Best Management Practices for Channel Catfish Culture in Plastic-Lined Ponds

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Goals and Objectives:

- To identify best management practices for culturing channel catfish in plastic-lined ponds.
- To model the nitrogenous and phosphorus outputs derived from culturing channel catfish in plastic-lined ponds.

Progress:

In 2000, the Iowa Department of Natural Resources began using ten 0.4-ha and six 0.04-ha plastic-lined ponds at the Rathbun Fish Hatchery and Research Facility (Moravia, Iowa) to culture game fish that are subsequently stocked into public waters. During the first 3 years of use, inconsistent growth and survival of channel catfish (*Ictalurus punctatus*) were evident. Two separate studies were composed to better understand the culture of channel catfish in these ponds. In study #1, the effects of stocking density was investigated in the 0.4-ha production ponds. In 2003, stocking densities were 75,000 and 112,000 fish/ha. No significant differences were seen in catfish production; although fish in the lower treatment were slightly larger. The only significant water quality difference was that the ponds stocked with 112,000 fish/ha had higher concentrations of total phosphorus. In 2004, the same ponds were stocked at rates of 38,000 and 75,000 fish/ha. The fish in the lower treatment exhibited significantly higher specific growth rates. These fish were also significantly longer and heavier at harvest. Ponds stocked at a rate of 75,000 fish/ha had significantly higher concentrations of ammonia, total phosphorus and chlorophyll a. These treatments were repeated in 2005 with similar results with the biggest difference being the improved fish growth due to increased water temperatures compared to 2004. In study #2, the six 0.04-ha plastic-lined ponds were used in conjunction with six 0.08-ha earthen ponds located at the Iowa State University Horticulture Station (Ames, Iowa), to assess the effects of dietary protein content on the production of channel catfish in 2004 and 2005. Plastic-lined ponds that received 28% protein feed exhibited significantly higher levels of total phosphorus and turbidity. Earthen ponds that received 36% protein feed displayed significantly higher concentrations of ammonia and chlorophyll a. Fish fed the 36% protein diet in the plastic-lined ponds had significantly higher relative weights (W_r) then fish fed the 28% protein diet. There was a significant difference in harvest lengths and weights in the earthen ponds, with the fish fed the 36% protein feed being longer. Given the significantly cooler temperatures of 2004, the same treatments used in 2004 were repeated in 2005. Analyses to date indicate limited differences between the two stocking treatments in fish production as well as in the two feed treatments. In contrast to the previous year, water quality issues, i.e., unionized ammonia, became problematic due to increased water temperatures as well as pH. However, although not significant ($P > 0.10$), plastic-lined ponds in the 36% protein feed treatment exhibited slightly higher concentrations of measured nitrogenous compounds, total phosphorus, alkalinity, and hardness. There limited differences in water quality in the earthen ponds due to increased pumping of nutrient-rich water, as several ponds leaked excessively in 2005.

Conclusions and Recommendations:

Given the noted difficulty in maintaining water quality in plastic-lined culture ponds as well as the need to stock channel catfish of at least 180 mm long, stocking densities need to be limited to 38,000 fish per ha. This relatively low stocking rate will allow for faster fish growth as well as improved water quality conditions that have been the cause for much of the poor survival in previous years. In addition, while there were limited significant advantages of using lower protein (~28%) fish diets, improved water quality conditions associated with the lower protein feeds were noted. The combination of lower stocking densities and the use of low protein diets combined with regular water quality assessments should be instrumental in developing culture protocols that allow for improved fish growth and survival.