Feasibility of Mark-Recapture and Acoustic Telemetry to Study Behavior and Survival of Late-Stage Parasitic Sea Lamprey

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by:

Christopher M. Holbrook[1], Thomas R. Binder[2], Michael J. Hansen[1]*, Steven J. Cooke[3]

[1]USGS Hammond Bay Biological Station, 11188 Ray Rd., Millersburg, MI 49759

[2]Michigan State University, 11188 Ray Rd., Millersburg, MI 49759

[3]Carleton University, 1125 Colonel By Drive, Ottawa, ON K1S 5B6 Canada

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ABSTRACT:

Accurate inferences from telemetry and data loggers require that tagged fish are a representative sample of the unmarked target population. Therefore, it must be assumed that tagging, tag-related handling, and the presence of a tag in or on a fish will not significantly alter behavior or survival of fish and that tags will be retained throughout the study. Effects of tags and tag-related handling on fish physiology, behavior, and survival have not been published for sea lamprey Petromyzon marinus during their adult life stage. P. marinus have been the focus of conservation and restoration in coastal North America and Europe and population control in the Laurentian Great Lakes, but knowledge of movement ecology and population dynamics during parasitic juvenile and early adult life stages remains inadequate for developing population assessment or control strategies at those life stages. Our primary objective was to establish guidelines for surgical implantation of transmitters into parasitic-stage juvenile and adult P. marinus. Specifically, late-stage juvenile sea lampreys, collected during early winter, were tagged with different size transmitters, transmitter attachment methods, and locations and were held in tanks to assess survival and spring spawning activity. Secondarily, we sought to determine if releasing coded-wire-tagged P. marinus could provide sufficient recaptures for a lake-wide abundance estimator. Results suggested that the largest tags tested (8 mm diameter) were associated with lower survival than smaller (6 and 7 mm diameter), but and that the smallest tags tested (6 mm diameter) did not appear to affect spring migratory activity. However, conclusions were limited by small sample sizes and high mortalities due to poor water quality (apparent gas bubble disease due to gas supersaturation of tank water in two of three years). Replication of this study with larger sample sizes would be needed to more fully satisfy the objectives. Nonetheless, results could inform the design of future studies. Recapture rates of coded-wire-tagged P. marinus released into open waters of Lake Huron during early winter were higher than ever reported for juvenile sea lampreys, which provides some optimism for the efficacy of a lake-wide mark-recapture-based abundance estimator. Future work may be needed to evaluate bias and precision of such an estimator. We also described novel methods (e.g., use of an annular raceway to evaluate effects of tags and tagging on migratory activity; assessment of longitudinal tag movement inside the body cavity) that may be used in future studies of effects of tags and tagging on behavior and survival of other taxa.