

Survival and Behavior of Juvenile Chinook Salmon in the Lower Columbia River, Estuary and Plume

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The survival of juvenile Chinook salmon in the lower 235 km of the Columbia River and estuary, between Bonneville Dam and the Pacific Ocean, has been monitored since 2005 using JSATS miniaturized acoustic transmitters and autonomous receivers. Results from 2005 and 2006 showed higher than expected losses in the lower Columbia River and estuary (LCRE) downstream of the Federal Columbia River Power System (FCRPS). Using receiver arrays to partition the LCRE during studies from 2007 through 2008 has revealed that the greatest loss of emigrant Chinook salmon smolts occurs in the lower portion (50 km) of the LCRE. Based on previous findings, 2009 efforts focused primarily on the lower 50 km of the LCRE. Yearling Chinook salmon tended to travel the 235 km between Bonneville Dam and the mouth of the river in about 4 days, with later groups traveling faster than fish released earlier. Subyearling Chinook salmon traveled more slowly, making the trip in 4 to 5 days. Both stocks slowed their migration speed considerably upon reaching the 'wide part' of the estuary (around river km (rkm) 50), especially subyearling Chinook salmon. Juvenile Chinook salmon used both main channel and off-channel habitats during their migration through the LCRE. Larger proportions of the subyearling Chinook salmon (36%) were detected in off-channel areas in comparison to their yearling counterparts (29%). Most of the juvenile Chinook salmon pass the Caspian tern and double-crested cormorant colonies relatively near East Sand Island, where the majority of the nesting takes place. The estimates of avian predation account for only a small portion (~10%) of the estimated loss of JSATS-tagged fish in the LCRE. Preliminary estimates for yearling Chinook salmon survival in 2009 showed approximately 90% survival from Bonneville Dam to Harrington Point at rkm 50, with sharp declines to the next two arrays at Astoria Bridge (rkm 22; 84% survival) and East Sand Island (rkm 8; 76% survival). Subyearling Chinook salmon survival was also lowest in the final 50 km of the river in 2008, though they survived at a higher rate than the yearling fish, with an estimated 89% surviving to East Sand Island (rkm 8). Later (after first week in July) migrating subyearling Chinook however, had very low apparent survival in most years (30-45%). During 2008, a short-term test of three JSATS receivers in the Columbia River plume resulted in detections of 72 tagged fish and showed that travel rate decreased three-fold upon ocean entry. Future plans for monitoring behavior and survival of juvenile salmon downstream of the FCRPS call for close integration with assessment of BiOp performance standards for survival at the lower three FCRPS dams and other proposed research in the estuary and plume. The monitoring capability that has been developed around JSATS technology can be applied and extended to assess the success of FCRPS mitigation strategies and other management actions in the LCRE and plume.