



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

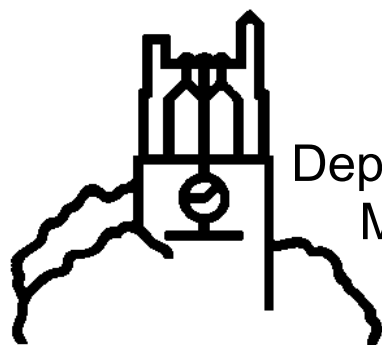
Staff Paper

**A PROFILE OF RECREATIONAL ANGLERS
IN MICHIGAN**

by
Frank Lupi

Staff Paper No. 04-17

2004



Department of Agricultural Economics
MICHIGAN STATE UNIVERSITY
East Lansing, Michigan 48824

A PROFILE OF RECREATIONAL ANGLERS IN MICHIGAN ¹

Frank Lupi
Associate Professor
Department of Agricultural Economics and
Department of Fisheries and Wildlife
Michigan State University
lupi@msu.edu

Agricultural Economics Staff Paper 04-17, 2004
Department of Agricultural Economics, Michigan State University

Copyright 2000 by Frank Lupi, Michigan State University. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies .

¹ Support for this research has been provided, in part, by the Fisheries Division, Michigan Department of Natural Resources (MDNR), and the U.S. Fish and Wildlife Service Federal Aid in Sportfish Restoration Project F-80-R-5 (Michigan), Study 508. Funding for the survey that gathered the fishing behavioral data from anglers was provided by the Michigan Department of Environmental Quality. I am indebted to John Hoehn, Theodore Tomasi and Heng Chen who were vital parts of the Michigan State University team that developed the survey, and we benefitted from the advice and experience of Douglas Jester. A portion of the data presented in this report was collected under contract by the Survey Research Division of the Institute for Public Policy and Social Research (IPPSR) at Michigan State University. The author is solely responsible for the content of this report.

INTRODUCTION

The purpose of this report is to use an existing angler survey database to create a profile of Michigan anglers and their trip behaviors. Information about angler activities, behaviors, and preferences that is representative of the general population of Michigan anglers can help fisheries managers design policies and allocate resources to better serve their clientele (Pollack et al, 1994). Representative angler survey information can also be used to benchmark the results of existing non-random angler surveys. Such survey data can also supplement the data from the National Survey of Fishing, Hunting and Wildlife Associated Recreation conducted every five years by the USFWS. Despite its importance, the national survey provides limited behavioral data on Michigan anglers, there are no attitudinal/preference data, and the sample size is very modest (fewer than 400 anglers in the 2001 survey). To add to the gaps in information about anglers, Michigan has not conducted statewide surveys of the general population of anglers since the mid 1980's (Jansen, 1985; Kikuchi, 1986; Mahoney et al, 1991) which makes most of the existing information about Michigan anglers' fishing activities and preferences quite dated.

This research will utilize a database on recreational anglers in Michigan that was collected in a telephone panel survey of Michigan anglers. The survey was developed at Michigan State University (MSU) and followed over 2,000 anglers throughout the 1994-5 fishing license year. The MSU survey was a general population survey that covered all types of resident anglers in Michigan. The survey also contains useful information about the characteristics of occasional anglers that only purchase licenses intermittently. The survey was conducted as part of a project to develop a model of the demand and economic value of recreational angling in Michigan (Lupi et al, 2000; Lupi et al, 2003). Although its main purpose was to collect angler behavior data, the survey also collected some additional characteristics about anglers. Even though the MSU survey is not as current as one might wish for, it does provide data that is ten or more years more recent than the other available statewide sources with preference data. Given the gap that exists with respect to knowledge of Michigan's anglers, this report aims to document and analyze what can be gleaned about Michigan anglers from this existing survey data before the

information becomes too dated to be useful. It is also hoped that the information can also be used to aid and enhance the design of future angler survey efforts.

THE SURVEY DATA

This section provides an overview of the telephone panel survey that was used to collect the data on anglers behavior and characteristics. The core information available from the MSU survey is outlined below:

1. Basic behavioral data:
 - a. Did the angler go fishing?
 - b. How many trips did they take?
 - c. For each trip:
 - i. trip duration
 - ii. water body fished at
 - iii. species targeted
2. Basic data on the anglers:
 - a. Residence
 - b. Demographics (age, education, gender, etc)
 - c. Fishing boat and cabin ownership
 - d. A limited number of attitudinal and preference questions
 - i. Reasons for fishing
 - ii. Importance of site attributes for choosing where to fish
 - iii. Favorite fish to catch, to eat

This trip and angler information was collected for residents of Michigan 18 years or older, and the trip information was only collected for trips in Michigan. Moreover, this analysis only reports data on trips taken in the open water season defined as April 1 to October 31.

An important goal of the survey was to obtain accurate data on the number and types of trips individual anglers take in Michigan over the course of a fishing season. Recall difficulties have been shown to increase with the length of the recall period and the number of intervening fishing events (WESTAT). The potential for recall bias was a factor in deciding against the use of surveys instruments which ask anglers to recall what they did in a previous year (annual recall). This decision ruled out surveys using the previous years fishing license list to ask about fishing in that year, as well as end of the season surveys of

the general population asking about that seasons' fishing activities. Because of the potential difficulties remembering the details of what one does over the course of a season, especially if there are many events to recall, a panel survey was developed which followed a sample of anglers throughout the 1994 fishing season. In the panel survey, the length of time between individuals' panel interviews was varied depending on the anticipated frequency of an individual's fishing. Thus, recall periods were shorter for anglers who fished often. The telephone survey was implemented using Computer Assisted Telephone Interviewing (CATI). With CATI surveys, the instrument can be programmed to utilize complex skip patterns without having to depend on the interviewer or the respondent to follow the appropriate skip patterns. Also, questions can be programmed to utilize information provided in response to previous questions and/or earlier interviews. Tailoring the survey instrument to each individual can improve the accuracy of respondents' answers, reduce the length of the interview, and reduce the cognitive burden of the interview on respondents. The survey development included four focus groups and an extensive pilot survey. The pilot survey was a small-scale version of the full survey. The pilot survey was conducted during the fishing season of 1993, and the full survey was conducted in 1994 to 1995.

The full survey consisted of two phases: a screening interview to recruit potential anglers into the panel and the subsequent panel interviews. The screening interviews were conducted from late March through early May, 1994. The sample was drawn from the phone numbers for the general population of Michigan residents. To improve the efficiency of the screening interviews, the sample of telephone numbers was stratified so that the proportion of numbers per county matched the proportion of licensed anglers per county. In the initial telephone contact, a random adult (age 18 or older) respondent was selected from the household. Males were over-sampled to improve the efficiency of the screening interviews because males are more likely to fish than females.

The screening interview was very brief with a few questions about fishing and demographics. Anyone indicating they fished in the previous year or they were "likely" to fish in the upcoming year was asked to participate in the panel. The definition of these "potential" anglers was based on an analysis of

the pilot survey results. The response rate for completing the screening interviews was between 62% and 75%, depending upon the method of calculating response rates. Of the 6,342 individuals who completed the screening, 3,415 respondents were identified as potential anglers and asked to join the panel. Of these, 2,668, or 78%, agreed to participate. Of those that agreed to participate in the panel, 2,135, or 80%, completed the entire panel. Of these, 1,908 had complete responses for basic demographic questions (e.g., age, gender) and also reported on enough details for all of their fishing trips for the data to be used in some way for the economic modeling of Lupi et al (2000).

Because of the stratification in the screening sample, weights were created to appropriately adjust for the stratification based on county population of licensed anglers, the male-female ratio, the number of adults in the household, and the number of telephone lines. After correcting for the sample stratification scheme used in the screening, there was some evidence that persons responding to the screening interview were slightly different than the Michigan population as a whole. To correct for these differences, case weights were created for each sampled person. These case weights were calculated so that the screening sample matched census data on the joint distribution of Michigan adults by regions, age, education, and gender.

The timing of panel interviews was designed so that frequent anglers were called more often than infrequent ones. Using questions from the screening interviews, panel members were partitioned into three groups based on their anticipated frequency of fishing. The group of frequent anglers was called six times in the period from April through November. The middle range group was called four times while the group of infrequent anglers was called twice. The grouping of respondents and the number of waves for each group was based on an analysis of the pilot data. The goal was to obtain the highest quality data on as many trips as possible, keeping research budget constraints in mind. The scheduling of the panel waves balanced the cost of the panel against the desire to reduce the recall period since the last interview. Another factor that was taken into account was feedback from the pilot survey indicating that infrequent anglers did not

want to be called frequently, even if the interview was short. Some detailed information such as the trip length or date was obtained on about 88% of all trips taken by the survey respondents.

Each time panel members were called they were asked how many times, if any, they had fished since their last interview. If they fished, they were asked a set of questions about each trip: location, target species, duration, etc. The final panel interview also included questions about their usual travel practices, cabin ownership, and employment characteristics. To avoid double counting of trips and to help respondents answer the question, interviewers would remind respondents of the date of their last interview along with the date and location of the last trip they took, a technique called bounded recall. To minimize any recall bias in the trip counts, respondents who were unable or unwilling to provide details of each of the fishing trips they initially reported were given an opportunity to revise their total number of trips for that interview period. Further, respondents who were in the more avid angling groups were sent fishing logs (diaries) to serve as memory aids when completing the phone interviews.

The analysis sample, upon which the economic modeling of Lupi et al (2000) was conducted, consisted of a subset of the survey respondents and the trips they reported. Eligible cases met basic conditions such as having completed the panel, and basic data existed for each of a person's trips and their demographics (see Appendix 1, Hoehn et al (1996) for complete details of these conditions). It is possible that implementing these data conditions might result in a sample that is not representative of the overall population of potential anglers. Therefore, a set of weights was created for the analysis sample of 1,908 cases that matched it to the (weighted) sample that was originally recruited to the panel, the "potential" anglers identified in the screening interview. This weighting process ensured that the distribution of angler characteristics in the analysis sample matched the distribution of characteristics in the original sample of recruited anglers. The characteristics matched included the angler's avidity group, the region of the state the angler lived in, the anglers age, and some additional demographic variables. These weights are discussed in detail in the Appendix to this report. The data that is used in the present analyses uses these weights to maximize the representativeness of these results.

Figure 1: Michigan Zones (Metro tri-county=1, Mid-Mich=2, Upper Mich=3).

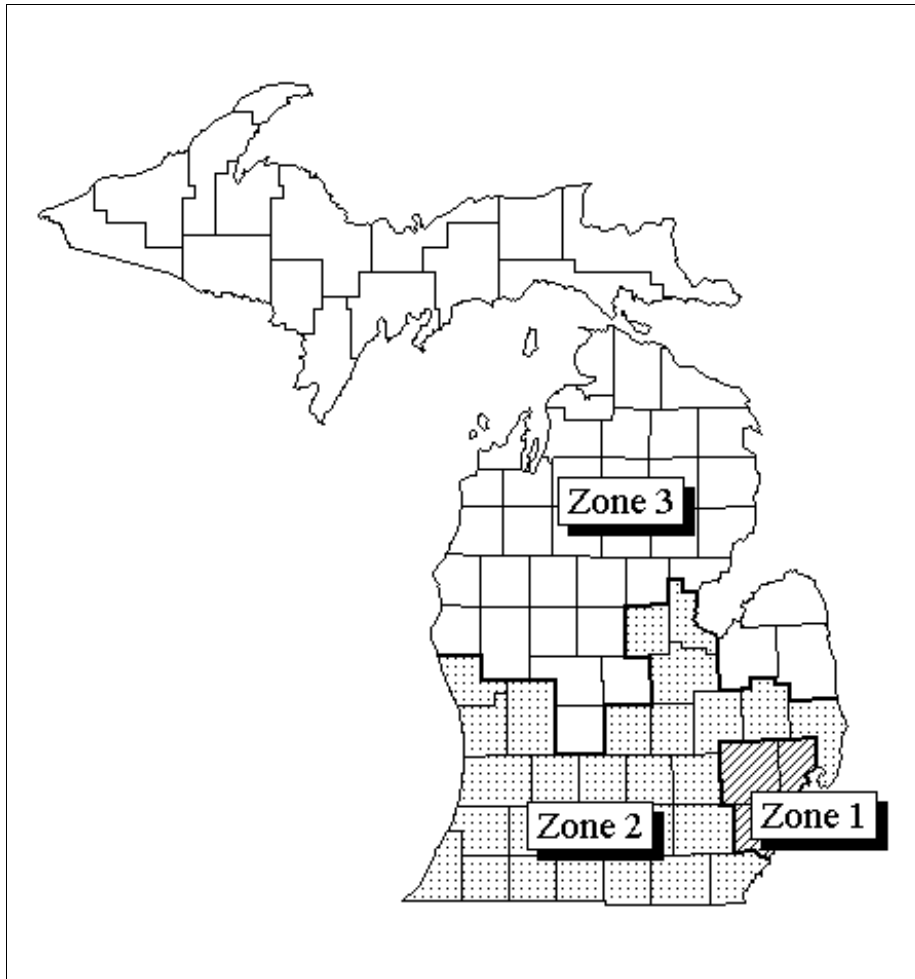


Figure 1 presents zones or regions of Michigan that were used in the stratification of the survey interviews and that are also used to characterize the fishing behaviors and preferences of anglers who reside in these zones.

SELECTED SURVEY RESULTS

In all, the MSU survey collected information on 8,288 trips. However, many of the individuals who reported taking trips did not complete the panel. Information was gathered on a total of 7,309 trips for people who completed the panel. Of these 7,309 trips, 6,401 (88%) provided *trip details* in the trip loop of the instrument ("trip details" is defined by cases providing valid responses for the trip length, for the

number of sites, and for the month of the trip). Recall that individuals who could not report details of all the trips they reported taking in a wave were given an opportunity to revise their trip count. Using the trip count before the correction would have indicated that there were 7,831 trips for cases who completed the panel. Thus, the opportunity to revise answers led to a 7% reduction in the total trip count (from 7,831 to 7,309).

In the first panel survey interview, respondents from group 1 or 2 were asked about up to three sites that they usually fish at, though not all mentioned three sites. Overall, 55% of all trips in the panel were made to one of the usual sites even though not all panel members were asked about usual sites. Of those that were asked about the usual sites (groups 1 and 2), about 67% of the trips were to one of the usual sites. Of the trips to a usual site, 66% were made to the usual site respondents mentioned first; 24% were made to the usual site that was mentioned second; and 10% were made to the usual site that was mentioned third. The usual sites were hard coded into the CATI program which permitted us to count repeat trips to usual sites within any wave. Within any wave, after two single day, single site trips to a usual site, respondents were asked if these repeat visits were "typical" trips to that site. If the respondent indicated it was a typical trip to that site, the interview skipped to the questions about the next trip. About 9% of the trips were classified as typical trips. These two features appeared to function to reduce interview time and respondent burden as desired.

In this section, selected survey results and summary statistics are presented. The results for angler characteristics represent Michigan resident anglers, 18 years or older, and the trip results are only for their trips in Michigan during the April-October season. The summary statistics are weighted by the weights that were created to correct for the screening stratification and the complete panel data. One effect of the weights is to reduce the weighted number of trips reflected in the tables that follow. Table 1 presents a summary of total trips for individuals who completed the panel. These statistics are also presented for the different avidity groups and for anglers living in different regions or zones of the state (see Figure 1 for a diagram of the zones). From the table, one can see that of the three residence zones, Metro area panel

Table 1: Summary Statistics for Total Fishing Trips taken by Survey Panel Members.

	Cases	Total trips	Mean	Std. dev.	% who fished	Mean for trips>0	Std. dev. trips>0
All cases	1908	4481	2.35	4.31	51.5	4.56	5.09
Residence zone							
1 Metro tri-county	731	1411	1.93	3.75	44.9	4.30	4.60
2 Mid Michigan	816	2068	2.53	4.49	54.6	4.64	5.22
3 Upper Michigan	361	1002	2.77	4.83	57.9	4.79	5.54
Angler avidity group							
Frequent	311	2104	6.76	7.04	87.2	7.75	7.01
Moderate	942	2078	2.21	3.29	61.4	3.59	3.56
Infrequent	655	298	0.46	1.44	20.3	2.25	2.51

members were least likely to fish and took the fewest trips on average, while Upper Michigan area panel members were most likely to fish and took the most trips on average. For the three residence zones, the unconditional mean trips by zone are significantly different at the 1% level, and the conditional means are not significantly different at the 10% level based on an F test of equality. From the % that fished column, one can see that the upper-Michigan anglers were more likely to fish and the metro anglers were least likely to fish, relative to the recruited pool of potential anglers. However, for those that did fish, they did so about the same amount regardless of residence region.

As expected, most of the frequent anglers in the panel fished, and they took the most trips on average (Table 1). The conditional and unconditional means for the avidity groups are significantly different at the 1% level (p-value < 0.001 in both cases). One interesting feature of the mean trips taken

Table 2: Distributions for Total Fishing Trips taken by Survey Panel Members

		Distribution of Number of Fishing Trips (Cumulative %)									
		0	1	2	3	4	5	10	20	30	47
All trips		48.5	62.8	71.8	82.5	85.9	89.8	95.3	98.7	99.8	100
Trips > 0			27.8	45.2	57.7	66.1	72.7	90.8	97.5	99.6	100
Residence Zone											
1 Metro Tri-county	All trips	55.1	67.6	76.3	81.4	83.5	87.6	96.7	99.1	99.8	100
	Trips>0		27.8	47.2	58.5	63.3	72.5	92.6	98.0	99.5	100
2 Mid-Michigan	All trips	45.4	60.6	69.7	76.4	82.5	85.3	94.7	98.6	99.8	100
	Trips>0		27.8	44.5	56.8	67.9	73.1	90.2	97.4	99.6	100
3 Upper-Michigan	All trips	42.1	58.3	67.4	75.9	80.7	83.9	93.7	98.1	99.8	100
	Trips>0		27.9	43.6	58.3	66.7	72.2	89.1	96.7	99.3	100
Avidity Groups											
Frequent	All trips	12.8	20.9	26.8	40.1	47.4	53.5	80.5	94.3	98.6	100
	Trips>0		9.3	16.1	31.3	39.6	46.7	77.6	93.5	98.4	100
Moderate	All trips	38.6	57.4	70.2	77.4	83.4	88.2	97.1	99.3	100	
	Trips>0		30.7	51.5	63.3	72.9	80.7	95.4	98.9	100	
Infrequent	All trips	79.7	90.5	95.5	97.5	98.1	98.2	99.6	99.9	100	
	Trips>0		53.3	77.6	87.7	90.4	90.9	97.8	99.4	100	

by group 1 is that these anglers all stated in the screening interview that they fished *more* than 20 times in the previous year, yet they averaged half that amount during the panel – perhaps an indication of the recall bias associated with framing a questions about a years worth of fishing trips.

Table 2 presents the distribution of trips that the anglers in the panel took during the April-October fishing season. The overall distribution of trips, from the first rows, reveals that the majority of the general population of anglers takes only a handful of trips. This result holds whether one looks at the distributions of trips by including those potential anglers that did not end up fishing (the first row) or one looks at only those anglers that did fish (the second row). Looking only at anglers that did fish from April to October

Table 3: Distribution of Trip Length for All Trips and for Multi-Day Trips.

Nights away	0	1	2	3	4	5	6	7	10	18
All trips (cumulative %)	79.6	84.1	92.2	95.3	96.8	97.4	98.0	99.1	99.5	100
Multi-day trips (cum.%)		22.2	61.8	77.1	84.2	87.1	90.3	95.4	97.6	100

during the panel survey, 73% took 5 trips or fewer and 91% took 10 trips or fewer. Examining the distribution of trips by the residence zones, one sees the same pattern as in Table 1: a higher percentage of our recruited anglers fished as one moves away from the Metro tri-county zone. However, looking at the distribution of trips, conditional on having fished, reveals little difference between the regions. Conversely, for our avidity groups, it is clear that the frequent angling group takes more trips than the other groups. Over half the “frequent” anglers that fished, did so more than 10 times.

The majority of trips for which information was collected on are single day trips. In order to determine whether a trip was single day or multi-day, respondents had to report on the details of the trip in the trip loop of the panel survey instrument. Table 3 presents the cumulative distribution of nights away for all trips and for multi-day trips based on the trips for which respondents provided trip length in the trip loop of the panel instrument. Only 22.2% of these trips include an overnight stay. Overall, about 95% of all trips are three nights or less while 77% of the multi-day trips are three nights or less. The maximum observed trip length was 18 nights. The average nights away for all trips is 0.61 with a standard deviation of 1.66. Thus, on average, trips are less than one night. Conditional on being a multi-day trip, the average nights away is 2.98 with a standard deviation of 2.53.

Differences in the distribution of day trips and multi-day trips for several key variables are presented in Table 4. The results in Table 4 are restricted to the 6,493 trips where trip length is known and the angler completed the panel and are weighted so that the effective trip count is 5,263. Trip length was determined based on the response to a question which asked if the trip was an overnight trip (overnight

Table 4: Trip Characteristics for Key Variables by Day and Multi-Day Trips.

	Valid cases	p-value*	Column distributions			Row distributions	
			% of <i>all</i> trips by category	% of <i>day</i> trips by category	% of <i>multi-day</i> trips by category	% of row that are <i>day</i> trips	% of row that are <i>multi-day</i>
Trip length	5,263					79.6	20.4
# places fished on trip	5,253	<0.00					
1 place			91.3	93.7	81.6	81.7	18.3
2 places			6.9	5.4	12.9	61.9	38.1
3 or more			1.8	0.9	5.5	39.2	60.8
Water type^a	5,046	<0.00					
Great Lakes			28.6	30.7	20.7	85.2	14.8
Inland Lakes			47.9	46.2	54.7	76.6	23.4
Rivers and Streams			23.4	23.1	24.6	78.4	21.6
Fish type^{a,b}	5,198	<0.00					
Warm			82.8	84.2	77.2	81.2	18.8
Cold			16.6	15.0	22.7	72.4	27.6
Mixed			0.6	0.7	0.1	96.9	3.1
Purpose^b	5,258	<0.00					
Fishing			89.3	95.4	65.9	84.9	15.1
Non-fishing			10.7	4.6	34.1	34.6	65.4
Zone of residence	5,263	<0.00					
1 Metro tri-county			31.2	30.3	34.8	77.3	22.7
2 Mid Michigan			46.6	45.3	51.4	77.4	22.6
3 Upper Michigan			22.2	24.3	13.8	87.2	12.8
Angler avidity group	5,263	<0.00					
1 Frequent			46.7	49.3	36.5	84.0	16.0
2 Moderate			46.5	44.1	55.8	75.4	24.6
3 Infrequent			6.8	6.6	7.7	76.9	23.1

* Significance level (p-value) for Pearson chi-squared test of independence; p-value<0.001 in all cases.

a. For the multiple site trips, the numbers reflect the type associated with the main site of the trip.

b. These numbers include the type associated with typical trips.

c. In all cases, only those trips meeting the participation level criteria of Hoehn et al (1996) were included.

trips are considered multi-day trips). The table presents a series of "crosstabs" between trip length (day/multi-day) and the following variables listed in the first column: the number of sites fished at on a trip, the water type, the fish type, the trip purpose, the zone of the angler, the avidity group of the angler,

and the month of the trip. Using Pearson's chi-squared test, independence of the distribution of day and multi day trips is rejected at the 1% level for all the variables listed in the first column of Table 4.

The second column of Table 4 presents the valid number of cases for the intersection of that variable and trip length. For example, there are 5,046 cases (weighted) where the water type is known along with the trip length. The third column presents the distribution of trips by each of the coding categories for the variables listed in the first column. The next column presents the distribution of single day trips by of the each coding categories for the variables listed in the first column. The fifth column does the same for multiple day trips. The fourth and fifth column are often referred to as "column percents" in standard tables of crosstabs. For each of the variables, the percents in these columns sum to one across the categories for any variable. The last two columns present the share of single and multiple day trips corresponding to that row of the table which are often referred to as "row percents." For any category (row), the row percents sum to one. In the first row, the percentage of trips which are day and multi-day are presented. Since this is not a crosstab with any variable, there are no column distributions for the first row.

Inspection of Table 4 reveals some interesting results. To begin with, most of the trips for anglers completing the panel are single day trips (80%). On the majority of trips (91%), anglers fished at just one site. Day trips were much more likely to be single site trips (94%) than multi-day trips (82%). Most trips were to inland lakes (48%) with rivers/streams receiving a somewhat smaller share of trips(23%) than the Great Lakes (29%). Multi-day trips were more likely to be at inland lakes (55%) than single day trips (46%). The "fish type" variable was created by aggregating the main species sought on a trip into categories for cold species (essentially trout and salmon) and warm species (essentially everything besides trout and salmon) since these were the categories used in previous analyses. Most trips were for warm water species (83%), but multi-day trips were more likely to be for cold species (23%) than single day trips (15%). The majority of trips were for the primary purpose of fishing (89%). As expected, single day trips were much more likely to be primarily for purposes of fishing (95%) than multi-day trips (66%). In terms

Table 5: Trip Characteristics for Key Variables by Angler Avidity Groups.

	Valid cases	p-value*	Column distributions (% of column within avidity group)			Row distributions (% of row across avidity groups)			
			% of all trips by category	% trips by frequent anglers by category	% trips by moderate anglers by category	% trips by infrequent anglers by category	% trips by frequent anglers	% trips by moderate anglers	% trips by infrequent anglers
Avidity group	5,425						47.0	46.4	6.6
# places fished on trip	5,269	0.097							
1 place			91.3	92.1	90.6	89.7	47.1	46.2	6.7
2 places			6.9	5.9	7.7	7.8	40.2	52.1	7.7
3 or more			1.9	2.0	1.7	2.5	49.0	41.8	9.2
Water type^a	5,054	0.057							
Great Lakes			28.7	28.9	29.0	24.1	48.3	46.3	5.4
Inland Lakes			48.0	49.2	46.4	50.3	49.1	44.2	6.7
Rivers and Streams			23.4	21.9	24.6	25.6	44.9	48.1	7.0
Fish type^{a,b}	5,208	0.002							
Warm			82.8	82.0	82.5	90.4	46.5	46.0	7.4
Cold			16.6	17.2	16.9	9.6	48.9	47.2	3.9
Mixed			0.6	0.8	0.5	0.0	59.4	40.6	0.0
Purpose^b	5,280	<0.00							
Fishing			89.1	93.5	86.5	77.3	48.9	45.2	5.9
Non-fishing			10.9	6.5	13.5	22.7	27.9	57.8	14.3
Zone of residence	5,423	<0.00							
1 Metro tri-county			31.4	28.9	34.0	31.1	43.2	50.2	6.6
2 Mid Michigan			46.2	47.7	43.4	54.4	48.5	43.7	7.8
3 Upper Michigan			22.4	23.4	22.5	14.4	49.1	46.6	4.3

* Significance level (p-value) for Pearson chi-squared test of independence; p-value<0.001 in all some cases.

a. For the multiple site trips, the numbers reflect the type associated with the main site of the trip.

b. These numbers include the type associated with typical trips.

c. In all cases, only those trips meeting the participation level criteria of Hoehn et al (1996) were included.

of the residence zones, (see Figure 1), upper Michigan anglers were much less likely to take multi-day trips (13%) than mid Michigan anglers (23%) or Metro area residents (23%). Frequent anglers were much more likely to take day trips (85%) than other anglers (78%). Anglers identified as avid anglers based on the

screening interviews took about 47% of all the trips and were much more likely to take single day trips(84%) than were anglers in the less avid groups. The infrequent, yet potential, anglers only took 7% of the trips.

Table 5 presents relationships between the angler avidity groups and aspects of the trips. The format of Table 5 is consistent with that of Table 4 where the first set of columns present column percentages from crosstab relationships and the second set of columns presents the row percentages. From Table 5, there are not substantial differences in the number of places fished at on a trip when broken out by avidity group. For the “frequent” group, a slightly higher share of their trips only involve one fishing site as compared to the other groups, though the differences are only significant at the 10% level. Inspecting the type of water body visited on the trip, the “infrequent” group is slightly more likely to fish at lakes and rivers, or equivalently, slightly less likely to fish at Great Lakes sites, when compared to the other avidity groups (p-value = 0.057). Looking at the species types targeted on a trip, trips by anglers in the “infrequent” avidity group are about half as likely (9.6%) to target trout or salmon (cold species) than are anglers from the more avid groups (about 17%). Frequent anglers have a significantly larger share of their trips (93.5%) where the primary purpose of the trip is fishing. Alternatively, the infrequent angler group has a significantly smaller share of their trips whose primary purpose is fishing (77%). Inspecting the relationships between angler residence zones and the avidity groups reveals that the Upper Michigan region is significantly less likely to have anglers classified as infrequent and the Mid Michigan region is slightly more likely to have infrequent anglers, all based on the avidity classifications used here (see the appendix for details). Fewer of the anglers from the Metro tri-county region were classified in the screening as frequent anglers than for the other regions. Recall however from Table 2 that the average angler that fishes does so about the same amount regardless of region. The relationship between the avidity groups and trip lengths was addressed in the discussion of Table 4.

Table 6: Trip Characteristics for Key Variables by Main Water Body Type for Trip.

	Valid cases	p-value*	Column distributions (% of column within water body type)			Row distributions (% of row across water body type)			
			% of all trips by category	% trips at Great Lake site by category	% trips at Inland Lake site by category	% trips at River-stream site by category	% trips at Great Lake site	% trips at Inland Lake site	% trips at River-stream site
Water body type^a	5,054					28.7	48.0	23.4	
# places fished on trip	5,047	<0.00							
1 place			91.4	95.2	90.6	88.2	29.9	47.5	22.6
2 places			6.8	4.1	7.5	8.7	17.2	52.8	30.0
3 or more			1.8	0.7	1.9	3.0	10.9	50.0	39.1
Fish type^{a,b}	4,991	<0.00							
Warm			82.6	79.5	96.1	58.3	27.6	56.1	16.3
Cold			16.8	20.0	3.8	39.8	34.2	11.0	54.8
Mixed			0.6	0.5	0.1	1.9	21.9	9.4	68.8
Purpose^b	5,050	<0.00							
Fishing			89.5	95.0	85.3	91.4	30.4	45.7	23.9
Non-fishing			10.5	5.0	14.7	8.6	13.6	67.4	19.1
Zone of residence	5,054	<0.00							
1 Metro tri-county			30.9	46.0	27.9	18.4	42.7	43.3	14.0
2 Mid Michigan			46.5	36.3	51.1	49.7	22.4	52.6	25.0
3 Upper Michigan			22.6	17.7	21.0	31.8	22.4	44.7	31.8

* Significance level (p-value) for Pearson chi-squared test of independence; p-value<0.001 in all cases.

a. For the multiple site trips, the numbers reflect the type associated with the main site of the trip.

b. These numbers include the type associated with typical trips.

c. In all cases, only those trips meeting the participation level criteria of Hoehn et al (1996) were included.

Again following the formats of previous tables, Table 6 presents relationships between the main type of water body that was fished at on a trip and other trip characteristics. Table 6 shows that there are significant differences in the number of places fished at on a trip when broken out by main type of water body fished. Although the large majority of trips of any type are to only one site, the rivers and streams trips are less likely to involve only one site within a trip (88%) when compared to inland lake trips (90.6%) and Great Lake trips which have the largest share of trips in which only one site is visited (95%). Regarding the purpose of a trip, inland lake trips have a significantly lower share of trips whose primary purpose is fishing (85%) than do trips to rivers and streams (91%) or Great Lakes (95%). Looking at the species types targeted on a trip, inland lake trips are substantially and significantly more likely to target a warm species (96%) when compared to Great Lakes (79.5%) and rivers and streams (58%). Put differently, most of the cold species trips are to rivers and streams (55%) and most of the warm species trips are to inland lakes (56%). Turning to the residence zone of anglers, Metro tri-county anglers are almost twice as likely (43% to 22%) to take their trips to the Great Lakes than are anglers of other regions, and anglers from the metro tri-county zone account for the largest share of Great Lakes trips (46%). Anglers from mid Michigan take most of the inland lake trips (51%), and anglers from upper Michigan have a larger share of their trips going to rivers (32%) than do mid Michigan anglers (25%) or metro tri-county anglers (14%).

Table 7 presents relationships between the main type of fish that was targeted on a trip and other trip characteristics. Notice that relationships between species sought and other variables were discussed already as they arose in Tables 4-6. As before, the bulk of trips are taken to only one fishing site. Never the less, trips targeting cold species (trout and salmon) are significantly more likely to visit three or more fishing locations on trip. Trips targeting warm species are more likely to have a primary purpose that is

Table 7: Trip Characteristics for Key Variables by Main Type of Fish Targeted on Trip.

	Valid cases	p-value*	Column distributions (% of column within water body type)			Row distributions (% of row across water body type)	
			% of all trips by category	% trips targeting Warm species by category	% trips targeting Cold species by category	% trips targeting Warm species	% trips targeting Cold species
Fish type^{a,b,d}	5,176					83.3	16.7
# places fished on trip	5,168	0.006					
1 place			91.1	91.4	89.8	83.5	16.5
2 places			7.0	7.0	7.0	83.4	16.6
3 or more			1.9	1.6	3.2	71.4	28.6
Purpose^b	5,175	<0.00					
Fishing			89.6	88.5	95.0	82.3	17.7
Non-fishing			10.4	11.5	5.0	92.0	8.0
Zone of residence	5,176	<0.00					
1 Metro tri-county			30.7	33.2	18.3	90.1	9.9
2 Mid Michigan			46.8	48.3	39.2	86.0	14.0
3 Upper Michigan			22.5	18.5	42.5	68.6	31.4

* Significance level (p-value) for Pearson chi-squared test of independence; p-value<0.001 in some cases.

a. For the multiple site trips, the numbers reflect the type associated with the main site of the trip.

b. These numbers include the type associated with typical trips.

c. In all cases, only those trips meeting the participation level criteria of Hoehn et al (1996) were included.

d. For ease of presenting data, the mixed species trips were dropped due to their small numbers, <1%.

not fishing (11.5%) than are trips targeting cold species (5%). With respect to the angler zones of residence, there are substantial and significant differences between regions and species sought on trips. A much larger share of trips taken by Metro area anglers (90%) target warm species than for anglers from Upper Michigan (67%). Put differently, about one third of the trips taken by Upper Michigan anglers target cold species (31%), whereas only one-tenth of the trips taken by Metro tri-county anglers target cold species.

Table 8: Trip Characteristics for Key Variables by Angler Region of Residence.

	Valid cases	p-value*	Column distributions (% of column within water body type)			Row distributions (% of row across water body type)			
			% of all trips by category	% trips from Metro tri-county anglers by category	% trips from Mid-Mich anglers by category	% trips at Upper Mich anglers by category	% trips from Metro tri-county anglers	% trips from Mid-Mich anglers	% trips from Upper-Mich anglers
Zone of residence	5,425						31.4	46.2	22.4
# places fished on trip	5,268	0.006							
1 place			91.3	90.0	92.7	90.0	30.8	47.2	21.9
2 places			6.9	8.3	5.6	7.6	37.5	38.0	24.5
3 or more			1.8	1.8	1.6	2.4	29.9	41.2	28.9
Purpose^a	5,280	<0.00							
Fishing			89.1	89.2	86.5	94.6	31.3	45.1	23.6
Non-fishing			10.9	10.8	13.5	5.4	31.2	57.8	11.0

* Significance level (p-value) for Pearson chi-squared test of independence; p-value<0.001 in some cases.

a. For the multiple site trips, the numbers reflect the type associated with the main site of the trip.

b. These numbers include the type associated with typical trips.

c. In all cases, only those trips meeting the participation level criteria of Hoehn et al (1996) were included.

Table 8 presents the relationships between angler residence zones and the two trip characteristics not already examined for the residence zones: places and purpose (see Tables 4-7 for the other trip characteristics and their association with residence zones). Anglers from Mid Michigan have a smaller share of trips where more than one fishing site was visited on the trip. Anglers residing in upper Michigan (see Figure 1) had a significantly larger share of their trips with fishing as the primary purpose.

Table 9: Main Target Species for Trips, and Favorite Species to Catch and To Eat.

Species of fish	Main species for trips (%)	Favorite species to catch (%)	Favorite species to eat (%)
Bass	21.1	25.7	7.1
Bluegill	12.0	8.0	9.5
Brook & brown trout	1.0	0.6	0.4
Carp, catfish, & suckers	2.4	2.5	1.9
Chinook salmon	1.5	2.1	1.4
Coho salmon	1.5	1.3	1.7
Lake trout	1.5	1.5	1.4
Northern pike/pike, muskie	3.0	5.4	1.5
Panfish	5.1	2.3	2.0
Perch	9.0	12.9	27.0
Salmon, unspecified	1.0	1.4	1.6
Steelhead, rainbow trout	3.7	2.7	1.7
Trout, unspecified	5.3	6.7	5.8
Walleye	15.9	17.4	22.2
Whatever's biting	11.5	1.1	0.2
Other	4.5	7.0	7.6
No favorite	n/a	1.5	7.0

Table 9 presents the distribution of the main fish species anglers reported they were trying to catch on a trip. Again, this information is reported for anglers who completed the panel, and only for trips which went through the trip and site loops of the panel instrument. Table 9 also presents the distribution of respondents' favorite species to catch and to eat. The favorite species distributions are across all respondents who completed the panel, but these questions were general preference questions that were asked of the anglers so they are not tied to any specific trips. There is a reasonable degree of correspondence between the favorite species to catch and the actual targets of trips. Bass (21%) and walleye (16%) are the target of the largest shares of trips, and they are also mentioned as the top species to catch. Perch is the species mentioned as the favorite to eat by most panel members (27%), though perch are less often the target of trips (9%).

Table 10: Main Target Species for Trips by Region of Angler Residence.

Species of fish	Main species for trip (% trips)	Main species for trip for anglers from <i>Metro tri-county</i> region (% trips)	Main species for trip for anglers from <i>Mid-Mich</i> region (% trips)	Main species for trip for anglers from <i>Upper Mich</i> region (% trips)
Bass	21.1	31.2	18.5	11.6
Bluegill	12.0	7.1	17.0	9.0
Brook & brown trout	1.0	0.5	0.6	2.7
Carp, catfish, & suckers	2.4	1.9	3.5	1.0
Chinook salmon	1.5	1.0	1.3	2.7
Coho salmon	1.5	1.9	1.1	1.9
Lake trout	1.5	0.7	1.3	2.9
Northern pike/pike, muskie	3.0	2.6	3.1	3.4
Panfish	5.1	2.7	6.6	5.4
Perch	9.0	5.8	11.5	8.5
Salmon, unspecified	1.0	1.0	1.0	1.0
Steelhead, rainbow trout	3.7	2.3	3.9	5.1
Trout, unspecified	5.3	2.2	5.1	10.3
Walleye	15.9	23.2	9.8	17.9
Whatever's biting	11.5	12.5	11.4	10.1
Other	4.5	3.3	4.2	6.7
N	4,727	1,530	2,156	1,041

Table 10 provides the breakdown of the main species targeted on a trip depending on the residence zone of the angler. The difference is significant (p -value <0.001). Clearly, the trips taken by Metro tri-county anglers are much more focused on bass and walleye than trips taken by anglers from other regions. Anglers residing in upper Michigan are comparatively more likely to take trips targeting trout or salmon. Anglers from Mid Michigan stand out for their larger shares of trips targeting bluegill, perch or panfish and their smaller share of trips targeting walleye. These results reflect the combination of the angler’s travel and trip behaviors along with the relative supply of the different types fishing opportunities in their region.

Table 11: Main Target Species for Trips by Main Water Body for Trip.

Species of fish	Main species for trip (% trips)	Main species for trips to <i>Great Lakes</i> sites (% trips)	Main species for trips to <i>Inland lakes</i> sites (% trips)	Main species for trips to <i>River-stream</i> sites (% trips)
Bass	20.5	7.2	33.0	10.8
Bluegill	11.8	1.6	22.2	3.7
Brook & brown trout	1.1	0.8	0.1	3.6
Carp, catfish, & suckers	2.3	1.3	0.5	7.9
Chinook salmon	3.6	3.2	0.2	2.4
Coho salmon	1.6	4.1	0.0	1.8
Lake trout	1.5	2.0	0.6	2.7
Northern pike/pike, muskie	3.1	0.6	4.7	2.7
Panfish	5.1	1.4	8.2	3.0
Perch	9.1	20.6	4.2	4.4
Salmon, unspecified	1.0	3.0	0.0	0.4
Steelhead, rainbow trout	3.7	2.9	0.6	11.7
Trout, unspecified	5.3	2.4	2.3	16.1
Walleye	16.4	32.0	10.4	8.9
Whatever's biting	11.2	11.3	9.5	14.8
Other	4.6	5.6	3.5	5.9
N*	4,516	1,328	2,198	990

* N differs across tables because cross tabulation requires valid cases for both variables.

Table 11 presents the target species for trips that were to the various water bodies. Anglers taking a trip to an inland lake were much more likely to target bass, bluegill, panfish, and pike than were anglers at the Great Lakes or rivers. Anglers fishing at rivers and streams were much more likely to be targeting any type of trout as well as carp/catfish/suckers. Bass and walleye were also common targets at rivers. Anglers fishing at Great Lakes sites primarily targeted warm species (walleye, perch, bass), and were much more likely to target walleye or perch than were anglers taking trips to other water bodies. Anglers fishing at a Great Lake site were also more likely to target salmon. Bear in mind that this analysis considered Lake St. Clair and major connecting waters (St. Clair River, Detroit River) as Great Lake sites.

Table 12: Reasons for Fishing

	Valid Cases	Column % over all reasons	Column % by reason				Row % of reason			
			Be with people	Enjoy nature	Catch fish	Other	Be with people	Enjoy nature	Catch fish	Other
All cases	1908						13.2	47.3	31.5	7.7
Residence zone	1893									
1 Metro tri-county		38.2	40.8	39.6	34.7	38.2	14.1	49.1	28.8	8.0
2 Mid Michigan		42.9	40.4	42.7	43.5	42.9	12.4	47.2	32.1	8.3
3 Upper Michigan		18.9	18.8	17.6	21.8	18.9	13.1	44.1	36.6	6.1
Angler avidity group*	1894									
1 Frequent		16.4	9.6	15.1	19.5	24.0	7.7	43.4	37.6	11.3
2 Moderate		49.7	42.6	49.6	54.1	44.5	11.4	47.2	34.5	6.9
3 Infrequent		33.9	47.8	35.4	26.5	31.5	18.7	49.4	24.8	7.2
Fished during panel*	1893									
No		48.1	54.4	45.0	51.2	44.2	14.9	44.2	33.7	7.1
Yes		51.9	45.6	55.0	48.8	55.8	11.6	50.2	29.8	8.4

* Using Pearson's Chi-square test of independence, the reasons differ significantly at the 1% level by angler avidity group and at the 5% level for those who did and did not fish during the panel (p-value 0.014), but do not differ significantly by residence zones.

Respondents who completed the panel were asked about the reason which best describes *why* they fish (see Table 12). Overall, close to half the respondents chose the reason "to enjoy nature" (47%), while about a third (32%) chose the reason "to catch fish." These responses did differ by the angler's avidity group and by their zone of residence. No significant differences were seen in these responses when comparing across residence zones, i.e., this measure of anglers' motivations for fishing did not differ by regions. Responses for panel members who fished during the panel did differ significantly from those who did not fish. The potential anglers in our panel that did not end up fishing placed a little more emphasis on fishing to be with people and on catching fish and a little less emphasis on enjoying nature than did the anglers that fished during our survey.

Table 13: Distributions for Total Fishing Trips taken by Survey Panel Members

		Mean # trips	Distribution of Number of Fishing Trips (Cumulative %)									
			0	1	2	3	4	5	10	20	30	47
All trips			48.5	62.8	71.8	82.5	85.9	89.8	95.3	98.7	99.8	100
Trips > 0				27.8	45.2	57.7	66.1	72.7	90.8	97.5	99.6	100
Reason for Fishing												
Be with people	All trips	1.44	54.5	73.0	79.8	88.6	90.3	92.0	98.3	99.7	100	
	Trips>0	3.17		40.5	55.1	74.9	78.8	82.3	96.3	99.3	100	
Enjoy nature	All trips	2.42	45.0	59.9	70.8	77.3	82.8	86.5	95.1	98.7	99.9	100
	Trips>0	4.39		27.1	47.0	58.7	68.7	75.4	91.2	97.6	99.7	100
Catch fish	All trips	2.49	51.1	62.9	71.5	77.4	80.6	84.1	94.9	98.3	99.5	100
	Trips>0	5.10		24.1	41.7	53.7	60.4	67.4	89.6	96.5	99.0	100
Other	All trips	3.07	44.3	60.2	62.9	68.5	74.7	79.2	91.5	98.7	100	
	Trips>0	5.51		28.6	33.3	43.4	54.5	62.6	84.8	97.7	100	

Table 13 presents the distribution of trips broken out by the responses to the questions about an angler’s main reason for fishing. Anglers whose main reason for fishing is to be with people take significantly fewer trips than do anglers whose reason is to enjoy nature. Anglers whose main reason for fishing is to catch fish take significantly more trips than either of these groups.

Respondents who completed the panel were also asked about the importance of various reasons for choosing *where* to fish (questions *S14a* to *S14i* in Table 14, see also the survey instrument in the appendix). The answers are summarized in Table 14. Environmental factors were rated very important by most panel members (i.e., *S14c* and *S14g*). Fish variety and quantity as well as boat access were very important for reasons choosing where to fish for many anglers (i.e., *S14d*, *S14f* and *S14b*), while parking, restroom facilities and trophy-sized fish were not at all important for many anglers (i.e., *S14.a*, *S14.e* and *S14.i*).

Table 14: Importance of Reasons for Choosing Where to Fish.

S14.x Reason:	Not at all important	Somewhat important	Very important	Mean[†]
	%	%	%	
S14.a Site has plenty of parking spaces	43	32	25	1.8
S14.b Site has good boat access	29	32	39	2.1
S14.c Site has water that is clean enough to swim in	15	20	65	2.5
S14.d Site has a variety of fish species	9	41	50	2.4
S14.e Good chance to catch a trophy-sized fish at the site	45	33	22	1.8
S14.f Good chance you will catch a lot of fish at the site	15	42	43	2.3
S14.g Fish at site do not contain chemical residues	4	8	88	2.8
S14.h Site is close to home	37	44	20	1.8
S14.i Site has restroom facilities with running water	40	33	28	1.9

† The mean is calculated by assigning the following values: "not at all"= 1, "somewhat"=2, and "very"=3.

SUMMARY

This report has used the angler survey data collected at Michigan State University in the mid 1990s to create a profile of Michigan anglers. The data from this report represents that activities of Michigan adult anglers during the period April 1, 1994 to October 31, 1994. Moreover, the trips discussed are only for the trips by Michigan residents that were taken in Michigan. The survey sample size exceeds that of the national survey by a factor of five, and extensive efforts went into assuring the representativeness of the data. Never the less, it is only one data set and cannot meet all management information needs. Caveats aside, the report seeks to fill some of the void in data on fishing behaviors so that managers can access the information to support resource allocation decisions. Current web based technologies and the electronic licensing system provide many opportunities for renewed and ongoing monitoring of angler behavior. It is hoped that this report can assist with the development of longer term tracking of the status and trends of Michigan anglers fishing behaviors and preferences.

REFERENCES

- Jamsen, G. 1985. *Michigan's 1981 and 1982 Sport Fishery*, Technical Reports 85-4 and 85-5, Fisheries Division, Michigan Department of Natural Resources, Ann Arbor, MI.
- Hoehn, J., T. Tomasi, F. Lupi, and H. Chen. 1996. *An Economic Model for Valuing Recreational Angling Resources in Michigan*, Report to the Michigan Department of Environmental Quality, Department of Agricultural Economics, Michigan State University, East Lansing, MI, December 1996.
- Kikuchi, H. 1986. *Segmenting Michigan's Sport Fishing Market: Evaluation of Two Approaches*, PhD Dissertation, Michigan State University.
- Lupi, F., J. Hoehn, H. Chen and T. Tomasi. 2001. "The Michigan Recreational Angling Demand Model," in *Macrobehavior and Microresults: Proceedings of International Institute of Fisheries Economics and Trade*, (Ann Shriver, ed.), Oregon State University, Corvallis, OR.
- Lupi, F., and J. Hoehn. 2001. "Case Study of a Travel-Cost Analysis: The Michigan Angling Demand Model," in *Revealing the Economic Value of Protecting the Great Lakes* (A. Cangelosi, ed.). Northeast Midwest Institute: Washington D.C., pages 111-120, 2001.
- Lupi, F., J. Hoehn, G. Christie. 2003. "Using an Economic Model of Recreational Fishing to Evaluate Benefits of Sea Lamprey (*Petromyzon marinus*) Control on the St. Marys River," *J. of Great Lakes Research*. 29 (S1):742-754.
- Lupi, F. 2004. "Recreational Angling Trip Expenditures of Michigan Residents," Agricultural Economics Staff Paper 04-18, Department of Agricultural Economics, Michigan State University.
- Mahoney, E., D. Jester, and G. Jamsen. 1991. "Recreational Fishing in Michigan," in: *Travel and Tourism in Michigan: A Statistical Profile*, (D. Spotts, ed.), Travel, Tourism, and Recreational Resource Center. Michigan State University, 307-343.
- NSFHWAR Michigan. 2003. *2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, Michigan*. U.S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce, U.S. Census Bureau.
- Pollock, K. H., C. M. Jones, and T. L. Brown. 1994. *Angler Survey Methods and Their Applications in Fisheries Management*. American Fisheries Society Special Publication 25, Bethesda, Maryland.
- WESTAT, Inc., 1989. *Investigation of Possible Recall/Reference Period Bias in National Surveys of Fishing, Hunting, and Wildlife-Associated Recreation*, U.S. Department of the Interior, Washington, D.C.