

2009 Salmon Forecasting Forum

by Skip McKinnell, Robert Emmett and Joseph Orsi

The 11th *ad hoc* Salmon Ocean Ecology Meeting (SOEM) was held April 7–8, 2009, in Juneau, Alaska, under the chairmanship of Joseph Orsi of the NOAA Alaska Fisheries Science Center's Auke Bay Laboratories. Dr. Douglas DeMaster (Director of the Alaska Fisheries Science Center) welcomed more than 100 participants to Juneau, and Dr. Phillip Mundy (Director of Auke Bay Laboratories) and Dr. James Irvine (Co-Chairman of the DFO Fisheries Oceanography Working Group) set the stage for the discussions with overviews of the state of the ocean and fisheries in 2008. The remainder of the meeting included 40 presentations over two days on variability of the Northeast Pacific and its potential effects on salmon marine survival and abundance. The meeting concluded with a session on outlooks (informal) and forecasts (formal) for salmon survival and returns in the upcoming year and beyond. Some of the findings will make their way into the next PICES report on the status and trends of marine ecosystems in the North Pacific.

The major oceanographic feature of the west coast of northern North America is a boundary that separates the fresher, colder subarctic Pacific Ocean in the north from the warmer, saltier subtropical Pacific Ocean in the south. Along the coast, however, a tongue of cooler water penetrates southward providing a subarctic-like environment whose character is enhanced or diminished by variability in the intensity of upwelling winds along the west coast and the amount of colder subarctic water that enters the California Current. Orsi *et al.* (2007) found that the major change in fish community composition occurred off the coast of British Columbia. If the position of the North Pacific Current and its British Columbia bifurcation were static, life would be simplified but its annual excursions north and south offer a challenge for geographically oriented forecasts.

The first salmon forecasting forum occurred at the SOEM in 2007, with the primary objective of providing a small, focused forum for scientists to apply their knowledge of the potential consequences of ocean/climate variability by regularly presenting and reviewing the success of their forecasts of salmon abundance and survival. In the fullness of time, a discussion of the reasons for successes and failures with a larger interdisciplinary community will provide directions for new research that will lead to improved understanding and, potentially, to improved forecasts of adult salmon runs.

This approach was copied from the ENSO forecast forum where scientists at universities and government agencies around the world are using different models and approaches to provide forecasts of sea surface temperature in the NINO3.4 region in the tropical Pacific, an El Niño indicator. Model forecasts are updated monthly, sent to a single website (Columbia University) and made available for the world to see. Application of this approach to forecasting Pacific salmon abundance and survival is much more difficult because no single stock is the focus of everyone's efforts. Nevertheless, the process of making, evaluating, and updating forecasts annually for multiple stocks has significant merit because of its capacity for learning.

As a consequence of investments made by various agencies in Canada and the United States in observations of the ocean, conducted by oceanographers (of all persuasions) and biologists (of many persuasions) along the west coast of North America during an era of high year-to-year variability, the basic research results are becoming clear. While it has been known for some time that salmon tend to survive poorly in a warmer ocean and better in a cooler ocean, the reason or reasons why this occurs are only now

Table 1 List of stocks forecast for 2009.

<u>Pink</u>	<u>Sockeye</u>	<u>Chinook</u>
<ul style="list-style-type: none"> Fraser River Southeast Alaska 	<ul style="list-style-type: none"> Fraser River/major groups: Early Stuart, Early Summer, Summer, Late, Miscellaneous Fraser River/Chilko Lake only Barkley Sound WC Vancouver Island Long Lake (central BC)*** Kvichak (Bristol Bay) Southeast Alaska 	<ul style="list-style-type: none"> Sacramento River fall Klamath River fall Columbia River Springs Columbia River Summers Snake River Columbia River Falls
<u>Chum</u>		
<ul style="list-style-type: none"> Nitinat River (WCVI)* Southeast Alaska 		
<u>Coho</u>		
<ul style="list-style-type: none"> West coast (OR/WA)** Carnation Creek (WCVI) Robertson Creek (WCVI) 		

* West coast of Vancouver Island; ** Oregon/Washington; *** British Columbia

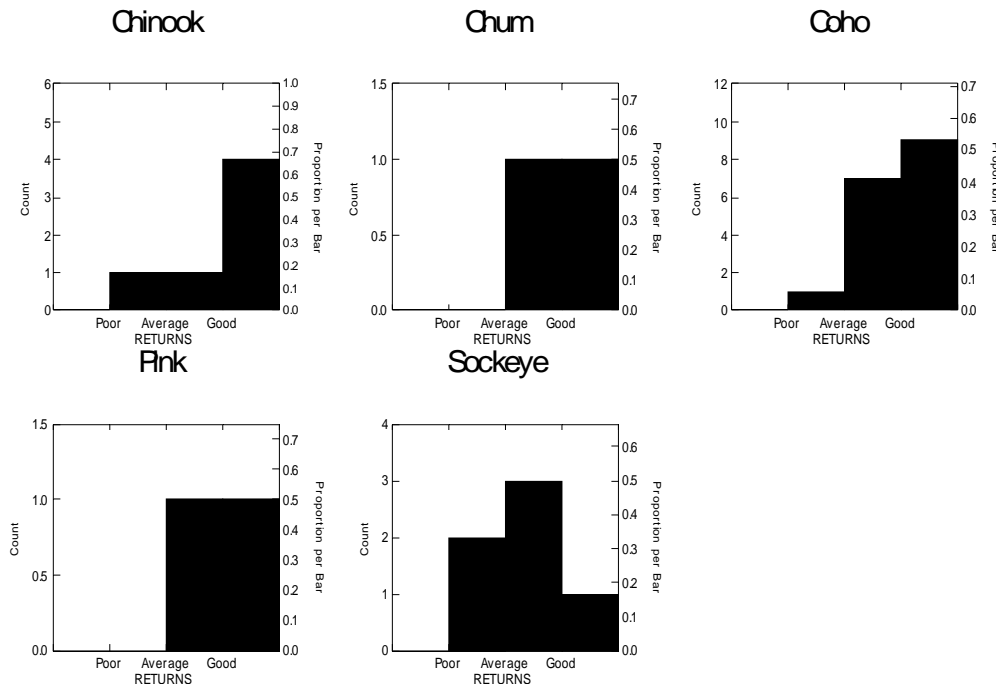


Fig. 1 Frequencies of anticipated returns in 2009 by species for all stocks in this year's forecasting forum. The heights of each of 3 bars indicate the numbers of stocks in each of 3 categories ranging from poor to good.

beginning to reveal themselves. While warm ocean temperatures provide a clue to the fate of salmon, it may not affect salmon survival directly, nor is it likely to act as a sole agent of mortality. Observations of coastal ocean ecosystems reveal that ocean warmth is reflecting a number of complex changes in the coastal marine ecosystem that the salmon experience when they first enter the sea.

Frequencies of anticipated returns in 2009 by species for all stocks in this year's forecasting forum are shown in Figure 1.

In summary, except for sockeye salmon, adult salmon returns for the stocks considered in the forecasting forum (Table 1) are expected to be average or good for all species. For coho and pink salmon the lack of "poor" expectations reflects significant "improvements" in the state of the coastal ocean during their ocean entry year of 2008. Comparisons across various indices indicate that the coastal ocean was far more subarctic than subtropical in 2008, with plankton and fish community composition and abundances that appear to be suited to improved juvenile salmon marine survival.



Dr. Skip McKinnell (mckinnell@pices.int) helps out when he can. He is the Deputy Executive Secretary of PICES and currently an Editor-in-Chief of the PICES North Pacific Ecosystem Status Report that is scheduled for publication in 2010.

Dr. Robert Emmett (Robert.Emmett@noaa.gov) has been working for NOAA Fisheries forever – 30 years. His primary research activities are presently focused on salmon marine survival and population fluctuations in coastal pelagic fishes (sardine, anchovy, herring and smelt).

Joseph (Joe) Orsi (Joe.Orsi@noaa.gov), who works as a Fishery Research Biologist at the Auke Bay Laboratories, Alaska Fisheries Science Center, has been studying the early marine ecology of Pacific salmon off the coast of Alaska for the past 28 years. Most recently, Joe's research has focused on monitoring juvenile salmon and their associated biophysical parameters in key ocean migration corridors in southeastern Alaska for the past 12 years. Joe was the chairperson of the Salmon Ocean Ecology Meeting in held in Juneau, Alaska, this year, and also helped as a steering committee member when the meeting was held in Canada in 2008.