Public Abstract
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Graduation Term:FS 2017
Department:Natural Resources
Degree:MS
Title:USE OF NON-LETHAL ENDPOINTS TO ESTABLISH WATER QUALITY REQUIREMENTS AND OPTIMA OF THE TOPEKA SHINER (NOTROPIS TOPEKA)

Water quality influences growth, development, and physiology of aquatic vertebrates. Current criteria on water quality assessments are primarily based on lethal level experiments (e.g. LC50 tests), which are poorly suited for assessing optimal water quality conditions or sub-lethal effects of common stressors. Measurements below threshold values may still impede organismal growth and development, especially considering the complex nature of compounding, low-level stressors. This is particularly important to consider for management of an endangered species that is actively cultured for reintroduction to extirpated locations. The endangered Topeka Shiner (Notropis topeka) is an ideal example for which this information is needed, as its remaining, stable populations display broad water quality optima and tolerance to naturally occurring stressors. We investigated the effects of dissolved oxygen, temperature (including acclimation), ammonia, nitrite, and chloride on Topeka Shiner using non-lethal endpoints by: (1) examining N. topeka's behavioral responses to a gradual reduction in oxygen, (2) determining thermal optima at different acclimation temperatures using swimming speed, and (3) determining the onset of effect of sub-lethal levels of nitrogenous compounds and chloride concentrations on swimming speed. We determined ASR50 and ASR90 (i.e. dissolved oxygen concentrations where 50% and 90% of fish use aquatic surface respiration) to occur at 1.65mg/L and 1.08 mg/L of dissolved oxygen, respectively. At 5.52 mg/L of dissolved oxygen, fish vertical position was significantly higher in the water column, presumably in preparation for aquatic surface respiration (ASR). With our thermal swimming tests, the optimum temperature range was determined to be 17.7 to 28.0 °C, while the predicted incipient mortality to high temperature ranged from 33.7 to 40.3 °C, depending on acclimation temperature. Ammonia and sodium chloride significantly reduced swimming speed at concentrations below known LC50 values. Other than an initial drop from 0-concentration, nitrite did not reduce swimming speed, even at concentrations higher than known LC50 measurements. Although not all stressors were suitable to test with this methodology, emphasis on determining optimal conditions over tolerances, and sub-lethal effects over mortality, assists in selection of sites that have water quality suited for N. topeka to thrive after reintroduction.