**Adfluvial adult bull trout (*Salvelinus confluentus*) depth distribution and diel vertical migration across multiple seasons**

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Abstract

For fish at temperate latitudes, lake depths offer a range of environmental conditions that can be accessed to optimize physiological processes such as metabolism and maximize species’ and life-stage specific fitness functions. The depths that fish occupy are ecologically relevant, however, only recently have detailed assessments that monitor individuals over a variety of temporal and spatial scales been possible through the use of biotelemetry. In the current study, acoustic biotelemetry transmitters equipped with pressure sensors were used to provide a detailed ecological assessment of adfluvial bull trout depth distribution and vertical migration relative to several biotic and abiotic variables. The results showed that bull trout depth distribution fluctuated seasonally with a clear pattern in diel vertical movement. Overall, bull trout were deepest during the summer (July, August, September) and shallowest in the spring (April, May, June), especially in April. The reproductive period (September-October) was characterized by moderate depths whereas the period associated with ice cover (January, February and March) showed moderate to deep depths. In addition we found that adfluvial bull trout exhibit diel vertical migration that was prominent in July and August but also existed in other months including January, February, and March (winter). Fish depth was related to the water depth of the reservoir, but not to fish size. Interestingly, males were observed to use shallower depths than females in every month except October (part of the reproductive season). The results of this study provide detailed ecological information on a threatened species, identify how cold-water stenotherms might accesses various depths on a daily and seasonal basis to theoretically maximize fitness, and suggest that seasonal variability in fish depth relative to turbine intakes may be an important consideration when assessing entrainment vulnerability at a dam powerhouse.