FINAL REPORT

Title: "Evaluation of Yellow Perch, *Perca flavescens*, Production Methods in Polyculture and Seasonal Rotation with Freshwater Prawns".
Project Account Number: R/A-03-97
Initiation Date: 6/1/97 **Completion Date:** 5/31/98

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Keywords: Yellow perch, Polyculture, Perca flavescens.

Major goals and objectives: To evaluate the polyculture of yellow perch in cages with freshwater prawns in ponds. To evaluate the effect of culture temperature on growth and survival of yellow perch.

Summary of progress: Both studies have been completed.

Accomplishments:

Study 1 indicates that the polyculture of yellow perch in cages within prawn production ponds is feasible. Data indicate that increasing yellow perch stocking densities up to 320 fish/m^3 actually increased weight gain and improved feed conversion. Using this system a one acre pond produced over 900 lbs of freshwater prawns ($6.50/lb) and 450 lbs of yellow perch ($3.00/lb).

Study 2 indicates that the optimal culture temperature for growth, survival and feed conversion in perch is approximately 24°C. At 20°C survival and feed conversion are good but growth rate is reduced. At 28°C growth, survival and feed conversion were all reduced.

Benefits: This research evaluates a unique polyculture combination that has not previously been evaluated. It increases total pond production and allows construction and operating cost to be spread over additional and diversified production. Temperature results establish optimal culture temperatures and growth implications.

Narrative:
Study 1 -

Annually the United states imports in excess of $2 billion in shrimp and shrimp products. Despite the fact that the marketing climate for shrimp in the U.S. appears promising, production of marine species has not developed substantially in the U.S. due to stringent environmental

significantly lower ($P < 0.05$) survival and net protein utilization than perch raised at 20°C or 24°C. Whole body moisture was significantly higher in ($P < 0.05$) perch raised at 20°C , which also had significantly higher levels of arachidonic acid (20:4 μ-6) and docosohexaenoic acid (22:6 μ-3). The ratio of palmitic acid (16:0) and palmitoleic acid (16:1 μ-6) was directly related ($P < 0.05$) to culture temperature. These data indicate that 24° may be an optimum temperature for yellow perch. At 20° survival and feed conversion are good, but growth rates are reduced. Temperatures near 28° appear sufficient to represent chronic stress conditions.

Partnerships with other individuals:

Study 2 (Polyculture) was conducted in a commercial prawn pond by cooperators Mark and Carolyn Straw of Straw Ridge Farm in Berea, KY. Carolyn (Orr) is Head of the Agriculture Department at Berea College and Mark is a Marketing Specialist with the Kentucky Department of Agriculture.

Publications:

Results of Study 1 have been submitted to the Journal of the World Aquaculture Society. The manuscript is currently in review. A copy is attached.

Undergraduate/graduate students supported by the project:

Several students were supported by this project and an integral part of the conduct of Study 1. They are co-authors on the attached manuscript and are also evidence of interaction with other institutions, including interns from area high schools.

Jeff Evans - graduate student - University of Kentucky
Charles Weibel - KSU undergraduate
Jonathan McKinney - student intern - Franklin County High School
Kim Dodson - student intern - Frankfort High School
Halimah Jones - KSU undergraduate.

Related projects with other funding agencies:

The freshwater shrimp portion of Study 2 was supported by the U.S.D.A. Sustainable Agriculture Research Education Program.

regulations in coastal regions and financial competition for coastal properties. These factors have increased the interest in, and potential of, developing production methods for freshwater varieties in inland regions. Research and development on the freshwater prawn Macrobrachium rosenbergii over the last ten years have greatly increased the potential feasibility of commercial production in the U.S. (D'Abramo et al. 1995). A number of studies conducted by KSU researchers have demonstrated that coolwater conditions in the region may actually be advantageous for prawn production (Tidwell et al. 1994) by delaying sexual maturation and suppressing aggressive prawn/prawn interactions (Tidwell et al. 1996).

Yellow perch and prawns may be suitable candidates for commercial polyculture (New 1990). Prawns have been experimentally reared with mullet (Martinez-Silva et al. 1981), catfish (Heinen et al. 1989), tilapia (Mires 1987), baitfish (Perry and Tarver 1987), and carps (Lia and Chao 1982). Culture of prawns in coolwater regions allows new polyculture options with coolwater finfish species, such as yellow perch, which are not practical further south (Tidwell et al. 1991). Polyculture has a potentially higher net return than monoculture (Rouse and Stickney 1982) since growth and survival of fish and prawns are largely independent (Wohlfarth et al. 1985), their production would be additive, increasing total pond production.

The objective of this study was to evaluate the polyculture of yellow perch and freshwater shrimp and the effect of stocking density on perch growth in cages.

Yellow perch juveniles weighing 46 g were stocked on June 5, 1998 into replicate cages at 80, 160, and 320 fish/m^3. Perch were fed a commercial salmonid diet to satiation once daily. Cages were suspended in a 0.3 ha prawn production pond stocked at 50,000 prawns/ha. Water was circulated and aerated constantly using a 1-hp turbo aerator.

After 105 days yellow perch were harvested (September 18, 1998), weighed, and counted. At harvest there was no significant difference ($P > 0.05$) in average weight or survival of yellow perch stocked at different cage densities. However, total weight gain was significantly higher ($P < 0.05$) and feed conversion ratios were significantly lower ($P < 0.05$) in cages stocked at 320 fish/m^3. The pond also produced 970 lbs/acre of prawns averaging 30 g each.

Study 2-

Temperatures reported as optimum for growth of juvenile vary. Hokansen and Kleiner (1974) reported the optimum temperature for feeding and rearing perch to be 23.9 to 27.8°C, while Huh et al. (1976) reported the optimum temperature for yellow perch fed formulated diets to be 22°C. Also, temperature may not affect all important culture variables in the same way. Andrews and Stickney (1972) found that feed conversion in channel catfish was most efficient at 18°C, while growth rate was highest at 30°C. Culture temperature may also affect the amount of lipid deposited, as well as its fatty acid profile, due to the role of unsaturated fatty acids in maintaining bio-membrane fluidity (Sargeant et al. 1989). These changes could affect the nutrient demands of the fish, as well as their organoleptic attributes, when raised at different temperatures. The objectives of this study were to evaluate growth, survival, and body compositions of yellow perch raised at different temperatures.

Yellow perch weighing 6.6 ± 1.5g were stocked into nine 4,755-l tanks at 131 fish/m^3 (625 perch/tank). There were three replicate tanks per temperature (20°, 24°, and 28°C). Perch were fed to apparent satiation twice daily using a 45% crude protein diet with 16% crude fat. After 93 days the perch in the 24° treatment were significantly larger ($P < 0.05$) than those in the 20° and 28° treatments, which were not significantly different ($P > 0.05$) from each other. Yellow perch raised at 28° had significantly higher ($P < 0.05$) feed conversion ratios and