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Economic Impacts of the Mississippi Seafood Industry by Major Species in 2009

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Introduction

Rapid changes in the economic structure of the Mississippi commercial fishing and seafood-related industry were observed during the last decade. Local spending by both the harvesting and processing sectors declined due to changing internal and external environments affecting the industry. Support infrastructure and available fishery resources had diminished due to natural, technological, and manmade disasters. Sustained seafood processing requires inflow of raw seafood products from outside sources. With the globalization of the seafood industry, distribution and consumption of seafood products are no longer constrained by local production. Imports from other countries or states enable local processors and dealers to process and sell seafood products to their customers on a regular basis. The global nature of the industry created commodity flows that virtually link the various processes of production, processing, distribution, storage, and consumption of seafood products.

The earliest estimates of the economic impacts of the Mississippi seafood industry were prepared by the author of this bulletin for the Performance Evaluation and Expenditure Review Committee of the Mississippi Legislature in 1991 (MSU-CREC 1991). The direct, indirect, and induced output effects of the seafood industry in 1989 totaled $489 million. To produce these outputs of economic goods, a broad range of supporting infrastructure provided forward and backward linkages from inside and outside of Mississippi. Among other facilities, this support infrastructure included fishing docks, ice plants, fuel docks, commercial processing plants, the commercial fishing fleet, marine electronics dealers, marine supply businesses, net and gear manufacturers and repair shops, and boat and motor manufacturers and repair shops. Subsequent estimates of the economic impact of the state's seafood industry by major species and economic sectors were prepared in 1991, 1994, and 1997 for the Mississippi Department of Marine Resources (Posadas 2000) and for the oyster and shrimp harvesting and processing sectors in 2007 (Posadas 2009a, 2009b).

The National Oceanic and Atmospheric Administration (NOAA) Fisheries Economic Model estimates four types of economic impacts: employment, income, total value added, and output or sales (Kirkley 2009). The economic impacts of the seafood industry in Mississippi and the 22 other coastal states in the U.S. were estimated starting in 2006 up to the present (NOAA Fisheries 2013a). The economic impacts were estimated by sector, including harvesting, processing, importing, wholesaling, and retailing. However, economic impact estimates for Mississippi,

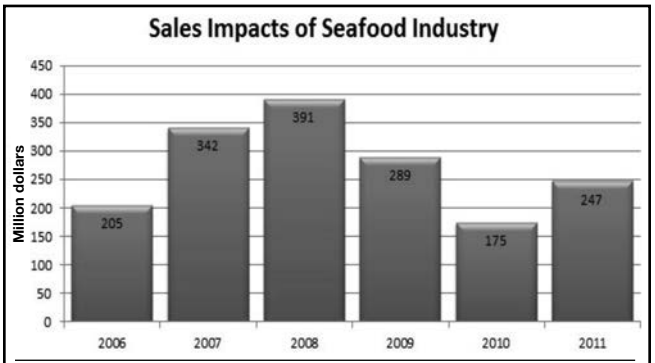

Figure 1. Sales impacts of the Mississippi seafood industry (in dollars) 2006–2011. Source of raw data: NOAA Fisheries (2013a).

were not broken down by major seafood species. The annual sales and employment impacts of the entire Mississippi seafood industry since 2006 are shown in Figures 1 and 2. The wide fluctuations in the economic impact estimates indicate that the state seafood industry was very vulnerable to natural and technological disasters that occurred in August 2005 and April 2010.

The Mississippi Department of Marine Resources (MDMR) and other state regulatory agencies need updated estimates of the economic impacts of the state seafood industry. This need became very urgent after the massive damages from the natural and technological disasters that hit the seafood industry (Posadas 2007, 2008, 2010a, 2010b; Posadas and Posadas 2011, 2013a, 2013b; Posadas et al. 2011). MDMR expressed a more vital need for additional information on the economic impacts of the seafood industry by economic sector and by major species landed, processed, distributed, and consumed in Mississippi.

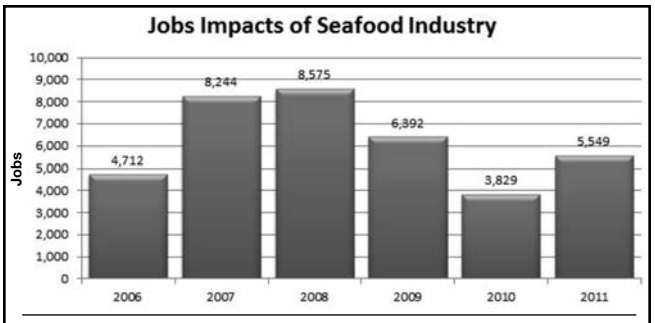

Figure 2. Employment impacts of the Mississippi seafood industry (in jobs) 2006–2011. Source of raw data: NOAA Fisheries (2013a).

This study measured the economic impacts of the Mississippi seafood industry by major species and by economic sector. Specifically, it aims to estimate the economic impact of seafood harvesting, processing, wholesaling, restaurant, and retailing sectors in Mississippi by major species, primarily shrimp, oyster, crab, and finfish.

Economic Impact Estimation

Economic Sectors

The commercial fishing or harvesting sector includes the "finfish fishing" and "shellfish fishing" sectors in the North American Industrial Classification System (NAICS 2013). The finfish fishing industry comprises establishments primarily engaged in the commercial catching or taking of finfish from their natural habitat. The shellfish fishing industry comprises establishments primarily engaged in the commercial catching or taking of shellfish from their natural habitat. The major species commercially harvested in Mississippi were shrimp, oyster, crab, and finfish (primarily menhaden) (Table 1).

The long-term sales and employment impacts of the Mississippi commercial harvesting sectors are shown in Figures 3–4. Significant reductions in commercial landing values were observed in 2005 and 2006 as a result of Hurricane Katrina in August 2005 (Posadas 2008). Similar reductions in commercial landing values were also observed in 2010 and 2011 as a result of the Deepwater Horizon oil spill in April 2010, which closed some of the state and federal commercial and recreational fishing grounds from April 2010 to April 2011 (Posadas and Posadas 2013a; Posadas et al. 2011).

Table 1. Mississippi commercial landings by species, 2009.

Species	Pounds	Dollars
Crab, Blue	545,328	572,852
Croaker, Atlantic	105	53
Drum, Black	9,608	2,926
Drum, Red	32,027	50,432
Finfishes, Unclassified General	485,555	237,661
Flatfish	24,695	57,815
King Whiting	5,636	4,755
Menhaden	216,709,145	17,986,861
Mullet, Striped (Liza)	62,330	29,993
Oyster, Eastern	2,191,724	6,100,264
Seatrout, Sand	8,249	6,604
Seatrout, Spotted	52,615	120,614
Sheepshead	11,675	6,714
Shellfish	2,445	4,003
Shrimp, Brown	6,347,459	6,847,481
Shrimp, Seabob	480	192
Shrimp, White	3,735,702	5,806,473
Snapper, Gray	1,440	3,553
Snapper, Red	57,264	157,560
Tripletail	935	1,667
Total	**230,284,417**	**37,998,473**

Source: NOAA Fisheries (2013b).

The seafood dealers and processors or the seafood-processing sector primarily includes the "seafood canning" and the "fresh and frozen seafood processing" sectors in NAICS (2013). The seafood canning industry comprises establishments primarily engaged in canning seafood and marine fats and oils and/or smoking, salting, and drying seafood. The "floating factory ships" that are engaged in the gathering and processing of seafood into canned seafood products are included in this industry. The fresh and frozen seafood processing industry comprises establishments primarily engaged in one or more of these activities: eviscerating fresh fish by removing heads, fins, scales, bones, and entrails; shucking and packing fresh shellfish; manufacturing frozen seafood; and processing fresh and frozen marine fats and oils.

The long-term economic impacts of the Mississippi seafood processing sectors are shown in Figures 5–6. Substantial declines in processing production were reported in 2005 and 2006 as a result of Hurricane

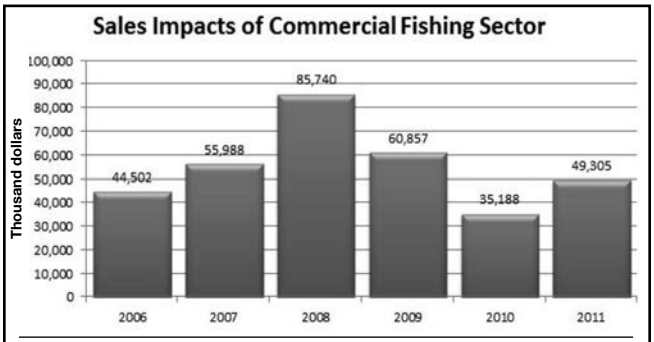

Figure 3. Sales impacts of the Mississippi commercial harvesting sector (in dollars), 2006–2011. Source of raw data: NOAA Fisheries (2013a).

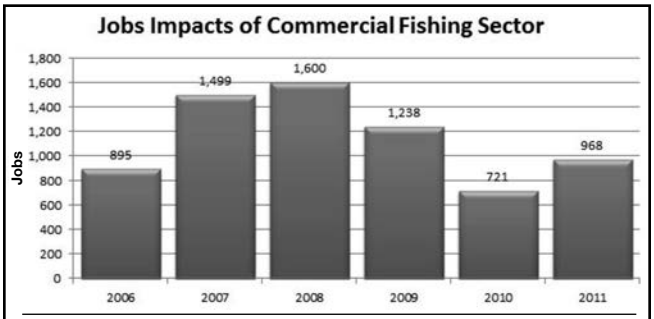

Figure 4. Employment impacts of the Mississippi commercial harvesting sector (in jobs), 2006–2011. Source of raw data: NOAA Fisheries (2013a).

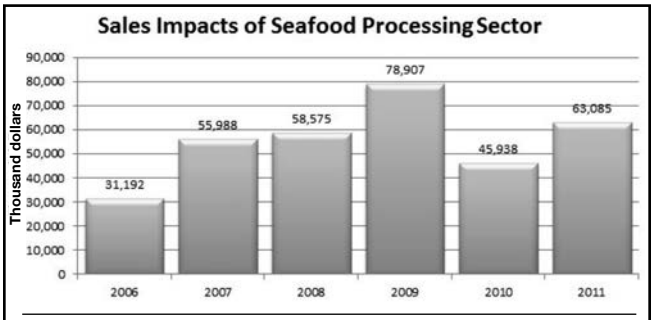

Figure 5. Sales impacts of the Mississippi seafood-processing sector (in dollars), 2006–2011. Source of raw data: NOAA Fisheries (2013a).

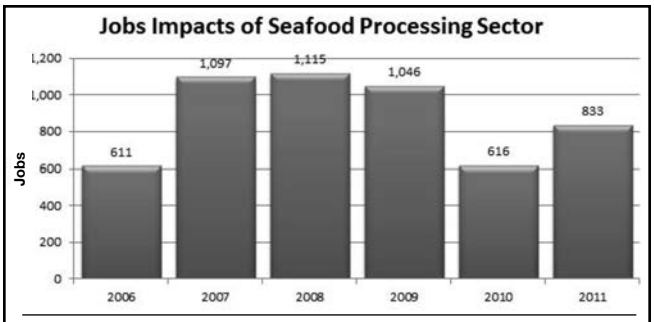

Figure 6. Employment impacts of the Mississippi seafood-processing sector (in jobs), 2006–2011. Source of raw data: NOAA Fisheries (2013a).

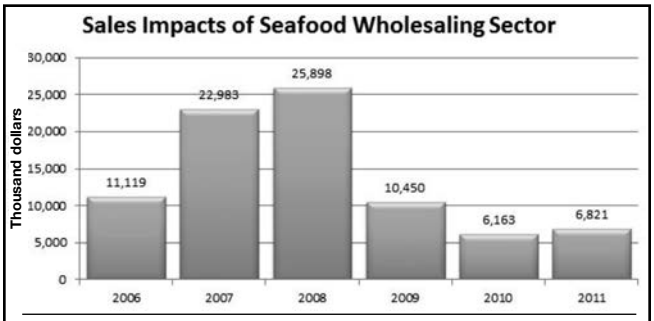

Figure 7. Sales impacts of the Mississippi seafood-wholesaling sector (in dollars), 2006–2011. Source of raw data: NOAA Fisheries (2013a).

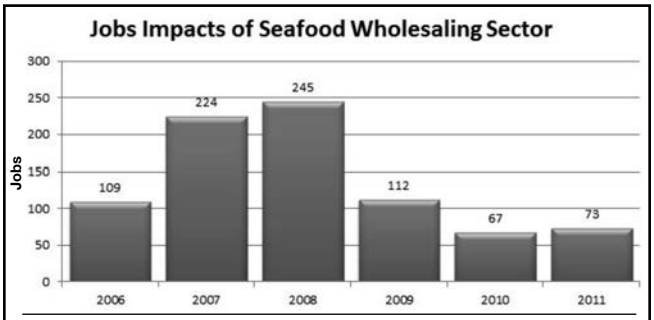

Figure 8. Employment impacts of the Mississippi seafood-wholesaling sector (in jobs), 2006–2011. Source of raw data: NOAA Fisheries (2013a).

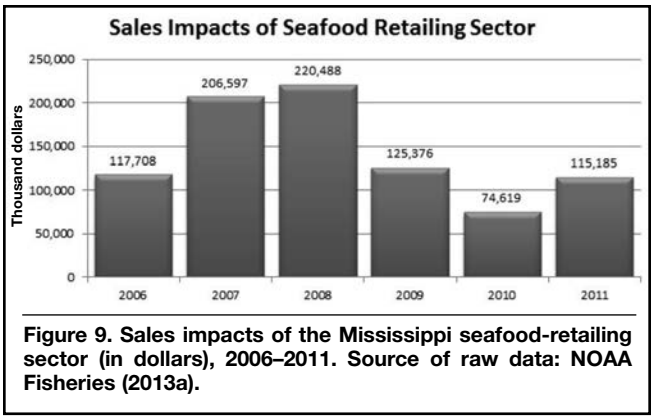

Figure 9. Sales impacts of the Mississippi seafood-retailing sector (in dollars), 2006–2011. Source of raw data: NOAA Fisheries (2013a).

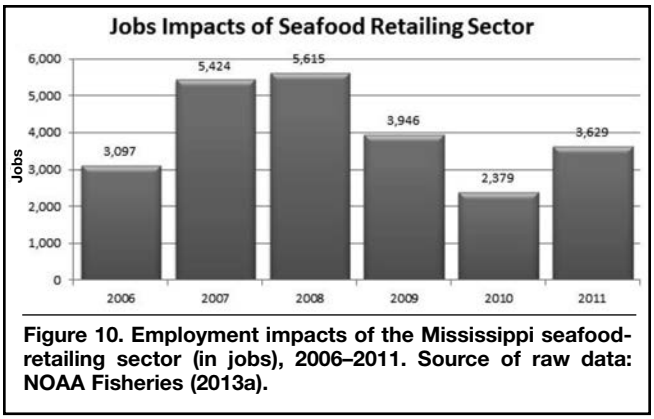

Figure 10. Employment impacts of the Mississippi seafood-retailing sector (in jobs), 2006–2011. Source of raw data: NOAA Fisheries (2013a).

Katrina (Posadas 2007). Similar cutbacks in seafood processing values were also observed as a result of the Deepwater Horizon oil spill (Posadas et al. 2011).

The seafood wholesalers and distributors or seafood-wholesaling sector corresponds to the "fish and seafood merchant wholesalers" sector in NAICS (2013). The fish and seafood merchant wholesalers industry comprises establishments primarily engaged in the merchant wholesale distribution of fish and seafood (except canned or packaged frozen).

The long-term economic impacts of the Mississippi seafood-wholesaling sectors are shown in Figures 7–8. Large reductions in wholesale seafood sales and employment were observed as a result of Hurricane Katrina. Seafood wholesaling values and employment dropped as a result of the Deepwater Horizon oil spill (Posadas et al. 2011).

The seafood-retailing sector corresponds to the "fish and seafood markets" and "restaurant establishments" serving seafood products in NAICS (2013). Fish and seafood markets include establishments primarily engaged in retailing fresh, frozen, or cured fish and seafood products. The restaurant sector corresponds to the "full-service restaurants," and "limited-service restaurants" in NAICS (2013).

The long-term sales and employment impacts of the seafood-retailing sector are shown on Figures 9–10. Hurricane Katrina adversely affected retail seafood sales and employment. Significant reductions in seafood retailing values and employment were observed in 2010 after the Deepwater Horizon oil spill (Posadas et al. 2011).

NOAA Fisheries Economics Model

The NOAA Fisheries Economic (FE) model is an interactive online model that provides estimates of the economic impacts in each of the 23 coastal states (NOAA Fisheries 2013a). The FE model uses an IMPLAN (MIG 2013) platform to estimate the economic impacts associated with fish and shellfish harvesting by U.S. commercial fishermen and the other major components of the U.S. seafood industry (Kirkley 2009). The FE model, however, is primarily intended to provide industry statistics at the state and national level. The FE model is not intended for management use in NOAA Fisheries regions in which

Table 2. Total sales impacts of the Mississippi seafood industry by sector and type of impact, in thousands of dollars, 2009.

Sector	Direct impact	Indirect impact	Induced impact	Total impacts
Grocers or fish markets	10,711	4,008	3,378	18,097
Commercial harvesters	37,998	17,297	5,561	60,857
Importers and brokers	4,298	6,619	2,735	13,652
Primary dealers or processors	43,775	21,435	13,698	78,907
Restaurants	65,030	21,274	20,975	107,279
Secondary wholesalers or distributors	6,684	874	2,892	10,450
Total	**168,496**	**71,507**	**49,239**	**289,242**

Source of data: NOAA Fisheries (2013a).

Table 3. Total employment impacts of the Mississippi seafood industry by sector and type of impacts, in number of jobs, 2009.

Sector	Direct impact	Indirect impact	Induced impact	Total impacts
Grocers or fish markets	368	30	31	429
Commercial harvesters	1,105	80	52	1,238
Importers and brokers	2	30	18	50
Primary dealers or processors	790	129	127	1,046
Restaurants	3,180	144	193	3,517
Secondary wholesalers or distributors	77	8	27	112
Total	**5,522**	**421**	**448**	**6,392**

Source of data: NOAA Fisheries (2013a).

Table 4. Total value-added impacts of the Mississippi seafood industry by sector and type of impact, in thousands of dollars, 2009

Sector	Direct impact	Indirect impact	Induced impact	Total impacts
Grocers or fish markets	6,680	2,575	1,735	10,990
Commercial harvesters	17,301	7,026	2,944	27,271
Importers and brokers	178	2,523	1,461	4,162
Primary dealers or processors	21,164	10,888	7,064	39,116
Restaurants	35,563	14,106	10,674	60,343
Secondary wholesalers or distributors	2,659	473	1,514	4,646
Total	**83,545**	**37,591**	**25,392**	**146,528**

Source of data: NOAA Fisheries (2013a).

Table 5. Total income impacts of the Mississippi seafood industry by sector and type of impact, in thousands of dollars, 2009.

Sector	Direct impact	Indirect impact	Induced impact	Total impacts
Grocers or fish markets	6,267	1,613	1,057	8,938
Commercial harvesters	16,230	879	1,726	18,835
Importers and brokers	62	1,300	825	2,188
Primary dealers or processors	19,855	7,079	4,284	31,217
Restaurants	33,363	7,814	6,583	47,759
Secondary wholesalers or distributors	2,495	292	901	3,688
Total	**78,272**	**18,977**	**15,376**	**112,625**

Source of data: NOAA Fisheries (2013a).

economic impact models have been developed specifically for management purposes.

The FE model generates economic impact estimates for the harvesting sector and the other segments of the seafood industry: restaurants, processors and dealers, wholesalers and distributors, and grocers or fish markets (Kirkley 2009). The income, value-added, and output impacts are expressed in dollars for the year specified by the user. Output or sales is the gross sales by businesses within the economic region affected by an activity. Labor income includes proprietors' income, income from self-employment, and personal income such as wages and salaries. Employment impacts are expressed in terms of a mix of both full-time and part-time jobs. Value-added is the contribution made to the value of seafood products at each stage of harvesting, processing, and distribution.

The total economic impact is the sum of direct, indirect, and induced impacts. Direct effects express the economic impacts in the sector in which the expenditure was initially made. Indirect impacts result from changes in economic activity of other industrial sectors that supply goods or services to the sector being evaluated. Induced impacts are the result of personal consumption expenditures by industry employees.

The FE model detailed estimates of the total output or sales impacts of the Mississippi seafood industry in 2009 (Table 2). The total output or sales impacts of the entire Mississippi seafood industry reached $289.2 million in 2009.

The total employment impacts of the Mississippi seafood industry as estimated by the FE model are shown in Table 3. The entire Mississippi seafood industry provided employment to a total of 6,392 workers in 2009.

The FE model estimates of total value-added impacts of the Mississippi seafood industry are shown in Table 4. The Mississippi seafood industry created a total value-added impact of $146.5 million in all the five seafood-related economic sectors in 2009.

The FE model estimates of the income impacts of the Mississippi seafood industry are shown in Table 5. The Mississippi seafood industry generated a total income impact of $112.6 million in 2009.

Economic Impacts by Major Species

Economic Impact Indicators

The 2009 statewide results of the NOAA Fisheries Economic model for the state of Mississippi were used in estimating the 2009 economic impacts of the state seafood industry by economic sector and major species. These results included the four types of economic impacts: output or sales, employment, income, and value-added. The estimates of the indirect tax impacts of the Mississippi seafood industry were not reported in the 2009 statewide results of the NOAA model.

Seafood Production Sectors

The 2009 total economic impacts of the Mississippi commercial harvesting and seafood processing sectors were broken down by major species using 2009 ex-vessel, dock or landing values, and processing-plant gate or wholesale values. The 2009 Mississippi commercial harvesting impacts were split according to the 2009 total state commercial landing values of each of the four major species. The 2009 Mississippi seafood processing sector impacts were also divided according to the 2009 state total plant-gate values of the processed products for each of the four major species.

Seafood Importing Sector

The Mississippi seafood importing sector was not included in the itemization into the four major species due to the lack of needed economic information about that sector. The FE model estimated that the 2009 Mississippi seafood-importing sector produced a total economic impact of $13.65 million and provided a total of 50 jobs. The Mississippi seafood-importing sector generated a total income impact of $2.19 million and value-added impact of $4.16 million.

Seafood Distribution Sectors

The 2009 economic impacts of the seafood-wholesaling sector and fish markets were separated according to the expenditure shares of each of the four major species reported by these sectors in a survey of January–December 2011 transactions of Mississippi seafood wholesalers and retailers conducted by the author in 2012–2013. The 2011 wholesale and retail sales values were the only values available for wholesaler and retailer seafood transactions broken down by major species in Mississippi. The 2009 seafood restaurant impacts were divided according to the expenditure

Table 6. Economic impacts of Mississippi seafood industry by sector and type of impacts without imports, in millions of dollars, 2009.

Sector	Sales impacts	Job impacts	Income impacts	Value-added impacts	Indirect tax impacts
Harvesting	60.86	1,238	18.84	27.27	1.85
Processing	78.91	1,046	31.22	39.12	1.56
Wholesaling	10.45	112	3.69	4.65	1.35
Fish markets	18.10	429	8.94	10.99	2.59
Restaurants	107.28	3,517	47.76	60.34	5.74
Total	**275.59**	**6,342**	**110.44**	**142.37**	**13.09**

Source of data: NOAA Fisheries (2013a).

Table 7. Economic impacts of Mississippi shrimp industry by sector and type of impacts without imports, in millions of dollars, 2009.

Sector	Sales impacts	Job impacts	Income impacts	Value-added impacts	Indirect tax impacts
Harvesting	20.27	412	6.27	9.08	0.62
Processing	53.65	711	21.23	26.60	1.06
Wholesaling	7.82	84	2.76	3.48	1.01
Fish markets	9.29	220	4.59	5.64	1.33
Restaurants	50.75	1,664	22.59	28.54	2.72
Total	**141.77**	**3,091**	**57.44**	**73.34**	**6.73**

shares of each of the four major species reported by these establishments in a 2010–2011 survey of Mississippi seafood restaurants for transactions from January to December 2009 (Posadas et al. 2012).

Indirect Tax Revenue Impacts

The author created an IMPLAN model to estimate the 2009 indirect tax revenue impacts of the Mississippi seafood industry by major species and economic sector. In order to capture structural changes in the state economy, Mississippi data from 2009 were used. The tax revenue impacts of the four major species were estimated by using the IMPLAN Professional 3.0 software. The use of the impact-planning software and 2009 data allowed the estimation of tax revenue impacts with the most updated state multipliers.

Total Economic Impact of the Seafood Industry

The total 2009 economic impacts of the entire Mississippi seafood industry by economic sector without imports are shown in Table 6. The commercial-harvesting sector contributed $60.86 million, which was 22.1 percent of total sales. The seafood-processing sector added sales of $78.91 million—28.6 percent of the total. The seafood-wholesaling sector produced sales of $10.45 million—3.8 percent of the total. Fish markets generated $18.10 million in sales—6.6 percent of the total. Seafood restaurants added $107.28 million—38.9 percent of the total.

Economic Impacts of the Shrimp Industry

The total 2009 economic impacts of the Mississippi commercial shrimp industry by economic sector without imports are shown in Table 7. The output of economic goods directly produced by this industry generated a total economic impact of $141.77 million. This economic output created 3,091 jobs and generated total income of $57.44 million. Commercial shrimp industry contributions to the indirect business tax collections reached $6.73 million in 2009.

Economic Impacts of the Oyster Industry

The total 2009 economic impacts of the Mississippi commercial oyster industry by economic sector without imports are shown in Table 8. The total output of economic goods directly produced by the this industry generated a total economic impact of $23.72 million. This economic output created 562 jobs and generated annual income amounting to $9 million. The commercial oyster industry contributed about $1.15 million to indirect business tax collections.

Table 8. Economic impacts of Mississippi oyster industry by sector and type of impacts without imports, in millions of dollars, 2009.

Sector	Sales impacts	Job impacts	Income impacts	Value-added impacts	Indirect tax impacts
Harvesting	9.77	199	3.02	4.38	0.30
Processing	2.62	35	1.04	1.30	0.05
Wholesaling	1.58	17	0.56	0.70	0.21
Fish markets	0.83	20	0.41	0.50	0.12
Restaurants	8.92	292	3.97	5.02	0.48
Total	**23.72**	**562**	**9.00**	**11.90**	**1.15**

Table 9. Economic impacts of Mississippi crab industry by sector and type of impacts without imports, in millions of dollars, 2009.

Sector	Sales impacts	Job impacts	Income impacts	Value-added impacts	Indirect tax impacts
Harvesting	0.92	19	0.28	0.41	0.03
Processing [1]	0.00	0	0.00	0.00	0.00
Wholesaling	0.17	2	0.06	0.08	0.02
Fish markets	1.04	25	0.51	0.63	0.15
Restaurants	6.05	198	2.70	3.41	0.32
Total	**8.18**	**244**	**3.55**	**4.52**	**0.52**

[1] Crab processing data were confidential since there were fewer than three processors.

Economic Impacts of the Crab Industry

The total 2009 economic impacts of the Mississippi commercial crab industry by economic sector without imports are shown in Table 9. The output directly produced by this industry generated a total economic impact of $8.18 million. This economic output created 244 jobs and generated total income of $3.55 million. This industry contributed about $0.52 million to indirect business tax collections in 2009.

Economic Impacts of the Finfish Industry

The total 2009 economic impacts of the Mississippi commercial finfish industry by economic sector without imports are shown in Table 10. The output of economic goods directly produced by this industry generated a total economic impact of $101.91 million. This economic output created 2,445 jobs and generated total income of $57.44 million. The commercial finfish industry contributions to the indirect business tax collections reached $4.68 million in 2009.

Table 10. Economic impacts of Mississippi finfish industry by sector and type of impacts without imports, in millions of dollars, 2009.

Sector	Sales impacts	Job impacts	Income impacts	Value-added impacts	Indirect tax impacts
Harvesting	29.90	608	9.25	13.40	0.91
Processing	22.64	300	8.96	11.22	0.45
Wholesaling	0.87	9	0.31	0.39	0.11
Fish markets	6.94	165	3.43	4.21	0.99
Restaurants	41.56	1,362	18.50	23.38	2.22
Total	**101.91**	**2,445**	**40.45**	**52.60**	**4.68**

Summary and Research Implications

The Mississippi marine regulatory agencies needed updated estimates of the economic impacts of the state seafood industry in order to effectively manage state marine resources. The need for economic information became more pressing due to the massive damage arising from recent natural and technological disasters that affected the industry. A more vital need was expressed by the state regulatory agencies for additional information on the economic impacts of the seafood industry by economic sector and by major species landed, processed, distributed, and consumed in Mississippi. This study estimated the economic impacts of the seafood harvesting, processing, wholesaling, restaurant, and retailing sectors in the state by major species, primarily shrimp, oyster, crab, and finfish.

The Mississippi seafood industry in 2009 generated total economic impacts of $275.59 million and provided 6,342 jobs in harvesting, processing, wholesaling, fish markets, and restaurants. The commercial harvesting sector contributed $60.86 million, or 22.1 percent of the total sales impacts. The seafood-processing sector added $78.91 million, or 28.6 percent of the total economic impacts. The seafood-wholesaling sector produced additional sales of $10.45 million, or 3.8 percent of the entire industry. Fish markets generated a total of $18.10 million in economic impacts, which was 6.6 percent of the entire industry. Seafood restaurants added $107.28 million, or 38.9 percent of the industry's impact.

The Mississippi commercial shrimp industry in 2009 generated a total economic impact of $141.77 million. This economic output created 3,091 jobs and generated total income of $57.44 million. The commercial shrimp industry contributions to the indirect business tax collections reached $6.73 million.

The total output of economic goods directly produced by the Mississippi commercial oyster industry generated total economic impact of $23.72 million. This economic output created 562 jobs and generated annual income of $9 million. The commercial oyster industry contributed about $1.15 million to indirect business tax collections.

The output directly produced by the Mississippi commercial crab industry in 2009 generated a total economic impact of $8.18 million. This economic output created 244 jobs and generated total income of $3.55 million. This industry contributed about $0.52 million to indirect business tax collections.

The output of economic goods directly produced by the Mississippi commercial finfish industry in 2009 generated a total economic impact of $101.91 million. This economic output created 2,445 jobs and generated total income of $57.44 million. The commercial finfish industry contributions to the indirect business tax collections reached $4.68 million in 2009.

This bulletin will be updated to include detailed estimates of the 2011 economic impacts of the Mississippi seafood industry by economic sector and by major seafood species. The total economic impacts of the harvesting and processing sectors in 2011 will be broken down by major species using the 2011 landings and plant-gate values. The 2011 harvesting impacts will be categorized according to the 2011 total landing values of each of the four major species. The 2011 processing sector impacts will be divided according to the 2011 total plant-gate values of the processed products for each of the four major species.

The 2011 economic impacts of the seafood-wholesaling sector and fish markets will be separated according to the same expenditure shares of each of the four major species reported by these sectors in a 2011 survey of Mississippi seafood wholesalers and retailers. The seafood restaurant impacts will be divided according to the same expenditure shares of each of the four major species reported by these establishments in a 2009 survey of Mississippi seafood restaurants.

This bulletin presents the most recent NOAA Fisheries economic information on the economic impacts of the entire Mississippi seafood industry from 2006 to 2011. The itemization of the economic impacts of the Mississippi seafood industry in 2009 by economic sector and major species was made possible by the results of the collaborative research efforts during the past 5 years between the Mississippi Department of Marine Resources and the author. The mail and online surveys of the full-service and limited-service restaurants in 2010–2011 and the seafood wholesalers and retailers in 2012–2013 collected the basic economic information needed in the detailed economic impact analysis of the Mississippi seafood industry. Economic impact estimation beyond the year 2011 will require updated establishment surveys of the breakdown of wholesale, retail, and restaurant sales transactions of seafood products in the state.

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