ABSTRACT

Marine recreational fishing is a popular outdoor leisure activity nationwide when measured by number of participants. The National Marine Fisheries Service estimates that 24.7 million saltwater anglers fished 127.2 million days in the coastal states of the U.S. in 2006. In this report, we quantify the level of fishing expenditures for these anglers within each coastal state and the U.S. as a whole. At the U.S. level, we estimate that saltwater anglers spent an estimated $5.8 billion on trip-based expenditures (e.g., ice, bait, and fuel) and another $25.6 billion on fishing equipment and durable goods (e.g., fishing rods, fishing tackle, and boats) in 2006. In the second exercise carried out for this study we conduct a regional input-output assessment to examine how those expenditures circulated through each state's economy as well as the economy of the entire U.S. We show that as angler expenditures filtered through the U.S. economy, they contributed an estimated $82.3 billion in total sales, $39.1 billion in value-added (i.e., contribution to gross domestic product), $24.0 billion in income, and supported nearly 534 thousand jobs in the U.S.

INTRODUCTION

The National Marine Fisheries Service (NMFS) has been collecting marine recreational catch, effort, and participation data since 1979 in an effort to assess the influence of recreational fishing on fish stocks. With the passing of the Magnuson-Stevenson Fishery Conservation and Management Act (MSFCMA) in 1996, Congress additionally mandated the analysis of the economic impacts on fishing participants and coastal communities of management policies. In response, NMFS began to conduct a series of marine angler expenditure surveys in the coastal regions of the U.S. in 1998. The first surveys were administered in the Northeast Region in 1998, in the Southeast Region in 1999, and in the Pacific Region in 2000. The purpose of the survey efforts was to provide data to quantify recreational fishing expenditures and the economic impacts (i.e., effects) of the expenditures in each region and the U.S. as a whole. A separate publication for each region (Steinback and Gentner, 2001; Gentner, Price, and Steinback, 2001a; Gentner, Price, and Steinback, 2001b) summarized the survey results and provided state-level estimates of expenditures by marine recreational fishermen. In a fourth publication (Steinback, Gentner, and Castle, 2004), the data from the first three reports were used to assess the total economic impacts of anglers' saltwater expenditures within each of the regions and the U.S. overall.

The angler expenditure and impact estimates shown in those four reports provides policy analysts with information to assess the economic effects of recreational fishing activities to communities and fishery dependent and independent businesses. Angler expenditures and the economic impacts generated from the expenditures changes over time, however. As recreational fishing becomes increasingly regulated in the U.S. it essential that state and federal regulators have access to the most recent expenditure data available. In this report we show the results of the second endeavor by NMFS to collect and quantify marine recreational fishing expenditures and the economic impacts generated from angler expenditures. For this second round of marine angler expenditure surveys, data were collected from anglers fishing in all of the coastal states in the Nation in 2006. The results shown here provide updated estimates of angler expenditures and economic impacts for every coastal state in the Nation and the U.S. overall. At the U.S. level, we

estimate that saltwater anglers spent an estimated $5.8 billion on trip-based expenditures (e.g., ice, bait, and fuel) and another $25.6 billion on fishing equipment and durable goods (e.g., fishing rods, fishing tackle, and boats) in 2006. We also show that as these angler expenditures filtered through the U.S. economy, they generated an estimated $82.3 billion in total sales, $39.1 billion in value-added (i.e., contribution to gross domestic product), $24.0 billion in income, and supported nearly 534 thousand jobs.

The report begins with a description of the survey sampling design and the completion statistics. The methods used to estimate mean angler expenditures, total angler expenditures, and economic impacts are shown next and then the expenditure and impact results are presented in four separate regional sections: the Northeast, Southeast, Pacific Coast, and Hawaii. Results for the entire U.S. are shown in a separate section. A number of statistical tests were conducted to examine the potential effects of non-response bias and survey mode differences and these findings are also discussed. The last section places the study results in context relative to the expenditure and impact estimates previously collected by NMFS and to angler expenditure estimates produced by the U.S. Fish and Wildlife Service (USFWS) in 2006. The last section also provides some concluding remarks regarding model assumptions and limitations.

DATA COLLECTION INSTRUMENTS

Across the U.S. there currently is no complete and consistent frame of saltwater anglers as some coastal states do not require a saltwater license. Therefore, this survey effort utilized a number of sampling frames. The Marine Recreational Information Program (MRIP) conducts an intercept creel survey in the state of Hawaii and in all of the states on the East and Gulf Coasts, excluding Texas. The MRIP survey platform represents the best, most consistent sample frame for saltwater anglers in states covered by the MRIP. Within the MRIP coverage area, an add-on to the intercept survey was used to collect expenditures resulting from the intercepted trip and to gather a frame for mailing a follow-up survey regarding annual durable expenditures. However, there are coverage gaps in the MRIP for collecting national level data as the entire West Coast, Texas, and Alaska are not covered. In those states, license frames were utilized to contact anglers via a mail survey regarding both trip and durable good purchases.

The MRIP

The MRIP consists of two independent and complementary surveys. These two surveys are stratified to provide independent estimates of catch, effort, and participation across states, fishing modes, and two month waves through each year. The fishing modes used for this stratification are: shore mode, private or rental boat mode, and party or charter boat mode. This method of stratification has proven useful for developing estimates annually or seasonally and it allows individual regions to easily add sample within strata to increase the precision of the estimates.

The first survey is an intercept survey of marine anglers at fishing access sites. This survey attempts to obtain a random sample of all marine recreational fishing trips. The MRIP maintains a list of over 6,000 sites in a master site list, which is continuously updated. Each of these sites is

ranked by an index of relative fishing pressure by mode, month, and weekday or weekend designation. For a given date, interviewers are assigned to a specific site and to a specific mode of fishing. Interviewers are also given two adjacent, alternate sites if a minimum number of interviews cannot be obtained at the original site assignment. Sampling for private/rental and party/charter modes is conducted after the angler's fishing day has been completed. Sampling for the shore mode may be conducted when at least two-thirds of the fishing for the day has been completed and the angler then estimates total trip effort.

The intercept sampling implies a three-stage-sampling framework. In stage one, a given site/day is randomly selected with probability of assignment proportional to the fishing pressure index of the site for that specific day (Cochran 1977). The second stage involves the selection of angling parties, boatloads, groups, or individuals, at the assigned site. Finally, stage three involves possible sub-sampling among the angling parties selected in stage two. Selection of parties (stage 2) and sub-sampling among parties (stage 3) is assumed random with equal probabilities. This allows the use of self-weighting estimators to obtain mean catch-per-trip estimates for each species across all strata.

This intercept survey is a creel survey primarily used to estimate mean catch-per-trip by species. Data elements collected during the base part of the intercept survey include state, county, and zip code of residence, hours fished, primary area fished, target species, gear used, and days fished in the last two and 12 months. The creel portion of the survey collects length and weight of all fish species retained by the angler and the species and disposition of all catch not retained by the angler.

For a given stratum, estimates of mean catch-per-trip multiplied by an estimate of the total number of trips (effort) equals the total catch for that stratum. The effort estimates are obtained through the second part of this survey process; the telephone survey of coastal households. Residential households are sampled randomly using the random digit dialing technique as described by Groves et al. (1988). All anglers in the contacted household are identified, and each is asked about their fishing activity for the previous two-month period. Multiple attempts are made to contact identified anglers. This survey is used to estimate effort by coastal residents living in households with telephones. Ratios from the intercept survey are used to correct these effort estimates to account for non-coastal residents and coastal residents who do not have telephones, as those groups are not covered in the household sampling frame. Data elements collected for this survey include the number of trips in the last two months and the number of trips in the last 12 months. For trips in the last two months, trip dates, mode, time of return, and state of access are also collected.

In NMFS' previous angler expenditure data collection efforts an intercept add-on survey was used to collect a few basic demographic characteristics and a respondent telephone number. The telephone number was then used to contact the angler to collect trip and durable expenditure information via a telephone follow-up survey. To increase sample sizes for the trip expenditure data, the trip-level questions were moved to the intercept add-on survey. This change in methodology reduced standard errors, increasing the precision of the trip expenditure estimates.

The economic intercept survey (Appendix 1) obtained overnight trip information, from those on overnight trips, including number of days away from residence, number of days spent fishing, lodging expenses, and the purpose of the trip. All anglers were asked travel costs, days of fishing in last two months, fishing ability, boat ownership, and trip supply expenditures (bait, ice, refreshments, boat fees, etc.).

Interviewers attempted to collect trip expenditure data from every participant in the creel portion of the survey. In the states where the MRIP survey was conducted, a total of 110,719 economic add-ons were attempted and 99,755 contained at least a home zip code allowing the calculation of travel distance and private transportation expenditures (Table 1). Overall, 68,632 respondents (62.0%) completed the trip expenditure portion of the MRIP economic intercept survey and 20,679 of those respondents (30.1%) supplied a mailing address. Intercept survey participants supplying a mailing address were then sent a mail survey to obtain durable expenditure information.

Mail Survey

The MRIP mail follow-up survey was dedicated to the collection of durable expenditures, socioeconomic, and demographic data (Appendix 2). Expenditure data categories included semi-durable goods (tackle, rods, reels, line, etc.), durable goods (motor boats and accessories, non-motorized boats, boating electronics, mooring, boat storage, boat insurance and vehicles or homes) and angling accessories and multi-purpose items (magazines, club dues, saltwater angling specific clothing and camping gear). Also, the expenditure survey collected a set of socioeconomic and demographic variables.

The switch to a mail survey in 2006 eliminated a number of concerns associated with collecting durable expenditure data over the telephone, as was done in the first round of angler expenditure surveys conducted by NMFS. These concerns included recall of detailed durable expenditures during a short telephone survey, the growing prevalence of cell phone only households, and falling response rates for telephone surveys in general. To compare how this change in methodology may have affected the results, both mail and telephone surveys were administered in the state of Florida. Results of the side-by-side comparisons are reported below.

The mail survey followed a four contact methodology outlined in Dillman (2000) for MRIP intercepted anglers, Hawaii Commercial Marine License (CML) holders, and Texas saltwater license holders. The mailing sequence for these anglers included a pre-notification letter, a survey and cover letter, a reminder postcard, and a final survey and cover letter mailing. Hawaii CML holders were sampled because a CML can be purchased by recreational fishermen so that catch can be sold. Also, while the MRIP is conducted in Hawaii, the survey samples at lower sampling rates than on the mainland, and due to the nature of shore access on many of the islands, shore mode anglers can be difficult to contact. To augment the sample in Hawaii, the CML data base was utilized as well as voluntary angler sign-ups through tackle shops and various fishery events attended by NMFS personnel.

Mail survey questions in Hawaii were designed so that anglers holding permits that allow fish sales could be post stratified as commercial fishermen, expense fishermen, or recreational fishermen based on their survey responses. These questions included whether or not catch was ever sold or whether the fishermen chartered their boat for paying customers. A recreational fisherman was defined as a fisherman that had not sold any fish nor chartered their boat during the previous 12 months. Additional questions were asked regarding the percentage of income earned from the sale of fish or vessel charters and this data was used to separate commercial from expense fishermen. Generally, this post stratification followed Hamilton and Huffman's (1997) work with the Hawaiian small boat fleet. Only fishermen that did not sell fish nor conducted any charters in the previous year are included in the expenditure estimates.

A modification to Dillman's (2000) four contact methodology was required for saltwater license holders in California, Oregon, Washington, and Alaska. Anglers in these states purchase a combined saltwater/freshwater fishing license so a fifth contact was necessary to exclude anglers that only fished in fresh water. In California, names and addresses for the mailing were collected via the California's Recreational Fisheries Survey (CRFS) existing telephone survey of licensed anglers. Details of their surveying methodology are available on the Pacific States Marine Fisheries Commission web site (PSMFC 2008). In all license frame states, the sampling was conducted on a wave basis to correspond to the intercept survey and in an effort to capture seasonality in trip expenditures.

Additional sample augmentation was required in California as well. Saltwater anglers are exempt from licensure when fishing from a man made structure such as a pier or a jetty and a significant amount of fishing effort takes place on the state's jetties and piers. As such, they would never be contacted through the CRFS. Additionally, for-hire anglers are contacted infrequently during the CRFS telephone survey, prompting the CRFS to conduct intercept interviews in both the man-made shore and for-hire modes. As a result, the intercept portion of the CRFS was used to collect additional sample for the mail survey by collecting the names and addresses of participants intercepted in the shore and for-hire fishing modes.

In Oregon, Washington, and Alaska a brief telephone screening survey was conducted. State license files were used for the dialing. Phone numbers were validated and missing phone numbers found using a private phone number look-up service. A maximum of ten attempts were made to contact anglers. If license holders took a saltwater fishing trip in the previous 12 months in the state of licensure, the respondent was deemed eligible to participate in the mail survey and mailing address details were verified.

In California, the actual sampling protocol was controlled by the Pacific States Marine Fisheries Commission (PSMFC, 2008). In all other license frame states, sample was randomly drawn, stratified by resident status, every two months from the most recent version of the entire license database without replacement. These samples were drawn proportionally to effort occurring during the same period for the previous year or the latest year that effort was estimated for the state. The target sampling intensity was 10% of the licensed saltwater anglers, but because sampling targets were formulated using the previous year's license frame and because Oregon, Washington, and Alaska required a prescreening survey, actual sampling rates varied from that

target. Final wave sampling in all license frame states, besides California, was delayed until each state could provide their final and complete sample frame from 2006.

Survey versions were personalized based on the state of intercept or licensure, including framing of state specific questions and graphics. Otherwise, questions were identical for every intercept state. The license frame state versions were different from the intercept version only in that the trip expenditure questions were added to the mail survey in the license frame states (Appendix 3). In the license frame states, the trip expenditures were anchored to the most recent saltwater trip taken. All information collected through the MRIP intercept survey was collected in the license frame surveys in order to have similar data on the referent trip.

In total, 41,669 mail surveys were sent to anglers across the U.S. (Table 1). Approximately 9.0% of the surveys (3,758) were returned undeliverable, but almost 40% were completed and returned (16,317 surveys). Response rates were fairly consistent across states and generally favorable. One notable exception was Texas. In Texas, all licenses that allowed saltwater fishing were sampled. This included a large number of combination license holders (31.2%) that buy licenses that allow saltwater fishing along with freshwater fishing and/or hunting. A recent survey by Texas Parks and Wildlife Department indicates that only 55.1% of Super Combo and 43.5% of Senior Super Combo license holders actually fish in saltwater (Leitz 2007). It is likely that any Texas combination license holder that did not fish in saltwater would not return the survey, explaining the low response rate in that state. To further explore potential non-response bias, a telephone survey of 10% of all non-respondents was conducted and the results are detailed below.

METHODS

Angler Expenditures

The surveys obtained information on total expenditures made during the trip that might involve multiple days and multiple participants. Therefore, information about party size and trip duration was collected so that trip expenditures could be estimated as per person, per day expenditures.

Data for all intercepted survey participants and all mail survey participants contained the home zip code of the participant. Round trip travel distance between the participant's home zip code and the actual latitude and longitude of the intercept site or the county of their most recent trip, in the case of license frame states, was calculated. The American Automobile Association's 2006 average variable cost of operating a vehicle ($0.145/mile) was used to convert distance to private transportation expenditures. While all surveys asked the respondent to supply private transportation costs, missing values in the data set were replaced with the calculated value.

Respondents to expenditure surveys conducted through the mail often leave questions unanswered if no spending occurred for the item(s) of interest. This makes it difficult to determine whether the actual response should have been zero or the respondent skipped-over that portion of the survey. To avoid making assumptions about a respondent's intentions, screening questions were added to the survey for every grouping of expenditure categories. If a respondent answered the screening question in the affirmative for a particular group of expenditure items

(i.e., fishing tackle or gear), all subsequent missing responses for each of the individual expense items within that group were coded as zeros. For respondents that provided negative responses to the screening questions, all subsequent missing responses were coded as missing data.

All expenditure groupings included an "other" category allowing an open-ended response for expenditure type and amount. These verbatim responses were then re-coded an added into the appropriate expenditure categories.

Because all durable goods can be used for multiple activities, each expenditure grouping, or in some cases individual categories, included a question about the percent of time the goods purchased in the grouping or category were used for saltwater fishing. The percentage given was used to reduce the expenditure amount used for estimation. In the first round of expenditure surveys that NMFS conducted, respondents were instructed to provide expenditures only for those categories in which the goods purchased were used primarily for saltwater fishing. In order to stay consistent with this notion of primacy, if a respondent said the item was used less than 50% of the time for saltwater fishing, the expenditure amount was re-coded as a zero.

Intercept surveys designed to collect a random sample of trips, as in the MRIP, generally incur an avidity bias as more avid anglers have a higher likelihood of being sampled. If this avidity bias is present in the data it would not effect the estimation of anglers' daily trip expenditures since the intercept selection probability employed by the MRIP is uniform across fishing trips. However, the avidity bias could effect the fishing equipment and durable expenditure estimates to the extent they are correlated with avidity. The last round of expenditure studies conducted by NMFS (Steinback and Gentner 2001; Gentner et al 2001; Gentner et al 2001a) used the MRIP intercept survey approach to sample anglers and a positive relationship between avidity and expenditures was found and corrected for with a weight developed by Thomson (1991). For this study, we did not test for this bias, but assumed that it exists for the fishing equipment and durable good expenditures since our sample of anglers originated from the MRIP intercept survey. The same weight developed by Thomson (1991) was used to correct for the avidity bias.

In addition to the avidity bias weight, another weight was developed in both the MRIP and license frame states to account for differences between expected and actual fishing effort in 2006. In the MRIP states, intercept sampling is based on quotas developed using expected fishing effort during a two-month sampling period (i.e., wave). Expected fishing effort is simply the effort estimate for the same two-month wave in the previous year. To ensure that the trip-level expenditure estimates are based upon the actual effort distributions that occurred in 2006, each expenditure data point in a particular stratum (i.e., state, mode, wave, residency status) was weighted by the proportion of total estimated effort in 2006 occurring in that stratum. The next section provides a narrative of the effort and participation estimates used in this study.

In all license frame states, a similar weight was used because sampling levels were based on quotas developed using expected license sales during the sampling period. Expected license sales by sampling period were predicted from 2005 license sales rates. Since both trip and durable good expenditures were collected from mail surveys sent to license holders, all expenditure data points were weighted by the number of anglers sampled in a stratum divided by the total saltwater license sales that occurred in that stratum in 2006.

Outliers were removed from the data set by strata (resident status and state of intercept/licensure) by expenditure category. The decision rule for outliers allowed strata with low variances to remain intact while strata with high variances had outliers removed. Initial weighted mean estimates for all expenditures categories were generated using the Proc Surveymeans procedure in SAS (SAS 2000) and any strata/category combination with a proportion of standard error (PSE) greater than 20% had the upper 1% of its distribution truncated.

Statistical tests were conducted to examine the potential effects of non-response bias and survey mode differences. Firstly, to examine potential differences between non-respondents and respondents, 10% of the mail survey non-respondents were re-contacted by telephone and asked about their demographic characteristics and their expenditures on fishing gear, fishing tackle, and fishing rods and reels. Secondly, the follow-up expenditure survey was conducted using a mail survey this time instead of a telephone survey, primarily to enhance the ability of the respondent to look up and provide an accounting of detailed annual expenditures. To test the impact of this decision, half of the anglers surveyed in Florida were mailed a follow-up expenditure survey and half were contacted by telephone using the same survey instrument. Results of these tests are shown below.

For policy purposes, only those expenditures that generate economic activity matter. Angler purchases of used goods from private parties do not generate any economic activity and are considered transfer payments from one household to another. Respondents were asked if expenditures on boats, vehicles, and second homes were made new or used, from dealers or private parties, or were financed. If a boat, vehicle, or home was purchased new the entire purchase price was used for estimation. If any of these items were purchased used from a private party and not financed, the expenditure was not included. If the purchase was financed, regardless of whether used or new, financed charges were assumed to be 2% of the loan principal. To calculate the loan principal and the 2006 interest payment to the banking sector, microdata from the Consumer Expenditure Survey (CES) were used to calculate the average loan term, the average principal balance, and the average interest rate (CES 2006). Amortization equations were used to develop the additional categories for each respondent purchasing a financed vehicle, boat, or second home. Additionally, for second homes, the average U.S. property tax was obtained from the National Association of Homebuilders (NAHB 2007). Real estate commissions from home purchases were assumed to be 6%.

Effort and Participation

Total trip expenditures were developed by multiplying mean trip expenditures by category by total annual effort in each stratum (state, mode, two-month period, and residency status), and total durable expenditures were developed by multiplying mean durable good expenditures by category by total annual participation in each stratum (state, two-month period, and residency status). The MRIP generates effort and participation estimates at the stratum-level so those estimates were used in the calculations for all East Coast and Gulf Coast states, excluding Texas where the MRIP survey is not conducted (Table's 2 and 3). For Texas, all three West Coast states, Hawaii, and Alaska, estimates of angler effort and participation are typically not produced

at the stratum level so it was necessary to adjust the available data obtained from those states for this study. These adjustments are delineated below.

Effort

For Texas, survey data were used to estimate effort because the state of Texas does not produce annual effort estimates for all modes. The survey asked respondents to provide the number of trips taken in the last two months in each fishing mode and asked for the number of trips taken in the state of licensure in the previous year. The harmonic mean of 12-month avidity over the last year was calculated for Texas respondents by resident status. Harmonic means were expanded by the number of resident and non resident participants. Effort by mode in Texas was estimated by taking the weighted mean proportion of effort in each mode from the mail survey. The Texas effort estimates were vetted by the Texas Parks and Wildlife Department.

For the West Coast states, PSMFC estimates were used in this analysis (PSMFC 2008). However, the PSMFC estimates that were provided were not stratified by resident status so the data were adjusted so that we could distinguish between resident and non-resident effort. In California, the effort estimates were post-stratified by the weighted mean of avidity from residents and non-residents intercepted during the CRFS intercept survey. In Oregon and Washington, the resident/non-resident effort was post-stratified by the proportion of resident/non-resident license holders. This may be problematic as it assumes the trip taking profile of a resident is the same as that of a non-resident. However, no other data was available to make this stratification.

In Alaska, Alaska Department of Fish and Game effort estimates were used for this analysis (Jennings 2008). MRIP effort estimates were utilized for the private boat and shore modes in Hawaii, and the for-hire effort estimates were obtained from the NMFS Pacific Islands Regional Office (Harman 2007) since the MRIP does not provide estimates of effort for the for-hire mode in Hawaii.

Participation

Although the MRIP participation estimates were used when available, the MRIP non-resident participation estimates are not additive across states as it is impossible to know from MRIP data if a non-resident participant in one coastal state is resident or non-resident participant in another coastal state. Because of the inability to assess double counting in non-resident participation in each state, only resident participation was used to expand the means to the U.S. total expenditure estimate. This restriction likely results in an underestimate of U.S. participation and durable expenditures. For all license frames, participation estimates are considered lower bound estimates as each state has exemptions for various fishing types.

Texas has the following license exemptions: under 17 years of age; born before September 1, 1930; mentally disabled and participating in recreational fishing as part of a medically approved therapy supervised by hospital personnel; mentally retarded person under the direct supervision of a licensed angler; and veterans. Participation in Texas was estimated as the sum of saltwater

licenses sold plus a proportion of combination licenses sold. Texas recently completed a survey of combination license holders and found that 55.1% of regular combo and 43.5% of senior combination license holders fished in saltwater. These proportions were used to reduce the number of saltwater participants across these categories. It was also assumed that these percentages also held for the resident and non-resident all-water and lifetime license holders.

Estimating participation in California was a real challenge. The only exemption in their license laws is for anglers fishing from man-made structures, but it is a large exemption. For licensed anglers in California, participation was simply estimated as the sum of resident and non-resident licenses sold. For unlicensed man-made mode anglers in California, participation was estimated by taking state total effort estimates in the man-made stratum and applying the harmonic mean of 12-month avidity in strata from the intercept survey. The actual field questionnaire asked each intercepted angler about 12-month avidity in the district of California where the angler was intercepted. Therefore this estimation strategy assumes that the intercepted angler fished only within the district where they were intercepted. This in district question was new to the 2006 man-made intercept form. In previous years, 12-month avidity was asked at the statewide level and a comparison of the harmonic mean showed that there was very little change in the mean avidity pre- and post questionnaire change. These participation estimates were vetted by the state of California (Ryan 2007).

Oregon's license frame does not separate fresh and saltwater anglers and contains the following exemptions: 14 and younger; Oregon landowners fishing from their own property; and fishing within three miles of shore between Cape Falcon, Oregon and Leadbetter Point, Washington either an Oregon or Washington license is valid. As a result, the estimates of participation presented here are considered lower bound estimates. Participation was estimated by taking the proportion of residents and non-residents reporting saltwater fishing activity during the last 12 months during the screener survey conducted as described above. Averaged across all six two-month waves, 75.5% of Oregon license holders had participated in saltwater fishing in the previous 12 months, but only 5.8% of all license holders were willing to participate in the mail survey.

Washington's license frame does not separate fresh and saltwater anglers and contains the following exemptions: 14 and younger; and fishing within three miles of shore between Cape Falcon, Oregon and Leadbetter Point, Washington either an Oregon or Washington license is valid. Therefore, the estimates of participation presented here are again considered lower bound estimates. Participation was estimated by taking the proportion of residents and non-residents reporting saltwater fishing activity during the last 12 months during the screener survey conducted as described above. Averaged across all six two-month waves 84.0% of Washington license holders had participated in saltwater fishing in the previous 12 months, but only 15.0% of all license holders were willing to participate in the mail survey.

Finally, Alaskan participation was provided by the Alaska Department of Fish and Game (Jennings 2007). While Alaska provided saltwater participation estimates, a screener was still necessary to contact saltwater anglers. Averaged across all six two-month waves 93.5% of Alaska license holders had participated in saltwater fishing in the previous 12 months, but only 2.42% of all license holders were willing to participate in the mail survey.

For the remainder of this report, U.S. total participation (15.5 million) includes only resident participants to avoid potential double counting of non-resident participants. As a result, the U.S. total used here likely underestimates total participation in 2006. The actual number of saltwater fishing participants in 2006 in the U.S. is estimated to range between 15.5 million anglers (the summation of all state resident participants) and 24.7 million anglers (the summation of all state resident and non-resident participates).

Economic Impacts

In addition to quantifying angler expenditures within each coastal state and the U.S. as a whole, the second exercise carried out for this study was a regional input-output assessment that examined how those expenditures circulated through each state's economy as well as the economy of the entire U.S. The economic contribution or impact of saltwater sportfishing extends well beyond simply measuring angler expenditures. Angler expenditures provide considerable income and employment in a wide range of manufacturing, transportation, and service sectors. The effects of these expenditures can be classified as: (1) direct, (2) indirect, or (3) induced. Direct effects occur when anglers spend money at retail and service oriented fishing businesses. Indirect effects occur when retail and service sectors purchase fishing supplies from wholesale trade businesses and manufacturers, and pay operating expenditures. These secondary industries, in turn, purchase additional supplies and this cycle of industry to industry purchasing continues until all indirect effects are derived from outside the region of interest (Steinback, Gentner, and Castle 2004). Payments for goods and services produced outside of the study area (i.e., outside state lines) are excluded because these effects impact businesses located in other regions. Induced effects occur when employees in the direct and indirect sectors make purchases from retailers and service establishments in the normal course of household consumption. The summation of the direct, indirect, and induced multiplier effects represent the total economic contributions or impacts generated from saltwater sportfishing expenditures to the overall regional economy. In this study, we provide total impact estimates for sales, value-added, income, employment, and taxes for each coastal state in the U.S. including aggregate estimates for the entire U.S.

Input-output modeling is an approach used to describe the structure and interactions of businesses in a regional economy. Input-output models are capable of tracking quantities and purchasing locations of expenditures by anglers, support businesses, and employees in both direct and indirectly affected industries. For a comprehensive description of the strengths and weaknesses of the input-output modeling technique see Miller and Blair (1985).

In the analyses presented here, a ready-made regional input-output system called IMPLAN Pro (Minnesota IMPLAN Group, Inc. 1997) was employed to estimate the economic contribution of marine recreational fishing to each coastal state in the US. The IMPLAN Pro system is a widely used, nationally recognized tool, providing detailed purchasing information for 509 industrial sectors.

State-level multiplier effects attributed to anglers' expenditures were estimated by multiplying the total value of each of the individual expense items (see Table 4 for list of items) that is spent within a particular state by the corresponding IMPLAN-generated multiplier. The IMPLAN Pro multipliers measure the total state-level sales, income, value-added, and employment change in each economic sector caused by a $1 change in output in any particular sector. Therefore, the product of the expenditure values that are spent within a particular state with their matching IMPLAN-generated multiplier provides an estimate of the contribution of each particular expenditure item to the state economy.

Angler expenditures were allocated to IMPLAN sectors based on the sectoring scheme shown in Table 4. Expenditure categories that included more than one IMPLAN sector were not aggregated to avoid the biases associated with aggregating. Instead, the expenditure in the category was distributed to individual IMPLAN sectors based on the proportion of final demand in each sector in each state. While the survey asked for total grocery expenditures, the typical grocery or convenience store purchase includes a wide range of products. To allocate generic grocery expenditures to more accurately reflect the mix of products purchased, the Personal Consumption Expenditure (PCE) activity data base for grocery store purchases contained in IMPLAN was used. PCE activity data bases are created by the Bureau of Economic Analysis and represent national average expenditure patterns.

In IMPLAN, margins are used to convert the retail-level prices paid by anglers into appropriate producer values. Margins ensure that correct values are assigned to products as they move from producers, to wholesalers, through the transportation sectors, and finally on to retail establishments. Regional purchase coefficients (RPCs) reflect the proportion of a retail item that is manufactured within the state or region. RPCs were applied to the retail expenditure estimates to insure that imported goods were not included in the impact estimates.

The resident status stratification is carried through to the impact analysis. Spending by residents on marine recreational fishing generally affects the amount of money available to be spent on other leisure-related activities within a state. A decrease in resident angler expenditures may shift disposable income to other leisure sectors resulting in little overall net change to sales, value-added, income, employment, and taxes within a state. However, even though the overall net change may approach zero, resident angling expenditures support jobs that might not otherwise exist. On the other hand, non-resident angling expenditures contribute to an overall net increase in economic impacts. To address these differences, separate input-output models were constructed for residents and non-residents. Multipliers in the non-resident model are estimated using the base state data in IMPLAN. To avoid double counting of resident expenditures, a separate model was constructed and the total value of resident expenditures was removed from the final demand in each state before the multipliers were generated.

State-level impacts were estimated for sales, value-added, income, employment, and taxes. Sales reflect total dollar sales generated from expenditures by anglers in each state. Value-added represents the contribution recreational angling makes to gross domestic product. 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.

RESULTS

Anglers' expenditures and the economic impacts of those expenditures on each coastal state's economy are discussed in five separate regional sections: the Northeast, Southeast, Pacific Coast, North Pacific, and Hawaii. A sixth section shows the expenditure and impact results for the entire U.S. In each regional section, expenditures and impacts are shown by state and aggregate impacts across regions are provided in the U.S. section. Nine tables of results are shown for each state. The first table shows mean expenditures and standard errors by mode and resident status. The second table shows total expenditures by mode and resident status, as well as 95% confidence intervals for the expenditure estimates. The third table summarizes the total economic impacts attributable to recreational fishing by resident status displaying the direct, indirect, and induced impacts on sales, value-added, income, and employment for resident and non-resident anglers.

Tables four through seven in each state separately detail the impacts on sales, value-added, income, and employment respectively by individual expenditure category. The eighth table displays the total economic impacts generated from saltwater fishing trip expenditures by fishing mode and resident status. This table excludes the impacts of fishing equipment purchases and other durable items that could be used for multiple trips since these could not be linked to a particular mode of fishing. The final table for each state shows the estimated revenue received by federal and state/local governments from angler purchases. The tax revenue estimates are based on data available in IMPLAN's social accounting matrix, which tracks monetary flows between industries and institutions such as households, government, investment, and trade. The rows of the table depict the types of tax payments and the institutions that receive them, while the columns represent the different institutions making each type of tax payment. Employee compensation, enterprise, and indirect business taxes are paid by businesses, while taxes on proprietary income and household expenditures are paid by individuals.

Northeast Region

Expenditures

Daily mean trip expenditures were generally higher for non-residents than residents in all of the coastal states in the Northeast (1st Table for each state). Non-resident anglers tended to travel further and were more inclined to take overnight fishing trips, requiring the use of lodging facilities. Resident anglers in New Hampshire fishing aboard for-hire boats and resident anglers in Connecticut, New Hampshire, and New York fishing from private or rental boats were the only groups of resident anglers to incur higher mean trip expenditures than their non-resident counterparts. The highest single mean trip expense for resident anglers in all of the Northeast coastal states was charter fees. The highest mean trip expense for non-residents was also charter fees in every state except in Maryland and Massachusetts where mean lodging fees exceeded all other trip expenditures.

In contrast to daily trip expenditures, resident anglers in every state but one (Maine) spent considerably more on fishing equipment and durable items in 2006, per angler, than out-of-state anglers. The largest difference in durable expenditures across the two groups of anglers was for boat related purchases. Residents tended to spend significantly more, per angler, on boat purchases, boat accessories, and boat storage in all of the Northeast states except in Maine. Non-resident anglers fishing in Maine were estimated to spend more for boats and boating related items in Maine, on average, than residents of Maine.

Total resident expenditures on trip-related items exceeded the amount spent by non-residents in 6 of the 10 Northeast coastal states (CT, MD, NH, NJ, NY, and VA), even though mean daily expenses in those states were generally higher for non-residents (2nd Table for each state). This occurred because residents of those six states fished many more days than non-residents in 2006. Resident anglers in the remaining four Northeast states (DE, ME, MA, and RI) also fished more days than non-residents, but mean daily resident expenditures were considerably lower so total non-resident trip expenditures exceeded resident expenditures in those states.

In terms of total expenditures on fishing equipment and durable goods in 2006, resident anglers spent more than non-residents in 8 of the 10 Northeast coastal states. Non-residents fishing in Maine and Rhode Island spent more, in total, than their resident counterparts due mainly to higher boating and fishing vehicle expenditures in those states.

Across all of the Northeast coastal states, anglers fishing in New Jersey, Maryland, Virginia, Massachusetts, and New York exhibited the highest total expenditures in 2006 (i.e., the sum of trip, fishing equipment, and durable good purchases). Anglers fishing in these states spent between $769 million and $1.4 billion on marine recreational fishing in 2006. Total resident expenditures exceeded the amount spent by non-residents in all of the Northeast states except in Maine and Rhode Island.

Economic Impacts

Overall, the highest sales, value-added, income, and employment impacts were generated by angler expenditures in New Jersey (Table 63). The $1.4 billion spent on retail good and services by anglers in New Jersey in 2006 generated $1.6 billion in total sales within the state, $830 million in value-added, $523 million in income, and supported 9,814 jobs. New Jersey was followed by Maryland, New York, Massachusetts, and Virginia in generating sales, value-added, income, and employment.

A substantial portion of the items purchased by anglers, however, was imported into each state. As a result, many of the angler dollars spent in each coastal state impacted the economies of other states and countries. The amount lost to other regions can be calculated from the difference between the total expenditures and the direct sales impacts in the third and fourth table for each state. For instance, of the $1.4 billion spent by anglers on all goods and services in New Jersey, only $951 million (68%) directly affected the New Jersey economy (Table 63); $441.5 million in goods and services were imported into the state in response to angler demands. Thus, on average, about 32 cents of every dollar spent by anglers in New Jersey leaves the state. This is the lowest

level of import requirements for any Northeast coastal state. Across all Northeast coastal states, the level of import requirements ranged from a low of 32 cents for every angler dollar spent in New Jersey to a high of 45 cents in Virginia.

Resident impacts were higher than those of non-residents in all of the Northeast coastal states except in Maine, Rhode Island, and Delaware. In Maine and Rhode Island, expenditures by non-residents generated the highest sales, value-added, income, and employment impacts (Tables 27 and 81). In Delaware, resident expenditures generated the highest sales, value-added, and income impacts, but non-resident expenditures generated about 40 more jobs than resident expenditures (Table 18). This is mostly due to the nature of non-resident expenditures in Delaware. Non-resident anglers in Delaware spent a substantial amount of money at restaurants, for groceries, charter fees, and for overnight lodging at hotels. The businesses that support these expenditures are highly labor intensive which translates into considerable employment impacts within the state of Delaware.

The most important expense categories in terms of generating impacts varied considerably by state (4^{th}, 5^{th}, 6^{th}, and 7^{th} tables shown for each state). The highest sales impacts were generated by purchases of used vehicles (CT), new vehicles (DE), lodging fees (ME and MA), new homes (MD), rods and reels (NH and RI), boat storage fees (NJ and NY), and new boats (VA). The highest value-added impacts were generated by the same expenditure categories in all of the Northeast states, except in New Hampshire and Rhode Island, where charter fees and private transportation costs produced more value-added effects. Additionally, the same expenditure categories that generated the highest sales impacts in each Northeast coastal state also created the highest income impacts in each state, except in New York, where second home maintenance costs produced the greatest income impacts. Lastly, in terms of total state-level employment generated from angler purchases, the most important expense categories were used vehicles (CT), food from restaurants (DE and RI), lodging fees (ME and MA), new homes (MD), charter fees (NH), rods and reels (NJ), second home maintenance (NY), and new boats (VA).

The impacts created by anglers fishing from private boats and from the shore were higher than those produced by party/charter boat fishing in all of the coastal states except New Hampshire (8^{th} table shown for each state). In Maine, Maryland, Massachusetts and Rhode Island, shore mode impacts were higher than the private/rental boat mode. The sales, income, value-added, 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. Overall, angler trip expenditures in New Jersey generated more sales, income, value-added, and employment impacts than any other coastal state.

Federal taxes generated by angler purchases ranged from $5 million in New Hampshire to $141 million in New Jersey (9^{th} table shown for each state). Revenue received by state/local governments varied from $3 million in New Hampshire to a high of $100 million in New Jersey. In total, angler expenditures in New Jersey generated the highest tax revenues of all the coastal states ($242 million).

Southeast Region

Expenditures

Daily mean trip expenditures were generally higher for non-residents than residents in all of the Southeast coastal states (1st table shown for each state). Non-resident anglers tended to travel further and were more inclined to take overnight fishing trips, requiring the use of lodging facilities. Resident anglers in Georgia fishing aboard for-hire boats, resident anglers in Georgia and Mississippi fishing from private/rental boats, and resident anglers in Louisiana fishing from shore were the only groups of resident anglers to incur higher mean trip expenditures than their non-resident counterparts. The highest single mean trip expense for resident anglers in all of the Southeast coastal states was charter fees. The highest mean trip expense for non-residents was also charter fees in every state except in South Carolina and Georgia where mean lodging fees and private transportation costs, respectively, exceeded all other trip expenditures.

In contrast to average daily trip expenditures, resident anglers in every state spent considerably more on fishing equipment and durable items in 2006, per angler, than out-of-state anglers. The largest difference in durable expenditures across the two groups of anglers was generally for boat-related purchases. Residents tended to spend significantly more, per angler, on boat purchases, boat accessories, and boat storage in all of the Southeast states.

Total resident expenditures on trip-related items exceeded the amount spent by non-residents in 4 of the 8 Southeast coastal states (GA, LA, MS, and TX), even though mean daily expenses in those states were generally higher for non-residents (2nd table shown for each state). This occurred because residents of those four states fished many more days than non-residents in 2006. Resident anglers in the remaining four Southeast states (AL, FL, NC, and SC) also fished more days than non-residents, but mean daily resident expenditures were considerably lower so total non-resident trip expenditures exceeded resident expenditures in those states. In terms of total expenditures for fishing equipment and durable goods in 2006, resident anglers spent more than non-residents in all of the Southeast coastal states.

Across all of the Southeast coastal states, anglers fishing in Florida, Texas, Louisiana, and North Carolina exhibited the highest total expenditures in 2006 (i.e., the sum of trip, fishing equipment, and durable good purchases). Anglers fishing in those states spent between $2.0 billion and $16.7 billion on marine recreational fishing in 2006. Total resident expenditures exceeded the amount spent by non-residents in all of the Southeast states.

Economic Impacts

Overall, the highest sales, value-added, income, and employment impacts were generated by angler expenditures in Florida (Table 125). The $16.7 billion spent on retail good and services by anglers in Florida in 2006 generated $14.2 billion in total sales that remained within the state, $7.6 billion in value-added, $2.1 billion in income, and supported 55,643 jobs. Florida was

followed by Texas, North Carolina, and Louisiana in generating sales, value-added, income, and employment.

A substantial portion of the items purchased by anglers, however, was imported into each state. As a result, many of the angler dollars spent in each coastal state impacted the economies of other states and countries. The amount lost to other regions can be calculated from the difference between the total expenditures and the direct sales impacts in the third and fourth table for each state. For instance, of the $3.2 billion spent by anglers on all goods and services in Texas, about $2.3 billion (72%) directly affected the Texas economy (Table 179); $887.4 million in goods and services were imported into the state in response to angler demands. Thus, on average, about 28 cents of every dollar spent by anglers in Texas leaves the state. This is the lowest level of import requirements for any Southeast coastal state. Across all Southeast coastal states, the level of import requirements ranged from a low of 28 cents for every angler dollar spent in Texas to a high of 52 cents in Florida.

Resident impacts were higher than those of non-residents in all of the Southeast coastal states except in North Carolina (3rd table shown for each state). In North Carolina, expenditures by non-residents generated the highest sales, value-added, income, and employment impacts even though resident expenditures were approximately $66.4 million higher than non-residents (Table 161). This is because non-resident anglers in North Carolina spent considerably more than residents at service-oriented businesses within the state, such as restaurants, supermarkets, convenience stores, hotels, and for-hire fishing boats. Service-oriented businesses tend to generate higher economic impacts within a region than commodity-level purchases (i.e., fishing tackle purchases) because the entire demand for the services is supplied by local businesses. Whereas, commodity-level purchases usually require some level of imports to meet consumer demand. For instance, in North Carolina, of the $86.4 million spent by anglers on fishing tackle in 2006, only about $46.9 million was supplied by manufacturers within the state (Table 161). Approximately $39.5 (46%) million was imported into the state to meet angler demands.

The most important expense categories in terms of generating impacts varied somewhat by state (4th, 5th, 6th, and 7th tables shown for each state). The highest sales impacts were generated by purchases of new boats (AL, FL, LA, and SC), boat storage (GA), vehicle maintenance (MS), and new homes (NC and TX). The highest value-added impacts were generated by the same expenditure categories in all of the Southeast states, except in Georgia and North Carolina, where new boat purchases and lodging costs produced more value-added effects. Additionally, the same expenditure categories that generated the highest sales impacts in each Southeast coastal state also created the highest income impacts in each state, except in Georgia, where new boat purchases produced the greatest income impacts. Lastly, in terms of total state-level employment generated from angler purchases, the most important expense categories were new boats (AL, FL, GA, LA, and SC), vehicle maintenance (MS), lodging fees (NC), and new homes (TX).

The impacts created by anglers fishing from private boats and from the shore were higher than those produced by party/charter boat fishing in all of the coastal states (8th table shown for each state). In South Carolina, North Carolina, and Alabama shore mode impacts were higher than private/rental boat mode. The sales, income, and employment impacts created by party/charter boat fishing and private/rental boat fishing were the highest in Florida, while the impacts

generated from shore fishing were the highest in North Carolina. Overall, angler trip expenditures in Florida generated more sales, income, and employment impacts than any other coastal state.

Federal taxes generated by angler purchases ranged from $15 million in Georgia to $1.2 billion in Florida (9th table shown for each state). Revenue received by state/local governments varied from $11 million in Georgia to a high of $867 million in Florida. In total, angler expenditures in Florida generated the highest tax revenues of all the coastal states ($2.1 billion).

Pacific Coast and North Pacific Regions

Expenditures

Daily mean trip expenditures were generally higher for non-residents than residents in the Pacific and North Pacific coastal states (1st table shown for each state). Non-resident anglers tended to have higher travel expenses and were more inclined to take overnight fishing trips, requiring the use of lodging facilities. However, resident anglers in California fishing from private/rental boats, resident anglers in Washington fishing aboard party/charter boats, and shore anglers residing in California and Oregon incurred higher mean trip expenditures than their non-resident counterparts. The highest single mean trip expense for resident anglers in all of the Pacific coastal states was charter fees. The highest mean trip expense for non-residents fishing in the Pacific states was also charter fees.

In terms of average expenditures on fishing equipment and durable items in 2006, non-residents spent more per angler in California and Oregon, and residents of Washington and Alaska spent considerably more on average than their non-resident counterparts. In California, maintenance costs for second homes was the primary driver behind higher average non-resident expenditures, and in Oregon the difference was mainly due to higher average expenditures for new vehicles purchased for fishing. In Washington and Alaska, where average resident expenditures were a great deal larger than non-resident outlays, the largest differences in average expenditures across the two groups of anglers was for new boats and vehicles.

Total resident expenditures on trip-related items exceeded the amount spent by non-residents in 3 of the 4 Pacific and North Pacific coastal states (CA, OR, and WA), even though mean daily expenses were generally higher for non-residents in those states, except in California (2nd Table for each state). This occurred because residents of those three states fished many more days than non-residents in 2006. In Alaska, non-resident anglers fished nearly as many days as resident anglers in 2006, and since their mean daily expenditures were so much higher total non-resident trip expenditures exceeded resident expenditures in Alaska.

In terms of total expenditures on fishing equipment and durable goods in 2006, resident anglers spent more than non-residents in all of the Pacific and North Pacific coastal states even though average expenditures, per angler, were higher for non-residents in California and Oregon. This occurred because resident participation was higher than non-resident participation in California and Oregon in 2006.

Across all of the Pacific and North Pacific coastal states, anglers fishing in California exhibited the highest total expenditures in 2006 (i.e., the sum of trip, fishing equipment, and durable good purchases). Anglers fishing in California spent an estimated $3.0 billion on marine recreational fishing in 2006 (Table 196). Total resident expenditures exceeded the amount spent by non-residents in all of the Pacific and North Pacific coastal states except in Alaska.

Economic Impacts

Overall, the highest sales, value-added, income, and employment impacts were generated by angler expenditures in California (Table 188). The $3.0 billion spent on retail good and services by anglers in California in 2006 generated $3.7 billion in total sales within the state, $1.9 billion in value-added, $1.3 billion in income, and supported 23,454 jobs. California was followed by Washington, Alaska, and Oregon in generating sales, value-added, income, and employment.

A substantial portion of the items purchased by anglers, however, was imported into each state. As a result, many of the angler dollars spent in each coastal state impacted the economies of other states and countries. The amount lost to other regions can be calculated from the difference between the total expenditures and the direct sales impacts in the third and fourth table for each state. For instance, of the $3.0 billion spent by anglers on all goods and services in California, only $2.0 billion (67%) directly affected the California economy (Table 188); $1.0 billion in goods and services were imported into the state in response to angler demands. Thus, on average, about 33 cents of every dollar spent by anglers in California leaves the state. This is the lowest level of import requirements for any Pacific coastal state. Across all Pacific and North Pacific coastal states, the level of import requirements ranged from a low of 33 cents for every angler dollar spent in California to a high of 51 cents in Washington.

Resident impacts were higher than those of non-residents in all of the Pacific and North Pacific coastal states except in Alaska (3rd table shown for each state). In Alaska, expenditures by non-residents generated the highest sales, value-added, income, and employment impacts (Table 215).

The most important expense categories in terms of generating impacts varied across each state (4th, 5th, 6th, and 7th tables shown for each state). The highest sales impacts were generated from charter fees (AK), rods and reels (CA), new vehicles (OR), and new boats (WA). The highest value-added impacts were generated by the same expenditure categories in Alaska and Washington. In California, boat insurance generated the highest value-added impacts, and in Oregon license fees produced the single highest value-added impacts. The highest income impacts were generated by license fees (AK and OR), rods and reels (CA), and new boats (WA). Lastly, in terms of total state-level employment generated from angler purchases, the most important expense categories were charter fees (AK), rods and reels (CA), license fees (OR), and new boats (WA).

The impacts created by anglers fishing from party/charter boats were higher than those produced by anglers fishing from the shore or from private/rental boats in Alaska and California (Tables

220 and 193). Private/rental boat fishing generated more impacts in Oregon than the other two modes of fishing and, in Washington, anglers fishing from the shore generated the highest level of impacts (Tables 202 and 211). The sales, income, value-added, and employment impacts created by party/charter boat fishing were the highest in Alaska, while the sales, value-added, and income impacts from private/rental boat fishing were the highest in California. Anglers fishing from private/rental boats in Alaska generated more employment than the other three Pacific and North Pacific coastal states. As for shore fishing effects, angler expenditures in California produced the highest sales, value-added, income, and employment impacts in the Pacific. Overall, angler trip expenditures in California generated more sales, income, and value-added impacts than the other coastal states, and the highest employment effects occurred in Alaska.

Federal taxes generated by angler purchases ranged from $24 million in Oregon to $317 million in California (9th table shown for each state). Revenue received by state/local governments varied from $17 million in Oregon to a high of $216 million in California. In total, angler expenditures in California generated the highest tax revenues of all the coastal states ($534 million).

Hawaii

Expenditures

Daily mean trip expenditures were much higher for non-residents visiting Hawaii than for residents (Table 222). Non-resident anglers tended to travel further, use more public transportation, and were more inclined to require the use of lodging facilities. The highest single mean trip expense for resident anglers was boat fuel and the highest mean trip expense for non-residents was charter fees. Non-residents also spent a considerable amount on gifts and souvenirs, per angler, in Hawaii.

In contrast to anglers' expenditures in most other coastal states in the U.S., non-residents fishing in Hawaii spent more on fishing equipment and durable items in 2006, per angler, than residents. This is mainly due to higher average non-resident expenditures for license fees, camping equipment, boat accessories, and vehicle maintenance. Residents of Hawaii spent more, on average, for rods and reels, new vehicle purchases, and new home purchases.

Total resident expenditures on trip-related items exceeded the amount spent by non-residents in Hawaii, even though mean daily expenses were considerably higher for non-residents (Table 223). This occurred because residents of Hawaii fished many more days than non-residents in 2006. In terms of total expenditures on fishing equipment and durable goods in 2006, non-resident anglers spent more than residents of Hawaii. The sum of the trip, fishing equipment, and durable good purchases in Hawaii in 2006 equaled $755.9 million.

Economic Impacts

The $755.9 million spent on retail good and services by anglers in Hawaii in 2006 generated $772.8 million in total sales within the state, $380.6 million in value-added, $253.6 million in income, and supported 7,023 jobs (Table 224).

A substantial portion of the items purchased by anglers, however, was imported into Hawaii. As a result, many of the angler dollars spent in Hawaii impacted the economies of other states and countries. The amount lost to other regions can be calculated from the difference between the total expenditures and the direct sales impacts in Tables 224 and 225. For example, of the $755.9 million spent by anglers on all goods and services in Hawaii, only $475.5 million (63%) directly affected the Hawaii economy; $280.3 million in goods and services were imported into the state in response to angler demands. Thus, on average, about 37 cents of every dollar spent by anglers in Hawaii leaves the state.

The economic impacts generated by resident and non-resident anglers in Hawaii were similar across the two groups of anglers in 2006. Expenditures by out-of-state anglers generated slightly more value-added, income, and employment in Hawaii than resident anglers in 2006, while resident expenditures generated more sales than non-resident outlays (Table 224).

The most important expense categories in terms of generating impacts were vehicle maintenance and rods and reels (Tables 225-228). The highest sales impacts were generated by purchases of rods and reels, and the highest value-added, income, and employment effects were created from expenditures for vehicle maintenance.

The impacts created by anglers fishing from shore were higher than those produced by party/charter boat fishing or private/rental fishing (Table 229). Lastly, Federal taxes generated by angler purchases amounted to $56.2 million and the revenue received by state/local governments was $48.6 million in 2006 (Table 230). In total, angler expenditures in Hawaii generated $105.0 million in tax revenue in 2006.

U.S.

Expenditures

U.S. total expenditures, including trip and durable good expenditures were $31.4 billion in 2006 (Table 231). Trip expenditures accounted for $5.8 billion and durable good purchases made up $25.6 billion of that total. The single largest trip expenditure in the U.S. was private transportation expenses at $1.2 billion (Table 231). The single largest durable equipment expenditure was new boat purchases at $6.8 billion.

The top five coastal states in terms of total expenditures were: Florida ($16.7 billion), Texas ($3.2 billion), California ($3.0 billion), Louisiana ($2.9 billion), and North Carolina ($2.0 billion). As with the U.S. totals, durable good purchases drive the state totals as well. The top five coastal states in terms of durable good expenditures were: Florida ($15.4 billion), California

($2.7 billion), Louisiana ($2.6 billion), Texas ($2.3 billion), and North Carolina ($1.3 billion). The highest total trip expenditures were found in Florida ($1.3 billion), Texas ($915 million), North Carolina ($709 million), New Jersey ($358 million), and California ($334 million).

Economic Impacts

Saltwater angler expenditures in the U.S. generated $82.3 billion in total sales, $38 billion in value-added, $24.0 billion in income, and supported 533,813 jobs (Table 232). Durable expenditures generated $68.7 billion in total sales, $31 billion in value-added, $19.9 billion in income, and supported 425,217 jobs (Tables 233-236). Trip expenditures in the U.S. produced $13.6 billion in total sales, $7.1 billion in value-added, $4.1 billion in income, and supported 108,596 jobs. To place the study results in context relative to the total income and employment generated in the U.S. in 2006, marine recreational fishing expenditures accounted for less than 0.5% of the total sales, 0.3% of total employment, 0.3% of total income, and 0.4% of total value-added existing in the nation.

Overall, U.S. fishermen spent over $31 billion, but only about $28 million remained in the country (89%); $3.4 million in goods and services were imported into the U.S. in response to angler demands (Table 232). The most important durable good purchase, in terms of economic impacts generated in the country, was new boats (Tables 233-236). The most important trip impact category was private transportation (i.e., auto fuel). Lodging expenses also generated substantial economic impacts across the country.

Shore mode fishing in the U.S. generated the highest total sales, value-added, income, and employment followed by private/rental boaters and anglers fishing aboard party/charter boats (Table 237). Approximately $6.0 billion in federal taxes and about $4.0 billion in total state taxes was generated from saltwater angler expenditures in the U.S. in 2006 (Table 238).

Statistical Tests

Non-Response

To examine statistical differences between respondents and non-respondents, the demographic characteristics, fishing expenditures, and avidity of the mail survey participants were compared to the non-respondents that were successfully re-contacted by telephone. Differences in the continuous variables between respondents and non-respondents were tested using a Wald test in the Proc Surveyreg procedure in SAS (SAS 2000). For categorical variables both the Rao-Scott and Wald chi-squared tests were used in the Proc Surveyfreq procedure in SAS (SAS 2000). These procedures and tests were selected because they can be applied to weighted data, as was used in this study. The null hypothesis for the tests was no difference in means across the treatment variables.

No significant differences in means were found for the three expenditure categories that were compared across respondents and non-respondents (Table 5). The tests were generally

inconclusive across the demographic variables. No significant differences were found for age, ethnicity (under both the Rao-Scott and Wald test), gender (under both tests), and employment (under the Wald test). However, the null hypothesis of no difference in means between respondents and non-respondents was rejected for the variables education, income, and race under both the Rao-Scott and Wald test. The null hypothesis was also rejected for employment when using the Rao-Scott test and for 12-month avidity. It is difficult to draw much insight into these differences for a number of reasons. Language barriers may have limited minority participation in the non-response telephone survey since it was conducted only in English. Results indicate that fewer races besides white were represented among those that completed the non-response telephone survey. Race, education, and income also tend to be correlated so this may have introduced bias into the non-response telephone survey results. Further, in contrast to our expectations, participants in the mail survey had a mean 12-month avidity of 1.92 trips while the non-response telephone survey participants had a mean 12-month avidity of 4.95 trips. We expected that more avid anglers would generally be more likely to respond to the initial mail survey. In the end, because all of the durable expenditure responses that we tested were not statistically different, no additional weighting was undertaken.

Survey Mode Differences

Statistical differences between expenditures and demographics collected through the mail versus those collected over the telephone in Florida were examined using the same Rao-Scott and Wald chi-squared tests described above. Of the 30 expenditure and demographic variables tested, 21 failed to reject the null of no significant difference in means with the results the same regardless of the categorical variable test used (Table 6). The expenditure categories found to be significantly different included: fishing gear (higher on phone), second home insurance (lower on phone), second home repair (lower on phone), vehicle purchase (higher on phone), and binocular purchase (higher on phone). For the demographic variables, 12-month avidity (lower on phone), education (higher on phone), ethnicity (Hispanic sample low on phone), and race (almost no non-white sample on phone) were statistically different.

While the test results showed no significant difference in means for the majority of the expenditure and demographic variables, the results are not definitive. Statistical difference tests perform more accurately with comparable sample sizes. While the mail survey in Florida met with a 53.4% success rate, the telephone survey met with a 5.1% success rate primarily due to bad telephone numbers collected during the intercept phase or initial refusal of the telephone number question during the field portion of the survey. A phone number look-up survey was used but little success was met. Interestingly, respondents were far more likely to supply a working mailing address. The resulting disparate sample sizes may have had an influence on the outcome of the statistical significance tests. The same holds true for the race variable where, as expected, the proportion of non-whites in the telephone sample was considerably lower than that contained in the mail survey sample.

DISCUSSION

Overall, total U.S. expenditures in 2006 have increased 79% compared to the inflation adjusted estimates shown in Steinback, Gentner, and Castle (2004) for the U.S. in 2000.[1] Further comparisons show an inflation adjusted increase in total U.S. trip expenditures of 36% and a 93% increase in total durable expenditures from 2000 to 2006. Although these increases seem inordinately large on the surface, the majority of the differences can be traced to a rise in angler effort and participation in the U.S. during this six year time period. According to MRIP estimates, effort increased 79% from 2000 to 2006 and participation increased 41% during this time period in the U.S. Thus, although total trip expenditures increased by 36%, effort rose by 79%, suggesting that mean expenditures per trip, at the U.S. level, actually declined from 2000 to 2006. Durable expenditures, on the other hand, were up 93% nationwide while participation only increased 41%. However, angler expenditures in Texas, Alaska, and Hawaii were not included in the expenditure estimates provided in Steinback, Gentner, and Castle (2004). If the comparison is made only across states included in both studies, the inflation adjusted increase in durable expenditures was 21%, less than the increase in participation from 2000 to 2006.

Another reason for the increase in total angler expenditures is that spending on durable goods has risen faster than inflation nationwide during this same period. The most recent data from the Bureau of Labor Statistic's Consumer Expenditure Survey (CES) shows expenditures on other transportation, which includes boats, increased 26% from 2000-2006 (CES 2006). Vehicle purchases remained level, but home expenditures rose 36%, mortgage balances increased 42%, and home values were up 98%. The later two statistics imply that homeowners were borrowing money from their homes to spend in the marketplace. Also, according to the National Marine Manufacturer's Association (NMMA) boat sales have increased 31% since 2000 (NMMA 2007). The NMMA estimated that sales of the three most popular fishing boats, outboard boats, sterndrive boats, and inboards increased 39%, 21%, and 5%, respectively, from 2000-2006. Total sales of these boats in 2006 (both new and used) was estimated to be $19.1 billion, a 4% increase over 2005. Adding canoe and kayak purchases increases this total to $19.3 billion. Total boat purchases in the U.S. in 2006, including new, used, and canoe and kayak purchases, was estimated to be $6.9 billion. Purchases of boat accessories were estimated to have doubled in the last nine years, according to the NMMA, and reached $2.8 billion in 2006. The estimated value of boat accessories purchased by U.S. anglers in this report is $834 million. Overall, the estimated increase in angler expenditures from 2000-2006 seems to compare favorably with the NMMA findings.

A number of additional durable expenditure categories were added to the survey in 2006 as well. Instead of lumping tackle and other fishing gear into one category as was done in the 2000 survey ($635 million in 2006 dollars), it was split into two categories for the 2006 survey ($1.5 billion in combined expenditures). In the 2000 survey there was only one category for boat expenses with a total of $3.8 billion spent nationwide in 2006 dollars after adjusting for inflation. For the 2006 survey, the boat expense category was separated into boat insurance, maintenance,

[1] The 2000 expenditure estimates shown in Steinback, Gentner, and Castle (2004) were adjusted to year 2006 dollars using the Bureau of Labor Statistics Consumer Price Index.

storage, and registration with a total of $1.4 billion spent by anglers in 2006, far less than the previous estimate. Vehicle maintenance was only included on the Pacific Coast form previously ($244 million) and this time maintenance and insurance were added to all forms with a total of $1.3 billion in expenditures. Similarly for second homes, maintenance was only included on the Pacific Coast ($30 million) in the 2000 survey and both insurance and maintenance were included this time for a total of $452 million in expenditures. On balance, the 2006 inflation adjusted estimate across all these categories from the previous survey was $4.7 billion and for the current survey it is $4.6 billion suggesting the addition of these categories did not bias expenditures upward.

Two other methodological changes are worth noting. First, to produce the expenditure estimates from the 2000 survey, CES data were used to determine the proportion of new versus used boats, cars, and second homes, the proportion of these items purchased from private parties versus businesses, and the proportion of these items that were financed. For the 2006 survey, those questions were asked during the survey and the percentages calculated directly from the survey were higher for new purchases, dealer purchases, and financed purchases than either the CES values used before or the current CES values. This has the effect of increasing mean expenditures over the values that would have been used had this analysis relied on the CES data. Secondly, the 2000 survey asked respondents to only report expenditures on goods "primarily" used for saltwater fishing. This time, anglers were asked the percentage of time each expenditure item was used for saltwater fishing in the last year and those percentages were used to determine the value of the purchases associated with saltwater fishing. To attempt to follow the notion of primacy, only goods used more than 50% of the time in saltwater were included in the estimates. The effect of this change on the estimates is unknown.

The USFWS also collected expenditure data from saltwater anglers across the U.S. in 2006. Their data show that anglers across the U.S. spent a total of $8.9 billion on saltwater fishing in 2006 (USFWS 2007), approximately 72% lower than our estimate of total angler expenditures in the U.S. ($31.4 billion). Surprisingly, the USFWS's estimate of total trip expenditures in the U.S. ($5.3 billion) is only 8.6% lower then our estimate ($5.8 billion). For durable good purchases, however, the difference is far larger with the USFWS reporting $3.6 billion in expenditures across the U.S. in 2006 compared to our estimate of $25.6 billion.

There are three primary reasons why the expenditure estimates presented here are higher than those reported in the USFWS report. First, the durable expenditure estimates presented in this study are driven by MRIP participation estimates. For 2006, the MRIP participation estimates are generally over 3 times higher than the USFWS estimates in those states where both surveys were administered. The disparities are likely due to differences in sampling procedures. The USFWS estimates do not count participation by anglers under 16 years of age and do not fully account for license exemptions as the MRIP telephone survey does (Van Voorhees 2007). Also, the sampling rates used for this study were considerably higher than those used for the USFWS study and the MRIP survey was specifically designed to target only recreational saltwater anglers. In contrast, the USFWS targets freshwater anglers, saltwater anglers, hunters, and other recreational activities as an add-on to the decennial census. Lastly, our study contains spending estimates for far more expenditure categories than shown in the USFWS report. The saltwater expenditure categories missing from the USFWS report include: magazines, club dues, license fees, boat

purchases, boat accessories, boat registration, fishing vehicle purchase, fishing vehicle maintenance, fishing vehicle insurance, second home purchase, second home property taxes, second home real estate commissions, second home maintenance, and second home insurance.

At the U.S. level, it was difficult to estimate total angler participation. A resident participant from one state may also have fished in one or more other states or vice-versa. Summing resident and non-resident participation across all states would certainly have overstated participation at the U.S. level. Therefore, only resident participation summed across all of the coastal states was used to expand the durable good expenditure means to total durable expenditures in the U.S. As a result, the durable expenditure estimates shown in this report for the U.S. likely underestimate actual expenditures.

As total angler expenditures increased from 2000 to 2006 so did the economic activity generated from those expenditures. The total sales resulting from angler expenditures in the U.S. increased from $36.7 billion in 2000[2] to $82.3 billion in 2006. The total income produced from angler expenditures, after adjusting for inflation, rose from $14.4 billion in 2000 to $24.0 billion in 2006, and the total employment supported by angler expenditures increased from 349,119 to 533,813 across the U.S. Steinback, Gentner, and Castle (2004) did not provide estimates of value-added generated from angler expenditures. In 2006, we estimate that angler spending generated approximately $38.1 billion in value-added across the U.S.

The majority of the changes in economic activity from 2000 to 2006 are simply due to an overall rise in angler expenditures during this time period. The rest of the differences are the result of structural changes in the economy and because of adjustments in the products and services purchased by anglers. The impact estimates shown in Steinback, Gentner, and Castle (2004) are based on 2000 IMPLAN data and since 2000 the linkages between businesses that support angler expenditures has changed. For this study we utilize 2006 IMPLAN data, so presumably any underlying structural changes in an economy, such as the mix of goods and services purchased by businesses that support angler expenditures, or in the proportions of goods and services purchased from local suppliers (i.e., RPCs), are reflected in the impact estimates shown here.

A comparison of Keynesian multipliers across the two studies provides an indication of the actual mathematical effect that structural changes in an economy and adjustments in the products and services purchased by anglers have had on the level of impacts generated from angler expenditures. Keynesian multipliers are defined as the ratio of total impacts to final expenditures and express the mathematical relationships between angler expenditures and the economic impacts generated from the expenditures (Archer 1984). While these multipliers are not shown here or in the Steinback, Gentner, Castle (2004) report, the astute reader will notice that at the U.S. level the aggregate output multiplier increased from 2000 to 2006 and the income and employment multipliers decreased during this time period. This means that because of structural changes in the U.S. economy and adjustments in the types of products and services purchased by anglers from 2000 to 2006, an average dollar of angler expenditure in 2006 generated comparatively greater total sales, but lower overall income and employment than in 2000. The outcome of these multiplier comparisons across states varies.

[2] The 2000 sales estimate shown in Steinback, Gentner, and Castle (2004), $30.5 billion, was converted to its 2006 equivalent using the Bureau of Labor Statistic's Consumer Price Index.

Keynesian multipliers can also be used to predict how changes in angler expenditures (increases or decreases) will affect sales, income, value-added, and employment in a region. To do this, one simply has to multiply the appropriate Keynesian multiplier (total impact/total expenditure) by the change. For example, an increase of $100,000 in overall angler expenditures in California would yield a total increase in sales within the state of approximately $122,200 ($100,000 x ($2.99 million/$2.62 million)). Caution is advised, however, when using the expenditure and impact estimates shown in this report to make projections because the projections are based on a particular region's industrial structure in 2006 and if the outcome of an increase in angler expenditures is desired, it is must be assumed that there is sufficient productive capacity (i.e., labor and capital) within the region to satisfy an increase in angler expenditures.

The economic impact estimates shown in this report may underestimate the state-level effects associated with marine recreational fishing. Separate models were constructed for each state so the state-level impacts represent only those effects that occurred within the state of interest. Impacts generated through the imports of goods and services from other neighboring coastal states were not part of each individual state assessment. For example, if a retail store in Rhode Island sold fishing tackle that was manufactured in Massachusetts, the impacts associated with the production of the fishing tackle would not be included in the Rhode Island or the Massachusetts impact assessment. The associated wholesale, distribution, and retail mark-ups that occurred in Rhode Island were included in the Rhode Island impact assessment, but the portion attributable to tackle manufacturing was not included in the Massachusetts assessment since the effects were generated from angler purchases in Rhode Island. As such, the state-level impacts generated from angler expenditures in 2006 were likely higher than shown in this report for states that exported fishing-related commodities to other neighboring coastal states. These cross-state effect, however, are captured in the aggregate U.S. model.

Although input-output modeling is the most common approach for describing the structure and interactions of regional economies, it is prudent to be aware of its assumptions regarding linear production functions, constant relative prices, and homogenous sector output. These assumptions are of questionable validity, but are necessary in order to construct the technical coefficients used to determine the direct, indirect, and induced effects in an input-output model. In fact, Propst and Gavrilis (1987) considered these assumptions in their assessment of regional economic impact procedures and concluded that the input-output approach can satisfy the widest range of information needs at high precision levels if primary data are supplied for final demand estimates (i.e., collected directly from anglers as was done for this study).

Another caveat that deserves attention relates to the underlying purpose and use of input-output analysis. In particular, it is a positivistic model designed to identify patterns of transactions and the resource requirements and sector output requirements resulting from changes in economic activity. The input-output approach should not be considered a substitute for normative approaches such as benefit-cost analysis. Benefit-cost analysis seeks to determine whether resources are being put to their best use by examining the difference between total economic value and total costs. In the context of recreational fishing, total net economic value is generally defined as willingness to pay in excess of actual expenditures. Alternatively, input-output assessments reveal how actual expenditures affect economic activity within each sector of an economy.

It is difficult to compare the impacts generated from marine recreational fishing to those generated from commercial fishing and no attempt was made to do so here. Recreational impacts are often compared to the dockside value of commercial fisheries landings, but this comparison fails to recognize the value-added impacts associated with fish processors, wholesale fish dealers, and the retail markets where the commercial catch is sold to consumers. These forward linked sectors could add considerable sales, income, and employment impacts to those generated from commercial harvesting alone. Studies that attempt to compare the impacts generated from recreational fishing to those generated from the sale of seafood in commercial markets should attempt to incorporate all of the backward and forward linkages associated with the commercial harvesting of seafood. Recreational fishing may also generate additional sales, income, employment, and tax impacts through incidental purchases by non-fishing companions and the auxiliary expenditures that occur on trips that were part of a longer vacation. If these types of expenditures occur as a direct result of fishing, a case could be made that any comparison to the commercial sector should also include the impacts generated from these supplemental expenditures.

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