Red Bluff Technical Report Abstract

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We examined plasma cortisol levels and behavioral stress-responses of juvenile chinook salmon (*Oncorhynchus tshawyacha*) passed through the Archimedes lifts and internal helical pump at Red Bluff Research Pumping Plant (RBRPP). If juvenile chinook salmon and other fish are significantly stressed by passage through the pumps at RBRPP, latent mortality may occur. In 1998, plasma cortisol was measured for Archimedes-passed salmon at 0, 1, 3, 6, 12, and 24 h after passage. Concentrations did not differ significantly between treatment and control groups indicating no detectable pump effect. In both groups, plasma cortisol concentrations peaked near 200 ng/mI after 1 h and returned to near-baseline after 12 h. In 1999, the Archimedes lifts and internal helical pump were used to examine salmon cortisol levels at 0, 1, 1.5, 3, 6, and 12 h after passage. Because the interaction between treatments and times was significant for both pump it)pes in 1999, we compared treatments at each time. Relatively small pump effects, less than 50 ng,lml net cortisol increase, were observed for the Archimedes lifts 1.5 and 12 h after passage and for the internal helical pump 3 h after passage. A handling-control comparison demonstrated that much of the observed stress response was due to capture, confinement. and transport of fish prior to insertion into pumps. Four behavioral metrics including swimming activity, use of cover, schooling, and vertical position were directly observed following Archimedes lift passage in 1998. Treatment fish did not differ behaviorally from control or reference fish. In general, these results indicate stress resulting from passage through pumps at RBRPP was unlikely to cause primary mortality and probably did not appreciably increase the chance of secondary mortality.