Seasonal differences in larval sea lamprey (*Petromyzon marinus*) sensitivity to the pesticide TFM

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ABSTRACT:

Invasive sea lamprey (*Petromyzon marinus*) are controlled in the Great Lakes with 4-nitro-3-(trifluoromethyl) phenol (commonly 3-trifluoromethyl-4-nitrophenol or TFM). The proper concentration of TFM must be applied during treatments to effectively kill larval sea lamprey while minimizing impacts to non-target species. In this study, bioassay tests were conducted in May, July, and September over two years, 2021 and 2022. The bioassay tests were conducted in a portable test trailer at each of six larval sea lamprey infested rivers in Michigan to determine potential seasonal changes in sensitivity of larval sea lamprey to TFM. Larvae ≥ 60 mm were collected from each stream and exposed for 12 h to TFM-treated stream water using two independent continuous-flow diluter systems. A suite of water chemistry and larval physiological properties were collected during the tests and modeled as potential predictors of seasonal changes in the sensitivity of larval sea lamprey to TFM. The observed minimum lethal concentrations to larval sea lamprey were 0–40% lower (May), 8% lower–59% higher (July), and 49–117% higher (September) than the current sea lamprey control program treatment prediction chart. Water temperature, liver glycogen content, and time of year were strongly associated with seasonal differences in TFM sensitivity. Use of these models may result in more accurate predictions of treatment-specific sea lamprey LC99.9s that have the potential to result in reduced impacts to nontarget species as well as limiting the number of lamprey surviving treatments.