Salmon and jellies and herring, oh my! Abiotic and biotic-dependent trends in abundance and distribution of pelagic critters in Skagit Bay across 17 years

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Salmon and jellies and herring, oh my!
Trends in the environment and critters of Skagit Bay’s pelagic waters across 17 years

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Jason Hall¹
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Outline

• Prospective talk w/extremely preliminary findings
  • Show & tell
  • I’d appreciate input & ideas

• Describe
  • the monitoring
  • analytical approach
  • time series of environmental conditions & fish abundances

• Examine
  • relationships among species & environmental conditions
Skagit Bay & its pelagic habitat

• Estuarine bay & strait in the Whidbey Basin
• Fed by Skagit River
• Many local fish use pelagic waters during various life history phases
  • E.g., salmon, forage fish, larval fish
  • These waters allow juvenile fish to grow
  • Species interact (e.g., competition, predation) depending on the life stage

• Many of these fish are of direct value to people or provide important trophic linkages
Monitoring

- Tow netting & water quality measurements
- 2001 – present (>2,250 sampling events)
- April – October (mostly)
Marine, mixed by sills & narrows
(Straight outta the Straits)

Dominated by Skagit River plume
(Fresh outta Skagit)

Stratified
(Fresh Skagit meets salty Saratoga)
Deception pass
Estimating conditions of fish & the environment

Seasonality in fish abundance & environment

Proximate observations will be similar
Trends in temperature & salinity
Trends in fish abundances

North
Middle
South
Is the fish assemblage shifting from salmon & forage fish to jellyfish & fish larvae?
Is the fish assemblage becoming more homogenous among regions of Skagit Bay?
Trends in jellyfish abundances

![Image of Lion’s mane jelly](image1)

**Lion’s mane jelly**

![Image of Fried egg jelly](image2)

**Fried egg jelly**

<table>
<thead>
<tr>
<th>Year</th>
<th>North</th>
<th>Middle</th>
<th>South</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010.0</td>
<td>0.1</td>
<td>0.2</td>
<td>0.3</td>
</tr>
<tr>
<td>2012.5</td>
<td>0.4</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>2015.0</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
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</tbody>
</table>
Temp & jellyfish

Lion’s mane & fried egg jellyfish tend not to co-occur.

Cool waters appear to favor lion’s mane jellyfish
Salmon & jellyfish

Appears that cool waters favor Chinook salmon & lion’s mane jellyfish while warm waters favor fried egg jellyfish.

<table>
<thead>
<tr>
<th>Water</th>
<th>Warm</th>
<th>Cool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmon</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Lion's Mane</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Fried Egg</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>
Moving forward

• Assess potential for interactions among species & environmental conditions (e.g., predation x metabolism, competition)
  • What relationships appear to be driven by species → species interactions and which are mediated by the environment?

• Incorporate fish condition (e.g., mass at length)
  • Recent warm waters increased growth of (surviving) Chinook salmon
    • see Josh’s talk

• Examine relationships between environment & fish in context of long terms changes in water condition
Acknowledgements & questions

• Funding
  • WA Department of Ecology – Skagit IMW

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  • Skagit River System Cooperative

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Kathryn Sobocinski
Casey Rice
Eric Beamer

Brainstorm w/me during a coffee break!

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