

Appendix 3

Vogel and Buchanan et al. Presentation Abstracts (2010)

Presentations given at

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Ecosystem Sustainability: Focusing Science on Managing California's Water Future
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A SYNTHESIS OF 22 TELEMETRY STUDIES TO EVALUATE CHINOOK SALMON SMOLT MIGRATION AND MORTALITY IN CALIFORNIA'S SACRAMENTO – SAN JOAQUIN DELTA

David Vogel, Natural Resource Scientists, Inc., dvogel@resourcescientists.com

Detailed information on juvenile Chinook salmon (*Oncorhynchus tshawytscha*) behavior, migratory pathways, and survival in the Sacramento – San Joaquin Delta in relation to complex hydrodynamic conditions and other environmental parameters have been insufficient to implement specific remedial actions (e.g., water project operational changes) to increase numbers. As a result, from 1996 through 2010, Natural Resource Scientists, Inc. conducted 22 separate research projects on juvenile salmon (including four studies of predatory fish) using acoustic or radio telemetry as a means to gain an improved understanding of fish movements and mortality. The study techniques adaptively evolved based on technological breakthroughs and extensive field observations throughout the Delta. Recently, highly detailed assessments of telemetered fish movements included: 1) a near-field environment within the fish transmitter detection range of telemetry receivers; 2) medium-field observations of movements in a fine-time scale between receivers in close proximity; and 3) far-field examinations of movements throughout Delta-wide telemetry arrays. These data were integrated with flow measurements, site-specific characteristics in migration corridors, and knowledge acquired from prior telemetry studies. Detailed data on fish route selection, reach survival, mortality sites, and behavior were acquired. Recent results concluded that numerous detections were actually dead salmon (or the transmitters) inside predatory fish. Research findings indicate that smolt survival assumptions and models must incorporate these new conclusions to avoid misinterpretation of data and improve quantitative estimates of fish survival and movements. To achieve this important goal will require a new approach, perhaps by seeking changes in the telemetry technology to determine predation. However, in the absence of a technological breakthrough, highly detailed data on the behavior of predatory fish movements as compared to juvenile fish movements remain critically necessary. If implemented and analyzed properly, data derived from this technology will continue to be a powerful analytical tool to study fish movements in the Delta.

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SURVIVAL AND ROUTE SELECTION OF JUVENILE CHINOOK SALMON IN THE SOUTHERN SACRAMENTO-SAN JOAQUIN RIVER DELTA, 2009

Rebecca Buchanan, University of Washington, rabuchan@u.washington.edu
John Skalski, University of Washington, skalski@u.washington.edu
Dave Vogel, Natural Resource Scientists Inc., dvogel@resourcescientists.com
Pat Brandes, U.S. Fish and Wildlife Service, Pat_Brandes@fws.gov

Chinook salmon smolts have low survival through the Sacramento-San Joaquin River Delta. Identifying management actions to improve survival requires detailed information on the migration routes salmon take through the Delta, and on reaches with high mortality. To address these questions, in 2009, 933 juvenile hatchery fall/spring Chinook salmon smolts were tagged with HTI micro acoustic tags and released in the San Joaquin River approximately 12 miles upstream of the confluence with Old River, as part of the Vernalis Adaptive Management Program. Tagged smolts were monitored at 18 fixed-site acoustic receivers located throughout the south Delta. Acoustic-tag detections were analyzed with a release-recapture model to estimate route entrainment probabilities at the head of Old River and survival probabilities in key reaches of the San Joaquin and Old rivers. Mortality from the release point to the head of Old River was estimated to be high (0.55, SE = 0.02) in 2009. Approximately half (53%, SE=3%) of the fish that arrived at Old River entered that river. Of those fish, an estimated 11.5% (SE=2.3%) subsequently arrived at the water export facilities, and less than 1% were detected downstream of the facilities. For the smolts remaining in the San Joaquin River, estimated survival was lowest from the Stockton Navy Bridge to Turner Cut (0.10, SE=0.03), but was moderately high through the city of Stockton (0.78, SE = 0.04). Overall, estimated survival through the south Delta was 0.06 (SE=0.01). The low survival may be related to high predation pressure from non-native fishes in key locations in the San Joaquin and Old rivers, possibly intensified by low flow conditions. Our information can be used to inform management on the roles of flow and reach specific survival on the passage of juvenile salmon migrating through the south Delta from the San Joaquin basin.

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