



# Factors Affecting the Distribution of Juvenile Prince William Sound Hatchery Pink Salmon in the Gulf of Alaska

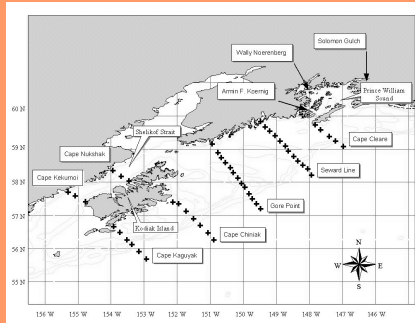
by  
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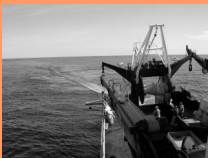
## Abstract

Variations in distribution, size and condition factor for juvenile Prince William Sound hatchery pink salmon caught in oceanic waters during August 2000 and 2001 along transects across the continental shelf of the Gulf of Alaska west of Prince William Sound were examined with respect to distance off shore, surface temperature, and zooplankton volume. Juvenile PWS hatchery pink salmon were smallest at nearshore and offshore locations along the Seward Line and Gore Point transects. Juvenile PWS hatchery pink salmon located offshore tended to have higher condition factor than those caught nearshore or within the middle of the transect. Condition factor was negatively related to zooplankton volume during 2000 (bongo nets were used) and not significantly related to zooplankton volume during 2001 (Tucker trawl was used). Distribution, represented by catch per unit effort, was not significantly related to sea surface temperature, salinity or zooplankton volumes, but the extent of offshore distribution of juvenile PWS hatchery pink salmon may be limited by higher salinity values found beyond the 200-m contour. Future analyses will link oceanographic measurements collected during Ocean Carrying Capacity surveys in the Gulf of Alaska (ADCP or current and salinity) to juvenile salmon biological characteristics (distribution, size and conditions) and zooplankton distributions.

## Sampling



Transects sampled by the Ocean Carrying Capacity program during July and August 2000 and 2001. (Cape Clear and Cape Kaguyak transects were not sampled during 2000.)



Fish samples were collected using a midwater trawl configured to fish near surface waters (surface to a depth of 18-20-m).

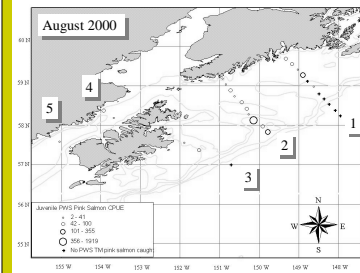


Zooplankton samples were collected prior to each tow using a bongo net that was towed obliquely to 100-m depth.



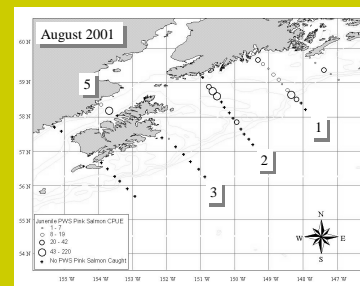
Starting in 2001, zooplankton samples were collected using a 1-m<sup>2</sup> Tucker trawl towed near the surface for 5-minutes.

## Distribution and Migration



During the August 2000 survey, juvenile PWS hatchery pink salmon were distributed nearshore of GAK 7 along the Seward Line, across the shelf along the Gore Point transect, nearshore Kodiak Island and within Shelikof Strait. The highest CPUE occurred offshore along the Gore Point transect.

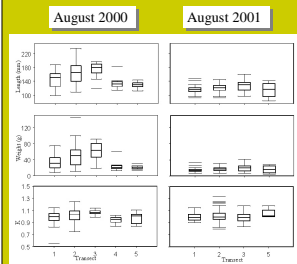
- 1 – Seward Line; 2 – Gore Point; 3 – Cape Chiniak;  
4 – Cape Nukshak; 5 – Cape Kaguyak.



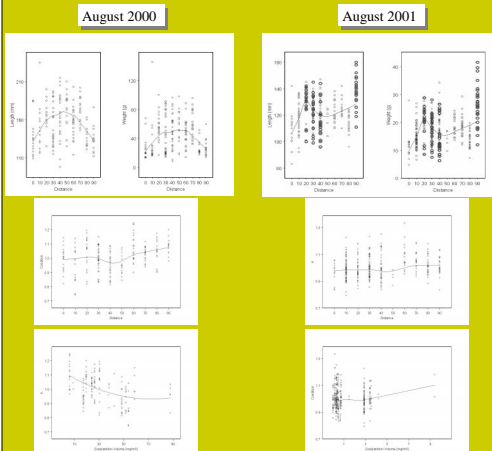
During August 2001, juvenile PWS hatchery pink salmon were distributed across the Cape Clear and Seward Line transects, at nearshore stations along the Gore Point transect and at stations along the eastern end of Shelikof Strait. Almost no juvenile PWS hatchery pink salmon were found offshore of Kodiak Island and Gore Point transects.

- 1 – Cape Clear; 2 – Seward Line; 3 – Gore Point;  
5 – Cape Nukshak.

## Growth and Condition



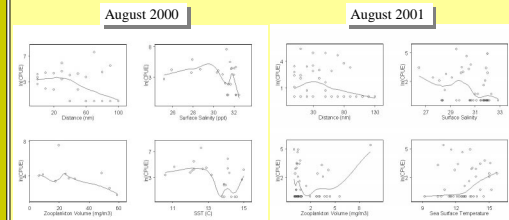
In general, length, weight, and condition factor (K; defined as the ratio of the weight of each fish to its expected weight based on the regressions of the allometric model of length and weight) of juvenile PWS hatchery pink salmon increased as salmon migrated westward; however size decreased for salmon caught within Shelikof Strait.



Loess plots of the size of juvenile Prince William Sound hatchery pink salmon caught along the Seward Line and Gore Point transects west of Prince William Sound indicate that the smallest juvenile pink salmon were found at nearshore and offshore stations (with the exception of 2001 where the largest juvenile salmon were caught at the station furthest offshore along the Gore Point transect).

Condition of juvenile PWS hatchery pink salmon tended to be highest at nearshore and offshore locations and lowest for stations sampled in the mid shelf regions. Also, condition of these pink salmon tended to decrease with increasing zooplankton volumes during 2000 (bongo nets) with no apparent relationship between condition and zooplankton volumes (Tucker trawl) for samples caught during 2001.

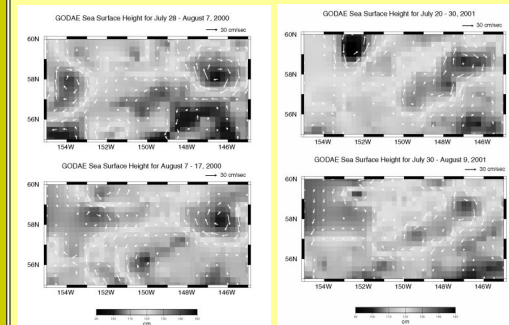
## Possible Factors Affecting Distribution



Loess plots indicate declining CPUE with distance offshore; a sharp drop in CPUE for surface salinity above 32 ppt; and a negative relationship between CPUE and zooplankton volume taken using oblique Bongo tows and no apparent relationship between CPUE and zooplankton volume taken from surface Tucker trawls.

Regression analyses of ln(CPUE) with distance offshore, surface salinity, zooplankton volume and surface temperature revealed no significant relationship between ln(CPUE) and these factors. (p<0.01 for all analyses).

## Other Possible Factors Affecting Distribution



Global ocean data assimilation experiment (GODAE) sea surface height anomalies indicate clockwise surface eddies along the continental shelf near Prince William Sound during August 2000 and 2001. Juvenile salmon encountered nearshore may be entrained in these eddies and advected offshore.

## Summary

Across shelf distribution (nearshore to offshore; based on catch per unit effort) of juvenile pink salmon from Prince William Sound hatcheries does not appear to be related to salinity, surface temperature, or zooplankton volumes.

Meso scale features such as the size and magnitude of surface eddies may entrain smaller juvenile pink salmon found nearshore and advect them further offshore.

Juvenile pink salmon from Prince William Sound hatcheries that were distributed further offshore had higher condition factor than those found mid-shelf. We do not understand why these pink salmon have higher condition factor offshore as opposed to mid shelf, but if condition factor of juvenile salmon is related to survival, then these salmon may have a distinct survival advantage over those distributed mid shelf.

Future analyses will link other oceanographic measurements collected during Ocean Carrying Capacity surveys in the Gulf of Alaska (acoustic doppler current profiler (ADCP) or continuous measurements of temperature and salinity taken from a thermosalinograph) to juvenile salmon biological characteristics (distribution, size and conditions) and zooplankton distributions.