Alaska Fisheries Science Center
NATIONAL MARINE FISHERIES SERVICE – NOAA FISHERIES

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Annual trends in biophysical factors associated with juvenile pink & chum salmon

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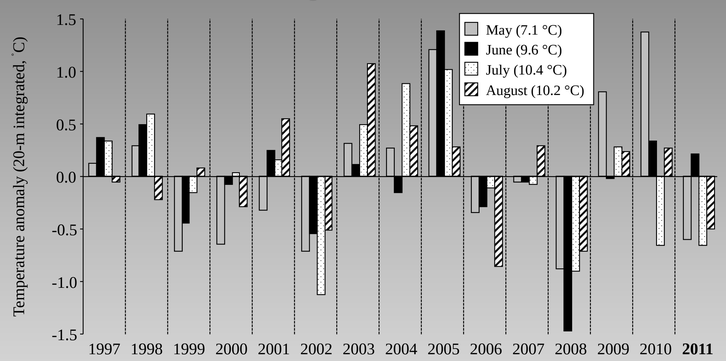
Temperature

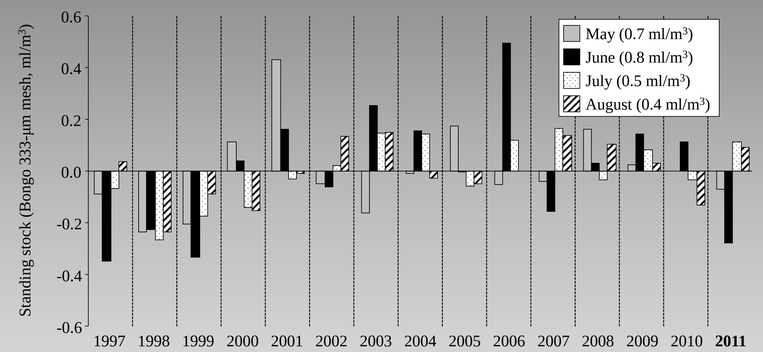


Regional anomalies in Icy Strait monthly 20-m integrated sea surface temperature (SST, °C) coincide with basin-scale ENSO events, such as the 1997-98 & 2009-10 El Niño & the 1999-2001 & 2007-08 La Niña.

The Southeast Coastal Monitoring (SECM) project annually collects data on juvenile Pacific salmon, ecologically-related species, and associated biophysical parameters in Southeast Alaska. The 15-year time series of data (1997-2011) is used to document annual trends in juvenile salmon abundance, identify relationships with biophysical parameters, and support models used to forecast adult pink salmon returns. We present annual biophysical anomalies as deviations from the long term means (values indicated in each figure key) for six of these regional trends. Long term monitoring of juvenile salmon enables researchers to understand how growth, abundance, and ecological interactions affect year-class strength of salmon and to better understand the role of salmon in North Pacific marine ecosystems during climate change.

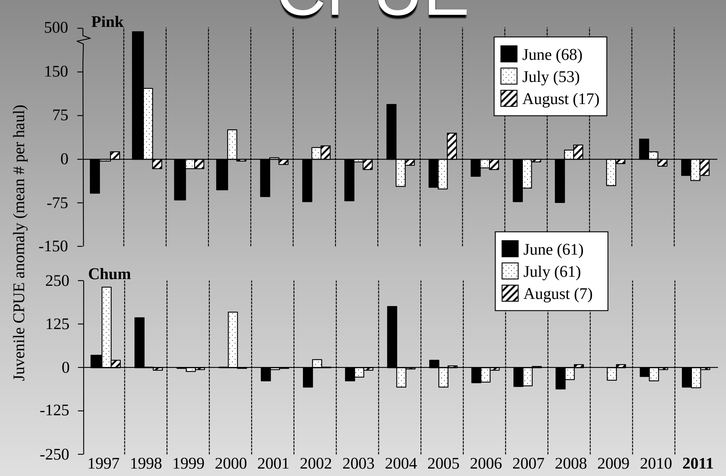
For more information on SECM time series: http://www.afsc.noaa.gov/ABL/MSI/msi_secm.htm

Zooplankton

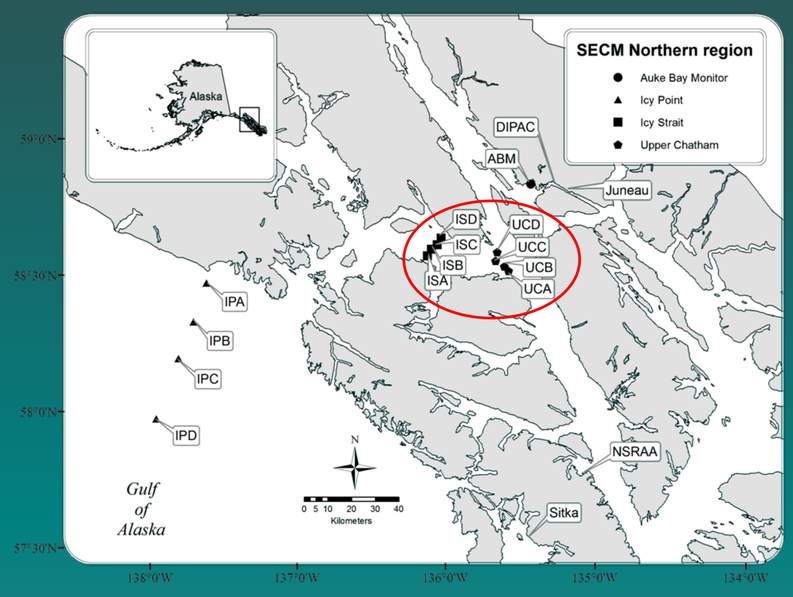


Standing stock (ml/m³) can be used to coarsely assess juvenile salmon prey fields, but correlates poorly with other biophysical measures. Zooplankton communities are complex, & while more difficult to determine, changes in species composition & numerical abundance may better reflect environmental shifts.

CPUE

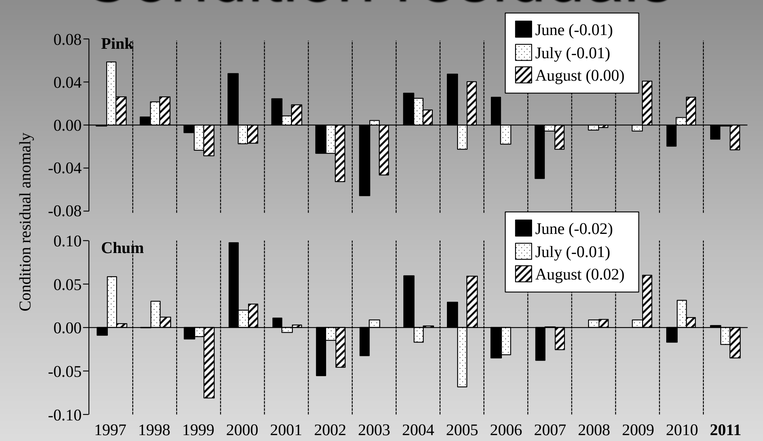


Catch-per-unit-effort (CPUE) depicts trends in abundance & timing of juvenile salmon. June CPUEs of pink & chum are positively correlated. Pink CPUEs are higher than chum CPUEs in each month.



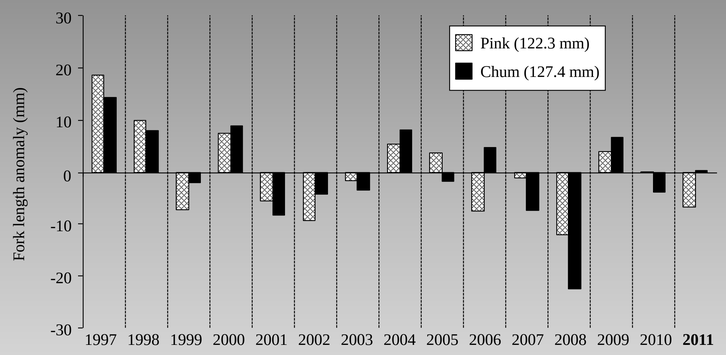
Icy Strait sampling stations in northern Southeast Alaska.

Condition residuals



Condition residuals (CR; from regression of ln-length (mm) & ln-weight (g)) and other growth metrics are used to compare monthly fish condition. The CR's vary seasonally & annually, but CR's of juvenile pink & chum salmon are positively correlated.

Size-at-time

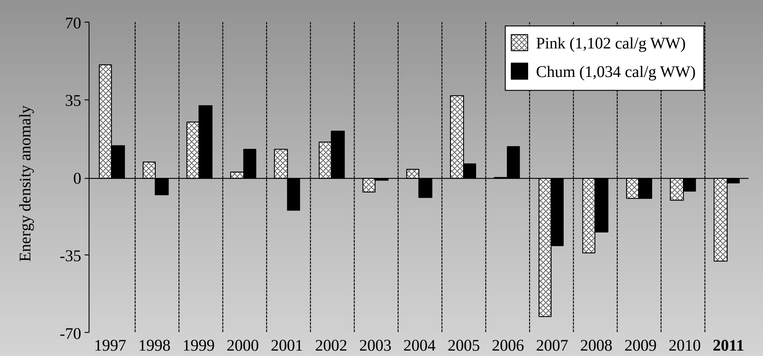


Size-at-time (S@T, on July 24) for juvenile pink & chum salmon is used as a proxy for growth to compare fish condition. Pink S@T is positively correlated with July SST. Sizes are smaller in colder years. Pink and chum S@Ts are positively correlated.

Summary

- Icy Strait monthly sea surface temperatures coincide with basin-scale ENSO events.
- Juvenile pink CPUE is the principal metric used to forecast adult harvest, whereas juvenile chum CPUE is not correlated with harvest.
- S@T, CR, & WBEC of pink & chum are positively correlated, suggesting the two species interact with their environments similarly.
- Zooplankton standing stock is not correlated with juvenile salmon S@T, CR, or WBEC; standing stock is only correlated with July pink CPUE.

Energy density



July energy density (whole body energy content, WBEC; cal/g wet weight) is used to assess nutritional condition. WBEC's of juvenile pink & chum are positively correlated, indicating a similar response to environmental conditions.