and diets to be modeled.

<table>
<thead>
<tr>
<th>No.</th>
<th>Group Name</th>
<th>Biomass</th>
<th>Total Mortality</th>
<th>Production/biomass</th>
<th>Consumption/biomass</th>
<th>Ecotrophic Efficiency</th>
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<tbody>
<tr>
<td>1</td>
<td>StripedBass UV</td>
<td>ORES data, see spreadsheet &quot;Species_mean_len_by_string_new.xlsx&quot; (0.289 g/m2)</td>
<td>CBFEM 1950 model</td>
<td>CBFEM 1950's model</td>
<td>CBFEM 1950's model</td>
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<td>Weakfish</td>
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<td>bioparams</td>
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<td>DivingDucks</td>
<td>VIMS report (2009) by Paige Ross and Mark Luckenbach</td>
<td>CBFEM 1950 model</td>
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<td>Doug Forsell's document</td>
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<td>&quot;Forsell_F+W_2004.xls&quot;</td>
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<td>EwE 2008 model</td>
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<td>Catfish</td>
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<td>12</td>
<td>ReefFish (incl)</td>
<td>Madeo Model</td>
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</tbody>
</table>
| 14  | OysterToadfish      | Lisa Kellogg's Final Report (2016) see spreadsheet "Macrofauna Data for Tom -  
see spreadsheet "Macrofauna Data for Tom" | Madeo model     |                     |                     |                       |
| 15  |                    |                                |                 |                    |                     |                       |
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Models Used

Ecopath w/ Ecosim Modeling Software

- Mass-balanced software that examines species interactions, and group functions represented by biomass.
  - Trying to balance enough prey for the predators
  - Shows the harvesting rate in different trophic levels in ecosystem
  - Forecasts the change in fish biomass over time in the reef scenarios
EwE

Model tracks each species biomass per area, mortality, consumption/biomass and how these change.
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Models Used

**IMPLAN**

- Input-output model that links the change in landings values to economic outcomes.
  - Multiplier-rate of economic change in: outcome, income, employment, and revenue.
  - Shows the dollar flow in the fishing industry and the local economy.
  - Shows the positive or negative impact on the state economy.
## Healthy Oysters, Healthy Economy

Reef Restoration creates more jobs & income for the Choptank River

<table>
<thead>
<tr>
<th>Facts &amp; background</th>
<th>Why is it important?</th>
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<tr>
<td><strong>50</strong> Gallons of water that a healthy oyster can filter in 1 day.</td>
<td>Oysters keep the water clean which makes a healthier environment.</td>
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<td><strong>&lt;1</strong> Percent of the historic oyster population remains in Chesapeake Bay.</td>
<td>Decrease in oyster population because of disease &amp; harvest means less fish and less jobs.</td>
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<td><strong>564</strong> Acres will be restored in the Choptank River Watershed.</td>
<td>Reefs attract fish and crabs that people catch. More fish also means more tourism.</td>
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<td><strong>100</strong> Percent successful to date reef restorations. 10 Tributaries are planned to be restored by 2025.</td>
<td>The reefs slow down the waves to protect coastal properties.</td>
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</table>
Importance of Harvested Fish in Choptank River

607+ Watermen in the Choptank Watershed in 2015

Maryland Dockside Value of Blue Crabs, Oysters, & Striped Bass

Oyster catches decreased, while blue crab catches increased. Oysters, Blue Crabs, and Striped Bass are popular for both commercial and recreational fishing.

Choptank River Facts

Economic Output
- Blue crab catch makes up 20% of the Chesapeake Bay’s Blue Crab catch
- $807,000 value of Finfish caught
- $8.7 million value of Blue Crab caught

Commercial Fishing
- 2,322 Finfish trips
- 21,517 Blue Crab fishing trips

Factsheet Design 2
Acknowledgements

Funders

- NOAA
- PEARL
- NFWF

Data contributions

- Maryland Department of Natural Resources
- Chesapeake Bay Program
- Oyster Recovery Partnership
- Chesapeake Bay Foundation

Literature

- http://www.chesapeakebay.net/discover/bayecosystem/dissolvedoxygen
- http://www.vims.edu/_docs/oysters/oyster-diseases-CB.pdf
Questions