

**Project Title: Intensification of First Year Largemouth Bass (*Micropterus Salmoides*)  
Using Alternative Pond-Based Production Systems [Termination Report]**

**Total Funds Committed:** \$328,367

**Initial Project Schedule:** September 1, 2021-August 30, 2022 [Extended to August 31, 2023]

**Current Project Year:** September 1, 2022-August 31, 2023

Participants: James Garvey (Southern Illinois University-Carbondale); Robert Rode  
(Purdue University); Paul Brown (Purdue University)

**Extension Liaison:** Paul Hitchens (Southern Illinois University-Carbondale)

**Industry Liaison:** Stacey Sisk, Big House Fish Farm

**Project Objectives**

*Objective #1-* To evaluate two alternative pond-based production systems (split ponds and pond-side tank culture) in the Midwest on largemouth bass, *Micropterus salmoides*, quantified production parameters.

*Objective #2-* To investigate and compare changes in water quality and the aquatic food web in the pond-based production systems.

*Objective #3-* To investigate the effect of the two-alternative pond-based production methods (split ponds and pond-side tank culture) on LMB response to stress.

*Objective #4-* To conduct an on-farm extension demonstration of the pond-side tank culture system.

*Objective #5-* To immediately disseminate results to industry via final termination report, NCRAC Extension fact sheet, on-farm and university-based workshops, videos, and other information technology transfer strategies.

**Project Summary**

Largemouth bass (*Micropterus salmoides*; LMB) are one of the most popular sportfish in the United States. They are also one of the most popular table fares, especially in live Asian markets. The majority of LMB food fish producers in the Midwest purchase fingerlings from southern states, typically 10 – 13 cm total length (4 – 5 in), in early spring of their second year. These fish are then stocked into grow-out ponds until they reach market size 0.68 kg (1.50 lb). Sometimes it is necessary to purchase smaller feed-habituated LMB in year one, and they are held in nursery ponds and later split to lower densities for grow-out. Whether cultured to a fingerling size for stock enhancement or cultured to the food market size, cannibalism in low-density production ponds is a major problem for producers; especially during the early growth stage. The PIs propose investigating intensified alternative production systems for LMB, which could allow for reduced cannibalism, lowered feed conversion ratios, improved opportunity for sheltering from piscivorous birds, and increased yields. Replicated systems will be evaluated for their applicability for largemouth bass producers in the Midwest. Information will be relayed to producers through field days, printed materials, presentations, among other avenues.

## **Anticipated Benefits**

This project will provide us with data that we can use to compare production practices between traditional culture ponds, pond-side tank culture systems, and split-ponds for largemouth bass in research ponds at Purdue University and SIU-Carbondale. Largemouth bass farmers in the Midwest will have the opportunity to visit the research sites and the on-farm demonstration to learn about whether or not these production systems may be worth adopting on their farms. These systems could provide an opportunity for largemouth bass farmers to purchase smaller fingerlings from hatcheries. Additionally, farmers of other species can have the opportunity to learn about other potential production practices.

## **Project Progress**

The initial phase of the project completed in fall 2023 showed that split pond facilities increase the survival and yield of fingerling largemouth bass in intensive outdoor culture, generating 53% more total biomass than in traditional open ponds. Technical issues with side-pond culture and water quality monitoring will be addressed in a second experiment to be completed in 2024.

### Objective 1

At Purdue, three pond-side tanks (3-m diameter each) were stocked with 2,500 age-0 largemouth bass on July 14, 2023. Three earthen ponds at Purdue were stocked with 1,500 age-0 largemouth bass each at the same time (density of 6,000/acre or 14,820/ha). The Purdue growth experiment ended October 15, 2023. At SIU Carbondale, three split ponds and three full ponds were stocked with age-0 largemouth bass at the same time on July 7, 2023 at the same stocking density as those systems at Purdue. Three 1.5-m pond-side tanks were stocked as well. All systems at SIU received 600 fish. A power outage caused a complete loss of fish within the pond-side tanks, and they were restarted with age-0 largemouth bass on August 8, 2023. All tanks and ponds at SIU were ended on September 12, 2023. A subsample of age-0 largemouth bass from each pond and tank at SIU were kept for analysis of condition and physiological evidence of stress. Lengths and masses of a subset of surviving fish were quantified at Purdue and SIU. Survivors were counted. Survival was equivalent between tanks (61%) and ponds (57%) at Purdue. At SIU, mean survival was 92% in tanks, 66% in split ponds, and 47% in regular ponds. Average mass of survivors in the tanks was 46 g and 54 g in tanks and ponds, respectively at Purdue. At SIU, final average mass was 29 g in pond-side tanks, 44 g in split ponds, and 41 g in regular ponds. High survival and growth in pond-side tanks at Purdue and SIU resulted in high total yield fingerling bass. However, both loss of oxygen and disease in tanks were issues, especially at SIU where a prolonged power outage killed the initial group of fish. Low survival of age-0 largemouth bass in the full ponds at SIU was likely due to cannibalism. High growth and survival of fish in the split ponds at SIU led to the highest total yield of age-0 largemouth bass in fall. Low cannibalism in the split ponds plus high water quality contributed to this high yield. These data are being analyzed and will be used to guide a second full experiment with higher densities of age-0 largemouth bass in spring 2024.

### Objective 2

Temperature, dissolved oxygen, pH, and nitrate were quantified in the SIU systems during July through September 2023. These data will be analyzed and summarized in the report associated with the extension of this project.

### Objective 3

Samples of largemouth bass are currently being processed for metrics of stress and will be analyzed in the report associated with the extension of this project.

#### Objective 4

The system at Purdue University was demonstrated to members of the aquaculture industry on October 7, 2023. The preliminary results of the SIU-Carbondale split-pond and pond-side tank experiments were presented to members of the Indiana Aquaculture Association and other professionals. The PIs answered questions and received feedback that will be incorporated into the second experiment in 2024. Participants toured the Purdue aquaculture facility including the pond-side tank facility containing experimental largemouth bass.

#### Objective 5

To immediately disseminate results to industry via final termination report, NCRAC Extension fact sheet, on-farm and university-based workshops, videos, and other information technology transfer strategies. This will be accomplished as part of the extension of this project to be completed in 2024.

#### **Outreach Overview**

Outreach work was conducted in early October 2023 where SIU-Carbondale presented preliminary results of split-pond and pond-side tank experiments to members of the aquaculture industry at Purdue University. Industry members toured the pond-side and full pond age-0 largemouth bass culture experiment at Purdue.

#### **Target Audiences**

Farmers are the intended audience as we seek to learn more about the production feasibility of pond side tank culture and split-ponds using smaller feed habituated largemouth bass.

#### **Outputs/Impacts**

Workshop at Purdue University was held in October 2023.

#### **Impact Summary**

*Relevance.* — Benefit to the industry is to raise age-0 largemouth bass fry to fingerling size at maximum production.

*Response.* — Pond-side tanks and split ponds showed that age-0 largemouth bass raised in intensive culture produce more biomass than in whole ponds.

*Results.* — The research demonstrates that investment in pond-side tanks and/or split ponds may substantially increase production of age-0 fingerlings at a cost savings to producers.

*Recap.* — Preliminary results from a pilot pond-side and split-pond system at two universities demonstrate benefits to intensive culture of age-0 largemouth bass fingerlings.

#### **Recommended Follow-Up Activities**

This project is being continued on a new grant. Because of unavoidable delays, this project is being continued through an extension, where data from the 2023 experiment will be combined with another experiment at SIU Carbondale and Purdue University. This extension will apply lessons learned from the initial study plus industry feedback to further explore the benefits of raising age-0 largemouth bass in intensive production.

#### **Publications, Manuscripts, Workshops, and Conferences**

See the Appendix for a cumulative output for all NCRAC-Funded Other activities.