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

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Alaska Hatchery Research Program Informational Meeting

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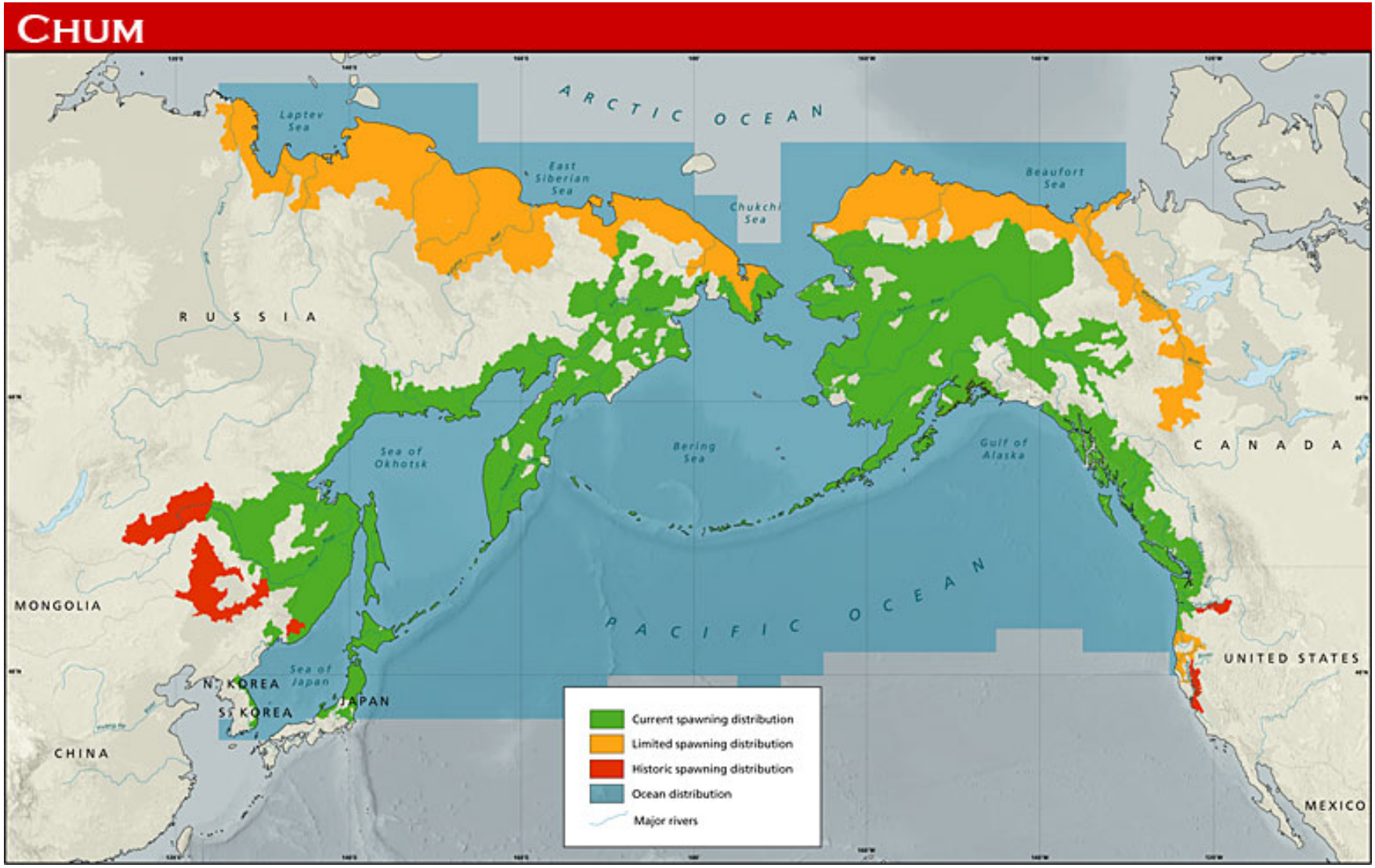
Alaska Hatchery Research Program

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

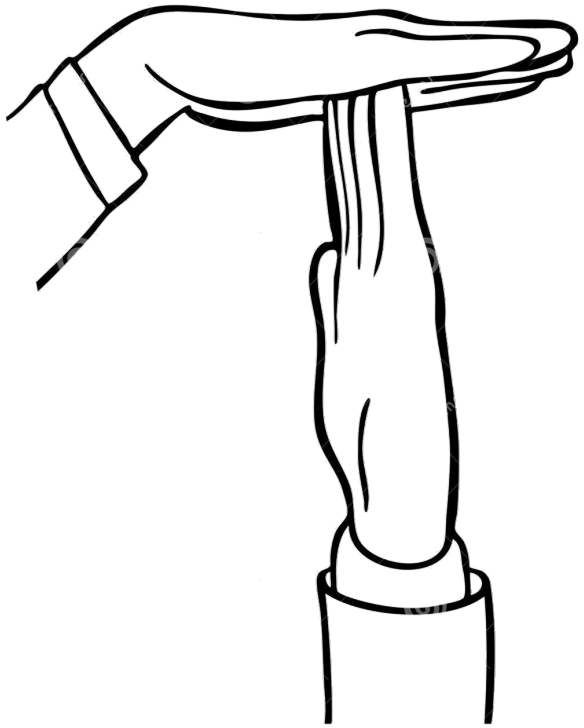
- Migrate as juveniles to ocean
- Typically 2-4 years spent at sea
- Two run timings: summer & fall

Distribution of Chum Salmon



http://www.salmonnation.org/fish/meet_species.html

Quick break to understand concepts



Understanding Genetic Structure

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

Understanding Genetic Structure

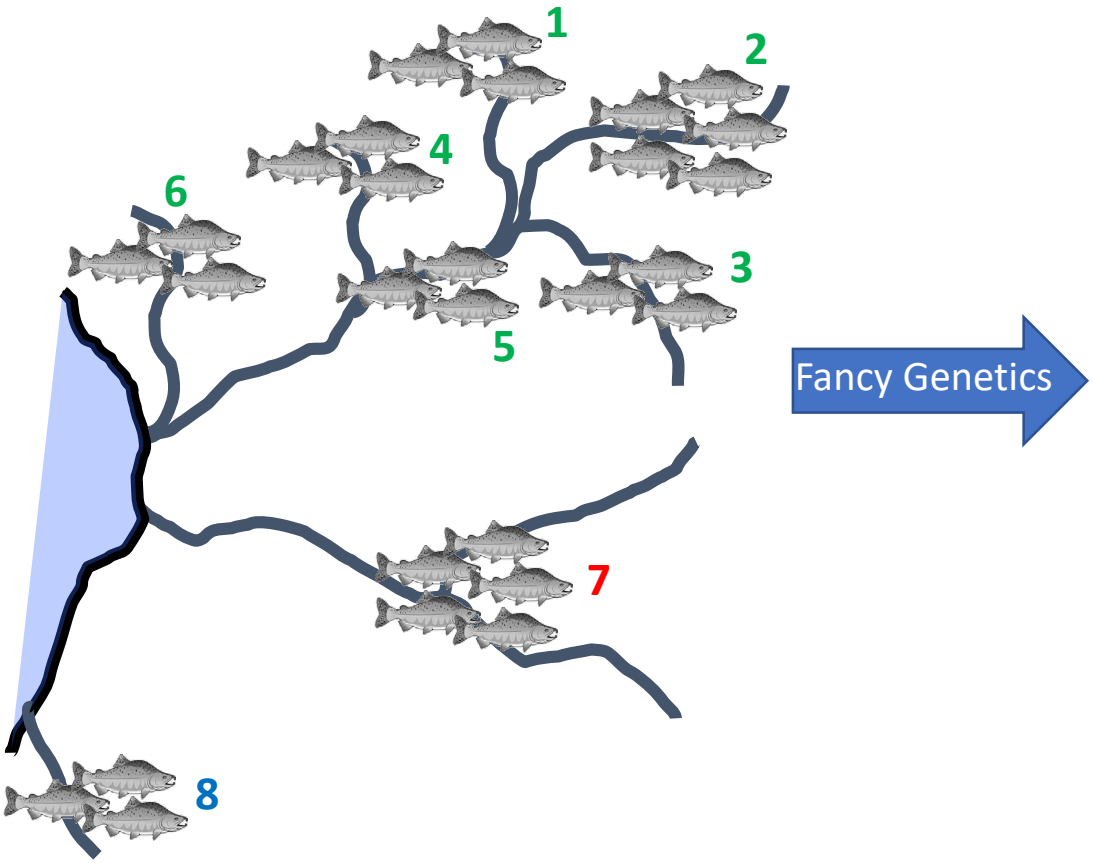
- Differences between populations:
  - Influenced by: selection, mutation, *genetic drift*, *migration*

genetic drift ~ ***homing***

migration ~ ***straying***

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

Population Structure: An example



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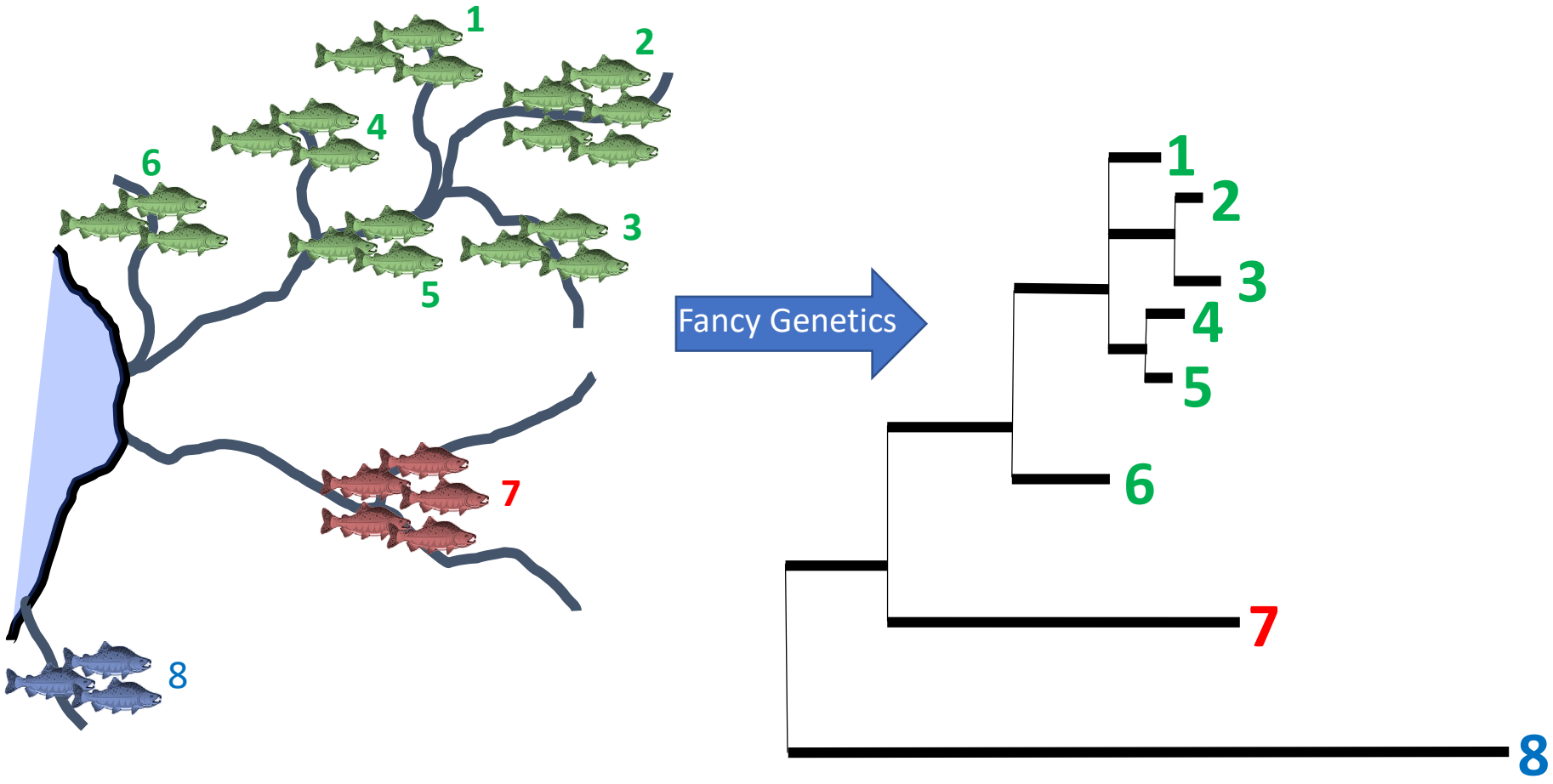

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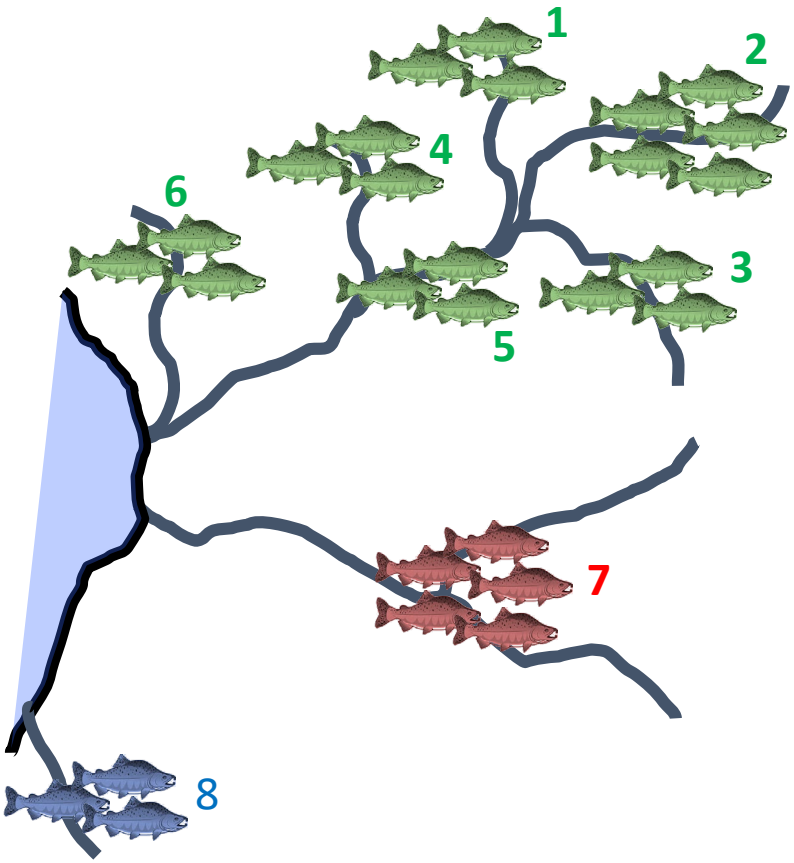
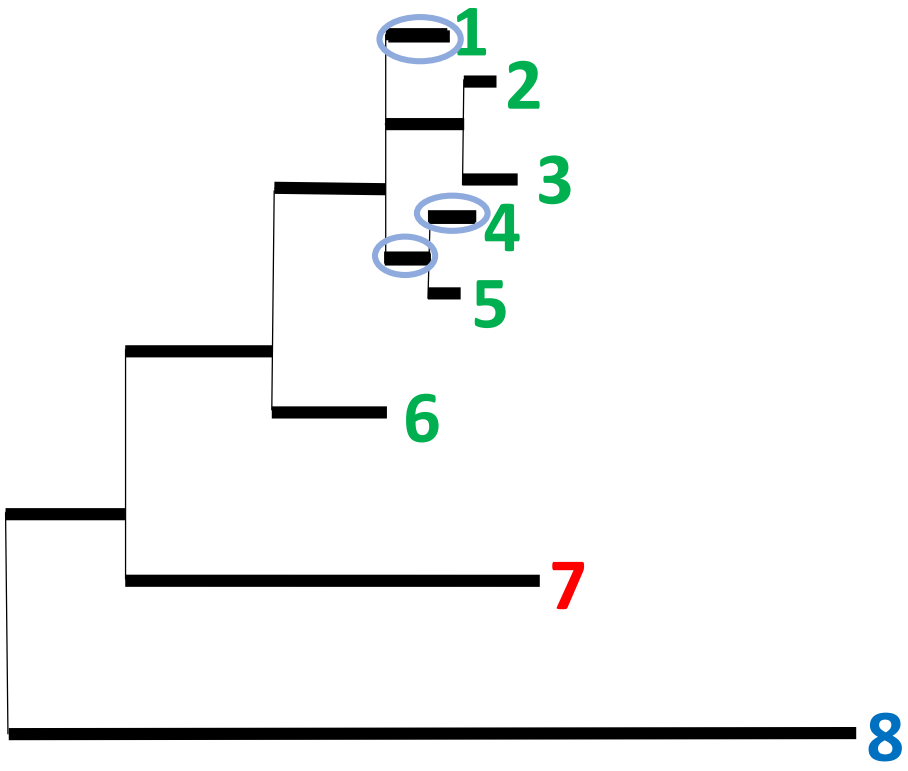
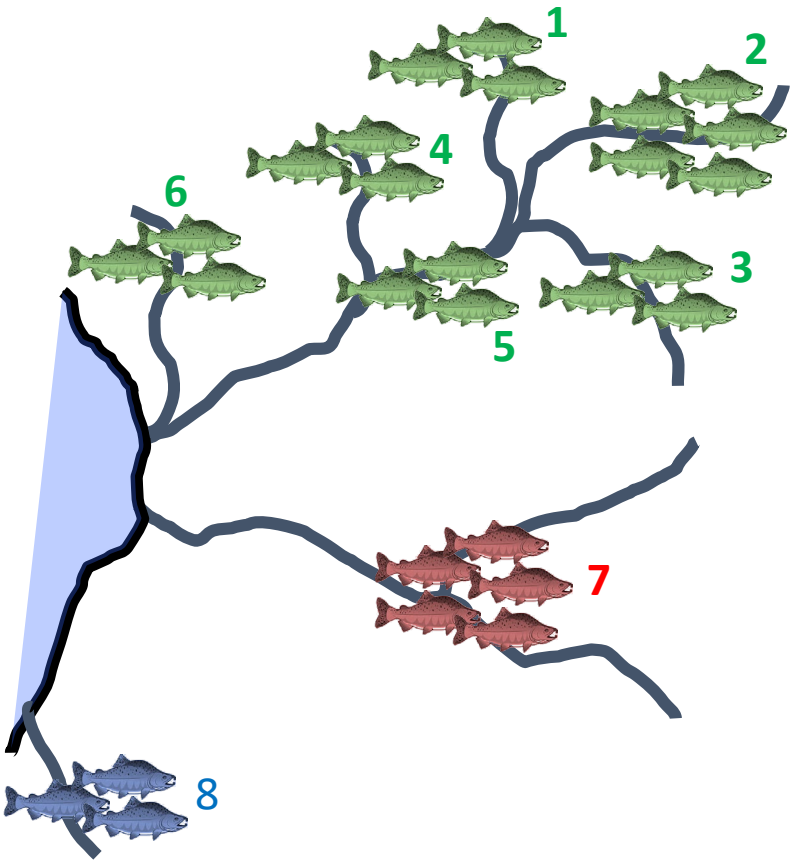
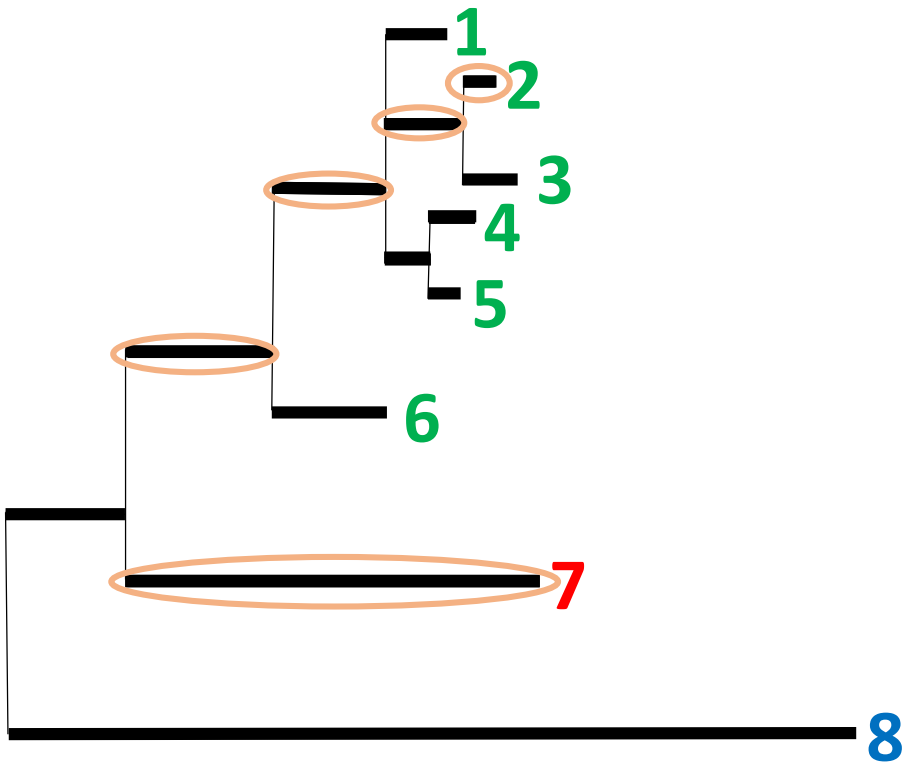




Difference between 1 and 4: + + =

Population Structure: An example

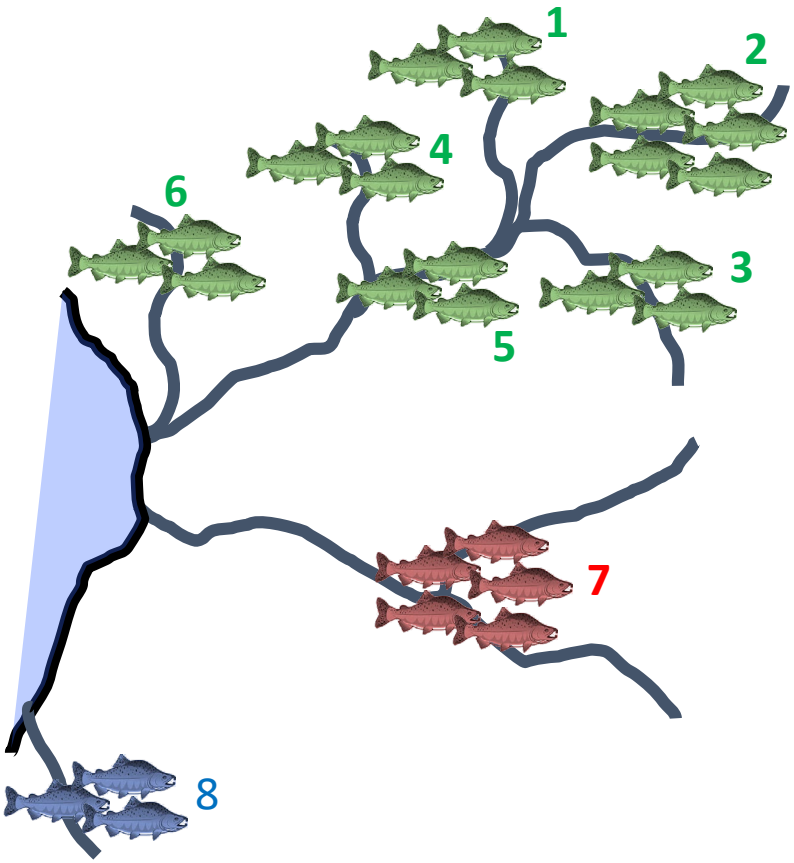


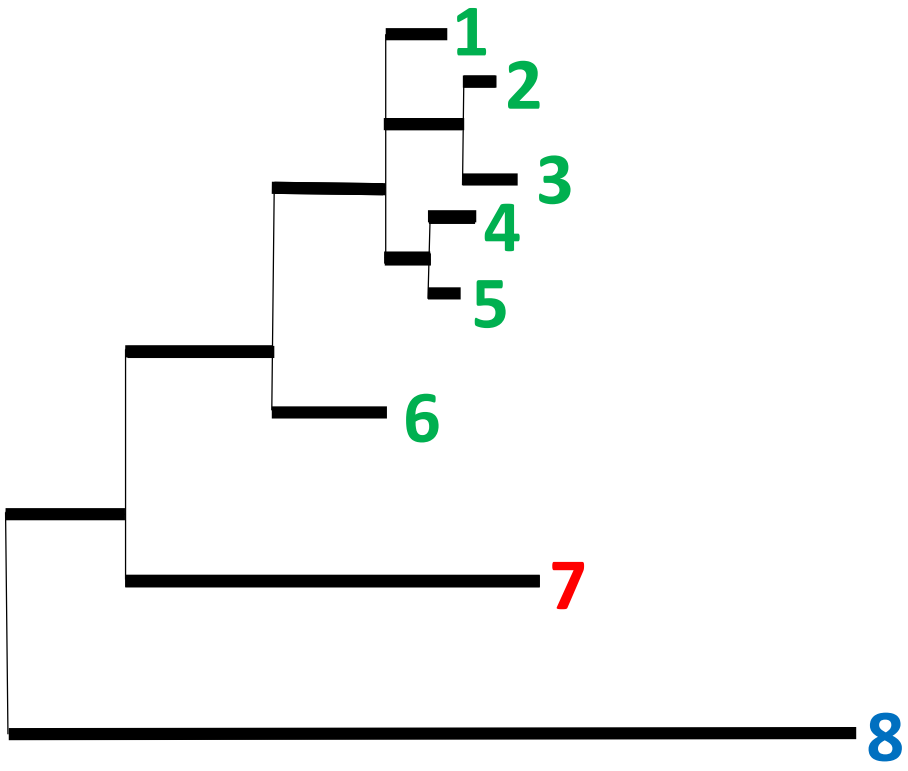


Difference between 1 and 4:

Difference between 2 and 7: + + + + =

Population Structure: An example





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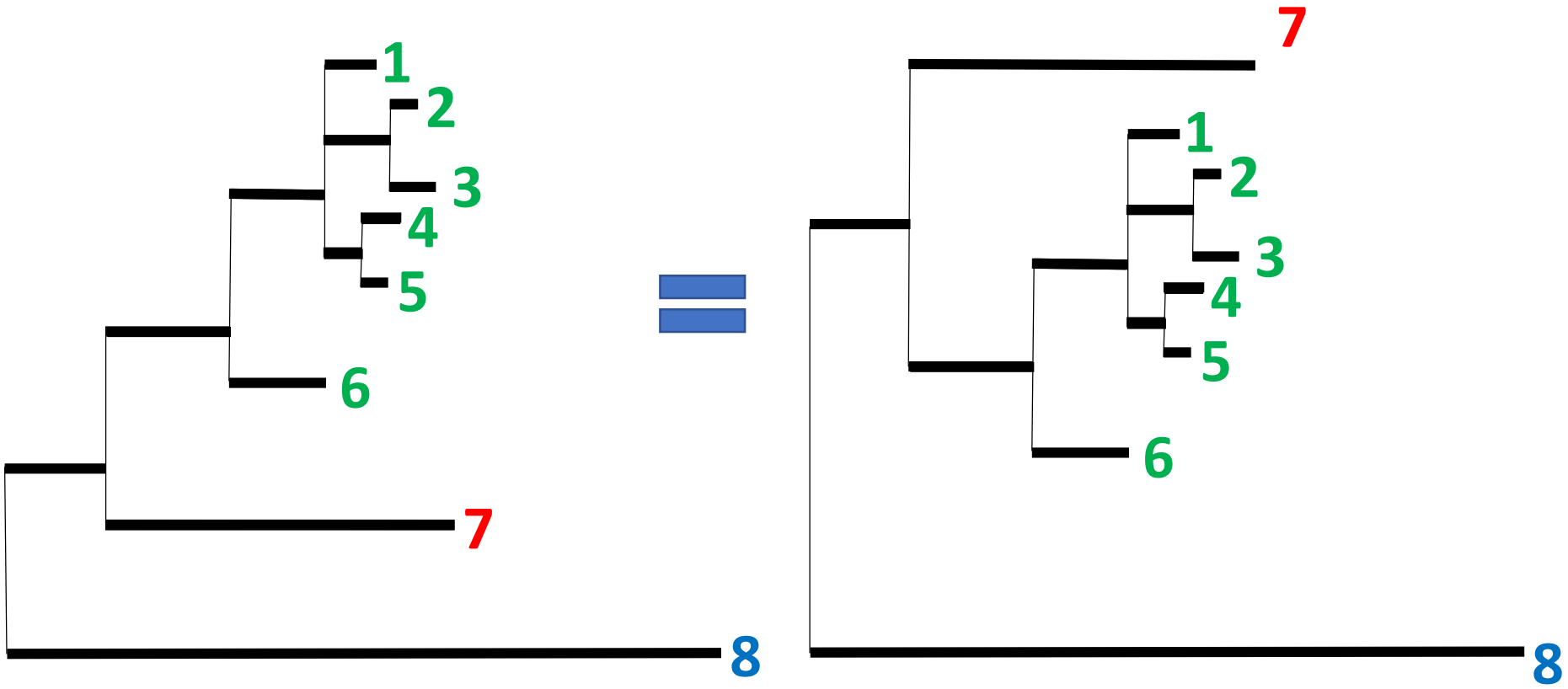

Now back to chum salmon…

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. Aebersold
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

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

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

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

Microsatellite Stock Identification of Chum Salmon on a Pacific Rim Basis

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Environmental Biology of Fishes **69**: 37–50, 2004.

Chum Salmon Genetic Diversity in the Northeastern Pacific Ocean Assessed with Single Nucleotide Polymorphisms (SNPs): Applications to Fishery Management

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William Templin
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Genetic population structure of chum salmon in the Pacific Rim inferred from mitochondrial DNA sequence variation

Shunpei Sato[a], Hiroyuki Kojima[b], Junko Ando[a], Hironori Ando[a], Richard L. Wilmot[c], Lisa W. Seeb[d], Vladimir Efremov[e], Larry LeClair[f], Wally Buchholz[g], Deuk-Hee Jin[h], Shigehiko Urawa[i], Masahide Kaeriyama[b], Akihisa Urano[a,j] & Syuiti Abe[k,l]
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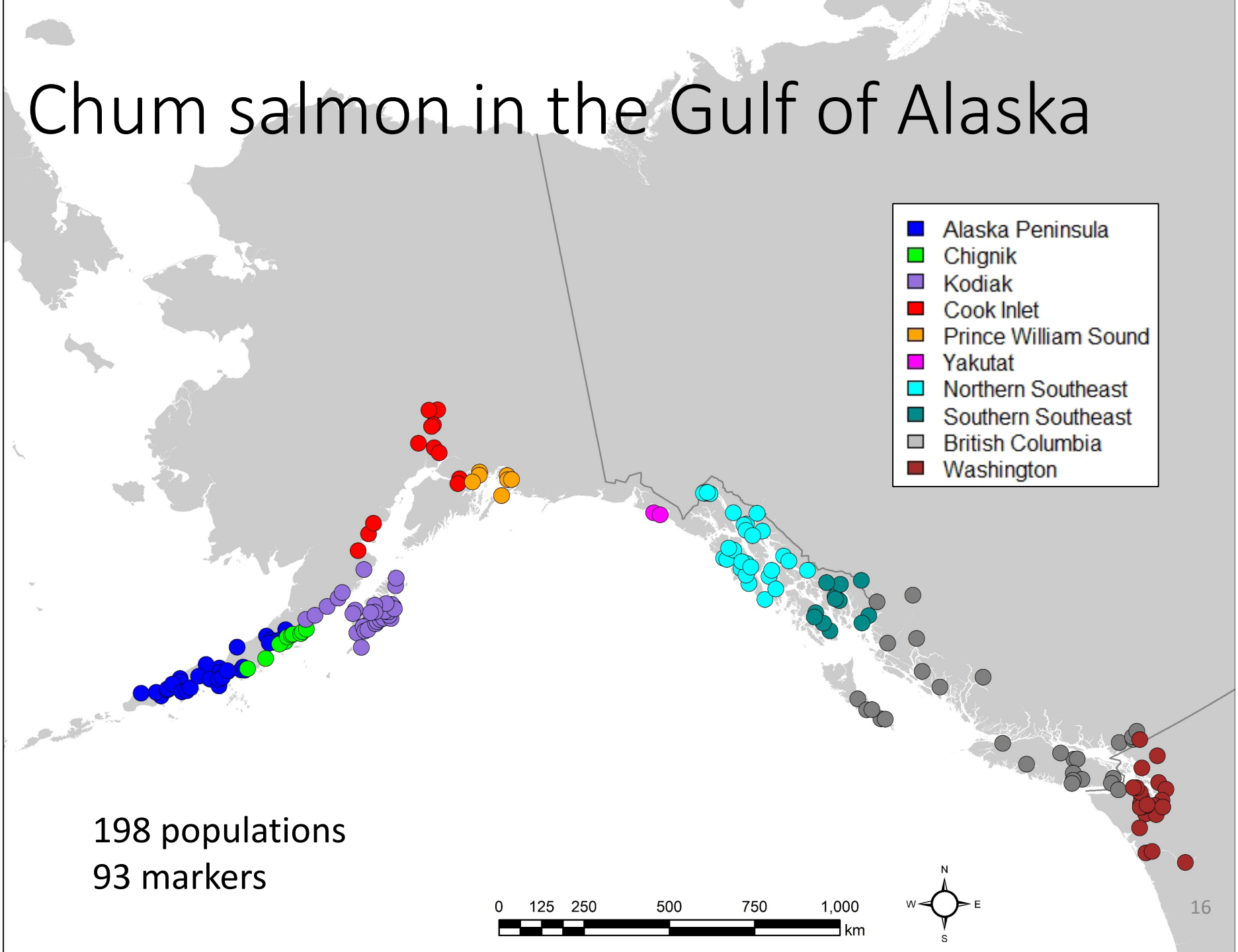
Chum salmon in the Gulf of Alaska



198 populations
93 markers

Chum salmon in the Gulf of Alaska

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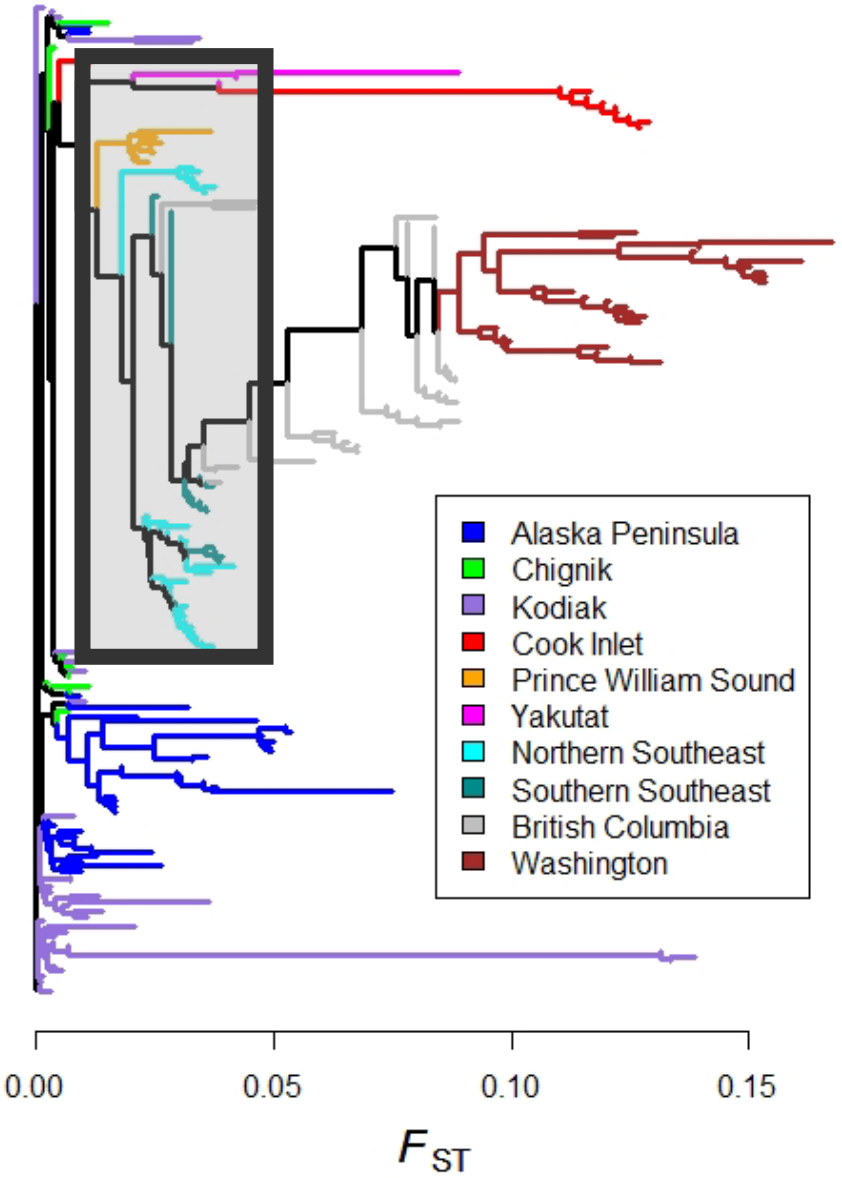
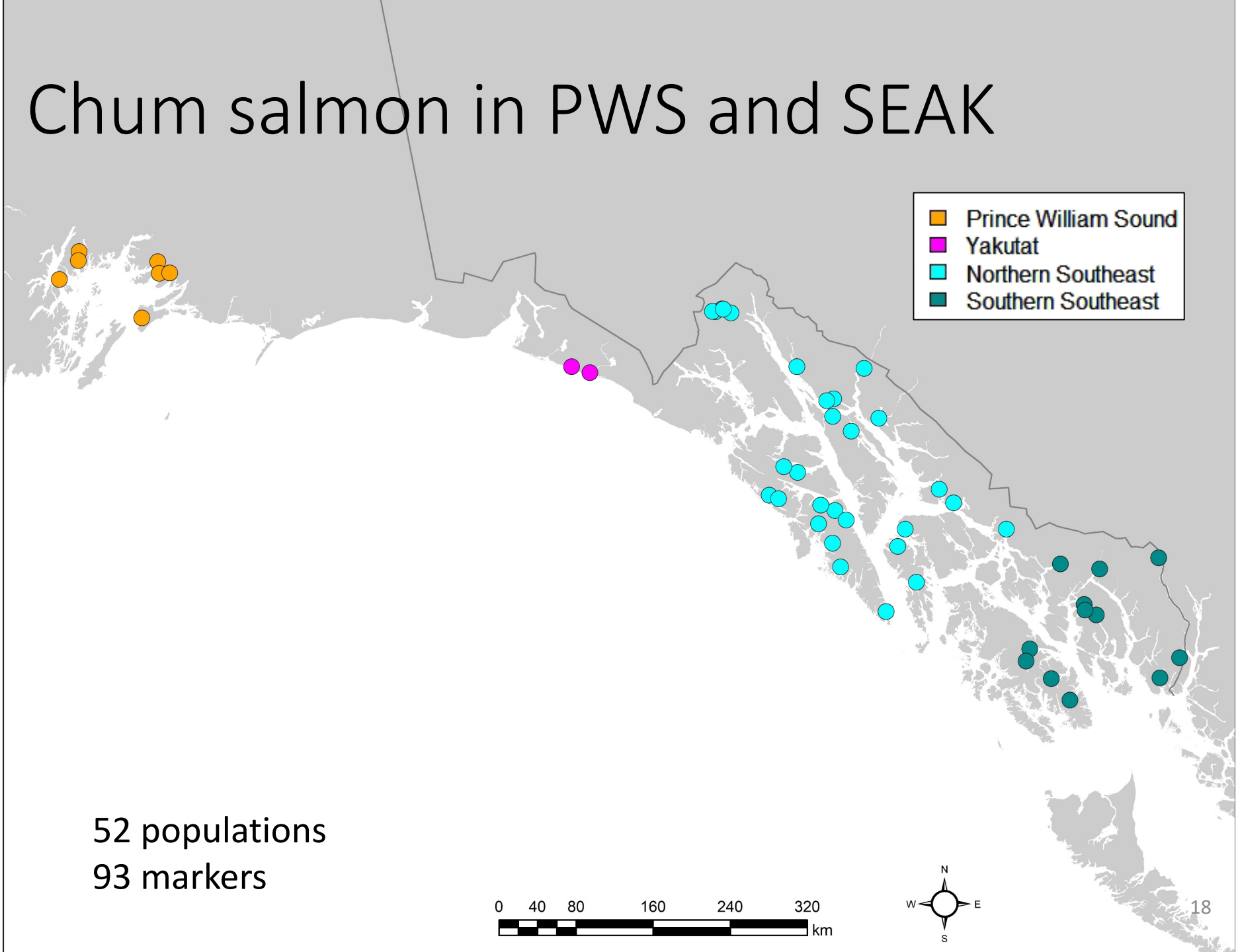


PWS to SEAK

Chum salmon in PWS and SEAK



52 populations
93 markers

Chum salmon in PWS and SEAK

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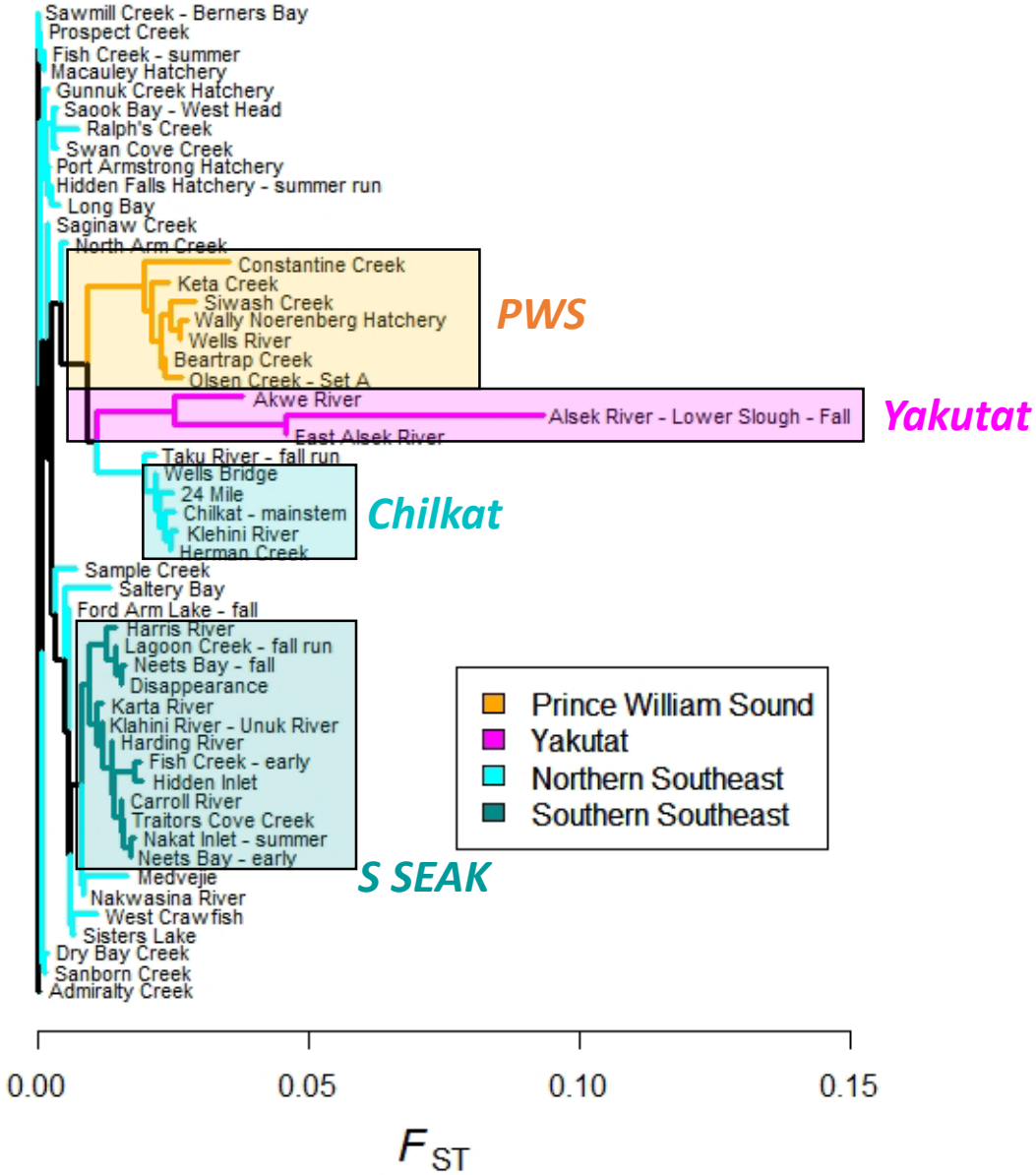

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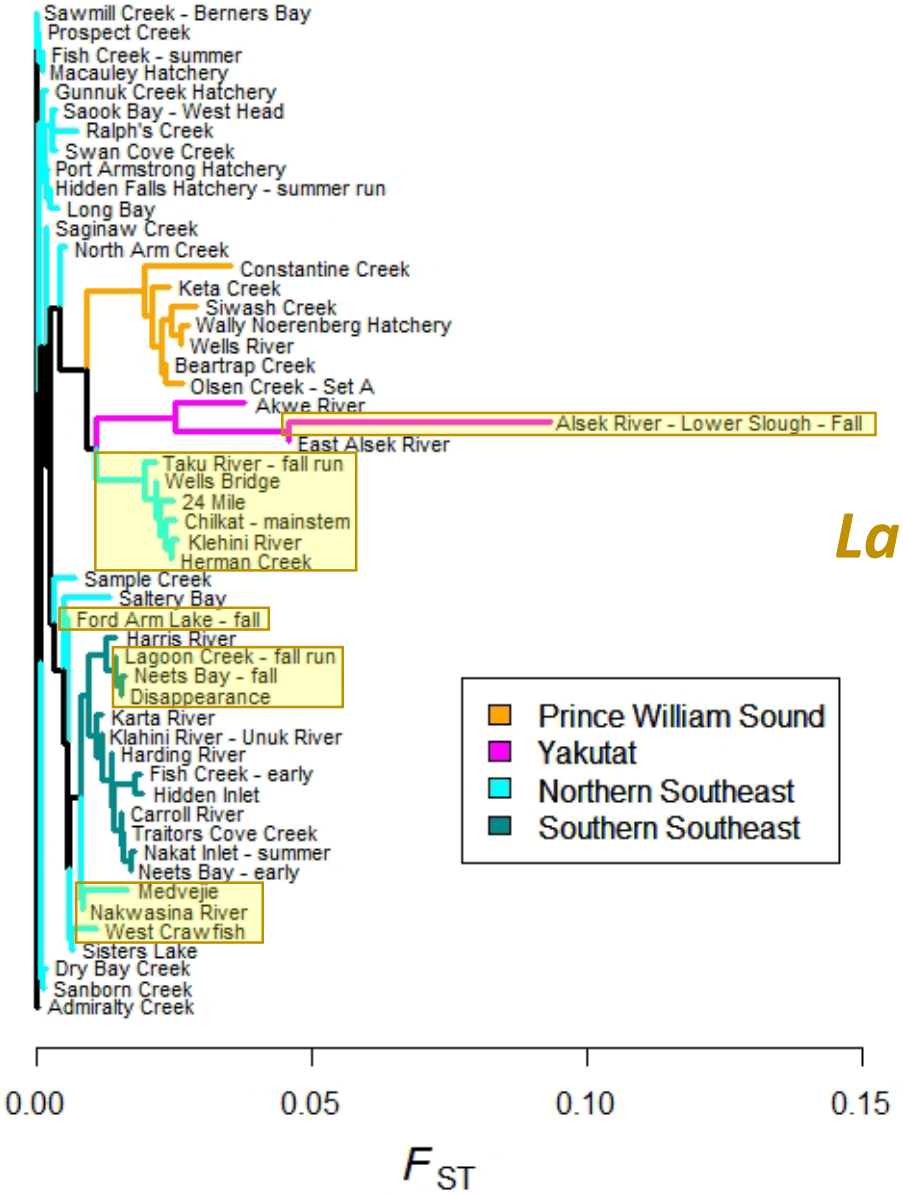

Late run timing

Conclusions: Chum salmon structure in AHRP study area

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


J. Hyde