Economic Contributions of Virginia's
Commercial Seafood and Recreational Fishing Industries:
A User's Manual for Assessing Economic Impacts

James E. Kirkley[1]
Thomas J. Murray[2]
John Duberg[3]

[1] James E. Kirkley, College of William & Mary, School of Marine Science, Virginia Institute of Marine Science, Gloucester Point, VA 23062.

[2] Thomas J. Murray, Virginia Sea Grant Marine Advisory Program, Virginia Institute of Marine Science, Gloucester Point, VA 23062.

[3] John Duberg, Nearing Group, Baltimore, MD.

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Executive Summary

The commercial and recreational fisheries of Virginia are relatively important to the economies of Virginia and various coastal communities, as well as to the well being of society. In addition, anglers receive substantial value in the form of non-monetary benefits from the experience of angling, and watermen typically receive non-monetary benefits from being able to maintain a particular lifestyle. Both of these activities offer potentially substantial contributions to the economies of Virginia and coastal communities.

In 1994, the Virginia Marine Resources Commission (VMRC) supported two large-scale studies on the economic contributions and importance of the seafood industry and recreational angling to the Commonwealth. The VMRC desired information on how the commercial seafood industry and recreational angling contributed to the economy of Virginia. Two lengthy reports were prepared on the economic importance of Virginia's commercial fishing industry and saltwater angling: (1) Kirkley, J.E. 1997. "Virginia Commercial Fishing Industry: Its Economic Performance and Contributions," and (2) Kirkley, J.E. and D. Kerstetter. 1997. "Saltwater Angling and its Economic Importance to Virginia." The Commercial Fisheries Improvement Fund of the VMRC, the Virginia Institute of Marine Science (VIMS), Virginia Polytechnic Institute and State University, the Virginia Sea Grant Marine Advisory Program, the Virginia Marine Products Board, and the Virginia Seafood Council funded the 1994 study on the seafood industry. The Virginia Saltwater Recreational Fishing Development Fund of the VMRC, the Virginia Sea Grant Marine Advisory Program, and VIMS funded the 1994 study on the economic importance of saltwater angling to the economy of Virginia.

In 2003, the VMRC, along with members of the commercial industry and recreational fishing associations, indicated a desire to update the 1994 economic assessments. This report provides not only an updated assessment of the economic contributions to the economies of Virginia and coastal communities, it also provides a User's Manual on how to generate estimates of the economic impacts of the seafood industry and recreational angling. This was done to allow the staff of VMRC to assess the potential economic impacts of various regulatory options, and to allow the general public to estimate the economic importance of the commercial seafood industry and recreational angling in Virginia. The Virginia Saltwater Recreational Fishing Development Fund of the VMRC and VIMS provided funding for the present study.

The economic contributions are measured in terms of sales or output, income or value-added, and number of full and part-time jobs generated by expenditures on commercial harvesting and recreational angling. The impacts are generated via custom input/output models based on information and coefficients available in IMPLAN, which is an off-the-shelf input/output model widely used by planners and government agencies to estimate the potential economic contributions of economic activity. IMPLAN does not, however, provide sufficient detail to estimate the economic impacts of sport fishing and commercial harvesting activities, and thus, these sectors had to be custom developed.

The two sectors generated a total of $1.23 billion in output or sales, $717.4 million in value-added or income, and 13,015 full and part-time jobs for the economy of Virginia.* Of the total $1.23 billion in sales and $717.4 million in value-added, the recreational sector contributed $823.7 million in sales or output and $478.4 million in value added or income. Out of the 13,015 full and part-time jobs, the recreational sector contributed 9,092 full and part-time jobs. The commercial seafood industry, which includes all economic activity from harvesters to restaurants, generated $407.9 million in sales or output, $239.0 million in value-added or income, and 3,923 full and part-time jobs.

Relative to conclusions presented in the previously mentioned recreational study, there were several differences in the conclusions of the present study. In 1994, the major species or recreational fishery was the Gulf Stream fishery; in the present study, anglers indicated no preferred or targeted species generated the largest economic impacts--$185.3 million in sales or output, $106.0 million in income, and 2,076 full and part-time jobs. Trips for which anglers identified spot and croaker as being the primary target species generated the second highest level of economic activity--$173.4 million in sales or output, $102.0 million in income, and 1,920 full and part-time jobs. Rockfish or striped bass fishing generated the third highest level of economic impacts--$168.2 million in sales or output, $98.4 million in income, and 1,803 full and part-time jobs. In contrast, the recreational striped bass fishery in 1994 generated $ 113.9 million sales or output (2005 constant dollar value), $ 64.1million in income, and 2,113 full and part-time jobs. Summer flounder generated the fourth highest level of economic impacts--$154.9 million in sales or output, $89.2 million in value-added, and 1,768 full and part-time jobs.

When results for the commercial sector of the present study are compared to the results for the older commercial study, a somewhat dismal picture emerges. First, despite an increase in the ex-vessel value of all species commercially landed in Virginia, the economic contributions of the seafood industry declined relative to 1994. In 1994, the seafood industry generated approximately $579.0 (2005 constant dollar value) million in sales or output, $406.4 million in value-added or income, and 10,798 full and part-time jobs. The $407.9 million in sales or output for the seafood industry in 2004 represents a decline of nearly 30 % between 1994 and 2004. Moreover, the seafood industry was considerably more diversified in 1994, in which nearly all the species or species groupings generated large economic contributions in terms of sales or output. In addition, blue crabs topped the list of all the species in 1994 relative to the level of sales or output generated. In 2004, blue crabs dropped to second in terms of sales or outputs generated for the economy. Sea scallops accounted for nearly 71 % of the total sales or output generated by the entire Virginia seafood industry in 2004; sea scallops accounted for 63.7 % of the total number of full and part-time jobs generated by the seafood industry. Data for estimating the economic importance of the menhaden reduction fishery and related processing activities were not available because of confidentiality, but if the economic production activities in 2003 for this species are considered, menhaden would be viewed as the third most significant fishery in the Commonwealth. Using 2003 economic activities as a proxy for economic activity the reduction fleet in 2004, sales or

* All values in the executive summary are presented in inflation adjusted dollars (2005 constant dollars).

output is estimated to equal $32.9 million; value-added or income is estimated to equal $19.0 million; and it is estimated that the reduction fishery generates approximately 281 full and part-time jobs for the economy of Virginia.

Leakages or expenditures on goods and services, which leave the state, are substantially affecting both the seafood industry and recreational fishing. Fuel, which is a major input for the commercial harvesting sector and necessary to support recreational angling, results in dollars leaving the state. The same is true for the purchases of electronic goods and services, boats and engines, rods, reels, tackle, bait, and groceries; all of which are expense items for both commercial and recreational fishing. For example, the regional purchase coefficient for gasoline is 0.12, which indicates that only $0.12 of every dollar spent on gasoline remains in Virginia to affect the economy.

Another change since the 1994 study is the increasing reliance of product from both other areas of the United States and from other nations. This has particularly been the case for blue crabs and oysters. Imports from foreign sources into Virginia, however, have also dramatically increased. In 1994, the 2005 constant dollar value of imports from foreign nations into Virginia equaled $90.4 million; in 2004, foreign imports to Virginia equaled $261.4 million (2005 constant dollar value). Moreover, Virginia harvesters, processors, and wholesalers distribute a large volume of product out of state, which also reduces the impacts of economic activity by the commercial sector on the economy of Virginia.

A remaining concern about the conclusions and estimates generated for the present study is the unknown affects of Hurricane Isabel on the seafood industry and recreational fishing in 2004. Isabel occurred in late 2003, and substantially damaged infrastructure supporting commercial and recreational fishing. In addition, coastal residents, including fishermen, spent time repairing damaged fishing gear and homes in 2004. At the same time, commercial landings, ex-vessel value, and the number of angler trips all increased between 2003 and 2004, and therefore, it is difficult to determine whether or not Isabel had a significant impact on the seafood industry and recreational angling in 2004. Alternatively, it is not possible to ascertain whether or not the estimates presented in this report are likely the result of unusual events or circumstances, and thus, not representative of the potential economic contributions of commercial and recreational angling in the Commonwealth of Virginia.

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1.0 Introduction

1.1 Introduction and Overview of Impact Assessment

This user's guide addresses both the recreational model and the commercial model developed for the Virginia Marine Resources Commission. Principally, the guide is intended to explain to a user how to enter data and print the estimated economic impacts the model calculates. In addition, the guide provides information on the methodologies embedded in the models, and the data that are used in the process of estimating economic impacts.

The methodology that underlies each model is the same. It is based on well-established economic theory that has been applied to countless economic activities. The analytical framework used to estimate the economic impacts is input-output (I/O) analysis, which is further explained in Section 1.

The user's guide begins with a general discussion of methodology. Following this discussion are sections devoted to explaining the development of the recreational and commercial models. A major obligation of this work, however, was to provide estimates of the economic contributions of the commercial seafood and recreational industries; these are presented in Section 4, which follows the discussions on model development and usage. In addition to estimating the impacts on the state's economy, impacts are also estimated for selected Virginia counties and municipalities.

1.2 Estimating Economic Impacts of Fishing Activities

Fishing encompasses a broad range of activities that create economic impacts. These range from a young boy buying fishing line for his homemade fishing pole to a company spending millions on a commercial fishing boat. Not all of these activities seem immediately connected to fishing. Nonetheless, when a recreational angler stays the night at a motel in Virginia Beach after taking a charter boat trip to fish in the Gulf Stream, that overnight stay is part of recreational fishing. When a restaurant in Fairfax County buys linen tablecloths for their diners who will sometimes order scallops, that purchase is part of the activities of the seafood industry that can ultimately be traced back to Virginia's commercial fishing fleet.

To connect these disparate activities together in order to estimate economic impacts, the analysis examines spending patterns of recreational and commercial fishers and of the seafood industry. The underlying principle of the analysis is that fishing in whatever form creates demand for goods and services. In creating these demands, fishing initiates a series of economic transactions, which collectively create a multiplier effect. That multiplier effect measures that extent to which those economic transactions create jobs; income for those who hold those jobs and other value added income; and sales of goods and services by businesses throughout Virginia.

The methodology that measures the economic impacts that constitute the multiplier effect is based on input-output (I-O) analysis. When, for example, Jan goes to The Fishing Store to buy a new fishing rod, the value of that new fishing rod is considered a direct effect of the demands created by fishing in Virginia. Part of the price of that fishing rod is dedicated to the wages of the employees of The Fishing Store, and thus, supports the jobs that the Fishing Store creates. These wages and jobs are also considered direct effects. The Fishing Store in turn purchases fishing rods from wholesalers, but also buys advertising from the local newspaper. These purchases are considered indirect effects of Jan's purchase. The wholesaler in turn buys fishing rods from manufacturers, accounting services, and many other goods and services. These purchases are supported in part by The Fishing Store's purchase of the fishing rod that was sold to Jan and are also considered indirect effects. These indirect effects continue as the suppliers of goods and services in turn purchase the goods and services they need to conduct their businesses. The owners and employees of the businesses directly and indirectly affected by Jan's fishing rod purchase receive wages and other income from the series of interrelated transactions, which they, in turn, spend on the array of consumer goods and services that are available within Virginia. This final category of spending creates the induced effect.

The repetitive spending that occurs in Virginia or its jurisdictions as a result of fishing activities is not endless. So long as money circulates within an economy, economic impacts occur. Nonetheless, so-called leakages occur as purchases are made outside Virginia, people set aside money for savings, or taxes are paid. These leakages place limits on the multiplier effect. Generally, the simpler and smaller an economy (e.g., a rural county with a small population), the more opportunities there are for leakages. The more complex and larger the economy (e.g., the state of Virginia), the fewer leakages will occur. By retaining circulating monies, these larger, more complex economies enjoy larger multiplier effects and more substantial economic impacts.

1.3 IMPLAN

The generation of economic estimates of impacts is made possible by the use of IMPLAN, the industry standard for input-output analysis. IMPLAN provides software and data that create models of the economies of Virginia and its counties and independent cities. These models capture the economic consequences of final demands for goods and services by analyzing the inter-industry purchases of goods and services that are stimulated by those final demands. IMPLAN also generates estimates of the impacts that occur when employees of the industries affected by final demands spend their wages and salaries.

The standard version of IMPLAN includes over 500 economic sectors within the agriculture, construction, manufacturing, wholesale, retail, and service industries. These sectors cover a very broad range of activities. Nevertheless, it is often useful to take advantage of IMPLAN's ability to create custom economic sectors for activities not well addressed by the standard version.[4]

[4] MIG, Inc. IMPLAN Professional Version 2.0 for Virginia and associated counties.

2.0 Virginia's Commercial Fishing model

2.1 The Commercial Impact Model

The commercial model developed for the VMRC estimates the economic impacts of the commercial harvesting of fish[5] and seafood by commercial fishermen in Virginia waters and the subsequent processing, distribution, and sale of fish and seafood products to final consumers. Impacts are expressed in terms of value added[6], output (sales by Virginia businesses), and employment (full-time and part-time jobs).

The model looks at these variables along several dimensions. Geographically, the model estimates impacts for activities within over 30 coastal counties and independent cities as well as statewide impacts where the state is defined as those 30-plus coastal counties and independent cities.[7] Separate estimates are calculated for 11 species or groups of species.[8] Finally, estimates are calculated for five sectors within the commercial fishing and seafood industry—harvesters, processors, distributors, grocers, and restaurants.

Using these variables, the model computes estimated impacts for a specific jurisdiction, for a specific species, for a specific sector of the seafood industry. The model thus can provide impacts for almost 2000 combinations of jurisdiction, species, and industry sector. An example of one of the combinations is the value added, output, and employment impacts of blue crabs harvested in Accomack County waters. For such a combination, the model provides estimates of direct, indirect, induced, and total impacts for value added, output, and employment.

In theory, the model can generate almost 24,000 individual impact estimates. Because not every jurisdiction will have commercial fishing trips for all species and industrial species (i.e. menhaden, alewives) are not sold through retail outlets, not all combinations of jurisdiction, species, and industry sector will be used.

For the seafood industry, the model can address activities associated with fish harvested in Virginia or the coastal jurisdictions and with fish and seafood products imported to Virginia or the jurisdictions. The inclusion of imported fish and seafood

[5] As used here, the term fish refers to the entire range of finfish, shellfish, and other life (i.e., sea urchins, seaweed, kelp, and worms) from marine and freshwaters that are included in the landings data maintained by the National Marine Fisheries Service.

[6] Value added as used here refers to employee compensation, income received by business owners, rental income, and indirect business taxes. The term and definition are taken from the IMPLAN software used to create the I/O model.

[7] The model includes the following counties—Accomack, Chesterfield, Essex, Fairfax, Gloucester, Henrico, Isle of Wight, James City, King and Queen, King George, King Williams, Lancaster, Mathews, Middlesex, New Kent, Northampton, Northumberland, Prince George, Prince William, Richmond, Stafford, Surry, Westmoreland, and York—and seven cities Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, Suffolk, and Virginia Beach. The "Other counties" group includes inland counties and landings caught in Virginia waters by harvesters from non-Virginia ports.

[8] The model separately addresses blue crab, conch, menhaden, sea scallops, hard clams, sharks/tuna/other longline, flounder, low value, moderate and high value, and oysters.

products in the impact estimates is an option controlled by the user. Imported fish and seafood products include those from other states as well as those from foreign countries.

For the counties and cities, seafood industry impacts not relying on imported fish and seafood are limited to those products that are created with fish landed and subsequently processed, distributed, and sold in that specific county or city. Because most fish and seafood products cross jurisdictional lines within Virginia as they move along the value-added chain, county and city impacts are small relative to the statewide impacts.

Any model represents an approximation of true conditions and is limited by various uncertainties. The most important uncertainty in the present model is likely that associated with the costs and earnings of commercial fish harvesters. Costs and earnings data are typically collected for specific gear types such as trawls or pots. One goal of this model is to synthesize these particular data into averages that reflect conditions for species or groups of species across Virginia.

Given that current cost and earnings data for some species are limited, there are unavoidable uncertainties built into this Virginia model. Despite these limitations, the model produces estimates of the economic impacts of the Virginia's fisheries that are logical and reasonable.

Furthermore, the model is structured so that improved data can be incorporated in an incremental manner, reducing uncertainties and increasing the utility of the model's estimates. Finally, the model is also structured to make its operations and assumptions reasonably transparent.

This user's guide comprises an overview of the model's operations, a brief discussion of modifying the model, and background information. The guide's purposes are

- to orient the user to the basic ways of using the model and
- to cite and describe the basic sources of information used to create the model

2.2 Overview of Model

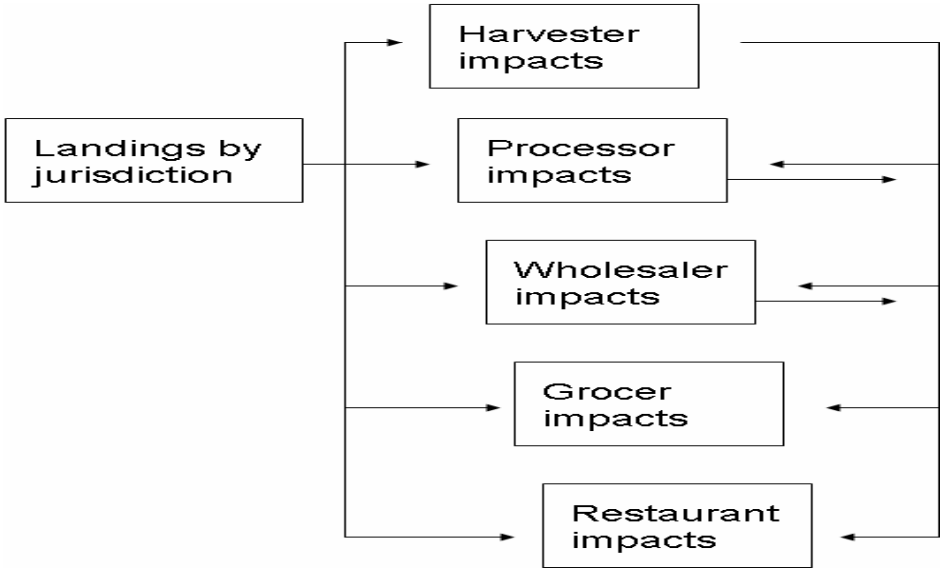
The Virginia commercial model can be used with a minimum of effort on the part of the user to generate an estimate of statewide or sub-state economic impacts of commercial fish landings. The following introduces the major components and operations of the model. More detailed information is provided in subsequent sections.

2.2.1 Basic Model Structure

Created in Microsoft Excel, the Virginia commercial model comprises a linked set of 10 worksheets. The general operation of the model is shown in Figure 2.1.

The user is responsible for two types of inputs: landings and relevant dates. The value of landings is entered for as many as 11 species or species groups for Virginia and its coastal counties and/or cities. While theoretically possible, it is assumed that not all species will be landed in each coastal county or city. The user also enters the year the landings occurred and the applicable year for output values.

Figure 2.1. Overview of Virginia I/O Model



With these inputs, the Virginia impacts of statewide landings or landings in individual counties and cities are calculated by species or species group. These impacts are calculated for harvesters and the different sectors of the seafood industry, specifically, processors, wholesalers, grocers, and restaurants.

The estimated impacts generated by the model are organized into tables organized by jurisdiction by species or species group and by industry segment. These tables are created in a separate worksheet of the model.

2.2.2 Using the Virginia Commercial Fishing Model

The commercial model is designed so that the user is clear as to what inputs are required, and how outputs are generated and printed. To facilitate data input, there are two separate worksheets for user inputs. Another worksheet includes all the print tables.

Users are asked to enter three types of input data:

(1) Value of landings. A separate worksheet (User inputs-commercial landings) is designed to accept values for commercial landings for 11 species or species groups for the state of Virginia or the subdivisions of Virginia. The user can enter any number of landings' values. Values are entered as dollars.

(2) Relevant dates. The user is required to enter a date for the year that the landings occurred and a date for the values of the impacts estimated by the model.

(3) Modeling of imports. A separate worksheet (User input-fish & seafood imports) is used to indicate whether or not the estimated economic impacts for the seafood sector include imported fish and seafood products.

The user can enter as many data on landings as desired. The model can estimate the impacts associated with landings of a single species with little value or it can estimate the impacts associated with a full year's landings and imports for each listed jurisdiction and for the state of Virginia.

The model assumes that any data input by the user relates to landings or imports for a single year in the period 1990 through 2005. Choosing proper dates is important as inflation can significantly affect the dollar's value. Typically, users will choose the current year for the value of the estimates created by the model.

The decision to exclude or include the value of imports in the estimated impacts is important. Imports represent a substantial share of the inputs used by processors, wholesalers, grocers, and restaurants. For example, for the species included in the model, it is estimated that half of the fish and seafood products used statewide by Virginia restaurants are from sources outside the state. As a result, including imported fish and seafood products will double the value of statewide impacts associated with Virginia restaurants.

Once required data are entered, the model creates estimates of the economic impacts associated with the landings. These estimates are organized into tables located in a separate worksheet (Print tables) that also includes macros to facilitate the printing of these tables. There are six tables for each jurisdiction—one each for harvesters, processors, wholesalers, grocers, and restaurants and a separate table that summarizes impacts for all these industry sectors. Each table has a corresponding print macro activated by clicking on the relevant "button" in the upper left corner of the "Print tables" worksheet.

2.3 Major Components of the Commercial Fishing Model

Each of the 10 worksheets in the model addresses a distinct set of estimating issues or model outputs as noted in Table 2.1. Some of these worksheets rely on data developed in additional files that support the development of the model. These data are described later in the user's guide (see Background Information).

Table 2.1. Worksheets within the Virginia Commercial I/O Model

Model worksheets	***Description***
1. User inputs-commercial landings	• Value of landings data is entered here. The user may input the value of landings for up to 11 species and species groups for the state or the various counties and independent cities. • The user must also enter dates (1) for the year of landings and (2) for the year of output values.
2. User input-fish& seafood imports	• The user enters either "yes" or "no" in the indicated cell to include or exclude, respectively, the value of imported fish and seafood products in impacts for the seafood industry.
3. Adjusted data input values	• The value of landings entered by the user is automatically adjusted to 2001 values to align with the IMPLAN data used by the model. Those data are in 2001 dollars, the most recent year available when the model was created.
4. Product Flow	• Data on the distribution of the value of fish and seafood products among harvesters and segments of the seafood industry are maintained here. • Data on relevant product flow for Virginia and for the counties and cities are included as separate data sets.
5. Print tables	• Tables with estimated value added, output, and employment impacts are displayed here. Estimates are created for each of the cities and counties and for Virginia and for up to11 species and species groups for each area. Separate tables are created for each segment of the industry. Summary tables are created for all jurisdictions and all species and species groups. • This worksheet presents all monetary values in the year indicated by the user. • Print macros and the buttons that activate them are located and described here.
6. Calculations-harvesters	• This worksheet includes two variables used by the "Print table" worksheet to generate the impact estimates for harvesters. • One variable is the value of landings for Virginia and/or for the various counties and cities. These values are taken from the "Adjusted data input values" worksheet. • The second variable is a set of multipliers used to calculate the economic impacts associated with the value of landings. These multipliers are taken from a companion weighted averages file created for the model and are a custom IMPLAN harvester sector for each combination of jurisdiction and species or species group. Each custom IMPLAN sector includes multipliers for value added, output, and employment and includes direct, indirect, induced, and total effects.

Table 2.1. Worksheets within the Virginia commercial model (continued)

Model worksheets	***Description***
7. Calculations-processors	• This worksheet is similar to the "Calculations-harvesters" worksheet and includes the variables used by the "Print tables" worksheet to estimate impacts for processors. • One variable is the value of fish and seafood products inputs used by processors, which come from Virginia sources (harvesters, other processors, wholesalers) and from sources outside the state. These values are determined by the value of landings and product flow data. • Custom IMPLAN processor sectors for each jurisdiction and species or species group are taken from the companion weighted averages file.
8. Calculations-wholesalers	• This worksheet is similar to the "Calculations-processors" worksheet and includes the variables used to calculate impact estimates for wholesalers. • The value of inputs is based on the value of landings and product flow data. • Custom IMPLAN wholesale sectors for each jurisdiction and species or species group are taken from the companion weighted averages file.
9. Calculations-grocers	• This worksheet is similar to the "Calculations-processors" worksheet and includes the variables used to calculate impact estimates for grocers. • The value of inputs is based on the value of landings and product flow data. • Custom IMPLAN grocers sectors for each jurisdiction and species or species group are taken from the companion weighted averages file.
10. Calculations-restaurants	• This worksheet is similar to the "Calculations-processors" worksheet and includes the variables used to calculate impact estimates for restaurants. • The value of inputs is based on the value of landings and product flow data. • Custom IMPLAN restaurant sectors for each jurisdiction and species or species group are taken from the companion weighted averages file.

2.4 Background Information

The model tries to estimate impacts in as compact a format as possible. This was done principally by using IMPLAN's capacity to create custom sectors when the standard IMPLAN sectors do not accurately reflect the economics of specific industries as is the case with fishing and the seafood industry. These custom sectors reflect the distinct characteristics of commercial fishing in different areas of Virginia as it targets different species and reflect similar distinctions in the processing and wholesale sectors of the seafood industry. Finally custom sectors for grocers and restaurants reflect variations in location, but assume that no distinctions among species exist in the retail end of the seafood industry. That is, the model assumes that the sale of scallops and flounder at groceries involves the same mix of costs for labor, energy, and other expenses. These custom sectors create a set of multipliers for each of the almost 2000 combinations of jurisdiction, species, and seafood industry sector included in the model.

2.4.1 Weighted Averages File

Because of the complexity and scope of the analysis that the commercial model undertakes, the model takes advantage of IMPLAN's capacity to create custom economic sectors. Developed to create these custom sectors, the weighted averages file has a consistent structure applied to each of the five sectors of the seafood industry analyzed by the model. Each sector uses two worksheets to create custom sectors. The first worksheet includes all the geographically dependent cost or earnings variables for each combination of jurisdiction and species group as shown in Table 2.2, which includes the statewide average costs and earnings for harvesters of blue crabs.

Cost and earnings data are presented as a percentage distribution, and are based on all relevant gear types for the species being addressed. The distribution of cost and earnings is summarized from survey and other data, and synthesizes all relevant cost information for a given species or species group. In the example shown in Table 2.2, the average Virginia blue crab harvester spends approximately 14 percent of revenue on fuel and lubricants. In addition to cost and earnings data, the worksheet also includes data on the extent to which these expenditures are made in the jurisdiction being analyzed. In the example above, the model assumes that half of Virginia blue crab harvesters' spending on fishing gear is made in Virginia and half is made out of state.

The second worksheet uses the distribution of expenditures data and applies IMPLAN multipliers and other variables to create the custom multipliers. IMPLAN has specific multipliers for most types of expenses incurred by harvesters—fuel, fishing gear, and so on. The distribution of expenditures is used to calculate a weighted average for each multiplier coefficient. These weighted averages are the custom sector coefficients used by the commercial model.

Table 2.2. Example of Geo-dependent Data, Commercial Fishery

State of Virginia	Species—Blue crabs	
Weighted Average All Gear Types	Distribution of expenditures	Share of expenditures in impact area
Purchases		
Fishing tackle, reels, other gear	0.20%	50.00%
Fishing nets	0.51%	50.00%
Electronics	13.38%	50.00%
Safety equipment	2.00%	50.00%
Misc. hardware & supplies	0.01%	100.00%
Repair & maintenance		
Fishing gear, nets	0.51%	100.00%
Vessel & engine	10.12%	100.00%
Groceries, food, & supplies	1.34%	100.00%
Fuel & lubricants	14.43%	100.00%
Ice	0.70%	100.00%
Bait	11.75%	100.00%
Licenses, permits	5.20%	100.00%
Accounting	0.51%	100.00%
Insurance	1.50%	100.00%
Moorage	1.75%	100.00%
Bank fees and services	0.80%	100.00%
Capital expenditures--boats	3.12%	50.00%
Crew & captain shares, other income	32.14%	100.00%
Profit	0.02%	100.00%
Total	100.00%	

This set of linked worksheets has been created for harvesters and for each of the sectors of the Virginia seafood industry analyzed by the model. Thus, the model has the capacity to create a distinct set of multipliers for each combination of jurisdiction and species for each of the sectors.

Whether this level of variability is necessary is uncertain. Particularly as products move along the value-added chain from harvesting ultimately to retail stores, there is less variability in the costs associated with adding value to a given species. For example, the cost structure of grocery stores is likely very consistent across species. Advertising costs for oysters are likely very similar to advertising costs for scallops or striped bass. Similarly, restaurants in Hampton probably have similar costs to those in Norfolk. Thus while the model can provide a high degree of variability, this potential is not fully utilized. Instead for distributors and retailers, it is assumed that cost and earning distributions are the same regardless of location or species.

Once developed, the custom sectors are exported to the commercial model. The result is that the commercial model is simpler and requires only a small fraction of the memory and computational resources that would be required if custom sectors were not used.

2.4.2 Commercial Model

The commercial model comprises a set of interrelated worksheets that combine input data on the value of landings and imports with data on economic relationships to estimate economic impacts. The model takes the results of the weighted averages file, and estimates the economic impacts associated with data input by the user.

2.4.3 Adjusting for Inflation

The model adjusts for the effects of inflation based on user entered dates in two steps. First, the values of landings and imported fish and seafood are converted to year 2001 dollars to match the IMPLAN data that are the foundation of the model. Once value added and output impacts are estimated in 2001 dollars, these estimates are converted to whichever year dollars the user selected for output values.

Note that there are no similar conversions of employment impacts from the estimates created in 2001 dollars. While the value of a dollar changes from year to year, the relationships in the model that estimate employment are not subject to adjustments from year to year. Any adjustments to employment using measures of inflation would distort the estimated number of jobs.

2.4.4 Product Flow

A separate worksheet contains a set of distributions that estimate where the landings as well as the outputs of each seafood industry sector are sold. This product flow is a set of assumptions that each sector will sell its products to one or more other downstream sectors or to a consumer. An analogous set of assumptions estimates where the seafood industry segments purchase the fish or seafood products that are inputs to their businesses.

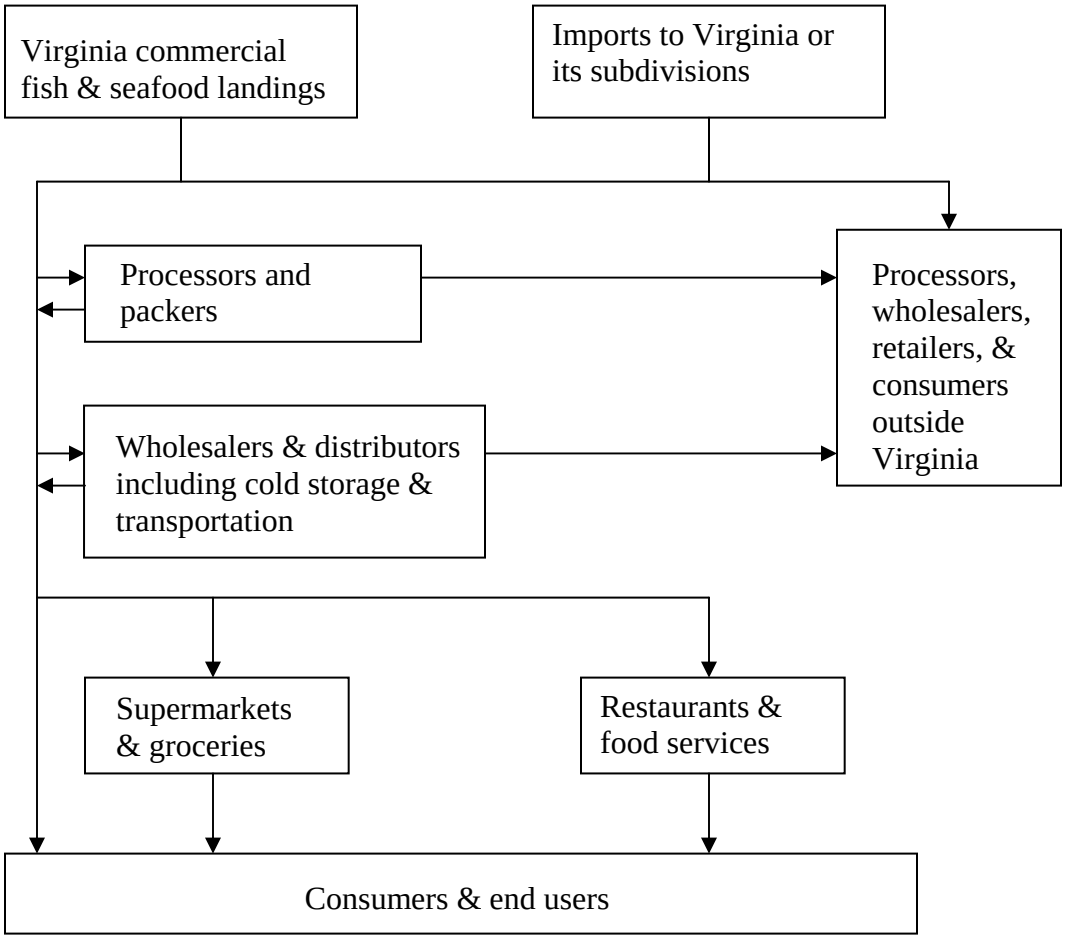
In creating the model, the linkages between harvesters and the segments of the seafood industry are a critical factor. These linkages are defined by product flow, which measures where products are sold and where inputs are purchased. For example, the model estimates that all Virginia processors of blue crabs purchase 51 percent of the blue crabs they process from Virginia processors, 12 percent from other Virginia processors, and 4 percent from Virginia wholesalers. The remaining 33 percent of blue crabs purchased by Virginia processors are from sources outside the state. Product flow estimates these purchase decisions for each seafood segment for each species or group of species.

Available data suggest that the pattern of sales within the seafood industry is more complex than the model assumes. If true, this likely means that the seafood industry has more opportunities to add value and create economic impacts than the model estimates, and that the model's estimates of economic impacts are accordingly conservative.

The product flow assumptions used by the model are shown in Figure 2.2. This estimate of product flow assumes there are four basic links in the value-added chain of activities. First is harvesting or importing of fish and seafood; second is processing and packing; third is wholesaling and distributing; fourth is retailing in two forms. In addition to these general links in the value-added chain, the model assumes that fish and seafood can be exported from Virginia or sold to final consumers. Whenever fish and seafood leaves Virginia or is consumed in Virginia, value is no longer added and the creation of economic impacts stops.

As Figure 2.2 shows, at any point in the flow, any sector can sell its products to any downstream sector. Harvesters and importers have the greatest latitude, being able to sell to processors, wholesalers, retailers, various customers outside or Virginia, or final consumers in Virginia. Conversely, retailers only sell to final consumers.

Figure 2.2. Flow of Products in Virginia Seafood Industry



2.4.5 Calculating the Economic Impacts of Harvesters

A separate worksheet in the model is used to generate estimates of the economic impacts of commercial fish harvests in Virginia. The spreadsheet starts with the value of landings for each species for each jurisdiction, which are taken from the adjusted data input values worksheet. These values are combined with the weighted average multiplier coefficients (from the weighted averages file) for the relevant species and jurisdiction to determine economic impacts in terms of value added, output, and employment.

The actual calculation of economic impacts is conducted in the print tables spreadsheet. This is a separate spreadsheet that stores all economic impacts for commercial fishing and the seafood industry.

2.4.6 Calculating Economic Impacts of Processors

In a separate worksheet, the model collects the data necessary to estimate the economic impacts of processing fish and seafood. The worksheet uses the product flow data to aggregate the value of landings that processors purchase from harvesters and the value of fish and seafood that processors purchase from other processors and from wholesalers. Using these values, the value of other costs and earnings for the processing sector is estimated.

When imports are excluded, the economic impacts of the processing sector are based on the value of landings and other fish and seafood inputs in the jurisdiction being analyzed. For example, when imports are excluded, the economic impacts of processing in Gloucester County would be based solely on the value of purchases by Gloucester County processors from Gloucester County harvesters, processors, and wholesalers.

As noted above, the user can choose to include or exclude the value of imports when estimating economic impacts. This choice is made on the user input-fish & seafood imports worksheet. The total value of imported fish and seafood products used as inputs by processors is taken from the product flow worksheet which specifies the percentage of purchases processors make from non-Virginia sources.

Processors' costs, other than fish and seafood products, and their earnings are the basis for estimating the economic impacts of the processing sector. The value of these costs and earnings are then matched to the processors' weighted average coefficients for the value added, output, and employment multipliers for each species and each jurisdiction.

It is important to exclude the value of fish and seafood inputs from the calculation of economic impacts for processors. The impacts of these fish and seafood are calculated for the sectors from which processors purchase these inputs. To include the value of fish and seafood inputs in the calculation of impacts for processors would double count impacts for these fish and seafood inputs.

As is true for the impacts of harvesting, the impacts of processing are calculated in the print tables spreadsheet. Processing impacts are available for each species and jurisdiction.

2.4.7 The Economic Impacts of Wholesalers, Grocers, and Restaurants

In each of these sectors of the seafood industry, economic impacts are estimated in a manner similar to that for processors. These worksheets gather the value of fish and seafood products that each sector purchases from harvesters, importers, or other seafood sectors.

Using these data, the value of additional costs and earnings are computed and matched with a weighted average set of multiplier coefficients for each species and jurisdiction. The economic impacts are then calculated and presented in the print tables worksheet.

For each sector, economic impacts can include or exclude imported fish and seafood products. When imports are excluded, the economic impacts are calculated only on the basis of fish and seafood products that originated in the jurisdiction being analyzed.

For example, when imports are excluded, the economic impacts of fish and seafood sold by Norfolk restaurants are restricted to fish that were landed, processed, and distributed by seafood establishments in Norfolk. In some cases, fish may not go through all those steps before purchase by a restaurant. Indeed, some fish may go directly from a commercial fishing boat to a restaurant kitchen. Nonetheless, given the many opportunities for fish to cross jurisdictional lines in its journey through the seafood industry, it is reasonable to assume that relatively little of the landings stay in a single jurisdiction until they are consumed. As a result, the county and city level impacts for the seafood industry are quite small relative to the statewide impacts.

2.4.7 Printing Tables

The economic impacts of commercial fishing and seafood activities are presented in a series of tables that are located in the print tables worksheet. This worksheet uses the variables in the calculations worksheets to calculate the economic impacts. This worksheet includes 72 separate tables. Each species or species group has six tables—one for each of the five industry sectors analyzed and a summary table. In addition to the 11 sets of tables for the 11 species and species groups, there is a set of six tables that presents the impacts for all species.

To facilitate the printing of these tables, there is a labeled array of 72 “buttons” in the upper left corner of this worksheet. Each button activates a print macro for one of the 72 tables. The buttons are individually labeled with the species and industry sector of the table to which the button is linked. The user can activate the print macros by clicking on the relevant buttons.

3.0 Virginia's Recreational Fishing Model

3.1 Overview of Economic Assessment

The recreational model developed for the VMRC estimates the economic impacts of those anglers who fish for their own pleasure in the marine waters of the state. These economic impacts measure value added, output, and employment dependent on the spending of recreational anglers.

There are many kinds of recreational fishing in Virginia and these are reflected in the model. The basic unit of analysis for recreational fishing is the fishing trip. These are often directed at particular species or groups of species. Accordingly, the model analyzes up to 14 different species and groups of species. Anglers may choose to fish from boats or the shore; when fishing from boats, anglers may choose from a range of types of boats. The model, as a result, encompasses three fishing modes. Finally, there are many fishing locations in the state and the model allows impact estimates for 20 specific coastal counties and cities as well as statewide impacts. The model also estimates impacts for "other" local jurisdictions, that is, for the relatively few fishing trips originating from cities or counties not specified in the model.

Given the number of options for these three variables, the model can in theory compute over 900 different sets of impacts. For example, one of these combinations would be an angler using a private boat to fish for striped bass from Hampton.

For such a combination, the model provides estimates of direct, indirect, induced, and total impacts for value added, output, and employment. Thus, the model can generate over 11,000 individual impact estimates. Because not every jurisdiction will generate recreational fishing trips for all species and every fishing mode, not all combinations will be used.

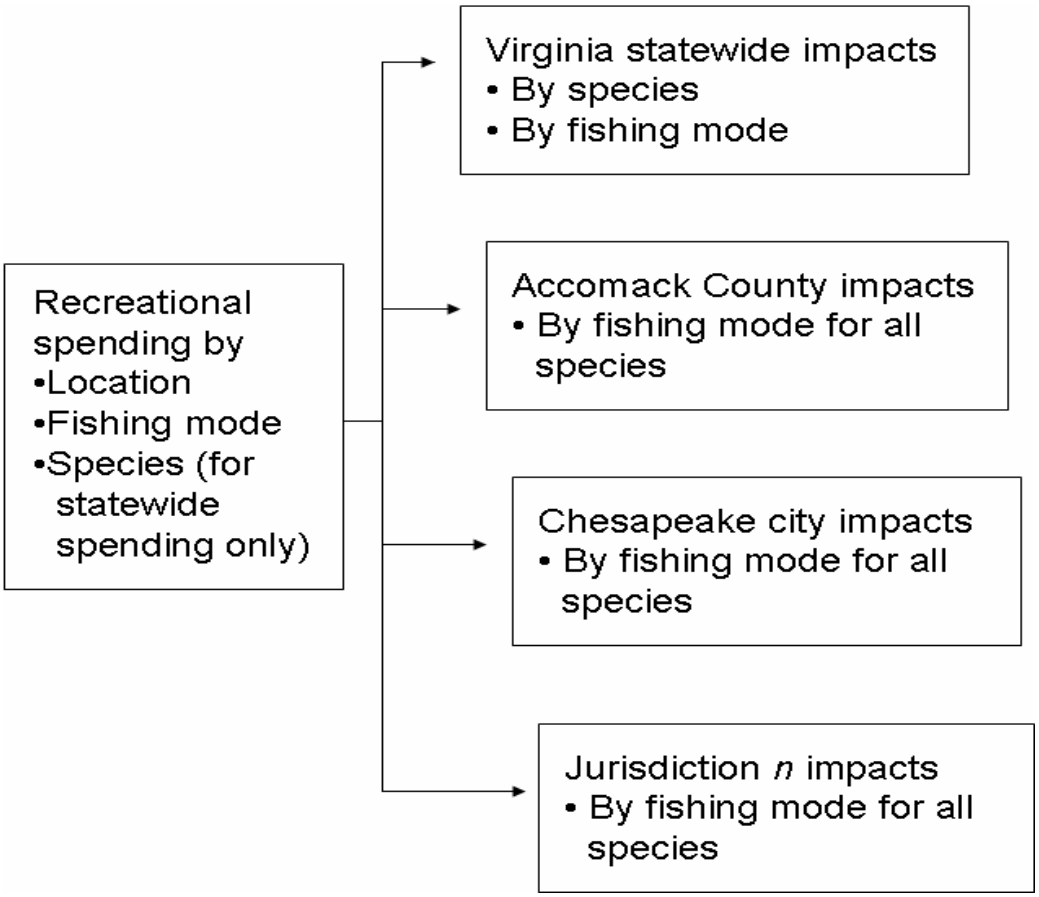
3.2 Overview of Model

With a modest effort by the user, the Virginia recreational model can generate an estimate of statewide or sub-state economic impacts of recreational fishing trips. The following introduces the major components and operations of the model. More detailed information is provided in subsequent sections.

The recreational model was created in Microsoft Excel and comprises six linked worksheets. These worksheets estimate impacts on the basis of anglers' spending and the year of this spending, which are provided by the user. For statewide impacts, the user designates the location of the fishing trip, the species targeted by the angler, and the fishing mode. For county-level impacts, the user designates location and fishing mode.

These expenditures are then assigned to the proper combination of location, species, and/or fishing mode by the model. Sets of economic impacts are then generated for the entered expenditure data. The basic model structure is presented in Figure 3.1.

Figure 3.1. Overview of Virginia Recreational Model



The impacts of recreational fishing in Virginia are organized into tables in a separate worksheet of the model. Statewide impacts are presented by species and by fishing mode. Impacts for selected coastal counties and independent cities are organized by fishing mode.

3.3 Using the Virginia Recreational Fishing Model

The user of the Virginia recreational fishing model needs to enter data on spending by recreational anglers, the year when spending occurred, and the year for values of impact results. These data are entered in separate worksheets.

(1) Recreational fishing expenditures. Spending by anglers is entered in the "user inputs—total spending" worksheet in cells highlighted in red. For statewide spending, the user enters data in the cell range C6 through P8. This range of cells allows the user to enter data for up to 14 species or groups of species and for up to three fishing modes. For county or city level spending, the user enters data by fishing mode for up to 21

jurisdictions in the cell range C9 through C71. At the sub-state level, all spending is assigned to the multiple species category.[9]

(2) The user needs to enter dates for recreational activities and output values in the "user inputs—drop down lists" worksheet. By clicking on cell F9 and following the directions in the dialog box, a range of years is presented. The user then selects the proper year for the recreational fishing activity. By clicking on cell F10 and using the same process, the user can select the year for dollar values shown in the tables generated by the model. In either case the user is provided a list of dates from 1990 through 2005.

The user may enter data on statewide recreational spending for as many as 42 combinations of species and fishing mode. For county-level spending, the user has 69 options of location and fishing mode. While the user can enter data in all these combinations, it is also possible to enter data in only one cell at the state or county level.

The model automatically calculates the appropriate impacts once the user enters the information on expenditures and the relevant years. Impacts are presented as value added, output, and employment. Direct, indirect, induced, and total impacts are presented. These impacts are organized into tables in the "print tables" worksheet. To facilitate printing these tables, there are buttons in the top left corner of the "print tables" worksheet for each table that activate print macros for the tables.

3.4 Major Components of the Recreational Fishing Model

As with the commercial fishing model, each of the six worksheets in the recreational fishing model addresses a distinct set of estimating issues or model outputs as noted in Table 3.1. Some of these worksheets rely on data developed in additional files that support the development of the model. These data are described later in the background information section.

3.4.1 Background information

Like the commercial model, the recreational model tries to estimate impacts in as compact a format as possible. This goal was achieved largely by using IMPLAN's capacity to create custom sectors when the standard IMPLAN sectors do not accurately reflect the economics of specific industries. For recreational fishing, these custom sectors reflect the distinct characteristics of recreational fishing by location, fishing mode, and, for statewide impacts, species. These custom sectors create a set of multipliers for each of the 111 combinations of location, fishing mode, and species included in the model.

[9] Survey response data for the individual counties and independent cities did not allow for spending to be disaggregated by species and fishing mode. While the model has been designed to allow for this level of detail, an analysis of local impacts by species and fishing mode depends on a more robust set of survey data.

Table 3.1. Worksheets within the Virginia Recreational I/O Model

Model worksheets	***Description***
1. User inputs-drop down lists	• The user uses drop down lists to enter dates (1) for the year of fishing activity and (2) for the year of output values. • Other lists are designed for a future version of the model.
2. User input-total spending	• The user enters spending statewide or for counties and cities. • For statewide spending, the user enters a value for a combination of species and fishing mode. • For counties and cities, the user enters spending by mode only in the range for multiple species. • This worksheet converts the spending values to 2001 dollars to align with the economic model used to estimate impacts.
3. Print tables	• Tables with estimated value added, output, and employment impacts are displayed here. Estimates are created for each city or county for up to three fishing modes. For Virginia, estimates are provided for combinations of up to14 species and species groups and up to three fishing modes. Separate tables are created for statewide and for county level impacts. • This worksheet presents all monetary values in the year indicated by the user. • Print macros and the buttons that activate them are located and described here.
4. Impact estimates	• All impacts generated by the model are presented here. These data are reformatted in the "print tables" worksheet. • This worksheet allows for future expansions of the model to allow for county-level estimates that combine species and fishing mode factors.
5. Impact calc's-species+area+mode	• All variables used to estimate impacts are placed in this worksheet. • Spending values are from the "user input-total spending" worksheet. • Multipliers used for each combined location, fishing mode, and (in the case of statewide spending) species are from a separate file, which creates custom multipliers for these combinations.
6. Drop down list data	• This worksheet contains the range of variables for the drop down lists used in the "user inputs-drop down lists" worksheet.

3.4.2 Custom Sector File

The recreational model uses IMPLAN's capacity to create custom economic sectors, which are housed in a separate Excel file. This file has a consistent structure applied to recreational fishing and allows for building custom multipliers for each combination of location, fishing mode, and species. In total the custom sector file can create 924 individual custom sectors.[10]

The creation of these custom sectors depends on the availability of reliable data describing the spending of recreational anglers. Because there are so many potential combinations of location, fishing mode, and species, it is difficult to collect sufficient survey data, particularly at the county level, to estimate accurately what constitutes typical spending by anglers for particular combinations of fishing mode and species. The type of spending data used to create the custom sectors is presented in Table 3.2, which includes the statewide average spending of anglers who use private or rented boats and target rockfish or striped bass.

Spending data are presented as a percentage distribution based on survey data and synthesizes all relevant information for a given combination of location, fishing mode, and species or species group. In the example shown in Table 3.2, the average Virginia rockfish angler who uses a private or rented boat devotes approximately 18 percent of total spending on fuel and lubricants and slightly more on engine repair and maintenance. All non-trip expenses for gear, clothing, insurance, and other equipment and boat expenses are annualized.

The file uses the distribution of expenditures data and applies IMPLAN multipliers and other variables to create the custom multipliers. IMPLAN has specific multipliers for most types of expenses incurred by anglers—fuel, fishing gear, and so on. The distribution of expenditures is used to calculate a weighted average for each multiplier coefficient. These weighted averages are the custom sector coefficients used by the recreational fishing model.

Once developed, the custom sectors are exported to recreational model. The result is that the recreational model is simpler and requires only a fraction of the memory and computational resources that would be required if custom sectors were not used.

3.4.3 Recreational Model

The recreational model comprises a set of interrelated worksheets that combine input data on the value of recreational fishing expenditures with data on economic relationships to estimate economic impacts. The model takes the results of the custom sector file and estimates the economic impacts associated with data input by the user.

[10] Although the model can create up to 924 combinations, some would never be used. For example, Gulf Stream fishing may be in private/rental boats or charter/party boats, but not from the shore.

3.4.4 Adjusting for Inflation

The model adjusts for the effects of inflation based on user-entered dates in two steps. First, the values of recreational expenditures are converted to year 2001 dollars to match the IMPLAN data that are the foundation of the model. Once value added and output impacts are estimated in 2001 dollars, these estimates are converted to whichever year dollars the user selected for output values.

Note that there are no similar conversions of employment impacts from the estimates created in 2001 dollars. While the value of a dollar changes from year to year, the relationships in the model that estimate employment are not subject to adjustments from year to year. Any adjustments to employment using measures of inflation would distort the estimated number of jobs.

3.4.5 Calculating Economic Impacts

A separate worksheet in the model is used to collect the variables used to estimate the economic impacts of recreational fishing. The worksheet starts with the value of recreational expenditures input by the user and taken from the data input worksheet. These values are combined with the custom sector multiplier coefficients (from the custom sector file) for the relevant combination of location, fishing mode, and (for Virginia impacts) species to determine economic impacts in terms of value added, output, and employment.

The actual calculation of economic impacts is conducted in the impact estimates spreadsheet. This is a separate spreadsheet that stores all economic impacts for recreational fishing.

3.4.6 Printing Tables

The economic impacts of recreational fishing activities are presented in a series of tables that are located in the print tables worksheet. This worksheet uses the data in the impact estimates worksheet, but reformats those data to provide a more compact presentation of the model's results.

This worksheet includes two main tables. One includes all county-level and city-level impacts by fishing mode. The other includes all statewide impacts by species and by fishing mode.

To facilitate the printing of these tables, there are two "buttons" in the upper left corner of the print tables worksheet. Each button activates a print macro for one of the tables. The buttons are individually labeled with the contents of the table to which the button is linked. The user can activate the print macros by clicking on the relevant buttons.

Table 3.2. Example of Geo-dependent Data, Recreational Fishery

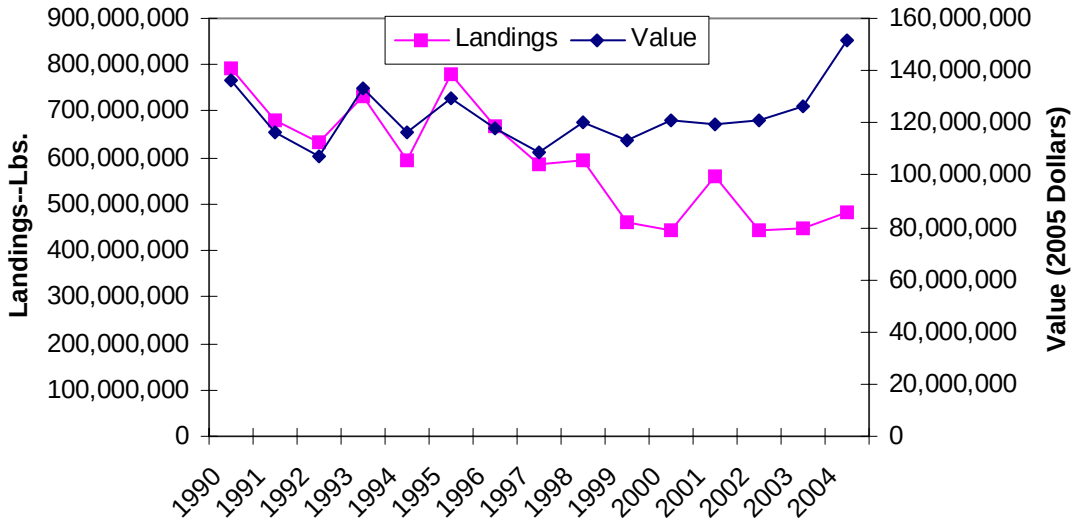
Jurisdiction	Fishing Mode	Categories of costs/NAICS-based IMPLAN Sector Description	Rockfish Expenditure Distribution
State of Virginia	**Private/Rental Boat**	**Trip Expenses**	
		Restaurant meals	5.11%
		Groceries	4.34%
		Lodging	5.31%
		Bait	2.52%
		Ice	3.72%
		Head boat fees	
		Charter boat fees	
		Boat rental fees	
		Equipment rental	
		Public transportation	
		Rental automobile	
		Private automobile	8.31%
		Licenses, other fees	
		Fishing Equipment Purchases	
		Fishing rods	6.62%
		Fishing reels	
		Special fishing clothing	1.18%
		Other fishing tackle	3.30%
		Boat Expenses	
		Boat fuel and oil	17.51%
		Docking and launching fees	2.81%
		Dry storage fees	8.52%
		Haul out/bottom paint	
		Engine repair/maintenance	18.41%
		New electronic equipment	
		New accessories and equipment	
		Trailer maintenance	
		New trailer	
		Insurance	8.59%
		Taxes/registration	3.76%
		Boat loan	
		New boat	
		Total/Weighted Averages	**100.00%**

4.0 Economic Contributions of Commercial and Recreational Fishing

4.1 Measuring the Economic Contributions

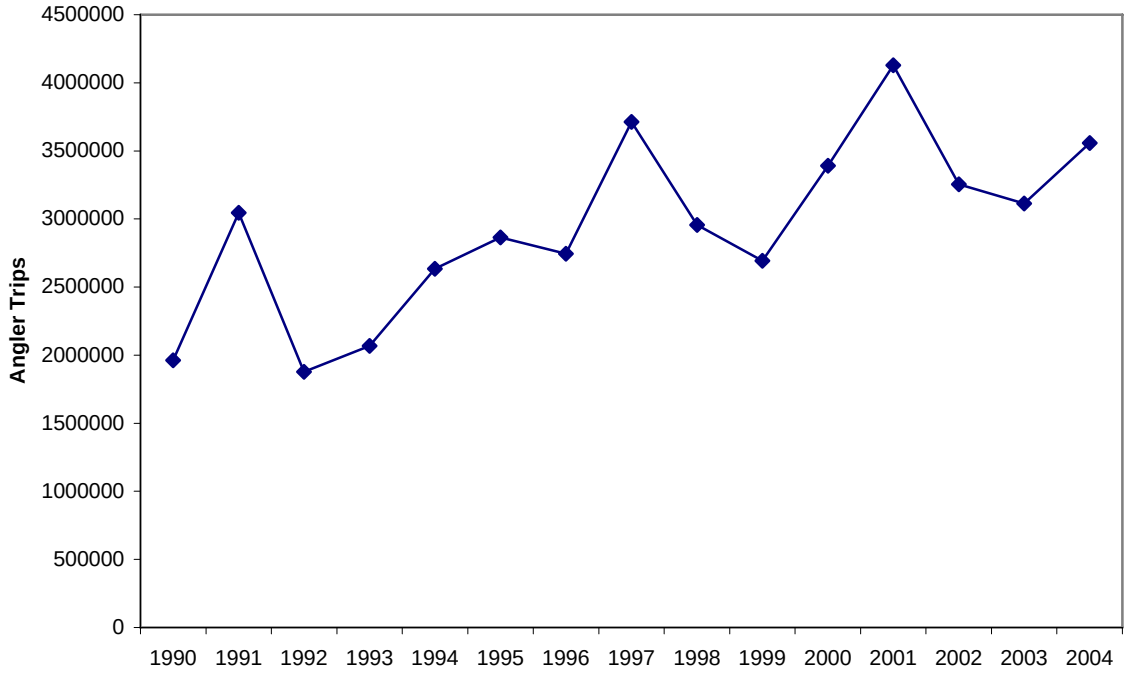
Activities supporting the commercial seafood industry and saltwater recreational fishing in the Commonwealth of Virginia are perceived as being very important to the economy of Virginia and the welfare of the residents of Virginia and coastal communities. Unfortunately, the two industries have followed quite dissimilar trends since 1990. In 1990, commercial landings in Virginia equaled 792.0 million pounds, and had an ex-vessel value of $136.6 million in year 2005 constant dollar value.[11] In 2004, landings had declined to 481.6 million pounds, but the ex-vessel value, mostly because of increased landings and prices for sea scallops, increased to $151.6 million (Figure 4.1). The annual rate of change in ex-vessel landings and value equaled –2.8 and 0.79 % between 1990 and 2004. In contrast, the number of angler trips, one measure of performance for recreational angling, increased from approximately 2.0 to 3.6 million trips between 1990 and 2004 (Figure 4.2).

Figure 4.1. Virginia Commercial Landings and Ex-vessel Value, 1990-2004



[11] The constant dollar value is a measure of inflation-adjusted values; in this case, we consider all dollar values to be in terms of year 2005 values.

Figure 4.2. Number of Virginia Saltwater Angling Trips, 1990-2004



In Section 4 of this report, a summary of the economic contributions of the commercial seafood industry and saltwater recreational fishing activities is presented. The emphasis is on economic impacts, as measured in terms of output or sale, income, and employment, which includes both full and part-time employment, generated by the commercial seafood industry and recreational fishing in the Commonwealth. The impacts are summarized in terms of direct, indirect, induced, and total. In addition, the presentation of the impacts in Section 4 focuses on the impacts at the state level, or how expenditures in the commercial and recreational sectors affect the economy of Virginia. The impact models do allow or accommodate the estimation of impacts at the county level, but a detailed presentation and discussion of county level impacts would require an excessive number of pages. The county level impacts for the commercial fisheries are, thus, presented in Section 4 only relative to all species. It was not possible to generate estimates of the county level impacts by species and mode of fishing; the data obtained from the surveys were too sparse to provide reliable estimates. It was possible, however, to estimate county level impacts relative to mode of sport fishing (i.e., impacts generated by private and rental boats, charter and head boats, and shore, beach, and pier fishing). In Section 4, only total economic impacts by county are presented; detailed summaries by mode and county are available from the model.

4.2 The Economic Impacts of the Seafood Industry and Recreational Fishing

Despite a decline in ex-vessel landings between 1990 and 2004, commercial harvesters landed approximately $143.0 million worth of fish and shellfish in Virginia in

2004.[12] At the most aggregate level, which represents the impacts generated from commercial fishing, processing, wholesale and distribution activities, retail sales and restaurants, the economic impacts, in terms of sales or output, income, and employment generated for the economy of Virginia, respectively, equaled $408.0 million, $239.0 million, and 3,923 full and part-time jobs.[13] If imports or sales of product obtained from outside of Virginia are included in the economic impact assessment of the commercial sector, the seafood industry of Virginia generated $545.1 million in sales or output, $321.9 million in income or value-added, and 5,292 full and part-time jobs. In contrast, saltwater recreational anglers spent approximately $655.1 million in 2004 ($731.2 million in year 2005 constant dollar value). Anglers made approximately 3.6 million trips in 2004. The total economic impact on the Virginia economy in terms of sales or output, income, and employment (full and part-time jobs), equaled, respectively, $823.7 million, $478.4 million, and 9,092 full and part-time jobs.

There are, however, some important caveats relative to employment. Employment is estimated or generated using economic activity within the state or geographic region. Alternatively, employment is generated using IMPLAN multipliers and regional purchase coefficients on a per million dollars basis of output. For example, after adjusting for out of state leakages, the harvesting sector employment multiplier for oysters equals 11.51 full and part-time jobs in the harvesting sector per million dollars of sales or output in the economy. In formula format, employment equals the landed value of the output (e.g., oysters) times the regional purchase coefficient (a measure of the percentage of expenditures remaining within the economy) times the number of full and part-time jobs per million dollars of output).

Both sectors have very large leakages. For example, expenditures on fuel and oil by commercial fishermen and anglers results in dollars leaving the state; the same is true for electronics, rods, reels, and tackle. The employment multipliers are, therefore, quite sensitive to the values of the regional purchase coefficients. In the case of oysters, if the leakages are ignored, or we consider all expenditures to generate economic activity within the state, the number of full and part-time jobs generated for the harvesting sector equals 6, but if we adjust the estimates for out-of-state leakages, the number of full and part-time jobs generated for the harvest sector equals only one. The reason the employment impacts are not higher is because the regional purchase coefficient for oysters equals only 0.30.

4.2.1 Detailed Assessment of the Economic Impacts of the Seafood Industry

Virginia has a wide array of commercial fisheries, which collectively land approximately 106 different species of finfish and shellfish. In addition, a wide variety of gear and equipment are used to commercially harvest finfish and shellfish in Virginia.

[12] The landed value in Section 4 was obtained from the Virginia Marine Resources Commission, and because of data differences does not equal the estimated landed value available from the National Marine Fisheries Service. It was necessary to use the VMRC estimates of landed value to develop the commercial impact model.

[13] All values are in terms of year 2005 constant dollar values.

Species are regularly harvested from inshore and territorial sea areas and offshore in the Exclusive Economic Zone (EEZ), which runs from three to 200 miles offshore. The major species, in terms of landed values, are sea scallops, blue crabs, summer flounder, striped bass, croaker, spot, and black sea bass. These species accounted for 95.8 % of the reported landed value in 2004. Excluded from the Virginia reported landings and most recent landings data available from the National Marine Fisheries Service (NMFS), however, is menhaden. In 2003, NMFS reported that menhaden landings equaled 373.9 million pounds, and had an approximate ex-vessel value of $22.5 million.[14]

4.2.2 Summary of Impacts for All Species (Combined)

Excluding the menhaden purse seine or reduction fishery, total landings in 2004 equaled 93.0million pounds. The ex-vessel or landed value, in terms of year 2005 constant dollar value, equaled $142.6 million. Total sales or output equaled $408.0 million; the direct, indirect, and induced impacts equaled, respectively, $149.9 million, $33.9 million, and $224.3 million (Table 4.1). Total income or value-added, which includes wages, profits, and taxes, equaled $$239.0 million; the direct, indirect, and induced impacts equaled, respectively, $90.2 million, $20.7 million, and $128.2 million. In terms of total jobs generated for Virginia, which includes all commercial activities from harvesting through restaurant and retail sales, the commercial seafood industry generated 3,923 full and part-time jobs.[15]

At the county or municipality level, the economic impacts are highly variable (Table 4.1). Newport News generated the largest level of economic impacts among the counties and municipalities included in the analysis. It must remembered, however, that the impacts are relative to the county; that is, landings in Newport News had an ex-vessel value of $54.5 million in 2004 (2005 constant dollar value), which generated total sales or output of $22.8 million for the economy of Newport News. Much of the product was shipped to other municipalities or out of state. In addition, many of the purchases made by harvesters, processors, wholesalers, restaurants, and retailers were made outside of Newport News. Other areas with relatively large economic activity generated by the seafood industry in 2004 included Accomack county, York county, Hampton, and Gloucester. The major species, in terms of landed value, for Accomack County, Hampton, and Newport News are blue crabs, summer flounder, and sea scallops. The major species for Gloucester County is blue crabs, and the major species for York County include blue crabs and sea scallops.

Most of the economic impacts are generated by the processing sector. Processing generated nearly 50 % ($195.8 million) of the total sales ($408.0 million) generated by the seafood industry (Table 4.2). The processing sector generated $115.4 million in

[14] In the detailed assessment, only reported landings and ex-vessel value are used to assess the economic impacts of the menhaden fishery. Using the 2003 ex-vessel value as an estimate of the 2004 ex-vessel value increases the total impacts, in terms of sales or output, income, and employment, respectively, to $434.1 million, $256.5 million, and 4,182 full and part-time jobs.

[15] Unfortunately, it is not possible to ensure that the estimates of employment are in terms of only full-time jobs. The multipliers available from IMPLAN are restricted to both full and part-time jobs.

value-added or total income, and 1,709 full and part-time jobs. The harvesting sector generated the second highest levels of sales ($78.4 million) and income ($41.2 million). Employment generated by harvesting activities was relatively low compared to the employment generated by economic activities in the other sectors. The low level of employment is likely indicative of the analytical framework focusing on estimating the number of full time jobs in the economy. Oddly, the harvesting sector generated less in sales in output than was the ex-vessel value of all species of finfish and shellfish landed in Virginia. The harvesting sector, however, has very large leakages; that is, expenditures or dollars, which leave the state (e.g., most of the expenditures on fuel leave the state to pay for fuel; the same is true of electronics and certain types of gear).

If the regional purchase coefficients are adjusted to allow leakages to be restricted to fuel and oil, the economic impacts generated by the seafood sector are considerably larger--$1.2 billion in output, $650.0 million in income, and 10.2 thousand full and part-time jobs. In this case, the number of full and part-time jobs for the harvesting sector, processing, wholesaling, retail sales (grocers), and restaurants equal, respectively, 2,103; 3,808; 1,159; 115; and 2,969. It is stressed, however, that the regional purchase coefficients used to develop this model are based on those available from IMPLAN and from data collected from surveys of members of the Virginia seafood industry.

Table 4.1. Economic Impacts of Virginia Commercial Seafood Industry (All dollar values are in terms of $1,000s of year 2005 constant dollar value)

All Sectors	Value of landings/ inputs ($ 000)	Value Added Impacts ($ 000)				Output Impacts ($ 000)				Employment Impacts (Full-/part-time jobs)			
		Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
State of Virginia	142,608	90,174	20,679	128,174	239,027	149,854	33,856	224,262	407,972	1,212	276	2,436	3,923
Accomack	13,695	642	60	778	1,480	975	111	1,363	2,449	17	2	20	39
Chesterfield	240	12	2	30	44	18	3	52	73	0	0	1	1
Essex	81	3	0	3	6	4	0	6	10	0	0	0	0
Fairfax	43	3	0	6	9	4	1	9	14	0	0	0	0
Gloucester	893	237	20	237	494	339	39	421	800	12	1	7	20
Henrico	6	1	0	0	1	1	0	0	1	0	0	0	0
Isle of Wight	1,995	110	12	14	135	163	19	23	205	3	0	0	4
James City	138	5	0	7	12	7	1	11	18	0	0	0	0
King and Queen	118	1	0	1	3	2	0	2	4	0	0	0	0
King George	258	10	1	13	24	14	1	21	35	0	0	0	1
King Williams	38	2	0	2	4	3	0	3	6	0	0	0	0
Lancaster	1,411	95	9	90	194	151	17	154	322	4	0	2	6
Mathews	2,490	157	14	14	185	253	25	23	301	8	0	0	9
Middlesex	963	60	6	35	101	102	12	61	175	2	0	1	3
New Kent	17	0	0	0	1	1	0	1	1	0	0	0	0
Northampton	2,864	146	8	128	282	215	14	218	446	6	0	3	9
Northumberland	3,394	128	10	101	238	185	18	166	369	6	0	3	9
Prince George	185	6	1	11	17	8	1	18	27	0	0	0	1
Prince William	60	3	0	6	9	3	0	10	14	0	0	0	0
Richmond	395	13	1	16	30	17	1	26	44	1	0	0	1
Stafford	202	7	1	10	17	9	1	16	27	0	0	0	0
Suffolk	387	23	2	19	44	33	3	33	69	0	0	0	1
Surry	90	2	0	2	5	4	0	4	8	0	0	0	0
Westmoreland	1,657	61	4	47	111	89	7	79	176	3	0	1	4
York	20,031	1,298	177	1,263	2,738	2,773	396	2,252	5,421	53	6	37	96
Other counties[a]	3,093	146	14	135	295	215	25	228	468	5	0	3	9
Chesapeake	64	4	1	4	8	6	1	7	14	0	0	0	0
Hampton	25,611	2,678	380	434	3,493	4,391	675	727	5,793	46	8	10	64
Newport News	54,478	5,394	976	4,995	11,365	12,201	1,719	8,905	22,825	83	18	109	211
Norfolk	785	67	14	69	150	128	23	121	272	1	0	1	3
Portsmouth	116	10	1	7	19	16	2	12	30	0	0	0	1
Virginia Beach	2,816	242	55	348	645	441	91	595	1,127	5	1	7	13

[a]Other counties include Virginia counties and landings caught in Virginia waters by harvesters from non-Virginia ports.

Table 4.2. Economic Impacts of the Seafood Industry, by Sector

Impact	Harvesters	Processors	Wholesalers	Grocers	Restaurants	Total
Sales/Output[a]						
Direct	34,982	70,511	23,299	4,720	16,343	149,854
Indirect	10,758	14,514	4,620	723	3,241	33,856
Induced	32,661	110,820	28,819	10,789	41,173	224,262
Total Direct	78,401	195,844	56,738	16,232	60,757	407,972
Value-Added[b]						
Direct	16,004	43,225	16,062	3,600	11,283	90,174
Indirect	6,421	8,875	2,863	457	2,063	20,679
Induced	18,770	63,293	16,521	6151	23,439	128,174
Total Direct	41,196	115,393	35,446	10,208	36,784	239,027
Employment[c]						
Direct	230	510	235	44	192	1,212
Indirect	61	116	44	6	48	276
Induced	321	1,083	326	105	600	2,436
Total Direct	612	1,709	605	156	841	3,923

[a]Sales or output equals the total level of sales generated in each sector; sales are in terms of $1,000s of year 2005 constant dollar values.
[b]Value-added is a measure of wages, salaries, business income, and indirect business taxes; value-added is in terms of $1,000s of year 2005 constant dollar values.
[c]Employment is measured in terms of number of jobs generated. An attempt has been made, however, to estimate the number of jobs in terms of full-time (12 person-months) of employment. Employment should not be interpreted, therefore, as the actual number of individuals employed in each sector.

4.2.2 Summary of Commercial Economic Impacts by Species

Since commercial fisheries are typically regulated on a per species basis, there is often considerable interest in knowing the economic impacts of harvesting various species. The economic impact model developed for this study facilitates estimation of the economic impacts of blue crabs, conch, menhaden, sea scallops, hard clams, sharks and tuna or longline species, flounder, low value finfish, moderate to high value finfish, other shellfish, and oysters. This covers the spectrum of all commercial species landed in the commercial fishery of Virginia. The low-value species module is restricted to species having an ex-vessel price $0.75 per pound or lower; the moderate to high-value finfish module is restricted to all other finfish species, which are not included in a separate module, to those species having an ex-vessel value greater than $0.75 per pound.

There are some important caveats to understanding or interpreting the economic impacts on a per species basis. First, the economic impacts of the menhaden reduction fishery were not estimated, and thus, are not included the assessment of the economic impacts. This is because data on the ex-vessel value for the reduction fishery in 2004 were not available. The menhaden model, however, is set up to include the assessment of the economic impacts of the reduction fishery. Including the Virginia ex-vessel value of menhaden in 2003 ($22.0 million) to estimate the total economic impacts of all species increased the sales or output to $434.1 million (vs. $408.0 million), value-added or income to $256.5 million (vs. $239.0 million), and the number of jobs to 4,182 (vs. 3,923). Second, the impacts on a per species basis are restricted to species actually

landed in the commercial fishery in Virginia. Alternatively, imports of products from out of state are excluded in the summary impact assessment presented in Section 4; the model does, however, facilitate estimation of the economic impacts of product being purchased from out of state.

Of all species commercially landed in Virginia, sea scallops generated the largest economic impacts in 2004. Landings of sea scallops in 2004 generated nearly 71 % ($289.0 million) of the total sales or output generated by the seafood industry in 2004; 71 % ($169.3 million) of the total value added; and 64 % (2,497 full and part-time jobs) of the total number of jobs generated by the seafood industry (Table 4.3). Blue crabs generated the second highest level of economic impacts--$46.2 million in sales or output; $26.9 million in value-added; and 422 full and part-time jobs. Low-valued finfish, however, while generating small values of sales and income, did generate the second highest level of employment—467 full and part-time jobs. The oyster fishery, once a major commercial fishery of Virginia, generated only $5.6 million in total output or sales, $1.2 million in income or value-added, and 49 full and part-time jobs. If we include imports of oysters from out of state, the economic contributions of oysters to the state's economy increases to $22.8 million in sales or output, $13.5 million in value added or income, and 200 full and part-time jobs. We obtain similar increases in sales, income, and number of jobs generated when purchases of blue crabs from out of state are considered in the assessment of the economic impacts.

Table 4.3. Economic Impacts/Contributions to the Economy of Virginia, by Commercial Species Landed in Virginia in 2004

	Value Added Impacts ($000) [a]				Output Impacts ($000)				Employment Impacts (Full-/part-time jobs)			
Species/Group	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
Blue Crab	10,092	2,465	14,307	26,863	17,096	4,084	25,025	46,204	147	30	245	422
Blue Crab Including Out-of-State Products	13,928.4	3,174.6	20,441.4	37,544.5	22,930.3	5,230.4	35,777.3	63,938.0	192.7	40.1	349.8	582.6
Conch	135	30	195	359	220	49	341	610	2	0	3	6
Menhaden	199	47	296	541	343	77	518	937	2	1	5	8
Menhaden	6,972	1,640	10,383	18,994	12,019	2,686	18,166	32,871	84	19	178	281
Sea Scallops	64,046	14,697	90,558	169,301	106,584	24,019	158,440	289,043	768	179	1,549	2,497
Hard Clams	1,088	237	1,656	2,981	1,776	387	2,899	5,062	45	9	72	126
Sharks/Tuna/Longline	392	91	522	1,005	650	147	913	1,710	5	1	9	15
Flounder	3,824	844	5,128	9,796	6,281	1,383	8,967	16,631	49	11	88	148
Low Value Finfish	4,417	998	6,984	12,400	7,249	1,638	12,234	21,121	120	29	319	467
Moderate/High Value Finfish	4,303	913	6,184	11,400	6,918	1,488	10,822	19,228	54	11	106	171
Other Shellfish	385	90	607	1,082	649	148	1,063	1,860	5	1	10	16
Oysters	1,295	267	1,738	3,300	2,090	435	3,040	5,565	16	3	30	49
Oysters Including Out-of State Product	5,217.9	1,056.6	7,243.7	13,518.2	8,387.5	1,725.0	12,676.4	22,789.0	62	14	124	200
Total Without Reduction Fishery	90,174	20,679	128,174	239,027	149,854	33,856	224,262	407,972	1,212	276	2,436	3,923
Total With Reduction Fishery	97,146	22,318	138,557	258,021	161,873	36,542	242,428	440,844	1,296	295	2,613	4,205

[a]All dollar values are in terms of year 2005 constant dollar values.

4.2.3 Detailed Assessment of the Economic Impacts of Recreational Fishing

Recreational fishing is of major economic importance to the United States. The 2001 Fish and Wildlife Survey report indicated that over 34 million individuals went fishing in 2001; they spent approximately $1,046 per individual; and expenditures for fishing trips equaled nearly $15.0 billion. The National Oceanic and Atmospheric Administration (NOAA), or NOAA Fisheries, reported that approximately 10.2 million individuals engaged in saltwater fishing in 2004, and they took approximately 73.8 million trips. In 2004, approximately 996.8 thousand individuals took nearly 3.6 million trips in Virginia. The average number of angler trips per individual was approximately 3.6 trips per individual.

Saltwater fishing in Virginia is not only important, in terms of enjoyment realized from fishing, to the well-being of society, but also it is also quite important to the economy of Virginia. Based on data obtained from surveys to conduct this study, it is estimated that anglers spent approximately $655.9 million in 2004 ($731.2 million in year 2005 constant dollar value) on saltwater recreational fishing in Virginia. The economic impacts or contributions to the economy of Virginia from the $655.9 million in expenditures equaled $823.7 million in sales or output, $478.4 million in value-added or income, and 9,092 full and part-time jobs.

In a similar analysis done for the commercial sector, if leakages are restricted to only fuel and oil, the economic impacts generated by recreational angling are considerably higher than those based on the modified IMPLAN regional purchase coefficients. Total sales or output equaled $1.9 billion; total income or value added equaled $1.1 billion; and employment generated equaled 20,971 full and part-time jobs. These higher numbers, however, seriously overstate the economic impacts of recreational angling on the economy of Virginia. Recreational angling, like commercial harvesting and processing activities, has substantial leakages (i.e., dollars leaving the state or municipality).

Topping the list of expenditure items was expenditures on boat repair and maintenance ($116.18 million in 2005 constant dollar value) (Table 4.4). Spending on boat fuel was the second highest spending category ($84.8 million in 2005 constant dollar values). The third highest expenditure category was expenditures on private autos for getting to and from sport fishing. Expenditures on rods and reels and tackle were also quite high in 2004. Many of particular expenditures, however, generate minimal impacts for the economy of Virginia. They represent expenditure categories with very high out-of-state leakages (e.g., many of dollars spent on fuel leave the state, as does expenditures to acquire rods, reels, and tackle). In contrast, expenditures on boat and repair, restaurants, groceries, boat slips, and ice typically generate large and positive economic impacts for the economy of Virginia.

The economic impacts or contributions to the economy of Virginia of saltwater recreational angling were assessed relative to mode of fishing and targeted species. Three modes were considered: (1) private and rental boats, (2) party and charter boats,

and (3) shore, beach, and pier fishing. The species or species groups were the following: (1) multiple species or non-targeted species, (2) striped bass or rockfish, (3) bluefish, (4) summer flounder, (5) weakfish or grey trout, (5) tautog, (7) speckled or spotted sea trout, (8) black sea bass, (9) scup, (10) spot and croaker, (11) near shore species, (12) Gulf Stream species, (13) spadefish, and (14) other species.

It was not possible, however, to estimate the economic impacts or contributions to the economies of coastal areas by mode and species; the data were too sparse to generate adequate estimates of the economic impacts by species. The available data, however, were sufficient to estimate the economic impacts or contributions of saltwater fishing to the various coastal communities by mode of fishing, but even that was limited in the sense that it was not possible to estimate the economic contributions of some modes for some counties. The following counties or municipalities were included in the economic analysis: (1) Accomack, (2) Essex, (3) Gloucester, (4) Isle of Wight, (5) James City, (6) King George, (7) Mathews, (8) Middlesex, (9) Northampton, (10) Northumberland, (11) Richmond, (12) Surry, (13) Westmoreland, (14) York, (15) Chesapeake City, (16) Hampton City, (17) Newport News, (18) Norfolk City, (19) Suffolk City, (20) Virginia Beach City, and (21) all other local jurisdictions. The economic impacts for the counties, however, are not additive in the sense that adding up the impacts for the counties yields an estimate of the economic impact for the state. County level impacts represent the economic impacts of recreational activity on the economies of the counties or municipalities, and not the impacts on the economy of the State of Virginia.

A decomposition of the economic impacts or contributions to the economy of Virginia by mode and direct, indirect, and induced impacts revealed that angling expenditures for private and rental boat trips generated the largest total economic impacts (Table 4.5). Unlike the commercial sector, however, in which the induced impacts dominated all other impacts, the direct impacts dominated the indirect and induced impacts for saltwater angling expenditures. The economic impacts, in terms of sales or output, value-added, and number of jobs for private and rental boat trips in 2004 equaled, respectively, $656.7 million, $387.7 million, and 7,119 full and part-time jobs. The economic contributions by anglers making trips from the shore, beach, or pier equaled, respectively, $116.3 million in sales or output, $62.2 million in value-added or income, and 1,422 full and part-time jobs. Charter and head boat angling contributed $50.8 million to sales or output, $28.5 million to value-added or income, and 551 full and part-time jobs in Virginia.

Table 4.4. Angler Expenditures by Expenditure Category in 2004

Sector	Expenditure in 2004	2005 Dollar Value
Restaurants	42,018,736	46,898,446
Groceries	48,249,662	53,852,981
Lodging	27,887,285	31,125,885
Bait	29,108,899	32,489,368
Ice	23,809,101	26,574,095
Equipment Rental	438,746	489,699
Party/charter/head boat fees	16,687,732	18,625,708
Rental Automobile	0	0
Public Transportation	319,465	356,565
Boat fuel and oil	75,992,353	84,817,480
Other (marina charges, etc.)	15,650,450	17,467,964
Personal Automobile--Miles	62,958,386	70,269,855
	343,120,815	382,968,044
Rods and Reels	53,695,847	59,931,641
Tackle	26,768,053	29,876,674
Special Clothes	9,556,995	10,666,865
Total: Rods, Reels, and Clothing.	90,020,895	100,475,181
Annual Boat Insurance	48,539,339	54,176,299
State and Municipality Tax	21,232,703	23,698,495
Slip and Dry Storage Fees	48,148,088	53,739,611
Maintenance and Repair	104,060,022	116,144,697
Total Boat Expenditures	221,980,153	247,759,102
Total:	655,121,863	731,202,326

Counties receiving substantial contributions to their local economies from recreational fishing include Accomack, Gloucester, Northampton, and York. Cities or municipalities realizing large benefits, in terms of economic activity or impacts, from recreational angling included Hampton, Newport News, Norfolk and Virginia Beach. In terms of ranking by level of economic impacts generated by angling expenditures, Virginia Beach ranked number one with $218.5 million of sales or output, $128.6 million in value-added or income, and 2,856 full and part-time jobs. Economic activity generated by recreational angling was also quite high for the following areas: (1) Newport News—$70.1 million in sales or output, $39.2 million in value-added or income, and 999 full and part-time jobs; (2) Accomack County--$53.2 million in sales or output, $40.9 million in value-added or income, and 836 full and part-time jobs; (3) Hampton City--$53.3 million in sales or output, $30.6 million in value-added or income, and 757 full and part-time jobs; (4) Northampton County--$43.3 million in sales or output, $27.0 million in value-added or income, and 699 full and part-time jobs; (5) Gloucester County--$38.0 million in sales or output, 22.1 million in value-added or income, and 668 full and part-time jobs;

(6) Norfolk City--$37.6 million in sales or output, $31.1 million in value-added or income, and 471 full and part-time jobs; and (7) York County--$24.4 million in sales or output, $13.7 million in value-added or income, and 402 full and part-time jobs.

Table 4.5. Economic Impacts of Saltwater Angling in 2004 on the Economies of Virginia and Coastal Communities (Values in 2005 Constant Dollars)

Jurisdiction	Fishing Mode	Value Added Impacts (000 $)				Output Impacts (000 $)				Employment Impacts (Full-/part-time jobs)			
		Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
State of Virginia	Private/Rental boat	245,639	65,841	76,235	387,715	417,581	111,156	127,968	656,705	4,967	881	1,271	7,119
	Charter/Party boat	17,204	5,618	5,681	28,503	31,886	9,346	9,537	50,768	387	69	95	551
	Shore/pier/beach	36,476	13,040	12,712	62,228	72,530	22,398	21,338	116,267	1,045	165	212	1,422
	All fishing modes	299,319	84,498	94,628	478,446	521,997	142,900	158,842	823,740	6,399	1,115	1,578	9,092
Accomack County	Private/Rental boat	20,773	2,744	3,225	26,742	36,158	5,073	5,585	46,816	580	67	76	723
	Charter/Party boat	695	100	109	904	1,214	192	188	1,594	24	2	3	29
	Shore/pier/beach	1,683	336	307	2,326	3,573	677	531	4,781	70	8	7	85
	All fishing modes	23,151	3,180	3,640	29,971	40,945	5,941	6,304	53,191	674	77	85	836
Essex County	Private/Rental boat	3,132	364	547	4,043	5,292	800	965	7,057	87	10	14	111
	Charter/Party boat	102	9	17	128	168	17	31	216	3	0	0	4
	All fishing modes	3,234	373	565	4,171	5,460	817	996	7,273	90	10	15	115
Gloucester County	Private/Rental boat	13,847	1,637	2,418	17,902	23,526	3,068	4,192	30,785	415	50	64	529
	Charter/Party boat	3,233	409	570	4,212	5,461	777	988	7,226	112	12	15	139
	All fishing modes	17,080	2,047	2,988	22,114	28,987	3,845	5,180	38,011	527	62	79	668
Isle of Wight County	Private/Rental boat	338	47	60	444	583	80	96	759	11	1	1	13
	All fishing modes	338	47	60	444	583	80	96	759	11	1	1	13
James City County	Private/Rental boat	1,315	154	184	1,653	2,009	252	292	2,553	25	3	3	31
	Shore/pier/beach	64	12	11	87	120	21	17	157	2	0	0	2
	All fishing modes	1,379	166	195	1,740	2,129	272	309	2,710	26	3	4	33
King George County	Private/Rental boat	421	75	52	548	755	114	76	945	13	2	1	15
	All fishing modes	421	75	52	548	755	114	76	945	13	2	1	15
Mathews County	Private/Rental boat	3,188	282	354	3,824	5,350	488	568	6,406	117	9	9	135
	Shore/pier/beach	33	5	8	45	65	9	12	86	2	0	0	3
	All fishing modes	3,221	287	362	3,869	5,415	497	580	6,492	119	9	9	138

Table 4.5. Impacts—continued

Jurisdiction	Fishing Mode	Value Added Impacts (000 $)				Output Impacts (000 $)				Employment Impacts (Full-/part-time jobs)			
		Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Middlesex County	Private/Rental boat	1,549	188	212	1,950	2,711	373	359	3,443	47	6	5	58
	Shore/pier/beach	80	15	13	108	174	32	21	227	4	1	0	5
	All fishing modes	1,629	204	225	2,058	2,885	405	380	3,670	50	7	6	63
Northampton County	Private/Rental boat	21,196	1,430	3,336	25,962	33,611	2,392	5,572	41,575	558	33	69	660
	Charter/Party boat	111	9	18	137	183	15	30	227	4	0	0	4
	Shore/pier/beach	688	61	124	873	1,230	109	207	1,547	31	1	3	35
	All fishing modes	21,995	1,500	3,478	26,973	35,024	2,516	5,809	43,349	593	34	71	699
Northumberland County	Private/Rental boat	461	45	48	555	766	78	76	921	15	1	1	17
	Charter/Party boat	22	2	2	27	37	4	4	45	1	0	0	1
	Shore/pier/beach	52	7	6	65	98	13	10	121	3	0	0	3
	All fishing modes	535	55	56	647	901	96	89	1,086	18	1	1	21
Richmond County	Private/Rental boat	209	21	29	258	349	37	46	432	6	0	1	7
	Shore/pier/beach	187	26	30	242	341	48	48	438	8	0	1	9
	All fishing modes	396	46	58	500	690	85	94	870	14	1	1	16
	Shore/pier/beach	12	1	1	14	23	3	1	27	1	0	0	1
	All fishing modes	12	1	1	14	23	3	1	27	1	0	0	1
Westmoreland County	Private/Rental boat	261	20	27	308	454	35	44	534	7	1	1	8
	Shore/pier/beach	235	25	28	288	485	49	46	580	12	1	1	14
	All fishing modes	496	45	55	596	939	84	91	1,114	19	1	1	22
York County	Private/Rental boat	10,026	1,335	1,403	12,764	17,822	2,584	2,329	22,735	296	40	31	367
	Charter/Party boat	258	39	37	335	468	77	62	607	10	1	1	12
	Shore/pier/beach	455	73	70	598	803	149	116	1,068	19	2	2	23
	All fishing modes	10,739	1,448	1,510	13,697	19,093	2,811	2,506	24,410	325	43	34	402
Chesapeake City	Private/Rental boat	1,549	328	343	2,220	2,606	603	565	3,775	39	7	7	53
	All fishing modes	1,549	328	343	2,220	2,606	603	565	3,775	39	7	7	53

Table 4.5. Impacts—continued

Jurisdiction	Fishing Mode	Value Added Impacts (000 $)				Output Impacts (000 $)				Employment Impacts (Full-/part-time jobs)			
		Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Hampton City	Private/Rental boat	20,027	3,949	3,845	27,821	34,554	7,642	6,325	48,521	522	84	81	687
	Charter/Party boat	2,041	343	434	2,818	3,444	606	704	4,754	54	8	9	71
	Shore/pier/beach	0	0	0	0	0	0	0	0	0	0	0	0
	All fishing modes	22,068	4,293	4,278	30,639	37,998	8,248	7,029	53,275	575	92	90	757
Newport News City	Private/Rental boat	22,728	4,261	4,514	31,503	39,905	7,691	7,639	55,235	588	88	93	769
	Charter/Party boat	264	56	54	374	503	99	91	693	8	1	1	10
	Shore/pier/beach	4,993	1,201	1,118	7,312	10,135	2,160	1,892	14,186	173	23	23	220
	All fishing modes	27,985	5,518	5,686	39,189	50,543	9,950	9,622	70,114	769	113	117	999
Norfolk City	Private/Rental boat	12,483	2,579	1,497	16,559	21,132	4,234	2,509	27,875	271	42	27	340
	Charter/Party boat	639	154	80	873	1,150	252	134	1,536	16	2	1	19
	Shore/pier/beach	2,971	869	409	4,249	6,005	1,451	685	8,142	91	13	7	111
	All fishing modes	16,093	3,602	1,986	21,681	28,287	5,937	3,328	37,553	377	58	36	471
Suffolk City	Private/Rental boat	2,402	340	470	3,212	4,161	582	791	5,534	62	8	10	80
	Charter/Party boat	0	0	0	0	0	0	0	0	0	0	0	0
	Shore/pier/beach	401	85	92	578	838	154	154	1,147	16	2	2	19
	All fishing modes	2,803	425	562	3,790	4,999	736	946	6,680	78	10	12	99
Virginia Beach City	Private/Rental boat	64,252	15,856	17,828	97,937	107,518	28,060	29,426	165,004	1,453	288	351	2,092
	Charter/Party boat	4,779	1,213	1,347	7,339	8,259	1,979	2,223	12,461	118	22	27	167
	Shore/pier/beach	14,607	4,208	4,472	23,287	26,619	6,990	7,381	40,991	435	75	88	597
	All fishing modes	83,638	21,277	23,648	128,563	142,396	37,029	39,031	218,456	2,005	385	466	2,856
Other Local Jurisdiction	Private/Rental boat	14,305	2,023	2,293	18,621	24,302	3,619	3,800	31,721	391	46	50	488
	Charter/Party boat	1,033	166	181	1,380	1,793	293	303	2,390	32	4	4	39
	Shore/pier/beach	361	66	64	491	705	121	105	931	16	1	1	19
	All fishing modes	15,699	2,255	2,538	20,492	26,800	4,033	4,208	35,042	439	52	55	546

4.2.4 Assessment of Economic Impacts by Species

Despite the fact that anglers often target groupings of species, they often seek one major desired species (e.g., striped bass or rockfish). In addition, fisheries management is typically species specific. In this section, the economic impacts or contributions to the economy of Virginia of trips targeting selected species are presented; as previously noted, inadequate data limited the ability to estimate the economic contributions to the various municipalities of trips targeting selected species. The species considered include the following: (1) multiple species or non-targeted species, (2) striped bass or rockfish, (3) bluefish, (4) summer flounder, (5) weakfish or grey trout, (5) tautog, (7) speckled or spotted sea trout, (8) black sea bass, (9) scup, (10) spot and croaker, (11) near shore species, (12) Gulf Stream species, (13) spadefish, and (14) other species. As previously stated, it was not possible to estimate the economic impacts of species-specific trips at the county level; the data were too sparse to yield adequate estimates of expenditures on species specific trips.

Of the 14 species or species groupings, the multiple species (not particular target species) grouping generated the largest economic impacts to the economy of Virginia.[16] Trips for which individuals indicated they had no desired species in mind when fishing generated $168.2 million in sales or output, 106.0 million in income, and 2,076 full and part-time jobs (Table 4.6). Species for which anglers indicated they were targeting, which also generated large economic impacts include the following: (1) spot/croaker--$173.4 million in sales or output, $102.0 million in value-added or income, and 335 full and part-time jobs; (2) striped bass or rockfish--$168.2 million in sales or output, $98.4 million in value-added or income, and 323 full and part-time jobs; (3) summer flounder--$154.9 million in sales or output, $89.2 million in value-added or income, and 294 full and part-time jobs; (4) bluefish--$32.2 million in sales or output, $19.1 million in value-added or income, and 62 full and part-time jobs; (5) black sea bass--$27.8 million in sales or output, $16.1 million in value-added or income, and 53 full and part-time jobs; and (6) weakfish or sea trout--$24.8 million in sales or output, $14.5 million in value-added or income, and 48 full and part-time jobs.

Trips for other species, with relatively large contributions to the economy included the following: (1) tautog--$9.7 million in sales or output, $5.6 million in value-added or income, and 18 full and part-time jobs; (2) speckled or spotted sea trout--$10.7 million in sales or output, $6.2 million in value-added or income, and 20 full and part-time jobs, (3) near shore species--$11.3 million in sales or output, $6.6 million in value-added or income, and 22 full and part-time jobs; and (4) Gulf Stream species--$10.8 million in sales or output, $6.2 million in value-added or income, and 20 full and part-time jobs. Trip expenditures on catching spadefish, which appears to be increasingly popular sport fish in Virginia, generated $5.6 million in sales or output, $3.3 million in value-added or income, and 11 full and part-time jobs.

[16] The multiple species trips could include trips in which spot, croaker, striped bass, sea trout, or other species were caught, but they angler had no preference for a particular species when making the trip.

Table 4.6. Economic Impacts or Contributions to Virginia's Economy of Trips Targeting Selected Species (Values are in 2005 Constant Dollar Values)

Species	Fishing Mode	Value Added Impacts (000 $) #				Output Impacts (000 $)				Employment Impacts (Full-/part-time jobs)			
		Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Multiple species	Private/Rental boat	45,512.8	12,399.3	14,192.7	72,104.7	77,787.1	20,872.9	23,823.7	122,483.7	905.0	164.4	236.7	1,306.1
	Charter/Party boat	1,890.9	613.1	657.6	3,161.6	3,475.1	1,032.4	1,103.8	5,611.4	55.6	7.9	11.0	74.5
	Shore/pier/beach	18,041.3	6,294.2	6,392.4	30,727.8	35,673.2	10,754.2	10,730.2	57,157.7	509.8	79.3	106.6	695.7
	All fishing modes	65,444.9	19,306.6	21,242.7	105,994.1	116,935.5	32,659.6	35,657.7	185,252.8	1,470	252	354	2,076
Rockfish	Private/Rental boat	54,830.1	14,910.9	17,072.6	86,813.5	93,688.7	25,039.5	28,657.9	147,386.1	1,095.6	197.1	284.7	1,577.4
	Charter/Party boat	5,864.1	1,911.8	1,920.8	9,696.7	10,881.9	3,169.6	3,224.3	17,275.7	123.2	23.2	32.0	178.4
	Shore/pier/beach	1,131.4	413.7	391.9	1,937.0	2,207.9	694.5	657.8	3,560.1	35.8	5.2	6.5	47.6
	All fishing modes	61,825.5	17,236.4	19,385.2	98,447.1	106,778.4	28,903.6	32,539.9	168,221.9	1,255	226	323	1,803
Bluefish	Private/Rental boat	11,395.6	2,984.7	3,491.3	17,871.6	19,195.0	5,064.6	5,860.5	30,120.1	227.9	40.6	58.2	326.8
	Charter/Party boat	311.5	106.9	103.7	522.1	592.7	177.3	174.0	944.1	6.5	1.3	1.7	9.5
	Shore/pier/beach	364.2	135.5	123.8	623.6	729.9	224.4	207.9	1,162.2	9.4	1.7	2.1	13.1
	All fishing modes	12,071.3	3,227.2	3,718.9	19,017.3	20,517.6	5,466.4	6,242.4	32,226.4	244	44	62	349
Summer flounder	Private/Rental boat	45,417.9	12,268.0	14,147.9	71,833.8	77,862.7	20,936.7	23,748.5	122,547.9	968.4	166.0	236.0	1,370.4
	Charter/Party boat	1,318.6	443.4	432.2	2,194.2	2,474.1	738.3	725.5	3,938.0	28.2	5.4	7.2	40.8
	Shore/pier/beach	8,967.4	3,196.8	3,031.4	15,195.6	17,739.9	5,541.5	5,088.5	28,369.9	265.0	40.8	50.6	356.3
	All fishing modes	55,703.9	15,908.2	17,611.5	89,223.6	98,076.8	27,216.5	29,562.5	154,855.8	1,262	212	294	1,768
Weakfish	Private/Rental boat	7,929.9	2,225.7	2,488.1	12,643.6	13,583.3	3,738.4	4,176.4	21,498.1	167.1	29.2	41.5	237.8
	Charter/Party boat	475.8	155.3	155.2	786.3	877.8	258.0	260.5	1,396.2	10.4	1.9	2.6	14.9
	Shore/pier/beach	639.9	195.9	211.9	1,047.7	1,172.5	328.9	355.7	1,857.1	15.3	2.5	3.5	21.3
	All fishing modes	9,045.6	2,576.9	2,855.2	14,477.7	15,633.5	4,325.3	4,792.6	24,751.4	193	34	48	274
Tautog	Private/Rental boat	2,690.4	744.2	842.6	4,277.2	4,669.7	1,252.8	1,414.4	7,336.9	54.1	9.8	14.1	77.9
	Charter/Party boat	660.2	218.4	225.1	1,103.7	1,227.2	365.4	377.8	1,970.5	17.6	2.7	3.8	24.1
	Shore/pier/beach	118.0	41.2	39.7	198.8	225.5	69.6	66.6	361.6	3.3	0.5	0.7	4.5
	All fishing modes	3,468.6	1,003.8	1,107.3	5,579.7	6,122.5	1,687.8	1,858.7	9,669.0	75	13	18	106
Speckled-spotted trout	Private/Rental boat	3,159.9	852.0	974.3	4,986.2	5,380.6	1,435.1	1,635.4	8,451.1	64.4	11.4	16.2	92.0
	Charter/Party boat	486.1	161.3	159.4	806.8	904.8	268.7	267.5	1,441.0	11.4	2.0	2.7	16.0
	Shore/pier/beach	253.3	91.8	86.6	431.8	498.7	150.3	145.4	794.4	6.5	1.1	1.4	9.1
	All fishing modes	3,899.3	1,105.1	1,220.3	6,224.8	6,784.1	1,854.0	2,048.4	10,686.5	82	14	20	117
Black sea bass	Private/Rental boat	8,799.7	2,477.3	2,747.5	14,024.5	15,274.0	4,173.7	4,612.0	24,059.7	167.8	32.7	45.8	246.3
	Charter/Party boat	597.5	180.2	203.5	981.2	1,114.2	302.2	341.5	1,757.9	14.0	2.3	3.4	19.6
	Shore/pier/beach	610.3	237.8	204.1	1,052.2	1,257.8	405.5	342.7	2,006.0	15.0	3.0	3.4	21.4
	All fishing modes	10,007.6	2,895.3	3,155.1	16,058.0	17,646.0	4,881.4	5,296.2	27,823.7	197	38	53	287

Table 4.6. Economic Impacts of Trips Targeting Selected Species--Continued

Species	Fishing Mode	Value Added Impacts (000 $) #				Output Impacts (000 $)				Employment Impacts (Full-/part-time jobs)			
		Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Scup	Private/Rental boat	915.8	257.8	285.9	1,459.5	1,589.6	434.4	480.0	2,503.9	17.5	3.4	4.8	25.6
	Charter/Party boat	-	-	-	-	-	-	-	-	-	-	-	-
	Shore/pier/beach	49.1	19.5	18.1	86.6	102.4	34.3	30.4	167.1	1.7	0.3	0.3	2.2
	All fishing modes	964.8	277.3	304.1	1,546.2	1,691.9	468.6	510.4	2,671.0	19	4	5	28
Spot-croaker	Private/Rental boat	56,049.9	14,231.0	17,186.5	87,467.4	93,169.7	24,026.4	28,849.1	146,045.2	1,121.0	193.5	286.6	1,601.2
	Charter/Party boat	2,165.6	730.7	714.4	3,610.7	4,064.1	1,218.8	1,199.1	6,481.9	46.7	8.9	11.9	67.5
	Shore/pier/beach	6,301.3	2,413.3	2,211.8	10,926.4	12,922.6	4,195.2	3,712.8	20,830.5	183.1	30.9	36.9	250.8
	All fishing modes	64,516.8	17,375.0	20,112.7	102,004.5	110,156.4	29,440.4	33,761.0	173,357.7	1,351	233	335	1,920
Near shore	Private/Rental boat	2,324.6	654.6	731.8	3,711.0	4,004.7	1,094.9	1,228.3	6,328.0	47.2	8.5	12.2	67.9
	Charter/Party boat	1,742.6	546.8	562.9	2,852.4	3,152.4	903.3	945.0	5,000.7	38.2	6.7	9.4	54.2
	Shore/pier/beach	-	-	-	-	-	-	-	-	-	-	-	-
	All fishing modes	4,067.3	1,201.4	1,294.7	6,563.4	7,157.1	1,998.3	2,173.3	11,328.7	85	15	22	122
Gulf Stream	Private/Rental boat	2,130.0	626.1	680.0	3,436.1	3,740.7	1,046.7	1,141.5	5,928.9	44.8	8.0	11.3	64.1
	Charter/Party boat	1,657.0	538.0	535.2	2,730.2	3,058.7	892.4	898.4	4,849.6	34.4	6.5	8.9	49.8
	Shore/pier/beach	-	-	-	-	-	-	-	-	-	-	-	-
	All fishing modes	3,787.0	1,164.1	1,215.3	6,166.3	6,799.4	1,939.2	2,039.9	10,778.5	79	15	20	114
Spadefish	Private/Rental boat	2,017.3	563.2	630.6	3,211.2	3,454.5	945.1	1,058.6	5,458.2	38.7	7.4	10.5	56.6
	Charter/Party boat	33.6	11.5	11.6	56.7	62.5	19.1	19.4	101.1	0.9	0.1	0.2	1.2
	Shore/pier/beach	-	-	-	-	-	-	-	-	-	-	-	-
	All fishing modes	2,050.9	574.8	642.2	3,267.9	3,517.0	964.3	1,078.0	5,559.3	40	8	11	58
Other species	Private/Rental boat	2,465.4	646.2	763.3	3,874.9	4,181.1	1,094.5	1,281.3	6,556.9	47.8	8.7	12.7	69.2
	Charter/Party boat	-	-	-	-	-	-	-	-	-	-	-	-
	Shore/pier/beach	-	-	-	-	-	-	-	-	-	-	-	-
	All fishing modes	2,465.4	646.2	763.3	3,874.9	4,181.1	1,094.5	1,281.3	6,556.9	48	9	13	69
All species	Private/Rental boat	245,639.2	65,841.0	76,235.1	387,715.4	417,581.4	111,155.8	127,967.6	656,704.7	4,967	881	1,271	7,119
	Charter/Party boat	17,203.6	5,617.5	5,681.5	28,502.6	31,885.5	9,345.6	9,536.9	50,768.0	387	69	95	551
	Shore/pier/beach	36,476.1	13,039.6	12,711.9	62,227.6	72,530.4	22,398.4	21,338.0	116,266.8	1,045	165	212	1,422
	All fishing modes	299,318.9	84,498.1	94,628.5	478,445.6	521,997.3	142,899.8	158,842.5	823,739.5	6,399	1,115	1,578	9,092

5.0 Summary and Conclusions

Results of the economic impact assessment revealed that the commercial seafood industry and recreational fishing contributed substantially to the economies of Virginia and various municipalities in 2004. The two sectors combined contributed or generated approximately $1.23 billion to the economy of Virginia. In addition, the commercial seafood industry and recreational fishing generated $717.5 million in value added or income, and 13,015 full and part-time jobs. The recreational sector accounted for nearly 67 % of the total sales or output and 67 % of the value-added or income generated by the commercial seafood industry and recreational fishing; expenditures generated by recreational anglers accounted for nearly 70 % of the total employment generated by the two sectors.

The results, however, also reveal some potentially disturbing trends. First, the economic importance of the commercial seafood industry has substantially declined since 1994, which at that time, had an estimated economic output of $465.4 million (in 1994 constant dollar value).[17] Second, the leakages or dollars leaving the state have been substantially increasing over time. Third, the multiplier for the recreational sector has been declining. In 1994, the ratio of sales or output to expenditures equaled 1.57; the ratio declined to 1.26 in 2005,which indicates an increasing level of leakages (expenditures or dollars leaving the state) for the recreational sector.

Another concern is that the number of major species or fisheries contributing to the economy has declined. In 1994, all of the species or species' groupings, except sharks and tunas, generated, at least, $5.0 million in sales or output. In 2004, most of the fisheries also generated $5.0 million or more in total sales, but their total sales were considerably below the sales or output levels of 1994. For example, in 1994 dollars, the 1994 blue crab fishery of Virginia generated $110.4 million in sales or output; the 2004 fishery generated only $46.2 million in total sales (in 2005 constant dollar values). Moreover, and excluding menhaden reduction fisher for which data were not available, the sea scallop fishery was responsible for nearly 71 % of total sales or output and value-added and 64.0 % of the total number of full and part-time jobs generated by the seafood industry of Virginia.

Another segment of the commercial industry indicating a downward trend is processing. In 1994, the processing sector generated $191.6 million in sales or output (1994 constant dollars) and 5,488 full and part-time jobs. In 2004, the processing sector generated $195.8 million in sales or output, but only 1,709 full and part-time jobs for the economy of Virginia. Several factors appear to be responsible for the decline in processing activities. In the survey done for this study, many plant managers and owners indicated that they were no longer processing or had decreased their level of processing. For some products, such as crab and oyster meats, processors indicated they had become increasingly dependent on out-of-state raw materials for processing, which again, translates into large leakages.

[17] I f adjusted to reflect 2005 constant dollar value, sales or output generated in 1994 equals $688.9 million.

In comparison, the recreational sector displayed the opposite trend. Total unadjusted expenditures increased from $303.5 million in 1994 ($377.6 million in 2004 dollars) to $655.1 million 2004 (2005 constant dollar value). The number of anglers and angler trips both increased between 1994 and 2004. The number of anglers and angler trips in 1994 equaled, respectively, 565.9 thousand and 2.6 million; in 2004, the number of anglers and angler trips equaled, respectively, 996.8 and 3.6 million.

There were, however, several changes between 1994 and 2004. In 1994, the major recreational fishery in terms of generated sales or output was the Gulf Stream fishery. In 2004, the major recreational fishery in terms of sales or output generated by angler expenditures was the non-targeted recreational fishery. The spot/croaker, striped bass, and summer flounder directed fisheries generated the second, third, and fourth highest economic impacts in terms of sales or output. These were the same major species in 1994, but the ordering of importance was different.

An important concern, particularly when reviewing the estimated impacts, is that the study was conducted during 2004, immediately following Hurricane Isabel. Isabel damaged much of the recreational and commercial infrastructure, which supports these two activities. It is highly likely that the estimated economic impacts from both commercial fishing and recreational angling are lower than they would have been without Isabel.

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