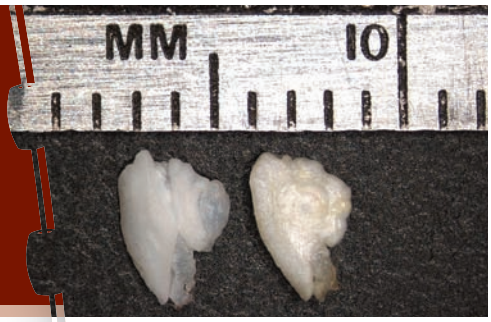

(Christian E. Zimmerman)

USE OF OTOLITH MICROCHEMISTRY IN NORTON SOUND SALMON POPULATIONS

PROJECT 501

PRINCIPAL INVESTIGATOR

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United States Geological Survey

CONTRIBUTING ORGANIZATIONS

Alaska Department of Fish and Game

Oregon State University

RESEARCH PERIOD

June 2005 - January 2007

BUDGET

$89,465.00

FISH LEND AN EAR TO SCIENCE

The genetic population structure of Pacific salmon is generally characterized by geographically distinct populations in partial genetic isolation. This structure is a result of the balance between genetic drift within populations and gene flow among populations. Homing and straying are mechanisms that, respectively, lead to increasingly and decreasingly isolated populations. Although understanding homing and straying is an important step in describing salmon population structure and dynamics, little information exists concerning the connectivity of salmon populations in Norton Sound streams. Because otoliths incorporate elements from the surrounding water, and rivers differ in their elemental signatures because of differences in geology, otoliths sometimes can be used to identify where fish are from and where they have been.

OUR OBJECTIVES

Test the utility of otolith microchemistry to identify stream of origin of Norton Sound chum and coho salmon, and build a baseline that could be used to determine the stream of origin of adult salmon. Specifically, to collect water samples, and juvenile chum and coho salmon otoliths from five Norton Sound rivers.

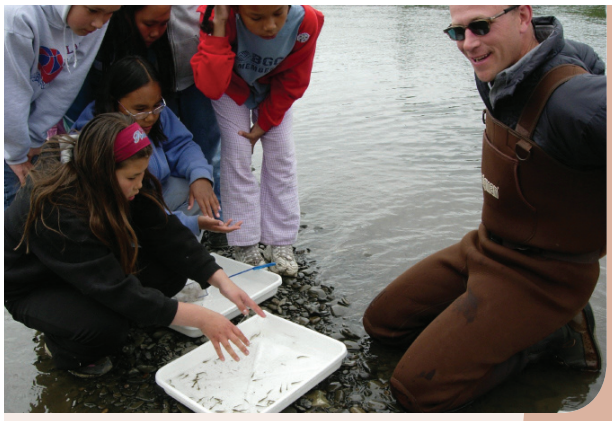
Identify patterns among streams and evaluate their applicability as natural tags to study homing and straying, using elemental and strontium isotope signatures from the otoliths.

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

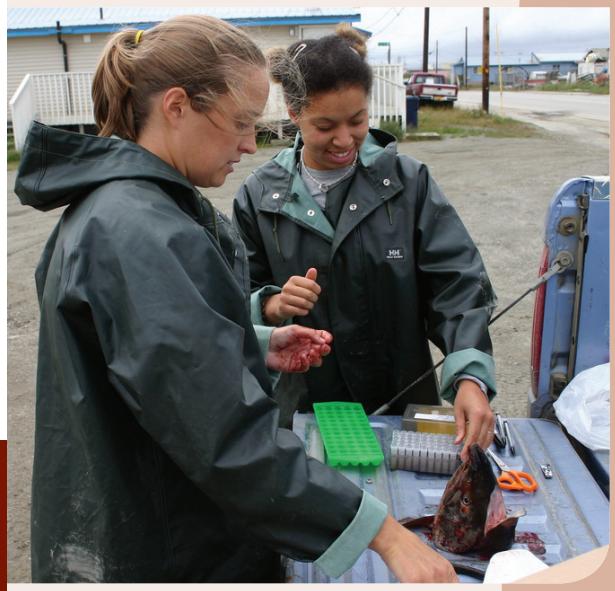
SNAPSHOT

This project tested the viability of using elemental and strontium isotope signatures from Norton Sound chum and coho salmon otoliths to identify their streams of origin. Researchers found that this technique is useful for determining the origin of coho salmon, but may not be useful for chum salmon, which spend less time in freshwater.

NORTON SOUND



(Henry Oyoumick)



(Tim Dunmall)

NORTON SOUND

HOW WE DID IT

We collected juvenile coho and chum salmon from the Nome, Niukluk, Fish, North, and Chiroskey rivers using minnow traps and beach seines. We collected 25 fish of each species from each river. We also obtained otoliths from adult salmon from subsistence fisheries on the Fish, Niukluk, and Nome rivers. We analyzed the otoliths using laser ablation inductively coupled mass spectrometry.

WHAT WE DISCOVERED

We found that elemental signatures are different enough among rivers to differentiate river of origin. The method could be successful in studying straying in coho salmon but is not likely to be useful for studying chum salmon. Chum salmon migrate shortly after emerging from the gravel, and otolith material deposited at this stage is still influenced by elements incorporated from yolk material, which includes elements incorporated from marine waters. It is not possible to distinguish a true freshwater signature for most chum salmon.

PRODUCTS AND OUTREACH

During field work, we met with students from Unalakleet to discuss the project, and fish biology in general. We have presented our findings at regional and national scientific meetings and prepared a manuscript for publication in a peer-reviewed journal.

WHAT'S NEXT?

Further work is needed to refine the signatures of other rivers within the Norton Sound region, as well as the AYK region. Following this work, large studies of straying could be conducted using large collections of adult otoliths collected from carcasses on the spawning grounds.

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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