PADDLEFISH *Polyodon spathula* POLYCULTURE WITH FRESHWATER SHRIMP *Macrobrachium rosenbergii*

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Several Kentucky farmers have adopted low-input shrimp farming over the past few years. While inorganic fertilization is optional, organic fertilization with alfalfa pellets is central to this practice. The use of organic fertilization augments overall pond productivity. Increasing pond productivity ensures that a wide variety of natural food items, including zooplankton, chironomids, nematodes and organisms colonizing detritus are available to shrimp at the beginning of the production season (Wurts 2004). This is especially beneficial for newly stocked juveniles because it provides an ample supply of high nutrient foods, assuring that shrimp have plenty to eat at the outset.

Much of the productivity from fertilization is in the form of zooplankton and phytoplankton, which are freely suspended in the water column above the pond bottom. Since the shrimp primarily feed on the bottom of the pond, the phytoplankton serve mostly as food for the zooplankton. Only the plankton that mature, die and fall to the bottom of the pond are available as food for shrimp.

The plankton populations represent a large, potential source of natural food that is unused in a fertilized, low-input shrimp pond. A free-swimming animal that could filter small particles the size of zooplankton from pond-water would be needed to harvest this food source. Fortunately, in Kentucky, we have a native fish that possibly could do the job. The paddlefish or "spoonbill catfish" feeds by swimming through the water with its mouth open, filtering zooplankton with its gill rakers. The 120-day growing season for freshwater shrimp production in Kentucky is too short to produce a food-size paddlefish. However, during a shrimp production season, it might be possible to grow a paddlefish fingerling into a paddlefish that is large enough for stocking lakes and reservoirs. So conceivably, polyculture could be used to produce paddlefish stockers with freshwater shrimp using low-input practices.

An aquaculture demonstration project was conducted in Kentucky during late spring, summer and early autumn of 2006. Ponds were located in Hopkins and Todd Counties. The study examined the feasibility of growing paddlefish stockers in ponds used for low-input, freshwater shrimp production. Each of three,0.2-hectare shrimp ponds was stocked with 200 juvenile paddlefish (988/hectare). Paddlefish were 15-20 cm long and weighed approximately 40 g each. Paddlefish were stocked on June 8, 2006. Ponds were fertilized with alfalfa pellets and triple super-phosphate 2 weeks prior to stocking shrimp. Shrimp were fed a 28 percent protein, pelleted sinking channel catfish feed. No aeration was used in any of the ponds (Wurts, 2007). Juvenile paddlefish were allowed to graze the robust zooplankton populations that developed in the fertilized, low-input shrimp ponds.

Ponds were harvested in September 2006. Paddlefish survival ranged from 10-61 percent. Average individual weights and lengths of paddlefish harvested from the three ponds ranged from 261-413 g and 46-51 cm. Paddlefish increased in weight from 653 percent to 1,033 percent in 106-113 days. The Secchi disk measurement in the pond where paddlefish survival was 10 percent was greater than 60 cm at harvest (Table 1). Survival was highest (43 and 61 percent) in ponds with Secchi disk measurements that ranged from 30-35 cm just prior to harvest. Ponds with the lowest Secchi disk readings would have had the most zooplankton, promoting better growth of paddlefish. The Secchi disk reading greater than 60 cm indicated clear water and that very few zooplankton were available for paddlefish to feed on. Clear water may have made the juvenile paddlefish more vulnerable to bird predation as well. This and a substantial aquatic weed (*Najas guadalupensis*) problem could have accounted for poor paddlefish survival in that pond.

Table 1. Secchi disk measurements and paddlefish survival in low-input shrimp ponds.

County	Secchi Disk (cm)	Survival (%)
Hopkins	30-35	43
Todd-A	30-35	61
Todd-B	>60	10

Paddlefish harvested should make good stockers

Post larval shrimp were stocked at 39520/hectare in the Hopkins Co pond and 24700/hectare or 29640/hectare in Todd Co ponds. In Hopkins County, 566 kg/hectare of shrimp were harvested

after 114 days. The average harvest yield from Todd Co ponds was 797 kg/hectare after 131 days. Shrimp harvested from ponds stocked with paddlefish grew well. Shrimp from the Hopkins Co pond were approximately 35 count (shrimp/kg) at harvest and those in the Todd Co ponds were 18-22 count. These results were within the range of those previously observed at both sites (Wurts 2007).

Some shrimp harvested from the Todd Co. polyculture ponds

With an overall average individual weight of 346 g, the paddlefish harvested were of suitable size for stocking into lakes, reservoirs and food fish production facilities. The results of this demonstration suggest that paddlefish might provide a suitable supplemental crop for low-input shrimp farmers and a means to harvest plankton that otherwise would be lost when ponds are drained at harvest. Polyculture of paddlefish with freshwater shrimp could increase pond yields without increasing feed and fertilizer inputs. Assuming an average paddlefish survival of 50 percent and a retail price of $3.00 each for stockers, the gross value added through polyculture could be US $1482/hectare. Furthermore, it may be possible to stock paddlefish fingerlings at higher densities while achieving similar survival and growth. Raising and selling paddlefish stockers might provide a supplemental crop and additional income for low-input shrimp producers in Kentucky.

References

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