



AYK SUSTAINABLE SALMON INITIATIVE

Project Synopsis

BERING SEA-MARINE



(Greg T. Ruggerone)

BERING SEA

PROJECT 410

PRINCIPAL INVESTIGATOR

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*Natural Resources
Consultants, Inc.*

CONTRIBUTING ORGANIZATIONS

*Alaska Department
of Fish and Game*

*United States
Geological Survey*

RESEARCH PERIOD

September 2004 -
June 2006

BUDGET

\$122,639.00

SEE HOW THEY GROW

The Yukon and Kuskokwim watershed areas encompass nearly 40% of Alaska and support large runs of Chinook salmon. People living within these river basins depend on salmon for subsistence, commercial and sport fishing, and culture. From 1997–2002, the abundance of returning Yukon and Kuskokwim Chinook salmon declined significantly. Factors affecting this decline are largely unknown. However, growth of salmon in freshwater and the ocean is generally thought to influence salmon survival.

OUR OBJECTIVES

Determine whether or not the growth of Chinook salmon was affected by major ocean-climate events, and if the decline in Chinook salmon abundance was associated with less growth in freshwater or the ocean.

Determine whether the growth of Yukon and Kuskokwim river Chinook salmon were correlated, affected by Asian pink salmon abundance, independent of previous growth at each life stage, or related to gender at similar lengths-at-age.

HOW WE DID IT

We obtained adult Chinook salmon scales collected since 1964 from the ADF&G archives. We measured 50 scales from each of the two dominant age groups: 1.3 (one year in freshwater, three years in the ocean) and 1.4 (one year in freshwater, four years in the ocean) from each of the rivers. We measured each scale from the scale focus to

RESEARCH FRAMEWORKS:

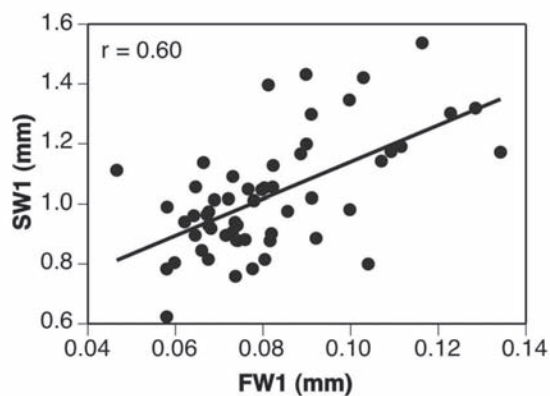
SALMON LIFE CYCLE –
PRIORITY #1;

SYNTHESIS &
PREDICTION –
PRIORITY #7

SNAPSHOT

Archived Yukon and Kuskokwim river Chinook salmon scale samples were used to study the growth of these fish at each life stage. Researchers found that each year's growth is dependent on the previous year, there is an alternating-year pattern, growth varies by age class, and females are consistently larger than males.

The abrupt decline in Chinook salmon abundance in the late 1990s was not clearly associated with a shift in Chinook salmon growth.



Growth of individual Yukon and Kuskokwim river Chinook salmon during the first year at sea (SW1) was positively correlated with their prior growth in freshwater (FW1). This pattern was consistent for both Chinook salmon stocks since the 1960s. (Ruggerone, NRC)

the outer edge of the first freshwater annulus (the winter band of growth rings), spring plus growth zone, each annual ocean growth zone, and from the last ocean annulus to the edge of the scale.

WHAT WE DISCOVERED

Growth in a given year was highly dependent on growth during the previous year for both Yukon and Kuskokwim river fish. This dependence complicated comparisons of growth patterns with abundance trends and environmental factors. Growth during the second year at sea was consistently greater during odd-numbered years, which are also the years of greater Asian pink salmon abundance, indicating that Chinook and pink salmon may indirectly compete for prey. Growth of age 1.3 salmon averaged 11% to 17% greater than that of age 1.4 salmon. Adult females were significantly longer than males (the opposite of sockeye and chum salmon), suggesting that growth may be especially important to the reproductive potential of female Chinook salmon. Greater growth of female Chinook salmon began in freshwater, indicating the importance of freshwater habitat.

PRODUCTS AND OUTREACH

Findings were presented at five meetings involving communities from western Alaska and three scientific conferences. Two journal manuscripts were published and a third manuscript is in preparation.

WHAT'S NEXT?

Additional research is needed on the relationships between Chinook salmon growth and abundance, and environmental conditions, while accounting for the strong dependency of previous year's growth. Further study is needed on the alternating year pattern of growth that we found. It is possible that Asian pink salmon are indirect competitors, consuming shared prey that are one year younger than that consumed by Chinook salmon during their second year at sea. The relationship between growth and survival of female Chinook salmon is being explored.

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

ARCTIC-YUKON-KUSKOKWIM SUSTAINABLE SALMON INITIATIVE

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