

Economic Activity Associated with Commercial Fisheries and Shellfish Aquaculture in Northampton County, Virginia

October 2014

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Virginia Coastal Zone
MANAGEMENT PROGRAM

Sea Grant
Virginia

VSG-14-03

VIMS Marine Resource Report No. 2014-12

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This work is a result of research sponsored in part by NOAA Office of Sea Grant,
U.S. Department of Commerce, under Grant No. NA10OAR4170085 to the
Virginia Sea Grant Program. The views expressed herein do not necessarily
reflect the views of any of those organizations.



Executive Summary

Northampton County shellfish farms sold over \$36.7 million worth of cultured clams and oysters during 2013. At the same time the county's commercial fishermen landed over \$5.7 million in wild caught finfish and shellfish. Taken together, Northampton County's aquatic harvesters unloaded \$42,496,494 of seafood products across the county's waterfronts.

With those sales begins an expansion of the county's economy generating additional growth and economic impacts on households, businesses, and government. As depicted in the table below, the initial farm sales and wild harvests multiply providing economic growth throughout the community. The resulting total impact during 2013 is estimated to have been \$97.4 million in output supporting 987 jobs which generated household and business incomes of \$27.1 million.

Continued access to high quality growing waters and important offshore fishing grounds is critical to maintaining the economic base which has developed to support this important industry and continue its export base for the county's future economic development.

Total Economic Impact of Shellfish Aquaculture and Commercial Fishing in Northampton County, Virginia - 2013

	Aquaculture	Commercial Fishing	Total
Output (\$ millions)	\$90.8	\$6.6	\$97.4
Employment (fte)	817	170	987
Income (\$ millions)	\$25.6	\$1.5	\$27.1

Introduction

The growth of the commercial shellfish aquaculture industry in Northampton County has added significant value to the Virginia's seafood marketplace. Today, watermen continue to harvest finfish and shellfish from public resources while, at the same time, shellfish growers are providing additional vast quantities of quality clams and oysters seafood to consumers.

This study was completed to assess the current state of commercial fishery and aquaculture industries in Northampton County and to estimate the economic activity that arises from these enterprises. Central to the continued success of this industry are both water quality and water access for these diverse water dependent industries. This report documents the current economic activity enabled due to access provided by Northampton County working waterfronts to Virginia's waters.

Background

Commercial fisheries have historically been an important economic sector in Northampton County and Virginia. Primarily, fisheries have been based upon wild stocks of fish and shellfish. In relatively recent years there has been increased investment and output in the business of culturing aquatic products. Indeed culture techniques were employed extensively in the historic oyster industry prior to endemic diseases destroying the bulk of the wild oyster resource. Today hard clam and oyster aquaculture are widespread in Northampton County, and increasing technical expertise and infrastructure provide a proven basis for future economic growth.

This growth of the shellfish aquaculture industry in Northampton County has added immense value to the Virginia's seafood marketplace. Hard clams and oysters are grown in Northampton County on coastal submerged lands leased from the Commonwealth of Virginia. As with other forms of shellfish aquaculture, successful oyster and clam farming depends on water quality, free from bacterial and industrial contamination.

¹ These values are at first sale, either "farm gate" or exvessel, and do not represent the significant value-added brought into the county by virtue of the export of the majority of this harvest outside the county and the Commonwealth of Virginia.

Generally the three steps of production include the seed production, nursery, and grow-out, and Northampton County is leading the way in hatchery production, nursery techniques, and controlled grow-out. Seed production occurs in land-based hatcheries. Brood stock oysters and clams are spawned in a controlled, indoor environment. Hatcheries are relatively capital intensive. The spawned juvenile clams and oysters are kept in the hatchery until they reach a size where they can be transferred to a land based or other nursery area. There are six active private hatcheries in Northampton County. While this production was typical of clam aquaculture initially, more recently the oyster aquaculture industry has diversified in much the same way.

Methodology

This study was completed to utilize data collected from shellfish growers and seafood harvesters in an effort to benchmark the extent of the industry and estimate its economic linkages and impact to the county and the Commonwealth of Virginia. The impact analysis section below further details the regional economic modeling that translated the direct farm level activity to local and regional economies. Appendix 1 provides a glossary of regional economic impact assessment terminology.

Survey

Since 2006, the author has conducted annual shellfish industry aquaculture crop reporting surveys resulting in the annual report entitled “Virginia Shellfish Aquaculture Situation & Outlook Report” based upon an annual survey of licensed commercial shellfish growers. A mail and internet-based survey is used to collect information from Virginia commercial clam and oyster growers known to be active in the industry. It is believed that the survey is representative of overall trends and reflects the majority of active commercial growers. For confidentiality reasons, the information collected is aggregated and the total represents both the eastern and western shores of Virginia. To demonstrate the most current economic activity in Northampton County a special survey was sent to shellfish aquaculture firms located in the County and a special data request provided data from the Virginia Marine Resources Commission for the wild harvest commercial fisheries unloading in the county.

Findings from these surveys found that Northampton County shellfish farms sold over \$36.7 million in clams and oysters during 2013. At the same time the county’s commercial fishermen unloaded over \$5.7 million in wild caught finfish and shellfish. Taken together the county’s aquatic harvesters unloaded \$42,496,494 of seafood products across the county’s waterfronts.

Overall clam and oyster sales bring economic growth to the eastern shore and the State as growers report that 86% of shellfish cultured locally are sold to out of State buyers. Not only does the seafood industry contribute in terms of employment and sales of products, it produces greater economic benefit to Virginia because of the economic activity it generates through inputs to the shellfish culture and commercial fishery firms.

The economic base multipliers for shellfish aquaculture and commercial fisheries are broadened by the fact that much of the grow-out capital and fabrication is locally completed adding significant value to the local economy as well.

In addition to this direct impact, employees within the aquatic harvest industry generate economic activity when they spend their income on housing, food, and other goods and services. In this way the economic benefits resulting from aquaculture and fisheries extend beyond the local culture to the general Virginia economy.

Economic Impact Analysis

Economic impact analysis begins with introducing a change in the output of goods and using the multiplier model to analyze the effects on a region’s economic base. The standard input-output model estimates the direct, indirect, and induced economic implications of some basic economic activity. The secondary effects (the indirect and induced impacts) and the

1 These values are at first sale. Either “farm gate” or exvessel and do not represent the significant value-added brought into Northampton County by virtue of the export of the majority of this harvest outside the County and the Commonwealth of Virginia.

2 VMRC Plans & Statistics Data Report for Northampton County, May 2014.

basic economic activity estimates provide an estimate of the multiplier effects from the basic activity (direct impact).

In the standard input-output model, measures of aggregate economic activity are used as a basis for estimating the total economic impact of the subject activity. For example, measures of direct employment or total sales in an industry are obtained, and these are then used as a basis for evaluating the total impact. In these report estimates of initial fish and shellfish sales by Northampton firms were obtained and used as the base measure for estimating the direct economic impact of the industry.

Given this measure of the direct purchases of the shellfish farming and commercial fisheries-related industry, an estimate is made of the indirect impacts using information on the interactions between these industry sectors and other economic sectors which are, to varying extent, dependent upon the aquatic harvest industries.

For example, suppliers of materials into the shellfish and fishery products transportation, storage, marketing, and distribution are also dependent upon the sales of fish and shellfish. These added sales or impacts are referred to as indirect impacts. Such indirectly dependent sectors include hundreds of other types of manufacturing, trade, for which industrial classifications range from Freight & Shipping to Containers & Packaging.

Ultimately, direct sales activity and resulting indirect activity generate some increases in employment and income in Northampton County and throughout the state. The extra income generated in this way leads to a third wave of economic impact through greater household expenditures on goods and services. Much of this additional re-spending will also occur within the local area, further expanding economic activity. These effects are referred to as the induced impacts of the industry.

Economic Input-Output Model Application

Most regional input-output studies attempt to characterize either, the economic impacts of specified changes in final demand for a given set of products, services, and industries, or the economic significance of specific industries in a regional and national economy. The research described herein accomplishes the latter task, assessing the economic significance of the shellfish farming upon related industries located in Northampton County and the Commonwealth of Virginia.

Because of the interrelationships among the many sectors of an economy, any new basic economic activity, such as increasing clam and oyster sales to out-of-county buyers, will generate additional waves of economic impact. By stimulating the expenditures by out-of-region customers for the export sale of marine products, the seafood production sectors initiate such expanding rounds of economic impact. These impacts first occur within Northampton communities and then throughout the state.

For example, the export marketing of seafood products from the County and Virginia calls forth additional activity among the suppliers of necessary inputs as well as among distributors of seafood related products, warehouses, and retailers. The impact of the sale of a dollar of aquaculture and fishery related goods and services, generates activity not only for the retail sector, but also indirectly generates economic activity for suppliers, accountants, and programmers whose employment supports the operation of the retail enterprise. In an analogous way, the activities of seafood-related marketers and consumers will generate multiple rounds of economic activity.

As mentioned above, economic impact analysis is an attempt to provide an estimate of the total impact of any economic activity in any region, including, not only the primary economic impact, but also secondary and tertiary impacts.

The IMPLAN Model

Many economic impact studies use information from the Regional Inter-industry Impact Model – (IMPLAN 2008). This model was developed using a combination of direct survey data obtained through national surveys of inter-industry interaction, and then shares down the inter-industry relationships to the local or regional level, based upon the structure or employment structure of industries in the state or region. The IMPLAN model used herein includes industry linkages specific to Northampton County and the Commonwealth of Virginia.

From these government derived regional inter-industry relationships, output, income, and employment multipliers are

estimated. Thus, in terms of simple analysis of the aggregate impacts of activity on the regional economy, published government estimates of the multiplier are used. The use of the IMPLAN multipliers for the present analysis is considered reasonable.

To perform the impact analysis, initial information on the level of primary or basic economic activity for the industry studied is needed. As mentioned above, measuring the total economic impact of any product, good, or service first requires an estimate of the volume of the goods sold by the aquaculture and fishing industry.

While the IMPLAN database system includes a commercial fisheries category it does not fully represent the characteristics of shellfish farming. The model was adjusted to reflect the specific financial characteristics of the Virginia shellfish culture industry based upon grower income and expenditure statement provided by the primary grower survey.

Results

Direct Economic Impacts of Shellfish Aquaculture

The initial sales of farm raised shellfish and seafood products by Northampton County businesses generated a combined direct impact on local economic output of an estimated \$36.8 million in 2013.

This direct economic impact of the shellfish aquaculture manifests itself in other economic growth measures as well. For example, the total direct employment associated with these shellfish farm sales was estimated to be 313 (full and part time jobs) in 2013.

Additionally the output and employment associated with the eastern shore shellfish farms generated an increase in labor incomes earned throughout the region. During 2013, personal incomes associated with initial aquaculture sales was \$9.6 million. Table 2 summarizes three standard measures of direct economic impacts of the county's aquaculture and commercial fishing industries.

Indirect Economic Impacts of Hard Clam Aquaculture

Having calculated the first (direct) effects of the aquatic harvests on various measures noted above, the further ripple effect of the initial change was quantified using an input-output model.

Based upon information on the interrelationships among the sectors of the regional economy, the values of the inter-industry multipliers are generated by the IMPLAN input-output model. Quantifying from which industries the aquaculture and

Table 2 - Direct Economic Impact of Shellfish Aquaculture and Commercial Fishing in Northampton County, Virginia - 2013

	Aquaculture	Commercial Fishing	Total
Output (\$ millions)	\$36.8	\$5.8	\$42.6
Employment (fte)	313	163	476
Income (\$ millions)	\$9.6	\$1.3	\$10.9

Table 3 - Indirect Economic Impact of Shellfish Aquaculture and Commercial Fishing in Northampton County, Virginia - 2013

	Aquaculture	Commercial Fishing	Total
Output (\$ millions)	\$35.3	\$0.2	\$35.6
Employment (fte)	343	2	345
Income (\$ millions)	\$10.0	\$0.1	\$10.1

fisheries sectors buy production inputs and to which sectors its final products are sold enables estimates of the multiplier effects to be made. Understanding both the purchases of inputs and sale of goods and services by the marine products sectors allows the forward and backward linking of the clam farming sector's economic activity. This permits the tracing of expenditures as they multiply throughout directly and indirectly impacted sectors. The indirect impact measures are shown in Table 3.

The initial sales of shellfish growers and fishermen generated further indirect impact on local economic output of an estimated \$35.6 million in 2013. As with the direct impacts the indirect economic impact of the hard clam aquaculture manifests itself in other economic growth measures as well. For example, the total indirect employment associated with firms providing necessary inputs to the eastern shore shellfish farm and commercial fishery sales was estimated to be 345 (full and part time jobs).

Additionally the output by firms selling to Eastern Shore clam farms generated increases in personal incomes earned throughout the region. For the Eastern Shore, personal income associated with the indirect support sectors of the hard clam aquaculture industry was \$7.5 million over the same period.

Induced Economic Impacts

As a result of added employees' compensation and personal income directly generated from clam farm sales and similar growth in indirect (supply) industries, overall income levels rise, with further expansion of expenditure and economic activity in the region. The direct and indirect increases in household incomes noted above bring about economic activity in non-clam aquaculture industry sectors such as retail trades, eating and drinking establishments, banking, hospitals, real estate, etc. The induced or third round economic impacts, which result from the direct and indirect economic activity shown above, are summarized in Table 4.

Total Economic Impact

To summarize, in addition to direct impacts, two other types of impacts are estimated:

- Indirect impacts, which measure the change in production in backward linked industries caused by the changing input needs of directly effected industries;
- Induced impacts, which measure the change in regional household expenditure patterns caused by changes in household income arising in the direct and indirect sectors.

When taken together the economic impacts resulting from commercial shellfish aquaculture result overall in increases in economic output of \$81.2 million, added employment of 925 individuals, accompanied by an overall increase in personal labor incomes of \$27.1 million. These total economic impacts are summarized in Table 5

Economic impact is traditionally measured in various ways. Table 6 summarizes the impacts using six standard economic indicators. Table 7 reflects the added economic impacts to the Commonwealth of Virginia that arise from Northampton County's aquaculture and fisheries economic base.

Table 4 - Induced Economic Impact of Shellfish Aquaculture and Commercial Fishing in Northampton County, Virginia - 2013

	Aquaculture	Commercial Fishing	Total
Output (\$ millions)	\$18.7	\$0.6	\$19.2
Employment (fte)	161	6	167
Income (\$ millions)	6.0	0.2	6.2

Table 5 - Total Economic Impact of Shellfish Aquaculture and Commercial Fishing in Northampton County, Virginia - 2013

	Aquaculture	Commercial Fishing	Total
Output (\$ millions)	\$90.8	\$6.6	\$97.4
Employment (fte)	817	170	987
Income (\$ millions)	\$25.6	\$1.5	\$27.1

Table 6 - Summary Economic Impacts in Northampton County from Northampton County Aquaculture & Commercial Fisheries Landings - 2014 (\$ Millions)

		Aquaculture	Commercial fishing	Total
Labor Income Impacts	Direct Impacts	\$9.6	\$1.3	\$10.9
	Indirect Impacts	\$10.0	\$0.1	\$10.1
	Induced Impacts	\$6.0	\$0.2	\$6.2
	Total	\$25.6	\$1.5	\$27.1
Indirect Business Tax Impacts	Direct Impacts	\$0.7	\$0.0	\$0.8
	Indirect Impacts	\$1.1	\$0.0	\$1.1
	Induced Impacts	\$1.4	\$0.0	\$1.5
	Total	\$3.3	\$0.1	\$3.4
Other Property Income Impacts	Direct Impacts	\$2.5	\$0.0	\$2.5
	Indirect Impacts	\$3.4	\$0.0	\$3.4
	Induced Impacts	\$4.1	\$0.1	\$4.3
	Total	\$10.0	\$0.2	\$10.2
Total Value Added Impacts	Direct Impacts	\$12.9	\$1.3	\$14.2
	Indirect Impacts	\$14.5	\$0.1	\$14.6
	Induced Impacts	\$11.6	\$0.3	\$11.9
	Total	\$38.9	\$1.8	\$40.7
Output Impacts	Direct Impacts	\$36.8	\$5.8	\$42.6
	Indirect Impacts	\$35.3	\$0.2	\$35.6
	Induced Impacts	\$18.7	\$0.6	\$19.2
	Total	\$90.8	\$6.6	\$97.4
Employment Impacts (FTE)	Direct Impacts	313	163	476
	Indirect Impacts	343	2	345
	Induced Impacts	161	6	166
	Total	817	170	987

Table 7 - Summary of Statewide Economic Impacts of Northampton County Aquaculture & Commercial Fisheries Landings - 2014 (\$ Millions)

		Aquaculture	Commercial fishing	Total
Labor Income Impacts	Direct Impacts	\$9.6	\$1.3	\$10.9
	Indirect Impacts	\$11.7	\$0.1	\$11.8
	Induced Impacts	\$6.6	\$0.2	\$6.7
	Total	\$27.9	\$1.5	\$29.4
Indirect Business Tax Impacts	Direct Impacts	\$0.7	\$0.0	\$0.8
	Indirect Impacts	\$1.3	\$0.0	\$1.3
	Induced Impacts	\$1.6	\$0.0	\$1.6
	Total	\$3.6	\$0.1	\$3.6
Other Property Income Impacts	Direct Impacts	\$2.5	\$0.0	\$2.5
	Indirect Impacts	\$3.9	\$0.0	\$3.9
	Induced Impacts	\$4.5	\$0.1	\$4.6
	Total	\$10.9	\$0.2	\$11.1
Total Value Added Impacts	Direct Impacts	\$12.9	\$1.3	\$14.2
	Indirect Impacts	\$16.8	\$0.1	\$17.0
	Induced Impacts	\$12.6	\$0.3	\$13.0
	Total	\$42.3	\$1.8	\$44.1
Output Impacts	Direct Impacts	\$36.8	\$5.8	\$42.6
	Indirect Impacts	\$39.6	\$0.2	\$39.8
	Induced Impacts	\$20.4	\$0.6	\$21.0
	Total	\$96.8	\$6.6	\$103.4
Employment Impacts (FTE)	Direct Impacts	313	163	476
	Indirect Impacts	365	2	367
	Induced Impacts	174	6	180
	Total	852	170	1,022

Appendix I. Glossary of Input-Output Terms

Direct effects/impacts: Direct impacts represent the revenues, value-added, income, or jobs that result directly from an economic activity within the study area or 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/ Resident 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-resident /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. In the IMPLAN results tables, Value-added equals the sum of Labor Income, Other Property Type Income, and Indirect Business Taxes.

Literature Cited

1. Minnesota IMPLAN Group, Inc. 2008. IMPLAN Professional 3.0, Economic Impact and Social Accounting Software and Data, IMPLAN State Package for Virginia. Stillwater, MN. [www. http://implan.com](http://implan.com)
2. Murray, Thomas J. and James E. Kirkley. 2005. Economic Activity Associated with Clam Aquaculture in Virginia – 2004. VIMS Marine Resource Report No. 2005-5. VSG-05-04.
3. Murray, Thomas J. and Karen L. Hudson. 2013. Virginia Shellfish Aquaculture Situation and Outlook Report – Results of the 2012 Virginia Shellfish Aquaculture Crop Reporting Survey. VIMS Marine Resource Report No. 2013-02. VSG-13-02.

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