Sturgeon of the Penobscot and the Gulf of Maine

Gayle Zydlewski

All photos take pursuant to ESA permit #1595
Collaborative effort:

Mike Kinnison
Joe Zydlewski
Stephen Fernandes
Phillip Dionne
Kevin Lachapelle
Theresa McGovern
Christine Lipsky
James Hawkes
Gail Wippelhauser
Research started in 2006:
Objectives focused on the Penobscot

- Confirm presence of shortnose sturgeon
- Identify critical habitat
- Estimate abundance

All photos take pursuant to ESA permit #1595
Current research objectives

- **Shortnose sturgeon**
  1. Refine a population model and sampling design for Gulf of Maine shortnose sturgeon
  2. Use non-invasive techniques to estimate aggregations
  3. Document spawning in the Penobscot River

- **Atlantic sturgeon**
  - Document habitat use of the Penobscot River
  - Document wintering habitat (marine)
Methods
Movement: Shortnose sturgeon
2006-2007

Fernandes et al. 2008 *in press*
Annual Movement Pattern

Winter:
- Upper estuary (aggregation)
- Downstream
- Upper estuary
- Spring
- Lower estuary
- Upstream

Fall:
- Upper estuary
- Fall
- Middle estuary
- Upstream

Summer:
- Lower estuary
- Upstream
- Bangor
Movement–implications for population model
2006-2007...1. Refine a population model

Fernandes et al. 2008 in press
All photos take pursuant to ESA permit #1595.

Tara Trinko, NOAA
Annual Movement Pattern

Winter
- upper estuary (aggregation) - downstream

Fall
- upper estuary - upstream

Spring
- lower estuary - upstream

Summer
- middle estuary - Immigration/Emigration

Immigration/Emigration

Bangor
Abundance Estimate: Robust Design

- Seasonal estimates survival, capture probability, abundance, and site fidelity

- Allows for grouping of multiple sampling events under a primary sampling session
## Preliminary Results

<table>
<thead>
<tr>
<th>Sample Period</th>
<th>Survival (S)</th>
<th>SE</th>
<th>Capture/ Recapture (p)</th>
<th>SE</th>
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<table>
<thead>
<tr>
<th>Sample Period</th>
<th>Emigration ((\gamma''))</th>
<th>SE</th>
<th>Immigration ((1-\gamma'))</th>
<th>SE</th>
<th>Abundance (N)</th>
<th>SE</th>
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<tbody>
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<td>(1) 2006-2007</td>
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### Compared Estimates

<table>
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<tr>
<th>Sample Period</th>
<th>Emigration ($\gamma''$)</th>
<th>(Observed) Emigration ($\gamma''$)</th>
<th>Immigration (1-$\gamma'$)</th>
<th>(Observed) Immigration (1-$\gamma'$)</th>
<th>Abundance (N)</th>
<th>SE</th>
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<th>SE</th>
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<td>1007</td>
<td>214</td>
<td>667</td>
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</tbody>
</table>

### Diagram

- **2006-2007**:
  - Sample area
  - Outside sample area

- **Summer ‘08**:
  - Sample area
  - Outside sample area
  - $0.00$ to $0.43$
  - $0.50$ to $0.00$

- **Fall ‘08**:
  - Sample area
  - Outside sample area
  - $0.00$ to $0.43$
  - $0.50$ to $0.00$
Another opportunity to estimate abundance... 2. non-invasive technique
Analysis: Nov 15

Predicted 378 fish
Water Temp 6.67 °C
Abundance Estimate

- Nov 15: 378
- Nov 17: 372
- Nov 21: 758
- Average: 503 ± 242
- Previous Estimates: 667 fall residents
3. Documenting Spawning

All photos take pursuant to ESA permit #1595

Justin Chiotti, MTU
Movement out of the winter site
Using a 2D bathymetric-based model to examine habitat suitability
What about Atlantic sturgeon?

All photos take pursuant to ESA permit #1595
The diagram illustrates the seasonal movements of species in different parts of the estuary.

- **Winter**: Aggregation of species in the upper estuary.
- **Fall**: Movement downstream to the middle estuary.
- **Middle Estuary**: Movement into the upper estuary for reproduction.
- **Spring**: Movement upstream to the upper estuary for spawning.
- **All photos take pursuant to ESA permit #1595**
SCUTES program
Students Collaborating to Undertake Tracking Efforts for Sturgeon

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Future Work

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Acknowledgments