

**MIGRATION AND SURVIVAL OF JUVENILE SALMONIDS IN
THE LOWER COLUMBIA RIVER AND ESTUARY:
RESULTS FROM RADIO-TELEMETRY**

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Introduction

Over several years we have conducted radio-telemetry studies on Pacific salmonid smolts including spring and fall chinook salmon and steelhead migrating in the Columbia River and its' estuary. The principle focus of these studies has been to evaluate differences in fish migratory behavior and survival in the lower Columbia River and estuary between fish groups that have different migration histories through the Columbia/Snake river hydrosystem. This presentation will be a summary of our major findings over several years.

Methods

Paired releases were established between fish that were barged from Lower Granite Dam (Snake River) and those collected from the Bonneville Dam smolt collection facility. Fish were collected and anesthetized at the hydroelectric facilities or on barges, and then implanted either surgically or gastrically with radio tags. After recovery, both groups of fish were released 1-5 km below Bonneville Dam then tracked using a combination of fixed receiver locations and active tracking with boats and small planes. We have calculated migration speeds to the estuary from the release point, established smolt migration patterns and channel use, and identified locations of mortality in both the river and estuary.

Results/Discussion

From paired releases, comparisons between fish transported by barge from Lower Granite Dam on the Snake River and in-river fish collected at Bonneville Dam on the Columbia River have not shown large differences in migratory patterns or mortality in the lower river. Most smolts of all types and species migrate within the principle channel in the lower river, although airplane surveys have also indicted some use of side channels. River flow has some influence on migration rates to the estuary, with faster rates coinciding with greater flow, but in general migration speeds have ranged from 1.9-3.5 km/h. At these rates, most smolts take 2.5 – 5 days to migrate from the release point to the estuary. We have seen no indication of a holding pattern in the river. In most years, the majority of tagged fish successfully migrated to the estuary, with most spring chinook and steelhead releases having in-river survival rates ranging from 70-90%. Once within the estuary many smolts leave the main shipping channel on the Oregon side and cross broad shallow areas towards the Washington shore, and then follow the flow of a secondary channel into the lower estuary. Tidal cycles influence the rate of egress to the ocean, which is corroborated with our acoustic tracking of steelhead smolts. Based on tracking of individual fish by boats, smolts that reach the estuary on an outgoing tide tend to move quickly through the estuary, while those arriving at the estuary on an incoming tide reduce or arrest their downstream movement until the next outgoing tide. These behaviors may influence smolt survival rates, where arrested movement increases the time juvenile salmonids are vulnerable to avian predators. In most years, less than 20% of tagged fish that reached the estuary were found in piscivorous bird colonies. Recent tag detection data show that efforts to reduce bird predation near Rice Island in the upper estuary may have shifted predation pressure to other areas in the estuary where birds have relocated.

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