GREAT LAKES FISHERY COMMISSION

Project Completion Report[1]

Estimation of Sea Lamprey Predation on Lake Trout in U.S. and Canadian Waters of Lake Huron

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RESEARCH COMPLETION REPORT

ESTIMATION OF SEA LAMPREY PREDATION ON LAKE TROUT IN U.S. AND CANADIAN WATERS OF LAKE HURON

Final Report

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Lake Trout Cohort-Population Models for the Main Basin of Lake Huron
Version 96-03

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INTRODUCTION

The lake trout cohort-population model (LTCPM) is an age-structured, deterministic, spreadsheet-based model that incorporates information on sea lamprey wounding rates, fishery data, and estimates of natural mortality to compute annual abundance at age. The LTCPM is a derivative of prior modeling work on lake trout in Lake Superior (Wisconsin/State Tribal Technical Committee 1984; Ebener et al. 1989) and in northern Lake Huron (Technical Fisheries Review Committee 1992). In this project, this model was developed for the main basin of Lake Huron where no significant natural recruitment currently occurs, therefore no stock-recruitment functions or information on wild fish has been incorporated in the current version (96-03). However, the model can be modified to account for these factors and re-calibrated. For further details on the model, see Sitar et al. (1996).

METHODS

File format for model

The LTCPM was developed in the Microsoft (MS) Excel (version 5) for Windows platform. The central (LTCENT.XLS) and northern Lake Huron (LTNORTH.XLS) models are compressed with WinZIP as LTCENT.ZIP and LTNORTH.ZIP. The southern Lake Huron file (LTSOUTH.XLS) was small enough to be on the disk without being compressed. Each model has multiple sheets integrated into one MS Excel file. Table 1 describes each of the sheets in the file. Named ranges of important model areas are available in the named range tool bar located just above cell A1 on the spreadsheets.

Table 1. Descriptions for spreadsheets in the lake trout cohort population model.

Sheet Name	Description
Index	Index and color code for model, instructions for model use, important notes
Projections	User input of constraints for model projections, has output of total instantaneous mortality (Z), has instructions on running projection simulations
Stocking	Contains stocking data
Population	Contains population parameters, model estimates of age- and year-specific abundance, biomass, numbers killed by natural mortality, number of mature females
Fishing	Contains fishery related parameters and data, includes age- and year-specific estimates of fishing mortality, harvest in numbers and biomass, observed effort and harvest
Lamprey	Contains sea lamprey related parameters and data, includes age- and year-specific estimates of sea lamprey induced mortality, numbers and biomass killed by lampreys, observed wounding data, age-length keys for lake trout, conversion matrix from length- to age-specific mortality rates
Graphdata	Data for charts and graphs
C-Abund.	Graph of lake trout abundance
C-deaths	Graph of lake trout deaths according to source
C-mort.	Graph of average mortality rates for ages 3-10 lake trout according to source

Running model projections

Model projections were structured to run under a Total Allowable Catch (TAC) scenario, where fishing mortality is the remainder of total mortality minus sea lamprey-induced minus natural mortality. If the remainder is negative or zero, then allowable fishing mortality is equal to zero. To run model projections, the user must define the following for the projection period: target total mortality rate (A), stocking rate (as number of yearlings/1000), and desired level of sea lamprey-induced mortality (as percent of the average of current (1991-1993) rates). In the case of the northern Lake Huron model, immigrants from central Lake Huron must also be entered (as number of yearlings/1000). Projections assume that natural mortality rates are constant and there is no natural recruitment.

Once the user defined inputs have been entered, the "Solver" must be run to estimate fishing mortality rates for the projection period. The "Solver" is under the "Tools" menu. The constraints and defined optimization values should be set. The user then should click on "Solve." After the optimization routine, the model will then be calibrated according to the specified constraints discussed above. This routine must be run each time any of the above user defined constraints are changed.

REFERENCES

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