IMPACT OF COMMERCIAL SHRIMP LANDINGS ON THE ECONOMY OF TEXAS AND COASTAL REGIONS

by

Lonnie L. Jones, John W. Adams
Wade L. Griffin and Jeffrey Allen

Associate Professor, Assistant Professor, Assistant Professor and Research Associate, respectively

Department of Agricultural Economics
Texas Agricultural Experiment Station
Texas A&M University

December 1974

TAMU-SG-75-204

Partially supported through Institutional Grant 04-3-158-18
to Texas A&M University
by the National Oceanic and Atmospheric
Administration's Office of Sea Grants
Department of Commerce

No Charge

Order from:

Department of Marine Resources Information
Center for Marine Resources
Texas A&M University
College Station, TX 77843

ABSTRACT

The value of commercial shrimp landings for 1971 in the state of Texas was $63.9 million. In the three coastal regions of Brownsville-Aransas, Port Lavaca-Galveston and Beaumont-Port Arthur in 1971 this value was $37.6, $23.6 and $2.7 million, respectively. These commercial shrimp landings have a significant impact on the economy of Texas and on the economies of the three coastal regions. The estimated direct, indirect and induced impact of 1971 commercial shrimp landings on the Texas economy was $197.2 million in output; $56.8 million in personal incomes; and 6,083 persons employed. Within the Brownsville-Aransas region, the $37.6 million landings by the commercial shrimp industry stimulated total economic output of $92.5 million. The $23.6 million landings by the commercial shrimp industry within the Port Lavaca-Galveston region stimulated total economic output of $55.9 million. Total economic output of $8.5 million was stimulated by the $2.7 million landings by the commercial shrimp industry within the Beaumont-Port Arthur region.

ACKNOWLEDGMENTS

This research was funded by the Texas Agricultural Experiment Station and by the Sea Grant Program of the National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The Gulf Coast shrimp resource supports a large and expanding industry. The value of 1971 shrimp landings was estimated at over $136 million, more than 80 percent of the total U.S. shrimp catch [1]. Commercial fish landed in Texas in 1971, most of which was shrimp, was valued at $70 million. Shrimp landed in Texas is a very large percent of the Gulf of Mexico landing. This implies that the waters adjacent to Texas are quite productive for shrimp and that these shrimp are important to the economy of Texas.

The economic contribution that shrimp producers make to the local economy and to the state of Texas is of interest since the resources of the Gulf and bays of Texas are used by many groups for both recreational and commercial purposes. Each year various groups increase their demand for the resources of the Gulf and bays. Since the Gulf and bays do not have an infinite capacity to satisfy this increased demand, the various groups become competitive for the resource. As groups become more and more competitive, one may conclude that some or all of these groups will be limited in their use of the resource. For example, if waste disposal occurs to the extent that other activities are precluded, the disposers of waste will have, in effect, appropriated the resource. The same concept applies when any special interest group uses the Gulf or bays to the exclusion of others.

The use of the Gulf and bay resources could be decided either by such a process of elimination or by public policy. Development of public policy means that state and local organizations and federal agencies will be confronted with decisions which may affect the shrimp resource as well as other resources of the Gulf. Among the factors that should be considered in decision-making is the economic contribution that each group of users makes toward the welfare of society. In this study, attention is focused on the economic contribution that shrimp producers make to the local economy and to Texas in order to evaluate the potential economic value of shrimp production.

The objective of this study is to estimate the amount of economic activity generated by the shrimp industry for both the state of Texas and for three coastal regions in Texas where shrimp landings occur. More specifically the objectives are to:

1. Estimate the total value of commercial shrimp landed in Texas and within each Gulf coast region of Texas.

2. Estimate the output, income and employment generated from commercial shrimp landings in Texas and output generated within each Gulf coast region of Texas.

PROCEDURE, STUDY AREA, AND DATA DESCRIPTION

Procedure

The local and statewide impact from shrimp production is estimated through economic multiplier analysis. Conceptually, the multiplier can be explained as follows. Shrimp fishermen buy various goods and services in order to fish for shrimp. They also receive wages that are spent to support their families. The people who provide these goods and services use a portion of this payment to pay wages and salaries and buy material to replace the goods purchased by the shrimp fishermen. These purchases in turn will result in more purchases. The economic impact of the initial purchases made by shrimp fishermen permeates the economy. Multipliers are a condensed measure of how much economic acitivity is generated by such initial purchases. These multipliers have been estimated and are available from input-output models recently developed within Texas and Gulf coast regions [3, 4, 5, 6, 7]. Multipliers that are useful to the understanding of the details of how initial economic activities affect the economy and that are used in this study are: output, income and employment.

Output Multiplier

The shrimp industry output multiplier, as used in this report, is an estimate of the total amount of output from all sectors of the economy required to support one dollar of output in the shrimp industry. Output multipliers are adapted from the Texas interindustry study for the Brownsville-Aransas, Port Lavaca-Galveston and Beaumont-Port Arthur Gulf Coast regions and for the entire state. As example of interpretation, an output multiplier of 3.0 means that a total output of $3.00 is required from the economy to support $1.00 of output by the shrimp industry. Of this amount, $2.00 is the indirect output by other sectors required to support $1.00 of shrimp industry output. The distribution of output impact over major sectors of the economy is estimated and presented in this report.

Income Multipliers

The income multiplier is an estimate of the total quantity of income (salaries, wages, profits and rent) paid to households per dollar income payment made by the shrimping industry. For example, an income multiplier estimated at 2.5 means that a total of $2.50 of household income is generated in the total economy for each $1.00 paid to households by the shrimp industry. Of course, $1.00 is direct payment to employees, and property owners and retained earnings to owners in the shrimp industry,

and $1.50 is indirect income stimulated in the remainder of the economy. The total income impact and its distribution over major sectors is estimated in this study.

Employment Multipliers

The shrimp industry employment multiplier is an estimate of the total employment in the economy that results from shrimp industry output expansion sufficient to require an additional employee to be hired. For example, an employment multiplier of 1.75 means that for each employee hired directly by the shrimp industry, another .75 employees are hired in other sectors of the economy. Alternatively, the total employment impact may be related to output of the shrimp industry. Both these expressions are presented in this report.

Study Areas

The areas for which economic impacts are estimated in this study include the state of Texas and three coastal regions that correspond to regions used in the Texas interindustry study [3, p. 7]. These coastal regions are: (1) the Brownsville-Aransas region, defined as 19 counties and representing that portion of the Texas Gulf Coast from Port Isabel to Aransas Pass (Region 7, Figure 1); (2) the Port Lavaca-Galveston area, encompassing 26 counties and the Gulf Coast from Aransas Pass to East Galveston Bay (Region 8, Figure 1); and (3) the Beaumont-Port Arthur area, made up of the area from East Galveston Bay to the Texas-Louisiana border (Region 9, Figure 1).

Data Description

The data used in this study are from two sources. First, five-year series of production- and price-data collected by the National Marine Fisheries Service (NMFS) and analyzed by Griffin [2] provided estimates of the value and total weight of shrimp landed in Texas ports during the 1967-1971 period. Landings by port are aggregated for the three regions. Second, output, income and employment multipliers were adapted from the 1967 input-output model of the State of Texas and three regional input-output models [4, 5, 6, 7].[1]

---

[1] Multipliers were actually developed for "fisheries." However, since the value of shrimp landed constitutes approximately 90 percent of the total value in the "fisheries" landings in Texas, these multipliers are appropriate for estimating the impact of shrimp industry output.

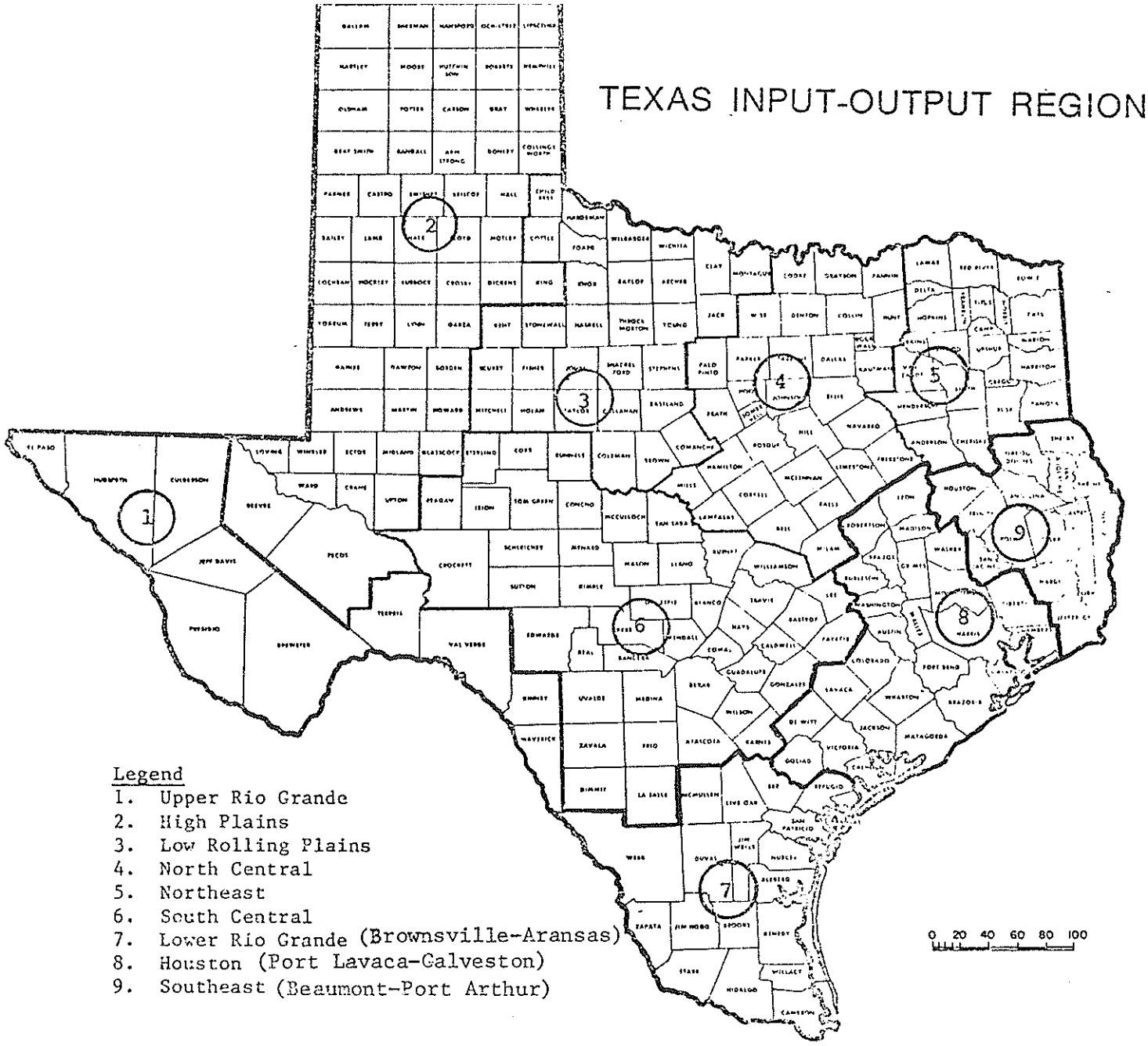

FIGURE 1

Source: [4, p. vi]

These data were used in combination to develop the estimates of total output, income and employment impacts for the state, and for three regions within the state, that result from output and purchases made by the shrimp industry.

TOTAL OUPTUT OF THE SHRIMP INDUSTRY

Table 1 shows the total output of shrimp in pounds and value for the state of Texas and the three coastal regions 7, 8 and 9 for the period 1967 to 1971. Production and value figures for 1971 are used in this analysis since they were the most recent figures available at the time this study was conducted and because shrimp output[2] for that year corresponds closely to an average year's production. The total output of the Texas shrimp industry in 1971 was 54.2 million pounds and has an average ex-vessel price[3] of $1.13 per pound (heads-off) for a total value of $63.9 million (Table 1).

DIRECT IMPACT OF THE TEXAS SHRIMP INDUSTRY

The direct impact of the shrimp industry on the remainder of the economy is demonstrated by the value of its estimated purchases from all other major economic sectors. Table 2 shows how the value of shrimp industry output in 1971 was used for purchases of productive inputs such as wages, salaries, profits, taxes, depreciation, and goods and services imported into Texas and the three Gulf Coast regions. Since the shrimp industry is labor-intensive, the largest component in each case was payments for labor and managerial services. For Texas, it is estimated that from a total value of production of $63.9 million, the industry paid $24.0 million in wages, salaries and profits, or over 37 percent (Table 2). Significant purchases of inputs and services also were made from industries such as food processing ($2.1 million), petroleum products ($2.8 million), ship and boats ($5.6 million) and others.

Table 2 indicates only the direct purchases by the shrimp industry from the economies of the State and Gulf Coast Regions. Hence, they

---

[2]Production in 1971 is approximately equal to the five-year average (1967-71). This is also evidenced in a study by Griffin, et. al., [1, Figure 21, p. 41].

[3]Ex-vessel price is the price received by the vessel owner for shrimp landed at the dock.

Table 1. Pounds[a], Value and Price per Pound of Shrimp Harvested (in Texas and by region for individual years 1967 through 1971).

Year	1967			1968			1969			1970			1971		
	Total Pounds (000)	Total Value ($1,000)	Ex-vessel $/lb.	Total Pounds (000)	Total Value ($1,000)	Ex-vessel $/lb.	Total Pounds (000)	Total Value ($1,000)	Ex-vessel $/lb.	Total Pounds (000)	Total Value ($1,000)	Ex-vessel $/lb.	Total Pounds (000)	Total Value ($1,000)	Ex-vessel $/lb.
Region 7[b]	36,949	28,148	.76	32,490	29,688	.91	27,321	27,745	1.02	31,956	20,418	.64	29,764	37,561	1.26
Region 8[c]	25,292	16,990	.67	18,537	15,392	.83	15,959	14,458	.91	22,088	13,550	.61	21,880	23,635	1.08
Region 9[d]	1,422	830	.58	1,306	792	.61	1,205	821	.68	1,358	675	.50	2,578	2,725	1.06
Texas	63,663	45,968	.67	52,333	45,872	.78	44,485	43,024	.97	55,402	34,373	.58	54,230	63,921	1.13

[a]Heads-off weight

[b]Brownville-Aransas

[c]Port Lavaca-Galveston

[d]Beaumont-Port Arthur

Table 2. Direct Purchases by the Shrimp Industry from Major Economic Sectors of Texas and Gulf Coast Regions, 1971.*

Industry	Texas ($1,000)	Brownsville-Aransas ($1,000)	Port Lavaca-Galveston ($1,000)	Beaumont-Port Arthur ($1,000)
Agriculture	9	800	432	13
Fisheries	589	402	220	6
Natural Gas	57	---	---	--
Food Processing	2,072	1,200	668	16
Textiles	628	312	232	6
Paper and Wood	8	---	4	--
Paints and Cleaners	76	41	193	1
Petro Products	2,847	1,058	198	25
Other manufacturing	150	179	262	4
Ships and Boats	5,611	3,065	2,070	53
Transportation	1,590	9	6	--
Communications	126	95	43	1
Utilities	132	91	48	1
Wholesale	2,063	1,025	508	30
Retail	1,046	985	416	23
Banking	1,003	74	2	--
Insurance	1,905	14	367	2
Services	554	563	127	4
Wages, Salaries and Profits	23,961	15,163	8,048	2,378
Property Payments	7,243	---	337	34
Taxes	1,471	1,167	620	22
Depreciation	5,641	3,930	2,082	--
Imports	5,138	7,188	6,752	106
TOTAL	63,921	37,561	23,635	2,725

* For given sector from which the shrimp industry makes purchases, regional values will not add to the state total because of differences in aggregation and estimation procedures in the original input-output models.

indicate only part of the total impact of the industry on the economy. Direct purchase by the shrimp industry from input-supplying industries stimulates output and subsequent purchases by those industries. In turn, these output changes give rise to more secondary and tertiary output responses in related industries. These indirect impacts, as well as the output increases induced by expenditures made by employees who receive income from the shrimp industry, are included in estimates of the aggregate (direct, indirect and induced) economic impact presented in the following sections of this report. These impacts are expressed in terms of output, income and employment multipliers and aggregate economic impacts.

AGGREGATE ECONOMIC IMPACT OF THE TEXAS SHRIMP INDUSTRY

Economic Output

The economic impact of the Texas shrimp industry is estimated on the basis of both the per dollar output and the aggregate dollar output of shrimp (Table 3). As shown in the second column of Table 3, $1.00 of output by the shrimp industry has a total economic output impact on the Texas economy of $3.08. This includes $1.00 of output by the shrimp industry and $2.08 of indirect and induced output by supporting industries. Related production by major sectors of the economy includes: 10¢ for food processing, 7.5¢ for petroleum products, 10.5¢ for wholesale trade services, 19.0¢ for retail trade, 13.3¢ for financing, etc. to support $1.00 of shrimp industry production (Table 3). These are total outputs required of each industry, including secondary and tertiary production requirements per dollar of shrimp industry output. Total income payments to households by all industries of about 89¢ are stimulated by the initial $1.00 of shrimp production. Payments go to households throughout the state from all industries in the form of salaries, wages, profits and rents as a result of $1.00 of shrimp production and the outputs required by supporting industries.

The total value of shrimp production to commercial shrimpers for Texas landed shrimp in 1971 was estimated to be $63.9 million. The total estimated output impact of this production on each major sector of the economy is presented in Column 3 of Table 3. The aggregate impact values are estimated by multiplying the total value of shrimp output by the output impact on each major industry per dollar of shrimp output. For example, it is estimated that $63.9 million output value stimulated $6.5 million value of output in the food processing industry, $4.8 million in petroleum products, $12.1 million in retail trade, $56.8 million in household income, etc. In total, the estimated direct, indirect and induced impact on the Texas economy of the value of 1971 shrimp production was $197.1 million (Table 3).

Table 3. Economic Impact of the Shrimp Industry's $63.9 Million of Output on the Economy of Texas, 1971.

Industry	Impact per Dollar of Shrimp Output ($)	Aggregate Impact by The Shrimp Industry (Million $)
Agriculture and Forestry	.0477	3.05
Shrimp	1.0000	63.92
Crude Oil and Natural Gas	.0433	2.76
Construction	.0094	.60
Food Processing	.1016	6.49
Textiles	.0163	1.04
Wood and Paper	.0260	1.66
Paints and Cleaners	.0025	.16
Petroleum Products	.0753	4.81
Ship Building	.0891	5.69
Other Manufacturing	.0540	3.45
Transportation	.0618	3.95
Communications	.0214	1.36
Utilities	.0433	2.77
Wholesale Trade	.1045	6.68
Retail Trade	.1898	12.13
Finance	.1334	8.52
Services	.1762	11.26
Households	.8896	56.84
TOTAL	3.0852	197.12

As these results indicate, the contribution of the Texas shrimping industry to the state's economy is significant. Almost $200 million are generated as a result of direct production, purchases made from other industries and household income stimulated by the shrimp industry. A loss or reduction in output by this industry would significantly affect a large number of economic sectors in the Texas economy. Those sectors experiencing the most significant reductions would be: the shrimp industry itself, households, food processing, petroleum products and others.

Income and Employment

The amounts of personal income and employment created by the shrimp industry are of importance in evaluating their contribution to the total economic welfare of the state and regions within the state. As indicated in Table 3, about $56.8 million of personal income is created throughout the state's economy by economic activity in the shrimp industry. This income value results both from direct payments to workers in the shrimp industry (estimated to be 37¢[4] of each dollar of output) and indirect income payments (estimated to total 52¢[5] per dollar of shrimp output) that are made by other industries as they produce in response to production requirements of the shrimp industry. Since the shrimp industry is relatively labor-intensive, and since it is closely interrelated with other producing sectors of the economy, its impact on personal income is significant. It is estimated that in 1971, the shrimp industry paid a total of $24.0 million directly to households and further stimulated an additional 32.8 million of income payments to households from industries in the remainder of the Texas economy. The income multiplier of the shrimp industry is estimated to be 2.37 ($56.8 ÷ $24.0 = $2.37).

The relationship between employment in the shrimp industry and employment in the total economy is estimated with the use of the shrimp industry employment multiplier.[6] The employment multiplier has been estimated at 1.22 [6]. This indicates that if production in the shrimp industry is increased enough such that one additional person is employed in the shrimp industry, total employment in the economy will rise by 1.22 persons. The additional .22 employees would be employed in industries that respond with increases in output of goods and services utilized in the shrimp industry.

---

[4] From Table 2, Column 2 (23,961 ÷ 63,921 = .37).

[5] From Table 3, Column 3 (.89 - .37 = .52).

[6] The employment multiplier used in this analysis was estimated for the Brownsville-Aransas area. A multiplier for the state was not available. The use of this multiplier probably underestimates the employment effect for the Texas economy.

The aggregate employment impact of the shrimp industry in 1971 is estimated from data available on the number of persons employed per dollar of output and the total dollar value of 1971 shrimp output. The most recent information available indicates that just less than one person (.78) is employed for each $10,000 of output in the Texas shrimp industry [6]. Hence, the total value of 1971 output, estimated at $63.9 million means that approximately 5,000 persons were employed directly in the shrimp industry. Moreover, as a result of the multiplier effect, giving rise to secondary and tertiary employment in related industries, it is estimated that the total employment impact on the Texas economy was just over 6,000 employees (4,986 x 1.22 = 6,083).

As with output and income, these employment effects would be concentrated primarily in close proximity to the shrimp resource--the Texas Gulf Coast regions. However, some secondary and tertiary impacts of the industry would be distributed throughout all regions of Texas because of the regional interdependence in the state's economy.

REGIONAL IMPACTS OF SHRIMPING

Since the shrimp industry is dependent upon the Gulf Coast waters as a source of shrimp, the major economic impact of the industry is concentrated in regions along the Texas Gulf Coast. In this study, economic impacts are estimated for three selected regions -- the Brownsville-Aransas region, the Port Lavaca-Galveston and the Beaumont-Port Arthur regions (Figure 1). Separate output multipliers, as estimated in the Texas interindustry study, are utilized for each region. These multipliers vary in magnitude among regions depending upon the size of the industry relative to the total regional economy, the relative number of local support industries, quantity of imported goods and services and other factors. These regional multipliers are estimates of the impact of the shrimp industry upon the local and regional economy and are generally of lesser magnitude due to leakages out of the region.

Brownsville-Aransas

The value of shrimp industry output in 1971 in the Brownsville-Aransas region was estimated to be $37.6 million (Table 1). The estimated impact of the regional economy of this production is shown in Table 4 on both a per dollar and an aggregate basis. It is estimated that one dollar of output by the shrimp industry gives rise to $2.46 total economic output in the Brownsville-Aransas region. The largest component of this (other than shrimp output itself) is household income.

In 1971, the $37.6 million output by the shrimp industry stimulated total economic output of $92.5 million within the Brownsville-Aransas region and affected each of the major economic sectors in the region (Table 4).

Table 4. Economic Impact of the Shrimp Industry's $37.6 Million of Output on the Economy of the Brownsville-Aransas Region, 1971.

Industry	Impact per Dollar of Shrimp Output ($)	Aggregate Impact by The Shrimp Industry (Million $)
Agriculture	.0471	1.77
Shrimp	1.0000	37.63
Crude Oil and Natural Gas	.0319	1.20
Construction	.0023	.09
Food Processing	.0625	2.35
Textiles	.0092	.35
Wood and Paper	.0068	.26
Petroleum Products	.0414	1.56
Other Manufacturing	.0952	3.58
Transportation	.0187	.70
Communications	.0187	.70
Utilities	.0305	1.15
Wholesale Trade	.0790	2.97
Retail Trade	.1642	6.18
Finance	.0389	1.46
Services	.1466	5.52
Households	.6658	25.05
TOTAL	2.4588	92.52

Port Lavaca-Galveston

In the Port Lavaca-Galveston region, the 1971 value of shrimp production was estimated at $23.6 million (Table 1). Table 5 shows the impact of this output on the Port Lavaca-Galveston regional economy, both per dollar and in aggregate. About $2.37 of total economic activity is stimulated within the region by each $1.00 of output in the shrimp industry. Hence, it is estimated that in 1971, the $23.6 million of output caused a total impact on the regional economy of $55.9 million (Table 5).

The output multipliers for the Brownsville-Aransas region and the Port Lavaca-Galveston region are similar in magnitude, 2.46 and 2.37, respectively. This indicates a similar degree of integration of the shrimping industry into the total economy of the two regions. Both are smaller than the state output multiplier, indicating that a substantial quantity of goods and services are probably imported into these regions from other areas of the state by the shrimp industry. In both regions, the economic impact is significant. Changes in output in the shrimp industry affect virtually all segments of the regional economies.

Beaumont-Port Arthur

In 1971, shrimp production in the Beaumont-Port Arthur region was valued at an estimated $2.7 million (Table 1). The estimated impact of each dollar of output and the aggregate impact of 1971 production are presented in Table 6. It is estimated that through the output multiplier effect each dollar of output by the shrimp industry stimulates a total of $3.11 of output in the Beaumont-Port Arthur regional economy.[7] In the aggregate, the 1971 production of $2.7 million gives rise to a total economic output of about $8.5 million. As in other regions, the Beaumont-Port Arthur shrimp industry impacts on all major sectors of the regional economy.

SUMMARY AND CONCLUSIONS

The Gulf of Mexico is an important resource base for sea food

[7] This output multiplier is of about the same magnitude as the state multiplier, 3.11 and 3.08, respectively. This implies that virtually all of the impact of local shrimp activity is retained within the region, hence the two multipliers are not significantly different. Many of the materials, ships and other shrimping supplies originate in the Beaumont-Port Arthur area. These are used locally and shipped to other areas of the State.

Table 5. Economic Impact of the Shrimp Industry's $23.6 Million of Output on the Economy of the Port Lavaca-Galveston Region, 1971.

Industry	Impact per Dollar of Shrimp Output ($)	Aggregate Impact by The Shrimp Industry (Million $)
Agriculture and Forestry	.0484	1.14
Shrimp	1.0000	23.60
Crude Oil and Natural Gas	.0122	.29
Construction	.0088	.21
Food Processing	.0604	1.43
Textiles	.0101	.24
Wood and Paper	.0146	.35
Paints and Cleaners	.0030	.07
Petroleum Products	.0233	.55
Ship Building	.0878	2.07
Other Manufacturing	.0412	.97
Transportation	.0139	.33
Communications	.0139	.33
Utilities	.0325	.77
Wholesale Trade	.0588	1.38
Retail Trade	.1827	4.31
Finance	.0925	2.18
Services	.1135	2.68
Households	.5509	13.00
TOTAL	2.3685	55.90

Table 6. Economic Impact of the Shrimp Industry's $2.7 Million of Output on the Economy of the Beaumont-Port Arthur Region, 1971.

Industry	Impact per Dollar of Shrimp Output ($)	Aggregate Impact of The Shrimp Industry (Million $)
Agriculture and Forestry	.0085	.02
Shrimp	1.0000	2.72
Crude Oil and Natural Gas	.0100	.03
Construction	.0043	.01
Food Processing	.0264	.07
Textiles	.0024	.01
Wood and Paper	.0097	.03
Paints and Cleaners	.0153	.04
Petroleum Products	.3558	.97
Ship Building	.0237	.06
Other Manufacturing		.07
Transportation	.0058	.02
Communications	.0143	.04
Utilities	.0517	.14
Wholesale Trade	.0372	.10
Retail Trade	.2077	.56
Finance	.0225	.06
Services	.1305	.36
Households	1.1631	3.16
TOTAL	3.1129	8.47

production of which shrimp is the most valuable. The total amount of shrimp landed in Texas in 1972 was 54.2 million pounds with a value of $63.9 million.

The impact or amount of economic activity generated through production by the shrimp industry in Texas and for three coastal regions in Texas was the primary concern of this study. The regions considered in this study were: the Brownsville-Aransas area, the Port Lavaca-Galveston area, and the Beaumont-Port Arthur area. Regional and statewide impact from shrimp production was estimated through multiplier analysis. Multipliers are a condensed measure of how much economic activity is generated by initial purchases from a given industry. These multipliers have been estimated and are available from the statewide input-output model recently developed for Texas. Multipliers used in this study were output, income and employment.

The direct values of commercial shrimp landings in the state of Texas and the three coastal regions of Brownsville-Aransas, Port Lavaca-Galveston and Beaumont-Port Arthur are estimated at $63.9, $37.6, $23.6 and $2.7 million, respectively. Significant direct purchases are made by the shrimp industry from the major economic sectors of Texas and the three Gulf Coast regions. Commercial shrimpers make payments primarily for wages, salaries, and profits (approximately 37 percent of total payments), food processing, petroleum products, shrimp and boats, depreciation and imports of goods and services.

The economic impact of the shrimp industry was estimated on both a per dollar and total dollar of shrimp output basis. The more significant supporting industries in terms of indirect and induced output were food processing, petroleum products, wholesale trade, retail trade and services. One dollar of output by the shrimp industry has a total economic output impact on the Texas economy of $3.08. In total dollars, the estimated direct, indirect and induced impact on the Texas economy from the $63.9 million of 1971 shrimp production was estimated at $197.1 million. The contribution to total economic welfare with respect to personal income was $56.8 million and employment created was 6,083 jobs.

About 80 percent of this aggregate statewide economic impact is concentrated in the three Gulf Coast regions studies. The estimated impact for one dollar of output by the shrimp industry was $2.46, $2.37 and $3.11 total economic output in the Brownsville-Aransas, Port Lavaca-Galveston and Beaumont-Port Arthur regions, respectively. In aggregate terms: $37.6 million output by the shrimp industry within the Brownsville-Aransas region stimulated total economic output of $92.5 million; $23.6 million output within the Port Lavaca-Galveston region stimulated total economic output of $55.9 million; and the $2.7 million output in the Beaumont-Port Arthur region stimulated total economic output of $8.5 million.

Increased demand by various groups for the resources of the Gulf and bays are causing ever-increasing pressure on local, state and federal agencies for coastal zone management policies are to be sound from the

standpoint of the welfare of society as a whole, then economic information as developed in this study must be considered along with information on contributions made by other Gulf Coast resource users. The results of this analysis indicate that the commercial shrimp industry makes an important contribution to the economies of the coastal regions and the state of Texas.

REFERENCES

[1] Griffin, Wade L., John P. Nichols and Ronald D. Lacewell, "Trends in Catch/Effort Series: Gulf of Mexico Shrimp Fishery," (unpublished report of National Marine Fisheries Service), United States Department of Commerce, NOAA, NMFS Contract No. 03-3-042-19, Texas Agricultural Experiment Station, Department of Agricultural Economics, Texas A&M University, College Station, Texas: (Dec., 1973), 85 pp.

[2] Griffin, Wade L., David Smith, Ronald D. Lacewell and John P. Nichols, "National Marine Fisheries Service Shrimp Landings; Description of Data Availability," Department Information Report No. 73-3, Texas Agricultural Experiment Station, Department of Agricultural Economics, Texas A&M University, College Station, Texas: (Jan., 1973), 17 pp.

[3] Grubb, Herbert W., "The Structure of the Texas Economy" Volume I, Office of the Governor, Office of Information Services, (March, 1973), Austin, Texas: 202 pp.

[4] Grubb, Herbert W., "The Structure of the Texas Economy" Volume II, Office of the Governor, Office of Information Services, (March, 1973), Austin, Texas: 366 pp.

[5] Hawkin, Charles F., "An Input-Output Model of the Southeast Region of Texas," Office of the Governor, Office of Information Services, (May, 1972), Austin, Texas.

[6] Murrell, Joe C., Jr., Ronald B. Geenens, Robert N. McMichael, "An Input-Output Model of the Lower Rio Grande Region of Texas," Office of the Governor, Office of Information Services, (April, 1972), Austin, Texas: 169 pp.

[7] Stern, Louis H., "Houston-Galveston Regional Input-Output Study for 1967," Office of the Governor, Office of Information Services, (June, 1972), Austin, Texas: 312.