

# Population structure of chum salmon in Prince William Sound and Southeast Alaska



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Alaska Department of Fish and Game Gene Conservation Lab

Alaska Hatchery Research Program Informational Meeting

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# Alaska Hatchery Research Program

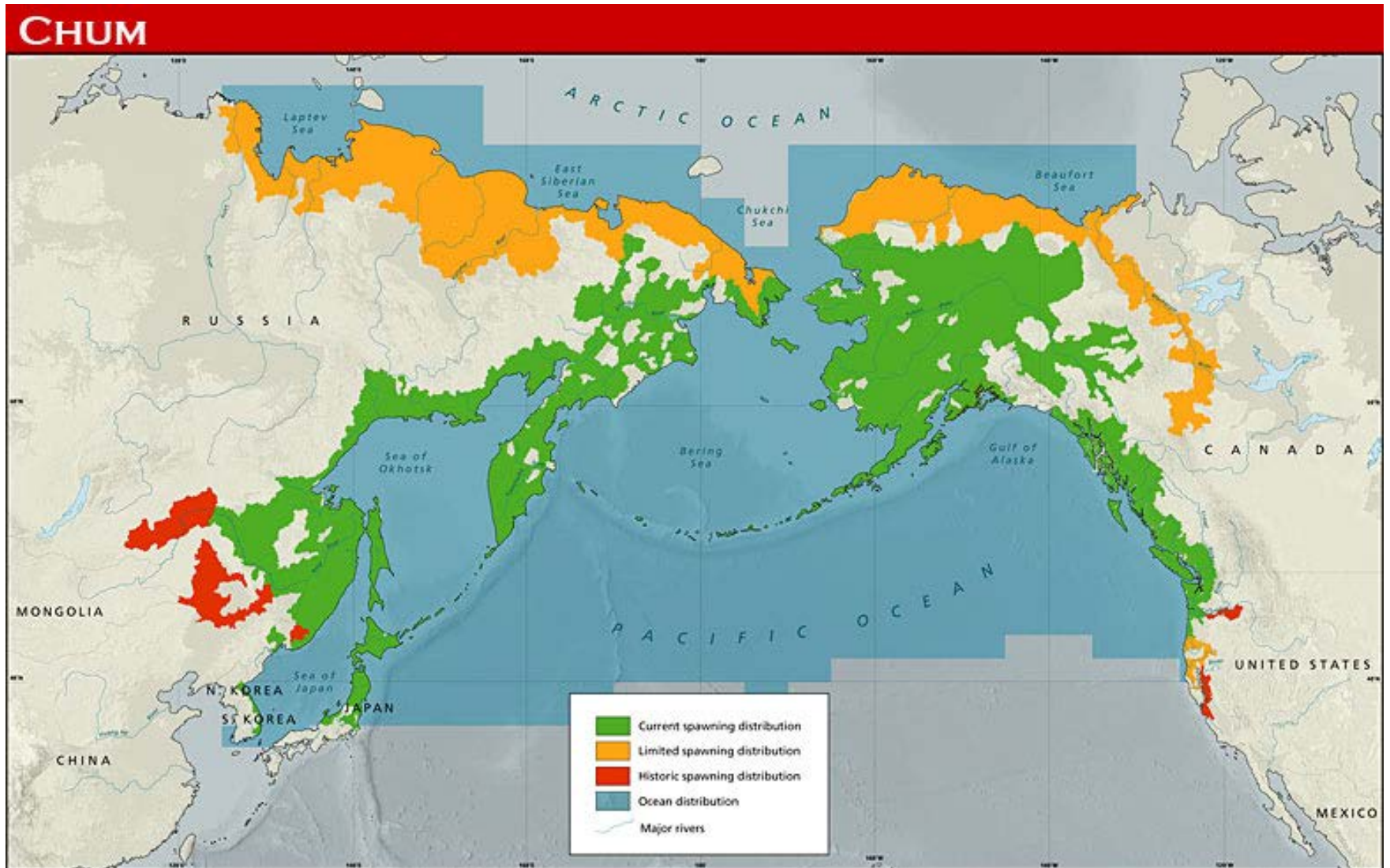
- 1) What is the genetic structure of pink and chum in PWS and SEAK?
- 2) What is the extent and annual variability of straying?
- 3) What is the impact on fitness (productivity) of natural pink and chum stocks due to straying hatchery pink and chum salmon?

# Life History of Chum Salmon

- Migrate as juveniles to ocean
- Typically 2-4 years spent at sea
- Two run timings: summer & fall



# Distribution of Chum Salmon



[http://www.salmonnation.org/fish/meet\\_species.html](http://www.salmonnation.org/fish/meet_species.html)

Quick break to understand concepts

# Understanding Genetic Structure

- Differences between populations:
  - Influenced by: selection, mutation, genetic drift, migration

# Understanding Genetic Structure

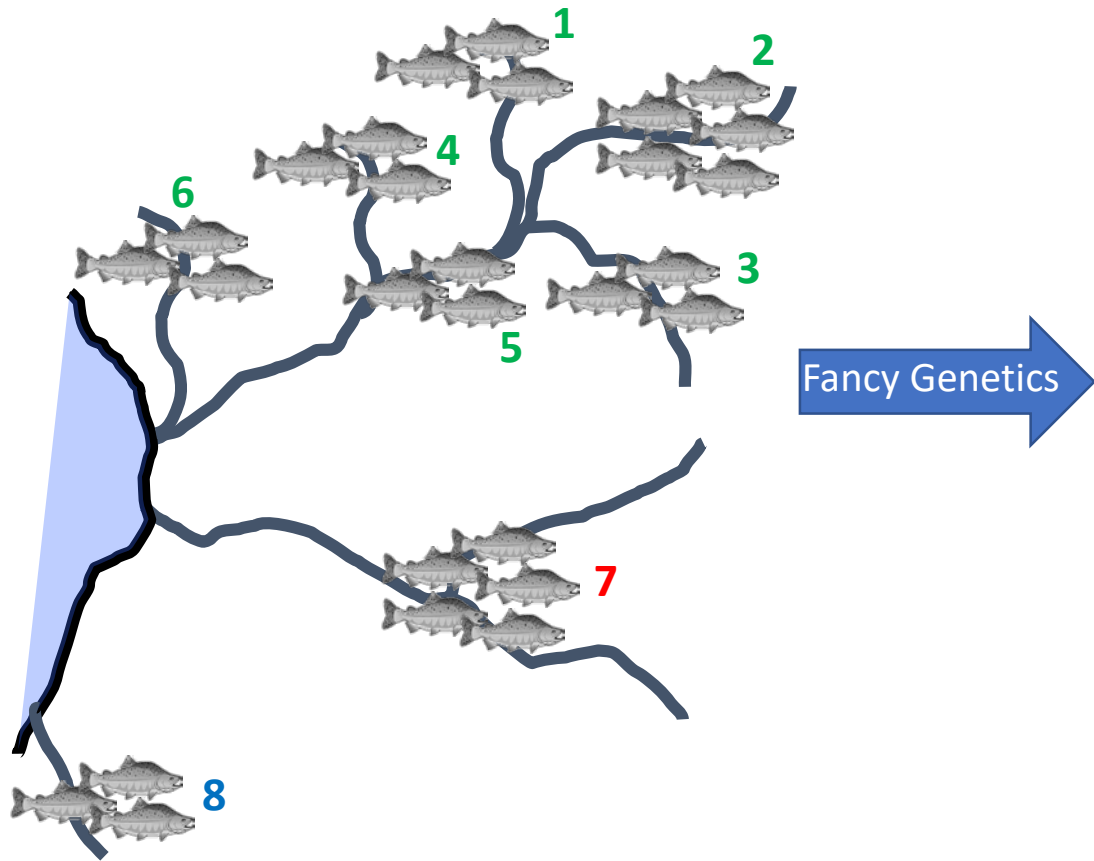
- Differences between populations:
  - Influenced by: selection, mutation, *genetic drift*, *migration*

*genetic drift* ~ **homing**

*migration* ~ **straying**

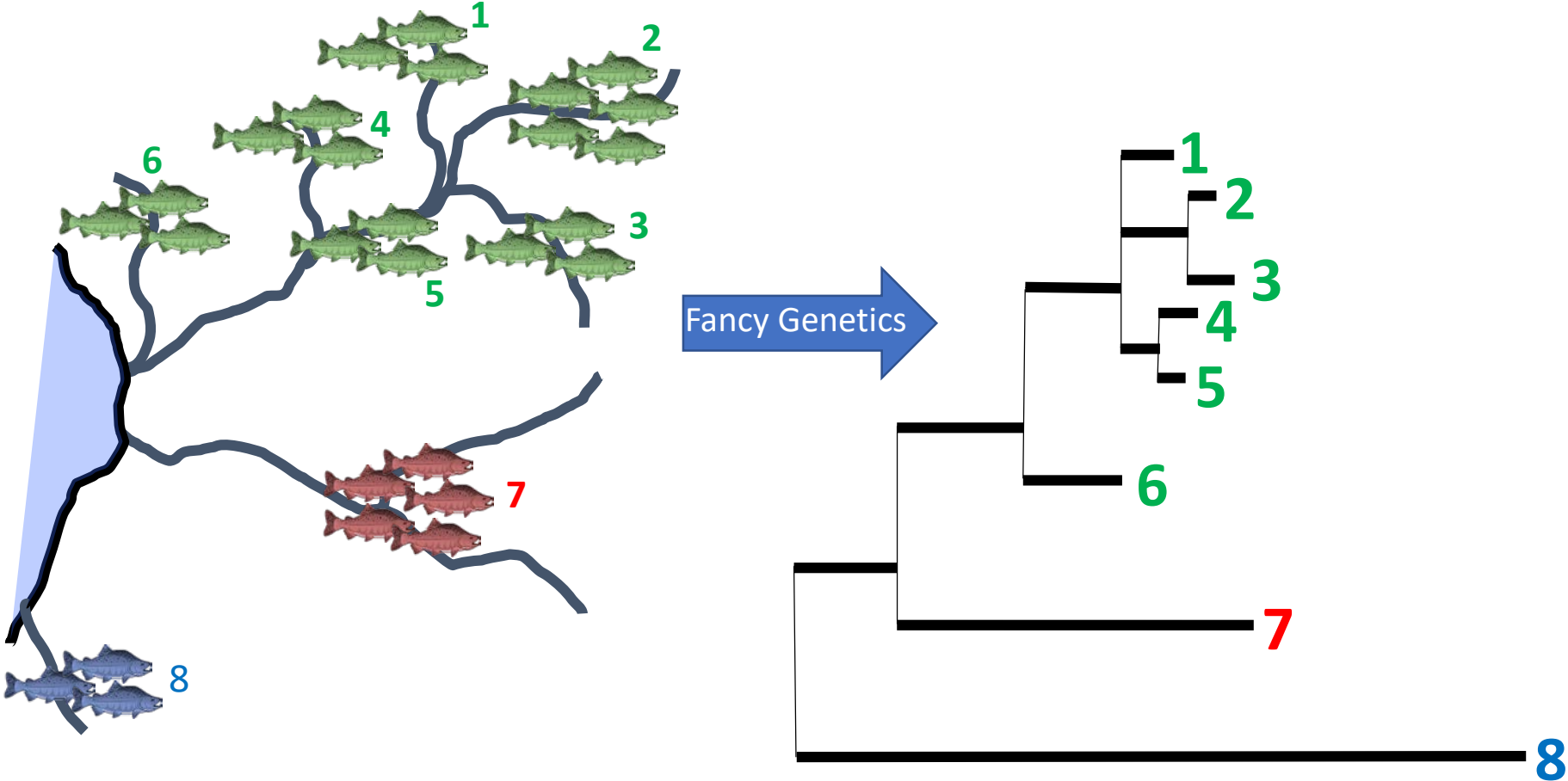
- *Measuring the balance between these within a species across an area*
- Measured by quantifying pairwise genetic differences
- Visualize using genetic trees

# Population Structure: An example



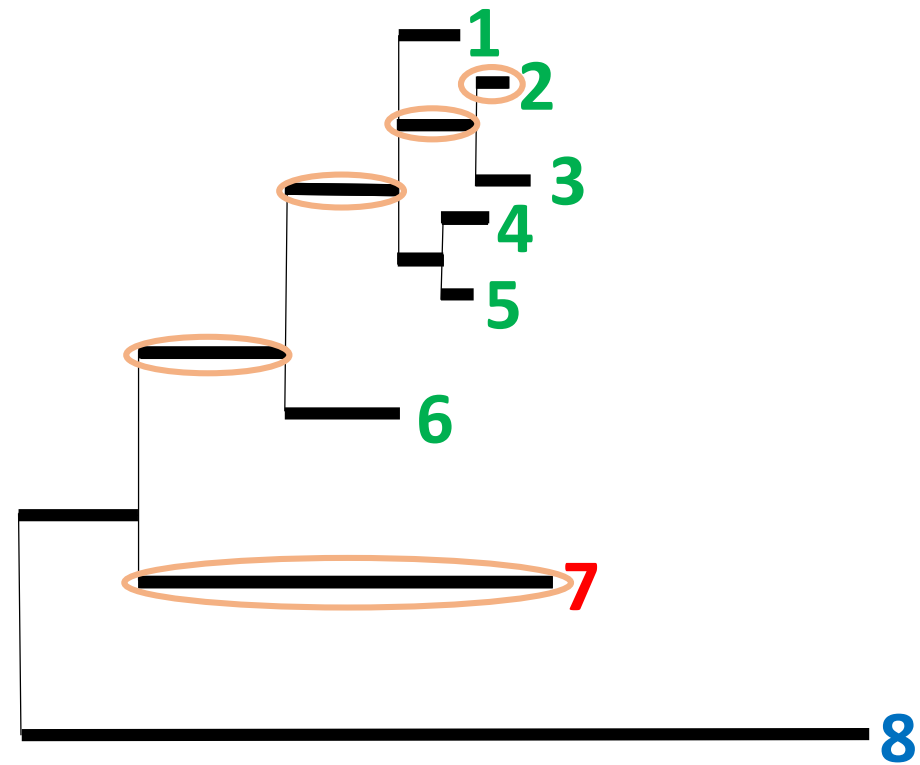
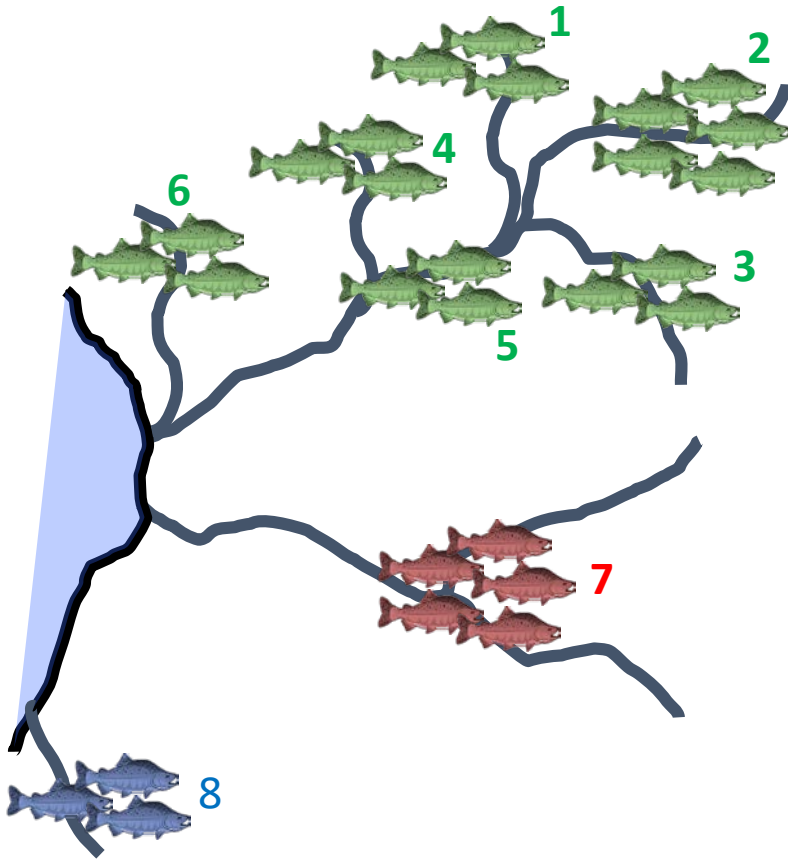


# Population Structure: An example





# Population Structure: An example

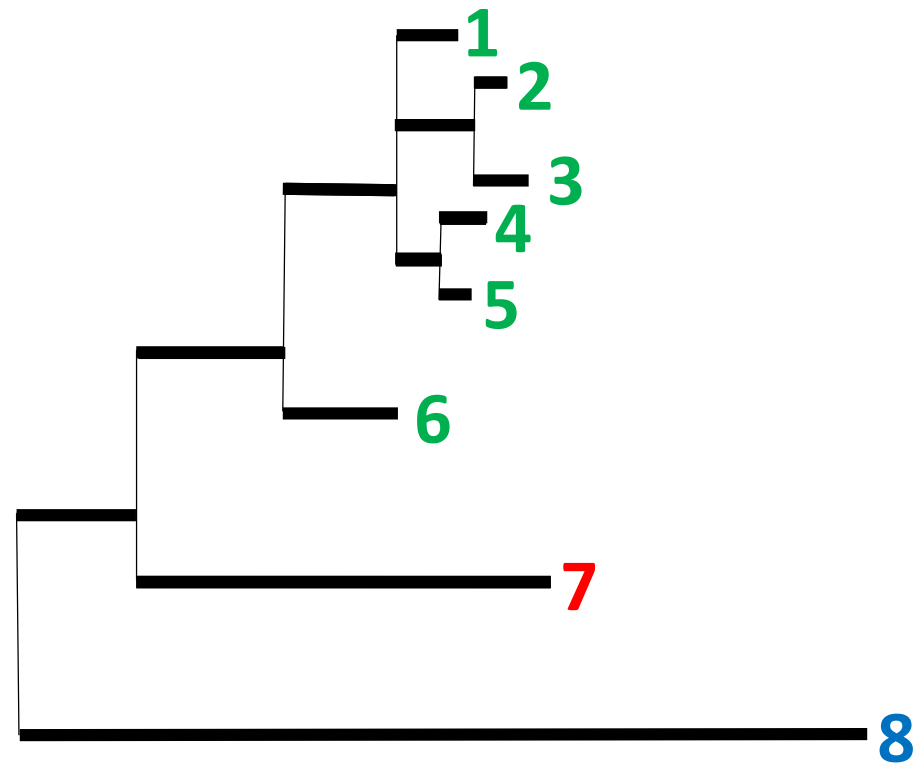
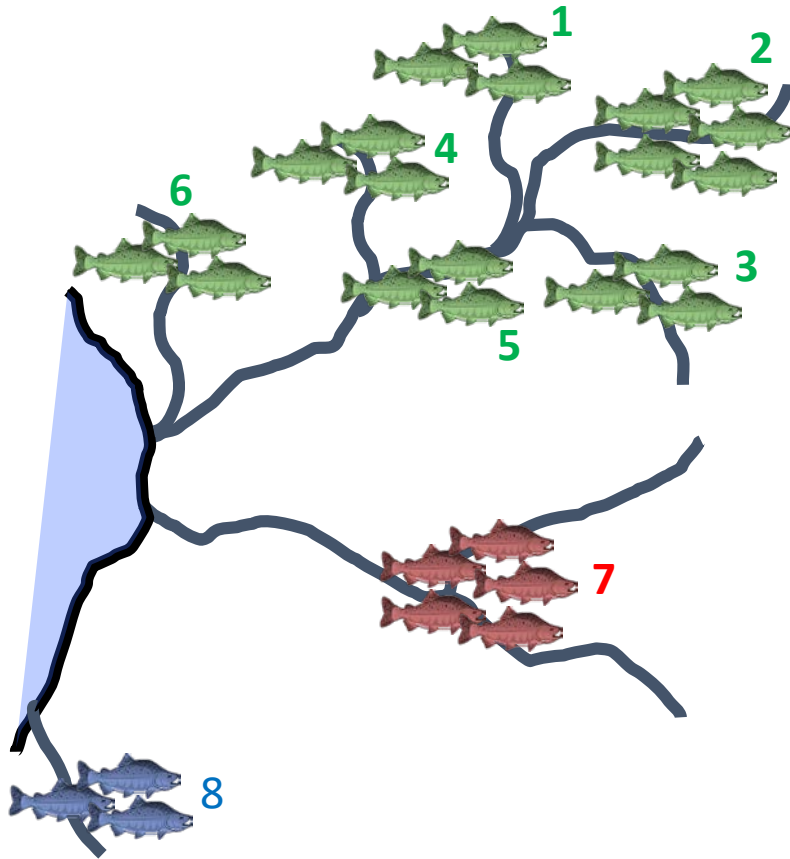


Difference between 1 and 4:

Difference between 2 and 7:    +    +    +    +    +    =



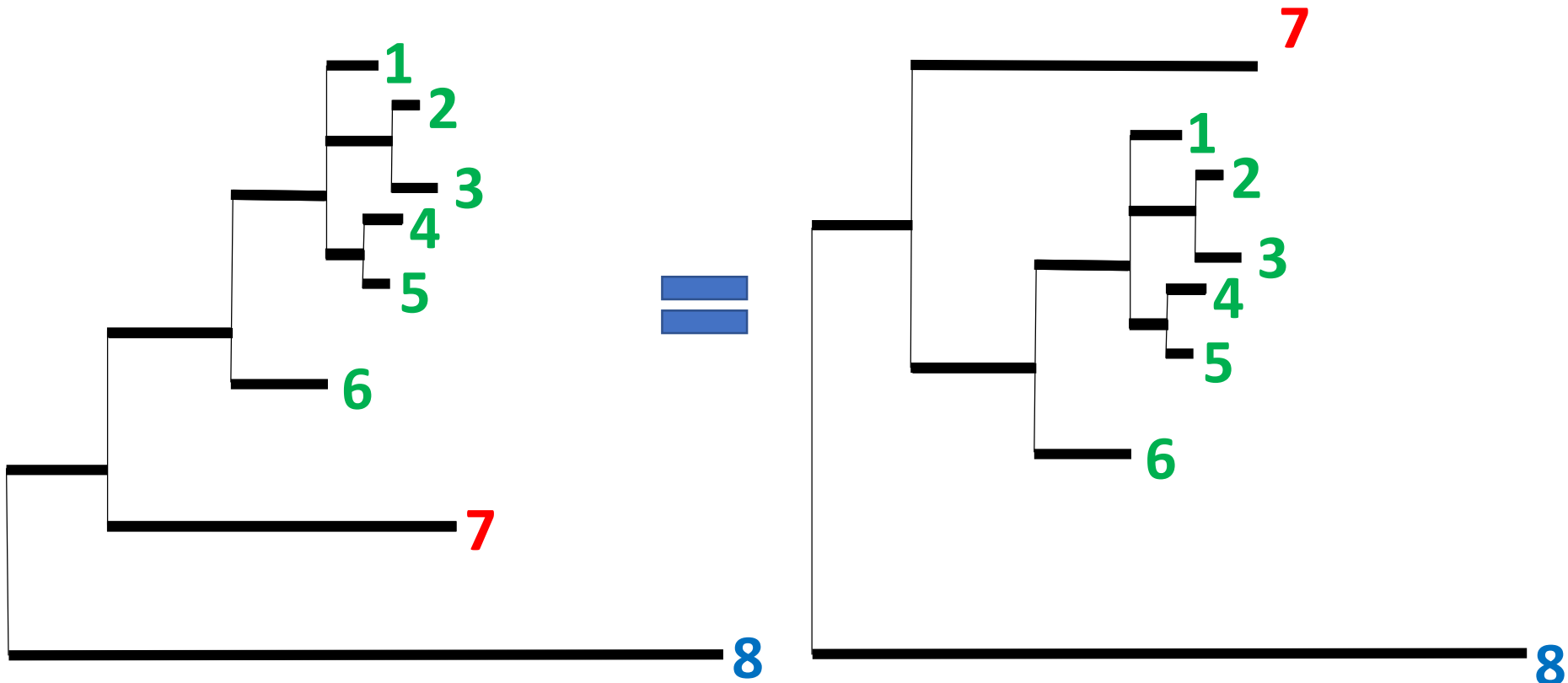
# Population Structure: An example



Difference between 1 and 4: \_\_\_\_\_

Difference between 2 and 7: \_\_\_\_\_

# Population Structure: An example



Now back to chum salmon...



# Previous work (a sampling)

## Determining Continent of Origin of Chum Salmon (*Oncorhynchus keta*) Using Genetic Stock Identification Techniques: Status of Allozyme Baseline in Asia

Gary A. Winans and Paul B. Aebbersold

Northwest Fisheries Science Center, National Marine Fisheries Service, Seattle, WA 98112-2097, USA

Shigehiko Urawa

Hokkaido Salmon Hatchery, Fisheries Agency of Japan, Sapporo 062, Japan

and Nataly V. Varnavskaya

Kamchatka-TINRO, Petropavlovsk, Russia

## Genetic Relationships Among Chum Salmon Populations in Southeast Alaska and Northern British Columbia

C.M. Kondzela, C.M. Guthrie, S.L. Hawkins, C.D. Russell, and J.H. Helle

Auke Bay Laboratory, Alaska Fisheries Science Center, National Marine Fisheries Service, National Oceanographic and Atmospheric Administration, 11305 Glacier Highway, Juneau, AK 99801-8626, U.S.A.

and A.J. Garret

School of Fisheries and Ocean Sciences, University of Alaska Fairbanks, 11120 Glacier Highway, Juneau, AK 99801, U.S.A.

## Population structure and stock identification of chum salmon (*Oncorhynchus keta*) from British Columbia determined with microsatellite DNA variation

Terry D. Beacham, Brian Spilsted, Khal D. Le, and Michael Wetklo

## Microsatellite Stock Identification of Chum Salmon on a Pacific Rim Basis

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*Environmental Biology of Fishes* 69: 37–50, 2004.  
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## Chum Salmon Genetic Diversity in the Northeastern Pacific Ocean Assessed with Single Nucleotide Polymorphisms (SNPs): Applications to Fishery Management

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Alaska Department of Fish and Game, Division of Commercial Fisheries,  
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## Genetic population structure of chum salmon in the Pacific Rim inferred from mitochondrial DNA sequence variation

Shunpei Sato<sup>a</sup>, Hiroyuki Kojima<sup>b</sup>, Junko Ando<sup>a</sup>, Hironori Ando<sup>a</sup>, Richard L. Wilmoth<sup>c</sup>, Lisa W. Seeb<sup>d</sup>, Vladimir Efremov<sup>e</sup>, Larry LeClair<sup>f</sup>, Wally Buchholz<sup>g</sup>, Deuk-Hee Jin<sup>h</sup>, Shigehiko Urawa<sup>i</sup>, Masahide Kaeriyama<sup>j</sup>, Akihisa Urano<sup>k,l</sup> & Syuiti Abe<sup>k,l</sup>

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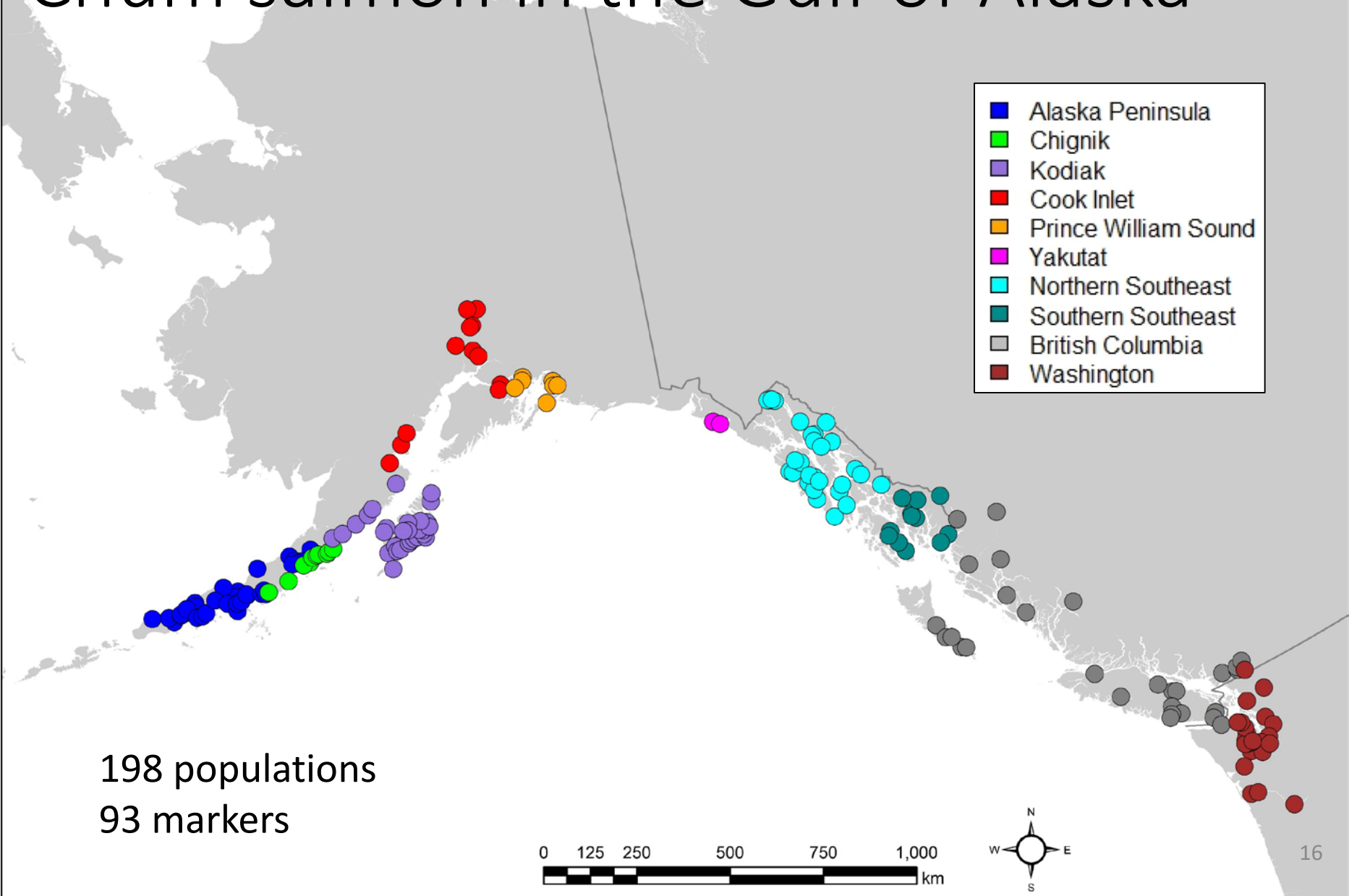
<sup>l</sup>Laboratory of Breeding Science, Graduate School of Fisheries Sciences, Hokkaido University,

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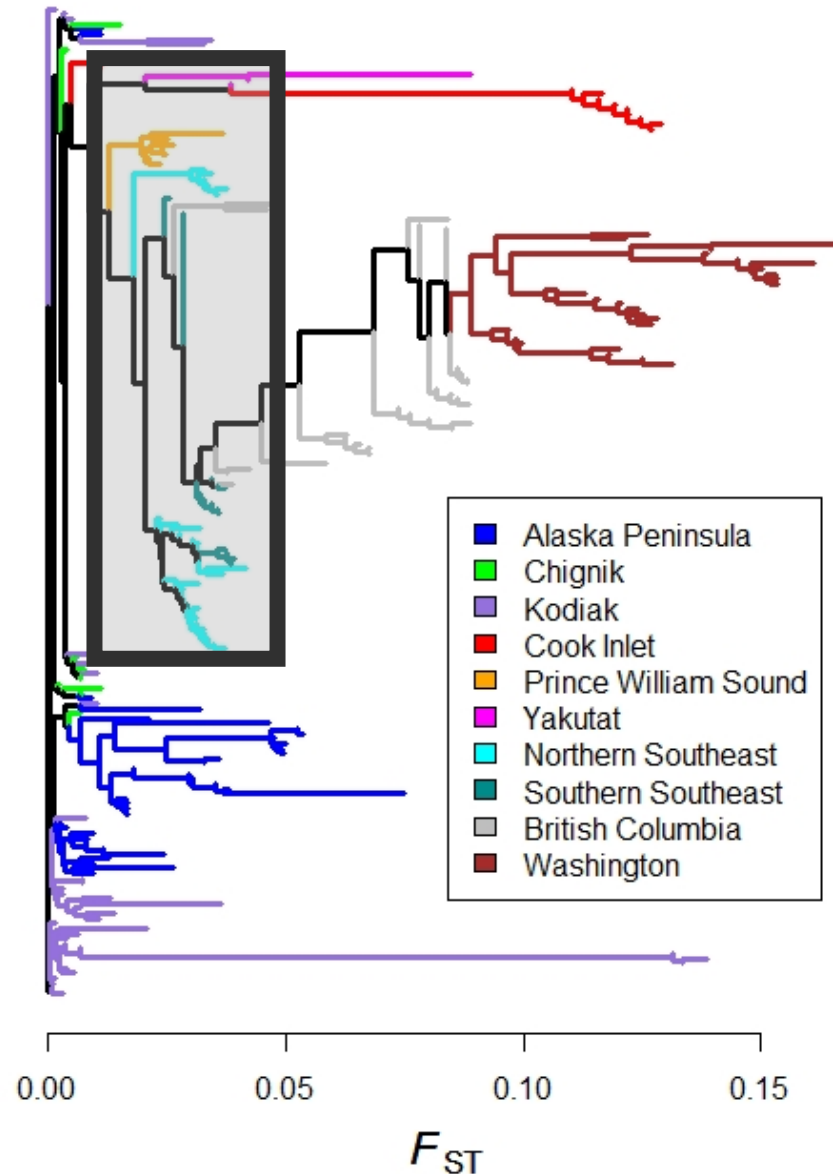
# Chum salmon in the Gulf of Alaska





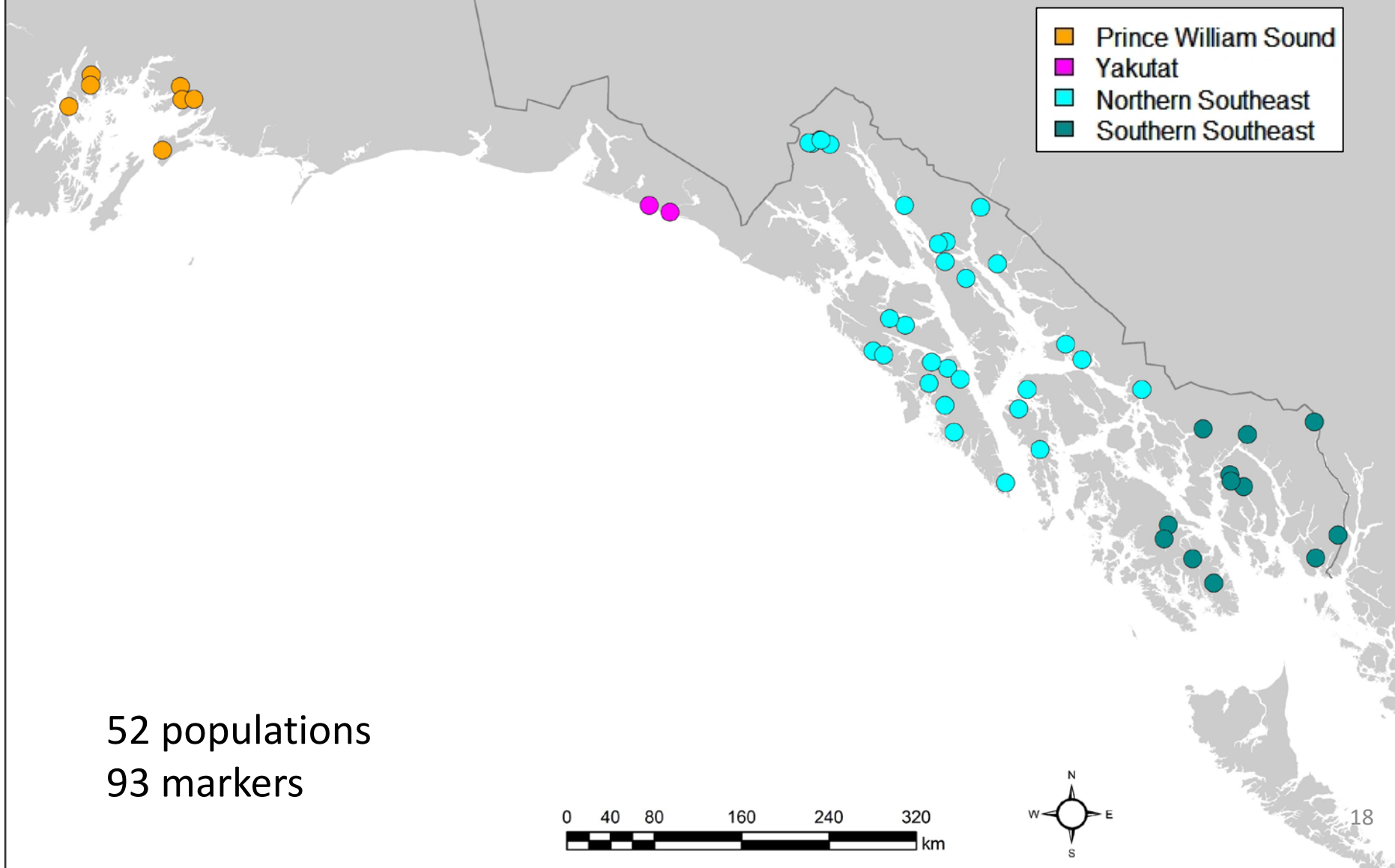
# Chum salmon in the Gulf of Alaska

198 populations  
93 markers



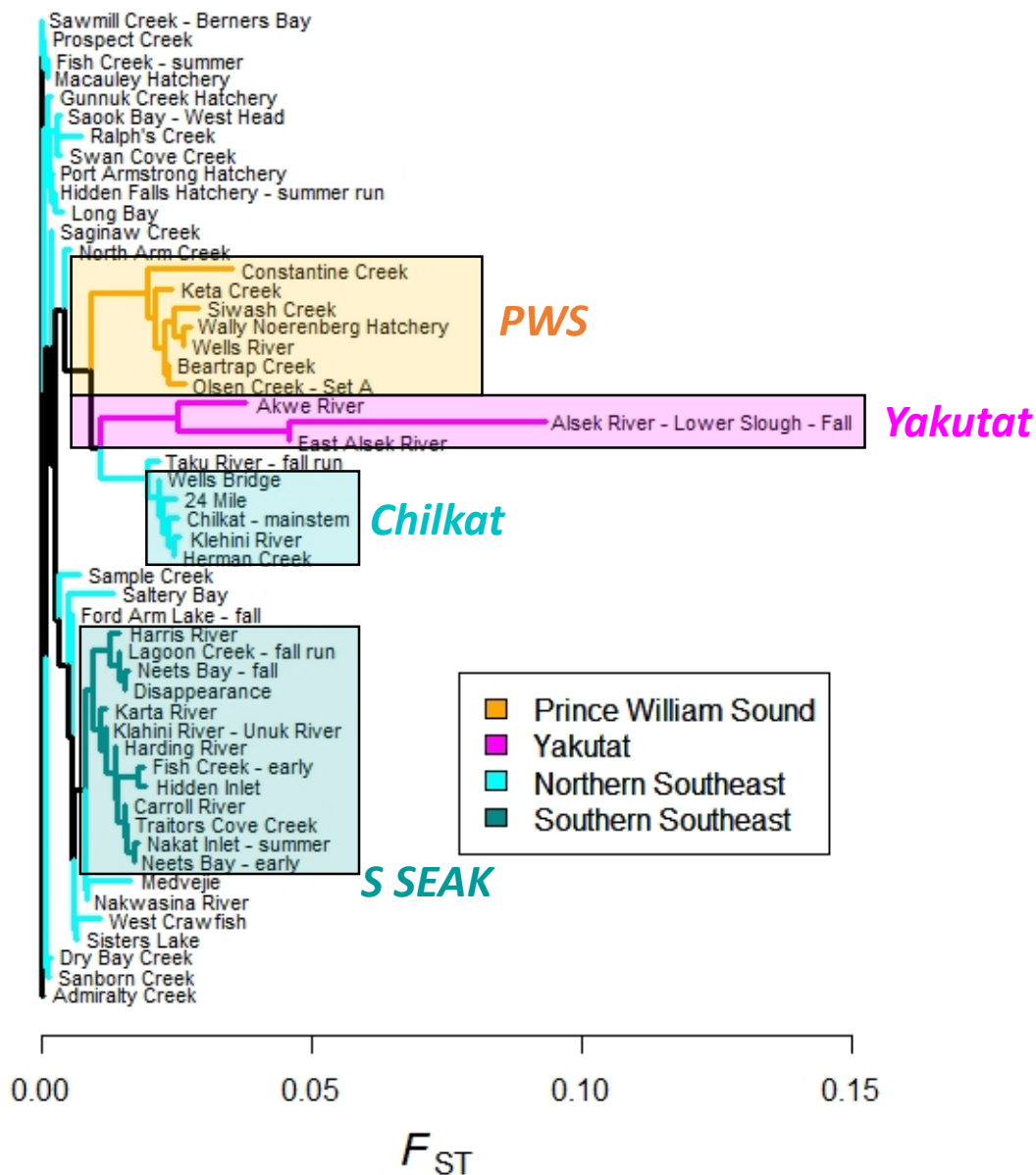
*PWS to SEAK*

# Chum salmon in PWS and SEAK



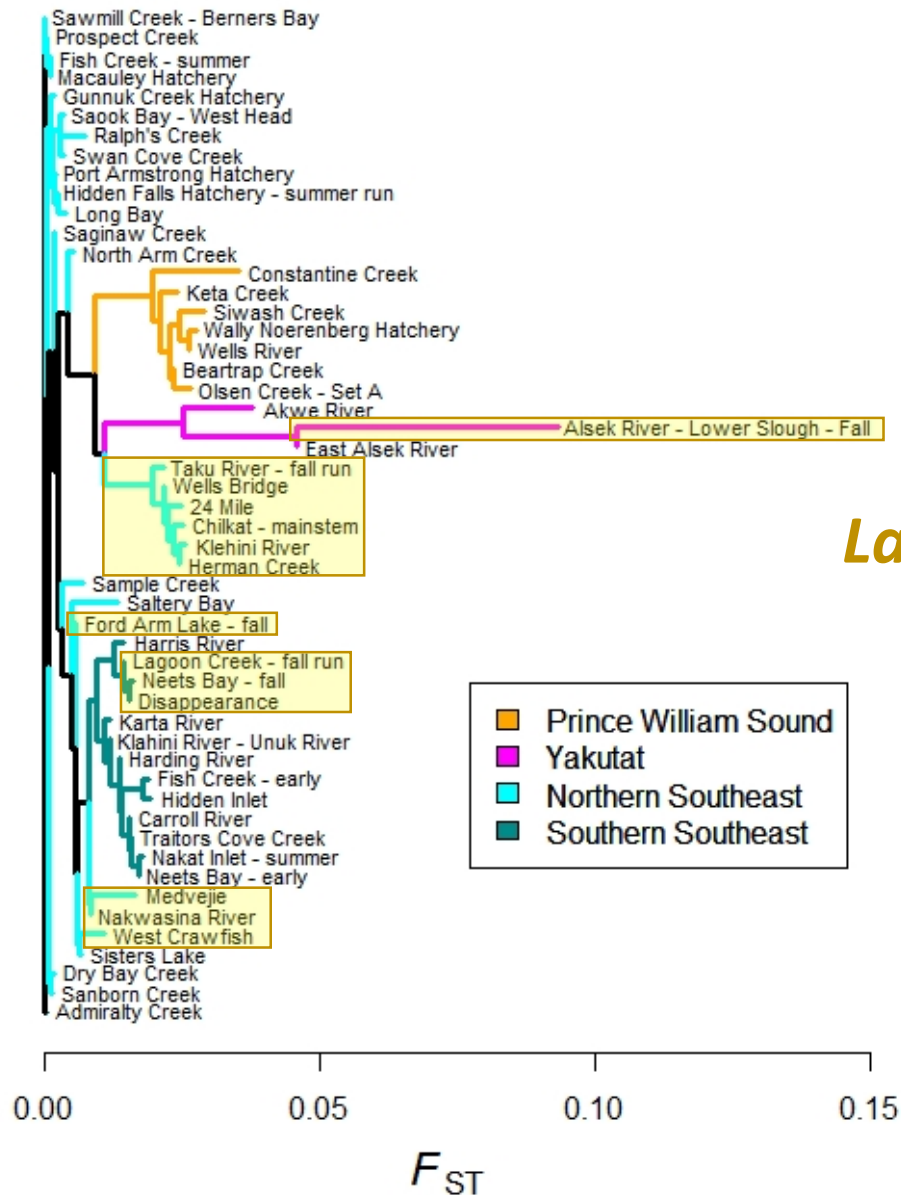
# Chum salmon in PWS and SEAK

52 populations  
93 markers



# Chum salmon in PWS and SEAK

52 populations  
93 markers



# Conclusions: Chum salmon structure in AHRP study area

- Generally correlated with geography
- Some differentiation by run timing
- Similar to other studies

