

# Estimating the Economic Impact of the Wild Shrimp, *Penaeus* sp., Fishery: A Study of Terrebonne Parish, Louisiana

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## Introduction

Louisiana's commercial shrimp fishermen face many economic and environmental challenges. These challenges are widespread across the Gulf Coast States, but the impact in Terrebonne Parish is significant due to the number of shrimpers in the area. Estrada et al. (2000) indicated that Terrebonne Parish had the

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*ABSTRACT—Two approaches are used to estimate the economic impact of domestic wild shrimp, *Penaeus* sp., fishing in Terrebonne Parish, Louisiana. A 2002 survey of commercial shrimp fishermen in the Parish yields information on sales and operating costs, and results are used to estimate a 1-yr sales effect in the Parish of \$36.7 to \$128.1 million due to shrimp fishing. In addition, 2001 shrimp ticket sales data (\$49.9 million) are input into a REMI (Regional Economic Models, Inc.) model built for the 4-parish bayou region of Louisiana. The REMI model forecasts a year 1 reduction in gross regional product (GRP) of \$45.9 million in the 4-parish area if the shrimp fishing industry were to disappear in Terrebonne Parish, and an 8-yr cumulative negative impact on GRP in the bayou region of \$191.3 million. Study limitations and suggestions for future research are included.*

largest number of vessel license holders of all Louisiana parishes. According to the Louisiana Department of Wildlife and Fisheries (LDWF), there were over 1,963 vessel licenses in Terrebonne Parish at the end of 2001, including both commercial and recreational vessels.<sup>1</sup>

The Louisiana shrimp industry represents 85% of the value of the State's total edible fishery production (Louisiana Department of Wildlife and Fisheries<sup>2</sup>). For the 20-year period from 1970 to 1990, over 40% of Gulf of Mexico shrimp taken were landed in Louisiana, and Terrebonne Parish, on average, had the highest volume of shrimp landings in the State (Estrada et al., 2000). Over time, this makes Terrebonne Parish a very significant parish/county in the gulf coast commercial wild shrimp industry.

The shrimp industry in Terrebonne Parish has a rich heritage that began in the 17th century with the Creoles and Acadians. Many commercial operations are family owned and have been handed down from generation to generation. These fishermen are born and raised in the area and rarely leave their native hometown (Louisiana Department of Wildlife and Fisheries<sup>2</sup>). They are embedded in the culture of Terrebonne Parish and Louisiana, and they attract many tourists who experience their food, fun, and general way of life.

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<sup>1</sup>Louisiana Department of Wildlife and Fisheries. Unpubl. 2001 shrimp vessel license data, commercial and recreational.

<sup>2</sup>Louisiana Department of Wildlife and Fisheries. Louisiana shrimp and shrimping. 2000. Retrieved September 23, 2002. [<http://www.wlf.state.la.us/apps/netgear/index>].

## Shrimping Industry Sectors

Commercial shrimping activities are represented in several sectors (Estrada et al., 2000).

**Shrimper**—owns and operates the boats, nets, and any other equipment used in harvesting shrimp and may sell directly to dockside dealer, processor, wholesaler, retailer, and/or consumer. Sometimes, the shrimper may own a processing plant as well.

**Dockside dealer**—purchases shrimp directly from fishermen, offers services to the fishermen, and some engage in importing shrimp from other countries.

**Processor**—purchases shrimp from fishermen and/or dockside dealers. They process the shrimp into products useful to the consumer (i.e. frozen, breaded, peeled, dried, etc.) and sell these products directly to the wholesaler or retailer (i.e. grocery stores or restaurants).

Each of these sectors is impacted by changes in catch volume and/or reduced value of the shrimp. The dealers and processors can fill the volume gaps by importing shrimp; however, the local shrimp fisherman has limited options.

This study estimates the economic impact of commercial shrimp fishing in Terrebonne Parish, La. We focus only on the shrimper sector, those who harvest wild shrimp. Two approaches are used to estimate this impact. First, results of a 2002 focus group and survey of Ter-

Terrebonne Parish shrimpers are presented. Then, the self-reported survey data are used to estimate revenues added to the local economy in a 1-year period. Second, the economic impact over an 8-year period is estimated using a REMI<sup>3</sup> (Regional Economic Models, Inc.) model created for the bayou region of Louisiana. Then, we discuss study limitations and offer suggestions for future research.

### The REMI Model

The REMI model is a forecasting system developed by George I. Treyz in order to improve the quality of research-based decision making in the public and private sectors. The model's aim is to answer "what if" questions about the financial impact of economic changes on local regions.

The model's power is in generating estimates of the regional effects of specific changes in an economy over time. The REMI Corporation builds the framework for a model around a specific area or region. This is a key difference in the REMI model, compared to other economic impact models in use. Each model is calibrated to local conditions, using a relatively large amount of local data. REMI models can be used for short- and long-term impact estimations and forecasts, while other models have limited capability for long-term analysis. The REMI models combine several analytical tools to estimate economic impacts: input-output, economic-base, and econometric models. REMI models have been used since 1980.

Economic impact models forecast three types of impacts: direct, indirect, and induced. A direct impact is created by the initial sale of the harvested shrimp, when the customer (dockside dealer or consumer) makes the purchase. Indirect impacts are secondary and are generated by direct impacts. The shrimp harvester spends the revenue from the sale buying goods and services, so the original sale of

the harvested shrimp benefits other businesses and industries. Induced impacts result from the wages and salaries paid by both directly and indirectly impacted industries, because the employees of these companies spend their income on goods and services. Induced impacts create a continual cycle of additional indirect and induced effects. The original dollars multiply in the economy.

A model was built by the REMI Corporation for the bayou region of Louisiana (which includes Terrebonne, Lafourche, Assumption, and St. Mary Parishes). This model was used to estimate the impact of the Terrebonne Parish shrimpers on the 4-parish bayou region economy. Total sales of white, *Penaeus setiferus*, and brown, *Penaeus aztecus*, shrimp (heads-on<sup>4</sup>) from the Parish for 2001 (\$49.9 million) were input into the model. The model asks "what if the wild shrimp harvesting sector in Terrebonne Parish disappeared from the economy?", deducts these shrimp sales from the overall regional revenues (in the farming, agricultural, and fisheries category), and then estimates the negative impact on the regional economy.

### Prior Attempts to Estimate the Economic Impact of Shrimping

Few attempts have been made to estimate the economic impact of shrimp fishing in the United States. None of the prior research focuses strictly on the wild shrimp fishery.

Three studies (Southwick Associates, 1997, 2005; Southwick Associates<sup>5</sup>) report the economic benefits of Louisiana fisheries, wildlife, and boating resources. Their 1997 study yielded a total estimated economic effect from marine shellfish of \$1.9 billion in 1996. The 2000 study of fisheries and boating resources in the Acadiana Bay Region of Louisiana estimated a total economic effect from commercial fisheries of

\$415.6 million in 1999. The Acadiana region includes the coastal waters of St. Mary Parish, Iberia Parish, and the eastern half of Vermilion Parish. The 2005 study of the economic benefits of fisheries, wildlife, and boating resources in Louisiana estimated the economic impact of all commercial fisheries in 2003 at \$2.6 billion, and marine shellfish contributed almost \$1.8 billion to this impact. All three Southwick studies used the Regional Input-Output Modeling System (RIMS-II)<sup>6</sup> to make these estimates.

The RIMS model was developed in the 1970's by the Bureau of Economic Analysis (BEA) as a method for estimating regional input-output (I-O) multipliers. During the 1980's, BEA enhanced the RIMS model by developing RIMS-II. This model is based on input-output tables, which show the industrial distribution of inputs purchased and outputs sold in an industry. A typical input-output table uses two data sources: 1) BEA's national I-O table shows the input and output structure of almost 500 domestic industries, and 2) BEA's regional economic accounts are used to adjust national tables for a region's industrial structure and trading patterns.

Posadas<sup>7</sup> used IMPLAN 2.0 to estimate the economic impacts due to shrimp harvesting, processing, and distribution in Mississippi at \$436,660,000 in 1997. The study includes estimates for the industry's economic impact in 1994 and 1991 (\$303,680,000 and \$290,010,000, respectively). The IMPLAN model<sup>8</sup> was developed by the USDA Forest Service in the 1970's for use in community impact analyses. In 1995, a new version of the software was developed by the Minnesota IMPLAN Group (IMPLAN 2.0). The second version creates Social Accounting Matrices, which are an extension of input-output accounts. IMPLAN

<sup>6</sup><http://www.bea.gov/bea/regional/rims>.

<sup>7</sup>Posadas, B. C. 2000. Output effects of seafood harvesting, processing and distribution in Mississippi. Power Point presentation at Mississippi State University, Coastal Research and Extension Center, 1815 Poppas Ferry Road, Biloxi, MS 39532.

<sup>8</sup><http://www.implan.com>] and <http://www.economics.nrcs.usda.gov/technical/implan/implan-model.html>.

<sup>3</sup>Mention of trade names or commercial firms does not imply endorsement by the National Marine Fisheries Service, NOAA. For a discussion of the model, see Regional Economic Models, Incorporated (REMI) Model [www.remi.com].

<sup>4</sup>Statistics are reported for heads-on and heads-off dockside sales in Louisiana. To be conservative, all sales in Terrebonne Parish are assumed heads-on in this manuscript.

<sup>5</sup>Southwick Associates. 2000. The 1999 economic contributions of fisheries and boating resources in the Acadiana Bay region. Unpubl. manusc. produced for the Acadiana Bay Assoc., New Iberia, La., 11 p.

**Table 1.— Previous studies of the economic impact of shrimping.**

Category	LaFleur, Yeates, and Aysen	Southwick (1997) and Southwick (2005)
	Economic Impact of Shrimpers in Terrebonne Parish	The Economic Benefits of Fisheries, Wildlife and Boating Resources in the State of Louisiana
Population surveyed	Shrimpers in Terrebonne Parish	Commercial fisherman in Louisiana; shrimp and shellfish
Economic model used	REMI	RIMS-II Input-Output model
Sector	Shrimp harvesters	Marine shellfish
Ex-vessel landings (dockside value)	49,997,119	221,100,000 (1996) and 202,040,322 (2003)
Sales	68,827,400	1,500,000,000 (1996) and 1,343,523,357 (2003)
Total economic effect	45,798,068	1,900,000,000 (1996) and 1,791,364,476 (2003)
Labor Income	52,070,000	315,200,000 (1996) and 288,025,817 (2003)
Jobs (no.)	3,108	22,000 (1996) and 20,089 (2003)
Sales tax revenue	667,480	60,400,000 (1996) and 55,212,412 (2003)
State income tax revenues	638,600	14,500,000 (1996) and 13,243,302 (2003)
Federal income tax revenues	Not specified	Not specified (1996) and 82,880,595 (2003)
Source of multipliers	REMI Bayou Region Model	Kearney/Centaur, Inc. 1984. Economic Impact of the Commercial Fishing Industry in the Gulf of Mexico and South Atlantic Regions. Gulf and South Atlantic Fisheries Development Foundation, Inc. Washington.
Conversion factors	Converted 1992 dollars to 2002 dollars using CPI index for All Urban-U.S. Cities Index)	Converted 1995 commercial fishery harvest dollars to 1996 CPI in 1997 study. No conversion in 2005 study; utilized 2003 landings data.
Replicated studies		

<sup>1</sup> Text footnote five.

<sup>2</sup> Text footnote seven.

has been used to analyze conservation projects and programs and to measure the economic and social impacts of these projects (in dollars of sales, local taxes received, and jobs created).

Adams et al. (2002) estimated the economic activities in Lee County, Fla., associated with the San Carlos Island shrimp processing/packing industry. Using IMPLAN 2.0 and three scenarios, these authors estimated direct, indirect, and induced impacts that ranged from \$54.96 million in economic output (High Case, optimistic scenario) to a low of \$13.48 million (Low Case, conservative scenario).

Table 1 presents an overview of these studies compared to the current study. None of the prior studies focused strictly on the economic impact of wild shrimp

fishing on a specific gulf coast economy. Our goal is to address this gap in the literature, using Terrebonne Parish, La.

This research setting provides a significant example of the economic impact of wild shrimp harvesting. Estrada et al. (2000:15,21) report that the State of Louisiana produces more shrimp landings than any other Gulf Coast State, and that Terrebonne Parish has, on average, the largest number of shrimp gear licenses in the state (17.3%) and accounts for the largest percentage (36%) of raw, heads-on shrimp dockside sales in the State.

### Perceptions of Terrebonne Parish Shrimpers

To understand the perceptions of Terrebonne Parish commercial shrimpers, a focus group was conducted on 5 October

2002. Seven shrimpers participated, and the focus group served three purposes: 1) identify the range of vessel sizes and cost/revenue variations in the local industry, 2) identify perceived threats to the industry, and 3) obtain focus group information to develop the survey instrument.

Focus group participants believed that threats to the industry are intense and are reflected in the decreasing number of vessels and licensed commercial fishermen. Figure 1 depicts a general decrease in the number of commercial licenses in Terrebonne Parish through 2000. Figure 1 was generated by taking individuals holding any type of commercial shrimp license and reducing it by the percentages of boats <25 feet for resident vessels licensed by holders of shrimp trawl licenses (Horst and Holloway, 2002:

Southwick <sup>1</sup>	Posados <sup>2</sup>	Adams, Mulkey and Hodges (2002)
The 1999 Economic Contributions of Fisheries and Boating Resources in the Acadiana Bay Region	Economic Impact of Seafood Harvesting, Processing and Distribution in Mississippi	Economic Importance of San Carlos Island Shrimp Processing Industry
All commercial fisherman in Acadiana Bay	Shrimp Industry in Mississippi (harvesters, processing, and distribution)	Managers & owners of 4 shrimp processing & packing facilities
RIMS-II Input-Output model	IMPLAN Professional 2.0	IMPLAN 2.0
All commercial fisheries	Shrimp industry	Shrimp industry
46,877,000	Landings and ex-vessel values in 1991, 1994, and 1997	Heads-off landings from 1981–1997
311,722,000	Not specified	Not specified
415,629,000	436,660,000 (1997)	13.48 (low case) to 54.96 (high case) million
66,827,000	82,500,000 (1997)	5.46 (low case) – 22.24 (high case) million
4,660	5,853 (1997)	382 (low case) – 1,555 (high case)
12,810,000	Not specified	Not specified
3,073,000	17,130,000 in indirect taxes (1997)	Not specified
15,133,000	Not specified	Not specified
Kearney/Centaur, Inc. 1984. Economic Impact of the Commercial Fishing Industry in the Gulf of Mexico and South Atlantic Regions. Gulf and South Atlantic Fisheries Development Foundation, Inc. Washington.	Lee. 1986. A Study of the Mississippi Input-Output Model. Mississippi Research and Development Center, Jackson and Minnesota Implan Group, Inc., (1997) Stillwater.	Minnesota Implan Group, Inc., 1997. Stillwater.
<p>Converted 1995 dockside value data to 1999—decreased by 6.93% Took 1995 data and converted 1999 by decreasing by 6.93% which was the decrease in dockside value during that period. Since the 1995 data was for the entire State of Louisiana, it was converted to the Acadiana Bay area by multiplying by the percentage of Louisiana coastline that Acadiana Bay represents.</p> <p>Southwick, Robert I. 1997. The Economic Benefits of Fisheries, Wildlife and Boating Resources in the State of Louisiana. Produced under contract for the Louisiana Department of Wildlife and Fisheries.</p>		

Tables 15, 25). Consistent with Horst and Holloway (2002), boats <25 feet are assumed to be recreational boats.

The shrimpers believed the threats include “dumping.” Imported, farmed shrimp are allegedly “dumped” (sold at prices less than cost which also means at a price less than native or local wild shrimp) on the docks in Louisiana by primarily Asian and Central American countries. In 2001, imported shrimp products accounted for 88% of shrimp consumed in the United States and 37% of the value of all imported seafood products (Thomas J. Murray and Associates<sup>9</sup>).

<sup>9</sup>Thomas J. Murray and Associates, Inc. 2003. Economic activity associated with the use of imported shrimp in the U.S. Unpubl. manusc. produced for the American Seafood Distributors Assoc., 20 p.

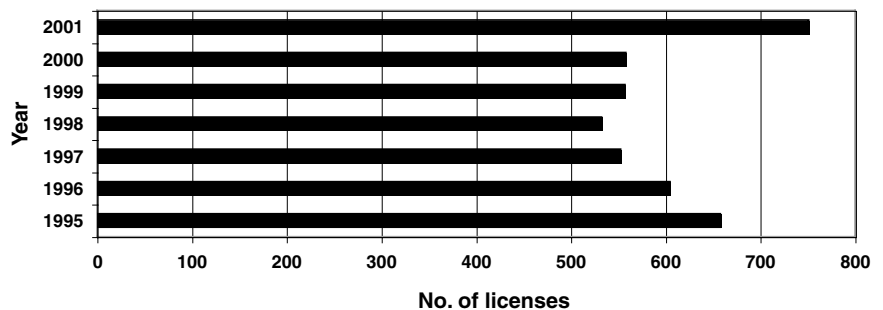


Figure 1.— Commercial shrimp gear licenses for Terrebonne Parish (Net of recreational shrimpers having commercial licenses). Sources: Horst and Holloway, 2002:23,38,40; Holloway, 2003).

Figure 2 represents some recent import trends into Louisiana customs (NMFS<sup>10</sup>). Haby et al. (2003:1) reported that in “1980, the supply of tropical shrimp in the U.S. was 466 million

pounds, with the domestic shrimp harvest contributing 44.6% (208 million

<sup>10</sup>NMFS, Fisheries Statistics Division. 2002. Silver Spring, MD. Personal commun.

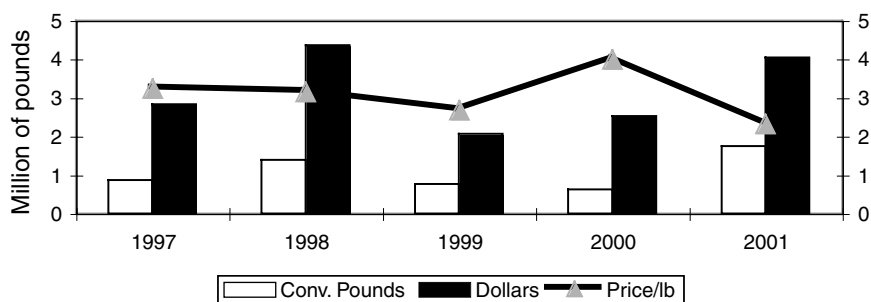


Figure 2.— Shrimp imports into Louisiana customs office (New Orleans). Source: National Marine Fisheries Service query, current data through September 2002.

pounds) to total supply. By 2001, the U.S. shrimp supply had increased to 1.38 billion pounds, with U.S. shrimp fishermen supplying only 201 million pounds, or only 14.6% to the domestic market.”

Due to the fact that other countries are less regulated in their production cycles (primarily through shrimp aquaculture) and labor practices, their production costs are much lower. In addition, these operations are being subsidized by their respective governments. Therefore, they can sell their catches to the Louisiana dockside dealers at lower prices, who subsequently sell to the processors at lower prices. This enables the dockside dealer and the processor to lower overall costs. However, it also results in driving down the prices paid for the native wild shrimp catch, which inhibits the local shrimpers from covering operating costs.

One piece of Louisiana legislation authored by State Representative Hunt Downer and signed into law by the Governor of Louisiana is Act 75 of the 2002 Regular Session of the Louisiana Legislature. This Act replaced the severance tax on shrimp harvested in Louisiana waters and imposed an excise tax on all shrimp imported into Louisiana (from other states or from other countries).

Other legislation and litigation being discussed include additional tariffs and quotas on the imported product from foreign countries. An anti-dumping lawsuit was also being formulated by eight states against sixteen (16) foreign nations. The Southern Shrimp Alliance represents the U.S. warmwater wild shrimp fishery from those eight

states (North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas). Their ultimate goal is to deflect the low-priced, allegedly “dumped,” imports by imposing tariffs, quotas, and providing remuneration to those fishermen who have suffered financially due to the “unfair trade practices” (DeSantis<sup>11</sup>).

Swibel<sup>12</sup> has reported that the efforts of the Southern Shrimp Alliance have paid off. In late November, 2004, the Bush Administration finalized duties on Chinese frozen and canned shrimp (28–113%) and on shrimp imported from Vietnam (4–26%). In early 2005, the International Trade Commission found unanimously that six countries (Brazil, China, Ecuador, India, Thailand, and Vietnam) were in violation of U.S. trade laws and imposed trade-weighted antidumping duties of 17.22% on shrimp imports from those countries. Given the 2004 Asian tsunami disaster, the International Trade Commission was to review the effect on the shrimp industries in India and Thailand.<sup>13</sup>

Louisiana shrimpers also believed that regulations on the methods of catching shrimp cause a decreased catch. These

regulations include Turtle Exclusion Devices (commonly known as TED’s) that protect sea turtles (*Caretta caretta*, *Chelonia mydas*, *Dermochelys coriacea*, *Eretmochelys imbricata*, and *Lepidochelys kempi*) from being caught in the nets, and Bycatch Reduction Devices (BRD’s) that protect finfish.

Shrimping laws can be traced back to 1886. Most of these laws address “the delineation of inside-outside shrimp lines, dates for seasons, and regulation or prohibition of certain types of gear” (Chronology<sup>14</sup>).

Shrimpers in the focus group said increases in operating costs pose another threat to the industry. Fuel is certainly one of the most crucial supplies of the shrimper’s vessel, and its price fluctuation has become an additional burden. Since 2000 diesel prices have risen from less than \$1 per gallon to almost \$3 a gallon by mid 2006.

In addition, these shrimpers reported ease of entry into the market by small recreational shrimpers as another threat. The recreational shrimpers are competing in the same waters with small commercial shrimpers who believe them to be reducing their catch.

According to the Louisiana Department of Wildlife and Fisheries<sup>15</sup>, the only requirements to obtain a recreational shrimp license are to provide picture identification and/or proof of residency and payment of a \$25 fee. Although this type of license only allows use of a ≤16-ft trawl net and imposes a catch limit of 100 pounds or less, a large number of recreational licensees could potentially produce a valid economic threat to small commercial fishermen—whether the recreational shrimper fishes for direct to consumer sales or for subsistence.

Roadside sales of shrimp in the bayou region of Louisiana are common. This suggests that some recreational shrimpers may take their catch directly to the consumer, getting a higher price than that

<sup>11</sup>DeSantis, J. 2002. Shrimpers, attorneys unite to fight imports. Houma Today [http://search.houmatoday.com/apps/pbcs.dll/article?AID=/20020910/NEWS/209100315&SearchID=73256968686459].

<sup>12</sup>Swibel, M. 2004. Crustacean nation. Forbes.com. [http://www.forbes.com/business/2004/12/01/cz\_ms\_1201beltway.html].

<sup>13</sup>Southern Shrimp Alliance. U.S. shrimp industry wins final antidumping cases against six countries, press release January 6, 2005 [http://www.shrimpanniance.com/Press%20Releases/1-6-05%20ITC%20Final.pdf].

<sup>14</sup>Chronology of Louisiana shrimp laws. 2000. [http://www.wlf.state.la.us/apps/netgear/index].

<sup>15</sup>Louisiana Department of Wildlife and Fisheries. Recreational fishing license information [http://www.wlf.louisiana.gov/licenses/fishing/recreational/].

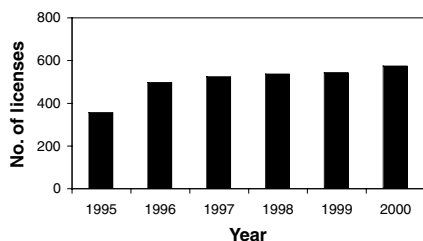


Figure 3.— Increases in recreational shrimp licenses. Source: Horst and Holloway, 2002:40.

offered at the dock. Figure 3 represents Louisiana licenses granted for strictly recreational shrimping purposes (trawls  $\leq 16$  ft) and it shows a visible trend of increases in recreational licenses (Horst and Holloway, 2002).

In 2000, about 68.3% (or 1,202) of all resident vessels in Terrebonne Parish licensed by holders of commercial shrimp trawl licenses were  $<25$  ft. Because few commercial shrimp harvesters use vessels under 25 ft, these vessels are assumed to be used by recreational fishermen who have a commercial license. Horst and Holloway (2002) provide this estimate for the state, and the focus group participants supported that estimate. Statistics produced by LDWF indicate that the number of vessels  $<25$  ft registered with a commercial shrimp license for Terrebonne Parish in year 2001 was 1,212 out of 1,963 total commercial licenses, or 63% of all commercial licenses.

These threats to the local shrimping industry and shrimpers in Terrebonne Parish are cause for great concern among those who make this their livelihood. Area shrimpers are convinced that government officials do not realize the shrimpers' true economic impact on the Terrebonne Parish economy.

The shrimp and shellfish industry is estimated to be worth \$1.9 billion to the State of Louisiana (Southwick Associates, 1997), and Terrebonne Parish makes an important contribution to the industry. This Parish includes: 17.3% of shrimp gear license holders in Louisiana, 36% of dockside dealers in the State, 38.4% of average annual landings of heads-on shrimp in Louisiana, and 27.7% of average annual landings of

heads-off shrimp (Southwick Associates, 1997; Estrada et al., 2000).

### The Research Questions

To estimate the local economic impact of the shrimping industry in Terrebonne Parish, we used two approaches:

1) What is the estimated range of a 1-year sales impact on Terrebonne Parish, using revenues reported by local commercial shrimpers in a 2002 survey?

2) What is the estimated economic loss to the 4-parish regional economy, over time, if the shrimping industry disappeared in Terrebonne Parish (estimated for an 8-year period by the REMI Model, using 2001 shrimp ticket data)?

Each approach provides a different perspective on the economic impact of wild shrimp fishing in the area. Survey results provide a "localized positive effect estimate," because the sales reported by participants can be used to estimate total sales revenue added to the Terrebonne Parish economy in 1 year. The modeling approach provides a "regional negative effect estimate," because the REMI model deducts the dockside/shrimp ticket sales in 1 year and then generates estimates of losses in sales, gross regional product, employment and population in that year and for 7 years into the future for the 4-parish bayou region. Two approaches facilitate examination of an important research question as well. To what extent will the sales data provided by Terrebonne Parish shrimp fishermen (subjective, self-reported data) yield estimates similar to those generated by the REMI model (objective, official state data)?

### Research Methodology for the Survey of Shrimpers

The population for the study was the commercial shrimpers in Terrebonne Parish. Using information from industry statistics, the Terrebonne Parish population was estimated at 751 commercial shrimpers. The total population (751) was derived by subtracting the percentage of vessels  $<25$  ft in length and licensed to holders of shrimp trawl licenses (62.7% or an estimated 1,212 licenses) from the total number of individuals holding any resident commercial

shrimp gear licenses (1,963) issued in the Parish in 2001. This approach follows the logic in the Horst and Holloway (2002) study, which assumed that all full-time or part-time commercial shrimpers have boats  $>25$  ft. The focus group participants confirmed Horst and Holloway's assumption that commercial fishermen utilize boats  $>25$  ft in length.

Surveys were distributed to 26.6% (200 surveys) of the population, using a judgmental sampling method. Members of the sample were not randomly selected; instead questionnaires were distributed by a shrimper/spokesperson to shrimpers owning vessels of differing size. This approach was used to secure the trust needed in the population of commercial shrimpers.

Focus group results were used to generate the questionnaire (Fig. 4). The questionnaire solicited information regarding catch volume, revenues and expenses, vessel size, perceived threats, and other industries impacted by shrimpers. Surveys were hand distributed in the field, during October 2002. About 100 surveys (50% response rate) were returned, representing 13.32% of the estimated population.

### Survey Results

Information yielded by the survey questionnaire included boat size, percentage of business devoted to shrimping activities, pounds of shrimp caught, gross revenues, various operating and maintenance expenditures (i.e. fuel, ice, insurance, etc.), perceived environmental and regulatory challenges, and key industries influenced by shrimpers.

Figure 5 illustrates the percentage of respondents by the size of the boat. Most respondents (54%) owned boats  $>55$  ft. Very few respondents used their boats for anything other than shrimping activities (Fig. 6). It would be logical to assume that the larger the boat, the larger the catch. The results in Table 2 generally indicate that as boat size increases, the size of annual catch (heads-on) increases as well.

However, the information gathered for boats  $>80$  ft does not follow this pattern. This suggests four possibilities: less experience in shrimping, less time spent

### Survey Questionnaire

In order to gather information on the impact of local shrimpers, please answer the following questions. It will take about 20 minutes. If there is any question that you do not want to answer, leave it blank. Please DO NOT put your name anywhere on this form.

1. Please put a check mark next to the boat size that you have and tell us the number of boats of that size.

BOAT SIZE	PUT CHECKMARKS IN THIS COLUMN	NUMBER OF BOATS
20-35 FEET		
36-55 FEET		
56-80 FEET		
81 FEET AND OVER		

2. What percentage of your business activity is shrimping? \_\_\_\_\_

3. How many pounds of shrimp did you catch in 2001?

_____ 0 – 25,000	_____ 100,001 – 125,000
_____ 25,001 – 50,000	_____ 125,001 – 150,000
_____ 50,001 – 75,000	_____ 150,001 – 175,000
_____ 75,001 – 100,000	_____ over 175,000

OR

How many boxes of shrimp did you catch in 2001? \_\_\_\_\_

4. Tell us the amount you spent on the following expenses in 2001?

Fuel burned \_\_\_\_\_

Ice blocks (include salt) \_\_\_\_\_

Groceries \_\_\_\_\_

Insurance \_\_\_\_\_

Repairs \_\_\_\_\_

Supplies \_\_\_\_\_ (includes webbing, string, shackles, chains, pulleys, paint, rope, oil, gear)

5. How much labor costs did you pay out in 2001? \_\_\_\_\_

6. How many deckhands and other laborers (include captain) did you hire in 2001? \_\_\_\_\_

7. How much money did you make before expenses in 2001? \_\_\_\_\_

8. Please choose the top 3 problems in the shrimping industry. (1-most important, 2-second most important, 3-third most important)

\_\_\_\_\_ Erosion

\_\_\_\_\_ Propaganda (misinformation)

\_\_\_\_\_ TEDS/ By-catch reduction devices

\_\_\_\_\_ Environmentalists

\_\_\_\_\_ Imported shrimp

\_\_\_\_\_ Lack of legislative support

\_\_\_\_\_ Other (please list \_\_\_\_\_)

9. What other industries do you think benefit from the shrimpers?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**THANK YOU FOR YOUR TIME AND COOPERATION. IT IS GREATLY APPRECIATED!**

Figure 4.—The survey questionnaire.

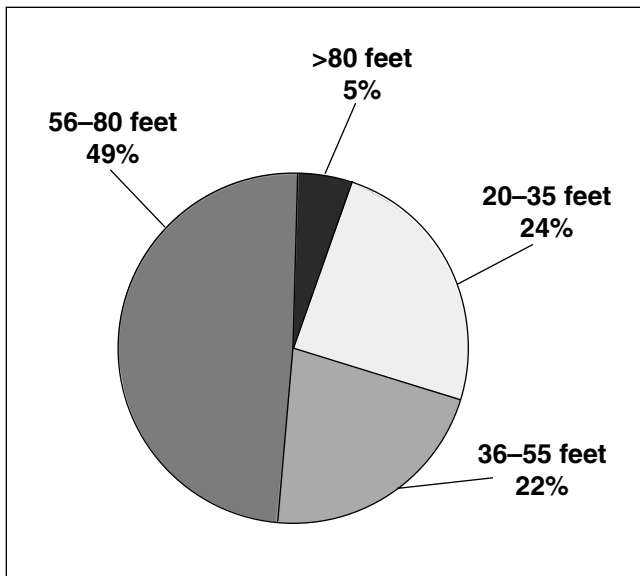


Figure 5.—Percent of respondents by boat size.

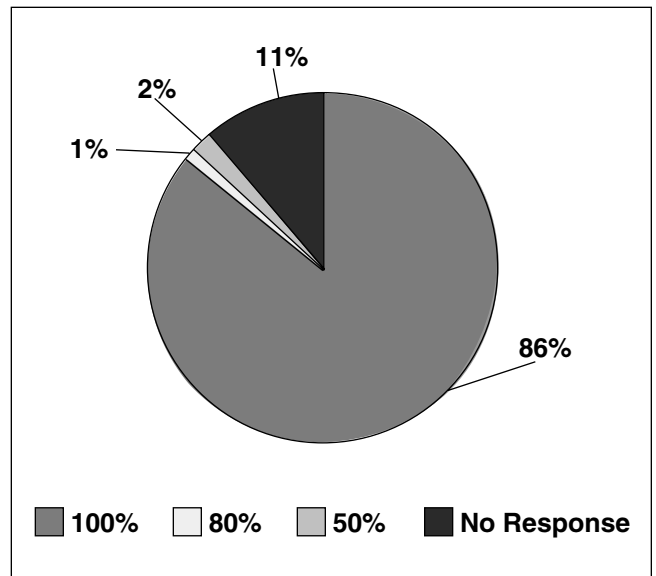


Figure 6.—Percentage of business activity related to shrimping.

on the water, trawling equipment differences (trawlers vs. the use of skimmer and/or butterfly nets), or under-reporting of catch by the largest vessels. The first explanation would confirm an earlier finding by Deseran (1997:8) that “large vessel captains tend to have less years of experience [in shrimping] than smaller vessel captains.”

### Revenue Trends

Average revenue per boat size as reported by the respondents is presented in Figure 7. Reported revenues more than triple, when comparing a vessel 36–55 ft to one 56–80 ft. A similar pattern is not observed once a vessel exceeds 80 ft.

### Expense Trends

Average expenses reported by the respondents include fuel, groceries, insurance, ice, repairs, supplies (boat and gear), and labor (Fig. 8–15). All expense categories are segmented by vessel size, and all mean expenses were calculated using only valid, non-zero responses. These figures generally indicate that as boat size increases, so do expenses. There is one exception to this pattern. Vessels >80 ft report no ice expense, since these vessels have freezers on board.

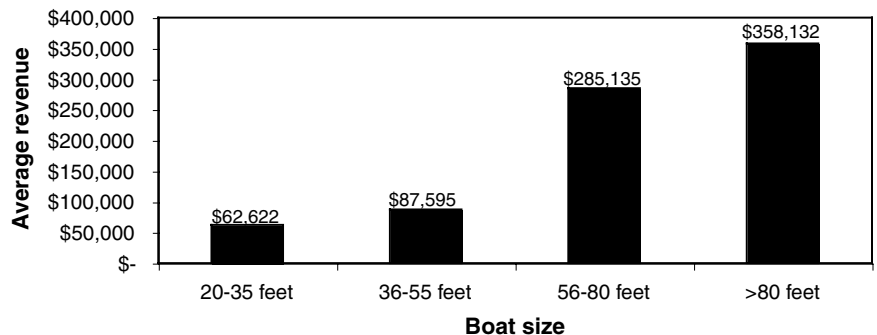


Figure 7.—Average revenue reported by boat size.

Figure 16 illustrates gross profit margin, derived from total revenues and expenses by boat size. Average profit margin was calculated by subtracting total expenses from total revenues, and computing the mean of the result by boat size. Our calculation best reflects a gross profit margin from wild shrimp fishing, after deducting only the expenses reported by the study participants. Profit margins may be overestimated, because the list of operating expenses is not exhaustive.

### Population Estimates

To compare the revenue information provided by the survey respondents with

Table 2.—Shrimp catch reported by boat size.

Heads-on pounds	Percent of Respondents			
	20-35 ft	36-55 ft	56-80 ft	>80 ft
<25,000	20.83			
25,001-50,000	62.50	22.73		
50,001-75,000	16.67	50.00	10.20	40.00
75,001-100,000		27.27	2.04	20.00
100,001-125,000				40.00
125,001-150,000			6.12	
150,001-175,000			32.65	
>175,000			48.98	
Total	100.0	100.0	100.0	100.0

LDWF statistics, it was necessary to re-group the survey boat sizes according to the categories reported in the Horst and Holloway study (2002). In the survey questionnaire, the boat size categories



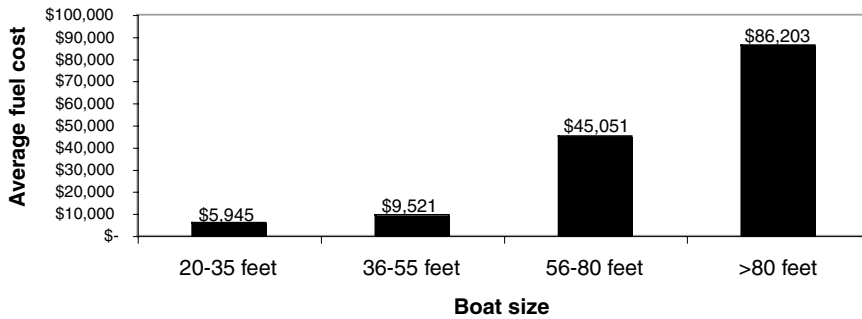


Figure 8.— Average fuel cost reported by boat size.

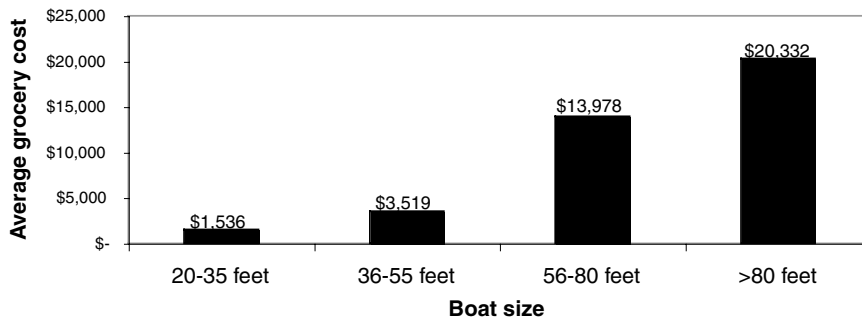


Figure 9.— Average grocery cost reported by boat size.

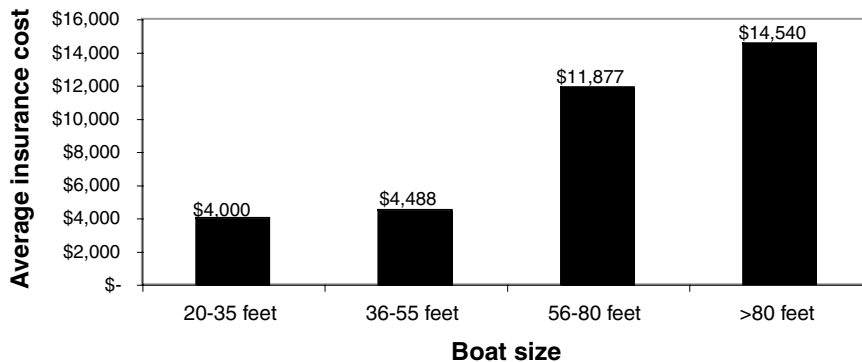


Figure 10.— Average insurance cost reported by boat size.

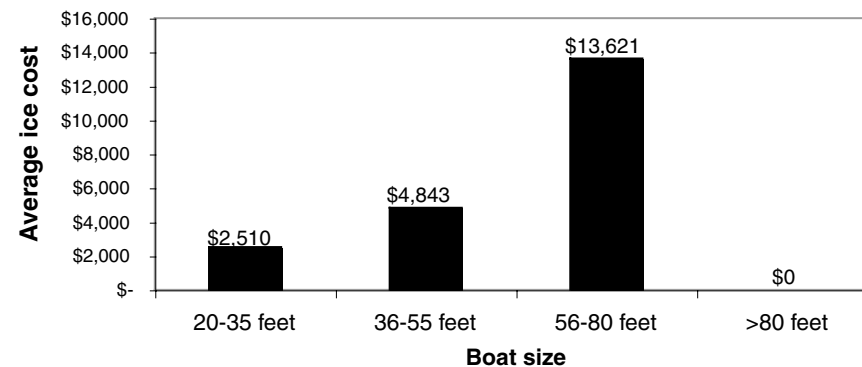


Figure 11.— Average ice cost reported by boat size.

and the estimation of the commercial shrimper population amongst the categories were distributed as shown in Table 3. However, LDWF reports different boat size categories and allocations of the population in Terrebonne Parish (Table 4). Comparing the groupings in Tables 3 and 4, it is clear that large boats ( $\geq 56$  ft) were over-represented in our survey. Over half of the survey vessels (54%) were  $\geq 56$  ft, while LDWF statistics show that in Terrebonne Parish only 16% of the vessels are  $\geq 51$  ft.

Therefore, to be more objective as well as to make a proper comparison between the survey revenues and the shrimp ticket sales reported by LDWF, the survey responses were regrouped into two categories to reflect the LDWF boat sizes as best as possible (Table 5). Although there is a small overlap for boats between the sizes of 50–55 ft when recoding the survey groups according to the LDWF categories, it is considered immaterial. There were very few 50–55 ft vessels in the survey group, and these boats were placed in category 1.

Figure 17 represents average survey revenue by regrouped boat size. Using these averages, we were able to estimate ranges of annual revenues for the entire population of Terrebonne commercial shrimpers and segmented by vessel length (Table 6). The ranges were calculated using a 95% confidence interval.

The revenues reported by LDWF for Terrebonne Parish shrimp ticket head-on sales in 2001 were \$49.9 million. If one predicted that 5–15% of catches went unreported for any number of reasons, then the LDWF number may actually be anywhere between \$52 and \$57 million, and these figures do fall within the confidence intervals estimated in Table 6. The wide confidence interval for all boats is a function of substantial error and variation in the self-reported survey data. This variation could be due to poor bookkeeping practices in the local industry, inadequacies in our measuring instrument, substantial differences in catch that are not explained by boat size, and/or under-reporting of the total annual catch by shrimpers. When survey results are stratified according to the LDWF categories (25–55 ft and >55 ft) the survey

**Table 3.—Boat size population estimated from the survey.**

Boat size	Survey Categories	
	No. of boats	Percentage of entire population
20–35 ft	182	24
36–55 ft	159	21
56–80 ft	372	50
>80 ft	38	5

**Table 4.—Boat size population reported by LDWF.**

Boat size	LDWF Categories	
	No. of boats	Percentage of entire population
25–30 ft	274	36
31–50 ft	354	47
51–65 ft	98	13
>65 ft	25	3

**Table 5.—Regrouped boat size categories (LDWF).**

Boat size	Regrouped Data and LDWF Estimates	
	No. of commercial boats in Terrebonne Parish	LDWF estimate of % in population
25–55 ft	628	84
56 ft and over	123	16

**Table 6.—Estimated ranges of revenue for Terrebonne Parish at a 95% confidence level.**

Boat size	Revenue Estimates	
	Low	High
25–55 ft	\$20,952,681	\$ 71,958,120
>55 ft	15,752,678	56,150,932
All boats	36,705,360	128,109,052

estimates more closely approximate LDWF sales data for the Parish and the confidence intervals narrow. It is interesting that the confidence interval is wider for smaller vessels (25–55 ft) than for larger vessels. This may be due to differences in bookkeeping practices and accuracy, or to productivity differences that exist between vessel categories.

### Threats

The shrimpers in the survey also reported perceived threats to the local industry. As shown in Figure 18, imported shrimp, environmental factors, and TED’s are perceived as the greatest threats.

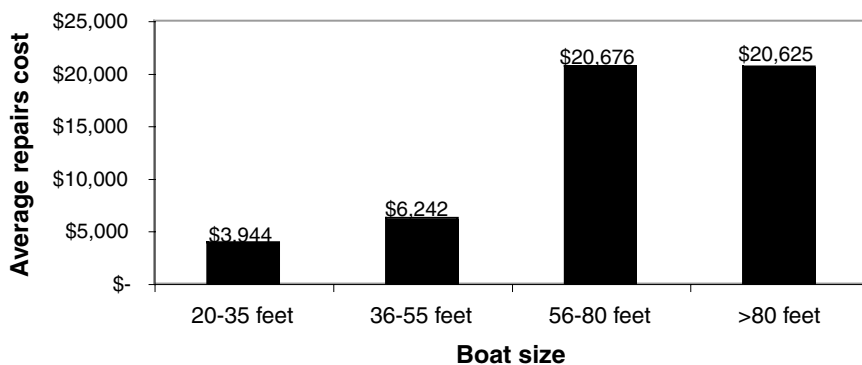


Figure 12.— Average repairs cost reported by boat size.

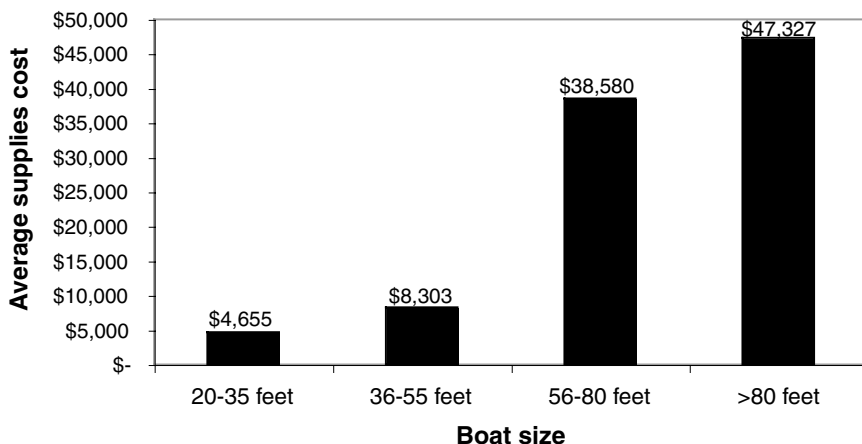


Figure 13.— Average supplies cost reported by boat size.

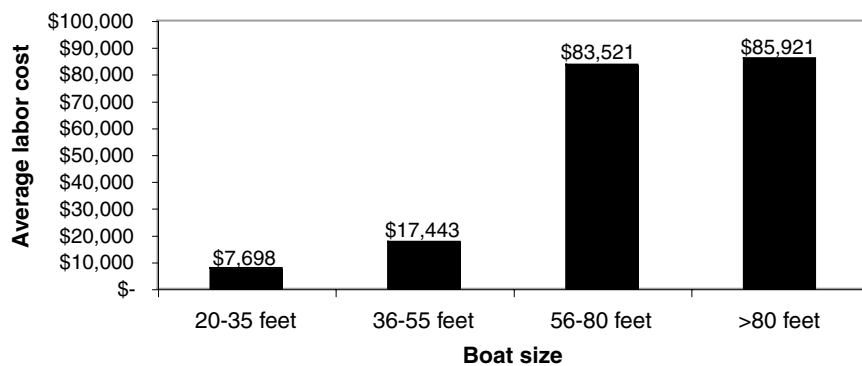


Figure 14.— Average labor cost reported by boat size.

### Impacted Industries

Shrimpers also reported the top industries impacted by the shrimping industry. These included mechanical and engine repairs, boat suppliers, restaurants and

grocery stores, banking, and hardware stores (Fig. 19).

### Bayou Region Economic Impact

Our analysis also includes an estimated economic impact on the 4-parish

**Table 7.—REMI estimated losses by year.**

Category	2003	2004	2005	2006	2007	2008	2009	2010
Loss to gross regional product	(45.8 mil)	(38.87 mil)	(32.55 mil)	(26.30 mil)	(20.76 mil)	(16.31 mil)	(12.28 mil)	(9.29 mil)
Personal income	(34.07 mil)	(41.16 mil)	(46.26 mil)	(49.17 mil)	(50.77 mil)	(51.61 mil)	(51.73 mil)	(51.58 mil)
Population	(233)	(632)	(1,129)	(1,521)	(1,832)	(2,076)	(2,267)	(2,412)
Salaries and wages	(52.07 mil)	(57.26 mil)	(58.95 mil)	(58.47 mil)	(56.84 mil)	(54.73 mil)	(52.01 mil)	(49.30 mil)
Disposable personal income	(27.68 mil)	(34.01 mil)	(38.71 mil)	(41.51 mil)	(43.15 mil)	(44.12 mil)	(44.46 mil)	(44.54 mil)
Employment	(3,108)	(2,939)	(2,789)	(2,638)	(2,500)	(2,379)	(2,251)	(2,142)
Sales	(68.83 mil)	(54.30mil)	(40.45 mil)	(27.44 mil)	(16.28 mil)	(7.57 mil)	.44 mil	6.37 mil

bayou region, calculated by the REMI model. Total annual sales (gross revenues) of catches to dockside dealers, processors, and consumers were taken from secondary sources to demonstrate the amount of business generated by the population. Total annual sales for year 2000–2001 were requested and received by port in Terrebonne Parish from the LDWF (Fig. 20). Figure 21, taken from the National Marine Fisheries Service data query<sup>16</sup>, represents all commercial

fishery products for a 5-year period, and shrimp represent the majority of the fishery products. As shown in Figure 20, shrimp ticket sales totaled \$49.9 million for Terrebonne Parish in 2001 and were used in the REMI economic impact model.<sup>17</sup>

The overall negative impact on gross regional product (GRP) in the 4-parish bayou region is about \$45.8 million in the first year (Table 7). This is a very significant economic impact, because the loss

of \$49.9 million in sales in Terrebonne Parish translates to a reduction in GRP of \$45.8 million in the 4-parish bayou region in the first year. In economic impact terms, almost 92% of those dollars remain in the 4-parish bayou region. When those sales are removed from the regional economy, there is almost a 1:1 reduction in the gross regional product of the 4-parish area.

In addition, the REMI model predicts those missing dollars in year 1 cause a series of negative effects on the regional economy over an 8-year time period. For example, the model estimates in year 2003 there would be a negative impact to GRP of \$45.8 million; however, this would improve over time to a negative impact on GRP of \$9.29 million in 2010. The logic is that over time, individuals who were previously employed in the wild shrimp fishing industry find other forms of work, and some of the lost sales are replaced with other business activities. The impacts over the 8 years (2003–2010) are estimated for other vital economic variables by the REMI model.

Economic impacts derived from the REMI model include sales, gross regional product (GRP), population, and employment estimates. All of these

<sup>16</sup>NMFS, Fisheries Statistics Division. 2002. Silver Spring, MD. Personal commun.

<sup>17</sup>The most recently available official data at the time of the study was 2001.

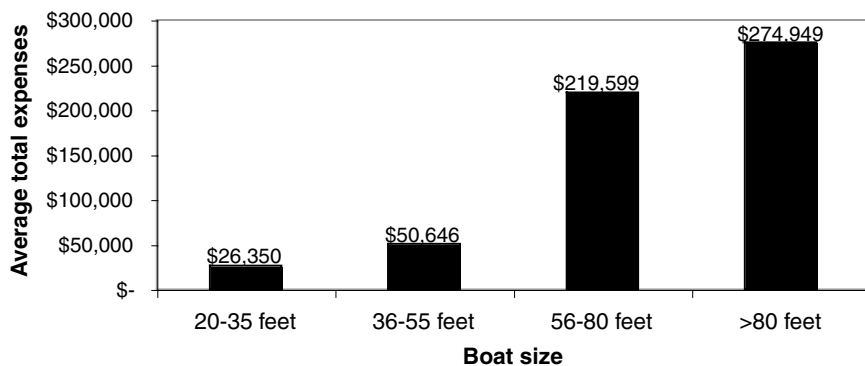


Figure 15.— Average total expenses reported by boat size.

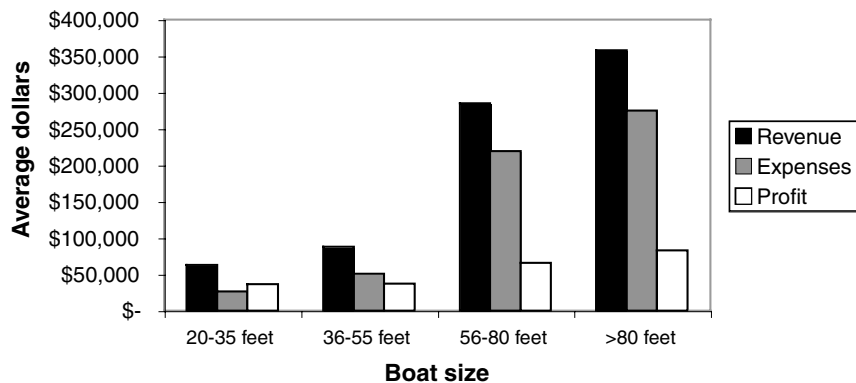


Figure 16.— Average revenues, expenses, and gross profits reported by boat size.

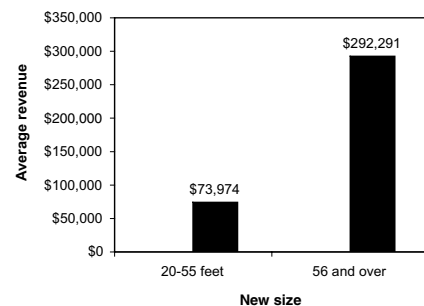


Figure 17.— Recoded average survey revenue.

estimates include any “ripple” or “multiplier” effect from lost shrimp sales. However, the REMI model includes conservative multiplier effects in the forecasts.<sup>18</sup>

Sales impacts refer to the decreases in the dollar value of goods and services sold in the 4-parish region, as a result of the lost shrimping revenue in Terrebonne Parish. The model estimates lost sales of \$68.8 million in the first year. While sales estimates are important, only a portion of any “multiplied” sales dollar remains strictly in the region. For example, a shrimper may spend some of the sales dollars to purchase equipment and supplies from companies that are not in the region.

The sales estimates are useful measures, but not necessarily the best measure of economic impact. Gross Regional Product, on the other hand, considers only decreases in the amount of goods and services actually produced (not just sold) in the bayou region, making it a better measure of the negative economic impact. The REMI model also estimates the amount by which full-time, year-round jobs would decrease in the region as a result of the lost shrimping revenue, and forecasts population changes over time.

<sup>18</sup>A discussion of economic impact models is beyond the scope of this manuscript, but there is considerable variation in the multipliers. To compare models, see Rickman and Schwer (1995).

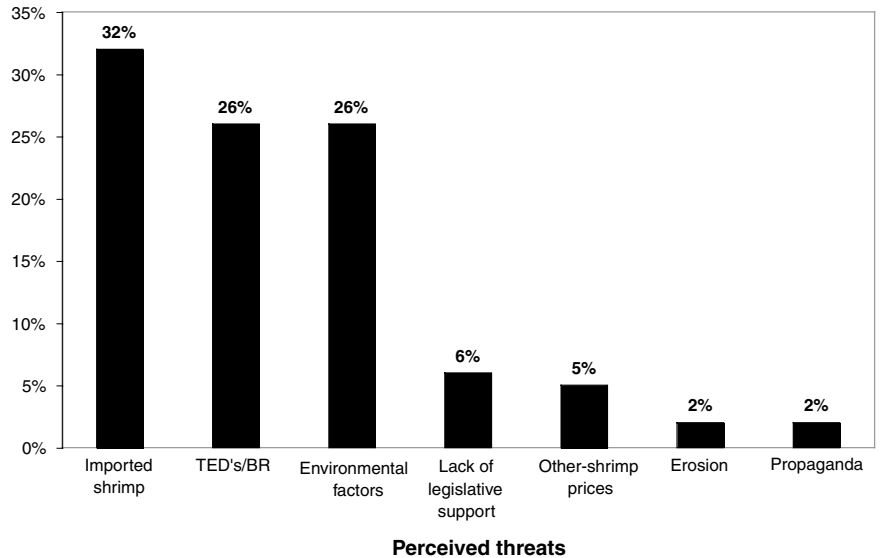


Figure 18.—Perceived threats to the shrimping industry.

In year 1 (2003), the REMI model forecasts a reduction in GRP of \$45.9 million in the region, a reduction in regional population of 233 individuals, a loss of over 3,100 jobs, a loss of \$52.07 million in regional salaries and wages, and a reduction of \$68.83 million in sales.

These negative impacts decrease over time, as “new” businesses and job opportunities slowly replace the lost shrimping revenues. The forecast clearly indicates an important negative economic impact

on the bayou region economy if the shrimp harvesting industry disappeared in Terrebonne Parish. The REMI estimates (2004–10) are not adjusted for inflation, so dollars lost would be smaller in years 2004–10 (all estimates in Table 7 are calculated in 2003 dollars).

To more accurately reflect GRP losses over time, the estimates for years 2–8 were discounted at 7%. The annual losses in GRP, and the cumulative loss to the bayou region economy over the 8-year period are:

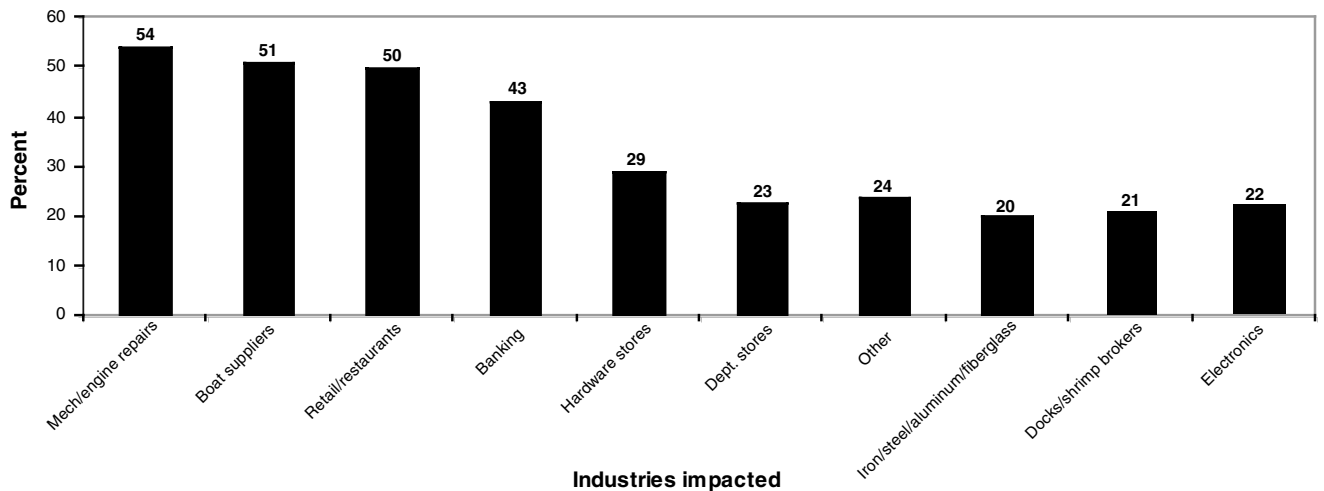


Figure 19.—Other industries impacted by shrimpers.

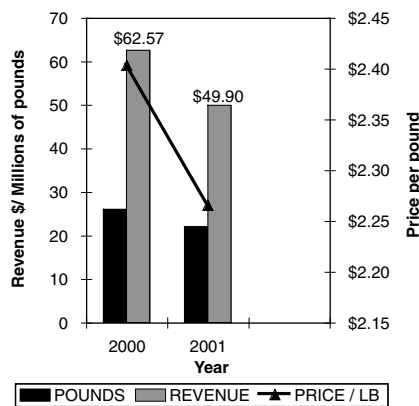


Figure 20.—Dulac-Chauvin ports, only white and brown shrimp revenues in pounds. Source: Louisiana Department of Wildlife and Fisheries

2003	\$45.8 million
2004	\$36.2 million
2005	\$30.3 million
2006	\$24.5 million
2007	\$19.3 million
2008	\$15.2 million
2009	\$11.4 million
2010	\$ 8.6 million

The cumulative discounted loss to GRP in the bayou region over the 8-year period is estimated at \$191.3 million. In addition, increasing population losses over the 8-year period parallel increasing losses in personal income, and disposable personal income over time.

### Scope and Limitations

The study results apply to wild shrimp fishermen in Terrebonne Parish, La., who had commercial gear licenses in 2001 and owned boats  $\geq 25$  ft. Secondary information used as input in the REMI Model was the most current available and was from year 2001 as provided by LDWF. Economic impact estimates apply only to the shrimper sector, because dock-side handlers and processors were not included in the study. However, they are also part of the overall economic impact, so the total impact of the shrimp industry in Terrebonne Parish is much larger than our estimates.

The results have several limitations. Time was a major limitation. Due to the unavailability of local shrimpers, a longer

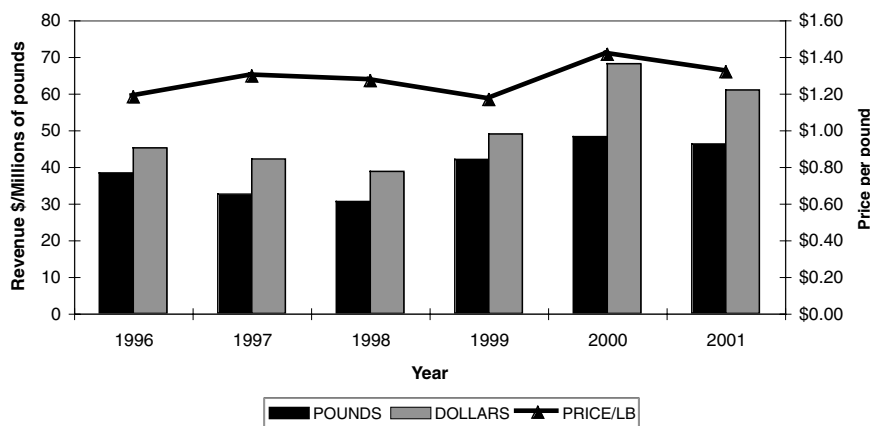


Figure 21.—Commercial fishery landings for Dulac-Chauvin ports. Source: National Marine Fisheries Service data query.

time period would have allowed other data collection alternatives. Because this study was performed during the shrimping season, many of the shrimpers were offshore and unreachable. Even though the response represented 13.32% of the total estimated population, serious questions remain regarding the representativeness of the sample group.

Members of the sample were not randomly selected; instead a judgmental method was used. Questionnaires were distributed by a shrimper spokesperson, who hand delivered the surveys to local shrimpers. This was critical to the success of the study, in that there is a significant lack of trust among the shrimpers when giving sensitive information to outsiders. The distributor Chauvin, a shrimper herself, was able to gain their trust by explaining the importance of collecting accurate and relevant data. However, she reported much hesitancy among those being surveyed in offering information, nonfamiliarity with financial information, and a general disbelief that such a project could offer a benefit to the shrimpers. This poses a second threat to the validity of survey results and estimates.

We were unable to get information from more shrimpers in each boat size category, and this limits the representativeness of the sample. The majority of the respondents owned vessels  $>55$  ft, and larger vessels are over-represented.

The lack of secondary data on Terrebonne Parish and the state-wide industry was another limitation. As a result, it was difficult to evaluate trends specific to the area.

There is a great deal of state-wide data available from the National Marine Fisheries Service; however, it only reports the revenue side. The only data that could be obtained for the Parish was revenue by port. Until costs and profits are reported, it will be difficult to paint a comprehensive financial picture of the industry in any state. In addition, our instrument measured specific costs and is not exhaustive. While survey results provide some information on the operating costs in the sector, these results should be viewed as an initial attempt to analyze cost structure and profitability.

Focus group participants hinted that catches from smaller boats might not get reported consistently on the trip tickets, as many of these catches are sold directly to the consumer by the shrimper. Therefore, trip ticket information may be understated, which, in turn, would result in the economic impact being understated by the REMI model. Also, this study concentrated on Terrebonne Parish. The findings should not be construed as being representative of any other parish in the State of Louisiana.

The REMI economic impact model did not have a specific category for the occupation of the shrimper. The category used was that of farming, agriculture,

and fisheries, which may or may not be specific enough to precisely model the impacts that changes in the shrimping industry have on the bayou region economy.

### **Future Research Recommendations**

LDWF should continue its statewide study (Estrada et al., 2000) of the shrimping industry which was interrupted due to inadequate funding. This would allow the collection of extensive demographic information about distribution channels, business arrangements, sales volumes, cost of operations, and significant changes in the industry. The continuance of this research would assist in a fuller understanding of the shrimping industry. It would also facilitate statewide and parish-specific economic analyses in future studies.

Research is needed to estimate the total 8-state economic impact of the domestic warmwater shrimp harvesting industry. Reliable data will be imperative to this research. However, for data to be reliable all catches must be properly recorded on trip tickets. This includes cash sales directly to the consumer. If this can happen, then the 8-state coalition would have a better chance of demonstrating the economic impact of the industry.

Annual shrimp landings over the past 20 years were reviewed in connection with the implementation of state and Federal laws. Although it appears that annual poundage for the Dulac–Chauvin ports have continually decreased as laws became more restrictive, much more study is needed. Many other factors could cause this decrease in poundage as well, such as environmental factors, habitat factors, and an increase in recreational licenses.

Efforts are needed to create local coalitions of shrimpers, which could assist in data collection efforts for the Louisiana Shrimping Association, LDWF, and the National Marine Fisheries Service. This would be one way to build trust and create an environment of collaboration between the fishermen and the agencies.

As one reviewer noted, research in this field creates a dilemma for the re-

searcher. While probabilistic sampling approaches are statistically more valid, they may not be feasible and may yield limited data due to trust problems. When non-probability sampling methods are used (as in the current study), higher response rates are achieved but at the price of questionable estimates.

Future research efforts are needed to standardize measurement categories and definitions. Our focus group generated 4 categories of vessels based on length, and those vessels lengths were not consistent with the categories used in other studies or by LDWF. However, only one focus group was conducted with 7 participants. More focus group research might have clarified these measurement problems prior to the survey. Any data collection effort should include the development of standard definitions for the data being requested; in the focus group, it was challenging to gain consensus on terms and definitions.

As a starting point, standard boat size categories should be developed. Several researchers have proposed that boats <25 ft should be considered recreational and not commercial in this industry. But if the industry is as entrepreneurial and “Mom and Pop” as it appears, then excluding these vessels results in underestimating the true economic impact in a region or state. This is particularly important when evaluating total shrimp sales in an area.

The authors believe that many “recreational” shrimpers engage in commercial activities, and this is especially true in the region studied. Shrimping is not only a business in the bayou region of Louisiana—it is a deeply embedded part of the culture, the cuisine, and the way of life. Both the fishermen and a number of individuals who work in the industry in Louisiana agree that all catches are not reported.

Research is needed to examine productivity issues in the wild shrimp harvesting sector as well. Although it is logical to assume that catch increases as vessel length increases, there are many other factors to consider. Time spent on the water, the type of harvesting equipment (trawler vs. skimmer or butterfly nets), variations in the incomes of vessel owners, and higher operating costs for

larger vessels can explain differences in catch as readily as vessel length. It is important to understand the interaction of these factors when evaluating productivity.

In addition, a real effort to standardize reporting of costs is needed. For example, vessels <80 ft reported the cost of ice; even though a vessel >80 ft has refrigeration equipment and no ice cost, there is an increased fuel cost. Other costs, such as interest on financed vessels or gear costs should be reported as well. All labor costs should be reported, especially the shrimper’s cost of “family labor.” One approach would be to record family labor hours, and to associate the going wage in the region with these hours. Then, family labor would no longer be a hidden cost in the sector. Without standardized reporting of revenues and costs, it is impossible to paint a comprehensive financial picture of the industry—or of any individual operator.

Finally, research is needed that compares the taste of wild shrimp to that of imported and pond-raised shrimp. The wild shrimp harvesters believe this is an advantage of wild shrimp that should result in higher prices for their product. Haby et al. (2003:25) state that “wild-caught shrimp have a flavor profile that results from two factors that cannot be duplicated in pond systems.” If consumers perceive a superior taste in wild shrimp, then a superior quality image can be developed and marketed for wild shrimp. A branding strategy based on this quality difference could mitigate the threats of increasing imports and low prices to wild shrimp fishermen.

### **Acknowledgments**

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Table 1.— Previous studies of the economic impact of shrimping.

	LaFleur, Yeates, and Aysen	Southwick (1997) and Southwick (2005)	Southwick <sup>1</sup>	Posados <sup>2</sup>	Adams, Mulkey and Hodges (2002)
Category	Economic Impact of Shrimpers in Terrebonne Parish	The Economic Benefits of Fisheries, Wildlife and Boating Resources in the State of Louisiana	The 1999 Economic Contributions of Fisheries and Boating Resources in the Acadiana Bay Region	Economic Impact of Seafood Harvesting, Processing and Distribution in Mississippi	Economic Importance of San Carlos Island Shrimp Processing Industry
Population surveyed	Shrimpers in Terrebonne Parish	Commercial fisherman in Louisiana; shrimp and shellfish	All commercial fisherman in Acadiana Bay	Shrimp Industry in Mississippi (harvesters, processing, and distribution)	Managers & owners of 4 shrimp processing & packing facilities
Economic model used	REMI	RIMS-II Input-Output model	RIMS-II Input-Output model	IMPLAN Professional 2.0	IMPLAN 2.0
Sector	Shrimp harvesters	Marine shellfish	All commercial fisheries	Shrimp industry	Shrimp industry
Ex-vessel landings (dockside value)	49,997,119	221,100,000 (1996) and 202,040,322 (2003)	46,877,000	Landings and ex-vessel values in 1991, 1994, and 1997	Heads-off landings from 1981–1997
Sales	68,827,400	1,500,000,000 (1996) and 1,343,523,357 (2003)	311,722,000	Not specified	Not specified
Total economic effect	45,798,068	1,900,000,000 (1996) and 1,791,364,476 (2003)	415,629,000	436,660,000 (1997)	13.48 (low case) to 54.96 (high case) million
Labor Income	52,070,000	315,200,000 (1996) and 288,025,817 (2003)	66,827,000	82,500,000 (1997)	5.46 (low case) – 22.24 (high case) million
Jobs (no.)	3,108	22,000 (1996) and 20,089 (2003)	4,660	5,853 (1997)	382 (low case) – 1,555 (high case)
Sales tax revenue	667,480	60,400,000 (1996) and 55,212,412 (2003)	12,810,000	Not specified	Not specified
State income tax revenues	638,600	14,500,000 (1996) and 13,243,302 (2003)	3,073,000	17,130,000 in indirect taxes (1997)	Not specified
Federal income tax revenues	Not specified	Not specified (1996) and 82,880,595 (2003)	15,133,000	Not specified	Not specified
Source of multipliers	REMI Bayou Region Model	Kearney/Centaur, Inc. 1984. Economic Impact of the Commercial Fishing Industry in the Gulf of Mexico and South Atlantic Regions. Gulf and South Atlantic Fisheries Development Foundation, Inc. Washington.	Kearney/Centaur, Inc. 1984. Economic Impact of the Commercial Fishing Industry in the Gulf of Mexico and South Atlantic Regions. Gulf and South Atlantic Fisheries Development Foundation, Inc. Washington.	Lee. 1986. A Study of the Mississippi Input-Output Model. Mississippi Research and Development Center, Jackson and Minnesota Implan Group, Inc., (1997) Stillwater.	Minnesota Implan Group, Inc., 1997. Stillwater.
Conversion factors	Converted 1992 dollars to 2002 dollars using CPI index for All Urban-U.S. Cities Index)	Converted 1995 commercial fishery harvest dollars to 1996 CPI in 1997 study. No conversion in 2005 study; utilized 2003 landings data.	Converted 1995 dockside value data to 1999— decreased by 6.93% Took 1995 data and converted 1999 by decreasing by 6.93% which was the decrease in dockside value during that period. Since the 1995 data was for the entire State of Louisiana, it was converted to the Acadiana Bay area by multiplying by the percentage of Louisiana coastline that Acadiana Bay represents.		
Replicated studies			Southwick, Robert I. 1997. The Economic Benefits of Fisheries, Wildlife and Boating Resources in the State of Louisiana. Produced under contract for the Louisiana Department of Wildlife and Fisheries.		

<sup>1</sup> Text footnote five.  
<sup>2</sup> Text footnote seven.

has been used to analyze conservation projects and programs and to measure the economic and social impacts of these projects (in dollars of sales, local taxes received, and jobs created).

Adams et al. (2002) estimated the economic activities in Lee County, Fla., associated with the San Carlos Island shrimp processing/packing industry. Using IMPLAN 2.0 and three scenarios, these authors estimated direct, indirect, and induced impacts that ranged from \$54.96 million in economic output (High Case, optimistic scenario) to a low of \$13.48 million (Low Case, conservative scenario).

Table 1 presents an overview of these studies compared to the current study. None of the prior studies focused strictly on the economic impact of wild shrimp

fishing on a specific gulf coast economy. Our goal is to address this gap in the literature, using Terrebonne Parish, La.

This research setting provides a significant example of the economic impact of wild shrimp harvesting. Estrada et al. (2000:15,21) report that the State of Louisiana produces more shrimp landings than any other Gulf Coast State, and that Terrebonne Parish has, on average, the largest number of shrimp gear licenses in the state (17.3%) and accounts for the largest percentage (36%) of raw, heads-on shrimp dockside sales in the State.

**Perceptions of Terrebonne Parish Shrimpers**

To understand the perceptions of Terrebonne Parish commercial shrimpers, a focus group was conducted on 5 October

2002. Seven shrimpers participated, and the focus group served three purposes: 1) identify the range of vessel sizes and cost/revenue variations in the local industry, 2) identify perceived threats to the industry, and 3) obtain focus group information to develop the survey instrument.

Focus group participants believed that threats to the industry are intense and are reflected in the decreasing number of vessels and licensed commercial fishermen. Figure 1 depicts a general decrease in the number of commercial licenses in Terrebonne Parish through 2000. Figure 1 was generated by taking individuals holding any type of commercial shrimp license and reducing it by the percentages of boats <25 feet for resident vessels licensed by holders of shrimp trawl licenses (Horst and Holloway, 2002:

Tables 15, 25). Consistent with Horst and Holloway (2002), boats <25 feet are assumed to be recreational boats.

The shrimpers believed the threats include “dumping.” Imported, farmed shrimp are allegedly “dumped” (sold at prices less than cost which also means at a price less than native or local wild shrimp) on the docks in Louisiana by primarily Asian and Central American countries. In 2001, imported shrimp products accounted for 88% of shrimp consumed in the United States and 37% of the value of all imported seafood products (Thomas J. Murray and Associates<sup>9</sup>).

<sup>9</sup>Thomas J. Murray and Associates, Inc. 2003. Economic activity associated with the use of imported shrimp in the U.S. Unpubl. manusc. produced for the American Seafood Distributors Assoc., 20 p.

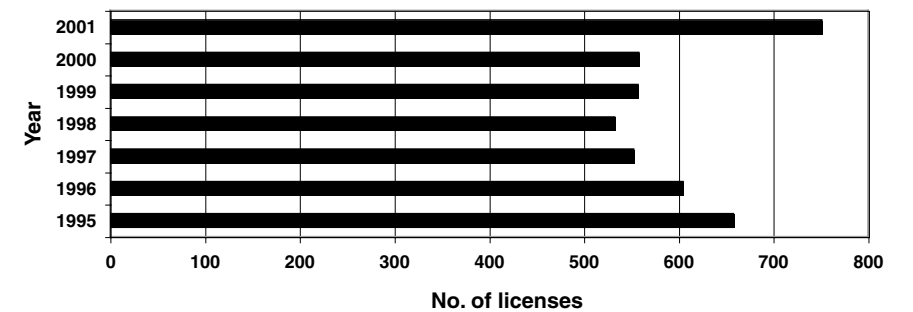


Figure 1.— Commercial shrimp gear licenses for Terrebonne Parish (Net of recreational shrimpers having commercial licenses). Sources: Horst and Holloway, 2002:23,38,40; Holloway, 2003).

Figure 2 represents some recent import trends into Louisiana customs (NMFS<sup>10</sup>). Haby et al. (2003:1) reported that in “1980, the supply of tropical shrimp in the U.S. was 466 million

pounds, with the domestic shrimp harvest contributing 44.6% (208 million

<sup>10</sup>NMFS, Fisheries Statistics Division. 2002. Silver Spring, MD. Personal commun.