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

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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 Berigan 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).
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’an an 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 Zieglar 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.
From 13 May through 3 October DO concentrations were measured daily in all ponds at 0600 hours at a 50 cm depth with a YSI oxygen meter. If DO was below 2.0 mg/L, water in the pond was circulated with a 10 cm diameter discharge centrifugal pump. Water temperature was recorded daily 16 May through 7 October in one pond at a 76 cm depth with a Taylor #76JMM317 continuous temperature recorder. Salinity, pH, un-ionized ammonia, total hardness, and total alkalinity were measured monthly (May–October) in each pond (Scott 1986).

From 3–7 October 1985 the water volume in all ponds was reduced by half to concentrate shiners and prawns. Each pond was seine two to three times to remove the bulk of the crop. Prawns and golden shiners were easily separated at harvest by allowing them to segregate in the bag of the seine. Shiners congregated at the surface where they were removed with dip nets, and prawns remained in the bag of the seine. Ponds were eventually pumped dry and remaining animals were removed by hand from the bottom. A random sample of 30 prawns and 30 shiners from each pond was measured and weighed to the nearest mm and g respectively. Remaining prawns and shiners were then counted and weighed to determine survival and yield. Prawns were harvested after 149 growing days, and shiners after 110 growing days.

Results and Discussion

Water Quality

Oxygen depletion became a problem in ponds, and there were significant differences \( (P < 0.01) \) between treatments (Table 1). Water temperature, pH, total alkalinity, and un-ionized ammonia were within acceptable limits; salinity and total hardness may have been marginal for shiners and prawns (Huner and Dupree 1984) (Table 2). No significant differences existed between treatments for these parameters \( (P > 0.05) \) except for total hardness.

At sunrise, DO concentrations less than 2.0 mg/L were recorded on 16% of the sample dates (Table 1). Incidence of DO less than 2.0 mg/L was not significantly different for the fed prawns in monoculture, fed prawns grown with shiners, and unfed prawns grown with shiners \( (P > 0.05) \). However, there were significantly \( (P < 0.01) \) more days with DO less than 2.0 mg/L for the ponds with shiners only. Reasons for this difference were unclear since shiner biomass in this treatment was less than the biomass in the polyculture treatment. Perry and Tarver (1981) and Cange et al. (1982a) reported similar results with occurrence of DO less than 2.0 mg/L in their studies with prawn monoculture and prawn-catfish polyculture at Rockefeller Refuge. Water was aerated when DO levels were less than 2.0 mg/L. Highest frequency of low DO occurred from 15 July to 12 September. Dissolved oxygen less than 2.0 mg/L was recorded on 214 occasions during this period which accounted for 66% of all DO measurements below 2.0 mg/L. On 3 and 4 August, 14 of 15 ponds had DO levels below 2.0 mg/L. Neither prawns nor shiners showed visible signs of stress until DO was below 1.0 mg/L. Prawns and shiners behaved normally after water was aerated. Data from pond B-13 were omitted from the analyses, since all fish and prawns were killed by low dissolved oxygen levels.

<table>
<thead>
<tr>
<th>Month</th>
<th>Treatment and number of ponds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PCa(3)</td>
</tr>
<tr>
<td>May</td>
<td>15</td>
</tr>
<tr>
<td>June</td>
<td>2</td>
</tr>
<tr>
<td>July</td>
<td>14</td>
</tr>
<tr>
<td>August</td>
<td>22</td>
</tr>
<tr>
<td>September</td>
<td>8</td>
</tr>
<tr>
<td>October</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>61</td>
</tr>
</tbody>
</table>

\( ^{a} \) Prawn control (fed).
\( ^{b} \) Shiner control (fed).
\( ^{c} \) Prawns not fed, shiners fed.
\( ^{d} \) Prawns and shiners fed.
Table 2. Summary of water quality data\textsuperscript{a} for prawn-shiner polyculture study at Rockefeller Wildlife Refuge, Grand Chenier, Louisiana, from 13 May to 8 October 1985.

<table>
<thead>
<tr>
<th>Water quality parameter</th>
<th>PC\textsuperscript{b} (3)</th>
<th>SC\textsuperscript{c} (4)</th>
<th>PNSF\textsuperscript{d} (4)</th>
<th>PFSF\textsuperscript{e} (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (°C)</td>
<td>29.3 ± 1.51</td>
<td>29.3 ± 1.51</td>
<td>29.3 ± 1.51</td>
<td>29.3 ± 1.51</td>
</tr>
<tr>
<td>Salinity (%)</td>
<td>2.9 ± 0.84</td>
<td>0.8 ± 0.84</td>
<td>2.3 ± 0.84</td>
<td>2.7 ± 0.84</td>
</tr>
<tr>
<td>Total alkalinity (HCO\textsubscript{3}⁻)</td>
<td>210 ± 30.07</td>
<td>223 ± 30.07</td>
<td>214 ± 30.07</td>
<td>225 ± 30.07</td>
</tr>
<tr>
<td>Total hardness (Ca\textsuperscript{++} and Mg\textsuperscript{+})</td>
<td>756 ± 144</td>
<td>387 ± 144</td>
<td>653 ± 144</td>
<td>639 ± 144</td>
</tr>
<tr>
<td>Un-ionized ammonia (NH\textsubscript{3})</td>
<td>0.038 ± 0.02</td>
<td>0.018 ± 0.02</td>
<td>0.019 ± 0.02</td>
<td>0.014 ± 0.02</td>
</tr>
<tr>
<td>pH</td>
<td>8.1 ± 0.25</td>
<td>8.3 ± 0.25</td>
<td>8.1 ± 0.25</td>
<td>8.1 ± 0.25</td>
</tr>
</tbody>
</table>

\textsuperscript{a} Treatment means ± one standard deviation.
\textsuperscript{b} Prawn control (fed).
\textsuperscript{c} Shiner control (fed).
\textsuperscript{d} Prawns not fed, shiners fed.
\textsuperscript{e} Prawns fed, shiners fed.

Water temperature ranged from 28°C on 15 May to 32°C on 24 July and was 23°C at harvest. Optimum temperatures for prawn growth range from 22–32°C (Ling 1969). This range is also optimal for golden shiner culture (Alpaugh 1972; Cincotta and Stauffer 1984). Salinity ranged from 0.0 to 6.0 ppt and averaged 2.1 ppt. Salinity from 0 to 30 ppt can be tolerated by larval prawns (Smith et al. 1976). Perdue and Nakamura (1976), in a laboratory study, and Smith et al. (1976), in a brackish-water pond study, reported that optimum prawn growth in brackish water occurred at 2 ppt, though excellent growth and survival was evident at a mean salinity of 7.2 ppt. Nelson (1968) found that golden shiner tolerance to salinity exceeded salinity levels measured in this study, although Huner and Dupree (1984) reported that many freshwater fish grow poorly or die at salinities greater than 5.0 ppt.

Total alkalinity was within acceptable limits (Boyd 1979) and ranged from 186 to 283 mg/L as CaCO\textsubscript{3}. Un-ionized ammonia (NH\textsubscript{3}N) never reached levels reported to be acutely toxic to prawns or shiners (Boyd 1979), ranging from 0.007 to 0.038 mg/L. Huner and Dupree (1984) and Boyd (1979) suggest that if levels remain below 0.06 mg/L there should be no adverse effect on aquatic organisms. Total hardness ranged from 276 to 753 mg/L as CaCO\textsubscript{3}. Hanson and Goodwin (1977) stated that as total hardness increased from 63 mg/L to 500 mg/L prawn growth decreased significantly.

Prawn Growth

Growth of prawns by treatment is shown in Table 3. Prawns grew continuously in the control (fed) and fed polyculture treatment until harvest, averaging 0.7 mm/day. There was no significant difference ($P > 0.05$) between the two. However, prawns in the treatment receiving no feed grew significantly slower ($P < 0.01$) than fed prawns, averaging 0.5 mm/day. Prawns in the unfed treatment did not grow after 13 September, three weeks prior to harvest. Apparently, the carrying capacity of the pond for natural food organisms had been reached. Similar results were reported by Perry et al. (1980) for unfed prawns.

The presence of shiners did not affect prawn growth ($P > 0.05$) when compared with prawns grown in monoculture (Table 3). Miltner et al. (1982), Huner et al. (1983), and Pavel (1985) observed that channel catfish had no adverse effect on prawn growth when compared with prawns grown in monoculture. Minimal prawn growth was observed in all ponds ($\bar{x} = 0.14$ mm/day) during the three weeks post-stocking (13–31 May), and maximum prawn growth oc-
curred after 31 May until harvest on 8 October. Prawns were fed on 102 feeding days; the maximum amount fed was 11 kg/ha/day. Feed conversion ratios for the fed prawn control and the fed polyculture trial were 0.95 and 1.11, respectively. Feed conversion ratios were low in all ponds as had been reported in earlier studies for prawn grow-out trials (Perry and Tarver 1981; Cange et al. 1982b; Perry and Tarver 1984). Though shiners were present in two treatments with prawns, it was assumed that they consumed virtually no prawn feed since feed sank quickly to the bottom. Similarly, the shiner ration was a mash which floated. Shiners took it readily, and virtually no prawns were observed feeding on shiner feed.

Prawn Yield

Mean prawn yield for the fed prawn monoculture, fed prawns with fed shiners and unfed prawns with fed shiners was 684, 613, and 356 kg/ha, respectively (Table 3). There was no significant difference in yield between treatments where prawns were fed (P > 0.05), but there was a significant (P < 0.01) decrease in prawn yield when prawns were not fed. Stahl (1979) and Perry and Tarver (1981) found similar results in monoculture and polyculture trials with prawns and finfish. Perry et al. (1982) reported an average yield of only 217 kg/ha for unfed prawns stocked at 37,050 per ha after 163 growing days, about 315% less production than fed prawns stocked in monoculture in that study. Prawns in the prawn (fed) control, fed prawns with fed shiners and unfed prawns with fed shiners had 78% (534 kg/ha), 80% (490 kg/ha), and 27% (96 kg/ha) of the harvest over the minimal marketable size of 30 g (Willis and Berrigan 1977; Smith et al. 1978). With the present market-size requirement for prawns, farmers will not realize a benefit with unfed prawns grown at 37,050 per ha and a short (150- to 170-) day growing season. Eble et al. (1977) and Jewel (1984) discussed the use of waste-heat and geothermal inputs as a means of increasing the growing season in

### Table 3. Production data for prawns by treatment in prawn-shiner polyculture study at Rockefeller Wildlife Refuge, Grand Chenier, Louisiana, from 13 May to 8 October 1985.

<table>
<thead>
<tr>
<th>Production parameter</th>
<th>PC³ (3)</th>
<th>PNSF⁴ (4)</th>
<th>PFSF⁵ (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number stocked per pond</td>
<td>1,482</td>
<td>1,482</td>
<td>1,482</td>
</tr>
<tr>
<td>Weight stocked per pond</td>
<td>0.963</td>
<td>0.963</td>
<td>0.963</td>
</tr>
<tr>
<td>Average size at stocking (g)</td>
<td>0.65</td>
<td>0.65</td>
<td>0.65</td>
</tr>
<tr>
<td>Average size at harvest (g)</td>
<td>28.7 ± 4.6</td>
<td>17.3 ± 5.2</td>
<td>26.3 ± 5.0</td>
</tr>
<tr>
<td>Food conversion ratio</td>
<td>0.95 ± 0.05</td>
<td>—</td>
<td>1.11 ± 0.4</td>
</tr>
<tr>
<td>Number recovered per pond</td>
<td>969 ± 167</td>
<td>883.3 ± 285</td>
<td>937.5 ± 108</td>
</tr>
<tr>
<td>Survival percent</td>
<td>65.4 ± 11.0</td>
<td>59.5 ± 19.3</td>
<td>63.2 ± 7.2</td>
</tr>
<tr>
<td>Net yield (kg/ha)</td>
<td>683.1 ± 31.3</td>
<td>354.7 ± 63.7</td>
<td>611.9 ± 126</td>
</tr>
</tbody>
</table>

³Treatment means ± one standard deviation.
⁴Prawn control (fed).
⁵Prawns not fed, shiners fed.
⁶Prawns fed, shiners fed.
Table 4. Production data\(^a\) for shiners by treatment in prawn-shiner polyculture study at Rockefeller Wildlife Refuge, Grand Chenier, Louisiana, from 13 May to 8 October 1985.

<table>
<thead>
<tr>
<th>Production parameter</th>
<th>SC(^b) (4)</th>
<th>PNSF(^c) (4)</th>
<th>PFSF(^d) (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number stocked per pond</td>
<td>12,844</td>
<td>12,844</td>
<td>12,844</td>
</tr>
<tr>
<td>Weight stocked (kg) per pond</td>
<td>2.86</td>
<td>2.86</td>
<td>2.86</td>
</tr>
<tr>
<td>Average size at stocking (g)</td>
<td>0.22</td>
<td>0.22</td>
<td>0.22</td>
</tr>
<tr>
<td>Average size at harvest (g)</td>
<td>2.5 (\pm) 0.68</td>
<td>5.5 (\pm) 2.5</td>
<td>9.9 (\pm) 1.8</td>
</tr>
<tr>
<td>Food conversion ratio</td>
<td>0.4 (\pm) 0.08</td>
<td>1.1 (\pm) 0.42</td>
<td>0.5 (\pm) 0.26</td>
</tr>
<tr>
<td>Number recovered per pond</td>
<td>7,871 (\pm) 2,988</td>
<td>3,360 (\pm) 4,140</td>
<td>1,802 (\pm) 605</td>
</tr>
<tr>
<td>Survival percent</td>
<td>60.5 (\pm) 23</td>
<td>25.7 (\pm) 31.7</td>
<td>13.8 (\pm) 4.6</td>
</tr>
<tr>
<td>Net yield</td>
<td>465.9 (\pm) 87</td>
<td>262.7 (\pm) 131</td>
<td>453.4 (\pm) 201</td>
</tr>
</tbody>
</table>

\(^a\) Treatment means \(\pm\) one standard deviation.
\(^b\) Shiner control (fed).
\(^c\) Prawns not fed, shiners fed.
\(^d\) Prawns fed, shiners fed.

north and south temperate regions to maximize yield. A decrease in stocking density is another technique that may increase the size of prawns at harvest, but the yield suffers. Perry et al. (1982) reported that as density was decreased, prawn survival and size at harvest increased.

**Shiner Growth**

Shiner growth in each treatment is shown in Table 4. Growth was continuous in all treatments from the time stocked until harvest, averaging 0.45 mm/day. Shiner growth was significantly different between treatments \((P < 0.01)\). As shiner survival decreased, there was a significant increase in average size \((P < 0.05)\) as a result of the lower fish density. Shiners in all treatments at harvest reached or exceeded predicted size for *Pomoxis* spp. fish bait. Mean feed conversion rates for all treatments combined averaged 0.7. Obviously shiners utilized natural food resources in the ponds. Crawford and Freeze (1982) stated that fathead minnows fed on natural foods, resulting in low feed conversion ratios in polyculture with Malaysian prawns.

**Shiner Survival**

Mean shiner survival for fed shiner monoculture, shiners with unfed prawns (PNSF), and fed shiners with fed prawns (PFSF) was 61, 26, and 14%, respectively (Table 4). Overall shiner survival ranged from 5 to 92%. Survival was significantly higher in shiner monoculture than in shiner-prawn polyculture systems \((P < 0.01)\), which indicates that prawns had an adverse effect on shiner survival. Shiner survival was higher for those grown with unfed prawns (26%) than with fed prawns (14%). Although there was a significant difference \((P < 0.01)\) between these polyculture treatments, this could not be interpreted biologically. It is possible that some unmeasured factor, not prawns, contributed to the increased shiner mortality. If prawns were actively seeking shiners due to limited nutritional resources, survival would have been lower in ponds with unfed prawns. On the other hand, fed prawns, being larger, may have been better predators of shiners.

**Shiner Yield**

Mean yield of golden shiners for fed shiner monoculture, fed shiners with fed prawns, and fed shiners with unfed prawns was 466, 453, and 263 kg/ha, respectively (Table 4). There were no significant differences between the treatments for yield \((P > 0.05)\). The introduction of prawns, then, may have lowered survival, but yield was not significantly decreased because of a larger shiner.
Table 5. Total yield (prawn harvest weight + shiner harvest weight) by treatment for 149 day grow-out at Rockefeller Wildlife Refuge, Grand Chenier, Louisiana, from 13 May to 8 October 1985.

<table>
<thead>
<tr>
<th>Species</th>
<th>PC&lt;sup&gt;a&lt;/sup&gt;</th>
<th>SC&lt;sup&gt;b&lt;/sup&gt;</th>
<th>PNSF&lt;sup&gt;c&lt;/sup&gt;</th>
<th>PFSF&lt;sup&gt;d&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prawn gross yield (kg/ha)</td>
<td>684.1</td>
<td>--</td>
<td>355.7</td>
<td>612.9</td>
</tr>
<tr>
<td>Shiner gross yield (kg/ha)</td>
<td>--</td>
<td>468.8</td>
<td>265.6</td>
<td>456.3</td>
</tr>
<tr>
<td>Total gross yield (kg/ha)</td>
<td>684.1</td>
<td>468.8</td>
<td>621.3</td>
<td>1,069.2</td>
</tr>
</tbody>
</table>

<sup>a</sup> Prawn control (fed).
<sup>b</sup> Shiner control (fed).
<sup>c</sup> Prawns not fed, shiners fed.
<sup>d</sup> Prawns and shiners fed.

Size at harvest. In a pilot study (unpublished data) with a prawn-shiner culture scheme and the same stocking densities for shiners, shiner yields ranged from 134 to 403 kg/ha with an average production of 168 kg/ha. Crawford and Freeze (1982), reported fathead minnow yields of 373 to 444 kg/ha when grown in polyculture with prawns. These minnow yields equaled or exceeded commercial production data for minnow producers in Arkansas (Crawford and Freeze 1982).

**Total Yields**

Mean total yields (prawns plus shiners) by treatment are presented in Table 5. Total yield for the shiner monoculture was 469 kg/ha, 621 kg/ha for the unfed prawn and fed shiner polyculture, and 684 kg/ha for the prawn monoculture, compared with 1,069 kg/ha for the fed polyculture system. Total yields were significantly increased by the presence of prawns (P < 0.01) and also by the addition of supplemental feeding (P < 0.01). By adding prawns, total yield was increased by 234% in the fed prawn shiner polyculture, and by adding supplemental feed, total yield increased by 172% over yield in the shiner monoculture. Similar increases in production have been reported in previous prawn-finish and finfish polycultures (Guerrero and Guerrero 1977; Brick and Stickney 1979; Cohen et al. 1983).

**Conclusions**

1. Prawn growth, survival, and yield were not affected by the presence of shiners. Shinner survival was apparently decreased by the presence of prawns, but prawns did not decrease shiner yield. Further evaluations should be made regarding actual prawn predation on shiners.

2. Because of the relatively short growing season in southern Louisiana, prawns will probably have to be fed unless thermal inputs are used, select strains suited for the area utilized, or a market established for prawns less than 30 g in weight.

3. Stocking and harvesting dates for shiners and prawns coincided well. It could be feasible to produce two shiner crops annually within one prawn growing season in southern Louisiana.

4. Separation of prawns and shiners at harvest presented no major difficulties, other than slightly increased harvest time.

5. The significance of these results are that two crops (prawns and shiners) can be grown together, increasing yield and potential profit. The strategy, then, is that prawn production supplements shiner production on commercial minnow farms.

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