

STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-80-R-8

Study No.: 230550

Title: Energetics approach to predicting growth, maturation, and fecundity of largemouth bass, bluegill, and walleye

Period Covered: October 1, 2006 to September 30, 2007

Study Objective (Summary): The overall objective of this study is to enhance our ability to evaluate fish population responses to alternative management actions, including alternative fishing regulations. The general objectives are to conduct laboratory and pond experiments to better understand the strongly density-dependent processes of growth and reproduction, and use the resulting information to improve the ability of simulation models to predict fish population responses.

Summary: Job 1 was to conduct a lab experiment on growth in length and weight, but it was not possible to complete a lab experiment this reporting period due to other assignments, inability to replace the technician who moved to another state, and inability to hire summer workers due to budget constraints. Under Job 2, a pond experiment was begun in collaboration with a graduate student to evaluate the maturation and fecundity of walleye given different amounts of forage fish. Under Job 3, ponds were drained and juvenile largemouth bass were stocked in order to prepare for a future pond experiment. Work was begun on an energetics-based population model of largemouth bass (Job 4). This model will be used to help evaluate the fish population response to alternative fishing regulations. Job 7 is to prepare this progress report.

Findings: Jobs 1, 2, 3, 4, and 7 were active during this reporting year, and progress is reported below.

Job 1. Title: Lab experiment on growth in length and weight.—It was not possible to complete the planned lab experiment on growth in length and weight during this reporting period. Due to budget constraints it was not possible to replace our technician (who moved away) and not possible to hire summer workers to help with this experiment. Because of other assignments I could not conduct the experiment by myself. A lab experiment will be attempted during the next reporting period.

Job 2. Title: Pond experiment on maturation and fecundity of walleye.—In May 2007, four ponds at the Saline Fisheries Research Station were stocked with juvenile walleye. Two ponds were stocked with a low ration of minnows, and two were stocked with a high ration of minnows. The objective is to produce groups of walleye of the same age with different body size. The ponds will be drained in spring 2008 to determine how body size affects the probability of maturation and fecundity of female walleye under these conditions. This experiment is being conducted in collaboration with a doctoral student at the University of Michigan.

Job 3. Title: Prepare for pond experiment with largemouth bass.—Several ponds were drained at the Saline Fisheries Research Station, and yearling bass were stocked into a separate pond. These bass will be used in a pond experiment during the next reporting period.

Job 4. Title: Develop and apply energetics-based population model.—I began development and application of an energetics-based population model. In this reporting period, work began on

modifying the preliminary model developed in an earlier study (Breck 1993, 1998). This model is an individual-based model with a bioenergetics approach to growth and body composition. A recently accepted manuscript (Breck, in press) describes a novel and more mechanistic approach to modeling body composition and energy density in fishes. This new approach is being implemented in the individual-based model and should provide a more realistic treatment of energy density, especially during starvation conditions, and allocation of new biomass to growth in condition and length.

During the summer of 2007, I mentored a recent graduate of the Masters program in the School of Natural Resources and Environment at the University of Michigan. The goal of this internship was to begin work on a model of black bass to help in evaluating the recent change in black bass regulations in Michigan that permits a catch-and-immediate-release season in the spring preceding the harvest season. Although the student was not able to complete the analysis, good progress was made on development of the model.

Job 7. Title: Write annual performance report.—This annual performance report has been prepared.

Literature Cited

- Breck, J. E. 1993. Hurry up and wait: growth of young bluegills in ponds and simulations with an individual-based model. *Transactions of the American Fisheries Society* 122:467–480.
- Breck, J. E. 1998. Development of a warmwater fish community model. Michigan Department of Natural Resources, Fisheries Research Report 2033, Ann Arbor.
- Breck, J. E. In press. Enhancing bioenergetics models to account for dynamic changes in fish body composition and energy density. *Transactions of the American Fisheries Society*.

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Date: September 30, 2007