



Origin of Juvenile Chum Salmon from Gulf of Alaska

Coastal Waters, 2001

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Overview

Finer scale resolution of juvenile chum salmon distribution and migration patterns in the Gulf of Alaska (GOA) is now attainable due to the development of thermal marking programs in several large-scale hatcheries and through the use of genetic analyses that take advantage of the genetic divergence that exists among regional groups of chum salmon populations. Our results support the earlier limited tagging studies that chum salmon juveniles migrate in a counter-clockwise direction around the GOA along the narrow coastal corridor during the summer months.

Methods

Sampling

- Juvenile chum salmon were collected in Gulf of Alaska coastal waters using a rope trawl towed at the surface 3.5 – 5 knots for 30 minutes by chartered F/V *Great Pacific* between 17 July and 6 August 2001.
- Sampling occurred at 75 stations along 11 transects that extended perpendicular from nearshore sites across the continental shelf to oceanic waters, between northern SE Alaska and Kodiak Island (Figure 1).

Hatchery Thermal Marks

- Otoliths were extracted and analyzed by the Alaska Dept. Fish & Game, Mark, Tag and Age Laboratory, Juneau, Alaska.
- Otoliths with thermal marks were compared with voucher specimens to identify hatchery of origin.

Genetic Stock Identification

- Muscle, heart, liver, and eye tissues were analyzed with protein electrophoresis to identify genotypes at 20 allozyme loci.
- Genotypes were compared to the Pacific Rim chum salmon genetic baseline with a maximum likelihood model to estimate geographic region of origin.
- Asian and western Alaskan regions did not contribute to juvenile chum salmon caught in the northern GOA based on an initial analysis; the genetic baseline used in remaining analyses excluded populations from these regions.

Results

Hatchery Thermal Marks

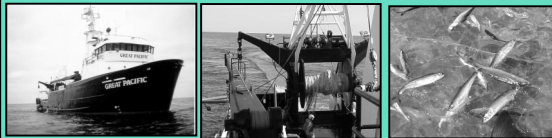
- 1035 juvenile chum salmon were examined for thermal marks; 373 (36%) were marked at one of three Alaskan hatcheries—Wally Noerenberg in Prince William Sound (PWS) and Macauley and Hidden Falls in SE Alaska, all of which thermally marked 100% of the >260 million fish released in 2001 (Figure 2)*.
- The fraction of thermally marked fish in each transect ranged from 0 – 85%.
- The highest concentration of thermally marked fish occurred in collections just beyond the western exit corridor of PWS.
- East of PWS, 40% of the fish were thermally marked from SE Alaska hatcheries. Macauley Hatchery fish were widely distributed, however, the majority (>70%) of SE Alaska hatchery fish were caught east of PWS.
- Very few hatchery fish were caught in Shelikof Strait.

*The Macauley and Nitinat River (Vancouver Is.) hatcheries had the same otolith mark pattern in 2001. Therefore, some of the fish assigned to the Macauley hatchery may be from the Nitinat hatchery. ADF&G is seeking additional information that may rectify the problem.

Genetic Stock Identification

- Few fish from Washington / S. British Columbia were recovered. Significant contribution was found only in the Kenai Peninsula collections, at 9% (Figure 3).
- Queen Charlotte Is. populations occurred at low levels both east and west of PWS.
- Populations from SE Alaska/N. British Columbia were found from every collection except southern Shelikof Strait, with greatest contribution east of PWS.
- Most of the PWS fish were found just west of the exit corridor. Their presence in the eastern GOA is likely misallocation of SE Alaska fish, due to some genetic similarity of populations in southern Alaska.
- Chum salmon from the Susitna/Yentna R. drainages were restricted to and comprised 40% of the large catches in northern Shelikof Strait.
- Fish from the Alaska Peninsula/Kodiak Is. were primarily found in Shelikof Strait—no significant contribution occurred along the Kenai Peninsula. The low frequency east of PWS is likely misallocation of SE Alaska fish.

F/V *Great Pacific*.....setting trawl.....and catch



Thermal Marks on Otoliths of Hatchery Chum Salmon



Future Direction

- Examine inter-annual differences in migration patterns; data is now available for collections from 2000.
- A newer Bayesian model should provide better regional estimates of origin.
- Combine the migration information from thermal mark and genetic analyses with oceanographic parameters and growth/diet data to more fully understand the distribution, abundance and survival of chum salmon in the GOA.

