Juvenile Salmon Ecology in the Lower Columbia River and Estuary: Tidal Freshwater Research

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A holistic knowledge and understanding of salmon ecology in the Columbia River Basin is fundamental to recovery of salmon stocks. Until recently, information pertaining to the ecology of juvenile salmon in tidal freshwater habitats in the Columbia River had been limited. Our research centers on two fundamental questions: 1) In what types of habitats within the tidal freshwater area of the Columbia River are juvenile salmonids found, when are they present, and under what environmental conditions? 2) What is the ecological contribution of shallow (0–5 m) tidal freshwater habitats to the recovery of ESA-listed salmonids in the Columbia Basin? This research, performed under the auspices of the NW Power and Conservation Council's Fish and Wildlife Program (Project No. 2005-001-00), is a collaborative effort among the Pacific Northwest National Laboratory, the Oregon Department of Fish and Wildlife, the National Marine Fisheries Service, and the University of Washington. The base study area for field research, initiated in 2007, has been the vicinity of the Sandy River delta (Rkm 190-202). In 2009, the study area was expanded to include sample sites in tidal freshwater habitats between Longview, WA and St. Helens, OR (Rkm 109-141). Physical and habitat data are collected concurrently with beach seine data to serve as covariates in a fish/habitat analysis.

Our research to date has resulted in several key findings with regard to habitat use of tidal freshwater habitats by specific genetic salmon stocks, habitat restoration, and implications of interactions between non-native species and juvenile salmon. Juvenile salmon are present in a diversity of shallow tidal freshwater habitats throughout the year. Chinook salmon encountered within our study area included many genetic stock groups; however, the majority of samples included Chinook salmon from the Upper Columbia River summer/fall stock group. Dissolved oxygen and water elevation data indicate restoration in the form of reestablishing connectivity between habitats may increase accessibility to juvenile salmon as well as improving water quality conditions in degraded habitats. In addition, we determined that 46% of the resident fish community within shallow tidal freshwater habitats sampled was comprised of non-native taxa. Results of our diet analysis on Chinook and coho salmon and the putative diets of non-native fishes, coupled with the consistent spatial and temporal overlap in occurrence of non-native species and salmonids suggest inter-specific resource competition between introduced fishes and native salmon may occur at our sites. This research is filling data gaps concerning the distribution of distinct genetic stocks of juvenile salmon, food habits of Chinook and coho salmon, and fish community structure within tidal fresh water habitats in the Lower Columbia River and estuary. As we continue to build our dataset on salmon ecology in tidal freshwater habitats, we are reducing uncertainties associated critical life stages of juvenile salmon, thus contributing to informed management decisions about restoration in the lower Columbia River. Future collaborative research efforts will continue to focus on assessing the early life history characteristics of juvenile salmon in a diversity of shallow tidal freshwater environments, and to link salmon ecology to habitat restoration and recovery of threatened and endangered salmonids in the Columbia River basin.