ECONOMIC ACTIVITY ASSOCIATED WITH

COMMERCIAL FISHING

ALONG THE TEXAS GULF COAST

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Introduction

This report focuses on estimating the economic activity specifically associated with commercial fishing in Sabine Lake/Sabine-Neches Estuary, Galveston Bay/Trinity-San Jacinto Estuary, Matagorda Bay/Lavaca-Colorado Estuary, San Antonio Bay/Guadalupe Estuary, Aransas Bay/Mission-Aransas Estuary, Corpus Christi Bay/Nueces Estuary, Baffin Bay/Upper Laguna Madre Estuary, and South Bay/Lower Laguna Madre Estuary. Each bay/estuary area will define a separate geographic region of study comprised of one or more counties. Commercial fishing, therefore, refers to bay (inshore) fishing only. The results show the ex-vessel value of finfish, shellfish and shrimp landings in each of these regions, and the impact this spending had on the economy in terms of earnings, employment and sales output.

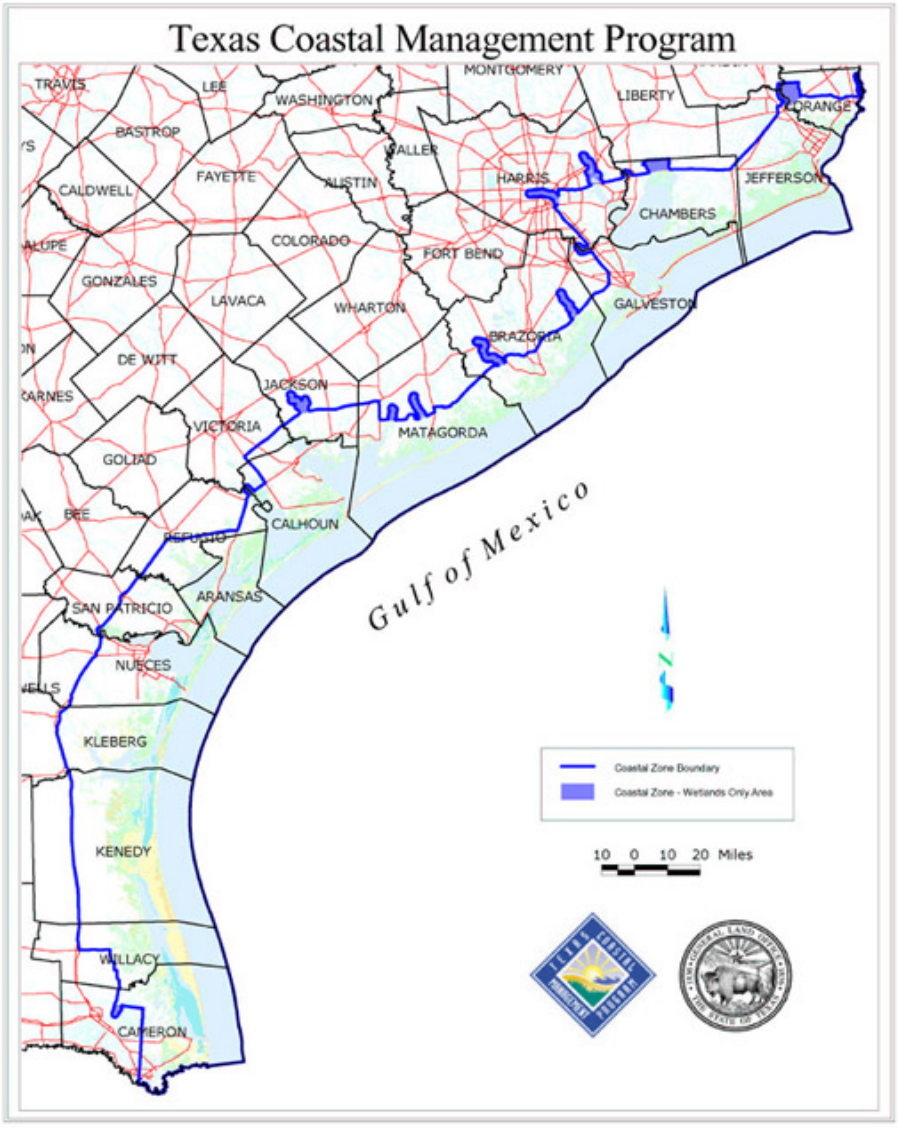
Estimates of the direct impacts associated with ex-vessel values were produced using IMPLAN, an input-output of the Texas economy developed by the Minnesota IMPLAN Group. The input data was obtained from the Texas Parks and Wildlife Department (TPWD) (Culbertson 2004). Commercial fishing impacts are provided in terms of direct expenditure, sales output, income, and employment. These estimates are reported by category of expenditure. A description of IMPLAN is included in Appendix C.

Indirect and Induced (Secondary) impacts are generated from the direct impacts calculated by IMPLAN. Indirect impacts represent purchases made by industries from their suppliers. Induced impacts represent spending by employees who earn income within the industry.

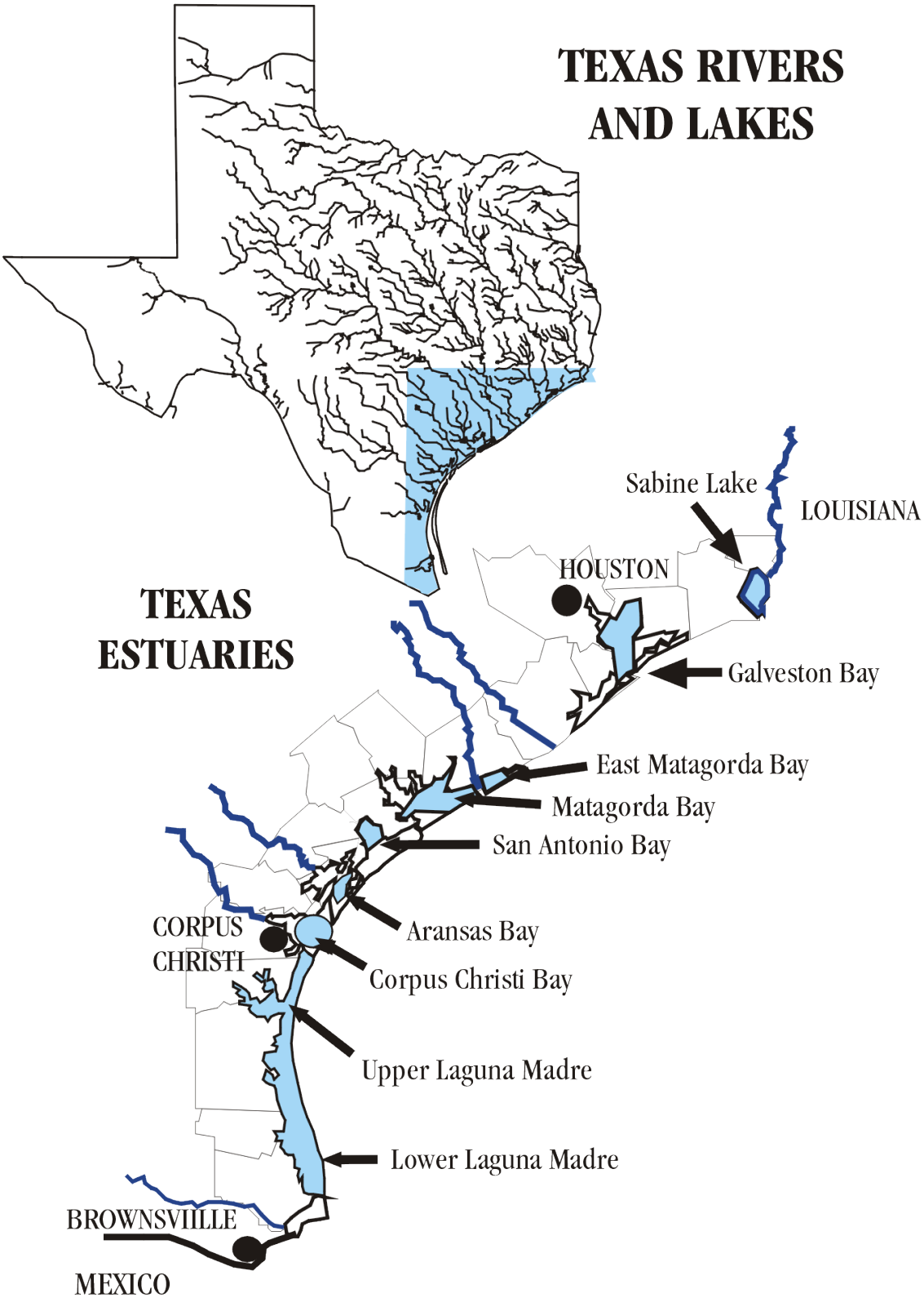
Section A provides a brief overview of the study area and geography of the bay system. Section B briefly describes commercial fishing in the study area. Section C summarizes the direct impact of commercial fishing in each of the Bay areas. Section D will provide estimates of economic activity of each region of study - regional direct and indirect employment, as well as direct and indirect income generated by commercial fishing. Appendix A contains definitions of words and terms used in this study. Appendix B provides details of data collection, methods used to calculate expenditures, adjustments made to the data, assumptions and discusses limitations of the model. Appendix C explains the model used to estimate economic activity.

A. Study Area and Geography of the Bay System[1]

Figure 1



[1] **See http://www.glo.state.tx.us/coastal/cmpdoc/jpegs/guidance-czb-sm.jpg for maps of Texas coastal zones.**



Gulf coast estuaries and bays, fed by freshwater inflows, contain coastal wetlands which are home to 95% of the recreational and commercially important fish species found in the Gulf of Mexico.' (Cook 2002) These wetlands are also the spawning ground of many species of shrimp. Commercial fishing of these species provides coastal residents with employment and income. 11 out of 15 of Texas major rivers have historically provided freshwater to the coast, but this is increasingly being threatened by demands for

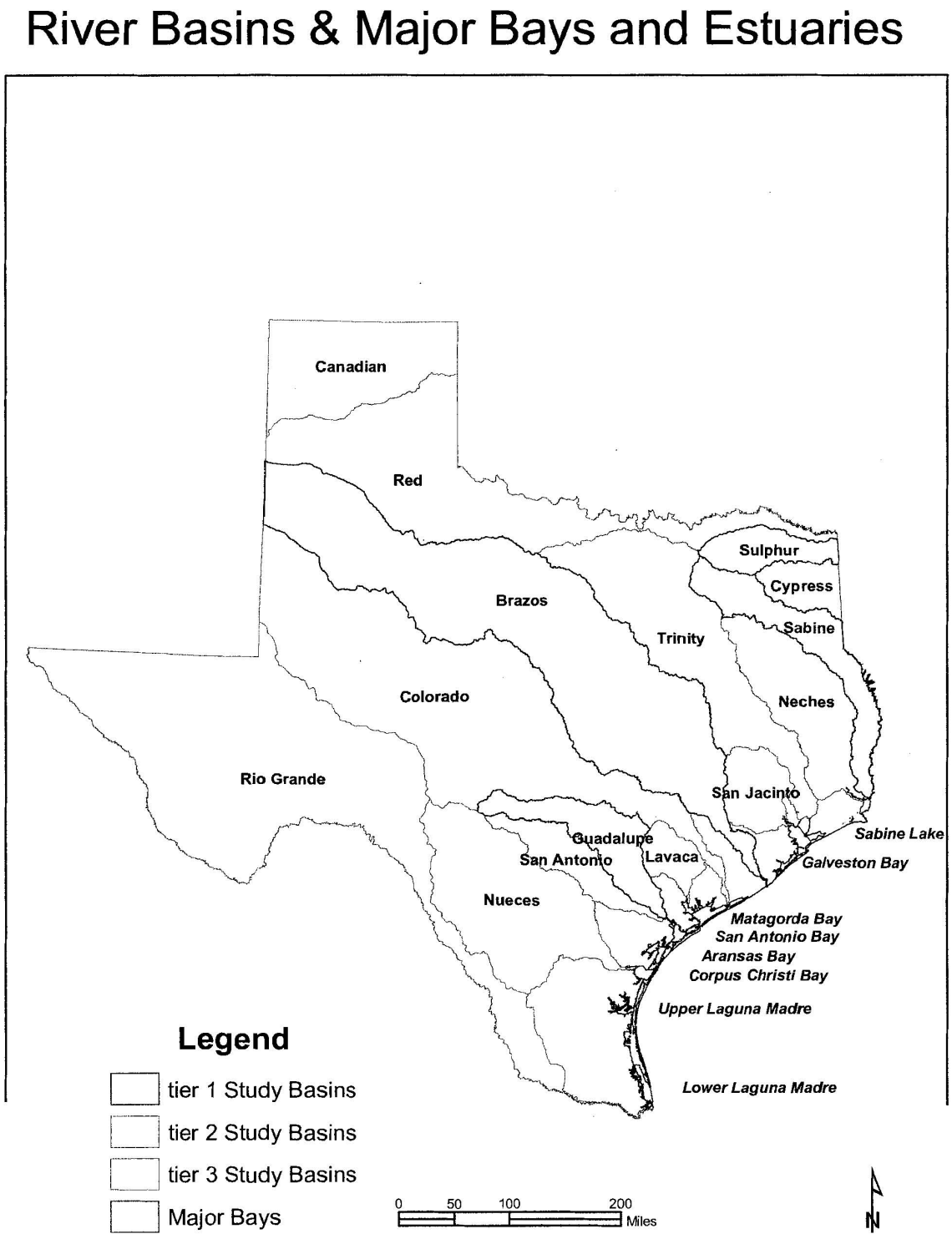
freshwater by agricultural, industrial and municipal interests. Figure 1 shows the study area by county where commercial fishing activities take place. Study area will be defined in this study as the area where both the activity and the economic activity takes place. Figure 2 shows the location of each bay. Table 1 shows the counties which are the primary beneficiaries of the sales, employment, and income from activities in the bays and estuaries fed by freshwater inflows. Bay regions may overlap more than one county boundary to define the economic region of interest to this study.

Table 1: Texas Bays, Estuaries and County Breakdown of Study Area

Bay/Estuary	Counties
South Bay/Lower Laguna Madre Estuary	
	+ ½ Kenedy (Port Mansfield Area)
	Cameron
	(Hidalgo)
	Willacy
Baffin Bay/Upper Laguna Madre Estuary	
	Kenedy (- ½ Kenedy Baffin Area)
	Kleberg
Corpus Christi Bay/Nueces Estuary	
	Nueces
	San Patricio
	Aransas (½ Aransas)
Aransas Bay/Mission-Aransas Estuary	
	(2/3 Refugio)
	Aransas
	San Patricio
San Antonio Bay/Guadalupe Estuary	
	(1/3 Refugio)
	Calhoun
	(½ Aransas)
	(Victoria)
Matagorda Bay/Lavaca-Colorado Estuary	
	(Jackson)
	Matagorda
	Calhoun
	Victoria
Galveston Bay and the Trinity-San Jacinto Estuary	
	Galveston
	Brazoria
	Harris
	(Liberty)
	Chambers
Sabine Lake and the Sabine-Neches Estuary	
	Orange
	Jefferson

Figure 3 shows the major rivers which provide the freshwater sources for the bays and estuaries of the Gulf.

Figure 3



B. About Commercial Fishing[2] in Texas

There are probably more than 600 species of Texas marine fishes, counting all habitats from the estuaries to the ocean depths of the abyssal zone 150 miles off the barrier islands. This is more than all the different kinds of Texas freshwater fishes, reptiles, amphibians, and mammals put together. At least 120 families of marine fishes live along the Texas coast. Getting an exact count is difficult because there are few effective barriers in the ocean, and it is large and difficult to explore; secretive species therefore often go unnoticed (Anderson and Ditton 2004).

The commercial seafood referred to in this study are comprised of finfish, shellfish, and shrimp. The source for the data used in this report, unless specified otherwise, is *Trends in Texas Commercial Fishery Landings, 1981-2001*, published by the Texas Parks and Wildlife Department – Coastal Fisheries Division (Culbertson 2004). Finfish species included in the data are black drum, yellowfin tuna, grouper, and flounder. Shellfish include blue crab, and Eastern oyster. Shrimp species which are used for eating are brown shrimp, pink shrimp and white shrimp. Bait shrimp data is also commercially harvested in the Gulf Coast, but not reported in this study[3].

Commercial fishing supports many communities along the Gulf Coast, providing employment, income, and revenue from sales. Freshwater inflows mix with saltwater in wetland areas of estuaries to provide the appropriate salinity where a number of finfish and shellfish species can find shelter, food, spawning and nursery grounds. The availability of shrimp, in particular, depends on the amount of vegetated area provided by wetlands. The health of the estuarine ecosystem and the economies of surrounding counties depend on careful water use and water management policies which preserve the flow of freshwater, a life cycle, and a food chain which ends with the harvesting of seafood for consumption (Stedman and Hanson 1991)

Commercial fishermen sell to licensed seafood and bait dealers. The dealers must fill out a report (Monthly Aquatic Products Report) each month. This report details where the fishing activity takes place, the total weight and the price paid for the species of finfish, shellfish, or crab (Culbertson 2004). The number of fishermen is estimated by the number of commercial saltwater fishermen non-resident and resident licenses sold in Texas 1981-2001. It was assumed for this study that residents travel less than 112 miles (or less than 90 minutes) to fish and non-residents travel more than 112 miles (more than 90 minutes).

[2] Saltwater fishing

[3] Data available for 1994 – 2001 only, or reported as offshore (Gulf of Mexico).

C. Initial Spending

Total earnings from commercial fishing activity are measured by the monies paid to commercial fishermen, 16 years or older, from the sale of their fish directly to commercial seafood and bait dealers. These revenues come from the value of the total fish caught and landed (unloaded) in the bay region (ex-vessel value). Ex-vessel value can be obtained directly from the Culbertson report (Culbertson 2004). Commercial fishing effort which occurs outside of an immediate bay, but landed in a bay of interest may also have an economic impact on surrounding counties.

1. Summary of Ex-Vessel Values

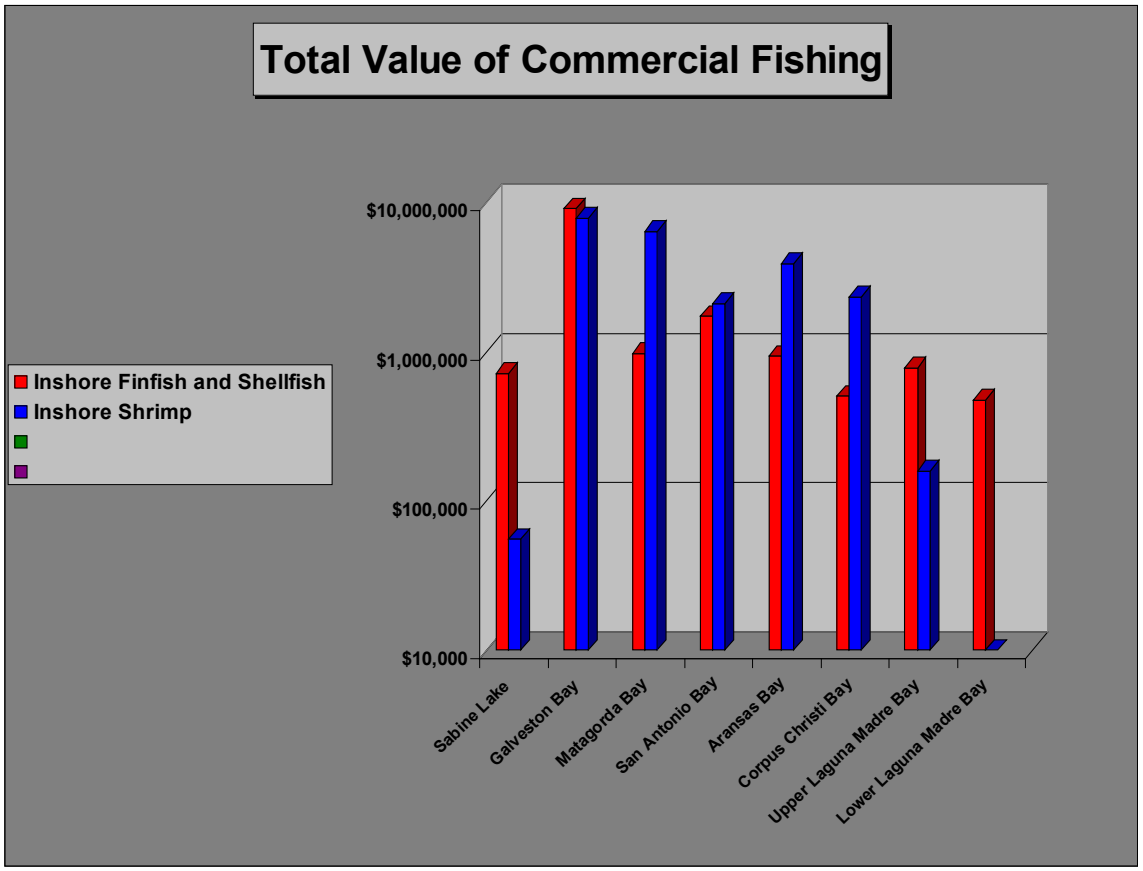
Total value of commercial fishing in each Bay area was estimated using inshore data from **Robinson, et al.** (Culbertson 2004) and offshore data from the **National Marine Fisheries Service (NMFS)**[4]. This data was used to estimate the total value of inshore finfish, shellfish, and shrimp. The following is a summary of all the landings and their values in the Bay region of Texas adjusted to 2003 dollars[5].

Table 1: Summary of Ex-Vessel Values of Finfish, Shellfish, and Shrimp, adjusted to 2003 dollars, by Bay

Bay	Inshore Finfish	Inshore Shellfish	Inshore Shrimp
Sabine Lake	$25, 664	692,297	$55,471
Galveston Bay	$205,152	8,953,512	$7,930,823
Matagorda Bay	$47,152	932,579	$6,451,662
San Antonio Bay	$171,599	1,564,157	$2,112,515
Aransas Bay	$227,739	714,095	$3,924,491
Corpus Christi Bay	$366,964	140,235	$2,341,033
Upper Laguna Madre Bay	$756,054	$27,047	$158,915
Lower Laguna Madre Bay	$395,584	$83,162	0

[4] Courtesy of Lance Robinson, TPWD.
[5] Adjusted using the PPI for unprocessed finfish and shellfish (BLS 2002).

Figure 1: Summary of Ex-Vessel Values of Finfish, Shellfish, and Shrimp, (1981-2001 average in 2003 dollars), by Bay



2. Inshore Ex-Vessel Values[6] for each Bay Area

I. Trinity-San Jacinto Estuary and the Galveston Bay System

Galveston Bay is surrounded by Harris, Galveston and Chambers counties and is approximately 30 miles long, 17 miles wide, and 6 to 12 feet deep. It is the largest estuary on the Texas coast. The waters of the Trinity and San Jacinto rivers mix with the saltwater from the Gulf of Mexico through the channel between Galveston Island and the Bolivar Peninsula (Bolivar Roads). By 2003 it was estimated[7] that there would be approximately 4.496 million people living in the Houston Metropolitan area, which contains counties surrounding Galveston Bay.

Shrimp have been exported from Galveston Bay since the 1920's when frozen transport became possible. By 1930, shrimp became the most important fishery for the bay above

[6] 21 year average from 1981-2001. These dollar values represent an upper bound on the ex-vessel value of landings.

[7] Population estimates from www.census.gov/popest/counties/tables/Coest2003-01-48.pdf

finfish and shellfish. According to more recent data[8] from the Coastal Fisheries Division of the Texas Parks and Wildlife Commission (Culbertson 2004), the grand total of finfish, shellfish and shrimp landed commercially in Galveston Bay ranged between a low of 9,987,728 pounds to a high of 12,269,054 pounds taken from the bay. Data from the same source, for bait shrimping efforts (live and dead bait shrimp), and the dollar ex-vessel value of bait shrimp landed commercially in Galveston Bay, are available for 2001 only, and so are not included in the estimate of economic activity derived from commercial fishing in this section. Consequently, estimates of economic activity from commercial fishing in the Trinity-San Jacinto Estuary and the Galveston Bay System are conservative estimates only.

Galveston Bay totaled $17.089 million in ex-vessel value of finfish, shellfish, and shrimp landings in the year 2001, and adjusted to 2003 dollars. The method that was used to estimate this number is discussed in Appendix B.

Table 2: Summary of Direct Impacts (000s $) of inshore landings for finfish, shrimp, and shellfish for Galveston Bay (1981-2001 average in 2003 dollars)

	Inshore
Fish and Shellfish (except shrimp)	$9158664
Shrimp	$7930823
Total	$17089487

[8] 1995 – 2001. 2001 represents the most recent data collected.

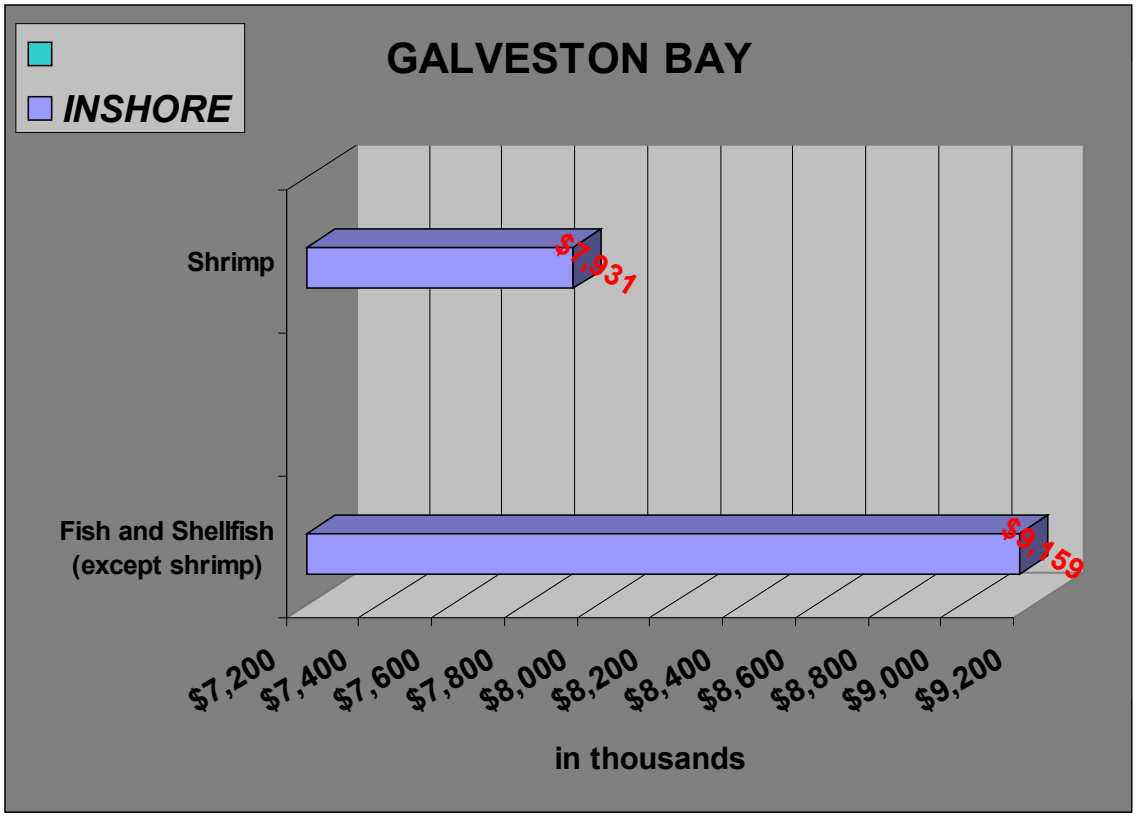


Table 3: Summary of expenditures per commercial fishing vessel owner – Galveston Bay

GALVESTON BAY FISHING EXPENDITURE						
		Chambers	Galv. Cnty.	Kemah	Brazoria	Average
	Food	1335.494	771.717	7412.365	534.7818	2513.589
	Fuel	18269.8	16713.3	127733	14480.3	44299.1
	Maint/Supplies	22113.39	14320.89	113363.4	11396.32	40298.5
	Crew Shares	12140.85	7015.61	67385.14	4861.652	22850.81
	OvrheadFixed	1168.84	1930.63	13729.2	2142.88	4742.888

II. Mission-Aransas Estuary and the Aransas Bay System

ARANSAS BAY, TEXAS. Aransas Bay, across Redfish Bay from Port Aransas in Aransas, San Patricio, and Nueces counties, is named for the Bay between Mustang and St. Joseph's islands.

Principal ports are Rockport and Aransas Pass, with access to the Gulf through Aransas Pass channel. Copano Bay, NW arm of Aransas Bay, receives Aransas R. (c.50 mi/80 km long) and Mission R. from NW, Copano Creek (c.20 mi/32 km long) from N. St. Charles Bay (11 mi/18 km. long, 1 mi/1.6 km-3 mi/4.8 km wide) is NE arm.

Commercial fishing in the bay area is made up of different activities which include bay fishing and gulf fishing. The former relates to smaller boats which sell the catch at points of the landing only. Gulf fishing uses commercial boats which sell their catch anywhere in the bay.

The Aransas Bay totaled to $4.86 million in ex-vessel value of finfish, shellfish, and shrimp landings in the year 2001 adjusted to 2003 dollars. The method that was used to estimate this number is discussed this is report.

Table 3: Direct Impacts of inshore landings for finfish, shrimp, and shellfish for Aransas Bay (1981-2001 average in 2003 dollars)

	Inshore
Fish and Shellfish (except shrimp)	$941834
Shrimp	$3924491
Total	$4866325

Figure 2: **Direct Impacts of inshore landings for finfish, shrimp, and shellfish for Aransas Bay (1981-2001 average in 2003 dollars)**

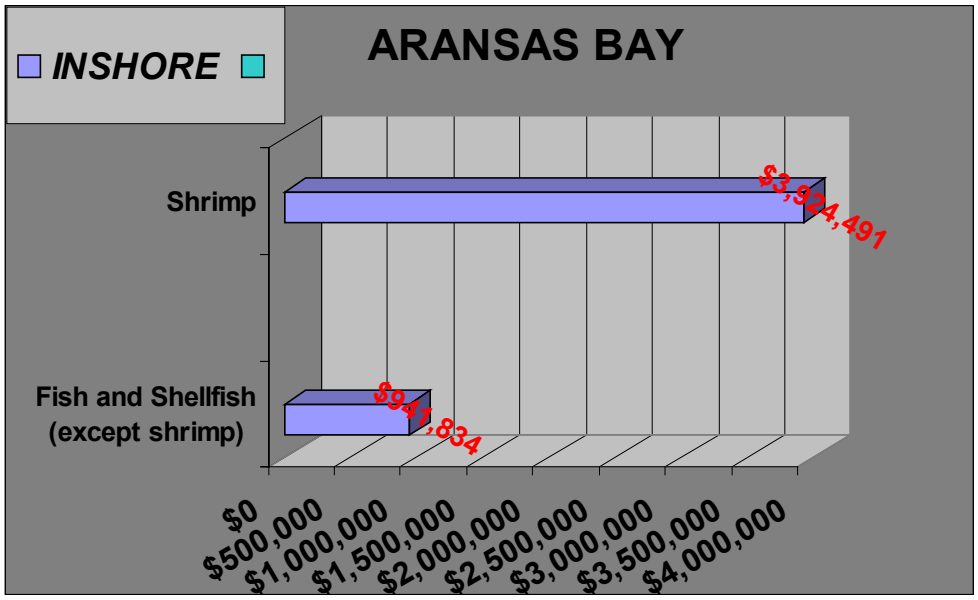


Table 4: Summary of expenditures per commercial fishing vessel owner – Aransas Bay

ARANSAS BAY FISHING EXPENDITURE		
	Food	8262.262
	Fuel	148365
	Maint/Supplies	122909.8
	Crew Shares	75111.47
	OvrheadFixed	17850.7

III. Nueces Estuary and the Corpus Christi Bay System

CORPUS CHRISTI BAY: Corpus Christi Bay is a large saltwater estuary at the mouth of the Nueces River (at 27°46' N, 97°15' W). It is protected from the waves and storms of the Gulf of Mexico by Mustang Island. The bay is entirely in the jurisdiction of Nueces County, though its northern shoreline is the boundary of San Patricio County.

Corpus Christi Bay is one of the few natural harbors on the Texas coast. The growth of the city of Corpus Christi is largely due to its maritime location. Corpus Christi Bay has developed into a major recreational area. The mild climate, the waters protected by the barrier islands, and the abundant sunshine draw thousands of both summer and winter tourists to the area. The Corpus Bay area temperature average is 71.2 degrees. The Corpus Christi Bay System has a total area of 124,796 acres with 127 miles of shoreline. The largest bay in this system is Corpus Christi Bay, which covers 95,997 acres. Its water surface area is 600 square miles and the population of the area is approximately 500,000.

Corpus Christi Bay totaled $2.84 million in ex-vessel value of finfish, shellfish, and shrimp landings in the year 2001.

Table 5: Direct Impacts of inshore landings for finfish, shrimp, and shellfish for Corpus Christi Bay (1981-2001 average in 2003 dollars)

	Inshore
Fish and Shellfish (except shrimp)	$507199
Shrimp	$2341033
Total	$2848232

Figure 3: **Direct Impacts of inshore and offshore landings for finfish, shrimp, and shellfish for Corpus Christi Bay (1981-2001 average in 2003 dollars)**

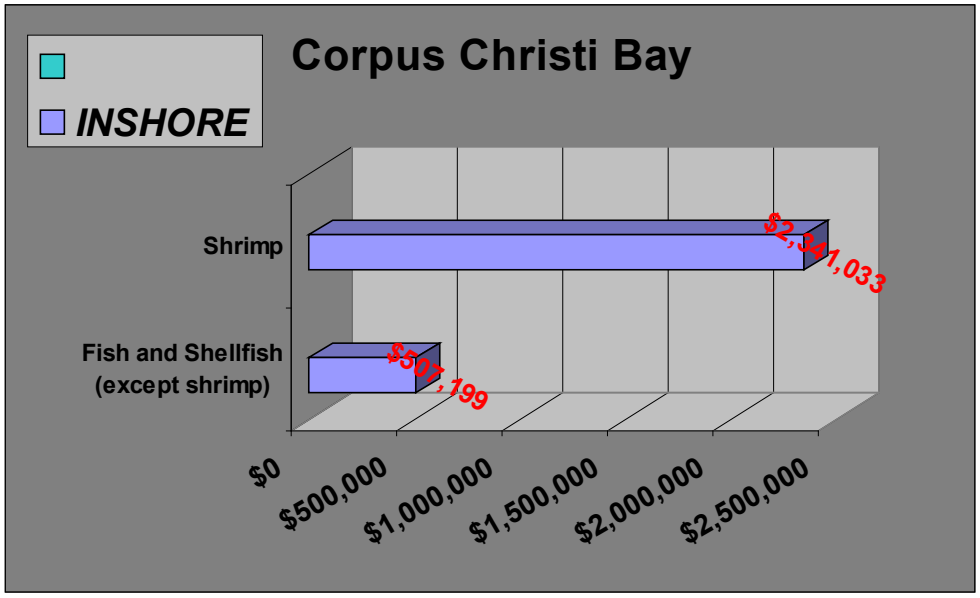


Table 6: Summary of expenditures per commercial fishing vessel owner – Corpus Christi Bay

CORPUS CHRISTI BAY FISHING EXPENDITURE		
	Food	3428.505
	Fuel	55886.1
	Maint/Supplies	45093.25
	Crew Shares	31168.23
	OvrheadFixed	7098.57

IV. Lavaca-Colorado Estuary and the Matagorda Bay System

MATAGORDA BAY: Matagorda Bay (at 28°38' N, 96°15' W) is a major bay on the Texas coast protected from the tides and storms of the Gulf of Mexico by the Matagorda Peninsula.

The bay is divided almost equally between Calhoun and Matagorda counties. Tres Palacios Bay, Turtle Bay, Carancahua Bay, Keller Bay, Cox Bay, and Lavaca Bay all open into Matagorda Bay. Matagorda Bay is also crossed by the Gulf Intracoastal Waterway and the ship channels to Palacios, Port O'Connor, and Port Lavaca. All of these channels have spoil banks alongside. The only entry to Matagorda Bay from the Gulf is through Cavallo Pass at the southern end of Matagorda Peninsula, or the Matagorda Ship Channel. At the north end of the bay an isthmus formed by Egret Island

and the extended banks of the Colorado River connect the mainland to Matagorda Peninsula and separate Matagorda Bay from East Matagorda Bay. The bay provides excellent feeding and nursery areas for marine species and represents an important fisheries resource in the region. Commercial fisheries include shrimp, oysters, blue crabs and fin-fish.

Matagorda County has a population of 38,290, although the Bay area might include parts of Calhoun and Victoria counties as well. Matagorda Bay totaled to $7.43 million in ex-vessel value of finfish, shellfish, and shrimp landings.

Table 7: Direct Impacts of inshore landings for finfish, shrimp, and shellfish for Matagorda Bay (1981-2001 average in 2003 dollars)

	Inshore
Fish and Shellfish (except shrimp)	$979731
Shrimp	$6451662
Total	$7431393

Figure 4: Direct Impacts of inshore and offshore landings for finfish, shrimp, and shellfish for Matagorda Bay (1981-2001 average in 2003 dollars)

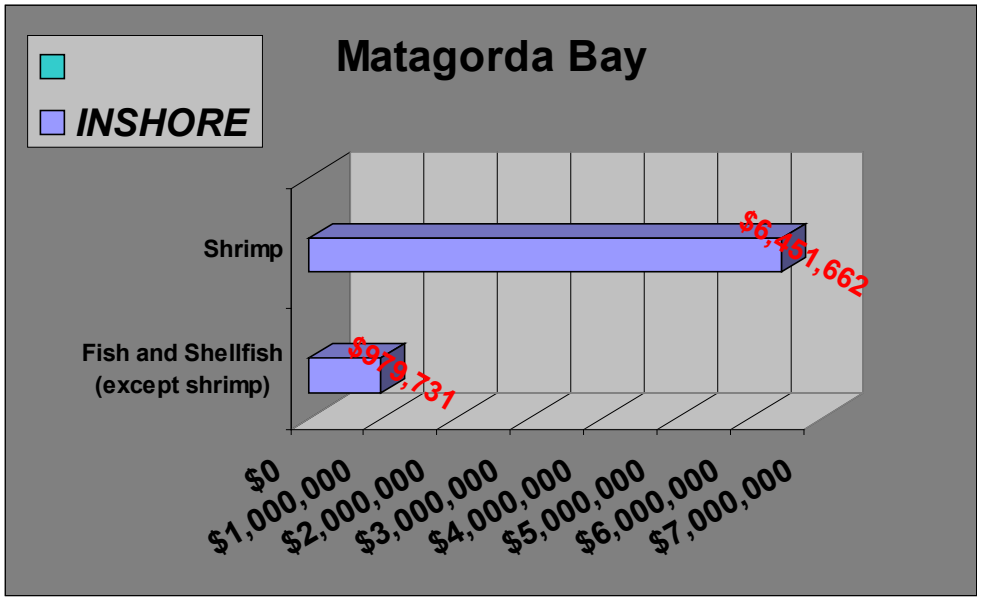


Table 8: Summary of expenditures per commercial fishing vessel owner – Matagorda Bay

MATAGORDA BAY FISHING EXPENDITURE					
		Mat. Bay	Port OCon		Average
	Food	1010.96	2832.002	4094.962	2645.975
	Fuel	22861.3	53300.3	78529.1	51563.57
	Maint/Supplies	18966.27	31611.6	64202.27	38260.05
	Crew Shares	9190.545	25745.47	37226.93	24054.32
	OvrheadFixed	2810.64	6419.98	9126.33	6118.983

V. Upper and Lower Laguna Madre Estuary and the Baffin Bay/South Bay Systems

LAGUNA MADRE. Laguna Madre is a long backwater bay that extends 130 miles south from Corpus Christi Bay to Port Isabel between Padre Island and the mainland. It fronts southern Nueces County, all of Kleberg, Kennedy, and Willacy counties, and most of Cameron County.

Laguna Madre Bay comprises of Upper and Lower Laguna Madre Bays. Lower Laguna Madre is an area of the bay located between the cut at South Padre Island on the tip of Texas next to the Mexican border and Port Mansfield Texas. The Population of counties surrounding the Laguna Madre estuary was estimated to be approximately 1,050,034, in 2003.

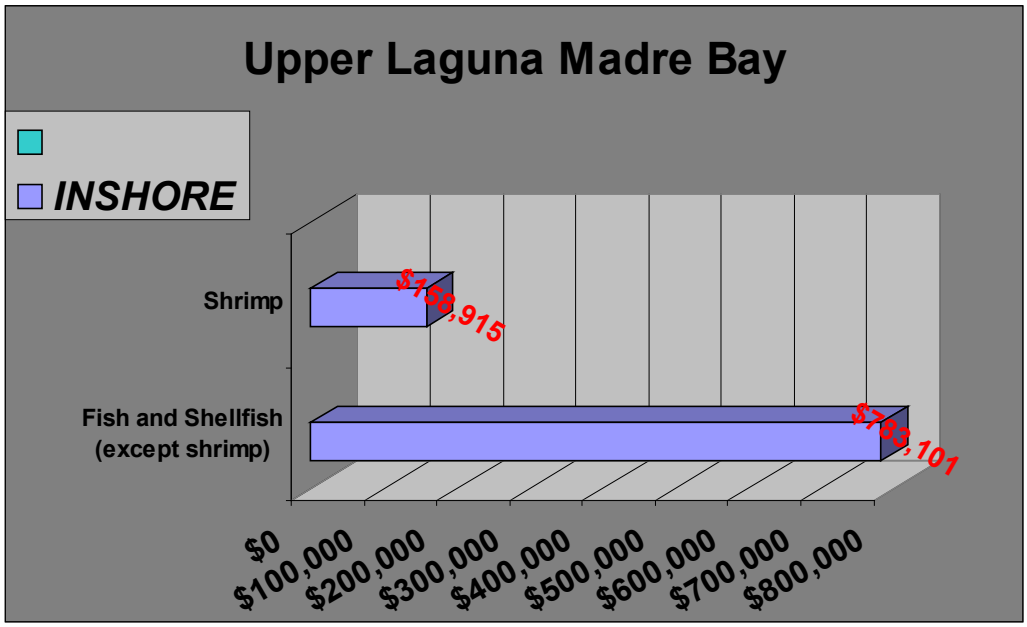
LowerUpper Laguna Madre Bay totaled to $0.86 million in ex-vessel value of finfish, shellfish, and shrimp landings in the year 2001. The method that was used to estimate this number is discussed this is report.

The impact of the sales of the landings (impacts of offshore and inshore commercial fishing) in Upper Laguna Madre Bay was estimated to be $5.9 million for the year 2001. For calculating the direct impact, three different scenarios were considered like inshore and offshore catches were considered.

Table 9: Direct Impacts of inshore landings for finfish, shrimp, and shellfish for Upper Laguna Madre Bay (1981-2001 average in 2003 dollars)

	Inshore
Fish and Shellfish (except shrimp)	$783101
Shrimp	$158915
Total	$942016

Figure 5: Direct Impacts of inshore and offshore landings for finfish, shrimp, and shellfish for Upper Laguna Madre Bay (1981-2001 average in 2003 dollars)



Lower Laguna Madre Bay totaled to $0.86 million in ex-vessel value of finfish, shellfish, and shrimp landings in the year 2001. Upper Laguna Madre Bay totaled $0.942 million in ex-vessel value of finfish, shellfish and shrimp landings in the year 2001.

Table 10: Direct Impacts of inshore landings for finfish, shrimp, and shellfish for Lower Laguna Madre Bay (1981-2001 average in 2003 dollars)

	Inshore
Fish and Shellfish (except shrimp)	$478746
Shrimp	0
Total	$478746

Figure 6: **Direct Impacts of inshore and offshore landings for finfish, shrimp, and shellfish for Lower Laguna Madre Bay (1981-2001 average in 2003 dollars)**

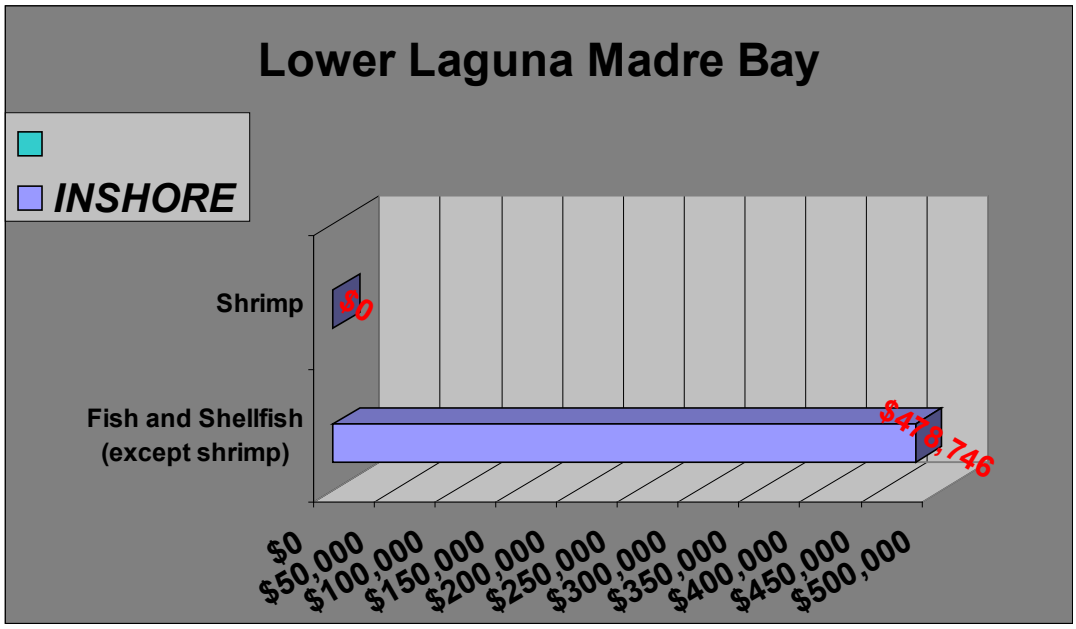


Table 11: Summary of expenditures per commercial fishing vessel owner – Upper and Lower Laguna Madre Bay

BAFFIN BAY FISHING EXPENDITURE	
	Pt. Isabel
Food	24.27758
Fuel	278.725
Maint/Supplies	307.6843
Crew Shares	220.7053
OvrheadFixed	52.4503

SOUTH BAY FISHING EXPENDITURE	
	Brnsville
Food	23.21926
Fuel	179.49
Maint/Supplies	157.9297
Crew Shares	211.0842
OvrheadFixed	15.7689

VI. Sabine-Neches Estuary and the Sabine Lake System

The Sabine Lake Bay: Sabine Lake is on the Louisiana-Texas boundary in eastern Orange and Jefferson counties, Texas, and western Cameron Parish, Louisiana. The lake, some fourteen miles long and seven miles wide, is formed by the confluence of the Neches and Sabine rivers. Through its five-mile-long tidal outlet, Sabine Pass, it drains some 50,000 square miles of Texas and Louisiana into the Gulf of Mexico.

The Sabine Lake Bay totaled to $0.75 million in ex-vessel value of finfish, shellfish, and shrimp landings in the year 2001.

Table 12: Direct Impacts of inshore landings for finfish, shrimp, and shellfish for Sabine Lake Bay (1981-2001 average in 2003 dollars)

	Inshore
Fish and Shellfish (except shrimp)	$717941
Shrimp	$55471
Total	$773412

Figure 7: Direct Impacts of inshore and offshore landings for finfish, shrimp, and shellfish for Sabine Lake Bay (1981-2001 average in 2003 dollars)

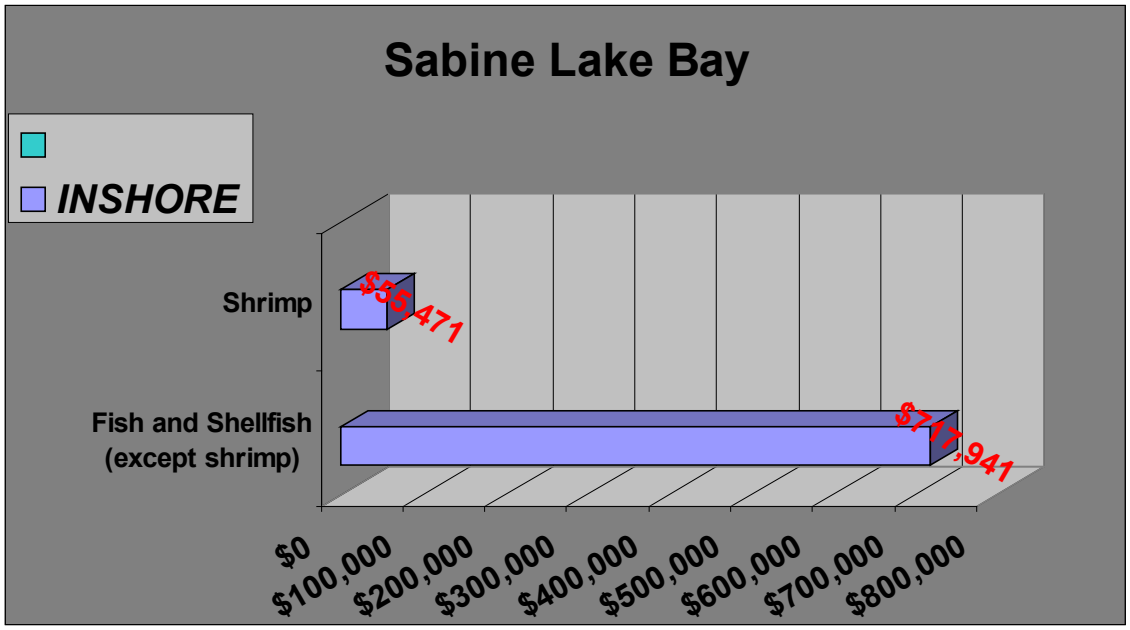


Table 13: Summary of expenditures per commercial fishing vessel owner – Sabine Lake

SABINE LAKE BAY FISHING EXPENDITURE	Beaumont
Food	34.53491
Fuel	901.481
Maint/Supplies	747.2336
Crew Shares	313.9538
OvrheadFixed	118.331

VII. Guadalupe Estuary and the San Antonio Bay System

SAN ANTONIO BAY. San Antonio Bay, in southwestern Calhoun County (at 28°18' N, 96°44' W), opens onto Espiritu Santo Bay to the east and is protected from the Gulf of Mexico by San Antonio Island. The mouth of the Guadalupe River forms a large delta area on the western bank of the bay. Guadalupe Bay and Hynes Bay are northern extensions of San Antonio Bay. San Antonio Bay covers an area of about 100 square miles.

The San Antonio Bay estuarine complex is located on the Texas coast, south of San Antonio Bay and north of Copano-Aransas Bays. San Antonio Bay comprises the majority of the system, which also includes Espirito Santo Bay, Mesquite Bay, Hynes Bay and Guadalupe Bay. Freshwater inflow comes from the San Antonio and Guadalupe Rivers, and Green Lake/Victoria ship channel.

Freshwater inflow to San Antonio Bay is predominantly from the Guadalupe and San Antonio Rivers. The major cities in this bay are San Antonio and Victoria, with a total population of 2132188 (2000 census). The major rivers are Guadalupe, San Antonio and Nueces.

The San Antonio Bay totaled to $3.7 million in ex-vessel value of finfish, shellfish, and shrimp landings in the year 2001.

Table 14: Direct Impacts of inshore landings for finfish, shrimp, and shellfish for San Antonio Bay (1981-2001 average in 2003 dollars)

	Inshore
Fish and Shellfish (except shrimp)	$1735756
Shrimp	$2112515
Total	$3848271

Figure 8: Direct Impacts of inshore landings for finfish, shrimp, and shellfish for San Antonio Bay (1981-2001 average in 2003 dollars)

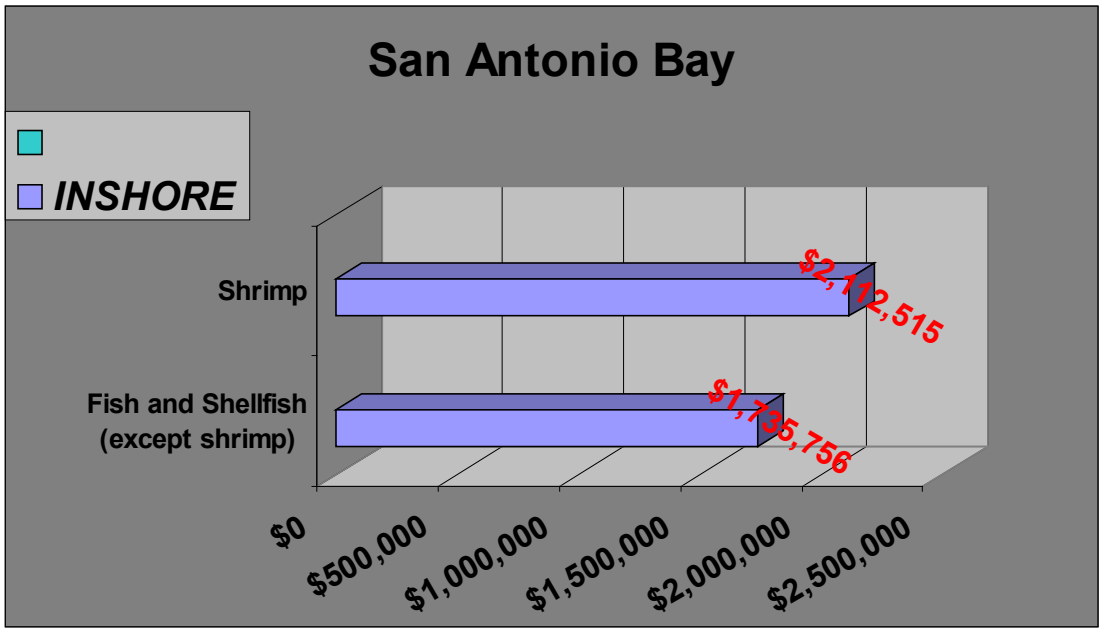


Table 15: Summary of expenditures per commercial fishing vessel owner – San Antonio Bay

SAN ANTONIO BAY FISHING EXPENDITURE					
		Calhoun	Pt. Lavaca	Seadrift	Average
	Food	14.83676612	410.2712	4929.439	1784.849
	Fuel	82.519	10312.2	78558.1	29650.94
	Maint/Supplies	92.69282308	7159.69	65024.03	24092.14
	Crew Shares	134.879692	3729.739	44813.08	16225.9
	OvrheadFixed	8.83342	1316.29	9187.93	3504.351

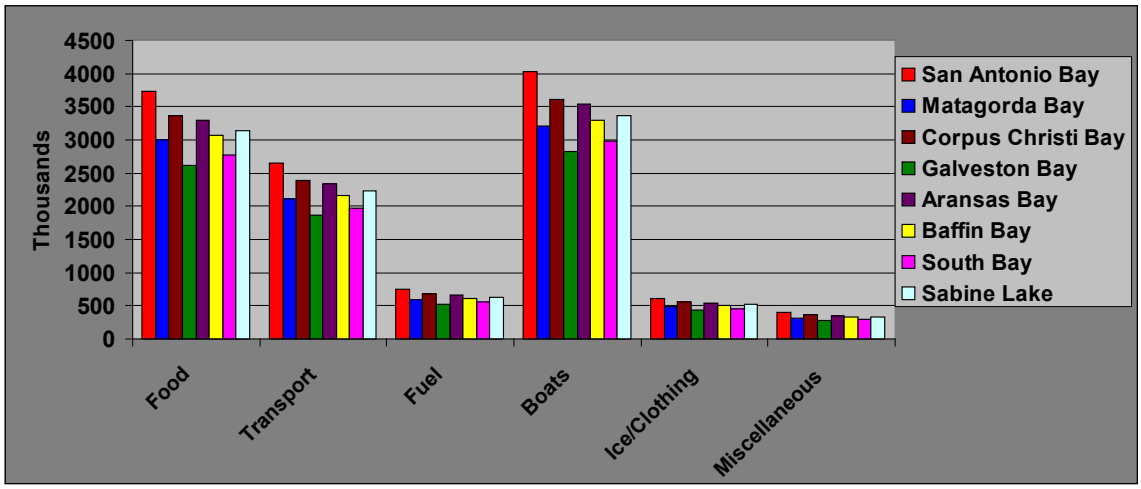
VIII. Annual Personal Expenditures by Spending Category

Relevant expenditure categories for commercial fishing include food, maintenance and supplies, fuel, crew shares, and overhead/fixed. Categories of expenditure are reported for commercial fishing and based on primary data for ports relevant to the study area. For each bay, annual vessel owner expenditures for each category are shown in the table below.

Table 16: Average (1981 – 2001) Annual Vessel Owner Expenditures by Category

	Bay							
Category	San Antonio Bay	Matagorda Bay	Corpus Christi ay	Galveston Bay	Aransas Bay	Baffin Bay	South Bay	Sabine Lake
Food	1784.849	2645.975	3428.505	2513.589	8262.262	24.27758	23.21926	34.53491
Maint/Supplies	29650.94	51563.57	55886.1	44299.1	148365	278.725	179.49	901.481
Fuel	24092.14	38260.05	45093.25	40298.5	122909.8	307.6843	157.9297	747.2336
Crew Shares	16225.9	24054.32	31168.23	22850.81	75111.47	220.7053	211.0842	313.9538
Overhead/Fixed	3504.351	6118.983	7098.57	4742.888	17850.7	52.4503	15.7689	118.331

Figure 9: Average (1981 – 2001) Annual Vessel Owner Expenditures by Category



D. Estimates of Economic Activity

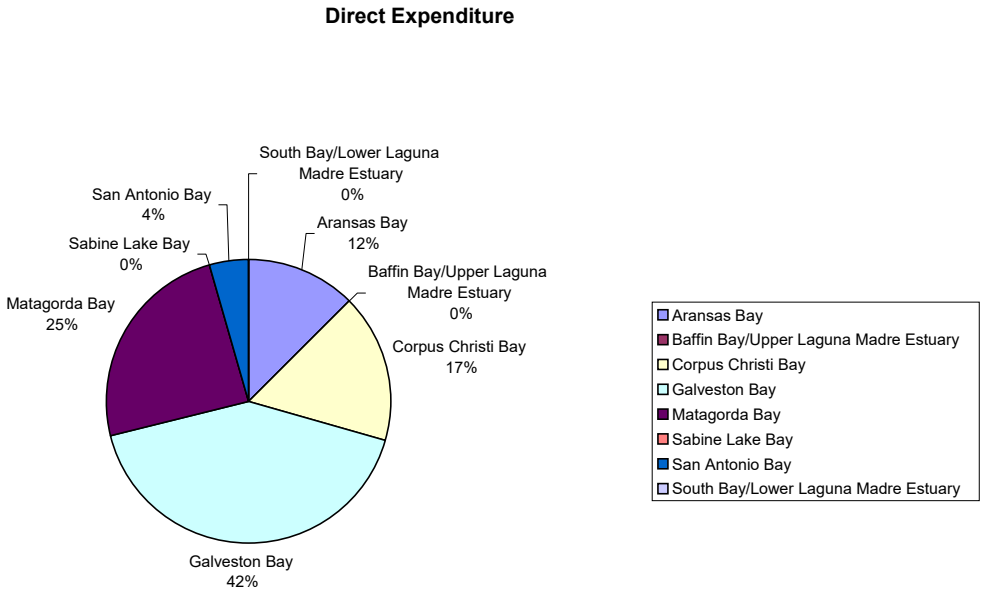
1. Impact Categories

Impact Category	Description
Sales Output	• Measured in dollars • The amount of total regional business sales revenue stimulated from goods sold in commercial fishing related sectors, as a result of the direct, indirect, and induced effect of an extra dollar of spending on commercial fishing activity in the region.
Income	• Measured in dollars • The amount of personal income stimulated in commercial fishing related sectors, as a result of the direct, indirect, and induced effect of an extra dollar of spending in the region.
Employment	• Measured by number of jobs • The number of jobs (not full-time equivalent) created in commercial fishing related sectors, as a result of the direct, indirect, and induced effect of an extra dollar of spending in the region. Includes wages, salaries and proprietors, full- and part-time positions.

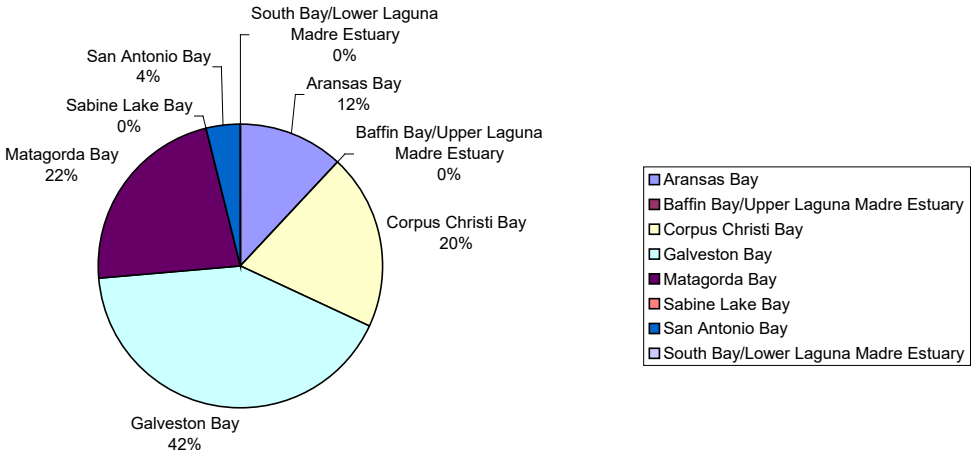
2. Direct and Indirect Impacts of Commercial Fishing Expenditures in Bays and Estuaries of the Gulf Coast: A Summary

    - Direct expenditures of $105,041,101 by participants in commercial fishing, contributed $145,724,159 in sales revenue to local businesses. Earnings by those employed in sectors directly and indirectly related to commercial fishing totaled to $82,555,699. Over twenty-two hundred jobs were created in commercial fishing related sectors.
    - Galveston, Matagorda, Corpus Christi and Aransas Bays benefit the most from direct and indirect impacts of commercial fishing activity in the Gulf.

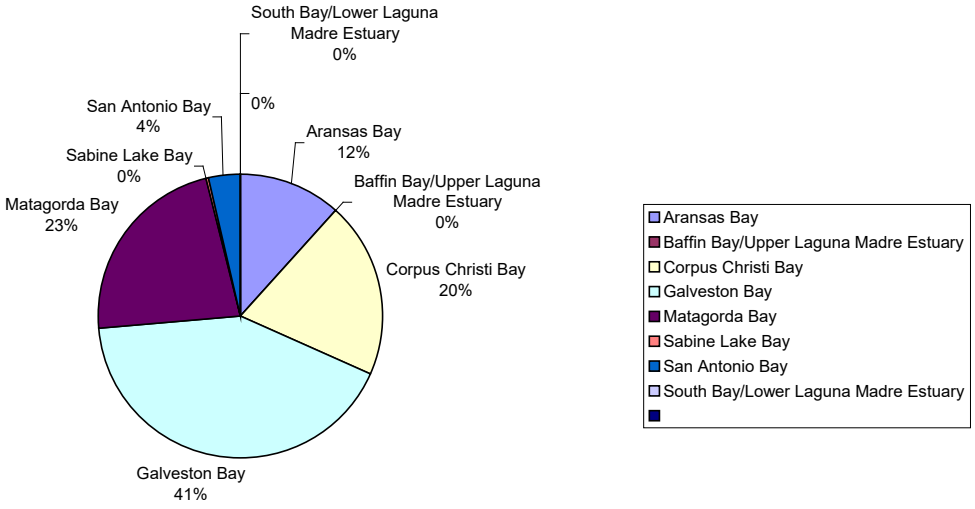
Figure 10: Economic Activity of Commercial Fishing Expenditure Showing Bay Proportion of Total



Sales Output



INCOME



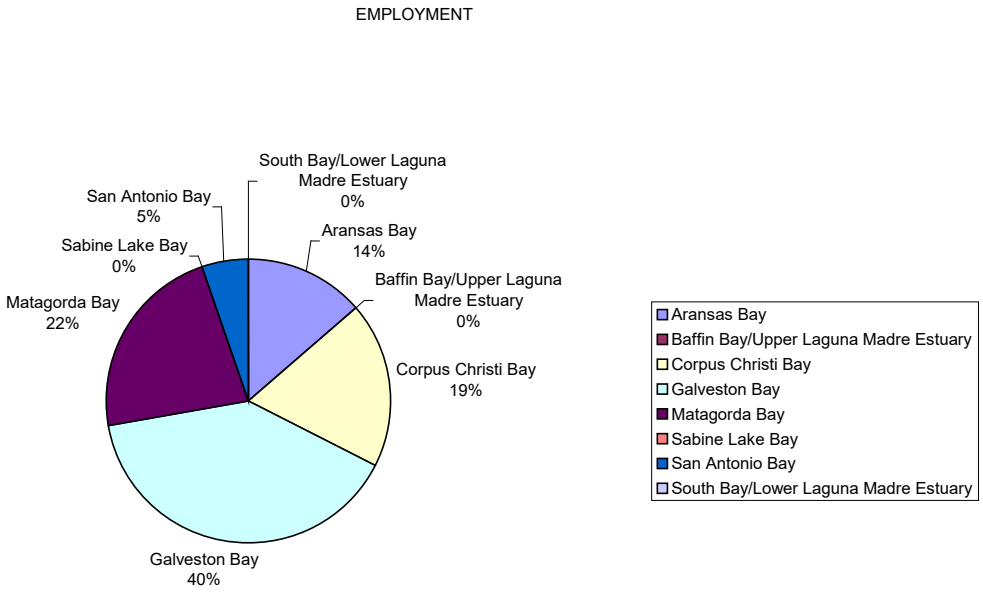


Table 17: Economic Activity of Commercial Fishing Expenditure[9]

Bay				
	Dir. Spending	Sales Output	Income	Employment
Aransas Bay	$13,037,474	$17,322,360	$9,638,683	305.4
Baffin Bay	$8,839	$11,499	$6,390	0.2
C. Christi Bay	$17,977,008	$29,162,603	$16,608,373	417.9
Galveston Bay	$43,587,862	$60,918,530	$34,418,612	887.4
Matagorda Bay	$25,755,030	$32,604,942	$18,785,199	495.1
Sab. Lake Bay	$67,693	$100,348	$57,564	1.3
S. Antonio Bay	$4,590,744	$5,579,181	$3,027,123	118.9
South Bay	$16,450	$24,695	$13,754	0.4
Total	**$105,041,101**	**$145,724,159**	**$82,555,699**	**2,227**

3. Direct and Indirect Impacts of Ex-Vessel Values in Bays and Estuaries of the Gulf Coast: A Summary

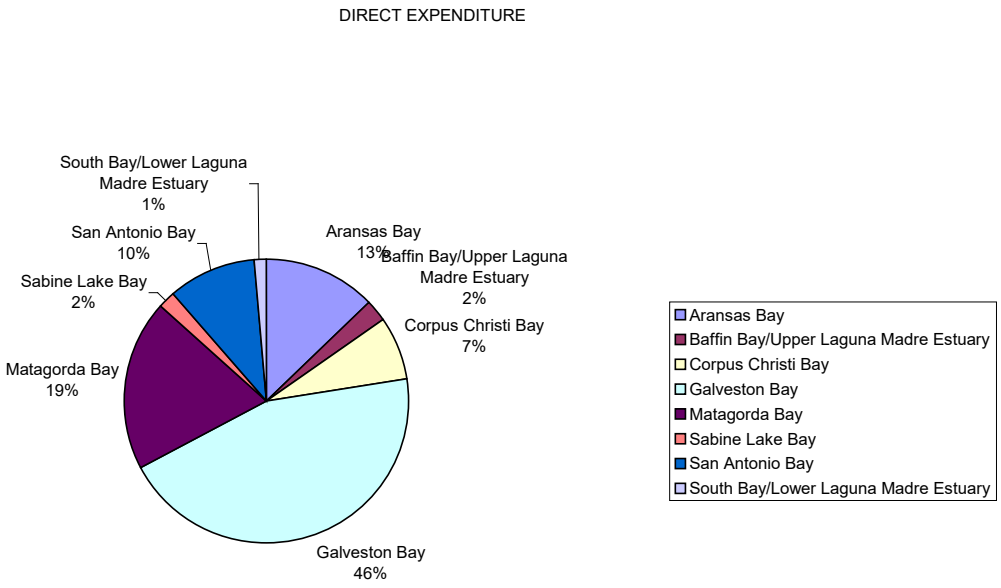
    - Direct expenditures of $38,277,882 by participants in commercial fishing, contributed $104,783,142 in sales revenue to local

[9] Food, Fuel, Maintenance and Supplies, Crew Shares, and Fixed Overhead Costs.

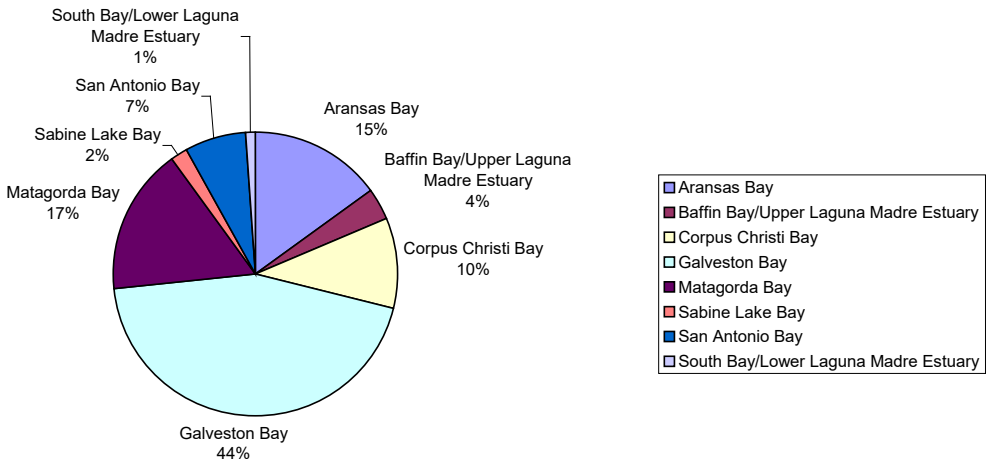
businesses. Earnings by those employed in sectors directly and indirectly related to commercial fishing totaled to $36,039,984. Over twenty-nine hundred jobs were created in commercial fishing related sectors.

- Galveston, Aransas, and Matagorda Bays benefit the most from direct and indirect impacts of landings in the Gulf.

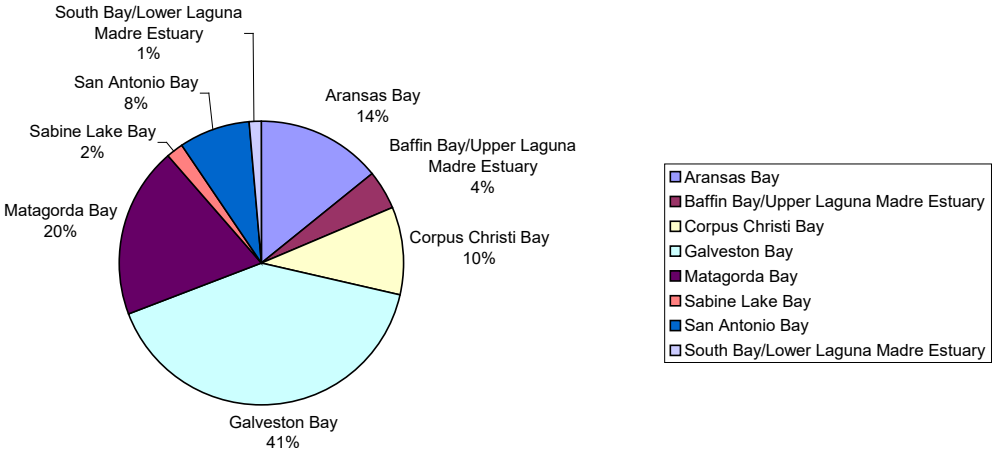
Figure 11: Economic Activity of Ex-Vessel Value of Landings Showing Bay Proportion of Total



SALES OUTPUT



HOUSEHOLD INCOME



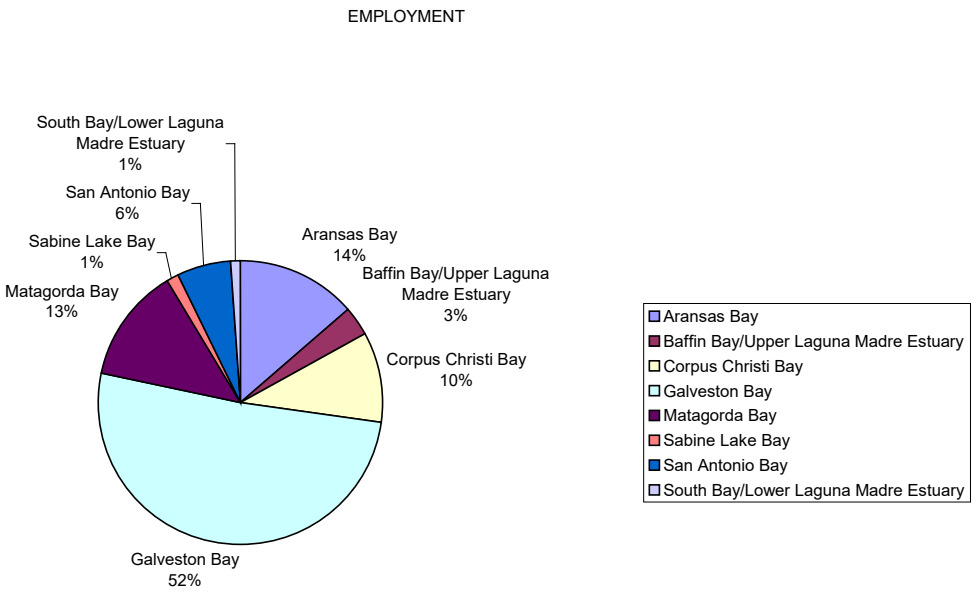


Table 18: Economic Activity of Ex-Vessel Value of Landings

Bay				
	Dir. Spending	Sales Output	Income	Employment
Aransas Bay	$4,866,325	$15,631,452	$5,090,066	396.8
Baffin Bay	$942,016	$3,727,648	$1,582,744	98.9
C. Christi Bay	$2,848,232	$10,979,660	$3,608,265	293.9
Galveston Bay	$17,089,487	$46,571,746	$14,600,647	1,492.3
Matagorda Bay	$7,431,393	$17,446,042	$7,046,627	380.2
Sab. Lake Bay	$773,412	$2,043,261	$688,025	39.3
S. Antonio Bay	$3,848,271	$7,176,277	$2,963,822	184.1
South Bay	$478,746	$1,207,057	$459,790	29.6
Total	**$38,277,882**	**$104,783,142**	**$36,039,984**	**2,915.0**

Appendix A – Terms and Definitions

Catch – the total number or poundage of fish captured from an area over some period of time, including fish that are caught but released or discarded instead of being landed.[10]

Direct Effect or Direct Impact – the money actually spent in local regional economy. In commercial fishing, this is represented by ex-vessel values, and vessel owner expenditures.

Economic Activity - the economic stimuli as a result of resident and non-resident expenditures.

Ex-vessel value – value of the seafood actually unloaded or landed at the dealers and received by commercial fishermen. It represents revenue earned by commercial fishermen when they sell their catch to dealers. These expenditures made to the fishermen will create a ripple effect through the economy after the catch has been landed.

Freshwater inflows – water that is less saline than marine water, and generally refers to water which flows downstream from inland sources. This water enters into the bay and mixes with the more saline seawater, creating an estuary area that is less salty than the ocean.[11]

IMPLAN – a micro-computer-based input-output (I-O) modeling system. With IMPLAN, one can estimate 528 sector I-O models for any region consisting of one or more counties. IMPLAN includes procedures for generating multipliers and estimating impacts by applying final demand changes to the model.

Indirect Effect – is the is the ripple effect of those industries within the local region which are one step removed from those industries which directly serve the dock-side processor (Ransom 2001).

Induced Effect – the ripple effect of increased household and/or institutional income. When people who work in the commercial fishing industry, and who serve the commercial fishermen earn money, they spend some of it within the region.

Input-Output Model[12] – An input-output model is a representation of the flows of economic activity between sectors within a region. The model captures what each business or sector must purchase from every other sector in order to produce a dollar's worth of goods or services. Using such a model, flows of economic activity associated with any change in spending may be traced either forwards (spending generating income which induces further spending) or backwards (visitor purchases of meals leads restaurants to purchase additional inputs – groceries, utilities, etc.). Multipliers maybe derived from an input-output model.

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[10] Definition provided by the North Carolina Department of Environment and Natural Resources – Division of Marine Fisheries. http://www.ncfisheries.net/stocks/defsl_n.html

[11] http://www.texaswatermatters.org

[12] Definitions of Input-output model, IMPLAN, and Sector are from Daniel J. Stynes, Economic Impacts of Tourism, s.v. "Glossary of Economic Impact Terms", http://www.msu.edu/course/prr/840/econimpact/pdf/ecimpvol1.pdf

Landings – number or percentage of fish unloaded at a dock by commercial fishermen. Landings are reported at the points at which fish are brought to shore.[13]

Multiplier – Estimates the impact the commercial fishing has on the regional economy. A multiplier of 1.50 indicates that for every dollar of expenditure in commercial fishing, $1.50 worth of products and services is generated in the regional economy. IMPLAN multipliers are used, which do not estimate the duration of the impact.[14]

Sector – is a grouping of industries that produce similar products or services.

Total Effect – the sum of the direct effect, the indirect effect, and the induced effect. Economic impact is usually described in terms of employment (jobs), sales, income, and value added. For instance, direct income is the earnings of labor and owners in commercial fishing activity. Indirect income is the earnings of labor and owners in firms supplying those directly involved in commercial fishing. Induced earnings, are the earnings of labor and owners that occur when those earning direct and indirect income spend their income.

Wetlands – lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant, animal, and marine life communities living in the soil and on its surface[15].

[13] Adapted from the definition provided by the North Carolina Department of Environment and Natural Resources – Division of Marine Fisheries. http://www.ncfisheries.net/stocks/defsl_n.html

[14] Definitions of direct, indirect, induced, total effects and multipliers are adopted from Ransom, M. M. (2001). Economic Impact of Salmon Fishing. Davis, CA, USDA Natural Resources Conservation Service.

[15] Adapted from California Wetlands Information System, s.v. "Defining Wetlands," http://ceres.ca.gov/wetlands/introduction/defining_wetlands.html

Appendix B – Details of Data Collection, Estimation Methods, Assumptions, and Limitations

Method of Data Collection and Estimation Methods

Ex-Vessel Values

Seafood dealers provide monthly reports of licensed commercial buyers of finfish, shellfish and shrimp. Ex-vessel value for inshore finfish, shellfish and shrimp was obtained from Culbertson et al. (Culbertson 2004). Ex-vessel value data for finfish, shellfish, and shrimp were available for 1981-2001. Ex-vessel values were averaged over the 20 year period, and then adjusted to 2003 dollars.

Ex-vessel values for bait shrimp are also available by bay area, but only for 2001, based on the Culbertson report, and are therefore excluded from estimates of economic activity. Thus the estimates of economic activity resulting from commercial fishing activity represent a lower bound of economic activity generated.

Ex-vessel values of finfish and shellfish, excluding shrimp are available for 1981-2001 from Gulf Coast grid zones (offshore), but not by Bay, and so were excluded from this study. Again, this means that estimates of economic activity resulting from commercial fishing activity represent a lower bound of economic activity generated.

Commercial Fishing Expenditures

Variable Commercial Fishing Costs are: Food, Fuel and Oil (Incl. filter and lubricants), Maintenance and Repair (routine, extraordinary and unexpected), Nets (hanging and repair, etc.), Miscellaneous (gear and supplies) and Crew Shares (payments to crew – i.e. income).

Fixed costs are: Transportation (freight, airfares to and from fishery, etc.), Moorage (and gear storage, haul out fees, etc.), Insurance, Administration (bookkeeping, bank and legal fees, dues, vessel license fees, permit renewal fees, property tax on vessel and depreciation, etc.) and Opportunity costs (skipper time spent on fisheries and his/her investment in vessel and gear).

Monthly Port Data was obtained from Wade Griffin for 1981 – 2001. Fuel, Maintenance and Supplies, Crew Shares, Overhead and Fixed costs expenditures are yearly average for all (primary) vessels reported from ports in each county (then aggregated to bay) area. Food is estimated at 11% of Crew shares[16]. Average expenditures of all Texas shrimp fishermen by category, per year, is summarized in the expenditure tables for each bay.

[16] Based on Average Expenditures of all Texas Shrimp Fishermen by Category Per Year for their Primary Boat. Table 79 Anderson, D. K. and R. B. Ditton (2002). A Social and Economic Study of the Texas Shrimp Fishery. A Report prepared under contract with the Texas Agricultural Experiment Station for the Texas Parks and Wildlife Department. College Station, Texas A&M University.

Other Input Data

Number of Fishing Boats

The number of fishing boats was based on commercial fishing boat license data obtained from the Texas Parks and Wildlife Service.

Number of Fishermen

The number of local fishermen was determined for each bay by multiplying the number of boat licenses issued for that bay times the average crew size rounded to 2.

Assumptions[17] and Limitations

Crew Size

Crew Size is estimated to be 2.0339 (2). This is the average crew size based on data from Wade Griffin. Data from approximately 14 ports were used. The 21 year average was based on data from 1981 – 2001.

Resident and Non-resident

Commercial Boat License data was categorized as coastal, adjacent and non-coastal. Commercial Boat Licenses issued to Coastal counties surrounding a Bay were assumed to indicate resident activity. Commercial Boat Licenses issued to adjacent (contiguous to a coastal county) and non-coastal counties were assumed to indicate non-residential activity.

Trip Length

2.7 – 3.4 days

Average number of days fished per boat per year

175 – 219.2667 days. 219 days is used in this study, based on the crew size.[18]

Annual number of days fished out of all ports reported for all years 1981 – 2001

251.78 days

Average Number of Trips per boat, per year 1981 - 2000

63 trips

Estimates

All estimates are adjusted for inflation and are based on the most current information which was available at the beginning of this study. The estimates of direct impact and secondary impacts reported here represent regional impacts. County level direct and indirect impacts have been aggregated and averaged to determine regional impacts, but regional estimates should be used and compared with caution, since bay/estuary regions

[17] Based on Wade Griffin survey or log data. All assumptions based on this data are my responsibility.
[18] See http://www.sefsc.noaa.gov/PDFdocs/SEFSC-SSRG-02_RedSnapperReview_Oct2003.pdf

can overlap several counties. Finally, estimates of commercial fishing impacts in each region may differ from those obtained from different models, methodologies and data sources. However, the input data contained herein compares with approaches taken in other studies.

Appendix C – Explanation of the Economic Model

(See also Implan Model and Commercial and Recreational Fishing in Research Study Folder)

Key elements of the Model

1. Response coefficients generated by IMPLAN and applied to expenditures of the firms and income earned by those employed and owning fishing enterprises.
2. Input Data
    a. Number of licenses issued to owners of commercial fishing vessels.
    b. Owner fixed costs
    c. Owner variable costs
    d. Ex-vessel values

IMPLAN[19] is a tool used to show the economic impact of an industry within a (regional) economy. It also provides an approximation of linkages between various sectors of the regional economy which are involved in the commercial fishing industry. Its results are generally considered to be reliable, given the assumptions and limitations of the model. That would include fuel and supplies for vessels, utilities, packaging materials, labor for processing plants, and other costs. IMPLAN also accounts for how incomes are derived by these expenditures, and how these incomes are spent and re-spent within the local economy. For instance, ex-vessel value data flows from the landing effort of the commercial vessels through the processors to consumer final demand (Adams). Since economic activity and not economic impact is the focus of this report, resident expenditures are included, and economic impact is not restricted to new dollars brought into the regional economy by product exports.

IMPLAN response coefficients were based on the 2003 economy, and landings data is adjusted to 2003 dollars.

[19] As described in "Commercial Bottom Trawling Industry in Florida: Balancing Environmental Impact with Economic Contribution". http://edis.ifas.ufl.edu/BODY_FE345

Adams, C. The Commercial Bottom Trawling Industry in Florida: Balancing Environmental Impact with Economic Contribution. Gainesville, Department of Food and Resource Economics, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida.

Anderson, D. K. and R. B. Ditton (2002). A Social and Economic Study of the Texas Shrimp Fishery. A Report prepared under contract with the Texas Agricultural Experiment Station for the Texas Parks and Wildlife Department. College Station, Texas A&M University.

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Cook, R. L. (2002). Executive Summary - The Texas Shrimp Fishery: A Report to the Governor and the 77th Legislature of Texas. Austin, Texas Parks and Wildlife Department**:** 1-63.

Culbertson, J., Robinson Lance, Campbell Page, Butler, Linda (2004). "Trends in Texas Commercial Fishery Landings, 1981-2001." Management Data Series **No. 224**(2004): 82-96 and 137-140.

Ransom, M. M. (2001). Economic Impact of Salmon Fishing. Davis, CA, USDA Natural Resources Conservation Service.

Stedman, S.-M. and J. Hanson (1991). Part Four: Wetlands, Fisheries and Economics in the Gulf of Mexico, NOAA - NMFS. **2004**.