Economic Impacts of the Aquaculture Industry in Alabama in 2005

by

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Executive Summary

The positive economic impacts of aquaculture on the State of Alabama in 2005 were evaluated using an IMPLAN® input-output computer model of the State's economy. This analysis was facilitated by the recent publication of the 2005 Census of Aquaculture by the U.S. Department of Agriculture, and cost of production data provided by the Alabama Cooperative Extension System and Auburn University.

Aquaculture in Alabama has grown rapidly since the 1980s, from nominal sales of less than $8 million (M) in 1981, to more than $102 M in 2005. In 2005 there were 201 aquaculture operations in Alabama with 594 paid and unpaid workers. Using data from the Census of Aquaculture and the Alabama Cooperative Extension System, an IMPLAN model of the State of Alabama was modified to more accurately represent its aquaculture industry. Economic impacts were estimated under the assumption that 95.6 percent of Alabama's aquaculture production was sold outside the State.

Direct, indirect and induced impacts for the State of Alabama were estimated for output, value-added, labor income, other property type income, indirect business taxes and employment. Direct impacts represent the revenues, income, taxes and jobs generated directly by the aquaculture industry. Indirect effects occur when aquaculture operations use revenues from sales made outside the State to purchase inputs from local suppliers, and in turn, when those suppliers purchase from other local suppliers. Induced impacts from non-local revenues occur when households of employees and business proprietors spend their income or profits for personal consumption at other local (in-state) businesses. Total impacts equal the sum of direct, indirect and induced effects, and measure the complete impact of an activity on Alabama's economy.

Output impacts represent the total value of revenues or expenditures associated with an activity or event. The total output impact of aquaculture on the State of Alabama was estimated to be $222.8 million (M) in 2005. Value-added impacts measure labor income, property type income, and indirect business taxes resulting from these revenues. The total value-added impact of aquaculture on Alabama in 2005 was estimated at $67.5 M. Labor income represents earnings by employees and proprietors of businesses impacted by aquaculture. Aquaculture's contribution to labor income in Alabama was estimated to total $49 M for the year 2005. Impacts from aquaculture on other property type income in the Alabama were estimated to total $15.0 M for 2005. Other property income consists of rents, royalties, interest, dividends, and corporate profits. Indirect business taxes include excise, property, and sales taxes, as well as licensees and fees paid by businesses, but do not include taxes on profits or income. It was estimated that $4.0 M in indirect business taxes were generated by Alabama aquaculture in 2005. Employment impacts approximate the number of full-time, part-time and seasonal jobs created by an economic activity. In 2005, it is estimated that 1,483 jobs were created by aquaculture in the State of Alabama. For all types of economic impacts, the combined indirect and induced effects of aquaculture's activities in the State exceeded its direct impacts.

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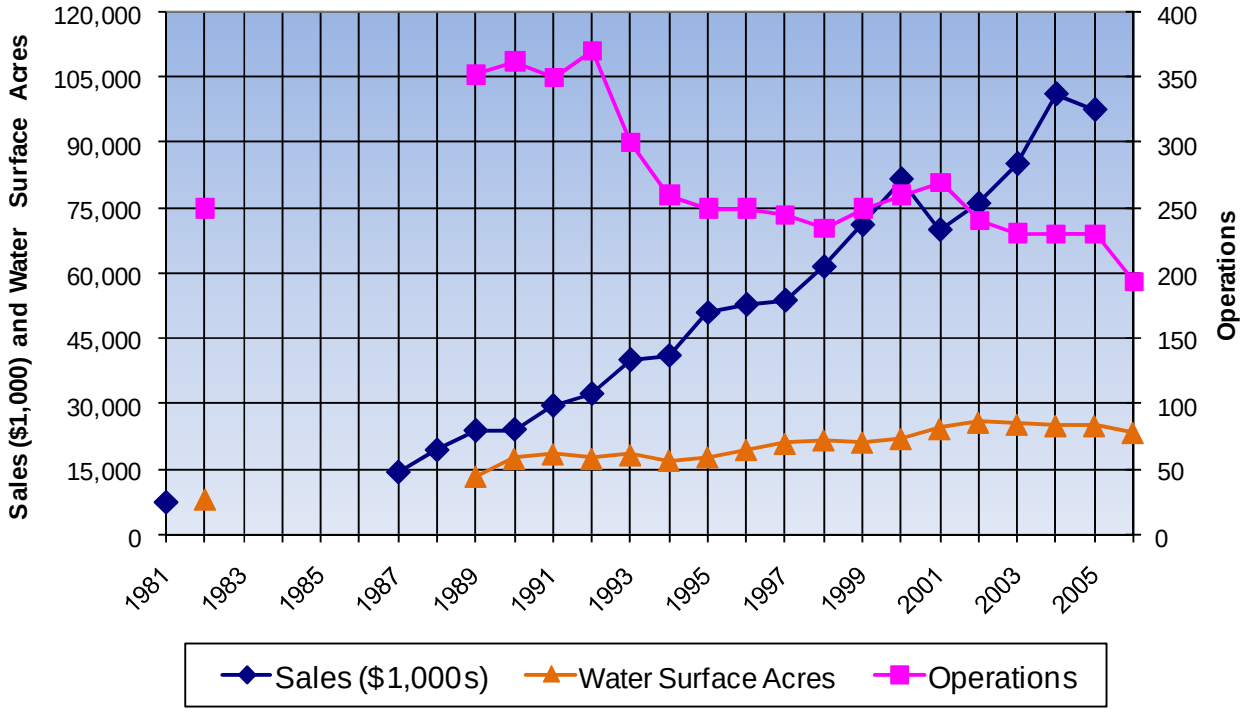
Introduction

Aquaculture in Alabama is dominated by catfish production and has grown rapidly since the 1980s, from nominal sales of less than $8 million (M) in 1981, to more than $102 M in 2005 (Figure 1) (Alabama Cooperative Extension System). As the harvest of wild fish approaches the capacity limits of the world's oceans, rivers and lakes, aquaculture will become an increasingly important resource in meeting the future demand for fish and seafood products in the U.S. and the world. The Department of Agricultural Economics and Rural Sociology at Auburn University, requested the Economic Impact Analysis Program[1] at the University of Florida to conduct an analysis of the economic impacts of Alabama's aquaculture industry on the State. This analysis was facilitated by the recent publication of the 2005 U.S. Department of Agriculture (USDA) - National Agricultural Statistics Service (NASS), Census of Aquaculture, in October of 2006.

Economic impact analysis provides a more comprehensive assessment of how an industry or event affects a regional economy, beyond its direct impacts (gross revenues or sales). Not only can secondary impacts (indirect and induced) be estimated when new revenues enter a regional economy, but impacts to specific types of businesses and institutions can be identified as well. Estimating the size of aquaculture's economic impacts on Alabama makes it possible to evaluate its relative importance to the State's overall economy and other industries or sectors within its economy.

[1] The Economic Impact Analysis Program is comprised of faculty at the University of Florida who have expertise in regional and natural resource economics, are are available to provide technical assistance to industry groups, government agencies and local communities for the purpose of conducting specific research and analysis of the economic impacts of particular industries, regions, or situations. It is housed within the Department of Food and Resource Economics.

Figure 1. Alabama Catfish Production: Sales, Water Surface Acres and Number of Operations: 1981 – 2006.



Source: Auburn University Department of Fisheries and Allied Aquaculture, and the Alabama Cooperative Extension System, http://www.aces.edu/dept/fisheries/aquaculture/statistics.php .

The Alabama Aquaculture Industry

According to the 2005 Census of Aquaculture (USDA-NASS), there were 215 aquaculture operations in Alabama in 2005, with 25,351 water-acres in production, 594 paid and unpaid workers (Table 1), and sales of over $102 million (M) (Figure 1, Tables 1 and 2). This last number represents a 72 percent increase in nominal sales since 1998. Most of this increase in sales is due to increasing yields in catfish production on a per acre basis. In 2005, almost 96 percent of all aquaculture sales in Alabama were from catfish production. The remaining 4 percent consisted of mostly game fish and crawfish sales. Total agricultural receipts for Alabama (excluding forest products and government payments) were $4,097 M in 2005 (USDA-NASS, Alabama Agricultural Statistics). Over 82 percent of these receipts came from livestock and poultry production, with broiler production accounting for $2,409 M, or nearly 59 percent of this total. In 2005, aquaculture comprised 2.5 percent of total agricultural commodity receipts for Alabama. After Mississippi and Arkansas, Alabama ranked as the third largest producer of aquacultural products in the nation that year.

Table 1. Employment in Alabama Aquaculture, 2005.

Unpaid	Paid 150 days or more	Paid less than 150 days	Total
	- - - - Number - - - -		
191	237	166	594

Source: USDA – NASS, 2005 Census of Aquaculture.

Table 2. Alabama Aquaculture Sales by Type of Operation and Species, 2005 and 1998

	2005			1998		
Type/species	**Farms**	**Sales $1,000**	**Sales Percent**	**Farms**	**Sales $1,000**	**Sales Percent**
Food Fish	201	99,458	96.75%	254	58,565	98.11%
Catfish	192	98,413	95.74%	250	58,222	97.53%
Tilapia	13	170	0.17%	6	(D)	(D)
Other [1]	(D)	875	0.85%	(D)	(D)	(D)
Sportfish	20	2,176	2.12%	8	292	0.49%
Baitfish	7	41	0.04%	2	(D)	(D)
Crustaceans	8	933	0.91%	5	20	0.03%
Total	**215**	**$102,796**	**100.00%**	**259**	**$59,694**	**100.00%**

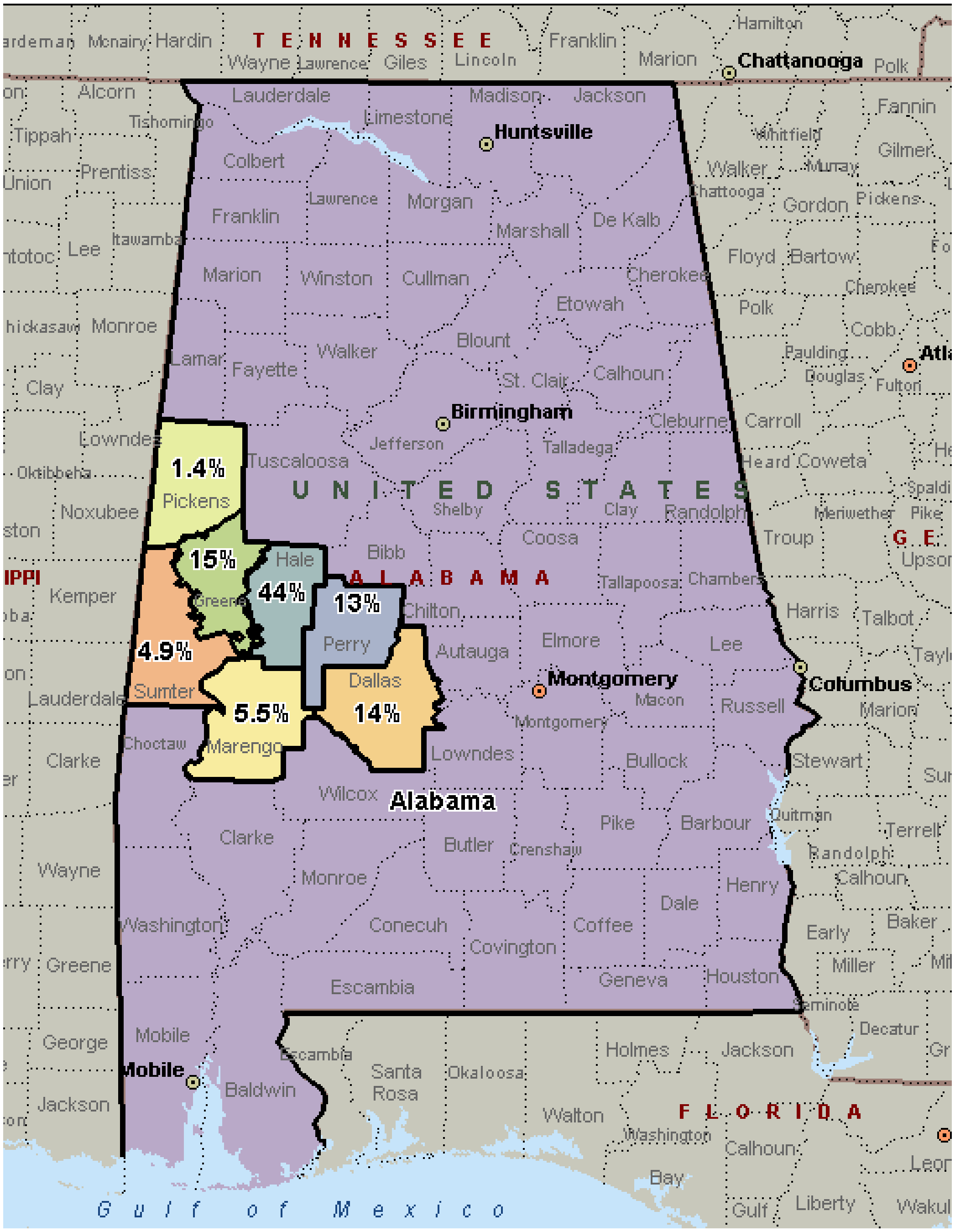
Source: USDA – NASS, 2005 Census of Aquaculture.

1. Sales value for "Other" food fish is calculated as Total food fish sales minus Catfish and Tilapia sales.

(D) Figures were not disclosed in order to maintain confidentiality.

Catfish production in Alabama takes place predominately in the western central portion of the State, in an area called the Blackland Prairie region (Figure 2) (Tucker et al.). In fact, seven counties in this area (Dallas, Greene Perry, Sumter, Marengo, Hale, and Pickens) are responsible for nearly 98 percent of the State's total catfish production. This region of Alabama is well suited to constructed-pond aquaculture, with land that is nearly flat to moderately sloping, and soils that have a sufficient clay content to maintain pond water levels. The catfish industry in Alabama and the other leading southern states has achieved a substantial degree of vertical integration. A significant proportion of feed mills and processing plants associated with aquaculture are owned by producers, or are engaged in long-term contractual relationships with producers and retail outlets. As a result, a high level of coordination takes place between feed suppliers, producers and processors in the catfish industry.

Figure 2. Alabama Study Area Showing Percent of Total State Production from Its Seven Largest Catfish Producing Counties in 2005.



Source: USDA – NASS, Alabama Annual Statistics Bulletin, 2006.
http://www.nass.usda.gov/Statistics_by_State/Alabama/Publications/Annual_Statistical_Bulletin/2006/pg47.pdf

Objectives

The objectives of this study were to:

1. Review published reports on economic impacts of the aquaculture industry in the United States.
2. Compile available data on quantities, prices, sales, and employment for aquaculture products in Alabama from the USDA/NASS Census of Aquaculture (2005), and other sources.
3. Compile information on costs of production for the major aquaculture products of catfish, shrimp and crawfish from State extension economists in Alabama and Mississippi.
4. Construct an input-output (I-O) model for the state of Alabama using the IMPLAN modeling software and associated databases.
5. Develop a customized production function for the aquaculture sector in the I-O model based on Alabama production cost data, to better represent local production practices and economic linkages.
6. Estimate direct, indirect, induced and total economic impacts for output (revenue), value added, employment, labor income, other income, and indirect business taxes, by major economic sector for the year 2005.
7. Provide a written final report to project sponsors that details all analytical methods, data sources, findings, qualifications, and conclusions.

Scope and Limitations

This analysis utilizes input-output (I-O) analysis to evaluate the positive economic contributions, in terms of sales or revenues, income, taxes and jobs resulting from aquaculture production in the State of Alabama. It does not measure or account for any changes in the quality of life or the environment for the State that may result from these activities. Also, possible effects on regional prices for goods, services, or real estate are not factored into, or predicted by, standard I-O analysis. The secondary (indirect and induced) economic impacts estimated by I-O analysis are derived from the backward linkages of an industry with its input suppliers, employees, proprietors and associated government entities, and are largely based on

national averages. As a result, the accuracy of the estimated secondary impacts rests on the assumption that the economic relationships between businesses, employees, consumers and institutions in Alabama are similar to those of the national economy. Generally, indirect and induced economic impacts are presumed to occur within twelve months of the primary or direct impacts of an event or activity. The economic impacts of forward linked industries that process, distribute and market Alabama aquaculture products were not evaluated in this study. As with any empirical estimation, the accuracy of the results depends directly on the accuracy of the inputs. It was not within the scope of this study to verify or validate the accuracy of data provided by the USDA Census of Aquaculture, Auburn University or the Alabama Agricultural Extension System.

Study Area Definition and Description.

The composition and size of the study area can have a significant effect on the results of an impact analysis. Geographic location of the event or activity of interest, the relevant government/political jurisdictions, and the degree of economic integration within the region are the important criteria for determining the appropriate study area. As specified in the sponsored research contract, the activity of interest is aquaculture in Alabama. To best capture both primary and secondary impacts, it is important to include geo-political areas where employees and business owners not only work, but live and spend their earnings. A review of Census Bureau and Bureau of Economic Analysis (US Department of Commerce) commuting pattern data for the year 2000 revealed that over 97 percent of individuals who worked in Alabama that year, also lived there. Examining data on commuting patterns for agricultural workers in Alabama revealed that over 93 percent these workers or proprietors also live inside the State. Based on these statistics, it is the authors' opinion that the degree of economic integration within Alabama is sufficient to capture the bulk of economic impacts generated by its aquaculture industry.

Regional Economic Impact Analysis: Background

The economic impacts estimated in this study are based on input-output (I-O) analysis and models. I-O analysis is a standard technique for estimating broad regional economic impacts that result from changes in economic activity of a specific industry sector or group of sectors in a particular region. I-O models are mathematical representations of a regional economy

formulated in terms of transactions between industries, employees, households, and governments (Schaffer, 1999).

The Food and Resource Economics Department is a licensed user of the IMPLAN Professional [2] economic impact modeling system. IMPLAN is system of software and databases that can be used to quickly construct input-output models and estimate economic multipliers and impacts. It includes data on economic activity in the U.S at the county level for 531 different industry and institutional sectors based on the North American Industry Classification System (NAICS). [3] Within NAICS and IMPLAN, businesses are classified into specific industry sectors based on their primary product or service. This extensive database allows economic I-O models to be constructed for individual counties, multi-county regions, or states within the U.S. For this analysis, the IMPLAN I-O model representing the economy of the State of Alabama was based on 2003 data.

The types of economic impacts typically estimated with I-O models include output, value-added, labor income, other property type income, indirect business taxes, and employment. Output impacts represent the total value of revenues or expenditures associated with an activity or event. Value-added impacts measure labor income, property type income, and indirect business taxes resulting from these revenues. Labor income represents earnings by employees and proprietors of affected businesses. Other property type income consists of rents, royalties, interest, dividends, and corporate profits. Indirect business taxes include excise, property, and sales taxes, as well as licensees and fees paid by businesses, but do not include taxes on profits or income. Employment impacts approximate the number of full-time, part-time and seasonal jobs created by an economic activity. Each of these measures represents a different way of assessing the size or contribution of a particular activity to a regional or national economy.

Economic impacts can occur in three ways: direct, indirect and induced. Direct impacts, represent the additional revenues, value-added, income, and jobs generated directly by business activity, consumer spending, or government transfers within a study area. Whether indirect or induced impacts occur depends on the source of dollars causing the direct impacts. When new or

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[2] Minnesota IMPLAN Group (MIG), 2004. IMPLAN, Economic Impact and Social Accounting Software, and data for Florida. Stillwater, MN. www.implan.com .

[3] IMPLAN Pro uses a sectoring scheme similar to North American Industry Classification System (NAICS): For details see http://www.implan.com/library/pdf_files/implan_sectoring_2001.pdf .

outside dollars enter a regional economy, either through expenditures by visitors from outside the region, from the sale (export) of goods and services to areas outside the local region, or institutional transfers, additional economic repercussions will occur in the form of indirect and induced impacts. Indirect impacts occur as businesses use revenues originating from outside the region to purchase goods and services from local suppliers. This secondary, or indirect business, generates additional revenues, income, jobs and taxes for the local economy. Induced impacts from nonlocal revenues occur when the households of employees and business owners (and those of their local suppliers) spend their earnings or profits at other businesses in the area for consumer goods and services. Again, additional revenues, income, jobs and taxes for the regional economy result from this activity. Indirect economic impacts indicate how important outside revenues are to area businesses that primarily serve other businesses. Induced impacts point to how significant outside revenues are for area businesses that primarily serve consumers. A glossary of input-output terminology is provided at the end of this report.

Procedures and Data

Building input-output models that reasonably estimate the economic impacts of a particular industry in given region requires data on all the related industries and institutions in that region. IMPLAN databases are constructed from data from numerous government sources for industry and regional economic data such as the Census Bureau, the Bureau of Economic Analysis and the Bureau of Labor Statistics. Industry and institution data is organized in IMPLAN using a 531 sector scheme, which is similar to the North American Industry Classification System (NAICS). In IMPLAN, aquaculture is combined with other types of animal production including swine, dairy and sheep operations into a sector called "Animal production – except cattle and poultry" (IMPLAN Sector 13). This IMPLAN sector corresponds to NAICS sectors 1122, 1124, 1125, and 1129 combined. Since more detailed data on aquaculture in Alabama is available, the IMPLAN model was adjusted to more accurately reflect this particular industry and region. Detailed data on catfish production was obtained from the 2005 Census of Aquaculture (USDA NASS) (Tables 1 and 2), Brown et al., and personal

correspondence with John Adrian and James Yeager at the Alabama Agricultural Extension System [4] (Table 3). Since 96 percent of aquaculture sales in Alabama in 2005 were catfish, the industry was treated as if it was catfish production.

Table 3. West Alabama Catfish Enterprise Budgets, 2004 and 2005 [1].

	2004		2005	
	$/acre	**percent**	**$/acre**	**percent**
Operating revenues	$3,257.80		$3,549.11	
Operating expenses				
Feed	$1,721.60	61.89%	$1,593.24	51.81%
Labor	$261.82	9.41%	$319.14	10.38%
Utilities	$119.88	4.31%	$176.96	5.75%
Chemicals	$51.28	1.84%	$69.92	2.27%
Machine hire	$68.80	2.47%	$125.33	4.08%
Machine repair	$186.15	6.69%	$176.68	5.74%
Interest	$151.22	5.44%	$239.12	7.78%
Fuel	$76.23	2.74%	$116.45	3.79%
Insurance	$28.41	1.02%	$32.11	1.04%
Property taxes	$5.01	0.18%	$9.06	0.29%
Cash rent	$67.68	2.43%	$35.64	1.16%
Miscellaneous	$32.65	1.17%	$55.65	1.81%
Pond and building repair	$11.15	0.40%	$126.13	4.10%
Total operating expenses	**$2,781.88**	**100.00%**	**$3,075.43**	**100.00%**
Net operating income	**$475.92**		**$473.68**	
Machinery depreciation	$156.98		$154.91	
Pond/Building depreciation	$38.60		$44.84	
Total depreciation	**$195.58**		**$199.75**	
Net Income	**$280.34**		**$273.93**	

Sources: John L. Adrian Jr., Professor, Agriculture Economics and Rural Sociology, Alabama Cooperative Extension Systems, Auburn University, AL, October, 2006.

Joseph J. Yeager, Extension Economist – Farm Business Management, Alabama Fish Farming Center, Alabama Cooperative Extension Systems, Greensboro, AL, November 2006.

Brown et al., 2006.

[1] Expenses represent averages per acre of water area.

[4] John L. Adrian Jr., Professor of Agricultural Economics & Rural Sociology, 308A Comer Hall, Auburn University, AL, October, 2006.

Joseph J. Yeager, Extension Economist – Farm Business Management, Alabama Fish Farming Center, 529 Centerville St, Greensboro, AL, November 2006.

For the purposes of this economic impact analysis, it was necessary to make several modifications to the catfish production budget in Table 3. The budgets in Table 3 were based on an accrual accounting system, where revenues were adjusted for estimated changes in the inventory of catfish in ponds. Since economic impacts are based on sales, the budgets had to be converted to a cash basis. After consulting with Adrian and Yeager, this conversion was carried out by adding the cost of fingerlings to both the expenditure and revenue sides of the budget. These expenditures were estimated as 16 percent ($585.80) of total operating expenditures for 2005. The 2005 budget in Table 3 also shows an eleven fold increase in pond and building repair expenditures over 2004. This was due to damages caused by Hurricanes Katrina and Rita in 2005. To prevent this anomaly from distorting the impact results, the value for pond and building repair used in this analysis was set equal to its average for 2004 and 2005 ($68.64). Finally, in order to capture some of the ongoing capital investment costs involved in catfish production, annual depreciation expenses for ponds, buildings and machinery were treated as normal production expenditures. The revised 2005 enterprise budget for modeling catfish production in Alabama is presented in Table 4.

Table 4. Modified Alabama Catfish Enterprise Budget, 2005.

Revenues	**Average per acre of water**		
Value of catfish production	$4,102.02		
Other receipts	$32.89		
Total Revenues	**$4,134.91**		
Operating expenditures	**Amount $**	**% of total expenditures.**	**% of total revenues**
Feed	$1,593.24	41.89%	38.53%
Fingerlings	$585.80	15.40%	14.17%
Labor	$319.14	8.39%	7.72%
Utilities	$176.96	4.65%	4.28%
Chemicals	$69.92	1.84%	1.69%
Machine hire	$125.33	3.30%	3.03%
Machine repair & depreciation	$331.59	8.72%	8.02%
Interest	$239.12	6.29%	5.78%
Fuel	$116.45	3.06%	2.82%
Insurance	$32.11	0.84%	0.78%
Property taxes	$9.06	0.24%	0.22%
Cash rent	$35.64	0.94%	0.86%
Miscellaneous	$55.65	1.46%	1.35%
Pond & building repair & depreciation	$113.48	2.98%	2.74%
Total	**$3,803.49**	**100.00%**	91.98%
Net income	**$331.42**		**8.02%**

To apply the modified budget to the IMPLAN model, individual budget items must be converted and allocated to the appropriate IMPLAN industry sectors. This allocation is presented in Table 5. The first three columns of this table contain the budget items, their amount, and percentage of total expenditures, including value-added, which equals employee compensation, profits, property taxes and other income. The allocation of those budget item expenditures to IMPLAN industry sectors is shown in the fourth, fifth and sixth columns of Table 5. The sector names and numbers are given in the fourth column. The selection of IMPLAN sectors for this allocation was based on sector descriptions provided in the IMPLAN Pro Users Guide and a review of production literature published by the Alabama Cooperative Extension System and the Mississippi State University Extension Service. In all but one instance, the allocation of individual budget items among multiple IMPLAN sectors was carried out evenly. An exception was made for Machine Repair expenditures where only 10 percent was allocated to Tire Manufacturing and 30 percent was allocated to each of the remaining three sectors selected for that budget item. The budgeted amount and percentage of total revenue allocated to each IMPLAN sector are given in the fifth and sixth columns of Table 5. The percentages given in the sixth column were used to customize the production function for IMPLAN sector 13 (Animal production- except cattle and poultry).

The value-added components of the enterprise budget are shown in the bottom quarter of Table 5. These values were calculated by multiplying the percent of total revenues shown in the last column of Table 4, by 2005 aquaculture revenues ($102.796 M) for each value-added category. These values were then used to modify the Study Area Data section for sector 13 of the IMPLAN model. In this case: labor expense was allocated to Employee Compensation; profits were designated as Proprietary Income; property taxes were allocated to Other Business Taxes; and other receipts were assigned to Other Property Income.

Additional modifications to the IMPLAN model were made to bring it into alignment with specific information available on Alabama aquaculture, and to adjust other default modeling parameters, which were not realistic for the State and aquaculture production. First, Adrian and Yeager indicated that eighty percent of feed purchases, and five percent of fingerling purchases took place within the State of Alabama. Since these items represented significant portions of the total budget and were substantially different from the Regional Purchase Coefficients estimated by the IMPLAN model, the values in IMPLAN were adjusted accordingly. To accommodate the

Table 5. Alabama Catfish Enterprise Budget with Budget Item Allocation to IMPLAN Sectors, 2005.

Input Expenditure Items	$ per Water-acre	Percent of Total	IMPLAN Sector Name (number)	Amount	% of Total Revenues
Feed	$1,593.24	38.53%	Other animal food manufacturing (47)	$1,593.24	38.531%
Fingerlings	$585.80	14.17%	Animal production- except cattle and poultry (13)	$585.80	14.167%
Utilities	$176.96	4.28%	Power generation and supply (30)	$176.96	4.280%
Chemicals	$69.92	1.69%			
			Other basic inorganic chemical manufacturing (150)	$17.48	0.423%
			Nitrogenous fertilizer manufacturing (156)	$17.48	0.423%
			Phosphatic fertilizer manufacturing (157)	$17.48	0.423%
			Pesticide & other agricultural chemical manufact. (159)	$17.48	0.423%
Machine hire	$125.33	3.03%	Agriculture and forestry support activities (18)	$125.33	3.031%
Machine repair	$331.59	8.02%			
			Tire manufacturing (179)	$33.16	0.802%
			Motor vehicle parts manufacturing (350)	$99.48	2.406%
			Automotive repair and maintenance (483)	$99.48	2.406%
			Commercial machinery repair & maintenance (485)	$99.48	2.406%
Fuel	$116.45	2.82%	Petroleum refineries (142)	$116.45	2.816%
Insurance	$32.11	0.78%	Insurance agencies, brokerages, & related (428)	$32.11	0.777%
Pond & building repair	$113.48	2.74%			
			Maintenance & repair of nonresidential buildings (43)	$56.74	1.372%
			Other maintenance and repair construction (45)	$56.74	1.372%
Cash Rent	$35.64	0.86%	Real estate (431)	$35.64	0.862%
Miscellaneous	$55.65	1.35%			
			Wholesale Trade (390)	$18.55	0.449%
			Accounting & bookkeeping services (438)	$18.55	0.449%
			Veterinary Services (449)	$18.55	0.449%
Interest	$239.12	5.78%	Monetary authorities & depository credit intermediaries (430)	$239.12	5.783%
Total input expenditures	**$3,475.29**	**84.05%**		**$3,475.29**	**84.048%**
Value added					
Labor	$319.14	7.72%	Employee compensation	$319.14	7.718%
Profits	$298.53	7.22%	Proprietary Income	$298.53	7.220%
Property taxes	$9.06	0.22%	Indirect Business Taxes	$9.06	0.219%
Other income	$32.89	0.80%	Other property income	$32.89	0.795%
Total value-added	**$659.62**	**15.95%**		**$659.62**	**15.952%**
Total inputs + value-added = Revenues	**$4,134.91**	**100.00%**		**$4,134.91**	**100.000%**

80 percent figure for local feed purchases it was necessary to double the State's Other Animal Food Manufacturing sector (47) capacity. The default IMPLAN model for Alabama also included foreign exports and institutional sales of sector 13 products. Since it was doubtful that this was actually the case for aquacultural products from Alabama, these values were set to zero. This completed the modifications to the production function for the analysis.

A final calculation to industry sales data was needed to estimate the proportion of aquacultural production that was exported from the State. This is the proportion that brings in outside revenues or dollars into Alabama and generates multiplier (indirect and induced) effects. This was carried out by comparing catfish consumption in Alabama to the rest of the United States. A private study for the Catfish Institute in 1998 (Dean, Hanson and Murry), estimated regional differences in per-capita catfish consumption for the U.S. in 1998. Estimates ranged from 2.94 pounds per-capita per year for the south-central region of the U.S, to 0.17 pounds for the Northeast. The average per-capita consumption for the U.S. as a whole was estimated at 1.04 pounds per-capita. Using this data in conjunction with U.S. Census population estimates for 2005, the proportion of Alabama catfish production exported outside the State was estimated at 95.65 percent. As presented in Table 6, the amount of catfish consumed within Alabama was estimated by multiplying its 2005 population of 4,557,808 (Census Bureau), by 2.94 pounds, which equals 13,399,956 pounds. Dividing this number by the estimated total consumption for the U.S. and subtracting that percentage from one (1), gives the exported percentage in the bottom row of the fifth column of Table 6. Thus, the sales values used to estimate the indirect and induced effects from aquaculture production is 95.65 percent of $102.796 M , or $98.327 M.

To complete the economic impact estimation, $98.327 M was entered into the modified IMPLAN model as revenues for sector 13. Within this value was deflated to 2003 prices within the IMPLAN software, so that it would conform to the year of the data used to build the model. Once the impact estimates were generated, the software can be used to re-inflate the values back to 2005 dollars. The results of this impact analysis are presented in the following section.

Table 6. Estimation of the Proportion of Alabama Catfish Sales Inside and Outside the State, 2005.

Geographic Area	2005 Population [1]	Estimated per capita consumption lbs. [2]	Estimated total consumption, lbs.	Percentage of total consumption	Estimated Value of Alabama Sales
US population	296,410,404	1.04	308,266,820	100.00%	$102,796,000
AL population	4,557,808	2.94	13,399,956	4.35%	$4,468,408
US pop. - AL	291,852,596	1.01	294,866,865	95.65%	$98,327,592

1. Census Bureau, http://www.census.gov/popest/datasets.html
2. Mississippi State University Extension Service, http://www.msucares.com/pubs/publications/p2317.pdf

Results

Summary results of the economic impact analysis of Alabama Aquaculture are shown in Table 7. Output, value-added, labor income, other property type income, indirect business taxes and employment impacts are shown in individual table rows. The local direct, and nonlocal direct, indirect, induced effects and total economic impacts are reported in separate table columns. Direct impacts are the revenues, income, taxes and jobs generated directly by the aquaculture industry. Direct impacts result from both local and non-local revenues, but only non-local (out of state) revenues generate indirect and induced effects. As previously described, indirect effects occur when directly impacted businesses use revenues originating from outside the region to purchases inputs (goods and services) from local suppliers and in turn, when those suppliers purchase from other local suppliers. Induced impacts from non-local revenues occur when the households of employees and business proprietors (and their local suppliers) spend their income or profits for personal consumption at other local (instate) businesses. Total impacts are the sum of these direct, indirect and induced effects, and measure the complete impact of an activity as it ripples through a regional economy. All results in Table 7 are stated in 2005 dollars.

Table 7. Economic Impacts of the Alabama Aquaculture Industry, 2005. [a]

Impact Type/Level	Units	Impacts from Local Revenues	Impacts from Non-Local Revenues			Impacts from All Revenues
		Direct	Direct	Indirect	$Induced	Total
Output	Million 2005$	$4.47	$98.33	$73.55	$46.45	$222.79
Value Added		$0.71	$15.69	$23.01	$28.11	$67.53
Labor Income		$0.67	$14.69	$14.68	$18.51	$48.54
Other Prop. Type Income		$0.04	$0.78	$6.70	$7.46	$14.98
Indirect Bus. Taxes		$0.01	$0.22	$1.63	$2.15	$4.00
Employment	Jobs	26	569	373	515	1,483

[a] Total impacts equal the sum of direct, indirect and induced impacts. Value-added impacts equal the sum of labor income, other property type income, and indirect business taxes. Employment represents both full-time and part-time jobs.

The total output impact generated by Alabama's aquaculture industry was estimated to be $222.8 million (M) in 2005, including $4.5 M from local revenues and $218.3 M in impacts from non-local revenues (Table 7). The estimated total output impact from non-local revenues was comprised of $98.3 M in direct effects, $73.6 M in indirect effects, and $46.5 M from the induced effects.

Value-added impacts represent the sum of labor income, other property type income, and indirect business taxes. The total value-added impact of Alabama aquaculture for 2005 was estimated at $67.5 M (Table 7). Labor income represents the sum of employee compensation and proprietor profits associated with Alabama aquaculture and was estimated to equal $48.5 M. Other property type income consists of rents, royalties, interest, dividends and other corporate profits. This impact was estimate to be $15.0 M for Alabama in 2005. An estimated $4.0 M in indirect business taxes, which represent excise, property, and sales taxes, as well as business and licensing fees, resulted from the aquaculture industry in 2005. This figure does not include taxes on income or profits.

Employment impacts estimate the number of full and part-time jobs created by an economic activity. A total of 1,483 jobs were estimated to have resulted from the direct, indirect and induced effects of the aquaculture industry in Alabama during 2005 (Table 7). Twenty-six jobs resulted from local sales of aquaculture products, and a total of 1,457 resulted from sales made outside the State.

The implicit multipliers of these impacts are shown in Table 8. Implicit multipliers are equal to the indirect, induced or total impacts divided by the direct impacts, so direct impact multipliers are equal to one by definition. In this case the direct impact used to calculate the multiplier is equal to the sum of the direct impact from both local and non-local revenues. These numbers can be interpreted by saying that for every one dollar of revenue (output) generated by aquaculture in Alabama, $2.12 in revenues are generated for the State as a whole. Or, for every $1.00 in labor income generated by aquaculture in Alabama in 2005, there was a $3.11 increase in total labor income for the State. With respect to jobs, the results indicate that for every job created within the aquaculture sector, nearly 2.45 jobs are generated altogether within the State. The multipliers for Other Property Type Income and Indirect Business Taxes are often large for agricultural industries. This is because their direct contributions for these types of value-added impacts are relatively small, as can be seen in Table 7.

Table 8. Implicit Multipliers for Economic Impacts from Non-local Revenues Generated by the Aquaculture Industry of Alabama, 2005.

Impact Type/Effect	Direct	Indirect	Induced	Total
Output	1.000	0.715	0.452	2.124
Total Value Added	1.000	1.403	1.714	4.074
Labor Income	1.000	0.956	1.205	3.118
Other Prop. Type Income	1.000	8.195	9.122	18.273
Indirect Business Taxes	1.000	7.242	9.532	17.731
Employment	1.000	0.627	0.865	2.447

More detailed breakouts of these impacts by two-digit aggregate NAICS sectors are provided in Appendix A, Tables A1 through A6, for output, value added, labor income, other property type income, indirect business taxes and employment respectively. The aggregate NAICS industry sectors with the largest output impacts from aquaculture were: Agriculture, Forestry, Fishing, and Hunting; Manufacturing; Government; Finance and Insurance; and Construction (Table A1). Agriculture, Forestry, Fishing and Hunting generated over 47 percent of the total output impacts. This was a result of the direct impacts of aquaculture belonging to this aggregate Agriculture sector. The sector with the next largest output impact was Manufacturing. Most of manufacturing's impact occurred at the indirect level. This represents sales by the "Other Animal Food Manufacturers" sector within the State which provides feed for aquaculture operations. The manufacturing sector captured 22.4 percent of the total output

impact (Table A1). Government accounted for the third largest output impacts at $11.83 M or 5.31 percent of the total output impact. With $7.32 M in output impacts, Finance and Insurance was the fourth largest aggregate sector impacted by aquaculture in the State. The fifth ranked sector was the Construction industry at $6.76 M.

The distribution of impacts for value-added (Table A2) and labor income (Table A3) are similar to output, except that the Government and Manufacturing swapped places as the second and third ranked sectors, and Retail Trade and, Health and Social Services beat out Construction as the fifth ranked sector. Government received the largest portion of Other Property Type Income impacts from aquaculture, followed by Finance and Insurance, Manufacturing, Utilities, and Real Estate (Table A4). For indirect business taxes (Table A5), Wholesale Trade and Retail Trade were the first and second ranked sectors, followed by Government, Utilities and Real Estate. Employment impacts (Table A6) were distributed in a pattern similar to value-added impacts, with Retail Trade taking the forth slot and Other Services ranking in fifth place.

Summary

From 1998 to 2005, aquaculture sales in Alabama increased by over 72 percent, during a period when many of the more traditional types of agriculture in the State struggled. While aquaculture is not nearly the largest agricultural sector in Alabama, it is still the third largest livestock industry in the State, behind poultry and cattle. With an expanding worldwide demand for fish protein meeting increased restrictions on the harvest of wild fish and seafood, the importance of aquaculture to the nation's food supply is destined to grow.

By calculating how Alabama aquaculture uses its revenues to pay employees and purchase inputs, and then estimating how households of employees and business proprietors spend those earnings at other businesses, economic impact analysis can be used to evaluate the total impact of aquaculture for the State. Output, value added, income and jobs are basic units for measuring such economic activity. Estimating the size of these economic indicators makes it possible to evaluate and compare the impact of aquaculture in Alabama to other activities or sectors in the State. The total economic output impacts of aquaculture for the State of Alabama were estimated to be $222.8 M in 2005. This impact included $67.5 M in value-added, $48.5 M in labor income, $15.0 M in other property income and $4.0 M in indirect business taxes. It is also estimated that Alabama aquaculture was responsible for generating a total of 1,483 full and part-time jobs for the State in 2005.

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Appendix A

Table A1. Output Impacts from the Alabama Aquaculture Industry by Aggregate NAICS Sectors, 2005.

NAICS Sector	Industry	Local Direct	Non-local Direct	Non-local Indirect	Non-local Induced	Total	Relative Share	Size Rank
number	Name	million$*	million$*	million$*	million$*	million$*	%	order
11	Ag, Forestry, Fish & Hunting	4.47	98.33	2.84	0.38	106.02	47.59%	1
31-33	Manufacturing	0.00	0.00	44.15	5.84	49.99	22.44%	2
92	Government & non NAICs	0.00	0.00	1.67	10.15	11.83	5.31%	3
52	Finance & insurance	0.00	0.00	4.88	2.44	7.32	3.29%	4
23	Construction	0.00	0.00	2.44	4.32	6.76	3.04%	5
81	Other services	0.00	0.00	3.73	1.57	5.29	2.38%	6
62	Health & social services	0.00	0.00	0.00	4.83	4.83	2.17%	7
22	Utilities	0.00	0.00	3.41	0.98	4.39	1.97%	8
44-45	Retail trade	0.00	0.00	0.22	4.15	4.37	1.96%	9
42	Wholesale Trade	0.00	0.00	2.50	1.70	4.20	1.88%	10
54	Professional- scientific & tech. svcs.	0.00	0.00	1.92	1.97	3.88	1.74%	11
48-49	Transportation & Warehousing	0.00	0.00	2.71	1.02	3.72	1.67%	12
53	Real estate & rental	0.00	0.00	1.21	2.22	3.43	1.54%	13
72	Accommodation & food services	0.00	0.00	0.24	2.06	2.30	1.03%	14
51	Information	0.00	0.00	0.31	1.09	1.40	0.63%	15
56	Administrative & waste services	0.00	0.00	0.40	0.74	1.14	0.51%	16
21	Mining	0.00	0.00	0.53	0.19	0.72	0.32%	17
55	Management of companies	0.00	0.00	0.36	0.19	0.54	0.24%	18
61	Educational svcs	0.00	0.00	0.01	0.38	0.38	0.17%	19
71	Arts- entertainment & recreation	0.00	0.00	0.03	0.25	0.28	0.13%	20
	Total	**4.47**	**98.33**	**73.55**	**46.45**	**222.79**	**100%**	

* 2005 dollars

Table A2. Value-added Impacts from the Alabama Aquaculture Industry by Aggregate NAICS Sectors, 2005.

NAICS Sector	Industry	Local Direct	Non-local Direct	Non-local Indirect	Non-local Induced	Total	Relative Share	Size Rank
number	Name	million$*	million$*	million$*	million$*	million$*	%	order
11	Ag, Forestry, Fish & Hunting	0.71	15.69	1.62	0.16	18.17	26.91%	1
92	Government & non NAICs	0.00	0.00	0.46	8.79	9.25	13.70%	2
31-33	Manufacturing	0.00	0.00	5.61	1.48	7.09	10.50%	3
52	Finance & insurance	0.00	0.00	3.50	1.38	4.87	7.22%	4
44-45	Retail trade	0.00	0.00	0.16	3.12	3.29	4.87%	5
42	Wholesale Trade	0.00	0.00	1.90	1.29	3.19	4.73%	6
23	Construction	0.00	0.00	1.25	1.82	3.07	4.55%	7
62	Health & social services	0.00	0.00	0.00	3.01	3.01	4.46%	8
22	Utilities	0.00	0.00	2.38	0.60	2.98	4.42%	9
81	Other services	0.00	0.00	1.83	0.81	2.64	3.91%	10
53	Real estate & rental	0.00	0.00	0.82	1.48	2.30	3.41%	11
54	Professional- scientific & tech. svcs.	0.00	0.00	1.02	1.24	2.26	3.35%	12
48-49	Transportation & Warehousing	0.00	0.00	1.47	0.56	2.02	3.00%	13
72	Accommodation & food services	0.00	0.00	0.12	0.94	1.06	1.57%	14
56	Administrative & waste services	0.00	0.00	0.24	0.42	0.66	0.98%	15
51	Information	0.00	0.00	0.14	0.45	0.59	0.87%	16
21	Mining	0.00	0.00	0.27	0.11	0.38	0.56%	17
55	Management of companies	0.00	0.00	0.20	0.11	0.31	0.46%	18
61	Educational svcs	0.00	0.00	0.00	0.19	0.20	0.29%	19
71	Arts- entertainment & recreation	0.00	0.00	0.02	0.15	0.17	0.24%	20
	Total	**0.71**	**15.69**	**23.01**	**28.11**	**67.53**	**100%**	

* 2005 dollars

Table A3. Labor Income Impacts from the Alabama Aquaculture Industry by Aggregate NAICS Sectors, 2005.

NAICS Sector	Industry	Local Direct	Non-local Direct	Non-local Indirect	Non-local Induced	Total	Relative Share	Size Rank
number	Name	million$*	million$*	million$*	million$*	million$*	%	order
11	Ag, Forestry, Fish & Hunting	0.67	14.69	1.89	0.10	17.35	35.73%	1
92	Government & non NAICs	0.00	0.00	0.32	5.39	5.71	11.77%	2
31-33	Manufacturing	0.00	0.00	4.11	1.06	5.16	10.64%	3
23	Construction	0.00	0.00	1.13	1.57	2.70	5.56%	4
62	Health & social services	0.00	0.00	0.00	2.61	2.61	5.38%	5
52	Finance & insurance	0.00	0.00	1.34	0.73	2.07	4.26%	6
44-45	Retail trade	0.00	0.00	0.10	1.95	2.05	4.23%	7
54	Professional- scientific & tech. svcs.	0.00	0.00	0.85	1.12	1.97	4.06%	8
81	Other services	0.00	0.00	1.30	0.63	1.93	3.98%	9
42	Wholesale Trade	0.00	0.00	1.06	0.72	1.79	3.68%	10
48-49	Transportation & Warehousing	0.00	0.00	1.03	0.43	1.45	3.00%	11
22	Utilities	0.00	0.00	0.70	0.19	0.89	1.84%	12
72	Accommodation & food services	0.00	0.00	0.08	0.66	0.74	1.52%	13
53	Real estate & rental	0.00	0.00	0.21	0.39	0.59	1.22%	14
56	Administrative & waste services	0.00	0.00	0.20	0.34	0.54	1.12%	15
51	Information	0.00	0.00	0.08	0.22	0.30	0.61%	16
55	Management of companies	0.00	0.00	0.16	0.08	0.24	0.49%	17
61	Educational svcs	0.00	0.00	0.00	0.19	0.19	0.39%	18
21	Mining	0.00	0.00	0.10	0.04	0.15	0.30%	19
71	Arts- entertainment & recreation	0.00	0.00	0.01	0.10	0.11	0.24%	20
	Total	**0.67**	**14.69**	**14.68**	**18.51**	**48.54**	**100%**	

* 2005 dollars

Table A4. Other Property Type Income Impacts from the Alabama Aquaculture Industry by Aggregate NAICS Sectors, 2005.

NAICS Sector	Industry	Local Direct	Non-local Direct	Non-local Indirect	Non-local Induced	Total	Relative Share	Size Rank
number	Name	million$*	million$*	million$*	million$*	million$*	%	order
92	Government & non NAICs	0.00	0.00	0.14	2.91	3.05	20.34%	1
52	Finance & insurance	0.00	0.00	2.09	0.59	2.68	17.92%	2
31-33	Manufacturing	0.00	0.00	1.26	0.39	1.66	11.06%	3
22	Utilities	0.00	0.00	1.32	0.32	1.65	10.99%	4
53	Real estate & rental	0.00	0.00	0.48	0.85	1.33	8.88%	5
42	Wholesale Trade	0.00	0.00	0.42	0.29	0.71	4.76%	6
44-45	Retail trade	0.00	0.00	0.03	0.58	0.61	4.06%	7
11	Ag, Forestry, Fish & Hunting	0.04	0.78	-0.30	0.05	0.57	3.77%	8
48-49	Transportation & Warehousing	0.00	0.00	0.39	0.11	0.50	3.33%	9
81	Other services	0.00	0.00	0.31	0.11	0.43	2.85%	10
62	Health & social services	0.00	0.00	0.00	0.37	0.37	2.46%	11
23	Construction	0.00	0.00	0.11	0.23	0.34	2.25%	12
54	Professional- scientific & tech. svcs.	0.00	0.00	0.15	0.10	0.26	1.70%	13
51	Information	0.00	0.00	0.05	0.19	0.23	1.57%	14
72	Accommodation & food services	0.00	0.00	0.03	0.19	0.21	1.41%	15
21	Mining	0.00	0.00	0.13	0.05	0.19	1.24%	16
56	Administrative & waste services	0.00	0.00	0.04	0.07	0.11	0.70%	17
55	Management of companies	0.00	0.00	0.04	0.02	0.07	0.44%	18
71	Arts- entertainment & recreation	0.00	0.00	0.00	0.03	0.03	0.23%	19
61	Educational svcs	0.00	0.00	0.00	0.00	0.00	0.01%	20
	Total	**0.04**	**0.78**	**6.70**	**7.46**	**14.98**	**100%**	

* 2005 dollars

Table A5. Indirect Business Tax Impacts from the Alabama Aquaculture Industry by Aggregate NAICS Sectors, 2005.

NAICS Sector	Industry	Local Direct	Non-local Direct	Non-local Indirect	Non-local Induced	Total	Relative Share	Size Rank
number	Name	million$*	million$*	million$*	million$*	million$*	%	order
42	Wholesale Trade	0.00	0.00	0.41	0.28	0.69	17.24%	1
44-45	Retail trade	0.00	0.00	0.03	0.59	0.63	15.64%	2
92	Government & non NAICs	0.00	0.00	0.00	0.49	0.49	12.25%	3
22	Utilities	0.00	0.00	0.35	0.09	0.45	11.13%	4
53	Real estate & rental	0.00	0.00	0.13	0.24	0.38	9.40%	5
81	Other services	0.00	0.00	0.21	0.07	0.28	7.05%	6
31-33	Manufacturing	0.00	0.00	0.24	0.03	0.27	6.68%	7
11	Ag, Forestry, Fish & Hunting	0.01	0.22	0.03	0.01	0.26	6.53%	8
52	Finance & insurance	0.00	0.00	0.07	0.06	0.12	3.08%	9
72	Accommodation & food services	0.00	0.00	0.01	0.10	0.11	2.84%	10
48-49	Transportation & Warehousing	0.00	0.00	0.05	0.02	0.07	1.75%	11
51	Information	0.00	0.00	0.01	0.04	0.06	1.41%	12
21	Mining	0.00	0.00	0.04	0.01	0.05	1.19%	13
54	Professional- scientific & tech. svcs.	0.00	0.00	0.02	0.02	0.04	1.00%	14
23	Construction	0.00	0.00	0.02	0.02	0.04	0.93%	15
62	Health & social services	0.00	0.00	0.00	0.03	0.03	0.80%	16
71	Arts- entertainment & recreation	0.00	0.00	0.00	0.02	0.02	0.42%	17
56	Administrative & waste services	0.00	0.00	0.01	0.01	0.02	0.41%	18
55	Management of companies	0.00	0.00	0.00	0.00	0.01	0.13%	19
61	Educational svcs	0.00	0.00	0.00	0.00	0.00	0.11%	20
	Total	**0.01**	**0.22**	**1.63**	**2.15**	**4.00**	**100%**	

* 2005 dollars

Table A6. Employment Impacts from the Alabama Aquaculture Industry by Aggregate NAICS Sectors, 2005.

NAICS Sector	Industry	Local Direct	Non-local Direct	Non-local Indirect	Non-local Induced	Total	Relative Share	Size Rank
number	Name	Jobs	Jobs	Jobs	Jobs	Jobs	%	order
11	Ag, Forestry, Fish & Hunting	25.84	568.66	83.12	5.36	682.98	46.11%	1
92	Government & non NAICs	0.00	0.00	3.92	111.63	115.55	7.80%	2
31-33	Manufacturing	0.00	0.00	79.58	20.47	100.05	6.75%	3
44-45	Retail trade	0.00	0.00	4.21	79.01	83.22	5.62%	4
81	Other services	0.00	0.00	44.19	33.77	77.96	5.26%	5
23	Construction	0.00	0.00	30.99	43.71	74.71	5.04%	6
62	Health & social services	0.00	0.00	0.00	60.36	60.36	4.07%	7
72	Accommodation & food services	0.00	0.00	5.26	45.82	51.08	3.45%	8
52	Finance & insurance	0.00	0.00	26.78	15.02	41.80	2.82%	9
54	Professional- scientific & tech. svcs.	0.00	0.00	20.95	19.80	40.75	2.75%	10
42	Wholesale Trade	0.00	0.00	20.09	13.68	33.77	2.28%	11
48-49	Transportation & Warehousing	0.00	0.00	22.77	9.95	32.71	2.21%	12
56	Administrative & waste services	0.00	0.00	9.66	16.17	25.83	1.74%	13
53	Real estate & rental	0.00	0.00	8.90	16.83	25.73	1.74%	14
61	Educational svcs	0.00	0.00	0.10	8.51	8.61	0.58%	15
22	Utilities	0.00	0.00	6.22	1.82	8.03	0.54%	16
71	Arts- entertainment & recreation	0.00	0.00	0.86	6.22	7.08	0.48%	17
51	Information	0.00	0.00	1.53	4.30	5.83	0.39%	18
55	Management of companies	0.00	0.00	2.30	1.15	3.44	0.23%	19
21	Mining	0.00	0.00	1.05	0.48	1.53	0.10%	20
	Total	**25.84**	**568.66**	**372.66**	**514.14**	**1,481.30**	**100%**	

* 2005 dollars

Glossary

Direct effects/impacts: Direct impacts, represent the revenues, value-added, income, or jobs that result directly from an economic activity within a regional economy.

Employment or Jobs: Represents the total numbers of wage and salaried employees as well as self-employed jobs. This includes full-time, part-time and seasonal workers measured in annual average jobs.

Indirect Business Taxes: Include sales, excise, and property taxes as well as fees and licenses paid by businesses during normal operations. It does not include taxes on profits or income.

Indirect effects/impacts: Indirect effects occur when businesses use revenues originating from outside the region, or study area, to purchase inputs (goods and services) from local suppliers. This secondary, or indirect business, generates additional revenues, income, jobs and taxes for the area economy.

Induced effects/impacts: Induced effects or impacts occur when new dollars, originating from outside the study area, are introduced into the local economy. Induced economic impacts occur as the households of business owners and employees spend their earnings from these enterprises to purchase consumer goods and services from other businesses within the region. This induced effect generates additional revenues, income, jobs and taxes for the area economy.

Input-Output Analysis: The use of input-output models to estimate how revenues or employment for one or more particular industries, businesses or activities in a regional economy impact other businesses and institutions in that region, and the regional as a whole.

Input-Output Models: A mathematical representation of economic activity within a defined region using inter-industry transaction tables or matrices where the outputs of various industries are used as inputs by those same industries and other industries as well.

Labor Income: All forms of employment compensation, including employee wages and salaries, and proprietor income or profits.

Local revenues/expenditures: Local revenues or spending represent simple transfers between individuals or businesses within a regional economy. These transactions do not generate economic spin-off or multiplier (indirect and induced) effects.

Margins: Represent the differences between retail, wholesale, distributor and producers prices.

Non-local revenues/expenditures: When outside or new revenues flow into a local economy either from the sale of locally produced goods and services to points outside the study area, or from expenditures by non-local visitors to the study area, additional economic repercussions occur through indirect and induced (multiplier) effects.

Other Property Type Income: Income in the form of rents, royalties, interest, dividends, and corporate profits.

Output: Revenues or sales associated with an industry or economic activity.

Total Impacts: The sum of direct, indirect and induced effects or economic impacts.

Value-added: Includes wages and salaries, interest, rent, profits, and indirect taxes paid by businesses.

Economic Impacts of the Aquaculture Processing and Production Industries in Alabama in 2005

An Addendum to:

Economic Impacts of the Aquaculture Industry in Alabama in 2005

by

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September 17, 2007

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Economic Impacts of the Aquaculture Processing and Production Industries in Alabama in 2005

This paper is an addendum to a report submitted in January of 2007 that evaluated the economic impacts of production aquaculture (primarily catfish) in the State of Alabama during 2005.[1] The analysis described here supplements the earlier report by separately evaluating the economic impacts generated by the processing of aquacultural catfish products in Alabama in 2005. Data for this supplemental analysis were provided by John Adrian and James Yeager with the Alabama Cooperative Extension System and Auburn University. [2]

There were 3 catfish processors located in Alabama in 2005. The combined sales of these operations for 2005 were reported to be $151,231,871. It was also reported that 1,290 individuals were employed at these operations that year. An estimated 94.66 percent of the total output of these operations was sold to nonlocal buyers outside the State of Alabama. Thus, $143.1 million (M) of the $151.2 M in total sales of processed catfish represented new dollars entering the State's economy, which generated multiplier (indirect and induced) effects for the State.

Except as explicitly stated below, the scope, limitations, assumptions and methodology for this supplemental analysis are identical to those described in the original report. As before, a mathematical Input-Output (I-O) model of the State of Alabama was constructed to estimate these economic impacts using the IMPLAN Professional data and software package. [3] Within IMPLAN, data on the U.S. economy is organized in a 531 sector scheme (including social accounts), which is similar to the North American Industry Classification System (NAICS). The IMPLAN sector used to represent catfish processing is named Seafood Product Preparation and Packaging (sector 71). This corresponds to NAICS sector 3117, which has the same name.

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[1] Economic Impacts of the Aquaculture Industry in Alabama in 2005, by Tom Stevens, Alan Hodges, and David Mulkey, January 12, 2007. University of Florida, Institute of Food and Agricultural Sciences.

[2] John L. Adrian Jr., Professor of Agricultural Economics & Rural Sociology, 308A Comer Hall, Auburn University, AL.
Joseph J. Yeager, Extension Economist – Farm Business Management, Alabama Fish Farming Center, 529 Centerville St, Greensboro, AL.

[3] Minnesota IMPLAN Group (MIG), IMPLAN, Economic Impact and Social Accounting Software, and data for Alabama (2003). Stillwater, MN. www.implan.com .

Since sales and employment data were available for Alabama's catfish processing industry/sector, the IMPLAN model was adjusted to reflect these numbers. Specifically, the industry output per worker ratio was adjusted to $117,234 ($151,231,871 ÷ 1,290) for IMPLAN sector 71. To avoid double counting impacts from live catfish production (which were already estimated in the original report) the regional purchase coefficients for IMPLAN sectors 13 (Animal production, except cattle and poultry and eggs) and 16 (Fishing) were set to zero.[4] These two sectors represented the primary unprocessed seafood or aquaculture inputs for IMPLAN sector 71.

Once these modifications were completed, the estimated total output value of catfish processing ($151,231,871) in Alabama was applied to the IMPLAN model as revenues generated by sector 71. To conform with national data used to build the model, this value was deflated to 2003 prices within the IMPLAN software. After the impact estimates were generated, the results were re-inflated back to 2005 dollars.

Summary results of the economic impact analysis of Alabama Aquaculture are shown in Table 1, and are stated in 2005 dollars. Output, value-added, labor income, other property type income, indirect business taxes and employment impacts are shown in individual table rows. The local and nonlocal direct, indirect, induced effects, along with the total economic impacts for the industry are organized in separate table columns. Direct impacts are comprised of the revenues, income, taxes and jobs that result directly from the catfish processing industry. Direct impacts or effects are generated by both local and non-local revenues, but only non-local (out of state) revenues generate indirect and induced effects. Indirect effects occur as goods and services are sold to directly impacted businesses by their local suppliers, who in turn purchase their own inputs from other local suppliers. Indirect impacts from the production of live catfish are not represented in these results because they were already captured in the original study. Induced impacts from non-local revenues occur when the households of employees and business proprietors (and their local suppliers) spend their income or profits for personal consumption at other Alabama businesses. Again, induced impacts generated from the associated production of live catfish are not represented in these results. The total economic impacts equal the sum of

[4] In this way the IMPLAN model could be used to estimate the impacts of processing activities exclusive of any impacts associated with producing live fish.

these direct, indirect and induced effects, and measure the complete impact of catfish processing sales on Alabama as these dollars filter through the State's economy.

Table 1. Economic Impacts of the Alabama Aquaculture Processing Industry, 2005. [a]

Impact Type/Level	Units	Impacts from Local Revenues	Impacts from Non-Local Revenues			Impacts from All Revenues
		Direct	Direct	Indirect	Induced	Total
Output	Million 2005$	8.08	143.16	54.90	59.94	266.07
Value Added		1.17	20.77	29.92	36.47	88.34
Labor Income		0.91	16.13	18.19	24.21	59.44
Other Prop. Type Income		0.24	4.29	8.07	9.54	22.15
Indirect Bus. Taxes		0.02	0.35	3.66	2.72	6.75
Employment	Jobs	69	1,221	442	670	2,402

[a] Total impacts equal the sum of direct, indirect and induced impacts. Output impacts include value-added plus the costs of other inputs. Value-added impacts equal the sum of labor income, other property type income, and indirect business taxes. Employment represents both full-time and part-time jobs.

Output impacts represent the total value of revenues or expenditures associated with an activity or event. The total output impact of aquaculture processing on the State of Alabama was estimated to be $266.1 million (M) in 2005. Value-added impacts measure labor income, property type income, and indirect business taxes resulting from these revenues. The total value-added impact of aquaculture processing in Alabama in 2005 was estimated at $88.3 M. Labor income represents earnings by employees and proprietors of businesses impacted by aquaculture. Catfish processing's contribution to labor income was estimated to total $59.4 M. Impacts from aquaculture processing for other property type income and indirect business taxes were estimated to total $22.1 M and 6.75 M respectively. Other property income consists of rents, royalties, interest, dividends, and corporate profits. Indirect business taxes include excise, property, and sales taxes, as well as licensees and fees paid by businesses, but do not include taxes on profits or income. Employment impacts approximate the number of full-time, part-time and seasonal jobs created by an economic activity. In 2005, an estimated 2,402 jobs were created either directly or indirectly by aquaculture processing within the State.

More detailed breakouts of these impacts by two-digit aggregate NAICS sectors are provided in Appendix A, Tables A1 through A6, for output, value added, labor income, other property type income, indirect business taxes and employment respectively. The aggregate NAICS industry sectors with the five largest Output impacts from aquaculture were: Manufacturing, Wholesale Trade, Government, Construction and Professional-Scientific Technological Services (Table A1). Since food processing is classified as a manufacturing sector, and since the production of fish was explicitly excluded in this study, it is not surprising that nearly 64 percent of the total output impacts were captured within this aggregate sector. The distribution of impacts for value-added (Table A2) are similar to output, except that the Retail Trade, and Health and Social Services pushed Construction and Professional-Scientific Services out of the top five. Similarly for Labor Income, Construction was replaced by Health and Social Services (Table A3). The top five industries responsible for the Other Property Income impacts were Manufacturing, Government, Wholesale Trade, Real Estate, and Finance and Insurance (Table A4). Typically the trade industries dominate in impacts related to indirect business taxes. For catfish processing, Wholesale and Retail Trade contributed over 56 percent of these types of impacts (Table A5) . Employment impacts (Table A6) were distributed in a pattern similar to value-added impacts, except Construction beat out Health and Social Services in belonging the five largest sectors.

The impacts of catfish/aquaculture processing can be combined with the impacts presented in Table 7 of the original report for Alabama catfish production. These combined impacts are presented below in Table 2. Combined output impacts of the aquaculture industry (production and processing) in Alabama are estimated to have totaled nearly $489 M during 2005. Aquaculture production and processing contributed almost $156 M in value-added impacts to the economy of Alabama that year. Nearly $108 M of that consisted of labor income. The remaining value-added impacts were comprised of $37.1 M in other property type income and $10.7 M in indirect business taxes. It is estimated that a combined total of 3,885 jobs were created by the production and processing of aquacultural products (catfish) in Alabama during 2005.

Table 2. Combined Economic Impacts of the Alabama Aquaculture Production and Processing Industries, 2005. [a]

Impact Type/Level	Units	Total Economic Impacts		
		Production	Processing	Combined
Output	Million 2005$	222.79	266.07	488.86
Value Added		67.53	88.34	155.86
Labor Income		48.54	59.44	107.99
Other Prop. Type Income		14.98	22.15	37.13
Indirect Bus. Taxes		4.00	6.75	10.75
Employment	Jobs	1,483	2,402	3,885

[a] Total impacts equal the sum of direct, indirect and induced impacts. Output impacts include value-added plus the costs of other inputs. Value-added impacts equal the sum of labor income, other property type income, and indirect business taxes. Employment represents both full-time and part-time jobs.

Summary

By tracing how revenues from the sale of Alabama processed catfish flow through its economy as plants purchase inputs, and as households of employees and proprietors spend their earnings, economic impact analysis can be used to provide a comprehensive assessment of the total impact of this industry for the State. Output, value added, income and jobs are basic units for measuring such economic activity. Estimating the size of these economic indicators makes it possible to evaluate and compare the impacts of catfish processing in Alabama to other activities or sectors in the State.

Appendix A

Table A1. Output Impacts from the Alabama Aquaculture Processing Industry by Aggregate NAICS Sectors, 2005.

NAICS Sector	Industry	Local Direct	Non-local Direct	Non-local Indirect	Non-local Induced	Total	Relative Share	Size Rank
number	Name	million$*	million$*	million$*	million$*	million$*	%	order
31-33	Manufacturing	8.076	143.156	11.040	7.433	169.705	63.78%	1
42	Wholesale Trade	0.000	0.000	15.836	2.171	18.007	6.77%	2
92	Government & non NAICs	0.000	0.000	0.900	13.505	14.405	5.41%	3
23	Construction	0.000	0.000	1.586	5.864	7.450	2.80%	4
54	Professional- scientific & tech. svcs.	0.000	0.000	3.822	2.560	6.382	2.40%	5
44-45	Retail trade	0.000	0.000	0.897	5.225	6.122	2.30%	6
62	Health & social services	0.000	0.000	0.001	6.009	6.009	2.26%	7
52	Finance & insurance	0.000	0.000	2.203	3.089	5.292	1.99%	8
53	Real estate & rental	0.000	0.000	2.193	2.808	5.001	1.88%	9
81	Other services	0.000	0.000	2.813	2.003	4.817	1.81%	10
48-49	Transportation & Warehousing	0.000	0.000	3.346	1.316	4.662	1.75%	11
55	Management of companies	0.000	0.000	4.335	0.237	4.571	1.72%	12
22	Utilities	0.000	0.000	2.631	1.274	3.905	1.47%	13
72	Accommodation & food services	0.000	0.000	0.473	2.586	3.059	1.15%	14
51	Information	0.000	0.000	1.167	1.392	2.558	0.96%	15
56	Administrative & waste services	0.000	0.000	1.097	0.959	2.056	0.77%	16
21	Mining	0.000	0.000	0.374	0.248	0.622	0.23%	17
11	Ag, Forestry, Fish & Hunting	0.000	0.000	0.086	0.481	0.567	0.21%	18
61	Educational svcs	0.000	0.000	0.014	0.464	0.478	0.18%	19
71	Arts- entertainment & recreation	0.000	0.000	0.087	0.314	0.401	0.15%	20
	Total	**8.076**	**143.156**	**54.901**	**59.938**	**266.071**	**100.00%**	

* 2005 dollars

Table A2. Value-added Impacts from the Alabama Aquaculture Processing Industry by Aggregate NAICS Sectors, 2005.

NAICS Sector	Industry	Local Direct	Non-local Direct	Non-local Indirect	Non-local Induced	Total	Relative Share	Size Rank
number	Name	million$*	million$*	million$*	million$*	million$*	%	order
31-33	Manufacturing	1.172	20.775	2.144	1.892	25.983	29.41%	1
42	Wholesale Trade	0.000	0.000	12.044	1.651	13.696	15.50%	2
92	Government & non NAICs	0.000	0.000	0.260	11.775	12.035	13.62%	3
44-45	Retail trade	0.000	0.000	0.674	3.926	4.600	5.21%	4
62	Health & social services	0.000	0.000	0.000	3.756	3.757	4.25%	5
54	Professional- scientific & tech. svcs.	0.000	0.000	2.084	1.614	3.699	4.19%	6
53	Real estate & rental	0.000	0.000	1.438	1.879	3.317	3.76%	7
52	Finance & insurance	0.000	0.000	1.522	1.748	3.270	3.70%	8
23	Construction	0.000	0.000	0.717	2.481	3.198	3.62%	9
48-49	Transportation & Warehousing	0.000	0.000	2.118	0.720	2.838	3.21%	10
55	Management of companies	0.000	0.000	2.464	0.135	2.599	2.94%	11
81	Other services	0.000	0.000	1.316	1.035	2.351	2.66%	12
22	Utilities	0.000	0.000	1.440	0.782	2.222	2.52%	13
72	Accommodation & food services	0.000	0.000	0.248	1.187	1.435	1.62%	14
56	Administrative & waste services	0.000	0.000	0.648	0.551	1.199	1.36%	15
51	Information	0.000	0.000	0.509	0.579	1.089	1.23%	16
21	Mining	0.000	0.000	0.195	0.137	0.332	0.38%	17
61	Educational svcs	0.000	0.000	0.007	0.237	0.244	0.28%	18
11	Ag, Forestry, Fish & Hunting	0.000	0.000	0.039	0.199	0.238	0.27%	19
71	Arts- entertainment & recreation	0.000	0.000	0.051	0.186	0.236	0.27%	20
	Total	**1.172**	**20.775**	**29.920**	**36.472**	**88.339**	**100.00%**	

* 2005 dollars

Table A3. Labor Income Impacts from the Alabama Aquaculture Processing Industry by Aggregate NAICS Sectors, 2005.

NAICS Sector	Industry	Local Direct	Non-local Direct	Non-local Indirect	Non-local Induced	Total	Relative Share	Size Rank
number	Name	million$*	million$*	million$*	million$*	million$*	%	order
31-33	Manufacturing	0.910	16.127	1.566	1.352	19.956	33.57%	1
42	Wholesale Trade	0.000	0.000	6.749	0.925	7.674	12.91%	2
92	Government & non NAICs	0.000	0.000	0.194	7.411	7.605	12.79%	3
62	Health & social services	0.000	0.000	0.000	3.254	3.254	5.47%	4
54	Professional- scientific & tech. svcs.	0.000	0.000	1.583	1.453	3.036	5.11%	5
44-45	Retail trade	0.000	0.000	0.421	2.452	2.873	4.83%	6
23	Construction	0.000	0.000	0.643	2.156	2.799	4.71%	7
48-49	Transportation & Warehousing	0.000	0.000	1.477	0.556	2.033	3.42%	8
55	Management of companies	0.000	0.000	1.894	0.103	1.997	3.36%	9
81	Other services	0.000	0.000	0.930	0.798	1.728	2.91%	10
52	Finance & insurance	0.000	0.000	0.704	0.921	1.625	2.73%	11
72	Accommodation & food services	0.000	0.000	0.162	0.827	0.989	1.66%	12
56	Administrative & waste services	0.000	0.000	0.525	0.447	0.972	1.64%	13
53	Real estate & rental	0.000	0.000	0.434	0.491	0.926	1.56%	14
22	Utilities	0.000	0.000	0.461	0.243	0.705	1.19%	15
51	Information	0.000	0.000	0.307	0.280	0.587	0.99%	16
61	Educational svcs	0.000	0.000	0.006	0.229	0.236	0.40%	17
71	Arts- entertainment & recreation	0.000	0.000	0.037	0.128	0.165	0.28%	18
11	Ag, Forestry, Fish & Hunting	0.000	0.000	0.024	0.131	0.155	0.26%	19
21	Mining	0.000	0.000	0.075	0.055	0.130	0.22%	20
	Total	**0.910**	**16.127**	**18.191**	**24.214**	**59.442**	**100.00%**	

* 2005 dollars

Table A4. Other Property Type Income Impacts from the Alabama Aquaculture Processing Industry by Aggregate NAICS Sectors, 2005.

NAICS Sector	Industry	Local Direct	Non-local Direct	Non-local Indirect	Non-local Induced	Total	Relative Share	Size Rank
number	Name	million$*	million$*	million$*	million$*	million$*	%	order
31-33	Manufacturing	0.242	4.295	0.536	0.503	5.576	25.17%	1
92	Government & non NAICs	0.000	0.000	0.066	3.749	3.815	17.22%	2
42	Wholesale Trade	0.000	0.000	2.692	0.369	3.061	13.82%	3
53	Real estate & rental	0.000	0.000	0.794	1.081	1.875	8.47%	4
52	Finance & insurance	0.000	0.000	0.765	0.754	1.519	6.86%	5
22	Utilities	0.000	0.000	0.739	0.417	1.156	5.22%	6
44-45	Retail trade	0.000	0.000	0.124	0.726	0.851	3.84%	7
48-49	Transportation & Warehousing	0.000	0.000	0.588	0.140	0.728	3.29%	8
54	Professional- scientific & tech. svcs.	0.000	0.000	0.471	0.135	0.606	2.74%	9
55	Management of companies	0.000	0.000	0.530	0.029	0.559	2.52%	10
62	Health & social services	0.000	0.000	0.000	0.463	0.463	2.09%	11
81	Other services	0.000	0.000	0.260	0.145	0.406	1.83%	12
51	Information	0.000	0.000	0.164	0.242	0.405	1.83%	13
23	Construction	0.000	0.000	0.063	0.296	0.359	1.62%	14
72	Accommodation & food services	0.000	0.000	0.057	0.234	0.291	1.31%	15
56	Administrative & waste services	0.000	0.000	0.105	0.090	0.195	0.88%	16
21	Mining	0.000	0.000	0.094	0.067	0.161	0.73%	17
11	Ag, Forestry, Fish & Hunting	0.000	0.000	0.015	0.059	0.074	0.33%	18
71	Arts- entertainment & recreation	0.000	0.000	0.010	0.038	0.048	0.22%	19
61	Educational svcs	0.000	0.000	0.000	0.003	0.003	0.01%	20
	Total	**0.242**	**4.295**	**8.072**	**9.541**	**22.150**	**100.00%**	

* 2005 dollars

Table A5. Indirect Business Tax Impacts from the Alabama Aquaculture Processing Industry by Aggregate NAICS Sectors, 2005.

NAICS Sector	Industry	Local Direct	Non-local Direct	Non-local Indirect	Non-local Induced	Total	Relative Share	Size Rank
number	Name	million$*	million$*	million$*	million$*	million$*	%	order
42	Wholesale Trade	0.000	0.000	2.604	0.357	2.961	43.89%	1
44-45	Retail trade	0.000	0.000	0.129	0.748	0.877	12.99%	2
92	Government & non NAICs	0.000	0.000	0.000	0.615	0.615	9.12%	3
53	Real estate & rental	0.000	0.000	0.210	0.306	0.516	7.65%	4
31-33	Manufacturing	0.020	0.353	0.041	0.037	0.451	6.68%	5
22	Utilities	0.000	0.000	0.239	0.122	0.361	5.35%	6
81	Other services	0.000	0.000	0.126	0.092	0.218	3.23%	7
72	Accommodation & food services	0.000	0.000	0.029	0.126	0.156	2.31%	8
52	Finance & insurance	0.000	0.000	0.053	0.073	0.126	1.87%	9
51	Information	0.000	0.000	0.039	0.058	0.097	1.43%	10
48-49	Transportation & Warehousing	0.000	0.000	0.053	0.024	0.077	1.14%	11
54	Professional- scientific & tech. svcs.	0.000	0.000	0.030	0.026	0.057	0.84%	12
55	Management of companies	0.000	0.000	0.041	0.002	0.043	0.64%	13
21	Mining	0.000	0.000	0.026	0.016	0.042	0.62%	14
23	Construction	0.000	0.000	0.010	0.030	0.040	0.59%	15
62	Health & social services	0.000	0.000	0.000	0.040	0.040	0.59%	16
56	Administrative & waste services	0.000	0.000	0.019	0.013	0.032	0.48%	17
71	Arts- entertainment & recreation	0.000	0.000	0.004	0.019	0.024	0.35%	18
11	Ag, Forestry, Fish & Hunting	0.000	0.000	0.001	0.008	0.009	0.14%	19
61	Educational svcs	0.000	0.000	0.000	0.006	0.006	0.09%	20
	Total	**0.020**	**0.353**	**3.656**	**2.717**	**6.746**	**100.00%**	

* 2005 dollars

Table A6. Employment Impacts from the Alabama Aquaculture Processing Industry by Aggregate NAICS Sectors, 2005.

NAICS Sector	Industry	Local Direct	Non-local Direct	Non-local Indirect	Non-local Induced	Total	Relative Share	Size Rank
number	Name	Jobs	Jobs	Jobs	Jobs	Jobs	%	order
31-33	Manufacturing	69	1,221	75	26	1,392	57.96%	1
92	Government & non NAICs	0	0	3	156	159	6.61%	2
42	Wholesale Trade	0	0	127	17	145	6.02%	3
44-45	Retail trade	0	0	17	99	117	4.85%	4
23	Construction	0	0	18	60	78	3.25%	5
62	Health & social services	0	0	0	75	75	3.14%	6
81	Other services	0	0	29	43	72	2.98%	7
72	Accommodation & food services	0	0	10	58	68	2.83%	8
54	Professional- scientific & tech. svcs.	0	0	31	26	56	2.35%	9
48-49	Transportation & Warehousing	0	0	33	13	46	1.92%	10
56	Administrative & waste services	0	0	25	21	46	1.92%	11
53	Real estate & rental	0	0	16	21	38	1.56%	12
52	Finance & insurance	0	0	14	19	33	1.37%	13
55	Management of companies	0	0	28	2	29	1.22%	14
51	Information	0	0	6	5	12	0.48%	15
61	Educational svcs	0	0	0	11	11	0.45%	16
71	Arts- entertainment & recreation	0	0	3	8	11	0.44%	17
11	Ag, Forestry, Fish & Hunting	0	0	1	7	8	0.32%	18
22	Utilities	0	0	5	2	7	0.29%	19
21	Mining	0	0	1	1	1	0.06%	20
	Total	**69**	**1,221**	**442**	**670**	**2,402**	**100.00%**	

* 2005 dollars