

Economic Impacts of Onshore Fishing Sites and Fishing Tournaments on the Mississippi Gulf Coast

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Abstract: Our study attached a monetary value to marine resources associated with fishing on the Mississippi Gulf Coast. In 2001, we conducted on-site surveys ($N = 475$) to collect expenditures of marine onshore anglers and marine fishing tournament participants in the Mississippi Gulf Coast three-county region. We then determined the extent and economic impacts of these activities and integrated marine onshore angler economic impacts and attendances into a Geographic Information System (GIS) for the Mississippi Gulf Coast. Our survey response rate was 86%. Total sales impacts generated from fishing-related expenditures totaled approximately \$2.6 million in the three-county Mississippi Gulf Coast region and \$2.9 million statewide. We also determined whether onshore fishing locations attendances were affected by their proximity to a casino. No significant differences were found for those onshore fishing locations attendances which were within one-half mile ($T = 0.62$ and $P = 0.56$) and one mile ($T = 0.29$ and $P = 0.78$) of a casino and those which were more than one-half mile and one mile, respectively. With increasing commercial development in the coastal area, studies such as ours can aid governmental entities in decision making crucial to these environments and the local economy.

Key words: economic impact, onshore fishing, fishing tournaments, GIS

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It is known that marine-related recreational and tourism expenditures contribute to the state and local economy; however, these expenditures have not been quantified in Mississippi. One method used to estimate economic benefits of marine resources is an economic impact assessment (EIA). This involves an analysis of actual expenditure information to determine economic impacts to a particular local or regional area of interest (Anderson et al. 1986). Expenditure information generally consists of on-site, food, travel, lodging, and equipment expenses that are collected along with the purchase location. EIAs are especially important in wildlife and fisheries man-

agement because they link decisions concerning the resource with its corresponding economic activity (Martin 1987). EIAs are used in natural resource development to understand and project economic outcomes that would not exist without the presence or growth of an activity (Steinback 1999).

Two commonly used techniques in EIAs are multiplier analyses and input-output (I/O) models. Multiplier analyses were developed in response to the National Environmental Policy Act of 1969 which required an assessment of the total impact a specific venture had on income, employment, and output (Propst and Gavrilis 1987). Later, EIAs evolved to include not just total direct impacts but all directly and indirectly impacted sectors of an economy. Multipliers were most simply defined as direct and indirect effects divided by direct effects (Loomis and Walsh 1997). Steinback (1999) stated that multipliers also make a backward linkage of the economy to show how direct sales promote other effects (e.g., the use of natural resources) on total economic output. A commonly used multiplier is the Type II multiplier, which divides total sales impact by the direct sales. Total sales consist of purchases made directly to businesses, those derived from supporting businesses, and the wages associated with both activities (Olson and Lindall 2000).

The need for more than estimates on employment and income impacts led to the use of I/O models (Loomis and Walsh 1997). I/O models provide an evaluation of total economic activity resulting from a subsequent change in one or more activities in an economy (Olson and Lindall 2000). These models provided not only associated impacts but also identified the impacted economic sectors and sector interrelationships, created by a proposed action or existing activity (Propst and Gavrilis 1987). In a natural resource context, I/O models have proven useful in evaluating economic impacts from various types of activities. For example, studies assessing economic impacts associated with hunting of featured game species, including Eastern wild turkey (*Meleagris gallopavo*) (Grado et al. 1997), Northern bobwhite (*Colinus virginianus*) hunting (Burger et al. 1999), and waterfowl hunting (Grado et al. 2001) have been conducted in the South. Numerous studies evaluating economic impacts related to recreational fishing have been accomplished (Anderson et al. 1986, Martin 1987, Propst and Gavrilis 1987, Steinback 1999, Grado et al. 2003).

Natural resource-based studies place a monetary value on the featured wildlife or fisheries resource, increase political and public awareness, and promote conservation. Furthermore, results from such studies can encourage rural development and legislative and financial support for natural resource-based businesses. Our study's primary objective was to determine expenditures and economic impacts of onshore fishing and fishing tournaments on the Mississippi Gulf Coast counties of Jackson, Harrison, and Hancock and on the State of Mississippi.

Since 1992, the Mississippi Gulf Coast has undergone a development boom with construction of casinos, other tourist-related facilities, and commercial and residential development. As a secondary objective, we determined the relationships from an economic impact perspective, between onshore fishing and the location of casinos. This secondary objective was to construct an interactive Geographic Information System (GIS) database of the Mississippi Gulf Coast with public onshore

fishing site locations with their associated level of regional economic impact and attendances, relative to casino locations. Our results will provide insights on the location of onshore fishing sites relative to casinos, urban areas, and more pristine areas. Even though GIS has long been used as a tool in natural resource management aiding in decision making, there has been little to no attempt to integrate information from EIAs into a GIS database. GIS has been used extensively in various aspects of coastal management. The combination of economic impacts with information derived from natural resource-based activity in a geospatial framework, however, is nonexistent in Mississippi.

Study Area

Our study area consisted of the three coastal counties in southern Mississippi (Hancock, Harrison, and Jackson). Both public onshore fishing sites and fishing tournaments exist in the study region. Anglers who fished from private piers were not surveyed.

Surveyed Sites

Eight of 43 public onshore fishing sites and three of 13 fishing tournaments in the three-county region were surveyed from May to October 2001. Our survey sites were chosen based on attendance levels, allowing us to make inferences concerning nonsurveyed sites with similar attendances in the three counties.

Site attendance was measured in activity days. An activity day was defined as the presence at a site by a recreationist, regardless of the length of stay. The Mississippi Department of Marine Resources (MDMR) provided the raw data needed to determine activity days of public onshore fishing participants in 2001. Activity days for fishing tournaments were estimated by site or event managers. Activity days were then compiled by site type, and data were collected from surveyed and nonsurveyed sites (Table 1, 2).

Methods

Survey Methods

Our study used an on-site survey technique and subsequent analyses to determine the economic impacts and degree of certain marine-related activities. Dillman (1978) reviewed different surveying techniques and found face-to-face and telephone interview surveys more popular than mail surveys because they provided more accurate data. Consequently, we used on-site, face-to-face interview surveys to gather information from anglers and activity participants to achieve a higher response rate and more reliable data. This method of surveying also allowed the interviewer to explain and interpret any questions the interviewee might have about the survey process. These were important considerations when using a lengthy, detailed survey associated with expenditure data collection.

From May to October 2001, onshore public fishing sites were surveyed on

Table 1. Coastal region marine-related fishing activity days by site type and residency on the Mississippi Gulf Coast during 2001.

| Site type | Respondents (<i>N</i>) | Response rate ^a (%) | Activity days ^b (<i>N</i>) |
|----------------------------|--------------------------|--------------------------------|---|
| On-shore fishing locations | 425 | 80 | 95,327 |
| Resident ^c | 338 | | 75,426 |
| Nonresident ^d | 87 | | 19,901 |
| Fishing tournaments | 50 | 82 | 7,689 |
| Resident | 28 | | 5,890 |
| Nonresident | 22 | | 1,799 |
| Total | 475 | 86 | 103,016 |

a. Weighted average response rate by site type.

b. Includes nonsurveyed site attendances.

c. Individuals who live in the three-county coastal region.

d. Individuals who do not live in the three-county coastal region.

Table 2. State marine-related fishing activity days on the Mississippi Gulf Coast by site type and residency during 2001.

| Site type | Respondents (<i>N</i>) | Response rate ^a (%) | Activity days ^b (<i>N</i>) |
|----------------------------|--------------------------|--------------------------------|---|
| On-shore fishing locations | 425 | 89 | 86,478 |
| Resident ^c | 386 | | 86,478 |
| Nonresident ^d | 39 | | 8,849 |
| Fishing tournaments | 50 | 82 | 7,689 |
| Resident | 41 | | 6,262 |
| Nonresident | 9 | | 1,427 |
| Total | 475 | 86 | 103,016 |

a. Weighted average response rate by site type.

b. Includes nonsurveyed site attendances.

c. Individuals who live in the State of Mississippi.

d. Individuals who do not live in the State of Mississippi.

weekdays and weekends (i.e., Friday, Saturday, and Sunday). Fishing tournaments were surveyed as they occurred. All surveys were conducted between May and October 2001.

Survey Instrument

We used an on-site fishing survey for onshore fishing sites (i.e., piers) and fishing tournaments. Survey questions pertained to fishing or other activity-related expenditures and fishing habits during the year. Out-of-state residents and Mississippi residents not living in the three-county study area were considered nonresidents for the intentions of the three-county EIA. Out-of-state residents were considered nonresidents for the state EIA.

We asked survey participants to provide their on-site, trip-related, and equip-

ment expenditures and the purchase location. In-state expenses were cataloged by amount and county of the purchase, and out-of-state expenses by amount and state of the purchase. Recording the location of the purchase in this manner allowed for the development of three different expenditure profiles: overall (i.e., all money spent to participate in the marine-related activity), three-county region (i.e., money spent only within the three Mississippi Gulf Coast counties to participate in the marine-related activity), and state (i.e., money spent only within the state of Mississippi to participate in the marine-related activity). Participants were only asked to provide on-site and trip-related expenditures for the current 24 hours to minimize recall error. In situations where participants were on day trips, they were asked to estimate their trip expenses for the remainder of the day. Equipment expenditures included durable items related to participation at the site and acquired during the past year. An estimate on annual use for durable items for all purposes was also collected. Mean in-region and out-of-region expenditure summaries were derived for each onshore fishing location and tournament (i.e., US\$/participant/activity day). In-region expenditure profiles by site, along with relevant attendance information facilitated the EIA.

During the survey, resident participants were presented with a hypothetical situation wherein they could not participate in their activity within the three-county study region. They were then asked to estimate the proportion of money presently being spent on their activity in the area of interest that would consequently be spent outside the area of interest to participate in that same or some other activity. Expenditures that would leave the region in the absence of the activity were used to adjust downward their total expenditures. This adjustment created more realistic, justifiable in-region expenses by residents for economic impact purposes (Grado et al. 2001).

Economic Impacts

Economic impacts of marine-related fishing activities were modeled using Impact Analysis for Planning (IMPLAN) software system. IMPLAN has been used extensively to study economic impacts of activities related to forestry, agriculture, recreation, tourism, commercial development, and the commercial endeavors of specific industries (Olson and Lindall 2000). IMPLAN software uses economic data from an area of interest to construct a model of its economy. Associated databases provide information required to construct regional or state IMPLAN models (Olson and Lindall 2000). County and state level models define relationships between industries and account for monetary leakages (i.e., business transactions) outside of an economy of interest. These data sets were used to analyze the three-county region and state input-output structure. Expenditures made in the three-county region or state on behalf of marine-related fishing activities were then organized as final demands on regional or state industries and businesses.

We built IMPLAN models of the three-county region and state to identify direct and secondary impacts resulting from in-region activity participant expenditures (Olson and Lindall 2000). Direct impacts were sales, salaries, wages, and jobs created by initial purchases of participants that were retained by an in-region or state economic entity in the operation of its business. Secondary impacts were composed of

indirect and induced impacts. Indirect impacts were created through purchases made by directly-impacted business or individuals with supporting businesses in the economy of interest. These impacts included the same categories as direct impacts. Induced impacts embodied those purchases by employees associated with direct and indirect impacted sectors that generated sales, salaries, wages, and jobs. Leakages are local expenditures leaving the region to purchase goods or services (Martin 1987). Leakages were calculated and represented the difference between total sales and local value added (Loomis and Walsh 1997). The extent of leakage depended on the size of the study region and business linkages outside the region of interest. Leakages in larger regions generally were reduced due to a more diverse economy capable of absorbing impacts of direct purchases (Martin 1987).

We used nonresident and adjusted resident expenditures in our study to measure economic impacts produced by marine-related fishing resource activities. All expenditure averages for each fishing activity were weighted by the number of site or event participants. Weighted average expenditure categories for resident and nonresidents were entered into the appropriate industrial sectors in the modeled economy of the three counties and then the state to facilitate the EIAs. Type II multipliers obtained from the EIAs were then used to assess impact relationships within the three-county and state economy (Loomis and Walsh 1997, Grado et al. 2001).

Geographic Information System

We created a fully-integrated GIS database for our study using ArcView 3.2. This geospatial coverage and database focused on public onshore fishing sites and their associated economic impact on the three-county region. Boundaries, city limits, roads, highways, rivers, and other water body data for the three-county region were obtained from the Mississippi Automated Resource Information System (IHL/MTC 2001). Latitudinal and longitudinal locations for public onshore fishing sites were provided by MDMR and entered into the database as point locations. Regional economic impacts of individual piers, along with pier attendances were then added as an attribute to each point. The onshore fishing site points displayed within the GIS event theme were classified and labeled according to their attendance and economic impact.

Casino locations within the three-county region were then added to the database as point locations. Latitudinal and longitudinal locations for each casino were obtained from www.MapQuest.com. Next, one-half mile and one mile buffers were placed around each casino within the GIS database. One-half mile and one mile buffers were selected because we determined that these were reasonable distances for an individual with fish equipment to walk to an onshore fishing location. A spatial analysis was then performed to determine public onshore fishing sites contained within the buffers.

We used the Statistical Analysis System (SAS) statistical package to analyze onshore fishing and casino location relationships (SAS 1999). The hypotheses tested were $H_0: \mu_{OS\ in} = \mu_{OS\ out}$ and $H_a: \mu_{OS\ in} \neq \mu_{OS\ out}$, where $\mu_{OS\ in}$ is the mean attendance, serving as a proxy for economic impacts of onshore fishing locations within

one-half mile and one mile of a casino and $\mu_{OS\ out}$ is the mean attendance of onshore fishing locations not within one-half mile and one mile of a casino. We used attendance as a valid proxy for economic impacts because the I/O models are linear in nature (Olson and Lindall 2000). A folded *f*-test was used to determine if sample variances were equal and a two-tailed *t*-test was used to determine if a significant difference existed between the two total mean attendances (SAS 1999). Both tests were performed in the PROC T-TEST procedure.

Results

Survey Results

We completed 475 surveys from May to October 2001. The number of surveys and refusals ($N = 77$) for each site was tallied and the overall response rate was 86%. The number of completed surveys was 425 at onshore fishing locations and 50 at fishing tournaments. The MDMR provided the number of activity days for marine-related activity participants during their visits to an onshore fishing location. We then derived the total number of marine-related activity days for an onshore fishing location. These data were needed to determine marine-related activity days for a site by residence category. For both onshore fishing locations and fishing tournament participants there were 103,016 activity days (Tables 1, 2).

Expenditures

Overall, state, and three-county region weighted average expenditures for onshore fishing participants averaged \$34.24, \$25.84, and \$22.47/participant/activity day for all sites, respectively (Table 3). Fishing tournament participants' overall, state, and three-county region expenditures were \$1,368.99, \$710.01, and \$678.27/participant/activity day, respectively (Table 3). Anglers at public onshore fishing sites spent the most money on bait (19%), groceries (16%), and casinos (12%). Participants of fishing tournaments spent the most money on boats (26%), boat motors (18%), and automobile and boat fuel (14%).

Economic Impacts

We reported the economic impacts derived from marine-related fishing activity participants for both onshore fishing locations and fishing tournament participants in the three-county region (Table 4) and state (Table 5) for total sales, value added, indirect business taxes, and employment by residency type. Value added was composed of employee compensation, proprietary income, other property income, and indirect business taxes. Total annual sales for both types of marine-related resource participants approximated \$2.6 million in the three-county region and \$2.9 million statewide (Tables 4, 5). These sales supported approximately 45 three-county region and 50 state full- and part-time jobs. Total value added within the three-county region was \$1.7 million and statewide, \$1.9 million, containing \$161,151 and \$181,959 in indirect business taxes, respectively. Indirect business taxes primarily stay within the

Table 3. Mean total expenditures (\$/participant/activity day) for all participants of onshore fishing and fishing tournaments for overall, three-county region, and Mississippi by site type and survey site during 2001.

| Site type | Overall ^a | | Region ^b | | Mississippi ^c | | |
|--|----------------------|--------|---------------------|--------|--------------------------|--------|-----|
| | Mean \$ | SE | Mean \$ | SE | Mean \$ | SE | N |
| Onshore fishing locations ^d | 34.24 | 8.37 | 22.47 | 5.06 | 25.84 | 5.58 | 425 |
| Urie Pier | 26.64 | 2.70 | 20.07 | 2.41 | 22.21 | 2.49 | 101 |
| West Side Pier | 34.38 | 10.56 | 30.19 | 10.08 | 30.32 | 10.16 | 29 |
| Washington Street Pier | 36.19 | 8.94 | 29.12 | 9.21 | 31.95 | 9.13 | 33 |
| Broadwater Beach Marina | 32.12 | 5.50 | 25.86 | 5.11 | 27.24 | 5.11 | 71 |
| Pass Christian Municipal Harbor | 28.56 | 6.27 | 18.41 | 3.41 | 24.99 | 6.09 | 49 |
| 8-mile Waterfront | 27.39 | 5.07 | 18.07 | 4.21 | 20.55 | 4.19 | 43 |
| Old Hwy. 90 Fishing Bridge Biloxi | 31.02 | 3.89 | 21.95 | 2.72 | 23.61 | 2.87 | 74 |
| Cedar Point Boat Launch | 57.61 | 24.03 | 16.06 | 3.31 | 25.84 | 4.61 | 25 |
| Fishing tournaments ^d | 1,368.99 | 317.51 | 678.27 | 213.72 | 710.01 | 210.61 | 50 |
| Sonny Johnson Memorial | 1,628.56 | 556.15 | 1,520.51 | 567.71 | 1,615.75 | 558.39 | 12 |
| Annual Mississippi Deep Sea Fish | 220.60 | 44.25 | 160.69 | 38.96 | 160.69 | 38.96 | 20 |
| Southern Kingfish Association | 2,257.81 | 352.13 | 353.60 | 34.49 | 353.60 | 34.49 | 18 |

a. Average dollars spent at all locations to participate in a marine-related activity.

b. Average dollars spent in three-county region to participate in a marine-related activity.

c. Average dollars spent in Mississippi to participate in a marine-related activity.

d. Average overall expenditures by site type.

economy of interest. Aggregated sectors of manufacturing, wholesale and retail trade, and services were the main benefactors of marine-related activity participant expenditures. Transportation, communication, and utilities; finance, insurance, and real estate; and government were sectors that also incurred substantial impacts.

Geographic Information System Results

There were five onshore fishing locations managed by MDMR that were within one-half mile of a casino. There were 43 onshore fishing locations managed by MDMR that were not within one-half mile of a casino. The mean attendance of onshore fishing locations within one-half mile of a casino was 2,426 participants/year and 1,935 participants/year for those not within one-half mile of a casino.

A folded *f*-test showed that the variances of attendances of onshore fishing locations within one-half mile and those not within one-half mile of a casino were not significantly different at a 95% level of confidence ($P = 0.86$). A two-tailed *t*-test at a 95% level of confidence revealed no significant difference ($T = 0.62$ and $P = 0.56$) between mean attendance of onshore fishing locations within one-half mile and those not within one-half mile of a casino.

The mean attendance of onshore fishing locations within one mile of a casino

Table 4. Total economic impacts of onshore fishing and fishing tournaments in Mississippi Gulf Coast counties during 2001.

| Site type | Total sales ^a (\$) | Value added (\$) | Indirect business taxes (\$) | Jobs (<i>N</i>) |
|---------------------------|-------------------------------|------------------|------------------------------|-------------------|
| Onshore fishing locations | 1,501,145 | 1,045,299 | 104,699 | 28 |
| Resident | 646,915 | 463,415 | 51,604 | 13 |
| Nonresident | 854,230 | 581,884 | 53,095 | 15 |
| Fishing tournaments | 1,084,234 | 702,986 | 56,452 | 17 |
| Resident | 635,394 | 393,677 | 39,534 | 10 |
| Nonresident | 448,840 | 309,309 | 16,918 | 7 |
| Total | 2,585,379 | 1,748,285 | 161,151 | 45 |

a. Total sales include direct, indirect, and induced sales.

Table 5. Total economic impacts of onshore fishing and fishing tournaments in Mississippi during 2001.

| Site type | Total sales ^a (\$) | Value added (\$) | Indirect business taxes (\$) | Jobs (<i>N</i>) |
|---------------------------|-------------------------------|------------------|------------------------------|-------------------|
| Onshore fishing locations | 1,695,506 | 1,118,785 | 118,626 | 31 |
| Resident | 1,060,526 | 711,346 | 81,899 | 20 |
| Nonresident | 634,980 | 407,439 | 36,727 | 11 |
| Fishing tournaments | 1,294,423 | 767,325 | 63,333 | 19 |
| Resident | 774,975 | 432,119 | 43,220 | 11 |
| Nonresident | 519,448 | 335,206 | 20,113 | 8 |
| Total | 2,989,929 | 1,886,110 | 181,959 | 50 |

a. Total sales include direct, indirect, and induced sales.

was 2,128 participants/year and 1,953 participants/year for those not within one mile of a casino. There were 10 onshore fishing locations managed by MDMR that were within one mile of a casino. There were 38 onshore fishing locations managed by MDMR that were not within one mile of a casino. A folded *f*-test showed that variances of attendance of onshore fishing locations within one mile and those not within one mile of a casino were not significantly different at a 95% level of confidence ($P = 0.20$). A two-tailed *t*-test at a 95% level of confidence revealed no significant difference ($T = 0.29$ and $P = 0.78$) between mean attendance of onshore fishing locations within one mile and those not within one mile of a casino.

Discussion

Survey Response Rates

For both the three-county region and state, the total response rate for all surveys was 86% (Tables 1, 2) which indicated that marine-related fishing activity participants exhibited a high willingness to participate in our survey. Onshore fishing par-

ticipants responded most positively to the survey, with a response rate of 89%. Fishing tournament participants had a lower response rate of 82% (Tables 1, 2). Onshore fishing participants were interviewed while fishing. They perhaps had a higher response rate because this activity tended to be more relaxed, allowing for more time to complete the survey with the interviewer, compared to fishing tournament participants who were surveyed during time-restricted weigh-ins.

Residents had more activity days than nonresidents within both the three-county region and state at onshore fishing locations (79% and 91%, respectively) and fishing tournaments (56% and 60%, respectively). A plausible explanation for this trend is that most surrounding states have larger marine coast lines than Mississippi, which would attract their residents and visitors from other states. Mississippi's coastline is primarily composed of man-made beaches, with natural beaches being located on barrier islands located a considerable distance off the coast.

Expenditures

Onshore fishing participants had a low average overall expenditure, at \$34.24/participant/activity day as compared to fishing tournament participants. Overall standard error of these expenditures was 8.37, meaning expenditures by these participants were moderately consistent (Table 3). Costs were reduced for these participants because onshore fishing requires relatively little equipment. Also, the bulk of participants were residents of the three-county region and, therefore, travel costs were reduced. Expenditures within the three-county region averaged \$22.47/participant/activity day, representing 66% of total expenditures made within the three-county region (Table 3). Daily expenditures within the state averaged \$25.84/participant/activity day, comprising 75% of total expenditures made within the state.

Fishing tournament participants overall average daily expenditure of \$1,368.99/participant/activity day was larger than onshore fishing participant's expenditure. Overall standard error of these expenditures was 317.51 (Table 3). These expenditures were highly variable due to equipment purchases—typically a boat or boat motor—being made within the year by some but not all fishing tournament survey participants. There were more residents of the three-county region and state participating in fishing tournaments than nonresidents to the state (Tables 1, 2). Expenditures within the three-county region averaged \$678.27/participant/activity day, indicating that 50% of all expenditures were made within the three-county region (Table 3). Daily expenditures within the state averaged \$710.01/participant/activity day, with 52% of all expenditures were made within the state.

Economic Impacts

Estimated total annual sales attributed to onshore fishing locations were \$1.5 million, three-county region, and \$1.7 million statewide. These sales supported approximately 28 three-county region and 31 statewide full- and part-time jobs, respectively. Despite onshore fishing generating 95,327 activity days/year, the economic impacts of this activity were still relatively small. This was attributed to most participants (79%) being residents of the three-county region, and with only 35% of indi-

vidual resident participant expenditures being able to be used for economic impact purposes. Fishing tournaments contributed an estimated \$1.1 million three-county region and \$1.3 million statewide in total sales and provided approximately 17 three-county region and 19 statewide full- and part-time jobs, respectively. Fishing tournaments' comparatively lower economic impact result from a smaller user base generating 56,452 activity days/year, comprised of 60% residents of the state. However, an average of 65% of individual resident participant expenditures could be used for economic impact. Another contributing factor to the low economic impact, for both on-shore fishing locations and fishing tournaments, was that fewer nonresident participants made equipment purchases within the three-county region or state.

Multiplier Effects

Economic multipliers derived from our study results were used to explain the three-county region and state's ability to absorb and use in-region marine-related activity participant expenditures. Multiplier size can be related to the size of the region of interest because as geographic size increases, value added increases and less expenditures "leak" outside the region (Loomis and Walsh 1997). Therefore, the state output multiplier would be larger than the three-county output multiplier. Multipliers are also influenced by the commercial and industrial makeup of an area. Steinback (1999) produced a multiplier of 1.60 for nonresident angler expenditures in Maine. In a study of turkey hunting in Mississippi, Grado et al. (1997) produced a multiplier of 2.3. A study of all nonresident hunting activities in nine rural Pennsylvania counties yielded a multiplier of 2.67 (Strauss et al. 1995). Previously, there were no comparative studies determining economic impacts and Type II multipliers for marine-related activities on the Mississippi Gulf Coast.

Type II multipliers derived from our study were 1.5 for the three-county region and 1.7 for the state. This indicated that for every dollar spent in the region there was \$1.50 of economic impact and for every dollar spent in state there was \$1.70 of economic impact. Typically, state and regional-level output multipliers for recreational activities range from 1.5 to 2.7 in the United States (Loomis and Walsh 1997). Our state and three-county region multipliers fall within the low end of this range, indicating that both economies are capturing fishing-related expenditures and that many supporting businesses located within the state and three-county region depend on the marine resource. However, these multipliers indicated that some forms of additional business development can be incorporated in the three-county region and state to create or capture expenditure activity.

Urban and rural development programs, aided by state and federal agencies and private businesses, can improve local economies by marketing and planning improvements or developments that enhance marine resources and its users based on economic impact analysis. Our study and similar studies, are especially applicable in rapid population growth areas, where policy-makers and the public are challenged with land-use issues, often between developing and conserving the resource. In general, the determination of economic values allows for an evaluation of funding expenditures in terms of benefit/cost ratios or comparisons with the economic value or

impact of other land-use activities and developments. Economic values of low-impact natural resource-based recreation activities, such as onshore fishing at public sites, may provide further justification for funding currently existing public areas or rebuilding those sites damaged by natural events such as hurricanes. It could also support the building of additional public sites to use for natural resource-based recreation.

Finally, it was recommended that the amount and quality of public sites and events be increased and improved to promote the marine-resources of the Mississippi Gulf Coast. Increasing and improving these areas could entice additional residents and nonresidents of Mississippi to participate in all marine-related activities, further increasing their economic value.

Geographic Information System

Our statistical analysis comparing onshore fishing locations within one-half mile and one mile of a casino with those not within one-half mile and one mile, revealed no significant difference ($P < 0.05$) between mean attendances of the two groups. We concluded that proximity to a casino had little to no effect on attendances of onshore fishing locations.

Despite the results of our proximity analysis, the GIS database created for our study is still extremely useful. Our study is one of the first to integrate GIS with EIAs, allowing the MDMR to simply select an onshore fishing location in the map portion of the database to reveal economic impact to the region and attendance of the onshore fishing location. In 2002, Hurricane Lili and Tropical Storm Isidore damaged or destroyed many of these onshore fishing locations. Having a database such as that developed by our study may have aided MDMR in making decisions concerning reconstruction efforts and also determine better placement for onshore fishing locations. Economic impacts can then be considered as another factor in the decision process.

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