PRELIMINARY REPORT ON THE ECONOMIC IMPACT OF THE MISSISSIPPI SEAFOOD INDUSTRY

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July 1991

INTRODUCTION

This report attempts to measure the economic impact of the Mississippi seafood industry. Essentially there exists some form of integration in the MS seafood industry, e. g., processor-wholesaler, wholesaler-retailer. The extent of the integration of the industry limits the reliability of the estimates made in this report. The simple economic relationships assumed may not correctly describe the seafood industry in Mississippi since they were not validated by long-term data. Users are hereby cautioned regarding the accuracy of the estimated economic impact of the seafood industry of Mississippi.

For the purpose of this report, the seafood industry consists of the harvesting, processing, wholesaling, retailing and restaurant sectors. The harvesting sector comprises commercial fishermen using various gears on board large vessels and small boats. The processing sector involves plants engaged in primary wholesale and processing. The wholesaling sector includes secondary wholesale and processing activities. The retailing sector refers to retail trade from stores. The restaurant sector deals with retail trade from food service.

The economic impact of the industry is estimated by using multiplier analysis. Three measures were used in calculating the economic impact of the industry. First, the outputs of fish and fishery products landed, processed or distributed in Mississippi. Second, the incomes earned by households because of the new outputs of fish and fishery products. Lastly, the employment generated because of the new outputs of fish and fishery products. In order to eliminate double counting, value added was used in measuring the output effects in the processing and distribution sectors.

In estimating the economic impact of commercial fisheries, Centaur Associates Inc. (1984) identified three components, namely: direct, indirect and

induced effects. Direct effects are effects in the initial sector under consideration. Indirect effects are those related to the purchase of inputs by the directly affected industry. These indirect impacts extend as each supplier purchases from other suppliers. Induced effects are those related to the purchase of goods and services resulting from wages paid by the directly and indirectly affected businesses. These induced effects have additional indirect and induced effects as well.

ALL SECTORS

Output Effects

The total output effects of industry are equal to the sum of the output effects in all sectors. The total direct, indirect and induced output effects of the industry in 1989 were \$488.92 million, as Table 1 shows. Excluding induced effects, the total output effects produced by the industry in 1989 were \$357.10 million.

Income Effects

The total income effects generated by the industry are equal to the sum of the income effects created by all sectors. The total direct, indirect and induced income effects produced by the industry in 1989 were \$255.74 million, as Table 3 shows. Without induced effects, the total income effects produced by the industry in 1989 were \$203.25 million.

Employment Effects

The total employment effects created by the industry are equal to the sum of the employment effects produced by all sectors. The total direct, indirect and induced employment effects created by the industry in 1989 were 27,691 man-years, as Table 5 shows. Excluding induced effects, the total output effects produced by the industry in 1989 were 21,615 man-years.

HARVESTING SECTOR

Sales Value

The sales value of the harvesting sector is equal to the sum of the ex-vessel values of all fishery products landed in Mississippi. The total ex-vessel value of landings in 1989 was \$45.70 million (Figure 1, NMFS 1991a). The shrimp fishery (\$30.29 million, NMFS 1991a) accounted for two-thirds of the total landing value in 1989. The menhaden fishery (\$10.60 million, NMFS 1991a) added over 23 percent to total ex-vessel value in 1989. The blue crab (\$0.33 million, NMFS 1991a), red

snapper (\$0.34 million, NMFS 1991a) and oyster (\$0.35 million, NMFS 1991a) fisheries contributed about three-fourths of a percent each to total landing value in 1989.



Figure 1. Ex-vessel value of commercial landings and number of commercial fishermen, Mississippi, 1980-89

Personal Income

The personal income of fishermen is equal to sales value of the harvesting sector multiplied by the income-sales ratio of the sector. The income-sales ratio (0.53) was imputed from the personal income and sales value of the Mississippi harvesting sector estimated by Centaur Associates, Inc. (1984), as shown in Table 4. The estimated total personal income earned by fishermen in 1989 was \$24.32 million, as Table 3 shows.

Employment

Total full-time employment in the harvesting sector is equal to sales value divided by the sales-employment ratio of the sector. The sales-employment ratio (\$31,143/man-year) was imputed from the sales value and employment of the Mississippi harvesting sector estimated by Centaur Associates, Inc. (1984), as shown in Table 6. The estimated total full-time employment in the harvesting sector in 1989 was 1,467 man-years, as Table 5 shows.

The reported number of Mississippi commercial fishermen in 1989 was 2,863 persons (Figure 1) consisting of 2,211 persons on vessels (documented, > 5 tons), 652 persons on boats (undocumented, < 5 tons, NMFS 1991b). An additional 746 persons were reported as casual fishermen (NMFS 1991b). Due to the seasonal nature of commercial fisheries, the actual number of commercial fishermen is expressed in number of full-time equivalent man-years of employment. Total full-time employment in the harvesting sector is equal to number of commercial fishermen fishermen multiplied by the ratio of fishing income to total income. A full-time commercial fisherman is a person who receives more than 50 percent of his annual income from commercial fishing activities. The equivalent number of full-time commercial fishermen in 1988 was 1,432 man-years.

Output Effects

Total output effects of the harvesting sector are equal to the total ex-vessel value multiplied by the output multiplier of the sector. The Type II and I output multipliers (2.46 and 1.55) are the output multipliers of the "forestry and fishery products" sector in the Mississippi model developed by Lee (1986), as Table 1 shows. The total output effects of the harvesting sector in 1989 were \$112.69 million. Minus induced effects, total output effects of the harvesting sector in 1989 were \$71.29 million.

Income Effects

Total income effects of the harvesting sector are equal to the personal income of fishermen multiplied by the income multiplier. The Type II and I income multipliers (1.70 and 1.35) are the income multipliers of the "forestry and fishery products" sector in the Mississippi model produced by Lee (1986), as Table 3 shows. The total income effects of the harvesting sector in 1989 were \$41.47 million. Less induced effects, the total income effects of the harvesting sector in 1989 were \$32.96 million.

Employment Effects

Total employment effects of the harvesting sector are equal to the total fulltime employment multiplied by the employment multiplier. The Type II and I employment multipliers (1.57 and 1.25) are the employment multipliers of the "forestry and fishery products" sector in the Mississippi model constructed by Lee (1986), as Table 5 shows. The total employment effects of the harvesting sector in 1989 were 2,308 man-years. Less induced effects, the total employment effects of the harvesting sector in 1989 were 1,841 man-years.

PROCESSING SECTOR

Sales Value

The total sales value of the processing sector is equal to the value of all processed fish and fishery products handled by Mississippi processing plants. The processing sector handled fishery products valued at \$172.63 million in 1989 (Figure 2, NMFS 1991c). Landings from state waters were not sufficient to sustain viable commercial operations of seafood processing plants. As a consequence, the Mississippi seafood processing industry handled landings of fishery products from other states and imports from foreign countries to sustain existing plant capacity.

Value Added

The value added created by the processing sector is equal to the sales value of processed products multiplied by the value added ratio within the sector. The value added ratio within the processing sector (0.30) was derived from the value added estimates and sales value of processed commercial fishery products of the U.S. reported by NMFS (1990), as Table 2 shows. The value added created by the processing sector in 1989 was \$52.91 million, as Table 1 shows.

Personal Income

Personal income in the processing sector is equal to sales value of the sector multiplied by the income-sales ratio of the sector. The income-sales ratio (0.09) was imputed from the personal income and sales value of the MS processing sector estimated by Centaur Associates, Inc. (1984), as shown in Table 4. Total personal income earned by workers in 1989 was \$15.91 million, as Table 3 shows.

Employment

Total full-time employment in the processing sector is equal to sales value divided by the sales-employment ratio of the sector. The sales-employment ratio





(\$103,468/man-year) was imputed from the sales value and employment of the MS processing sector estimated by Centaur Associates, Inc. (1984), as shown in Table 6. Total full-time employment in the processing sector in 1989 was 1,668 manyears, as Table 5 shows. The reported number of employed persons in the processing sector in 1989 was 2,093 persons (Figure 2, NMFS 1990).

Output Effects

The total output effects in the processing sector are equal to the value added created by the sector multiplied by the output multiplier for the sector. The Type II and I output multipliers (1.83 and 1.50) are the output multipliers calculated for the "miscellaneous food products" sector in the Mississippi model created by Lee (1986), as Table 1 shows. The total output effects of the processing sector in 1989 were \$97.22 million. Excluding the induced effects, the total output effects produced by the processing sector were \$79.51 million.

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Income Effects

Total income effects of the processing sector are equal to the personal income of fishermen multiplied by the income multiplier. The Type II and I income multipliers (3.57 and 2.83) are the income multipliers of the "miscellaneous food products" sector in the Mississippi model produced by Lee (1986), as Table 3 shows. The total income effects of the processing sector in 1989 were \$56.83 million. Less induced effects, the total income effects of the processing sector in 1989 were \$45.16 million.

Employment Effects

Total employment effects of the processing sector are equal to the total fulltime employment multiplied by the employment multiplier. The Type II and I employment multipliers (4.00 and 3.11) are the employment multipliers of the miscellaneous food products sector in the Mississippi model constructed by Lee (1986), as Table 5 shows. The total employment effects of the processing sector in 1989 were 6,687 man-years. Less induced effects, the total employment effects of the processing sector in 1989 were 5,195 man-years.

WHOLESALING SECTOR

Value Added

The value added created by the wholesaling sector is equal to the landing value multiplied by the "per unit landing value" value added ratio of the sector. The value added ratio "per unit landing value" of the sector (0.43) was derived from the value added estimates of the wholesaling sector and the ex-vessel value of the commercial marine fisheries of the U.S. published by NMFS (1990), as Table 2 shows. The estimated value added created by the Mississippi seafood wholesaling sector in 1989 was \$20.01 million, as Table 1 shows.

Sales Value

The sales value of the wholesaling sector is equal to the value added divided by the value added ratio within the sector. The value added ratio within sector (0.10) was derived from the value added estimates and sales value of the wholesaling of U.S. commercial marine fishery products reported by NMFS (1990). The Mississippi seafood wholesaling sector handled fishery products valued at \$196.41 million in 1989, as Table 1 shows.

Personal Income

Personal income in the wholesaling sector is equal to sales value of the sector multiplied by the income-sales ratio of the sector. The income-sales ratio (0.09) was imputed from the personal income and sales value of the MS wholesaling sector estimated by Centaur Associates, Inc. (1984), as shown in Table 4. Total personal income earned by Mississippi wholesaling workers in 1989 was \$18.08 million, as Table 3 shows.

Employment

Total full-time employment in the wholesaling sector is equal to sales value divided by the sales-employment ratio of the sector. The sales-employment ratio (\$149,375/man-year) was imputed from the sales value and employment of the MS wholesaling sector estimated by Centaur Associates, Inc. (1984), as shown in Table 6. Total full-time employment in the Mississippi seafood wholesaling sector in 1989 was 1,315 man-years, as Table 5 shows.

Output Effects

The total output effects in the wholesaling sector are equal to the value added created by the sector multiplied by the output multiplier for the sector. The Type II and I output multipliers (2.14 and 1.30) are the output multipliers calculated for the wholesale trade sector in the Mississippi model created by Lee (1986), as Table 1 shows. The total output effects of the wholesaling sector in 1989 were \$42.97 million. Excluding the induced effects, the total output effects produced by the wholesaling sector in 1989 were \$26.02 million.

Income Effects

Total income effects of the wholesaling sector are equal to the personal income of wholesaling employees multiplied by the income multiplier. The Type II and I income multipliers (1.51 and 1.20) are the income multipliers of the wholesaling trade sector in the Mississippi model produced by Lee (1986), as Table 3 shows. The total income effects of the wholesaling sector in 1989 were \$27.43 million. Less induced effects, the total income effects of the wholesaling sector in 1989 were \$21.80 million.

Employment Effects

Total employment effects of the wholesaling sector are equal to the total fulltime employment multiplied by the employment multiplier. The Type II and I employment multipliers (1.67 and 1.25) are the employment multipliers of the wholesaling trade sector in the Mississippi model constructed by Lee (1986), as

Table 5 shows. The total employment effects of the wholesaling sector in 1989 were 2,199 man-years. Less induced effects, the total employment effects of the wholesaling sector in 1989 were 1,647 man-years.

RESTAURANT SECTOR

Value Added

The value added created by the restaurant sector is equal to the landing value multiplied by the "per unit landing value" value added ratio of the sector. The value added ratio "per unit landing value" of the sector (2.77) was derived from the value added estimates of the restaurant sector and the ex-vessel value of the commercial marine fisheries of the U.S. published by NMFS (1990), as Table 2 shows. The estimated value added created by the Mississippi seafood restaurant sector in 1989 was \$126.70 million, as Table 1 shows.

Sales Value

The sales value of the restaurant sector is equal to the value added divided by the value added ratio within the sector. The value added ratio within sector (0.46) was derived from the value added estimates and sales value of the restaurant sector of U.S. commercial marine fishery products reported by NMFS (1990), as Table 2 shows. The Mississippi seafood restaurant sector handled fishery products valued at \$269.85 million in 1989, as Table 1 shows.

Personal Income

Personal income in the restaurant sector is equal to sales value of the sector multiplied by the income-sales ratio of the sector. The income-sales ratio (0.26) was imputed from the personal income and sales value of the MS restaurant sector estimated by Centaur Associates, Inc. (1984), as shown in Table 4. The income-sales ratio is underestimated due to the non-inclusion of tips in the calculation of personal income. Total personal income earned by Mississippi restaurant workers in 1989 was \$70.22 million, as Table 3 shows.

Employment

Total full-time employment in the restaurant sector is equal to sales value divided by the sales-employment ratio of the sector. The sales-employment ratio (\$28,556/man-year) was imputed from the sales value and employment of the MS restaurant sector estimated by Centaur Associates, Inc. (1984), as shown in Table 6. The sales-employment ratio is undervalued due to the non-inclusion of tips in the

estimation of personal income. Total full-time employment in the Mississippi seafood restaurant sector in 1989 was 9,450 man-years, as Table 5 shows.

Output Effects

The total output effects in the restaurant sector are equal to the value added created by the sector multiplied by the output multiplier for the sector. The Type II and I output multipliers (1.43 and 1.16) are the output multipliers calculated for the "eating and drinking places" sector in the Mississippi model created by Lee (1986), as Table 1 shows. The total output effects of the restaurant sector in 1989 were \$181.38 million. Excluding the induced effects, the total output effects produced by the restaurant sector in 1989 were \$147.78 million.

Income Effects

Total income effects of the restaurant sector are equal to the personal income of restaurant employees multiplied by the income multiplier. The Type II and I income multipliers (1.58 and 1.26) are the income multipliers of the "eating and drinking places" sector in the Mississippi model produced by Lee (1986), as Table 3 shows. The total income effects of the restaurant sector in 1989 were \$111.43 million. Less induced effects, the total income effects of the restaurant sector in 1989 were \$88.56 million.

Employment Effects

Total employment effects of the restaurant sector are equal to the total fulltime employment multiplied by the employment multiplier. The Type II and I employment multipliers (1.55 and 1.21) are the employment multipliers of the "eating and drinking places" sector in the Mississippi model constructed by Lee (1986), as Table 5 shows. The total employment effects of the restaurant sector in 1989 were 14,671 man-years. Less induced effects, the total employment effects of the restaurant sector in 1989 were 11,448 man-years.

RETAILING SECTOR

Value Added

The value added created by the retailing sector is equal to the landing value multiplied by the "per unit landing value" value added ratio of the sector. The value added ratio "per unit landing value" of the sector (0.54) was derived from the value added estimates of the retailing sector and the ex-vessel value of the commercial marine fisheries of the U.S. published by NMFS (1990), as Table 2 shows. The

estimated value added created by the Mississippi seafood retailing sector in 1989 was \$24.83 million, as Table 1 shows.

Sales Value

The sales value of the retailing sector is equal to the value added divided by the value added ratio within the sector. The value added ratio within sector (0.19) was derived from the value added estimates and sales value of the retailing sector of U.S. commercial marine fishery products reported by NMFS (1990), as Table 2 shows. The Mississippi seafood retailing sector handled fishery products valued at \$127.57 million in 1989, as Table 1 shows.

Personal Income

Personal income in the retailing sector is equal to sales value of the sector multiplied by the income-sales ratio of the sector. The income-sales ratio (0.09) was imputed from the personal income and sales value of the MS retailing sector estimated by Centaur Associates, Inc. (1984), as shown in Table 4. Total personal income earned by Mississippi retailing workers in 1989 was \$12.42 million, as Table 3 shows.

Employment

Total full-time employment in the retailing sector is equal to sales value divided by the sales-employment ratio of the sector. The sales-employment ratio (\$97,414/man-year) was imputed from the sales value and employment of the Mississippi retailing sector estimated by Centaur Associates, Inc. (1984), as shown in Table 6. Total full-time employment in the Mississippi seafood retailing sector in 1989 was 1,310 man-years, as Table 5 shows.

Output Effects

The total output effects in the retailing sector are equal to the value added created by the sector multiplied by the output multiplier for the sector. The Type II and I output multipliers (2.20 and 1.30) are the output multipliers calculated for the retail trade sector in the Mississippi model created by Lee (1986), as Table 1 shows. The total output effects of the retailing sector in 1989 were \$54.66 million. Excluding the induced effects, the total output effects produced by the retailing sector in 1989 were \$32.50 million.

Income Effects

Total income effects of the retailing sector are equal to the personal income of retailing employees multiplied by the income multiplier. The Type II and I income

multipliers (1.49 and 1.18) are the income multipliers of the retail trade sector in the Mississippi model produced by Lee (1986), as Table 3 shows. The total income effects of the retailing sector in 1989 were \$18.59 million. Less induced effects, the total income effects of the retailing sector in 1989 were \$14.77 million.

Employment Effects

Total employment effects of the retailing sector are equal to the total full-time employment multiplied by the employment multiplier. The Type II and I employment multipliers (1.39 and 1.13) are the employment multipliers of the retail trade sector in the Mississippi model constructed by Lee (1986), as Table 5 shows. The total employment effects of the retailing sector in 1989 were 1,826 man-years. Less induced effects, the total employment effects of the retailing sector in 1989 were 1,484 man-years.

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TABLE 1

Computation of Output Effects of MS Commercial Marine Fisheries, 1989

	Sales Value	Value Added	Multiplier		Total Output Effects	
Sector	<pre>\$ million</pre>	<pre>\$ million</pre>	Туре І	Type II	Dir+Indi	Dir+Indi+ Indu
Harvesting	45.70	28.88	1.55988	2.46589	71.29	112.69
Processing	172.63	52.91	1.50282	1.83761	79.51	97.22
Wholesaling	196.41	20.01	1.30043	2.14752	26.02	42.97
Restaurant	269.85	126.70	1.16644	1.43162	147.78	181.38
Retailing	127.57	24.83	1.30875	2.20110	32.50	54.66
Total	812.16	253.33			357.10	488.92

Sources and formulas:

Harvesting sales value: NMFS (1991a). Processing sales value: NMFS (1991c). Wholesaling, retailing and restaurant sales value = value added / value added ratio within sector. Harvesting and processing value added = sales value X value added ratio within sector. Value added ratios: Table 2. Wholesaling, retailing and restaurant value added = harvesting sales value X value added ratio per unit landing value. Harvesting output effects = sales value X output multiplier. Processing, wholesaling, retailing and restaurant output effects = value added X output multiplier.

Computation of Value Added Ratios of US Commercial Marine Fisheries, 1989

	Value Added	Sales Value	Value Added Ratio		
Sector	<pre>\$ million</pre>	<pre>\$ million</pre>	Within Sector	Per Unit Landing Value	
Harvesting	2,046.81	3,238.44	0.63204	0.63204	
Processing	2,805.26	9,153.59	0.30647	0.86624	
Wholesaling	1,418.05	13,918.02	0.10189	0.43788	
Restaurant	8,978.12	19,122.58	0.46950	2.77236	
Retailing	1,759.70	9,040.13	0.19465	0.54338	
Total	17,007.93	54,472.77	0.31223	5.25189	

Sources and formulas:

Value added and sales values: NMFS (1990). Value added ratio within sector = value added / sales value. Value added ratio per unit landing value = value added / harvesting sales value.

Computation of Income Effects of MS Commercial Marine Fisheries, 1989

	Sales Value	Income	Multiplier		Total Income Effects	
Sector	\$ million	<pre>\$ million</pre>	Туре І	Type II	Dir+Indi	Dir+Indi+ Indu
Harvesting	45.70	24.32	1.35528	1.70531	32.96	41.47
Processing	172.63	15.91	2.83819	3.57121	45.16	56.83
Wholesaling	196.41	18.08	1.20580	1.51722	21.80	27.43
Restaurant	269.85	70.22	1.26113	1.58685	88.56	111.43
Retailing	127.57	12.42	1.18951	1.49673	14.77	18.59
Total	812.16	140.95			203.25	255.74

Sources and formulas:

Sales value: Table 1. Income = sales value X income-sales ratio. Income-sales ratio: Table 3. Income multiplier: Lee (1996). Total income effects = income X income multiplier.

Computation of Income-Sales Ratio in MS Commercial Marine Fisheries, 1980

	Sales Value	Income	Income-Sales Ratio
Sector	\$ million	\$ million	
Harvesting	21.80	11.60	0.53211
Processing	35.80	3.30	0.09218
Wholesaling	23.90	2.20	0.09205
Restaurant	26.90	7.00	0.26022
Retailing	11.30	1.10	0.09735
Total	119.70	25.20	0.21053

Sources and formulas:

Sales value and income: Centaur Associates, Inc. (1984). Income-sales ratio = income / sales value.

Computation of Employment Effects of MS Commercial Marine Fisheries, 1989

Sector	Sales Value	Employment	Multiplier		Total Employment Effects	
	\$ million	man-year	Туре І	Type II	Dir+Indi	Dir+Indi+I ndu
Harvesting	45.70	1,467.42	1.25423	1.57263	1,840.48	2,307.71
Processing	172.63	1,668.44	3.11340	4.00798	5,194.51	6,687.06
Wholesaling	196.41	1,314.88	1.25287	1.67225	1,647.37	2,198.81
Restaurant	269.85	9,449.77	1.21150	1.55254	11,448.39	14,671.14
Retailing	127.57	1,309.57	1.13341	1.39446	1,484.28	1,826.14
Total	812.16	15,210.07			21,615.04	27,690.86

Sources and formulas:

Sales value: Table 1. Employment = sales value / sales-employment ratio. Employment-sales ratio: Table 6. Employment multiplier: Lee (1986). Total employment effects = employment X employment multiplier.

Computation of	f Sales-Employment	Ratio	in MS Comm	mercial Mari	ine Fisheries, 1980	
	Sales Value		Employment		Sales-Employment Ratio	
Sector	<pre>\$ million</pre>		man-year		\$/man-year	
Harvesting		21.80		700.00	31,142.86	
Processing		35.80		346.00	103,468.21	
Wholesaling		23.90		160.00	149,375.00	
Restaurant		26.90		942.00	28,556.26	
Retailing		11.30		116.00	97,413.79	
Total	1	19.70		2,264.00	52,871.02	

Sources and formulas:

Sales and employment: Centaur Associates, Inc. (1984). Sales-employment ratio = sales value / employment.