Genetic Stock Identification of Juvenile Chinook Salmon in the Northern California Current

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INTRODUCTION

Juvenile salmon in coastal waters generally include individuals from a heterogeneous mix of freshwater sources with, often genetically influenced, life-history differences that may affect growth and migration. An understanding of the vital features of juveniles in the marine environment requires identification of the source populations being studied. One approach is to use Genetic Stock Identification (GSI) to estimate population origins.

METHODS

Samples of juvenile chinook salmon were collected in early- (May/June) and Late-summer (August/September) in two nearshore coastal areas. A southern area along the coast from northern California (near Crescent City) to southern Oregon (near Newport) was sampled in 2000 in the trawl surveys of Brodeur et al. (NEP GLOBEC). A northern coastal area extending from Newport, Oregon to La Push, Washington was sampled during NMFS pelagic trawl surveys (Emmett and Brodeur 2000). Juvenile chinook salmon were frozen at sea for subsequent dissection of skeletal muscle, liver, heart, and eye tissues. Fish were genotyped at 32 polymorphic allozyme loci.

Mixed-stock analyses (Pella and Milner 1987) were conducted on sets of ocean-mixture genotypes. We used baseline genetic data from chinook salmon sampled in approximately 165 rivers and hatcheries ranging from northern California to southern British Columbia (Teel et al. 1999). Estimated proportions of individual source populations were summed to 11 regional stock groups.

Results

Sample sizes, estimated percentage contributions (and SDs) of 11 regional stock groups in early- and late-summer samples of juvenile chinook salmon collected in two coastal areas of the Northern California Current.

Stock Group	N=53 South June	N=227 South August	N=309 North May	N=207 North September
North of Columbia River	0 (0)	0 (0)	0 (0)	1 (1)
Lower Columbia River	2 (3)	1 (2)	2 (3)	6 (3)
Upper Willamette River	0 (0)	0 (0)	5 (2)	0 (0)
Upper Columbia Basin Fall/Summer Run	2 (11)	3 (2)	23 (3)	35 (4)
Upper Columbia Basin Spring/Summer Run	2 (2)	0 (0)	70 (3)	3 (1)
North Oregon Coast	0 (0)	0 (0)	0 (1)	28 (6)
Mid Oregon Coast	59 (14)	1 (2)	0 (0)	14 (5)
South Oregon Coast	25 (14)	34 (7)	0 (0)	3 (2)
Upper Klamath Basin	0 (5)	10 (5)	0 (0)	0 (3)
North California Coast	0 (0)	8 (5)	0 (0)	5 (4)
Sacramento and San Joaquin rivers	9 (6)	42 (4)	0 (0)	5 (2)

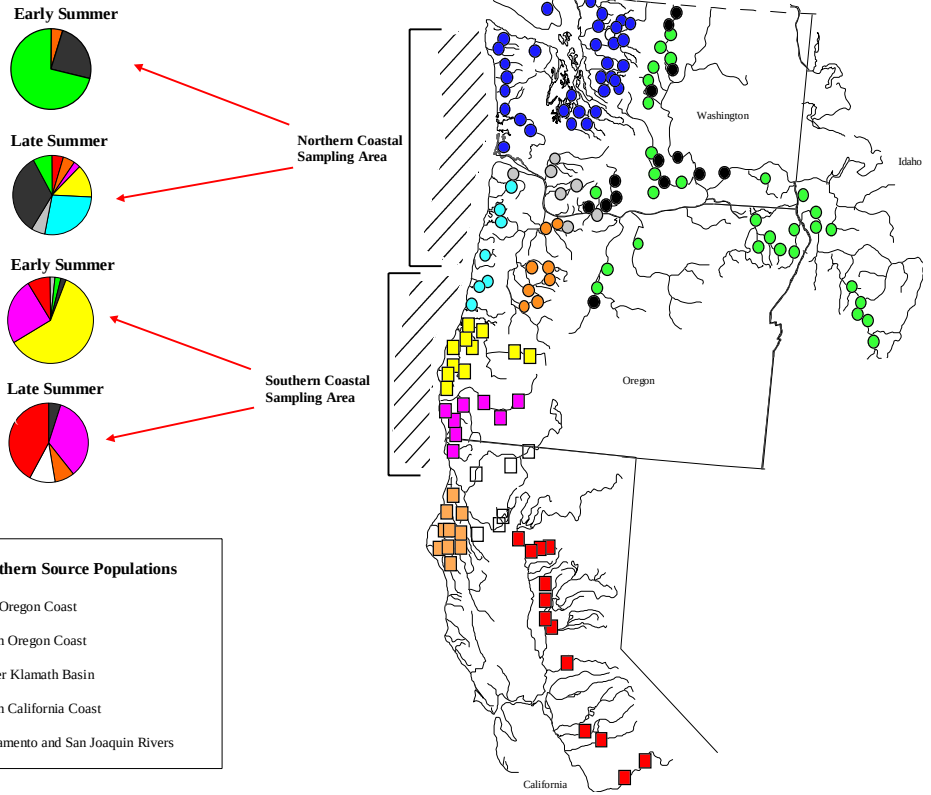
Northern Source Populations

- North of Columbia River
- Lower Columbia River
- Upper Willamette River
- Upper Columbia Basin Fall / Summer Run
- Upper Columbia Basin Spring / Summer Run
- North Oregon Coast

Southern Source Populations

- Mid Oregon Coast
- South Oregon Coast
- Upper Klamath Basin
- North California Coast
- Sacramento and San Joaquin Rivers

Pie Charts Show Stock Proportions of Early- and Late-Summer Juveniles in Two Coastal Sampling Areas



Findings

1. The stock compositions of juvenile chinook salmon in the nearshore waters of the Northern California Current differ considerably between our southern (Crescent City, CA to Newport, OR) and northern (Newport, OR to La Push, WA) sampling areas.

We estimated that over 90% of the fish in the southern area, originated in streams and hatcheries that enter the sea south of Newport Oregon. In contrast, these populations contributed only 0 - 27% of the chinook salmon in the northern area.

2. The stock compositions of juvenile chinook salmon in both ocean sampling areas shifted extensively during the summer.

In the southern area, early summer samples were mostly from rivers just north of Cape Blanco such as the Umpqua, Coquille, Sixes, and Elk rivers. By late summer over 90% of the fish were from stock groups south of Cape Blanco. Juveniles in August were primarily from California's Central Valley (42%) and southern Oregon rivers such as the Rogue, Chetco, and Winchuck.

We estimated that all of the juvenile chinook salmon in the May sample in the northern area were from the Columbia River. In September, over half of the fish in this region were from coastal rivers south of the Columbia River. Upper Columbia River spring-run (timing of adult return to freshwater) and Snake River spring and summer run chinook salmon were predominate in May (70%). These fish are thought to make extensive northern marine migrations and by September were nearly absent from our samples. In contrast, Upper Columbia River fall- and summer-run and Snake River fall-run were abundant in both May (23%) and September (35%).

Literature Cited

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