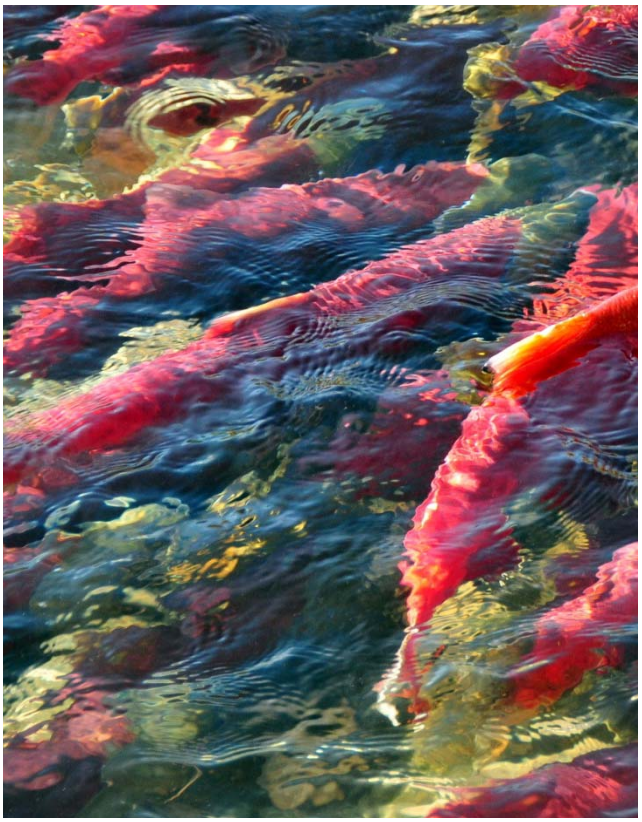
Oceanography Improves Salmon Forecasts

by Skip McKinnell



Sockeye salmon spawners in the Adams River, 2010.

Regular international dialogue about Pacific salmon biology on the North American coast dates back to the first IPSIF (International Pacific Salmon Investigations Federation) meeting in Seattle in 1925. Its 2012 incarnation was the 14th annual gathering (in the modern era) of oceanographers, marine ecologists, biologists, and even parasitologists showing how progress is being made to unravel some of the mysteries of the life, health, and death of Pacific salmon in the ocean. Special thanks to Prof. Jessica Miller (Oregon State University) and her students and colleagues for their spectacular local arrangements in the beautiful seaside town of Newport, Oregon. Neither the snowfall nor the torrential rains on the first two days of spring (March 21–22) prevented the appointment with science in Newport.

Skip McKinnell (PICES) started the first day with a state of "climate/ocean/salmon" triad. Brian Beckman and Bill Peterson (NWFSC), and Marc Trudel (PBS) generously contributed to his presentation with updates of their ocean-going sampling of juvenile salmon during the previous year. It has been a traditional part of the meeting to review how the ocean had changed during the past year (Fig. 1), and whether it was likely to be good or bad for the survival of salmon along the west coast. Greater understanding of the ecological interconnections has allowed considerable progress to be made in forecasting returns and survival.

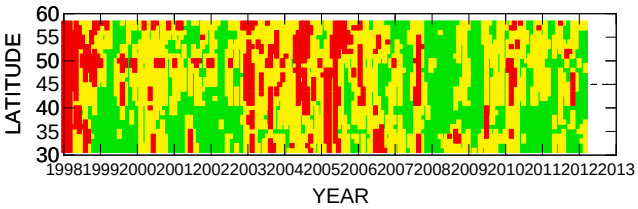


Fig. 1 Monthly sea surface temperatures (SST) adjacent to the North American coast from Mexico to Alaska by 1° latitude blocks. Colours represent SSTs in the upper (red), middle (yellow), and lower (green) thirds of observed SSTs in each calendar month from January 1998 to February 2012. This reflects a pattern of variability during the period of years when the annual salmon ocean ecology meetings have been convened.

The remainder of the first morning was spent hearing from various speakers about forecasting methods and performance from Alaska to California. This session was capped off at the workshop banquet with the annual best forecaster award going to Joe Orsi (Alaska Fisheries Science Center, Juneau, USA) for remarkable and sustained success in forecasting pink salmon returns in Southeast Alaska. There will be tough competition for the award at next year's meeting. Bill Peterson's oceanographic team made a forecast of 160,000 adult spring chinook returning to Bonneville Dam (Columbia River) in 2012 and the return was 158,089. That performance will be tough to beat. It shows the benefit of having representative samples of salmon abundance in the sea as late as possible in their life history. That juvenile salmon abundance and associated ocean ecology at the end of summer growth after ocean entry can provide relatively reliable forecasts of returns one and two years later gives strong support to the idea that cohort abundance is established in most years by the end of the first summer.

The second session on *Understanding and Integrating Survival in the Columbia River Basin* captured the attention of the local audience because it addressed issues that are associated with marine survival in Columbia River salmon. The lower reaches of the Columbia River form the border between Oregon and Washington State and, historically, it was the single largest source of wild chinook salmon in the world. The third session on *Growth and Foraging Ecology* dealt primarily with getting past the correlations to the mechanics of how ocean ecosystem variability affects growth and survival. The workshop ended with a general session on various topics, including Atlantic salmon migration timing in Spain. According to a tradition of rotating the meetings along the coast, the next annual salmon ecology workshop is scheduled for British Columbia.