



AYK SUSTAINABLE SALMON INITIATIVE

Project Synopsis

YUKON RIVER WATERSHED



(Christian E. Zimmerman)

PROJECT 436

PRINCIPAL INVESTIGATOR

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Geological Survey*

CONTRIBUTING ORGANIZATION

*Bureau of Land
Management*

RESEARCH PERIOD

May 2004 -
April 2005

BUDGET

\$97,445.00

CHUM SALMON IN FRESHWATER

Long-term research on salmon ecology and the quantitative evaluation of environmental factors affecting the production cycle are critical components of the management of Yukon River and western Alaska salmon. Unfortunately, there has been limited research on the freshwater ecology of salmon in populations located at the northern extremes of Pacific salmon distributions. Until recently, efforts have been directed at management and harvest concerns. Understanding freshwater life history and ecology has not been a priority.

OUR OBJECTIVES

Increase understanding of salmon freshwater survival. First, to map the spawning locations used by adult chum salmon, describe these habitats, and monitor temperature in spawning gravels. Second, to estimate the number of juvenile chum salmon that migrate from the creek.

Estimate the chum salmon egg-to-smolt survival by comparing the number of juvenile salmon emigrating from the stream with the estimated number of eggs deposited by adult salmon the previous year. These values are critical for developing better models of population dynamics and understanding how environmental variables affect salmon survival.

**RESEARCH
FRAMEWORK:**
SALMON LIFE CYCLE –
PRIORITY #2

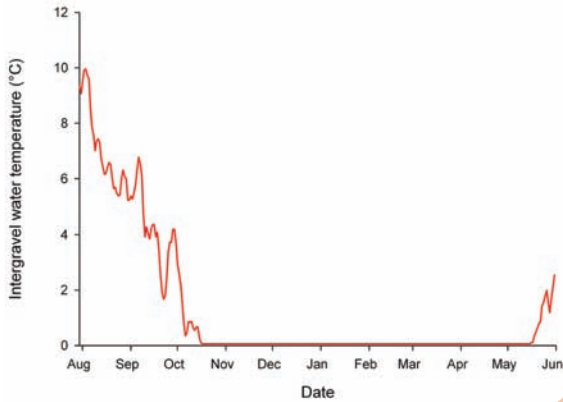
SNAPSHOT

This project mapped chum salmon spawning habitat in Clear Creek and characterized environmental components of the spawning habitat.

Estimates of migrating juveniles were combined with estimates of eggs deposited to determine an egg-to-smolt survival range of 11–21% for chum salmon in Clear Creek.



(Christian E. Zimmerman)



Intergravel water temperature measured adjacent to chum salmon redds, Clear Creek. (Zimmerman, USGS)

HOW WE DID IT

First, we developed a map of the Clear Creek watershed that included the stream and surrounding area using high resolution GPS to map the stream channel and create an overlay with aerial images. During the spawning season, we completed several surveys to map the locations of spawning salmon and redds. Recording thermometers were inserted in the gravel, next to redds, to monitor temperature during the incubation period. Incline plane traps were used to capture and count juvenile chum salmon.

WHAT WE DISCOVERED

Between 2002 and 2005, the total number of chum salmon spawning in Clear Creek ranged from 3,674 to 26,420 chum salmon. In 2004, we mapped the locations of 772 chum salmon redds. While chum salmon in many northern locations use warmer upwelling waters, we found that intergravel water temperatures experienced by incubating chum salmon eggs in Clear Creek were similar to surface water temperatures (and ranged from over 10°C to near freezing). This indicates that Clear Creek chum salmon are using areas of downwelling surface water. Estimates of the abundance of chum salmon smolts emigrating from Clear Creek ranged from 545,000 to over 3 million, and egg-to-smolt survival of chum salmon ranged from 11–21%.

PRODUCTS AND OUTREACH

A geospatial database of all environmental data collected is available electronically from the investigators, and two manuscripts for publication in peer-reviewed journals have been prepared. Outreach activities included employment of interns provided by the Yukon River Drainage Fisheries Association.

WHAT'S NEXT?

More work is needed to refine the role of environmental variation (including temperature and dissolved oxygen) on survival of incubating chum salmon eggs. We recommend combining data from this study with similar studies at other locations to better refine our understanding of the freshwater ecology of salmon in the AYK region.

AYK SSI Mission: *To collaboratively develop and implement a comprehensive research plan to understand the causes of the declines and recoveries of AYK salmon.*

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