Future warming and impacts on U.S. Northwest fisheries

Presented by
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Northeast U.S. Commercial Fishery Value

Commercial Fishery Value at Major U.S. Ports, 2015

Legend
Millions of Dollars
- 10
- 25
- 50
- 100
- 300

New Bedford, MA ($322 million)
Dutch Harbor, AK ($218 million)

NOAA, 2015
Importance of Climate Model Resolution

- NOAA NCEI (10-km)
- GFDL CM2.1
  - Low-res. ocean (100-km)
- GFDL CM2.5
  - Mid-res. ocean (25-km)
- GFDL CM2.6
  - High-res. ocean (10-km)

Sea Surface Temperature °C

Range: 5 to 21
Importance of Climate Model Resolution

Saba et al. 2016
Using GFDL’s CM2.6 for species projections

Atlantic cod

Kleisner et al. 2017

Value of Landings

<table>
<thead>
<tr>
<th>Rank</th>
<th>Species</th>
<th>Thousand Dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lobsters</td>
<td>679,214</td>
</tr>
<tr>
<td>2</td>
<td>Crabs</td>
<td>678,727</td>
</tr>
<tr>
<td>3</td>
<td>Shrimp</td>
<td>488,384</td>
</tr>
<tr>
<td>4</td>
<td>Salmon</td>
<td>460,166</td>
</tr>
<tr>
<td>5</td>
<td>Pollock</td>
<td>449,198</td>
</tr>
<tr>
<td>6</td>
<td>Scallops</td>
<td>440,496</td>
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<tr>
<td>7</td>
<td>Cod</td>
<td>264,191</td>
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<tr>
<td>8</td>
<td>Flatfish</td>
<td>263,615</td>
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<tr>
<td>9</td>
<td>Oysters</td>
<td>213,773</td>
</tr>
<tr>
<td>10</td>
<td>Clams</td>
<td>206,299</td>
</tr>
</tbody>
</table>
Using GFDL’s CM2.6 for species projections

Distance to port under continued ocean warming.

Does not account for:

- Fishing mortality change.
- Bottom-up forcing
- Species interactions.

Kleisner et al. 2017
Summary

• GFDL’s CM2.6 is now being widely used for Northeast U.S. fisheries research

• Thermal habitat projections for all major species are on nefsc.noaa.gov

• CM2.6 - Zooplankton distribution shifts

• CM2.6 - Predator/prey interactions

• CM2.6 - Sea turtles