

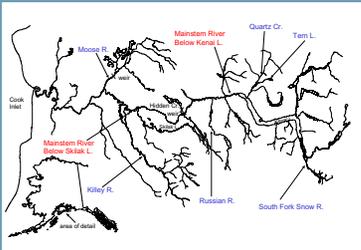
# Assisting Management With Admixture Analysis of Coho Salmon Smolt: Freshwater Dispersal of Juveniles in the Kenai River, Alaska

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Kenai River Sampling Locations

## Background

- The Kenai River in southcentral Alaska supports the largest freshwater sport fishery for coho salmon in the state. Average in-river sport fish harvest is 41,089 (1977 - 2000). Economic value of fishery is \$8.5 million (1986 estimate).
- Alaska Department of Fish and Game Sport Fish Division monitors the longterm trend between smolt abundance and total harvest to set management objectives. Smolt abundance is estimated through mark-recapture: smolts outmigrating from the Moose River are marked and recaptured as adults. Marine (commercial) harvest is estimated by recapture of coho salmon marked as described above and in-river sport harvest by creel and postal surveys.
- Differential fishing pressure occurs on early returning versus late returning stocks. Coho salmon returning early contribute to commercial and in-river sport and personal use harvests; late returning fish contribute to in-river sport harvests.

## Goal

- Determine the relative abundance of outmigrating smolt by return timing to detect potential effects of differential harvest and/or compensatory production.



Smolt outmigrating from Hidden Creek

## Objective 1: Test for genetic evidence of population structure of coho salmon in the Kenai River drainage

- Coho salmon in the Kenai River are managed as a single population, though there is evidence of early and late spawning timing and coho salmon use a wide variety of habitats for spawning.

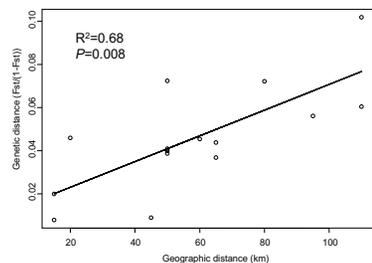


### Methods:

1. Coho salmon collected from eight spawning locations, including early spawners (locations in blue) and late spawners (locations in red).
2. Genetic variation assayed at *Oke-2*, *-3*, *-4*; *Oki-1*, *-3*, *-11*; *One-3*; and *Ots-3*, *1*, *-105*.

### Results:

1.  $F_{st} = 0.061$  ( $P < 0.001$ ).
2. Allele frequency differences detected among all pairwise comparisons of collections.
3.  $F_{st}/(1-F_{st})$  positively correlated with geographic distance indicating populations conform to an isolation by distance model (From Olsen et al. 2003. Conservation Genetics 4:XXX-XXX)



## Objective 2: Use genetic data to estimate the early- and late returning population components of smolts outmigrating from the Moose River

- Because fishing pressure changes over the duration of the return, a method is needed to estimate the abundance of smolts produced from early- and late-returning coho salmon.

Coho salmon smolt from the Moose River are marked to estimate abundance.

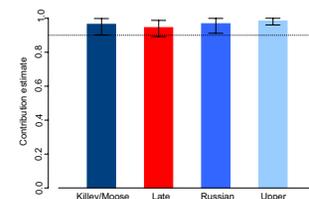
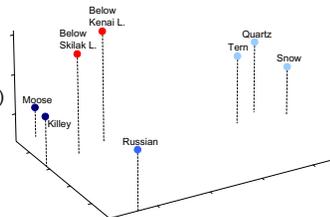


### Methods:

1. Coho salmon outmigrating from the Moose River were enumerated from 5/20 to 6/22 in 2003. Adipose clips were saved for genetic analysis.
2. Population data analyzed to determine if early and late returning components can be identified in mixtures

### Results:

1. The late returning component (red) is spatially separated from the early returning component (blue). Further subdivision is apparent in the early returning component.



2. Stock groups depicted will be identifiable in mixtures. Conditional maximum likelihood estimates of stock contributions made for 1000 artificial mixes ( $N=400$ ) from a single stock exceeded 90%.

## Continuing Analyses: Test assumptions of the mark-recapture program for coho salmon in the Kenai River

- Marking of coho salmon smolts begins at the start of outmigration and stops when the marking goal is reached, generally half way through the outmigration.

Assumption: Coho salmon from all populations are fully mixed during the entire outmigration.

Analysis: Smolts sampled during the entire outmigration in 2003. Compare conditional maximum likelihood estimates for time strata to determine if stock proportions change over time.



Coded-wire tagging smolt

- Coho salmon smolts are marked at a single site, the Moose River.

Assumption: Coho salmon from a full complement of spawning locations rear in the Moose River.

Analysis: Use comparisons of conditional maximum likelihood estimates to detect differences in composition at two sites (Moose River and Hidden Creek); use individual based analysis to document presence of smolts from all stocks at each sampling site.



Moose River



Hidden Creek

## Conclusions

- Coho salmon in the Kenai River drainage are genetically subdivided.
- Mixed-stock analysis provides a method to understand dispersal of juvenile coho salmon in the Kenai River drainage and estimate smolt abundance from early- and late returning components to better assess trends in production.