GREAT LAKES FISHERY COMMISSION

2008 Completion Report[1]

EVALUATION OF AN ALTERNATIVE MODEL OF STREAM SELECTION FOR LAMPRICIDE TREATMENT

by:

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APPENDIX 1:

(to be submitted to Journal of Great Lakes Research, August 2008)

Variation in larval sea lamprey demographics among Great Lakes tributaries: A mixed-effects model analysis of historical survey data

by

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Running Title:

Larval sea lamprey demographics

ABSTRACT:

Sea lamprey control relies on judicious selection of streams for treatment with lampricides. Not all sea lamprey producing streams need to be treated annually, so to save costs the Great Lakes Fishery Commission relies on a larval assessment program to rank streams for treatment. The assessment program provides stream-specific information on the abundance of larval sea lampreys that are likely to become parasitic juveniles within the next year. However, the assessment program is expensive, accounting for up to one-third of lampricide program costs, and resources used for assessment subtract from those available to treat streams. In this project we sought to evaluate alternative strategies for selecting streams for treatment. First, we analyzed historical survey data collected between 1959 and 2005 to look for patterns of sea lamprey recruitment or growth dynamics that might explain differences in the frequency or regularity with which streams require treatment. We found that streams that have been regularly treated experienced significantly higher recruitment than less regularly treated streams, but showed no consistent differences in larval growth rates. Second, we developed a rapid survey method for larval assessment and, in cooperation with sea lamprey program staff, conducted both conventional and rapid assessment methods on all surveyed streams for three years (2005-2007). We compared stream rankings using the two methods and then conducted mark-recapture assessments at the time of treatment to quantity the population of sea lampreys in streams that would have been treated based on rapid assessment but not conventional assessment, or vice-versa. We found that if the resources saved by using rapid assessment methods, which required approximately one-third of the labor of conventional assessment, were used to treat additional streams, the rapid assessment strategy would result in greater control than the conventional assessment strategy. The results of this work have led to a change in the larval assessment procedures for the Great Lakes Fishery Commission, which has now adopted the rapid assessment method as their primary tool for ranking streams.

PRESS RELEASE:

Sometimes more is not better. Fishery managers rely on scientific information to make decisions, but information comes at a cost. When dollars spent on information reduce dollars available for action, managers are faced with a tough choice – how much of my precious resources should I spend on gathering information? A recent evaluation of the larval assessment methods used to inform sea lamprey managers about where to deploy stream treatments to kill sea lampreys before they become parasites has led to the conclusion that less might be better. Researchers compared two survey methods for assessing sea lamprey populations in streams. One method provides more precise information, but is nearly three times as expensive as the other. Using the more precise method reduces the chances of choosing the wrong streams to treat, but fewer resources are left over after paying for the assessment, so fewer streams get treated. It turns out that spending less on the more rapid, less expensive method, while most likely leading to a greater chance of making errors in stream selection, appears to result in a more effective program. The greater success comes because managers can hedge their bets. Treating more streams based on less certain assessments results in more sea lamprey being killed than treating fewer streams from based on more certain assessments. The Great Lakes Fishery Commission has decided to adopt the rapid assessment method and hopes to see improvements in sea lamprey control resulting from this new allocation of resources between assessment and treatment.

SUMMARY STATEMENT:

Objectives

1. Develop an alternative procedure for ranking streams for treatment based on historical information and minimal contemporary assessment information;
2. Select streams for lampricide treatment using the alternative method, as well as the traditional (QAS-based) method;
3. Using mark-recapture methods applied to treated streams, compare the population of larval and juvenile lamprey targeted by the two methods;
4. Compare costs (assessment costs) and benefits (population targeted) of the two methods.

All four objectives for the project were met. We used historical analysis and consultation with sea lamprey program staff to develop an alternative procedure for stream ranking, known during the project as the "Rapid Assessment" method. The historical analysis is documented in a manuscript to be submitted to the Journal of Great Lakes Research, attached as Appendix 1. The rapid assessment method was employed in parallel with conventional quantitative assessment in 2005-2007, and used to rank streams for treatment in 2006-2008. Mark-recapture methods were used to assess sea lamprey populations in a subset of the streams that would have been selected for treatment based on one assessment method but not the other, in 2006 and 2007. After presentations to and consultation with the Great Lakes Fishery Commission, we elected not to conduct mark-recapture studies in 2008 because no streams were ranked for treatment using the conventional methods that would not have been ranked using rapid assessment, implying that a mark-recapture study was unnecessary to compare the effectiveness of the two assessment methods. The results of our comparison of the two methods of assessment are described in a manuscript that has been accepted for publication in the Canadian Journal of Fisheries and Aquatic Sciences, attached as Appendix 2.

Although not part of the objectives for this project, the research in this study also motivated an essay on the importance of valuing information in fishery management and explicitly considering the trade-off between using resources to acquire more information versus using those same resources for other resource management purposes. This essay will be published in the July 2008 issue of Fisheries magazine and is attached as Appendix 3.