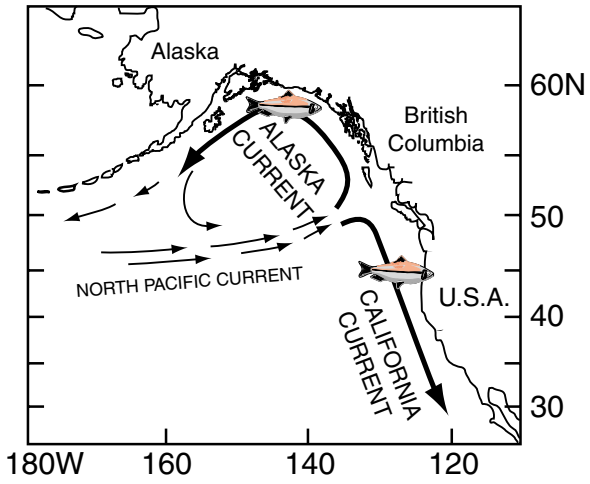
Global Ocean Ecosystems Research in the Northeast Pacific (U.S. GLOBEC NEP)

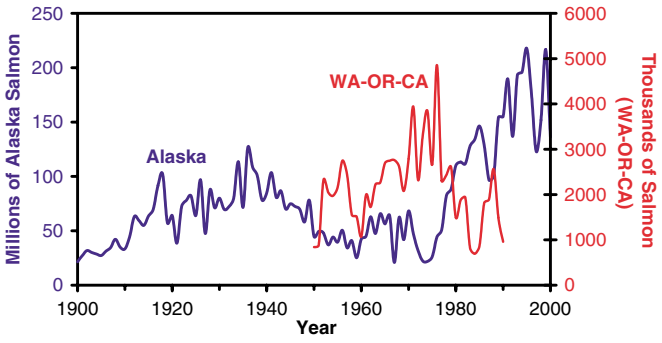
Effects of Climate Variations on Coastal Ocean Ecosystems and Salmon

In the North Pacific, the eastward North Pacific Current splits as it nears North America and feeds water into both the counterclockwise Alaska Gyre and the equatorward California Current. The coastal ecosystems in the Alaska Gyre and the California Current are being studied as part of an 8–10 year project off the coasts of the Pacific Northwest (PNW) and Alaska (the Global Ocean Ecosytem Dynamics program). **U.S. GLOBEC** observations began in 1997, with the goal of understanding how changes in the winds and currents affect the productivity of the coastal ecosystems and the survival of juvenile salmon after they enter the ocean. Observations suggest that the biological productivity of these ecosystems alternates with characteristic periods of 3–7 years (the El Niño/La Niña cycle) and several decades, as shown by changes in salmon catch in the two regions. The intriguing aspect of these longer fluctuations is that salmon off Alaska are abundant when salmon off the Pacific Northwest are scarce. Since 1999, this pattern has reversed (salmon returns are down in Alaska and up in the Pacific Northwest). Does this "out-of-phase" relationship hold a clue to the underlying mechanism for changes in salmon abundance in both systems?

The U.S. GLOBEC research team investigating this mystery in the NE Pacific consists of over 90 principal investigators (PI's) from 26 institutions, with numerous post-docs, research assistants and students. The coordinating office for the project is housed in COAS at OSU, where 17 PI's participate in the effort. Activities include a sustained program to monitor changes in both systems, computer models of ocean circulation and ecosystem-fish dynamics, retrospective studies of longer time series and intensive process studies. Measurements span the entire food webs of the ecosystems (currents, nutrients, plankton, fish, birds, mammals), using the latest technology and up to three vessels at a time. Moored instruments measure currents, water properties and biology, while a shore-based radar system continuously estimates surface currents. Satellite sensors measure surface currents, temperature and plankton distributions to provide the larger-scale context for the field measurements



Schematic diagram of the surface currents in the NE Pacific Ocean. U.S. GLOBEC study sites are indicated by the fish symbols



Commercial catch of salmon in the two regions of the NEP. Fluctuations with high and low periods of 20-30 years are evident, as are shorter periods. Note that salmon catches are greater in Alaska when PNW catch are low and vice versa. Commercial salmon fishing was prohibited off the PNW in 1990.

For further information about the U.S. GLOBEC NEP program, visit the web site: http://globec.oce.orst.edu
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Funding for U.S. GLOBEC NEP is provided by the National Science Foundation and the Coastal Ocean Program of the National Oceanic and Atmospheric Administration.