

# The Economic Importance of Marine Angler Expenditures in the United States; Selected Results

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**Abstract.** In 1998, the National Marine Fisheries Service (NMFS) launched a series of marine recreational angler expenditure survey in the Northeast (NE) management region (Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, and Virginia). This series was extended to the Southeast (SE) management region (North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, and Louisiana) in 1999 and the Pacific (PAC) management region (California, Oregon, and Washington) in 2000. These surveys were designed to collect the data needed to estimate average and total angler expenditures, by state and resident status, on trip expenses and durable goods for use in economic impact assessment. These estimates are currently being used to develop economic impacts, by state and by the United States (US) as a whole, using IMPLAN<sup>1</sup>, a ready-made input-output model. This report briefly summarizes the methodologies used to estimate expenditures and economic impacts from the survey data. Across the US, anglers spent \$20.4 billion in 2000 with the SE contributing \$12.5 billion, the PAC contributing with \$4.5 billion, and the NE contributing \$4.2 billion. Due to space limitations, only results from the state of Massachusetts are presented here. Massachusetts was chosen because it has the highest expenditures of any state in the NE with \$847 million spent by saltwater recreational anglers in 1998. This level of expenditures generated \$341 million dollars in output, \$153 million dollars in personal income, and 5,200 jobs in the state of Massachusetts.

**Keywords:** Marine Recreational Angling, Economic Impacts, Recreational Expenditures

## 1. INTRODUCTION

Saltwater anglers spend over \$2.2 billion on trip-related items to go fishing in United States (US) annually. Additionally, anglers spend \$18.2 billion on equipment and durable goods in the US annually. (Gentner et. al. 2001a). Expenditures of this magnitude generate considerable income and tax revenue and create jobs across a wide range of industries that provide goods and services directly to saltwater anglers as well as industries that supply those businesses. The flow of angler expenditures through local economies can be decomposed into three economic measures, or impacts; (1) direct impacts, (2) indirect impacts, and (3) induced impacts. Direct impacts are defined as the initial expenditure made by anglers during their fishing trip or over the course of a year. Indirect impacts are generated as the directly impacted retail and service sectors pay operating expenditures and purchase fishing supplies from wholesale trade businesses and manufacturers. These secondary industries must then, in turn, purchase additional supplies and this cycle of industry-to-industry purchasing continues until the amount remaining within the region of interest is negligible. Finally, induced impacts result when employees of the direct and indirect sectors make purchases from retailers and service establishments in the normal course of household consumption. The summation of direct, indirect, and induced impacts is the total economic impact of an activity.

The ability to recognize and assess the financial contributions of recreational fishing activities to communities and fishery dependent and independent businesses is important for several reasons. First, as the need for recreational management measures continues to intensify in the US, it has become increasingly important for state and federal regulators to determine how management actions will affect revenues, incomes, employment, and taxes. In fact, enumeration and minimization of adverse economic impacts of policies is mandated by legislation. Secondly, these figures provide state resource management agencies with the ability to identify infrastructure that is directly and indirectly linked to angler expenditures and to use these figures to justify public infrastructure improvements. Lastly, estimates of economic impacts are useful to private individuals interested in locating a recreational fishing dependent business in a local community.

In 1998, the National Marine Fisheries Service (NMFS) began a series of surveys in the coastal regions of the United States. NMFS conducted surveys in the Northeast Region (NE) in 1998, in the Southeast Region (SE) in 1999, and in the Pacific Region (PAC) in 2000 to evaluate recreational fishing expenditures and the financial effects generated from these expenditures in each region, and for the US as a whole. A separate publication for each region (Steinback and Gentner, 2001, Gentner et al, 2001a and Gentner et al, 2001b) summarized the results of the surveys and provided state-level estimates of expenditures by marine recreational fishermen in the three regions. In this report,

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<sup>1</sup> Mention of trade names does not indicate endorsement of goods by the National Marine Fisheries Service.

estimates from these three publications are used to assess the total financial effects attributable to anglers= saltwater expenditures in Massachusetts, a state in the NE US. This document will not enumerate all economic impacts results by state due to space limitations and because the estimation procedure is not yet complete for other regions. The reader is encouraged to check the NMFS economic publications website at <http://www.st.nmfs.gov/st1/econ/pubs.html> for the final document that will detail economic impacts for all coastal US states. The report should be available in late 2002 or early 2003.

## 2. METHODOLOGY

An input-output model was used to estimate the total financial effects attributable to marine recreational fishing in the US. Input-output modeling is an approach commonly used to describe the structure and interactions of businesses in a regional economy. Input-output models track the amount and location of expenditures by anglers backwards through retailers, transporters, wholesalers, manufacturers and their employees. Input-output assessments reveal how anglers= expenditures affect the overall economic activity in a particular region in terms of output, income, employment, and taxes. For a comprehensive description of the input-output modeling technique see Miller and Blair (1985). In the analysis presented here, a ready-made regional input-output modeling system called IMPLAN (Impact analysis for Planning) was used to determine the economic importance of marine recreational fishing to each coastal state in the US. The IMPLAN system is a widely used, nationally recognized tool, that provides detailed purchasing information for 528 industrial sectors and a user-friendly media for customizing input-output models to specific applications (Minnesota IMPLAN Group, Inc. 1997). The original IMPLAN system was designed in 1976 to assist the USDA Forest Service with resource management planning. It was modified in 1996 by the Minnesota IMPLAN Group, Inc. (1997) and can now be used to generate the economic effects resulting from other activities, including recreational fishing (see Steinback 1999).

### 2.1. Angler Expenditures

Angler expenditures in the US by state for marine fishing were obtained directly from three publications (Steinback and Gentner, 2001, Gentner et al, 2001a and Gentner et al, 2001b). These expenditure data were produced from an extensive survey of marine recreational fishermen in the NE in 1998, SE in 1999, and PAC in 2000. The surveys were conducted as part of the NMFS Marine Recreational Fisheries Statistics Survey (MRFSS). The MRFSS has collected data to estimate fishing effort, participation, and finfish catch by marine anglers in the US since 1979 (Gentner and Lowther, 2002). Statistical procedures were developed to account for sampling and avidity biases, and total expense estimates were provided for all expenditure items by state and resident type. Expenditure categories estimated included trip-related goods (food, lodging, travel costs, boat fuel, party/charter fees, access or boat launching fees, equipment rental, bait, and ice), fishing equipment and semi-durable items (rods, reels, lines, tackle, magazines, club dues, special fishing clothing, camping gear, binoculars, and taxidermy), and durable goods (motor boats and accessories, non-motorized boats, boating electronics, mooring, boat storage, boat insurance and vehicles or second homes used primarily for marine angling).

Angler expenditures were analyzed separately for residents and non-residents for each of the coastal states in the US for a number of reasons. Spending by residents on marine recreational fishing generally affects the amount of money available to spend on other leisure-related activities within a state. As such, a decrease in resident expenditures on angling, *ceteris paribus*, would likely shift disposable income to other leisure sectors resulting in little overall net change to output, income, employment, and taxes within a state. Although the overall net change may approach zero, resident angling supports specific jobs that would not otherwise exist. Thus, it still is important to state resource management agencies and public officials to identify the industries that would be directly and indirectly impacted by changes in resident angler expenditures. On the other hand, non-resident angler spending is considered "new" money and contributes to an overall net increase in total output, income, employment, and taxes for the region.

Several of the expenditure items estimated for Massachusetts (Steinback and Gentner, 2001) were modified to more accurately characterize the actual purchasing activities of the anglers. For each state, the food expenditure estimate was partitioned into restaurant and grocery expenditures according to the following proportions; 68% for retail grocery and 32% for restaurants (American Sportfishing Association; A. J. Fedler personal communication 1999). Using data from the U.S. Department of Labor Consumer Expenditure Survey, boat (motorized and non-motorized) expenditures were split into purchases made for new boats and used boats (CES 1998). Additionally, CES data were used to separate used boats purchased at the retail level and used boats purchased from private individuals. In an input-output model, payments directly from one household to another do not generate any economic impacts as they don't generate any additional economic activity beyond the transfer of funds. The same procedure was used for the purchase of fishing vehicles and vacation homes, except the data for vacation homes came from the U.S. Census Bureau State and Metropolitan Data Book (SMDB 1998). For vacation homes, sales of used or existing homes produce impacts in the form of real estate commissions, loan fees, and state property taxes, but do not generate new construction impacts. Real estate commissions were estimated for both types of vacation home purchases (new

and existing) and were assumed to be 6% of total expenditures. Fees for home loans, boat loans, and vehicle loans that accrue to the banking and credit industries were assumed to be 2% of the principal divided by the average loan length (25 years for homes; 6.8 years for boats; and 4.4 years for vehicles as obtained from CES 1998). Finally, the average property tax rate (12.5%; CES 1998) was used to calculate total state-level property taxes generated from the purchase of vacation homes. To give some perspective, Massachusetts has the sixth highest expenditures in the US with \$846 million in total expenditures. The top five states, with total expenditures in parentheses, are Florida (\$8.4 billion), California (\$2.5 billion), North Carolina (\$1.6 billion), Washington (\$1.4 billion), and Louisiana (\$1.2 billion).

## 2.2. Economic Impact Assessment

The financial effects of angler expenditures were estimated by applying the total adjusted expense estimates to the appropriate IMPLAN sector multipliers in each state. The multipliers measure the direct, indirect, and induced relationships between industries and households. Input-output models require all values to be in producer prices (manufacturer prices) so each of the angler expenditure categories was associated with its corresponding IMPLAN producing sector. In IMPLAN, margins are used to convert the retail-level prices paid by anglers into the appropriate producer values. Margins ensure that the correct value is assigned to products as they move from producers, to wholesalers, through the transportation sectors, and finally on to retail establishments.

To assign all of the angler expenditure categories to their appropriate IMPLAN producing sector, several of the IMPLAN sectors were combined into single sectors. This was necessary because some of the angler expenditure categories contained in Steinback and Gentner (2001), and subsequent reports did not match the IMPLAN sectoring scheme exactly. For example, the camping equipment expenditures are associated with three IMPLAN producing sectors (textile bags, canvas products, and fabricated textile products). Because the survey did not collect the information necessary to disaggregate this expenditure category, these IMPLAN sectors were combined into a single sector by summing the values associated with each industry prior to generating the multipliers. Potential measurement error is introduced by aggregating the IMPLAN sectors in this manner. When sectors are aggregated, their production functions are changed to reflect the average across the aggregated sectors. This will change the multipliers. For industries that use similar inputs and produce similar outputs in similar proportions, the bias is slight. For more information about the potential biases associated with aggregation, readers are referred to the IMPLAN Professional User's Guide (Minnesota IMPLAN Group, Inc. 1997).

Initially, a lack of detail on food purchases by anglers prevented the conversion of expenditures to producer values for expenditures on groceries and at restaurants. There are approximately 50 IMPLAN food processing and agricultural producing sectors that represent the average grocery-shopping list. Instead of aggregating all of these sectors together or making subjective judgments regarding what products anglers purchased, possibly introducing considerable bias into the input-output model, only the economic impact of the retail margins accruing to the grocery and restaurant sectors were estimated initially. The average estimated margins associated with grocery stores and restaurants are 26% and 65%, respectively (U.S. Bureau of the Census 1997). This procedure ignores the effects attributable to manufacturing, wholesaling, and transportation of the retail product, underestimating the economic impact that would be generated by the purchase of food products from farmers and manufacturers within the state.

It has been recently brought to the authors' attention that IMPLAN contains a vector representing average grocery purchases developed from national average expenditures. Before the final expenditure estimates are published, the impacts will be re-estimated to reflect this additional information. This change will result in larger impacts from food purchases. Additionally, while most consider restaurants to be a service industry, they add value to processed food products and, as such, IMPLAN treats them as an industry. As a result, the final expenditure estimates will apply the entire 32% of food expenditures to the restaurant sector instead of only applying the margin, as was done in estimates below. This change will also increase impacts.

IMPLAN estimates economic impacts in terms of output, incomes, taxes, and employment. Output reflects total production in dollars generated from expenditures by anglers in each state. This includes sales plus or minus inventory changes. Income represents wages, salaries, benefits, and proprietary income generated from angler expenditures. Employment includes both full-time and part-time workers and is expressed as total jobs. Finally, taxes denote the income received by federal and state/local governments. Direct, indirect, and induced effects associated with angler expenditures were estimated for non-residents and residents for each of the coastal states in the US. As discussed above, however, spending by resident anglers on any recreation-related activity, such as fishing, is internalized in an input-output model. Therefore, resident expenditures for fishing were removed from the state-level models prior to constructing multipliers to avoid overestimating impacts. This technique enabled the contribution of angler expenditures by residents to be modeled in the same manner as non-residents.

## 3. RESULTS

Model results are summarized in six figures for the state of Massachusetts. The first figure shows the total economic impacts attributable to recreational fishing by resident status (Figure 1). The figure shows the direct, indirect and induced impacts on output, income and employment for residents and non-residents. The separate contributions

of each of the expenditure categories detailed in this study are presented in Figure 2, 3, and 4. Each figure is divided into impacts from trip expenditures and impacts from equipment and durable expenditures. Figure 2 details the total output generated, Figure 3 details the total income generated, and Figure 4 details the total number of jobs created. Figure 5 breaks down the total trip expenditure impacts by mode. These calculations exclude the impacts of fishing equipment purchases and other durable items that could be used for multiple trips since they cannot be linked to a particular mode of fishing. Figure 6 details the revenue received by federal and state/local governments from angler purchases. These estimates are based on data available in IMPLAN=s social accounting matrix which tracks the monetary flows between industries and institutions. The rows of the figure depict the institution receiving the tax as well as the type of tax being paid, while the columns represent the institutions making the tax payments. Public officials and other interested readers concerned with the appropriate interpretation and use of these estimates are encouraged to review IMPLAN=s method for producing tax estimates in Olson (1999).

Resident status	Impact expenditures	Impacts			
		Direct	Indirect	Induced	Total
<b>Output (thousands of dollars)</b>					
Resident	779,139	181,496	37,086	62,236	280,818
Non-resident	66,096	38,588	8,687	13,345	60,620
Total	845,235	220,084	45,773	75,581	341,438
<b>Income (thousands of dollars)</b>					
Resident	779,139	85,295	15,458	25,017	125,770
Non-resident	66,096	17,948	3,665	5,367	26,980
Total	845,235	103,243	19,123	30,384	152,750
<b>Employment (# of jobs)</b>					
Resident	779,139	3,114	362	751	4,227
Non-resident	66,096	733	84	162	979
Total	845,235	3,847	446	913	5,206

Figure 1. Preliminary Massachusetts total economic impacts.

Resident impacts are approximately 2 to 5 times greater than nonresident impacts. For example, the \$779.1 million spent by resident anglers in 1998 generated a total of \$280.8 million in output as follows: \$181.5 million in output for the direct sectors (\$597.6 million was transferred to out-of-state producers of goods and services as imports), \$37.1 million in output for the indirect sectors, and \$62.2 million in output from households purchasing goods and services (induced impacts; Figure 2). Non-resident expenditures resulted in an additional \$38.6 million in output directly, \$8.7 million in indirect sales, and \$13.3 million in induced sales. The personal income generated from recreational fishing expenditures by residents was also considerably higher than for non-residents. Resident expenditures generated a total of \$125.8 million in personal income for the state, while non-resident anglers generated about \$27 million in personal income. In terms of employment, approximately 4,227 jobs were dependent upon resident expenditures and 979 jobs on non-resident expenditures in the state. The disparity between resident and nonresident impacts is generally due to higher overall effort and hence expenditures by residents. Although average expenditures were similar between residents and non-residents in most NE states in 1998, resident participants outnumbered non-residents by almost 2 to 1 and fished over 3 times as many days as non-residents (Steinback and Gentner 2001).

While the New Jersey impact estimates are not included in this report, an interesting issue emerges. Massachusetts has much higher total expenditures than New Jersey with \$687 million dollars in expenditures. But because New Jersey has far more manufacturing, and oil refining in particular, New Jersey total impacts surpass Massachusetts's total impacts. For instance, New Jersey's lower expenditures generate almost \$100 million more in total output, almost \$25 million more in income, and almost 700 more jobs, making New Jersey the state with the largest economic impacts in the Northeastern US. Many of the dollars spent in each NE coastal state actually impacted the economies of other states and countries as imports. Of the \$845.2 million spent by resident and non-resident anglers in Massachusetts, only \$220.1 million (26%) directly affected the Massachusetts economy (Figure 1); \$625.1 million in goods and services were imported into the state in response to angler demands. Thus, on average, only about 26 cents

Expenditure category	Impact expenditures	Impacts			
		Direct	Indirect	Induced	Total
<b>(thousands of dollars)</b>					
Food					
Groceries	31,844	8,279	925	3,049	12,253
Restaurants	14,985	9,741	3,064	3,087	15,892

Private Transportation	12,339	3,864	832	1,300	5,996
Lodging	14,159	14,159	4,246	4,767	23,172
Public Transportation	4,856	4,856	1,340	1,858	8,054
Boat Fuel	22,981	7,204	1,552	2,423	11,179
Party/Charter Fee	5,916	5,916	1,816	1,968	9,700
Access/Boat Launching	7,504	7,504	2,305	2,497	12,306
Equipment Rental	1,237	1,237	379	412	2,028
Bait	16,822	6,137	1,092	2,076	9,305
Ice	3,261	2,314	558	845	3,717
<b>Total Trip Expenditures</b>	<b>135,904</b>	<b>71,211</b>	<b>18,109</b>	<b>24,282</b>	<b>113,602</b>
Rods & Reels	98,282	53,353	9,217	18,429	80,999
Tackle & Gear	39,881	21,663	3,742	7,483	32,888
Camping Equipment	6,520	4,772	1,048	1,518	7,338
Binoculars	1,612	1,262	306	436	2,004
Fishing Clothing	6,814	3,762	993	1,209	5,964
Processing/Taxidermy	211	211	70	65	346
Magazines	3,265	1,591	328	531	2,450
Club Dues	3,616	3,616	1,540	1,417	6,573
Boat Expenses	4,340	4,340	1,391	1,454	7,185
New Motor Boat	101,641	17,403	2,707	6,142	26,252
New Nonmotor boat	751	129	20	45	194
Used Boats	261,735	5,303	643	1,924	7,870
Electronics	6,228	5,494	1,596	1,790	8,880
New Fishing Vehicle	64,117	17,742	2,987	5,980	26,709
Used Fishing Vehicle	108,938	7,122	863	2,585	10,570
Vacation Home	324	54	23	13	90
Fees for Vehicle Loans	446	446	82	114	642
Fees for Boat Loans	550	550	102	141	793
Fees for Home Loans	0	0	0	0	0
Property Taxes for all Vacation Homes	41	41	0	20	61
Real Estate Commission	19	19	6	3	28
<b>Total Annual Expenditures</b>	<b>709,331</b>	<b>148,873</b>	<b>27,664</b>	<b>51,299</b>	<b>227,836</b>
<b>Total All Activity</b>	<b>845,235</b>	<b>220,084</b>	<b>45,773</b>	<b>75,581</b>	<b>341,438</b>

Figure 2. Preliminary Massachusetts total output impacts.

of every dollar spent in Massachusetts by recreational fishermen remained within the state in 1998. In comparison, 46 cents of every dollar spent in New Jersey stays within the state. The majority of this difference can be attributed to angler purchases of boat fuel and gasoline for their automobiles. Refineries and distributors operating within the state supplied approximately 87% of the gasoline purchased in New Jersey. In Massachusetts, however, there are very few petroleum refineries so this percentage fell to about 30%. Thus, the actual effect of angler expenditures on a state's economy depends upon the level of imports necessary to supply the goods and services anglers purchase.

Expenditure category	Impact expenditures	Impacts			
		Direct	Indirect	Induced	Total
<b>(thousands of dollars)</b>					
Food					
Groceries	31,844	4,549	373	1,225	6,147
Restaurants	14,985	3,898	1,106	1,241	6,245
Private Transportation	12,339	1,740	369	523	2,632
Lodging	14,159	5,922	1,795	1,917	9,634
Public Transportation	4,856	2,388	620	747	3,755
Boat Fuel	22,981	3,245	688	975	4,908
Party/Charter Fee	5,916	2,400	779	791	3,970
Access/Boat Launching	7,504	3,044	988	1,004	5,036

Equipment Rental	1,237	501	162	166	829
Bait	16,822	2,890	471	834	4,195
Ice	3,261	1,155	216	340	1,711
<b>Total Trip Expenditures</b>	<b>135,904</b>	<b>31,732</b>	<b>7,567</b>	<b>9,763</b>	<b>49,062</b>
Rods & Reels	98,282	26,010	3,827	7,409	37,246
Tackle & Gear	39,881	10,561	1,554	3,008	15,123
Camping Equipment	6,520	2,045	413	610	3,068
Binoculars	1,612	577	129	175	881
Fishing Clothing	6,814	1,585	375	486	2,446
Processing/Taxidermy	211	77	28	26	131
Magazines	3,265	724	135	213	1,072
Club Dues	3,616	1,666	620	569	2,855
Boat Expenses	4,340	1,560	798	585	2,943
New Motor Boat	101,641	8,850	1,099	2,469	12,418
New Nonmotor boat	751	65	8	18	91
Used Boats	261,735	2,857	260	774	3,891
Electronics	6,228	2,257	644	719	3,620
New Fishing Vehicle	64,117	8,479	1,209	2,404	12,092
Used Fishing Vehicle	108,938	3,838	348	1,039	5,225
New Vacation Home	324	12	9	5	26
Fees for Vehicle Loans	446	141	44	46	231
Fees for Boat Loans	550	173	54	57	284
Fees for Home Loans	0	0	0	0	0
Property Taxes for all Vacation Homes	41	32	0	8	40
Real Estate Commission	19	2	2	1	5
<b>Total Annual Expenditures</b>	<b>709,331</b>	<b>71,511</b>	<b>11,556</b>	<b>20,621</b>	<b>103,688</b>
<b>Total All Activity</b>	<b>845,235</b>	<b>103,243</b>	<b>19,123</b>	<b>30,384</b>	<b>152,750</b>

Figure 3. Preliminary Massachusetts total income impacts.

Figures 2, 3, and 4 depict the separate contributions of each of the expenditure categories for Massachusetts. Expenditures for rods and reels was the single most important expense category in terms of generating output, income, and employment in each NE state except in New Hampshire and Delaware. For example in Massachusetts, rod and reel expenditures generated almost \$81 million in output, \$37.2 million in income, and approximately 1,138 jobs. Lodging also contributed significant output, income, and employment impacts to all of the NE states, as did boat fuel purchases, private transportation expenses, and sales of tackle and gear. A substantial portion of the items purchased by anglers, however, were imported into each state, as a result, many of the impacts generated by these purchases were transferred to other states and countries. The amount lost to other regions can be calculated from the difference between total expenditures and direct impacts in Figure 2. For instance, of the \$23 million spent on boat fuel by anglers in Massachusetts only \$7.2 million stayed within the Massachusetts economy (Figure 2) and \$15.8 million was transferred to out-of-state refineries of petroleum products. Of the 32 expenditure categories analyzed in this study, 19 involved imports while within the 13 remaining categories, 100% of the initial expenditures remained within the state. These 13 sectors provide services and as such are not subject to imports.

Expenditure Category	Impact expenditures	Impacts			Total
		Direct	Indirect	Induced	
Food		(# of jobs)			
Groceries	31,844	191	9	37	237
Restaurants	14,985	250	28	37	315
Private Transportation	12,339	42	8	16	66
Lodging	14,159	224	47	57	328
Public Transportation	4,856	86	12	23	121
Boat Fuel	22,981	77	15	29	121
Party/Charter Fee	5,916	252	18	24	294
Access/Boat Launching	7,504	320	24	30	374

Equipment Rental	1,237	53	4	5	62
Bait	16,822	80	11	25	116
Ice	3,261	35	5	10	50
<b>Total Trip Expenditures</b>	<b>135,904</b>	<b>1,610</b>	<b>181</b>	<b>293</b>	<b>2,084</b>
Rods & Reels	98,282	828	87	223	1138
Tackle & Gear	39,881	336	36	91	463
Camping Equipment	6,520	68	10	18	96
Binoculars	1,612	19	3	5	27
Fishing Clothing	6,814	64	9	15	88
Processing/Taxidermy	211	3	1	1	5
Magazines	3,265	25	3	6	34
Club Dues	3,616	132	16	17	165
Boat Expenses	4,340	25	18	18	61
New Motor Boat	101,641	244	25	74	343
New Nonmotor boat	751	2	0	1	3
Used Boats	261,735	83	6	23	112
Electronics	6,228	55	13	22	90
New Fishing Vehicle	64,117	236	28	72	336
Used Fishing Vehicle	108,938	110	8	31	149
New Vacation Home	324	0	0	0	0
Fees for Vehicle Loans	446	3	1	1	5
Fees for Boat Loans	550	3	1	2	6
Fees for Home Loans	0	0	0	0	0
Property Taxes for all Vacation Homes	41	1	0	0	1
Real Estate Commission	19	0	0	0	0
<b>Total Annual Expenditures</b>	<b>709,331</b>	<b>2,237</b>	<b>265</b>	<b>620</b>	<b>3,122</b>
<b>Total All Activity</b>	<b>845,235</b>	<b>3,847</b>	<b>446</b>	<b>913</b>	<b>5,206</b>

Figure 4. Preliminary Massachusetts total employment impacts.

The impacts of trip expenditures by anglers fishing from private boats and from the shore were generally higher than those produced by party/charter boat fishing in all of the NE coastal states. Across all states, the output, income, and employment impacts created by party/charter boat fishing and private/rentalboat fishing were the highest in New Jersey, while the impacts generated from shore fishing were the highest in Massachusetts (Figure 5). Overall, angler trip expenditures in New Jersey generated more output, income, and employment impacts than any of the other NE coastal states, again because New Jersey imports fewer goods.

Figure 6 shows the revenue received by federal and state/local governments from angler purchases. Federal taxes generated by angler purchases ranged from \$4.6 million in New Hampshire to \$52.2 million in New Jersey. Revenue received by state/local governments varied from \$3.0 million in New Hampshire to a high of \$37.7 million in Massachusetts (Figure 6). In total, angler expenditures in New Jersey generated the highest tax revenues of all the NE coastal states (\$89.0 million).

Mode and resident status	Total trip expenditures	Impacts		
		Output	Income	Employment
		(thousand of dollars)		(# of jobs)
<b>Party boat</b>				
Resident	6,370	8,345	3,466	230
Non-resident	4,314	5,641	2,349	142
Total	10,684	13,986	5,815	372
<b>Private boat</b>				
Resident	60,714	43,518	18,830	800
Non-resident	12,678	9,847	4,292	166
Total	73,392	53,365	23,122	966
<b>Shore</b>				
Resident	34,111	26,806	11,614	435

Non-resident	17,717	19,366	8,501	308
Total	51,828	46,172	20,115	743
<b>All Modes</b>				
Resident	101,195	78,669	33,910	1,465
Non-resident	34,709	34,854	15,142	616
Total	135,904	113,523	49,052	2,081

Figure 5. Preliminary Massachusetts total economic impacts of trip expenditures by mode and resident status.

#### 4. DISCUSSION

Overall, the state-level impact numbers found in this analysis are lower than estimates supplied in previous studies conducted in the NE (see Maharaj and Carpenter 1998; and Storey and Allen 1993). Maharaj and Carpenter (1998) generated estimates for all 50 states in the US, while Storey and Allen (1993) focused on an individual state, Massachusetts. Both studies combined marine angler expenditure data with an input-output model, but neither used IMPLAN to analyze the impacts. Maharaj and Carpenter (1998) estimated the total economic impacts generated from angler expenditures in each state, but these estimates appear to include impacts that accrue to other regions through domestic and foreign imports. The methodology section in Maharaj and Carpenter (1998) makes no reference to imports and it appears that total expenditures were used as the direct impacts without accounting for imports. This definition results in inflated estimates of direct impacts for all expenditure items that require some level of imports to satisfy angler demands. In other words, direct impacts are only equivalent to expenditures if no imports are required to satisfy demand. Of the 32 expenditure items purchased by anglers in this study, only 13 were supplied to anglers without requiring imports. The estimates shown in this paper reflect only those impacts that remain within a given state.

Storey and Allen (1993) accounted for the effects of imports on local supply in Massachusetts. However, the methods and assumptions used in constructing several components of the input-output model (e.g., production functions and margins) varied considerably from those employed within the IMPLAN system. In addition, Storey and Allen (1993) use the standard type II multiplier to estimate the induced effects of angler expenditures. This procedure assumes that all household income is spent within the state of Massachusetts and that income and consumption are linearly related; that is, when income increases/decreases consumption increases/decreases proportionately. If household income is being spent outside the state or the marginal propensity to consume is not constant, then the type II multiplier will be overstated. The estimates shown in this study were based on type III multipliers which use information about inter-institutional transfers from IMPLAN's social accounting matrix to account for leakage of household income out of the region, and also employs a nonlinear consumption function that allows the marginal propensity to consume to decrease as income rises (see Minnesota IMPLAN Group, Inc. 1997).

Total economic impacts in the US cannot be calculated by summing the estimates across states. This procedure would underestimate total US impacts because as you aggregate upwards spatially, the level of imports falls. That is, as the analysis region grows, the number of goods that are completely supplied within the region goes up. In order to capture the total economic effects that occurred in the US, it would be necessary to create an aggregate input-output model that encompasses all US states. A US model is planned, and, once completed, it will provide an interesting comparison to Maharaj and Carpenter's (1998) US level results. It is likely that these two estimates will be closer to one another than the state level results presented here. Additionally, once the changes have been made to the grocery and restaurant impact estimates, the impacts presented here will rise, reducing further the differences between these studies.

	Employee Compensation	Proprietary Income	Household Expenditures	Enterprises (Corporations)	Indirect Business Taxes	Total
<b>Enterprises (Corporations)</b>						
Transfers	62,217					62,217
<b>Total</b>	62,217	0	0	0	0	62,217
<b>Federal Government Non-Defense</b>						
Corporate Profits Tax				5,676,585		5,676,585
Indirect Business Tax						
Custom Duty					1,314,959	1,314,959
Excise Taxes					4,126,019	4,126,019
Federal NonTaxes					1,033,182	1,033,182
Estate and Gift Tax						0
Income Tax			18,890,621			18,890,621
Fines and Fees			138,039			138,039



Social Insurance Tax							
Employee Contribution	7,917,830	778,293					8,696,123
Employer Contribution	8,305,630						8,305,630
<b>Total</b>	<b>16,223,460</b>	<b>778,293</b>	<b>19,028,660</b>	<b>5,676,585</b>	<b>6,474,160</b>	<b>48,181,158</b>	
<b>State/Local Government Non-Education</b>							
Corporate Profits Tax				1,334,532			1,334,532
Dividends				7,448			7,448
Indirect Business Tax							
Motor Vehicle Lic					227,510		227,510
Other Taxes					795,230		795,230
Property Tax					17,162,367		17,162,367
State/Local NonTaxes					431,306		431,306
Sales Tax					10,652,569		10,652,569
Personal Tax							
Estate and Gift Tax							0
Income Tax			5,900,911				5,900,911
Motor Vehicle License			149,703				149,703
Fines and Fees			633,851				633,851
Other Licenses			9,999				9,999
Property Taxes			97,339				97,339
Social Insurance Tax							
Employee Contribution	54,949						54,949
Employer Contribution	250,322						250,322
<b>Total</b>	<b>305,271</b>	<b>0</b>	<b>6,791,803</b>	<b>1,341,980</b>	<b>29,268,982</b>	<b>37,708,036</b>	
	<b>16,590,948</b>	<b>778,293</b>	<b>25,820,463</b>	<b>7,018,565</b>	<b>35,743,142</b>	<b>85,951,411</b>	

Figure 6. Preliminary federal and state tax impacts in Massachusetts.

The effect of proposed management measures on the output, income, employment, and taxes generated from angler expenditures depends upon the sensitivity of the affected anglers to the regulations. If management restrictions result in a decrease in the overall number of recreational fishing trips, thereby lowering anglers= total expenditures, there will be a reduction in the sales, service, and manufacturing sectors associated with recreational fishing expenses. In conjunction with the appropriate demand models, these reductions could be estimated from the input-output models developed in this study. Unfortunately, the absolute magnitude of change in demand is difficult to predict since very little information is available to empirically estimate how sensitive the affected anglers might be to the proposed regulations. Clearly, however, there are many businesses directly or indirectly dependent upon recreational fishing expenditures and an attempt should be made to identify these needs when evaluating management alternatives that have the potential to reduce recreational fishing effort. In the absence of appropriate demand models, sensitivity evaluations could be conducted with the models developed in this study to show the potential effects of management actions on output, income, employment, and taxes.

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