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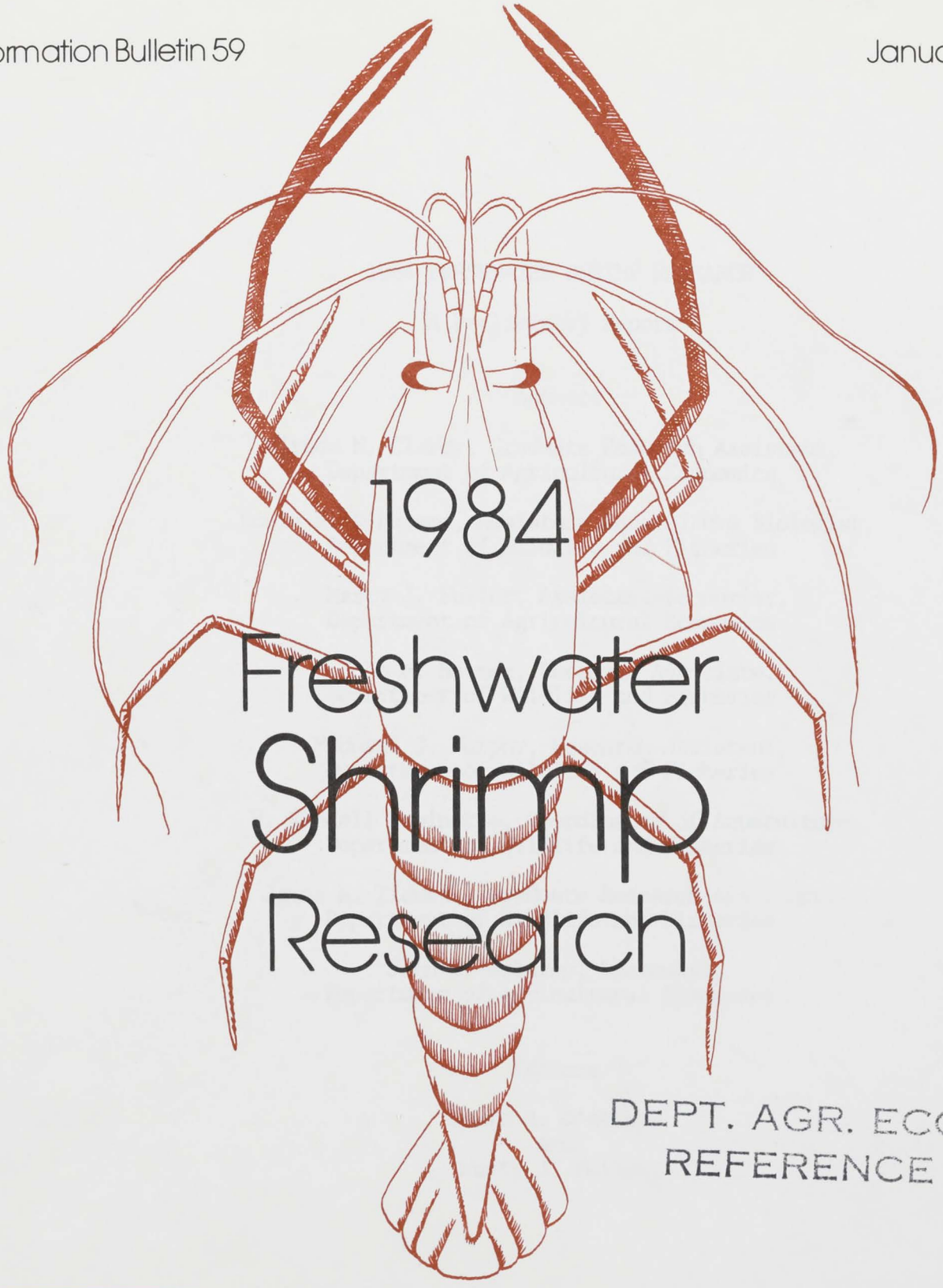

1984 Freshwater Shrimp Research

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1984 FRESHWATER SHRIMP RESEARCH

A Preliminary Report

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1984 FRESHWATER SHRIMP RESEARCH

Evaluation of the economic feasibility of producing Macrobrachium rosenbergii, the giant Malaysian prawn (shrimp), in Mississippi was initiated at Mississippi State University in 1984. The primary objective of the first year's research was to determine if the prawns can be grown to marketable size in our climate under various production regimes.

Sixteen ponds of about .15 surface acres each were constructed. The ponds were constructed with a sloped bottom and a 3 to 1 bank slope. Two 3 inch airlift pumps were installed in each of the test ponds, and emergency aeration was available through the use of a p.t.o.=driven paddlewheel. Also, a prawn-culture expert, Dr. Ziva Ra'anan, was hired for eight weeks to advise and assist MAFES researchers in the proper handling, stocking and harvesting methods. This allowed MAFES scientists to quickly learn a great deal about the culture of this species during a very short period from an expert whose country's climatic conditions closely resemble those of the southern region of the United States.

Seed stock for the 1984 research were purchased from Aquaculture Jamaica, Ltd., Kingston, Jamaica. The "nursed juveniles" (15 to 75 day postlarvae) were air freighted to the United States and arrived at MSU on May 2. The shrimp were held indoors in large tanks until pond temperatures appeared suitable for stocking.

Treatments

Four planned production treatments were attempted at MSU during the 1984 growing season. These included (1) shrimp monoculture--conventional ponds, (2) shrimp monoculture--special design ponds, (3) polyculture--catfish fry and shrimp and (4) polyculture--pond-run catfish and shrimp. Each of these treatments was replicated four times.

An additional treatment was included when it was learned that an adequate number of stocker shrimp had survived. This treatment involved testing of a special crustacean diet. Two "old" ponds averaging about .10 acres were devoted to this treatment.

Shrimp Monoculture

Stocking of the shrimp monoculture ponds occurred on May 10 at a rate of 32,000 per acre, with average size ranging from .03 to .52 grams. The shrimp were fed a 25% protein pelleted, sinking feed. Feeding rates were based on recommendations of Dr. Ra'anan. These rates ranged from a high of more than 20% of body weight during the early stages to as low as 3% of body weight in the final stages. The shrimp were fed twice daily, with one half of the feed distributed in the morning and the other half in late afternoon.

Certain water-quality variables, such as dissolved oxygen and temperature, were monitored twice daily. Other variables were monitored as necessary.

The monoculture ponds were sampled each third week with a 1/4" mesh seine to obtain an estimate of the average weight of the shrimp. These data, along with estimated survival, were used to calculate weekly feed schedules within the tri-weekly sampling periods.

Dr. Ra'anan recommended selective harvests during the course of the growing season to increase yield. The selective harvests were designed to capture all shrimp weighing in excess of 30 grams.

Final harvest of the monoculture ponds began on September 17 and concluded on September 25. The general procedure was to lower the pond water level to about 3 feet and make two seine hauls with a 1/2" mesh seine to capture as many shrimp as possible. The pond was then drained, and the remaining shrimp were harvested from the pond bottom or a catch basin located near the standpipe. The harvested shrimp were placed into large aerated tanks for 5-15 minutes to allow cleansing of mud from gills and appendages. The shrimp were then placed in plastic mesh baskets and killed by submerging them in ice water for about 10 minutes. The shrimp were transported on ice to a facility where they were counted, sorted and weighed. They then were blast-frozen and stored.

Shrimp Monoculture--Special-design ponds

Stocking of shrimp in the specially designed ponds also took place on May 10 with average size ranging from .03 to .52 grams. These ponds were designed with a "mesa" or submerged levee running the length of the pond in the center. The top of the mesa was about 18 inches below the water level of the pond.

The objective of this treatment was to determine the effects of increased slope area on the production and survival of shrimp. The shrimp in this treatment were stocked, managed and harvested according to the procedures outlined for shrimp monoculture in conventional ponds.

Polyculture--Catfish Fry and Shrimp

This treatment was designed to determine the compatibility of raising catfish fry and shrimp. The ponds were managed solely for catfish fry production, with the shrimp being a supplementary crop.

The shrimp (mean weight, .52g) were stocked on May 10 at a rate of 2000 per acre. Catfish fry were stocked at a rate of 80,000 per acre on June 20. This date was later than anticipated due to the abnormally late catfish spawn in 1984.

The fry were fed one pound of 48-50% protein flour per day in one late-afternoon feeding until July 19. On July 20 the fry were switched to a 32% protein crumbles diet and fed at a daily rate of 5% of the estimated biomass for the remainder of the experiment. Feeding was performed once a day in the late afternoon except on heavily overcast or rainy days.

Dissolved oxygen and temperature were monitored twice daily. Other water quality variables were monitored as necessary.

No scheduled sampling of these ponds occurred during the growing season. The final harvest was conducted on September 19. Water levels were lowered to about 3 feet, and one to three hauls with a 3/4" mesh seine were made. This procedure was designed to catch the shrimp only. A 1/2" mesh seine was then drawn through the pond one to two times to collect the fry. The ponds were then drained, and the remaining shrimp and fry were harvested from the pond bottom or the catch basin located at the standpipe end. The shrimp were handled as outlined for shrimp monoculture in conventional ponds.

Polyculture--Pond-Run Catfish and Shrimp

This treatment was designed to determine the compatibility of freshwater shrimp with catfish of sizes that are commonly found in commercial food-fish culture. As with the catfish fry system, these ponds also were managed for fish production with shrimp as a supplementary crop.

Shrimp averaging .52 grams were stocked on May 10 at a rate of 2,000 per acre. Three size classes of catfish were stocked on May 11 at a total rate of 4,500 fish per acre. One third of the fish stocked averaged 1.25 pounds, one-third averaged .5 pounds, and one-third averaged about 1 ounce (6 inch fingerling).

The fish were fed once a day in the late afternoon except on heavily overcast or rainy days. The daily amount of feed represented 3% of the estimated total biomass of fish in the pond, up to a maximum of 100 pounds of feed per acre. All fish were fed a 25% protein sinking feed for the first three weeks of the growout period. Thereafter, a 32% protein floating feed was fed except for one pond where a 32% sinking medicated feed was fed for five days. Water quality variables such as dissolved oxygen and temperature were monitored twice daily with other variables monitored as necessary.

No scheduled sampling of these ponds was done during the growing season. The final harvest was on September 20 and 21. Water levels were lowered to about 3 feet, and a 1/2" mesh seine was drawn through the pond at least twice. The pond-water level was lowered, and one or two more seine hauls were made. Shrimp and catfish were harvested together. The ponds were then drained, and the remaining fish and shrimp were harvested from the pond bottom or the catch basin located at

the standpipe end. Shrimp were handled according to the procedures outlined in the monoculture section. Catfish were individually counted and collectively weighed.

Shrimp Monoculture--Special Crustacean Diet

Shrimp in this treatment were stocked on May 11 and averaged .03 grams. They were managed according to the procedures outlined for shrimp monoculture in conventional ponds except for type of feed. The shrimp in this treatment were fed a 35% protein diet compared to a 25% ration for the others. Harvest of the two ponds was on September 27 and October 2.

Results

Results of the 1984 shrimp monoculture research are summarized in Table 1. Polyculture results are summarized in Tables 2 and 3.

Monoculture

Survival ranged from 0 to more than 85%, with an average of 34.55%. Average harvest weight was 28.65 grams (16 count whole). The average yield per acre for the two monoculture treatments (conventional and special-design ponds) was 698 pounds.

Polyculture--Catfish Fry and Shrimp

Fry survival was poor, ranging from 0 to more than 53%. No shrimp survived in three of the four ponds, and only 5.36% of the shrimp in the remaining pond survived.

Polyculture--Pond Run Catfish and Shrimp

Catfish feed conversion averaged 2.20, ranging from 1.86 to 4.09. Average weight of the harvested catfish ranged from 1.39 to 1.61 pounds.

Shrimp survival ranged from 87 to more than 96% for the four ponds. The average yield of shrimp was 153 pounds per acre. Average shrimp size ranged from 33.83 grams (13 count whole) to 42.26 grams (11 count whole).

Monoculture--Special Crustacean Diet

Survival ranged from 76 to more than 85%, with an average of 82.10%. Average harvest weight was 23.99 grams (19 count whole). The average yield per acre for this treatment was 1415 pounds.

Summary

Ten of the ponds devoted to shrimp research in 1984 were used for shrimp monoculture research, and the others were used in polyculture research with freshwater shrimp and catfish. All ponds were stocked with shrimp in May and were harvested in late September.

With the exception of the polyculture treatment with pond-run catfish, shrimp survival was highly variable. Researchers believe that high mortalities occurred due to water quality problems--high pH and associated high unionized ammonia levels that occurred in June. The scientists feel that this problem can be alleviated in future research and that survival can be improved. Insufficient data are available to permit analysis of the economic merit of the selective harvesting procedures and the special crustacean diet.

Information obtained from the 1984 research will be helpful in planning future research to determine the economic feasibility of producing Macrobrachium rosenbergii in Mississippi.

Table 1. Results of 1984 shrimp monoculture research

Pond Number	Pond Size	Total[1] Stocked	Stocking Weight	Average Harvest Weight	Number Harvested	Survival	Growout Days	Biomass Produced	Total[2] Fed	Conversion[3]	Yield
	(Acres)		(Grams/Animal)			(Percent)		(Lbs.)			(Lbs./Acre)
26	.14	4,480	.03	30.78	100	2.23	130	6.48	161.18	24.87	48
27	.14	4,480	.24	23.68	3,819	85.25	131	196.96	543.47	2.76	1,424
30	.13	4,160	.52	28.05	3,125	75.12	138	188.49	639.04	3.39	1,487
36	.14	4,480	.24	50.13	536	11.96	131	56.88	447.80	7.87	423
37*	.14	4,480	.24	—	—	0.00	—	—	63.00	—	—
38*	.15	4,800	.24	41.48	1,025	21.35	137	91.20	650.33	7.13	625
39*	.14	4,480	.52	28.79	2,284	50.98	130	139.84	620.90	4.44	1,036
40*	.13	4,160	.03	25.47	1,383	33.25	137	77.68	364.07	4.69	600
7**	.10	3,200	.03	24.94	2,844	88.88	145	156.19	396.94	2.54	1,562
9**	.11	3,622	.03	23.00	2,756	76.09	140	139.51	353.53	2.53	1,268

*Special design pond.

**Special crustacean diet.

[1]All ponds stocked at a rate of 32,000/acre.

[2]All ponds fed according to schedule provided by Ziva Ra'anan.

[3]Ratio of total fed to biomass produced.

Table 2. Results of 1984 polyculture research--catfish fry and freshwater shrimp

Pond Number	Pond Size	Catfish Fry Stocking Number Stocked[1]	Stocking Total Weight	Stocking Average Weight	Harvest Number Harvested	Harvest Total Weight	Harvest Average Weight	Biomass Produced	Growout Days	Survival	Total Fed	Conversion[2]
			(Grams)			(Lbs.)	(Grams)	-(Lbs.)-		(Percent)	(Lbs.)	
29	.15	12,000	480	.04	1,224	191.58	71	190.52	92	10.20	249.56	1.31
32	.14	11,200	448	.04	—	—	—	—	92	0.00	231.26	—
34	.15	12,000	480	.04	1,079	183.20	77	182.14	92	8.99	249.56	1.37
35	.14	11,200	448	.04	5,939	235.67	18	234.68	92	53.03	231.26	.99

Pond Number	Shrimp Number Stocked[3]	Number Harvested	Survival	Average Harvest Weight	Growout Days	Biomass Produced	Yield
			(Percent)	(Grams)		-(Lbs.)-	(Lbs./Acre)
29	300	—	0.00	—	132	—	—
32	280	—	0.00	—	132	—	—
34	300	—	0.00	—	132	—	—
35	280	15	5.36	96.67	132	2.87	21

[1]Fry stocked at a rate of 80,000/acre.

[2]Ratio of total fed to biomass produced.

[3]Stocked at a rate of 2,000/acre, average weight of .52 grams each.

Table 3. Results of 1984 polyculture research—pond run catfish and freshwater shrimp

Pond Number	Pond Size	Catfish Stocking Number Stocked[1]	Catfish Stocking Total Weight (Lbs.)	Catfish Stocking Average Weight	Catfish Harvest Number Harvested	Catfish Harvest Total Weight (Lbs.)	Catfish Harvest Average Weight	Biomass Produced (Lbs.)	Growout Days	Survival (Percent)	Total Fed (Lbs.)	Conversion[2]
25	.16	720	466.49	.65	729	1160.16	1.59	693.67	132	101.00	1308.75	1.89
28	.14	630	396.16	.63	565	859.57	1.52	463.41	132	89.68	981.37	2.12
31	.15	675	420.41	.62	480	666.78	1.39	246.37	133	69.78	1008.31	4.09
33	.15	675	445.55	.66	657	1059.30	1.61	613.75	133	97.04	1142.75	1.86

Pond Number	Shrimp Number Stocked[3]	Shrimp Number Harvested	Shrimp Survival (Percent)	Shrimp Average Harvest Weight (Grams)	Shrimp Growout Days	Shrimp Biomass Produced (Lbs.)	Shrimp Yield (Lbs./Acre)
25	320	300	93.80	33.83	133	22.00	140
28	280	268	95.71	42.26	133	24.65	178
31	300	261	87.00	35.76	134	20.24	137
33	300	290	96.67	36.97	134	23.30	158

[1]Stocked at a rate of 4,500 fish/acre.

[2]Ratio of total fed to biomass produced.

[3]Stocked at a rate of 2,000 shrimp/acre, average weight of .52 grams each.

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