Research Funded by GLOBEC

Juvenile salmon survival in coastal waters of the Northeast Pacific Ocean: topdown or bottom-up control? Vladlena Gertseva, Thomas Wainwright, Vladimir Gertsev October 19, 2004 **PICES XIII Annual Meeting**

Why juveniles?





From: Pearcy W.G. 1992. Ocean Ecology of North Pacific Salmonids.

Early ocean life is the most "critical" time for a year class



Research objectives

- Summarize knowledge on juvenile salmon interactions in coastal oceanic waters
- Develop a mathematical model of juvenile salmon dynamics
- Identify processes controlling the survival of juvenile salmon





Modeling individual growth



Modeling fish abundance



 $N(t) = N_0 \cdot exp(-Q_2 \cdot Y \cdot t)$

 N_0 - initial number of fish Y - additive loss Q_2 - buffer coefficient t - time

Coho salmon

<u> 1999 – 2002</u> <u>May, June, September</u>

- Fish abundance
- Fish weight
- Temperature
- Salinity
- Trophic demands
- Abiotic preferences



Model simulations



Sensitivity analysis

- Vary the values of different parameters
- parameters
 Record the response of the juvenile salmon
- Determine the most important factors

Model predictions

effect of variations in predation on total biomass



Model predictions effect of variations in trophic coefficient on total biomass



Growth of juvenile coho salmon



Abundance of juvenile coho salmon



Conclusions

- Juvenile salmon biomass in the coastal waters is primarily defined by variations in activity at upper trophic levels rather than lower ones
- Juvenile salmon survival is primarily controlled by a top-down, but not a bottom-up mechanism in the nearshore oceanic ecosystem

Theoretical implications

- Provides a theoretical insight into complicated relationships between juvenile salmon and their environment
- Enables a simultaneous study of both upper and lower trophic level effects
- Sets the range of data necessary for studying the survival of juvenile salmon
- Defines future research priorities

Research priority



Study predators

- Abundance
- Food habits
- Feeding rates