May 2nd, 10:30 AM - 12:00 PM

Variation in juvenile Chinook salmon diet composition and foraging success between two estuaries with contrasting land-use histories

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David, Aaron; Simenstad, Charles; Cordell, Jeffrey R.; Toft, Jason David; Ellings, Christopher; Gray, Ayesha; and Berge, Hans B., "Variation in juvenile Chinook salmon diet composition and foraging success between two estuaries with contrasting land-use histories" (2014). *Salish Sea Ecosystem Conference*. 70.  

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Speaker
Aaron David, Charles Simenstad, Jeffrey R. Cordell, Jason David Toft, Christopher Ellings, Ayesha Gray, and Hans B. Berge

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Wetland loss and juvenile Chinook salmon foraging performance in Salish Sea (and other) estuaries

Aaron David¹, Charles Simenstad¹, Jeffery Cordell¹, Jason Toft¹, Christopher Ellings², Ayesha Gray³, Hans Berge⁴

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²Nisqually Indian Tribe, Department of Natural Resources
³Earth Design Consultants
⁴King County, Water and Land Resource Division
A critical size and period hypothesis to explain natural regulation of salmon abundance and the linkage to climate and climate change

R.J. Beamish, Conrad Mahnken

Pacific Biological Station, 3190 Hammond Bay Road, Nanaimo, BC, V9R 5K6, Canada
National Marine Fisheries Service, 7305 Beach Drive East, Port Orchard, WA 98366, USA

Size Selective Predation Among Juvenile Salmonid Fishes in a British Columbia Inlet

ROBERT R. PARKER
Fisheries Research Board of Canada
Biological Station, Nanaimo, B.C.

Over-winter lipid depletion and mortality of age-0 rainbow trout (Oncorhynchus mykiss)

Peter A. Biro, Ashley E. Morton, John R. Post, and Eric A. Parkinson

From Duffy and Beauchamp (2011)
Estuaries provide productive foraging opportunities

But human impacts to estuaries may affect juvenile salmon foraging performance
Wetland loss/modification

Reduced invertebrate populations

Shifts in invertebrate assemblages

Reduced juvenile salmon growth

Reduced salmon foraging performance

Reduced estuarine and marine survival

Density of conspecifics

From Magnusson and Hilborn (2003)
Hypotheses

Minimal wetland loss

Extensive wetland loss
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<th>Estuary</th>
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<th>Number of salmon</th>
<th>Years sampled</th>
<th>Percent wetlands lost</th>
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<td>Alsea</td>
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<td>43</td>
<td>2003</td>
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<td>2003; 2005</td>
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<td>2003</td>
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<tr>
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<td>505</td>
<td>2010-2012</td>
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<td>Yaquina</td>
<td>(Bieber 2005)</td>
<td>32</td>
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Methods
Ration size = 100*(stomach contents mass / fish mass)
$\log(\text{Ration} + 0.1)$

$P = 0.42$

$R^2 = 0.10$

Proportion of wetlands lost
Energy ration = \[ \sum \text{prey taxa mass}_i \ast \text{energy density}_i \] / fish mass
Multivariate diet analysis

- Canonical correspondence analysis (CCA)
- Used sampling events (location x date) as the unit of observation.
- Explanatory variables:
  - Proportional wetland loss
  - Salinity
  - Day of year
  - Mean fork length
# Multivariate results

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Conclusions

- Little evidence of a direct effect of estuarine wetland loss on salmon foraging performance.

- But, wetland loss appeared to mediate the effect of density on salmon foraging performance.

- Salmon recovery efforts need to recognize that density-dependent processes may still be important at abundances that are low relative to historic levels (Achord et al. 2003; Green and Beechie 2004).
Acknowledgements

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Photos: Michael Grilliot, Jeff Cordell, Jason Toft, Christopher Ellings, Stuart Munsch, the Wetland Ecosystem Team.