



## “Fishing for Innovation in the Natural Sciences”

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### *Fish Interactions with Hydrokinetic Turbines: What Have We Learned from Flume Studies?*

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A major concern associated with the installation of hydrokinetic turbines in ocean and tidal habitats is the potential for fish to be injured or killed if they pass through the blade swept area of an operating unit. To address this issue, we evaluated turbine avoidance and entrainment mortality associated with fish exposed to three different hydrokinetic turbine designs in a large laboratory flume. The turbines evaluated included two axial-flow ducted units and a spherical cross-flow design. Testing was conducted at approach velocities of about 1.1 to 2.1 m/s and test species included rainbow trout, smallmouth bass, hybrid striped bass, and white sturgeon. The effects of fish size were examined for rainbow trout exposed to each turbine design and avoidance tests with one of the two axial-flow units included “day” and “night” light conditions. High turbine passage survival rates (typically 98-100%) were observed for all species and size groups tested with the three turbines. Active avoidance of turbine entrainment was noted for trout, hybrid striped bass, and smallmouth bass, whereas white sturgeon appeared to move passively downstream with no apparent attempts to avoid entrainment. The results of these studies have produced valuable data that can be used to assess the potential for hydrokinetic turbine projects to impact fish populations. However, these tests examined fish interactions with a single unit; additional information on the impacts to fish passing through multi-turbine arrays will also be needed and likely can be provided with data from field studies and computer modeling.