2015 NCRAC ANNUAL PROGRESS REPORT

Project Title: Determination of Production Parameters of Selected Yellow Perch Lines at Commercial Densities in Ponds at Two or More Facilities in the North Central Region [Termination Report]
Key Word(s): Yellow Perch
Total Funds Committed: $150,000
Initial Project Schedule: September 1, 2010 to August 31, 2013
Current Project Year: September 1, 2014 to August 31, 2015
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Extension Liaison: Geoffrey K. Wallat, Ohio State University, Ohio
Industry Liaison: Charles E. Hicks, New Bloomfield, Missouri
Reason for Termination: Project objectives completed and funds have been terminated.

Project Objectives

1. Using consistent protocols, assess survival and growth rate of two replications of first
   - year fingerlings of improved lines of yellow perch as compared to fingerlings from local brood stock (feed - trained fingerlings to be stocked at 60,000/acre (150,000 fish/ha).
2. Using consistent protocols, assess 2nd year survival, growth rate, and market parameters (production, fillet yields, percent market size) of both replications of improved lines of yellow perch as compared to local fish.
3. Disseminate results to industry and to end - user customers via fact sheets, scientific publications, and an on - farm field day.

Project Summary

Yellow perch has its unique niche market in the Great Lake Region and the North Central Region (NCR). Despite this opportunity, rapid expansion of the yellow perch aquaculture industry has not occurred in these regions. One reason in particular hindering expansion has been relatively slow growth of currently cultured populations of this species. Using current yellow perch strains, only 60% of the fish cultured in aquaculture operations reach market size in a normal growth cycle (16 months), with the rest being below market size. This is an inefficient use of resources, feed, and operational costs, and leads to marginal profits at best. Therefore, improving and promoting yellow perch growth and aquaculture using new technology will significantly improve the profitability of fish farmers. Genetic improvement of aquaculture species offers a substantial opportunity for increasing production efficiency, health, production quality and, ultimately, profitability in aquaculture industries. The Ohio State University has developed genetically improved yellow perch. On-station and on-farm tests are important steps for commercialization of genetically improved strains.

Technical Summary and Analysis

Objective 1.—

Ohio: Researchers conducted replicated tests of the selected line of fish vs. the local-strain using two types of rearing tests: 1) at the Piketon Station (selected line and a local-strain were reared in separate ponds, each having two replicates) and at Mill Creek (MC) Perch Farm (selected line and a local-strain were raised communally). Eight molecular markers were used to assign selected and local-strain yellow perch to their family of origin for communal rearing.

In the first year the selected line of fish grew significantly larger than local perch native to the farm in two communal ponds at MC Perch Farm. The selected line fish outweighed the local strain by 32.00% on average at the end of the Year 1 test. Fingerling survival in the MC Perch Farm's communal ponds with improved fish was as high as they have ever experienced. In the Piketon ponds, the selected line fish exhibited a 27.16% higher survival rate and a 22.01% higher production than the local Ohio strain by the end of October of Year 1. Although the 27.16% higher survival rate of the selected line fish resulted in a significantly higher density and lower feed rations, these fish still had a higher mean body weight than the local Ohio strain.

Wisconsin: Approximately 15,000 feed-trained selected line fingerlings were hauled from OSU Piketon Research Facility to the WI NADF with <1% mortality. All ponds were harvested in October of year 1. The selected line fish from two ponds averaged 125.1mm (4.93 in) and 25.6 g (0.90 oz) and 120.3 mm (4.74 in) and 22.5 g (0.79 oz), respectively. The WI-strain perch from two ponds averaged 118.6 mm (4.67 in) and 20.1 g (0.71 oz), and 111.8 mm (4.65 in) and 17.9 g (0.63 oz), respectively. Average fingerling survival was 92.0% for selected line and 72.0% for WI local strain. Although the 20.0% higher survival rate of the selected line fish resulted in a significantly higher density and lower feed rations (rations were calculated based on the same assumed survival rate for all the ponds), they still grew 26.60% faster than the unimproved fish.

Objective 2.—

Ohio: For MC Perch Farms, out of 240 fish that were family-origin identified from each of the two ponds, selected at the end of the Year 2 test in two communal ponds.

In the Piketon ponds, selected line fish exhibited a 12.30% higher survival rate and a 42.07% higher production than the local Ohio strain by the end of October of Year 2. Although the 12.30% higher survival rate of the improved fish resulted in a significantly higher density and lower feed, the improved line still grew 25.50% faster than the unimproved fish. There was no significant difference in dress-out percentage between improved line and local Ohio strain.

Wisconsin: All four ponds were harvested in September, 2013. A total of 29 and 40 selected line perch were harvested from two ponds, and 40 and 21 WI local strain fish were harvested from two ponds. The selected line perch averaged 198.17 mm (7.80 in) and 111.90 g (3.95 oz) and 202.0 mm (7.95 in) and 114.28 g (4.03 oz), respectively. WI strain perch from two ponds averaged 189.53 mm (7.46 in) and 89.85 g (3.16 oz) and 197.24 mm (7.77 in) and 100.91 g (3.56 oz), respectively. Length and weight were both significantly ($p<0.001$) greater for selected line

yellow perch compared to WI local strain yellow perch. Fillet weight was significantly ($p<0.001$) greater for selected line perch, while percent fillet yield was significantly greater for WI local strain yellow perch.
line fish accounted for 71.25% and 51.25% in each of the individual ponds with an average of 61.25% which suggests that selected line fish and MC perch had survival rates of 61.25% and 38.75%, respectively. The local Ohio strain at MC Perch farms from two ponds averaged 204.0 mm (8.03 in) and 105.6g (3.72 oz), and 193.9 mm (7.63 in)and 92.9 g (3.28 oz), respectively. The selective line fish from two ponds averaged 218.1 mm (8.59 in) and 142.7 g (5.03 oz), and 212.0 mm (8.35 in) and 129.9 g (4.58 oz), respectively. The selected line fish outweighed the local strain by 35.16% and 39.90%, respectively, with an average of 37.53%,

Northern Wisconsin experienced severe and prolonged winter weather in 2013 that resulted in pond ice cover that did not dissipate until early May. This extreme weather conditions in turn was like the significant cause in the poor survival of both groups of fish. Due to the poor survival of all fish, total production and percent market size were unable to be calculated.

Objective 3.— Farm test progress and results have been disseminated to industry and to end-user customers via three articles published in newsletters, journals and website.

Principle Accomplishments
The Ohio State University has established selective breeding program for genetic improvement of growth in yellow perch. The third generation of genetically improved perch has been created. Farm tests of the genetically improved lines were conducted in three sites in NCR. Farm tests showed the improved fish had ~35% faster growth rate and ~20% higher survival rate than unimproved fish. Fish farmers could use the genetically improved perch to increase production efficiency of yellow perch aquaculture. Also, marker aided cohort selection has been developed and tested. This effective breeding method can be used in other species.

Impacts
Genetically improved yellow perch that grow ~35% faster than unimproved fish would have a tremendous positive impact on the NCR yellow perch aquaculture industry. The impact of this project will be primarily through the delivery of the superior yellow perch strains to farmers for use in a wide range of culture and exposure conditions across the NCR. Fish farmers could use the genetically improved perch to significantly improve production efficiency of yellow perch aquaculture. The greatest return on investment for this project is the ultimate reduction in production costs due to increased growth rate and reduced feed costs by using genetically improved strains.

Recommended Follow-Up Activities
All female population of yellow perch should be developed using currently improved lines to further improve growth. Cost recovery basis for these improved lines of stock should be developed through either institutional or commercial outlets.