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Laboratory Design and Testing of an Electrical Crowder for Predator Reduction at the Tracy Fish Collection Facility

Abstract: Fish screening facilities in the south Sacramento-San Joaquin Delta can provide favorable habitat for predator fish, primarily striped bass. At Tracy Fish Collection Facility (TFCF), striped bass reside upstream, downstream, and within the facility, feeding on seasonal influxes of smaller entrained fish. This study investigates the use of electricity as a safe and effective way of deterring large predator fish from taking up residency in the TFCF with little or no impact on smaller fish. After examining potential alternatives involving electricity, a fixed rolling electrical crowder was selected for further development in a hydraulics laboratory. The electric crowder consists of an electrofisher unit that transmits pulsed DC to an electrical sequencer. The sequencer is programmed to transmit current to sets of electrode pairs such that the electrical field rolls in the downstream direction at a specified speed. The crowder moves fish through avoidance rather than taxis, so injury to fish is minimized. Electrode spacing, polarity, and field strength were optimized in the model. Laboratory observations show that most adult striped bass in the size range of 285 to 590 mm swam quickly out of the field. Depending on orientation and proximity to electrodes, some striped bass were drawn to an electrode in taxis. Covers should be installed around electrodes to prevent fish from directly contacting electrodes. The crowder must roll more slowly than channel velocity to allow stunned fish to drift out of the field. Channel velocity did not affect response to the crowder; however, lighting conditions had a significant effect on behavior. Juvenile rainbow trout and Chinook salmon in the size range of 88-108 mm were not greatly affected by the electric crowder.

Statement of Relevance: An electrical crowder has the potential to reduce predator loads at the TFCF. Reducing pre-screen loss of salmonids to 10 percent or less was set forth in the 2009 Biological Opinion for the Central Valley Project. If this method is effective at the TFCF, an electric crowder may be employed at other screening facilities for predator management.