

North Pacific Research Board: Format for Semiannual Progress Reports

Project #: R0327

Title: Early marine ecology of juvenile chum salmon (*Oncorhynchus keta*) in Kuskokwim Bay, Alaska

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Contract Period and Amount of Funding: May 1, 2003 – April 30, 2006 \$624,025

Report Period: January 1 to June 30, 2005

Report Date: July 15, 2005

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Project Summary: This project examines the early marine ecology of chum salmon in Kuskokwim Bay, Alaska. Our goal is to assess the effect of physical and biological environmental factors on feeding, condition, and growth of juvenile chum salmon in Kuskokwim Bay. Using a bioenergetically-based food web model coupled with directed sampling for prey and diet composition, growth, size structure, and energy content will help us to understand patterns observed in feeding, growth and condition of chum salmon juveniles. Specifically, our objectives include (1) determining the spatial and seasonal distribution of chum salmon juveniles throughout Kuskokwim Bay, (2) assessing the spatial and seasonal patterns of environmental variables, and (3) describing the relationship between juvenile distribution patterns and these variables. In addition, we will (4) describe food habits, (5) analyze length, weight, condition, (6) diurnal feeding patterns, and (7) growth of chum salmon. Finally, (8) we will model the bioenergetics and growth of chum salmon juveniles in Kuskokwim Bay.

Progress Summary:

To date all zooplankton samples have been transferred to ethanol. For all plankton samples settled volume was measured and the samples were split if necessary. Zooplankton were identified to major taxonomic groups and counted. In addition, all CTD data were processed. In the lab, juvenile salmon field identifications were confirmed and all chum salmon were measured to the nearest 1.0 mm fork length (FL) and weighed to the nearest 0.001g wet weight. Chum salmon otoliths and stomachs were removed, and the stomachs weighed. Gut contents were weighed and preserved in ethanol, and remaining fish were freeze-dried for subsequent analysis of energetic content. To date, calorimetry has been completed for all 2003 and 2004 chum salmon juveniles. Diet analysis has been accomplished for a total of 80 chum salmon juveniles.

In 2004, sea surface temperature (SST) markedly increased from 6 to 8°C in the week of May 17-20 to maximum temperatures of 15.6° C in the week of June 9-11 (Figure 1a and b). SST was noticeably warmer in the mouth of Kuskokwim River and declined towards the outer Kuskokwim Bay. Sea surface salinity (SSS) ranged from 0.06 to 27.6 (Figure 1c and d). Water with lower SSS was observed on the eastern side of Kuskokwim Bay, while higher salinities were found in the north-western part of the bay.

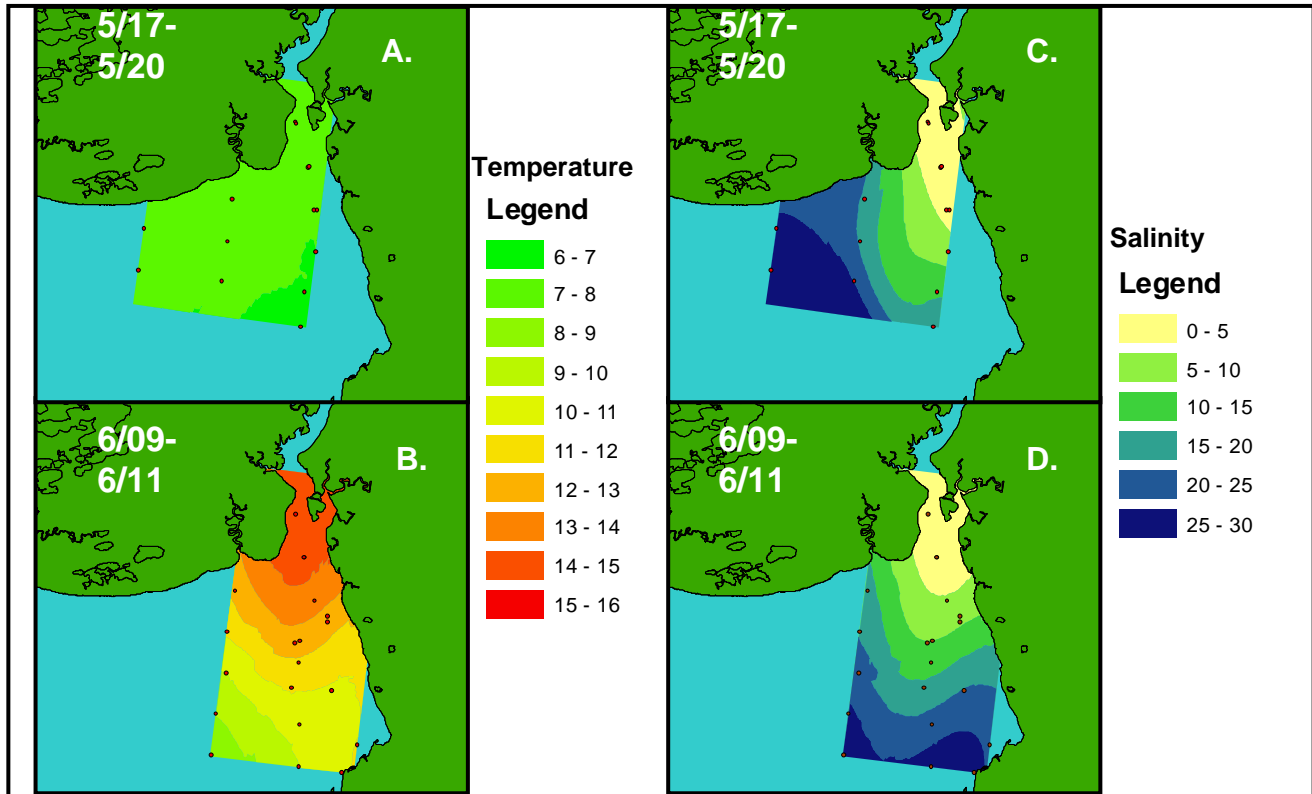


Figure 1. Sea surface temperature (A. and B.) and sea surface salinity (C. and D.) in 2004 in Kuskokwim Bay measured at 2 m water depth.

Mean energy density of juvenile chum salmon in May of 2004 was 5371.44 cal/g (n=11, SD=169.36) and gradually decreased to 4924.01 cal/g (n=80, SD=88.89) in June (Figure 2).

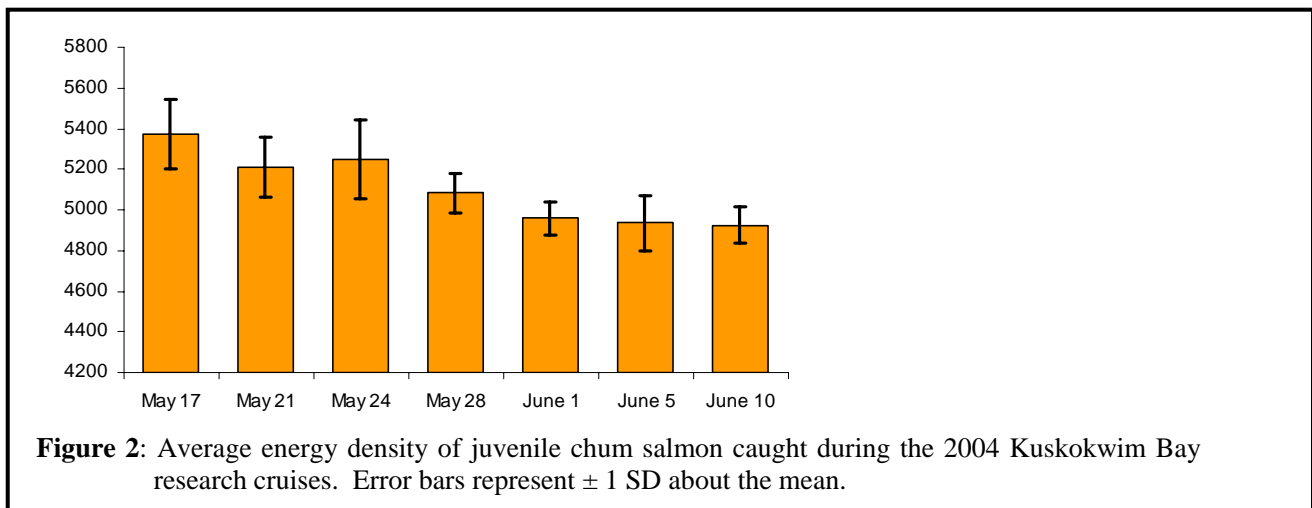


Figure 2: Average energy density of juvenile chum salmon caught during the 2004 Kuskokwim Bay research cruises. Error bars represent ± 1 SD about the mean.

Out-migrating chum salmon juveniles began in May and appeared to peak in the second week of June, with densities of chum juveniles increasing from zero-catches to a maximum of 29.7 fish/1000 m³. The majority of juvenile chum apparently followed the main river channels and the eastern shore of the bay (Figure 3).

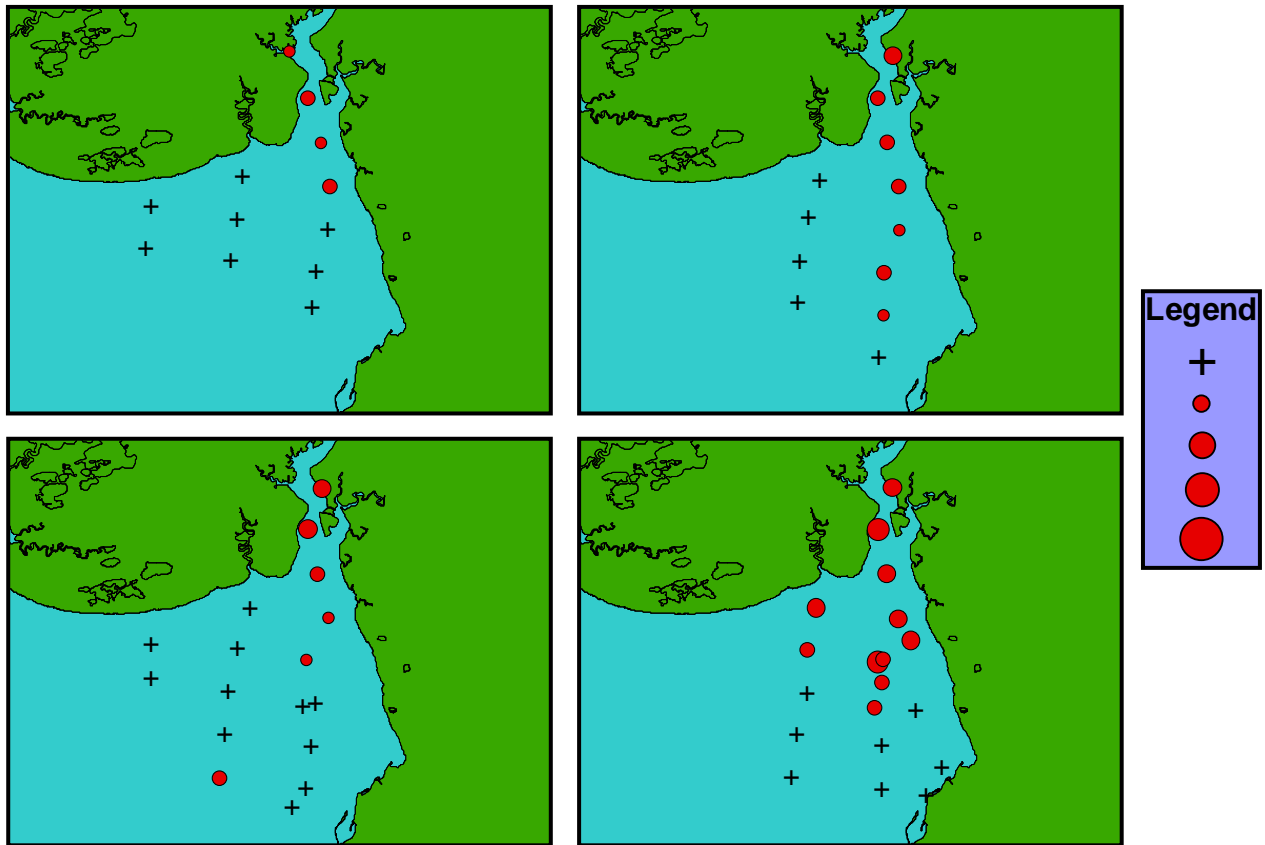


Figure 3. Density of chum salmon juveniles by station and sampling week in 2004, Kuskokwim Bay, Alaska

Publications and Presentations:

Burril, S., N. Hillgruber, and C.E. Zimmerman (2005). Estuarine ecology of juvenile chum salmon (*Oncorhynchus keta*) in Kuskokwim Bay, Alaska. Pink and Chum Salmon Workshop. Ketchikan, Alaska, February 2005.

Zimmerman, C.E., N.T. Hillgruber, S.E. Burril, M.A. St. Peters, and J.D. Wetzel. (2005). Offshore marine observation of willow ptarmigan (*Lagopus lagopus*) including water landings, Kuskokwim Bay, Alaska. The Wilson Bulletin 117(1): 12-14.