Department of Agriculture, Trade and Consumer Protection
Division of Marketing
Agricultural Development & Diversification Program (ADD)

1999 Grant Project Final Report

Contract Number: 14024

Grant Title

Overwintering Pond-Reared Yellow Perch Fingerlings Indoors to Enhance Growth and Productivity

Project Beginning Date: Sept. 1999 **Project End Date: Nov. 2000**

Amount of Funding Awarded: $3,914

Name of Principle Contact Person: Terence P. Barry

E-Mail: tpbarry@chorus.net

Submitted by: Terence P. Barry

Date: October 3, 2000

INTENT OF THE GRANT PROJECT

This project was designed to solve a key problem constraining the expansion of the yellow perch aquaculture industry--the high cost of feed-trained fingerlings. The project was designed to benefit perch fingerling producers by helping them to produce more fish, and perch growout producers (both pond-based and recirculation producers) by making more fingerlings available at a reduced cost.

In large quantities (e.g., >10,000 fish) yellow perch fingerlings sell for approximately $0.075 per inch. Most perch producers using recirculation systems greatly favor buying 3" fish, at a cost of $0.21-0.24 per fish. Because yellow perch are marketed at a small size compared to most other cultured fishes (3-5 fish/lb), fingerling costs represent an extremely high percentage of total production costs--as high as 35-50%. Clearly, improved methods are needed to enhance the production efficiency of fingerling producers and reduce high fingerling costs.

Currently, the most economical way to produce feed-trained yellow perch fingerlings is in ponds. This approach involves stocking larvae into fertilized production ponds, where they feed on natural food until they reach approximately 0.5 to 0.75 inches in length, at which time formulated starter food is broadcast onto the ponds using automatic feeders. At present, approximately 50,000 fish/acre are typically produced using this method, ranging from 2.5 to 6 inches in length. When these pond-reared fish are transferred to indoor tanks, over 90% are trained to formulated feed as evidenced by their feeding behavior, growth and survival.

A major problem with pond-based fingerling production is the large size variation of yellow perch fingerlings harvested from ponds in the autumn. In general, 10% of the fingerlings grown in ponds can be classified as large (> 5 inches in total length), 20-30% as medium (3-5 inches), and 60-70% as small (< 3 inches). This size variation is a problem because larger fish cannibalize smaller fish. This reduces the number of fingerlings in ponds by over 50% from July to October. Another problem is that only about 10% of the total fingerlings produced are large enough to reach market size in ponds during the next growing season. Thus, farmers who want to grow fingerlings to market size must dedicate ponds for 3 full years to each crop of fish (2 years of fingerling production and 1 year of growout to market size). Finally, fish smaller than 3 inches generally show less than 50% survival when overwintered in ponds.

There are two general approaches that could be used to minimize the problem of large size variation. First, develop improved production methods. The problem might be solved, for example, by using different culture procedures (e.g., more frequent feeding, more feeders per pond, different stocking density, etc.). The second general approach, which we evaluated in this project, is to harvest the smallest fingerlings in the fall and rear them indoors during the winter months until they reach a larger size (>4.5 inches).

PROJECT OBJECTIVES

The principal objective of the project was to develop an improved method for producing feed-trained yellow perch fingerlings. Specifically, we were interested in finding out if it would be both technically and economically viable to overwinter the smallest fingerlings indoors to minimize or eliminate the problems stated above.

CHANGES FROM ORIGINAL PROPOSAL

Our original collaborator, Paragon Aquaculture, was unable to participate in the study. We formed a new collaboration with Kevin Champeau of Freedom High School to conduct the portion of the study requiring an indoor, recirculation system. Because of facilities limitations at Freedom High School, only 1,000 fish were overwintered in temperature-regulated indoor tanks. We added an additional treatment group to the study. As originally proposed, fish are currently being overwintered in (1) ponds, and in (2) tanks at optimal growth temperatures (21°C) at Freedom High School. In addition, fish are also being reared in (3) tanks at well-water temperatures (~6°C) at Willow Creek Aquaculture. This extra treatment group was added because there is evidence that yellow perch will remain on feed and grow slightly throughout the winter at well-water temperatures. We wanted to evaluate whether a strategy of overwintering yellow perch fingerlings on well water could be an economical way for pond yellow perch fingerling producers who do not have access to a recirculation system to increase their productivity.

RESULTS

In November, 1999, approximately 1,000 small yellow perch fingerlings were stocked into (duplicate tanks at Freedom High School at optimal growth temperature (21°C) and (2) duplicate tanks at Willow Creek Aquaculture at well-water temperatures (6°C). A 0.04 ha pond at Willow Creek Aquaculture was stocked with 6,000 fish. The fish were fed on a regular basis using standard procedures. In April, 2000, all of the tank-reared and pond fish were harvested and data collected on overall growth and survival. Approximately 100 fish from each of the three treatment groups (recirculation tanks, well-water tanks, pond) were then individually tagged and measured. All of the pond-reared fish and the100 tagged fish from each of the three treatment groups were then restocked into the pond for growout. These fish were then harvested following the spring-time growth spurt in June, 2000 at which time the growth of the tagged fish was measured.

Overwintering Survival

Pond-Reared Fish**:** In contrast to our hypothesis and previous observations, the survival of small yellow perch fingerlings overwintered in the pond was excellent (>95%). The reasons for this high survival rate may be related to the fact that the fish were overwintered at high density in a relatively small pond. Under these conditions the fish may have had better access to food than fish overwintered in larger ponds. This observation is important in that it suggests that farmers may be able to get better overwintering fish survival if they concentrate their fish in smaller ponds.

Tank-Reared Fish**:** As expected, overwintering survival was excellent in both the recirculation tanks and well-water tanks (>95%).

Overwintering Growth

The growth data is shown in Figure 1 below. At the start of the experiment in November, 1999 the fish was approximately 6 cm in total length (Fig. 1). In April, 2000

the average fish lengths of the fish in the three treatment groups were as follows. Pond, 6.1 + 0.1 cm; Well water, 7.3 + 0.1 cm; Recirculation system, 10.6 + 0.1. As anticipated, the pond fish did not grow over the winter. The well water fish grew ~22% more than the pond fish. The recirculation fish grew ~75% more than the pond fish and 45.2% more than the well water fish.

Springtime Growth

Between April and June, after being stocked (or restocked in the case of the pond fish) into ponds, the fish in the three treatment groups grew as follows. Pond, from 6.1 to 8.4 cm (37.7% growth); Well water, from 7.3 to 9.7 (32.8%); Recirculation, from 10.6 to 12.7 cm (19.8%).

CONCLUSIONS

We can draw three major conclusions from this study. First, production in a recirculation system is clearly a good way to increase the growth of small yellow perch fingerlings over the winter months. From November to April fish reared indoors grew 75% more than fish overwintered in ponds which essentially did not grow at all. Second, there was a slight advantage of overwintering fingerlings on well water. However, the slight improvement in growth may be offset by the increased cost (e.g., labor, overhead) and risk associated with holding the fish indoors. There is a much greater risk of catastrophic fish loss in tanks compared to ponds. Electrical failure and disease outbreaks etc. are much more likely to impact fish in tanks. Thus, we would not recommend overwintering fish on well-water. Third, the surprisingly high survival of the fingerlings overwintered in ponds suggests that crowding fingerlings in a small pond may be a superior way to overwinter fingerlings in ponds. Another advantage of using small ponds, is the ease with which these fish can be captured in the spring for restocking into larger growout ponds.

APPLICABILITY TO DEVELOPMENT

Pond Producers

The project will lead to increases in the productivity and profitability of pond-based yellow perch aquaculture. As an example, in 1997, WCA produced ~50,000 feed-trained fingerlings from one 0.5 acre pond. Unfortunately, 70% (35,000) of the fish were less than 3" in length at harvest. Half of these fish died over the winter, and the survivors showed no growth. By fall, none of the surviving fish had grown to market size (although they grew to an average size >5"). If these 35,000 fish could have been reared indoors to an average size of 5" with 90% survival, WCA would have produced an extra ~32,000 5" fish from this one half acre pond. Moreover, all of these fish would be expected to grow to a market size by fall. The value of 31,500 5" fingerlings alone is ~$11,000. The ability to grow the fingerlings to a market size in only one more growing season would free up a pond that would otherwise be dedicated to growing medium-sized fingerlings to market size in a third growing season. The estimated value of a 1 acre growout pond is about $10,000 in profit per year. Clearly the economic advantages of our proposed project could be substantial for pond producers.

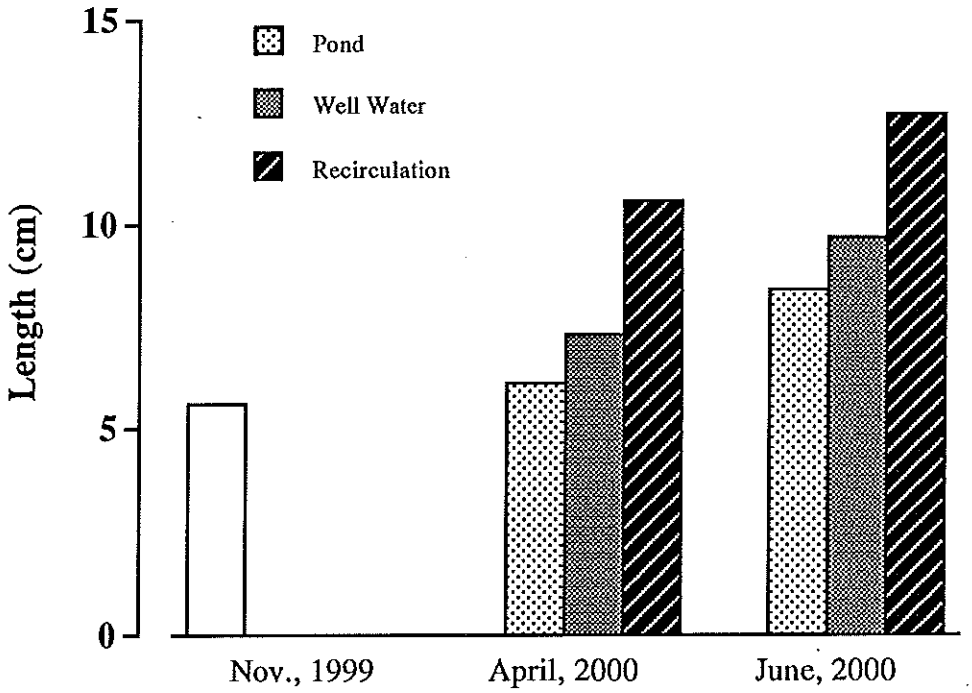
Recirculation Producers

Indoor producers will make money raising fingerlings during the winter to sell back to pond producers in the spring. Extending the example above, an indoor producer would make ~$4,000 raising 31,500 3" fingerlings to 5" (assuming a price of $0.07 per inch of fish).

Inasmuch as the cost of feed-trained fingerlings should decline in proportion to the increase in pond fingerling production, indoor producers will greatly benefit from reduced fingerling costs.

We showed that the growth and survival of small (<3") fingerling yellow perch raised indoors is very high. Generally, recirculation growers prefer a larger size fingerling because they are thought to perform better. Our results suggest that small fish perform very well and thus may encourage recirculation producers to adopt a strategy of buying and rearing smaller fingerlings, thereby markedly reducing their fingerling costs.

The ready availability of fingerlings during the winter will benefit recirculation growers who must currently purchase fingerlings from out of state during the winter months. This will keep Wisconsin dollars in state, and also reduce fingerlings costs by minimizing transportation costs.


15
10
5
0
Length (cm)
Pond
Well Water
Recirculation
Nov., 1999
April, 2000
June, 2000