Post-release survival and detection frequency of acoustically tagged yellow perch in Lake Erie

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ABSTRACT:

Improved understanding of Lake Erie's yellow perch (*Perca flavescens*) seasonal distributions and movements would benefit the development and communication of sustainable management practices. Before developing a large-scale multi-year telemetry study researchers must determine expected post-release survival of fish implanted with acoustic telemetry tags as well as the average detection rates and quantity/quality of data returned per fish to inform sample sizes necessary to achieve study objectives. We tagged and released 158 yellow perch in Lake Erie's western basin during October-November 2022 with three different tag models (Innovasea V7, V7D, and V9DT) to evaluate detection probabilities, survival, and fate. The existing western basin GLATOS receiver array was bolstered with additional receivers to evaluate three nested array densities (array_3km, array_7km, and array_10km). The receiver arrays were maintained annually, with final detection data collected for this study on August 14, 2024. Although the probability of detecting tag transmissions within an array were low (0.4% to 1.5%), improved detection occurred with higher powered V9DT tags in the high-density array_3km. We evaluated apparent survival at three temporal benchmarks: 30-, 147-, and 270-days post release. Apparent survival varied with array density, tag model, and fish size with the highest apparent survival rates occurring in larger fish (>270 mm) tagged with higher-powered tags (V9DT) in the high-density array (array_3km). For future large-scale, long-term studies we recommend using higher-powered V9 tag models, bolstering arrays to increase receiver density when feasible, and distributing a higher proportion of transmitters to smaller fish. Fate assignments were similar across array densities including a high proportion of tagging related and unknown mortalities. Future studies would benefit from using improved release techniques (e.g., deep release cage), reducing time on vessel, and tagging during cooler water periods (< 12 °C) to reduced tagging related mortalities. In addition, deploying tag models that incorporate sensors (e.g., digestion and/or temperature/pressure) would benefit fate characterization and reduce uncertainties. Finally, harvest related mortalities were likely underestimated; externally tagging all fish accompanied by an advanced outreach effort to inform commercial and recreational stakeholders of the ongoing studies in conjunction with existing high reward tags would improve recapture/reporting rates and fate characterization. Recommendations from this study have been implemented in ongoing acoustic telemetry studies for yellow perch on Lake Erie (2024_DUF_441041) and will aid future projects in large open water systems.