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General Notes

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POLYCULTURE OF GIANT MALAYSIAN PRAWNS (*MACROBRACHIUM ROSENBERGII*) AND FATHEAD MINNOWS (*PIMEPHALES PROMELAS*)

Since the discovery of the complete life cycle of the Malaysian prawn, *Macrobrachium rosenbergii*, a promising aquacultural industry has developed (Ling, 1962). Being native to tropical areas of Southeast Asia (Ling, 1962), Malaysian prawn culture in the United States has been limited to Hawaii (Fujimura, 1974), Puerto Rico (Prince and Watters, 1976) and the southern continental United States (Smith et al., 1976; Willis and Berrigan, 1977a; Perry et al., 1981).

Polyculture of freshwater prawns with other aquatic organisms has been undertaken in recent years. Species cultured with prawns include bighead carp (*Aristichthys nobilis*), silver carp (*Hypophthalmichthys molitrix*), white amur (*Ctenopharyngodon idella*), common carp (*Cyprinus carpio*) (R. J. Baur, pers. comm., Illinois Natural History Survey, Kinmundy) and channel catfish (*Ictalurus punctatus*) (Huner et al., 1980).

In certain geographic areas, bait fish culture has emerged as an important industry. Based upon annual monetary farm sales, minnow farming is the largest aquacultural industry in the United States, with the fathead minnow (*Pimephales promelas*) being one of the three most frequently cultured bait fishes (Brown, 1980).

Since prawns are already established in certain regions as food, bait, and ornamental organisms (Berrigan et al., 1978), polyculture with fathead minnows would enable a bait culturist to raise a specialized crop of high value in addition to fathead minnow production.

Polyculture of prawns and fathead minnows was conducted in two 0.3 ha earthen ponds at the Joe Hogan State Fish Hatchery, Lonoke, Arkansas. Prawn post-larvae from the Anunue Fisheries Research Center in Honolulu, Hawaii, were stocked at densities of 17/m² and 24/m². Stocking density of fathead minnows was 30 kg/ha.

Feed utilized was a pelleted catfish ration containing 30% protein and 10% fish meal. Feeding rate was initially 14% of prawn body weight per day, but was later decreased to 4% of prawn body weight per day.

Sampling of prawns was conducted at two week intervals. Sampling included collection by shoreline seining and measuring of rostrum to telson length for prawns captured (Perry et al., 1981).

At harvest, total weights were obtained for prawns and fathead minnows. Mean lengths and weights were taken for prawns. One hundred individuals of each, per pond, were measured to obtain mean measurements. Food conversion ratios were calculated by dividing total weight of prawns and minnows produced by the total weight of feed places in the ponds.

Survival of prawn post-larvae was excellent during shipment (Table 1). However, after stocking, survival decreased drastically. Complete prawn mortality occurred in one pond. This mortality may have been caused by insecticide drift from local agriculture and/or mosquito control application since the pond's location was in the proximity of such activities. Survival of prawns in the second pond was 39% with mortality determined to be the result of predation by aquatic insects, wading birds and semi-aquatic snakes and turtles. Aquaria observations also indicated that cannibalism could have contributed significantly to prawn mortality.

Large size variation (2.0 to 20.0 g and 5.7 to 14.0 cm) was noted among prawns at harvest (Table 2) and was probably due to the "bull runt" phenomenon described by Smith et al. (1976). Prevention of this phenomenon and the resultant harvest of a larger-sized, more uniform crop might have been achieved by periodically removing larger prawns (Berrigan et al., 1978).

Prawn production was low (371.7 kg/ha) and may have been affected by the stocking density utilized (Willis and Berrigan, 1977b) and the initial size of prawns stocked into the ponds (Ling, 1969; Willis et al., 1976). Perhaps the factor most inhibiting growth of prawns was the climate shortened, 95 day growing season.

Fathead minnow production (Table 2) was excellent (373 kg/ha and 443.5 kg/ha). Production equaled or exceeded average production data for fathead minnow producers in Arkansas (Henderson et al., 1978; Freeze and Fiegel, 1980), the largest producer of bait fish in the United States (Brown, 1980).

Net feed conversion ratios (Table 2) strongly suggest that natural food organisms were being utilized by both prawns and minnows, in addition to the commercial pellets. It is probable that plant materials were ingested by both minnows and prawns (Willis and Berrigan, 1977a; Giudice et al., 1980). In addition, fecal material might have been utilized by the prawns (Johanenens and Satoni, 1966; Frankenburg and Smith, 1967). Other food sources available to the larger prawns included fathead minnows and smaller prawns. Aquaria observations revealed strong tendencies toward cannibalism and prawns were observed on numerous occasions to feed upon fathead minnows. The feed used appeared to have acceptable palatability. Adult prawns held in aquaria were observed to readily consume the pellets.

Although no replications existed in this study, the indication that Giant Malaysian prawns may be reared with fathead minnows without apparently affecting minnow production, suggests a possible new use of prawns in the southern United States. However, further evaluation of several areas are needed before this type of polyculture becomes a reality. Stocking densities should be established which would allow maximum

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production of both prawns and minnows. Also, further evaluations of selective prawn harvest is needed to determine the feasibility of this type of harvest. Considering the relatively high cost of purchasing prawn post-larvae, the economics of this type of polyculture should also be closely examined.

Table 1. Stocking rates utilized in polyculture of Giant Malaysian Prawns and Fathead Minnows.

Pond Number	Prawns			Fathead Minnow		
	Total Number Stocked	Number Per m ²	Mean Weight (g)	Mean Length (cm)	Total weight Stocked (kg)	Weight (kg) per Hectare
A	19,000	17	0.06	10.2	9.1	30.3
B	28,500	24	0.04	10.2	9.1	30.3

Table 2. Harvest data from polyculture of Giant Malaysian Prawns and Fathead Minnows.

Pond Number	Total Production (kg)	Ag per Hectare	Survival %	T freshwater Prawns		Fathead Minnow		Total Production (kg)	Ag per Hectare	Total Production (kg)	Ag per Hectare	Feed Conversion Ratio	
				Weight (g)	Length (cm)	Production (kg)	Ag per Hectare						
A	112.0	0	8	112.0	373.3	118.0	373.3	113.7	1.00-1				
B	112.0	371.7	39.0	10.2	2.5-15.0	10.2	5.7-18.0	134.4	445.5	247.0	875.2	141.6	1.7-1

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