Northwest **Power** and **Conservation** Council

January 8, 2019

MEMORANDUM

TO: **Fish and Wildlife Committee members**

FROM: **Patty O'Toole, Program Implementation Manager**

SUBJECT: **Ocean and Plume Science and Management Forum update**

BACKGROUND:

Presenter: Patty O'Toole

Summary: Staff will provide an update on the recent Ocean and Plume Science and Management Forum (Ocean Forum) meeting, held on December 10, at the Council office in Portland.

Relevance: The Council supports convening one or two meetings of the Ocean Forum each year.

Background: The Ocean Forum is a group of ocean researchers and freshwater fish managers that meet once or twice each year to share information and to focus on the management implications of ocean, plume and estuary research. The Council provide support for the forum by providing and maintaining meeting resources (example: Forum webpage) and the chair of the Fish and Wildlife Committee acts as the Ocean Forum chair.

There were two technical presentations at the December Ocean Forum meeting: 1) *update on physical conditions and biological response across the North Pacific Ocean*; and 2) presentation on the *variation in growth of yearling smolts in the Columbia River estuary*. At the January Fish and Wildlife Committee meeting, staff will provide a brief report on the meeting.

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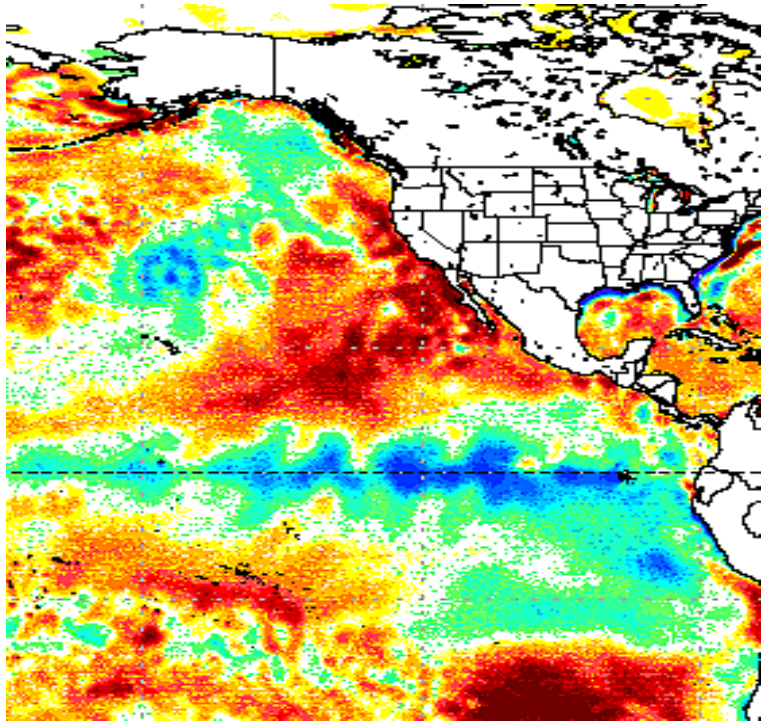
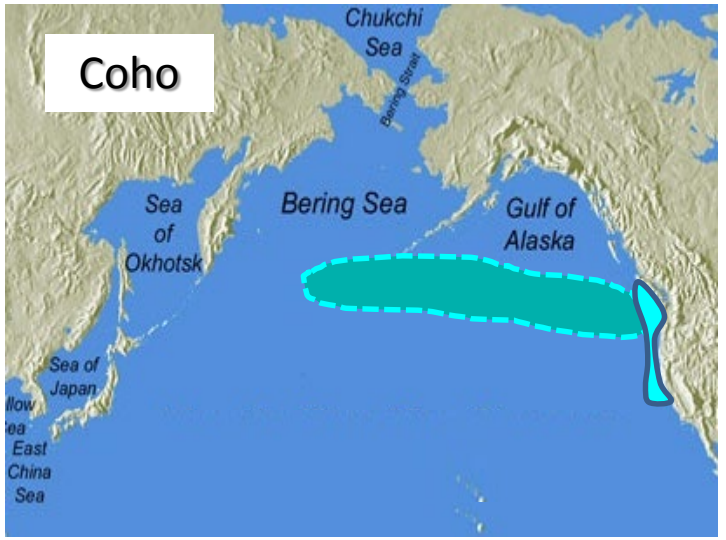
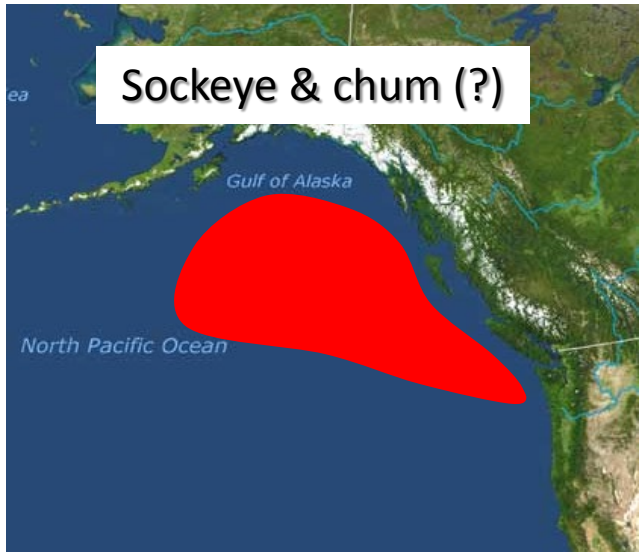
Update on physical conditions and biological response across the North Pacific Ocean



Laurie Weitkamp
NOAA Fisheries
Northwest Fisheries Science Center
Newport Field Station
Laurie.weitkamp@noaa.gov

Columbia River high seas distributions

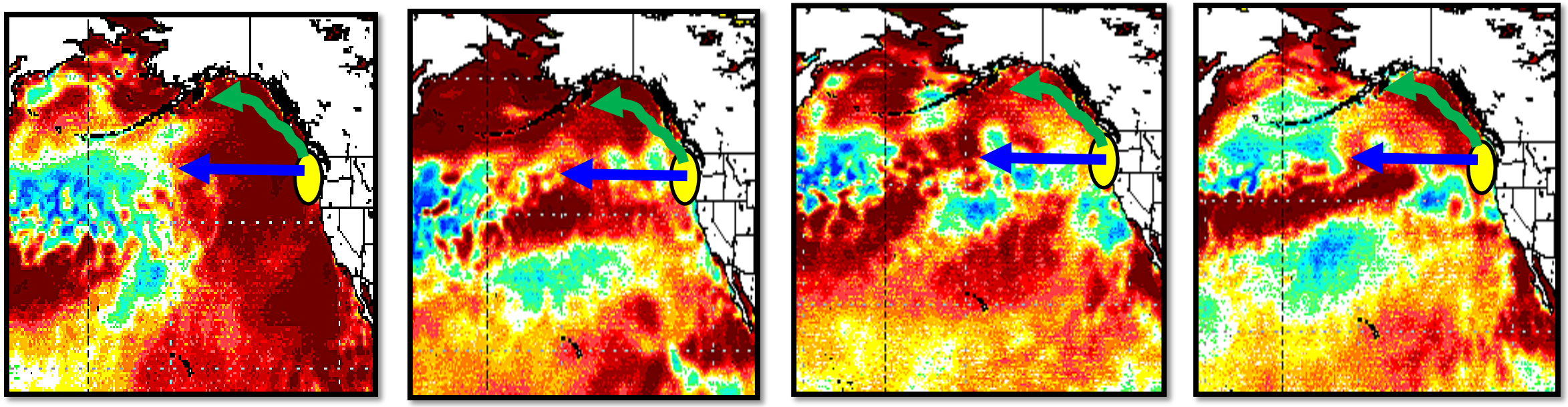




Initial salmon migrations in recent Julys

(shading = sea surface temperature anomalies)

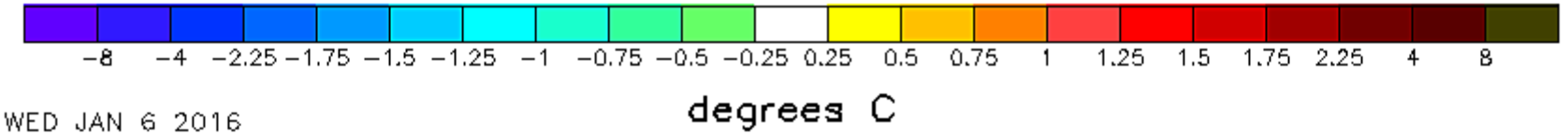
July 2015 **July 2016** **July 2017** **July 2018**



Spring Chinook

Steelhead

Fall Chinook, coho



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3. Biological response to physical conditions

Pyrosomes caught in a 5 minute tow off the Washington coast, May 2018

Highlights

- Extremes across the N Pacific
- Observations from BPA-funded juvenile salmon surveys (JSOES study)
- Adult salmon returns, AK to CA
- Marine mammals

Bottom line

Huge response across N Pacific from diatoms to marine mammals

Getting more normal but still kinda 'weird'

2018 Extremes across the N Pacific

Pyrosomes were here in spring, but left this fall

Zooplankton returning to “normal”

Results of a 5 min tow, May 2018

Pyrosomes in fish guts aren’t digesting

Big hypoxia event caused crab die-offs

Continuing crab and/or razor clam fisheries closures due to domoic acid

Some warm water fish still around (May 2018)

Pacific pompano

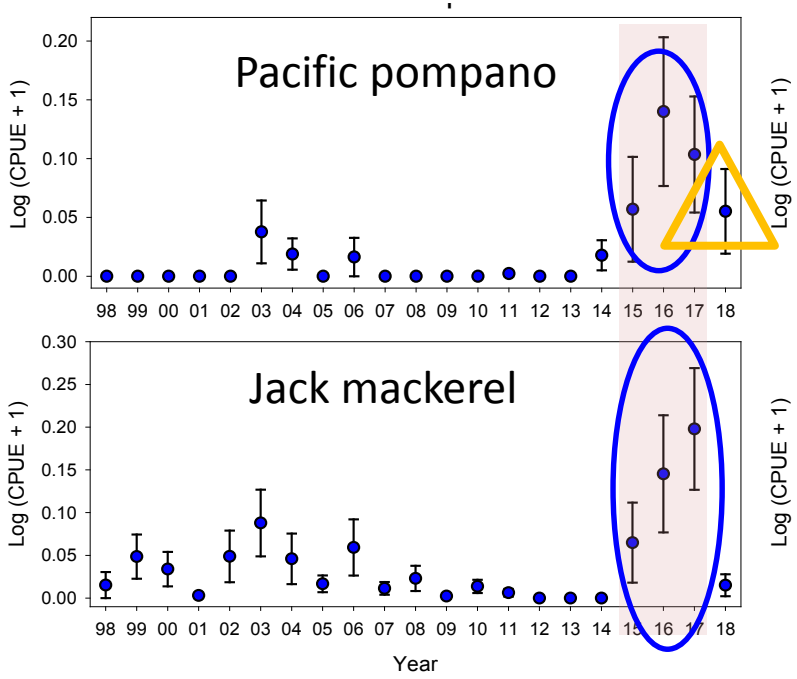
Unusual abundances of **fish** in Juvenile salmon surveys, 1998-2018

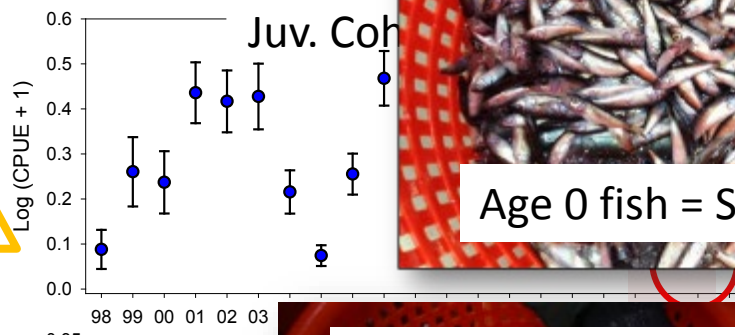
2015-2017

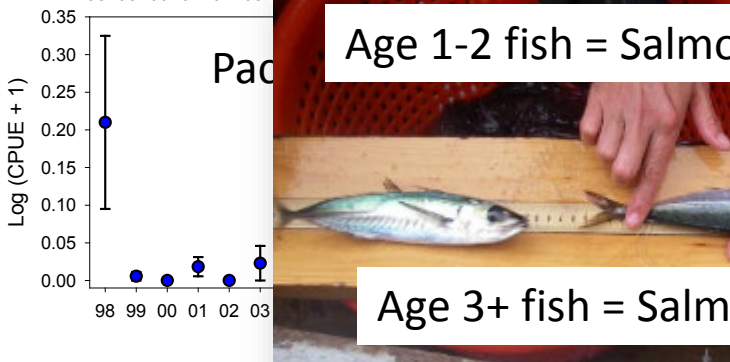
Winners!

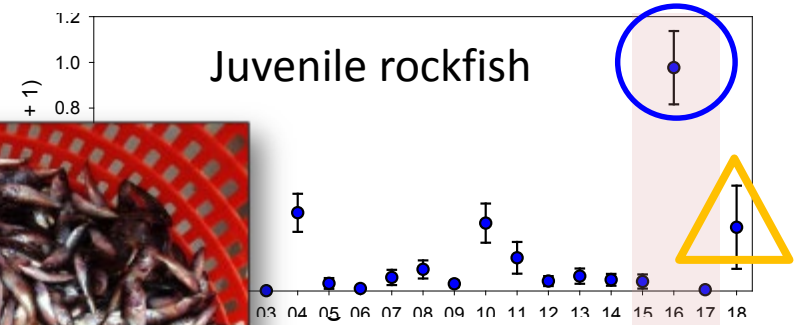
Losers

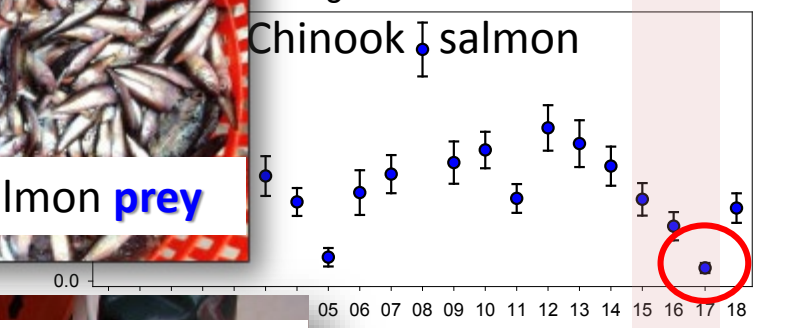
2018 anomalies











Morgan et al. in press

Unusual adult salmon observations: it's not just the Columbia!

2015

5. Summary

- Warm ocean waters present since 2014 still continue across large parts of the North Pacific Ocean
- Biological response to warm ocean has been huge and persistent
  - Effects observed at all levels of marine ecosystem
  - Expect biological effects of warm ocean conditions will continue for several years (e.g., salmon returns, hake increase)
- The current weak El Nino and predicted warm coastal waters this coming spring are unlikely to be favorable for cold water species (e.g., salmon, crab).
- **What's next?!!**

Bill's stoplight rankings

www.nwfsc.noaa.gov

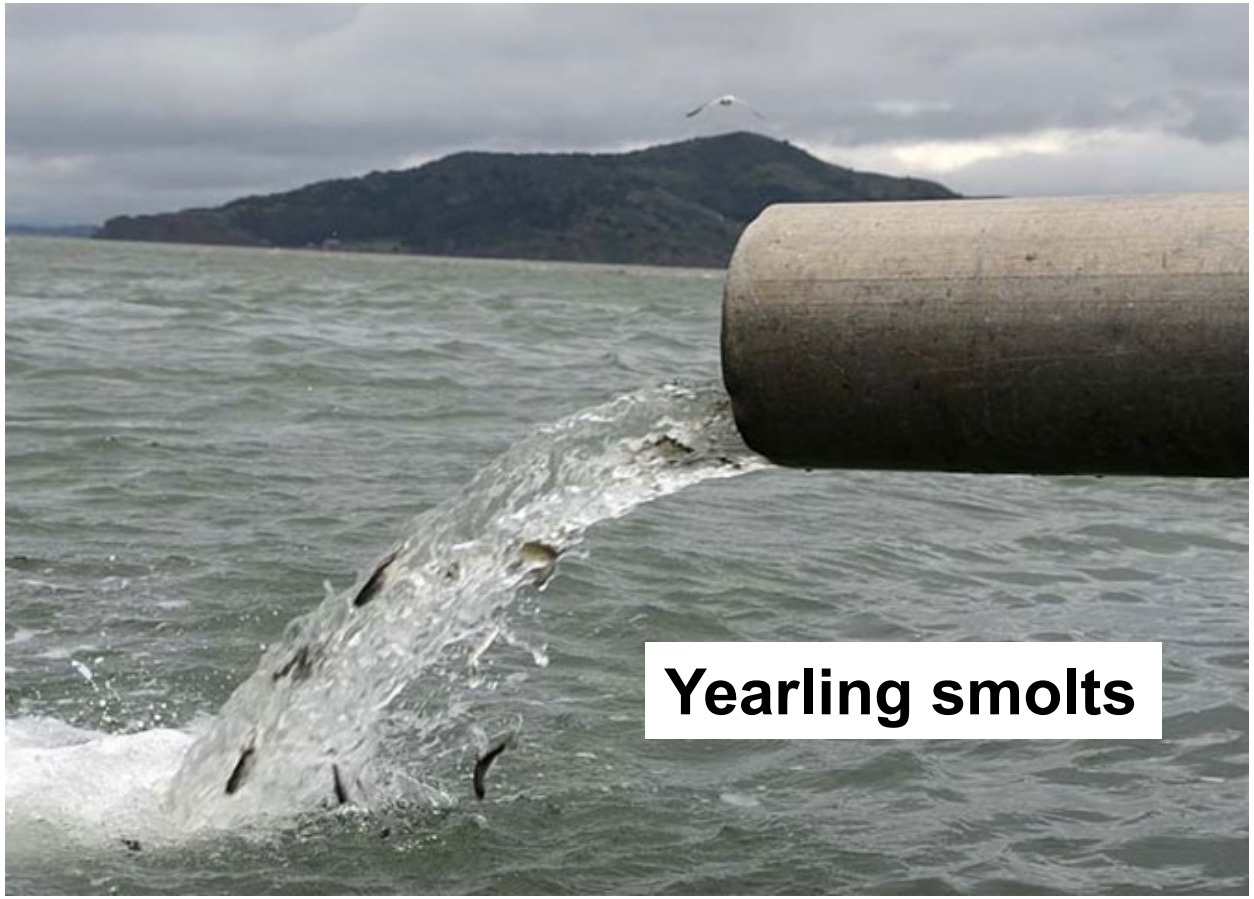
		Year																			
	Ecosystem Indicators	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*
Ocean basin	PDO (Sum Dec-March)	18	6	3	13	7	20	12	16	14	9	5	1	15	4	2	8	10	21	19	17	11
	PDO (Sum May-Sept)	10	4	6	5	11	17	16	18	12	14	2	9	7	3	1	8	19	21	20	15	13
	ONI (Average Jan-June)	20	1	1	7	14	16	15	17	9	12	3	11	18	4	6	8	10	19	21	13	5
Physical	46050 SST (°C; May-Sept)	16	9	3	4	1	8	21	15	5	17	2	10	7	11	12	13	14	20	18	6	19
	Upper 20 m T (°C; Nov-Mar)	20	11	8	10	6	15	16	12	13	5	1	9	17	4	3	7	2	21	19	18	14
	Upper 20 m T (°C; May-Sept)	17	12	14	4	1	3	21	19	7	8	2	5	13	10	6	18	20	9	15	11	16
	Deep temperature (°C; May-Sept)	21	6	8	4	1	10	12	16	11	5	2	7	14	9	3	15	20	18	13	17	19
	Deep salinity (May-Sept)	19	3	9	4	5	16	17	10	7	1	2	14	18	13	12	11	20	15	8	6	6
Biological	Copepod richness anom. (no. species; May-Sept)	19	2	1	7	6	14	13	18	15	10	8	9	17	4	5	3	11	20	21	16	12
	N. copepod biomass anom. (mg C m^{-3}; May-Sept)	19	14	10	11	3	16	13	20	15	12	6	9	8	1	2	4	5	17	21	18	7
	S. copepod biomass anom. (mg C m^{-3}; May-Sept)	21	2	5	4	3	14	15	20	13	10	1	7	16	9	8	6	11	18	19	17	12
	Biological transition (day of year)	18	8	5	7	9	14	13	19	12	2	1	3	16	6	10	4	11	21	21	17	15
	Ichthyoplankton biomass (mg C 1,000 m^{-3}; Jan-Mar)	21	12	3	8	10	19	18	15	17	16	2	13	5	14	11	9	20	6	7	1	4
	Ichthyoplankton community index (PCO axis 1 scores; Jan-Mar)	10	13	2	7	5	11	20	18	3	12	1	14	15	8	4	6	9	19	21	17	16
	Chinook salmon juvenile catches (no. km^{-1}; June)	19	4	5	16	8	12	17	20	11	9	1	6	7	15	3	2	10	13	18	21	14
	Coho salmon juvenile catches (no. km^{-1}; June)	19	8	13	6	7	3	16	20	17	5	4	10	11	15	18	1	12	9	14	21	2
	Mean of ranks	17.9	7.2	6.0	7.3	6.1	13.0	15.9	17.1	11.3	9.2	2.7	8.6	12.8	8.1	6.6	7.7	12.8	16.7	17.2	14.4	11.6
	Rank of the mean rank	21	5	2	6	3	15	17	19	11	10	1	9	13	8	4	7	13	18	20	16	12

NWPCC Ocean Forum 10 Dec 2018

The Columbia River Estuary

Brian Beckman & Laurie Weitkamp

The pipe paradigm: The lower river acts as a pipe, conveying fish from Bonneville Dam to the Ocean

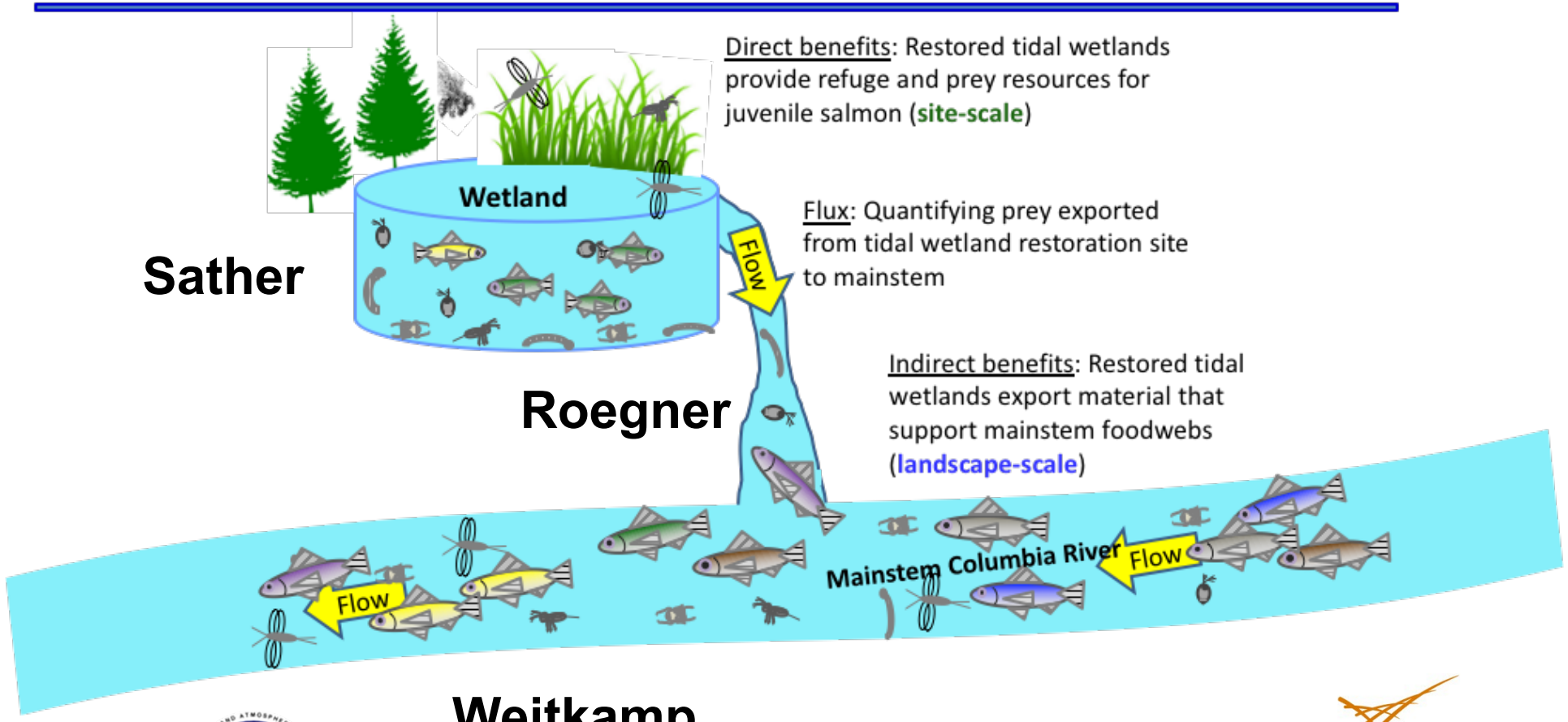


Indirect benefits of habitat restoration on juvenile salmon: landscape-scale evaluation

Laurie Weitkamp, Kym Jacobson, Brian Beckman, and Kurt Fresh
Northwest Fisheries Science Center, NOAA Fisheries
Angelica Munguia
Oregon State University

USACE AEMR

AEMR Conceptual model: Prey production in restored tidal wetlands benefit juvenile salmon directly onsite and indirectly offsite



Direct benefits: Restored tidal wetlands provide refuge and prey resources for juvenile salmon (site-scale)

Flux: Quantifying prey exported from tidal wetland restoration site to mainstem

Indirect benefits: Restored tidal wetlands export material that support mainstem foodwebs (landscape-scale)

Sather

Roegner

Weitkamp

NOAA

Pacific Northwest NATIONAL LABORATORY

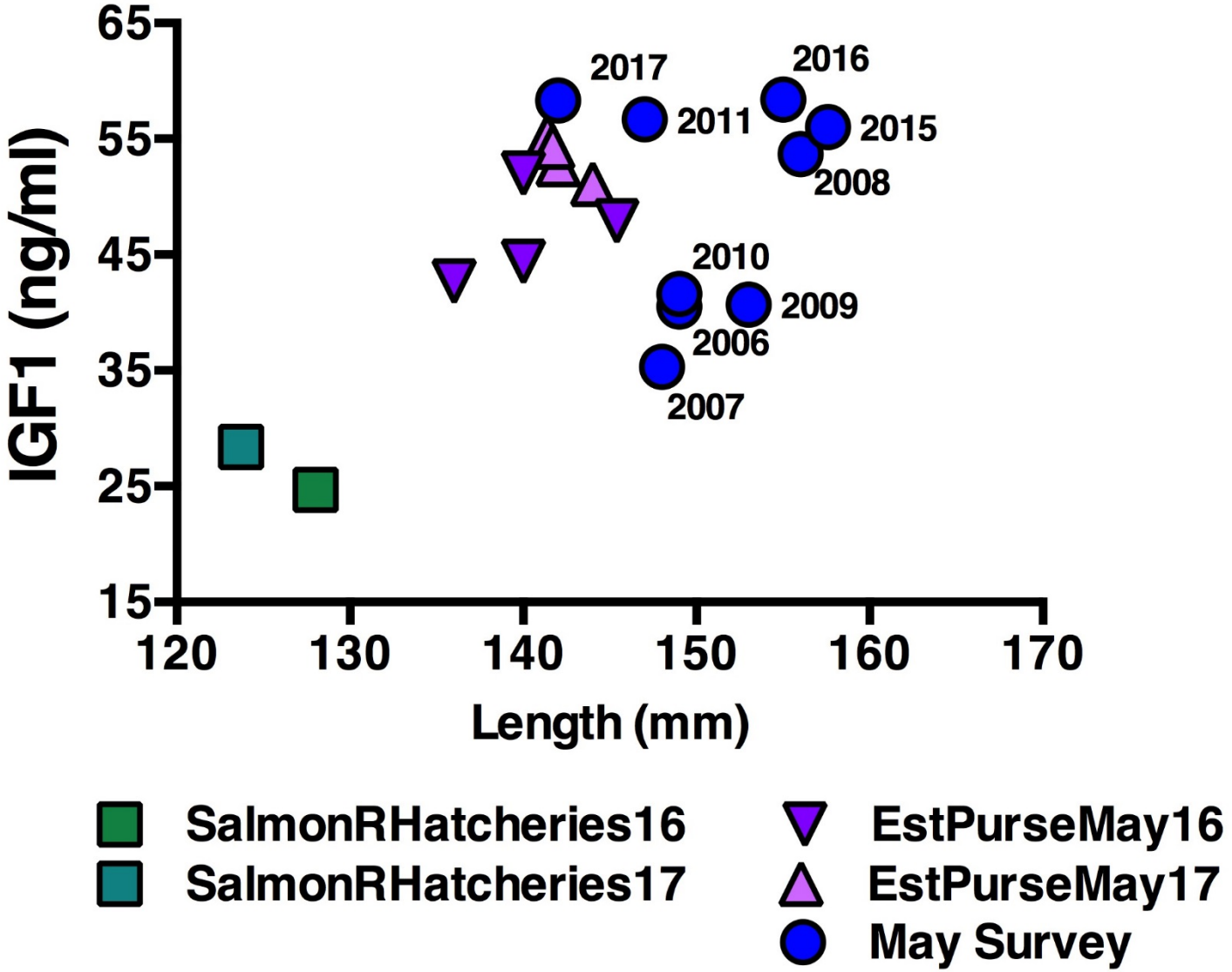
Proudly Operated by Battelle Since 1965

Two boat townet

Purse seine

Neuston (surface plankton net)

Estuarine and marine growth are similar



Migration through the lower river and estuary is not equivalent to moving through a pipe: feeding and growth do occur

Feeding and growth levels are similar to those found in the ocean