



# Eulachon: State of the Science and Science-to-Policy Forum



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# Identifying Uncertainty – Sources of Information

- Today's presentations
- Scientific findings
- Status Reviews (Biological Opinion)
- Recovery planning
- Council's F & WL Program

# Key takeaways from today's presentations

- I covered these in the discussion after lunch.

# Moody and Pritchler 2010 (UBC)

- Key Ho for decline
  - Land use practices
  - Pollution (Pichard and Marmorek 2007)
  - Dredging
  - Shoreline development and flow management
  - By catch in fisheries
  - Climate change
  - Marine food, ocean productivity
  - Increased competition and predation

# Moody and Pritchler 2010 (UBC)

- Columbia River analyses – correlation factors
  - Shrimp catch (-)  $r^2 = 0.28 - 0.45$
  - Hake catch (-)  $r^2 = 0.17 - 0.20$
  - Sea lion abundance (-)  $r^2 = 0.33 - 0.36$
  - Hake biomass (+)  $r^2 = 0.37 - 0.46$
  - Climate indices – found no correlation

# Status Review - Qualitative Ranking of Columbia River Threats (BRT mean score)

- Major threats
  - Climate change impacts on ocean conditions (4.3)
  - Eulachon by-catch in fisheries (3.8)
  - Climate change impacts on freshwater habitats (3.4)
  - Dams/water diversions (3.3)
- Minor threats
  - Water quality (3.0)
  - Dredging (2.9)
  - Predation (2.9)

# Biological Opinion

- Uncertainties

- Eulachon larvae in the estuary-plume environment depend on phytoplankton abundance – how is this affected by FCRPS operations?
- Because of population structure, populations may be vulnerable to environmental catastrophe and year-class failure, such as poor ocean conditions (e.g., El Nino)
- What are the effects of quantity and timing of instream flows on critical habitat?



# Draft List of Critical Uncertainties in NPCC F & WL Program Draft Research Plan

	<b>Research question or critical uncertainty</b>
1	What are the life history characteristics of eulachon, and what actions could be aimed at rebuilding eulachon populations? Monitor eulachon returns through a combination of scientific test sampling of adults, and early life history (larval and egg) investigations; support actions aimed at rebuilding those populations towards desired and historic levels.
2	Monitor and evaluate the causal mechanisms and migration/behavior characteristics affecting survival of larval eulachon during their first weeks in the Columbia River estuary, plume, and ocean environments.
3	What is the ecological importance of the tidal freshwater, estuary, plume, and nearshore ocean environments to the viability and recovery of the Columbia River subpopulation of eulachon?
4	Develop an oceanographic indicators ecosystem conditions model to determine the significance of plume and nearshore ocean conditions that affect eulachon survival.
5	How are climate change, ocean acidification, salinity, estuary turbidity maximum (ETM), and localized hypoxia likely to affect forage fish in the coming decades?
6	How do changes in the Columbia River hydrograph effect survival, productivity and recovery potential of eulachon?
7	How do restoration projects in the estuary contribute to reproductive success and rearing of forage fish?
8	What role do forage fish have in survival of juvenile Chinook salmon, coho, and steelhead, such as by providing alternative prey to avian predators and sea lions?



# Summary – common themes for uncertainties

- Climate change and ocean conditions
  - Eulachon abundance is highly variable
    - Acute responses to ocean productivity
  - Eulachon are not commercially harvested
    - Little evaluation of ecological drivers of productivity
  - Columbia River – data collected linking salmonid growth and survival to ocean conditions and plume characteristics is a logical starting point for data analysis
  - If productivity appears linked to ocean conditions, why did Moody and Pritcher (2010) find no correlation with ocean climate indices? Do we have the right metrics for assessing Eulachon?

# Summary – themes and uncertainties

- Freshwater productivity
  - Overall – general lack of juvenile data
  - Potential effects of climate change?
    - Water temperature, altered hydrograph, low flow
  - Is existing habitat limiting spawning/rearing?
  - To what extent have dams (Columbia, Cowlitz, Sandy) constrained distribution and access to key habitats?
  - FCRPS flow regulation and effect on plume size and productivity?

# Summary – themes and uncertainties

- By-catch
  - Recent reduction methods appear to be working
    - Excluder devices and LED lights
    - How confident are we in this conclusion?
    - Is more monitoring needed?
- Predation and competition
  - Hake
  - Pinnipeds

of small fish which now begin to run and are  
 taken in great quantities in the Columbia R.  
 about 40 miles above us by means of skimming  
 or scooping nets. on this page I have drawn  
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 as perfect as I can make it with my  
 pen and will serve to give a  
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 next to the tail has no  
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the lower R.  
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then men  
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 half formed in fact  
 has eleven rays. all  
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 dusky colour and that of  
 part of the sides and belly  
 is white. no spots on any  
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 eye is of a bluish cast, and the  
 a light green colour nearly white  
 of the eye is black and the iris of  
 white. the under jaw exceeds the upper  
 the mouth opens to great extent, folding  
 that of the hearing. it has no teeth.  
 the abdomen is obtuse and smooth, in this  
 differing from the herring, shad, anchovy  
 or of the Malacopterygians (Caden & Clap)  
 Clupea

Closing remarks:

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Robert Anderson

John Ferguson