

2009 Michigan CHARTER FISHING STUDY



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Great Lakes charter fishing is an important contributor to tourism in Michigan's coastal communities. Spending profiles changed little since 1985, with each fishing party spending an average of \$1,262.96 in 2009. Economic impacts of charter fishing to coastal communities included gross sales of at least \$14.9 million and 343,845 labor hours in 2009. Charter fishing also drew out-of-state tourists, who booked 2,995 excursions in 2009 and generated at least \$2.1 million in labor income for Michigan workers. Since 1990, trips booked by out-of-state customers decreased by 34% and trips booked by customers from the Detroit and Flint metro areas decreased by 75% while trips booked by customers from other regions of Michigan increased by 15%. The number of charter excursions taken per year on each lake has fluctuated through the years. Lake Huron experienced a 49% decline in trips from 2002 to 2009 as the Chinook salmon fishery declined. This loss of effort represents a loss of \$1.46 million in economic output and 51,429 labor hours in 2009 alone, with most of the decline in central and southern ports. Over the same time period, economic impacts to Saginaw Bay ports increased by \$355,197 in output as walleye fishing improved. Trip satisfaction was high across the state, and was most influenced by the hospitality of the captain and mate, the comfort of the vessel, and the number of fish caught. Sources of information used by customers to choose a boat to patronize changed substantially since 1985, with the Internet now playing a major role in marketing.

Introduction

Michigan's charter fishing industry began following the successful establishment of stocking programs for non-native Pacific salmon in Great Lakes waters. Coho salmon *Oncorhynchus kisutch* were stocked successfully beginning in 1966, and Chinook salmon *Oncorhynchus tshawytscha* in 1967 (Kocik and Jones 1999). A sport fishery based primarily on stocked salmonines grew rapidly following the nearly complete collapse of commercial fisheries for native species due to overfishing, pollution, accidental introduction of invasive species, and a shift in fisheries management regarding allocation of Great Lakes fisheries resources (Brown *et al.* 1999). The growth of Great Lakes sport fishing was facilitated by growing success in controlling the invasive sea lamprey *Petromyzon marinus* and the ability of introduced salmonines to prey heavily on abundant exotic alewife *Alosa pseudoharengus* (Bence and Smith 1999).

During the 1970s and early 1980s, Michigan's charter fishing industry grew concurrently with the expanding fishery. In 1985, a survey of charter boat customers in Michigan documented sources of information used and reasons for choosing a specific charter business to patronize, place of residence, and expenditures while in coastal communities (Mahoney *et al.* 1986 {hereafter referred to

as the 1985 study}). Since that time, salmonine populations have fluctuated, the forage base has changed dramatically, Michigan's economy has suffered due to a decline in the auto industry, and the number of state-licensed charter boat operators has decreased from 920 in 1985 to 550 in 2009.

The current study revisits many questions posed in the 1985 study, with the intent of providing an updated profile of charter customers following the changes in the Great Lakes fishery and Michigan's economy. This study also includes the most thorough investigation of economic impacts attributed to charter fishing in Michigan. A better understanding of charter customers, successful marketing strategies, and the economic impacts realized by coastal communities as a result of charter fishing could help charter businesses remain solvent and link environmental and societal changes to trends in coastal tourism generated by Great Lakes charter fishing.

Profile of Fisheries

Michigan's charter fleet included 584 boats operated by 550 reporting captains at the beginning of the 2009 season, which represents a 40% decrease in the number of captains since 1985 (unpublished data, Michigan Department of Natural Resources and the Environment {MDNRE}; Manohey *et al.* 1986). Each year, the majority of Great Lakes and tributary charter fishing occurs during summer months, with 95% of trips occurring May-October (unpublished data, MDNRE). Effort is not evenly distributed across the four bordering Great Lakes, and each lake offers different fishing opportunities.

Lake Michigan accounted for 78% of all charter fishing excursions in Michigan during 2009 and catches were dominated by Chinook salmon and other salmonines (Wesander and Clapp 2010). Natural reproduction of Chinook salmon has been significant in recent years, approximately 50% of Lake Michigan Chinooks are now wild-spawned (Claramunt *et al.* 2008) while reproduction of native lake trout *Salvelinus namaycush* remains negligible despite extensive restoration efforts (Madenjian and Desorice 2010). Chinook salmon stocking by all states bordering Lake Michigan has been reduced twice to prevent salmon from depleting forage fish and de-stabilizing predator-prey balance (Claramunt *et al.* 2010). Lake Michigan continues to provide the high catch rates of salmon that made the Great Lakes sport fishery famous, and accounts for the majority of charter fishing effort in Michigan. Some charter fishing for steelhead *Oncorhynchus mykiss* also occurs in tributaries to Lake Michigan during winter months, although a significant portion of guided steelhead fishing is catch-and-release and therefore not subject to mandatory state reporting.

In Lake Huron, the Chinook salmon fishery declined precipitously along with the alewife population in 2004 (Johnson *et al.* 2010). Factors leading to the decline in alewife in Lake Huron may include strong natural reproduction of Chinook salmon in Ontario tributaries coupled with high stocking rates (Johnson *et al.* 2010) and rapid expansion of exotic invertebrates such as dreissenid mussels that can influence pelagic productivity. The importance of these factors and others, such as bird predation, is not fully understood (Riley *et al.* 2008). Regardless of the cause, the number of charter excursions has fallen by 49% since and the prevalence of Chinook salmon in the catch has declined

from 46% to 5% (unpublished data, MDNRE). Lake Huron now accounts for fewer than 12% of charter fishing trips taken in Michigan waters (Wesander and Clapp 2010). Ports that historically relied on salmon fishing have seen dramatic declines in fishing effort, while Saginaw Bay ports have fared better due to the increase in walleye *Sander vitreus* that followed the decline of alewife. Natural reproduction of walleye following the alewife collapse (Fielder *et al.* 2007) has eliminated the need for stocking, and natural reproduction of lake trout has also increased in recent years (Fitzsimons *et al.* 2010). Lake Huron is a fishery in transition, and now supports a world-class walleye fishery in Saginaw Bay and mixed-bag fisheries where Chinook salmon were formerly more abundant.

In contrast to lakes Huron and Michigan, the Lake Superior sport fishery has always been dominated by native lake trout, which now represent 88% of the charter fishing catch (unpublished data, MDNRE). Despite the high catch rates of lake trout, Lake Superior remains a minor component of the state's charter industry and accounted for only 2% of charter trips in 2009 (Wesander and Clapp 2010). This is likely due to the difficulty and cost of accessing offshore fishing sites, low population density on Upper Michigan's north shore, and the unpredictable nature of winds and waves that lead to trip cancellations.

Lake Erie, Lake St. Clair, the St. Clair River, and Detroit River accounted for 8% of charter trips taken in Michigan waters (Wesander and Clapp 2010). These fisheries focus on coolwater and warmwater gamefish as opposed to coldwater salmon and trout. Catch reports from MDNRE suggest that these fisheries focus primarily on walleye and yellow perch *Perca flavescens*. However, charter anglers were not required to report released fish to MDNRE as of 2009. As a result, the catch-and-release fisheries for muskellunge *Esox masquinogoy* and smallmouth bass *Micropterus dolomieu* were not fully captured by catch and effort reporting. Furthermore, Michigan charter boats often fish Ontario (or Ohio) waters after leaving from Michigan ports on these waterways and do not report trips that do not include fishing in Michigan waters.

Methods

An online survey of charter fishing customers was developed using SurveyMonkey.com with input from charter operators and two of the authors from the 1985 study (Appendix A). Surveys were collected June-October 2009. In attempts to obtain a random sample of charter customers, a random sample of 151 charter operators was selected from the MDNRE list of 550 operators engaged in mandatory catch and effort reporting during the 2008 season. In addition to these 151 captains, two ports with active charter boat associations, large fleets, and leadership that supported this study provided lists of all active captains that fish out of Ludington and Grand Haven on Lake Michigan. This was done to augment the random sample in the event of low response rate, and it was hoped that these ports would provide enough responses to calculate port-specific spending profiles and economic impacts. All charter captains known to fish Lake Huron were also invited to participate due to a need for greater understanding of regional economic impacts following the recent decline of the Lake Huron fishery, bringing the total number of invitations to 277.

Captains were initially invited to participate by mail and asked to reply with an indication of their willingness to collect and provide authors with e-mail addresses of customers. This would have facilitated e-mail invitation of customers to complete the online survey, and would have allowed e-mailing of reminder letters to respondents and subsequent correction for any observed non-response or recall bias (Dillman 1978). However, only 24 captains indicated a willingness to provide authors with customer contact information. These captains were mailed a second letter and enclosed sheet to record customer e-mail addresses.

All 277 captains initially contacted were then sent 30 or more business-card sized invitations (Appendix B) and a second letter that assured the anonymity of customers who used the URL printed on cards to take the online survey. Cards advertised that participants would be entered to win one of two free charter fishing trips funded by Ludington Charter Boat Association. Each card included a unique Participant Code to dissuade respondents from filling out multiple surveys and entering repeatedly in the free charter drawing. Codes were also used to distinguish customers of randomly selected captains (codes 0-9999) from customers of captains invited to participate due to their port or lake fished (codes 10000-19999).

Two of the 24 captains who initially agreed to collect customer e-mail addresses provided a total of 33 customer e-mail addresses at the end of the season. A reminder e-mail was sent to these 33 customers, who were given a Participant Code of “88888.” Due to low overall response rate, at the end of the fishing season charter captains who attended the 2009 meeting of the Michigan Charter Boat Association were also asked to contact their customers with an e-mail invitation and the Participant Code “99999.” These batch codes allowed authors to separate respondents into four groups without collection of any identifiers of individual customers or the captains they fished with.

The IMPLAN economic impact model was used to determine economic impacts of charter fishing (Appendix C). Calculation of economic impacts is specific to the region defined, and impacts at two scales were considered in this study. These included impacts to the state of Michigan’s economy and impacts to coastal communities that offer charter fishing within Michigan. In each analysis, only non-residents of the region considered to contribute to economic impacts because it is assumed that residents would have spent discretionary income on some activity analogous to charter fishing had charter fishing been unavailable (Tyrrell and Johnston 2001). This means that only excursions booked by out-of-state residents contributed to impacts on Michigan’s economy. For coastal communities, only excursions that were booked by clients living more than 50 miles (80 km) from the port where the charter boat was docked were considered. Furthermore, economic impacts could only be attributed to charter fishing if charter fishing was the primary reason for visiting the port in question.

Eleven spending categories were included in the survey (Appendix C). These were based on the five categories recommended by Stynes and White (2006) to facilitate linking spending to key sectors in the IMPLAN model. Multipliers used for Lake Michigan economic models were based on an average of four representative coastal Lake Michigan counties. Likewise, Lake Superior was based on three representative counties. A single model for Lake Erie, Lake St. Clair, the St. Clair River,

and the Detroit River was based on three representative counties from that region. Lake Huron was approached differently due to regional differences within the lake and a desire to consider regional impacts. Multipliers from each coastal Lake Huron county were included in county-based economic models, which enabled calculation of economic impacts at a finer scale. Aggregated impacts for all counties in a given region are reported in results, and aggregated regions were used to calculate lakewide economic impacts.

Lake Huron's decline in salmon fishing (ca. 2004) and subsequent increase in walleye fishing has affected the economies of different regions in different ways. The economic impact of these changes in effort was assessed by comparing the difference in impacts calculated using 2002 versus 2009 effort data. This provides the amount lost (or gained) during 2009 as a result of changes in charter fishing effort since 2002.

Results

Approximately 9,000 customer invitation cards were distributed to captains. Surveys were completed by 141 customers, 12 of which were contacted by reminder e-mail and 1 of which was contacted by a captain directly following the end of the charter fishing season. Of the remaining 128 respondents, 50 were invited by randomly selected captains, 77 were invited by other captains, and one did not provide a code. Due to low sample sizes, data from all groups were pooled for analysis. Although small sample size for initial non-responders was too low ($n = 12$) for meaningful investigation of potential non-response bias, the 1985 study found no significant differences between responders and non-responders for any questions asked. The authors assume that the same would hold true for the 2009 survey, for which many similar questions were asked.

Eight additional surveys were not analyzed due to one of two reasons. Four excluded surveys only recorded answers to the first several questions and had a Participant Code that appeared for another complete survey, indicating the respondent was interrupted during the survey and returned later to complete the survey in its entirety. Four other surveys appeared to be attempts at entering the free charter drawing. These did not include any Participant Code and only included answers to one or two survey questions. Three of these were from the same IP address on the same date.

Of the 141 valid survey responses, one was reported from an inland lake near Lake Michigan. A minority of charter operators offers inland lake or river trips in addition to Great Lakes fishing, and this survey was subsequently included in analysis. The majority (87.1%) of responses from customers who fished on the Great Lakes had fished in Lake Michigan, and Lake Huron was the only other lake that was fished by more than two respondents (Table 1).

The number of anglers per charter fishing party has remained remarkably consistent through the years (Table 2). Five respondents to the 2009 survey apparently booked multiple boats for large fishing parties. These parties included 13 to 22 anglers. Most charter boats are only licensed to carry up to six passengers. This and the high charter fee expenditures reported suggest that these five respondents were not chartering a single boat. Those responses were therefore excluded from analysis. The resulting mean of 3.9 anglers per party is very similar to the MDNRE count of 4.1 anglers per party in 2009 based on mandatory catch and effort reporting (Wesander and Clapp 2010).

Most charter fishing parties included members of the booking customers' family and/or friends of the booking customer in 2009 (Table 3). Nearly half of respondents reported that fishing parties included people with a variety of relationships to the booking customer. The 1985 study asked respondents to choose one type of relationship that best described members of the party, making calculation of percentages dissimilar to the present study. However, fishing parties in 1985 were also made up primarily of family or friends, with only 6.5% reporting parties comprised primarily of business associates (Mahoney *et al.* 1986).

Customer loyalty plays an important role in the charter fishing industry, with customers reporting up to 70 trips taken with the captain they fished with prior to taking the survey. On average, customers had taken 3.6 trips on the boat they fished from most recently (including the most recent trip). The percentage of repeat customers was 53% in 2009, up from 43% in 1985. New anglers continue to be attracted to charter fishing in Michigan, although the percentage of customers reporting that this was their first time charter fishing in Michigan decreased from 39% in 1985 to 24% in 2009. Charter anglers also booked a lower percentage of full-day trips in 2009 than in 1985 (Table 4; χ^2 test for independence; $P = 0.002$).

While the proportion of out-of-state customers has not changed much since 1985, there was a large decrease in the proportion of in-state customers from the Detroit and Flint areas with a corresponding increase in the proportion of in-state customers from other regions (Table 5; χ^2 test for independence; $P < 0.001$). Although the proportion of other in-state customer has risen, the overall number of charters taken by customers in each broad geographic category has apparently fallen since 1985 (Table 6). However, 1990 provides a better benchmark for comparison due to more accurate effort data and the impact of bacterial kidney disease (BKD) and falling harvest rates for Chinook salmon in the late 1980s. Total number of trips taken by customers in the Detroit/Flint area has fallen dramatically since 1990, while number of trips taken by other Michigan customers has risen slightly (Table 6).

A series of questions addressed the possibility that customers had altered behaviors due to the recent economic downturn. A minority of customers had booked fewer trips during 2009 (13%), booked trips closer to home (9%), or chosen charter boats with lower fees (10%). However, most customers (76%) reported that they made none of the aforementioned changes to charter booking behavior in 2009. Although some customers reported declines in trip-related expenditures in 2009 relative to previous years, other customers reported approximately equal increases in expenditures

and the majority of customers reported no change (Table 7). As a result, spending profiles from 2009 are considered representative of recent history.

Sources of information used by customers have changed greatly since 1985 with the advent and widespread adoption of online communications. When deciding which charter boat to fish on, 51.4% of customers used at least one of the four website categories listed in Table 8. Friends and relatives continue to be the most widespread source of information when deciding which boat to fish on, but websites are collectively a close second while magazines, newspapers, signs and outdoor shows are less important as a marketing tool than they were in 1985 (Table 8). Although the percentage of customers who reported that they saw the boat and inquired or saw a brochure for the boat also decreased since 1985, they remained fairly high relative to other information sources. Relationships among captains are also very important, and nearly 11% of customers indicated they were referred by another captain in 2009. This may happen when one captain is booked for a given date or is contacted by a customer with a party too large to accommodate with one boat.

The most important of nine criteria used by customers to choose a boat to patronize was the ability of the boat's captain to locate fish, with 95% of customers rating this as "Very Important" or "Extremely Important" (Table 9). This was also the most important of thirteen criteria investigated during the 1985 study. Safety and appearance of the boat also was also important to customers in both studies, while the proximity of the boat to a second home was less important. Although proximity to homes, friends, and relatives was of minor importance, the current study found that overall ease of access to the boat and/or port ranked as "Important", "Very Important", or "Extremely Important" to 74.6% of customers. Similarly, 68.2% of customers reported that the appearance of a website or other advertisement for the boat was "Important" or better.

Satisfaction of charter fishing customers was very high in 2009, with 73.8% rating their most recent trip as "Excellent" and 93.6% of customers rating their most recent trip as "Excellent" or "Good." Six criteria for trip satisfaction also were rated by customers (Table 10). Hospitality and comfort were more important to trip satisfaction than catch-related criteria, but all criteria including scenery and/or weather were at least "Important" to a majority of anglers. The 1985 study did not address trip satisfaction.

Spending profiles changed somewhat between 1985 and 2009, but overall local spending per charter fishing party remained remarkably consistent (Table 11). Annual variation in charter fishing effort is therefore more important in determining annual fluctuations in economic impacts. Using 2009 spending profiles, total economic output attributed to charter-related tourism was graphed for four representative years (Figure 1). This demonstrates the economic effects of fluctuations in the Great Lakes fishery, which occur for a variety of reasons. Since 2009 was an abnormally poor year in terms of charter fishing effort, it is also pertinent to consider economic impacts in a year with average effort (Table 12).

The impact of charter fishing to tourism in Michigan's coastal communities is significant, with over 9 million employment hours and over \$395 million in gross sales generated over the past 20 years

(Table 12). Charter fishing also attracts out-of-state visitors, who took 79,640 trips from 1990-2009 and added \$147.6 million in sales and \$56.7 million in labor income to Michigan's economy. Average annual impacts to the state of Michigan are shown on Table 13.

Although each of the lakes has experienced fluctuations charter fishing effort, Lake Huron has faced the most dramatic changes in recent years. Lake Huron has experienced a 64% decline in number of charter trips taken from 1990 to 2009, with the proportion of all Michigan charter trips taken on Lake Huron falling from 19.5% in 1990 to 9.5% in 2008. Both the number of trips and the proportion of trips taken on Lake Huron increased in 2009, primarily due to the growing walleye fishery in Saginaw Bay.

Lake Huron's decline in salmon fishing (ca. 2004) and subsequent increase in walleye fishing has affected the economies of different regions in different ways. Effort in central ports (Rockport to Tawas) and southern ports (Port Austin south to Port Huron) declined severely from 2002 to 2009, while northern ports changed little and inner Saginaw Bay showed a dramatic increase (Figure 2). In 2009, central region ports lost \$1,076,466 in economic output and 34,365 labor hours while southern ports lost \$768,862 and 27,241 labor hours. Economic impacts to Saginaw Bay ports increased by \$355,197 and 10,398 labor hours. County-specific economic impacts for Lake Huron can be found in Appendix D.

Nearly half of fishing party spending went toward charter fees and tips, which generated \$9.4 million in economic output when including indirect and induced effects (Appendix E). Lodging was another major expense for fishing parties that resulted in \$3.2 million in output and 77,981 employment hours (Appendix E). Lake Michigan accounted for the majority of economic impacts in 2009, with \$2.9 million of lodging-related output and 61,278 lodging-related employment hours occurring in coastal Lake Michigan communities (Appendix E).

Discussion

Charter fishing is one aspect of the recreational fisheries that are a cornerstone of nature-based tourism around the Great Lakes. Linking changes in charter fishing effort to coastal economic impacts provides a quantitative basis for evaluating some of the consequences of changes to Great Lakes ecosystem health, sport fish populations, and the regional economy. Although it is beyond the scope of this study to determine the relative importance of factors leading to changes in charter fishing effort, the case of Lake Huron provides an example of how economic models developed for this study can be used in the future to link economic damages to causal factors once they are more fully understood.

In Lake Huron, the decline of Chinook salmon was clearly implicated in the decline of central and southern ports. Chinook salmon catch-per-unit-effort (CPUE) decreased from 18 fish per hundred hours of charter angler effort in 2002 to a mere 3 fish per hundred hours by 2009. Mechanisms behind the decline of salmon and their alewife prey are not fully understood, although there are

several reasonable hypotheses (Johnson *et al.* 2010, Riley *et al.* 2008). Lower food web effects of exotic invertebrates including dreissenid mussels and *Bythotrephes* were likely compounded by top-down effects of underestimated natural reproduction of salmon (Johnson *et al.* 2010). Predation by double-crested cormorant *Phalacrocorax auritus* may also be implicated in the demise of alewife (Riley *et al.* 2008, Dobiesz *et al.* 2005).

After the collapse of salmon in Lake Huron, lakewide walleye CPUE increased from 2 fish per hundred hours of charter angler effort to 28 fish per hundred hours by 2009. Factors leading to the resurgence of the walleye fishery in Saginaw Bay are somewhat less ambiguous than factors leading to the collapse of alewife. The increase in walleye reproduction since 2004 is attributed primarily to the alewife collapse, and the resulting decrease in predation on larval walleye (Fielder *et al.* 2007). These ecosystem changes in Lake Huron have had major impacts on coastal communities. In addition to the well-publicized decline of ports dependant on salmon fisheries, the rising economic impact of charter fishing for walleye in Saginaw Bay is at least in part attributable to ecosystem changes.

Lake trout catch rates also increased in Lake Huron following the collapse of salmon, rising from 15 to 18 fish per hundred hours of charter angler effort (unpublished data, MDNRE). Unlike walleye, lake trout are most abundant in deep, cold water near traditional salmon fishing ports and are not caught near Saginaw Bay ports that experienced increases in fishing effort and economic impacts. Although catch rate of lake trout is now as high as Chinook catch rate was in 2002, economic trends since that time show serious losses. This is not surprising since the Chinook salmon is rated higher by anglers in terms of fighting ability and food quality (Lange and Smith 1995, Alexander 2009). Furthermore, ecosystem changes may be making it less economically attractive for charter captains to target lake trout. Lake trout are typically caught very close to the substrate, which is now covered with quagga mussels and benthic algae that present a risk to expensive trolling tackle (personal communication, Capt. Ed Retherford quoted in Alexander 2009). Lake trout also are typically caught in deeper water and farther from port than Chinook salmon, which results in higher gasoline expenditures for captains who operate vessels that may travel less than one mile per gallon of fuel consumed (personal communication, Capt. Kevin Hughes, Capt. Ed. Retherford).

The economic downturn may be another factor in the decline of charter fishing effort. Lake Michigan excursions fell in 2008 and 2009 despite high Chinook salmon catch rates. The overall economic climate is often cited by Lake Michigan captains as the biggest reason for recent declines, noting that customers are consistently pleased with fishing success despite the smaller size of returning adult Chinooks in recent years. The automobile industry decline is probably a major factor in the documented decrease in charter trips taken by anglers from Flint and Detroit metro areas since 1985. Whether this is a recent shift in customer demographics is impossible to determine due to a lack of data from charter customers between 1985 and 2009.

While the number of excursions and the number of charter operators has decreased, the local expenditures of each fishing party have not changed much since 1985. Charter fishing effort is therefore the more dynamic variable, and the one that is most important to track through time.

Effort data provided to the MDNRE by charter operators since 1989 were used in this study as drivers of economic models used to estimate impacts through time and at a variety of spatial scales. Spending profiles for each fishing party were assumed to be constant from 1990-2009.

Despite similar spending profiles, the 1985 estimate of expenditures in coastal communities was much higher than the 2009 estimate of \$11.7 million. After adjusting for inflation, the 1985 estimate of local expenditures by customers who travelled primarily for charter fishing was \$41.3 million. That figure excluded charter fees, which would add \$15.7 million for a total of \$56.9 million in local expenditures by charter customers in 1985. This would suggest that charter customer expenditures dropped by nearly 80% by 2010. However, there are two reasons to expect that is an overestimate of the actual decline in expenditures: 1) a portion of excursions are not reported to MDNRE, 2) mail-in surveys may overestimate effort if active captains are more likely to respond.

Mandatory charter fishing catch and effort reporting was not instituted until 1989. Since 1990, effort has been determined based on this mandatory reporting. This differs substantially from the method used to estimate 59,800 total charter excursions in 1985 (Mahoney *et al.* 1985). The 1985 estimate was arrived at by multiplying the mean number of charter trips taken annually per captain (65) by the total number of captains operating in Michigan (920). This may have resulted in an overestimate of effort in 1985 because captains who booked relatively few trips may not have been invited to participate in the study and no attempt was made to randomize participation of captains. If relatively inactive captains were not invited to participate, this would bias the mean number of charter trips taken annually and inflate effort and expenditure estimates.

Although estimated effort may have been too high in 1985, it is also known that mandatory reporting may underestimate actual effort; some captains may under-report and a few may refuse to report (personal communication, Donna Wesander, MDNRE). Also, trips that are initiated in Michigan ports are excluded if fishing takes place outside of Michigan waters; this is common on Lake Erie and the St. Clair system. Catch-and-release fishing is also excluded from MDNRE reporting, this would include catch-and-release fishing for bass *Micropterus* spp., muskellunge *Esox masquinogoy*, and steelhead in rivers. Under-reporting, fishing out-of-state waters via Michigan ports, and catch-and-release fishing could account for some of the discrepancy between survey estimates of effort and actual values produced by mandatory reporting.

Going into 1990, the first complete year of mandatory reporting, 884 charter operators were registered for reporting (personal communication, Donna Wesander, MDNRE) and in 1990 Michigan charter operators reported 20,695 excursions (Wesander and Clapp 2010). The average operator therefore reported 23 trips in 1990. In 2009, 584 operators reported 12,578 trips for an average of 22 per operator (unpublished data, MDNRE). Thus, there was little change in the average number of trips taken annually per operator from 1990 through 2009 as recorded by mandatory reporting. However, there is a large discrepancy between the average number of trips per operator as calculated by survey results in 1985 (65 trips/operator) and the 1990 and 2009 results from mandatory reporting. This suggests that the methods used in 1985 and 1990 did not produce comparable results.

The magnitude of this discrepancy is not precisely known for each year, but a 2002 mailed survey provides an estimate 59% higher than effort recorded by mandatory reporting during the same year (Pistis and Lichtkoppler 2003, Wesander and Clapp 2010). While only 9% of charter operators were invited to participate in the 1985 study, all licensed captains were mailed the 2002 survey and 52% responded. The 2002 survey estimated an average of 59.2 trips per captain. Of these trips, 9.5 were for steelhead or smallmouth bass. Even if all of these trips were catch-and-release trips not reported to MDNRE, they only amount to 16% of all excursions. Non-response bias was not explicitly addressed in the 2002 survey, so it is possible that more active captains tended to respond and inflate trip numbers in the 2002 study. However, given the high response rate we cannot discount the possibility that mandatory reporting produces trip counts that are lower than actual effort.

Regardless of this possible discrepancy, mandatory reporting provides consistent methodology for estimating annual effort over a twenty-year period. Mandatory reporting was chosen to provide effort estimates used in calculation of economic impacts for this study because of the consistent methodology and the ability to track effort at multiple spatial scales (e.g., port, lake, county). When interpreting economic impact results, it should be assumed that values reported are minimum estimates and that actual values may be substantially greater than those reported.

In addition to changes in the number of operators and excursions, the percentage of full-day trips also decreased since 1985. This is a relatively recent trend. In 2002, 69% of trips were half-day excursions (Pistis and Lichtkoppler 2003). This rose to 81% by 2009. Although customers were not specifically asked if they booked shorter trips (half-day vs. full-day) due to the lower price, it is possible that the documented decrease in longer trips was related to the economic downturn. Although customers may have chosen shorter and less expensive trips due to the struggling economy, the average returning customer did not spend less in port than in previous years.

Historically, fisheries management has been informed with a wealth of data regarding fish populations and their responses to management actions. Economic and social aspects of fish population fluctuations, and management decisions that influence them, are not subject to the same level of attention by researchers. This has been recognized by the Great Lakes Fishery Commission, and was the basis for development of a new human dimensions research theme in 2002 (Dobson *et al.* 2005). Incorporating economic and other social concerns into the decision-making framework may ultimately result in more sustainable fisheries through demonstration of the human benefits of management programs. Likewise, linking economic harm to fish population declines resulting from harmful policies could be instrumental in revising policies that harm Great Lakes fisheries.

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TABLE 1.—Comparison of survey respondents and Michigan charter fishing effort by lake in 2009.

	Number of Respondents	Percent of Respondents	Percent of All Great Lakes Charter Trips
Lake Erie	2	1.4%	5.5%
Lake Huron	15	10.8%	11.7%
Lake Michigan	121	87.1%	77.5%
Lake Superior	1	0.7%	1.9%
St. Clair System	0	0.0%	3.4%

TABLE 2.—Fishing party size for Michigan charter fishing excursions in 1985 and 2009.

Number Per Fishing Party	1985	2009
1	2.0%	2.3%
2	15.0%	7.8%
3	15.4%	24.8%
4	37.5%	38.8%
5	15.4%	20.9%
6+	14.7%	5.4%
Mean	4.1	3.9

TABLE 3.—Relationship of fishing party members to customers who booked Michigan charter fishing trips in 2009. Percentages do not sum to 100% because many fishing parties included members with a variety of relationships to the booking customer.

Relationship	
Family Members	69.5%
Friends	53.9%
Business Associates	19.9%
Clients or Donors	4.3%
People I had not Previously Met	9.9%

TABLE 4.—Percentage of customers booking half-day and full-day charter fishing trips in Michigan.

Trip Length	1985	2009
Half-day	68%	81%
Full-day	32%	19%

TABLE 5.—Percentage of charter fishing customers by geographic area.

Location	ZIP Code		1985	2009
	Prefix			
Michigan				
Detroit/Flint Area			43.9%	18.4%
Royal Oak	480-		21.7%	2.9%
Detroit	481- to 483-		14.3%	14.0%
Flint	484-, 485-		7.9%	1.5%
Other Areas			26.1%	49.2%
Grand Rapids	493- to 495-		5.4%	12.5%
Other Southern L.P.	486- to 492-		17.2%	30.9%
Northern L.P. and U.P.*	496- to 499-		3.5%	5.8%
Other States and Canada			30.0%	32.4%
Ohio			11.0%	12.5%
Indiana			3.7%	6.6%
Kentucky			1.5%	2.9%
Illinois			4.5%	1.5%
Other States**			9.3%	7.4%
Ontario, Canada			-	1.5%

* Upper Peninsula ports were excluded from 1985 study.

** 1985 study included Canada with other states.

TABLE 6.—Michigan charter fishing excursions by booking customer’s place of residence. Total excursions for 1985 were estimated in the 1985 study, while total excursions in 1990 and 2009 were reported to MDNRE. The percentage of customers from each geographic area was estimated in 1985 and 2009. No customer survey was conducted in 1990, so percentages from 1985 were used to calculate number of excursions for each area in 1990.

Customer's Place of Residence	Excursions in 1985	Excursions in 1990	Excursions in 2009
Detroit/Flint Area	26,252	9,085	2,314
Other Michigan Areas	15,608	5,401	6,187
Out-of-State	17,940	6,209	4,075
TOTAL	59,800	20,695	12,576

TABLE 7.—Changes in spending reported by survey respondents who had booked charter fishing trips in previous years.

Change in Expenditures	
I spent over 30% more on non-charter expenses in 2009 than in previous years	4.2%
I spent 20% more on non-charter expenses in 2009 than in previous years	5.2%
I spent 10% more on non-charter expenses in 2009 than in previous years	4.2%
I spent 5% more on non-charter expenses in 2009 than in previous years	6.3%
I spent approximately the same amount on non-charter expenses in 2009 and in previous years	58.3%
I cut my spending on non-charter expenses by 5% in 2009	4.2%
I cut my spending on non-charter expenses by 10% in 2009	7.3%
I cut my spending on non-charter expenses by 20% in 2009	7.3%
I cut my spending on non-charter expenses by 30% or more in 2009	3.1%

TABLE 8.—Sources of information used by customers when choosing a charter boat to patronize.

Source of Information	1985	2009
Michigan Charter Boat Association Website	-	28.3%
Other Charter Boat Association Website	-	5.8%
Charter Boat Captain's Website	-	29.7%
On-line Search Engine (e.g., Google)	-	15.9%
Brochure	19.3%	13.0%
Friend or Relative	-	55.1%
Friend or Relative Who Accompanied	23.9%	-
Friend or Relative Who Did Not	22.0%	-
Referred by Another Captain	-	10.9%
Bait and Tackle Store	5.0%	5.1%
Other Local Business*	3.8%	2.2%
Chamber of Commerce	2.1%	2.9%
Convention and Visitor's Bureau	-	0.0%
Outdoor/Fishing/Boat Show	5.3%	1.4%
Television Commercial**	1.0%	1.4%
Radio Show or Commercial	0.7%	-
Magazine Article or Ad	4.3%	0.7%
Newspaper Article or Ad	4.5%	0.0%
Sign or Billboard***	5.3%	0.0%
Phone Book	-	0.0%
Booking Agent****	1.9%	0.0%
I Saw the Boat and Inquired	11.2%	8.0%

* "Businesses Near the Boat" in 1985 study

** "Television Show or Commercial" in 1985 study

*** "Sign Near the Boat" in 1985 study

**** "Reservation Service" in 1985 study

TABLE 9.—Importance of criteria used by Michigan charter fishing customers when choosing a boat to patronize.

	Not at all Important (0)	Not Very Important (1)	Important (2)	Very Important (3)	Extremely Important (4)	2009 Mean	1985 Mean
Safety Features of Vessel	0.0%	4.3%	22.9%	28.6%	44.3%	3.1	2.8
Ability of Captain to Locate Fish	0.0%	0.7%	4.3%	39.0%	56.0%	3.5	3.0
Appearance of Boat and Captain*	0.0%	3.5%	28.4%	41.1%	27.0%	2.9	2.0
Appearance of Website and/or Ads	4.3%	27.5%	40.6%	22.5%	5.1%	2.0	-
Lots to do in the Port Area	14.4%	42.4%	28.8%	11.5%	2.9%	1.5	-
Boat is Close to Home	18.0%	50.4%	23.0%	7.2%	1.4%	1.2	-
" " Second Home or Cabin**	35.8%	36.5%	16.8%	8.0%	2.9%	1.1	0.5
" " Family or Friends	30.9%	43.9%	18.7%	3.6%	2.9%	1.0	-
Boat or Port is Easy to Get to	2.2%	23.2%	47.8%	20.3%	6.5%	2.1	-

* "Appearance of Boat" in 1985 study

** "Boat is Close to Second Home" in 1985 study

TABLE 10.—Importance of criteria used by Michigan charter fishing customers in determining trip satisfaction.

	Not at all Important (0)	Not Very Important (1)	Important (2)	Very Important (3)	Extremely Important (4)	2009 Mean
Hospitality of Captain and Mate	0.0%	0.7%	9.2%	43.3%	46.8%	3.4
Comfortable Environment on Boat	0.0%	2.8%	15.6%	46.1%	35.5%	3.1
Number of Fish Caught	0.0%	7.8%	39.0%	32.6%	20.6%	2.7
Size of Fish Caught	0.7%	18.4%	46.8%	24.1%	9.9%	2.2
Species of Fish Caught	2.9%	28.6%	38.6%	22.9%	7.1%	2.0
Scenery and/or Weather	2.9%	16.4%	41.4%	26.4%	12.9%	2.3

TABLE 11.—Spending profiles for fishing parties in 1985 and 2009. All values are shown in 2009 U.S. dollars. Categories differed between 1985 and 2009 surveys as noted.

	Local Spending per Party	
	1985	2009
Charter fees and tips ^A	\$454.08	\$613.02
Hotels, motels, B&Bs, camping ^B	\$249.48	\$213.08
Restaurants and taverns ^C	\$239.24	\$119.37
Groceries and liquor stores ^D	\$107.80	\$75.81
Fuel for automobiles and trucks ^E	\$9.44	\$93.29
Entertainment	\$47.20	\$23.29
Souvenirs and shopping ^F	\$77.12	\$37.61
Auto/truck expenditures other than fuel	-	\$14.31
Fishing licenses	-	\$50.71
Fishing equipment	-	\$5.60
Other	-	\$16.84
TOTAL	\$1,181.36	\$1,262.96

A - 1985 study listed as "Charter fees"

B - 1985 study listed as "Lodging"

C - 1985 study listed as "Meals"

D - 1985 study listed as "Groceries"

E - 1985 study listed as "Gas"

F - 1985 study listed as "Shopping and other spending"

TABLE 12.—Economic impacts of charter fishing to communities along the coasts of Michigan’s Great Lakes. Total expenditures include only local spending by out-of-town customers. Output encompasses gross sales, including indirect and induced spending, resulting from local spending by out-of-town customers. All monetary values are shown in 2009 U.S. dollars.

Total Economic Impacts 1990-2009

	Trips	Total Expenditures	Output	Personal Income	Employment Hours
Lake Erie and St. Clair System	37,027	\$ 34,374,153	\$ 47,523,422	\$ 17,917,972	848,037
Lake Huron	51,029	\$ 47,372,962	\$ 55,827,831	\$ 20,534,171	1,810,553
Lake Michigan	236,030	\$ 219,119,327	\$ 280,940,207	\$ 120,796,755	6,288,230
Lake Superior	10,290	\$ 9,552,760	\$ 11,640,635	\$ 4,302,441	361,526
TOTAL	334,376	\$ 310,419,201	\$ 395,932,096	\$ 163,551,338	9,308,346

Mean Annual Economic Impacts 1990-2009

	Trips	Total Expenditures	Output	Personal Income	Employment Hours
Lake Erie and St. Clair System	1,851	\$ 1,718,708	\$ 2,376,171	\$ 895,899	42,402
Lake Huron	2,551	\$ 2,368,648	\$ 2,791,392	\$ 1,026,709	90,528
Lake Michigan	11,802	\$ 10,955,966	\$ 14,047,010	\$ 6,039,838	314,411
Lake Superior	515	\$ 477,638	\$ 582,032	\$ 215,122	18,076
TOTAL	16,719	\$ 15,520,960	\$ 19,796,605	\$ 8,177,567	465,417

Annual Economic Impacts for 2009

	Trips	Total Expenditures	Output	Personal Income	Employment Hours
Lake Erie and St. Clair System	1,114	\$ 1,034,186	\$ 1,429,797	\$ 539,083	25,514
Lake Huron	1,470	\$ 1,364,680	\$ 1,563,551	\$ 574,493	50,002
Lake Michigan	9,750	\$ 9,051,449	\$ 11,605,165	\$ 4,989,910	259,756
Lake Superior	244	\$ 226,518	\$ 276,027	\$ 102,021	8,573
TOTAL	12,578	\$ 11,676,833	\$ 14,874,539	\$ 6,205,506	343,845

TABLE 13.—Average annual economic impacts to the state of Michigan resulting from excursions booked by out-of-state customers who travelled to Michigan primarily for the purpose of charter fishing during 1990-2009 (mean = 3,982 trips/year). Total expenditures include only local spending by out-of-state customers. Output encompasses gross sales, including indirect and induced spending, resulting from local spending by out-of-state customers. All monetary values are shown in 2009 U.S. dollars.

	Total Expenditures	Output	Employment Hours	Personal Income
Charter fees and tips	\$ 2,440,939	\$ 4,633,385	102,987	\$ 1,744,476
Fishing licenses	\$ 202,029	\$ 373,909	7,858	\$ 229,287
Hotels, motels, B&Bs, camping	\$ 848,442	\$ 1,649,262	33,328	\$ 585,371
Fuel for automobiles/trucks	\$ 371,444	\$ 101,395	2,377	\$ 38,977
Auto/truck expenditures other than fuel	\$ 56,980	\$ 16,062	272	\$ 5,633
Groceries and beverages	\$ 301,876	\$ 166,053	3,976	\$ 70,107
Restaurants and taverns	\$ 475,294	\$ 267,788	6,678	\$ 88,903
Fishing equipment	\$ 22,286	\$ 17,551	547	\$ 7,286
Souvenirs and shopping	\$ 149,765	\$ 64,653	1,899	\$ 27,826
Entertainment	\$ 92,724	\$ 53,506	1,189	\$ 20,145
Other	\$ 67,073	\$ 36,624	1,076	\$ 15,762
TOTAL	\$ 5,028,851	\$ 7,380,188	162,187	\$ 2,833,774

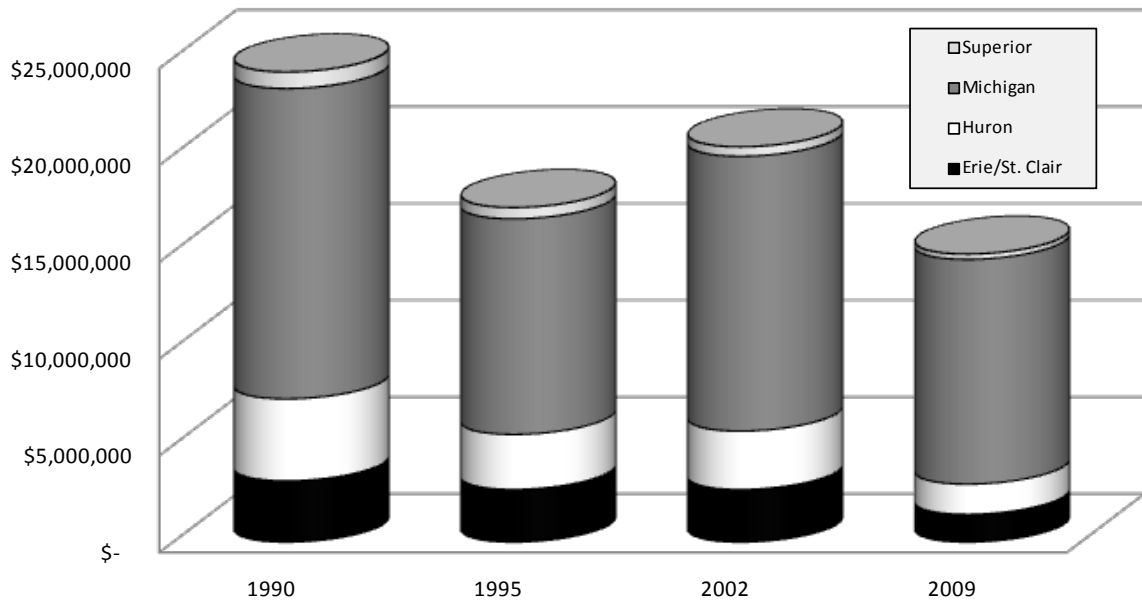


FIGURE 1.—Economic output fluctuates according to charter fishing effort, which declined from 1990 to 1995 and leveled off in the early 2000s before declining again in 2008 and 2009. Output (gross sales) is shown in 2009 U.S. dollars and was calculated based on 2009 spending profiles and charter fishing effort data from MDNRE for each year shown.

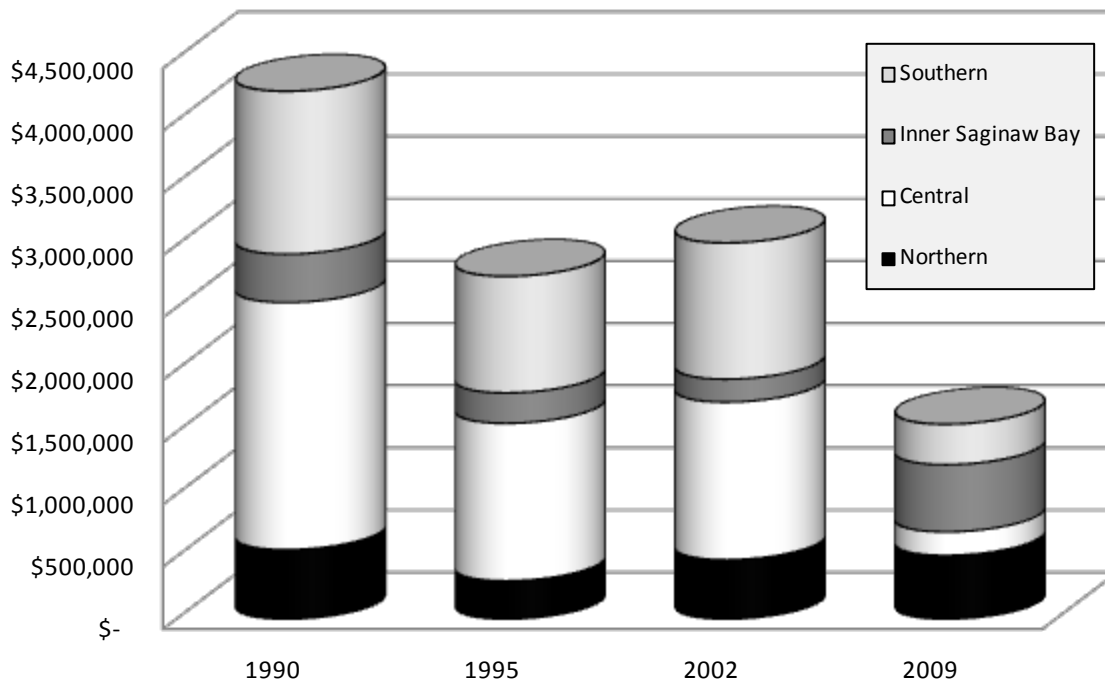


FIGURE 2.—Economic output (gross sales; shown in 2009 U.S. dollars) for communities in four regions of Lake Huron’s coast. Northern Lake Huron includes the St. Mary’s River north to the rapids at Sault Ste. Marie, the Straits of Mackinaw west to Mackinaw City, and Lake Huron south to Presque Isle Harbor; central ports include Rockport south to Tawas; southern ports include Port Austin south to Port Huron; other ports are included in inner Saginaw Bay. Output was calculated based on 2009 spending profiles and charter fishing effort data from MDNRE for each year shown.

Appendix A: Online Survey

Charter Fishing Customer Survey

1. Consent Letter

Because of your enthusiasm for charter fishing, we have invited you to complete this survey. It is important for coastal communities to understand the contribution that the charter boat industry makes to local economies. We therefore developed this survey to better understand the economic impacts of charter fishing, and to provide feedback for charter captains to help them serve the needs of customers. Your input is important to this effort.

This short survey should take less than 20 minutes to complete. Nevertheless, do not let the brevity of the survey understate the importance of the information collected. The information we collect will be summarized and distributed to coastal community leaders and charter boat captains. We will not collect, nor will we deliver any personal information, so your identity will not be revealed through this survey. Your participation in this survey is strictly voluntary. You can refuse to complete any or all questions in this survey, and you have the right to withdraw at any time.

This survey is a component of a joint research project with Michigan State University, MSU Extension, and Michigan Sea Grant. Your participation in any or all questions of this survey is evidence of your consent to participate this survey. You must be at least 18 years old to participate.

If you have any questions about the survey items, why the survey is being conducted, or how to complete and return the questionnaire, please do not hesitate to call me at (517) 355-2153. Question concerning your rights as a participant in this survey can be directed to the MSU Human Research Protection Program at (517) 355-2180.

Thank you for participating in this important survey.

Steven Miller
Center for Economic Analysis
88 Agriculture Hall,
East Lansing, MI 48824

2. Participant Code

1. This survey is intended for charter fishing customers who received a pocket card inviting them to participate. Each card included a participant code in the upper right hand corner.

The code is NOT linked to any of your personal information and is only being used to limit each charter customer to one survey response per trip.

Participant Code

3. Your Charter Fishing Party

1. How many people fished with you on your most recent charter fishing trip?

Charter Fishing Customer Survey

2. Did your charter fishing party include:

Check all that apply.

- Family Members
- Friends
- Business Associates
- Clients or Donors
- People I had not Previously Met

4. Trip Details

1. When was your most recent charter fishing trip?

Date MM DD YYYY
 / /

2. Was your most recent charter fishing trip a half day or full day trip?

- Half Day
- Full Day

3. How many charter fishing trips have you been on in Michigan (include your most recent trip)?

4. How many charter fishing trips have you taken on the boat you fished from most recently (include your most recent trip)?

5. Was 2009 the first year that you booked a charter fishing trip in Michigan?

.

.

- Yes
- No

5. Spending in Previous Years

Charter Fishing Customer Survey

1. Did you (or do you plan to) book fewer trips in 2009 than in previous years?

- Yes
 No

2. Did you book charter trips closer to home in 2009 than in previous years?

- Yes
 No

3. Did you choose charter boats with lower fees in 2009 than in previous years?

- Yes
 No

4. Due to the recent economic downturn, it is possible that charter fishing customers are contributing less to local economies than they did in previous years. To help account for this, please estimate any change in your spending on non-charter expenses during 2009.

Non-charter expenses include lodging, food, gas and entertainment spending that occurs in conjunction with a charter fishing trip.

- I spent over 30% more on non-charter expenses in 2009 than in previous years
 I spent 20% more on non-charter expenses in 2009 than in previous years
 I spent 10% more on non-charter expenses in 2009 than in previous years
 I spent 5% more on non-charter expenses in 2009 than in previous years
 I spent approximately the same amount on non-charter expenses in 2009 and in previous years
 I cut my spending on non-charter expenses by 5% in 2009
 I cut my spending on non-charter expenses by 10% in 2009
 I cut my spending on non-charter expenses by 20% in 2009
 I cut my spending on non-charter expenses by 30% or more in 2009

6. Choosing a Charter Boat

Charter Fishing Customer Survey

1. Which of the following helped you to locate and choose a charter boat?

Check all sources that you used to locate and choose a boat.

- Michigan Charter Boat Association Website
- Other Charter Boat Association Website
- Charter Boat Captain's Website
- On-line Search Engine (e.g., Google)
- Brochure
- Friend or Relative
- Referred by Another Captain
- Bait and Tackle Store
- Other Local Business
- Chamber of Commerce
- Convention and Visitor's Bureau
- Outdoor/Fishing/Boat Show
- Television Commercial
- Magazine Article or Ad
- Newspaper Article or Ad
- Sign or Billboard
- Phone Book
- Booking Agent
- I Saw the Boat and Inquired

Charter Fishing Customer Survey

2. How important are the following criteria when choosing a charter boat to fish on?

	Not at all Important	Not Very Important	Important	Very Important	Extremely Important
Safety features of Vessel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ability of Captain to Locate Fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Appearance of Boat and Captain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Appearance of Website and/or Ads	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lots to do in the Port Area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Boat is Close to Home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Boat is Close to a Second Home or Cabin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Boat is Close to Family or Friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Boat or Port Easy to Get to	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. Rating Your Trip

1. How important are the following criteria to your satisfaction with a charter fishing trip?

	Not At All Important	Not Very Important	Important	Very Important	Extremely Important
Hospitality of Captain and Mate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comfortable Environment on Boat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Number of Fish Caught	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Size of Fish Caught	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Species of Fish Caught	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Scenery and/or Weather	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Based on your criteria, how would you rate your most recent charter fishing experience?

- Excellent
- Good
- Average
- Poor
- Very Poor

8. Port Information

Charter Fishing Customer Survey

1. What body of water (lake, bay, or river) did you fish on?

2. What port did your charter boat leave from?

Name the nearest town or city if the boat was launched or docked in a remote area.

3. In your last trip to the port city or town listed above, how important was charter fishing in your decision to visit?

- Charter fishing was the only purpose of visiting the port
- Charter fishing was the primary, but not the only, purpose of visiting the port
- Charter fishing wasn't the primary purpose of visiting the port, but I did plan on charter fishing before leaving home
- I did not plan to go charter fishing before deciding to visit the port

4. Do you live more than 50 miles from the port city or town listed above?

- Yes
- No

9. Fishing Locally

1. If charter fishing was not available locally, would you have traveled to go charter fishing elsewhere?

- Yes
- No

10. Trip Expenditures

1. How many nights did you spend in the port area?

The port area includes anything within 50 miles of the charter boat's dock or launch site.

Charter Fishing Customer Survey

2. When visiting the port area, where did you stay?

Check any and all that apply, skip if you didn't stay overnight.

- Hotel or Motel
- Campground
- With Relatives or Friends
- Second Home or Cabin
- Other (Lodge, B&B, Condo, etc.)

3. To estimate the economic impacts, we need to collect detailed information on your spending while in the port area for your charter fishing trip.

Enter the amount spent by your ENTIRE FISHING PARTY during your trip to the port area. Please be as accurate and precise as possible, and include spending for all days and nights spent in the port area.

If you do not know the exact amount, use your best guess. Enter a zero if no money was spent for a given category.

Charter fees and tips	<input type="text"/>
Fishing licenses	<input type="text"/>
Hotels, motels, B&Bs, camping	<input type="text"/>
Fuel for automobiles/trucks	<input type="text"/>
Auto/truck expenditures other than fuel	<input type="text"/>
Groceries and liquor stores	<input type="text"/>
Restaurants and taverns	<input type="text"/>
Fishing equipment	<input type="text"/>
Souvenirs and shopping	<input type="text"/>
Entertainment	<input type="text"/>
Other	<input type="text"/>

11. Zip Code

1. What is your zip code?

12. Thank You

Appendix B: Pocket Card Invitation



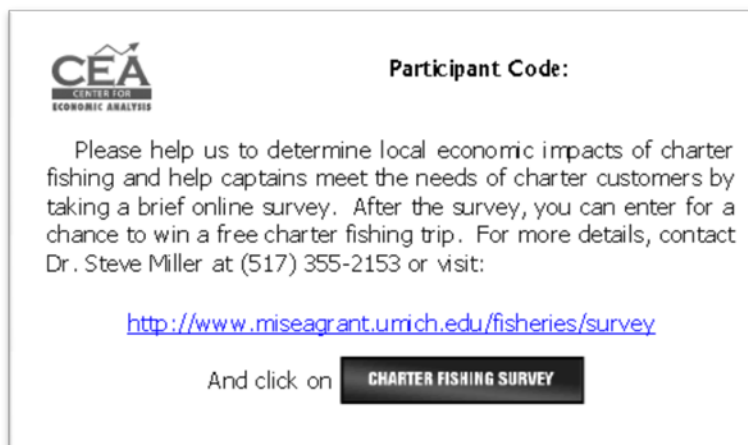
A pocket card invitation for a free charter fishing trip. The card features the Sea Grant Michigan logo on the top left, the Michigan State University Extension logo on the top right, and two circular seals at the bottom. The central text reads "WIN A FREE CHARTER FISHING TRIP!!". At the bottom, a grey bar contains the text "See back of card for details" followed by a right-pointing arrow.

Sea Grant
Michigan

**WIN
A FREE
CHARTER FISHING
TRIP!!**

MICHIGAN STATE
UNIVERSITY
EXTENSION

See back of card for details →



A section of the pocket card providing participant information. It includes the CEA logo (Center for Economic Analysis) on the top left. The text asks for help in determining local economic impacts of charter fishing and provides contact information for Dr. Steve Miller. A blue hyperlink is provided for the survey, and a button labeled "CHARTER FISHING SURVEY" is shown.

CEA
CENTER FOR
ECONOMIC ANALYSIS

Participant Code:

Please help us to determine local economic impacts of charter fishing and help captains meet the needs of charter customers by taking a brief online survey. After the survey, you can enter for a chance to win a free charter fishing trip. For more details, contact Dr. Steve Miller at (517) 355-2153 or visit:

<http://www.miseagrant.umich.edu/fisheries/survey>

And click on **CHARTER FISHING SURVEY**

Appendix C: The IMPLAN Economic Impact Model

The Minnesota IMPLAN Group Inc. model for economic impact evaluation, IMPLAN Pro. 2 (Minnesota IMPLAN Group Inc. 2004), is a general application economic impact evaluation model based on a common economic construct known as a social accounting matrix (SAM). The SAM is a comprehensive accounting system that identifies all the monetary transactions between the sectors in an economy. The SAM comprises a square matrix (number of columns equals number of rows) that represents individual sectors as both buyers and sellers. Each row represents the revenue earned by the corresponding sector while each column represents its expenditures (Isard et al. 1998, pp. 283). This construct builds a closed system that represents transactions within and amongst all sectors: inter-industry transactions; transactions between industries and government; transaction between industries and households; transaction between households and government; and the purchases and sales between the state economic sectors and the rest of the world.

IMPLAN provides industry detail to 440 different industry categories including agricultural, goods-producing, and service-providing industries. Institutions are broken out into households by income group, federal, state and local government sectors, and by import and export markets. The SAM also provides household and government purchases of goods and services. Additional transactions are recorded within the SAM including transactions across households, government transfers to households and household transactions to government in the form of taxes and fees. Because the social accounting system examines all the aspects of a local economy, it provides a comprehensive snapshot of the economy and its spending patterns.

The I-O framework was first described by Francois Quesnay in 1758 and developed by Wassily Leontief (1960). The structure supports demand-driven responses, where changes in output demand in one industry materializes in changes in the demand for production of other industries. For example, an increase in local demand for printing services will spur demand for feed paper, ink, printer repair services and other goods and services required by printing companies. The beneficiaries of these direct transactions will increase the demand for inputs used in their respective production processes. Households that enjoy enhanced employment opportunities earn and spend more on goods and services and taxes. Such household impacts generate additional direct and secondary transactions across the economy. The extent to which initial stimulus generates such secondary transactions is hindered by the degree of purchases made outside the modeled region. Industries that purchase inputs from local suppliers generate greater secondary transactions than industries that tend to purchase inputs produced outside the state, holding all else constant.

I-O models have become staple economic impact models for regional analysis (Blakely and Bradshaw 2002). I-O models provide a systematic and intuitive approach to estimating economy-wide impacts of a change in the local economy. This approach uses linear relationships to reflect production processes that equate industry inputs and outputs. The linear transactions that define a SAM are generalized in a set of multipliers that capture the full extent of transactions associated with

any changes in the level of production in an industry (Cabrera et al. 2008). To exemplify, within the I-O analysis, the total impact is specified in value of transactions as,

$$Total\ Effect = Direct\ Effect + Indirect\ Effect + Induced\ Effect \quad (1)$$

The I-O model takes changes in demand called direct effect and relates them to overall economic impact called total effect through a set of mathematical equations described above. In this analysis, the direct effect is the value of transactions generated from charter fishing excursions booked by non-residents of the coastal community. The indirect effect is the value of secondary inter-industry transactions in response to direct effects. The induced effect is the value of transactions resulting from changes in income in response to direct effects. Because the relationships are linear, the direct, indirect and induced effects can be specified as multiples of the direct effect and equation (1) can be restated as,

$$Total\ Effect = (1 + k_1 + k_2) \cdot Direct\ Effect, \quad (1.1)$$

where k_1 and k_2 greater than or equal to zero. More simply, Equation (1.1) can be restated as,

$$Total\ Effect = k \cdot Direct\ Effect \quad (2)$$

where $k = (1 + k_1 + k_2)$. Equation (2) says that the economy-wide impact, Total Effect, is some multiple of the direct effect, where the multiplier takes a positive value equal or greater than one. The minimum value the multiplier can take, one, reflects the intuitive result that if the economy's output of agricultural products – for example – expands by \$1 million dollars, the economy will expand at least by \$1 million dollars. However, if the indirect and induced effects are not equal to zero, this \$1 million increase in output will spur other industries to expand output of goods and services and will generate household income that are applied to the purchase of goods and services in the economy; generating a total economic impact greater than the initial \$1 million expansion.

Generally, the economic multiplier is specified as a ratio of the total to direct effects. Rearranging equation (2) provides,

$$k = \frac{Total\ Effect}{Direct\ Effect} \quad (3)$$

where the multiplier, k encompasses all the direct, indirect and induced effects for a given industry and denotes the impact of a change in direct effects on the total economic system. Each industry in a region is characterized by its own multiplier k . Industries with expansive localized production chains will tend to have higher multipliers than industries that rely on suppliers outside of the modeling region. When there is adequate supply within the state, the state has more potential to retain the total effects of the industry. However, when producers have to depend on supplies outside the state, leakage occurs and part of the total effect is lost.

The I-O impact evaluation model requires several restrictive assumptions. First, the model imposes constant returns to scale, such that a doubling of output requires a doubling of all inputs. Second, technology is fixed with no substitution. These two assumptions impose that an increase in industry output requires an equal and proportionate increase in all inputs. Additionally, supply is assumed perfectly elastic such that there are no supply constraints. This final assumption also asserts that all prices are fixed, such that an increase in demand for any commodity will not result in a price change for that industry. I-O models have been criticized on the grounds that some of these assumptions are overly restrictive and the magnitude of the bias generated by these assumptions are greater the larger the industry direct effects are relative the overall size of the industry (Coughlin and Mandelbaum 1991). Despite this criticism, I-O models have become a standard by which economic impact assessment generated.

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Appendix D: Lake Huron Economic Impacts by County

(All monetary values shown in 2009 U.S. dollars)

1990

Region		Trips	Total Expenditures	Output	Employment Hours	Personal Income
Alcona	Central	393	\$ 364,843	\$ 385,192	12,577	\$ 143,931
Alpena	Central	333	\$ 309,142	\$ 362,786	10,359	\$ 136,148
Arenac	Saginaw Bay	155	\$ 143,895	\$ 163,957	4,453	\$ 60,059
Bay	Saginaw Bay	175	\$ 162,462	\$ 208,889	5,315	\$ 80,236
Cheboygan	Northern	84	\$ 77,982	\$ 87,903	2,223	\$ 33,141
Chippewa	Northern	65	\$ 60,343	\$ 67,620	1,846	\$ 26,394
Huron	Southern	1,054	\$ 978,485	\$ 1,099,559	39,638	\$ 407,231
Iosco	Central	1,165	\$ 1,081,532	\$ 1,235,623	40,731	\$ 455,043
Mackinac	Northern	138	\$ 128,113	\$ 144,244	5,107	\$ 49,965
Presque Isle	Northern	260	\$ 241,372	\$ 257,330	11,679	\$ 85,011
Sanilac	Southern	180	\$ 167,104	\$ 184,396	6,412	\$ 67,925
St. Clair	Southern	20	\$ 18,567	\$ 23,283	684	\$ 8,914
Tuscola	Saginaw Bay	15	\$ 13,925	\$ 15,679	555	\$ 5,431
TOTAL		4,037	\$ 3,747,764	\$ 4,236,461	141,581	\$ 1,559,431

1995

Region		Trips	Total Expenditures	Output	Employment Hours	Personal Income
Alcona	Central	159	\$ 147,608	\$ 155,841	5,088	\$ 58,231
Alpena	Central	332	\$ 308,213	\$ 361,696	10,328	\$ 135,739
Arenac	Saginaw Bay	115	\$ 106,761	\$ 121,645	3,304	\$ 44,560
Bay	Saginaw Bay	103	\$ 95,620	\$ 122,946	3,128	\$ 47,225
Cheboygan	Northern	-	\$ -	\$ -	-	\$ -
Chippewa	Northern	108	\$ 100,262	\$ 112,354	3,068	\$ 43,855
Huron	Southern	735	\$ 682,340	\$ 766,771	27,642	\$ 283,980
Iosco	Central	704	\$ 653,561	\$ 746,677	24,614	\$ 274,979
Mackinac	Northern	61	\$ 56,630	\$ 63,760	2,258	\$ 22,086
Presque Isle	Northern	132	\$ 122,543	\$ 130,644	5,929	\$ 43,160
Sanilac	Southern	162	\$ 150,393	\$ 165,957	5,771	\$ 61,133
St. Clair	Southern	2	\$ 1,857	\$ 2,328	68	\$ 891
Tuscola	Saginaw Bay	-	\$ -	\$ -	-	\$ -
TOTAL		2,613	\$ 2,425,788	\$ 2,750,620	91,198	\$ 1,015,839

2002

Region		Trips	Total Expenditures	Output	Employment Hours	Personal Income
Alcona	Central	251	\$ 233,017	\$ 246,013	8,033	\$ 91,925
Alpena	Central	287	\$ 266,438	\$ 312,671	8,928	\$ 117,341
Arenac	Saginaw Bay	58	\$ 53,845	\$ 61,352	1,666	\$ 22,474
Bay	Saginaw Bay	79	\$ 73,340	\$ 94,299	2,399	\$ 36,221
Cheboygan	Northern	17	\$ 15,782	\$ 17,790	450	\$ 6,707
Chippewa	Northern	84	\$ 77,982	\$ 87,386	2,386	\$ 34,109
Huron	Southern	905	\$ 840,160	\$ 944,119	34,035	\$ 349,662
Iosco	Central	666	\$ 618,284	\$ 706,373	23,285	\$ 260,136
Mackinac	Northern	255	\$ 236,730	\$ 266,538	9,438	\$ 92,327
Presque Isle	Northern	105	\$ 97,477	\$ 103,922	4,716	\$ 34,332
Sanilac	Southern	142	\$ 131,826	\$ 145,468	5,058	\$ 53,585
St. Clair	Southern	3	\$ 2,785	\$ 3,492	103	\$ 1,337
Tuscola	Saginaw Bay	28	\$ 25,994	\$ 29,267	1,036	\$ 10,138
TOTAL		2,880	\$ 2,673,659	\$ 3,018,690	101,533	\$ 1,110,296

2009

Region		Trips	Total Expenditures	Output	Employment Hours	Personal Income
Alcona	Central	14	\$ 12,997	\$ 13,722	448	\$ 5,127
Alpena	Central	69	\$ 64,056	\$ 75,172	2,146	\$ 28,211
Arenac	Saginaw Bay	147	\$ 136,468	\$ 155,494	4,223	\$ 56,959
Bay	Saginaw Bay	197	\$ 182,886	\$ 235,150	5,984	\$ 90,323
Cheboygan	Northern	69	\$ 64,056	\$ 72,206	1,826	\$ 27,223
Chippewa	Northern	174	\$ 161,534	\$ 181,015	4,943	\$ 70,655
Huron	Southern	299	\$ 277,578	\$ 311,924	11,245	\$ 115,524
Iosco	Central	94	\$ 87,265	\$ 99,698	3,286	\$ 36,716
Mackinac	Northern	144	\$ 133,683	\$ 150,515	5,329	\$ 52,138
Presque Isle	Northern	108	\$ 100,262	\$ 106,891	4,851	\$ 35,312
Sanilac	Southern	12	\$ 11,140	\$ 12,293	427	\$ 4,528
St. Clair	Southern	-	\$ -	\$ -	-	\$ -
Tuscola	Saginaw Bay	143	\$ 132,755	\$ 149,470	5,292	\$ 51,776
TOTAL		1,470	\$ 1,364,680	\$ 1,563,551	50,002	\$ 574,493

Appendix E: Economic Impacts by Sector in 2009

Lake Erie-St. Clair Region Economic Impacts

	Total Expenditures	Direct Effects	Output	Employment Hours	Personal Income
Charter fees and tips	\$ 501,980	\$ 501,980	\$ 892,672	14,888	\$ 322,134
Fishing licenses	\$ 41,547	\$ 41,547	\$ 72,893	1,375	\$ 45,679
Hotels, motels, B&Bs, camping	\$ 174,482	\$ 174,482	\$ 323,099	5,958	\$ 116,893
Fuel for automobiles/trucks	\$ 76,388	\$ 11,382	\$ 20,053	441	\$ 7,748
Auto/truck expenditures	\$ 11,718	\$ 1,746	\$ 3,166	48	\$ 1,125
Groceries and beverages	\$ 62,081	\$ 17,196	\$ 32,688	721	\$ 13,995
Restaurants and taverns	\$ 97,744	\$ 28,346	\$ 51,498	1,255	\$ 17,680
Fishing equipment	\$ 4,583	\$ 1,856	\$ 3,455	105	\$ 1,446
Souvenirs and shopping	\$ 30,799	\$ 6,745	\$ 12,745	352	\$ 5,530
Entertainment	\$ 19,069	\$ 5,797	\$ 10,309	172	\$ 3,720
Other	\$ 13,794	\$ 3,821	\$ 7,220	199	\$ 3,133
TOTAL	\$ 1,034,186	\$ 794,899	\$ 1,429,797	25,514	\$ 539,083

Lake Huron Region Economic Impacts

	Total Expenditures	Direct Effects	Output	Employment Hours	Personal Income
Charter fees and tips	\$ 662,398	\$ 662,398	\$ 981,739	33,658	\$ 354,215
Fishing licenses	\$ 54,825	\$ 54,825	\$ 80,995	2,087	\$ 52,887
Hotels, motels, B&Bs, camping	\$ 230,242	\$ 230,242	\$ 347,985	9,076	\$ 111,836
Fuel for automobiles/trucks	\$ 100,799	\$ 15,019	\$ 22,101	675	\$ 8,302
Auto/truck expenditures	\$ 15,463	\$ 2,304	\$ 3,533	79	\$ 1,075
Groceries and beverages	\$ 81,920	\$ 22,692	\$ 35,329	1,161	\$ 14,673
Restaurants and taverns	\$ 128,980	\$ 37,404	\$ 55,112	1,784	\$ 16,458
Fishing equipment	\$ 6,048	\$ 2,449	\$ 3,757	173	\$ 1,549
Souvenirs and shopping	\$ 40,642	\$ 8,901	\$ 13,829	587	\$ 6,005
Entertainment	\$ 25,162	\$ 7,649	\$ 11,337	389	\$ 4,090
Other	\$ 18,202	\$ 5,042	\$ 7,834	332	\$ 3,402
TOTAL	\$ 1,364,680	\$ 1,048,924	\$ 1,563,551	50,002	\$ 574,493

Lake Michigan Region Economic Impacts

	Total Expenditures	Direct Effects	Output	Employment Hours	Personal Income
Charter fees and tips	\$ 4,393,455	\$ 4,393,455	\$ 7,401,915	150,109	\$ 3,415,535
Fishing licenses	\$ 363,632	\$ 363,632	\$ 583,457	14,317	\$ 373,240
Hotels, motels, B&Bs, camping	\$ 1,527,113	\$ 1,527,113	\$ 2,496,499	61,278	\$ 795,249
Fuel for automobiles/trucks	\$ 668,564	\$ 99,616	\$ 157,889	4,266	\$ 59,051
Auto/truck expenditures	\$ 102,558	\$ 15,281	\$ 25,124	475	\$ 8,188
Groceries and beverages	\$ 543,348	\$ 150,507	\$ 253,983	7,393	\$ 104,925
Restaurants and taverns	\$ 855,483	\$ 248,090	\$ 421,446	12,056	\$ 126,070
Fishing equipment	\$ 40,112	\$ 16,245	\$ 27,025	1,278	\$ 10,982
Souvenirs and shopping	\$ 269,563	\$ 59,034	\$ 99,629	4,481	\$ 42,597
Entertainment	\$ 166,893	\$ 50,736	\$ 82,040	2,542	\$ 31,000
Other	\$ 120,726	\$ 33,441	\$ 56,158	1,561	\$ 23,073
TOTAL	\$ 9,051,449	\$ 6,957,152	\$ 11,605,165	259,756	\$ 4,989,910

Lake Superior Region Economic Impacts

	Total Expenditures	Direct Effects	Output	Employment Hours	Personal Income
Charter fees and tips	\$ 109,949	\$ 109,949	\$ 172,705	5,638	\$ 62,251
Fishing licenses	\$ 9,100	\$ 9,100	\$ 14,218	359	\$ 9,404
Hotels, motels, B&Bs, camping	\$ 38,217	\$ 38,217	\$ 62,093	1,669	\$ 20,374
Fuel for automobiles/trucks	\$ 16,731	\$ 2,493	\$ 3,930	119	\$ 1,520
Auto/truck expenditures	\$ 2,567	\$ 382	\$ 608	13	\$ 209
Groceries and beverages	\$ 13,598	\$ 3,767	\$ 6,294	207	\$ 2,652
Restaurants and taverns	\$ 21,409	\$ 6,209	\$ 9,660	311	\$ 2,915
Fishing equipment	\$ 1,004	\$ 407	\$ 668	32	\$ 280
Souvenirs and shopping	\$ 6,746	\$ 1,477	\$ 2,462	102	\$ 1,084
Entertainment	\$ 4,177	\$ 1,270	\$ 1,994	65	\$ 719
Other	\$ 3,021	\$ 837	\$ 1,395	58	\$ 614
TOTAL	\$ 226,518	\$ 174,107	\$ 276,027	8,573	\$ 102,021

Total Economic Impacts of Charter Fishing to Michigan Coastal Communities, 2009

	Total Expenditures	Direct Effects	Output	Employment Hours	Personal Income
Charter fees and tips	\$ 5,667,782	\$ 5,667,782	\$ 9,449,031	204,294	\$ 4,154,134
Fishing licenses	\$ 469,104	\$ 469,104	\$ 751,563	18,139	\$ 481,211
Hotels, motels, B&Bs, camping	\$ 1,970,055	\$ 1,970,055	\$ 3,229,676	77,981	\$ 1,044,351
Fuel for automobiles/trucks	\$ 862,482	\$ 128,510	\$ 203,973	5,501	\$ 76,620
Auto/truck expenditures	\$ 132,306	\$ 19,714	\$ 32,431	615	\$ 10,596
Groceries and beverages	\$ 700,947	\$ 194,162	\$ 328,294	9,482	\$ 136,246
Restaurants and taverns	\$ 1,103,617	\$ 320,049	\$ 537,715	15,407	\$ 163,124
Fishing equipment	\$ 51,747	\$ 20,957	\$ 34,905	1,589	\$ 14,256
Souvenirs and shopping	\$ 347,750	\$ 76,157	\$ 128,666	5,521	\$ 55,217
Entertainment	\$ 215,301	\$ 65,452	\$ 105,680	3,167	\$ 39,529
Other	\$ 155,742	\$ 43,141	\$ 72,606	2,150	\$ 30,222
TOTAL	\$ 11,676,833	\$ 8,975,083	\$ 14,874,539	343,845	\$ 6,205,506