



# Socioeconomics News

Newsletter of the Socioeconomics Section of the American Fisheries Society

Fall 2002

## Officers

### President

John Whitehead  
Dept. of Economics and Finance  
University of North Carolina at  
Wilmington  
(910) 962-7497  
[whiteheadj@uncw.edu](mailto:whiteheadj@uncw.edu)

### President-elect

(Vacant)

### Secretary-Treasurer

Peter Fricke  
NOAA/NMFS  
(301) 713-2338  
[peter.fricke@noaa.gov](mailto:peter.fricke@noaa.gov)

### Past President

Ray Rhodes  
South Carolina Dept. of Natural  
Resources  
(843) 762-5040  
[rhodes@mrd.dnr.state.sc.us](mailto:rhodes@mrd.dnr.state.sc.us)

### Newsletter Editor

Herb Holloway  
La. Dept. of Wildlife and Fisheries  
(225) 765-2605  
[holloway\\_ha@wlf.state.la.us](mailto:holloway_ha@wlf.state.la.us)

## CONTENTS

*From the President's Desk.....1*  
*SE Section Web Page.....2*  
*Call for Newsletter Essays.....2*  
*SE Section Minutes.....3*  
*Call for Papers.....6*  
*New Book Release from AFS.....7*  
*Contributed Paper (Brad Gentner)....7*

## From the President's Desk

### Greetings!

The Socioeconomics section is in good health, both in terms of finances and membership. Our bank balance continues to grow and we are even contemplating spending some of the money (!) on worthy endeavors. Our membership has grown by over 10% during the past year. We remain small (114) and do not have a vote on the AFS Governing Board, but we have the critical mass necessary to make important contributions to AFS.

While we have critical mass, we need to increase our membership. A larger membership would increase socioeconomic participation at the meetings, improve communication between socioeconomic-types and fisheries scientists, and improve the section's finances. No big membership drive is planned -- my only plan of action to address the membership issue is to make the Socioeconomics Section as visible as possible. Also, please remember to check the \$5 box to renew your section membership this coming year. And when appropriate, please ask your colleagues and students to become members.

The 2002-03 section officers are John Whitehead (President), Ray Rhodes (Past President), and Peter Fricke (Secretary-Treasurer). Herb Holloway will continue as newsletter editor. In case you didn't notice, we have no president-elect for 2002-03. We are looking for a non-economist to fill this position (for whatever reason, economists have been president for quite some time now). If you are interested, or would like to nominate someone, **please submit nominations for president-elect to Ray Rhodes by October 27, 2002.**

The Socioeconomics section has been busy this past year and has plans for another busy year. The 2002 Annual Meeting included the revised version of the workshop "Fisheries Economics for Non-Economists." Ray Rhodes and myself conducted the workshop which attracted 15 students. Ray Rhodes and Geoffry Habron organized the symposium "Socioeconomic Aspects of Fishery and Aquatic Habitat Management and Restoration." Despite several last minute cancellations the symposium was judged a success.

A committee of members has been working on the update to AFS Special Publication 24 *Investigation and Valuation of Fish Kills*. The final product is expected within the next twelve months. We hope to have a workshop and symposium focusing on this work at the 2004 Annual Meeting in Madison.

This year the AFS Southern Division is having its Spring Meeting in Wilmington, North Carolina, February 12-16. I'm taking advantage of the location to organize a

*From the President's Desk – cont.*

symposium sponsored by the section. The call for papers is located elsewhere in this newsletter. Please plan to participate if you are interested. Also, please pass the call for papers on to anyone you think may be interested.

The Socioeconomics Section plans to have a presence at the 2003 Annual Meeting in Quebec. Ray Rhodes is leading the effort to present the first annual Weithman Award for the best student paper in socioeconomics at the AFS Annual Meeting. This award is presented by the Socioeconomics Section jointly with the Missouri Chapter. Look for details in the Spring 2003 newsletter. We are planning a symposium focused on a few important topics – marine protected areas, tribal and indigenous fisheries, harvesting capacity and ecosystem management. We are also planning a poster session.

Finally, thanks to Ray Rhodes for serving as president from 2000-2002 and Peter Fricke for serving as Secretary-Treasury for at least as long as I've been a section member. Both Ray and Peter were honored with plaques at the 2002 business meeting.

I look forward to working with you this coming year. Please share any ideas or concerns that you may have with me at any time.

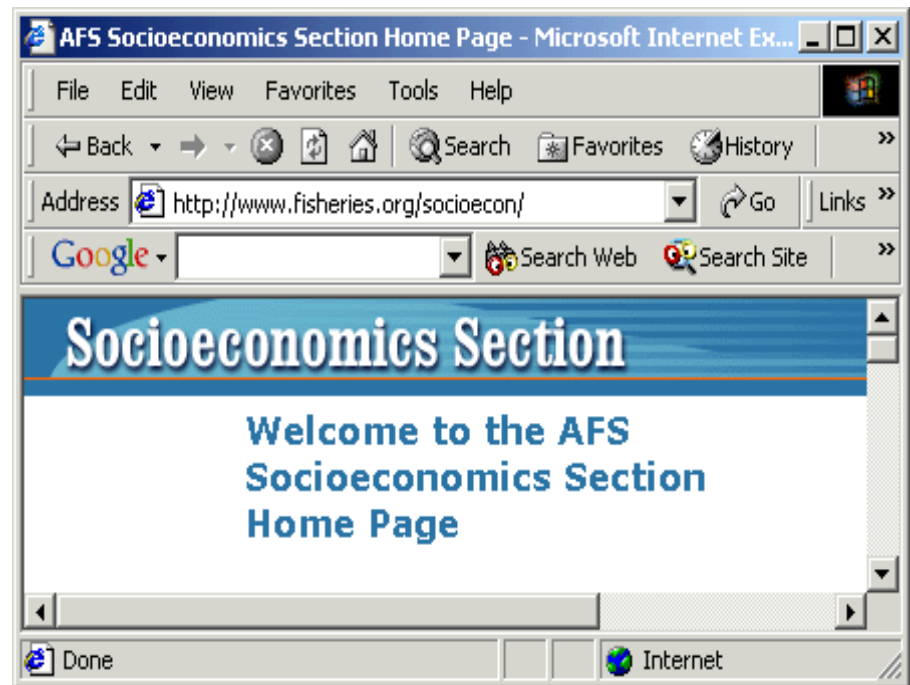
*John Whitehead*

*Section Web Page*

The AFS Socioeconomics Section Web Page was designed by Chuck Adams (thanks Chuck!) and has recently been updated and linked to the AFS webpage.

At <http://www.fisheries.org>, left click your mouse on the “About AFS” link in the left hand column, then on “Committees/Units.” Once you are on the Committees/Units page scroll down to “Sections” and click again. You should then find the “Socioeconomic” link to our page. Or, go directly to <http://www.fisheries.org/socioecon>.

Check the web page for information on Calls for Papers, Symposia, Workshops, SP-24, and other information of relevance to Section members.

*Call for Newsletter Essays*

With the move to an electronic newsletter (slated for publication twice each year ... at least when there is enough material), there is space available for publication of your topical essays, short research reports, or book reviews related to the socioeconomic aspects of fisheries. If you would like to submit essays, reports, or reviews for the newsletter please send it via e-mail to John Whitehead at [whiteheadj@uncw.edu](mailto:whiteheadj@uncw.edu). There is no length requirement or constraint, however, a typical length might be between 1000 and 2000 words.

## *Section Minutes*

### American Fisheries Society Socioeconomics Section

#### Draft Minutes of the Annual Business Meeting Baltimore, MD; August 18, 2002

**Call to Order:** President Ray Rhodes called the meeting to order at 5:10 pm in the Calvert Room of the Baltimore Hyatt Regency Hotel. There were fourteen members present. Apologies for absence were received from Courtland Smith, Vishwanie Maharaj, James Acheson, Roger Correy, Herb Holloway and Michael Weber.

**Minutes of the 2001 Annual Business Meeting:** The draft minutes, of the meeting held in Phoenix, AZ, were presented by Secretary-Treasurer Peter Fricke. Copies had been e-mailed to Section members and were available for those present. There being no questions, **Wayne Davis** moved, and **Theo Brainerd** seconded, that the minutes be adopted. This motion was approved unanimously.

**Treasurer's Report:** Secretary-Treasurer Fricke reported that the Section was financially healthy with funds of \$7,558.80 in the Section's bank account on July 31, 2002. The balance in hand had grown by \$739.46 since August 1, 2001. Our only expenses had been \$68 for the mail ballots sent to members in September, 2001. Membership dues had brought in \$560.00, and the account had earned \$247.46 in interest during the year. **John Whitehead** moved, and **Geoffrey Habron** seconded, that the Treasurer's Report be approved. This motion was approved unanimously.

**Newsletter Editor's Report:** In the absence of Herb Holloway, President Rhodes reported that the last issue of the Newsletter had been published in May, 2001. The editor, Herb Holloway, had not received sufficient news-worthy items or articles from members for a newsletter, and thus he had circulated information during 2002 by e-mail as he received it.

#### Old Business:

**1. Status of the Student Award (A. Stephen Weithman, Jr Award):** The award, of \$150, is offered jointly with the Missouri Chapter for the best student paper in socio-economics presented at the AFS Annual Meeting. The award was approved by the AFS Board at its August, 2001 meeting. President Rhodes reported that the award was not being offered in 2002 because there had been no time to set up the process and advertise the award. President Rhodes indicated that he planned to complete the work soon, and the award would be advertised with the call for papers for the meeting in Quebec in 2003.

**2. Monetary Valuation of Fish Kills Working Group:** The Section's steering committee on the revision of AFS Special Publication 24 (SP-24) is Ray Rhodes (SC DNR), Herb Holloway (LDWF), Richard Christian (USFWS Hatcheries) and Gary Whelan (MI DNR). SP-24 is the source of fish costs used by a majority of states for assigning and recovering restitution after fish kills, and is the primary source of data for investigation of all kills not covered by the federal Natural Resource Damage Assessment guidelines. SP-24 was originally published in 1974, was revised and re-issued in 1993, and is currently being revised again under a contract between AFS and the USF&WS. The work has been subcontracted to Southwick and Associates, who also prepared the second edition of SP-24.

The report also includes guidelines for investigating fish kills prepared by the AFS Southern Division's Pollution Committee. These guidelines will remain relatively unchanged in the new edition. The cost data and valuation guidelines developed by the Socioeconomics Section and Rob Southwick in 1993 need substantial revision to bring them into line with current conditions and standards, and ensure that damages and costs are correctly assessed. In addition to the guidance on replacement costs of finfish developed by the Section, the third edition of SP-24 will contain information on replacement costs of freshwater mussels. The mussel work will be done jointly with the Freshwater Mussel Conservation Society and its partners, the Illinois Department of Natural Resources and the National Fish and Wildlife Foundation.

The preliminary work for the revised edition is complete according to President Rhodes and Rob Southwick. Surveys of state hatcheries and agencies, Federal hatcheries and private hatcheries have been sent out, and follow-up work is in progress. Data collection is scheduled to end in October. Data analysis will begin once all completed surveys are received. Fish weight-length formulas will be used to fill in data gaps and to smooth any cost-curves. The final report should be complete and ready for printing in March, 2003 after extensive peer review.

Considerable discussion ensued. It was noted that the USF&WS had only funded the replacement cost portion of the proposed study, thus economic values would not be included in the study. The contractor, Southwick Associates, in its interim report urged the Socioeconomics Section to continue pursuing the valuation research and data section, and members present wanted to know how and if this could be done. The issue was referred to the steering committee with a request that they enlist the views and help of as many members as possible. It was generally agreed that a workshop and symposium should be organized for the 2004 AFS meeting, to be held in Madison, WI, to address valuation and replacement costs of fish-kills and to promote the revised report, and Wayne Davis (KY-DNR) was asked to coordinate this effort.

**3. "Fisheries Economics for Non-economists" Workshop.** John Whitehead reported that the workshop had been held earlier that day (August 18, 2002) and had been attended by fifteen people. Interest in the topic had been high and sustained, i.e. all fifteen remained awake and stayed for the full day (9 am to 4:30 pm). President Rhodes thanked Geoffrey Habron for organizing the workshop. John Whitehead thanked Ray Rhodes for helping him to teach it. The workshop was organized under the AFS Continuing Education program and was attended by fishery managers and biologists. After expenses it was noted that the Section would earn some \$700 from the workshop.

All present agreed that the workshops were a worthwhile contribution to the AFS community and that efforts should be made to present workshops at future national and regional meetings. John Whitehead was thanked for his work on this issue.

**4. Status of the Socioeconomics Symposium at the 2002 Annual Meeting.** President Rhodes reported that the Section was sponsoring five 90-minute sessions, which would be held consecutively all-day Wednesday and Thursday morning. He congratulated the members for their papers and willingness to contribute time and effort.

**5. Status and Trends of Section Membership.** Secretary-Treasurer Fricke reported that as of August 1, 2002, there were 112 members of the Section. This is an increase of 14 members since August 1, 2001, and 4 members since August 2000. He was asked whom he thought were members. He said that it was his impression that about 50 percent of the Section's present members were non-social scientists (including economists) who were fishery managers or biologists interested in social and economic issues related to fisheries. The other 50 percent were a mix of economists, anthropologists, sociologists and other social scientists working on fishery issues. This second group owed their primary allegiance to other academic disciplines and organizations; hence, their participation in AFS reflected their research and occupational interests and fluctuated over time.

**6. Increasing Section Membership.** President Rhodes asked those present to re-visit this issue, with reference to the previous year's discussion. Of the three recommendations (develop the newsletter, organize annual meeting symposia, organize regional symposia at AFS division and chapter meetings) the annual meeting symposia had been fully realized. The Newsletter had been published once during the year but the editor needed articles,

research reports, book reports, and other contributions from members to develop a thriving newsletter. No regional symposia had been developed.

There was a long discussion of this item of business. Among the issues debated was whether there should be an effort to persuade professors to involve their students in AFS, as Roger Rulifson (East Carolina University) had done. Another was to consider the quality and breadth of social science (including economics) work done by Section members and to highlight this in Section publications, reports to AFS, and in symposia. A final theme, which was not resolved, was how to get members involved in the work of the Section.

**7. Recruiting for the office of President-Elect for the coming year.** President Rhodes noted that the Section had tried to maintain a rotation of offices between economists and other social scientists, and preferably the next President-Elect should be a social scientist. President Rhodes asked those present to actively solicit and consider nominations for President-Elect, and to provide him with names as soon as possible. There would be a mail-ballot of the membership for this office. The Secretary-Treasurer was elected annually and Peter Fricke had indicated he would be willing to serve again, following the tradition of Chuck Adams (“Secretary-Treasurer for Life” Emeritus).

**8. Election and Installation of Officers for 2002-2003:** President-elect John Whitehead was installed as President. Peter Fricke was confirmed as Secretary-Treasurer. President Whitehead thanked Past-President Rhodes for his unstinting service to the Section and presented him with a plaque on behalf of the membership. Past-President Rhodes, in turn, thanked Peter Fricke for his services to the Section and presented him with a plaque from the membership.

#### **New Business:**

**1. Program of Work:** President Whitehead stated he had three primary goals for meeting its goals for 2002-2003 [outlined in [Fisheries](#), September 2002, page 4], that the Section provide quality services to its membership, and that the Section actively promote symposia at the AFS annual and regional meetings.

**2. Suggested Special Sessions, Workshops and Other Topics for AFS 2003:** President Whitehead called for suggestions for the AFS 2003 meeting in Quebec City, August 10-14, 2003. He noted that symposium proposals had to be submitted to the Society in December, thus the Section must get its work done by Thanksgiving, 2002. This work would include reviewing topics and panels the Section is asked to sponsor and notifying the Program Chair of the Section’s interest. After some discussion the following topics were developed by those present (suggested symposia convenors are shown in parentheses):

- Tribal and indigenous fisheries [Geoffrey Habron]
- Ecosystem management
- MPAs and marine sanctuaries [Michael Orbach/Leah Bunce]
- Harvesting capacity [Theo Brainerd/John Ward]
- Economics of freshwater fisheries management
- Poster Session on North American Fisheries Anthropology [Susan Abbott-Jamieson]
- Economics of the Shrimp Fishery and Shrimp Markets
- Canadian-U.S. studies of fishing and fisheries [Peter Fricke/Peter Sinclair]
- Comparative studies in international fisheries (non-North American)

**3. Other, regional, Symposia:** President Whitehead drew the Section’s attention to the Spring Meeting of the Southern Division to be held in Wilmington, NC, February 12-16, 2003. He hoped that members would propose symposia and/or workshops for that meeting and would be very interested in developing a symposium on the roles of economics and the other social sciences in ecosystem management, and another symposium on the use and utility of economic models in fishery management.

**4. Presentation on the AFS 2004 Annual Meeting:** Mike Staggs, Director of Fisheries, WI DNR, asked the Section to consider symposia and workshops for the AFS 2004 meeting to be held in Madison, WI, August 21-26. President Whitehead assured him that the Section would do so, and thanked him for his presentation.

**5. Presentation on the World Fisheries Congress:** Delegates from the organizing committee spoke to the Section. The next World Fisheries Congress will be held in Vancouver, BC, May 2-6, 2004. The agenda will be broad-based, addressing most fishery issues and the call for papers will be in April 2003. The Congress and AFS intend to ask AFS Sections for financial support for the meeting.

**Adjournment:** There being no further business, a motion to adjourn was offered by Geoffrey Habron, seconded by Bruce Wilkins, and agreed to by all. The meeting adjourned at 6:35 p.m.

---

---

*Call for Papers*  
**Fisheries Socioeconomics Symposium**  
**2003 AFS Southern Division**  
**Spring Meeting**  
Wilmington, NC  
12-16 February 2003

The North Carolina Chapter of the American Fisheries Society invites you to join them on the riverfront of historic Wilmington, North Carolina, at the Hilton Riverside Hotel for the 11<sup>th</sup> Annual Spring Meeting of the Southern Division of the American Fisheries Society. See the Southern Division's meeting website for more information: <http://www.sdafs.org/meetings/03sdafs/2003home.htm>.

The Socioeconomics Section of the American Fisheries Society plans to sponsor a symposium around the broad theme "Fisheries Socioeconomics." This symposium will demonstrate the value of using social and economic concepts and methods for fishery and aquatic habitat issues. Empirical, conceptual and theoretical papers covering all aspects of fisheries social science are invited. Student papers are especially encouraged.

Presentations will be scheduled for 20 minutes (15 minute presentation and 5 minutes for questions) that will be strictly enforced. Media for presentations may include 35-mm slides or Microsoft PowerPoint. Abstracts should be a 200-word (or less) statement of objectives, principal results and conclusions and must include (in order) title; author names, addresses, phone, and e-mail; abstract text; and format (35-mm slides or PowerPoint). Please indicate which author will be the presenter and principal contact person. Please send abstracts **by October 15** via e-mail using WordPerfect, MS Word (preferred) or ASCII text to John Whitehead (e-mail: [whiteheadj@uncw.edu](mailto:whiteheadj@uncw.edu)). Please phone 910-962-7497 if you do not receive receipt acknowledgment of your abstract within 7 days of submission. Authors will be notified regarding presentation acceptance in early December 2002.



Alligator Gar  
USFWS/Duane Raver

## *New Book Release from AFS*

### **Catch and Release in Marine Recreational Fisheries**

**Jon A. Lucy and Anne L. Studholme, editors**

Catch and release fishing has a long history in freshwater recreational fisheries, as a management tool to reduce the impact of fishing on fish populations. Aside from regulatory requirements, freshwater anglers have long practiced catch and release fishing in the interests of promoting conservation-oriented angling. However, in comparison to freshwater, catch and release fishing in marine fisheries is proving more difficult to define relative to its full impact on anglers and use as a fishery management tool.

This symposium proceeding brings together information from researchers, fishery managers, coastal resource management and conservation organizations, and angling community leaders, addressing the issues that have arisen in relation to recreational fishing.

Includes sections on:

- Release Mortality and Circle Hooks
- Stress Effects Related to Catch and Release
- Conventional and Ultrasonic Tagging Studies
- Angler Attitudes and Behavior
- Management Issues

AFS Symposium 30  
275 pp., hardcover, August 2002  
Stock Number: 540.30  
List price: \$50  
AFS member price: \$35  
ISBN 1-888569-30-1

To order:  
Online: [www.fisheries.org/cgi-bin/hazel-cgi/hazel.cgi](http://www.fisheries.org/cgi-bin/hazel-cgi/hazel.cgi)  
Phone: (678) 366-1411  
Fax: (770) 442-9742  
Email: [afspubs@pbd.com](mailto:afspubs@pbd.com)

---

## *Contributed Paper*

The following paper was scheduled to be presented in Baltimore during the Socioeconomics Symposium at the AFS Annual Meeting, but had to be cancelled due to an unfortunate emergency the day before the Symposium. Brad Gentner, lead author, explains...

*"I wanted to offer a brief explanation regarding why the following paper was not presented at AFS in Baltimore. I had double booked myself with the International Institute of Fisheries Economic and Trade meeting in New Zealand on the outside chance NOAA would send me overseas. Lucky for me, NOAA approved. I let Ray Rhodes know that I wouldn't be attending back in July, but he wouldn't let me back out, insisting I find a replacement. Jeremy Castle, a research assistant from UMD and a co-author on the paper said he would be willing to take my place. Unfortunately, the day before the presentation, he had to leave town to attend to a family emergency and was unable to contact Peter Fricke or Ray. I want to apologize for any inconvenience."*

We wanted Socioeconomic Section members to have the opportunity to read the paper, and Brad graciously agreed to allow us to distribute it as part of this newsletter.

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

Brad Gentner; NMFS Fisheries Statistics and Economics Division  
Scott Steinback; NMFS Northeast Fisheries Science Center  
Jeremy Castle; NMFS Fisheries Statistics and Economics Division

**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,

---

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

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, 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			Total
		Direct	Indirect	Induced	
<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			Total
		Direct	Indirect	Induced	
<b>(thousands of dollars)</b>					
<b>Food</b>					
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			Total
		Direct	Indirect	Induced	
<b>(thousands of dollars)</b>					
<b>Food</b>					
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>
<b>Rods &amp; Reels</b>	<b>98,282</b>	<b>26,010</b>	<b>3,827</b>	<b>7,409</b>	<b>37,246</b>
<b>Tackle &amp; Gear</b>	<b>39,881</b>	<b>10,561</b>	<b>1,554</b>	<b>3,008</b>	<b>15,123</b>
<b>Camping Equipment</b>	<b>6,520</b>	<b>2,045</b>	<b>413</b>	<b>610</b>	<b>3,068</b>
<b>Binoculars</b>	<b>1,612</b>	<b>577</b>	<b>129</b>	<b>175</b>	<b>881</b>
<b>Fishing Clothing</b>	<b>6,814</b>	<b>1,585</b>	<b>375</b>	<b>486</b>	<b>2,446</b>
<b>Processing/Taxidermy</b>	<b>211</b>	<b>77</b>	<b>28</b>	<b>26</b>	<b>131</b>
<b>Magazines</b>	<b>3,265</b>	<b>724</b>	<b>135</b>	<b>213</b>	<b>1,072</b>
<b>Club Dues</b>	<b>3,616</b>	<b>1,666</b>	<b>620</b>	<b>569</b>	<b>2,855</b>
<b>Boat Expenses</b>	<b>4,340</b>	<b>1,560</b>	<b>798</b>	<b>585</b>	<b>2,943</b>
<b>New Motor Boat</b>	<b>101,641</b>	<b>8,850</b>	<b>1,099</b>	<b>2,469</b>	<b>12,418</b>
<b>New Nonmotor boat</b>	<b>751</b>	<b>65</b>	<b>8</b>	<b>18</b>	<b>91</b>
<b>Used Boats</b>	<b>261,735</b>	<b>2,857</b>	<b>260</b>	<b>774</b>	<b>3,891</b>
<b>Electronics</b>	<b>6,228</b>	<b>2,257</b>	<b>644</b>	<b>719</b>	<b>3,620</b>
<b>New Fishing Vehicle</b>	<b>64,117</b>	<b>8,479</b>	<b>1,209</b>	<b>2,404</b>	<b>12,092</b>
<b>Used Fishing Vehicle</b>	<b>108,938</b>	<b>3,838</b>	<b>348</b>	<b>1,039</b>	<b>5,225</b>
<b>New Vacation Home</b>	<b>324</b>	<b>12</b>	<b>9</b>	<b>5</b>	<b>26</b>
<b>Fees for Vehicle Loans</b>	<b>446</b>	<b>141</b>	<b>44</b>	<b>46</b>	<b>231</b>
<b>Fees for Boat Loans</b>	<b>550</b>	<b>173</b>	<b>54</b>	<b>57</b>	<b>284</b>
<b>Fees for Home Loans</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Property Taxes for all Vacation Homes</b>	<b>41</b>	<b>32</b>	<b>0</b>	<b>8</b>	<b>40</b>
<b>Real Estate Commission</b>	<b>19</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>5</b>
<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			<b>(# of jobs)</b>		
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/rental boat 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.

	<b>Employee Compensation</b>	<b>Proprietary Income</b>	<b>Household Expenditures</b>	<b>Enterprises (Corporations)</b>	<b>Indirect Business Taxes</b>	<b>Total</b>
<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>	16,223,460	778,293	19,028,660	5,676,585	6,474,160	48,181,158
<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>	305,271	0	6,791,803	1,341,980	29,268,982	37,708,036
	16,590,948	778,293	25,820,463	7,018,565	35,743,142	85,951,411

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.

## 5. REFERENCES

- CES (Consumer Expenditure Survey). 1998. U.S. Department of Labor, Bureau of Labor Statistics, CES.
- Gentner, B., and A. Lowther. 2002. "Evaluating Marine Sport Fisheries in the USA." In: *Recreational Fisheries: Ecological, Economic, and Social Evaluation*. T.J. Pitcher and C.E. Hollingsworth eds. Blackwell Science, Oxford.
- Gentner, B, S. Steinback, and M. Price. 2001a. Marine angler expenditures in the Southeast region, 1999. NOAA Technical Memorandum NMFS-F/SPO-48.
- Gentner, B, S. Steinback, and M. Price. 2001b. Marine angler expenditures in the Pacific Coast region, 2000. NOAA Technical Memorandum NMFS-F/SPO-49.
- Maharaj, V., and J. E. Carpenter. 1998. The 1996 economic impact of sport fishing in the United States. American Sportfishing Association, Alexandria, Virginia.
- Miller, R. E., and P. D. Blair. 1985. Input-output analysis: foundations and extensions. Prentice-Hall, Englewood Cliffs, New Jersey.
- Minnesota IMPLAN Group, Inc. 1997. IMPLAN professional: social accounting and impact analysis software. Minnesota IMPLAN Group, Inc., Minneapolis.
- Olson, D. C. 1999. Using social accounts to estimate tax impacts. Paper presented at the Mid-Continent Regional Science Association Meeting. Minneapolis, Minnesota.
- SMDB (State and Metropolitan Area Data Book). 1998. U.S. Bureau of the Census, SMDB 1997-1998 5<sup>th</sup> edition. Washington, D.C.
- Steinback, S. R. 1999. Regional economic impact assessments of recreational fisheries: an application of the IMPLAN modeling system to marine party and charter boat fishing in Maine. *North American Journal of Fisheries Management* 19:724-736.
- Steinback, S., and B. Gentner. 2001. Marine angler expenditures in the Northeast region, 1998. NOAA Technical Memorandum NMFS-F/SPO-47.
- Storey, D. A., and G. P. Allen. 1993. Economic impact of marine recreational fishing in Massachusetts. *North American Journal of Fisheries Management* 13:698-708.
- U.S. Bureau of the Census. 1997. Annual benchmark report for retail trade: January 1987 through December 1996. Current Business Reports, Series BR/96-RV, Washington, D.C.