

Origin of Juvenile Chum Salmon from Gulf of Alaska Coastal Waters, 2000 and 2001 Determined from Genetic Variation and Hatchery Thermal Marks

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Summer surveys (July–August) of juvenile salmon ecology along the continental shelf of the Gulf of Alaska are conducted annually by scientists from the Ocean Carrying Capacity program of the National Marine Fisheries Service’s Auke Bay Laboratory. These surveys are an effort to link changes in salmon production to biological and physical factors in the ocean environment. An improved understanding of salmon distribution is one objective of this research. We identified the origin of juvenile chum salmon collected in transects from around the Gulf of Alaska in 2000 and 2001, using the presence of thermal marks in hatchery fish and the divergence of genetic characteristics among regional groups of populations.

Juvenile chum salmon were caught on every surveyed transect along the continental shelf between nearshore and slope stations; very few fish were recovered from oceanic stations (Fig. 1). In both years, 36% of the juvenile chum salmon caught during the survey had been thermal-marked from three Alaska hatcheries, the Macaulay and Hidden Falls facilities in Southeast Alaska, and the Wally Noerenberg facility in Prince William Sound. By transect, the proportion of thermal-marked fish ranged from 0 to 85%. The majority of thermal-marked fish were captured just beyond the nearest coastal exit corridor; few thermal-marked fish were recovered from Shelikof Strait or south of Kodiak Island. Thermal-marked fish from Macaulay Hatchery were recovered between Icy Point and Gore Point, with one recovery in Shelikof Strait at Cape Kekurnoi. Hidden Falls fish were restricted to transects east of Prince William Sound, except for one fish recovered on the Gore Point transect. Thermal-marked fish from the Wally Noerenberg facility were recovered on every transect west of Prince William Sound, with the majority caught on the Seward and Gore Point transects.

Identification analyses based on genetic characteristics revealed similar regional estimates across the Gulf of Alaska between the two years. Overall, the contribution of southern North American populations was low; significant, but limited contribution was only found in transects off the Kenai Peninsula. Two distinct size categories of fish along the Gore Point transect occurred in 2000. At least 90% of the larger fish were estimated to be from the southern British Columbia–Washington region, whereas 85% of the smaller fish were from Prince William Sound. As with the thermal-marked fish results, the genetic estimate of contribution of Southeast Alaska–northern British Columbia populations was greatest in collections east of Prince William Sound, and the Prince William Sound contribution was concentrated just west of Prince William Sound. Fish

Fig. 1. Juvenile chum salmon transects surveyed in the Gulf of Alaska by the Ocean Carrying Capacity program during the summers of 2000 and 2001.



from northern Cook Inlet (Susitna and Yentna rivers), and the Alaska Peninsula–Kodiak Island regions made up a large proportion of fish caught in the Shelikof Strait transects. These results provide the most detailed view to date on the distribution of juvenile chum salmon migrating through this coastal corridor. Upon entering coastal waters, at least some juvenile chum salmon from southern North America stocks turn northward along the outer coast and migrate in a narrow band along the continental shelf, where they are met by more northern stocks. This summer migration continues in a counterclockwise direction around the continental shelf of the northern Gulf of Alaska at least as far as Kodiak Island. Fall surveys in the northern Gulf of Alaska and southern Alaska Peninsula will be necessary to determine where and when stocks move further offshore to oceanic waters.