

EPRI-sponsored Laboratory Evaluation of Factors Affecting Larval Fish Return Systems at Cooling Water Intake Structures

Background

Power Facilities needing to reduce entrainment of fish eggs and larvae have limited options. Technologies such as fine-mesh traveling screens that can be deployed in existing intake bays with minimal structural modifications have the greatest potential for wide-scale application.

However, after the collection and transfer component of fine-mesh screens, the surviving eggs and larvae will be subjected to stressors associated with a fish return system back to the source waterbody.



Fish Return System Testing Facility - 2 ft Drop

Much of the available literature on stressors is based on observations of juvenile and adult fish that have interacted with man-made structures (e.g., traveling screens, hydroelectric project spillways, hydroelectric turbines). Stressors include turbulence, shear, abrasion, impact/drop, and velocity. Fish may be exposed to multiple stressors during their exposure to such structures. When injury occurs under complex flow situations, it can be difficult to determine which stressor caused the injury or mortality.

Also, the inherent variability in fish populations, natural conditions (e.g. temperature, storms, debris), and/or anthropogenic factors (e.g. maintenance, unscheduled outages) severely limit the ability to isolate the effects of any component of the fish return system in the field. A laboratory study allows for control of multiple factors.

Therefore, EPRI sponsored a laboratory evaluation to determine the mortality of larvae associated with a fish return system at various drop heights and velocities.



Golden Shiner post-yolk sac

Objectives

The main objective of this study was to construct a fish conveyance system to allow the assessment of stressors associated with transporting larval fish. In particular, the project determined the survival of larval fish exposed to several velocities and drop heights at the outfall of a fish return line.

Preliminary Results

- Survival overall was high but variable by species. The highest survival observed was for channel catfish.
- There was a trend toward decreased survival at higher velocity and higher drop heights.
- In general survival increased as fish developed i.e., bigger fish had higher survival. However, there was a drop in survival for some species during transition from yolk-sac to post yolk-sac.
- Results are encouraging; if survival is high off the fine-mesh screens then fish return systems should not be a factor.

Results are available free to EPRI members; non-EPRI members requesting the report should contact Doug Dixon at: ddixon@epri.com