REDUCING UNCERTAINTY IN THE SEA LAMPREY OPERATING MODEL WITH LIFE-STAGE SPECIFIC EMPIRICAL EVIDENCE; METHODOLOGICAL APPROACH AND MODEL-BASED EVALUATION

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ABSTRACT:

The operational sex ratio of animal populations is of critical importance in the biology and management of wildlife populations. Sea lamprey (Petromyzon marinus) in the Laurentian Great Lakes have been subject to a concerted effort over 60 years to suppress their population size, and there has been an apparent response to this change in abundance in the form of a shift in sex ratios from male-bias pre-control, to female-bias post-control. The reason for this observed shift could stem either from 1) assessment bias whereby collection gear selects for one sex over the other, or 2) a biological response to compensate for decreased population size. In this study we sampled sea lamprey through ontogeny across 10 tributaries of Lake Michigan to empirically determine their sex ratio during the larval, juvenile, and adult life stages. We then used these data in a stochastic age-structured population model to forecast the effect of adult sex ratios on control tactics, and attempt to reconcile larval and adult sex ratios to better understand sea lamprey biology. We found that the sex ratio of sea lamprey in Lake Michigan appears, generally, to be female-biased. We found no support for the hypothesis that female larvae initiate metamorphosis within larger size classes, or that females experience greater rates of mortality during or following metamorphosis. Rather, we conclude that female larvae are more common during the larval stage owing to environmental sex determining mechanism, stemming from reduced densities or high productivity streams. We found support for the hypothesis that adult male sea lamprey are more likely to be captured by assessment traps. Although traps appeared biased toward the collection of males, females are the more abundant sex in the adult population. This could suggest that we are currently underestimating the reproductive potential of the species, reducing our certainty in stock-recruitment relationships and the effectiveness of control tactics. Our

data suggest that the adult population would respond strongly to increased exploitation of adult females via trapping, indicating future research could focus on sex-specific behavioral differences during the upstream migration. Lastly, we found no evidence adult females are more likely to be misclassified during the spawning migration.