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

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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 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

Fancy Genetics
Population Structure: An example

Difference between 1 and 4:  +  +  =
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. Aehersold
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Shigehiko Urawa,
Hokkaido Salmon Hatchery, Fisheries Agency of Japan, Sapporo 062, Japan
and Nataly V. Varnavskaya
Kamchatka-DFO, Petropavlovsk, Russia

Genetic Relationships Among Chum Salmon Populations in Southeast Alaska and Northern British Columbia
C.M. Kondzea, C.M. Guthrie, S.L. Hawkins, C.D. Russell, and J.H. Helle
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and A.J. Charette
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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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Population structure and stock identification of chum salmon (Oncorhynchus keta) from British Columbia determined with microsatellite DNA variation
Terry D. Beacham, Brian Spilloto, Khai D. Le, and Michael Wettko

Microsatellite Stock Identification of Chum Salmon on a Pacific Rim Basis
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Genetic population structure of chum salmon in the Pacific Rim inferred from mitochondrial DNA sequence variation
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Chum salmon in the Gulf of Alaska

198 populations
93 markers
Chum salmon in the Gulf of Alaska

198 populations
93 markers
Chum salmon in PWS and SEAK

52 populations
93 markers
Chum salmon in PWS and SEAK

52 populations
93 markers

Chilkat

Yakutat

PWS

S SEAK
Chum salmon in PWS and SEAK

52 populations
93 markers

Late run timing
Conclusions: Chum salmon structure in AHRP study area

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