

Survival, Behavior and Feeding of Juvenile Delta Smelt (*H. transpacificus*) Under Varied Turbidity Conditions

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Abstract: Although scientists recognize that juvenile delta smelt do not need turbid environments to see their food, turbid waters may provide juveniles with more cover from predation and increase success of feeding. This study evaluated whether variable turbidity affected their swimming behavior or influenced the quantity of food the organisms ingested. Delta smelt juveniles aged 140 days post-hatch (8 replicate 7-L aquaria; 6 smelt per replicate) were exposed over 96 hours to three levels of turbidity (3, 6 and 9 NTU) of two different turbidity types: an algal greening agent and potting soil extract. Four replicates were used to assess swimming behavior, and the second set of four replicates was used to assess turbidity effects on feeding ability. Replicates designated for swimming behavior endpoints were placed in swimming chambers for two minutes of video capture, and their distance moved and swimming velocity were analyzed using behavioral software. Replicates designated for the feeding endpoint (number of *Artemia*/gut) were starved for 23 hours, fed *Artemia* nauplii at a density of 0.26 nauplii/ml for 10 minutes, euthanized, and then subjected to gut content enumeration. All fish survived in every treatment. No significant differences were found in swimming behavior or gut contents among all variations of turbidity. Food was completely absent from the gut in 29% of all test regimes regardless of turbidity levels and types, indicating the possible presence of a stressed condition unrelated to turbidity. Small variations in lighting and adjacency to human activity were analyzed as possible explanations for vacant guts. No statistical differences were observed related to positional effects. These findings lead to the conclusion that variation in turbidity in the 3 - 9 NTU range between green and brown sources of turbidity does not seriously affect the survival, swimming behavior or feeding of juvenile delta smelt.

Statement of Relevance: Identifying feeding and swimming responses of delta smelt juveniles to variation in degree and type of turbidity produces practical information regarding the smelt's responses to changes in environmental conditions and informs management decisions.