

Clues to Chinook salmon nearshore migration in Southeast Alaska from estimates of stock composition in troll harvests



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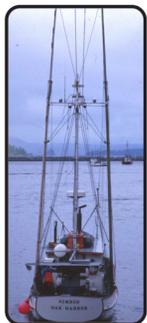
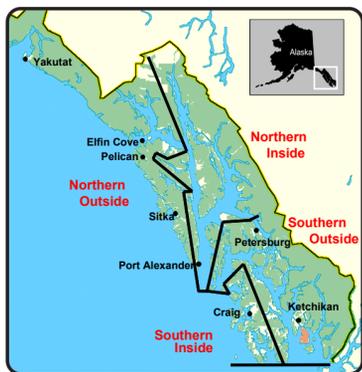


Introduction

The Southeast Alaska troll fishery harvests Chinook salmon originating from Alaska, British Columbia, and the Pacific Northwest. Management of the chinook salmon harvest in Southeast Alaska depends, in part, on information from coded-wire tag recoveries, a marker applied only to a subset of populations (mainly hatcheries). Genetic stock identification can provide stock composition information unavailable from the tag data. This method has been used extensively to estimate the composition of mixed-stock fisheries for Chinook salmon in the Pacific Northwest and is possible because standardized baseline data for allozyme loci are available from throughout the species range. Since 1999, the Alaska Department of Fish and Game has used allozymes to provide independent estimates of the stock composition of the harvest throughout the year in Southeast Alaska troll fisheries. Legal-sized (longer than 71 cm) Chinook salmon were sampled from landings during the summer (July to September), winter (October to April) and spring (May to June) troll fisheries and from sublegal-sized Chinook incidentally caught during the summer fishery. Estimates indicate that the abundance of many stocks of Chinook salmon varies seasonally and by age class.

Southeast Alaska Troll Fishery

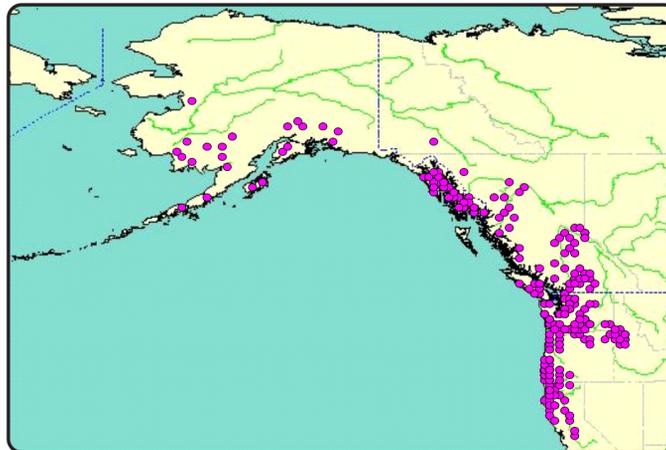
The troll fishery in Southeast Alaska occurs in State and Federal Exclusive Economic Zone waters east of Cape Suckling and north of Dixon Entrance. The fishery is in part managed by a quota established by the Pacific Salmon Commission (PSC). The quota is dependent on the projected abundance of Chinook salmon forecasted by the Chinook Technical Committee (CTC) of the PSC using the Chinook salmon model which integrates data on catch, escapement, coded-wire tag recovery, and recruitment information. Genetic data are now being used to estimate the origin of Chinook salmon harvested in these troll fisheries to provide independent estimates to compare to those derived from the CTC model.



Fishery Sampling

During the years from 1999 to 2002, Chinook salmon were collected from landings at processors at ports in Southeast Alaska during Chinook salmon retention periods in the early winter troll fishery (October 11-December 31), the late winter troll fishery (January 1-April 14), the summer fishery (July and August-September). Samples were stratified by management quadrant (Northern Outside, Northern Inside, Southern Outside, Southern Inside) and were subsampled proportional to the catch in each quadrant so that estimates would not be biased by location of catch. Muscle, eye, and fin tissues were assayed for genetic variation at 26 allozyme loci. Stock composition estimates for 28 stock groups were made using SPAM 3.6 (<http://www.cf.adfg.state.ak.us/geninfo/research/genetics/software/spampage.htm>).

Collections in the Coastwide Baseline



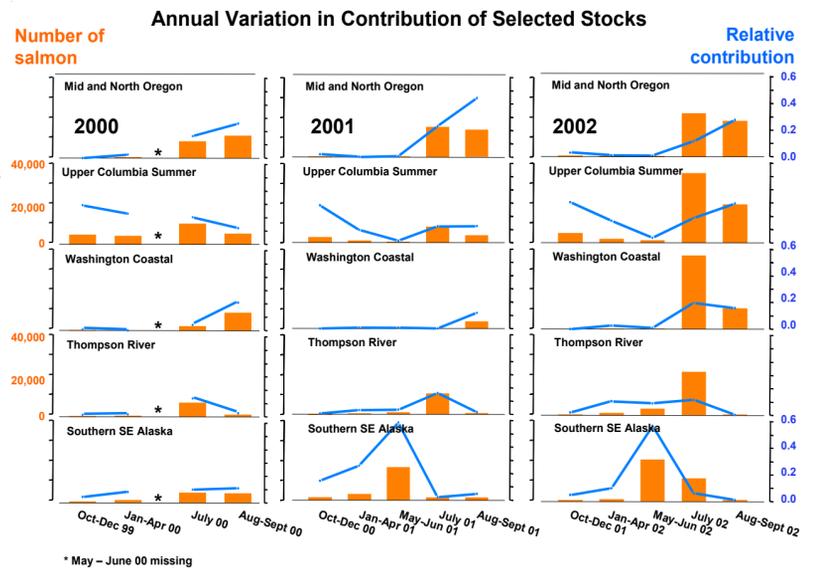
NPAFC Document 440
Comprehensive Allozyme Database Discriminates Chinook Salmon Around the Pacific Rim.
D. Teel, P. Crane, C. Guthrie, A. Marshall, D. Van Doornik, W. Templin, N. Varnavskaya, and L. Seeb. October 1999



Temporal Changes in Abundance

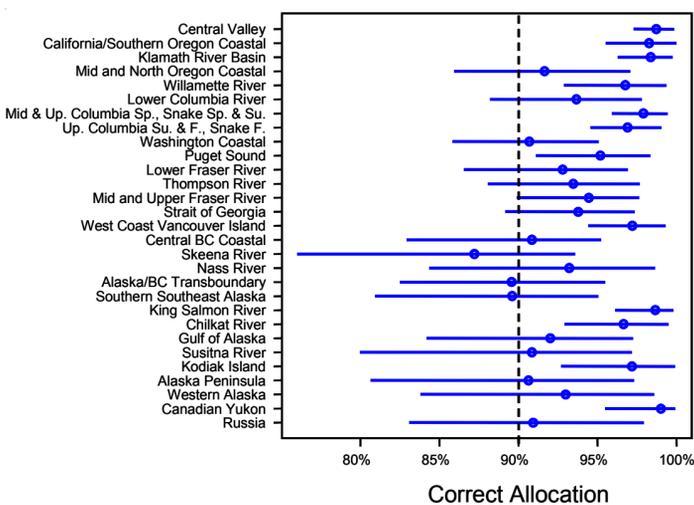
The contribution of major stock groups to the troll fishery changes through time, an indication of the migration timing of these stocks through the nearshore waters of Southeast Alaska.

- Chinook salmon from the Oregon and Washington coasts were major contributors to the summer troll fisheries, but were absent during the winter and spring.
- Chinook salmon from the Upper Columbia River summer and fall stocks were major contributors to the fishery except for during the spring.
- Chinook salmon from the Thompson River were usually present in large numbers only during the month of July.
- Chinook salmon from Southern Southeast Alaska are mainly harvested in the spring.



Coastwide Baseline

A coastwide allozyme baseline for Chinook salmon has been developed that is composed of allele frequency estimates for 44 loci in 254 populations from around the Pacific Rim including major populations potentially contributing to the Southeast Alaska troll fishery (See Map Above Right). Populations were grouped into reporting regions based on genetic similarity and geographic proximity. The identifiability of these reporting regions was investigated by creating simulated mixtures composed entirely of salmon from a single region. When the composition of these mixtures is estimated, the percent correctly identified to the region-of-origin indicates how well this region can be identified. Correct allocation greater than 90% indicates a "highly identifiable" region. Simulations of the dataset verified that 44 fine scale and 29 broad scale genetic aggregates could be identified in mixtures (See Below).



Point estimates and 90% bootstrap confidence intervals are given.

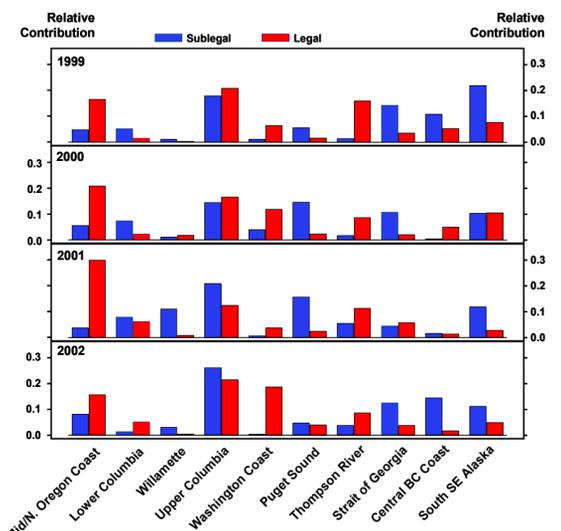
Distribution of Age-classes

Differences in the stock composition of samples from legal- and sublegal-sized Chinook salmon during the summer fishery indicates that different stocks of salmon use the nearshore waters of Southeast Alaska at different lifestages. In the nearshore waters of Southeast Alaska:

- Chinook salmon from the Oregon and Washington coasts and Thompson River are present as larger, more mature individuals.
- Chinook salmon from the Upper Columbia summer and fall stocks are present as both immature and maturing individuals.
- Chinook salmon from the Lower Columbia, Willamette River, Puget Sound, coastal British Columbia and Southern Southeast Alaska are present as smaller, less mature individuals.



Contribution of Selected Stocks to Summer Samples



Conclusions

Estimates indicate that the primary populations of Chinook salmon present in Southeast Alaska during the summer are from the upper Columbia River, the Oregon and Washington coasts, Thompson River, West Coast Vancouver Island, Central British Columbia, and Southern Southeast Alaska. During the early winter a similar assemblage of populations is present except for a reduction in the Washington and Oregon coastal and Thompson River populations. Southeast Alaska and northern British Columbia are increasingly prevalent toward the spring. In the spring fishery, the Upper Columbia River stocks, which are a major population component at all other times of the year, are almost absent.

Legal- and sublegal-sized Chinook salmon present in Southeast Alaska during the summer are from different stock groups; evidence that waters of Southeast Alaska are used by many populations of Chinook salmon during different parts of their life history.

Acknowledgements

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