

Products and Markets for Small Louisiana Shrimp

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Introduction

The Louisiana shrimp industry is undergoing a period of change because of increased competition and changes in shrimp markets. Shrimp imports have increased rapidly, rising 180 million pounds between 1976 and 1985. The percentage of the total U.S. shrimp supply accounted for by imports increased from 50 to 70 percent (U.S. Department of Commerce, 1986a) during that period. This increase in canned imports was even greater, increasing from 11 to over 80 percent (U.S. Department of Commerce, 1986a). These canned imports, mainly from Thailand, compete directly with Louisiana canned shrimp.

Historically, the shrimp industry in Louisiana has had its foundation in the harvest of small shrimp from the state's inshore waters. This is an important difference between Louisiana's and other Gulf states' shrimp industries. This has been a controversial practice, as some fishery managers and industry members

argue that the shrimp should be allowed to grow to larger sizes. It has been proposed that this would improve the financial situation of the entire industry.

Yet in any reallocation of resources there are always those that gain and others that lose. A management plan that would increase the size of shrimp harvested from Louisiana's waters would have to decrease the shrimp available to the 13,000 inshore shrimpers and reallocate the landings to the 1,700 offshore shrimpers (Roberts and Pawlyk, 1986). The inshore fleet is composed of smaller state-registered boats that are not able to shrimp in deeper waters where the larger, offshore Coast Guard-documented vessels currently fish.

Studies have been done of the large and varied Louisiana shrimping fleet (Roberts and Sass, 1980; Roberts and Sass, 1979; Sass and Roberts, 1979), but none have examined the shore-based facilities of the state. When investigating management plans, it is important to have baseline information that this study provided. For example, the Gulf Council's shrimp management plan, in cooperation with the state of Texas, instituted a program designed to delay harvest of brown shrimp in order to increase shrimp size at harvest. The shrimpers and processing industry are forced to forego income during the closure in hope of larger income after the season opens. Analysis done by the National Marine Fisheries Service (NMFS) has

shown that the value of landings is greater with the closure (personal communication, anonymous reviewer). It has not been documented whether this increase in value of landings compensates for all the costs caused by the closure and the delayed income.

Caillouet and Patella (1978) reported that there was evidence of an increase in the proportion of shrimp landed in the 68-and-over size category of shrimp in Texas and Louisiana. Another study reported that from 1950 to 1980, the Gulf supply of shrimp in this size category increased more than three times (Vondruska, 1984), while landings from the Gulf region increased only 40 percent (U.S. Department of the Interior, 1965; U.S. Department of Commerce, 1981). These increases in supply provide another reason why the products and markets for small shrimp should be better understood.

Another purpose for studying the uses of small shrimp was to determine their importance in creating employment in Louisiana. Shrimp has the highest total value of all Louisiana fisheries. The extensive shrimp industry is located in the state's southern parishes. With the decline of the oil-based economy in this area, interest is growing in promoting industries that are based on renewable resources to create employment. The effects of adding value to small shrimp through processing and the employment that this creates should be understood.

Methods

Data were collected from Louisiana shrimp processing and marketing firms using personal interviews. The 1984 survey covered 1983 calendar year operations. The firms were first stratified by location. They were located

ABSTRACT—Louisiana has long been known for its sometimes controversial harvest of small shrimp from its inshore waters. With the trend toward landings of smaller shrimp from the Gulf, the economics of the small shrimp processing and marketing industry is of increasing importance. The production of three shrimp products, raw head-on, peeled, and canned, was found to be dependent on small-shrimp supply. Over 20 percent of the shrimp moving through Louisiana's processing plants was shipped out of the state for further processing. Most of these were small, head-on shrimp. Louisiana is an important supplier of small-shrimp products and small shrimp for processors in other Gulf states.

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throughout southern Louisiana, from Cameron in the west to Venice in the Mississippi River delta. Some of the firms were located in metropolitan New Orleans, but the majority were found in much smaller towns. The surveyed firms were also stratified by the types of shrimp products that they were thought to produce so that an adequate sample of each type of product would be included in the survey. The 31 selected respondents accounted for 59 percent of the volume of Louisiana's shrimp landings as reported by the NMFS (U.S. Department of Commerce, 1986c) and 39 percent of the 80 land-based shrimp firms thought to be located in Louisiana.

For the purposes of this study, small shrimp were defined as those that were >50 count, headless, per pound. This definition was made after consultation with individuals knowledgeable about the Louisiana shrimp industry, especially the canning sector. Of the approximately 42 million pounds of product sold by the 31 firms in the survey, 65 percent, or 27.4 million pounds, were from small shrimp, the size with which Louisiana differentiated itself from the other Gulf states.

Firm Characteristics

The firms in Louisiana's shrimp industry were divided into two distinct types: 1) Handlers, which produce only raw head-on or raw headless shrimp, and 2) processors, which process some or all of their shrimp into frozen-headless, peeled, canned, dried, and breaded products. On the basis of this classification, 39 percent of the surveyed firms were handlers and the remainder, processors (Table 1). The firms were also classified by size according to their dollar value of sales: Small firms had <\$3 million in sales, medium firms had

Table 1.—Number of firms surveyed by type and size of firm.

Firm type	All firms	Small	Medium	Large
Handlers	12	7	5	0
Processors	19	7	7	5
Total	31	14	12	5

\$3-5 million in sales, and large firms had sales >\$5 million.

The firms also were divided into two other classifications: Those that utilized more than 50 percent small shrimp and those firms that utilized less than 50 percent. This resulted in 19 firms in the small-shrimp utilization category. Two thirds or more of the shrimp purchased by these firms were smaller than 50-count headless to the pound. This classification was used to examine the differences that might occur between firms dependent on small shrimp and the rest of the industry.

Table 2 illustrates some of the descriptive differences among the size classifications of the shrimp firms. Average sales were just under \$5 million, with a wide range from small to large firms. In 1983, handlers averaged \$2.8 million in sales and processors \$6.2 million. Average age of the firms was 22 years, with little variation by firm size. However, processors averaged 29 years in business, while handlers averaged only 10 years. It was determined that many of the handlers began business by purchasing an already existing shrimp handling business. The turnover of these firms accounts for their shorter time in the business.

The investment information in Table 2 provides further insight into the relative newness of the handling firms. Many of these firms are small. While the average initial investment for all firms was over \$450,000, initial investment for the small firms was only \$150,000, making them easier to purchase. The initial investment for medium-sized firms was more than three times that of the small firms and

Table 2.—Average characteristics of the Louisiana shrimp industry, 1983.

Item	All firms	Small	Medium	Large
Sales (million dollars)	\$4.9	\$2.6	\$4.3	\$14.1
Age of firm (years)	22.0	20.4	23.7	22.2
Investment	\$469,000	\$150,000	\$560,000	\$1,700,000
Equity/borrowed ratio	0.303	1.38	0.358	0.055

that for large firms was 10 times that of the small firms. The ratio of owner's equity to borrowed capital gives the relative amounts that the investor must finance in order to get into the shrimp industry. Entry was easier with small firms. The prospective investor could provide more of the total capital necessary to begin business than the investor needed to finance from banks or other sources. The situation for large-sized firms was reversed. It was necessary to borrow almost all of the needed capital to start up a large shrimp firm. These factors account for the relative newness of the small shrimp handlers in Louisiana's shrimp industry.

Employment

A total of 1,167 people, full and part-time, was employed during the season by the 31 firms surveyed. These firms represent an important source of seasonal employment in the small coastal towns where they are located. It was estimated that 1,978 people were employed by the entire Louisiana shrimp processing and handling industry during the shrimping season, judging from the percentage of landings covered by the survey. Table 3 details the employment by position and by whether these were year-round or seasonal jobs.

There were very few year-round positions provided by these firms, with an overall average of eight per firm. There was little variation in this figure by size of firm. There was a wide variation in the number of seasonal employees by size of firm. Small firms hired just over

Table 3.—Average number of employees of Louisiana's shrimp industry by size of firm and type of position, 1983.

Position	All firms	Small	Medium	Large
Year-round				
Management	2.6	2.1	2.9	3.2
Plant Workers	4.5	5.2	3.6	4.6
Clerical	0.8	0.4	0.9	1.6
Sales	0.2	0.0	0.4	0.0
Subtotal	8.1	7.7	7.8	9.4
Seasonal				
Plant Workers	29.4	14.3	26.8	78.0
Clerical	0.2	0.1	0.0	0.8
Subtotal	29.6	14.4	26.8	78.8
Grand total	37.7	22.1	34.6	88.2

14 seasonal workers, while the large firms hired nearly 80 per plant. The overall average was just under 30 seasonal employees.

An important consideration for the state of Louisiana is the amount of employment created by firms dependent on small shrimp for their operations. It has been argued that firms that utilize small shrimp create more jobs than those that rely on larger shrimp. The firms were divided into two groups as described in the methods section of this paper; the 19 firms that used more than 50 percent small shrimp (>50 count headless) for their inputs were compared with the 12 that used less than 50 percent small shrimp. The small-shrimp-dependent firms had an average of 7.6 year-round positions and 29.7 seasonal jobs per plant. Those firms that were not small-shrimp-dependent had 8.7 year-round jobs per plant and 29.5 seasonal jobs. On the average, small-shrimp-dependent firms created no more employment than the other firms.

When examining employment, special attention should be paid to the firms with the greatest numbers of employees per firm, the canneries. All of the canneries fell into the small-shrimp-dependent category and were responsible for many of the jobs created by small-shrimp-dependent firms. Canneries averaged 14.6 year-round positions and 85.6 seasonal jobs. Firms other than canneries that were dependent on small shrimp had only 5.1 year-round and 14.9 seasonal positions per plant.

The closing of a cannery or other large shrimp processing plant can have varying effects on the local economy, depending on the firm's location. The loss of a plant in metropolitan New Orleans would not affect that area's eco-

nomy as greatly as the closing of a firm in one of the smaller towns located throughout southern Louisiana. The loss of plants in such depressed areas would have much more serious consequences for the local economy.

Table 4 details the total employment created by the surveyed firms. Only 21 percent of the positions are year-round. The seasonal employment created by the shrimp industry can have an important impact on southern Louisiana. The data in Table 5 have been divided according to dependence on small shrimp. This illustrates the importance of small shrimp on southern Louisiana. The small-shrimp-dependent firms account for 61 percent of the employment in the surveyed firms. About 60 percent of the 709 jobs created by the surveyed small-shrimp-dependent firms were in the five firms that canned shrimp.

Shrimp Supply

The sources of supply for small shrimp used by Louisiana's shrimp firms are detailed in Table 6. Over 75 percent of the shrimp were unloaded at the firm's dock, with about 5 percent of total shrimp supply coming directly from company-owned vessels. The remaining shrimp were unloaded from independent shrimpers. Transshipments (shipments from other Louisiana shrimp firms) accounted for just over 15 percent of the small shrimp supply. About 5 percent of small-shrimp supplies were from brokers and other U.S. firms. Less than 0.5 percent of small shrimp was imported. This is in contrast to Florida, where only 35 percent of the shrimp purchased for processing was supplied

by Florida's shrimpers (Prochaska and Andrews, 1974).

Sources of supply of small shrimp varied by size of firm. As the size of the firm increased, the reliance on its own dock for supply of small shrimp decreased. Some of the large firms did not operate dock facilities, but trucked in all shrimp needed for processing. The large firms relied more on transshipments and out-of-state sources for shrimp supplies. Surprisingly, even though large firms landed less shrimp at their docks, they did not use any imported small shrimp. Imports accounted for a very small percentage of the small shrimp used by Louisiana's shrimp industry. Florida's shrimp industry imported 40 percent of the volume of shrimp processed in that state (Alvarez et al., 1976).

The sources of supply of small shrimp did not vary significantly from the sources of all shrimp used by the Louisiana shrimp industry (Roberts and Pawlyk, 1986a). With the quantities of shrimp imported by the United States increasing every year since 1980 (452.2 million pounds in 1985; NMFS, 1986), shrimp of other sizes are readily available to the Louisiana shrimp industry. Shrimp are also available from other states. These sources were not found to be important to Louisiana's shrimp industry. The industry remains dependent on small shrimp.

Products and Marketing Channels

The shrimp products sold by the surveyed firms were as follows: Fresh head-on, fresh headless, frozen headless, canned, peeled, breaded, and

Table 4.—Total employment in surveyed firms, by size of firm and type of position.

Firm size	Year-round	Seasonal	Total
Small	108	202	310
Medium	94	322	416
Large	47	394	441
Total	249	918	1,167

Table 5.—Total employment in surveyed firms, by dependence on small shrimp.

Firm type	Year-round	Seasonal	Total
Not dependent on small shrimp	104	354	458
Small-shrimp dependent			
Canneries	73	355	428
Other	72	209	281
Subtotal	145	564	709
Grand total	249	918	1,167

Table 6.—Sources of supply of small shrimp for Louisiana's shrimp industry by size of firm, 1983.

Source	All firms	Small	Medium	Large
Company vessels	5.3	10.7	0.3	3.0
Independent vessels	72.6	84.2	66.9	53.4
Subtotal	77.9	94.9	67.2	56.4
Transshipments	16.5	2.7	30.9	20.0
Brokers	3.2	0.7	0.0	18.0
Other U.S. firms	1.7	0.1	1.9	5.6
Imports	0.4	0.9	0.0	0.0
Grand total ¹	100.0	100.0	100.0	100.0

¹May not add to 100 percent due to rounding.



Figure 1.—Market areas for Louisiana shrimp.

dried. Fresh and frozen headless shrimp were combined into one product type, headless shrimp, because of their similarities and the relatively small amount of fresh headless shrimp produced (5.5 percent of total production). Peeled, breaded, and dried shrimp were combined into the category of "other" shrimp, since the latter two products represented only 2 percent of total volume sold by the surveyed firms and were sold by one and two of the firms, respectively.

The relative importance of small shrimp by product type is depicted in Table 7. These calculations were based on the amount of >50 count, headless shrimp used in each product category. Three products, head-on, canned, and "other," were over 70 percent small shrimp. Peeled shrimp were 77 percent small.

Since there has been increasing interest in adding value to seafood products through processing to create employment in Louisiana, it is interesting that the least processed product, head-on shrimp, and the two most processed products, canned and "other" shrimp, are all dependent on small shrimp.

The market channels for Louisiana's small shrimp were investigated by asking the surveyed firms to provide infor-

mation on the locations of their sales by type of product. Other Gulf states become involved in the processing of small shrimp through the receipt of small Louisiana raw shrimp. To identify the amount of shrimp that leaves Louisiana to be processed, the other Gulf states and Louisiana were designated as separate market areas. This was done because it was hypothesized that raw shrimp shipped out of Louisiana would ultimately be processed in other Gulf states. The remaining markets in the shrimp product distribution system were identified as large regions (Fig. 1). Alaska and Hawaii were considered part of the western market. Any shrimp shipped out of the United States was designated as exported.

The Louisiana shrimp production that was marketed in each area by product category is identified in Table 8. Table 8 also contains the percent of total production that is further processed outside Louisiana. Almost 27 percent of the 42 million pounds sold by the surveyed firms was sold as raw, head-on shrimp. Over 60 percent of the total head-on volume went to the other Gulf states. On a headless basis, this amounted to 6.9 million pounds of raw, head-on shrimp in 1983, of which 5.1 million pounds were small. Survey data were used to

Table 7.—Percent and volume (in million pounds) of use of small shrimp (>50 count, headless) by product type by surveyed Louisiana firms, 1983.

Product form	Small shrimp		
	Total volume	Percent	Volume
Head on	11.2	73.6	8.2
Headless	13.2	28.3	3.9
Canned	9.1	100.0	9.1
"Other"	8.2	77.5	6.2
	42.1		27.4

Table 8.—Market channels for Louisiana shrimp products in percent of total pounds sold, 1983.

Market area	Product form			
	Head on	Headless	Canned	Other
Louisiana	8.7	6.0	5.1	4.6
Other Gulf	16.5 (15.4) ¹	5.0 (2.7)	2.0	3.1
Southeast	0.5 (0.5)	2.5 (0.6)	2.7	2.7
Northeast	0.9 (0.0)	9.5 (1.4)	2.5	6.6
Midwest	0.0 (0.0)	7.2 (1.6)	2.8	0.9
West	0.1 (0.1)	1.5 (0.1)	3.6	0.8
Export	0.0 (0.0)	1.3 (0.2)	2.9	0.1
Total	26.7 (16.0)	32.9 (6.6)	21.6	18.9

¹Percent of total production further processed in each market area. For descriptions of market areas, see Figure 1.

estimate corresponding figures for all Louisiana firms based on 1983 landings. Even though the surveyed firms represented 38 percent of the shrimp firms located in the state, it was thought that since they accounted for 59 percent of the landings, that the latter figure would be more appropriate for estimating the total volumes for each product sold. Of the fresh Louisiana head-on shrimp sold, 11.8 million pounds were shipped to the other Gulf states with 10.9 million pounds being processed there. About 8.1 million of the 10.9 million pounds was classified as small. A total of 11.4 million pounds of head-on shrimp were further processed outside of Louisiana, with 8.4 million pounds classified as small.

Headless shrimp had the lowest percentage and volume of small shrimp of the four product classifications. At the time of the survey, there was not a favorable market for small headless shrimp. There was less out-of-state processing done on headless shrimp than was done to the head-on shrimp. A total

Table 9.—Number of Gulf canned shrimp processing plants, total Gulf canned production, and imports, 1960-85 (NMFS data).

Year	Number of plants	Canned shrimp (millions of cases)	
		Domestic	Imported
1960	34	1.9	NA ¹
1961	33	1.1	NA
1962	34	1.7	NA
1963	31	2.2	0.6
1964	26	1.3	0.4
1965	28	2.2	0.3
1966	28	1.9	0.2
1967	29	2.0	0.3
1968	28	2.0	0.6
1969	26	2.0	0.5
1970	24	2.5	0.6
1971	23	2.1	0.4
1972	21	2.2	0.2
1973	21	2.0	0.4
1974	20	1.9	0.9
1975	19	1.0	0.2
1976	16	1.7	0.4
1977	15	2.1	0.4
1978	14	1.5	0.6
1979	13	0.9	0.6
1980	13	1.8	0.6
1981	12	1.1	0.7
1982	11	0.7	0.8
1983	12	1.0	2.0
1984	11	0.9	2.0
1985	10	0.5	2.5 ²

¹Not available.
²Preliminary.

of 9.4 million pounds of headless shrimp were shipped out of Louisiana for further processing by all Louisiana firms. Of this, 1.5 million pounds were small shrimp.

Louisiana supplied 9.9 million pounds of small shrimp to other states for further processing, which was 5 percent of the 1983 Gulf landings of shrimp. Louisiana is an important supplier of small shrimp used in processing plants around the Gulf. However, employment that might be created by the processing of these shrimp is being lost by Louisiana.

While head-on shrimp were distributed to only two of the market areas, canned and "other" shrimp were sold by the surveyed firms to all of the market areas including the export market. Canned shrimp were evenly distributed throughout the market areas. A larger proportion of "other" shrimp was shipped to the northeast, less to other areas. Based on estimates for all Louisiana firms, canned shrimp accounted for 15.4 million pounds of the small pro-

cessed shrimp in 1983. Total pounds of "other" shrimp sold were 13.6 million headless, with 10.4 million pounds classified as small. The exports of canned Louisiana shrimp accounted for 27 percent of the 7.6 million pounds of canned shrimp exports in 1983 (U.S. Department of Commerce, 1986a). Even though the volume of Gulf shrimp landings increased from 126 million pounds in 1983 to 162 million pounds in 1984 (U.S. Department of Commerce, 1986b), the amount of shrimp canned in the Gulf fell from 937,000 cases to 819,000, and fell further in 1985 to 548,000 (U.S. Department of Commerce, 1986c), even though Louisiana's shrimp harvest set a new record (74 million pounds, U.S. Department of Commerce, 1986c). The decline in canning must have been caused by factors other than quantity of landings in the needed sizes. This is another indication of the decline in the U.S. shrimp canning industry.

One factor contributing to the decrease in Gulf canned pack shrimp is increasing competition from imported canned shrimp (Table 9), especially from Thailand. The first year that canned shrimp imports exceeded Gulf canned pack was 1982. An expanding seafood canning industry in Thailand has been cited as an important factor in the increased imports of canned shrimp in the United States market.

Firm Concentration

Another way to examine Louisiana's small shrimp industry is to analyze the concentration of production using the Lorenz curve analysis. A Lorenz curve is a continuous function that graphically depicts the relationship between the percentage of firms and the percentage of sales made by these firms. If each firm has an equal share of sales, the Lorenz curve will appear as a diagonal line originating from the origin of the graph. An industry with most of the production coming from one large firm will appear as a concave line, with the line "bowed" toward the right hand side of the graph. The more concentrated the industry, the further the Lorenz curve will "bowed" to the right, away from the diagonal line.

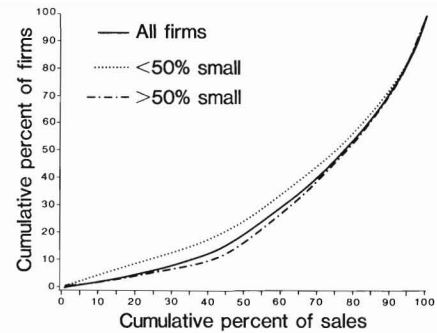


Figure 2.—Lorenz curves for the Louisiana shrimp industry by percent of small shrimp used, 1983.

It was hypothesized that the production from firms that utilized mostly small shrimp would be concentrated in fewer firms than those that processed larger shrimp, because of the presence of large canners in the small-shrimp-dependent group. To examine this hypothesis, the surveyed firms were divided into two groups according to their dependence on small shrimp, as described in the Methods section. The shrimp purchased by 12 of the firms consisted of <50 percent small shrimp, while the remaining 19 firms' shrimp purchases were >50 percent small. As can be seen from Figure 2, the hypothesis was supported. Those firms that used more than 50 percent small shrimp were more concentrated than those that were less dependent on these sizes.

A factor contributing to the concentration of the firms dependent on small shrimp is the increasing concentration of canners in the Gulf. As can be seen in Table 9, the number of shrimp canners in the Gulf has been steadily decreasing over time. There were only one-third as many canners in 1984 as there were in 1960.

Perceived Problems

The Louisiana small shrimp processing and marketing industry is not without its problems. The shrimp industry has been faced with increasing competition from imports. When asked to identify factors that would affect firm growth in the future, imported and cultured shrimp accounted for 29 and 16

percent of the answers, respectively. This is not surprising given the rapid increase of shrimp imports in recent years and the industries' dependence on domestic supplies of shrimp. Canneries were especially concerned with the rapidly rising imports of inexpensive canned shrimp, especially from Thailand. One difficulty reported by some of the canners is that the smallest size category of canned shrimp does not have a minimum size. Thus, Thai canned shrimp can be smaller than domestic canned shrimp and still stay within Food and Drug Administration regulations. This, coupled with lower labor costs, gives the canned imports a price advantage. Overall supply of shrimp and supply of shrimp in certain sizes was also a major concern of Louisiana's shrimp industry. These categories accounted for 22 and 9 percent of the responses, respectively. It is important to note that none of these problems can be directly controlled by the individual firms or the industry itself.

Discussion

Small shrimp are important to the economy of southern Louisiana. About 27.3 million pounds or 65 percent of all shrimp sold in 1983 by the 31 firms surveyed were small (<50 count headless). Out of this amount, 15.3 million pounds were processed into canned shrimp (9.1 million pounds) or "other" shrimp (6.2 million pounds). Canneries accounted for many of the almost 1,200 full and part-time jobs created by the surveyed firms. With a steady decline in both Gulf canneries and canned shrimp, and with rising imports in this product category, canners are declining as a source of employment for southern Louisiana. The only other Louisiana products in which small shrimp were used in large amounts were "other" shrimp (mostly peeled), and raw head-on. Much of the raw head-on shrimp was shipped from the state to be processed elsewhere. If the percentage of shrimp leaving Louisiana for processing increases from its current level of

22.6 percent, additional jobs will be lost in Louisiana.

The survey of firms did not gather any data on whether the peeled market can be expanded to compensate for the decline of the domestic canned market. Two indications that it may expand are: 1) All but one of the canneries also sold peeled shrimp; thus they have some experience with this product and may be able to redirect their marketing efforts to peeled shrimp products. And 2) at least three new shrimp peeling firms began operation in Louisiana in 1986.

Only one of the problems that the industry identified, the supply of shrimp in certain sizes, can be affected by the state's management of the shrimp resource. There would be winners and losers in any change in the current management scheme. If management moved toward larger shrimp, Louisiana firms that sell headless shrimp will have a greater supply of shrimp. The supply of shrimp for peeling would decline, affecting this market, which is attracting new firms. A decline in quantities of small shrimp would also adversely affect the canners, whose market is already in decline. Total employment would decline since canneries hire a large percentage of the seasonal workers employed by the industry. This could have a severe affect on the economy of the small, southern Louisiana towns where many of these firms are located. Other changes in total employment would be caused by changes in the number of firms operating in Louisiana. The shrimp resource would reallocate from the 13,000 shrimp trawlers and the 4,000 butterfly netters that operated in the state's inshore waters in 1985 to the 1,700 larger vessels that shrimped offshore (Roberts and Pawlyk, 1986), which would again lessen employment.

The Louisiana small-shrimp-dependent industry must adapt to the changing conditions caused by increased competition and changes in the markets for shrimp. It is hampered by the fact that none of these changes are directly under the control of the firms or the industry. How the industry and managers

react to these changes will have lasting effects on the economy of southern Louisiana.

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Literature Cited

- Alvarez, J., C. O. Andrews, and F. J. Prochaska. 1976. Economic structure of the Florida shrimp processing industry. Univ. Fla. Sea Grant Coll. Program, Rep. 9, 46 p.
- Caillouet, C. W., and F. J. Patella. 1978. Relationship between size composition and ex-vessel value of reported shrimp catches from two Gulf coast states with different harvesting strategies. *Mar. Fish. Rev.* 40(2):14-18.
- Prochaska, F. J., and C. O. Andrews. 1974. Shrimp processing in the southeast: Supply problems and structural change. *S. J. Agric. Econ.* 6(1): 247-252.
- Roberts, K. J., and P. W. Pawlyk. 1986a. Louisiana shrimp marketing, with reference to small shrimp. La. State Univ. Sea Grant Coll. Program, Rep. LSU-TL-86-001, 70 p.
- _____, and _____. 1986b. Louisiana's commercial fishing licenses issued from 1976 to 1985. La. State Univ. Sea Grant Coll. Program, Rep. LSU-TL-86-003, 15 p.
- _____, and M. E. Sass. 1980. Louisiana's inshore shrimp fishery. La. State Univ. Sea Grant Coll. Program, Rep. LSU-TL-80-003, 12 p.
- _____, and _____. 1979. Financial aspects of Louisiana shrimp vessels, 1978. La. State Univ. Sea Grant Coll. Program, Rep. LSU-TL-79-007, 9 p.
- Sass, M. E., and K. J. Roberts. 1979. Characteristics of the Louisiana shrimp fleet. La. State Univ. Sea Grant Coll. Program, Rep. LSU-TL-79-006, 15 p.
- U.S. Department of Commerce. 1986a. Fisheries of the United States, 1985. U.S. Dep. Commer., NOAA, Natl. Mar. Fish. Serv., *Curr. Fish. Stat.* 8380, 121 p.
- _____. 1986b. Shrimp statistics. U.S. Dep. Commer., NOAA, Natl. Mar. Fish. Serv., Jan. 1986, 2 p.
- _____. 1981. Fisheries of the United States, 1980. U.S. Dep. Commer., NOAA, Natl. Mar. Fish. Serv., *Curr. Fish. Stat.* 8100, 131 p.
- _____. 1965. Fishery statistics of the United States, 1965. U.S. Dep. Int., Bur. Commer. Fish., *Stat. Dig.* 59, 756 p.
- Vondruska, J. 1984. Trends in U.S. markets for canned shrimp. Natl. Mar. Fish. Serv., 9450 Koger Blvd., St. Petersburg, FL 33702, 6 p.