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Polyculture of the Giant Malaysian Prawn and the Golden Shiner in Southwestern Louisiana[1]

GREGORY SCOTT

School of Forestry, Wildlife and Fisheries, Louisiana Agricultural Experiment Station, Louisiana State University Agricultural Center, Baton Rouge, Louisiana 70803 USA

W. GUTHRIE PERRY, JR.

Rockefeller Wildlife Refuge, Louisiana Department of Wildlife and Fisheries, Route 1, Box 20-B Grand Chenier, Louisiana 70643 USA

JAMES W. AVAULT, JR.[2]

School of Forestry, Wildlife and Fisheries, Louisiana Agricultural Experiment Station, Louisiana State University Agricultural Center, Baton Rouge, Louisiana 70803 USA

Abstract

Juvenile prawns (*Macrobrachium rosenbergii*) were stocked at 37,050/ha and golden shiner (*Notemigonus crysoleucas*) fry at 321,100/ha into 16 earthen ponds at Rockefeller Wildlife Refuge, Grand Chenier, Louisiana. Four replicated treatments were tested: fed prawn monoculture, fed shiner monoculture, fed prawn and fed shiner polyculture, and unfed prawn fed shiner polyculture. The study lasted 149 days.

There were no significant differences in growth between prawns fed in monoculture and prawns fed in polyculture ($P > 0.05$). However, fed prawns grew significantly larger ($P < 0.05$) than unfed prawns. Prawn survival in all treatments combined averaged 63%. Survival was significantly higher ($P < 0.05$) for fed prawns than for unfed prawns. Prawn yields averaged 533 kg/ha, when all treatments were combined. Yield was significantly higher ($P < 0.05$) for prawns grown with shiners and for prawns that received supplemental feed.

Growth was significantly higher ($P < 0.05$) for shiners grown with fed prawns than for shiners grown with unfed prawns. Shiner survival averaged 33% and was significantly higher ($P < 0.05$) in monoculture than in polyculture. Yield for all ponds averaged 392 kg/ha, with no significant differences between treatments ($P > 0.05$).

Commercial culture of the freshwater Malaysian prawn, (*Macrobrachium rosenbergii*) is of interest worldwide because the prawn commands an excellent market price (Hanson and Goodwin 1977). Prawn culture in the U.S. is practical only in the southern states because of the species limited tolerance for temperatures below 13 C. Research in South Carolina (Smith et al. 1976, 1978) and Florida (Willis and Berrigan 1977) demonstrated that prawn culture was feasible with a growing season of only 150 to 180 days, thus allowing the possibility of commercial prawn culture in the southern U.S. However, development of a commercial prawn industry in the southeastern U.S. is constrained by: 1) competition in the marketplace with penaeid shrimp; 1986 New York wholesale prices for 15 count, headless shrimp and prawns are $14.95/kg and $12.65/kg, respectively, 2) lack of hatcheries and nurseries for production of juvenile prawns (Smith and Sandifer 1979; Cange et al. 1983), 3) the relatively short (150 to 170 days) growing season (Hanson and Goodwin 1977), and 4) large size variation at harvest (Cange et al. 1986).

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[2] Corresponding author.

Though there is doubt that monoculture of prawns in some countries is economical, polyculture could become economical. Guerrero and Guerrero (1977) compared the polyculture of *Tilapia nilotica* and *M. rosenbergii* with monoculture of each species in the Philippines. Results showed that the yield of *T. nilotica* increased by 21% when the fish were grown with prawns. The total yield of both species in polyculture was 22% greater than in monoculture. Several other researchers have shown the possible suitability of prawns for polyculture with channel catfish (*Ictalurus punctatus*) (Huner et al. 1983), fry and fingerling channel catfish and carp species (Miltner et al. 1982), and male tilapia hybrid and carp (Cohen and Ra'anan 1983). However, little information is available regarding the potential for prawn-bait fish polyculture.

Louisiana is the third largest bait fish producer in the U.S. with 1,215 ha (Brown and Gratzek 1980). Of the five principal species of bait fish cultured, golden shiners (*Notemigonus crysoleucas*) account for 85% of the total U.S. production. The total U.S. wholesale value of the golden shiner is estimated at $30 to $41 million, with retail estimates of $60 to $80 million, and at a wholesale price of $3.39/kg live weight, they account for 85% of the total dollar value (Brown and Gratzek 1980). Monoculture of golden shiners for bait has been practiced in Mississippi, Arkansas, and Missouri since 1950 (Brown and Gratzek 1980). Buck et al. (1972) demonstrated the potential for the polyculture of channel catfish and golden shiners in Illinois. Two cash crops, catfish and shiners, were produced with little increase in production costs. Crawford and Freeze (1982) investigated the polyculture of prawns and fathead minnows (*Pimephales promelas*) in Arkansas and concluded that it has possibilities.

The purpose of this study was to determine growth, survival, and yield of golden shiners and prawns in both monoculture and polyculture systems.

Materials and Methods

Experimental Ponds and Stocking Procedures

Sixteen earthen ponds (0.04 ha; 90–120 cm deep) at Rockefeller Wildlife Refuge, Grand Chenier, southwest Louisiana were filled with brackish water of approximately 3 ppt. On 13 May 1985 juvenile prawns (13–68 mm TL and 0.3–2.4 g) from the Ben Hur Research Farm in Baton Rouge, Louisiana were released into 12 randomly selected ponds at 37,050 per ha. On 19 June 1985 golden shiners (22–40 mm TL and 0.08–0.36 g) from Wisner Minnow Farms, Wisner, Louisiana, were released at 321,100 per ha in 12 ponds. Four treatments, with four replications each were used as follows: 1) fed prawn monoculture, 2) fed shiner monoculture, 3) fed prawn and fed shiner polyculture, 4) and unfed prawn and fed shiner polyculture.

Experimental Procedures

Prawns receiving feed were fed with Zeigler sinking shrimp pellets (40% crude protein) between 1500 and 1700 hours, six days per week. For the first three weeks, prawns receiving feed were fed at 35% of the estimated prawn biomass; feeding rates were then lowered and adjusted for prawn size at three week intervals as follows: 0.01 to 0.1 g received 14% of bodyweight daily, 0.1 to 1.5 g received 7%, 1.5 to 3.0 g 4%, 3.0 to 10.0 g 3%, 10 to 20 g 2%, and >20 g received 1% (Scott 1986). Prawn growth was determined by seine sampling (Scott 1986). Golden shiners were fed Prime Quality (Mountaire Feeds, Inc.) fish food meal (33% crude protein) which floated at the surface. At three week intervals, shiners in a randomly selected pond were allowed to feed to satiation for 30 minutes (Giudice et al. 1981). The food consumed by shiners in this pond determined the amount fed to shiners in remaining ponds for the next three weeks. Prawns and shiners were not fed when dissolved oxygen (DO) was below 2.0 mg/L or on days of heavy overcast and rain.