



AYK SUSTAINABLE SALMON INITIATIVE

Project Synopsis

AYK REGION-WIDE



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(Christian E. Zimmerman)

PROJECT 617

PRINCIPAL INVESTIGATOR

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Wildlife Service*

CONTRIBUTING ORGANIZATIONS

*Alaska Department
of Fish and Game*

Kawerak, Inc.

RESEARCH PERIOD

June 2006 -
June 2008

BUDGET

\$213,070.00

SALMON GENETIC LANDSCAPES

Identifying the factors influencing population structure is important for understanding how populations evolve and for predicting how they may change in the face of environmental changes. To better understand the genetic diversity of western Alaska Chinook, coho, and chum salmon, we need to understand how these species' population structures are affected by their habitat. Landscape genetics allows us to identify geographical landscape effects on genetic processes such as gene flow, genetic drift, and selection.

OUR OBJECTIVES

Estimate the influence of geographical, environmental, ecological, and life history factors on the genetic diversity of Chinook, coho, and chum salmon from Norton Sound and the Yukon and Kuskokwim rivers.

Create a freely accessible GIS database of genetic data from these populations.

HOW WE DID IT

We used microsatellite genotypes collected from Chinook salmon in 47 locations, coho salmon in 28 locations, and chum salmon in 53 different locations. We used an average of 85 samples from each species. We then created a GIS data layer of the sampling locations. We obtained habitat GIS data layers from the Alaska Geospatial Data Clearinghouse and the Canadian GeoBase. We examined

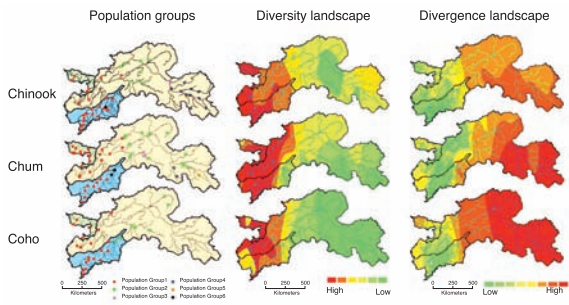
RESEARCH FRAMEWORK:

SYNTHESIS &
PREDICTION –
PRIORITIES #8 AND #10

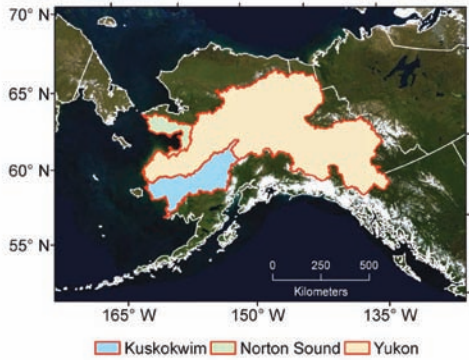
SNAPSHOT

We examined the population structure of Chinook, coho, and chum salmon from Norton Sound, and the Yukon and Kuskokwim rivers. We compared the genetic composition of these populations with environmental factors, particularly habitat variety.

Our results suggest that conservation efforts should focus on coastal versus inland populations rather than at the level of the three watersheds.



Coastal and inland population groups for Chinook, chum and coho salmon from Norton Sound and the Yukon and Kuskokwim rivers. The colored symbols indicate population groups defined by combining genetic and geographic data. (Olsen, USFWS)



Map showing Norton Sound and the Yukon and Kuskokwim river watersheds. Chinook, chum and coho salmon were sampled from each watershed for genetic analysis. (Olsen, USFWS)

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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nine habitat attributes representing four general categories (spatial isolation, habitat size, climate, and ecology).

WHAT WE DISCOVERED

We found similar, but unexpected, population structure patterns for each species. Notably, each species exhibited a single coastal population group and one or more inland population groups rather than the expected greater difference among the three major watersheds. Some inland population groups were inconsistent with the waterway network, suggesting influence by historical events. Region-wide population structure of each species was partially explained by multiple factors. However, only precipitation was a factor for all species. This suggests that the population genetic response to environmental changes will probably vary among species.

PRODUCTS AND OUTREACH

Our data are available in a spreadsheet format and as a Google web map on the Internet. We have submitted a manuscript for publication in a peer-reviewed journal.

WHAT'S NEXT?

Our results suggest that conservation efforts should first focus regionally at the coastal-inland population dichotomy rather than at the level of the three watersheds, which is the present scale of management. Since the region-wide models were not supported at the coastal and inland scales, we recommend further analysis at these smaller scales including more population samples and more precise data collection on habitat variation.