THE ADVERSE EFFECTS TO FISHES OF PILE-DRIVING - THE IMPLICATIONS FOR ESA AND EFH CONSULTATIONS IN THE PACIFIC NORTHWEST

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Abstract

Piles are integral components of many overwater and in-water structures, providing support for piers and bridges, functioning as fenders and dolphins to protect other structures, and are used to construct breakwaters and bulkheads. While treated-wood and concrete piles are commonly used for construction of these structures, there is a growing trend toward the use of hollow steel piles. In the Pacific Northwest, several recently-reported fish-kills that occurred during the installation of piles have raised concern among Federal and state agencies charged with protecting aquatic resources. Federal concern centers primarily on implementation of Section 7 of the Endangered Species Act (ESA) and the Essential Fish Habitat (EFH) provisions of the Magnuson-Stevens Fishery Conservation and Management Act.

Injuries to fishes inflicted by pile driving are poorly studied, but include rupture of the swim bladder and internal hemorrhaging. The mechanism of injury appears to be the intense underwater pressure wave generated during some pile-driving activities. The type and intensity of the underwater sounds produced depend on a variety of factors, including, but not limited to, the type and size of the pile, the firmness of the substrate and depth of water into which the pile is being driven, and the type and size of the pile-driving hammer. In general, driving steel piles with an impact hammer appears to generate pressure waves that are more harmful than those generated by impact-driving of concrete or wood piles, or by vibratory-hammer driving of any type of pile. Of the reported fish-kills, all have occurred during impact-driving of steel piles. However, conditions required to produce sound pressure waves that can injure or kill fishes are not presently understood.

Recent reports of fishes killed during pile driving are producing changes in the way that such activities are being viewed by the Washington State Habitat Branch of the National Marine Fisheries Service during ESA and EFH consultations. These changes include requirements for hydro-acoustic monitoring of the sound pressure levels generated during pile driving, and, if maximum thresholds are exceeded, the incorporation of measures to reduce those sound pressure levels. This presentation discusses the approach taken by the Washington State Habitat Branch to address the uncertainties associated with pile driving and the adverse effects this activity may have on ESA-listed salmonids and EFH.

Biographical Sketch: In 1984, John Stadler a received B.S. degree in biology from the University of Oregon. In 1988, he received his M.S. from the School of Fisheries, University of Washington. The title of his thesis was "Feeding Biology of the Northern Clingfish, *Gobiesox maeandricus*: Diet, Morhpology and Behavior." In 1990, John began his doctoral studies in the Department of Marine Biology and Fisheries, at the Rosenstiel School of Marine and Atmospheric Sciences, University of Washington. In 1991, he took a leave of absence from the University of Miami to work for the Interamerican Tropical Tuna Commission, at the Achotines Laboratory in the Republic of Panama. During this period, John directed the larval tuna survey program, and conducted at-sea sampling to investigate the distribution and abundance of larval Eastern Pacific tunas off the Pacific coast of Panama. John returned to the University of Miami in 1994, and received his Ph.D. degree in 2000. The title of his dissertation was "Species Recognition and Sex Discrimination by Males of the Notchtongue Goby, *Bathygobius curacao* (Pisces: Teleostei)". Since then, John has been employed at the Washington Habitat Branch of the National Marine Fisheries Service in Lacey, Washington, where he is the Washington State Coordinator for Essential Fish Habitat.