Why keep your southern ponds fallow? Raise yellow perch

I. PATRICK SAOUD[1]

The yellow perch, *Perca flavescens,* has many attributes that make it attractive for commercial aquaculture in the USA. Market demand for yellow perch is strong and commercial harvests related to stock declines and regulatory constraints have failed to keep up with the strong demand, thus creating an interest in yellow perch aquaculture. The main market for yellow perch in the United States is in the North Central Region, with consumption in Wisconsin accounting for most of the wild caught fish. Consequently, an aquaculture industry for the fish is developing in the North Central Region (NCR). However, temperatures in the NCR are not conducive to year-round growth. Optimal temperatures for yellow perch reported in the literature vary among researchers but range between 22 and 28°C with a range of tolerance from freezing to 33°C (Tidwell *et al.* 1999, Brown *et al.* 2002). Heidinger and Kayes (1986) suggested that in the NCR, fish raised in ponds on natural food require two to three years to reach a marketable size of 20 cm and about 150 g.

Pond through which water was circulated.

Another factor affecting fish growth is stocking density. Density could affect water quality, survival, growth, size variation, feed conversion and predation. Various authors report stocking densities of yellow perch fingerlings between 20,000 and 150,000 fish/ha depending on the size of stocked fish, length of the culture period and final harvest weight of the fish. However, since yellow perch survival varies significantly from facility to facility (Head and Malison 2000) and is affected by outside disturbances (Malison and Held 1992), optimal rearing densities for individual production facilities, or at least regions, should be investigated.

One remedy to the low winter temperatures in the NCR is to culture yellow perch in warmer southern climates. The caveat is that summer temperatures in southern states are higher than optimum for the fish. The solution would be to winter the fish juveniles in the south and grow them out in the northern states. Fish relocation of this sort is not new in aquaculture. Diadromous fishes are generally spawned in one location and then transported to another for growout. Cage cultured fishes are grown to specific sizes in ponds or recirculating systems before being stocked into cages. The technology for transporting live fish overland is well developed and can be transferred to the yellow perch culture industry. In the present experiment, we evaluated yellow perch survival and growth at three different densities in outdoor tanks during the winter in Alabama. The intent was to evaluate the feasibility of overwintering juveniles in the southern states and relocating sub-adults to the NCR in the summer.

Overwintering

Size graded yellow perch fingerlings were purchased from a hatchery in South Carolina and relocated to the North Auburn Fisheries Station (NAFS) in Alabama. They were stocked in a system consisting of 27, 600 L round tanks (D = 115 cm; H ≈ 60 cm) supplied with water from a 400 m^2, 1.5 m deep earthen pond. On 15 January 2003 the fish (average weight 6.05 g) were stocked into the tanks at three densities (30, 60 and 90 fish per tank) with nine replicate tanks per treatment. A remote temperature logger[2] was submerged in one of the tanks and recorded temperature hourly for the duration of the experiment. Fish were offered extruded slow sinking feed (40 percent protein; Silver Cup Trout formulation) at five percent of their weight at stocking until March 27, when ambient water temperature rose to 20°C. On 28 March, the fish were harvested, counted and weighed, and returned to their respective tanks. Missing fish were replaced with fish from a separate holding tank. Ration was increased to five percent of the new fish biomass per tank. The experiment was terminated on 19 April because of an overabundance of filamentous algae in the tanks.

Fish were harvested, counted and weighed. Fish from three replicate tanks in each treatment were individually weighed and their lengths determined. Feed efficiency (FE), relative condition factor (K_n) and absolute growth (AG) of the fish for the first 71 days of culture and the last 23 days were calculated.

Results and Discussion

Survival of yellow perch in the present experiment was

(Continued on page 54)

greater than 99 percent at all stocking densities evaluated (Table 1). There were no differences in fish survival at temperatures below 20˚ C and at temperatures greater than 20˚C (Figure1). Stocking density had a significant effect on growth rate at both temperature ranges chosen for the present study. Perch stocked at 30 per tank grew faster than fish stocked at 60 per tank which in turn grew faster than fish stocked at 90 per tank (Table 1). Covariant analysis using density and initial weight as the covariants during the second phase of the experiment showed that there was no effect of initial weight on final weight. Stocking density also had an effect on feed efficiency, where FE of fish stocked at 30 per tank was significantly greater than FE at 60 and 90 per tank. However, stocking density did not have an effect on the condition index of the fish nor on the coefficient of variation in size among treatments. These results suggest that yellow perch are communal fish that could be held at greater densities than suggested in the literature if offered enough feed, and if water quality is kept within acceptable ranges.

Tank system at North Auburn Fisheries Station used for the experiment.

Author stocking yellow perch into tanks.

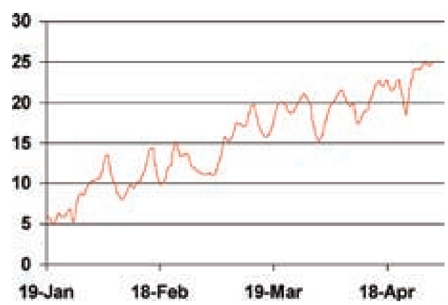

Fig. 1. Average daily pond water temperature in Auburn, Alabama between January 15, 2003 and April 30, 2003.

Temperature had a significant effect on growth rate. Absolute growth when temperature was less than 20˚C was significantly less than AG when temperature was more than 20˚C (Table 1). Such results suggest that winter temperatures in Alabama are conducive to yellow perch growth. Average water temperature in the pond used for the present study did not drop below 4.5˚C during the winter of 2003, although the surface froze for two days in early February, and temperatures started rising above 20˚C as early as 27 March. Temperatures in central Wisconsin did not rise to 20˚C until late June.[3] Ponds in Wisconsin are usually covered with ice from January through 15 March and temperature rises to *circa* 10˚C around the end of April.[4] Aquaculturists in southern states who raise tropical and temperate species usually have fallow ponds during winter months. Most tropical and temperate species such as tilapia and penaeid shrimp require temperatures in excess of 26˚C to perform well. It would be possible for farmers to harvest their ponds in September or October and stock yellow perch fingerlings in November when temperatures are below 28˚C. Then, in the spring, farmers would harvest the advanced fingerlings and ship them to the North Central Region for growout. Results of the present study suggest that the fish would grow well in the late fall as well as in early spring, when growth in the north central region is slow. Moreover, catfish farmers could use a setup such as the one used in the present experiment to maintain yellow perch in water pumped from catfish ponds.

The present study demonstrates that yellow perch survive and grow well in Alabama during the winter months. With further research on culture requirements such as stocking densities, feeds, feeding regimens and transportation protocols, an industry could be successfully introduced.

Notes

[1]Imad Patrick Saoud, Department of Biology, American University of Beirut, Bliss St. Beirut, Lebanon. E-mail: imad.saoud@aub.edu.lb; Web page: http://staff.aub.edu.lb/~is08/ or Department of Fisheries and Aquaculture, Auburn University, Auburn, AL 36849

[2] HOBO, Onset Computer Corp., Massachusetts, USA

[3]WI-MN Cooperative Extension Agricultural Weather.

[4]Jeffrey A Malison, College of Agricultural & Life Sciences, 658 Animal Science Building, 1675 Observatory Dr., Madison, WI 53706. Tel: (414) 648-2902. E-mail: jmalison@wisc.edu

References

Brown, P. B., J. E. Wetzel, J. Mays, K. A. Wilson, C. S. Kasper and J. Malison. 2002. Growth differences among stocks of yellow perch, *Perca flavescens*, are temperature dependent. Journal of Applied Aquaculture 12 (1): 43-56.

Head, A. B. and J. A. Malison. 2000. Effects of lighting spectrum and disturbance level on the growth and stress responses of yellow perch *Perca flavescens*. Journal of the World Aquaculture Society 31 (1): 73-80.

Heidinger, R. C. and T. B. Kayes. 1986. Yellow Perch. Pages 103-113 *In* R. R. Stickney, editor. Culture of Nonsalmonid Freshwater Fishes. CRC Press, Boca Raton, Florida.

Malison, J. A. and J. A. Held. 1992. Effects of fish size at harvest, initial stocking density and tank lighting conditions on the habituation of pond-reared yellow perch (*Perca flavescens*) to intensive culture conditions. Aquaculture 104: 67-78.

Tidwell, J. H., S. D. Coyle, J. Evans, C. Weibel, J. McKinney, K. Dodson and H. Jones. 1999. Effect of culture temperature on growth, survival, and biochemical composition of yellow perch *Perca flavescens*. Journal of the World Aquaculture Society 30 (3): 324-330.