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April 26, 2012

MEMORANDUM

TO: Fish and Wildlife Committee Members

FROM: Raquel Crosier, Washington Council Staff
Patty O'Toole, Council Staff

SUBJECT: Brief discussion of west coast forage fish and their relationship to Columbia River salmon and steelhead

On January 11th 2011 the ISAB presented to the Council its report, *Columbia River Basin Food Webs: Developing a Broader Scientific Foundation for Fish and Wildlife Restoration*. In this report the ISAB stated that "The Columbia River estuary and plume exhibit food web characteristics in sharp contrast to those in other habitats, and are exceptionally important to sustaining fisheries." Since last January there has been growing public interest in the issue of food webs. There have been several reports and news articles written in the past year which describe the depletion of forage fish as a consequence of overharvest, and point to the adverse impacts on species such as salmon and steelhead.

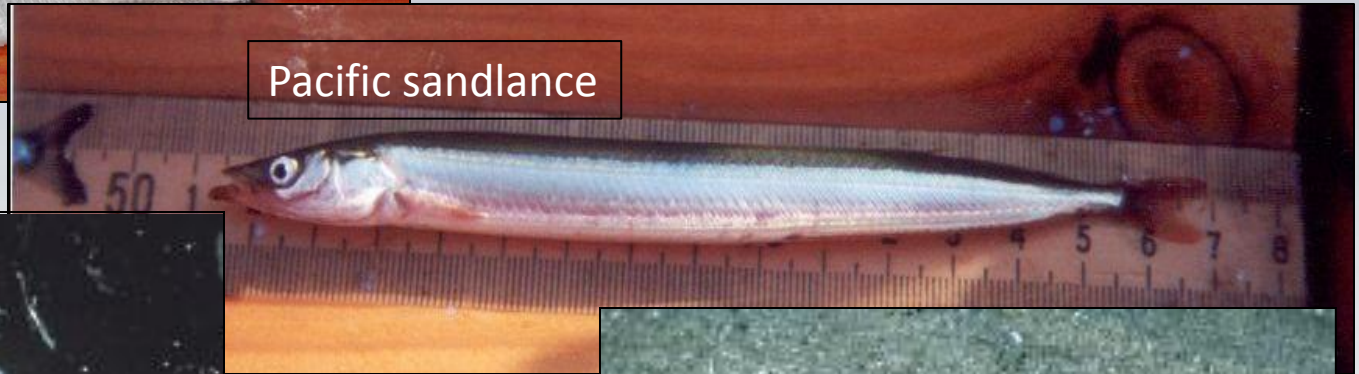
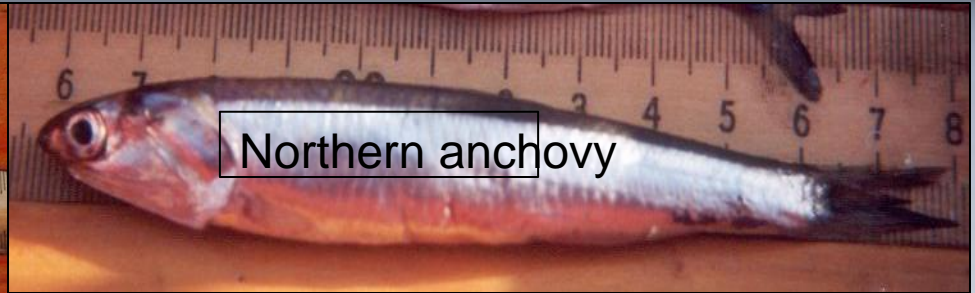
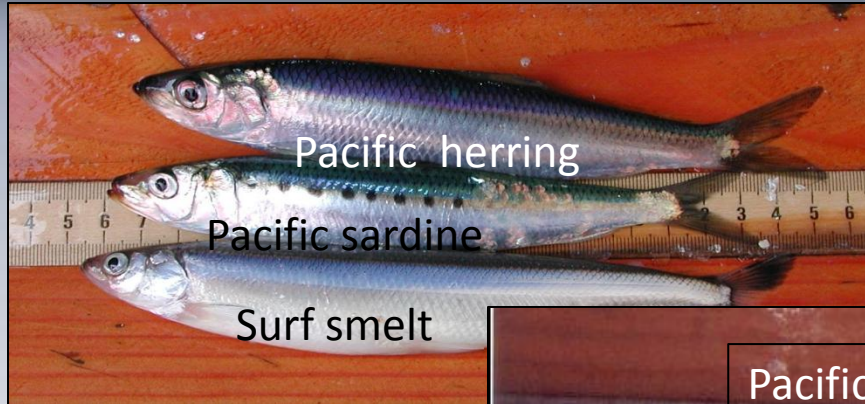
Council Staff Patty O'Toole will highlight references to forage fish in the 2011 ISAB Food Web Report. In addition, she will explain the extent to which the Council Fish and Wildlife Program is researching the impact of forage fish on juvenile salmon and steelhead in the estuary and plume of the Columbia River within our ocean research projects.

Raquel Crosier, Washington Staff, and Patty O'Toole will suggest a panel presentation on forage fish at a future F&W Committee Meeting. This panel could include representatives from USGS, ISAB, Pacific Fisheries Management Council's subcommittee on Coastal Pelagic Species, and other researchers doing work on this topic. Raquel and Patty will also update the Committee on the upcoming June meeting of the Pacific Fisheries Management Council, featuring a workshop on potential management of forage fish populations.

Forage fish and their relationship to Columbia River Salmon and Steelhead

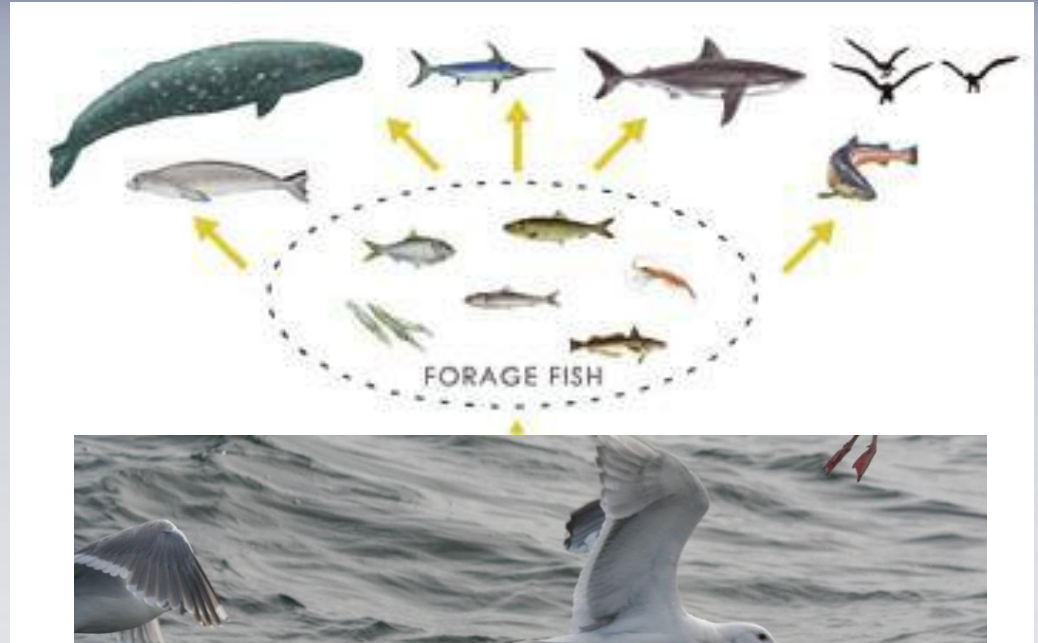


What are forage fish?



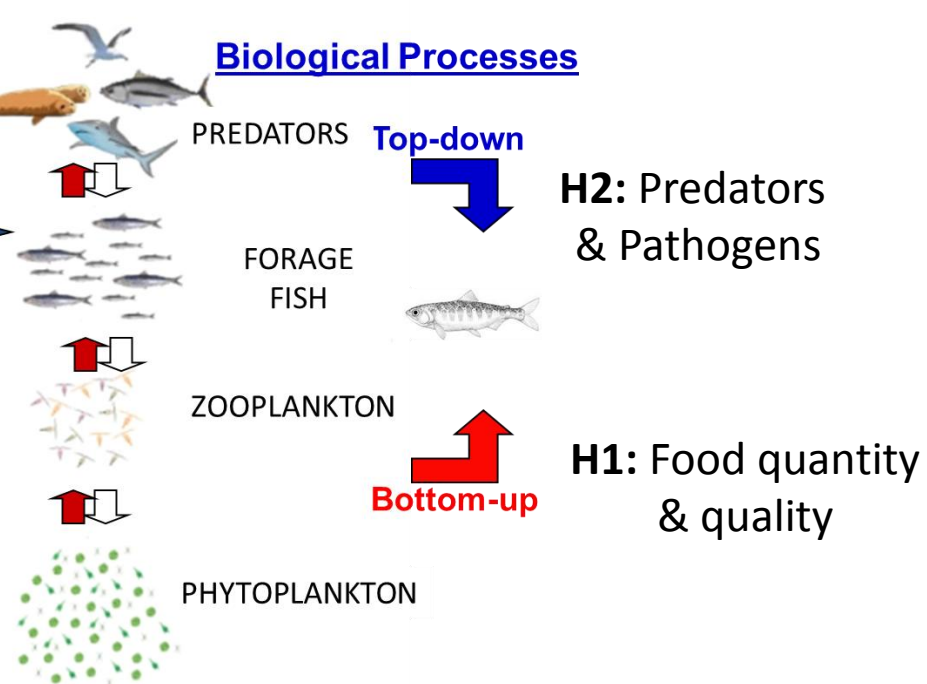
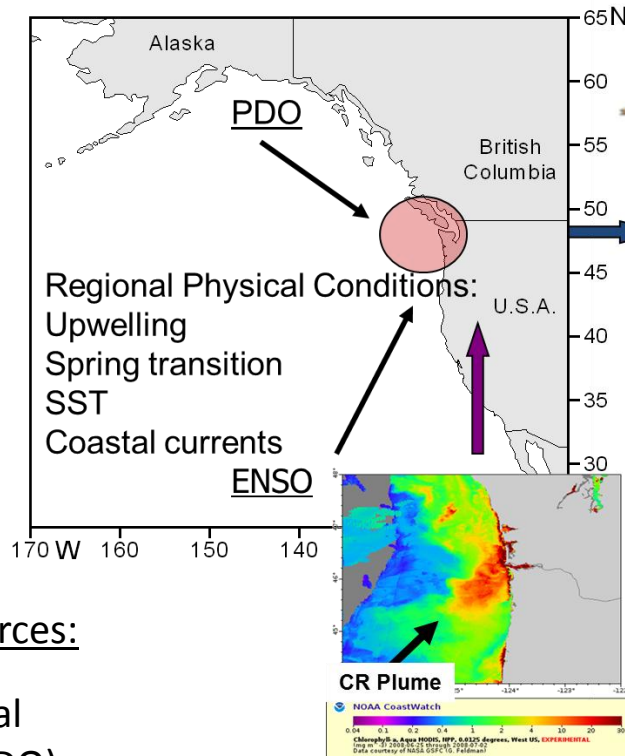
Forage Fish - Relationship to Salmon and Steelhead

- Food source
 - Competition
 - Prey Buffer
-
- Existing research



Conceptual Model for Ocean Surveys

Physical forces acting at all scales
can influence biological processes
important for salmon



Basin scale forces:

- Pacific Decadal Oscillation (PDO)
- El Niño Southern Oscillation (ENSO)

H3: Plume Structure

H4: Hydropower System

H5: Freshwater vs. Ocean Survival

Threats to Forage Fish

- Habitat loss
- Pollution
- Climate change
- Ocean acidification
- Fishing pressure
 - Fish based feed for aquaculture and agriculture
 - Pet food, pharmaceuticals, other



Recent Publications

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Columbia Basin Bulletin Issue Summary No. 17

Salmon and Hydro: An Account of Litigation over Federal Columbia River Power System Biological Opinions for Salmon and Steelhead, 1991-2009

This issue summary offers a historical account of the continual litigation over Columbia Basin salmon and steelhead biological opinions since the first Endangered Species Act listings and summarizes the major issues that have dominated Columbia Basin Salmon recovery since 1991.

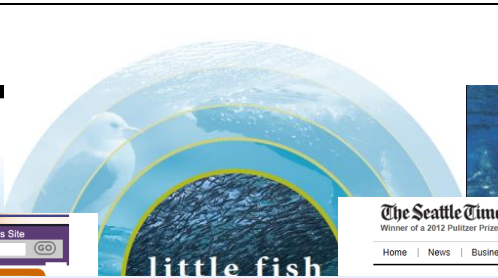
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FORAGE FISH
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Winner of a 2012 Pulitzer Prize

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Print Article

Pressure to harvest small schooling fish could have serious effects on larger species, scientists warn

Pressure to harvest small schooling fish could have serious effects on larger species, scientists warn.

is some of the pressure of new fishing gear that make up the ocean's top pressure globally everything from tuna pens to coastal fishing.

fish scientists

ortant isn't new," says National Marine Fisheries Service scientist Brandon Cole. "There are growing concerns globally that some forage fish stocks are unhealthy and the way we harvest them is unsustainable," says a marine biologist.

The ocean food web

FOURIES: Chinook salmon, Coho salmon, Steelhead trout, Pacific halibut, Pacific herring, Pacific sand lance, Pacific whiting, Atlantic herring, Pacific sand lance, jack mackerel, blue mackerel, allow

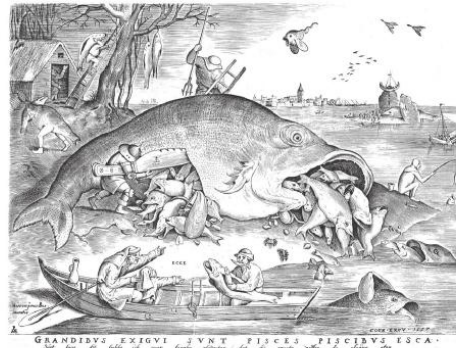
late last year by who tracked small fish they eat

1 a remarkable ocean forage fish like squid or cuttlefish. Scientists increasingly recognize that maintaining this small group of fish is important for the health of the ecosystem.

Along the U.S. West Coast, most major fish, mammal and seabird species rely on forage fish for food — a group of about 30 species of small schooling fish. Scientists increasingly recognize that maintaining this small group of fish is important for the health of the ecosystem.

OCEANA

Columbia River Food Webs: Developing a Broader Scientific Foundation for Fish and Wildlife Restoration



Independent Scientific Advisory Board

Document ISAB 2011-1
January 7, 2011

Options for consideration

Next steps?