

STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-80-R-6

Study No.: 230701

Title: Decision-support tools for managing fisheries of inland lakes

Period Covered: October 1, 2004 to September 30, 2005

Study Objective: To prepare reviews of the characteristics of Michigan's inland lakes and of fisheries management of selected species in inland lakes, and to develop decision-support tools to help manage fisheries on inland lakes. One critical set of tools to be developed is methods for allocating fish among multiple fisheries that occur in the same lake, given a safe harvest level. Another objective of this study is to develop tools that help fisheries managers compare the status and potential of specific lakes and fisheries.

Summary: According to the amended study schedule, Jobs 1, 2, 4 and 5 were active this year. Under Job 1, data from 4,194 temperature and dissolved oxygen profiles in lakes have been entered into database tables and this information is being summarized. Under Job 2, additional information has been compiled on the biology and management of centrarchid fishes in Michigan. Several activities occurred under Job 4 in the development of decision-support tools. Work continued on editing and linking database tables and geographic information system (GIS) files that will be used to build decision-support tools for natural resource managers. Collaborations continued with university faculty and graduate students to analyze statewide patterns of fish growth rate. A manuscript was prepared and submitted on models for fish proximate composition and energy density. Work continues on development of a bioenergetics-based model for fish growth to explain and predict growth in fish length and condition as well as fish weight. Work is underway on a model for fish population dynamics incorporating life history information, in order to better understand factors influencing age at maturity and timing of juvenile transitions between habitats. Job 5 is to prepare this progress report.

Findings: Jobs 1, 2, 4, and 5 were scheduled for 2004-05, and progress is reported below.

Job 1. Title: Review characteristics of Michigan's inland lakes.—Additional information on inland lakes has been entered into electronic form from Limnology cards in the lake files at the Institute for Fisheries Research. In this reporting period the remaining temperature and dissolved oxygen profiles were entered into Excel and converted into Access database tables. These 4,194 profiles have an average of 9 temperature records for each profile (a total of 36,398 measurement records). Work is continuing to assign unique lake codes to these profiles so that other lake characteristics (such as geographic location, area, and volume) can be linked to these profiles for further analysis and so that summaries can be prepared. Information on temperature and dissolved oxygen is important for classifying lakes and for making decisions about fish stocking and other management actions.

Job 2. Title: Review Michigan's fisheries management of selected species.—Additional information has been compiled on the biology and management of centrarchid fishes in Michigan. A helpful reference recently became available on the identification and geographic distribution of all species of fishes in Michigan (Bailey et al. 2004), including our twelve species of centrarchids. Another document, prepared by a Fisheries Division committee of which I was a

member, contains a summary and review of the ecology and management of smallmouth bass and largemouth bass in Michigan (SALBRC 2004).

Job 4. Title: Develop additional decision-support tools.—Development continued on several database tables and geographic information system (GIS) files that will be used to build decision-support tools for natural resource managers.

Collaborations are continuing with faculty and graduate students at Michigan State University to analyze and explain patterns in fish growth rate across the state. A major goal is to develop predictive models that can help fisheries managers generate an expected growth rate for a particular lake against which to compare observed growth rate. Graduate students are preparing manuscripts and talks for scientific meetings to present initial results.

An analysis was done on the changes in Michigan's fishing license sales over the last 25 years, in order to provide background information for planning for license sales in the future. Total numbers of Michigan fishing licenses sold have declined almost every year since 1987. Detailed information on license sales is available since 1995, the first full year of Michigan's electronic retail sales system. Over the last 10 years there has been a small but steady decline in the proportion of young adults (but not older adults) that purchase a fishing license.

A manuscript has been prepared and submitted describing new models for proximate body composition and energy density in fishes. These models should help in developing bioenergetics models with a more realistic treatment of starvation conditions as well as allocation of new biomass to growth in condition and length. One purpose of such bioenergetics models is to give fish biologists a tool for interpreting differences in fish body condition between lakes or over time. New lab data (collected under Study 669) and data from the published literature are providing a basis for evaluating and extending the approach described by Breck (1998).

Work is underway on a model for fish population dynamics incorporating life history information. The model should help us gain insight into how differences in growth and survival among populations could influence the optimal size and age at maturity and the optimal size and age for juveniles to change habitats. The goal is to improve management decisions on stocking and fishing regulations.

Job 5. Title: Write progress report.—This progress report has been prepared.

Literature Cited:

Bailey, R. M., W. C. Latta, and G. R. Smith. 2004. An atlas of Michigan fishes with keys and illustrations for their identification. University of Michigan, Museum of Zoology, Miscellaneous Publications No. 192, Ann Arbor.

Breck, J. E. 1998. Development of a warmwater fish community model. Michigan Department of Natural Resources, Fisheries Research Report 2033, Ann Arbor.

SALBRC (Smallmouth and Largemouth Bass Regulations Committee). 2004. Black bass fishing seasons in Michigan: background, research review, and recommendations. Michigan Department of Natural Resources, Fisheries Division. Available: <http://www.michigandnr.com/PUBLICATIONS/PDFS/Fishing/BassRegulations.pdf> (September 2005).

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