

STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-80-R-5

Study No.: 230669

Title: Prey selection and predation rate of piscivorous fish

Period Covered: October 1, 2003 to September 30, 2004

Study Objective: To estimate survival of juvenile bluegills in ponds as a function of bluegill size and density, and predator size and density; and to concurrently measure predator survival and growth.

Summary: Jobs 1, 3, 5, and 6 were active this year. A new Job 8 was added in the amendment for 2004-05, and activity on this job was begun this reporting period. Under the new Job 8, a lab experiment was conducted in summer 2004 to evaluate growth in length and weight in relation to body condition and feeding level, and analysis of the experiment is beginning. Four ponds were drained (Job 3) to prepare for an experiment (Job 5) using adult walleye, which will begin in late fall 2004. Adult fish were not available until later in the fall than originally proposed, so stocking of these fish (Job 1) must be delayed until October 2004. Other largemouth bass and bluegill were stocked and are being held in ponds for future experiments. Job 6 is to prepare this progress report.

Findings: Jobs 1, 3, 5, 6, and 8 were scheduled for 2003-04, and progress is reported below.

Job 1. Title: Stock ponds.—Plans are in place to stock four ponds in late fall 2004 for a pond experiment to evaluate walleye fecundity in relation to forage availability the previous fall. Adult walleye were not available in September as originally planned, so the experiment will begin in October 2004. The four ponds have been drained to remove previous fish and are ready to be stocked. This experiment is described under Job 5.

Several other ponds were drained and fish were removed. Juvenile largemouth bass were stocked into a separate pond so they would be available for experiments next year.

We continue to hold reproducing populations of largemouth bass and bluegill at the Saline Fisheries Research Station. Predators and prey will be available for experiments in summer 2005. With the additional reproduction that will take place next spring, there should be adequate numbers of fish for conducting experiments during the 2005 growing season.

Job 3. Title: Drain ponds.—Juvenile largemouth bass were reared in Pond 2 and removed from this pond at draining on April 22, 2004. A subset of these fish was used for the predator-growth experiment described in Job 8.

On September 24 and 27, 2004, four ponds (Ponds 7, 8, 16, & 17) were drained and the fish were removed to prepare for a pond experiment which will begin in late fall 2004. Adult walleye will be stocked (Job 1) and a pond experiment will be conducted (Job 5).

Job 5. Title: Conduct strong test of predation model.—A pond experiment will be conducted under Job 5 in fall 2004 to measure the growth and potential reproduction of predators provided food at two levels. Working with Dr. Ed Rutherford (University of Michigan, School of Natural

Resources and Environment and Institute for Fisheries Research), the plan is to stock 20 adult walleye per pond into 4 ponds (2 ponds per feeding level) starting in October 2004, when Saline pond temperatures have cooled to a range conducive to good walleye growth. We plan to add 1.7 kg of fathead minnows as forage fish every two weeks to 2 ponds, and not add forage fish to the other 2 ponds. We have established a population of fathead minnows in Pond 13 for such a use. In January we plan to sample three female fish per pond by hook and line to measure length, weight, condition, and gonad development. Shortly after ice-out in the spring we will terminate the experiment by draining the ponds and measuring length, weight, condition, and gonad development of the remaining fish. We will compare observed growth and condition with predictions from a model of fish growth. In addition to providing a test of the growth model, this experiment will provide information about the potential effect on walleye fecundity of forage levels the previous fall.

Job 6. Title: Prepare annual progress report.—This annual progress report was prepared.

Job 8. Title: Conduct lab experiment on predator growth.—A lab experiment was conducted in summer 2004 to measure the amount of growth in length and weight for largemouth bass that differ in condition when fed different ration sizes. The experiment used a 3x3 cross-classified design, involving fish in three levels of body condition fed at three ration levels for 7 weeks. In the pre-treatment phase of the experiment, three levels of body condition were established by feeding fish at three different ration levels. In the second phase of the experiment there were three replicate fish at each of the nine treatment combinations for a total of 27 fish. Length (nearest mm) and weight (nearest 0.1 g) were measured weekly. Water temperature was measured daily in two aquaria on opposite sides of the lab. During the second phase of the experiment, wet weight (nearest 0.01 g) of minnows added to each tank was measured daily, as well as the wet weight of any unconsumed minnows from the previous day. During one week, feces were collected daily from each tank, dried 24 h at 55°C, and measured to the nearest 0.01 g. On several occasions throughout the experiment, a subsample of minnows was measured for length, wet and dry weight (dried 24 h at 55°C).

To set up the experiment, a total of 377 juvenile largemouth bass were obtained from Pond 2 on April 22, 2004; all but 25 were in the range 160-210 mm. From these, 36 fish in the range 187-191 mm were selected and held in the lab in individual aquaria. Fish were randomly assigned to one of three feeding levels to produce 12 fish per feeding level. Fish were acclimated to the lab for 5 d and feeding was started on fathead minnows. Then for a 37-d pre-treatment period, fish were fed high, medium, or low daily rations of fathead minnows in order to produce 12 fish in each of three levels of condition for the start of the experiment. There was no mortality during acclimation or the subsequent experiment; one fish had to be replaced after 8 days in the lab due to fungus growth. At the end of the initial period, average relative weight (mean \pm 1 SE) for the three feeding groups was as follows: high ration: 99.2 \pm 1.2%; medium ration: 95.8 \pm 0.7%; low ration: 87.4 \pm 0.7% (N = 12 per group).

The second phase of the experiment began on June 4, 2004. At this time 9 randomly selected fish (3 fish per condition level) were sacrificed, measured for length, weight, and gonad weight, and frozen for subsequent determination of dry weight. The remaining 27 fish were randomly reassigned to produce 3 fish from each condition level at each of the three feeding levels. During the treatment period, fish were measured weekly to determine growth in length and weight and consequent change in condition. After 42 d, all fish were sacrificed and measured for length, weight, and gonad weight, and frozen for subsequent determination of dry weight. At the end of the experiment, average relative weight for the three feeding groups was as follows: high ration: 101.5 \pm 1.6%; medium ration: 96.1 \pm 0.8%; low ration: 87.2 \pm 1.1% (N = 9 per group).

Analysis of this experiment is underway. Modifications will be proposed to models of fish growth to explain the observed results and allow prediction of ration- and condition-dependent growth in both length and weight.

Prepared by: James E. Breck
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